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Preliminary Geotechnical Recommendations Report
South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

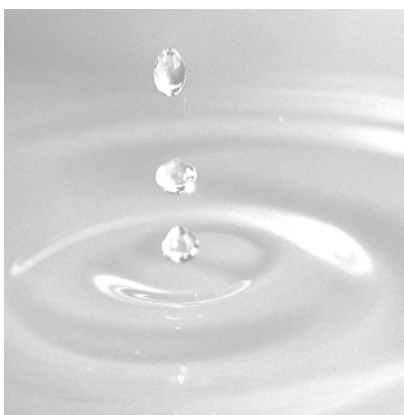
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Executive Summary

General Dynamics Electric Boat Corporation is planning improvements to both the North and South Yards at their Groton facility on the Thames River in Groton, Connecticut to support the Columbia Class submarine program. This report contains the results of our subsurface exploration program and preliminary geotechnical recommendations for the proposed work in the South Yard. The results of our subsurface exploration program and preliminary geotechnical recommendations for the North Yard are presented in a separate report.

The South Yard is located on the south end of the General Dynamics Electric Boat Corporation's Groton Facilities as shown in Fig. 1. The proposed South Yard development is located mostly over the water west of buildings 273 and 166, and south of buildings 132 and 232 and pier 253 as shown in Fig. 2. We understand that the South Yard development includes a waterfront deck structure on which an Assembly Building will be located, a Trades Building (5 stories), CCSM Building (half of the building will include an approximately 80-foot-tall bay and the other half will be two stories tall), dock and mooring dolphins for the floating dry dock, and a dredged Sinking Basin.

The subsurface conditions on land portions of the South Yard generally consisted of 10 to 54 feet of fill over bedrock. The fill consisted of mostly granular soil with cobbles and boulders, and the bedrock consisted of granite and granitic gneiss. The fill also contained voids or very loose zones, and we occasionally lost return of our drill water. Due to the presence of cobbles and boulders in the fill, we recommend that the landside buildings be supported on rock-socketed drilled micropiles or drilled shafts.

The subsurface conditions over water in the South Yard generally consisted of soft organic soil over sand and gravel, over bedrock. The organic soil varied in thickness from about 1 foot close to the shoreline to more than 100 feet near the Federal Channel limit. The sand and gravel layer was generally 5 to 10 feet thick below the proposed Deck and Assembly Building. The sand and gravel is more than 45 feet thick closer to the Federal Channel near the Sinking Basin. The layer was not fully penetrated in the borings near the Sinking Basin. We recommend that the waterfront deck and other waterside structures be supported on rock-socketed drilled shafts.

The Sinking Basin, which is designed to accommodate the submergence of the floating drydock, will be dredged as well as a portion of the organic soil below the Assembly Building. For static conditions, we recommend that the dredged slopes be no steeper than 3.5H:1V. It should be anticipated that some sloughing of the dredged slopes will occur and that maintenance dredging will be required. We computed factors of safety less than 1.0 for the pseudostatic stability of dredge slopes as flat as 12H:1V, which indicates that the strength

of the organic soil is sufficiently low that the dredged slopes will likely experience a lateral stability failure and lateral movement during a seismic event.

Any slope movement will induce lateral loads on the drilled shaft foundations. The induced moment and shear on the foundation elements caused by the displaced soil mass should be added to the loads induced by the lateral seismic loading. More detailed analyses will need to be performed during the next design phase to quantify the lateral load applied to the drilled shafts supporting the Assembly Building and Deck structure due to slope movement.

1. Introduction

1.1 Purpose

This report presents the results of our subsurface explorations and our preliminary geotechnical recommendations for the 30% design of the proposed South Yard development at the General Dynamics Electric Boat Facility in Groton, Connecticut.

1.2 Scope of Work

We performed the following scope of work for the South Yard:

- Engaged a heavy civil marine contractor to perform probes with an H-Pile advanced to refusal using a vibratory hammer to evaluate the depth to hard bottom conditions.
- Engaged a drilling subcontractor to perform geotechnical borings on land and in the water, and a Cone Penetration Test (CPT) subcontractor to perform seismic CPTs in the water for evaluating soil and bedrock conditions in the South Yard.
- Performed laboratory tests on soil and rock core samples.
- Prepared this report presenting the results of our explorations and testing and our preliminary geotechnical recommendations for 30% design of the South Yard development.

1.3 Site and Project Description

General Dynamics is planning improvements to both their North and South Yards at their Electric Boat Facility on the Thames River in Groton, Connecticut as shown in Fig. 1. This report contains the results of our subsurface exploration program and preliminary geotechnical recommendations for the proposed work in the South Yard. The results of our subsurface exploration program and preliminary geotechnical recommendations for the North Yard are presented in a separate report.

Based on our discussions with you and our review of preliminary drawing C100 dated 2017.11.07, we understand the proposed construction in the South Yard includes the following as shown in Fig. 2:

- Waterfront deck structure (approximately 850 feet x 343 feet) and Assembly Building occupying most of the deck (approximately 660 feet x 320 feet) to house the submarine assembly. The Assembly Building will be about 180 feet tall.

- Trades Building (5 stories) and CCSM Building (half of the building will include an approximately 80-foot-tall bay and the other half will be two stories tall) on the east and northeast sides of the proposed Assembly Building, respectively.
- Dock and mooring dolphins to the southeast of the proposed Assembly Building to service the floating drydock.
- Dredged Sinking Basin for the floating drydock will be dredged southwest of the proposed Assembly Building to launch the future Columbia Class submarines. We understand that the dredge basin will need to extend to El. -82 MLW.
- Foundations for an ocean transport vessel may also be required south of the Assembly Building.
- Dredged Areas west of the Assembly Building and south of the Assembly Building may need to extend to El. -40 MLW and El. -30 MLW, respectively.

We understand that the CCSM, Trades, and Assembly Buildings will all be structurally independent from each other.

1.4 Elevation Datum

The elevations in this report are in feet and reference Mean Low Water using the National Tidal Datum Epoch 1983-2001 at National Oceanic and Atmospheric Administration (NOAA) Tidal Station 8461490 in New London, Connecticut on the opposite side of the Thames River. El. 0.0 MLW = El. -1.65 NAVD88.

Elevations on the borings log prepared for land borings reference NAVD 88.

2. Subsurface Conditions

2.1 Subsurface Explorations

2.1.1 *Bedrock Probes*

GEI engaged Mohawk Northeast of Groton, Connecticut to perform 60 probes in the South Yard in July 2017. Probes were performed using an HP-14 pile driven to refusal using a vibratory hammer. The pile was marked in 1-foot increments, and the depth to probe refusal (below the water surface) and the time of refusal were recorded. We converted the refusal depths to elevations based on the actual tide elevations recorded from the NOAA Tidal Station 8461490 in New London, Connecticut. Refusal elevations estimated as described above have an approximate accuracy of ± 1 foot. The probe horizontal locations were measured in the field using a hand-held GPS unit and are accurate within about 5 feet. The northing, easting, mudline elevation, and refusal elevation for the probes are provided in Appendix A. Probe locations are shown in Fig. 3.

2.1.2 *Waterside Boring Program*

GEI engaged Aquifer Drilling and Testing (ADT) of Mineola, New York to perform borings from a barge in the water west of the South Yard from August through October 2017. A total of 35 borings were performed in the South Yard at the locations shown in Fig. 3. ADT used a CME-45 track-mounted drill rig on a spud barge to perform borings GEI-301 through GEI-312, GEI-310A, GEI-401 through GEI-415, GEI-420, and GEI-421. Boring locations for these holes were measured using a hand-held GPS unit. ADT used a CME-55 track rig on a jack-up barge to perform borings GEI-416 through GEI-419, and GEI-422. Boring locations were measured using the GPS unit in the pilot house of the jack-up barge, which had a higher accuracy than GEI's hand-held unit. ADT drilled the borings using steel flush-joint casing with rotary wash drilling methods. Split spoon sampling and Standard Penetration Tests (SPTs) were performed as indicated on the boring logs contained in Appendix B. The SPTs were performed using an automatic hammer system. Bedrock was cored in several of the borings using an NX-size core barrel. Borings were backfilled with the soil cuttings.

2.1.3 *Cone Penetration Tests*

GEI engaged ConeTec of West Berlin, New Jersey to perform one Cone Penetration Test (CPT) and three Seismic Cone Penetration Tests (SCPT) in the South Yard in September 2017. The cones were advanced continuously to refusal. Seismic shear wave velocity measurements were taken at one meter intervals at the SCPT locations. The SCPT and CPT

locations were measured using the GPS unit in the pilot house of the jack-up barge. The CPT data report prepared by ConeTec is included in Appendix C.

2.1.4 Landside Boring Program

GEI engaged ADT to perform borings and probes on land in the South Yard from August through November 2017. A total of twelve borings and eight probes were performed in the South Yard as shown in Fig. 3. ADT used a CME-85 truck-mounted drill rig to perform borings GEI-201 through GEI-206 and GEI-501 through GEI-505, and probes GEI-601 through GEI-608. Locations for these explorations were measured using a hand-held GPS unit. ADT drilled the borings using steel flush joint casing with rotary wash drilling methods. Split spoon sampling and SPTs were performed in the borings as indicated on the boring logs contained in Appendix B. The SPTs were performed using an automatic hammer system. The probes were advanced to the top of rock with no soil sampling. Logs of the landside probes are contained in Appendix B. Bedrock was cored in each of the borings and probes using an NX-size core barrel. Borings were backfilled with the soil cuttings. Boring and probe locations performed on land are shown in Fig. 3.

2.1.5 Previous Subsurface Explorations

Electric Boat had 20 borings drilled in June and July 1961, as documented in drawing EB 237-00-047. The historic boring locations are shown in Fig. 3. The results of those subsurface explorations are provided in Appendix D.

Emcon performed several borings on land between 1993 and 1995 for environmental sampling and for the installation of groundwater monitoring wells. The results of those explorations are also included in Appendix D, and the boring locations are shown in Fig. 3.

2.2 Subsurface Conditions

The soil layers encountered in the borings are described below, starting at the mudline. Subsurface profiles are included in Figs. 4 through 10. The subsurface profiles include data from the 2017 borings and bedrock probes, and select 1961 historic borings. The soil conditions are known only at the boring locations. Conditions between borings may differ significantly from those shown in the subsurface profiles and described below.

Fill – Fill was encountered at the ground surface in each of the land borings (GEI-200 series and GEI-500 series). The fill generally consisted of narrowly to widely graded sand with varying amounts of gravel, and contained numerous cobbles and boulders. The thickness of this layer ranged from 10 to 54 feet thick. Voids or loose zones were encountered in the fill as evidenced by ability to advance the drill casing by pushing, dropping of the drill rods, and loss of drill water return.

Organic Soil – Organic soil was encountered below the fill in several of the land borings nearest to the water and in each of the water borings at the mudline (approximately El. -9 to El. -33). This layer generally consisted of soft gray organic silt and clay with trace shell fragments. Unified soil classifications ranged from OL to OH. The thickness of the organic soil ranged from about 1 foot to 100 feet thick.

Sand and Gravel – Sand and Gravel was encountered below the Organic Soil in most of the water borings. SPT N-values ranged from 10 to 100 blows per foot but were generally greater than 25 blows per foot indicating a medium dense to very dense soil. The thickness of the layer typically ranged from 1.5 feet to more than 46 feet thick. This layer was not encountered in GEI-303, -407, -408, -411, -413, or -415. The water borings that did not core rock were terminated in this layer.

Bedrock – The bedrock generally consisted of a medium hard to hard, fresh to slightly weathered, moderately jointed to highly fractured, granite and granitic gneiss. In the water borings, the top of bedrock varied from El. -11 to deeper than El. -160. In the land borings, the top of bedrock varied from El. 8 to El. -69. Recoveries ranged from 0 to 100 percent, and were generally greater than 80 percent. Rock Quality Designations (RQDs) for the rock cores ranged from 0 to 100 percent, with most values greater than 50 percent, indicating good quality rock.

2.3 Regional Geology

Based on USGS bedrock geologic map of the New London quadrangle in Connecticut GQ-574 by R. Goldsmith (1967), the bedrock consists of New London Gneiss, described as a light-gray, medium- to fine-grained massive gneissic granodiorite, with quartz monzonite and containing shiny black biotite and magnetite grains. The predominant minerals are oligoclase and quartz with subordinate microcline. Visible foliation is produced by parallelism of biotite flakes and streaks of slightly different mineral composition.

2.4 Active Seismic Faults

Connecticut is classified by the Federal Emergency Management Agency (FEMA) as an area of moderate seismic risk. There are no active seismic faults in Connecticut. Ancient regional fault zones (most more than 300 million years old) typically trend northeast-southwest across the state and motion from distant earthquakes can be manifested within these zones. The two major fault zones closest to the site are the (northwest-trending) Honey Hill Fault Zone, located approximately 15 miles north, and the (northeast-trending) Lantern Hill Fault, approximately 13 miles east.

2.5 Groundwater and Flood Conditions

In the filled areas of the project site, groundwater levels are expected to be similar to the water level in the Thames River. We obtained the following water level elevations in the Thames River from the NOAA Tidal Station 8461490 referenced to MLW:

- Highest Observed Water Level (9/21/1938): El. 10.39
- Mean Higher High Water: El. 2.86
- Mean High Water: El. 2.57
- Mean Low Water: El. 0.0
- Mean Lower Low Water: El. -0.19
- Lowest Observed Water Level (2/2/1976): El. -4.19

Based on FEMA Flood Insurance Rate Map 09011C0502J, dated August 5, 2013, the estimated 100-year flood elevation of the Thames River near the South Yard is El. 14 (NAVD88) = El. 15.65 (MLW), which exceeds the highest observed water level recorded during the Great New England Hurricane of 1938.

Groundwater was measured in two previously installed wells at depths ranging from approximately 15 to 16 feet below ground surface (approximately El. 1 to El. 3).

2.6 Laboratory Test Results

2.6.1 Soil

We performed index testing and strength testing on soil samples collected from the borings. The laboratory testing is described in more detail below.

2.6.1.1 Grain Size Tests

We performed eight grain size tests on the soil samples listed in Table 1. The results of the grain size tests and the corresponding classification of the soils are summarized in Table 1 and laboratory test reports are provided in Appendix E. The grain size tests and the soil classification were performed in general accordance with ASTM Standards D422 and D2487, respectively. Visual manual classification was performed on samples in general accordance with ASTM Standard D2488.

2.6.1.2 Atterberg Limits, Organic Content and Water Content

We performed 18 Atterberg Limits on samples of the organic soil in general accordance with ASTM D4318. We performed organic content tests on 5 samples in accordance with ASTM

D297 and moisture content tests on 46 samples of organic soil in general accordance with ASTM D2216. Results are summarized in Table 1 and Figs 11 and 12. Test data are provided in Appendix E.

2.6.1.3 Strength Tests

We performed six isotropically consolidated undrained triaxial compression with pore pressure measurement (CIU') tests on samples of the organic soil in general accordance with ASTM D4767. We also performed five unconsolidated undrained compression (UU) tests on samples of organic soil in general accordance with ASTM D2850. We performed nine miniature laboratory vane shear tests on samples of organic soil in general accordance with ASTM D4648. Results are summarized in Table 2 and Fig. 11. Test data are provided in Appendix E.

2.6.2 Rock

GeoTesting Express of Acton, Massachusetts performed ten unconfined compression tests in general accordance with ASTM D7012C to evaluate the compressive strength of the bedrock in the South Yard. Test results are summarized below. All failures occurred through intact material and not along discontinuities. Test data are provided in Appendix E.

Boring and Core Run	Top of Rock Core Specimen Elevation (feet)	Unit Weight (pounds per cubic foot, pcf)	Compressive Strength (pounds per square inch, psi)
GEI-301, C1	-30.5	165	16,209
GEI-304, C1	-69.0	183	9,428
GEI-304, C2	-74.0	161	22,340
GEI-311, C2	-109.9	166	17,014
GEI-401, C1	-54.3	165	19,809
GEI-403, C3	-81.4	164	18,206
GEI-404, C3	-72.4	165	18,499
GEI-405, C1	-56.4	171	7,577
GEI-405, C4	-67.2	165	23,277
GEI-407, C1	-74.6	165	17,095

3. Foundation Recommendations

3.1 Foundation Types

We recommend that the foundations for the Assembly Building, deck, mooring dolphins, and dock consist of rock-socketed drilled shafts. We recommend that the CCSM and Trades Buildings be supported on rock-socketed drilled shafts or drilled micropiles. Each of these foundation types are discussed below. Preliminary foundation loads were not available as of the date of this report.

The foundations will need to be designed for both axial and lateral loads. Design parameters are provided below for the axial design of the foundations. Once the geometry and loading is finalized, we recommend that GEI be engaged to perform the lateral load analyses. We typically use commercially available software such as LPILE or GROUP for these analyses. Recommended preliminary soil parameters for the lateral load analyses are presented in Table 3.

Driven piles are not recommended for the structures over water because we expect piles would have insufficient lateral capacity due to the anticipated free length of the foundation elements in the water column, soft organic soils, and areas of higher bedrock as shown in the subsurface profiles on Figs. 5 and 6. On land, we encountered numerous cobbles and boulders in the fill. The frequency of boulders and cobbles in the fill would make driven piles very difficult and potentially infeasible to install. Therefore, we do not recommend driven piles as a foundation type for the proposed South Yard development.

We recommend that the foundations be provided with corrosion protection suitable for the marine environment. Possible corrosion methods include protective coatings, pile jackets, sacrificial steel allowances, active or passive cathodic protection, or some combination of these methods.

If both micropiles and drilled shafts are used to support the same structure, consideration should be taken regarding their differing stiffness and the potential for differential settlements.

3.1.1 *Rock-Socketed Drilled Shafts*

We recommend that rock-socketed drilled shafts consist of a permanent steel casing seated into the bedrock. We recommend that the permanent steel casings be advanced 6 to 12 inches into the bedrock to form a complete seal. Where the bedrock is fractured or sloping, the casing may need to be advanced further into the bedrock to form a complete seal.

For computing minimum rock socket lengths for the drilled shafts, we recommend using an allowable side friction or bond value of 175 pounds per square inch (psi) in the medium hard to hard granitic gneiss bedrock with rock core recoveries generally greater than 85 percent and RQDs greater than 50 percent using an NX-size double tube core barrel. We recommend using an allowable end bearing of 40 tons per square foot (tsf) with an allowable increase of 10 percent (4 tsf) per foot of embedment up to a maximum of 80 tons per square foot when embedded 10 feet or more into bedrock. These recommendations assume allowable stress design (ASD) is used. We recommend that rock socket lengths drilled into medium hard to hard bedrock be no less than 2.5 times the diameter. Additional embedment may be required to accommodate lateral loads on the drilled shafts as brittle failure of the upper portion of rock socket may occur.

We recommend that all rock sockets be camera-inspected to verify that the casing is properly seated into bedrock and the quality of the rock is consistent with the cores obtained in the borings and is of acceptable quality to achieve the allowable side friction. We recommend that all rock-socketed drilled shafts be air-lifted to thoroughly clean the bottom if the design relies on end bearing of the rock socket.

We recommend assuming some of the drilled shafts will not encounter the required quality of rock at the bedrock surface. This will result in additional rock socket drilling to achieve the required capacity. The camera inspection will identify zones of lesser quality rock and the geotechnical field engineer will generally quantify the downgraded allowable friction and compute the required increase in rock socket length. Approximately 25 percent of the borings encountered lesser quality bedrock in the uppermost 5 feet, which may require downgrading the allowable friction based on the camera inspection. Lower quality rock can also generally be identified based on the rock socket drilling times and confirmed by camera inspection. For budgeting purposes, we suggest assuming 30 percent of the rock sockets will need to be advanced an additional 3 to 5 feet beyond the design length to accommodate rock of lesser quality.

The shaft may be reinforced with a steel reinforcing cage, a steel wide flange section, or both. The drilled shafts should be tremie concreted. We recommend that cross hole sonic logging (CSL) tubes be installed within rebar cages to perform non-destructive testing upon completion of each drilled shaft. We recommend using one CSL tube per foot of diameter.

We also recommend performing a preproduction load test with an Osterberg Cell on a rock-socketed drilled shaft to measure the ultimate side friction and end bearing in the bedrock. This information would be used to optimize the design of the drilled shafts by justifying higher allowable friction and end bearing values resulting in reduced rock socket lengths and lower foundation costs. The load test shaft may be located on land to simplify the testing and reduce installation and testing costs.

3.1.2 Drilled Micropiles

We recommend that drilled micropiles be considered for supporting portions of the CCSM and Trades Buildings located on filled ground. Drilled micropiles are installed by drilling a steel casing in sections to the desired depth (in this case into the top of bedrock). As the casing is advanced, water is jetted through the casing to remove the soil cuttings. When the casing is seated into bedrock, a rock socket is drilled, the hole is thoroughly cleaned, steel reinforcing is lowered inside the casing, and the casing is tremie grouted with cement grout. Drilled micropiles can generally be installed through the boulders and cobbles encountered in the borings in the fill layer.

We recommend that the geotechnical capacity of the micropile be developed in skin friction in the bedrock. For computing minimum rock socket lengths for the micropiles, we recommend using an allowable side friction of 200 psi in the medium hard to hard granite and granitic gneiss bedrock with RQDs greater than 50 percent. We recommend that end-bearing not be included in the design micropile capacity, because it is often difficult to clean drill cuttings from the bottom of the drill hole. We recommend a minimum rock socket length of 8 feet.

If tension loads are anticipated, longer rock sockets will likely be required to mobilize the dead weight of the rock pullout wedge.

We recommend performing a load test to measure the ultimate bond stress of the rock sockets for the micropiles and to satisfy the Building Code. We also recommend that individual micropiles within a group be spaced at least 3 diameters or 30 inches (whichever is greater), center-to-center. Micropiles should be connected to the above grade structure using reinforced concrete pile caps. The bottom of the pile caps should be installed a minimum of 42 inches below grade for frost protection.

3.2 Retaining Walls

We understand that retaining walls are proposed on the east sides of the CCSM and Trades Buildings, and south of the proposed dock near the floating drydock mooring dolphins at the locations shown in Fig. 2. We recommend using the earth pressures shown in Fig. 13 for designing the retaining walls.

We expect the retaining wall south of the dock will likely be founded on bedrock which will result in the retaining wall being restrained against rotation. Retaining walls founded on bedrock should be designed for at-rest earth pressures as shown in Fig. 13.

For retaining wall footings constructed on bedrock subgrades, we recommend the following:

- Rock subgrade should be level to within 10 degrees of the horizontal.

- Subgrade should be adequately cleaned with water and/or compressed air to inspect the subgrade surface. Loose rock, sand, silt, and other deleterious material should be removed.
- Where the rock surface is uneven and may be difficult to keep clean, we recommend installing a 3-inch-thick concrete working mat over the approved subgrade.
- Retaining wall footings constructed on rock should be at least 3 feet wide and should be designed for a net allowable bearing pressure of 8 tons per square foot.

The fill layer in the area of the retaining walls on the east side of the CCSM and Trades Buildings varies in thickness from about 10 to 38 feet. If supported in the existing fill, we estimate that the retaining walls could settle up to 2 inches. We recommend the following for retaining wall footings constructed on existing fill:

- Design the retaining wall foundations for a maximum allowable net bearing pressure of 1,000 psf (averaged over the effective footing width B' , where $B' = B - 2e$, B is the total footing width and e is the load eccentricity from the center of the footing).
- For loads caused by surcharges, wind, or earthquakes, limit the maximum footing toe pressure to 1,500 psf.
- Retaining wall footings constructed on existing fill should be at least 4 feet wide.
- Strip footings and foundation walls should be designed to act as grade beams that can span over potential soft areas of the existing fill. We recommend designing the footings and foundation walls to span at least 8 feet between assumed support points.
- Footings should bear at least 42 inches below finished grade for frost protection.
- Construct footings on a 24-inch-thick layer of dense graded crushed stone underlain with a nonwoven geotextile, as described below under Subgrade Preparation. The fill subgrade and dense graded crushed stone should be compacted with multiple passes of a vibratory compactor as recommended in Section 4.
- Over excavate debris in the fill and replace it with crushed stone.

3.3 Bulkhead

We understand that a bulkhead is proposed to be installed under the deck at the north end of the proposed South Yard development. The new bulkhead is shown to be located entirely within existing fill areas, i.e. landside of the existing top of bank. Based on preliminary dredge concepts, we understand that the mudline in front of this bulkhead will be dredged to

El. -40. The top of the proposed Deck is at El. 14.15 (El. 12.5 NAVD88). Assuming a 3-foot-thick slab, there will be up to about 51 feet of retained soil behind the proposed bulkhead.

We recommend using a drilled-in wall system such as a secant pile wall for this bulkhead due to the height of the wall and the presence of boulders and cobbles in the fill. It may not be possible to design a sheet pile wall for the required wall height or to install a sheet pile wall due to the cobbles and boulders.

A secant pile wall is constructed with overlapping primary and secondary piles. The secondary piles are generally reinforced with a steel wide flange or reinforcing cage. The top of this wall will need to be tied back using a deadman system, permanent tiebacks, and/or the Deck Structure. We expect the secondary piles will need to be socketed into bedrock to develop adequate toe resistance. Top of bedrock along the proposed bulkhead is expected to vary from about El. -75 on the north end to El. -50 on the southeast end. We recommend considering seismic loading due to the proximity to the proposed Deck structure. Recommended earth pressures for the permanent bulkhead structures are provided in Fig 14.

Design details for the termination of the new bulkhead where it ties into existing structures will need to be developed during the next design phase.

3.4 Seismic Design

Based on ASCE 7-10, the soils in the South Yard generally meet the requirements of Site Class E due to the thick layer of organic soil over water. We recommend using Site Class E for the seismic design of the Deck and Assembly Building over water. Site Class D may be used for the CCSM and the Trades Buildings as well as the portion of the Deck over land.

We recommend that the structural design of the deep foundations consider the seismic effects from inertial loading (i.e., dynamic response) of the structure and kinematic loading on the foundations (piles and/or shafts) caused by lateral ground motions as outlined in ASCE 61-14. These effects should be considered as simultaneous applied loads. The seismic analysis should consider the phasing of the inertial and kinematic loads (whether they act in the same or opposite directions) and the locations where the loads are applied to the foundations.

Based on a preliminary liquefaction screening of the soil types and corrected N-values, we identified a few samples in the sand and gravel layer that are potentially susceptible to liquefaction (reduction in shear strength). However, the samples that are potentially liquefiable are isolated; therefore, it is our opinion that liquefaction is not a concern in the South Yard.

3.5 Settlement

We estimate that total settlement of the rock-socketed drilled shaft foundations (excluding elastic shortening) will be less than 1 percent of the diameter for the drilled shaft and less than ½-inch for the rock-socketed micropiles. We expect differential settlements of less than ½ inch between adjacent foundation elements.

3.6 Dredging

We understand that dredging will be performed in the following locations:

- The Sinking Basin, which has a footprint of approximately 160 by 700 feet, will be dredged to El. -82. Existing mudline elevations within the sinking basin limits range from approximately El. -16 to El. -33.
- The area west of the proposed Assembly Building and Deck will be dredged to El. -40. Existing mudline elevations in this area range from El. -16.0 to El. -38.0.
- The area south of the proposed Assembly Building will be dredged to El. -30. Existing mudline elevations in this area range from El. -12 to El. -18. The northeast corner of this area encroaches onto the existing land. Portions of this area will require 10 to 20 feet of rock excavation.

3.7 Slope Stability

The primary geotechnical considerations for the dredge areas are the stability of the dredged slopes and potential lateral loading of the Assembly Building and Deck foundation elements. Based on our discussions with Stantec and the project team, we understand that the Sinking Basin slopes do not need to be designed for seismic loading. However, the slopes under the Assembly Building and Deck must be evaluated for seismic loading and the foundation elements designed for any resulting lateral soil loading due to lateral stability failures (lateral spreading or shear failure) of the dredged slopes.

3.7.1 Sinking Basin

Based on our preliminary evaluation for static long-term drained loading, we recommend that the basin side slopes be dredged no steeper than 3.5H:1V to achieve a safety factor of 1.5.

For the long-term drained loading case, we used an effective friction angle of 23 degrees for the organic soil. It should be anticipated that some sloughing of the dredged slopes will occur and that maintenance dredging will be required. Steeper slopes would likely result in increased sloughing, which would increase the maintenance dredging required to maintain the basin at the design depth.

For the static undrained loading case, we used varying undrained shear strengths. Where no soil is to be excavated, we used a linearly increasing strength profile based on the ratio of $S_u / (\sigma'_{v0}) = 0.22$ where σ'_{v0} is the maximum past effective pressure. We divided the side slope of the basin into separate zones to approximate the strength reduction at differing over consolidation ratios (OCRs). Along the side slopes and at the bottom of the dredge basin where the soil will be excavated, we evaluated the undrained strength using $S_u = 0.22(\sigma'_{v0})OCR^{0.8}$ and used linear approximation or bi-linear approximation of the strength increase. Our preliminary analyses yielded safety factors above 1.5 for the dredge basin with side slopes of 3.5H:1V for both the drained and un-drained loading cases.

We understand the slopes of the Sinking Basin do not need to be evaluated for seismic loading; however, in the northeast corner of the Sinking Basin, the slope extends below the proposed Assembly Building and Deck, which will require seismic evaluation as described in the next section.

The dredging for the southern slope of the sinking basin could affect the Town of Groton storm water discharge pipe and diffuser. We understand that the storm water pipe will be relocated to accommodate the sinking basin construction. The southern slope dredging should be performed after the storm water pipe is relocated.

3.7.2 Slope Under the Assembly Building Deck

Based on MIL-STD-1625D(SH) and ASCE 61-14, the slopes below the proposed Assembly Building and Deck must be evaluated for both static stability and seismic stability. While slopes of 3.5H:1V are adequate for static loading, they are not adequate for seismic loading.

We performed preliminary pseudostatic slope stability analyses using the following approach:

- Obtained Peak Ground Acceleration (PGA) of 0.079 g from USGS hazard maps developed for ASCE 7-10.
- Amplified the PGA for site effects for Site Class E using an F_{PGA} of 2.5 per ASCE 7-10. $PGA_M = 2.5 * 0.079 = 0.199$ g.
- Applied a factor of 0.7 per ASCE 7-10 for allowable stress design on PGA_M . $A = 0.7 * PGA_M = 0.7 * 0.199$ g = 0.1393 g.
- Applied a reduction of 0.5 on the factored PGA_M modified for site effects (0.1393 g) to compute the pseudostatic horizontal acceleration coefficient assuming some deformation will occur. $K_h = 0.5 * 0.1393$ g = 0.07 g.

We performed our preliminary analyses at the following three Assembly Building locations: along the west side, through the southwest corner, and along the south side.

We computed factors of safety less than 1.0 for dredge slopes as flat as 12H:1V, which indicates that the strength of the organic soil is sufficiently low that the dredged slopes will likely experience a lateral stability failure and lateral movement during a seismic event. Any slope movement will induce lateral loads on the drilled shaft foundations. The slope extending from under the southwest corner of the Assembly Building into the Sinking Basin appears to be the critical section, because of its proximity to the Assembly Building and Deck.

The induced moment and shear on the foundation elements caused by the displaced soil mass should be added to the loads induced by the lateral seismic loading. This process is typically an iterative process between the structural and geotechnical engineers to estimate and combine the induced shear and moments from the lateral soil loading and the structure dead, live, and seismic loads. More detailed analyses will need to be performed during the next design phase to quantify the lateral load applied to the drilled shafts supporting the Assembly Building and Deck structure due to slope movement.

4. Construction Considerations

4.1 Existing Structures

There are several existing buildings near the proposed development, as well as several utilities and the railway.

We recommend that the impact of construction induced vibrations (peak particle velocities) on nearby building structures, utilities, and activities be evaluated and appropriate limits be established for the proposed construction. We also recommend that a pre-construction survey of existing structures that will remain and that are located within 200 feet of the proposed work be performed before construction.

4.2 Subsurface Obstructions

We understand that the project site was filled over time and that the potential exists to encounter subsurface obstructions including but not limited to buried structures, utilities, riprap, and cobbles and boulders. The contractor should carefully plan their means and methods to address the obstructions. Where the obstructions are relatively shallow, the contractor may be able to remove them using an excavator. Where the obstructions are deep, the contractor will need to select their means and methods capable of advancing through the obstructions.

4.3 Excavation and Dewatering

All excavations on land should be made in accordance with Occupational Safety and Health Administration (OSHA) standards. The contractor should employ a competent person and follow the OSHA regulations.

If excavation support is required, the design should be submitted for review before installation. A Connecticut registered professional engineer engaged by the contractor should design the excavation support system.

We expect that groundwater will generally not be encountered during construction of pile caps and retaining wall footings. The contractor should grade the site to direct runoff away from foundation excavations. However, where elevator pits are required, groundwater may be encountered. Based on the fill soils encountered in the borings, the fill is expected to be highly permeable. The contractor will have to minimize the area of open excavation and potentially use an excavation support system that provides groundwater cutoff. If excavations extend below the groundwater level, filtered sumps may be insufficient and

dewatering wells may be needed in and around excavations to control the groundwater. We expect that groundwater levels in the fill close to the river fluctuate with the tides.

4.4 Subgrade Preparation and Backfilling

The retaining wall foundations east of the Trades Building will likely bear in the existing fill layer. The borings encountered numerous cobbles and boulders within the existing fill layer. Therefore, we expect voids may be present. If voids are encountered during excavation, we recommend using crushed stone (3/8-inch to 1/2-inch) to fill the voids. Alternatively, a flowable cementitious material, such as sand-cement grout or controlled density fill, may be used to fill the voids.

We recommend that the crushed stone and foundation subgrades for the retaining wall footings be compacted with at least four passes of a 5-ton vibratory roller. We recommend placing a nonwoven geotextile over the compacted subgrade and placing a 2-foot-thick layer of dense graded crushed stone below the retaining wall foundations. Crushed stone should be compacted with a minimum of four passes of the vibratory roller.

Material placed behind the retaining walls should meet the gradation requirements for Structural Fill as specified in Table 4. Structural Fill should be compacted to at least 95% of its maximum dry density (ASTM D1557).

4.5 Freezing Conditions

The soils at the site are frost susceptible. Therefore, if construction is performed during freezing weather, special precautions will be required to prevent the subgrade soils from freezing. Freezing of the soil beneath the foundation during construction may result in subsequent settlement of the structure.

Soil placed as fill should be free of frost, as should the ground on which it is placed.

5. Limitations

This report was prepared for the exclusive use of Stantec for preliminary design only. Our recommendations are based on the project information provided to us at the time of this report and our subsurface explorations and may require modification if there are any changes in the nature, design, or location of the proposed structures. We cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

It was not part of our scope to perform a detailed site history. Therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Before construction of the proposed structures, a diligent effort should be made to determine the presence and location of any buried structures including utilities. This effort should include a thorough review of available drawings and other records of the site use and facilities. If the presence of such structures is determined to be likely, GEI should be notified so that we may review and revise our recommendations, if appropriate.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from the anticipated conditions are encountered, it may be necessary to revise the recommendations in this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices; no warranty, express or implied, is made.

Tables

Table 1. Index Test Results

South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

Boring No.	Sample No.	Sample Depth (feet)	Sample Elevation (MLW)	Engineering Classification ASTM D2487 / ASTM D2488	Grain Size (ASTM D422)			Moisture Content (%) ASTM D2216	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content %
					Gravel (%)	Sand (%)	Fines (%)					
GEI-306	S1	0 - 2	-17.1	ORGANIC SOIL (OL/OH)				87.5				
	S2	5 - 7	-22.1	ORGANIC SOIL (OL)	0	14.4	85.6	82.0	48	29	19	4.5
	S3	10 - 12	-27.1	ORGANIC SOIL (OL/OH)				64.8				
	S4	15 - 17	-32.1	ORGANIC SOIL (OL/OH)				67.6				
	S5	20 - 22	-37.1	ORGANIC SOIL (OL/OH)				83.2				
	S6	25 - 27	-42.1	ORGANIC SOIL (OL/OH)				82.5				
	S7	30 - 32	-47.1	FAT CLAY (CH)	0	2.5	97.5	68.9	70	29	41	
	S8	35 - 37	-52.1	ORGANIC SOIL (OL/OH)				66.0				
GEI-308	S1	0 - 2	-18.4	ORGANIC SOIL (OH)				89.2	72	35	37	
	S2	5 - 7	-23.4	ORGANIC SOIL (OL/OH)				96.8				
	S5	20 - 22	-38.4	ORGANIC SOIL (OH)				80.7	83	38	45	
GEI-309	S1	0 - 2	-17.6	ORGANIC SOIL (OL/OH)				66.3				
	S2	5 - 7	-22.6	ORGANIC SOIL (OL/OH)				78.1				
	S3	10 - 12	-27.6	ORGANIC SOIL (OL/OH)				80.0				
	S4	15 - 17	-32.6	ORGANIC SOIL (OH)	0	3.1	96.9	63.1	60	32	28	3.8
	S5	20 - 22	-37.6	ORGANIC SOIL (OH)				83.2				
	S6	25 - 27	-42.6	ORGANIC SOIL (OH)				84.7				
	S7	30 - 32	-47.6	ORGANIC SOIL (OH)				78.4				
	S8	35 - 37	-52.6	ORGANIC SOIL (OH)				86.3				
	S9	40 - 42	-57.6	ORGANIC SOIL (OH)				82.8				
	S10	45 - 47	-62.6	ORGANIC SOIL (OH)	0	2.1	97.9	90.3	100	44	56	
	S11	50 - 52	-67.6	ORGANIC SOIL (OH)				54.1				
	S12	55 - 57	-72.6	NARROWLY GRADED GRAVEL WITH CLAY AND SAND (GP-GC)	58.3	36.0	5.7	10.5				
GEI-312	S1	0 - 2	-21.5	ORGANIC SOIL (OL)				69.4				
	S2	5 - 7	-26.5	ORGANIC SOIL (OL)				77.3				
	S3	10 - 12	-31.5	ORGANIC SOIL (OL)				74.5				
	S4	15 - 17	-36.5	ORGANIC SOIL (OL)				63.7				
	S5	20 - 22	-41.5	ORGANIC SOIL (OH)				65.9				
	S6	25 - 27	-46.5	ORGANIC CLAY (OH)				68.1				
	S7	30 - 32	-51.5	ORGANIC CLAY (OH)				76.5				
	S8	35 - 37	-56.5	ORGANIC SOIL (OH)	0	0.9	99.1	79.5	87	34	53	3.2
	S9	40 - 42	-61.5	ORGANIC SOIL (OH)				68.9				
	S10	45 - 47	-66.5	ORGANIC SOIL (OH)				85.1				
	S11	50 - 52	-71.5	ORGANIC SOIL (OH)	0	2.8	97.2	57.1	56	29	27	
	S12	60 - 62	-81.5	ORGANIC SOIL (OH)	0	2.0	98.0	57.8	53	30	23	

Table 1. Index Test Results

South Yard Development
 General Dynamics Electric Boat Corporation
 Groton, Connecticut

Boring No.	Sample No.	Sample Depth (feet)	Sample Elevation (MLW)	Engineering Classification ASTM D2487 / ASTM D2488	Grain Size (ASTM D422)			Moisture Content (%) ASTM D2216	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content %
					Gravel (%)	Sand (%)	Fines (%)					
GEI-403	S1	0 - 2	-16.3	ORGANIC SOIL (OH)				123.2				
	S2	10 - 12	-26.3	ORGANIC SOIL (OH)				89.4	68	37	31	
	S3	20 - 22	-36.3	ORGANIC SOIL (OH)				87.1	85	35	50	
	S4	30 - 32	-46.3	ORGANIC SOIL (OH)				72.8	80	32	48	
GEI-404	S1	0 - 2	-16.8	ORGANIC SOIL (OH)				97.4	64	37	27	
	S2	10 - 12	-26.8	ORGANIC SOIL (OH)				69.3	66	34	32	
	S3	20 - 22	-36.8	ORGANIC SOIL (OH)				86.6	88	40	48	
GEI-406	S1	0 - 2	-18.7	ORGANIC SOIL (OH)				73.5				
	S2	10 - 12	-28.7	ORGANIC SOIL (OH)				78.1	63	33	30	
	S3	20 - 22	-38.7	ORGANIC SOIL (OH)				80.1	79	35	44	
	S4	30 - 32	-48.7	ORGANIC SOIL (OH)				72.2	80	34	46	

Table 2. Strength Test Results

South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

Boring No.	Sample No.	Sample Depth Feet	Sample Elevation Feet	Engineering Classification ASTM D2487	Water Content %	Test Type	Drained Friction Angle (degrees)	Consolidation or Cell Pressure (psf) ¹	Undrained Shear Strength (psf)
GEI-420	U1	52.9	-70.9	ORGANIC SOIL (OH)	61.2	UU Triaxial	NA	4500	400
		53.5	-71.5	ORGANIC SOIL (OH)	57.7	CIUC Triaxial Compression	36	1450	550
		53.8	-71.8	ORGANIC SOIL (OH)	54.4	Mini Lab Vane Shear	NA	NA	520
	U2	62.8	-80.8	ORGANIC SOIL (OH)	52.8	UU Triaxial	NA	1790	440
		63.2	-81.2	ORGANIC SOIL (OH)	39.6	CIUC Triaxial Compression	26	1750	810
		63.9	-81.9	ORGANIC SOIL (OH)	51.2	Mini Lab Vane Shear	NA	NA	120 ²
	U5	93.5	-111.5	ORGANIC SOIL (OH)	60.5	UU Triaxial	NA	7380	980
		93.8	-111.8	ORGANIC SOIL (OH)	61.8	Mini Lab Vane Shear	NA	NA	390
GEI-421	U1	68.3	-85.5	ORGANIC SOIL (OH)	50.8	UU Triaxial	NA	5850	460
		68.9	-86.1	ORGANIC SOIL (OH)	48.0	CIUC Triaxial Compression	23	2130	570
		69.3	-86.5	ORGANIC SOIL (OH)	51.2	Mini Lab Vane Shear	NA	NA	530 ³
	U2	85.1	-102.3	ORGANIC SOIL (OH)	60.0	UU Triaxial	NA	7100	770
		85.7	-102.9	ORGANIC SOIL (OH)	55.6	CIUC Triaxial Compression	39	2640	1210
		86.1	-103.3	ORGANIC SOIL (OH)	58.3	Mini Lab Vane Shear	NA	NA	1130
	U3	92.7	-109.9	ORGANIC SOIL (OH)	44.1	Mini Lab Vane Shear	NA	NA	1180
GEI-422	U1	25.2	-47.7	ORGANIC SOIL (OH)	89.8	Mini Lab Vane Shear	NA	NA	330
	U1	25.2	-47.7	ORGANIC SOIL (OH)	62.8	CIUC Triaxial Compression	61.4	680.0	410
	U2	35.2	-57.7	ORGANIC SOIL (OH)	77.9	Mini Lab Vane Shear	NA	NA	380
		35.6	-58.1	ORGANIC SOIL (OH)	69.2	CIUC Triaxial Compression	38.4	1020.0	520
	U3	46.5	-69.0	ORGANIC SOIL (OH)	82.1	Mini Lab Vane Shear	NA	NA	80 ²

NOTES

1. psf - Pounds per Square Foot

2. Sample was likely disturbed prior to testing.

2. Bleeding of water observed during insertion of vane into soil.

Table 3. Soil Properties for LPILE Analyses

South Yard Development
 General Dynamics Electric Boat
 Groton, Connecticut

Soil Type	LPILE Soil Model	Buoyant Soil Unit Weight (pcf)	Friction Angle (degrees)	Soil Strain Parameter, E_{50}	Soil Modulus Parameter, k (pci)	Undrained Cohesion, c (psf)	Uniaxial Compressive Strength (psi)
Organic Soil	Soft Clay (Matlock)	36.0	--	0.02	--	Top of Layer: 100 Bottom of Layer: $100 + 7.5 \times \text{layer thickness}$	--
Sand and Gravel	Sand (Reese)	66.0	36	--	125	--	--
Bedrock	Strong Rock (Vuggy Limestone)	103	--	--	--	--	3,500

Notes:

1. pcf - pounds per cubic foot, pci - pounds per cubic inch, psi - pounds per square inch.
2. See Table 4 for typical soil profiles.

Table 4. Requirements for Structural Fill

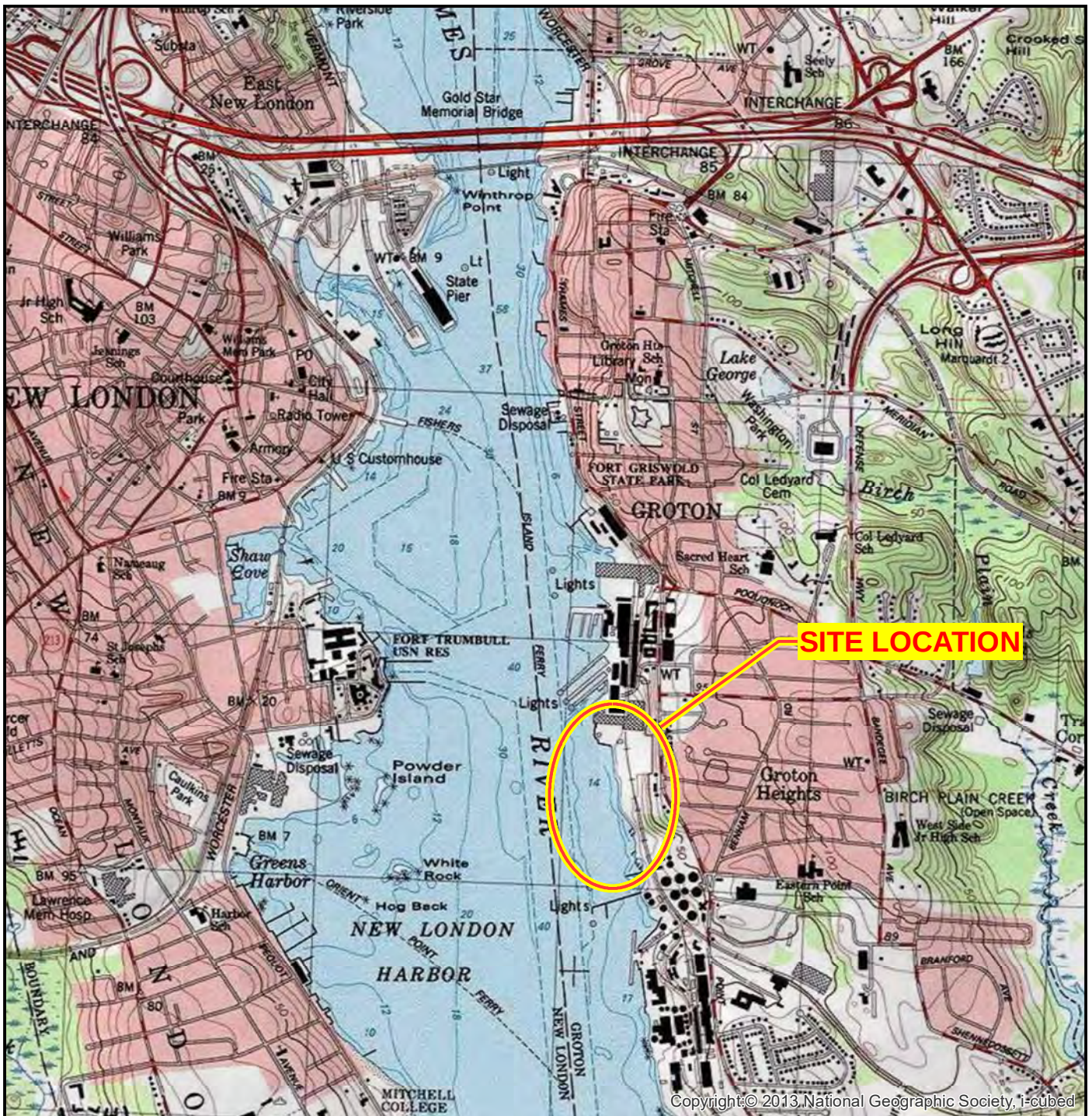
South Yard Development
General Dynamics Electric Boat
Groton, Connecticut

Structural Fill shall consist of hard, durable sand and gravel, free of clay, organic matter, surface coatings, and other deleterious materials. Soil finer than the No. 200 sieve (the “fines”) shall be non-plastic. Structural Fill shall meet the following gradation requirements:

Sieve Size	Percent Passing by Weight
3 inches	100
½ inch	50 – 100
No. 4	35 – 85
No. 16	20 – 65
No. 50	5 – 40
No. 200 (fines)	0 – 8

Structural Fill shall be compacted in maximum 9-inch-thick, loose lifts to at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 (Modified AASHTO Compaction).

Figures



0 1,000 2,000 4,000



SCALE, FEET



CONNECTICUT
CITY/TOWN LOCATION

South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

Stantec
Burlington, Massachusetts

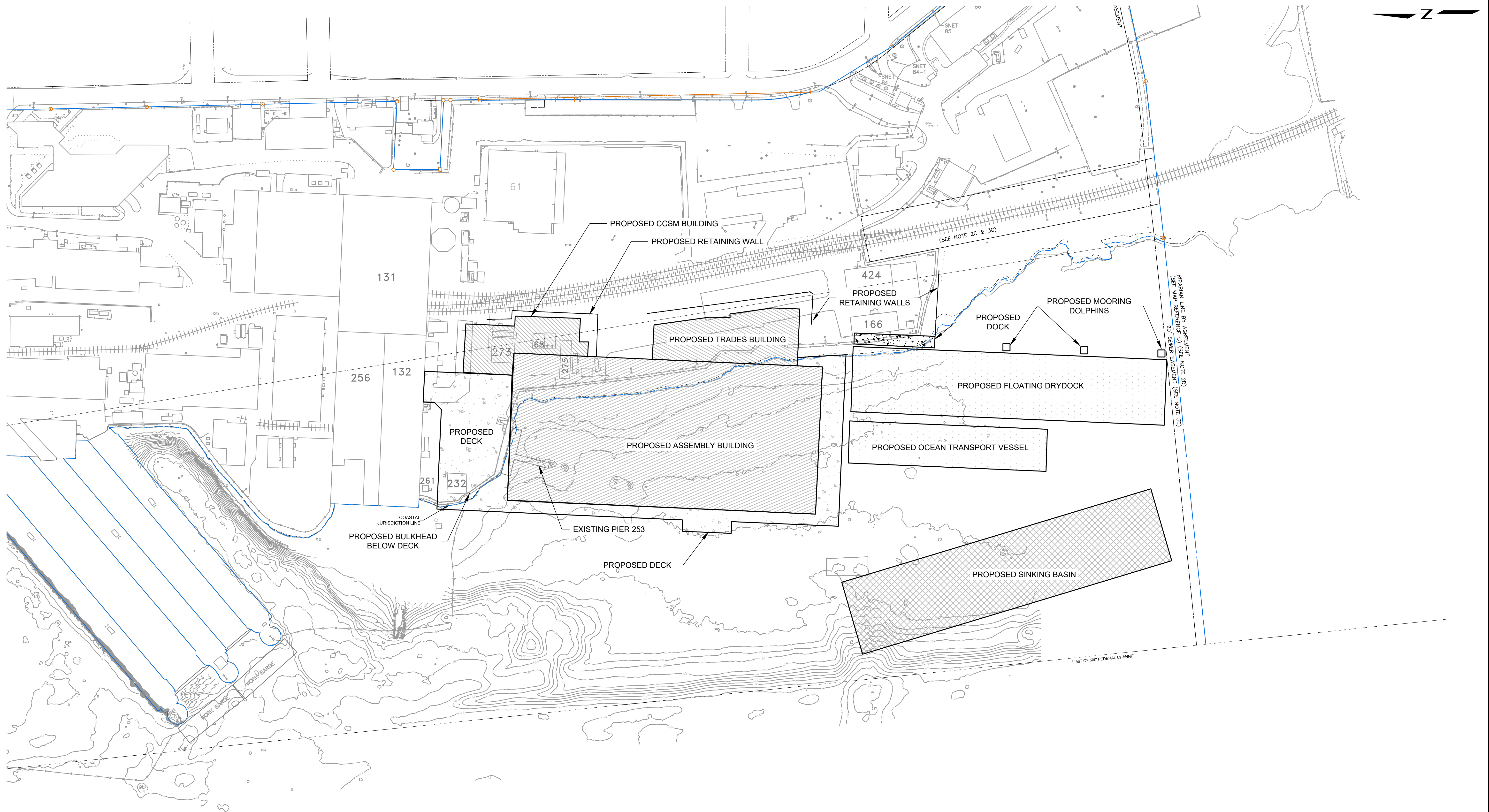


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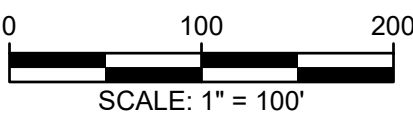
SITE LOCATION MAP

December 2017

Fig. 1



- NOTES:**
- 1. BATHYMETRY ELEVATIONS REFERENCED TO MEAN LOW WATER (MLW).
 - 2. BASE PLAN TITLED "WATERFRONT SOUNDINGS 2016" DATED 06-2016 PREPARED BY HYDRO DATA INC.
 - 3. LOCATIONS OF PROPOSED STRUCTURES AND BASIN ARE PRELIMINARY BASED ON PRELIMINARY DRAWING C100, TITLED "SITE PLAN", DATED 2017.11.07 PROVIDED BY STANTEC.



South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

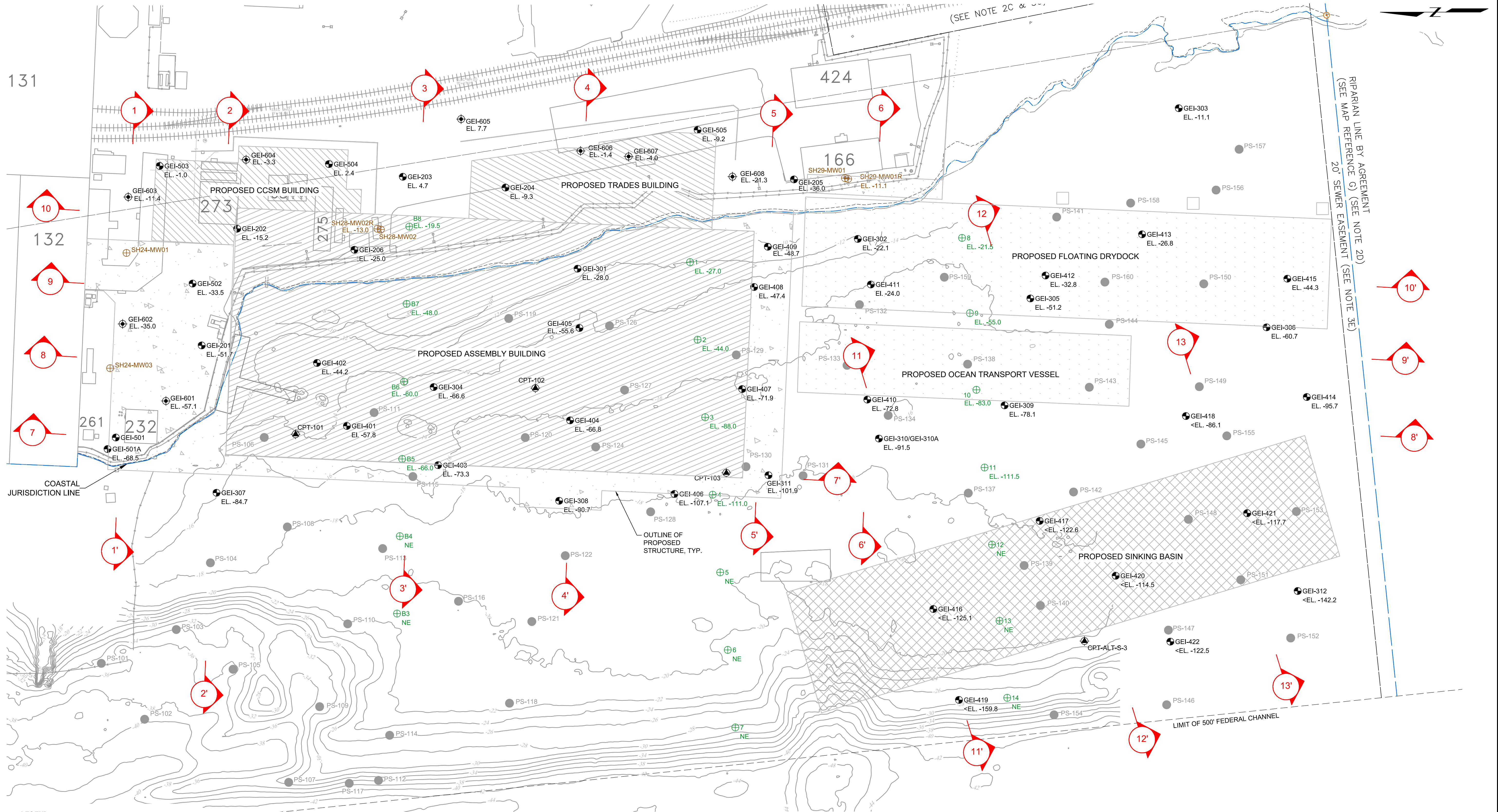
Stantec
Burlington, Massachusetts



SOUTH YARD
PROPOSED DEVELOPMENT

Project 1702805
December 2017

Fig. 2



- LEGEND:**
- GEI-301
EL. -62.4
GEI-601
EL. -35.0
 - CPT-101
 - PS Series
 - 1961 BORING
TOP OF ROCK ELEV. (MLW)
EL. -62.4
 - EMCON 1993-1995 BORING
TOP OF ROCK ELEV. (MLW)
EL. -62.4
 - CROSS-SECTION LOCATION

- NOTES:**
- BEDROCK ELEVATIONS LABELED FOR GEI-200, GEI-500 AND GEI-600 SERIES ARE REFERENCED TO NAVD 88.
 - BEDROCK ELEVATIONS LABELED FOR GEI-300 AND GEI-400 SERIES ARE REFERENCED TO MEAN LOW WATER (MLW).
 - BATHYMETRY ELEVATIONS REFERENCED TO MEAN LOW WATER (MLW).
 - BASE PLAN TITLED "WATERFRONT SOUNDINGS 2016" DATED 06-2016 PREPARED BY HYDRO DATA INC.
 - LOCATIONS OF PROPOSED STRUCTURES AND BASIN ARE PRELIMINARY BASED ON PRELIMINARY DRAWING C100, TITLED "SITE PLAN", DATED 2017.11.07 PROVIDED BY STANTEC.
 - LOCATIONS FOR 1961 BORINGS WERE APPROXIMATED BASED ON LOCATIONS SHOWN ON DRAWING EB237-00-047. NE INDICATES BEDROCK WAS NOT ENCOUNTERED.
 - LOCATIONS FROM 1993-1995 EMCON BORINGS WERE APPROXIMATED BASED ON LOCATIONS SHOWN ON DRAWING 1 TITLED "ANNUAL GROUNDWATER MONITORING PROGRAM SAMPLE LOCATIONS" DATED APRIL 2015.
 - WHERE BEDROCK ELEVATION IS NOTED AS <EL. XX.X, THE BOREHOLE WAS ADVANCED TO THAT ELEVATION BUT DID NOT ENCOUNTER BEDROCK.
 - CROSS-SECTIONS ARE SHOWN IN FIGS. 5 THROUGH 10.



