1. Updated Other Buisness SBPF Conservation Commission Meeting Updated 1_08_20

   Documents:

   OTHER BUISNESS SBPF CONSERVATION COMMISSION MEETING UPDATED 1_08_20.PDF

TOWN OF NANTUCKET NATURAL RESOURCES DEPARTMENT

JEFF CARLSON, NATURAL RESOURCES DIRECTOR
2 BATHING BEACH ROAD
NANTUCKET, MA 02554

JCARLSON@NANTUCKET-MA.GOV
508-228-7230

10/23/2019

Siasconset Beach Preservation Fund
c/o Steven Cohen
P.O. Box 2279
Nantucket, MA 02584

Dear Attorney Cohen,
This is in regards to DEP File Number SE48-2824 and the potential meeting of a failure criteria as defined by special condition 34b. which states "failure to conduct the shoreline monitoring and post-storm monitoring as required herein." Special Condition 27 states that "The ongoing beach monitoring/survey program currently conducted by the Woods Hole Group shall continue. The monitoring program shall be conducted on a quarterly basis for the first 3 years in order to timely identify beach impacts that may be attributable to the Geotubes and to assess whether the mitigation program is adequate. Beach profiles shall be taken from the top of the coastal bank, coastal dune or Geotube seaward to the -5 foot MLW contour. Beach profile data and analysis shall be submitted to the Department and the NCC within 30 days of completion of the quarterly survey. Following 3 years of quarterly surveys, SBPF may request to amend the Order of Conditions to alter the monitoring program." The 78th Survey was provided to the Commission on March 12, 2019 from data collected in December of 2018 (4th quarter). The 79th survey was provided to the Commission on October 17, 2019 from data collected in September 2019 (3rd quarter). Given this time the reports for the 1st and 2nd quarter of 2019 were not filed which activates special condition 34b. As special condition 35 requires that "should any of the failure criteria be met, the Applicant shall schedule an appearance before the Conservation Commission at its next available hearing." To these ends the Conservation Commission is requesting that the Sconset Beach Preservation Fund attend the November 6th meeting of the Conservation Commission to discuss this matter. Please confirm that date, who will be representing SBPF and provide any materials for review by November 1st, 2019.

Sincerely,

Jeffrey Carlson
Town of Nantucket
Natural Resources Director

Epsilon ASSOCIATES INC.

Projects:\21597\2013 Emergency Project\Monitoring and Work Reports\

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October 31, 2019

Mr. Jeff Carlson
Nantucket Conservation Commission
2 Bathing Beach Road
Nantucket, MA 02554

Subject: SE44-2824 Baxter Road and Sconset Bluff Storm Damage Prevention Project

Dear Mr. Carlson,

We are in receipt of your letter dated October 23, 2019 regarding shoreline surveys pursuant to Special Condition 27, which seeks the continuance of the shoreline surveys performed by the Woods Hole Group on a quarterly basis for three years. This condition also allows the Siasconset Beach Preservation Fund ("SBPF") to request a reduced monitoring program after three years by requesting an Amended Order of Conditions. Condition 27 reads:

> *"The ongoing beach monitoring/survey program currently conducted by the Woods Hole Group shall continue. The monitoring program shall be <u>conducted on a quarterly basis for the first 3 years</u>* [emphasis added] *in order to timely identify beach impacts that may be attributable to the Geotubes and to assess whether the mitigation program is adequate. Beach profiles shall be taken on a quarterly basis along the 44 proposed profile lines. Beach profiles shall be taken from the top of the coastal bank, coastal dune or Geotube seaward to the -5 foot ML W contour. Beach profile data and analysis shall be submitted to the Department and the NCC within 30 days of completion of the quarterly survey. <u>Following 3 years of quarterly surveys, SBPF may request to amend the Order of Conditions to alter the monitoring program</u>.* [emphasis added]*"*

The SBPF submitted the Notice of Intent ("NOI") for the geotube extension project (DEP File No. 48-3115) in January 2018 in accordance with SE48-2824 Special Condition 18 which restricted any requests to extend the shoreline protection project to after January 1, 2018. Special Condition 18 also stated that:

> *"… The Commission will make its best efforts to review and decide such an application within 120 days. …"*

The Public Hearing on the extension project was opened September 17, 2018. Given the language in Special Condition 18 we expected a decision in January 2019. The decision however was not issued until June 2019. During the 6-month period (January 2019 to June 2019) i.e. Quarters 1 and 2 of 2019, we expected the hearing to close several times and that the Commission would issue a decision on the extension project. We expected at a minimum that the Commission would allow the survey monitoring program to be reduced from quarterly to semiannually since that had been clearly supported by Mr. Berman and because that was not an ongoing line of inquiry during the nine-month hearing process.

We note that for five years, 2013 through 2018, the SBPF conducted and submitted quarterly shoreline surveys and during that time the surveys did not reveal any adverse effect to adjacent beaches. The results of those surveys show significant variability in the shoreline with some periods exhibiting accretion and other periods exhibiting erosion. One of the conclusions from the 79th survey, reads as follows:

> "*… Although there is substantial variability, no post-geotube changes have yet been observed that deviate substantially from past observations. The present shoreline is at a similar location as ~10 years ago at many profiles.*"

The results of the 79th survey show that the shoreline is about where it was approximately 8 to 10 years ago in many locations, see Figures 6 through 12 which includes the geotube area and the shoreline some 1,200 feet to the south (Profile 90 – Figure 6) and some 1,050 feet to the north (Profile 93 – Figure 12).

We acknowledge that two quarterly surveys were not submitted. The Commissioners may recall that Josh Posner with SBPF suffered a serious illness this past winter / spring, and his illness contributed to scheduling delays and missed surveys. We provide this information as context, and we regret having not formally notified you of the missed surveys or requested as a separate action to change the survey monitoring frequency.

After the Order of Conditions was issued in June 2019, the Quarter 3 survey was scheduled and completed as quickly as the contractor could schedule it. The report was submitted to the Commission as the 79th Survey. The Quarter 4 survey is scheduled. SBPF will continue with the quarterly monitoring going forward in time until such time as the DEP issues a Superseding Order which we trust will allow for a reduced frequency or the Commission issues an Amended Order.

Please consider this letter a formal request to change the required survey monitoring frequency from quarterly to twice per year. This topic of reduced shoreline monitoring frequency has been discussed over the past several years. Reduced frequency has been proposed in all annual reports and the Commission's peer reviewer, Mr. Greg Berman, commented on this request in his review dated April 17, 2017:

> *"2.3 Shoreline Monitoring – The requested reduction to 2 profiles per year is reasonable based on the collected data so far as well as more consistent with MassDEP guidance. However the MassDEP guidance is based on strictly nourishment projects, not necessarily projects with a CES that needs to be monitored to ensure no negative impacts."*

Semi-annual monitoring is consistent with the monitoring protocol in the MassDEP Beach Nourishment Best Practices Guide (MassDEP, 2007), which suggest seasonal surveys for a year or so, followed by annual surveys for monitoring beach nourishment projects. The National Research Council also recommends a similar approach to beach profile monitoring, which suggests reducing the frequency of surveys over time (National Academy Press, 1995). The established logic behind these common shoreline monitoring frequency standards is that natural short-term volatility of shoreline location and volume is such that no statistically valid conclusions regarding sustained changes in shoreline behavior can be drawn from observations less than 6-12 months apart. To be consistent with standard engineering practice, which typically is focused on capturing an eroded "winter" profile along with a recovered "summer" profile after more quiescent periods, if there will be two surveys per year, one survey is proposed for late winter / early spring and the other is proposed in late summer.

The SBPF also has consistently conducted post-storm inspections and provided that information along with the documentation of post-storm maintenance to the Commission on a timely basis.

In closing, the SBPF is again on track to conduct quarterly monitoring going forward until such time as the issuing authorities allow a reduced frequency of semi-annual shoreline monitoring.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

cc: J. Posner, SBPF
S. Cohen, Cohen & Cohen law, PC
G. Wood, Rubin and Rudman, LLC
N. Corcoran, DER-SERO

Sconset Bluff Sediment Analysis Tracking (2019 Sand Sources)

Source	Date	Analyzed By	Texture			Compatable
			Phi	ASTM	Phi Range (Wentworth)	
Sheep Commons Lane	11-Jan-19	Alpha Analytical		94% Sand *6% coarse* *60% medium* *28% fine sand*	 0.5-1.0 1.0-2.0 2.0+	Yes
South Shore Road	8-Aug-19	Peter Rosen	1.02	92% Sand		Yes
17/19 Spearhead Road	26-Aug-19	Peter Rosen	0.89	92% Sand		Yes
21 Derrymore Road	7-Sep-19	Peter Rosen	1.0	92% Sand		Yes
77 Pocomo Road	16-Sep-19	Peter Rosen	1.03	96% Sand		Yes
18 Greglan Road	12-Oct-19	Peter Rosen	0.78	94% Sand		Yes
Sand Sample Textural Range (Phi) to date			0.78 - 1.05	Sand sources to date within range of on-site beach sediment texture		

On-Site Sediments:

Beach Sediment Textural Range (1998 - 2006)	0.7 - 1.5	Medium to Coarse Sand
Bank Sediment Textural Range (2001 - 2006)	1.2 - 2.0	Medium Sand

Background Information:

On-Site Sediment Texture	Year	Phi	Classification (Wentworth)
Coastal Bank Sediments	2001	2	Medium-Fine Sand
	2003	1.8	Medium Sand
	2006	1.2	Medium Sand
Beach Sediments	1998	1.5	Medium Sand
	2001	1	Medium-Coarse Sand
	2003	0.9	Coarse Sand
	2006	0.7	Coarse Sand

Phi Scale	Wentworth Classification
-1 to 0	Very coarse sand
0 to 1	Coarse sand
1 to 2	Medium sand
2 to 3	Fine sand
3 to 4	Very fine sand

ANALYTICAL REPORT

Lab Number:	L1900688
Client:	Epsilon Associates, Inc. 3 Mill & Main Place Suite 250 Maynard, MA 01752
ATTN:	Dwight R. Dunk
Phone:	(978) 897-7100
Project Name:	SBPF
Project Number:	21597
Report Date:	01/11/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: SBPF
Project Number: 21597

Lab Number: L1900688
Report Date: 01/11/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1900688-01	SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET	SOIL	NANTUCKET, MA	01/04/19 11:00	01/07/19

Project Name: SBPF
Project Number: 21597

Lab Number: L1900688
Report Date: 01/11/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: SBPF
Project Number: 21597

Lab Number: L1900688
Report Date: 01/11/19

Case Narrative (continued)

Grain Size Analysis

The WG1195627-1 Laboratory Duplicate RPDs for % fine gravel (43%), % total gravel (43%) and % total fines (32%), performed on L1900688-01, are outside the acceptance criteria. The elevated RPDs have been attributed to the non-homogeneous nature of the native sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative

Date: 01/11/19

INORGANICS
&
MISCELLANEOUS

Project Name: SBPF
Project Number: 21597

Lab Number: L1900688
Report Date: 01/11/19

SAMPLE RESULTS

Lab ID: L1900688-01
Client ID: SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET
Sample Location: NANTUCKET, MA
Sample Depth:
Matrix: Soil

Date Collected: 01/04/19 11:00
Date Received: 01/07/19
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Grain Size Analysis - Mansfield Lab										
Cobbles	ND		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Coarse Gravel	ND		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Fine Gravel	7.30		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Total Gravel	7.30		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Coarse Sand	5.20		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Medium Sand	56.0		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Fine Sand	29.7		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Total Sand	90.9		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD
% Total Fines	1.80		%	0.100	NA	1	-	01/08/19 08:35	12,D6913/D7928	GD

Lab Duplicate Analysis

Batch Quality Control

Project Name: SBPF

Project Number: 21597

Lab Number: L1900688

Report Date: 01/11/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Grain Size Analysis - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1195627-1 QC Sample: L1900688-01 Client ID: SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET						
Cobbles	ND	ND	%	NC		20
% Coarse Gravel	ND	ND	%	NC		20
% Fine Gravel	7.30	4.70	%	**43**	Q	20
% Total Gravel	7.30	4.70	%	**43**	Q	20
% Coarse Sand	5.20	6.00	%	14		20
% Medium Sand	56.0	60.0	%	7		20
% Fine Sand	29.7	28.0	%	6		20
% Total Sand	90.9	94.0	%	3		20
% Total Fines	1.80	1.30	%	**32**	Q	20

Project Name: SBPF
Project Number: 21597

Lab Number: L1900688
Report Date: 01/11/19

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
N/A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1900688-01A	Bag	N/A	NA		20.7	Y	Absent		A2-HYDRO-TFINE(),A2-HYDRO-CGRAVEL(),A2-HYDRO-FSAND(),A2-HYDRO-MSAND(),A2-HYDRO-TGRAVEL(),A2-HYDRO-CSAND(),A2-HYDRO-TSAND(),A2-HYDRO-COBBLES(),A2-HYDRO-FGRAVEL()

*Values in parentheses indicate holding time in days

Project Name:	SBPF	**Lab Number:**	L1900688
Project Number:	21597	**Report Date:**	01/11/19

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Report Format: Data Usability Report

Project Name: SBPF **Lab Number:** L1900688

Project Number: 21597 **Report Date:** 01/11/19

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name: SBPF **Lab Number:** L1900688
Project Number: 21597 **Report Date:** 01/11/19

REFERENCES

12 Annual Book of ASTM Standards. (American Society for Testing and Materials) ASTM International.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

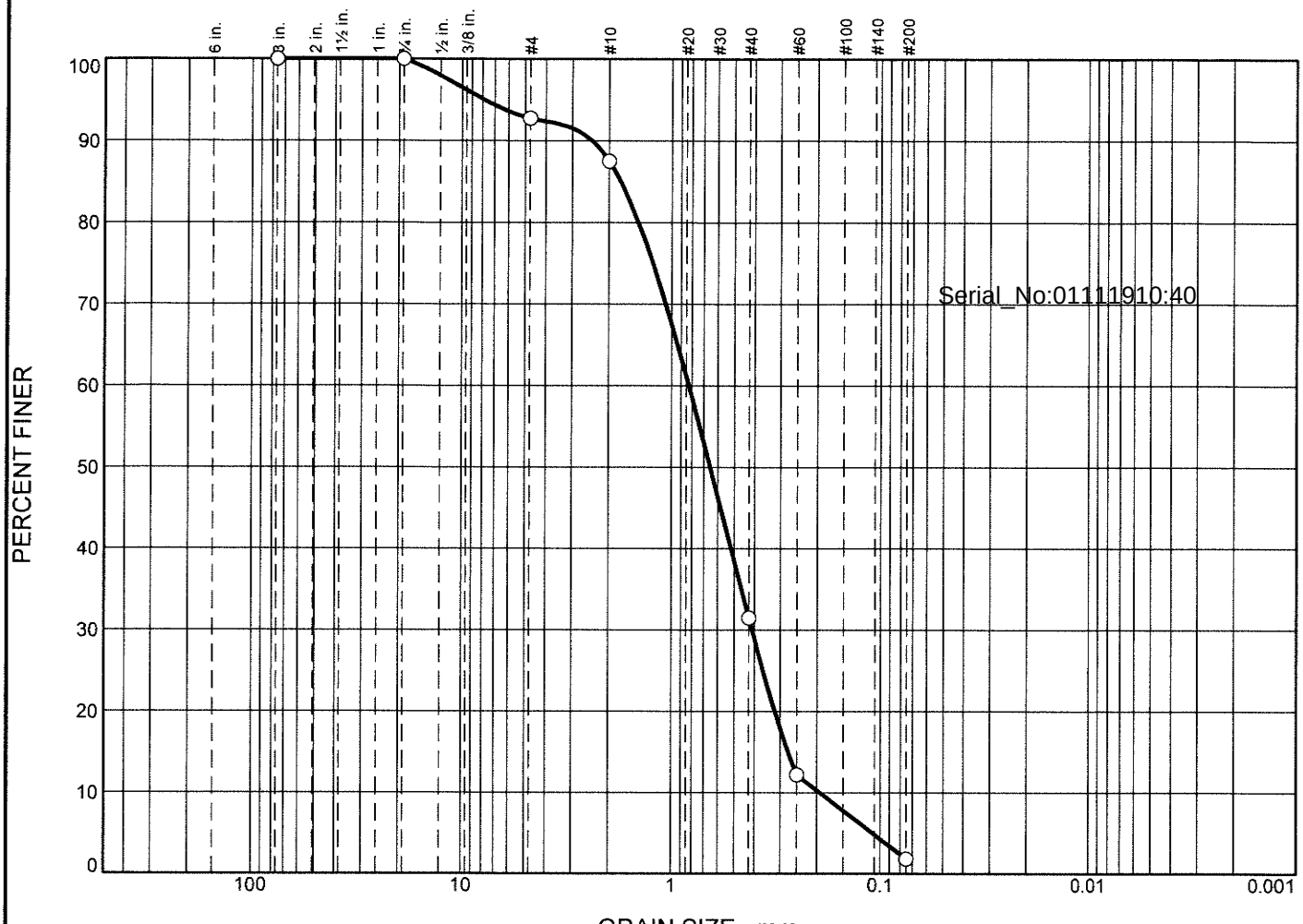
We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Serial_No:01111910:40

ASTM D6913/D7928

GRAIN SIZE ANALYSIS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	7.3	5.2	56.0	29.7	1.8	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				1.7597	0.8267	0.6525	0.4102	0.2751	0.1939	1.05	4.26

	Material Description	USCS	AASHTO
○		SP	

Project No. **Client:**

Project:

○ **Source:** SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET

Date: ○

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

1/10/2019

Location: SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET
Sample Number: L1900688-01
USCS Classification: SP

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 88.88
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:01111910:40

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
88.88	0.00	3	0.00	0.00	100.0
		0.75	0.00	0.00	100.0
		#4	6.46	0.00	92.7
		#10	4.66	0.00	87.5
		#40	49.77	0.00	31.5
		#60	17.16	0.00	12.2
		#200	9.21	0.00	1.8

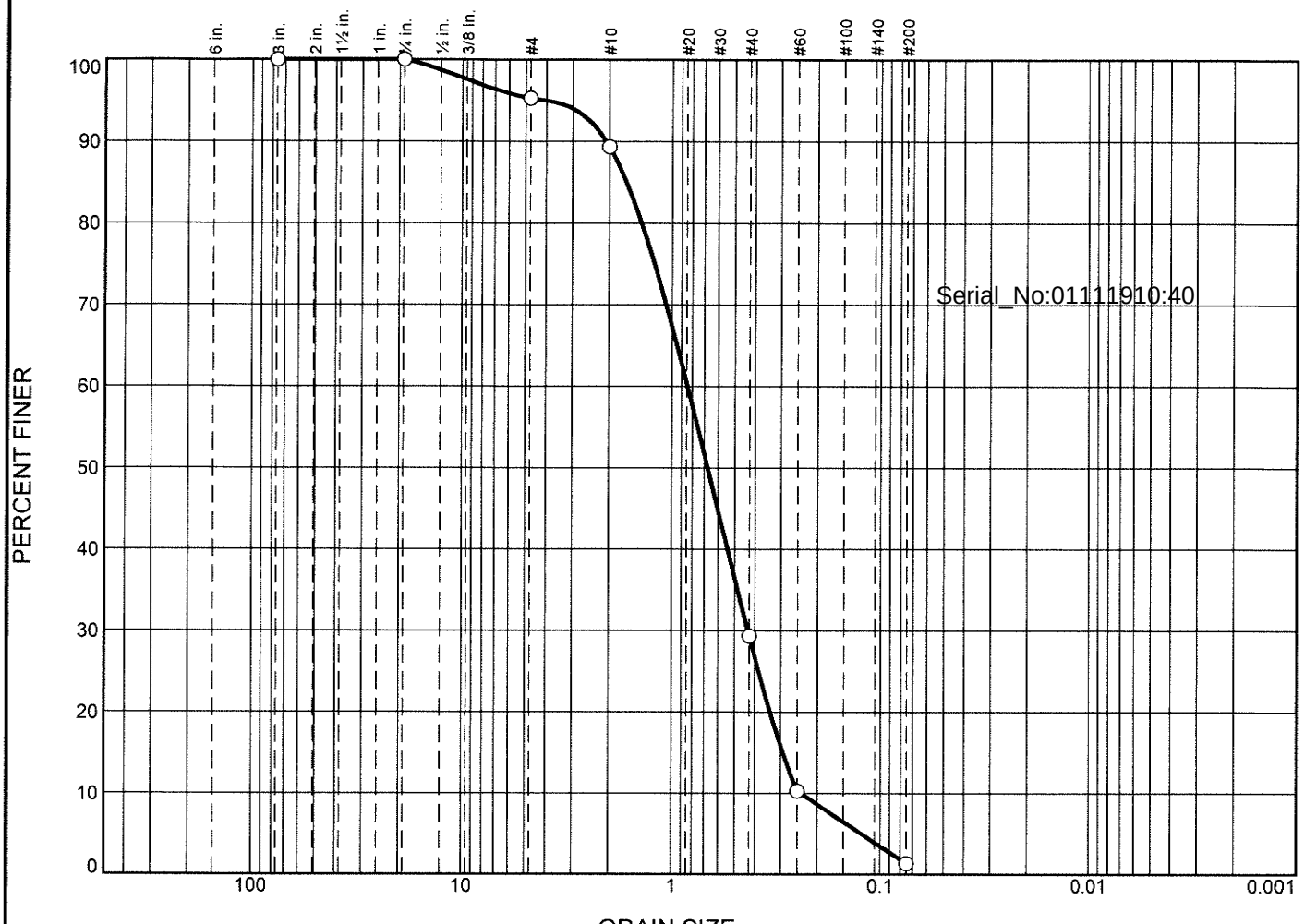
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	7.3	7.3	5.2	56.0	29.7	90.9			1.8

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1085	0.1939	0.2751	0.3185	0.4102	0.5183	0.6525	0.8267	1.4460	1.7597	2.4193	7.8203

Fineness Modulus	C_u	C_c
2.76	4.26	1.05

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.7	6.0	60.0	28.0	1.3	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				1.6584	0.8423	0.6739	0.4316	0.2930	0.2408	0.92	3.50

	Material Description	USCS	AASHTO
○		SP	

Project No. **Client:**

Project:

○ **Source:** SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET

Date: ○

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

1/10/2019

Location: SAND STOCK PILE- 2 SHEEP COMMONS LANE, NANTUCKET
Sample Number: WG1195627-1
USCS Classification: SP

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 89.22
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:01111910:40

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
89.22	0.00	3	0.00	0.00	100.0
		0.75	0.00	0.00	100.0
		#4	4.21	0.00	95.3
		#10	5.30	0.00	89.3
		#40	53.53	0.00	29.3
		#60	17.01	0.00	10.3
		#200	7.97	0.00	1.3

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	4.7	4.7	6.0	60.0	28.0	94.0			1.3

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1227	0.2408	0.2930	0.3374	0.4316	0.5410	0.6739	0.8423	1.4036	1.6584	2.0732	4.0450

Fineness Modulus	C_u	C_c
2.74	3.50	0.92

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.

EPA 6860: SCM: Perchlorate

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE OF

ALPHA ANALYTICAL

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 1/7/19

ALPHA Job #: L1900688

Project Information

Project Name: SBPF

Project Location: NANTUCKET, MA

Project #:

Project Manager: JAMES D. FEELEY

ALPHA Quote #:

Turn-Around Time

☐ Standard ☒ Rush (ONLY IF PRE-APPROVED)

Client Information

Client: COTTAGE + CASTLE

Address: 37 OLD SOUTH RD. #6 NANTUCKET, MA 02554

Phone: (508) 825-8825

Fax:

Email: Chris@cottageandcastleinc.com

☐ These samples have been Previously analyzed by Alpha

Due Date: Time:

Report Information Data Deliverables

☐ FAX ☒ EMAIL

☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

EPSILON ASSOC, INC.

Regulatory Requirements/Report Limits

State/Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

SAND ANALSIS FOR SBPF REPLENISHMENT SAND. CONTACT DWIGHT DUNK @ EPSILON ASSOCIATES WITH QUESTIONS. (978) 461-6226

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☐ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

TOTAL # BOTTLES

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials													Sample Specific Comments
L0688.01	2 SHEEP COMMONS LANE	1/4/19	11:00 AM			☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	SAND STOCK PILE -					☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	2 SHEEP COMMONS					☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	LANE, NANTUCKET, MA					☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	02554					☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
					Container Type	-	-	-	-	-	-	-	-	-	-	-	-	
					Preservative	-	-	-	-	-	-	-	-	-	-	-	-	

Relinquished By:	Date/Time	Received By:	Date/Time
		Fedex	
Fedex		[illegible], AAC	01/07/19 09:[illegible]

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I-NJ) (rev. 8-JAN-12)

GEO/PLAN ASSOCIATES
30 MANN STREET
HINGHAM, MASSACHUSETTS 02043-1316
(781) 740-1340
geoplanassoc@gmail.com

August 8, 2019

Epsilon Associates
P.O. Box 700
Maynard, Massachusetts 01754-0700

Attention: Mr. Dwight Dunk

Re: Nourishment Sand Compatibility Analysis, 18 South Shore Road, Nantucket

Dear Mr. Dunk:

I performed size analyses of composite sediment samples from two locations at 18 South Shore Road, Nantucket The purpose of this letter is to evaluate the suitability of these sediment sources as mitigation sediment for a segment of beach along Siasconset Beach, Nantucket. The project area is within previously-identified sampling sites designated as sediment sampling transects (Line 15 through Line 19). Extensive sediment sampling of the area (beach, bank, dune) was performed in 2006 along these lines and adjacent areas by Coastal Planning and Engineering, Inc. Other grain size data from this beach area is available from earlier sampling in 1998, 2001, and 2003. Some of these samples I collected and analyzed.

The mean sizes of the composite samples and other characteristics are compiled below for comparison. While the methodologies for analysis are consistent, the reporting of the data, the lateral extent of the sampling along Siasconset Beach, and the field sampling methods may vary. This doesn't affect the documentation of the sand characteristics, and the resulting time-series provides a measure of variability of the natural sands over time.

D. Discussion

Compatible beach sediment is not sand that exactly matches the existing beach, but rather sediment that is relatively stable and can coexist with the naturally-deposited sediment in the coastal setting. If the compatibility of the sediment is evaluated relative to potential stability of the beach (which is generally the case), **compatible sediment is equal or coarser than the existing sediment.**

The proposed source areas are glacial outwash sediments. Both samples have insignificant mud (<1%), which is a plus for compatibility, as mud is quickly lost, and the most common objections are based on aesthetics or water turbidity. Both of the proposed source areas are geologically the same material (glacial outwash sediments) from the same vicinity as the natural bank materials. Both samples contain some gravel. While the gravel does not necessarily match surface beach sediment samples, small gravel is a visible component of these beaches and the adjacent shallow nearshore. Importantly, both samples are medium sand which is coarser than the natural sourse, which is the coastal bank, These coarser sands have the greatest likelihood of remaining stable on Siasconset Beach. While the sizes are reported as means, there is a range of sizes finer and coarser in all samples. However, both the natural beach sediment and both potential pit sources have very small amounts of sand finer than medium sand. This is the component of the sand that is more likely to be lost from the beach. Therefore, the wave sorting will likely re-sort nourishment sand to have comparable sizes to existing conditions, or coarser, so most of the source material will have as great a probability of remaining within the adjacent beach system as the natural bank material.

Both sand pit sediment samples are slightly coarser than both of the natural bank. Much of the variation in mean size is due to differences in gravel content. The differences in gravel content, however, are not significant. Grain size is measured by weight, which is affected by gravel greater than if it were measured by volume, which is how sediment is specified for mitigation purposes. Therefore, both proposed source pit sediments are beach-compatible sediments.

Please feel free to contact me if there are further questions concerning the evaluation of these sand samples.

Yours truly,

Peter S. Rosen

Peter S. Rosen, Ph. D.
Coastal Geologist

A. 18 South Shore Road, Nantucket

Sample 1	Mean:	1.02 phi	(medium sand)
	Sorting Coefficient:	1.35	(poorly sorted)
	92% sand, 08% gravel		
	mud insignificant		

Sample 2

Mean:	1.05 phi	(medium sand)
Sorting Coefficient:	1.27	(poorly sorted)
94% sand, 06% gravel		
mud insignificant		

B. Natural Bank Sediments

2001: 2.0 phi (medium – fine sand) includes 8% mud
2003: 1.8 phi (medium sand) includes 5.5% pebbles or granules
2006: 1.2 phi (medium sand) includes minor fine pebbles/granules

The bank sediments range between medium-fine sand to medium sand, and contain varying amounts of fine gravel and mud. Direct observation of this coastal bank shows that, although dominantly sand, there is frequently a mud and gravel component and periodic mud layers and clay banks are part of the deposit. The fine or coarse tails and the variation in sizes are typical for glacial outwash sediments in this setting.

C. Beach Sediments

1998: 1.5 phi (medium sand)
2001: 1.0 phi (medium – coarse sand)
2003 0.9 phi (coarse sand)
2006: 0.7 phi (coarse sand)

The 2006 samples are coarser than the earlier samples, either due to natural variation in sand sources over time, or cyclic changes in size related to energy. Regardless of the cause, these four sampling intervals indicate that the mean size of the natural sediment on the beach fluctuates, but is not coarser that the 0.7 phi 2006 samples.

GEO/PLAN Associates
Sediment Grain Size Analysis Summary
Client: Epsilon Associates
Project Name: SBPF
Project Location: 18 South Shore Road, Nantucket, MA
Project No.
August 2019

	%	%	%	%	PHI PERCENT										Total Sample		Coarse Only	
Sample Number	**Gravel**	**Sand**	**Silt**	**Clay**	>-5	-4	-3	-2	-1	0	1	2	3	4	Mean	Std Dev	Mean	Std Dev
Sample 1	7.8	92.2	0.0	0.0	0.00	0.00	0.00	2.66	5.15	12.77	25.96	28.32	20.38	4.76	1.02	1.35	1.02	1.35
Sample 2	5.8	94.2	0.0	0.0	0.00	0.00	0.00	0.75	5.04	14.13	27.23	30.25	16.82	5.78	1.05	1.27	1.05	1.27

GEO/PLAN Associates
Sediment Grain Size Analysis
Client: Epsilon Associates
Project Name: SBPF
Project Location: 18 South Shore Road, Nantucket, MA
Project No.
August 2019

Sample: **Sample 1**

Phi	Cum Wt	Total Wt	% Wt	Cum %	Sand Only % Wt	Sand Only Cum %
>-5	0.00	0.00	0.00	0.00	0.00	0.00
-4	0.00	0.00	0.00	0.00	0.00	0.00
-3	0.00	0.00	0.00	0.00	0.00	0.00
-2	1.26	1.26	2.66	2.66	2.66	2.66
-1	3.68	2.43	5.15	7.81	5.15	7.81
0	9.70	6.02	12.77	20.59	12.77	20.59
1	21.92	12.23	25.96	46.54	25.96	46.54
2	35.26	13.34	28.32	74.86	28.32	74.86
3	44.86	9.60	20.38	95.24	20.38	95.24
4	47.10	2.24	4.76	100.00	4.76	100.00

Phi	Total Wt	Bkr Wt	Corr. Wt	Wt Frac	% Wt	Bk No.
Silt	0.0000	0.0000	0.0000	0.0000	0.0000	--
Clay	0.0000	0.0000	0.0000	0.0000	0.0000	--
		Disp. Wt	0.0000			

Wt. Coarse	47.0950
Wt Fine	0.0000
Total Wt	47.0950

Phi	Wt %	Phi Mid Pt	Wt % Mid Pt	Mid pt - Mean (=X)	X sq	X sq Wt %
>-5	0.00	-5.50	0.00	-6.52	42.55	0.00
-4	0.00	-4.50	0.00	-5.52	30.50	0.00
-3	0.00	-3.50	0.00	-4.52	20.46	0.00
-2	2.66	-2.50	-6.66	-3.52	12.41	33.07
-1	5.15	-1.50	-7.72	-2.52	6.36	32.77
0	12.77	-0.50	-6.39	-1.52	2.32	29.62
1	25.96	0.50	12.98	-0.52	0.27	7.10
2	28.32	1.50	42.47	0.48	0.23	6.45
3	20.38	2.50	50.96	1.48	2.18	44.48
4	4.76	3.50	16.65	2.48	6.14	29.19
Silt	0.00	6.00	0.00	4.98	24.77	0.00
Clay	0.00	9.00	0.00	7.98	63.63	0.00
TOTAL	100.00		102.29			182.67

Total Sample		Mean =	1.02	Variance =	1.83
				Sample SD =	1.35
Coarse Only	100.00		102.29		182.67
		Mean =	1.02	Variance =	1.83
				Sample SD =	1.35

Gravel	Sand	Silt	Clay	Total
7.8	92.2	0.0	0.0	100.0

Sand	Silt	Clay	Total
100.0	0.0	0.0	100.0

GEO/PLAN Associates
Sediment Grain Size Analysis
Client: Epsilon Associates
Project Name: SBPF
Project Location: 18 South Shore Road Nantucket, MA
Project No.
August 2019

Sample: **Sample 2**

Phi	Cum Wt	Total Wt	% Wt	Cum %	Sand Only % Wt	Sand Only Cum %
>-5	0.00	0.00	0.00	0.00	0.00	0.00
-4	0.00	0.00	0.00	0.00	0.00	0.00
-3	0.00	0.00	0.00	0.00	0.00	0.00
-2	0.44	0.44	0.75	0.75	0.75	0.75
-1	3.40	2.96	5.04	5.79	5.04	5.79
0	11.70	8.30	14.13	19.92	14.13	19.92
1	27.69	15.99	27.23	47.15	27.23	47.15
2	45.45	17.77	30.25	77.40	30.25	77.40
3	55.33	9.88	16.82	94.22	16.82	94.22
4	58.72	3.40	5.78	100.00	5.78	100.00

Phi	Total Wt	Bkr Wt	Corr. Wt	Wt Frac	% Wt	Bk No.
Silt	0.0000	0.0000	0.0000	0.0000	0.0000	--
Clay	0.0000	0.0000	0.0000	0.0000	0.0000	--
		Disp. Wt	0.0000			

Wt. Coarse	58.7200
Wt Fine	0.0000
Total Wt	58.7200

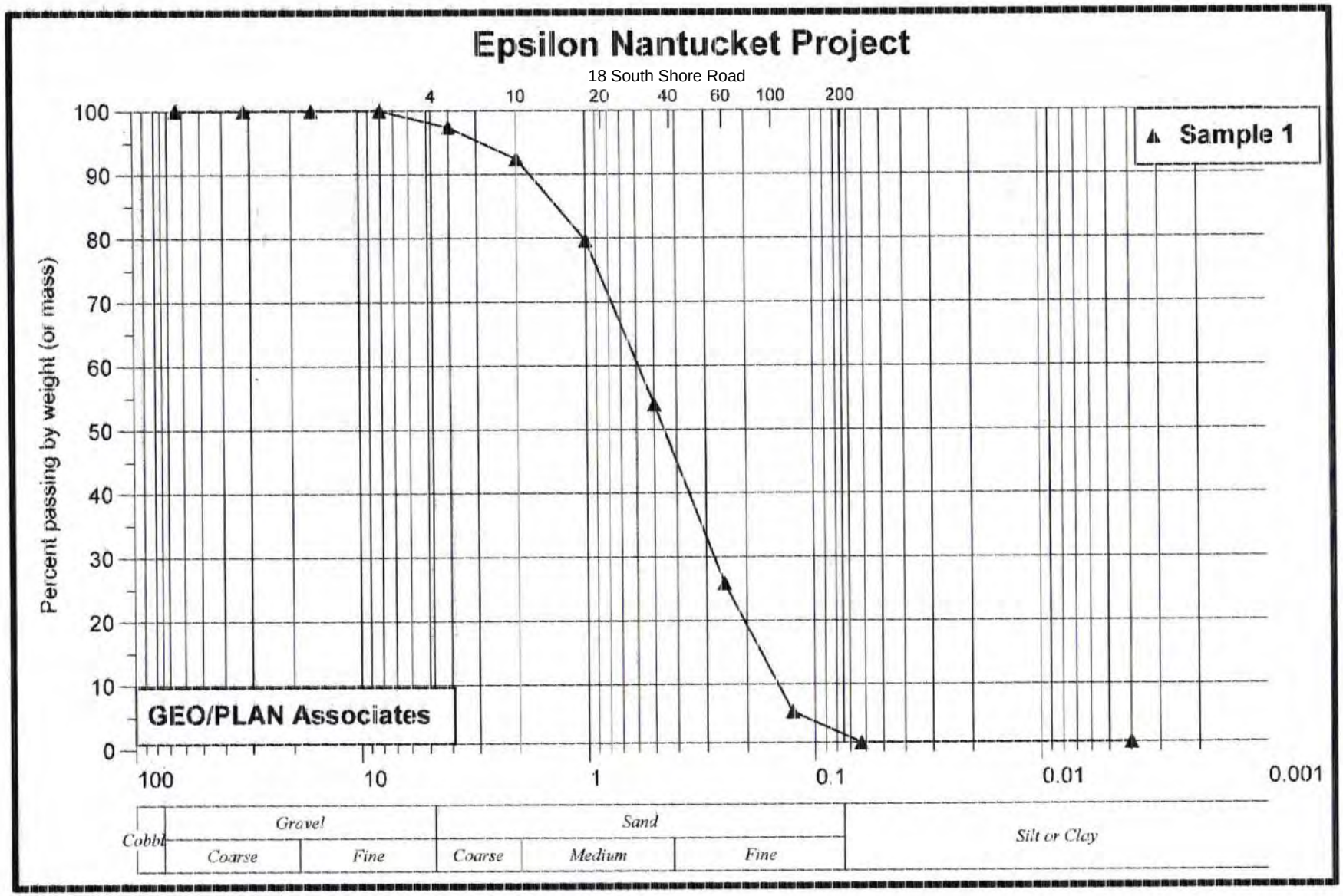
Phi	Wt %	Phi Mid Pt	Wt % Mid Pt	Mid pt - Mean (=X)	X sq	X sq Wt %
>-5	0.00	-5.50	0.00	-6.55	42.87	0.00
-4	0.00	-4.50	0.00	-5.55	30.78	0.00
-3	0.00	-3.50	0.00	-4.55	20.68	0.00
-2	0.75	-2.50	-1.87	-3.55	12.59	9.43
-1	5.04	-1.50	-7.56	-2.55	6.49	32.72
0	14.13	-0.50	-7.06	-1.55	2.40	33.84
1	27.23	0.50	13.62	-0.55	0.30	8.17
2	30.25	1.50	45.38	0.45	0.20	6.19
3	16.82	2.50	42.04	1.45	2.11	35.47
4	5.78	3.50	20.24	2.45	6.01	34.77
Silt	0.00	6.00	0.00	4.95	24.52	0.00
Clay	0.00	9.00	0.00	7.95	63.24	0.00
TOTAL	100.00		104.78			160.59

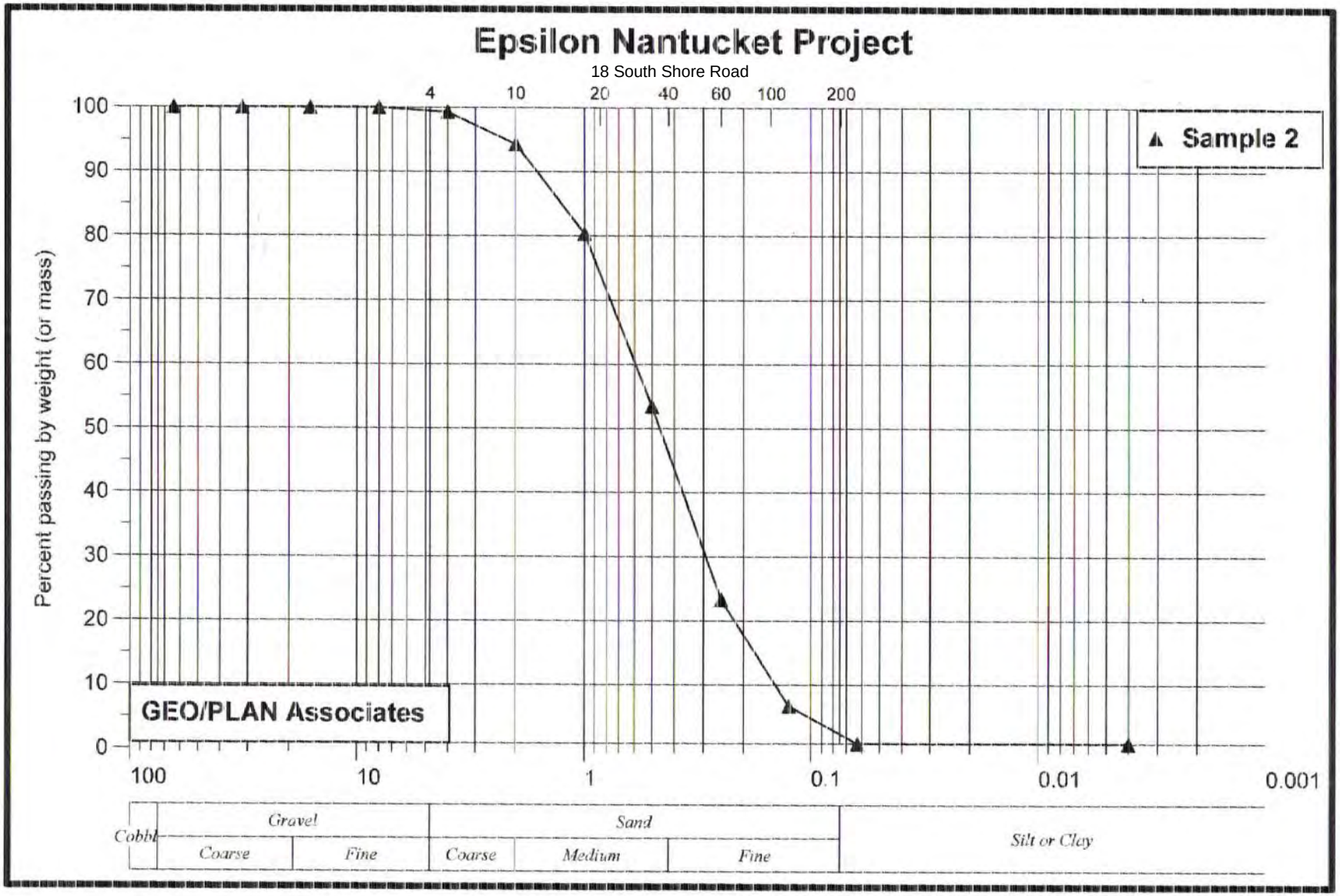
Total Sample Mean = 1.05 Variance = 1.61
Sample SD = 1.27

Coarse Only 100.00 104.78 160.59
Mean = 1.05 Variance = 1.61
Sample SD = 1.27

Gravel	Sand	Silt	Clay	Total
5.8	94.2	0.0	0.0	100.0

Sand	Silt	Clay	Total
100.0	0.0	0.0	100.0


Epsilon Nantucket Project
18 South Shore Road
4
10
20
40
60
100
200
Sample 1
Percent passing by weight (or mass)
100
90
80
70
60
50
40
30
20
10
0
GEO/PLAN Associates
100
10
1
0.1
0.01
0.001
Cobbl
Gravel
Coarse
Fine
Sand
Coarse
Medium
Fine
Silt or Clay


Epsilon Nantucket Project
18 South Shore Road
Sample 2
GEO/PLAN Associates
Percent passing by weight (or mass)
100
90
80
70
60
50
40
30
20
10
0
4
10
20
40
60
100
200
100
10
1
0.1
0.01
0.001
Cobbl
Gravel
Coarse
Fine
Sand
Coarse
Medium
Fine
Silt or Clay

MEMORANDUM

Date: 03 SEPT 2019

To: J. Feeley, Cottage + Castle

From: D.R. Dunk

Subject: 17 Spearhead Road, Nantucket, MA – Seive Analyses from Geotech Boring Samples

In addition to the sieve analyses Dr. Peter Rosen performs for material collected at 5- and 10-foot depths, McArdle Gannon Associates, Inc. also provided discrete sieve analyses for material collect at dept, some 17 – 20 feet deep at the same locations. There was no composite sample generated from this material, there I present the average and median as a surrogate for a composite sample. Data from the discrete locations are presented below in Table 1.

Table 1. Summary of Sieve Analyses from Spearhead Road, Nantucket MA

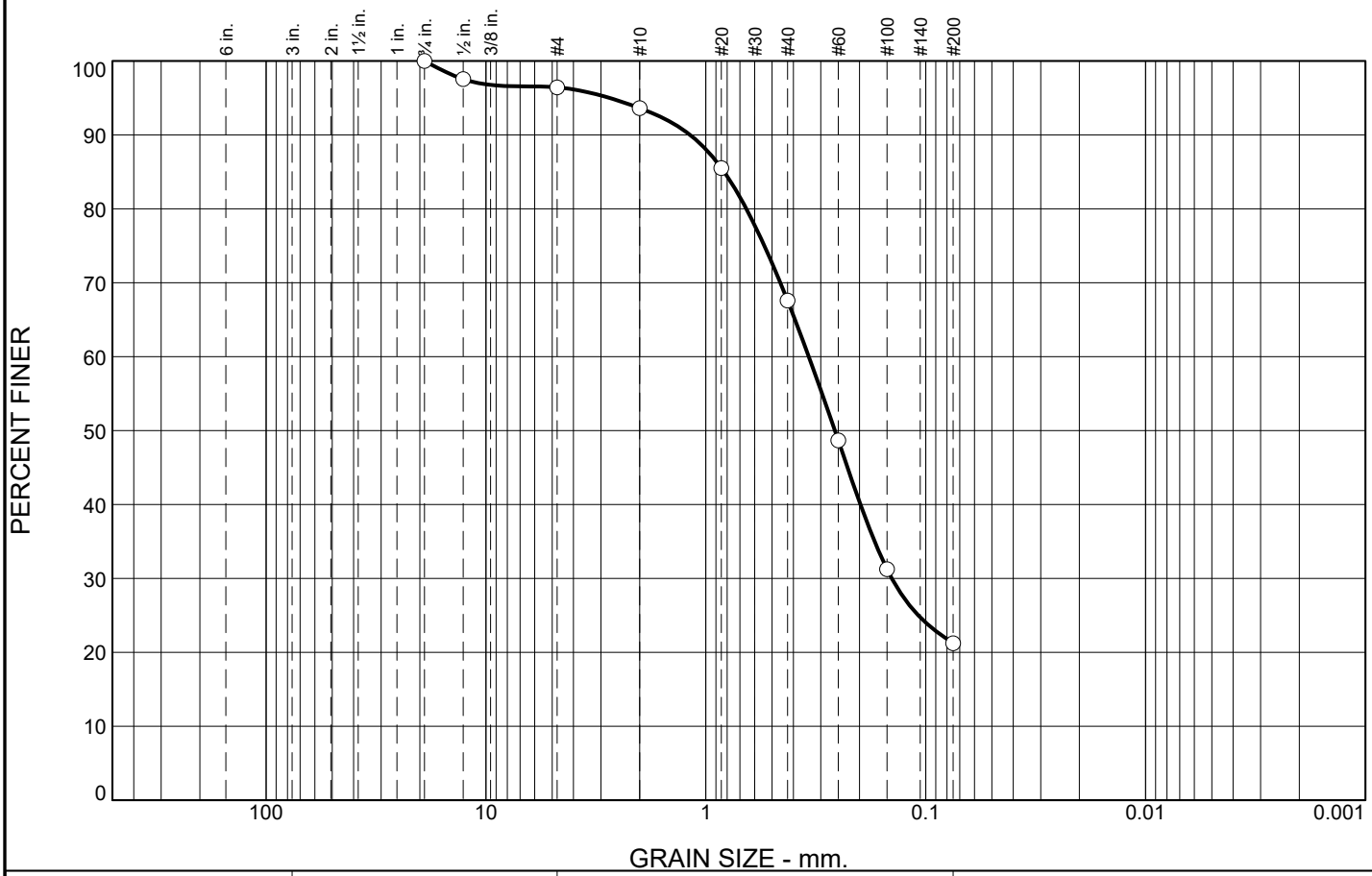
Sample ID / Depth	Gravel (%)	Sand (%)	Fines (%)	Total (%)
S-6 / 17' – 19'	3.6	75.2	21.2	100
S-8 / 22' – 24'	20.1	62.7	17.2	100
S-7 / 20' – 22'	3.9	79.3	16.8	100
S-8 (MGA 2) . 22' – 24'	12.6	74.6	12.8	100
S-6 (MGA 3) / 17' – 19'	11.2	76	12.8	100
S-9 / 25' - 27'	8.4	75.2	16.4	100
AVERAGE	9.97	73.83	16.20	
MEDIAN	9.8	75.2	16.6	

The material from depth, summarized above is primarily fine to coarse sand (73.8%), with the gravel fraction (±10%) being primarily being fine to very fine gravel, with about 16% fines (very fine sand and smaller). This material appears to be compatible with Sconset Beach beach sand. This deeper material when mixed with the shallower materials, analyzed separately by Dr. Rosen and determined to be compatible with Sconset Beach beach sand, to produce a site composite is likewise considered compatible with the beach sand.

Encl. Particle Size Distribution Reports

Epsilon ASSOCIATES INC.

