Report of Geotechnical Explorations

Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation Newington, NH and Eliot, ME

October 4, 2016

Prepared for:

United States Army Corps of Engineers
New England District

Prepared by:

GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

EXECUTIVE SUMMARY

The purpose of the Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation was to perform subsurface explorations to evaluate sediment and bedrock properties, execute a laboratory testing program to identify material properties, and to develop recommendations relative to the anticipated required rock excavation methodologies needed to complete the dredging project. The report consists of this Executive Summary, a Report of Geotechnical Explorations, and supporting tables, figures and appendices.

The project site is located at the northernmost end of the Portsmouth Harbor and Piscataqua River Federal Navigation Project, which consists of a 6.2-mile long channel that is 35 feet deep at MLLW and is generally 400 feet wide. The site is immediately northwest of Frankfort Island and Mast Cove. The site borders Eliot, Maine to the northeast and Newington, New Hampshire to the southwest.

The proposed navigation improvement project will widen the upper turning basin from a width of 800 feet to a width of 1,200 feet by expanding the existing basin in a northeast direction. The basin expansion is planned to be dredged to the authorized depth of -35 feet MLLW. In overburden soils, the allowable dredge overdepth is 2 feet, corresponding to a maximum dredge depth of -37 feet MLLW. In areas where bedrock is encountered above the authorized depth, there will be a required dredge overdepth of 2 feet (-37 feet MLLW) plus an allowable 2-foot dredge overdepth, corresponding to a maximum dredge depth of -39 feet MLLW.

One of the critical issues for the proposed dredging project will be the potential impact of bedrock if encountered above the proposed dredge depths. The lateral extent, the number of locations where high bedrock is encountered within the dredge area, and the consistency/hardness of the bedrock will play a role in determining the appropriate rock removal approaches (i.e., mechanical rock removal and/or underwater blasting) for the project. Therefore, GZA's subsurface investigation was focused on providing information relative to the location of the bedrock both horizontally and vertically within with the proposed basin expansion area as well as identifying the physical properties of the bedrock to support evaluation of its excavatability/rippability.

In 2006 and 2007, a preliminary subsurface exploration program was completed by the U.S. Army Corps of Engineers within the Project limits. The previous explorations included eight test borings, three probes, and a marine geophysical survey that included side scan sonar, magnetic intensity, and sub bottom profile survey techniques. One boring was terminated approximately 13 feet into bedrock, and the remaining seven test borings were terminated in the overburden soils. The probes were drilled and terminated upon reaching reported refusal.

Using the results of previous explorations, the US Army Corps of Engineers preliminarily designed a supplemental subsurface program to specifically investigate areas within the proposed basin expansion where high bedrock was anticipated. GZA was engaged by the USACE to finalize design of the program and execute the program between July 13, 2016 and July 29, 2016. The program consisted of ten (10) test borings, designated as FD16-01 through FD16-10. These test borings were drilled by New England Boring Contractors (NEBC) of Derry, New Hampshire and observed and logged by GZA. The recent test borings were completed in the river from a 35-foot by 13.5-foot jack-up barge using a skid-mounted CME 45 drill

rig. The borings were drilled to termination elevations of -50 to -53.5 feet MLLW, at or deeper than the planned termination elevation of -50 feet MLLW. Four borings were terminated between 3.5 and 16.4 feet into bedrock, and the remaining six borings were terminated in the overburden soils, below the proposed dredge limits.

Based on the recent subsurface investigation, the generalized subsurface profile at the site includes three primary soil strata overlying bedrock including Glaciomarine Clay (lean clay with sand or gravel; USCS: CL), Glaciofluvial/Glaciomarine Outwash (fine to coarse sand with up to about 10 percent fine gravel and up to about 10 percent silt; USCS: SP, SP-SM, SW), and Glacial Till (silty sand with gravel to silty gravel with sand, consisting of varying percentages of sand and gravel and 15 to 30 percent silt; USCS: SM, GM), overlying bedrock. Overburden stratification was interpreted based on visual-manual description, associated USCS soil types, and split-spoon blow counts for the encountered soil. Laboratory gradation testing was not conducted on soil samples.

Glacial Till was encountered in seven of 10 borings, and it was above the maximum dredge depth in three borings summarized below:

Test Boring	Top of Glacial Till (feet MLLW)
FD16-02	-28.1
FD16-07	-35.7
FD16-08	-34.9

The predominant overburden material that will be excavated during the planned dredging activities is the Outwash sand/gravel stratum. To a lesser extent, the Glacial Till stratum may be encountered within the lower approximately 1/3 of the middle portion of the planned dredged area.

Based on our visual characterization of the soil, the encountered Outwash stratum appears consistent with sand and gravel material encountered, analyzed and tested in the B-series borings. Therefore, the Outwash stratum material would likely be suitable for beneficial reuse for beach nourishment by way of nearshore placement, based on the evaluation criteria outlined in the March 2014 Draft Feasibility Report and Draft Environmental Assessment.

Bedrock was cored in four of the FD16-series test borings (FD16-01, -02, -07 and -09) and one of the B-series borings (B-6). The bedrock consisted of schist and phyllite of the Eliot Formation. The schist and phyllite were generally described as hard, fresh to slightly weathered, fine grained, and gray to dark gray. An approximately 3-foot-thick basalt intrusion was encountered in FD16-07, which was described as hard, fresh to slightly weathered, fine grained, and dark gray.

Based on the results of the recently completed test borings, the acoustic bottom elevation contours developed from the results of previous geophysical testing do not appear to represent top of bedrock, in GZA's opinion. In general, bedrock was encountered below the elevations suggested by the geophysical results. The shallowest bedrock encountered in or near the southern area designated as possible rock excavation (see **Figure 2** of the Report) was at FD16-07, -40.6 feet MLLW. Therefore, GZA concluded that bedrock is unlikely to be encountered within the southern portion of the basin expansion. Two borings within the northerly area designated as possible rock excavation (FD16-02 and B-6; see **Figure 2** of the Report) encountered rock at -30 to -33.7 feet MLLW, indicating that up to 7 feet of rock may be encountered <u>above</u> the specified 2-foot overdredge depth. Two borings drilled in or adjacent to the northern portion of the area identified on **Figure 2** (FD-01 and FD-08) encountered rock at -49.4 feet

MLLW or did not encounter rock above -50 feet MLLW, indicating rock is less likely to be encountered in the vicinity of these borings.

GZA retained GeoTesting Express, Inc. in Acton, Massachusetts to complete a laboratory testing program to assess the bedrock samples recovered during the FD16-series boring program. The testing program included Elastic Moduli Uniaxial Compression tests, Pulse Velocity tests, Axial Point Load tests, Diametral Point Load tests, Splitting Tensile tests, CERCHAR Abrasivity tests, Total Hardness tests, and Petrographic analyses. GZA utilized the results of bedrock coring and laboratory testing to perform a rock removal/rippability assessment for the Project.

Three rock removal assessment methods (i.e., dredgeability, rippability, and excavatability) were utilized to evaluate/predict the difficulty of rock excavation. The compiled rock removal assessment results are presented in the table below:

Rock Removal Assessment Method	Range of Results	Rating/Index			Rating/Index Needed for Blasting
		Min	Max	Ave	
Dredgeability	Easy to Average Ripping	33	41	37	>65
Rippability	Class 2 (Moderate) to Class 3 (Difficult)	49	63	57	90
Excavatability	Very Hard ripping to Extremely hard ripping/blasting	142	2,639	1,088	>1,000 to 10,000

The rock removal assessment results indicate that the anticipated rock excavation difficulty is generally near the middle of each classification range at each location. Each of the methodologies generally yielded results which did not predict the need for blasting. The exception was the Q-system-based excavatability assessment, which predicts extremely hard ripping to blasting for two of the five borings; however, it does not enter the blasting-only difficulty level.

In GZA's opinion, the rock removal assessment results suggest that the degree of bedrock fracturing at the site is a predictor for increased "ease of dredgeability" and rock removal via blasting does not seem to be a requirement, despite the relatively high laboratory-derived bedrock strength and velocity parameters. However, the areas with more competent bedrock (i.e., higher RQD values) seem to indicate the potential for a localized area(s) where rock removal via blasting or other specialized means may be necessary.

During the evaluation of the previous and recent data, GZA identified three primary data gaps. The test boring program identified significantly less bedrock within the Project area when compared to the estimates obtained from the previous test borings and geophysical work within the Project area. However, there is a portion of the proposed turning basin widening area with dimensions of approximately 250 by 600 feet in which the available data suggests it is possible that bedrock will be encountered above the required dredging depth over the majority of the area. Because the localized area of potential bedrock excavation is based on only two widely-spaced borings where rock would be encountered above -37 feet MLLW, it is GZA's opinion that the available data is not sufficient to develop reliable top of rock elevation contours.

A second data gap is a conclusive assessment of the typical bedrock fracturing within the Project area. The degree of bedrock fracturing was found to vary considerably across the site. Considering the relatively limited rock coring completed in the excavation area and the depth range of interest and the variable degree of bedrock fracturing, there still remains a relatively high degree of uncertainty regarding appropriate rock excavation methodology needed to complete the proposed work. As such, a data gap exists relative to the amount of bedrock data needed to more thoroughly assess the appropriate rock removal methodology for the Project, specifically areas where underwater blasting may be needed.

A third data gap/discrepancy is the linkage between the predicted acoustic basement estimated from the previous geophysical work and the top of bedrock as defined by the recent FD16-series test boring program. The previously-defined acoustic basement indicated bedrock/dense soils at elevations both higher and lower than the actual conditions encountered at the FD16-series test boring locations. Thus, there is a data gap/discrepancy between these two sets of subsurface data and further calibration of the geophysical model is warranted, in GZA's opinion.

The available data indicates the bedrock within the Project area should be able to be removed via excavation/ripping methods and large scale controlled blasting techniques would not be a necessity. However, considering the likelihood for localized high points in the bedrock surface and rock cut depths generally being less than about 5 feet, localized implementation of specific rock removal techniques may be required. From logistical and economic standpoints, it may be more cost effective to implement a targeted drilling and blasting program through the overburden soils in the areas of anticipated high bedrock to improve the understanding of the conditions in these areas as opposed to dealing with them on a case by case manner during construction.

GZA recommends that preliminary cost estimates be performed using the current data to identify anticipated costs for several rock removal options. These options should include: 1) conventional dredging operations assuming the bedrock is rippable; 2) implementing controlled blasting though the overburden soils in the high bedrock area prior to implementing conventional dredging; and 3) conventional dredging followed by specialized rock removal operations consisting of percussion/grinding methods. Implementation of additional subsurface explorations to obtain more refined the rock removal limits for the Project should be considered if the cost estimate for supplemental explorations is much less than the cost for high bedrock removal based on conservative cost estimates.

If warranted, the design of the supplemental explorations should be performed after or in conjunction with the recalibration of the previous geophysical work completed at the site using the FD16-series boring data. The goal of the supplemental subsurface exploration work will be to increase the number of data points within the Project Area to allow for the development of top of bedrock elevation contours and thus, to improve the accuracy of rock removal quantity estimates. The subsurface explorations will also generate additional rock samples which could be tested to provide additional information relative to the rippability/excavatability of the bedrock.

Contract Number: W912WJ-16-D-0003
GZA Project Number: 09.0025912.00

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

1.0. INTRODUCTION

This report presents the results of the subsurface exploration, laboratory testing, and interpretation conducted by GZA GeoEnvironmental, Inc. (GZA) for the U.S. Army Corps of Engineers (USACE) project entitled "Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation in Newington, New Hampshire and Eliot, Maine."

1.1. AUTHORITY

GZA's services were provided in response to Delivery Order/Call No. 0002 under Contract Number W912WJ-16-D-0003, Delivery Order/Call Number 0002 between GZA and the United States Army Corps of Engineers New England District (NAE), dated May 13, 2016.

1.2. OBJECTIVES AND SCOPE OF WORK

The general objective of the assignment was to perform ten (10) subsurface explorations to evaluate sediment and bedrock properties, execute a laboratory testing program to identify material properties, and to develop recommendations relative to the anticipated required excavation methodologies needed to complete the dredging project. To meet this general objective, GZA completed the following Scope of Work:

- Prepared a Work Plan for the assignment;
- Prepared an Accident Prevention Plan (APP), including an Activity Hazard Analysis (AHA), for the field work;
- Reviewed available data for the project, contained in the report entitled, "Final Feasibility Report and Final Environmental Assessment and FONSI for Navigation Improvement Project, Portsmouth Harbor and Piscataqua River, New Hampshire & Maine, prepared by the U.S. Army Corps of Engineers, dated July 2014" (report text and Appendix F, Geotechnical Design);
- Conducted an initial site visit to observe surficial conditions, marine traffic, drilling access and existing utilities;
- Coordinated a kick-off meeting to review the Work Plan and Accident Prevention Plan;
- Coordinated and observed a subsurface exploration program, which consisted of ten borings, drilled by New England Boring Contractors;
- Designed and coordinated a laboratory testing program to evaluate engineering properties of the bedrock, conducted by GeoTesting Express;
- Evaluated previously-collected data and the recent test boring/laboratory testing program, interpreted the subsurface conditions including bedrock excavatability and potential sediment reuse, and potential data gaps;
- Developed recommendations for bedrock removal methods and additional subsurface explorations (as needed); and
- Prepared this report presenting our findings.

1.3. HORIZONTAL AND VERTICAL DATUM

Test boring horizontal locations are reported on the boring logs as northing and easting coordinates in survey feet and reference the North American Datum of 1983 (NAD 83), Maine State Plane 2000 West.

Elevations were surveyed in feet using the North American Vertical Datum 1988 (NAVD 88) and converted to Mean Lower Low Water datum (MLLW). The conversion factor from NAVD88 to MLLW for Portsmouth, New Hampshire was obtained from the National Oceanic and Atmospheric Administration (NOAA) Tidal Elevation webpage for Station 8420411, Dover, Cocheco River, New Hampshire, and is provided below:

NAVD El. (feet) + 3.93 feet = MLLW Elevation (feet)

2.0. PROJECT DESCRIPTION

2.1. PROJECT LOCATION

The project site is located at the northernmost end of the Portsmouth Harbor and Piscataqua River Federal Navigation Project, which consists of a 6.2-mile long channel that is 35 feet deep at MLLW and is generally 400 feet wide. The site is immediately northwest of Frankfort Island and Mast Cove. The site borders Eliot, Maine to the northeast and Newington, New Hampshire to the southwest. The site location is shown on the **Project Locus, Figure 1**.

2.2. SITE DESCRIPTION

The existing upper turning basin is approximately 800 feet wide and 35 feet deep, as shown on the **Overall Site and As-Built Exploration Location Plan, Figure 2**. The existing bathymetric data indicates the existing mudline elevations generally varying between -35 and -48 feet MLLW in the existing turning basin. The proposed widening project will expand the basin in a northeast direction to increase the basin width to 1,200 feet. Along the northeast boundary between the existing turning basin and the proposed widening area, the mudline elevations were approximately 10 to 25 feet higher than those within the existing basin. Existing mudline elevations range between approximately -2 and -20 feet MLLW across most of the proposed widening area.

2.3. SUMMARY OF PROPOSED DREGDING PROJECT

The navigation improvement project at the Portsmouth Harbor and Piscataqua River federal navigation project would widen the upper turning basin from a width of 800 feet to a width of 1,200 feet by expanding the existing basin in a northeast direction. The basin will be dredged to the authorized depth of -35 feet MLLW. In overburden soils, the allowable dredge overdepth is 2 feet, corresponding to a maximum dredge depth of -37 feet MLLW. In areas where bedrock is encountered above the authorized depth, there is a required dredge overdepth of two feet (-37 feet MLLW) plus an allowable 2-foot dredge overdepth, corresponding to a maximum dredge depth of -39 feet MLLW.

Based on the existing bathymetric data, the 1,200-foot basin width and the authorized depth of -35 feet MLLW, approximately 753,400 cubic yards of material will need to be removed. As outlined in the Draft

Feasibility Report, under the Federal Base Plan for disposal, we understand that the dredged material (sand, gravel and rock) will be placed at the Isles of Shoals North ocean placement site. We also understand that the USACE is still evaluating beneficial use alternatives for both the sandy material and the rock and will continue to do so during final design. It is recognized that some non-federal interests other than the project Sponsor have indicated that the sand and gravel could be beneficially disposed of at nearshore site(s) near the beaches in Wells, Maine, and Salisbury, Newburyport and Newbury, Massachusetts.

Although beneficial uses were discussed in the Draft Feasibility Report for excavated rock, no firm plans were presented and the current plan will include disposal at a disposal site near the Isle of Shoals. However, during detailed design, coordination will continue and it is likely that a beneficial use will be identified.

2.4. CRITICAL PROJECT ISSUES

One of the critical issues for the proposed dredging project is the potential to encounter bedrock and its impact on the achievement of the project objectives. The presence, frequency, and consistency of bedrock could require alternative dredging approaches including mechanical rock removal and/or underwater blasting. The subsurface investigation was therefore focused on providing information relative to the location of the bedrock both horizontally and vertically within with the proposed basin expansion area as well as identifying the physical properties the bedrock to allow for an evaluation of its excavatability.

3.0. FIELD INVESTIGATIONS

3.1. SUBSURFACE EXPLORATION PROGRAMS

Prior to GZA's engagement on the project, an exploration program was completed by the U.S. Army Corps of Engineers in 2006 and 2007. The previous explorations included test borings, probes, and marine geophysical testing. In 2016, GZA was engaged by the NAE to coordinate and execute a supplemental subsurface exploration program to fill data gaps that remained after the completion of the 2006/2007 explorations. Details of both the previous and the recent subsurface exploration programs are described below.

3.1.1. PREVIOUS SUBSURFACE EXPLORATION PROGRAMS

3.1.1.1. PREVIOUS GEOPHYSICAL PROGRAMS

In December of 2006, Ocean Surveys, Inc. (OSI) conducted a marine geophysical survey that included side scan sonar, magnetic intensity, and sub bottom profile survey techniques. The survey area included an approximate 900 by 2,600-foot survey area which covered the entire turning basin widening area and the adjacent portion of the existing turning basin/federal channel.

The purpose of the side scan sonar survey was to attempt to identify different sediment types within the riverbed and bottom features, including boulders and shoals, based on their respective varying acoustic reflectivity.

Magnetic intensity surveys were also conducted as part of the operation to attempt to identify/locate ferrous objects on or below the riverbed. Isolated magnetic variations are often generated by man-made debris; however, significant variations can be generated by shallow metamorphic bedrock and boulders that have an abundance of ferrous materials in the rocks.

The sub-bottom profiling was conducted to identify and map the acoustic basement reflector. Based on their respective material properties, the acoustic basement reflector may represent either the top of the dense glacial till stratum or the top of bedrock.

3.1.1.2. PREVIOUS TEST BORING PROGRAMS

Between September 10, 2007 and November 30, 2007, eight test borings (B-1 through B-8) and three probes (P-1 through P-3) were drilled by New Hampshire Boring of Derry, New Hampshire. The NAE coordinated/directed the exploration program and logged the borings.

The previous test borings were completed in the river from a 35-foot by 13.5-foot jack-up barge using a skid-mounted Dietrich D50 drill rig. The as-drilled boring locations and mudline elevations are provided on the logs and the locations are shown on **Figure 2**.

The borings (B-1 through B-8) were drilled to depths of approximately 22 to 37 feet below mudline (bml), corresponding to termination elevations of -40 to -43 feet MLLW. Boring B-6 was terminated approximately 13 feet into bedrock, and the remaining seven test borings were terminated in the overburden soils. The borings were drilled using 4-inch driven casing and drive and wash drilling techniques. Standard penetration testing (SPT) and split-spoon sampling were performed at 5-foot typical intervals in the overburden using a 24-inch-long, 1-3/8-inch inside-diameter sampler and a 140-pound (lb) safety hammer, with a 30-inch drop. Bedrock cores were obtained using NX2 coring equipment.

The probes (P-1 through P-3) were drilled and terminated upon reaching reported refusal at depths ranging from approximately 37 to 58.9 feet bml, corresponding to termination elevations of -52.5 to -61 feet MLLW. The probes were advanced using a 300-lb hammer to drive NW rods equipped with a lead A-rod center plug that was ground into a 60-degree point. Top of rock was interpreted based on a bouncing refusal. Soil samples were not collected in the probes.

A summary of the results of the previous borings and probes is presented in **Table 2**. The previous test boring logs are included in **Appendix H**.

3.1.2. RECENT SUBSURFACE EXPLORATION PROGRAM

Between July 13, 2016 and July 29, 2016, ten (10) test borings (FD16-01 through FD16-10) were drilled under the current contract. The recent test borings were drilled by New England Boring Contractors (NEBC) of Derry, New Hampshire. GZA coordinated and oversaw the exploration program and logged the borings on a fulltime basis.

The recent test borings were completed in the river from a 35-foot by 13.5-foot jack-up barge using a skid-mounted CME 45 drill rig. The as-drilled boring locations and mudline elevations are provided on the logs, and the locations are shown on **Figure 2**.

GZA used Differential Real Time Kinematic[1] (RTK) GPS surveying equipment to assist in positioning the barge at each borehole location. When the barge was set up on location, GZA surveyed the as-drilled boring location and the deck elevation to calculate the mudline elevation and the minimum required termination depth below mudline.

The borings were drilled to depths of approximately 32 to 47 feet bml, corresponding to termination elevations of -50 to -53.5 feet MLLW, at or deeper than the planned termination elevation of -50 feet MLLW. Four borings were terminated between 3.5 and 16.4 feet into bedrock, and the remaining six borings were terminated in the overburden soils, below the proposed dredge limits.

The recent test borings were drilled using drive and wash drilling techniques with 4-inch casing. Split-spoon sampling was conducted continuously using 24-inch-long split spoon samplers. In general, a 2-½-inch I.D. sampler was used for soil sampling, which was driven using a rope-and-cathead lift system and a 300-lb safety hammer with an 18-inch drop. Where noted on the boring logs, a 1-3/8-inch I.D. SPT sampler was driven using a rope-and-cathead lift system and a 140-lb safety hammer with a 30-inch drop. The 1-3/8-inch sampler was generally used in clean, fine-grained sands, as the recovery was found to be greater for these materials with the smaller of the two samplers used. Photographs were taken of each split spoon sample, as presented in **Appendix C**.

Considering the different sampler size and hammer weight and drop between the split spoons used, the recorded blow counts are not equivalent relative to evaluation of density/consistency of soil. The 2.5-inch inside-diameter (I.D.) split spoon was typically driven with a 300-lb hammer and 18-inch drop height. 1-3/8-inch I.D. split spoon driven with a 140-lb hammer and 30-inch drop. SPT N_{60}-values were calculated for each sample to correspond to blow counts that would be expected for a 140-lb safety hammer operated with a rope and cathead pulley system. The SPT N_{60}-values are used herein to describe the relative density of granular soils and the consistency of cohesive fine-grained soils. SPT $N_{1,60}$-values were also calculated, which include a correction to normalize the blow counts to the expected value at an effective stress equal to atmospheric pressure. Calculated N_{60} and $N_{1,60}$ values are presented in **Table 3**.

Bedrock coring was conducted in general accordance with ASTM D 2113 using NX coring equipment to retrieve bedrock specimens. The total rock core recovery from each borehole ranged from 83 to 100 percent of the cored length. Wet and dry photographs were taken of each collected rock core, and the core photographs are presented along with a summary of the recovery and rock quality data for each core run in **Appendix D**.

Each boring was observed and logged by GZA personnel. Visual classification of the soil samples was performed in accordance with the Unified Soil Classification System (USCS), ASTM D 2488. Bedrock core was logged in terms of rock type, hardness, structure, degree of weathering, mineralization and discontinuities using GZA's Modified International Society of Rock Mechanics (ISRM) Rock Classification System. A summary of the results of the recent borings is presented in **Table 2**. Recovery, quality and discontinuity characteristics of cored bedrock are summarized in **Table 5**.

---

[1] Real Time Kinematic (RTK) satellite navigation is a technique used to enhance the precision of position data derived from satellite-based positioning systems such as GPS. Differential Global Positioning System (DGPS) is an enhancement to Global Positioning System that provides improved location accuracy, from the 15-meter nominal GPS accuracy to about 10 cm in case of the best implementations

Final logs of the recent test borings were prepared by GZA using the USACE's gINT log template and are presented in **Appendix A**. GZA prepared hand-written field logs and submitted them periodically to the NAE for review throughout the recent drilling program. Submitted field logs are presented in **Appendix B**. Daily field reports were prepared by GZA providing a summary of daily drill operations, operating personnel, observing personnel, observations, and equipment, which are presented in **Appendix F**.

3.1.2.1. DEVIATIONS FROM WORK PLAN

In general, the test borings were completed in accordance with the approved Work Plan, which is attached in **Appendix J**. Three deviations from the work plan are described below.

Continuous sampling was planned to be conducted with the 3-inch outside diameter, 2.5-inch I.D. split spoon when drilling in overburden soils at each test boring location. However, due to initial poor recoveries when sampling the clean, fine-grained sands in the early borings, a smaller sampler was used to improve recoveries. A 1-3/8-inch I.D. SPT split spoon using a 140-lb hammer and a 30-inch drop was used when these soils were encountered. Typically, the SPT split spoon achieved better recovery within the fine to medium grained clean sands.

The work plan states that each boring is to be drilled to -50 feet MLLW. Borings terminated in soil were drilled to between -50 to -51.3 feet MLLW. Three of the borings that included rock coring, borings FD16-01, -07, and -09, were drilled to between -52.9 and -55 feet MLLW. In these three borings, bedrock was encountered between 0.6 and 9.4 feet <u>above</u> the contracted minimum boring depth elevation of -50 feet MLLW. At each location, the coring was extended deeper to promote recovery of suitable bedrock samples for laboratory testing.

The work plan included a suite of laboratory testing on rock samples as summarized in **Section 4.0** below. Because rock was encountered in only four of the ten borings, the testing was limited to these four borings. In some cases, the recovered bedrock pieces were of insufficient length to provide a full suite of testing in accordance with the work plan.

4.0. ROCK MECHANICS TESTING

GZA retained GeoTesting Express, Inc. in Acton, Massachusetts to complete a bedrock laboratory testing program for the assignment. The test type, test method, and number of each type of test completed for each boring are summarized in the table below. The laboratory test reports are attached in **Appendix E.**

Boring	ISRM 3 Method			Elastic Moduli in Uniaxial Compression (ASTM D 7012D) (1)	Pulse Velocity and Ultrasonic Elastic Constants (ASTM D	Axial Point Load Index (ASTM D 5731)	Diametral Point Load Index (ASTM D 5731)	Splitting Tensile Strength (ASTM D 3967)	CERCHAR Abrasivity (ASTM D 7625)	Hardness (Tarkoy)	Petrographic Analysis (ISRM)
	Average Dry Unit Weight (ISRM)	Average Bulk Specific Gravity	Average Porosity								
FD16-01	1	1	1	1	1	2	BS	2	2	0	1
FD16-02	1	1	1	2	2	3	2	3	3	2	1
FD16-07	2	2	2	0	0	2	1	2	2	0	2
FD16-09	1	1	1	BS	1	1+BS	1	1	1	0	1
Totals	**5**	**5**	**5**	**3**	**4**	**8**	**4**	**8**	**8**	**2**	**5**
Note: BS indicates the sample was broken when received at the lab and could not be tested. Sufficient sample was not available to provide a replacement specimen.											

5.0. INTERPRETATION OF SUBSURFACE CONDITIONS

5.1. STRATIGRAPHY

Based on the recently-completed subsurface investigation, the generalized subsurface profile at the site includes three primary soil strata overlying bedrock. Stratification was interpreted based on visual-manual description, associated USCS soil types, and split-spoon blow counts for the encountered soil. Laboratory gradation testing was not conducted on soil samples. A general description of the subsurface strata encountered in the borings is presented below, in order of increasing depth below mudline. Please note that the previous B-series borings were not included in the overburden stratigraphy evaluation, as the soil descriptions were not sufficiently detailed and actual recovered soil samples were not available for our review.

The approximate thickness of each interpreted stratum is presented for the FD16-series borings in **Table 2**. Energy corrected N_{60} values for each split spoon sample are presented and summarized in **Table 3**, and the blow counts summarized for each stratum below consist of N_{60} values. Two interpreted subsurface profiles were created showing the encountered soil types and interpreted stratification. The locations of the profiles are shown on **Figure 2**, and the profiles are presented as **Figures 4** and **5**.

5.1.1. GLACIOMARINE CLAY

In two of the FD16-series borings (FD16-04 and -05), approximately 7 to 11 feet of clay was encountered. Based on available geological maps, the clay is interpreted to consist of a glaciomarine deposit mapped as the Presumpscot Formation. The Presumpscot Formation is described as silt, clay and sand deposited on the sea floor, and it is also described as massive to laminated, gray and blue-gray (weathering brown) silt and silty clay that occurs as a blanket deposit over bedrock and older glacial sediments. The Presumpscot Formation may locally contain boulders, sand and gravel[2].

---

[2] Surficial geology descriptions in this report from Surficial Geology Maps by Maine Geological Survey, Open File No. 99-96 (Portsmouth Quadrangle) and Open File No. 99-88 (Kittery Quadrangle).

The glaciomarine clay encountered in the borings was identified as lean clay with sand or gravel (USCS: CL). SPT N_{60}-values ranged from 0 (weight of hammer) to 5, indicating primarily a very soft to soft material. These borings were located in the northern half of the northeast side of the proposed widening area.

5.1.2. GLACIOFLUVIAL/GLACIOMARINE OUTWASH

All ten of the borings encountered a stratified sand/gravel deposit. The encountered thickness of this stratum ranged from approximately 16 to 43 feet. Three borings (FD16-04, -05 and -10) were terminated in this stratum at or below -50 feet MLLW. The bottom of this stratum was at or below the maximum dredge depth of -37 feet MLLW in all but three borings (FD16-02, -07 and -08). This stratum is interpreted to consist of glaciofluvial/glaciomarine outwash. The outwash sand/gravel unit appears to be correlative with on-shore units mapped in Maine as “Marine Regressive Sand Deposits” and is described as massive to stratified and cross-stratified, well-sorted, brown to gray-brown sand.

The predominant soil type identified in the outwash sand/gravel stratum consisted of fine to coarse sand with up to about 10 percent fine gravel and up to about 10 percent silt (USCS: SP, SP-SM, SW). Occasional zones of sand with gravel (USCS: SP, SP-SM), silty sand/silty sand with gravel (USCS: SM) and gravel with sand (USCS: GP, GP-GM) were also encountered within the outwash sand/gravel stratum. SPT N_{60}-values ranged from 3 to 54, indicating a loose to very dense material. Most of the SPT N-values were between 5 and 20 blows per foot (bpf), indicating a primarily loose to medium dense material.

5.1.3. GLACIAL TILL

At seven of the ten borings, approximately 1 to 16 feet of a dense, silty gravel/sand stratum was encountered. Based on our visual identification of the soil and understanding of the regional surficial geology, this material is interpreted to be glacial till. This stratum has been described as a poorly sorted mixture of silt, sand, clay, cobbles and boulders, typically not stratified.

Three borings (FD16-03, -06 and -08) were terminated within the till at or below -50 feet MLLW. The top of the glacial till stratum was at or below the maximum dredge depth of -37 feet in all but three borings (FD16-02, -07 and -08). Glacial till was not encountered in two of the borings (FD16-04 and -05). The elevations of the top of the glacial till stratum above the maximum dredge depth are summarized in the table below.

Test Boring	Top of Glacial Till (feet MLLW)	Bottom of Overburden / Top of Bedrock (feet MLLW)
FD16-02	-28.1	-33.7
FD16-07	-35.7	-40.6
FD16-08	-34.9	-47.9

Figure 3 presents an elevation contour plan for the top of the glacial till based on the FD16-series borings. For borings FD16-04 and -05, the contours are based on a top of glacial till elevation of -50 feet MLLW.

The predominant soil type identified in the glacial till was silty sand with gravel to silty gravel with sand, consisting of varying percentages of sand and gravel and 15 to 30 percent silt (USCS: SM, GM). Less frequent zones of sand, sand with gravel or gravel with sand (USCS: SP, GP) and sandy silt (USCS: ML) were also encountered. The lower 1 to 3 feet of this stratum often contained apparent cobbles and/or boulders based on observed difficulty advancing the roller bit. SPT N-values were between 14 and greater than 100 bpf, indicating a medium dense to very dense material. The gravel content may have artificially increased the resistance of the split-spoon for some of the higher blow count samples.

5.1.4. BEDROCK

Bedrock at the site is mapped as the Eliot Formation bedrock unit of the Merrimack group. The Eliot formation consists of gray to green phyllite, calcareous quartzite, quartz-mica schist, and well-bedded calc-silicate. A basalt dike was noted in the area.

Bedrock was cored in four of the FD16-series test borings (FD16-01, -02, -07 and -09) and one of the B-series borings (B-6). The field classification of the rock encountered in the FD16-series boring was primarily phyllite. After receipt of the petrographic analysis, the bedrock was re-classified as schist. The rock encountered in B-6 was classified as phyllite. The schist and phyllite were generally described as hard, fresh to slightly weathered, fine grained, and gray to dark gray. An approximately 3-foot-thick basalt intrusion was encountered in FD16-07, which was described as hard, fresh to slightly weathered, fine grained, and dark gray.

The bedrock classifications based on petrographic and photo-micrographic descriptions for each boring are presented below:

- FD16-01: Altered carbonate-sericite-quartz Schist
- FD16-02: Altered carbonate-sericite-quartz Schist
- FD16-07 Schist: Altered chlorite-k-feldspar-quartz Schist
- FD16-07 Basalt: Altered Basalt
- FD16-09: Altered carbonate-sericite-quartz Schist

The discontinuities were very close to closely spaced, low to high angle with some vertical joints, planar and smooth, to stepped and rough, fresh to discolored, and tight to open. Discontinuity spacing and characteristics are presented for each core run in **Table 4**.

Only two of the 18 borings drilled in the turning basin widening area encountered bedrock above the maximum dredge depth, including FD16-02 and B-6, where rock was encountered at -33.6 and -30 feet MLLW, respectively. Bedrock cored above the maximum allowable bedrock dredge overdepth (between -30 and -39 feet MLLW) had rock quality designation (RQD) ranging from 0 to 94 percent. The RQD for each rock was calculated in the field. Mechanically-induced breaks were noted and excluded from the RQD calculation. The RQD for a given core run is the total length of the sum of all rock core pieces greater than 4 inches in length divided by the total core run length, expressed as a percentage.

5.1.4.1 ROCK MECHANICS TEST RESULTS

The rock laboratory test reports are presented in **Appendix E** and summarized in **Table 5**. Ranges of laboratory values for key engineering parameters for the encountered bedrock are summarized in the table below:

Laboratory Parameter	Minimum	Maximum	Average
Unconfined Compressive Strength (psi)	3,485	11,187	8,238
Compressive Wave (p-wave) Velocity (ft/sec)	5,926	9,359	7,330
Axial Point Load Index (psi)	264	1,133	651
Correlated Axial Point Load Compressive Strength (psi)	5,390	25,600	13,793
Diametral Point Load Index (psi)	428	650	539
Correlated Diametral Point Load Compressive Strength (psi)	9,810	15,000	12,405
Splitting Tensile Strength (psi)	472	1,800	964
CERCHAR Abrasiveness Classification	Medium	High	Medium
Total Hardness	43.0	55.7	49.0

6.0. CONCLUSIONS

6.1. ASSESSMENT OF SUBSURFACE DATA

6.1.1. PREVIOUS GEOPHYSICAL DATA

The primary findings from the previous geophysical testing conducted previously are briefly summarized below:

- Side Scan Sonar: The scan data were previously interpreted to show either glacial till or sand and gravel river bottom conditions across the turning basin expansion area with some finer grained soil areas closer to the Maine shoreline. Approximately 80 objects were identified to be sitting on the riverbed ranging from approximately 3 to 6 feet in diameter.
- Magnetic Intensity Survey: The survey identified approximately 74 magnetic anomalies within the proposed turning basin expansion area. These anomalies were interpreted by OSI to be man-made debris. Fluctuations were not identified in the background field associated with subsurface geology.
- Subbottom Profiling: In general, the acoustic basement reflector was relatively weak and discontinuous. It appears to GZA that the coarse material and glacial deposits that form the riverbed may have interfered with the signal and thus generated an acoustic basement (i.e., top of bedrock) that was at a higher elevation than what the test borings data has shown.

Based on the results of the test borings conducted at the site, the acoustic bottom elevation contours developed from the results of previous geophysical testing do not appear to represent top of bedrock, as shown on **Figures 4** and **5**, which show the interpreted acoustic basement in relation to the interpreted top of rock. In general, bedrock was encountered below the elevations suggested by the geophysical results. However, the locations of bedrock shown in the feasibility study for the project (indicated on **Figure 2**) are generally consistent with borings in which bedrock was encountered above -50 feet MLLW, as indicated by **Figures 4** and **5**.

The shallowest bedrock encountered in or near the southern area designated as possible rock excavation on **Figure 2** (based on the acoustic basement elevation) was at FD16-07, -40.6 feet MLLW. Five borings and probes within about 350 feet of this location did not encounter bedrock above -40 to -50 feet MLLW. Therefore, it is concluded that rock is unlikely to be encountered in the identified southerly location.

Two borings within the northerly area designated as possible rock excavation on **Figure 2** (based on the acoustic basement elevation) encountered rock at -30 to -33.7 feet MLLW, indicating that up to 7 feet of rock may be encountered above the specified 2-foot overdredge depth. Borings FD16-02 and B-6, the locations of shallowest bedrock, are in the central to southern portion of the northern area identified as possible rock excavation. Two borings drilled in or adjacent to the northern portion of this area (FD-01 and FD-08) encountered rock at -49.4 feet MLLW or did not encounter rock above -50 feet MLLW. Therefore, it is concluded that rock is most likely to be encountered in approximately the southern half of the identified area, and less likely to be encountered in the northern portion of the northern area. The northwest-southeast orientation of the high portion of the acoustic basement that represents the northerly possible rock excavation area has similar orientation with glacial till drumlins mapped on-shore in Maine.

6.1.2. OVERBURDEN

With the exception of the clay stratum encountered at borings FD16-04 and FD16-05 along the northeast side of the proposed turning basin widening area, the predominant overburden material that will be excavated during the planned dredging activities is the Outwash sand/gravel stratum. To a lesser extent, the Glacial Till stratum may be encountered within the lower approximately 1/3 of the middle portion of the planned dredged area. Potential beneficial reuse of overburden soil is described in **Section 6.2** below.

6.2. SEDIMENT REUSE ASSESSMENT

Based on our visual characterization of the soil, the encountered Outwash sand/gravel stratum appears consistent with material encountered, analyzed and tested in the B-series borings. Therefore, the Outwash stratum material would likely be suitable for beneficial reuse for beach nourishment by way of nearshore placement, based on the evaluation criteria outlined in the March 2014 Draft Feasibility Report and Draft Environmental Assessment.

6.3. ROCK REMOVAL ASSESSMENT

GZA utilized the results of bedrock coring (summarized on **Table 4**) and laboratory testing (summarized on **Table 5**) to perform a qualitative rock removal assessment for the Project. Three rock removal assessment methods (i.e., dredgeability, rippability, and excavatability) were utilized to evaluate/predict the difficulty of required rock removal based on the identified conditions[3]. Each of the three assessment methods is discussed below.

6.3.1. DREDGEABILITY

Dredgeability is a rock removal assessment methodology that was developed by Smith (1987)[4]. The methodology is used to analyze the ability to excavate rock underwater with respect to known or assumed equipment, methods and *in-situ* characteristics. This method uses unconfined compressive

---

3 Rock removal assessment methods are described in Bieniawski, Z.T. (1989). "Engineering Rock Mass Classifications: a Complete Manual for Engineers and Geologists in Mining, Civil and Petroleum Engineering." 1 Edition. Wiley-Interscience., Canada. Specific references for each method are provided below.

4 Smith, H.J. (1987). "Estimating the Mechanical Dredgeability of Rock." *Proc. 28th U.S. Symp. Rock Mech.*, A. A. Balkema, Boston.

strength, rock weathering, orientation and joint spacing to assign a “dredgeability” Descriptive Class for different levels of dredging difficulty, as summarized in the table below.

Descriptive Class	Total Rating
Very Easy Ripping	9-19
Easy Ripping	19-37
Average Ripping	37-50
Hard Ripping	50-65
Very Hard Ripping or Blasting	>65

6.3.2. RIPPABILITY

Rippability is a rock removal assessment methodology that was developed by Singh et al (1986)[5]. This methodology was intended to be used as a selection guide for Caterpillar-brand tractor-mounted rippers. This method uses tensile strength, weathering, compressive wave velocity, abrasiveness, and discontinuity spacing to develop a “rippability” class. The five rippability classes are presented in the table below.

Class	Total Rating	Ripping Assessment	Recommended Dozer
Class 1	<30	Easy	Light Duty
Class 2	30-50	Moderate	Medium Duty
Class 3	50-70	Difficult	Heavy Duty
Class 4	70-90	Marginal	Very Heavy Duty
Class 5	>90	Blast	--

6.3.3. EXCAVATABILITY

Excavatability is a rock removal assessment methodology that was developed by Kirstin (1982)[6] based on the Q-system of rock classification developed at the Norwegian Geotechnical Institute and described by Barton et al. (1974)[7]. This method uses unconfined compressive strength in combination with Q-system parameters that are based on the properties of bedrock discontinuities, including number, roughness, and alteration of joints. These parameters are used to develop an “Excavatability Index”, N, which classifies the ease of rock ripping/excavation as summarized in the table below.

Excavatability Index, N	Ease of Ripping
1 < N < 10	Easy ripping
10 < N < 100	Hard ripping
100 < N < 1,000	Very hard ripping
1,000 < N < 10,000	Extremely hard ripping/blasting
N > 10,000	Blasting

6.3.4. ANALYSIS AND RESULTS

GZA independently analyzed each boring in which bedrock was cored using each of the three rock removal methodologies described above to assess the range in ratings. The borings evaluated include

---

5 Singh, R.N. et al. (1986). “Assessment of Ground Rippability in Opencast Mining Operations.” Min. Dept. Mag. Univ. Nottingham.

6 Kirsten, H.A.D. (1982). “A Classification System for Excavation in Natural Materials.” Civ. Eng. S. Afr.

7 Barton, N.R., Lien, R. and Lunde, J. (1974). “Engineering classification of rock masses for the design of tunnel support.” Rock Mech. 6(4), 189-239.

FD16-01, FD16-02, FD16-07, FD16-09 and B-6. The parameters and analyses used for each method and the results are presented in **Table 6**. In general, if velocity or unconfined compressive strength data were not available for the bedrock at a particular boring location, the average value from all of the laboratory tests completed for this Project for that particular parameter was used as a default value.

Additional assumptions were made regarding joint spacing and properties for the previously-completed boring B-6 because such data/core photographs were not available for our use. However, B-6 was considered to be an important data point to our overall evaluation given that its RQD values were typically higher than those recorded from the other borings where bedrock was encountered.

The compiled rock removal assessment results are presented in the table below:

Rock Removal Assessment Method	Range of Results	Rating/Index			Rating/Index Needed for Blasting
		Min	Max	Ave	
Dredgeability	Easy to Average Ripping	33	41	37	>65
Rippability	Class 2 (Moderate) to Class 3 (Difficult)	49	63	57	90
Excavatability	Very Hard ripping to Extremely hard ripping/blasting	142	2,639	1,088	>1,000 to 10,000

The rock removal assessment results indicate that the anticipated rock excavation difficulty is generally near the middle of each classification range at each location. Each of the methodologies generally yielded results which did not predict the need for blasting. The exception was the Q-system-based excavatability assessment, which predicts extremely hard ripping to blasting for two of the five borings, but still does not enter the blasting-only difficulty level.

In GZA's opinion, the rock removal assessment results suggest that the degree of bedrock fracturing at the site is a predictor for increased "ease of dredgeability" and rock removal via blasting does not seem to be a requirement, despite the relatively high laboratory-derived bedrock strength and velocity parameters. However, the areas with more competent bedrock (i.e., higher RQD values) such as at boring B-6, seem to indicate the potential for a localized area(s) where rock removal via blasting or other specialized means may be necessary.

Although the data set is not considered to be extensive, the data suggests the bedrock removal difficulty will increase with depth; however, localized areas with difficult conditions may be encountered near the top of bedrock as evidenced by boring B-6.

Based on GZA's experience with the Eliot formation bedrock in the site vicinity coupled with the boring data from the Project area, the degree of bedrock fracturing will vary significantly over relatively short distances. Therefore, cost, schedule and permitting impacts resulting from areas of difficult rock excavation requiring underwater blasting or other specialized means should be considered.

6.4. DATA GAPS

During the evaluation of the previous and recent data, GZA identified three primary data gaps. In general, the results of the FD16-series test boring program have identified significantly less bedrock within the Project area when compared to the estimates obtained from the previous test borings and geophysical work within the Project area. However, there is a portion of the proposed turning basin widening area with dimensions of approximately 250 by 600 feet (refer to **Figure 2**) in which the available data suggests it is possible that bedrock will be encountered above the required dredging depth over the majority of the area. Because the localized area of potential bedrock excavation is based on only two widely-spaced borings where rock would be encountered above -37 feet MLLW, it is GZA's opinion that the available data is not sufficient to develop reliable top of rock elevation contours and thus is considered to be a data gap.

A second data gap is a conclusive assessment of the typical bedrock fracturing within the Project area. The degree of bedrock fracturing was found to vary considerably across the site, most notably in boring B-6 compared to some of the more fractured rock from the FD16-series borings. Considering the relatively limited rock coring completed in the excavation area and the depth range of interest and the variable degree of bedrock fracturing, there still remains a relatively high degree of uncertainty regarding appropriate rock excavation methodology needed to complete the proposed work. As such, a data gap exists relative to the amount of bedrock data needed to more thoroughly assess the appropriate rock removal methodology for the Project, specifically areas where underwater blasting may be needed.

A third data gap/discrepancy is the linkage between the predicted acoustic basement estimated from the previous geophysical work and the top of bedrock as defined by the recent FD16-series test boring program. The variation between these surfaces is displayed on **Figures 4** and **5**. The previously-defined acoustic basement indicated bedrock/dense soils at elevations both higher and lower than the actual conditions encountered at the FD16-series test boring locations. Thus, there is a data gap/discrepancy between these two sets of subsurface data.

7.0. RECOMMENDATIONS

7.1. ROCK REMOVAL METHODS

When strictly considering the available data, the bedrock within the Project area should be able to be removed via excavation/ripping methods and large scale controlled blasting techniques would not be a necessity. However, considering the likelihood for localized high points in the bedrock surface and rock cut depths generally being less than about 5 feet, localized implementation of specific rock removal techniques such as controlled blasting or long-stick excavators equipped with either hydraulic cutterheads, grinders or pulverizers may be required.

From logistical and economic standpoints, it may be more cost effective to implement a targeted drilling and blasting program through the overburden soils in the area of anticipated high bedrock to improve the understanding of the conditions in these areas as opposed to dealing with them on a case by case manner during construction. Conventional dredging operations could be subsequent to the controlled blasting with a reduced risk of delays. Without the overburden present, shallow bedrock rock cuts are the hardest rock cuts for blasting because charges cannot be placed in the upper portion of the rock due to the potential for "rifling" or loss of the charge from the hole because of the lack of cover. Consequently, deeper drilling and blasting may be needed to safely and effectively remove the rock. Therefore, if blasting is conducted, removal of overburden prior to blasting is not recommended.

If controlled blasting is not performed prior to commencing and completing conventional dredging operations, localized, shallow bedrock cuts will be required to achieve the targeted dredging depths. Some of the shallow bedrock may be able to be ripped as suggested by the results of our rippability/excavatability analyses. However, it is likely that some areas will not be rippable based on unfavorable or limited bedrock jointing/fracturing patterns.

As an alternative to controlled blasting in high bottom areas that cannot be dredged by typical means and methods, the use of rock cutterheads, grinders, or pulverizers mounted on long-stick excavators may be used to efficiently remove relatively shallow bedrock cuts. However, their effectiveness is difficult to predict due to the inherent variability of the bedrock structure and their efficiency is difficult to predict due to the limited available data to delineate the anticipated bedrock removal limits. Typically, such operations are better suited for removal of isolated high knobs and not necessarily for a mass rock cut over a relatively large area.

7.2. ADDITIONAL STUDIES

When considering the results of the FD16-series test borings, the predicted acoustic bottom surface from the previous geophysical work was not found to be consistent with the predicted bedrock surface in all areas, considering that the acoustic bottom was interpreted both above and below the top of rock encountered (or not encountered) at the FD16-series test boring locations. The profile shown on **Figure 4** indicates a reasonably good correlation between top of rock and acoustic bottom in the highest rock area, but this correlation does not exist in other parts of the Project. Consideration should be given to recalibrating the previous geophysical models with the FD16-series boring data to attempt to refine the top of bedrock predictions. The use of multiple assumed velocities for the different sediment/bedrock types identified during the drilling program could improve geophysically-derived depth interpretations. Reprocessing of the previously gathered seismic data could also produce a better signal to noise ratio and thus more useful data. Some supplemental geophysical work may be required to complete the recalibration. However, the overall cost of the exercise, when compared to the anticipated project costs, would be relatively small.

GZA also recommends that preliminary cost estimates be performed using the current data to identify anticipated costs for several rock removal options. These options should include: 1) conventional dredging operations assuming the bedrock is rippable; 2) implementing controlled blasting though the overburden soils in the high bedrock area prior to implementing conventional dredging; and 3) conventional dredging followed by specialized rock removal operations consisting of percussion/grinding methods described previously. If the differential rock removal costs for both Options 2 and 3 are greater than the cost of the FD16-series subsurface exploration program recently completed by GZA, then implementation of supplemental subsurface explorations to obtain more refined the rock removal limits for the Project would seem to be cost effective. However, if the differential rock removal costs for either Option 2 or 3 are less than the cost of the FD16-series subsurface exploration program, than it would be fiscally prudent to move the project into final design without supplemental subsurface explorations.

For preliminary cost estimating, we recommend evaluating assumed average bedrock removal depths ranging from 2 to 5 feet over the entire approximate high bedrock area identified on **Figure 2**. This range represents an average top of rock elevation between -32 and -35 feet MLLW and a maximum excavation depth of -37 feet MLLW.

Depending on the outcome of the preliminary cost estimating, further refinement could be performed to explore potential cost benefits provided by implementing construction phase explorations to refine the rock removal limits along with considerations for various pay items (i.e., unit cost) that would afford the Corps and the selected contractor appropriate means to mitigate financial risks.

7.3. ADDITIONAL SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

If the preliminary cost estimate outlined in **Section 7.2** indicates the rock removal costs are higher than the FD16-series subsurface exploration program, it may be appropriate to conduct a series of supplemental subsurface explorations to better define the limits of the potential high bedrock within the Project area (see **Figure 2**). The design of the supplemental explorations should be performed after or in conjunction with the recalibration of the previous geophysical work completed at the site using the FD16-series boring data. The goal of the supplemental subsurface exploration work will be to increase the number of data points within the Project Area to allow for the development of top of bedrock elevation contours and thus, the anticipated rock removal quantity. The subsurface explorations will also generate additional rock samples which could be tested to provide additional information relative to the rippability/excavatability of the bedrock.

TABLES

Table 1
Summary of Proposed and Actual Boring Locations
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Boring Designation	Proposed Coordinates		As-drilled Coordinates		Distance from Proposed	Original Estimated Mudline EL. (MLLW)	As-drilled Mudline El. (MLLW)	Start Date	Finish Date
	Northing	Easting	Northing	Easting					
FD16-01	104,696.3	2,781,555.2	104,703.5	2,781,553.1	2.4	-14	-15.8	7/20/2016	7/20/2016
FD16-02	104,385.9	2,781,607.7	104,378.8	2,781,613.0	8.8	-11	-12.1	7/28/2016	7/29/2016
FD16-03	104,099.9	2,782,043.8	104,093.8	2,782,047.5	7.1	-4	-3.4	7/15/2016	7/16/2016
FD16-04	104,645.9	2,781,781.0	104,640.1	2,781,787.0	0.3	-16	-18.0	7/21/2016	7/22/2016
FD16-05	104,318.6	2,782,050.4	104,326.8	2,782,036.9	15.3	-16	-16.7	7/13/2016	7/14/2016
FD16-06	103,826.1	2,782,248.9	103,818.2	2,782,256.0	10.5	-15	-14.2	7/22/2016	7/25/2016
FD16-07	103,914.4	2,781,998.5	103,908.7	2,781,997.4	0.1	-10	-12.6	7/25/2016	7/27/2016
FD16-08	104,843.5	2,781,322.5	104,838.4	2,781,322.8	5.7	-16	-18.5	7/19/2016	7/19/2016
FD16-09	103,642.9	2,782,263.3	103,629.6	2,782,265.2	13.6	-10	-12.7	7/27/2016	7/28/2016
FD16-10	103,446.1	2,782,308.0	103,438.2	2,782,320.9	15.1	-14	-9.3	7/14/2016	7/15/2016

Notes:
1. Coordinates are listed in U.S. Feet and reference NAD 83, Maine State Plane West 2000. Elevations are listed in feet and reference Mean Lower Low Water (MLLW) datum.
2. Distance between proposed and as-drilled locations calculated in N-E plane (i.e., elevation change neglected).

Table 2
Subsurface Summary
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Boring Designation	As-drilled Coordinates (1)		Mudline El. (1)	Overburden Strata Thickness (ft) (2,3,4,5)			Total Encountered Overburden Thickness (ft)	Top of Rock El.	Depth of Rock Drilled (ft)	Bottom of Boring El.
	Northing	Easting		Glaciomarine Clay	Glaciofluvial/ Glaciomarine Outwash	Glacial Till				
FD16-01	104,703.5	2,781,553.1	-15.8	0.0	24.7	8.9	33.6	-49.4	4.1	-53.5
FD16-02	104,378.8	2,781,613.0	-12.1	0.0	16.0	5.6	21.6	-33.7	16.4	-50.1
FD16-03	104,093.8	2,782,047.5	-3.4	0.0	43.0	> 4.0	47.0	NE	0.0	-50.4
FD16-04	104,640.1	2,781,787.0	-18.0	10.9 *	> 21.1	NE	32.0	NE	0.0	-50.0
FD16-05	104,326.8	2,782,036.9	-16.7	7.1 *	> 26.9	NE	34.0	NE	0.0	-50.7
FD16-06	103,818.2	2,782,256.0	-14.2	0.0	35.0	> 1.0	36.0	NE	0.0	-50.2
FD16-07	103,908.7	2,781,997.4	-12.6	0.0	23.1	4.9	28.0	-40.6	14.4	-55.0
FD16-08	104,838.4	2,781,322.8	-18.5	0.0	16.4	> 15.6	32.0	NE	0.0	-50.5
FD16-09	103,629.6	2,782,265.2	-12.7	0.0	32.9	2.3	35.2	-47.9	5.0	-52.9
FD16-10	103,438.2	2,782,320.9	-9.3	0.0	> 42.0	NE	42.0	NE	0.0	-51.3
B-1	103,511.5	2,782,522.9	-13.0				27.0	NE	0.0	-40.0
B-2	104,172.3	2,781,786.4	-3.0				37.0	NE	0.0	-40.0
B-3	104,052.6	2,782,268.9	-15.0				27.0	NE	0.0	-42.0
B-4	104,438.4	2,781,783.8	-3.0				37.0	NE	0.0	-40.0
B-5	104,925.0	2,781,460.3	-14.5				27.0	NE	0.0	-41.5
B-6	104,631.0	2,781,500.2	-15.0				15.0	-30.0	12.0	-42.0
B-7	103,985.5	2,781,847.7	-19.0				22.0	NE	0.0	-41.0
B-8	103,732.7	2,782,109.8	-18.0				22.0	NE	0.0	-40.0
P-1	105,013.1	2,781,703.1	-2.0				58.9	-60.9	0.0	-60.9
P-2	103,605.5	2,782,165.0	-15.5				37.0	-52.5	0.0	-52.5
P-3	104,971.2	2,781,345.4	-12.0				49.0	-61.0	0.0	-61.0

Notes:
1. Coordinates are listed in U.S. Feet and reference NAD 83, Maine State Plane West 2000. Elevations are listed in feet and reference Mean Lower Low Water (MLLW) datum.
2. "*" indicates sand layers/lenses above or within Clay stratum were included in the reported thickness.
3. ">" indicates the bottom of the stratum was not encountered and the thickness is greater than the penetrated thickness.
in feet and reference Mean Lower Low Water (MLLW) datum.
4. "NE" indicates stratum was not encountered in the borehole.
5. Thickness of strata not interpreted for B-series borings or P-series probes.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	Elevation (feet MLLW)	Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter (inches)	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7) (blows/ft)	Effective Unit Weight (pcf)	Effective Overburden Pressure (5) (psf)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7) (blows/ft)
Boring FD16-01, Mudline El.		**-15.8**															
S-1	0 - 2	-15.8 - -17.8	Outwash	GP	8	5	5	4	10	3	0.7	1.29	9	61	61	1.70	15
S-2	2 - 4	-17.8 - -19.8	Outwash	SP	5	4	4	3	8	3	0.7	1.29	7	61	183	1.70	12
S-3	4 - 6	-19.8 - -21.8	Outwash	SP	5	3	4	4	7	3	0.7	1.29	6	61	305	1.70	11
S-4	6 - 8	-21.8 - -23.8	Outwash	SP	2	4	7	7	11	3	0.7	1.29	10	61	427	1.70	17
S-5	8 - 10	-23.8 - -25.8	Outwash	SP	7	7	8	9	15	3	0.7	1.29	14	61	549	1.70	23
S-6	10 - 12	-25.8 - -27.8	Outwash	SP	4	5	8	9	13	3	0.7	1.29	12	61	671	1.70	20
S-7	12 - 14	-27.8 - -29.8	Outwash	SP	4	9	11	14	20	3	0.7	1.29	18	61	793	1.63	30
S-8	14 - 16	-29.8 - -31.8	Outwash	SP	3	4	6	6	10	3	0.7	1.29	9	61	915	1.52	14
S-9	16 - 18	-31.8 - -33.8	Outwash	SP	7	8	11	11	19	2	1	1	19	61	1,037	1.43	27
S-10	18 - 20	-33.8 - -35.8	Outwash	SP	5	6	8	7	14	2	1	1	14	61	1,159	1.35	19
S-11	20 - 22	-35.8 - -37.8	Outwash	SP	3	3	6	10	9	2	1	1	9	61	1,281	1.29	12
S-12	22 - 24	-37.8 - -39.8	Outwash	SP	8	12	20	10	32	2	1	1	32	61	1,403	1.23	39
S-13	24 - 26	-39.8 - -41.8	Till	SM	6	5	28	16	33	2	1	1	33	71	1,535	1.17	39
S-14	26 - 28	-41.8 - -43.8	Till	SM	8	11	12	12	23	2	1	1	23	71	1,677	1.12	26
S-15	28 - 30	-43.8 - -45.8	Till	SM	23	15	9	8	24	3	0.7	1.29	22	71	1,819	1.08	23
S-16	30 - 32	-45.8 - -47.8	Till	GM	9	21	47	55	68	3	0.7	1.29	61	71	1,961	1.04	64
S-17	32 - 32.1	-47.8 - -47.9	Till	N/A	R					3	0.7	1.29	-	71	2,036	1.02	-
Boring FD16-02, Mudline El.		**-12.1**															
S-1	0 - 2	-12.1 - -14.1	Outwash	SP	11	9	20	9	29	3	0.7	1.29	26	61	61	1.70	45
S-2	2 - 4	-14.1 - -16.1	Outwash	SP	9	6	6	12	12	3	0.7	1.29	11	61	183	1.70	18
S-3	4 - 6	-16.1 - -18.1	Outwash	SP	8	10	9	9	19	2	1	1	19	61	305	1.70	32
S-4	6 - 8	-18.1 - -20.1	Outwash	GP	10	12	10	15	22	2	1	1	22	61	427	1.70	37
S-5	8 - 10	-20.1 - -22.1	Outwash	GP	9	12	9	6	21	2	1	1	21	61	549	1.70	36
S-6	10 - 12	-22.1 - -24.1	Outwash	SW	4	5	6	7	11	2	1	1	11	61	671	1.70	19
S-7	12 - 14	-24.1 - -26.1	Outwash	SW	7	11	10	9	21	2	1	1	21	61	793	1.63	34
S-8	14 - 16	-26.1 - -28.1	Outwash	SW	8	5	6	11	11	2	1	1	11	61	915	1.52	17
S-9	16 - 18	-28.1 - -30.1	Till	GP	31	37	39	13	76	2	1	1	76	71	1,047	1.42	108
S-10	18 - 20	-30.1 - -32.1	Till	ML	22	51	100	71	151	2	1	1	151	71	1,189	1.33	201
S-11	20 - 20.4	-32.1 - -32.5	Till	GM	R					2	1	1	-	71	1,274	1.29	-

See Notes on page 6 of table.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)			Elevation (feet MLLW)			Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7)	Effective Unit Weight	Effective Overburden Pressure (5)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7)
														inches			blows/ft	pcf	psf		blows/ft
Boring FD16-03, Mudline El.				**-3.4**																	
S-1	0	-	2	-3.4	-	-5.4	Outwash	SP-SM	7	1	4	2	5	3	0.7	1.29	5	61	61	1.70	8
S-2	2	-	4	-5.4	-	-7.4	Outwash	SP	4	6	6	2	12	3	0.7	1.29	11	61	183	1.70	18
S-3	4	-	6	-7.4	-	-9.4	Outwash	SP-SM	10	10	44	21	54	3	0.7	1.29	49	61	305	1.70	83
S-4	6	-	8	-9.4	-	-11.4	Outwash	SM	11	12	14	12	26	3	0.7	1.29	23	61	427	1.70	40
S-5	8	-	10	-11.4	-	-13.4	Outwash	SM	9	8	12	14	20	3	0.7	1.29	18	61	549	1.70	31
S-6	10	-	12	-13.4	-	-15.4	Outwash	SM	11	15	45	18	60	3	0.7	1.29	54	61	671	1.70	92
S-7	12	-	14	-15.4	-	-17.4	Outwash	SM	11	15	15	18	30	3	0.7	1.29	27	61	793	1.63	44
S-8	14	-	16	-17.4	-	-19.4	Outwash	CL	4	3	5	6	8	3	0.7	1.29	7	61	915	1.52	11
S-9	16	-	18	-19.4	-	-21.4	Outwash	SC	3	4	7	8	11	3	0.7	1.29	10	61	1,037	1.43	14
S-10	18	-	18.3	-21.4	-	-21.7	Outwash	SC	R					3	0.7	1.29	-	61	1,107	1.38	-
S-11	21	-	23	-24.4	-	-26.4	Outwash	ML	6	8	16	20	24	3	0.7	1.29	22	61	1,177	1.34	29
S-12	23	-	25	-26.4	-	-28.4	Outwash	GM	7	10	13	9	23	3	0.7	1.29	21	61	1,299	1.28	27
S-13	25	-	27	-28.4	-	-30.4	Outwash	SP	4	5	5	7	10	3	0.7	1.29	9	61	1,421	1.22	11
S-14	27	-	29	-30.4	-	-32.4	Outwash	SP	9	8	10	13	18	3	0.7	1.29	16	61	1,543	1.17	19
S-15	29	-	31	-32.4	-	-34.4	Outwash	SP	11	15	18	20	33	3	0.7	1.29	30	61	1,665	1.13	34
S-16	31	-	33	-34.4	-	-36.4	Outwash	SP	7	11	13	17	24	3	0.7	1.29	22	61	1,787	1.09	24
S-17	33	-	35	-36.4	-	-38.4	Outwash	SP	9	12	15	16	27	3	0.7	1.29	24	61	1,909	1.05	26
S-18	35	-	37	-38.4	-	-40.4	Outwash	SP	7	9	11	13	20	3	0.7	1.29	18	61	2,031	1.02	18
S-19	37	-	39	-40.4	-	-42.4	Outwash	SP	8	12	15	19	27	3	0.7	1.29	24	61	2,153	0.99	24
S-20	39	-	41	-42.4	-	-44.4	Outwash	SP	6	11	19	31	30	2	1	1	30	61	2,275	0.96	29
S-21	41	-	43	-44.4	-	-46.4	Outwash	SP	13	13	17	31	30	2	1	1	30	61	2,397	0.94	28
S-22	43	-	43.4	-46.4	-	-46.8	Till	SM	R					3	0.7	1.29	-	71	2,473	0.93	-
S-23	45	-	47	-48.4	-	-50.4	Till	SP	17	26	45	34	71	3	0.7	1.29	64	71	2,558	0.91	58

See Notes on page 6 of table.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	Elevation (feet MLLW)	Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7)	Effective Unit Weight	Effective Overburden Pressure (5)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7)
										inches			blows/ft	pcf	psf		blows/ft
Boring FD16-04, Mudline El.		**-18.0**															
S-1	0 - 2	-18.0 - -20	Clay	SM	1	1	0	1	1	3	0.7	1.29	1	56	56	1.70	2
S-2	2 - 4	-20 - -22	Clay	CL	1	0	1	1	1	3	0.7	1.29	1	56	168	1.70	2
S-3	4 - 6	-22 - -24	Clay	CL	0	0	0	1	0	3	0.7	1.29	0	56	280	1.70	0
S-4	6 - 8	-24 - -26	Clay	CL	0	0	1	2	1	3	0.7	1.29	1	56	392	1.70	2
S-5	8 - 10	-26 - -28	Clay	CL	0	0	1	2	1	3	0.7	1.29	1	56	504	1.70	2
S-6	10 - 12	-28 - -30	Outwash	SM	0	3	2	3	5	3	0.7	1.29	5	61	621	1.70	8
S-7	12 - 14	-30 - -32	Outwash	SP-SM	2	1	2	3	3	3	0.7	1.29	3	61	743	1.69	5
S-8	14 - 16	-32 - -34	Outwash	SP-SM	2	3	3	4	6	3	0.7	1.29	5	61	865	1.56	8
S-9	16 - 18	-34 - -36	Outwash	N/A	5	3	3	2	6	3	0.7	1.29	5	61	987	1.46	8
S-10	18 - 20	-36 - -38	Outwash	SP	3	3	3	2	6	3	0.7	1.29	5	61	1,109	1.38	7
S-11	20 - 22	-38 - -40	Outwash	SP	4	16	19	28	35	3	0.7	1.29	32	61	1,231	1.31	41
S-12	22 - 24	-40 - -42	Outwash	SP	21	20	25	32	45	2	1	1	45	61	1,353	1.25	56
S-13	24 - 26	-42 - -44	Outwash	SP	7	10	7	9	17	3	0.7	1.29	15	61	1,475	1.20	18
S-14	26 - 28	-44 - -46	Outwash	SP	7	10	12	16	22	2	1	1	22	61	1,597	1.15	25
S-15	28 - 30	-46 - -48	Outwash	SP	5	9	9	18	18	2	1	1	18	61	1,719	1.11	20
S-16	30 - 32	-48 - -50	Outwash	SP	8	9	11	14	20	2	1	1	20	61	1,841	1.07	21
Boring FD16-05, Mudline El.		**-16.7**															
S-1	0 - 2	-16.7 - -18.7	Clay	CL	1	1	1	1	2	3	0.7	1.29	2	56	56	1.70	3
S-2	2 - 4	-18.7 - -20.7	Clay	CL	1	2	2	2	4	3	0.7	1.29	4	56	168	1.70	6
S-3	4 - 6	-20.7 - -22.7	Clay	SM	2	2	2	3	4	3	0.7	1.29	4	56	280	1.70	6
S-4	6 - 8	-22.7 - -24.7	Clay	CL	1	2	4	6	6	3	0.7	1.29	5	56	392	1.70	9
S-5	8 - 10	-24.7 - -26.7	Outwash	SM	4	4	3	2	7	3	0.7	1.29	6	61	509	1.70	11
S-6	10 - 12	-26.7 - -28.7	Outwash	SM	3	2	3	37	5	3	0.7	1.29	5	61	631	1.70	8
S-7	12 - 14	-28.7 - -30.7	Outwash	SP-SM	12	7	12	12	19	3	0.7	1.29	17	61	753	1.68	29
S-8	14 - 16	-30.7 - -32.7	Outwash	SP-SM	12	9	9	14	18	3	0.7	1.29	16	61	875	1.56	25
S-9	16 - 18	-32.7 - -34.7	Outwash	SP-SM	4	7	6	5	13	3	0.7	1.29	12	61	997	1.46	17
S-10	18 - 20	-34.7 - -36.7	Outwash	SP	3	3	3	5	6	3	0.7	1.29	5	61	1,119	1.38	7
S-11	20 - 22	-36.7 - -38.7	Outwash	N/A	6	4	5	6	9	3	0.7	1.29	8	61	1,241	1.31	11
S-12	22 - 24	-38.7 - -40.7	Outwash	N/A	4	4	5	6	9	3	0.7	1.29	8	61	1,363	1.25	10
S-13	24 - 26	-40.7 - -42.7	Outwash	SP	7	4	5	6	9	3	0.7	1.29	8	61	1,485	1.19	10
S-14	26 - 28	-42.7 - -44.7	Outwash	SP	3	4	5	5	9	3	0.7	1.29	8	61	1,607	1.15	9
S-15	28 - 30	-44.7 - -46.7	Outwash	SP	7	6	5	6	11	3	0.7	1.29	10	61	1,729	1.11	11
S-16	30 - 32	-46.7 - -48.7	Outwash	N/A	3	4	8	7	12	3	0.7	1.29	11	61	1,851	1.07	12
S-17	32 - 34	-48.7 - -50.7	Outwash	SP	5	5	10	13	15	3	0.7	1.29	14	61	1,973	1.04	14

See Notes on page 6 of table.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	Elevation (feet MLLW)	Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter (inches)	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7) (blows/ft)	Effective Unit Weight (pcf)	Effective Overburden Pressure (5) (psf)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7) (blows/ft)
Boring FD16-06, Mudline El.	**-14.2**																
S-1	0 - 2	-14.2 - -16.2	Outwash	SM	1	4	9	9	13	3	0.7	1.29	12	61	61	1.70	20
S-2	2 - 4	-16.2 - -18.2	Outwash	SM	9	8	9	9	17	3	0.7	1.29	15	61	183	1.70	26
S-3	4 - 6	-18.2 - -20.2	Outwash	SP	2	3	5	10	8	3	0.7	1.29	7	61	305	1.70	12
S-4	6 - 8	-20.2 - -22.2	Outwash	SP	1	2	5	7	7	2	1	1	7	61	427	1.70	12
S-5	8 - 10	-22.2 - -24.2	Outwash	SP	7	5	6	5	11	2	1	1	11	61	549	1.70	19
S-6	10 - 12	-24.2 - -26.2	Outwash	SP	2	4	4	6	8	2	1	1	8	61	671	1.70	14
S-7	12 - 14	-26.2 - -28.2	Outwash	SP	5	5	6	11	11	2	1	1	11	61	793	1.63	18
S-8	14 - 16	-28.2 - -30.2	Outwash	SP	5	6	5	5	11	2	1	1	11	61	915	1.52	17
S-9	16 - 18	-30.2 - -32.2	Outwash	SP	5	7	7	7	14	2	1	1	14	61	1,037	1.43	20
S-10	18 - 20	-32.2 - -34.2	Outwash	SP	5	6	7	8	13	2	1	1	13	61	1,159	1.35	18
S-11	20 - 22	-34.2 - -36.2	Outwash	SP	4	5	5	7	10	2	1	1	10	61	1,281	1.29	13
S-12	22 - 24	-36.2 - -38.2	Outwash	SP	7	4	5	8	9	2	1	1	9	61	1,403	1.23	11
S-13	24 - 26	-38.2 - -40.2	Outwash	SP	4	6	9	11	15	3	0.7	1.29	14	61	1,525	1.18	16
S-14	26 - 28	-40.2 - -42.2	Outwash	SP	7	9	13	17	22	3	0.7	1.29	20	61	1,647	1.13	23
S-15	28 - 30	-42.2 - -44.2	Outwash	SP	6	8	9	11	17	2	1	1	17	61	1,769	1.09	19
S-16	30 - 32	-44.2 - -46.2	Outwash	SP	9	9	8	11	17	2	1	1	17	61	1,891	1.06	18
S-17	32 - 34	-46.2 - -48.2	Outwash	SP	4	6	5	5	11	2	1	1	11	61	2,013	1.03	11
S-18	34 - 36	-48.2 - -50.2	Outwash	SP	10	6	6	18	12	2	1	1	12	61	2,135	1.00	12
Boring FD16-07, Mudline El.	**-12.6**																
S-1	0 - 2	-12.6 - -14.6	Outwash	SP-SM	2	1	3	1	4	3	0.7	1.29	4	61	61	1.70	6
S-2	2 - 4	-14.6 - -16.6	Outwash	SP	3	3	4	3	7	3	0.7	1.29	6	61	183	1.70	11
S-3	4 - 6	-16.6 - -18.6	Outwash	SP	8	5	5	8	10	3	0.7	1.29	9	61	305	1.70	15
S-4	6 - 8	-18.6 - -20.6	Outwash	SP	7	8	9	8	17	3	0.7	1.29	15	61	427	1.70	26
S-5	8 - 10	-20.6 - -22.6	Outwash	SP	11	17	17	17	34	3	0.7	1.29	31	61	549	1.70	52
S-6	10 - 12	-22.6 - -24.6	Outwash	GP	10	11	13	17	24	3	0.7	1.29	22	61	671	1.70	37
S-7	12 - 14	-24.6 - -26.6	Outwash	GP	10	10	9	7	19	3	0.7	1.29	17	61	793	1.63	28
S-8	14 - 16	-26.6 - -28.6	Outwash	SP	5	5	6	8	11	3	0.7	1.29	10	61	915	1.52	15
S-9	16 - 18	-28.6 - -30.6	Outwash	SP	6	9	10	9	19	3	0.7	1.29	17	61	1,037	1.43	25
S-10	18 - 20	-30.6 - -32.6	Outwash	SP	10	11	14	14	25	2	1	1	25	61	1,159	1.35	34
S-11	20 - 22	-32.6 - -34.6	Outwash	SM	12	29	13	11	42	2	1	1	42	61	1,281	1.29	54
S-12	22 - 24	-34.6 - -36.6	Outwash	SP	13	11	12	15	23	2	1	1	23	61	1,403	1.23	28
S-13	24 - 26	-36.6 - -38.6	Till	GM	11	10	8	18	18	3	0.7	1.29	16	71	1,535	1.17	19
S-14	26 - 26.8	-38.6 - -39.4	Till	GP-GM	49	R				3	0.7	1.29	-	71	1,634	1.14	-

See Notes on page 6 of table.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	Elevation (feet MLLW)	Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7)	Effective Unit Weight	Effective Overburden Pressure (5)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7)
										inches			blows/ft	pcf	psf		blows/ft
Boring FD16-08, Mudline El.		**-18.5**															
S-1	0 - 2	-18.5 - -20.5	Outwash	SP	7	4	3	4	7	3	0.7	1.29	6	61	61	1.70	11
S-2	2 - 4	-20.5 - -22.5	Outwash	SP	12	8	8	7	16	3	0.7	1.29	14	61	183	1.70	25
S-3	4 - 6	-22.5 - -24.5	Outwash	GP	3	2	1	2	3	3	0.7	1.29	3	61	305	1.70	5
S-4	6 - 8	-24.5 - -26.5	Outwash	SP	0	5	14	25	19	3	0.7	1.29	17	61	427	1.70	29
S-5	8 - 10	-26.5 - -28.5	Outwash	GM	9	13	17	10	30	3	0.7	1.29	27	61	549	1.70	46
S-6	10 - 12	-28.5 - -30.5	Outwash	SP	3	4	5	8	9	3	0.7	1.29	8	61	671	1.70	14
S-7	12 - 14	-30.5 - -32.5	Outwash	SP	7	6	8	9	14	3	0.7	1.29	13	61	793	1.63	21
S-8	14 - 16	-32.5 - -34.5	Outwash	SP	5	8	9	11	17	3	0.7	1.29	15	61	915	1.52	23
S-9	16 - 18	-34.5 - -36.5	Till	ML	7	16	29	39	45	3	0.7	1.29	41	71	1,047	1.42	58
S-10	18 - 20	-36.5 - -38.5	Till	SM	40	49	37	32	86	3	0.7	1.29	78	71	1,189	1.33	104
S-11	20 - 22	-38.5 - -40.5	Till	SP-SM	15	9	7	8	16	3	0.7	1.29	14	71	1,331	1.26	18
S-12	22 - 24	-40.5 - -42.5	Till	GM	13	15	12	27	27	3	0.7	1.29	24	71	1,473	1.20	29
S-13	24 - 26	-42.5 - -44.5	Till	GM	22	15	12	27	27	3	0.7	1.29	24	71	1,615	1.14	28
S-14	26 - 28	-44.5 - -46.5	Till	GM	22	17	15	11	32	3	0.7	1.29	29	71	1,757	1.10	32
S-15	28 - 30	-46.5 - -48.5	Till	SM	10	9	7	10	16	3	0.7	1.29	14	71	1,899	1.06	15
S-16	30 - 32	-48.5 - -50.5	Till	SM	6	12	27	70	39	3	0.7	1.29	35	71	2,041	1.02	36
Boring FD16-09, Mudline El.		**-12.7**															
S-1	0 - 2	-12.7 - -14.7	Outwash	SP	1	2	1	2	3	3	0.7	1.29	3	61	61	1.70	5
S-2	2 - 4	-14.7 - -16.7	Outwash	SP	3	4	5	5	9	3	0.7	1.29	8	61	183	1.70	14
S-3	4 - 6	-16.7 - -18.7	Outwash	SP	4	6	10	8	16	3	0.7	1.29	14	61	305	1.70	25
S-4	6 - 8	-18.7 - -20.7	Outwash	SP	3	2	3	4	5	3	0.7	1.29	5	61	427	1.70	8
S-5	8 - 10	-20.7 - -22.7	Outwash	SP	4	4	5	6	9	3	0.7	1.29	8	61	549	1.70	14
S-6	10 - 12	-22.7 - -24.7	Outwash	SP	3	4	6	6	10	3	0.7	1.29	9	61	671	1.70	15
S-7	12 - 14	-24.7 - -26.7	Outwash	SP	3	5	7	7	12	3	0.7	1.29	11	61	793	1.63	18
S-8	14 - 16	-26.7 - -28.7	Outwash	SP	6	6	7	8	13	3	0.7	1.29	12	61	915	1.52	18
S-9	16 - 18	-28.7 - -30.7	Outwash	SP	4	4	5	7	9	3	0.7	1.29	8	61	1,037	1.43	12
S-10	18 - 20	-30.7 - -32.7	Outwash	SP	7	9	14	15	23	2	1	1	23	61	1,159	1.35	31
S-11	20 - 22	-32.7 - -34.7	Outwash	SP	3	6	7	9	13	2	1	1	13	61	1,281	1.29	17
S-12	22 - 24	-34.7 - -36.7	Outwash	SP	5	9	9	13	18	2	1	1	18	61	1,403	1.23	22
S-13	24 - 26	-36.7 - -38.7	Outwash	SP	7	12	14	26	26	2	1	1	26	61	1,525	1.18	31
S-14	26 - 28	-38.7 - -40.7	Outwash	SP	9	8	10	14	18	2	1	1	18	61	1,647	1.13	20
S-15	28 - 30	-40.7 - -42.7	Outwash	SP	9	8	11	14	19	2	1	1	19	61	1,769	1.09	21
S-16	30 - 32	-42.7 - -44.7	Outwash	SP	4	8	10	20	18	2	1	1	18	61	1,891	1.06	19
S-17	32 - 34	-44.7 - -46.7	Till	SM	8	22	18	16	40	2	1	1	40	71	2,023	1.02	41
S-18	34 - 35.2	-46.7 - -47.9	Till	SM	8	35	R			2	1	1	-	71	2,137	1.00	-

See Notes on page 6 of table.

Table 3
Summary of Split Spoon Blow Counts
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	Elevation (feet MLLW)	Geologic Stratum	USCS Symbol	Recorded Blows per 6 inches				Field "N" (1)	Sampler Outside Diameter (inches)	Sampling System Conversion Factor (2)	Hammer Energy Conversion Factor (3)	Energy Corrected SPT N60 value (4,7) (blows/ft)	Effective Unit Weight (pcf)	Effective Overburden Pressure (5) (psf)	Overburden Correction Factor, Cn	Overburden Corrected SPT N160 value (6,7) (blows/ft)
Boring FD16-10, Mudline El.		**-9.3**															
S-1	0 - 2	-9.3 - -11.3	Outwash	GP	8	4	2	2	6	3	0.7	1.29	5	61	61	1.70	9
S-2	2 - 4	-11.3 - -13.3	Outwash	GP	8	7	9	7	16	3	0.7	1.29	14	61	183	1.70	25
S-3	4 - 6	-13.3 - -15.3	Outwash	N/A	6	6	5	6	11	3	0.7	1.29	10	61	305	1.70	17
S-4	5 - 7	-14.3 - -16.3	Outwash	GP	7	5	4	4	9	3	0.7	1.29	8	61	427	1.70	14
S-5	6 - 8	-15.3 - -17.3	Outwash	SP	14	6	5	5	11	3	0.7	1.29	10	61	549	1.70	17
S-6	7 - 9	-16.3 - -18.3	Outwash	GP	6	8	8	8	16	3	0.7	1.29	14	61	671	1.70	25
S-7	8 - 10	-17.3 - -19.3	Outwash	GP	12	7	4	4	11	3	0.7	1.29	10	61	793	1.63	16
S-8	9 - 11	-18.3 - -20.3	Outwash	SP	5	3	6	13	9	3	0.7	1.29	8	61	915	1.52	12
S-9	10 - 12	-19.3 - -21.3	Outwash	SP	8	9	7	9	16	3	0.7	1.29	14	61	1,037	1.43	21
S-10	11 - 13	-20.3 - -22.3	Outwash	SP	11	9	4	7	13	3	0.7	1.29	12	61	1,159	1.35	16
S-11	12 - 14	-21.3 - -23.3	Outwash	GP	9	7	7	7	14	3	0.7	1.29	13	61	1,281	1.29	16
S-12	13 - 15	-22.3 - -24.3	Outwash	GP	8	9	6	8	15	3	0.7	1.29	14	61	1,403	1.23	17
S-13	14 - 16	-23.3 - -25.3	Outwash	SW	11	7	6	7	13	3	0.7	1.29	12	61	1,525	1.18	14
S-14	15 - 17	-24.3 - -26.3	Outwash	SW	9	8	9	8	17	3	0.7	1.29	15	61	1,647	1.13	17
S-15	16 - 18	-25.3 - -27.3	Outwash	SW	9	10	12	13	22	3	0.7	1.29	20	61	1,769	1.09	22
S-16	17 - 19	-26.3 - -28.3	Outwash	GP	9	14	17	11	31	3	0.7	1.29	28	61	1,891	1.06	30
S-17	18 - 20	-27.3 - -29.3	Outwash	GP	11	21	15	16	36	3	0.7	1.29	33	61	2,013	1.03	33
S-18	19 - 21	-28.3 - -30.3	Outwash	GP	28	16	16	13	32	3	0.7	1.29	29	61	2,135	1.00	29
S-19	20 - 22	-29.3 - -31.3	Outwash	GP	14	23	13	10	36	3	0.7	1.29	33	61	2,257	0.97	31
S-20	21 - 23	-30.3 - -32.3	Outwash	GP	6	5	6	8	11	3	0.7	1.29	10	61	2,379	0.94	9
S-21	22 - 24	-31.3 - -33.3	Outwash	SP	8	16	19	20	35	3	0.7	1.29	32	61	2,501	0.92	29

Notes:
1. Field "N" consists of the sum of blows to drive the split spoon from 6 to 18 inches below ground. This does not represent an SPT N-value for a 3" OD spoon.
2. Sampling system conversion factor is based on a net area ratio calculation and results in a blow count reduction for a sampler larger than 2" OD.
3. Hammer energy conversion factor is based on the hammer weight multiplied by drop height of the hammer and results in a blow count increase for the 300 lb hammer and 18" drop.
4. Energy corrected N60 is calculated by multiplying the sum of blow counts between 6 and 18 inches of spoon penetration by the sampling system and hammer energy conversion factors.
5. Overburden correction factor is the square root of the ratio of atmospheric pressure over the effective overburden pressure, limited to a maximum of 1.7.
6. Overburden corrected N160 is calculated by multiplying N60 by Cn.
7. Calculated N60 and N160 values are rounded to the nearest integer blow/ft value.
8. blows/ft=hammer blows per foot, pcf=pounds per cubic foot, psf=pounds per squarefoot

Table 4
Summary of Bedrock Cores
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Boring	Run	Mudline Elevation (MLLW)	Depth of Core Run below ML (ft)			Depth to Rock (ft)	Depth (ft) Below Top of Rock			Length of Core Run (in)	Rec (in)	Rec (%)	RQD (in)	RQD %	Joint Spacing Desc.	Corr. Spacing (in)	Aperture Desc.	Corr. Aperture (in)	Elev. (ft MLLW)		Rock Type
			Top		Bottom		Top		Bottom										Top	Bottom	
FD16-01	C-1	-15.8	34.2	-	37.7	34.2	0.0	-	3.5	42	42	100%	22	52%	Very Close to Close	.75 to 8 in.	Tight to Open	0.004 - 0.1 in.	-50.0	-53.5	Schist
RECOVERY TOTAL, FD16-01										**42**	**42**	**100%**									
FD16-02	C-1	-12.1	22.0	-	26.5	21.6	0.4	-	4.9	54	38	70%	0	0%	Very Close to Close	.75 to 8 in.	Partially Open to Open	0.01 - 0.1 in.	-34.1	-38.6	Schist
FD16-02	C-2	-12.1	26.5	-	30.0	21.6	4.9	-	8.4	42	42	100%	20	48%	Very Close to Moderate	.75 to 24 in.	Tight to Open	0.004 - 0.1 in.	-38.6	-42.1	Schist
FD16-02	C-3	-12.1	30.0	-	35.0	21.6	8.4	-	13.4	60	60	100%	44	73%	Very Close to Moderate	.75 to 24 in.	Partially Open to Open	0.01 - 0.1 in.	-42.1	-47.1	Schist
FD16-02	C-4	-12.1	35.0	-	38.0	21.6	13.4	-	16.4	36	36	100%	21	58%	Very Close to Close	.75 to 8 in.	Tight to Partially Open	0.004 - 0.02 in.	-47.1	-50.1	Schist
RECOVERY TOTAL, FD16-02										**192**	**176**	**92%**									
FD16-07	C-1	-12.6	28.0	-	29.3	28.0	0.0	-	1.3	16	15	94%	0	0%	Very Close	.75 to 2.5 in.	Partially Open	0.01 - 0.02 in.	-40.6	-41.9	Schist
FD16-07	C-2	-12.6	29.3	-	31.7	28.0	1.3	-	3.7	28	19	68%	0	0%	Very Close to Close	.75 to 8 in.	Tight to Partially Open	0.004 - 0.02 in.	-41.9	-44.3	Schist/Basalt
FD16-07	C-3	-12.6	31.7	-	32.7	28.0	3.7	-	4.7	12	12	100%	0	0%	Extremely Close to Very Close	Less than .75. to 2.5 in.	Open	0.02 - 0.1 in.	-44.3	-45.3	Schist
FD16-07	C-4	-12.6	32.7	-	34.7	28.0	4.7	-	6.7	24	24	100%	0	0%	Very Close to Close	.75 to 8 in.	Tight to Partially Open	0.004 - 0.02 in.	-45.3	-47.3	Schist
FD16-07	C-5	-12.6	34.7	-	37.3	28.0	6.7	-	9.3	31	31	100%	0	0%	Very Close to Close	.75 to 8 in.	Tight to Partially Open	0.004 - 0.02 in.	-47.3	-49.9	Schist/Basalt
FD16-07	C-6	-12.6	37.3	-	39.5	28.0	9.3	-	11.5	26	26	100%	0	0%	Very Close to Close	.75 to 8 in.	Tight to Partially Open	0.004 - 0.02 in.	-49.9	-52.1	Schist
FD16-07	C-7	-12.6	39.5	-	42.4	28.0	11.5	-	14.4	35	35	100%	8	23%	Very Close to Close	.75 to 8 in.	Tight to Open	0.004 - 0.1 in.	-52.1	-55.0	Schist
RECOVERY TOTAL, FD16-07										**172**	**162**	**94%**									
FD16-09	C-1	-12.7	36.2	-	40.2	35.2	1.0	-	5.0	48	40	83%	13	27%	Very Close to Close	.75 to 8 in.	Tight to Open	0.004 - 0.1 in.	-48.9	-52.9	Schist
						RECOVERY TOTAL, FD16-09				**48**	**40**	**83%**									
B-6	C-1	-15.0	18.0	-	23.0	18.0	0.0	-	5.0	60	60	100%	55	92%	--	--	--	--	-33.0	-38.0	Phyllite
B-6	C-2	-15.0	23.0	-	28.0	18.0	5.0	-	10.0	60	60	100%	56	94%	--	--	--	--	-38.0	-43.0	Phyllite
RECOVERY TOTAL, B-6										**120**	**120**	**100%**									

Table 5
Summary of Bedrock Laboratory Test Results
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Sample	Depth (feet)	ISRM Method 3			Elastic Moduli in Uniaxial Compression (ASTM D 7012D) (1)			Pulse Velocity and Ultrasonic Elastic Constants (ASTM D 2845)					Point Load Index (ASTM D 5731) (5)				Splitting Tensile Strength (ASTM D 3967) (2)	CERCHAR Abrasivity (ASTM D 7625)			Hardness (Tarkoy)		
		Average Dry Unit Weight (ISRM)	Average Bulk Specific Gravity	Average Porosity	Unconfined Compressive Strength	Youngs Modulus, $E_{T,50}$	Poisson's Ratio	Bulk Unit Weight	P-Wave Velocity, Axial	S-Wave Velocity, Axial	Youngs Modulus, E	Poisson's Ratio	Is (50mm), Axial	Correlated Compressive Strength, Axial (3)	Is (50mm), Diametral	Correlated Compressive Strength, Diametral (4)		Average CERCHAR index for smooth surface (CAIs)	Average CERCHAR index for natural surface (CAI*)	Abrasiveness Index Classification	Schmidt (Hr)	Modified Tabor Abrasion (Ha)	Total (Ht) (6)
		pcf			psi	ksi		pcf	ft/sec	ft/sec	ksi		psi	psi	psi	psi	psi						
Boring FD16-01																							
C-1	34.2-34.4	--	--	--	--	--	--	--	--	--	--	--	752	15,700	--	--	--	--	--	--	--	--	--
C-1	34.4-34.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,270	1.09	1.56	Medium	--	--	--
C-1	35.21-35.57	--	--	--	11,187	4,810	0.46	167	6,923	4,761	1.72	0.05	--	--	--	--	--	--	--	--	--	--	--
C-1	36.0-36.4	--	--	--	--	--	--	--	--	--	--	--	--	--	BS	BS	--	--	--	--	--	--	--
C-1	37.0-37.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.93	1.4	Medium	--	--	--
C-1	37.4-37.7	--	--	--	--	--	--	--	--	--	--	--	810	16,900	--	--	1,520	--	--	--	--	--	--
C-1	34.2-37.7	170	2.73	0.014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boring FD16-02																							
C-1	22.2-22.4	--	--	--	--	--	--	--	--	--	--	--	*	*	--	--	--	--	--	--	--	--	--
C-2	26.85-27.23	--	--	--	3,485	1,860	0.30	165	7,111	5,433	1.68	0.20	--	--	--	--	--	--	--	--	--	--	--
C-2	27.5-28.4	--	--	--	--	--	--	--	--	--	--	--	264	5,390	428	9,810	706	1.75	2.21	High	--	--	--
C-3	30.0-30.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.45	1.92	Medium	--	--	--
C-3	30.41-30.78	--	--	--	10,042	2,010	0.20	164	9,359	5,802	2.83	0.19	--	--	--	--	--	--	--	--	--	--	--
C-3	30.8-31.4	166	2.66	0.033	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C-3	31.4-32.1	--	--	--	--	--	--	--	--	--	--	--	593	12,000	--	--	599	--	--	--	--	--	--
C-3	32.8-33.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.9	2.062	43.0
C-3	34.6-35.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	796	--	--	--	--	--	--
C-4	35.0-35.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.9	2.410	55.7
C-4	35.7-36.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.06	1.53	Medium	--	--	--
C-4	36.1-36.4	--	--	--	--	--	--	--	--	--	--	--	--	--	*	*	--	--	--	--	--	--	--
Boring FD16-07																							
C-2	29.9-30.1	--	--	--	--	--	--	--	--	--	--	--	--	--	*	*	--	--	--	--	--	--	--
C-5	34.7-35.1	--	--	--	--	--	--	--	--	--	--	--	1133	25,600	--	--	--	--	--	--	--	--	--
C-7	41.0-41.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	548	1.66	2.12	High	--	--	--
C-7	41.6-42.1	--	--	--	--	--	--	--	--	--	--	--	353	7,170	--	--	472	1.19	1.66	Medium	--	--	--
Basalt	31.7-35.9	173	2.77	0.003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phyllite	28.6-40.7	168	2.71	0.011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boring FD16-09																							
C-1	36.2-36.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,800	--	--	--	--	--	--
C-1	37.5-37.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.48	1.95	Medium	--	--	--
C-1	37.9-38.2	--	--	--	--	--	--	--	--	--	--	--	BS	BS	--	--	--	--	--	--	--	--	--
C-1	38.3-38.6	--	--	--	--	--	--	--	--	--	--	--	--	--	650	15,000	--	--	--	--	--	--	--
C-1	38.8-39.4	--	--	--	BS	--	--	167	5,926	3,337	1.01	0.27	*	*	--	--	--	--	--	--	--	--	--
C-1	36.2-39.5	164	2.63	0.015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

1. Young's modulus and Poisson's ratio reported for the unconfined compressive strength test correspond to values at approximately 50% of the rock strength. Values at lower and higher stress levels are provided in the laboratory reports.
2. Splitting tensile strength test was conducted at a strain rate of 2.5% per minute.
3. A generalized correction factor, K, of 19 was used to develop the correlated unconfined compressive strength for axial point load testing in accordance with ASTM D5731 Table 1.
4. A generalized correction factor, K, of 23 was used to develop the correlated unconfined compressive strength for diametral point load testing in accordance with ASTM D5731 Table 1.
5. "*" indicates invalid test, specimen did not fail from point to point.
6. Total Hardness (Ht) calculated using the equation: $Ht = Hr \times (Ha)^{0.5}$
7. pcf=pounds per cubic foot, psi=pounds per square inch, ksi=kips per square inch, ft/sec=feet per second

Table 6
Bedrock Excavatability Evaluation
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Dredgeability Assessment Items	**Ratings by Boring (based on average values of parameters by boring)**				
Boring	**FD16-01**	**FD16-02**	**FD16-07**	**FD16-09**	**B-6 (2007)**
Rock Hardness (psi)	11,187	6,764	8,238	8,238	8,238
Rating	**10.0**	**7.4**	**8.5**	**8.5**	**8.5**
Rock Weathering	Slight/Unweathered	Slight/Unweathered	Slight/Unweathered	Slight/Unweathered	Slight/Unweathered
Rating	**9**	**9**	**9**	**9**	**9**
Orientation	Slightly Unfavorable	Slightly Unfavorable	Slightly Unfavorable	Slightly Unfavorable	Slightly Unfavorable
Rating	**10**	**10**	**10**	**10**	**10**
Joint Spacing (Upper 5')	0.5 to 5	0.5 to 3	0.5 to 2	1 to 5	3 to 12
Rating	**10**	**7**	**5**	**10**	**13**
Total	39	33	33	38	41
Difficulty	Average Ripping	Easy Ripping	Easy Ripping	Average Ripping	Average Ripping

Notes:
1. Green highlight indicates no boring specific data available. Value is the average of test results from other borings onsite.
2.Unconfined compressive strength test results used for hardness.
3. Ratings are linearly interpolated using ranges in Table 9.7 for rock hardness.

	Very Easy Ripping			**Easy Ripping**			**Average Ripping**			**Hard Ripping**			**Very Hard Ripping or Blasting**		
Rock Hardness (psi)		<	435	435	-	1450	1450	-	3625	3625	-	10150	10150	<	
Rating	**0**	-	**1**	**1**	-	**2**	**2**	-	**5**	**5**	-	**10**	**10**		
Rock Weathering	Completely Weathered			Highly Weathered			Weathered			Slightly Weathered			Unweathered		
Rating	**1**	-	**3**	**3**	-	**5**	**5**	-	**7**	**7**	-	**10**	**10**		
Orientation	Very Favorable			Favorable			Slightly Unfavorable			Unfavorable			Very Unfavorable		
Rating	**3**	-	**5**	**5**	-	**10**	**10**	-	**13**	**13**	-	**15**	**15**		
Joint Spacing (D=60 in)		<	3	3	-	20	20	-	60	60	-	180	180		
Rating	**5**	-	**10**	**10**	-	**20**	**20**	-	**25**	**25**	-	**30**	**30**		
Total Rating	**9**	-	**19**	**19**	-	**37**	**37**	-	**50**	**50**	-	**65**	**65**		

Table 9.7 Underwater Rippability/Dredgeability Rating Chart (from Bieniawski, 1989, "Engineering Rock Mass Classifications", after Smith, 1987)

Rippability Assessment Items	**Ratings by Boring (based on average values of parameters by boring)**				
Boring	**FD16-01**	**FD16-02**	**FD16-07**	**FD16-09**	**B-6 (2007)**
Uniaxial Tensile Strength (psi)	1,395	700	510	1,800	1,800
Rating	**10.6**	**5.8**	**4.5**	**12.4**	**12.4**
Weathering	Slight/None	Slight/None	Slight/None	Slight/None	Slight/None
Rating	**14**	**14**	**14**	**14**	**14**
Velocity (ft/sec)	6,923	8,235	7,330	5,926	7,330
Rating	**15.4**	**18.1**	**14.9**	**12.8**	**14.9**
Abrasiveness (CAI)	Moderate	Moderate	Moderate	Moderate	Moderate
Rating	**9**	**12**	**13**	**12**	**12**
Discontinuity Spacing (in)	0.75 to 6	0.75 to 8	0.5 to 3	0.75 to 5	3 to 12
RQD	52%	24%	0%	27%	93%
Rating	**7**	**7**	**3**	**7**	**10**
Total Rating	**56.0**	**57.0**	**49.4**	**58.2**	**63.3**
Ripping Assessment	CLASS 3	CLASS 3	CLASS 2	CLASS 3	CLASS 3
Difficulty	Difficult	Difficult	Moderate	Difficult	Difficult
Equipment Recommended	Heavy Duty	Heavy Duty	Medium Duty	Heavy Duty	Heavy Duty

Notes:
1. Green highlight indicates no boring specific data available. Value is the average of test results from other borings onsite.
2. Splitting tensile strength test results used for uniaxial tensile strength.
3. p-wave velocity results used for velocity.
4. Ratings are linearly interpolated using ranges in Table 9.6 for uniaxial tensile strength and velocity.
5. Average RQD in upper 10' of cored rock used for RQD.

	Class 1			**Class 2**			**Class 3**			**Class 4**			**Class 5**		
Uniaxial Tensile Strength (psi)		<	290	290	-	870	870	-	1450	1450	-	2175	2175	<	
Rating	**0**	-	**3**	**3**	-	**7**	**7**	-	**11**	**11**	-	**14**	**14**	-	**17**
Weathering	Complete			Highly			Moderate			Slight			None		
Rating	**0**	-	**2**	**2**	-	**6**	**6**	-	**10**	**10**	-	**14**	**14**	-	**18**
Velocity (ft/sec)	1312	-	3608	3608	-	5248	5248	-	6232	6232	-	8200	8200	<	
Rating	**0**	-	**6**	**6**	-	**10**	**10**	-	**14**	**14**	-	**18**	**18**	-	**25**
Abrasiveness	Very Low			Low			Moderate			High			Extreme		
Rating	**0**	-	**5**	**5**	-	**9**	**9**	-	**13**	**13**	-	**18**	**18**	-	**22**
Discontinuity Spacing (in)		<	2.4	2.4	-	12	12	-	40	40	-	79.2	79.2	<	
Rating	**0**	-	**7**	**7**	-	**15**	**15**	-	**22**	**22**	-	**28**	**28**	-	**33**
Total Rating			**30**	**30**	-	**50**	**50**	-	**70**	**70**	-	**90**	**90**	<	
Ripping Assessment	Easy			Moderate			Difficult			Marginal			Blast		
Equipment Recommended	Light Duty			Medium Duty			Heavy Duty			Very Heavy Duty			---		

Table 9.6 Rippability (from Bieniawski, 1989, "Engineering Rock Mass Classifications", after Singh, 1987)

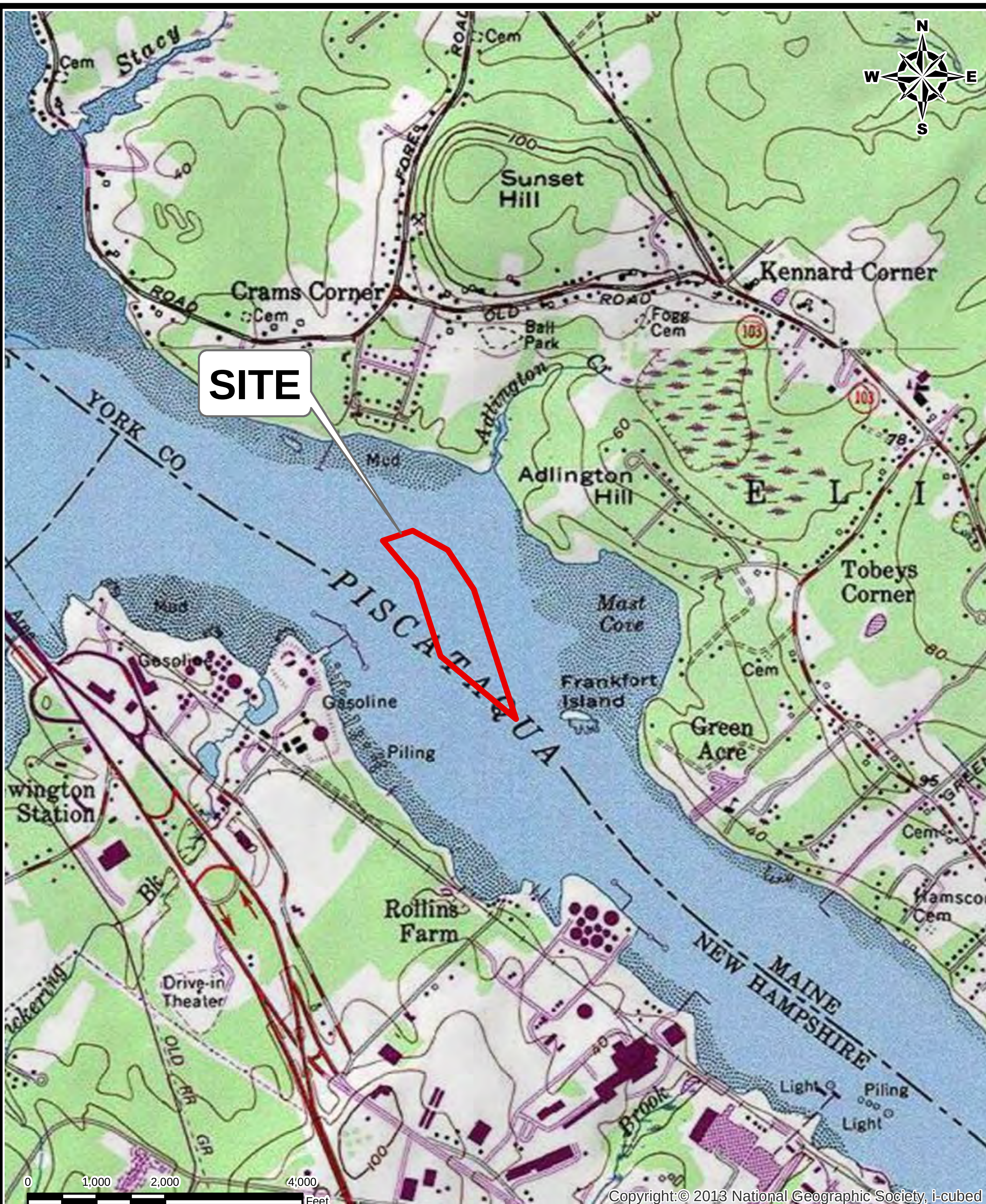
Q-System Items for Excavatability	**Ratings by Boring (based on average values of parameters by boring)**				
Boring	**FD16-01**	**FD16-02**	**FD16-07**	**FD16-09**	**B-6 (2007)**
Ms (UCS in Mpa)	77.1	46.6	56.8	56.8	56.8
RQD	52	24	10	27	93
Rating for Number of Joint Sets, Jn	One Plus Random	Two Plus Random	Two Plus Random	Two Plus Random	Two Plus Random
Rating	**3**	**6**	**6**	**6**	**6**
Rating for Roughness of Joint Set, Jr	Planar/Smooth	Rough/Undulating	Planar/Rough	Rough/Undulating	Rough/Undulating
Rating	**1**	**3**	**1.5**	**3**	**3**
Rating for Alteration of Joint Set, Ja	Fresh	Fresh	Fresh to Discolored	Fresh	Discolored
Rating	**1**	**1**	**1**	**1**	**1**
Relative Ground Structure Number, Js	Intact	Intact	Intact	Intact	Intact
Rating	**1**	**1**	**1**	**1**	**1**
N	1,336	559	142	766	2,639
Difficulty	Extremely Hard	Very Hard	Hard	Very Hard	Extremely Hard

Notes:
1. Green highlight indicates no boring specific data available. Value is the average of test results from other borings onsite.
2. Blue highlight indicates minimum value used in Q-System rating.
3. Q-system parameters developed in accordance with Hutchinson and Diederichs, 1996).

1 < N < 10	Easy ripping
10 < N < 100	Hard ripping
100 < N < 1,000	Very hard ripping
1,000 < N < 10,000	Extremely hard ripping/blasting
N > 10,000	Blasting

Ease of Excavation based on Excavatability Index, N (from Bieniawski, 1989, "Engineering Rock Mass Classifications")

FIGURES



SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED DECEMBER 12, 2009 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS

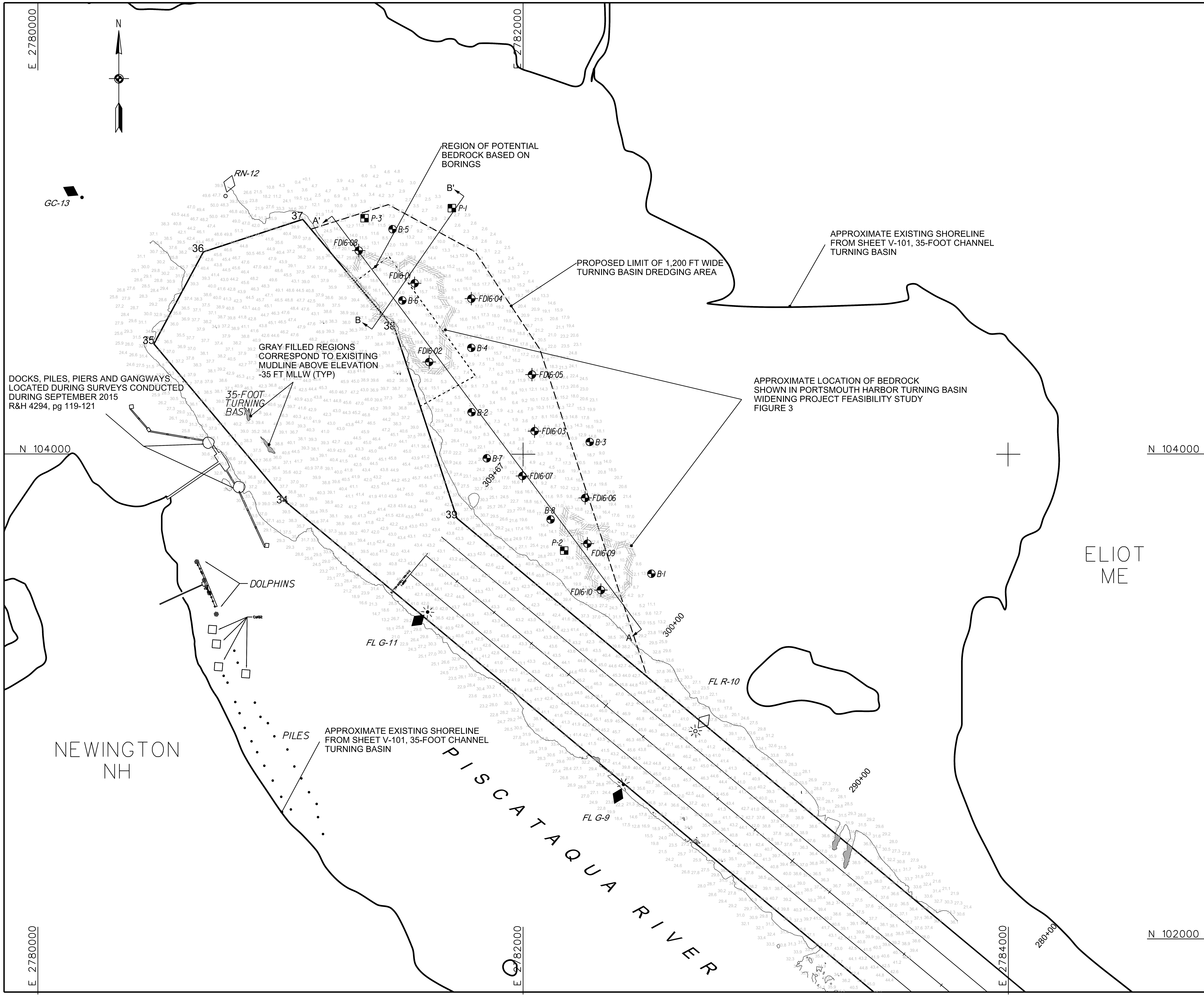
PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER SUBSURFACE INVESTIGATION
NEWINGTON, NH & ELIOT, ME

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT

LOCUS PLAN

PROJ MGR: ARB	REVIEWED BY: ARB	CHECKED BY: MAT	FIGURE
DESIGNED BY: KHM	DRAWN BY: ADM	SCALE: 1 in = 2,000 ft	1
DATE: SEP 2016	PROJECT NO. 09.0025912.00	REVISION NO.	



GENERAL NOTES:

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILES "C-100.DGN" AND "PIS-2788 V-HP-MAS.DGN" PROVIDED TO GZA BY U.S.ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT.

2. LOCATIONS OF B-SERIES BORINGS AND P-SERIES PROBES WERE TAKEN FROM COORDINATES SHOWN ON THE BORING LOGS INCLUDED IN THE PORTSMOUTH HARBOR TURNING BASIN WIDENING PROJECT FEASIBILITY STUDY.

3. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF THE AS-DRILLED BORINGS, PREVOUS BORINGS, AND PREVIOUS PROBES IN RELATION TO THE SUBJECT SITE.

4. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

FDI6-10	LOCATION OF DRILLED BORING, REFER TO BORING LOGS FOR AS DRILLED COORDINATES.
P-3	APPROXIMATE LOCATION OF PREVIOUSLY CONDUCTED PROBE
B-8	APPROXIMATE LOCATION OF PREVIOUSLY CONDUCTED BORING
21.0	MUDLINE SPOT ELEVATION FROM BATHYMETRIC SURVEY, FEET BELOW MEAN LOWER LOW WATER DATUM (MLLW)
B B	LOCATIONS OF CROSS SECTIONS

GRAPHIC SCALE (FT):

200 0 200 400

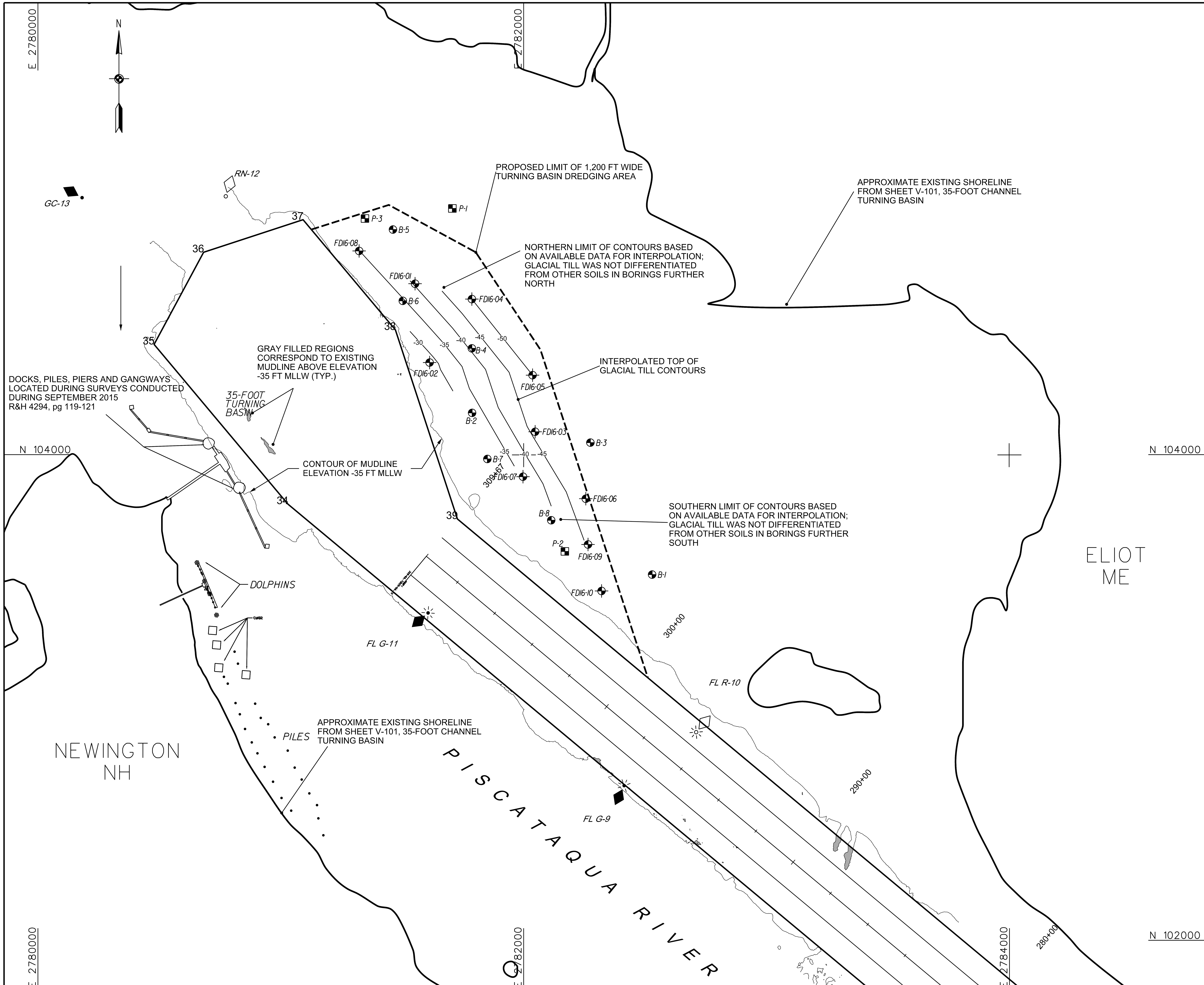
NO.	ISSUE/DESCRIPTION	BY	DATE

PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER SUBSURFACE INVESTIGATION
NEWINGTON, NH & ELIOT, ME

OVERALL SITE AND AS-DRILLED BORING LOCATION PLAN

PREPARED BY:	PREPARED FOR:
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT

PROJ MGR: ARB	REVIEWED BY: ARB	CHECKED BY: MAT	FIGURE
DESIGNED BY: BMC	DRAWN BY: BMC	SCALE: 1" = 200'	2
DATE: OCTOBER 2016	PROJECT NO. 09.0025912.00	REVISION NO. 0	SHEET NO. 1 OF 1



GENERAL NOTES:

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILES "C-100.DGN" AND "PIS-2788 V-HP-MAS.DGN" PROVIDED TO GZA BY U.S.ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT.

2. LOCATIONS OF B-SERIES BORINGS AND P-SERIES PROBES WERE TAKEN FROM COORDINATES SHOWN ON THE BORING LOGS INCLUDED IN THE PORTSMOUTH HARBOR TURNING BASIN WIDENING PROJECT FEASIBILITY STUDY.

3. THE PURPOSE OF THIS DRAWING IS TO SHOW THE INTERPOLATED TOP OF GLACIAL TILL STRATUM. THE LIMITS OF THE TILL SHOWN WERE INTERPOLATED FROM THE FD16 TEST BORINGS. THE ACTUAL LIMITS OF THE TILL EXTEND BEYOND THE CONTOURED AREA SHOWN.

4. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

5. COORDINATES SHOWN ARE BASED ON THE TRANSVERSE MERCATOR GRID SYSTEM FOR THE STATE OF MAINE (WEST ZONE 1802) AND NAD 1983.

LEGEND:

FD16-10 — LOCATION OF DRILLED BORING, REFER TO BORING LOGS FOR AS DRILLED COORDINATES.