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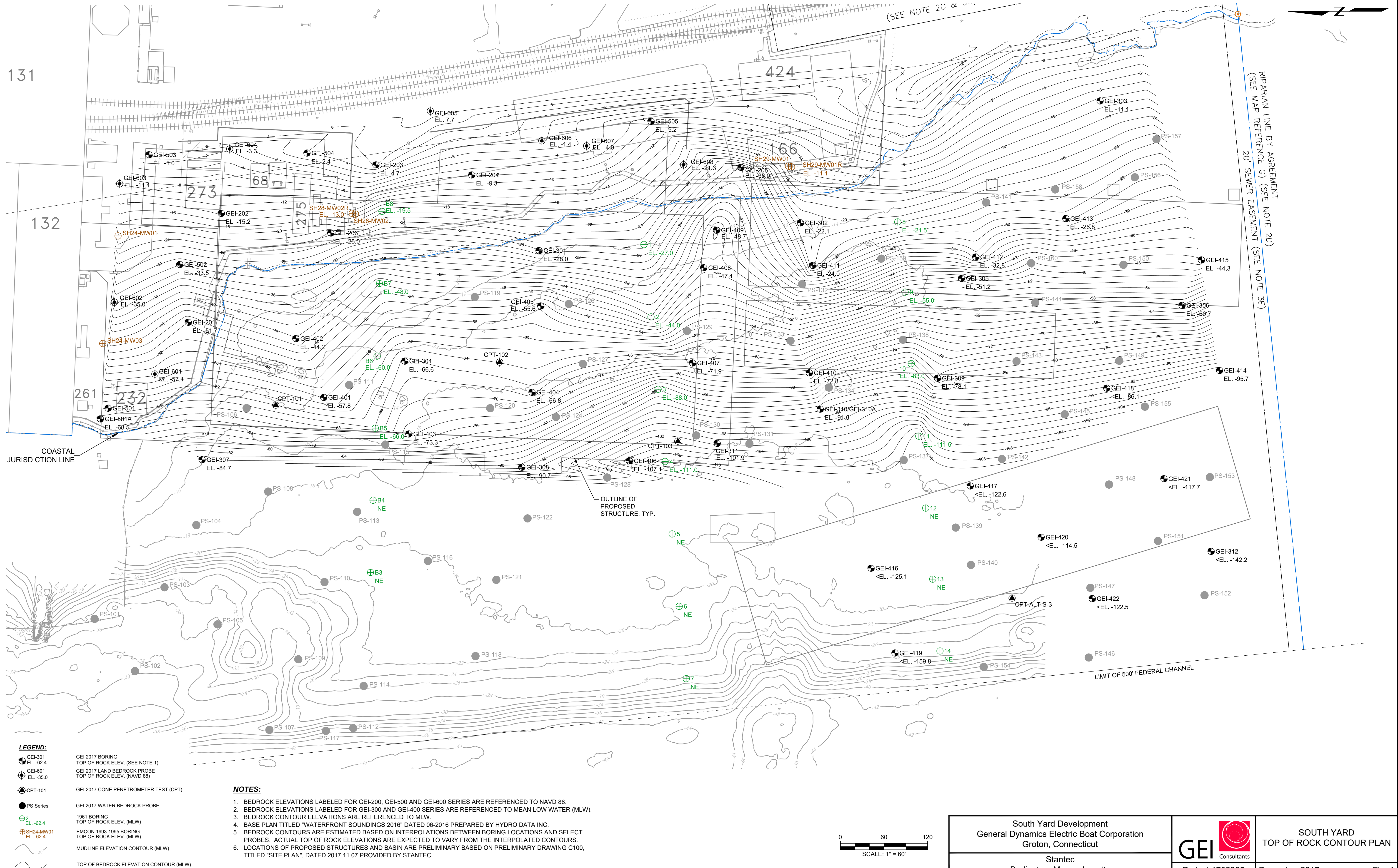
GEI
Consultants

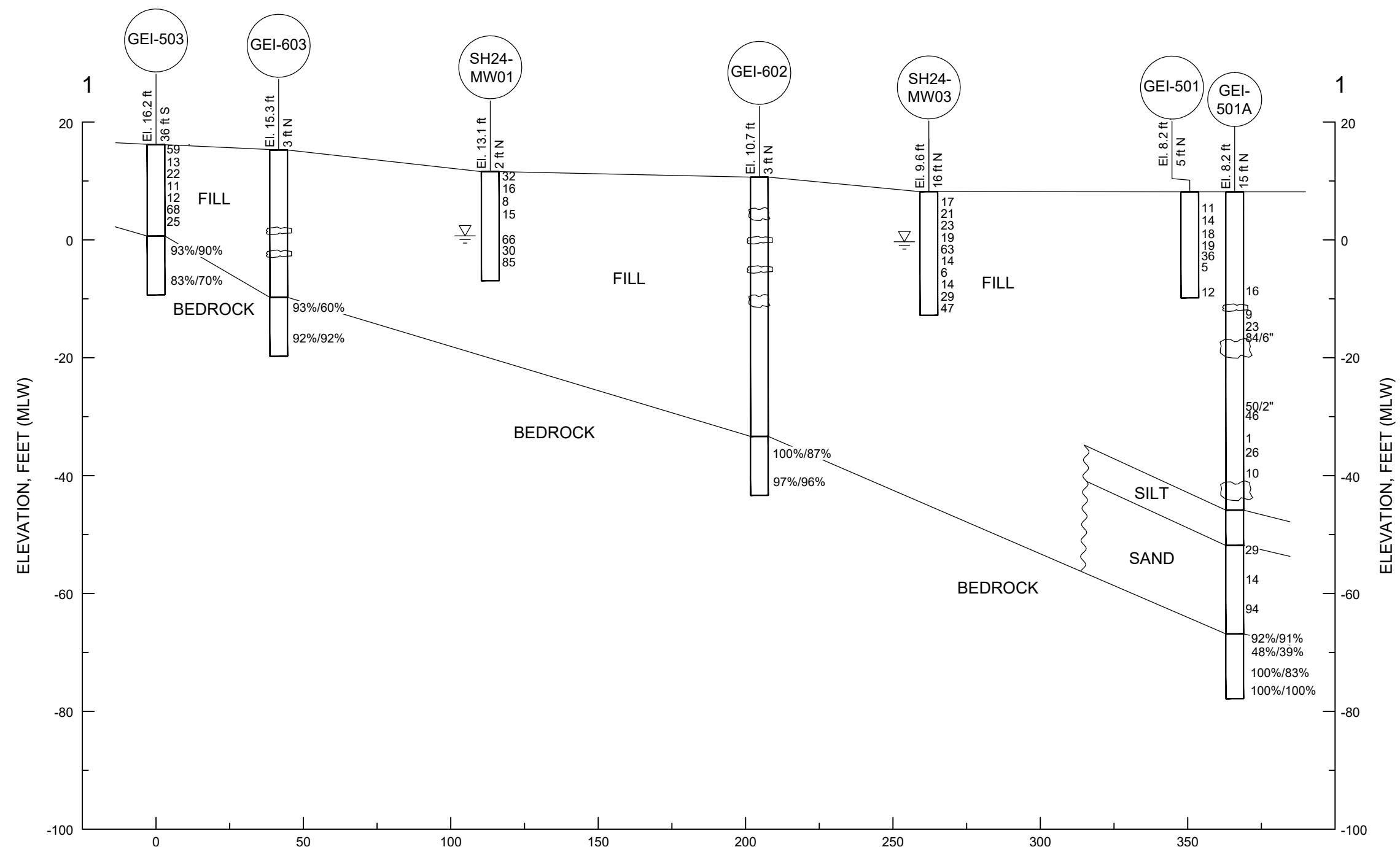
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**SOUTH YARD
SUBSURFACE EXPLORATION
LOCATION PLAN**

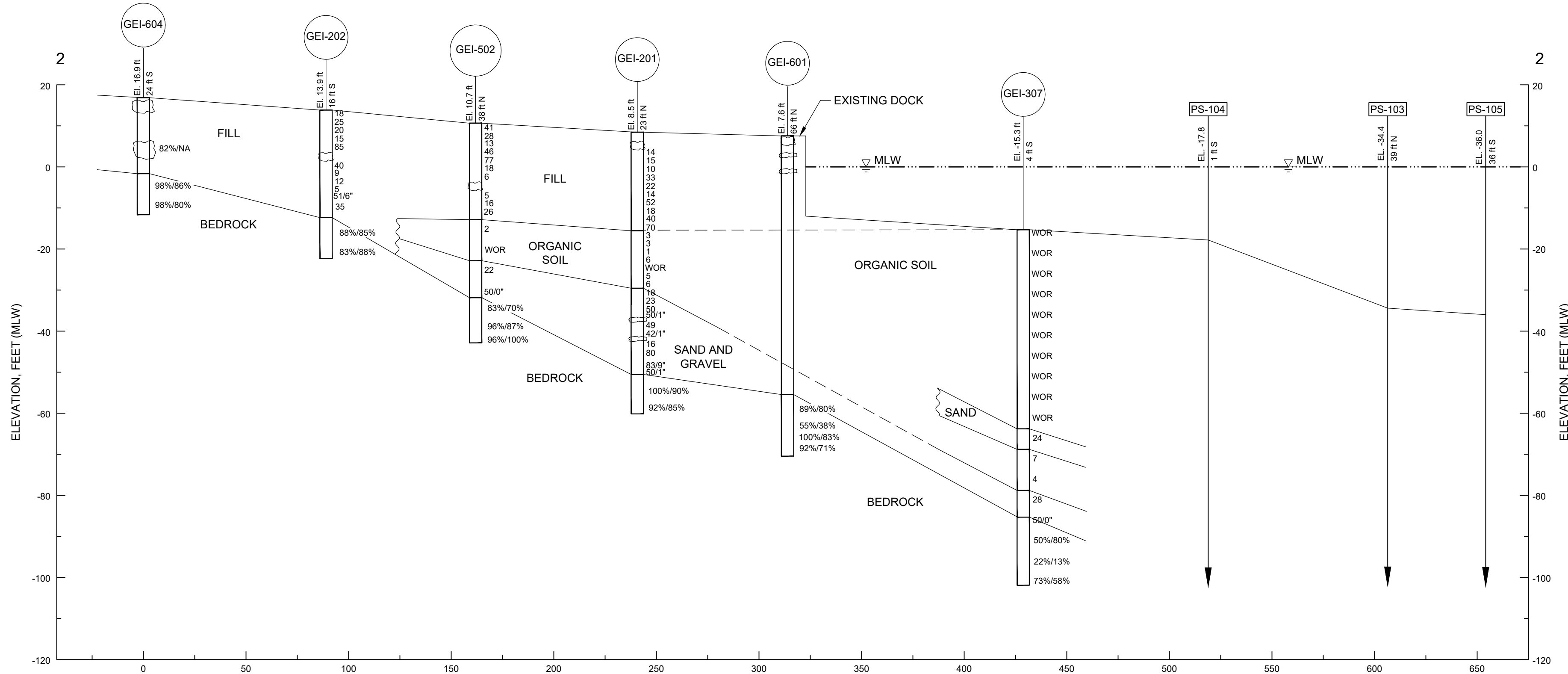
December 2017

Fig. 3

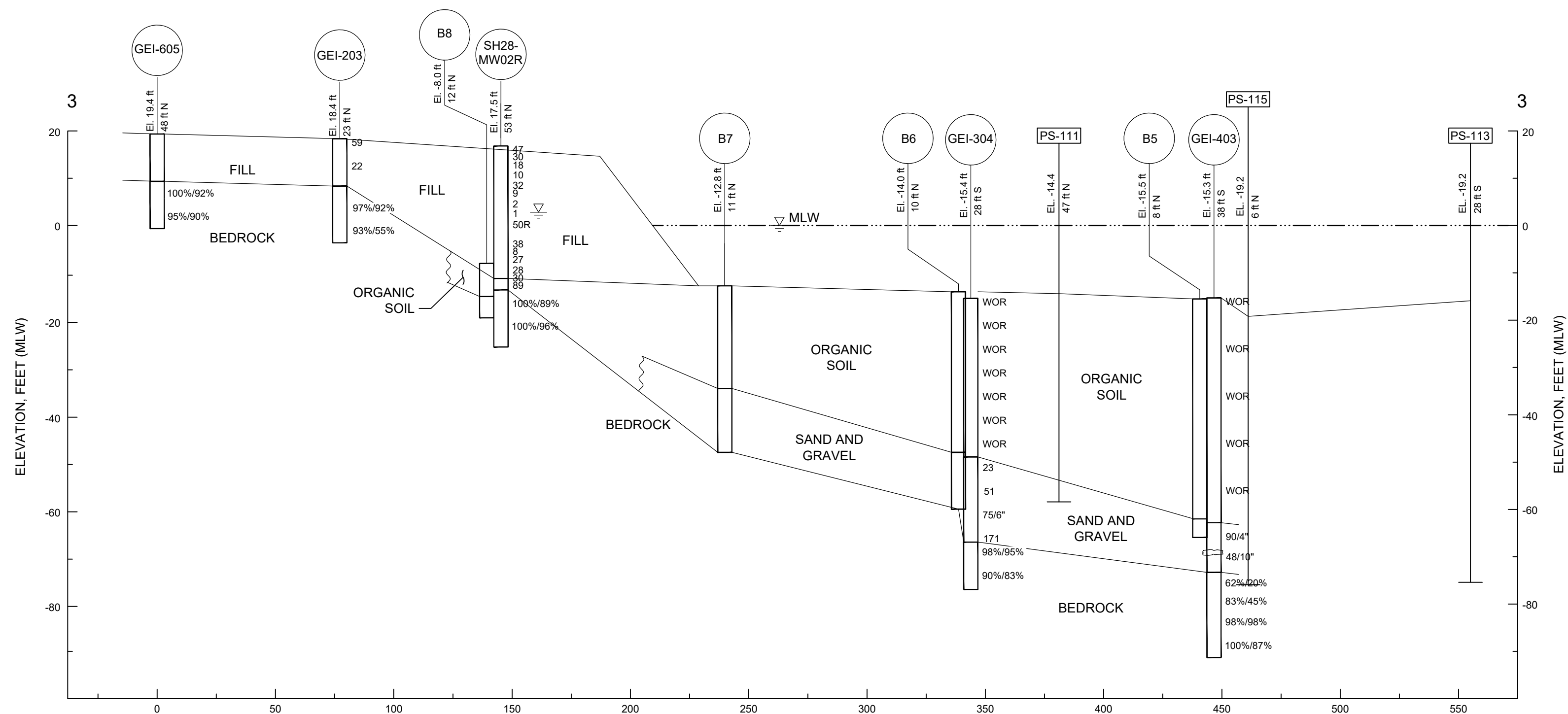




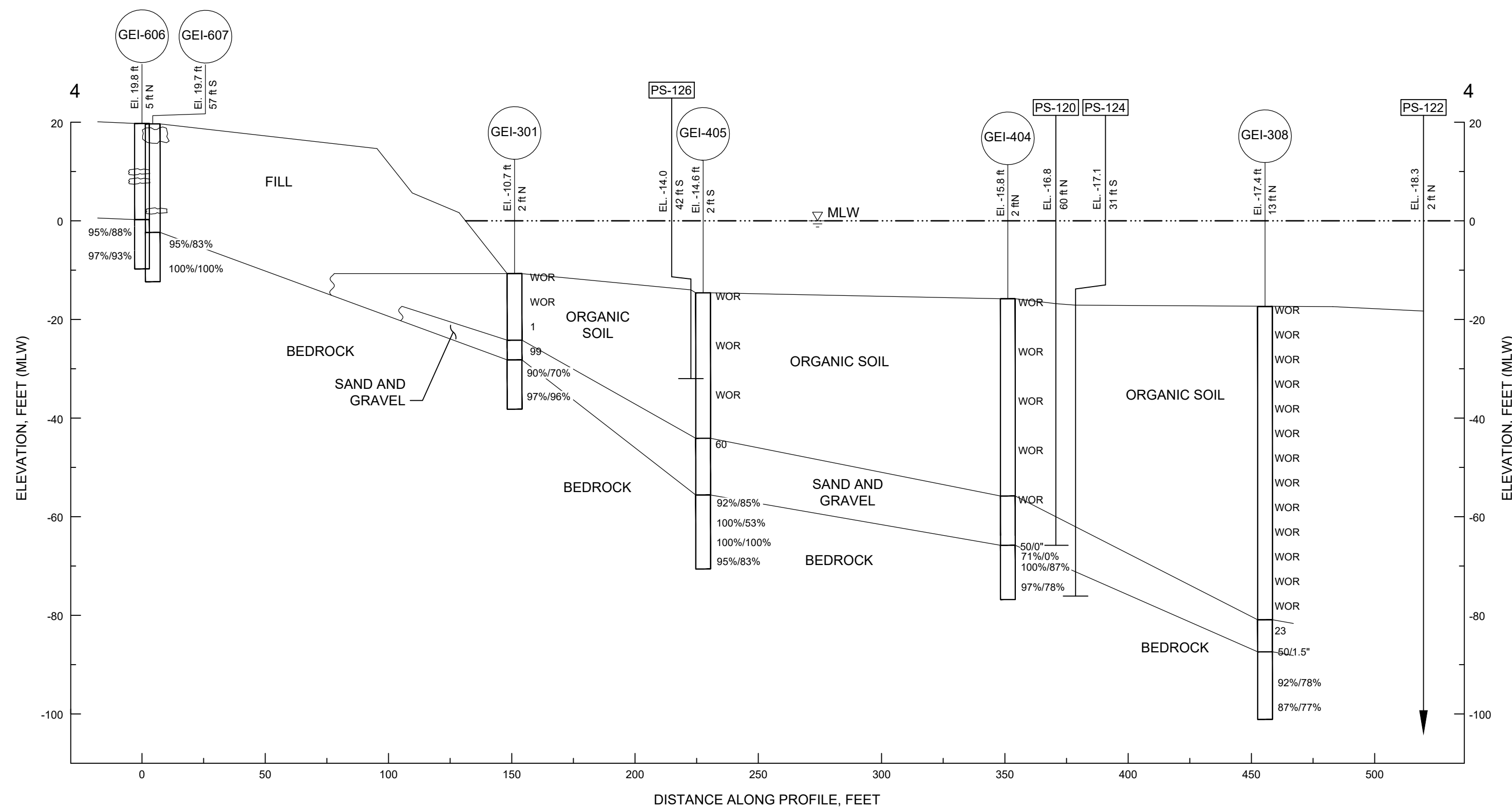
SUBSURFACE PROFILE 1



SUBSURFACE PROFILE 2

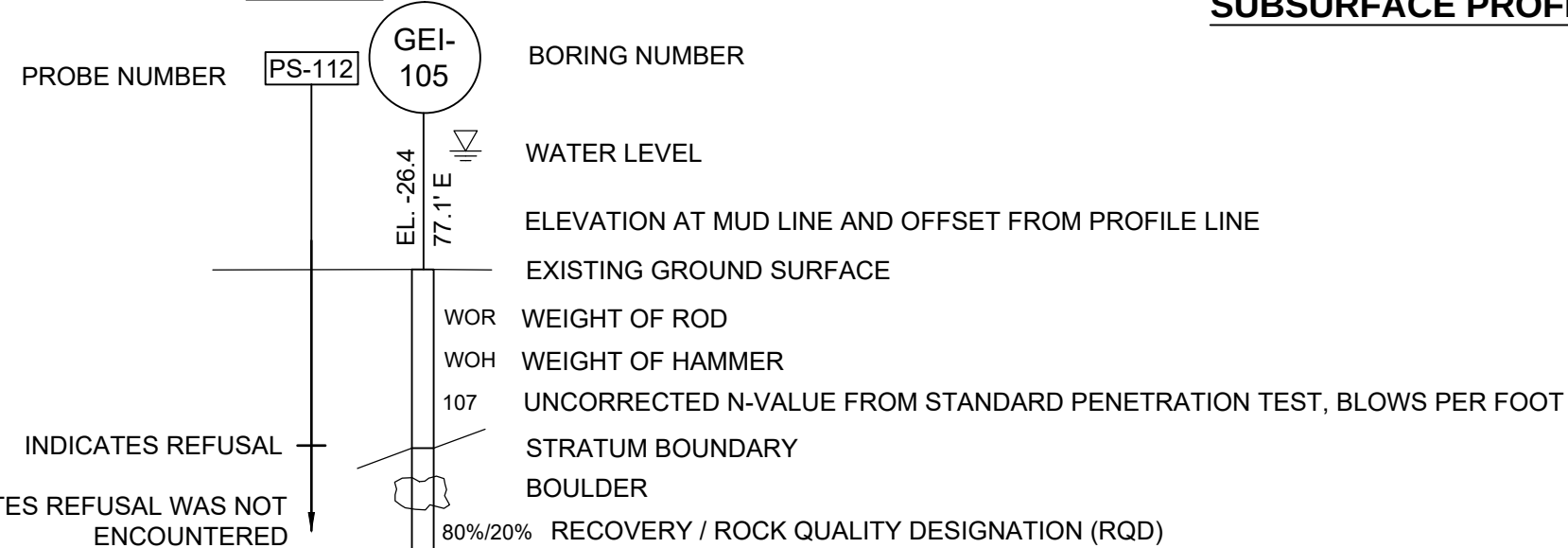


SUBSURFACE PROFILE 3



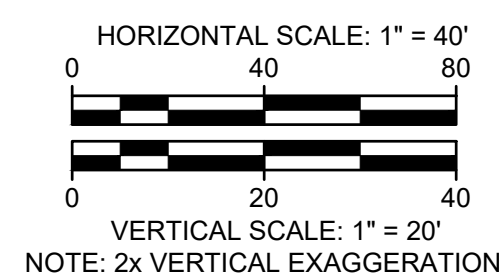
SUBSURFACE PROFILE 4

LEGEND:



NOTES

- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 3.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



South Yard Development
General Dynamics Electric Boat Corporation
Groton, Connecticut

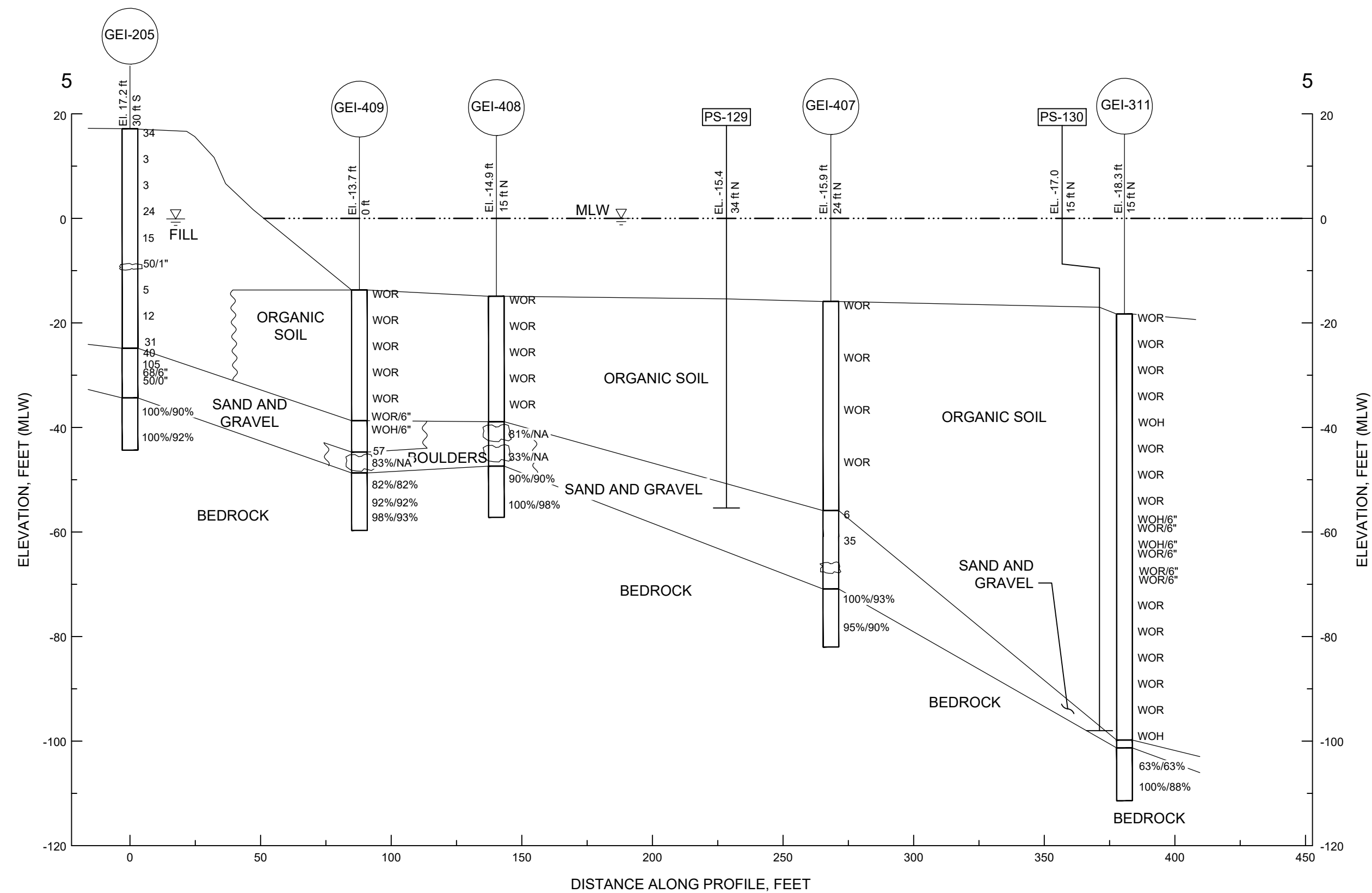
Stantec
Burlington, Massachusetts



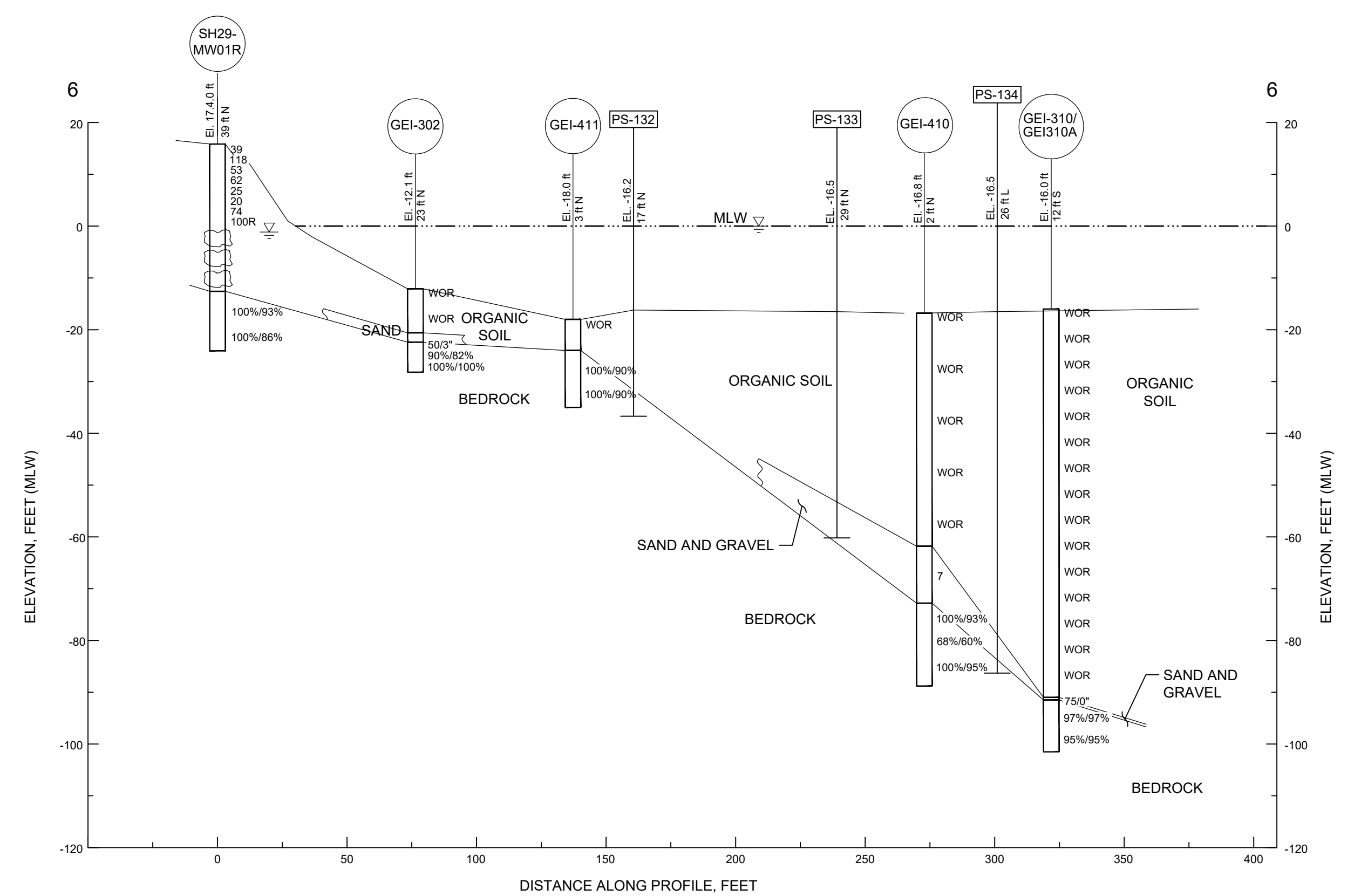
SUBSURFACE PROFILES
1 THROUGH 4

Project 1702805 December 2017

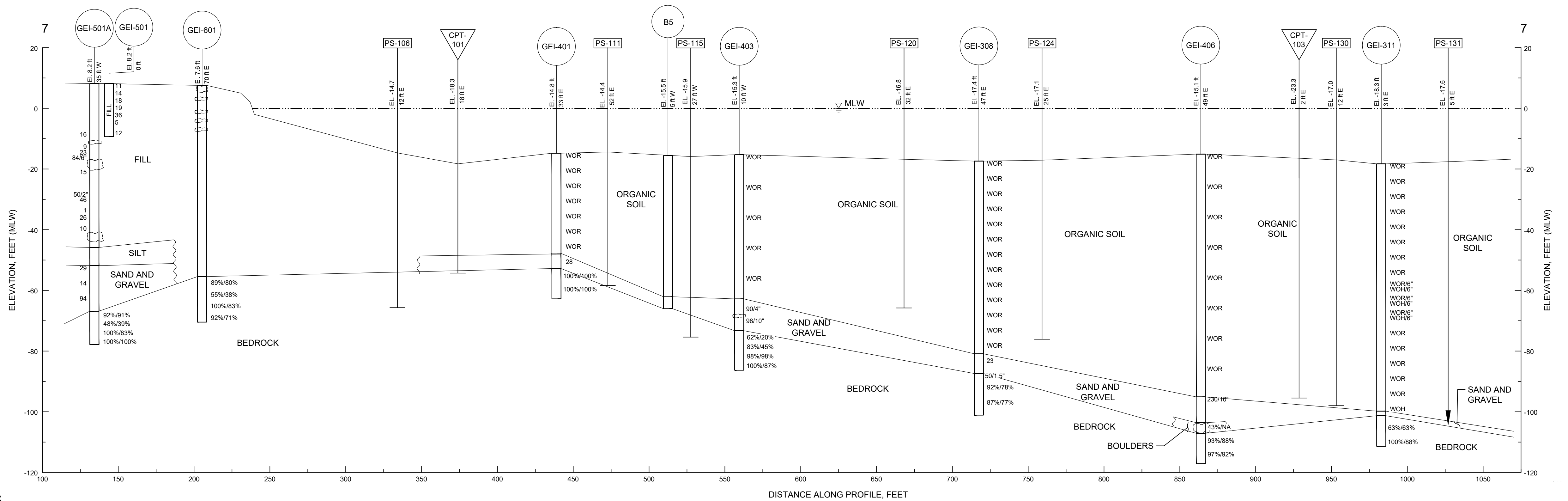
Fig. 5



SUBSURFACE PROFILE 5

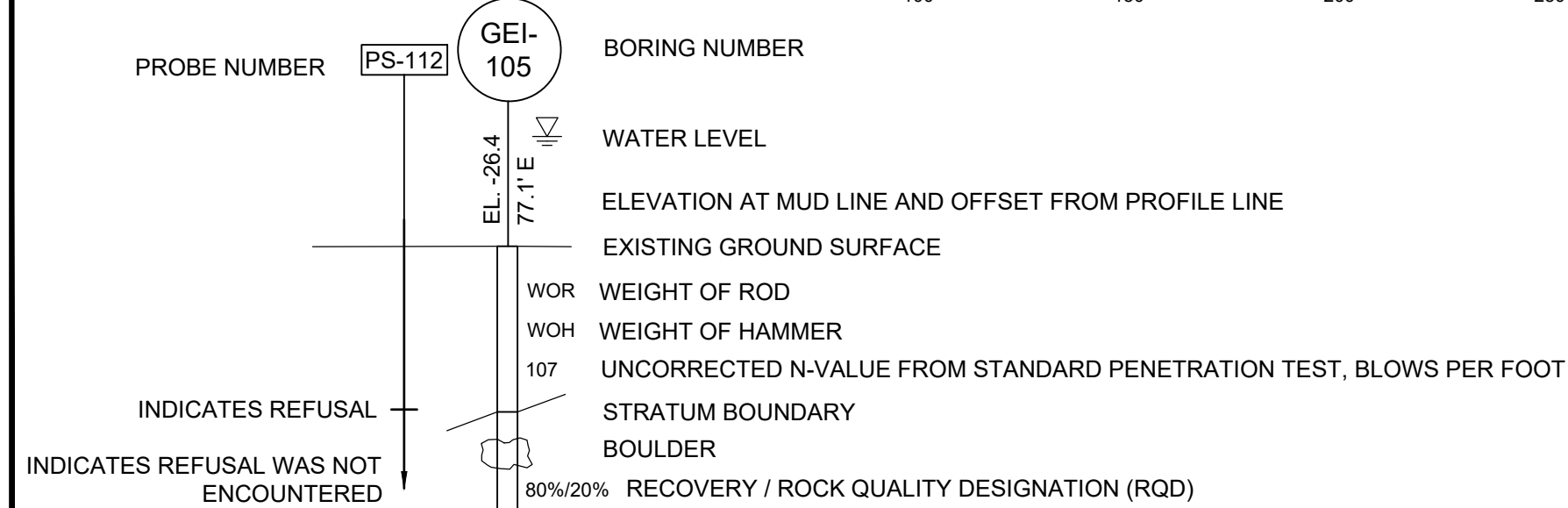


SUBSURFACE PROFILE 6



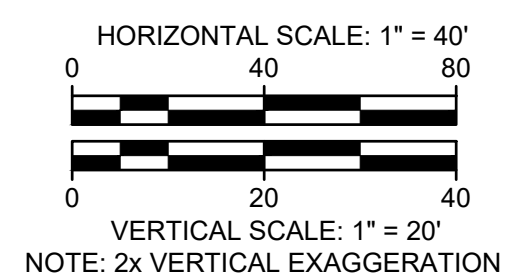
SUBSURFACE PROFILE 7

LEGEND:



NOTES

- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 3.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



South Yard Development
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Groton, Connecticut

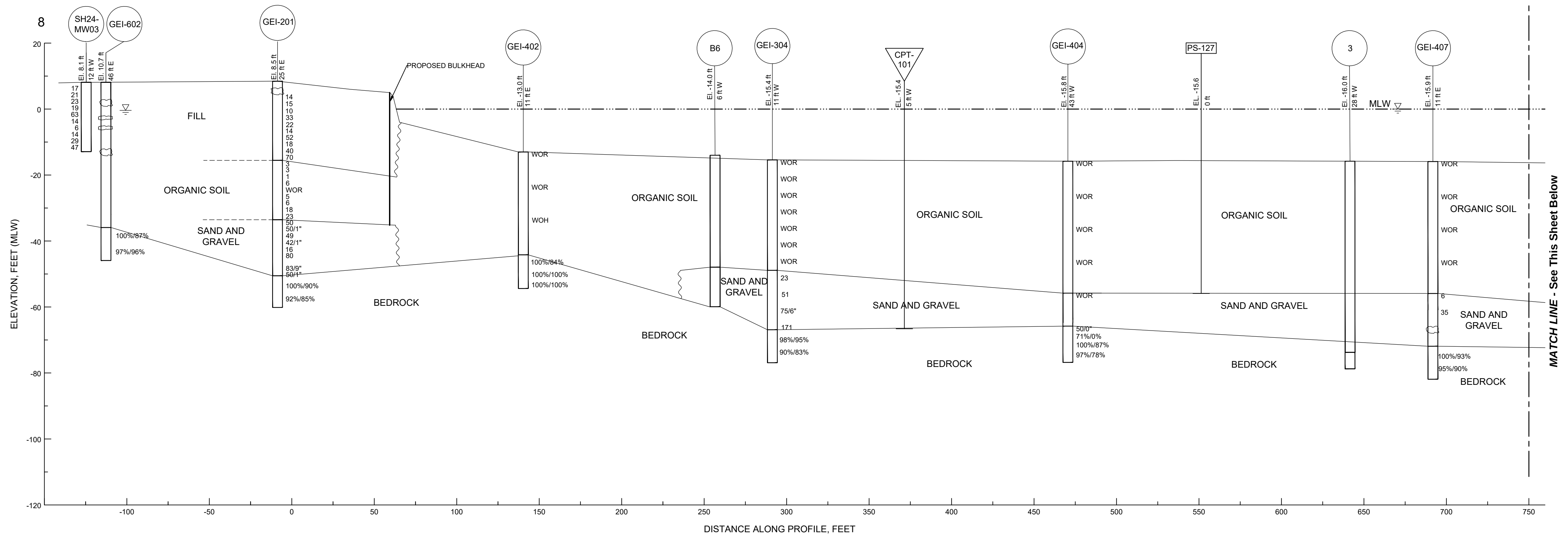
Stantec
Burlington, Massachusetts

GEI Consultants
Project 1702805

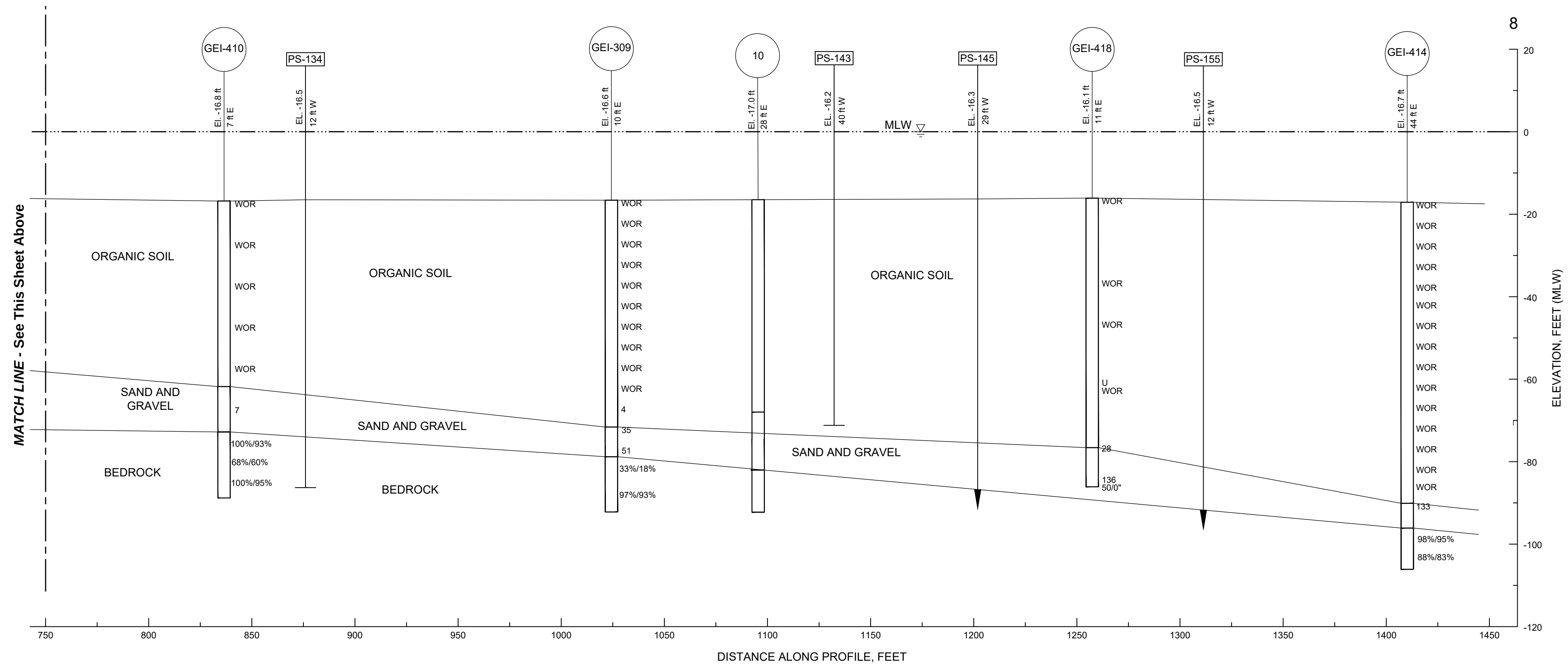
SUBSURFACE PROFILES
5 THROUGH 7

December 2017

Fig. 6

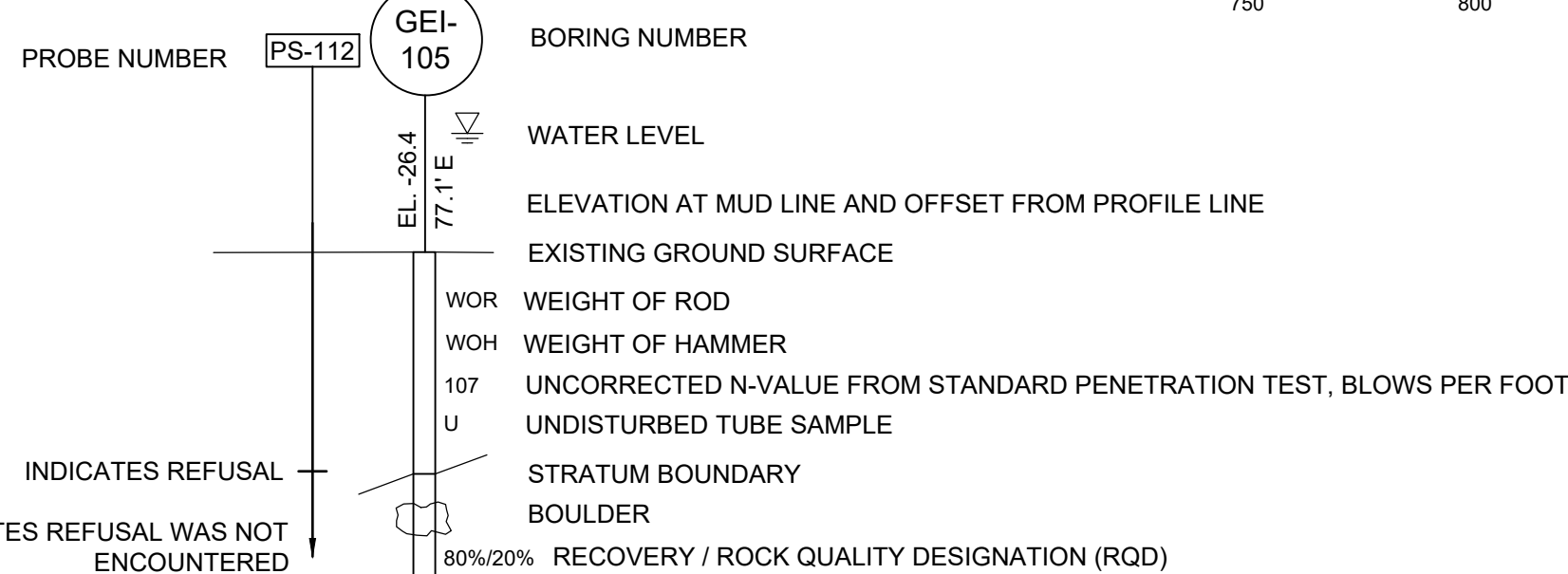


SUBSURFACE PROFILE 8



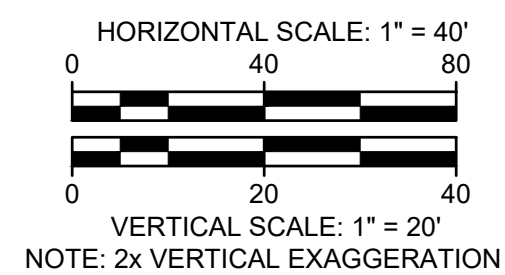
SUBSURFACE PROFILE 8

LEGEND:

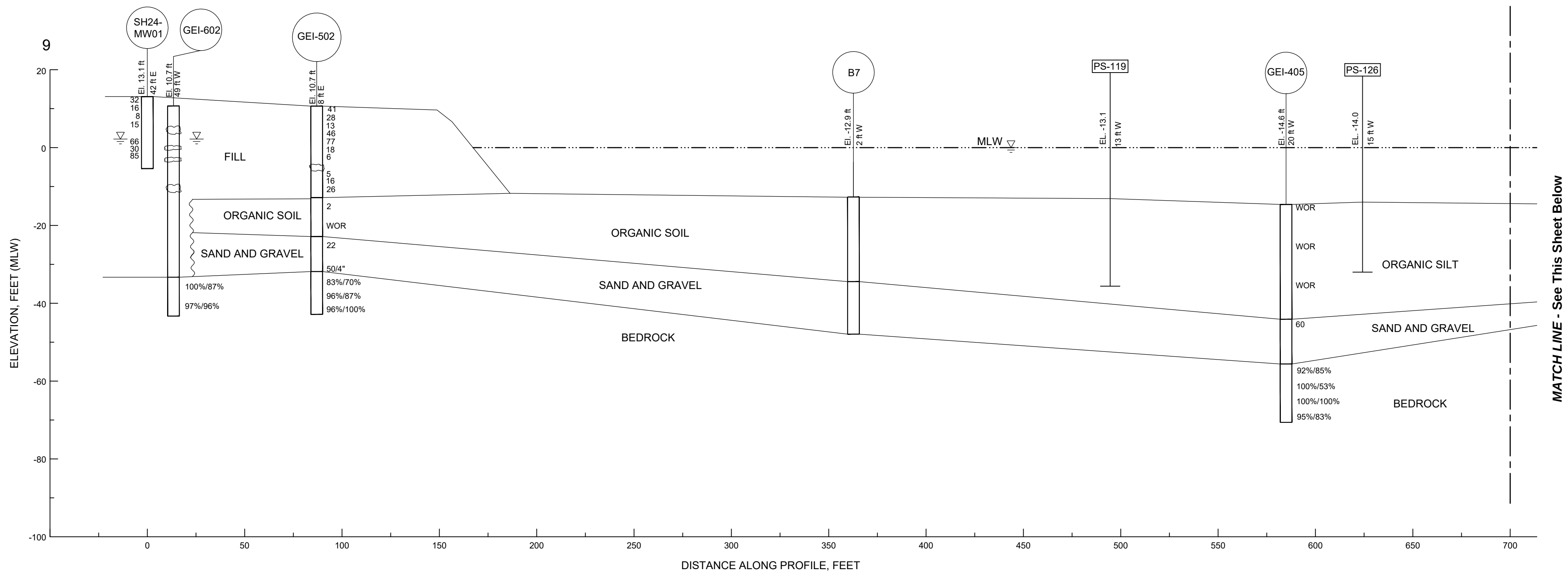


NOTES

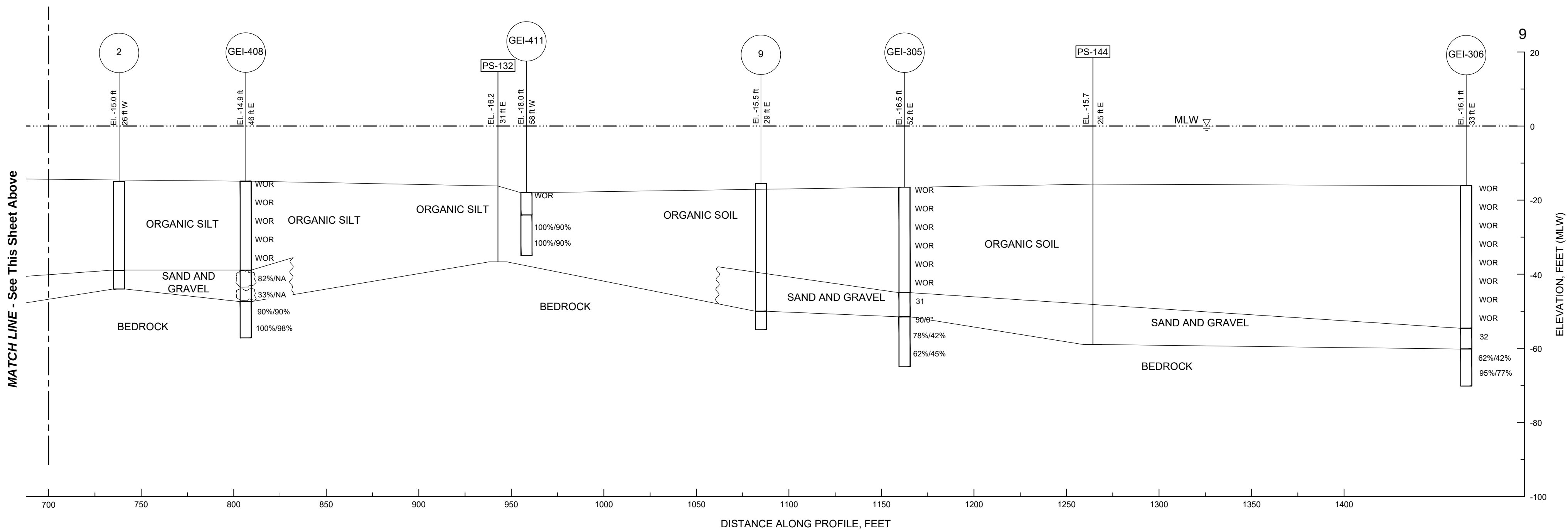
- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 2.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



South Yard Development General Dynamics Electric Boat Corporation Groton, Connecticut		SUBSURFACE PROFILE 8
Stantec Burlington, Massachusetts	Project 1702805	December 2017

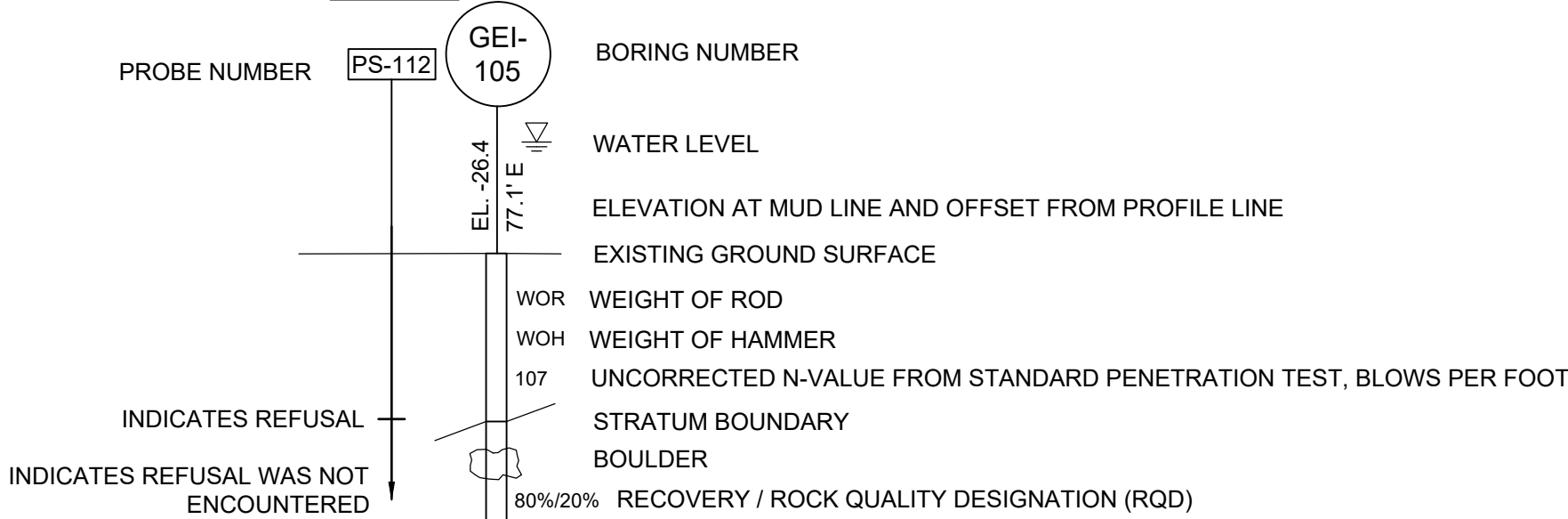


SUBSURFACE PROFILE 9



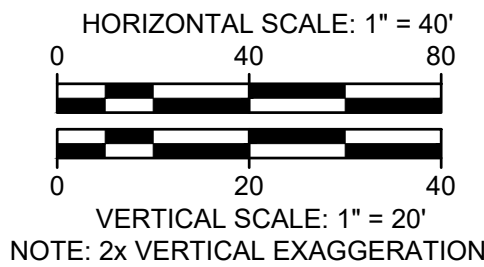
SUBSURFACE PROFILE 9

LEGEND:



NOTES

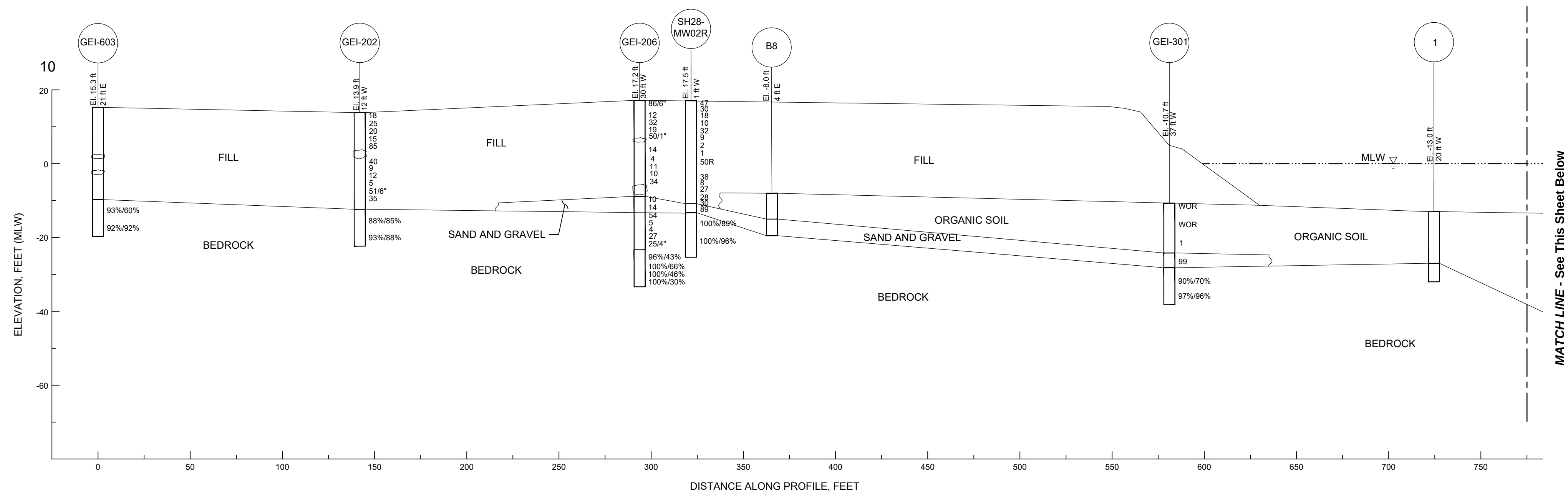
- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 3.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



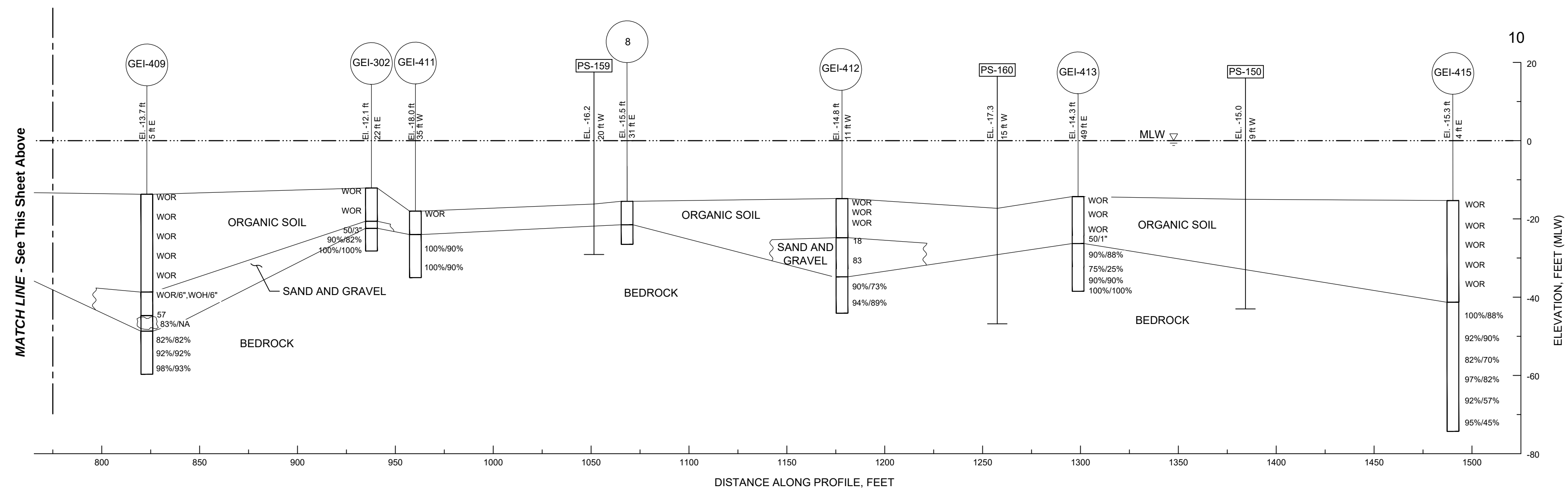
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Stantec Burlington, Massachusetts