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.6	2.8	26.0	46.4	21.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	97.6		
#4	96.4		
#10	93.6		
#20	85.5		
#40	67.6		
#60	48.7		
#100	31.3		
#200	21.2		

* (no specification provided)

Soil Description

Olive, fine to medium SAND, some (-) Silt, trace fine Gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1786 D_{85}= 0.8258 D_{60}= 0.3403
D_{50}= 0.2590 D_{30}= 0.1426 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

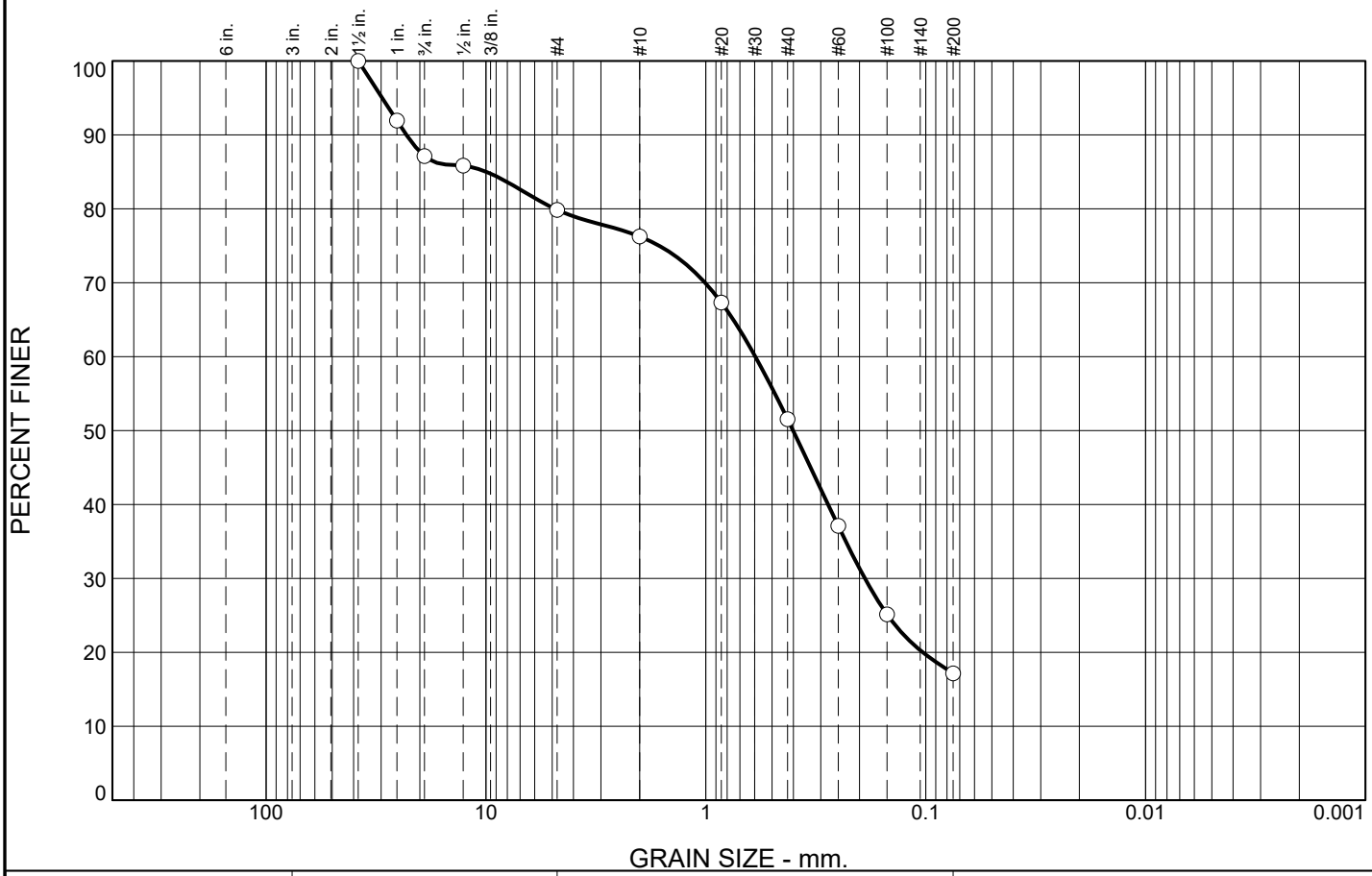
Existing Fill
Water Content: 13.6%

Source of Sample: MGA-1 **Depth:** 17 - 19'
Sample Number: S-6 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.9	7.2	3.6	24.7	34.4	17.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	91.9		
3/4	87.1		
1/2	85.8		
#4	79.9		
#10	76.3		
#20	67.3		
#40	51.6		
#60	37.1		
#100	25.1		
#200	17.2		

* (no specification provided)

Soil Description

Olive, fine to medium SAND, some (-) fine to coarse Gravel, little Silt, trace Brick.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 22.9882 D_{85}= 9.9559 D_{60}= 0.5951
D_{50}= 0.4010 D_{30}= 0.1890 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

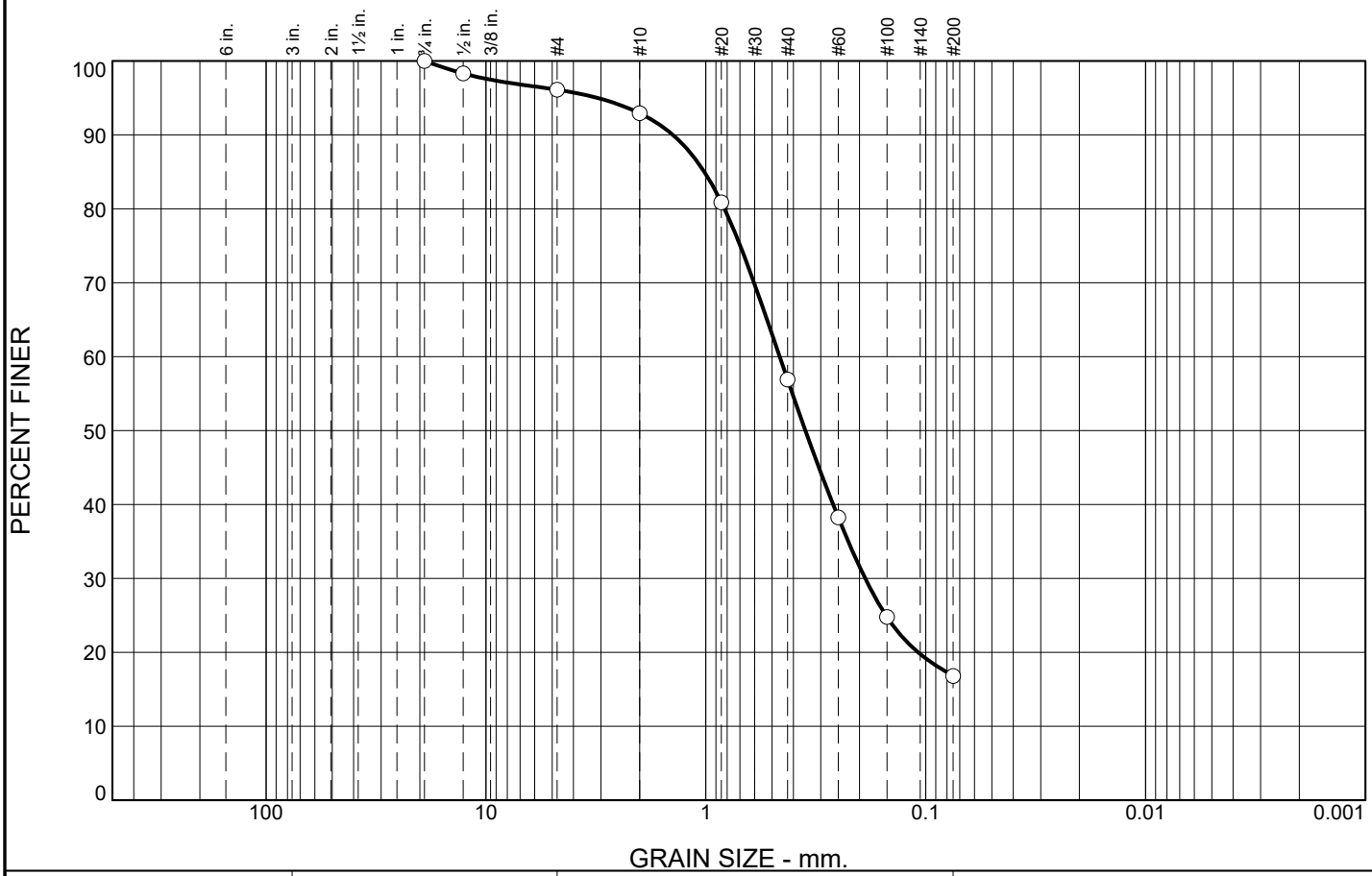
Existing Fill
Water Content: 11.2%

Source of Sample: MGA-1 **Depth:** 22 - 24'
Sample Number: S-8 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.9	3.2	36.0	40.1	16.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	98.3		
#4	96.1		
#10	92.9		
#20	80.9		
#40	56.9		
#60	38.3		
#100	24.8		
#200	16.8		

* (no specification provided)

Soil Description

Olive-brown to tan, fine to medium SAND, little Silt, trace fine Gravel, trace Brick.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.4096 D_{85}= 1.0162 D_{60}= 0.4613
D_{50}= 0.3525 D_{30}= 0.1884 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

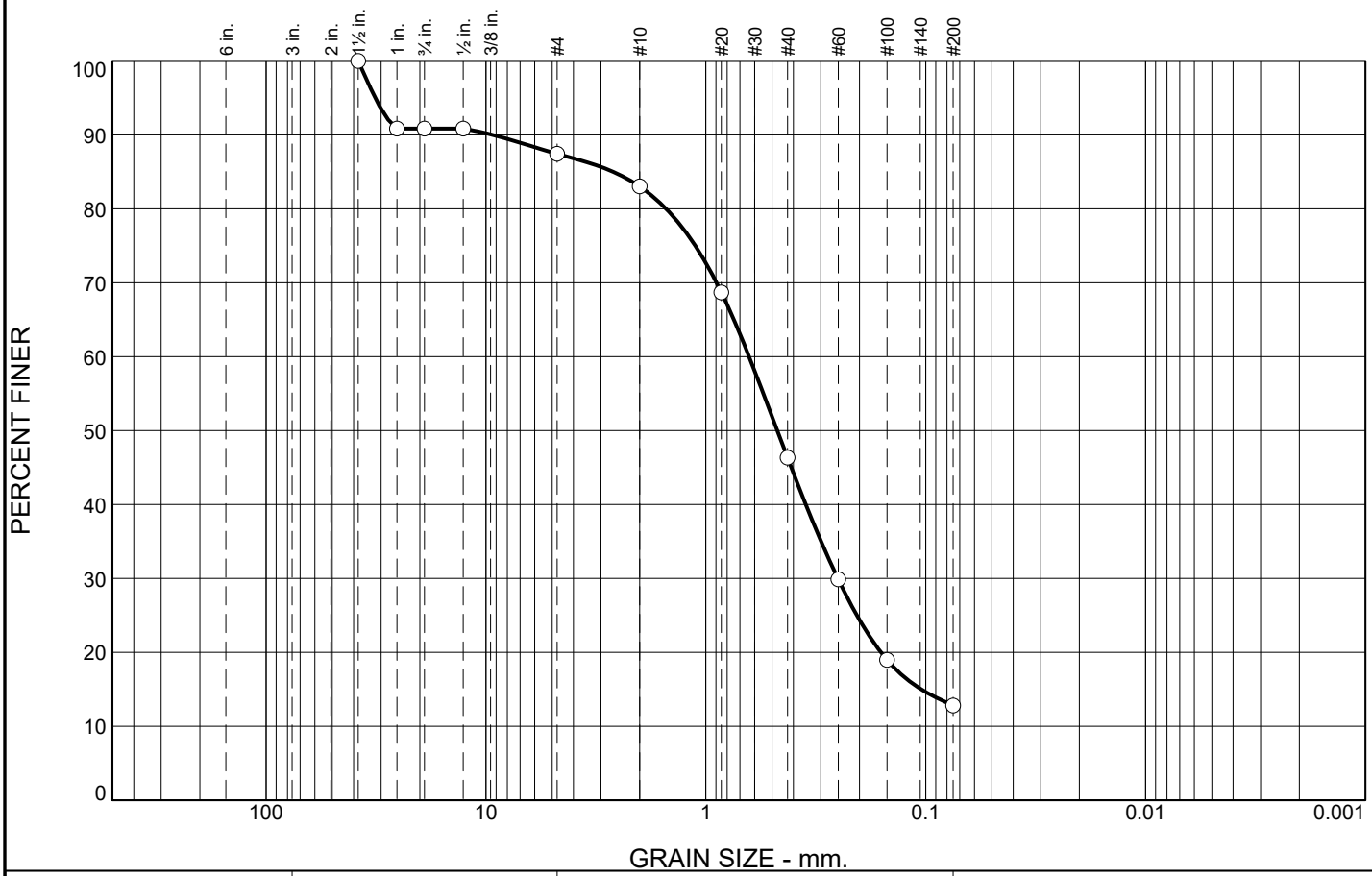
Existing Fill
Water Content: 9.6%

Source of Sample: MGA-2 **Depth:** 20 - 22'
Sample Number: S-7 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	3.5	4.4	36.7	33.5	12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	90.9		
3/4	90.9		
1/2	90.9		
#4	87.4		
#10	83.0		
#20	68.7		
#40	46.3		
#60	29.9		
#100	19.0		
#200	12.8		

* (no specification provided)

Soil Description

Olive-gray, fine to medium SAND, little (-) Silt, little (-) fine to coarse Gravel, trace Roots.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 9.3144 D_{85}= 2.6316 D_{60}= 0.6357
D_{50}= 0.4730 D_{30}= 0.2512 D_{15}= 0.1048
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

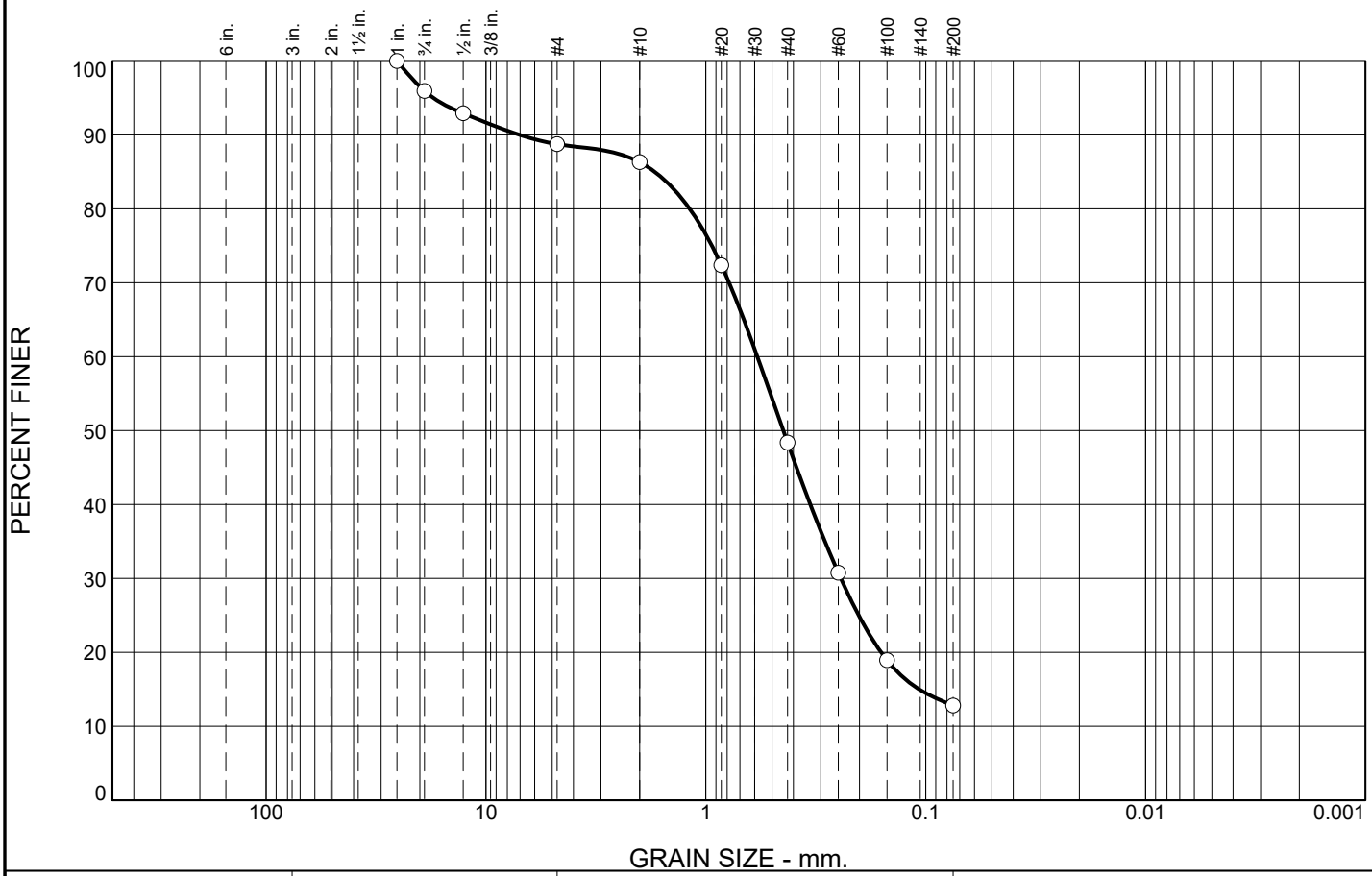
Existing Fill
Water Content: 12.3%

Source of Sample: MGA-2 **Depth:** 22 - 24'
Sample Number: S-8 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.1	7.1	2.5	37.9	35.6	12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
3/4	95.9		
1/2	92.9		
#4	88.8		
#10	86.3		
#20	72.4		
#40	48.4		
#60	30.8		
#100	18.9		
#200	12.8		

* (no specification provided)

Soil Description

Dark olive, fine to medium SAND, little (-) Silt, little (-) fine to coarse Gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 7.0086 D_{85}= 1.7033 D_{60}= 0.5828
D_{50}= 0.4442 D_{30}= 0.2434 D_{15}= 0.1071
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

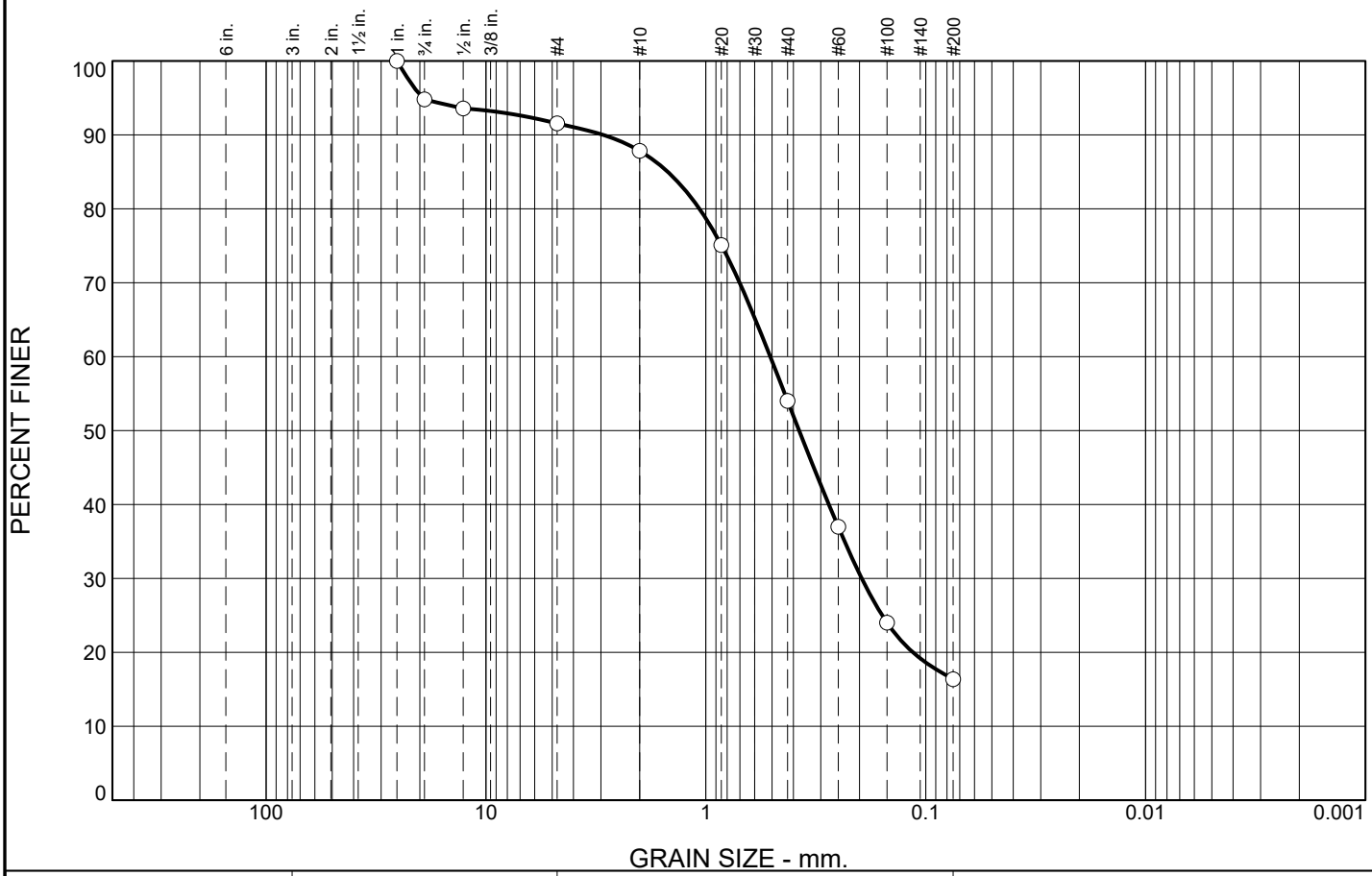
Existing Fill
Water Content: 13.4%

Source of Sample: MGA-3 **Depth:** 17 - 19'
Sample Number: S-6 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

PARTICLE SIZE DISTRIBUTION REPORT



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.2	3.2	3.8	33.8	37.6	16.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
3/4	94.8		
1/2	93.6		
#4	91.6		
#10	87.8		
#20	75.1		
#40	54.0		
#60	37.0		
#100	24.0		
#200	16.4		

* (no specification provided)

Soil Description

Olive-gray, fine to medium SAND, little Silt, trace (+) fine to coarse Gravel.

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.9281 D_{85}= 1.4892 D_{60}= 0.5091
D_{50}= 0.3765 D_{30}= 0.1953 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Existing Fill
Water Content: 10.9%

Source of Sample: MGA-3 **Depth:** 25 - 27'
Sample Number: S-9 **Date:** 11-21-2018

McArdle Gannon Associates, Inc.
Engineers & Consultants

Client: Arrowhead, LLC
Project: ACK Naturals
17 Spearhead Road, Nantucket, MA
Project No: W0736 **Figure**

GEO/PLAN ASSOCIATES
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geoplanassoc@gmail.com

September 7, 2019

Epsilon Associates
P.O. Box 700
Maynard, Massachusetts 01754-0700

Attention: Mr. Dwight Dunk

Re: Nourishment Sand Compatibility Analysis, 21 Derrymore Road, Nantucket

Dear Dwight:

I performed size analyses of one sediment sample from 21 Derrymore Road, Nantucket. The purpose of this letter is to evaluate the suitability of this sediment source as mitigation sediment for a segment of beach along Siasconset Beach, Nantucket. The project area is within previously-identified sampling sites designated as sediment sampling transects (Line 15 through Line 19). Extensive sediment sampling of the area (beach, bank, dune) was performed in 2006 along these lines and adjacent areas by Coastal Planning and Engineering, Inc. Other grain size data from this beach area is available from earlier sampling in 1998, 2001, and 2003. Some of these samples I collected and analyzed.

The mean size of the 21 Derrymore Road sample and other characteristics is shown below for comparison. While the methodologies for analysis are consistent, the reporting of the data, the lateral extent of the sampling along Siasconset Beach, and the field sampling methods may vary. This doesn't affect the documentation of the sand characteristics, and the resulting time-series provides a measure of variability of the natural sands over time.

A. Proposed Source Sediment

21 Derrymore Rd	Mean:	1.0 phi	(coarse-medium sand)
	Sorting Coefficient:	1.14	(poorly sorted)
	96% sand, 4% gravel		
	mud insignificant (less than 1% by weight)		

B. Natural Bank Sediments

2001:	2.0 phi (medium – fine sand) includes 8% mud
2003:	1.8 phi (medium sand) includes 5.5% pebbles or granules
2006:	1.2 phi (medium sand) includes minor fine pebbles/granules

The bank sediments range between medium-fine sand to medium sand, and contain varying amounts of fine gravel and mud. Direct observation of this coastal bank shows that, although dominantly sand, there is frequently a mud and gravel component and periodic mud layers and clay banks are part of the deposit. The fine or coarse tails and the variation in sizes are typical for glacial outwash sediments in this setting.

C. Beach Sediments

1998:	1.5 phi (medium sand)
2001:	1.0 phi (medium – coarse sand)
2003	0.9 phi (coarse sand)
2006:	0.7 phi (coarse sand)

The 2006 samples are coarser than the earlier samples, either due to natural variation in sand sources over time, or cyclic changes in size related to energy. Regardless of the cause, these four sampling intervals indicate that the mean size of the natural sediment on the beach fluctuates, but is not coarser that the 0.7 phi 2006 samples.

D. Discussion

Compatible beach sediment is not sand that exactly matches the existing beach, but rather sediment that is relatively stable and can coexist with the naturally-deposited sediment in the coastal setting. If the compatibility of the sediment is evaluated relative to potential stability of the beach (which is generally the case), **compatible sediment is equal or coarser than the existing sediment.**

The proposed source area is glacial outwash sediments. The sample has minor amount of mud (<1%), which is lower than the natural bank source sediment. This is a plus for compatibility, as mud is quickly lost, and is the most common objections to nourishment sand are based on aesthetics or water turbidity. The proposed source area is geologically the same material (glacial outwash sediments) from the same vicinity as the natural bank materials. The sample contains some gravel (4%), but the gravel in this sample is all in the granule range, slightly coarser than sand. Nonetheless, gravel is a visible component of Sconset beaches and the adjacent shallow nearshore. Importantly, the sample is coarse-medium sand, which has the greater likelihood of remaining stable on Siasconset Beach than the natural bank source material. While the sizes are reported as means, there is a range of sizes finer and coarser in all samples. However, both the natural beach sediment and the proposed source material have very small amounts of sand finer than medium sand. This is the component of the sand that is more likely to be lost from the beach. Therefore, the wave sorting will likely re-sort nourishment sand to have comparable sizes to existing conditions, or coarser, so most of the source material will have as great a probability of remaining within the adjacent beach system as the natural bank material.

The 21 Derrymore Road sediment sample is a match of mean size of beach sediment in 2001, and equal to the mean of the average of all beach samples. The sample is coarser than the natural bank source material. Therefore, based on the sample submitted, the proposed sand source from 21 Derrymore Road is compatible for use as nourishment on Sconset Beach.

Please feel free to contact me if there are further questions concerning the evaluation of these samples.

Yours truly,

Peter S. Rosen

Peter S. Rosen, Ph. D.
Coastal Geologist

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October 12, 2019

Epsilon Associates
3 Mill & Main Place, Suite 250
Maynard, Massachusetts 01754

Attention: Mr. Dwight Dunk

Re: Nourishment Sand Compatibility Analysis, 77 Pocomo Road, Nantucket

Dear Dwight:

I performed size analyses of the sediment sample from 77 Pocomo Road, Nantucket. The purpose of this letter is to evaluate the suitability of this sediment source as mitigation sediment for a segment of beach along Siasconset Beach, Nantucket. The project area is within previously-identified sampling sites designated as sediment sampling transects (Line 15 through Line 19). Extensive sediment sampling of the area (beach, bank, dune) was performed in 2006 along these lines and adjacent areas by Coastal Planning and Engineering, Inc. Other grain size data from this beach area is available from earlier sampling in 1998, 2001, and 2003. Some of these samples I collected and analyzed.

The mean sizes of the composite sample and other characteristics are compiled below for comparison. While the methodologies for analysis are consistent, the reporting of the data, the lateral extent of the sampling along Siasconset Beach, and the field sampling methods may vary. This doesn't affect the documentation of the sand characteristics, and the resulting time-series provides a measure of variability of the natural sands over time.

The sample, beach, and bank characteristics are compiled below:

A. Proposed Source

Pocomo Road	Mean:	1.03 phi	(medium sand)
	Sorting Coefficient:	1.11	(poorly sorted)
	96% sand, 4% gravel		
	mud insignificant (less than 2% by weight)		

B. Natural Bank Sediments

2001: 2.0 phi (medium – fine sand) includes 8% mud
2003: 1.8 phi (medium sand) includes 5.5% pebbles or granules
2006: 1.2 phi (medium sand) includes minor fine pebbles/granules

The bank sediments range between medium-fine sand to medium sand, and contain varying amounts of fine gravel and mud. Direct observation of this coastal bank shows that, although dominantly sand, there is frequently a mud and gravel component and periodic mud layers and clay banks are part of the deposit. The fine or coarse tails and the variation in sizes are typical for glacial outwash sediments in this setting.

C. Beach Sediments

1998: 1.5 phi (medium sand)
2001: 1.0 phi (medium – coarse sand)
2003 0.9 phi (coarse sand)
2006: 0.7 phi (coarse sand)

The 2006 samples are coarser than the earlier samples, either due to natural variation in sand sources over time, or cyclic changes in size related to energy. Regardless of the cause, these four sampling intervals indicate that the mean size of the natural sediment on the beach fluctuates, but is not coarser that the 0.7 phi 2006 samples.

D. Discussion

Compatible beach sediment is not sand that exactly matches the existing beach, but rather sediment that is relatively stable and can coexist with the naturally-deposited sediment in the coastal setting. If the compatibility of the sediment is evaluated relative to potential stability of the beach (which is generally the case), **compatible sediment is equal or coarser than the existing sediment.**

The proposed source area is a 77 Pocomo Road, Nantucket. The sample has a minor amount of mud (<2%), which is a plus for compatibility, as mud is quickly lost, and is the most common objections to nourishment sand are based on aesthetics or water turbidity. The proposed source area is not the same as the natural bank sediments. Based on an assumption from the location (without field confirmation), the Pocomo Road sediments are likely a glacial lakebottom/lake margin deposit, unlike areas south of the moraine, which are mostly glacial outwash and have generally been coarser. The sample contains a small amount of gravel, but it is exclusively fine granules near the sand boundary. Gravel is a visible component of Sconset beaches and the adjacent shallow nearshore, which this material will not measureably augment. Importantly, the sample is medium sand, which overlaps with the finer component of Siasconset Beach sand. However, it is not the more stable portion of the sediment population. This is the component of the sand that is more likely to be lost from the beach. Therefore, the wave sorting will likely re-sort nourishment sand to have comparable sizes to existing conditions, or coarser, so most of the source material will be transported offshore or alongshore.

However, the Pocomo Road sample is comparable to the size of the natural bank sediment, which is fed to the beach and re-sorted by waves.

Therefore, the 77 Pocomo Road sediment is compatible for use at Sconset Beach, particularly for use in the geotube template. Since it has a low mud content, it's use as such will be more stable than typical natural bank sediment.

Please feel free to contact me if there are further questions concerning the evaluation of these samples.

Yours truly,

Peter S. Rosen, Ph. D.
Coastal Geologist

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October 12, 2019

Epsilon Associates
P.O. Box 700
Maynard, Massachusetts 01754-0700

Attention: Mr. Dwight Dunk

Re: Nourishment Sand Compatibility Analysis, 18 Greglan, Nantucket

Dear Dwight:

I performed size analyses of composite sediment samples from two locations. The purpose of this letter is to evaluate the suitability of these sediment sources as mitigation sediment for a segment of beach along Siasconset Beach, Nantucket. The project area is within previously-identified sampling sites designated as sediment sampling transects (Line 15 through Line 19). Extensive sediment sampling of the area (beach, bank, dune) was performed in 2006 along these lines and adjacent areas by Coastal Planning and Engineering, Inc. Other grain size data from this beach area is available from earlier sampling in 1998, 2001, and 2003. Some of these samples I collected and analyzed.

The mean sizes of the composite samples and other characteristics are compiled below for comparison. While the methodologies for analysis are consistent, the reporting of the data, the lateral extent of the sampling along Siasconset Beach, and the field sampling methods may vary. This doesn't affect the documentation of the sand characteristics, and the resulting time-series provides a measure of variability of the natural sands over time.

A. Proposed Sources

Mean:	0.78 phi	(coarse sand)
Sorting Coefficient:	1.06	(poorly sorted)

94% sand, 06% gravel
mud insignificant

B. Natural Bank Sediments

2001:	2.0 phi (medium – fine sand) includes 8% mud
2003:	1.8 phi (medium sand) includes 5.5% pebbles or granules
2006:	1.2 phi (medium sand) includes minor fine pebbles/granules

The bank sediments range between medium-fine sand to medium sand, and contain varying amounts of fine gravel and mud. Direct observation of this coastal bank shows that, although dominantly sand, there is frequently a mud and gravel component and periodic mud layers and clay banks are part of the deposit. The fine or coarse tails and the variation in sizes are typical for glacial outwash sediments in this setting.

C. Beach Sediments

1998:	1.5 phi (medium sand)
2001:	1.0 phi (medium – coarse sand)
2003	0.9 phi (coarse sand)
2006:	0.7 phi (coarse sand)

The 2006 samples are coarser than the earlier samples, either due to natural variation in sand sources over time, or cyclic changes in size related to energy. Regardless of the cause, these four sampling intervals indicate that the mean size of the natural sediment on the beach fluctuates, but is not coarser that the 0.7 phi 2006 samples.

D. Discussion

Compatible beach sediment is not sand that exactly matches the existing beach, but rather sediment that is relatively stable and can coexist with the naturally-deposited sediment in the coastal setting. If the compatibility of the sediment is evaluated relative to potential stability of the beach (which is generally the case), **compatible sediment is equal or coarser than the existing sediment.**

The proposed source areas are glacial outwash sediments. Both samples have insignificant mud (<1%), which is a plus for compatibility, as mud is quickly lost, and the most common objections are based on aesthetics or water turbidity. The 18 Greglan source area is geologically the same material (glacial outwash sediments) from the same vicinity as the natural bank materials. Both samples contain some gravel. While the gravel does not necessarily match surface beach sediment samples, small gravel is a visible component of these beaches and the adjacent shallow nearshore. Importantly, the sample is coarse sand which is coarser than the natural source, which is the coastal bank, and coarser than most beach samples. These coarser sands have the greatest likelihood of remaining stable on Siasconset Beach. While the sizes are reported as means, there is a range of sizes finer and coarser in all samples. However, both the natural beach sediment and both potential source have very small amounts of sand finer than medium sand. This is the component of the sand that is more likely to be lost from the beach. Therefore, the wave sorting will likely re-sort nourishment sand to have comparable sizes to existing conditions, or coarser, so most of the source material will have as great a probability of remaining within the adjacent beach system as the natural bank material.

Therefore, the source sediment at 18 Greglan is beach nourishment compatible.

Please feel free to contact me if there are further questions concerning the evaluation of these sand samples.

Yours truly,

Peter S. Rosen

Peter S. Rosen, Ph. D.
Coastal Geologist

GEO/PLAN Associates
Sediment Grain Size Analysis
Client: Epsilon Associates
Project Name:
Project Location:18 Greglan, Nantucket, MA
Project No.
Septembert 2019

Sample: **18 Greglan**

Phi	Cum Wt	Total Wt	% Wt	Cum %	Sand Only % Wt	Sand Only Cum %
>-5	0.00	0.00	0.00	0.00	0.00	0.00
-4	0.00	0.00	0.00	0.00	0.00	0.00
-3	0.00	0.00	0.00	0.00	0.00	0.00
-2	0.33	0.33	0.53	0.53	0.53	0.53
-1	3.82	3.49	5.70	6.23	5.70	6.23
0	12.82	9.01	14.70	20.92	14.70	20.92
1	32.31	19.49	31.81	52.74	31.81	52.74
2	57.41	25.09	40.95	93.68	40.95	93.68
3	59.78	2.38	3.88	97.56	3.88	97.56
4	61.28	1.50	2.44	100.00	2.44	100.00

Phi	Total Wt	Bkr Wt	Corr. Wt	Wt Frac	% Wt	Bk No.
Silt	0.0000	0.0000	0.0000	0.0000	0.0000	--
Clay	0.0000	0.0000	0.0000	0.0000	0.0000	--
		Disp. Wt	0.0000			

Wt. Coarse	61.2750
Wt Fine	0.0000
Total Wt	61.2750

Phi	Wt %	Phi Mid Pt	Wt % Mid Pt	Mid pt - Mean (=X)	X sq	X sq Wt %
>-5	0.00	-5.50	0.00	-6.28	39.48	0.00
-4	0.00	-4.50	0.00	-5.28	27.91	0.00
-3	0.00	-3.50	0.00	-4.28	18.35	0.00
-2	0.53	-2.50	-1.33	-3.28	10.78	5.72
-1	5.70	-1.50	-8.54	-2.28	5.21	29.70
0	14.70	-0.50	-7.35	-1.28	1.65	24.21
1	31.81	0.50	15.91	-0.28	0.08	2.56
2	40.95	1.50	61.42	0.72	0.51	21.03
3	3.88	2.50	9.69	1.72	2.95	11.42
4	2.44	3.50	8.54	2.72	7.38	18.01
Silt	0.00	6.00	0.00	5.22	27.21	0.00
Clay	0.00	9.00	0.00	8.22	67.51	0.00
TOTAL	100.00		78.34			112.63

Total Sample		Mean =	0.78	Variance =	1.13
				Sample SD =	1.06
Coarse Only	100.00		78.34		112.63
		Mean =	0.78	Variance =	1.13
				Sample SD =	1.06

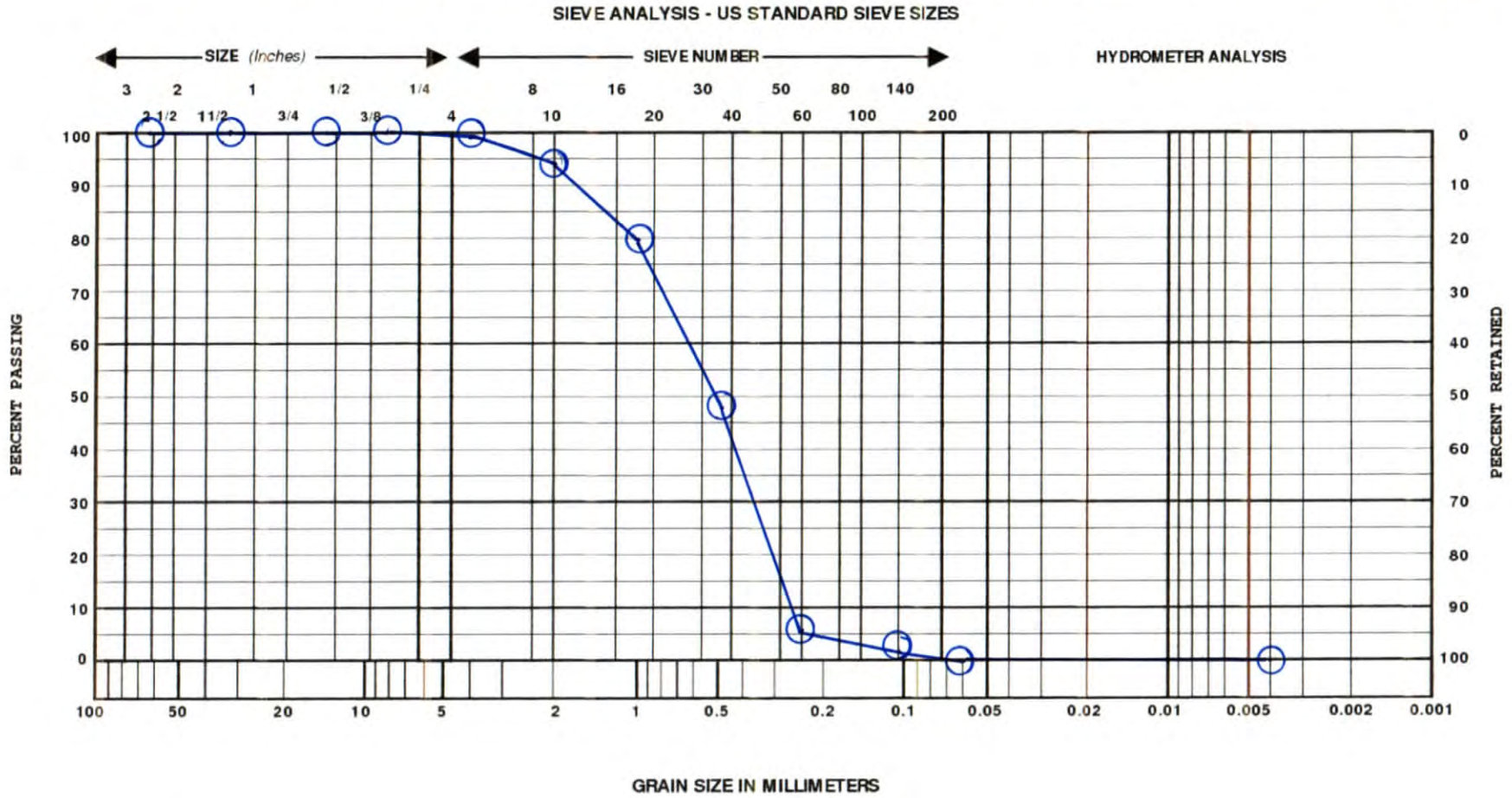
Gravel	Sand	Silt	Clay	Total
6.2	93.8	0.0	0.0	100.0

Sand	Silt	Clay	Total
100.0	0.0	0.0	100.0

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Epsilon - 18 Greglan, Nantucket MA #1 Sand

2. DATE 10/9/19



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)

3. TECHNICIAN *(Signature)*

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

Joanne Dodd

From: Jeff Carlson
Sent: Monday, November 4, 2019 10:42 AM
To: Joanne Dodd
Cc: 'burton balkind'
Subject: FW: sbpf

Joanne,
Please distribute to the Commission and add it to the Town website.

Thanks,
Jeff Carlson
Natural Resources Director
Town of Nantucket
2 Bathing Beach Road
Nantucket, MA 02554
508-228-7230

From: burton balkind <sprucecool@yahoo.com>
Sent: Thursday, October 31, 2019 5:04 PM
To: Jeff Carlson <JCarlson@nantucket-ma.gov>
Subject: sbpf

Dear Members of the Nantucket Conservation Commission,

I understand that there is a sediment analysis for sand compatibility for size, but are there guidelines for analysis for potential sand compatibility and contamination?

Specifically visual contamination in the form of trash and debris, chemical contaminants such as contamination from highly toxic per- and polyfluorinated compounds (PFAS) and other chemicals or biological contamination such as fecal matter or high levels of nitrogen but not limited to just those examples?

The active Order of Conditions (SE 48-24, SOC MassDEP file number SE 48-2610) section C. General Condition Under Massachusetts Wetlands Protection Act #1 states “Failure to comply with all condition stated herein, and with all statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order”

As further stated in the Order, condition #7, “Any fill used in connection with the project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any to the foregoing”. Therefore the photos from June 10, 2019 (previously forwarded to the Commission), are a clear violation of this condition as there is visual contamination in the fill used.

Upon further readings, my next question for the Board is, while the Order of Conditions requires for mitigation sand come from offsite locations, is it appropriate for such sand to be from locations such as construction sites, abandoned or failed septic systems/fields? While visually the sand might look “clean," might the sand be contaminated at the chemical or biological level?

Furthermore, does the potentially contaminated sand serve as a point source pollutant and contaminate?

The role of the mitigation sand is to be sacrificed to the ocean in a similar manner that the bluff would naturally feed the beaches and ultimately the ocean. As the potentially contaminated sand enters the site,

is there cause for concern for the health safety and welfare of not only the bluff, but the surrounding environment, habitats, beaches, the ocean and the public?

“The Clean Water Act prohibits anybody from discharging "pollutants" through a "point source" into a "water of the United States" unless they have a National Pollutant Discharge Elimination System (NPDES) permit. The permit will contain limits on what you can discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health”. - United States Environmental Protection Agency.

Stephen Cohen, attorney hired by SBPF, stated at the August 29, 2019, MassDEP site visit that every truck load of sand has a ticket and is accounted for. Therefore, it should not be too difficult to determine where the mitigation sand is coming from and what potentially contaminated materials are in each load of sand and at what level. Thus allowing the Commission to determine if the sand being used is truly compatible to that of what is naturally present at the bluff site. Until this happens, and SBPF is able to produced this data, an Enforcement Order should be issued by the Commission for SBPF to cease and desist from disposing of potentially contaminated and incompatible sands over the bluff and onto the beach. Since it is clear that they have already deposited incompatible and contaminated sands over the bluff, they should not be given a second chance to befoul our beaches and ocean.

I appreciate your time and efforts on this matter. I look forward to hear back from you. If further information is requested, please do not hesitate to contact me.

Sincerely,

burton balkind

NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

11.4.19

TO: Members of the Nantucket Conservation Commission and Jeff Carlson
FROM: D. Anne Atherton for the NCC Team
RE: Questions for Discussion re Geotubes
COPY FYI: DEP Officials (Jim Mahala, Nate Corcoran, and Greg DeCesare)

It has come to our attention that there are a number of enforcement-related questions regarding the 900-foot geotube revetment installed under an Emergency Order in the winter of 2013/2014 on the public beach below the bluff in Sconset. We share these questions with you here and respectfully request that they be addressed as soon as possible. **Enforcement of the permit for this controversial project, the subject of widespread community concern, should be a priority**. [NOTE: The failure of SBPF to submit two quarterly monitoring reports is being addressed by the Commission on November 6 so it is not cited in this memorandum.]

1. **Is the Commission aware that there is photographic evidence that directly contradicts information provided by the applicant regarding the "pushed-up" beach sand following September storms**? The Project Manager for the geotube revetment addressed the issue of "pushed-up beach sand" during Public Comment at the September 25 meeting of the Commission. [See video of meeting at the beginning.] He told the Commission "there was no pushed-up sand except at the extreme northern end of the geotubes." He apparently also provided photos for the Commission of the [to paraphrase] "one small spot." [Below is a photo taken by NCC team member Burton Balkind on or about September 11 showing bulldozed beach sand at the north end of geotubes, consistent with the statement made by the Project Manager.]

However, photographs taken at the same time indicate that the information provided by the Project Manager was **inaccurate.** In addition to the "pushed-up beach sand" at the northern end of the structure, there were also **multiple** areas on the eastern (ocean-facing) side of the project where beach sand had been bulldozed to cover the geotubes. [See below for photos taken by Susan Landmann that clearly illustrate this fact: one view is to the south, the other to the north.] Why was this information omitted by the Project Manager?

According to Mr. Carlson, "Excavation outside of installing the geotubes is not part of the permit." [See ConCom Minutes, September 11, 2019.] Not only was the work performed NOT permitted, but also the information provided to the Commission by the representative of the applicant is directly contradicted by photographic evidence, submitted here for the record.

2. **What has happened to the "scour sheet" at the north end of the geotubes that apparently was (partially?) dislodged and damaged during the recent storm Dorian?** Photos (taken during storm conditions) clearly show the "scour sheet" being dislodged (and damaged?) by the elements. Was this situation reported to the Commission? What has been the outcome?

3. **Is the mitigation "sand" recently delivered to the bluff sand or dirt?** The Order of Conditions for this project is very specific in regard to the mitigation sand to be provided. [See attached chart containing General and Special Conditions from the Amended Order of Conditions relating to the mitigation sand.] The recent delivery of many tons of sediment to the bluff has raised questions about whether or not the material introduced into the beach environment meets those requirements.

Simply put: **Is this sediment "sand"? Or is it "dirt"?** How is the answer to this question determined? While the material may meet the requirements of a sieve analysis (to ascertain grain size), what testing is done to determine whether that material is sand rather than dirt? What testing is done to ensure that the material is "clean" fill? During the permitting for this project, there was much discussion about the mitigation "sand" required: would the two one-island pits have enough sand to fulfill the mitigation needs? Where would additional "sand" be obtained? Off-island and offshore were mentioned. At no time was any reference made to on-island excavation sites other than the two sand pits. Do the sources[1] cited in the report submitted by SBPF meet the requirements?

Photo of what has been reported to be the "stockpiling" site for sediment destined for the bluff. It is located in the area of Spearhead and Arrowhead. Can the applicants confirm this information?

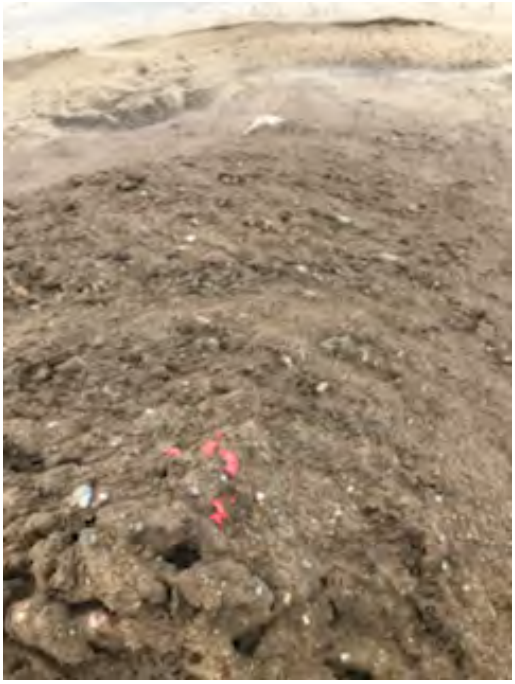
[1] Sconset Bluff Sediment Analysis Tracking 2019 Sand Sources (6): Sheep Commons Lane, South Shore Road, 17/19 Spearhead Road, 21 Derrymore Road, 77 Pocomo Road, 18 Greglan Avenue.

Photo of “sand” delivery to the bluff. Susan Landmann, the photographer, noted a plastic bottle in the material being dumped. When she pointed it out, the attendant on site picked it up. Can the applicant verify that this is “clean fill,” consistent with General Condition #7 in the Amended Order? Why was such verification omitted by the Project Manager?

4. **Are the harmful impacts of the non-performing returns continuing?** The applicant received an Amended Order from the Commission in November 2018 (a year ago) to address the issue of the returns. The problem with the returns was to be accomplished by extending the revetment 50 feet at either end (for a total of 100 feet) and installing newly designed returns to deal with the end scour and erosion that were occurring. According to the applicants: "This work is required to maintain the stability of the Coastal Bank and bluff, and to maintain the integrity of the existing geotube bank stabilization system." We don't see any evidence that this work has been done. If not, why not? Will the acknowledged harmful impacts of the current returns continue through another winter storm season?

Photo below was taken following the recent nor'easters (October) shows ongoing end scour and severe erosion at the northern end of the revetment.

5. **Has action been taken in regard to reports of contaminated material being dumped over the bluff in early June?** If this material was NOT intended for the geotubes, then what project/s was it intended for? While the sand-filled fabric bags placed below the bluff in front of other properties were permitted by the Town of Nantucket under a different Order of Conditions and license, that Order of Conditions and license were issued to the same applicant (SBPF).



NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

QUESTIONS RAISED BY DELIVERY OF **MITIGATION SAND**

DATES: FRIDAY AND SATURDAY, OCTOBER 18 AND 19, 2019 (AND INTO THE NEXT WEEK)

GENERAL AND SPECIAL CONDITIONS BELOW FROM ORDER OF CONDTIONS (AS AMENDED)

FOR THE CURRENT GEOTUBE PROJECT (85 to 105 BAXTER ROAD) RELATING TO MITIGATION SAND

SE48-2824, Date of Issuance 11.28.18

11.4.19

GENERAL CONDITION FROM ORDER OF CONDITIONS		QUESTIONS AND COMMENTS
#7.	Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.	How was the sediment tested to meet the standards contained in General Condition #7?
SPECIAL CONDITIONS FROM ORDER OF CONDITIONS		**QUESTIONS AND COMMENTS**
#25.	All sand used for mitigation or to fill and cover the Geotubes shall be imported from an off-site source and **shall be compatible with the existing bank and beach sediments**.	Is this sediment "compatible with existing bank and beach sediments? If yes, how do we know it is?

SPECIAL CONDITIONS FROM ORDER OF CONDITIONS		QUESTIONS AND COMMENTS
#32.	Sand mitigation shall be at a rate of 22 cubic yards per linear foot (cy/lf) per year in accordance with the following schedule: [c. and d. only]. c. **Annually in September-November**: Place an additional volume of **sand** to ensure a substantial portion of the sand template volume (10-15 cy/If) is available at the onset of the winter storm season. Throughout the winter, place additional sand on an as-needed basis, in accordance with the replenishment trigger in the Milone & MacBroom November 12, 2013 letter (i.e., if half the vertical height of the lowest Geotube is exposed, place a minimum of 2 cy/If). If the balance of the 22 cy/lf volume is not placed in its entirety before March 1, the balance of the sand will be placed by March 31. d. Delivery tickets from sand supplier shall be provided annually to the Department and the NCC to document the total volume of sand provided on a yearly basis.	Was “sand” delivered to the bluff or was dirt delivered?

SPECIAL CONDITIONS FROM ORDER OF CONDITIONS		QUESTIONS AND COMMENTS
#34.	Failure of SBPF to conduct the actions set out in subsections **(a) to (f) herein shall constitute a project failure** ("failure criteria") if not performed within the stipulated timeframes or within such other reasonable periods of time as determined by the Commission in the event of a delay in performance outside the control of SBPF, or if there are unmitigated adverse impacts from the project. The "failure criteria" include: a. **Failure to provide the sand mitigation as required herein.** [Continues through f.]	If the sediment delivered to the bluff on Friday, October 18 and 19 does not meet the Special Conditions related to mitigation *sand** in this Order, then this would constitute a project failure, wouldn't it, consistent with this condition, #34?
#52.	**A list of all sand sources currently being used shall be provided to the Commission**. Should an additional source be added or change a sieve analysis demonstrating compatible material shall be provided to the Commission for review and **approval prior** to the installation of any material.	What is the source of this material? Just one source, or a number of sources? Has a sieve analysis been done on this material? If yes, when? By whom? Has the Commission reviewed and approved this material (from each source as compatible) prior to its delivery as outlined in this Special Condition? Has the Commission been provided with evidence for its review and approval? Was there lag time between when/if the sieve analyses were performed and when the sediment was delivered to the bluff? If yes, where was the sediment stored? In whose custody was it? Were precautions taken to safeguard it from any contamination? If yes, what were they?

PRINCIPALS

Theodore A Barten, PE
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Dale T Raczynski, PE
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Lester B Smith, Jr
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R:\21597 Lighthouse\2013 Emergency Project\Monitoring and Work Reports\

November 15, 2019

Mr. Jeff Carlson
Natural Resources Director, Town of Nantucket
Conservation Commission Office
2 Bathing Beach Road
Nantucket, MA 02554

Via U.S. Mail & Electronic Mail

Subject: DEP File No. SE48-2824 - Baxter Road and Sconset Bluff Storm Damage Prevention Project

Dear Mr. Carlson:

On behalf of the Siasconest Beach Preservation Fund ("SBPF") we provide brief responses to the comments regarding template sand submitted to the Nantucket Conservation Commission by: 1) Burton Balkind via email dated November 4, 2019; and 2) the Nantucket Coastal Conservancy via memo dated November 4, 2019.

Mr. Balkind's email generally raises three issues regarding sand: 1) potential chemical contamination; 2) potential biological contamination; and 3) potential presence of trash or other debris mixed in with sand.

As noted by Mr. Balkind samples from all sand sources are analyzed for compatibility with beach sand prior to being accepted for use on the template. To date all sources have been determined to be compatible based on grain size analysis. Regarding potential chemical contamination, the island of Nantucket was not an industrialized area and therefore on-island sand sources are at low risk for being contaminated with oil and other hazardous materials. As for potential bacterial contamination, storing sand on the sand lot which is subject to desiccation and sunlight (ultra-violet radiation) would kill bacteria (if any is present) before being placed on the template, and those actions (desiccation and UV exposure) will continue while on the template. The commenter also raises the specter of a National Pollution Discharge Elimination System ("NPDES") permit. Compliance with the NPDES Construction General Permit is required when construction projects: 1) expose 1 acre of more of erodible soil; 2) have a point source discharge; and 3) the point source discharge convey stormwater to a waters of the United States. All three criteria must be met. In this case runoff from the template is not conveyed via a point source discharge therefore no NPDES permit not required.

The following comments were submitted by the Nantucket Coastal Conservancy:

1. *Is the Commission aware that there is photographic evidence that directly contradicts information provided by the applicant regarding the "pushed-up" beach sand following September storms?*

There was a mis-recollection by the equipment operator about the number of places where sand was pushed up onto the toe of the template. When Mr. Feeley talked to the operator before the September meeting about this matter Mr. Feeley understood that sand was pushed up at only one location (note the operator was away on vacation and not looking at any photos and working purely from memory). Mr. Feeley relied on the operator's discussion and his review of the post maintenance report. After reviewing the additional photos the operator he agrees that he did push up sand in those additional locations. This has already been discussed with the equipment operator and will not happen again.

We note that in the video of the September 25, 2019 hearing Mr. Balkind spoke after Mr. Feeley left the room, and Mr. Balkind noted there were <u>three</u> small spots where sand was pushed up. Review of the photos reveals <u>five</u> small spots (the northerly end and four other small areas) where sand was pushed up. This is noted only to show memories are not perfect.

Equipment operators are fully aware not to do this again.

2. *What has happened to the "scour sheet" at the north end of the geotubes that apparently was (partially?) dislodged and damaged during the recent storm Dorian?*

The scour sheet had been re-covered by beach sand movement by the time template maintenance was performed to re-cover exposed geotubes with sand off the template, see maintenance report from September 9, 2019 submitted separately to the Conservation Commission. Assuming the SBPF receives authorization to extend the geotube system, the existing scour sheet will be exposed and repaired or replaced at that time and where needed.

3. *Is the mitigation "sand" recently delivered to the bluff sand or dirt?*

Sieve analysis of sand sources was performed which demonstrates the sediment is characterized as coarse sand to medium-coarse sand depending on the source. As noted, the sieve analyses, (a subset is included with the comment letter) a small fraction of fines (silt and clay) is observed in some samples. Sand with fines will typically have a darker color due to the silt / clay particles mixed in with sand and attached to the sand grains. As the fines are washed out of the sand and off the sand particles, and the material is bleached by the sun the sediment gets lighter in color over time. This phenomenon has been observed on the template previously.

The evaluation of sand being used on the template is consistent with guidance prepared by the Massachusetts Department of Environmental Protection ("MassDEP") in the

publication titled: *Beach Nourishment-MassDEP's Guide to Best Management Practices for Projects in Massachusetts*, dated March 2007. Attachment C of that document highlights three criteria for characterizing source material, and those are:

1. grain-size distributions are comparable,
2. the likelihood of contamination is similar based on depositional characteristics, spill history, location of point source discharges, etc., and
3. samples were obtained from the same reach of shoreline.

1. Source material sieve analyses have been conducted for all sources and it has been determined to be comparable (compatible) with the sand on the beach. Those reports are on file with the Conservation Commission. The MassDEP guidance reads: "*Ideally, the grain size of the source material should be the same size or larger than the native beach sand to minimize erosion.*" This is the standard for sand to be determined "compatible" and accepted for placement on the template.
2. The source sites are not MassDEP listed sites as those would require any material to be hauled off site for disposal as contaminated material. The island of Nantucket was not an area of heavy industry and those broad swathes of the island have a low likelihood being contaminated by oil or other hazardous materials. As noted, sediment collected from a location that has no history of prior releases of oil or hazardous materials and which contains less 10% fines (sediment passing the #200 sieve) measured by weight can be exempted from chemical analysis[1].
3. Not applicable for upland sand sources. This criterion supposes source material will be from a dredge site and thus it is preferred that sediment be collected from a nearby reach of shoreline.

4. Are the harmful impacts of the non-performing returns continuing?

Following receipt of the Amended Order of Conditions in 2018, natural sand movements along the Sconset shoreline infilled the geoube / template ends preventing the installation of returns extensions. The returns will be examined to determine if the apparent erosion has removed sufficient volume / area of sand to install the returns as designed and permitted, without needing to excavate into the bluff to install the return extensions. Installation will need to be performed after an intense storm when the return extensions can be installed without needing to excavate into the bluff.

5. Has action been taken in regard to reports of contaminated material being dumped over the bluff in early June?

As previously explained in a site visit last June with Cottage + Castle and Jeff Carlson when this issue was raised, no material was delivered to the template by SBPF in June. Material

[1] This standard is established for dredged material in 314 CMR 9.07(2)(a) which establishes sampling and analysis requirements for dredging and dredged material disposal.

was delivered by others for installation of coir envelope systems south of the SBPF template.