P-3 — APPROXIMATE LOCATION OF PREVIOUSLY CONDUCTED PROBE

B-8 — APPROXIMATE LOCATION OF PREVIOUSLY CONDUCTED BORING

-50 — INTERPOLATED ELEVATION CONTOUR OF TOP OF GLACIAL TILL BASED ON FD16-SERIES BORINGS, FEET MLLW DATUM

GRAPHIC SCALE (FT):

200 0 200 400

NO.	ISSUE/DESCRIPTION	BY	DATE

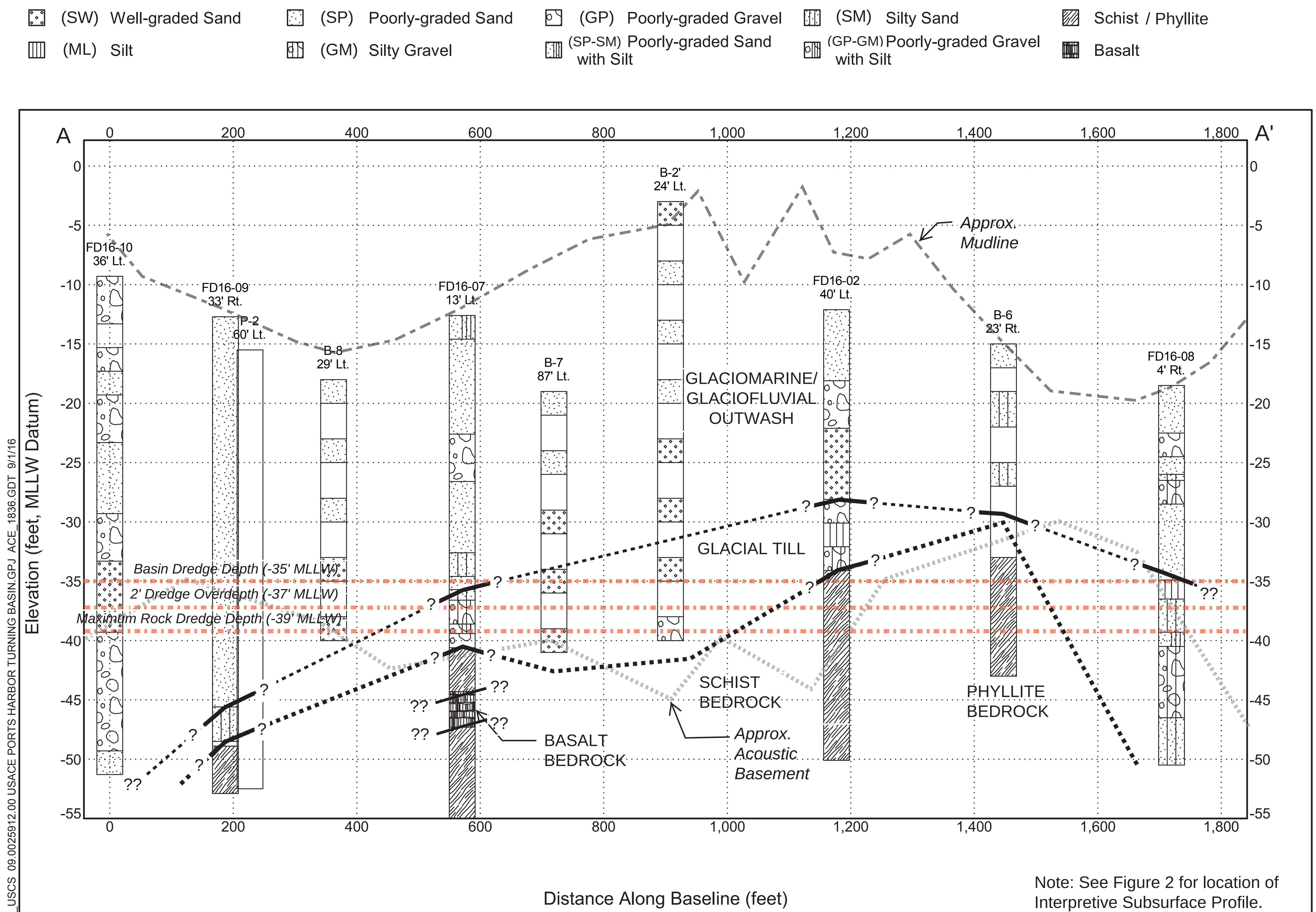
PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER SUBSURFACE INVESTIGATION
NEWINGTON, NH & ELIOT, ME

INTERPOLATED TOP OF GLACIAL TILL CONTOUR PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

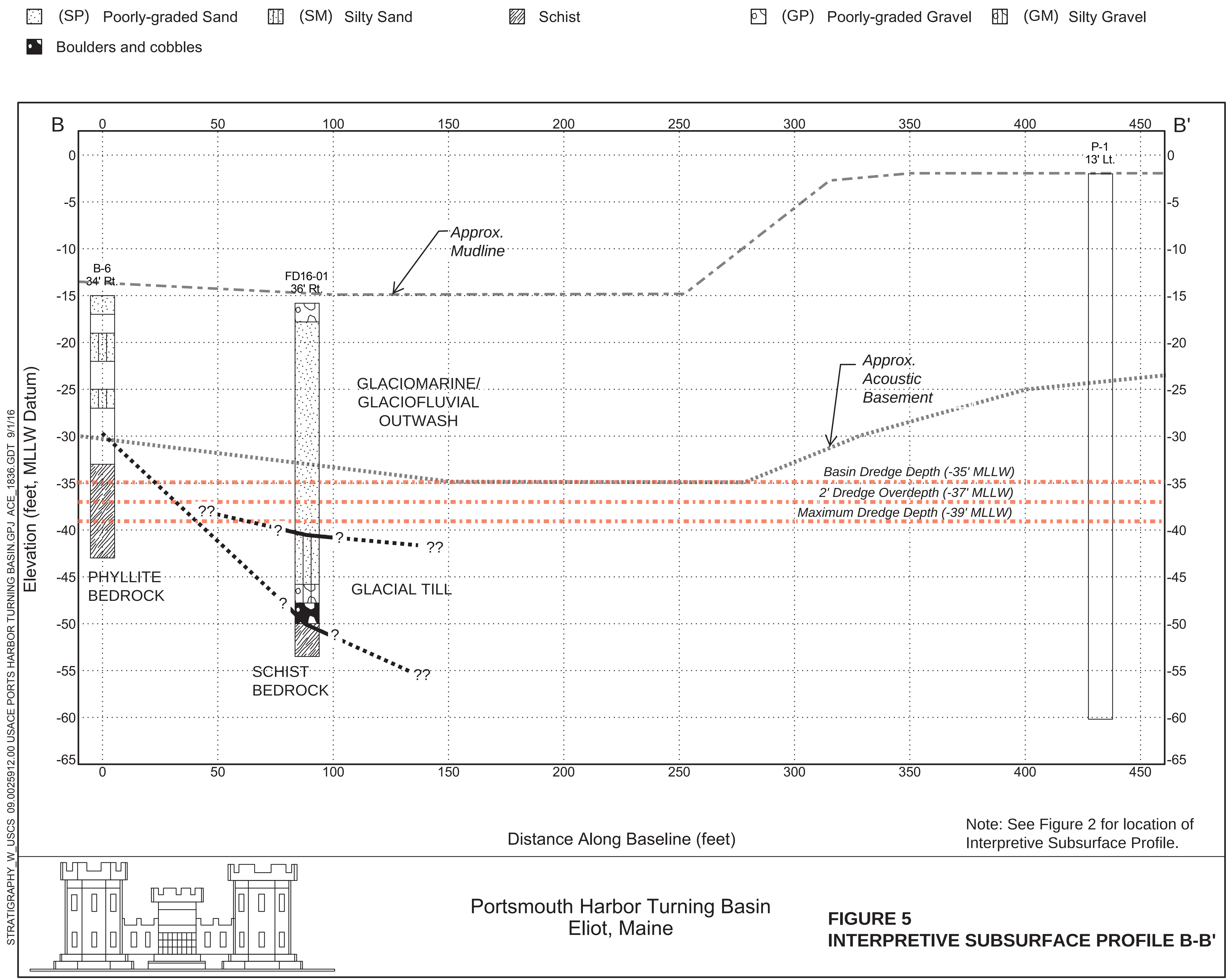
PREPARED FOR: U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT

PROJ MGR: ARB	REVIEWED BY: ARB	CHECKED BY: MAT	FIGURE
DESIGNED BY: BMC	DRAWN BY: BMC	SCALE: 1" = 200'	3
DATE: OCTOBER 2016	PROJECT NO. 09.0025912.00	REVISION NO. 0	SHEET NO. 1 OF 1



Portsmouth Harbor Turning Basin
Eliot, Maine

FIGURE 4
INTERPRETIVE SUBSURAFCE PROFILE A-A'



Portsmouth Harbor Turning Basin
Eliot, Maine

FIGURE 5
INTERPRETIVE SUBSURFACE PROFILE B-B'

APPENDIX A

Final gINT Logs and Key

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Modified ISRM Rock Classification (GZA)

Rock cores are visually classified by the Modified ISRM System using the following format and order: Field hardness, weathering, grain size, color, ROCK TYPE, joint description (spacing, dip angle, type, shape and roughness, weathering, aperture, infilling, condition of joint surfaces, other features such as minerals.

FIELD HARDNESS:
Very Hard – Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologists pick.
Hard – Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Medium – Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 in. maximum size by hard blows from the point of a geologist's pick.
Soft – Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very Soft – Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

WEATHERING:
Fresh – Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Slightly Weathered – Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately Weathered – Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones. In granitoid rock, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Highly Weathered – More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Completely Weathered – All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact. Quartz may be present as dikes or Stringers.
Residual Soil – All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

GRAIN SIZE:
Fine Grained – Barely seen with naked eye.
Coarse Grained: 1/8 in. to 1/4 in.
Aphanitic: Too small to be seen with naked eye.
Medium Grained: Barely seen with naked eye to 1/8 in.
Very Coarse Grained: >1/4 in.

COLOR and ROCK TYPE

JOINT DESCRIPTION:
Spacing and Dip Angle:

Joints	Spacing	Dip	Angle
Extremely Close	Less than ¾ in.	Horizontal	0° - 5°
Very Close	¾ in. – 2 ½ in.	Low Angle	5° - 35°
Close	2 ½ in. - 8 in.	Moderately dipping	35° - 55°
Moderate	8 in. – 24 in.	High Angle	55° - 85°
Wide	24 in. – 80 in.	Vertical	85° - 90°
Very Wide	80 in. – 20 ft.		
Extremely Wide	Greater than 20 ft.		

Type of Discontinuities:
Joint – A break of geologic origin in the continuity of a body of rock along which there has been no visible displacement. May form sets (parallel joints).
Shear – A zone of fractures along which differential movement has taken place parallel to the surface sufficient to produce slickensides, striations, or polishing. May be accompanied by a zone of fractured rock up to a few inches wide.
Fault – Major discontinuity along which there has been appreciable displacement and accompanied by gouge and/or severely fractured adjacent zone of rock.
Shear or Fault Zone – A band or zone of parallel, closely spaced discontinuities along which differential movement has occurred, accompanied by gouge, maylonite, and breccia.
Bedding – A surface parallel to the surface of the deposition
Foliation – A parallel orientation of platy minerals, or mineral banding in metamorphic rocks.

Shape and Roughness:

Shape	Roughness
Stepped	Rough
Undulating	Smooth
Planar	Slickensided

Weathering of Joints:
Fresh – No visible sign of weathering of the rock material
Discolored – The color of the original fresh rock material is changed. The degree of change from the original color should be indicated. If the color change is confined to particular mineral constituents this should be documented.
Decomposed – The rock is weathered to the condition of soil in which the original material fabric is still intact, but some or all of the mineral grains are decomposed
Disintegrated – The rock is weathered to the condition of soil in which the original fabric is still intact. The rock is friable, but the mineral grains are not decomposed.

Aperture:

Tight – Core pieces on either side of a discontinuity can be fitted together by hand so that no visible void spaces remain.
Open – Core pieces on either side of a discontinuity cannot be fitted tightly together and voids are remain.

		Opening
Very Tight	"Closed features"	<0.004 in.
Tight		0.004-0.01 in.
Partially Open		0.01-0.02 in.
Open	"Gapped features"	0.02 – 0.1 in.
Moderately Wide		0.1 – 0.4 in.
Wide		>0.4 in.
Very Wide	"Open features"	0.4 – 4.0 in.
Extremely Wide		4.0 – 40.0 in.
Cavernous		>40 in.

Infilling:
Silt, Sand, Clay, Calcite

Miscellaneous Features:
Pit – Barely seen with the naked eye, to ¼ inch in diameter
Vug – ¼ inch to 2 inches in maximum diameter
Cavity – 2 inches to 2 feet in maximum diameter
Cave – larger than 2 feet in maximum diameter

ROCK OUTCROP CHARACTERIZATION
Also include the following parameters when describing rock outcrops and rock masses:
Persistence:

	Dimensions
Very low persistence	<3.3 ft
Low persistence	3.3 – 9.8 ft
Medium persistence	9.8 -32.8 ft
High persistence	32.8 -65.6 ft
Very high persistence	>65.6 ft

Number of Sets (occurring locally):

I	Massive, occasional random joints
II	One joint set
III	One joint set plus random
IV	Two joint sets
V	Two joint sets plus random
VI	Three joint sets
VII	Three joint sets plus random
VIII	Four or more joint sets
IX	Crushed rock, earth-like

GZA reports the total core recovery and rock quality designation for each core run* on the boring logs. The definitions of these terms are as follows:

TOTAL CORE RECOVERY (REC)

$$\textbf{REC (\%)} = \frac{\text{Sum of Recovered Core}}{\text{Length of Core Run}} \times 100$$

ROCK QUALITY DESIGNATION (RQD)

$$\textbf{RQD (\%)} = \frac{\text{Sum of Lengths of intact Core with Full Diameter in Pieces 4 in. and Longer}}{\text{Length of Core Run}} \times 100$$

The RQD is in general accordance with methodology described by Deere and Deere (1988). In addition, significant vertical to sub-vertical foliation/cross-foliation joints/fractures occur within the rock mass and influence ground behavior. The length of core exhibiting the vertical to sub-vertical joints/fractures has been deducted from the RQD, which is consistent with the "pieces of intact rock core" criteria. The vertical to sub-vertical joints/fractures have been identified on the rock core or the upside divider in the core box with permanent "dots" spaced every 0.1 feet apart. These dots have been counted and entered in the fractures per foot column on the boring log.

* - RQD not reported for severely and/or completely weathered rock or core runs with length of 2.0 feet or less.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 3 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104,703.5 E 2,781,553.1	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 7/20/16; COMPLETED 7/20/16
7. THICKNESS OF OVERBURDEN 33.60	17. ELEVATION TOP OF HOLE -15.80
8. DEPTH DRILLED INTO ROCK 4.10	18. TOTAL ROCK CORE RECOVERY FOR BORING 100 %
9. TOTAL DEPTH OF HOLE 37.70	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/6	8-5-5-4	Started drilling on 7/20/16 at 0815.	Poorly graded Gravel with Sand (GP), 75% gravel, approximately 20% medium coarse sand, 5% silt, loose, gray, wet, possible cobble.
		S-2	2 to 4	24/8	5-4-4-3		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, loose, brown, wet.
-20	5	S-3	4 to 6	24/5	5-3-4-4		Poorly graded Sand (SP), approximately 85% fine to medium sand, 10% gravel, 5% silt, loose, brown, wet.
		S-4	6 to 8	24/5	2-4-7-7		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
		S-5	8 to 10	24/17	7-7-8-9		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
	10	S-6	10 to 12	24/0	4-5-8-9	No recovery in 3" SS. Drove 2" SS to get 24" recovery.	Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
		S-7	12 to 14	24/0	4-9-11-14	No recovery in 3" SS. Drove 2" SS to get 18" recovery.	Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
-30	15	S-8	14 to 16	24/0	3-4-6-6	No recovery in 3" SS. Drove 2" SS to get 6" recovery.	Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, brown, wet.
		S-9	16 to 18	24/24	7-8-11-11	2" SS	Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
		S-10	18 to 20	24/13	5-6-8-7	2" SS	Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -15.80		Hole No. FD16-01
PROJECT Portsmouth Harbor Turning Basin		INSTALLATION New England District	SHEET 2 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-11	20 to 22	24/24	3-3-6-10	2" SS		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, loose, brown, wet.
		S-12	22 to 24	24/24	8-12-20-10	2" SS		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, dense, brown, wet.
-40	25	S-13	24 to 26	24/16	6-5-28-16	2" SS		Top 8": Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, dense, brown, wet. Bottom 8": Silty Sand with Gravel (SM), approximately 60% fine to medium sand, 20% gravel, 20% silt, dense, gray, wet.
		S-14	26 to 28	24/16	8-11-12-12	2" SS		Silty Sand with Gravel (SM), approximately 65% fine to medium sand, 20% gravel, 15% silt, medium dense, gray, wet, with cobbles, based on intermittent roller bit resistance.
		S-15	28 to 30	24/6	23-15-9-8			Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 25% gravel, 15% silt, medium dense, gray, wet.
	30	S-16	30 to 32	24/19	9-21-47-55			Silty Gravel with Sand (GM), approximately 55% gravel, 30% fine to coarse sand, 15% silt, very dense, gray, wet.
		S-17	32 to 32.1	1/0	50/1"			Probable Cobble/Boulder. (Penetrate with roller bit) Probable Cobble/Boulder. (Penetrate with roller bit) Wash return similar to recovery in S-16. Possible Top of Rock at 33.6' below mudline (bml) based on roller bit resistance. Advance roller bit to 34.2' bml prior to coring.
-50	35	C-1	34.2 to 37.7	42/42	52			Hard, fresh, fine grained, gray, SCHIST. Joints are very close to close, moderately dipping to high angle, planar, smooth to rough, fresh to discolored, tight to open. Rock Core Times (min/ft): 6.0, 3.0, 5.25, 2.5/6"
-60	40 45					Completed boring on 7/20/16 at 1315. Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +8.2', mudline measured at 24.0' below top of barge deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing. Rock was cored using an NX core barrel. 4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb		Bottom of boring at depth 37.7 ft.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
						safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lbsafety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks. 6. Elevation of top of hole references the mudline elevation.		
	50							
-70								
	55							
	60							
-80								
	65							
	70							

Hole No. FD16-02

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: New England District	SHEET 1 OF 3 SHEETS

1. PROJECT: Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 104,378.8 E 2,781,613.0	11a. VERTICAL DATUM: MLLW / 11b. HORIZONTAL DATUM: Maine State Plane, NAD 83 West
3. DRILLING AGENCY: New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG: CME 45
4. NAME OF DRILLER: Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 11 / UNDISTURBED 0
5. NAME OF INSPECTOR: Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES: 4
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE: STARTED 7/28/16 / COMPLETED 7/29/16
7. THICKNESS OF OVERBURDEN: 21.60	17. ELEVATION TOP OF HOLE: -12.10
8. DEPTH DRILLED INTO ROCK: 16.40	18. TOTAL ROCK CORE RECOVERY FOR BORING: 92 %
9. TOTAL DEPTH OF HOLE: 38.00	19. SIGNATURE OF INSPECTOR: Blaine Cardali, GZA

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-1	0 to 2	24/5	11-9-20-9	Started drilling on 7/28/16 at 1415.		Poorly graded Sand with Gravel (SP), approximately 55% fine to coarse sand, 40% gravel, 5% silt, medium dense, brown/gray, wet.
		S-2	2 to 4	24/13	9-6-6-12	Stopped at 4.0' bgs on 7/28/16 at 1500, started again on 7/29/16 at 0730.		Poorly graded Sand with Gravel (SP), approximately 65% fine to coarse sand, 30% gravel, 5% silt, medium dense, brown, wet.
	5	S-3	4 to 6	24/11	8-10-9-9	2" SS (S-3)		Poorly graded Sand with Gravel (SP), approximately 55% fine to coarse sand, 40% gravel, 5% silt, medium dense, brown/gray, wet.
		S-4	6 to 8	24/7	10-12-10-15	2" SS (S-4)		Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, medium dense, brown/gray, wet.
-20		S-5	8 to 10	24/7	9-12-9-6	2" SS (S-5)		Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, medium dense, brown/gray, wet.
	10	S-6	10 to 12	24/11	4-5-6-7	2" SS (S-6)		Well graded Sand (SW), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, brown, wet.
		S-7	12 to 14	24/24	7-11-10-9	2" SS (S-7)		Well graded Sand with Gravel (SW), approximately 75% fine to coarse sand, 20% gravel, 5% silt, medium dense, brown, wet.
	15	S-8	14 to 16	24/7	8-5-6-11	2" SS		Well graded Sand (SW), approximately 95% fine to medium sand, 5% silt, medium dense, tan, wet.
		S-9	16 to 18	24/15	31-37-39-13	2" SS		Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, very dense, brown, wet.
-30		S-10	18 to 20	24/19	22-51-100-71	2" SS		Sandy Silt (ML), approximately 55% silt, 35% fine to coarse sand, 10% gravel, hard, brown, wet.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-11	20 to 20.4	5/5	100/5"	2" SS		Silty Gravel (GM), approximately 60% gravel, 30% silt, 10% fine to coarse sand, very dense, light brown, wet.
			20.4 to 21.6	14/0				Possible silty Gravel based on wash return. (Penetrate with roller bit.)
			21.6 to 22	5/0				Possible Top of Rock at 21.6' based on roller bit resistance. Advance roller bit to 22.0' prior to coring.
	25	C-1	22 to 26.5	54/38	0			Hard, fresh to weathered, fine grained, gray, SCHIST. Joints are very close to close, moderately dipping undulating, rough, fresh to discolored, partially open to open. Rock Core Times (min/ft): 5.0, 7.5, 4.0, 5.5, 5.0/0.5'
-40		C-2	26.5 to 30	42/42	48			Hard, fresh to slightly weathered, fine grained, gray, SCHIST, with calcite stringers. Joints are very close to moderately close, rough, undulating, fresh to discolored, tight to open. Rock Core Times (min/ft): 2.75, 3.75, 4.25, 7.0/0.5'
	30	C-3	30 to 35	60/60	73			Hard, fresh, fine grained, gray, SCHIST, with calcite stringers. Joints are very close to moderately spaced, low angle to moderately dipping, undulating, rough, fresh, partially open to open. Rock Core Times (min/ft): 3.75, 3.5, 4.0, 4.25, 4.5
	35	C-4	35 to 38	36/36	58	Completed drilling on 7/29/16 at 1240.		Hard, fresh, fine grained, gray, SCHIST, with calcite stringers. Joints are very close to close, low angle, undulating, rough, fresh, tight to partially open. Rock Core Times (min/ft): 4.0, 4.75, 5.75
-50	40 45					Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +6.9', mudline measured at 19.0' below top of barge deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing. Rock was cored using an NX core barrel. 4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb		Bottom of boring at depth 38 ft.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-60	50					safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks. 6. Elevation of top of hole references the mudline elevation.		
	55							
-70	60							
	65							
-80	70							

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 3 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104,093.8 E 2,782,047.5	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 23; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 7/15/16; COMPLETED 7/18/16
7. THICKNESS OF OVERBURDEN 47.00	17. ELEVATION TOP OF HOLE -3.40
8. DEPTH DRILLED INTO ROCK	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 47.00	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/7	7-1-4-2	Started drilling on 7/15/16 at 1010.	Poorly graded Sand with Silt and Gravel (SP-SM), approximately 50% fine to coarse sand, 40% gravel, 10% silt, loose, brown, wet.
		S-2	2 to 4	24/24	4-6-6-2		Top 10": Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 20% silt, 20% gravel, medium dense, brown, wet. Bottom 14": Poorly graded Sand with Gravel (SP), approximately 80% fine to coarse sand, 15% gravel, 5% silt, medium dense, brown, wet.
	5	S-3	4 to 6	24/11	10-10-44-21		Poorly graded Sand with Silt and Gravel (SP-SM), approximately 75% fine sand, 15% gravel, 10% silt, very dense, brown, wet.
-10		S-4	6 to 8	24/9	11-12-14-12		Silty Sand with Gravel (SM), approximately 65% fine to coarse sand, 20% silt, 15% gravel, medium dense, brown, wet.
		S-5	8 to 10	24/24	9-8-12-14		Silty Sand with Gravel (SM), approximately 60% fine to medium sand, 20% silt, 20% gravel, medium dense, brown, wet.
	10	S-6	10 to 12	24/18	11-15-45-18		Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 20% silt, 20% gravel, very dense, brown, wet.
		S-7	12 to 14	24/17	11-15-15-18		Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 20% silt, 20% gravel, medium dense, brown, wet.
	15	S-8	14 to 16	24/14	4-3-5-6		Top 4": Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 20% silt, 20% gravel, loose, brown, wet. Bottom 10": Sandy lean Clay with Gravel, (CL), approximately 55% clay, 30% fine to coarse sand, 15% gravel, medium stiff, gray, wet.
-20		S-9	16 to 18	24/18	3-4-7-8		Clayey Sand with Gravel (SC), approximately 55% fine to medium sand, 25% gravel, 20% clay, medium dense, gray, wet.
		S-10	18 to 18.3	4/4	50/4"	Split spoon refusal at 18.3' bgs. Roller bit ahead to 19.3' bgs and set up to core. Cored from 19.3'-21.0' bgs	Clayey Sand with Gravel (SC), approximately 55% fine to medium sand, 25% gravel, 20% clay, very dense, gray, wet. Probable Boulder.

NAE 1836 LETTER 09.0025912.00 USACE PORTS HARBOR TURNING BASIN.GPJ NAE DATA TEMPLATE.GDT 9/26/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -3.40	Hole No. FD16-03
PROJECT Portsmouth Harbor Turning Basin	INSTALLATION New England District	SHEET 2 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
						before punching through.	
		S-11	21 to 23	24/6	6-8-16-20		Gravelly Silt with Sand (ML), approximately 40% silt, 35% gravel, 25% fine to medium sand, very stiff, brown, wet.
		S-12	23 to 25	24/6	7-10-13-9	Stopped at 23.0' bgs on 7/15/16 at 1400, started again on 7/18/16 at 0745.	Silty Gravel with Sand (GM), approximately 60% gravel, 25% medium to coarse sand, 15% silt, medium dense, light brown, wet.
	25	S-13	25 to 27	24/6	4-5-5-7		Poorly graded Sand with Gravel (SP), approximately 80% fine to coarse sand, 15% gravel, 5% silt, loose, brown, wet.
-30		S-14	27 to 29	24/24	9-8-10-13		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
	30	S-15	29 to 31	24/5	11-15-18-20		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, dense, brown, wet.
		S-16	31 to 33	24/24	7-11-13-17		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
		S-17	33 to 35	24/8	9-12-15-16		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
	35	S-18	35 to 37	24/7	7-9-11-13		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
-40		S-19	37 to 39	24/0	8-12-15-19	No recovery in 3" SS, drove 2" SS to get 6" recovery.	Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
	40	S-20	39 to 41	24/6	6-11-19-31	2" SS	Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
		S-21	41 to 43	24/21	13-13-17-31	2" SS	Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
		S-22	43 to 43.4	5/5	100/5"		Silty Sand with Gravel (SM), approximately 50% fine sand, 35% silt, 15% gravel, very dense, gray, wet.
							43.4'-44.2': Apparent Boulder. (Penetrate with roller bit.)
						Roller bit from 44.2'-45.0'.	
	45	S-23	45 to 47	24/18	17-26-45-34		Top 10": Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, very dense, brown, wet.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-50						Completed drilling on 7/18/16 at 1410.		Bottom 8": Silty Gravel with Sand (GM), approximately 55% gravel, 30% fine to coarse sand, 15% silt, very dense, gray, wet.
								Bottom of boring at depth 47 ft.
	50					Notes:		
	55					1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7).		
-60						2. Barge deck surveyed at +10.6', mudline measured at 14.0' below top of barge deck.		
	60					3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing.		
	65					4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks.		
-70						5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks.		
	70					6. Elevation of top of hole references the mudline elevation.		

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 2 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104,640.1 E 2,781,787.0	11a. VERTICAL DATUM MLLW / 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN 32.00	16. DATE STARTED 7/21/16 COMPLETED 7/22/16
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE -18.00
9. TOTAL DEPTH OF HOLE 32.00	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/4	1-1-WOH-1	Started drilling on 7/21/16 at 1000.	Silty Sand (SM), approximately 70% fine to medium sand, 25% silt, 5% gravel, very loose, brown/black, wet, with shells and organics.
-20		S-2	2 to 4	24/24	1-WOH-1-1		Lean Clay with Sand (CL), approximately 90% clay, 10% fine to coarse sand, very soft, gray, wet.
	5	S-3	4 to 6	24/24	WOH-WOH-WOH-1		Lean Clay with Sand (CL), approximately 90% clay, 10% fine sand, very soft, gray, wet.
		S-4	6 to 8	24/24	WOR-WOH-1-2		Lean Clay with Sand (CL), approximately 70% clay, 20% fine sand, 10% gravel, very soft, gray, wet.
		S-5	8 to 10	24/24	WOH-WOH-1-2		Lean Clay with Sand (CL), approximately 85% clay, 15% fine sand, very soft, gray, wet.
	10	S-6	10 to 12	24/24	WOH-3-2-3		Top 11": Lean Clay with Sand (CL), approximately 70% clay, 20% fine sand, 10% gravel, medium stiff, gray, wet. Bottom 13": Silty Sand (SM), approximately 80% fine sand, 20% silt, loose, brown wet.
-30		S-7	12 to 14	24/22	2-1-2-3		Poorly graded Sand with Silt (SP-SM), approximately 90% fine sand, 10% silt, very loose, brown, wet.
	15	S-8	14 to 16	24/14	2-3-3-4		Poorly graded Sand with Silt (SP-SM), approximately 90% fine sand, 10% silt, loose, brown, wet.
		S-9	16 to 18	24/0	5-3-3-2	No recovery in 3" SS. Drove 2" SS, immediately dropped to 18.0' bgs.	No recovery.
		S-10	18 to 20	24/0	3-3-3-2	No recovery in 3" SS. Drove 2" SS to get 22" recovery.	Poorly graded Sand, (SP), approximately 95% fine to medium sand, 5% silt, loose, gray, wet.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: -18.00

Hole No. FD16-04

PROJECT: Portsmouth Harbor Turning Basin

INSTALLATION: New England District

SHEET 2 OF 2 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-11	20 to 22	24/3	4-16-19-28		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% silt, 5% gravel, dense, gray, wet.
-40		S-12	22 to 24	24/19	21-20-25-32	2" SS	Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% silt, 5% gravel, dense, olive, wet.
	25	S-13	24 to 26	24/0	7-10-7-9	No recovery in in 3" SS; drove 2" SS to get 9" recovery.	Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, medium dense, gray, wet
		S-14	26 to 28	24/7	7-10-12-16	2" SS. Stopped at 26.0' bgs on 7/21/16 at 1500, started again on 7/22/16 at 0745.	Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, medium dense, gray, wet.
		S-15	28 to 30	24/11	5-9-9-18	2" SS	Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, medium dense, gray, wet.
	30	S-16	30 to 32	24/12	8-9-11-14	2" SS	Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, medium dense, gray, wet.
-50						Completed drilling on 7/22/16 at 0930.	Bottom of boring at depth 32 ft.
	35						
	40						
-60							
	45						

Notes:

1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7).

2. Barge deck surveyed at +6.5', mudline measured at 24.5' below top of barge deck.

3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing.

4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks.

5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks.

6. Elevation of top of hole references the mudline elevation.

NAE 1836 LETTER 09.0025912.00 USACE PORTS HARBOR TURNING BASIN.GPJ NAE DATA TEMPLATE.GDT 9/26/16

Hole No. FD16-05

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: New England District	SHEET 1 OF 3 SHEETS

1. PROJECT: Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 104,326.8 E 2,782,036.9	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: Maine State Plane, NAD 83 West
3. DRILLING AGENCY: New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG: CME 45
4. NAME OF DRILLER: Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17; UNDISTURBED 0
5. NAME OF INSPECTOR: Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN: 34.00	16. DATE STARTED: 7/13/16; COMPLETED: 7/14/16
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE: -16.70
9. TOTAL DEPTH OF HOLE: 34.00	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
	19. SIGNATURE OF INSPECTOR: Blaine Cardali, GZA

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-1	0 to 2	24/12	1-1-1-1	Started drilling on 7/13/16 at 1010.		Lean Clay with Sand (CL), approximately 70% clay, 20% fine sand, 10% gravel, soft, gray, wet.
-20		S-2	2 to 4	24/24	1-2-2-2			Top 8": Lean Clay with Sand (CL), approximately 85% clay, 15% fine sand, soft, gray, wet. Bottom 16": Lean Clay with Sand (CL), approximately 70% clay, 30% sand, soft, light brown, wet.
	5	S-3	4 to 6	24/20	2-2-2-3			Silty Sand (SM), approximately 70% fine sand, 30% silt, very loose, light brown, wet.
		S-4	6 to 8	24/24	1-2-4-6			Top 13": Lean Clay with Gravel (CL), approximately 80% clay, 15% gravel, 5% fine sand, medium stiff, gray, wet. Bottom 11": Silty Sand (SM), approximately 75% fine sand, 25% silt, loose, tan, wet.
		S-5	8 to 10	24/18	4-4-3-2			Silty Sand (SM), approximately 75% fine sand, 20% silt, 5% fine gravel, loose, tan, wet.
	10	S-6	10 to 12	24/18	3-2-3-37			Silty Sand (SM), approximately 75% fine sand, 15% silt, 10% gravel, loose, tan, wet.
-30		S-7	12 to 14	24/24	12-7-12-12			Top 7": Silty Sand (SM), approximately 75% fine sand, 15% silt, 10% gravel, medium dense, tan, wet. Bottom 17": Poorly graded Sand with Silt and Gravel (SP-SM), approximately 65% fine to coarse sand, 25% gravel, 10% silt, medium dense, tan, wet.
	15	S-8	14 to 16	24/17	12-9-9-14			Poorly graded Sand with Silt and Gravel (SP-SM), approximately 70% fine to coarse sand, 20% fine gravel, 10% silt, medium dense, tan, wet.
		S-9	16 to 18	24/24	4-7-6-5			Top 12": Poorly graded Sand with Silt (SP-SM), approximately 90% fine to medium sand, 10% silt, medium dense, tan, wet. Bottom 12": Poorly graded Sand with Silt and Gravel (SP-SM), approximately 60% fine to coarse sand, 30% fine gravel, 10% silt, medium dense, brown/gray, wet.
		S-10	18 to 20	24/11	3-3-3-5			Top 7": Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, brown, wet. Bottom 9": Poorly graded Sand with Gravel (SP), approximately 75% fine to coarse sand, 20% gravel, 5% silt, loose, gray, wet.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-11	20 to 22	24/0	6-4-5-6			No recovery.
-40		S-12	22 to 24	24/0	4-4-5-6			No recovery.
	25	S-13	24 to 26	24/6	7-4-5-6			Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, light gray, wet.
		S-14	26 to 28	24/15	3-4-5-5			Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, loose, light gray, wet.
		S-15	28 to 30	24/4	7-6-5-6			Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, light gray, wet.
	30	S-16	30 to 32	24/0	3-4-8-7			Recovery consisted of one piece of coarse Gravel.
-50		S-17	32 to 34	24/7	5-5-10-13			Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, light gray, wet.
	35					Completed drilling on 7/14/16 at 0920. Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +7.8', mudline measured at 24.5' below top of barge deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing. 4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling		Bottom of boring at depth 34 ft.
	40							
-60	45							

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE	Hole No.
-16.70	FD16-05

PROJECT	INSTALLATION	SHEET
Portsmouth Harbor Turning Basin	New England District	3 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
						Remarks. 6. Elevation of top of hole references the mudline elevation.		
	50							
-70								
	55							
	60							
-80								
	65							
	70							

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: New England District	SHEET 1 OF 3 SHEETS

1. PROJECT: Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 103,818.2 E 2,782,256.0	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: Maine State Plane, NAD 83 West
3. DRILLING AGENCY: New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG: CME 45
4. NAME OF DRILLER: Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 18; UNDISTURBED 0
5. NAME OF INSPECTOR: Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN: 36.00	16. DATE: STARTED 7/22/16; COMPLETED 7/25/16
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE: -14.20
9. TOTAL DEPTH OF HOLE: 36.00	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
	19. SIGNATURE OF INSPECTOR: Blaine Cardali, GZA

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-1	0 to 2	24/24	1-4-9-9	Started drilling on 7/22/16 at 1030.		Silty Sand (SM), approximately 80% fine sand, 15% silt, 5% gravel, medium dense, light brown, wet.
		S-2	2 to 4	24/11	9-8-9-9			Silty Sand (SM), approximately 80% fine sand, 15% silt, 5% gravel, medium dense, light brown, wet.
	5	S-3	4 to 6	24/0	2-3-5-10	No recovery in 3" SS, drove 2" SS to get 10" recovery.		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, light, brown, wet.
-20		S-4	6 to 8	24/13	1-2-5-7	2" SS (S-4)		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, light brown, wet.
		S-5	8 to 10	24/19	7-5-6-5	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, light brown, wet.
	10	S-6	10 to 12	24/9	2-4-4-6	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, light brown, wet.
		S-7	12 to 14	24/10	5-5-6-11	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, light brown, wet.
	15	S-8	14 to 16	24/10	5-6-5-5	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, light brown, wet.
-30		S-9	16 to 18	24/13	5-7-7-7	2" SS Stopped at 16.0' bgs on 7/22/16 at 1400, started again on 7/25/16 at 0745.		Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, medium dense, light brown, wet.
		S-10	18 to 20	24/20	5-6-7-8	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, light brown, wet.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-11	20 to 22	24/16	4-5-5-7	2" SS		Poorly graded Sand (SP), approximately 95% fine sand, 5% silt, loose, light brown, wet.
		S-12	22 to 24	24/20	7-4-5-8	2" SS		Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, loose, light brown, wet.
	25	S-13	24 to 26	24/6	4-6-9-11			Poorly graded Sand (SP), approximately 85% fine to medium sand, 10% gravel, 5% silt, medium dense, brown, wet.
-40		S-14	26 to 28	24/24	7-9-13-17			Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
		S-15	28 to 30	24/7	6-8-9-11	2" SS		Poorly graded Sand (SP), approximately 95% fine to coarse sand, 5% silt, medium dense, brown, wet.
	30	S-16	30 to 32	24/22	9-9-8-11	2" SS		Pooly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, light brown, wet.
		S-17	32 to 34	24/13	4-6-5-5	2" SS		Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, light brown/gray, wet.
	35	S-18	34 to 36	24/17	10-6-6-18	2" SS		Top 12": Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, light brown/gray, wet. Bottom 5": Silty Gravel with Sand (GM), approximately 70% gravel, 15% fine to medium sand, 15% silt, medium dense, gray, wet.
-50						Completed drilling on 7/25/16 at 1230.		Bottom of boring at depth 36 ft.
	40							
	45							
-60								

Notes:

1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7).

2. Barge deck surveyed at +4.8', mudline measured at 19.0' below top of barge deck.

3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing.

4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks.

5. Samples were retrieved

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -14.20		Hole No. FD16-06
PROJECT Portsmouth Harbor Turning Basin		INSTALLATION New England District	SHEET 3 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
						using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks. 6. Elevation of top of hole references the mudline elevation.		
	50							
	55							
-70								
	60							
	65							
-80								
	70							

NAE 1836 LETTER 09.0025912.00 USACE PORTS HARBOR TURNING BASIN.GPJ NAE DATA TEMPLATE.GDT 9/26/16

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 3 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103,908.7 E 2,781,997.4	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 7
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 7/25/16; COMPLETED 7/27/16
7. THICKNESS OF OVERBURDEN 28.00	17. ELEVATION TOP OF HOLE -12.60
8. DEPTH DRILLED INTO ROCK 14.40	18. TOTAL ROCK CORE RECOVERY FOR BORING 94 %
9. TOTAL DEPTH OF HOLE 42.40	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/11	2-1-3-1	Started drilling on 7/25/16.	Poorly graded Sand with Silt (SP-SM), approximately 75% fine to coarse sand, 15% gravel, 10% silt, very loose, black/brown, wet.
		S-2	2 to 4	24/24	3-3-4-3		Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 25% gravel, 5% silt, loose, brown, wet.
	5	S-3	4 to 6	24/10	8-5-5-8	Stopped at 4.0' bgs on 7/25/16 at 1500, started again on 7/26/16 at 0745.	Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 25% gravel, 5% silt, loose, brown, wet.
-20		S-4	6 to 8	24/7	7-8-9-8		Poorly graded Sand with Gravel (SP), approximately 55% fine to coarse sand, 40% gravel, 5% silt, medium dense, brown, wet.
		S-5	8 to 10	24/14	11-17-17-17	4" cobble stuck in SS tip at 8.0'.	Poorly graded Sand with Gravel (SP), approximately 55% fine to coarse sand, 40% gravel, 5% silt, dense, brown, wet, with cobbles.
	10	S-6	10 to 12	24/8	10-11-13-17		Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, medium dense, brown, wet.
		S-7	12 to 14	24/15	10-10-9-7		Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, medium dense, brown, wet.
	15	S-8	14 to 16	24/5	5-5-6-8		Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 25% gravel, 5% silt, medium dense, brown, wet.
-30		S-9	16 to 18	24/11	6-9-10-9		Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 25% gravel, 5% silt, medium dense, brown, wet.
		S-10	18 to 20	24/13	10-11-14-14	2" SS	Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, brown, wet.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE -12.60

Hole No. FD16-07

PROJECT: Portsmouth Harbor Turning Basin

INSTALLATION: New England District

SHEET 2 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-11	20 to 22	24/10	12-29-13-11	2" SS	Silty Sand with Gravel (SM), approximately 65% fine to medium sand, 20% silt, 15% gravel, dense, brown/gray, wet.
		S-12	22 to 24	24/22	13-11-12-15	2" SS	Top 13": Poorly graded Sand with Gravel(SP), approximately 80% fine to coarse sand, 15% gravel, 5% silt, medium dense, brown, wet. Bottom 9": Silty Sand (SM), approximately 60% fine to medium sand, 30% silt, 10% gravel, medium dense, gray, wet.
	25	S-13	24 to 26	24/16	11-10-8-18		Silty Gravel with Sand (GM), approximately 60% gravel, 20% silt, 20% fine to coarse sand, medium dense, gray, wet.
		S-14	26 to 26.8	9/9	49-105/3"		Poorly graded Gravel with Silt (GP-GM), approximately 80% gravel, 10% fine to coarse sand, 10% silt, very dense, gray, wet.
-40							Possible Gravel. (Penetrate with roller bit.) Advance roller bit to 28.0' bml prior to coring.
		C-1	28 to 29.3	16/15	0		Hard, fresh to slightly weathered, fine grained, gray, SCHIST. Joints are very close, moderately dipping, planar, rough, fresh to discolored, partially open. Rock Core Times (min/ft): 6.0, 5.0/4"
	30	C-2	29.3 to 31.7	28/19	0		Hard, fresh to slightly weathered, fine grained, dark gray/gray, SCHIST. Joints are very close to close, low angle, planar, rough, fresh to discolored, tight to partially open. One high angle joint. Basalt intrusions, 2" thick. Rock Core Times (min/ft): 5/4", 4.5, 4.5
		C-3	31.7 to 32.7	12/12	0		Hard, fresh to slightly weathered, fine grained, dark gray, BASALT. Highly fractured, recovery consisted of gravel. Rock Core Times (min/ft): 9.0
		C-4	32.7 to 34.7	24/24	0		Hard, fresh, fine grained, dark gray, BASALT. Joints are very close to close, low angle, planar, rough, fresh to discolored, tight to partially open. Rock Core Times (min/ft): 7.0, 4.75
	35	C-5	34.7 to 37.3	31/31	0		Hard, fresh, fine grained, gray/dark gray, SCHIST. Primary joints are very close to close, low angle, planar, rough, fresh to discolored, tight. Secondary joints are close, high angle to vertical, planar, rough, fresh, tight to partially open. Basalt intrusions, 2"-8" thick. Rock Core Times (min/ft): 3.0, 4.0, 4.25/6"
-50		C-6	37.3 to 39.5	26/26	0	Stopped at 37.5' on 7/25/16 at 1515, started again on 7/27/16 at 0745.	Hard, fresh, fine grained, gray, SCHIST. Primary joints are very close to close, low angle, planar, rough, fresh to discolored, tight to partially open. Secondary joints are very close to close, high angle to vertical, planar, rough, fresh, tight. Rock Core Times (min/ft): 6.25, 9.25, 5.0/2"
	40	C-7	39.5 to 42.4	35/35	23		Hard, fresh to slightly weathered, fine grained, gray, SCHIST. Primary joints are very close to close, low angle, planar, rough, fresh to discolored, open to tight. Secondary joints are very close to close, high angle to vertical, planar, undulating, rough, fresh to discolored, open to tight. Secondary joints are very close to close, high angle to vertical, planar, undulating, rough, fresh to discolored, tight to open, some calcite infilling. Rock Core Times (min/ft): 5.0, 5.5, 3.0/8"
	45					Completed drilling on 7/27/16 at 1015. Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7).	Bottom of boring at depth 42.4 ft.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-60	50					2. Barge deck surveyed at +9.3', mudline measured at 21.9' below top of barge deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing. Rock was cored using an NX core barrel. 4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks. 6. Elevation of top of hole references the mudline elevation.		
	55							
-70	60							
	65							
-80	70							

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 2 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104,838.4 E 2,781,322.8	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 7/19/16; COMPLETED 7/19/16
7. THICKNESS OF OVERBURDEN 32.00	17. ELEVATION TOP OF HOLE -18.50
8. DEPTH DRILLED INTO ROCK	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 32.00	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/16	7-4-3-4	Started drilling on 7/19/16 at 0830.	Poorly graded Sand (SP), approximately approximately 90% fine to coarse sand, 5% gravel, 5% silt, loose, brown, wet.
-20		S-2	2 to 4	24/24	12-8-8-7		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
	5	S-3	4 to 6	24/2	3-2-1-2		Poorly graded Gravel with Sand (GP), approximately 80% gravel, 15% fine to coarse sand, 5% silt, very loose, brown/gray, wet.
		S-4	6 to 8	24/24	WOR-5-14-25		Top 18": Poorly graded Sand (SP), approximately 90% fine to medium sand, 5% gravel, 5% silt, medium dense, brown, wet. Bottom 6": Silty Sand with Gravel (SM), approximately 45% fine to coarse sand, 40% silt, 15% gravel, medium dense, brown, wet.
		S-5	8 to 10	24/12	9-13-17-10		Silty Gravel with Sand (GM), approximately 60% gravel, 25% silt, 15% fine to coarse sand, medium dense, brown/gray, wet, with cobbles.
-30	10	S-6	10 to 12	24/19	3-4-5-8		Poorly graded Sand (SP), approximately 90% fine to medium sand, 5% gravel, 5% silt, loose, brown, wet.
		S-7	12 to 14	24/11	7-6-8-9		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
	15	S-8	14 to 16	24/10	5-8-9-11		Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, brown, wet.
		S-9	16 to 18	24/17	7-16-29-39		Top 5": Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, dense, brown, wet. Bottom 12": Sandy Silt with Gravel (ML), approximately 55% silt, 30% fine to coarse sand, 15% gravel, hard, brown, wet.
		S-10	18 to 20	24/10	40-49-37-32		Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 25% gravel, 15% silt, very dense, brown, wet.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE	Hole No.
-18.50	FD16-08

PROJECT	INSTALLATION	SHEET
Portsmouth Harbor Turning Basin	New England District	SHEET 2 OF 2 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
-40		S-11	20 to 22	24/19	15-9-7-8		Top 9": Silty Sand with Gravel (SM), approximately 60% fine to coarse sand, 25% gravel, 15% silt, medium dense, brown, wet. Bottom 10": Poorly graded Sand with Silt and Gravel (SP-SM), approximately 70% fine sand, 20% gravel, 10% silt, medium dense, gray, wet.
		S-12	22 to 24	24/10	13-15-12-27		Silty Gravel with Sand (GM), approximately 60% gravel, 25% fine to coarse sand, 15% silt, medium dense, gray, wet.
	25	S-13	24 to 26	24/12	22-15-12-27		Silty Gravel with Sand (GM), approximately 60% gravel, 25% fine to coarse sand, 15% silt, medium dense, gray, wet.
		S-14	26 to 28	24/8	22-17-15-11		Silty Gravel with Sand (GM), approximately 60% gravel, 25% fine to coarse sand, 15% silt, dense, gray, wet.
		S-15	28 to 30	24/24	10-9-7-10		Silty Sand with Gravel (SM), approximately 55% fine to coarse sand, 30% gravel, 15% silt, medium dense, gray, wet.
-50	30	S-16	30 to 32	24/16	6-12-27-70	Drilling completed on 7/19/16 at 1400.	Silty Sand with Gravel (SM), approximately 55% fine to coarse sand, 30% gravel, 15% silt, dense, gray, wet, with cobbles.
	35					Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +5.5', mudline measured at 24.0' below top of barge deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing.	Bottom of boring at depth 32 ft.
-60	40					4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks.	
	45					6. Elevation of top of hole references the mudline elevation.	

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 3 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103,629.6 E 2,782,265.2	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 18; UNDISTURBED 0
5. NAME OF INSPECTOR Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 7/27/16; COMPLETED 7/28/16
7. THICKNESS OF OVERBURDEN 36.20	17. ELEVATION TOP OF HOLE -12.70
8. DEPTH DRILLED INTO ROCK 4.00	18. TOTAL ROCK CORE RECOVERY FOR BORING 83 %
9. TOTAL DEPTH OF HOLE 40.20	19. SIGNATURE OF INSPECTOR *Blaine Cardali, GZA*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-1	0 to 2	24/5	1-2-1-2	Started drilling on 7/27/16 at 1330.		Poorly graded Sand with Gravel (SP), approximately 80% fine to coarse sand, 15% gravel, 5% silt, very loose, dark brown/black, wet, with organics.
		S-2	2 to 4	24/12	3-4-5-5			Poorly graded Sand (SP), approximately 90% fine to medium sand, 5% gravel, 5% silt, loose, brown, wet.
	5	S-3	4 to 6	24/17	4-6-10-8			Poorly graded Sand (SP), approximately 90% fine to medium sand, 5% gravel, 5% silt, medium dense, brown, wet.
-20		S-4	6 to 8	24/4	3-2-3-4			Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, loose, brown, wet.
		S-5	8 to 10	24/5	4-4-5-6			Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, loose, brown, wet.
	10	S-6	10 to 12	24/8	3-4-6-6			Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, loose, brown, wet.
		S-7	12 to 14	24/10	3-5-7-7			Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
	15	S-8	14 to 16	24/13	6-6-7-8			Top 8": Poorly graded Sand with Gravel (SP), approximately 65% fine to coarse sand, 30% gravel, 5% silt, medium dense, brown, wet. Bottom 5": Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, medium dense, brown, wet.
-30		S-9	16 to 18	24/10	4-4-5-7			Poorly graded Sand with Gravel (SP), approximately 65% sand, 30% gravel, 5% silt, loose, brown, wet.
		S-10	18 to 20	24/20	7-9-14-15	2" SS		Poorly graded Sand with Gravel (SP), approximately 65% fine to coarse sand, 30% gravel, 5% silt, medium dense, brown, wet.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE: -12.70

Hole No. FD16-09

PROJECT: Portsmouth Harbor Turning Basin

INSTALLATION: New England District

SHEET 2 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-11	20 to 22	24/11	3-6-7-9	2" SS		Poorly graded Sand with Gravel (SP), approximately 75% fine to coarse sand, 20% gravel, 5% silt, medium dense, brown, wet.
		S-12	22 to 24	24/7	5-9-9-13	2" SS		Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, brown, wet.
	25	S-13	24 to 26	24/8	7-12-14-26	2" SS		Poorly graded Sand (SP), approximately 85% fine to coarse sand, 10% gravel, 5% silt, medium dense, brown, wet.
-40		S-14	26 to 28	24/12	9-8-10-14	Stopped at 26.0' bgs on 7/27/16 at 1500, started again on 7/28/16 at 0745. 2" SS		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
		S-15	28 to 30	24/11	9-8-11-14	2" SS		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
	30	S-16	30 to 32	24/11	4-8-10-20	2" SS		Poorly graded Sand (SP), approximately 90% fine to coarse sand, 5% gravel, 5% silt, medium dense, brown, wet.
		S-17	32 to 34	24/13	8-22-18-16	2" SS		Top 11": Poorly graded Sand (SP), approximately 95% fine to medium sand, 5% silt, dense, light brown/light gray, wet. Bottom 2": Silty Sand with Gravel (SM), approximately 60% fine to medium sand, 25% silt, 15% gravel, dense, gray, wet.
	35	S-18	34 to 35.2	14/10	8-35-100/2"	Increased roller bit resistance from 33.8'-36.2' bgs.		Silty Sand with Gravel (SM), approximately 55% fine to medium sand, 30% gravel, 15% silt, very dense, gray, wet.
-50		C-1	36.2 to 40.2	48/40	27	Attempted 2" SS at 36.2'; spoon bouncing. Set up to core.		Possible fractured bedrock based on roller bit advancement. (Penetrate with roller bit.) Advance roller bit to 36.2' bml. Hard, fresh, fine grained, gray, SCHIST. Primary joints are very close to close, low angle, rough, undulating, fresh, tight to partially open. Secondary joints are close, moderately dipping to high angle, rough, undulating, fresh, partially open to open. Rock Core Times (min/ft): 4.75, 5.5, 6.5, 6.5
	40					Completed drilling on 7/28/16 at 1200. Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +5.3', mudline measured at 18.0' below top of barge deck. 3. Borehole was drilled		Bottom of boring at depth 40.2 ft.
	45							

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-60						using drive and wash techniques and 4.5" O.D. casing. Rock was cored using an NX core barrel.		
	50					4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks.		
						5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks.		
	55					6. Elevation of top of hole references the mudline elevation.		
-70								
	60							
	65							
-80								
	70							

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: New England District	SHEET 1 OF 3 SHEETS

1. PROJECT: Portsmouth Harbor Turning Basin, Eliot, Maine	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 103,438.2 E 2,782,320.9	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: Maine State Plane, NAD 83 West
3. DRILLING AGENCY: New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG: CME 45
4. NAME OF DRILLER: Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 21; UNDISTURBED 0
5. NAME OF INSPECTOR: Blaine Cardali, GZA	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE: STARTED 7/14/16; COMPLETED 7/15/16
7. THICKNESS OF OVERBURDEN: 42.00	17. ELEVATION TOP OF HOLE: -9.30
8. DEPTH DRILLED INTO ROCK	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
9. TOTAL DEPTH OF HOLE: 42.00	19. SIGNATURE OF INSPECTOR: Blaine Cardali, GZA

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-10		S-1	0 to 2	24/8	8-4-2-2	Started drilling on 7/14/16 at 1021.		Poorly graded Gravel with Sand (GP), approximately 80% gravel, 15% fine to coarse sand, 5% silt, loose, brown/dark gray, wet.
		S-2	2 to 4	24/7	8-7-9-7			Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, medium dense, brown, wet.
	5	S-3	4 to 6	24/0	6-6-5-6	Increased resistance of roller bit from 2.0'-4.0' bgs appeared to be due to cobbles.		No recovery.
		S-4	6 to 8	24/7	7-5-4-4			Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, loose, brown, wet.
		S-5	8 to 10	24/9	14-6-5-5			Poorly graded Sand with Gravel (SP), approximately 60% fine to coarse sand, 35% gravel, 5% silt, medium dense, brown, wet.
-20	10	S-6	10 to 12	24/7	6-8-8-8			Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% sand, 5% silt, medium dense, gray, wet.
		S-7	12 to 14	24/16	12-7-4-4			Poorly graded Gravel with Sand (GP), approximately 55% gravel, 40% fine to coarse sand, 5% silt, medium dense, gray/brown, wet.
	15	S-8	14 to 16	24/7	5-3-6-13			Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 25% gravel; 5% silt, loose, brown, wet.
		S-9	16 to 18	24/5	8-9-7-9			Poorly graded Sand with Gravel (SP), approximately 70% fine to coarse sand, 30% gravel, medium dense, brown, wet, with one 3" cobble.
		S-10	18 to 20	24/10	11-9-4-7	Drilling from 16.0'-42.0' bgs, roller bit had intermittent resistance indicating possible cobbles/boulders in sand and gravel layering.		Poorly graded Sand with Gravel (SP), approximately 60% fine to coarse sand, 40% gravel, medium dense, brown/gray, wet, with two apparent fragments of 3" cobbles.

NAE 1836 LETTER 09.0025912.00 USACE PORTS HARBOR TURNING BASIN.GPJ NAE DATA TEMPLATE.GDT 9/26/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -9.30		Hole No. FD16-10
PROJECT Portsmouth Harbor Turning Basin		INSTALLATION New England District	SHEET 2 OF 3 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-30		S-11	20 to 22	24/7	9-7-7-7			Poorly graded Gravel with Sand (GP), approximately 70% gravel, 30% fine to coarse sand, medium dense, brown/gray, wet.
		S-12	22 to 24	24/11	8-9-6-8			Poorly graded Gravel with Sand (GP), approximately 60% gravel, 40% fine to coarse sand, medium dense, brown/gray, wet.
	25	S-13	24 to 26	24/6	11-7-6-7			Well graded Sand with Gravel (SW), approximately 65% fine to coarse Sand, 30% gravel, 5% silt, medium dense, brown, wet.
		S-14	26 to 28	24/14	9-8-9-8			Well graded Sand with Gravel (SW), approximately 70% fine to coarse sand, 25% gravel, 5% silt, medium dense, brown, wet.
		S-15	28 to 30	24/24	9-10-12-13			Well graded Sand (SW), approximately 80% fine to coarse sand, 15% gravel, 5% silt, medium dense, brown, wet.
-40	30	S-16	30 to 32	24/11	9-14-17-11			Poorly graded Gravel with Sand (GP), approximately 70% gravel, 25% fine to coarse sand, 5% silt, dense, gray/brown, wet.
		S-17	32 to 34	24/24	11-21-15-16			Poorly graded Gravel with Sand (GP), approximately 70% gravel, 25% fine to coarse sand, 5% silt, dense, gray/brown, wet.
	35	S-18	34 to 36	24/13	28-16-16-13			Poorly graded Gravel with Sand (GP), approximately 70% gravel, 25% fine to coarse sand, 5% silt, dense, brown/gray, wet.
		S-19	36 to 38	24/23	14-23-13-10			Poorly graded Gravel with Sand (GP), approximately 60% gravel, 35% fine to coarse sand, 5% silt, dense, brown, wet.
		S-20	38 to 40	24/6	6-5-6-8			Poorly graded Gravel with Sand (GP), approximately 70% gravel, 25% fine to coarse sand, 5% silt, medium dense, brown, wet.
-50	40	S-21	40 to 42	24/24	8-16-19-20	Completed drilling on 7/15/16 at 0930.		Poorly graded Sand with Gravel (SP), approximately 65% fine to coarse sand, 30% gravel, 5% silt, dense, brown, wet.
	45					Notes: 1. Drill platform: Lift boat/jackup barge (Seismic Princess No. 7). 2. Barge deck surveyed at +9.7', mudline measured at 19.0' below top of barge		Bottom of boring at depth 42 ft.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
						deck. 3. Borehole was drilled using drive and wash techniques and 4.5" O.D. casing. 4. Samples were retrieved using a 3" O.D. split spoon (SS) driven with a 300 lb safety hammer with an 18" drop unless noted otherwise in Drilling Remarks. 5. Samples were retrieved using a 2" O.D. SS driven with a 140 lb safety hammer operated with a rope and cathead with a 30" drop where noted in Drilling Remarks. 6. Elevation of top of hole references the mudline elevation.		
	50							
-60								
	55							
	60							
-70								
	65							
	70							
-80								

APPENDIX B

Original Field Logs

FD16-10

Hole No.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 6 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N103428.2, E 2782320.9	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG DIEDRICH D-50
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 21; DISTURBED ; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES —
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
7. THICKNESS OF OVERBURDEN >42' below mudline	16. DATE STARTED 7/14/16 1021; COMPLETED 7/15/16 0930
8. DEPTH DRILLED INTO ROCK —	17. ELEVATION TOP OF HOLE -9.3 MLLW
9. TOTAL DEPTH OF HOLE 42.0	18. TOTAL ROCK CORE RECOVERY FOR BORING % —
	19. SIGNATURE OF INSPECTOR Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-9.3								
		S-1	0-2	24/8	8-4 2-2			S-1: Poorly graded Gravel with Sand (GP). 80% G; 15% F-C S; 5% ML, loose, Brown/dark gray, wet.
-11.3	2							
		S-2	2-4	24/7	8-7 9-7	Resistance of R/C from 2-4' Appeared to be due to cobbles.		S-2: Poorly graded gravel with Sand. (GP), 60% G; 35% F-C S; 5% ML, Medium dense, brown, wet.
-13.3	4							
		S-3	4-6	24/0	6-6 5-6			No recovery
-15.3	6							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. F016-10
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 2 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-15.3	6	S-4	6-8	24/7	7-5 4-4			S-4: Poorly graded Gravel with Sand (GP), 60% G; 35% F-C S; 5% ML; loose, dark gray, wet.
-17.3	8	S-5	8-10	24/9	14-6 5-5			S-5: Poorly graded Sand with Gavel (SP), 60% F-C S; 35% G; 5% ML, M. dense, brown, wet.
-19.3	10	S-6	10-12	24/7	6-8 8-8			S-6: Poorly graded Gravel with Sand (GP), 60% G; 35% S; 5% ML, M. dense, gray, wet.
-21.3	12	S-7	12-14	24/16	12-7 4-4			S-7: Poorly graded Gravel with Sand (GP), 55% G, 40% F-C S, 5% ML, M. dense, gray/brown, wet
-23.3	14							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-10
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 3 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample Information						
-23.3	14	S-8	14'-16	24/7	5-3 6-13			S-8 Poorly graded Sand (SP), 85% F-C S; 10% G; 5% M-C, loose, brown, wet.
-25.3	16	S-9	16'-18	24/5	8-9 7-9	Intermittent resistance indicating Cobbles		S-9: Poorly graded Sand with Gravel (SP), 80% F-C S; 20% G, M. dense, brown, wet, with One 3" Cobble.
-27.3	18	S-10	18'-20	24/10	11-9 4-7			S-10: Poorly graded Sand with gravel (SP), 60% F-C S; 40% G, M. dense, brown/gray, wet with 2 3" cobbles.
-29.3	20	S-11	20'-22	24/7	9-7 7-7			S-11: Poorly graded Gravel with Sand (GP), 70% G, 30% F-C S, M. dense, brown/gray, wet.
-31.3	22							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE

Hole No. FD16-10

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 4 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-31.3	22							
		S-12	22'-24	24/11	8-9 6-8			S-12: Poorly graded Gravel with Sand (GP), 60% G, 40% F-C S, M. dense, brown/gray, wet.
-33.3	24							
		S-13	24'-26	24/6	11-7 6-7			S-13: Poorly graded Sand with Gravel (SP), 65% F-C S; 30% G; 5% ML, M. dense, Brown, wet,
-35.3	26							
		S-14	26'-28	24/19	9-8 9-8			S-14: well graded Sand with Gravel (SW), 70% F-C S; 25% G; 5% ML, M. dense, brown, wet.
-37.3	28							
		S-15	28'-30	24/24	9-10 12-13			S-15: well graded Sand (SW) 80% F-C S; 15% G; 5% ML, M. dense, brown, wet,
-39.3	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE | Hole No. FD16-10

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 5 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-39.3	30							
		S-16	30'-32	24/11	9-14 17-11			S-16: Poorly graded Gravel with Sand (GP), 70% G, 25% F-C S; 5% ML, dense, gray/brown, wet.
-41.3	32							
		S-17	32'-34	24/24	11-21 15-16			S-17: Poorly graded Gravel with Sand (GP), 70% G; 25% F-C S; 5% ML, dense, gray brown, wet.
-43.3	34							
		S-18	34'-36	24/13	28-16 16-13			S-18: Poorly graded Gravel with Sand (GP), 70% G; 25% F-C S; 5% ML, dense, brown/gray, wet
-45.3	36							
		S-19	36'-38	24/23	14-23 13-10			S-19: Poorly graded Gravel with Sand (GP), 60% G, 35% F-C S; 5% ML, dense, brown, wet.
-47.3	38							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-10
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 6 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-47.3	38							
		S-20	38' 40	24/6	6-5 6-8			S-20 Poorly graded Gravel with Sand (GP). 70% G, 25% F-C S; 5% ML, M. dense, brown, wet.
-49.3	40							
		S-21	40' 42	24/24	8-16 19-20			S-21: Poorly graded Sand with Gravel (SP). 65% F-C S, 30% G, 5% ML, dense, brown, wet.
-51.3	42					Bottom of exploration at 42' below mudline		

1. DRILLING FROM 16-42; r/c had intermittent resistance indicating possible cobbles/boulders in sand and gravel layers.
2. 4" CASING TO 38' below mudline,

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

FD16-05
Hole No.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS

1. PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME
2. BORING LOCATION (Coordinates or Station): N 104326.8 E 2782036.9
3. DRILLING AGENCY: New England Boring Contractors
4. NAME OF DRILLER: Sam Cooley
5. NAME OF INSPECTOR: Blaine Cardali
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: >34 below mudline
8. DEPTH DRILLED INTO ROCK: N/A
9. TOTAL DEPTH OF HOLE: 34'
10. SIZE AND TYPE OF BIT: 4" roller bit
11a. VERTICAL DATUM: MLLW
11b. HORIZONTAL DATUM: State Plane, NAD 83 West
12. MANUFACTURER'S DESIGNATION OF DRILL RIG: DEIDRICH D-50
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 17 UNDISTURBED
14. TOTAL # OF ROCK SAMPLES: 0
15. ELEVATION GROUND WATER: TIDAL
16. DATE: STARTED 7/13/16 10:10 COMPLETED 7/14/16 0920
17. ELEVATION TOP OF HOLE: -16.7 MLLW
18. TOTAL ROCK CORE RECOVERY FOR BORING: — %
19. SIGNATURE OF INSPECTOR: Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-16.7	0	S-1	0-2'	24/12	1-1-1-1			S-1: Silt with Sand (ML), 70% ML 20% F. S, 10% g; Soft, gray, wet.
-18.7	2	S-2	2-4	24/24	1-2 2-2			S-2 TOP 8" Lean Clay with Sand (CL), 85% CL; 15% S; soft, gray wet
								S-2 Bot 16": Sandy Silt (ML), 60% ML, 35% F.S; 5% G, loose, light brown, wet.
-20.7	4	S-3	4-6	24/20	2-2 2-3			S-3: Silty Sand (SM), 70% F.S, 30% ML, loose, light brown, wet.
-22.7	6							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836 JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE | **Hole No.** FD16-05

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-22.7	6	S-4	6-8	24/24	1-2 4-6			S-4: TOP 13": Lean Clay with Gravel, (CL) 80% CL, 15% G, 5% F. S, soft, gray wet
								Bot 11": Silty Sand (SM), 75% F. S; 25% ML; loose, tan, wet.
-24.7	8	S-5	8-10	24/18	4-4 3-2			S-5: Silty Sand with Gravel, (SM), 75% Sand; 20% ML; 5% F. G ; loose, tan, wet,
-26.7	10	S-6	10-12	24/18	3-2 3-37			S-6: Silty Sand (SM) 75% F Sand, 15% ML; 10% gravel, loose, tan, wet.
-28.7	12	S-7	12-14'	24/24	12-7 12-12			S-7: TOP 7" Same as S-6
								Bottom 17": Poorly graded Sand with Gravel (SP), 70% F-C S; 25% G; 5% ML, M. dense; tan, wet
-30.7	14							

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE | Hole No. FD16-05

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample Information						
-30.7	14	S-8	14-16	24/17	12-9 9-19			S-8: Poorly graded Sand with Gravel, 75% F-C S, 20% Fine G, 5% ML, M. dense, tan, wet.
-32.7	16							S-9 Top 12: Poorly graded Sand with Silt (SP-SM) 90% F-M S; 10% ML; M. dense, tan wet
		S-9	16-18'	24/24	4-7 6-5			
								Bot 12" Poorly graded Sand with Gravel and Silt (SP-SM), 60% F-C S; 30% F G; 10% ML, M. dense, brown/gray, wet.
-34.7	18							S-10: Top 7" Poorly graded Sand (SP) 95% F-M Sand, 5% ML, loose, brown, wet.
		S-10	18-20'	24/11	3-3 3-5			Bot 4" Poorly graded Sand with gravel (SP) 75% F-C Sand, 20% gravel, 5% ML, loose, gray, wet.
-36.7	20							
		S-11	20-22'	24/0	6-4 5-6	Base on drilling advancement and wash return, Material appears similar to S-13 from 20-24		No recovery
-38.7	22							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16 - 05
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-38.7	22	S-12	22-24					No recovery.
-40.7	24	S-13	24-26	24/6	7-4 5-6			S-13: Poorly Graded SAND (SP) 95% F-M Sand; 5% ML, Loose, light gray, wet,
-42.7	26	S-14	26-28	24/15	3-4 5-5			S-14: Poorly Graded Sand (SP), 95% F-C S; 5% ML, Loose, light gray, wet
-44.7	28	S-15	28-30	24/4	7-6 5-6			S-15: Well grade Sand (SW-SM) 90% F-C S; 5% G; 5% ML, m.dense light gray, wet.
-46.7	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE		Hole No. FD16-05
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-46.7	30	S-16	30-32	24/0	3-4 8-7			S-16: RECOVERY CONSISTED OF A PIECE OF COARSE GRAVEL.
-48.7	32	S-17	32-34	24/7	5-5 10-13			S-17: Well graded Sand (SW) 95% F-C S; 5% MC; M.dense, light gray, wet
-50.7	34					Bottom of exploration at 34.0' bml (-50.7' MLLW)		

1. 4" CASING TO 30 Feet below the mudline.

NAE FORM 1836-A JUN 10 — DURING DRILLING / AT COMPLETION / AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

Hole No. FD6-03

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 7 SHEETS
1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		10. SIZE AND TYPE OF BIT 4" roller bit	
2. BORING LOCATION (Coordinates or Station) N 104093.8 E 2782047.5		11a. VERTICAL DATUM MLLW	11b. HORIZONTAL DATUM MAINE State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors		12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45	
4. NAME OF DRILLER Sam Cooley		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 23	UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali		14. TOTAL # OF ROCK SAMPLES —	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.		15. ELEVATION GROUND WATER	TIDAL
7. THICKNESS OF OVERBURDEN ±47'		16. DATE STARTED 7/15/16 1010	COMPLETED 7/18/16 14:10
8. DEPTH DRILLED INTO ROCK —		17. ELEVATION TOP OF HOLE -3.4	
9. TOTAL DEPTH OF HOLE 47.0		18. TOTAL ROCK CORE RECOVERY FOR BORING % —	
		19. SIGNATURE OF INSPECTOR *Blaine Cardali*	

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-3.4	0	S-1	0-2	24/7	7-1 4-2			S-1: Poorly graded Sand with Silt and Gravel (SP-SM), 50% F-C S; 40% G; 10% ML, loose, brown, wet.
-5.4	2	S-2	2-4	24/24	4-6 6-2		2.8	S-2: TOP 10": Silty Sand with Gravel (SM) 60% F-C S; 20% ML; 20% G. M. dense, brown, wet. Bottom 14": Poorly graded Sand with Gravel (SP) 80% F-C S; 15% G; 5% ML m. dense, brown, wet.
-7.4	4	S-3	4-6	24/11	10-10 44-21			S-3: Poorly graded Sand with Silt and Gravel (SP-SM), 75% F S; 15% G; 10% ML, very dense, brown, wet.
-9.4	6							

1. Samples retrieved using a 3" O.D. Split spoon (SS) with a 300 lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with a 140 lb hammer with 30" drop.

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-9.4	6							
		S-4	6-8	24/9	11-12 14-12			S-4: Silty Sand with Gravel (SM), 65% F-CS; 20% ML; 15% G, m. dense, brown, wet
-11.4	8							
		S-5	8-10	24/24	9-8 12-14			S-5: Silty Sand with Gravel (SM), 60% F-MS; 20% ML; 20% G, m. dense, brown, wet
-13.4	10							
		S-6	10-12	24/18	11-15 45-18			S-6: Silty Sand with Gravel (SM), 60% F-CS; 20% ML; 20% G, v. dense, brown, wet.
-15.4	12							
		S-7	12-14	24/17	11-15 15-18			S-7: Silty Sand with Gravel (SM), 60% F-CS; 20% ML; 20% G, m. dense, brown, wet.
-17.4	14							

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. F016-03

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 3 OF 7 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-17.4	14	S-8	14'–16	24/14	4-3, 5-6			S-8: Top 4" same as S-7. Bot 10": Sandy lean clay with gravel. (CL), 55% CL; 30% F-C S; 15% G, Stiff, gray, wet.
-19.4	16	S-9	16'–18	24/18	3-4, 7-8			S-9: Clayey Sand with gravel (SC) 55% F-m S; 25% G; 20% CL, M. dense, gray, wet.
-21.4	18	S-10	18'–18.3	4/4	50/4"	Splitspoon refusal at 18.3'. R/C ahead to 19.3+ Set up to core. Cored from 19.3 to 21.0 before punching through.		S-10: Clayey Sand with gravel (SC) 55% F-m S; 25% G; 20% CL, very dense, gray, wet. Boulder From 18.3 – 21.0
-23.4	20	S-11	21'–23	24/6	6-8, 16-20			S-11: Silty Gravel with Sand (GM) 40% ML; 35% G; 25% F-m S, M. dense, brown, wet.
-25.4	22							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-03
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 4 OF 7 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-25.4	22							
	23					Stopped at 23' on 7/15/16 at 1400, Started again on 7/18/16 at 0745.		S-12: Silty Gravel with Sand (GM), 60% G; 25% m-c S; 15% ML, Medium dense, light brown, wet.
-27.4	24	S-12	23'-25	24/6	7-10 13-9			
	25							S-13: Poorly graded Sand (SP), 80% F-C S; 15% G; 5% ML, loose, brown, wet.
-29.4	26	S-13	25-27	24/6	4-5 5-7			
	27	S-14	27-29	24/24	9-8 10-13			S-14: Poorly graded Sand (SP), 95% F-C S; 5% ML, Medium dense, brown, wet.
-31.4	28							
	29							S-15: Poorly graded Sand (SP) 90% F-C S; 5% G; 5% ML, dense, brown, wet.
-33.4	30	S-15	29'-31	24/5	11-15 18-20			

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-03
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 5 OF 7 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-33.4	30							
		S-16	31-33	24/24	7-11 13-17			S-16: Poorly graded Sand (SP), 95% F-C S; 5% ML, Medium dense, brown, wet.
-35.4	32							
		S-17	33-35	24/8	9-12 15-16			S-17: Poorly graded Sand (SP), 95% F-C S; 5% ML, medium dense, brown, wet.
-37.4	34							
								S-18: Poorly graded Sand (SP), 95% F-m S; 5% ML, Medium dense, brown, wet.
-39.4	36	S-18	35/37	24/7	7-9 11-13			
		S-19	37-39'	24/0	8-12 15-19	No recovery in 3" SS, drove a 2" SS to get 6" recovery		S-19: Poorly graded Sand (SP) 95% F-m S; 5% ML, dense, brown, wet,
-41.4	38							

NAE FORM 1836-A JUN 10 — DURING DRILLING — AT COMPLETION — AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-03
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 6 OF 7 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-41.4	38							
		S-20	39-41	24/6	6-11 19-31	2" SS		S-20 Poorly graded Sand (SP), 95% F-C S; 5% ML, m.dense, brown, wet.
-43.4	40					S-20, S-21 2" SS driven with 140lb hammer, 24" drop		
		S-21	41-43	24/21	13-13 17-31			S-21: Poorly graded Sand (SP); 95% F-C S; 5% ML, m.dense, brown, wet
-45.4	42							
		S-22	43-43.4	5/5	R			S-22: Silty Sand with Gravel (SM), 50% f-S; 35% ML, 15% G, Very dense gray, wet
-47.4	44					43.4→44.2 Rollerbit		43.4-44.2 Boulder
						44.2-45.0 Roller Core		
		S-23	45-47	24/18	17-26 45-34			S-23: Top 10": Poorly graded Sand (SP); 95% F-M S; 5% ML, m.dense, brown, wet.
-49.4	46						45.8'	

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT Portsmouth Harbor Turning Basin, Eliot, ME HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16-03
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 7 OF 7 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-49.4	46							S-23: Bottom 8": Silty Gravel with Sand (GM), 55% G; 30% F-C S; 15% ML, Very dense, gray, wet.
-50.4	-47					Bottom of exploration at 47' below mudline (-50.4 MLLW)		
-51.4	-48							

3. 4" casing to 43' below the mudline.

Hole No. FDV6-08

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 164838.4 E 2781322.8	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM MAINE State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES —
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
7. THICKNESS OF OVERBURDEN +32	16. DATE STARTED 7/19/16 0830; COMPLETED 7/19/16 1400
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE -18.5
9. TOTAL DEPTH OF HOLE 32.0	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR *Blaine Cardali*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-18.5	0	S-1	0-2	24/16	7-4 3-4			S-1: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, loose, brown, wet.
-20.5	2	S-2	2-4	24/21	12-8 8-7			S-2: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, m.dense, brown, wet.
-22.5	4	S-3	4-6	24/2	3-2 1-2			S-3: Poorly graded Gravel with Sand (GP) 80% G; 15% F-C S; 5% ML, very loose, brown/gray, wet.
-24.5	6							

1. Samples retrieved using 3" O.D. Splitspoon (SS) with a 300 lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with 100 lb hammer with 30" drop.

NAE FORM 1836 JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING — PROJECT Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16-08
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-24.5	6	S-4	6-8	24/24	WOR-5 14-25			S-4 TOP 18": Poorly graded Sand (SP) 90% F-m S; 5% G; 5% ML, m. dense brown, wet
						7.5'		Bot 6": Sandy Silt with Gravel (ML) 55% ML; 30% F-C S; 15% G, dense, brown, wet.
-26.5	8	S-5	8-10	24/12	9-13 17-10			S-5: Silty Gravel with Sand (GM) 70% G; 15% F-C S; 15% ML, M. dense, brown/gray, wet, with cobbles.
-28.5	10	S-6	10-12	24/19	3-4 5-8			S-6: Poorly graded Sand (SP), 90% F-m S; 5% G; 5% ML, loose, brown, wet
-30.5	12	S-7	12-14	24/11	7-6 8-9			S-7: Poorly grade Sand (SP), 90% F-C S; 5% G; 5% ML, M. dense, brown, wet,
-32.5	14							

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16 - 08

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-32.5	14	S8	14-16	24/10	5-8 9-11			S-8: Poorly graded Sand (SP), 85% F-C S; 10% G; 5% ML, M.dense, brown, wet.
-34.5	16	S-9	16-18	24/17	7-16 29-39			S-9: TOP 5" Poorly graded Sand (SP), 85% F-C S; 10% G; 5% ML, dense, brown, wet.
							16.4	Bottom 12" Sandy Silt with Gravel (ML) 55% ML; 30% F-C S; 15% G, dense, brown, wet.
-36.5	18	S-10	18-20	24/	46-49 37-32			S-10: Silty Sand w/ Gravel (SM), 60% F-C S; 25% G; 15% ML, very dense, brown, wet.
-38.5	20	S-11	20-22	24/19	15-9 7-8			S-11: TOP 9" Silty Sand with Gravel (SM) 60% F-C S; 25% G; 15% ML, m.dense, brown wet.
							20.8	Bott 10" Poorly graded Sand with Silt and Gravel (SP-SM), 70% F S; 20% G; 10% ML, m.dense, gray, wet.
-40.5	22							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16-08
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample Information						
-40.5	22	S-12	22-24	24/10	13-15 12-27			S-12: Silty Gravel with Sand (GM); 60% G; 25% F-C S; 15% ML, m. dense, gray, wet.
-42.5	24	S-13	24-26	24/12	22-15 12-27			S-13: Silty Gravel with Sand (GM), 60% G; 25% F-C S; 15% ML, m. dense, gray, wet.
-44.5	26	S-14	26-28	24/8	22-17 15-11			S-14 Silty Gravel with Sand (GM), 60% G; 25% F-C S; 15% ML, dense, gray, wet.
-46.5	28	S-15	28-30	24/24	10-9 7-10			S-15: Silty Sand with Gravel (SM), 55% F-C S; 30% G; 15% ML, medium dense, gray, wet.
-48.5	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		**Hole No.** FD16-08
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample Information						
-48.5	30	S-16	30-32	24/16	6-12 27-70			S-16; Silty Sand with Gravel (SM), 55% F-CS; 30% G; 15% ML, dense, gray, wet, with cobbles.
-50.5	32					Bottom of exploration to 32' below the mudline 4" Casing to 26.0' below mudline,		

NAE FORM 1836-A
JUN 10

▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT	HOLE NO.
Portsmouth Harbor Turning Basin, Eliot, ME	

FD16-01

Hole No.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS
1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		10. SIZE AND TYPE OF BIT 4" roller bit	
2. BORING LOCATION (Coordinates or Station) N/04703.5 E 278/553.1		11a. VERTICAL DATUM MLLW	11b. HORIZONTAL DATUM MAINE State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors		12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45	
4. NAME OF DRILLER Sam Cooley		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 16	DISTURBED / UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali		14. TOTAL # OF ROCK SAMPLES 1.0	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.		15. ELEVATION GROUND WATER TIDAL	
7. THICKNESS OF OVERBURDEN 33.6		16. DATE STARTED 7/20/16 0815 COMPLETED 7/20/16 1315	
8. DEPTH DRILLED INTO ROCK 3.5' (R/C 4.6 ft)		17. ELEVATION TOP OF HOLE -15.8	
9. TOTAL DEPTH OF HOLE 37.7		18. TOTAL ROCK CORE RECOVERY FOR BORING % 100%	
		19. SIGNATURE OF INSPECTOR Blaine Cardali	

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-15.8	0	S-1	0-2	24/6	8-5 5-4			S-1: Poorly graded Gravel (GP), 75% G; 20% M-CS; 5% ML; loose gray, wet, Possible cobble.
	1							
-17.8	2	S-2	2-4'	24/8	5-4 4-3			S-2: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, loose brown, wet.
-19.8	4	S-3	4-6	24/5	5-3 4-4			S-3: Poorly graded Sand (SP), 85% F-M S; 10% G; 5% ML, loose, brown, wet.
-21.8	6							

1. Samples retrieved using a 3" O.D. Splitspoon (SS), with a 300-lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with a 100 lb hammer with 30" drop.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16-01

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-21.8	6	S-4	6-8	24/5	2-4 7-7			S-4: Poorly graded Sand (SP); 95% F-M S; 5% ML, M. dense, brown, wet.
-23.8	8	S-5	8-10	24/17	7-7 8-9			S-5: Poorly graded Sand (SP); 95% F-M S; 5% ML, Medium dense, brown, wet.
-25.8	10	S-6	10-12	24/0	4-5 8-9	No recovery in 3" SS, drove 2" SS to get 24" recovery		S-6: Poorly graded Sand (SP), 95% F-M S; 5% ML, M. dense, brown, wet.
-27.8	12	S-7	12-14'	24/0	4-9 11-14	No recovery in 3" SS, drove 2" SS to get 18" recovery.		S-7: Poorly graded Sand (SP), 95% F-M S; 5% ML, M. dense, brown, wet.
-29.8	14							

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-29.8	14	S-8	14-16	24/0	3-4 6-6	No recovery in 3" SS, drove 2" SS to get 6" recovery		S-8 Poorly graded Sand (SP), 95% F-M S; 5% ML, M. dense, brown, wet.
-31.8	16	S-9	16-18	24/24	7-8 11-11	2" SS		S-9: Poorly graded Sand (SP), 95% F-M S; 5% ML, M. dense, brown, wet.
-33.8	18	S-10	18-20	24/13	5-6 8-7	2" SS		S-10: Poorly graded Sand (SP), 95% F-M S; 5% ML, Medium dense, brown wet.
-35.8	20	S-11	20-22	24/24	3-3 6-10	2" SS		S-11: Poorly graded Sand (SP), 95% F-C S; 5% ML, loose, brown, wet.
-37.8	22							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16-01
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-37.8	22	S-12	22-24	24/24	8-12 20-10	2" SS		S-12: Poorly graded Sand (SP), 95% F-C S; 5% ML, dense, brown wet.
-39.8	24	S-13	24-26	24/16	6-5 28-16	2" SS		S-13: Top 8": Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, dense brown wet
						24.7		Bottom 8": Silty Sand with Gravel (SM), 60% F-m S; 20% G; 20% ML, dense, gray, wet.
-41.8	26	S-14	26-28	24/16	8-11 12-12	2" SS		S-14: Silty Sand with Gravel (SM), 65% F-m S; 20% G; 15% ML, M. dense, gray, wet, with cobbles based on intermittent rk resistance.
-43.8	28	S-15	28-30	24/6	23-15 9-8			S-15: Silty Sand with Gravel (SM), 60% F-C S, 25% G; 15% ML, m. dense, gray, wet.
-45.8	30							

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT Portsmouth Harbor Turning Basin, Eliot, ME HOLE NO.

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16-01

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-45.8	30	S-16	30 - 32	24/19	9 - 21 47-55	-		S-16: Silty Gravel with Sand (GM), 55% G; 30% F-C S; 15% ML, very dense, gray, wet.
-47.8	32	S-17	32-32.1	1/0	50/1"	SS refusal at 32.1; r/c to 33.1'; punch through to 33.6' then r/c to 34.2 and set up to core.	33.1 33.6	32.1 to 33.1 Cobble/Boulder 33.1 to 33.6 wash return similar to recovery in S-16. 33.6 possible TOR.
-49.8	34	C-1	34.2 - 37.7	42/42	52%			C-1: Hard, fresh, fine-grained, gray PHYLLITE. Joints are very close to close, moderately dipping to high angle, planar, smooth to rough, fresh to discolored, and tight to open. Core times: 6.0, 3.0, 5.25, 2.5/0.5'
-51.8	36							
	38							Bottom of exploration at 37.7' below the mudline

3.4 inch casing to 33.6 feet below the mud line.

NAE FORM 1836-A JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME HOLE NO.

Hole No. FD16-04

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104640.1 E2781787.0	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES - 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED — DEG. FROM VERT.	15. ELEVATION GROUND WATER RDAL
7. THICKNESS OF OVERBURDEN +32.0'	16. DATE STARTED 7/21/16 1000 COMPLETED 7/22/16 0930
8. DEPTH DRILLED INTO ROCK —	17. ELEVATION TOP OF HOLE -18.0
9. TOTAL DEPTH OF HOLE 32.0	18. TOTAL ROCK CORE RECOVERY FOR BORING % —
	19. SIGNATURE OF INSPECTOR Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-18.0	0	S-1	0-2	24/4	1-1 WOH-1			S-1: Silty Sand (SM), 70% F-M S; 25% MC; 5% G, very loose, brown/black, wet, with shells and organics.
-20	2	S-2	2-4	24/24	1-WOH 1-1			S-2: Lean Clay with Sand (CL), 90% CL; 10% FS, Very Soft, gray, wet.
-22	4	S-3	4-6	24/24	WOH-WOH WOH-1			S-3: Lean Clay with Sand (CL), 90% CL; 10% FS; Very Soft, gray, wet.
-24	6							

1. Samples retrieved using a 3" Splitspoon(s) with a 300lb hammer with an 18" drop. unless otherwise stated in drilling remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with a 100-lb with a 30" drop.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-04
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		Sample Information						
-24	6	S-4	6-8	24/24	WOR-WOH 1-2			S-4: Sandy lean Clay (CL), 70% CL, 20% F S; 10% G, very soft, gray, wet.
-26	8	S-5	8-10	24/24	WOH-WOH 1-2			S-5: Lean Clay with Sand (CL); 85% CL; 15% F.S; Very Soft, gray, wet
-28	10	S-6	10-12	24/24	WOH-3 2-3			S-6: Top 11" Sandy Lean Clay (CL); 70% CL; 20% F S; 10% G, M. Stiff, gray, wet.
						10.9		Bottom 13": Silty Sand (SM); 80% F S; 20% ML, loose, brown, wet.
-30	12	S-7	12-14	24/22	2-1 2-3			S-7: Poorly graded Sand (SP), 95% F S; 5% ML, Very loose, brown, wet.
-32	14							

NAE 1836 LETTER, USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE | **Hole No.** FD16-04

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-32	14	S-8	14-16	24/14	2-3 3-4			S-8: Poorly graded Sand (SP), 95% FS; 5% ML, loose, brown, wet.
-34	16	S-9	16-18	24/0	5-3 3-2	No recovery in 3"SS. Drove 2" SS, immediately dropped to 18.0'.		No recovery
-36	18	S-10	18-20	24/22	3-3 3-2	no recovery in 3" SS; drove 2" to get 22" recovery		S-10 Poorly graded Sand (SP) 95% F-M S, 5% ML, loose, tan, wet.
-38	20	S-11	20-22	24/3	4-16 19-28	2" SS		S-11: Poorly graded Sand (SP); 95% F-C S; 5% ML, dense, tan, wet.
-40	22							

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE

Hole No. F016-04

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME
INSTALLATION: New England District
SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-40	22	S-12	22-24	24/19	21-20 25-32	2" SS		S-12: Poorly graded Sand (SP). 90% F-CS; 5% ML; 5% G, dense, olive, wet.
-42	24	S-13	24-26	24/0	1-10 7-9	No recovery in 3" SS, drove 2" SS to get 9" recovery		S-13: Poorly graded Sand (SP) 95% FS; 5% ML, Medium dense, gray, wet.
-44	26	S-14	26-28	24/7	7-10 12-16	2" SS Stopped at 26' on 7/21/16 at 1500, Started again on 7/22/16 at 0745.		S-14: Poorly graded Sand (SP) 95% FS; 5% ML, Medium dense, gray, wet.
-46	28	S-15	28-30	24/11	5-9 9-18	2" SS		S-15: Poorly graded Sand (SP), 95% FS; 5% ML, Medium dense, gray, wet.
-48	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME HOLE NO.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE		Hole No. FD16-04
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME		INSTALLATION New England District	SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-48	30	S-16	30-32'	24/12	8-9 11-14	2" SS		S-16: Poorly graded Sand (SP), 95% FS; 5% ML, Medium dense, gray, wet.
-50	32					Bottom of exploration 32.0' below mudline corresponding to -50.0' MLLW.		

3.4 inch casing to 30' below the mudline.

Hole No. FDB-06

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N103818.2 E2782256.0	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM MAINE State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 18; DISTURBED; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE STARTED 7/22/16 1030; COMPLETED 7/25/16 1230
7. THICKNESS OF OVERBURDEN + 36.0'	17. ELEVATION TOP OF HOLE -14.2
8. DEPTH DRILLED INTO ROCK 0.0	18. TOTAL ROCK CORE RECOVERY FOR BORING — %
9. TOTAL DEPTH OF HOLE 36.0	19. SIGNATURE OF INSPECTOR Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-14.2	0	S-1	0-2	24/24	1-4 9-9			S-1: Silty SAND (SM), 80% FS; 15% ML; 5% G Medium dense, light brown, wet.
-16.2	2	S-2	2-4'	24/11	9-8 9-9			S-2: Silty SAND (SM), 80% FS; 15% ML; 5% G, medium dense, light brown, wet
-18.2	4	S-3	4-6'	24/0	2-3 5-10	no recovery in 3" SS, drove 2" SS to get 10" Recovery		S-3: Poorly graded Sand (SP) 95% F-M S; 5% ML, loose, light brown, wet.
-20.2	6							

1. Samples retrieved using 3" O.D. split spoon (SS) with a 300 lb hammer, with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with a 140 lb hammer with 30" drop.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-06
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 2 OF 8 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-20.2	6	S-4	6-8'	24/13	1-2 5-7	2" SS		S-4: Poorly graded Sand (SP), 95% F-M S; 5% ML, loose, light brown, wet.
-22.2	8	S-5	8-10	24/19	7-5 6-5	2" SS		S-5: Poorly graded Sand (SP), 95% F-M S; 5% ML, Medium dense, light brown, wet.
-24.2	10	S-6	10-12'	24/9	2-4 4-6	2" SS		S-6: Poorly graded Sand (SP), 95% F-M S; 5% ML, loose, light brown, wet
-26.2	12	S-7	12-14'	24/10	8-5 6-11	2" SS		S-7: Poorly graded Sand (SP) 95% F-M S; 5% ML, Medium dense, light brown, wet.
-28.2	14							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16-06

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-28.2	14	S-8	14-16'	24/10	5-6 5-5	2" SS		S-8: Poorly graded Sand (SP); 95% F-M S; 5% ML, Medium dense, light brown, wet.
-30.2	16	S-9	16-18'	24/13	5-7 7-7	2" SS Stopped at 16.0' on 7/22/16 at 1400, started again on 7/25/16 at 0745.		S-9: Poorly graded Sand (SP), 95% F. S; 5% ML, Medium dense, light brown, wet.
-32.2	18	S-10	18-20	24/20	5-6 7-8	2" SS		S-10: Poorly graded Sand (SP) 95% F-M S; 5% ML, Medium dense, light brown, wet.
-34.2	20	S-11	20-22'	24/16	4-5 5-7	2" SS		S-11: Poorly graded Sand (SP) 95% F S; 5% ML, loose, light brown, wet.
-36.2	22							

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16-06

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-36.2	22	S-12	22-24	24/20	7-4 5-8	2" SS		S-12: Poorly graded Sand (SP), 95% F-m S; 5% ML, loose, light brown, wet.
-38.2	24	S-13	24-26	24/6	4-6 9-11			S-13: Poorly graded Sand (SP) 85% F-m S; 10% G; 5% ML, Medium dense, brown, wet.
-40.2	26	S-14	26-28	24/24	7-9 13-17			S-14: Poorly graded Sand (SP) 95% F-m S; 5% ML, Medium dense, brown, wet.
-42.2	28	S-15	28-30	24/7	6-8 9-11	2" SS		S-15: Poorly graded Sand (SP) 95% F-c S; 5% ML, Medium dense, brown, wet.
-44.2	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-06
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-44.2	30	S-16	30-32	24/22	9-9 8-11	2" SS		S-16: Poorly graded Sand (SP) 90% F-C S; 5% G; 5% ML, medium dense, light brown, wet.
-46.2	32	S-17	32-34	24/13	4-6 5-5	2" SS		S-17: Poorly graded Sand (SP) 85% F-C S; 10% G; 5% ML, medium dense, light brown/gray, wet.
-48.2	34	S-18	34-36	24/17	10-6 6-18	2" SS		S-18: TOP 12" Poorly graded Sand (SP) 85% F-C S; 10% G; 5% ML, medium dense, light brown/gray, wet
							35.0	Bottom 5" Silty Gravel with Sand (GM) 70% G; 15% F-M S; 15% ML, medium dense, gray, wet,
-50.2	36							Bottom of exploration @ 36.0 Feet below the mudline.
	38							

3. 4" casing to 32.0' below the mudline.

NAE FORM 1836-A JUN 10 ∇ DURING DRILLING ∇ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | HOLE NO.

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

Hole No. FD16-07

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 6 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103908.7 E 2781997.4	11a. VERTICAL DATUM MLLW / 11b. HORIZONTAL DATUM MAINE State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 14 : DISTURBED : UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE STARTED 7/25/16 1400 COMPLETED 7/27/16 1015
7. THICKNESS OF OVERBURDEN 26.7	17. ELEVATION TOP OF HOLE -12.6
8. DEPTH DRILLED INTO ROCK (r/c 1.3') 14.4	18. TOTAL ROCK CORE RECOVERY FOR BORING % 94
9. TOTAL DEPTH OF HOLE 42.4	19. SIGNATURE OF INSPECTOR Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-12.6	0	S-1	0-2	24/11	2-7 3-1			S-1: Silty Sand with Gravel (SM) 70% F-C S; 15% G; 15% MC, loose black/brown, wet.
-14.6	2	S-2	2-4	24/24	3-3 4-3	Stopped at 4' on 7/25/16 at 1500, Started again on 7/26/16 at 0745.		S-2: Poorly graded Sand with Gravel (SP), 70% F-C S; 25% G; 5% ML, loose, brown, wet.
-16.6	4	S-3	4-6	24/10	8-5 5-8			S-3: Poorly graded Sand with Gravel (SP), 70% F-C S; 25% G; 5% MC, loose, brown, wet.
-18.6	6							

1. Samples retrieved using a 3" O.D. Splitspoon (SS), with a 300 lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used where noted in Drilling Remarks, driven with a 140-lb hammer with a 30" drop.

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-07
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-18.6	6	S-4	6-8	24/7	7-8 9-8			S-4: Poorly graded Sand with Gravel (SP); 60% F-C S; 35% G; 5% ML, Medium dense, brown, wet.
-20.6	8	S-5	8-10	24/14	11-17 17-17	4" cobble stuck in spoon tip.		S-5: Poorly graded Sand with Gravel (SP); 60% F-C S; 35% G; 5% ML, dense, brown, wet, with cobbles.
-22.6	10	S-6	10-12	24/8	10-11 13-17			S-6: Poorly graded Gravel with Sand (GP), 60% G, 35% F-C S; 5% ML, medium dense, brown, wet.
-24.6	12	S-7	12-14	24/15	10-10 9-7			S-7: Poorly graded Gravel with Sand (GP), 60% G; 35% F-C S; 5% ML, medium dense, brown, wet.
-26.6	14							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-07
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-26.6	14	S-8	14-16	24/5	5-5 6-8			S-8: Poorly graded Sand with Gravel (SP), 70% F-C S; 25% G; 5% ML, medium dense, brown, wet.
-28.6	16	S-9	16-18	24/11	6-9 10-9			S-9: Poorly graded Sand with Gravel (SP), 70% F-C S; 25% G 5% ML, medium dense, brown, wet.
-30.6	18	S-10	18-20	24/13	10-11 14-14	2" SS		S-10: Poorly graded Sand (SP) 85% F-C S; 10% G; 5% ML, medium dense, brown, wet.
-32.6	20	S-11	20-22	24/10	12-29 13-11	2" SS		S-11: Silty Sand with Gravel (SM) 65% F-M S; 20% ML; 15% G, dense brown/gray wet.
-34.6	22							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	**Hole No.** FD16 - 07

PROJECT	INSTALLATION	SHEET 4 OF 5 SHEETS
Portsmouth Harbor Turning Basin, Eliot, ME	New England District	

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-34.6	22	S-12	22-24	24/22	13-11 12-15	2" SS		S-12: Top 13": Poorly graded Sand (SP) 80% F-C S; 15% G; 5% ML, medium dense, brown, wet
						23.1		Bot 9" Clayey Sand (SC), 60% F-M S; 30% CL; 10% G, medium dense, gray, wet.
-36.6	-24	S-13	24-26	24/16	11-10 8-18			S-13: Clayey Gravel with Sand (GC), 60% G; 20% CL; 20% F-C S, medium dense, gray, wet.
-38.6	-26	S-14	26-26.7	9/9	49-105/3"	SS refusal at 26.7' below mudline R/C to 28.0 and Setup to core.		S-14 Poorly graded Gravel with Silt (GP-GM) 80% G; 10% F-C S; 10% ML, very dense, gray, wet.
						26.7		R/C Ahead through apparent dense Gravel.
-40.6	-28	C-1	28.0-29.3	16/15	0%			C-1: Hard, fresh to slightly weathered, Fine grained, gray, PHYLLITE. Joints are very close, moderately dipping, Planar, rough, partially open, and Fresh to discolored, Core times: 6.0, 5.0/0.3'
						29.3		C-2: Hard, Fresh to slightly weathered Fine grained, dark gray/gray/ PHYLLITE/BASALT. Joints
-42.6	30	C-2	29.3-31.7	28/19	0%			

3. 4 inch casing to 26.7' below the mudline.

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-07

PROJECT	INSTALLATION	SHEET 5 OF 5 SHEETS
Portsmouth Harbor Turning Basin, Eliot, ME	New England District	

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-42.6	30							are very close to close, low angle, planar, rough and fresh to discolored, tight/to partially open. One high angle joint. Core times: 5/0.4, 4.5, 4.5
						31.7		
-41.6	32	C-3	31.7-32.7	12/12	0			C-3: Hard, Fresh to Slightly weathered, fine-grained, dark gray, BASALT highly Fractured, recovery consists of gravel. core times: 9.0
						32.7		
		C-4	32.7-34.7	24/24	0			C-4: Hard, Fresh, Fine grained, dark gray BASALT. Joints are very close to close, low angle, planar, rough and fresh to discolored, tight to partially open. Core times: 7.0, 4.75
-46.6	34							
						34.7		
		C-5	34.7-37.3	31/31	0			C-5: Hard, Fresh, Fine grained, gray/dark gray PHYLLITE/BASALT, Primary joints are very close to close, low angle, planar, rough and fresh to discolored, tight. Secondary joints are close high angle to vertical, planar, rough and fresh, tight to partially open. Core times: 3.0, 4.0, 4.25/0.6'
-48.6	36							
						Stopped at 37.3 on 7/26/16 at 1515, started again on 7/27/16 at 0745. 37.3		
-50.6	38	C-6	37.3-39.5	26/26	0			C-6: Hard, Fresh, Fine grained, gray, PHYLLITE, Primary joints are very close to close, low angle, planar, rough and

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT	HOLE NO.
Portsmouth Harbor Turning Basin, Eliot, ME	

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-07
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 6 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-50.6	38							Fresh to discolored, tight to pi open, Secondary joints are very close to close, high angle to vertical, planar, rough, and fresh and tight. Core times: 6.25, 9.25, 5.0/0.2'
						39.5		
-52.6	40	C-7	39.5-42.4	35/35	23			C-7: Hard, Fresh to slightly weathered, Fine grained, gray, PHYLLITE. Primary joints are very close to close, low angle, planar, rough, and fresh to discolored, open to tight. Secondary joints are very close to close, high angle to vertical, planar/undulating, rough, fresh to discolored, tight to open, some calcite infilling. Core times: 5.0, 5.5, 3.0/0.9'
-54.6	42							
						42.4		Bottom of exploration to 42.4' below the mudline (-55.0 MLLW)

3,4-inch casing to 26.7' below mudline.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 6 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103629.6 E 2782265.2	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM Maine State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 18; DISTURBED; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
	16. DATE STARTED 7/28/16 1130; COMPLETED 7/28/16 1200
7. THICKNESS OF OVERBURDEN 35.2	17. ELEVATION TOP OF HOLE -12.7
8. DEPTH DRILLED INTO ROCK 4.0 (1.0 r/c)	18. TOTAL ROCK CORE RECOVERY FOR BORING % 83
9. TOTAL DEPTH OF HOLE 40.2	19. SIGNATURE OF INSPECTOR Blaine Cardali

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-12.7	0	S-1	0-2	24/5	1-2 1-2			S-1: Poorly graded Sand with Gravel (SP), 80% F-C S; 15% G; 5% ML, very loose, brown, wet with organics.
-14.7	2	S-2	2-4	24/12	3-4 5-5			S-2: Poorly graded Sand (SP), 90% F-m S; 5% G; 5% ML, loose, brown, wet.
-16.7	4	S-3	4-6	24/17	4-6 10-8			S-3: Poorly graded Sand (SP), 90% F-m S; 5% G; 5% ML, Medium dense, brown, wet.
-18.7	6							

1. Samples retrieved using a 3" split spoon (SS) with a 300 lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks.
2. 2" O.D. SS was used as noted in drilling remarks, driven using a 140-lb hammer 30" drop.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-09
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 2 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-18.7	6	S-4	6-8	24/4	3-2 3-4			S-4: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, loose, brown, wet.
-20.7	8	S-5	8-10	24/5	4-4 5-6			S-5: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, loose, brown, wet.
-22.7	10	S-6	10-12	24/8	3-4 6-6			S-6: Poorly graded Sand (SP), 90% F-C S; 5% G, 5% ML, loose, brown wet.
-24.7	12	S-7	12-14	24/10	3-5 7-7			S-7: Poorly graded Sand (SP), 90% F-C S, 5% G, 5% ML, Medium dense, brown wet.
-26.7	14							

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE

Hole No. FD16-09

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME

INSTALLATION: New England District

SHEET 3 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-26.7	14	S-8	14-16	24/13	6-6 7-8			S-8: Top 8": Poorly graded Sand with Gravel (SP), 65% F-C S; 30% G; 5% ML, medium dense, brown, wet.
						14.7'		Bottom 5": Poorly graded Sand (SP) 95% F-m S, 5% ML, medium dense, brown, wet.
-28.7	16	S-9	16-18	24/10	4-4 5-7			S-9: Poorly graded Sand with Gravel (SP), 65% F-C S; 30% G; 5% ML, loose, brown, wet.
-30.7	18	S-10	18-20	24/20	7-9 14-15	2" SS		S-10: Poorly graded Sand with Gravel (SP), 65% F-C S; 30% G; 5% ML, medium dense, brown, wet.
-32.7	20	S-11	20-22	24/11	3-6 7-9	2" SS		S-11: Poorly graded Sand with Gravel (SP) 75% F-C S; 20% G; 5% ML, medium dense, brown, wet.
-34.7	22							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-09
PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION: New England District	SHEET 4 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-34.7	22	S-12	22-24	24/7	5-9 9-13	2" SS		S-12: Poorly graded Sand (SP); 85% F-C S; 10% G; 5% ML, medium dense, brown, wet.
-36.7	24	S-13	24-26	24/8	7-12 14-26	2" SS		S-13: Poorly graded Sand (SP) 85% F-C S; 10% G; 5% ML, medium dense, brown, wet.
-38.7	26	S-14	26-28	24/12	9-8 10-14	Stopped at 26.0' on 7/27/16 at 1500, started again on 7/28/16 at 0745. 2" SS		S-14: Poorly graded Sand (SP) 90% F-C S; 5% G; 5% ML; dense, brown, wet.
-40.7	28	S-15	28-30	24/11	9-8 11-14	2" SS		S-15: Poorly graded Sand (SP), 90% F-C S; 5% G; 5% ML, medium dense, brown, wet.
-42.7	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	**Hole No.** FD16-09
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 5 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-42.7	30	S-16	30-32	24/11	4-8 10-20	2" SS		S-16: Poorly graded Sand (SP) 90% F-C S; 5% G; 5% ML, medium dense, brown, wet
-44.7	32	S-17	32-34	24/13	8-22 18-16	2" SS		S-17: TOP 11" Poorly graded Sand (SP) 95% F-M S; 5% ML, dense, light brown/light gray, wet.
						32.9		Bot 2" Clayey Sand with Gravel (SC), 60% F-M S, 25% CL, 15% G, dense, gray, wet.
-46.7	34	S-18	34-36	14/10	8-35 100/2"	SS refusal at 35.2', r/c to 35.8 and r/c advancement increased from 35.8 to 36.2.		S-18: Clayey Sand with Gravel (SC), 55% F-M S, 30% G, 15% CL, very dense, gray, wet.
						35.8		Possible Fractured bedrock based on roller cone advancement
-48.7	36	C-1	36.2-40.2	48/40	27%	attempted 2" SS at 36.2'. Spoon bouncing. Set up to core		C-1: Hard, Fresh, fine grained, gray, PHYLLITE. Primary joints are very close to close, low angle, rough, undulating, fresh, tight to partially open. Secondary joints are close, moderately dipping to high angle, rough undulating, Fresh, Partially open to open. Core times; 4.75, 5.5, 6.5, 6.5
-50.7	38							

3. 4" casing to 35.2' below mudline.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-09
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 6 OF 6 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-50.7	38							
-52.7	40					40.2		
						Bottom of exploration at 40.2' below mudline (-52.9 mlw)		
-54.7	42							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ∇ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

Hole No. ED16-02

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 5 SHEETS

1. PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104378.8 E 2781613.0	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 West
3. DRILLING AGENCY New England Boring Contractors	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER Sam Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 11; UNDISTURBED
5. NAME OF INSPECTOR Blaine Cardali	14. TOTAL # OF ROCK SAMPLES 4
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER TIDAL
7. THICKNESS OF OVERBURDEN 21.6	16. DATE STARTED 7/28/16 1415; COMPLETED 7/29/16 1240
8. DEPTH DRILLED INTO ROCK (r/c 0.4 to 22) 16.0	17. ELEVATION TOP OF HOLE -12.1
9. TOTAL DEPTH OF HOLE 28.0	18. TOTAL ROCK CORE RECOVERY FOR BORING % 92
	19. SIGNATURE OF INSPECTOR *Blaine Cardali*

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-12.1	0	S-1	0-2	24/5	11-9 20-9			S-1: Poorly graded Sand with Gravel (SP), 55% F-C S; 40% G; 5% ML, Medium dense, brown/gray, wet,
-14.1	2	S-2	2-4	24/13	9-6 6-12	Stopped at 4.0' on 7/28/16 at 1500, started again on 7/29/16 at 0730.		S-2: Poorly graded Sand with Gravel (SP), 65% F-C S; 30% G; 5% Medium dense, brown, wet.
-16.1	4	S-3	4-6	24/11	8-10 9-9	2" SS		S-3: Poorly graded Sand with Gravel (SP) 55% F-C S; 40% G; 5% ML, medium dense, brown/gray, wet.
-18.1	6							

1. Sample retrieved using a 3" Split spoon (SS) with a 300 lb hammer with an 18" drop, unless otherwise stated in Drilling Remarks
2. 2" O.D. SS was used as noted in Drilling Remarks, driven using a 140-lb hammer 30" drop.

NAE FORM 1836 JUN 10 — ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING — PROJECT Portsmouth Harbor Turning Basin, Eliot, ME — HOLE NO.