GEI Consultants
Project 1702805

SUBSURFACE PROFILE 9
December 2017
Fig. 8

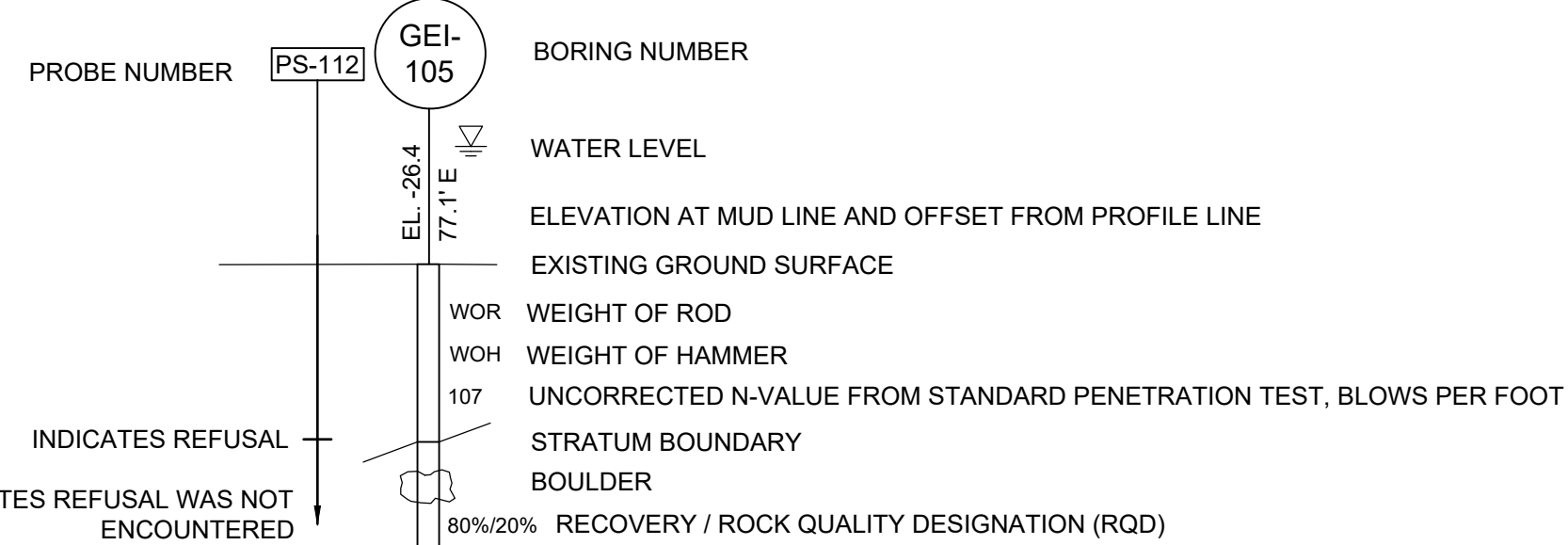


SUBSURFACE PROFILE 10



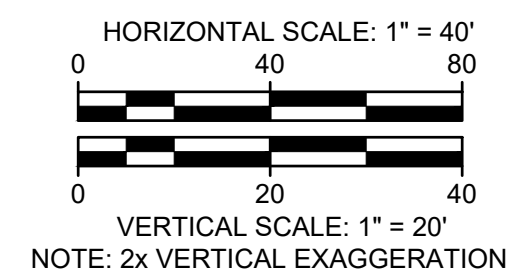
SUBSURFACE PROFILE 10

LEGEND:



NOTES

- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 3.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



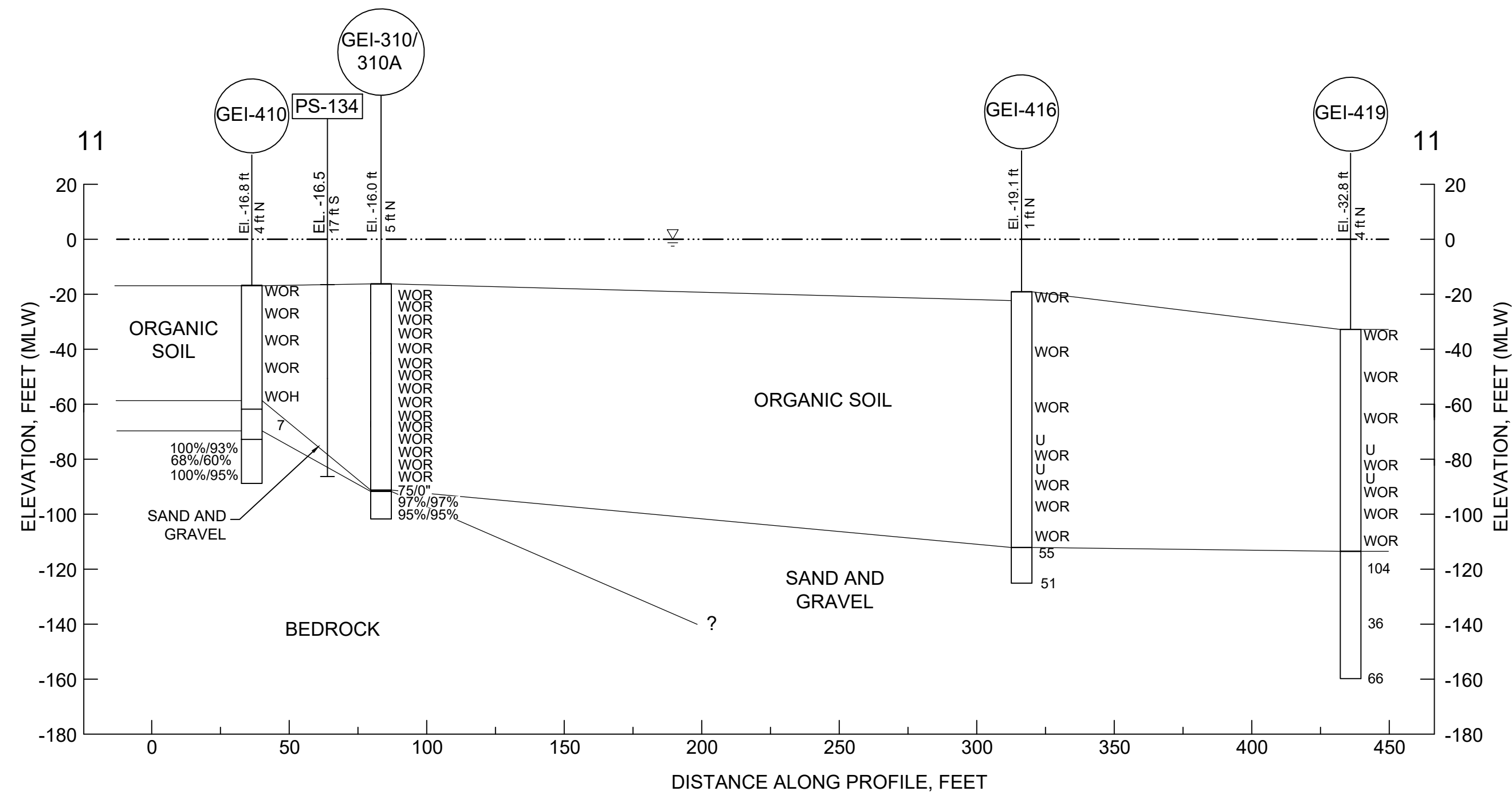
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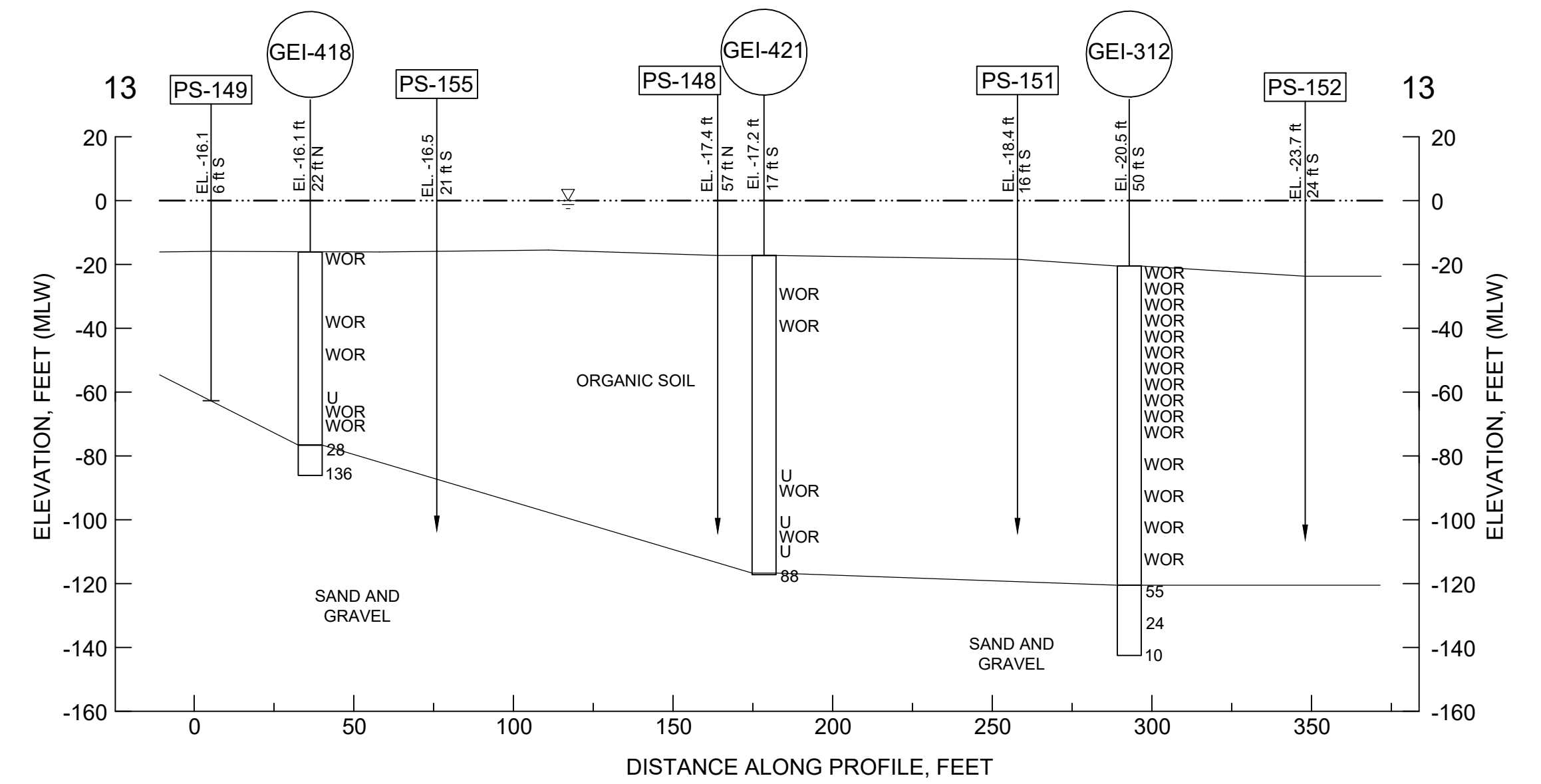


SUBSURFACE PROFILE 10

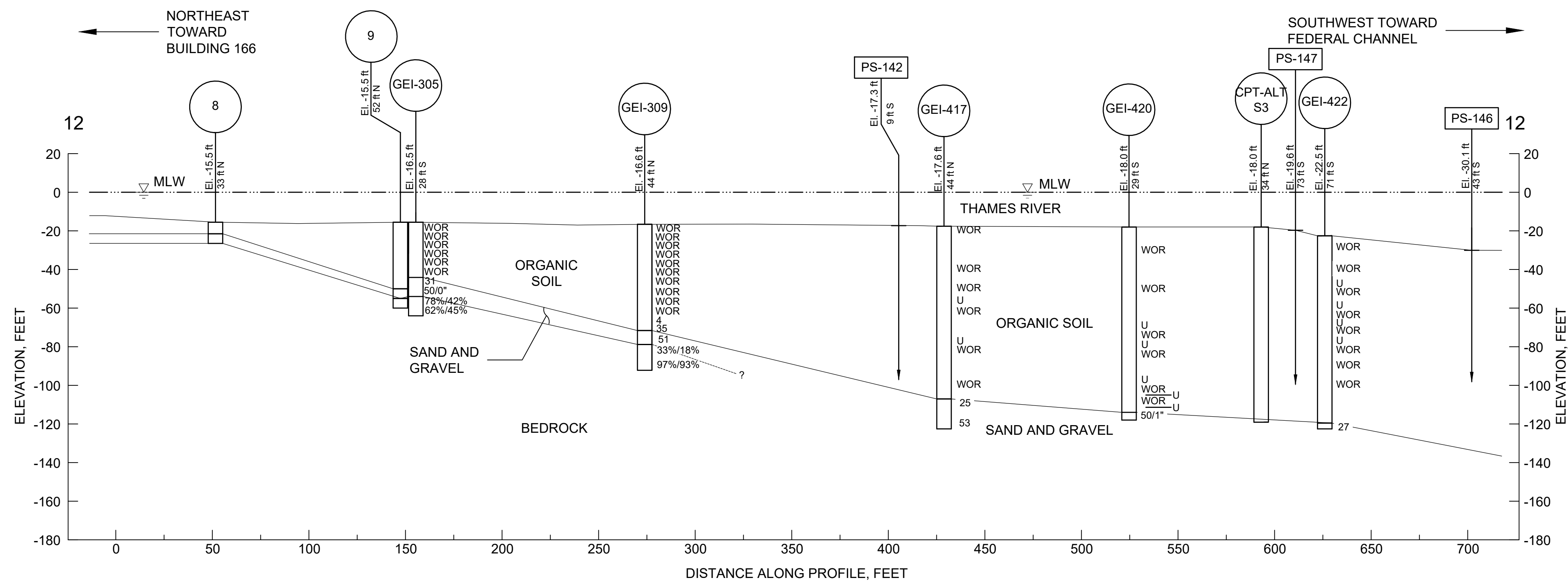
Project 1702805 December 2017 Fig. 9



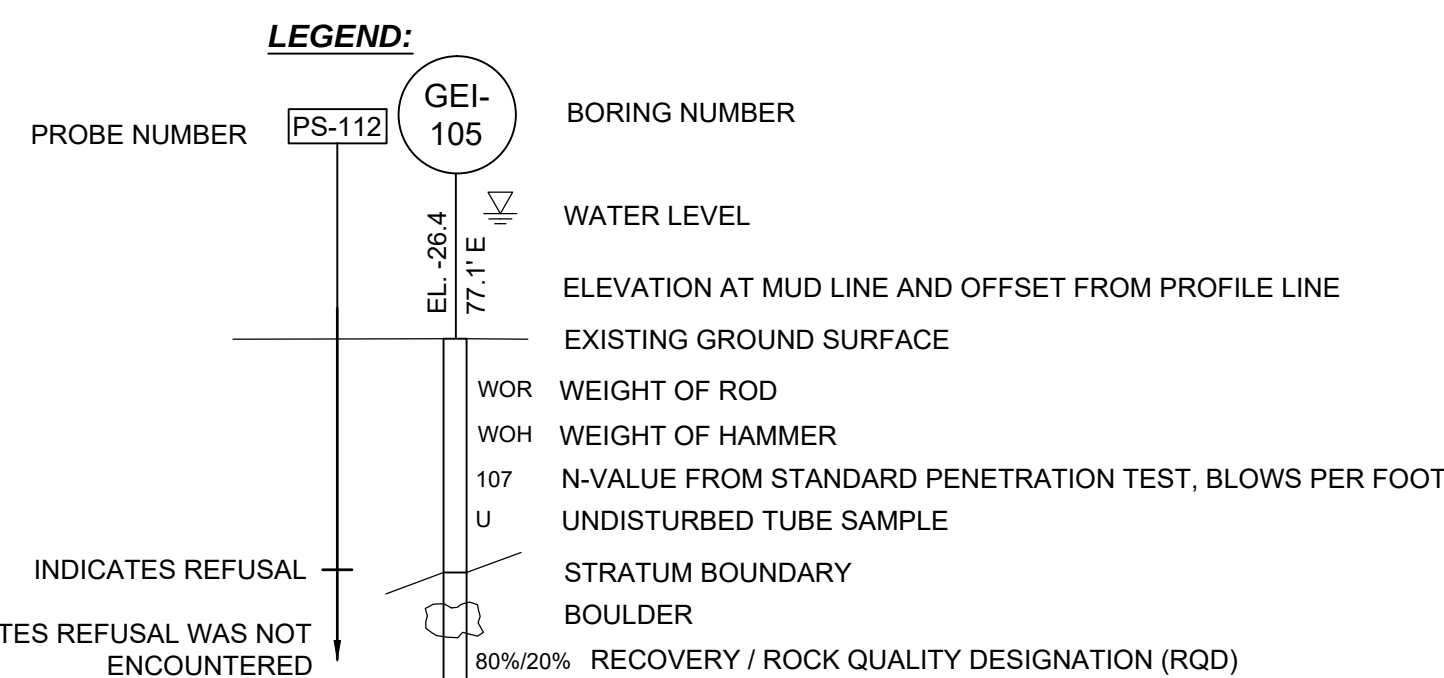
SUBSURFACE PROFILE 11



SUBSURFACE PROFILE 13

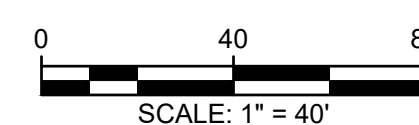


SUBSURFACE PROFILE 12



NOTES

- ELEVATIONS ARE REFERENCED TO MEAN LOW WATER EL. 0.0 MLW = EL. -1.65 NAVD 88.
- PROFILE AND BORING LOCATIONS ARE SHOWN IN FIG. 3.
- THE BOUNDARIES BETWEEN STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES BETWEEN BORINGS MAY VARY SIGNIFICANTLY FROM THE INTERPOLATIONS SHOWN.



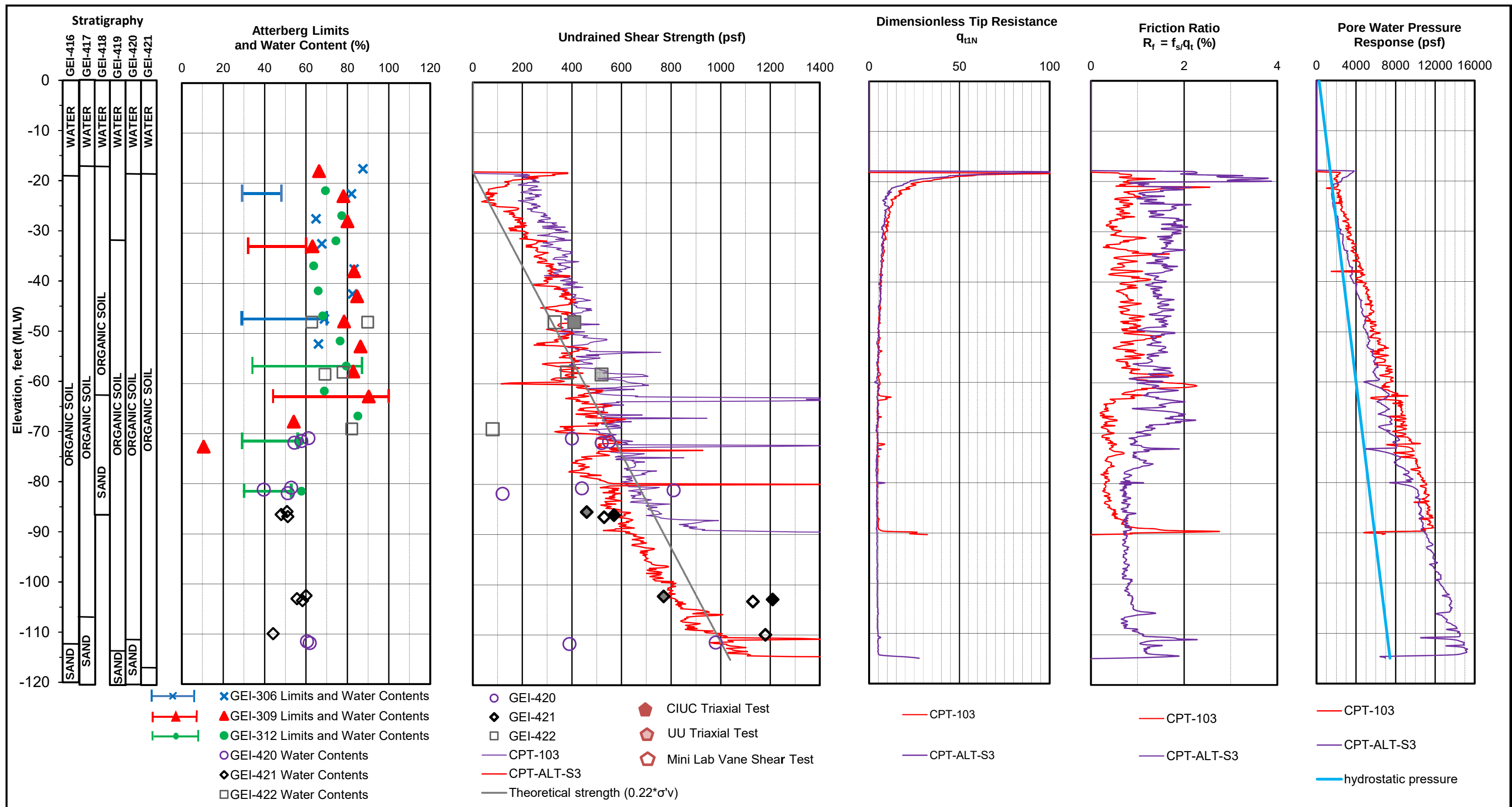
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SUBSURFACE PROFILES 11
THROUGH 13

December 2017 Fig. 10



Notes:

- Undrained strength from CPT data used $N_{kt} = 12$
- See Fig. 3 for Boring and CPT

Explorations	Year	Performed by
GEI-301 through 312	2017	GEI/ADT
GEI-401 through 422		
CPT-103, CPT-Alt-S-3	2017	GEI/ConeTec

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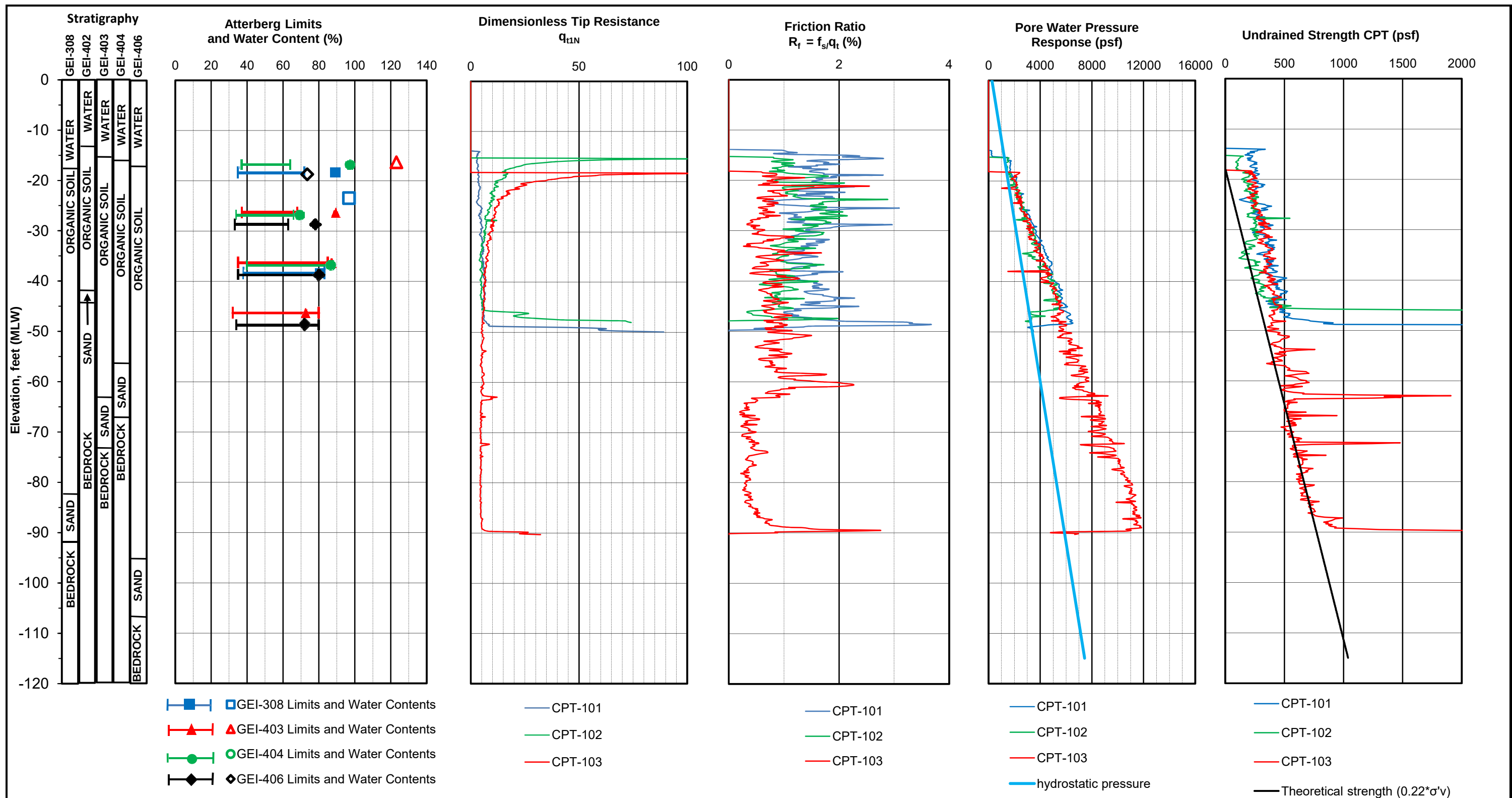


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SOIL PROPERTIES VS. ELEVATION
PROPOSED DREDGE BASIN

December 2017

Fig. 11



Notes:

- Undrained strength from CPT data used $N_{kt} = 12$
- See Fig. 3 for Boring and CPT

Explorations	Year	Performed by
GEI-301 through 312	2017	GEI/ADT
GEI-401 through 422		
SCPT17-103, CPT17-Alt-S-3	2017	GEI/ConeTec

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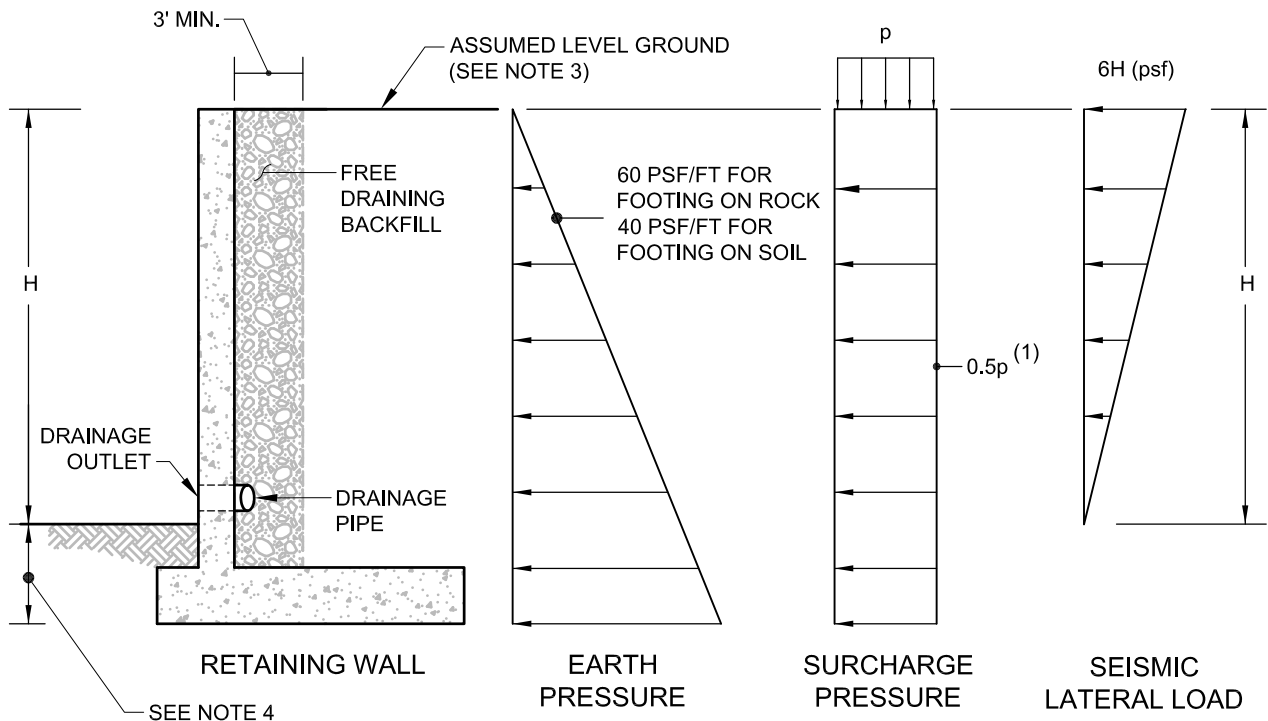


Project 1702805

SOIL PROPERTIES VS. ELEVATION
PROPOSED BUILDING FOOTPRINT

December 2017

Fig. 12



NOTES:

1. p = TOTAL BEARING PRESSURE (psf) FROM ADJACENT SLAB-ON-GRADE, PAVEMENT, OR GROUND INCLUDING STATIC AND LIVE LOADS, MINIMUM OF 200 PSF.
2. LATERAL EARTH PRESSURE IS BASED ON DRAINED CONDITIONS ON THE BACK OF THE RETAINING WALL.
3. LATERAL EARTH PRESSURE MUST BE ADJUSTED IF THERE IS SLOPING GROUND BEHIND THE RETAINING WALL.
4. PROVIDE MINIMUM OF 42 INCHES OF SOIL COVER FOR FROST PROTECTION FOR FOOTINGS CONSTRUCTED ON SOIL.

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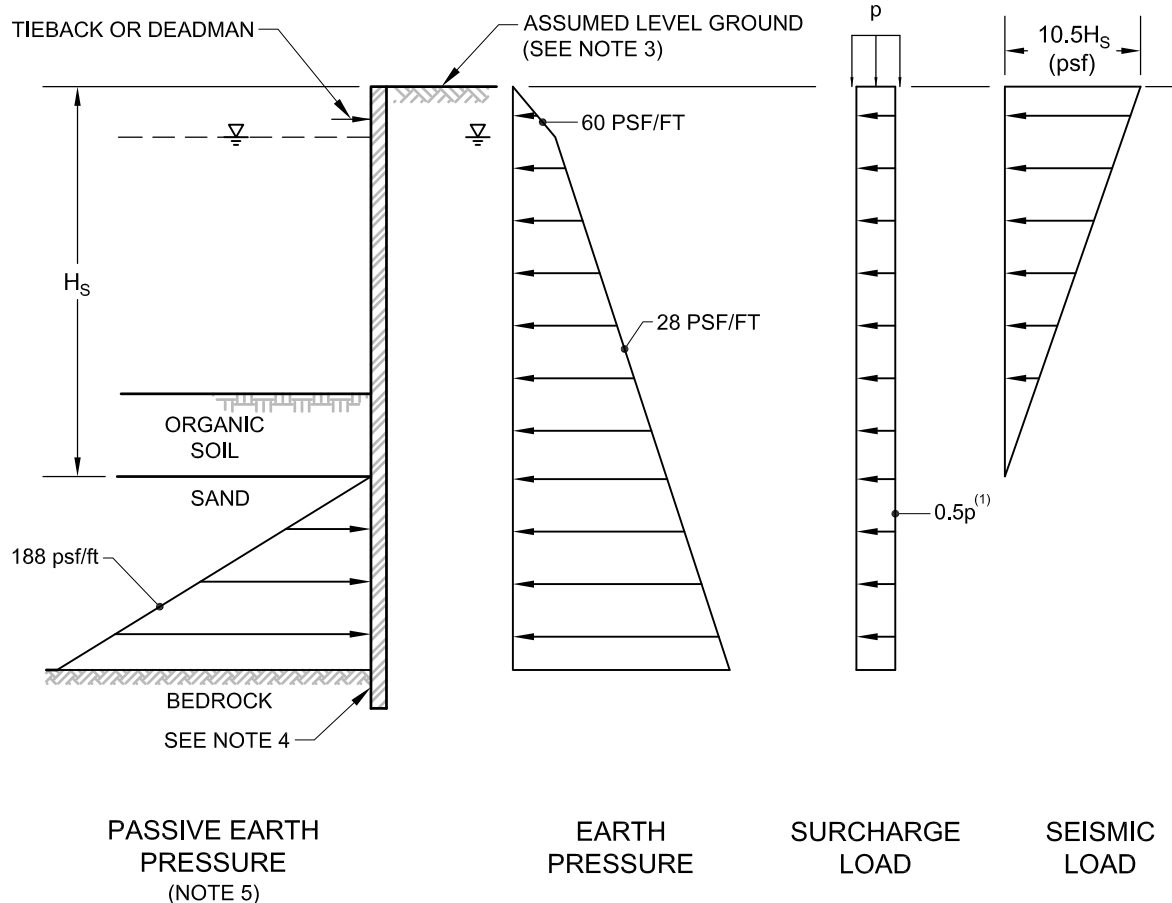


Project 1702805

RECOMMENDED LATERAL
EARTH PRESSURES ON
RETAINING WALLS

December 2017

Fig. 13



NOTES:

1. p = TOTAL BEARING PRESSURE (psf) FROM ADJACENT SLAB-ON-GRADE, PAVEMENT, OR GROUND INCLUDING STATIC AND LIVE LOADS, MINIMUM 200 PSF. SURCHARGE LOAD IS NOT REQUIRED WHERE DECK STRUCTURE IS PRESENT ACTING AS A RELIEVING PLATFORM.
2. LATERAL EARTH PRESSURE IS BASED BORING GEI-501/GEI-501A AND ASSUMES DRAINED CONDITIONS ON THE BACK OF THE BULKHEAD WALL.
3. LATERAL EARTH PRESSURE MUST BE ADJUSTED IF THERE IS SLOPING GROUND IN FRONT OF OR BEHIND THE BULKHEAD.
4. PROVIDE MINIMUM 4-FOOT TOE IN BEDROCK TO PIN THE TOE OF WALL. ASSUME PINNED SUPPORT ACTS 2 FEET BELOW TOP OF BEDROCK.
5. REDUCE PASSIVE PRESSURE BY 1/3 FOR EVALUATING SEISMIC CASE.
6. STAGED CONSTRUCTION ANALYSIS SHOULD BE PERFORMED TO EVALUATE IF TEMPORARY CONSTRUCTION LOADING YIELDS HIGHER STRESSES IN THE WALL.

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Groton, Connecticut

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Burlington, Massachusetts



Project 1702805

LATERAL EARTH PRESSURES
ON SECANT PILE WALL
BULKHEAD

December 2017

Fig. 14

Appendix A

Probe Data

Appendix A. Bedrock Probe Locations and Elevations

South Yard Assembly Building
General Dynamics Electric Boat
Groton, Connecticut

Exploration	Northing (feet)	Easting (feet)	Mudline Elevation (ft)	Refusal Elevation (ft)
PS-101	686,180	1,183,166	-36.0	<-99
PS-102	686,124	1,183,095	-40.2	<-99.2
PS-103	686,083	1,183,210	-34.4	<-97.4
PS-104	686,040	1,183,295	-17.8	<-97.6
PS-105	686,011	1,183,159	-36.0	<-97.5
PS-106	685,970	1,183,456	-14.7	-65.7
PS-107	685,939	1,183,013	-38.6	<-98.6
PS-108	685,941	1,183,341	-17.5	-98.0
PS-109	685,899	1,183,111	-33.6	<-98.4
PS-110	685,863	1,183,217	-22.1	<-97.3
PS-111	685,830	1,183,488	-14.4	-58.4
PS-112	685,824	1,183,016	-40.6	<-98.1
PS-113	685,819	1,183,314	-19.2	<-97.2
PS-114	685,810	1,183,074	-26.4	<-98.2
PS-115	685,780	1,183,406	-15.9	-75.4
PS-116	685,721	1,183,246	-19.9	<-96.9
PS-117	685,862	1,183,012	-41.7	<-97.7
PS-118	685,656	1,183,115	-21.3	<-97.3
PS-119	685,657	1,183,609	-13.1	-35.6
PS-120	685,636	1,183,456	-16.8	-65.8
PS-121	685,627	1,183,220	-18.9	<-99.4
PS-122	685,584	1,183,304	-18.3	<-99.3
PS-124	685,545	1,183,444	-17.1	-76.1
PS-126	685,528	1,183,599	-14.0	-32.0
PS-127	685,508	1,183,517	-15.6	-55.9
PS-128	685,475	1,183,361	-17.8	<-99.3
PS-129	685,365	1,183,562	-15.4	-55.4
PS-130	685,352	1,183,419	-17.0	-98.0
PS-131	685,279	1,183,407	-17.6	<-99.6
PS-132	685,207	1,183,627	-16.2	-36.7
PS-133	685,223	1,183,549	-16.5	-60.2
PS-134	685,170	1,183,485	-16.5	-86.3
PS-137	685,067	1,183,385	-17.9	<-97.1
PS-138	685,068	1,183,550	-16.1	-68.1
PS-139	684,995	1,183,292	-18.6	<-97.1
PS-140	684,975	1,183,241	-18.7	<-98.6
PS-141	684,954	1,183,739	-14.3	-23.2

Appendix A. Bedrock Probe Locations and Elevations

South Yard Assembly Building
General Dynamics Electric Boat
Groton, Connecticut

Exploration	Northing (feet)	Easting (feet)	Mudline Elevation (ft)	Refusal Elevation (ft)
PS-142	684,932	1,183,386	-17.3	<-97
PS-143	684,912	1,183,521	-16.2	-71.2
PS-144	684,886	1,183,601	-15.7	-59.0
PS-145	684,846	1,183,448	-16.3	<-97
PS-146	684,813	1,183,113	-30.1	<-98.1
PS-147	684,810	1,183,209	-19.6	<-99.4
PS-148	684,785	1,183,351	-17.4	<-96.9
PS-149	684,771	1,183,521	-16.1	-72.7
PS-150	684,765	1,183,653	-15.0	-43.0
PS-151	684,717	1,183,273	-18.4	<-99.4
PS-152	684,653	1,183,199	-23.7	<-99.2
PS-153	684,646	1,183,361	-17.0	<-99.4
PS-154	684,957	1,183,100	-26.3	<-98.8
PS-155	684,735	1,183,458	-16.5	<-98.8
PS-156	684,749	1,183,774	-14.2	-27.2
PS-157	684,720	1,183,826	-13.6	-21.4
PS-158	684,859	1,183,757	-14.3	-21.5
PS-159	685,098	1,183,662	-16.2	-29.1
PS-160	684,892	1,183,656	-17.3	-46.8

Notes:

1. Coordinates are referenced to NAD 83 Connecticut State Plane.
2. Elevations are referenced to Mean Low Water.
3. Refusal Elevation is the elevation at which the probe could not be advanced further due to hard driving conditions. A "<" symbol indicates that the probe was advanced as deep as possible with the equipment used, but did not encounter refusal.

Appendix B

Boring Logs

BORING INFORMATION

NORTHING (ft): 686,051
 GROUND SURFACE EL. (ft): 6.8
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 68.6
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,574
 DATE START/END: 9/1/2017 - 9/5/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-201**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Hand auger to 2 ft through gravel fill		2" ASPHALT.
						Drilled through boulder 2-4 ft.		
	5	S1	4 to 6	24/0	6-8-6-4			S1: NO RECOVERY; Gravel lodged in tip of split spoon.
	0	S2	6 to 8	24/4	4-4-11-9			S2: WIDELY GRADED SAND (SW); ~85% fine to coarse sand, ~10% fine gravel, 5% nonplastic fines. Tan. Gravel lodged in tip of split spoon.
		S3	8 to 10	24/5	5-6-4-3			S3: WIDELY GRADED SAND (SW); ~85% fine to coarse sand, ~10% fine gravel, ~5% nonplastic fines. Tan.
	10	S4	10 to 12	24/4	15-20-13-4			S4: WIDELY GRADED SAND WITH GRAVEL (SW); ~80% fine to coarse sand, ~20% fine gravel up to 0.75". Tan. Gravel lodged in tip of split spoon.
		S5	12 to 14	24/0	16-15-7-7			S5: NO RECOVERY; Granite gravel plugged tip.
	15	S6	14 to 16	24/2	9-8-6-8			S6: WIDELY GRADED GRAVEL WITH SAND (GW); ~75% fine to coarse gravel, ~20% fine to coarse sand, ~5% nonplastic fines. Gray.
		S7	16 to 18	24/12	25-27-25-16			S7: NARROWLY GRADED SAND WITH SILT WITH GRAVEL (SP-SM); ~40% fine to medium sand, ~40% fine subrounded gravel, ~20% nonplastic fines. Black. Creosote odor.
	-10	S8	18 to 20	24/0	10-10-8-6	Black wash		S8: NO RECOVERY. Gravel wash in tip.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,051
GROUND SURFACE EL. (ft): 6.8
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,574
DATE START/END: 9/1/2017 - 9/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-201

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S9	20 to 22	24/12	14-20- 20-36		FILL	S9: WIDELY GRADED SAND WITH GRAVEL (SW); ~60% fine to coarse sand, ~35% fine gravel up to 0.75", <5% nonplastic fines. Black.
		S10	22 to 24	24/4	5-45-25- 35			S10: WIDELY GRADED SAND WITH GRAVEL (SW); ~60% fine to coarse sand, ~35% fine gravel up to 0.75", <5% nonplastic fines. Black.
	25	S11	24 to 26	24/15	1-2-1-2		ORGANIC SILT	S11: LEAN CLAY (CL); ~95% low plasticity fines, ~5% fine sand. Gray.
		S12	26 to 28	24/21	1-2-1-2			S12: LEAN CLAY (CL); Similar to S11.
		S13	28 to 30	24/23	WOR/12"- 1-2			S13: LEAN CLAY (CL); Similar to S11.
	30	S14	30 to 32	24/24	4-3-3-3			S14: LEAN CLAY (CL); Similar to S11.
		S15	32 to 34	24/24	WOR/18"- 2			S15: CLAYEY SAND (SC); ~55% fine to coarse sand, ~40% low plasticity fines, ~5% fine gravel. Gray.
		S16	34 to 36	24/24	WOR-2- 3-2			S16: LEAN CLAY WITH GRAVEL (CL); ~80% low plasticity fines, ~20% fine gravel up to 0.5". Gray.
	35	S17	36 to 38	24/24	WOR-1- 5-3			S17: LEAN CLAY (CL); ~90% low plasticity fines, ~10% fine sand. Gray.
		S18	38 to 40	24/24	2-3-15- 16		SAND AND GRAVEL	S18: SILTY SAND (SM); ~80% fine to coarse sand, ~20% nonplastic fines. Black.
	40	S19	40 to 42	24/12	11-12- 11-8			S19: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); ~60% subrounded fine gravel, ~30% fine to medium sand, ~10% nonplastic fines. Gray.
		S20	42 to 44	24/15	16-21- 29-44			S20: WIDELY GRADED SAND WITH GRAVEL (SW); ~80% fine to coarse sand, ~15% fine gravel, ~5% nonplastic fines. Gray.
		S21	44 to 44.6	7/4	41-50/1"			S21: WIDELY GRADED SAND WITH GRAVEL (GW); ~55% fine to coarse sand, ~40% fine subrounded gravel, <5% nonplastic fines. Gray. Gravel in tip of SS.
	45					Drilled through boulder or cobble.		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 686,051
GROUND SURFACE EL. (ft): 6.8
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,574
DATE START/END: 9/1/2017 - 9/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-201

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40		S22	46 to 48	24/10	13-15-34-35	Drilled through boulder or cobble.	SAND AND GRAVEL	S22: WIDELY GRADED GRAVEL WITH SAND (GW); ~65% angular fine gravel, ~30% fine to coarse sand, <5% nonplastic fines. Red/Brown.
		S23	48 to 49.1	13/10	5-9-42/1"			S23: WIDELY GRADED GRAVEL WITH SAND (GW); Similar to S22.
50		S24	50 to 52	24/8	2-4-12-10			S24: WIDELY GRADED GRAVEL WITH SAND (GW); Similar to S22.
		S25	52 to 54	24/16	30-30-50-74			S25: WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM)); ~65% fine to coarse gravel up to 1.5", ~25% fine to coarse sand, ~10% nonplastic fines. Brown. Weathered rock. Advanced casing through boulder.
55								
		S26	56 to 57.3	15/10	25-40-43/3"	Hard drilling to 56 ft through possible cobbles and boulders.		S26: SILTY SAND WITH GRAVEL (SM); ~45% fine to coarse sand, ~40% fine to coarse gravel up to 1", ~15% nonplastic fines. Brown, dark gray.
-50								
		S27	58 to 58.1	1/0	50/1"	Weathered rock at top of SS. Core times (min/ft): 9,8,7,5,5	BEDROCK	S27: NO RECOVERY.
60		C1	58.1 to 63.6	61/61	90			C1: GRANITIC GNEISS; Gray, hard, slightly weathered, some fracture surfaces have staining. Horizontal fractures at 6, 13, 25, 31, 31.5, 39, 40, and 57 inches. Black zone at 0 - 20 inches from top of core.
		C2	63.6 to 68.6	60/55	85			C2: GRANITIC GNEISS. Gray, hard, slightly weathered, some fracture surfaces have staining. Fractures along horizontal plane at 12, 24, 33, 38, and 52 inches.
65						Core times (min/ft): 4,5,5,6,7		
-60								
70								Bottom of boring at depth 68.6 ft. Borehole backfilled with cuttings.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,005
 GROUND SURFACE EL. (ft): 12.2
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 36.2
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,724
 DATE START/END: 9/5/2017 - 9/6/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-202**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
10		S1	0 to 2	24/14	16-11-7- 12		FILL	S1 (0"-3"): Asphalt S1 (3"-14"): NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~80% fine to medium sand, ~15% fine gravel, ~5% nonplastic fines. Brown.
		S2	2 to 4	24/4	17-14- 11-6			S2: NARROWLY GRADED SAND WITH SILT (SP-SM); ~95% fine to medium sand, ~5% nonplastic fines. Brown.
		S3	4 to 6	24/12	10-11-9- 9			S3: NARROWLY GRADED SAND (SP); ~85% mostly fine to medium sand, ~15% fine to coarse gravel, ~5% nonplastic fines.
		S4	6 to 8	24/0	10-9-6-8			S4: NO RECOVERY
		S5	8 to 10	24/0	5-7-78- 37			S5: NO RECOVERY.
10						Drilled through boulders and cobbles to depth 12.5 ft.		
15		S6	12.5 to 14.5	24/15	12-25- 15-12		FILL	S6: WIDELY GRADED SAND WITH SILT AND GRAVEL (GW-GM); ~55% fine to coarse sand, ~40% angular fine gravel, ~5% nonplastic fines. Brown/Black.
		S7	14.5 to 16.5	24/4	4-5-4-8			S7: NARROWLY GRADED GRAVEL WITH SAND (GP); ~60% fine gravel, ~40% fine to coarse sand. Black.
		S8	16.5 to 18.5	24/0	4-5-7-7			S8: NO RECOVERY. Gravel plugged split spoon tip.
		S9	18.5 to 20.5	24/6	3-3-2-2			S9: WIDELY GRADED SAND WITH GRAVEL (SW); ~70% fine to coarse sand, ~30% fine gravel. Black.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,005
GROUND SURFACE EL. (ft): 12.2
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,724
DATE START/END: 9/5/2017 - 9/6/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-202

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S10	20.5 to 21	6/0	20-50/0"		FILL	S10: NO RECOVERY. Granite gravel lodged in tip.
-10		S11	22.5 to 24	18/11	3-32-3-50/0"	Bent split spoon.	SAND AND GRAVEL	S11: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~60% medium sand, ~35% fine gravel, ~5% nonplastic fines.
25						Installed 4" casing. Cleaned out to 26.2 ft.		
		C1	26.2 to 31.2	60/53	85	Core times (min/ft): 7,5,4,4,8	BEDROCK	C1: GRANITIC GNEISS; Hard, medium grained, slightly weathered, fractures at 20 degrees from horizontal. Foliation visible at about 20 to 30 degrees from horizontal.
-20		C2	31.2 to 36.2	60/56	88	Core times (min/ft): NM		C2: GRANITIC GNEISS. Similar to C1. One fracture at 1/2" from top of core.
35								
								Bottom of boring at depth 36.2 ft. Borehole backfilled with cuttings.
40								
-30								
45								

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,793
 GROUND SURFACE EL. (ft): 16.7
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 22.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,791
 DATE START/END: 8/30/2017 - 8/30/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-203**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/1	87-22- 37-35		FILL	S1: NO RECOVERY. Asphalt plugged tip of split spoon.
	5	S2	5 to 7	24/4	5-2-17- 34	Gravel lodged in split spoon tip.		S2: NARROWLY GRADED GRAVEL WITH SAND (GP); ~80% angular fine gravel from tricone, ~20% fine to coarse sand. Wash. Brown.
	10					Installed 10 ft of 5" casing with spin shoe. Telescoped 4" casing to 12 ft.	BEDROCK	
	10					Driller indicated hard drilling was encountered while cleaning out the casing to 10 ft. Possible top of rock around 10 to 10.5 ft.		
	15	C1	12 to 17	60/58	92	Core times (min/ft): 6, 6, 5, 5, 4		C1: GRANITIC GNEISS; Hard, slightly weathered. Fractures at 31, 34, 40 in. All fractures 45 degrees from horizontal. Foliation visible at 20 to 45 degrees from horizontal. Gray.
	0	C2	17 to 22	60/56	55	Core times (min/ft): 5, 5, 6, 5, 5		C2: GRANITE; Similar to C1, except moderately fractured. Fractures 30 to 40 degrees from horizontal and spaced to 8 inches apart. Staining on fracture surfaces.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,793
GROUND SURFACE EL. (ft): 16.7
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,791
DATE START/END: 8/30/2017 - 8/30/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-203
PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
							BEDROCK	
								Bottom of boring at depth 22 ft. Borehole backfilled with cuttings.
	25							
-10								
	30							
	35							
-20								
	40							
	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation
CITY/STATE: Groton, CT
GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,661
 GROUND SURFACE EL. (ft): 17.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 36.6
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,777
 DATE START/END: 8/29/2017 - 8/30/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-204**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/16	83-22- 43-84			S1 (0-3): ASPHALT S1 (3-11): WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~50% fine to coarse sand, ~40% angular fine gravel, ~10% nonplastic fines. S1 (11-16): GRANITE; ~50% angular gravel, ~50% fine to coarse sand (Pulverized gravel).
	5					Advance 5 in casing. Lost wash water at 4 ft.		
	10					Drilled through boulders and cobbles from 5-10 ft.	FILL	S2: Not used.
	10	S3	10 to 12	24	6-3-10-2			S3: NARROWLY GRADED GRAVEL WITH SILT AND SAND (SP-SM); ~50% fine angular gravel (Granite), ~40% fine to coarse sand, ~10% nonplastic fines. Brown.
	15	S4	15 to 17	24/0	4-76-8-9			S4: NO RECOVERY. Granite fragment lodged in split spoon tip.
	0							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,661
GROUND SURFACE EL. (ft): 17.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,777
DATE START/END: 8/29/2017 - 8/30/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-204**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24	1-2-13- 29	Gravel in tip of split spoon.	FILL	S5: WIDELY GRADED SAND WITH GRAVEL (SW); ~60% fine to coarse sand, ~40% angular fine gravel. Gray. Gravel plugged tip of split spoon. Boulder fragment.
	25							
		C1	26.8 to 27.6	10/10	7	Core times (min/ft): 8 Telescope with 4" casing. Core times (min/ft): 6,5,4,6		C1: GRANITE; Hard, slightly weathered. Fractures are generally horizontal and spaced 1" to 32" apart. Gray.
-10		C2	27.6 to 31.8	50/49	97			C2: GRANITE. Similar to C1, except fractures are spaced 3 to 12" apart.
	30							
		C3	31.6 to 36.6	60/56	93	Core times (min/ft): 4, 4, 4, 5, 4		C3: GRANITE; Similar to C1, except fractures are spaced 3 to 8" apart.
	35							
								Bottom of boring at depth 36.6 ft. Borehole backfilled with cuttings.
-20								
	40							
	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,291
 GROUND SURFACE EL. (ft): 15.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 61.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,787
 DATE START/END: 8/28/2017 - 8/29/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-205**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/9	18-8-26-31	Advance split spoon through asphalt		S1 (0"-2"): ASPHALT. S1 (2"-9"): WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~50% fine to coarse sand, ~40% angular fine gravel, ~10% nonplastic fines, dry. Brown.
	5	S2	5 to 7	24/0	4-2-1-2	Pushing gravel, cobbles. No wash returning.		S2: NO RECOVERY.
	10	S3	10 to 12	24/0	1-2-1-16	Advanced casing to 15 ft using spin shoe. No water return during cleanout.	FILL	S3: NO RECOVERY. Gravel in tip of split spoon.
	15	S4	15 to 17	24/1	11-4-20-24	Difficult to advance casing (>200 blows/3").		S4: NARROWLY GRADED GRAVEL (GP); ~95% fine angular gravel (rock fragments), ~5% fine sand (wash).