Monitoring Compliance

In response to discussion at the past meeting, SBPF provides below a table noting the status of 2019 monitoring and reporting. The underwater video and bathymetric surveys are typically approved concurrent with quarterly shoreline surveys. Whereas the two shoreline line surveys were missed, as explained in our letter of October 31, 2019 and discussed at the last meeting, those related surveys were also missed. As noted previously surveys have been scheduled and /or performed to put the project back into compliance with the survey and monitoring schedule.

Shoreline Change - quarterly	Not current 2 in 2019 (Q3 and Q4)
Bathymetric Survey- semi-annually	Not current 1 in 2019 (autumn 2019)
Underwater Video - semi-annually	Not current 1 in 2019 (autumn 2019)
Post-storm Inspections	Current
Template Survey - annually	Current
Quarterly Work Reports	Current
Post-Storm Reports for "Significant" storms	Current
Annual report	Current (year 2018 submitted in 2019; year 2019 will be submitted in 2020)

If you have any questions regarding this correspondence, please to contact me at (978)-897-7100 or via email at ddunk@epsilonassociates.com.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

cc: J. Posner, SBPF
J. Feeley, Cottage + Castle
S. Cohen, Cohen & Cohen Law, PC
G. Wood, Rubin & Rudman, LLC

NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

November 19, 2019

Ms. Ashley Erisman
Chair
Nantucket Conservation Commission
Town of Nantucket

TRANSMITTED BY HAND AND ELECTRONICALLY

Dear Chair Erisman and Members of the Commission:

We are writing to you in regard to the mitigation program and sand-management plan contained in the Amended Order of Conditions (OCC), D SE48-2824, dated November 28, 2018, for the 900-foot geotube revetment installed by the Siasconset Beach Preservation Fund (applicants) on the public beach below the bluff, originally under an Emergency Order in the winter of 2013 and 2014.

We are writing because of our great concern regarding the many thousands of tons of sediment that citizens have observed first being trucked to Sconset during the past weeks and then being poured over the side of the bluff onto the geotubes and surrounding beach (presumably to fulfill the fall delivery schedule). While we are not scientists, **common sense tells us that this sediment is dirt, not sand.**

According to information provided by the applicants, this material has been excavated from scattered construction sites on-island and stockpiled in a mid-island location. While the required analyses of grain size may have been conducted, it appears that no testing for contaminants has been performed, although we have received reliable anecdotal information that the excavation sites used may be questionable in this regard.[1] **This process of obtaining the required mitigation sand represents a departure from the prior protocol** followed by the applicants since the geotubes were installed: in the past, they obtained the needed mitigation sand from one of two on-island pits.

After reading through the responses from the consultants for the applicants that have been submitted for the November 20 agenda discussion, it appears that this dirt may, indeed,

[1] Example: We have received reliable information that one of the source sites listed, South Shore Road, is a property on which there was a failed septic system. When material from this location was offered to the Town for use at the Surfside Treatment Plant, it was rejected. While, yes, this is anecdotal information, it should be fairly simple to verify with Town officials. We have been told the property in question on South Shore Road is 18, although this was not noted on the SBPF report.

meet the requirements for mitigation sand as contained in the current Order. **If this is the case, then we respectfully request that the current Order be revisited and the requirements for the mitigation program modified as expeditiously as possible.**

THE BIG PICTURE

The current situation (the use of dirt for mitigation sand) is unacceptable. If excavation dirt is to be permitted in Sconset, is it to be used in all other areas of the island? What are the short- and long-term impacts of such a practice for our beaches, whether publicly or privately owned? The matter needs to be addressed now. The present situation cannot be allowed to continue.

SUGGESTED FIRST STEP: TEST RECENTLY DELIVERED MATERIAL

Perhaps, as a first step, **ConCom should order comprehensive and scientific testing of the mitigation material that has recently been delivered to the bluff and has since been spread over the geotubes and surrounding area.**

The ConCom could commission testing to be performed as quickly as possible by an **independent** group (perhaps the UMASS Boston Field Station) **at the expense of the applicants**. The goal of the testing would be to ascertain exactly what is in the sediment that has just been placed on the geotubes and the beach: what are the characteristics of the material (beyond grain size) that has been used to meet the current "mitigation sand" standard? For instance: Is there construction debris present, are there any contaminants (such as oil) in the sediment, are there other chemicals consistent with soil polluted by a failed septic system, etc.? Core samples will have to be taken because of the volume of sediment and the manner in which it has been packed down on top of the geotube revetment.

SUGGESTED NEXT STEP: MODIFY THE CURRENT ORDER TO AMEND THE MITIGATION PROGRAM

Once the testing has been completed and analyzed, the **ConCom could consider amending the current Order of Conditions** to define the standards for the "mitigation sand" clearly so that dirt from excavation sites and other sources cannot be used. Perhaps it is time to develop Best Management Practices (BMP) for mitigation sand specifically for Nantucket and our beaches, rather than rely on BMP developed by DEP. Clearly the grain-analysis-only BMP of DEP are not adequate for Nantucket's beaches, the hallmark of our environment and driver of our economy.

SOME SPECIFICS

· **Redefine the term "mitigation sand"** that is used throughout the Order. Exactly what should be the characteristics of mitigation material that is compatible with the beach sand in the area of the geotubes? Should the sediment more closely match what's on the beach or what's in the bluff? Is there a difference?

· **Redefine (or define more specifically) the term "clean fill,"** as contained in General Condition #7. Maybe the reference to "clean fill" should be omitted and replaced with a newly defined term of "mitigation sand" so there is no confusion between sand and dirt.

· **Ascertain whether the site of the geotubes has become a potential point-source contamination location and consequently a violation of the Clean Water Act**.

· **Establish a chain of custody for the sediment** after it has been tested and before it is delivered to the bluff. Where is it stockpiled? What steps are to be taken to ensure that it is not degraded between testing and delivery to the site? Is there a ticket for every truckload identifying the source of the sediment and certifying its components? If not, there should be.

· **Establish a requirement that a certain number of years' worth of mitigation sand that meets the requirements should be identified and approved in advance**. The mitigation program is essential to the project: the material to be used in such a large volume is far too critical not to plan for it ahead of time. Clearly clean sand is getting more and more difficult to obtain, and the cost is soaring, especially on-island. Yes, we have plenty of clean sand on Nantucket, but the land is so valuable that it obviously does not make financial sense to mine clean sand on-island.

ANOTHER OPTION

· **Consider recommending the termination of the project**. Perhaps it is simply neither practical nor prudent to continue with this project, given its environmental impacts. The geotubes were always meant to be temporary. They were installed five years ago to abate an emergency. That emergency has been abated. There are now feasible alternatives to hard armoring 900-feet of bluff and public beach with geotubes, requiring a continuing mitigation program that is proving to be increasingly unsustainable.

Maybe the time has come for the Commission to have a conversation with the members of the Select Board, the ultimate stewards of our public beaches. As the owners of the property, who issued the license to the applicants for use of the public land for this

purpose, the Select Board looks to the Commission for guidance. Understandably, the serious negative impacts of this project were not anticipated back in 2013. Provision #11 of the Memorandum of Understanding between the parties has a provision that permits either party (the Town or SBPF) to terminate the agreement if it "determines that it is not practical nor prudent to proceed with the project."

Has the time come to consider this option?

Sincerely,

The NCC Coordinating Team

Elin Anderwald
Joyce Berruet
Burton Balkind
Peter Brace
Barbara Bund
Susan Landmann
Susan McFarland
Liz Trillos
Mary Wawro
Karen Werner

D. Anne Atherton
Administrative Coordinator

COPY FYI:
DEP SERO (Jim Mahala, Nate Corcoran, and Greg DeCesare)
Members, Nantucket Select Board

I have some concerns about the sampling done and the average grain size. The mitigation sediments appears to have a higher proportion of fine silt than the native beach and dune and higher than the advisable 10% ceiling for beach nourishment. It also appears that there is some cobble or large gravel, increasing the required volume to process.

1. From my understanding of ASTM standard protocol (C136/C136M-14), a composite sample is usually created from all samples collected the reports here indicate that was not done. Total sample size should be indicated.

2. When coarse and fine aggregate mixtures of gravel as large as 9.5 mm are processed 1 Kg is the minimum test size, and if more coarse than more is required.

3. 3. Test results above 10% silt raises concerns and if there is a lot of silt that might be why it looks like dirt and not sand.

4. Compatible to Sconset mitigation fill should be 85 to 95% medium sand, with some gravel and about 0 to 8% silt.

5. The McArdle Gannon grain size results have an average of 16%. Having pockets of silt in the natural embankment eroding in wind and rain is different from repeatedly dumping what becomes compacted sediment at the lower level. Native beach and dune had less than 8%, and more frequently 1 to 2% fines.

6. High levels of silt will wash away a larger proportion of sediment dumped. Larger grain size is expected to remain on the beach longer. Silt clouds the water and can smother infaunal life below the midtide.

7. Where are the results of the underwater tests of the native beach and continued beach profiles? Quarterly profiles yield a lot of seasonally important information for the surrounding area and the project itself.

8. The obvious need for more fill is drawing new source sites for mitigation sediment. It is the generator's responsibility for testing to establish that concentrations of any contaminent of adequately characterized and meet clean reuse criteria. Is that documentation available?

9. 1 test profile per 1,000 cubic yards (1,500-1,700 tons) is what the literature cites as acceptable. People are concerned that substandard fill from variable excavation sites being used may be harboring septic, pesticide, metals, fertilizer, paint, oil or other residues.

10. Mitigation sand source sites should be tested periodically to represent shipment delivered and to document compatibility and clean source. For grain size compatibility a minimum of 10 subsamples, not smaller than 100g, combined are appropriate for mixed grain size up to 9.5 mm. If the coarse fraction is larger then a sample volume increase is required per ASTM C136/C136M-14. Weigh each subsample, heat at 110C until steady weight is recorded then process. Results should include total weigh and volume of samples, with the particle size distribution results.

11. Samples for environmental contamination evaluation should be collected, processed and reported to declare clean fill. How has this been documented thus far?

Yvonne Vaillancourt
Director, Nantucket Field Station
School for the Environment, UMass Boston
180 Polpis Road
Nantucket, MA 02554

RECEIVED
NOV 20 2019
11/20 meeting

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
And the Nantucket Wetlands Bylaw (Chapter 136)

DEP File Number:
SE48-2824

A. Violation Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

This Enforcement Order is issued by:

Nantucket
Conservation Commission (Issuing Authority)

11/20/2019
Date

To:

Siasconset Beach Preservation Fund
Name of Violator

PO Box 2279, Nantucket, MA 02584
Address

1. Location of Violation:

See attached property owner list
Property Owner (if different)

87-105 Baxter Road
Street Address

Nantucket
City/Town

02584
Zip Code

Map: 48 Parcels: 8, 21, 22, 18, 17, & 15
Assessors Map/Plat Number

Map: 49 Parcels: 19 & 8
Parcel/Lot Number

2. Extent and Type of Activity (if more space is required, please attach a separate sheet):

Failure to meet reporting and monitoring requirements; see attached findings.

B. Findings

The Issuing Authority has determined that the activity described above is in a resource area and/or buffer zone and is in violation of the Wetlands Protection Act (M.G.L. c. 131, § 40) and its Regulations (310 CMR 10.00), because:

☐ the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone without approval from the issuing authority (i.e., a valid Order of Conditions or Negative Determination).

B. Findings (cont.)

☒ the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone in violation of an issuing authority approval (i.e., valid Order of Conditions or Negative Determination of Applicability) issued to:

Siasconset Beach Preservation Fund Name	9/30/2015 (Amended 11/28/18) Dated
SE48-2824 File Number	27, 34b Condition number(s)

☐ The Order of Conditions expired on (date): _____ Date

☐ The activity violates provisions of the Certificate of Compliance.

☐ The activity is outside the areas subject to protection under MGL c.131 s.40 and the buffer zone, but has altered an area subject to MGL c.131 s.40.

☐ Other (specify):

C. Order

The issuing authority hereby orders the following (check all that apply):

☐ The property owner, his agents, permittees, and all others shall immediately cease and desist from any activity affecting the Buffer Zone and/or resource areas.

☐ Resource area alterations resulting from said activity shall be corrected and the resource areas returned to their original condition.

☐ A restoration plan shall be filed with the issuing authority on or before _____ Date

for the following:

The restoration shall be completed in accordance with the conditions and timetable established by the issuing authority.

C. Order (cont.)

☐ Complete the attached Notice of Intent (NOI). The NOI shall be filed with the Issuing Authority on or before:

Date

for the following:

No further work shall be performed until a public hearing has been held and an Order of Conditions has been issued to regulate said work.

☒ The property owner shall take the following action (e.g., erosion/sedimentation controls) to prevent further violations of the Act:

Appeared in front of Commission 11/6/2019; see attached findings

Failure to comply with this Order may constitute grounds for additional legal action. Massachusetts General Laws Chapter 131, Section 40 provides: "Whoever violates any provision of this section (a) shall be punished by a fine of not more than twenty-five thousand dollars or by imprisonment for not more than two years, or both, such fine and imprisonment; or (b) shall be subject to a civil penalty not to exceed twenty-five thousand dollars for each violation". Each day or portion thereof of continuing violation shall constitute a separate offense.

D. Appeals/Signatures

An Enforcement Order issued by a Conservation Commission cannot be appealed to the Department of Environmental Protection, but may be filed in Superior Court.

Questions regarding this Enforcement Order should be directed to:

Jeff Carlson, Natural Resources Director
Name

508-228-7230
Phone Number

M-F 9AM-1PM
Hours/Days Available

Issued by:

Nantucket
Conservation Commission

Conservation Commission signatures required on following page.

FINDINGS and ADDITIONAL CONDITIONS
Massachusetts Wetlands Protection Act (MGL Chapter 131, Section 40)
Town of Nantucket Wetlands Bylaw (Chapter 136)

Address:	87-105 Baxter Road
Assessor's Map and Parcel:	48-8, 14, 14.1, 15, 17, 18, 19, 21, 22, 35
Property Owner:	Town of Nantucket
Applicant:	Siasconset Beach Preservation Fund (SBPF)
DEP File Number:	SE48-2824
Filing Date:	8/14/2015
Date Hearing Closed:	9/10/2015
Date Orders Issued:	9/30/2015
Date Order Amended:	11/28/2018
Plan of Record Information:	Baxter Road Stabilization Project (2 Sheets), dated 3/12/2013, Final revision of 9/9/2015, stamped by Joseph R. Marrone, P.E.
Amended Plan of Record:	Sconset Beach Preservation Fund (Proposed Plan View Sheet 1, Typical Sections Sheet 2), dated 9-25-2018 and prepared by W.F. Baird & Associates Ltd.
Date Enforcement Issued:	**11/20/2019**

Enforcement Findings:

1. **The Commission found by unanimous vote at the 11/6/2019 meeting of the Nantucket Conservation Commission that Special Condition 27 which reads:** *The ongoing beach monitoring/survey program currently conducted by the Woods Hole Group shall continue. The monitoring program shall be conducted on a quarterly basis for the first 3 years in order to timely identify beach impacts that may be attributable to the Geotubes and to assess whether the mitigation program is adequate. Beach profiles shall be taken on a quarterly basis along the 44 proposed profile lines. Beach profiles shall be taken from the top of the coastal bank, coastal dune or Geotube seaward to the -5 foot MLW contour. Beach profile data and analysis shall be submitted to the Department and the NCC within 30 days of completion of the quarterly survey. Following 3 years of quarterly surveys, SBPF may request to amend the Order of Conditions to alter the monitoring program.* **Has not been properly met and is in violation.**

1. **The above violation is included in additional condition 34 which reads as follows:** *34. Failure of SBPF to conduct the actions set out in subsections (a) to (f) herein shall constitute a project failure ("failure criteria") if not performed within the stipulated timeframes or within such other reasonable periods of time as determined by the Commission in the event of a delay in performance outside the control of SBPF, or if there are unmitigated adverse impacts from the project. The "failure criteria" include:*
    a. *Failure to provide the sand mitigation as required herein.*
    b. *Failure to conduct the shoreline monitoring and post-storm monitoring as required herein.*
    c. *Failure to repair and/or replace damaged geotextile tubes in a timely manner. If repair or replacement cannot be accomplished within 30 days from the date of the damage, SBPF shall notify the Department and the NCC before 30 days have elapsed and provide a repair schedule for Department review and approval.*

d. *Excessive loss in updrift or downdrift beach cross section that can be attributed to the project. If the quarterly monitoring program identifies excessive loss to the adjacent shoreline (compared to historical data) that may be attributable to the project, then SBPF shall provide notice to the Department and the NCC within 30 days of the completion of the quarterly survey. Upon such notice the procedures set forth in the SOC for such circumstances shall apply.*

e. *Failure to maintain adequate beach width in front of the Bank. If the beach in the project area erodes so that the position of MHW migrates landward to the seaward edge of the second tier of geotextile tubes for any two consecutive quarterly surveys, then within 30 days of completion of the second quarterly survey SBPF shall provide notice to the Department and the NCC.*

f. *Failure to maintain a walkable beach in front of the Geotubes. It shall be a failure if the beach on the seaward side of the coastal bank is not passable by foot and has narrowed by a greater percentage in comparison to the widths of nearby and adjacent beaches up-drift and down-drift, including those beaches in front of other forms of erosion control, for the majority of two consecutive quarters, considering storms, tides, and similar conditions. It is understood that the portion of the beach in front of the geotubes is by definition narrower than nearby unprotected beaches because the geotubes and the sand template covers the back of the beach. In calculating whether the beach has narrowed disproportionately the distance will be measured from Mean High Water to the natural toe of the bluff which in some locations is buried behind the erosion protection system. Upon such a failure SBPF, shall provide notice to the Department and the NCC within 30 days.*

g. *Failure to maintain all required insurance, permits and licenses.*

h. *Failure to meet reporting requirements or good faith effort to provide required reporting.*

The Commission found by unanimous vote that the failure criteria described in #34b has been met and the following actions shall be taken in effort to remedy the failure.

1. Any future missed reports or meeting of any other failure criteria shall cause a public hearing to be scheduled to discuss further remedial action including removal of the structure and/or revocation of the Order of Conditions.
2. This Enforcement Action shall be recorded at the Nantucket Registry of Deeds in all places that the Order of Conditions is recorded and for all properties included in this Order of Conditions. Failure to provide this on a timely basis shall trigger failure criteria #34h as shown above.
3. The applicant shall file a contract with the Commission that demonstrates that a full years worth of funded monitoring for all monitoring requirements is in place within thirty days of issuance of this enforcement. Failure to provide this on a timely basis shall trigger failure criteria #34h as shown above. This shall be in place and required each year until Special Condition #27 is amended or a Certificate of Compliance is issued.
4. The applicant shall file a complete list of responsibility parties involved with management and oversight of the project. The applicant shall file updates to list if any parties change.

Property Owners and Title Information
DEP File Number SE48-2824
87-105 Baxter Road

Map	Parcel	Street Address	Owner Name	Title Reference
48	8	Sconset Bluff	Town of Nantucket	C-1702
49	8	87 Baxter Road	Samuel Furrow and Ann Furrow	Book 839, Page 295
48	22	91 Baxter Road	Daniel L. Korengold, Trustee of the D&M Baxter Road Nominee Trust u/d/t dated July 30, 2012	Book 1352, Page 45
48	21	93 Baxter Road	Steven T. Freeman and Erin P. Freeman	Book 1069, Page 97
48	19	97 Baxter Road	Lawrence C. McQuade and Margaret O. McQuade	C-17087
48	18	99 Baxter Road	Ann B. Furrow	C-20681
48	17	101 Baxter Road	101 Baxter Road, LLC	Book 1427, Page 341
48	15	105 Baxter Road	Marilee Brill Matteson, Trustee of the Marilee Brill Matteson Nominee Trust, u/d/t dated July 21, 2015	C-25689

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
And the Nantucket Wetlands Bylaw (Chapter 136)

DEP File Number:
SE48-2824

D. Appeals/Signatures (cont.)

In a situation regarding immediate action, an Enforcement Order may be signed by a single member or agent of the Commission and ratified by majority of the members at the next scheduled meeting of the Commission.

Signatures:

Signature of delivery person or certified mail number

12/3/19

Dear Members of the Nantucket Conservation Commission,

After watching the video of the meeting from November 20, 2019, I would like to bring some troubling information to the board's attention since I was not able to attend the meeting.

Mitigations sand locations were given to the public on October 23, 2019 and in the November 20, 2019 Conservation Commission meeting packet. One location being 18 South Shore Road with sand samples being tested on August 8, 2019. (Please see the attached documents). As you can see 18 South Shore Road prior to 2019 had one home on the site. This home had an in-ground septic system. In the original map there is one septic tank and two leach pits clearly to the front (closest to South Shore Road) on the property. On April 30, 2019, the Planning Board approved the application for a second dwelling on the property now labeled as the "primary dwelling" and the existing dwelling being called the "secondary doweling". Also on April 30, 2019, the property owner, Stoyan Ivanor, applied for a septic abandonment permit with the Health Department. The as-built connection plan was submitted and certified on June 24, 2019. On June 26, 2019, the property owner applied for a sewer permit with the Sewer Department. In looking at the Sewer Permit map dated June 13, 2019, the new dwelling is clearly on top of the existing and abandoned septic tank and two leach pits. Excavating sand from this location would further prove that knowingly contaminated sand was being used from this site as mitigation sand for 'Sconset Bluff mitigation sand.

As stated at the November 20, 2019 meeting, it is the responsibility of the generator of sand to test the sand. Mr. Dunk pointed out at the November 20, 2019 meeting that Cottage and Castle is the contractor for the sand. Mr. Ivanor is a subcontractor for Cottage and Castle. Cottage and Castle is hired by the applicant SBPF. Mr. Cohen stated that SBPF is not only the applicant but the property owners and neighbors. It is extremely hard to believe that given all the parties involved that the matter of sand from an old septic system was being used as mitigation sand was not brought up for discussion.

As discussed by Town Counsel at the November 20, 2019 meeting, the Order of conditions allows the Board to question the source of the sand and that the Commission has the right to revoke the Order should the conditions with respect to the sand not be in compliance. Applying contaminated sand is a clear violation of both State and Local regulations in addition to a violation of the Clean Water Act.

When the Select Board issued a license for SPBF to use our beaches for this project it is implied that the licensee would have the community's best interest in mind as well as being a good steward of our finite natural resources. This action represents enormous violation of the public trust. I would suggest that if the licensee is willing to do this once it is not a reach to believe they would continue these practices. The commission should move to revoke SPBF's license immediately.

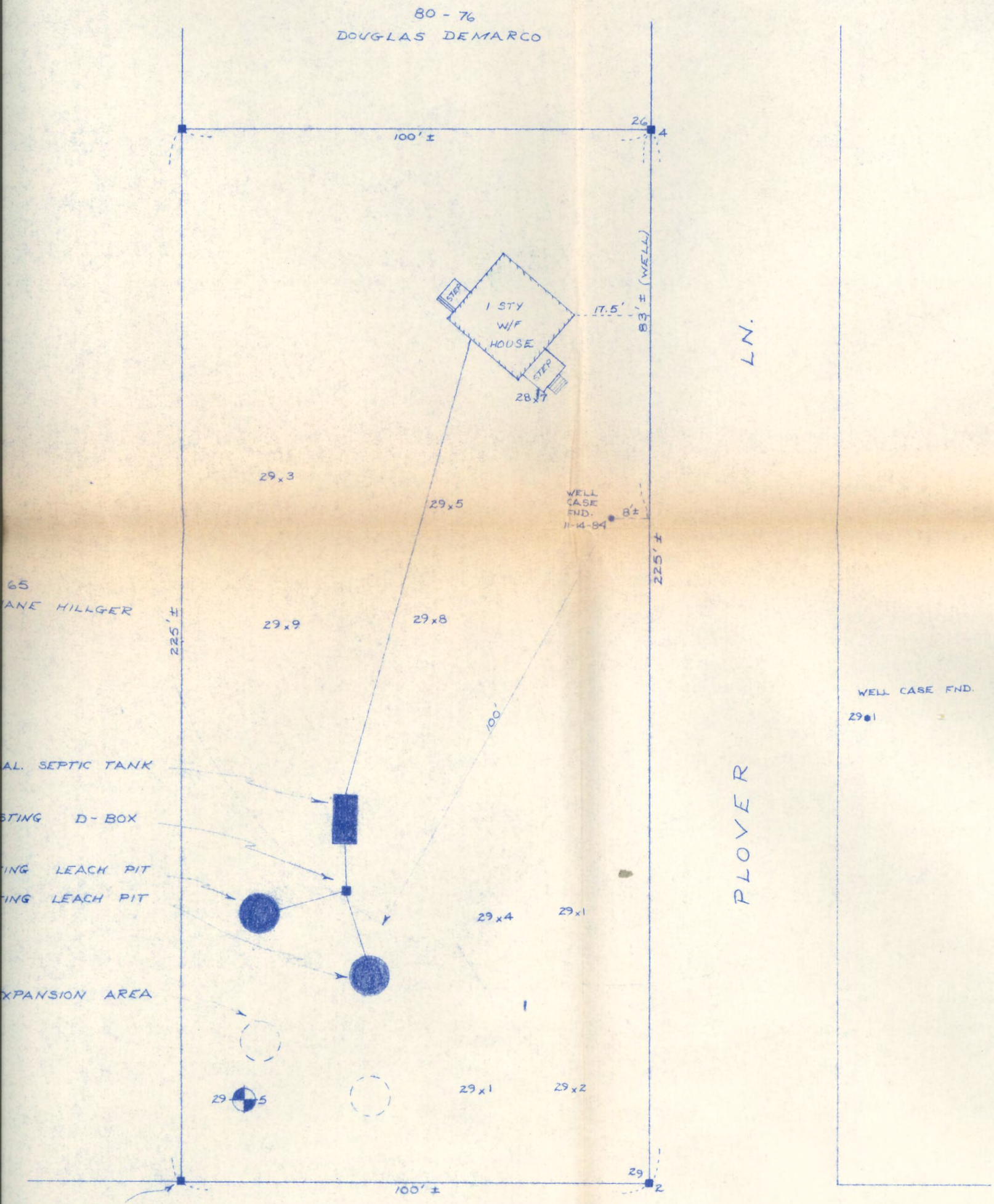
Thank you for your time and consideration.

Sincerely,

David Iverson

EPPLE &
AT 228-
COVERIN

1



NANTUCKET HEALTH DEPARTMENT
3 EAST CHESTNUT STREET
NANTUCKET, MASSACHUSETTS 02554
Telephone 508.228.7200
Fax 508.325.6117

HEALTH DEPARTMENT
#1645
APR 30 2019
RECEIVED

SEPTIC SYSTEM ABANDONMENT APPLICATION

$100.00 Fee payable to the "Town of Nantucket"

I, Stoyan Ivanov hereby apply to the Nantucket Health Department for approval of the abandonment of the existing sewage disposal system at 18 S Shore rd, Nantucket, MA in order to:

(✓) connect to the Municipal Sanitary Sewer;
( ) construct a new onsite individual sewage disposal system; or
( ) other (please explain in the space provided below.

If this property is being connected to a private or municipal sanitary sewer, a copy of the sewer connection must be submitted with this application.

In order to properly abandon the existing sewage disposal system, the septic tank shall be pumped of its entire contents by a licensed septic hauler; and

- shall be excavated and removed from the site; or
- the bottom of the tank shall be opened or ruptured after being pumped of its contents so as to prevent retention of water and the tank shall be completely filled with clean sand or other suitable material approved in writing by the Board of Health.

A copy of the septic hauler pump report for this site must be submitted to the Nantucket Board of Health.

Once the system has been abandoned, no further use of the system for any purpose is allowed.

Applicant's Signature — Date: 04/30/2019

Please be advised that proper abandonment of the septic tank or cesspool must be witnessed by the Nantucket Health Department. Please provide the Health Department with at least **two business days' advance notice** of the date and time when the abandonment will occur so that the required inspection may take place.

Inspector's Signature — Date: 4/30/19 — Abandon Date:

MAP: 80 — PARCEL: 66 — Expiration Date: 7/30/19 — Permit Number: A14-19

Nantucket Planning Board

May 1, 2019

Paul Murphy, Building Commissioner
2 Fairgrounds Road
Nantucket, Massachusetts 02554

RE: 18 South Shore Road (Map 80 Parcel 66) – Stoyan Ivanov

Dear Mr. Murphy:

Please be advised that the Planning Board, at its meeting on April 8, 2019 the Planning Board considered the above application for adequate access, as per §139-20.1 of the *Nantucket Code*, and granted a secondary dwelling approval, conditional upon the following:

(1) That an apron at the driveway entrance with South Shore Road that shall be maintained with a minimum depth of ten (10) feet and a minimum width of fifteen (15) feet;
(2) That the travelled surface of the driveway shall be a minimum of ten (10) feet in width and a maximum foot of fifteen (15) feet in width;
(3) That any future landscaping at the driveway entrances be limited to low growing plant material not to exceed three (3) feet in height;
(4) That the driveways be cleared free of vegetation and obstruction to a width of twelve (12) feet and a height of thirteen (13) feet; and,
(5) That the applicant shall submit an As-Built prior to the final inspection by staff which shall take place prior to the issuance of a Certificate of Occupancy.

The approval is also **conditional** upon adherence to the site plan submitted by the applicant and endorsed by the Chairman, showing the relative locations of proposed or existing dwellings and driveways or parking areas. As per Section 139-2 of the *Nantucket Zoning Code*, the approval referenced herein is valid for a period of **two years only**, calculated from the date of site plan endorsement by the Planning Board.

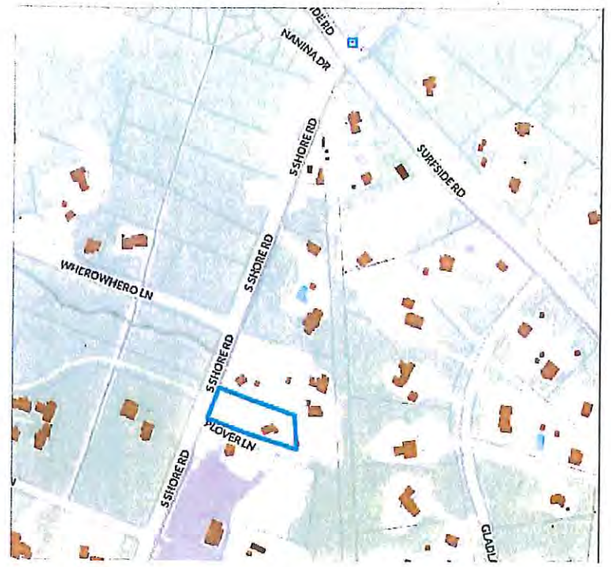
If you have any questions regarding this approval, please contact the Planning Office at 508-325-7587.
Sincerely,

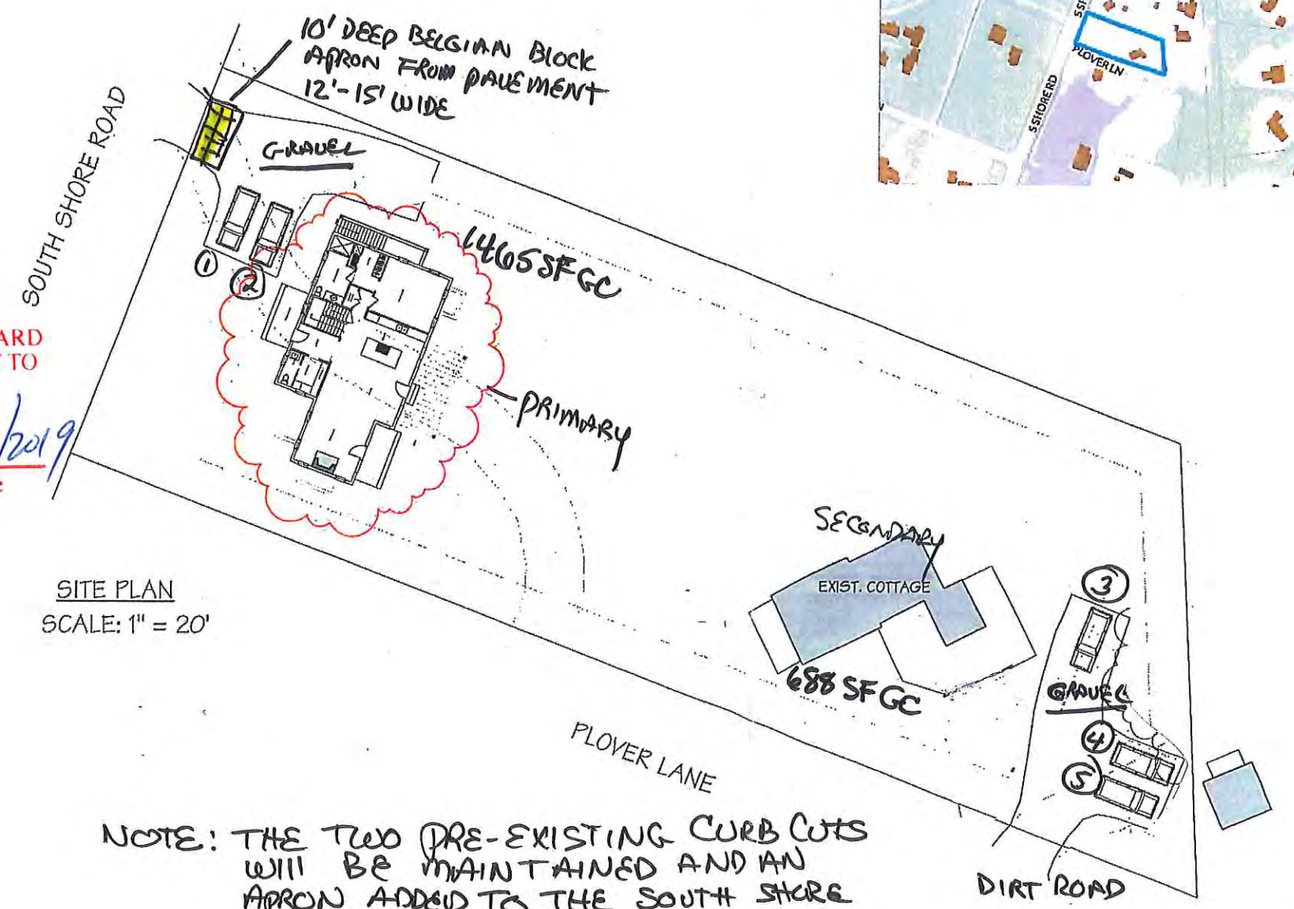
Andrew V. Vorce,
Director of Planning

Cc: Stoyan Ivanov
Marcus Silverstein - Zoning Enforcement Officer

NOTE TO APPLICANTS: Please note that a copy of the plan you submitted to the Board, which has been endorsed by the Chairman, is enclosed and must be presented to the Building Department when applying for a building permit. There will be a $25 administrative fee to re-issue an endorsed site plan.

THE IVANOV RESIDENCE
18 SOUTH SHORE RD.
NANTUCKET, MA 02554





SITE PLAN
SCALE: 1" = 20'

NOTE: THE TWO PRE-EXISTING CURB CUTS WILL BE MAINTAINED AND AN APRON ADDED TO THE SOUTH SHORE ROAD ENTRANCE

APPROVED
BY THE NANTUCKET PLANNING BOARD
FOR ADEQUATE ACCESS PURSUANT TO
SECTION 139-20.1 OF THE
NANTUCKET ZONING BYLAW
AICP STAFF MEMBER — Date 4/30/2019

DATE PRINTED 2/21/2019

REVISIONS:

COVER SHEET
DATE: 02/21/2019
SCALE: AS NOTED

THE IVANOV RESIDENCE
18 South Shore Rd.
Nantucket, MA

MP: 80 / 66

A

TOWN of NANTUCKET

SEWER APPLICATION AND PERMIT

PERMIT # SS- 6314

PRIMARY DWELLING

THE TOWN RESERVES THE RIGHT TO A 30 DAY APPLICATION REVIEW PERIOD.

(AS Built Connection Plan Submitted 6/24/19)

X	RESIDENTIAL
	COMMERCIAL
	DISCONNECT
	RECONNECT
	VERIFICATION

FEE: $ 2000.00 - CHK #1665 DATE PAID: 5 / 20 / 19 DATE ISSUED: 06 / 26 / 2019 EXPIRATION DATE: 06 / 26 / 2020

OWNER: Stoyan Ivanov PHONE: 5083326459 AGENT: PHONE:

ADDRESS: 18 S Shore rd EMAIL: uniquecarpentryinc@gmail.com ADDRESS: EMAIL:

LOCATION OF WORK: 18 S Shore MAP# 80-66

CONTRACTOR: GFM Enterprise PARCEL#

ADDRESS: PHONE:

SEWER CONNECTION PLANS MUST ACCOMPANY APPLICATION. INSPECTIONS ARE REQUIRED FOR ALL WORK.

AS BUILTS MUST BE SUBMITED BEFORE FINAL SIGNATURES CAN BE OBTAINED.

NO.	FIXTURE TYPE
6	BEDROOMS
2	KITCHEN SINKS
1	DISHWASHERS
1	GARBAGE DISPOSALS
–	LAUNDRY SINKS
5	WATER CLOSETS
	URINALS
5	LAVATORIES
3	SHOWERS
1	BATHTUBS
2	WASHING MACHINES
	OTHERS

CONDITIONS OF THIS PERMIT

BY ACCEPTANCE OF THE PERMIT THE UNDERSIGNED AGREES TO ACCEPT AND ABIDE BY THE SEWER USE RULES AND REGULATIONS OF THE TOWN AND COUNTY OF NANTUCKET ADOPTED SEPTEMBER 1975 AND AS MAY BE SUBSEQUENTLY AMENDED.TO MAINTAIN SAID SEWER INSTALLATION AT NO EXPENSE TO THE TOWN OF NANTUCKET, TO GRANT AS MAY BE NECESSARY, ANY EASEMENTS ATTENDANT TO SAID SEWER INSTALLATION TO THE TOWN OF NANTUCKET AND ITS AGENTS. TO PROVIDE ANY BONDING BY CASH OR SURETY AS MAY BE DEEMED NECESSARY BY THE DIRECTOR, NANTUCKET SEWER DEPARTMENT TO ENSURE SATISFACTORY COMPLETION OF THE WORK AUTHORIZED BY THIS PERMIT. TO PROVIDE AMPLE NOTIFICATION TO THE DIRECTOR, NANTUCKET SEWER DEPARTMENT WHEN THE SEWER INSTALLATION IS/WILL BE READY FOR INSPECTION AND BEFORE ANY PORTION OF SAID WORK IS COVERED. TO HOLD HARMLESS AND INDEMNIFY THE TOWN OF NANTUCKET AGAINST ALL CLAIMS OF WHATEVER NATURE INCLUDING PROPERTY DAMAGE AND BODILY INJURY RESULTING FROM THE WORK PERFORMED UNDER THIS PERMIT.

ALSO, TO PROVIDE EVIDENCE OF COMPREHENSIVE PUBLIC LIABILITY INSURANCE IN FORCE TO THE DIRECTOR, NANTUCKET SEWER DEPARTMENT.

FOR OFFICE USE ONLY:

SEWER PLANS RECEIVED: ✓ APPROVED: ✓ DENIED:	APPLICATION COMPLETE: ✓	SEWER PRIVILEGE FEE DOCUMENT SIGNED: ✓
WANNACOMET WATER CO FORM: ✓	INSPECTION:	INSPECTOR:
	WORK ORDER#	AS BUILT PLANS:

SIGNATURE APPLICANT/OWNER: WITNESS: BOND: SEWER DIRECTOR/ DESIGNEE:

MULTIPART FORM **PLEASE PRESS FIRMLY**: WHITE: SEWER DEPARTMENT, YELLOW: TAX ASSESOR, PINK: OWNER, GOLDENROD: PLUMBING INSPECTOR, CONTRACTOR

TOWN OF NANTUCKET - SEWER DEPARTMENT

SEWER PERMIT PROCESSING CHECKLIST

(Internal department use only)

RECEIPT DATE: 5/20/19 **PERMIT #:** SS - 6314

PERMIT ADDRESS: 18 SOUTH SHORE ROAD **MAP/PARCEL:** 80/66

APPLICANT *(or Representative)*: STOYAN IVANOV

OWNER NAME *AGENT NAME + PHONE*

Permit Type:

NEW CONNECTION	NEW CONNECTION	LICENSED LODGING ESTABLISHMENT	COMMERCIAL	DISCONNECT/ RECONNECT
(1st dwelling unit, 2nd dwelling unit, connection after 5 years of sewer being available) FEE: $2,000	(Within 5 years of sewer being available) FEE: $500	FEE: $0.55 per SQ FT (but no less than $1,250)	FEE: $1 per SF (but no less than $2,000)	FEE: $0

EXTENSION (6 mo) - FEE: $50

OFFICE Documents Provided:

- ☐ Sewer Permit Packet

APPROVED JUN 26 2019 NANTUCKET SEWER DEPT.

APPLICANT Documents Received:

- ☑ Check # 1665 for permit fee T052419
- ☑ Signed permit
- ☑ Signed Privilege Fee Letter
- ☑ WWCO Application Form
- ☑ Sewer Plan *(unless waived for DC/RC)*
- N/A Septic Abandonment (Acknowledgement)

Status:

- ☐ **APPROVED** *(Date:* _____ *)*
- ☐ **HOLD / REJECTED** *(Date:* _____ *)*

NOTES/COMMENTS - CX REF #6144 (SECONDARY DWELLING, REAR OF PROPERTY)

Office Post Processing:

- ☐ Permit scanned / Digital file created Permit
- ☐ Entered in Sewer Permit Database Check
- ☐ Processed / Sent to Finance
- ☐ Permit placed in alpha Active Permit Folder
- ☐ Inspection requested
- ☐ Inspection completed
- ☐ Sewer As-Built Plan received
- ☐ Sewer As-Built Plan scanned/ Added to digital file
- ☐ Building Permit signed *(If applicable)*
- ☐ Permit & documentation paper filed

RECEIVED
MAY 20 2019
NANTUCKET SEWER DEPT.

Town of Nantucket Sewer Department
WASTEWATER MANAGEMENT

David C. Gray, Sr.
Sewer Director
81 S. Shore Road
Nantucket, MA 02554

Town Direct 508-228-7200 x 7800
Cell 401-413-8370
dgray@nantucket-ma.gov

SANITARY SEWER PERMIT # 6314

NOTICE

TO: Sewer Connection Permit Applicants

FROM: Town of Nantucket DPW APRIL 28, 2005/ Nantucket Sewer Department April 10, 2017

DATE: APRIL 28, 2005

RE: **Sewer Privilege Charges**

Effective April 28, 2005, the following applies to anyone making application for a sewer connection permit:

- Acting under the Authority of Chapter 120, section 6, the Board of Selectmen, acting as the Board of Sewer Commissioners, at its regular meeting on April 27, 2005, voted to carry out the action necessary to implement the intent of Article 4, STM 4/12/05 by confirming that:
- Sewer privilege charges will be assessed to those unconnected properties in the Town Sewer District and needs areas (to those applying for connection effective April 28, 2005), once the final construction cost of the Surfside WWTF project is known, which will be when the project is complete (in 2010)
- The purpose of this document is to hereby notify individuals making application for a sewer connection permit(s) that, as of April 28, 2005, they will be subject to a sewer privilege charge of six thousand three hundred twenty two dollars and fifteen cents ($6,322.15), as confirmed above.

FURTHER

- Chapter 120, Section 6 of the Nantucket Code, in accordance with the authority granted to municipalities under M.G.L. Chapters 80 and 83, grants the Board of Sewer Commissioners broad powers to assess betterments and/or other charges related to improvements to the Town's sewerage facilities;
- The Town (Annual Town Meeting of May 8, 1990; Article 17) established a Sewer Enterprise Fund in accordance with General Laws;
- The Town (Special Town Meeting of April 12, 2005; Article 4) voted to authorize the borrowing necessary to upgrade and expand the Surfside Wastewater Treatment Facility and to assign a portion of those costs to be recaptured through the Sewer Enterprise Fund.

MUST BE SIGNED BY OWNER OR LEGAL COUNSEL

Owner: _____ Date: 05/20/2019

Property Address: 18 S Shore rd MAP: 80 PARCEL: 66

Updated 04-10-2017 Nantucket Sewer Department Director

- SP #6314 -

[COPY FROM SP#6144]

WANNACOMET WATER COMPANY
ONE MILESTONE ROAD
NANTUCKET, MA 02554

RECEIVED
OCT 09 2018
NANTUCKET SEWER DEPT.

APPLICATION for SEWER

The undersigned hereby makes application to the Town of Nantucket's Sewer Department through its agent the Wannacomet Water Company. The undersigned agrees to abide by the established rules and regulations as set by the Town of Nantucket, or which hereafter may be enacted or adopted, and to pay for service at the adopted rates as filed or any subsequent rates which may be filed and accepted. There is a minimum monthly charge for zero usage set by the Town.

Date of Ownership: 07/27/2018 **Map & Parcel:** 80-66

Location of Dwelling: 18 S Shore rd (SECOND DWELLING)

Owners Name: Stoyan Ivanov

Billing Address: 18 S Shore rd
Nantucket MA 02554

Email Address: uniquecarpentryinc@gmail.com

E-Bill & Paper Bill: ☑ **Paper Bill only:** ☐ **E-Bill only:** ☐

Nature of Occupancy: (check off all that apply)

☐ Seasonal ☑ Year round ☐ residential/single house ☐ Condo ☐ Guest House ☐ Restaurant
☐ Other:

Today's Date or Ownership Date: 07/27/2018

Phone Numbers: (H) (W)

Cell Phone: 508 332 6459 **Other Phone:**

Name & Contact Info for Plumber and/or Caretaker:

In-Ground Irrigation System: Yes ☑ No ☐

Job Excavator/Contractor: Clifford Schorer

Contact Person in case of Emergency:

Signature of Owner or Authorized Applicant:

Service Requested by: Stoyan Ivanov

For company use only:

Invoice: **Service No:**
New Service I.D. Account No:
Renewal
Size of Service Size of Meter Commercial Residential

From: Art Crowley
Sent: Tuesday, June 25, 2019 11:38 AM
To: Christine Herrmann; Anne Barrett
Cc: Lora Kebbati
Subject: RE: Sewer Connection Complete - 18 South Shore Road (80/66)

I inspected the abandonment yesterday

From: Christine Herrmann
Sent: Tuesday, June 25, 2019 11:06 AM
To: Art Crowley <ACrowley@nantucket-ma.gov>; Anne Barrett <ABarrett@nantucket-ma.gov>
Cc: Lora Kebbati <lkebbati@nantucket-ma.gov>
Subject: Sewer Connection Complete - 18 South Shore Road (80/66)

Good morning,

The sewer connection for 18 South Shore Road (80/66) was completed on 06/21/19 – I just received the sewer as-built in our office today, and confirmed with our crew that it has been completed. I'm still waiting on confirmation of the exact date, so sorry that this is so belated!

Have you inspected the septic abandonment yet? We have another permit in pending status, and part of the reason we're holding it is we want to make sure that it has been properly abandoned and inspected – we're also waiting for another plan.

Thanks,
Christine

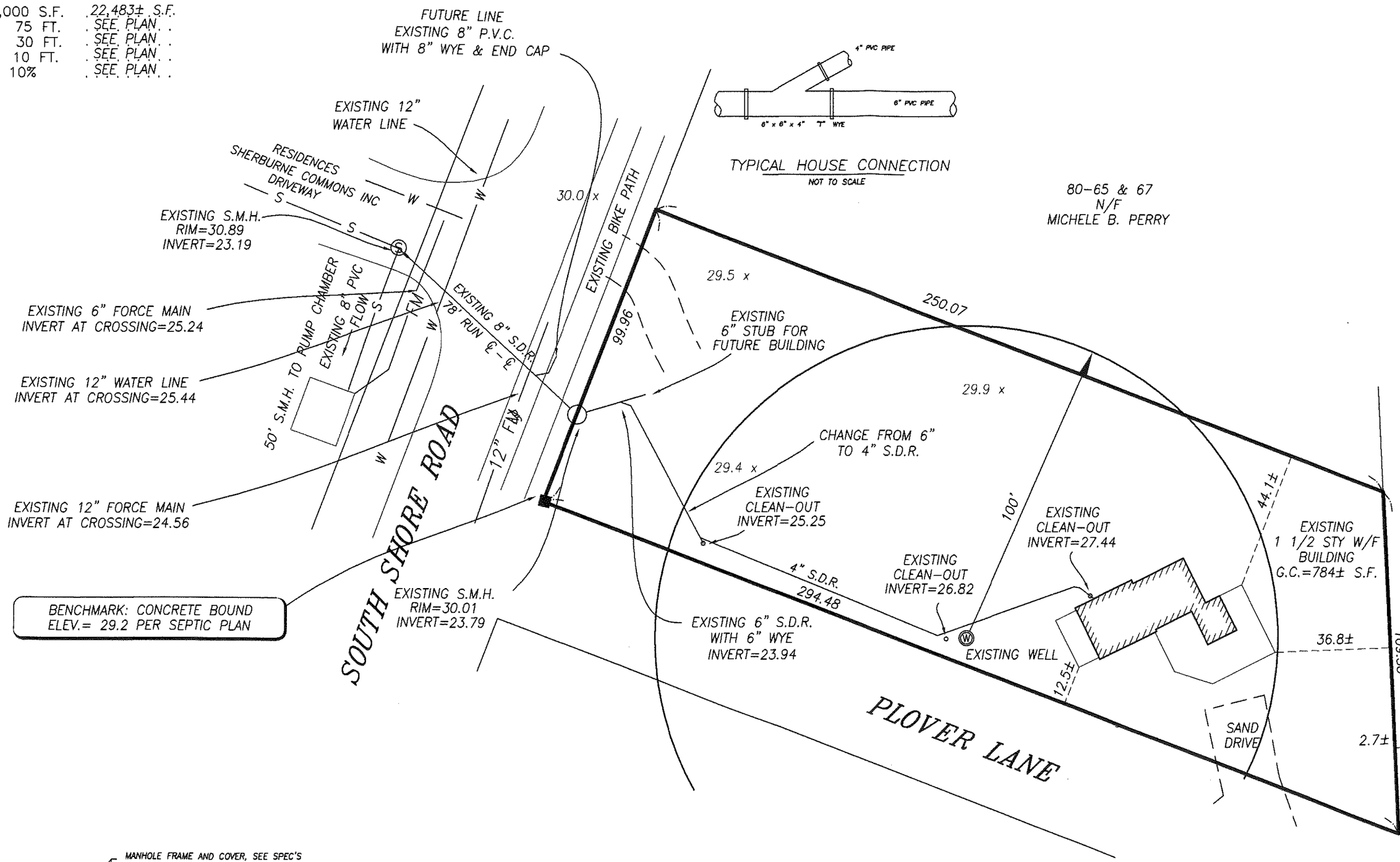
APPROVED
JUN 26 2019
NANTUCKET SEWER DEPT.

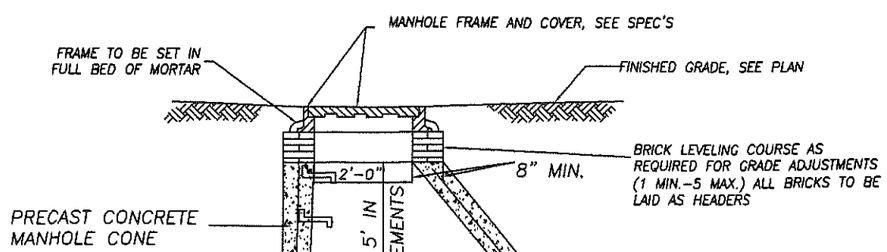
Christine M. Herrmann
Administrative Assistant
Town of Nantucket Sewer Department
81 South Shore Road
Nantucket, MA 02554
508-228-7200 x7801
cherrmann@nantucket-ma.gov

** Please note that I will be on vacation from July 1st through July 8th. **

CURRENT ZONING CLASSIFICATION:
Residential 40 (R-40)

		EXISTING:
MINIMUM LOT SIZE:	40,000 S.F.	22,483± S.F.
MINIMUM FRONTAGE:	75 FT.	SEE PLAN
FRONT YARD SETBACK:	30 FT.	SEE PLAN
REAR/SIDE SETBACK:	10 FT.	SEE PLAN
GROUND COVER % :	10%	SEE PLAN





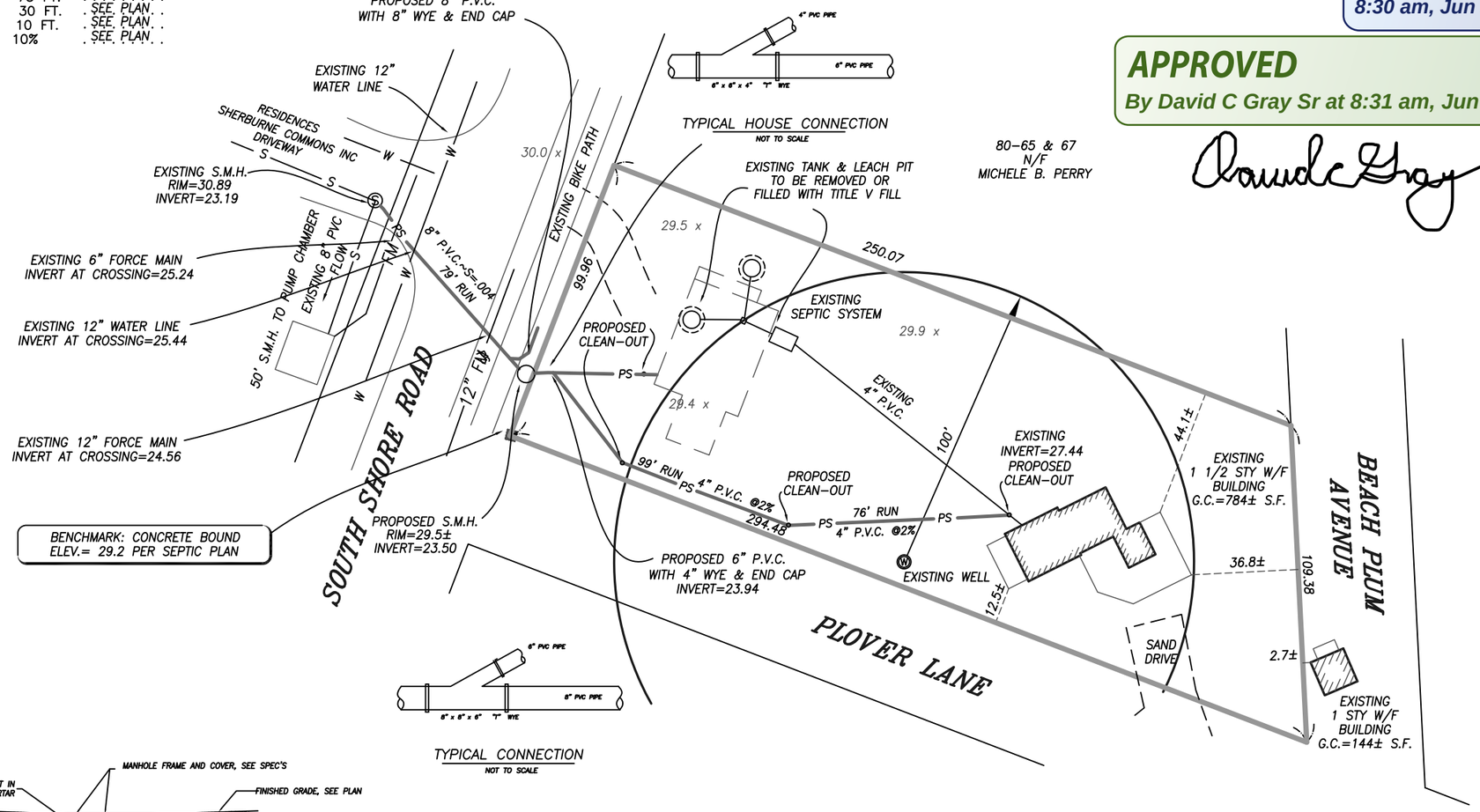
STREETS, DRIVEWAYS AND WALKS | LAWNS AND CROSS COUNTRY

CURRENT ZONING CLASSIFICATION:
Residential 40 (R–40)

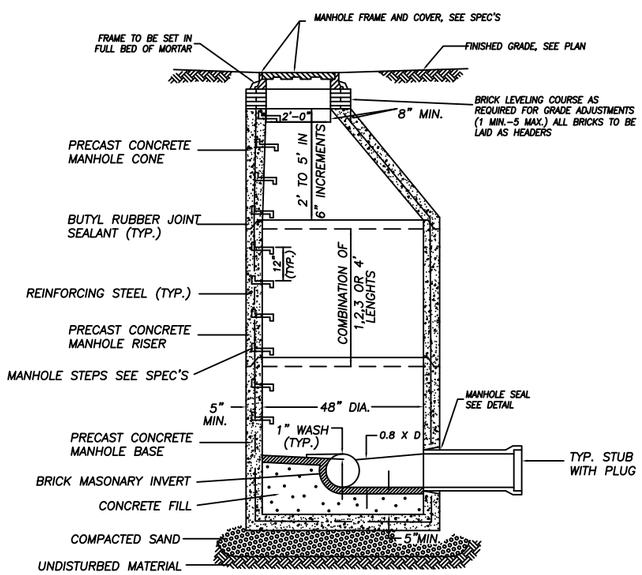
		EXISTING:
MINIMUM LOT SIZE:	40,000 S.F.	22,483± S.F.
MINIMUM FRONTAGE:	75 FT.	SEE PLAN
FRONT YARD SETBACK:	30 FT.	SEE PLAN
REAR/SIDE SETBACK:	10 FT.	SEE PLAN
GROUND COVER % :	10%	SEE PLAN

REVISED
8:30 am, Jun 13, 2019

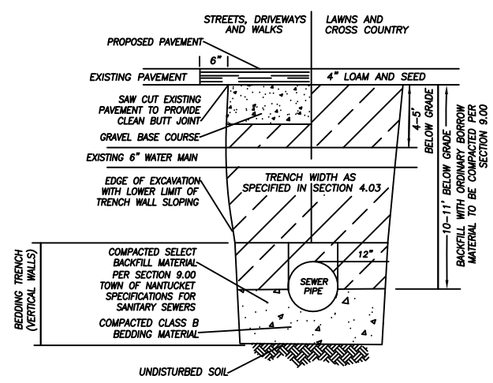
APPROVED
By David C Gray Sr at 8:31 am, Jun 13, 2019



TYPICAL CONNECTION
NOT TO SCALE



4'–0" DIA. PRECAST
CONCRETE MANHOLE DETAIL
NOT TO SCALE



SEWER TRENCH DETAIL
NOT TO SCALE

NOTES:

1. CLASS B BEDDING REQUIRED HAND COMPACTED TO 95% COMPACTION RATIO.
2. ALL STRUCTURES TO BE CAPABLE OF H–20 LOADING.
3. SOUTH SHORE ROAD MUST BE SAW–CUT IN ADVANCE 6" BEYOND EXCAVATION.
4. PRECAST MANHOLES TO CONFORM TO ASTM C478 AND SHALL BE MARKED BY MANUFACTORE MINIMUN COMPRESSIVE STRENGHT OF CONCRETE TO BE 4000 PSI @28 DAYS
5. CONTRACTOR TO CALL AND OBTAIN A DIG SAFE (1–888–344–7233) NUMBER PRIOR TO COMMENCING WORK, AND CONTACT NANTUCKET ELECTRIC COMPANY AND NANTUCKET CABLEVISION.
6. ALL PVC PIPE SHALL MEET THE REQUIREMENTS OF ASTM DESIGNATION D3034, LATEST REVISION. MAXIMUM ALLOWABLE LENGHT PER SECTION SHALL NOT EXCEED 20 FEET FROM BELL TO SPIGOT. WALL THICKNESS SHALL MEET ASTM D3034: SDR 35 OR BETTER.