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	**Hole No.** FD16-02
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 2 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-18.1	6	S-4	6-8	24/7	10-12 10-15	2" SS		S-4: Poorly graded Gravel with Sand (GP); 60% G, 35% F-C S; 5% ML, medium dense, brown/gray, wet
-20.1	8	S-5	8-10	24/7	9-12 9-6	2" SS		S-5: Poorly graded Gravel with Sand (GP); 60% G, 35% F-C S; 5% ML, medium dense, brown/gray, wet
-22.1	10	S-6	10-12	24/11	4-5 6-7	2" SS		S-6: Poorly-graded Sand (SP), 85% F-C S; 10% G; 5% ML, medium dense, brown, wet
-24.1	12	S-7	12-14	24/24	7-11 10-9	2" SS		S-7: Poorly graded Sand with Gravel (SP), 75% F-C S; 20% G; 5% ML, medium dense, brown/red,
-26.1	14							

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE | **Hole No.** FD16-02

PROJECT: Portsmouth Harbor Turning Basin, Eliot, ME | INSTALLATION: New England District | SHEET 3 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-26.1	14	S-8	14-16	24/7	8-5 6-11	2" SS		S-8: Poorly graded Sand (SP) 95% F-M S; 5% ML, medium dense tan, wet.
-28.1	16	S-9	16-18	24/15	31-37 39-13	2" SS		S-9: Poorly graded Gravel with Sand (GP); 60% G; 35% F-C S; 5% ML, very dense, brown, wet.
-30.1	18	S-10	18-20	24/19	[illegible]-51 100-[illegible]	2" SS		S-10: Silty Sand (SM), 55% F-C S; 35% ML, 10% G, very dense, brown, wet.
-32.1	20	S-11	20-20.4	5/5	100/5"	2" SS Adv from 20.4 to 21.6 minimal resistance, increased resistance from 21.6 to 22.0, set up to core at 22.0'		S-11: Silty Gravel (GM) 60% G; 30% ML; 10% F-C S, very dense light brown, wet
-34.1	22							

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-02
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 4 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-34.1	22	C-1	22-26.5	54/38	0%			C-1: Hard, Fresh to weathered, Fine grained, gray, PHYLLITE. Joints are very close to close, moderately dipping, undulating, rough, Fresh to discolored, partially open to open. Core times: 5.0, 7.5, 4.0, 5.5, 5.0/0.5'
-36.1	24							
-38.1	26							
						26.5		
		C-2	26.5-30.0	40/40	50%			C-2: Hard, Fresh to slightly weathered, fine grained, grey, PHYLLITE, with calcite [illegible], Joints are very close to moderately close, rough, undulating, Fresh to discolored, tight to open. Core times: 2.75, 3.75, 4.25, 7.0/0.5'
-40.1	28							
-42.1	30							

NAE 1836 LETTER USACE TEMPLATE BLANK - GZA.GPJ NAE DATA TEMPLATE.GDT 7/7/16

NAE FORM 1836-A JUN 10 ▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE	Hole No. FD16-02
PROJECT Portsmouth Harbor Turning Basin, Eliot, ME	INSTALLATION New England District	SHEET 5 OF 5 SHEETS

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
-42.1	30	C-3	30.0 -35.0	60/60	73%			C-3: Hard, fresh, fine grained, gray, PHYLLITE, with calcite stringers. Joints are very close to moderately spaced low angle to moderately dipping, undulating, rough, fresh, partially open to open. Core times: 3.75, 3.5, 4.0, 4.25, 4.5
-44.1	32							
-46.1	34	S-18						
						35.0		
		C-4	35.0-38.0	36/36	58%			C-4: Hard, Fresh, fine grained, gray, PHYLLITE, with calcite stringers. Joints are very close to close, low angle, undulating, rough, Fresh, tight to partially open. Core times: 4.0, 4.75, 5.75
-48.1	36							
-50.1	38							

3. 4" casing to 21.6

Bottom of exploration at 38.0 feet below the mudline (-50.1' MLLW)

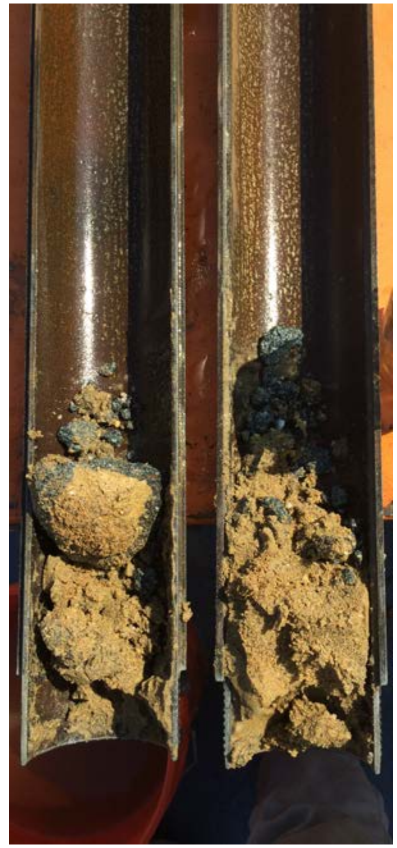
APPENDIX C

Soil Sample Photographs

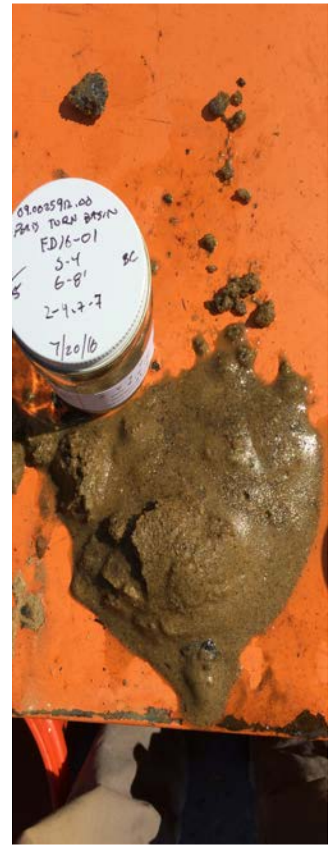
United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-01, S1
Depth = 0’ to 2’
Elev. = -15.8’ to -17.8’ MLLW

FD16-01, S2
Depth = 2’ to 4’
Elev. = -17.8’ to -19.8’ MLLW



FD16-01, S3
Depth = 4’ to 6’
Elev. = -19.8’ to -21.8’ MLLW



FD16-01, S4
Depth = 6’ to 8’
Elev. = -21.8’ to -23.8’ MLLW

FD16-01, S5
Depth = 8’ to 10’
Elev. = -23.8’ to -25.8’ MLLW

FD16-01, S6
Depth = 10’ to 12’
Elev. = -25.8’ to -27.8’ MLLW

FD16-01, S7
Depth = 12’ to 14’
Elev. = -27.8’ to -29.8’ MLLW

FD16-01, S8
Depth = 14’ to 16’
Elev. = -29.8’ to -31.8’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-01, S9
Depth = 16’ to 18’
Elev. = -31.8’ to -33.8’ MLLW

FD16-01, S10
Depth = 18’ to 20’
Elev. = -33.8’ to -35.8’ MLLW

FD16-01, S11
Depth = 20’ to 22’
Elev. = -35.8’ to -37.8’ MLLW

FD16-01, S12
Depth = 22’ to 24’
Elev. = -37.8’ to -39.8’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-01, S13
Depth = 24’ to 26’
Elev. = -39.8’ to -41.8’ MLLW

FD16-01, S14
Depth = 26’ to 28’
Elev. = -41.8’ to -43.8’ MLLW

FD16-01, S15
Depth = 28’ to 30’
Elev. = -43.8’ to -45.8’ MLLW

FD16-01, S16
Depth = 30’ to 32’
Elev. = -45.8’ to -47.8’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-02, S1
Depth = 0' to 2'
Elev. = -12.1 to -14.1 MLLW

FD16-02, S2
Depth = 2' to 4'
Elev. = -14.1 to -16.1 MLLW

FD16-02, S3
Depth = 4' to 6'
Elev. = -16.1 to -18.1 MLLW

FD16-02, S4
Depth = 6' to 8'
Elev. = -18.1 to -20.1 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME

Split Spoon Recovery Photographs

FD16-02, S5
Depth = 8' to 10'
Elev. = -20.1 to -22.1 MLLW

FD16-02, S6
Depth = 10' to 12'
Elev. = -22.1 to -24.1 MLLW

FD16-02, S7
Depth = 12' to 14'
Elev. = -24.1 to -26.1 MLLW

FD16-02, S8
Depth = 14' to 16'
Elev. = -26.1 to -28.1 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-02, S9
Depth = 16' to 18'
Elev. = -28.1 to -30.1 MLLW

FD16-02, S10
Depth = 18' to 20'
Elev. = -30.1 to -32.1 MLLW

FD16-02, S11
Depth = 20' to 20.4'
Elev. = -32.1 to -32.5 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME

Split Spoon Recovery Photographs

FD16-03, S1
Depth = 0’ to 2’
Elev. = -3.4’ to -5.4’ MLLW

FD16-03, S2
Depth = 2’ to 4’
Elev. = -5.4’ to -7.4’ MLLW

FD16-03, S3
Depth = 4’ to 6’
Elev. = -7.4’ to -9.4’ MLLW

FD16-03, S4
Depth = 6’ to 8’
Elev. = -9.4’ to -11.4’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-03, S5
Depth = 8' to 10'
Elev. = -11.4' to -13.4' MLLW

FD16-03, S6
Depth = 10' to 12'
Elev. = -13.4' to -15.4' MLLW

FD16-03, S7
Depth = 12' to 14'
Elev. = -15.4' to -17.4' MLLW

FD16-03, S8
Depth = 14' to 16'
Elev. = -17.4' to -19.4' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-03, S9
Depth = 16’ to 18’
Elev. = -19.4’ to -21.4’ MLLW

FD16-03, S10
Depth = 18’ to 18.3’
Elev. = -21.4’ to -21.7’ MLLW

FD16-03, S11
Depth = 21’ to 23’
Elev. = -24.4’ to -26.4’ MLLW

FD16-03, S12
Depth = 23’ to 25’
Elev. = -26.4’ to -28.4’ MLLW

FD16-03, S13
Depth = 25’ to 27’
Elev. = -28.4’ to -30.4’ MLLW

FD16-03, S14
Depth = 27’ to 29’
Elev. = -30.4’ to -32.4’ MLLW

FD16-03, S15
Depth = 29’ to 31’
Elev. = -32.4’ to -34.4’ MLLW

FD16-03, S16
Depth = 31’ to 33’
Elev. = -34.4’ to -36.4’ MLLW

FD16-03, S17
Depth = 33' to 35'
Elev. = -36.4' to -38.4' MLLW

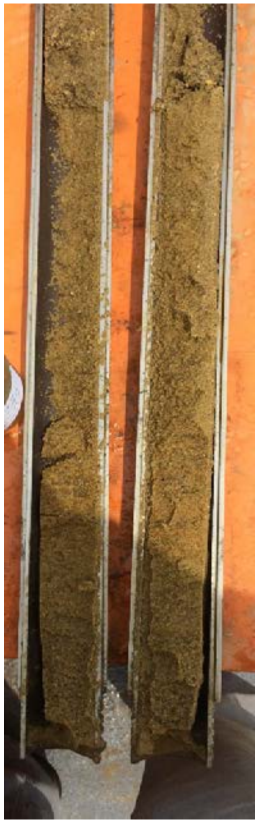
FD16-03, S18
Depth = 35' to 37'
Elev. = -38.4' to -40.4' MLLW

FD16-03, S19
Depth = 37' to 39'
Elev. = -40.4' to -42.4' MLLW

FD16-03, S20
Depth = 39' to 41'
Elev. = -42.4' to -44.4' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME

Split Spoon Recovery Photographs



FD16-03, S21
Depth = 41’ to 43’
Elev. = -44.4’ to -46.4’ MLLW

FD16-03, S22
Depth = 43’ to 43.4’
Elev. = -46.4’ to -46.8’ MLLW

FD16-03, S23
Depth = 45’ to 47’
Elev. = -48.4’ to -50.4’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-04, S1
Depth = 0' to 2'
Elev. = -18.0' to -20.0' MLLW

FD16-04, S2
Depth = 2' to 4'
Elev. = -20.0' to -22.0' MLLW

FD16-04, S3
Depth = 4' to 6'
Elev. = -22.0' to -24.0' MLLW

FD16-04, S4
Depth = 6' to 8'
Elev. = -24.0' to -26.0' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-04, S5
Depth = 8’ to 10’
Elev. = -26.0’ to -28.0’ MLLW

FD16-04, S6
Depth = 10’ to 12’
Elev. = -28.0’ to -30.0’ MLLW

FD16-04, S7
Depth = 12’ to 14’
Elev. = -30.0’ to -32.0’ MLLW

FD16-04, S8
Depth = 14’ to 16’
Elev. = -32.0’ to -34.0’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

No Recovery

FD16-04, S9
Depth = 16’ to 18’
Elev. = -34.0’ to -36.0’ MLLW

FD16-04, S10
Depth = 18’ to 20’
Elev. = -36.0’ to -38.0’ MLLW

FD16-04, S11
Depth = 20’ to 22’
Elev. = -38.0’ to -40.0’ MLLW

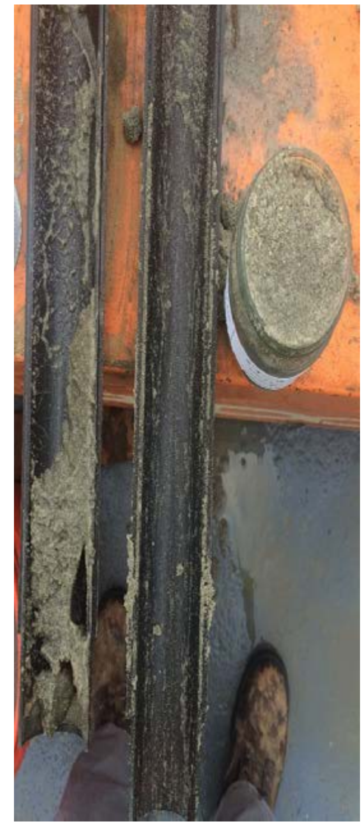
FD16-04, S12
Depth = 22’ to 24’
Elev. = -40.0’ to -42.0’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-04, S13
Depth = 24’ to 26’
Elev. = -42.0’ to -44.0’ MLLW

FD16-04, S14
Depth = 26’ to 28’
Elev. = -44.0’ to -46.0’ MLLW

FD16-04, S15
Depth = 28’ to 30’
Elev. = -46.0’ to -48.0’ MLLW



FD16-04, S16
Depth = 30’ to 32’
Elev. = -48.0’ to -50.0’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-05, S1
Depth = 0’ to 2’
Elev. = -16.7 to -18.7 MLLW

FD16-05, S2
Depth = 2’ to 4’
Elev. = -18.7 to -20.7 MLLW

FD16-05, S3
Depth = 4’ to 6’
Elev. = -20.7 to -22.7 MLLW

FD16-05, S4
Depth = 6’ to 8’
Elev. = -22.7 to -24.7 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-05, S5
Depth = 8’ to 10’
Elev. = -24.7 to -26.7 MLLW

FD16-05, S6
Depth = 10’ to 12’
Elev. = -26.7 to -28.7 MLLW

FD16-05, S7
Depth = 12’ to 14’
Elev. = -28.7 to -30.7 MLLW

FD16-05, S8
Depth = 14’ to 16’
Elev. = -30.7 to -32.7 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-05, S9
Depth = 16' to 18'
Elev. = -32.7 to -34.7 MLLW

FD16-05, S10
Depth = 18' to 20'
Elev. = -34.7 to -36.7 MLLW

No Recovery

FD16-05, S11
Depth = 20' to 22'
Elev. = -36.7 to -38.7 MLLW

No Recovery

FD16-05, S12
Depth = 22' to 24'
Elev. = -38.7 to -40.7 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-05, S13
Depth = 24’ to 26’
Elev. = -40.7 to -42.7 MLLW

FD16-05, S14
Depth = 26’ to 28’
Elev. = -42.7 to -44.7 MLLW

FD16-05, S15
Depth = 28’ to 30’
Elev. = -44.7 to -46.7 MLLW

No Recovery

FD16-05, S16
Depth = 30’ to 32’
Elev. = -46.7 to -48.7 MLLW

FD16-05, S17
Depth = 32’ to 34’
Elev. = -48.7 to -50.7 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-06, S1
Depth = 0' to 2'
Elev. = -14.2 to -16.2 MLLW

FD16-06, S2
Depth = 2' to 4'
Elev. = -16.2 to -18.2 MLLW

FD16-06, S3
Depth = 4' to 6'
Elev. = -18.2 to -20.2 MLLW

FD16-06, S4
Depth = 6' to 8'
Elev. = -20.2 to -22.2 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-06, S5
Depth = 8’ to 10’
Elev. = -22.2 to -24.2 MLLW

FD16-06, S6
Depth = 10’ to 12’
Elev. = -24.2 to -26.2 MLLW

FD16-06, S7
Depth = 12’ to 14’
Elev. = -26.2 to -28.2 MLLW

FD16-06, S8
Depth = 14’ to 16’
Elev. = -28.2 to -30.2 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-06, S9
Depth = 16’ to 18’
Elev. = -30.2 to -32.2 MLLW

FD16-06, S10
Depth = 18’ to 20’
Elev. = -32.2 to -34.2 MLLW

FD16-06, S11
Depth = 20’ to 22’
Elev. = -34.2 to -36.2 MLLW

FD16-06, S12
Depth = 22’ to 24’
Elev. = -36.2 to -38.2 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-06, S13
Depth = 24' to 26'
Elev. = -38.2 to -40.2 MLLW

FD16-06, S14
Depth = 26' to 28'
Elev. = -40.2 to -42.2 MLLW

FD16-06, S15
Depth = 28' to 30'
Elev. = -42.2 to -44.2 MLLW

FD16-06, S16
Depth = 30' to 32'
Elev. = -44.2 to -46.2 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-06, S17
Depth = 32' to 34'
Elev. = -46.2 to -48.2 MLLW

FD16-06, S18
Depth = 34' to 36'
Elev. = -48.2 to -50.2 MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-07, S1
Depth = 0' to 2'
Elev. = -12.6' to -14.6' MLLW

FD16-07, S2
Depth = 2' to 4'
Elev. = -14.6' to -16.6' MLLW

FD16-07, S3
Depth = 4' to 6'
Elev. = -16.6' to -18.6' MLLW

FD16-07, S4
Depth = 6' to 8'
Elev. = -18.6' to -20.6' MLLW

FD16-07, S5
Depth = 8’ to 10’
Elev. = -20.6’ to -22.6’ MLLW

FD16-07, S6
Depth = 10’ to 12’
Elev. = -22.6’ to -24.6’ MLLW

FD16-07, S7
Depth = 12’ to 14’
Elev. = -24.6’ to -26.6’ MLLW

FD16-07, S8
Depth = 14’ to 16’
Elev. = -26.6’ to -28.6’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME

Split Spoon Recovery Photographs

FD16-07, S9
Depth = 16' to 18'
Elev. = -28.6' to -30.6' MLLW

No Photo

FD16-07, S10
Depth = 18' to 20'
Elev. = -30.6' to -32.6' MLLW

FD16-07, S11
Depth = 20' to 22'
Elev. = -32.6' to -34.6' MLLW

FD16-07, S12
Depth = 22' to 24'
Elev. = -34.6' to -36.6' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-07, S13
Depth = 24’ to 26’
Elev. = -36.6’ to -38.6’ MLLW

FD16-07, S14
Depth = 26’ to 26.8’
Elev. = -38.6’ to -39.4’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-08, S1
Depth = 0’ to 2’
Elev. = -18.5’ to -20.5’ MLLW

FD16-08, S2
Depth = 2’ to 4’
Elev. = -20.5’ to -22.5’ MLLW

FD16-08, S3
Depth = 4’ to 6’
Elev. = -22.5’ to -24.5’ MLLW

FD16-08, S4
Depth = 6’ to 8’
Elev. = -24.5’ to -26.5’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-08, S5
Depth = 8' to 10'
Elev. = -26.5' to -28.5' MLLW

FD16-08, S6
Depth = 10' to 12'
Elev. = -28.5' to -30.5' MLLW

FD16-08, S7
Depth = 12' to 14'
Elev. = -30.5' to -32.5' MLLW

FD16-08, S8
Depth = 14' to 16'
Elev. = -32.5' to -34.5' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-08, S9
Depth = 16' to 18'
Elev. = -34.5' to -36.5' MLLW

FD16-08, S10
Depth = 18' to 20'
Elev. = -36.5' to -38.5' MLLW

FD16-08, S11
Depth = 20' to 22'
Elev. = -38.5' to -40.5' MLLW

FD16-08, S12
Depth = 22' to 24'
Elev. = -40.5' to -42.5' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-08, S13
Depth = 24' to 26'
Elev. = -42.5' to -44.5' MLLW

FD16-08, S14
Depth = 26' to 28'
Elev. = -44.5' to -46.5' MLLW

FD16-08, S15
Depth = 28' to 30'
Elev. = -46.5' to -48.5' MLLW

FD16-08, S16
Depth = 30' to 32'
Elev. = -48.5' to -50.5' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-09, S1
Depth = 0' to 2'
Elev. = -12.7' to -14.7' MLLW

FD16-09, S2
Depth = 2' to 4'
Elev. = -14.7' to -16.7' MLLW

FD16-09, S3
Depth = 4' to 6'
Elev. = -16.7' to -18.7' MLLW

FD16-09, S4
Depth = 6' to 8'
Elev. = -18.7' to -20.7' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-09, S5
Depth = 8’ to 10’
Elev. = -20.7’ to -22.7’ MLLW

FD16-09, S6
Depth = 10’ to 12’
Elev. = -22.7’ to -24.7’ MLLW

FD16-09, S7
Depth = 12’ to 14’
Elev. = -24.7’ to -26.7’ MLLW

FD16-09, S8
Depth = 14’ to 16’
Elev. = -26.7’ to -28.7’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-09, S9
Depth = 16’ to 18’
Elev. = -28.7’ to -30.7’ MLLW

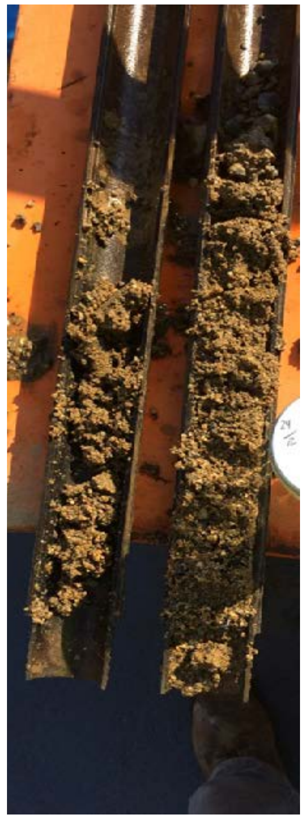
FD16-09, S10
Depth = 18’ to 20’
Elev. = -30.7’ to -32.7’ MLLW

FD16-09, S11
Depth = 20’ to 22’
Elev. = -32.7’ to -34.7’ MLLW

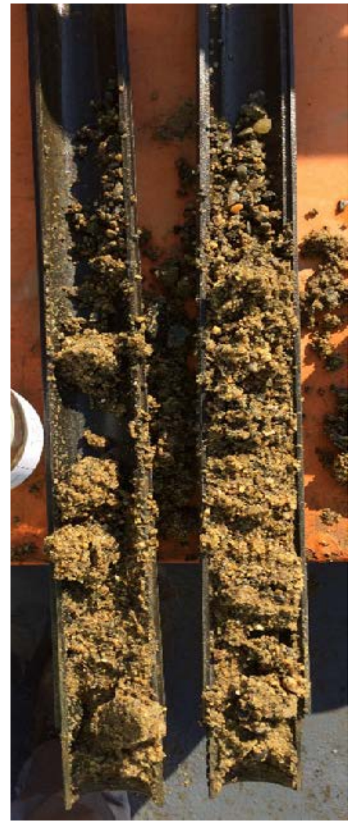
FD16-09, S12
Depth = 22’ to 24’
Elev. = -34.7’ to -36.7’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-09, S13
Depth = 24’ to 26’
Elev. = -36.7’ to -38.7’ MLLW



FD16-09, S14
Depth = 26’ to 28’
Elev. = -38.7’ to -40.7’ MLLW



FD16-09, S15
Depth = 28’ to 30’
Elev. = -40.7’ to -42.7’ MLLW

FD16-09, S16
Depth = 30’ to 32’
Elev. = -42.7’ to -44.7’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-09, S17
Depth = 32' to 34'
Elev. = -44.7' to -46.7' MLLW

FD16-09, S18
Depth = 34' to 35.2'
Elev. = -46.7' to -47.9' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-10, S1
Depth = 0' to 2'
Elev. = -9.3' to -11.3' MLLW

FD16-10, S2
Depth = 2' to 4'
Elev. = -11.3' to -13.3' MLLW

No Recovery

FD16-10, S3
Depth = 4' to 6'
Elev. = -13.3' to -15.3' MLLW

FD16-10, S4
Depth = 6' to 8'
Elev. = -15.3' to -17.3' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-10, S5
Depth = 8' to 10'
Elev. = -17.3' to -19.3' MLLW

FD16-10, S6
Depth = 10' to 12'
Elev. = -19.3' to -21.3' MLLW

FD16-10, S7
Depth = 12' to 14'
Elev. = -21.3' to -23.3' MLLW

FD16-10, S8
Depth = 14' to 16'
Elev. = -23.3' to -25.3' MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-10, S9
Depth = 16’ to 18’
Elev. = -25.3’ to -27.3’ MLLW

FD16-10, S10
Depth = 18’ to 20’
Elev. = -27.3’ to -29.3’ MLLW

FD16-10, S11
Depth = 20’ to 22’
Elev. = -29.3’ to -31.3’ MLLW

FD16-10, S12
Depth = 22’ to 24’
Elev. = -31.3’ to -33.3’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-10, S13
Depth = 24’ to 26’
Elev. = -33.3’ to -35.3’ MLLW

FD16-10, S14
Depth = 26’ to 28’
Elev. = -35.3’ to -37.3’ MLLW

FD16-10, S15
Depth = 28’ to 30’
Elev. = -37.3’ to -39.3’ MLLW

FD16-10, S16
Depth = 30’ to 32’
Elev. = -39.3’ to -41.3’ MLLW

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Split Spoon Recovery Photographs

FD16-10, S17
Depth = 32' to 34'
Elev. = -41.3' to -43.3' MLLW

FD16-10, S18
Depth = 34' to 36'
Elev. = -43.3' to -45.3' MLLW

FD16-10, S19
Depth = 36' to 38'
Elev. = -45.3' to -47.3' MLLW

FD16-10, S20
Depth = 38' to 40'
Elev. = -47.3' to -49.3' MLLW

FD16-10, S21
Depth = 40’ to 42’
Elev. = -49.3’ to -51.3’ MLLW

APPENDIX D

Core Photographs

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Boring FD16-01
Rock Core Photographs

Boring No.	Run	Depth (ft)	Elevation (ft MLLW)	Recovery (in)	Recovery (%)	RQD (in)	RQD (%)	Rock Type	Box Row
FD16-01	C-1	34.2 - 37.7	-50.0 - -53.5	42	100	22	52	Schist	1

Notes: 1. Box row corresponds to the core box section in which the rock core sample is contained.
2. Top photo is dry, bottom photo is wet.

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Boring FD16-02
Rock Core Photographs

Boring No.	Run	Depth (ft)	Elevation (ft MLLW)	Recovery (in)	Recovery (%)	RQD (in)	RQD (%)	Rock Type	Box Row
FD16-02	C-1	22.0 - 26.5	-34.1 - -38.6	38	70	0	0	Schist	1/2
FD16-02	C-2	26.5 - 30.0	-38.6 - -42.1	42	100	20	48	Schist	2
FD16-02	C-3	30.0 - 35.0	-42.1 - -47.1	60	100	44	73	Schist	3
FD16-02	C-4	35.0 - 38.0	-47.1 - -50.1	36	100	21	58	Schist	4

Notes: 1. Box row corresponds to the core box section in which the rock core sample is contained; Row 1=Top, Row 4=Bottom.
2. Top photo is dry, bottom photo is wet.

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Boring FD16-07
Rock Core Photographs

Boring No.	Run	Depth (ft)	Elevation (ft MLLW)	Recovery (in)	Recovery (%)	RQD (in)	RQD (%)	Rock Type	Box Row
FD16-07	C-1	28.0 - 29.3	-40.6 - -41.9	15	94	0	0	Schist	1
FD16-07	C-2	29.3 - 31.7	-41.9 - -44.3	19	68	0	0	Schist/Basalt	1
FD16-07	C-3	31.7 - 32.7	-44.3 - -45.3	12	100	0	0	Basalt	1
FD16-07	C-4	32.7 - 34.7	-45.3 - -47.3	24	100	0	0	Basalt	1/2
FD16-07	C-5	34.7 - 37.3	-47.3 - -49.9	31	100	0	0	Schist/Basalt	2
FD16-07	C-6	37.3 - 39.5	-49.9 - -52.1	26	100	0	0	Schist	2/3
FD16-07	C-7	39.5 - 42.4	-52.1 - -55.0	35	100	8	23	Schist	3

<u>Notes:</u> 1. Box row corresponds to the core box section in which the rock core sample is contained; Row 1=Top, Row 3=Bottom.
2. Top photo is dry, bottom photo is wet.

United States Army Corps of Engineers
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME
Boring FD16-09
Rock Core Photographs

Boring No.	Run	Depth (ft)	Elevation (ft MLLW)	Recovery (in)	Recovery (%)	RQD (in)	RQD (%)	Rock Type	Box Row
FD16-09	C-1	36.2 - 40.2	-48.9 - -52.9	40	83	13	27	Schist	1

Notes: 1. Box row corresponds to the core box section in which the rock core sample is contained.
2. Top photo is dry, bottom photo is wet.

APPENDIX E

Laboratory Data Test Results

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016-8/18/2016
Tested By:	smd
Checked By:	jsc

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 3

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
FD16-01	C-1	34.2-37.7	0.43	170	2.73	0.014

Notes: Results are based on ten irregular test specimens.
Unit weight obtained by buoyancy technique.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/16/2016-8/18/2016
Tested By:	smd
Checked By:	jsc

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 3

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
FD16-02	C-3	30.8-31.4	0.83	166	2.66	0.033

Notes: Results are based on ten irregular test specimens.
Unit weight obtained by buoyancy technique.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016-8/18/2016
Tested By:	smd
Checked By:	jsc

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 3

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
FD16-07	C-1	36.2-39.5	0.75	164	2.63	0.015

Notes: Results are based on ten irregular test specimens.
Unit weight obtained by buoyancy technique.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016-8/18/2016
Tested By:	smd
Checked By:	jsc

Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 3

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
FD16-07	C-1 Basalt	31.7-35.9	0.32	173	2.77	0.003

Notes: Results are based on ten irregular test specimens.
Unit weight obtained by buoyancy technique.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016-8/18/2016
Tested By:	smd
Checked By:	jsc

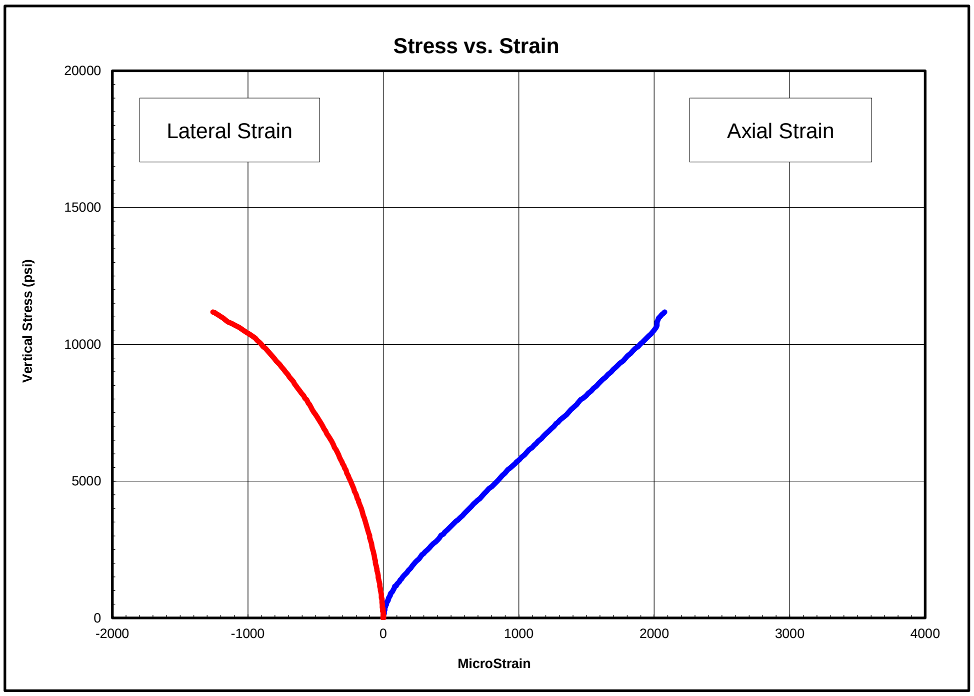
Unit Weight, Porosity & Specific Gravity of Rock - ISRM Method 3

Boring ID	Sample ID	Depth, ft.	Average Moisture Content, %	Average Dry Unit Weight, pcf	Average Bulk Specific Gravity	Average Porosity
FD16-07	C-1 Phyllite	28.6-40.7	0.24	168	2.71	0.011

Notes: Results are based on ten irregular test specimens.
Unit weight obtained by buoyancy technique.
Pore Volume obtained by water saturation.
Bulk Specific Gravity obtained by buoyancy technique.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-01
Sample ID:	C-1
Depth, ft:	35.21-35.57
Sample Type:	rock core
Sample Description:	See photographs Intact material failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 11,187 psi

One axial strain gauge failed to record meaningful data. Young's Modulus and Poisson's Ratio reported based on results of a single axial strain gauge.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1100-4100	5,160,000	0.25
4100-7100	4,810,000	0.46
7100-10100	4,700,000	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

GeoTesting EXPRESS

Client:	GZA GeoEnvironmental, Inc.	Test Date:	8/15/2016
Project Name:	Portsmouth Harbor Turning Basin	Tested By:	rlc
Project Location:	Eliot, ME	Checked By:	jsc
GTX #:	305149		
Boring ID:	FD16-01		
Sample ID:	C-1		
Depth:	35.21-35.57 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.22	4.22	4.22
Specimen Diameter, in:	1.97	1.97	1.97
Specimen Mass, g:	565.73		
Bulk Density, lb/ft^3	167	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.1	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00030	-0.00030	-0.00040	-0.00050	-0.00050
Diameter 2, in (rotated 90°)	-0.00010	-0.00020	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020	-0.00030	-0.00040	-0.00040

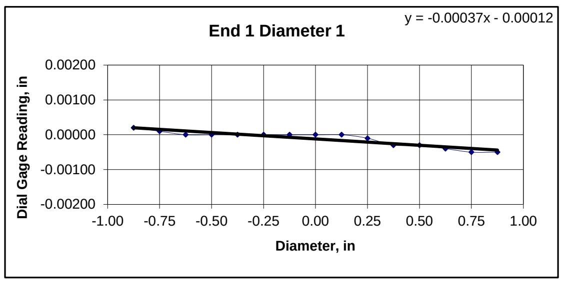
Difference between max and min readings, in:
0° = 0.00070 90° = 0.00040

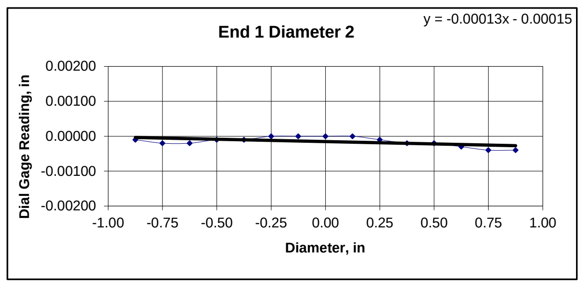
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00030	-0.00040	-0.00030	-0.00030	-0.00030	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040

Difference between max and min readings, in:
0° = 0.0006 90° = 0.0004

Maximum difference must be < 0.0020 in. Difference = ± 0.00035

Flatness Tolerance Met? YES





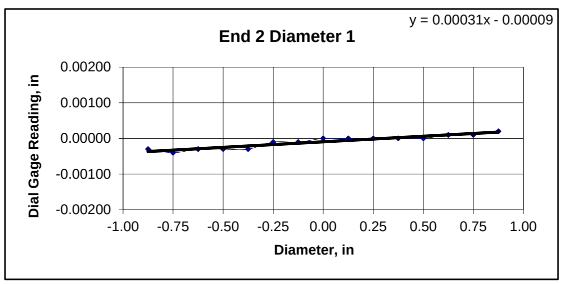
DIAMETER 1

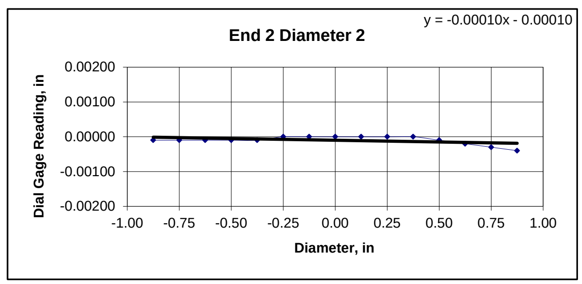
End 1:
Slope of Best Fit Line 0.00037
Angle of Best Fit Line: 0.02120

End 2:
Slope of Best Fit Line 0.00031
Angle of Best Fit Line: 0.01776

Maximum Angular Difference: 0.00344

Parallelism Tolerance Met? YES
Spherically Seated





DIAMETER 2

End 1:
Slope of Best Fit Line 0.00013
Angle of Best Fit Line: 0.00745

End 2:
Slope of Best Fit Line 0.00010
Angle of Best Fit Line: 0.00573

Maximum Angular Difference: 0.00172

Parallelism Tolerance Met? YES
Spherically Seated

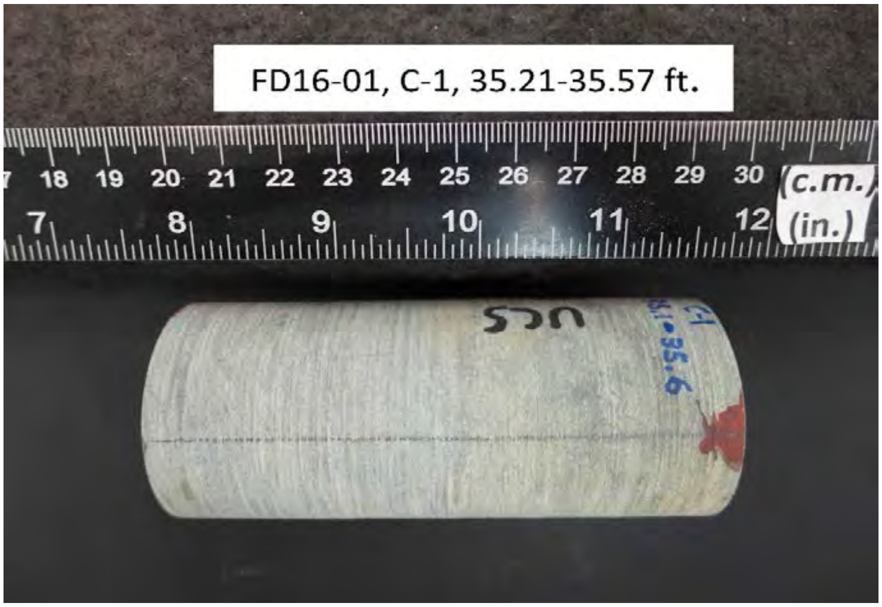
PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00070	1.970	0.00036	0.020	YES
Diameter 2, in (rotated 90°)	0.00040	1.970	0.00020	0.012	YES
END 2					
Diameter 1, in	0.00060	1.970	0.00030	0.017	YES
Diameter 2, in (rotated 90°)	0.00040	1.970	0.00020	0.012	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-01
Sample ID:	C-1
Depth, ft:	35.21-35.57

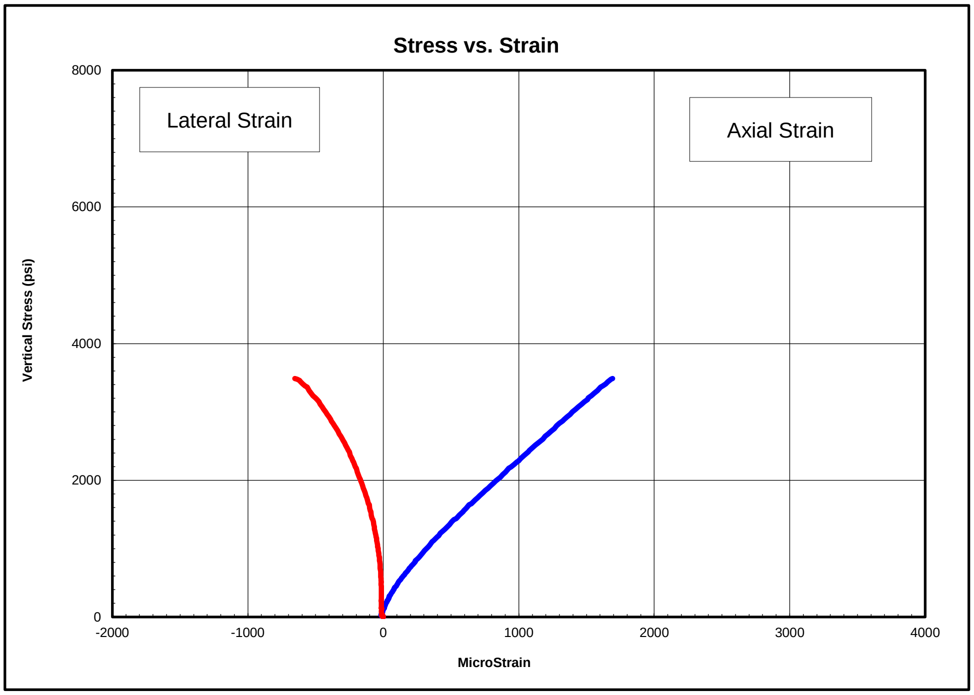


After cutting and grinding

After break

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-2
Depth, ft:	26.85-27.23
Sample Type:	rock core
Sample Description:	See photographs Discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 3,485 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
300-1300	2,400,000	0.13
1300-2200	1,860,000	0.30
2200-3100	1,780,000	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	GZA GeoEnvironmental, Inc.	Test Date:	8/15/2016
Project Name:	Portsmouth Harbor Turning Basin	Tested By:	rlc
Project Location:	Eliot, ME	Checked By:	jsc
GTX #:	305149		
Boring ID:	FD16-02		
Sample ID:	C-2		
Depth:	26.85-27.23 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average	
Specimen Length, in:	4.42	4.42	4.42	
Specimen Diameter, in:	1.98	1.98	1.98	
Specimen Mass, g:	590.97			
Bulk Density, lb/ft^3	165	**Minimum Diameter Tolerence Met?**		YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**		YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:

Is the maximum gap $\leq$ 0.02 in.? YES

Maximum difference must be < 0.020 in.

Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00030	-0.00030	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90^o)	0.00040	0.00020	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00050	-0.00060	-0.00060

Difference between max and min readings, in:

0° = 0.00040 90° = 0.00100

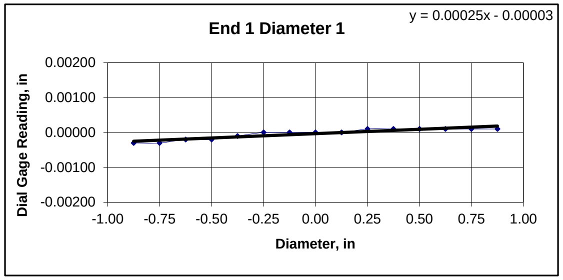
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00030	-0.00020	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90^o)	0.00050	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020	-0.00030	-0.00040	-0.00040	-0.00050

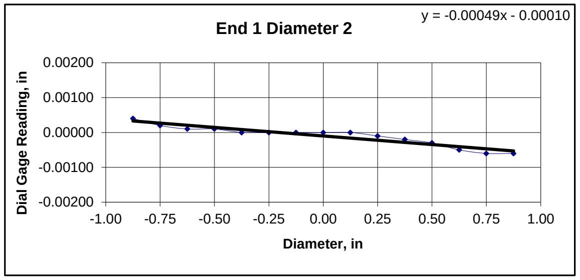
Difference between max and min readings, in:

0° = 0.0004 90° = 0.001

Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00050

Flatness Tolerance Met? YES





DIAMETER 1

End 1:

Slope of Best Fit Line	0.00025
Angle of Best Fit Line:	0.01432

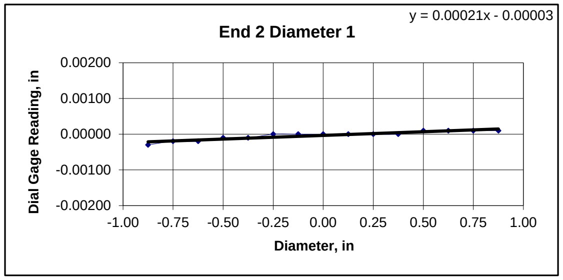
End 2:

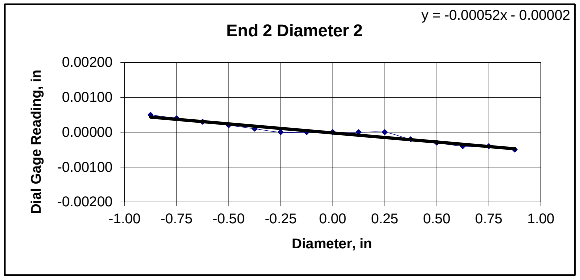
Slope of Best Fit Line	0.00021
Angle of Best Fit Line:	0.01203

Maximum Angular Difference: 0.00229

Parallelism Tolerance Met? YES

Spherically Seated





DIAMETER 2

End 1:

Slope of Best Fit Line	0.00049
Angle of Best Fit Line:	0.02807

End 2:

Slope of Best Fit Line	0.00051
Angle of Best Fit Line:	0.02922

Maximum Angular Difference: 0.00115

Parallelism Tolerance Met? YES

Spherically Seated

PERPENDICULARITY (Procedure P1)

(Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00040	1.980	0.00020	0.012	YES
Diameter 2, in (rotated 90^o)	0.00100	1.980	0.00051	0.029	YES
END 2					
Diameter 1, in	0.00040	1.980	0.00020	0.012	YES
Diameter 2, in (rotated 90^o)	0.00100	1.980	0.00051	0.029	YES

Maximum angle of departure must be $\leq$ 0.25°

Perpendicularity Tolerance Met? YES

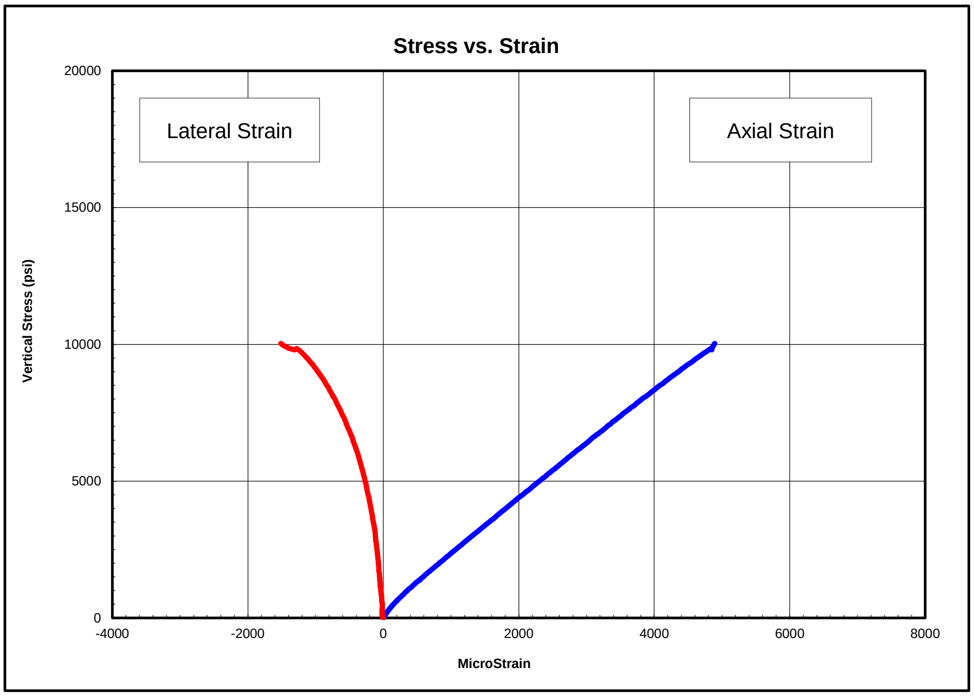
Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-2
Depth, ft:	26.85-27.23

After cutting and grinding

After break

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-3
Depth, ft:	30.41-30.78
Sample Type:	rock core
Sample Description:	See photographs Intact material failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 10,042 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1000-3700	2,060,000	0.09
3700-6400	2,010,000	0.20
6400-9000	1,920,000	0.39

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

Client:	GZA GeoEnvironmental, Inc.	Test Date:	8/15/2016
Project Name:	Portsmouth Harbor Turning Basin	Tested By:	rlc
Project Location:	Eliot, ME	Checked By:	jsc
GTX #:	305149		
Boring ID:	FD16-02		
Sample ID:	C-3		
Depth:	30.41-30.78 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY

	1	2	Average
Specimen Length, in:	4.46	4.47	4.47
Specimen Diameter, in:	1.99	1.99	1.99
Specimen Mass, g:	599.82		
Bulk Density, lb/ft^3	164	**Minimum Diameter Tolerence Met?**	YES
Length to Diameter Ratio:	2.2	**Length to Diameter Ratio Tolerance Met?**	YES

DEVIATION FROM STRAIGHTNESS (Procedure S1)

Maximum gap between side of core and reference surface plate:
Is the maximum gap ≤ 0.02 in.? YES

Maximum difference must be < 0.020 in.
Straightness Tolerance Met? YES

END FLATNESS AND PARALLELISM (Procedure FP1)

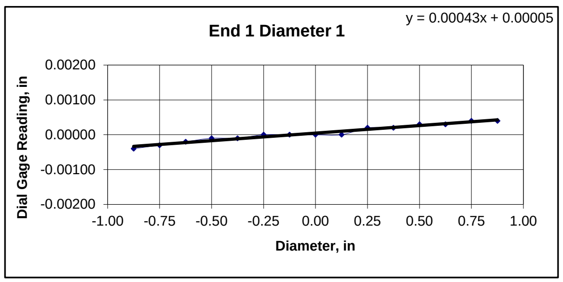
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00040	-0.00030	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00020	0.00020	0.00030	0.00030	0.00040	0.00040
Diameter 2, in (rotated 90°)	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00030	0.00030	0.00030

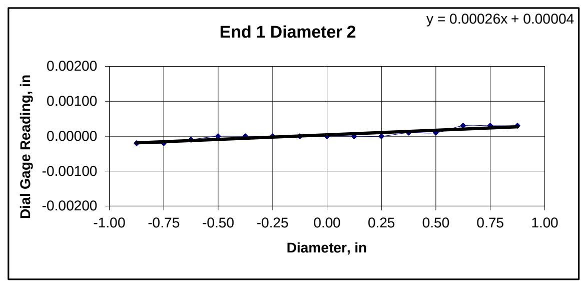
Difference between max and min readings, in:
0° = 0.00080 90° = 0.00050

END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00030	-0.00030	-0.00020	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020	0.00030	0.00040
Diameter 2, in (rotated 90°)	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00020	-0.00020

Difference between max and min readings, in:
0° = 0.0007 90° = 0.0006

Maximum difference must be < 0.0020 in. Difference = ± 0.00040
Flatness Tolerance Met? YES





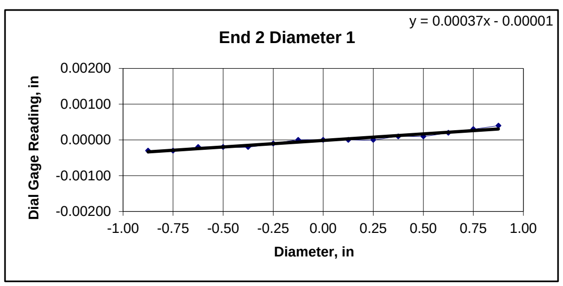
DIAMETER 1

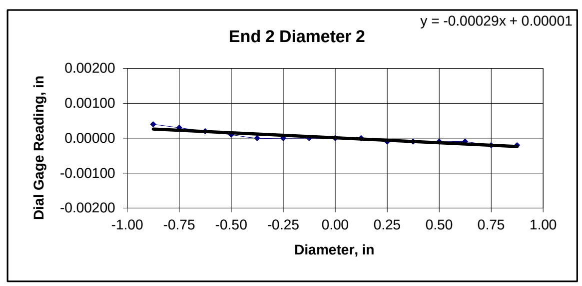
End 1:
Slope of Best Fit Line 0.00043
Angle of Best Fit Line: 0.02464

End 2:
Slope of Best Fit Line 0.00037
Angle of Best Fit Line: 0.02120

Maximum Angular Difference: 0.00344

Parallelism Tolerance Met? YES
Spherically Seated





DIAMETER 2

End 1:
Slope of Best Fit Line 0.00026
Angle of Best Fit Line: 0.01490

End 2:
Slope of Best Fit Line 0.00029
Angle of Best Fit Line: 0.01662

Maximum Angular Difference: 0.00172

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)

END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?
Diameter 1, in	0.00080	1.990	0.00040	0.023	YES
Diameter 2, in (rotated 90°)	0.00050	1.990	0.00025	0.014	YES
END 2					
Diameter 1, in	0.00070	1.990	0.00035	0.020	YES
Diameter 2, in (rotated 90°)	0.00060	1.990	0.00030	0.017	YES

Maximum angle of departure must be ≤ 0.25°

Perpendicularity Tolerance Met? YES

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/17/2016
Tested By:	rlc
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-3
Depth, ft:	30.41-30.78

After cutting and grinding

After break

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016
Tested By:	smd
Checked By:	jsc

Pulse Velocities and Ultrasonic Elastic Constants of Rock by ASTM D2845 - Summary Table

Boring ID	Sample ID	Depth, ft	Bulk Density, lbs/ft^3	P-Wave Velocity, (ft/sec) (Axial)	S-Wave Velocity, (ft/sec) (Axial)	Young's Modulus, (psi) 10^6	Poisson's Ratio
FD16-01	C-1	35.21-35.57	167	6,923	4,761	1.72	0.05
FD16-02	C-2	26.85-27.23	165	7,111	5,433	1.68	0.20
FD16-02	C-3	30.41-30.78	164	9,359	5,802	2.83	0.19
FD16-09	C-1	38.8-39.4	167	5,926	3,337	1.01	0.27

Notes: Density determined on rock core samples by measuring dimensions and weight and then calculating.
All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.
No coupling medium was used.

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149

Pulse Velocities and Ultrasonic Elastic Constants of Rock by ASTM D2845

FD16-01
C-1
35.21-35.57 ft

FD16-02
C-2
26.85-27.23 ft

FD16-02
C-3
30.41-30.78 ft

FD16-09
C-1
38.8-39.4 ft

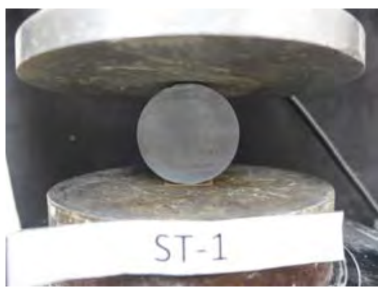
Client: GZA GeoEnvironmental, Inc.
Project: Portsmouth Harbor Turning Basin
Location: Eliot, ME
Project No: GTX-305149

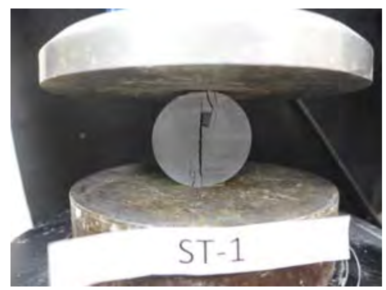
Boring ID:	FD16-01	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	34.4-34.8 ft	Test Id:	386431		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
34.46-34.55 ft	ST-1	1.02	1.7	0.60	3,435	1,270	1





Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

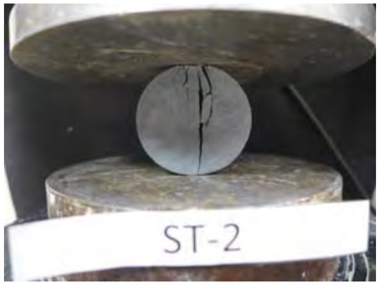
The reported diameter(D) is the average of three measurements.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-01	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	37.4-37.7 ft	Test Id:	386432		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
37.51-37.60 ft	ST-2	1.16	1.98	0.59	5,489	1,520	1



Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

GeoTesting EXPRESS

Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-02	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-3	Test Date:	08/17/16	Checked By:	jsc
Depth :	31.4-32.1 ft	Test Id:	386428		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
31.4-32.1 ft	ST-3	1.09	1.98	0.55	2,042	599	3

Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure (See attached photographs)

Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-02	Sample Type: cylinder	Tested By:	smd
Sample ID: C-2	Test Date: 08/17/16	Checked By:	jsc
Depth : 27.5-28.4 ft	Test Id: 386430		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
27.79-27.86 ft	ST-4	0.89	1.99	0.45	1,954	706	3

Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

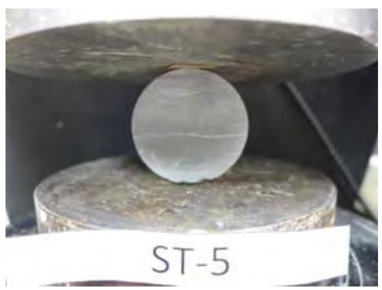
The reported diameter(D) is the average of three measurements.

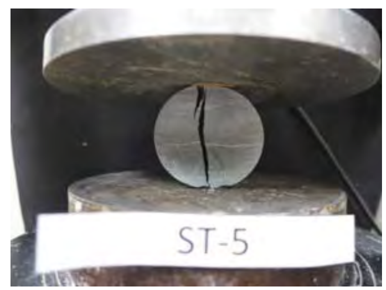
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

Client:	GZA GeoEnvironmental, Inc.			
Project:	Portsmouth Harbor Turning Basin			
Location:	Eliot, ME		Project No:	GTX-305149
Boring ID:	FD16-02	Sample Type: cylinder	Tested By:	smd
Sample ID:	C-3	Test Date: 08/17/16	Checked By:	jsc
Depth :	34.6-35.0 ft	Test Id: 386435		
Test Comment:	---			
Visual Description:	---			
Sample Comment:	---			

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
34.85-34.94 ft	ST-5	1.03	1.99	0.52	2,562	796	1





Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

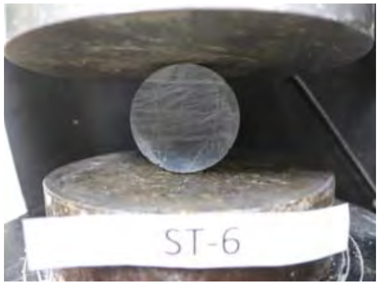
The reported diameter(D) is the average of three measurements.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149
Boring ID: FD16-07	Sample Type: cylinder	Tested By:	smd
Sample ID: C-7	Test Date: 08/17/16	Checked By:	jsc
Depth : 41.0-41.2 ft	Test Id: 386433		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
41.80-41.87 ft	ST-6	0.92	1.99	0.46	1,570	548	3



Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

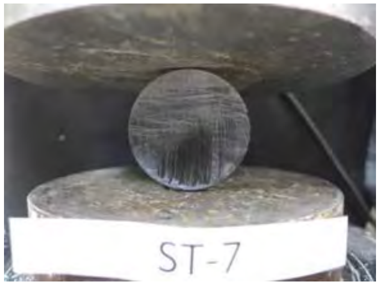
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

GeoTesting EXPRESS

Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-07	Sample Type: cylinder	Tested By:	smd
Sample ID: C-7	Test Date: 08/17/16	Checked By:	jsc
Depth : 41.6-42.1 ft	Test Id: 386434		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
41.02-41.10 ft	ST-7	1.03	1.98	0.52	1,518	472	3



Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-09	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	36.2-36.6 ft	Test Id:	386429		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Splitting Tensile Strength of Intact Rock Core Specimens by ASTM D3967

Specimen Depth	Test No	Thickness (L), in	Diameter (D), in	Thickness to Diameter Ratio (L/D)	Failure Load (P), lb	Splitting Tensile Strength, psi	Failure Type
36.23-36.32 ft	ST-8	1.03	1.95	0.53	5,710	1,800	3

Notes: Strain rate: 2.5%/min.

ASTM requires the thickness-to-diameter ratio (L/D) of each test specimen to be between 0.2 and 0.75.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

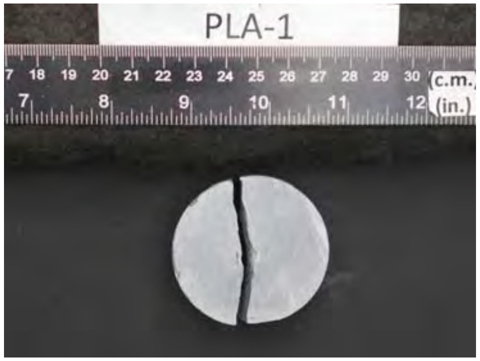
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)

Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-01	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	37.4-37.7 ft	Test Id:	387037		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-1	37.41-37.50	1.98	1.02	2,280	2.57	1.60	888	0.911	810	19	16,900

Before



After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-02	Sample Type: cylinder	Tested By:	smd
Sample ID: C-1	Test Date: 08/17/16	Checked By:	jsc
Depth : 22.2-22.4 ft	Test Id: 387030		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-2	22.28-22.37	1.97	1.07	585	2.67	1.63	*	0.920	*	19	*

Before

After

Discontinuity Failure

* Invalid Test - Specimen did not fail from point to point.

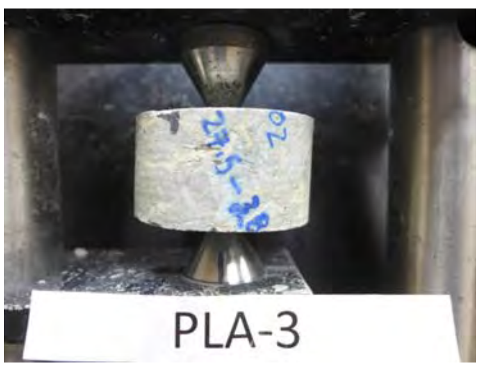
Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

GeoTesting EXPRESS

Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149
Boring ID: FD16-02	Sample Type: cylinder	Tested By:	smd
Sample ID: C-2	Test Date: 08/17/16	Checked By:	jsc
Depth : 27.5-28.4 ft	Test Id: 387026		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-3	27.87-27.96	1.99	1.12	803	2.83	1.68	284	0.931	264	19	5,390



Before

After

Intact material and Discontinuity Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149

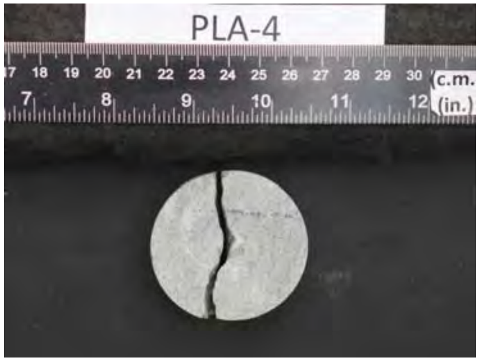
Boring ID:	FD16-02	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-3	Test Date:	08/17/16	Checked By:	jsc
Depth :	31.4-32.1 ft	Test Id:	387024		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-4	31.4-32.1	1.99	1.16	1,855	2.94	1.71	631	0.940	593	19	12,000

Before



After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

De = the equivalent core diameter

Is = the uncorrected point load strength index

F = the size correction factor

Is(50) = the size corrected point load strength index

Client:	GZA GeoEnvironmental, Inc.			
Project:	Portsmouth Harbor Turning Basin			
Location:	Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-07		Sample Type: cylinder	Tested By:	smd
Sample ID: C-7		Test Date: 08/17/16	Checked By:	jsc
Depth : 41.6-42.1 ft		Test Id: 387028		
Test Comment:	---			
Visual Description:	---			
Sample Comment:	---			

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-5	41.71-41.79	1.99	0.90	904	2.27	1.51	399	0.886	353	18	7,170

Before

After

Intact material and Discontinuity Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client:	GZA GeoEnvironmental, Inc.			
Project:	Portsmouth Harbor Turning Basin			
Location:	Eliot, ME		Project No:	GTX-305149
Boring ID:	FD16-01	Sample Type: cylinder	Tested By:	smd
Sample ID:	C-1	Test Date: 08/17/16	Checked By:	jsc
Depth :	34.2-34.4 ft	Test Id: 387031		
Test Comment:	---			
Visual Description:	---			
Sample Comment:	---			

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-6	34.23-34.33	1.95	1.02	2,104	2.55	1.60	827	0.910	752	19	15,700

Before

After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

De = the equivalent core diameter

Is = the uncorrected point load strength index

F = the size correction factor

Is(50) = the size corrected point load strength index

Client: GZA GeoEnvironmental, Inc.
Project: Portsmouth Harbor Turning Basin
Location: Eliot, ME

Project No: GTX-305149

Boring ID:	FD16-07	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-5	Test Date:	08/17/16	Checked By:	jsc
Depth :	34.7-35.1 ft	Test Id:	387027		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-7	34.7-35.1	1.98	0.56	2,017	1.42	1.19	1420	0.798	1133	18	25,600

Before

After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149

Boring ID:	FD16-09	Sample Type:	tube	Tested By:	smd
Sample ID:	C-1	Test Date:	08/19/16	Checked By:	jsc
Depth :	39.15-39.29 ft	Test Id:	388007		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

Axial Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLA-8	39.15-39.29	1.98	1.78	3,496	4.48	2.12	*	1.033	*	21	*

Before

After

Discontinuity Failure

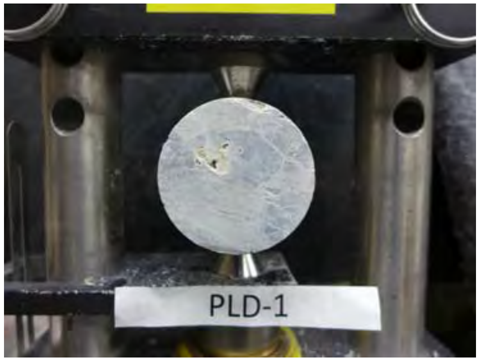
* Invalid Test - Specimen did not fail from point to point.

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client: GZA GeoEnvironmental, Inc.				
Project: Portsmouth Harbor Turning Basin				
Location: Eliot, ME			Project No:	GTX-305149
Boring ID: FD16-02	Sample Type:	cylinder	Tested By:	smd
Sample ID: C-2	Test Date:	08/17/16	Checked By:	jsc
Depth : 27.5-28.4 ft	Test Id:	387020		
Test Comment: ---				
Visual Description: ---				
Sample Comment: ---				

DIAMETRAL Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLD-1	27.97-28.23	1.98	3.13	1,675	3.93	1.98	427	1.003	428	23	9,810



Before

After

Intact Material Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.

The reported thickness (L) is the average of three measurements.

The reported diameter(D) is the average of three measurements.

De = the equivalent core diameter

Is = the uncorrected point load strength index

F = the size correction factor

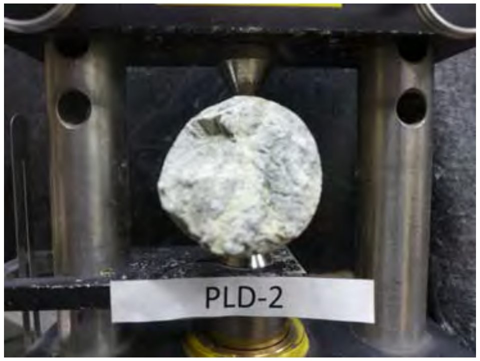
Is(50) = the size corrected point load strength index

Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-02	Sample Type: cylinder	Tested By:	smd
Sample ID: C-4	Test Date: 08/17/16	Checked By:	jsc
Depth : 36.1-36.4 ft	Test Id: 387023		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

DIAMETRAL Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLD-2	36.1-36.4	1.98	3.21	1,661	3.91	1.98	*	1.002	*	23	*



Before

After

Discontinuity Failure

* Invalid Test - Specimen did not fail from point to point.

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-07	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-2	Test Date:	08/17/16	Checked By:	jsc
Depth :	29.9-30.1 ft	Test Id:	387022		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

DIAMETRAL Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLD-3	29.9-30.1	1.97	3.21	1,985	3.89	1.97	*	1.001	*	23	*

Before

After

Discontinuity Failure

* Invalid Test - Specimen did not fail from point to point.

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

GeoTesting EXPRESS

Client: GZA GeoEnvironmental, Inc.
Project: Portsmouth Harbor Turning Basin
Location: Eliot, ME — Project No: GTX-305149

Boring ID:	FD16-09	Sample Type:	cylinder	Tested By:	smd
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	38.3-38.6 ft	Test Id:	387019		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

DIAMETRAL Point Load Strength Index of Rock by ASTM D5731

Test No.	Specimen Depth, ft	Diameter, in	Thickness, in	Failure Load (P), lb	De, sq in	De, in	Is, psi	F	Is(50mm) psi	Generalized Correction Factor, K	Estimated Compressive Strength, psi
PLD-4	38.3-38.6	1.97	3.34	2,522	3.88	1.97	650	1.000	650	23	15,000

Before

After

Intact material and Discontinuity Failure

Notes: Generalized correction factor, K, used to estimate the compressive strength based on the specimen depth and ASTM D5731 Table 1.
The reported thickness (L) is the average of three measurements.
The reported diameter(D) is the average of three measurements.
De = the equivalent core diameter
Is = the uncorrected point load strength index
F = the size correction factor
Is(50) = the size corrected point load strength index

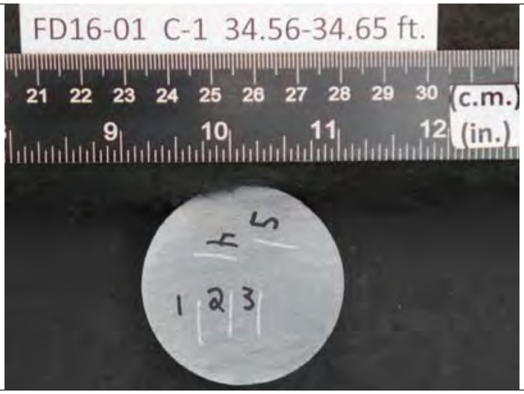
Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-01	Sample Type: cylinder	Tested By:	daa
Sample ID: C-1	Test Date: 08/17/16	Checked By:	jsc
Depth : 34.4-34.8 ft	Test Id: 387013		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-01	C-1	34.56-34.65 ft	1	0.9	1.4	1.15	
			2	0.8	1.3	1.05	
			3	0.9	1.4	1.15	
			4	1.1	1.4	1.25	
			5	0.6	1.1	0.85	
			Average CAIs			1.09	
			Average CAI *			1.56	
			CERCHAR Abrasiveness Index Classification			**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149

Boring ID:	FD16-01	Sample Type:	cylinder	Tested By:	daa
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	37.0-37.4 ft	Test Id:	387014		

Test Comment: ---
Visual Description: ---
Sample Comment: ---

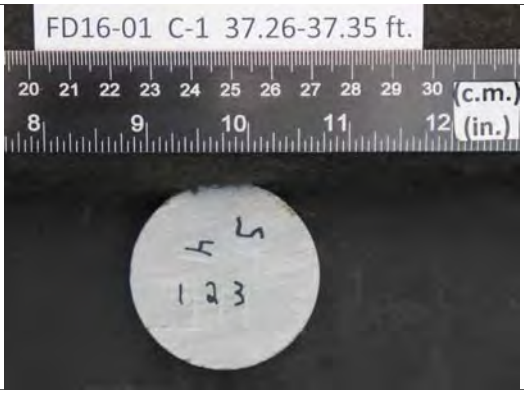
Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-01	C-1	37.26-37.35 ft	1	1.2	1.7	1.45	
			2	0.6	1.1	0.85	
			3	0.8	1.3	1.05	
			4	0.5	1.0	0.75	
			5	0.3	0.8	0.55	
			Average CAIs			0.93	
			Average CAI *			1.40	

CERCHAR Abrasiveness Index Classification | **Medium abrasiveness**

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



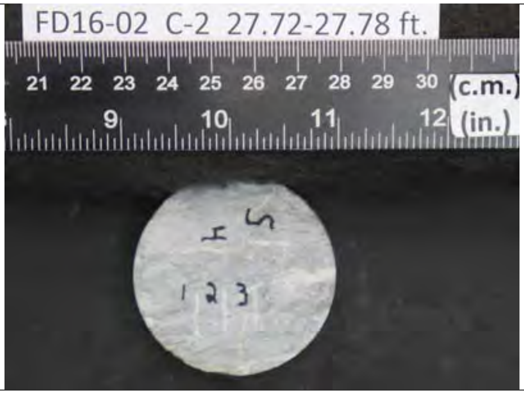
Client:	GZA GeoEnvironmental, Inc.
Project:	Portsmouth Harbor Turning Basin
Location:	Eliot, ME
Project No:	GTX-305149
Boring ID:	FD16-02
Sample ID:	C-2
Depth :	27.5-28.4 ft
Sample Type:	cylinder
Test Date:	08/17/16
Test Id:	387011
Tested By:	daa
Checked By:	jsc
Test Comment:	---
Visual Description:	---
Sample Comment:	---

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-02	C-2	27.72-27.78 ft	1	2.6	2.1	2.35	
			2	1.1	1.6	1.35	
			3	1.3	1.8	1.55	
			4	1.4	1.9	1.65	
			5	1.6	2.1	1.85	
			Average CAIs			1.75	
			Average CAI *			2.21	
			CERCHAR Abrasiveness Index Classification			High abrasiveness	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



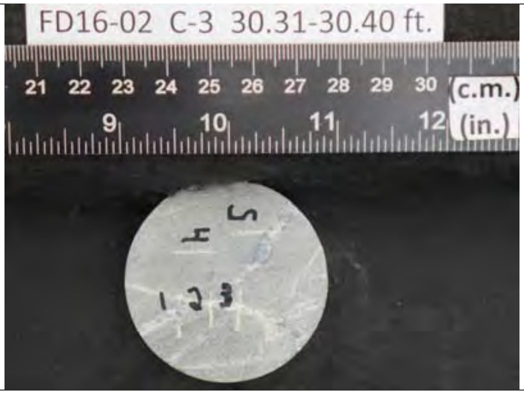
Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-02	Sample Type:	cylinder	Tested By:	daa
Sample ID:	C-3	Test Date:	08/17/16	Checked By:	jsc
Depth :	30.0-30.8 ft	Test Id:	387012		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-02	C-3	30.31-30.40 ft	1	2.4	2.8	2.60	
			2	2.3	2.8	2.55	
			3	0.3	0.7	0.50	
			4	0.6	1.1	0.85	
			5	0.5	1.0	0.75	
			Average CAIs			1.45	
			Average CAI *			1.92	
			CERCHAR Abrasiveness Index Classification			**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



GeoTesting EXPRESS

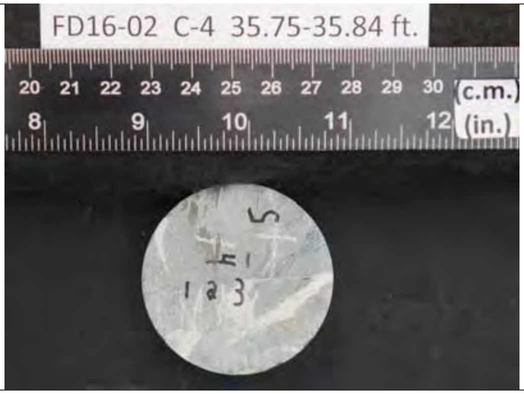
Client: GZA GeoEnvironmental, Inc.			
Project: Portsmouth Harbor Turning Basin			
Location: Eliot, ME		Project No:	GTX-305149
Boring ID: FD16-02	Sample Type: cylinder	Tested By:	daa
Sample ID: C-4	Test Date: 08/17/16	Checked By:	jsc
Depth : 35.7-36.1 ft	Test Id: 387017		
Test Comment: ---			
Visual Description: ---			
Sample Comment: ---			

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-02	C-4	35.75-35.84 ft	1	0.9	1.4	1.15	
			2	0.6	1.0	0.80	
			3	0.7	1.2	0.95	
			4	1.2	1.7	1.45	
			5	0.7	1.2	0.95	
			Average CAIs			1.06	
			Average CAI *			1.53	
CERCHAR Abrasiveness Index Classification						**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



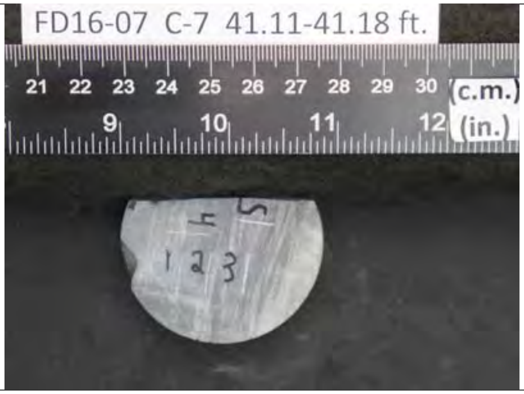
Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-07	Sample Type:	cylinder	Tested By:	daa
Sample ID:	C-7	Test Date:	08/17/16	Checked By:	jsc
Depth :	41.0-41.2 ft	Test Id:	387015		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-07	C-7	41.11-41.18 ft	1	2.4	2.9	2.65	
			2	1.2	1.7	1.45	
			3	0.5	0.9	0.70	
			4	1.6	2.1	1.85	
			5	1.4	1.9	1.65	
			Average CAIs			1.66	
			Average CAI *			2.12	
			CERCHAR Abrasiveness Index Classification			**High abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



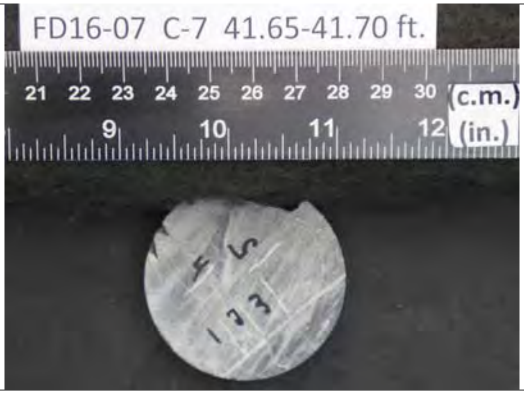
Client:	GZA GeoEnvironmental, Inc.				
Project:	Portsmouth Harbor Turning Basin				
Location:	Eliot, ME			Project No:	GTX-305149
Boring ID:	FD16-07	Sample Type:	cylinder	Tested By:	daa
Sample ID:	C-7	Test Date:	08/17/16	Checked By:	jsc
Depth :	41.6-42.1 ft	Test Id:	387016		
Test Comment:	---				
Visual Description:	---				
Sample Comment:	---				

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-07	C-7	41.65-41.70 ft	1	1.1	1.6	1.35	
			2	0.9	1.4	1.15	
			3	1.2	1.7	1.45	
			4	1.0	1.5	1.25	
			5	0.5	1.0	0.75	
			Average CAIs			1.19	
			Average CAI *			1.66	
			CERCHAR Abrasiveness Index Classification			**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



Client:	GZA GeoEnvironmental, Inc.		
Project:	Portsmouth Harbor Turning Basin		
Location:	Eliot, ME	Project No:	GTX-305149

Boring ID:	FD16-09	Sample Type:	cylinder	Tested By:	daa
Sample ID:	C-1	Test Date:	08/17/16	Checked By:	jsc
Depth :	37.5-37.9 ft	Test Id:	387010		

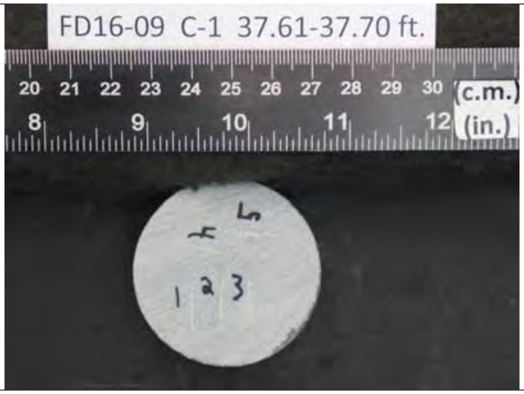
Test Comment: ---
Visual Description: ---
Sample Comment: ---

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
FD16-09	C-1	37.61-37.70 ft	1	1.2	1.7	1.45	
			2	1.1	1.6	1.35	
			3	0.7	1.2	0.95	
			4	1.8	2.3	2.05	
			5	1.4	1.8	1.60	
			Average CAIs			1.48	
			Average CAI *			1.95	
			CERCHAR Abrasiveness Index Classification			**Medium abrasiveness**	

Notes

Test Surface: Saw Cut
Moisture Condition: As Received
Apparatus Type: Original CERCHAR
Stylus Hardness: Rockwell Hardess 54/56 HRC
Stylus Displacement Relative to Rock Fabric:
Styli 1-3: Normal; Styli 4-5: Parallel
* CAI = (0.99 * CAIs) + 0.48
CAIs = CERCHAR index for smooth (saw cut) surface
CAI = CERCHAR index for natural surface
Comments:



GeoTesting EXPRESS

Client:	GZA GeoEnvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016
Tested By:	smd
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-3
Depth, ft.:	32.8-33.6
Visual Description:	See Photographs

	Schmidt Hardness (Hr)		Modified Tabor Abrasion Hardness (Ha)		Total Hardness (Ht)
	29.9		**2.062**		**43.0**
	Correction Factor		Disk 1		
		1.0041	Weight Before (g)	51.7700	
			Weight After (g)	51.2200	
	Calibration Readings	Sample Readings	Weight Loss (g)	0.5500	
	74	31	Disk 2		
	74	28	Weight Before (g)	57.0200	
	72	29	Weight After (g)	56.6000	
	75	27	Weight Loss (g)	0.4200	
	74	27			
	75	25	Average		
	74	30	Weight Loss (g)	0.485	
	75	28			
	71	31			
	73	27			

Notes: Testing performed in accordance with Tarkoy, Peter J., 1985
All specimens tested at standard laboratory temperature.
Samples oven dried at 105^{o} C.

$$H_T = H_R x \sqrt{H_A}$$

Client:	GZA Geoenvironmental, Inc.
Project Name:	Portsmouth Harbor Turning Basin
Project Location:	Eliot, ME
GTX #:	305149
Test Date:	8/15/2016
Tested By:	smd
Checked By:	jsc
Boring ID:	FD16-02
Sample ID:	C-4
Depth, ft.:	35.0-35.6
Visual Description:	See Photographs

	Schmidt Hardness (Hr)		Modified Tabor Abrasion Hardness (Ha)		Total Hardness (Ht)
	35.9		**2.410**		**55.7**
	Correction Factor		Disk 1		
		1.0041	Weight Before (g)	52.3200	
			Weight After (g)	51.8300	
	Calibration Readings	Sample Readings	Weight Loss (g)	0.4900	
	74	27	Disk 2		
	74	37	Weight Before (g)	56.5000	
	72	34	Weight After (g)	56.1600	
	75	27	Weight Loss (g)	0.3400	
	74	36			
	75	35	Average		
	74	35	Weight Loss (g)	0.415	
	75	34			
	71	34			
	73	29			

Notes: Testing performed in accordance with Tarkoy, Peter J., 1985

All specimens tested at standard laboratory temperature.

Samples oven dried at 105^{o} C.

$$H_T = H_R x \sqrt{H_A}$$

Portsmouth Harbor Turning Basin

GTX305149

Petrographic Report #9OW

August 31, 2016

for

Mark P. Dobday
GeoTesting Express, Inc.
125 Nagog Park
Acton, MA 01720

by

Michael DePangher, Ph.D.
Spectrum Petrographics, Inc.

Key to Petrographic and Photomicrographic Descriptions - v. 160808

Clay minerals common in altered rocks must often be identified by X-ray diffraction either because their optic properties are not diagnostic or because they are too fine grained to be reliably identified by optical methods. The term "clay" is used herein to denote fine grained phyllosilicates in general. Under ideal conditions, it is often possible to optically discriminate between 4 major groups: kaolinite, smectite, mica (including illite), and chlorite. This is done whenever conditions permit.

The term "sericite" is applied to fine grained colorless phyllosilicates that show upper 2nd order maximum interference colors. These could include muscovite, illite, paragonite, lepidolite, margarite, clintonite, pyrophyllite, and talc. The term "intermediate clay" is applied to fine grained very pale or colorless phyllosilicates that show upper 1st order maximum interference colors. These are probably dominated by chlorite, smectite, and mixed-layer illite/smectite.

The term "opaques" is used to refer to all materials opaque (and sometimes semi-opaque) to transmitted light. The term "FEOH" is herein used to indicate fine grained, yellowish to reddish brown, earthy materials of varying opacity in transmitted light. FEOH is probably mostly Fe oxy-hydroxides but may sometimes include sphalerite, realgar, orpiment, jarosite, a number of Mn oxy-hydroxides, and organic matter.

A question mark after a rock or mineral name in a petrographic description means that there is uncertainty about the identification of that rock or mineral.

Particle size distributions are given as (A-B µm), where A and B are the median and largest particle sizes, respectively, in microns. A question mark (?) in the position of A or B indicates that the value of A or B was indeterminate, probably because of excessively large or small particle size or statistically insignificant numbers of particles.

Mineral abundances are visual estimates for an entire slide. For multi-lithologic materials (cuttings, etc...), mineralogy, textures, and alteration are described only for the dominant lithology.

Section preparation codes are as follows: (1) Format: 27 x 46 mm; 51 x 76 mm; or 1" round; (2) Finish: standard lapping (STD); or polished (POL); (3) Stains: sodium cobaltinitrite (SCN); alizarin red S + potassium ferricyanide (ARSPF); and barium chloride + potassium rhodizonate (BCPR); and (4) Cover: none; or permanent Loctite acrylic (PLA).

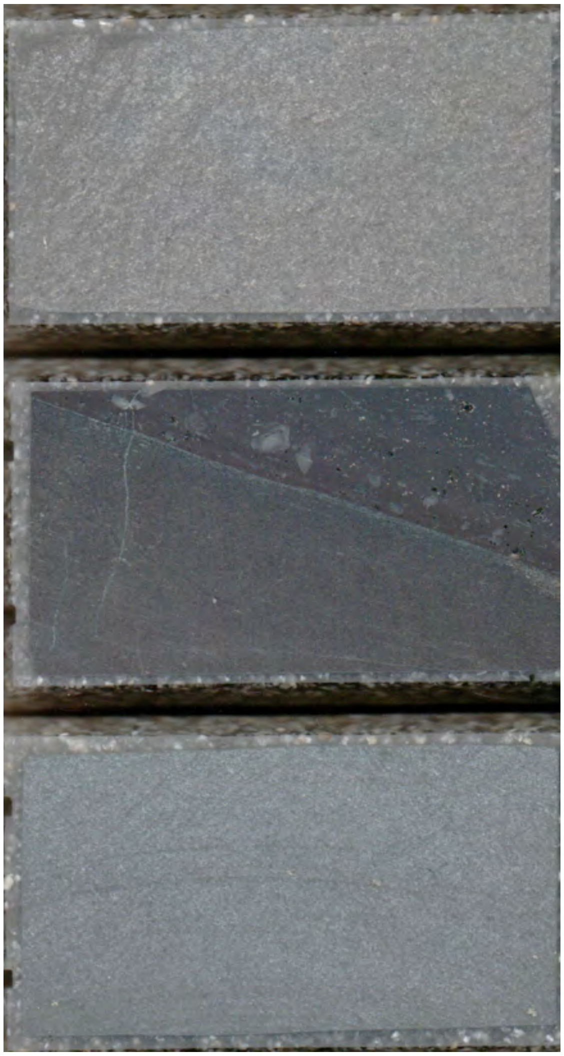
Photomicrograph captions contain the following items of information in consecutive order separated by forward slashes: (1) sample identifier; (2) JPG image file name composed of concatenated [job identification code + sequence number]; (3) illumination type; and (4) field of view (FOV). For illumination types: "PPL" indicates plane-polarized light; "XPL indicates cross-polarized light; "R" indicates reflected light. "550" means that a 550 nanometer wavelength plate was inserted in the light path. "C" indicates that the substage condenser was in (sometimes used for Fe-oxides). "O" indicates oblique incident illumination. These various illuminations can be combined. "CON" indicates conoscopic illumination. POL means that a polarizing filter was used with the lens, and DAY means the sample was photographed in diffused daylight. Unless otherwise noted, images are taken in XPL and PPL of a single field of view.

Features on photomicrographs are indicated by the number of the feature in the ALTERATION section of the text or by a mineral name abbreviation, e.g., **Q**uartz, **P**lagioclase, **K**-feldspar, **ser**icite, **b**io**t**ite, **fe**rroan **c**al**c**ite, **act**inolite.

Igneous rock classifications are according to IUGS (1973; 1979); sandstones are classified according to McBride (1963); mudrocks are classified according to Picard (1971); carbonates are classified according to Folk (1959); and metamorphic rocks classified according to IUGS (Fettes and Desmons, 2011).

The term “protolith” is used for the interpreted primary lithology. The term “precursor” is used for a secondary lithology from which the current rock was derived.

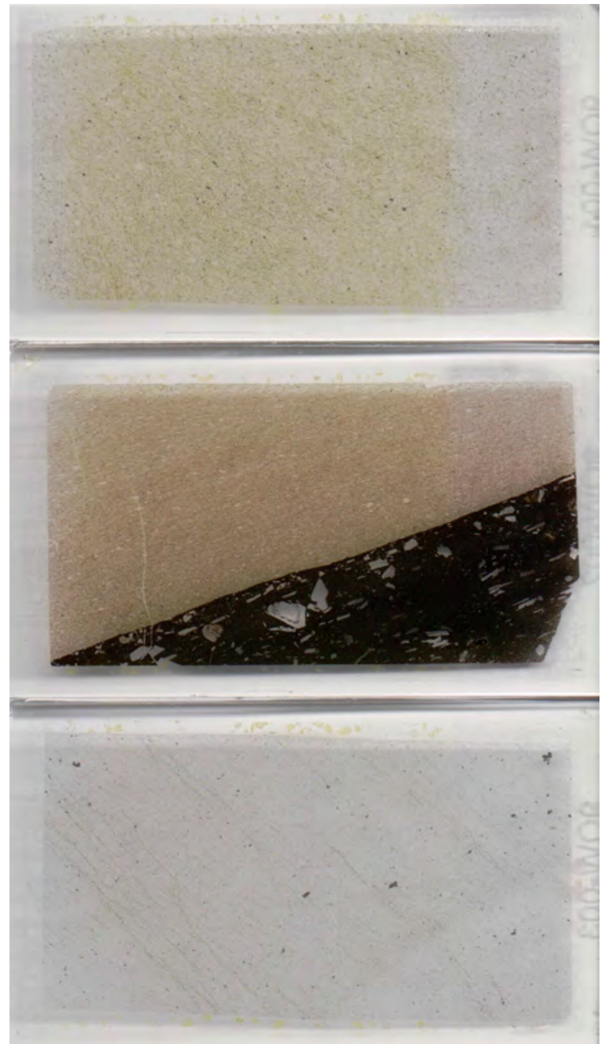
Hand Specimens & Whole Thin Section Images



FD16-07, Phyllite

FD16-07, Basalt

FD16-01, C-1



FD16-02,C-3,31.4-32.1 ft

FD16-09,C-,136.2-140. ft

SAMPLE # **FD16-07, Phyllite** August 31, 2016

ROCK NAME ALTERED CHLORITE-KFELDSPAR-QUARTZ SCHIST -- probably formed by regional dynamothermal metamorphism and hydrothermal alteration (secondary K-feldspar + chlorite + carbonate + opaques) of a calcareous sandy mudstone protolith.

MINERALS Quartz (40%) + K-feldspar (30%) + chlorite (20%) + carbonate (8%) + opaques (2%) + plagioclase (<1%) + zircon (<1%) + apatite (<1%).

TEXTURES Ductile deformation during regional dynamothermal metamorphism has produced a moderately directed fabric (in hand specimen), but the orientation specified for the thin section cut is parallel to that fabric and so does not show it. Overall size distribution is seriate.

Porphyroblasts (0%) were not observed.

Porphyroclasts (15%) are relict subround quartz sand grains up to 750 μm in diameter with floating contacts.

Matrix (85%) is dominated by [quartz + [biotite (?) completely altered to K-feldspar + chlorite + carbonate].

Cement (0%) was not observed.

ALTERATION Alteration features in relative chronological order from oldest to youngest are: (1) regional dynamothermal metamorphism; and (2) biotite (?) completely altered to [K-feldspar + chlorite + carbonate]

SECTIONING Format: 27 x 46 mm Finish: STD Stains: SCN (top 2/3) + ARSPF (none) Cover: PLA

IMAGES

FD16-07, Phyllite 9OW_001.jpg/XPL/FOV = 4.00 x 5.83 mm ALTERED CHLORITE-KFELDSPAR-QUARTZ SCHIST showing typical appearance (same view as (9OW_002.jpg).

FD16-07, Phyllite 9OW_002.jpg/PPL/FOV = 4.00 x 5.83 mm ALTERED CHLORITE-KFELDSPAR-QUARTZ SCHIST showing typical appearance (same view as (9OW_001.jpg).

SAMPLE # **FD16-07, Basalt** August 31, 2016

ROCK NAME ALTERED BASALT -- probably formed by alteration (secondary sericite + biotite + opaques + carbonate) of a fine grained basalt sill (?) intruded (?) into a biotite-quartz schist. S1 and S2 ductile deformation probably represent regional dynamothermal metamorphism.

MINERALS Cryptocrystalline basalt (80%) + plagioclase (10%) + sericite (5%) + opaques (3%) + carbonate (2%).

TEXTURES Intrusive (?) igneous protolith. Flow has preferentially aligned elongate plagioclase phenocrysts to produce a moderately-directed fabric. Overall size distribution is bimodal.

Phenocrysts (20%)

Plagioclase (15%) are are euhedral, whole to broken, isolated to glomeroporphyritic, 800-3200 μm, zoned, twinned, sometimes sieve texture, and moderately altered to sericite.

Clinopyroxene (?) (5%) are subhedral, whole, isolated to glomeroporphyritic, 400-1200 μm, and completely altered to biotite + opaques + carbonate.

Xenoliths/Xenocrysts (0%) were not observed.

Groundmass (80%) is composed of cryptocrystalline basalt.

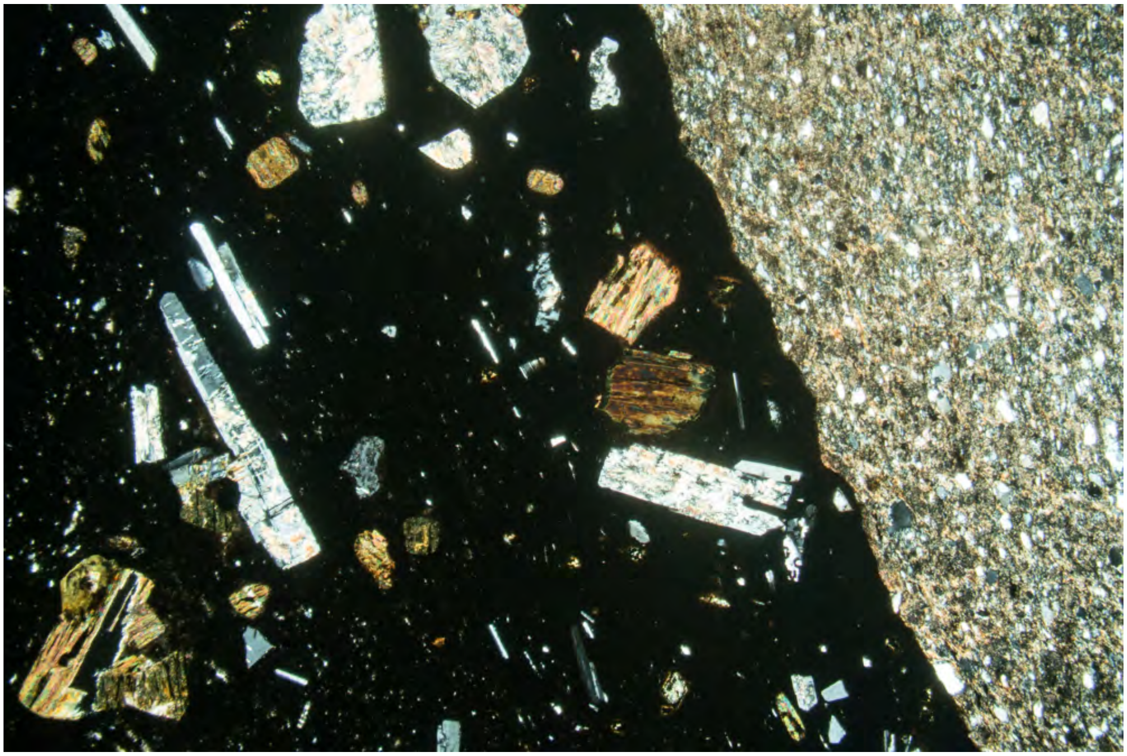
Vesicles (0%) were not observed.

ALTERATION Alteration features in relative chronological order from oldest to youngest are: (1) deformation S1; (2) deformation S2 at approximately right angles to S1; (3) intrusion of basalt sill (?); and (4) veins of carbonate + K-feldspar w/o selvages.

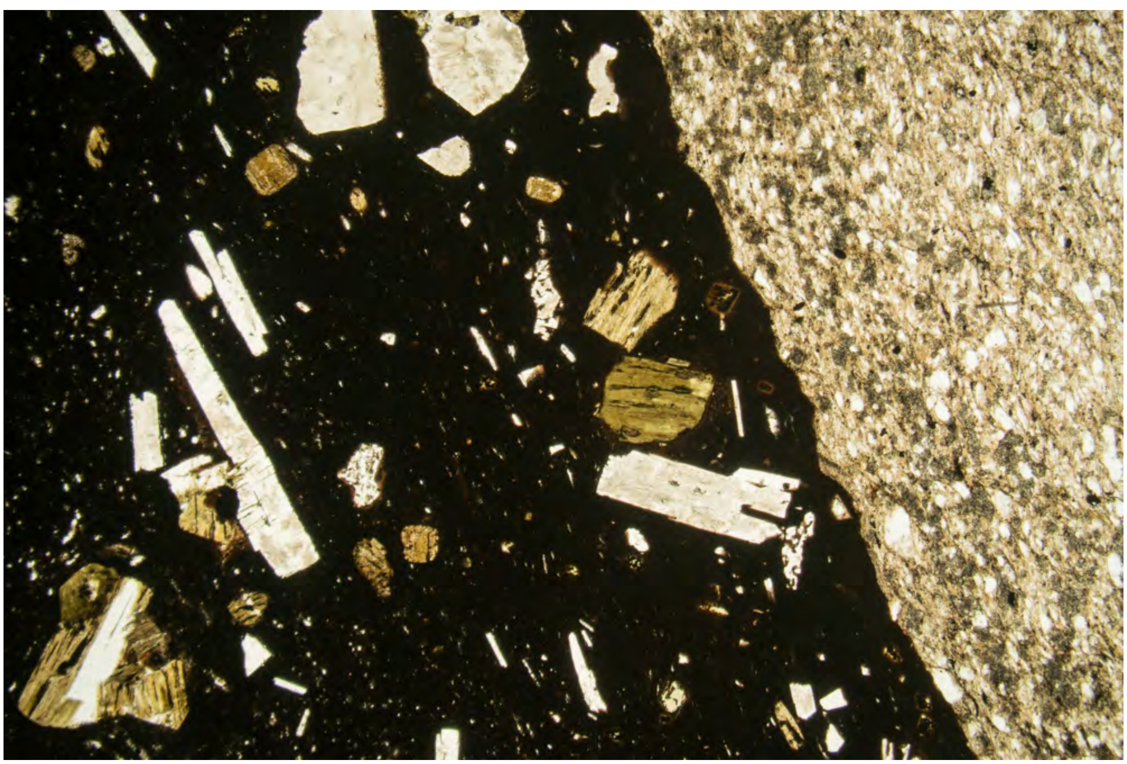
SECTIONING Format: 27 x 46 mm Finish: STD Stains: SCN (top 2/3) + ARSPF (none) Cover: PLA

IMAGES

FD16-07, Basalt 9OW_003.jpg/XPL/FOV = 4.00 x 5.83 mm ALTERED BASALT showing typical appearance at contact with schist (same view as 9OW_004.jpg).



FD16-07, Basalt 9OW_004.jpg/PPL/FOV = 4.00 x 5.83 mm ALTERED BASALT showing typical appearance at contact with schist (same view as 9OW_003.jpg).



SAMPLE # **FD16-01, C-1** August 31, 2016

ROCK NAME ALTERED CARBONATE-SERICITE-QUARTZ SCHIST -- probably formed by regional dynamothermal metamorphism and alteration (secondary sphene + FEOH) of a calcareous sandy mudstone protolith.

MINERALS Quartz (50%) + sericite (25%) + carbonate (25%) + tourmaline (<1%) + zircon (<1%) + sphene (<1%) + opaques (<1%) + FEOH (<1%).

TEXTURES Ductile S1 deformation during regional dynamothermal metamorphism has produced a moderately directed fabric. Ductile S2 folding at approximately right angles to S1 has not destroyed the S1 fabric. Overall size distribution is seriate.

Porphyroblasts (0%) were not observed.

Porphyroclasts (10%) are relict subround quartz sand grains up to 140 µm in diameter with floating contacts.

Matrix (90%) is dominated by quartz + sericite + carbonate.

Cement (0%) was not observed.

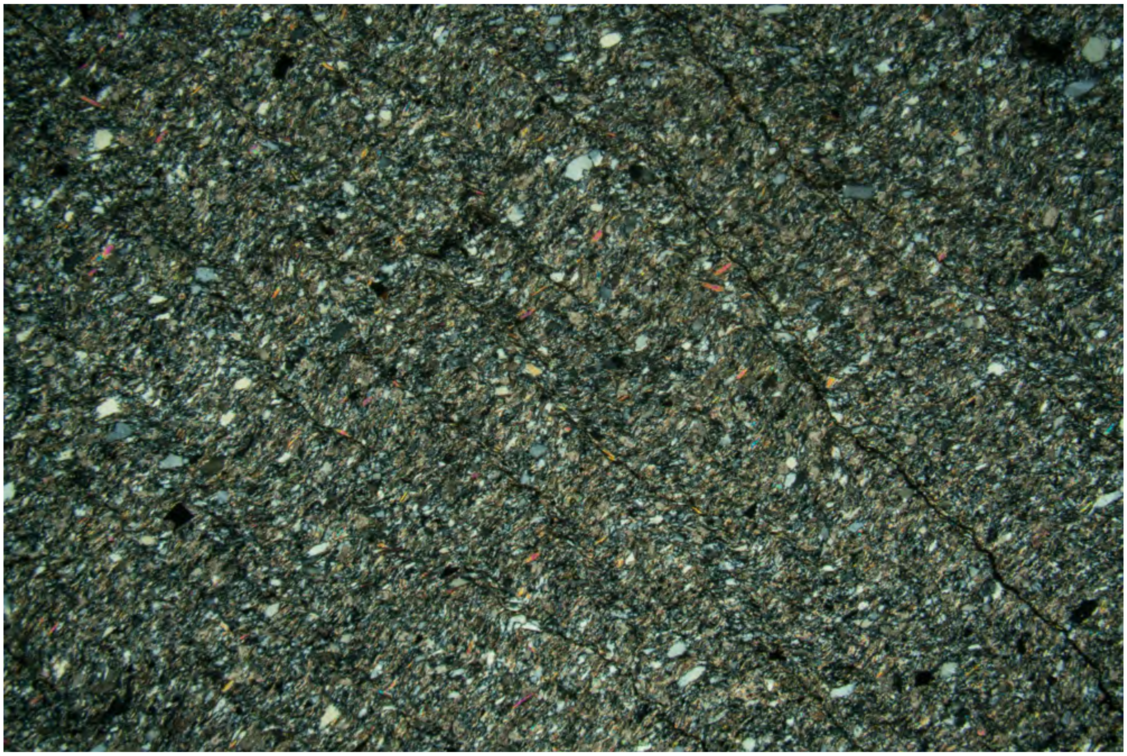
ALTERATION Alteration features in relative chronological order from oldest to youngest are: (1) ductile deformation S1; (2) ductile deformation S2 at right angles to S1; and (3) veinlets of FEOH w/o selvages.

Alteration features of indeterminate relative ages: (1) opaques weakly altered to sphene.

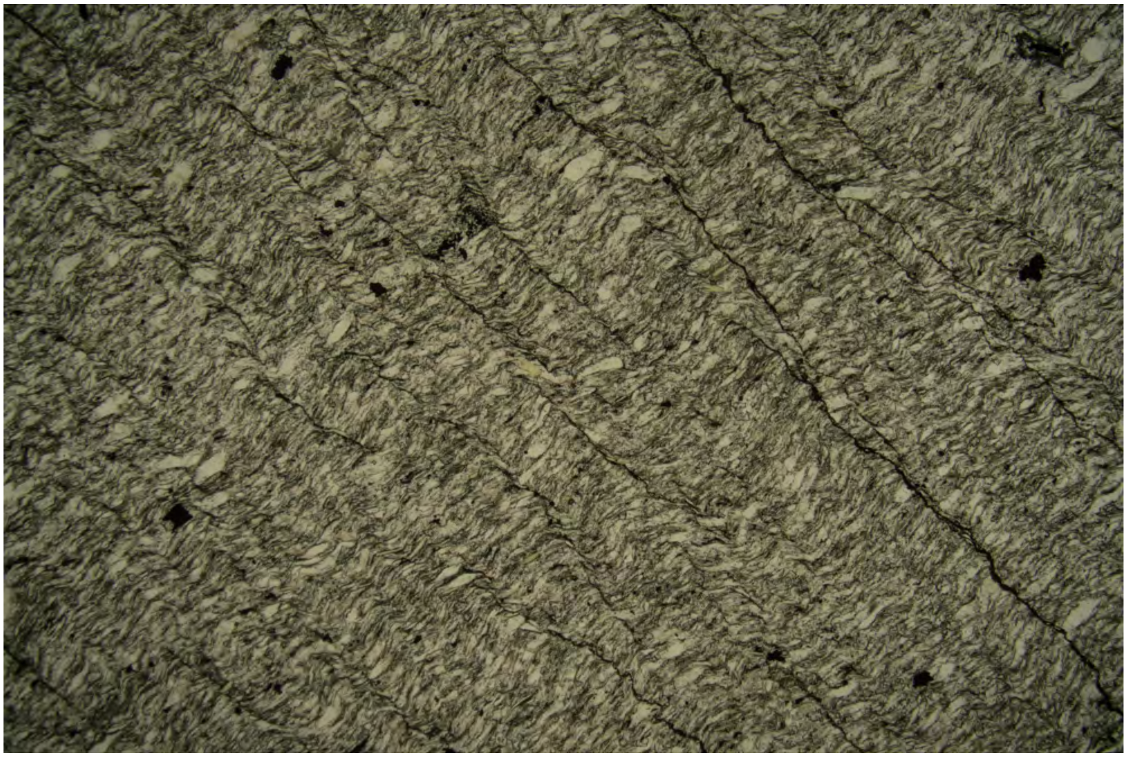
SECTIONING Format: 27 x 46 mm Finish: STD Stains: SCN (top 2/3) + ARSPF (none) Cover: PLA

IMAGES

FD16-01, C-1 9OW_005.jpg/XPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_006.jpg).



FD16-01, C-1 9OW_006.jpg/PPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_005.jpg).



SAMPLE # **FD16-02,C-3,31.4-32.1 ft** August 31, 2016

ROCK NAME ALTERED CARBONATE-SERICITE-QUARTZ SCHIST -- probably formed by regional dynamothermal metamorphism and alteration (secondary quartz + carbonate + leucoxene) of a calcareous sandy mudstone protolith.

MINERALS Quartz (50%) + sericite (40%) + carbonate (9%) + leucoxene (1%) + tourmaline (<1%) + zircon (<1%).

TEXTURES Ductile S1 deformation during regional dynamothermal metamorphism has produced a moderately directed fabric. Ductile S2 folding at approximately right angles to S1 has not destroyed the S1 fabric. Overall size distribution is seriate.

Porphyroblasts (0%) were not observed.

Porphyroclasts (5%) are relict subround quartz sand grains up to 600 μm in diameter with floating contacts.

Matrix (95%) is dominated by quartz + sericite + carbonate.

Cement (0%) was not observed.

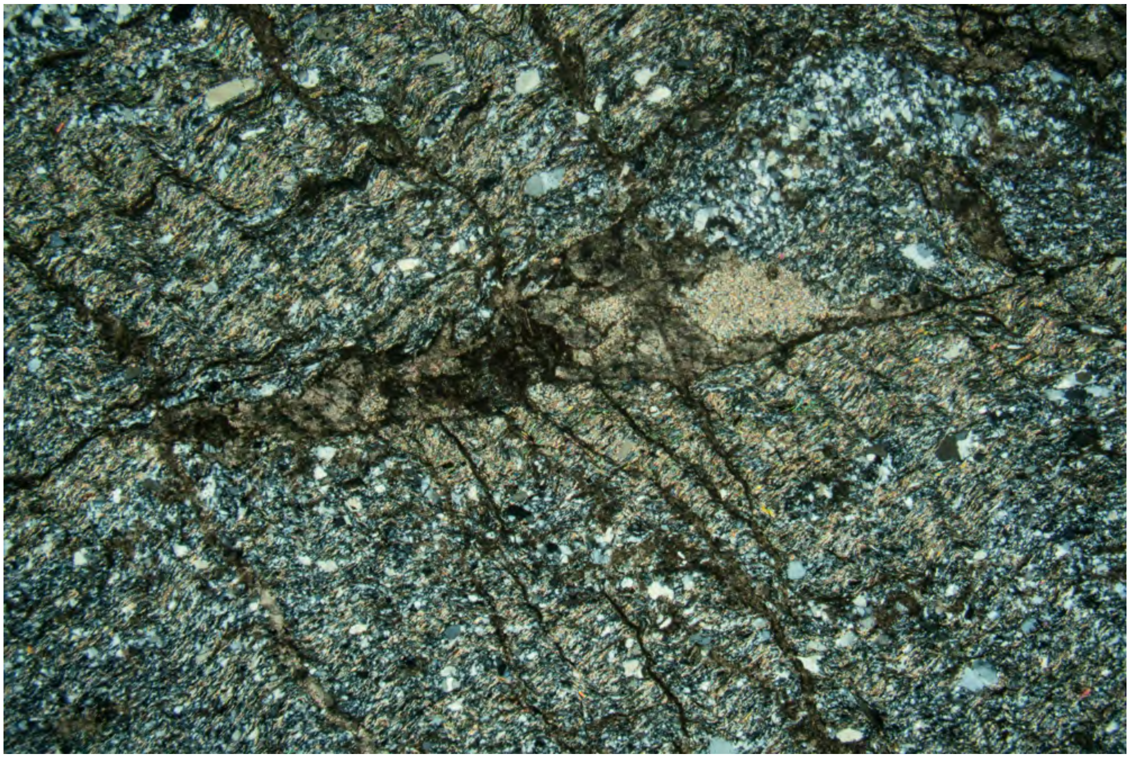
ALTERATION Alteration features in relative chronological order from oldest to youngest are: (1) ductile deformation S1; (2) ductile deformation S2 at right angles to S1; (3) veins of quartz + carbonate w/o selvages parallel to S1; and (4) veins of carbonate w/o selvages parallel to S2.

Alteration features of indeterminate relative ages: (1) opaques completely altered to leucoxene.

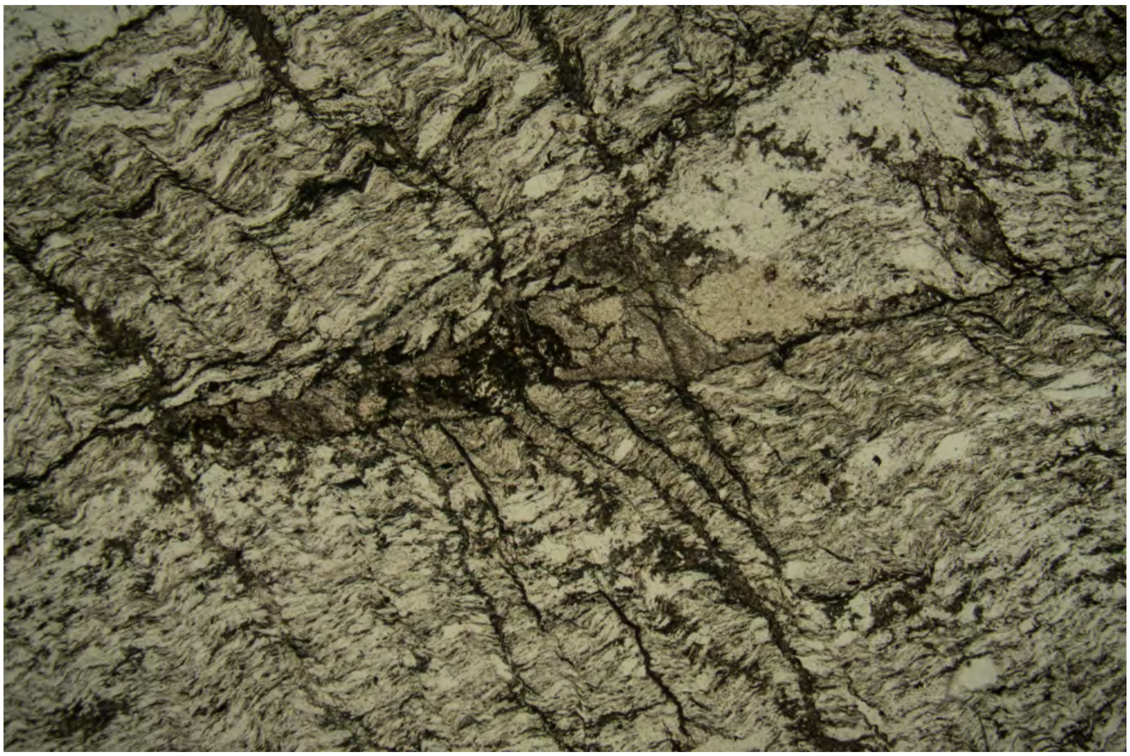
SECTIONING Format: 27 x 46 mm Finish: STD Stains: SCN (top 2/3) + ARSPF (none) Cover: PLA

IMAGES

FD16-02,C-3,31.4-32.1 ft 9OW_007.jpg/XPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_008.jpg).



FD16-02,C-3,31.4-32.1 ft 9OW_008.jpg/PPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_007.jpg).



SAMPLE # **FD16-09,C-1,136.2-140.2 ft** August 31, 2016

ROCK NAME ALTERED CARBONATE-SERICITE-QUARTZ SCHIST -- probably formed by regional dynamothermal metamorphism and alteration (secondary quartz + carbonate + leucoxene) of a calcareous sandy mudstone protolith.

MINERALS Quartz (63%) + sericite (25%) + carbonate (10%) + leucoxene (2%) + tourmaline (<1%) + zircon (<1%) + opaques (<1%).

TEXTURES Ductile S1 deformation during regional dynamothermal metamorphism has produced a weakly directed fabric. Very weak ductile S2 folding at approximately right angles to S1 has not destroyed the S1 fabric. Overall size distribution is seriate.

Porphyroblasts (0%) were not observed.

Porphyroclasts (5%) are relict subround quartz sand grains up to 360 μm in diameter with floating contacts.

Matrix (95%) is dominated by quartz + sericite + carbonate.

Cement (0%) was not observed.

ALTERATION Alteration features in relative chronological order from oldest to youngest are: (1) weak ductile deformation S1; (2) very weak ductile deformation S2 at right angles to S1; and (3) veins of quartz + carbonate w/o selvages.

Alteration features of indeterminate relative ages: (1) opaques strongly altered to leucoxene.

SECTIONING Format: 27 x 46 mm Finish: STD Stains: SCN (top 2/3) + ARSPF (none) Cover: PLA

IMAGES

FD16-09,C-1,136.2-140.2 ft 9OW_009.jpg/XPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_010.jpg).

FD16-09,C-1,136.2-140.2 ft 9OW_010.jpg/PPL/FOV = 4.00 x 5.83 mm ALTERED CARBONATE-SERICITE-QUARTZ SCHIST showing typical appearance (same view as 9OW_009.jpg).

ROCK CHAIN OF CUSTODY & TEST REQUEST

GeoTesting Express, Inc.
125 Nagog Park
Acton, MA 01720
800 434 1062 Toll Free
978 635 0266 Fax

2358 Perimeter Park Drive, Suite 320
Atlanta, GA 30341
770 645 6575 Tel
770 645 6570 Fax

www.geotesting.com

CLIENT		INVOICE (complete if different from Client)	
Company: GZA GeoEnvironmental, Inc.		Company:	
Address: 477 Congress Street, Suite 700		Address:	
City, State, Zip: Portland, ME 04101		City, State, Zip:	
Contact: Andrew Blaisdell	Phone: 207-358-5117	Contact:	Phone:
E-mail: Andrew.Blaisdell@gza.com	Cell: 207-232-8869	E-mail:	Cell:

PROJECT		
Project Name: Portsmouth Harbor Turning Basin	Client Project #: 09.0025912.00	Purchase Order#:
Project Location: Eliot, Maine	GTX Sales Order #:	Requested Turnaround:
On-site Contact:	E-mail:	Phone:

ROCK

Core Run #	Sample ID	Depth	CERCHAR Abrasivity (ASTM D 7625) * 55HRC/40HRC	Direct Shear (ASTM D5607)*	Direct Tensile Strength (ASTM D 2936)	Elastic Moduli in Triaxial Compression (ASTM D 7012B)	Elastic Moduli in Uniaxial Compression (ASTM D 7012D)	Unit Weight (ISRM)	Petrographic Analysis (ISRM)	Point Load Index (ASTM D 5731)* Diametral, Axial, Lump/Block	Punch Penetration (Handewith)	Slake Durability (ASTM D 4644)	Splitting (Brazilian) Tensile Strength (ASTM D 3967)	Schmidt Hammer (ASTM D 5873)	Total Hardness (Schmidt Hammer and Taber Abrasion)	Triaxial Compression (ASTM D 7012A)	Unconfined Compression (ASTM D 7012C)	Other: Specific Gravity	Other: Porosity
1	FD16-09, C-1	36.2-36.6'											X						
1	FD16-09, C-1	37.5-37.9'	X																
1	FD16-09, C-1	38.3-38.6'								X (D)									
1	FD16-09, C-1	38.8-39.4'					X												
1	FD16-09, C-1 irregular pieces	36.2-39.5						X	X									X	X
2	FD16-02, C-2	26.5-27.5'					X								X				
2	FD16-02, C-2	27.5-28.4'	X							X (A&D)			X						
3	FD16-02, C-3	30.0-30.8'	X				X												
3	FD16-02, C-3	30.8-31.4'						X										X	X
3	FD16-02, C-3	31.4-32.1'							X	X (A)			X						
3	FD16-02, C-3	34.6-35.0'											X						

*Specify Test Conditions (Undisturbed or Remolded, Density and Moisture, Test Normal Loads, Test Confining Stresses, etc.):

Additional Testing for FD16-09, 02 see sheet 3
D = Diametral, A = Axial

AUTHORIZE BY SIGNING AND DATING:

SIGNATURE: ______________________ **PRINT NAME:** Andrew Blaisdell **DATE:** 08/10/16

For GTX Use Only
Incoming Sample Inspection Performed ☐
Adverse conditions:

Relinquished By: Blaine Cardali	**DATE:** 08/10/16 **TIME:** 11:00 am	**Received By:**	**DATE:** **TIME:**
Relinquished By:	**DATE:** **TIME:**	**Received By:**	**DATE:** **TIME:**

GeoTesting EXPRESS

ROCK CHAIN OF CUSTODY & TEST REQUEST

GeoTesting Express, Inc.
125 Nagog Park
Acton, MA 01720
800 434 1062 Toll Free
978 635 0266 Fax

2358 Perimeter Park Drive, Suite 320
Atlanta, GA 30341
770 645 6575 Tel
770 645 6570 Fax

www.geotesting.com

CLIENT		INVOICE (complete if different from Client)	
Company: GZA GeoEnvironmental, Inc.		Company:	
Address: 477 Congress Street, Suite 700		Address:	
City, State, Zip: Portland, ME 04101		City, State, Zip:	
Contact: Andrew Blaisdell	Phone: 207-358-5117	Contact:	Phone:
E-mail: Andrew.Blaisdell@gza.com	Cell: 207-232-8869	E-mail:	Cell:

PROJECT		
Project Name: Portsmouth Harbor Turning Basin	Client Project #: 09.0025912.00	Purchase Order#:
Project Location: Eliot, Maine	GTX Sales Order #:	Requested Turnaround:
On-site Contact:	E-mail:	Phone:

ROCK																			
Core Run #	Sample ID	Depth	CERCHAR Abrasivity (ASTM D 7625) * 55HRC/40HRC	Direct Shear (ASTM D5607)*	Direct Tensile Strength (ASTM D 2936)	Elastic Moduli in Triaxial Compression (ASTM D 7012B)	Elastic Moduli in Uniaxial Compression (ASTM D 7012D)	Unit Weight (ISRM)	Petrographic Analysis (ISRM)	Point Load Index (ASTM D 5731)* Diametral, Axial, Lump/Block	Punch Penetration (Handewith)	Slake Durability (ASTM D 4644)	Splitting (Brazilian) Tensile Strength (ASTM D 3967)	Schmidt Hammer (ASTM D 5873)	Total Hardness (Schmidt Hammer and Taber Abrasion)	Triaxial Compression (ASTM D 7012A)	Unconfined Compression (ASTM D 7012C)	Other: Specific Gravity	Other: Porosity
4	FD16-02, C-4	35.0-35.6'													X				
4	FD16-02, C-4	35.7-36.1'	X																
4	FD16-02, C-4	36.1-36.4'								X (D)									
1	FD16-01, C-1	34.4-34.8'	X										X						
1	FD16-01, C-1	35.1-35.6'					X												
1	FD16-01, C-1	36.0-36.4'								X (D)									
1	FD16-01, C-1	37.0-37.4'	X																
1	FD16-01, C-1	37.4-37.7'								X (A)			X						
1	FD16-01, C-1 irregular pieces	34.2-37.7'						X	X									X	X
2	FD16-07, C-2	29.9-30.1'								X (D)									
5	FD16-07, C-5	34.7-35.1								X (A)									

*Specify Test Conditions (Undisturbed or Remolded, Density and Moisture, Test Normal Loads, Test Confining Stresses, etc.):

Additional Testing for FD16-02,01 see sheet 3
D = Diametral, A = Axial

AUTHORIZE BY SIGNING AND DATING:

SIGNATURE:__________ **PRINT NAME:** Andrew Blaisdell **DATE:** 08/10/16

For GTX Use Only
Incoming Sample Inspection Performed ☐
Adverse conditions:

Relinquished By: Blaine Cardali	**DATE:** 08/10/16 **TIME:** 11:00 am	**Received By:**	**DATE:** **TIME:**
Relinquished By:	**DATE:** **TIME:**	**Received By:**	**DATE:** **TIME:**

GeoTesting EXPRESS

ROCK CHAIN OF CUSTODY & TEST REQUEST

GeoTesting Express, Inc.
125 Nagog Park
Acton, MA 01720
800 434 1062 Toll Free
978 635 0266 Fax

2358 Perimeter Park Drive, Suite 320
Atlanta, GA 30341
770 645 6575 Tel
770 645 6570 Fax

www.geotesting.com

CLIENT		INVOICE (complete if different from Client)	
Company: GZA GeoEnvironmental, Inc.		Company:	
Address: 477 Congress Street, Suite 700		Address:	
City, State, Zip: Portland, ME 04101		City, State, Zip:	
Contact: Andrew Blaisdell	Phone: 207-358-5117	Contact:	Phone:
E-mail: Andrew.Blaisdell@gza.com	Cell: 207-232-8869	E-mail:	Cell:

PROJECT		
Project Name: Portsmouth Harbor Turning Basin	Client Project #: 09.0025912.00	Purchase Order#:
Project Location: Eliot, Maine	GTX Sales Order #:	Requested Turnaround:
On-site Contact:	E-mail:	Phone:

ROCK Core Run #	Sample ID	Depth	CERCHAR Abrasivity (ASTM D 7625) * 55HRC/40HRC	Direct Shear (ASTM D5607)*	Direct Tensile Strength (ASTM D 2936)	Elastic Moduli in Triaxial Compression (ASTM D 7012B)	Elastic Moduli in Uniaxial Compression (ASTM D 7012D)	Unit Weight (ISRM)	Petrographic Analysis (ISRM)	Point Load Index (ASTM D 5731)* Diametral, Axial, Lump/Block	Punch Penetration (Handewith)	Slake Durability (ASTM D 4644)	Splitting (Brazilian) Tensile Strength (ASTM D 3967)	Schmidt Hammer (ASTM D 5873)	Total Hardness (Schmidt Hammer and Taber Abrasion)	Triaxial Compression (ASTM D 7012A)	Unconfined Compression (ASTM D 7012C)	Other: Specific Gravity	Other: Porosity
7	FD16-07, C-7	41.0-41.2'	X										X						
7	FD16-07, C-7	41.6-42.1'	X							X (A)			X						
Basalt	FD16-07, C-1 irregular pieces	31.7-35.9'						X	X									X	X
Phyllite	FD16-07, C-1 irregular pieces	28.6-40.7'						X	X									X	X
1	FD16-09, C-1	37.9-38.2'								X (A)									
1	FD16-02, C-1	22.2-22.4'								X (A)									
3	FD16-02, C-3	32.8-33.6'													X				
1	FD16-01, C-1	34.2-34.4								X (A)									

*Specify Test Conditions (Undisturbed or Remolded, Density and Moisture, Test Normal Loads, Test Confining Stresses, etc.):

D = Diametral, A = Axial

AUTHORIZE BY SIGNING AND DATING:

SIGNATURE: ______________________ **PRINT NAME:** Andrew Blaisdell **DATE:** 08/10/16

For GTX Use Only
Incoming Sample Inspection Performed ☐
Adverse conditions:

Relinquished By: Blaine Cardali	**DATE:** 08/10/16 **TIME:** 11:00 am	**Received By:**	**DATE:** **TIME:**
Relinquished By:	**DATE:** **TIME:**	**Received By:**	**DATE:** **TIME:**


Notes:
UC=Elastic Moduli in Uniaxial Compression
PLA=Point Load (Axial)
PLD=Point Load (Diametral)
ST=Splitting Tensile
C=CERCHAR
H=Total Hardness
X=Unit weight/porosity/specific gravity/
petrography tests completed on small
irregular pieces.