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,291
GROUND SURFACE EL. (ft): 15.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,787
DATE START/END: 8/28/2017 - 8/29/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-205

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/2	34-8-7- 30			S5: NARROWLY GRADED GRAVEL (GP); ~95% fine angular gravel (fragments from drilling), ~5% nonplastic fines.
						No wash return while cleaning out.		
-10	25	S6	25 to 25.1	1/1	50/1"	Split spoon encountered bouncing refusal.		S6: WIDELY GRADED SAND (SW); fine to coarse sand in tip (wash).
						Drilled through cobbles and boulders.		
	30	S7	30 to 32	24/10	4-2-3-4			S7: SANDY SILT (ML); ~60% nonplastic fines, ~40% fine to medium sand. Gray.
-20	35	S8	35 to 37	24/9	6-5-7-11			S8: WIDELY GRADED SAND WITH SILT (SW-SM); ~80% fine to coarse sand, ~10% fine gravel, ~10% nonplastic fines. Gray.
	40	S9	40 to 42	24/5	9-10-21- 26	3" casing could not be advanced past 41 ft. When 3" casing was extracted, spin shoe was melted and partially collapsed, and plugged with granite fragments. Suspended drilling on 8/29/2017 and continued on 9/7/2017. Removed 4" casing and advanced 5" casing to 25 ft, then telescoped 4" casing. Advance casing, cleanout with tricone. No wash return.		S9: WIDELY GRADED SAND WITH GRAVEL (SW); ~65% fine to coarse sand, ~30% angular fine gravel, ~5% nonplastic fines. Gray.
		S10	42 to 44	24/12	6-17-23- 35			S10: NARROWLY GRADED SAND WITH GRAVEL (SP); ~60% fine sand, ~40% fine gravel. Tan.
		S11	44 to 46	24/14	12-36- 69-58			S11: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~50% fine to medium sand, ~30% fine gravel, ~20% nonplastic fines. Gray.
-30	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,291
GROUND SURFACE EL. (ft): 15.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,787
DATE START/END: 8/28/2017 - 8/29/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-205**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S12	46 to 47	12/8	38-18- 50/0"	Telescoped 3" casing through possible boulder to 51.5 ft.	SAND AND GRAVEL	S12: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~50% fine to medium sand, ~40% fine gravel, ~10% nonplastic fines. Gray. Weathered rock in split spoon tip. S13: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); Similar to S12. Weathered rock in split spoon tip.
		S13	47 to 47.4	5	99/5"- 50/0"			
50						Core times (min/ft): 8, 7, 8, 6, 6	BEDROCK	C1: GRANITIC GNEISS; Hard, slightly weathered. Fractures are horizontal to 20 degrees from horizontal, fractures at 9, 37, 40, and 41 in. Gray.
		C1	51.5 to 56.5	60/60	90			
55								
-40						Core times (min/ft): 4, 5, 6, 8, 9	BEDROCK	C2: GRANITIC GNEISS; Hard, slightly weathered to fresh, fractures horizontal to 30 degrees from horizontal, fractures 14, 16, and 19 in. Pink intrusions 22"-42" from top of core.
		C2	56.5 to 61.5	60/60	92			
60								Bottom of boring at depth 61.5 ft. Borehole backfilled with cuttings.
65								
-50								
70								

NOTES:

PROJECT NAME: General Dynamics Electric Boat
Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,855
 GROUND SURFACE EL. (ft): 15.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 50.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,697
 DATE START/END: 8/30/2017 - 8/31/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 85 Truck

BORING**GEI-206**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 1	12/1	12-11- 75/<1"	Stopped split spoon at 12 in, spin 5" casing to 2 ft.		S1: NO RECOVERY. Asphalt lodged in spoon tip. Hard driving split tip of split spoon.
						Drilled through cobble 2.5-3 ft.		
		S2	3 to 5	24/6	7-6-6-8			S2: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~50% fine to coarse sand, ~40% fine angular gravel, ~10% nonplastic fines.
	5	S3	5 to 7	24/8	22-22- 10-8			S3: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S2.
	10	S4	7 to 9	24/10	5-13-6-5			S4: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); ~60% fine angular gravel, ~30% fine to coarse sand, ~10% nonplastic fines. Tan.
		S5	9 to 9.5	6/1	5-50/<1"	Drilled through boulder.		S5: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); Similar to S4.
	10						FILL	
		S6	12 to 14	24/0	10-7-7-4			S6: NO RECOVERY. Gravel lodged in tip.
						Advanced 5" casing through cobbles and boulders, cleaned out to 15 ft.		
	15	S7	15 to 17	24/0	7-3-1-3			S7: NO RECOVERY. Gravel lodged in tip.
	0	S8	17 to 19	24/7	5-6-5-5			S8: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% fine angular gravel, ~20% nonplastic fines. Brown.
		S9	19 to 21	24/1	4-7-3-3			

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,855
GROUND SURFACE EL. (ft): 15.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,697
DATE START/END: 8/30/2017 - 8/31/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-206

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-10	25	S10	21 to 23	24/5	6-7-27- 15	Drilled through boulder 23-26 ft.	FILL	S9: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% fine angular gravel, ~20% nonplastic fines. Brown.
								S10: SILTY SAND WITH GRAVEL (SM); Similar to S9.
		S11	26 to 28	24/3	3-3-7-4			S11: NARROWLY GRADED SAND WITH SILT (SP-SM); ~80% fine to medium sand, ~10% fine gravel, ~10% non-plastic fines.
		S12	28 to 30	24/6	4-9-5-6			S12: NARROWLY GRADED SAND WITH SILT (SP-SM); Similar to S11.
		S13	30 to 32	24/14	2-12-42- 47			S13 (0"-2"): NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~60% fine to coarse sand, ~30% fine rounded gravel, ~10% nonplastic fines. Gray.
		S14	32 to 34	24/12	1-3-2-2			S13 (2"-14"): SILTY SAND (SM); ~50% fine sand, ~40% nonplastic fines, ~10% fine gravel.
		S15	34 to 36	24/3	2-2-2-3			S14: SANDY SILT (ML); ~60% nonplastic fines, ~30% fine sand, ~10% fine gravel. Gray.
		S16	36 to 38	24	1-8-19- 16			S15: SANDY SILT (ML); Similar to S14.
		S17	38 to 38.8	10/5	20-25/4"			S16: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~60% fine to coarse sand, ~30% fine gravel, ~10% nonplastic fines. Gray.
-20	35					Native Sand	SAND AND GRAVEL	S17: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); Similar to S16.
-30	40	C1	40.5 to 44.5	48/46	43	Core times (min/ft): 8, 11, 8, 10	BEDROCK	C1: GRANITE; Hard, slightly weathered, gray. Fractures are horizontal to 45 degrees from horizontal and spaced 0.5 to 8" apart. Pink intrusions 44 to 46 in.
		C2	44.5 to 45.5	12/12	66			C2: GRANITE; Similar to C1, except pink intrusions are from 0 to 4".
		C3	45.5 to	24/24	46			C3: GRANITE; Hard, slightly weathered, gray. Fractures are

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

BORING INFORMATION

NORTHING (ft): 685,568

GROUND SURFACE EL. (ft): -10.7

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 27.5

LOGGED BY: J. Shelkey

EASTING (ft): 1,183,673

DATE START/END: 8/2/2017 - 8/2/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-301**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/18	WOR/24"		ORGANIC SOIL	S1: SANDY ORGANIC SILT (OL/OH); ~80% nonplastic fines, ~20% fine sand. Gray.
	5	S2	5 to 7	24/24	WOR/24"			S2: SANDY ORGANIC SILT (OL/OH); ~95% nonplastic fines, ~5% fine sand. Gray.
-20	10	S3	10 to 12	24/19	WOR/12"- 1-1			S3: SANDY ORGANIC SILT (OL/OH); Similar to S2. Wood and shell fragments present. Gray.
	15	S4	15 to 17	24/7	39-40- 59-46	Increased drilling resistance 14-15 feet.	SAND	S4: WIDELY GRADED SAND (SW); ~95% fine to coarse sand, ~5% nonplastic fines. Gray.
-30		C1	17.5 to 22.5	60/54	70		BEDROCK	C1: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures horizontal to 40 degrees and are spaced 0.5" to 18" apart. Staining on some fracture surfaces.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-301**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25	C2	22.5 to 27.5	60/58	96		BEDROCK	C2: GRANITIC GNEISS; hard, slightly weathered, gray. Horizontal fractures at 17, 41, 42 inches. Staining on some fracture surfaces.
-40	30							Bottom of boring at depth 27.5 ft. Borehole backfilled with cuttings.
-45	35							
-50	40							
-55	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,209

GROUND SURFACE EL. (ft): -12.1

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 16.1

LOGGED BY: J. Shelkey

EASTING (ft): 1,183,711

DATE START/END: 8/2/2017 - 8/2/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-302**

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/20	WOR/24"	Moved location twice due to obstructions.	ORGANIC SOIL	S1 (0-17"): ORGANIC SILT (OL/OH); ~100% nonplastic fines, trace of shell fragments. Black. S1 (17-20"): ORGANIC SANDY SILT (OL/OH); ~80% nonplastic fines, ~20% fine sand. Dark brown/gray.
	5	S2	5 to 7	24/24	WOR/18" 1			S2: ORGANIC SANDY SILT (OL/OH); Similar to S1 (17-20").
-20							SAND	
	10	S3 C1	10 to 10.3 10.3 to 15.3	3/1 60/54	50/3" 82		BEDROCK	S3: SILTY SAND (SM); ~85% fine sand, ~15% nonplastic fines. Gray. C1: GRANITIC GNEISS; hard, slightly weathered, gray, top 7" of core is black. Fractures are generally horizontal, one fracture is at 60 degrees from horizontal. Fractures generally spaced 12 to 18" apart. Foliation visible at about 60 degrees from horizontal.
15		C2	15.3 to 16.1	10/10	100	Broke crossover box from angle drive on drill rig during C2 core.		C2: GRANITIC GNEISS; Similar to C1, gray.
-30								Bottom of boring at depth 16.1 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



PAGE 1 of 1



BORING INFORMATION

NORTHING (ft): 685,753
 GROUND SURFACE EL. (ft): -15.4
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 61.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,521
 DATE START/END: 8/3/2017 - 8/3/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-304**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): 16.5 8/3/2017

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OL/OH); ~90% nonplastic fines, ~10% fine sand. Gray.
-20	5	S2	5 to 7	24/20	WOR/24"			S2: ORGANIC SILT (OL/OH); Similar to S1.
							ORGANIC SOIL	
-10	10	S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OL/OH); Similar to S1.
							ORGANIC SOIL	
-30	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC SILT (OL/OH); Similar to S1.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,753
GROUND SURFACE EL. (ft): -15.4
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,521
DATE START/END: 8/3/2017 - 8/3/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-304

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/14	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT (OL/OH); ~90% nonplastic fines, ~10% fine sand. Gray.
-40	25	S6	25 to 27	24/15	WOR/24"			S6: ORGANIC SILT (OL/OH); Similar to S5.
-30	30	S7	30 to 32	24/12	WOR/24"			S7: ORGANIC SANDY SILT (OL/OH); ~80% nonplastic fines, ~20% fine sand. Gray.
						Mixed drilling mud with 25 lbs bentonite.		
-50	35	S8	35 to 37	24/1	12-12- 11-13		SAND AND GRAVEL	S8: NARROWLY GRADED GRAVEL AND SHELLS (GP); Possibly all wash.
-40	40	S9	40 to 42	24/12	13-15- 36-42			S9: NARROWLY GRADED GRAVEL WITH SAND (GP); ~60% mostly coarse gravel up to 1", ~35% fine to coarse sand, ~5% nonplastic fines. Gray.
						Hard driving bent split spoon.		
-60	45	S10	45 to 46	12/12	10-75			S10: WIDELY GRADED SAND WITH SILT (SW-SM); ~80% fine to coarse sand, ~20% nonplastic fines.

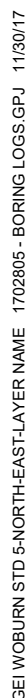
NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805





BORING INFORMATION

NORTHING (ft): 684,988

GROUND SURFACE EL. (ft): -16.5

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 48.5

LOGGED BY: S.Cote

EASTING (ft): 1,183,635

DATE START/END: 8/10/2017 - 8/10/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-305**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): ∇ 19.0 8/10/2017 $\blacktriangledown$ 18.1 8/10/2017**ABBREVIATIONS:**

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/18	WOR/24"			S1: ORGANIC SILT (OL/OH); ~95% low plasticity fines, ~5% fine to coarse sand. Gray.
	5	S2	5 to 7	24/19	WOR/24"			S2: ORGANIC SILT (OL/OH); ~ 100% low plasticity fines. Gray. Contains occasional shell fragments.
	10	S3	10 to 12	24/23	WOR/24"			S3: ORGANIC SILT (OL/OH); ~ 100% low plasticity fines. Gray. Contains occasional shell fragments and organic fibers. Slight organic odor.
	15	S4	15 to 17	24/10	WOR/24"			S4: ORGANIC SILT (OL/OH); ~ 100% low plasticity fines. Gray. Contains occasional shell fragments up to 1/2" diameter.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 684,988
GROUND SURFACE EL. (ft): -16.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,635
DATE START/END: 8/10/2017 - 8/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-305

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/15	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT (OL/OH); ~ 100% low plasticity fines. Gray. Contains frequent shell fragments.
-40	25	S6	25 to 27	24/23	WOR/24"		ORGANIC SOIL	S6: ORGANIC SILT WITH SAND (OL/OH); ~80% low plasticity fines, ~15% fine to coarse sand, ~5% fine gravel. Gray. Sand concentrated more towards bottom of sample.
							SAND AND GRAVEL	
	30	S7	30 to 32	24/12	10-21- 10-3	Rollerbit grinding and drill rig chatter at ~30 feet.		S7: SILTY GRAVEL WITH SAND (GM); ~50% fine to coarse gravel up to 1", ~35% fine to coarse sand, ~15% nonplastic fines. Gray.
							SAND AND GRAVEL	
-50	35	S8	35 to 35	0/0	50/0"			S8: No recovery.
							BEDROCK	
	40	C1	38.5 to 43.5	60/47	42	Core times (min/ft): 5, 7, 8, 7, 7		C1: GRANITIC GNEISS; Hard, fresh to slightly weathered. Foliation visible at about 45 degrees from horizontal. Fractures spaced 3-16" apart from 0-34", highly fractured from 34-47".
							BEDROCK	
-60	45	C2	43.5 to 48.5	60/37	45	Core times (min/ft): NM		C2: GRANITIC GNEISS; Similar to C1, except 0-12" is highly fractured and 12-37" has fractures spaced 3-15" apart.
							BEDROCK	

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,988
GROUND SURFACE EL. (ft): -16.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,635
DATE START/END: 8/10/2017 - 8/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-305
PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
							BEDROCK	
								Bottom of boring at depth 48.5 ft. Borehole backfilled with cuttings.
	50							
	-70							
	55							
	60							
	-80							
	65							
	70							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,684
GROUND SURFACE EL. (ft): -16.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 54.1
LOGGED BY: S.Cote

EASTING (ft): 1,183,598
DATE START/END: 8/9/2017 - 8/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 3

HAMMER TYPE:	Automatic
AUGER I.D./O.D.:	NA / NA

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray to dark gray. Contains occasional shell fragments. Organic like odor. Water content = 87.5%
-20								
5		X S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OL/OH); 85.6% low plasticity fines, 14.4% mostly fine sand. Gray to dark gray. Contains occasional shell fragments and organic fiber. Slight organic like odor. Water content = 82.0%. LL = 48, PI = 19. [Laboratory Grain Size Analysis and Atterberg Limits Performed]
10		X S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray. Contains occasional shell fragments. Water content = 64.8%
-30								
15		X S4	15 to 17	24/24	WOR/24"		S4: ORGANIC SILT (OL/OH); Similar to S3. Water content = 67.6%	

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,684
GROUND SURFACE EL. (ft): -16.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,598
DATE START/END: 8/9/2017 - 8/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-306

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray. Contains occasional shell fragments. Water content = 83.2%
	25	S6	25 to 27	24/24	WOR/24"			S6: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray. Contains occasional shell fragments and wood fragment. Water content = 82.5%
	30	S7	30 to 32	24/24	WOR/24"		ORGANIC SOIL	S7: FAT CLAY (CH); 97.5% low to medium plasticity fines, 2.5% mostly fine sand. Gray. Water content = 68.9%. LL = 70, PI = 41. [Laboratory Grain Size Analysis and Atterberg Limits Performed]
	35	S8	35 to 37	24/12	WOR/24"			S8: ORGANIC SILT (OL/OH); ~95% low plasticity fines, ~5% fine to coarse sand. Gray. Frequent shell fragments. Water content = 66.0%
	40	S9	40 to 42	24/6	8-14-18-14		GRAVEL	S9: SILTY GRAVEL WITH SAND (GM); ~65% fine to coarse gravel up to 1", ~20% nonplastic fines, ~15% fine to coarse sand. Gray.
	45	C1	44.1 to 49.1	60/37	42		BEDROCK	C1: GRANITIC GNEISS: Hard, fresh to slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and spaced 2 to 8" with a highly fractured zone from 19-29" from top of core. Foliation visible about 40 degrees from horizontal.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 684,684
GROUND SURFACE EL. (ft): -16.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,598
DATE START/END: 8/9/2017 - 8/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-306**

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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	C2	49.1 to 54.1	60/57	77	Core times (min/ft): 5, 6, 5, 6, 7	BEDROCK	C2: GRANITIC GNEISS: Hard, fresh to slightly weathered. Fractures are generally horizontal and spaced 3 to 30" apart. Foliation visible about 20 degrees from horizontal. White and pink granite intrusion at 23-48" from top of core.
-70	55							Bottom of boring at depth 54.1 ft. Borehole backfilled with cuttings.
	60							
-80	65							
	70							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,032
 GROUND SURFACE EL. (ft): -15.3
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 86.6
 LOGGED BY: S.Cote

EASTING (ft): 1,183,385
 DATE START/END: 8/14/2017 - 8/16/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-307**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/10	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray.
	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OL/OH); Similar to S1. Contains trace shell fragments.
	10	S3	10 to 12	24/12	WOR/24"		ORGANIC SOIL	S3: ORGANIC SILT (OL/OH); Similar to S1. Contains trace shell fragments.
	15	S4	15 to 17	24/21	WOR/24"		ORGANIC SOIL	S4: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray, contains shell fragments.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,032
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,385
DATE START/END: 8/14/2017 - 8/16/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-307**

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray, contains trace shell fragments.
-40	25	S6	25 to 27	24/24	WOR/24"			S6: ORGANIC SILT (OL/OH); Similar to S5.
-30	30	S7	30 to 32	24/24	WOR/24"			S7: ORGANIC SILT (OL/OH); Similar to S5.
-50	35	S8	35 to 37	24/23	WOR/24"			S8: ORGANIC SILT (OL/OH); Similar to S5.
-40	40	S9	40 to 42	24/23	WOR/24"			S9: ORGANIC SILT (OL/OH); Similar to S5.
-60	45	S10	45 to 47	24/22	WOR/24"			S10: ORGANIC SILT WITH SAND (OL/OH); ~85% low plasticity fines, ~10% fine to coarse sand, ~5% fine to coarse gravel up to 0.75". Gray, contains trace shell fragments and organic fibers.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,032
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,385
DATE START/END: 8/14/2017 - 8/16/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-307

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	S11	50 to 52	24/11	10-10- 14-21	Increased resistance driving casing 50-54 feet.	SAND	S11: WIDELY GRADED SAND (SW); ~70% fine to coarse sand, ~15% mostly fine gravel up to 0.5", ~10% nonplastic fines. Gray, trace wood fragments in tip of split spoon.
-70	55	S12	55 to 57	24/12	WOH-3- 4-7		ORGANIC SOIL	S12: ORGANIC SILT (OL); ~95% low plasticity fines, ~5% fine sand. Gray, organic-like odor. Contains ~50% wood fragments. Possible timber pile.
	60	S13	60 to 62	24/6	WOH-2- 2-2			S13: ORGANIC SILT (OL); ~80% low plasticity fines, ~15% fine gravel up to 0.25", ~5% fine to coarse sand. Gray, organic-like odor. Contains ~50% wood fragments. Possible timber pile.
-80	65	S14	65 to 67	24/10	14-16- 12-17		SAND	S14: NARROWLY GRADED SAND WITH GRAVEL (SP); ~80% fine to medium sand, ~15% fine to coarse gravel up to 1", ~5% nonplastic fines. Gray, trace wood fragments.
	70	S15	70 to 70	0/0	50/0"		ROCK	S15: No recovery. Rock fragments in tip of spoon.
		C1	71.6 to	60/30	18			C1: GRANITE: Hard, fresh to slightly weathered, gray. Fractures are generally horizontal and spaced 0.5 to 8" apart.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 686,032
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,385
DATE START/END: 8/14/2017 - 8/16/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-307**

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90	75		76.6			Core times (min/ft): 7, 5, 5, 3, 3	ROCK	C2: GRANITE: Similar to C1.
		C2	76.6 to 81.6	60/13	13	Core times (min/ft): 6, 4, 5, 4, 3		
-100	85	C3	81.6 to 86.6	60/44	58	Core times (min/ft): 5, 7, 4, 4, 5		C3: GRANITE: Similar to C1, except fractures are spaced 0.5 to 31". Pink intrusion 0-12".
-110	95							Bottom of boring at depth 86.6 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,592
 GROUND SURFACE EL. (ft): -17.4
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 83.7
 LOGGED BY: S.Cote

EASTING (ft): 1,183,375
 DATE START/END: 8/7/2017 - 8/8/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-308**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/16	WOR/24"			S1: ORGANIC SILT (OL/OH); ~95% low plasticity fines, ~5% fine sand. Gray. Contains trace shell fragments. Water Content = 89.2%. LL = 72, PI = 37. [Atterberg Limits Performed]
-20								
	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OL/OH); Similar to S1. Contains trace plant fibers. Water Content = 96.8%.
	10	S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray. Contains frequent shell fragments.
-30								
	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray. Contains wood fragments and organic fibers. Slight organic like odor.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,592
GROUND SURFACE EL. (ft): -17.4
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,375
DATE START/END: 8/7/2017 - 8/8/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-308**

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray. Contains shell fragments. Slight organic like odor. Water Content = 80.7%. LL = 83, PI = 45. [Atterberg Limits Performed]
-40								
	25	S6	25 to 27	24/24	WOR/24"			S6: ORGANIC SILT (OL/OH); Similar to S5.
	30	S7	30 to 32	24/24	WOR/24"			S7: ORGANIC SILT (OL/OH); Similar to S5.
-50								
	35	S8	35 to 37	24/24	WOR/24"			S8: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray. Contains occasional shell fragments. Faint organic like odor.
	40	S9	40 to 42	24/24	WOR/24"			S9: ORGANIC SILT (OL/OH); Similar to S8.
-60								
	45	S10	45 to 47	24/24	WOR/24"			S10: ORGANIC SILT (OL/OH); ~100% low to medium (mostly medium) plasticity fines. Gray. Contains occasional shell fragments. Faint organic like odor.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,592
 GROUND SURFACE EL. (ft): -17.4
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,375
 DATE START/END: 8/7/2017 - 8/8/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-308

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	S11	50 to 52	24/24	WOR/24"			S11: ORGANIC SILT (OL/OH); ~100% low to medium plasticity fines. Gray. Contains occasional shell fragments.
	-70							
	55	S12	55 to 57	24/24	WOR/24"		ORGANIC SOIL	S12: ORGANIC SILT (OL/OH); Similar to S11.
	60	S13	60 to 62	24/24	WOR/24"	Increased resistance while driving casing at ~59 ft.		S13: ORGANIC SILT (OL/OH); ~95% low plasticity fines, ~5% fine sand. Gray. Contains occasional organic fiber and ~30% shell fragments.
	-80							
	65	S14	65 to 67	24/24	WOR-11-12-11		SAND	S14: NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% fine sand, ~10% nonplastic fines. Gray. Contains few organic fibers.
	70	S15	70 to 70.1	2/1	50/1.5"	Drill rig chatter while washing out casing starting at ~70 ft.	BEDROCK	S15: SILTY SAND WITH GRAVEL (SM); ~70% fine sand, ~30% nonplastic fines, ~10% fine gravel up to 1/4". Gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,592
GROUND SURFACE EL. (ft): -17.4
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,375
DATE START/END: 8/7/2017 - 8/8/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-308**

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90								
	75	C1	73.7 to 78.7	60/55	78	Core barrel advancing slowly and bouncing in hole. Core times (min/ft): 24-16-14-15-10	BEDROCK	C1: GRANITIC GNEISS; Hard, slightly weathered, gray. Fractures are generally horizontal to 10 degrees from horizontal and are spaced 3 to 42" apart. Foliation visible at 20 degrees from horizontal.
	80	C2	78.7 to 83.7	60/52	77	Core times (min/ft): 7-9-11-7-6 Core barrel jammed twice while coring C2.		C2: GRANITIC GNEISS; Similar to C1, except fractures are spaced 1 to 27" apart.
-100								
	85							Bottom of boring at depth 83.7 ft. Borehole backfilled with cuttings.
	90							
-110								
	95							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,021

GROUND SURFACE EL. (ft): -16.6

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 75.6

LOGGED BY: S.Cote

EASTING (ft): 1,183,497

DATE START/END: 8/16/2017 - 8/17/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-309**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch / 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OL/OH); ~100% low plasticity fines. Gray. Contains trace shell fragments. Water content = 66.3%
-20	5	S2	5 to 7	24/19	WOR/24"			S2: ORGANIC SILT (OL/OH); Similar to S1. Water content = 78.1%
	10	S3	10 to 12	24/22	WOR/24"			S3: ORGANIC SILT (OL/OH); Similar to S1. Contains single 1/2" piece of gravel. Water content = 80.0%
-30	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC CLAY (OH); 96.9% low to medium plasticity fines, 3.1% mostly fine sand. Gray. Contains trace shell fragments. Water content = 63.1%. LL = 60, PI = 28. [Laboratory Grain Size Analysis and Atterberg Limits Performed]

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 685,021
GROUND SURFACE EL. (ft): -16.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,497
DATE START/END: 8/16/2017 - 8/17/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-309**

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"			S5: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains frequent shell fragments. Water content = 83.2%.
-40								
	25	S6	25 to 27	24/24	WOR/24"			S6: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains trace shell fragments. Water content = 84.7%.
	30	S7	30 to 32	24/24	WOR/24"			S7: ORGANIC CLAY (OH); Similar to S6. Water content = 78.4%.
-50								
	35	S8	35 to 37	24/24	WOR/24"			S8: ORGANIC CLAY (OH); Similar to S6. Contains trace wood fragments. Water content = 86.3%.
	40	S9	40 to 42	24/24	WOR/24"			S9: ORGANIC CLAY (OH); Similar to S6. Water content = 82.8%.
-60								
	45	S10	45 to 47	24/24	WOR/24"			S10: ORGANIC CLAY (OH); 97.9% low to medium plasticity fines, 2.1% mostly medium sand. Gray. Water content = 90.3%. LL = 100, PI = 56. [Laboratory Grain Size Analysis and Atterberg Limits

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,021
GROUND SURFACE EL. (ft): -16.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,497
DATE START/END: 8/16/2017 - 8/17/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-309

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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
								Performed]
	50	S11	50 to 52	24/24	WOR/12"- 4-WOH		ORGANIC SOIL	S11 (0-12): ORGANIC CLAY (OH); ~95% low plasticity fines, <5% fine to medium sand. Gray. Water content = 54.1%. S11 (12-24): ORGANIC CLAY (OH); ~95% low plasticity fines, <5% fine to medium sand. Gray. Contains ~40% shell fragments.
	55	S12	55 to 57	24/12	WOR/6"- 12-23-30		SAND AND GRAVEL	S12: WIDELY GRADED GRAVEL WITH SAND (GW); 58.3% fine to coarse gravel, 36.0% fine to coarse sand, 5.7% nonplastic fines. Gray. Water content = 10.5%. [Laboratory Grain Size Analysis Performed]
	60	S13	60 to 62	24/10	20-21- 30-29			S13: WIDELY GRADED GRAVEL WITH SAND (GW); ~60% fine to coarse gravel (up to 1"), ~35% fine to coarse sand, ~10% silt. Gray.
	65	C1	62.2 to 67.2	60/20	18	Core times (min/ft): 6,4,3,2,3	BEDROCK	C1: GRANITIC GNEISS; Hard, fresh to slightly weathered, gray. Fractures are horizontal to 70 degrees from horizontal and are spaced 0.5 to 8" apart. Foliation visible at about 40 degrees from horizontal.
	70	C2	70.6 to 75.6	60/58	93	Core times (min/ft): 7,3,5,3,4		C2: GRANITE: Similar to C1, except fractures are horizontal to 10 degrees from horizontal and are spaced 1 to 40" apart.
						Drilled through fractured rock 67.2 to 70.6 feet without coring.		

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,185
 GROUND SURFACE EL. (ft): -18.4
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 52.0
 LOGGED BY: S.Cote

EASTING (ft): 1,183,460
 DATE START/END: 8/18/2017 - 8/18/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-310**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20		S1	0 to 2	24/23	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray to dark gray. Contains trace shell fragments. Slight organic like odor.
5		S2	5 to 7	24/13	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
10		S3	10 to 12	24/24	WOR/24"			S3: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains trace shell fragments.
-30								
15		S4	15 to 17	24/23	WOR/24"			S4: ORGANIC CLAY (OH); Similar to S3.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 685,185
GROUND SURFACE EL. (ft): -18.4
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,460
DATE START/END: 8/18/2017 - 8/18/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-310**
PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40		S5	20 to 22	24	WOR/24"		ORGANIC SOIL	S5: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains trace shell fragments.
25		S6	25 to 27	24/12	WOR/24"			S6: ORGANIC CLAY (OH); Similar to S5.
30		S7	30 to 32	24/12	WOR/24"			S7: ORGANIC CLAY (OH); Similar to S5.
-50								
35		S8	35 to 37	24/22	WOR/24"			S8: ORGANIC CLAY (OH); Similar to S5.
40		S9	40 to 42	24/24	WOR/24"			S9: ORGANIC CLAY (OH); Similar to S5.
-60								
45		S10	45 to 47	24/24	WOR/24"			S10: ORGANIC CLAY (OH); Similar to S5. Contains frequent shell fragments.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-310**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
							ORGANIC SOIL	S11: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains few shell fragments.
50		S11	50 to 52	24/24	WOR/24"			
-70								Bottom of boring at depth 52 ft. Borehole backfilled with cuttings.
55								
60								
-80								
65								
70								
-90								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

PAGE 1 of 4



NORTHING (ft): 685,182
GROUND SURFACE EL. (ft): -16.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,455
DATE START/END: 8/24/2017 - 8/24/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-310A**

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40	25							Advanced to 50 feet without sampling. See log of GEI-310.
-50	35							Advanced to 50 feet without sampling. See log of GEI-310.
-60	45							Advanced to 50 feet without sampling. See log of GEI-310.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,182
GROUND SURFACE EL. (ft): -16.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,455
DATE START/END: 8/24/2017 - 8/24/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-310A**

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	S1	50 to 52	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~85% low to medium plasticity fines, ~15% fine sand. Gray.
-70	55	S2	55 to 57	24/12	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
	60	S3	60 to 62	24/24	WOR/24"			S3: ORGANIC CLAY (OH); Similar to S1.
							ORGANIC SOIL	
-80	65	S4	65 to 67	24/18	WOR/24"			S4: ORGANIC CLAY (OH); Similar to S1.
	70	S5	70 to 72	24/24	WOR/24"			S5: SANDY SILT WITH GRAVEL (ML); ~55% non-plastic fines, ~30% fine to medium sand, ~15% fine gravel. Gray. Contains shell fragments.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,182
GROUND SURFACE EL. (ft): -16.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,455
DATE START/END: 8/24/2017 - 8/24/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-310A**

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90	75	S6 C1	75 to 75.5 75.5 to 80.5	6/4 60/58	6-75/0" 97	Core times (min/ft): 6,7,5,4,4	ORGANIC SOIL	S6: SANDY SILT WITH GRAVEL (ML); ~40% non-plastic fines, ~40% fine to coarse sand, ~20% fine gravel. Gray. C1: GRANITIC GNEISS: Hard, fresh to slightly weathered, gray. One horizontal fracture at 37". Foliation visible at 20 degrees from horizontal.
-80		C2	80.5 to 85.5	60/57	95		BEDROCK	C2: GRANITIC GNEISS: Similar to C1, except there are two horizontal fractures at 13 and 25".
-100	85							Bottom of boring at depth 85.5 ft. Borehole backfilled with cuttings.
-90								
-110	95							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,324

GROUND SURFACE EL. (ft): -18.3

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 93.1

LOGGED BY: S.Cote

EASTING (ft): 1,183,408

DATE START/END: 8/8/2017 - 8/9/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-311**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20		S1	0 to 2	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OH/OL); ~100% low plasticity fines. Gray to dark gray. Strong organic like odor.
5		S2	5 to 7	24/22	WOR/24"			S2: ORGANIC SILT (OH/OL); Similar to S1. Contains occasional shell fragments.
10		S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OH/OL); ~100% low plasticity fines. Gray. Slight organic like odor. Occasional shell fragment.
-30								
15		S4	15 to 17	24/24	WOR/24"			S4: ORGANIC SILT (OH/OL); Similar to S3.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 685,324
GROUND SURFACE EL. (ft): -18.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,408
DATE START/END: 8/8/2017 - 8/9/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-311

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40		S5	20 to 22	24/24	WOR- WOH/18"		ORGANIC SOIL	S5: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray. Contains frequent shell fragments.
25		S6	25 to 27	24/10	WOR/24"			S6: ORGANIC SILT (OH/OL); ~100% low plasticity fines. Gray. Contains frequent shell fragments.
30		S7	30 to 32	24/24	WOR/24"			S7: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray. Contains occasional shell fragments.
-50								
35		S8	35 to 37	24/24	WOR/24"			S8: ORGANIC SILT (OH/OL); Similar to S7.
40		S9	40 to 42	24/24	WOR/12"- WOH/6"- 2	Increase in resistance driving casing at ~40 feet.		S9: ORGANIC SILT (OH/OL); Similar to S7. Contains wood fragment.
-60								
45		S10	45 to 47	24/24	WOR/12"- WOH/6"-			S10: ORGANIC SILT (OH/OL); Similar to S7.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,324
GROUND SURFACE EL. (ft): -18.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,408
DATE START/END: 8/8/2017 - 8/9/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-311**

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
					1			
	50	S11	50 to 52	24/10	WOR/6"- WOH/12"- 1			S11: ORGANIC SILT (OH/OL); ~100% low plasticity fines. Gray. Contains ~40% shell fragments up to 1/2".
	55	S12	55 to 57	24/24	WOR/24"			S12: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray. Contains frequent shell fragments and single wood fragment.
	60	S13	60 to 62	24/24	WOR/24"	Slower casing advancement at ~59 feet.	ORGANIC SOIL	S13: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray.
	65	S14	65 to 67	24/24	WOR/24"			S14: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray. ~3" layer containing frequent shell fragments.
	70	S15	70 to 72	24/24	WOR/24"			S15: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,324
GROUND SURFACE EL. (ft): -18.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,408
DATE START/END: 8/8/2017 - 8/9/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-311

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75		S16	75 to 77	24/24	WOR/24"		ORGANIC SOIL	S16: ORGANIC SILT (OH/OL); ~100% low to medium plasticity fines. Gray.
80		S17	80 to 82	24/24	WOH/18" 9			S17: ORGANIC SILT (OL/OH); ~95% low to medium plasticity fines, ~5% fine sand. Gray. (18-24) Contains wood fragments.
-100							SAND	S17 (18-24"): SILTY SAND (SM); ~80% fine sand, ~20% nonplastic fines. Gray. Frequent wood fragments.
85		C1	83.1 to 88.1	60/38	63	Rollerbit grinding at ~83 feet. Core times (min/ft): 5-6-9-6-8	BEDROCK	C1: GRANITIC GNEISS; hard, fresh, gray. Fractures are horizontal to 60 degrees from horizontal, and are spaced 4 to 6" apart. Foliation visible at 20 degrees from horizontal.
90		C2	88.1 to 93.1	60/60	88	Core times (min/ft): 8-7-5-6-9		C2: GRANITIC GNEISS; Similar to C1, except fractures are horizontal and spaced 0.5 to 32" apart.
-110								Bottom of boring at depth 93.1 ft. Borehole backfilled with cuttings.
95								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

BORING INFORMATION

NORTHING (ft): 684,644

GROUND SURFACE EL. (ft): -20.5

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 122.0

LOGGED BY: S.Cote

EASTING (ft): 1,183,259

DATE START/END: 8/18/2017 - 8/18/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-312**

PAGE 1 of 5

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NA

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"			S1: ORGANIC SILT (OL); ~100% low plasticity fines. Gray to dark gray. Strong organic like odor. Water content = 69.4%.
	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OL); Similar to S1. Water content = 77.3%.
-30	10	S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OL); Similar to S1. Water content = 74.5%.
	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC SILT (OL); Similar to S1. Water content = 63.7%.
-40							ORGANIC SOIL	

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 684,644
GROUND SURFACE EL. (ft): -20.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,259
DATE START/END: 8/18/2017 - 8/18/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-312**

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains trace shell fragments. Water content = 65.9%.
	25	S6	25 to 27	24/20	WOR/24"			S6: ORGANIC CLAY (OH); Similar to S5. Contains trace plant fibers. Water content = 68.1%.
-50	30	S7	30 to 32	24/23	WOR/24"			S7: ORGANIC CLAY (OH); Similar to S5. Water content = 76.5%.
	35	S8	35 to 37	24/24	WOR/24"			S8: ORGANIC CLAY (OH); 99.1% low to medium plasticity fines, 0.9% mostly fine sand. Gray. Water content = 79.5%. LL = 87, PI = 53. [Laboratory Grain Size Analysis and Atterberg Limits Performed]
-60	40	S9	40 to 42	24/24	WOR/24"			S9: ORGANIC CLAY (OH); ~100% low to medium plasticity fines. Gray. Contains trace shell fragments. Water content = 68.9%.
	45	S10	45 to 47	24/24	WOR/24"			S10: ORGANIC CLAY (OH); Similar to S9. Water content = 85.1%.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,644
GROUND SURFACE EL. (ft): -20.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,259
DATE START/END: 8/18/2017 - 8/18/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-312**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-70	50	S11	50 to 52	24/24	WOR/24"		ORGANIC SOIL	S11: ORGANIC CLAY (OH); 97.2% low to medium plasticity fines, 2.8% mostly fine sand. Gray. Water content = 57.1%. LL = 56, PI = 27. [Laboratory Grain Size Analysis and Atterberg Limits Performed]
55								
-80	60	S12	60 to 62	24/16	WOR/24"			S12: ORGANIC CLAY (OH); 98.0% low to medium plasticity fines, 2.0% mostly fine sand. Gray. Water content = 57.8%. LL = 53, PI = 23. [Laboratory Grain Size Analysis and Atterberg Limits Performed]
65								
-90	70	S13	70 to 72	24/24	WOR/24"			S13: ORGANIC SILT (OL); ~100% low plasticity fines. Gray. Contains trace shell fragments.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,644
GROUND SURFACE EL. (ft): -20.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,259
DATE START/END: 8/18/2017 - 8/18/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-312**

PAGE 4 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75								
-100								
80		S14	80 to 82	24/24	WOR/24"			S14: ORGANIC SILT (OL); ~100% low plasticity fines. Gray. Contains trace shell fragments.
85								
-110								
90		S15	90 to 92	24/24	WOR/24"		ORGANIC SOIL	S15: ORGANIC SILT (OL); ~100% low plasticity fines. Gray. Contains trace plant fibers.
95								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,644
GROUND SURFACE EL. (ft): -20.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,259
DATE START/END: 8/18/2017 - 8/18/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-312**

PAGE 5 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-120	100	S16	100 to 102	24/22	18-30- 25-19	Increased resistance driving casing at ~100 feet.	SAND AND GRAVEL	S16: WIDELY GRADED SAND WITH GRAVEL (SW); ~50% fine to coarse sand, ~45% fine to coarse gravel (up to 1"), ~5% silt. Gray.
-130	110	S17	110 to 112	24/8	10-12- 12-21			S17: NARROWLY GRADED SAND (SP); ~95% fine sand, <5% silt. Tan.
-140	120	S18	120 to 122	24/8	5-5-5-7			S18: NARROWLY GRADED SAND (SP); similar to S17.
								Bottom of boring at depth 122 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,865
 GROUND SURFACE EL. (ft): -14.8
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 48.0
 LOGGED BY: S.Cote

EASTING (ft): 1,183,471
 DATE START/END: 9/26/2017 - 9/27/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: N. Marmolejo
 RIG TYPE: CME 45

BORING**GEI-401**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/12	WOR/24"			S1: ORGANIC CLAY (OH); 100% medium to high plasticity fines. Gray. Contains frequent shell fragments.
-20	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC CLAY (OH); 100% medium to high plasticity fines. Gray. Contains shell fragments and plant/wood fibers.
10		S3	10 to 12	24/24	WOR/24"		ORGANIC SOIL	S3: ORGANIC CLAY (OH); 100% high plasticity fines. Gray. Contains shell fragments and plant/wood fibers.
-30	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC CLAY (OH); Similar to S3.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-401**

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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description		
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD					
		S5	20 to 22	24/24	WOR/24"	Rollerbit grinding at 33 feet.	ORGANIC SOIL	S5: ORGANIC CLAY (OH); 100% high plasticity fines. Gray. Contains occasional shell fragments.		
	-40	25	S6	25 to 27	24/24			WOR/24"	S6: ORGANIC CLAY (OH); Similar to S5.	
		30	S7	30 to 32	24/23		WOR/24"	S7: ORGANIC CLAY (OH); 100% high plasticity fines. Gray. Contains wood fibers.		
	-50	35	S8	35 to 37	24/7		3-11-17-20	SAND AND GRAVEL	S8: SILTY GRAVEL WITH SAND (GM); ~60% fine to coarse gravel (up to 1"), ~30% fine to coarse sand, ~10% medium plasticity fines.	
		40	C1	38 to 43	60/60		88	Core times (min/ft): 9,9,10,8,9	BEDROCK	C1: GRANITIC GNEISS; Hard, fresh to slightly weathered, gray. Fractures are horizontal to 10 degrees from horizontal and are spaced 0.5 to 24" apart. Foliation visible at 20-30 degrees from horizontal.
	45	C2	43 to 48	60/60	100	Core times (min/ft): 6,5,5,4,5	C2: GRANITIC GNEISS; Similar to C1, except fractures are spaced 10 to 20" apart.			

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,865
GROUND SURFACE EL. (ft): -14.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,471
DATE START/END: 9/26/2017 - 9/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-401
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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
							BEDROCK	
								Bottom of boring at depth 48 ft. Borehole backfilled with cuttings.
	50							
	55							
-70								
	60							
	65							
-80								
	70							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,903
 GROUND SURFACE EL. (ft): -13.0
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 41.3
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,552
 DATE START/END: 10/9/2017 - 10/9/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-402**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/8	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
	5							
	-20							
	10	S2	10 to 12	24/24	WOR/24"			S2: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, gray.
	15							
	-30							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,903
GROUND SURFACE EL. (ft): -13.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,552
DATE START/END: 10/9/2017 - 10/9/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-402**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S3	20 to 22	24/24	WOH			S3: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, gray.
	25						ORGANIC SILT	
	-40							
	30					Hard driving casing at 29 ft. Clear out with tricone. No sample.		
		C1	31.2 to 36.2	60/60	84	Core times (min/ft): 5, 6, 3, 3, 4		C1: GRANITIC GNEISS; Hard, fresh, gray and pink. Fractures are 10 to 20 degrees from horizontal and are spaced 2 to 28" apart. Foliation visible at 10-20 degrees from horizontal.
	35						BEDROCK	
	-50	C2	36.2 to 40.2	48/48	100	Core times (min/ft): 2, 3, 3, 3		C2: GRANITE; Hard, fresh, gray and pink. Fractures are 10 to 20 degrees from horizontal and are spaced 1 to 22" apart.
	40							
		C3	40.2 to 41.3	13/13	100	Core times (min/ft): 4		C3: GRANITE; Similar to C2, except fractures are horizontal and spaced 2 to 11" apart.
	45							Bottom of boring at depth 41.3 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,748
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 76.0
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,421
DATE START/END: 10/4/2017 - 10/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 4

HAMMER TYPE:	Automatic
AUGER I.D./O.D.:	NA / NA

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/2	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH); ~90% medium plasticity fines, ~10% fine sand, dark gray. Water Content = 123.2%.
-20	5							
10		X S2	10 to 12	24/24	WOR/24"			S2: ORGANIC SILT (OH); ~80% medium plasticity fines, ~20% fine sand, dark gray. Water Content = 89.4%. LL = 68, PI = 31. [Atterberg Limits Performed]
-30	15							

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS GPJ 11/30/17

NORTHING (ft): 685,748
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,421
DATE START/END: 10/4/2017 - 10/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-403

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S3	20 to 22	24/24	WOR/24"		ORGANIC SILT	S3: ORGANIC SILT (OH); ~80% medium plasticity fines, ~20% fine sand, dark gray. Water Content = 87.1%. LL = 85, PI = 50. [Atterberg Limits Performed]
-40	25							
		S4	30 to 32	24/24	WOR/24"			S4: ORGANIC SILT (OH); Similar to S3. Water Content = 72.8%. LL = 80, PI = 48. [Atterberg Limits Performed]
-50	35							
		S5	40 to 42	24/24	WOR/24"			S5: ORGANIC SILT (OH); Similar to S4.
-60	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,748
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,421
DATE START/END: 10/4/2017 - 10/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-403

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Resistance and chatter with tricone at 47.5 ft		
	50	S6	50 to 50.8	10/8	17-40/4"- 50/0"		SAND AND GRAVEL	S6: NARROWLY GRADED GRAVEL WITH SAND (GP); ~80% fine subrounded gravel, ~15% fine to coarse sand, ~5% fines, gray.
						Drilled through boulder 53-54 ft.		
-70	55	S7	54 to 55.3	16	14-18- 30/4"- 50/0"			S7: NARROWLY GRADED GRAVEL WITH SAND (GP); ~60% fine to coarse gravel up to 1", ~40% fine to coarse sand, gray.
		C1	58 to 63	60/37	20	Core times (min/ft): 2, 2, 6, 4, 6	GNEISS	C1: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are horizontal to 80 degrees from horizontal and are spaced <0.5 to 15" apart. Foliation visible at 20 degrees from horizontal.
	60							
		C2	63 to 65	24/20	45	Core times (min/ft): 4, 10		C2: GRANITIC GNEISS; Similar to C1, except fractures are horizontal to 10 degrees from horizontal and are spaced <0.5 to 9" apart.
-80	65					Removed 3" casing to replace spin shoe. Re-installed 3" casing to 66 ft and continued coring.		
		C3	66 to 71	60/59	98	Core times (min/ft): 5, 5, 3, 3		C3: GRANITIC GNEISS; Similar to C1, except fresh and no fractures. Pink and white intrusion at 10 to 30" and 44 to 46".
	70	C4	71 to 76	60/60	87	Core times (min/ft): 4, 3, 3, 3, 5		C4: GRANITIC GNEISS; Similar to C1, except fresh, fractures are horizontal and spaced 2 to 51" apart.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,748
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,421
DATE START/END: 10/4/2017 - 10/5/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-403**
PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90	75						GNEISS	
-100	85							Bottom of boring at depth 76 ft. Borehole backfilled with cuttings.
-110	95							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,578
GROUND SURFACE EL. (ft): -15.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 61.0
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,478
DATE START/END: 10/10/2017 - 10/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 3

HAMMER TYPE: Automatic

AUGER I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary

WATER LEVEL DEPTHS (ft): Not measured

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength N
Sv = Pocket Torvane Shear Strength Bl
LL = Liquid Limit 30
PI = Plasticity Index sp
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/19	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH); ~80% medium plasticity fines, ~20% fine sand, gray. Water Content = 97.4%. LL = 64, PI = 27. [Atterberg Limits Performed]
-20	5							
		X S2	10 to 12	24/19	WOR/24"			S2: ORGANIC SILT (OH); Similar to S1. Water Content = 69.3%. LL = 66, PI = 32. [Atterberg Limits Performed]
-30	15							

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,578
 GROUND SURFACE EL. (ft): -15.8
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,478
 DATE START/END: 10/10/2017 - 10/10/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-404

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S3	20 to 22	24/24	WOR/24"		ORGANIC SILT	S3: ORGANIC SILT (OH); ~80% medium plasticity fines, ~20% fine sand, gray. Water Content = 86.6%. LL = 88, PI = 48. [Atterberg Limits Performed]
-40	25							
		S4	30 to 32	24/24	WOR/24"			S4: ORGANIC SILT (OH/OL); Similar to S3.
-50	35							
		S5	40 to 42	24/24	WOR/24"		SAND	S5: SILTY SAND (SM); ~60% fine to medium sand, ~40% nonplastic fines, gray. Contains shell fragments.
-60	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,578
GROUND SURFACE EL. (ft): -15.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,478
DATE START/END: 10/10/2017 - 10/10/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-404
PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Increased drilling resistance and rig chatter at 48 ft.	SAND	S6: NARROWLY GRADED SAND WITH GRAVEL (SP); ~60% coarse sand, ~40% fine gravel, gray.
	50	S6	50 to 50.4	5	70/5"- 50/0"			
		C1	51 to 53	24/17	0	Core times (min/ft): 5, 9	BEDROCK	C1: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are 10 to 70 degrees from horizontal and spaced <0.5 to 3" apart. Foliation visible at 10 degrees from horizontal.
		C2	53 to 56	36/36	87	C1 barrel jammed at 53 ft. Core times (min/ft): 4, 3, 4		C2: GRANITIC GNEISS; Similar to C1, except fractures at horizontal to 20 degrees from horizontal and spaced 1 to 15" apart.
		C3	56 to 61	60/58	78	Core times (min/ft): 3, 3, 3, 3, 3		C3: GRANITIC GNEISS; Similar to C1, except fractures are horizontal to 10 degrees from horizontal and spaced 3 to 18" apart.
								Bottom of boring at depth 61 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,566
GROUND SURFACE EL. (ft): -14.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 56.0
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,597
DATE START/END: 10/12/2017 - 10/12/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 3

HAMMER TYPE: Automatic

AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength N
Sv = Pocket Torvane Shear Strength B
LL = Liquid Limit 30
PI = Plasticity Index sp
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-18	5	S1	0 to 2	24/24	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
-10	10	S2	10 to 12	24/24	WOR/24"			S2: ORGANIC SILT (OH/OL); Similar to S1.
-30	15							

GEI PROJECT NUMBER: 1702805

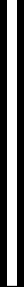


VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-405**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
			S3	20 to 22	24/24	WOR/24"	ORGANIC SILT	S3: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
			S4	30 to 31.9	23	33-29- 31- 100/5"	SAND AND GRAVEL	S4 (0-8"): NARROWLY GRADED (SP); ~85% fine to coarse sand, ~10% fine gravel, ~5% nonplastic fines, shells, gray. S4 (8-17"): SILTY SAND (SM); ~85% fine to medium sand, ~10% nonplastic fines, ~5% fine angular gravel, tan (weathered bedrock).
			C1	41 to 46	60/55	85	BEDROCK	C1: GRANITE; hard, slightly weathered, dark gray. Fractures are 10 to 30 degrees from horizontal and spaced 1 to 20" apart.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,566
GROUND SURFACE EL. (ft): -14.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,597
DATE START/END: 10/12/2017 - 10/12/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-405**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		C2	46 to 49	36/36	53	Core times (min/ft): 4, 4, 4	BEDROCK	C2: GRANITE; Similar to C1, except fractures are 10 to 60 degrees from horizontal. Highly fractured zone from 33 to 36". Light gray from 16 to 31".
	50	C3	49 to 51	24/24	100	C2 barrel jammed at 49 ft. Core times (min/ft): 4, 3		C3: GRANITIC GNEISS; Hard, fresh, gray. One 10 degree fracture at 12" from top of core. Foliation visible at 10 degrees from horizontal.
	55	C4	51 to 56	60/57	83	Core times (min/ft): 5, 6, 4, 5, 5		C4: GRANITIC GNEISS; Hard, fresh, gray. Fractures are horizontal to 30 degrees from horizontal and are spaced 3 to 25" apart. Foliation visible at 10 to 60 degrees from horizontal. Pink intrusion at 30 to 37".
	-70							Bottom of boring at depth 56 ft. Borehole backfilled with cuttings.
	60							
	65							
	-80							
	70							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-406**

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S3	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S3: ORGANIC CLAY (OH); ~80% medium plasticity fines, ~20% fine sand. Gray. Water Content = 80.1%. LL = 79, PI = 44. [Atterberg Limits Performed]
-40	25							
30		S4	30 to 32	24/24	WOR/24"			S4: ORGANIC CLAY (OH); Similar to S3. Water Content = 72.2%. LL = 80, PI = 46. [Atterberg Limits Performed]
-50	35							
40		S5	40 to 42	24/24	WOR/24"			S5: ORGANIC CLAY (OH); Similar to S3.
-60	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

NORTHING (ft): 685,444
GROUND SURFACE EL. (ft): -15.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,384
DATE START/END: 10/3/2017 - 10/3/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-406**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	S6	50 to 52	24/24	WOR/24"		ORGANIC SOIL	S6: ORGANIC CLAY (OH); ~80% medium plasticity fines, ~20% fine sand. Gray.
-70	55							
	60	S7	60 to 62	24/24	WOR/24"		ORGANIC SOIL	S7: ORGANIC CLAY (OH); Similar to S6.
-80	65						ORGANIC SOIL	
	70	S8	70 to 72	24/24	WOR/24"		ORGANIC SOIL	S8: ORGANIC CLAY (OH); Similar to S6. Contains trace plant/leaf material.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



PAGE 10 OF 9								
Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90	75					Core times (min/ft): 6,6,9	ORGANIC SOIL	
							SAND AND GRAVEL	S9: WIDELY GRADED SAND WITH GRAVEL (SW); ~50% fine to coarse sand, ~40% fine gravel, ~10% non-plastic fines. Gray.
-80		X	S9	80 to 81.5	18/12			27-130- 100/4"
-100	85							
						Core times (min/ft): 6,6,9	BOULDER	C1: GNEISS BOULDER; Hard, slightly weathered, gray.
-90			C1	88.5 to 91	30/13			
						Core times (min/ft): 3,4,4,4,5	BEDROCK	C2: GRANITIC GNEISS; Hard, fresh, gray. Fractures are horizontal to 10 degrees from horizontal and are spaced 3" to 43" apart. Foliation visible at 20 degrees from horizontal.
-110	95		C2	92 to 97	60/56			88
			C3	97 to 102	60/58	92		
						Core times (min/ft): 4,3,3,3,3		

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,444
GROUND SURFACE EL. (ft): -15.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,384
DATE START/END: 10/3/2017 - 10/3/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-406**

PAGE 5 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
100							BEDROCK	
-120	105							Bottom of boring at depth 102 ft. Borehole backfilled with cuttings.
-130	115							
120								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,357
GROUND SURFACE EL. (ft): -15.9
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 66.0
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,518
DATE START/END: 10/11/2017 - 10/11/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE:	<u>Automatic</u>	CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
AUGER I.D./O.D.:	<u>NA / NA</u>	DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>
DRILLING METHOD:	<u>Driven casing and washed with rotary tooling.</u>				
WATER LEVEL DEPTHS (ft):	<u>Not measured</u>				

ABBREVIATIONS:	Pen. = Penetration Length	S = Split Spoon Sample	Qp = Pocket Penetrometer Strength	NA, NM = Not Applicable, Not Measured
	Rec. = Recovery Length	C = Core Sample	Sv = Pocket Torvane Shear Strength	Blows per 6 in.: 140-lb hammer falling
	RQD = Rock Quality Designation	U = Undisturbed Sample	LL = Liquid Limit	30 inches to drive a 2-inch-O.D.
	= Length of Sound Cores>4 in / Pen.,%	SC = Sonic Core	PI = Plasticity Index	split spoon sampler.
	WOR = Weight of Rods	DP = Direct Push Sample	PID = Photoionization Detector	
	WOH = Weight of Hammer	HSA = Hollow-Stem Auger	I.D./O.D.= Inside Diameter/Outside Diameter	

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/24	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
	5							
	10	X S2	10 to 12	24/24	WOR/24"			S2: ORGANIC SILT (OH/OL); Similar to S1.
	15							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



PAGE 2 of 3

Consultants

GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,357
GROUND SURFACE EL. (ft): -15.9
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,518
DATE START/END: 10/11/2017 - 10/11/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-407**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X						
	50					Drilled through a boulder at 50-52 ft.	SAND AND GRAVEL	
	55							
	60	C1	56 to 61	60/60	93	Core times (min/ft): 4,4,4,5,4	BEDROCK	C1: GNEISS; Hard, fresh, gray. Fractures are horizontal to 10 degrees from horizontal and are spaced 3" to 20" apart. Foliation visible at 10 to 20 degrees from horizontal.
	65	C2	61 to 66	60/57	90	Core times (min/ft): 5,5,4,4,5		C2: GNEISS; Similar to C1, except fractures are spaced 3" to 30" apart. Pink intrusion at 23" to 37".
	70							Bottom of boring at depth 66 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,342
GROUND SURFACE EL. (ft): -14.9
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 42.8
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,649
DATE START/END: 10/2/2017 - 10/2/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 2

HAMMER TYPE: Automatic

AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

DRILLING METHOD: _____
WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength N
Sv = Pocket Torvane Shear Strength Bl
LL = Liquid Limit 30
PI = Plasticity Index sp
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Soil and Rock Sampling Log								
Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		<						

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,342
GROUND SURFACE EL. (ft): -14.9
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,649
DATE START/END: 10/2/2017 - 10/2/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-408

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24	WOR/24"	Core times (min/ft): 8,5,5,5,5	ORGANIC SOIL	S5: ORGANIC CLAY (OH); 80% medium plasticity fines, 20% fine sand. Gray.
		C1	24 to 29	60/49			BOULDERS	C1: GRANITE BOULDER; Hard, slightly weathered, gray.
		C2	29 to 32	36/12		Core times (min/ft): 4,6,4,4		C2: GNEISS BOULDER; Hard, slightly weathered, gray. Foliation visible at 10 to 20 degrees from horizontal.
		C3	32 to 37	60/54	90	Core times (min/ft): 4,5,4,5,6	BEDROCK	C3: GNEISS; Hard, slightly weathered to fresh, gray. Fractures are horizontal and spaced 9 to 22" apart. Foliation visible at 10 to 20 degrees from horizontal.
		C4	37 to 42	60/60	98	Core times (min/ft): 5,4,3,4,4		C4: GNEISS; Similar to C2, except core run has horizontal fractures at 51", 53", and 54".
								Bottom of boring at depth 42 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,324

GROUND SURFACE EL. (ft): -13.7

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 46.0

LOGGED BY: S.Cote/J. Shelkey

EASTING (ft): 1,183,701

DATE START/END: 9/27/2017 - 9/29/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: C. Chaillou

RIG TYPE: CME 45

BORING**GEI-409**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"			S1: ORGANIC CLAY (OH); 100% medium to high plasticity fines. Dark gray. Frequent organic fibers, organic-like odor.
	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
	10	S3	10 to 12	24/24	WOR/24"			S3: ORGANIC CLAY (OH); 100% high plasticity fines. Gray. Occasional organic fiber.
	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC CLAY (OH); Similar to S3.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 685,324
GROUND SURFACE EL. (ft): -13.7
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,701
DATE START/END: 9/27/2017 - 9/29/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-409

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC CLAY (OH); 100% high plasticity fines. Gray. Occasional organic fiber.
	25	S6	25 to 27	24/24	WOR/12" WOH-2		SAND	S6: SILTY SAND (SM); ~60% mostly fine to medium sand, ~40% silt. Gray. Contains shell fragments.
	30	S7	30 to 32	24/6	13-27- 30-36			S7: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~40% fine to medium gravel, ~10% silt. Gray.
		C1	32 to 35	36/30			BOULDERS	C1: GRANITE BOULDER
	35	C2	35 to 40	60/49	82	Core times (min/ft): 4,5,4,8,5		C2: GRANITE; hard. Fractures at 20 degrees off of horizontal. light gray/pink (0-36), black (36-44), gray (44-49), slightly weathered joints.
	40	C3	40 to 41	12/11	92	Core times (min/ft): 5	BEDROCK	C3: GNEISS; hard, gray, joints slightly weathered.
		C4	41 to 46	60/59	93	Core times (min/ft): 5,4,6,5,5		C4: GNEISS; gray (0-55), black (55-60), hard. Fractures at 20 degrees off of horizontal.
	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: Borehole backfilled with cuttings.
Borehole backfilled with cuttings.

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,197
GROUND SURFACE EL. (ft): -16.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 72.0
LOGGED BY: J. Shelkey

EASTING (ft): 1,183,505
DATE START/END: 10/12/2017 - 10/12/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: C. Chaillou
RIG TYPE: CME 45

PAGE 1 of 3

HAMMER TYPE:	Automatic
AUGER I.D./O.D.:	NA / NA
DRILLING METHOD:	Driven casing and washed with rotary
WATER LEVEL DEPTHS (ft):	Not measured

CASING I.D./O.D.:	<u>4 inch/ 4.5 inch</u>	CORE BARREL TYPE:	<u>NX</u>
DRILL ROD O.D.:	<u>2.625 inch</u>	CORE BARREL I.D./O.D.:	<u>2.125 inch / 3 inch</u>

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores>4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength N
Sv = Pocket Torvane Shear Strength B
LL = Liquid Limit 30
PI = Plasticity Index sp
PID = Photoionization Detector
I.D./O.D.= Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling
30 inches to drive a 2-inch-O.D.
split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
-20	5							
10		X S2	10 to 12	24/24	WOR/24"			S2: ORGANIC SILT (OH/OL); Similar to S1
-30	15							

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-410**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S3	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S3: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
-40	25							
30		S4	30 to 32	24/24	WOR/24"			S4: ORGANIC SILT (OH/OL); Similar to S3.
-50	35							
40		S5	40 to 42	24/24	WOR/24"			S5: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, trace shell hash, gray.
-60	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,197
 GROUND SURFACE EL. (ft): -16.8
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,505
 DATE START/END: 10/12/2017 - 10/12/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-410

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
50		S6	50 to 52	24/18	2-3-4-49		SAND AND GRAVEL	S6: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% angular to subangular fine gravel, ~20% nonplastic fines, trace shell hash, gray. Angular gravel is gneiss.
55								
		C1	56 to 61	60/60	93	Core times (min/ft): 7-7-7-7-7	BEDROCK	C1: GRANITIC GNEISS; hard, fresh, gray. Fractures are generally horizontal to 10 degrees from horizontal and are spaced 3" to 10" apart. Foliation visible at 45 to 60 degrees from horizontal.
60		C2	61 to 66	60/41	60	Core times (min/ft): 10-7-8-6-7		C2: GRANITIC GNEISS; Similar to C1, except fractures are spaced 0.5" to 22" apart.
65						Advanced 3" casing through fractured rock to 67 ft.		
		C3	67 to 72	60/60	95	Core times (min/ft): 5-6-4-4-4		C3: GRANITIC GNEISS; Similar to C1.
70								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation
 Borehole backfilled with cuttings.