SEWER CONNECTION PLAN
OF LAND IN
NANTUCKET, MASS.

SCALE: 1"= 30' DATE: JUNE 12, 2019

Owner: . . . . . STOYAN T. IVANOV . . . . . .
Deed: . . . 1657–63 . . . Plan: 2–1; LOTS 17–18 22–108; LOTS 19–27
Locus: . . . . . 18 SOUTH SHORE ROAD . . . .

ISLAND SURVEYORS, LLC
Professional Land Surveyors
90 OLD SOUTH ROAD
NANTUCKET, MASS. 02554
(508) 228–2720

ASSESSOR MAP: . . . 80 . , PARCEL: . . . 66 . .

K–744

TOWN of NANTUCKET

SEWER APPLICATION AND PERMIT

PERMIT # SS- 6314

PRIMARY DWELLING

THE TOWN RESERVES THE RIGHT TO A 30 DAY APPLICATION REVIEW PERIOD.

CERTIFIED TRUE COPY OF AN ORIGINAL DOCUMENT SIGNED [illegible] DATE 6/26/19

X	RESIDENTIAL
	COMMERCIAL
	DISCONNECT
	RECONNECT
	VERIFICATION

CHK #1665 (AS Built Connection Plan Submitted 6/24/19)

FEE: $ 2000.00 DATE PAID: 5 / 20 / 19 DATE ISSUED: 06 / 26 / 2019 EXPIRATION DATE: 06 / 26 / 2020

OWNER: Stoyan Ivanov PHONE: 508 332 6459 AGENT: PHONE:

ADDRESS: 18 S Shore rd EMAIL: uniquecarpentryinc@gmail.com ADDRESS: EMAIL:

LOCATION OF WORK: 18 S Shore MAP# 80-66

CONTRACTOR: GFM Enterprise PARCEL#

ADDRESS: PHONE:

SEWER CONNECTION PLANS MUST ACCOMPANY APPLICATION. INSPECTIONS ARE REQUIRED FOR ALL WORK.

AS BUILTS MUST BE SUBMITED BEFORE FINAL SIGNATURES CAN BE OBTAINED.

NO.	FIXTURE TYPE
6	BEDROOMS
2	KITCHEN SINKS
1	DISHWASHERS
1	GARBAGE DISPOSALS
–	LAUNDRY SINKS
5	WATER CLOSETS
	URINALS
5	LAVATORIES
3	SHOWERS
1	BATHTUBS
2	WASHING MACHINES
	OTHERS

CONDITIONS OF THIS PERMIT

BY ACCEPTANCE OF THE PERMIT THE UNDERSIGNED AGREES TO ACCEPT AND ABIDE BY THE SEWER USE RULES AND REGULATIONS OF THE TOWN AND COUNTY OF NANTUCKET ADOPTED SEPTEMBER 1975 AND AS MAY BE SUBSEQUENTLY AMENDED.TO MAINTAIN SAID SEWER INSTALLATION AT NO EXPENSE TO THE TOWN OF NANTUCKET, TO GRANT AS MAY BE NECESSARY, ANY EASEMENTS ATTENDANT TO SAID SEWER INSTALLATION TO THE TOWN OF NANTUCKET AND ITS AGENTS. TO PROVIDE ANY BONDING BY CASH OR SURETY AS MAY BE DEEMED NECESSARY BY THE DIRECTOR, NANTUCKET SEWER DEPARTMENT TO ENSURE SATISFACTORY COMPLETION OF THE WORK AUTHORIZED BY THIS PERMIT. TO PROVIDE AMPLE NOTIFICATION TO THE DIRECTOR, NANTUCKET SEWER DEPARTMENT WHEN THE SEWER INSTALLATION IS/WILL BE READY FOR INSPECTION AND BEFORE ANY PORTION OF SAID WORK IS COVERED. TO HOLD HARMLESS AND INDEMNIFY THE TOWN OF NANTUCKET AGAINST ALL CLAIMS OF WHATEVER NATURE INCLUDING PROPERTY DAMAGE AND BODILY INJURY RESULTING FROM THE WORK PERFORMED UNDER THIS PERMIT.

ALSO, TO PROVIDE EVIDENCE OF COMPREHENSIVE PUBLIC LIABILITY INSURANCE IN FORCE TO THE DIRECTOR, NANTUCKET SEWER DEPARTMENT.

FOR OFFICE USE ONLY:

SEWER PLANS RECEIVED: ✓ APPROVED: ✓ DENIED:	APPLICATION COMPLETE: ✓	SEWER PRIVILEGE FEE DOCUMENT SIGNED: ✓
WANNACOMET WATER CO FORM: ✓	INSPECTION:	INSPECTOR:
	WORK ORDER#	AS BUILT PLANS:

SIGNATURE APPLICANT/OWNER: WITNESS: BOND: SEWER DIRECTOR DESIGNEE:

MULTIPART FORM **PLEASE PRESS FIRMLY**: WHITE: SEWER DEPARTMENT, YELLOW: TAX ASSESOR, PINK: OWNER, GOLDENROD: PLUMBING INSPECTOR, CONTRACTOR

8:49 LTE

All Inboxes 9 Messages

Found in Cloud Drive

JC **Jeff Carlson** 11/6/19
To: Meghan Perry >

RE: Address question

Hello Meghan,
I apologize for the delay and would confirm that the address on South Shore Road was #18. We will be posting the sieve analysis to the Town website as well. I do appreciate your concerns related to additional testing for chemical parameters. I have passed these concerns along to DEP in an effort to gain some guidance from them as well. Tonight's discussion for SBPF is focused on the missed reporting and failure criteria and I believe it is the intention of the Commission to have the sediment/nourishment issue discussed at the following meeting in more detail and hopefully with an opinion from DEP. PFAS in particular is being widely discussed and the state is working towards have a reporting level and remediation program. There has not been any PFAS testing to date on Nantucket but I personally believe that it is only a matter of time before testing will have to begin. Thank you again for raising your concern.

Thanks,
Jeff Carlson
Natural Resources Director
Town of Nantucket
2 Bathing Beach Road
Nantucket, MA 02554
508-228-7230

See More

ANALYTICAL REPORT

Lab Number:	L1957130
Client:	Epsilon Associates, Inc. 3 Mill & Main Place Suite 250 Maynard, MA 01752
ATTN:	Dwight R. Dunk
Phone:	(978) 897-7100
Project Name:	TCE
Project Number:	Not Specified
Report Date:	12/02/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: TCE
Project Number: Not Specified

Lab Number: L1957130
Report Date: 12/02/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1957130-01	GREGLEN AVE 11/25/19 SAMPLE 1	SOIL	18 GREGLEN AVE	11/25/19 14:00	11/26/19

Project Name:	TCE	**Lab Number:**	L1957130
Project Number:	Not Specified	**Report Date:**	12/02/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	TCE	**Lab Number:**	L1957130
Project Number:	Not Specified	**Report Date:**	12/02/19

Case Narrative (continued)

Grain Size Analysis

The WG1314592-1 Laboratory Duplicate RPDs for % coarse gravel (143%), % fine gravel (94%) and % total gravel (102%), performed on L1957130-01, are outside the acceptance criteria. The elevated RPDs have been attributed to the non-homogeneous nature of the native sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 12/02/19

INORGANICS
&
MISCELLANEOUS

Project Name: TCE
Project Number: Not Specified

Lab Number: L1957130
Report Date: 12/02/19

SAMPLE RESULTS

Lab ID: L1957130-01
Client ID: GREGLEN AVE 11/25/19 SAMPLE 1
Sample Location: 18 GREGLEN AVE

Date Collected: 11/25/19 14:00
Date Received: 11/26/19
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Grain Size Analysis - Mansfield Lab										
Cobbles	ND		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Coarse Gravel	0.100		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Fine Gravel	0.900		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Total Gravel	1.00		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Coarse Sand	2.80		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Medium Sand	39.1		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Fine Sand	54.8		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Total Sand	96.7		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC
% Total Fines	2.30		%	0.100	NA	1	-	11/27/19 09:14	12,D6913/D7928	MC

Lab Duplicate Analysis

Batch Quality Control

Project Name: TCE

Project Number: Not Specified

Lab Number: L1957130

Report Date: 12/02/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Grain Size Analysis - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1314592-1 QC Sample: L1957130-01 Client ID: GREGLEN AVE 11/25/19 SAMPLE 1						
Cobbles	ND	ND	%	NC		20
% Coarse Gravel	0.100	0.600	%	**143**	Q	20
% Fine Gravel	0.900	2.50	%	**94**	Q	20
% Total Gravel	1.00	3.10	%	**102**	Q	20
% Coarse Sand	2.80	2.30	%	20		20
% Medium Sand	39.1	36.5	%	7		20
% Fine Sand	54.8	56.1	%	2		20
% Total Sand	96.7	94.9	%	2		20
% Total Fines	2.30	2.00	%	14		20

Project Name: TCE
Project Number: Not Specified

Lab Number: L1957130
Report Date: 12/02/19

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
N/A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1957130-01A	Bag	N/A	NA		21.6	Y	Absent		A2-HYDRO-TFINE(),A2-HYDRO-CGRAVEL(),A2-HYDRO-FSAND(),A2-HYDRO-MSAND(),A2-HYDRO-TGRAVEL(),A2-HYDRO-CSAND(),A2-HYDRO-TSAND(),A2-HYDRO-COBBLES(),A2-HYDRO-FGRAVEL()

*Values in parentheses indicate holding time in days

Project Name:	TCE	**Lab Number:**	L1957130
Project Number:	Not Specified	**Report Date:**	12/02/19

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report

Project Name:	TCE	**Lab Number:**	L1957130
Project Number:	Not Specified	**Report Date:**	12/02/19

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

Report Format: Data Usability Report

Project Name: TCE
Project Number: Not Specified

Lab Number: L1957130
Report Date: 12/02/19

Data Qualifiers

RE - Analytical results are from sample re-extraction.
S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Project Name: TCE **Lab Number:** L1957130
Project Number: Not Specified **Report Date:** 12/02/19

REFERENCES

12 Annual Book of ASTM Standards. (American Society for Testing and Materials) ASTM International.

LIMITATION OF LIABILITIES

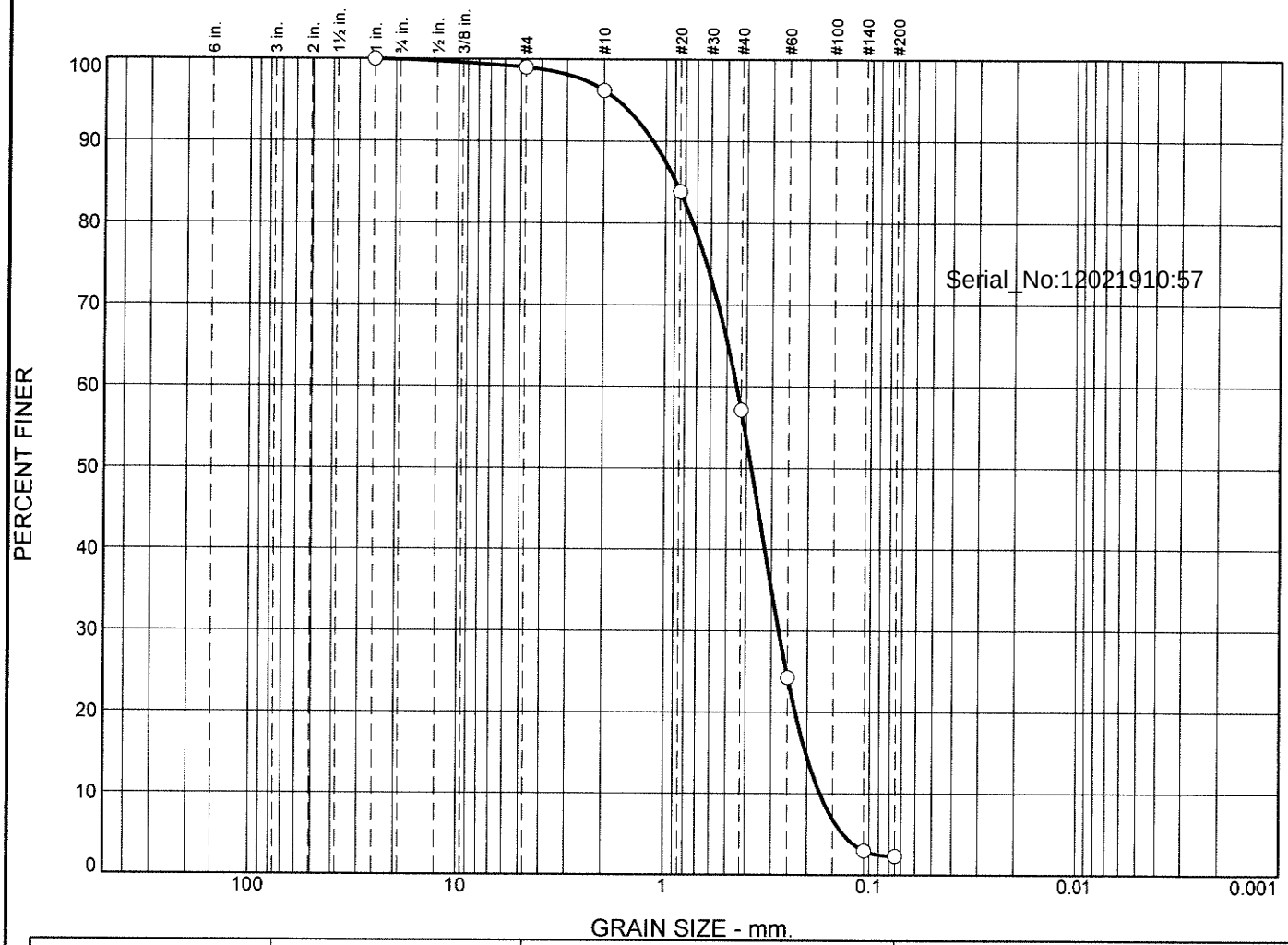
Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

ASTM D6913/D7928

GRAIN SIZE ANALYSIS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.1	0.9	2.8	39.1	54.8	2.3	

☒	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				0.8934	0.4476	0.3780	0.2766	0.2030	0.1731	0.99	2.59

	Material Description	USCS	AASHTO
○		SP	

Project No. **Client:**

Project:

○ **Source:** GREGLEN AVE 11/25/19 SAMPLE 1 **Sample No.:** L1957130-01

Date: ○

Remarks:

○ Sampled and Tested by MCH

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

11/29/2019

Location: GREGLEN AVE 11/25/19 SAMPLE 1
Sample Number: L1957130-01
USCS Classification: SP
Testing Remarks: Sampled and Tested by MCH

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 92.51
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:12021910:57

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
92.51	0.00	1	0.00	0.00	100.0
		#4	0.95	0.00	99.0
		#10	2.57	0.00	96.2
		#20	11.44	0.00	83.8
		#40	24.71	0.00	57.1
		#60	30.38	0.00	24.3
		#140	19.71	0.00	3.0
		#200	0.61	0.00	2.3

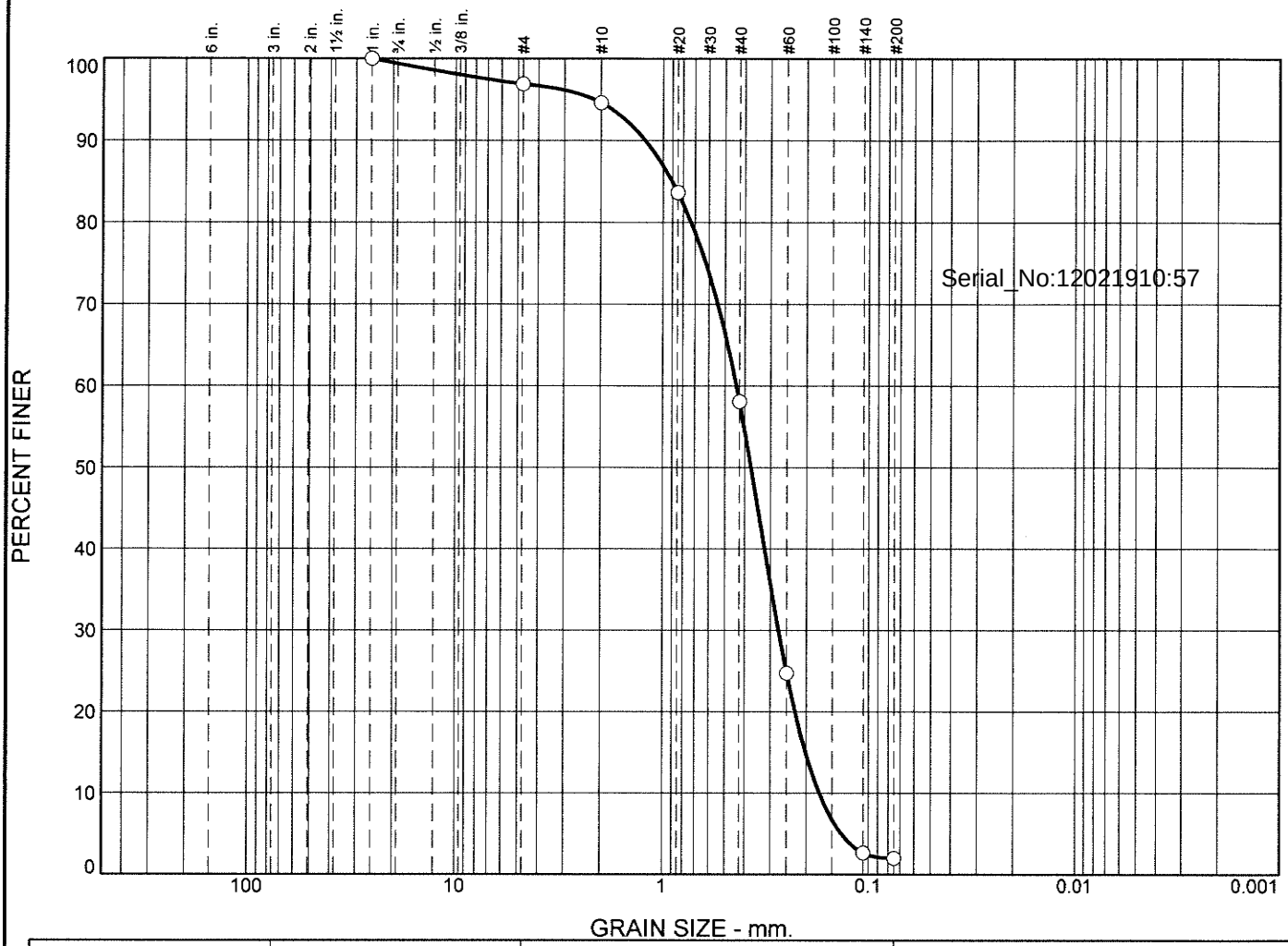
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.1	0.9	1.0	2.8	39.1	54.8	96.7			2.3

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1337	0.1731	0.2030	0.2292	0.2766	0.3240	0.3780	0.4476	0.7355	0.8934	1.1532	1.7199

Fineness Modulus	C_u	C_c
1.99	2.59	0.99

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.6	2.5	2.3	36.5	56.1	2.0	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				0.9058	0.4400	0.3725	0.2737	0.2018	0.1729	0.99	2.55

	Material Description	USCS	AASHTO
○		SP	

Project No. **Client:**

Project:

○ **Source:** GREGLEN AVE 11/25/19 SAMPLE 1 **Sample No.:** WG1314592-1

Date: ○

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

11/29/2019

Location: GREGLEN AVE 11/25/19 SAMPLE 1
Sample Number: WG1314592-1
USCS Classification: SP

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 92.89
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:12021910:57

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
92.89	0.00	1	0.00	0.00	100.0
		#4	2.88	0.00	96.9
		#10	2.14	0.00	94.6
		#20	10.17	0.00	83.6
		#40	23.77	0.00	58.1
		#60	30.92	0.00	24.8
		#140	20.53	0.00	2.7
		#200	0.62	0.00	2.0

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.6	2.5	3.1	2.3	36.5	56.1	94.9			2.0

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1355	0.1729	0.2018	0.2274	0.2737	0.3200	0.3725	0.4400	0.7319	0.9058	1.2186	2.1573

Fineness Modulus	C_u	C_c
2.04	2.55	0.99

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE ____ OF ____

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 11/26/19

ALPHA Job #: L1957130

Client Information

Client: Epsilon
Address: 3 Mill & Main Place
Suite 250, Maynard, MA 01754
Phone: 978-897-7100
Fax:
Email: ddunk@epsilonassociates.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: TCE
Project Location: 18 Greglen Ave
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☒ RUSH (only confirmed if pre-approved)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #: 21597

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: Sieve Analysis ☒ / no hydrometer testing	SAMPLE HANDLING (Filtration ☐ Done ☐ Not needed ☐ Lab to do; Preservation ☐ Lab to do (Please specify below))	Sample Specific Comments	TOTAL # BOTTLES
957130-01	Greglen Ave 11/25/19 Sample 1	11/25/19	2:00pm	Sand	AT	X			

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
Sean Sennell	11/26/19 17:19	[illegible]	11/26/19 17:19

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

ANALYTICAL REPORT

Lab Number:	L1958190
Client:	Epsilon Associates, Inc. 3 Mill & Main Place Suite 250 Maynard, MA 01752
ATTN:	Dwight R. Dunk
Phone:	(978) 897-7100
Project Name:	Not Specified
Project Number:	Not Specified
Report Date:	12/09/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Six Park Row, Mansfield, MA 02048
508-261-7467 (Fax) -- -- - emccarter@mansfieldma.com

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1958190
Report Date: 12/09/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1958190-01	11 SOUTH SHORE	SOIL	Not Specified	12/02/19 12:14	12/05/19

Project Name:	Not Specified	**Lab Number:**	L1958190
Project Number:	Not Specified	**Report Date:**	12/09/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L1958190
Project Number:	Not Specified	**Report Date:**	12/09/19

Case Narrative (continued)

Grain Size Analysis

The WG1317526-1 Laboratory Duplicate RPDs for % fine gravel (119%), % total gravel (119%), % fine sand (28%) and % total fines (116%), performed on L1958190-01, are outside the acceptance criteria. The elevated RPDs have been attributed to the non-homogeneous nature of the native sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 12/09/19

INORGANICS
&
MISCELLANEOUS

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1958190
Report Date: 12/09/19

SAMPLE RESULTS

Lab ID: L1958190-01
Client ID: 11 SOUTH SHORE
Sample Location: Not Specified

Date Collected: 12/02/19 12:14
Date Received: 12/05/19
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Grain Size Analysis - Mansfield Lab										
Cobbles	ND		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Coarse Gravel	ND		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Fine Gravel	2.30		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Total Gravel	2.30		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Coarse Sand	5.90		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Medium Sand	47.4		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Fine Sand	43.5		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Total Sand	96.8		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD
% Total Fines	0.900		%	0.100	NA	1	-	12/06/19 08:22	12,D6913/D7928	GD

Lab Duplicate Analysis

Batch Quality Control

Project Name: Not Specified

Project Number: Not Specified

Lab Number: L1958190

Report Date: 12/09/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Grain Size Analysis - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1317526-1 QC Sample: L1958190-01 Client ID: 11 SOUTH SHORE						
Cobbles	ND	ND	%	NC		20
% Coarse Gravel	ND	ND	%	NC		20
% Fine Gravel	2.30	9.00	%	**119**	Q	20
% Total Gravel	2.30	9.00	%	**119**	Q	20
% Coarse Sand	5.90	5.80	%	2		20
% Medium Sand	47.4	49.0	%	3		20
% Fine Sand	43.5	32.8	%	**28**	Q	20
% Total Sand	96.8	87.6	%	10		20
% Total Fines	0.900	3.40	%	**116**	Q	20

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1958190
Report Date: 12/09/19

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1958190-01A	Bag	A	NA		21.2	Y	Absent		A2-HYDRO-TFINE(),A2-HYDRO-CGRAVEL(),A2-HYDRO-FSAND(),A2-HYDRO-MSAND(),A2-HYDRO-TGRAVEL(),A2-HYDRO-CSAND(),A2-HYDRO-TSAND(),A2-HYDRO-COBBLES(),A2-HYDRO-FGRAVEL()

*Values in parentheses indicate holding time in days

Project Name: Not Specified **Lab Number:** L1958190

Project Number: Not Specified **Report Date:** 12/09/19

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report

Project Name:	Not Specified	**Lab Number:**	L1958190
Project Number:	Not Specified	**Report Date:**	12/09/19

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

Report Format: Data Usability Report

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L1958190
Report Date: 12/09/19

Data Qualifiers

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Project Name: Not Specified **Lab Number:** L1958190
Project Number: Not Specified **Report Date:** 12/09/19

REFERENCES

12 Annual Book of ASTM Standards. (American Society for Testing and Materials) ASTM International.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

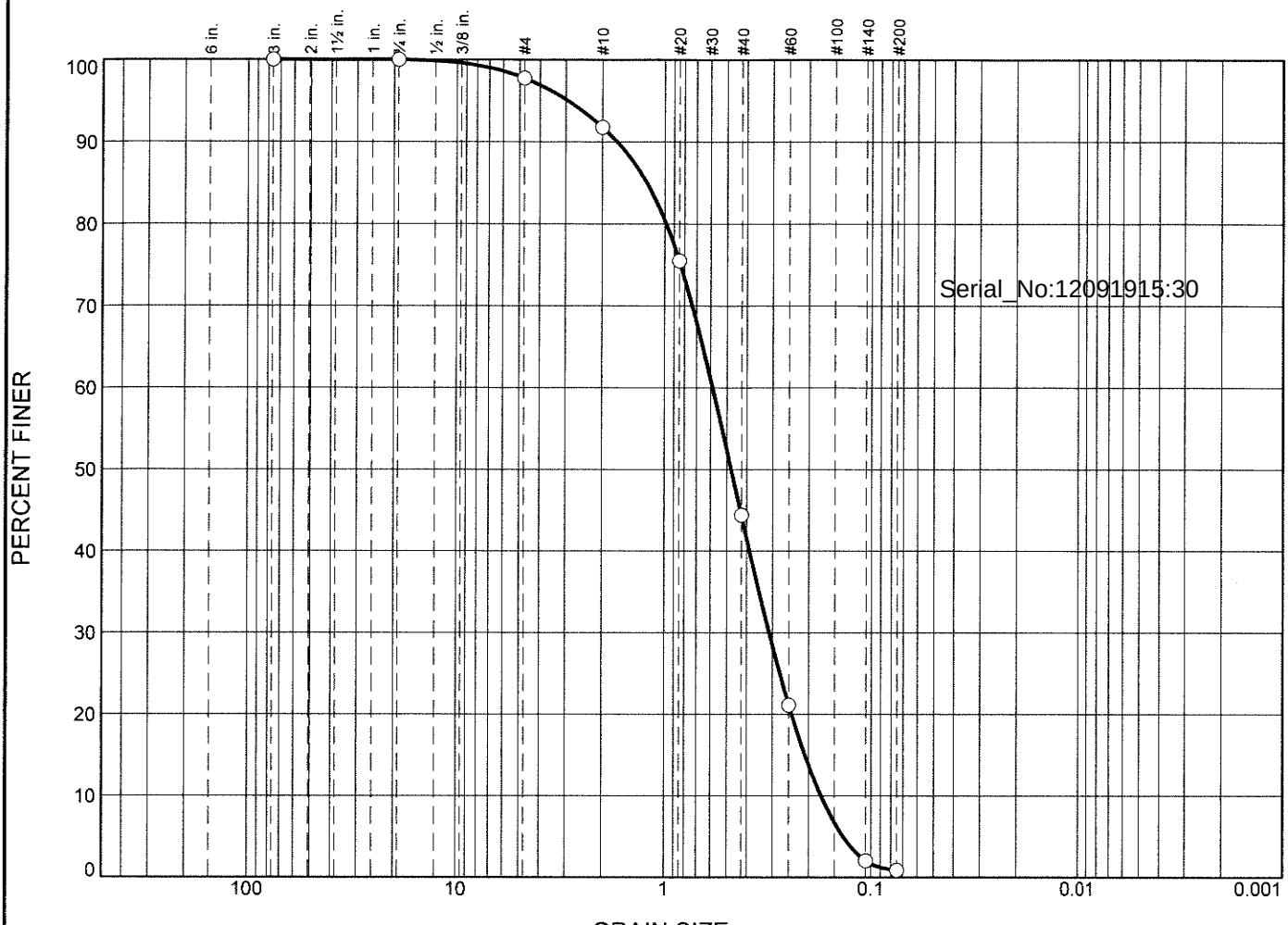
We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Serial_No:12091915:30

ASTM D6913/D7928

GRAIN SIZE ANALYSIS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.3	5.9	47.4	43.5	0.9	

☒	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				1.2184	0.5863	0.4767	0.3114	0.2085	0.1741	0.95	3.37

Material Description	USCS	AASHTO
○	SP	

Project No. **Client:**

Project:

○ **Source of Sample:** 11 SOUTH SHORE **Sample Number:** L1958190-01

Date: ○

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

12/9/2019

Location: 11 SOUTH SHORE
Sample Number: L1958190-01
USCS Classification: SP

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 95.45
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:12091915:30

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
95.45	0.00	3	0.00	0.00	100.0
		0.75	0.00	0.00	100.0
		#4	2.15	0.00	97.7
		#10	5.72	0.00	91.8
		#20	15.52	0.00	75.5
		#40	29.69	0.00	44.4
		#60	22.19	0.00	21.1
		#140	18.22	0.00	2.1
		#200	1.11	0.00	0.9

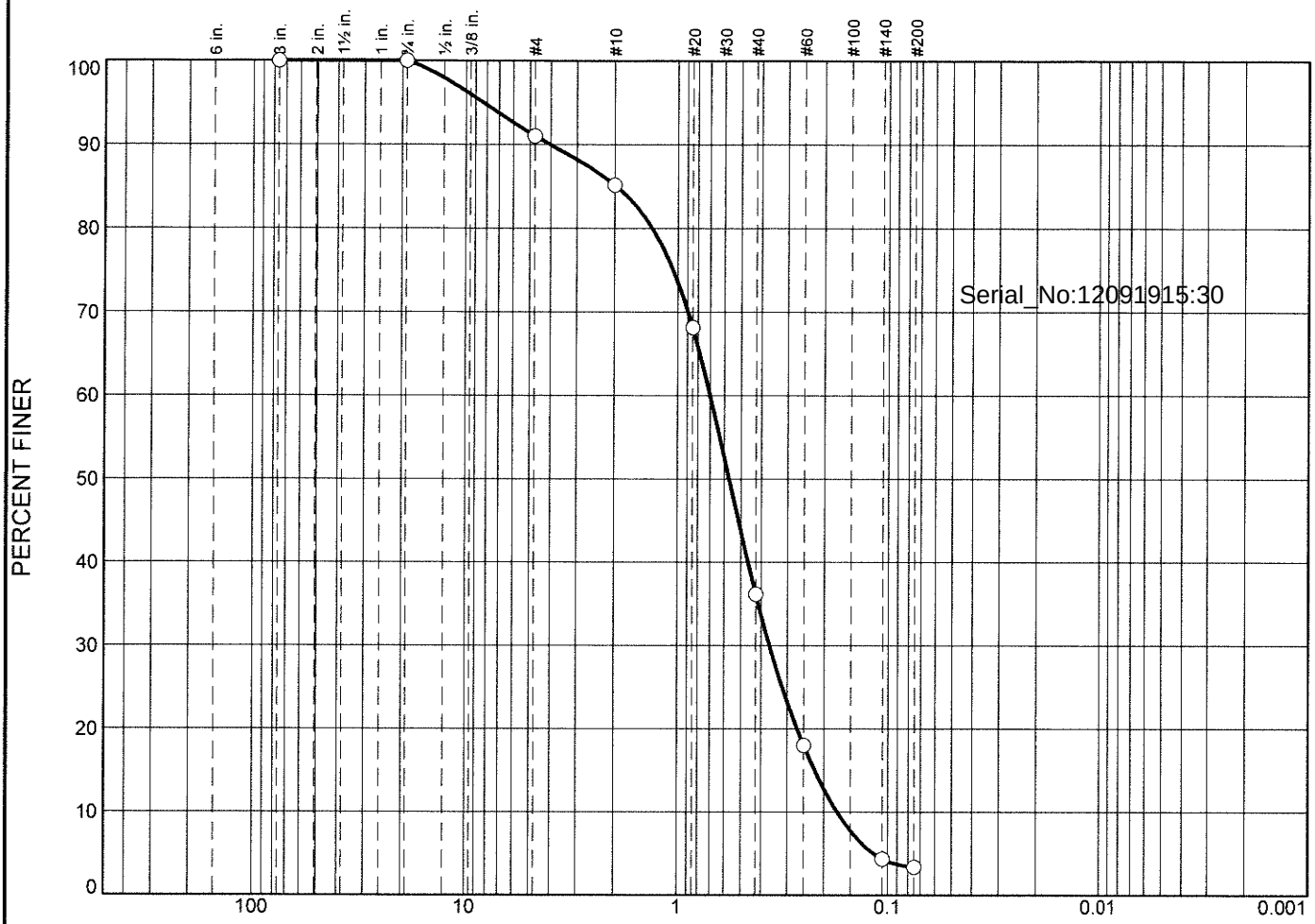
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	2.3	2.3	5.9	47.4	43.5	96.8			0.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1362	0.1741	0.2085	0.2423	0.3114	0.3879	0.4767	0.5863	0.9836	1.2184	1.6953	2.9339

Fineness Modulus	C_u	C_c
2.29	3.37	0.95

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.0	5.8	49.0	32.8	3.4	

	Colloids	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○				1.9652	0.7008	0.5693	0.3650	0.2214	0.1732	1.10	4.05

	Material Description	USCS	AASHTO
○		SP	

Project No. **Client:**

Project:

○ **Source of Sample:** 11 SOUTH SHORE **Sample Number:** WG1317526-1

Date: ○

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

12/9/2019

Location: 11 SOUTH SHORE
Sample Number: WG1317526-1
USCS Classification: SP

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 96.02
Tare Wt. = 0.00
Minus #200 from wash = 0.0%

Serial_No:12091915:30

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
96.02	0.00	3	0.00	0.00	100.0
		0.75	0.00	0.00	100.0
		#4	8.63	0.00	91.0
		#10	5.62	0.00	85.2
		#20	16.34	0.00	68.1
		#40	30.70	0.00	36.2
		#60	17.43	0.00	18.0
		#140	13.11	0.00	4.4
		#200	0.96	0.00	3.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	9.0	9.0	5.8	49.0	32.8	87.6			3.4

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1165	0.1732	0.2214	0.2689	0.3650	0.4628	0.5693	0.7008	1.3254	1.9652	4.0403	8.2955

Fineness Modulus	C_u	C_c
2.65	4.05	1.10

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE ____ OF ____

Date Rec'd in Lab: 12/5/19

ALPHA Job #: L1958190

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Epsilon
Address: 3 Mill & Main Place, Suite 250 Maynard, MA 01754
Phone: 978-897-7100
Fax:
Email: ddoak@epsilonassociates.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name:
Project Location:
Project #:
Project Manager:
ALPHA Quote #:

Turn-Around Time

☐ Standard ☒ RUSH (only confirmed if pre-approved)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: grain size only - no hydrometer testing

SAMPLE HANDLING
Filtration ____
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS	Sample Specific Comments	TOTAL # BOTTLES
958190 - 01	11 South Shore	12/2/19	12:14 pm	Sand	AT	✓		

Container Type	
Preservative	

Relinquished By:	Date/Time	Received By:	Date/Time
Sam Sewell	12/5 15:23	[illegible]	12/5/19 1523

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

TOWN OF NANTUCKET NATURAL RESOURCES DEPARTMENT

JEFF CARLSON, NATURAL RESOURCES DIRECTOR JCARLSON@NANTUCKET-MA.GOV
2 BATHING BEACH ROAD 508-228-7230
NANTUCKET, MA 02554

MEMO

12/5/2019

To: Conservation Commission
Libby Gibson, Town Manager
Gregg Tivnan, Assistant Town Manager
Rachel Day, Assistant Town Manager

From: Jeff Carlson, Natural Resources Director

Re: SE48-2824 SBPF Geotube Project 12-4-19 Field Inspection

In response to questions raised in regards to the existing mitigation material by Conservation Commission members and the general public a field inspection was conducted on December 4, 2019. To detail the methodology used I observed and photographed the structure in total from the top of the natural Coastal Bank. An area of brick and stone was observed and some large stones and potential debris was observed from the top. Using an existing access down the bank I proceeded to walk the entire length of the top of the Geotubes photographing noteworthy features or materials of concern in the nourishment template. I then walked the entire beach in front of the structure photographing all uncovered areas and other noteworthy features. I did not disturb the template or dig into any material but only what was visible without soil disturbance. I have provided every picture taken during this inspection. In general I found a number of red bricks and brick fragments along the length of the structure, large stones, and potential landscaping style stone which was not found within the template during previous inspections. The pictures also detail some other debris like PVC pipe fragments found within the material throughout the template. The DEP Nourishment guidelines and existing Order of Conditions calls for clean, compatible material to the Coastal Bank or Coastal Beach. Based on the December 4, 2019 inspection I have significant concerns that this material meets these criteria as required by the Order of Conditions.

NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

December 3, 2019

Ms. Ashley Erisman, Chair
Nantucket Conservation Commission
Town of Nantucket

Dear Chair Erisman and Members of the Commission:

We would like to follow up in regard to the brief discussion the Commission held at its November 20 meeting concerning the **underwater video and bathymetric reporting requirements** for the Current Geotube Project (85 To 105 Baxter Road) SE48-2824, Date of Issuance 11.28.18.

The consultant for the applicants, Mr. Dwight Dunk acknowledged in his letter of November 15, referring to Monitoring Compliance:

> In response to discussion at the past meeting [November 6], SBPF provides below a table noting the status of 2019 monitoring and reporting. The underwater video and bathymetric surveys are typically approved concurrent with quarterly shoreline surveys. **Whereas the two shoreline line surveys were missed, as explained in our letter of October 31, 2019 and discussed at the last meeting, those related surveys were also missed.** As noted previously surveys have been scheduled and /or performed to put the project back into compliance with the survey and monitoring schedule. [See page 4 of letter. Emphasis added.]

Shoreline Change - quarterly	Not current 2 in 2019 (Q2and Q4)
Bathymetric Survey - semi-annually	**Not current** 1 in 2019 (autumn 2019)
Underwater Video - semi-annually	**Not current** 1 in 2019 (autumn 2019)

NOTE: Although Mr. Dunk lists the Bathymetric Survey and the Underwater Video as separate reports, we believe that the "underwater video and bathymetric reporting requirements" have been (in the past) contained in **one report**, titled "Sconset Beach Underwater Video Survey," consistent with Special Condition #28. [As an example see Report dated March 22, 2019.]

The important point, however, is that the underwater video and bathymetric surveys are NOT "related" to the Quarterly Reports. They are **separate from** the Quarterly Reporting requirement and, in fact, are **contained in a stand-alone Special Condition** (#28). And further, there is no dispute that the Sconset Beach Underwater Video Survey for the spring of 2019 has not been submitted, and apparently the fall survey was only recently commissioned.

Special Condition, #28, reads as follows:

> As proposed, offshore (bathymetric) profiles shall be taken each spring and fall. GPS locations shall be taken along each transect with the coordinates provided. These transects shall be reused for each survey to cover the same areas. Offshore profiles shall be taken out to the -25 foot to -35 foot MLW92 contour or 2,000 to 3,000 feet offshore, whichever is greater. The bathymetric survey transects shall overlap the beach profiles (no gaps) and the tide gage used during the survey shall be surveyed into the same datum as the beach profiles. Bathymetry profile data and analysis shall be submitted to the Department and NCC within 30 days of completion of the survey. Photographs and/or video shall be taken along the transects within the project area and the area directly adjacent to the project area. The underwater video shall be able to characterize the bottom sediments, species present and relative abundance including the calculating of the percent cobble where appropriate.

As noted in Special Condition #28, the underwater video survey report is to be done twice a year, in the fall and spring (whereas the Quarterly Reports are to be submitted four times a year). In addition, the underwater video survey reports have been conducted by a different entity from the firm preparing the Quarterly Reports (Woods Hole Group). For example: The Sconset Beach Underwater Video Survey Report (dated March 22, 2019) was prepared by Epsilon Associations, Inc., and CR Environmental, Inc.

When the Commission voted unanimously at the November 6 meeting to find that the applicants had met the failure criteria contained in Special Condition #34, **the action referred specifically to Special Condition #27** requiring Quarterly Reports (shoreline change) and NOT to **Special Condition #28** requiring underwater video reports.

However, because the Commission was unaware at the time of the vote that the requirements of Special Condition #28 had also not been met (underwater video survey reports due in the spring and fall of 2019), the Enforcement Order issued at the subsequent meeting on November 20 did **not** cite the failure of Special Condition #28.

In order for the record to be complete, we respectfully request that the Commission put non-compliance with Condition #28 on its agenda for December 18. It appears that the Commission should consider taking formal action and find that the applicant failed to meet the reporting requirements of Special Condition #28 and has, in this respect, also met the failure criteria relating to reporting and monitoring contained in Special Condition #34.

Sincerely,

The NCC Coordinating Team

ATTACHMENTS (2): SUMMARY DIFFERENCES BETWEEN SPECIAL CONDITIONS #27 AND #27 AND TEXT OF SPECIAL CONDITION #34

SUMMARY: DIFFERENCES BETWEEN SPECIAL CONDITON #27 AND SPECIAL CONDITION #28

SPECIAL CONDITION	FREQUENCY	PREPARED BY
#27: **The ongoing beach monitoring/survey program currently conducted by the Woods Hole Group shall continue.** The monitoring program shall be conducted on a **quarterly basis** for the first 3 years in order to timely identify beach impacts that may be attributable to the Geotubes and to assess whether the mitigation program is adequate. Beach profiles shall be taken on a quarterly basis along the 44 proposed profile lines. Beach profiles shall be taken from the top of the coastal bank, coastal dune or Geotube seaward to the -5 foot MLW contour. Beach profile data **and analysis** shall be submitted to the Department and the NCC within 30 days of completion of the quarterly survey. Following 3 years of quarterly surveys, SBPF may request to amend the Order of Conditions to alter the monitoring program.	Quarterly	The Woods Hole Group
#28: **As proposed, offshore (bathymetric) profiles shall be taken each spring and fall.** GPS locations shall be taken along each transect with the coordinates provided. These transects shall be reused for each survey to cover the same areas. Offshore profiles shall be taken out to the -25 foot to -35 foot MLW92 contour or 2,000 to 3,000 feet offshore, whichever is greater. The bathymetric survey transects shall overlap the beach profiles (no gaps) and the tide gage used during the survey shall be surveyed into the same datum as the beach profiles. Bathymetry profile data and analysis shall be submitted to the Department and NCC within 30 days of completion of the survey. Photographs and/or video shall be taken along the transects within the project area and the area directly adjacent to the project area. The underwater video shall be able to characterize the bottom sediments, species present and relative abundance including the calculating of the percent cobble where appropriate.	Spring and Fall	Epsilon Associations, Inc., and CR Environmental, Inc. (Falmouth)

SPECIAL CONDITION #34: FAILURE CRITERIA

#34: **Failure of SBPF to conduct the actions set out in subsections (a) to (f) herein shall constitute a project failure ("failure criteria") if not performed within the stipulated timeframes or within such other reasonable periods of time as determined by the Commission** in the event of a delay in performance **outside** the control of SBPF, or if there are unmitigated adverse impacts from the project. The "failure criteria" include:

a. Failure to provide the sand mitigation as required herein.

b. Failure to conduct the shoreline monitoring and post-storm monitoring as required herein.

c. Failure to repair and/or replace damaged geotextile tubes in a timely manner. If repair or replacement cannot be accomplished within 30 days from the date of the damage, SBPF shall notify the Department and the NCC before 30 clays have elapsed and provide a repair schedule for Department review and approval.

d. Excessive loss in updrift or downdrift beach cross section that can be attributed to the project. If the quarterly monitoring program identifies excessive loss to the adjacent shoreline (compared to historical data) that may be attributable to the project, then SBPF shall provide notice to the Department and the NCC within 30 clays of the completion of the quarterly survey. Upon such notice the procedures set forth in the SOC for such circumstances shall apply.

e. Failure to maintain adequate beach width in front of the Bank. If the beach in the project area erodes so that the position of MHW migrates landward to the seaward edge of the second tier of geotextile tubes for any two consecutive quarterly surveys, then within 30 days of completion of the second quarterly survey SBPF shall provide notice to the Department and the NCC.

f. Failure to maintain a walkable beach in front of the Geotubes. It shall be a failure if the beach on the seaward side of the coastal bank is not passable by foot and has narrowed by a greater percentage in comparison to the widths of nearby and adjacent beaches up-drift and clown-drift, including those beaches in front of other forms of erosion control, for the majority of two consecutive quarters, considering storms, tides, and similar conditions. It is understood that the portion of the beach in front of the geotubes is by definition narrower than nearby unprotected beaches because the geotubes and the sand template covers the back of the beach. In calculating whether the beach has narrowed disproportionately the distance will be measured from Mean High Water to the natural toe of the bluff which in some locations is buried behind the erosion protection system. Upon such a failure SBPF, shall provide notice to the Department and the NCC within 30 clays.

g. Failure to maintain all required insurance, permits and licenses.

h. **Failure to meet reporting requirements** or good faith effort to provide required reporting.

[Emphasis added.]

NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

December 7, 2019

Ms. Ashley Erisman, Chair
Nantucket Conservation Commission
Town of Nantucket

ADDITIONAL FAILURE: GENERAL CONDITION #7

Dear Chair Erisman and Members of the Commission:

We draw your attention to what appears to be a flagrant violation of the Order of Conditions (as amended) issued to the Siasconset Beach Preservation Fund (SBPF) for the Current Geotube Project (85 To 105 Baxter Road) SE48-2824, Date of Issuance 11.28.18

General Condition #7 states: Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing. [See page 5 of 12.]

Attached below are three photos taken on Wednesday, December 4 and Tuesday, December 3 of the project area. They clearly document the failure of the applicant to meet General Condition #7.

Since SBPF is obviously in violation of another condition of its Order, we request that the Commission issue a stop-work order as expeditiously as possible to halt any further polluting of the public beach below the bluff and, further, that the Commission convene a special meeting to formally find that SBPF has met another failure criterion.

Sincerely,

D. Anne R. Atherton

The NCC Coordinating Team
D. Anne Atherton, Administrative Coordinator

ATTACHMENTS (3)

COPY: Members, Nantucket Select Board
DEP SERO (Jim Mahala, Nate Corcoran, Greg DeCesare)

DATE: Wednesday, December 4, 2019 (Taken by Susan Landmann)

DATE: Wednesday, December 4, 2019 (Taken by Susan Landmann)

DATE: Tuesday, December 3, 2019 (Taken by Burton Balkind)

Joanne Dodd

From: burton balkind <sprucecool@yahoo.com>
Sent: Monday, December 9, 2019 8:21 AM
To: Jeff Carlson; Joanne Dodd; D. Anne R. Atherton; Joan Stockman; Rick Atherton
Subject: sbpf sand
Attachments: Glacier end cape_1.jpg; thumbnail (4).jpeg

Dear Members of the Nantucket Conservation Commission,

First, I am disappointed by the applicant for the excuses they have given for not filing the required monitoring documents. SBPF has been an organization and incorporated according to the Massachusetts Attorney General's office since November 04, 1993 as a "non-profit". It has a full board, large annual budget, counsel, consultants and various interested parties involved. Surely they have known these monitoring documents were required. Furthermore, the same person who was unable to submit the monitoring results for this project and to this Commission was able to submit many documents to other town boards for other projects during the same time period in question. The applicants cannot unilaterally decide not to fulfill a requirement in an Order of Conditions because they do not feel it is necessary. The authority to make changes to a valid Order of Conditions lies solely with the Commission or in the case of a Superseding Order of Conditions with the Department.

Epsilon Associates is listed at the Mass StateAttorney's office as being employed by SBPF since 1993 and I personally would estimate Epsilon's involvement even longer. While many board members have also been listed over a similar time period, I find it hard to believe that none of these people where aware of the required quarterly monitoring.

My point with regards to mitigation sand has to do with the locations of sand obtained. Please see attached maps.

Mr. Dunk and Mr. Cohen both made the argument that there is basically no difference in the sand across the Island. Mr. Dunk said that the geology of Nantucket and the materials are similar throughout the Island and the materials are what the glacier left. While I agree that Nantucket was formed by the deposits from the Cape Cod lobe of the Wisconsin Ice Sheet, I disagree that one can infer that all the material is the same. The Ice sheet stopped its southward progression roughly 10,000 years ago and started to recede. Roughly 5,000 years ago sea levels rose such that the ocean was in contact with what is now Nantucket and the island has been eroding ever since. The glacier however did not leave all of the same sediment across the island. The island is composed of outwash plain that is bordered to its north by the Terminal Moraine. The outwash plain consists of well sorted cobble and sands and predominately the center of the island to the south shore. North of the terminal moraine are soils are composed of smaller finer grains and found in areas like Polpis and Wauwinet. Anyone who has done any excavations or building on Nantucket knows it is more difficult to get a perk test in Polpis where it is smaller particles and more clay like because of this, while it is easier to get a perk test done on other parts of the island because it is well sorted cobble and drains well. As the Board is aware and as Ms. Vaillancourt further explained, contaminants are more easily held by smaller particles/fines than well sorted cobble.

Additionally, 5,000 years ago one could consider the sediment to be contaminant free, however one must now take into considerations the human additions. Mr. Dunk's November 15, 2019 letter implies that industrial use was not done on Nantucket, however I would disagree and say that the human additions to the sand composite are unknown unless scientifically tested. For example, the location of the stockpiling sight and the Spearhead Road sand site is on what once was Coffin's pit. Many islanders know that Coffin's pit was a borrow pit and material that was removed has been replaced with materials from unknown locations across the island. One could guesstimate the pit was 40 feet deep prior to being filled in. This is a strong case for why the sand should be tested for more than just grain size.

Initially as part of the permitting for this project, the sand was to come from known locations, local sand pits. Since then as the local pits have begun to run out of "bank sand" material, sand being used for mitigation come from many locations across the island whose previous land use is not known or recorded. The instance of Mr. Iverson's letter and documentation, is a good example of what might continue to occur.

As a follow up to the stockpile location, Mr. Cohen and Mr. Dunk stated that if the location of the excavated sand was from a "close" site to the bluff it would not necessarily go to the stockpiling site, but rather directly to the bluff. I would like to know what is considered "close" as we live on a very small island and I would consider most locations to be "close."

In light of the current photos taken, letters and documents submitted to the Commission, and continued actions done by the applicant, an Enforcement Order should be issued by the Commission for SBPF to cease and desist from further disposing of potentially contaminated and incompatible sands over the bluff, onto the beach and into the ocean. It is clear that they have already deposited incompatible and contaminated sands over the bluff on more than one occasion with documentation submitted to the Commission. Mr. Cohen stated at the November 20, 2019 meeting that SBPF will continue dispensing mitigation sand so as not to fail to meet the conditions of the Order, however given the track record of sand being used I find that highly inappropriate and that said sand might already be in violation of the Order.