BORING ID | SAMPLE ID | DEPTH | PEN (in) | REC (in) | REC % | RQD (in) | RQD % | CORE TIMES
FD16-09 | C-1 | 36.2-40.2 | 48 | 40 | 83 | 13 | 27 | 4.75, 5.5, 6.5, 6.5
FD16-02 | C-1 | 22.0-26.5 | 54 | 38 | 70% | 0 | 0 | 5.0, 7.5, 4.0, 5.5, 5.0/5'
FD16-02 | C-2 | 26.5-30.0 | 40 | 40 | 100% | 20 | 50% | 2.75, 3.75, 4.25, 7.0/6.5'
FD16-02 | C-3 | 30.0-35.0 | 60 | 60 | 100 | 44 | 73 | 3.75, 3.5, 4.0, 4.25, 4.5
FD16-02 | C-4 | 35.0-38.0 | 36 | ~~40~~ 36 | 100 | 21 | 58 | 4.0, 4.75, 5.75
Notes:
UC=Elastic Moduli in Uniaxial Compression
PLA=Point Load (Axial)
PLD=Point Load (Diametral)
ST=Splitting Tensile
C=CERCHAR
H=Total Hardness
X=Unit weight/porosity/specific gravity/
petrography tests completed on small
irregular pieces.
ST
X
X
X
X
X
C
PLA
PLD
X
X
UC
FD16-02
PLA
26.5'
UC/H
PLA/ST/C/PLD
30.0'
UC/C
X
PLA/ST/X
H
ST
35.0'
H
C
PLD

APPENDIX F

Daily Progress Reports

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**1**
Date:	**7/13/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL					
NAME	**ARRIVE**	**DEPART**	**FIELD**	**TRAVEL**	**TOTAL**
Blaine Cardali	7:00	15:15	8.25	2	10.75
Joshua Zall	7:00	11:30	4.5	3	7.5
Andy Blaisdell	7:00	8:00	1	2	3

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8
Garret Peacock	Driller	NEBC	8
David Thompson	Barge operator	NEBC	8

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**
Steve Potts	USACE
Devin Bykonen	Army ROTC (Co-op)

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-05	1010/0.0	1420/24.0	24	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted health and safety discussion with project team for project initiation.
2. Attempted to start drilling at Boring FD16-03, but NEBC stated that due to tidal water levels this boring may have a period of time with no boat access around low tide, therefore this boring will be completed on a later date when the tides can be timed correctly.
3. Boring FD16-05 was surveyed to be approximately 7.8 feet north and 13.2 feet west of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-05 was observed to be at -16.7 feet MLLW, indicating the boring will be drilled to at least 33.3 feet below the mudline.
5. Samples S-11 and S-12 corresponding to 20-22 and 22-24 feet below mudline, respectively, did not have recovery. NEBC proposed that a "trap" be attempted in the next sample in place of the typical plastic "basket" within the shoe of the split spoon in order to retrieve samples. The trap is only available for a standard 2" OD split spoon at this time. Although the specification is 3" OD baskets, the intent is to get recovery. Based on discussion with Andy Blaisdell, it was decided that the 2" OD spoon with the trap may have a better chance for recovery, so it will be attempted tomorrow. NEBC is also ordering traps for the 3" OD spoon.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**2**
Date:	**7/14/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.75
Joshua Zall	1.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.75
Garret Peacock	Driller	NEBC	8.75
David Thompson	Barge operator	NEBC	8.75

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-05	0720 / 24.0	0920 / 34.0	10.0	0	Yes
FD16-10	1015 / 0.0	1530 / 34.0	34.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-05 was completed to 34.0 feet below the mudline corresponding to -50.7 feet MLLW.
3. Boring FD16-10 was surveyed to be approximately 7.8 feet south and 12.9 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-10 was observed to be at -9.7 feet MLLW, indicating the boring will be drilled to at least 40.7 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 4 inches, except for S-16 of FD16-05 (3" cobble was in tip of spoon) and S-3 of FD16-10 were no soil was recovered.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**3**
Date:	**7/15/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	7.5
Joshua Zall	1.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	7.5
Garret Peacock	Driller	NEBC	7.5
David Thompson	Barge operator	NEBC	7.5

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-10	0730 / 34.0	0930 / 42.0	8.0	0	Yes
FD16-03	1010 / 0.0	1400 / 23.0	23.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-10 was completed to 42.0 feet below the mudline corresponding to -51.3 feet MLLW.
3. Boring FD16-03 was surveyed to be approximately 14.9 feet south and 3.5 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-03 was observed to be at -3.4 feet MLLW, indicating the boring will be drilled to at least 46.6 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 4 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT

DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	4
Date:	7/18/2016
Job Number:	09.0025912.00
Job Name:	Portsmouth Harbor Turning Basin
Location:	Newington, NH/Eliot, ME
Contract #:	W912WJ-16-D-0003
Client:	U.S. Army Corps of Engineers New England District

GZA PERSONNEL

NAME	FIELD HOURS WORKED
Blaine Cardali	8.25

SUBCONTRACTOR PERSONNEL

NAME	POSITION	ORGANIZATION	HOURS WORKED
Sam Cooley	Foreman/Driller	NEBC	8.25
Garret Peacock	Driller	NEBC	8.25
David Thompson	Barge operator	NEBC	8.25

ADDITIONAL PERSONNEL

NAME	ORGANIZATION

ACTIVITIES OBSERVED

BORING DESIGNATION	START TIME/DEPTH (FT)	FINISH TIME/DEPTH (FT)	OVERBURDEN SAMPLED (FT)	ROCK CORED (FT)	COMPLETE?
FD16-03	0745 / 23.0	1415 / 47.0	24.0	0	Yes

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-03 was completed to 47.0 feet below the mudline corresponding to -50.4 feet MLLW.
3. Soil was recovered in each split spoon, minimum recovery was 5 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**5**
Date:	**7/19/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.0
Joshua Zall	1.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.0
Garret Peacock	Driller	NEBC	8.0
David Thompson	Barge operator	NEBC	8.0

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-08	0815 / 0.0	1400 / 32.0	32.0	0	Yes

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-08 was surveyed to be approximately 5.7 feet south and 0.8 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
3. Mudline for FD16-08 was observed to be at -18.5 feet MLLW, indicating the boring will be drilled to at least 31.5 feet below the mudline.
4. Soil was recovered in each split spoon, minimum recovery was 2 inches.
5. Boring FD16-08 was completed to 32.0 feet below the mudline corresponding to -50.5 feet MLLW.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**6**
Date:	**7/20/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.75
Lucas Taylor	1.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.75
Garret Peacock	Driller	NEBC	8.75
David Thompson	Barge operator	NEBC	8.75

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-01	0815 / 0.0	1515 / 37.7	34.2	3.5	Yes

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-01 was surveyed to be approximately 1.8 feet south and 1.6 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
3. Mudline for FD16-01 was observed to be at -15.8 feet MLLW, indicating the boring will be drilled to at least 34.2 feet below the mudline.
4. Soil was recovered in each split spoon, minimum recovery was 5 inches.
5. Boring FD16-01 was completed to 37.7 feet below the mudline corresponding to -53.5 feet MLLW.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #: 7
Date: 7/21/2016
Job Number: 09.0025912.00
Job Name: Portsmouth Harbor Turning Basin
Location: Newington, NH/Eliot, ME
Contract #: W912WJ-16-D-0003
Client: U.S. Army Corps of Engineers
New England District

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	9.00
Lucas Taylor	2.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	9.0
Garret Peacock	Driller	NEBC	9.0
David Thompson	Barge operator	NEBC	9.0

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**
Stephen Potts	United States Army Corps of Engineers
Sheila Harvey	United States Army Corps of Engineers
Joe Fentress	United States Army Corps of Engineers

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-04	1000 / 0.0	1515 / 26.0	26.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-04 was surveyed to be approximately 0.2 feet north and 0.3 feet west of the proposed location which is within the specified 20 feet of planned coordinates.
3. Mudline for FD16-04 was observed to be at -18.0 feet MLLW, indicating the boring will be drilled to at least 32.0 feet below the mudline.
4. Soil was recovered in each split spoon, minimum recovery was 3 inches, except for S-9 where no soil was recovered.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**8**
Date:	**7/22/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	7.5
Joshua Zall	2.5

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	7.5
Garret Peacock	Driller	NEBC	7.5
David Thompson	Barge operator	NEBC	7.5

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-04	0745 / 26.0	1000 / 32.0	6.0	0	Yes
FD16-06	1045 / 0.0	1400 / 16.0	16.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-04 was completed to 32.0 feet below the mudline corresponding to -50.0 feet MLLW.
3. Boring FD16-06 was surveyed to be approximately 7.8 feet south and 7.0 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-06 was observed to be at -14.2 feet MLLW, indicating the boring will be drilled to at least 35.8 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 7 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**9**
Date:	**7/25/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.5
Lucas Taylor	2.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.5
Garret Peacock	Driller	NEBC	8.5

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-06	0745 / 16.0	1230 / 36.0	20.0	0	Yes
FD16-07	1400 / 0.0	1445 / 4.0	4.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-06 was completed to 36.0 feet below the mudline corresponding to -50.2 feet MLLW.
3. Boring FD16-07 was surveyed to be approximately 0.1 feet south and 0.1 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-07 was observed to be at -12.6 feet MLLW, indicating the boring will be drilled to at least 37.4 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 6 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #: 10
Date: 7/26/2016
Job Number: 09.0025912.00
Job Name: Portsmouth Harbor Turning Basin
Location: Newington, NH/Eliot, ME
Contract #: W912WJ-16-D-0003
Client: U.S. Army Corps of Engineers
New England District

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	9.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	9.0
Garret Peacock	Driller	NEBC	9.0
David Thompson	Barge operator	NEBC	9.0

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-07	0745 / 4.0	1515 / 37.3	22.7	9.3	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Soil was recovered in each split spoon, minimum recovery was 5 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**11**
Date:	**7/27/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.75
Lucas Taylor	2.5

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.75
Garret Peacock	Driller	NEBC	8.75
David Thompson	Barge operator	NEBC	8.75

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**
Stephen Potts	United States Army Corps of Engineers
Jessica Rudd	United States Army Corps of Engineers

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-07	0745 / 37.3	1015 / 42.4	0.0	5.1	Yes
FD16-09	1130 / 0.0	1500 / 26.0	26.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-07 was completed to 42.4 feet below the mudline corresponding to -55.0 feet MLLW.
3. Boring FD16-09 was surveyed to be approximately 13.4 feet south and 2.2 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-09 was observed to be at -12.7 feet MLLW, indicating the boring will be drilled to at least 37.3 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 5 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT

DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #:	**12**
Date:	**7/28/2016**
Job Number:	**09.0025912.00**
Job Name:	**Portsmouth Harbor Turning Basin**
Location:	**Newington, NH/Eliot, ME**
Contract #:	**W912WJ-16-D-0003**
Client:	**U.S. Army Corps of Engineers New England District**

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.50
Lucas Taylor	3.8

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	8.5
Garret Peacock	Driller	NEBC	8.5
David Thompson	Barge operator	NEBC	8.5

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-09	0745 / 26.0	1200 / 40.2	9.2	4	Yes
FD16-02	1415 / 0.0	1500 / 4.0	4.0	0	No

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-09 was completed to 40.2 feet below the mudline corresponding to -52.9 feet MLLW.
3. Boring FD16-02 was surveyed to be approximately 7.2 feet south and 5.0 feet east of the proposed location which is within the specified 20 feet of planned coordinates.
4. Mudline for FD16-02 was observed to be at -12.1 feet MLLW, indicating the boring will be drilled to at least 37.9 feet below the mudline.
5. Soil was recovered in each split spoon, minimum recovery was 5 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

SUBSURFACE EXPLORATION OVERSIGHT
DAILY FIELD REPORT

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101
207-879-9190

Report #: 13
Date: 7/29/2016
Job Number: 09.0025912.00
Job Name: Portsmouth Harbor Turning Basin
Location: Newington, NH/Eliot, ME
Contract #: W912WJ-16-D-0003
Client: U.S. Army Corps of Engineers
New England District

GZA PERSONNEL	
NAME	**FIELD HOURS WORKED**
Blaine Cardali	8.50
Tanya Justham	1.0

SUBCONTRACTOR PERSONNEL			
NAME	**POSITION**	**ORGANIZATION**	**HOURS WORKED**
Sam Cooley	Foreman/Driller	NEBC	7.75
Garret Peacock	Driller	NEBC	7.75
David Thompson	Barge operator	NEBC	7.75

ADDITIONAL PERSONNEL	
NAME	**ORGANIZATION**

ACTIVITIES OBSERVED					
BORING DESIGNATION	**START TIME/DEPTH (FT)**	**FINISH TIME/DEPTH (FT)**	**OVERBURDEN SAMPLED (FT)**	**ROCK CORED (FT)**	**COMPLETE?**
FD16-02	0730 / 4.0	1245 / 38.0	18.0	16	Yes

SUMMARY OF WORK PERFORMED AND OBSERVATIONS

1. Conducted daily health and safety discussion.
2. Boring FD16-02 was completed to 38.0 feet below the mudline corresponding to -50.1 feet MLLW.
3. Soil was recovered in each split spoon, minimum recovery was 5 inches.

Prepared by: Blaine Cardali

Reviewed by: Andy Blaisdell

APPENDIX G

Daily Tailgate Meeting Sheets

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: X Initial H&S Orientation ____ Periodic "Toolbox" Safety Meeting

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/13/16 Time 0715 Job No. 09.0025912.00

PM A. BLAISDELL PIC M. TAYLOR

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
WENT THROUGH GZA HASP
HOSPITAL LOCATION
ON BOARD HAZARDS
PFD ON BARGE
SLIPS, TRIPS, FALLS.
WATER!

NAME (printed)	SIGNATURE	COMPANY
Garrett [illegible]	[illegible]	NE Boring
Sam Curley	[illegible]	NE Boring
Devin Bykonen	[illegible]	USACE NAE
Andy Blaisdell	[illegible]	GZA
DAVID Thompson	[illegible]	NEBC
JOSHUA ZALL	[illegible]	GZA
Stephen Potts	[illegible]	USACE-NAE

Conducted by: B. Cardal. Date: 7/13/16

10.75

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASING

Date 7/14/16 **Time** 0730 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
SLIPS TRIPS AND FALLS
OVER HEAD HAZARDS
WATER!

NAME (printed)	SIGNATURE	COMPANY
Blake Cardali	[signature]	GZA
[illegible] Pearce	[signature]	NEBC
Sam Caloy	[signature]	NEBoring Co
DAVID Thompson	[signature]	NEBC
Joshua Zaru	[signature]	GZA

Conducted by: Blake Cardali Date: 7/14/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location Portsmouth Harbor Turning Basin

Date 7/15/16 **Time** 0730 **Job No.** 02.0025912.00

PM ARB **PIC** ____________

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
WATER, STAY HYDRATED, BREAKS AS NEEDED
OVER HEAD HAZARDS (RODS, HAMMER, etc)
SLIPS TRIPS AND FALL, KEEP WORK AREAS CLEAN
SUNSCREEN.
BE CAREFUL WHEN GETTING ON/OFF TENDER BOAT

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Garrett Patrick	[signature]	NEBC
David Thompson	[signature]	NEBC
Sam Cooley	[signature]	NEBC
Josh Zall	[signature]	GZA

Conducted by: Blaine Cardali Date: 7/15/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/18/15 **Time** 0730 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, trips and falls
HAZARDS GETTING ON AND OFF TENDER BOAT
OVER HEAD HAZARDS
STAY HYDRATED / TAKE BREAKS AS NEEDED
ACCESS POINT BADGERS ISLAND / HOSPITAL - PORTSMOUTH

NAME (printed)	SIGNATURE	COMPANY
Garrett Pearce	[signature]	NEBC
DAVID Thompson	[signature]	NEBC
Blaine Cardali	[signature]	GZA
Sam Cooley	[signature]	NEBoring
Nicholas Williams	[signature]	GZA

Conducted by: Blaine Cardali Date: 7/18/15

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/19/16 **Time** 0700 **Job No.** 09.0025912.00

PM ARB **PIC** ARB

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slip, TRIP, AND FALLS
HAZARDS GETTING ON/OFF TENDER BOAT
OVER HEAD HAZARDS AROUND RIG (RODS)
STAY HYDRATED / TAKE BREAKS IF NEEDED
ACCESS POINT → BADGERS ISLAND → HOSPITAL (PORTSMOUTH)
CLEAN UP WORK AREAS.

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
ERIK FRIEDE	[signature]	GZA
JOSH ZALL	[signature]	GZA
Lucas Taylor	[signature]	GZA
Garrett [illegible]	[signature]	NEBC
DAVID THOMPSON	[signature]	NEBC
Sam Cowley	[signature]	NEBC

Conducted by: Blaine Cardali Date: 7/19/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** X **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/20/16 **Time** 0730 **Job No.** 09.0025912.00

PM APB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
SLIPS, TRIPS, AND FALLS
HAZARDS GETTING ON/OFF TENDER BOAT
OVERHEAD HAZARDS (RODS 1' ABOVE MAST)
STAY HYDRATED; TAKE BREAKS AS NEEDED
ACCESS POINT FOR EMERGENCIES => 1 BADGERS ISLAND
PORTSMOUTH MEMORIAL HOSP. [illegible]
KEEP WORK AREAS CLEAN

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Lucas Taylor	[signature]	GZA
DAVID Thompson	[signature]	NEBC
SAM Conley	[signature]	NEBC
Garrett Peacock	[signature]	NEBC

Conducted by: Blaine Cardali Date: 7/20/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/21/16 **Time** 0745 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
SLIPS, TRIPS, AND FALLS
HAZARDS GETTING ON AND OFF THE TENDER BOAT
OVERHEAD HAZARDS (1' ABOVE THE MAST) FLYING BOOMS
STAY HYDRATED; TAKE BREAKS AS NEEDED
ACCESS POINT FOR EMERGENCIES → 1 BADGERS ISLAND
HOSPITAL = PORTSMOUTH MEMORIAL
KEEP AREAS CLEAN
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Garrett Peacock	[signature]	NEBC
DAVID THOMPSON	[signature]	NEBC
Sam Cody	[signature]	NEBC
Lucas Taylor	Lucas Taylor	GZA
Stephen Potts	[signature]	USACE-NAE
Joe Fortress	Joe Fortress	USACE-NAE
Sheila Harvey	Sheila Harvey	USACE-SO

Conducted by: Blaine Cardali Date: 7/21/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/22/16 **Time** 0730 **Job No.** 09.0025912.00

PM ARB **PIC** ____________

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, trips, and falls
Hazards getting on/off Tender boat.
overhead hazards
Stay hydrated / take breaks high temps/humidity today
Access point for emergencies → 1 badger island.
keep areas clean
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Garrett Racoek	[signature]	NEBC
DAVID THOMPSON	[signature]	NEBC
Sam Cooley	[signature]	NE Boring Co
Lucas Taylor	Lucas Taylor	GZA

Conducted by: Blaine Cardali Date: 7/22/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __x__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location Portmouth harbor turning Basin

Date 7/25/16 **Time** 0730 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, trips, and falls
Hazards getting on/off tender boat
over head hazards
Stay hydrated
Access point badgers island
keep work area's clear
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cadoli	[signature]	GZA
Garrett Pearce	[signature]	NEBC
Sam Cooley	[signature]	NE Boring
Lucas Taylor	Lucas Taylor	GZA

Conducted by: Blaine Cadoli Date: 7/25/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/26/16 **Time** 0740 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, Trips, and Falls
HAZARDS GETTING ON/OFF TENDER BOAT
OVER HEAD HAZARDS
STAY HYDRATED / TAKE BREAKS
ACCESS POINT -> 1 BADGERS ISLAND -> PORTSMOUTH MEMORIAL
KEEP WORK AREAS CLEAN
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Garrett Pucci	[signature]	NEBC
DAVID Thompson	[signature]	NEBC
Sam Coly	[signature]	NE Boring Co.

Conducted by: Blaine Cardali Date: 7/26/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/27/16 **Time** 0745 **Job No.** 09.0025912.00

PM ARB **PIC** ______

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, Trips, and Falls
GETTING ON/OFF TENDERBOAT
OVER HEAD HAZARDS (RODS)
STAY HYDRATED / TAKE BREAKS
ACCESS POINT → 1 BADGERS ISLAND → PORTSMOUTH MEMORIAL HOSPITAL
KEEP WORK AREAS CLEAN
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
DAVID Thompson	[signature]	NEBC
Sam Cash	[signature]	NEBC
Garrett Peacock	[signature]	NEBC
Jessica Rudd	Jessica F. Rudd	USACE
Stephen Potts	[signature]	USACE-NAE
Lucas Taylor	Lucas Taylor	GZA

Conducted by: Blaine Cardali Date: 7/27/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTS MOUTH HARBOR TURNING BASIN

Date 7/28/16 **Time** 0745 **Job No.** 09.0025912n.00

PM ARB **PIC** ____________

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, trips and Falls.
HAZARDS GETTING ON/OFF TENDER BOAT
OVER HEAD HAZARDS
STAY HYDRATED / TAKE BREAKS
ACCESS POINT / HOSPITAL
KEEP WORK AREAS CLEAN
PPE

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
DAVID Thompson	[signature]	NEBC
GARCIA PEACOCK	[signature]	NEBC
SAM Cooley	[signature]	NE Boring Co
Lucas Taylor	[signature]	GZA

Conducted by: Blaine Cardali Date: 7/28/16

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** __X__ **Periodic "Toolbox" Safety Meeting**

Project Site/Location PORTSMOUTH HARBOR TURNING BASIN

Date 7/29/16 **Time** 0730 **Job No.** 09.0025912.00

PM ARB **PIC** ____________

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED
Slips, trips, Falls
over head hazards
ON/OFF TENDER BOAT
PPE
ACCESS POINT / HOSPITAL
EXTREME WEATHER CAUTION

NAME (printed)	SIGNATURE	COMPANY
Blaine Cardali	[signature]	GZA
Sam C[illegible]	[signature]	NCBC
Dave Th[illegible]	[signature]	NCBC
GARRETT PEACOCK	G PCOCK	NCBC

Conducted by: Blaine Cardali Date: 7/29/16

APPENDIX H

Relevant Previous Subsurface Information

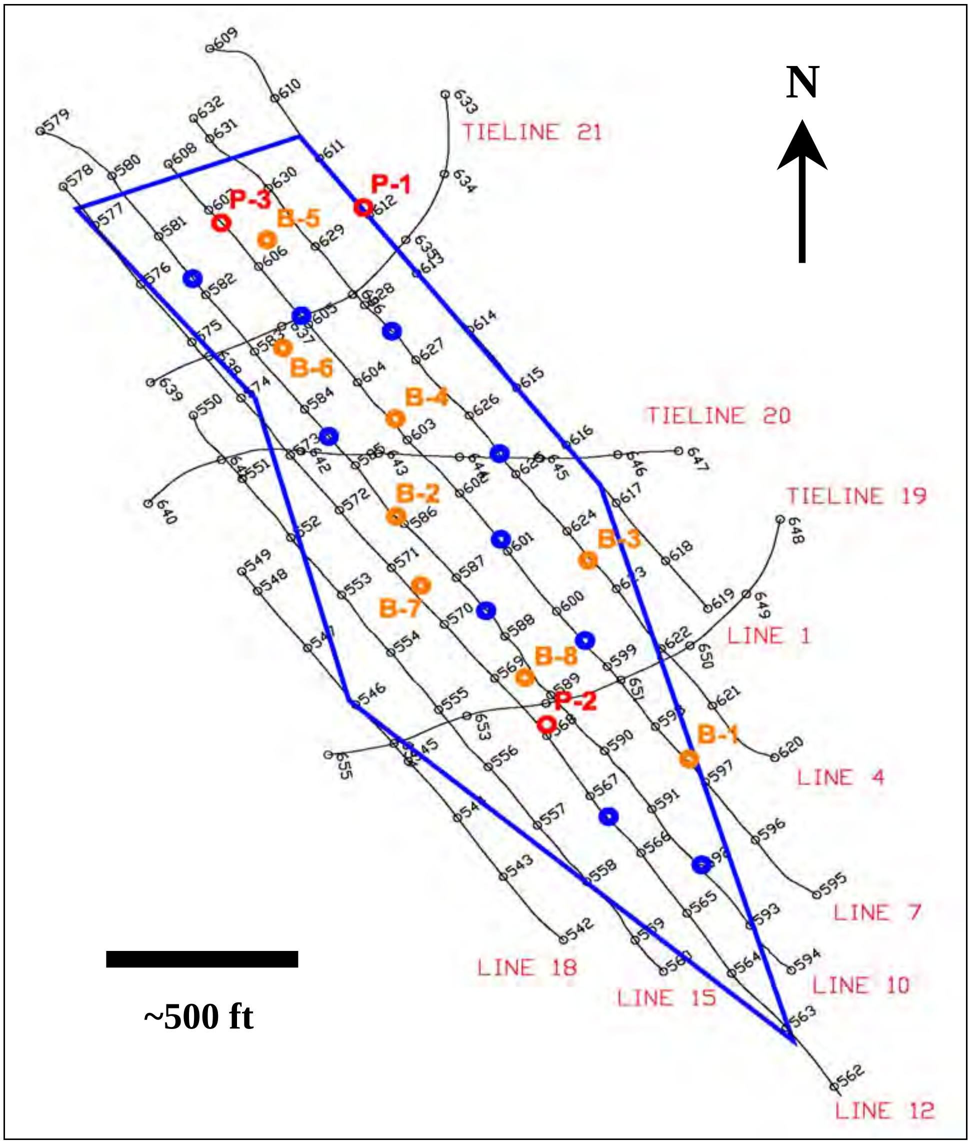


Figure 5. Recommended additional geotechnical stations in the site (blue), if further delineation of subsurface geologic conditions is deemed necessary.

Hole No. B-1

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT: FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 103,511.5 E 2,782,522.9	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: State Plane, NAD 83 Maine West
3. DRILLING AGENCY: New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL: Detrich D-50
4. NAME OF DRILLER: Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED 0
5. NAME OF INSPECTOR: Maria Orosz	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER: ft (▽ ft; ▼ ft; ▼ ft)
	16. DATE/TIME: STARTED 9/10/07 0945; COMPLETED 9/10/07 1200
	17. ELEVATION TOP OF HOLE: -13.00 ft
7. THICKNESS OF OVERBURDEN: 27.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
8. DEPTH DRILLED INTO ROCK: ft	19. SIGNATURE OF INSPECTOR: *Maria Orosz*
9. TOTAL DEPTH OF HOLE: 27.00 ft	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-13.00 / -15.00	0.00 / 2.00		0.0-2.0 Silty fine, SAND and gravel, wet, brown	J-1	SPT	2-2-17-21		0.7	35%		
-15.00 / -18.00	2.00 / 5.00		2.0-5.0 ROLLERBITTED.								
-18.00 / -20.00	5.00 / 7.00		5.0-7.0 Medium to coarse, SAND and gravel, wet, brown	J-2	SPT	16-11-11-11		0.5	25%		
-20.00 / -23.00	7.00 / 10.00		7.0-10.0 ROLLERBITTED.								
-23.00 / -25.00	10.00 / 12.00		10.0-12.0 Medium to coarse, SAND and gravel, wet, brown, with one larger angular piece of gravel.	J-3	SPT	13-14-13-8		0.3	15%		
-25.00 / -28.00	12.00 / 15.00		12.0-15.0 ROLLERBITTED.								
-28.00 / -30.00	15.00 / 17.00		15.0-17.0 Medium to coarse, SAND and gravel, wet, brown, with one larger piece of gravel.	J-4	SPT	5-7-8-8		0.4	20%		
-30.00 / -33.00	17.00 / 20.00		17.0-20.0 ROLLERBITTED.								

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE -13.00 ft **Hole No. B-1**

PROJECT: FS for Navigational Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-35.00	22.00		20.0-22.0 Fine, SAND little gravel, wet, brown		J-5	SPT	3-3-7-9		1	50%		
-38.00	25.00		22.0-25.0 ROLLERBITTED.									
-40.00	27.00		25.0-27.0 Fine, SAND some gravel, wet, brown BOTTOM OF HOLE		J-6	SPT	4-5-8-14		0.9	45%		

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 16.5'
4. Drill rods periodically ran rough for short periods of time during drilling, especially while drilling through sands and gravels.
5. The majority of SPT samples did not have sample in shoe, most likely due to wash out.
6. Boring were advanced using 4" casing and 4" rollerbit.
7. Roundness of gravel was subangular.
8. GPS coordinates were determined through data processing.

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 104,172.3 E 2,781,786.4	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 8; UNDISTURBED 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft (▽ ft; ▼ ft; ▼ ft)
7. THICKNESS OF OVERBURDEN 37.00 ft	16. DATE/TIME STARTED 9/10/07 1322; COMPLETED 9/11/07 0855
8. DEPTH DRILLED INTO ROCK ft	17. ELEVATION TOP OF HOLE -3.00 ft
9. TOTAL DEPTH OF HOLE 37.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR *Maria Orosz*

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-3.00 / -5.00	0.00 / 2.00		0.0-2.0 Medium to coarse, SAND and gravel, wet, brown	J-1	SPT	9-11-5-2		0.5	25%		
-5.00 / -8.00	2.00 / 5.00		2.0-5.0 ROLLERBITTED.								
-8.00 / -10.00	5.00 / 7.00		5.0-7.0 Medium, SAND little gravel, wet, brown	J-2	SPT	6-5-4-5		0.6	30%		
-10.00 / -13.00	7.00 / 10.00		7.0-10.0 ROLLERBITTED.								
-13.00 / -15.00	10.00 / 12.00		10.0-12.0 Fine to medium, SAND little gravel, wet, brown	J-3	SPT	4-4-6-8		1	50%		
-15.00 / -18.00	12.00 / 15.00		12.0-15.0 ROLLERBITTED.								
-18.00 / -20.00	15.00 / 17.00		15.0-17.0 Fine to medium, SAND little gravel, wet, brown, Bottom 0.3 medium to coarse sand and gravel.	J-4	SPT	4-8-12-12		0.8	40%		
-20.00 / -23.00	17.00 / 20.00		17.0-20.0 ROLLERBITTED.								

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE -3.00 ft **Hole No. B-2**

PROJECT: FS for Navigational Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-25.00	22.00		20.0-22.0 Medium to coarse, SAND and gravel, wet, brown		J-5	SPT	9-12-17-17		0.6	30%		
-28.00	25.00		22.0-25.0 ROLLERBITTED.									
-30.00	27.00		25.0-27.0 Medium to coarse, SAND and gravel, wet, brown		J-6	SPT	6-8-11-14		0.7	35%		
-33.00	30.00		27.0-30.0 ROLLERBITTED									
-35.00	32.00		30.0-32.0 Medium to coarse, SAND and gravel, wet, brown		J-7	SPT	11-12-14-18		0.8	40%		
-38.00	35.00		32.0-35.0 ROLLERBITTED									
-40.00	37.00		35.0-37.0 GRAVEL with medium to coarse sand, wet, brown, In tip of SPT the color changed to gray BOTTOM OF HOLE		J-8	SPT	7-31-30-27		0.8	40%		

<u>Notes:</u>

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 9.0'
4. Drill rods running rough between 20.0' - 27.0'.
5. Drill rods periodically ran rough for short periods of time during drilling, especially while drilling through sands and gravels.
6. The majority of SPT samples did not have sample in shoe, most likely due to wash out.
7. Boring were advanced using 4" casing and 4" rollerbit.
8. Roundness of gravel was subangular.

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -3.00 ft	Hole No. B-2	
PROJECT FS for Navigational Improvement		INSTALLATION Baltimore District	SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
			9. GPS coordinates were determined through data processing.									

NAB 1836 LETTER PORTSMOUTH NAB ALL BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

Hole No. B-3

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT: FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 104,052.6 E 2,782,268.9	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: State Plane, NAD 83 Maine West
3. DRILLING AGENCY: New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL: Detrich D-50
4. NAME OF DRILLER: Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED 0
5. NAME OF INSPECTOR: Maria Orosz	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER: ft
	16. DATE/TIME: STARTED 9/11/07 1000; COMPLETED 9/11/07 1310
7. THICKNESS OF OVERBURDEN: 27.00 ft	17. ELEVATION TOP OF HOLE: -15.00 ft
8. DEPTH DRILLED INTO ROCK: ft	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
9. TOTAL DEPTH OF HOLE: 27.00 ft	19. SIGNATURE OF INSPECTOR: Maria Orosz

▽ ft
▼ ft
▼ ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-15.00 / -17.00	0.00 / 2.00		0.0-2.0 Fine to medium, SAND contains shells, little gravel, wet, black and brown	J-1	SPT	3-3-3-2		0.4	20%		
-20.00	5.00		2.0-5.0 ROLLERBITTED.								
-20.60	5.60		5.0-5.6 Fine to medium, SAND little gravel, wet, brown	J-2	SPT	31-120/0.1		0.6	100%		
-25.00	10.00		7.0-10.0 ROLLERBITTED.								
-27.00	12.00		10.0-12.0 Sandy fine, SILT with gravel, wet, brown	J-3	SPT	2-5-22-37		1.2	60%		
-30.00	15.00		12.0-15.0 ROLLERBITTED.								
-32.00	17.00		15.0-17.0 Fine, SAND with two interbedded silt layers, wet, brown	J-4	SPT	4-5-5-6		0.7	35%		
-35.00	20.00		17.0-20.0 ROLLERBITTED.								

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -15.00 ft	Hole No. B-3
PROJECT FS for Navigational Improvement	INSTALLATION Baltimore District	SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-37.00	22.00		20.0-22.0 Fine, SAND wet, brown		J-5	SPT	8-2-6-8		0.4	20%		
-40.00	25.00		22.0-25.0 ROLLERBITTED.									
-42.00	27.00		25.0-27.0 Fine to medium, SAND wet, brown BOTTOM OF HOLE		J-6	SPT	8-6-4-6		0.9	45%		

Notes:
1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 18.5'
4. Casing dropped 0.5' while setting up to sample J-2, potentially due to washed out sand and gravel.
5. Drill rods running rough between 5.6' to 10.0' - sounded like grinding on gravel.
6. Drilling for B-3 was rougher for longer periods of time than B-1 and B-2.
7. The majority of SPT samples did not have sample in shoe, most likely due to wash out.
8. Boring were advanced using 4" casing and 4" rollerbit.
9. Roundness of gravel was subangular.
10. GPS coordinates were determined through data processing.

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

Hole No. B-4

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT: FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 104,438.4 E 2,781,783.8	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: State Plane, NAD 83 Maine West
3. DRILLING AGENCY: New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL: Detrich D-50
4. NAME OF DRILLER: Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 0
5. NAME OF INSPECTOR: Maria Orosz	14. TOTAL # OF ROCK SAMPLES: 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER: ft
	16. DATE/TIME: STARTED 9/13/07 1230; COMPLETED 9/13/07 1230
7. THICKNESS OF OVERBURDEN: 37.00 ft	17. ELEVATION TOP OF HOLE: -3.00 ft
8. DEPTH DRILLED INTO ROCK: ft	18. TOTAL ROCK CORE RECOVERY FOR BORING: %
9. TOTAL DEPTH OF HOLE: 37.00 ft	19. SIGNATURE OF INSPECTOR: Maria Orosz

▽ ft / ▽ ft / ▼ ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-3.00 / -5.00	0.00 / 2.00		0.0-2.0 Silty medium to coarse, SAND and gravel, wet, brown, rock stuck in tip of SPT	J-1	SPT	8-12-21-18		0.6	30%		
-5.00 / -8.00	2.00 / 5.00		2.0-5.0 ROLLERBITTED.								
-8.00 / -10.00	5.00 / 7.00		5.0-7.0 Fine to medium, SAND little gravel, wet, brown	J-2	SPT	4-6-9-11		0.9	45%		
-10.00 / -18.00	7.00 / 15.00		7.0-15.0 ROLLERBITTED.								
-18.00 / -20.00	15.00 / 17.00		15.0-17.0 Fine to medium, SAND little gravel, wet, brown, Bottom 0.2 fine sandy silt	J-3	SPT	4-6-10-12		1.3	65%		
-20.00	17.00		17.0-25.0 ROLLERBITTED.								

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

PROJECT: FS for Navigational Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-28.00	25.00										
-30.00	27.00		25.0-27.0 Fine to medium, SAND little gravel, wet, brown	J-4	SPT	7-13-30-42		1.1	55%		
-38.00	35.00		27.0-35.0 ROLLERBITTED.								
-40.00	37.00		35.0-37.0 Fine to medium, SAND wet, brown BOTTOM OF HOLE	J-5	SPT	10-12-38-81		1.4	70%		

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 8.0'
4. Drill rods running rough between 2.0' to 5.0', 7.0' to 10.0', and 25.0' to 37.0'.
5. The majority of SPT samples did not have sample in shoe, most likely due to wash out.
6. Boring was advanced using 4" casing and 4" rollerbit.
7. Roundness of gravel was subangular.
8. GPS coordinates were not processed and the raw utilized.

Hole No. B-5

DRILLING LOG

DIVISION: North Atlantic Division

INSTALLATION: Baltimore District

SHEET 1 OF 2 SHEETS

1. PROJECT: FS for Navigational Improvement, Portsmouth, NH
2. BORING LOCATION (Coordinates or Station): N 104,925.0 E 2,781,460.3
3. DRILLING AGENCY: New Hampshire Boring
4. NAME OF DRILLER: Dave Thompson
5. NAME OF INSPECTOR: Maria Orosz
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 27.00 ft
8. DEPTH DRILLED INTO ROCK: ft
9. TOTAL DEPTH OF HOLE: 27.00 ft
10. SIZE AND TYPE OF BIT: 4" roller bit

11a. VERTICAL DATUM: MLLW

11b. HORIZONTAL DATUM: State Plane, NAD 83 Maine West

12. MANUFACTURER'S DESIGNATION OF DRILL: Detrich D-50
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 6; UNDISTURBED 0
14. TOTAL # OF ROCK SAMPLES: 0
15. ELEVATION GROUND WATER: ft (∇ ft; ∇ ft; ▼ ft)
16. DATE/TIME: STARTED 11/27/07 0945; COMPLETED 11/27/07 1245
17. ELEVATION TOP OF HOLE: -14.50 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: *Maria Orosz*

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-14.50 / -16.50	0.00 / 2.00		0.0-2.0 Sandy fine, SILT wet, brown, Upper 0.3 black fine sand with shells	J-1	SPT	1-1-3-3		1.4	70%		
-16.50 / -19.50	2.00 / 5.00		2.0-5.0 ROLLERBITTED.								
-19.50 / -21.50	5.00 / 7.00		5.0-7.0 Sandy fine, SILT wet, brown	J-2	SPT	3-3-5-5		0.6	30%		
-21.50 / -24.50	7.00 / 10.00		7.0-10.0 ROLLERBITTED.								
-24.50 / -26.30	10.00 / 11.80		10.0-11.8 Silty fine, SAND with gravel, wet, brown, One large piece of gravel approx 0.1'	J-3	SPT	30-50-96-100/0.3		1.2	67%		
-26.30 / -29.50	11.80 / 15.00		11.8-15.0 ROLLERBITTED.								
-29.50 / -31.50	15.00 / 17.00		15.0-17.0 Fine, SAND wet, brown, Bottom 0.2 gravel and coarse sand.	J-4	SPT	20-17-18-21		1.1	55%		
-31.50 / -34.50	17.00 / 20.00		17.0-20.0 ROLLERBITTED.								

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE -14.50 ft

Hole No. B-5

PROJECT: FS for Navigational Improvement

INSTALLATION: Baltimore District

SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-36.50	22.00		20.0-22.0 Fine, SAND little gravel, wet, brown	J-5	SPT	9-20-21-24		1.2	60%		
-39.50	25.00		22.0-25.0 ROLLERBITTED.								
-41.50	27.00		25.0-27.0 Fine to medium, SAND little gravel, wet, brown BOTTOM OF HOLE	J-6	SPT	12-29-40-48		1.3	65%		

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 23.5'
4. Boring was advanced using 4" casing and 4" rollerbit.
5. Roundness of gravel was subangular.
6. Drill rods running rough between 7.0' to 15.0'.
7. GPS coordinates were not processed and the raw utilized.

Hole No. B-6

DRILLING LOG	DIVISION: North Atlantic Division	INSTALLATION: Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT: FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT: 4" roller bit
2. BORING LOCATION (Coordinates or Station): N 104,631.0 E 2,781,500.2	11a. VERTICAL DATUM: MLLW; 11b. HORIZONTAL DATUM: State Plane, NAD 83 Maine West
3. DRILLING AGENCY: New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL: Detrich D-50
4. NAME OF DRILLER: Dave Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 3; UNDISTURBED 0
5. NAME OF INSPECTOR: Maria Orosz	14. TOTAL # OF ROCK SAMPLES: 2
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER: ft
	16. DATE/TIME: STARTED 11/28/07 0800; COMPLETED 11/28/07 1305
7. THICKNESS OF OVERBURDEN: 12.00 ft	17. ELEVATION TOP OF HOLE: -15.00 ft
8. DEPTH DRILLED INTO ROCK: 10.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING: 100 %
9. TOTAL DEPTH OF HOLE: 28.00 ft	19. SIGNATURE OF INSPECTOR: Maria Orosz

▽ ft ▼ ft ▼ ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-15.00 to -17.00	0.00 to 2.00		0.0-2.0 Fine to medium, SAND with gravel, wet, brown	J-1	SPT	7-8-9-10		0.6	30%		
-17.00 to -20.00	2.00 to 5.00		2.0-5.0 ROLLERBITTED.								
-20.00 to -22.00	5.00 to 7.00		5.0-7.0 Silty fine, SAND with gravel, wet, brown	J-2	SPT	18-28-40-43		0.5	25%		
-22.00 to -25.00	7.00 to 10.00		7.0-10.0 ROLLERBITTED.								
-25.00 to -27.00	10.00 to 12.00		10.0-12.0 Silty fine, SAMD with gravel, wet, brown, Upper 0.2 black gravel and coarse sand	J-3	SPT	76-88-63-72		1	50%		
-27.00 to -33.00	12.00 to 18.00		12.0-15.0 ROLLERBITTED. 15.0-18.0 SPT refusal @ 15' (0.0/100). ROLLERBITTED to 18.0'. Wash water from tailings was cloudy gray, and tailings appeared to be crushed rock. Began coring at 18.0.'								
-33.00	18.00		18.0-23.0 Gneiss gray, slightly weathered, fine, medium hard, Rock contained pitted voids from 18.0 to 19.0'. One apparent fracture at 19.9'. Fracture was slightly stained, rough, narrow, dipping at approx 50 degrees								

DRILLING LOG (Cont. Sheet) ELEVATION TOP OF HOLE -15.00 ft **Hole No. B-6**

PROJECT: FS for Navigational Improvement | INSTALLATION: Baltimore District | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-38.00	23.00		Mechanical breaks occurred at 18.2', 18.9', 20.1', 20.5' and 22.2'.		CR Run 1			5	100%	0.92	55.2
-43.00	28.00		23.0-28.0 Gneiss gray, slightly weathered, fine, medium hard, One apparent fracture at 23.7'. Fracture was slightly stained, rough, narrow, dipping at approx 60 degrees. Mechanical breaks occurred at 24.6', 25.3', 25.7', and 26.5'. Mechanical break angles ranged from 40 to 70 degrees. BOTTOM OF HOLE		CR Run 2			5	100%	0.94	56.4

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 15.0'
4. Boring was advanced using 4" casing and 4" rollerbit.
5. Roundness of gravel was subangular.
6. Run Times (ft/min) for Run #1: 3-4-4-4-4, and Run#2: 4-3-3-3-3.
7. Poor recovery for J-2 due to rock in catcher.
8. Drill rods running rough between 7.0' to 10.0'.
9. GPS coordinates were determined through data processing.

Hole No. B-7

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103,983.5 E 2,781,847.7	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Dave Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft
	16. DATE/TIME: STARTED 11/29/07 0830; COMPLETED 11/28/07 1100
	▽ ft; ▼ ft; ▼ ft
7. THICKNESS OF OVERBURDEN 22.00 ft	17. ELEVATION TOP OF HOLE -19.00 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 22.00 ft	19. SIGNATURE OF INSPECTOR Maria Orosz

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-19.00 / -21.00	0.00 / 2.00		0.0-2.0 Fine, SAND little gravel, wet, brown	J-1	SPT	11-4-3-2		1	50%		
-21.00 / -24.00	2.00 / 5.00		2.0-5.0 ROLLERBITTED.								
-24.00 / -26.00	5.00 / 7.00		5.0-7.0 Fine to medium, SAND little gravel, wet, brown	J-2	SPT	5-5-3-5		1.3	65%		
-26.00 / -29.00	7.00 / 10.00		7.0-10.0 ROLLERBITTED.								
-29.00 / -31.00	10.00 / 12.00		10.0-12.0 Fine to coarse, SAND with gravel, wet, brown	J-3	SPT	4-4-4-6		1.2	60%		
-31.00 / -34.00	12.00 / 15.00		12.0-15.0 ROLLERBITTED.								
-34.00 / -36.00	15.00 / 17.00		15.0-17.0 Medium to coarse, SAND with gravel, wet, brown	J-4	SPT	7-8-12-31		0.9	45%		
-36.00 / -39.00	17.00 / 20.00		17.0-20.0 ROLLERBITTED.								

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -19.00 ft	Hole No. B-7
PROJECT FS for Navigational Improvement	INSTALLATION Baltimore District	SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
			20.0-22.0 Medium to coarse, SAND with gravel, wet, brown		J-5	SPT	13-78-39-26		1.4	70%		
-41.00	22.00		BOTTOM OF HOLE									

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 25.0'
4. Boring was advanced using 4" casing and 4" rollerbit.
5. Roundness of gravel was subangular.
6. Drill rods running rough between 17.0' to 20.0'.
7. The current was very strong in this location.
8. For samples J-1, J-3, and J-5, the 3" spoon was used to retrieve a greater amount of sample.
9. GPS coordinates were determined through data processing.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT 4" roller bit
2. BORING LOCATION (Coordinates or Station) N 103,732.7 E 2,782,109.8	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Dave Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 5; UNDISTURBED 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft; ▽ ft; ▽ ft; ▼ ft
	16. DATE/TIME: STARTED 11/29/07 1237; COMPLETED 11/30/07 1000
	17. ELEVATION TOP OF HOLE -18.00 ft
7. THICKNESS OF OVERBURDEN 22.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
8. DEPTH DRILLED INTO ROCK ft	19. SIGNATURE OF INSPECTOR *Maria Orosz*
9. TOTAL DEPTH OF HOLE 22.00 ft	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE	SPT/AB/CR	BLOWS / 0.5 ft	PP/TOR	Length REC.	% REC.	RQD	Length RQD
-18.00 / -20.00	0.00 / 2.00		0.0-2.0 Fine to medium, SAND wet, brown, One large piece of gravel approx 0.3'	J-1	SPT	19-6-2-2		0.7	35%		
-23.00	5.00		2.0-5.0 ROLLERBITTED.								
-25.00	7.00		5.0-7.0 Coarse, SAND AND GRAVEL wet, brown	J-2	SPT	5-5-7-9		1	50%		
-28.00	10.00		7.0-10.0 ROLLERBITTED.								
-30.00	12.00		10.0-12.0 Fine to medium, SAND AND GRAVEL little gravel, wet, brown	J-3	SPT	14-19-23-30		0.9	45%		
-33.00	15.00		12.0-15.0 ROLLERBITTED.								
-35.00	17.00		15.0-17.0 Medium to coarse, SAND AND GRAVEL wet, brown	J-4	SPT	12-30-31-40		2	100%		
-38.00	20.00		17.0-20.0 ROLLERBITTED.								

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
			20.0-22.0 Coarse, SAND AND GRAVEL wet, brown		J-5	SPT	13-15-17-14		1	50%		
-40.00	22.00		BOTTOM OF HOLE									

Notes:

1. Soils are field visually classified in accordance with the Unified Soils Classification System
2. Sampled using a standard 1 3/8" split spoon driven manually by a 140 lb. hammer dropped 30".
3. Water depth at start of drilling from top of water to mudline was 25.0'
4. Boring was advanced using 4" casing and 4" rollerbit.
5. Roundness of gravel was subangular.
6. For samples J-1, J-2, J-4, and J-5, the 3" spoon was used to retrieve a greater amount of sample.
7. GPS coordinates were determined through data processing.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 105,013.1 E 2,781,703.1	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft; ▽ ft; ▼ ft; ▼ ft
	16. DATE/TIME STARTED 9/13/07 0740; COMPLETED 9/13/07 0915
7. THICKNESS OF OVERBURDEN 58.90 ft	17. ELEVATION TOP OF HOLE -2.00 ft
8. DEPTH DRILLED INTO ROCK ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 58.90 ft	19. SIGNATURE OF INSPECTOR Maria Orosz

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-2.00	0.00		0.0-58.9									
			19.0-24.0 Casing blows per foot: 26-24-22-24-21									

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -2.00 ft	Hole No. P-1
PROJECT FS for Navigational Improvement	INSTALLATION Baltimore District	SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
			24.0-29.0 Casing blows per foot: 23-21-22-21-21									
			29.0-34.0 Casing blows per foot: 21-21-20-21-22									
			34.0-39.0 Casing blows per foot: 26-25-25-22-20									
			39.0-44.0 Casing blows per foot: 23-27-24-23-22									
			44.0-49.0 Casing blows per foot: 21-21-18-21-27									

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -2.00 ft	Hole No. P-1
PROJECT FS for Navigational Improvement	INSTALLATION Baltimore District	SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
			49.0-54.0 Casing blows per foot: 26-26-29-34-42									
			54.0-58.9 Casing blows per foot: 40-42-48-56-49									
-60.90	58.90		BOTTOM OF HOLE									

Notes:

1. Water depth at start of drilling from top of water to mudline was 2.5'
2. Probe holes were advanced using a 300 lb hammer to pound NW rods into the sediment. An A-rod center plug that was ground into a 60 degree point was used to advance the NW rods.
3. Top of rock was determined by a bouncing refusal.
4. Casing blows were only recorded for P-1.
5. GPS coordinates were determined through data processing.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 2 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 103,605.5 E 2,782,165.0	11a. VERTICAL DATUM MLLW 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED: 0 — UNDISTURBED: 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft ▽ ft ▼ ft ▼ ft
	16. DATE/TIME STARTED 9/12/07 0130 COMPLETED 9/12/07 1453
	17. ELEVATION TOP OF HOLE -15.50 ft
7. THICKNESS OF OVERBURDEN 37.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
8. DEPTH DRILLED INTO ROCK ft	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE 37.00 ft	*Maria Orosz*

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-15.50	0.00		0.0-37.0									

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-52.50	37.00		BOTTOM OF HOLE									

Notes:

1. Water depth at start of drilling from top of water to mudline was 15.5'
2. Hard driving rods near bottom of probe hole.
3. At completion of probe hole, the final rod that was pulled was bent.
4. Probe holes were advanced using a 300 lb hammer to pound NW rods into the sediment. An A-rod center plug that was ground into a 60 degree point was used to advance the NW rods.
5. Top of rock was determined by a bouncing refusal.
6. GPS coordinates were not processed and the raw utilized.

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION Baltimore District	SHEET 1 OF 3 SHEETS

1. PROJECT FS for Navigational Improvement, Portsmouth, NH	10. SIZE AND TYPE OF BIT
2. BORING LOCATION (Coordinates or Station) N 104,971.2 E 2,781,345.4	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM State Plane, NAD 83 Maine West
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL Detrich D-50
4. NAME OF DRILLER Manlea "Bub" Thompson	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 0; UNDISTURBED 0
5. NAME OF INSPECTOR Maria Orosz	14. TOTAL # OF ROCK SAMPLES 0
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER ft (▽ ft; ▼ ft; ▼ ft)
	16. DATE/TIME: STARTED 9/12/07 0840; COMPLETED 9/12/07 1132
	17. ELEVATION TOP OF HOLE -12.00 ft
7. THICKNESS OF OVERBURDEN 49.00 ft	18. TOTAL ROCK CORE RECOVERY FOR BORING %
8. DEPTH DRILLED INTO ROCK ft	19. SIGNATURE OF INSPECTOR *Maria Orosz*
9. TOTAL DEPTH OF HOLE 49.00 ft	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-12.00	0.00		0.0-49.0									

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -12.00 ft		Hole No. P-3
PROJECT FS for Navigational Improvement		INSTALLATION Baltimore District	SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD

NAB 1836 LETTER PORTSMOUTH NAB ALL BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

NAB FORM 1836-A
NOV 06

DURING DRILLING AT COMPLETION AFTER DRILLING

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -12.00 ft	Hole No. P-3	
PROJECT FS for Navigational Improvement	INSTALLATION Baltimore District		SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)		SAMPLE	SPT/ AB/ CR	BLOWS / 0.5 ft	PP/ TOR	Length REC.	% REC.	RQD	Length RQD
-61.00	49.00		BOTTOM OF HOLE									

Notes:

1. Water depth at start of drilling from top of water to mudline was 11.5'
2. Probe holes were advanced using a 300 lb hammer to pound NW rods into the sediment. An A-rod center plug that was ground into a 60 degree point was used to advance the NW rods.
3. Top of rock was determined by a bouncing refusal.
4. GPS coordinates were determined through data processing.

NAB 1836 LETTER PORTSMOUTH_NAB_ALL_BORINGS.GPJ USACE BALTIMORE.GDT 12/7/07

APPENDIX I

Scope of Work

STATEMENT OF WORK
SUBSURFACE EXPLORATIONS

PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER
SUBSURFACE INVESTIGATION
NEWINGTON, NEW HAMPSHIRE AND ELIOT, MAINE

CONTRACT NO. W912WJ-R-15-0058
REQUEST FOR PROPOSAL
2 February 2016

PROJECT: Subsurface Drilling Investigation for Subsurface Characterization

SITE: Portsmouth Harbor Federal Navigation Project– Turning Basin, Newington, New Hampshire and Eliot, Maine.

PURPOSE: The US Army Corps of Engineers New England District (NAE) is conducting a subsurface drilling investigation in specific areas of the Federal navigation channel. The channel turning basin will be widened to the existing authorized channel depth (-35 ft MLLW) as the result of a Chief of Engineers report on improvement to Portsmouth Harbor.

The objectives of the marine subsurface drilling investigation are to characterize sediment and collect bedrock cores to evaluate the density, strength, and other properties of bedrock and sediment and characterize those materials that will require pre-treatment blasting versus those that can be removed by mechanical methods. This is a high priority project for the District, and rock core borings are required as soon as feasible, in order to facilitate coordination with regulatory agencies regarding blasting and to determine the appropriate removal methods in support of preparation of plans and specifications for a contract solicitation for dredging and rock removal as soon as possible.

1. CONTRACT TASKS

This is a firm fixed price contract. The cost proposal for the A/E services contract proposal shall contain estimates for the following tasks and the work breakdown should be structured as follows:

<u>BASE:</u>

TASK 1 - Work Plan, Tidal Correction Plan, Accident Prevention Plan (APP), and Activity Hazard Analysis (AHA)
TASK 2 - Drilling Mobilization/Demobilization
TASK 3 - Portsmouth Harbor Borings
TASK 4 - Rock Mechanics Testing & Data Report
TASK 5 – Portsmouth Harbor Report of Explorations

Optional Tasks
TASK 3.A – Additional Boring
TASK 4.A – Additional Rock Mechanics Testing
TASK 6 - Weather Day

Tasks and Options are described in detail below.

TASK 1 – WORK PLAN, TIDAL CORRECTION PLAN, ACCIDENT PREVENTION PLAN (APP), AND ACTIVITY HAZARD ANALYSIS

a. Work Plan

The Work Plan shall address the marine boring program and describe all procedures, personnel, subcontractors, proposed methods, proposed equipment, proposed field boring log form, and final boring log format, and general sequence of work. Marine plant shall be sufficiently sized and equipped to provide a safe and stable work platform considering the water depths and tidal range at the site. The work plan shall include a description of the proposed marine plant and personnel qualifications.

Water depths in the area to be widened adjacent to the existing turning basin typically range from a minimum of approximately 2 ft at low tide (MLLW) to approximately 10 ft at high tide. Water depths in the Federal Channel turning basin typically range from a minimum of 35 ft at low tide (MLLW) to approximately 43 ft at high tide. The area is subject to a mean tidal range of about 7 to 9 feet. Fairly swift currents of up to 5 knots occur in the Piscataqua River. The Contractor is responsible for identifying the range of depths throughout the project and shall provide the necessary equipment (e.g. liftboat or jack-up barge) and plan his operations to accommodate this range of conditions.

The Contractor shall obtain all necessary clearances, state and local permits. Permits for drilling work in Portsmouth Harbor have not been required in the past. The Contractor is responsible for coordinating all aspects of the work, making necessary port and docking arrangements, and coordinating in advance with the Coast Guard and Harbor Master.

The borings are located within a Federal government maintained navigation channel and rights-of-entry are not required. Portsmouth Harbor channels are mainly used by deep draft commercial vessels, fishing vessels, and numerous small recreation and commercial craft, which may cause some interference with contract operations. The Contractor will be required to conduct the work in such a manner as to obstruct navigation as little as possible, and in the event the Contractor's plant so obstructs the channel as to make difficult or endanger the passage of any vessels, the plant shall be promptly moved on the approach of any vessel to such an extent as may be necessary to afford a practicable passage. Moving of contractor plant may also be based on the determination of the docking pilot if vessel traffic requires it. The contractor is required to perform the work from a marine/floating plant and make all required notifications. The Contractor shall make his own investigations of limitations of access and docking or launching facilities to be used by the Contractor to complete the work. In addition to Dig Safe Systems, Inc., the Contractor shall also contact: Public Service Company of New Hampshire, Eversource, Unitil/Northern Utilities, Central Maine Power, FairPoint Communications, Comcast, Verizon, and Municipal Sewer and Water Departments to determine location of utilities under that portion of the Federal Channel and Turning Basin.

The Contractor shall describe the methods for accurately finding and determining drilling locations horizontally with sub-meter accuracy, and for achieving vertical accuracy in the measurement of exploration depths. Drilling depths shall be accurate to +/- 6 inches.

b. Tidal Correction Plan

The Contractor shall develop a written plan describing the procedures to be used to determine boring depths and tidal corrections and shall submit this plan to NAE for approval prior to field work. Contractor shall explain how tidal corrections will be made. Differential GPS methods and tide boards are required for this project. NAE already has some tide boards established in the area that the Contractor may use for this purpose.

c. Accident Prevention Plan (APP)

See Attachment A for the Minimum Outline for an Accident Prevention Plan.

The Contractor shall prepare an Accident Prevention Plan (APP) specific to the activities being performed. It shall include an Activity Hazard Analysis as described below. All field work, including mobilization and demobilization, shall be conducted in accordance with the final approved APP and AHA, the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1, 2008), and all applicable federal, state, and local safety and health requirements. The APP shall be approved prior to any fieldwork being performed.

The APP shall detail how safety and health will be managed during the project. The APP shall address the requirements of applicable Federal, State and local safety and health laws, rules, and regulations. The Contractor shall comply with Federal Acquisition Regulation Clause No. 52.236-13 for Accident Prevention, which is added by reference. Special attention shall focus on the requirements of the US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1 (2008) specifically Appendix A, (Minimum Basic Outline for Accident Prevention Plan), and Section 01.A.11 through 01.A.13, and Figure 1-1 (Activity Hazard Analysis (AHA)). Work shall not proceed until the APP has been reviewed by the Corps Safety Manager and accepted by the Contracting Officer Representative.

The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

All personnel, especially those operating the marine plant, shall be experienced and possess all licenses and permits needed. The Plan shall include a description of the marine plant and crew, and shall provide documentation that the plant and crew meet all safety requirements, including any inspections or certification of the vessels required by the Coast Guard. Even if a vessel is exempt from Coast Guard inspection, NAE requires a current vessel inspection report be provided in the Accident Prevention Plan.
Also, any manufacturer's information regarding stability and operating restrictions for the floating plant shall be included in the APP. The Lead Contractor shall ensure that the requirements of EM 385-1-1, Section 19 are followed in regards to marine vessel operations and safety.

The marine plant shall be operated by personnel with sufficient marine experience. Submittal shall include a resume of the vessel operator's experience for approval by USACE. Even if a captain’s license is not required to operate the vessel or marine plant, the contractor must still comply with the boat operators training requirements of the regulations and at a minimum meet the requirements of EM 385-1-1 and applicable State Standards. The lead vessel operator shall be placed in charge of ensuring all marine safety precautions are followed. The operator shall be required to monitor and log all weather conditions obtained through radio broadcasts throughout the day. The Lead Contractor shall provide a Site Safety and Health Officer (SSHO), to ensure that the APP is followed. The APP submittal shall include the qualifications of the SSHO for USACE approval. The SSHO qualifications shall include the following: Demonstrated work on similar projects; 10-hour OSHA construction safety class or equivalent within last 5 years; and documented experience conducting drilling and rock coring on marine plant. The Lead Contractor's geologist inspector may serve as the SSHO, however, the SSHO designated by the contractor must be present at the work site at all times

The APP shall detail safe access and egress methods for any type of marine plant used in the work. Safe access and egress shall be maintained for all tide elevations. A Severe Weather Plan shall be submitted, and shall include means and methods of protecting personnel and equipment when severe weather is forecast.

In addition, the Contractor shall conduct a safety meeting at the project site on the first day of work. Thereafter, safety briefings shall be held weekly; records of the safety briefings shall be submitted weekly. The inspector shall document all safety meetings on a copy of the safety meeting form, attached.

d. Activity Hazard Analysis (AHA):

An Activity Hazard Analysis shall be submitted for each major phase of work. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform. The analysis shall define all activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted by the Contracting Officer and a preparatory meeting has been conducted by the contractor to discuss its contents with all engaged in the activities, including the Contractor, subcontractor(s), and Government on-site representatives. The Activity Hazard Analysis shall be continuously reviewed and when appropriate modified to address changing site conditions or operations.

e. Accident Reporting:

All accidents and near misses shall be investigated by the Contractor. All work related recordable injuries, illness and property damage accidents (excluding on-the-road vehicle accidents), in which the property damage exceeds $5,000.00 shall be verbally reported to the Contracting Officer's Representative within 48 hours of the incident and ENG Form 3394 shall be completed and submitted to the NAE Safety Manager within six working days of the incident.

TASK 2 – MOBILIZATION/DEMOBILIZATION

The maximum dredge depth being considered is –39 MLLW (-35 MLLW authorized depth, plus 2 feet required overdredge, plus 2 feet allowable overdredge), the exploration program should be geared to acquire high-quality data to –50 MLLW.

Contractor shall plan, coordinate, prepare, procure, supply and mobilize to the project site the necessary resources to meet the contract requirements, including all marine drilling plant and support vessels, pilots, operators and crew, drill rig, drill crew, geologist, supplies, and equipment capable of performing the work scoped in the exposed marine conditions of the outer navigation channels.

The Contractor is responsible for making all Notices to Mariners, and coordinating with the Coast Guard and Harbor Master.

Before beginning operations, the Contractor shall coordinate with the U.S. Coast Guard to issue a "Notice to Mariners" regarding the Contractor's operations. The U.S. Coast Guard point-of-contact for this project is as follows:

The U.S. Coast Guard point-of-contact for this project is as follows:
Officer-in-Charge, Marine Inspection
U.S. Coast Guard First District
Sector Northern New England
259 High Street
South Portland, ME 04106
Telephone: 207-767-0320

The Portsmouth Harbor, Harbormaster is:
Tracy Shattuck- Chief Harbor Master
Bert Condon – Harbor Master (603-365-0507)
Dick Delude- Harbor Master (603-235-7332)
555 Market Street
Portsmouth, NH 03801
Telephone: 603-436-8500
Email: t.shattuck@peasedev.org

TASK 3 – PORTSMOUTH HARBOR BORINGS

Project Background:

The existing Federal Navigation Project for Portsmouth Harbor and Piscataqua River consists of a 6.2 mile long navigation channel that is 35 feet deep (MLLW) and a minimum of 400 feet wide. It extends from the river's mouth at New Castle, New Hampshire and Kittery Maine to the head of the deep-draft navigation at Newington, New Hampshire and Eliot, Maine.

According to the Feasibility Study, approximately 728,100 cubic yards of sand and gravel and 25,300 cubic yards of rock are anticipated to be removed during the widening of the Upper Turning Basin from 800 ft wide to 1200 ft wide.

Portsmouth Harbor has undergone numerous phases of maintenance and improvement dredging, deepening, and widening since its establishment as a major port in the northeast.

A Feasibility Study, completed in July 2014, examined the alternatives for further improvements to navigation.

Previous investigations to support this study include:

- 2008 Marine Geophysics (seismic reflection)
- 2007 Subsurface Explorations (borings and probes)

Relevant portions of these reports will be provided to the Contractor separately, with this Request for Proposal.

The current bathymetric survey will be provided to the Contractor, both as pdf files and MicroStation files. The bathymetric survey will include the limits of the deepening Project and shallow areas of interest within the Project that will be required to be dredged. Sidescan sonar images will be provided as pdf files.

Base Maps. The Corps will provide (1) electronic files of the most recent condition survey plans for the areas being studied in/along the Portsmouth Harbor Channel on the USACE web page, (2) HYPACK electronic files containing the bathymetric data for the proposed dredge study areas, and (3) existing information regarding areas of known bedrock, encountered during previous maintenance dredging.

Site Conditions: Water depth in the area of the borings is typically ranges from approximately 2 to 40 feet, and the area is subject to an average tide range of about 7 to 9 feet.

Vertical Datum: The datum for this project is Mean Lower Low Water (MLLW) and shall be the vertical datum from which all depths and elevations are measured. In the scope, depths below MLLW are shown, and therefore negative signs are not used, but it should be understood that where an elevation is referenced to MLLW, the elevation would in fact be negative. All contractor records and submittals shall show the negative sign where elevations are referenced to MLLW. Where depths below MLLW are used, the negative sign shall be left off.

Horizontal Coordinate System: All field work and submittals shall reference and report horizontal locations using the Maine West State Plane and NAD 1983.

The geotechnical engineering services to be performed under this task are listed below, and described in greater detail in subsequent sections:

a. Drill and sample borings, and collect and log bedrock core. Save samples of all materials and deliver to a Corps' approved laboratory for rock mechanics testing.
b. Produce field logs of the borings (handwritten, typed, and corrected), including drilling observations, boring coordinates and bottom elevations, and field classifications for all soils and rock encountered.

Contractor's schedule and effort shall include reasonable time for vessel traffic, set-up, etc. Contractor shall sequence executable work to minimize potential for downtime or delay where weather will be a limiting factor. Contractor shall coordinate work schedule around incoming/departing ship schedules including tankers and ships, and any associated security requirements that may impact operations.

Drilling, Sampling, and Logging

a. Datum, Coordinate System, Units: All field work and submittals shall reference and report horizontal locations using the Maine West State Plane and NAD 1983. Vertical datum will be the Mean Lower Low Water (MLLW) vertical datum. Measurements shall be made in feet, and tenths of feet.

b. Survey of Locations: Actual boring locations shall be measured in the field by the Contractor, using Differential RTK GPS survey equipment, in such a way that sub-meter accuracy is achieved horizontally, and vertical accuracy is +/- 6 inches.

c. Boring Locations:

Identify up to 20 boring locations. Under the base task order, the scope shall include the performance of 3 borings. It is the Government's intent that additional borings totaling up to approximately 10 may be added to the scope by exercising Optional Task 3.A. All boring locations shall be approved by USACE considering the Contractor's recommendations in order to provide adequate horizontal spatial coverage in areas with likely shallow bedrock. Coordinates will be specified in Maine West State Plane, NAD 1983.

Portsmouth Harbor Boring Locations

d. Positional Accuracy: Contractor shall position and set up the plant in such a way that actual field drilling locations are within 20 feet of the location coordinates proposed by the Contractor and approved by NAE. Actual boring location coordinates shall be recorded on the logs and also tabulated separately in the report. NAE's Survey Unit may be consulted for any supplemental site survey information. Corps survey contacts can be reached at 978-318-8526.

e. Boring Depth: Borings shall extend to an elevation at least -50 ft MLLW or deeper. If bedrock is encountered above -50 ft MLLW, ten (10) feet of bedrock core shall be collected at each location. The Contractor shall maintain on-site all materials, equipment, and personnel required to perform rock coring as described herein.

f. Drilling Qualifications: Contractor shall provide all labor, materials, and equipment necessary to complete the specified subsurface explorations and sampling. The Contractor shall provide well maintained and calibrated drilling and sampling equipment, and a qualified crew and driller experienced in all phases of exploration drilling, sampling, and test methods for engineering purposes. The driller shall have at least five years drilling experience using spun and drive casing, rock coring, and roller bit and wash boring methods in the North Atlantic region, and shall have a minimum of 5 years of experience operating from marine or floating plant. Resumes of the drillers shall be submitted with the contractor's proposal.

g. Drilling Inspector Qualifications: The Contractor shall provide a drilling inspector who is trained as a geologist. The inspector shall be knowledgeable in the local bedrock geology, description and classification of bedrock core, visual soil classification methods of ASTM D 2488, in the Unified Soil Classification System of ASTM D 2487, in the general drilling procedures to be used for this project, rock coring in accordance with ASTM D 2113, and in the performance of subsurface drilling operations and rock coring from a marine plant. The inspector shall have at least 5 years of experience in this type of work. Resume(s) of the drilling inspector(s) shall be submitted with the contractor's proposal. The inspector shall perform field inspection, develop field exploration logs, classify samples, perform quality control, record the daily operations of the drill crew, and perform other recording and coordination duties as required including a daily safety meeting. The inspector shall have no other duties other than the inspection work described. No member of the drilling crew shall perform the inspection function in addition to their drilling crew duties. No drilling work or other field work of this project, other than mobilization and demobilization, shall be performed in the absence of the inspector. The inspector shall be NAE's primary point-of-contact for this project. The Contractor shall provide the inspector with a cellular telephone or equal means of communication so that contact with NAE is possible during all work hours.

h. <u>Casing</u>: All borings shall use 4-inch minimum diameter steel casing, and casing shall be seated into the top of bedrock sufficiently to allow rock coring, but no deeper than necessary, in order to ensure collection of rock from the uppermost zone of bedrock.

i. <u>Rock Coring</u>: Rock coring shall be performed using an NX or NQ-size double-tube swivel type 5-foot core barrel, in accordance with procedures in ASTM D 2113. Rock coring operations shall be conducted in a way to maintain integrity of core, minimize disturbance and breakage from coring operations, and maximize recovery. Use of wireline methods, NQ-size, and split core barrels is preferred.

j. <u>Minimum Acceptable Recovery</u>: For each boring, a minimum of 80% core recovery is required. Borings with core recoveries of less than 80% shall be offset and re-drilled. If the second attempt also recovers less than 80%, then the boring will be accepted as complete, and no further attempts will be required.

k. <u>Bedrock Core Logging and Documentation</u>: Bedrock core shall be logged, in terms of rock type, hardness, structure, degree of weathering, mineralization, discontinuities (angle of inclination measured from horizontal, planarity, roughness, aperture, infillings, coatings, mineralization, etc.). Percent recovery and Rock Quality Designation (RQD) shall be calculated in the field and recorded on the boring logs. Mechanical breaks shall be noted both on the core and on the logs. Core shall be marked with vertical stripes to allow pieces to be replaced in proper orientation. Core shall be securely placed in sturdy, wooden, or equivalent, core box, and boring number, date, core run numbers, recovery, and RQD shall be recorded on the attached core box cover. Wet core shall be photographed, to include the information on the core box cover, and a scale. Spacers, such as wooden blocks, shall be used to mark between core runs, zones of core loss, and to secure the core against shifting during transport. The procedures of ASTM D 5079 for the preservation and transportation of core samples shall be followed.

l. <u>Field Boring Logs</u>: The drilling inspector assigned to this project shall keep detailed field logs of the borings. Logs shall be filled out on a daily basis such that each day of drilling activity is fully recorded at the end of work for that day. The field logs shall be produced using the Corps form (ENG Form 1836 and 1836-A) to be provided separately, or one proposed by the Contractor in the work plan and approved by NAE. Field boring logs shall have a minimum scale of one inch equals one foot, to allow sufficient room for material descriptions. Field logs shall be completely filled out in the field, at the time of drilling and sampling, with classifications, drilling observations, the start and finish clock times for each core run, drill times (minutes per ft), and drill fluid losses. Logs shall include at a minimum: dates, boring numbers, location, driller and inspector names, drilling details and methods used, and listed by depth, sample number, core run number, classifications (including ASTM descriptions, moisture levels, color, density, estimated percentage of major and minor components), strata breaks, blow count data for sample and casing drives, casing depths, sample recoveries, and other pertinent details of the drilling operations. The inspector shall also record coring bit type and condition. During rock coring the inspector shall record rig operations (down pressure, wash water pressure, core barrel rotation), coring rate (minutes per foot), and drilling observations (rough drilling, chatter, rod drops, drill fluid, etc.) and any drilling fluid loss, location and quantity. The Contractor shall record depth information on the boring logs so that the 0.0-foot depth coincides with the channel bottom; corrections for water depth, tidal fluctuations, and measurements in the field shall be performed to accomplish this. Contractor shall record the clock time at the start of and completion of each core run, so that tide level can be determined from the nearest tide gauge, as a back-up to other methods, to confirm water elevation at the time of drilling. All final elevations on the logs shall be in MLLW. All field logs and records shall be preserved in good reproducible condition and shall be available for examination by the NAE Representative throughout the field work. Separate detailed field logs shall be made for each exploration.

m. Field Submissions: Copies of the field boring logs shall be submitted to NAE on a weekly basis. In addition to the field logs, a short narrative shall be written by the inspector describing each day's activities as related to actions taken and work completed. These Progress Reports shall be submitted daily to NAE, via e-mail or FAX. Copies of the daily written Progress Reports shall be included in the Report of Explorations.

n. Where overburden is found to be present overlying bedrock, then continuous soil sampling methods shall be used to sample the material until bedrock is reached. Total depth of the boring shall still be that needed to reach elevation at least -50 ft MLLW. Soil sampling shall be in accordance with Standard Penetration Test (SPT) procedures as specified in ASTM D 1586, except that a 300-pound hammer, an 18-inch drop, and a 2.5-inch inside diameter split sampling spoon shall be used due to the anticipated soil conditions. Visual classification of soil samples retrieved from the sampling spoon shall be performed by the drilling inspector in accordance with ASTM D 2488 and the Unified Soil Classification System. Refusal of the sampling spoon for the purposes of this project is defined as 100 blows per 6 inches of penetration, or bouncing refusal. Bedrock shall be cored upon reaching refusal.

o. Rotary auger and Odex drilling methods are not permitted on this project. All borings shall be advanced by roller bitting and wash methods and rock coring, as appropriate.

p. Samples: The Contractor shall save and label representative samples of each material encountered while sampling. The Contractor shall supply all sample jars, labels, and core boxes required for the preservation of samples. Core boxes shall be constructed of lumber or plywood with operating latches and shall be labeled properly. Material shall be collected in 8 oz. minimum jars or in sufficient quantity to allow performance of subsequent laboratory soil tests, including grain size analysis and hydrometer tests. All jar samples shall have the boring and sample identification written on both the lid and a label on the side of the jar, using indelible ink pen or marker. All samples shall be delivered to Corps' approved laboratory (to be identified prior to Notice to Proceed). For planning purposes, Contractor shall assume the Corps' approved laboratory is located in Acton, MA.

q. The Contractor shall keep on the job sufficient marine plant, support vessels, and equipment to meet the requirements of the work. The marine plant shall be made available prior to the Notice to Proceed such that it can be inspected by an NAE representative for quality assurance activities. The marine plant and equipment shall be in satisfactory operating condition and be capable of safely and efficiently performing the work in the depths of water defined above. The floating plant and equipment shall be subject to inspection by NAE at all times. No reduction in the capacity of the marine plant and equipment employed on the work shall be made except by written permission of the Contracting Officer. Prior to commencement of work at the site, the Contractor shall make available to NAE for review copies of all applicable inspections and certifications of marine plant and equipment as required by EM 385-1-1, the U.S. Army Corps of Engineers Safety and Health Requirements Manual, as well as Federal, State and local laws and regulations.

OPTIONAL TASK 3.A - ADDITIONAL BORING

The Contractor shall install one additional boring pursuant to the requirements cited in Task 3. It is also understood that these borings shall be exercised (if required) in sufficient time so that they may be performed before the commencement of the Task 3 drilling operations.

This optional task is multi-executable up to 7 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

TASK 4 – ROCK MECHANICS TESTING & DATA REPORT

The field inspector shall assess bedrock cores for rock mechanics testing throughout the course of the drilling work, and select intervals for testing during the field program.

The following rock mechanic tests shall be performed on bedrock core from each boring location:

TEST	Number per Core Location	Total Number of Tests
Unconfined Compressive Strength w/ Young's Modulus (ASTM D7012, Method D, and ASTM D 3148; core preparation by ASTM D 4543)	1	3
Point Load Index (ASTM D 5731)	1	3
Splitting Tensile Strength (Brazilian)(ASTM D 3967)	1	3
Total Hardness	1	3
Cerchar Abrasivity Index (CAI) (ASTM D7625-10)	1	3
Unit Weight & Classification	1	3
Petrographic Analysis (ISRM procedures)	1	3
Acoustic Velocity	1	3

Rock mechanics testing shall be conducted at a Corps' approved laboratory. As part of the proposal the contractor shall identify the proposed laboratory for the testing.

Contractor shall select proposed test intervals by submitting to the Corps for approval boring logs marked up with proposed test intervals. Core specimens subjected to testing shall be returned to the core box to the interval from which they came. Split core samples broken by strength testing shall be taped together if necessary. Upon completion of testing, Contractor shall return all rock core boxes to the NAE core storage building at Fort Devens, Devens, MA. Address will be provided to Contractor prior to NTP.

Report: Contractor shall prepare a data report presenting, tabulating, and summarizing the rock mechanics testing results.

OPTIONAL **TASK 4.A – ADDITIONAL ROCK MECHANICS TESTING**

The Contractor shall perform one additional rock mechanic testing pursuant to the requirements cited in Task 4.It is also understood that these tests shall be exercised (if required) in sufficient time so that they may be performed before the commencement of the Task 4 laboratory operations.

This optional task is multi-executable up to 7 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

TASK 5 – PORTSMOUTH HARBOR REPORT OF EXPLORATIONS

Contractor shall prepare and submit Report of Explorations, presenting and summarizing the field effort, and any deviations from the Work Plan. Report shall include Weekly Safety Meeting logs, Daily Progress Reports, final checked boring logs, and a tabulation of actual (GPS surveyed) boring locations, elevations of channel bottom, depth drilled, completion depth and elevation of each boring location, length of rock cored, % recovery, RQDs, photographs of cores, and a figure showing the actual boring locations.

Final electronic typed logs shall be generated in gINT v.8, or another equivalent software program. If gINT is used, the Corps will provide the data template and libraries. Electronic files shall be provided to NAE upon completion.

In this report, Contractor shall use the findings from the previous seismic survey, rock mechanics testing, and boring program to evaluate and make recommendations regarding the appropriate rock removal methods required for each location, specifically whether the rock at each location requires blasting, or if it can be removed by other mechanical means (ripper, hydraulic percussive methods, such as a hoe ram, etc.).

The final submission shall be submitted in both electronic and paper versions. The electronic version shall be submitted on computer disk (CD or DVD), or external hard drive, and shall include all drawings, tables, graphs, and text, as appropriate. The storage media shall be clearly labeled with the file name and description in an orderly fashion. The storage media shall include the individual electronic native files (Word, Excel, MicroStation, gINT, etc.) All text files shall be done in Microsoft Word. In addition, an electronic version shall be submitted as one consolidated file in PDF format (Adobe Acrobat, most current version), including scanned copies of the original field logs.

OPTIONAL **TASK 6 - WEATHER DAY**

Weather Day Option includes the costs associated with marine plant and personnel in a non-working mode on a day due to weather conditions making it infeasible and/or unsafe to perform required work.

One weather day option will be exercised and awarded prior to mobilization. Weather days not required, will be de-obligated, and the contract reduced by the contract option amount not used. Contractor must telephone the Corps (Dr. Stephen S. Potts at 978-318-8311) immediately when weather conditions prohibit work, obtain approval for use of a Weather Day, and follow up with a submittal formally documenting the conditions when weather made water work unsafe and/or infeasible.

This optional task is multi-executable up to 3 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

2. SUBMITTALS

Submittals and their requirements have been described under the individual tasks and options, and are summarized below:

- Work Plan
- Tidal Corrections Plan
- Accident Prevention Plan (including AHA)
- Safety Meeting Logs (weekly)
- Field Boring Logs (weekly)

- Progress Reports (daily)
- Report of Explorations, including field and final boring logs, paper copies, and electronic versions (pdf of entire document, and all native files)
- Rock core (boxed) and soil/rock jar samples
- Rock Mechanics Testing Data Report(s)

All Government-furnished material (references, reports, data, etc.) provided shall be returned with the Final Report.

All submittals (with the exception of the rock core) to the Government shall be directed to the U. S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751, Attn: Dr. Stephen S. Potts. Rock core selected for testing shall be delivered to a Corps' approved rock mechanics testing laboratory (e.g. Acton, MA or Totowa, NJ). The rock core shall be delivered to the Corps' rock core storage area at Fort Devens, Devens, MA, at the completion of the project.

3. COORDINATION

All field activities and site visits, as appropriate for this project, shall be coordinated by telephone at least five days prior to actual commencement of work with Dr. Stephen S. Potts (978-318-8311). At a minimum, during the progress of the field work, the Contractor's inspector shall coordinate with NAE prior to the start of drilling work for each boring, at the completion of each boring, and when any difficulties or questions arise requiring NAE input.

4. QUALITY CONTROL

The Contractor is responsible for the quality of the submittals. The Contractor shall review each submittal for its completeness, elimination of all conflicts, errors, and omissions, and the overall professional and technical accuracy of the submission. It is emphasized that the work must be prosecuted using proper internal controls and review procedures. Documents, which are deficient in any of the areas stated herein, shall be returned for correction or upgrading, as determined by NAE, prior to completion of the NAE review. Contract submission dates shall not be extended if a resubmission of material is required due to a submission being deficient. The Contractor shall state in writing, in the fee proposal letter, that he is cognizant of the requirements herein, and that the firm, and its associates, if any, have the professional competency and technical expertise necessary to accomplish this project.

5. COMPLETION SCHEDULE

The Contractor shall execute work in accordance with the following schedule:

TASK	No. of Copies	Due Date

Submit Work Plan, Tidal Correction Plan, and Accident Prevention Plan	3	Within 14 calendar days of Notice to Proceed (NTP)
Government Review		Within 14 calendar days of receiving the submittal.
Incorporate NAE Review comments, and Submit Finalized Plans	3	Within 14 calendar days of Receipt of NAE comments on Draft
Mobilize and start field borings		Within 14 calendar days of NAE approval of boring locations
Daily Progress Reports and Weekly Safety Briefing Records and Field Boring Logs		Duration of and Field Boring Work
Complete Boring Field Work		Within 30 calendar days of start
Draft Report of Boring Explorations	3	Within 14 calendar days of boring demob.
Government Review		Within 14 calendar days of receiving the submittal.
Final Report of Boring Explorations	3	Within 14 calendar days of Receipt of NAE comments on Draft
Draft Data Report of Rock Mechanics Testing	3	Within 30 calendar days of drilling demob.
Final Data Report of Rock Mechanics Testing	3	Within 14 calendar days of Receipt of NAE comments on Draft.

NAE will provide the contractor a set of draft comments. Any questions regarding NAE comments on Draft submittals shall be addressed to the appropriate Government reviewer and clarified before the final submittal is made. The Contractor shall prepare a transmittal cover letter when furnishing the final submittal for this project. The letter shall include a statement that all comments have been addressed and incorporated and all requirements have been met. If the final submittal does not address all comments it shall be returned to the Contractor for revision and resubmission at no additional expense to the Government.

6. REFERENCES

ASTM D 1586 (2011) Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

ASTM D 1587 (1994) Practice for Thin-Walled Tube Geotechnical Sampling of Soils.

ASTM D 2113 (2008) Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation

ASTM D 2487 (2011) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2488 (2009a) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

ASTM D 3148 (2002 – Withdrawn 2005) Standard Test Method for Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression

ASTM D 3213 (2013) Standard Practices for Handling, Storing, and Preparing Soft Intact Marine Soil

ASTM D 3967 (2008) Standard Test Method for Splitting Tensile Strength of Intact Rock Core Specimens

ASTM D 4220-95 (2007) Standard Practices for Preserving and Transporting Soil Samples

ASTM D 4543 (2008) Standard Practices for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances

ASTM D 5079 (2008) Standard Practices for Preserving and Transporting Rock Core Samples

ASTM D 5434 (2012) Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock

ASTM D 5731 (2008) Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

ASTM D 6032 (2008) Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core

ASTM D 7012 (2013) Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures

EM 385-1-1 (2008) U.S. Army Corps of Engineers Safety and Health Requirements Manual.

EM 1110-1-1804 (2001), Geotechnical Investigations Engineering Manual

ENG FORM 1836 (Mar 71), Drilling Log.

ENG FORM 1836-A (ER 1110-1-1801), Drilling Log (Cont Sheet).

FAR 52.236-13 Federal Acquisition Regulation for Accident Prevention

U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual, Second Edition, Volumes I and II, 1998, Reprinted 2001,

USACE guidance documents and forms can be found and downloaded from the following web site: www.usace.army.mil/library/

USACE Portsmouth Harbor Reports:

Final Feasibility Report and Final Environmental Assessment and FONSI for Navigation Improvement Project, Portsmouth Harbor and Piscataqua River, New Hampshire & Maine, US Army Corps of Engineers, New England District and NH Pease Development Authority-Division of Ports and Harbors, July, 2014.

Final Report, Marine Geophysical Investigation, Navigation Channel Improvement Project, Piscataqua River, Portsmouth New Hampshire, OSI Report No. 06ES102-NH, 17 September, 2008.

USACE Drilling Logs, 2007, BH-1 through BH-8 and P-1 through P-3.

ATTACHMENT A

MINIMUM BASIC OUTLINE FOR ACCIDENT PREVENTION PLAN

An accident prevention plan is a dynamic project specific safety and health policy and program document. The following areas are typically addressed in an accident prevention plan, but a plan will be **job-specific** and shall address any unusual or unique aspects of the project or activity for which it is written. The accident prevention plan shall interface with the employer's overall written safety and health program. Referenced sections of the employer's company General Safety Program, shall be included as appropriate.

1. SIGNATURE SHEET. Title, signature, and phone number of the following:
    - a. plan preparer (corporate safety staff person, QC);
    - b. plan approval, e.g. Certified Safety Professional or Certified Industrial Hygienist;
    - c. plan concurrence (provide concurrence of other applicable corporate and project personnel (contractor), e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC as warranted.

2. BACKGROUND INFORMATION. List the following:
    - a. contractor;
    - b. contract number;
    - c. project name;
    - d. brief project description, description of work to be performed, and location (map);
    - e. contractor accident experience (provide information such as EMR, OSHA 300 Forms, corporate safety trend analyses);
    - f. listing of phases of work and hazardous activities requiring activity hazards analyses.

3. STATEMENT OF SAFETY AND HEALTH POLICY. (In addition to the corporate policy statement, a copy of the corporate safety program may provide a significant portion of the information required by the accident prevention plan).

4. RESPONSIBILITIES AND LINES OF AUTHORITIES.
    - a. identification and accountability of personnel responsible for safety-at both corporate and project level (contracts specifically requiring safety or industrial hygiene personnel should include a copy of their resume - the District Safety and Occupational Health Office will review the qualifications for acceptance).
    - b. lines of authority

5. SUBCONTRACTORS AND SUPPLIERS. Provide the following: .

a. identification of subcontractors and suppliers (if known);

b. means for controlling and coordinating subcontractors and suppliers;

c. safety responsibilities of subcontractors and suppliers. It should be noted that the Prime Contractor is responsible for ensuring that all subcontractors have the necessary written health and safety programs in place, have provided their employees with the necessary training, and subcontractors conduct their work in accordance with all relevant Occupational Health and Safety Standards which includes OSHA, USACE and ANSI at a minimum.

6. TRAINING.

a. list subjects to be discussed with employees in the safety indoctrination.

b. list mandatory training and certifications which are applicable to this project (e. g., U.S. Coast Guard Licensed Captain etc. and any requirements for periodic retraining/recertification.

c. identify requirements for emergency response training.

d. outline requirements (who attends, when given, and who will conduct etc,) for supervisory and employee safety meetings.

7. SAFETY AND HEALTH INSPECTION. Provide details on:

a. who will conduct safety inspections (e.g., project manager, safety professional, QC, supervisors, employees, etc.), when inspections will be conducted, how the inspections will be recorded, deficiency tracking system, follow-up procedures, etc;

b. any external inspections/certifications which may be required (e.g., Coast Guard).

8. SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE.

a. the company's written safety program goals, objectives, and accident experience goals for this contract should be provided.

b. a brief description of the company's safety incentive programs (if any) should be provided.

c. policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified.

d. provide written company procedures for holding managers and supervisors accountable for safety.

9. ACCIDENT REPORTING. The contractor shall identify who shall complete the following, how, and when:

a. exposure data (man-hours worked);

b. accident investigation, reports and logs;

c. immediate notification of major accidents.

10. MEDICAL SUPPORT. Outline on-site medical support and off-site medical arrangements.

11. PERSONAL PROTECTIVE EQUIPMENT. Outline procedures (who, when, how) for conducting hazard assessments and written certifications for use of personal protective equipment.

12. PLANS (PROGRAMS, PROCEDURES) REQUIRED BY THE SAFETY MANUAL (as applicable). Written plans and/or procedures addressing the following project specific items shall be included in the Contractor's Accident Prevention Plan. It is the Contractor's responsibility to review the entire list and provide the appropriate information. If an item is not applicable to the project then the Contractor shall note it as such with a statement of: "not applicable." For those items which are applicable to the project, the Contractor shall ensure that the information and standard operating procedures are applicable to the work which will be performed.

a. hazard communication program (01.B.04);
b. emergency response plans:
    - procedures and tests (01E.01)
    - spill plans (01.E.01, 06.A.02)
    - firefighting plan (01.E.01, 19.A.04)
    - posting of emergency telephone numbers (01.E.04)
c. health hazard control program (06.A.02);
d. hazardous energy control plan (12.A.07);
e. contingency plan for severe weather (19.A.03);
f. floating plant and marine activities (section 19)
g. personal protection equipment (section 5, especially 05.I).
h. plan for prevention of alcohol and drug abuse (Defense Federal Acquisition Regulation Supplement Subpart 252.223-7004, Drug-Free Work Force);

13. OTHER. The contractor shall also provide information on how he will meet the requirements of other major sections of EM 385-1-1, not identified in a-h above, in the accident prevention plan. Particular attention shall be paid to medical and first aid requirements, sanitation, personal protective equipment, fire prevention, machinery and mechanized equipment and thermal extremes as they may apply to this project. Detailed site-specific hazards and controls shall be identified in the activity hazard analysis for each phase of the operation.

WEEKLY SAFETY MEETING

Date Held: ________________________
Time: ____________________________

CONTRACTOR: _________________________ Contract No. DACW33-
PERSONNEL PRESENT (check): Contractor ____ Sub. ____ Government ____

SUBJECTS DISCUSSED (check items that were discussed during meeting):

USACE EM385-1-1 ______ (Specific sections: __________________________)
On-site Accident Prevention Plan (or Site Safety and Health Plan) ______
Individual protective equipment (steel-toed boots, safety glasses, etc..) _____
Prevention of slips/falls _____
Back injury/safe lifting techniques _____
Fire prevention _____
First aid _____
Tripping hazards _____
Equipment inspection and maintenance _____
Hoisting equipment, winch and crane safety _____
Ropes, hooks, chains, and slings _____
Water safety _____
Boat safety _____
HAZMAT, Toxic hazards, MSDS, respiratory, ventilation _____
Staging, ladders, concrete forms, safety nets, handrails ____
Hand tools, power tools, machinery, chain saws _____
Vehicle operation safety _____
Electrical grounding, temporary wiring, GFCI _____
Lockouts/safe clearance procedures _____
Welding, cutting _____
Excavation hazards/rescue _____
Loose rock/steep slopes _____
Explosives _____
Sanitation and waste disposal _____
Clean-up, trash _____

Other safety issues of concern specific to contract that was discussed during meeting:

All persons attending meeting the meeting must sign below or on the back of the form.

Contractor Representative Signature ____________________________ Date: _______
CE Inspector/QA (if present at meeting) __________________________ Date: _______

GZA
Proactive by Design

Geotechnical
Environmental
Ecological
Water
Construction Management

249 Vanderbilt Avenue
Norwood, MA 02062
T: 781.278.3700
F: 781.278.5701
F: 781.278.5702
www.gza.com

March 4, 2016
File No. 09.P000080.16

Department of the Army
New England District
Corps of Engineers
696 Virginia Road
Concord, MA 01742-2751

Attn: Ms. Beverly E. Lawrence, AE Coordinator

Re: Proposal for T.O. 1
Contract NO. W912WJ-Rl15-0058
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH & Eliot, ME

Dear Ms. Lawrence:

GZA GeoEnvironmental Inc. (GZA) is pleased to submit our proposal to the US Army Corps of Engineers, New England District (District) for the Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation in Newington, New Hampshire and Eliot, Maine. Our proposal has been prepared in response to your Request for Proposal dated February 2, 2016 for the referenced project.

We understand the project will involve widening the upper channel turning basin to the existing authorized channel depth (-35 feet MLLW) with 2-foot required and 2 foot allowed for overdredging. The objective of the requested subsurface investigation program is to characterize sediment and collect bedrock cores to evaluate the density, strength, and other properties of bedrock and sediment and characterize those materials that will require pre-treatment blasting versus those that can be removed by mechanical methods.

GZA understands that this assignment is a high priority project for the District. The results of the investigation will be used to facilitate coordination with other regulatory agencies regarding blasting and to determine the appropriate removal methods in support of preparation of plans and specifications for a contract solicitation for dredging and rock removal for the project.

SCOPE OF SERVICES

As outlined in the RFP, the District has outlined a scope of work that consists of base scope items and optional items. Based on our understanding of the RFP, GZA proposed the following scope items:

BASE SCOPE OF WORK

Task 1 – Work Plan, Tidal Correction Plan, Accident Prevention Plan and Activity Hazard Analysis

GZA will prepare a Work Plan, Accident Prevention Plan and an Activity Hazard Analysis (AHA) for the drilling services as outlined in the referenced RFP. Our procedures to account for tidal change during drilling will be described in the Work Plan. The need for detailed Tidal Correction Plan is not required for the work because the drilling work will be accomplished using a jack-up barge. Refer to Task 5 for more information.

Task 2 – Drilling Mobilization/Demobilization

GZA plans to retain New Hampshire Boring, now doing business as New England Boring Contractors (NEBC), from Londonderry, New Hampshire to provide a jack-up barge, crew boat, and drill rig to conduct the borings. GZA and NEBC will mobilize and demobilize from the site for the Base Scope of Work as defined in the RFP. Task 2 will be performed in accordance with the requirements outlined in the BASE SCOPE/TASK 2 of the referenced RFP. We anticipate that Task 2 will include an initial site visit by our Field Engineer, utility clearance, project planning and coordination activities, a project kickoff meeting, and equipment mobilization, as described below.

Initial Site Visit

Our Field Engineer will perform an initial site visit with the drilling subcontractor and the District, if desired, to observe soil, bedrock and water conditions visible at the ground surface, and observe traffic, drilling access and existing utilities to the extent visible. The drilling subcontractor will identify and confirm a suitable launch point for the barge and support equipment during this site visit. Markings will also be made for Digsafe utility clearance during the initial site visit.

Utility Clearance

In preparation for the subsurface explorations, GZA and the drilling subcontractor will review plans provided by the District, which are assumed to include all underground utilities, including privately-owned utility locations. Utility clearance will be coordinated by, and the responsibility of, the drilling subcontractor. GZA, in coordination with the District, may need to adjust the proposed boring locations due to accessibility, utility conflicts, or other obstructions encountered. Our drilling subcontractor will contact Digsafe to notify them of the proposed explorations and obtain a Digsafe reference number.

Coordination

GZA will coordinate the field work with the District, U.S. Coast Guard, and the Portsmouth Harbor Harbormaster. This effort will include issuing a "Notice to Mariners" regarding the proposed work and impacts to the boating public, as well as additional correspondence in writing and/or by phone to communicate relevant work details to parties of interest.

Kickoff Meeting

GZA will arrange for a kickoff meeting prior to start of the drilling program. The kick off meeting will be held to review GZA's Work Plan and to review the coordination requirements to execute the work and the project schedule. We envision the kickoff meeting attendees will include GZA's Project Manager, Task Leader and Field Engineer, our drilling subcontractor Project Manager, and the District's Project Team. We also intend to invite the U.S. Coast Guard and Portsmouth Harbormaster. We have budgeted for this meeting to be held in the general site vicinity (Portsmouth, NH area) and will be approximately 1-2 hours onsite.

Equipment Mobilization

Our drilling subcontractor will mobilize the marine equipment and drill rig from their shop to the launch point and coordinate a means to place the equipment in the water. We anticipate that one day will be spent mobilizing the equipment and preparing to drill, and another day will be used for demobilization. We have assumed that our Field Engineer will be available part-time to oversee these activities, allowing for up to 6 hours of on-site time during mobilization. Mobilization and demobilization to and from boring locations during the drilling program is included under Task 3.

All personnel involved with the barge drilling operation will be outfitted with personal flotation devices (PFDs) while on the tender boat and barge. Emergency floatation rings with retrieval lines and 20-lb fire extinguishers will be present on the barge and available at all times. The work boat will stay with the barge while the barge is occupied and be available for emergency response at all times.

Task 3 – Portsmouth Harbor Borings

Boring Plan Development

As outlined in the RFP, the base scope of work will include three (3) test borings. The primary goal of these test borings is to provide information needed to evaluate rock removal considerations during the proposed dredging project. As such, GZA reviewed the existing information with a focus on identifying areas where high rock may be encountered during the proposed dredging. GZA selected three boring locations, designated as B-101 through B-103, at the approximate locations shown on **Figures 1** and **2**. The test borings will each be advanced to -50 feet MLLW in accordance with the RFP. Corresponding boring depths have been estimated based on the bathymetric elevation contours developed by Ocean Surveys Inc. (OSI), which are shown on **Figure 1** and summarized in **Table 1**.

In developing our proposal, we investigated the anticipated current velocities and river bottom profile information in the Upper Turning Basin to evaluate barge/drilling equipment sizing and appropriateness. For the Sarah Mildred Long Bridge Project, GZA prepared hydrodynamic models for the entire Piscataqua River. GZA was able to use this model to cut a cross section in the area of the proposed Upper Turning Basin and prepare a current velocity profile in the vicinity of the proposed test borings.

Based on our experience and evaluations, we selected the use of a jack-up barge to execute the proposed drilling program. Based on our past experience on the river, borings performed within the channel (i.e. deeper than -16 feet MLLW) will not be able to be performed with the jack-up barge. The current velocity increases substantially within the deeper water which would require a large barge and support equipment. We have found that drilling within the channel will require the use of a 100-foot drill barge held in place by large crane-placed spud piles. In some areas, additional stabilization measures consisting of a tug boat pushing against the current would also be necessary to keep the barge on location and to limit disturbance to the retrieved rock core samples. The costs of the large barge with crane placed spuds and tug boat support would likely be an order of magnitude higher than the jack-up barge alternative.

For these reasons, we selected the jack-up barge to execute the proposed boring program.

Proposed Drilling Approach

As indicated in Task 2, GZA intends to engage NEBC to provide a jack-up barge, crew boat, and drill rig to conduct the borings. In 2007, NEBC drilled the initial phase of borings and probes for District for this project. The borings were designated as B-1 through B-8 and P-1 through P-3 and are shown on **Figure 2**. NEBC also drilled 29 test borings in the

Piscataqua River from various different barges for the Sarah Mildred Long bridge replacement project in 2013 as a subcontractor to GZA.

The proposed jack-up barge is 35 feet long and 13.5 feet wide and is self-powered to allow independent positioning on each borehole location. The drilling contractor will lift the barge using three jack-up spuds. The barge will be lifted to an elevation high enough to work above high tide, thereby allowing the barge to remain at a constant elevation throughout the execution of each boring. The crew boat will be used to travel between the barge and the launch point.

We intend to drill the borings using drive and wash methods with 4-inch diameter casing. NEBC intends to pump water from the Piscataqua River for use in drive and wash drilling and bedrock coring. Continuous split-spoon sampling will be performed using a 2.5-inch inside diameter sampler driven with a 300-lb hammer and 18 inch drop in overburden soils. Bedrock will be cored using an NQ2 wireline core barrel in each test boring to achieve the specified boring depth, producing 2±-inch diameter rock core specimens. We have estimated overburden and rock core depths for the borings based on the acoustic basement contours developed by OSI, shown on **Figure 2**. Based on these contours, we estimate soil thicknesses ranging from about 18 to 33 feet and rock core depths ranging from about 13 to 18 feet, as summarized in **Table 1**. We estimate that the three, B-100 series test borings will be completed in six (6) rig days.

GZA notes that the RFP requires a minimum of 80% core recovery "is required and that borings with core recoveries of less than 80% shall be offset and re-drilled. If the second attempt also recovers less than 80%, then the boring will be accepted as complete, and no further attempts will be required."

We interpret that this recovery requirement will be based on the entire core run at each test boring location, rather than being applicable to each every 5 +/- foot core interval. Based on our experience drilling in the river, the bedrock nearest to the top of rock surface is frequently highly fractured with high angle to vertical discontinuities. This condition typically results in reduced recoveries in the upper zone of the bedrock. Because the anticipated core depths will generally be 10 feet or less, we anticipate achieving less than 80 percent recoveries in the first and possibly second run at each test boring locations. To avoid unnecessary redrilling where similar results are achieved, we request that re-drilling only be required if the core recovery is less than 80% based on mechanical drilling issues and not due to the fractured nature of the bedrock. GZA's Field Engineer will assess the cause of limited recoveries as needed and immediately notify the Task Leader, who will notify the District.

Borehole Location and Survey

The jack-up barge is equipped with GPS equipment to assist in positioning the barge at the boring location. GZA will also provide a surveyor with RTK surveying equipment to assist in positioning the barge at the proposed boring locations, as needed. GZA will survey the as-drilled boring locations and barge deck elevation to calculate the mudline elevation. Survey data will be collected relative to the North American Datum of 1983 (NAD83), Maine State Plane West, and North American Vertical Datum of 1988 (NAVD88). Elevations will be converted to MLLW datum in the field, prior to drilling, to identify the required test boring depth to reach -50 feet MLLW.

Drilling Inspection

GZA will provide an experienced Field Engineer to coordinate and observe the borings, classify soil and rock samples, and prepare boring logs. The collected soil samples will be classified using visual-manual methods using ASTM D2488 and the Unified Soil Classification System (USCS). Bedrock core samples will be classified visually using GZA's Modified International Society for Rock Mechanics (ISRM) Rock Classification system, including all of the logging requirements included in the RFP.

As a quality control measure, a GZA Geologist will provide intermittent oversight during drilling, primarily to confirm the bedrock type designated by the Field Engineer. We assume this will include two, 2-hour site visits by our Geologist during the B-100 series borings. In addition, our Field Engineer will be in contact with our senior personnel as the exploration program progresses. The team will review and submit any proposed program adjustment to the locations, depths, and sampling requirements for the borings to the District for review by the District. Requested modifications to the drilling program will be made to make the best use of the budgeted drilling time based on the conditions encountered.

Our Field Engineer will prepare and submit field test boring logs and daily progress reports as required in the RFP. Each rock core box will be photographed in a wet and dry condition as drilling progresses. GZA will deliver soil and rock samples collected from the borings to locations designated by the District in accordance with the RFP.

Task 4 – Rock Mechanics Testing and Data Report

GZA will engage an USACE approved rock testing laboratory to perform rock mechanics testing for the project in accordance with the RFP. GZA will initially select rock core samples for testing. GZA will submit field boring logs marked up with proposed test intervals to the District for review and approval. GZA, in conjunction with the rock testing laboratory, will prepare a data report presenting, tabulating, and summarizing the rock mechanics testing results. Core specimens subjected to testing shall be returned to the core box to the interval from which they came. Split core samples broken by strength testing will be taped together if necessary and returned to the rock core box prior to submission to the District.

Task 5 – Portsmouth Harbor Report of Explorations

GZA will prepare and submit a Portsmouth Harbor Report of Explorations in accordance with the requirements outlined in the RFP. The report will include a description of the field work including any deviations from the approved Work Plan. The report appendices will include weekly safety meeting logs, daily progress reports, field and final gINT boring logs, core photographs, laboratory test results and an exploration location figure. The results of the test borings will be included in a tabular format and will include pertinent information recorded during drilling.

The Report of Explorations will also include GZA's findings, conclusions, and recommendations relative to the rock removal for the project. GZA will use the information from the previous completed seismic survey data along with the test boring and laboratory testing as the basis for our assessment. As requested in the RFP, GZA will focus the report on rock removal options for the project, i.e. blasting vs. mechanical methods. Lastly, GZA will also evaluate the subsurface data gathered to date and provide recommendations, if needed, for additional explorations, if data gaps are identified, specifically with respect to the rock removal limits within the anticipated dredging limits.

GZA will provide the District with a draft version of the complete report in PDF format. The draft report will include the report text, figures, tables and appendices. GZA will incorporate one round of consolidated comments from the District prior to issuing the final report. The final report will be submitted in hard copy and electronic formats. The electronic files (both native files and the complete report in PDF format) will be provide on CD or DVD.

OPTIONAL SCOPE OF WORK

The following tasks are optional tasks that will require approval from the District prior to be executed by GZA.

Task 2A – Drilling Mobilization/Demobilization – Additional

It is in the District's best interest to authorize execution of any of the additional borings prior to the end of the base drilling scope described in Task 3. If the District authorizes any additional borings after GZA and NEBC have demobilized from the site, an additional mobilization/demobilization charge will be incurred for each mobilization/demobilization event.

Task 3.A – Additional Boring(s)

GZA will perform additional boring(s) as directed the District. The additional boring(s) will be performed in accordance with the provisions outlined in Task 3 and the referenced RFP. GZA anticipated that the District will endeavor to provide authorization for any additional borings prior to the drilling subcontractor demobilizing from the site.

GZA understands that up to seven (7) additional test borings may be authorized by the District under Task 3A. The anticipated locations of the additional borings, designated as B-201 through B-204 and B-205A through B-207A, are shown on **Figures 1** and **2**. The estimated boring depths, overburden thickness, and rock core depth for each boring are summarized in **Table 1**.

Borings B-205A through B-207A have been relocated approximately 50 to 75 feet east (away from the channel) relative to the locations recommended in OSI's report. As described in Task 3, we are proposing to relocate these borings to areas outside the channel where the mudline elevation is no deeper than -16 feet MLLW. This approach will allow the additional borings to be drilled using the same jack-up barge drilling arrangement as proposed under Task 3 and thus reduce costs. If additional borings are required in the channel/deeper water, the larger barge with crane and tugboat support will be required and GZA will need to provide an alternative scope and pricing to the District. To avoid time delays, additional mobilization costs, and daily operation cost that is an order of magnitude higher than the jack-up barge alternative, we recommend deeper water drilling be avoided.

We estimate that each additional boring will require about one and half days to complete with continuous sediment sample using a 2 ½ inch ID sampler and the 300 lb. hammer. We estimate that the anticipated completion time for each boring could be reduced to one day if we use a standard 1 3/8 inch ID sampler and a 140 lb. hammer with sampling interval at 5-foot intervals. So, we estimate the total number of rig days to complete the additional borings will range between 9 and 13 rig days.

Task 4.A – Additional Suite of Rock Mechanics Testing

If requested by the District, GZA will engage the USACE approved rock testing laboratory to perform an additional suite of rock mechanic testing pursuant to the per core location requirements cited in Task 4 in this proposal and in the RFP. GZA understands that up to seven additional rock mechanic testing suites may be authorized by the District under Task 3A. We assume that the additional rock mechanics testing results will be included in the data report prepared under Task 4. A supplemental data report is not included.

If requested by the District, GZA could select individual or composited sediment samples for grain size analysis testing. Unit costs for grain size analyses have been included separately under Task 4.A.

Task 5.A – Additional Report of Explorations

If requested by the District, GZA will expand the Report of Exploration prepared under Task 5 to incorporate the data obtained from additional boring(s). The report will be expanded to include a description of the additional field work and their impact on the findings, conclusions and recommendations. The report appendices will be expanded to include weekly safety meeting logs, daily progress reports, and final boring logs for the additional borings. The exploration location figure will be updated to include the additional boring locations. The results of the additional test borings will be added to the table included in the report prepared under Task 5.

Task 6 – Weather Day

The optional Task 6 Weather Day will be used to cover costs associated with the marine plant and personnel in a non-working mode on a day due to weather conditions making it infeasible and/or unsafe to perform required work.

GZA will notify Dr. Stephen S. Potts at the District immediately when weather conditions prohibit work, obtain approval for use of a Weather Day, and follow up with a submittal formally documenting the conditions when the weather made the water work unsafe and/or infeasible.

Up to three (3) Weather Day provisions will be included as part of the Optional Scope of Work as outlined in the RFP. The task price will be valid for a period of one (1) year from notice to proceed of the task order. Weather days that are not used/required will be de-obligated, and the contract reduced by the appropriate task amount.

Task 7 – Develop a Web-based GIS Application for Project Information Management

If requested by the District, GZA will develop and deploy a secure web-based GIS application for the project. This application will provide the project team with interactive access to critical geospatial information. For this assignment, we envision the as drilled boring locations could be added and upload the boring logs (field, final, or both) and laboratory test data into the web-based GIS application. The application could be used for District review of the work products.

The application could be used after our drilling assignment has been completed to allow the District to effectively manage and share project information. Having secure and ready access to up-to-date information will allow the District to make faster, more informed decisions and develop solutions in a more efficient and timely manner. We envision the application would be scalable where it could be used during design and construction phases to manage critical project data such as survey information, sediment data, dredging quantities, etc.

SUBMITTALS

The anticipated submittals under this contract are listed below:

- Work Plan (including tidal correction provisions)
- Accident Prevention Plan (including AHA)
- Safety Meeting Logs (weekly)
- Field Boring Logs (weekly)
- Progress Reports (daily)
- Rock Mechanics Testing Data Report(s)
- Report of Explorations, including field and final boring logs, paper copies, and electronic versions (pdf of entire document, and all native files)
- Rock core (boxed) and soil/rock jar samples

GZA will review each submittal for its completeness, potential conflicts, errors, and omissions, and for the overall professional and technical accuracy of each submission. GZA is cognizant of the requirements of the RFP and have the professional competency and technical expertise necessary to accomplish this assignment. All submittals (with the exception of the soil and rock samples) to the Government will be directed to:

U. S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742-2751
Attn: Dr. Stephen S. Potts

Upon completion of the field work, the sediment and rock core samples will be retained and stored by GZA. At the completion of the project, the rock core samples will be delivered to the Corps' rock core storage area at Fort Devens, MA. The sediment samples will be delivered to a location specified by the District.

PROJECT ORGANIZATION TEAM

As stated in our IDIQ for Geotechnical Engineering and Related Services Submittal, below is our project team that will be working on this task order.

Project Role	USACE Labor Category	GZA Personnel
Project Director	Program Manager	Anders B. Bjarngard, P.E.
Project Manager	Project Manager	Matthew A. Taylor P.E.
Task Leader	Senior Engineer	Andrew Blaisdell, P.E.
Field Engineer/Drilling Inspector	Engineer	Evan Lonstein, P.E.
Geologist	Geologist	Tanya Justham
Surveyor	Survey Party Chief	Alex Karp

Mr. Andrew Blaisdell, P.E. will be our Task Leader for the Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation. Mr. Blaisdell is a Senior Project Manager in located in our Portland, Maine office. Mr. Blaisdell has extensive experience with design, coordination and oversight of marine-based subsurface exploration programs including recently managing a subsurface exploration program on the Piscataqua River for the Sarah Mildred Long Bridge Replacement. The drilling program, which included 29 barge borings, was performed with a combination a jack-up barge and 50- to 100-foot long floating barges with crane and tugboat support. Mr. Blaisdell's proximity to the site (i.e. Portland, ME) and his experience drilling on the Piscataqua River will be very beneficial to the District in GZA's execution of this project. A copy of Mr. Blaisdell's water-based drilling program experienced is included in **Attachment A**.

We are proposing to use **Mr. Evan Lonstein, P.E.** as our Field Engineer/Drilling Inspector for the project. Although Mr. Lonstein is not a classically trained geologist, he has extensive experience observing and coordinating water based drilling programs including drilling on the Piscataqua River. In addition, Mr. Lonstein is one of GZA's key bedrock mapping field engineers, with extensive experience mapping hard rock sites throughout New England, which has increased his experience in rock characterization. Mr. Lonstein, who is also based in our Portland, Maine office, has worked from Mr. Blaisdell on numerous projects including the Sarah Mildred Long Bridge project. A copy of Mr. Lonstein's resume is included in **Attachment A** of this proposal for your review and consideration.

We are also proposing to use **Ms. Tanya Justham** as our Geologist for the project. Ms. Justham will provide quality control review and oversight to rock type characterization by our Field Engineer/Drilling Inspector. Ms. Justham is based in our Bedford, New Hampshire office, and has worked with Mr. Blaisdell and Mr. Lonstein on several projects in a similar capacity, including subsurface exploration and bedrock mapping projects. A copy of Ms. Justham's resume is included in **Attachment A** for your review and consideration.

The NEBC driller for this project will be **Mr. Sam Cooley**. Mr. Cooley has extensive water-based drilling experience, specifically on the Piscataqua River. A copy of Mr. Cooley's resume is included in the **Attachment A** for your review and consideration.

PROJECT SCHEDULE

We are prepared to commit our key engineering staff to meet the project schedule milestones as presented in the RFP. It must be recognized that unforeseen conditions that become evident during the course of the studies may alter the schedule such as unfavorable weather or subsurface conditions that may cause delays and may extend our schedule. However, we will make every effort to make adjustments to the program, even if unfavorable conditions are encountered, to meet the stated schedule in the RFP.

BASIS OF CHARGES AND CONDITIONS OF ENGAGEMENT

The Conditions of our Engagement will be as defined in our Contract W912WJ-16-D-0003. GZA's billings will be based upon a negotiated lump sum amount in accordance with our negotiated wage rates. Our drilling subcontractor and direct expenses will be billed at cost plus the negotiated profit rate. The following table provides a schedule of values in the table below.

ESTIMATE OF CHARGES

The estimated costs for the services outlined in the US Army Corps of Engineers Request for Proposal (RFP) for Contract No. W912WJ-R-15-0058 dated, February 2, 2016, are broken down as follows:

TASK DESCRIPTIONS		Lump Sum Costs
BASE SCOPE OF WORK		
Task 1 – Work Plan, Tidal Correction Plan, Accident Prevention Plan, and Activity Hazard Analysis		$7,392
Task 2 – Mobilization/Demobilization		$22,557
Task 3 – Portsmouth Harbor Borings (3 borings)		$35,095
Task 4 –Rock Mechanics Testing & Data Report		$5,574
Task 5 – Portsmouth Harbor Report of Explorations		$8,266
Subtotal Lump Sum Base Scope of Work Budget =		**$78,884**
OPTIONAL SCOPE OF WORK		
	Unit Cost	Total Cost
Task 2A – Additional Mobilization/demobilization (per event)	$17,248	--
Task 3.A-Additional Boring (Up to 7 borings)	$8,495 to $10,415	$59,464 to $72,908
Task 4.A-Additional Suite of Rock Mechanics Testing Per Additional Boring Location (Up to 7 testing suites)	$1,981	$13,866
Task 5.A – Portsmouth Harbor Report of Explorations Update Per Additional Boring (Up to 7 add'l borings)	$687	$4,809
Task 6 – Weather Day – (Up to 3 days)	$6,331	$18,993
Task 7 – Develop and Provide Web-based GIS Data Management Application	$4,311	$4,311
Subtotal Lump Sum Optional Tasks =		**$101,443 to $114,888**
Total Lump Sum Cost = Base + Optional Tasks =		**$180,328 to $193,772**

The lump sum costs presented above have been developed using our approved hour rates, approved overhead rate, and a proposed profit of 10 percent. Refer to the Budget Summary Tables included in Attachment A for a breakdown of our hours and expenses on a per task basis.

ACCEPTANCE

Upon an acceptance by the USACE, the work will be performed in accordance with the Architect-Engineer Contract No. W912WJ-16-D-0003 between USACE and GZA dated March 2, 2016.

Thank you for the opportunity to submit this proposal. If you have any questions, please do not hesitate to call us.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Andrew Blaisdell, P.E.
Task Leader

Matthew A Taylor, P.E.
Project Manager

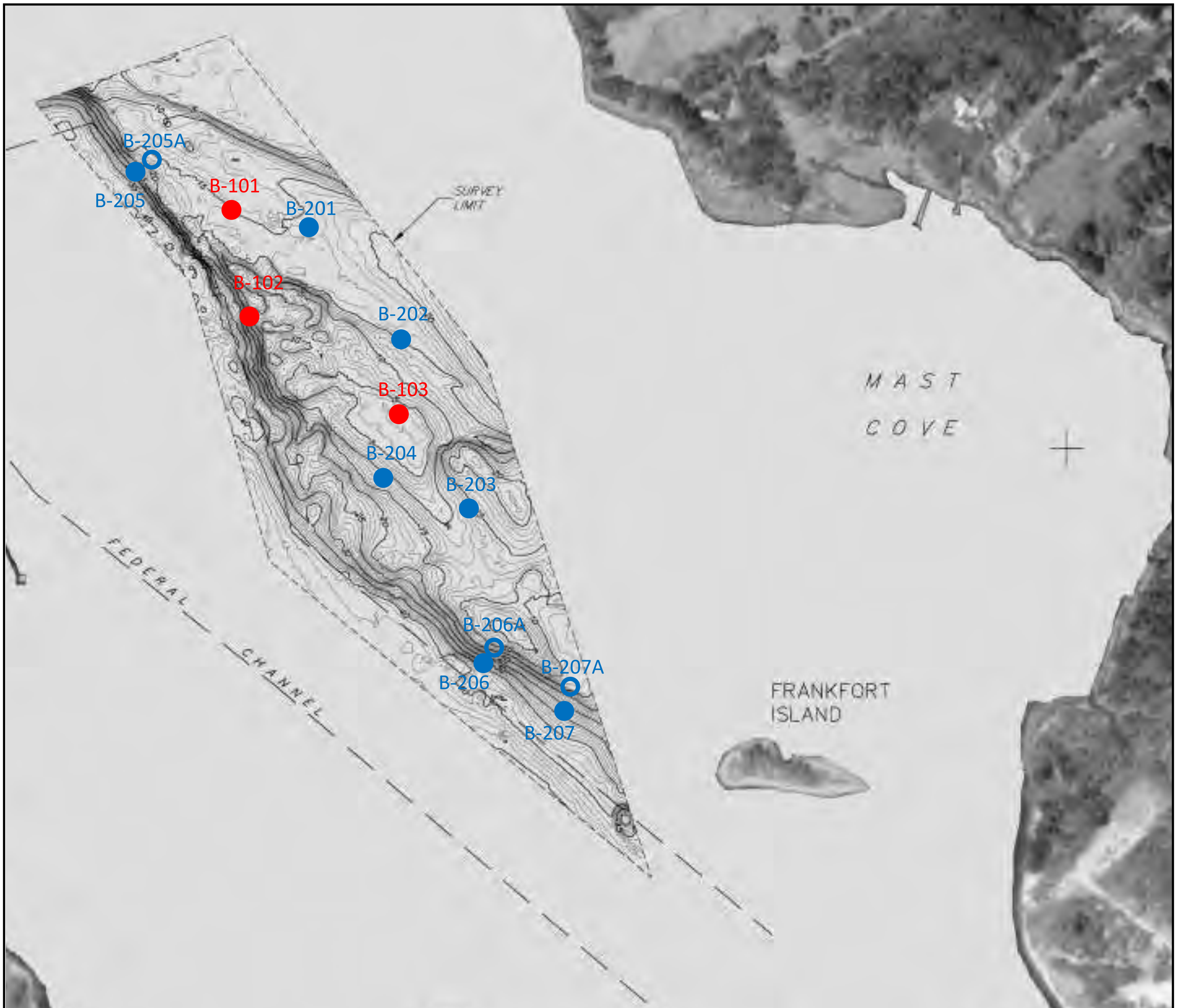
Anders B. Bjarngard, P.E.
Project Director

Attachments:

Figure 1 – Proposed Boring Location Plan showing Bathymetry
Figure 2 – Proposed Boring Location Plan showing Acoustic Basement

Table 1 – Proposed Boring Plan Summary
Table 2 – Budget Summary Table

Attachment A –Key Resumes



Legend:

●	B-101	Indicates proposed Base Scope Boring loca on
○	B-205A	Indicates boring loca on proposed by USACE, relocated to allow access by planned marine barge equipment
●	B-205	Indicates proposed Addi onal Scope Boring loca on

Notes:

1. Basemap from plan en tled "Piscataqua River Hydrograph Contours" sheet V-1 produced by Ocean Surveys, Inc. dated 09/15/2008.