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

BORING INFORMATION

NORTHING (ft): 685,192
 GROUND SURFACE EL. (ft): -18.0
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 17.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,653
 DATE START/END: 10/5/2017 - 10/6/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-411**

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20		S1	0 to 2	24/4	WOR/24"	Core times (min/ft): 6, 6, 5, 5, 5	ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~80% medium plasticity fines, ~20% mostly fine sand. Gray.
5								
10		C1	7 to 12	60/60	90		BEDROCK	C1: GRANITIC GNEISS; Hard, slightly weathered, gray. Fractures are horizontal to 30 degrees from horizontal, and are spaced 0.5" to 30" apart. Foliation visible at 20 to 30 degrees from horizontal.
-30		C2	12 to 17	60/60	90	Core times (min/ft): 5, 5, 5, 5, 7		C2: GRANITIC GNEISS; Similar to C1, except fractures are horizontal to 45 degrees from horizontal and are spaced 1" to 27" apart.
15								Bottom of boring at depth 17 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,968

GROUND SURFACE EL. (ft): -14.8

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 29.5

LOGGED BY: S. Sarandis

EASTING (ft): 1,183,664

DATE START/END: 9/15/2017 - 9/15/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: N. Marmolejo

RIG TYPE: CME 45

BORING**GEI-412**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch/ 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/2	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~95% medium plasticity fines, ~5% fine sand, dark gray to black.
		S2	2 to 4	24/24	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
-20	5	S3	5 to 7	24/24	WOR/24"			S3: ORGANIC CLAY WITH SAND (OH); ~85% medium plasticity fines, ~15% fine sand, dark gray.
							SAND AND GRAVEL	
10		S4	10 to 12	24/17	WOR/6"- 8-10-10			S4: SILTY SAND WITH GRAVEL (SM); ~55% fine to coarse sand, ~30% subrounded fine to coarse gravel, ~15% nonplastic fines, gray.
-30	15	S5	15 to 17	24/16	24-37- 46-60			S5: SILTY SAND WITH GRAVEL (SM); ~50% fine to coarse sand, ~30% subrounded fine to coarse gravel, ~20% nonplastic fines, zones and pockets of completely weathered rock, gray.
						Bedrock, based on action of roller bit. Roller bit to 20', set 3" casing.		

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 684,968
GROUND SURFACE EL. (ft): -14.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,664
DATE START/END: 9/15/2017 - 9/15/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-412
PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		C1	20 to 25	60/54	73		BEDROCK	C1: GRANITIC GNEISS; Hard, fresh, 0-12" is gray, 12-54" is black. Fractures are 10 to 20 degrees from horizontal and are spaced 1" to 24" apart. Foliation visible at 20 to 30 degrees from horizontal.
-40	25	C2	25 to 29.5	54/51	89			C2: GRANITIC GNEISS; Hard, fresh, 0-31" is black, 31-51" is gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 1" to 24" apart. Foliation visible at 20 to 30 degrees from horizontal.
	30							Bottom of boring at depth 29.5 ft. Borehole backfilled with cuttings.
-50	35							
	40							
-60	45							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,844

GROUND SURFACE EL. (ft): -14.3

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

TOTAL DEPTH (ft): 24.2

LOGGED BY: J. Shelkey

EASTING (ft): 1,183,717

DATE START/END: 9/18/2017 - 9/18/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

DRILLER NAME: N. Marmolejo

RIG TYPE: CME 45

BORING**GEI-413**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic

CASING I.D./O.D.: 4 inch / 4.5 inch

CORE BARREL TYPE: NX

AUGER I.D./O.D.: NA / NA

DRILL ROD O.D.: 2.625 inch

CORE BARREL I.D./O.D.: 2.125 inch / 3 inch

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description	
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD				
-20		S1	0 to 2	24/7	WOR/24"		ORGANIC SOIL	S1: ORGANIC SILT (OH); ~95% medium plasticity fines, ~5% fine sand, dark gray.	
	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OH); Similar to S1.	
	10	S3	10 to 12	24/24	WOR/24"		S3: ORGANIC SILT (OH); Similar to S1.		
-30		S4	12 to 12.1	1/1	50/1"	Increased drilling resistance at 12 ft. Core times (min/ft): 7, 7, 6, 7, 11	BEDROCK	S4: NARROWLY GRADED GRAVEL WITH SAND (GP); ~60% angular fine gravel, ~40% medium fine sand, gray. Gravel appears to be weathered bedrock.	
		C1	12.1 to 12.5 to 17.5	60/54	88			C1: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 1" to 15" apart. Foliation visible at 10 to 20 degrees from horizontal.	
	15								
		C2	17.5 to 18.5	12/9	25			Core barrel plugged from 17.5 to 18.5 ft.	C2: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 1" to 5" apart. Foliation visible at 10 to 20 degrees from horizontal.
		C3	18.5 to 23.5	60/54	90	Core times (min/ft): 6, 5, 6, 6, 6		C3: GRANITIC GNEISS; Similar to C1, except fractures are spaced 8" to 15" apart.	

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI

Consultants

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,717

DATE START/END: 9/18/2017 - 9/18/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-413**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20								
-25		C4	23.5 to 24.2	8/8	100	Terminated boring when kelly bar broke.	BEDROCK	C4: GRANITIC GNEISS; Similar to C1, except no fractures.
-40								Bottom of boring at depth 24.2 ft. Borehole backfilled with cuttings.
-30								
-35								
-50								
-40								
-45								
-60								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,633
 GROUND SURFACE EL. (ft): -16.7
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 89.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,508
 DATE START/END: 10/17/2017 - 10/17/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 45

BORING**GEI-414**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.2125 inch / 3 inch
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"		ORGANIC SILT	S1: ORGANIC SILT (OH/OL); ~90% medium plasticity fines, ~10% fine sand, gray.
-20	5	S2	5 to 7	24/24	WOR/24"			S2: ORGANIC SILT (OH/OL); Similar to S1.
	10	S3	10 to 12	24/24	WOR/24"			S3: ORGANIC SILT (OH/OL); Similar to S1.
-30	15	S4	15 to 17	24/24	WOR/24"			S4: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,633
GROUND SURFACE EL. (ft): -16.7
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,508
DATE START/END: 10/17/2017 - 10/17/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-414

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SILT	S5: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand, gray.
-40								
	25	S6	25 to 27	24/24	WOR/24"			S6: ORGANIC SILT (OH/OL); Similar to S5.
	30	S7	30 to 32	24/24	WOR/24"			S7: ORGANIC SILT (OH/OL); ~95% medium plasticity fines, ~5% fine sand, gray.
-50								
	35	S8	35 to 37	24/24	WOR/24"			S8: ORGANIC SILT (OH/OL); Similar to S7.
	40	S9	40 to 42	24/24	WOR/24"			S9: ORGANIC SILT (OH/OL); Similar to S7.
-60								
	45	S10	45 to 47	24/24	WOR/24"			S10: ORGANIC SILT (OH/OL); Similar to S7.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,633
GROUND SURFACE EL. (ft): -16.7
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,508
DATE START/END: 10/17/2017 - 10/17/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-414**

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	S11	50 to 52	24/20	WOR/24"			S11: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, gray.
-70								
	55	S12	55 to 57	24/24	WOR/24"			S12: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, gray. Trace shell hash
	60	S13	60 to 62	24/24	WOR/24"			S13: ORGANIC SILT (OH/OL); ~70% medium plasticity fines, ~30% fine sand, gray.
-80								
	65	S14	65 to 67	24/24	WOR/24"			S14: ORGANIC SILT (OH/OL); Similar to S13.
	70	S15	70 to 72	24/22	WOR/24"			S15: ORGANIC SILT (OH/OL); Similar to S13.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,633
GROUND SURFACE EL. (ft): -16.7
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,508
DATE START/END: 10/17/2017 - 10/17/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-414**

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-90		S16	73 to 75	24/8	50-89- 44-36		SAND AND GRAVEL	S16: WIDELY GRADED SAND (SW); ~95% fine to coarse sand, ~5% silt, gravel lodged in tip of split spoon, gray.
75								
		C1	79 to 84	60/59	95		BEDROCK	C1: GRANITIC GNEISS; Hard, fresh to slightly weathered, gray. Fractures are horizontal to 10 degrees from horizontal and are spaced 2" to 14" apart. Foliation visible at 10 to 45 degrees from horizontal.
80								
		C2	84 to 89	60/53	83			C2: GRANITIC GNEISS; Similar to C1, except fractures are spaced 1" to 36" apart.
-100								
85								
90								Bottom of boring at depth 89 ft. Borehole backfilled with cuttings.
-110								
95								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,658
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
TOTAL DEPTH (ft): 59.0
LOGGED BY: S.Cote

EASTING (ft): 1,183,660
DATE START/END: 9/25/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
DRILLER NAME: N. Marmolejo
RIG TYPE: CME 45

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic **CASING I.D./O.D.:** 4 inch/ 4.5 inch **CORE BARREL TYPE:** NX
AUGER I.D./O.D.: NA / NA **DRILL ROD O.D.:** 2.625 inch **CORE BARREL I.D./O.D.:** 2.125 inch / 3 inch
DRILLING METHOD: Driven casing and washed with rotary tooling.
WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length	S = Split Spoon Sample	Qp = Pocket Penetrometer Strength	NA, NM = Not Applicable, Not Measured
Rec. = Recovery Length	C = Core Sample	Sv = Pocket Torvane Shear Strength	Blows per 6 in.: 140-lb hammer falling
RQD = Rock Quality Designation	U = Undisturbed Sample	LL = Liquid Limit	30 inches to drive a 2-inch-O.D.
= Length of Sound Cores > 4 in / Pen., %	SC = Sonic Core	PI = Plasticity Index	split spoon sampler.
WOR = Weight of Rods	DP = Direct Push Sample	PID = Photoionization Detector	
WOH = Weight of Hammer	HSA = Hollow-Stem Auger	I.D./O.D. = Inside Diameter/Outside Diameter	

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S1	0 to 2	24/10	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~100% medium plastic fines, contains shell fragments, strong organic odor. Dark gray.
-20	5	X S2	5 to 7	24/4	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
10		X S3	10 to 12	24/20	WOR/24"			S3: ORGANIC CLAY (OH); ~100% high plastic fines, contains shell fragments. Gray.
-30	15	X S4	15 to 17	24/24	WOR/24"			S4: ORGANIC CLAY (OH); ~100% high plastic fines, contains shell fragments, contains trace organic fibers. Gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,658
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,660
DATE START/END: 9/25/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-415**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S5	20 to 22	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC CLAY (OH); ~95% high plastic fines, ~5% fine sand. Gray.
-40	25					Attempted to core 26-29 ft with no recovery. Possible weathered rock.		
		C1	29 to 34	60/60	88	Core times (min/ft): 6,6,7,5,5	BEDROCK	C1: GRANITIC GNEISS; Hard, slightly weathered, gray. Fractures are horizontal to 20 degrees and are spaced 0.5" to 13" apart. Foliation visible at 10 to 20 degrees from horizontal.
-50	35	C2	34 to 39	60/55	90	Core times (min/ft): 6,5,5,5,5		C2: GRANITE: Similar to C1, except fractures are 10 to 45 degrees from horizontal and are spaced <0.5" to 25" apart.
		C3	39 to 44	60/49	70	Core times (min/ft): 4,4,5,5,4		C3: GRANITE: Hard, slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 0.5" to 10" apart. Foliation visible at 10 to 20 degrees from horizontal.
-60	45	C4	44 to 49	60/58	82	Core times (min/ft): 4,6,6,5,5		C4: GRANITE: Similar to C3, fractures are horizontal to 45 degrees from horizontal and are spaced 2" to 22" apart.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,658
GROUND SURFACE EL. (ft): -15.3
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,660
DATE START/END: 9/25/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-415**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	50	C5	49 to 54	60/55	57	Core times (min/ft): 7,8,9,9,9	BEDROCK	C5: GRANITE: Similar to C3, except fractures are spaced 5.5 to 12" apart.
-70	55	C6	54 to 59	60/58	45	Core times (min/ft): 8,6,6,7,6		C6: GRANITE: Hard, slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 0.5" to 8" apart. Foliation visible at 10 to 20 degrees from horizontal.
	60							Bottom of boring at depth 59 ft. Borehole backfilled with cuttings.
-80	65							
	70							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,112
GROUND SURFACE EL. (ft): -19.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,236
DATE START/END: 9/26/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-416**

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40		S2	20 to 22	24/24	WOR/24"	$Q_p = 0.0$ tsf	ORGANIC SOIL	S2: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand. Dark gray.
25								
30								
-50								
35								
40		S3	40 to 42	24/22	WOR/24"	$Q_p = 0.0$ tsf		S3: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand. Dark gray.
-60								
45								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,112
GROUND SURFACE EL. (ft): -19.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,236
DATE START/END: 9/26/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-416**

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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
50								
-70								
55		U1	55 to 57	24/11	PUSH			U1: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand. Dark gray.
		S4	57 to 59	24/24	WOR/24"	Q _p = 0.0 tsf	ORGANIC SOIL	S4: ORGANIC CLAY (OH); Similar to U1, trace shell hash.
60								
-80								
65		U2	65 to 67	24/24	PUSH	Q _p = 0.2, 0.15 tsf S _v = 0.5 tsf		U2: SANDY ORGANIC SILT (OL); ~65% low plasticity fines, ~35% fine sand. Dark gray.
		S5	67 to 69	24/24	WOR/24"	Q _p = 0.0 tsf		S5: SANDY ORGANIC SILT (OL); ~65% low plasticity fines, ~35% fine sand. Dark gray.
70								
-90								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,112
GROUND SURFACE EL. (ft): -19.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,236
DATE START/END: 9/26/2017 - 9/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-416**

PAGE 4 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75								
		S6	76.3 to 78.3	24/24	WOR/24"			S6: SANDY ORGANIC SILT (OL); ~65% low plasticity fines, ~35% fine sand. Dark gray.
80								
-100								
85								
		S7	87 to 89	24/24	WOR/24"		ORGANIC SOIL	S7: SANDY ORGANIC SILT (OL); Similar to S6.
90								
-110								
		S8	93 to 95	24/16	37-24- 31-36			S8: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); ~60% mostly fine gravel, ~30% fine to coarse sand, ~10% nonplastic fines. Gray.
95							SAND AND GRAVEL	

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-416**

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Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-100						Q _p = 0.5, 0.25 tsf	SAND AND GRAVEL	S9: SILTY SAND (SM); ~70% fine sand, ~30% nonplastic fines. Brown.
-105		S9	104 to 106	24/16	17-23-28-25			
-110								Bottom of boring at depth 106 ft. Borehole backfilled with cuttings.
-120								
-130								
-140								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

BORING INFORMATION

NORTHING (ft): 684,976
 GROUND SURFACE EL. (ft): -17.6
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 105.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,349
 DATE START/END: 9/27/2017 - 9/27/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 55

BORING**GEI-417**

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DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"	Q _p = 0.0 tsf	ORGANIC SOIL	S1: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Gray.
-20	5							
	10							
-30	15							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



NORTHING (ft): 684,976
GROUND SURFACE EL. (ft): -17.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,349
DATE START/END: 9/27/2017 - 9/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-417

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S2	20 to 22	24/24	WOR/24"	$Q_p = 0.0$ tsf	ORGANIC SOIL	S2: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Gray.
-40								
25								
30		S3	30 to 32	24/24	WOR/24"	$Q_p = 0.0$ tsf		S3: ORGANIC CLAY WITH SAND (OH); Similar to S2.
-50							ORGANIC SOIL	
35								
40		U1	40 to 42	24/24		$Q_p = 0.25, 0.5$ tsf $S_v = 0.2, 0.25, 0.27$ tsf		U1: SANDY ORGANIC CLAY (OH); ~70% medium plasticity fines, ~30% fine sand. Gray.
-60		S4	42 to 44	24/24	WOR/24"	$Q_p = 0.0$ tsf		S4: SANDY ORGANIC CLAY (OH); ~70% medium plasticity fines, ~30% fine sand. Gray.
45								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,976
GROUND SURFACE EL. (ft): -17.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,349
DATE START/END: 9/27/2017 - 9/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-417**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
50								
-70								
55								
60		U2	60 to 62	24/23		$Q_p = 0.0, 0.25 \text{ tsf}$ $S_v = 0.15, 0.17, 0.18 \text{ tsf}$	ORGANIC SOIL	U2: SANDY ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Gray.
-80		S5	62 to 64	24/24	WOR/24"	$Q_p = 0.25 \text{ tsf}$		S5: SANDY ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Gray.
65								
70								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,976
GROUND SURFACE EL. (ft): -17.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,349
DATE START/END: 9/27/2017 - 9/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-417**

PAGE 4 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75							ORGANIC SOIL	S6: SANDY ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Gray.
80		S6	80 to 82	24/24	WOR/24"			
-100							SAND AND GRAVEL	S7 (0-12): SANDY ORGANIC SILT (OL); Similar to S6. S7 (12-17): SILTY SAND (SM); ~50% fine sand, ~40% non-plastic fines, ~10% fine gravel. Gray.
85								
90		S7	89.5 to 91.5	24/17	7-9-16- 42			
-110								
95								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,976
GROUND SURFACE EL. (ft): -17.6
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,349
DATE START/END: 9/27/2017 - 9/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-417**

PAGE 5 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
100		S8	100 to 102	24/16	43-20- 30-42		SAND AND GRAVEL	S8: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~60% fine to medium sand, ~30% fine to coarse gravel up to 1", ~10% non-plastic fines. Gray.
-120								
105								Bottom of boring at depth 105 ft. Borehole backfilled with cuttings.
110								
-130								
115								
120								
-140								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,788
 GROUND SURFACE EL. (ft): -16.1
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 70.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,484
 DATE START/END: 9/28/2017 - 9/28/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 55

BORING**GEI-418**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD:
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"	Q _p = 0.0 tsf	ORGANIC SOIL	S1: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Gray.
-20	5							
-30	10							
	15							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI Consultants



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-418**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S2	20 to 22	24/4	WOR/24"	Q _p = 0.0 tsf	ORGANIC SOIL	S2: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Gray.
	25							
	30	S3	30 to 32	24	WOR/24"	Q _p = 0.0 tsf		S3: ORGANIC CLAY WITH SAND (OH); Similar to S2.
	35							
	40							
	45	U1	44 to 46	24/22		Q _p = 0.25, 0.5 tsf S _v = 0.25, 0.30 tsf		U1: ORGANIC CLAY WITH SAND (OH); Similar to S2. Shells throughout.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,788
GROUND SURFACE EL. (ft): -16.1
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,484
DATE START/END: 9/28/2017 - 9/28/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-418**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S4	46 to 48	24/20	WOR/24"		ORGANIC SOIL	S4: GRAVELLY SILT WITH SAND (ML); ~50% low plasticity fines, ~30% fine gravel, ~20% fine sand.
	50							
	-70							
	55							
	60	S5	60 to 62	24	WOR/6"- 11-17-17		SAND AND GRAVEL	S5 (0-6"): GRAVELLY SILT WITH SAND (ML); Similar to S4.
								S5 (6-24"): WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% fine to coarse sand, ~20% fine gravel, ~15% non-plastic fines.
	-80							
	65	S6	67.5 to 69.5	24/16	58-64- 72-90			S6: SILTY SAND WITH GRAVEL (SM); ~55% fine to coarse sand, ~40% fine to coarse gravel up to 1", ~5% non-plastic fines. Gray.
	70	S7	70 to 70	0/0	50/0"			S7: No sample penetration.
								Bottom of boring at depth 70 ft. Borehole backfilled with cuttings.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,079
 GROUND SURFACE EL. (ft): -32.8
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 127.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,119
 DATE START/END: 9/25/2017 - 9/25/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 55

BORING**GEI-419**

PAGE 1 of 6

DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"			S1: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Dark gray.
5								
-40								
10								
15		S2	15 to 17	24/24	WOR/24"			S2: ORGANIC CLAY WITH SAND (OH); Similar to S1.
-50								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,079
GROUND SURFACE EL. (ft): -32.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,119
DATE START/END: 9/25/2017 - 9/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-419**

PAGE 2 of 6

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
25								
-60								
30		S3	30 to 32	24/24	WOR/24"			S3: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Dark gray. Contains trace shell fragments.
35							ORGANIC SOIL	
-70								
40								
45		U1	45 to 47	24/10				U1: ORGANIC CLAY WITH SAND (OH); Similar to S3.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,079
GROUND SURFACE EL. (ft): -32.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,119
DATE START/END: 9/25/2017 - 9/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-419

PAGE 3 of 6

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-80		S4	47 to 49	24/24	WOR/24"		ORGANIC SOIL	S4: ORGANIC SILT WITH SAND (OL); ~80% low plasticity fines, ~20% fine sand. Dark gray.
50								
55		U2	55 to 57	24/11				U2: ORGANIC SOIL WITH SAND (OL); Similar to S4.
-90		S5	57 to 59	24/24	WOR/24"			S5: ORGANIC CLAY WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Dark gray.
60								
65		S6	65 to 67	24/24	WOR/24"			S6: ORGANIC SILT WITH SAND (OL); ~80% low plasticity fines, ~20% fine sand. Dark gray.
-100								
70								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,079
GROUND SURFACE EL. (ft): -32.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,119
DATE START/END: 9/25/2017 - 9/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-419**

PAGE 4 of 6

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75		S7	75 to 77	24/24	WOR/24"		ORGANIC SOIL	S7: SANDY ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Dark gray.
-110								
80							SAND	
85		S8	85 to 87	24/14	29-56- 48-20			S8: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~50% fine to coarse sand, ~40% fine to coarse gravel up to 1", ~10% low plasticity fines. Brown.
-120							SAND	
90								
95							SAND	
-130								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,079
GROUND SURFACE EL. (ft): -32.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,119
DATE START/END: 9/25/2017 - 9/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-419
PAGE 5 of 6

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
100								
105		S9	105 to 107	24/17	13-18- 18-19			S9: SILTY SAND (SM); 70% fine sand, ~30% non-plastic fines.
-140								
110								
115								
-150								
120								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,079
GROUND SURFACE EL. (ft): -32.8
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,119
DATE START/END: 9/25/2017 - 9/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-419**

PAGE 6 of 6

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
125		S10	125 to 127	24/13	16-30- 36-54		SAND	S10: WIDELY GRADED SAND WITH GRAVEL (SW); ~65% fine to coarse sand, ~30% fine gravel, ~5% non-plastic fines. Contains weathered bedrock fragments.
-160								Bottom of boring at depth 127 ft. Borehole backfilled with cuttings.
130								
135								
-170								
140								
145								
-180								
150								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,878
 GROUND SURFACE EL. (ft): -18.0
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 100.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,279
 DATE START/END: 9/13/2017 - 9/15/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: N. Marmolejo
 RIG TYPE: CME 45

BORING**GEI-420**

PAGE 1 of 5

DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20								
5								
10		S1	10 to 12	24/12	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
-30								
15								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-420**

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40								
25								
30		S2	30 to 32	24/24	WOR/24"			S2: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
-50							ORGANIC SOIL	
35								
40								
-60								
45								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

NORTHING (ft): 684,878
GROUND SURFACE EL. (ft): -18.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,279
DATE START/END: 9/13/2017 - 9/15/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-420**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
50								
-70		U1	52 to 54	24/18	PUSH			U1: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
55		S3	54 to 56	24/24	WOR/24"			S3: ORGANIC CLAY (OH); ~85% medium plasticity fines, ~10% fine sand, ~5% shells and plant fiber, gray.
60								
-80		U2	62 to 64	24/18	PUSH			U2: ORGANIC CLAY (OH); ~85% medium plasticity fines, ~10% fine sand, ~5% shells and plant fiber, gray.
65		S4	64 to 66	24/24	WOR/24"			S4: ORGANIC CLAY (OH); ~85% medium plasticity fines, ~10% fine sand, ~5% shells and plant fiber, gray.
70								
-90								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,878
GROUND SURFACE EL. (ft): -18.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,279
DATE START/END: 9/13/2017 - 9/15/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-420
PAGE 4 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75								
80		U3	80 to 82	24/19	PUSH			U3: ORGANIC CLAY (OH); ~85% medium plasticity fines, ~10% fine sand, ~5% shells and plant fiber, gray.
-100		S5	82 to 84	24/24	WOR/24"			S5: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
85		U4	84.5 to 86.5	24/17	PUSH			U4: ORGANIC CLAY (OH); ~95% high plasticity fines, ~5% fine sand, gray.
		S6	86.5 to 88.5	24/10	WOR/24"			S6: ORGANIC CLAY (OH); ~95% medium plasticity fines, ~5% fine sand, gray.
90								
-110		U5	93 to 95	24/8	PUSH			U5: ORGANIC CLAY (OH); ~95% medium plasticity fines, ~5% fine sand, gray.
95		S7	95 to 96.6	19/19	WOR/18" 50/1"			S7 (0-12"): ORGANIC CLAY (OH); ~95% medium plasticity fines, ~5% fine sand, gray.
							SAND	S7 (12-19"): WIDELY GRADED SAND WITH GRAVEL (SW). Cobble in tip.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 684,878
GROUND SURFACE EL. (ft): -18.0
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,279
DATE START/END: 9/13/2017 - 9/15/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-420
PAGE 5 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
							SAND	
	100							Bottom of boring at depth 100 ft. Borehole backfilled with cuttings.
	-120							
	105							
	110							
	-130							
	115							
	120							
	-140							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,709
 GROUND SURFACE EL. (ft): -17.2
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 100.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,359
 DATE START/END: 9/11/2017 - 9/12/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: N. Marmolejo
 RIG TYPE: CME 45

BORING**GEI-421**

PAGE 1 of 5

DRILLING INFORMATION

HAMMER TYPE: Automatic
 AUGER I.D./O.D.: NA / NA

CASING I.D./O.D.: 4 inch/ 4.5 inch
 DRILL ROD O.D.: 2.625 inch

CORE BARREL TYPE: NA
 CORE BARREL I.D./O.D.: NA / NA

DRILLING METHOD: Driven casing and washed with rotary tooling.

WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS:

Pen. = Penetration Length
 Rec. = Recovery Length
 RQD = Rock Quality Designation
 = Length of Sound Cores > 4 in / Pen., %
 WOR = Weight of Rods
 WOH = Weight of Hammer

S = Split Spoon Sample
 C = Core Sample
 U = Undisturbed Sample
 SC = Sonic Core
 DP = Direct Push Sample
 HSA = Hollow-Stem Auger

Qp = Pocket Penetrometer Strength
 Sv = Pocket Torvane Shear Strength
 LL = Liquid Limit
 PI = Plasticity Index
 PID = Photoionization Detector
 I.D./O.D. = Inside Diameter/Outside Diameter

NA, NM = Not Applicable, Not Measured
 Blows per 6 in.: 140-lb hammer falling
 30 inches to drive a 2-inch-O.D.
 split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-20	5							
10		S1	10 to 12	24/24	WOR/24"		ORGANIC SOIL	S1: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
-30	15							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-421**

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X S2	20 to 22	24/24	WOR/24"			S2: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand, gray.
-40	25					Advanced to 67.4 ft without sampling.	ORGANIC SOIL	
-50	30							
-60	35							
-45	40							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

NORTHING (ft): 684,709
GROUND SURFACE EL. (ft): -17.2
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,359
DATE START/END: 9/11/2017 - 9/12/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-421**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Advanced to 67.4 ft without sampling.	ORGANIC SOIL	
	50							
	-70							
	55							
	60							
	-80							
	65							
		U1	67.4 to 69.4	24/24	PUSH			U1: ORGANIC SILT (OL); ~90% low plasticity fines, ~10% fine sand, gray.
	70	S3	69.4 to 71.4	24/24	WOR/24"			S3: ORGANIC SILT (OL); ~90% low plasticity fines, ~10% fine sand, gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-421**

PAGE 4 of 5

[illegible]

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI

Consultants

VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-421**

PAGE 5 of 5

[illegible]

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 684,808
 GROUND SURFACE EL. (ft): -22.5
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 100.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,194
 DATE START/END: 9/22/2017 - 9/22/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 55

BORING**GEI-422**

PAGE 1 of 5

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NA
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: NA / NA
 DRILLING METHOD: Driven casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/24	WOR/24"			S1: ORGANIC CLAY (OH); ~90% medium plasticity fines, ~10% fine sand. Gray.
5								
-30								
10								
15		S2	15 to 17	24/24	WOR/24"			S2: ORGANIC CLAY (OH); Similar to S1.
-40								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,808
 GROUND SURFACE EL. (ft): -22.5
 VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,194
 DATE START/END: 9/22/2017 - 9/22/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-422

PAGE 2 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
25		U1	25 to 27	24/10	PUSH		ORGANIC SOIL	U1: ORGANIC SILT (OL); ~90% low plasticity fines, ~10% fine sand. Gray.
-50		S3	27 to 29	24/24	WOR/24"			S3: ORGANIC SILT (OL); ~95% low plasticity fines, ~5% fine sand. Dark gray.
30								
35		U2	35 to 37	24/12	PUSH			U2: ORGANIC SILT (OL); Similar to S3.
-60								
40		S4	39 to 41	24/24	WOR/24"			S4: ORGANIC SILT WITH SAND (OL); ~80% low plasticity fines, ~20% fine sand. Dark gray. Contains shell fragments.
45		U3	45 to 47	24/20	PUSH			U3: ORGANIC SILT (OL); ~90% low plasticity fines, ~10% fine sand. Gray.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,808
GROUND SURFACE EL. (ft): -22.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,194
DATE START/END: 9/22/2017 - 9/22/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-422**

PAGE 3 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-70		S5	47 to 49	24/24	WOR/24"		ORGANIC SOIL	S5: ORGANIC SILT WITH SAND (OH); ~80% medium plasticity fines, ~20% fine sand. Gray. Contains trace shell fragments.
50								
55		U4	55 to 57	24/19	PUSH			U4: ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Gray.
-80		S6	57 to 59	24/24	WOR/24"			S6: SANDY ORGANIC SILT (OL); ~70% low plasticity fines, ~30% fine sand. Gray. Contains trace shell fragments.
60								
65		S7	65 to 67	24/24	WOR/24"			S7: ORGANIC SILT WITH SAND (OL); ~75% low plasticity fines, ~20% fine sand, 5% shell fragments. Gray. Contains frequent shell fragments.
-90								
70								

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 684,808
GROUND SURFACE EL. (ft): -22.5
VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

EASTING (ft): 1,183,194
DATE START/END: 9/22/2017 - 9/22/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-422**

PAGE 4 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75		S8	75 to 77	24/24	WOR/24"			S8: ORGANIC SILT WITH SAND (OL); ~75% low plasticity fines, ~20% fine sand, 5% shell fragments. Gray. Contains frequent shell fragments.
-100								
80								
85								
-110								
90						Rig chatter at 90 feet, lost water return.		
95								
-120		S9	97 to 99	24/2	16-14- 13-14		SAND	S9: NARROWLY GRADED GRAVEL WITH SAND (GP); ~55% fine to coarse gravel up to 1.25" (one piece), ~45% fine to medium sand. Tan. Gravel lodged in spoon tip.

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



VERT./HORIZ. DATUMS: MLW/NAD 83 CT State Plane

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-422**

PAGE 5 of 5

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		X						
	100					Running sand filled 3 inch casing.	SAND	
								Bottom of boring at depth 100 ft. Borehole backfilled with cuttings.
	105							
-130								
	110							
	115							
-140								
	120							

NOTES: Boring drilled from a barge. Ground surface elevation refers to mudline elevation. Sample depths are measured below mudline.

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,161
 GROUND SURFACE EL. (ft): 6.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 18.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,456
 DATE START/END: 10/19/2017 - 10/19/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-501**

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NA
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: NA / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 0.9	11/4	9-100/5"			S1 (0-2"): ASPHALT S1 (2-4"): SILTY GRAVEL WITH SAND (GM); ~50% fine gravel, ~35% fine to coarse sand, ~15% nonplastic fines. Brown. Dry.
		S2	2 to 4	24/6	6-6-5-4			S2: SILTY GRAVEL WITH SAND (GM); Similar to S1 (2-4").
		S3	4 to 6	24/12	7-8-6-19			S3: SILTY SAND WITH GRAVEL (SM); ~40% nonplastic fines, ~30% fine sand, ~30% fine to coarse gravel. Brown. Dry.
		S4	6 to 8	24/12	16-8-10-5			S4: SILTY SAND WITH GRAVEL (SM); ~40% fine to coarse sand, ~40% fine gravel, ~20% nonplastic fines, brown.
		S5	8 to 10	24/8	6-10-9-6			S5: SILTY GRAVEL WITH SAND (GM); ~50% fine gravel, ~30% fine to coarse sand, ~20% nonplastic fines. Brown.
		S6	10 to 12	24/14	15-24-12-15			S6: SILTY GRAVEL WITH SAND (GM); Similar to S5.
		S7	12 to 13.7	20/9	2-2-3-50/2"			S7: SILTY GRAVEL WITH SAND (GM); ~60% fine to coarse gravel, ~20% fine to coarse sand, ~20% nonplastic fines. Brown.
		S8	16 to 18	24/0	4-4-8-12			S8: NO RECOVERY. Broke spoon off in hole.
								Bottom of boring at depth 18 ft. Borehole backfilled with cuttings.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,172
 GROUND SURFACE EL. (ft): 6.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 86.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,441
 DATE START/END: 10/20/2017 - 10/20/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING
GEI-501A

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Advanced to 16 feet without sampling. See log of boring GEI-501.		Advanced to 16 feet without sampling. See log of boring GEI-501.
	5							
	0							
	10							
	15							
	-10	S1	16 to 18	24/8	4-8-8-16			S1: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~60% fine to medium sand, ~30% fine to coarse gravel, ~10% nonplastic fines. Brown.
						Boulder 19'-20'		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,172
GROUND SURFACE EL. (ft): 6.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,441
DATE START/END: 10/20/2017 - 10/20/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-501A

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S2	20 to 22	24/9	9-5-4-5			S2: WIDELY GRADED GRAVEL WITH SAND (GW); ~50% fine to coarse gravel, ~45% fine to coarse sand, ~5% nonplastic fines. Gray.
		S3	22 to 24	24/0	21-16-7-5			S3: No recovery.
	25	S4	24 to 25	12/7	15-34-50/0"			S4: NARROWLY GRADED SAND WITH GRAVEL (SP); ~50% fine to medium sand, ~45% fine gravel, ~5% nonplastic fines. Gray.
						Drilled through boulder 25-28 ft.		
		S5	28 to 30	24/5	6-8-7-5			S5: NARROWLY GRADED SAND WITH GRAVEL (SP); Similar to S4.
	30							
	35							
		S6	36 to 36.7	8/4	32-50/2"			S6: NARROWLY GRADED SAND WITH GRAVEL (SP); Similar to S4.
		S7	36.7 to 38.7	24	28-28-18-26	Bent split spoon in S7		S7: NARROWLY GRADED SAND WITH GRAVEL (SP); Similar to S4.
						Drill chatter 39'-41'		
	40							
		S8	41 to 43	24/0	5-1/18"			S8: No recovery.
		S9	43 to 45	24	5-10-16-13			S9: NARROWLY GRADED SAND WITH GRAVEL (SP); ~55% medium sand, ~45% angular fine gravel. Gray.
	45					Drill chatter		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 686,172
GROUND SURFACE EL. (ft): 6.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,441
DATE START/END: 10/20/2017 - 10/20/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-501A**

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40		S10	47 to 49	24/9	12-1-9- 15	Advanced through cobbles and boulders 49-52 ft.	FILL	S10: NARROWLY GRADED SAND (SP); ~85% fine sand, ~10% fine to coarse gravel, ~5% nonplastic fines. Gray.
	50							
						Lost wash water		
		S11	54 to 54.5	6/6		Rods dropped 55'-56'.	SILT	S11: ORGANIC SILT (OH/OL); ~90% medium plasticity fines, ~10% fine sand. Gray.
	55							
-50								
	60	S12	60 to 62	24/11	6-14-15- 16	Hole caving	SAND AND GRAVEL	S12: NARROWLY GRADED SAND WITH GRAVEL (SP); ~55% fine to coarse sand, ~40% subrounded fine gravel and shell hash, ~5% fines. Gray.
	65	S13	65 to 67	24/10	8-11-3- 12			S13: NARROWLY GRADED GRAVEL WITH SILT AND SAND (GP-GM); ~60% fine gravel, ~30% fine to coarse sand, ~10% nonplastic fines. Gray.
-60								
	70	S14	70 to 72	24	53-40- 54-63			S14: SILTY SAND WITH GRAVEL (SM); ~50% fine to medium sand, ~40% fine gravel, ~10% nonplastic fines. Gray.

NOTES:

PROJECT NAME: General Dynamics Electric Boat
Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,172
GROUND SURFACE EL. (ft): 6.5
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,441
DATE START/END: 10/20/2017 - 10/20/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-501A**

PAGE 4 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
75		C1	75 to 76	12/11	91	Core times (min/ft): 6	BEDROCK	C1: GRANITIC GNEISS; Hard, slightly weathered, gray. One 10 degree fracture at 7". Foliation visible at 20 degrees from horizontal.
-70		C2	76 to 80	48/23	39	Core times (min/ft): 5-3-4-5		C2: GRANITIC GNEISS; Hard, slightly weathered, gray. Fractures are horizontal to 20 degrees from horizontal and are spaced 1" to 13" apart. Foliation visible at 10 degrees from horizontal.
80		C3	80 to 83	36/36	83	Core times (min/ft): 5-3-3		C3: GRANITIC GNEISS; Similar to C2, except one horizontal fracture at 16".
		C4	83 to 86	36/36	100	Core times (min/ft): 5-5-6		C4: GRANITIC GNEISS; Similar to C2, except one horizontal fracture at 24".
85								
-80								Bottom of boring at depth 86 ft. Borehole backfilled with cuttings.
90								
95								
-90								

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,062
 GROUND SURFACE EL. (ft): 9.0
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 53.6
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,654
 DATE START/END: 10/24/2017 - 10/24/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-502**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/4	54-21-20-11			S1: Asphalt and subbase gravel.
		S2	2 to 4	24/11	10-17-11-12			S2: FILL; red brick, cinders and ash.
	5	S3	4 to 6	24/0	7-7-6-5			S3: No recovery.
		S4	6 to 8	24/12	14-11-35-16			S4: NARROWLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); ~50% mostly fine sand, ~40% fine gravel, ~10% fines. Brown. Dry.
0		S5	8 to 10	24/4	20-65-12-9			S5: NARROWLY GRADED GRAVEL WITH SAND (GP); ~80% fine angular gravel, ~20% fine to coarse sand. Brown.
	10	S6	10 to 12	24/4	30-11-7-9		FILL	S6: NARROWLY GRADED GRAVEL WITH SAND (GP); Similar to S5.
		S7	12 to 14	24/0	8-3-3-3			S7: No recovery.
	15							
		S8	16.5 to 18.5	24/8	4-3-2-3	Drilled through boulder at 15-16.5'		S8: SILTY SAND WITH GRAVEL (SM); ~60% fine to coarse sand, ~25% nonplastic fines, ~15% fine to coarse gravel up to 1". Gray.
-10		S9	18.5 to 20.2	20/8	4-6-10-50/2"			S9: SILTY SAND (SM); ~70% fine to coarse sand, ~30% nonplastic fines. Gray. Wood in tip of spoon.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,062
GROUND SURFACE EL. (ft): 9.0
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,654
DATE START/END: 10/24/2017 - 10/24/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING GEI-502

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S10	20.5 to 22.5	24/0	3-12-14-3		FILL	S10: No recovery. Wood plugging tip of spoon.
	25	S11	25 to 27	24/24	1-1-1-1		ORGANIC SOIL	S11: ORGANIC SILT (OH/OL); ~80% medium plasticity fines, ~20% fine sand. Gray.
	30	S12	30 to 32	24/24	WOR/18-1	Q _p = 0.25, 0.5, 0.25, 0.5 tsf		S12: ORGANIC SILT (OH/OL); ~60% medium plasticity fines, ~30% fine sand, ~10% shell hash. Gray.
	35	S13	35 to 37	24/7	15-13-9-11	Drill rig chatter	SAND AND GRAVEL	S13: WIDELY GRADED SAND (SW); ~95% fine to coarse sand, ~5% nonplastic fines. Trace shells present. Gray.
	40	S14	41 to 41.3	4/4	50/4"			S14: SILTY SAND (SM); ~85% fine to coarse sand, ~15% nonplastic fines. Gray.
	45	C1	42.5 to 47.5	60/50	70	Core times (min/ft): 3-3-4-4-3	BEDROCK	C1: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are horizontal to 30 degrees from horizontal and are spaced 2 to 14 inches apart. Foliation visible at 10 to 20 degrees from horizontal.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 686,062
GROUND SURFACE EL. (ft): 9.0
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,654
DATE START/END: 10/24/2017 - 10/24/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-502**
PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		C2	47.5 to 51.5	48/46	87	Core times (min/ft): 2-2-3-3	BEDROCK	C2: GRANITIC GNEISS; Similar to C1, except fractures are horizontal to 20 degrees from horizontal and are spaced 2" to 19" apart.
		C3	51.5 to 53.6	25/24	100	Core times (min/ft): 3-3		C3: GRANITIC GNEISS; Similar to C1, except no fractures.
								Bottom of boring at depth 53.6 ft. Borehole backfilled with cuttings.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,105
 GROUND SURFACE EL. (ft): 14.5
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 25.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,805
 DATE START/END: 10/19/2017 - 10/19/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-503**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
10 5	5	S1	0 to 2	24/16	26-19- 40-21		FILL	S1 (0-2"): ASPHALT S1 (2-16"): WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~60% fine to coarse sand, ~30% fine gravel, ~10% nonplastic fines. Brown. FILL.
		S2	2 to 4	24/10	8-5-8-5			S2: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S1.
		S3	4 to 6	24/8	4-10-12- 14			S3: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~50% fine to coarse sand, ~40% gravel, ~10% nonplastic fines. Brown. FILL.
		S4	6 to 8	24/9	2-5-6-12			S4: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S3.
		S5	8 to 10	24/10	8-6-6-13			S5: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S3, trace charcoal.
		S6	10 to 12	24/8	12-25- 43-15			S6: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S3.
		S7	12 to 14	24/11	12-11- 14-8			S7: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); Similar to S3.
0	15					Hard drilling at 15 ft	BEDROCK	
		C1	15.5 to 20.5	60/56	90	Core times (min/ft): 4-4-3-3-4		C1: GRANITE; hard, fresh to slightly weathered, gray. Fractures are generally horizontal to 10 degrees from horizontal and are spaced 3" to 24" apart.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,888
 GROUND SURFACE EL. (ft): 16.4
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 24.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,807
 DATE START/END: 10/31/2017 - 10/31/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-504**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		S1	0 to 2	24/10	32-10- 11-11		FILL	S1: WIDELY GRADED SAND WITH GRAVEL (SW); ~60% fine to coarse sand, ~35% fine to coarse gravel up to 1", ~5% nonplastic fines. Brown. 2" asphalt chips.
		S2	2 to 4	24/11	14-10- 15-7			S2: WIDELY GRADED SAND WITH GRAVEL (SW); Similar to S1.
		S3	4 to 6	24/11	7-12-26- 12			S3: NARROWLY GRADED GRAVEL WITH SAND (GP); ~70% fine to coarse sand, ~25% fine to coarse gravel up to 1", ~5% nonplastic fines. Brown.
		S4	6 to 8	24/9	7-8-8-6			S4: NARROWLY GRADED GRAVE WITH SAND (GP); Similar to S3.
		S5	8 to 9.5	18/10	11-19- 50-50/0"			S5: WIDELY GRADED SAND WITH GRAVEL (SW); ~65% fine to coarse sand, ~30% fine angular gravel, ~5% nonplastic fines. Brown.
		S6	10 to 12	24/2	8-9-10-8			S6: NO RECOVERY.
		S7	12 to 12.5	6/0	30-50/0"	Cleaned casing out to 14' and start coring. 14.5' lost wash water.		S7: NO RECOVERY.
		C1	14 to 19	60/55	77	Core times (min/ft): 10,5,5,3,3	BEDROCK	C1: GRANITE; hard, slightly weathered, gray and white. Fractures are horizontal to 20 degrees from horizontal and are spaced 1" to 16" apart.
		C2	19 to 24	60/52	78	Core times (min/ft):		C2: GRANITE; Similar to C1 except fractures are spaced 2" to 22" apart.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,888
GROUND SURFACE EL. (ft): 16.4
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,807
DATE START/END: 10/31/2017 - 10/31/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-504
PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						3,3,3,3,4	BEDROCK	
	25							Bottom of boring at depth 24 ft. Borehole backfilled with cuttings.
-10								
	30							
	35							
-20								
	40							
	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,415
 GROUND SURFACE EL. (ft): 17.8
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 37.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,851
 DATE START/END: 10/27/2017 - 10/30/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-505**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description	
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD				
	5	S1 0 to 1.3 16/7 100-12- 90/4"				Encountered boulder at 16". Drilled through with rollerbit, then advanced 4" casing.	BOULDER FILL	S1 (0-2"): ASPHALT PAVEMENT S1 (2"-16"): NARROWLY GRADED SAND WITH GRAVEL (SP); ~70% fine sand, ~20% fine gravel, ~10% nonplastic fines. Brown. Dry.	
								NO RECOVERY.	
			2 to 2.2 2/0 34/2"						S2: WIDELY GRADED SAND WITH GRAVEL (SW); ~70% fine to coarse sand, ~30% fine gravel. Grey.
			S2 4 to 6 24/5 6-9-9-8						S3: WIDELY GRADED SAND WITH GRAVEL (SW); Similar to S2.
			S3 6 to 8 24/3 8-7-9-11						S4: NARROWLY GRADED GRAVEL WITH SAND (GP); ~65% fine to coarse gravel up to 1", ~35% fine to coarse sand. Brown.
			S4 8 to 10 24/5 10-7-8-6						S5: NARROWLY GRADED GRAVEL WITH SAND (GP); ~65% mostly fine gravel, ~35% fine to coarse sand. Brown.
			S5 10 to 12 24/1 14-12-7- 17						S6: NO RECOVERY; Gravel lodged in tip of SS.
			S6 12 to 14 24/0 2-2-5-8						S7: WIDELY GRADED GRAVEL (GW); ~100% fine to coarse angular gravel. Gravel lodged in tip.
			S7 14 to 16 24/1 16-12- 10-12						S8: NARROWLY GRADED GRAVEL WITH SAND (GP); ~80% fine angular gravel, ~20% fine to coarse sand. Gray. Gravel lodged in tip of split spoon.
			S8 16 to 18 24/1 7-9-6-7					Bent spoon while driving.	S9: NARROWLY GRADED SAND WITH GRAVEL (SP); ~50% fine to coarse sand, ~40% fine gravel (Gneiss and red brick), ~10% nonplastic fines. Red/Brown/Black.
	0	S9 18 to 20 24/3 13-7-20- 44							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,415
GROUND SURFACE EL. (ft): 17.8
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,851
DATE START/END: 10/27/2017 - 10/30/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-505**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25					Advanced 4" casing. Hard drilling through cobbles and boulders. No SS sample. Spun casing to start coring at 27.0 ft.	BOULDER FILL	
-10		C1	27 to 32	60/60	95	Core times (min/ft): 8,7,6,5,5	BEDROCK	C1: GRANITE; hard, fresh to slightly weathered, gray. Fractures are horizontal to 10 degrees from horizontal and are spaced 3" to 30" apart.
30		C2	32 to 37	60/51	80	Core times (min/ft): 5,5,5,5,5		C2: GRANITE; Similar to C1, except fractures are spaced 3" to 18" apart.
35								
-20								Bottom of boring at depth 37 ft. Borehole backfilled with cuttings.
40								
45								

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,097
 GROUND SURFACE EL. (ft): 5.9
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 78.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,503
 DATE START/END: 10/25/2017 - 10/26/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-601**

PAGE 1 of 4

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Blind drill to top of rock. Drill through boulder from 0 to 2 ft.		Advanced without sampling to 64 feet.
	5					Drill through boulder from 4 to 5 ft.		
	0					Drill through boulder from 8 to 9 ft.		
	10					Rig chatter, drilled through possible boulder at 11 ft.		
	15					Slowly advancing, possible boulder at 14 ft.		
	-10							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



EASTING (ft): 1,183,503

DATE START/END: 10/25/2017 - 10/26/2017

DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-601**

PAGE 2 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-10	25					22 to 35 ft: Pushed casing with no significant resistance. Wash very light colored.		
-20								
-30	35					35 to 45 ft: Black silt in wash return		
-40	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS GPJ 11/30/17

NORTHING (ft): 686,097
GROUND SURFACE EL. (ft): 5.9
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,503
DATE START/END: 10/25/2017 - 10/26/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-601**

PAGE 3 of 4

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
50						Rig chatter, slight resistance at 48 ft.		
55						Black wash return. No resistance with tricone advancement.		
-50						Change in resistance. Slow advancement of tricone.		
60								
65		C1	64 to 69	60/52	80	Top of rock at 63 feet. Casing at 63.5 ft. Core times (min/ft): 4, 5, 3, 3, 3	BEDROCK	C1: GRANITE; hard, fresh to slightly weathered, gray. Fractures are horizontal to 10 degrees from horizontal and spaced 3" to 25" apart. Pink intrusion from 10" to 42".
-60		C2	69 to 72.5	42/23	38	Core times (min/ft): 3, 2, 3, 3/6"		C2: GRANITE; Similar to C1, except fractures are spaced 0.5" to 10" apart.
70								

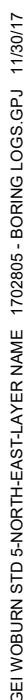
NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805





BORING INFORMATION

NORTHING (ft): 686,152
 GROUND SURFACE EL. (ft): 9.0
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 54.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,602
 DATE START/END: 10/25/2017 - 10/25/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-602**

PAGE 1 of 3

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
						Advanced without sampling to 44 feet.		
	5					Encountered possible boulder from 5 to 7 ft.		
	10					Drilled through possible boulder from 10 to 11 ft.		
	15					Drilled through possible boulder from 14 to 15 ft.		
	-10							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805

GEI

Consultants

NORTHING (ft): 686,152
GROUND SURFACE EL. (ft): 9.0
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,602
DATE START/END: 10/25/2017 - 10/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-602**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25					Drilled through possible boulder from 20 to 22 ft.		
	30							
	35							
	40					Wash turned dark brown (possible organic silt).		
	45	C1	44 to 49	60/60	87	Core times (min/ft): 3-4-3-5-5	BEDROCK	C1: GRANITIC GNEISS; hard, fresh to slightly weathered, gray. Fractures are generally horizontal and are spaced 3" to 24" apart. Foliation visible at 10 to 20 degrees from horizontal.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,152
GROUND SURFACE EL. (ft): 9.0
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,602
DATE START/END: 10/25/2017 - 10/25/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-602**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-40	50	C2	49 to 54	60/58	96	Core times (min/ft): 3-3-3-3-3	BEDROCK	C2: GRANITIC GNEISS; simliar to C1, except fractures are spaced 14" to 28" apart.
55								Bottom of boring at depth 54 ft. Borehole backfilled with cuttings.
-50	60							
65								
-60	70							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 686,145
 GROUND SURFACE EL. (ft): 13.6
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 35.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,765
 DATE START/END: 10/26/2017 - 10/27/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-603**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
10	5					Advanced without sampling to 25 feet.	FILL	
10								
0						Cored through a boulder at 13 ft. Did not save sample.		
15						Rods dropped 15 to 16 ft.		
						Drilled through boulder from 17 to 18 ft.		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 686,145
GROUND SURFACE EL. (ft): 13.6
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,765
DATE START/END: 10/26/2017 - 10/27/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-603**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-10	25	C1	25 to 30	60/56	60	Core times (min/ft): 8-3-4-3-6	FILL	
-20	30	C2	30 to 35	60/55	92	Core times (min/ft): 4-3-4-3-3	BEDROCK	C1: GRANITE; hard, slightly weathered, gray. Fractures are generally horizontal and spaced 0.5" to 20" apart.
-30	35					Lost wash water.		C2: GRANITE; similar to C1, except color is light gray and fractures are spaced 8" to 11" apart.
-40	45							Bottom of boring at depth 35 ft. Borehole backfilled with cuttings.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,994
 GROUND SURFACE EL. (ft): 15.2
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 28.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,813
 DATE START/END: 10/31/2017 - 11/1/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-604**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	5					Advanced without sampling to 10.5 feet. Drilled through boulder from 1 to 4 ft. Rods dropped 3".	FILL	
10								
	10							
		C1	10.5 to 15.5	60/49		Core times (min/ft): 15,5,5,2,1		C1: GRANITIC GNEISS BOULDER; hard, slightly weathered, gray. Fractures are horizontal to 10 degrees horizontal and are spaced 0.5" to 15" apart. 18" to 23" is concrete.
0	15							
		C2	18.5 to 23.5	60/59	86	Core times (min/ft): 6,5,3,2,3		C2: GRANITIC GNEISS; hard, slightly weathered, gray. Fractures are horizontal to 30 degrees from horizontal and are spaced 3" to 21" apart. Foliation visible at 10 to 20 degrees from horizontal.

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,994
GROUND SURFACE EL. (ft): 15.2
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,813
DATE START/END: 10/31/2017 - 11/1/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

BORING
GEI-604
PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
-10	25	C3	23.5 to 28.5	60/59	80	Core times (min/ft): 3,3,3,3,2	BEDROCK	C3: GRANITIC GNEISS; similar to C2, except fractures are spaced 4" to 19" apart. One nearly vertical fracture from 48" to 59".
-20	30							Bottom of boring at depth 28.5 ft. Borehole backfilled with cuttings.
-30	35							
-40	40							
-45	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,718
 GROUND SURFACE EL. (ft): 17.7
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 20.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,865
 DATE START/END: 11/1/2017 - 11/1/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-605**

PAGE 1 of 1

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 5 inch/ NA CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	5					Advanced without sampling to 10 ft.	FILL	
	10					No noticeable change in drilling resistance 0-10'		
	10	C1	10 to 15	60/60	92	Casing at 10 ft. Core times (min/ft): 12,5,5,4,3	BEDROCK	C1: GNEISS; Hard, slightly weathered. Fractures 0-20 degrees off horizontal. Fractures fresh to slightly weathered. Fractures at 17", 26", 31", 32", 40", 53", and 54". Feldspar inclusions throughout core. Mottled Gray, 1 black with diorite lenses.
	15	C2	15 to 20	60/57	90	Core times (min/ft): 4,4,5,5,5		C2: GNEISS; Hard, slightly weathered. Fractures dip 0-20 degrees off horizontal. Fractures at 2", 3", 8", 16", 25", 34", 44", and 54". fractures fresh or slightly weathered. Weathered fractures at diorite seams. Occasional large feldspar inclusions. Gray.
	0							

NOTES:

PROJECT NAME: boring at Electric Boat Corporation
 Borehole backfilled with cuttings.

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,565
 GROUND SURFACE EL. (ft): 18.1
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 29.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,824
 DATE START/END: 10/31/2017 - 10/31/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-606**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	5					Advanced to 19.5 ft without sampling.		
	10					Drilled through possible boulder from 9 to 10 ft.		
	10					Drilled through possible boulder from 11 to 12 ft.		
	15							
	0					Casing advanced to 18 ft.		
		C1	19.5	60/57	88			C1: GNEISS; Hard, fresh. Fractures dip 0-20 degrees off

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,565
GROUND SURFACE EL. (ft): 18.1
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,824
DATE START/END: 10/31/2017 - 10/31/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-606**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
			to 24.5			Core times (min/ft): 10, 5, 4, 5, 5		horizontal. Fractures at 15", 22", 45", 53", 55", 56", and 57". Mottled Gray with black diorite lenses.
	25	C2	24.5 to 29.5	60/58	93	Core times (min/ft): 4, 4, 5, 3, 3	BEDROCK	C2: GNEISS; Hard, fresh. Fractures dip 0-40 degrees off horizontal, seams fresh to slightly weathered. Fractures at 4", 9", 13", 25", 30", 39", 44", and 56". Mottled Gray with black diorite lenses.
	30							Bottom of boring at depth 29.5 ft. Borehole backfilled with cuttings.
	35							
	-20							
	40							
	45							

NOTES:

PROJECT NAME: General Dynamics Electric Boat
Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,503
 GROUND SURFACE EL. (ft): 18.0
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 32.0
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,817
 DATE START/END: 10/30/2017 - 10/30/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-607**

PAGE 1 of 2

DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 4 inch/ 4.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / 3 inch
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD			
						Advanced without sampling to 22 ft.		
	5					Cobbles and boulders encountered 0-5 ft.		
	10					Rig chatter at 8 ft, possible cobbles and boulders.		
	10							
	15							
	0					Spun casing through possible boulder 17 to 17.5 ft.		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,503
GROUND SURFACE EL. (ft): 18.0
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,817
DATE START/END: 10/30/2017 - 10/30/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-607**

PAGE 2 of 2

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		C1	22 to 27	60/57	83	Core times (min/ft): 6, 4, 4, 4, 4	BEDROCK	C1: GNEISS; hard, slightly weathered, fractures dip 0 to 40 deg , fractures at 10", 20", 41", 44", and 46". Gray.
		C2	27 to 32	60/60	100	Core times (min/ft): 4, 4, 3, 3, 3		C2: GNEISS; hard, slightly weathered, fractures at 11", 20", 27", and 48", fractures dip 0 to 20 deg from horizontal. Gray.
								Bottom of boring at depth 32 ft. Borehole backfilled with cuttings.

NOTES:

PROJECT NAME: General Dynamics Electric Boat
Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



BORING INFORMATION

NORTHING (ft): 685,370
 GROUND SURFACE EL. (ft): 16.2
 VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane
 TOTAL DEPTH (ft): 52.5
 LOGGED BY: J. Shelkey

EASTING (ft): 1,183,791
 DATE START/END: 11/1/2017 - 11/1/2017
 DRILLING COMPANY: Aquifer Drilling and Testing, Inc.
 DRILLER NAME: C. Chaillou
 RIG TYPE: CME 75 Truck

BORING**GEI-608**

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DRILLING INFORMATION

HAMMER TYPE: Automatic CASING I.D./O.D.: 3 inch/ 3.5 inch CORE BARREL TYPE: NX
 AUGER I.D./O.D.: NA / NA DRILL ROD O.D.: 2.625 inch CORE BARREL I.D./O.D.: 2.125 inch / NA
 DRILLING METHOD: Spun casing and washed with rotary tooling.
 WATER LEVEL DEPTHS (ft): Not measured

ABBREVIATIONS: Pen. = Penetration Length S = Split Spoon Sample Qp = Pocket Penetrometer Strength NA, NM = Not Applicable, Not Measured
 Rec. = Recovery Length C = Core Sample Sv = Pocket Torvane Shear Strength Blows per 6 in.: 140-lb hammer falling
 RQD = Rock Quality Designation U = Undisturbed Sample LL = Liquid Limit 30 inches to drive a 2-inch-O.D.
 = Length of Sound Cores > 4 in / Pen., % SC = Sonic Core PI = Plasticity Index split spoon sampler.
 WOR = Weight of Rods DP = Direct Push Sample PID = Photoionization Detector
 WOH = Weight of Hammer HSA = Hollow-Stem Auger I.D./O.D. = Inside Diameter/Outside Diameter

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./Rec. (in)	Blows per 6 in. or RQD			
						Advanced to 37.5 feet without sampling.		
	5							
	10					Drill rig chatter.		
	10					Drilled through possible boulder from 10.0 to 12.0 ft.		
	15							
	0					Wash return turned black.		