The active Order of Conditions (SE 48-24, SOC MassDEP file number SE 48-2610) section C. General Condition Under Massachusetts Wetlands Protection Act #1 states "Failure to comply with all condition stated herein, and with all statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order".

As further stated in the Order, condition #7, "Any fill used in connection with the project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any to the foregoing". You've all seen the photos. The violations are clear, numerous and repetitive with no regard for the permit, the conditions or the environment.

I appreciate the Commission's time and effort on this very time consuming long-term project.

If any further documentation is required, please do not hesitate to ask.

Sincerely,

burton balkind

FIGURE 1.—Index map showing location of Nantucket, Martha's Vineyard, and Cape Cod, the glacial lobes, and inferred limit of the late Wisconsinan ice

Beach Nourishment

MassDEP's Guide to Best Management Practices for Projects in Massachusetts

March 2007

ACKNOWLEDGEMENTS

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Glossary

Accretion - the gradual addition of land by deposition of water-borne sediment.

Beach Fill – also called "artificial nourishment", "beach nourishment", "replenishment", and "restoration," comprises the placement of sediment within the nearshore sediment transport system (*see littoral zone*). (paraphrased from Dean, 2002)

Beach Profile – the cross-sectional shape of a beach plotted perpendicular to the shoreline.

Cross-Shore Response – changes to the beach profile caused by the onshore and offshore movement of sediment after nourishment has taken place. It is the process by which a beach's natural equilibrium profile is reached.

Depth of Closure – the seaward limit of sediment transport due to seasonal beach profile changes such as those caused by erosion and accretion. (Dean 2002)

Downdrift – the alongshore direction coincident with the dominant sediment transport direction. (Adapted from Dean and Dalrymple 2002)

Equilibrium Beach Profile – for the purpose of beach nourishment, equilibration of the on-offshore beach profile from the arbitrary shape created by placing sand on the beach to the natural equilibrium shape created by the environment. This process typically includes transfer of sand from the dry beach and the shallow constructed portions of the profile to the offshore. Wave/water level conditions and sediment size are the controlling factors that determine a beach's equilibrium profile. (Adapted from Dean and Dalrymple 2002)

Fall Velocity – the maximum speed attained by a falling particle under the action of gravity in water (in other words, the terminal velocity). In general, large particles will have a higher fall velocity than small particles; therefore, large particles will be less likely to be suspended in the water column compared to finer particles.

Foreshore Beach – the intertidal portion of the beach. The foreshore, also called the *intertidal* or *littoral zone*, is that part of a beach that is exposed at low tides and submerged at high tides

Hot Spot or Erosional Hot Spot – area along a shoreline where coastal erosion is significantly greater than adjacent areas. Erosional hot spots can occur as a result of nonuniform wave conditions along the shoreline (e.g., offshore shoals redirecting wave energy), nonuniform sediment sizes along the shoreline, and sediment transport into a nearshore excavated area. (Adapted from Dean 2002)

Isolines - term for any graph or map on which some variable feature is contoured.

Lag Deposit – deposit consisting of coarser sediment (generally pebbles, cobbles, and boulders) that remains on a beach after finer particles are transported downdrift by waves, winds and currents. Lag deposits are usually more resistant to erosion than sand beaches.

Littoral Zone – the area of beach that lies between the high water line and the depth of closure. The littoral zone is where a majority of sediment transport processes occur along the shoreline. Also known as the foreshore beach and intertidal zone.

Longshore Transport – the amount of sediment moved along the coast through the combined effect of waves and currents. (Adapted from Dean and Dalrymple 2002)

Nomograph - a chart representing numerical relationships.

Subaerial Beach – the entire upper portion of a beach that is not under water at low tide.

Summary

Basic steps for Beach Nourishment Projects

Proponents of beach nourishment projects in Massachusetts are required to determine beach conditions and stability, characterize the physical and chemical properties of the material to be dredged, as well as the physical properties of the material on the receiving beach. Keep in mind that the most important factors for beach nourishment projects is the grain size distribution of the source material as compared to the native beach material, and the location of the project in relation to sensitive coastal receptors.

STEP 1. Determine if the project is near endangered species habitat and in or adjacent to: Shellfish Beds, Vegetated Shallows, Spawning Ares, or Rocky Sub-tidal Habitat. Detail the impacts of the proposed project on these areas.

If a beach or dune nourishment project is near endangered species habitat, proponents should consult with the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm) concerning potential impacts to the habitat. Proposed beach and dune nourishment slopes can often be modified to avoid impacts to rare, threatened, or endangered species.

Species and plant density should be surveyed and extent of habitat mapped, particularly in shellfish beds, vegetated shallows, spawning areas, or rocky sub-tidal habitat. Time of Year (TOY) restrictions, along with other restrictions, may be necessary to minimize impacts to marine fisheries or other biological organisms, particularly during spawning season.

STEP 2. Determine Wetlands and Waterways Permits required from MassDEP or other agency approvals for the project and note application timelines.

The following Wetlands & Waterways permits may be required for beach nourishment and beneficial reuse projects.

The **Public Waterfront Act** (MGL Chapter 91) requires a Chapter 91 waterways license or permit for any activity located in, under, or over flowed tidelands, filled tidelands, Great Ponds and certain non-tidal rivers and streams located throughout the Commonwealth. In general, beach nourishment and the beneficial reuse of dredged sediment as beach fill qualify as Water-Dependent projects. Such projects fall in the category of MassDEP application # BRP WW 01.

The **Massachusetts Wetlands Protection Act** (MGL Chapter 131, § 40) prohibits the removal, dredging, filling, or altering of wetlands without a permit. To obtain a permit (called an Order of Conditions), a project proponent must submit a Notice of Intent to the municipal Conservation Commission and MassDEP.

A **401 Water Quality Certification** from MassDEP is required under the federal Clean Water Act for any activity that results in a discharge of dredged material, dredging, or dredged material disposal greater than 100 cubic yards to waters subject to regulation by any federal agency. If no federal permit is needed for an activity, then no 401 Certification is required from MassDEP.

For a copy of these permit applications and for more information regarding the application process and timelines, refer to MassDEP's permitting web page: www.mass.gov/dep/service/online/gettings.htm.

STEP 3. Determine the profile of the receiving beach.

The placement of dredged sediment should take into account the profile of the existing beach and the location of the dredging area. If the proposed nourishment profile varies significantly from the existing profile, then the material will adjust quickly as the beach system tries to re-establish a slope, resulting in less material on the beach, as material is shifted into the near-shore region of the beach. The adjustment of the beach profile could possibly harm adjacent coastal resources. Dredging material should be placed downdrift of the dredge site to minimize sediment returning to the area it was dredged, and to facilitate the movement of sediment alongshore. (*See Attachment A for more details.*)

STEP 4. Determine the grain size of receiving beach.

Characterization of the receiving beach material is vital for a successful beach nourishment project. The first step is to develop and implement a sediment sampling and analysis plan. Elements of the plan should include:

- sampling locations,
- sampling method,
- number of samples to be collected,
- what method will be used to composite representative samples, and
- how grain-size distribution will be determined.

Typically, sediment samples are collected along survey profile-lines that run perpendicular to the shoreline, and should include all the features found in the project area (e.g. dune, dune base, mid-backshore, berm crest, mean high water, mid-tide, mean low water, trough, and bar crest.). In general, beach/dune systems having a narrow range of grain-sizes will require fewer samples to characterize them than will systems with a wide range of grain-sizes.

After all the locations along the profile-line are sampled, the individual samples should be combined. To create a combined sample, the samples collected at key locations along the profile-line must be dried before an equal-weight portion of each is measured out. Then the equal portions are combined together to create a single sample for grain-size distribution analysis. This process should be repeated for each profile-line established. Ultimately, there will be one combined sample for each profile-line. Then evaluate the grain size distribution for each sample. For detailed information on this process, refer to Attachment B.

STEP 5. Characterize source materials and determine best dredging source.

For each possible source material location, sediment samples will need to be collected and compared to the receiving beach sediment for compatibility. Obtain samples by taking cores from the entire depth of the dredging area. Generally, collect one core for each 5,000 cubic yards to be dredged. However, this can vary based on the homogeneity of the material – the less homogeneous, the more samples that need to be taken. Up to 3 cores may be combined to create a single sample for analysis, using the procedure outlined above in step 4. Then, evaluate the grain size distribution for each sample. (*See Attachment B.*) Additional chemical testing for contamination of the sediment may also be required. (*See Attachment C.*)

The physical properties of sediment that are the most important for determining its suitability as nourishment material are composition, grain size, mechanical strength, and resistance to abrasion. In most areas of New England, sediment is predominantly composed of quartz particles, so that borrow material will likely have adequate strength and high resistance to abrasion.

Ideally, the grain size of the source material should be the same size or larger than the native beach sand to minimize erosion. Material that has a smaller diameter than the native sand can remain in equilibrium only at slopes flatter than the existing beach. If smaller diameter sand is used, the volume of material required will be much greater and consequently, more costly.

STEP 6. Develop a beach monitoring/maintenance plan.

The primary objectives of monitoring a beach nourishment project are:

- to document and evaluate whether the project is performing as designed,
- to identify maintenance and re-nourishment requirements, and
- to evaluate project impacts.

Ideally, monitoring plans should include beach profile surveys to determine material stability. Generally, a number of surveys should be performed during the first year following construction preferably seasonally. After the first year, the beach nourishment transects can be monitored annually. Collection of post-storm profile information is also helpful in evaluating the cross-shore response of the project to storm waves and tides. Beach profile monitoring provides information on the following:

- the percent nourishment remaining within the project area compared to baseline conditions,
- the occurrence of downdrift accretion on beaches,
- affected terrestrial and marine species,
- the presence of areas highly susceptible to erosion (i.e., "hot spots") as indicated by variable longshore beach widths, and
- the future nourishment volumes needed to maintain the sediment supply.

For all projects, monitor the material placed on the beach to determine shoreline changes and whether the beach fill is shifting. Monitoring requires measuring elevations along a series of shore perpendicular control transects along the length of the project area. The number of transects required to evaluate the nourishment depends on the size of the nourishment project, as well as the presence of shoreline features that may control sediment transport. Typically, transects should be spaced every 100 to 400 feet. Surveys are generally conducted landward of any expected long-term changes in beach/dune shape, to a water depth where changes between the equilibrated nourishment profile and the pre-construction profile are anticipated to be minimal.

Monitoring reports are typically prepared after the first year of complete data evaluation, and bi-annually thereafter. These reports should include general information regarding the wave climate and storm activity, changes in sand volume over time, and measured shoreline changes. The information is used to evaluate performance, assess any adverse environmental impacts, and estimate future re-nourishment requirements.

OVERVIEW | Purpose, Beach Nourishment, BMPs, Permit Requirements

Purpose

The intent of establishing these best management practices is to:

1) provide guidance to those proposing beach nourishment projects on how to minimize erosion and maximize the time sand remains on the beach;
2) provide guidance to those designing the project on how to minimize potential adverse impacts to any natural resource areas;
3) promote the beneficial reuse of clean, compatible, dredge material and keep it in the longshore sediment transport system; and
4) expedite regulatory review.

By following this guidance, proponents can expedite the permitting process.

Beach Nourishment

The term beach nourishment generally refers to the process of adding sediment, also known as "beach fill," to a beach and/or dune system. Massachusetts has defined two types of beach nourishment projects. The most common is the beneficial re-use of clean, compatible sediment from a nearby dredging project to augment the volume of a beach or dune. This is done by directly placing sand either on the beach/dune, or in the nearshore where it can act as a source of sediment for the beach/dune system. Beach nourishment can also refer to a designed, engineered project where a specified volume of sand is added to a beach/dune system to provide a desired level of storm damage protection and flood control. The expectations and results associated with each type of nourishment are different; beneficial re-use projects are designed to keep the dredged sediment in the littoral system, but not necessarily to provide any specific level of protection, while engineered projects are designed to provide a specific level of storm damage protection.

Local, state, and federal regulatory agencies strongly encourage the use of non-structural measures such as beach nourishment to prevent storm damage and control flooding, because beach nourishment closely resembles natural processes and is the least disruptive to the littoral transport processes. Structural measures include seawalls and revetments which often have adverse effects on adjacent and nearby beaches by increasing erosion through wave reflection and by eliminating important sediment sources. However, site-specific conditions (e.g., erosion rate, grain size distribution, wave climate) and proximity of coastal resources (e.g., salt marsh, eelgrass, shellfish, rocky sub-tidal habitat) must be considered to minimize potential impacts to these sensitive resource areas as well as maximize protection of coastal development and infrastructure.

The most important factor for beach nourishment projects is the grain size distribution of the source material as compared to the native beach material, also referred to as sediment compatibility. For dredging projects, state policy requires that clean, compatible sediment be placed on adjacent beaches to keep the material in the littoral system. Note that location is important. If sediment is placed where it would not be stable due to its incompatibility, then unintended adverse impacts on eelgrass, shellfish beds, salt marshes, or the dredge channel could result.

For the purposes of this document it is assumed that the sand source is either a dredging project related to maintaining navigational channels, access to docks, piers, and boat ramps, or from a terrestrial location. The document does not address sand mining, where dredging is undertaken exclusively for obtaining sand for a nourishment project.

Local, state and federal permitting processes require biological and physical characterization of dredging sites and the proposed beach nourishment site. Applicants must compile information about shellfish resources, submerged aquatic vegetation, fisheries, coastal shorebird habitat, and other natural coastal resources. Local, state, or federal government may impose conditions as part of the permit or certification process to protect those coastal resources. The extent of the physical characterization of the sediment depends on the size of the project, with larger projects requiring more characterization.

Beach nourishment in rare coastal shorebird habitat for such species as Piping Plovers and Roseate and Least Terns requires careful consideration, planning, design, and coordination with the Natural Heritage and Endangered Species Program.

These species require specific feeding and nesting habitat requirements. Nourishment projects can enlarge and enhance these habitat features and are generally considered a benefit in the project review phase. Nourishment design should include specific plant species that provide the needed nesting and escape cover. Because these species nest and fledge during times of peak outdoor recreational season, fencing and resource management must address the competing use.

Specifications and Best Management Practices for Beach Nourishment Projects

Below are the recommended best management practices for beach nourishment projects. Proponents of beach nourishment projects in Massachusetts are required to determine beach stability, and characterize the physical and chemical properties of the material to be dredged, as well as the physical properties of the material on the receiving beach. Note that the extent to which a project may need to be modified based on these recommendations is a function of several elements: the design life and cost of the project, the potential adverse impacts on local natural resource areas, and the benefits of beach nourishment versus other alternatives, such as relocating coastal infrastructure or implementing structural or bio-engineering solutions.

General

- For publicly funded dredging projects, downdrift public beaches should take priority for placement of the dredge sediments.
- For projects involving beneficial re-use of clean, compatible dredge sediment, dredge material should generally be placed on a beach or dune downdrift of the dredge site to minimize the potential for material returning to the area where it was dredged, and to facilitate the movement of sediment alongshore through the littoral system. Exceptions to this rule are allowed and should be evaluated on a case-by-case basis.

Beach Stability and Characterization

- The proposed placement of dredged sediment should take into account the slope of the existing beach. If the proposed equilibrated nourishment profile varies significantly from the existing beach profile, then the nourishment will adjust relatively quickly as the beach system tries to re-establish an equilibrated slope, resulting in less material on the beach face, as material is shifted into the near-shore region of the beach profile. The adjustment of the beach profile could possibly harm adjacent coastal resources. Attachment A provides a step-by-step methodology for determining general beach nourishment stability. Attachment B provides a methodology for determining the biological and physical characteristics of the receiving beach.
- If a beach or dune nourishment project is near a state or federal endangered species habitat, then proponents should consult with the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm) concerning potential impacts to the habitat. The NHESP web site also features maps that will identify areas of concern. Proposed beach and dune nourishment slopes can often be modified to avoid impacts to rare, threatened or endangered species. Time of Year (TOY) Restrictions may be necessary to minimize impacts to marine fisheries or other biological organisms.
- The use of vegetation and sand fencing on coastal dune enhancement projects and the landward portions of beach nourishment projects can reinforce the stability of the material placed at the site. Sand fencing and specific dune vegetation in coastal shorebird habitat should be designed to ensure the viability of the bird habitat and to reduce impacts from human disturbance during the nesting and fledgling times. Information on managing shorebird habitat, including rare species habitat, may be found in the "Guidelines for Barrier Beach Management in Massachusetts: A Report of the Massachusetts Barrier Beach Task Force," February 1994. Copies of the report can be ordered from the Massachusetts Office of Coastal Zone Management.

Source Material Characterization

- The grain-size distribution of the dredge or source material should be compared to the grain size distribution at the proposed placement site to determine sediment compatibility. Attachment C presents a methodology for characterizing the source material. In general, source material that is similar to or coarser than the native

sediment at the placement site is likely to be more stable after placement. If the grain size of the source material is finer than the grain size of the receiving beach, it will be more susceptible to erosion. If it is susceptible to an erosion rate greater than the historic rate, then beach fill could drift into adjacent coastal resources. The likelihood of eroded sediment drifting into these resources needs to be quantified as part of the regulatory review process. If there are no sensitive resource areas nearby, then incompatibility may not be as problematic, although it will still result in a shorter project life. Attachment A provides an approach to assess the stability of sediment placed on a beach for nourishment, and Attachment D provides an example on how to determine sediment compatibility for a nourishment project designed for shore protection.

- Sediment containing greater than 10% by weight of the material passing the No. 200 U.S. Standard Series Testing Sieve is generally unsuitable for beach or dune nourishment.
- The appropriateness of using source material coarser than the native sediment should be evaluated on a case-by-case basis. If the placement of the material will not adversely affect the natural function of the beach, dune, or near shore resources, or cause adverse changes in wave reflection or refraction, then there are unlikely to be significant environmental impacts. However, coarser material could affect recreational use and aesthetics.
- Regular monitoring of the beach nourishment project may be needed to evaluate the effectiveness of the project, document any effects on adjacent sensitive resources, or to understand changes in beach dynamics for future planning purposes. A sample beach-monitoring plan is included in Attachment E. Monitoring of rare coastal shorebird habitat may be required by the Natural Heritage and Endangered Species Program if the project is within their priority habitats or may be required to determine its potential use by such species.
- If material from a publicly funded dredge project will be placed on a private beach, it is likely that an easement for public access will be needed for the area where nourishment is placed in order to comply with 310 CMR 9.00, available online at www.mass.gov/dep/water/laws/regulati.htm#wways. Attachment F provides a sample easement that can be used for beach nourishment projects.

Permit Requirements and Timelines

The following Wetlands & Waterways permits may be required for beach nourishment and beneficial reuse projects.

- The Public Waterfront Act MGL Chapter 91 and its regulations require a Chapter 91 waterways license or permit for any activity located in, under, or over flowed tidelands, filled tidelands, Great Ponds and certain non-tidal rivers and streams located throughout the Commonwealth. In general, beach nourishment and the beneficial reuse of dredged sediment as beach fill qualify as Water-Dependent projects. Such projects fall in the category of MassDEP application # BRP WW 01.
- The Massachusetts Wetlands Protection Act (General Law Chapter 131, Section 40) prohibits the removal, dredging, filling, or altering of wetlands without a permit. To obtain a permit (called an Order of Conditions), a project proponent must submit a Notice of Intent to the municipal Conservation Commission and MassDEP. The Conservation Commission issues a decision on the permit requests. Any appeals made to the Conservation Commission's permit are subsequently submitted to MassDEP.
- A 401 Water Quality Certification from MassDEP is required under the federal Clean Water Act for any activity that results in a discharge of dredged material, dredging, or dredged material disposal greater than 100 cubic yards (c.y.) to waters subject to regulation by any federal agency. If no federal permit is needed for an activity, then no 401 Certification is required from MassDEP. Projects subject to 401 regulations may be classified as either major (BRP WW 07) or minor (BRP WW 08). Major projects involve the dredging of 5,000 c.y. or greater, while minor projects involve dredging less than 5,000 c.y.

To apply for any permit, proponents will need to send a transmittal form for permit application, application fee, and appropriate application. If you are applying for multiple permits related to the same project, MassDEP advises you to notify us. General timelines of the application review process for each of these three permits can be found on the next page. These timelines begin once MassDEP receives your payment and complete application. For a copy of these permit applications and for more information regarding the application process, refer to the following website: http://www.mass.gov/dep/service/online/gettings.htm.

Permitting Timelines

Chapter 91, Wetlands Permitting, 401 Water Quality Certification

Chapter 91 License Application

For Water-Dependent Projects (application type BRP WW01)

Time Period	MassDEP Action
	Application received at MassDEP
30 to 60 days	Public Comment Period (includes Public Hearing if needed)
Within 60 days	Administrative Completeness review
Within 90 days	Technical Review and Issue Written Determination
21 days	Appeal Period
------	Issue License
Maximum Application Time = 276 days	

Wetlands Permitting Process

Time Period	MassDEP Action
	Notice of Intent application received at MassDEP
Within 21 days	Public hearing (hearing notice must be published in a public newspaper at least 5 days prior to hearing)
Within 21 days	Order of Conditions permit
10 days	Appeal Period
Within 70 days	Superseding Order of Conditions if local Order is appealed
10 days	Appeal Period
Within one year	Adjudicatory hearing and Final agency hearing
Maximum Application Time = 500 days (if adjudicatory hearing required)	

401 Water Quality Certification

For Major projects (BRP WW07) and Minor projects (BRP WW08)

Time Period		Action
BRP WW07	BRP WW08	
30 days	30 days	Review for Administrative Completeness
120 days	90 days	Technical Review
120 days	90 days	Second Technical Review*

**A second technical review will take place only if necessary.*

Technical Attachments to Beach Nourishment: MassDEP's Guide to Best Management Practices for Projects in Massachusetts

Attachment A | Beach Stability Determination

For beach nourishment projects where the primary goal is to increase the volume of sediment in the beach system to improve storm damage protection, the volume of proposed nourishment, grain size and design slope are three of the most important considerations. The stability of sediment placed on a beach is directly related to grain size. Material that is finer than what is presently on the receiving beach may move quickly off the beach and into other areas, possibly causing adverse impacts on nearby natural resource areas, and reducing the level of storm protection. If a specific volume of beach sediment is needed for storm damage protection and flood control, then using finer beach fill could make a project more costly to maintain. If placing coarser material will not adversely affect the natural function of the beach, dune, or near shore resources, or cause adverse changes in the wave reflection or refraction, then there are unlikely to be significant environmental impacts. On the other hand, coarser material could affect recreational use and aesthetics.

Some movement and drifting of sediment offshore and alongshore is unavoidable on any beach nourishment project. The grain size, slope, position on the beach relative to mean high tide and placement method will affect the amount and rate of shifting that occurs. The U.S. Army Corps of Engineers manual entitled Design of Beach Fills (http://www.usace.army.mil/publications/eng-manuals/em1110-2-1100/PartV/PartV.htm) includes four diagrams (see Figure A3) that illustrate the behavior of sediment placed on a given beach relative to grain size, as well as the equilibrated profile that would result from using four different grain sizes.

It is important to estimate where and how quickly beach fill will erode in order to assess if it meets the project goals and whether it will affect adjacent resource areas. If the material is placed at a slope that is steeper than the existing beach slope, then wind and wave action will eventually re-establish the natural flatter slope. Sediment can also result in unintended impacts if it rapidly drifts into adjacent resource areas. For nourishment projects where relatively small quantities of sediment from a dredging project are placed along relatively short stretches of a longer shoreline, sediment will tend to spread out, resulting in a relatively small net gain in volume to the intended and downdrift beaches.

The volume of material placed on a beach for a beach nourishment project designed to provide 100-year storm protection is generally about 100 cubic yards per linear foot; the design will vary depending on historic shoreline changes, wave sizes and storm frequencies, longshore transport rates, and the level of protection needed. For example, a project on Long Beach in Barnstable designed to provide flood protection for 10-year return frequency storms placed approximately 50 to 60 cubic yards of sediment per linear foot of beach.

One simple technique for quantitatively evaluating the relationship between mean grain size and beach slope for nourishment projects is based on the concept of equilibrium beach profiles (see Dean and Dalrymple, 2002). Simply put, the equilibrium profile is the profile a stretch of beach will tend toward after any disturbance (i.e., storms, nourishment). Equilibrium profile theory indicates that the beach profile shape will follow:

$$h = Ay^{2/3} \qquad (1)$$

where

h = water depth at distance y from the shoreline
A = profile scale factor
y = distance from shoreline

The nearly linear relationship between the profile scale factor, A, and the rate at which a particle of sediment settles out of the water column--also known as the fall velocity, w, was determined by Dean (1987) and is expressed by the following equation:

$$A = 0.067w^{0.44} \qquad (2)$$

The sediment fall velocity, w, can be expressed as a function of a material's mean sediment diameter, D (Hallmeier, 1981):

$$w = 14D^{1.1} \qquad (3)$$

The relationship between the parameters *A*, *w*, and *D* is illustrated in Figure A1.

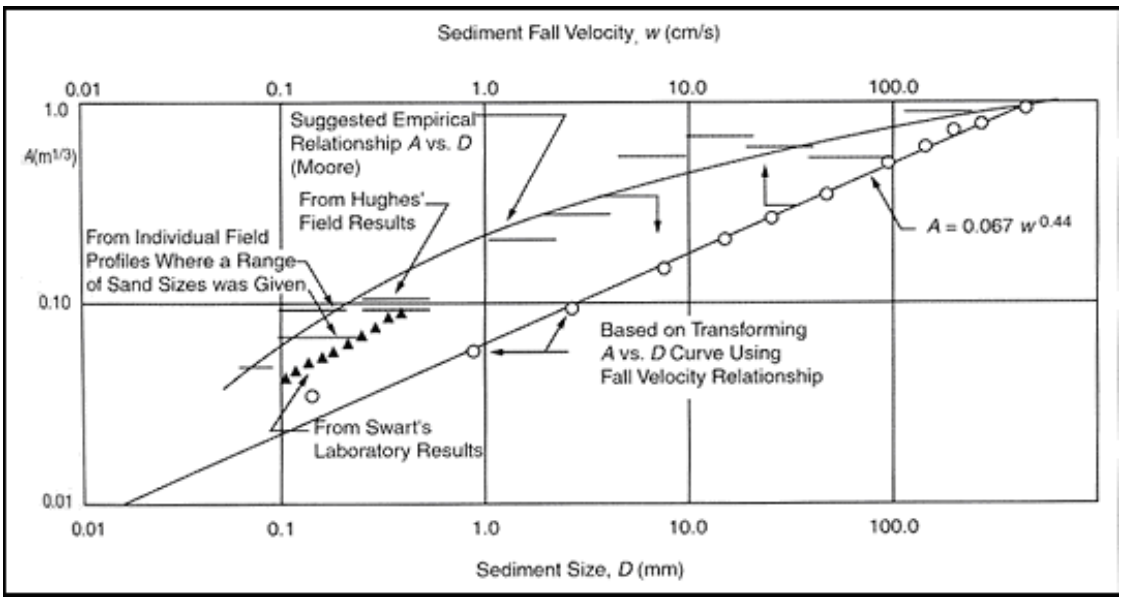

Figure A1. Profile scale factor *A* versus sediment diameter *d* and fall velocity *w* (from Dean, 1987; adapted in part from Moore, 1982).

Using equations (2) and (3), a value for *A* can be estimated and used to graphically depict offshore beach profiles. The following example demonstrates how to calculate the equilibrium beach profile scale factor, *A*, for nourishment material with a mean sediment diameter, *D*, of 0.2 mm.

<u>Step One:</u> Determine the Sediment Fall Velocity, *w*, by specifying a value for *D* into equation (3).

If $D = 0.2$ mm

Then $w = 14(0.2)^{1.1} = 2.4$

<u>Step Two:</u> Determine the Profile Scale factor, *A*, using the value obtained for *w* in Step One and equation (2).

If $w = 2.4$

Then $A = 0.067(2.4)^{0.44} \sim 0.1$

<u>Step Three:</u> Use the determined value of *A* and equation (1) to graph *water depth* v. *distance offshore*. Figure A2 is a graph of the equation $h = 0.1y^{2/3}$. The result is a visual estimate of the beach's offshore profile once equilibrium is reached.

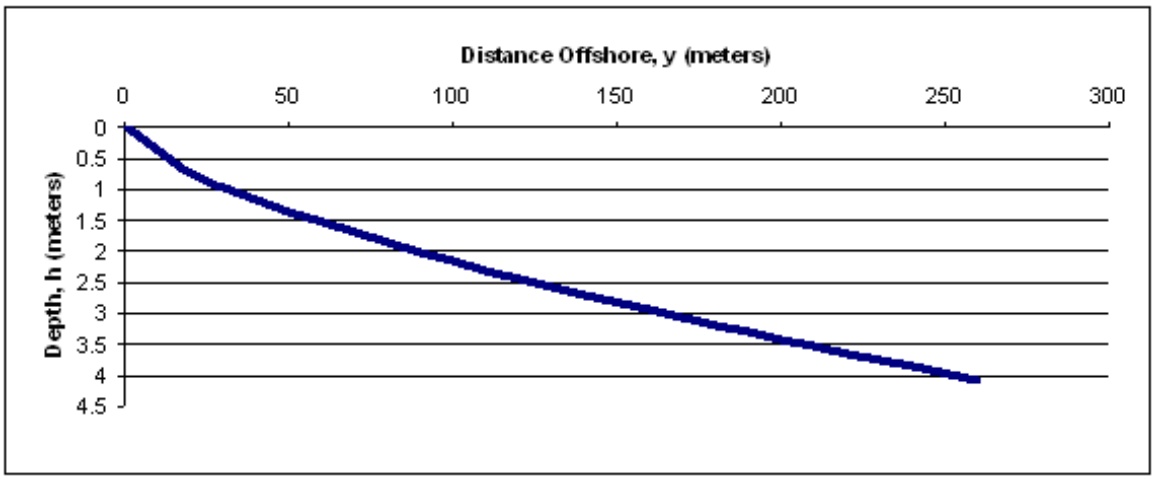

Figure A2. Equilibrium beach profile for sediment with a mean diameter, *D*, of 0.2 mm.

Depending on local wave action and storm frequency, it may take several months for a nourished beach to equilibrate in the cross-shore direction. Plotting beach profiles for both native and proposed beach sediment is useful in determining how nourishment material will be distributed over time, although note that equilibrium profile theory merely represents the overall concave shape of the offshore profile, and does not include the influence of tides or near shore sand bars.

Plotting beach profiles for multiple potential sediment sources and their corresponding grain size distributions (therefore, different *A* values) yields the results shown in Figure A3, where equation (1) is used to compute profile shape seaward of the shoreline. Figure A3 illustrates the reduced volume requirements needed to maintain a specific beach width, if the source material is coarser than the native beach, and *vice versa*. As a first approximation, plotting the equilibrium beach profile for the native beach with the anticipated equilibrium profile for the nourishment material will indicate the general depth of equilibrated fill in the near shore region.

This method of evaluating beach profiles for native and proposed beach sediment provides general information regarding the differences in profile shape; however, the method does not directly determine stability or potential longevity of the placed material. A more detailed methodology that compares several native beaches and borrow-site parameters is required to determine the potential stability of the nourishment material. This methodology, as well as calculations for a Massachusetts beach and two potential borrow sites are included in **Attachment D**. The detailed methodology is typically used when a beach nourishment project is engineered to provide a specific level of shore protection.

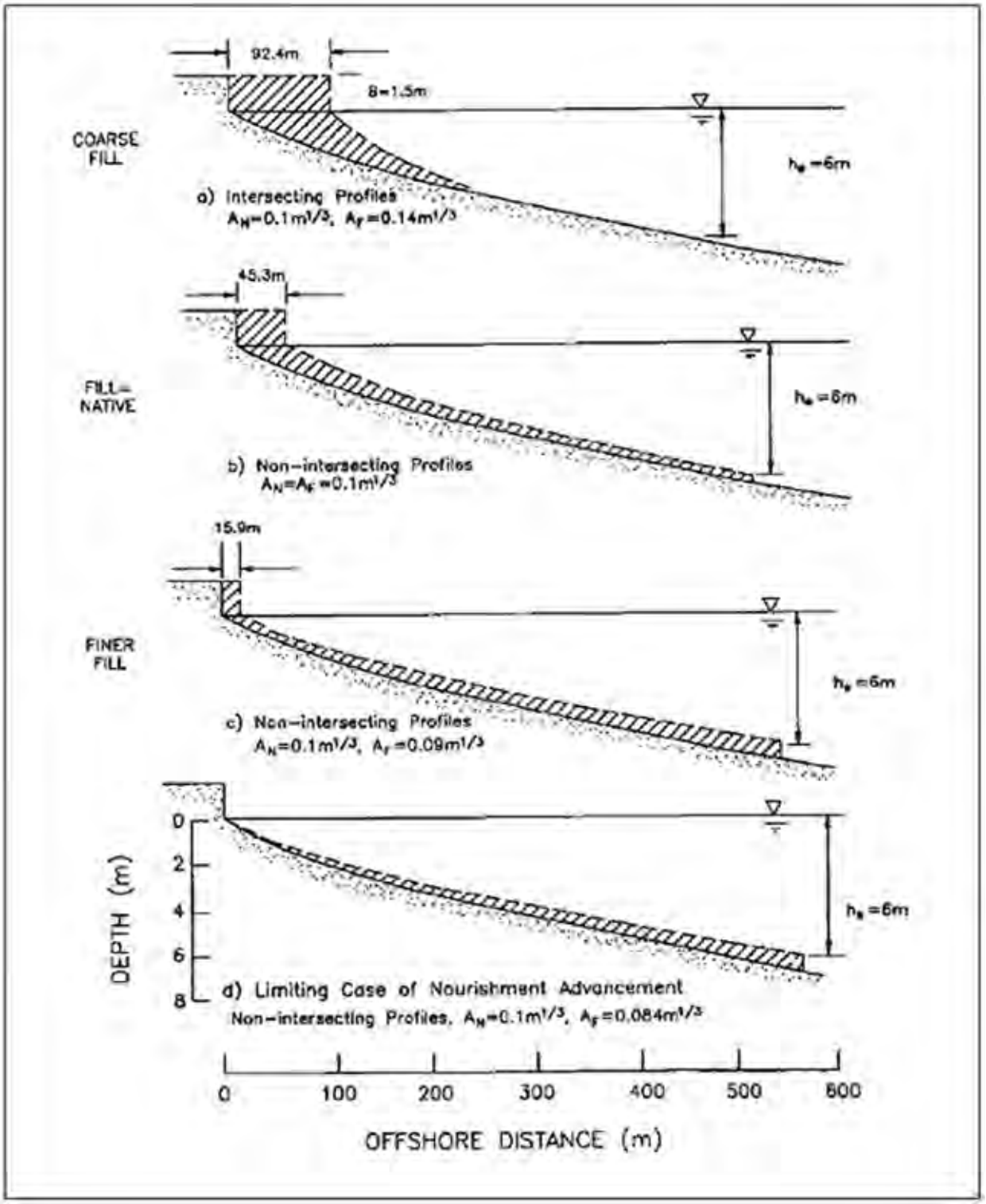

Figure A3. Behavior of beach profile with varying fill grain size (from US Army Corps of Engineers, 1995).

ATTACHMENT B | Receiving Beach Characterization

(Adapted from US Army Corps of Engineers, Design of Beach Fills, EM1110-2-3301 and Coastal Engineering Technical Note, Native Beach Assessment Techniques For Beach Fill Design, CETN II-29)

Biological Characterization

An important facet of any beach nourishment project is the evaluation of the potential effects on both terrestrial and aquatic species that may use the beach and adjacent inter- and sub-tidal areas for shelter, feeding, and reproduction. At a minimum, the following issues must be considered.

- Is the project area within or adjacent to any estimated habitat of rare wildlife or priority habitat of rare species as mapped by the Massachusetts Natural Heritage and Endangered Species Program? Similarly, are any federally listed and proposed, endangered or threatened species likely to use the project area or adjacent areas under present conditions or following nourishment?
- Are there shellfish beds in or adjacent to the project area? If so, the species present and their density should be surveyed, and the extent of their habitat mapped.
- Are vegetated shallows (e.g., eelgrass, widgeon grass) present in or adjacent to the project area? If so, the species and plant density should be surveyed and the extent of the beds mapped.
- Is there rocky sub-tidal habitat in or adjacent to the project area? If so, this should be delineated on the project plans.
- It is important to consult with Massachusetts Division of Marine Fisheries and the National Marine Fisheries Service to determine if the project and adjacent areas are used by species that may not be readily observable during the field investigation, resulting in the destruction of animals or interference with their normal reproductive behaviors. A good example of the latter would be horseshoe crabs, which spawn on some beaches during spring and early summer. A poorly timed nourishment project could impede the horseshoe crabs' ability to reproduce.

Physical Characterization

Accurate characterization of the native beach material is vital for a successful beach nourishment project. The first step is to develop and implement a sediment sampling and analysis plan. Elements of the plan should include the following:

- sampling locations,
- sampling method,
- number of samples to be collected,
- what method will be used to composite representative samples, and
- how grain-size distribution will be determined.

Typically, sediment samples are collected along survey profile-lines within the project area. The profile-lines, which run perpendicular to the shoreline, should include all the morphological features found in the project area (See Figure B1). In general, beach/dune systems comprised of well-sorted sediment, or those having a narrow range of grain-sizes, will require fewer samples to accurately characterize them than will systems with poorly-sorted sediment, or those having a wide ranges of grain-sizes.

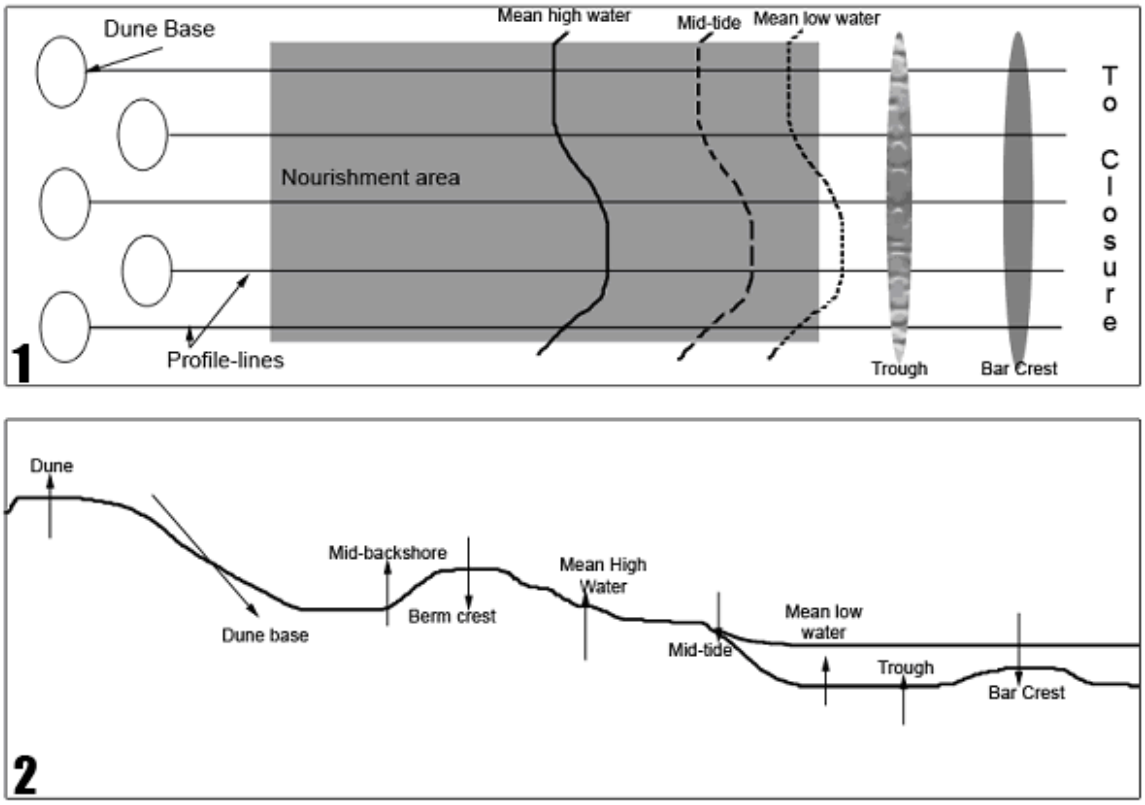

Figure B(1). Example of profile-lines for a nourishment project. (2). Characteristic zones and features of a beach profile.

Samples should be collected along the profile lines at locations that correspond to natural shore- parallel zones, distinct tidal elevations, and at specified elevation increments. Figure B2 outlines the characteristic zones and features of a typical beach profile. The arrows on Figure B2 show which zones usually result in sand deposition (↓) or uptake (↑).

Sample Collection

To characterize the existing or native beach for beach nourishment, it is recommended that, at a minimum, samples be collected at mean high water (MHW), mid-tide (MT), and mean low water (MLW). If possible, include samples on the berm crest. If a well defined offshore bar system has been observed locally, collect additional samples in the trough and in the vicinity of the bar. These samples can be used to characterize the foreshore beach where the source material will be placed and re-sorted by wave action.

For beaches comprised primarily of sand, sampling consists of surface grabs of approximately 100 g of material from the surface layer (within 1 foot of surface) of the subaerial beach (above the mean high water line). Offshore samples can be collected with assistance divers or grab samplers. (Commonly used samplers include Ponar, Ekman clamshell, Van Veen, and Smith-MacIntire).

After all the locations along the profile-line are sampled, the individual samples should be composited (i.e., combined). To create a composite sample, the sub-samples (collected at key locations along the profile-line) must be thoroughly dried before an equal-weight portion of each is measured out. Then the equal portions are combined together to create a single sample for grain-size distribution analysis. This process should be repeated for each profile-line established. Ultimately there will be one composited sample for each profile-line.

Many beaches in Massachusetts consist of "reworked glacial sediments" ranging in grain size from fine sand to cobbles; for these beaches, significantly larger samples are required to develop grain size characteristics. Guidance for determining the appropriate sample size for analysis can be found in ASTM (American Society for Testing and Materials) Method D421 Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants (available online at www.astm.org).

Sample Evaluation

Determine the grain-size distribution of the sand samples in accordance with ASTM Method D422 Standard Test Method for Particle-Size Analysis of Soils, using, at a minimum, sieve numbers 4 (4.76 mm), 10 (2.0 mm), 14 (1.41 mm), 20 (0.84 mm), 40 (0.42 mm), 60 (0.25 mm), and 200 (0.074 mm). Submit the resulting data in both numeric and graphical formats. The data should be displayed with both a size (mm or mesh size) and grain size scale to facilitate review and interpretation. An example of the preferred graphical format is included below.

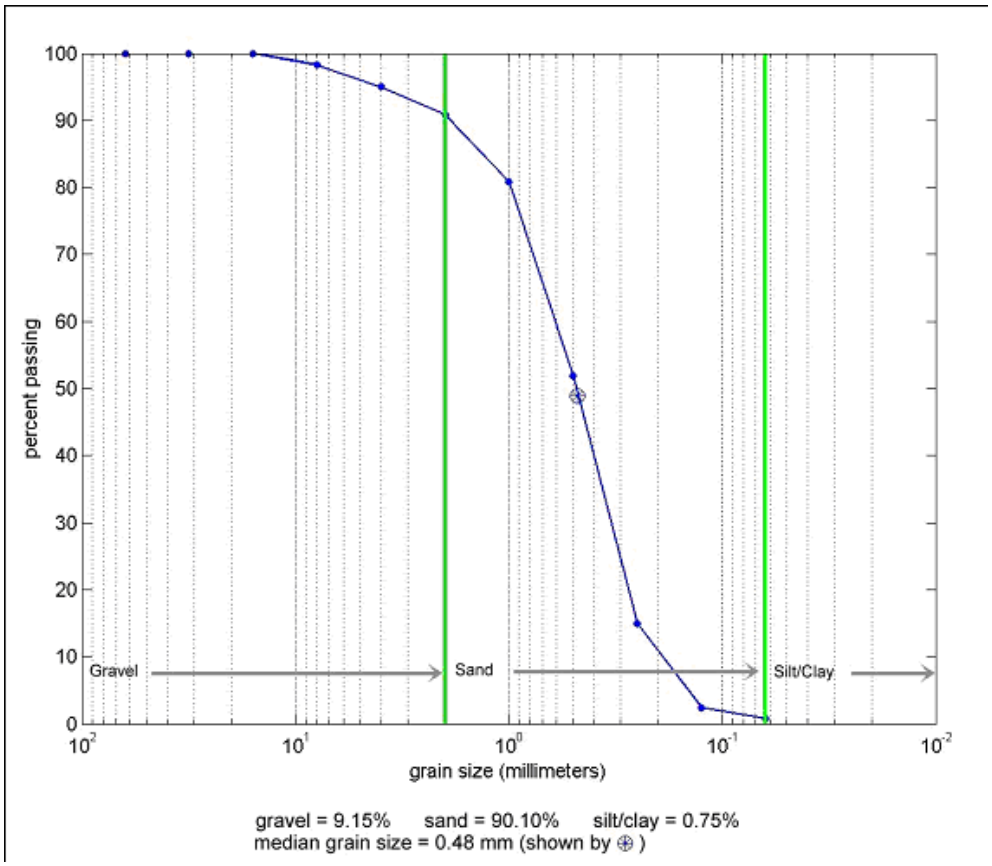

Figure B3. Example of a grain size analysis curve.

Due to the glacial origin of coastal sediment in Massachusetts, pebble, cobble, and boulder size material is common on beaches and tidal flats. Some beaches have naturally high percentages of cobble size material, such as Egypt Beach in Scituate (See example in photograph B1). In other cases, such as the Plymouth Shoreline near Manomet Beach, the finer sediment has eroded, leaving a lag deposit of pebble, cobble, and/or boulders on the surface. (See example in photograph B2).

The latter situation complicates both sampling and determining sediment compatibility. For beach nourishment projects, the grain size of potential sources should be based on many factors: the wave climate, exposure, characterization of the sediment across the existing beach profile, and projected stability of the proposed source material on the beach. For beach nourishment involving the beneficial re-use of dredge material intended to keep the sediment in the system, the stability is less critical if there are no sensitive resources that would be adversely affected by the transport of sediment alongshore or offshore. Several test pits may be helpful in determining the abundance of cobble relative to other sediment types.

Photograph B1. Beach with high percent of cobbles (courtesy of Rebecca Haney).

Photograph B2. Beach with lag deposits of sand, cobbles, and boulders (courtesy of Jim Mahala).

Attachment C | Source Material Characterization

Sediment samples will need to be collected for the grain-size distribution analysis. Collect samples from locations within the area to be dredged to accurately document the variability in grain-size distribution.

Obtain samples by coring to the full depth of the dredging area. For projects up to 10,000 cubic yards, collect one core per 5,000 cubic yards of sediment to be dredged; note, however, that the number of samples may vary depending upon the relative homogeneity or heterogeneity of the sediment. For larger dredging projects the number of cores should be determined by the extent of the dredging area and the homogeneity or heterogeneity of the material to be dredged. Up to three (3) cores (subsamples) may be composited, or combined together, to create a single sample for analysis provided that:

- grain-size distributions are comparable,
- the likelihood of contamination is similar based on depositional characteristics, spill history, location of point source discharges, etc., and
- samples were obtained from the same reach.

To create a composite sample, thoroughly dry the sub-samples before measuring equal-weight portions from each. Next, combine the equal portions to create a single sample for analysis. Repeat this process for each composite sample to be created.

Determine the grain-size distribution for each sample in accordance with ASTM Method D422 *Standard Test Method for Particle-Size Analysis of Soils*, using, at a minimum, sieve numbers 4 (4.76 mm), 10 (2.0 mm), 14 (1.41 mm), 20 (0.84 mm), 40 (0.42 mm), 60 (0.25 mm), and 200 (0.074 mm). Provide the resulting data in both numeric and graphical formats. As with the beach fill characterization (Attachment B), display the data with both a size (mm or mesh size) and grain scale size to facilitate review.

Generally, chemical testing of sediment containing less than 10% by weight of particles passing the No.200 U.S. Standard Series Testing Sieve is required unless exempted by the MassDEP. A "due diligence" review may demonstrate, to the Department's satisfaction, that the area is unlikely to be contaminated with oil or hazardous materials. A "due diligence" review, may include, but is not limited to, a review of records of the local Board of Health, Fire Department, Harbormaster and/or Department of Public Works, the Department's Bureau of Waste Site Cleanup, knowledge of historic land uses, information from prior dredging projects and discharges of pollutants in the project area watershed.

Attachment D

Sample Problem: Beach and Borrow Site Sediment Analysis to Determine Stability of Nourishment Material for Shore Protection

Introduction

To determine the sediment characteristics of Town Beach for the proposed beach nourishment project, the project proponent conducted a sampling and sediment analysis program. The proponent evaluated samples of sediment from the beach and two possible borrow sites to determine compatibility. Both borrow sites are navigation channels proposed for maintenance dredging. Both are located within a mile of Town Beach.

Town Beach Sediment

To assess whether the potential borrow sites were compatible with the native beach sediment, the proponent collected a series of beach grab samples along cross-shore profiles. The proponent collected these samples near the high water line, the mid-tide line, the beach berm crest, and the low water line. A total of nineteen (19) samples were collected on Town Beach. The proponent collected the samples along eight (8) shore perpendicular transects, that were spaced at approximately 1,000 ft. to 1,500 ft. intervals to capture the natural variability of material along the beach.

Grain size analyses for the nineteen samples are presented in Figure D1. The analyses showed heterogeneous sediment ranging from fine sand to fine gravel. However, the majority of the material was relatively homogenous, containing primarily medium to coarse sand. On average the samples contained less than 10 percent gravel by weight. The grain size envelope is shown in the shaded region of Figure D1. The left border of the shaded area indicates the coarsest material (medium sand-to-gravel) and the right border indicates the finest material (fine-to-medium sand) found on the beach. To compare the native beach sediment to the proposed borrow material, the proponent developed a composite sample of the beach using a standard U.S. Army Corps of Engineers design methodology (USACE, 1995). The composite sample was generated by summing the percentage of sediment in each size interval for the nineteen samples. The total value in each size interval was then divided by the number of samples to obtain an average value. The blue/gray line bisecting the shaded area in Figure D1 represents the results of the composite grain size analysis for Town Beach, and shows the mean grain size of the native beach to be approximately 0.33 mm.

Sediment from Dredging Channel A

Channel A is a navigation channel that is also a potential source of suitable beach nourishment material for Town Beach. To test for compatibility, the proponent conducted grain size analyses on several cores from the site. The material was found to range from medium sand to gravel. Figure D2 shows the specific range of material found in Channel A.

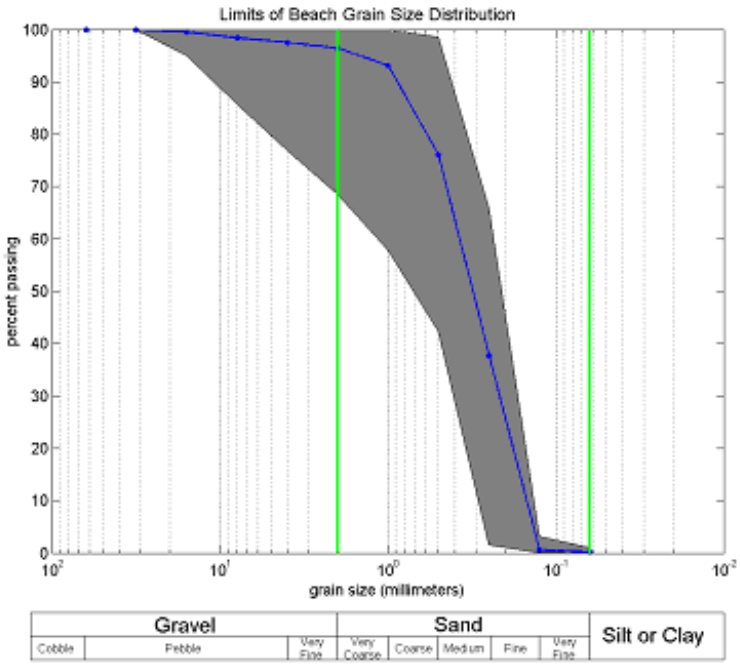

Figure D1. Grain size distribution of the native beach material found along Plymouth Beach, where the shaded area represents the grain size envelope and the curve bisecting the shaded area represents the composite grain size curve.

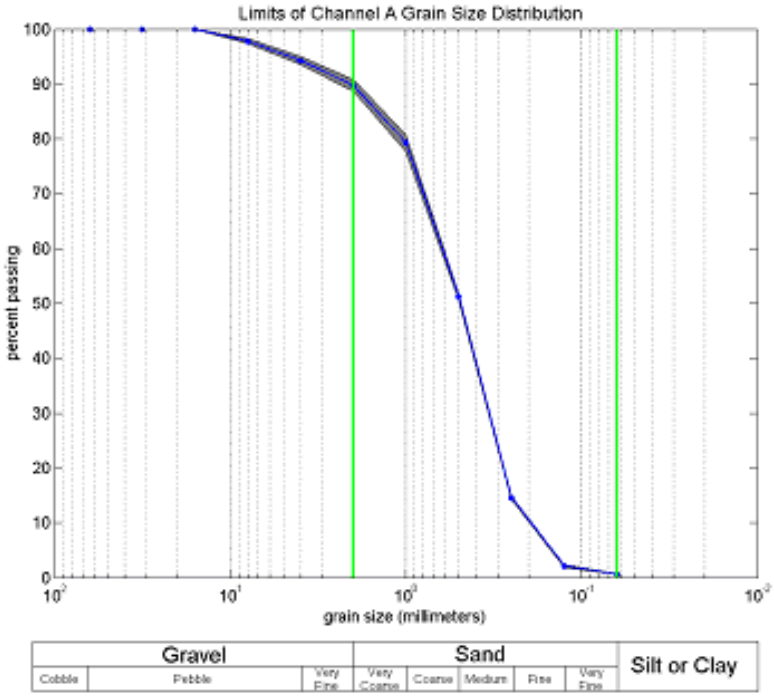

Figure D2. Grain size distribution of the material found in the Channel A borrow site, where the shaded area represents the grain size envelope and the curve bisecting the shaded area represents the composite grain size curve.