NO.	ISSUE / DESCRIPTION	BY	DATE

Proposed Boring Location Plan showing Bathymetry
Newington, New Hampshire and Eliot, Maine

Subsurface Drilling Investigation for Subsurface Characterization
Portsmouth Harbor Federal Navigation Project—Turning Basin

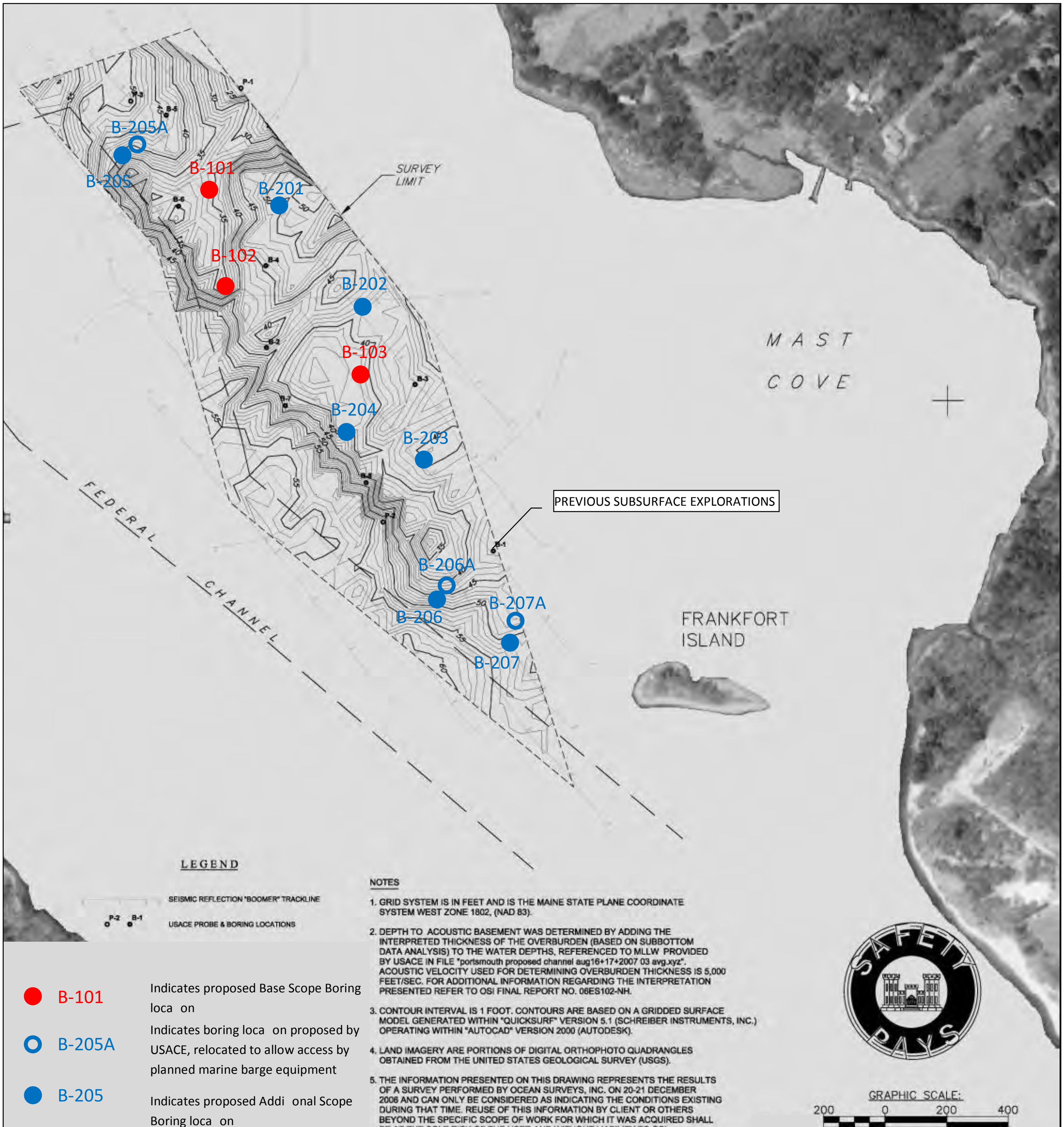
PREPARED BY:

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:

US Army Corps of Engineers
New England District (NAE)

PROJ MGR: ARB	REVIEWED BY: MAT	CHECKED BY: ABB	Figure
DESIGNED BY: CCN	DRAWN BY: CCN	SCALE: AS SHOWN	1
DATE: March 2016	PROJECT NO. -	REVISION NO: -	



Notes:

1. Basemap from plan en tled "Piscataqua River Acous c Basement Contours" sheet V-3 produced by Ocean Surveys, Inc. dated 09/15/2008.

NO.	ISSUE / DESCRIPTION	BY	DATE

Proposed Boring Location Plan showing Acoustic Basement
Newington, New Hampshire and Eliot, Maine

PREPARED BY: **GZA** GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: US Army Corps of Engineers New England District (NAE)

Subsurface Drilling Investigation for Subsurface Characterization
Portsmouth Harbor Federal Navigation Project—Turning Basin

PROJ MGR: ARB	REVIEWED BY: MAT	CHECKED BY: ABB	Figure 2
DESIGNED BY: CCN	DRAWN BY: CCN	SCALE: AS SHOWN	
DATE: March 2016	PROJECT NO. -	REVISION NO: -	

Table 1
Proposed Boring Plan Summary
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Boring Designation	Mudline El. (MLLW)	Acoustic Basement El. (MLLW)	Total Boring Depth (ft)	Estimated Soil Boring Depth (ft)	Estimated Core Depth (ft)
BASE SCOPE BORINGS					
B-101	-14	-32	36	18	18
B-102	-11	-36	39	25	14
B-103	-4	-37	46	33	13
OPTIONAL SCOPE BORINGS					
B-201	-16	-50	34	34	0
B-202	-16	-45	34	29	5
B-203	-15	-44	35	29	6
B-204	-10	-39	40	29	11
B-205A	-16	-43	34	27	7
B-206A	-10	-40	40	30	10
B-207A	-14	-47	36	33	3

Notes:
1. See Figures 1 and 2 for boring locations.
2. Mudline El. estimated based on bathymetry developed by OSI, shown on Figure 1.
3. Acoustic Basement El. estimated based on contours developed by OSI, shown on Figure 2.
4. Total boring depth calculated as mudline elevation minus -50 ft MLLW, max boring depth.
5. Estimated core depth calculated as acoustic basement elevation minus -50 ft MLLW.

APPENDIX J

Work Plan, Tidal Correction Plan, and Accident Prevention Plan

Work Plan
Revision 1

Geotechnical Explorations

Portsmouth Harbor Turning Basin
Newington, NH & Eliot, ME

June 10, 2016

Prepared for:

United States Army Corps of Engineers
New England District

Contract Purchase Order Agreement
W912WJ-16-D-0003
Delivery Order/Call No. 0002

Prepared by:

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101

Contract Number: W912WJ-16-D-0003
Delivery Order/Call No. 0002
GZA Project Number: 09.0025912.00

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST of APPENDICIES

LIST OF ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
bgs	Below Ground Surface
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CIH	Certified Industrial Hygienist
CPR	Cardiopulmonary Resuscitation
dB	Decibels
°C	Degrees Centigrade
°F	Degrees Fahrenheit
EM	Engineering Manual
EMS	Emergency Medical Service
eV	Electron Volt
FSM	Field Site Manager
GZA	GZA GeoEnvironmental, Incorporated
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
HTRW	Hazardous, Toxic, or Radioactive Waste
IDW	Investigative Derived Waste
IRP	Installation Restoration Program
LEL	Lower Explosive Limit
LOTO	Lock Out/Tag Out
mg/m3	Milligrams per cubic meter of air
MSDS	Material Safety Data Sheet
NFPA	National Fire Prevention Association
NEBC	New England Boring Contractors
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
NWS	National Weather Service
O2	Oxygen
OSHA	Occupational Safety and Health Administration
OU	Operational Unit
QC	Quality Control
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts per Million
SCBA	Self Contained Breathing Apparatus
SHM	Safety and Health Manager
SSHP	Site Safety & Health Plan
SSHS	Site Safety and Health Supervisor
TLV	Threshold Limit Value
TM	Task Manager
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds

1.0 SIGNATURE SHEET

Work Plan for
Portsmouth Harbor Turning Basin
Newington, NH & Eliot, ME
Contract Number: W912WJ-16-D-0003
Delivery Order/Call No. 0002

Plan Prepared by:
Andrew Blaisdell, Task Leader / Associate Principal
Phone: (207) 358-5117

____

Plan Approval by:
Matthew Taylor, Project Manager / Associate Principal
Phone: (781) 278-5803

____

Plan Concurrence by:
Anders Bjarngard, Project Director / Principal
Phone: (781) 278-4802

____

2.0 BACKGROUND INFORMATION

2.1 CONTRACTOR

GZA GeoEnvironmental, Inc. has contracted with the United States Army Corps of Engineers (USACE), New England District to perform geotechnical engineering services. GZA has been contracted to perform subsurface investigations, perform geotechnical laboratory testing, and prepare a geotechnical data report outlining the results of the investigations at the Portsmouth Harbor Turning Basin located in Newington, NH and Eliot, ME. GZA has subcontracted New England Boring Contractors (NEBC) to perform the drilling. GZA will provide field oversight during the investigation.

2.2 IDENTIFICATION OF SUBCONTRACTORS AND SUPPLIERS

1. New England Boring Contractors (Drilling subcontractor). Point of Contact: Steve Garside, see Table 3 for contact information.
2. GeoTesting Express (Laboratory testing subcontractor). Point of Contact: Mark Dobday, Table 3 for contact information.

2.3 CONTRACT NUMBER

W912WJ-16-D-0003
Delivery Order/Call NO. 0002

2.4 PROJECT NAME

Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation - Newington, NH and Eliot, ME

2.5 PROJECT DESCRIPTION

The objective of the drilling program is to perform ten (10) subsurface explorations to evaluate sediment and bedrock properties and to characterize the materials that will require pre-treatment blasting or removal by mechanical methods for the Portsmouth Harbor Turning Basin in Newington, NH; see Figure 1, Locus Plan. The subsurface investigation program will be conducted by New England Boring Contractors (NEBC) of Londonderry, New Hampshire from a jack-up barge within the proposed turning basin. Ten test borings, designated FD16-01 through FD16-10, will be advanced to -50 feet MLLW utilizing steel casing and rotary wash drilling methods.

3.0 COORDINATION AND SUBSURFACE EXPLORATIONS

3.1 PROJECT INITIATION

3.1.1 INITIAL SITE VISIT

Our Field Engineer will perform an initial site visit with the drilling subcontractor and the District, if desired, to observe soil, bedrock and water conditions visible at the ground surface, and observe boat traffic, drilling access and existing utilities to the extent visible. At that time, the drilling subcontractor will confirm suitability of the planned launch point for the marine plant and support equipment (Hilton Park in Dover, New Hampshire). Markings will also be made for Digsafe utility clearance during the initial site visit.

3.1.2 UTILITY CLEARANCE

In preparation for the subsurface explorations, GZA and NEBC will request plans from the District showing underground utilities, including privately-owned utility locations, in the work area. However, we understand such plans may not be available. Utility clearance will be coordinated by, and the responsibility of, NEBC. GZA, in coordination with the District, may need to adjust the proposed boring locations due to accessibility, utility conflicts, or other obstructions encountered.

NEBC will contact Dig Safe Systems, Inc. (Digsafe) to notify them of the proposed explorations and obtain a Digsafe reference number. In addition to Digsafe, NEBC will also contact: Public Service Company of New Hampshire, Eversource, Unitil/Northern Utilities, Central Maine Power, FairPoint Communications, Comcast, Verizon, and Municipal Sewer and Water Departments to determine location of utilities under that portion of the Federal Channel and Turning Basin.

3.1.3 COORDINATION

GZA will coordinate the field work with the District, U.S. Coast Guard, and the Portsmouth Harbor Harbormaster. This effort will include issuing a “Notice to Mariners” regarding the proposed work and impacts to the boating public, as well as additional correspondence in writing and/or by phone to communicate relevant work details to parties of interest. The current Notice to Mariners is included in Appendix B.

3.1.4 KICKOFF MEETING

GZA will arrange for a kick-off meeting prior to start of the drilling program. The kick-off meeting will be held to review GZA’s Work Plan and to review the coordination requirements to execute the work and the project schedule. We envision the kick-off meeting attendees will include GZA’s Project Manager, Task Leader and Field Engineer, our drilling subcontractor Project Manager, and NAE’s Project Team. We also intend to invite the U.S. Coast Guard and Portsmouth Harbormaster. We plan to hold this meeting in the general site vicinity (Portsmouth, New Hampshire area) and will be approximately 1 to 2 hours onsite.

3.2 TEST BORING LOCATIONS

NEBC will supply a jack-up barge equipped with global positioning satellite (GPS) equipment to assist in the initial positioning of the barge over the proposed boring locations. GZA will provide a surveyor with

Differential Real Time Kinematic[1] (RTK) GPS surveying equipment to assist in the final positioning the barge/marine plant to confirm that the actual boring locations are within 20 feet of the proposed location coordinates listed on Table 1 with sub-meter horizontal accuracy. When the barge has been set up on location, GZA will survey the as-drilled boring locations and the deck elevation with 6±-inch accuracy in order to calculate the mudline elevation. Elevations will be converted from the North American Vertical Datum 1988 (NAVD88) to MLLW prior to drilling to identify the required depth to reach -50 feet MLLW. The conversion factor from NAVD88 to MLLW for Portsmouth, New Hampshire was obtained from the National Oceanic and Atmospheric Administration (NOAA) Tidal Elevation webpage for Station 8420411, Dover, Cocheco River, New Hampshire, and is provided below:

NAVD El. (feet) + 3.93 feet = MLLW Elevation (feet)

The borings are located within a federal government-maintained navigation channel and rights-of-entry are not required. Portsmouth Harbor channels are mainly used by deep draft commercial vessels, fishing vessels, and numerous small recreation and commercial craft, which may cause some interference with contract operations. NEBC will conduct the work in such a manner as to obstruct navigation as little as possible. It should be noted that due to the shallower mudline elevations at the proposed boring locations, obstruction of the channel by the marine plant is considered to be unlikely.

3.3 PROPOSED EQUIPMENT AND LOGISTICS

NEBC will provide a self-powered 35-foot by 13.5-foot jack-up barge/marine plant with a Diedrich D-50 skid drill rig to perform the test borings. A 21-foot aluminum tri-hull vessel will be launched daily and will operate as land-to-marine plant transportation. The drill rig is equipped with a cathead which is mechanically driven from the drill rig transmission and has one speed for forward and reverse. The line-pull capabilities reach 5,000 lbs at a maximum speed of 500 feet per minute. An emergency shut-off or positive cathead brake stops the mechanical rotation in less than one revolution when the emergency stop switch is activated.

The work boat will be docked each night at 1 Badger Island Road, Kittery, Maine. This will also be the address used for emergency response.

Marine survey, Captain's license, and vessel certification documentation are included in Appendix C.

3.4 TEST BORINGS

The subsurface exploration program will be conducted by NEBC as a subcontractor to GZA. The work will be performed using a jack up barge marine plant and is anticipated to be completed within 18 rig days. As outlined in the Order for Supplies or Services dated May 4, 2016, the assignment will include the execution of ten (10) test borings, FD16-01 to FD16-10, Refer to the attached Figure 1, Proposed Boring Location Plan for the approximate locations of the proposed borings. Each boring will be advanced to El. -50 feet mean lower low water (MLLW) utilizing steel casing and rotary wash drilling methods.

Based on the available mudline and acoustic bottom elevation data, mudline elevations are anticipated to vary from about El. -4 to El. -16 feet MLLW, resulting in boring depths ranging from about 34 to 46 feet

---

[1] Real Time Kinematic (RTK) satellite navigation is a technique used to enhance the precision of position data derived from satellite-based positioning systems such as GPS. Differential Global Positioning System (DGPS) is an enhancement to Global Positioning System that provides improved location accuracy, from the 15-meter nominal GPS accuracy to about 10 cm in case of the best implementations

below mudline, as summarized in Table 1. Due to spud length limitations, the proposed barge/marine plant is only capable of drilling at a location with a mudline elevation of about -16 feet MLLW or shallower. If the actual mudline elevation is deeper than El. -16 MLLW, the proposed boring will be relocated to the nearest alternate boring location with a mudline elevation of at least El. -16 MLLW.

3.5 DRILLING, SAMPLING AND LOGGING

The borings will be drilled using drive and wash methods with 4-inch diameter casing. NEBC intends to pump water from the Piscataqua River for use in drive and wash drilling and bedrock coring. Continuous split-spoon sampling will be performed using a 2.5-inch inside diameter spilt spoon sampler to -50.0 feet MLLW or top of bedrock, whichever is shallower. The sampler will be driven with a 300-lb hammer and an 18-inch drop. Refusal of the sampling spoon for the purposes of this project is defined as 100 blows per 6 inches of penetration, or bouncing refusal.

Upon extraction of each split spoon sample, the spoon will be opened on a stable and level surface, and any material in the spoon tip will be placed into sample jars. Prior to placing the retrieved sample into jars, all observations and soil descriptions will be made. Observations made by the inspector include visual classifications in accordance with ASTM Standard D-2488, recovery length, measurements made relative to depth representing soil interfaces, and two digital photographs of the material in the spoon. Soil for each classification made in each spoon sample will be placed in a soil jar (one soil jar for every soil type observed per spoon sample). Sufficient material will be retrieved to provide accurate laboratory testing to the extent possible.

If bedrock is encountered, rock coring will be conducted in accordance with ASTM D 2113 using a 5-foot-long NQ2 wireline rock core to retrieve continuous bedrock specimens. A minimum of 80 percent core recovery is required for each boring. The percent recovery will be calculated based on the recovered rock core length divided by the total length of rock cored. We anticipate that between 6 inches and 2 feet of fractured/weathered rock may exist at the bedrock surface in each test boring. After split spoon refusal is encountered, casing will be seated into the top of bedrock sufficiently to allow rock coring, but no deeper than necessary, in order to ensure collection of rock from the uppermost zone of bedrock. The depth of seating into rock will be monitored carefully by GZA and the driller to promote drilling and recovery of as much rock as possible.

It should be understood that recovery can be more significantly affected by weathering or fracturing in the upper 5 feet of rock than at greater depths. If rock is encountered only in the lower approximately 5 feet of the borehole and less than 80 percent recovery is obtained, GZA will discuss the results with a representative from the District to review the adequacy of the available core and drill data. If the District representative believes additional coring is required due to total core recovery less than 80 percent, a second boring will generally be drilled within 5 feet of the original location. This second boring will be completed without soil sampling. If the second attempt also recovers less than 80 percent, the boring will be accepted as complete, and no further attempts will be required.

Bedrock core will be logged in terms of rock type, hardness, structure, degree of weathering, mineralization, and discontinuities (angle of inclination measured from horizontal, planarity, roughness, aperture, infillings, coatings, mineralization, etc.). Percent recovery and Rock Quality Designation (RQD) will be calculated in the field and recorded on the boring logs. Mechanical breaks will be noted both on the core and on the logs. Core will be marked with vertical stripes to allow pieces to be replaced in proper orientation. Core will be securely placed in sturdy, wooden, or equivalent, core boxes. Boring number, date, core run numbers, recovery, and RQD will be recorded on the attached core box cover. Wet and dry core will be photographed, to include the information on the core box cover, and a scale. Spacers, such as wooden blocks, will be used to mark between core runs, zones of core loss, and to secure the core against shifting during transport. The procedures of ASTM D 5079 for the preservation and transportation of core samples shall be followed. Bedrock core samples will be classified visually using GZA's Modified International Society for Rock Mechanics (ISRM) Rock Classification system. GZA's ISRM rock classification summary sheet is included in Appendix D.

Drilling spoils and fluid generated during the drilling process will be confined to the drilling tub, which prevents spillage and slip hazards in the work area. At the completion of drilling, drill spoils will be returned into the borehole prior to casing removal.

The boring will be completed after notification of and approval by the District point of contact.

3.5.1 FIELD BORING LOGS

GZA will provide an experienced Field Engineer to coordinate and observe the borings, classify soil and rock samples, and prepare boring logs. Logs will be prepared in gINT format using NAE ENG Form 1836 and 1836A. A blank field log and an example of a final test boring log are included in Appendix D. Logs will be filled out on a daily basis such that each day of drilling activity is fully recorded at the end of work for that day. Field boring logs will have a minimum scale of one inch equals one foot, to allow sufficient room for material descriptions. Field logs will be completely filled out in the field, at the time of drilling and sampling, with classifications, drilling observations, the start and finish clock times for each core run, drill times (minutes per ft), and drill fluid losses.

Logs will include at a minimum: dates, boring numbers, location, driller and inspector names, drilling details and methods used, and listed by depth, sample number, core run number, classifications (including ASTM descriptions, moisture levels, color, density, estimated percentage of major and minor components), strata breaks, blow count data for sample and casing drives, casing depths, sample recoveries, and other pertinent details of the drilling operations. The inspector will also record coring bit type and condition. During rock coring the inspector will record rig operations (down pressure, wash water pressure, core barrel rotation), coring rate (minutes per foot), and drilling observations (rough drilling, chatter, rod drops, drill fluid, etc.) and any drilling fluid loss, location and quantity. The Field Engineer will record depth information on the boring logs so that the 0.0-foot depth coincides with the channel bottom; and measurements in the field will be performed to accomplish this. All final elevations on the logs will be in MLLW. All field logs and records will be preserved in good reproducible condition and will be available for examination by the NAE Representative throughout the field work. Separate detailed field logs will be made for each exploration.

As a quality control measure, a GZA Geologist will provide intermittent oversight during drilling, primarily to confirm the bedrock type designated by the Field Engineer. We assume this will include two, 2-hour site visits by our Geologist during the borings. In addition, our Field Engineer will be in contact with our Task Manager as the exploration program progresses.

Copies of the field boring logs will be submitted to the District on a weekly basis. In addition to the field logs, a short narrative will be written by GZA's Field Engineer describing each day's activities as related to actions taken and work completed. These Progress Reports will be submitted daily to NAE, via e-mail. Copies of the daily written Progress Reports will be included in the Report of Explorations.

3.6 SAMPLE STORAGE AND DELIVERY

During the field exploration program, soil and rock samples will be temporarily stored in the Port of New Hampshire storage building in Portsmouth. GZA has coordinated with the local Sponsor at Pease, Geno Marconi, to confirm this is acceptable. GZA will conduct quality control review of sample descriptions and select samples for laboratory testing from this facility.

During and/or following completion of drilling, samples of bedrock will be submitted to GeoTesting Express in Acton, Massachusetts for laboratory testing. The samples will be transmitted with chains of custody (COC) via overnight UPS or FedEx shipping.

At the completion of the field work, GZA will transport the samples not submitted for laboratory testing to the USACE-NAE storage facility, 50 MacArthur Avenue, Devens, Massachusetts.

3.7 TIDAL CORRECTION PLAN

Based on the type of barge/marine plant proposed for the assignment, GZA's proposed Tidal Correction Plan (TCP) does not require monitoring of the tidal level or an independent tide board to correct drill depths for variations in water level. Our proposed TCP consists of the following procedure:

1. A GZA surveyor will survey the deck elevation and provide it to GZA's Field Engineer once the barged spuds have been set and the marine plant deck has been raised to the final drilling height.
2. The surveyor will survey and mark a reference point with known elevation on one of the barge spuds. This referenced point will be used in the event that the deck needs to be moved up or down during the drilling operation.
3. At the start of drilling, the drill casing will be placed down to the mudline and the elevation will be calculated based on the measured distance from bottom of a known length of casing to top of deck elevation at initial casing touchdown.

Elevations will be converted from the North American Vertical Datum 1988 (NAVD88) to MLLW prior to drilling to identify the required depth to reach -50 feet MLLW.

3.8 SPILL CONTAINMENT

To contain potential spills, an emergency spill kit containing oil absorbent pads, oil drip pans, and oil containment booms will be on board during drilling operations. The pads will absorb oil/ hydraulic fluid on the water surface in the event of a spill. All hydraulic fuel utilized by the Diedrich D-50 will consist of a bio-degradable Bio-Blend® hydraulic fluid. Drip pans to collect oil/ hydraulic fluid will be placed under areas of the drill rig susceptible to spills or leaks minimizing the amount of fluid contacting the water.

3.9 SITE SAFETY

An initial Site Inspection and Health and Safety Meeting will be conducted by GZA prior to the start of work. At this time, the Accident Prevention Plan (APP), Activity Hazard Analysis (AHA) and GZA's Site-Specific Health and Safety Plan will be reviewed with the field crew. Our proposed AAP and AHA have been prepared and submitted to the District under separate cover. At a minimum, weekly safety meetings will be conducted thereafter to discuss pertinent safety issues and concerns over the course of the project. During each health and safety meeting, a discussion of physical hazards and potential safety concerns will be given and the APP and AHA will be reviewed. All paperwork including the AHA, APP, contact information, SDS sheets, and Work Plan, will be located in a designated location onsite at all times.

All personnel involved with the drilling operation will be outfitted with personal flotation devices while on the tender boat and barge. Emergency floatation rings with retrieval lines and 20-lb fire extinguishers will be present on the marine plant and available at all times. The work boat will stay with the marine plant while the marine plant is occupied and be available for emergency response at all times.

3.10 WEATHER DAYS

In the event that weather and/or marine conditions result in dangerous working conditions, GZA will coordinate with the District's point of contact and issue a "weather day", as necessary. The most likely scenarios that would invoke a weather day include heavy rain, high winds, or thunderstorms. Any "weather day" event will be immediately supported with documentation of chronological data from on-site photographs, weather stations, buoy reports, or tidal stations. To the extent possible, the anticipated weather conditions will be monitored and discussed with the District point-of-contact daily to avoid working in dangerous conditions.

4.0 LABORATORY TESTING

GZA will engage GeoTesting Express of Acton, Massachusetts (an USACE approved rock testing laboratory) to perform rock mechanics testing for the project in accordance with the RFP. GZA will initially select rock core samples for testing. GZA will submit field boring logs marked up with proposed test intervals to the District for review and approval. GZA, in conjunction with the rock testing laboratory, will prepare a data report presenting, tabulating, and summarizing the rock mechanics testing results. Core specimens subjected to testing will be returned to the core box to the interval from which they came. Split core samples broken by strength testing will be taped together if necessary and returned to the rock core box prior to submission to the District.

5.0 REPORT OF EXPLORATIONS

GZA will prepare and submit a Portsmouth Harbor Report of Explorations in accordance with the requirements outlined in the RFP. The report will include a description of the field work including any deviations from the approved Work Plan. The report appendices will include weekly safety meeting logs, daily progress reports, field and final gINT boring logs, core photographs, laboratory test results and an exploration location figure. The results of the test borings will be included in a tabular format and will include pertinent information recorded during drilling.

The Report of Explorations will also include GZA's findings, conclusions, and recommendations relative to the rock removal for the project. GZA will use the information from the previous completed seismic survey data along with the test boring and laboratory testing as the basis for our assessment. As requested in the RFP, GZA will focus the report on rock removal options for the project, i.e. blasting vs. mechanical methods. Lastly, GZA will also evaluate the subsurface data gathered to date and provide recommendations, if needed, for additional explorations, if data gaps are identified, specifically with respect to the rock removal limits within the anticipated dredging limits.

GZA will provide the District with a draft version of the complete report in PDF format. The draft report will include the report text, figures, tables and appendices. GZA will incorporate one round of consolidated comments from the District prior to issuing the final report. The final report will be submitted in hard copy and electronic formats. The electronic files (both native files and the complete report in PDF format) will be provide on CD or DVD.

6.0 SUBMITTALS

The submittals that will be made by GZA to the District during execution of the work are listed below.

- Safety Meeting Logs (weekly)
- Field Boring Logs (weekly)
- Progress Reports (daily)
- Report of Explorations, including field and final boring logs, paper copies, and electronic versions (pdf of entire document, and all native files)
- Rock core (boxed) and soil/rock jar samples
- Rock Mechanics Testing Data Report(s)

7.0 SCHEDULE

GZA and NEBC will execute the work in accordance with the schedule shown on the attached Gantt chart, Figure 2. GZA and NEBC plan to complete the work on Monday through Friday, with planned departure and return times at the docking facility of 0700 and 1600, allowing for approximately 8 hours of drilling time per day. We do not plan to work on weekends. If modified hours are deemed appropriate during execution of the work based on progress or other factors, GZA will contact the District to request modifications.

8.0 RESPONSIBILITIES AND LINES OF AUTHORITY

8.1 RESPONSIBILITY

Any person onsite may shut down a site work operation that poses imminent danger or is immediately dangerous to life or health. When such precautions must be taken, the SSHS will be immediately notified and actions to remedy the situation will be implemented.

Please reference Table 3 for personnel contact information and Appendix G for personnel credentials and certifications.

8.2 PROJECT SAFETY

GZA's project safety procedures and protocols are described in the Accident Prevention Plan (APP).

TABLES

Table 1
Proposed Boring Plan Summary
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Boring Designation	Northing	Easting	Mudline El. (MLLW)	Acoustic Basement El. (MLLW)	Total Boring Depth (ft)	Estimated Soil Boring Depth (ft)	Estimated Core Depth (ft)
FD16-01	104,696	2,781,555	-14	-32	36	18	18
FD16-02	104,386	2,781,608	-11	-36	39	25	14
FD16-03	104,100	2,782,044	-4	-37	46	33	13
FD16-04	104,646	2,781,781	-16	-50	34	34	0
FD16-05	104,319	2,782,050	-16	-45	34	29	5
FD16-06	103,826	2,782,249	-15	-44	35	29	6
FD16-07	103,914	2,781,998	-10	-39	40	29	11
FD16-08	104,844	2,781,322	-16	-43	34	27	7
FD16-09	103,643	2,782,263	-10	-40	40	30	10
FD16-10	103,446	2,782,308	-14	-47	36	33	3

Notes:
1. See Figure 1 for boring locations.
2. Mudline El. estimated based on bathymetry data taken from Sheet V-101 and shown on Figure 1.
3.Acoustic Basement El. estimated based on data presented in OSI report.
4. Total boring depth calculated as mudline elevation minus -50 ft MLLW, max boring depth.
5. Estimated core depth calculated as acoustic basement elevation -50 ft MLLW.
6. Coordinates are listed in U.S. Feet and reference NAD 83, Maine State Plane West 2000.

Table 2
Proposed Laboratory Testing Summary
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Rock Laboratory Test	ASTM Standard	Number of Tests per Boring	Total Number of Tests
Elastic Moduli of Rock in Uniaxial Compression	D 7012D	1	10
Point Load Index of Rock - Axial	D 5731A	1	10
Point Load Index of Rock - Diametral	D 5731D	1	10
Splitting Tensile Test (Brazilian)	D 3967	1	10
Total Hardness (ISRM and Tarkoy)		1	10
CERCHAR Abrasivity Index	D 7625	1	10
Unit Weight of Rock	ISRM	1	10
Unit Weight, Porosity and Specific Gravity of Rock		1	10
Petrographic Analysis of Rock		1	10
Pulse Velocity	D 2845	1	10

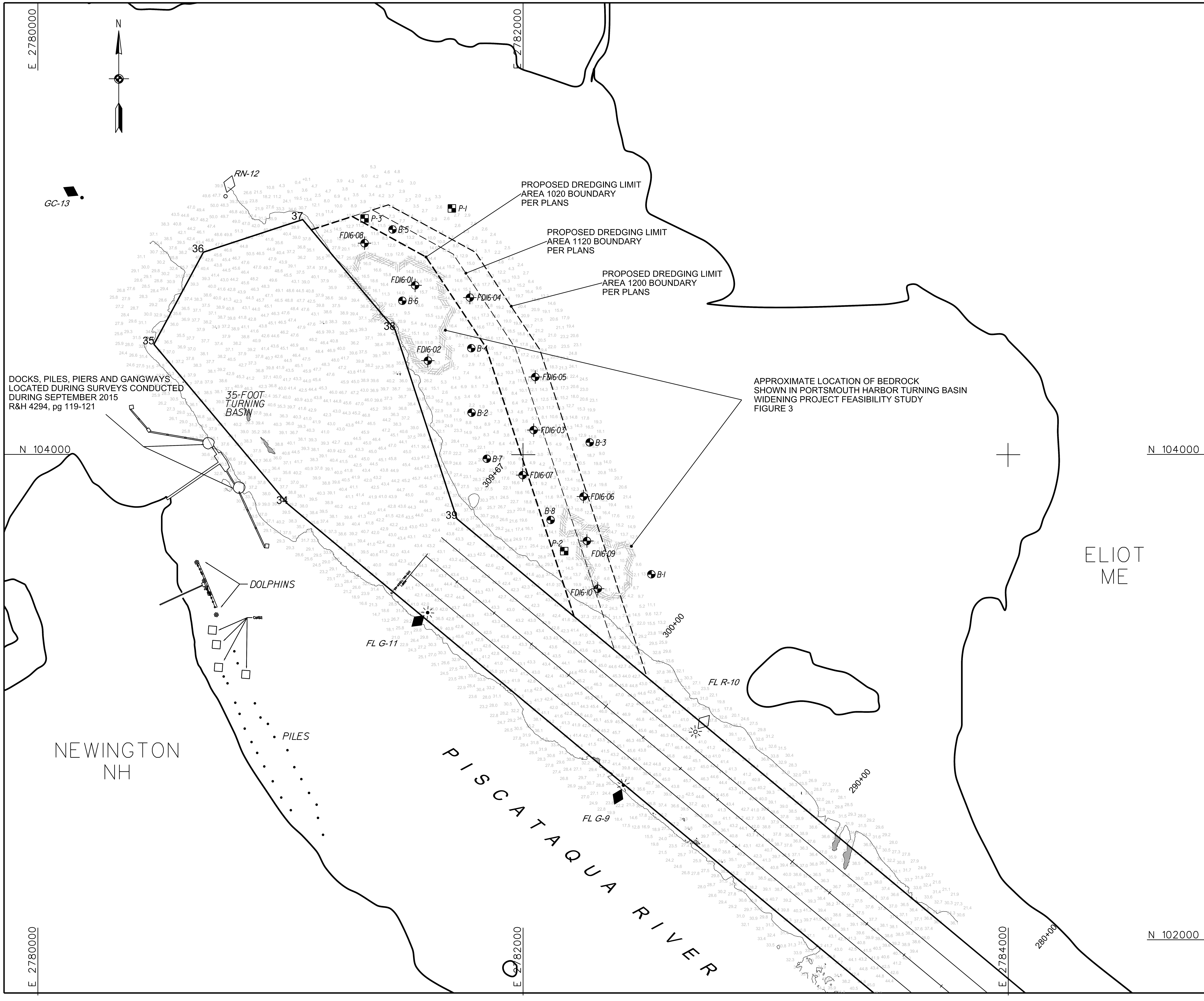
Notes:
1. If total sample recovery is inadequate to complete the full suite of tests for any boring,
GZA will assess testing that can be performed and advise the District on recommended test methods.
2. Testing will be conducted by GeoTesting Express in Acton, Massachusetts.

Table 3
Contact Information
Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH - Eliot, ME

Name	Company	Project Title/Role(s)	Phone Numbers	Email Address
Blaine Cardali	GZA	Field Engineer / Site Safety & Health Officer	207-751-3252 (c)	blaine.cardali@gza.com
Tanya Justham	GZA	Project Geologist	603-232-8765 (o) 603-493-1548 (c)	tanya.justham@gza.com
Joshua Szmyt	GZA	Alternate Field Engineer / SS&HO	603-232-8728 (o) 603-494-1713 (c)	joshua.szmyt@gza.com
Andrew Blaisdell	GZA	Task Manager	207-358-5117 (o) 207-232-8869 (c)	andrew.blaisdell@gza.com
Matthew Taylor	GZA	Project Manager	781-278-5803 (o) 781-686-3737 (c)	matthew.taylor@gza.com
Anders Bjarngard	GZA	Project Director	781-278-4802 (o) 781-760-6429 (c)	anders.bjarngard@gza.com
Steve Garside	NEBC	Manager	603-437-1610	SteveG@NHBoring.com
Sam Cooley	NEBC	Driller	603-828-6115 (c)	Unavailable
Stephen Potts	USACE NAE	Lead Geologist	978-318-8311 (o) 734-904-0646 (c)	stephen.potts@usace nae.com
Mark Dobday	GeoTesting	Rock Laboratory Manager	800-434-1062 (c)	mark.dobday@geotesting.com
Officer-in-Charge, Marine Inspection	U.S. Coast Guard 1st District	Officer-in-Charge, Marine Inspection	207-767-0320	Unavailable
Tracy Shattuck	Portsmouth Harbor	Chief Harbor Master	603-436-8500	t.shattuck@peasedev.org
Bert Condon	Portsmouth Harbor	Harbor Master	603-365-0507	Unavailable
Dick Delude	Portsmouth Harbor	Harbor Master	603-235-7332	Unavailable
David Oliver	GZA	Local Health and Safety Coordinator	(603) 315-4999 (c) (603) 232-8745 (o)	david.oliver@gza.com
Richard Ecord	GZA	Certified Safety Professional/ GZA H&S Director/SHM	(404) 234-2834 (c) (781) 278-3809 (o)	richard.ecord@gza.com

Notes:
(o) indicates office phone number, (c) indicates cell phone

FIGURES



GENERAL NOTES:

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILES "C-100.DGN" AND "PIS-2788 V-HP-MAS.DGN" PROVIDED TO GZA BY U.S.ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT.

2. APPROXIMATE LOCATIONS OF EXISTING BORINGS AND PROBES SHOWN IN PORTSMOUTH HARBOR TURNING BASIN WIDENING PROJECT FEASIBILITY STUDY, FIGURE 3.

3. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF THE PROPOSED BORINGS, PREVOUS BORINGS, AND PREVIOUS PROBES IN RELATION TO THE SUBJECT SITE. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

FDI6-10	Location of proposed boring
P-3	Approximate location of previously conducted Probe
B-8	Approximate location of previously conducted Boring
21.0	Mudline spot elevation from bathymetric survey, feet below Mean Lower Low Water datum (MLLW)

GRAPHIC SCALE:

200 0 200 400

NO.	ISSUE/DESCRIPTION	BY	DATE
0	Rev. 1 Work Plan	NVW	6/7/16

PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER SUBSURFACE INVESTIGATION
NEWINGTON, NH & ELIOT, ME

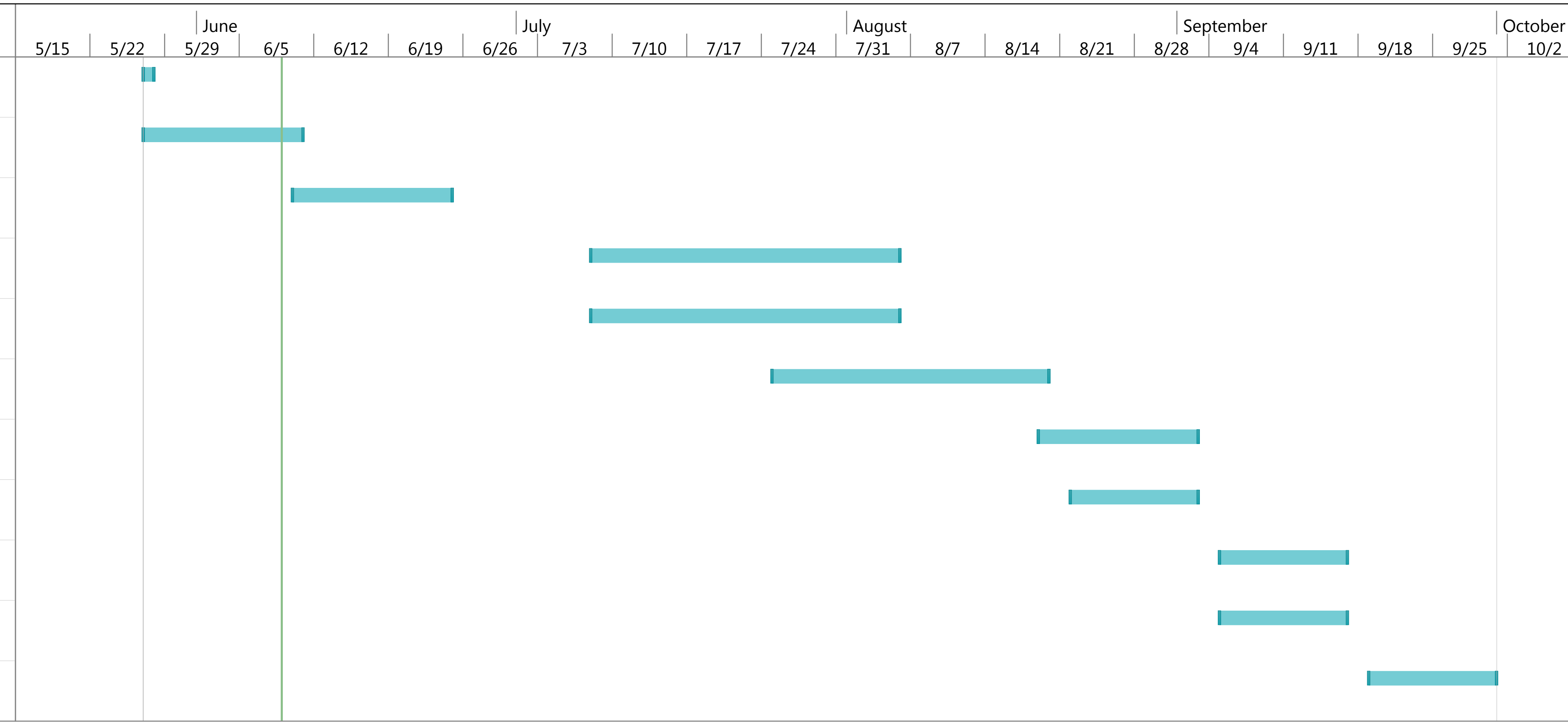
PROPOSED BORING LOCATION PLAN

PREPARED BY:	PREPARED FOR:
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT

PROJ MGR: ARB	REVIEWED BY: ARB	CHECKED BY: MAT	FIGURE
DESIGNED BY: NVW	DRAWN BY: NVW	SCALE: 200	1
DATE: JUNE 2016	PROJECT NO. 09.0025912.00	REVISION NO. 0	SHEET NO. 1 OF 1

Work Plan Schedule

ID	Task Name	Duration	Start	Finish
1	Submit Work Plan, Tidal Correction Plan, and Accident Prevention Plan	1 day	Fri 5/27/16	Fri 5/27/16
2	Government Review of Submittal Items	11 days	Fri 5/27/16	Fri 6/10/16
3	Incorporate NAE Review comments, and Submit Finalized Plans	11 days	Fri 6/10/16	Fri 6/24/16
4	Mobilize and complete Test Borings	21 days	Fri 7/8/16	Fri 8/5/16
5	Daily Progress Reports, Weekly Safety Briefing Records, Field Boring Logs	21 days	Fri 7/8/16	Fri 8/5/16
6	Draft Report of Boring Explorations	20 days	Mon 7/25/16	Fri 8/19/16
9	Draft Data Report of Rock Mechanics Testing	11 days	Fri 8/19/16	Fri 9/2/16
7	Government Review of Boring Report	10 days	Mon 8/22/16	Fri 9/2/16
8	Final Report of Boring Explorations	10 days	Mon 9/5/16	Fri 9/16/16
10	Government Review of Lab Report	10 days	Mon 9/5/16	Fri 9/16/16
11	Final Report of Rock Mechanics - Lab Testing	10 days	Mon 9/19/16	Fri 9/30/16



Project: FIGURE 2
Date: June 10, 2016

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

GZA GeoEnvironmental, Inc.

APPENDIX A

Statement of Work

Section C - Descriptions and Specifications

STATEMENT OF WORK
SUBSURFACE EXPLORATIONS

PORTSMOUTH HARBOR TURNING BASIN AND
PISCATAQUA RIVER
SUBSURFACE INVESTIGATION
NEWINGTON, NEW HAMPSHIRE AND ELIOT, MAINE

CONTRACT NO. W912WJ-16-D-0003
REQUEST FOR PROPOSAL
2 February 2016

PROJECT: Subsurface Drilling Investigation for Subsurface Characterization

SITE: Portsmouth Harbor Federal Navigation Project– Turning Basin, Newington, New Hampshire and Eliot, Maine.

PURPOSE: The US Army Corps of Engineers New England District (NAE) is conducting a subsurface drilling investigation in specific areas of the Federal navigation channel. The channel turning basin will be widened to the existing authorized channel depth (-35 ft MLLW) as the result of a Chief of Engineers report on improvement to Portsmouth Harbor.

The objectives of the marine subsurface drilling investigation are to characterize sediment and collect bedrock cores to evaluate the density, strength, and other properties of bedrock and sediment and characterize those materials that will require pre-treatment blasting versus those that can be removed by mechanical methods. This is a high priority project for the District, and rock core borings are required as soon as feasible, in order to facilitate coordination with regulatory agencies regarding blasting and to determine the appropriate removal methods in support of preparation of plans and specifications for a contract solicitation for dredging and rock removal as soon as possible.

1. CONTRACT TASKS

This is a firm fixed price contract. The cost proposal for the A/E services contract proposal shall contain estimates for the following tasks and the work breakdown should be structured as follows:

<u>BASE:</u>

TASK 1 - Work Plan, Tidal Correction Plan, Accident Prevention Plan (APP), and Activity Hazard Analysis (AHA)
TASK 2 - Drilling Mobilization/Demobilization
TASK 3 - Portsmouth Harbor Borings

TASK 4 - Rock Mechanics Testing & Data Report
TASK 5 – Portsmouth Harbor Report of Explorations

Optional Tasks
TASK 3.A – Additional Boring
TASK 4.A – Additional Rock Mechanics Testing
TASK 6 - Weather Day

Tasks and Options are described in detail below.

TASK 1 – WORK PLAN, TIDAL CORRECTION PLAN, ACCIDENT PREVENTION PLAN (APP), AND ACTIVITY HAZARD ANALYSIS

a. Work Plan

The Work Plan shall address the marine boring program and describe all procedures, personnel, subcontractors, proposed methods, proposed equipment, proposed field boring log form, and final boring log format, and general sequence of work. Marine plant shall be sufficiently sized and equipped to provide a safe and stable work platform considering the water depths and tidal range at the site. The work plan shall include a description of the proposed marine plant and personnel qualifications.

Water depths in the area to be widened adjacent to the existing turning basin typically range from a minimum of approximately 2 ft at low tide (MLLW) to approximately 10 ft at high tide. Water depths in the Federal Channel turning basin typically range from a minimum of 35 ft at low tide (MLLW) to approximately 43 ft at high tide. The area is subject to a mean tidal range of about 7 to 9 feet. Fairly swift currents of up to 5 knots occur in the Piscataqua River. The Contractor is responsible for identifying the range of depths throughout the project and shall provide the necessary equipment (e.g. liftboat or jack-up barge) and plan his operations to accommodate this range of conditions.

The Contractor shall obtain all necessary clearances, state and local permits. Permits for drilling work in Portsmouth Harbor have not been required in the past. The Contractor is responsible for coordinating all aspects of the work, making necessary port and docking arrangements, and coordinating in advance with the Coast Guard and Harbor Master.

The borings are located within a Federal government maintained navigation channel and rights-of-entry are not required. Portsmouth Harbor channels are mainly used by deep draft commercial vessels, fishing vessels, and numerous small recreation and commercial craft, which may cause some interference with contract operations. The Contractor will be required to conduct the work in such a manner as to obstruct navigation as little as possible, and in the event the Contractor's plant so obstructs the channel as to make difficult or endanger the passage of any vessels, the plant shall be promptly moved on the approach of any vessel to such an extent as may be necessary to afford a practicable passage. Moving of contractor plant may also be based on the determination of the docking pilot if vessel traffic requires it. The contractor is required to perform the work from a marine/floating plant and make all required notifications. The Contractor shall make his own investigations of limitations of access and docking or launching facilities to be used by the Contractor to complete the work. In addition to Dig Safe Systems, Inc., the Contractor shall also contact: Public Service Company of New Hampshire, Eversource, Unitil/Northern Utilities, Central Maine Power, FairPoint Communications, Comcast, Verizon, and Municipal Sewer and Water Departments to determine location of utilities under that portion of the Federal Channel and Turning Basin.

The Contractor shall describe the methods for accurately finding and determining drilling locations horizontally with sub-meter accuracy, and for achieving vertical accuracy in the measurement of exploration depths. Drilling depths shall be accurate to +/- 6 inches.

b. Tidal Correction Plan

The Contractor shall develop a written plan describing the procedures to be used to determine boring depths and tidal corrections and shall submit this plan to NAE for approval prior to field work. Contractor shall explain how tidal corrections will be made. Differential GPS methods and tide boards are required for this project. NAE already has some tide boards established in the area that the Contractor may use for this purpose.

c. Accident Prevention Plan (APP)

See Attachment A for the Minimum Outline for an Accident Prevention Plan.

The Contractor shall prepare an Accident Prevention Plan (APP) specific to the activities being performed. It shall include an Activity Hazard Analysis as described below. All field work, including mobilization and demobilization, shall be conducted in accordance with the final approved APP and AHA, the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1, 2008), and all applicable federal, state, and local safety and health requirements. The APP shall be approved prior to any fieldwork being performed.

The APP shall detail how safety and health will be managed during the project. The APP shall address the requirements of applicable Federal, State and local safety and health laws, rules, and regulations. The Contractor shall comply with Federal Acquisition Regulation Clause No. 52.236-13 for Accident Prevention, which is added by reference. Special attention shall focus on the requirements of the US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1 (2008) specifically Appendix A, (Minimum Basic Outline for Accident Prevention Plan), and Section 01.A.11 through 01.A.13, and Figure 1-1 (Activity Hazard Analysis (AHA)). Work shall not proceed until the APP has been reviewed by the Corps Safety Manager and accepted by the Contracting Officer Representative.

The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

All personnel, especially those operating the marine plant, shall be experienced and possess all licenses and permits needed. The Plan shall include a description of the marine plant and crew, and shall provide documentation that the plant and crew meet all safety requirements, including any inspections or certification of the vessels required by the Coast Guard. Even if a vessel is exempt from Coast Guard inspection, NAE requires a current vessel inspection report be provided in the Accident Prevention Plan.
Also, any manufacturer's information regarding stability and operating restrictions for the floating plant shall be included in the APP. The Lead Contractor shall ensure that the requirements of EM 385-1-1, Section 19 are followed in regards to marine vessel operations and safety.

The marine plant shall be operated by personnel with sufficient marine experience. Submittal shall include a resume of the vessel operator's experience for approval by USACE. Even if a captain's license is not required to operate the vessel or marine plant, the contractor must still comply with the boat operators training requirements of the regulations and at a minimum meet the requirements of EM 385-1-1 and applicable State Standards. The lead vessel operator shall be placed in charge of ensuring all marine safety precautions are followed. The operator shall be required to monitor and log all weather conditions obtained through radio broadcasts throughout the day. The Lead Contractor shall provide a Site Safety and Health Officer (SSHO), to ensure that the APP is followed. The APP submittal shall include the qualifications of the SSHO for USACE approval. The SSHO qualifications shall include the following: Demonstrated work on similar projects; 10-hour OSHA construction safety class or equivalent within last 5 years; and documented experience conducting drilling and rock coring on marine plant. The Lead Contractor's geologist inspector may serve as the SSHO, however, the SSHO designated by the contractor must be present at the work site at all times

The APP shall detail safe access and egress methods for any type of marine plant used in the work. Safe access and egress shall be maintained for all tide elevations. A Severe Weather Plan shall be submitted, and shall include means and methods of protecting personnel and equipment when severe weather is forecast.

In addition, the Contractor shall conduct a safety meeting at the project site on the first day of work. Thereafter, safety briefings shall be held weekly; records of the safety briefings shall be submitted weekly. The inspector shall document all safety meetings on a copy of the safety meeting form, attached.

d. Activity Hazard Analysis (AHA):

An Activity Hazard Analysis shall be submitted for each major phase of work. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform. The analysis shall define all activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted by the Contracting Officer and a preparatory meeting has been conducted by the contractor to discuss its contents with all engaged in the activities, including the Contractor, subcontractor(s), and Government on-site representatives. The Activity Hazard Analysis shall be continuously reviewed and when appropriate modified to address changing site conditions or operations.

e. Accident Reporting:

All accidents and near misses shall be investigated by the Contractor. All work related recordable injuries, illness and property damage accidents (excluding on-the-road vehicle accidents), in which the property damage exceeds $5,000.00 shall be verbally reported to the Contracting Officer's Representative within 48 hours of the incident and ENG Form 3394 shall be completed and submitted to the NAE Safety Manager within six working days of the incident.

TASK 2 – MOBILIZATION/DEMOBILIZATION

The maximum dredge depth being considered is –39 MLLW (-35 MLLW authorized depth, plus 2 feet required overdredge, plus 2 feet allowable overdredge), the exploration program should be geared to acquire high-quality data to –50 MLLW.

Contractor shall plan, coordinate, prepare, procure, supply and mobilize to the project site the necessary resources to meet the contract requirements, including all marine drilling plant and support vessels, pilots, operators and crew, drill rig, drill crew, geologist, supplies, and equipment capable of performing the work scoped in the exposed marine conditions of the outer navigation channels.

The Contractor is responsible for making all Notices to Mariners, and coordinating with the Coast Guard and Harbor Master.

Before beginning operations, the Contractor shall coordinate with the U.S. Coast Guard to issue a "Notice to Mariners" regarding the Contractor's operations. The U.S. Coast Guard point-of-contact for this project is as follows:

The U.S. Coast Guard point-of-contact for this project is as follows:
Officer-in-Charge, Marine Inspection
U.S. Coast Guard First District
Sector Northern New England
259 High Street
South Portland, ME 04106
Telephone: 207-767-0320

The Portsmouth Harbor, Harbormaster is:
Tracy Shattuck- Chief Harbor Master
Bert Condon – Harbor Master (603-365-0507)
Dick Delude- Harbor Master (603-235-7332)
555 Market Street
Portsmouth, NH 03801
Telephone: 603-436-8500
Email: t.shattuck@peasedev.org

TASK 3 – PORTSMOUTH HARBOR BORINGS

Project Background:

The existing Federal Navigation Project for Portsmouth Harbor and Piscataqua River consists of a 6.2 mile long navigation channel that is 35 feet deep (MLLW) and a minimum of 400 feet wide. It extends from the river's mouth at New Castle, New Hampshire and Kittery Maine to the head of the deep-draft navigation at Newington, New Hampshire and Eliot, Maine.

According to the Feasibility Study, approximately 728,100 cubic yards of sand and gravel and 25,300 cubic yards of rock are anticipated to be removed during the widening of the Upper Turning Basin from 800 ft wide to 1200 ft wide.

Portsmouth Harbor has undergone numerous phases of maintenance and improvement dredging, deepening, and widening since its establishment as a major port in the northeast.

A Feasibility Study, completed in July 2014, examined the alternatives for further improvements to navigation.

Previous investigations to support this study include:

- 2008 Marine Geophysics (seismic reflection)
- 2007 Subsurface Explorations (borings and probes)

Relevant portions of these reports will be provided to the Contractor separately, with this Request for Proposal.

The current bathymetric survey will be provided to the Contractor, both as pdf files and MicroStation files. The bathymetric survey will include the limits of the deepening Project and shallow areas of interest within the Project that will be required to be dredged. Sidescan sonar images will be provided as pdf files.

Base Maps. The Corps will provide (1) electronic files of the most recent condition survey plans for the areas being studied in/along the Portsmouth Harbor Channel on the USACE web page, (2) HYPACK electronic files containing the bathymetric data for the proposed dredge study areas, and (3) existing information regarding areas of known bedrock, encountered during previous maintenance dredging.

Site Conditions: Water depth in the area of the borings is typically ranges from approximately 2 to 40 feet, and the area is subject to an average tide range of about 7 to 9 feet.

Vertical Datum: The datum for this project is Mean Lower Low Water (MLLW) and shall be the vertical datum from which all depths and elevations are measured. In the scope, depths below MLLW are shown, and therefore negative signs are not used, but it should be understood that where an elevation is referenced to MLLW, the elevation would in fact be negative. All contractor records and submittals shall show the negative sign where elevations are referenced to MLLW. Where depths below MLLW are used, the negative sign shall be left off.

Horizontal Coordinate System: All field work and submittals shall reference and report horizontal locations using the Maine West State Plane and NAD 1983.

The geotechnical engineering services to be performed under this task are listed below, and described in greater detail in subsequent sections:

a. Drill and sample borings, and collect and log bedrock core. Save samples of all materials and deliver to a Corps' approved laboratory for rock mechanics testing.
b. Produce field logs of the borings (handwritten, typed, and corrected), including drilling observations, boring coordinates and bottom elevations, and field classifications for all soils and rock encountered.

Contractor's schedule and effort shall include reasonable time for vessel traffic, set-up, etc. Contractor shall sequence executable work to minimize potential for downtime or delay where weather will be a limiting factor. Contractor shall coordinate work schedule around incoming/departing ship schedules including tankers and ships, and any associated security requirements that may impact operations.

Drilling, Sampling, and Logging

a. Datum, Coordinate System, Units: All field work and submittals shall reference and report horizontal locations using the Maine West State Plane and NAD 1983. Vertical datum will be the Mean Lower Low Water (MLLW) vertical datum. Measurements shall be made in feet, and tenths of feet.

b. Survey of Locations: Actual boring locations shall be measured in the field by the Contractor, using Differential RTK GPS survey equipment, in such a way that sub-meter accuracy is achieved horizontally, and vertical accuracy is +/- 6 inches.

c. Boring Locations:

   Identify up to 20 boring locations. Under the base task order, the scope shall include the performance of 3 borings. It is the Government's intent that additional borings totaling up to approximately 10 may be added to the scope by exercising Optional Task 3.A. All boring locations shall be approved by USACE considering the Contractor's recommendations in order to provide adequate horizontal spatial coverage in areas with likely shallow bedrock. Coordinates will be specified in Maine West State Plane, NAD 1983.

Portsmouth Harbor Boring Locations

d. Positional Accuracy: Contractor shall position and set up the plant in such a way that actual field drilling locations are within 20 feet of the location coordinates proposed by the Contractor and approved by NAE. Actual boring location coordinates shall be recorded on the logs and also tabulated separately in the report. NAE's Survey Unit may be consulted for any supplemental site survey information. Corps survey contacts can be reached at 978-318-8526.

e. Boring Depth: Borings shall extend to an elevation at least -50 ft MLLW or deeper. If bedrock is encountered above -50 ft MLLW, ten (10) feet of bedrock core shall be collected at each location. The Contractor shall maintain on-site all materials, equipment, and personnel required to perform rock coring as described herein.

f. Drilling Qualifications: Contractor shall provide all labor, materials, and equipment necessary to complete the specified subsurface explorations and sampling. The Contractor shall provide well maintained and calibrated drilling and sampling equipment, and a qualified crew and driller experienced in all phases of exploration drilling, sampling, and test methods for engineering purposes. The driller shall have at least five years drilling experience using spun and drive casing, rock coring, and roller bit and wash boring methods in the North Atlantic region, and shall have a minimum of 5 years of experience operating from marine or floating plant. Resumes of the drillers shall be submitted with the contractor's proposal.

g. Drilling Inspector Qualifications: The Contractor shall provide a drilling inspector who is trained as a geologist. The inspector shall be knowledgeable in the local bedrock geology, description and classification of bedrock core, visual soil classification methods of ASTM D 2488, in the Unified Soil Classification System of ASTM D 2487, in the general drilling procedures to be used for this project, rock coring in accordance with ASTM D 2113, and in the performance of subsurface drilling operations and rock coring from a marine plant. The inspector shall have at least 5 years of experience in this type of work. Resume(s) of the drilling inspector(s) shall be submitted with the contractor's proposal. The inspector shall perform field inspection, develop field exploration logs, classify samples, perform quality control, record the daily operations of the drill crew, and perform other recording and coordination duties as required including a daily safety meeting. The inspector shall have no other duties other than the inspection work described. No member of the drilling crew shall perform the inspection function in addition to their drilling crew duties. No drilling work or other field work of this project, other than mobilization and demobilization, shall be performed in the absence of the inspector. The inspector shall be NAE's primary point-of-contact for this project. The Contractor shall provide the inspector with a cellular telephone or equal means of communication so that contact with NAE is possible during all work hours.

h. Casing: All borings shall use 4-inch minimum diameter steel casing, and casing shall be seated into the top of bedrock sufficiently to allow rock coring, but no deeper than necessary, in order to ensure collection of rock from the uppermost zone of bedrock.

i. Rock Coring: Rock coring shall be performed using an NX or NQ-size double-tube swivel type 5-foot core barrel, in accordance with procedures in ASTM D 2113. Rock coring operations shall be conducted in a way to maintain integrity of core, minimize disturbance and breakage from coring operations, and maximize recovery. Use of wireline methods, NQ-size, and split core barrels is preferred.

j. Minimum Acceptable Recovery: For each boring, a minimum of 80% core recovery is required. Borings with core recoveries of less than 80% shall be offset and re-drilled. If the second attempt also recovers less than 80%, then the boring will be accepted as complete, and no further attempts will be required.

k. Bedrock Core Logging and Documentation: Bedrock core shall be logged, in terms of rock type, hardness, structure, degree of weathering, mineralization, discontinuities (angle of inclination measured from horizontal, planarity, roughness, aperture, infillings, coatings, mineralization, etc.). Percent recovery and Rock Quality Designation (RQD) shall be calculated in the field and recorded on the boring logs. Mechanical breaks shall be noted both on the core and on the logs. Core shall be marked with vertical stripes to allow pieces to be replaced in proper orientation. Core shall be securely placed in sturdy, wooden, or equivalent, core box, and boring number, date, core run numbers, recovery, and RQD shall be recorded on the attached core box cover. Wet core shall be photographed, to include the information on the core box cover, and a scale. Spacers, such as wooden blocks, shall be used to mark between core runs, zones of core loss, and to secure the core against shifting during transport. The procedures of ASTM D 5079 for the preservation and transportation of core samples shall be followed.

l. Field Boring Logs: The drilling inspector assigned to this project shall keep detailed field logs of the borings. Logs shall be filled out on a daily basis such that each day of drilling activity is fully recorded at the end of work for that day. The field logs shall be produced using the Corps form (ENG Form 1836 and 1836-A) to be provided separately, or one proposed by the Contractor in the work plan and approved by NAE. Field boring logs shall have a minimum scale of one inch equals one foot, to allow sufficient room for material descriptions. Field logs shall be completely filled out in the field, at the time of drilling and sampling, with classifications, drilling observations, the start and finish clock times for each core run, drill times (minutes per ft), and drill fluid losses. Logs shall include at a minimum: dates, boring numbers, location, driller and inspector names, drilling details and methods used, and listed by depth, sample number, core run number, classifications (including ASTM descriptions, moisture levels, color, density, estimated percentage of major and minor components), strata breaks, blow count data for sample and casing drives, casing depths, sample recoveries, and other pertinent details of the drilling operations. The inspector shall also record coring bit type and condition. During rock coring the inspector shall record rig operations (down pressure, wash water pressure, core barrel rotation), coring rate (minutes per foot), and drilling observations (rough drilling, chatter, rod drops, drill fluid, etc.) and any drilling fluid loss, location and quantity. The Contractor shall record depth information on the boring logs so that the 0.0-foot depth coincides with the channel bottom; corrections for water depth, tidal fluctuations, and measurements in the field shall be performed to accomplish this. Contractor shall record the clock time at the start of and completion of each core run, so that tide level can be determined from the nearest tide gauge, as a back-up to other methods, to confirm water elevation at the time of drilling. All final elevations on the logs shall be in MLLW. All field logs and records shall be preserved in good reproducible condition and shall be available for examination by the NAE Representative throughout the field work. Separate detailed field logs shall be made for each exploration.

m. Field Submissions: Copies of the field boring logs shall be submitted to NAE on a weekly basis. In addition to the field logs, a short narrative shall be written by the inspector describing each day's activities as related to actions taken and work completed. These Progress Reports shall be submitted daily to NAE, via e-mail or FAX. Copies of the daily written Progress Reports shall be included in the Report of Explorations.

n. Where overburden is found to be present overlying bedrock, then continuous soil sampling methods shall be used to sample the material until bedrock is reached. Total depth of the boring shall still be that needed to reach elevation at least -50 ft MLLW. Soil sampling shall be in accordance with Standard Penetration Test (SPT) procedures as specified in ASTM D 1586, except that a 300-pound hammer, an 18-inch drop, and a 2.5-inch inside diameter split sampling spoon shall be used due to the anticipated soil conditions. Visual classification of soil samples retrieved from the sampling spoon shall be performed by the drilling inspector in accordance with ASTM D 2488 and the Unified Soil Classification System. Refusal of the sampling spoon for the purposes of this project is defined as 100 blows per 6 inches of penetration, or bouncing refusal. Bedrock shall be cored upon reaching refusal.

o. Rotary auger and Odex drilling methods are not permitted on this project. All borings shall be advanced by roller bitting and wash methods and rock coring, as appropriate.

p. <u>Samples</u>: The Contractor shall save and label representative samples of each material encountered while sampling. The Contractor shall supply all sample jars, labels, and core boxes required for the preservation of samples. Core boxes shall be constructed of lumber or plywood with operating latches and shall be labeled properly. Material shall be collected in 8 oz. minimum jars or in sufficient quantity to allow performance of subsequent laboratory soil tests, including grain size analysis and hydrometer tests. All jar samples shall have the boring and sample identification written on both the lid and a label on the side of the jar, using indelible ink pen or marker. All samples shall be delivered to Corps' approved laboratory (to be identified prior to Notice to Proceed). For planning purposes, Contractor shall assume the Corps' approved laboratory is located in Acton, MA.

q. The Contractor shall keep on the job sufficient marine plant, support vessels, and equipment to meet the requirements of the work. The marine plant shall be made available prior to the Notice to Proceed such that it can be inspected by an NAE representative for quality assurance activities. The marine plant and equipment shall be in satisfactory operating condition and be capable of safely and efficiently performing the work in the depths of water defined above. The floating plant and equipment shall be subject to inspection by NAE at all times. No reduction in the capacity of the marine plant and equipment employed on the work shall be made except by written permission of the Contracting Officer. Prior to commencement of work at the site, the Contractor shall make available to NAE for review copies of all applicable inspections and certifications of marine plant and equipment as required by EM 385-1-1, the U.S. Army Corps of Engineers Safety and Health Requirements Manual, as well as Federal, State and local laws and regulations.

OPTIONAL **TASK 3.A - ADDITIONAL BORING**

The Contractor shall install one additional boring pursuant to the requirements cited in Task 3. It is also understood that these borings shall be exercised (if required) in sufficient time so that they may be performed before the commencement of the Task 3 drilling operations.

This optional task is multi-executable up to 7 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

TASK 4 – ROCK MECHANICS TESTING & DATA REPORT

The field inspector shall assess bedrock cores for rock mechanics testing throughout the course of the drilling work, and select intervals for testing during the field program.

The following rock mechanic tests shall be performed on bedrock core from each boring location:

TEST	Number per Core Location	Total Number of Tests
Unconfined Compressive Strength w/ Young's Modulus (ASTM D7012, Method D, and ASTM D 3148; core preparation by ASTM D 4543)	1	3
Point Load Index (ASTM D 5731)	1	3
Splitting Tensile Strength (Brazilian)(ASTM D 3967)	1	3
Total Hardness	1	3
Cerchar Abrasivity Index (CAI) (ASTM D7625-10)	1	3
Unit Weight & Classification	1	3
Petrographic Analysis (ISRM procedures)	1	3
Acoustic Velocity	1	3

Rock mechanics testing shall be conducted at a Corps' approved laboratory. As part of the proposal the contractor shall identify the proposed laboratory for the testing.

Contractor shall select proposed test intervals by submitting to the Corps for approval boring logs marked up with proposed test intervals. Core specimens subjected to testing shall be returned to the core box to the interval from which they came. Split core samples broken by strength testing shall be taped together if necessary. Upon completion of testing, Contractor shall return all rock core boxes to the NAE core storage building at Fort Devens, Devens, MA. Address will be provided to Contractor prior to NTP.

Report: Contractor shall prepare a data report presenting, tabulating, and summarizing the rock mechanics testing results.

OPTIONAL TASK 4.A – ADDITIONAL ROCK MECHANICS TESTING

The Contractor shall perform one additional rock mechanic testing pursuant to the requirements cited in Task 4.It is also understood that these tests shall be exercised (if required) in sufficient time so that they may be performed before the commencement of the Task 4 laboratory operations.

This optional task is multi-executable up to 7 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

TASK 5 – PORTSMOUTH HARBOR REPORT OF EXPLORATIONS

Contractor shall prepare and submit Report of Explorations, presenting and summarizing the field effort, and any deviations from the Work Plan. Report shall include Weekly Safety Meeting logs, Daily Progress Reports, final checked boring logs, and a tabulation of actual (GPS surveyed) boring locations, elevations of channel bottom, depth drilled, completion depth and elevation of each boring location, length of rock cored, % recovery, RQDs, photographs of cores, and a figure showing the actual boring locations.

Final electronic typed logs shall be generated in gINT v.8, or another equivalent software program. If gINT is used, the Corps will provide the data template and libraries. Electronic files shall be provided to NAE upon completion.

In this report, Contractor shall use the findings from the previous seismic survey, rock mechanics testing, and boring program to evaluate and make recommendations regarding the appropriate rock removal methods required for each location, specifically whether the rock at each location requires blasting, or if it can be removed by other mechanical means (ripper, hydraulic percussive methods, such as a hoe ram, etc.).

The final submission shall be submitted in both electronic and paper versions. The electronic version shall be submitted on computer disk (CD or DVD), or external hard drive, and shall include all drawings, tables, graphs, and text, as appropriate. The storage media shall be clearly labeled with the file name and description in an orderly fashion. The storage media shall include the individual electronic native files (Word, Excel, MicroStation, gINT, etc.) All text files shall be done in Microsoft Word. In addition, an electronic version shall be submitted as one consolidated file in PDF format (Adobe Acrobat, most current version), including scanned copies of the original field logs.

OPTIONAL **TASK 6 - WEATHER DAY**

Weather Day Option includes the costs associated with marine plant and personnel in a non-working mode on a day due to weather conditions making it infeasible and/or unsafe to perform required work.

One weather day option will be exercised and awarded prior to mobilization. Weather days not required, will be de-obligated, and the contract reduced by the contract option amount not used. Contractor must telephone the Corps (Dr. Stephen S. Potts at 978-318-8311) immediately when weather conditions prohibit work, obtain approval for use of a Weather Day, and follow up with a submittal formally documenting the conditions when weather made water work unsafe and/or infeasible.

This optional task is multi-executable up to 3 times, and the price will be valid for a period of one (1) year from notice to proceed of this task order.

2. SUBMITTALS

Submittals and their requirements have been described under the individual tasks and options, and are summarized below:

- Work Plan
- Tidal Corrections Plan
- Accident Prevention Plan (including AHA)
- Safety Meeting Logs (weekly)
- Field Boring Logs (weekly)
- Progress Reports (daily)
- Report of Explorations, including field and final boring logs, paper copies, and electronic versions (pdf of entire document, and all native files)
- Rock core (boxed) and soil/rock jar samples
- Rock Mechanics Testing Data Report(s)

All Government-furnished material (references, reports, data, etc.) provided shall be returned with the Final Report.

All submittals (with the exception of the rock core) to the Government shall be directed to the U. S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, Massachusetts 01742-2751, Attn: Dr. Stephen S. Potts. Rock core selected for testing shall be delivered to a Corps' approved rock mechanics testing laboratory (e.g. Acton, MA or Totowa, NJ). The rock core shall be delivered to the Corps' rock core storage area at Fort Devens, Devens, MA, at the completion of the project.

3. COORDINATION

All field activities and site visits, as appropriate for this project, shall be coordinated by telephone at least five days prior to actual commencement of work with Dr. Stephen S. Potts (978-318-8311). At a minimum, during the progress of the field work, the Contractor's inspector shall coordinate with NAE prior to the start of drilling work for each boring, at the completion of each boring, and when any difficulties or questions arise requiring NAE input.

4. QUALITY CONTROL

The Contractor is responsible for the quality of the submittals. The Contractor shall review each submittal for its completeness, elimination of all conflicts, errors, and omissions, and the overall professional and technical accuracy of the submission. It is emphasized that the work must be prosecuted using proper internal controls and review procedures. Documents, which are deficient in any of the areas stated herein, shall be returned for correction or upgrading, as determined by NAE, prior to completion of the NAE review. Contract submission dates shall not be extended if a resubmission of material is required due to a submission being deficient.

The Contractor shall state in writing, in the fee proposal letter, that he is cognizant of the requirements herein, and that the firm, and its associates, if any, have the professional competency and technical expertise necessary to accomplish this project.

5. COMPLETION SCHEDULE

The Contractor shall execute work in accordance with the following schedule:

TASK	No. of Copies	Due Date
Submit Work Plan, Tidal Correction Plan, and Accident Prevention Plan	3	Within 14 calendar days of Notice to Proceed (NTP)
Government Review		Within 14 calendar days of receiving the submittal.
Incorporate NAE Review comments, and Submit Finalized Plans	3	Within 14 calendar days of Receipt of NAE comments on Draft
Mobilize and start field borings		Within 14 calendar days of NAE approval of boring locations
Daily Progress Reports and Weekly Safety Briefing Records and Field Boring Logs		Duration of and Field Boring Work
Complete Boring Field Work		Within 30 calendar days of start
Draft Report of Boring Explorations	3	Within 14 calendar days of boring demob.
Government Review		Within 14 calendar days of receiving the submittal.
Final Report of Boring Explorations	3	Within 14 calendar days of Receipt of NAE comments on Draft
Draft Data Report of Rock Mechanics Testing	3	Within 30 calendar days of drilling demob.
Final Data Report of Rock Mechanics Testing	3	Within 14 calendar days of Receipt of NAE comments on Draft.

NAE will provide the contractor a set of draft comments. Any questions regarding NAE comments on Draft submittals shall be addressed to the appropriate Government reviewer and clarified before the final submittal is made. The Contractor shall prepare a transmittal cover letter when furnishing the final submittal for this project. The letter shall include a statement that all comments have been addressed and incorporated and all requirements have been met. If the final submittal does not address all comments it shall be returned to the Contractor for revision and resubmission at no additional expense to the Government.

6. REFERENCES

ASTM D 1586 (2011) Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

ASTM D 1587 (1994) Practice for Thin-Walled Tube Geotechnical Sampling of Soils.

ASTM D 2113 (2008) Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation

ASTM D 2487 (2011) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 2488 (2009a) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

ASTM D 3148 (2002 – Withdrawn 2005) Standard Test Method for Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression

ASTM D 3213 (2013) Standard Practices for Handling, Storing, and Preparing Soft Intact Marine Soil

ASTM D 3967 (2008) Standard Test Method for Splitting Tensile Strength of Intact Rock Core Specimens

ASTM D 4220-95 (2007) Standard Practices for Preserving and Transporting Soil Samples

ASTM D 4543 (2008) Standard Practices for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances

ASTM D 5079 (2008) Standard Practices for Preserving and Transporting Rock Core Samples

ASTM D 5434 (2012) Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock

ASTM D 5731 (2008) Standard Test Method for Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications

ASTM D 6032 (2008) Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core

ASTM D 7012 (2013) Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures

EM 385-1-1 (2008) U.S. Army Corps of Engineers Safety and Health Requirements Manual.

EM 1110-1-1804 (2001), Geotechnical Investigations Engineering Manual

ENG FORM 1836 (Mar 71), Drilling Log.

ENG FORM 1836-A (ER 1110-1-1801), Drilling Log (Cont Sheet).

FAR 52.236-13 Federal Acquisition Regulation for Accident Prevention

U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual, Second Edition, Volumes I and II, 1998, Reprinted 2001,

USACE guidance documents and forms can be found and downloaded from the following web site: www.usace.army.mil/library/

<u>USACE Portsmouth Harbor Reports</u>:

Final Feasibility Report and Final Environmental Assessment and FONSI for Navigation Improvement Project, Portsmouth Harbor and Piscataqua River, New Hampshire & Maine, US Army Corps of Engineers, New England District and NH Pease Development Authority-Division of Ports and Harbors, July, 2014.

Final Report, Marine Geophysical Investigation, Navigation Channel Improvement Project, Piscataqua River, Portsmouth New Hampshire, OSI Report No. 06ES102-NH, 17 September, 2008.

USACE Drilling Logs, 2007, BH-1 through BH-8 and P-1 through P-3.

ATTACHMENT A

MINIMUM BASIC OUTLINE FOR ACCIDENT PREVENTION PLAN

An accident prevention plan is a dynamic project specific safety and health policy and program document. The following areas are typically addressed in an accident prevention plan, but a plan will be **job-specific** and shall address any unusual or unique aspects of the project or activity for which it is written. The accident prevention plan shall interface with the employer's overall written safety and health program. Referenced sections of the employer's company General Safety Program, shall be included as appropriate.

1. SIGNATURE SHEET. Title, signature, and phone number of the following:
   a. plan preparer (corporate safety staff person, QC);
   b. plan approval, e.g. Certified Safety Professional or Certified Industrial Hygienist;
   c. plan concurrence (provide concurrence of other applicable corporate and project personnel (contractor), e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC as warranted.

2. BACKGROUND INFORMATION. List the following:
   a. contractor;
   b. contract number;
   c. project name;
   d. brief project description, description of work to be performed, and location (map);
   e. contractor accident experience (provide information such as EMR, OSHA 300 Forms, corporate safety trend analyses);
   f. listing of phases of work and hazardous activities requiring activity hazards analyses.

3. STATEMENT OF SAFETY AND HEALTH POLICY. (In addition to the corporate policy statement, a copy of the corporate safety program may provide a significant portion of the information required by the accident prevention plan).

4. RESPONSIBILITIES AND LINES OF AUTHORITIES.
   a. identification and accountability of personnel responsible for safety-at both corporate and project level (contracts specifically requiring safety or industrial hygiene personnel should include a copy of their resume - the District Safety and Occupational Health Office will review the qualifications for acceptance).
   b. lines of authority

5. SUBCONTRACTORS AND SUPPLIERS. Provide the following: .
   a. identification of subcontractors and suppliers (if known);
   b. means for controlling and coordinating subcontractors and suppliers;

c. safety responsibilities of subcontractors and suppliers. It should be noted that the Prime Contractor is responsible for ensuring that all subcontractors have the necessary written health and safety programs in place, have provided their employees with the necessary training, and subcontractors conduct their work in accordance with all relevant Occupational Health and Safety Standards which includes OSHA, USACE and ANSI at a minimum.

6. TRAINING.

a. list subjects to be discussed with employees in the safety indoctrination.
b. list mandatory training and certifications which are applicable to this project (e. g., U.S. Coast Guard Licensed Captain etc. and any requirements for periodic retraining/recertification.
c. identify requirements for emergency response training.
d. outline requirements (who attends, when given, and who will conduct etc,) for supervisory and employee safety meetings.

7. SAFETY AND HEALTH INSPECTION. Provide details on:

a. who will conduct safety inspections (e.g., project manager, safety professional, QC, supervisors, employees, etc.), when inspections will be conducted, how the inspections will be recorded, deficiency tracking system, follow-up procedures, etc;
b. any external inspections/certifications which may be required (e.g., Coast Guard).

8. SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE.

a. the company's written safety program goals, objectives, and accident experience goals for this contract should be provided.
b. a brief description of the company's safety incentive programs (if any) should be provided.
c. policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified.
d. provide written company procedures for holding managers and supervisors accountable for safety.

9. ACCIDENT REPORTING. The contractor shall identify who shall complete the following, how, and when:

a. exposure data (man-hours worked);
b. accident investigation, reports and logs;
c. immediate notification of major accidents.

10. MEDICAL SUPPORT. Outline on-site medical support and off-site medical arrangements.

11. PERSONAL PROTECTIVE EQUIPMENT. Outline procedures (who, when, how) for conducting hazard assessments and written certifications for use of personal protective equipment.

12. PLANS (PROGRAMS, PROCEDURES) REQUIRED BY THE SAFETY MANUAL (as applicable). Written plans and/or procedures addressing the following project specific items shall be included in the Contractor's Accident Prevention Plan. It is the Contractor's responsibility to review the entire list and provide the appropriate information. If an item is not applicable to the project then the Contractor shall note it as such with a statement of: "not applicable." For those items which are applicable to the project, the Contractor shall ensure that the information and standard operating procedures are applicable to the work which will be performed.

a. hazard communication program (01.B.04);
b. emergency response plans:
    - procedures and tests (01E.01)
    - spill plans (01.E.01, 06.A.02)
    - firefighting plan (01.E.01, 19.A.04)
    - posting of emergency telephone numbers (01.E.04)
c. health hazard control program (06.A.02);
d. hazardous energy control plan (12.A.07);
e. contingency plan for severe weather (19.A.03);
f. floating plant and marine activities (section 19)
g. personal protection equipment (section 5, especially 05.I).
h. plan for prevention of alcohol and drug abuse (Defense Federal Acquisition Regulation Supplement Subpart 252.223-7004, Drug-Free Work Force);

13. OTHER. The contractor shall also provide information on how he will meet the requirements of other major sections of EM 385-1-1, not identified in a-h above, in the accident prevention plan. Particular attention shall be paid to medical and first aid requirements, sanitation, personal protective equipment, fire prevention, machinery and mechanized equipment and thermal extremes as they may apply to this project. Detailed site-specific hazards and controls shall be identified in the activity hazard analysis for each phase of the operation.

WEEKLY SAFETY MEETING

Date Held: ________________________
Time: ____________________________

CONTRACTOR: _________________________ Contract No. DACW33-
PERSONNEL PRESENT (check): Contractor ____ Sub. ____ Government ____

SUBJECTS DISCUSSED (check items that were discussed during meeting):

USACE EM385-1-1 ______ (Specific sections: __________________________)
On-site Accident Prevention Plan (or Site Safety and Health Plan) ______
Individual protective equipment (steel-toed boots, safety glasses, etc..) _____
Prevention of slips/falls _____
Back injury/safe lifting techniques _____
Fire prevention _____
First aid _____
Tripping hazards _____
Equipment inspection and maintenance _____
Hoisting equipment, winch and crane safety _____
Ropes, hooks, chains, and slings _____
Water safety _____
Boat safety _____
HAZMAT, Toxic hazards, MSDS, respiratory, ventilation _____
Staging, ladders, concrete forms, safety nets, handrails ____
Hand tools, power tools, machinery, chain saws _____
Vehicle operation safety _____
Electrical grounding, temporary wiring, GFCI _____
Lockouts/safe clearance procedures _____
Welding, cutting _____
Excavation hazards/rescue _____
Loose rock/steep slopes _____
Explosives _____
Sanitation and waste disposal _____
Clean-up, trash _____

Other safety issues of concern specific to contract that was discussed during meeting:

All persons attending meeting the meeting must sign below or on the back of the form.

Contractor Representative Signature ____________________________ Date: _______
CE Inspector/QA (if present at meeting) __________________________ Date: _______

Section F - Deliveries or Performance

DELIVERY INFORMATION

CLIN	DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	UIC
0001	01-MAY-2017	7,392	U S ARMY ENGR DISTRICT, NEW ENGLAND ERIN E BRADLEY 696 VIRGINIA RD CONCORD MA 01742-2751 978-318-8195 FOB: Destination	W912WJ
0002	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0002AA	01-MAY-2017	19,847.25	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0002AB	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0003	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0004	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0005	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0006	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0007	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ
0008	POP 01-MAY-2016 TO 01-MAY-2017	N/A	(SAME AS PREVIOUS LOCATION) FOB: Destination	W912WJ

Section G - Contract Administration Data

ACCOUNTING AND APPROPRIATION DATA

AA: 96X31210000 082418 32006JCJ29013856 NA 96190
AMOUNT: $170,467.00
CIN W13G86603206860001: $127,850.25
CIN W13G86603206860002: $42,616.75

APPENDIX B

U.S. Coast Guard **“**Notice to Mariners”

U.S. Department
of Homeland Security
**United States
Coast Guard**

LOCAL NOTICE TO MARINERS

District: 1 Week: 22/16

COASTAL WATERS FROM EASTPORT, MAINE TO SHREWSBURY, NEW JERSEY

NOTES:
(1) Unless otherwise indicated, missing and destroyed structures are presumed to be in the immediate vicinity of assigned position. Mariners should proceed with caution.
(2) The Local Notice to Mariners is a weekly edition.
(3) Inquiries, published articles or Information: mail to:LNM@uscg.mil
(4) The U.S. Coast Pilot supplements the navigational information shown on nautical charts.
(5) The Coast Pilot, along with its corrections, are available online at http://www.nauticalcharts.noaa.gov/nsd/cpdownload.htm .

The Local Notice to Mariners is available online at http://www.navcen.uscg.gov/?pageName=lnmDistrict&region=1
The updated 2016 Light List is available online at: http://www.navcen.uscg.gov/?pageName=lightListWeeklyUpdates
Information on Private Aids to Navigation is available at: http://www.uscg.mil/d1/prevention/NavInfo/navinfo/paton.htm
Reports of Channel conditions can be found at the Army Corps of Engineers website at:
http://www.nan.usace.army.mil/Missions/Navigation/ControllingDepthReports.aspx .
NOAA Tides and Currents can be found at: http://tidesandcurrents.noaa.gov/ .

The United States Coast Guard Navigation Information Service (NIS), operated by the USCG Navigation Center, is staffed 24 hours a day, 7 days a week. The NIS provides information on the current operational status, effective policies, and general information for GPS and DGPS. The NIS also disseminates Safety Broadcasts (BNM), Local Notice to Mariners (LNM), and the latest Notice Advisory to Navstar Users (NANU). NANU notices can be obtained via email subscription through the USCG Navigation Center website: http://cgls.uscg.mil/mailman/listinfo/nanu . In addition, the NIS investigates all reports of degradation or loss of GPS, DGPS or AIS service. Users are encouraged to report all degradation or loss of radio navigation services to the NIS via any of the following: Phone: (703) 313-5900, mail to: tis-sg-nisws@uscg.mil , or on the internet at: http://www.navcen.uscg.gov .

PLEASE IMMEDIATELY REPORT DISCREPANCIES IN AIDS TO NAVIGATION TO THE NEAREST COAST GUARD UNIT

COMMANDER, FIRST COAST GUARD DISTRICT (dpw)
408 Atlantic Avenue, Boston, Massachusetts 02110-3350
Telephone: (617) 223-8356
24 Hour FAX: (617) 223-8291
http://www.uscg.mil/d1/prevention/Marineinforegulations.asp

All bearings are in degrees TRUE - All times are in Local Time unless otherwise noted.

ABBREVIATIONS

A through H

ADRIFT - Buoy Adrift
AICW - Atlantic Intracoastal Waterway
Al - Alternating
B - Buoy
BKW - Breakwater
bl - Blast
BNM - Broadcast Notice to Mariner
bu - Blue
C - Canadian
CHAN - Channel
CGD - Coast Guard District

I through O

I - Interrupted
ICW - Intracoastal Waterway
IMCH - Improper Characteristic
INL - Inlet
INOP - Not Operating
INT - Intensity
ISL - Islet
Iso - Isophase
kHz - Kilohertz
LAT - Latitude
LB - Lighted Buoy

P through Z

PRIV - Private Aid
Q - Quick
R - Red
RACON - Radar Transponder Beacon
Ra ref - Radar reflector
RBN - Radio Beacon
REBUILT - Aid Rebuilt
RECOVERED - Aid Recovered
RED - Red Buoy
REFL - Reflective
RRL - Range Rear Light

C/O - Cut Off
CONT - Contour
CRK - Creek
CONST - Construction
DAYMK/Daymk - Daymark
DBN/Dbn - Daybeacon
DBD/DAYBD - Dayboard
DEFAC - Defaced
DEST - Destroyed
DISCON - Discontinued
DMGD/DAMGD - Damaged
ec - eclipse
EST - Established Aid
ev - every
EVAL - Evaluation
EXT - Extinguished
F - Fixed
fl - flash
Fl - Flashing
G - Green
GIWW - Gulf Intracoastal Waterway
HAZ - Hazard to Navigation
HBR - Harbor
HOR - Horizontal Clearance
HT - Height
LBB - Lighted Bell Buoy
LHB - Lighted Horn Buoy
LGB - Lighted Gong Buoy
LONG - Longitude
LNM - Local Notice to Mariners
LT - Light
LT CONT - Light Continuous
LTR - Letter
LWB - Lighted Whistle Buoy
LWP - Left Watching Properly
MHz - Megahertz
MISS/MSNG - Missing
Mo - Morse Code
MRASS - Marine Radio Activated Sound Signal
MSLD - Misleading
N/C - Not Charted
NGA - National Geospatial-Intelligence Agency
NO/NUM - Number
NOS - National Ocean Service
NW - Notice Writer
OBSCU - Obscured
OBST - Obstruction
OBSTR - Obstruction
Oc - Occulting
ODAS - Anchored Oceanographic Data Buoy
RELIGHTED - Aid Relit
RELOC - Relocated
RESET ON STATION - Aid Reset on Station
RFL - Range Front Light
RIV - River
RRASS - Remote Radio Activated Sound Signal
s - seconds
SEC - Section
SHL - Shoaling
si - silent
SIG - Signal
SND - Sound
SPM - Single Point Mooring Buoy
SS - Sound Signal
STA - Station
STRUCT - Structure
St M - Statute Mile
TEMP - Temporary Aid Change
TMK - Topmark
TRLB - Temporarily Replaced by Lighted Buoy
TRLT - Temporarily Replaced by Light
TRUB - Temporarily Replaced by Unlighted Buoy
USACE - Army Corps of Engineers
W - White
Y - Yellow

Additional Abbreviations Specific to this LNM Edition:

SNNE- U.S. Coast Guard Sector Northern New England
SBOS- U.S. Coast Guard Sector Boston
SSENE- U.S. Coast Guard Sector Southeastern New England
SLIS- U.S. Coast Guard Sector Long Island Sound
SNEW- U.S. Coast Guard Sector New York

AIS - Automatic Identification System
AtoN - Aids to Navigation
LLNR - Light List Number
NM - Nautical Mile

SECTION I - SPECIAL NOTICES

This section contains information of special concern to the Mariner.

NOTICE TO ALL PRIVATE BOATS AT SEA

United States laws and regulations require that ALL private boats arriving from a foreign port or place MUST report to the Bureau of Customs and Border Protection IMMEDIATELY upon their arrival into the United States. Every person entering the United States must be seen in person for immigration purposes by a Customs and Border Protection officer, except those participating in the I-68 -Canadian Border Boat Landing Program-. However, holders of form I-68 are still required to report their arrival into the United States to the Bureau of Customs and Border Protection. Masters and passengers must provide proof of citizenship or legal immigration status, and be in possession of a valid passport and visa, if required. Citizens of countries that are participants in the Visa Waiver Program are not eligible to seek admission to the United States under that program via private vessel. Once your boat is anchored or tied, you are considered to have entered the United States. No one may leave the vessel until Customs and Border Protection grants permission. The only exception to this requirement is to report arrival. In order to fulfill the requirement to immediately report a private boat arrival, the master of the vessel must contact the nearest Customs and Border Protection Office, or if the arrival occurs after business hours, the nearest 24 hour port of entry. Upon reporting, you may be required to proceed to a staffed port for inspection by Customs and Border Protection. Failure to comply with these requirements could result in serious criminal and civil penalties, including seizure of the boat. International mariners are urged to report any suspicious or illegal activity to the Bureau of Customs and Border Protection at 1-800-BE-ALERT.

LNM 09/15

NY/NJ – OPERATION CLEAR CHANNEL IN THE PORT OF NY/NJ

The Operation Clear Channel program is designed to educate boaters about the hazards of operating small vessels and personal watercraft in the confines of navigational channels used by larger commercial ships. Federal Navigation Rules, also known as the “Rules of the Road”, address this safety concern by giving commercial vessels priority, or right-of-way, over smaller vessels when navigating in narrow channels. An average of 1,400 commercial vessels navigate the waters of the Port of NY/NJ every day and the masters of these vessels, while always on the lookout, cannot always see smaller vessels operating within the channels.

Recreational boaters should keep a sharp lookout and always be prepared to give way to ships constrained in their ability to maneuver, especially when operating within close proximity of a channel. U.S. Coast Guard units in New York and New Jersey actively promote boater awareness through vessel enforcement patrols and visits to local marinas. The U.S. Coast Guard focuses Operation Clear Channel efforts on high-traffic regions, such as Ambrose Channel, Sandy Hook Channel and Raritan Bay, but patrols all of New York Harbor in an effort to promote awareness. Mariners interested in increasing their knowledge of boating safety, including the "Rules of the Road", should consider a U.S. Coast Guard Auxiliary boating safety course. Course information is available online at http://www.cgaux.org in the "Take a Boating Course" section, or by calling 1-800-336-BOAT. Further information can be found at http://thesafeharbor.us/index.html

LNM 02/15

SAFE BOATING VIDEO FOR THE PORT OF NY & NJ

This free online educational resource for safe boating in the Port of NY & NJ is a cooperative effort by the I BOAT NJ program through NJ DOT and U.S. Coast Guard Sector New York. The project contains a feature length 26 minute safety video describing the challenges of the multi user Port environment and 5 sub chapters: Paddlers, Motor Boaters, Sailors, Pilots and Operation Clear Channel. Its mission is to increase safety and awareness in the Port and its target is recreational boaters who transit and operate in the Port. It can be found online at http://thesafeharbor.us/index.html . Please distribute far and wide.

LNM 07/15

US NOTICE TO MARINERS (NTM)

The US Notice to Mariners provides timely marine safety information for the correction of all US Government navigation charts and publications from a wide variety of sources both foreign and domestic. To ensure the safety of life at sea, the information published in the Notice to Mariners is designed to provide for the correction of unclassified nautical charts, the Unclassified NGA/DLIS Catalog of Hydrographic Products, United States Coast Pilots, NGA List of Lights, USCG Light Lists, and other related nautical publications produced by NGA, NOS and the U.S. Coast Guard. The US Notice to Mariners will contain only those chart corrections of interest to ocean going vessels. It is available online at http://msi.nga.mil/NGAPortal/MSI.portal?_nfpb=true&_pageLabel=msi_portal_page_61 . NTM 01 – Special Paragraphs includes information on: America's Waterway Watch program asking those who work, live, or recreate on or near the water to be aware of suspicious activity, The Prudent Mariner and the use of floating Aids to Navigation, and Northern Right Whales.

LNM 07/15

MARINER ALERT-SHIP/WHALE COLLISIONS

Collisions between vessels and whales are a threat to a number of endangered large whale species – most notably, the right whale. The United States has established measures to reduce this threat. A vessel speed restriction requires that vessels 65 feet or greater in length travel 10 knots or less in certain areas and on a rolling basis at certain times where endangered right whales may be present: http://www.fisheries.noaa.gov/pr/pdfs/shipstrike/compliance_guide.pdf). This rule applies within 20 nautical miles around all major ports and in other locations along the U.S. eastern seaboard. Temporary voluntary speed limits also may be imposed in other areas when an aggregation of three or more right whales is confirmed. In addition, ships 300 gt and greater are required to report their location and speed to a USCG shore station in certain prescribed areas: http://www.nmfs.noaa.gov/pr/shipstrike/msr.htm . A computer-based interactive guide and training resource for mariners is available at: http://www.greateratlantic.fisheries.noaa.gov/shipstrike/doc/mtr.html . The guide provides information on endangered whales, recommended navigational actions when operating in whale habitat, a guide to reporting sightings of dead or injured right whales, and related information. Additional steps mariners can take to help reduce the chances of hitting a right whale can be found at: http://www.nero.noaa.gov/shipstrike/doc/guidelines%20placard_high.pdf .

LNM 02/15

SECTION II - DISCREPANCIES

This section lists all reported and corrected discrepancies related to Aids to Navigation in this edition. A discrepancy is a change in the status of an aid to navigation that differs from what is published or charted.

DISCREPANCIES (FEDERAL AIDS)

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End
35	Seguin Light	SS WEAK	13295	SNNE-0059-16	21/16	
1075	**Little River Light**	**SS INOP**	**13392**	**SNNE-0060-16**	**22/16**	
1475	Pomp Island Ledge Daybeacon 2	DAYMK MISSING	13326	SNNE-0215-15	02/16	
1540	Pleasant River Buoy 6	MISSING	13324	SNNE-0049-16	18/16	
1545	Pleasant River Buoy 7	MISSING	13324	SNNE-0049-16	18/16	
1550	Pleasant River Buoy 8	MISSING	13324	SNNE-0049-16	18/16	
1555	Pleasant River Buoy 10	MISSING	13324	SNNE-0049-16	18/16	

1560	Pleasant River Buoy 12	MISSING	13324	SNNE-0049-16	18/16
1565	Pleasant River Buoy 14	MISSING	13324	SNNE-0049-16	18/16
1570	Bungy Rock Daybeacon 15	DAYMK IMCH	13324	SNNE-0051-16	19/16
1580	Pleasant River Buoy 17	MISSING	13324	SNNE-0049-16	18/16
2340	Bass Harbor Head Bell Buoy EB	OFF STA	13313	SNNE-0199-15	43/15
2445	Union River Channel Buoy 2	MISSING	13316	SNNE-0049-16	18/16
2450	Union River Channel Buoy 4	MISSING	13316	SNNE-0049-16	18/16
2455	Union River Channel Lighted Buoy 6	MISSING	13316	SNNE-0049-16	18/16
2460	Union River Channel Buoy 7	MISSING	13316	SNNE-0049-16	18/16
2465	Union River Channel Buoy 9	MISSING	13316	SNNE-0049-16	18/16
4100	**Drunkard Ledge Daybeacon**	**DAYMK IMCH**	**13308**	**SNNE-0043-16**	**22/16**
5150	**New Harbor Lighted Bell Buoy NH**	**LT IMCH**	**13301**	**SNNE-0062-16**	**22/16**
5590	Seguin Light	SS WEAK	13295	SNNE-0059-16	21/16
6295	**Upper Kennebec River Buoy 33**	**OFF STA/TRUB**	**13298**	**SNNE-0058-16**	**22/16**
8265	York Harbor Buoy 3	MISSING	13283	SNNE-0008-16	04/16
9223	**Merrimack River Buoy 52**	**MISSING**	**13274**	**NONE**	**22/16**
11360	**Nantasket Roads Channel Lighted Buoy 6**	**OFF STA**	**13270**	**SBOS-0050-16**	**22/16**
11675	Harry's Rock Light HR	STRUCT DMGD	13270	SBOS-0194-15	33/15
12170	Cohasset Western Channel Daybeacon 5	DAYMK IMCH	13269	SBOS-0042-16	18/16
14050	Saquatucket Harbor East Jetty Light 6	DAYMK MISSING	13229	SSENE-0213-13	43/13
15835	Woods Hole Passage Lighted Bell Buoy 13	SINKING	13235	NONE	21/16
19450	Point Judith Light	SS INOP	13219	SSENE-0111-16	20/16
20515	Mystic Harbor Buoy 6	OFF STA	13214	SLIS-0104-16	20/16
21325	Eatons Neck Light	REDUCED INT/SS INOP	12365	SLIS-0109-16	13/16
25420	**Cos Cob Harbor Lighted Buoy 2**	**LT EXT**	**12367**	**SLIS-0118-16**	**22/16**
25560	**Forbes Rocks Outer Buoy 1**	**SINKING**	**12367**	**SNEW-0157-16**	**22/16**
25565	**Forbes Rocks North Gong Buoy 1A**	**SINKING**	**12367**	**SLIS-0121-16**	**22/16**
26025	**Eastchester Bay Channel Lighted Buoy 7**	**OFF STA/TRLB**	**12366**	**SNEW-0146-16**	**22/16**
27120	**Plum Point Shoal Buoy 3**	**MSLD SIG**	**12366**	**SNEW-0136-16**	**22/16**
27662	Old Silas Rock Buoy 1	MISSING	13212	NONE	16/16
34410	**Beach Channel Buoy 7**	**MISSING**	**12350**	**SNEW-0145-16**	**22/16**
34795	Staten Island Rear Range Light	REDUCED INT	12402	SNEW-0291-15	27/15
35135	Sandy Hook Channel Range Front Light	LT IMCH	12401	SNEW-0443-15	39/15
36395	Keyport Harbor Channel Buoy 9	OFF STA	12331	SNEW-0132-16	21/16
38290	Kingston Flats Light KF	STRUCT DMGD	12347	SNEW-0015-15	03/15

DISCREPANCIES (FEDERAL AIDS) CORRECTED

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End
155	Boon Island Light	WATCHING PROPERLY	13278	SNNE-0040-16	16/16	22/16
4100	Drunkard Ledge Daybeacon	REBUILT/RECOVERED	13308	SNNE-0043-16	16/16	22/16
4285	Seal Ledge Daybeacon 4	WATCHING PROPERLY	13307	SNNE-0037-16	13/16	22/16
7610	Spring Point Ledge Light	WATCHING PROPERLY	13292	SNNE-0061-16	22/16	23/16
9006	Merrimack River North Jetty Light 4	WATCHING PROPERLY	13282	SBOS-0047-16	22/16	22/16
20030	Watch Hill Reef Gong Buoy 1	WATCHING PROPERLY	13214	NONE	20/16	22/16
20115	Ram Island Reef Daybeacon RI	WATCHING PROPERLY	13214	SLIS-0089-16	17/16	22/16
20520	Mystic Harbor Buoy 8	WATCHING PROPERLY	13214	SLIS-0114-16	22/16	22/16
21290	Penfield Reef Light	WATCHING PROPERLY	12369	SLIS-0120-16	22/16	22/16
22305	Niantic River Channel Buoy 1	WATCHING PROPERLY	13211	LIS-0116-16	22/16	22/16
24815	Georges Rock Lighted Buoy 1	WATCHING PROPERLY	12368	SLIS-0115-16	22/16	22/16
26025	Eastchester Bay Channel Lighted Buoy 7	WATCHING PROPERLY	12366	SNEW-0126-16	22/16	22/16
26885	Oyster Bay Lighted Buoy 5	WATCHING PROPERLY	12365	SLIS-0106-16	21/16	22/16
27230	East River Main Channel Lighted Buoy 5	WATCHING PROPERLY	12339	SNEW-0140-16	21/16	22/16

29670	Bay Shore Lighted Buoy 2	WATCHING PROPERLY	12352	SLIS-0110-16	21/16	22/16
29740	Patchogue Bay Entrance Lighted Buoy 1	WATCHING PROPERLY	12352	SLIS-0109-16	21/16	22/16
30295	Moriches Bay Lighted Buoy 15	REPORTED IN ERROR	12352	SLIS-0083-16	16/16	22/16
30925	Jones Inlet Lighted Buoy 4	WATCHING PROPERLY	12352	SLIS-0083-16	16/16	22/16
31535	East Rockaway Inlet Lighted Buoy 6	WATCHING PROPERLY	12350	SLIS-0080-16	15/16	22/16
34220	Rockaway Point Breakwater Light 4	WATCHING PROPERLY	12402	SNEW-0143-16	22/16	22/16
37265	Kill Van Kull Channel Junction Lighted Whistle Buoy KV	WATCHING PROPERLY	12334	SNEW-0154-16	22/16	22/16
39955	Stony Point Lighted Buoy 81	WATCHING PROPERLY	14784	SNNE-0057-16	20/16	22/16

DISCREPANCIES (PRIVATE AIDS)

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End
415	WHOI Traffic Separation Scheme Research Lighted Buoy AB-1	ADRIFT	13274	SBOS-0037-16	16/16	
651	ACOE Block Island Lighted Research Buoy 154	OFF STA/LT EXT	12300	SSENE-0183-13	37/13	
2931	Buck's Harbor East Channel Buoy 1	MISSING	13309	SNNE-0147-15	30/15	
9416.4	Ipswich River Buoy 6	OFF STA	13282	SBOS-0239-15	51/15	
10135	Dion Yacht Yard Channel Daybeacon 1	DAYMK IMCH	13276	SBOS-0198-15	34/15	
10138	Dion Yacht Yard Channel Daybeacon 7	DAYMK IMCH	13276	SBOS-0199-15	34/15	
10138.1	Dion Yacht Yard Channel Daybeacon 8	DAYMK IMCH	13276	SBOS-0200-15	34/15	
10139	Dion Yacht Yard Channel Daybeacon 9	DAYMK IMCH	13276	SBOS-0201-15	34/15	
10140	Dion Yacht Yard Preferred Channel Daybeacon	DAYMK IMCH	13276	SBOS-0197-15	34/15	
10926	Fan Pier South Hazard Lighted Buoy	LT EXT	13272	SBOS-0084-15	12/15	
10974	Chelsea Creek NSTAR Hazard Buoy	MISSING	13272	SBOS-0066-15	09/15	
11106	Logan Airport Security Zone Buoy 12	OFF STA	13270	SBOS-0032-16	16/16	
11411	Nantasket Roads DRC Lighted Hazard Buoy A	LT IMCH	13270	SBOS-0138-15	28/15	
11411.1	Nantasket Roads DRC Lighted Hazard Buoy B	MISSING	13270	SBOS-0093-15	14/15	
11411.2	Nantasket Roads DRC Lighted Hazard Buoy C	OFF STA/LT EXT	13270	SBOS-0094-15	10/15	
14833	Waquoit Bay West Jetty Light	STRUCT DEST	13229	SSENE-0234-15	18/15	
16926.4	New Bedford South Terminal Buoy 5	OFF STA	13232	SSENE-0251-15	21/15	
16926.5	New Bedford South Terminal Buoy 6	OFF STA	13232	SSENE-0250-15	21/15	
17853	Newport Harbor North Channel Buoy 1	DAYMK IMCH	13223	SSENE-0384-15	51/15	
17853.2	Newport Harbor North Channel Buoy 3	DAYMK IMCH	13223	SSENE-0384-15	51/15	
17853.3	Newport Harbor North Channel Buoy 4	DAYMK IMCH	13223	SSENE-0384-15	51/15	
17853.4	Newport Harbor North Channel Buoy 5	DAYMK IMCH	13223	SSENE-0384-15	51/15	
17853.5	Newport Harbor North Channel Buoy 6	DAYMK IMCH	13223	SSENE-0384-15	51/15	
17915.1	Coasters Harbor Navy Channel Buoy 1	MSLD SIG	13223	SSENE-0140-14	31/14	
17915.2	Coasters Harbor Navy Channel Buoy 2	OFF STA/MSLD SIG	13223	SSENE-0141-14	31/14	
17915.3	Coasters Harbor Navy Channel Buoy 4	MSLD SIG	13223	SSENE-0142-14	31/14	
17916	Newport Naval Station Security Zone Buoy A	OFF STA	13223	NONE	10/15	
17923	Newport Naval Station Security Zone Buoy G	MISSING	13223	SSENE-0246-11	43/11	
17926	Newport Naval Station Security Zone Buoy I	MISSING	13223	SSENE-0248-11	43/11	
17929	Newport Naval Station Security Zone Buoy L	SINKING	13223	SSENE-0250-11	43/11	
17932	Newport Naval Station Security Zone Buoy N	MISSING	13223	SSENE-0090-12	33/12	
17938	Newport Naval Station Security Zone Buoy S	MISSING	13223	SSENE--0270-15	24/15	
17939	Newport Naval Station Security Zone Buoy T	MISSING	13223	SSENE-0269-15	24/15	
19112	Dutch Island Harbor Channel Buoy 2	MSLD SIG	13223	SSENE-0136-11	29/11	

19275	Quonset Point Terminal Approach Buoy EB-B	MISSING	13223	NONE	17/16
23590	Hammonasset River Daybeacon 16	DAYMK MISSING	12374	SLIS-0333-15	34/15
23620	Hammonasset River Daybeacon 23	DAYMK MISSING	12374	SLIS-0329-15	34/15
23640	Hammonasset River Daybeacon 27	DAYMK MISSING	12374	SLIS-0333-15	34/15
23645	Hammonasset River Daybeacon 28	DAYMK MISSING	12374	SLIS-0333-15	34/15
23706	Hammonasset River Daybeacon 41	DAYMK MISSING	12374	SLIS-0333-15	34/15
23706.5	Hammonasset River Daybeacon 46	DAYMK MISSING	12374	SLIS-0333-15	34/15
23706.6	Hammonasset River Daybeacon 47	DAYMK MISSING	12374	SLIS-0332-15	34/15
23707	Hammonasset River Daybeacon 51	DAYMK MISSING	12372	SLIS-0331-15	34/15
23707.3	Hammonasset River Daybeacon 55	DAYMK MISSING	12374	SLIS-0333-15	34/15
23707.6	Hammonasset River Daybeacon 58	DAYMK MISSING	12374	SLIS-0330-15	34/15
23707.7	Hammonasset River Daybeacon 59	DAYMK MISSING	12374	SLIS-0333-15	34/15
23707.8	Hammonasset River Daybeacon 61	DAYMK MISSING	12374	SLIS-0333-15	34/15
23707.9	Hammonasset River Daybeacon 62	DAYMK MISSING	12374	SLIS-0333-15	34/15
23790	West River Entrance Buoy 5	OFF STA	12373	SLIS-0058-16	09/16
26350	Nissequogue River Lighted Buoy 14	OFF STA	12364	SLIS-0266-15	27/15
27805	Threemile Harbor Buoy 5	MISSING	13209	NONE	15/16
29790	**Corey Creek Entrance Light 2**	**LT EXT**	**12352**	**SLIS-0109-16**	**22/16**
35025	Highlands Light	LT EXT	12324	SEC 0135-16	21/16
35575	Leonardo Channel Buoy 4	OFF STA	12401	SNEW-0118-16	20/16
37209.1	Claremont Terminal Channel Rear Range Light	MSLD SIG	12334	SNEW-0470-15	42/15
39321	Burton Island Pass Buoy 1	OFF STA	14781	SNNE-0056-16	20/16

DISCREPANCIES (PRIVATE AIDS) CORRECTED

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End
16963	Buzzards Bay Environmental Monitoring Lighted Buoy	WATCHING PROPERLY	13232	NONE	19/16	22/16
17892	Jamestown Harbor Channel Lighted Buoy 2	WATCHING PROPERLY	13223	SSENE-0118-16	22/16	22/16
22470	Smith Cove Daybeacon 8	WATCHING PROPERLY	13211	SLIS-0256-15	26/15	22/16
26770	Northport Harbor Channel Buoy 10	WATCHING PROPERLY	12365	SLIS-0364-15	41/15	22/16
26775	Northport Harbor Channel Buoy 12	WATCHING PROPERLY	12365	SLIS-0364-15	41/15	22/16
28882	East Creek Lighted Buoy 2	WATCHING PROPERLY	12358	SLIS-0117-16	22/16	22/16

PLATFORM DISCREPANCIES

Nam	Status	Position	BNM Ref.	LNM St	LNM End

None

PLATFORM DISCREPANCIES CORRECTED

Nam	Status	Position	BNM Ref.	LNM St	LNM End

None

SECTION III - TEMPORARY CHANGES and TEMPORARY CHANGES CORRECTED

This section contains temporary changes and corrections to Aids to Navigation for this edition. When charted aids are temporarily relocated for dredging, testing, evaluation, or marking an obstruction, a temporary correction shall be listed in Section IV giving the new position.

TEMPORARY CHANGES

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End
201	UNH Jeffreys Ledge Moored Observatory Lighted Buoy	DISCONTINUED	13278	NONE	16/15	
226	UNH Isle of Shoals CO2 Research Lighted Buoy	DISCONTINUED	13274	SNNE-0151-14	31/14	
560	NOAA Data Lighted Buoy 44018	DISCONTINUED	13203	SENE-0057-16	13/16	

1135	Stone Island Ledge Daybeacon 3	DISCONTINUED	13326	SNNE-0032-13	11/13
3375	Isle Au Haut Thorofare Daybeacon 4	DISCONTINUED	13305	SNNE-0221-14	01/16
6260	Upper Kennebec River Channel Buoy 23	TRUB	13298	SNNE-0029-16	15/16
7396	Cousins Island Channel Buoy 1	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.1	Cousins Island Channel Buoy 3	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.2	Cousins Island Channel Buoy 4	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.3	Cousins Island Channel Buoy 5	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.4	Cousins Island Channel Buoy 7	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.5	Cousins Island Channel Buoy 8	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.6	Cousins Island Channel Buoy 9	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.7	Cousins Island Channel Buoy 10	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.8	Cousins Island Channel Buoy 11	DISCONTINUED	13290	SNNE-0080-15	19/15
7396.9	Cousins Island Channel Buoy 12	DISCONTINUED	13290	SNNE-0080-15	19/15
7397	Cousins Island Channel Junction Buoy	DISCONTINUED	13290	SNNE-0080-15	19/15
9025	Merrimack River Bar Guide Light	DISCONTINUED	13282	SBOS-0087-15	12/15
9480	Essex Bay Entrance Lighted Bell Buoy 1	DISCONTINUED	13279	SBOS-0238-15	51/15
9805	Annisquam River South Entrance Daybeacon	DISCONTINUED FOR DREDGING	13281	SBOS-0143-14	34/15
9920	Gloucester Inner Harbor Junction Lighted Buoy GH	DISCONTINUED FOR DREDGING	13281	SBOS-0230-15	47/15
9990	Whaleback Daybeacon 8	DISCONTINUED FOR DREDGING	13275	SBOS-0076-13	01/16
12190	Cohasset Channel Buoy 9	DISCONTINUED FOR DREDGING	13269	SBOS_0043-16	18/16
12200	Cohasset Channel Buoy 11	DISCONTINUED FOR DREDGING	13269	SBOS-0043-16	18/16
12635	Duxbury Bay Channel Buoy 11	RELOCATED FOR DREDGING	13253	SBOS-0223-15	44/15
12640	Duxbury Bay Channel Buoy 12	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12645	Duxbury Bay Channel Buoy 13	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12650	Duxbury Bay Channel Buoy 14	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12655	Duxbury Bay Channel Buoy 15	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12660	Duxbury Bay Channel Buoy 16	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12670	Duxbury Bay Channel Buoy 19	RELOCATED FOR DREDGING	13253	SBOS-0222-15	43/15
12675	Duxbury Bay Channel Buoy 20	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12680	Duxbury Bay Channel Buoy 21	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
12685	Duxbury Bay Channel Buoy 22	RELOCATED FOR DREDGING	13253	SBOS-0223-15	43/15
13037	USGS Research Lighted Buoy W	DISCONTINUED	13246	SLIS-0278-15	29/15
13333	North Beach Cut Mid-Channel Buoy A	DISCONTINUED	13248	SENE-0284-15	27/15
13333.1	North Beach Cut Mid-Channel Buoy B	DISCONTINUED	13248	SENE-0284-15	27/15
13333.2	North Beach Cut Mid-Channel Buoy C	DISCONTINUED	13248	SENE-0284-15	27/15
13333.3	North Beach Cut Mid-Channel Buoy D	DISCONTINUED	13248	SENE-0284-15	27/15
13333.4	North Beach Cut Mid-Channel Buoy E	DISCONTINUED	13248	SENE-0284-15	27/15
13333.5	North Beach Cut Mid-Channel Buoy F	DISCONTINUED	13248	SENE-0284-15	27/15
13333.6	North Beach Cut Mid-Channel Buoy G	DISCONTINUED	13248	SENE-0284-15	27/15
13333.7	North Beach Cut Mid-Channel Buoy H	DISCONTINUED	13248	SENE-0284-15	27/15
14800	Succonnesset Shoal Lighted Buoy 12	DISCONTINUED	13229	SENE-0275-15	27/15

19690	Block Island Old Harbor Channel Bell Buoy 1	DISCONTINUED	13217	NONE	19/16
19720	Block Island Breakwater Light 3	TRLB	13217	SSENE-0145-12	48/12
19765	Great Salt Pond Entrance Lighted Buoy 8	DISCONTINUED FOR DREDGING	13217	SSENE-0107-16	20/16
19770	Great Salt Pond Buoy 10	DISCONTINUED FOR DREDGING	13217	SSENE-0108-16	20/16
20367	Pawcatuck River Channel Daybeacon 23	DISCONTINUED	13214	SLIS-0206-15	18/15
21436	UCONN Execution Rocks Research Lighted Buoy A	DISCONTINUED	12364	SNEW-0007-16	02/16
23775	**West River Entrance Buoy 2W**	**DISCONTINUED FOR DREDGING**	**12373**	**SLIS-108-16**	**22/16**
23790	**West River Entrance Buoy 5**	**DISCONTINUED FOR DREDGING**	**12373**	**SLIS-0108-16**	**22/16**
24165	Fort Hale Channel Buoy 4	TRUB	12371	SLIS-0069-16	11/16
25090	Fivemile River Entrance Buoy 4	TRUB	12368	SLIS-0403-14	45/14
25445	Cos Cob Harbor Channel Buoy 8	TRUB	12367	SLIS-0019-16	05/16
26160	Port Jefferson Directional Light	DISCONTINUED	12362	SLIS-0380-15	45/15
26895	Oyster Bay Harbor Channel Junction Lighted Buoy B	TRUB	12365	NONE	18/15
38695	Hudson River Lighted Buoy 159	RELOCATED	12348	NONE	19/16
39575	**Ferris Rock Isolated Danger Lighted Buoy DFR**	**TRUB**	**14782**	**NONE**	**22/16**
	Isle Au Haut Temporary Buoy 4	ESTABLISHED	13305	NONE	07/16
	Menemsha Creek Temporary Danger Buoy	**ESTABLISHED**	**13233**	**NONE**	**22/16**

TEMPORARY CHANGES CORRECTED

LLNR	Aid Name	Status	Chart No.	BNM Ref.	LNM St	LNM End

None

PLATFORM TEMPORARY CHANGES

Nam	Status	Position	BNM Ref.	LNM St	LNM End

None

PLATFORM TEMPORARY CHANGES CORRECTED

Nam	Status	Position	BNM Ref.	LNM St	LNM End

None

This section contains corrections to federally and privately maintained Aids to Navigation, as well as NOS corrections.
This section contains corrective actions affecting chart(s). Corrections appear numerically by chart number, and pertain to that chart only.
It is up to the mariner to decide which chart(s) are to be corrected. The following example explains individual elements of a typical chart correction.

Chart Number	Chart Edition	Edition Date	Last Local Notice to Mariners	Horizontal Datum Reference	Source of Correction	Current Local Notice to Mariners
12327	91st Ed.	19-APR-97	Last LNM: 26/97	NAD 83		27/97

Chart Title: NY-NJ-NEW YORK HARBOR - RARITAN RIVER
Main Panel 2245 NEW YORK HARBOR — CGD01
(Temp) ADD NATIONAL DOCK CHANNEL BUOY 3 — at 40-41-09.001N 074-02-48.001W
Green can

Corrective Action — Object of Corrective Action — Position

(Temp) indicates that the chart correction action is temporary in nature. Courses and bearings are given in degrees clockwise from 000 true.
Bearings of light sectors are toward the light from seaward. The nominal range of lights is expressed in nautical miles (NM) unless otherwise noted.