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



NORTHING (ft): 685,370
GROUND SURFACE EL. (ft): 16.2
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,791
DATE START/END: 11/1/2017 - 11/1/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-608**

PAGE 2 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
	25							
	-10							
	30							
	35							
	-20							
	40	C1	37.5 to 42.5	60/49	82	Casing advanced to 37.5 ft. Core times (min/ft): 12, 7, 4, 3, 2	BEDROCK	C1: GNEISS; Hard, slightly weathered. Fractures 10-40 degrees off horizontal, fractures at 7", 11", 15", 31", fracture at 15" filled in with silty sand. Gray.
	45	C2	42.5 to 46.5	48/42	63	Core times (min/ft): 5, 9, 4, 3		C2: GNEISS; Hard, slightly weathered. Fractures dip 10-90 degrees along bedding planes of diorite fractures 20", 40", 43"-48", black intrusions and increased fracturing (40-54). Gray.

NOTES:

PROJECT NAME: General Dynamics Electric Boat
Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



GEI WOBURN STD 5-NORTH-EAST-LAYER NAME 1702805 - BORING LOGS.GPJ 11/30/17

NORTHING (ft): 685,370
GROUND SURFACE EL. (ft): 16.2
VERT./HORIZ. DATUMS: NAVD 88/NAD 83 CT State Plane

EASTING (ft): 1,183,791
DATE START/END: 11/1/2017 - 11/1/2017
DRILLING COMPANY: Aquifer Drilling and Testing, Inc.

**BORING
GEI-608**

PAGE 3 of 3

Elev. (ft)	Depth (ft)	Sample Information				Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		Sample No.	Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD			
		C3	46.5 to 48.5	24/21	79	Core times (min/ft): 4, 13	BEDROCK	C3: GNEISS; Hard, fresh. Fractures dip 0-10 degrees off horizontal, fractures at 2" and 8". Gray.
	50	C4	48.5 to 52.5	48/52	96	Core times (min/ft): 6, 3, 3, 4		C4: GNEISS; Hard, fresh. Fractures dip 10-20 degrees off horizontal, fractures at 33", 36", 44", and 50", fractures at diorite bedding planes and Feldspar crystals. Gray with pink intrusions.
	55							Bottom of boring at depth 52.5 ft. Borehole backfilled with cuttings.
-40								
	60							
	65							
-50								
	70							

NOTES:

PROJECT NAME: General Dynamics Electric Boat Corporation

CITY/STATE: Groton, CT

GEI PROJECT NUMBER: 1702805



Appendix C

CPT Data Report

PRESENTATION OF SITE INVESTIGATION RESULTS

Electric Boat Facility Expansion Groton, Connecticut

Prepared for:

GEI Consultants

ConeTec Job No: 17-53122

Project Start Date: 11-Sep-2017

Project End Date: 14-Sep-2017

Report Date: 20-Sep-2017



Prepared by:

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www.conetecdataservices.com



Introduction

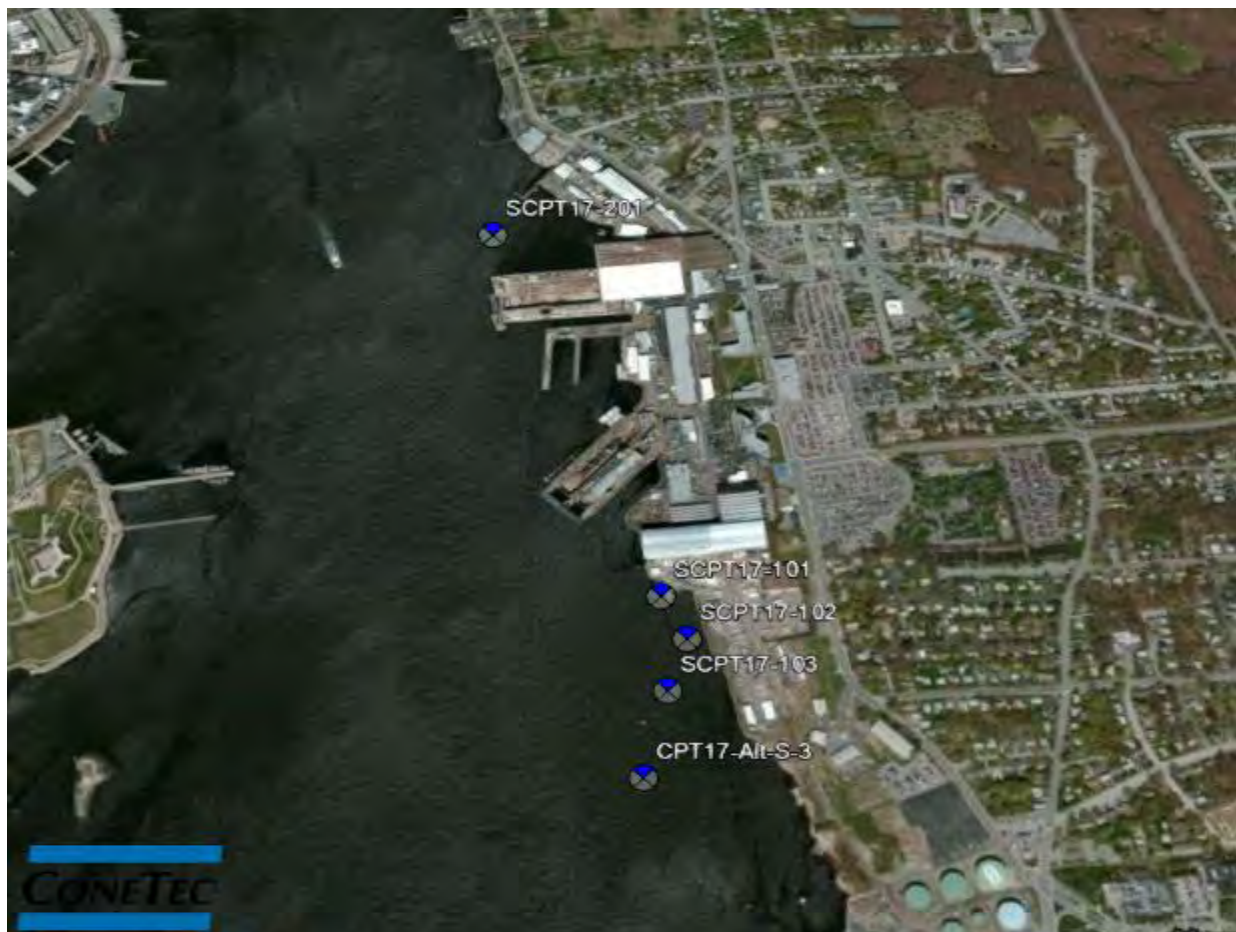
The enclosed report presents the results of a piezocone penetration testing (CPTu or CPT) and seismic piezocone penetration testing (SCPTu or SCPT) program carried out, from a lift boat, at the Electric Boat Facility Expansion site located in Groton, Connecticut. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to GEI Consultants (GEI) of Woburn, Massachusetts.

A total of 1 cone penetration test and 4 seismic cone penetration tests were completed at 5 locations. The CPT and SCPT program was performed to evaluate the subsurface soil conditions. CPT and SCPT sounding locations were selected and numbered under supervision of GEI personnel (Ms. Sarah Cote).

Project Information

Project	
Client	GEI Consultants
Project	Electric Boat Facility Expansion, Groton, CT
ConeTec project number	17-53122

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
Drill Rig	Drill Rig (single cylinder)	CPT and SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
CPT and SCPT	Provided by GEI	2234 (NAD83 / ftUS / CT State Plane)

Cone Penetration Test (CPT)	
Depth reference	Water surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	One pore pressure dissipation tests was completed primarily to determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at three foot depth intervals at four locations.

Cone Description	Cone Number	Cross Sectional Area (cm ²)	Sleeve Area (cm ²)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
498:T375F10U500	498	15	225	375	10	500

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses were calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile. The unit weight of water was used from the water surface from the time to the mudline depth. Soils were classified as either drained or undrained based on the Normalized Soil Behaviour Type Chart (SBT Q_{tn}) (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures – clayey silt to silty clay (zone 4). Soils that were classified as undefined (zone 0) were classified as undrained.

Limitations

This report has been prepared for the exclusive use of GEI Consultants (Client) for the project titled “Electric Boat Facility Expansion, Groton, CT”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec. ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.



The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm² and 15 cm² tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm² penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm² piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u₂" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

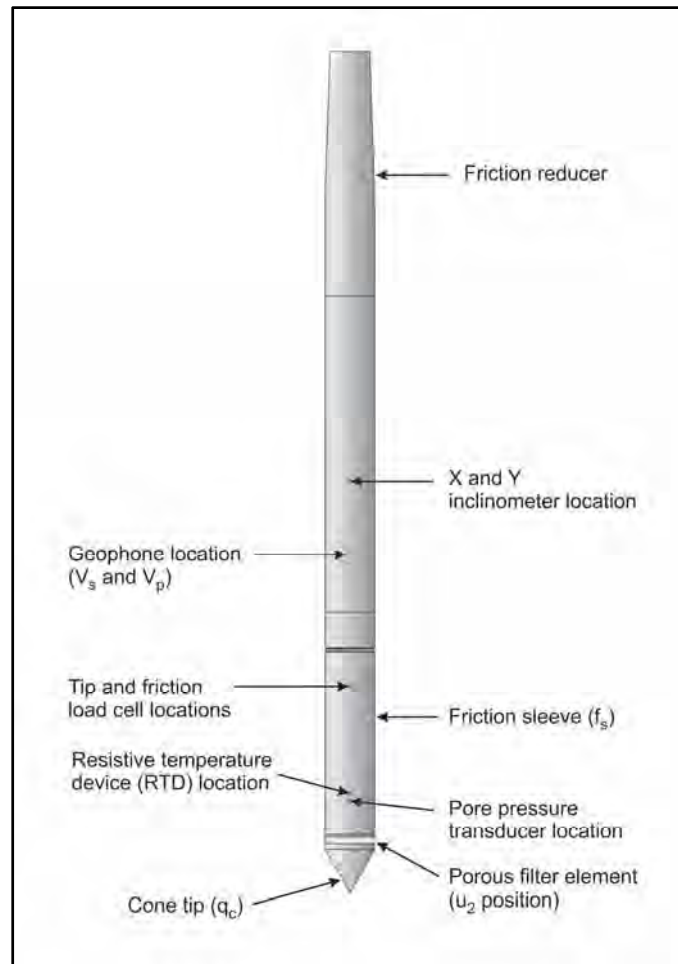


Figure CPTu. Piezocone Penetrometer (15 cm²)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where: q_t is the corrected tip resistance

q_c is the recorded tip resistance

u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)

a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization 4, Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (V_p) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

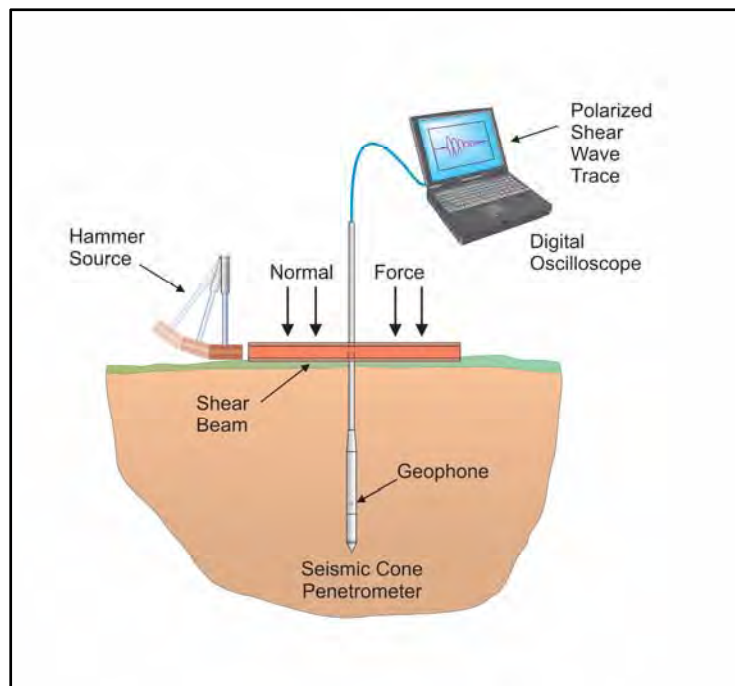


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

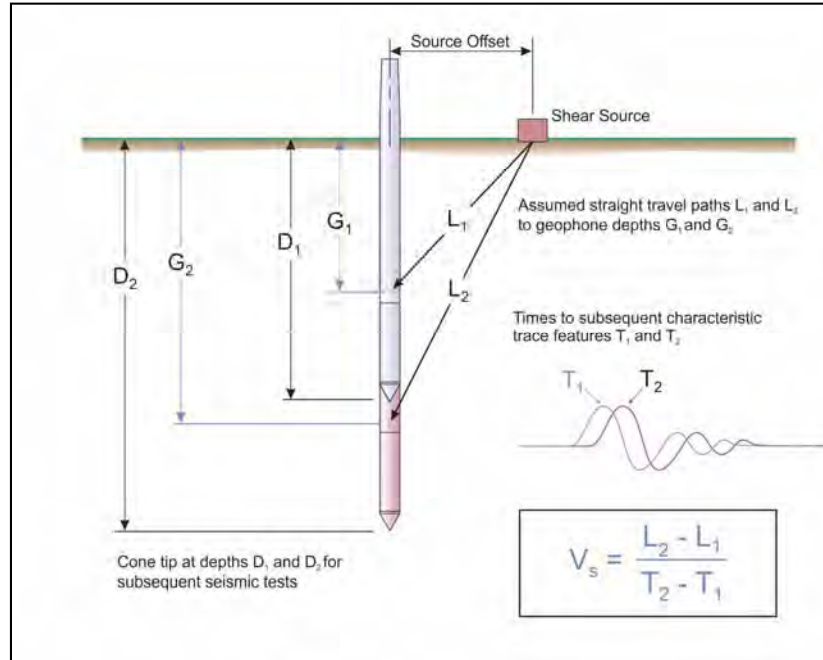


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
 d_i = the thickness of any layer between 0 and 100 ft (30 m)
 v_{si} = the shear wave velocity in ft/s (m/s)
 $\sum_{i=1}^n d_i = 100 \text{ ft (30 m)}$

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30} .

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, "Minimum Design Loads for Buildings and Other Structures", Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

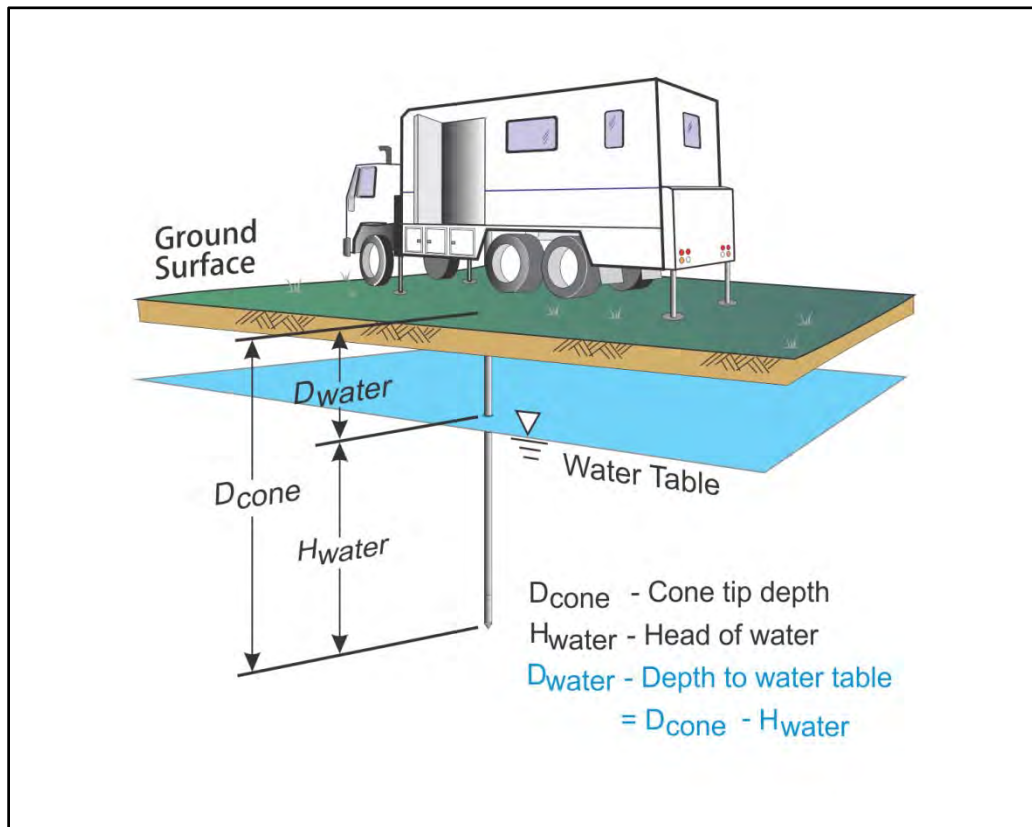


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

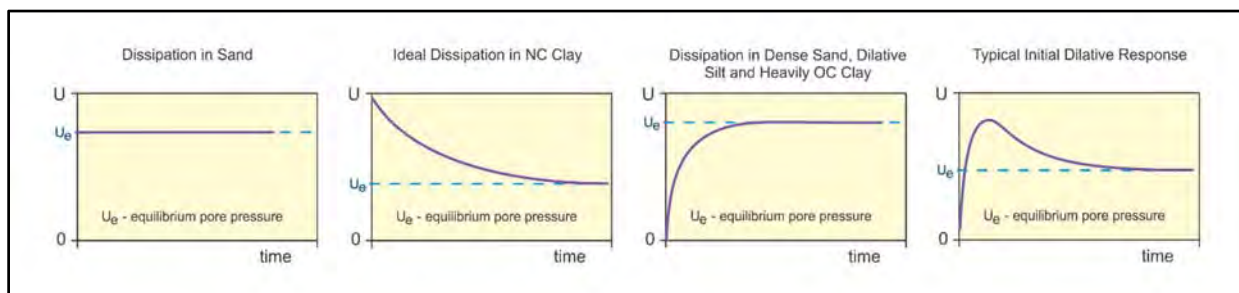


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100} . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100} . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T^*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- T^* is the dimensionless time factor (Table Time Factor)
 a is the radius of the cone
 I_r is the rigidity index
 t is the time at the degree of consolidation

Table Time Factor. T^* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50} , dissipation tests must be taken to a pressure less than u_{50} . The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100} . To estimate u_{50} , both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50} . In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r , the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50} , other methods should be applied to confirm the results for c_h .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Soil Behavior Type Chart Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Start Date: 12-Sep-2017
End Date: 14-Sep-2017

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface ¹ (ft)	Final Depth (ft)	Shear Wave Velocity Tests	CT State Plane Northing ² (ft)	Ct State Plane Easting (ft)	UTM Northing ³ (m)	UTM Easting (m)	Refer to Notation Number
CPT17-Alt-S-3	17-53122_CPALTS3	13-Sep-2017	498:T375F10U500	0.0	119.09		684918	1183195	4580486	744086	
SCPT17-101	17-53122_SP101	12-Sep-2017	498:T375F10U500	0.0	54.30	9	685930	1183460	4580797	744159	4
SCPT17-102	17-53122_SP102	12-Sep-2017	498:T375F10U500	0.0	51.02	6	685623	1183519	4580703	744180	4
SCPT17-103	17-53122_SP103	13-Sep-2017	498:T375F10U500	0.0	95.47	17	685378	1183411	4580628	744148	4
SCPT17-201	17-53122_SP201	14-Sep-2017	498:T375F10U500	0.0	73.98	8	688478	1182842	4581568	743951	4
Totals	5 soundings				393.86	40					

1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates (as built) are CT State Plan, NAD83 and were provided to us by GEI Consultants.
3. Coordinates are NAD83 / UTM Zone 18 and were converted from CT State Plane using Corpscon6.
4. Assumed phreatic surface determined from the water surface at the start of the CPT.
5. No phreatic surface detected



GEI Consultants

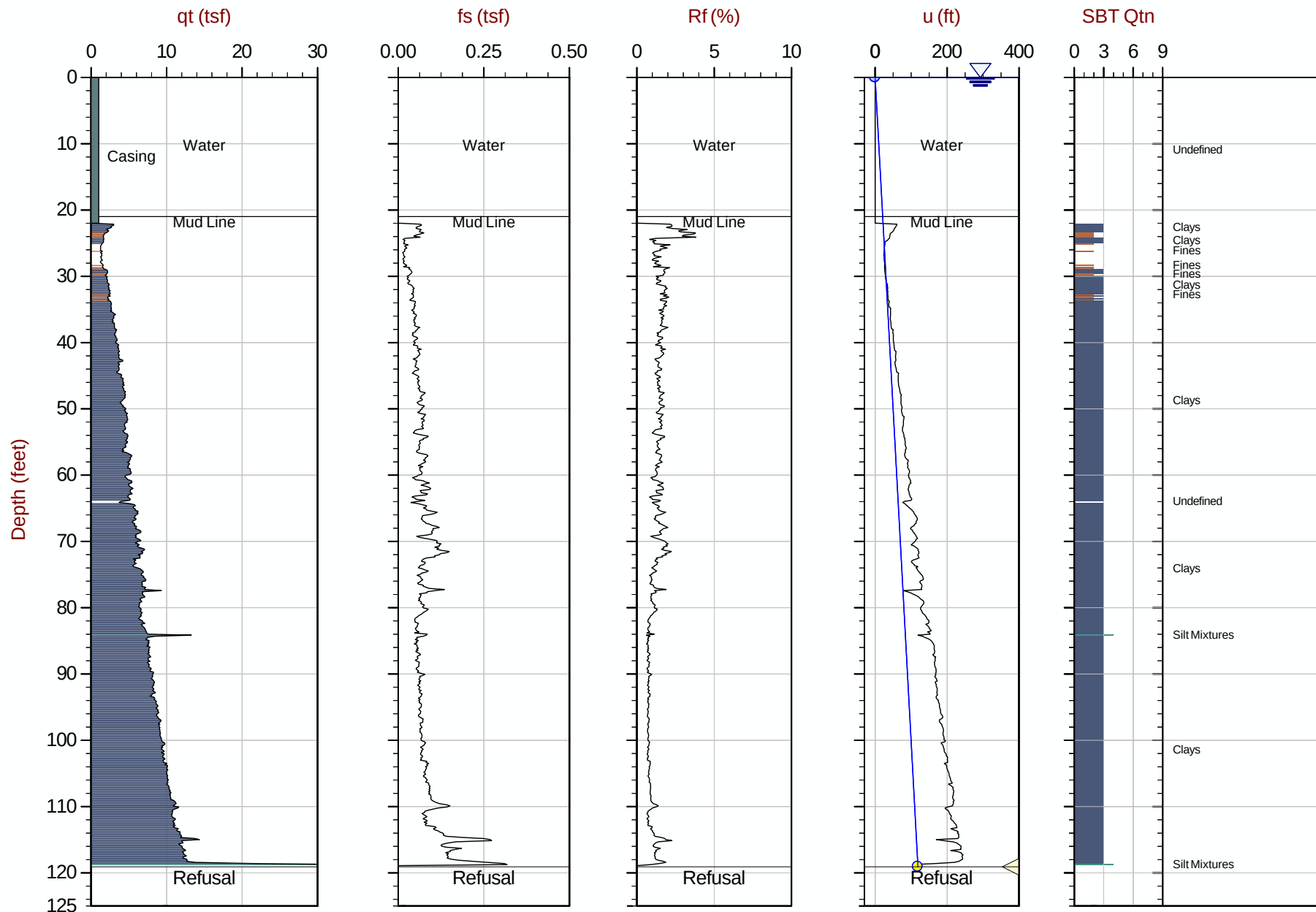
Job No: 17-53122

Date: 2017-09-13 14:00

Site: Electric Boat Facility Expansion

Sounding: CPT17-Alt-S-3

Cone: 498:T375F10U500



Max Depth: 36.300 m / 119.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_CPALTS3.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 684918ft E: 1183195ft

Hydrostatic Line ● Ueq ● Assumed Ueq ▲ PPD, Ueq achieved ▲ PPD, Ueq not achieved

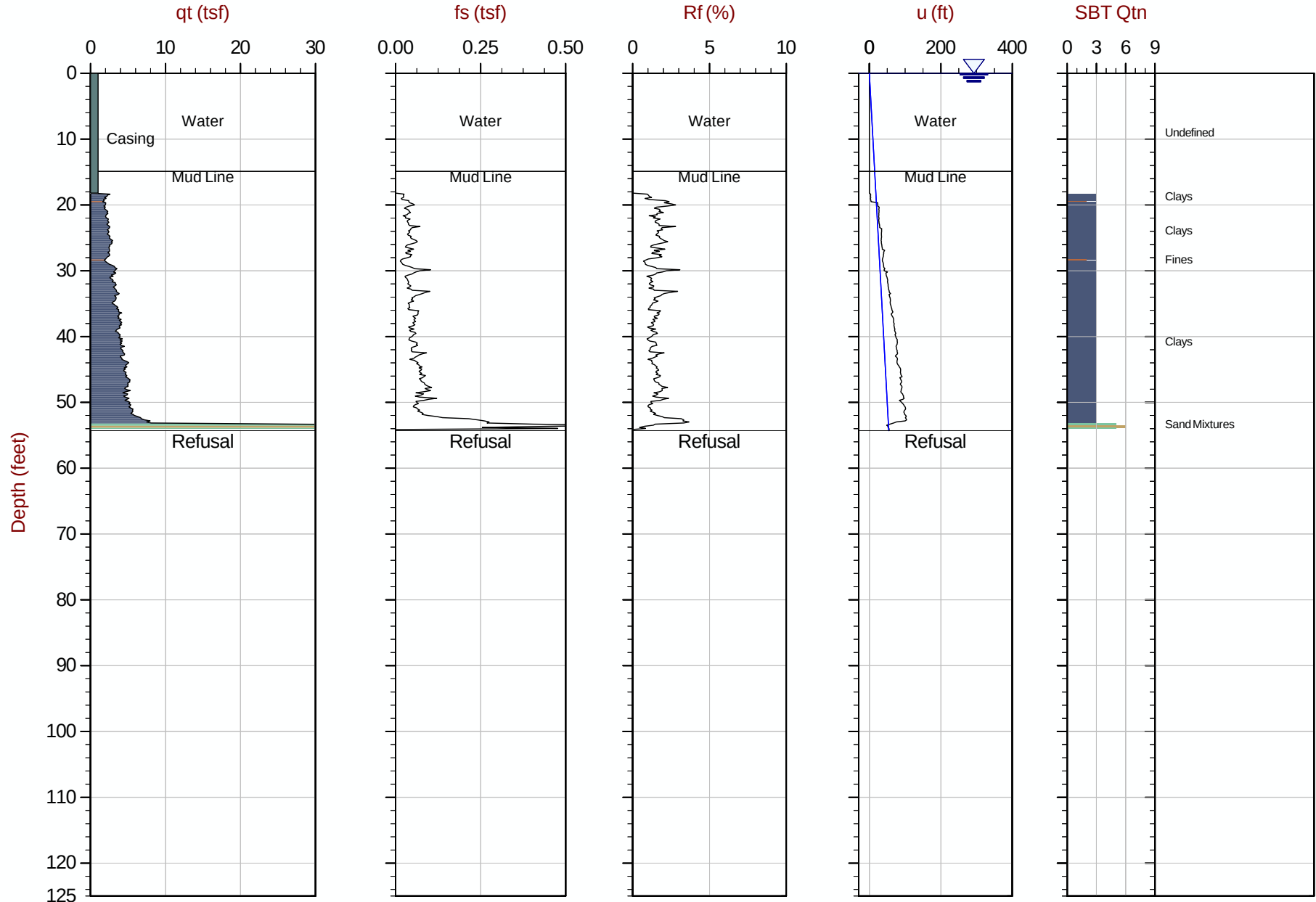
The reported coordinates were provided by GEI.



GEI Consultants

Job No: 17-53122
Date: 2017-09-12 09:07
Site: Electric Boat Facility Expansion

Sounding: SCPT17-101
Cone: 498:T375F10U500



Max Depth: 16.550 m / 54.30 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP101.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685930ft E: 1183460ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

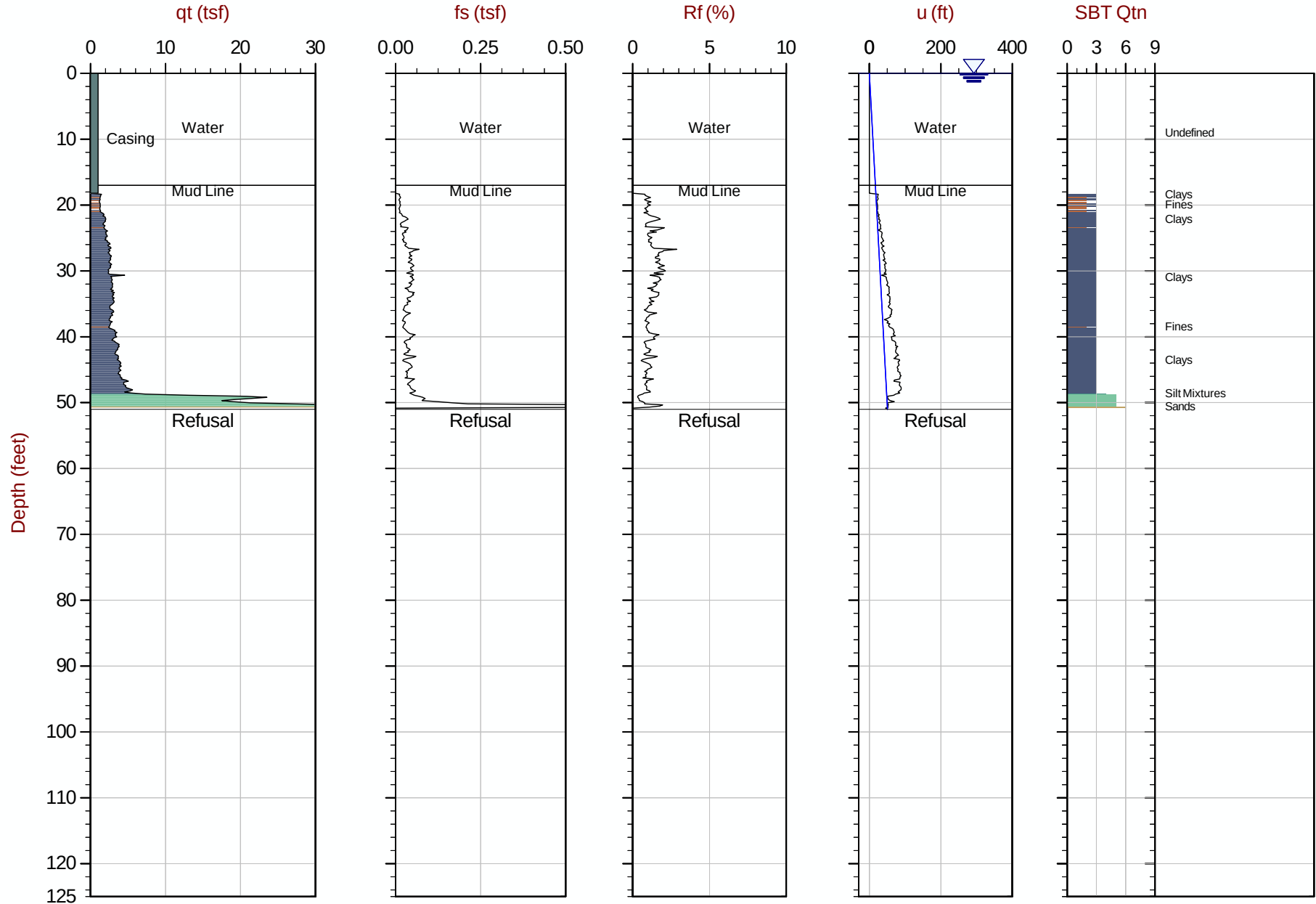
Job No: 17-53122

Date: 2017-09-12 14:47

Site: Electric Boat Facility Expansion

Sounding: SCPT17-102

Cone: 498:T375F10U500



Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP102.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685623ft E: 1183519ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

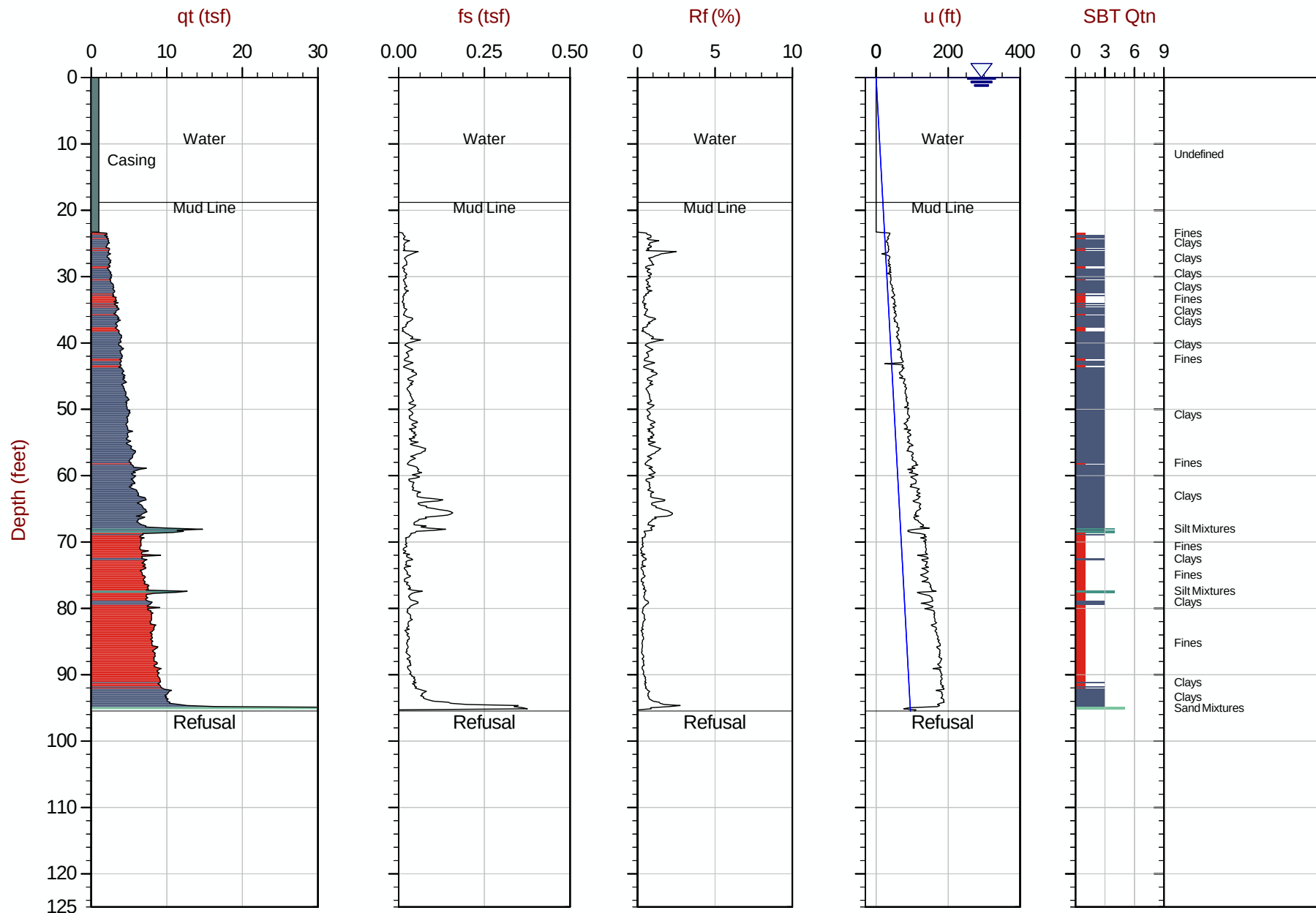
Job No: 17-53122

Date: 2017-09-13 08:56

Site: Electric Boat Facility Expansion

Sounding: SCPT17-103

Cone: 498:T375F10U500



Max Depth: 29.100 m / 95.47 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP103.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685378ft E: 1183411ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

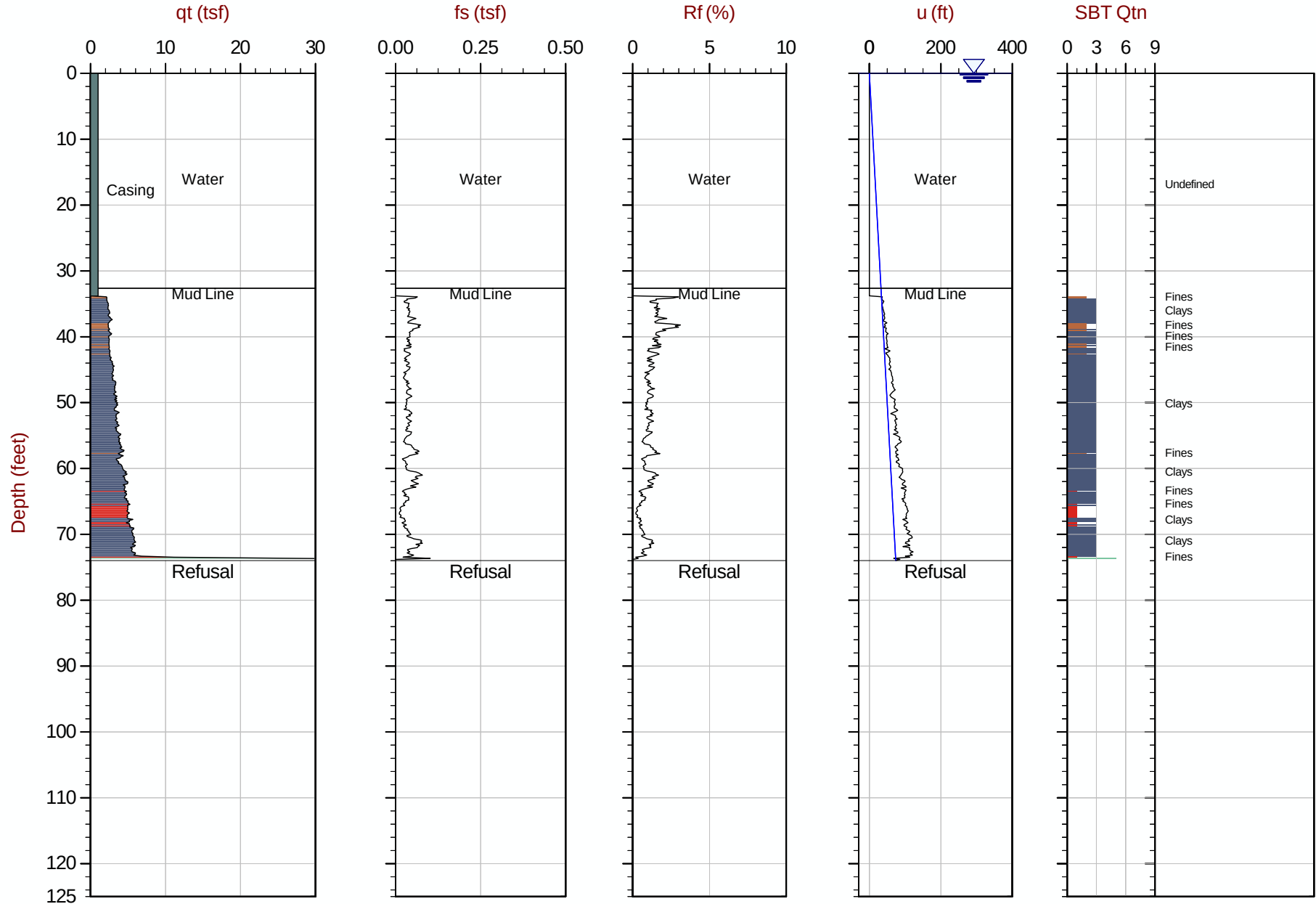
Job No: 17-53122

Date: 2017-09-14 10:35

Site: Electric Boat Facility Expansion

Sounding: SCPT17-201

Cone: 498:T375F10U500



Max Depth: 22.550 m / 73.98 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP201.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 688478ft E: 1182842ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.

Advanced Cone Penetration Test Plots



GEI Consultants

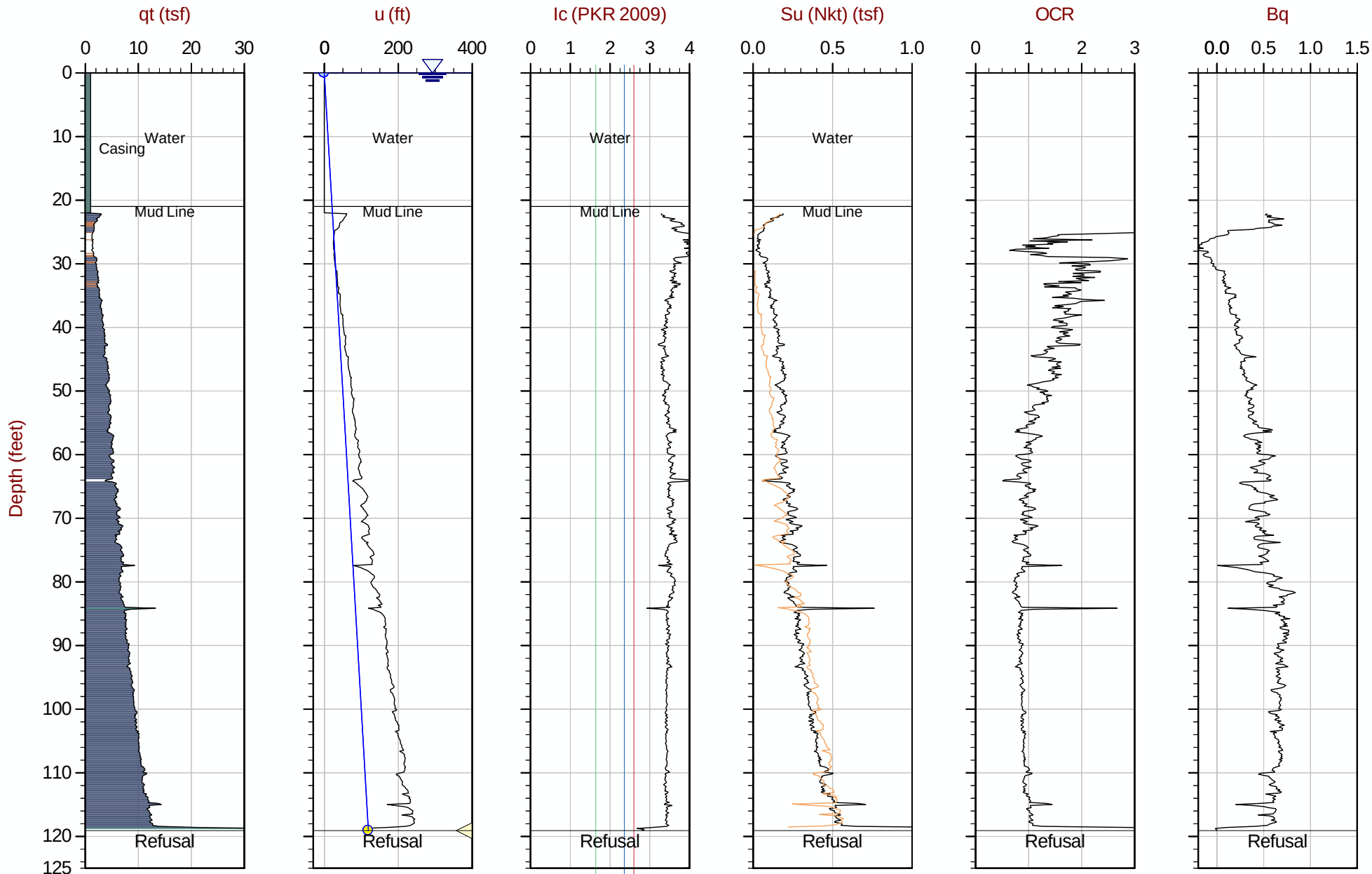
Job No: 17-53122

Date: 2017-09-13 14:00

Site: Electric Boat Facility Expansion

Sounding: CPT17-Alt-S-3

Cone: 498:T375F10U500



Max Depth: 36.300 m / 119.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_CPALTS3.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers
Su Nkt/Ndu: 12.0 / 7.0

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 684918ft E: 1183195ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

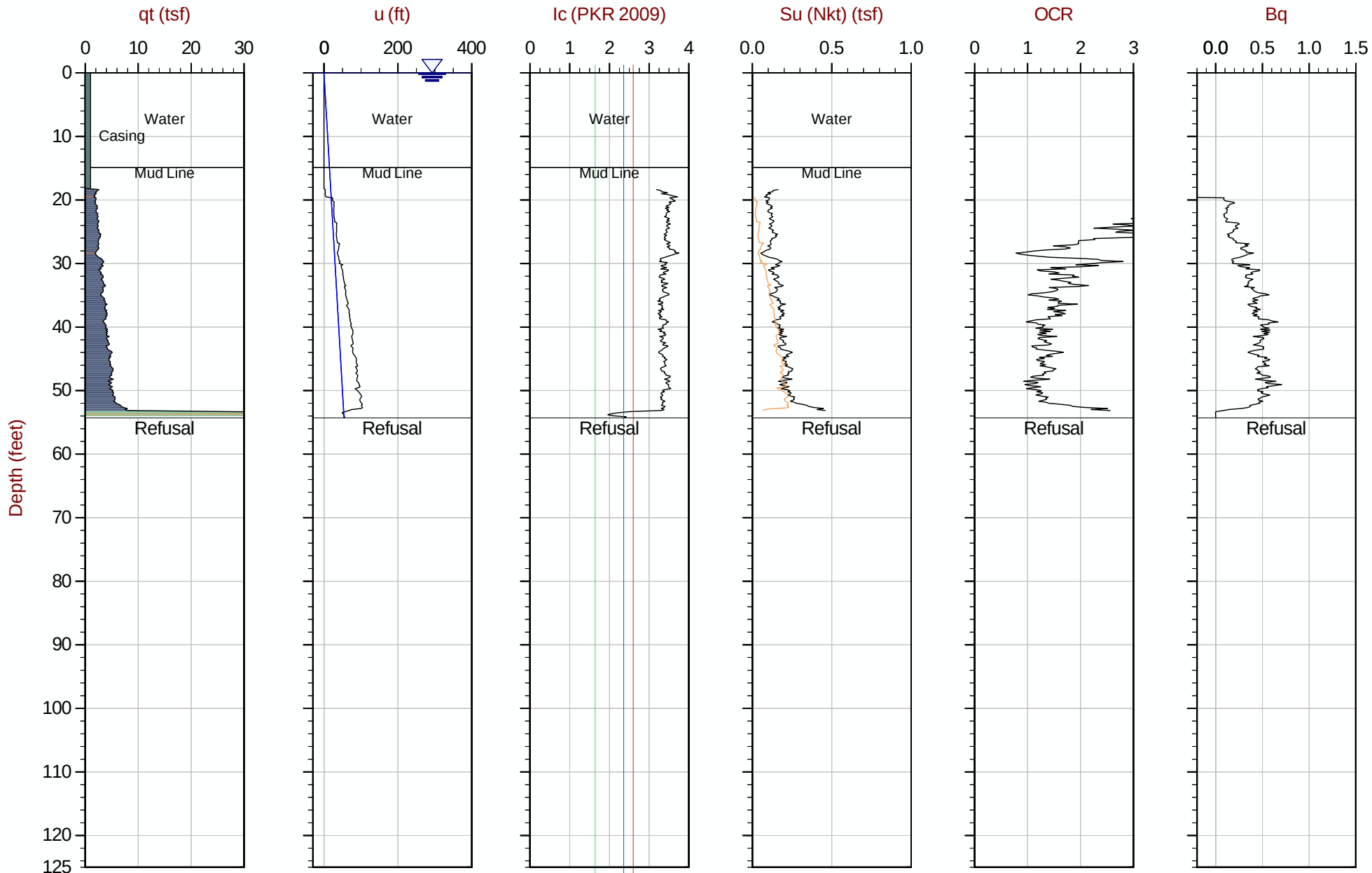
Job No: 17-53122

Date: 2017-09-12 09:07

Site: Electric Boat Facility Expansion

Sounding: SCPT17-101

Cone: 498:T375F10U500



Max Depth: 16.550 m / 54.30 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP101.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers
Su Nkt/Ndu: 12.0 / 7.0

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685930ft E: 1183460ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

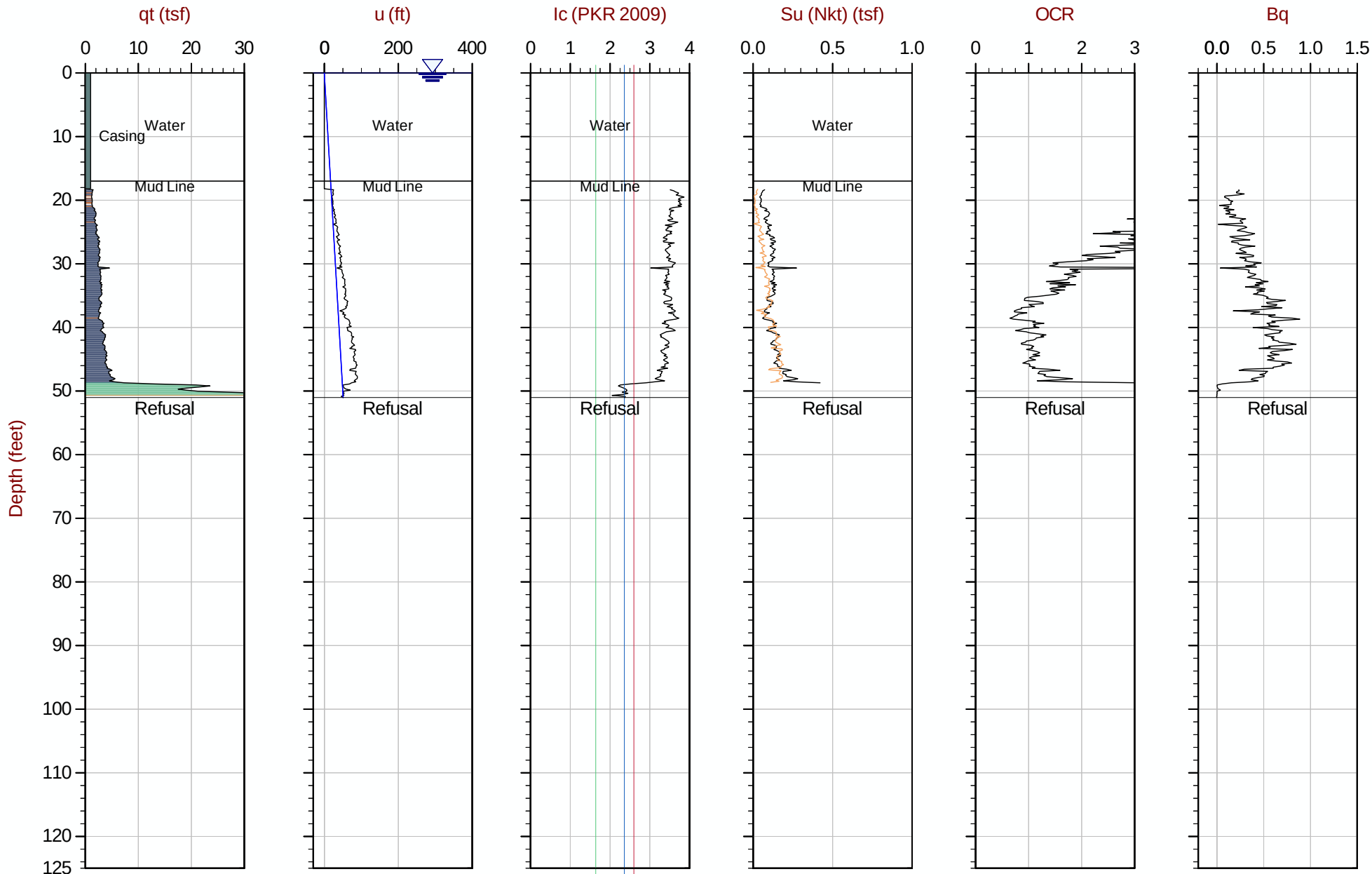
Job No: 17-53122

Date: 2017-09-12 14:47

Site: Electric Boat Facility Expansion

Sounding: SCPT17-102

Cone: 498:T375F10U500



Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP102.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers
Su Nkt/Ndu: 12.0 / 7.0

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685623ft E: 1183519ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

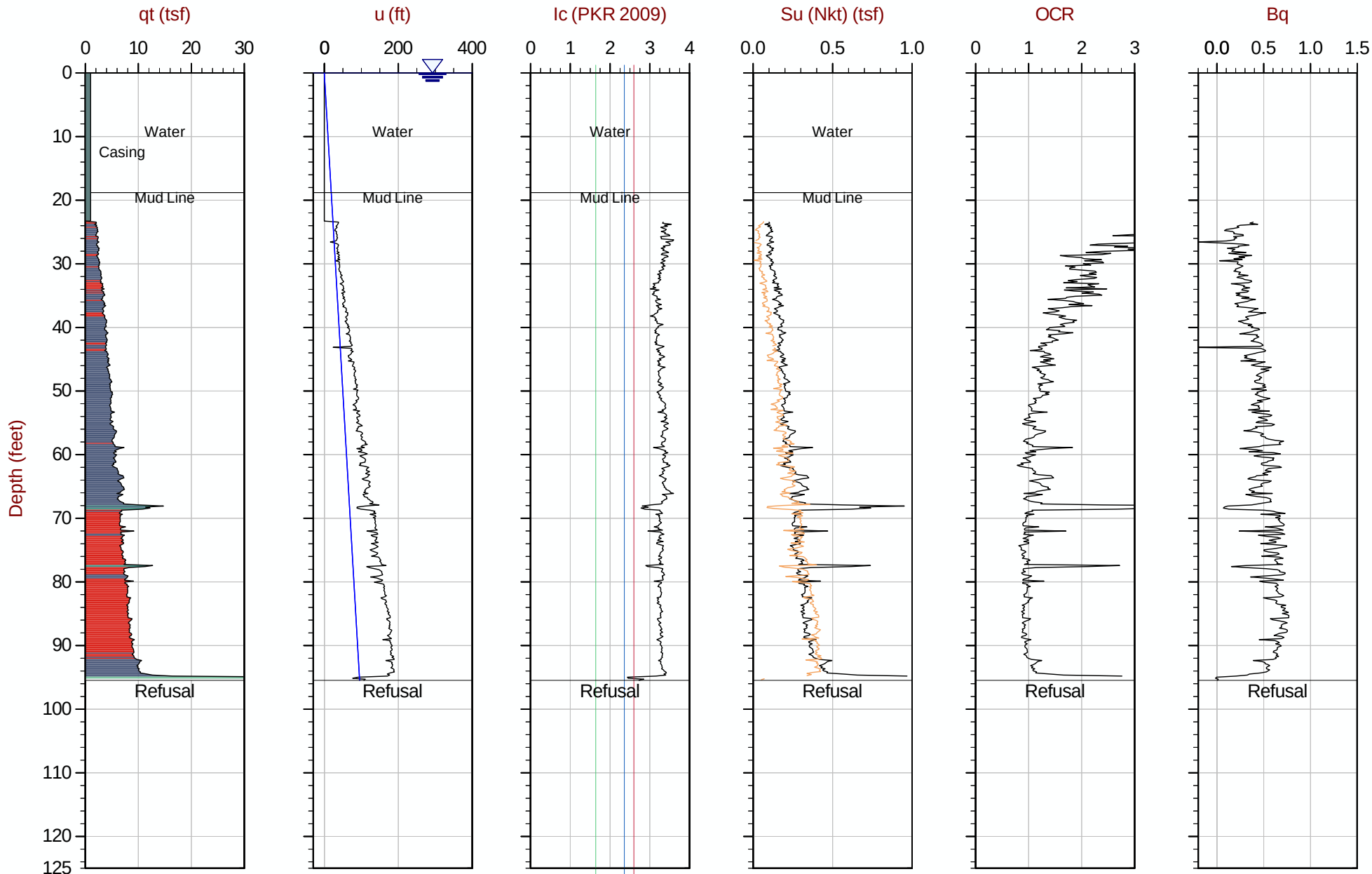
Job No: 17-53122

Date: 2017-09-13 08:56

Site: Electric Boat Facility Expansion

Sounding: SCPT17-103

Cone: 498:T375F10U500



Max Depth: 29.100 m / 95.47 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP103.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers
Su Nkt/Ndu: 12.0 / 7.0

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685378ft E: 1183411ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

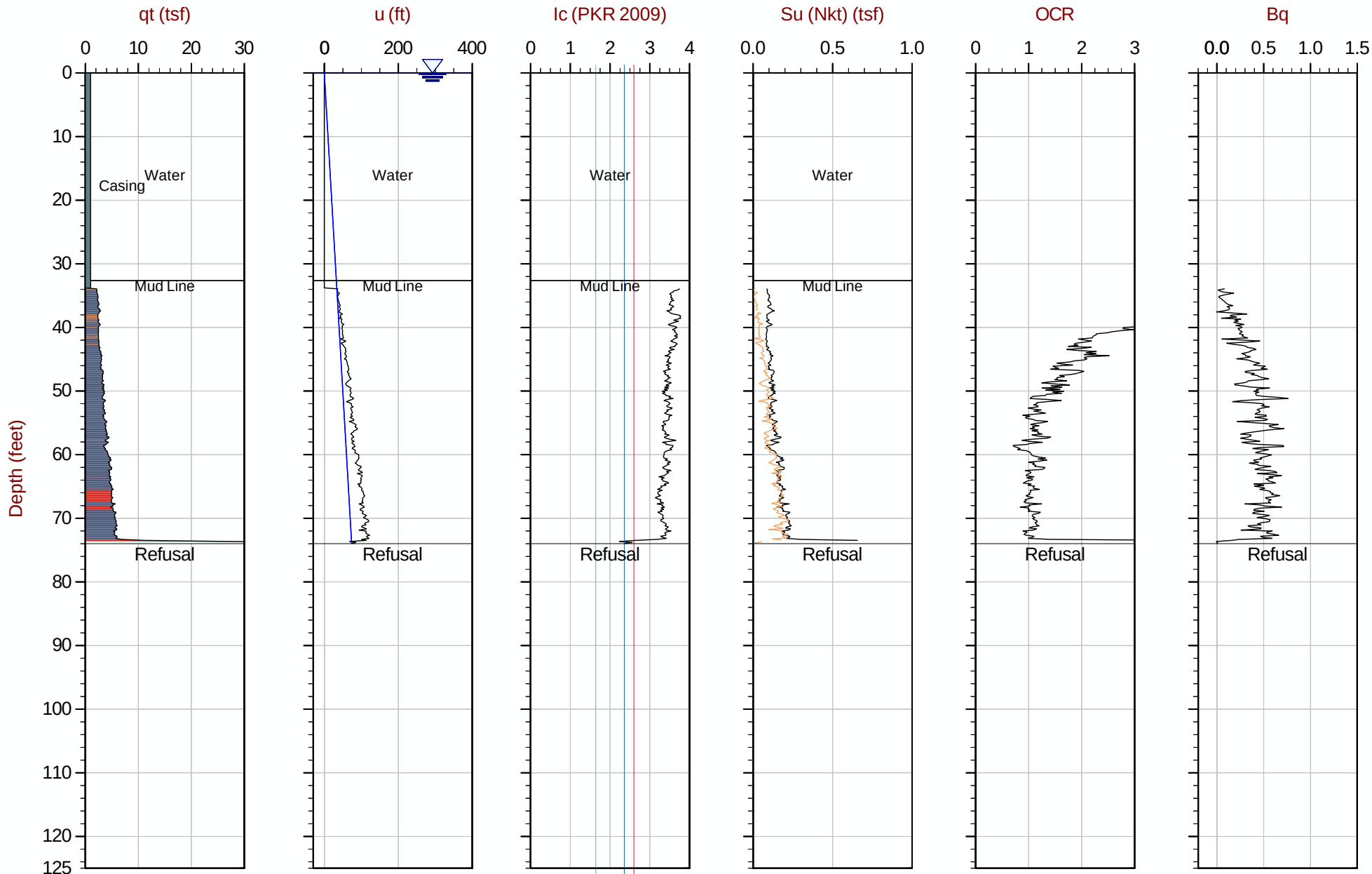
Job No: 17-53122

Date: 2017-09-14 10:35

Site: Electric Boat Facility Expansion

Sounding: SCPT17-201

Cone: 498:T375F10U500



Max Depth: 22.550 m / 73.98 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP201.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers
Su Nkt/Ndu: 12.0 / 7.0

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 688478ft E: 1182842ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.