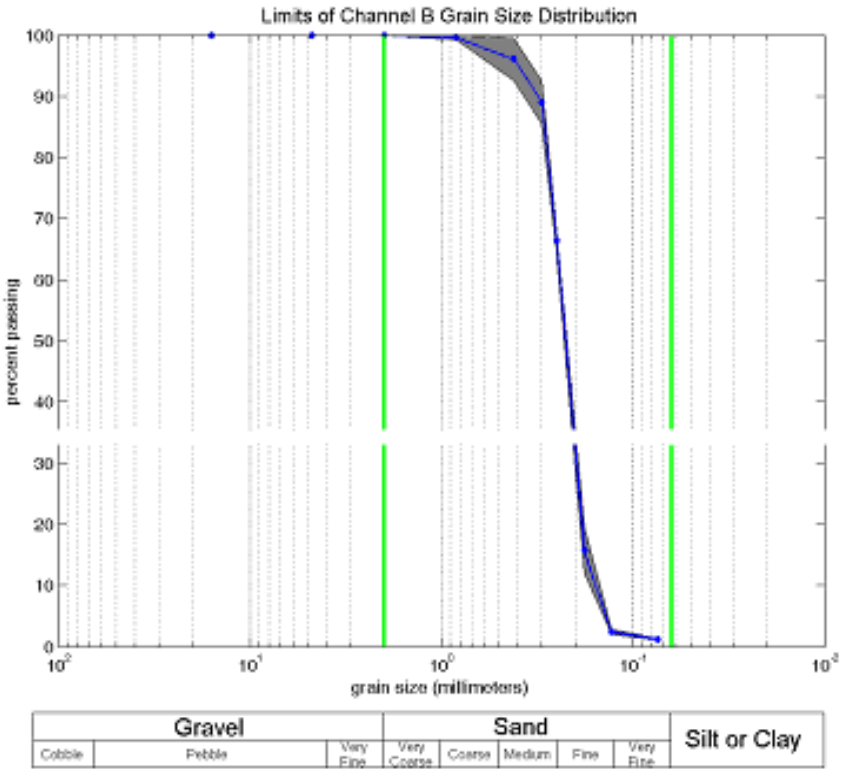

Figure D3. Grain size distribution of the material found in the Channel B borrow site, where the shaded area represents the grain size envelope and the curve bisecting the shaded area represents the composite grain size curve.

Navigation Channel B Sediment

The proponent also determined grain size from cores taken from Navigation Channel B. The material was found to have a very narrow range of medium to fine sand. Figure E3 shows the specific range of material found in the channel.

Sediment Characteristics

The two physical properties of sediment that are most important for determining its suitability as nourishment material are composition and grain size; desirable physical properties are mechanical strength and resistance to abrasion. In most regions of New England, sediment is predominantly composed of quartz particles, so that borrow material will likely have adequate strength and high resistance to abrasion.

Ideally, the grain size of the source material should be the same size or larger than the native beach sand to minimize erosion. Material that has a smaller diameter than the native sand can remain in equilibrium only at slopes flatter than the existing beach. If smaller diameter sand is used, the volume required to form an equilibrium offshore profile will be much greater and consequently, more costly. The mean grain size for the nourishment material on Town Beach should be equal or greater than the mean grain size observed on the native beach, or 0.33 mm.

In practice, nourishment material never exactly matches the native beach material in a project area. James (1975) developed an approach for indicating the behavior of a fill material having different characteristics than the native material. This approach uses a ratio indicating how much fill material is required as a result of the different sediment characteristics between the fill and native materials. The approach assumes the following:

- The native sediment is most compatible for creating a beach profile consistent with the existing beach.
- Sorting of borrow material by coastal processes will achieve a similar grain size distribution as the native beach, given enough time.
- Sorting of borrow material will winnow out a minimum amount of the original nourishment volume.
- Both native and borrow material exhibit normal grain size distributions.

Using the assumptions described above, James (1975) defined a factor for estimating the required nourishment volumes considering differences between the channel sediment and native materials. This overfill ratio, RA, is the volume of borrow material required to produce a stable unit of usable nourishment material with the same grain size characteristics as the native material. R_A is determined by comparing the mean sediment diameter (ϕ) and sorting values of the native and proposed borrow sediment. The ϕ scale of sediment diameter is defined as:

$$\phi = -\log_2(D) = -\frac{\ln(D)}{\ln 2}$$

where D is the sediment grain size in millimeters. The adjusted overfill ratio is determined using the following relationships between the borrow and native material:

$$\frac{\sigma_{\phi b}}{\sigma_{\phi n}}$$

and

$$\frac{M_{\phi b} - M_{\phi n}}{\sigma_{\phi n}}$$

$\sigma_{\phi b}$ = standard deviation or measure of sorting for borrow material

$\sigma_{\phi n}$ = standard deviation or measure of sorting for native material

$M_{\phi b}$ = mean sediment diameter for borrow material

$M_{\phi n}$ = mean sediment diameter for native material

Plot the values from the above relationships on the appropriate U.S. Army Corp nomograph (see Figure E4), and determine R_A by interpolating between values represented by the isolines. (Note: A detailed description of this technique is described in the *Shore Protection Manual*, U.S. Army Corps of Engineers, 1984).

Results

Estimate the overfill ratio for the grain size distributions of the native beach material and the sediment in Navigation Channels A and B. The grain size distribution for these samples is shown in Figure E4. The results from the above analysis show that for Navigation Channel A, $\sigma_{\phi b}$ = 1.24, $\sigma_{\phi n}$ = 1.03, $M_{\phi b}$ = 0.70, and $M_{\phi n}$ = 1.47. The overfill ratio, R_A, is 1.02 (Figure E5), meaning 1.02 cubic yards of sediment will be required for every cubic yard of native material.

The low overfill ratio indicates that the material from Navigation Channel A closely matches the native material, and would be a good source of sediment for nourishment of Town Beach. The analysis results for Navigation Channel B are, $\sigma_{\phi b}$= 0.34, $\sigma_{\phi n}$ = 1.03, $M_{\phi b}$= 2.13, and $M_{\phi n}$= 1.47. The overfill ratio, RA, falls in the unstable range (Figure E5), indicating that sand from Navigation Channel B would quickly erode, causing the beach to return to its pre-construction condition. Because the goal of the project is to increase the volume of sediment in the beach system for shore protection, Navigation Channel B is not a good nourishment source for Town Beach.

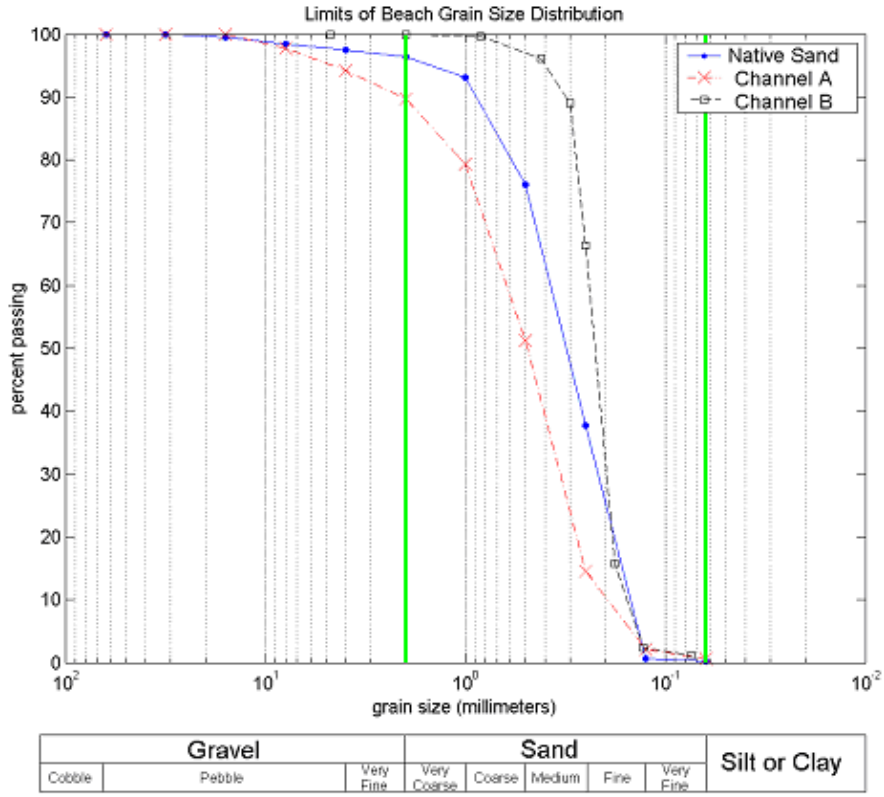

Figure D4. Comparison of grain size distribution curves for native beach material and material from proposed borrow site.

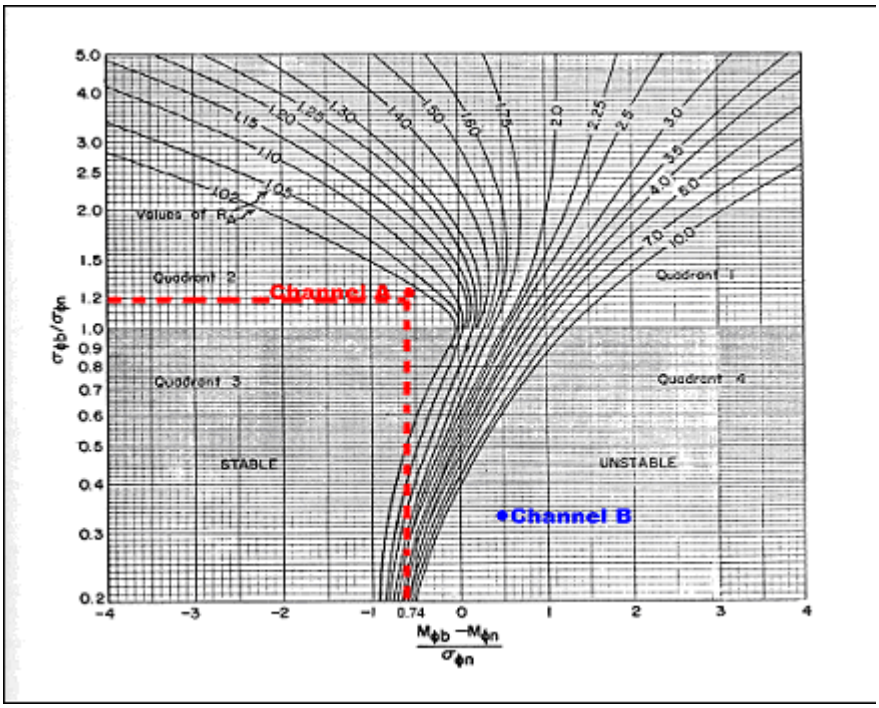

Figure D5. USACE nomograph represent the computed overfill factors (RA) for Channel A and Channel B in relation to the native material on Town Beach.

Attachment E | Generic Beach Monitoring Plan

This attachment provides a general overview of the elements that make up a good monitoring program. More specific information and instructions can be found in the U.S. Army Corps of Engineers' publications: *Design of Beach Fills, EM 1110-2-3301 and Coastal Project Monitoring, EM 1110-2-1004*. In general, the efforts described in the U.S. Army Corps Engineering Manuals refer to engineered beach nourishment projects. For smaller-scale beach nourishment projects, monitoring would likely be limited to an evaluation of potential adverse impacts to resource areas associated with sediment movement rates. Refer to CZM's Beach Management Guidelines for information about monitoring for the presence of rare coastal shorebirds post-construction. Should their presence be observed, contact the NHESP for further information.

The primary objectives of monitoring a beach nourishment project are:

- to document and evaluate whether the project is performing as designed,
- to identify maintenance and re-nourishment requirements, and
- to evaluate project impacts.

Ideally, monitoring plans should include beach profile surveys and an evaluation of the survey data to determine nourishment stability. Monitoring should begin prior to material placement, so that baseline conditions can be documented, and continue at regular intervals thereafter. If possible, collect post-storm profile information because it is helpful in evaluating the cross-shore response of the project to storm waves and tides.

When the purposes of a beach nourishment program are shore protection and reestablishing the local sediment supply, an evaluation of long-term nourishment needs is necessary for planning future beach maintenance. Generally, the beach nourishment design life is determined during the design process; however, monitoring will show how well the actual nourishment performance compares to design performance. Beach profile monitoring provides information on:

- the percent nourishment remaining within the project area compared to baseline conditions,
- the occurrence of downdrift accretion on beaches,
- the presence of areas highly susceptible to erosion (i.e., "hot spots") as indicated by variable longshore beach widths, and
- the future nourishment volumes needed to maintain the sediment supply

For all projects, monitor the material placed on the beach to determine shoreline changes and whether the beach fill is shifting. Monitoring requires measuring elevations along a series of shore perpendicular control transects (or cross-sections) along the length of the project area. The number of transects required to evaluate the nourishment depends on the size of the nourishment project, as well as the presence of shoreline features that may control sediment transport in the longshore direction (e.g., natural headlands or groins). Typically, transects should be spaced every 100 to 400 feet. Surveys are generally conducted landward of any expected long-term changes in beach/dune shape, to a water depth where changes between the equilibrated nourishment profile and the pre-construction profile are anticipated to be minimal.

stock photos

Contractors are usually required to measure profiles before, during and after construction to document the amount of sand placed so they can receive the appropriate amount of compensation. The monitoring plan should measure actual nourishment performance in the first three months of the project because the initial equilibration and longshore spreading occurs relatively quickly. A qualified surveyor or engineering contractor with experience in beach profile monitoring should undertake additional post-construction monitoring. Generally, a number of surveys should be performed during the first year following construction including, ideally, seasonally. After the first year, the beach nourishment transects can be monitored annually. For major beach nourishment programs (i.e., more than 2,000 feet long), the nourishment transects are measured within the original design template, as well as within approximately 1,000 feet updrift and downdrift of the project limits.

Monitoring reports are typically prepared after the first year of complete data evaluation, and bi-annually thereafter. These reports should summarize all data collected, including general information regarding the wave climate and storm activity, changes in sand volume over time, and measured shoreline changes. The information can then be used to evaluate performance, assess any adverse environmental impacts, and estimate future re-nourishment requirements.

Attachment F

Sample Easement

Public Access Easement

I (WE) _____of _____ the "Grantor(s)," which term shall, in perpetuity of the nature and character and to the extent hereinafter set forth, over a parcel (the "Property") located in _____, at the following address:_____

WHEREAS, Grantor is sole owner in a fee simple of certain real property (the "Property") in_____, more particularly described above; and

WHEREAS, the property possesses natural, scenic, and open space values of great importance to the people of Harwich and the people of the Commonwealth of Massachusetts; and WHEREAS, the value of the property has been (or will be) restored, enhanced, and protected ("The Nourished Area") by a locally funded beach nourishment project more particularly described in the plans provided at Town Hall; and
WHEREAS, the Grantor has received a direct benefit from said publicly-funded beach nourishment project;

NOW, THEREFORE, in consideration of the facts recited above and the mutual convents, terms, conditions, and restrictions contained herein, and pursuant to laws of the Commonwealth of Massachusetts, the Grantor hereby voluntarily grants and conveys to the Grantee an easement in perpetuity over the Property of the nature and character and to the extent hereinafter set forth: There is granted to the Grantee, the residents of _____and the public generally, a public on-foot right-of-passage along and across the shore of the coastline between the mean high water line and the entire "nourished area" subject to the following restrictions and limitations:

Said public on-foot right-of-passage shall not be exercised (a) later than one-half hour after sunset nor earlier than sunrise; (b) where the Commissioner of the Department of Conservation and Recreation for the purpose of protecting marine fisheries and wildlife or for controlling erosion, designates and posts natural area of critical ecological significance as areas in which, on either a regular or seasonal basis as circumstances in each situation require, the public not exercise the on-foot free right-of-passage; (c) where there exists a structure, enclosure, or other improvements made or allowed pursuant to any law or any license, permit, or other authority issued or granted under the General Laws or where exist agricultural fences for the purposes of enclosing livestock, provided that such area is clearly and conspicuously posted.

The Grantor(s), and the heirs, successors, and assigns of the Grantor(s) covenant and agree to reimburse the Grantee all reasonable cost and expenses (including without limitation counsel fees) incurred in enforcing this easement or in remedying or abating and violation thereof By its acceptance the Grantee does not undertake any liability or obligation relating to the condition of the Property.

The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties: each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.
The Grantor agrees to incorporate the terms of this Restriction in any deed or other legal instrument by which he divests himself of any interest in all or a portion of the Property.

Executed under seal this _____day of _____, 200__

_____

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Epsilon ASSOCIATES INC.

Projects:\21597\2013 \Monitoring and Work Reports\Template Re-grading and Work Reports

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December 11, 2019

Mr. Jeff Carlson
Natural Resources Director, Town of Nantucket
Conservation Commission Office
2 Bathing Beach Road
Nantucket, MA 02554

Via U.S. Mail & Electronic Mail

Subject: DEP File No. SE48-2824 – Response to 12-4-2019 Field Inspection

Dear Mr. Carlson:

Epsilon Associates Inc. ("Epsilon") submits this correspondence on behalf of the Siasconest Beach Preservation Fund ("SBPF"), in response your memo dated 12/5/2019 presenting your observations made during your December 4, 2019 site inspection. With regard to topics raised by your observation, and moving forward with sand template nourishment, we offer the following:

1. To date the SBPF has delivered and placed approximately 100,000 cubic yards ("c.y.") of sand to the template over the past six years. Sand samples have been collected for grain size analysis and only those samples determined to be compatible based on grain size have been accepted. Testing results are submitted to your office prior to sand being placed on the template.
2. There are a few sources of unacceptable material that can make its way onto the template and those are: A) A known source is debris (e.g. PVC pipe, brick, patio block, etc.) on to the ramp and template is eroded out of the bluff face. That material is the remains of homes that were removed from the bluff. This source is captured in several of the photos attached to your memo. B) Other contractors use the publicly available sand ramp to dump material over the bluff for other shoreline projects. SBPF does not know the sources or kinds of material others may dump down this publicly accessible sand ramp. I believe you met on-site on Friday, December 6, 2019 with Cottage+Castle and observed that a non-SBPF contractor had dumped material at the top of the bluff at the access way between 85 and 87 Baxter Road (where material is dumped) and observed readily noticeable debris (brick, lumber and plastic tape), and a root ball in that load. This is noted as anectodical evidence that others use this ramp and may deliver material with debris in it. C) The SBPF contractor delivers recycled sand to the site as well. Cottage+Castle works to remove debris from re-cycled sand source before

it is delivered to the template and also inspects the template and removes any debris, if present, when placing and maintaining the template.

To remove the known source of debris, i.e. the bluff at 85 Baxter Road, SBPF will remove exposed materials from the bluff face. Then on a periodic basis remove material so that it does not fall on to the ramp or template. Additionally, pursuant to the DRAFT protocol attached include screening recycled sand to remove debris that may be in the sand, e.g. brick, block, timber, root balls etc. This will serve to remove SBPF deposited sand form being a source of debris onto the template.

3. We discussed developing a protocol for evaluating non-sand pit sources ("non-pit") sand with the Nantucket Conservation Commission ("Commission") during the November 20, 2019 Commission meeting. The plan was to submit that for discussion at the December 18, 2019 meeting. Please see the attached DRAFT protocol for your review and for discussion during the December 11, 2019 meeting. The overall approach is to evaluate non-pit sand in a manner consistent with the MassDEP beach nourishment guidance. Please note the MassDEP beach nourishment guidance is based on dredged material being the sand source, thus some changes are needed when applying the guidance to non-dredge material sources. Use of this guidance was discussed as a voluntary action to supplement Special Condition No. 25 as a means to better define compatibility.
4. The MassDEP is expected to issue a Superseding Order of Conditions for the extension project (File No. SE42-3115) in the near future. Future maintenance and monitoring conditions developed by MassDEP would be applicable for this initial 950-foot installation going forward. Holding

We look forward to discussing this matter at the Commission meeting scheduled for December 11, 2019 at 4:00 PM.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

encl.

cc: J. Posner, SBPF
J. Feeley, Cottage + Castle
S. Cohen, Cohen & Cohen Law, PC
G. Wood, Rubin & Rudman, LLC

Baxter Road and Sconset Bluff Storm Damage Prevention Project (DEP File No. SE48-2824)

Mitigation Sand Analysis Protocol

Starting January 1, 2020

This protocol was developed to augment the sand requirement established in the Order of Conditions ("OOC"), specifically Special Condition No. 25 which reads:

> "*25. All sand used for mitigation or to fill and cover the Geotubes shall be imported from an off-site source and shall be compatible with the existing bank and beach sediments*."

To date all sand sourced and delivered to the template has undergone sieve analysis and was determined to be compatible with the existing bank and beach sediments based on grain size. Sources that were not considered to be compatible were not, and will not, be purchased for use on the template.

This protocol follows the overall approach outlined by the Massachusetts Department of Environmental Protection ("MassDEP") for determining compatibility of sediment for beach nourishment projects int eh document titled, *Beach Nourishment-MassDEP's Guide to Best Management Practices for Projects in Massachusetts*, dated March 2007. Sediment analysis protocols in the MassDEP guidance is based on MassDEP regulations 314 CMR 9.07, which prescribes a stepwise process to evaluate sediment quality:

1. Conduct a site due diligence review to demonstrate that the source site is unlikely to contain anthropogenic concentrations of oil or hazardous materials.
2. Conduct sieve analysis of source sand. If source sand contains less than 10% by weight of particles passing the No. 200 U.S. Standard Series Testing Sieve (nominal opening 0.0029 inches), and if the "due diligence" review demonstrates that the source site is unlikely to contain anthropogenic concentrations of oil or hazardous materials, then no chemical testing is required.
3. If due diligence suggests sand may be contaminated and / or fines comprise 10% or more of the sample by weight, then conduct chemical analysis of source sand. For sources supplying up to 10,000 cubic yards of sand, one sample per 1,000 c.y. shall be collected for laboratory analysis[1].

DRAFT

[1] consistent with 314 CMR 9.07 (2)(b)4

SAND ANALYSIS TO DETERMINE COMPATIBILITY

Following that stepwise process, the Sconset Beach Preservation Fund ("SBPF") proposes the following sand analysis protocol for sand sourced from sites other than commercial sand pits (either on-island or off-island commercial sand pits) before it is placed on the template. Results of the sand analysis will be submitted to the Nantucket Natural Resources Department for review and acceptance before sand is placed on the template.

Scenario 1

Due Diligence:

For each sand source site SBPF will use contract for an EDR Radius Map Review[2] to determine if the site has the potential to be contaminated from anthropogenic sources. The EDR Radius Map Review searches over 1,600 environmental databases, including state, city and tribal sources and it meets Environmental Site Assessment ("ESA") Phase 1 requirements and ASTM E1527-13 standards for ESA Phase 1 assessments.

Additionally, SBPF will determine if the source site is served by municipal sewer or has an on-site septic system. No sand will be accepted from a septic system leach field if sourced from a parcel served by a septic system

Seive Analysis:

Consistent with current practice sand samples will be collected for sieve analysis. Sand sieve analyses will be conducted by Dr. Peter Rosen, and when he is not available by Alpha Labs. Dr. Rosen will analyze the sieve results to determine compatibility when he performs sieve analysis, and Epsilon Associates Inc. ("Epsilon") will determine compatibility when Alpha performs the sieve analysis.

Compatibility is determined on grain size only. Compatibility will be assessed for compliance with Special Condition No. 25 – consistency with natural bank and beach sediments, plus the MassDEP guidance in which sand is considered compatible when it is similar to or coarser than the beach sediments.

Decision Point #1:

When the sand source due diligence review demonstrates the site is unlikely to be contaminated by anthropogenic sources of oils and hazardous material **and** the sand contains less than 10% fines **and** the sand is considered compatible with natural bank and beach sediments; it shall be considered compatible. The documentation will be provided to the Nantucket Natural Resources Department for review and acceptance before sand is placed on the template.

Scenario 2

Due diligence review shows sand source site is **unlikely** to be contaminated by anthropogenic source of oil and hazardous materials **BUT** sieve analysis shows the sand contains greater than 10% fines by weight (passing the No. 200 sieve).

[2] https://edrnet.com/prods/edr-radius-map-report-geocheck/

DRAFT

Decision Point 2a

If SBPF wants to proceed with a source site meeting these criteria, then **chemical testing is required**. Sand samples will be sent to Alpha Analytical Laboratories for soil site characterization testing consistent with procedures established by the MassDEP.

If testing shows the sand is **free of contaminants** by meeting Massachusetts Contingency Plan Soils R-1 (residential 1) criteria **AND** sieve analysis determines the sand is considered compatible with natural bank and beach sediments; it shall be considered compatible. The documentation will be provided to the Nantucket Natural Resources Department for review and acceptance before sand is placed on the template.

Decision Point 2b.

SBPF may reject the sand source based on results of sieve analysis documenting 10% or more fines by weight.

<u>Scenario 3</u>

Due diligence review shows sand source site is **likely** to be contaminated by anthropogenic source of oil and hazardous materials, whether or not sieve analysis shows the sand contains greater than 10% fines by weight (passing the No. 200 sieve) then **chemical testing is required**.

Decision Point 3.a.

SBPF **may elect** to subject the sand sample for chemical testing. Sand samples will be sent to Alpha Analytical Laboratories for soil site characterization testing.

If testing shows the sand is **free of contaminants** by meeting Massachusetts Contingency Plan ("MCP") Soils R-1 (residential 1) criteria **AND** sieve analysis determines the sand is considered compatible with natural bank and beach sediments; it shall be considered compatible. The documentation will be provided to the Nantucket Natural Resources Department for review and acceptance before sand is placed on the template.

Decision Point 3.b.

SBPF may reject the sand source based on results of due diligence review only.

SAND PROCESSING AND TEMPLATE MANAGEMENT

1. It is assumed that sand sourced from a commercial sand pit is clean and free of debris. Sand sourced from sites other than a commercial sand pit and is determined to be compatible and accepted for use on the template, will be screened to remove man-made material such as brick, timber root balls, etc. before it is delivered to the template.

2. After sand is placed on the template, the SBPF will inspect the template weekly and collect and remove all debris from the template and dispose of it properly.

DRAFT

Rec. @ 12/11
Special Meeting

December 11th, 2019

Note to the Nantucket Conservation Commission
From Yvonne Vaillancourt, Director Nantucket Field Station

Having attended the last meeting and following the photos and personal accounts of the fill being dumped at the Geotube project, it clear that it is not clean fill from an undisturbed pit on the island.

Photos and personal accounts have documented the large, easily seen debris within the truckloads dumped on the bluff.
This violates the conditions of the project. This is not compatible with the beach conditions.
There were no bricks in the native sample. The cobble was small and there were no construction materials. This is an egregious violation of the conditions of the project.

What else is in this so called clean fill, which does not fit the conditions required? What is there which we cannot see?

It is reasonable to expect fill with septic failure contamination associated with one documented site. Bacteria and other biological contaminants survive in sand. They would not be destroyed sitting in a pile of sediment and traces introduced to the beach and water would keep microbes around.

The obvious need for more fill is drawing new source sites for mitigation sediment with no concern for the quality of the clean condition which is critical. There are justifiable concerns that substandard fill from variable excavation sites are now being used and may be harboring septic contamination, pesticide residue, industrial chemicals used in training such as flame retardants used in training, oil and any number of other concerning particulates which might come with dirty excavation fill.

When the sources have shifted from undisturbed sand pits to dump pits from a mixture of excavation sites the sediment must be tested to document clean fill.

How can the public look the recent photos and be OK with unclean fill having been used?

How can we look at the recent photos and not wonder what else is there?

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

DEP File Number:
SE48-2824

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
And the Nantucket Wetlands Bylaw (Chapter 136)

A. Violation Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

This Enforcement Order is issued by:

Nantucket
Conservation Commission (Issuing Authority)

12/11/2019
Date

To:

Siasconset Beach Preservation Fund
Name of Violator

PO Box 2279, Nantucket, MA 02584
Address

1. Location of Violation:

See attached property owner list
Property Owner (if different)

87-105 Baxter Road
Street Address

Nantucket
City/Town

02584
Zip Code

Map: 48 Parcels: 8, 21, 22, 18, 17, & 15
Assessors Map/Plat Number

Map: 49 Parcels: 19 & 8
Parcel/Lot Number

2. Extent and Type of Activity (if more space is required, please attach a separate sheet):

Fill being used and installed on template contains improper material.

B. Findings

The Issuing Authority has determined that the activity described above is in a resource area and/or buffer zone and is in violation of the Wetlands Protection Act (M.G.L. c. 131, § 40) and its Regulations (310 CMR 10.00), because:

☐ the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone without approval from the issuing authority (i.e., a valid Order of Conditions or Negative Determination).

B. Findings (cont.)

☒ the activity has been/is being conducted in an area subject to protection under c. 131, § 40 or the buffer zone in violation of an issuing authority approval (i.e., valid Order of Conditions or Negative Determination of Applicability) issued to:

Siasconset Beach Preservation Fund Name	9/30/2015 (Amended 11/28/18) Dated
SE48-2824 File Number	General Condition 7 Condition number(s)

☐ The Order of Conditions expired on (date): _____ Date

☐ The activity violates provisions of the Certificate of Compliance.

☐ The activity is outside the areas subject to protection under MGL c.131 s.40 and the buffer zone, but has altered an area subject to MGL c.131 s.40.

☐ Other (specify):

C. Order

The issuing authority hereby orders the following (check all that apply):

☒ The property owner, his agents, permittees, and all others shall immediately cease and desist from any activity affecting the Buffer Zone and/or resource areas.

☐ Resource area alterations resulting from said activity shall be corrected and the resource areas returned to their original condition.

☒ A restoration plan shall be filed with the issuing authority on or before 12/13/2019 Date

for the following:

Development of protocols for testing existing nourishment materials with potential removal and replacement of the nourishment material ensure that it is compliant with all applicable conditions. (See attached findings)

The restoration shall be completed in accordance with the conditions and timetable established by the issuing authority.

C. Order (cont.)

☐ Complete the attached Notice of Intent (NOI). The NOI shall be filed with the Issuing Authority on or before:

Date

for the following:

No further work shall be performed until a public hearing has been held and an Order of Conditions has been issued to regulate said work.

☐ The property owner shall take the following action (e.g., erosion/sedimentation controls) to prevent further violations of the Act:

Failure to comply with this Order may constitute grounds for additional legal action. Massachusetts General Laws Chapter 131, Section 40 provides: "Whoever violates any provision of this section (a) shall be punished by a fine of not more than twenty-five thousand dollars or by imprisonment for not more than two years, or both, such fine and imprisonment; or (b) shall be subject to a civil penalty not to exceed twenty-five thousand dollars for each violation". Each day or portion thereof of continuing violation shall constitute a separate offense.

D. Appeals/Signatures

An Enforcement Order issued by a Conservation Commission cannot be appealed to the Department of Environmental Protection, but may be filed in Superior Court.

Questions regarding this Enforcement Order should be directed to:

Jeff Carlson, Natural Resources Director
Name

508-228-7230
Phone Number

M-F 9AM-1PM
Hours/Days Available

Issued by:

Nantucket
Conservation Commission

Conservation Commission signatures required on following page.

FINDINGS and ADDITIONAL CONDITIONS
Massachusetts Wetlands Protection Act (MGL Chapter 131, Section 40)
Town of Nantucket Wetlands Bylaw (Chapter 136)

Address:	87-105 Baxter Road
Assessor's Map and Parcel:	48-8, 14, 14.1, 15, 17, 18, 19, 21, 22, 35
Property Owner:	Town of Nantucket
Applicant:	Siasconset Beach Preservation Fund (SBPF)
DEP File Number:	SE48-2824
Filing Date:	8/14/2015
Date Hearing Closed:	9/10/2015
Date Orders Issued:	9/30/2015
Date Order Amended:	11/28/2018
Plan of Record Information:	Baxter Road Stabilization Project (2 Sheets), dated 3/12/2013, Final revision of 9/9/2015, stamped by Joseph R. Marrone, P.E.
Amended Plan of Record:	Sconset Beach Preservation Fund (Proposed Plan View Sheet 1, Typical Sections Sheet 2), dated 9-25-2018 and prepared by W.F. Baird & Associates Ltd.
Date Enforcement Issued:	**12/11/2019**

Enforcement Findings:

1. **The Commission found by unanimous vote at the 12/11/2019 meeting of the Nantucket Conservation Commission that General Condition 7 which reads:** *Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles or parts of any of the foregoing.* **Based upon inspection and photographic evidence this condition has not been met and is in violation. An inspection report is attached to this Enforcement Order.**

The following actions shall be taken in effort to remedy the failure.

1. The applicant shall provide within 48 hours a plan detailing monitoring and the removal of all debris found within the nourishment template. This plan shall be approved by the Conservation Commission prior to its enactment and shall contain methodologies, material testing, screening procedures and timeframes for completion. This protocol is scheduled for review at a 12/16/19 special meeting of the Conservation Commission.
2. The applicant shall provide daily updates of quantity removed and photographs documenting debris removal progress.
3. The applicant shall provide protocols for the chemical and biological testing of the existing nourishment template, the area from the base of the template to Mean High Water and from Mean High Water to Mean Low Water to ensure that no contaminated material is located within these areas. The protocol shall also include procedures for removal if contaminated material is found. This protocol is scheduled for review at the 12/18/2019 meeting of the Conservation Commission.
4. Any further non-compliant nourishment material being installed on the project shall be cause for a project failure. Upon this failure determination a public hearing shall be scheduled for the Conservation Commission to discuss further remedial action including potential removal of the structure and/or revocation of the Order of Conditions.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 9 – Enforcement Order

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
And the Nantucket Wetlands Bylaw (Chapter 136)

DEP File Number:

SE48-2824

D. Appeals/Signatures (cont.)

In a situation regarding immediate action, an Enforcement Order may be signed by a single member or agent of the Commission and ratified by majority of the members at the next scheduled meeting of the Commission.

Signatures:

Signature of delivery person or certified mail number

Projects:\21597\2013 \Monitoring and Work Reports\Template Re-grading and Work Reports

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978 897 7100
FAX 978 897 0099

December 13, 2019

Mr. Jeff Carlson
Natural Resources Director, Town of Nantucket
Conservation Commission Office
2 Bathing Beach Road
Nantucket, MA 02554

Via U.S. Mail & Electronic Mail

Subject: DEP File No. SE48-2824 – Sand Screening Procedure

Dear Mr. Carlson:

On behalf of the Siasconest Beach Preservation Fund ("SBPF"), Epsilon Associates Inc. ("Epsilon") submits this correspondence pursuant to Conditions 1 and 2 of the Enforcement Order dated 12/12/2019. Attached is the proposed sand screening procedure for the Commission's consideration.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

encl.

cc: J. Posner, SBPF
J. Feeley, Cottage + Castle
S. Cohen, Cohen & Cohen Law, PC
G. Wood, Rubin & Rudman, LLC

TEMPLATE SAND SCREENING PROCEDURE

The following procedure outlines the steps the SBPF proposes to remove the non-naturally occurring material from the template. It is understood that sand screening will proceed after the sand characterization (chemical and biological testing) is completed.

Sand Screening

1. Immediate Action

1. The template will be inspected daily, and all observed man-made material will be removed by hand from the template. The attached inspection log will be completed each day. Photos of whatever man-made debris is collected during that day's inspection will be taken and attached to the inspection log.

2. For materials along the side slope, the contractor will access the beach 3 of 5-work days with an excavator #2, or similar machinery, fitted with a bucket. Non-naturally occurring material will be placed in the bucket and removed off-site. The attached inspection log will be completed each day. Photos of whatever man-made debris is collected during that day's inspection will be taken and attached to the inspection log.

3. Collected material will be photographed, cataloged by type, and noted in the inspection log

4. Collected material will be disposed of off-site.

2. Sand Screening Procedure

No sand was placed on the template between February 2019 and Mid-October 2019. The material that resulted in the issuance of the Enforcement Order dated December 12, 2019 was a portion of the material place in the autumn of 2019. The material to be screened is in on the upper layers of the template and on the face of the geotubes, or side slope. It is expected that equipment and vehicles will access the template from the Hoicks Hollow ramp. Sand will be screened in 50- to 100-foot long sections so that the excavated area can be opened and backfilled in the same work day.

1. Sand will be screened on-site using a screening-bucket (see attached manufacturers information) or similar piece of mobile screening equipment. A screening-bucket is a bucket fitted with a centrifugal screen that can excavate and screen material in a single unit screen, the screen retains items larger than the mesh including man-made materials such as pipe sections, brick, block and debris and allows the sand to fall out. The selected mobile screener will be used to screen sand from the top of the template. A screening-bucket is affixed to an articulated arm can excavate and screen sand present on the upper portion of the template side slope. If a different mobile unit is used, an excavator can removed sand from the upper portion of the template side slope for screening.

2. Sand will be excavated and screened a minimum depth of 1-foot below the gray sand layer.

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3. Sand along the face of the geotubes, beyond the reach of the screening bucket or excavator bucket, will be hand raked and sorted to remove debris to avoid damaging the geotubes. Clean sand will be used to recover the face of the tubes as needed.

4. Screened sand and the residual (material that remains in the screening-bucket) will be segregated during the operation, with residuals and screened sand placed in different temporary stockpiles on the template.

5. After a section of templated is screened, the screened sand will be replaced into the excavation (or side slope) from where it was removed on a daily basis.

6. This procedure will be completed for the length of the template until the entire length has been screened.

7. Residual material will be hauled off-site for disposal.

8. Residual material will be observed and logged as to type of material as well as an estimate of its volume.

DRAFT

SBPF Site Inspection Report/Log

Inspector:

Date: Time: Weather:

General Site Conditions:

Type & Quantity of Debris Removed/Action Taken

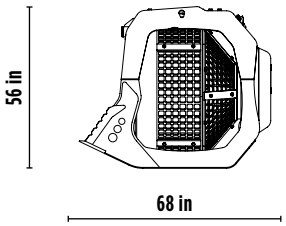
Type	Estimated Quantity	Action Taken

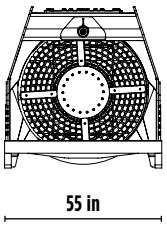
DRAFT

U.S.A.

MB-S14 S4

THE CRUSHING EVOLUTION





ACCESSORIES

- RECOMMENDED SPARE PARTS KIT
- FIXED COUPLING
- BASKET PROTECTION KIT
- HOUR METER
- WARRANTY EXTENSION GOLD 24

SPECIFICATIONS

EQUIPMENT	≥ 19,800 < 44,100 lbs
LOAD CAPACITY	1.43 cy
GRID DIAMETER	47 in
DIMENSIONS	68" x 55" x 56" H in
OIL FLOW	16 gal/min
PRESSURE	> 2,176 PSI
WEIGHT	2,425 lbs

AREAS OF APPLICATION

RECYCLING

UTILITY WORK

SMALL AND MEDIUM-SCALE URBAN SITES

The data provided above is not binding, as the manufacturer reserves itself the right to make improvements to its products at any time and with no advance notice.
References to excavator weights are approximate and many may be subject to changes.

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Projects:\21597\2013 \Monitoring and Work Reports\Template Re-grading and Work Reports

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December 16, 2019

Mr. Jeff Carlson
Natural Resources Director, Town of Nantucket
Conservation Commission Office
2 Bathing Beach Road
Nantucket, MA 02554

Via U.S. Mail & Electronic Mail

Subject: DEP File No. SE48-2824 – Sand Sampling Procedure

Dear Mr. Carlson:

On behalf of the Siasconest Beach Preservation Fund ("SBPF"), Epsilon Associates Inc. ("Epsilon") submits this sand sampling proposal pursuant to Conditions 1 and 2 of the Enforcement Order dated 12/12/2019.

During autumn 2019 approximately 10,000 to 12,000 cy of sand was placed on the Template ahead of the winter storm season. Concerns have arisen regarding the source and quality of a subset of that sand, about or approaching 4,000 cy, placed during this period. The NCC issued an EO on December 12, 2019 that requires SBPF conduct chemical and biological testing of the suspect sand.

PURPOSE

To determine if the suspect sand differs from sand typically used to re-cover the Template annually, SBPF proposes to collect and characterize samples of typical sand within the Template as well as of the suspect sand. Samples will be collected at an approximate rate of one sample per 1,000 cy of the typical sand fill (consistent with 314 CMR 9.07) and at a rate of one sample per 500 cy of the suspect sand that wase placed during the fall of 2019. The sampling frequency is commonly used to characterize soils in Massachusetts and would be expected to identify variation in soil quality from various sources. Therefore, 8 samples of the typical sand, and eight samples of the suspect sand will be collected. Eight samples of beach sand between the toe of the Template and Mean High Water will also be collected to determine if eroded suspect sand has been deposited on the beach. Therefore, a total of 24 samples will be collected.

SAMPLE COLLECTION

A grid will be laid out on the Template by the project surveyor. The grid will be 20'x 50' laid out with the first grid line approximately 25 feet from the southerly extent of the Template and then every 50 feet until the end of the Template is reached for an anticipated total of 19 grid lines. Two grid rows will be established at 20 foot spacing centered on top of the Template. The grid will result in a total of 38 grid points. The grid layout is shown on the attached plan.

Samples will be collected at each grid point using a GeoProbe sampler hand-driven at least four feet below Template surface grade. Samples will be collected in four-foot clear plastic sampling tubes. The tubes will be sliced open and the vertical strata will be evaluated to determine depth and thickness of the suspect sand at each grid point. Samples will be screened in the field with a photoionization detector ("PID") using Jar Headspace Method. This method determines the Total Organic Vapors ("TOV") in soil.

Grid point samples will be composited in the field such that each Laboratory Sample will represent approximately 1,000 cubic yards of the typical sand fill or 500 cubic yards of the suspect sand fill. The specific number of discrete grid point-samples composited within each Laboratory Sample is expected to vary based on the thickness of the typical sand and suspect sand at each grid point location.

Eight samples will be collected of the typical sand placed on the Template in fall 2019. Eight samples will be collected of the suspect sand that was also placed on the Template in fall 2019. An additional eight beach samples will be collected of sand between the toe of the Template and Mean High Water; beach samples will be collected in the top one foot.

SAMPLE ANALYSES

Sand samples will be placed in pre-cleaned laboratory containers, labelled, logged and shipped under Chain-of-Custody procedures to an independent Massachusetts-certified analytical laboratory. Samples will be analyzed for the following:

Chemical Constituents

- Total Petroleum Hydrocarbons ("TPH")
- Volatile Organic Compounds ("VOCs")
- Polynuclear Aromatic Hydrocarbons ("PAHs")
- RCRA 8 Metals (Ar, Ba, Cd, Cr, Pb, Hg, Se, Ag)

Biological Constituents

- Total Coliform
- Nitrates

The sample analyzed for VOCs will be a grab sample of the material exhibiting the highest PID reading within the composite group. The laboratory data will be collated and reviewed to determine if statistically significant variations in the Chemical and Biological Constituents

note above are apparent between the typical sand and the suspect sand used as backfill on the Template, or if other regulatory compliance requirements are triggered.

Laboratory analyses have been selected based on typical parameters included in MassDEP policy for dredge spoils (Chemical Constituents) and for potential septic system leach field contaminants (Biological Constituents).

SUMMARY

This Sand Sampling Plan was prepared in response to the EO issued by the NCC to SBPF. The plan is intended to describe the procedures and protocols to be followed to evaluate potential chemical differences, if any, between typical sand fill and suspect sand fill at the SBPF Erosion Control Project.

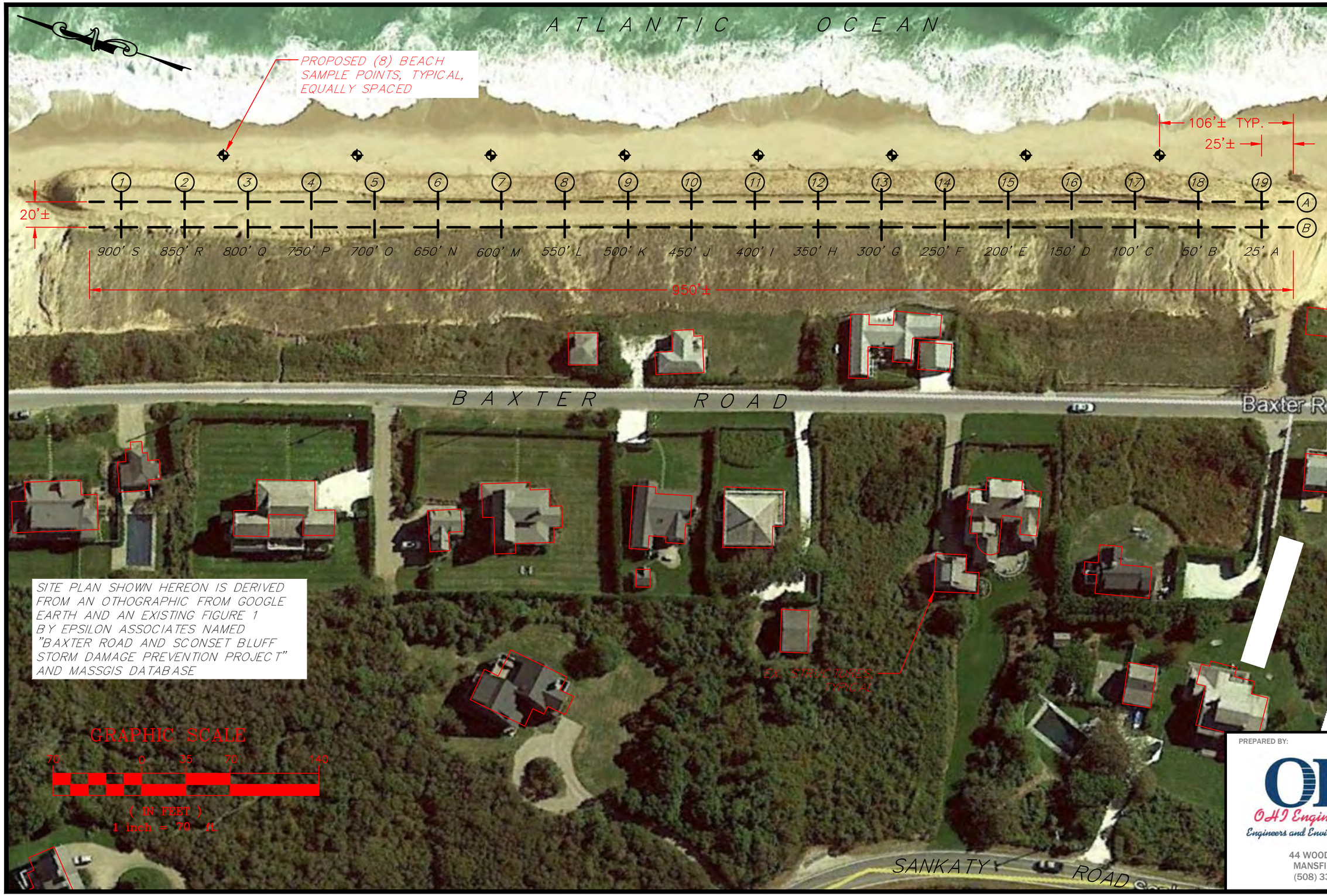
Following collection and laboratory analysis of 24 sand samples, the data will be collated, reviewed, and a summary report will be issued to the NCC.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

encl.

cc: J. Posner, SBPF
J. Feeley, Cottage + Castle
S. Cohen, Cohen & Cohen Law, PC
G. Wood, Rubin & Rudman, LLC



NO:	REVISIONS	DATE	BY	CHKD	APVD
0		12/16/2019	BDJ	JRB	JRB

PROJECT NAME

OHI ENGINEERING PROJECT NO.: 19-2000
GRID LAYOUT SBPF EROSION CONTROL
PROJECT MOUNT AUBURN STREET
SIACONSET, MA

PREPARED BY:

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Massachusetts issues new standards for 'forever chemicals' in water supply

By David Abel Globe Staff, December 13, 2019, 12:38 p.m.

The MWRA's wastewater treatment plant in Quincy. DAVID ABEL/GLOBE STAFF/GLOBE STAFF

Amid growing concerns about toxic chemicals in the water supply, state regulators Friday announced significant new limits on the human-made compounds in drinking water and approved new requirements ordering polluters to clean up contaminated soil and ground water.

The long-awaited rules come as environmental officials acknowledge that the per- and polyfluoroalkyl chemicals, known as PFAS, have been found in a growing number of communities across the state.

that have provided test results to the state Department of Environmental Protection, officials said this week. Of those, 12 found that the amounts exceed the proposed standards for drinking water.

Of 26 non-municipal water systems — those that supply large institutions, such as schools and prisons — half of them detected PFAS in their wells, and nine exceeded the proposed standards.

"The protective standards being filed today are significant steps to protect public health," Governor Charlie Baker said in a statement.

A growing body of research has found that PFAS — dubbed "forever chemicals" because they never fully degrade — can be harmful to human health in even minute amounts. The compounds, which were developed in the 1940s, have since been used in products from nonstick pans to pizza boxes.

Officials at the US Environmental Protection Agency, who have promised to release national drinking-water limits for the two most prevalent PFAS chemicals, currently maintain a health advisory that recommends municipalities alert the public if the two chemicals reach 70 parts per trillion.

Massachusetts has used the same level for five of the most common PFAS chemicals.

Under the new standards, the state will require polluters to clean up contaminated soil and groundwater if the total concentration of six chemicals in PFAS reaches 20 parts per trillion.

Regulators announced the same limit for drinking water. Those rules must still go through a public-comment period and could be revised. They're slated to take

effect in the middle of next year. Under those rules, all public water systems — those that serve more than 25 people every day for at least two months a year — will be required to test for the six chemicals.

If they detect PFAS concentrations exceeding the new standard, they would be required to alert their consumers and take a range of action to remove the contamination.

"We believe setting these standards is the right thing to do to protect public water systems," said Martin Suuberg, commissioner of the state Department of Environmental Protection.

The new standards mirror similar standards set in Vermont, which advises residents to avoid drinking water if the concentration of the six chemicals cumulatively reaches 20 parts per trillion. New Hampshire this year set a limit of 11 parts per trillion for one of the more prevalent chemicals, while officials in New Jersey recently set similarly low standards for other common compounds.

Some environmental advocates say the new standards don't go far enough.

A draft report by the federal Department of Health and Human Services, which the EPA last year tried to prevent from being published, said the chemicals could be harmful at one-sixth the levels the agency now considers safe.

Studies by the Harvard T.H. Chan School of Public Health have recommended that children not consume water with concentrations of the chemicals greater than 1 part per trillion and have called the health risks "greatly underestimated."

The plan "doesn't fully protect the health of Massachusetts families," said Sylvia Broude, executive director of Toxics Action Center, an environmental advocacy

group in Boston. "Growing scientific evidence shows there is no safe level of PFAS in water, and that's why we've been calling for a drinking water standard of 1 ppt for total combined PFAS."

She and others urged the state to prevent communities from distributing water from wells that exceed the proposed standard immediately. They also called on the state to take legal action against the producers of the chemicals, such as DuPont and 3M.

Suuberg declined to comment on whether the state is considering legal action. Officials from the state attorney general's office said they're monitoring the issue closely.

Other environmental advocates, while calling on the state to move more quickly, said they were pleased with the new standards.

"I know that other organizations are asking for 1 ppt, or even zero, and if money for treatment was unlimited . . . I'd agree those lower levels would be ideal," said Laurie Nehring, president of People of Ayer Concerned about the Environment.

The town of Ayer took one well offline after local officials discovered its water was contaminated with elevated levels of PFAS.

"We have been waiting for this regulation to come out for a long time," Nehring said.

Suuberg said his department is also considering whether it should apply standards to other sources of the chemicals that could harm people, such as fertilizers known as biosolids, which are produced as byproducts of wastewater treatment plants.

The Globe reported this month that the Massachusetts Water Resources Authority has been selling fertilizer throughout the region that its own tests found contains more than 18,000 parts per trillion of three PFAS chemicals. That fertilizer is used by farmers and gardeners.

Recognizing that the new requirements will pose a financial burden on communities, state lawmakers this week approved $24 million to help communities pay for testing and for no-interest loans for installing filtration systems.

Most municipal water systems lack the expensive technology to filter such small concentrations of PFAS.

The state aid will be helpful to towns such as Easton, which recently found that six of its seven wells contained PFAS. The chemicals in two of the wells exceed the proposed standards, one by more than twice the limit.

Local officials are considering their options, which include installing a multimillion-dollar filtration system for the town's drinking water. Last month, Easton began issuing a $75 rebate for residents to buy certified filters for their homes.

"We've been learning in the last few weeks how serious this is," said Dottie Fulginiti, chair of the town's select board. "We're still coming up with a plan about how to address this, but anything like this in our water is very concerning."

David Abel can be reached at dabel@globe.com. Follow him on Twitter @davabel.

Show 19 comments

Hi Jeff,

Please forward these links to my fellow commissioners for consideration going forward regarding SBPF and amended order of conditions:

https://floridadep.gov/sites/default/files/offshore-sand-search-guidelines_0.pdf
(First of seventeen references to Munsell color test on p.6 of report, which is p.9/27 in the pdf document)

https://en.wikipedia.org/wiki/Munsell_color_system

https://floridadep.gov/rcp/coastal-engineering-geology/documents/offshore-sand-search-guidelines

Thank you.

Ian

Offshore Sand Search Guidelines

September 21, 2010

Bureau of Beaches and Coastal Systems
Florida Department of Environmental Protection

Offshore Sand Search Guidelines
September 21, 2010

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I. PROGRAM AUTHORIZATION AND BACKGROUND

1. Authorization

As stipulated in Chapter 161, Florida Statutes, the Legislature recognizes that beach erosion is a statewide problem, and that a state-initiated program (with funding support) is the most efficient means to properly manage Florida beaches. The Legislature has authorized the Florida Department of Environmental Protection (Department) to take necessary steps to implement a beach management and shore protection program. The Department has implemented this program using a number of ecosystem management tools, including: (1) funding assistance, (2) strategic planning, (3) environmental data acquisition and analysis, (4) project management, (5) regulatory oversight and (6) development of innovative technologies. Key among those factors which must be considered for any viable restoration or nourishment project is proper identification of a suitable source of beach-compatible sand.

For this document, the Department‟s Bureau of Beaches and Coastal Systems (Bureau) has combined two ecosystem management tools (environmental data acquisition/analysis and regulatory oversight) into one initiative - the Offshore Sand Search Guidelines project.

2. Background

From the 1960s through the mid-1980s, the search for potential borrow areas focused on Florida‟s coastal and nearshore waters. At that time, locating beach compatible sand did not routinely make use of a sophisticated sand search plan or extensive laboratory investigation. Tidal inlet shoals (ebb, flood) or nearshore sands were frequently targeted (i.e., Jupiter Island, 1973-1983; Ft. Pierce, 1983) as reliable sources of suitable sand. These borrow areas were generally close to the proposed project area and required a minimal economic investment.

Coastal and nearshore sand deposits were initially identified on the basis of their distinct geomorphology and/or local relief. These deposits accumulated from the diversion of littoral drift and therefore their "suitability" as beach fill was rarely in doubt. The process of estimating sediment quality and quantity were facilitated by shallow water and mild conditions of wave climate. Design considerations were minimal (i.e., median grain-size, percent fines) and generally limited to the performance of the proposed beach fill as a "soft solution" to shore protection. Environmental regulation was also minimal.

By the mid-1980s, the search for potential borrow areas began to move offshore. Several factors were responsible for this change, including the depletion of coastal and nearshore sand reserves and increased demand created by the urbanization of Florida‟s coastline and implementation of the Beach Management Act of 1986. Most of the coastal and nearshore sand deposits that had not yet been utilized were no longer considered as potential borrow areas because they generally lacked sufficient volume or could not be dredged under the increasing environmental constraints of habitat (i.e., seagrass, nearshore hardbottom) and water quality protection.

The search for offshore sand was initially a relatively simple task. Shoreface-connected and isolated shoals (e.g., Cape Canaveral Shoals, Brevard County; Capron Shoal, Ft. Pierce) were identified on the basis of their distinct geomorphology in water depths generally less than 30 feet. However, confirmation of suitability for beach placement now requires a more in-depth field and laboratory investigation, as these sand deposits are relict features that formed several thousand years ago and can be as much as 20 miles from the project area (e.g., Brevard County‟s South Reach Shore Protection Project). Initial volume estimates were also subject to revision after the details of sedimentology and stratigraphy were determined.