12300 **49th Ed.** **01-JUN-12** **Last LNM: 20/16** **NAD 83** **22/16**

ChartTitle: **Approaches to New York, Nantucket Shoals to Five Fathom Bank**

Main Panel 666 NY APPROACHES - NANTUCKET SHOALS TO FIVE FATHOM BANK. Page/Side: N/A

			CGD01	
	ADD	Block Island South Lighted Research Buoy Yellow Fl (5)Y	at 41-06-36.240N	071-31-00.840W

12350 **60th Ed.** **01-AUG-11** **Last LNM: 08/16** **NAD 83** **22/16**

ChartTitle: **Jamaica Bay and Rockaway Inlet**

Main Panel 691 JAMAICA BAY AND ROCKAWAY INLET. Page/Side: N/A

			CGD01	
(Temp)	RELOCATE	East Rockaway Inlet Lighted Buoy 6	from 40-35-06.062N	073-45-29.403W
			to 40-35-07.986N	073-45-28.511W

12352 **35th Ed.** **01-FEB-16** **Last LNM: 19/16** **NAD 83** **22/16**

ChartTitle: **Shinnecock Bay to East Rockaway Inlet**

CHART SHINNECOCK BAY TO EAST ROCKAWAY INLET. Page/Side: N/A

			CGD01	
(Temp)	RELOCATE	East Rockaway Inlet Lighted Buoy 6	from 40-35-06.062N	073-45-29.403W
			to 40-35-07.986N	073-45-28.511W
			CGD01	
	RELOCATE	Jones Inlet Buoy 3	from 40-34-32.743N	073-34-52.939W
			to 40-34-36.215N	073-34-59.097W
			CGD01	
	RELOCATE	Jones Inlet Lighted Buoy 4	from 40-34-33.381N	073-34-49.034W
			to 40-34-33.356N	073-34-54.640W

13003 **52nd Ed.** **01-OCT-15** **Last LNM: 15/16** **NAD 83** **22/16**

ChartTitle: **Cape Sable to Cape Hatteras**

Main Panel 2156 CAPE SABLE TO CAPE HATTERAS. Page/Side: A

			CGD01	
	ADD	Block Island South Lighted Research Buoy Yellow Fl (5)Y	at 41-06-36.240N	071-31-00.840W

13006 **36th Ed.** **01-JUL-12** **Last LNM: 15/16** **NAD 83** **22/16**

ChartTitle: **West Quoddy Head to New York**

Main Panel 2155 WEST QUODDY HEAD TO NEW YORK-EAST COAST. Page/Side: N/A

			CGD01	
	ADD	Block Island South Lighted Research Buoy Yellow Fl (5)Y	at 41-06-36.240N	071-31-00.840W

ADD USGS Research Lighted Buoy W Yellow Fl Y	CGD01 at 41-50-22.800N	070-19-44.400W

13009 **36th Ed.** **01-MAY-14** **Last LNM: 15/16** **NAD 83** **22/16**

ChartTitle: **Gulf of Maine and Georges Bank**

Main Panel 2154 GULF OF MAINE AND GEORGES BANK. Page/Side: N/A

ADD USGS Research Lighted Buoy W Yellow Fl Y	CGD01 at 41-50-22.800N	070-19-44.400W

13200 **38th Ed.** **01-SEP-12** **Last LNM: 15/16** **NAD 83** **22/16**

ChartTitle: **Georges Bank and Nantucket Shoals**

Main Panel 2153 GEORGES BANK AND NANTUCKET SHOALS. Page/Side: N/A

ADD USGS Research Lighted Buoy W Yellow Fl Y	CGD01 at 41-50-22.800N	070-19-44.400W

13205 **40th Ed.** **01-JUN-14** **Last LNM: 04/16** **NAD 83** **22/16**

ChartTitle: **Block Island Sound and Approaches**

Main Panel 2150 BLOCK ISLAND SOUND AND APPROACHES. Page/Side: A

ADD Block Island South Lighted Research Buoy Yellow Fl (5)Y	CGD01 at 41-06-36.240N	071-31-00.840W

13214 **30th Ed.** **01-FEB-14** **Last LNM: 17/16** **NAD 83** **22/16**

ChartTitle: **Fishers Island Sound**

Main Panel 2142 FISHERS ISLAND SOUND. Page/Side: N/A

ADD Mystic Marina Approach Daybeacon 5 Green	CGD01 at 41-20-36.600N	071-57-50.800W

13215 **21st Ed.** **01-AUG-14** **Last LNM: 04/16** **NAD 83** **22/16**

ChartTitle: **Block Island Sound Point Judith to Montauk Point**

Main Panel 2141 BLOCK ISL SND-PT JUDITH TO MONTAUK PT CONN-RI-NY. Page/Side: A

ADD Block Island South Lighted Research Buoy Yellow Fl (5)Y	CGD01 at 41-06-36.240N	071-31-00.840W

13218 **42nd Ed.** **01-JUL-13** **Last LNM: 04/16** **NAD 83** **22/16**

ChartTitle: **Marthas Vineyard to Block Island**

Main Panel 2139 MARTHAS VINEYARD TO BLOCK ISLAND. Page/Side: N/A

ADD Block Island South Lighted Research Buoy Yellow Fl (5)Y	CGD01 at 41-06-36.240N	071-31-00.840W

13246 **40th Ed.** **01-OCT-13** **Last LNM: 19/16** **NAD 83** **22/16**

ChartTitle: **Cape Cod Bay**

Main Panel 2098 CAPE COD BAY MA. Page/Side: N/A

ADD USGS Research Lighted Buoy W Yellow Fl Y	CGD01 at 41-50-22.800N	070-19-44.400W

SECTION V - ADVANCE NOTICES

This section contains advance notice of approved projects, changes to aids to navigation, or upcoming temporary changes such as dredging, etc. Mariners are advised to use caution while transiting these areas.

SUMMARY OF ADVANCED APPROVED PROJECTS

Approved Project(s)	Project Date	Ref. LNM
None		

Advance Notice(s)

NJ/NY–ANCHORAGE REGULATION REVISIONS (Revised)

The Coast Guard has disestablished thirteen anchorage grounds and one special anchorage area that are now obsolete. The disestablished anchorage grounds are numbers 1-A and 1-B on New Rochelle Harbor; Numbers 2, 3, 4, and 5 on western Long Island Sound; Number 7 on the East River; Numbers 34, 36, 37, 38, and 39 on Newark Bay; and Number 46 on Raritan Bay. Anchorage Ground numbers 26, 28, and 47 were combined into a smaller Anchorage Ground Numbers 26 and 28. The Newark Bay Southwest Special Anchorage Area on Newark Bay was also disestablished. The final rule revising these anchorage regulations became effective May 2, 2016. The final rule and chartlets of the affected areas are at http://homeport.uscg.mil/newyork > Waterways Management > CG Advisory Notices. Chart corrections are pending from NOAA.

Charts: 12325 12327 12331 12332 12333 12337 12364 12366 12367 12401 12402 LNM: 20/16

SECTION VI - PROPOSED CHANGES

Periodically, the Coast Guard evaluates its system of aids to navigation to determine whether the conditions for which the aids to navigation were established have changed. When changes occur, the feasibility of improving, relocating, replacing, or discontinuing aids are considered. This section contains notice(s) of non-approved, proposed projects open for comment. SPECIAL NOTE: Mariners are requested to respond in writing to the District office unless otherwise noted (see banner page for address).

PROPOSED WATERWAY PROJECTS OPEN FOR PUBLIC COMMENT

Proposed Project(s)	Closing	Docket No.	Ref. LNM
None			

Proposed Change Notice(s)

CT-LONG ISLAND SOUND-STRATFORD POINT TO SHERWOOD POINT (Chart 12369)-BRIDGEPORT HARBOR-JOHNSON

The U.S. Coast Guard is considering making the following changes to Aids to Navigation to this waterway:

RELOCATE Johnson Creek Channel Buoy 2 (LLNR 24650) from 41-09-56.571N/073-10-12.490W to (PA) 41-09-58.000N/073-10-11.000W

ESTABLISH Johnson Creek Channel Buoy 2A (LLNR 24651) Red nun, in (PA) 41-09-57.000N/073-10-07.000W.
ESTABLISH Johnson Creek Channel Buoy 2B (LLNR 24651) Red nun, in (PA) 41-09-55.000N/073-10-02.000W.

Interested Mariners are strongly encouraged to comment on this proposal in writing, either personally or through their organization. All comments will be carefully considered and are requested prior to 24 June 2016 to complete the process. In order to most effectively consider your feedback and improve the data collection, when responding to this proposal, please include size and type of vessel, recreational or commercial, and distance from aid that you start looking for it, and if and how you use the signal. Please do not call the Coast Guard via telephone or other means, only written responses to this proposal will be accepted. Refer to Project No. 01-16-107. E-mail can be sent to: D01-SMB-DPWPublicComments@uscg.mil .

Charts: 12364 12369 LNM: 22/16

ATTENTION FLORIDA BOATERS: FLORIDA – ST. LUCIE INLET TO FORT MYERS AND LAKE OKEECHOBEE WAMS STUDY

The U.S. Coast Guard is conducting a Waterway Analysis and Management System (WAMS) review of the Okeechobee Waterway, from St. Lucie Inlet to Moore Haven Mile 80. The study focuses on the area's aids to navigation, waterborne commerce, marine casualty information, port/harbor resources, emergency response plans, routing and emergency communication capabilities, and future development projects. Any interested company or individual wishing to provide recommendations on existing or additional aids to navigation in this area should be received no later than Friday, 17 June 2016 to be considered. Please follow this link for an online survey for this waterway: https://www.surveymonkey.com/r/StLuicetoOkeechobeeWA MS

Send comments to:
U.S. Coast Guard Sector Miami Attn: CWO Robert Wooten Prevention Department
Waterways Management 100 MacArthur Causeway Miami Beach, FL 33139 Phone: (305) 535-4311
Email: robert.a.wooten@uscg.mil

Charts: 11428 11472 LNM: 21/16

MA- NANTUCKET SOUND AND APPROACHES (Chart 13237)- GREAT ROUND SHOAL CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

REMOVE the SOUND SIGNAL from the following aid;

Great Round Shoal Channel Lighted Bell Buoy 13 (LLNR 13640)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016.

We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016.
Refer to Project No. 01-16-079 when referencing this project.

Charts: 13237 13241 13244 LNM: 21/16

MA- NANTUCKET SOUND AND APPROACHES (Chart 13237)-COTUIT ANCHORAGE

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Cotuit Anchorage Lighted Bell Buoy 1 (LLNR 14730)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-083 when referencing this project.

Charts: 13229 13237 LNM: 21/16

MA- NANTUCKET SOUND AND APPROACHES (Chart 13237)-MUSKEGET CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Muskeget Channel Buoy 5 (LLNR 15375)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-085 when referencing this project.

Charts: 13233 13237

MA-BUZZARDS BAY (Chart 13230)-NEW BEDFORD HARBOR SOUTHWEST APPROACH

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Inez Rock Buoy 11 (LLNR 16786)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-096 when referencing this project.

Charts: 13218 13229 13230 13232 LNM: 21/16

MA-BUZZARDS BAY (Chart 13230)-WESTPORT HARBOR APPROACH

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Westport Harbor Approach Lighted Bell Buoy WH (LLNR 17440)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-098 when referencing this project.

Charts: 13218 13228 LNM: 21/16

MA-CAPE COD CANAL AND APPROACHES (Chart 13236)-MATTAPOISETT HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Mattapoisett Harbor Approach Buoy 2 (LLNR 17060)

Mattapoisett Harbor Approach Buoy 8 (LLNR 17090)
Mattapoisett Harbor Approach Buoy 10 (LLNR 17100)

RELOCATE Mattapoisett Harbor Approach Buoy 6 (LLNR 17080) to (PA) 41-38-15.378N/ 070-47-25.324W

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-097 when referencing this project.

Charts: 13218 13229 13230 13232 13236 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-BUZZARDS BAY MAIN CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

REMOVE the SOUND SIGNAL from the following aids;

Buzzards Bay Lighted Bell Buoy 6 (LLNR 16035)
Buzzards Bay Lighted Bell Buoy 8 (LLNR 16050)
Buzzards Bay Lighted Bell Buoy BB (LLNR 16055)
Buzzards Bay Lighted Bell Buoy 10 (LLNR 16060)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-092 when referencing this project.

Charts: 13218 13229 13230 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-CLEVELAND LEDGE CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

REMOVE the SOUND SIGNAL from the following aids;

Cleveland Ledge Channel Lighted Bell Buoy 2 (LLNR 16095)
Cleveland Ledge Channel Lighted Gong Buoy 7 (LLNR 16120)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-093 when referencing this project.

Charts: 13218 13229 13230 13236 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-CUTTYHUNK

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Cuttyhunk East Entrance Lighted Bell Buoy CH (LLNR 16315)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-094 when referencing this project.

Charts: 13218 13229 13230 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-QUISSET HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

RELOCATE Quisset Harbor Entrance Lighted Buoy 2 (LLNR 16330) to (PA) 41-32-30.766N/ 070-39-54.770W

PERMANENTLY DISESTABLISH Quisset Harbor Entrance Buoy 4 (LLNR 16330)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-095 when referencing this project.

Charts: 13218 13229 13230 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-ROBINSONS HOLE

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Robinsons Hole Buoy 1 (LLNR 15875)
Robinsons Hole Buoy 3 (LLNR 15880)
Robinsons Hole Buoy 4 (LLNR 15885)
Robinsons Hole Buoy 6 (LLNR 15890)
Robinsons Hole Buoy 8 (LLNR 15895)
Robinsons Hole Buoy 10 (LLNR 15900)
Robinsons Hole Buoy 11 (LLNR 15905)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-091 when referencing this project.

Charts: 13218 13229 13230 13233 LNM: 21/16

MA-MARTHA'S VINEYARD TO BLOCK ISLAND (Chart 13218)-VINEYARD SOUND MAIN CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Lucas Shoal Buoy LS (LLNR 15590)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-089 when referencing this project.

Charts: 13218 13229 13230 13233 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-CENTERVILLE HARBOR APPROACH

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Channel Rock Buoy (LLNR 14710)
Gannet Ledge Buoy 6 (LLNR 14720)
Spindle Rock Buoy 8 (LLNR 14725)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016.
Refer to Project No. 01-16-082 when referencing this project.

Charts: 13229 13237 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-EDGARTOWN HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Edgartown Harbor Channel Buoy 9 (LLNR 15425)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-086 when referencing this project.

Charts: 13233 13238 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-HYANNIS HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Hyannis Harbor Approach Lighted Bell Buoy HH (LLNR 14515)
Hyannis Harbor Lighted Buoy 4 (LLNR 14525)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016.
Refer to Project No. 01-16-081 when referencing this project.

Charts: 13229 13237 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-MADAKET HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Madaket Harbor Approach Lighted Bell Buoy 2 (LLNR 15295)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-084 when referencing this project.

Charts: 13237 13241 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-OAK BLUFFS HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Lone Rock Buoy 1 (LLNR 15440)
Oak Bluffs Harbor Approach Obstruction Buoy (LLNR 15455)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-087 when referencing this project.

Charts: 13229 13233 13237 13238 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-POLLOCK RIP CHANNEL

The U.S. Coast Guard is considering making the following changes to this waterway:

REMOVE the SOUND SIGNAL from the following aids;

Pollock Rip Channel Lighted Gong Buoy 4 (LLNR 13535)
Pollock Rip Channel Lighted Bell Buoy 6 (LLNR 13545)
Pollock Rip Channel Lighted Bell Buoy 10 (LLNR 13565)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016.
Refer to Project No. 01-16-078 when referencing this project.

Charts: 13237 13244 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-SAQUATUCKET HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Saquatucket Harbor Buoy 8 (LLNR 14055)
Saquatucket Harbor Buoy 9 (LLNR 14060)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016.
Refer to Project No. 01-16-080 when referencing this project.

Chart 13229 LNM: 21/16

MA-NANTUCKET SOUND AND APPROACHES (Chart 13237)-VINEYARD HAVEN

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Vineyard Haven Buoy 4 (LLNR 15465)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-088 when referencing this project.

Charts: 13229 13230 13233 13238 LNM: 21/16

MA-WOODS HOLE (Chart 13235)-LITTLE HARBOR

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Little Harbor Buoy 9 (LLNR 15675)
Little Harbor Buoy 10 (LLNR 15680)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-090 when referencing this project.

Charts: 13229 13235 LNM: 21/16

RI-BLOCK ISLAND (Chart 13217)-GREAT SALT POND

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Great Salt Pond Buoy 13 (LLNR 19785)
Great Salt Pond Buoy 14 (LLNR 19790)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-104 when referencing this project.

Charts: 13215 13217 LNM: 21/16

RI-BLOCK ISLAND SOUND AND APPROACHES (Chart 13205)-WEST PASSAGE

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Nebraska Shoal Buoy 2NS (LLNR 19470)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-102 when referencing this project.

Charts: 13205 13215 13218 LNM: 21/16

RI-NARRAGANSETT BAY (Chart 13221)-EAST PASSAGE

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Gould Island Southwest Shoal Buoy 2 (LLNR 17955)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-103 when referencing this project.

Charts: 13221 13223 LNM: 21/16

RI-NARRANSETT BAY (Chart 13221)-SAKONNET RIVER

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Sakonnet River Entrance Lighted Whistle Buoy SR (LLNR 17575)
Sakonnet River Bell Buoy 2A (LLNR 17585)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-099 when referencing this project.

Charts: 13218 13221 LNM: 21/16

RI-NARRANSETT BAY (Chart 13221)-WARREN RIVER

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Warren River Junction Buoy (LLNR 18765)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-100 when referencing this project.

Charts: 13221 13224 LNM: 21/16

RI-NARRANSETT BAY (Chart 13221)-WEST PASSAGE-GREENWICH BAY APPROACH

The U.S. Coast Guard is considering making the following changes to this waterway:

PERMANENTLY DISESTABLISH the following aids;

Warwick Narrows West End Buoy 5 (LLNR 19325)
Warwick Narrows East End Buoy 6 (LLNR 19330)

Your feedback is welcome and should be provided to Mr. Edward G. LeBlanc at 401-435-2351, or Edward.G.LeBlanc@uscg.mil by June 30, 2016. We will carefully consider all comments submitted and adjust our proposal if warranted. Only then will we begin to make on-the-water changes to aids to navigation, and in no case would any of these changes take place before November 1, 2016. Refer to Project No. 01-16-101 when referencing this project.

Charts: 13221 13224 LNM: 21/16

MA-SEACOAST-PORTSMOUTH TO CAPE ANN-MERRIMACK RIVER ENTRANCE

The U.S. Coast Guard is considering making the following changes to Aids to Navigation to this waterway:

ESTABLISH Merrimack River Entrance Light 5 (LLNR 9010) Flashing Green 2.5s 4NM nominal range in (PA) 42°-48'-58"N/070°-48'-16"W at the eastern end of the reconstructed south jetty.

PERMANENTLY DISESTABLISH Merrimack River Entrance Buoy 5 (LLNR 9010) from (PA) 42°-48'-57.318"N/070°-48'-09.611"W.

Interested Mariners are strongly encouraged to comment on this proposal in writing, either personally or through their organization. All comments will be carefully considered and are requested prior to 01 July 2016 to complete the process. In order to most effectively consider your feedback and improve the data collection, when responding to this proposal, please include size and type of vessel, recreational or commercial, and distance from aid that you start looking for it, and if and how you use the signal. Please do not call the Coast Guard via telephone or other means, only written responses to this proposal will be accepted. Refer to Project No. 01-16-075. E-mail can be sent to: D01-SMB-DPWPublicComments@uscg.mil .

Charts: 13003 13009 13260 13274 13278 13282 LNM: 20/16

MA-NANTUCKET SOUND AND APPROACHES-NANTUCKET SOUND-PARS

The US Coast Guard issued a notice stating it's conducting a Port Access Route Study (PARS) to determine if it should revise existing regulations to improve navigational safety in Nantucket Sound. We encourage interested parties to participate in the study. Comments should be received no later than 20 June 2016 and address such factors as impacts to navigation resulting from increased vessel traffic, traffic pattern changes, weather conditions, or navigational difficulties. Comments can be submitted online at http://www.regulations.gov, enter USCG-2016-0165 in the search bar and next to the search results click "Comment Now". The full notice, 81 Fed. Reg. 15327, can be found at https://www.gpo.gov/fdsys/pkg/FR-2016-03-22/pdf/2016-06424.pdf.

Chart 13237 LNM: 12/16

SECTION VII - GENERAL

This section contains information of general concern to the Mariners. Mariners are advised to use caution while transiting these areas.

SUMMARY OF GENERAL PROJECTS STILL IN EFFECT

Enclosure

LNM: 22/16

CT-MILFORD HARBOR

The Army Corp of Engineers will be dredging in Milford Harbor entrance channel from 15-29 June 2016. The hours of operation will be 7 days week from 7:00 am - 7:00 pm. On scene will be the dredge CURRITUCK.

LNM: 22/16

NJ-CARTERET

Fill material is being off loaded south of Arthur Kill until September 30, 2016. The hours of operation are Monday - Saturday, 7:00 am - 5:00 pm. On scene are the barges SEI 32 and S. TOBIN that will be monitoring VHF-FM channels 72 and 74.

LNM: 22/16

NY-EAST RIVER

19 Heavy Lifts over FDR Drive will be done from June 13 - August 31, 2016. The hours of operation will be daily from 12:00 am - 6:00 am, the rig will be on scene 24 hours a day. On scene will be the Chesapeake 1000, stand by tug and barge if needed, that will be monitoring VHF-FM channels 78 and 13. Mariners are requested to proceed with caution when transiting the area.

Chart 12339 LNM: 22/16

RI – NARRAGANSETT BAY – WEST PASSAGE JAMESTOWN BRIDGE

Scheduled underwater inspections –

A contractor for the Rhode Island Turnpike and Bridge Authority will conduct routine underwater inspection operations from approximately 8 a.m. to 5 p.m. daily, weekdays, from June 6, 2016 through June 9, 2016, along the various piers of the Jamestown Bridge in the West Passage of Narragansett Bay. One or two divers will be in the water each day conducting inspections, and will be accompanied and monitored by a two-person crew aboard the 26’ LINDA CASEY II Vessel. Appropriate flags will be displayed while divers are underwater. Crew aboard the 26’ LINDA CASEY II will be monitoring VHF channel 16 at all times during diving operations.

The main channel of the West Passage will remain open to vessel traffic.

The project point-of-contact is Mr. James Karalekas, of Collins Engineering, who will be on-site and can be reached via cellphone at 413-636-3775.

The Contact (Principal Engineer) for the Rhode Island Turnpike and Bridge Authority is Mr. Joseph Levesque, who can be reached at 401-258-3725.

Mariners are urged to use extreme caution when navigating the West Passage of Narragansett Bay in the vicinity of the Jamestown Bridge during these underwater inspection operations.

Charts 13221, and 13223

Sending via email to Edward G. Le Blank, USCG.mil
Edward G. LeBlanc
Commander, U.S. Coast Guard (retired)
Chief, Waterways Management Division
Coast Guard Sector Southeastern New England Voice 401-435-2351 Cell 401-580-8747 Fax 401-435-2399
E-mail: Edward.G.LeBlanc@uscg.mil

LNM: 22/16

MA-NANTUCKET

Diving operations will be done on the Andrea Doria, in (PA) 40-29-24.800N 069-52-02.760W, on June 3, 2016. Diving will be done for 24 hours. On scene will be the M/V WARREN JR that will be monitoring VHF-FM channel 16. Mariners are requested to proceed with caution after passing arrangement have been made.

LNM: 21/16

MA–CAPE COD BAY–WAVE COLLECTION BUOY DEPLOYED

See enclosure

LNM: 21/16

ME-TIBBETT NARROWS TO SCHOODIC ISLAND (REVISED 19/15)

An uncharted submerged object has been reported in approximate position 44-22-57.000N 067-52-46.002W in the vicinity of the Petit Manan Bar. All mariners are urged to use caution when transiting through the area.

LNM: 19/15

NY-SECTOR NEW YORK ANCHORAGE GROUNDS REVIEW

The Coast Guard is conducting a review of Anchorage Grounds on the Arthur Kill, East River, Eastchester and Flushing Bays. Mariners and other concerned parties are encouraged to comment. The Coast Guard is considering disestablishing or reducing the size of the following commercial Anchorage Ground Numbers:
Number 01 on Long Island Sound / Eastchester Bay – 33 CFR 110.155(a)(1).
Numbers 08, 09, 10, 11, and 14 on the East River – 33 CFR 110.155(b).
Numbers 41 and 42 on the Arthur Kill – 33 CFR 110.155(j)(1) and (2).
The regulations for these anchorage grounds are codified at 33 CFR 110.155 and are available at www.ecfr.gov and U.S. Coast Pilot 2, Chapter 2.
1. Do you know of any maritime interests intending to resume, or continue, use of these anchorage grounds? Are portions of these anchorage grounds no longer in use due to shallow water depths, congestion with other vessel operations, inadequate anchor holding, exposure to tides, currents, or weather?
2. Are there Anchorage Grounds where mooring buoys should not be permitted due to congestion?
3. Sector NY(spw) will be accepting comments until July 15, 2016. Please submit written comments to jeff.m.yunker@uscg.mil.

LNM: 22/16

SECTION VIII - LIGHT LIST CORRECTIONS

An Asterisk *, indicates the column in which a correction has been made to new information

(1) No.	(2) Name and Location	(3) Position	(4) Characteristic	(5) Height	(6) Range	(7) Structure	(8) Remarks	
658	*Block Island South Lighted Research Buoy*	41-06-36.240N 071-31-00.840W	Fl (5)Y 20s			Yellow.	Private Aid.	22/16
*	*	*	*	*	*	*	*	
1401.3	*Cooke Aquaculture Lighted Buoy NW*	44-29-41.040N 067-33-23.760W	Fl Y 12s			Yellow.	Private Aid.	22/16
		*						
13037	*USGS Research Lighted Buoy W*	41-50-22.800N 070-19-44.400W	Fl Y 4s			Yellow.	Property of UCSD Scripps Institution of Oceanography. Private Aid.	22/16
*	*	*	*	*	*	*	*	
20617	Mystic Marina Approach Daybeacon 5	41-20-36.600N 071-57-50.800W				SG on pile.	Private Aid.	22/16
*	*	*	*	*	*	*	*	
20651	Mystic Marina Approach Daybeacon 13	41-20-51.426N 071-57-41.066W				SG on pile.	Private Aid.	22/16
*	*	*	*	*	*	*	*	

(1) No.	(2) Name and Location	(3) Position	(4) Characteristic	(5) Height	(6) Range	(7) Structure	(8) Remarks	
20652	Mystic Marina Approach Daybeacon 14	41-20-52.896N 071-57-39.255W				TR on pile.	Private Aid.	22/16
*	*	*	*	*	*	*	*	
20653	Mystic Marina Approach Daybeacon 15	41-20-53.095N 071-57-39.985W				SG on pile.	Private Aid.	22/16
*	*	*	*	*	*	*	*	
30920	Jones Inlet Buoy 3	40-34-36.215N 073-34-59.097W				Green can.		22/16
		*						
30925	*Jones Inlet Lighted Buoy 4*	40-34-33.356N 073-34-54.640W	Q R		3	Red.		22/16
		*						
31535	*East Rockaway Inlet Lighted Buoy 6*	40-35-07.986N 073-45-28.511W	Q R		3	Red.	Replaced by nun when endangered by ice.	22/16
		*						

ENCLOSURES

ENCLOSURE

RI – RHODE ISLAND SOUND – HORIZONTAL DIRECTIONAL DRILLING

LNM: 04/16

ENCLOSURE

Marine Events

ENCLOSURE

Bridge section

NJ-BAYONNE-VESSEL TRANSIT BENEATH THE BAYONNE BRIDGE

Enclosure-Marine Safety Information Bulletin

LNM: 16/14

Steven D. Poulin
Rear Admiral, U.S. Coast Guard
Commander, First Coast Guard District

SUMMARY OF GENERAL PROJECTS STILL IN EFFECT

LOCATION	OPERATION	COMPLETION DATE	LNM
CT/Clinton Harbor	Shoaling	Until further notice	21/09
NJ/NY Port of NJ/NY	Harbor deepening project	Until further notice	21/10
MA-Nummet Channel	Shoaling	Until further notice	38/10
MA-Chatham Harbor	Shoaling	Until further notice	45/10
MA-Truro-Pamet Harbor	Shoaling	Until further notice	06/11
MA-Newburyport Harbor/Plum Is Sound	Shoaling	Until further notice	21/11
MA-Gloucester-Annisquam River	Shoaling	Until further notice	41/11
MA-East Falmouth	Shoaling	Until further notice	21/12
MA-Martha's Vineyard-Muskeget Channel	Soundings	Until further notice	42/12
CT-Housatonic River	Regulated Navigation Area	11/30/17	02/13
MA-Hyannis Hbr Entrance Channel	Shoaling	Until further notice	10/13
NY-Moriches Bay/Inlet	Shoaling	Until further notice	12/13
MA-Boston Inner Harbor	Marine construction	Fall 2016	32/13
ME-Kennebec River-Richmond-Dresden (SR197) Bridge	Temporary RNA	12/31/16	43/13
MA-Annisquam River	Shoaling	Until further notice	02/14
MA-Bass River	Shoaling	Until further notice	02/14
MA-Essex Bay	Shoaling	Until further notice	02/14
MA-Lynn Harbor	Shoaling	Until further notice	02/14
MA-Merrimack River Entrance	Shoaling	Until further notice	02/14
MA-Merrimack River-Joppa Flat Area	Shoaling	Until further notice	02/14
MA-Plum Island Sound	Shoaling	Until further notice	02/14
MA-Plymouth Harbor	Shoaling	Until further notice	02/14
NH-Hampton Harbor	Shoaling	Until further notice	02/14
ME/Rockland-Lermond Cove	Reduced water depth	Until further notice	13/14
VT-Lake Champlain	Acoustic telemetry research	Until further notice	22/14
NY-Hudson River	Lighted buoy installations	09/15/18	27/14
NY-Moriches Bay & Shinnecock Bay	Shoaling	Until further notice	27/14
NY-Kill Van Kull	Pier demolition/construction	07/31/17	32/14
NY-Sheepshead Bay	Low water at MLW	Until further notice	35/14
ME-Yarmouth-Royal River-Casco Bay	Dredging/ meteorological surveys	Until further notice	40/14
ME-Prouts Neck-Scarborough River	Dredging	Until further notice	43/14
ME-Yarmouth -Royal Rivers	Dredging	Until further notice	43/14
MA-New Bedford-Hurricane Barrier	Repairs	Until further notice	45/14
ME-Eastport Breakwater	Collapse/Safety zone	01/30/17	51/14
NY/Gravesend Bay	Dredging	06/22/16	51/14
RI/Point Judith	Sunken vessel	Until further notice	01/15
ME-Machias Bay-Cutler	US Navy Pier collapsed	Until further notice	02/15
NY-Fire Island	Shoaling	Until further notice	07/15
NY-East River	Bulkhead repairs	06/17/17	22/15
NY-New York Harbor	Transporting steel bridge parts	10/31/16	23/15
NY-Raritan River-Crossman Dock	Dredging	08/31/16	27/16
MA-New Bedford	Dredging	07/27/16	30/15
NY-Harlem River	Bulkhead replacement and pile repairs	04/05/17	33/15
NY-East River	Delivery of construction material	09/01/16	34/15
RI – Barrington River	Massasoit Bridge replacement	09/20/16	35/15
NY-Brooklyn	Construction	08/31/16	35/15
MA-Duxbury Harbor	Dredging	until further notice	36/15
NY-Fire Island	Beach fill work	Until further notice	39/15
NY-Manhattan	Seawall rehabilitation	Until further notice	42/15

	Current profilers		
MA-New Bedford	Dredging	06/01/16	45/15
NY-Port of Coeymans (REVISED)	Barge work	10/31/16	03/16
NY-Raritan Bay	Acoustic doppler buoys	09/18/16	03/16
NY/NJ-Brooklyn & Jersey City	Fender repairs	07/29/16	06/16
RI-Narragansett Bay-Coddington Cove	Dredging	09/31/16	06/16
NJ/NY-Hudson River (REVISED)	Temporary safety zone	07/09/16	07/16
NY-Manhattan-East River	Pedestrian Bridge reconstruction	03/31/17	08/16
NY-Shinnecock Inlet Channel	Shoaling	Until further notice	09/16
NY-East River	Fender replacement	10/30/16	10/16
NJ-Newark Bay, Hackensack River, Passaic River NY-New York harbor, Raritan Bay	Drawbridge closures	Until further notice	10/16
NY-Hudson River	Sewall Repairs	12/31/16	10/16
NY-Hudson River	Salvage operations	Until further notice	12/16
NJ-Hudson River	Submarine power cable repairs	7/31/16	14/16
NJ-Colts Neck	Dredging	8/15/16	15/16
MA-Marshfield-New Inlet	Shoaling	Until further notice	15/16
NY-Hudson River	Seawall rehabilitation	10/12/16	15/16
RI-Narragansett Bay-Fox Point Hurricane Barrier	Mechanical maintenance	June 2016	15/16
MA-Green Harbor (REVISED)	Shoaling	Until further notice	16/16
MA-Saugus (REVISED)	Shoaling	Until further notice	16/16
NY-Fishers Island	Meteorological buoy deployment	11/30/16	17/16
RI –Block Island Windfarm	Cable laying	06/05/16	17/16
MA-Woods Hole	Research buoys	July 2016	17/16
NY-Manhattan (REVISED)	Dredging	Until further notice	17/16
CT-Guilford	Dredging	05/31/16	18/16
MA-Manhattan-E 91 St	Marine Transfer	12/31/17	19/16
NJ-Edgewater	Submarine cable repairs	05/29/16	20/16
NY-Brooklyn	Pier C demolition	07/31/16	20/16
NY-Troy	599 River St., Sewall repairs	07/18/16	20/16

MARINE EVENTS

SECTOR SOUTHEASTERN NEW ENGLAND

ONE TIME EVENTS

MA – BUZZARDS BAY – BUZZARDS BAY OPEN WATER CHALLENGE – Sailing Race/Regatta
Mariners are advised that the Buzzards Bay Open Water Challenge is scheduled to take place in Buzzards Bay. This event will take place **on 4 June, 2016 from 08:00 A.M. to 11:00 A.M.** Expect 25 sailboats, 14ft – 26ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-751-0715.
Chart 13230. File No. 025-16

MA – PROVINCETOWN HARBOR, CAPE COD BAY – PROVINCETOWN COASTAL ROWING REGATTA – Sailing Race/Regatta
Mariners are advised that the Provincetown Coastal Rowing Regatta is scheduled to take place in Provincetown Harbor and Cape Cod Bay. This event will be held on **4 June, 2016 from 08:30 A.M. to 3:00 P.M.** Expect 25 sailboats, 23ft – 30ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by phone at 617-413-7131.
Chart 13249. File No. 028-16

RI—QUONSET PT, NARRAGANSETT BAY—SAFETY ZONE FOR RI NATIONAL GUARD AIRSHOW
Mariners are advised that a Safety Zone will be in effect off Quonset Point on **June 10 – 12, 2016 from 9:00 a.m. to 5:30 p.m**. due to the annual RI Air National Guard Air Show. The area will be marked with white buoys and several Coast Guard vessels. Interested mariners may contact the on-scene commander via VHF channel 16.
Charts 13221, 13225 and 13223. File: 042-16.

RI—QUONSET PT, NARRAGANSETT TOWN BEACH—RI NATIONAL GUARD AIRSHOW
Mariners are advised that the RI National Guard is scheduled to host its annual Air show Arial demonstrations during the following dates and times:
June 10, 2016 beginning at 9:00 a.m. until 5:00 p.m. in the vicinity of Quonset Point.
June 10, 2016 beginning at 5:30 p.m. until 7:30 p.m. in vicinity of Narragansett Town Beach.
June 11, 2016 beginning at 9:00 a.m. until 5:00 p.m. in the vicinity of Quonset Point.
June 12, 2016 beginning at 9:00 a.m. until 5:00 p.m. in the vicinity of Quonset Point.
Expect various sized Coast Guard, commercial and pleasure craft to be anchored in the channel to Davisville Pier. The area will be closed for an enforced Safety Zone. Interested Mariners may contact Major Patrick Desmond at 401-267-3405.
Chart 13221, 13225 and 13223. File: 042-16.

REOCCURRING EVENTS

RI – EAST PASSAGE OF NARRAGANSETT BAY – NEWPORT YACHT CLUB WEDNESDAY SERIES – Sailing Race/Regatta
Mariners are advised that the **Newport Yacht Club Wednesday Series** is scheduled to take place in the East Passage of Narragansett Bay in the vicinity of Rose and Goat Island. The event will be held each **Wednesday evening between May 11– August 11, 2016 from 5:00 p.m. to 8:30 p.m.** Expect 35 sailboats, 20–45ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by VHF radio CH 73 or by phone at 404-326-5382.
Chart 13223. File No. 009-16

MA – OUTER SIPPICAN HARBOR AND BUZZARDS BAY – BEVERLY YACHT CLUB H-12 AND BULLSEYE SUNDAY RACE SERIES– Sailing Race/Regatta
Mariners are advised that the **Beverly Yacht Club's H-12 and Bullseye Sunday Race Series** is scheduled to take place in the vicinity of Outer Sippican Harbor and Buzzards Bay. The event will be held each **Sunday afternoon between May 29 – August 14, 2016 from 1:00 p.m. to 4:00 pm.** Expect 20 sailboats, 15ft in length. Mariners are advised to proceed with extreme caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 102-16

RI – EAST PASSAGE OF NARRAGANSETT BAY – NEWPORT YACHT CLUB TUESDAY SERIES – Sailing Race/Regatta
Mariners are advised that the **Newport Yacht Club Tuesday Series** is scheduled to take place in the East Passage of Narragansett Bay in the vicinity of Rose and Goat Island. The event will take place each **Tuesday evening between May 10 –August 23, 2016 from 5:00 p.m. to 8:30 p.m.** Expect 35 sailboats, 20ft – 45ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by VHF radio CH 73 or by phone at 404-326-5382.

Chart 13223. File No. 008-16

RI – WEST PASSAGE OF NARRAGANSETT BAY – WICKFORD YACHT CLUB WEDNESDAY NIGHT SERIES – Sailing Race/Regatta

Mariners are advised that the Wickford Yacht Club Wednesday Night Series is scheduled to take place in the West Passage of Narragansett Bay between Quonset Point and the Jamestown Bridge. This event will take place **every Wednesday beginning on 1 June, 2016 and ending on 24 August, 2016 05:30 P.M. to 07:30 P.M.** Expect 40 sailboats, 20ft – 50ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by VHF radio CH 78 or by phone at 401-714-3671.
Chart 13221. File No. 029-16

MA – OUTER SIPPICAN HARBOR AND BUZZARDS BAY – BEVERLY YACHT CLUB WOMEN'S KEELBOAT RACE SERIES– Sailing Race/Regatta

Mariners are advised that the **Beverly Yacht Club Women's Keelboat Race Series** is scheduled to take place in the vicinity of Outer Sippican Harbor and Buzzards Bay. This event will take place **each Tuesday from June 7 – August 30, 2016 between 6:00 p.m. and 8:00 pm.** Expect up to 10 sailboats, 24ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 108-16

MA – SIPPICAN HARBOR AND BUZZARDS BAY – BEVERLY YACHT CLUB WDNESDAY NIGHT RACE SERIES– Sailing Race/Regatta

Mariners are advised that the **Beverly Yacht Club's Wednesday Night Race Series** is scheduled to take place in the vicinity of Sippican Harbor and Buzzards Bay. The event will be held each **Wednesday night between May 25 – August 31, 2016 from 6:00 p.m. to 8:00 pm.** Expect 15 sailboats, 30-50ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 097-16

MA – OUTER SIPPICAN HARBOR– BEVERLY YACHT CLUB LADIES THURSDAY RACE SERIES– Sailing Race/Regatta

Mariners are advised that the **Beverly Yacht Club's Ladies Thursday Race Series** is scheduled to take place in the Outer Sippican Harbor vicinity. The event will be held **each Thursday afternoon between May 26 – September 1, 2016 from 1:00 p.m. to 3:00 pm.** Expect 18 sailboats, 16ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 098-16

MA – OUTER SIPPICAN HARBOR AND BUZZARDS BAY – BEVERLY YACHT CLUB THURSDAY TWILIGHT RACE SERIES– Sailing Race/Regatta

Mariners are advised that the **Beverly Yacht Club's Thursday Twilight Race Series** is scheduled to take place in the vicinity of Outer Sippican Harbor and Buzzards Bay. This event will be held **each Thursday evening between May 26 – September 1, 2016 from 6:00 p.m. and 8:30 pm.** Expect 25 sailboats, 24-30ft in length. Mariners are advised to proceed with extreme caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 103-16

MA – OUTER SIPPICAN HARBOR AND BUZZARDS BAY – BEVERLY YACHT CLUB SATURDAY FUN RACE SERIES– Sailing Race/Regatta

Mariners are advised that the **Beverly Yacht Club's Saturday Fun Race Series** is scheduled to take place in the vicinity of Outer Sippican Harbor and Buzzards Bay. This event will be held **each Saturday from May 28 – September 24, 2016 between 10:00 a.m. and 4:00 pm.** Expect 15 sailboats, 15-45ft in length. Mariners are advised to proceed with extreme caution when transiting the area. Interested mariners may contact the person in charge by phone at 508-748-0540.
Chart 13223. File No. 104-16

RI – EAST PASSAGE OF NARRAGANSETT BAY – FLEET 9 WEDNESDAY NIGHT RACE SERIES – Sailing Race/Regatta

Mariners are advised that the **Fleet 9 Wednesday Night Race Series** is scheduled to take place in the East Passage of Narragansett Bay, in the vicinity of the Newport Bridge. The event will be held each **Wednesday evening between May 11 – September 28, 2016 from 5:30 p.m. to 8:30 pm.** Expect up to 34 sailboats, 30ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by VHF radio CH 72 & 13 or by phone at 401-462-5440.
Chart 13221. File No. 083-16

RI – EAST PASSAGE OF NARRAGANSETT BAY – COASTERS HARBOR NAVY YACHT CLUB WEDNESDAY R19 FLEET RACING SERIES – Sailing Race/Regatta

Mariners are advised that the **CHNYC Wednesday R19 Fleet Racing** is scheduled to be held in the East Passage of Narragansett Bay in the vicinity of Newport, RI. The event will be held each **Wednesday evening between May 11 and September 28, 2016 from 5:00 p.m. to 8:00 p.m.** Interested mariners may contact the person in charge by VHF radio CH 9, 13 and 72 or by phone at 401-741-0433.
Chart 13221. File: 045-16.

RI – EAST PASSAGE OF NARRAGANSETT BAY – J24 FLEET 50 THURSDAY NIGHT RACE SERIES – Sailing Race/Regatta
Mariners are advised that the **J24 Fleet 50 Thursday Night Race Series** is scheduled to take place in the vicinity of East Passage Narragansett Bay. The event will be held each **Thursday evening between May 19 – October 1, 2016 from 6:00 p.m. to 9:00 pm.** Expect 25-30 sailboats, 24ft in length. Mariners are advised to proceed with caution when transiting the area. Interested mariners may contact the person in charge by VHF radio CH 69 or by phone at 401-486-5318.
Chart 13221. File No. 082-16

RI – EAST PASSAGE NARRAGANSETT BAY – IYAC SPORTBOAT SERIES – Sailing Race/Regatta
Mariners are advised that the International Yacht & Athletics Club (IYAC) Monday Night Race Series is scheduled to be held in the East Passage Narragansett Bay area. The races will take place from 5:30 p.m. to 7:30 p.m. beginning June 6, 2016 through October 1, 2016. Expect 10 sail boats from 20'to 32' in length. Mariners are advised to proceed with caution while transiting the area. Interested mariners may contact the Person in Charge by VHF radio CH 72 or by phone at 401-935-8097.
Chart 13221. File: 003-16

RI – UPPER NARRAGANSETT BAY, PROVIDENCE RIVER– NTYC REGATTA THURSDAY SERIES – Sailing Race/Regatta
Mariners are advised that the **Narragansett Terrace Yacht Club Regatta Thursday Series** is scheduled to take place in **Upper Narragansett Bay and the Providence River**. Racing will occur each **Thursday evening between May 19 and October 8, 2016 from 5:30 p.m. to 9:00 p.m.** Expect up to 20 sailboats, 19 to 35ft in length. Mariners are advised to proceed with extreme caution when transiting the area. Interested mariners may contact the person in charge by VHF Radio CH 68 or by phone at 401-451-5176.
Chart 13221 File No. 053-16

SECTOR NEW YORK

UPPER NEW YORK BAY
(North of the Verrazano Bridge including Hudson River north to Whitehall Narrows, East River West of the Throgs Neck Bridge)

NY – UPPER NEW YORK HARBOR - Sailing Regatta
Mariners are advised that a regatta is scheduled to be held on the Upper New York Harbor in the vicinity of Governors Island, beginning **April 26, 2016 through October 15, 2016**. Races will occur on Tuesdays, Wednesdays, Thursdays from 6:00 p.m. to 9:00 p.m. and Saturdays from 12:00 p.m. to 5:00 p.m. approximately 14 sailboats (24-26 feet in length) will participate. Interested mariners may contact the Principal Race Officer on marine band radio channel 72 VHF-FM. Chart 12343 LNM 16/16 (CGD01)

NY/NJ – UPPER NEW YORK BAY- Sailing Regatta
Mariners are advised that a sailing regatta is scheduled to be held on the Upper NY Bay south of Morris Canal, beginning **May 21, 2016 and running until October 8, 2016**. Races will occur between 5:00 p.m. and 8:00 p.m. every Saturday. Approximately 10 sailboats (24-40 feet in length) will participate on short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 69 VHF-FM. Chart 12327, 12335 LNM 21/16 (CGD1)

NY/NJ – UPPER BAY NEW YORK– NY HARBOR – Sailing Regatta
Mariners are advised that regattas are scheduled to be held on the NY Harbor, south of the Morris Canal to the Statue of Liberty, beginning **May 1, 2016** and continuing until **October 31, 2016**, between the hours of **9:00 a.m. and 5:00 p.m. on every Sunday and 6:00pm to 9:00pm on every Wednesday**. Approximately 10 sailboats 26 feet in length will participate in short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 68 VHF-FM Chart 12327, 12335. LNM 17/16 (CGD1)

NY– WALLABOUT BAY – EAST RIVER – Light Show
Mariners are advised that a light show is scheduled for Fridays, Saturdays and Sundays from **May 7 through June 12, 2016** occurring weekly from 7**:00 p.m. to 9:30 p.m.** within the waters of the East River in vicinity of Wallabout Bay. The light show will take place onboard a stationary vessel moored at Berth 3A at the Brooklyn Navy Yard. Chart 12335. LNM 18/16 (CGD1)

NY/NJ – UPPER NEW YORK BAY- Sailing Regatta
Mariners are advised that regattas are scheduled to be held on the Upper NY Bay in the vicinity of Liberty Island, beginning **May 17, 2016 and running until October 6, 2016**. Races will occur between the hours of 6:30 p.m. and 8:30 p.m. Approximately 15 sailboats

(24-45 feet in length) will participate on short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 69 VHF-FM. Chart 12327, 12335 LNM 20/16 (CGD1)

NY – HUDSON RIVER – TROY – **Fireworks Display**
Mariners are advised that a fireworks display is scheduled to be held on the Hudson River at approximate position 42 43' 37.85"N, 073 41' 48.29"W, Troy, NY. The fireworks display is to be held from **9:00 p.m. to 9:30 p.m. on June 3, 2016**. Chart 12348. LNM 22/16 (CGD01)

NY- JAMAICA/UPPER NY BAY – HUDSON/EAST RIVERS – Sailing Event
Mariners are advised that a 62ft Hawaiian twin masted canoe is scheduled to transit within the New York Harbor and surrounding waters on multiple dates from **June 1 through June 19, 2016.** The event will occur in vicinity of Jamaica Bay, June 1-4, Upper Bay and Hudson River June 4-8, East River on June 8 and Upper NY Bay June 10-19. Interested mariners may contact the Principal Event Organizer on marine band radio channel 13 VHF-FM. Chart 12343, 12327, LNM 22/16 (CGD01)

NY– HUDSON RIVER – Mid Hudson River Bridge to Walkway Bridge, NY – Swim
Mariners are advised that a swim is scheduled to be held on the waters of the Hudson River on **June 04, 2016 from 8:30 a.m. to 3:30 p.m**., with an inclement weather date of June 05, 2016, same times apply. Approximately 300 participants will swim along the eastern most stanchions of the Mid-Hudson Bridge and the Walkway over the Hudson Bridge. Swimmers will be escorted by kayaks, and motorized support vessels. Interested mariners may contact the Swim Coordinator on channel 6 VHF-FM. Charts 12347, 12343 12346, 12345, 12335, 12334, 12327. LNM 22/16 (CGD1)

NY- UPPER NY BAY –LOWER NY BAY- HUDSON RIVER – Regatta
Mariners are advised that a regatta is scheduled for **Jun 3-4, 2016 from 1:00 p.m. to 3:00 p.m.** within the waters of the Upper NY Bay, Lower NY Bay, and Hudson River. On **June 3**, approximately 12 sailing yachts, (40 FT in length) will have a hospitality sail within the Upper NY Bay and Hudson River. On **June 4,** the yachts will proceed from Ellis Island, south through the Upper NY Bay and Lower NY Bay then out to sea. Chart 12327. LNM 23/16 (CGD1)

NY – HUDSON RIVER – NEWBURGH - Sailing Regatta
Mariners are advised that a regatta is scheduled to be held on the Hudson River in the vicinity of Newburgh NY, beginning **June 05, 2016 through October 10, 2016**. Races will occur on Sundays from 11:00 p.m. to 5:00 p.m. approximately 25 sailboats (22-36 feet in length) will participate on short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 72 VHF-FM. Chart 12343 LNM 23/16 (CGD01)

NY – HUDSON RIVER – NEWBURGH - Sailing Regatta
Mariners are advised that a regatta is scheduled to be held on the Hudson River in the vicinity of Newburgh NY, on **June 11, July 16, 30 and August 27, 2016**. The race will occur from 11:00 p.m. to 5:00 p.m. approximately 25 sailboats (22-36 feet in length) will participate on short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 72 VHF-FM. Chart 12343 LNM 23/16 (CGD01)

NY – HUDSON RIVER – NEWBURGH - Sailing Regatta
Mariners are advised that a regatta is scheduled to be held on the Hudson River in the vicinity of Newburgh NY, beginning **June 08, 2016 through September 28, 2016**. Races will occur on Wednesdays from 6:30 p.m. to 8:00 p.m. approximately 25 sailboats (22-36 feet in length) will participate on short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 72 VHF-FM. Chart 12343 LNM 23/16 (CGD01)

NY/NJ – HUDSON RIVER – PIER 60 – Parade of Ships
Mariners are advised that a Silver Bell Parade of Vessels is scheduled to occur on **June 9, 2016**, between 6:30 p.m. and 7:15 p.m. Vessels will make a formation south of Pier 60 and proceed north past the viewing stand, continue north to Pier 62 then disperse. Chart 12335. LNM 23/16

NY/NJ – UPPER NY BAY – HUDSON RIVER – EAST RIVER – Rowing Regatta
Mariners are advised an outrigger competition is scheduled for Saturday, **June 11, 2016** from **7:00 a.m. to 5:30 p.m.** within the waters of the Upper NY Bay, Hudson River, and East River. Approximately 30 outrigger canoes, 40 ft in length starting and finishing at the Hudson River Park's Pier 26. The canoes will navigate the Hudson River, and East River. Manhattan Bridge, traveling the East River, around Battery Park, up the Hudson River to Pier 66, Manhattan, across to NJ, south past the Statue of Liberty, west to Governors Island, then north through the Buttermilk Channel back to the Manhattan Bridge. Chart 12335. LNM 24/16 (CGD1)

NY/NJ – HUDSON RIVER – PIER 45 – Swim Event
Mariners are advised that a swim is scheduled for **June 12, 2016 from 2:00 p.m. to 8:00 p.m**. Approximately 400 swimmers will be assisted by power driven vessels and kayaks. The swim begins at Christopher Street Pier, Manhattan and travels south to end at Pier 26 North River, N. Moore Street, Manhattan. Interested mariners may contact the Principal Swim Safety Officer on marine band radio channels 6 VHF-FM. Chart 12327, 12335 LNM 24/16 (CGD1)

LOWER NEW YORK BAY
(South of the Verrazano Bridge, west of Arverne, Rockaway Beach)

NJ/NY – LOWER NY BAY – RARITAN BAY – Sailing Regatta
Mariners are advised that regattas are scheduled to be held on the Raritan Bay, in the vicinity of Round Shoal, north of Keyport Harbor, North of Seguine Point, East of Ward Point, beginning May 18, 2016 and continuing until October 12, 2016, between the hours of 6:00 p.m. and 8:00 p.m. on various dates throughout the time frame listed. Approximately 35 sailboats 24-40 feet in length will participate in short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 71 VHF-FM. Chart 12331. LNM 20/16 (CGD1)

NY/NJ – LOWER NY BAY – RARITAN BAY – Sailing Regatta
Mariners are advised that regattas are scheduled to be held on the Raritan Bay in the Lower NY Bay south of Staten Island and west of Keyport Harbor on **May 31, June 19, July 4** and **September 5, 2016** between the hours of **10:00 a.m. and 6:00 p.m**. on the dates listed. Approximately 10 sailboats 24-40 feet in length will participate in short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 71 VHF-FM. Chart 12327. LNM 21/16 (CGD1)

NY/NJ – LOWER NY BAY – RARITAN BAY – Sailing Regatta
Mariners are advised that regattas are scheduled to be held on the Raritan Bay, between West of Romer shoal Lighthouse and West Bank Light on **June 04, August 20 and September 18, 2016, between the hours of 8:00 a.m. and 6:00 p.m.** Approximately 20 sailboats 24-40 feet in length will participate in short-distance courses. Interested mariners may contact the Principal Race Officer on marine band radio channel 71 VHF-FM. Chart 12331. LNM 23/16 (CGD1)

NY– LOWER NY BAY - JAMAICA BAY- Parade of Ships
Mariners are advised that a Boat Parade is scheduled to occur on **June 4, 2016**, between **11:00 a.m. and 2:00 p.m**. Approximately 100 vessels, 15-42 feet in length will begin a parade of ships formation in Grassy Bay, sail west in the North Channel, continue past Canarsie Pier and transit counter clockwise around Jamaica Bay. Interested mariners may contact the Fleet Captain on marine channels VHF-FM CH. 6, 21 Chart 12350 LNM 23/16 (CGD1)

LONG ISLAND SOUND
(East of Throgs Neck Bridge to west of Matinecock Point)

NY – LONG ISLAND SOUND – EASTCHESTER BAY – Sailing Regatta
Mariners are advised that a regatta is scheduled to be held on the Long Island Sound in the vicinity of Eastchester Bay, between Execution Light and the Throgs Neck Bridge each Wednesday from **May 11 to September 07, 2016** from **7:00 p.m. and 10:00 p.m**. Approximately 35 sailboats (21-40 feet in length) will participate in long-distance courses on the Western Long Island Sound. Interested mariners may contact the Principal Race Officer on marine band radio channel 16 VHF-FM. Chart 12367. LNM 19/16 (CGD1)

NY – PORT WASHINGTON – MANHASSET BAY – Fireworks Display
Mariners are advised that a firework display has been scheduled to be held over the waters of Manhasset Bay, Port Washington. The display will occur on **June 4, 2016, 11:00 p.m**. from Manhasset Bay Yacht Club, Port Washington, New York. Chart 12366. LNM 22/16 (CGD01)

NEW JERSEY
(North of Long Branch)

NJ/NY – GREENWOOD LAKE – Boat Race
Mariners are advised that a power boat race is scheduled to be held on the waters of Greenwood Lake, NJ on **June 4, 2016** between 11:00 a.m. and 7:00 p.m. Approximately 50 high speed power boats (each no larger than 18 feet in length) will race on a one mile oval course in the southern end of Greenwood Lake.
LNM 22/16 (CGD01)

For Sector New York Marine Events information, reference our web link: http://homeport.uscg.mil/newyork > Waterways Management > 02 Marine Events and Firework Displays or email D01-SMB-SecNY-SPW-MarineEvents@uscg.mil . Additional contacts at Sector New York: MST1 RJ Sampert, ronald.j.sampert@uscg.mil (718) 354-4197.

SECTOR NORTHERN NEW ENGLAND

ME – PORTLAND HARBOR – PORTLAND – Atlantic Cup Offshore Finish
Mariners are advised that the Atlantic Cup Offshore Finish will be held June 6th, 2016 from 12:00 a.m. to 12:00 p.m. Approximately twelve 40 foot sailing vessels will be racing from New York, NY and will finish in the main shipping channel Portland Harbor, Maine. Traffic from spectator craft is expected to be minimal. There will a lighted inflatable marker placed at the following coordinate: 43° 39’53”N, 070° 14’05”W which is approximately 200 feet due east of buoy G1. All mariners are advised to use caution when transiting the area. Chart number: 13292. For further information: Hugh Piggin, Phone: (401) 662-9161.

ME – CASCO BAY – CLAPBOARD ISLAND – Tuesday Boat Race
Mariners are advised that Etchells Fleet 27 2016 Tuesday Night Series are scheduled to be held in Casco Bay in the vicinity of Clapboard Island, ME. The event will be held every Tuesday from May 17, 2016 through September 20, 2016 from 5:00 p.m. to 9:00 p.m. Approximately eighteen 30’ sailboats will be participating. Chart number: 13290. For event information contact: Jamie Carter, (808) 227-2908.

ME – CASCO BAY – PORTLAND – Boat Race
Mariners are advised that Wednesday Race Series is scheduled to be held in Casco Bay in the vicinity of Portland, ME. The event will be held every Wednesday from May 25, 2016 through September 28, 2016 from 5:30 p.m. to 10:00 p.m. 30 sailboats 17’-45’ in length will be participating. All mariners are requested to exercise caution when transiting the area. Chart number: 13290. For event information contact: Matthew Minson, (207) 570-2516.

ME – CASCO BAY – CLAPBOARD ISLAND – Wednesday Night Boat Race
Mariners are advised that the J24 Fleet 43 Wednesday Night series are scheduled to be held in Casco Bay in the vicinity of Clapboard Island, ME. The event will be held every Wednesday from May 21, 2016 through September 7, 2016 from 5:30 p.m. to 8:30 p.m. Approximately fifteen 24’ sailboats will be participating. Chart number: 13290. For event information contact: Race Committee, (207) 781-9820.

SECTOR BOSTON

JUNE EVENTS

LOCATION	DATE	TIME	EVENT/ SPONSOR	CHART
Hingham Bay, MA	18-May-16 14-Sep-16	1800- 2100	Hingham Bay PHRF Wednesday Night Race Series Hingham Bay PHRF	13270
Boston Inner Harbor	18-May-16 31-Aug-16	1800- Sunset	Boston Sailing Club Races Boston Sailing Club	13270
Boston Inner Harbor, MA	18-May-16 14-Sep-16	1800- 2000	Constitution Yacht Club Wednesday Night Racing Constitution Yacht Club	13272
Salem Sound, MA	19-May-16 29-Sep-16	1800- 2100	Jubilee Yacht Club Thursday Evening Racing Jubilee Yacht Club	13275
Massachusetts Bay, MA Scituate Harbor	25-May-16 26-Aug-16	1800- 2045	Scituate PHRF Twilight Series Scituate PHRF	13269
Sandy Bay, MA	28-May-16 11-Sep-16	1300- 1630	2016 Yacht Racing Season, Summer Weekends Sandy Bay Yacht Club	13279

Boston Inner Harbor, MA	09-Jun-16 25-Aug-16	1800- 2000	Thursday Night Racing Piers and Parks Sailing Center	13272
Sandy Bay, MA	15-Jun-16 31-Aug-16	1630- 1930	2016 Wednesday Night Racing Series Sandy Bay Yacht Club	13279
Boston Inner Harbor, MA	22-Jun-16 19-Aug-16	0400- 1600	Courageous Sailing Youth Program Courageous Sailing Center	13272
Salisbury Beach, MA	25-Jun-16 03-Sep-16	2100- 2300	Surfside Fireworks Salisbury Beach Partnership	13282
Charles River, MA	04-Jun-16 04-Jun-16	2215- 2315	100th Anniversary of MIT in Cambridge MIT Alumni Association	13270
Marblehead Channel, MA	05-Jun-16 05-Jun-16	1000- 1600	Lambert Ocean Race Eastern Yacht Club	13276
Charles River, MA	11-Jun-16 11-Jun-16	0730- 0930	Charles River One Mile Swim Charles River Swimming Club	13272
Broad Sound, MA	11-Jun-16 11-Jun-16	1100- 1600	Constitution Yacht Club Spring Regatta Constitution Yacht Club	13270
Sandy Bay, MA	11-Jun-16 11-Jun-16	1000- 1700	2016 Cruising Class Race Sandy Bay Yacht Club	13279
Marblehead Channel, MA	17-Jun-16 17-Jun-16	1730- 2030	Summer Pursuit Race #1 Eastern Yacht Club	13276
Boston Harbor, MA Gloucester	17-Jun-16 18-Jun-16	1800- 0600	Constitution Yacht Club June Moon Chase Race Constitution Yacht Club	13267
Sandy Bay, MA	17-Jun-16 19-Jun-16	1030- 1630	2016 Rhodes 19 District Championship Sandy Bay Yacht Club	13279
Gloucester Harbor, MA	18-Jun-16 18-Jun-16	0900- 1200	International Dory Races Gloucester international Dory Racing Committee	13281
Boston Harbor, MA Hingham Bay	18-Jun-16 18-Jun-16	1500- 2000	Solstice Regatta Hingham Bay PHRF	13270
Fort Point Channel, MA Boston Harbor	18-Jun-16 18-Jun-16	1030- 1500	The 5th Annual Fort Point Open Hull Lifesaving Museum	13272
Nantasket Beach, MA	18-Jun-16 18-Jun-16	2130- 2230	Hull Youth Football Fireworks Hull Youth Football	13270
Salem Sound, MA	18-Jun-16 19-Jun-16	1000- 1600	Around the Rocks Regatta Jubilee Yacht Club	13276
Boston Harbor, MA	22-Jun-16 22-Jun-16	0800- 1400	Boston Light Relay Swim Gary Emich	13270
Gloucester Harbor, MA	22-Jun-16 26-Jun-16	1630- 1900	St. Peter’s Fiesta St. Peter’s Fiesta Committee	13281
Boston Harbor, MA George’s Island	23-Jun-16 23-Jun-16	2100- 2200	Boston Harbor Island Alliance – Fireworks Boston Harbor Island Alliance	13270
Salem Sound, MA	25-Jun-16 25-Jun-16	1000- 1630	Jubilee YC Phil Small Race Jubilee Yacht Club	13275

Neponset River, MA	25-Jun-16 25-Jun-16	2145- 2215	We Are Milton Fireworks Display We Are Milton	13270
Sandy Beach, MA Cohasset Harbor	26-Jun-16 26-Jun-16	0700- 0900	Cohasset Triathlon Streamline Events	13269

BRIDGE SECTION

COAST GUARD HAS GRANTED APPROVAL FOR THE FOLLOWING BRIDGE DEVIATION AND REGULATION CHANGES:

BRIDGE/ WATERWAY	MILE	33CFR Sect.	DEVIATION/RULE	EFF.DATE
Loop Pkwy Bridge/Long Creek	0.7	117.799(f)	Temporary Deviation	10/2/2016
Meadowbrook State Pkwy Bridge/Sloop Ch.	12.8	117.799(h)	Temporary Deviation	10/2/2016
Path Bridge/Hackensack River	3.0	117.723	Temporary Deviation	3/19/2016-9/12/2016
Rt 82 Bridge/Connecticut River	16.8	117.205(c)	Temporary Deviation	4/18/2016-6/30/2016
AK Br./Arhtur Kill	11.6	117.702	Temporary Deviation	7/16/2016-7/24/2016
Lehigh Valley/Newark Bay	3.0	117.5	Temporary Deviation	6/05/2016-6/13/2016
Blynman Bridge/Blynman Canal	0.0	117.586	Temporary Deviation	6/23/2016
US2 Bridge/Lake Champlain	91.8	117.993(b)	Temporary Deviation	5/15/2016-6/15/2016
Devon Bridge/Housatonic River	3.9	117.207(b)	Temporary Deviaiton	5/31/2016-7/18/2016
Marine Pkwy Bridge/Jamaica Bay	3.0	117.795(a)	Temporary Deviaiton	6/6/2016-6/17/2016

MAINE – PENOBSCOT RIVER – Bridge Replacement – Construction to the Route 155/6 Bridge across Penobscot River is in progress. There will not be any obstruction in the navigation channel. All work will be operated from the temporary work trestle which located outside the navigation channel. This work will be completed by **December 2017**. Mariners are advised to use caution when transiting the area.
Charts 13309 LNM 22/16 (CGD1)

MAINE – DAMARISCOTTA – SHEEPSCOT AND KENNEBEC RIVERS – THE GUT – Bridge Construction - Bridge construction will continue through **May 24, 2016** at the Gut Bridge between Rutherford Island and Bristol Neck at South Bristol, Maine. Starting on May 25, 2016 demolition of the termporary bridge will require additional navigation channel closures. The navigational channel will be closed to vessel traffic between the hours of 9 am and 3 pm and between the hours of 10 pm and 4 am until **July 4, 2016**. Normal working hours will be 5:30 a.m. through 7 p.m. Monday through Friday. Mariners should exercise caution while transiting the area. Questions regarding the bridge construction can be directed to Maine DOT resident engineer, Ms. Catherine Metty at (207) 446-0683
Chart 13293 LNM 22/16 (CGD1)

VERMONT – LAKE CHAMPLAIN – THE GUT – Bridge Repairs and Deviation- Bridge motor and drive repairs will continue **15 May, 2016** through **June 15, 2016** at the US2 Drawbridge (Grand Isle) over the gut between North Hero Island and South Hero Island at Sandy Point, Vermont. Working hours will be 7 a.m. through 4 p.m. Monday through Friday. There may be limited night or weekend work. The draw from 8 a.m. to 8 p.m. daily will open on demand at the top of the hour operated by an alternate slower drive. Cianbro Corporation can be contacted at (203) 395-5667. Mariners should exercise caution while transiting the area.
Chart 14781 LNM 22/16 (CGD1)

NEW HAMPSHIRE – PORTSMOUTH TO DOVER AND EXETER – PISCATAQUA RIVER - Bridge Construction – Bridge construction to replace the superstructure at the U.S. Navy Bridge 1 at the Portsmouth Naval Shipyard will commence on **December 8, 2014** and continue through **April 1, 2017.** A 70' x 105' crane barge will be located at the bridge at various locations. One navigation channel at the bridge will always be open for the passage of vessel traffic. Working hours will be 6:30 a.m. through 5 p.m., Monday through Friday. Mariners should exercise caution while transiting the area.
Chart 13285 LNM 22/16 (CGD1)

NEW HAMPSHIRE – PORTSMOUTH TO DOVER AND EXETER – PISCATAQUA RIVER – LITTLE BAY – Bridge Construction - Bridge construction at the Newington Dover (Spaulding Turnpike) Bridges across Little Bay at mile 0.1, at Dover, New Hampshire will commence on **April 15, 2015** and will continue through **September 2017**. Working hours will be 7 a.m. to 4 p.m., Monday through Friday. Mariners should exercise caution while transiting the area.
Chart 13285 LNM 22/16 (CGD1)

NEW HAMPSHIRE – LITTLE HARBOR – Bridge Repairs – Deck and utility repairs to the Pierce Island Bridge across Little Harbor will commence on **June 2016** through **September 2016**. A mobile hydra platform will be utilized during the duration of the project. The platform will be deployed during working hours 7 a.m. to 3:30 p.m. and removed at the end of each workday Monday throught Friday. Location of the platform will be variable and time dependent reducing the vertical clearance by 6 feet and horizontal clearance by 4 feet. The platform may be removed for emergency situations. On-site contact Todd Tibbetts, George R. Cairns & Sons Inc. (603) 765-2011. Mariners are advised to transit the area with caution.
Chart 13283 LNM 21/16 (CGD1)

MASSACHUSETTS - NANTUCKET SOUND AND APPROACHES – MITCHELL RIVER – Bridge Construction – Bridge construction is underway at the Bridge Street Bridge mile 0.2, across the Mitchell River at Chatham, Massachusetts and will continue through **August 30, 2016.** Working hours will 7 a.m. to 4 p.m., Monday through Friday. The main channel is currently open and draw span is being operated manually with barge work continuing near Span 4 to Span 5. Mariners should exercise caution while transiting the area.
Chart 13237 LNM 22/16 (CGD1) **MASSACHUSETTS – NEWBURYPORT HARBOR AND PLUM ISLAND SOUND – MERRIMACK RIVER – Bridge Construction** – Construction of the new Whittier I-95 Bridge across the Merrimack River, mile 6.0, between Newburyport and Amesbury, Massachusetts, is underway and will continue through the fall of **2016.** Tug and barges used for the construction will be conducting operations in both the Federal and Steamboat Channels. The two channels will remain open at all times; however, they will be reduced in horizontal width to allow for construction of the bridge. The main Federal channel will be reduced to approximately 145 feet in width and the Steam Boat channel will reduced to approximately 86 feet in width. Both channels will be marked by day boards on the temporary steel support structures located on the edge of the reduced channel and also with quick flashing red lights during times of reduced visibility. It is recommended that vessel traffic hail the tug Katahdin via VHF-FM Channel 16 or13 before transiting the bridge. Mariners are urged to transit at the slowest safe speed to minimize wake and should proceed with extreme caution when transiting the construction area.
Chart 13282 LNM 22/16 (CGD1)

MASSACHUSETTS – BEVERLY HARBOR – DANVERS RIVER – Bridge Construction – Construction on the Massachusetts Bay Transportation Authority (MBTA)/AMTRAK Bridge at mile 0.05 of the Danvers River will commence on or about **October 5, 2015** and run through **November 2016.** Construction and material barges may be operating in proximity to the navigation channels. Hours of construction operations are Monday through Friday between 6:30 AM and 4300 PM. One navigation channel is to be available at all times for navigation through the draw. Any questions concerning the bridge should be directed to the contractor, The Middlesex Corporation, Mr. Nic Sobey via cell phone at 508-400-3915. Mariners should exercise caution when transiting the work area.
Chart 13276 LNM 22/16 (CGD1)

MASSACHUSETTS – BOSTON HARBOR – CHARLES RIVER – Bridge Construction – Bridge construction is ongoing and will continue through **May 30, 2017**, at the Longfellow Bridge across the Charles River, mile 1.5, between Boston and Cambridge, Massachusetts. Work barges will be deployed at various locations outside the main navigation channel rehabilitating the support piers at the bridge. Working hours are 6 a.m. to 5 p.m. Monday through Saturday. Any questions concerning the bridge should be directed to the contractor, J.F. White, Mr. Greg Labrum, via land line at 508-879-4700 or cell phone at 617-719-7150. Mariners should exercise caution when transiting the work area.
Chart 13272 LNM 22/16 (CGD1)

MASSACHUSETTS – BOSTON INNER HARBOR – CHARLES RIVER – Bridge Rehabilitation – Construction to the Anderson Memorial Bridge, mile 5.1, Charles River is in progress. There are barges operating in the navigation channel. Mariners can contact Massachusetts DOT Resident Engineer Mr. Roderick Connelly at 617-981-2564 for the barge locations. The center span will reopen 19 May 2016 and the Boston span will be closed for repairs. The project will be completed by **June 2017**. Mariners are advised to use caution when transiting the area.
Chart 13272 LNM 22/16 (CGD1)

MASSACHUSETTS - BOSTON HARBOR - WEYMOUTH - FORE RIVER - Bridge Construction – Bridge construction at the new Route 3A highway bridge, mile 0.0, across the Weymouth Fore River between Quincy and Weymouth, Massachusetts is ongoing and will continue through **March 2017**. A 30’ x 90’ barge will be located on the Quincy side of the main channel and a 34’ x 110’ barge will be located on the Weymouth side of the main channel, both outside the federal channel, to protect the construction area. Additional crane barges may be placed within the Federal channel occasionally to allow a safe working radius for the crane. The barges will be moved immediately for all commercial deep draft and barge transits. The contractor will be monitoring anticipated marine traffic and will fully remove all barges from the channel as needed. Working hours will be 7 a.m. through 4:30 p.m., Monday through Friday. The barges can be contacted on VHF-FM Channel 13 or by calling the contractor Mr. Jim Jones at 617-719-7174. Mariners should exercise caution while transiting the area.
Chart 13270 LNM 22/16 (CGD1)

MASSACHUSETTS - OAK BLUFFS HARBOR – LAGOON POND – Bridge Construction/Channel Closure – From approximately 7 a.m. on Wednesday, **September 16th, 2015**, to 7 p.m. on Saturday, May 14th, 2016, the Massachusetts Department of Transportation (MA DOT) will conduct operations to complete the new Beach Road drawbridge over Lagoon Pond in Martha’s Vineyard, Massachusetts. During this period the navigation channel will be open with a 24 hour advance notice to vessels and to facilitate bridge replacement. May 15th, 2016 until September 15th, 2016 the draw span will be opended on signal at 8:15 am to 8:45 am, 10:15 to 11 am, 3:15 pm to 4 pm, 5 pm to 5:45 pm and 7:30 pm to 8 pm. Mariners are urged to use extreme caution while navigating in the vicinity of the Beach Road drawbridge over Lagoon Pond during this period. The dates listed above may change due to unforeseen circumstances. Monitor weekly Local Notice to Mariners for any changes. MA DOT’s project engineer is Mr. Michael McGrath who can be contacted at 508-884-4282. MA DOT’s contractor for this project is The Middlesex Corporation. The contractor’s on-scene workboats monitor VHF channels 13 and 16. Mr. Jamie Doyle, project manager for The Middlesex

Corporation, can be reached by cellular telephone at 617-306-8208 or bridge tender at 508-693-1212. Questions or concerns regarding navigation issues associated with these operations may be addressed to Mr. Edward G. LeBlanc at Coast Guard Sector Southeastern New England, 401-435-2351.
Chart 13237 LNM 22/16 (CGD1)

RHODE ISLAND – NARRAGANSETT BAY – WICKFORD COVE – Bridge Rehabilitation – Construction on the Hussey Memorial Bridge Number 11 at mile 0.6 across Wickford Cove will continue through approximately **September, 2016.** Steel and Rivet work will be completed from barges in the area. Hours of construction operations are Monday through Friday between 7:00 AM and 9:00 PM. Any questions concerning the bridge should be directed to the contractor, The Aetna Bridge Company, Mr. David Struba via land line at 401-663-2292. Mariners should exercise caution when transiting the work area.
Chart 13223 LNM 22/16 (CGD1)

RHODE ISLAND – MASSACHUSETTS – NARRAGANSETT BAY – TAUNTON RIVER - Bridge Painting and Vertical Clearance Reduction – Cleaning and painting operations are underway at the I-195/Rt-79 (Braga Bridge) at mile 0.4, across the Taunton River between Fall River and Somerset, Massachusetts. Painting operations will continue through **July 2017.** A paint containment platform will be installed under the bridge beginning **February 21, 2014** reducing the vertical clearance by approximately 10 feet. The containment system will be in place through early **2017**. In addition, three work barges (124’ x 62’) (90’ x 30’) and (20’ x 8’) will be positioned at various locations outside the main navigation channel. Working hours will be 7 a.m. to 10 p.m., Monday through Friday. Mariners should exercise caution while transiting the area.
Chart 13221 LNM 22/16 (CGD1)

RHODE ISLAND - POINT JUDITH HARBOR - Bridge Replacement - Construction of the Great Island Road Bridge located approximately 0.85 above the mouth of Point Judith Pond is in progress. There will not be any obstruction in the navigation channel. Hours of construction operations are Monday through
Friday between 7:00 AM and 3:30 PM. This work is scheduled to be completed by **April 2017**. Mariners are advised to use caution when transiting the area.
Charts 13219 LNM 22/16 (CGD1)

RHODE ISLAND – SEEKONK RIVER – Bridge Inspection – On **June 21, 2016** through **June 24, 2016** between 9 a.m. to 3 p.m., a snooper truck and one safety boat will be operating IVO the Henderson Bridge across Seekonk River at mile 1.5 to perform bridge inspections. Mariners requiring full horizontal and vertical clearance can contact the contractor via marine radio VHF-FM Ch 13/16 or call 860-866-6441. Mariners are advised to exercise caution when transiting the area.
Chart 13224 LNM 22/16 (CGD1)

RHODE ISLAND – SEEKONK RIVER – Bridge Inspection – On **June 27, 2016** through **July 7, 2016** between 9 a.m. to 4 p.m., a 55 foot reach bucket boat will be operating IVO the Washington I-195wb Bridge across Seekonk River at mile 0.6 to perform bridge inspections. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM Ch 13/16 or call 203-836-0358. Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 13225 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – NEW LONDON HARBOR AND VICINITY – THAMES RIVER – Drainage Repairs – Repairs to the Gold Star Memorial (I-95) NB bridge over Thames River, mile 3.1 will commence on May 9, 2016. Under bridge inspection unit will be operated between 8 p.m. to 4 a.m. over the navigable channel. Mariners requiring full vertical clearance can contact the contractor via marine radio VHF-FM channel 13/16 or call 860-462-5066. This project is to be completed by **June 24, 2016.** Mariners are advised to exercise caution when transiting the area.
Chart 13213 LNM 22/16 (CGD1)

CONNECTICUT - LONG ISLAND SOUND – LONG ISLAND SOUND TO DEEP RIVER – CONNECTICUT RIVER – Emergency Repairs – Repairs to the Route 82 Bridge at mile 16.8, across Connecticut River at East Haddam, Connecticut are in progress. There will not be any obstruction in the waterway. All work will be performed on top of the bridge and will not affect operation of the bridge. The repairs are to be completed by **June 30, 2016**.
Chart 12375 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – LONG ISLAND SOUND TO DEEP RIVER – CONNECTICUT RIVER – Notice of Temporary Deviation – The Coast Guard has issued a temporary deviation from the regulation governing the operation of the Route 82 Bridge across Connecticut River at mile 16.8. Under this temporary deviation, the bridge will open on signal from April 18, 2016 to **June 30, 2016**, Monday to Friday between 7 a.m. and 3 p.m. if at least two-hour notice is given by calling (860) 873-5015 or (860) 873-8106. Vessels that can pass under the draw without a bridge opening may do so at all times. Mariners are advised to plan their transits accordingly.
Chart 12375 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – NEW HAVEN HARBOR– QUINNIPIAC RIVER – <u>Aesthetic Lighting Installation</u> – Construction to the I-95 Bridge, mile 0.1, across Quinnipiac River is in progress. A 75ft by 30ft barge will be operating outside the navigation channel during daylight hours. This work is to be completed by **May 31, 2016**. Mariners are advised to transit the area with caution.
Chart 12371 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – NEW HAVEN HARBOR– MILL RIVER – <u>Bridge Rehabilitation</u> – Construction to the I-91 Bridge across Mill River is in progress. A quick deck will be installed on the side of the bridge piers and to stay in place for the duration of the project. This work is to be completed by **December 1, 2016**. Mariners are advised to transit the area with caution.
Chart 12371 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – HOUSATONIC RIVER AND MILFORD HARBOR – HOUSATONIC RIVER – <u>Bridge Replacement</u> – Construction to the I-95 (Moses Wheeler) Bridge at mile 3.9 across Housatonic River between Milford and Stratford, Connecticut is in progress. There are barges operating IVO the channel. An unobstructed 80ft of navigation channel is available at all times through **December 31, 201**6. The project will be completed by **March 2017.** Mariners are advised to transit the area with extreme caution and reduce wake.
Chart 12370 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – HOUSATONIC RIVER AND MILFORD HARBOR – HOUSATIONIC RIVER – <u>Notice of Temporary Deviation from Regulations</u> – The Coast Guard has issued a temporary deviation from the regulation governing the operation of the Metro-North Devon Bridge at mile 3.9 across Housatonic River at Stratford, Connecticut. Under this temporary deviation, the bridge will be operated according to the schedule below:

a. From 8 a.m. on May 31, 2016 through 4 a.m. on June 3, 2016, the bridge will not open to marine traffic.
b. From 4 a.m. on June 3, 2016 through 8 a.m. on June 6, 2016, the bridge will open fully on signal upon 24 hr advance notice.
c. From 8 a.m. on June 6, 2016 through 4 a.m. on June 10, 2016, the bridge will not open to marine traffic.
d. From 4 a.m. on June 10, 2016 through 8 a.m. on June 13, 2016, the bridge will open fully on signal upon 24 hr advance notice.
e. From 8 a.m. on June 13, 2016 trough 4 a.m. on June 17, 2016, the bridge will not open to marine traffic.
f. From 4 a.m. on June 17, 2016 through 8 a.m. on June 20, 2016, the bridge will open fully on signal upon 24 hr advance notice.
g. From 8 a.m. on June 20, 2016 through 4 a.m. on June 24, 2016, the bridge will not open to marine traffic.
h. From 4 a.m. on June 24, 2016 through 8 a.m. on June 27, 2016, the bridge will open fully on signal upon 24 hr advance notice.
i. From 8 a.m. on June 27, 2016 through 4 a.m. on July 1, 2016, the bridge will not open to marine traffic.
j. From 4 a.m. on July 1, 2016 through 8 a.m. on July 5, 2016, Bridge Normal Operation.
k. From 8 a.m. on July 5, 2016 through 4 a.m. on July 8, 2016, the bridge will not open to marine traffic.
l. From 4 a.m. on July 8, 2016 through 8 a.m. on July 11, 2016, the bridge will open fully on signal upon 24 hr advance notice.
m. From 8 a.m. on July 11, 2016 through 4 a.m. on July 15, 2016, the bridge will not open to marine traffic.
n. From 4 a.m. on July 15, 2016 through 8 a.m. on July 18, 2016, the bridge will open fully on signal upon 24 hr advance notice.

Vertical Clearance under the closed span is 25ft at MLW and 19ft at MHW. Vessels that can pass under the span without a bridge opening may do so at all times. Mariners can call the bridge operator at 203-337-3677 or Warren Best at 646-285-6544 for bridge opening advance notice. Mariners are advised to plan their transits accordingly
Chart 12370 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – NORWALK RIVER – <u>Fender Repairs</u> – Repairs to the fenders (East Channel) at the Walk RR Bridge across Norwalk River at mile 0.1 will commence on June 6, 2016 and be completed by approximate August 26, 2016. There will be a 35ft by 70ft barge or 14ft by 40ft material barge or 8ft by20ft work float operated in the East Channel during work hours. From August 29, 2016 to **September 16, 2016**, a 24ft by 48ft barge or 14ft by 40ft material barge or 8ft by 20ft work float will be operated in the West Channel. Mariners requiring full horizontal clearance in the west channel can contact bridge operator via marine radio VHF-FM CH 13/16 or call 203-363-5709.
Working hours are from Monday to Friday between 7 p.m. and 5 a.m. Barges will not be in the channel after work hours and will not affect operation of the bridge. Mariners are advised to exercise caution when transiting the area.
Chart 12368 LNM 22/16 (CGD1)

CONNECTICUT – LONG ISLAND SOUND – SHERWOOD POINT TO STAMFORD HARBOR – PEQUONNOCK RIVER – <u>Bridge Outage</u> –The East Washington Street Bridge across Pequonnock River at mile 0.6 is out of service due to electrical/mechanical systems (including navigation lights) were severely damaged by the Superstorm Sandy. Mariners are advised to plan their transits accordingly.
Chart 12369 LNM 22/16 (CGD1)

NEW YORK – LONG ISLAND SOUND – HEMPSTEAD HARBOR TO TALLMAN ISLAND – EASTCHESTER BAY – Bridge Replacement – Construction to the temporary City Island Bridge across Eastchester Creek at mile 2.2 is in progress. Barges are operating in and out of the navigable channel during construction. A minimum of 50ft horizontal clearance will be free of obstruction through the navigation channel at all times. Installation of the turbidity curtain along the shoreline is in progress. Mariners can contact the Community Liaison Huascar Robles at 718-885-1247 extension 114 or hrobles@zetlin.com for any construction information. The barge placement for the temporary bridge is authorized through **December 31, 2016**. The entire project is scheduled to be completed by **June 1, 2017.** Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 12366 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – REYNOLDS CHANNEL - Bridge Inspection – From June 7, 2016 to **June 10, 2016** between 8 a.m. to 4 p.m., a barge will be operating IVO the Long Beach Bridge across Reynolds Channel at mile 4.7 to perform bridge inspection. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM Ch 13/16 or call 646-773-3461 or 646-773-3352. Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 12366 LNM 22/16 (CGD1)

NEW YORK – LONG ISLAND SOUND – HEMPSTEAD HARBOR TO TALLMAN ISLAND – HUTCHINSON RIVER – Bridge Inspection – On June 8, 2016 and **June 9, 2016** between 8 a.m. to 3 p.m., a 20ft by 30ft SM1 barge and tug Jerry will be operating IVO the Pelham Parkway (Shore Road) Bridge across Hutchinson River at mile 0.4 to perform bridge inspection. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM Ch 13/16 or call 917-596-4763. Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 12366 LNM 22/16 (CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – NEWTOWN CREEK – DUTCH KILLS - Bridge Inspection – From May 23, 2016 to **May 27, 2016** between 8 a.m. and 3:30 p.m., a boat with scaffold will be operating IVO the Hunter Point Avenue Bridge across Dutch Kills at mile 1.4 to perform bridge inspection. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM Ch 13/16 or call Mr. Guillet at 917-513-3059. Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 12366 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – BARNUM ISLAND CREEK – Diving Inspection – On **June 8, 2016** during daylight hours, diving inspection will be performed IVO the Long Beach Road Bridge across Barnum Island Creek at mile 2.0. Mariners are advised to exercise caution when transiting the area and proceed at a no wake speed.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – QUANTUCK CREEK – Bridge Inspection – Inspection to the Jessup Lane (West Bay) Bridge, mile 0.1, across Quantuck Canal will commence on June 2, 2016. Under bridge inspection unit will be operated between 8 a.m. to 4 p.m. over the navigable channel. Mariners requiring full vertical clearance can contact the contractor via marine radio VHF-FM channel 13/16 or call 646-773-3461 or 646-773-3352. This project is to be completed on **June 3, 2016**. Mariners are advised to exercise caution when transiting the area.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – FIRE ISLAND INLET – Scour Monitoring Installation – Construction to the Robert Moses Causeway across Fire Island Inlet at mile 4.0 will commence on June 6, 2016. Working hours are between 6 a.m. and 4 p.m. from Monday to Friday. A 20ft by 60ft barge and push boat will be operating IVO the bridge. Diving activities will be performed at the piers. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF CH 13/16 or call 631-394-9618. Mariners are advised to exercise extreme caution when transiting the area. All work will be completed by **October 28, 2016**.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – SLOOP CHANNEL - Bridge Closures – To accommodate the Jones Beach State Park Air Shows, the Meadowbrook and Wantagh State Parkway Bridges, both across Sloop Channel at mile 12.8 and at mile 15.4 respectively, need not open for the passage of vessel traffic on Saturday May 28, 2016 and Sunday **May 29, 2016** between 2:30 p.m. and 5:30 p.m. Vessels that can pass under the draw without a bridge opening may do so at all times. Mariners are advised to plan their transits accordingly.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – SLOOP CHANNEL - Bridge Closures – To accommodate the Jones Beach State Park July 4 fireworks event, the Meadowbrook and Wantagh State Parkway Bridges, both across Sloop Channel at mile 12.8 and at mile 15.4 respectively, need not open for the passage of vessel traffic on Monday **July 4, 2016**

between 9 p.m. and midnight. Vessels that can pass under the draw without a bridge opening may do so at all times. Mariners are advised to plan their transits accordingly.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – LONG CREEK TO SLOOP CHANNEL – Notice of Temporary Deviation – The Coast Guard has issued a temporary deviation from the regulation governing the operation of the Loop Parkway and Meadowbrook State Parkway Bridges, across Long Creek and Sloop Channel at mile 0.7 and at mile 12.8, respectively. Under this temporary deviation both bridges may remain in the closed position on Sunday **October 2, 2016** between 11 a.m. and 1 p.m. to facilitate a public event. Mariners are advised to plan their transits accordingly.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – SHINNECOCK BAY TO EAST ROCKAWAY INLET – SLOOP CHANNEL – Scour Repairs – Scour repairs at the Meadowbrook State Parkway Bridge across Sloop Channel at mile 12.8 is in progress. Weeks 60 crane barge and mini dump scow will be operating in the navigational channel. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-CH 13/16 or call 201-304-2385 between 6 a.m. and 6 p.m., Monday through Friday with 2 hours advance notice. No equipments will be in the navigation channel after work hours. The barge placement for this project is authorized through **June 30, 2016**. Mariners are advised to exercise caution when transiting the area.
Chart 12352 LNM 22/16 (CGD1)

NEW YORK – JAMAICA BAY AND ROCKAWAY INLET – ROCKAWAY INLET – JAMAICA BAY – Corrective Maintenance Repairs – Repairs to the Cross Bay Blvd Bridge across Jamaica Bay at mile 10.0 will commence on April 11, 2016. All work will be done on top of the bridge. This project will be completed by **May 31, 2016**. Mariners are advised to exercise caution when transiting the area.
Chart 12350 LNM 22/16 (CGD1)

NEW YORK – JAMAICA BAY AND ROCKAWAY INLET – ROCKAWAY INLET – JAMAICA BAY – Preservation, Cleaning and Sealing the Pier Tops – Construction to the Cross Bay Blvd Bridge across Jamaica Bay at mile 6.0 is in progress. A 30ft by 80ft Hughes 719 deck barge and 45ft tug Harbor II will be operating in the navigation channel. The barge will reduce the horizontal clearance by approximately 32ft. Working hours are from Monday to Saturday between 7 a.m. and 3 p.m. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM CH 13/16 or call James Lyons at 917-567-6304. This project will be completed by **July 29, 2016**. Mariners are advised to exercise caution when transiting the area.
Chart 12350 LNM 22/16 (CGD1)

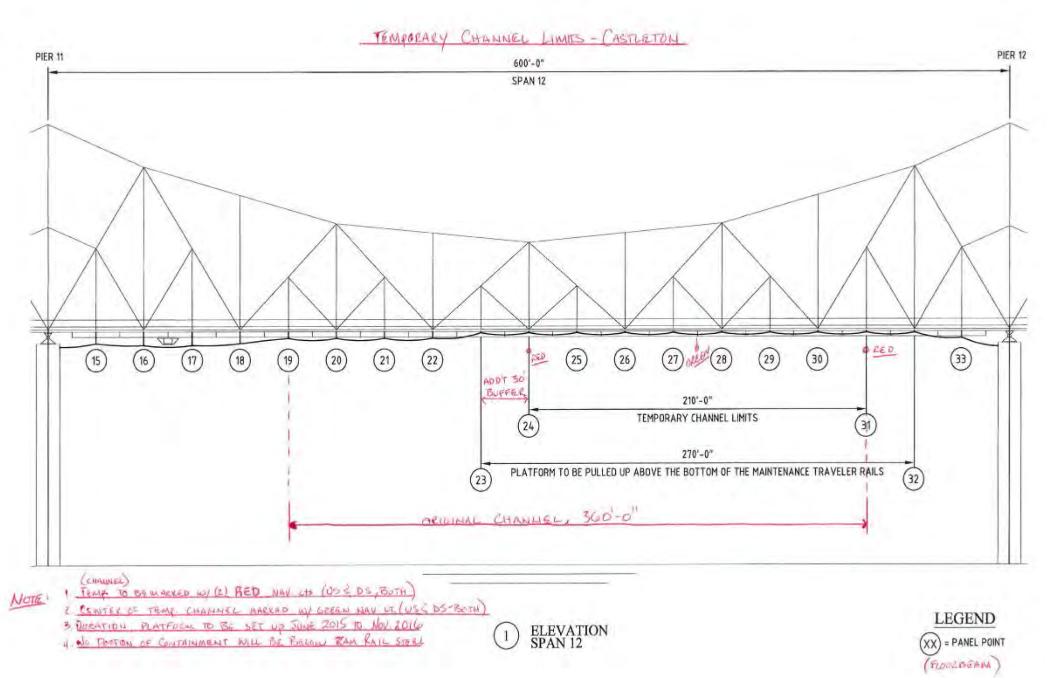
NEW YORK – JAMAICA BAY AND ROCKAWAY INLET – ROCKAWAY INLET – JAMAICA BAY – Notice of Temporary Deviation – The **Co**ast Guard has issued a temporary deviation from the regulation governing the operation of the Gil Hodges (Marine Parkway) Bridge across Jamaica Bay at mile 3.0. Under this temporary deviation, the bridge may remain in the closed position from 7 a.m. on June 6, 2016 through 5 p.m. on **June 17, 2016**. Vessels that can pass under the draw without a bridge opening may do so at all times. Mariners are advised to plan their transits accordingly.
Chart 12350 LNM 22/16 (CGD1)

NEW YORK – JAMAICA BAY AND ROCKAWAY INLET – MILL BASIN – Bridge Replacement - Replacement of the Shore (Belt) Parkway Bridge across Mill Basin at mile 0.8 is in progress. Barges are operating in and out of the navigable channel during construction. A minimum of 65ft horizontal clearance will be free of obstruction through the navigation channel at all times. Welding (hotwork) will be performed on the bridge deck grating between Monday and Friday during nighttime hours. Barge placement is authorized through **February 20, 2017.** Mariners can contact the Community Liaison at 347-702-6430 extension 114 or cell 347-203-9530 for any construction information. This project is scheduled to be completed by **February 13, 2021.** Mariners are advised to plan ahead and transit the area with extreme caution.
Chart 12350 LNM 22/16 (CGD1)

NEW YORK – JAMAICA BAY AND ROCKAWAY INLET – GERRITSEN INLET – Bridge Replacement - Replacement of the Shore (Belt) Parkway Bridge across Gerritsen Inlet at mile 0.0 is in progress. A minimum of 65ft horizontal clearance will be free of obstruction through the navigation channel at all times. Mariners can contact the NYC Community Liaison Alex Rothberg at 347-702-6430 extension 114 or cell 347-203-9530 for any construction information. This project is scheduled to be completed by **October 30, 2017.** Mariners are advised to plan ahead and transit the area with extreme caution.
Chart 12350 LNM 22/16 (CGD1)

NEW YORK – HUDSON RIVER– UPPER HUDSON RIVER – Bridge Painting – Painting of the Castleton on the Hudson Bridge across the Hudson River at mile 135.7 is in progress. Installation of temporary scaffolding under the bridge will commence on or about 2nd week of June reducing the vertical clearance under the scaffolding by approx. 6 feet. However a temporary 210 foot channel will be provided and it will be marked by two red margins of channel lights and a green center of channel navigational lights on both the up and downstream sides of the bridge. The 210 foot navigational channel will be free and clear of any obstructions at all times for passage of large vessels. Orange day mark will be installed to mark the margin of channel.

Vessel with an air draft of 115 or higher are requested to notify the bridge at (518) 337-7231 or (518) 755-0231 thru **1 July 2015.** Vessel with air draft of 125 or higher are requested to notify the bridge at the same number for the duration of the project. This project is estimated to be completed by November 2016.
For up to date information contact the NYS Thruway authority Resident Engine
Mr. Tim Mastro at (518) 337-7231 or Mr. Wall Werner at (518) 755-0231. For emergency 24/7 contact NYS Thruway Communication at (866) 691-8282.
Mariners are advised to reduce wake and exercise extreme caution when transiting the area.
Chart 12343 LNM 22/16 (CGD1)



Mariners are advised to exercise caution and reduce wake when transiting the area.
Chart 12343 LNM 22/16 (CGD1)

NEW YORK - NEW YORK TO WAPPINGER CREEK - HUDSON RIVER - New Bridge Construction - Construction of the new Tappan Zee Bridge across the Hudson River, mile 27.7 is in progress. Work will continue constructing access trestles and cofferdams that extend +/- 1,100 ft. west from the Westchester shoreline and +/- 1,200 ft. east of the Rockland shoreline of the Hudson River north of the Tappan Zee Bridge. These structures will remain in place through 2017. Floating equipment will be located east and west of the Main Navigation channel and will include crew boats, tug boats, barge mounted cranes, barges and anchor buoys.

Work constructing the permanent bridge foundations has begun and will continue through 2017. The work will involve over a hundred pieces of floating equipment and support vessels that will be moored/anchored or transiting from the Westchester shoreline to the Rockland shoreline
including the side channels and portions of the main navigation channel. Mariners are advised that the side channels to the east and west of the main channel are closed to vessel traffic and are advised to use only the center 600' of the main channel to navigate in a north-south direction through the area. Additionally, mariners are strongly advised to stay clear of all construction equipment and support vessels by 1000 feet or more when transiting the area.

Additionally there are 16 equipment moorings located west of the navigation channel, 8 to the south and 8 to the north of the bridge. The locations of the 16 moorings are as follows: (1N) N41 04.467 W73 53.669; (2N) N41 04.473 W73 54.118; (3N) N41 04.472 W73 54.563; (4N) N41 04.648 W73 53.895; (5N) N41 04.650 W73 54.340; (6N) N41 04.829 W73 53.670; (7N) N41 04.825 W73 54.118; (8N) N41 04.821 W73 54.562; (1S) N41 03.999 W73 53.894; (2S) N41 03.999 W73 54.285; (3S) N41 03.872 W73 53.540; (4S) N41 03.696 W73 54.202; (5S) N41 03.688 W73 53.820; (6S) N41 03.542 W73 53.486; (7S) N41 03.406 W73 54.092; (8S) N41 03.317 W73 53.737 they are each lit with a 360 degree steady burning white light. The Coast Guard has established a safety zone surrounding these equipment moorings. Entry into, anchoring, loitering, or movement within the Safety Zone is prohibited unless the vessel is working on the bridge construction operations or authorized by the Captain of the Port New York (COTP) or his designated representative.

Nine buoys have been installed marking the equipment mooring area safety zone. Each buoy has a 39" diameter and a height of 82.5" (64"above the waterline). The buoys are white with an orange warning decal and lit with a white flashing light visible for 3 nm. The buoys in the following approximate positions: 41-04-59.700N, 073-54-45.540W;41-05-00.180N, 073-53-21.481W; 41-04-11.280N, 073-54-48.000W; 41-04-08.280N,073-53-19.320W; 41-03-07.080N, 073-54-14.700W; 41-03-09.240N,073-53-16.860W.These buoys are being removed for the 2015-2016 winter and will be reinstalled in spring 2016.

Mariners are advised to transit the main channel, reduce wake and use extreme caution while transiting the area in the vicinity of the Tappan Zee Bridge especially during inclement weather and darkness, and pay particular attention to vessel movements
Chart 12343 LNM 22/16 (CGD1)

NEW YORK – NEW YORK TO WAPPINGER CREEK – HUDSON RIVER - Regulated Navigation Area and Safety Zone – The Coast Guard is revising the current regulated navigation area (RNA) for the navigable waters of the Hudson River surrounding the Tappan Zee Bridge. First, the Coast Guard is establishing a new safety zone surrounding commercial mooring buoys installed for the ongoing Tappan Zee Bridge replacement project. The safety zone will prohibit all vessel traffic that could pose an imminent hazard to persons and vessels that will be transiting to and from the bridge site and maneuvering in close quarters between other construction vessels and large mooring buoys. Second, the Coast Guard is expanding the size of the current RNA and designating two areas within the RNA, the Eastern RNA and the Western RNA, based upon their respective locations in relation to the new safety zone. This rule is necessary to provide for the safety of life in the RNA and safety zone during the construction of the New NY Bridge and demolition of the existing Tappan Zee Bridge.
This rule is effective without actual notice from **July 25, 2014 to December 31, 2018**. Comments and related material will be accepted and reviewed by the Coast Guard through **December 31, 2018.** For the purposes of enforcement, actual notice will be used from the date the rule was signed, July 3, 2014 until July 25, 2014. If you have questions on this rule, call or e-mail Chief Craig Lapiejko, Waterways Management at Coast Guard First District, telephone 617-223-8351, e-mail craig.lapiejko@uscg.mil or, Mr. Jeff Yunker, Coast Guard Sector New York Waterways Management Division, U.S. Coast Guard; telephone 718-354-4195, e-mail jeff.m.yunker@uscg.mil. Comments and related material will be accepted and reviewed by the Coast Guard through September 23, 2014. You may submit comments, identified by docket number "USCG-2013-0705", using any one of the following methods: (1) Federal eRulemaking Portal: http://www.regulations.gov. (2) Fax: (202) 493-2251. (3) Mail or Delivery: Docket Management Facility (M-30), U.S. Department of Transportation, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590-0001. Deliveries accepted between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays. The telephone number is 202-366-9329.
§165.T01-0174 Regulated Navigation Areas and Safety Zone Tappan Zee Bridge Construction Project, Hudson River; South Nyack and Tarrytown, NY

(a) Regulated Navigation Area Boundaries. The following are regulated navigation areas:

(1) "Western RNA": all waters bound by the following approximate positions: 41°04'39.16"N, 073°55'00.68"W on the western shoreline; thence to 41°04'28.34"N, 073°54'47.18"W; thence to 41°04'11.28"N, 073°54'48.00"W; thence to 41°03'57.26"N, 073°54'40.73"W; thence to 41°03'57.36"N, 073°54'47.38"W; thence to 41°03'58.66"N, 073°54'56.14"W; thence to 41°04'03.00"N, 073°55'07.60"W; thence to a point on the western shoreline at 41°04'06.69"N, 073°55'14.10"W; thence northerly along the shoreline to the point of origin (NAD 83).

(2) "Eastern RNA": all waters bound by the following approximate positions: 41°04'21.96"N, 073°52'03.25"W on the eastern shoreline; thence to 41°04'26.27"N, 073°52'19.82"W; thence to 41°04'26.53"N, 073°53'20.07"W; thence to 41°03'56.92"N, 073°53'18.84"W; thence to 41°03'56.69"N, 073°52'24.75"W; thence to a point on the eastern shoreline at 41°03'46.91"N, 073°52'05.89"W; thence northerly along the shoreline to the point of origin (NAD 83).

(b) Safety Zone Boundaries: The following is a Safety Zone: all waters bound by the following approximate positions: 41°04'59.70"N, 073°54'45.54"W; thence to 41°05'00.18"N, 073°53'21.48"W; thence to 41°03'09.24"N, 073°53'16.86"W; thence to 41°03'07.08"N, 073°54'14.70"W; thence to 41°04'11.28"N, 073°54'48.00"W; 41-04-59.700"N, 073-54-00.420"W; 41-03-32.220"N, 073-53-18.180"W; 41-03-08.100"N, 073-53-40.800"W; thence to the point of origin (NAD 83).

(c) Regulations.

(1) The general regulations contained in 33 CFR 165.10, 165.11, and 165.13, 165.20 and 165.23 apply.

(2) Any vessel transiting through the Western RNA must make a direct and expeditious passage. No vessel may stop, moor, anchor or loiter within the RNA at any time unless they are working on the bridge construction operations.

(3) Any vessel transiting through the Eastern RNA must make a direct and expeditious passage. No vessel may stop, moor, anchor or loiter within the RNA at any time unless they are working on the bridge construction operations or they are transiting to, or from, the special anchorage area codified in 33 CFR 110.60(c)(8) located on the eastern shoreline at Tarrytown, NY and within the boundaries of the RNA.

(4) Entry and movement within the Eastern RNA or Western RNA is subject to a "Slow-No Wake" speed limit. All vessels may not produce a wake and may not attain speeds greater than five knots unless a higher minimum speed is necessary to maintain steerageway. All vessels must proceed through the Eastern RNA and Western RNA with caution and operate in such a manner as to produce no wake.

(5) Entry into, anchoring, loitering, or movement within the Safety Zone is prohibited unless the vessel is working on the bridge construction operations or authorized by the Captain of the Port New York (COTP) or his designated representative.

(6) All persons and vessels must comply with all orders and directions from the COTP or the COTP's designated representative. The "designated representative" of the COTP is any Coast Guard commissioned, warrant or petty officer who has been designated by the COTP to act on the COTP's behalf. The designated representative may be on a Coast Guard vessel or New York State Police, Westchester County Police, Rockland County Police, or other designated craft; or may be on shore and will communicate

with vessels via VHF-FM radio or loudhailer. Members of the Coast Guard Auxiliary may be present to inform vessel operators of this regulation.

(7) Upon being hailed by a Coast Guard vessel by siren, radio, flashing light or other means, the operator of the vessel must proceed as directed.

(8) For the purpose of this regulation, the Federal navigation channel, located in the Eastern RNA is marked by the red and green navigation lights on the existing Tappan Zee Bridge, and the New NY Bridge. As the project progresses, the Federal navigation channel will be intermittently closed, or partially restricted, to all vessel transits. While the Federal navigation channel is closed, vessels that can safely navigate outside the Federal navigation channel would still be able to transit through the Eastern RNA. These closures or partial restrictions are tentatively scheduled to take place between March 2015 and October 2016. The COTP will cause a notice of the channel closure or restrictions by appropriate means to the affected segments of the public. Such means of notification may include, but are not limited to, Broadcast Notice to Mariners and Local Notice to Mariners.

(9) Notwithstanding anything contained in this section, the Rules of the Road (33 CFR part 84—Subchapter E, inland navigational rules) are still in effect and must be strictly adhered to at all times.

(d) Enforcement Periods. This regulation will be enforced 24 hours a day from 5:00 a.m. on July 3, 2014 until 11:59 p.m. on December 31, 2018.

(1) Notice of suspension of enforcement: If enforcement is suspended, the COTP will cause a notice of the suspension of enforcement by appropriate means to the affected segments of the public. Such means of notification may include, but are not limited to, Broadcast Notice to Mariners and Local Notice to Mariners. Such notification will include the date and time that enforcement will be suspended as well as the date and time that enforcement will resume.

(2) Violations of this regulation may be reported to the COTP at 718-354-4353 or on VHF-Channel 16.

Chart-12343 LNM 22/16 (CGD1)

NEW YORK – NEW YORK TO WAPPINGER CREEK - HUDSON RIVER – Temporary Navigational Lights - Temporary navigational lights was be relocated as per the diagram below at the existing Tappan Zee Bridge across the Hudson River at mile 27.0. . The new temporary navigational lighting plan includes marking the 600 foot wide main channel by affixing four-180˚ steady, red navigation lights to the underside of the main span, 2 each on the upstream and downstream sides of the structure, 300 feet either side of the centerline of the bridge. Each green center of channel light will have 3 white lights stacked vertically above it. The center 600' feet of the Main Navigation Channel will be free for the passage of marine traffic and clear of all obstructions at all times.

This temporary configuration is expected to be in place through **mid-2016**, at which time more detailed information for channel restrictions and closures during the installation of the superstructure of the new main spans will be published.

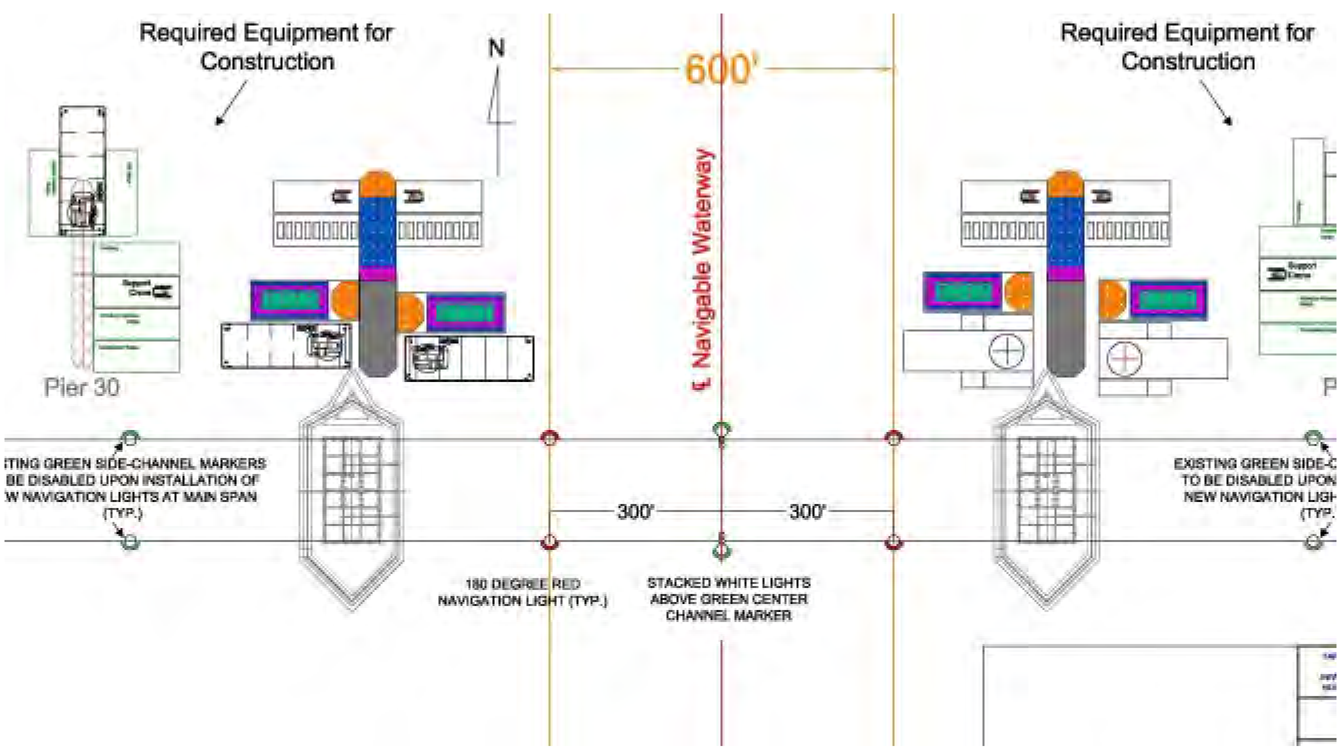


Chart 12343 LNM 22/16 (CGD1)

NY – HUDSON RIVER– UPPER HUDSON RIVER – Bridge Railing Replacement–Railing replacement at the Walkway over the Hudson Bridge across Hudson River at mile 76.1 will commence on or about 28 March 2016. Hours of operation will be 0700 to

1600 and 2100 to 0500, Monday through Saturday. This project is expected to be completed by **end of 2016**. All work will be performed on top of the bridge and will not impact marine traffic. Mariners are advised to exercise caution when transiting the area.
Chart 12347 LNM 22/16(CGD1)

NEW YORK – TALLMAN ISLAND TO QUEENSBORO BRIDGE – FLUSHING RIVER – Bridge Rehabilitation – Construction to the Roosevelt Ave Bridge across Flushing River at mile 0.8 is in progress. There will not be any construction equipment in the navigable channel. The project will be completed by **May 7, 2019.**
Chart 12339 LNM 22/16 (CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – NEWTOWN CREEK – Bike Path Installation – From January 15, 2016 **to June 30, 2016**, Monday through Saturday, between 7 a.m. and 4 p.m., and between 9 p.m. and 6 a.m., an under bridge inspection unit will be operated under the Pulaski (McGuiness Blvd) Bridge across Newtown Creek at mile 0.6, Brooklyn, New York. Mariners requiring full vertical clearance can contact the contractor via marine radio VHF-FM CH 13/16 or call 917-299-4735 with 15 minutes advance notice. Mariners are advised to exercise caution when transiting the area.
Chart 12338 LNM 22/16(CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – NEWTOWN CREEK – Bridge Inspection – From June 13, 2016 to June 17, 2016 between 0800 and 1600, a barge with manlift will be operating IVO the Pulaski (McGuiness Blvd) Bridge across Newtown Creek at mile 0.6, Brooklyn, New York for bridge inspection. Mariners requiring full horizontal clearance can contact the contractor via marine radio VHF-FM CH 13/16 or call 917-923-7591. Mariners are advised to exercise caution when transiting the area.
Chart 12338 LNM 22/16 (CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – NEWTOWN CREEK – Bridge Replacement – Construction to the Kosciuszko New Eastbound (EB) Bridge across Newtown Creek at mile 2.1 is in progress. A temporary construction traveler will be operating over the navigable channel and will reduce the vertical clearance by approx. 10 feet. Mariners requiring full vertical clearance can contact the contractor via marine radio VHF-FM CH 13/16 or call 360-516-0208/646-235-7819 with 48 hours advance notice. The temporary construction traveler is authorized through September 30, 2016. The project will be completed by **March 31, 2017**. Mariners are advised to exercise caution when transiting the area.
Chart 12338 LNM 22/16 (CGD1)

NEW YORK- NEW HARBOR –EAST RIVER – Biennial Bridge Inspection-Biennial Bridge inspection of the Triboro (RFK) Bridge across the East River, mile 7.8, will commence on or about 1 June and continue through 31 October 2016. Bridge inspectors, equipped with marine radios, will be monitoring Chan. 13/16 VHF-FM. Bridge inspection will have no impact to navigation. Hours of operation are from 0800 to 1600, Mondays through Fridays. Mariners are advised to exercise caution when transiting the area.
Chart 12342 LNM 22/16 (CGD1)

NEW YORK- NEW HARBOR –EAST RIVER – Biennial Bridge Inspection-Biennial Bridge inspection of the Queensboro (59th St) Bridge across the East River, mile 5.5, will commence on or about 2 May and continue through **29 July 2016**. At times the traveler platform which will reduce the vertical clearance by approximately 15 feet will be operating at various locations over the navigable channel. Bridge inspectors, equipped with marine radios, will be monitoring Chan. 13/16 VHF-FM. Mariners requiring full vertical clearance under the bridge can contact the bridge inspector and request the traveler platform be moved out of the navigable channel. Hours of operation are from 0800 to 1400, Mondays through Fridays. The traveller platform will be moved out of the navigable channel after work hours, or when not in use. Mariners are advised to exercise caution when transiting the area.
Chart 12342 LNM 22/16 (CGD1)

NEW YORK- NEW HARBOR –EAST RIVER – Biennial Bridge Inspection-Biennial Bridge inspection of the Williamsburg Bridge across the East River, mile 1.1, will commence on or about 2 May and continue through **31 December 2016**. At times the traveler platform which will reduce the vertical clearance by approximately 15 feet will be operating at various locations over the navigable channel. Bridge inspectors, equipped with marine radios, will be monitoring Chan. 13/16 VHF-FM. Mariners requiring full vertical clearance under the bridge can contact the bridge inspector and request the traveler platform be moved out of the navigable channel. Hours of operation are from 0800 to 1600, Mondays through Fridays. The traveller platform will be moved out of the navigable channel after work hours, or when not in use. Mariners are advised to exercise caution when transiting the area.
Chart 12342 LNM 22/16 (CGD1)

NEW YORK- NEW YORK HARBOR – EAST RIVER – Bridge Painting & Rehabilitation – Painting/approach rehabilitation of the Brooklyn Bridge across the East River, mile 0.8, is in progress. Contractor has installed scaffolding from the Brooklyn side through mid-channel. Scaffolding reduces the available vertical clearance under the bridge by approx. 6 feet. The scaffolding will be marked by three red lights, one at each end of the scaffolding and one at the center. The remainder of the channel between mid-channel and the Manhattan side will provide full vertical clearance and is clear of any obstructions, however, at times the movable

platforms will be in use and occupy part of the Brooklyn half channel, the traveler platform can be move for passage of large vessels, with a one hour advance notice. Large vessels requiring the full vertical clearance of the bridge should contact the resident engineer in advance at 347-242-6442 for up to date information. This project is expected to be completed by end **January 2017.** Mariners are advised to exercise caution when transiting the area and large vessels are reminded to transit the Manhattan half of the channel.
Chart 12335 LNM 22/16 (CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – HARLEM RIVER- Fender System Damaged – The 207 St. (University Ave.) Bridge across Harlem River at mile 6.0 suffered a major fender collapsed at the East draw (Bronx side). To prevent further damage until it can be permanently repaired NYCDOT **is** r**equesting all mariners to transit the West Draw** (Manhattan side) until further notice. Mariners are advised to exercise extreme caution and reduce wake when transiting the area.
Chart 12327 LNM 22/16 (CGD1)

NEW YORK – NEW YORK HARBOR – EAST RIVER – HARLEM RIVER- Bridge Out of Service – The Macombs Dam and 207 St. Bridges across Harlem River at mile 3.2 and 6.0 are still unable to open due the major damaged sustain during Hurricane Sandy. Vertical clearance under the closed span of Macomb's Dam is approx. 27 feet at MHW and the 207th Bridge is approx. 26 feet at MHW. NYCDOT is now in the process of awarding the contract to repair the bridge. Vessels that can transit under the closed span may do so at any time. Mariners are advised to plan accordingly and exercise extreme caution when transiting the area.
Chart 12327 LNM 22/16 (CGD1)

NEW YORK - NEW YORK HARBOR – EAST RIVER - HARLEM RIVER – Underwater Survey –Underwater survey at the Macombs Dam swing Bridge across Harlem River, mile 3.2 will commence on or about 11 May through **30 June 2016**. Hours of operation are from 0700 to 1700, daily, Mondays through Fridays. A 20ft boat will be operating IVO of the bridge. Mariners are advised to proceed with extreme caution and reduce wake when transiting the area.
Chart 12342 LNM 22/16 (CGD1)

NEW YORK AND NEW JERSEY – NEW YORK HARBOR – KILL VAN KULL – Bridge Construction- The construction project for the raising of the Bayonne Bridge navigational clearance across the Kill Van Kull, mile 1.5, is in progress. Phase 1 is removal of the west side sidewalk. Phase 2 involves the demolition of the eastern half approach of the span deck. All work at this time is above the bridge deck and on the bridge approaches and will not impact marine traffic. This project is expected to be completed by the end **of 2016**. More information will be provided as the project progresses. Mariners are advised to exercise caution when transiting the area.
Chart 12327 LNM 22/16 (CGD1)

NEW YORK AND NEW JERSEY – NEW YORK HARBOR – ARTHUR KILL – Bridge Construction- Construction for the replacement of the Goethals Bridge across the Arthur Kill, mile 11.5, is in progress. In water work (pile driving, cofferdam installation) will commence on the New Jersey side of the waterway. A crane barge measuring 40 ft X 120 ft will be operating in the area. All work will be outside the navigable water and will not impact marine traffic. More information will be provided as the project progresses. Mariners are advised to exercise caution when transiting the area.
Chart 12327 LNM 22/16 (CGD1)

NEW YORK – NEW JERSEY – NEW YORK HARBOR – RARITAN BAY – KILL VAN KULL – ARTHUR KILL - Temporary Deviation – The Coast Guard has issued a temporary deviation from the operating schedule that governs the Arthur Kill (AK) Railroad Bridge across Arthur Kill, mile 11.6, between Staten Island, New York and Elizabeth, New Jersey. This deviation allows the bridge to remain in the closed position to facilitate bridge inspection as follows:

1. On July 16, 2016 from 7:28 a.m. to 11:31 and from 1:31 p.m. to 5:48 p.m.
2. On July 17, 2016 from 8:16 a.m. to 12:17 p.m. and 2:17 p.m. to 6:29 p.m.
3. On July 23, 2016 from 6:32 a.m. to 10:29a.m. and from 12:29 p.m. to 4:47 p.m.
4. On **July 24, 2016** from 7:16 a.m. to 11:22 a.m. and from 1:22 p.m. to 5:41 p.m.

AK Bridge vertical clearance in the closed position is 31 feet at Mean High Water and 35 feet at Mean Low Water. Vessels able to pass through the bridge in the closed positions may do so at anytime. Mariners are advised to plan accordingly.
Chart 12337 LNM 22/16 (CGD1)

NEW YORK – NEW JERSEY - NEW YORK HARBOR – ARTHUR KILL -Biennial Bridge Inspection-– Biennial Bridge inspection of the Outerbridge Crossing Bridge across the Arthur Kill at mile 2.0 is in progress. The inspection is expected to be completed **by 30 September 2016**. In performing this inspection an under bridge inspection type vehicle (UBIU) that extends over the side and beneath the bridge will be used. Vertical clearance under the bridge will be reduced by approximately 10 ft when the UBIU is in use. Bridge inspectors will monitor Chan. 13/16 VHF-FM. Mariners requiring the full vertical clearance can contact the bridge inspector to move the UBIU out of the navigable channel. In addition, the inspectors will be operating under the main span using a 32 ft X 28ft scaffolding which will reduce the available vertical clearance by approx. fice feet. The scaffolding will be marked by steady

red lights on the lower four corners. The scaffolding will be pulled up above the bottom girder when not in use. Under water diving operations will also be conducted at the bridge. Bridge inspector/contractor will be equipped with a marine radio and will monitor channel 13/16 and can be contacted by mariners requiring full vertical clearance of the bridge. Hours of operation will be 0730 to 1630 Mondays through Fridays. Mariners are advised to exercise caution when transiting the area.
Chart 12327 LNM 22/16(CGD1)

NEW YORK – NEW JERSEY - NEW YORK HARBOR – ARTHUR KILL -Biennial Bridge Inspection-– Biennial Bridge inspection of the Goethals Bridge across the Arthur Kill at mile 11.5 is in progress and continue **through 30 September 2016**. In performing this inspection an under bridge inspection type vehicle (UBIU) that extends over the side and beneath the bridge will be used. Vertical clearance under the bridge will be reduced by approximately 10 ft when the UBIU is in use. Bridge inspectors will monitor Chan. 13/16 VHF-FM. Mariners requiring the full vertical clearance can contact the bridge inspector to move the UBIU out of the navigable channel. In addition, the inspectors will be operating under the main span using a 32 ft X 28ft scaffolding which will reduce the available vertical clearance by approx.five feet. The scaffolding will be marked by steady red lights on the lower four corners. The scaffolding will be pulled up above the bottom girder when not in use. Under water diving operations will also be conducted at the bridge. Bridge inspector/contractor will be equipped with a marine radio and will monitor channel 13/16 and can be contacted by mariners requiring full vertical clearance of the bridge. Hours of operation will be 0730 to 1630 Mondays through Fridays. Mariners are advised to exercise caution when transiting the area.
Chart 12327 LNM 22/16(CGD1)

NEW JERSEY – NEW YORK HARBOR – NEWARK BAY – HACKENSACK AND PASSAIC RIVERS - Temporary Deviation – The Coast Guard has issued a temporary deviation from the operating schedule that governs the Lehigh Valley Drawbridge across the Newark Bay, mile 3.0, at Jersey City, New Jersey. This deviation is necessary to allow the bridge owner to replace rails and ties at the bridge. This deviation allows the bridge to remain closed for 26 hours for two days. This deviation is effective from 7 a.m. to 9 p.m. on June 5, 2016 and from 7 a.m. to 7 p.m. on **June 6, 2016**, and a rain date from 7 a.m. to 9 p.m. on June 12, 2016 and from 7 a.m. to 7 p.m. on June 13, 2016. Lehigh Valley Drawbridge has a vertical clearance in the closed position of 35 feet at Mean High Water and 39 feet at Mean Low Water. Vessels able to pass through the bridge in the closed positions may do so at anytime. Mariners are advised to plan accordingly.
Chart 12327 LNM 22/16 (CGD1)

NEW JERSEY- NEWYORK HARBOR - NEWARK BAY – HACKENSACK RIVER-HACKENSACK AND PASSAIC RIVER- -Notice of Temporary Final Rule - The Coast Guard is temporarily modifying the operating schedule that governs the operation of the Route 1 & 9 (Lincoln Highway) Bridge across the Hackensack River, mile 2.0. New Jersey Department of Transportation, requested to temporarily restrict bridge openings during the morning and afternoon rush hour periods to alleviate traffic congestion resulting from area (Pulaski Skyway) roadway closures. Effective **March 1, 2014** through **September 30, 2017**, the draw of the Route 1 & 9 (Lincoln Highway) Bridge, mile 2.0, across the Hackensack River shall open on signal; except that, the draw need not open for the passage of vessel traffic between 6 a.m. and 10 a.m. and between 2 p.m. and 6 p.m., Monday through Friday, except holidays. Tide dependent deep draft vessels may request bridge openings between 6 a.m. and 10 a.m. and between 2 p.m. and 6 p.m. provided at least a twelve hour advance notice is given by calling 973-589-5143. It is expected that this temporary change to the regulations will provide relief to vehicular traffic while continuing to meet the reasonable needs of navigation. Mariners are advised to plan their transits accordingly.
Chart 12327 LNM 22/16 (CGD1)

NEW JERSEY – NEW YORK HARBOR – NEWARK BAY – HACKENSACK RIVER - Temporary Deviation –The Coast Guard has issued a temporary deviation from the operating schedule that governs the PATH Bridge across the Hackensack River, mile 3.0, at Jersey City, New Jersey. This deviation is necessary to allow the bridge owner to replace rails and ties at the bridge. This deviation allows the bridge to remain closed on Saturdays through Mondays for twenty-six consecutive weekends. This deviation is effective from 12:01 a.m. on March 19, 2016 to 12:01 a.m. on **September 12, 2016**. Path Bridge has a vertical clearance in the closed position of 40 feet at mean high water and 45 feet at mean low water. Vessels able to pass through the bridge in the closed positions may do so at anytime. Mariners are advised to plan accordingly.
Chart 12327 LNM 22/16 (CGD1)

NEW JERSEY - NEW YORK HARBOR – NEWARK BAY - HACKENSACK RIVER - New Bridge Construction – Replacement of the Whitt-Penn Bridge across the Hackensack River at mile 3.1 is in progress. At this time work on the waterway has been completed, and the channel are free and clear of any obstruction. More information will be published as received. Mariners are advised to exercise extreme caution when transiting the area.
Chart 12337 LNM 22/16 (CGD1)

NEW JERSEY – NEW YORK HARBOR - NEWARK BAY – HACKENSACK AND PASSAIC RIVER - Notice of Temporary Final Rule - The Coast Guard is temporarily modifying the operating schedule that governs the operation of the Route 1 & 9 (Lincoln Highway) Bridge across the Passaic River, mile 1.9. New Jersey Department of Transportation, requested to temporarily restrict bridge openings during the morning and afternoon rush hour periods to alleviate traffic congestion resulting from area (Pulaski Skyway) roadway closures. Effective **March 1, 2014** through **September 30, 2017,** the draw of the Route 1 & 9 (Lincoln Highway) Bridge, mile 2.0, across the Hackensack River shall open on signal; except that, the draw need not open for the passage of vessel

traffic between 6 a.m. and 10 a.m. and between 2 p.m. and 6 p.m., Monday through Friday, except holidays. Tide dependent deep draft vessels may request bridge openings between 6 a.m. and 10 a.m. and between 2 p.m. and 6 p.m. provided at least a twelve hour advance notice is given by calling the 973-589-5143. It is expected that this temporary change to the regulations will provide relief to vehicular traffic while continuing to meet the reasonable needs of navigation. Mariners are advised to plan their transits accordingly.
Chart 12327 LNM 22/16 (CGD1)

NEW JERSEY- SANDY HOOK TO LITTLE EGG HARBOR– NAVESINK RIVER – Sub-Structure Rehabilitation– Sub-structure rehabilitation at the Oceanic Drawbridge across Navisink River at mile, 4.5, at Monmouth County, New Jersey is in progress. A 24ft X 40 hydraulic spud barge and 24ft buddy boat and14ft rescue boat will be operating at the various piers and will not obstruct the navigable channel during daylight hours, Mondays through Fridays. After work hours work float will be move out of the waterway. This project is expected to be completed **by 31 October2016**.
Mariners are advised to reduce wake and exercise caution when transiting the area.
Chart 12324 LNM 22/16(CGD1)

NEW JERSEY- RARITAN RIVER – Pier Rehabilitation– Sub-structure rehabilitation at the NJTRO Raritan River Drawbridge across Raritan River at mile, 0.5, at Perth Amboy, New Jersey will commence or about 1 June 2016. 3 spud barges measuring 10ft X 40ft coupled together will form a 30ft X 40ft work platform. Barges will be operating at various locations on the west side of the bridge. No work will be done on the movable span or the navigational channel. After work hours work platform will be moored in place outside the navigable channel.. This project is expected to be completed by 21 August 2016.
Mariners are advised to reduce wake and exercise caution when transiting the area.
Chart 12332 LNM 22/16(CGD1)

Coast Guard Sector New York

Marine Safety Information Bulletin – 01-14

Vessel Air Drafts and Bayonne Bridge Allisions

April 18, 2014

The Bayonne Bridge is undergoing a two-year construction project to raise the roadway an average of 65 feet. The associated demolition activities and work platforms outside of the navigable channel present serious safety considerations for mariners. Despite previous Coast Guard advisories, the Bayonne Bridge has been struck twice within the past four months. The most recent allision demasted a ship's INMARSAT C and Ship Safety Alert System antennas. In this case, the Coast Guard is pursuing a civil penalty against the ship's owner.

To ensure the safety of the bridge work crews, as well as ships navigating in the vicinity of the construction project, each vessel owner, master, or person in charge is reminded to review and update as necessary their ship's particulars. In accordance with Title 33 Code of Federal Regulations Section 164.11(k), this includes knowing the distance from their ship's keel to its highest point, providing accurate information to the Pilot and the ship's agent for safe navigation, and clearly indicating whether vessel modification data or any adjustable or whip antennas are included.

Bridge allisions, including ship antenna and mast strikes, may cause severe property damage or even loss of life. Vessels must take proactive measures to ensure they can safely navigate under bridges and other overhead obstructions before attempting such transits. Depending on the facts of future incidents, the Coast Guard will likely pursue civil penalties against any vessel owner, master, or person in charge that provides inaccurate vessel information that contributes to a bridge allision within the New York-New Jersey Captain of the Port Zone. The maximum penalty authorized by the Ports and Waterway Safety Act is $40,000 per incident.

For current vertical and horizontal clearance information and construction status at the Bayonne Bridge, refer to NOAA Chart 12333, the First Coast Guard District Local Notice to Mariners (LNM) at http://www.navcen.uscg.gov, and http://www.nws.noaa.gov/om/marine/ports.htm.

GORDON LOEBL
Captain, U.S. Coast Guard
Captain of the Port, New York-New Jersey
Sector New York, 212 Coast Guard Drive, Staten Island, NY 10305
http://homeport.uscg.mil/newyork

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Sector New York

212 Coast Guard Drive
Staten Island, NY 10305
Staff Symbol: (spw)
Phone: (718) 354-2353
Fax: (718) 354-4190

COAST GUARD ADVISORY NOTICE (CGAN 2016-007)

To: Distribution　　Date: May 23, 2016

From: Waterways Management Division　　Revision No: 1

Re: FLEET WEEK May 25, 2016

NAVAL VESSEL PROTECTION ZONE (NVPZ) & SAFETY ZONE:

All naval vessels have a 500 yard Naval Vessel Protection Zone around them. This zone is in effect **AT ALL TIMES** except when the naval vessel is moored in a restricted area. When within this 500 yard zone, all vessels shall operate at the minimum safe speed necessary to maintain course and shall proceed as directed by the Coast Guard or Navy. No vessel or person is allowed within 100 yards of naval vessels without permission of the Captain of the Port. Other law enforcement agencies will assist the Coast Guard in maintaining the NVPZ and safety zones.

1. General information and restrictions for the Hudson River and Upper Bay during the parade of ships:

- Commercial passenger vessels on established ferry routes may need to pass through the parade of ships within the 500 yard Naval Vessel Protection Zone boundary. Commercial passenger vessels that need to transit through the military warship section of the parade must make passing arrangements with the Coast Guard and receive authorization to cross via VHF Ch 13. Passenger vessels must pass a minimum distance of 250 yards from all military warships. Vessels must operate at the minimum speed necessary to maintain safe course while crossing the parade formation and take all direction that may be provided by the Coast Guard or Naval warship. All vessel traffic in the Hudson River and Upper Bay shall transit to the west of the parade column and shall operate at the minimum speed necessary to maintain safe course.

2. The following waterway restrictions and closures will be in effect during Fleet Week 2016.

- No vessels are authorized within the restricted area around the Stapleton Homeport Pier on Staten Island from 8:00 a.m., May 25, 2016 through 4:00 p.m., May 31, 2016.
- No vessels are authorized within 250 yards of the Manhattan Cruise Terminal on the Hudson River between the south east corner of Pier 86 and the northeast corner of Pier 92, from 8:00 a.m., May 25, 2016 through 4:00 p.m., May 31, 2016, with the exception of scheduled cruise ship arrivals and departures.
- No vessels are authorized within the NVPZ around naval vessels moored at Brooklyn Marine Terminal from 8:00 a.m., May 25, 2016 through 8:00 p.m., May 31, 2016.

#

Wednesday, May 25, 2016

- 10:00 a.m. Stapleton Anchorage 23B, and Gravesend Anchorage are closed to commercial vessels.
- 10:00 a.m. Last inbound tug/barge, or deep draft vessel, permitted to pass through the Alpha buoy and enter Ambrose channel.
- 10:00 a.m. Last outbound tug/barge, or deep draft vessel, permitted to pass through The Narrows (Verrazano Bridge) & out Ambrose Channel.
- 1:00 p.m. Inbound traffic permitted in Ambrose Channel.
- 1:00 p.m. Upper Bay open for transits of tug/barge and deep draft vessels. (Coordinate exact timing of transits with VTS New York.)

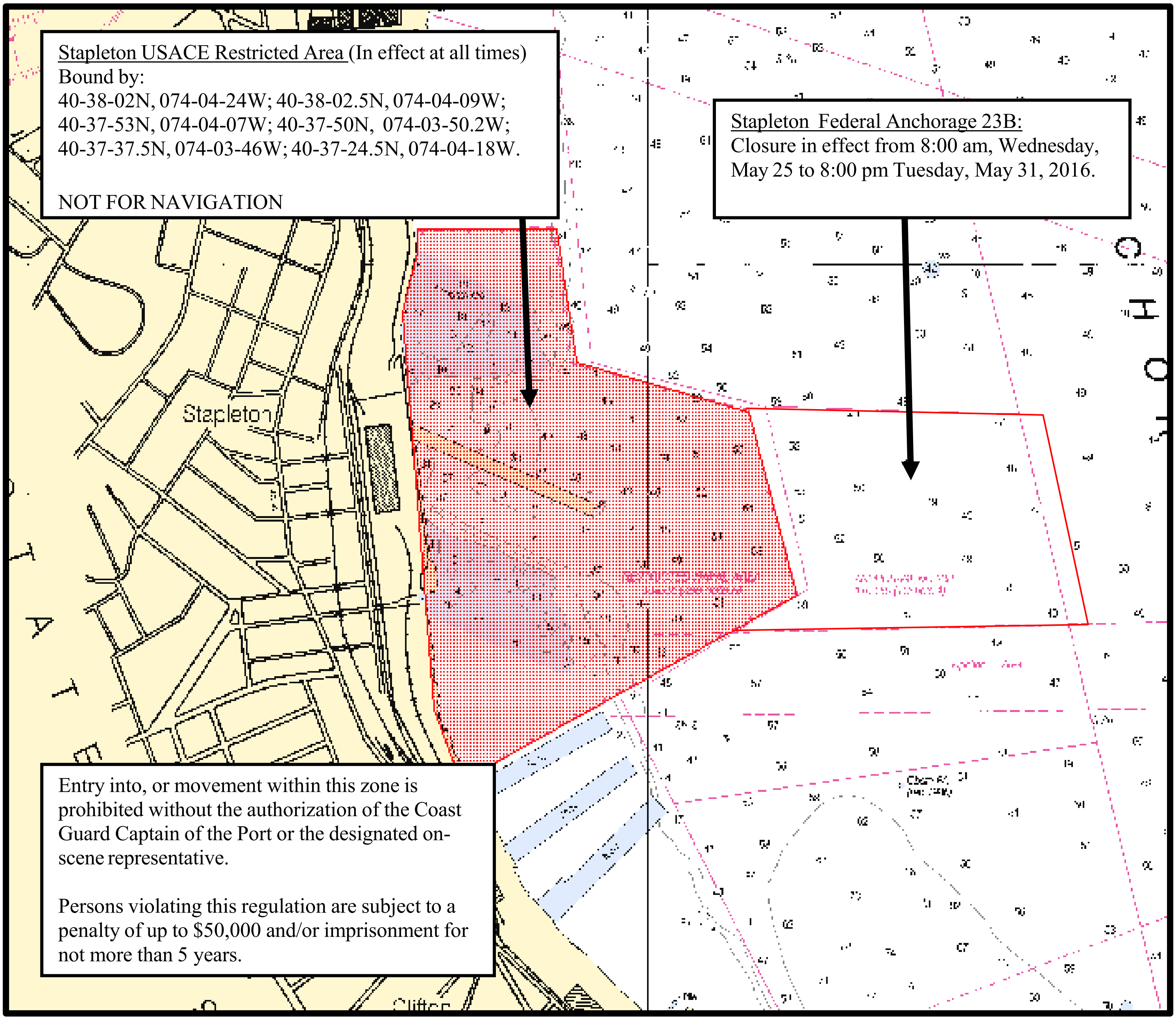
  Stapleton Anchorage 23B (immediately adjacent to Homeport Pier) will remain closed until June 1, 2016.

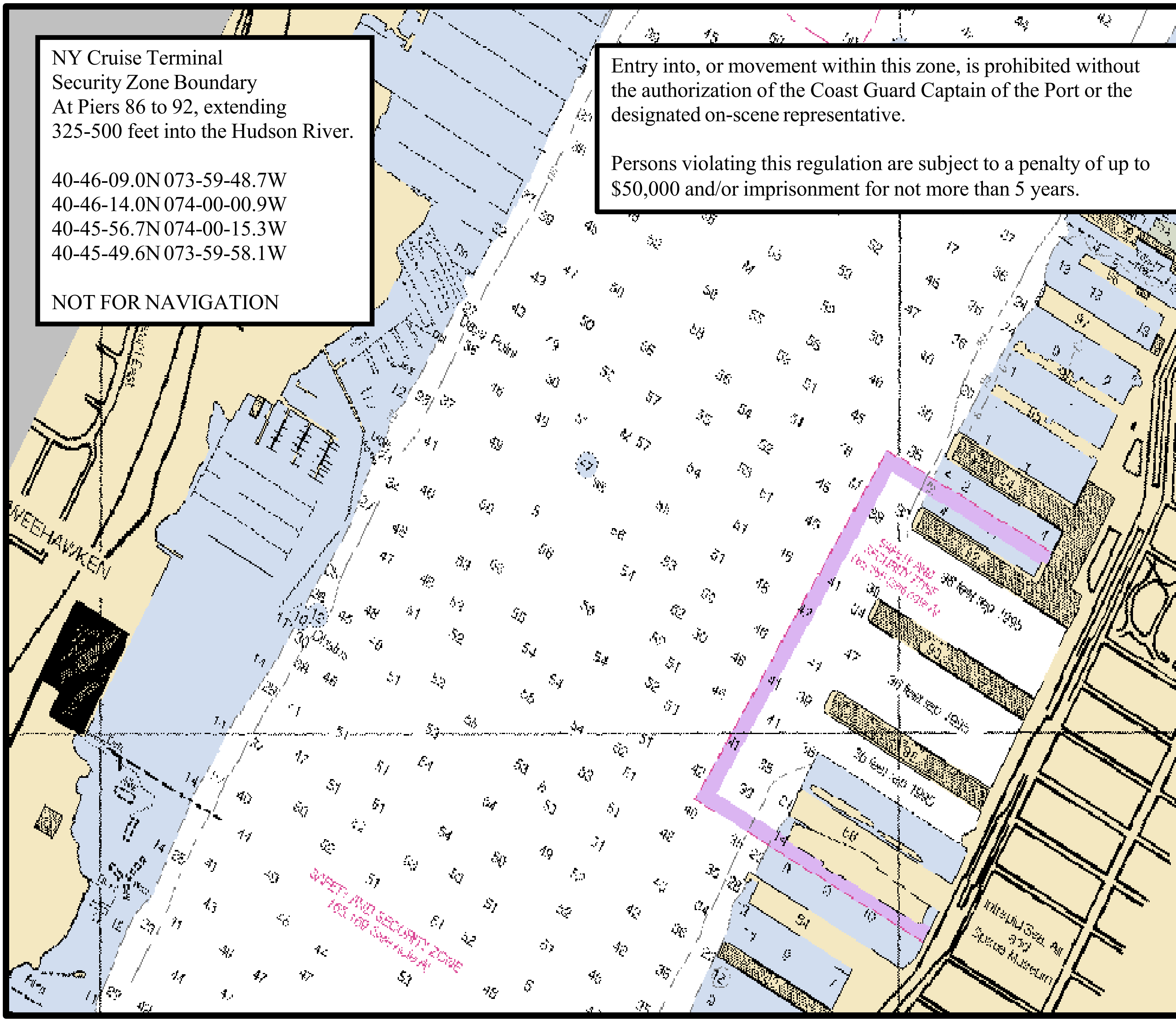
3. Please note that all times listed above are approximate. The potential exists for unanticipated delays due to ship movement and/or implementation of additional vessel controls with little or no warning within the Port of NY/NJ from Wednesday, May 25 through Tuesday, May 31, 2016. For the most up to date information on current restrictions please contact VTS New York at (718) 354-4088.

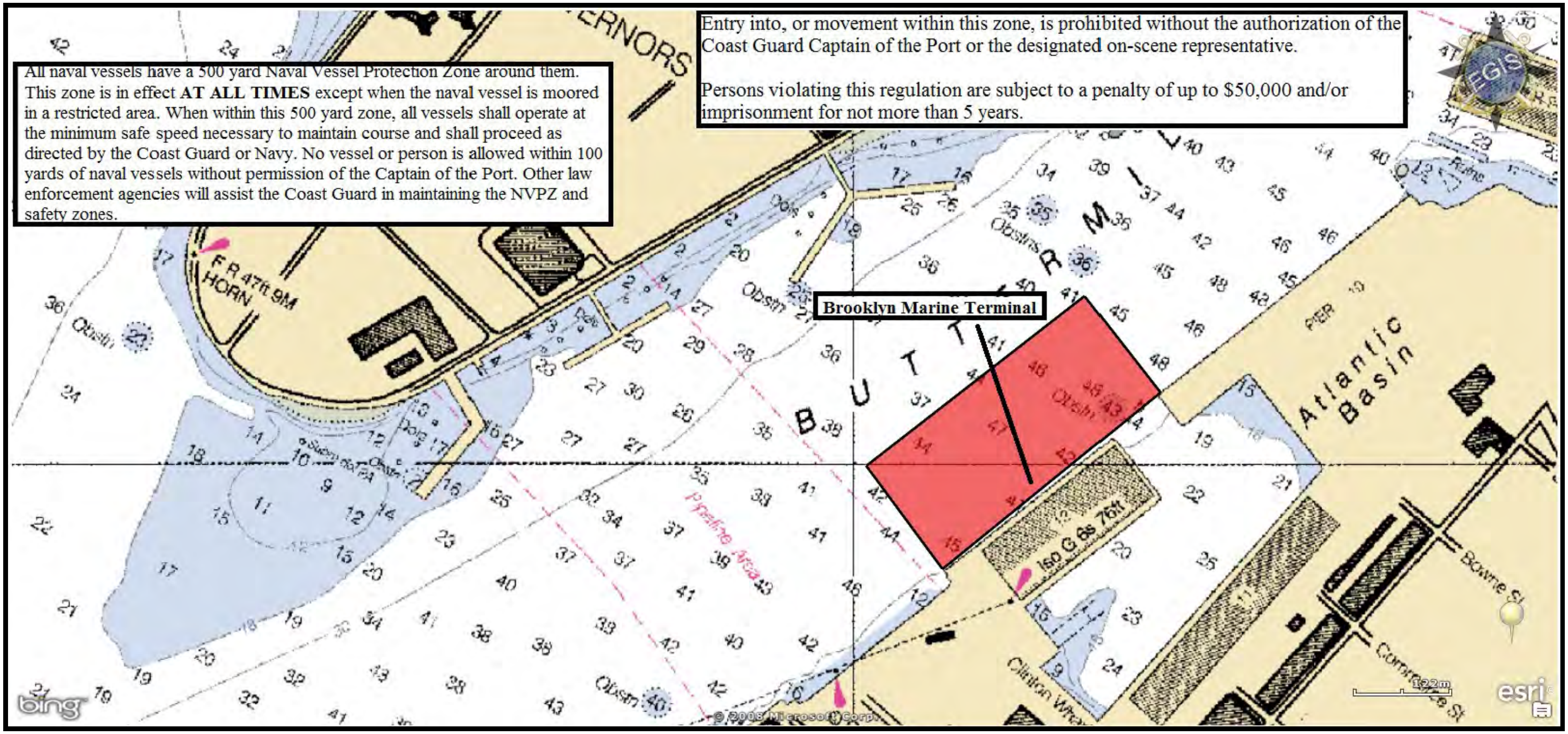
4. Entry into or movement within the restricted zones is prohibited unless authorized by the Coast Guard Captain of the Port or a designated on-scene representative. Any person violating this regulation is subject to a penalty of up to $50,000 and/or imprisonment for not more than 5 years.

5. Additional waterway information is available at: http://homeport.uscg.mil/newyork.

#

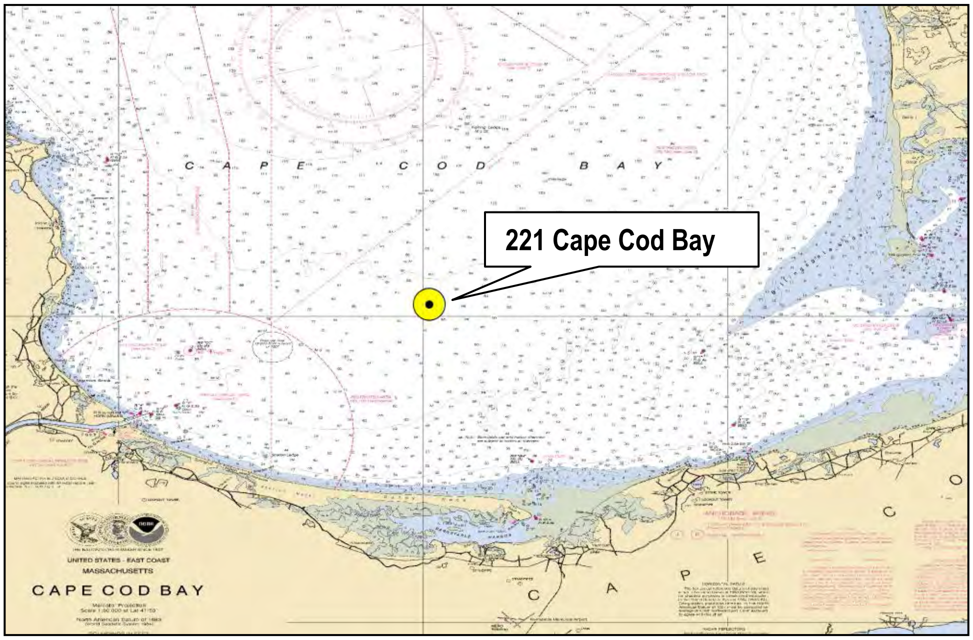

Stapleton USACE Restricted Area (In effect at all times)
Bound by:
40-38-02N, 074-04-24W; 40-38-02.5N, 074-04-09W;
40-37-53N, 074-04-07W; 40-37-50N, 074-03-50.2W;
40-37-37.5N, 074-03-46W; 40-37-24.5N, 074-04-18W.
NOT FOR NAVIGATION
Stapleton Federal Anchorage 23B:
Closure in effect from 8:00 am, Wednesday, May 25 to 8:00 pm Tuesday, May 31, 2016.
Stapleton
Entry into, or movement within this zone is prohibited without the authorization of the Coast Guard Captain of the Port or the designated on-scene representative.
Persons violating this regulation are subject to a penalty of up to $50,000 and/or imprisonment for not more than 5 years.


NY Cruise Terminal
Security Zone Boundary
At Piers 86 to 92, extending
325-500 feet into the Hudson River.
40-46-09.0N 073-59-48.7W
40-46-14.0N 074-00-00.9W
40-45-56.7N 074-00-15.3W
40-45-49.6N 073-59-58.1W
NOT FOR NAVIGATION
Entry into, or movement within this zone, is prohibited without the authorization of the Coast Guard Captain of the Port or the designated on-scene representative.
Persons violating this regulation are subject to a penalty of up to $50,000 and/or imprisonment for not more than 5 years.
WEEHAWKEN


All naval vessels have a 500 yard Naval Vessel Protection Zone around them. This zone is in effect **AT ALL TIMES** except when the naval vessel is moored in a restricted area. When within this 500 yard zone, all vessels shall operate at the minimum safe speed necessary to maintain course and shall proceed as directed by the Coast Guard or Navy. No vessel or person is allowed within 100 yards of naval vessels without permission of the Captain of the Port. Other law enforcement agencies will assist the Coast Guard in maintaining the NVPZ and safety zones.
Entry into, or movement within this zone, is prohibited without the authorization of the Coast Guard Captain of the Port or the designated on-scene representative.
Persons violating this regulation are subject to a penalty of up to $50,000 and/or imprisonment for not more than 5 years.
Brooklyn Marine Terminal
BUTTERMILK
Atlantic Basin
F R 47ft 9M HORN
Pipeline Area
Bowne St
Clinton Wharf
© 2008 Microsoft Corp
bing
esri

WAVE BUOY

Cape Cod Bay, MA – Station 221, NDBC 44090 - Deployed May 20, 2016



Location	Cape Cod Bay
Latitude	41° 50.38' N
Longitude	070° 19.74' W
Water Depth	14 fthm, 85 ft, 26 m

IMPORTANT – Do not tie up to this buoy because it will interfere with data collection and may damage the buoy.

Buoy measures wave height,
wave direction, wave period and
sea surface temperature.
The data are broadcast on the
NWS Marine Weather Channel. Data are also
UPDATED EVERY 30 MINUTES
on the web at
www.neracoos.org
http://www.ndnbc.noaa.gov
http://cdip.ucsd.edu (click on RECENT).

The wave height reported is the "significant" wave height (Hs), which represents the average of the 1/3 highest waves. Approximately double the Hs to obtain the maximum wave height.

At night time, the buoy will emit a yellow color Coast Guard compliant flashing light.

For questions concerning the data, contact
SCRIPPS INSTITUTION OF OCEANOGRAPHY
La Jolla, CA
858-534-3032
Email: www@cdip.ucsd.edu

Seacoast WAMS User Feedback Form

1. **What is your vessel type?** ***(select one)***
    - Military
    - Motor Vessel >300GRT
    - Motor Vessel <300GRT
    - Towing Vessel >26ft
    - Towing Vessel <26ft
    - Fishing Vessel
    - Passenger Vessel
    - Power Recreational Vessel
    - Sailing Recreational Vessel
2. **What is your position onboard the vessel?** ***(select one)***
    - Owner
    - Captain
    - Pilot
    - Mate
    - Crew
    - Port Captain
    - Dispatcher

3. **How long have you held this position?** ***(select one)***
    - <1 year
    - 1-5 years
    - 5-10 years
    - 10-20 years
    - >20 years
4. **What is the highest type of training/license that you hold?** ***(select one)***
    - Master Unlimited
    - Mate Unlimited
    - Master 1600GRT
    - Mate 1600GRT
    - Master 500GRT
    - Mate 500GRT
    - Master 200GRT
    - Mate 200GRT
    - Master 100GRT
    - Mate 100GRT
    - OUPV
    - State issued license
    - NASBLA Approved Boating Safety Courses
    - USCG Auxiliary Safe Boating Courses
    - U.S. Power Squadron Safe Boating Course
    - Unlicensed

5. **What is your voyage type on the Seacoast Waterway?** ***(select one)***
    - Transatlantic
    - Coastal
    - Local

6. **What region(s) of the Seacoast Waterway do you routinely transit?** ***(select all that apply)***
    - Northeast
    - Mid-Atlantic
    - Southeast
    - Gulf

7. **On average, how many days do you spend at sea per year? *(select one)***
    - o <30 days
    - o 30-90 days
    - o 90-180 days
    - o >180 days

8. **What is your Primary means to determine your position? *(select one)***
    - o Global Navigation Satellite System (GPS)
    - o Radar
    - o Fathometer
    - o Pelorus
    - o Handheld Bearing Observation Device

9. **What is your Secondary means to determine your position? *(select one)***
    - o Global Navigation Satellite System (GPS)
    - o Radar
    - o Fathometer
    - o Pelorus
    - o Handheld Bearing Observation Device

10. **What navigation reference materials do you use onboard when transiting? *(select all that apply)***
    - o Light List
    - o Coast Pilot
    - o Navigation Rules
    - o Local Notice to Mariners
    - o Weekly Notice to Mariners
    - o Commercial Chart Book or Cruising Guide
    - o Commercial Navigation Applications

11. **What navigation reference materials do you use for voyage planning? *(select all that apply)***
    - o Light List
    - o Coast Pilot
    - o Navigation Rules
    - o Local Notice to Mariners
    - o Weekly Notice to Mariners
    - o Commercial Chart Book or Cruising Guide
    - o Commercial Navigation Applications

12. **What format do you prefer your navigation reference materials to be in? *(select one)***
    - o Electronic (Downloaded prior to getting u/w)
    - o Web-Based (Real-Time)
    - o CD
    - o Mobile
    - o Paper

13. **If you use electronic reference material, what format do you prefer? *(select one)***
    - o PDF
    - o XML
    - o KML (GIS)
    - o Shape File (GIS)
    - o Chart Overlay (ECDIS/ECS)
    - o I do not know

14. **What depth of water do you consider to be Shoal Water? *(select one)***
    - <12 ft
    - 12-17ft
    - 18-29ft
    - 30-41ft
    - 42-60ft
    - >60ft

15. **What is your (or your company's) preferred minimum safe distance to shoal water? *(select one)***
    - <1NM
    - 1-2NM
    - 2-3NM
    - 3-5NM
    - >5NM

16. **When making landfall requiring you to transit within your preferred minimum safe distance to shoal water how many watchstanders do you normally have on the bridge? *(select one)***
    - 1
    - 2
    - 3
    - >3

17. **How many watchstanders do you normally have on watch when transiting outside your preferred minimum distance to shoal water? *(select one)***
    - 1
    - 2
    - 3
    - >3

18. **While underway, what do you use as your primary means to verify your proximity to shoal water? *(select one)***
    - GPS Position
    - ECDIS/ECS Cross Track Error
    - Radar Ranging to Landfall
    - Radar Ranging to Shoal Buoy
    - Radar Indexing
    - Visual Distance estimation using geographic features
    - Visual Distance estimation using ATON
    - Depth Finder

19. **At what distance do you need a visual indication of Landfall? *(select one)***
    - <1NM
    - 1-2NM
    - 2-3NM
    - 3-5NM
    - 5-7NM
    - 7-10NM
    - >10NM

20. **If you answered >10NM, please explain why you require a visual indication of Landfall at >10NM.**

____

____

____

____

____

21. **Do you need a visual indication of Shoal Water or Hazard? *(select one)***
    - Yes
    - No

22. **At what distance do you need a visual indication of Shoal Water or Hazard? *(select one)***
    - <1NM
    - 1-2NM
    - 2-3NM
    - 3-5NM
    - 5-7NM
    - 7-10NM
    - >10NM

23. **If you answered >10NM, please explain why you require a visual indication of Shoal Water or Hazard at >10NM.**

____
____
____
____
____

24. **Do you need an audible (bell, whistle, gong) indication of Shoal Water or Hazard? *(select one)***
    - Yes
    - No

25. **At what distance do you need an audible indication of Shoal Water or Hazard? *(select one)***
    - <1NM
    - 1-2NM
    - >2NM

26. **If you answered >2NM, please explain why you require an audio indication of Shoal Water or Hazard at >2NM.**

____
____
____
____
____

27. **Do you use RACONs**
    - Yes
    - No

28. **If you answered yes, please explain how and why.**

____
____
____
____
____

29. **What kind of communications equipment do you have onboard? *(select all that apply)***
    - GMDSS (Global Maritime Distress and Safety System)
    - HF SSB (High-Frequency Single Side Band)
    - VHF Marine Band
    - Satellite
    - Cellular
    - AIS
    - Internet 1-20NM offshore

- o Internet >20NM offshore

30. While underway, how do you prefer to obtain weather information? ***(select one)***

- o GMDSS (Global Maritime Distress and Safety System)
- o HF SSB (High-Frequency Single Side Band)
- o VHF Marine Band
- o Satellite
- o Cellular
- o AIS
- o Internet 1-20NM offshore
- o Internet >20NM offshore

APPENDIX C

Equipment Registrations and Certifications

DHS,USCG, CG-1270 (REV. 06-04)

OMB APPROVED 1625-0027

UNITED STATES OF AMERICA

DEPARTMENT OF HOMELAND SECURITY
UNITED STATES COAST GUARD

NATIONAL VESSEL DOCUMENTATION CENTER

CERTIFICATE OF DOCUMENTATION

VESSEL NAME	OFFICIAL NUMBER	IMO OR OTHER NUMBER	YEAR COMPLETED
SEISMIC PRINCESS #7	1117211	LAZ48809F595	1996

HAILING PORT	HULL MATERIAL	MECHANICAL PROPULSION
ST BERNARD LA	STEEL	YES

GROSS TONNAGE	NET TONNAGE	LENGTH	BREADTH	DEPTH
17GRT	14NRT	35.0	15.0	4.0

PLACE BUILT

ST BERNARD LA

OWNERS	OPERATIONAL ENDORSEMENTS
NEW HAMPSHIRE BORING	COASTWISE

MANAGING OWNER

NEW HAMPSHIRE BORING
40 FORDWAY STREET
PO BOX 165
DERRY NH 03038

RESTRICTIONS
NONE

ENTITLEMENTS
NONE

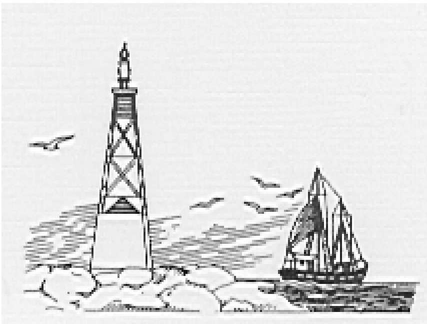
REMARKS
NONE

ISSUE DATE
JULY 15, 2015

THIS CERTIFICATE EXPIRES

AUGUST 31, 2016

DIRECTOR, NATIONAL VESSEL DOCUMENTATION CENTER



TAUNTON OFFICE
128 Dean St.,1st Floor Front
Taunton, MA 02780
Tel: 508 884-5055
Fax: 508 884 5056

FAIRHAVEN OFFICE
26 Water Street
Fairhaven, MA 02719
Tel: 508-996-4110
Fax: 508-990-2094

Marine Safety Consultants, Inc.

Tel: 207-775-7933 400 Commercial Street, Suite 403 Portland, ME 04101
Fax: 207-775-7471

April 12, 2016
File No.: 16-0256

New Hampshire Boring
40 Fordway Extension
Derry, NH 03038

SUITABILITY FOR SERVICE SURVEY

THIS IS TO CERTIFY THAT on April 7, 2016, the undersigned surveyor, did conduct and hold survey of the jack up rig, SEISMIC PRINCESS, while ashore in Derry, NH. The purpose of this survey was to determine the vessels suitability for its intended service as a work platform in protected waters.

VESSEL	: SEISMIC PRINCESS
O.N.	: 1117211
LENGTH	: 35’
BREADTH	: 15’
DEPTH	: 4’
TONNAGE	: 17 gross
BUILT	: 1996/ St. Bernard, LA

VESSEL DESCRIPTION

The SEISMIC PRINCESS is a self-propelled jack up vessel of welded steel construction. The vessel features parallel straight sides, flat bottom raked at both ends, straight forward and aft head logs and a flat deck with no sheer. There is a 10” moon pool on the centerline forward.

Set to port, starboard and aft are the lifting legs fitted to external wells and operated by individual hydraulic motors. The hydraulic power pack is driven by the main engine. All hydraulic hoses and fittings were found to be in good condition.

The deck is flat and enclosed with a 42” high handrail fitted with chain enclosures at the corners.

To the aft port side is a steel deckhouse, with windows all around in support of the navigation and operational controls for the vessel. The deck house is accessed by a weathertight door on its starboard side.

The vessel is equipped with a magnetic compass, chart plotter and VHF radio, fire extinguishers and a life ring with line attached. PFDs are to be provided for all crew.

The hull is without watertight subdivision and longitudinally framed reinforced with transverse trusses. Access to the space is by means of a non watertight hatch on a 4” raised coaming. The hull houses the main engine, an 85 HP Detroit Diesel which is coupled to a Twin Disc MG 506 reverse/reduction gear turning a 4 blade bronze propeller on a 1 ½” stainless steel shaft.

The vessel caries approx. 135 gallons of diesel fuel in an integral steel tank. Fuel lines are USCG type A1 hose in good condition. There is a submersible bilge pump in the aft section of the hull.

Vessels electrical system is 12 VDC by battery located in the engine space. Power is distributed through a selector switch to a fuse panel at the helm. All lights appear to be in proper location and condition, but were not tested for purpose of this survey.

CONDITIONS FOUND

Coatings about the hull and deck of the dredge are considered to be in good condition with usual wear and tear observed. Deck fittings and trips should be identified in bright yellow color. None of the machinery was operated for purpose of this survey.

OBSERVATIONS

Based on the observations made within the limits presented herein, in the opinion of the undersigned, the SEISMIC PRINCESS is suitable for its intended service as a work platform in protected waters, provided PFDs are provided for all personnel working aboard.

This report is based on examination of the vessel, and of those parts, spaces and equipment that could be sighted without removals or operation, and is rendered without bias or prejudice. In accepting same, it is agreed that the extent of obligation of this surveyor, with respect thereto, is limited to furnishing a competent survey, and in the making of this report, this surveyor is acting on behalf of the person or firm requesting same and no liability shall attach to this surveyor, for the accuracy, errors and/or omissions therefore.

SEISMIC PRINCESS
16-0256

Naval architecture and marine engineering analysis as usually performed in the design stage of the vessel's construction were not part of this survey and typical subjects such as adequacy of stability and seakeeping were not within the scope of this survey.

Submitted without prejudice,
MARINE SAFETY CONSULTANTS, INC.

NATIONAL ASSOCIATION OF MARINE SURVEYORS, INC.
NEIL C. ROSEN
No.
119-860
CERTIFIED MARINE SURVEYOR

Neil C. Rosen NAMS CMS
Marine Surveyor

TAUNTON OFFICE
128 Dean St.,1st Floor Front
Taunton, MA 02780
Tel: 508 884-5055
Fax: 508 884 5056

FAIRHAVEN OFFICE
26 Water Street
Fairhaven, MA 02719
Tel: 508-996-4110
Fax: 508-990-2094

Marine Safety Consultants, Inc.

Tel: 207-775-7933 400 Commercial Street, Suite 403 Portland, ME 04101
Fax: 207-775-7471

April 12, 2016
File No.: 16-0256

New Hampshire Boring
40 Fordway Extension
Derry, NH 03038

SUITABILITY FOR SERVICE SURVEY

THIS IS TO CERTIFY THAT on April 7, 2016, the undersigned surveyor, did conduct and hold survey of the 21' aluminum tri-hulled workboat, while ashore in Derry, NH. The purpose of this survey was to determine the vessels suitability for its intended service as a service vessel in protected waters.

VESSEL	: 21' workboat
H.I.N.	: NHZ231470409
LENGTH	: 21'
BREADTH	: 8'
DEPTH	: 3.5'
TONNAGE	: Less than 5 gross
BUILT	: 2009/ St. Bernard, LA

VESSEL DESCRIPTION

The workboat is an open deck vessel fitted with deckhouse enclosure of welded steel construction. The vessel features parallel straight sides, flat bottom raked at the bow and squared at the stern. The aft deck is of diamond plate enclosed by a 24" bulwark.

The deck house is fitted with large windows all around and accessed by means of an aft weathertight door. There are (2) submersible bilge pumps in the aft compartment.

The vessel is equipped with a chart plotter and VHF radio, fire extinguishers and a life ring with line attached. PFDs are to be provided for all crew.

The hull is transversely framed and partially foam filled for floatation. Access to the space is by means of flush deck hatches. Mounted on the stern are twin 60 HP Mercury 4 stroke outboard motors, complete

New Hampshire Borings
21' Aluminum workboat
16-0256
with tilt/ trim control and hydraulic steering.

The vessel caries approx. 50 gallons of gasoline is two new poly tanks mounted under the rail port and starboard. Fuel lines are USCG type A1 hose with in line Racor filter.

Vessels electrical system is 12 VDC by battery located in the aft compartment. Power is distributed through a selector switch to a fuse panel at the helm.

CONDITIONS FOUND

The hull is without coatings and considered to be in good condition with usual wear and tear observed. None of the machinery was operated for purpose of this survey.

OBSERVATIONS

Based on the observations made within the limits presented herein, in the opinion of the undersigned, the 21' aluminum workboat is suitable for its intended service as a service vessel in protected waters, provided PFDs are provided for all personnel working aboard.

This report is based on examination of the vessel, and of those parts, spaces and equipment that could be sighted without removals or operation, and is rendered without bias or prejudice. In accepting same, it is agreed that the extent of obligation of this surveyor, with respect thereto, is limited to furnishing a competent survey, and in the making of this report, this surveyor is acting on behalf of the person or firm requesting same and no liability shall attach to this surveyor, for the accuracy, errors and/or omissions therefore.

Naval architecture and marine engineering analysis as usually performed in the design stage of the vessel's construction were not part of this survey and typical subjects such as adequacy of stability and seakeeping were not within the scope of this survey.

Submitted without prejudice,
MARINE SAFETY CONSULTANTS, INC.

NATIONAL ASSOCIATION OF MARINE SURVEYORS, INC.
NEIL C. ROSEN
No.
119-860
CERTIFIED MARINE SURVEYOR

Neil C. Rosen NAMS CMS
Marine Surveyor

APPENDIX D

Personnel Resumes and Qualifications

RESUME

Blaine M. Cardali, EIT

Engineer II

Education

B.S., 2014, Civil Engineering, University of New Hampshire

Registrations & Certificates

Engineer-in-Training – 2013, New Hampshire, #6342

Areas of Specialization

- Geotechnical Engineering
- Geological Engineering
- Geo-Environmental Engineering
- Subsurface Investigation
- Construction Oversight
- Dam Engineering

Professional Activities

- Order of the Engineer
- ASCE Member

Professional Development

- OSHA Hazardous Waste Operations 40 Hour Safety Course June 2014
- Nuclear Gauge Safety Training June 2014
- Training Aids for Dam safety June 2012
- OSHA 10 hour Construction Course December 2014

Summary of Experience

Mr. Cardali is a civil engineer with experience in geotechnical projects and construction oversight. His field experience has included geotechnical explorations on waterfront and marine projects, bridges, highways, and residential and commercial, and construction oversight for foundation construction and rock slope stabilization projects. In his previous position with the Maine Dam Safety Program, Mr. Cardali conducted condition inspections and downstream hazard analyses according to title 37 B MRSA, The Safety of Dams.

Relevant Project Experience

Field Engineer, MEDOT Sarah Mildred Long Bridge Construction, Kittery, ME to Portsmouth, NH. The project involved oversight and documentation of subsurface investigations as confirmatory borings to assess bedrock type, quality and depth to assist in drilled shaft design for the bridge replacement. Confirmation borings were drilled from a floating spud barge and a temporary work trestle in high high-current, tidal setting. The project also involved the construction oversight of the drilled shafts including the use of temporary casing, permanent casing, float can, Wirth rock coring drill, mini-SID to assess shaft bottom cleanliness, steel rebar cage placement, concrete pouring, and Thermal Integrity Profiling testing. The project also involved spread footings bearing on tremie seals bearing on bedrock for some piers and abutments. Responsibilities included preparing boring logs, rock classification, collection of rock samples, documentation of subsurface profile, keeping a log of construction activities, assessing suitability of bedrock subgrade for spread footings, and reporting to GZA Project Manager and MaineDOT representatives.

Field Engineer, University of New England MSC Pier, Biddeford, Maine. The project involved drilling test borings on a floating spud barge in a tidal setting, oversight, and documentation of subsurface investigations for the Marine Science Center Pier. Responsibilities included preparing boring logs, soil classification and collection of subsurface samples and documentation of subsurface profile.

Field Engineer, Union Wharf MSRC Berth, Portland, Maine. The project involved drilling oversight, and documentation of subsurface investigations for the Union Wharf Pier. Responsibilities included preparing boring logs, soil classification and collection of subsurface samples, field vane tests and documentation of subsurface profile.

Field Engineer, Presque Isle Bypass Segment 1 & 2, Presque Isle, Maine. The project entailed the exploration and design of improvements to the Presque Isle, Maine bypass. Coordinated and observed over 200 test borings on an approximate 6-mile-long, cross country alignment, including split spoon sampling in soil, rock coring, and access using ATV-mounted drilling equipment at difficult locations.

Project Engineer, Rock Slope Stability Evaluation, Confidential Address, Wakefield, Massachusetts. GZA provided geotechnical engineering services regarding an existing rock slope behind a townhome development. Field engineer involved with a geological reconnaissance using hand measurements with a Brunton compass taken from foot, ladder, and by rappelling to characterize joints in the rock mass. GZA developed recommendations for stabilization and scaling to mitigate potential rockfall hazards. Mr. Cardali also provided full-time observation and oversight during a portion of the

Blaine M. Cardali, EIT

Engineer II

implementation of rock slope mitigation. The work was successfully completed in accordance with the plans and specifications.

Field Engineer, MTA Exit 63 Gray Interchange Improvements, Gray, Maine. The project entailed the exploration and design of improvements to the Maine Turnpike Exit 63 interchange. Coordinated and observed 25 land-based soil test borings and rock cores using truck-mounted and ATV-mounted drilling equipment at difficult to access locations.

Field Engineer, Spectra Energy AIM New York Crossing, Peekskill, New York. The project involved oversight and documentation of subsurface investigations for a new gas pipeline. Responsibilities included management of subcontractors, field reporting to Spectra personnel, preparing boring logs, soil classification, collection of subsurface samples, and documentation of subsurface profile.

Field Engineer, Spectra Energy Atlantic Bridge Taconic Parkway Crossing, Yorktown, New York. The project involved oversight and documentation of subsurface investigations for a new gas pipeline. Test boring depths ranged from 120 to 200 feet below ground surface and included up to 120 feet of rock coring per boring. Responsibilities included management of subcontractors, field reporting to Spectra personnel, preparing boring logs, soil classification, collection of subsurface samples, and documentation of subsurface profile.

Field Engineer, MaineDOT Barters Island Bridge Replacement, Boothbay, Maine. The project involved oversight and documentation of subsurface investigations to locate the top of rock depth to assist in design for the bridge replacement. Responsibilities included logging test borings drilled through an existing bridge deck and the bridge approach embankments, preparing boring logs, rock classification, collection of rock samples, documentation of subsurface profile, and rock bearing calculations.

Field Engineer, Saddleback Ridge Wind Project, Carthage, Maine. This project involved the construction of foundations for wind turbines. The turbines were supported by spread footings bearing on bedrock, with rock anchors installed around the perimeter of the foundation for uplift resistance. Responsible for assessment of suitability of bedrock subgrade before foundation construction, monitoring tension load testing for rock anchors, and resistivity testing.

Field Engineer, Keene State College Pondside IV Residence Hall, Keene, New Hampshire. The project involved the oversight of pile installation of the Pondside IV Residence Hall. Responsibilities included documentation of driving criteria and documentation of obstructions observed during the installation of new piles. Office Responsibilities included tabulating as-driven documentation for each pile installed, and preparing a daily field report for submittal to the client.

Field Engineer, Wastewater Treatment Plant Upgrades, Newmarket, New Hampshire. The project involved the oversight of pile installation for upgrades in a wastewater treatment plant. Responsibilities included documentation of driving criteria, documentation of obstructions observed during the installation of new piles, and documentation of Load Transfer Platform (LTP) construction above piles. Office responsibilities included tabulating as-driven documentation for each pile installed, documenting LTP installation and testing operations, and preparing a daily field report for submittal to the client.

Field Engineer, National Grid Substations, Smithfield, Rhode Island. The project involved the construction of foundation structures associated with overhead electrical lines. Provided construction oversight of drilled shaft installation in multiple locations and documented compliance with project specifications.

Field Engineer, Bath Iron Works Outfitting Hall Addition and Blast and Paint Building, Bath, Maine. The project involved the oversight of pile installation of the outfitting hall addition and the Blast and Paint building. Responsibilities included documentation of driving criteria, documentation of obstructions observed during the installation of new piles, and observation of the installation and testing of rock anchors, as well as Nuclear Density Testing surrounding pile caps and bases of paved areas. Office Responsibilities included tabulating as-driven documentation for each pile installed, documenting rock anchor installation and testing operations, and preparing a daily field report for submittal to the client.

OSHA Occupational Safety and Health Administration

36-005269094

This card acknowledges that the recipient has successfully completed a 10-hour Occupational Safety and Health Training Course in

Construction Safety and Health

Blaine Cardali

Peter Rice 97357 — (Trainer name – print or type)

12/30/2014 — (Course end date)

NATIONAL SAFETY COUNCIL®

Security Control No.

678352

Blaine Cardali

has completed the

NSC CPR Course

Training Center: 2041792

Completion Date: 5/14/2015

Expires: 5/14/2017

Instructional Hours: 3.5

Instructor Signature

859582

Instructor No.

Keep this card for your records. Void if reproduced.

NATIONAL SAFETY COUNCIL®

Security Control No.
121889

Blaine Cardali

has completed the

NSC First Aid Course

Training Center: 2041792
Completion Date: 5/14/2015
Expires: 5/14/2017

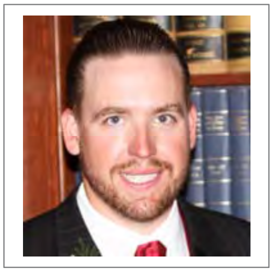
Instructional Hours: 3.5

Instructor Signature

859582
Instructor No.

Keep this card for your records. Void if reproduced.

RESUME



Joshua T. Szmyt

Engineer I

Summary of Experience

Mr. Szmyt is a civil engineer with experience in geotechnical investigations and serves as an Engineer I in the Bedford, New Hampshire office. Mr. Szmyt joined GZA in September 2007. His assignments include traditional geotechnical field engineering and subsurface explorations, including soil sampling and rock coring and classifications, test pits, monitoring well installation, and sampling. Mr. Szmyt possesses strong interpersonal communication, technical, and computer skills.

Relevant Project Experience

Field Engineer, Maine DOT- Sarah Mildred Long Bridge Replacement-PIN 16710, Portsmouth New Hampshire and Kittery Maine. GZA conducted a subsurface exploration program consisting of 43 test borings, both on the water and land, to evaluate subsurface conditions and bedrock conditions for the construction of a proposed draw bridge for the Route 1 bypass spanning the Piscataqua River between New Hampshire and Maine.

Field Engineer, The New Tappan Zee Bridge Project Geotechnical Investigation, Tarrytown and West Nyack, New York. GZA conducted a subsurface exploration program, in conjunction with HDR Inc., consisting of multiple test borings, both on the water and land, to evaluate subsurface conditions for the construction of the proposed The New Tappan Zee Bridge spanning the Hudson River for the Interstate I-87/I-287. Subsurface exploration activities included collection and field classification of both non-cohesive and cohesive soils along with collecting field data with pocket penetrometers and torvanes.

Penobscot River Bridge MEDOT WIN 16705.00 Geotechnical Evaluation, Howland-Enfield Maine. GZA conducted a subsurface exploration program consisting of 4 test borings on the water to evaluate subsurface conditions and bedrock conditions for the rehabilitation/construction of a proposed bridge that spans the Penobscot River for Route 116.

Field Engineer, Warren BRF 013-4(32), Bridge No. 166 - VT 100 over the Mad River, Warren, Vermont. For this Accelerated Bridge Construction (ABC) bridge replacement project, GZA conducted a subsurface exploration program consisting of two test borings and two test probes to evaluate subsurface soil and bedrock conditions at the bridge abutment locations. Subsurface conditions consisted of up to 29 feet of sand and gravel with nested cobbles and boulders overlying bedrock.

Field Engineer, Fairfield BRO 1448 (22), TH-30 Bridge No. 48 over Wanzer Brook, Fairfield, Vermont. For this Accelerated Bridge Construction (ABC) bridge replacement project, GZA conducted a subsurface exploration program consisting of four test borings to evaluate subsurface soil and bedrock conditions at the bridge abutment locations. Subsurface conditions were variable and consisted of sands, silts and glacial till of varying thicknesses overlying bedrock at depths from 38 to 46 feet below ground surface.

Field Engineer, Downtown (Main Street) Complete Streets Improvement Project, Concord, New Hampshire. GZA conducted a subsurface exploration program consisting of 15 test borings to evaluate subsurface conditions for the rehabilitation of 4,800 feet of roadway and construction of new foundations at three intersections.

Education

B.S., 2005, Civil Engineering, Northeastern University

Areas of Specialization

- Subsurface Investigation
- Geotechnical Construction Monitoring
- Environmental Construction Monitoring
- Nuclear Density Testing
- Concrete and grout sampling

Professional Development

- NorthEast Transportation Training and Certification Program (NETTCP) Subsurface Inspector Certification
- OSHA 40-Hour Hazardous Waste Site Personnel Basic Health and Safety Course
- OSHA 10-Hour Occupational Safety and Health Training Course in Construction Safety and Health
- Cintas, Basic First Aid and CPR

Joshua T. Szmyt

Engineer I

Field Engineer, NH Route 123/124 Bridge Replacement over the Souhegan River, New Ipswich, New Hampshire. Working under a Task Order assignment for NHDOT, GZA conducted a subsurface exploration program consisting of two test borings, with borehole geophysical testing in each completed test boring to provide information on the bedrock structure.

Field Engineer, Route 107 Widening over I-95, Seabrook, New Hampshire. The project involved widening the Route 107 Bridge by one lane in each direction over Interstate 95 requiring abutment and pier extensions. GZA developed and executed a subsurface investigation, performed engineering evaluations, and provided geotechnical recommendations for the roadway widening, proposed signal and sign foundations, fill embankments, and pier and abutment widening.

Field Engineer, U.S. Army Corps of Engineers, Geothermal Pathfinder Wells, New England Region (Massachusetts and New Hampshire). GZA is assessing the geothermal feasibility of, and developing geothermal design approaches for four sites: Devens, MA USARC; Ayer, MA AFRC; Brockton, MA USARC; and Londonderry, NH AFRC. The project consists of a phased approach that includes a preliminary assessment of each site to evaluate and recommend a design approach, installation and testing of a single ground source heat pump test well ("Pathfinder" well), and preparation of a report presenting the findings of the test well and recommendations for design of a geothermal system at each site.

Field Engineer, Massport Haul Road, Chelsea, Massachusetts. Supervision of borehole drilling and test pits along with both environmental and geotechnical samples, classification of soil, monitoring well installation, and sampling for a proposed roadway.

Field Engineer, Keene State College Alumni and Advancement Center, Keene, New Hampshire. GZA performed a geotechnical engineering study for the proposed KSC Alumni and Advancement Center. Subsurface conditions consisted of approximately 30 feet of liquefiable sands over 70 to 80 feet of highly compressible clay. GZA recommended the building and ground floor slab be founded on steel H-piles end-bearing on bedrock or in dense glacial till soils. GZA observed dynamic pile load tests and provided construction monitoring services during the installation of the H-piles.

Field Engineer, Glencliff Home, Benton, New Hampshire. Supervision of borehole drilling, classification of soil, and monitoring well installation for foundation design of a 2-story biomass plant facility.

Field Engineer, MaineDOT PI Bypass - Phase 1A Geotechnical Evaluation, Presque Isle, Maine. GZA conducted a subsurface exploration program consisting of 94 test borings to evaluate subsurface conditions and bedrock conditions for the construction of a proposed bypass approximately 2.5 miles long.

Field Engineer, The New Tappan Zee Bridge Project Construction Monitoring, Tarrytown and West Nyack, New York. GZA observed dynamic pile load tests and provided construction monitoring services during the installation of the pipe piles during the construction of the proposed The New Tappan Zee Bridge spanning the Hudson River for the Interstate I-87/I-287.

Field Engineer, Boiler Plant Renovations, Keene State College, Keene, New Hampshire. Subsurface conditions consisted of over 50 feet of soft clay. During an initial phase, GZA recommended supporting new boilers and a stack on steel H-piles bearing in the underlying glacial till stratum. The use of H-piles limited the impacts of construction on the adjacent working boilers and nearby structures. Despite the low headroom installation, H-piles were preferred to eliminate the quantity of spoils generated by drilled-in piles such as mini-piles that would have to be removed from the building. During a subsequent phase, the existing building was demolished and the new structure supported on steel H-piles. GZA provided construction monitoring services during the installation of the H-piles.

Field Engineer, Hospital Expansion, Portsmouth, New Hampshire. Supervision of micropile drilling which also included performing micropile inspection to insure proper installation which included checking required total length of micropile, rock socket length, amount of grout placed in pile, and length of rebar install with spacers.

Field Engineer, Rivergreen, Everett, Massachusetts. Supervision of borehole drilling, classification of soil, and monitoring well installation for a proposed multi use complex.

OSHA 001100714

U.S. Department of Labor
Occupational Safety and Health Administration

Joshua Szmyt

has successfully completed a 10-hour Occupational Safety and Health Training Course in

Construction Safety & Health

Richard Hughes — 7-26-06
(Trainer) (Date)

NATIONAL SAFETY COUNCIL®

Security Control No. 941498

Joshua Szmyt

has completed the

NSC CPR Course

Training Center: 2041792
Completion Date: 03/17/2016
Expires: 03/17/2018
Instructional Hours: 2.5

Instructor Signature

859582
Instructor No.

Keep this card for your records. Void if reproduced.

RESUME

Tanya Justham

Assistant Project Manager

Education

B.S., 2001, Geology, St. Lawrence University
M.S., 2008, Geology, University of North Dakota

Registrations & Certificates

New Hampshire Certified Asbestos Disposal Site Worker-in-Training – 2015, NH, #ADS-0497

Affiliations

- Member of Geologic Society of America
- Member of Geochemical Society

Areas of Specialization

- Geology
- Geochemistry
- Hydrogeology
- Groundwater Monitoring
- Subsurface Exploration
- Remedial Investigations and Feasibility Studies
- ASTM Phase I/ II Environmental Site Assessments

Summary of Experience

Ms. Justham is a geologist/aqueous geochemist with GZA. Her field experience includes subsurface explorations, including soil sampling and rock coring and classifications, test pits, monitoring well installation, and sampling. She has been involved in numerous projects at commercial/industrial facilities throughout New Hampshire, Maine, and Massachusetts. Her responsibilities with GZA and other consulting companies have included supervising a variety of subsurface exploration procedures, sampling environmental media for geotechnical, physical, and geochemical parameters, QA/QC compliance, site health and safety plan preparation and implementation, aquifer pump testing, hydraulic conductivity testing, data interpretation, providing support for Superfund Sampling and Analysis Plan (SAP) and Brownfields Quality Assurance Project Plan (QAPP) development, and report writing. Ms. Justham also provides aqueous geochemistry expertise for investigative and remedial projects.

Relevant Project Experience

GEOLOGICAL

Project Geologist/Geochemist, Geothermal Investigation, Confidential Government Client, Four Locations in New Hampshire and Massachusetts. GZA and its subcontractors drilled, installed, and tested three standing column and one closed loop test wells at four sites. Ms. Justham performed mineral and rock identifications for the boring logs, created Eh-pH element species stability (Pourbaix) diagrams specific to the conditions at each site, and evaluated the water quality for fouling potential for the three standing column well sites.

Project Geologist, Rock Slope Evaluation, MADOT, Route 8, Sandisfield, Massachusetts. GZA performed rock mapping and rock slope stability evaluations to assess short-term and long-term stabilization for a section of Route 8 following a rock slide along a section of road cut. LiDAR survey was paired with field mapping to create a 3-dimensional model for use in rock slope stability and rockfall catchment analyses. Ms. Justham's responsibilities included mapping geologic structural features and identifying rock types and mineral compositions.

Project Geologist, Sewalls Falls Road Bridge, Concord, New Hampshire. For this municipally managed bridge replacement project, GZA conducted a subsurface exploration program consisting of six test borings to evaluate subsurface soil and bedrock conditions at the bridge abutment and pier locations for the new replacement bridge. Ms. Justham assisted with the exploration program including soil boring and rock coring and provided rock identification.

Project Geologist, Proposed Women's Prison, Concord, New Hampshire. GZA conducted a subsurface exploration program consisting of test borings and test pits to evaluate subsurface soil and bedrock conditions at the proposed site of a new women's prison. Ms. Justham assisted with the exploration program including soil boring and rock coring and provided rock identification.

Project Geologist, Geothermal Construction Support, Phillips Hall, Phillips Exeter Academy, Exeter, New Hampshire. GZA provided geothermal consulting and construction support services for the construction of a closed loop geothermal well

Tanya Justham

Assistant Project Manager

field to serve Phillips Hall following building renovations and an HVAC retrofit. Approximately 49 wells were drilled to depths of 400 feet below ground surface to provide approximately 90 Tons of heating and cooling for a hybrid system utilizing geothermal wells supplemented by District steam.

Ms. Justham provided oversight of the well field construction including drilling and installation of closed loop geothermal wells and construction of associated header and manifold piping to the building mechanical room.

Project Geologist, Multiple Geotechnical and Geothermal Projects, Multiple Sites in New Hampshire and Massachusetts.

Ms. Justham provides support to various geotechnical and geothermal projects including mineral and rock type identifications and assistance with review of rock descriptions for boring logs.

GEOCHEMISTRY

Project Manager/Geochemist, Hydrogeologic Services, Mottolo Superfund Site, Raymond, New Hampshire. This NHDES / EPA project involves the long-term monitoring of the Site to confirm the progress and evaluate the nature and extent of residual dissolved phase chlorinated volatile organic compounds (VOCs) and arsenic contamination in a highly fractured bedrock groundwater system in which off-site residential water supply wells have been impacted. A Focused Feasibility Study was performed to evaluate the remedial alternatives and included a cost sensitivity analysis. Ms. Justham has assisted with and overseen field work which included residential well sampling, borehole interval sampling, interval sampling of groundwater monitoring wells using passive diffusion bags (PDBs), and sampling of a FLUTe™ multilevel sampling system. Ms. Justham has also assisted EPA with the development of the fourth five-year-review, prepared annual summary reports, and developed a sampling plan to address questions relating to geochemistry and natural attenuation at the site.

Project Geologist/Geochemist, Hydrogeologic Services, New Hampshire Department of Environmental Services, New Hampshire Plating, Merrimack, New Hampshire. GZA is currently managing the ongoing environmental monitoring program at this site to evaluate post remediation environmental conditions. Ms. Justham has assisted in SAP development and implementation including technical support during development of applicable Standard Operating Procedures (SOPs). Field work has included pore water sampling activities, low-flow sampling, PDB deployment/sampling, and rotosonic drilling and well installation. Ms. Justham has assisted with the development of the second five-year-review and prepared annual summary reports. In addition, Ms. Justham provided geochemical expertise for a well closure evaluation involving mobilized arsenic and technical oversight for a high resolution site investigation using Waterloo^APS TM^ technology to determine if the remedy is working as anticipated.

Project Geologist/Geochemist, Hydrogeologic Services, Troy Mills Landfill Superfund Site, Troy, New Hampshire. This NHDES / EPA project involves the long-term remedial monitoring of a former drum burial area to monitor residual Light Non-Aqueous Phase Liquid (LNAPL) and the progress of natural attenuation of dissolved phase groundwater contamination. Field work has included low-flow sampling, surface water and leachate sampling, LNAPL gauging, and LNAPL baildown tests. Ms. Justham's office responsibilities have included SAP review, preparation of the annual summary reports, and assistance with the development of the second five-year-review.

Professional Development

40-Hour OSHA Hazardous Waste Operations Certified (current)
AED and Adult CPR - 2015
USDOT/IATA Training on the Shipping and/or Transportation of Hazardous Materials, April 2015
ASTM Environmental Site Assessments for Commercial Real Estate Standards 2-Day Training Course, September 2011 and June 2014
Hydrogeology of Massachusetts, Board of Registration of Hazardous Waste Site Cleanup Professionals, May 2013
Environmental Geochemistry, Mineralogy, and Microbiology of Arsenic Short Course, June 2014

This document is a seafarers' identity document for the purpose of the Seafarers' Identity Documents Convention (Revised), 2003, of the International Labor Organization.

SIGNATURE OF BEARER

UNITED STATES OF AMERICA

MERCHANT MARINER CREDENTIAL

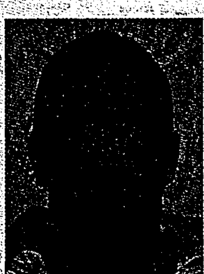
Issued By: The United States Coast Guard National Maritime Center
Website: http://www.uscg.mil/nmc Phone: 1-888-I-ASK-NMC

Document Number
USA000311152

Type
PG

Country Code
USA

Reference Number
3761294



Full Name
SAMUEL THOMAS COOLEY

Present Address
81 RAYDON RD EXT
YORK, ME 03909

Citizenship
USA

Height
5'10"

Hair Color
BRO

DOB
16-DEC-1978

Sex
M

Weight
219

Eye Color
BLU

Place of Birth
CONCORD, NH

Issue Date
21-JUL-2015

Expiration Date
21-JUL-2020

PGUSACOOLEY<<SAMUEL<THOMAS<<<<<<<<<<<<<<<<<<<
0003111529USA7812167M2007210<<<<<<<<<<<<<<<<4

New England Boring Contractors

Employee: **Samuel Cooley**
Key Titles: Supervisor, Licensed Captain, and Drill Forman
Base Office: Derry, NH
Employment: 2001 to Present

Responsibilities and Specialties:

Supervisor: Supervises and oversees all off-shore barge drilling projects, which includes the mobilization, demobilization, and operation of the Company's Shollowdraft 35' Elevator Barge. This vessel has three 40' jack-up legs and is equipped with a Diedrich D-50 Drill Rig, which is mounted on the main deck. This drill rig maintains a 23' derrick and is capable of drilling depths of up to 35'. Operating this immense equipment takes precise execution and proper procedural training. Samuel has been educated and has a thorough understanding of these procedures with many years of experience to support his abundant expertise.

Licensed Captain: In 2015, Samuel successfully completed the US Coast Guard OUPV Captains Training and Licensure Course. This has made him a valuable and sought-after asset for even our most challenging barge projects.

Drill Foreman: With 15 year tenure at New England Boring Contractors, Samuel has the highest level of experience and knowledge in field of Geotechnical and Environmental Exploration. This knowledge includes all of the various phases of soil boring, rock coring, undisturbed sampling, packer tests, vane shearing, and the installation and decommissioning of monitoring wells and piezometers. These talents, accompanied by his expertise in barge work, make him flexible and more than capable for any project's needs.

Additional Certifications:

- 40 Hour OSHA
- 8 Hour OSHA Refresher
- CPR & First-Aid

OSHA Occupational Safety and Health Administration

11-004652874

This card acknowledges that the recipient has successfully completed a 10-hour Occupational Safety and Health Training Course in
Construction Safety and Health

Garrett Peacock

Alexander DeVittori — 12/31/2014

(Trainer name – print or type) — (Course end date)

OSHA 10 HOUR CONSTRUCTION & SAFETY HEALTH REFRESHER

NO EXPIRATION DATE

OSHA 002208958

U.S. Department of Labor
Occupational Safety and Health Administration

SAMUEL COOLEY

has successfully completed a 10-hour Occupational Safety and Health Training Course in

Construction Safety & Health

Peter Storms
(Trainer)

3-12-09
(Date)

APPENDIX E

Blank Field Log, Sample Boring Log and
Rock Classification Sheet

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

BORING NO.:
SHEET:
PROJECT NO:
REVIEWED BY:

Drilling Co.:	**Type of Rig:**	**Boring Location:** See Plan	**H. Datum:**
Foreman:	**Rig Model:**	**Ground Surface Elev. (ft.):**	**V. Datum:**
Logged By:	**Drilling Method:**	**Final Boring Depth (ft.):**	
		Date Start - Finish:	

Auger/Casing Type:	**Sampler Type:**
I.D/O.D.(in):	**I.D./O.D. (in.):**
Hammer Weight (lb.):	**Sampler Hmr Wt (lb):**
Hammer Fall (in.):	**Sampler Hmr Fall (in):**
Other:	**Other:**

Date	Time	Water Depth	Casing	Stab. Time
Not				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
5													
10													
15													
20													
25													
30													

REMARKS

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.:

Hole No. FD-13-1

DRILLING LOG	DIVISION North Atlantic Division	INSTALLATION New England District	SHEET 1 OF 2 SHEETS

1. PROJECT NOAA Berthing Facility, Woods Hole, MA	10. SIZE AND TYPE OF BIT 4" Diameter Side Jet
2. BORING LOCATION (Coordinates or Station) N 2,653,308.0 E 882,122.0	11a. VERTICAL DATUM MLLW; 11b. HORIZONTAL DATUM MA State Plane (Mainland)
3. DRILLING AGENCY New Hampshire Boring	12. MANUFACTURER'S DESIGNATION OF DRILL RIG CME 45
4. NAME OF DRILLER S. Cooley	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 15; UNDISTURBED 0
5. NAME OF INSPECTOR N. Westkott	14. TOTAL # OF ROCK SAMPLES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE STARTED 4/8/13; COMPLETED 4/10/13
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE -26.17
8. DEPTH DRILLED INTO ROCK	18. TOTAL ROCK CORE RECOVERY FOR BORING 0 %
9. TOTAL DEPTH OF HOLE 66.00	19. SIGNATURE OF INSPECTOR N. Westkott

Elev. (ft)	Depth (ft)	Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks	Soil and Rock Description
		S-1	0 to 2	24/15	10-18-33-19	1. Metal fragments observed in top of recovered sample. (rusted, colored metal pieces on mud-line recovered in spoon).	
-30	5						
		S-2	6 to 8	24/13	20-28-29-34	2. 5" casing advanced to ±4.5' below mud-line, roller bit through obstruction between 4.5' & 6.0'.	
	10	S-3	10 to 12	24/14	20-26-19-34	3. Following sample at 10'-12' 4" casing telescoped with side jet roller bit.	Top 13": Silty Sand (SM): About 50% hard subangular fine to medium sand, about 40% non-plastic silt, about 10% hard subangular fine gravel, maximum size=15mm, olive-brown Bottom 1": Silt (ML): About 90% non-plastic silt, about 10% hard fine sand, brown
-40	15	S-4	15 to 17	24/3	42-29-35-43		Well Graded Gravel (GW): About 80% hard angular fine to coarse gravel, about 15% hard subangular fine to coarse sand, about 5% few silty fines, maximum size=50mm, light brown
		S-5	17 to 19	24/19	11-16-19-20	4. Advanced 2" diameter SPT through 15'-17', little recovery. Washed borehole 2' below casing and advanced 3" spoon 17'-19' with 18" drop with 300lb hammer. Limited recovery in sample S-4 due to cobble sized particle in spoon tip.	Poorly Graded Sand with Silt (SP-SM): 56% hard fine to medium sand, 31% non-plastic silt, 13% hard subrounded fine to coarse gravel, maximum size=50mm, olive-brown
	20						
		S-6	22 to 24	24/8	43-34-31-29		Silty Sand (SM): About 50% hard fine to medium sand, about 30% hard subangular coarse gravel, about 20% non-plastic silt, maximum size=50mm, olive-brown
-50	25					5. Observed slight decrease in drilling resistance (chatter) through 19' & 22' below mud-line.	
		S-7	27 to 29	24/8	23-28-19-52		Silty Sand (SM): About 50% hard fine to medium sand, about 30% non-plastic silt, about 20% hard subrounded fine to coarse gravel, maximum size=25mm, olive-brown

NAE 1836 LETTER 33895.00 NOAA BERTING FACILITY, WOODS HOLE, MA.GPJ NAE DATA TEMPLATE.GDT 5/15/13

DRILLING LOG (Cont. Sheet)	ELEVATION TOP OF HOLE -26.17		**Hole No. FD-13-1**
PROJECT NOAA Berthing Facility		INSTALLATION New England District	SHEET 2 OF 2 SHEETS

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks	Graphic Log	Soil and Rock Description
		S-8	32 to 34	24/11	15-25-25-33			Top 5": Poorly Graded Sand (SP): About 90% hard fine sand, about 10% non-plastic silt, brown Bottom 6": Silty Sand (SM): About 60% fine sand, about 40% non-plastic silt
-60	35							
		S-9	37 to 39	24/15	6-16-27-29			Poorly Graded Sand (SP): About 95% hard fine to medium sand, about 5% non-plastic silt, light brown
	40							
		S-10	42 to 44	24/24	16-17-20-33			Top 6": Poorly Graded Sand (SP): About 90% hard fine sand, about 10% non-plastic silt, light brown Bottom 1": Well Graded Sand (SW): About 95% hard subrounded fine to coarse sand, about 5% fines, brown
-70	45							
		S-11	47 to 49	24/18	12-21-35-42	6. 6" of blow-in material was encountered as sample S-11 was initiated. Marsh Funnel recording 60 seconds, added more mud. Marsh Funnel =75 seconds.		Well Graded Sand (SW): About 90% hard fine to coarse sand, about 10% fines, light brown
	50							
		S-12	52 to 53.7	20/13	10-21-39-100/2"			Well Graded Sand (SW): About 80% hard subangular fine to coarse sand, about 15% hard subangular fine to coarse gravel, about 5% fines, maximum size=25mm, brown
-80	55	S-13	54 to 56	24/21	15-12-15-25	7. Upon removing rods following roller bit/washing of inside casing, no blow-in encountered. During advancement of SPT, at S-12 increased resistance observed per 6", and refusal was achieved as material blew-in to spoon sample. Artesian condition or high		Well Graded Sand (SW): About 90% hard fine to coarse sand, about 5% hard angular fine gravel, about 5% fines, maximum size=25mm, brown
	60	S-14	59 to 61	24/15	12-12-13-16			Well Graded Sand (SW): About 95% hard subangular fine to coarse sand, about 5% fines, orange-brown
-90	65	S-15	64 to 66	24/14	10-11-12-14			Well Graded Sand (SW): About 90% hard subangular fine to coarse sand, about 5% hard subangular fine gravel, about 5% fines, maximum size=25mm, brown
								Bottom of boring at depth 66 ft. Notes: 1. The following samples were submitted for grain size analysis: S-2 and S-5.

Modified ISRM Rock Classification (GZA)

Rock cores are visually classified by the Modified ISRM System using the following format and order: Field hardness, weathering, grain size, color, ROCK TYPE, joint description (spacing, dip angle, type, shape and roughness, weathering, aperture, infilling, condition of joint surfaces, other features such as minerals.

FIELD HARDNESS:
Very Hard – Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologists pick.
Hard – Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Medium – Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 in. maximum size by hard blows from the point of a geologist's pick.
Soft – Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very Soft – Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

WEATHERING:
Fresh – Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Slightly Weathered – Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately Weathered – Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones. In granitoid rock, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Highly Weathered – More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Completely Weathered – All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact. Quartz may be present as dikes or Stringers.
Residual Soil – All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

GRAIN SIZE:
Fine Grained – Barely seen with naked eye.
Coarse Grained: 1/8 in. to 1/4 in.
Aphanitic: Too small to be seen with naked eye.
Medium Grained: Barely seen with naked eye to 1/8 in.
Very Coarse Grained: >1/4 in.

COLOR and ROCK TYPE

JOINT DESCRIPTION:
Spacing and Dip Angle:

Joints	Spacing	Dip	Angle
Extremely Close	Less than ¾ in.	Horizontal	0° - 5°
Very Close	¾ in. – 2 ½ in.	Low Angle	5° - 35°
Close	2 ½ in. - 8 in.	Moderately dipping	35° - 55°
Moderate	8 in. – 24 in.	High Angle	55° - 85°
Wide	24 in. – 80 in.	Vertical	85° - 90°
Very Wide	80 in. – 20 ft.		
Extremely Wide	Greater than 20 ft.		

Type of Discontinuities:
Joint – A break of geologic origin in the continuity of a body of rock along which there has been no visible displacement. May form sets (parallel joints).
Shear – A zone of fractures along which differential movement has taken place parallel to the surface sufficient to produce slickensides, striations, or polishing. May be accompanied by a zone of fractured rock up to a few inches wide.
Fault – Major discontinuity along which there has been appreciable displacement and accompanied by gouge and/or severely fractured adjacent zone of rock.
Shear or Fault Zone – A band or zone of parallel, closely spaced discontinuities along which differential movement has occurred, accompanied by gouge, maylonite, and breccia.
Bedding – A surface parallel to the surface of the deposition
Foliation – A parallel orientation of platy minerals, or mineral banding in metamorphic rocks.

Shape and Roughness:

Shape	Roughness
Stepped	Rough
Undulating	Smooth
Planar	Slickensided

Weathering of Joints:
Fresh – No visible sign of weathering of the rock material
Discolored – The color of the original fresh rock material is changed. The degree of change from the original color should be indicated. If the color change is confined to particular mineral constituents this should be documented.
Decomposed – The rock is weathered to the condition of soil in which the original material fabric is still intact, but some or all of the mineral grains are decomposed
Disintegrated – The rock is weathered to the condition of soil in which the original fabric is still intact. The rock is friable, but the mineral grains are not decomposed.

Aperture:

Tight – Core pieces on either side of a discontinuity can be fitted together by hand so that no visible void spaces remain.
Open – Core pieces on either side of a discontinuity cannot be fitted tightly together and voids are remain.

		Opening
Very Tight	“Closed features”	<0.004 in.
Tight		0.004-0.01 in.
Partially Open		0.01-0.02 in.
Open	“Gapped features”	0.02 – 0.1 in.
Moderately Wide		0.1 – 0.4 in.
Wide		>0.4 in.
Very Wide	“Open features”	0.4 – 4.0 in.
Extremely Wide		4.0 – 40.0 in.
Cavernous		>40 in.

Infilling:
Silt, Sand, Clay, Calcite

Miscellaneous Features:
Pit – Barely seen with the naked eye, to ¼ inch in diameter
Vug – ¼ inch to 2 inches in maximum diameter
Cavity – 2 inches to 2 feet in maximum diameter
Cave – larger than 2 feet in maximum diameter

ROCK OUTCROP CHARACTERIZATION
Also include the following parameters when describing rock outcrops and rock masses:
Persistence:

	Dimensions
Very low persistence	<3.3 ft
Low persistence	3.3 – 9.8 ft
Medium persistence	9.8 -32.8 ft
High persistence	32.8 -65.6 ft
Very high persistence	>65.6 ft

Number of Sets (occurring locally):

I	Massive, occasional random joints
II	One joint set
III	One joint set plus random
IV	Two joint sets
V	Two joint sets plus random
VI	Three joint sets
VII	Three joint sets plus random
VIII	Four or more joint sets
IX	Crushed rock, earth-like

GZA reports the total core recovery and rock quality designation for each core run* on the boring logs. The definitions of these terms are as follows:

TOTAL CORE RECOVERY (REC)

$$\textbf{REC (\%)} = \frac{\text{Sum of Recovered Core}}{\text{Length of Core Run}} \times 100$$

ROCK QUALITY DESIGNATION (RQD)

$$\textbf{RQD (\%)} = \frac{\text{Sum of Lengths of intact Core with Full Diameter in Pieces 4 in. and Longer}}{\text{Length of Core Run}} \times 100$$

The RQD is in general accordance with methodology described by Deere and Deere (1988). In addition, significant vertical to sub-vertical foliation/cross-foliation joints/fractures occur within the rock mass and influence ground behavior. The length of core exhibiting the vertical to sub-vertical joints/fractures has been deducted from the RQD, which is consistent with the “pieces of intact rock core” criteria. The vertical to sub-vertical joints/fractures have been identified on the rock core or the upside divider in the core box with permanent “dots” spaced every 0.1 feet apart. These dots have been counted and entered in the fractures per foot column on the boring log.

* - RQD not reported for severely and/or completely weathered rock or core runs with length of 2.0 feet or less.

Accident Prevention Plan
Revision 1

Geotechnical Explorations

Portsmouth Harbor Turning Basin
Newington, NH & Eliot, ME

June 28, 2016

Prepared for:

United States Army Corps of Engineers
New England District

Prepared by:

GZA GeoEnvironmental, Inc.
477 Congress Street, Suite 700
Portland, ME 04101

Contract Number: W912WJ-RI15-0058
GZA Project Number: 09.0025912.00

TABLE OF CONTENTS

Page No.

LIST OF FIGURES

LIST of APPENDICIES

LIST OF ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
bgs	Below Ground Surface
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CIH	Certified Industrial Hygienist
CPR	Cardiopulmonary Resuscitation
dB	Decibels
°C	Degrees Centigrade
°F	Degrees Fahrenheit
EM	Engineering Manual
EMS	Emergency Medical Service
eV	Electron Volt
FSM	Field Site Manager
GZA	GZA GeoEnvironmental, Incorporated
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
HTRW	Hazardous, Toxic, or Radioactive Waste
IDW	Investigative Derived Waste
IRP	Installation Restoration Program
LEL	Lower Explosive Limit
LOTO	Lock Out/Tag Out
mg/m3	Milligrams per cubic meter of air
MSDS	Material Safety Data Sheet
NFPA	National Fire Prevention Association
NEBC	New England Boring Contractors
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise Reduction Rating
NWS	National Weather Service
O2	Oxygen
OSHA	Occupational Safety and Health Administration
OU	Operational Unit
QC	Quality Control
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts per Million
SCBA	Self Contained Breathing Apparatus
SHM	Safety and Health Manager
SSHP	Site Safety & Health Plan
SSHS	Site Safety and Health Supervisor
TLV	Threshold Limit Value
TM	Task Manager
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds

1.0 SIGNATURE SHEET

Accident Prevention Plan for
Portsmouth Harbor Turning Basin
Newington, NH & Eliot, ME
Contract Number: W912WJ-RI15-0058

Plan Prepared by:
Andrew Blaisdell, Task Leader / GZA Associate Principal
Phone: (207) 358-5117

____

Plan Approval by:
Matthew Taylor, Project Manager / GZA Associate Principal
Phone: (781) 278-4802

____

Plan Concurrence by:
Richard Ecord, CSP, CIH
GZA EH&S Director / Associate Principal
Phone: (781) 278-3809

____

GZA GeoEnvironmental, Inc.

2.0 BACKGROUND INFORMATION

2.1 CONTRACTOR

GZA GeoEnvironmental, Inc. has contracted with the United States Army Corps of Engineers (USACE), New England District to perform geotechnical engineering services. GZA has been contracted to perform subsurface investigations, perform geotechnical laboratory testing, and prepare a geotechnical data report outlining the results of the investigations at the Portsmouth Harbor Turning Basin located in Newington, NH and Eliot, ME. GZA has subcontracted New England Boring Contractors (NEBC) to perform the drilling. GZA will provide field oversight during the investigation.

2.2 CONTRACT NUMBER

W912WJ-RI15-0058

2.3 PROJECT NAME

Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation
Newington, NH and Eliot, ME

2.4 PROJECT DESCRIPTION

The objective of the drilling program is to perform ten (10) subsurface explorations to evaluate sediment and bedrock properties and to characterize the materials that will require pre-treatment blasting or removal by mechanical methods for the Portsmouth Harbor Turning Basin in Newington, NH; see Figure 1, Locus Plan. The subsurface investigation program will be conducted by New England Boring Company (NEBC) from a jack-up barge within the proposed turning basin. Ten test borings, designated B-101 through B-103 B-201 through B-207, will be advanced to -50 feet MLLW utilizing steel casing and rotary wash drilling methods. Additional details of the subsurface investigation plan are presented in GZA's Work Plan for Geotechnical Explorations.

2.5 CONTRACTOR ACCIDENT EXPERIENCE

Refer to Appendix H, ***GZA Accident Experience*** for accident experience information.

2.6 PHASES OF WORK REQUIRING ACTIVITY HAZARD ANALYSES

The following work activities have been identified for this project:

- Mobilization/ Demobilization of drilling equipment
- Soil and Rock / drilling and sampling

At a minimum, each work activity requires the subcontractor to complete an Activity Hazard Analysis (AHA) and submit it to the Field Site Manager (FSM) prior to starting the activity (Appendix E). The submitted AHA will remain accessible on the project site for review by all site personnel and will be included as part of training during all phases of work.

3.0 STATEMENT OF SAFETY AND HEALTH POLICY

3.1 GZA GEOENVIRONMENTAL, INC. POLICY

For nearly 50 years, GZA has provided innovative and sustainable engineering services to our clients. Our people make that happen, and are our most important resource. To act in a responsible manner to protect our employees and the environment, we commit to the following actions, all of which are consistent with GZA's overall approach: Proactive by Design.

- Employees: We will provide employees with a safe, healthful workplace, and strive to prevent injury and illness associated with our operations.
- Clients: We will work with our clients to help them address their environmental, health, and safety needs.
- Training: We will educate our employees so they have the knowledge and skills to carry out this commitment and perform their work in safe and environmentally responsible ways.
- Subcontractors: We will do business with subcontractors who value the environment and employee safety, and will work with them to enhance their environmental, health, and safety performance.
- Compliance: We will continually strive to meet or exceed applicable environmental, health, and safety laws and GZA requirements.
- Communities: We will encourage participation in environmental, health, and safety initiatives in communities where we operate.

GZA commits to continuously improve our environmental, health, and safety performance. To integrate this policy within GZA's overall business activities we will set goals, measure progress, and communicate results on an annual basis. Compliance with this policy is the responsibility of every GZA employee.

4.0 RESPONSIBILITIES AND LINES OF AUTHORITY

4.1 RESPONSIBILITY

Any person on site may shut down a site work operation that poses imminent danger or is immediately dangerous to life or health. Please reference Appendix G for all onsite personnel credentials and certifications. When such precautions must be taken, the SSHS will be immediately notified and actions to remedy the situation will be implemented. The following personnel will be the onsite contacts and the project administrators:

Name	Project Title/ Assigned Role	Telephone Numbers
Blaine Cardali	Field Site Supervisor/FSM	cell: (207) 751-3252 work: (207) 358-5131
Blaine Cardali	Site Safety and Health Supervisor/SSHS	cell: (207) 751-3252 work: (207) 358-5131
Blaine Cardali	First Aid Personnel/Competent Person	cell: (207) 751-3252 work: (207) 358-5131
Andrew Blaisdell	Task Leader	cell: (207) 232-8869 work: (207) 358-5117
Matthew Taylor	Project Manager	cell: (781) 686-3737 work: (781) 278-5803
Anders Bjarngard	Project Director	cell: (781)-760-6429 work: (781)-278-4802
David Oliver	Local Health and Safety Coordinator	cell: (603) 315-4999 work: (603) 232-8745
Richard Ecord	Certified Safety Professional	cell: (404) 234-2834 work: (781) 278-3809
Richard Ecord	GZA Health and Safety Director/SHM	cell: (404) 234-2834 work: (781) 278-3809

4.2 LINES OF AUTHORITY FOR PROJECT SAFETY

4.2.1 CONTRACTOR

GZA GeoEnvironmental, Inc. is the prime contractor who is responsible for conducting work, directing subcontractors, and implementing this Accident Prevention Plan and Site Safety and Health Plan (APP/SSHP). GZA will conduct safety briefings for all personnel working on or entering the site under its contract.

4.2.2 PROJECT DIRECTOR AND PROJECT MANAGER

The Project Director and Project Manager have primary responsibility for fulfillment of contract terms and oversight of operations to verify that all legal and safety requirements are met. The Project Director and Project Manager have the responsibility to keep the project on schedule and within budget and communicate with the client regarding progress toward specified goals. The Project Director and Project Manager ensure that resources are allocated and support is provided to adequately meet the health and safety requirements for the project.

4.2.3 TASK LEADER

The GZA Task Leader will have primary responsibility to satisfy the technical and administrative requirements of the project and will provide direction and oversight to the field site manager (FSM) and the site safety and health supervisor (SSHS). The task leader will be responsible for communicating progress and any problems to the Project Director, who in turn will report to the USACE Project Manager. The Task Leader is responsible for procuring and providing the proper safety equipment at the site and ensuring that personnel assigned to the site have the proper experience to perform their work. The Task Leader is also responsible for ensuring that proper support and resources are provided to implement the health and safety requirements for this project.

4.2.4 SITE SAFETY AND HEALTH SUPERVISOR (SSHS)

The SSHS is responsible for implementing and overseeing this plan. The SSHS is responsible for identifying safety and health hazards that may impact site personnel, maintaining proper medical surveillance, providing hazard communication information, training employees in safe operating procedures, emergency response, reviewing accident reports, and reviewing inspection results. The SSHS is also responsible for advising the project safety and health manager (SHM) and project manager on matters concerning the safety and health of employees or the public. The SSHS may be required to perform various types of area or personnel monitoring to verify worker exposure and ensure the proper selection of personal protective equipment (PPE). The SSHS should be consulted before any changes in the recommended procedures or levels of protective clothing or equipment are made.

4.2.5 FIELD SITE MANAGER (FSM)

The FSM is the on-site operations coordinator of the field activities. The FSM is HAZWOPER-trained, and receives the annual HAZWOPER 8-hour refresher training. The FSM has received the OSHA 10 hour

Construction Industry Safety course. The FSM will maintain site security, control site access for unauthorized personnel, supervise personnel on the site, coordinate the activities of subcontractor personnel and stop site activities based on unsafe conditions or weather extremes. The FSM will enforce and verify that all procedures (safety and health, decontamination, protective equipment, etc.) are followed. The FSM will report to the Task Leader. The FSM will revise this APP by written amendment if site conditions change based on consultations with the SHM, the Task Leader, and the Project Director.

4.2.6 PROJECT SAFETY AND HEALTH MANAGER (SHM)

The project SHM is GZA's Health and Safety Director who will provide professional support by reviewing all safety and health programs as they apply to this project. The SHM will approve the APP/SSHP and all modifications to the plan as they affect the safety and health of field personnel. The SHM will be consulted on matters relating to emergency response and will provide directions for upgrading and/or downgrading of protection levels as needed.

The project SHM is responsible for providing professional safety and health support and oversight management to the SSHS. The SHM will review and provide support in all concerns regarding the safety and health of field personnel assigned to the project. The SHM will be responsible for evaluating air monitoring data and recommending changes in engineering controls as needed. Periodic field audits of the project work site may be conducted by the SHM to evaluate the adequacy of the program and implement any necessary changes. The SHM will review accident reports and the results of inspections. In addition, the following individuals will have the authority and responsibility to change the levels of protection and, if necessary, shut down field operations:

- Site Safety and Health Supervisor (SSHS)
- Field Site Manager (FSM)
- Project Safety and Health Manager (SHM)

4.2.7 FIELD TEAM MEMBERS

The field team members will be responsible for reading and understanding this plan and following the directives of the SSHS, FSM, and the SHM. The field team members will be responsible for performing all work according to the procedures outlined in this plan and to notify the SSHS, FSM, and SHM of any conditions that may pose a threat to the safety and health of the employees and the community.

Figure 2 provides a graphic presentation of the lines of authority for project safety.

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 IDENTIFICATION OF SUBCONTRACTORS AND SUPPLIERS

- New England Boring Contractors – Drilling subcontractor

5.2 SUBCONTRACTOR CONTROL AND COORDINATION

Each subcontractor will be issued a copy of this APP and will be required to comply with the requirements set forth herein. Subcontractors and Suppliers will comply fully with all laws, orders, regulations and statutes with respect to safety, accident prevention, safety equipment and practices. In particular, subcontractors/suppliers agree to comply with the most recent version of USACE Safety and Health Requirements Manual (EM) 385-1-1, Federal Occupational Safety and Health Administration (OSHA) Standards for Construction and General Industry (29 CFR 1926 and 29 CFR 1910) and State codes, as well as this APP. Subcontractors will conduct inspections to determine that safe working conditions and equipment exist and accepts sole responsibility for providing a safe place to work for its employees and for employees of its subcontractors and suppliers and for the adequacy of and required use of all safety equipment.

Subcontractor/Suppliers will comply with all applicable safety, pollution control, noise control and environmental laws and regulations. Subcontractor/Supplier personnel will attend safety meetings organized on site by the prime contractor and submit all required safety submittals in a timely manner.

The subcontractor is responsible to provide names and training qualifications for subcontractor's competent person(s). These forms will be submitted to GZA prior to allowing the subcontractor to start work. A competent person is one who can recognize hazards or potential hazards and has the authority to correct or abate the hazard. In addition, qualifications for being a competent person shall include attendance at least the OSHA 10-Hour Construction Safety Course.

The prime contractor will have the authority to stop work if unsafe working conditions are observed. The subcontractor shall address the unsafe working condition and amend work practices to meet the requirements of this APP.

5.3 SUBCONTRACTOR SAFETY RESPONSIBILITIES

The GZA subcontractor is responsible for preparing and submitting an AHA for activities identified in Section 2.6 of the APP. The AHA has been developed in coordination with appropriate subcontractors. Key Subcontractor (New England Boring Contractors) responsibilities (not necessarily all) are outlined below. The Key subcontractor is responsible to perform routine inspections and provide documentation of all the equipment which will be utilized for above mentioned project. All forms are included as part of Appendix E.

Activity Hazard Analysis (AHA) (Appendix E)

Prior to any work activities that present work hazards to a new contractor or sub-contractor entering any USACE site, all contractors performing the specified work will complete the Activity Hazard Analysis and have it submitted for approval by the USACE. The AHA will define the sort of activities which each contractor will perform. The AHA will describe the sequence of work, the anticipated hazards, site conditions, materials used for the operations, and control measures to prevent hazardous working environments. The AHA will be reviewed by all site personnel prior to start of work as part of the site briefing.

Health and Safety Orientation/ Briefing Record (Appendix B)

Prior to every employee being allowed to start work at the site, each contractor will submit Appendix B to acknowledge familiarization with site safety and health procedures.

Periodic "Toolbox" Safety Meeting (Appendix B)

The SHSS or FSM may also use Appendix B to document topics and personnel present for periodic safety training, which will be conducted on a weekly basis at a minimum.

Site Inspection Log (Appendix A)

The SHSS or FSM may use this form to periodically evaluate safety and health conditions on the site.

USACE Health and Safety Incident Analysis Form (Appendix C)

Subcontractor will report any accidents, incidents, near misses (near hits) occurring during their work at the site to the FSM immediately according to the procedures of this APP. The USACE form will be used to document and report such incidents.

In addition, per GZA policy, all EHS Events (incidents, first aid, near misses, unsafe acts/conditions, fires, chemical spills, property damage, and extraordinary safe behaviors) must be reported immediately to the Project Manager, and within 24hours to the EHS Event Reporting Portal at: www.kelleronline.com/portal. Username gempl1 Password 4Incidents!

6.0 TRAINING

6.1 TRAINING SUBJECTS DISCUSSED IN THE SAFETY INDOCTRINATION

Every job site is unique; therefore all workers (GZA employees and subcontractor employees) are required to attend Initial Health and Safety Orientation training prior to being allowed access to the site. "Initial Health and Safety Orientation" includes emergency response procedures and review of the locations of the Health and Safety Plan, Accident Prevention Plan, and all material safety data sheets (MSDS). At the conclusion of training, each employee will be asked to sign the form with the understanding they have understood the topics covered and have had an opportunity to ask questions. The topics discussed during the safety indoctrination for this particular project will as a minimum, include the following:

1. Overview of Accident Prevent Plan (APP) including,
   - Emergency response
   - Location of and directions to nearest hospital
   - MSDS sheets

2. Overview of Activity Hazard Analysis (AHA) including,
   - Overview of subsurface exploration (drilling) safety procedures
   - Location of first aid kits
   - Location of fire extinguishers
   - Handling of environmentally impacted soils or water
   - Proper use and disposal of PPE required for the project

Exceptions for those not required to attend the orientation include those persons who will be continuously escorted onsite for less than 8 hours, or a one-time brief visit.

6.2 LIST OF MANDATORY TRAINING AND CERTIFICATIONS FOR THIS PROJECT

6.2.1 GZA FIELD PERSONNEL

All GZA field personnel are required to successfully complete and hold current certificates in the following:

- OSHA 10-Hour Construction Safety
- First Aid/Adult Cardiopulmonary Resuscitation (CPR)

6.2.2 SUBCONTRACTORS

Training requirements will vary for workers, depending on their tasks, and onsite conditions. Therefore, subcontractors are to provide a certification of training for every employee working on the project. These forms will be submitted to the FSM prior to the employee starting work. The mandatory subcontractor training (must be current) required on this project includes:

- OSHA 10-Hour Construction Safety

6.3 REQUIREMENTS FOR EMERGENCY RESPONSE TRAINING

GZA GeoEnvironmental, Inc. and its subcontractors are not emergency responders and are not trained to respond to large fires, large spills, or the cleanup of such events. GZA and its subcontractors will be responsible for responding to incipient fires, very small spills (less than 5 gallons), and will be responsible for initial first aid response and administration of CPR. The exact role of every employee will be covered during the initial site briefing and topics discussed for emergency response are listed below.

- All employees shall attend the "Initial Health and Safety Orientation" to learn site specific emergency response procedures and know the location of and understand the operation of available first aid equipment, spill response equipment, MSDS sheets, emergency contact phone numbers, locations of nearest phone, location of nearest hospital, etc.
- Material Safety Data Sheets (MSDS) will be made readily available for all hazardous substances associated with the project. Training on these substances and their safe usage shall be conducted.

6.4 REQUIREMENTS FOR SUPERVISOR AND EMPLOYEE SAFETY MEETINGS

Weekly safety meetings will be conducted by the Field Site Manager and/or Site Safety Officer to reiterate safety precautions, accident prevention procedures, and review AHA sheets. All employees and subcontractors will be present during the weekly safety meetings. All safety meetings will be documented on the Health and Safety Briefing Record (Appendix B) or an equivalent form.

At any point in time, if a hazardous working condition is observed by any personnel on site, an immediate safety meeting will be conducted to implement necessary operational changes or controls to correct the hazard.

7.0 SAFETY AND HEALTH INSPECTIONS

7.1 INSPECTIONS AND AUDITS

The SSHS, designee, or the Subcontractor will conduct a periodic safety and health inspection of the project site. The "Site Inspection log" (Appendix A) may be used to record the results of the inspection, or the results will be recorded into the field log book. Any noted deficiencies will have corrective action initiated by the FSM. Corrective actions are to be initiated by the FSM or the GZA Task Leader immediately with a note as to who was contacted to correct the item and what corrective action was taken and when it occurred.

Periodically, a quality control (QC) Safety and Health audit may be completed by the project SHM.

7.2 INSPECTOR QUALIFICATIONS

The SHSS will possess a HAZWOPER 40-hour certificate, will be current on HAZWOPER 8-hour annual refresher training. In addition, the SHSS will have at least 1 year of experience working on site specific hazard assessments. Any designee will have similar credentials. The QC Safety and Health audit will normally be conducted by a CSP/CIH, having at least 5 years of experience. In addition, the CSP will be current on HAZWOPER training. Records of employee qualifications are kept in the GZA Safety & Health Department.

7.3 IMMINENT DANGER

For any dangers that are serious and/or immediately dangerous to life or health, work shall be stopped until corrective actions are taken.

8.0 SAFETY AND HEALTH EXPECTATIONS AND COMPLIANCE

8.1 PROJECT SAFETY GOALS AND POLICY

GZA's goal for this project is that it be completed without a loss-day injury. OSHA, State and local safety regulations will be incorporated in this program as required.

Each Subcontractor is responsible for managing its own safety and health program and related programs. Subcontractors are also responsible for monitoring and enforcing the project disciplinary procedures, or disciplinary procedures which are more stringent, for employees performing non-conformance work in relation to safety and health. Subcontractors shall monitor the work of their employees to assure the employee's actions do not create an unsafe condition, which may result in harm to themselves, other persons on site or result in property damage. Failure of Subcontractor management to enforce the disciplinary policies established in this manual may result in disciplinary action taken against Subcontractor management by GZA.

8.2 ENFORCEMENT

The enforcement of the GZA Project Safety and Health Program and all related local, state, federal or otherwise stated safety and health rules, regulations and policies is a vital aspect to achieving a safe and healthful work environment. For this reason, GZA will monitor the activities of the Subcontractors on site and require that subcontractors comply with all aspects of the GZA Project Safety and Health Program.

Project Safety and Health audits will be performed as discussed in Section 7.1 of this plan. Findings of un-safe conditions will be immediately corrected, or the related work activity discontinued until the un-safe condition is corrected, with written verification of the corrections submitted to the GZA FSM within 24 hours.

Subcontractors are responsible for enforcing all safety and health policies adopted on this project. GZA will take disciplinary action against Subcontractor management for failing to enforce such policies. The following actions may be taken against Subcontractor management and personnel for noncompliance issues:

Verbal instruction may be used at the discretion of the designated safety supervisor for conditions or practices which are less than serious and are not likely to cause an accident or incident. Violations may fit into four classes defined as follows:

Non-serious – Any condition or practice which is not likely to cause death or serious physical harm to any person.

Serious – Any condition or practice which is causing or likely to cause death or serious physical harm to any person.

Stop Work/Imminent Danger – The existence of any condition or practice which would reasonably be expected to cause death or serious physical harm before such condition or practice can be corrected. This is a "stop work" situation. All persons shall be withdrawn from the affected area, and no one is allowed in the area except those people deemed necessary to correct the condition or practice and whom are using the necessary controls to guard them from the hazard.

Repeat – Violations which have been verbally stated or written to an employee or Subcontractor more than once.

Abatement of safety and health violation notices shall take place within the allotted time given to abate the unsafe condition. If the Subcontractor fails to comply with the abatement policy within the allotted time period, without submittal of an alternate solution, GZA may take corrective action procedures and back charge expense to the Subcontractor who created the unsafe condition.

All Subcontractors on site shall have a violation policy and procedures that shall meet, at a minimum, the following standards:

8.3 VIOLATION POLICY

Violations issued are subject to the OSHA regulations which regulate construction sites, the Subcontractor Safety and Health Program and the GZA Project Safety and Health Program. The possible consequences subject to the violation are as follows:

Non-Serious Violations

- First Offense is verbal warning. Use log book documentation for future reference.
- Second Offense is followed with sit down meeting with all contractors and involved employees.
- Third Offense is time off project or dismissal.

Serious Violations and Repeat Violations

- First Offense is subject to time off project or dismissal at the discretion of the FSM and/or the Task Leader.

GZA GeoEnvironmental, Inc. reserves the right to request the dismissal of project personnel who commit serious or repeat safety or health violations.

9.0 ACCIDENT REPORTING

All accidents involving contactor personnel meeting the reporting requirements of 29 CFR 1904 and/or property damage in an amount greater than $5,000 will be reported to the Government Designated Authority (GDA) within 4 hours. Serious accidents meeting the requirements of EM385-1-1, section 01.D.02 will be reported immediately to the GDA. The contractor will maintain a first aid log, daily field log, for all accidents where first aid is administered, but the incident does not meet the reporting requirements for 29 CFR 1904. All reportable accidents will be investigated by the contractor and will require an ENG Form 3394 submitted to the GDA within 5 calendar days of the accident date. The contractor will maintain exposure hours worked for all employees and subcontractor employees on the project and submit those hours in the daily narratives to the GDA.

9.1 EXPOSURE DATA REPORTING (MAN-HOURS WORKED)

The site FSM, will record man-hours of all site personnel (GZA and subcontractor) in his/her field log book on a daily basis and record a list of onsite personnel in daily field narratives.

GZA will complete the "USACE Contractor Monthly Summary Record of Injuries/Illness and Work Hour Exposure" form for the prime and all subcontractors, and forward the completed form to NAE (sheila.harvey@usace.army.mil) no later than close of business on the 10th calendar day of the following month. The form will be transmitted to the GDA electronically.

9.2 ACCIDENT INVESTIGATIONS, REPORTS, AND LOGS

For all incidents, including injuries, work-related illnesses, property damage, or near misses (near hits), Subcontractor will immediately notify the SSHS. Within 24 hours, the subcontractor will provide a written accident report to GZA, who will complete and send an Accident Investigation Report (Form USACE ENG 3394; Appendix C) to the Task Leader and the Safety and Health Manager. Accidents must also be immediately reported to the USACE.

9.3 NOTIFICATION OF MAJOR ACCIDENTS

In the event of a major accident, work-related illness, or near miss (near hit), the subcontractor will immediately notify the SSHS. This includes lost-work time cases, lost work-day cases. In certain cases, OSHA must be notified within 8-hours. For major accidents, the SSHS will notify the Task Leader within 4 hours of the event, reporting will follow the procedure described above. Please refer to Section 12.2.4 and Appendix I for a list of emergency contact information and telephone numbers.

10.0 MEDICAL SUPPORT

10.1 ADDRESS AND DIRECTIONS TO HOSPITAL (OFF-SITE MEDICAL SUPPORT)

Portsmouth Regional Hospital, 333 Borthwick Ave, Portsmouth, NH 03801

Telephone: (603) 436-5110

See Appendix D of this APP for the detailed directions to the hospital.

10.2 ON-SITE MEDICAL SUPPORT

GZA will have first aid kits on hand at areas most accessible to employees and in the proximity of those areas where accidents are most likely to occur. Each SSHS will be responsible for keeping the first aid kits adequately supplied for the project.

The SSHS will ensure that first aid kits are available on the worksite and that these locations are known to all employees on the premises. Checks of the first aid equipment will be made as part of the "Site Inspection Log" (Appendix A).

As a measure to provide immediate first aid attention to personnel who suffer minor injuries, at least two selected site personnel are trained in first aid (if the site has more than one person present) and CPR. The FirstAid/CPR trained individuals include the FSM and the SHSS.

Prior to the start of work, GZA will coordinate with local emergency response services of our planned work and general schedule. In the event of an injured worker, emergency personnel will meet at 1 Badgers Island, West Kittery, Maine when the injured person is being transported to shore. The address is a dock behind Kate's Bakery.

11.0 PERSONAL PROTECTIVE EQUIPMENT

All employees and subcontractors wear the appropriate combination of Personal Protective Equipment (PPE) for the task. Although, no single combination of PPE can protect field personnel from all hazards, proper use of PPE can reduce the risks of injuries. Field personnel must be prepared to upgrade their PPE if unexpected hazardous situations are encountered. Careful anticipation of worst case conditions and caution during field operations are imperative to an effective PPE program. The use of PPE will be discussed during the "Initial Health and Safety Briefing" and will be addressed as necessary for changing site conditions. Each employee is responsible for wearing appropriate PPE in operations where there is exposure to hazardous conditions, or where the need is indicated to reduce hazards. At a minimum to be worn at all times during drilling operations, the initial level of PPE will include the following:

- Type 2 Hard Hat
- Safety Glasses with side shields (ANSI approved)

- Steel Toe Safety Shoes/Boots (ASTM certified)
- Hearing Protection (foam ear plugs/ear muffs)
- Leather or other heavy duty coated (PVC, rubber, etc.) work gloves
- Personnel Floatation Devices with whistle or beacon (USCG approved)

Should site conditions change and warrant modifications to this initial level of PPE, measures will be taken to select the appropriate PPE for the required task. Such measures could include the use of face shields, full body harnesses for fall protection/prevention, reflective clothing, and respiratory protection, although the need for respiratory protection is not anticipated on this project.

12.0 REQUIRED PLANS

12.1 HAZARD COMMUNICATION PROGRAM

12.1.1 GENERAL INFORMATION

In compliance with the OSHA Hazard Communication standard, the following written Construction Hazard Communication Program has been established for GZA and this project. Any questions regarding this program, or help needed in implementing this program, should be directed to the GZA SHM. The written program will be available on-site for review by any interested employee.

12.1.2 CONTAINER LABELING

The GZA SSHS will verify that all containers received for use will:
• Be clearly labeled as to the contents,
• Have the appropriate hazard warning written on the label,
• List the name and address of the manufacturer on the label.

12.1.3 SAFETY DATA SHEETS (SDS)

All subcontractors are responsible for notifying the SSHS as to the hazardous chemicals (as defined by OSHA in 1910.1200) they are bringing on-site. Furthermore, contractors are responsible for providing copies of the SDS to the SSHS for every chemical brought on site and the SSHS will be responsible for receiving and maintaining the data sheets applicable to the drilling project. All SDS sheets provided by each contractor can be found in Appendix F and will be kept on site at all times by the SSHS.

12.1.4 EMPLOYEE TRAINING ON HAZARD COMMUNICATION

Each employee, who may be potentially exposed to hazardous substances during the course of their work, is provided with hazard communication training during “Initial Health and Safety Briefing” prior to the start of work.

The SSHS is responsible for ensuring that subcontractors follow the OSHA requirements for hazard communication and any applicable state requirements.

12.1.5 INFORMING CONTRACTORS OF HAZARDOUS CHEMICALS ON-SITE

All subcontractors who bring employees and/or contractors on-site are responsible for and required by the work contract to train their employees and subcontract employees in safe chemical handling and to submit copies of the SDS to the SSHS.

It is the responsibility of the SSHS to make the following information available to contractors such as by arranging an on-site training/orientation meeting:

- Location of SDS,
- SDS availability for employees' review,
- Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures,
- Requirements for container labeling.

12.2 EMERGENCY RESPONSE PLANS

12.2.1 PROCEDURES AND TESTS

Employees have been trained to immediately contact or notify their immediate supervisor and/or foremen. Supervisors/foremen have been trained as the "competent person" to react to an emergency situation. The SSHS must be notified of the situation as soon as possible to help lead appropriate immediate action.

Rescue and medical duty responsibilities are to be determined only by trained and competent personnel. If the extent of injuries can be treated by first aid medical attention, then a first aid certified person would administer medical help. In the event of rescue, immediate notification of the SSHS, FSM, and the Task Leader will be initiated. The competent person will evaluate the circumstances and an appropriate rescue action will take place if action can be accomplished without endangering employees. If rescue can be conducted safely by a trained competent person or person's onsite, then such action will take place. If rescue is determined to require additional assistance, then emergency medical service or Fire Department rescue personnel will be notified and dispatched to the jobsite. To implement the site specific emergency action plan, rescue services (911) will be immediately notified to respond to the patient pick-up location at 1 Badger Island Road in Kittery, Maine. A site plan representing the emergency responder patient pick-up location will be provided on the cover of the onsite APP binder and in Appendix D, "Route to Hospital and Emergency Responder Patient Pick-up". The SSHS or the FSM shall immediately notify the GZA Task Leader, Safety and Health Manager and the USACE Project Manager of any accident/incident. Copies of these emergency procedures will be provided to personnel in charge at the site.

12.2.2 SPILL PLANS

GZA and its subcontractors are not trained to respond to large releases. GZA and its subcontractors will respond to smaller releases (less than 5 gallons) or larger releases of non-hazardous materials. Release kits will be readily available at the work site and employees will be trained in their use. If hazardous or unknown potentially hazardous materials are unexpectedly discovered during project work activities, workers will evacuate and secure the area (to keep out unsuspecting personnel), and call for assistance being careful not to be exposed to the material. The SSHS and, depending on the size of the release, the Task Leader shall be contacted. For large releases of hazardous materials, a Hazardous Materials Response team may need to be contacted to limit exposures to site personnel and/or the community. Response to small spills will be necessary for the event of a diesel fuel spill, as all hydraulic fluids utilized by both the jack-up barge and Diedrich D-50 drill rig will be a BioBlend® biodegradable hydraulic fluid. It is anticipated re-fueling during marine activities will be required for the Diedrich D-50. The two vessels will be fueled prior to mobilization. SDS sheets for all onboard materials are provided in Appendix F. Response to a diesel release will be comprised of the following procedure; shut-off of all equipment, coverage of contaminated areas with absorbent pads, if containment extends beyond barge surface installation of oil boom perimeter, and immediately inform project personnel.

12.2.3 FIREFIGHTING PLAN

Contractor's Fire Prevention procedures will be covered in the "Initial Health and Safety Briefing" at the job-site. Fire extinguishers will be made readily available and employees will be trained on their use prior to the start of work. Inspection of fire extinguishers will be conducted as part of the Site Inspection Log (Appendix A) and will be conducted on a regular basis. Only small fires that may be controlled with hand held fire extinguishers will be attempted to be extinguished, otherwise the local fire department will be contacted.

12.2.4 POSTING OF EMERGENCY TELEPHONE NUMBERS

The following list of emergency phone numbers will be posted in a readily visible location at the work site. The emergency phone number contact list is attached to this APP in Appendix I.

EMERGENCY NUMBERS

Fire Department:	911 or (603) 436-9441
EMS:	911 or (207) 438-9142
Police:	911 or (603) 431-5461
Portsmouth Regional Hospital	(603) 436-5110
New England Poison Control Center:	(800) 222 -1222
GZA Project Safety and Health Manager (Richard Ecord):	(781) 278-3809
GZA Task Leader (Andrew Blaisdell):	(207) 358-5117 / (207) 232-8869
GZA Site Health and Safety Officer/ Field Site Manager (Blaine Cardali):	(207) 751-3252

UTILITY CLEARANCE NUMBERS

Dig Safe:	1-888-344-7233

OTHER PRIMARY CONTACTS

Dr. Stephen Potts, USACE	1-978-318-8311

Tracy Shattuck, Harbor Master, Town of Portsmouth 1-603-436-8500

Officer-in-Charge, Marine Inspection, U.S.C.G. 1-207-767-0320

A map and directions to the nearest hospital are provided in Appendix D, (Portsmouth Regional Hospital, 333 Borthwick Avenue, Portsmouth, NH 03801)

12.3 HEALTH HAZARD CONTROL PROGRAM

See AHA (Activity Hazard Analysis) Appendix E.

Possible health hazards at this work site will be more thoroughly defined through review of the AHA. In general, some primary health and safety concerns during field activities include drilling related physical hazards, fall hazards (the jack-up vessel has 4 foot rails all around the deck, and has chains across the areas used for egress), potential water hazards, and noise. Personnel will also be monitored for heat and cold stress when atmospheric conditions warrant.

The self-propelled jack-up vessel deck is 35 foot long by 13.5 foot wide. It is flat deck with a moon hole in the front third of the barge. The drill and barge system will be assembled off site and a crane will be used to lift the spuds into place and place the drill rig and tooling on the deck. The drill rig and tooling racks are welded to the frame and deck of the jack-up barge. A tender boat will provide shoreline egress. All required vessel inspection documentation (professional survey) will be provided to USACE prior to mobilization. Captain's licenses are not required to operate the barge or tender boat according to Coast Guard regulations. Onboard personnel qualifications and a vessel photograph can be referenced in Appendix G.

Hearing protection including earplugs or ear muffs will be worn at all times, as well as the initial level of PPE which includes a hard hat, steel toe boots/shoes, work gloves, and safety glasses with side shields.

Chemical hazards for the site include drilling chemicals such as hydraulic oils may be brought on onsite. Personnel will review the Safety Data Sheets of chemicals brought on site and be familiar with proper handling operations including the proper use of PPE.

12.4 HAZARDOUS ENERGY CONTROL PLAN (LOCKOUT/TAGOUT)

All maintenance to marine vessel or drill rig will be completed on shore at sub-contractor facilities where company lock-out tag procedures will be performed in accordance to company health and safety policies.

12.5 CONTINGENCY PLAN FOR SEVERE WEATHER

In the event that severe weather approaches, all personnel shall shut down field operations and take shelter. Severe weather conditions shall include: sustained winds of 25 knots or greater, 3 foot seas, and/or lightning. All facility personnel must understand the Emergency Response and General Evacuation

Procedures for their location. This information will be provided during the initial health and safety site briefing. Employees must also know the correct exits to use for all areas they enter and the assembly point locations.

Prior to mobilization and daily operations, marine activities will be planned accordingly to all relevant atmospheric and marine forecasting (i.e. weather, wind, temperature, wave height and direction, tidal fluctuations, and marine currents). The jack-up vessel can be jack-up to a height which is above typical significant wave heights if required as an immediate preventive measure. In severe weather the jack-up vessel will be positioned in a safe harbor which the location will vary based on the prevailing conditions. The tender vessel will be removed from the water through use of its trailer.

Note that not all emergencies are the same. In some cases, employees will have to follow a procedure that is different from the facility evacuation plan.

12.6 FLOATING PLANT AND MARINE ACTIVITES

Prior to performing any marine activities associated with this contract, appropriate assessments will be taken by the sub-contractor in relation to all potential marine conditions specific to the above mentioned site location. Such assessments will include and not be limited to; potential tidal and sea conditions as relating to the limitations of vessel capabilities. The captain will inform all crew members of the procedures for all emergency action plans including man over board, abandon ship, fire, sinking, etc. prior to leaving the dock. All contracted floating plants or marine vessels are required to be fully inspected prior the project specified use. Vessel inspections will include; proper weight distribution and securing of all equipment, intact tie/ anchoring points, vessel and anchoring buoys and lighting, and emergency response equipment (ladder, water rescue equipment, spill kit, first-aid, etc.). On-board documentation is required to include vessel operator and crew personnel qualifications. Prior to mobilization of contracted floating plants or vessels, navigation access will be planned for mobilization/demobilization, and emergency response plans. During all marine activities, awareness of navigation channels/fairways, structures, and other vessels will be maintained by line of sight, and a band frequency 156-162 radio or telephone device will be operational for all navigational and emergency communication. While conducting marine activities, maritime “Rules of the Road” will be adhered to. Daily awareness of tidal conditions and any potential hazardous weather conditions will be monitored. The daily access point for workers being transported to and from the barge will be at 1 Badgers Island, West Kittery, Maine.