The search for offshore borrow areas has continued to move further offshore and field investigations now routinely include a survey of surface and sub-surface features. A successful offshore sand search is now commonly facilitated by the participation of a multidisciplinary team capable of designing an investigation that will detect sand resources that do not necessarily display a distinct geomorphology or must be identified using sub-bottom seismic surveys. Multidisciplinary teams may include a professional geologist, professional engineer, professional surveyor, and a marine archeologist with experience in the coastal systems of Florida.

Determination of compatibility includes consideration of sediment grain size, sediment composition and color. These additional compatibility constraints reflect the fact that beach nourishment projects are no longer designed solely for shore protection. Parameters related to environmental function, recreational use, and aesthetics are now routinely evaluated.

Today, offshore sand searches extend to distances in excess of six miles offshore and are conducted in water depths approaching 100 feet. Potential borrow areas may not be present as distinct bathymetric features, but instead as subtle sub-bottom features identifiable only on the basis of geophysics and the presence of distinct internal sedimentary structures. Investigations may require the use of vibracores, bathymetric, seismic, magnetometer, and sidescan surveys. To ensure compatibility with the project beach and a sufficient volume of recoverable material, a much denser data set must be acquired from both the potential borrow area and the project beach.

3. Goals and Guideline Objectives

The Department‟s principle objective is to establish technical recommendations of content, format, and quality of geologic information while providing maximum flexibility to modify an investigation as warranted by project-specific conditions. Once the Department adopts the offshore sand search guidelines document, it can be used for guidance to develop a standard Scope of Work for use by local project sponsors. Not all projects will be required to include each task that is referenced in the guidelines. Tasks may be omitted from a project‟s Scope of Work as long as each omission is justified by an explanation of site-specific conditions or project-specific design parameters. Conversely, additional tasks may be warranted in an investigation when accompanied by an explanation of their necessity.

When the guidelines document is used appropriately, professional engineers/ professional geologists will be able to draft a Scope of Work, conduct an offshore investigation, and deliver a report knowing *a priori* that each element meets the expectations of State and local project sponsors. Thus, the need for additional iterations requiring more resource expenditure and time

will be minimized. This document does not constitute specific requirements of sand search investigations, but it documents the overall process that provides the Department with reasonable assurance of the quality of the data received and standardizes the formats for deliverables for the Reconnaissance Offshore Sand Search/ Offshore Sand Source Inventory, Scope of Work deliverables, and Joint Coastal Permit application submittals.

An additional goal of these guidelines is to formalize the content and format of geotechnical data submitted to the Department for review. These guidelines detail the content and format of the deliverables to ensure that deliverables/submittals contain the correct information, and to allow for a more streamlined review by Bureau staff. The sand search report should be submitted in paper copy and include detailed maps of the study area/ borrow area, including locations of seismic lines, bathymetric contours, and vibracores.

The Department encourages coordination with Bureau staff at each step of the sand search investigation. Coordination often begins with the submittal of a Scope of Work for review. The Department also encourages the local sponsor to submit sand search scopes of work for review even if it is only a courtesy review and State cost-sharing funds are not being requested. Scope of Work review furthers one of the goals of this guideline by allowing for review of the plan of investigation to ensure that the data collected (and ultimately submitted) for review are adequate for the permitting process.

4. ROSS / OSSI

The Reconnaissance Offshore Sand Search/ Offshore Sand Source Inventory (ROSS/OSSI) is a statewide program to identify strategic offshore sand resources for the planning and construction of beach nourishment projects by the Department and local government sponsors. The ROSS/OSSI system provides a comprehensive tool that allows the identification and assessment of potential offshore sand resources that are suitable for beach nourishment projects. The 2007 Legislature amended Chapter 161.144, F. S., to require the Department to develop and maintain an inventory of identified offshore sand sources that provides information on location and classification of sand sources as potential, proposed or permitted borrow areas. The Department is developing a comprehensive web-based Offshore Sand Source Inventory (OSSI) with additional information on sand volume and quality as a tool for strategic planning of sand resources.

At the end of each phase of the investigation, ROSS/OSSI data should be submitted and/or updated. This includes more than simply shapefiles of the borrow area and vibracore/seismic line locations. Updated information for inclusion in OSSI should be submitted at each stage of the sand search and design as the borrow area evolves from potential to proposed to permitted. This includes an update of the available/used volume of beach compatible sand and sediment composite data to characterize the material remaining in the borrow area.

5. Other Agency Requirements

This document is meant to serve as a guideline for investigating a potential sand source such that the information collected and submitted meets the permitting requirements for the

Bureau. Current guidance from the State Historic Preservation Office (SHPO) and the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) (formerly the Minerals Management Service) suggests that the remote sensing surveys should utilize modern remote sensing technology and include the collection of magnetometer, bathymetric, sidescan sonar and sub-bottom seismic profiling data. These data must be collected in real-time, correlated with either a Real Time Kinematic Global Positioning System (RTK GPS) or a Differential Global Positioning System (DGPS). The surveys must be directed by a professional surveyor and mapper and coordinated with a qualified marine archaeologist. The marine archaeologist should have experience in the operation of remote sensing instrumentation and specific knowledge of Florida‟s maritime history. Magnetic anomalies that indicate a potentially significant cultural resource are identified for avoidance by the marine archaeologist. The marine archaeologist will typically provide recommendations for horizontal and/or vertical offset buffers. SHPO requires that vibracores collected subsequent to the remote sensing survey be collected within 50 feet of the as-run remote sensing survey lines and must avoid any cultural resources identified as potentially significant by the marine archaeologist, using buffers accepted by SHPO.

This document does not detail all requirements of other State and Federal agencies, including BOEMRE or SHPO, for investigating and permitting borrow sources and their recipient beach placement sites. Communication and coordination on the part of the local sponsor and the professional engineer/ professional geologist is still necessary to ensure other agency requirements are met, especially as requirements of State and Federal agencies are subject to change.

II. PRINCIPAL STAGES OF AN OFFSHORE SAND SEARCH

Most large engineering or scientific investigations proceed in a series of stages. To a first approximation, all offshore sand search investigations follow the same generalized procedures. Sand search investigations differ in the size of the area they cover. To be technically effective while remaining cost efficient, sand search investigation programs should involve the following principle tasks:

1. Office study and planning

The office study stage of a sand search involves the establishment of volumetric objectives and criteria for the sediment characteristics deemed to be compatible with the recipient beach, a review of existing information, the development of a survey design and sampling plan of the reconnaissance level field investigation, and the development of a budget and timeline. At the conclusion of the office study, offshore areas that have the potential to meet the sediment compatibility criteria are designated for reconnaissance level investigation and permits for field investigations are obtained from the appropriate agencies. The application of experience and professional judgment by a coastal geologist is critical in planning a successful offshore sand search.

2. Reconnaissance level investigation of potential borrow areas

Using the information collected during the office study, a reconnaissance level investigation shall be developed. During the reconnaissance level investigation, data are collected throughout a large area or at a number of discreet sedimentary features to obtain a limited amount of information on potential borrow sources. This stage typically involves the collection of a comprehensive set of bathymetric records, sub-bottom seismic surveys, sidescan sonar surveys, magnetometer surveys, vibracores, and samples of native/existing beach sediments (if not previously collected). Based on the results of the reconnaissance investigations, the sand search area or targeted sedimentary features can be further refined to the most promising sand deposits, and a more detailed design level field investigation can be planned.

3. Design level investigation of potential borrow areas

Based on the analysis of the data from the reconnaissance level investigation, the collection of additional data is typically required during this stage to fully examine the proposed borrow areas and comply with regulatory requirements. Additional vibracores and sub-bottom seismic data may be collected at this stage to fill in data gaps and create data coverage adequate for design and permitting of the proposed borrow area. These additional data may also include a more detailed sidescan sonar survey to detect obstructions, hard-bottom or other environmental resources and a magnetometer survey to detect cultural resources of historical significance and obstructions to dredging. These cultural and environmental resource surveys should be performed on a closer line spacing to fill in data gaps and provide adequate data coverage to delineate any resources in the area. Continuing coordination and communication with the resource agencies on the part of the local sponsor and their coastal geologist is necessary to ensure all agency requirements are met.

4. Detailed characterization of specific borrow sites and designation as potential, proposed, or unsuitable for future use

After the reconnaissance and design level investigations are completed, data will exist in a quantity and quality sufficient to designate a borrow area as potential, proposed, or unsuitable for future use. Potential borrow areas may have been identified in the office study or reconnaissance level investigation as potential, but not further investigated for use in the current study or in enough detail to designate it as proposed. Proposed borrow areas contain enough data in a sufficient quantity and quality to move to permitting.

During an investigation, borrow areas may be designated as a potential sand source, but may not be investigated further. While the targeted sedimentary feature may be beach compatible, its use may not be necessary to meet the volumetric need for the current project. It may not be further investigated or developed because a closer or more compatible source is available. A feature may be designated as unsuitable for future use for a given project or abandoned entirely due to poor sediment quality. When data are updated for the ROSS/OSSI database at each stage of an investigation, the borrow area designations should be reevaluated and appropriately changed. The geotechnical data will be included in ROSS/OSSI regardless of

sediment quality so that future researchers can evaluate all of the available data and determine sediment compatibility for future projects.

5. Compatibility analysis and final design of the specific borrow area

The compatibility analysis will include the identification of suitable and unsuitable sediment horizons based on the sediment criteria established for the project and considerations of potential borrow area material performance after project construction. The final borrow area design and the borrow area plans and specifications are prepared when all the concerns regarding the sediment quality within the borrow area, the cultural resource impact potential, the environmental consideration, and the physical considerations have been addressed. The results of the previous tasks will be used to define the geometry (i.e., lateral boundaries and excavation depths) of the borrow area(s).

Each of these investigation stages may include similar operational elements. Each stage of investigation may involve planning, field sampling, laboratory testing, data analysis and reporting. Professional judgment of a coastal geologist is necessary when interpreting the data collected and planning each step of the investigation and final design of the borrow area. The scope or level of effort in each stage depends on the types of borrow sources being investigated, the design parameters of the proposed fill area, the amount of available information and the relative degree of „success" in each antecedent stage of the sand search. The following sections describe the objectives and tasks that should provide adequate coastal data for beach management planning and permitting.

III. PRIMARY TASKS OF AN OFFSHORE SAND SEARCH

Task 1- Office Study and Planning

a) Preliminary Planning

This stage involves an office study of maps, charts, the ROSS/OSSI database, and literature sources concerning the targeted general investigation area. These materials provide information on the regional geomorphology and geology, help to identify features that may contain potential fill material, and suggest a logical sequence and boundaries for the study.

At the beginning of a sand search, specifications are established as the minimum criteria for beach-compatible sediment suitable for the proposed project area. The specifications are based on the native/existing beach sediment characteristics at the proposed project area, which may require additional sediment sampling and analysis at the project beach during this stage of the investigation. The specifications include silt content, visual shell content, carbonate content, gravel content, moist Munsell color, sorting, and grain size distribution.

Offshore sites are chosen as preliminary targets based on any information that leads the investigator to a source of potentially beach compatible sand. Areas of silty, clayey, or rocky material are omitted from the investigation. This may come at the beginning of the investigation

with knowledge of the geology and paleogeography of the area, past vibracore and seismic investigations, or initial reconnaissance field information collected in the area. At the conclusion of the preliminary planning phase, offshore sites are identified for reconnaissance level investigation.

b) Survey Design and Sampling Plan

The office study involves planning the reconnaissance level field investigation. The planning includes the specification of field data to be collected and the equipment needed to execute the data collection. Surface grab samples, vibracore samples, sub-bottom seismic and sidescan sonar records from previous investigations may be reviewed and incorporated as a means of providing preliminary information on the targeted offshore site(s). Historic data may be incorporated into the final borrow area design if the quality of the data meets current guidelines and is adequate to illustrate the composite character of the material. The Department should be consulted regarding the suitability of historic data for use in the final design during investigation planning. A borrow area shall not be designed solely on historic data.

Another important task is laying out the preliminary survey or trackline plots to be followed by the survey vessel while collecting bathymetric and seismic reflection data during the reconnaissance level field investigation. The coverage and spacing of the reconnaissance level surveys and vibracores should be sufficient to determine if the site contains potentially beach compatible sediment. The design level field investigation will include more closely spaced vibracores and perhaps additional sub-bottom seismic surveys within the potential borrow area.

Locations of the vibracores selected during the office study should be based on analysis of the seismic reflection records and the configuration of the sedimentary feature. Vibracore locations should be located on or within 50 feet of a seismic track line and avoid potential cultural and environmental resources. A dynamic vibracoring plan is often used to allow the geologist to pursue the most compatible material while in the field. Both primary and secondary locations for vibracores can be identified in the survey design and sampling plan. Secondary locations can be vibracored based upon field-logging of the primary vibracores while on the ship used to conduct the vibracoring.

c) Permitting for Field Investigations

Currently, the Department requires that investigators obtain a de minimus permit exemption for geotechnical investigations such as vibracoring. The submittal of a shapefile of the investigation area is required in the permit application. This shapefile aids the Department in tracking and reporting the investigations occurring throughout the State as required by Chapter 161.144, F.S.

Depending on the timing of the investigations, a de minimus permit exemption request may be required at both the reconnaissance and design levels. If the sand search is occurring in Federal waters, a geotechnical and/or geophysical investigation permit may be required from the BOEMRE. The application for and receipt of these exemptions/permits should be included in the Scope of Work, schedule, and budget for the sand search. The requirements for these permits affect the sequence and specifications of the field investigations.

Task 2- Reconnaissance Field Investigations

The collection of geophysical data should be conducted under the responsible charge of a professional geologist registered in the State of Florida. All navigation and survey control for seismic, sidescan, magnetometer, bathymetry, and positioning for vibracores/ surface samples should be certified by a professional surveyor registered in the State of Florida. The geophysical instrumentation for remote sensing surveys must represent state-of-the-art technology and must be deployed in a manner that limits interference among the instrumentation systems. Data recorders should be interfaced with the navigation system (i.e., via Hypack Max® or similar software) to ensure proper integration of information. All instrumentation must be adequately tuned and all recorded data must be readable, accurate, and properly annotated. Poor quality data resulting from inadequate acquisition or processing techniques is not acceptable and may result in the need to repeat the survey.

Vertical and horizontal data will be collected and presented in feet referenced to the North American Vertical Datum of 1988 (NAVD 88) and North American Datum of 1983/1990 (HARN NAD 83/90), respectively. Map products intended for permit and proprietary purposes should reference horizontal coordinates in the Florida State Plane Coordinate System.

a) Bathymetric Survey

The reconnaissance level field investigation includes a bathymetric survey, which is conducted to map seafloor topography and identify the most prominent bathymetric highs within the boundaries of the potential borrow area(s). Prior to the start of the survey, an offshore tide gauge is set in the vicinity of the project area to record water levels during the survey for data post-processing. The fathometer is calibrated and interfaced with a DGPS. Alternatively, a RTK-GPS may be used for more accurate positioning, which may require the establishment of an elevated base station for surveys that are several miles offshore.

At each stage of the investigation, efforts will be made to reduce the vertical inaccuracies during surveys and other data collection processes, such as recording the top of hole elevations for the vibracores. Vertical inaccuracies are cumulative through the process of identifying, designing, and dredging a borrow area beginning with the survey methods used during the reconnaissance level investigation through the vertical location control of the dredge head. To ensure survey control and accuracy standards are consistent with Department specifications, the professional surveyor will submit a certification that the hydrographic survey meets BBCS Technical Standards established in Part II.A of the *BBCS Monitoring Standards for Beach Erosion Control Projects* and minimum technical standards of Chapter 61G17-6, F.A.C., which references the requirements set forth in the United States Army Corps of Engineers manual EM 1110-2-1003.

b) Sub-bottom (seismic) Profile Survey

A sub-bottom profile should be conducted simultaneously with the bathymetric survey to interpret subsurface sediment distribution and define the thickness of the sand deposit within the targeted sedimentary feature(s). During the reconnaissance level investigations, seismic lines should be spaced such that the general geomorphology and character of the area being investigated can be determined.

Seismic reflection profile surveys must be performed using a high-frequency "chirp" sub-bottom acoustic profiler operating a linear frequency sweep over full spectrum frequency range within the 0.5- to 16-kHz bandwidth to provide continuous and very high resolution information on near-surface geologic features. Systems that are frequency modulated and full-wave rectified are preferred. The sub-bottom profiler system should be run to provide penetration that exceeds the anticipated depth of disturbance below the design dredge depth during dredging operations. The data collected must be recorded digitally to allow signal processing to improve data quality further and allow export to a workstation for integrated interpretation and mapping of the data.

Any sub-bottom profiler system with a chirp full spectrum sub-bottom towfish is recommended for subsurface remote sensing surveys. The equipment should transmit an FM pulse that is linearly swept over a full spectrum frequency range (also called a "chirp pulse"). A versatile wideband FM sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges is recommended. This instrumentation should be able to generate cross-sectional images of the seabed (to a depth of up to 50 ft). The tapered waveform spectrum results in images that have virtually constant resolution with depth.

Throughout an offshore seismic reflection survey, selection of the chirp pulse and acquisition gain settings should be modified in real time to obtain the best possible resolution of subsurface features and the sequence stratigraphy (i.e., vertical sequence and lateral distribution of sediment bodies comprised by different grain sizes and sediment composition). This in turn will optimize data quality and enhance subsequent interpretation. The towfish should be towed at an optimum depth and location that maximizes the acoustic reflection of the outgoing seismic pulse while reducing towfish motion and noise associated with the vessel movement and sea surface conditions. Horizontal positioning of the towfish should be obtained to achieve the required survey accuracies by utilizing automated hydrographic positioning systems that correct for the layback position of the towfish.

c) Sidescan sonar survey

A sidescan sonar survey should be conducted to identify environmental resources (such as hardbottom areas and sea grass beds), items of historical significance and/or navigation hazards/debris. The coverage and spacing of the survey lines should include the geologic feature and adjacent areas that could potentially be affected by the dredging activity. Spacing should also take into account the requirements of other agencies.

A towed, dual-channel, dual-frequency, sidescan sonar system operating between 300- and 1000-kHz to provide a continuous planimetric image of the seafloor is preferred for remote sensing surveys. The sidescan sonar sensor should be towed above the seafloor at a distance that is 10 to 20 percent of the range of the instrument. The equipment should use full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and superb signal to noise ratio echo data. The sidescan should be interfaced to the GPS system along with positioning data from the onboard navigational system to ensure proper positioning of the survey. Horizontal positioning of the towfish should be obtained to achieve the required survey accuracies by utilizing automated hydrographic positioning systems that correct for the layback position of the towfish.

If the historic data collected during the office study, such as cultural or environmental resource investigations/mapping, clearly indicates the absence of natural and cultural resources in the investigation area, this survey may not be necessary for the targeted sedimentary feature. However, other agencies, such as BOEMRE or SHPO, may require sidescan surveys on a specific spacing as verification of the absence of resources. The requirements of other agencies should be considered when planning this portion of the investigation.

d) Magnetometer survey

A magnetometer survey should be conducted to identify buried objects of ferrous (iron) composition. This is required for offshore dredging projects that have the potential to impact features of historical significance (cultural resources) such as shipwreck debris. The magnetometer survey is also important to identify the location of buried objects such as cables, pipeline debris and other manmade items that may interfere with dredging operations.

The purpose of the magnetometer survey is to establish the presence of, and subsequent exclusion zones around, any potential underwater wrecks, submerged hazards, or any other features that would affect borrow area delineation and dredging activities. The magnetometer sensor must be towed as near as possible to the seafloor and in a manner that limits interference from the vessel hull and the other survey instruments. The magnetometer should have a sensitivity of less than one gamma (γ) or one nanoTesla (nT), and the data sampling interval should not exceed one second. The background noise level should not exceed a total of 3 γ peak to peak. The navigation program should be interfaced with the magnetometer in order to collect positioning data digitally in real-time.

The coverage and spacing of the survey lines should include the geologic feature and adjacent area that could potentially be affected by the dredging activity. Spacing should also take into account the requirement guidelines of other agencies. If the office study clearly indicates the absence of resources in the investigation area, this survey may not be necessary for the targeted sedimentary feature. However, other agencies, such as BOEMRE or SHPO, may require magnetometer surveys on a specific spacing as verification of the absence of resources. The requirements of other agencies should be considered when planning this portion of the investigation. Horizontal positioning of the towfish should be obtained to achieve the required survey accuracies by utilizing automated hydrographic positioning systems that correct for the layback position of the towfish.

e) Vibracore Collection

The direct sampling of sub-bottom materials is essential for borrow source identification and evaluation. This is usually accomplished by means of a continuous coring apparatus that can obtain 20-foot cores of unconsolidated sediments. In the types of sediments usually encountered in borrow site exploration, gravity corers are not suitable for obtaining cores of the requisite length; some type of power corer must be used, usually vibrator driven coring devices. In the reconnaissance level field exploration, vibracore locations are chosen to better understand the geology of the feature by correlation with the seismic data and to verify the presence of beach-compatible sediment. The vibracores should be sited on, or within 50 feet of, the seismic lines collected in order to validate the interpretation of both the vibracores and the seismic data.

Often, a dynamic vibracoring plan is used to allow the geologist to delineate the most compatible material, rather than being held to a rigid plan set forth in the survey design and sampling plan. A dynamic vibracoring plan is often used to allow the geologist to pursue the most compatible material. Both primary and secondary locations for vibracores can be identified in the survey design and sampling plan. Secondary locations can be vibracored based upon field-logging of the primary vibracores while on the ship used to conduct the vibracoring. Each core is split longitudinally, visually analyzed and logged "on the fly" during field operations to optimize field operations by modifying secondary vibracore locations as needed. Collected vibracores are then sectioned and shipped to the geotechnical laboratory for processing and analysis. Sampling and analysis of the vibracores follows the protocol as outlined in Section IV below.

Core penetration depth and rate will be monitored and recorded (penetrometer records). A minimum recovery of 80 percent of the sediment penetrated at each core location is necessary to provide the geologist and the Department with reasonable assurance that the stratigraphy and material being sampled is accurately represented in the vibracores. In the event that refusal is encountered prior to achieving the desired depth and/or recovery, an additional vibracore shall be taken and/or a hydraulic jetting technique will be used to facilitate a second attempt and to optimize the probability of achieving core penetration to the desired depth. It should be anticipated during this task that all vibracores used in the design of the borrow area must extend a minimum of two feet below the final maximum dredge depth. Vibracore penetration and recovery objectives must be achieved as these are a limiting factor in determining the maximum dredge depth.

Task 3- Design level Field Investigations

a) Sub-bottom seismic survey

If widely-spaced seismic survey lines were collected during the reconnaissance level investigation, then additional seismic survey lines should be collected during the design level investigation. The denser line spacing of a design level survey will provide a more detailed understanding of the extent of stratigraphic layer(s) within the potential borrow area. This information will assist in defining the area of influence of each vibracore in design of the final borrow area. Additional seismic data may also aid in cultural/environmental resource identification. The professional judgment of an experienced coastal geologist is necessary in planning the location and spacing of these survey lines to best map the stratigraphy of the potential borrow area.

b) Sidescan sonar survey

A design level sidescan sonar survey may be necessary to further identify environmental resources (such as hardbottom areas and sea grass beds), items of historical significance and/or navigation hazards/debris identified during the reconnaissance level investigation. The coverage and spacing of the survey lines should include the potential borrow area and adjacent area that may be effected by the dredging activity. Spacing should also take into account the requirement guidelines of other agencies necessary for the final design of the proposed borrow area. The coverage of the survey should include the geologic feature and adjacent areas that may be

affected by the dredging activity, but the line spacing should be denser in order to fully define the resources.

If the office study and reconnaissance level investigation clearly indicate the absence of natural and cultural resources in the investigation area, a survey during the design level field investigation may not be necessary. However, other agencies, such as BOEMRE and SHPO, may require sidescan surveys on a specific spacing as verification of the absence of resources. The extent of the survey and line spacing should follow the guidelines of these other agencies.

c) Magnetometer survey

A design level magnetometer survey may be necessary to further identify buried objects within the proposed borrow area that may or may not have been identified during the reconnaissance level investigation. The coverage and spacing of the survey lines should include the potential borrow area and adjacent area that could potentially be effected by the dredging activity. Spacing should also take into account the requirement guidelines of other agencies necessary for the final design of the proposed borrow area.

If the office study and reconnaissance level investigation clearly indicate the absence of cultural or historic resources in the investigation area, a survey during the design level field investigation may not be necessary. However, other agencies, such as BOEMRE and SHPO, may require magnetometer surveys on a specific spacing as verification of the absence of resources. The guidelines of other agencies should be considered when planning this portion of the investigation.

d) Cultural Resources Investigation

Once the limits of the borrow area are defined, detailed geophysical investigations with a close line spacing should be used to investigate the presence of cultural resources within the proposed borrow limits. This task is conducted to refine the limits of the potential borrow area(s) identified in the preliminary tasks. A detailed cultural resource investigation is required to fulfill permit requirements for the potential borrow area(s). The cultural resource surveys generally consist of magnetometer, sidescan and seismic surveys and may be conducted in conjunction with the survey tasks described above. A marine archaeologist‟s report may be necessary at various stages of the investigation to satisfy BOEMRE or SHPO requirements and obtain subsequent investigation permits.

It is recommended that selected magnetic anomalies within the potential borrow area(s) be field verified through diver verification if they significantly impact the borrow area. Diver verification can allow for the maximization of use and increased dredging efficiency of the borrow area by eliminating magnetic anomalies as resources and/or reducing buffers. All work must be performed with the expressed permission and in accordance with the survey requirements of the SHPO. A report must be submitted to SHPO (and BOEMRE if necessary) for review. The proposed borrow area(s) will be modified, as required by SHPO, to avoid areas of potential historical cultural resources.

If any significant cultural resources (i.e., shipwrecks, large cultural artifacts, etc.) are mapped within the limits of the proposed borrow area or adjacent area potentially affected by the

dredging activity, the borrow area design must be modified to avoid disturbing these resources. This is usually accomplished by adding no-dredge buffers around the cultural resource feature(s) or by modifying margins of the borrow area (when the cultural resource features occur near the borrow area boundaries).

e) Vibracore Collection

Additional vibracores should be collected to adequately characterize the sediment for final design of the borrow area. Vibracores should be spaced no more than 1,000-feet apart. Vibracores should be of a sufficient length such that they extend at least two feet below the maximum dredge depth. It should be noted that vibracore length and recovery (minimum of 80%) could be a limiting factor in the borrow area design and should be considered when determining the vibracore lengths during all phases of vibracoring. Vibracores should be sited such that the seismic lines can be used to correlate the area between vibracores for a better understanding of the relationship between compatible and non-compatible sediment layers. Additional discussion regarding siting and core recovery are provided in Task 2 above. Sampling and analysis of the vibracores follows the protocol as outlined in Section IV below.

Task 4- Compatibility Analysis and Borrow Area Design

A compatibility analysis is used to ensure the borrow area material is similar to the recipient beach sediments and will maintain the environmental functions and character of the beach. The sediment identified in the cores should be compared to native and/or existing (if no native data exists) beach samples with respect to textural and compositional parameters, as previously described, and color similarity. The compatibility assessment will include the identification of unsuitable sediment horizons and considerations of potential borrow area material performance after project construction.

The following is a qualitative description of the review of quantitative data that the Department uses to determine compatibility. There is no quantitative protocol for determining similarity because the data and science does not exist for a quantitative determination of similarity needed to maintain the general character and environmental function of the material occurring on the beach and in the adjacent dune and coastal system. Therefore, in the absence of additional scientific research, this will remain a qualitative process of reviewing quantitative data.

In addition, the Department has not made similarity determinations a quantitative process because of the variability of sediments found on the beaches of Florida. If enumerated parameters were set for determining similarity, the acceptable ranges in parameters would have to take into account the values found throughout the State. However, the upper (or lower) end of the range may not maintain general character and functionality on all beaches. For example, a range of acceptable mean grain sizes for the entire State will include mean grain sizes that would be much too coarse for beaches in the Panhandle. As another example, the color of the beaches throughout the State is rather variable. Material acceptable for placement on one east coast beach, such as Indian River and Martin County beaches, may not be acceptable for placement on a different east coast beach, such as St. Johns County, much less a beach in Escambia County. For shellier beaches, the acceptable range of mean grain size and sorting may be wider compared

to projects where finer quartz sediments with little to no carbonate/ shell content is acceptable. For these reasons, the Department has not set enumerated parameters for ranges used to determine similarity.

At each step, the sediment characteristics are compared to the native/existing beach sediments for the project and compatibility determined. The Department begins its review with an examination of the sediment characteristics of the individual samples of the borrow area, reviews the extent of layering in the borrow area and the sediment characteristics for each layer, and then looks at the individual vibracores and their area of influence. The Department recognizes that discreet layers of non-compatible material may exist within the borrow area that do not adversely impact the overall sediment quality of the borrow area. Minor layers of non-compatible material may be included in the borrow area design as long as the Department has reasonable assurance that the minor layers will not change the composite character of the material and that the non-compatible will not be concentrated on the beach during placement. Finally, each subarea of the borrow area (if applicable) is examined, followed by the borrow area as a whole. Therefore, determinations of compatibility are not based simply on the overall characteristics of the borrow area.

Determinations of compatibility should take into account the environmental functions of the native material within the berm/dry beach. Therefore, the compatibility analysis should compare the borrow area composite statistics to the overall beach sediment characteristics and also to the berm/dry beach composite statistics. This is important to ensure that the material placed on the beach is compatible for turtle nesting.

In addition to the composite grain size statistics for the borrow area and beach sediments described above, frequency curves (histograms) and cumulative frequency curves of the composites should be created for visual comparison of the grain size distribution of the borrow area and beach sediments. The curves should be plotted such that they overlie each other for easier comparison. Composite statistics should also be created for each vibracore and its area of influence. For projects that include multiple borrow areas, composites should be created for each borrow area.

Composite grain size parameters of the borrow area material created for the compatibility analysis are used in the engineering and structural design of the beach fill. A compatibility analysis should be performed using several standard industry procedures, such as overfill ratio methods and equilibrium profile methods for grain size and qualitative comparisons of additional parameters. These methods include Dean (Dean, R.G. 1974. "Compatibility of Borrow Material for Beach Fill." *Proceedings, 14th International Conference on Coastal Engineering.* ASCE, 1319-1333.), Krumbein and James (Krumbein, W.C., and James, W.R. 1965. "Spatial and Temporal Variations in Geometric and Material Properties of a Natural Beach," Technical Report No. 44, Coastal Engineering Research Center, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.), and the USACE method (U.S. Army Corps of Engineers. 2003. Coastal Engineering Manual (EM 1110-2-110): Part V, p. v-4-25.).

The first step in reviewing the material in a borrow area is to determine whether the enumerated parameters in Chapter 62B-41.007(2)(j)1-5, F.A.C. are exceeded. If they are, that

parameter for the beach is examined to determine if the beach exceeds the parameters, which would provide justification for accepting the exceedance in the borrow area material. If the borrow area material exceeds the enumerated parameters and the beach does not, the Department suggests that that the borrow area be redesigned to avoid the material containing excess silt, gravel or rock.

In order to maintain the general character of the beach, the composition of the borrow area material and the native/ existing material is compared. If a beach is predominantly quartz, the borrow area material should be predominantly quartz. Similarly, if the beach has a high shell content, the borrow area material should maintain that general character by containing comparable amounts of shell material.

Reviewing the curves for individual samples and various composites can reveal the presence of coarser and finer portions of the sediment distribution of the borrow area material as compared to the beach. One factor that is being considered closely is the relative portion of fine sand. Higher fine sand content in the fill material compared to the native/ existing material on the beach may lead to chronic turbidity. Therefore, fine sand content and not simply silt content is examined when determining the potential for turbidity and compatibility.

The next step in the compatibility review is to determine the similarity in the mean grain size, sorting, and distribution of the sediments (unimodal or bimodal). Similarity in mean grain size is often determined based on tenths of a millimeter, but can be determined to hundredths of a millimeter depending on the sediment type. It is generally accepted that material with a higher shell content will often have a higher mean grain size. A higher shell content will also often lead to a higher sorting value. It is also recognized that a borrow area may contain layers of shellier material and sandier material. Therefore, for beaches with a higher shell content, the acceptable range of mean grain size and sorting may be wider compared to beaches with finer quartz sediments with little to no carbonate/ shell content. Similarity of sediments with high shell content is often determined to tenths of a millimeter. Similarity of sediments with a low shell content is often determined to hundredths of a millimeter when possible.

In addition, sorting values should be similar such that beaches with higher sorting values are restored/ nourished with material with a higher sorting value when possible. The main purpose in examining the sorting and distribution of the sediments is to ensure that material with a bimodal distribution is not placed on a beach with a unimodal distribution. This is to reduce the potential impact to turtle nesting ability. For this reason, the shapes of the cumulative frequency curves and the frequency curves (histograms) are reviewed for similarity.

After the mean grain size and sorting parameters are examined, the visual shell content and carbonate content are examined. In general, the visual shell content and the carbonate content are related. When one value is higher, the other will be as well. When the carbonate content is high, but the visual shell content is low, the reviewer is alerted to the potential for fine-grained carbonate. Fine-grained carbonate may be associated with turbidity and cementation/crusting of sediments, and accordingly should be identified as a risk and avoided where possible. Where visual shell and carbonate content in a borrow area are higher, a larger

range in allowable mean grain size is often determined compatible to account for the fluctuations in shell content through a borrow area.

The final step in determining compatibility is color. The only mention of color in Rule is the statement in Chapter 62B-41.007(2)(j), F.A.C., that beach compatible fill shall be similar in color. The Rule speaks to maintaining environmental function and character. It does not speak to maintaining aesthetic qualities of the beach. While the Department recognizes the desire of local communities to maintain a given color, the Department cannot use this as the sole basis to review sediment for compatibility and exclude a sand source from use.

The main focus of maintaining similarity in color is for sea turtles. While there has been no scientific correlation drawn between sediment color and temperature and sex ratios of turtles, it is generally accepted that these factors are related. Therefore, the color of the borrow area material should be similar. It is generally accepted that moist sediment is slightly darker (one Munsell value) than dry sediment and that fill material will lighten one Munsell value once placed on the beach and allowed to dry in the sun.

When reviewing sand sources for color compatibility, a range if hues may be sought for similarity, but the most important sediment color criterion is the value. The "value" component of the Munsell notation is an indication of lightness. The "chroma" notation is indicative of the strength, or saturation, of a color, or its departure from a neutral of the same value. When searching for sand, Chroma should be specified as a 1 for the fill material unless the native or existing material has a higher chroma value.

The source of the color of the material should be taken into account when determining similarity of color. For example, iron staining of material (often seen in the Panhandle of Florida) will not bleach and is not removed by abrasion during the dredging process. Iron staining is a natural process, often has a distinct color, and can be seen when the material is visually examined. The color of the shell content often drives the overall color of the fill material. Even though the quartz grains may be the same color, the color of shell may vary. Depending on the shell material, the color will likely lighten one value once exposed to the sun and allowed to dry after placement. In some cases, the interstitial or pore water contained in a borrow area is the cause for material to appear darker than is the actual sediments. Color determinations made by inspecting the vibracores are often darker than the resulting dredged and placed sand, as the dredging process washes the sediment and removes the dark interstitial fluid. For this reason, it is often useful to make multiple color determinations if it is suspected that the material appears darker due to dark interstitial or pore water. Washing a few samples to mimic the dredging process is often helpful to determine if this is the case.

The final borrow area design and the borrow area plans and specifications are prepared when all the concerns regarding the sediment quality within the borrow area, the cultural resource impact potential, the environmental consideration and the physical considerations have been addressed. The final borrow area design shape and cut depths may differ significantly from the design prepared at the end of the survey plan and initial borrow area design due to the implementation of no-dredge buffers that reduce negative impacts from dredging. In addition, a minimum two-foot buffer above non-compatible material should exist below the maximum

dredge depth. If a reduced buffer (less than two feet) is proposed, more stringent dredging control and accuracy requirements shall be necessary. A buffer less than two feet will only be considered if the offshore sand search investigation provides adequate survey accuracy during the collection of the geotechnical and geophysical data. Consideration will also be given to the environmental resources in both the borrow area and the placement area, the type of dredge to be used, and the nature of the non-compatible material beyond the buffer that may be encountered during dredging. Potential impact to adjacent environmental resources (such as hardbottom and seagrass) should dredging occur below the buffer into non-compatible material could preclude use of a reduced buffer. A pipeline cutter head dredge typically disturbs material below the maximum dredge depth compared to a hopper dredge. As such, the buffer above non-compatible material may be greater than two feet depending upon the depth to which the material below the excavation device will be disturbed.

The results of the previous tasks will be used to define the geometry (i.e., lateral boundaries and excavation depths) of the borrow sites. Based on the results of the previous tasks, the vertical and horizontal limits of the final borrow area(s) will be identified and mapped. The borrow area limits should be referenced to State Plane Coordinates.

The final design of a borrow area should be one that is economically feasible to dredge and considers conservation of sand resources. The design should allow all the available beach compatible sediment in the borrow area to be dredged in such a manner that no significant quantity of beach compatible material remains where it is not technically or economically feasible to dredge in a subsequent event. Considerations should also be made for the feasibility of dredging a borrow area that contains a number of subareas with variable dredge depths.

After a borrow area has been delineated, plan view maps and cross-sections of the area should be prepared. These maps must include the location of each vibracore, seismic survey lines, bathymetry, the proposed horizontal boundaries of each borrow area, and the maximum dredge depth.

Task 5- ROSS/OSSI Data

At the end of each phase of the investigation, ROSS/OSSI data shall be submitted and/or updated. This includes more than simply shapefiles of the borrow area and vibracore/seismic line locations. Updated information for inclusion in OSSI should be submitted to the Department at this stage of the sand search for both the proposed borrow area (borrow area designed in Task 4 above) and for the remaining potential areas identified and investigated during the sand search.

The updated ROSS/OSSI data should include the available volume of beach compatible sand and composites of the geotechnical information included in OSSI to reflect the change in material remaining in the borrow area(s). New/updated shapefiles will reflect the change in the aerial extent of each designation of borrow areas based on the sand search investigation. Targeted sedimentary features will change designation through sand search investigations as the quantity and quality of the data collected changes. These designation changes may occur as a

portion of the borrow area is excluded from further investigation at the time, excluded as unsuitable for future use, or further investigated to become potential, proposed, or permitted.

A brief definition of the borrow area designations is included below. More information can be found in OSSI documents.

Potential borrow areas are those areas that have some level of data within them beyond just empirical data. This data should include a minimum of 2-5 vibracores at no greater than 5,000-foot spacing and sited on sub-bottom seismic lines, and one or more sub-bottom seismic lines over the area. The spacing of vibracores can be increased using additional seismic data depending on the homogeneity of the sedimentary feature. The level of data should show that there is potential for useable sand, suggesting further data collection is necessary.

Proposed borrow areas require a higher quantity and quality of data than potential borrow areas. The data for proposed borrow areas should include a minimum of magnetometer, sub-bottom seismic, and sidescan sonar data collected on 90 to 300 meters spacing through the target feature. The data should also include vibracores sited on the sub-bottom seismic lines and collected at a maximum spacing of 1,000 to 3,000 feet.

Permitted borrow areas (those borrow areas being submitted for JCP permitting) should include the highest level of data coverage. This coverage includes magnetometer, sub-bottom seismic, and sidescan sonar at line spacing suitable for cultural and environmental resource determinations. In addition, vibracores shall be spaced at no greater than 1,000 feet.

Professional judgment of the coastal geologist/engineer should be used when determining the designation of the borrow areas, the available quantity of beach compatible sediment within each borrow area, and calculating the composites of the geotechnical data within each designation.

Task 6- Generation of a final report

The final report should include the following in paper copy:

- Description of the work performed.
- Description of the geology/ geomorphology of the study area.
- Bathymetric maps.
- Isopach maps of sediment thickness, and/or the elevation of the bottom of beach compatible material.
- Plan view map of vibracore locations and survey tracklines depicting both the investigation as a whole (all vibracore and seismic survey tracklines) and each targeted sedimentary feature/ borrow area.
- Cross-sections of the borrow area(s).
- Vibracore logs.
- Tabular summary of gradation analyses for the beach and borrow area sediments including mean (phi), mean (mm), median (mm), standard deviation/sorting (phi), visual shell content, carbonate percentage, silt percentage (material passing the #230

sieve), fine gravel content (percent retained on the #4 sieve but passing the 3.4" sieve), coarse gravel content (percent retained on ¾-inch sieve) (if necessary for the project), and moist Munsell color.

- Tabular summary of composite statistics.
- Sediment compatibility analysis, including the sediment criteria set for the project.
- A description of the methodology used to calculate the composite values and formulas to illustrate the calculations.
- Recommendations and conclusions for future work and/or use of borrow areas identified.
- Discussion of borrow area design with respect to dredging efficiency and conservation of sand resources.
- Preliminary design drawings of the final borrow area(s) (if design level report).

The final report should include at minimum the following in electronic copy on an attached CD/DVD:

- Electronic (pdf) copy of the portion of the report submitted on paper.
- Sub-bottom (seismic) survey profiles.
- Frequency (histogram) and cumulative frequency curves, sieve data sheets, color determinations, and carbonate analyses for the beach and borrow area sediments.
- Vibracore penetrometer records.
- Active, unlocked spreadsheets used to calculate composite sediment data. A description of the methodology used to calculate the composite values within the spreadsheet and formulas to illustrate the calculations should be included in the deliverable, especially if only inactive spreadsheets are provided.
- OSSI/Updated OSSI data for the entire study area.
- The document, especially the sediment data attached electronically, should be tabbed in the pdf document to allow for easy navigation through the document.

The final borrow area design and geotechnical report should be submitted to the project sponsor and the Department as a Scope of Work deliverable for review and comment to ensure that the data collected is adequate and acceptable for permitting.

Task 7- Deliverables

At a minimum, the consultant should provide the following work products:

- The geotechnical report outlined in Task 6.
- All geotechnical data for the potential borrow area, including but not limited to core logs, grain size data sheets, (cumulative) frequency curves, % carbonate, % shell, moist Munsell color, and core photographs in electronic formats suitable for inclusion in the ROSS database.
- All geotechnical data for the native/existing beach (including but not limited to grain size data sheets, (cumulative) frequency curves, % carbonate, % shell, moist Munsell color).
- An active spreadsheet of any composites created, along with the (cumulative) frequency curves and summary statistics of the composites for both the proposed

borrow area and the native/existing beach. A description of the methodology used to calculate the composite values within the spreadsheet and formulas to illustrate the calculations should be included in the deliverable, especially if only inactive spreadsheets are provided.

- Complete citations for reports of geotechnical data cited in the planning stage that contain data that will be used to characterize the beach and/or borrow area sediment. (The actual reports cited should be available upon request.)
- All of the above data should also be provided in the form of a summary table including the mean, median (d50), standard deviation (sorting), moist Munsell color, silt percent, fine gravel content, visual shell content and carbonate content.
- Shapefiles of the borrow area for inclusion in the ROSS database.
- At the end of each phase of the investigation, updated shapefiles and composite geotechnical/engineering data will be submitted to the Department for inclusion in the ROSS/OSSI database.
- Updated information for inclusion in OSSI as the borrow area evolves from potential to proposed to permitted. This includes an update of the composites of the geotechnical information included in OSSI and an estimated volume of potentially beach compatible sediment.
- All geotechnical, geophysical, and remote sensing information in electronic files suitable for input to the Department‟s Reconnaissance Offshore Sand Search (ROSS) database. The data can be submitted in the form of Access or gINT files. Include any shapefiles or PDF files including but not limited to seismic images with time stamp annotations, seismic tracklines, seismic shotpoints, core locations and borrow area outlines. If html files are provided of the seismic data, a shapefile of the tracklines should still be included.
- Preliminary design plan drawings of the selected alternative design.
- Certification statement of bathymetric survey results for vertical accuracy purposes.
- Borrow area remote sensing survey data and maps created from the data, including bathymetric, seismic, sidescan and magnetometer data as appropriate for the project.
- Borrow site wave effects analysis report, if applicable.
- Certification by a Professional Geologist registered in the State of Florida for the geotechnical data submitted.
- Cultural resources investigation report.
- Progress reports submitted to the Department throughout the investigation.
- An executive summary in the final report documenting the process, results and recommendations for additional work.

It should be noted that data requirements and formats may change with advances in technology with respect to the equipment used to collect, process, analyze, and store data. They may also change with time as new pieces of information are determined by the Department to be necessary to the review of borrow areas and determinations of compatibility.

IV. DATA ANALYSIS AND REPORTING

1. Analysis of Bathymetric Data

The purpose of the bathymetric data analysis is to determine the bathymetry of the study area for use later in the process (such as determining volumes and cross-checking elevations collected during the vibracore and seismic data collection), to verify the top of hole elevation for the vibracores (which also serves as a cross-check for the elevation taken at the time of vibracore collection), and to note any areas that may have a bathymetric expression indicative of a possible sand source.

2. Vibracore Sedimentological Analysis

The vibracore analysis includes logging, sampling and photographing the vibracores obtained from the study area. The purpose of this is to adequately describe the material collected in the vibracores, and therefore, the target sedimentary feature. Once the vibracores have been analyzed, they should be correlated to the processed, interpreted seismic data.

a) Preparation and photography

Color photographs of the split cores, including an 18% gray card for comparison and control, are taken. The photographs should be labeled with the project name, core name, and core section. The photographs should include a legible scale along the length of the vibracore section such that the specific depth of a layer/feature can be identified and compared to the vibracores log. There should also be a notation of the direction of the top of the core section, either by using an arrow or direct notation of depth within the vibracore. The photographs should be free of shadows with a consistent light source that mimics noon-day sun. The photographs should be taken from above the core rather than from one end/side looking across the vibracore to avoid distortion.

b) Logging

The vibracores are transferred to a geotechnical laboratory where they are described by a qualified geologist based on visual observation utilizing the ROSS-compatible version of ENG Form 1836 in accordance with Unified Soil Classification System (USCS) terminology and United State Army Corps of Engineers (USACE) format – including lithologic descriptions and mineralogic details. On each vibracore log, preferably in the remarks column, the sample depth within the vibracore, silt content, mean grain size (mm), carbonate percentage (if determined), visual shell estimate, USCS classification, and moist Munsell color should be noted for each sample analyzed from that vibracore.

Vibracore logs should not be decompacted to account for compaction or loss during vibracoring. Decompaction is the process by which some investigators will describe the recovered portion of the vibracore as if it spanned the entire penetrated length of the vibracore. In some cases, individual layers are expanded based on the sediment character and professional judgment of the geologist/engineer logging the vibracore, or the professional geologist certifying the geotechnical data, to make it appear that 100% of the penetrated length was recovered. In other cases, a mathematical approach is taken whereby additional length/thickness is added to

each layer in a core assuming the compaction of sediments during vibracoring was uniform to make the recovery appear to be 100% of the penetrated length. Neither method above should be employed. The core should be described based on the actual length recovered.

The location of voids and areas of no recovery should be noted on the vibracore logs. Reasons for lack of recovery should be noted on the vibracore log and in the geotechnical report as necessary. Reasons may include loss during vibracore retrieval from bottom of core tube or staking/plugging the core tube with clay, hard-packed sands, or rock.

c) Sub-sample selection

Sediment samples are collected from major sediment horizons to capture the changes in sediment character within each core for gradation and composition analysis. Samples should be collected from the entire length of the core such that the sampling characterizes not only the beach compatible sediment, but also the non-compatible material lying below the potential design depth of the borrow area. This provides reasonable assurance that the material below the dredge depth is known to the Department and any risks associated with that material, such as increased silt content, are identified and characterized. A virtual sample is a sample collected and analyzed from a layer within a vibracore which is then used to represent another layer within the same or neighboring vibracores. Virtual samples may be used once a clear pattern of recurring layers within or between vibracores is identified. Based upon the judgment of a professional geologist, the character of the sediment within the layers represented by the virtual samples is determined to be nearly identical. Virtual samples may be used to represent both compatible and non-compatible layers. Virtual samples may not be used to represent more than 25% of the vibracore samples. The Department may require that additional samples be collected and analyzed to validate the use of virtual samples.

3. Laboratory Testing

Once the vibracores have been photographed and sampled, the samples are analyzed for color, visual shell content, grain size distribution, and a subset of samples for carbonate content.

a) Color

By convention, the color of sediment collected in conjunction with an offshore sand search is quantified following the methods defined in the Munsell Soil Book of Colors. This method was initially developed as an offshoot of soil science. Munsell color notations have three components: hue, value and chroma. The “hue” component indicates the color of the sample in relation to red, yellow, green, blue and purple. For coastal sediments from many areas of Florida, the hue of the sample is often denoted relative to red and yellow. However, sediments from some coastal areas are frequently white, tan, or very light gray. Munsell has prepared a supplemental set of nearly white hues, wherein choices between white and light gray have been expanded to more than 20 options of white hues.

Munsell color classification of the samples should be conducted on moist samples prior to drying to obtain the in-situ color of the sediments. Directions for the use of the charts are provided with each handbook.

Sample color determinations should be performed on a moist sample, under non-polarized light conditions that mimic noon-day sun, and preferably by the same technician for the entire project (because human color perception is somewhat variable between observers). If multiple technicians are working on the same project, they should meet to examine the color of various strata encountered during the logging process. If an inconsistency exists in the color determinations, a consensus will be reached as to the appropriate Munsell designation for these layers. The majority of the beach sediments in Florida do not neatly match a given Munsell color. The sediment can fall between colors, but whole numbers for value should be chosen rather than approximating between two values with a decimal fraction. In addition, the presence of shell and heavy minerals can influence the color of the sample. While the color of the quartz component of the sediment may not vary very much, the mottling caused by varying percentages of shell and heavy minerals can greatly affect the overall color of a sample.

b) Grain size and texture

Sieve analyses of vibracore samples should be performed in accordance with the American Society for Testing and Materials (ASTM) Standard Methods Designation D 421-85 and D 422-63 for particle size analysis of soils. These methods cover the quantitative determination of the distribution of sand particles. For sediment finer than the No. 230 sieve (4.0 phi) the ASTM Standard Test Method, Designation D 1140-54 should be used. Following the sieve analysis, the samples should be classified using the USCS according to ASTM D 2487 and D 2488.

The following U.S. Standard sieves should be used: 3/4", 5/8", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, and 230. The ¾", the #4, and the #230 are currently required by Rule 62B-41.007(2)(j), F.A.C. All sediment statistics should be computed using the moment method. Results should be presented in gradation analysis tables and plotted in cumulative grains size distribution curves, and frequency distribution curve (histograms). Statistical parameters should include mean and median grain size (in phi and mm), sorting coefficient (phi), silt content (% passing the #230 sieve), fine gravel content (cumulative % material retained on #4 sieve), percent shell (visual estimate), percent carbonates by weight (laboratory tests) and moist Munsell color.

c) Carbonate and Visual Shell Analysis

Sediment composition is determined for 25-33% of the core samples using the loss on ignition (LOI) or acid digestion method to quantify the sample weight percent organic matter and carbonate content. If acid digestion is being used, the Department recommends using the basic methodology described in Twenhofel, W.H. and Tyler, S.A., 1941, Methods of Study of Sediments. New York: McGraw-Hill, 183 p. The ASTM standard for carbonate testing (D 4373-02) should *not* be followed, as it requires the pulverizing and splitting of samples to obtain a one-gram sample. Pulverizing and splitting of beach sands introduces unnecessary error into the testing. The samples selected for carbonate analysis should be those within the cores likely to be included in the borrow area.

Dependent upon the location of the borrow area, a subset of the samples (roughly half) that undergo carbonate testing should be re-sieved in order to identify the distribution of the

carbonate material. This re-sieving is to be performed on the same samples that underwent carbonate testing and follow the same protocol outlined herein for sieve analysis.

Samples from borrow areas along the southwest, southeast, and central east coasts shall undergo a post-carbonate testing sieve analysis. Roughly half of the samples that are tested for carbonate should undergo post-carbonate sieving. Therefore, the size of the sample carbonate tested should be large enough that an adequate sample size remains for sieving. Since the use of LOI does not allow for a large enough sample to sieve after carbonate testing, acid digestion should be used.

While carbonate testing is still required, samples from borrow areas along the Panhandle and northeast coasts do not need to undergo post-carbonate testing sieve analyses. The expectation is that carbonate from the Panhandle and northeast coasts will not be fine sand- or silt-sized.

A visual estimate of the relative abundance of shell material in each of the samples selected for carbonate analysis should also be provided. Relative abundance of shell material should be determined by visual estimate of sample sieve splits using a binocular scope (if necessary) and reported as a volume percent of the total sample.

4. Seismic Data Processing

The first data processing step is to calculate the approximate depth of the reflector below the sound source by converting the two-way travel time (the time in milliseconds that it takes for the "chirp pulse" to leave the source, hit the reflector and return to the source) to feet by utilizing an approximate value for the speed of sound through both the water and underlying geology. This estimate of the composite sound velocity is based on several assumptions including the speed of sound through water (which is typically 1.5 m/ms) as well as on the speed of sound through the sediment (which can vary from 1.6 m/ms for unconsolidated sediment to >1.7 m/ms for limestone).

The imagery should then be processed to reduce noise effects (commonly due to the vessel, sea state, or other natural and anthropogenic phenomenon) and enhance stratigraphy. This can be done using the processing features available in SonarWiz.MAP +SBP®; AGC, swell filter, and a user-defined gain control (UGC). The SonarWiz.MAP +SBP® AGC is similar to the Discover-SB® AGC feature, where the data are normalized in order to remove the extreme high and low returns, while enhancing the contrast of the middle returns. In order to appropriately apply the swell filter and UGC functions, the sub-bottom data should be bottom-tracked to produce an accurate baseline representation of the seafloor. Once this is done through a process of automatic bottom tracking (based on the high-amplitude signal associated with the seafloor) and manual digitization, the swell filter and UGC should be applied to the data. The swell filter is based on a ping averaging function that removes vertical changes in the data due to towfish movement caused by the sea state. The swell filter should be increased or decreased depending on the period and frequency of the sea surface wave conditions. Special care should be taken to not remove, or smooth over, geologic features that are masked by the sea state noise. The final

step is to apply the UGC. The SonarWiz.MAP +SBP® UGC feature allows the user to define amplitude gains based on either the depth below the source, or the depth below the seafloor. This processing allows for the removal of the noise within the water column, increase the contrast within the stratigraphy, and increase the amplitude of the stratigraphy with depth.

After data processing, sub-surface data interpretation should be performed. This can be done using SonarWiz.MAP +SBP® software or similar post-processing methods. Using the SonarWiz.MAP +SBP® platform, processed seismic profile lines can be opened to digitally display the recorded sub-surface stratigraphy. Using the software‟s Sonar File Manager, color coded vibracore descriptions can be added directly to the seismic profiles. Using the vibracore descriptions as a guide, the seismic stratigraphy can be interpreted and the depth of the base of the good quality material (top of marginal to poor quality material) determined. The stratigraphic reflector that best correlates with this layer can then be digitized. Not all of the seismic lines can be annotated in this way. If a core was not collected near a particular seismic line, then it cannot be annotated because there is no control for digitization.