12.7 PERSONAL PROTECTIVE EQUIPMENT

PPE training is described in Section 11 of this APP.

12.8 PLAN FOR PREVENTION OF DRUG AND ALCOHOL ABUSE

GZA prohibits the use, possession or distribution on any of its offices and project sites of any of the following by GZA and subcontractor employees: alcoholic beverages, intoxicants, narcotics, illegal or unauthorized drugs (including marijuana), simulated drugs and related drug paraphernalia. Employees shall not report for duty under the influence of any drug/alcohol that may in any way adversely affect their working ability, alertness, coordination, response or the safety of others on the job. For purposes of this program, influence shall be presumed for any individual whose drug or alcohol level exceeds the current applicable testing levels.

If determined necessary by GZA, any employee who is currently working on the project may be asked to provide evidence of a negative drug/alcohol screen. In concerning a post injury, the employee must complete the drug test no later than the time of safety orientation prior to commencing work. Such test will be administrated at the time of when the injured worker receives medical treatment. GZA will not perform random drug testing however, lower-tier subcontractors to GZA may utilize a random testing program.

GZA and its subcontractors shall not allow employees who are found to be using alcohol or drugs illegally to remain on the project. GZA and its subcontractors will determine when the employee in violation can return to the project or be permanently removed. Subcontractors must submit their drug and alcohol programs to GZA for evaluation or they will be required to adopt the drug and alcohol program of GZA. GZA will periodically check with subcontractors to evaluate the compliance of the submitted drug and alcohol program.

Legally prescribed drugs may be permitted on premises or work locations, provided the drugs are contained in the original prescription container and are prescribed by an authorized medical practitioner for the current use of the person in possession. Legally prescribed drugs must not affect working ability, alertness, coordination or response of the person taking the medication.

Smoking tobacco on a USACE site is permitted; however, personnel must be beyond 50 feet of the drilling equipment. Smoking is not permitted during any drilling operations.

13.0 OTHER

13.1 MEDICAL AND FIRST AID REQUIREMENTS

At least two persons on the site will be trained in first aid and adult CPR. Major subcontractors are required to provide first-aid and CPR trained personnel according to their crew size. Emergency phone numbers shall be posted near all job-site phones or listed in the APP/SHSP, and the location of nearest treatment facility shall be discussed at safety meetings regularly. First-aid kits shall be provided and replenished on a regular basis by the company or job-site safety officer.

13.2 SITE SANITATION PLAN

Clean drinking water, a sanitary container for the paper cups and waste receptacle for the used cups shall be provided. If workers choose, they may bring their own personal water jugs/thermos. Personnel will use local toilets in site facilities. A portable hand washes facility or other suitable hand washing facilities will be made available to workers on site, as necessary. Food and drink will be kept away from the work area.

13.2.1 HOUSEKEEPING

General contractor and all subcontractors shall be responsible for daily clean up and disposal of all construction and personal debris generated on the project. Inspections shall be done regularly and proper actions taken to insure that a clean and safe job site is maintained.

The contractor will place all generated garbage in an appropriate container and arrange for disposal by means of contracted vendor or, the garbage will be disposed of at a designated trash receptacle. Garbage is considered solid investigative derived waste and will include gloves, paper towels, and plastics. Soil and groundwater is not to be included under this category.

13.3 FIRE PREVENTION PLAN

Fire prevention procedures will be covered in weekly safety meetings at the job-site on a regular basis covering material pertinent to operations being conducted. The predominant ignition source during the project will be the electrical and mechanical segments of the drill rig. The drill rig will be subject to an initial inspection to ensure proper mechanical and electrical operation and it is the responsibility of all subcontractors to ensure that their equipment is in proper working condition prior to and throughout the course of the work. Fuel sources will not be stored near potential ignition sources and general housekeeping procedures will be followed to eliminate potential fuel sources.

Type ABC fire extinguishers will be made available at the work site and all employees will be trained in their use and general firefighting procedures. The fire extinguishers will be inspected on a regular basis and maintained in proper working order throughout the project.

13.4 MOTOR VEHICLES, MACHINERY, AND MECHANIZED EQUIPMENT

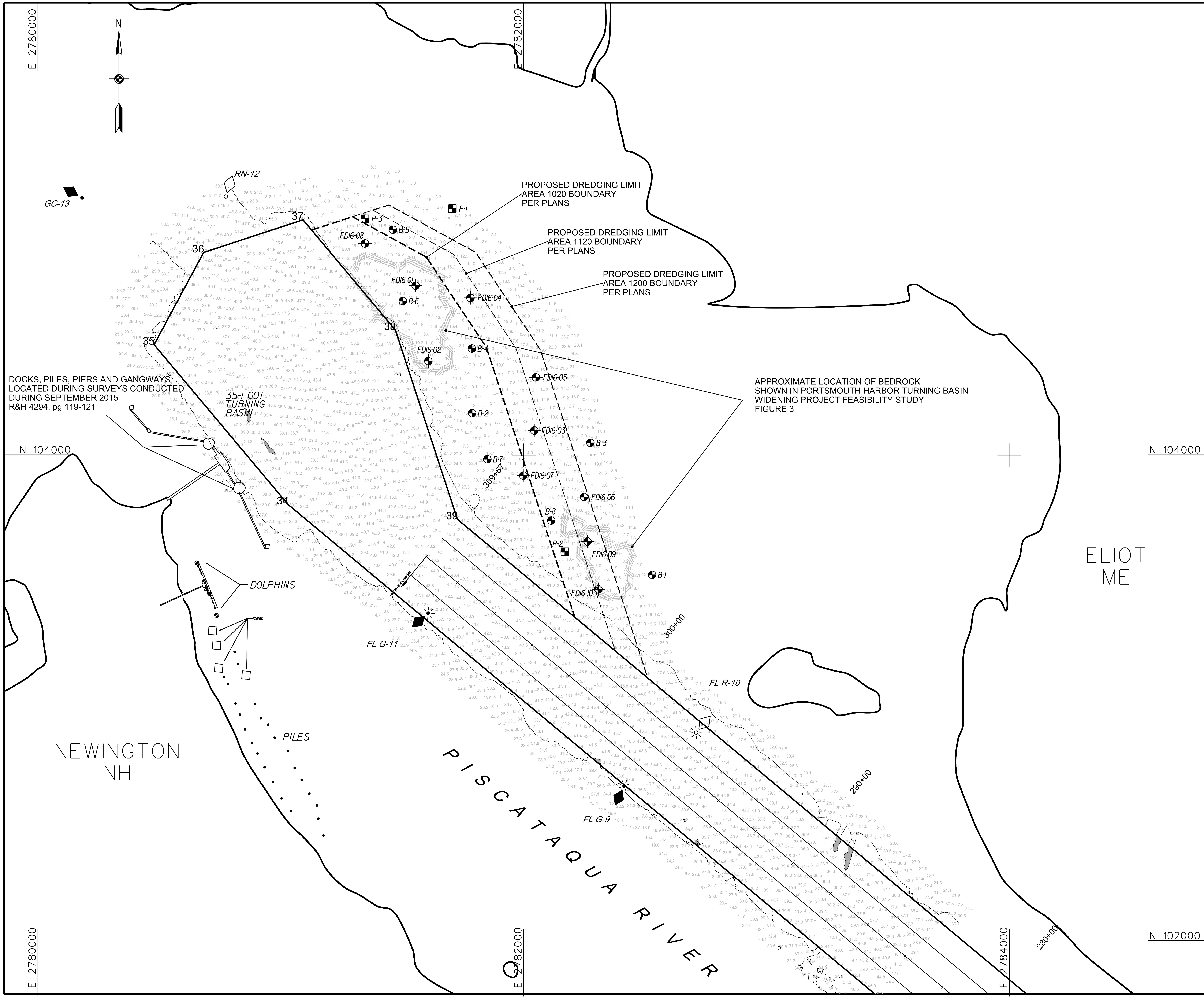
The following guidance applies when operating motor vehicles or equipment:

- The driver is responsible for the safety of passengers and cargo stability.
- Seat belts will be worn at all times.
- Obey all local traffic laws or regulations of the installation.
- Motor must be shut off during refueling of drill rig. All other vehicles will be refueled off site.
- Personnel must be properly seated in vehicles before moving.
- A flagman should direct the backing of a vehicle in congested areas.
- Only licensed drivers will be allowed to operate company vehicles.
- All machinery and equipment shall be operated by qualified and authorized personnel.
- Heavy construction equipment to be operated on site shall be inspected regularly and certified to be in safe operating condition.

The attached activity hazard analysis (AHA) for drilling will provide the pertinent safety information for the safe operation of drilling equipment and provide information regarding the inspection of each portion of the drill rig prior to use.

13.5 THERMAL EXTREMES

All thermal extremes that may be encountered during the work shall be addressed as needed on a daily basis. Weather forecasts will be monitored and the procedures outlined in Section 12.5, Contingency for Severe Weather, will be followed. Work will be planned accordingly with the weather and precautionary measures will be taken as necessary to prevent the loss of equipment due to extreme weather and to ensure that the progress of the work will be maintained after the weather event. All employees shall provide the appropriate clothing and personal protective equipment for the temperature.



GENERAL NOTES:

1. BASE MAP DEVELOPED FROM ELECTRONIC DRAWING FILES "C-100.DGN" AND "PIS-2788 V-HP-MAS.DGN" PROVIDED TO GZA BY U.S.ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT.

2. APPROXIMATE LOCATIONS OF EXISTING BORINGS AND PROBES SHOWN IN PORTSMOUTH HARBOR TURNING BASIN WIDENING PROJECT FEASIBILITY STUDY, FIGURE 3.

3. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF THE PROPOSED BORINGS, PREVOUS BORINGS, AND PREVIOUS PROBES IN RELATION TO THE SUBJECT SITE. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

FDI6-10	Location of proposed boring
P-3	Approximate location of previously conducted Probe
B-8	Approximate location of previously conducted Boring
21.0	Mudline spot elevation from bathymetric survey, feet below Mean Lower Low Water datum (MLLW)

GRAPHIC SCALE:

200 0 200 400

NO.	ISSUE/DESCRIPTION	BY	DATE
0	Rev. 1 Work Plan	NVW	6/7/16

PORTSMOUTH HARBOR TURNING BASIN AND PISCATAQUA RIVER SUBSURFACE INVESTIGATION
NEWINGTON, NH & ELIOT, ME

PROPOSED BORING LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DISTRICT

PROJ MGR: ARB	REVIEWED BY: ARB	CHECKED BY: MAT	FIGURE
DESIGNED BY: NVW	DRAWN BY: NVW	SCALE: 200	1
DATE: JUNE 2016	PROJECT NO. 09.0025912.00	REVISION NO. 0	SHEET NO. 1 OF 1

FIGURE 2: LINES OF AUTHORITY FOR PROJECT SAFETY

APPENDIX A

GZA Site Inspection Log

Site Inspection Log

PROJECT NAME:	LOCATION:
PROJECT NUMBER:	DATE:
PROJECT MANAGER:	COMPLETED BY:
SITE DESCRIPTION AND NATURE OF WORK:	

HAZARD COMMUNICATION
[ ]Chemical hazards identified
[ ]All containers properly labeled
[ ]MSDS/workplace notebook on site
[ ]Site safety briefing completed and documented

ACCIDENTS/EMERGENCY INFO
[ ]First aid personnel identified
[ ]Hospital location identified
[ ]Police/Fire/Ambulance phone numbers available
[ ]Incident investigation forms available
[ ]Fire extinguisher present

SANITATION
[ ]Washing facilities available
[ ]Toilet facilities available
[ ]Approved trash receptacle available
[ ]Water/refreshments available

STORAGE
[ ]Tools/Drill tooling/supplies safely stacked to prevent rolling or collapse
[ ]Work areas and passage ways kept clear

HOUSEKEEPING
[ ]Work areas clean and orderly
[ ]Storage areas clean and orderly
[ ]Combustible scrap/debris removed regularly
[ ]Waste containers of flammable or toxic materials covered

OVERHEAD HAZARDS
[ ]15^{ft} minimum clearance maintained
[ ]All sources of falling objects/swinging loads/ rotating equipment identified
[ ]Barriers or other methods in place to prevent injury due to overhead hazards

POSTING
[ ]Emergency phone/contact info posted
[ ]OSHA poster displayed

UNDERGROUND HAZARDS
[ ]All underground hazards identified and communicated to workers on site
[ ]Utility/Dig-Safe clearance confirmed
[ ]Clearance dates: ___________________________
[ ]Clearance ID#: ____________________________

EXCAVATIONS and TRENCHES
[ ]All personnel and storage at least 2^{ft} from top edge of excavation
[ ]Ladder in place
[ ]Guarding/barriers in place

VEHICULAR TRAFFIC
[ ]All vehicular traffic routes which could impact worker safety identified and communicated
[ ]Barriers or other methods established to prevent injury from moving vehicles

PEDESTRIAN TRAFFIC/SITE CONTROL
[ ]All walkways which could be impacted by site activities identified and communicated
[ ]Barriers or other methods established to prevent pedestrian injury from site activities

ENVIRONMENTAL HAZARDS
[ ]Poisonous plants/stinging or biting insects/vermin/sewage/etc. identified and communicated

COMMENTS/OTHER HAZARDS_______________
____
____
____
____
____
____

x = OK
NA = Not Applicable

APPENDIX B

GZA Health and Safety Briefing Record

HEALTH AND SAFETY ORIENTATION/BRIEFING RECORD

CHECK ONE: ______ **Initial H&S Orientation** _______**Periodic "Toolbox" Safety Meeting**

Project Site/Location____

Date______________________ **Time**____________________________ **Job No.**________________

PM____________________________________ **PIC**____

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED

NAME (printed)	SIGNATURE	COMPANY

Conducted by: ____ Date:________________________

APPENDIX C

USACE Incident Investigation Form

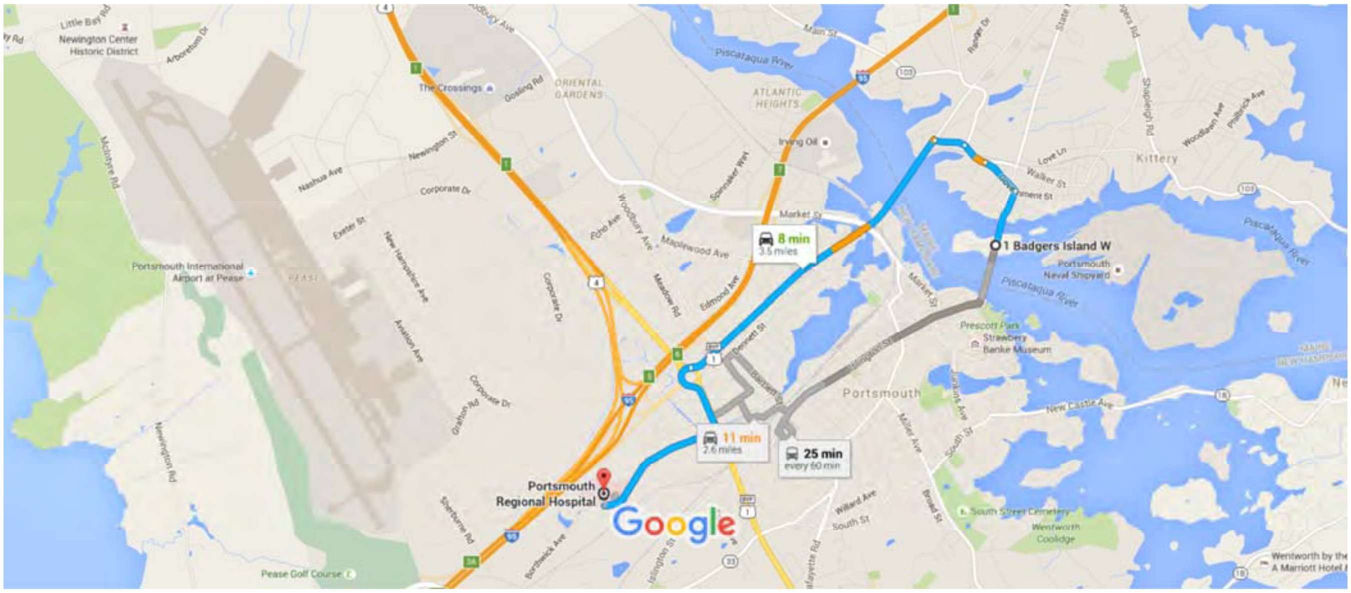
APPENDIX D

Route to Hospital/ EMT Patient Pick-up Plan

Google Maps

1 Badgers Island W, Kittery, ME 03904 to Portsmouth Regional Hospital

Drive 3.5 miles, 8 min



Map data ©2016 Google 2000 ft

via US-1 BYP S

7 min without traffic

8 min

3.5 miles

via US-1 S and Borthwick Ave

9 min without traffic

11 min

2.6 miles

10:38 AM—11:03 AM

40

25 min

Google Maps

APPENDIX E

Activity Hazard Analysis/ Vessel Inspection

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 28 June 2016

Project: 09.0025912.00

Activity: Geotechnical Subsurface Exploration - Portsmouth Harbor Turning Basin and Piscataqua River Subsurface Investigation

Activity Location: Newington, NH / Eliot, ME Contract No. W912WJ-RI15-0058

Prepared By: New England Boring Contractors

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Prepare for Drilling	Underground Utilities	• Underground utilities shall be identified and boring location coordinates will be determined and available prior to commencing field work. •Boring locations will be located with use of a differential RTK GPS-unit which provides sub-meter accuracy. • Maintain a minimum 3-foot distance from all marked utility lines. • Vigilance will be exercised on site to check for signs of utilities and boring/trench locations will be modified if utilities are observed.	M
X		Load Transport	• All equipment tooling shall be properly secured during transport. All vehicles and equipment will comply with DOT requirements. The barge will be transported upstream by water to the site from a previous project. Drill rig and storage will be welded or bolted to deck. • Never move the drilling rig with the mast upright. Set hydraulic leveling jacks before raising the mast. Ensure the drilling site foundation is stable and as level as possible.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Drilling	Slips, Trips, Falls and Fall Protection	• Clear ropes, hammers, spoils, tooling, and other ground hazards from the work area. Practice good housekeeping to keep the deck around the drilling area clear of obstructions, equipment, and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground/deck surfaces. • Fall protection must be provided if the distance from the walking/working surface to the water's surface is 6' or more, according to 29 CFR 1926.501(b)(1): 1. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge located 6' or more above a lower level shall be protected from falling by the use of a guardrail systems, safety net systems, or personal fall arrest system; 2. The preamble to the standard states that the term "lower level surface" includes liquids (volume 59 of the Federal Register, page 40,681). Therefore, employers must provide fall protection during construction activities when employees are working 6' or more above the water; 3. The use of fall protection, including fall protection that eliminates drowning hazards, does not relieve employers from having to provide ring buoys and a lifesaving skiff under 1926.106(c) and (d);The requirements in 1926.10(c) and (d) for ring buoys and a skiff address the hazard of falls that may occur in the event of a failure of the operation of fall protection devices or a lapse in there use. Therefore, ring buoys, and a skiff will be provided irrespective of the fall protection provided on the marine construction site.	M
X		Eye Injury	• ANSI approved safety glasses will be worn at ALL TIMES.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Struck By	• ANSI-approved hard hats will be worn at ALL TIMES. • High Visibility Vest or Personal Flotation Device will be worn at ALL TIMES. • Drill rods and augers stored and transported in racks shall be blocked to prevent shifting. Unload, drill rods and augers, layer by layer. Be prepared for sudden shift when tailing rod sections. Keep a wide base and secure footing. • Hoisting: Never engage the rotary clutch until all personnel and equipment are clear. Never leave the brake unattended when engaged. Drill rods and auger sections should not be picked up or dropped suddenly. Do not lift more than 10 feet of augers or one joint of pipe between tool breaks. Test the brakes daily. Use caution when drilling in the wet or damp conditions. Suspend drilling activities if moisture compromises the performance of the braking mechanism. • Catline: Do not use more wraps than necessary to lift the load. More than one layer of wraps on the cathead is not allowed. Personnel should not stand near, step over, or go under the cathead rope while tensioned. The cathead must be kept clear of obstructions and entanglements. Never leave the cathead unattended when engaged. Do not stand under the object being lifted with the catehead. • Derrick: The mast should be lowered, if possible, to make repairs or to free up entangled wire rope or the catline. If the mast must be ascended while upright, a proper ladder and safety climbing system must be used in conjunction with a full body harness. The drill rig operator must be aware of the weather conditions and terminate operations in the event of unsafe conditions (lighting heard or sighted – work may only begin 30 minutes after lightening was last heard or observed). • Augers: Use a long handled flat shovel when removing auger cuttings. Stay away from the augers while rotating. Prevent shovel from lodging into the augers and kicking out. Do not wear loose clothing or clothing with pull strings when working with augers.	M
X		Back Injury	• Do not lift awkward sized items. Use proper lifting techniques. • Use equipment to lift and move drums, equipment, and supplies. Lift with your legs, not with your back. Use proper lifting techniques when handling rods, augers, and tools. Use mechanical equipment during lifting whenever possible. Use the buddy system when lifting tools and supplies. • Additional personnel will be used to lift items weighing over 50 pounds.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Loose Clothing	• No loose clothing or jewelry shall be worn around the cat head and drill head. • Tape all loose clothing to keep from getting caught in rotating objects. • Only authorized personnel shall be near the rotating augers (i.e. driller and helper). • Long hair shall be kept underneath protective clothing or tied up no longer than shoulder length.	H
X		Noise Exposure	• All employees will use hearing protection while drilling.	M
X	Maritime Drilling Activities	Drowning	• Wear US Coast guard Approved PFD.	M
X		Equipment getting inundated	• Secure vehicle and any land side equipment above tide level.	M
X		Swamping, sinking, running aground, getting beached by tide.	• Check Marine forecast and tide chart, discuss adjustments to schedule as appropriate. • Be a second set of eyes for the drillers/operators noting tide level, wind, wake, equipment action/reaction and current conditions as these may impact safety.	M
X		Getting lost, running aground.	• Discuss with operator Navigation capabilities in case of weather (is boat equipped with radar or GPS to find home if fog sets in). • Discuss with operator Navigation lights (to run after dusk) and adjustments to schedule as appropriate.	M
X		Slips, falls, capsizing	• Board and seat in location that will not destabilize or overload the boat, or obstruct operator's view (surfaces are slippery and may be moving).	M
X		Getting crushed or pinched between moving vessel, or pulled overboard by line.	• Communicate with operator regarding casting off and landing. Assist only at their direction. Keep hands and feet clear from pinching/crushing between boat and other dock float pier, or boat.	M
X		Falling overboard	• Make sure appropriate fall prevention and rescue (throw ring, etc) is in place around perimeter	M
X		Getting hit by a tool or knocked overboard	• Observe and discuss drilling/construction operations with site coordinator. Agree on a safe location from which to monitor work. It should provide sufficient access to operations to observe, log samples, and review stored samples, and be away from potential casing, rod and tool mishaps. Stay clear of mooring operations, lines winches, etc. The safe place for the observer will probably change with operations since this is a very compact work area. Consider where you would move if equipment became unstable or the barge was to overturn. • All equipment should be securely stowed when not in immediate use. A wake, wave or gust may cause casing rods or other items to move.	M
X		Collision with marine traffic	• Assess visibility of work platform at all times. Provide at least minimum night lighting required by Coast Guard, and check work locations with harbor master or Coast Guard.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Emergency Procedures	• Communicate via cell or marine radio of there is a risk of navigation issues (swamping, overturning) or there are mechanical or navigation equipment issues.	M
X	Maintenance	Equipment Failure	• Inspect drill rig before mobilization. • Test all kill switches. • Inspect all hand tools and hydraulic hoses. • Inspect compressed air hoses and couplings where applicable. • Only a qualified driller/operator will be allowed to operate the drill rig.	L
X		Equipment	• The drilling rig and associated equipment must be maintained in a proper functioning condition. All motors must be shut off, and electrical, mechanical, and hydraulic components locked out of service when making repairs. All equipment must be inspected daily prior to use. Equipment must be operated and maintained in accordance with EM 385-1-1 and the manufacturer's guidelines. Safety shutoff system must be tested daily and not disabled. Bleed off pressure on hydraulic lines before undoing fittings. Do not leave tools loose on the rig after maintenance has been performed. A "spill kit" containing oil absorbent pads and other cleanup supplies will be staged in the work area. Refueling will be performed with jerry cans with fixed funnels over absorbent pads.	L
X		Fire	• All motors must be shut off, during refueling. Smoking in the vicinity of the drilling rig/backhoe is not permitted. A 20 lb A-B-C fire extinguisher must be maintained on the drilling rig, backhoe, and associated motorized equipment. Fuel containers will not be stored within 10' of equipment engines. Fuel will be stored in UL approved safety containers with contents clearly labeled.	L
X	Heat and Cold	Thermal Stress	• Heat Stress 1. Know and understand signs, symptoms, and treatments for heat stress. 2. Take breaks in shaded areas in accordance with project plans. 3. Remove or unzip coveralls during breaks. 4. Drink water or dilute electrolyte solutions (i.e. Gatorade). Limit salt intake. • Cold Stress 1. Wear Multi Layer cold weather clothing. Outer layer should be wind resistant fabric. 2. Drink warm fluids and take rest breaks in warm shelter. Use the buddy system.	L
X				

Add Items

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• 15' by 40' jack-up barge •15' tender vessel • Diedrich D-50 drill rig	• OSHA 10-hour training. • Drilling safety training. • Site specific training.	• Pre-mobilization jack-up barge inspection. • Daily equipment inspection prior to work activities. • Daily "Kill" switch inspections.
X			
X			

Involved Personnel:

Acceptance Authority (digital signature): Steven Garside

Digitally signed by Steven Garside
DN: cn=Steven Garside, o=New Hampshire Boring, Inc., ou, email=steveg@nhboring.com, c=US
Date: 2013.03.25 15:20:33 -04'00'

TAUNTON OFFICE
128 Dean St.,1st Floor Front
Taunton, MA 02780
Tel: 508 884-5055
Fax: 508 884 5056

FAIRHAVEN OFFICE
26 Water Street
Fairhaven, MA 02719
Tel: 508-996-4110
Fax: 508-990-2094

Marine Safety Consultants, Inc.

Tel: 207-775-7933
Fax: 207-775-7471
400 Commercial Street, Suite 403 Portland, ME 04101

April 12, 2016
File No.: 16-0256

New Hampshire Boring
40 Fordway Extension
Derry, NH 03038

SUITABILITY FOR SERVICE SURVEY

THIS IS TO CERTIFY THAT on April 7, 2016, the undersigned surveyor, did conduct and hold survey of the jack up rig, SEISMIC PRINCESS, while ashore in Derry, NH. The purpose of this survey was to determine the vessels suitability for its intended service as a work platform in protected waters.

VESSEL	: SEISMIC PRINCESS
O.N.	: 1117211
LENGTH	: 35’
BREADTH	: 15’
DEPTH	: 4’
TONNAGE	: 17 gross
BUILT	: 1996/ St. Bernard, LA

VESSEL DESCRIPTION

The SEISMIC PRINCESS is a self-propelled jack up vessel of welded steel construction. The vessel features parallel straight sides, flat bottom raked at both ends, straight forward and aft head logs and a flat deck with no sheer. There is a 10” moon pool on the centerline forward.

Set to port, starboard and aft are the lifting legs fitted to external wells and operated by individual hydraulic motors. The hydraulic power pack is driven by the main engine. All hydraulic hoses and fittings were found to be in good condition.

The deck is flat and enclosed with a 42” high handrail fitted with chain enclosures at the corners.

To the aft port side is a steel deckhouse, with windows all around in support of the navigation and operational controls for the vessel. The deck house is accessed by a weathertight door on its starboard side.

The vessel is equipped with a magnetic compass, chart plotter and VHF radio, fire extinguishers and a life ring with line attached. PFDs are to be provided for all crew.

The hull is without watertight subdivision and longitudinally framed reinforced with transverse trusses. Access to the space is by means of a non watertight hatch on a 4” raised coaming. The hull houses the main engine, an 85 HP Detroit Diesel which is coupled to a Twin Disc MG 506 reverse/reduction gear turning a 4 blade bronze propeller on a 1 ½” stainless steel shaft.

The vessel caries approx. 135 gallons of diesel fuel in an integral steel tank. Fuel lines are USCG type A1 hose in good condition. There is a submersible bilge pump in the aft section of the hull.

Vessels electrical system is 12 VDC by battery located in the engine space. Power is distributed through a selector switch to a fuse panel at the helm. All lights appear to be in proper location and condition, but were not tested for purpose of this survey.

CONDITIONS FOUND

Coatings about the hull and deck of the dredge are considered to be in good condition with usual wear and tear observed. Deck fittings and trips should be identified in bright yellow color. None of the machinery was operated for purpose of this survey.

OBSERVATIONS

Based on the observations made within the limits presented herein, in the opinion of the undersigned, the SEISMIC PRINCESS is suitable for its intended service as a work platform in protected waters, provided PFDs are provided for all personnel working aboard.

This report is based on examination of the vessel, and of those parts, spaces and equipment that could be sighted without removals or operation, and is rendered without bias or prejudice. In accepting same, it is agreed that the extent of obligation of this surveyor, with respect thereto, is limited to furnishing a competent survey, and in the making of this report, this surveyor is acting on behalf of the person or firm requesting same and no liability shall attach to this surveyor, for the accuracy, errors and/or omissions therefore.

SEISMIC PRINCESS
16-0256

Naval architecture and marine engineering analysis as usually performed in the design stage of the vessel's construction were not part of this survey and typical subjects such as adequacy of stability and seakeeping were not within the scope of this survey.

Submitted without prejudice,
MARINE SAFETY CONSULTANTS, INC.

NATIONAL ASSOCIATION OF MARINE SURVEYORS, INC.
NEIL C. ROSEN
No.
119-860
CERTIFIED MARINE SURVEYOR

Neil C. Rosen NAMS CMS
Marine Surveyor

TAUNTON OFFICE
128 Dean St.,1st Floor Front
Taunton, MA 02780
Tel: 508 884-5055
Fax: 508 884 5056

FAIRHAVEN OFFICE
26 Water Street
Fairhaven, MA 02719
Tel: 508-996-4110
Fax: 508-990-2094

Marine Safety Consultants, Inc.

Tel: 207-775-7933 400 Commercial Street, Suite 403 Portland, ME 04101
Fax: 207-775-7471

April 12, 2016
File No.: 16-0256

New Hampshire Boring
40 Fordway Extension
Derry, NH 03038

SUITABILITY FOR SERVICE SURVEY

THIS IS TO CERTIFY THAT on April 7, 2016, the undersigned surveyor, did conduct and hold survey of the 21' aluminum tri-hulled workboat, while ashore in Derry, NH. The purpose of this survey was to determine the vessels suitability for its intended service as a service vessel in protected waters.

VESSEL	: 21' workboat
H.I.N.	: NHZ231470409
LENGTH	: 21'
BREADTH	: 8'
DEPTH	: 3.5'
TONNAGE	: Less than 5 gross
BUILT	: 2009/ St. Bernard, LA

VESSEL DESCRIPTION

The workboat is an open deck vessel fitted with deckhouse enclosure of welded steel construction. The vessel features parallel straight sides, flat bottom raked at the bow and squared at the stern. The aft deck is of diamond plate enclosed by a 24" bulwark.

The deck house is fitted with large windows all around and accessed by means of an aft weathertight door. There are (2) submersible bilge pumps in the aft compartment.

The vessel is equipped with a chart plotter and VHF radio, fire extinguishers and a life ring with line attached. PFDs are to be provided for all crew.

The hull is transversely framed and partially foam filled for floatation. Access to the space is by means of flush deck hatches. Mounted on the stern are twin 60 HP Mercury 4 stroke outboard motors, complete with tilt/ trim control and hydraulic steering.

The vessel caries approx. 50 gallons of gasoline is two new poly tanks mounted under the rail port and starboard. Fuel lines are USCG type A1 hose with in line Racor filter.

Vessels electrical system is 12 VDC by battery located in the aft compartment. Power is distributed through a selector switch to a fuse panel at the helm.

CONDITIONS FOUND

The hull is without coatings and considered to be in good condition with usual wear and tear observed. None of the machinery was operated for purpose of this survey.

OBSERVATIONS

Based on the observations made within the limits presented herein, in the opinion of the undersigned, the 21' aluminum workboat is suitable for its intended service as a service vessel in protected waters, provided PFDs are provided for all personnel working aboard.

This report is based on examination of the vessel, and of those parts, spaces and equipment that could be sighted without removals or operation, and is rendered without bias or prejudice. In accepting same, it is agreed that the extent of obligation of this surveyor, with respect thereto, is limited to furnishing a competent survey, and in the making of this report, this surveyor is acting on behalf of the person or firm requesting same and no liability shall attach to this surveyor, for the accuracy, errors and/or omissions therefore.

Naval architecture and marine engineering analysis as usually performed in the design stage of the vessel's construction were not part of this survey and typical subjects such as adequacy of stability and seakeeping were not within the scope of this survey.

Submitted without prejudice,
MARINE SAFETY CONSULTANTS, INC.

Neil C. Rosen NAMS CMS
Marine Surveyor

APPENDIX F

SDS Sheets for Drill Rig Materials

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

Section 1: Identification

Product Identifier: **NS-MP Hypoid Gear Lubricant**

Other means of identification: Kendall NS-MP Hypoid Gear Lubricant, SAE 75W-90
Kendall NS-MP Hypoid Gear Lubricant, SAE 80W-90
Kendall NS-MP Hypoid Gear Lubricant, SAE 85W-140

SDS Number: **726200**

Intended Use: Automotive Gear Oil

Uses Advised Against: All others

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

Manufacturer:
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information:
Phone: 800-762-0942
Email: SDS@P66.com
URL: www.Phillips66.com

Customer Service:
U.S.: 800-368-7128 or International: +1-83-2486-3363
Technical Information: 1-877-445-9198

Section 2: Hazards Identification

Classified Hazards
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other Hazards
None Known

Label Elements
No classified hazards

Section 3: Composition / Information on Ingredients

Chemical Name	CASRN	Concentration[1]
Distillates, petroleum, hydrotreated heavy paraffinic	64742-54-7	14-92
Residual oils, petroleum, solvent-dewaxed	64742-62-7	0-80
Distillates, petroleum, solvent-dewaxed heavy paraffinic	64742-65-0	0-80
Non-Hazardous Materials	VARIOUS	5-60

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Chemical Name	ACGIH	OSHA	Other
Distillates, petroleum, hydrotreated heavy paraffinic	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	TWA: 5mg/m³ as Oil Mist, if Generated	---
Residual oils, petroleum, solvent-dewaxed	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	TWA: 5mg/m³ as Oil Mist, if Generated	---
Distillates, petroleum, solvent-dewaxed heavy paraffinic	TWA: 5mg/m³ STEL: 10 mg/m³ as Oil Mist, if Generated	TWA: 5mg/m³ as Oil Mist, if Generated	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practice suggests the use of eye protection that meets or exceeds ANSI Z.87.1 whenever working with chemicals.

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: Amber, Transparent
Physical Form: Liquid
Odor: Petroleum

Flash Point: Minimum 302 °F / 150 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: No data

Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): <1
Particle Size: N/A
Percent Volatile: Negligible
Flammability (solid, gas): May Ignite
Solubility in Water: Negligible

Vapor Pressure: <1 mm Hg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 0.87 - 0.91 @ 60ºF (15.6ºC)
Bulk Density: 7.2 - 7.6 lbs/gal
Viscosity: 14.0 - 32 cSt @ 100°C; 97 - 441 cSt @ 40°C
Pour Point: -49 to 10 °F / -45 to -12 °C

Section 10: Stability and Reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Not expected to be irritating. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Not expected to be irritating.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

Section 12: Ecological Information

GHS Classification:
No classified hazards

Toxicity: All acute aquatic toxicity studies on samples of lubricant base oils show acute toxicity values greater than 100 mg/L for invertebrates, algae and fish. These tests were carried out on water accommodated fractions and the results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	***Not regulated***
Note:	***If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	***Not regulated***
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.***

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: *Not regulated*
Note: ***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.***

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

WHMIS Hazard Class:
none

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
01-Aug-2013	03-Aug-2010	726200	FINAL

Revised Sections or Basis for Revision:
Format change; Physical Properties (Section 9); Toxicological (Section 11)

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:

The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

Section 1: Identification

Product Identifier: **Super-D XA® Diesel Engine Oil with Liquid Titanium®**

Other means of identification: Kendall Super-D XA® Diesel Engine Oil with Liquid Titanium® 10W-30
Kendall Super-D XA® Diesel Engine Oil with Liquid Titanium® 15W-40

SDS Number: **814642**

Intended Use: Heavy Duty Diesel Engine Oil

Uses Advised Against: All others

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

Manufacturer:
Phillips 66 Lubricants
P.O. Box 4428
Houston, TX 77210

SDS Information:
URL: www.Phillips66.com
Phone: 800-762-0942
Email: SDS@P66.com

Customer Service:
U.S.: 800-368-7128 or International: +1-83-2486-3363
Technical Information: 1-877-445-9198

Section 2: Hazards Identification

Classified Hazards
This material is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Other Hazards
None Known

Label Elements
No classified hazards

Section 3: Composition / Information on Ingredients

Chemical Name	CASRN	Concentration[1]
Distillates, petroleum, hydrotreated heavy paraffinic	64742-54-7	>75
Non-Hazardous Materials	VARIOUS	<25

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: Inhalation of oil mists or vapors generated at elevated temperatures may cause respiratory irritation. Accidental ingestion can result in minor irritation of the digestive tract, nausea and diarrhea. Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: If container is not properly cooled, it can rupture in the heat of a fire. This material may burn, but will not ignite readily.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

Special protective actions for firefighters: Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Avoid spreading burning liquid with water used for cooling purposes. Cool equipment exposed to fire with water, if it can be done safely. Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Keep all sources of ignition away from spill/release. See Sections 2 and 7 for additional information on hazards and precautionary measures. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). This material may burn, but will not ignite readily. Stay upwind and away from spill/release. Avoid direct contact with material.

Environmental Precautions: Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Stop spill/release if it can be done safely. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802). Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

Methods and material for containment and cleaning up:

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. See Section 13 for information on appropriate disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations. Dike far ahead of spill for later recovery or disposal.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Do not wear contaminated clothing or shoes. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Spills will produce very slippery surfaces. Used motor oils have been shown to cause skin cancer in mice after repeated application to the skin without washing. Brief or intermittent skin contact with used motor oil is not expected to cause harm if the oil is thoroughly removed by washing with soap and water.

Conditions for safe storage: Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Keep container(s) tightly closed and properly labeled. Store only in approved containers. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Keep away from any incompatible material (see Section 10).

Section 8: Exposure Controls / Personal Protection

Chemical Name	ACGIH	OSHA	Other
Distillates, petroleum, hydrotreated heavy paraffinic	TWA: 5 mg/m³ STEL:10 mg/m³ as Oil Mist, if Generated	TWA: 5 mg/m³ (as Oil Mist, if generated)	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye/face protection is not normally required; however, good industrial hygiene practice suggests *the use of eye protection that meets or exceeds* ANSI *Z.87.1 whenever working with chemicals.*

Skin/Hand Protection: The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals. Suggested protective materials: Nitrile

Respiratory Protection: A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. R or P95 filters may be used.

Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH). Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: Amber, Transparent
Physical Form: Liquid
Odor: Petroleum
Odor Threshold: No data
pH: Not applicable
Vapor Density (air=1): >1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data

Flash Point: > 438 °F / > 226 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: No data
Vapor Pressure: <1 mm Hg
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: No data
Auto-ignition Temperature: No data
Decomposition Temperature: No data

Evaporation Rate (nBuAc=1): No data
Particle Size: N/A
Percent Volatile: Negligible
Flammability (solid, gas): N/A
Solubility in Water: Negligible

Specific Gravity (water=1): 0.8707 - 0.8759 @ 60ºF (15.6ºC)
Bulk Density: 7.27 - 7.31 lbs/gal
Viscosity: 12.2 - 15.5 cSt @ 100°C; 80 - 117 cSt @ 40°C
Pour Point: < -40 °F / < -40 °C

Section 10: Stability and Reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Extended exposure to high temperatures can cause decomposition. Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous decomposition products: Not anticipated under normal conditions of use, During use in engines, contamination of oil with low levels of hazardous fuel combustion by-products (e.g. polycyclic aromatic hydrocarbons) may occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Not expected to be irritating. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Not expected to be irritating.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Repeated Exposure): No information available on the mixture, however none of the components have been classified for target organ toxicity (or are below the concentration threshold for classification).

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Distillates, petroleum, hydrotreated heavy paraffinic

Carcinogenicity: This oil has been highly refined by a variety of processes to reduce aromatics and improve performance characteristics. It meets the IP-346 criteria of less than 3 percent PAH's and is not considered a carcinogen by the International Agency for Research on Cancer.

Section 12: Ecological Information

GHS Classification:
No classified hazards

Toxicity: All acute aquatic toxicity studies on samples of lubricant base oils show acute toxicity values greater than 100 mg/L for invertebrates, algae and fish. These tests were carried out on water accommodated fractions and the results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material are greater than 5.3, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

Mobility in Soil: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of the hydrocarbon constituents in soil and sediment.

Other adverse effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle used oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	***Not regulated***
Note:	***If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	***Not regulated***
Note:	***U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.***

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	***Not regulated***

Note:	*U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.* LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Chemical Name	Concentration[1]	de minimis
Zinc Compound(s)	1.0 - 1.2	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

WHMIS Hazard Class:
none

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA

All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
29-Jul-2013	02-Oct-2010	814642	FINAL

Revised Sections or Basis for Revision:
Format change; Composition (Section 3)

Precautionary Statement(s):
P331: Do NOT induce vomiting
P310: Immediately call a POISON CENTER or doctor/physician
P301: IF SWALLOWED:
P260: Do not breathe dust/fume/gas/mist/vapours/spray
P281: Use personal protective equipment as required
P201: Obtain special instructions before use
P501: Dispose of contents/container to approved disposal facility.

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

SAFETY DATA SHEET

Reliant

Prepared according to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**Reliant**
PRODUCT USE:	Engine Oils
PRODUCT DESCRIPTION:	Base Oil and Additives
CAS#	Mixture
MANUFACTURER'S NAME:	**D-A Lubricant Company, Inc.**
ADDRESS:	801 Edwards Drive, Lebanon, IN 46052 USA
EMERGENCY PHONE:	1-800-899-9004 **TOLL-FREE in USA/Canada**
BUSINESS PHONE:	1-317-923-5321 (Product Information)
WEB SITE:	www.dalube.com
DATE OF PREPARATION:	23 May 2015
DATE OF LAST REVISION:	20 March 2013

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is an amber colored liquid with a petroleum hydrocarbon odor.
HEALTH HAZARDS: Prolonged or repeated exposure may cause irritation to eyes, respiratory system and skin. Repeated exposure may cause dryness of the skin.
FLAMMABILITY: This product is not classified as a flammable liquid. Flashpoint: >185°C (>365°F) ASTM D-92
ENVIRONMENTAL EFFECTS: The Environmental effects of this product have not been investigated. Floats on water. If it enters soil, it will be absorbed to soil particles and will not be mobile. This product may cause gastrointestinal distress in birds and mammals through ingestion during pelage grooming.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
Non-Regulated	Not Controlled	 Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# Various Highly Refined Petroleum Base Stocks – Listed in Annex I All are Severely Hydrotreated with less than 3 % DMSO extract as measured by IP 346
Substances not listed either individually or in group entries must be self classified

Components Contributing to Hazard:
Highly refined Mineral Oil

GHS Hazard Classification(s):
Skin Irritation Category 2
Eye Irritation Category 2B

Hazard Statement(s):
H320: Causes eye irritation
H315: Causes skin irritation

Precautionary Statement(s):
P264: Wash hands thoroughly after handling
P280: Wear protective gloves/protective clothing/eye protection/face protection

EU HAZARD CLASSIFICATION PER DIRECTIVE 1999/45/EC:
[Xi] Irritant

Risk Phrases:
R36/38: Irritating to eyes and skin

Safety Phrases:
S24/25: Avoid contact with skin and eyes
S37/39: Wear suitable gloves and eye/face protection

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE:

EYE: Expected to cause mild irritation of the eye if exposed to liquid spray or mist. May cause tearing, or burning of the eyes.

SKIN: May cause mild skin irritation from prolonged or repeated skin contact. Symptoms of irritation may include redness, drying, and cracking of the skin.

INHALATION: No significant adverse health effects are expected to occur upon short-term exposure

INGESTION: Ingestion can cause mild irritation of the digestive tract or cause a laxative effect. Because of the low viscosity of this material, this material can enter the lungs directly by aspiration during swallowing or vomiting. If aspirated into lungs, this material can cause severe lung damage.

CHRONIC: Prolonged or repeated skin contact can cause mild irritation and inflammation characterized by drying, cracking, (dermatitis) or oil acne.

TARGET ORGANS: ACUTE: Eye, Skin CHRONIC: Skin

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Highly Refined Mineral Oil	See Note Below	Various	Not Listed	>70%	HAZARD CLASSIFICATION: Self Classified: [Xi] Irritant RISK PHRASES: R36/38
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: This product can contain any of the following highly refined petroleum base stocks: 64742-01-4, 64742-54-7, 64742-58-1, 64741-88-4, 72623-84-8, 72623-87-1, 64742-46-7, 64742-57-0, 64742-62-7, 64741-89-5, 72623-85-9, 8042-47-5, 64742-52-5, 64742-55-8, 64742-65-0, 72623-83-7, 72623-86-0

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2010 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000.*

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label, bill of lading and/or MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FRE-FIGHTING MEASURES

FLASH POINT:	>185ºC (>365°F) ASTM D-92
AUTOIGNITION TEMPERATURE:	Not Established
FLAMMABLE LIMITS (in air by volume, %):	Lower (LEL): Not Available Upper (UEL): Not Available
FIRE EXTINGUISHING MATERIALS:	Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SAFETY DATA SHEET

Reliant

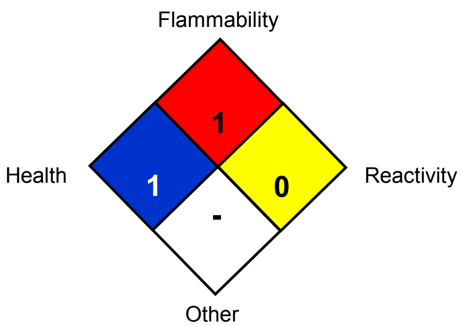
UNUSUAL FIRE AND EXPLOSION HAZARDS: Do not use straight streams of water. This product is a combustible liquid at temperatures above flash point.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	**1**
FLAMMABILITY HAZARD (RED)	**1**
PHYSICAL HAZARD (YELLOW)	**0**

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: 0 = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.

SPILLS: Contain spill if safe to do so. Product may create a slip hazard if not cleaned up. Prevent entry into drains, sewers, and other waterways. Soak up with an absorbent material and place in an appropriate container for disposal. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

If spill of any amount is made into or upon navigable waters, the contiguous zone or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing vapors/mists generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Protect from physical damage.

Other precautions: For professional industrial use only. Good personal hygiene is important. Empty containers retain residue which can be dangerous. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other ignition sources; they may explode and cause injury or death

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Highly Refined Petroleum Base Stocks	Various	5 mg/m³ Oil Mist	5 mg/m³ Oil Mist	5 mg/m³ Oil Mist

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above. Use local exhaust ventilation to control airborne vapor. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not normally required. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or chemical goggles as appropriate to prevent eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
APPEARANCE & ODOR:	Amber colored liquid with a petroleum hydrocarbon odor.
ODOR THRESHOLD (PPM):	Mild
VAPOR PRESSURE (mmHg):	<0.013 hPa (0.1 mm Hg) at 20°C
VAPOR DENSITY (AIR=1):	No Data Available
EVAPORATION RATE (nBuAc = 1):	No Data Available
BOILING POINT (C°):	>°260C (>500°F)
MELTING POINT (C°):	No Data Available
pH:	No Data Available
SPECIFIC GRAVITY:	0.8625 at 60°F
VISCOSITY:	No Data Available
SOLUBILITY IN WATER (%)	Negligible

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable

DECOMPOSITION PRODUCTS: Material does not decompose under normal storage conditions. When heated to decomposition this product produces carbon dioxide and carbon monoxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Excessive heat and high energy sources of ignition.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is not available for mixture: Information given is based on data on the components and toxicology of similar products.
Acute Oral Toxicity LD50 >5,000 mg/kg
Acute Dermal Toxicity LD50 >5,000 mg/kg

SUSPECTED CANCER AGENT: This product does not contain an ingredient(s) that are found on one or more of the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, or suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin and eyes.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

ADDITIONAL INFORMATION: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible.
Continuous contact with used engine oils has caused skin cancer in animal tests

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: It is not expected to be biodegradable. Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: If applied to leaves, this product may kill grasses and small plants by interfering with transpiration and respiration. This product is not toxic to fish but may coat gill structures resulting in suffocation if spilled in shallow, running water. Product may be moderately toxic to amphibians by preventing dermal respiration. This product may cause gastrointestinal distress in birds and mammals through ingestion during pelage grooming.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains, or in water courses. Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Non-Regulated Material

HAZARD CLASS NUMBER and DESCRIPTION: : None

UN IDENTIFICATION NUMBER: None

PACKING GROUP: None

DOT LABEL(S) REQUIRED: None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): None

MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):
This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product components are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:
SARA 313 Reporting: Zinc Dialkyl Dithiophosphate CAS#68649-42-3 <0.5%

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes   Chronic Health: No   Fire: No   Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): This product does not contain ingredient(s) which are on the California Proposition 65 lists.

ANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as “Not Controlled”, as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed or exempt on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

Disclaimer: The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE**. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

SAFETY DATA SHEET

SECTION 1 **PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME: #880 Crown & Chassis Grease NGLI #2
PRODUCT IDENTIFIER CODE(S): 8455/8456
PRODUCT RECOMMENDED/INTENDED USE: Lubricants
MANUFACTURER/SUPPLIER: TEXAS REFINERY CORP.
ADDRESS: 840 N. MAIN STREET
FORT WORTH, TX 76164
GENERAL INFORMATION: 817-332-1161
24 HR. EMERGENCY PHONE NUMBER: CHEMTREC 1-800-424-9300

SECTION 2 **HAZARDS IDENTIFICATION**

GHS Classification:

Health	Physical	Environmental
Skin Irritant- Category 3 Eye Irritant- Category 2B	No known physical hazards.	No known environmental hazards.

GHS Label:

Symbols: None	
Hazard Statements **Signal Word:** Warning Causes eye irritation. Causes mild skin irritation.	***Precautionary Statements:*** Wash skin thoroughly after handling. Keep container tightly closed when not in use. Store away from strong oxidizers. ***First Aid:*** **If in eyes:** Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention. **If skin irritation occurs:** Wash skin with soap and water. If irritation persists get medical attention. **If swallowed:** Do NOT induce vomiting. Get immediate medical attention.

SECTION 3 **COMPOSITION/INFORMATION ON INGREDIENTS**

Component	CAS Number	Weight %
Heavy paraffinic distillates (petroleum) (oil mist)	64742-54-7	75-90
Antimony Compound*	ADQ500	<2

Note: *This product contains a toxic chemical(s) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Each regulated chemical is present at a concentration that does not exceed the specified upper bound concentration value. **(See Section 8 for Exposure Limits)**

SECTION 4 **FIRST AID MEASURES**

PRINCIPAL ROUTES OF EXPOSURE: Skin
EFFECTS OF OVEREXPOSURE: Prolonged contact may cause mild skin and eye irritation. The primary hazard associated with grease is in high pressure grease guns. If injected under the skin, necrosis could result; Ingestion may cause irritation, nausea or diarrhea.
EYE: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. If eye irritation persists, get medical attention.
SKIN: If skin irritation occurs wash thoroughly with soap and water. If irritation persists get medical attention.
INGESTION: Do NOT induce vomiting. Get medical attention.
INHALATION: N/A. No inhalation hazards expected under normal conditions and use of this product.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None known.
NOTES TO PHYSICIAN: None.

SECTION 5 FIRE FIGHTING MEASURES

FIRE CLASSIFICATION: GHS Non-flammable. Non-combustible.
NFPA RATINGS: **HEALTH: 0** **FLAMMABILITY: 1** **REACTIVITY: 0**
FLASH POINT (°F/C) : >410/210 (COC)
LOWER EXPLOSION LIMIT/UPPER EXPLOSION LIMIT: Not determined.
OSHA FLAMMABILITY CLASSIFICATION: Non-flammable. Non-combustible.
SUITABLE EXTINGUISHING MEDIA: Use alcohol foam, dry chemical or CO_2; water fog can be used to keep exposed containers cool.
FIREFIGHTING PROCEDURES: Use air-supplied breathing equipment in enclosed areas. Cool exposed containers with water spray.
PROTECTION OF FIRE FIGHTERS: Self-contained breathing apparatus and full protective gear.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Do not store with strong oxidants.
COMBUSTION PRODUCTS: Carbon monoxide and Carbon dioxide.

SECTION 6 ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTION: Wear appropriate personal protective equipment when cleaning up spills (See Section 8). Keep unnecessary people away; isolate hazard area and deny entry.
PROCEDURES: Clean up mechanically. Do not flush to sewer or waterways. Prevent release into the environment if possible. Refer to section 15 for spill/release reporting information.

SECTION 7 HANDLING AND STORAGE

HANDLING: Avoid eye contact and prolonged or repeated exposure to skin. Observe good personal hygiene practices when handling this lubricant.
STORAGE: Store container tightly closed away from strong oxidizers.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: None.
PERSONAL PROTECTIVE EQUIPMENT: Not required under normal conditions of use.
EYE/FACE PROTECTION: N/A
SKIN PROTECTION: N/A
RESPIRATORY PROTECTION: N/A
OCCUPATIONAL EXPOSURE LIMITS:

Component	PEL:	TLV:
Heavy paraffinic distillates (petroleum) (oil mist)	5 mg/m^3	5 mg/m^3
Antimony Compound	0.5 mg/m^3	0.5 mg/m^3

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE (Color and physical state): Red grease.
ODOR: Mineral oil odor.
pH: Not Applicable
MELTING POINT/FREEZING POINT: Not determined.

BOILING POINT (^{0}F/C) : >600/316
FLASH POINT (^{0}F/C) : >410/210 (COC)
EVAPORATION RATE (Butyl Acetate=1): N/A
FLAMMABILITY: Non-flammable. Non-combustible.
UPPER/LOWER FLAMMABILITY OR EXPLOSIVE LIMITS: Not determined.
VAPOR PRESSURE (mm Hg) : <1.0
VAPOR DENSITY (Air=1): N/A
SOLUBILITY (ies) in Water: Insoluble.
SPECIFIC GRAVITY (H_2O=1): 0.97
PERCENT VOLATILE BY VOLUME: Nil

SECTION 10 **STABILITY AND REACTIVITY**

CHEMICAL STABILITY: This material is considered stable under specified conditions of storage, shipment and/or use.
INCOMPATIBILITY WITH OTHER MATERIALS: Incompatible with strong oxidizers.
CONDITIONS TO AVOID: Extremely high temperatures.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide and carbon dioxide.
HAZARDOUS REACTION/ POLYMERIZATION: Will not occur.

SECTION 11 **TOXICOLOGICAL INFORMATION**

ACUTE TOXICITY VALUES:
Heavy paraffinic distillates (petroleum) (oil mist):
Oral LD_{50} (Rat) = >6000 mg/kg
Dermal LD_{50} (Rabbit) = >2000 mg/kg
Inhalation LC_{50} (Rat) = 8500 mg/L/4H
Antimony Compound:
Oral LD_{50} (Rat) = 7000 mg/kg
Dermal LD_{50} (Rabbit) = No data available.
Inhalation LC_{50} (Rat) = No data available.
IRRITANT EFFECT ON THE SKIN: Mild skin irritant.
IRRITANT EFFECT ON THE EYES: Eye irritant.
SENSITIZATION: None.
MUTAGENICITY: No specific data available
CARCINOGENICITY: None known.
REPROTOXICITY/TERATOGENICITY: None known.
FURTHER INFORMATION ON TOXICOLOGY: This product is expected to be non-toxic based on available data for the components.

SECTION 12 **ECOLOGICAL INFORMATION**

No ecotoxicity data available for the components.
INFORMATION ON ELIMINATION (PERSISTENCE AND DEGRADABILITY)
BIOACCUMULATION: No specific data available
ECOTOXICOLOGICAL EFFECTS: No specific data available
FURTHER INFORMATION ON ECOLOGY: Do not allow to contaminate the soil, waterways or waste water

SECTION 13 **DISPOSAL CONSIDERATIONS**

PROCEDURES: Federal, State and/or Local approved disposal methods.
CONTAINER CLEANING AND DISPOSAL: Federal, State and/or Local approved cleaning and disposal methods.

SECTION 14 **TRANSPORT INFORMATION**

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING DESCRIPTION: Not subject to the DOT regulations on dangerous goods.
INTERNATIONAL MARITIME ORGANIZATION (IMDG) SHIPPING DESCRIPTION: Not subject to the IMCO regulations on dangerous goods.
FREIGHT CLASSIFICATION: Petroleum, lubricating grease (NMFC 155250 SUB 2 CLASS 65)

SECTION 15 **REGULATORY INFORMATION**

TOXIC SUBSTANCES CONTROL ACT (TSCA): All hazardous components of this product are included on the TSCA inventory.
CLEAN WATER ACT (CWA): If spilled into waters of the U.S., this material may be reportable under the Clean Water Act.
CLEAN AIR ACT (CAA): This material is not a hazardous substance under the Clean Air Act.
EPCRA 311/312 CATEGORIES: X **1. IMMEDIATE (ACUTE) HEALTH EFFECTS**
2. DELAYED (CHRONIC) HEALTH EFFECTS
3. FIRE HAZARD
4. SUDDEN RELEASE OF PRESSURE HAZARD
5. REACTIVITY HAZARD

THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICAL(S) SUBJECT TO REPORTING REQUIREMENTS OF SARA SECTION 313 (40 CRF 372):

Component	CAS Number	Maximum %
Antimony Compound	ADQ500	2.0

THIS PRODUCT CONTAINS THE FOLLOWING CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR REPRODUCTIVE HARM: N/A

CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS):
N/A. This product is not regulated by WHMIS (Canada).

EUROPEAN INVENTORY OF EXISTING CHEMICALS (EINECS):
R36/38- Irritating to eyes and skin.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label where possible.
S7/14- Keep container tightly closed away from strong oxidizers.
S24/25- Avoid contact with eyes and skin.
S29/35- Do not empty into drains; dispose of this material and its container in a safe way.

SECTION 16 **OTHER INFORMATION**

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS: This information is intended solely for the use of individuals trained in the NFPA system.

HEALTH: 0
FLAMMABILITY: 1
REACTIVITY: 0

REVISION INDICATOR: New SDS compliant with GHS AND OSHA.
DATE OF REVISION: 03/01/2013
SUPERSEDES: 06/26/2012

DISCLAIMER: THIS INFORMATION IS BEING SUPPLIED TO YOU UNDER OSHA "RIGHT TO KNOW" REGULATION 29 CFR 1910.1200 AND IS OFFERED IN GOOD FAITH. THE INFORMATION CONTAINED HEREIN IS BASED ON THE DATA AVAILABLE TO US AND IS BELIEVED TO BE TRUE AND ACCURATE TO THE BEST OF OUR KNOWLEDGE. TEXAS REFINERY CORP. MAKES NO WARRANTY, EXPRESSED OR IMPLIED, REGARDING THE ACCURACY OF THIS DATE, THE HAZARDS CONNECTED WITH THE USE OF THE MATERIAL, OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF. TEXAS REFINERY CORP. MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE SAFE USE OF THIS MATERIAL IN YOUR PROCESS OR IN COMBINATION WITH OTHER SUBSTANCES. TEXAS REFINERY CORP. ASSUMES NO RESPONSIBILITY FOR DAMAGE OR INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN.

Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: **ULSD #2 15 MOTOR VEHICLE**

Manufacturer Information:

Sunoco, Inc. (R&M)
1735 Market Street LL

Philadelphia, Pennsylvania, 19103-7583
sunocomsds@sunocoinc.com

Product Use:

Diesel Fuel 2 (15 ppm Sulfur)

Emergency Phone Numbers:

Chemtrec	(800) 424-9300	24 Hours
Sunoco Inc.	(800) 964-8861	24 Hours

Information:

Product Safety Information (888) 567-3066

2. HAZARDS IDENTIFICATION

- **EMERGENCY OVERVIEW**
  Danger! Combustible liquid and vapor. Vapors may cause flash fire or explosion. Static accumulator. May form an ignitable vapor/air mixture. Harmful if inhaled. May cause headaches and dizziness. Harmful if absorbed through skin. Harmful or fatal if swallowed. Pulmonary aspiration hazard. While ingesting or vomiting, may enter lungs and produce damage. Causes skin irritation. Can cause severe chronic toxicity. Possible cancer hazard.

Hazards Ratings:

Key: 0 = least, 1 = slight, 2 = moderate, 3 = high, 4 = extreme

	Health	Fire	Reactivity	PPI
NFPA	1	2	0	
HMIS	2	2	0	x

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS No.	Amount (Vol%)
#2 DIESEL HIGHWAY	68476-34-6	100 - 100
1,2,4 TRIMETHYLBENZENE	95-63-6	0 - 2
NAPHTHALENE	91-20-3	0 - 2
XYLENE	1330-20-7	0 - 1
CUMENE	98-82-8	0 - 1
ETHYL BENZENE	100-41-4	0 - 1

EXPOSURE GUIDELINES (SEE SECTION 15 FOR ADDITIONAL EXPOSURE LIMITS)

	CAS No.	Governing Body	Exposure Limits		
Limit for the product	68476-34-6	ACGIH	TWA	100	mg/m3
CUMENE	98-82-8	ACGIH	TWA	50	ppm
CUMENE	98-82-8	OSHA	TWA	50	ppm
ETHYL BENZENE	100-41-4	ACGIH	TWA	20	ppm
ETHYL BENZENE	100-41-4	OSHA	TWA	100	ppm
NAPHTHALENE	91-20-3	ACGIH	STEL	15	ppm
NAPHTHALENE	91-20-3	ACGIH	TWA	10	ppm
NAPHTHALENE	91-20-3	OSHA	TWA	10	ppm
XYLENE	1330-20-7	ACGIH	STEL	150	ppm
XYLENE	1330-20-7	ACGIH	TWA	100	ppm
XYLENE	1330-20-7	OSHA	TWA	100	ppm
#2 DIESEL HIGHWAY	68476-34-6	ACGIH	TWA	100	mg/m3

4. FIRST AID MEASURES

- **INHALATION**
  Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen and continue to monitor. Get immediate medical attention.
- **SKIN**
  Wash with soap and water for 20 minutes. Get medical attention if irritation develops or persists. Following injection, prompt debridement of the wound is necessary to minimize necrosis and tissue loss. Wash clothing before reuse. Destroy contaminated shoes and other leather products.
- **EYES**
  Flush eye with water for 20 minutes. Get medical attention.
- **INGESTION**
  If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

- **EXTINGUISHING MEDIA**
  Water spray; Regular foam; Dry chemical; Carbon dioxide;
- **FIRE FIGHTING INSTRUCTIONS**
  Use water spray to cool fire exposed tanks and containers. Water or foam may cause frothing. Wear structural fire fighting gear. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

FLAMMABLE PROPERTIES

	Typical	Minimum	Maximum	Text Result	Units	Method
Flash Point				> 125	F	PMCC
Autoignition Temperature	500				F	N/A
Lower Explosion Limit				No data	%	N/A
Upper Explosion Limit				No data	%	N/A

6. ACCIDENTAL RELEASE MEASURES

Prevent ignition, stop leak and ventilate the area. Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Use appropriate personal protective equipment as stated in Section 8 of this MSDS. Advise the Environmental Protection Agency (EPA) and appropriate state agencies, if required. Absorb spill with inert material (e.g., dry sand or earth), then place in a chemical waste container. Vacuum or sweep up material and place in a disposal container.

7. HANDLING AND STORAGE

- **HANDLING**
  Use only in a well-ventilated area. STATIC ACCUMULATOR. This liquid may form an ignitable vapor-air mixture in closed tanks or containers. This liquid may accumulate static electricity even when transferred into properly grounded containers. Bonding and grounding may be insufficient to remove static electricity. Static *electricity accumulation may be significantly increased by the presence of small quantities of water.* Always bond receiving container to the fill pipe before and during loading, following NFPA-77 and/or API RP 2003 requirements. Automatic gauging devices and other floats in vessels or tanks which contain static accumulating liquids should be electrically bonded to the shell. Bonding and grounding alone may be inadequate to eliminate fire and explosion hazards associated with electrostatic charges. In addition to bonding and grounding, efforts to mitigate the hazards of an electrostatic discharge may include, but are not limited to, ventilation, inerting and/or reduction of transfer velocities. Always keep the nozzle in contact with the container throughout the loading process. Do not fill any portable containers in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e. loading this material in tanks or shipping compartments that previously contained middle distillates or similar products). Non-equilibrium conditions may increase the risks associated with static electricity such as tank and container filling, tank cleaning, sampling, gauging, loading, filtering, mixing, agitation, etc. Dissipation of electrostatic charges may be improved with the use of conductivity additives when used with other mitigating efforts, including bonding and grounding. Avoid breathing (dust, vapor, mist, gas). Avoid prolonged or repeated contact with skin. Wash thoroughly after handling.
- **STORAGE**
  Keep away from heat, sparks, and flame. Keep container closed when not in use. NFPA class II storage. Flash point is greater than 100 degrees F and less than 140 degrees F.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Consult With a Health and Safety Professional for Specific Selections

- **ENGINEERING CONTROLS**
  Use with adequate ventilation. Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product.
- **PERSONAL PROTECTION**
  - **EYE PROTECTION**
    Splash proof chemical goggles are recommended to protect against the splash of product.
  - **GLOVES or HAND PROTECTION**
    Protective gloves are recommended when prolonged skin contact cannot be avoided. The glove(s) listed below may provide protection against permeation. Gloves of other chemically resistant materials may not provide adequate protection. Polyvinyl chloride (PVC); Neoprene; Nitrile; Polyvinyl alcohol; Viton;
  - **RESPIRATORY PROTECTION**
    Concentration in air determines the level of respiratory protection needed. Use only NIOSH certified respiratory equipment. Respiratory protection is not usually needed unless product is heated or misted.. Half-mask air purifying respirator with organic vapor cartridges is acceptable for exposures to ten (10) times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable for exposures to fifty (50) times the exposure limit. Exposure should not exceed the cartridge limit of 1000

ppm. Protection by air purifying respirators is limited. Use a positive pressure-demand full-face supplied air respirator or SCBA for exposures greater than fifty (50) times the exposure limit. If exposure is above the IDLH (Immediately Dangerous to Life and Health) or there is the possibility of an uncontrolled release, or exposure levels are unknown, then use a positive pressure-demand full-face supplied air respirator with escape bottle or SCBA. Wear a NIOSH-approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

- **OTHER**
  Where splashing is possible, full chemically resistant protective clothing and boots are required. The following materials are acceptable for use as protective clothing: Polyvinyl alcohol (PVA); Polyvinyl chloride (PVC); Neoprene; Nitrile; Viton; Polyurethane; Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Remove contaminated clothing and wash before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Property	Typical	Units	Text Result	Reference
Appearance		other	Lt Amber Liquid	
Boiling Point		F		
Bulk Density		lb/gal	No data	
Melting Point		F	No data	
Molecular Weight		g/mole	No data	
Octanol/Water Coefficient		other	No data	
pH		other	No data	
Specific Gravity	0.87	other		
Solubility In Water		wt %	Nil	
Odor		other	Kerosene-like	
Odor Threshold		other	No data	
Vapor Pressure	1.6	mmHg		
Viscosity (F)		other	No data	
Viscosity (C)	1.9	CsT		
% Volatile		wt %	No data	

10. STABILITY AND REACTIVITY

- **STABILITY**
  Stable
- **CONDITIONS TO AVOID**
  Avoid heat, sparks and open flame.
- **INCOMPATIBILITY**
  Cutting oil Strong oxidizers
- **HAZARDOUS DECOMPOSITION PRODUCTS**
  Combustion may produce carbon monoxide, carbon dioxide and other asphyxiants.
- **HAZARDOUS POLYMERIZATION**
  Will not polymerize.

11. TOXICOLOGY INFORMATION

Single Exposure Health Effects

Oral:

LD50 (g/kg):	No data

Dermal:

LD50 (mg/kg):	No data

Inhalation:

LC50 (mg/l):	No data
LC50 (mg/m3):	No data
LC50 (ppm):	No data

- **POTENTIAL HEALTH EFFECTS**

  - **INHALATION**
    Vapors and/or aerosols which may be formed at elevated temperatures may be irritating to eyes and respiratory tract. May cause headaches and dizziness. High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis and loss of consciousness and even death).

  - **SKIN**
    May be absorbed through the skin in harmful amounts. Contains a material that has caused skin tumors in laboratory animals. Causes severe skin irritation. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

  - **EYES**
    Mildly irritating to the eyes.

  - **INGESTION**
    Harmful or fatal if swallowed. Pulmonary aspiration hazard. While ingesting or vomiting, may enter lungs and produce damage.

  - **PRE-EXISTING MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

The following diseases or disorders may be aggravated by exposure to this product: skin, eye, nervous system, respiratory system, lung (asthma-like conditions),

Additional Toxicology Information

No data available

Component Toxicity Information

Overexposure to naphthalene, a minor component of this product, may cause skin, eye and respiratory tract irritation, anemia, loss of vision, nervous system effects and kidney and thymus damage. Also, exposure to naphthalene has produced "respiratory tract" tumors in laboratory animals. Ethylbenzene, a component of this product, has been designated by the International Agency for Research on Cancer as "possibly carcinogenic to humans", based on increased tumor incidence in laboratory animals. Overexposure may lead to nervous system effects, including drowsiness, dizziness, nausea, headaches, paralysis, loss of consciousness and even death. Repeated overexposure has caused a hearing loss in laboratory animals.

Cumene may be harmful or fatal if swallowed. Pulmonary aspiration hazard. After ingestion, may enter lungs and cause damage. May cause respiratory irritation, fluid in the lungs and lung damage. May be irritating to the skin and eyes. May cause nervous system effects, including drowsiness, dizziness, coma and even death. Overexposure has caused kidney, nose, and liver damage in laboratory animals. Following inhalation exposure, an increased tumor incidence has been observed in experimental animals. The significance of this finding to human health is presently unknown.

12. ECOLOGICAL INFORMATION

No data available

13. DISPOSAL CONSIDERATIONS

Follow federal, state and local regulations. This material is a RCRA hazardous waste. Do not flush material to drain or storm sewer. Contract to authorized disposal service.

14. TRANSPORT INFORMATION

Governing Body	Mode	Proper Shipping Name
DOT	Ground	Diesel Fuel

Governing Body	Mode	Hazard Class	UN/NA No.	Label
DOT	Ground	3 (Combustible Liquid)	NA1993	

15. REGULATORY INFORMATION

This product contains the following EPCRA section 313 chemicals subject to the reporting requirements of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372): Maximum Wt%: Naphthalene- CAS Number 91-20-3, 2.5%; %; Ethyl benzene- CAS Number 100-41-4, 1.0%; Cumene- CAS Number 98-82-8, 1.0%; The remaining Sara 313 components listed in Section 14 of the MSDS are less than the reported de minimis levels.This information must be included in all MSDSs that are copied and distributed for this material.

Regulatory List	Component	CAS No.
ACGIH - Occupational Exposure Limits - Carcinogens	ULSD #2 15 MOTOR VEHICLE	68476-34-6
ACGIH - Occupational Exposure Limits - TWAs	ULSD #2 15 MOTOR VEHICLE	68476-34-6
ACGIH - Skin Absorption Designation	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - Australia (AICS)	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - Canada - Domestic Substances List	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - China	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - European EINECS Inventory	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - Korea - Existing and Evaluated	ULSD #2 15 MOTOR VEHICLE	68476-34-6
Inventory - Philippines Inventory (PICCS)	ULSD #2 15 MOTOR	68476-34-6

	VEHICLE	
Inventory - TSCA - Sect. 8(b) Inventory	ULSD #2 15 MOTOR VEHICLE	68476-34-6
New Jersey - Department of Health RTK List	ULSD #2 15 MOTOR VEHICLE	68476-34-6
New Jersey - Env Hazardous Substances List	ULSD #2 15 MOTOR VEHICLE	68476-34-6
ACGIH - Occupational Exposure Limits - Carcinogens	#2 DIESEL HIGHWAY	68476-34-6
ACGIH - Occupational Exposure Limits - Carcinogens	ETHYL BENZENE	100-41-4
ACGIH - Occupational Exposure Limits - Carcinogens	NAPHTHALENE	91-20-3
ACGIH - Occupational Exposure Limits - Carcinogens	XYLENE	1330-20-7
ACGIH - Occupational Exposure Limits - TWAs	#2 DIESEL HIGHWAY	68476-34-6
ACGIH - Occupational Exposure Limits - TWAs	CUMENE	98-82-8
ACGIH - Occupational Exposure Limits - TWAs	ETHYL BENZENE	100-41-4
ACGIH - Occupational Exposure Limits - TWAs	NAPHTHALENE	91-20-3
ACGIH - Occupational Exposure Limits - TWAs	XYLENE	1330-20-7
ACGIH - Short Term Exposure Limits	ETHYL BENZENE	100-41-4
ACGIH - Short Term Exposure Limits	NAPHTHALENE	91-20-3
ACGIH - Short Term Exposure Limits	XYLENE	1330-20-7
ACGIH - Skin Absorption Designation	#2 DIESEL HIGHWAY	68476-34-6
ACGIH - Skin Absorption Designation	NAPHTHALENE	91-20-3
CAA (Clean Air Act) - HON Rule - Organic HAPs	CUMENE	98-82-8
CAA (Clean Air Act) - HON Rule - Organic HAPs	ETHYL BENZENE	100-41-4
CAA (Clean Air Act) - HON Rule - Organic HAPs	NAPHTHALENE	91-20-3
CAA (Clean Air Act) - HON Rule - Organic HAPs	XYLENE	1330-20-7
CAA (Clean Air Act) - HON Rule - SOCMI Chemicals	CUMENE	98-82-8
CAA (Clean Air Act) - HON Rule - SOCMI Chemicals	ETHYL BENZENE	100-41-4
CAA (Clean Air Act) - HON Rule - SOCMI Chemicals	NAPHTHALENE	91-20-3
CAA (Clean Air Act) - HON Rule - SOCMI Chemicals	XYLENE	1330-20-7
CAA - 1990 Hazardous Air Pollutants	CUMENE	98-82-8
CAA - 1990 Hazardous Air Pollutants	ETHYL BENZENE	100-41-4
CAA - 1990 Hazardous Air Pollutants	NAPHTHALENE	91-20-3
CAA - 1990 Hazardous Air Pollutants	XYLENE	1330-20-7
California - Proposition 65 - Carcinogens List	ETHYL BENZENE	100-41-4
California - Proposition 65 - Carcinogens List	NAPHTHALENE	91-20-3
Canada - WHMIS - Ingredient Disclosure	1,2,4 TRIMETHYLBENZENE	95-63-6
Canada - WHMIS - Ingredient Disclosure	ETHYL BENZENE	100-41-4
CERCLA/SARA - Haz Substances and their RQs	CUMENE	98-82-8
CERCLA/SARA - Haz Substances and their RQs	ETHYL BENZENE	100-41-4
CERCLA/SARA - Haz Substances and their RQs	NAPHTHALENE	91-20-3
CERCLA/SARA - Haz Substances and their RQs	XYLENE	1330-20-7
CERCLA/SARA - Section 313 - Emission Reporting	1,2,4 TRIMETHYLBENZENE	95-63-6
CERCLA/SARA - Section 313 - Emission Reporting	CUMENE	98-82-8
CERCLA/SARA - Section 313 - Emission Reporting	ETHYL BENZENE	100-41-4
CERCLA/SARA - Section 313 - Emission Reporting	NAPHTHALENE	91-20-3
CERCLA/SARA - Section 313 - Emission Reporting	XYLENE	1330-20-7
CWA (Clean Water Act) - Hazardous Substances	ETHYL BENZENE	100-41-4
CWA (Clean Water Act) - Hazardous Substances	NAPHTHALENE	91-20-3
CWA (Clean Water Act) - Hazardous Substances	XYLENE	1330-20-7
CWA (Clean Water Act) - Priority Pollutants	ETHYL BENZENE	100-41-4
CWA (Clean Water Act) - Priority Pollutants	NAPHTHALENE	91-20-3
CWA (Clean Water Act) - Toxic Pollutants	ETHYL BENZENE	100-41-4
CWA (Clean Water Act) - Toxic Pollutants	NAPHTHALENE	91-20-3
IARC - Group 2B (Possibly carcinogenic to humans)	ETHYL BENZENE	100-41-4
IARC - Group 2B (Possibly carcinogenic to humans)	NAPHTHALENE	91-20-3
IARC - Group 3 (not classifiable)	XYLENE	1330-20-7

Inventory - Australia (AICS)	#2 DIESEL HIGHWAY	68476-34-6
Inventory - Australia (AICS)	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - Australia (AICS)	CUMENE	98-82-8
Inventory - Australia (AICS)	ETHYL BENZENE	100-41-4
Inventory - Australia (AICS)	NAPHTHALENE	91-20-3
Inventory - Australia (AICS)	XYLENE	1330-20-7
Inventory - Canada - Domestic Substances List	#2 DIESEL HIGHWAY	68476-34-6
Inventory - Canada - Domestic Substances List	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - Canada - Domestic Substances List	CUMENE	98-82-8
Inventory - Canada - Domestic Substances List	ETHYL BENZENE	100-41-4
Inventory - Canada - Domestic Substances List	NAPHTHALENE	91-20-3
Inventory - Canada - Domestic Substances List	XYLENE	1330-20-7
Inventory - China	#2 DIESEL HIGHWAY	68476-34-6
Inventory - China	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - China	CUMENE	98-82-8
Inventory - China	ETHYL BENZENE	100-41-4
Inventory - China	NAPHTHALENE	91-20-3
Inventory - China	XYLENE	1330-20-7
Inventory - European EINECS Inventory	#2 DIESEL HIGHWAY	68476-34-6
Inventory - European EINECS Inventory	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - European EINECS Inventory	CUMENE	98-82-8
Inventory - European EINECS Inventory	ETHYL BENZENE	100-41-4
Inventory - European EINECS Inventory	NAPHTHALENE	91-20-3
Inventory - European EINECS Inventory	XYLENE	1330-20-7
Inventory - Japan - (ENCS)	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - Japan - (ENCS)	CUMENE	98-82-8
Inventory - Japan - (ENCS)	ETHYL BENZENE	100-41-4
Inventory - Japan - (ENCS)	NAPHTHALENE	91-20-3
Inventory - Japan - (ENCS)	XYLENE	1330-20-7
Inventory - Korea - Existing and Evaluated	#2 DIESEL HIGHWAY	68476-34-6
Inventory - Korea - Existing and Evaluated	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - Korea - Existing and Evaluated	CUMENE	98-82-8
Inventory - Korea - Existing and Evaluated	ETHYL BENZENE	100-41-4
Inventory - Korea - Existing and Evaluated	NAPHTHALENE	91-20-3
Inventory - Korea - Existing and Evaluated	XYLENE	1330-20-7
Inventory - Philippines Inventory (PICCS)	#2 DIESEL HIGHWAY	68476-34-6
Inventory - Philippines Inventory (PICCS)	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - Philippines Inventory (PICCS)	CUMENE	98-82-8
Inventory - Philippines Inventory (PICCS)	ETHYL BENZENE	100-41-4
Inventory - Philippines Inventory (PICCS)	NAPHTHALENE	91-20-3
Inventory - Philippines Inventory (PICCS)	XYLENE	1330-20-7
Inventory - TSCA - Sect. 8(b) Inventory	#2 DIESEL HIGHWAY	68476-34-6
Inventory - TSCA - Sect. 8(b) Inventory	1,2,4 TRIMETHYLBENZENE	95-63-6
Inventory - TSCA - Sect. 8(b) Inventory	CUMENE	98-82-8
Inventory - TSCA - Sect. 8(b) Inventory	ETHYL BENZENE	100-41-4
Inventory - TSCA - Sect. 8(b) Inventory	NAPHTHALENE	91-20-3
Inventory - TSCA - Sect. 8(b) Inventory	XYLENE	1330-20-7
Massachusetts - Right To Know List	1,2,4 TRIMETHYLBENZENE	95-63-6
Massachusetts - Right To Know List	CUMENE	98-82-8
Massachusetts - Right To Know List	ETHYL BENZENE	100-41-4
Massachusetts - Right To Know List	NAPHTHALENE	91-20-3
Massachusetts - Right To Know List	XYLENE	1330-20-7
New Jersey - Department of Health RTK List	#2 DIESEL HIGHWAY	68476-34-6
New Jersey - Department of Health RTK List	1,2,4 TRIMETHYLBENZENE	95-63-6
New Jersey - Department of Health RTK List	CUMENE	98-82-8
New Jersey - Department of Health RTK List	ETHYL BENZENE	100-41-4

New Jersey - Department of Health RTK List	NAPHTHALENE	91-20-3
New Jersey - Department of Health RTK List	XYLENE	1330-20-7
New Jersey - Env Hazardous Substances List	#2 DIESEL HIGHWAY	68476-34-6
New Jersey - Env Hazardous Substances List	1,2,4 TRIMETHYLBENZENE	95-63-6
New Jersey - Env Hazardous Substances List	CUMENE	98-82-8
New Jersey - Env Hazardous Substances List	ETHYL BENZENE	100-41-4
New Jersey - Env Hazardous Substances List	NAPHTHALENE	91-20-3
New Jersey - Env Hazardous Substances List	XYLENE	1330-20-7
New Jersey - Special Hazardous Substances	CUMENE	98-82-8
New Jersey - Special Hazardous Substances	ETHYL BENZENE	100-41-4
New Jersey - Special Hazardous Substances	NAPHTHALENE	91-20-3
New Jersey - Special Hazardous Substances	XYLENE	1330-20-7
NTP - Report on Carcinogens - Suspect Carcinogens	NAPHTHALENE	91-20-3
OSHA - Final PELs - Skin Notations	CUMENE	98-82-8
OSHA - Final PELs - Time Weighted Averages	CUMENE	98-82-8
OSHA - Final PELs - Time Weighted Averages	ETHYL BENZENE	100-41-4
OSHA - Final PELs - Time Weighted Averages	NAPHTHALENE	91-20-3
OSHA - Final PELs - Time Weighted Averages	XYLENE	1330-20-7
Pennsylvania - RTK (Right to Know) List	1,2,4 TRIMETHYLBENZENE	95-63-6
Pennsylvania - RTK (Right to Know) List	CUMENE	98-82-8
Pennsylvania - RTK (Right to Know) List	ETHYL BENZENE	100-41-4
Pennsylvania - RTK (Right to Know) List	NAPHTHALENE	91-20-3
Pennsylvania - RTK (Right to Know) List	XYLENE	1330-20-7
TSCA - Sect. 12(b) - Export Notification	NAPHTHALENE	91-20-3
TSCA - Section 4 - Chemical Test Rules	NAPHTHALENE	91-20-3

Title III Classifications Sections 311,312:

- Acute: **YES**
- Chronic: **YES**
- Fire: **YES**
- Reactivity: **NO**
- Sudden Release of Pressure: **NO**

16. OTHER INFORMATION

Follow all MSDS/label precautions even after container is emptied because it may retain product residue. Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner or properly disposed of. Email Address: For MSDS requests/information please contact sunocomsds@sunocoinc.com

Material Safety Data Sheet
for
Portland Cements
1997

Section I - Identity

Manufacturer's Name and Address: Dragon Products Company, Inc.
P.O. Box 191
Thomaston, Maine 04861

Emergency Telephone Number: (207) 594-5555

Chemical Name and Synonyms: Portland Cement
(CAS #65997-15-1)

Trade Name and Synonyms:

Dragon Products Company, Inc.	T-I	Portland Cement
Portland, Maine	T-II	Portland Cement
	T-III	Portland Cement

Section II - Chemical Data

Chemical Family: Calcium Salts

Formula: Portland cement consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate to control set. Portland cement clinker is a sintered material produced by heating to high temperature (greater than 1,200 degrees Celsius) a mixture of substances such as limestone and shale from the earth's crust. The substances manufactured are essentially hydraulic calcium silicates contained in a crystalline mass, not separable into the individual components.

Substances similar to the following are known to be present in portland cement:

$3CaO.SiO_2$	(CAS #12168-85-3)
$2CaO.SiO_2$	(CAS #10034-77-2)
$3CaO.Al_2O_3$	(CAS #12042-78-3)
$4CaO.Al_2O_3.Fe_2O_3$	(CAS #12068-35-8)
$CaSO_4.XH_2O$	(CAS #13397-24-5)

Small amounts of CaO, MgO, K_2SO_4, Na_2SO_4 may also be present.

Section III - Hazardous Ingredients

Ingredients: Portland cements are listed by OSHA in 29 CFR 1910.1000, Table Z-1-A, and require Material Safety Data Sheets (FR, January 19, 1989). MSHA (30 CFR 55.5.-1, Ref. 2), ACGIH (TLV's for 1973, Appendix E) and ACGIH (TLV's for 1984-5, Appendix D) list portland cements as nuisance dusts. Portland cements are NOT listed by NTP, IARC, or OSHA as carcinogens. However, since portland cement is manufactured from raw materials mined from the earth (limestone, marl, sand, shale, clay, etc.) and process heat is provided by burning fossil fuels, trace, but detectable, amounts of naturally occurring elements may be found during chemical analysis.

Section IV - Physical Data

Boiling Point: Not Applicable, Portland Cement is a Powdered Solid
Vapor Pressure: Not Applicable, Portland Cement is a Powdered Solid
Vapor Density: Not Applicable, Portland Cement is a Powdered Solid
Solubility in Water: Slight (0.1 - 1.0%)
Specific Gravity: ($H_20=1$) 3.15
Evaporation Rate: Not Applicable, Portland Cement is a Powdered Solid
Appearance and Odor: Gray or White Powder; No Odor
Melting Point: Not Applicable

Section V - Fire and Explosion Hazard Data

Flash Point: Portland cements are noncombustible and not explosive.
Flammable or Explosive Limits: Not Applicable
Extinguishing Media: Not Applicable
Special Firefighting Procedures: Not Applicable
Unusual Fire and Explosion Hazards: None
Lower Explosive Limit: Not Applicable
Upper Explosive Limit: Not Applicable

Section VI - Health Hazard Data

ACGIH Threshold Limit Value (1988-89): Total dust containing no asbestos and less than 1% silica - 10 mg/m^3

OSHA PEL (Transitional): Total Dust - 50 Million Particles/ft^3

OSHA PEL (Final): Total Dust - 10 mg/m^3
Respirable Dust - 5 mg/m^3

Effects of Overexposure:

Acute: Wet cement, especially as an ingredient in plastic (unhardened) concrete, mortar or slurries, can dry the skin and may irritate the eyes upon contact. Wet cement may cause severe caustic burns to the eyes or skin. Inhalation can irritate the upper respiratory system.

Chronic: Cement dust can cause inflammation of the lining tissue of the interior of the nose and inflammation of the cornea. Hypersensitive individuals may develop an allergic dermatitis.
[Cements may contain trace (less than 0.05%) amounts of chromium salts or compounds including hexavalent chromium, or other metals found to be hazardous or toxic in some chemical forms. These metals are mostly present as trace substitutions within the principal minerals.]

Emergency and First Aid Procedures: Irrigate eyes immediately and repeatedly with water and get prompt medical attention. Wash exposed skin areas with soap and water. Apply sterile dressings. If ingested, consult a physician immediately. Drink water.

Section VII - Reactivity Data

Stability: Product is stable. Keep dry until used.

Incompatibility: If wet mortar or concrete comes in contact with an outside source of aluminum powder or other alkali and alkaline earth elements, hydrogen gas may be liberated.

Hazardous Decomposition Products: None

Hazardous Polymerization: Will not occur.

Section VIII - Spill Procedures

Steps to be Taken in Case Material is Spilled: Use dry cleanup methods that do not disperse the dust into the air. Avoid breathing the dust. Emergency procedures are not required.

Disposal Method: Small amounts of material can be disposed of as common waste or returned to the container for later use if it is not contaminated. Large volumes may require special handling.

Section IX - Special Protection Information

Respiratory Protection: In dusty environments, the use of a MSHA/NIOSH-approved respirator is recommended.

Ventilation: Local exhaust can be used to control airborne dust levels.

Eye Protection: Use tight fitting goggles in dusty environments.

Skin Protection: Use barrier creams, impervious, abrasion-and alkali- resistant gloves, boots and protective clothing to protect the skin from prolonged contact with wet cement in plastic concrete, mortar or slurries. Immediately after working with cement or cement-containing materials, workers should shower with soap and water. **Precautions must be taken. Cement burns with little warning - little heat is sensed.**

Section X - Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ASTM	American Society for Testing and Materials
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
ft^3	Cubic Foot
IARC	International Agency for Research on Cancer
m^3	Cubic Meter
mg	Milligram
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
TLV's	Threshold Limit Values

Note: This Material Safety Data Sheet attempts to describe as accurately as possible the potential exposures associated with normal cement use. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. Users have the responsibility to evaluate and use this product safely and to comply with all applicable laws and regulations.

BIOBLEND
High Performance BioBased Lubricants

MATERIAL SAFETY DATA SHEET

BioBlend BioFlo AW32

SECTION 1: CHEMICAL PRODUCT AND COMPANY INFORMATION

Company Identification:
BioBlend Renewable Resources, LLC
2250 Arthur Ave.
Elk Grove Village, IL 60007

Emergency Contact: BioBlend 630-227-1800

Health Emergency: Contact the Local Poison Control Center.

Product Name: BioFlo AW32

Product Family: BioBlend

Date: 7/8/2013

Health HMIS 0
Flammability HMIS 1
Reactivity HMIS 0
Personal Protection HMIS B

SECTION 2: HAZARDOUS INGREDIENTS / EXPOSURE LIMITS

Ingredients:	*CAS#*	*Weight:*
Not Classified as Hazardous		

SECTION 3: HAZARDS IDENTIFICATION

Overexposure (Acute): GENERAL: Low oral and dermal toxicity.

Eye Contact: May cause eye irritation.

Skin Contact: May cause skin irritation.

Inhalation: None known.

Ingestion: May cause stomach discomfort, nausea and vomiting.

SECTION 4: FIRST AID MEASURES

Eye Contact: Flush eyes with water for 15 minutes. Get medical attention if irritation develops.

Skin Contact: Remove contaminated clothing. Wash skin with soap and water. Get medical attention if irritation persists.

Inhalation: Vapor inhalation under ambient conditions is not normally a problem. If overcome by vapors from overheated product, remove to fresh air. Give artificial respiration or oxygen if necessary. Get medical attention if discomfort continues.

Ingestion: Not expected to be a problem if ingested. Get medical attention if physical discomfort occurs.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point: >325ºF

Extinguishing Media: Use CO2, dry chemicals, sand, dolomite, etc.; alcohol resistant foam, water spray, fog or mist.

Fire Safety Procedure: Wear self-contained breathing apparatus and full turn out gear to fight fire. Use water to keep exposed containers cool and disperse vapors. Avoid spreading liquid and fire by water flooding.

Unusual Fire Hazard: Empty containers contain residue and/or vapors. Do not weld, cut. pressurize, braze, solder, drill, grind or expose to heat, sparks or flame.

SECTION 6: ACCIDENTAL RELEASE MEASURES / DISPOSAL

Environmental Impact: This product is >80% biodegradable, low toxicity, and is not expected to have adverse effects on humans or the environment, including fish and wildlife.

Procedures for Spill: Evacuate non-essential personnel. Use personal protective equipment. Remove sources of ignition, ventilate spill area, prevent entry into sewers and waterways. Pick up free material for recycle or disposal. Absorb residual liquid with inert material.

Waste Management: Dispose of according to federal, state and local regulations.

SECTION 7: HANDLING AND STORAGE

Handling Procedures: Wash hands thoroughly after handling material. Avoid contact with skin and eyes.

Storage Procedures: Do not store near potential sources of ignition. Store in a well ventilated area.

Incompatible Products:

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Equipment: Impermeable gloves and splash goggles.

Respiratory Protection: If overheated, use approved respiratory protective equipment.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance / Odor: Light amber; mild odor.

Specific Gravity: 0.913

Solubility in H2O, % by Volume: Not Determined.

Boiling Point, 760 mm Hg: Not Determined.

Vapor Pressure: Not Determined.

Freezing Point: -20F(-28C)

Volatiles, % by Volume: Not Determined.

Evaporation Rate, Butyl Acetate=1: Not Determined.

SECTION 10: STABILITY AND REACTIVITY

Thermal Stability: Stable.

Hazardous Polymerization: Will not occur.

Hazardous Decomposition Products: In the case of incomplete combustion, will produce oxides of carbon and carbon dioxide.

Materials to Avoid: Strong oxidizers.

SECTION 11: TOXICOLOGICAL INFORMATION

Toxicologocal Information: No experimental toxicological data on the product as such are available.

SECTION 12: TRANSPORTATION INFORMATION

U.S. DOT: Not regulated by DOT as a hazadous material.

TDG (Canada):

SECTION 13: REGULATORY INFORMATION

U.S. TSCA Inventory: All components of this product are listed on the TSCA inventory.

Calif Prop 65: Not Listed.

SARA Extremely Hazardous Sub: Not listed as such.

SARA Section 313: Does not contain any 313 ingredients.

CERCLA Hazardous Substances: No reportable quantity for this product or its components.

RCRA Status:

SECTION 14: OTHER INFORMATION

The information presented herein has been compiled from sources considered to be reliable and is accurate to the best of BioBlend's knowledge; however, BioBlend makes no warranty whatsoever, expressed or implied, of merchantability or of fitness for a particuler purpose, regarding the accuracy of such data or the results to be obtrained from the use thereof. BioBlend assumes no responsibility for injury to recipient or to third persons or for any damage to property; recipient assumes all such risks.

APPENDIX G

Personnel Qualifications

New England Boring Contractors

Employee: **Samuel Cooley**
Key Titles: Supervisor, Licensed Captain, and Drill Forman
Base Office: Derry, NH
Employment: 2001 to Present

Responsibilities and Specialties:

Supervisor: Supervises and oversees all off-shore barge drilling projects, which includes the mobilization, demobilization, and operation of the Company's Shallowdraft 35' Elevator Barge. This vessel has three 40' jack-up legs and is equipped with a Diedrich D-50 Drill Rig, which is mounted on the main deck. This drill rig maintains a 23' derrick and is capable of drilling depths of up to 35'. Operating this immense equipment takes precise execution and proper procedural training. Samuel has been educated and has a thorough understanding of these procedures with many years of experience to support his abundant expertise.

Licensed Captain: In 2015, Samuel successfully completed the US Coast Guard OUPV Captains Training and Licensure Course. This has made him a valuable and sought-after asset for even our most challenging barge projects.

Drill Foreman: With 15 year tenure at New England Boring Contractors, Samuel has the highest level of experience and knowledge in field of Geotechnical and Environmental Exploration. This knowledge includes all of the various phases of soil boring, rock coring, undisturbed sampling, packer tests, vane shearing, and the installation and decommissioning of monitoring wells and piezometers. These talents, accompanied by his expertise in barge work, make him flexible and more than capable for any project's needs.

Additional Certifications:

- 40 Hour OSHA
- 8 Hour OSHA Refresher
- CPR & First-Aid

RESUME

Blaine M. Cardali, EIT

Engineer II

Education

B.S., 2014, Civil Engineering, University of New Hampshire

Registrations & Certificates

Engineer-in-Training – 2013, New Hampshire, #6342

Areas of Specialization

- Geotechnical Engineering
- Geological Engineering
- Geo-Environmental Engineering
- Subsurface Investigation
- Construction Oversight
- Dam Engineering

Professional Activities

- Order of the Engineer
- ASCE Member

Professional Development

- OSHA Hazardous Waste Operations 40 Hour Safety Course June 2014
- Nuclear Gauge Safety Training June 2014
- Training Aids for Dam safety June 2012
- OSHA 10 hour Construction Course December 2014

Summary of Experience

Mr. Cardali is a civil engineer with experience in geotechnical projects and construction oversight. His field experience has included geotechnical explorations on waterfront and marine projects, bridges, highways, and residential and commercial, and construction oversight for foundation construction and rock slope stabilization projects. In his previous position with the Maine Dam Safety Program, Mr. Cardali conducted condition inspections and downstream hazard analyses according to title 37 B MRSA, The Safety of Dams.

Relevant Project Experience

Field Engineer, MEDOT Sarah Mildred Long Bridge Construction, Kittery, ME to Portsmouth, NH. The project involved oversight and documentation of subsurface investigations as confirmatory borings to assess bedrock type, quality and depth to assist in drilled shaft design for the bridge replacement. Confirmation borings were drilled from a floating spud barge and a temporary work trestle in high high-current, tidal setting. The project also involved the construction oversight of the drilled shafts including the use of temporary casing, permanent casing, float can, Wirth rock coring drill, mini-SID to assess shaft bottom cleanliness, steel rebar cage placement, concrete pouring, and Thermal Integrity Profiling testing. The project also involved spread footings bearing on tremie seals bearing on bedrock for some piers and abutments. Responsibilities included preparing boring logs, rock classification, collection of rock samples, documentation of subsurface profile, keeping a log of construction activities, assessing suitability of bedrock subgrade for spread footings, and reporting to GZA Project Manager and MaineDOT representatives.

Field Engineer, University of New England MSC Pier, Biddeford, Maine. The project involved drilling test borings on a floating spud barge in a tidal setting, oversight, and documentation of subsurface investigations for the Marine Science Center Pier. Responsibilities included preparing boring logs, soil classification and collection of subsurface samples and documentation of subsurface profile.

Field Engineer, Union Wharf MSRC Berth, Portland, Maine. The project involved drilling oversight, and documentation of subsurface investigations for the Union Wharf Pier. Responsibilities included preparing boring logs, soil classification and collection of subsurface samples, field vane tests and documentation of subsurface profile.

Field Engineer, Presque Isle Bypass Segment 1 & 2, Presque Isle, Maine. The project entailed the exploration and design of improvements to the Presque Isle, Maine bypass. Coordinated and observed over 200 test borings on an approximate 6-mile-long, cross country alignment, including split spoon sampling in soil, rock coring, and access using ATV-mounted drilling equipment at difficult locations.

Project Engineer, Rock Slope Stability Evaluation, Confidential Address, Wakefield, Massachusetts. GZA provided geotechnical engineering services regarding an existing rock slope behind a townhome development. Field engineer involved with a geological reconnaissance using hand measurements with a Brunton compass taken from foot, ladder, and by rappelling to characterize joints in the rock mass. GZA developed recommendations for stabilization and scaling to mitigate potential rockfall hazards. Mr. Cardali also provided full-time observation and oversight during a portion of the

Blaine M. Cardali, EIT

Engineer II

implementation of rock slope mitigation. The work was successfully completed in accordance with the plans and specifications.

Field Engineer, MTA Exit 63 Gray Interchange Improvements, Gray, Maine. The project entailed the exploration and design of improvements to the Maine Turnpike Exit 63 interchange. Coordinated and observed 25 land-based soil test borings and rock cores using truck-mounted and ATV-mounted drilling equipment at difficult to access locations.

Field Engineer, Spectra Energy AIM New York Crossing, Peekskill, New York. The project involved oversight and documentation of subsurface investigations for a new gas pipeline. Responsibilities included management of subcontractors, field reporting to Spectra personnel, preparing boring logs, soil classification, collection of subsurface samples, and documentation of subsurface profile.

Field Engineer, Spectra Energy Atlantic Bridge Taconic Parkway Crossing, Yorktown, New York. The project involved oversight and documentation of subsurface investigations for a new gas pipeline. Test boring depths ranged from 120 to 200 feet below ground surface and included up to 120 feet of rock coring per boring. Responsibilities included management of subcontractors, field reporting to Spectra personnel, preparing boring logs, soil classification, collection of subsurface samples, and documentation of subsurface profile.

Field Engineer, MaineDOT Barters Island Bridge Replacement, Boothbay, Maine. The project involved oversight and documentation of subsurface investigations to locate the top of rock depth to assist in design for the bridge replacement. Responsibilities included logging test borings drilled through an existing bridge deck and the bridge approach embankments, preparing boring logs, rock classification, collection of rock samples, documentation of subsurface profile, and rock bearing calculations.

Field Engineer, Saddleback Ridge Wind Project, Carthage, Maine. This project involved the construction of foundations for wind turbines. The turbines were supported by spread footings bearing on bedrock, with rock anchors installed around the perimeter of the foundation for uplift resistance. Responsible for assessment of suitability of bedrock subgrade before foundation construction, monitoring tension load testing for rock anchors, and resistivity testing.

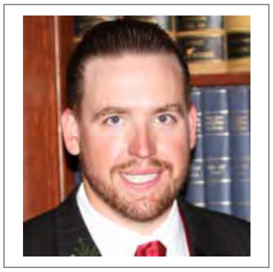
Field Engineer, Keene State College Pondside IV Residence Hall, Keene, New Hampshire. The project involved the oversight of pile installation of the Pondside IV Residence Hall. Responsibilities included documentation of driving criteria and documentation of obstructions observed during the installation of new piles. Office Responsibilities included tabulating as-driven documentation for each pile installed, and preparing a daily field report for submittal to the client.

Field Engineer, Wastewater Treatment Plant Upgrades, Newmarket, New Hampshire. The project involved the oversight of pile installation for upgrades in a wastewater treatment plant. Responsibilities included documentation of driving criteria, documentation of obstructions observed during the installation of new piles, and documentation of Load Transfer Platform (LTP) construction above piles. Office responsibilities included tabulating as-driven documentation for each pile installed, documenting LTP installation and testing operations, and preparing a daily field report for submittal to the client.

Field Engineer, National Grid Substations, Smithfield, Rhode Island. The project involved the construction of foundation structures associated with overhead electrical lines. Provided construction oversight of drilled shaft installation in multiple locations and documented compliance with project specifications.

Field Engineer, Bath Iron Works Outfitting Hall Addition and Blast and Paint Building, Bath, Maine. The project involved the oversight of pile installation of the outfitting hall addition and the Blast and Paint building. Responsibilities included documentation of driving criteria, documentation of obstructions observed during the installation of new piles, and observation of the installation and testing of rock anchors, as well as Nuclear Density Testing surrounding pile caps and bases of paved areas. Office Responsibilities included tabulating as-driven documentation for each pile installed, documenting rock anchor installation and testing operations, and preparing a daily field report for submittal to the client.

RESUME



Education

B.S., 2005, Civil Engineering, Northeastern University

Areas of Specialization

- Subsurface Investigation
- Geotechnical Construction Monitoring
- Environmental Construction Monitoring
- Nuclear Density Testing
- Concrete and grout sampling

Professional Development

- NorthEast Transportation Training and Certification Program (NETTCP) Subsurface Inspector Certification
- OSHA 40-Hour Hazardous Waste Site Personnel Basic Health and Safety Course
- OSHA 10-Hour Occupational Safety and Health Training Course in Construction Safety and Health
- Cintas, Basic First Aid and CPR

Joshua T. Szmyt

Engineer I

Summary of Experience

Mr. Szmyt is a civil engineer with experience in geotechnical investigations and serves as an Engineer I in the Bedford, New Hampshire office. Mr. Szmyt joined GZA in September 2007. His assignments include traditional geotechnical field engineering and subsurface explorations, including soil sampling and rock coring and classifications, test pits, monitoring well installation, and sampling. Mr. Szmyt possesses strong interpersonal communication, technical, and computer skills.

Relevant Project Experience

Field Engineer, Maine DOT- Sarah Mildred Long Bridge Replacement-PIN 16710, Portsmouth New Hampshire and Kittery Maine. GZA conducted a subsurface exploration program consisting of 43 test borings, both on the water and land, to evaluate subsurface conditions and bedrock conditions for the construction of a proposed draw bridge for the Route 1 bypass spanning the Piscataqua River between New Hampshire and Maine.

Field Engineer, The New Tappan Zee Bridge Project Geotechnical Investigation, Tarrytown and West Nyack, New York. GZA conducted a subsurface exploration program, in conjunction with HDR Inc., consisting of multiple test borings, both on the water and land, to evaluate subsurface conditions for the construction of the proposed The New Tappan Zee Bridge spanning the Hudson River for the Interstate I-87/I-287. Subsurface exploration activities included collection and field classification of both non-cohesive and cohesive soils along with collecting field data with pocket penetrometers and torvanes.

Penobscot River Bridge MEDOT WIN 16705.00 Geotechnical Evaluation, Howland-Enfield Maine. GZA conducted a subsurface exploration program consisting of 4 test borings on the water to evaluate subsurface conditions and bedrock conditions for the rehabilitation/construction of a proposed bridge that spans the Penobscot River for Route 116.

Field Engineer, Warren BRF 013-4(32), Bridge No. 166 - VT 100 over the Mad River, Warren, Vermont. For this Accelerated Bridge Construction (ABC) bridge replacement project, GZA conducted a subsurface exploration program consisting of two test borings and two test probes to evaluate subsurface soil and bedrock conditions at the bridge abutment locations. Subsurface conditions consisted of up to 29 feet of sand and gravel with nested cobbles and boulders overlying bedrock.

Field Engineer, Fairfield BRO 1448 (22), TH-30 Bridge No. 48 over Wanzer Brook, Fairfield, Vermont. For this Accelerated Bridge Construction (ABC) bridge replacement project, GZA conducted a subsurface exploration program consisting of four test borings to evaluate subsurface soil and bedrock conditions at the bridge abutment locations. Subsurface conditions were variable and consisted of sands, silts and glacial till of varying thicknesses overlying bedrock at depths from 38 to 46 feet below ground surface.

Field Engineer, Downtown (Main Street) Complete Streets Improvement Project, Concord, New Hampshire. GZA conducted a subsurface exploration program consisting of 15 test borings to evaluate subsurface conditions for the rehabilitation of 4,800 feet of roadway and construction of new foundations at three intersections.

Joshua T. Szmyt

Engineer I

Field Engineer, NH Route 123/124 Bridge Replacement over the Souhegan River, New Ipswich, New Hampshire. Working under a Task Order assignment for NHDOT, GZA conducted a subsurface exploration program consisting of two test borings, with borehole geophysical testing in each completed test boring to provide information on the bedrock structure.

Field Engineer, Route 107 Widening over I-95, Seabrook, New Hampshire. The project involved widening the Route 107 Bridge by one lane in each direction over Interstate 95 requiring abutment and pier extensions. GZA developed and executed a subsurface investigation, performed engineering evaluations, and provided geotechnical recommendations for the roadway widening, proposed signal and sign foundations, fill embankments, and pier and abutment widening.

Field Engineer, U.S. Army Corps of Engineers, Geothermal Pathfinder Wells, New England Region (Massachusetts and New Hampshire). GZA is assessing the geothermal feasibility of, and developing geothermal design approaches for four sites: Devens, MA USARC; Ayer, MA AFRC; Brockton, MA USARC; and Londonderry, NH AFRC. The project consists of a phased approach that includes a preliminary assessment of each site to evaluate and recommend a design approach, installation and testing of a single ground source heat pump test well ("Pathfinder" well), and preparation of a report presenting the findings of the test well and recommendations for design of a geothermal system at each site.

Field Engineer, Massport Haul Road, Chelsea, Massachusetts. Supervision of borehole drilling and test pits along with both environmental and geotechnical samples, classification of soil, monitoring well installation, and sampling for a proposed roadway.

Field Engineer, Keene State College Alumni and Advancement Center, Keene, New Hampshire. GZA performed a geotechnical engineering study for the proposed KSC Alumni and Advancement Center. Subsurface conditions consisted of approximately 30 feet of liquefiable sands over 70 to 80 feet of highly compressible clay. GZA recommended the building and ground floor slab be founded on steel H-piles end-bearing on bedrock or in dense glacial till soils. GZA observed dynamic pile load tests and provided construction monitoring services during the installation of the H-piles.

Field Engineer, Glencliff Home, Benton, New Hampshire. Supervision of borehole drilling, classification of soil, and monitoring well installation for foundation design of a 2-story biomass plant facility.

Field Engineer, MaineDOT PI Bypass - Phase 1A Geotechnical Evaluation, Presque Isle, Maine. GZA conducted a subsurface exploration program consisting of 94 test borings to evaluate subsurface conditions and bedrock conditions for the construction of a proposed bypass approximately 2.5 miles long.

Field Engineer, The New Tappan Zee Bridge Project Construction Monitoring, Tarrytown and West Nyack, New York. GZA observed dynamic pile load tests and provided construction monitoring services during the installation of the pipe piles during the construction of the proposed The New Tappan Zee Bridge spanning the Hudson River for the Interstate I-87/I-287.

Field Engineer, Boiler Plant Renovations, Keene State College, Keene, New Hampshire. Subsurface conditions consisted of over 50 feet of soft clay. During an initial phase, GZA recommended supporting new boilers and a stack on steel H-piles bearing in the underlying glacial till stratum. The use of H-piles limited the impacts of construction on the adjacent working boilers and nearby structures. Despite the low headroom installation, H-piles were preferred to eliminate the quantity of spoils generated by drilled-in piles such as mini-piles that would have to be removed from the building. During a subsequent phase, the existing building was demolished and the new structure supported on steel H-piles. GZA provided construction monitoring services during the installation of the H-piles.

Field Engineer, Hospital Expansion, Portsmouth, New Hampshire. Supervision of micropile drilling which also included performing micropile inspection to insure proper installation which included checking required total length of micropile, rock socket length, amount of grout placed in pile, and length of rebar install with spacers.

Field Engineer, Rivergreen, Everett, Massachusetts. Supervision of borehole drilling, classification of soil, and monitoring well installation for a proposed multi use complex.

RESUME

Tanya Justham

Assistant Project Manager

Education

B.S., 2001, Geology, St. Lawrence University
M.S., 2008, Geology, University of North Dakota

Registrations & Certificates

New Hampshire Certified Asbestos Disposal Site Worker-in-Training – 2015, NH, #ADS-0497

Affiliations

- Member of Geologic Society of America
- Member of Geochemical Society

Areas of Specialization

- Geology
- Geochemistry
- Hydrogeology
- Groundwater Monitoring
- Subsurface Exploration
- Remedial Investigations and Feasibility Studies
- ASTM Phase I/ II Environmental Site Assessments

Summary of Experience

Ms. Justham is a geologist/aqueous geochemist with GZA. Her field experience includes subsurface explorations, including soil sampling and rock coring and classifications, test pits, monitoring well installation, and sampling. She has been involved in numerous projects at commercial/industrial facilities throughout New Hampshire, Maine, and Massachusetts. Her responsibilities with GZA and other consulting companies have included supervising a variety of subsurface exploration procedures, sampling environmental media for geotechnical, physical, and geochemical parameters, QA/QC compliance, site health and safety plan preparation and implementation, aquifer pump testing, hydraulic conductivity testing, data interpretation, providing support for Superfund Sampling and Analysis Plan (SAP) and Brownfields Quality Assurance Project Plan (QAPP) development, and report writing. Ms. Justham also provides aqueous geochemistry expertise for investigative and remedial projects.

Relevant Project Experience

GEOLOGICAL

Project Geologist/Geochemist, Geothermal Investigation, Confidential Government Client, Four Locations in New Hampshire and Massachusetts. GZA and its subcontractors drilled, installed, and tested three standing column and one closed loop test wells at four sites. Ms. Justham performed mineral and rock identifications for the boring logs, created Eh-pH element species stability (Pourbaix) diagrams specific to the conditions at each site, and evaluated the water quality for fouling potential for the three standing column well sites.

Project Geologist, Rock Slope Evaluation, MADOT, Route 8, Sandisfield, Massachusetts. GZA performed rock mapping and rock slope stability evaluations to assess short-term and long-term stabilization for a section of Route 8 following a rock slide along a section of road cut. LiDAR survey was paired with field mapping to create a 3-dimensional model for use in rock slope stability and rockfall catchment analyses. Ms. Justham's responsibilities included mapping geologic structural features and identifying rock types and mineral compositions.

Project Geologist, Sewalls Falls Road Bridge, Concord, New Hampshire. For this municipally managed bridge replacement project, GZA conducted a subsurface exploration program consisting of six test borings to evaluate subsurface soil and bedrock conditions at the bridge abutment and pier locations for the new replacement bridge. Ms. Justham assisted with the exploration program including soil boring and rock coring and provided rock identification.

Project Geologist, Proposed Women's Prison, Concord, New Hampshire. GZA conducted a subsurface exploration program consisting of test borings and test pits to evaluate subsurface soil and bedrock conditions at the proposed site of a new women's prison. Ms. Justham assisted with the exploration program including soil boring and rock coring and provided rock identification.

Project Geologist, Geothermal Construction Support, Phillips Hall, Phillips Exeter Academy, Exeter, New Hampshire. GZA provided geothermal consulting and construction support services for the construction of a closed loop geothermal well

Tanya Justham

Assistant Project Manager

field to serve Phillips Hall following building renovations and an HVAC retrofit. Approximately 49 wells were drilled to depths of 400 feet below ground surface to provide approximately 90 Tons of heating and cooling for a hybrid system utilizing geothermal wells supplemented by District steam.

Ms. Justham provided oversight of the well field construction including drilling and installation of closed loop geothermal wells and construction of associated header and manifold piping to the building mechanical room.

Project Geologist, Multiple Geotechnical and Geothermal Projects, Multiple Sites in New Hampshire and Massachusetts.

Ms. Justham provides support to various geotechnical and geothermal projects including mineral and rock type identifications and assistance with review of rock descriptions for boring logs.

GEOCHEMISTRY

Project Manager/Geochemist, Hydrogeologic Services, Mottolo Superfund Site, Raymond, New Hampshire. This NHDES / EPA project involves the long-term monitoring of the Site to confirm the progress and evaluate the nature and extent of residual dissolved phase chlorinated volatile organic compounds (VOCs) and arsenic contamination in a highly fractured bedrock groundwater system in which off-site residential water supply wells have been impacted. A Focused Feasibility Study was performed to evaluate the remedial alternatives and included a cost sensitivity analysis. Ms. Justham has assisted with and overseen field work which included residential well sampling, borehole interval sampling, interval sampling of groundwater monitoring wells using passive diffusion bags (PDBs), and sampling of a FLUTe™ multilevel sampling system. Ms. Justham has also assisted EPA with the development of the fourth five-year-review, prepared annual summary reports, and developed a sampling plan to address questions relating to geochemistry and natural attenuation at the site.

Project Geologist/Geochemist, Hydrogeologic Services, New Hampshire Department of Environmental Services, New Hampshire Plating, Merrimack, New Hampshire. GZA is currently managing the ongoing environmental monitoring program at this site to evaluate post remediation environmental conditions. Ms. Justham has assisted in SAP development and implementation including technical support during development of applicable Standard Operating Procedures (SOPs). Field work has included pore water sampling activities, low-flow sampling, PDB deployment/sampling, and rotosonic drilling and well installation. Ms. Justham has assisted with the development of the second five-year-review and prepared annual summary reports. In addition, Ms. Justham provided geochemical expertise for a well closure evaluation involving mobilized arsenic and technical oversight for a high resolution site investigation using Waterloo^APS TM technology to determine if the remedy is working as anticipated.

Project Geologist/Geochemist, Hydrogeologic Services, Troy Mills Landfill Superfund Site, Troy, New Hampshire. This NHDES / EPA project involves the long-term remedial monitoring of a former drum burial area to monitor residual Light Non-Aqueous Phase Liquid (LNAPL) and the progress of natural attenuation of dissolved phase groundwater contamination. Field work has included low-flow sampling, surface water and leachate sampling, LNAPL gauging, and LNAPL baildown tests. Ms. Justham's office responsibilities have included SAP review, preparation of the annual summary reports, and assistance with the development of the second five-year-review.

Professional Development

40-Hour OSHA Hazardous Waste Operations Certified (current)
AED and Adult CPR - 2015
USDOT/IATA Training on the Shipping and/or Transportation of Hazardous Materials, April 2015
ASTM Environmental Site Assessments for Commercial Real Estate Standards 2-Day Training Course, September 2011 and June 2014
Hydrogeology of Massachusetts, Board of Registration of Hazardous Waste Site Cleanup Professionals, May 2013
Environmental Geochemistry, Mineralogy, and Microbiology of Arsenic Short Course, June 2014

APPENDIX H

GZA Accident Experience

GZA GeoEnvironmental, Inc.[1]

Rev: 5 January 2016

Five-Year Injury and Illness Statistics Summary

	2011	2012	2013	2014	2015
Experience Modification Rate (EMR)		0.94	0.95	0.95	0.91
Employees @ Year End	491	476	541	556	593
Hours Worked	967,891	932,460	999,707	1,029,795	1,104,288
Lost Workday Cases	4	0	1	0	0
Lost Workdays	39	0	1	0	0
Restricted/Transfer Duty Workday Cases	0	2	0	0	1
Restricted/Transfer Workdays	69	7	11	0	14
Medical Attention Cases	1	3	0	4	2
Fatalities	0	0	0	0	0
Total OSHA Recordable Cases	5	5	1	4	3
OSHA Total Recordable Incident Rate [2]	1.03	1.07	0.2	0.78	0.54
OSHA Lost Workday Incident Rate [3]	8.06	0	0.2	0	0
OSHA Days Away/Restricted/Transfer Rate[4]	0.83	0.43	0.2	0	0.18
Last 3 Years Average TRIR	1.31	1.25	0.77	0.68	0.51

Notes:

1 Includes GZA and all GZA subsidiaries, with the exception of Laurel Oil & Gas

2 TRIR= [Total Cases] * 200,000 / [Hours Worked]

3 LWIR= [Lost Workdays]*200,000/ [Hours Worked]

4 DART= [Lost and Restricted Workdays] * 200,000 / [Hours Worked]

APPENDIX I

Emergency Contact List

EMERGENCY NUMBERS

Fire Department:	911
EMS:	911
Police:	911
Porstmouth Regional Hospital:	(603) 436-5110
New England Poison Control Center:	(800) 222 -1222
GZA Project SHM (Richard Ecord):	(404) 234-2834
GZA Task Leader (Andy Blaisdell):	(207) 232-8869
GZA Site Health and Safety Officer/ Field Site Manager (Blaine Cardali):	(207) 751-3252

UTILITY CLEARANCE NUMBERS

Dig Safe:	1-888-344-7233

OTHER PRIMARY CONTACTS

Dr. Stephen Potts, PhD, PG USACE Geo-Environmental Engineering Branch	1-978-318-8311
Mr. Casey Haskell, PG USACE Geotechnical Engineering Section	1-978-318-8020
Tracy Shattuck, Chief Harbor Master, Town of Portsmouth	1-603-436-8500
Bert Condon, Harbor Master, Town of Portsmouth	1-603-365-0507
Dick Delude, Harbor Master, Town of Portsmouth	1-603-235-7332
Officer-in-Charge, Marine Inspection, U.S.C.G.	1-207-767-0320
Steve Garside, New England Boring Contractors	1-603-437-1610

A map and directions to the nearest hospital are provided from the muster point, 1 Badgers Island W, Kittery, Maine in Appendix D, (Portsmouth Regional Hospital, 333 Borthwick Avenue, Portsmouth, NH 03801)