Using the seafloor and the reflector representing non beach-compatible material, the thickness of the sediment wedge can be calculated and exported in order to develop an isopach (sediment thickness) map of each feature. The maps that are created should be verified by importing and gridding the thickness data in a software package (such as Golden Software, Inc‟s Surfer 8®, or AutoCAD Civil 3D). After gridding the data, contour maps showing sediment thickness can be produced. The contour maps can then be checked for discrepancies in the data and adjustments made. Once the data is verified, final thicknesses can be exported to be used in the borrow area design process.

Upon the completion of interpretation and digitization, all of the seismic data should then be exported as a "Web" based project of HTML/JPEG files viewable in any standard web browser software package. Shapefiles of the seismic tracklines should also be provided in the deliverable for inclusion in ROSS/OSSI.

If the seismic data cannot be presented in HTML/JPEG files viewable with a web browser, jpeg images of the lines should be provided for all of the raw images and the subset of those that are annotated. In addition, all of the trackline shapefiles, time stamp annotations, and seismic shotpoints should be produced and included in the deliverable for inclusion in ROSS/OSSI.

V. PERMIT APPLICATION REQUIREMENTS

After the sand search investigation and borrow area design is complete, the work will support a JCP application submitted to the Department. Although the consultant may have previously submitted the deliverables as specified in Task 7 above, the JCP application must include a sub-set of project-specific information for examination by other resource agencies and the general public reviewing the application. The permit application must include all relevant project details including geotechnical and environmental information.

The minimum geotechnical information required in a JCP application includes:

- Core borings and sediment grain size analyses from representative points throughout the area to be excavated. Core spacing should be no more than 1,000 feet on center. Core logs should extend at least 2 feet below the proposed bottom elevation. The depth of each visible horizon in the log should be reported relative to NAVD and the material in each stratum classified according to USCS or Wentworth classification.
- Particle size analyses of the sediment and measures of the percentage of organics by dry weight. Gradation curves should be produced from sieve analyses of each stratum in the core. Grain size must be determined down to the standard unit 230 sieve size.
- A table with the following column headers: 1) sieve number, 2) diameter in mm, 3) diameter in phi units, 4) weight retained on sieve, 5) weight percent retained on sieve, 6) cumulative weight retained on sieve, 7) cumulative weight percent retained on sieve. All weights and percentages should be recorded to the nearest 0.01 gm.
- A table with columns for mean, median (d50), standard deviation (sorting), moist Munsell color, silt percent, fine gravel content, and carbonate content of each sample. A table with the same columns must be included for any composites created, such as individual vibracores, borrow areas, and the native/existing beach.
- Frequency and cumulative frequency plots of each sample.
- The active spreadsheet used to calculate composite statistics, as well as a cumulative frequency curve of the composite(s). This should include a description of the methodology used to calculate the composite values within the spreadsheet and formulas to illustrate the calculations.
- Chemical analyses of the sediment will be required if there is reason to believe that sediment is contaminated. (This is not included in the deliverable outlined in Task 7.)
- An analysis of the compatibility of the fill material with respect to the native sediment at the disposal site. This should include all relevant computations, the overfill ratios and the composite graphs of the grain size distribution of the fill material and the native sediment at the disposal site.
- Dredge plan to ensure that the final borrow area design is economically feasible to dredge and achieves the objective of conservation of sand resources.
- A sediment QA/QC plan that will ensure that the sediment to be used for beach restoration or nourishment will meet the standard in paragraph Chapter 62B-41.007(2)(j), F.A.C. (This is not included in the deliverable outlined in Task 7.)
- All geotechnical information in electronic files suitable for input to the ROSS database. The data can be submitted in the form of Access or gINT files. Include any shapefiles or PDF files including but not limited to seismic images with time stamp annotations, seismic tracklines, seismic shotpoints, core locations and borrow area outlines.

Recieved @ 12/18/19
Meeting by
RJ Turcotte
NLC.
ON BEHALF OF YVONNE
Vaillancourt

Yvonne Vaillancourt
12/18/2019

I can't be at the con com meeting today but would like to give input:

I wanted to comment on the submitted sampling protocol for the sand. I think any part of the cores they pull up that have color or odor need to be tested.
I don't know if 8 samples are enough- how do they expect to distinguish the previous sand from the most recent? I think the point should be whether or not the most recent deliveries fit similar soil provision and are compatible or not at that location.
I would think that more samples representing the recent load compared to acceptable limits is a better thing to ask for to better characterize what was put on the template more recently.

1. **Biological and chemical testing needs to be done on discrete samples and not using composite samples , unlike the grain size sieve testing which is better done with composite.**

They must give you a listing of discrete sample test results for the samples they draw. It otherwise dilutes the findings. He refers to 314 CMR 9.00 but that is for dredged material. They are not using dredged material.
Is not 310 CMR 40.0032(3) Similar Soils Provision Guidance more appropriate? (Attached)
It lists conditions that must be met before managed soil can be moved to and re-reused.
(1. must not be hazardous 2. must be less than reportable concentrations 3. must not create a notifiable condition 4. must not be significantly more contaminated than the soil at the receiving location.)

2. Grain size testing uses composite samples but with contamination concerns you want discrete separated samples to be tested, otherwise it is diluting potential contaminants and that is not suggested if you are identifying contaminants based on observations leading to the testing.
Are they doing any sieve analysis again? If so they should split the samples and use half for composite sieve analysis and the other half not mix so they can test discretely for chemical and biological concerns.

3. They should be asked to provide photo documentation of the of samples they pull out and not only note but test any portion with identifying observations of visual or olfactory note. Those spots should be sampled and NOT mixed in a composite sample.

4. They should take a subsample of the samples and burn it to determine the organic proportion.

SBPF should provide:

1. Physical description with sieve results- is this wanted again or just chemical and biological? I would think the fines would have rinsed away or settled unless tested deeper down.
2. Chemical characterization of the soil with results listed for each test for each discrete sample
    1. "clean sand", "questionable" and "deposited leached samples on the beach" are sampled 8 times, each of those three should have 8 test results for each chemical test and the total coliform test to best characterize any potential pockets of contamination found. <u>You do not want to see a composite or average you want to see a total of 24 test results, 8 for each of the three areas.</u>
    2. Why not test for copper and zinc?
3. Biological characterization of each soil sample - total coliform and nitrates is good, should include a subsample for organic proportion of the sample for each sample (24 total coliform tests)
4. Photo documentation of each core with descriptive visual and olfactory notes about any particular spots

There is a link at the bottom of the attached file for fill guidance coming out of New Jersey:
http://www.state.nj.us/dep/srp/guidance/srra/fill_protocol.pdf

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Similar Soils Provision Guidance

Guidance for Identifying When Soil Concentrations at a Receiving Location Are "Not Significantly Lower Than" Managed Soil Concentrations Pursuant to 310 CMR 40.0032(3)

September 4, 2014[1]
(Originally published October 2, 2013 and revised April 25, 2014[2])

WSC#-13-500

The information contained in this document is intended solely as guidance. This guidance does not create any substantive or procedural rights, and is not enforceable by any party in any administrative proceeding with the Commonwealth. Parties using this guidance should be aware that there may be other acceptable alternatives for achieving and documenting compliance with the applicable regulatory requirements and performance standards of the Massachusetts Contingency Plan.

I. Purpose and Scope

The Massachusetts Contingency Plan ("MCP", 310 CMR 40.0000) establishes conditions and requirements for the management of soil excavated at a disposal site. This guidance addresses the specific requirements of 310 CMR 40.0032(3) and the criteria by which a Licensed Site Professional ("LSP") may determine that soil may be moved without prior notice to or approval from the Department. Soil managed pursuant to 310 CMR 40.0032(3) may be transported using a Bill of Lading ("BOL"), but a BOL is <u>not</u> required. Attachment 1 provides a flowchart depiction of the Similar Soil regulations and guidance.

This guidance is not applicable to the excavation and movement of soil from locations other than M.G.L. Chapter 21E disposal sites, nor to the management of soils considered Remediation Waste under the MCP.

[1] Updated to revise an inaccurate RCS-1 concentration for lead in Table 2 and an inaccurate RCS-2 concentration for selenium in Table 3.
[2] Updated to reflect the 2014 revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep
Printed on Recycled Paper

II. Relationship to Other Local, State or Federal Requirements

This guidance is intended to clarify and more fully describe regulatory requirements contained within the MCP. Nothing in this guidance eliminates, supersedes or otherwise modifies any local, state or federal requirements that apply to the management of soil, including any local, state or federal permits or approvals necessary before placing the soil at the receiving location, including, *but not limited to,* those related to placement of fill, noise, traffic, dust control, wetlands, groundwater or drinking water source protection.

III. Requirements of 310 CMR 40.0032(3)

The requirements specified in 310 CMR 40.0032(3) are:

> (3) Soils containing oil or waste oil at concentrations less than an otherwise applicable Reportable Concentration and that are not otherwise a hazardous waste, and soils that contain one or more hazardous materials at concentrations less than an otherwise applicable Reportable Concentration and that are not a hazardous waste, may be transported from a disposal site without notice to or approval from the Department under the provisions of this Contingency Plan, provided that such soils:
>
> (a) are not disposed or reused at locations where the concentrations of oil or hazardous materials in the soil would be in excess of a release notification threshold applicable at the receiving site, as delineated in 310 CMR 40.0300 and 40.1600; and
>
> (b) are not disposed or reused at locations where existing concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and/or hazardous materials present in the soil being disposed or reused.

There are therefore four requirements that must be met before the managed soil can be moved to and re-used (or disposed) at a new location without notice to or approval from MassDEP. Each requirement (A. through D.) is addressed below.

A. The Managed Soil Must Not Be a Hazardous Waste

310 CMR 40.0032(3) applies to soils containing oil or waste oil that are not otherwise a hazardous waste, and to soils containing hazardous materials that are not a hazardous waste. The MCP definition of hazardous waste (310 CMR 40.0006) refers to the definitions promulgated in the Massachusetts Hazardous Waste Regulations, 310 CMR 30.000.

Under the federal Resource Conservation and Recovery Act of 1976 ("RCRA", 42 U.S.C. §§6901 *et. seq.*), the Massachusetts Hazardous Waste Management Act (M.G.L. c.21C), and the Massachusetts Hazardous Waste Regulations (310 CMR 30.000), soil is considered to contain a hazardous waste (hazardous waste soil) if, when generated, it meets either or both of the following two conditions:

- the soil exhibits one or more of the characteristics of a hazardous waste pursuant to 310 CMR 30.120 [such as exhibiting a characteristic of toxicity under 310 CMR 30.125 and 30.155 (Toxicity Characteristic Leaching Procedure, or TCLP)]; or
- the soil contains hazardous constituents from a listed hazardous waste identified in 310 CMR 30.130 or Title 40, Chapter I, Part 261 (Identification and Listing of Hazardous Waste) of the Code of Federal Regulations.

MassDEP has published a Technical Update entitled: *Considerations for Managing Contaminated Soil: RCRA Land Disposal Restrictions and Contained-In Determinations* (August 2010, http://www.mass.gov/eea/docs/dep/cleanup/laws/contain.pdf) that focuses on the determination of whether contaminated soil must be managed as a hazardous waste subject to RCRA requirements, and the presumptive approval process an LSP/PRP can use to document such a determination.

B. The Managed Soil Must Be Less Than Reportable Concentrations (RCs).

This requirement is intended to ensure that the soil being excavated and relocated from a disposal site is not "Contaminated Soil" and therefore neither "Contaminated Media" nor "Remediation Waste" as those terms are defined in 310 CMR 40.0006[3].

310 CMR 40.0361 sets forth two reporting categories for soil (RCS-1 and RCS-2). Reporting Category RCS-1 applies to locations with the highest potential for exposure, such as residences, playgrounds and schools, and to locations within the boundaries of a groundwater resource area. Reporting Category RCS-2 applies to all other locations.

Note that the "applicable Reportable Concentrations" referred to in 310 CMR 40.0032(3) may be the RCS-1 or RCS-2 criteria, depending upon which category would apply to the soils being excavated *at the original disposal site location*, not the RCs applicable to the soils at the receiving location (see Section III.C. below).

> **EXAMPLE:** If soil is being excavated from a disposal site at an RCS-2 location and the soil contaminant concentrations are found to be less than the RCS-2 criteria, then the soil is not "Contaminated Soil" since the soil is less than the release notification threshold established for RCS-2 soil by 310 CMR 40.0300 and 40.1600. The RCS-2 soil in this example is not "Contaminated Soil" even if one or more constituent concentration is greater than an RCS-1 value.

Also, the language at 310 CMR 40.0032(3) specifies the *applicable* RCs. If a notification exemption (listed at 310 CMR 40.0317) applies to the OHM in soil at its original location, then the corresponding Reportable Concentration is not *applicable*. Thus 310 CMR 40.0032(3) should be read to apply to soils containing concentrations of oil or hazardous material ("OHM") less than the applicable RCs *or* covered by a notification exemption. This interpretation of the requirement is consistent with the definition of Contaminated Soil, which uses the term "notification threshold" rather than "Reportable Concentration."

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[3] Contaminated Soil - means soil containing oil and/or hazardous material at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600.

Contaminated Media - means Contaminated Groundwater, Contaminated Sediment, Contaminated Soil, and/or Contaminated Surface Water.

Remediation Waste - means any Uncontainerized Waste, Contaminated Media, and/or Contaminated Debris that is managed pursuant to 310 CMR 40.0030. The term "Remediation Waste" does not include Containerized Waste.

C. The Managed Soil Must Not Create a Notifiable Condition at the Receiving Location.

This requirement is intended to prevent the creation of new reportable releases that must be subsequently assessed and remediated.

If the contaminant concentrations in the soil being relocated are less than the RCS-1 criteria, then placement of the soil in any RCS-1 location would not create a new notifiable condition. There are, however, conditions that could result in a notifiable condition.

First, if the soil is excavated from an RCS-2 location (as described in the example in Section III.B. above) with contaminant concentrations *between* the RCS-1 and RCS-2 criteria, then the placement of that soil at an RCS-1 receiving location would create a notifiable condition since one or more concentrations of OHM would then exceed the RCS-1 criteria in the RCS-1 receiving location.

Second, a notification exemption that applies to the original location of the soil may not apply to the receiving location. (For example, the lead paint exemption at 310 CMR 40.0317(8) is specific to "the point of application.") In cases where a notification exemption applies only to the original location, the managed soil must be evaluated solely based on whether its OHM concentrations exceed the applicable RCs at the receiving location.

D. The Managed Soil Must Not Be Significantly More Contaminated Than the Soil at the Receiving Location.

This requirement has been referred to as the "anti-degradation provision" although it is more accurately described as the "Similar Soils Provision." 310 CMR 40.00032(3)(b) requires that the concentrations of OHM at the receiving location not be "significantly lower" than the relocated soil OHM concentrations. One could also say that the provision requires that "there is no significant difference between the relocated soil and the soil at the receiving location," or that "the soils being brought to the receiving location are similar to what is already there." This requirement embodies several considerations.

First, as a general principle, M.G.L. c.21E is intended to clean up contaminated properties and leave them better than they started -- even to clean sites to background conditions, if feasible. It would be inconsistent with this principle to then raise the ambient levels of contamination in the environment as a consequence of a response action conducted under the MCP.

Second, despite the three other requirements (A. through C. above) of 310 CMR 40.0032(3), decisions about the movement of the managed soil will be based upon sampling of soil that is likely to have significant heterogeneity. The Similar Soils Provision is an additional measure to minimize the adverse effects of soil characterization that may not be representative of such heterogeneity.

Third, none of the criteria of 310 CMR 40.0032(3) address the question of whether the soil poses a *risk* in its original or receiving location, although the hazardous waste- and notification-related requirements seem to *imply* risk-based decision making. Put simply, soil that is not a hazardous waste and does not require notification may still pose incremental risk at the receiving location. The Similar Soils Provision is intended to ensure that the managed soil does not increase risk of harm to health, safety, public welfare or the environment at the receiving location, since it will be similar to what is already there.

The "not... significantly lower" language of 310 CMR 40.0032(3)(b) can be interpreted to mean either a quantitative "not statistically different" analysis, or a semi-quantitative, albeit somewhat subjective, approach. MassDEP does not believe that a statistics-driven quantitative approach is necessary when comparing managed soil to known or assumed background conditions, given (a) the relatively low concentrations at issue and (b) the cost of such an analysis, driven by the quantity of sampling needed to show a statistical difference.

The regulations imply that the LSP must have knowledge about the concentrations of OHM in the soil at the receiving location in order to apply the Similar Soils Provision. The regulations also imply that the new soil may contain concentrations of OHM that are *somewhat* higher than those levels at the receiving location – just not "significantly" higher.

MassDEP recognizes that there may be several approaches to address this "knowledge" issue when implementing the Similar Soils Provision of the MCP.

- **Assume the soils at the receiving location are natural background**. Sampling of the soil at the receiving location is not necessary if it is assumed that the concentrations of OHM there are consistent with natural background conditions. MassDEP acknowledges that there is a range of background levels, and that the concentrations at any given location may be lower than the statewide levels published by the Department[4], but the costs associated with determining site-specific background are not justified by likely differences. Further, the published "natural background" levels are similarly used in several areas of the MCP as an acceptable endpoint, including site delineation and the development of the MCP cleanup standards.

  Of course, routine due diligence about the receiving location may still reveal factors that would make the location inappropriate to receive the proposed fill material. Nothing in this guidance relieves any party of the obligation to conduct such due diligence and appropriately consider and act on information thereby obtained.

[4] *See* Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (May, 2002) http://www.mass.gov/eea/docs/dep/cleanup/laws/backtu.pdf

- **Sample the soils at the receiving location**.
  The sampling plan should include a sufficient number of samples taken at locations selected to provide an understanding of the concentrations of OHM present and the distribution of OHM throughout the receiving location. In order to provide data appropriate for the Similar Soils comparison, the soil at the receiving location should be analyzed for constituents that are likely to be present there (e.g., naturally occurring metals) as well as any OHM known or likely to be present in the soil brought from the disposal site. If a receiving location has been adequately and comprehensively characterized, that data may then be used for comparison to the OHM concentrations in any subsequent soil deliveries - additional sampling is not required.

- **Provide Technical Justification for an Alternative Approach**
  There may be situations for which a different combination of analytical and non-analytical information available for both the source and receiving locations is sufficient to conclude that the nature and concentrations of OHM in the soils are not significantly different. Guidance on recognizing such conditions and the level of documentation that would be necessary to support such a technical justification is beyond the scope of this guidance.

Once the concentrations of OHM in the soils are known (or assumed consistent with this guidance), the LSP must compare the concentrations of the source and receiving locations and determine whether the concentrations at the receiving location are "significantly lower" than those in the soil proposed to be relocated from the disposal site. This comparison may be conducted in several ways, including analyses with appropriate statistical power and confidence. MassDEP has also developed a *rule-of-thumb* comparison to simplify this determination, as described in Section IV.

IV. Determining whether soils at the receiving location are "significantly lower" using a simplified approach

The simplified comparison shall be made using the *maximum* values of the OHM concentrations in both the soil at the receiving location and the soil proposed to be disposed of or reused.

Use of the maximum values is appropriate for several reasons. First, the provisions of 310 CMR 40.0032(3) include comparisons to Reportable Concentrations, and notification is triggered by any single value (i.e., maximum value) exceeding the RC. Second, soil is by its nature heterogeneous, and the use of maximum values is a means of minimizing sampling costs while addressing the expected variability of results. Third, if natural background levels are assumed at the receiving location, the MassDEP published background concentrations are upper percentile levels that are only appropriately compared to similar (e.g., maximum) values of the soil data set.

Note also that when using the maximum reported concentrations for comparison purposes, the typical or average concentration will be lower. This is important to recognize if/when the question of the risk posed by the soil is raised. For example, the RCS-1 and the Method 1 S-1 standard for arsenic are both 20 mg/kg. The Reportable Concentration is applied as a not-to-be-exceeded value, triggering the need to report the release and investigate further. However the S-1 standard is applied as an average value, considering exposure over time. At a location where the highest arsenic value found is less than 20 mg/kg, the average concentration would be well below the Method 1 S-1 standard.

The maximum concentration in the soil at the receiving location may be less than that in the proposed disposed/reused soil by some amount and not be considered "significantly lower." The question is how much lower is "significantly lower"? In this guidance, MassDEP establishes a multiplying factor to be applied to the concentration in the soil at the receiving location. The multiplying factor varies depending upon the concentration in the soil at the receiving location, as shown in Table 1.

Table 1. Receiving Soil Concentration Multiplying Factors

If the concentration in soil at the receiving location for a given OHM is:	Then use a multiplying factor of:
< 10 mg/kg	10
10 mg/kg ≤ *x* <100 mg/kg	7.5
100 mg/kg ≤ *x* <1,000 mg/kg	5
≥ 1,000 mg/kg	2.5

EXAMPLE: The soil at a receiving location that is considered RCS-1 is appropriately sampled and the maximum concentration of silver is found to be 6 mg/kg. Using Table 1, the concentration of silver at the receiving location would not be considered "significantly lower" than *10 x 6 mg/kg = 60 mg/kg*. Since 60 mg/kg is less than the silver RCS-1 value of 100 mg/kg, soil containing a maximum concentration that is less than 60 mg/kg silver could be reused at this location.

EXAMPLE: The soil at a receiving location that is considered RCS-1 is assumed to be consistent with natural background. The MassDEP published natural background level for arsenic is 20 mg/kg. Using Table 1, the concentration of arsenic at the receiving location would not be considered "significantly lower" than *7.5 x 20 mg/kg = 150 mg/kg*. However, since 150 mg/kg is greater than the arsenic RCS-1 value of 20 mg/kg, only soil containing a maximum concentration that is less than 20 mg/kg arsenic could be reused at this location. [The managed soil must not create a notifiable condition at the receiving location, see Section III.C. above.]

EXAMPLE: The soil at a receiving location that is considered RCS-2 is assumed to be consistent with natural background. The MassDEP published natural background level for benzo[a]anthracene is 2 mg/kg. Using Table 1, the concentration of benzo[a]anthracene at the receiving location would not be considered "significantly lower" than *10 x 2 mg/kg = 20 mg/kg*. Since 20 mg/kg is less than the benzo[a]anthracene RCS-2 value of 40 mg/kg, soil containing a maximum concentration that is less than 20 mg/kg benzo[a]anthracene could be reused at this location. [Note that due to the lower reportable concentration, RCS-1 receiving locations could only accept soil containing less than 7 mg/kg benzo[a]anthracene.]

The multiplying factors in Table 1 and the MassDEP published natural background levels can be used to establish concentrations of OHM in soil that would be acceptable for reuse at an RCS-1 receiving location, consistent with the requirements of 310 CMR 40.0032(3). Table 2 lists such concentrations. Note that soil that meets the criteria in Table 2 could be re-used at *any* location (RCS-1 or RCS-2). Similarly, Table 3 lists concentrations of OHM in soil that would be acceptable for reuse at an RCS-2 receiving location (but *not* RCS-1 locations).

If a chemical is not listed on these tables, then MassDEP has not established a natural background concentration[5]. This guidance is limited to the use of only MassDEP-published statewide background concentrations. Therefore an alternative approach, such as sampling the receiving location and comparing maximum reported concentrations, would be appropriate to meet the requirements of 310 CMR 40.0032(3).

[5] For example, MassDEP has not established natural background levels for PCBs, volatile organic compounds (VOCs) or petroleum-related constituents.

Table 2.
Limits to the Concentration of OHM In Soil for Re-Use
Assuming Natural Background Conditions at an RCS-1 Receiving Location

OIL OR HAZARDOUS MATERIAL	Concentration In "Natural" Soil mg/kg	Rule-of-Thumb Multiplier	Multiplied Value mg/kg	RCS-1 mg/kg	Limiting[1] Soil Concentration mg/kg
ACENAPHTHENE	0.5	10	5	4	< 4
ACENAPHTHYLENE	0.5	10	5	1	< 1
ALUMINUM	10,000	2.5	25000		< 25000
ANTHRACENE	1	10	10	1000	< 10
ANTIMONY	1	10	10	20	< 10
ARSENIC	20	7.5	150	20	< 20
BARIUM	50	7.5	375	1000	< 375
BENZO(a)ANTHRACENE	2	10	20	7	< 7
BENZO(a)PYRENE	2	10	20	2	< 2
BENZO(b)FLUORANTHENE	2	10	20	7	< 7
BENZO(g,h,i)PERYLENE	1	10	10	1000	< 10
BENZO(k)FLUORANTHENE	1	10	10	70	< 10
BERYLLIUM	0.4	10	4	90	< 4
CADMIUM	2	10	20	70	< 20
CHROMIUM (TOTAL)	30	7.5	225	100	< 100
CHROMIUM(III)	30	7.5	225	1000	< 225
CHROMIUM(VI)	30	7.5	225	100	< 100
CHRYSENE	2	10	20	70	< 20
COBALT	4	10	40		< 40
COPPER	40	7.5	300		< 300
DIBENZO(a,h)ANTHRACENE	0.5	10	5	0.7	< 0.7
FLUORANTHENE	4	10	40	1000	< 40
FLUORENE	1	10	10	1000	< 10
INDENO(1,2,3-cd)PYRENE	1	10	10	7	< 7
IRON	20,000	2.5	50000		< 50000
LEAD	100	5	500	200	< 200
MAGNESIUM	5,000	2.5	12500		< 12500
MANGANESE	300	5	1500		< 1500
MERCURY	0.3	10	3	20	< 3
METHYLNAPHTHALENE, 2-	0.5	10	5	0.7	< 0.7
NAPHTHALENE	0.5	10	5	4	< 4
NICKEL	20	7.5	150	600	< 150
PHENANTHRENE	3	10	30	10	< 10
PYRENE	4	10	40	1000	< 40
SELENIUM	0.5	10	5	400	< 5
SILVER	0.6	10	6	100	< 6
THALLIUM	0.6	10	6	8	< 6
VANADIUM	30	7.5	225	400	< 225
ZINC	100	5	500	1000	< 500

[1] Concentration of OHM in soil must be LESS THAN (not equal or greater than) this value.

Table 3.
Limits to the Concentration of OHM In Soil for Re-Use
Assuming Natural Background Conditions at an RCS-2 Receiving Location

OIL OR HAZARDOUS MATERIAL	Concentration In "Natural" Soil mg/kg	Rule-of-Thumb Multiplier	Multiplied Value mg/kg	RCS-2 mg/kg		Limiting[1] Soil Concentration mg/kg
ACENAPHTHENE	0.5	10	5	3000	<	5
ACENAPHTHYLENE	0.5	10	5	10	<	5
ALUMINUM	10,000	2.5	25000		<	25000
ANTHRACENE	1	10	10	3000	<	10
ANTIMONY	1	10	10	30	<	10
ARSENIC	20	7.5	150	20	<	20
BARIUM	50	7.5	375	3000	<	375
BENZO(a)ANTHRACENE	2	10	20	40	<	20
BENZO(a)PYRENE	2	10	20	7	<	7
BENZO(b)FLUORANTHENE	2	10	20	40	<	20
BENZO(g,h,i)PERYLENE	1	10	10	3000	<	10
BENZO(k)FLUORANTHENE	1	10	10	400	<	10
BERYLLIUM	0.4	10	4	200	<	4
CADMIUM	2	10	20	100	<	20
CHROMIUM (TOTAL)	30	7.5	225	200	<	200
CHROMIUM(III)	30	7.5	225	3000	<	225
CHROMIUM(VI)	30	7.5	225	200	<	200
CHRYSENE	2	10	20	400	<	20
COBALT	4	10	40		<	40
COPPER	40	7.5	300		<	300
DIBENZO(a,h)ANTHRACENE	0.5	10	5	4	<	4
FLUORANTHENE	4	10	40	3000	<	40
FLUORENE	1	10	10	3000	<	10
INDENO(1,2,3-cd)PYRENE	1	10	10	40	<	10
IRON	20,000	2.5	50000		<	50000
LEAD	100	5	500	600	<	500
MAGNESIUM	5,000	2.5	12500		<	12500
MANGANESE	300	5	1500		<	1500
MERCURY	0.3	10	3	30	<	3
METHYLNAPHTHALENE, 2-	0.5	10	5	80	<	5
NAPHTHALENE	0.5	10	5	20	<	5
NICKEL	20	7.5	150	1000	<	150
PHENANTHRENE	3	10	30	1000	<	30
PYRENE	4	10	40	3000	<	40
SELENIUM	0.5	10	5	700	<	5
SILVER	0.6	10	6	200	<	6
THALLIUM	0.6	10	6	60	<	6
VANADIUM	30	7.5	225	700	<	225
ZINC	100	5	500	3000	<	500

[1] Concentration of OHM in soil must be LESS THAN (not equal or greater than) this value.

V. Sampling Considerations

The soil proposed for disposal/re-use should be sampled at sufficient and adequately distributed locations so that the concentrations of the contaminants of concern in the soil are adequately characterized. This includes sampling for the purpose of MCP site assessment and sampling to characterize the soil in any given stockpile/shipment leaving the site. The factors listed below should be considered when developing and implementing such a sampling plan. Evaluation of release, source, and site specific conditions assist in developing the basis for the selection of field screening techniques, sampling methodologies, sampling frequencies, and the contaminants of concern (e.g., analytical parameters) used to characterize the soil. These include, but are not necessarily limited to the following:

- the type(s) and likely constituents known or suspected to be in the soil;
- current and former site uses, past incidents involving the spill or release of OHM, and past and present management practices of OHM at the site;
- the potential for the soil to contain listed hazardous waste or to be a characteristic hazardous waste;
- the presence or likelihood of any other OHM (e.g., chlorinated solvents, metals, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs) , halogenated volatile organic compounds (VOCs));
- visual/olfactory observations, field screening, analytical data, and/or in-situ pre-characterization data;
- soil matrix type - naturally occurring soil or fill/soil mixtures (e.g., homogeneous or heterogeneous soil conditions);
- the identification and segregation of discrete "hot spots";
- the concentration variability in the soil;
- the volume of soil;
- the current and likely future exposure potential at the receiving location, including the potential for sensitive receptors, such as young children, to contact the soil (for example, more extensive sampling of the stockpiles would be warranted for soil slated to be moved to a residential setting than for soil being moved to a secure, low-exposure potential regulated receiving facility); and
- any sampling requirements stipulated by the receiving location.

The assessment of the soil, including the nature and concentrations of OHM therein, is a component of the MCP site assessment and therefore must meet all applicable performance standards, including those for environmental sample collection, analysis and data usability[6]. The assessment should address the precision, accuracy, completeness, representativeness, and comparability of the sampling and analytical results used to determine whether the soil

[6] Additional guidance on data usability is available in Policy #WSC-07-350, MCP Representativeness Evaluations and Data Usability Assessments. http://www.mass.gov/eea/docs/dep/cleanup/laws/07-350.pdf

stockpiles meet the Similar Soils Provision requirements. The representativeness of any site assessment sampling data if used to characterize contaminant concentrations in soil to be moved and reused offsite should be carefully evaluated. Additional guidance on soil sampling considerations is available from U.S. EPA and other state environmental agencies.[7]

VI. Segregation and Management of Soils of Different Known Quality

Soil containing concentrations of OHM equal to or greater than the values listed in Table 3 cannot be managed using the streamlined approach described in this guidance. Such soil must be managed in a manner consistent with its regulatory classification, which may include management as a hazardous waste, as a remediation waste, or under a case-specific Similar Soils determination.

Segregation of soil of different quality should occur based upon *in-situ* pre-characterization sampling results. Stockpiles of soil are mixtures that would require more extensive sampling to document the effectiveness of any attempted post-excavation segregation.

The known presence of soil that exceeds the Table 3 concentrations and the subsequent segregation of soil is one factor that would indicate the need for more frequent sampling (at least in that area of soil excavation) as described in Section V.

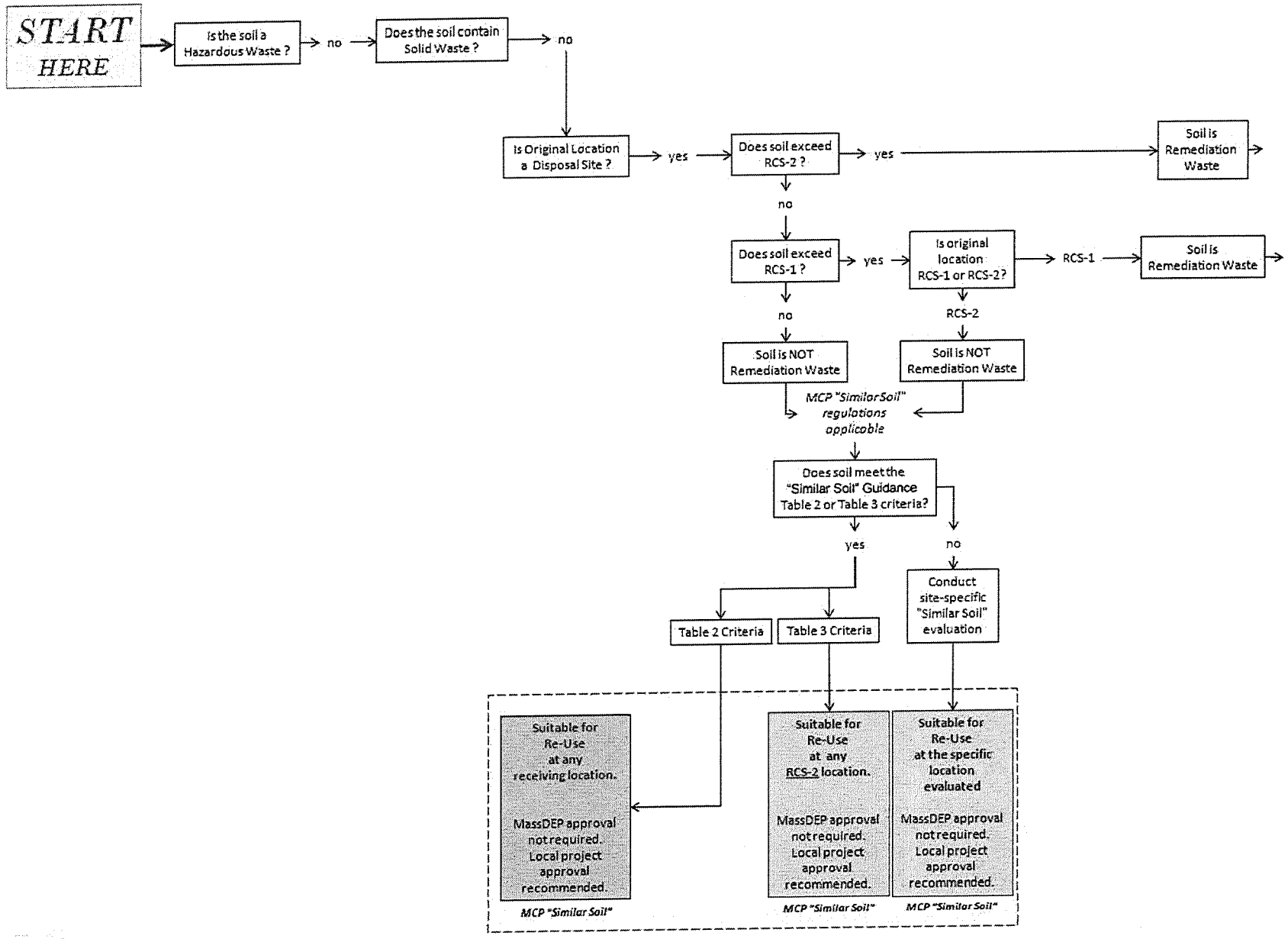
[7] Note that the guidance below are not specific to MGL Chapter 21E disposal sites and may not reflect MCP-specific considerations to determine the suitability of soils for offsite transport and use, such as for residential and other S-1 locations.

NJDEP. 2011. Alternative and Clean Fill Guidance for SRP Sites.
New Jersey Department of Environmental Protection Site Remediation Program
http://www.state.nj.us/dep/srp/guidance/srra/fill_protocol.pdf

USEPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term.
Office of Solid Waste and Emergency Response (OSWER), Washington, DC
http://www.epa.gov/oswer/riskassessment/pdf/1992_0622_concentrationterm.pdf

USEPA. 1995. Superfund Program Representative Sampling Guidance Volume 1: Soil.
OSWER. Washington, DC.
(Note that guidance for determining the number of samples for statistical analysis is addressed in Section 5.4.1).
http://www.epa.gov/tio/download/char/sf_rep_samp_guid_soil.pdf

Attachment 1 – Similar Soil Flowchart



Epsilon ASSOCIATES INC.

Projects:\21597\2013 \Monitoring and Work Reports\Template Re-grading and Work Reports

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December 26, 2019

Mr. Jeff Carlson ***Via Electronic Mail***
Natural Resources Director, Town of Nantucket
Conservation Commission Office
2 Bathing Beach Road
Nantucket, MA 02554

Subject: DEP File No. SE48-2824 – Sand Sampling Procedure

Dear Mr. Carlson:

On behalf of the Siasconest Beach Preservation Fund ("SBPF"), Epsilon Associates Inc. ("Epsilon") submits the attached Sand Sampling Plan ("Plan") prepared by OHI Engineering Inc. ("OHI") and dated December 26, 2019. This Plan incorporates the additional intertidal samples and analytes the Nantucket Conservation Commission ("Commission") requested at the December 18, 2019 meeting.

I was not able to attend the December 18, 2019 meeting and therefore I was not able comment in person on the additional analytes proposed by the Commission. Except for the addition of Zinc (Zn) to the suite of analytes, it is my professional opinion that the other analytes do not add to the characterization of the sand or to understanding the potential impact to the receiving water, i.e. open ocean off Sconset. I understand the purpose of the sampling is to assess: 1) whether or not sand delivered to the template (indirect beach nourishment) is contaminated by chemicals or septage (sand characterization), and 2) whether the sand will adversely the effect the marine environment when it is eroded in the ocean (effect receiving water quality). Following is my assessment of the proposed analytes regarding these two purposes.

pH – pH not an analyte used to characterize dredged material or for beach nourishment because ocean water has high buffering capacity the pH of the sand will not change the pH of the receiving water. pH is the concentration of Hydrogen ions (H+) in a material. Ocean water, salt water, has plenty of ions and cations in it (Na+, Cl-, Ca+, Mg+, K+, OH-,

etc.) such that any acidic or basic material will quickly be buffered to the ambient pH of the receiving ocean water

Phosphorous and Phosphate – relative to assessing sand for septage contamination this analyte is redundant to Nitrate. Thus, for site characterization purposes it is not needed. Relative to potential effects on the receiving water one might think analyzing to P is prudent to assess potential effects on primary productivity and potential to exacerbate algal blooms. This is not needed because ocean water is Nitrogen (N) limited, thus an increase in P inputs will not increase primary productivity or exacerbate algal blooms.

Total Nitrogen (TN) – TN measures organic and inorganic forms of Nitrogen. In wastewater treatment, including septic system dynamics, bacteria in the system (bacterial film at the bottom of leaching beds) converts organic N compounds to inorganic N. Nitrite is a shorter-lived species of N and is converted to Nitrate, a longer-lived species of N. Thus, nitrate and total coliform are good indicators of potential septage contamination. In terms of potential impact to algal blooms only the Nitrate is of real concern. Nitrite is a shorter-lived form that is converted to Nitrate. Organic N compounds (e.g. urea) is not available to phytoplankton. Organic N needs to be converted by bacteria to inorganic N before it can be used in photosynthesis. By the time any high organic N containing material enters the water and is converted to inorganic N it will have become well dispersed geographically in the high energy environment off Sconset and not noticeable above ambient N. Thus, again the Nitrate is the best analyte to assess any potential effect on the receiving water.

Therefore, we respectfully request that the Commission only require sampling the sand for the following analytes:

Chemical Constituents

- Total Petroleum Hydrocarbons (“TPH”)
- Volatile Organic Compounds (“VOCs”)
- Polynuclear Aromatic Hydrocarbons (“PAHs”)
- RCRA 8 Metals (Ar, Ba, Cd, Cr, Pb, Hg, Se, Ag) plus Zn

Biological Constituents

- Total Coliform
- Nitrates

The attached Sand Sampling Plan was prepared by OHI in response to the EO and comments made this Commission at the December 18, 2019 meeting. The plan describes the procedures and protocols to be followed to evaluate potential chemical differences, if any, between typical sand fill and suspect sand fill on the SBPF template.

Sincerely,
EPSILON ASSOCIATES, INC.

Dwight R. Dunk, LPD, PWS, BCES
Principal

encl. Sand Sampling Plan - Siasconset Beach Preservation Fund, Siasconset, MA

cc: J. Posner, SBPF
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S. Cohen, Cohen & Cohen Law, PC
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SAND SAMPLING PLAN

SIASCONSET BEACH PRESERVATION FUND
SIASCONSET, MA

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OHI PROJECT # 19-2000

Report Date:

DECEMBER 26, 2019

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INTRODUCTION

OHI Engineering, Inc. (OHI) prepared this Sand Sampling Plan for sampling and analysis of fill sands used at the Siasconset Beach Preservation Fund (SBPF) coastal bank erosion control project in Siasconset, MA. This Sampling Plan has been prepared in response to an Enforcement Order (EO) issued by the Nantucket Conservation Commission (NCC) on December 12, 2019 and was prepared for Epsilon Associates, Inc. on behalf of the SBPF.

BACKGROUND

To protect and stabilize 'Sconset Bluff, the SBPF commenced construction of an erosion barrier in 2013 and augmented it in 2015. The erosion barrier consists of four tiers of sand-filled geotubes extending along approximately 950 feet of the coastal bank. Sand placed over the geotubes is allowed to erode during storm events; the Template is replenished on a regular basis. It is our understanding that the top of the sand template (Template) is about 25 to 35 feet wide. The Template design calls for having 22 cubic yards (cy) of sand per linear foot, totalling approximately 20,000 cy of sand on the Template.

During autumn 2019 approximately 10,000 to 12,000 cy of sand was placed on the Template ahead of the winter storm season. Concerns have arisen regarding the source and quality of a subset of that sand, about or approaching 4,000 cy, placed during this period. The NCC issued an EO on December 12, 2019 that requires SBPF conduct chemical and biological testing of the suspect sand.

PURPOSE

To determine if the suspect sand differs from sand typically used to re-cover the Template annually, OHI proposes to collect samples of typical sand within the Template as well as of the suspect sand. Samples will be collected at an approximate rate of one sample per 1,000 cy of the typical sand fill and at a rate of one sample per 500 cy of the suspect sand that was placed during the fall of 2019. The sampling frequency is commonly used to characterize soils in Massachusetts and would be expected to identify variation in soil quality from various sources. Therefore, eight samples of the typical sand, and eight samples of the suspect sand will be collected. Eight samples of beach sand between the toe of the Template and Mean High Water and eight samples in the intertidal zone will also be collected to determine if eroded suspect sand has been deposited on the beach. Therefore, a total of 32 samples will be collected.

SAMPLE COLLECTION

Sampling locations will be laid out on the Template by the project surveyor prior to the start of sampling work. Sampling locations will be centered on the top of the Template and spaced every 50 feet with the most southerly location approximately 25 feet from the southerly extent of the Template and then every 50 feet until the northerly end of the Template is reached for an anticipated total of 19 sampling locations. Existing elevations at each of the sampling points will be determined using a lidar survey conducted by Epsilon Associates after the fall fill event. The elevations will be compared to as-built elevations in

order to determine the approximate depth of the sand covering the geotubes at each sampling point.

Samples will be collected at each sample point using a hand-driven GeoProbe sampler. Samples will be collected in four-foot clear plastic sampling tubes. Sampling depth is expected to range between eight and 12 feet below the top of the Template, depending on the sand thickness above the geotubes. The GeoProbe sampler will not be driven within at least three feet of the geotubes, as determined by the 2019 lidar and as-built survey, in an effort to avoid penetrating the geotubes with the sampling device. The clear plastic sampling tubes will be sliced open and the vertical strata will be evaluated to determine depth and thickness of the suspect sand at each grid point. Samples will be screened in the field with a photoionization detector (PID) using Jar Headspace Method. This method determines the Total Organic Vapors (TOV) in soil.

Laboratory Samples will be collected that represent approximately 1,000 cubic yards of the typical sand fill or 500 cubic yards of the suspect sand fill. Discrete samples will be collected for laboratory analysis. The samples sent for laboratory analysis will be selected based on jar headspace results as well as visual and olfactory evidence. Generally, the sample exhibiting the highest PID reading will be selected for laboratory analysis.

Eight samples will be collected of the typical sand placed on the Template. Eight samples will be collected of the suspect sand that was placed on the Template in fall 2019. Eight beach sand samples will be collected of sand between the toe of the Template and Mean High Water and eight additional beach sand samples will be collected from the intertidal zone; beach samples will be collected in the top one foot. A total of 32 samples will be collected.

SAMPLE ANALYSES

Sand samples will be placed in pre-cleaned laboratory containers, labelled, logged and shipped under Chain-of-Custody procedures to an independent Massachusetts-certified analytical laboratory. Samples will be analyzed for the following:

Chemical Constituents

- Total Petroleum Hydrocarbons (TPH)
- Volatile Organic Compounds (VOCs)
- Polynuclear Aromatic Hydrocarbons (PAHs)
- RCRA 8 Metals (Ar, Ba, Cd, Cr, Pb, Hg, Se, Ag) plus Zinc (Zn)

Biological Constituents

- Total Coliform
- Nitrates/Nitrite
- Total Nitrogen (Kjeldahl)
- Phosphorus
- Phosphate

General Chemistry

- pH

The laboratory data will be collated and reviewed to determine if significant variations in the Chemical, Biological and General Chemistry Constituents noted above are apparent between the typical sand and the suspect sand used as backfill on the Template, and with the beach sand, or if other MassDEP regulatory compliance requirements are triggered.

Laboratory analyses have been selected based on typical parameters included in MassDEP policy for dredge spoils (Chemical Constituents) and for potential septic system leach field contaminants (Biological Constituents).

SCHEDULE

The sand sampling process is expected to require 4 to 5 field days to complete, weather depending. The independent laboratory will be requested to provide expedited 5-day turnaround.

Data tabulation and review will require approximately two weeks after receipt of all laboratory data with the report completed within two weeks of data review.

Sampling work is expected to commence on or about January 6, 2020, subject to weather. Therefore, OHI anticipates report submittal will occur on or about February 14, 2020.

SUMMARY

This Sand Sampling Plan has been prepared in response to the EO issued by the NCC to SBPF. The plan is intended to describe the procedures and protocols to be followed to evaluate potential chemical differences, if any, between typical sand fill and suspect sand fill at the SBPF Erosion Control Project.

Following collection and laboratory analysis of 32 sand samples, the data will be tabulated, reviewed, and a summary report will be issued to the NCC.

I am also sending two technical guidance documents from the EPA/USACE that deal with chemical testing of dredged material for use in ocean disposal (which CES mitigation sand would fall under).

https://www.epa.gov/sites/production/files/2015-10/documents/green_book.pdf - Evaluation of Dredged Material Proposed
for Ocean Disposal
https://www.epa.gov/sites/production/files/2015-10/documents/r1rim.pdf - REGIONAL IMPLEMENTATION MANUAL for the EVALUATION OF DREDGED MATERIAL PROPOSED FOR DISPOSAL IN NEW ENGLAND WATERS

Perhaps these documents would be helpful in determining the parameters that should be tested for?

NANTUCKET COASTAL CONSERVANCY | to preserve and protect nantucket's natural beaches

January 3, 2020

Ms. Ashley Erisman, Chair
Nantucket Conservation Commission
Town of Nantucket

Dear Chair Erisman and Members of the Commission:

We would like to comment on the most recent information [page 274 onwards] submitted by consultants for the Siasconset Beach Preservation Fund (SBPF) in regard to **proposed testing for chemical and biological contamination of mitigation material delivered to the bluff and beach** below during the Fall of 2019 for the current Geotube Project (85 To 105 Baxter Road) SE48-2824, Date of Issuance 11.28.18. Because time is pressing, we are submitting our comments and questions ahead of the January 8 meeting at which the Commission will address this critical matter.

BASIC PREMISE IN TESTING PROPOSAL MISSTATED

The basic premise in the Sand Sampling Plan submitted by OHI Engineering, Inc. (OHI) on behalf of the respondents (SBPF) is misstated. OHI correctly says (in the Introduction to the proposal) that, "This Sampling Plan has been **prepared in response to an Enforcement Order (EO)** issued by the Nantucket Conservation Commission (NCC) on December 2, 2019." [Page 293 of packet for Other Business, January 8, 2020. Emphasis added.]

Further, OHI states, referring to the approximately 10,000-to-12,000 cy of sand placed on the template, "Concerns have arisen regarding the source and quality of a **subset of that sand**, about or approaching 4,000 cy, placed during this period.[1] **The NCC issued an EO on December 12, 2019 that requires SBPF conduct chemical and biological testing of the suspect sand.**" [Ibid. Emphasis added.]

However this is not what the EO requires. Specifically the EO requires the following:

> 3. **The applicant shall provide protocols for the chemical and biological testing of the existing nourishment template**, the area from the base of the template to Mean High Water and from Mean High Water to Mean Low Water to ensure that no contaminated material is located within these areas. [EO, December 11, 2019, page 4.]

There is NO mention of "suspect sand" in the EO. Yet, OHI refers to the "suspect sand" throughout the Sand Sampling Plan and, in fact, proposes a different sampling/testing protocol for the "suspect sand" and for the "typical sand fill."

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[1] Where in the record have the respondents indicated that a "subset of that sand" approaches 4,000 cy? We don't recall information being provided as to the amount of material excavated from each site of the six sites. Were these 4,000 cy excavated from a single site or multiple sites? **The respondents should submit information to the Commission re how many cy were excavated from each site and delivered to the bluff.**

In the proposal, OHI states the following as its Purpose: "To determine if the **suspect sand** differs from **sand typically used** to re-cover the Template annually, OHI proposes to collect samples of typical sand within the Template as well as of the suspect sand." It then goes on to propose different sampling protocols for the "suspect sand" and for the "typical sand."

The Minutes of the November 20 Commission meeting (when the discussion of testing protocol for possible contamination was discussed) make NO mention of "suspect sand." [Pages 3-7.]

The fact that the underlying purpose of the Sand Sampling Plan, as stated by OHI, is inaccurate, is concerning and raises serious questions that require answers before moving ahead.

ADDITIONAL QUESTIONS AND COMMENTS

- **What is the definition of "suspect sand"** used by OHI in the Sand Sampling Proposal?
- **How is it possible to identify the "suspect sand" on the template** when it has been mixed in and spread around with other deliveries?
- **What is the definition of "typical sand fill"?**
- **Does "typical sand fill" include excavated dirt?**
- Has the Conservation Commission identified any particular sand delivered to the bluff as "suspect"?
- The public has provided evidence that material excavated from one site may be contaminated. However, the respondents have provided no evidence that material excavated from the additional (5) sites is not contaminated, have they?
- Haven't questions been raised by the Commission and the staff that indicate **all of the material** delivered to the project site during this period **is, in fact, "suspect**" for not being "clean" and therefore subject to possible contamination?
- **What is the Commission's objective for requesting testing for contamination**: to determine that there is no contaminated material on the geotubes and surrounding beach (at the time that the samples are taken)? And/or to determine whether or not contaminated material was delivered to the project in the first place? And/or is the purpose to be sure also that future deliveries are not contaminated? If yes, will the proposed Sand Sampling Plan provide an answer/the answers?
- Overall, rather than "typical sand fill," shouldn't **the standard for any testing** be the standard required in Special Condition #25 in the Order of Conditions: "All sand used for mitigation or to fill and cover the Geotubes shall be imported from an off-site source and shall be **compatible with the existing bank and beach sediments**"?

Thank you for you consideration.

Sincerely,
The NCC Team, D. Anne Atherton, Administrative Coordinator

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/12/19 Time: 12:56pm. Weather: Sunny

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection few bricks and piece of PVC pipe l wire was removed from southern side of bluff which was exposed during grading of templet. < 1 gallon.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/13/19 Time: 12:56pm. Weather: Sunny

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection few bricks and electrical wire was removed from southern side of bluff which was exposed during grading of templet . < 1 gallon.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/14/19 Time: 7:15am. Weather: Sunny

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection some bricks, beach trash and big rocks were removed from face side of bluff which was exposed during rain storm . We also collected some rope likely from a fishing boat which is in a ball on the left side of the bucket in the photo. ~ 40 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/15/19 Time: 12:10pm. Weather: rainy

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection few bricks wood stick and plastic were removed from face of bluff which was exposed during rainstorm. ~ 2 ½ gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/16/19 Time: 9:11 am. Weather: Sunny

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection brick and electrical wire were removed from face of bluff which was exposed during hightide . < 1 gallon.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/17/19 Time: 10:24 am. Weather: Rainy

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection few bricks and metal pipe ware removed from face of bluff which was exposed during snow/rain. ~ 1.5 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/18/19 Time: 7:38pm. Weather: Cloudy

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection few bricks and plastic pipe were removed from face of bluff which was exposed during rain. ~ 1.5 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/19/19 Time: 7:38am. Weather: Cloudy

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection no objects were exposed.

2019

SBPF Site Inspection Report/Log

Inspector: Ali Tepsurkaev

Date: 12/20/19 Time: 8:00am. Weather: Cloudy

General Site Conditions

Site conditions was in good condition.

Type & Quantity of Debris Removed/Action Taken

Inspected structure from North to South along of face of templet and ramps. During inspection no objects were exposed.

2019

SBPF Site Inspection Report/Log

Inspector: Jamie Feeley

Date: 12/21/19 Time: 3:45 PM Weather: partly cloudy

General Site Conditions

Site was in good condition

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the template and the ramps. Picked up several bricks, a piece of concrete and some pipe and wire material. ~ 5 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Joao Coutinho

Date: 12/23/19 Time:9:04AM Weather: calm and sunny

General Site Conditions

Site was in good condition.

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the template and the ramps. Picked up several bricks and a short piece of electrical wire from the face of the bluff.

~ 1 gallon.

2019

SBPF Site Inspection Report/Log

Inspector: Jamie Feeley

Date: 12/24/19 Time:3:45PM Weather: partly cloudy

General Site Conditions

Site was in good condition

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the template and the ramps.

Picked up several bricks, a piece of concrete and some pipe and wire material. ~ 4 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Joao Coutinho

Date: 12/26/19 Time: 11:38AM Weather: calm

General Site Conditions

Site was in good condition

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the template and the ramps.

Picked up several bricks, assorted wire and small pieces of pipe. ~ 9 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Joao Coutinho

Date: 12/27/19 Time: 3:11PM Weather: calm

General Site Conditions

Site was in good condition

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the templet and the ramps. Picked up several full and partial bricks. ~ 5 gallons.

2019

SBPF Site Inspection Report/Log

Inspector: Roland Voyages

Date: 12/29/19 Time: 1:20pm Weather: Overcast and windy

General Site Conditions

Geotubes are partially exposed at the North end of structure.

Type & Quantity of Debris Removed/Action Taken

Very high wind conditions precluded scaling the bluff and walking the template.

2019

SBPF Site Inspection Report/Log

Inspector: Joao Coutinho

Date: 12/31/19 Time: 9:38AM Weather: Overcast and breezy 41°F

General Site Conditions

Site was in good condition. Lower geotubes significantly more exposed along structure.

Type & Quantity of Debris Removed/Action Taken

Fully inspected the structure from North to South. Walked along the template and the ramps. Picked up several bricks, assorted cable, 2 pieces of a tarp like material and a 2' piece of conduit. ~ 5 gallons.