Seismic Cone Penetration Test Plots



GEI Consultants

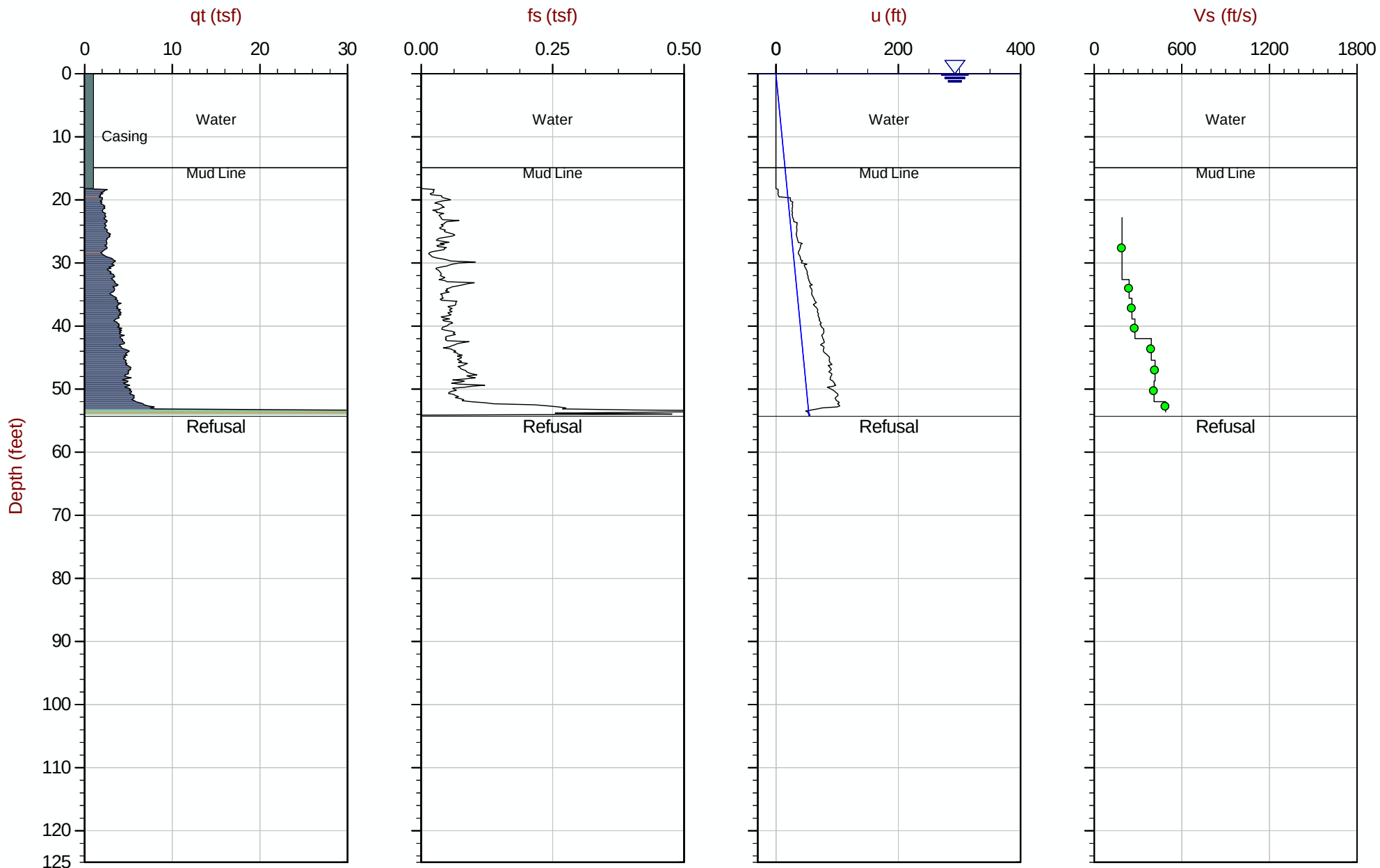
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Date: 2017-09-12 09:07

Site: Electric Boat Facility Expansion

Sounding: SCPT17-101

Cone: 498:T375F10U500



Max Depth: 16.550 m / 54.30 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP101.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685930ft E: 1183460ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

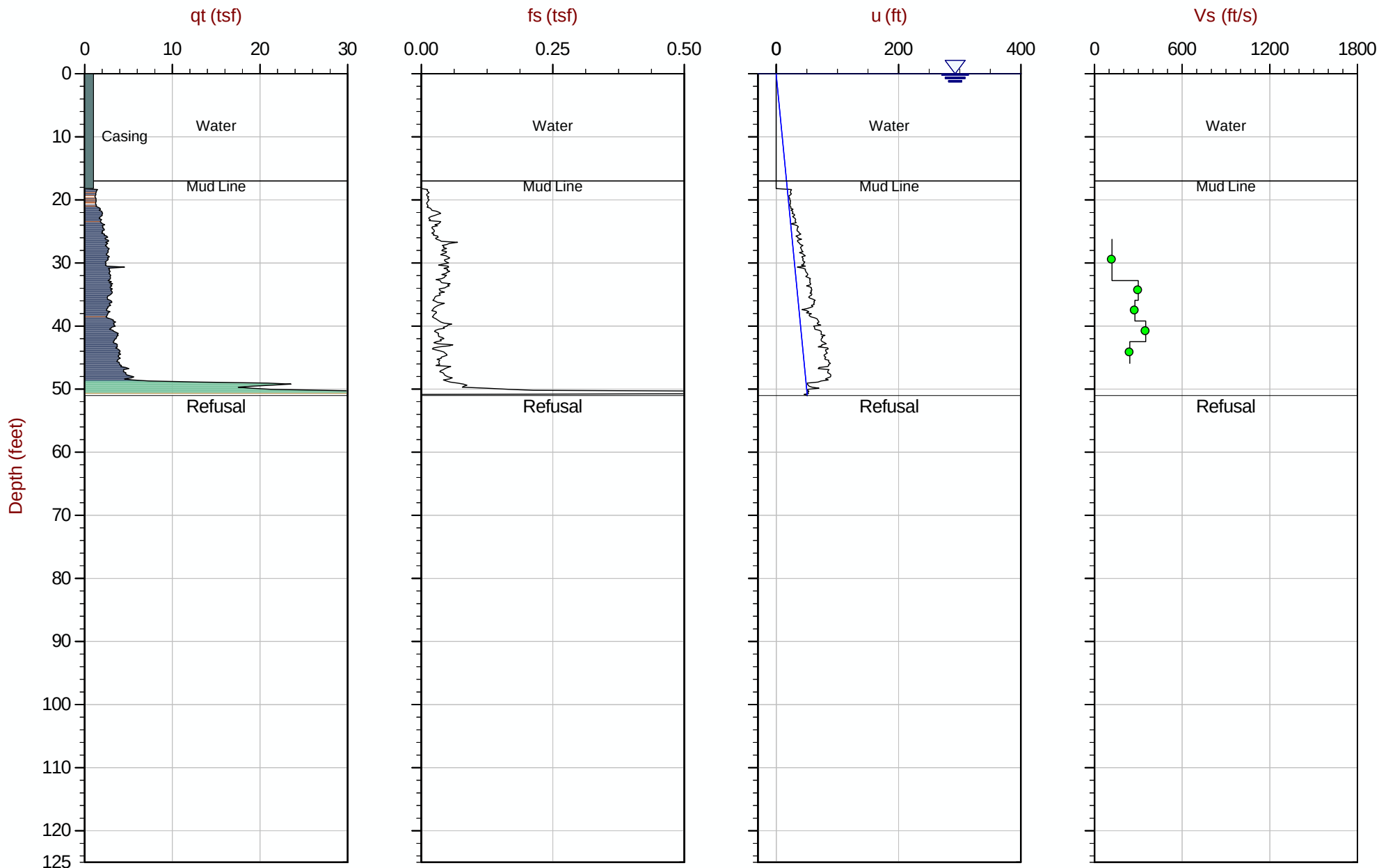
Job No: 17-53122

Date: 2017-09-12 14:47

Site: Electric Boat Facility Expansion

Sounding: SCPT17-102

Cone: 498:T375F10U500



Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP102.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685623ft E: 1183519ft

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were provided by GEI.



GEI Consultants

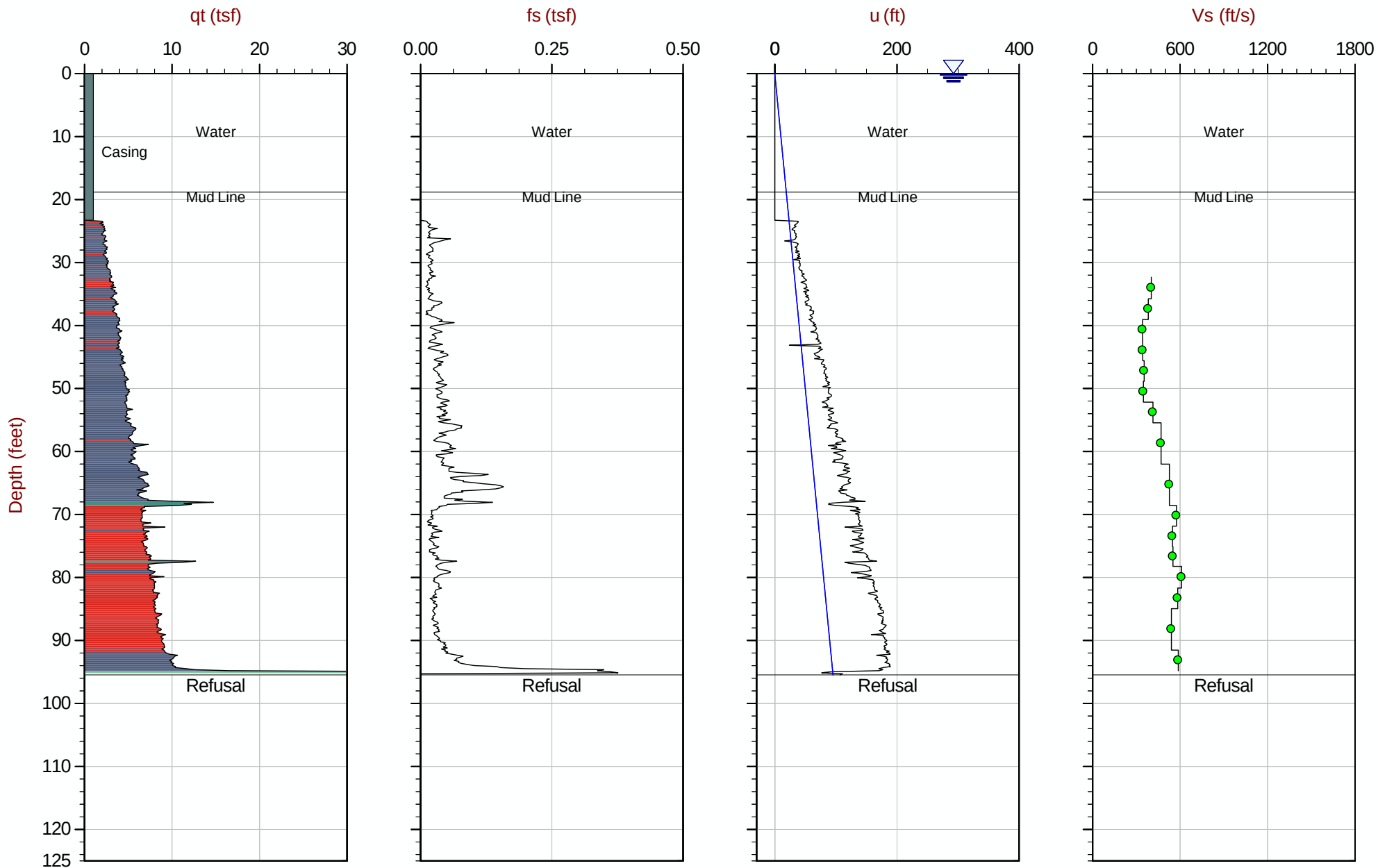
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Date: 2017-09-13 08:56

Site: Electric Boat Facility Expansion

Sounding: SCPT17-103

Cone: 498:T375F10U500



Max Depth: 29.100 m / 95.47 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP103.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 685378ft E: 1183411ft

Hydrostatic Line

The reported coordinates were provided by GEI.



GEI Consultants

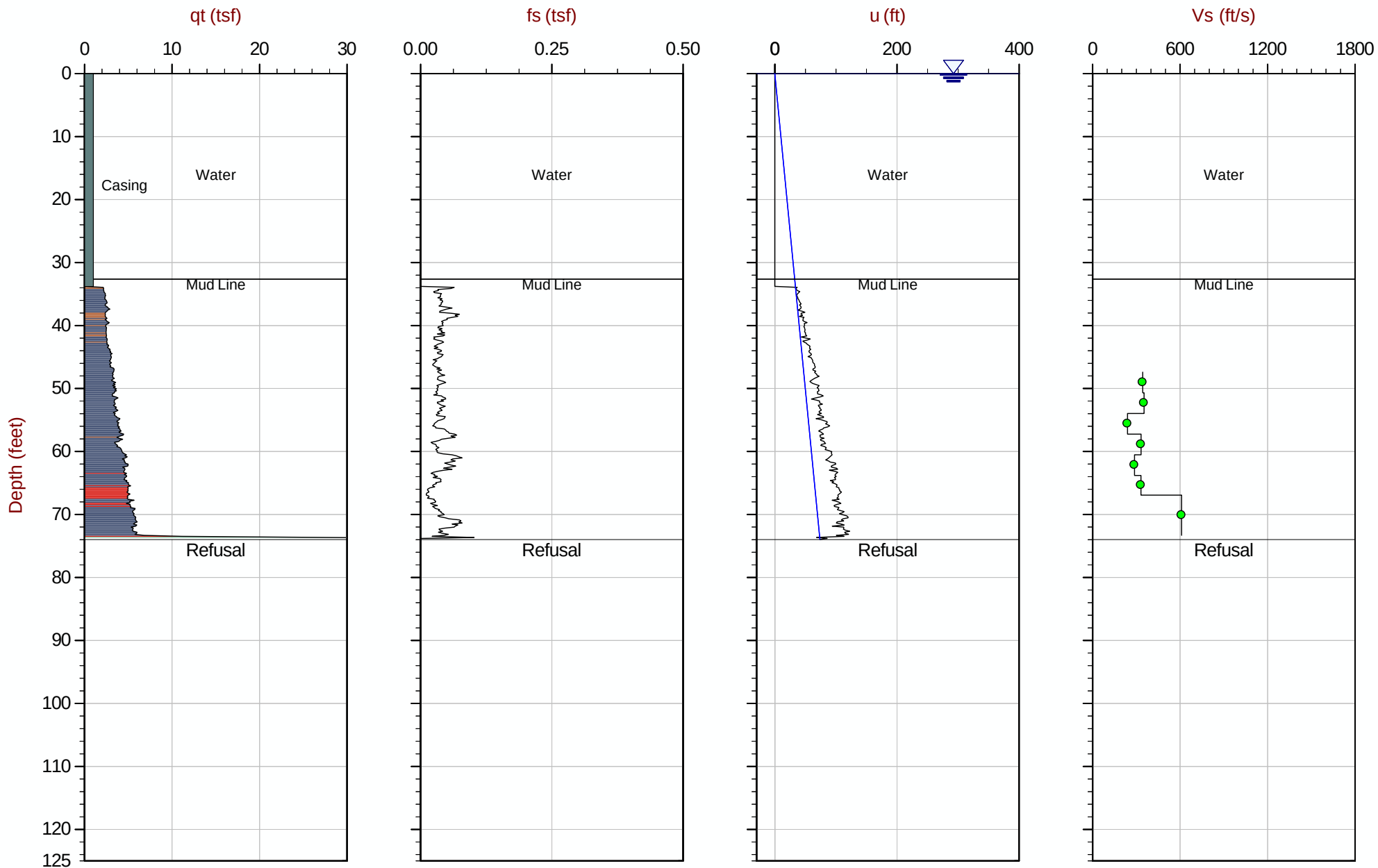
Job No: 17-53122

Date: 2017-09-14 10:35

Site: Electric Boat Facility Expansion

Sounding: SCPT17-201

Cone: 498:T375F10U500



Max Depth: 22.550 m / 73.98 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 17-53122_SP201.COR
Unit Wt: SBTQtn (PKR2009), User Defined Layers

SBT: Robertson, 2009 and 2010
Coords: CT State Plane N: 688478ft E: 1182842ft

Hydrostatic Line ● Ueq ● Assumed Ueq ▲ PPD, Ueq achieved ▲ PPD, Ueq not achieved

The reported coordinates were provided by GEI.

Seismic Cone Penetration Test Tabular Results (Vs)



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Sounding ID: SCPT17-101
Date: 12-Sep-2017

Seismic Source: Waterseis
Source Offset (ft): 14.44
Source Depth (ft): 14.99
Geophone Offset (ft): 0.66

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
23.46	22.80	16.41			
33.30	32.64	22.80	6.39	33.49	191
36.25	35.60	25.16	2.36	9.83	240
39.53	38.88	27.91	2.75	10.61	259
42.65	41.99	30.62	2.71	9.71	279
46.10	45.44	33.70	3.08	7.88	391
49.38	48.72	36.69	2.99	7.18	417
52.66	52.00	39.72	3.04	7.41	410
54.30	53.64	41.26	1.53	3.13	490



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Sounding ID: SCPT17-102
Date: 12-Sep-2017

Seismic Source: Waterseis
Source Offset (ft): 17.00
Source Depth (ft): 14.76
Geophone Offset (ft): 0.66

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
26.90	26.25	20.52			
33.46	32.81	24.79	4.28	35.60	120
36.58	35.92	27.14	2.35	7.83	300
39.86	39.21	29.77	2.63	9.49	277
43.14	42.49	32.52	2.75	7.83	351
46.59	45.93	35.50	2.98	12.34	242



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Sounding ID: SCPT17-103
Date: 13-Sep-2017

Seismic Source: Waterseis
Source Offset (ft): 14.76
Source Depth (ft): 19.00
Geophone Offset (ft): 0.66

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
32.97	32.32	19.88			
36.42	35.76	22.33	2.45	6.08	403
39.70	39.04	24.89	2.56	6.69	382
42.98	42.32	27.60	2.71	7.91	343
46.26	45.60	30.42	2.82	8.21	344
49.54	48.88	33.33	2.91	8.21	354
52.82	52.17	36.30	2.97	8.52	349
56.10	55.45	39.32	3.02	7.30	414
62.66	62.01	45.47	6.15	13.08	470
69.23	68.57	51.72	6.25	11.86	527
72.51	71.85	54.87	3.15	5.48	576
75.79	75.13	58.04	3.17	5.78	548
78.90	78.25	61.06	3.02	5.48	551
82.35	81.69	64.41	3.35	5.48	611
85.63	84.97	67.60	3.20	5.48	584
92.19	91.54	74.02	6.42	11.86	541
95.47	94.82	77.24	3.22	5.48	588



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Sounding ID: SCPT17-201
Date: 14-Sep-2017

Seismic Source: Waterseis
Source Offset (ft): 15.50
Source Depth (ft): 33.00
Geophone Offset (ft): 0.66

SCPT_u SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
48.06	47.41	21.16			
51.34	50.69	23.52	2.36	6.84	344
54.63	53.97	26.08	2.56	7.25	353
57.91	57.25	28.78	2.70	11.27	240
61.19	60.53	31.59	2.81	8.45	333
64.47	63.81	34.49	2.90	10.06	288
67.59	66.93	37.30	2.81	8.45	332
73.98	73.33	43.20	5.90	9.66	611

Soil Behavior Type Chart Scatter Plots



GEI Consultants

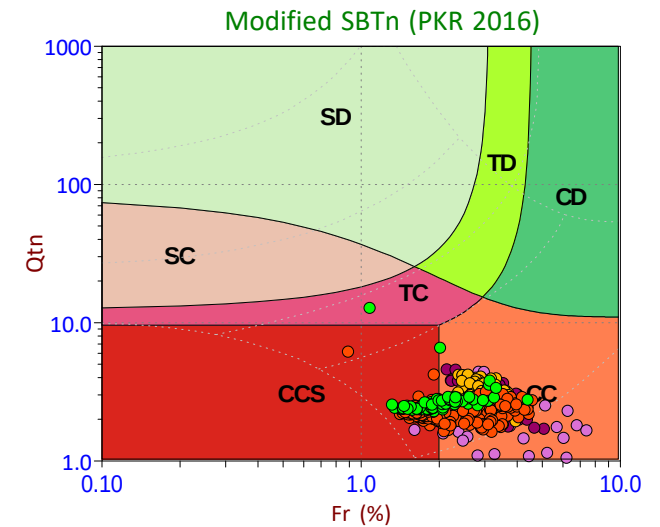
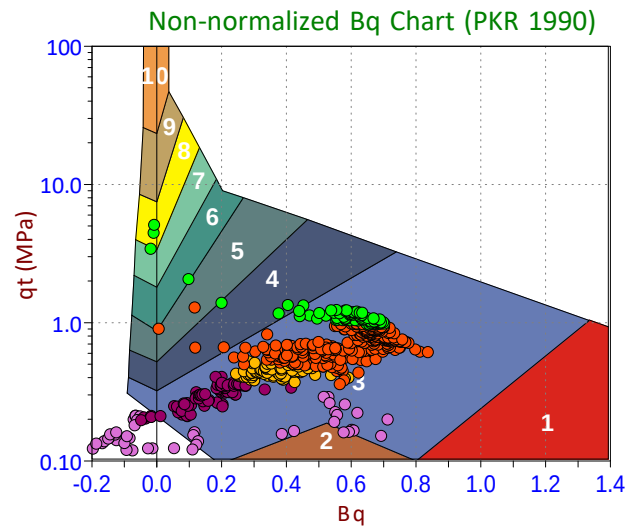
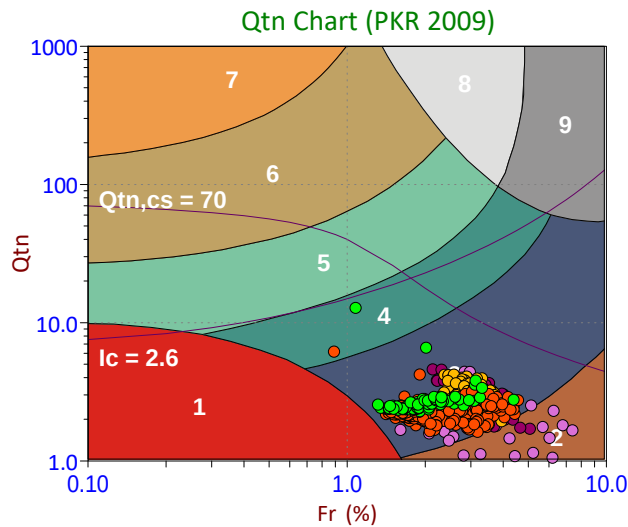
Job No: 17-53122

Date: 2017-09-13 14:00

Site: Electric Boat Facility Expansion

Sounding: CPT17-Alt-S-3

Cone: 498:T375F10U500



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 105.0 ft
- >105.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

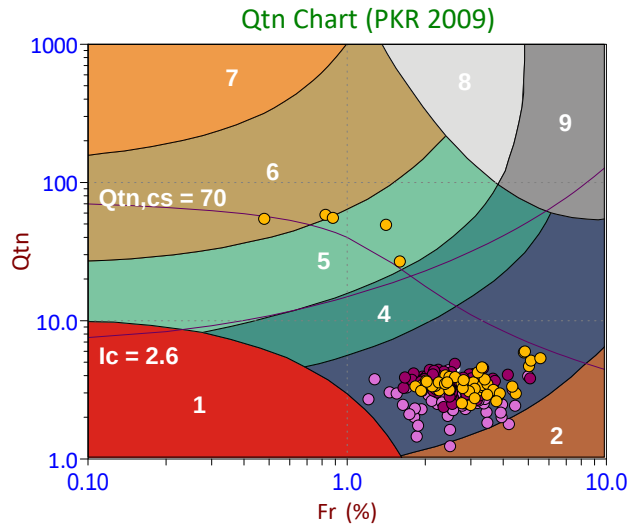
- Fines
- Fines
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

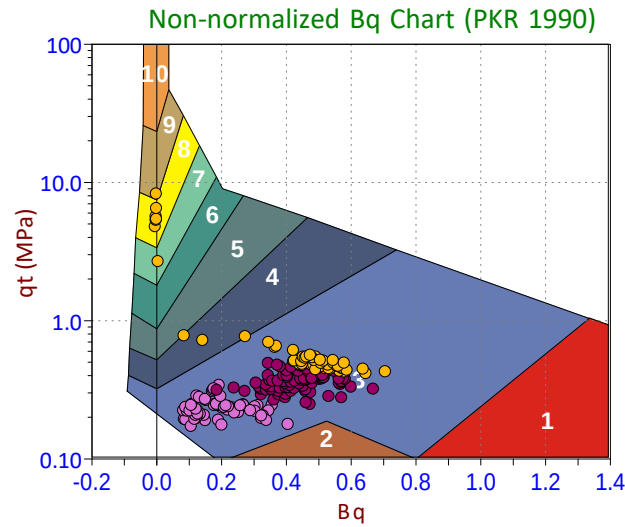


Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 105.0 ft
- >105.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

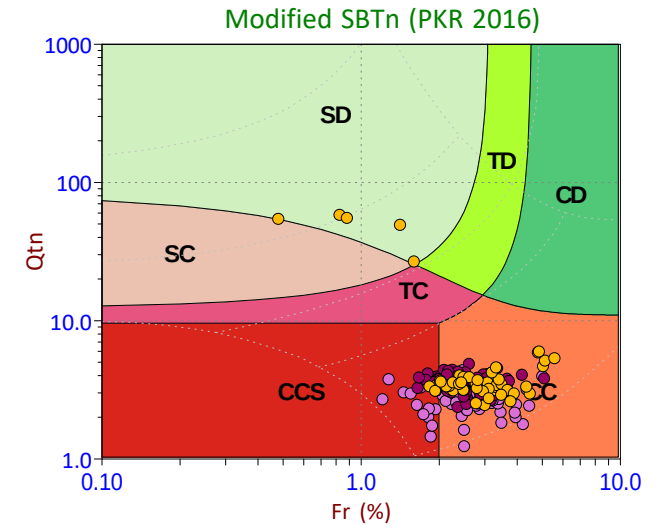
Legend

- Fines
- Fines
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand



Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)



GEI Consultants

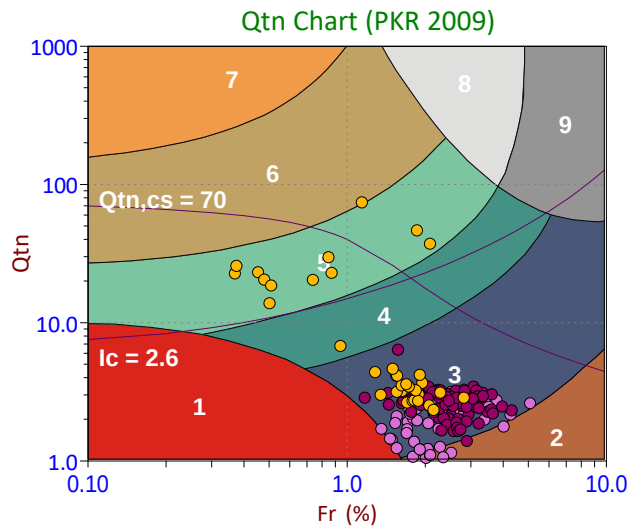
Job No: 17-53122

Date: 2017-09-12 14:47

Site: Electric Boat Facility Expansion

Sounding: SCPT17-102

Cone: 498:T375F10U500

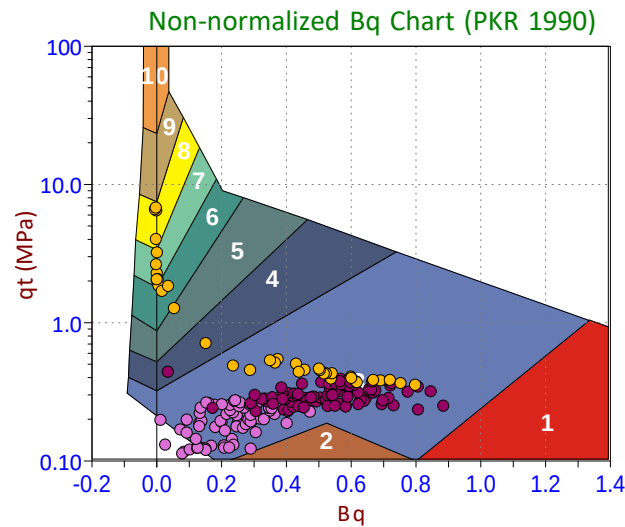


Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 105.0 ft
- >105.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

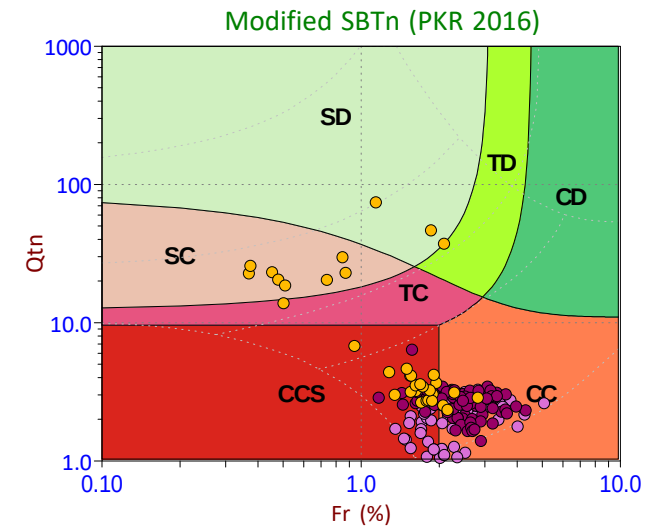
Legend

- Fines
- Fines
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand



Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)



GEI Consultants

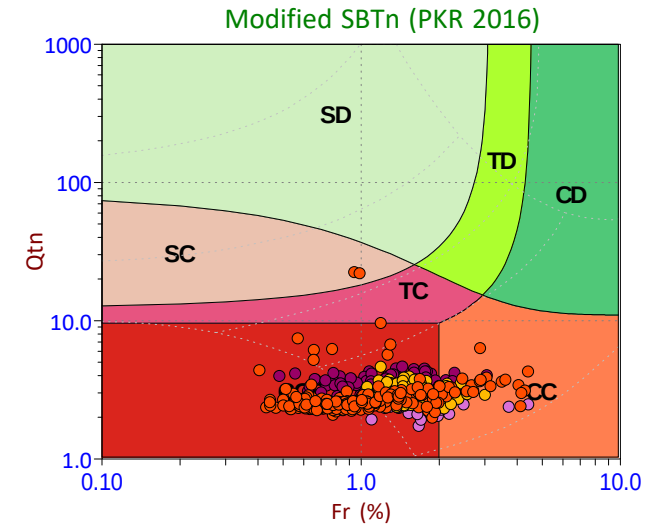
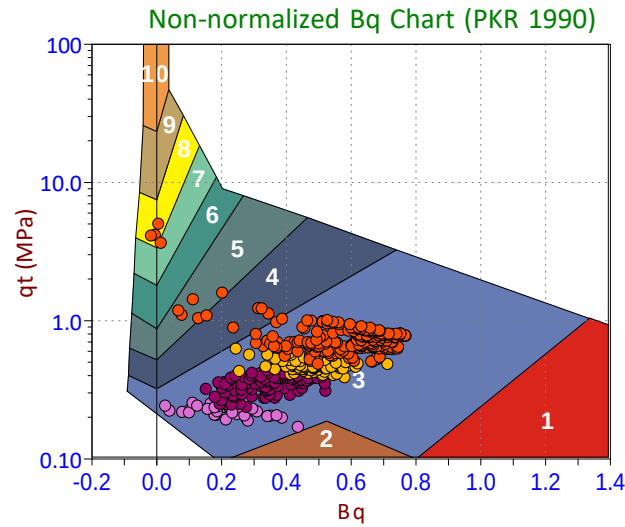
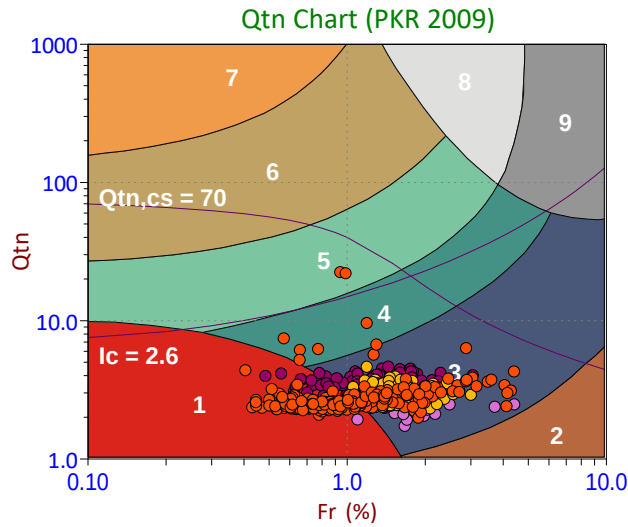
Job No: 17-53122

Date: 2017-09-13 08:56

Site: Electric Boat Facility Expansion

Sounding: SCPT17-103

Cone: 498:T375F10U500



Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 105.0 ft
- >105.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

Legend

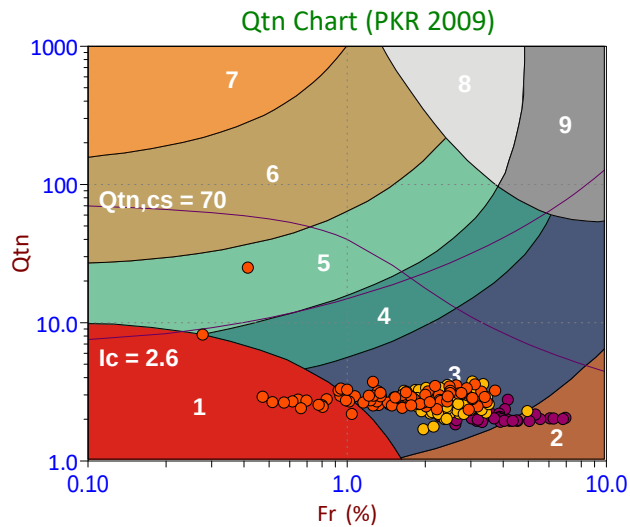
- Fines
- Fines
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

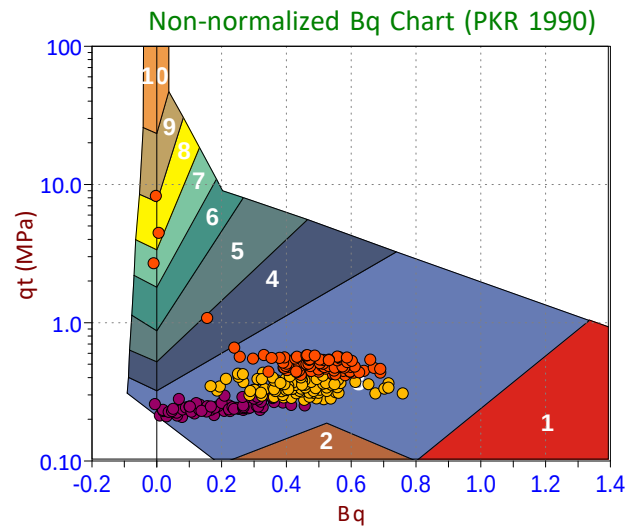


Depth Ranges

- >0.0 to 15.0 ft
- >15.0 to 30.0 ft
- >30.0 to 45.0 ft
- >45.0 to 60.0 ft
- >60.0 to 105.0 ft
- >105.0 to 75.0 ft
- >75.0 to 90.0 ft
- >90.0 to 120.0 ft
- >120.0 to 135.0 ft
- >135.0 to 150.0 ft
- >150.0 ft

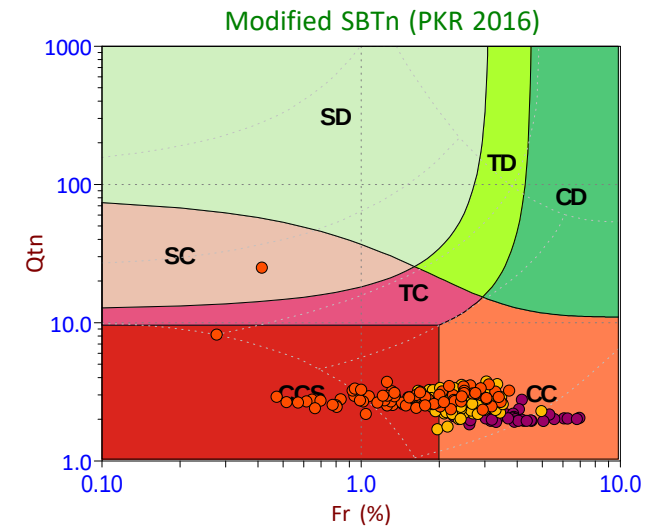
Legend

- Fines
- Fines
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained



Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand



Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Summary and
Pore Pressure Dissipation Plots



Job No: 17-53122
Client: GEI Consultants
Project: Electric Boat Facility Expansion, Groton, CT
Start Date: 12-Sep-2017
End Date: 14-Sep-2017

CPT_u PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm ²)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U _{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)
CPT17-Alt-S-3	17-53122_CPALTS3.PPD	15	90	119.09	119.13	-0.03	
Totals	1 dissipations		1.5 min				



GEI Consultants

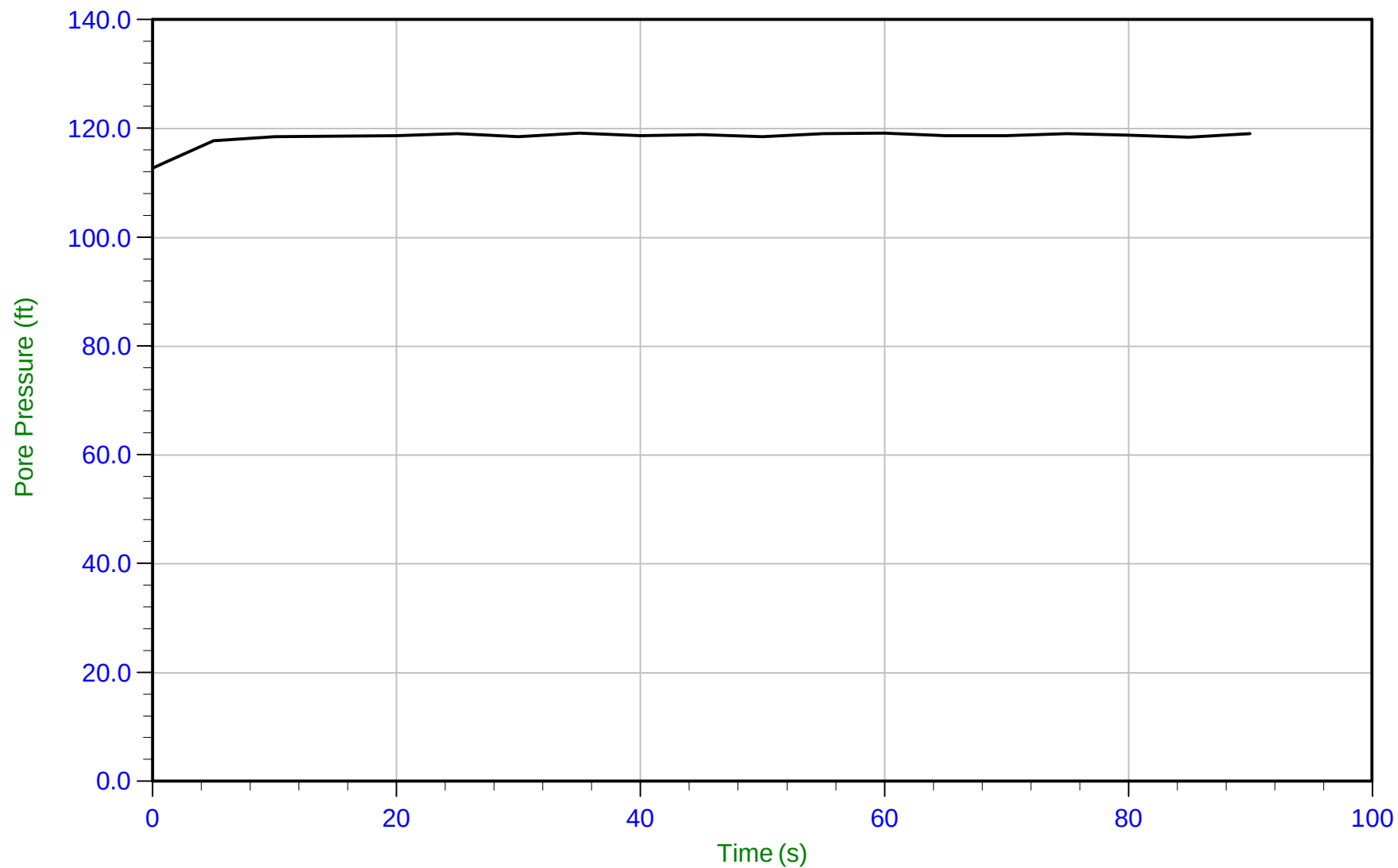
Job No: 17-53122

Date: 13-Sep-2017 14:00:22

Site: Electric Boat Facility Expansion

Sounding: CPT17-Alt-S-3

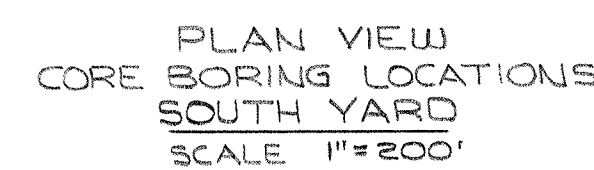
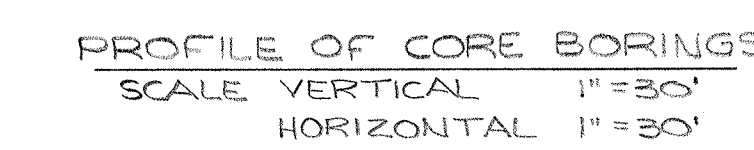
Cone: AD498 Area=15 cm²



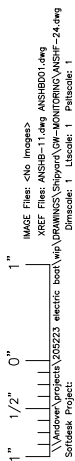
Trace Summary: Filename: 17-53122_CPALTS3.PPD U Min: 112.7 ft WT: -0.010 m / -0.033 ft
Depth: 36.300 m / 119.093 ft U Max: 119.2 ft Ueq: 119.1 ft
Duration: 90.0 s

Appendix D

Historic Boring Data



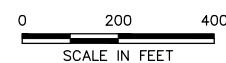
GENERAL DYNAMICS			
ELECTRIC BOAT DIVISION			
CORE BORING LOCATIONS South Yard			
FACILITIES AND PLANT ENGINEERING			
DRAWN: <u>WRS/ueed</u>	DATE:	DRAWING NO.	REV
CHECKED:		<u>EB 237-00-047</u>	
ENGINEER:			
APPROVED:		SCALE: <u>As Noted</u>	



SH06-MW01 MONITORING WELL LOCATION AND IDENTIFIER
M = INTERMEDIATE WELL SCREEN
R = BEDROCK WELL SCREEN

NOTE:

SH01-MW01R, SH01-MW02R, SH01-MW03R,
SH01-MW04R, SH04-MW01, SH04-MW02,
SH13-MW03, SH16-MW01, SH18-MW10, SH18-MW11,
SH19-MW15, SH19-MW16, SH20-MW02, AND
SH21-MW04 ARE DESTROYED.

[illegible]

ELECTRIC BOAT CORPORATION
SHIPYARD FACILITY
GROTON, CONNECTICUT
**ANNUAL GROUNDWATER MONITORING
PROGRAM SAMPLE LOCATIONS
APRIL 2015**

DRAWING NO.
1
PROJECT NO.
205223



Boring/Well No.: SH24-MW01

Page 1 of 1

Project Name: Shipyard RFI	Location: South of Building 192
Project Number: 83605-010.000	Ground Elevation: 12.41'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 686147.30 (NAD83)
Logged By: S. Maher, J. Cerbone	Easting: 1183693.00 (NAD83)
Drilled By: G. Leavitt, A. Johnson	Drilling Method: HSA/D&W
Date(s): 08/24/95 - 08/28/95	Total Depth: 18.5'
Static Water Level: 10.90' bgs	Borehole Diameter: 5.00in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.4' to: 7.5'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 7.5' to: 17.5'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction MP. EL. 12.02	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
					3 in. Asphalt pavement.					
		S-1	32		Dense, tan, fine SAND, trace Silt. Fill.			8.1	1.2	3
		S-2	16		Medium dense, tan to black, medium to fine SAND, trace Silt. Fill.			2.6	1.6	3
5		S-3	8		Loose, dark brown, fine to medium SAND, trace Silt. Fill.			ND	1.1	3
		S-4	15		Medium dense, dark brown, fine to medium SAND, trace Silt. Fill.			1.4	1.2	4
10					Unknown obstruction encountered.					
		S-5	66		Very dense, black, coarse to fine SAND, little fine to medium Gravel, little Silt, with a petroleum sheen and staining. Fill. Saturated at 10.9 ft. bgs			86	43.2	6
		S-6	30		Dense, black, fine to medium SAND, trace Silt, with petroleum staining.			NA	1.5	5
15		S-7	85		Very dense, black, fine to medium SAND, trace Silt.			NA	0.6	3
					End of boring at 18.5 ft. bgs The borehole was advanced as follows: 4.25 in. ID HSA to 13.0 ft. bgs 5 in. casing drive and wash to 18.5 ft. bgs					



Boring/Well No.: SH24-MW03

Page 1 of 2

Project Name: Shipyard RFI	Location: South of Building 132
Project Number: 83605-010.000	Ground Elevation: 8.95'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 686168.30 (NAD83)
Logged By: D. Lent, J. Markey	Easting: 1183545.00 (NAD83)
Drilled By: J. Garside, S. Garside	Drilling Method: HSA
Date(s): 11/11/93 - 11/12/93	Total Depth: 21.0'
Static Water Level: 8.50' bgs	Borehole Diameter: 8.25in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.4' to: 4.0'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 4.0' to: 14.0'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction MP. EL. 8.52	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
					3 in. Asphalt pavement.					
		S-1	17		Medium dense, red brown, coarse to fine SAND, and fine to coarse GRAVEL, trace Silt. Fill.			ND	0.6	2
		S-2	21		Medium dense, red brown, coarse to fine SAND, and coarse to fine GRAVEL, trace Silt. Fill.			NS	0.6	2
5		S-3	23		Medium dense, brown, fine to medium SAND, little fine to medium Gravel, little Clayey Silt. Fill.			NS	2.0	2
		S-4	19		Medium dense, gray, fine to coarse SAND, little Clayey Silt, trace Gravel, with petroleum odor. Saturated at 8.5 ft. bgs			ND	0.8	2
10		S-5	63		Very dense, gray, fine to coarse SAND, and coarse to fine GRAVEL, little Clayey Silt, with petroleum odor and sheen.			8.0	6.4	3
		S-6	14		Soil recovered in split spoon tip only, no material description recorded, but field screening analysis performed.			5.5	0.6	2
		S-7	6		Loose, gray brown, coarse to fine SAND, some fine to medium Gravel, little Clayey Silt, with petroleum odor and sheen.			6.0	0.3	1
15		S-8	14		Medium dense, gray brown, coarse to fine SAND, some fine to medium Gravel, little Clayey Silt, with petroleum odor and sheen.			0.5	0.4	1
		S-9	29		Medium dense, dark gray, fine to medium SAND.			ND	0.5	1
		S-10	47		No recovery.			NS	NS	NS



Boring/Well No.: SH28-MW02R

Page 1 of 3

Project Name: Shipyard RFI	Location: South of Building 273
Project Number: 83605-010.000	Ground Elevation: 16.82'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 685825.30 (NAD83)
Logged By: D. Lent, J. Cerbone, J. Markey	Easting: 1183724.00 (NAD83)
Drilled By: T. Garside	Drilling Method: HSA/Rollerbit/NX Core
Date(s): 12/22/93 - 02/03/94	Total Depth: 42.5'
Static Water Level: 14.00' bgs	Borehole Diameter: 4.00in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.3' to: 37.5'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 37.5' to: 42.5'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction MP. EL. 16.53	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
		S-1	47		Dense, brown, coarse to fine SAND, and coarse to fine GRAVEL, trace(-) Silt, with petroleum odor. Fill.			15	869	3
		S-2	30		Dense, brown, coarse to fine SAND, and coarse to fine Gravel, trace(-) Silt, with pieces of brick and petroleum odor. Fill.			30	1312	3
5		S-3	18		Medium dense, brown, coarse to fine SAND, some coarse to fine Gravel, little Silt, with petroleum odor. Fill.			40	3.2	4
		S-4	10		Medium dense, brown, coarse to fine SAND, some coarse to fine Gravel, little Silt, with petroleum odor.			NS	4.9	5
		S-5	32		Medium dense, brown, coarse to fine SAND, some coarse to fine Gravel, little(+) Clayey Silt, with pieces of slag, and petroleum odor. Fill.			1.5	4.7	5
10		S-6	9		Medium dense, brown, coarse to fine SAND, some Clayey Silt, trace medium to fine Gravel. Fill.			1.5	5.2	5
		S-7	2		Very loose, brown, coarse to fine SAND, some Clayey Silt, little coarse to fine Gravel. Fill.			NA	6.8	5
15		S-8	1		Very loose, brown, coarse to fine SAND, little Clayey Silt, trace coarse to fine Gravel. Fill. Saturated at 14.0 ft.			NA	2.0	3
		S-9	50R		Very dense, brown and black, coarse to fine SAND, some Clayey Silt. Fill.			NA	69.6	2



Project Name: Shipyard RFI	Location: South of Building 273
Project Number: 83605-010.000	Ground Elevation: 16.82'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 685825.30 (NAD83)
Logged By: D. Lent, J. Cerbone, J. Markey	Easting: 1183724.00 (NAD83)
Drilled By: T. Garside	Drilling Method: HSA/Rollerbit/NX Core
Date(s): 12/22/93 - 02/03/94	Total Depth: 42.5'
Static Water Level: 14.00'bgs	Borehole Diameter: 4.00in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.3' to: 37.5'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 37.5' to: 42.5'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
25		S-10	38		Dense, dark gray, coarse to fine SAND, some coarse to fine Gravel, trace Silt & Clay.			NA	18.0	3
		S-11	8		Medium dense, dark gray, coarse to fine coarse SAND, little Clayey Silt, trace coarse to fine Gravel.			ND	2.1	2
		S-12	27		Medium dense, dark gray, medium to fine SAND, trace Clayey Silt, trace(-) coarse to fine Gravel.			ND	9.3	2
		S-13	28		Medium dense, dark gray, coarse to fine coarse SAND, and coarse to fine GRAVEL.			NA	1.6	2
		S-14	30		Dense, dark gray, medium to fine SAND, and SILT & CLAY, trace coarse to fine Gravel, with organic material.			NA	9.4	1
30		S-15	89		Very dense, dark gray, medium to fine SAND, and SILT & CLAY, little coarse to fine Gravel, with organic material.			NS	12.6	2
					Bedrock encountered at 30.5 ft.					
35		R-1 GW-1	NA		Very hard, gray, freshly weathered, medium to fine grained, granodioritic GNEISS; four natural fractures. RQD = 89%.			NS	4.6	1
		R-2 GW-2	NA		Very hard, gray, freshly weathered, medium to fine grained, granodioritic GNEISS; four natural fractures. RQD = 96%.			NS	1.0	1



Boring/Well No.: SH29-MW01

Page 1 of 2

Project Name: Shipyard RFI	Location: West of Building 166
Project Number: 83605-010.000	Ground Elevation: 16.76'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 685225.40 (NAD83)
Logged By: J. Cerbone, S. Maher	Easting: 1183789.00 (NAD83)
Drilled By: G. Leavitt, R. Dupont	Drilling Method: HSA
Date(s): 08/29/95 - 08/29/95	Total Depth: 22.0'
Static Water Level: 15.00' bgs	Borehole Diameter: 8.25in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.6' to: 12.0'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 12.0' to: 22.0'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction MP. EL. 16.14	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
5		S-1	102		Very dense, brown, fine to coarse SAND, some fine to coarse Gravel. Fill.			123	0.2	2
		S-2	68		Very dense, brown, fine to coarse SAND, some fine to coarse Gravel. Fill.			77	ND	ND
		S-3	60		Very dense, brown, fine to coarse SAND, some fine to coarse Gravel. Fill.			59	<0.05	1
					Boulder encountered at 5.6 ft. bgs					
		S-4	6		No recovery.			NS	NS	NS
10		S-5	9		Loose, brown, fine to coarse SAND, some fine to coarse Gravel. Fill.			ND	0.1	1
		S-6	14		Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel. Fill.			ND	0.4	1
		S-7	11		Medium dense, brown, coarse GRAVEL. Fill. Saturated at 15.0 ft. bgs			ND	0.9	3
15		S-8	19		No recovery.			NS	NS	NS
		S-9	34		No recovery.			NS	<0.05	1



Boring/Well No.: SH29-MW01R

Page 1 of 2

Project Name: Shipyard RFI	Location: West of Building 166
Project Number: 83605-010.000	Ground Elevation: 16.67'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 685221.30 (NAD83)
Logged By: J. Markey	Easting: 1183788.00 (NAD83)
Drilled By: G. Twombly, J. Michette	Drilling Method: HSA/D&W/NX Core
Date(s): 01/19/94 - 02/02/94	Total Depth: 40.0'
Static Water Level: 17.00' bgs	Borehole Diameter: 4.00in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.4' to: 35.0'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 35.0' to: 40.0'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction MP. EL. 16.28	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
5		S-1	39		Dense, brown, coarse to fine GRAVEL, and fine to coarse SAND, trace Silt. Fill.			ND	0.8	1
		S-2	118		Soil recovered in split spoon tip only, no material description recorded, but field screening analysis performed.			NS	3.6	3
5		S-3	53		Very dense, brown, fine to coarse SAND, little fine to coarse Gravel, trace Silt. Fill.			1.0	2.1	5
		S-4	62		Very dense, brown, fine to coarse SAND, little coarse to fine Gravel, trace Silt. Fill.			ND	1.3	1
10		S-5	25		No recovery.			NS	NS	NS
		S-6	20		Medium dense, brown, coarse to fine GRAVEL, and fine to coarse SAND, trace Silt. Fill.			ND	1.3	1
		S-7	74		Very dense, brown, coarse to fine GRAVEL, and fine to coarse SAND, trace Silt. Fill.			6.0	72.1	2
15		S-8	100R		Very dense, brown, fine to coarse SAND, and fine to coarse GRAVEL, trace Silt. Fill.			NS	10.8	5
					Boulders encountered from 16.0 to 28.5 ft. bgs Saturated at 17.0 ft. bgs					



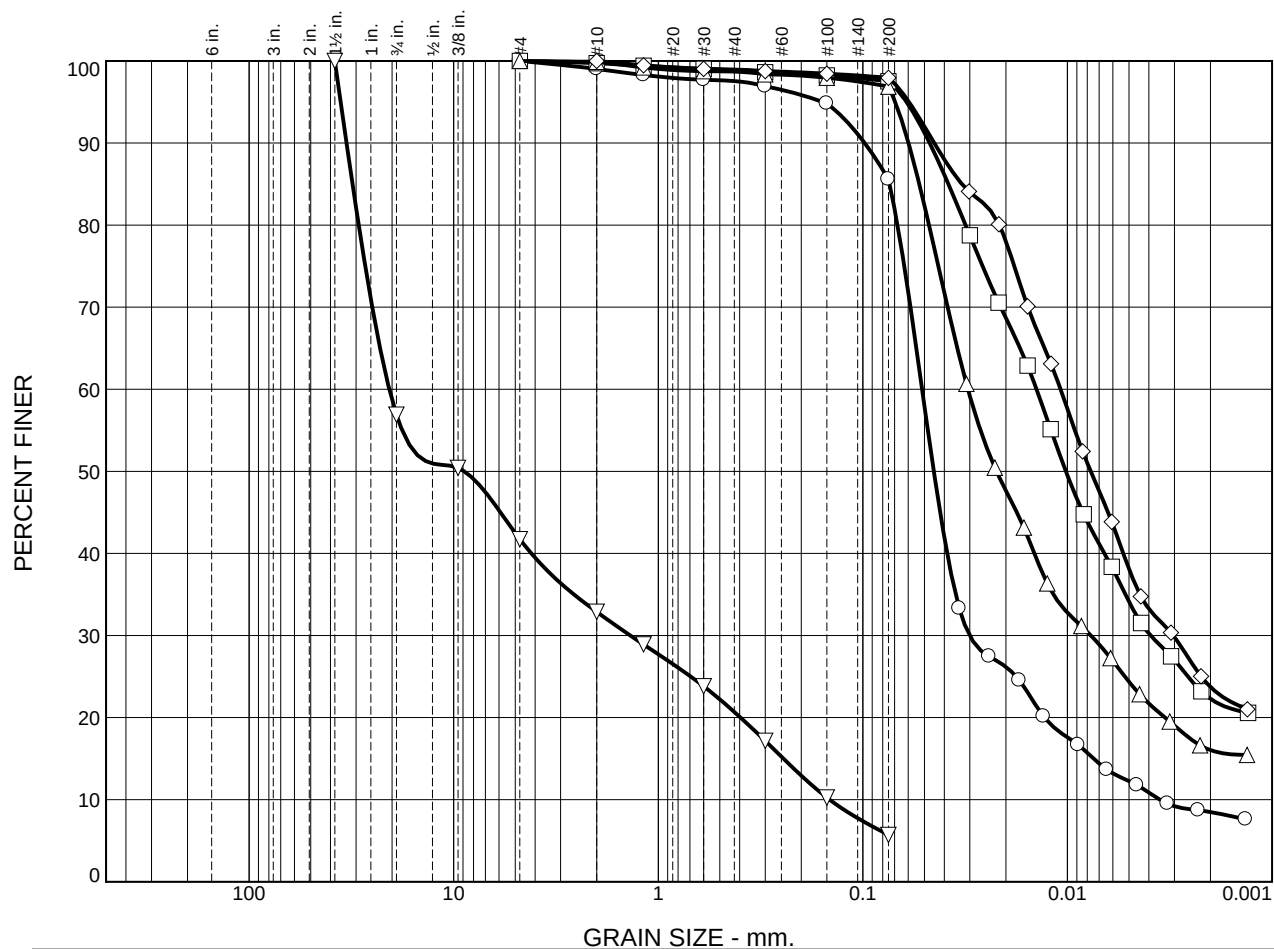
Project Name: Shipyard RFI	Location: West of Building 166
Project Number: 83605-010.000	Ground Elevation: 16.67'
Client: Electric Boat Corporation	Datum: NGVD29
Contractor: New Hampshire Boring	Northing: 685221.30 (NAD83)
Logged By: J. Markey	Easting: 1183788.00 (NAD83)
Drilled By: G. Twombly, J. Michette	Drilling Method: HSA/D&W/NX Core
Date(s): 01/19/94 - 02/02/94	Total Depth: 40.0'
Static Water Level: 17.00' bgs	Borehole Diameter: 4.00in (at well screen interval)
Well Casing: type: Schedule 40 PVC dia: 2in fm: 0.4' to: 35.0'	Remarks: (1) VOC data obtained using a PID with a 10.2 or 11.7 eV lamp (2) VOC data obtained using a Photovac model 10S Series gas chromatograph
Screen: type: Slotted size: 00.01in dia: 2in fm: 35.0' to: 40.0'	

Depth (ft)	Recovery	Sample No.	n-value	Graphic Log	Material Description (In accordance with Modified Burmister, 1958)	Well Construction	Water Level	VOCs (ppm) ⁽¹⁾	VOC Peak Area (VS) ⁽²⁾	VOC Peaks ⁽²⁾
25					The borehole was advanced as follows: 4.25 in. ID HSA to 16.0 ft. bgs 6 in. casing drive and wash to 23.5 ft. bgs 5 in. Rollerbit drilling to 24.5 ft. bgs 4 in. casing drive and wash to 28.5 ft. bgs 4 in. Rollerbit drilling to 30.0 ft. bgs NX rock coring and 4 in. rollerbit reaming to 40.0 ft. bgs					
30	R-1 GW-1	NA			Bedrock encountered at 28.5 ft. bgs Very hard, gray, freshly weathered, medium to fine grained, granodioritic GNEISS; three natural fractures. RQD = 93%.			NA	4.0	1
35	R-2 GW-2	NA			Very hard, gray, freshly weathered, medium to fine grained, granodioritic GNEISS; four natural fractures. RQD = 86%.			NA	2.0	1
					End of boring at 40.0 ft. bgs (See above for borehole advancement)					

Appendix E

Laboratory Testing Results

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0.0	0.0	0.0	1.0	1.5	11.9	85.6
□	0.0	0.0	0.0	0.3	0.8	1.4	97.5
△	0.0	0.0	0.0	0.1	1.2	1.8	96.9
◇	0.0	0.0	0.0	0.0	1.1	1.0	97.9
▽	0.0	43.1	15.2	8.8	12.2	15.0	5.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	AASHTO
○	GEI-306	S2	5-7 ft	ORGANIC SOIL	-
□	GEI-306	S7	30-32 ft	FAT CLAY	-
△	GEI-309	S4	15-17 ft	ORGANIC SOIL	-
◇	GEI-309	S10	45-47 ft	ORGANIC SOIL	-
▽	GEI-309	S12	55-57 ft	Narrowly Graded Gravel with Clay and Sand	-

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801



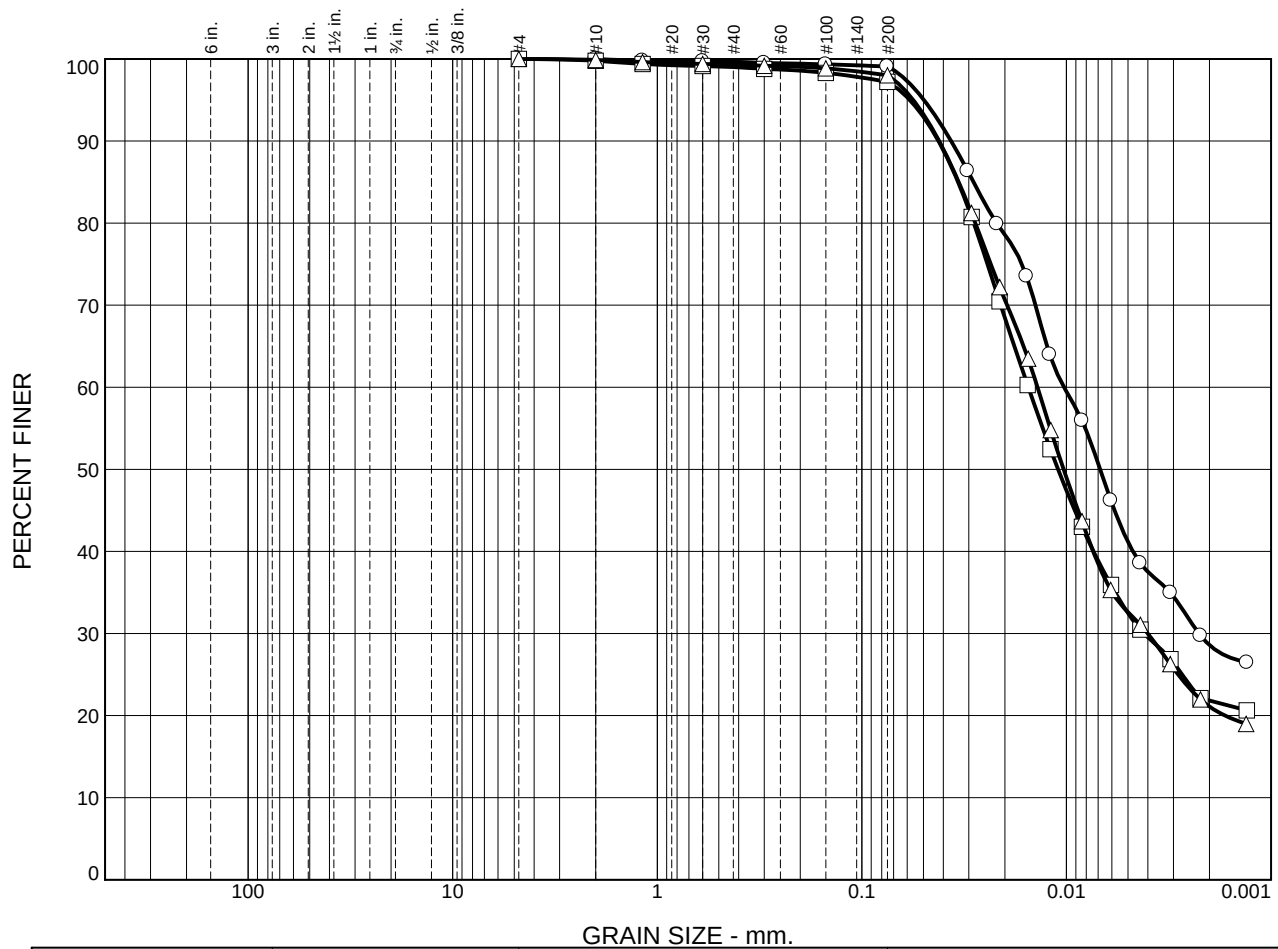
Client: Stantec Consulting Services, Inc.

Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	
○	0.0	0.0	0.0	0.0	0.3	0.6	99.1
□	0.0	0.0	0.0	0.2	0.8	1.8	97.2
△	0.0	0.0	0.0	0.1	0.6	1.3	98.0

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	AASHTO
○	GEI-312	S8	35-37 ft	ORGANIC SOIL	-
□	GEI-312	S11	50-52 ft	ORGANIC SOIL	-
△	GEI-312	S12	60-62 ft	ORGANIC SOIL	-

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801



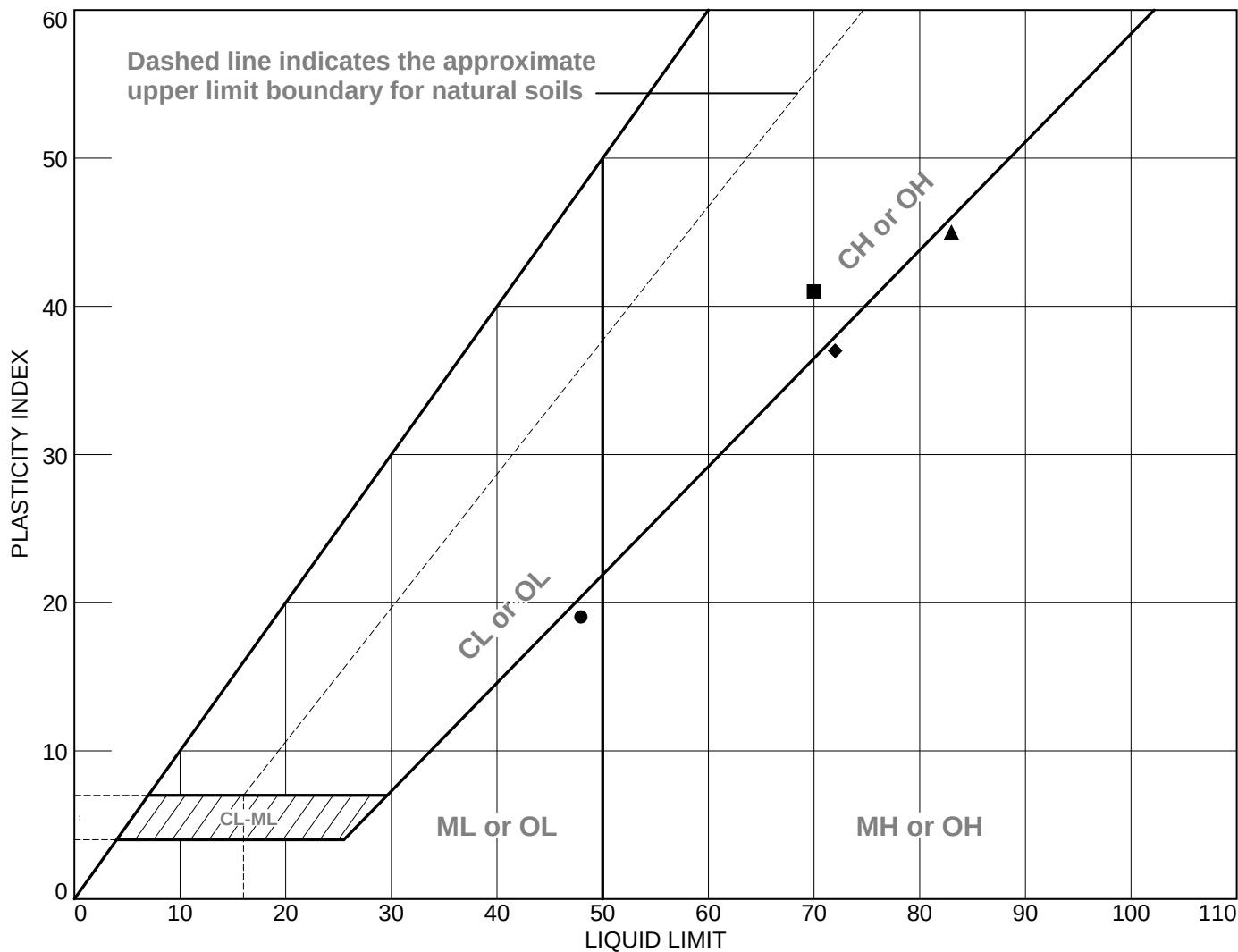
Client: Stantec Consulting Services, Inc.

Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	GEI-306	S2	5-7 ft	82.0	29	48	19	OL
■	GEI-306	S7	30-32 ft	68.9	29	70	41	CH
▲	GEI-308	S5	20-22	80.7	38	83	45	OH
◆	GEI-308	S1	0-2 ft	89.2	35	72	37	OH

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801



Client: Stantec Consulting Services, Inc.

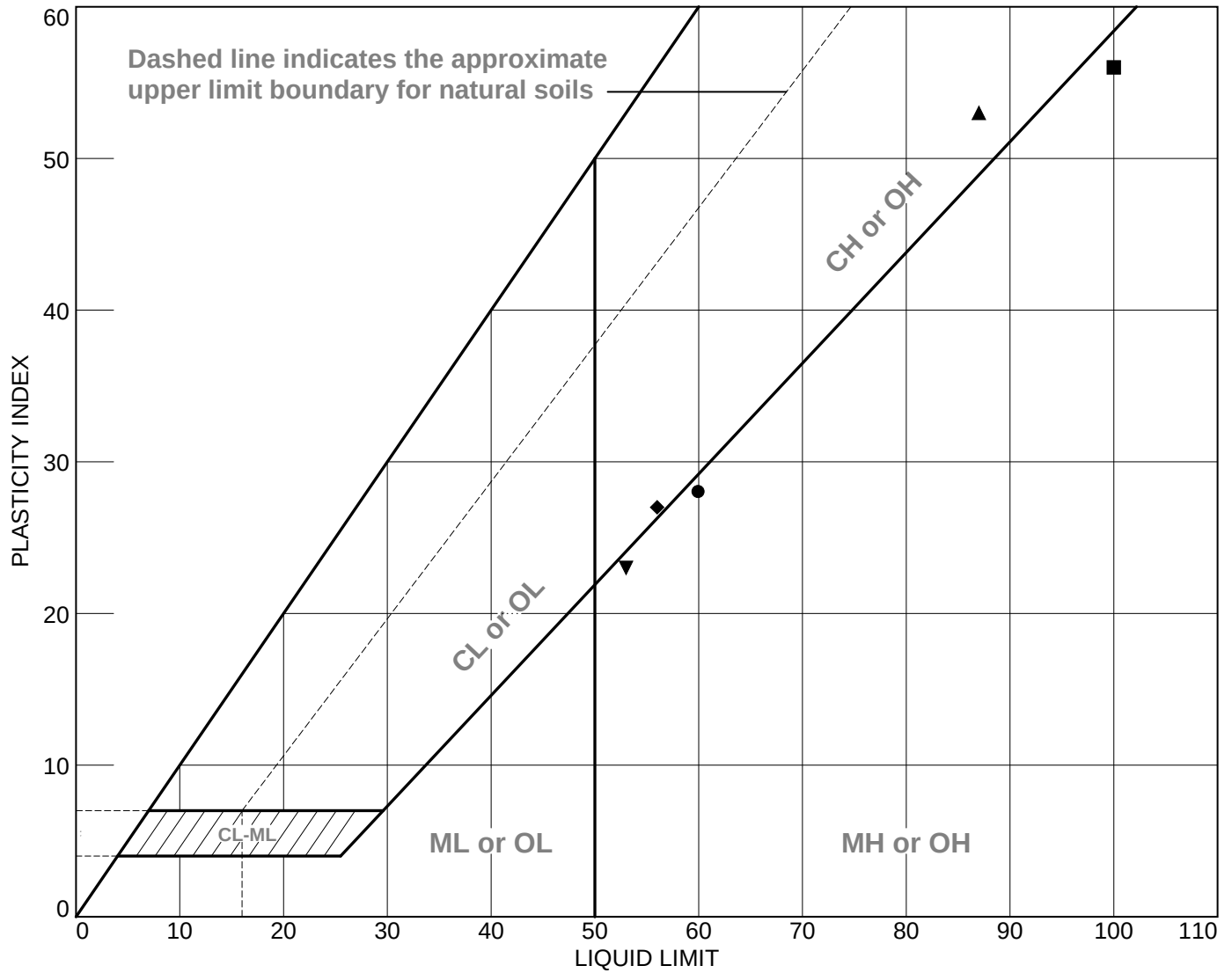
Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

Tested By: △ KPG ◇ NM/EF

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	GEI-309	S4	15-17 ft	63.1	32	60	28	OH
■	GEI-309	S10	45-47 ft	90.3	44	100	56	OH
▲	GEI-312	S8	35-37 ft	79.5	34	87	53	OH
◆	GEI-312	S11	50-52 ft	57.1	29	56	27	OH
▼	GEI-312	S12	60-62 ft	57.8	30	53	23	OH

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801



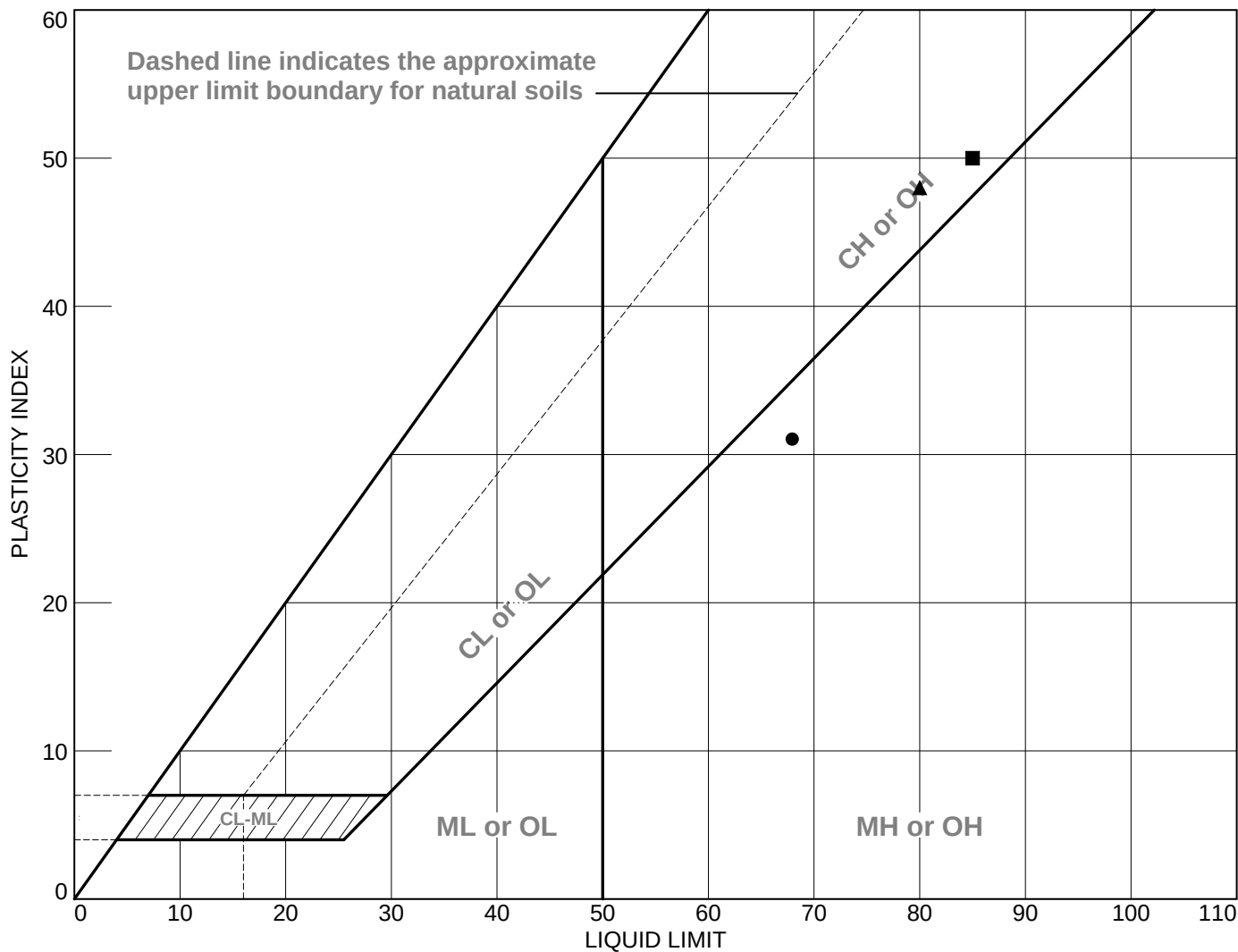
Client: Stantec Consulting Services, Inc.

Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	GEI-403	S2	10-12 ft	89.4	37	68	31	OH
■	GEI-403	S3	20-22 ft	87.1	35	85	50	OH
▲	GEI-403	S4	30-32 ft	72.8	32	80	48	OH

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400 Unicorn Park Drive
Woburn, MA 01801



Client: Stantec Consulting Services, Inc.

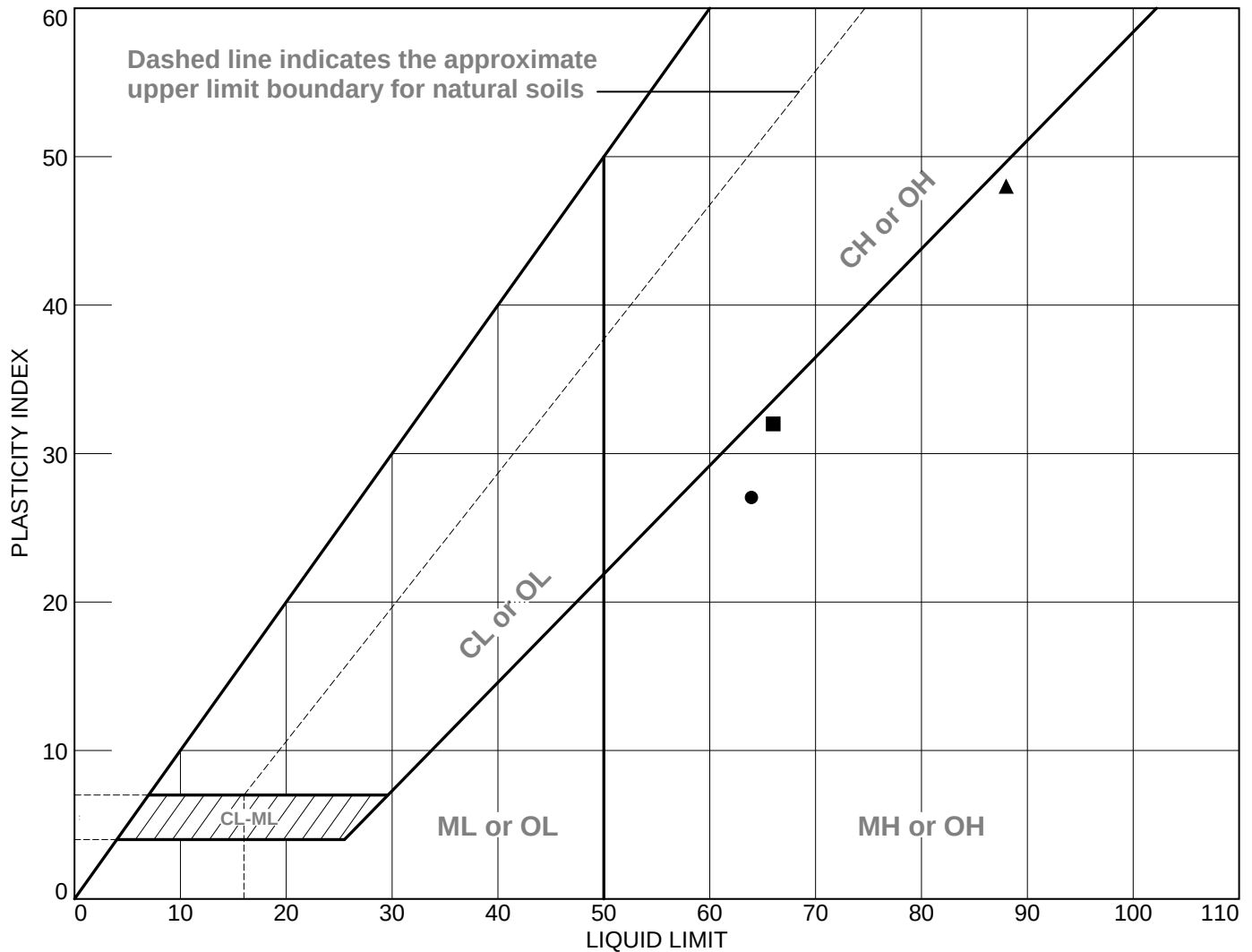
Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

Tested By: NM/EF

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	GEI-404	S1	0-2	97.4	37	64	27	OH
■	GEI-404	S2	10-12	69.3	34	66	32	OH
▲	GEI-404	S3	20-22	86.6	40	88	48	OH

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Woburn, MA 01801



Client: Stantec Consulting Services, Inc.

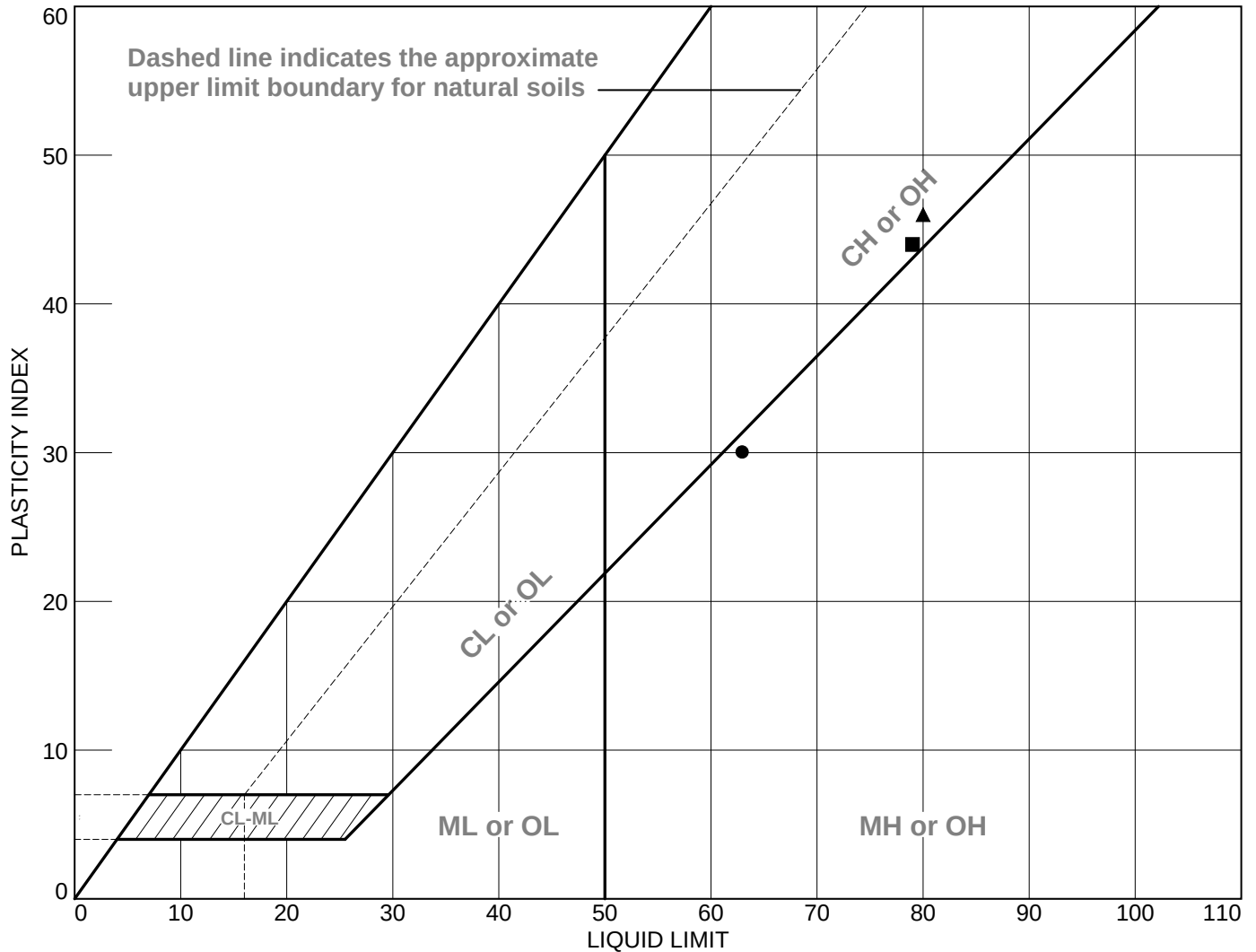
Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

Tested By: KPG

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	GEI-406	S2	10-12	78.1	33	63	30	OH
■	GEI-406	S3	20-22	80.1	35	79	44	OH
▲	GEI-406	S4	30-32	72.2	34	80	46	OH

GEI Consultants, Inc.
400 Unicorn Park Drive
Woburn, MA 01801



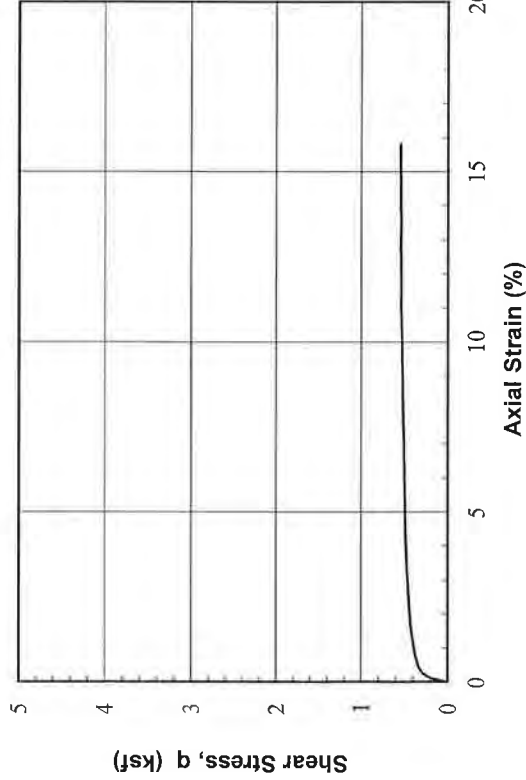
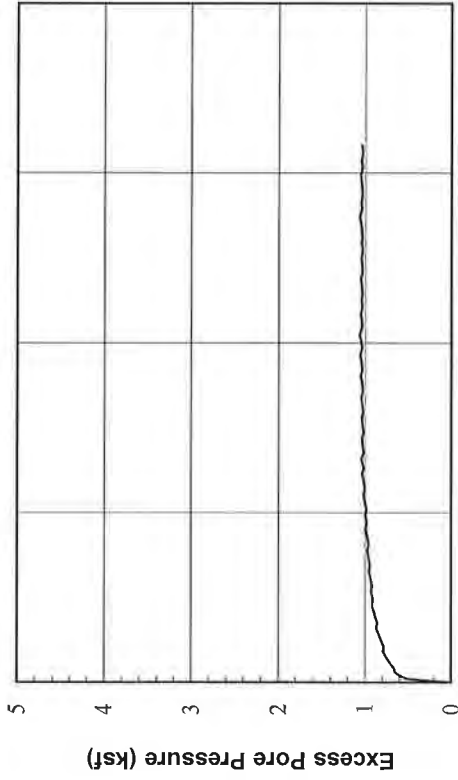
Client: Stantec Consulting Services, Inc.

Project: General Dynamics Electric Boat Assembly Facility

Project No.: 1702805

Figure

Tested By: KPG



SAMPLE INFORMATION

Boring: GEI-420 Sample: U1 Depth (ft): 53.5 ft Test: R16
 Type: 2.8-inch diameter Shelby tube sample
 Description: Dark gray ORGANIC SOIL (OH)

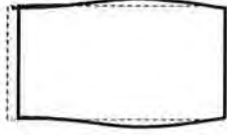
SPECIMEN INFORMATION (after saturation)

Height: 5.718 in Dia.: 2.797 in Area: 6.265 sq. in
 Water Content: 57.7% Dry Unit Weight: 64.9 pcf

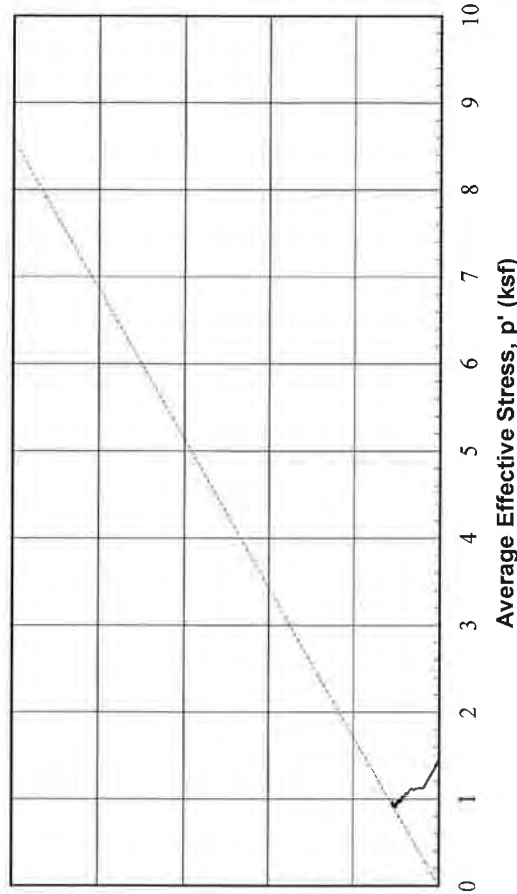
TEST SUMMARY (end of test)

Effective Confining Stress: 1.45 ksf vertical, 1.45 ksf horiz.
 Water Content: 53.5 % Dry Unit Weight: 67.9 pcf
 B Coefficient: 1 Strain Rate: 0.005 %/min
 Peak Shear Stress: 0.55 ksf @ 15.8 % Strain
 Peak Friction Angle: 35.7 deg. @ 13.8 % Strain

REMARKS:



Failure Sketch



Operator: E. Fazlic
 Checked: D. Aghajyan
 Test Date: 5-Oct-2017

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut

Stantec Consulting Services, Inc.



CONSOLIDATED ISOTROPIC
 UNDRAINED TRIAXIAL COMPRESSION
 with Pore Pressure Measurements

Project 1702805

October 2017

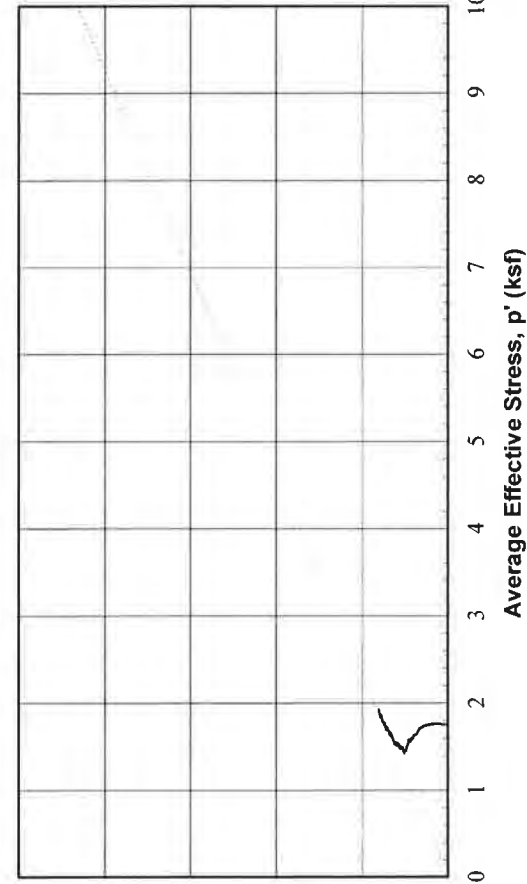
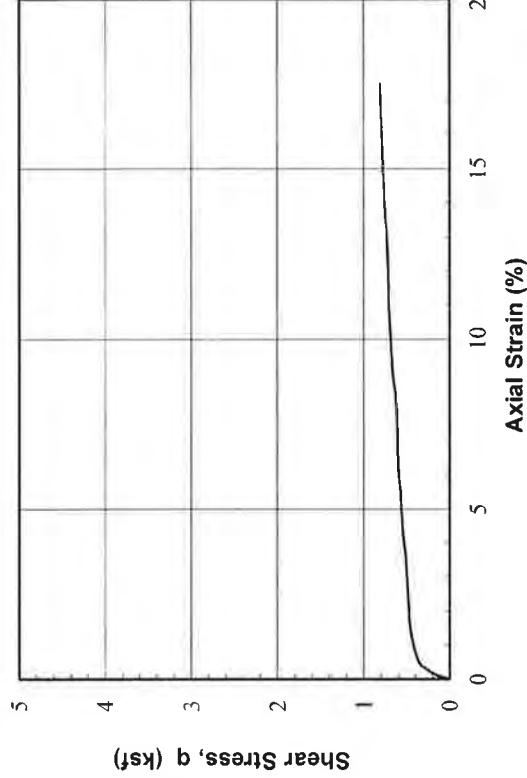
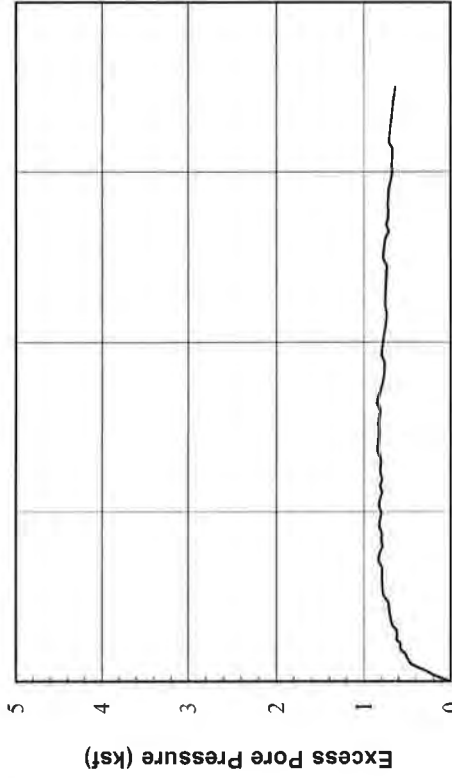
Fig.

10/31/2017 17:12

PROJECT #:	1702805											
PROJECT:	Electric Boat Assembly Facility											
TEST:	R'6											
BORING:	GEI-420											
SAMPLE:	U1											
DEPTH (ft):	53.5 ft											
OPER.:	E. Fazlic											
TEST DATE:	10/5/2017											
DCDT No.	146											
DCDT Calibration Factor	6.5277E-05	inch/cnt										
Load Cell No.	1890-0004											
Load Cell Cal. Factor	0.027097	lb/cnt										
Pressure Transducer	CP-GEI-4											
Pres. Trans. Cal. Factor	0.019127	psi/cnt										
Gravity of Solids	2.60	(assumed)										
B value start shear	1.00											
Test Stage End off#	I											
Stage Strain rate	0.005	%/min										
Data Start Row	4											

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.253	50.509	56.386	1.85	6.26	0.87	0.58	2.32	1.45	1.02	0.43	2.48	25.2	1.01
0.259	50.834	56.482	1.95	6.27	0.88	0.57	2.32	1.44	1.01	0.44	2.53	25.7	1.02
0.265	51.213	56.559	2.05	6.27	0.90	0.56	2.33	1.44	1.00	0.44	2.57	26.1	1.02
0.277	51.837	56.769	2.26	6.29	0.93	0.53	2.35	1.42	0.97	0.45	2.68	27.2	1.04
0.288	52.351	56.673	2.46	6.30	0.91	0.54	2.36	1.44	0.99	0.45	2.66	27.0	1.01
0.300	52.893	56.826	2.67	6.31	0.93	0.52	2.37	1.43	0.98	0.46	2.75	27.8	1.02
0.312	53.354	56.750	2.87	6.33	0.92	0.53	2.37	1.45	0.99	0.46	2.73	27.6	1.00
0.323	53.869	56.884	3.08	6.34	0.94	0.51	2.38	1.44	0.98	0.46	2.81	28.4	1.01
0.335	54.329	57.018	3.28	6.35	0.96	0.49	2.39	1.43	0.96	0.47	2.90	29.2	1.02
0.347	54.763	56.922	3.49	6.37	0.95	0.51	2.40	1.45	0.98	0.47	2.87	28.9	1.00
0.359	55.142	57.037	3.69	6.38	0.96	0.49	2.41	1.44	0.97	0.48	2.94	29.5	1.01
0.370	55.576	57.132	3.90	6.39	0.98	0.48	2.41	1.44	0.96	0.48	3.01	30.1	1.02
0.382	55.928	57.037	4.10	6.41	0.96	0.49	2.42	1.46	0.97	0.48	2.97	29.7	1.00
0.394	56.280	57.151	4.31	6.42	0.98	0.47	2.43	1.45	0.96	0.49	3.05	30.4	1.01
0.406	56.551	57.285	4.52	6.43	1.00	0.45	2.43	1.43	0.94	0.49	3.15	31.2	1.02
0.417	56.768	57.190	4.72	6.45	0.99	0.47	2.43	1.45	0.96	0.49	3.09	30.7	1.01
0.429	57.012	57.285	4.93	6.46	1.00	0.45	2.44	1.44	0.95	0.49	3.16	31.3	1.02
0.441	57.229	57.209	5.13	6.48	0.99	0.47	2.44	1.45	0.96	0.49	3.11	30.9	1.00
0.453	57.446	57.324	5.34	6.49	1.01	0.45	2.44	1.44	0.94	0.49	3.20	31.6	1.02
0.464	57.690	57.438	5.54	6.50	1.02	0.43	2.44	1.42	0.93	0.50	3.29	32.3	1.03
0.476	57.906	57.343	5.75	6.52	1.01	0.45	2.45	1.44	0.94	0.50	3.23	31.8	1.02
0.488	58.150	57.438	5.95	6.53	1.02	0.43	2.45	1.43	0.93	0.50	3.30	32.4	1.03
0.500	58.367	57.534	6.16	6.55	1.04	0.42	2.45	1.42	0.92	0.50	3.39	33.0	1.04
0.511	58.557	57.438	6.36	6.56	1.02	0.43	2.46	1.43	0.93	0.50	3.31	32.4	1.02
0.523	58.855	57.630	6.57	6.58	1.05	0.40	2.46	1.41	0.91	0.50	3.48	33.6	1.04
0.535	58.909	57.438	6.77	6.59	1.02	0.43	2.46	1.44	0.93	0.50	3.32	32.5	1.02
0.547	59.126	57.496	6.98	6.60	1.03	0.42	2.46	1.43	0.93	0.50	3.37	32.9	1.02
0.558	59.505	57.553	7.18	6.62	1.04	0.42	2.47	1.43	0.92	0.51	3.43	33.3	1.03
0.570	59.830	57.438	7.39	6.63	1.02	0.43	2.47	1.45	0.94	0.51	3.35	32.7	1.00
0.582	60.155	57.515	7.60	6.65	1.03	0.42	2.48	1.44	0.93	0.51	3.43	33.2	1.01
0.594	60.453	57.591	7.80	6.66	1.04	0.41	2.48	1.44	0.92	0.51	3.50	33.8	1.02
0.605	60.697	57.477	8.01	6.68	1.03	0.43	2.48	1.46	0.94	0.51	3.41	33.1	1.00
0.617	60.941	57.534	8.21	6.69	1.04	0.42	2.49	1.45	0.93	0.52	3.47	33.5	1.00
0.629	61.212	57.630	8.42	6.71	1.05	0.40	2.49	1.44	0.92	0.52	3.56	34.1	1.01
0.640	61.402	57.496	8.62	6.72	1.03	0.42	2.49	1.46	0.94	0.52	3.45	33.4	0.99
0.652	61.646	57.572	8.83	6.74	1.04	0.41	2.49	1.45	0.93	0.52	3.52	33.9	1.00
0.664	61.917	57.668	9.03	6.75	1.05	0.40	2.50	1.44	0.92	0.52	3.61	34.5	1.01
0.676	62.133	57.534	9.24	6.77	1.04	0.42	2.50	1.46	0.94	0.52	3.50	33.7	0.99
0.687	62.377	57.611	9.44	6.78	1.05	0.41	2.50	1.46	0.93	0.52	3.57	34.2	1.00
0.699	62.594	57.725	9.65	6.80	1.06	0.39	2.51	1.44	0.92	0.53	3.69	35.0	1.01
0.711	62.811	57.572	9.85	6.82	1.04	0.41	2.51	1.47	0.94	0.53	3.55	34.1	0.99

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.723	63.055	57.649	10.06	6.83	1.05	0.40	2.51	1.46	0.93	0.53	3.63	34.6	1.00
0.734	63.353	57.764	10.26	6.85	1.07	0.39	2.51	1.45	0.92	0.53	3.75	35.4	1.01
0.746	63.624	57.572	10.47	6.86	1.04	0.41	2.52	1.48	0.94	0.53	3.57	34.2	0.98
0.758	63.949	57.611	10.68	6.88	1.05	0.41	2.52	1.48	0.94	0.53	3.62	34.5	0.98
0.770	64.328	57.668	10.88	6.89	1.05	0.40	2.53	1.47	0.94	0.54	3.69	35.0	0.98
0.781	64.545	57.534	11.09	6.91	1.04	0.42	2.53	1.49	0.96	0.54	3.57	34.2	0.96
0.793	64.735	57.630	11.29	6.93	1.05	0.40	2.53	1.48	0.94	0.54	3.66	34.8	0.97
0.805	64.491	57.534	11.50	6.94	1.04	0.42	2.52	1.49	0.95	0.53	3.55	34.1	0.97
0.817	64.735	57.611	11.70	6.96	1.05	0.41	2.53	1.48	0.94	0.54	3.63	34.6	0.98
0.828	64.952	57.687	11.91	6.97	1.06	0.40	2.53	1.47	0.93	0.54	3.71	35.1	0.99
0.840	65.141	57.534	12.11	6.99	1.04	0.42	2.53	1.49	0.96	0.54	3.57	34.2	0.96
0.852	65.385	57.572	12.32	7.01	1.04	0.41	2.53	1.49	0.95	0.54	3.61	34.5	0.97
0.864	65.629	57.649	12.52	7.02	1.05	0.40	2.53	1.48	0.94	0.54	3.69	35.0	0.97
0.875	65.819	57.515	12.73	7.04	1.03	0.42	2.54	1.50	0.96	0.54	3.57	34.2	0.96
0.887	66.008	57.630	12.93	7.06	1.05	0.40	2.54	1.49	0.95	0.54	3.67	34.9	0.97
0.899	66.090	57.553	13.14	7.07	1.04	0.42	2.54	1.50	0.96	0.54	3.60	34.4	0.96
0.911	66.008	57.611	13.34	7.09	1.05	0.41	2.53	1.49	0.95	0.54	3.64	34.7	0.97
0.922	66.117	57.668	13.55	7.11	1.05	0.40	2.53	1.48	0.94	0.54	3.70	35.0	0.98
0.934	66.361	57.764	13.76	7.12	1.07	0.39	2.53	1.47	0.93	0.54	3.80	35.7	0.99
0.946	66.632	57.591	13.96	7.14	1.04	0.41	2.54	1.49	0.95	0.54	3.64	34.7	0.96
0.957	66.875	57.649	14.17	7.16	1.05	0.40	2.54	1.49	0.94	0.54	3.70	35.0	0.97
0.969	67.038	57.534	14.37	7.18	1.04	0.42	2.54	1.50	0.96	0.54	3.59	34.4	0.95
0.981	67.228	57.591	14.58	7.19	1.04	0.41	2.54	1.50	0.95	0.54	3.65	34.7	0.96
0.993	67.390	57.649	14.78	7.21	1.05	0.40	2.54	1.49	0.95	0.54	3.70	35.1	0.97
1.004	67.553	57.687	14.99	7.23	1.06	0.40	2.54	1.48	0.94	0.54	3.74	35.3	0.97
1.016	67.770	57.572	15.19	7.24	1.04	0.41	2.54	1.50	0.96	0.54	3.64	34.7	0.96
1.028	67.932	57.649	15.40	7.26	1.05	0.40	2.54	1.49	0.95	0.55	3.71	35.1	0.97
1.040	68.068	57.515	15.60	7.28	1.03	0.42	2.54	1.51	0.97	0.55	3.59	34.3	0.95
1.051	68.257	57.591	15.81	7.30	1.04	0.41	2.55	1.50	0.96	0.55	3.66	34.8	0.96



SAMPLE INFORMATION

Boring: GEI-420 Sample: U2 Depth (ft): 63.2 ft Test: R'5
Type: 2.8-inch diameter Shelby tube sample
Description: Dark-gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION (after saturation)

Height: 5.241 in Dia.: 2.763 in Area.: 6.139 sq. in
Water Content: 42.5% Dry Unit Weight: 77.1 pcf

TEST SUMMARY (end of test)

Effective Confining Stress: 1.75 ksf vertical, 1.75 ksf horiz.
Water Content: 39.6 % Dry Unit Weight: 79.9 pcf
B Coefficient: 0.96 Strain Rate: 0.003 %/min
Peak Shear Stress: 0.81 ksf @ 17.5 % Strain
Peak Friction Angle: 25.6 deg @ 15.9 % Strain

REMARKS:

Operator: E. Fazlic
Checked: D. Aghayan
Test Date: 19-Oct-2017

General Dynamics
Electric Boat Assembly Facility
Groton, Connecticut

Stantec Consulting Services, Inc.



CONSOLIDATED ISOTROPIC
UNDRAINED TRIAXIAL COMPRESSION
with Pore Pressure Measurements

Project 1702805

October 2017

Fig.

11/10/2017 10:41

GEI Consultants, Inc. 400 Unicorn Park Drive, Woburn, MA 01801

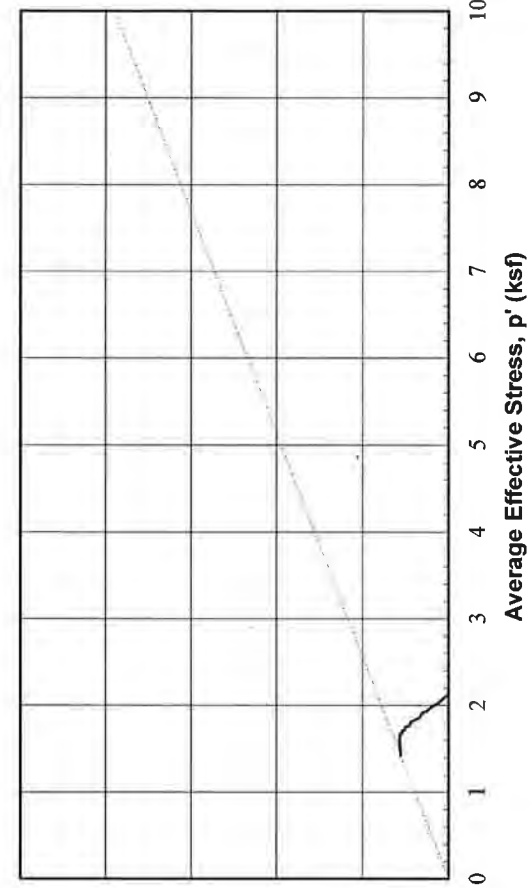
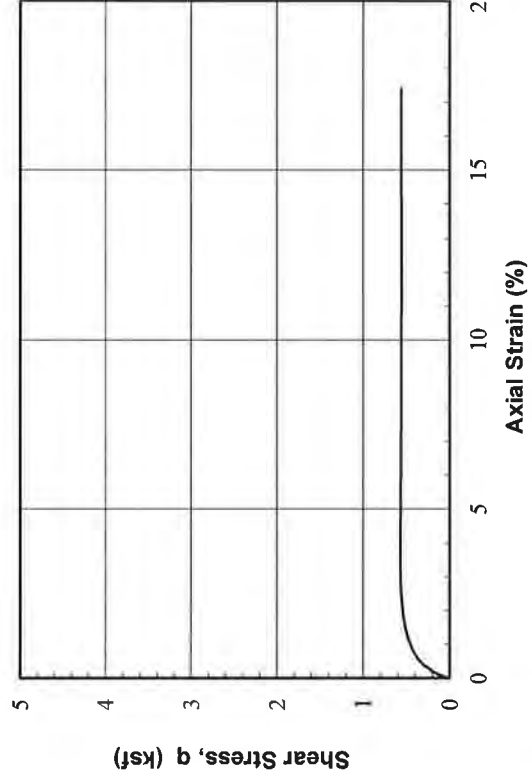
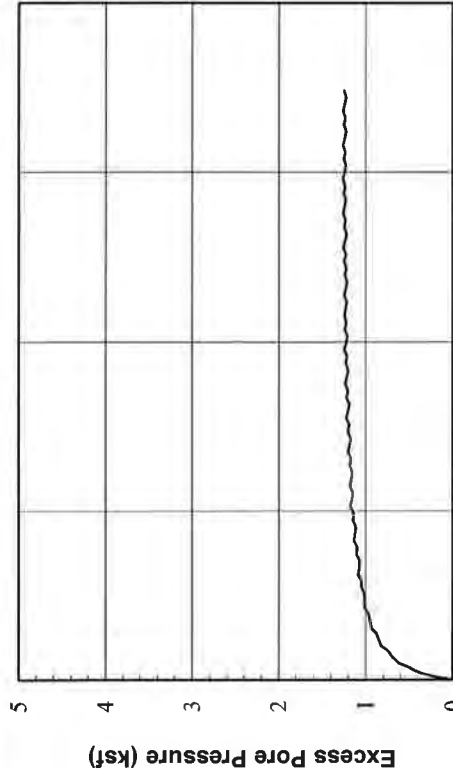
PROJECT #:	1702805	PROJECT:	Electric Boat	STAGE		SIGMAV'	SIGMAH'	Height	Diameter	Area	Water Content	Dry Density	Total Density	Void Ratio
TEST:	R'5	TEST:	GEI-420	In situ		(ksf)	(ksf)	(in)	(in)	(in ²)	(%)	(pcf)	(pcf)	
BORING:	U2	BORING:	63.2 ft	After Sampling		--	--	--	--	--	--	--	--	--
SAMPLE:		SAMPLE:	E. Fazlic	In tube before extrusion		--	--	5.787	2.875	6.491	54.07	66.9	103.0	1.428
DEPTH (ft):		DEPTH (ft):	10/19/2017	Under vac.		0.72	0.72	5.306	2.785	6.092	--	77.7	--	1.089
OPER.:		OPER.:												
TEST DATE:		TEST DATE:												
DCDT No.	147	DCDT No.												
DCDT Calibration Factor	6.7108E-05	DCDT Calibration Factor	inch/cnt	End of:										
Load Cell No.	A8897	Load Cell No.		Saturation		0.62	0.62	5.306	2.796	6.139	42.51	77.1	109.9	1.105
Load Cell Cal. Factor	0.058033	Load Cell Cal. Factor	lb/cnt	Consol. Stage 1		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
Pressure Transducer	25218	Pressure Transducer		Consol. Stage 2		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
Pres. Trans. Cal. Factor	0.023604	Pres. Trans. Cal. Factor	psi/cnt	Consol. Stage 3		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
				Consol. Stage 4		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
Gravity of Solids	2.60	Gravity of Solids	(assumed)	Consol. Stage 5		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
				Consol. Stage 6		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
B value start shear	0.96	B value start shear												
Test Stage End of#	1	Test Stage End of#		This Stage Initial Values		1.75	1.75	5.241	2.763	5.996	39.64	79.9	111.6	1.031
Stage Strain rate		Stage Strain rate		Kc start stage										
Data Start Row	4	Data Start Row												

calculated from end of test

Excess Pore Pressure	Area	Axial Strain	Pore Pressure	Load Cell	Axial DCDT	Excess Pore Pressure	Sigma3 effective	Total SigmaV	SigmaV Effective	P'	q	s1/s3'	Friction Angle	Pressure Parameter A
(lb/in ²)	(in ²)	(%)	(lb/in ²)	(lb)	(inch)	(ksf)	(ksf)	(ksf)	(ksf)	(ksf)	(ksf)		(deg)	(-)
43.054	6.00	0.00	43.054	14.624	0.065	0.00	1.75	1.75	1.75	1.75	0.00	1.00	0.0	0.00
43.927	6.00	0.10	43.927	26.521	0.071	0.13	1.62	2.03	1.91	1.77	0.14	1.18	4.6	0.44
44.564	6.01	0.20	44.564	33.195	0.076	0.22	1.53	2.19	1.98	1.75	0.22	1.29	7.3	0.49
45.060	6.01	0.30	45.060	38.128	0.081	0.29	1.46	2.31	2.02	1.74	0.28	1.39	9.3	0.51
45.697	6.02	0.40	45.697	43.002	0.087	0.38	1.37	2.43	2.05	1.71	0.34	1.50	11.5	0.56
46.240	6.03	0.51	46.240	45.092	0.092	0.46	1.29	2.48	2.02	1.65	0.36	1.56	12.7	0.63
46.429	6.03	0.61	46.429	46.542	0.097	0.49	1.26	2.51	2.02	1.64	0.38	1.60	13.4	0.64
46.594	6.04	0.71	46.594	47.587	0.103	0.51	1.24	2.53	2.02	1.63	0.39	1.63	13.9	0.65
46.689	6.04	0.81	46.689	48.632	0.108	0.52	1.22	2.56	2.03	1.63	0.41	1.66	14.4	0.65
47.066	6.05	0.91	47.066	49.560	0.113	0.58	1.17	2.58	2.00	1.59	0.42	1.71	15.2	0.69
47.090	6.06	1.01	47.090	50.373	0.119	0.58	1.17	2.60	2.02	1.59	0.42	1.73	15.5	0.68
47.090	6.06	1.11	47.090	51.127	0.124	0.58	1.17	2.62	2.03	1.60	0.43	1.74	15.7	0.67
47.444	6.07	1.21	47.444	51.823	0.129	0.63	1.12	2.63	2.00	1.56	0.44	1.79	16.5	0.72
47.373	6.08	1.32	47.373	52.578	0.134	0.62	1.13	2.65	2.03	1.58	0.45	1.80	16.6	0.69
47.373	6.08	1.42	47.373	53.158	0.140	0.62	1.13	2.66	2.04	1.58	0.46	1.81	16.8	0.68
47.444	6.09	1.52	47.444	53.681	0.145	0.63	1.12	2.67	2.04	1.58	0.46	1.83	17.0	0.68
47.704	6.09	1.62	47.704	54.087	0.150	0.67	1.08	2.68	2.01	1.54	0.47	1.86	17.6	0.72
47.798	6.10	1.72	47.798	54.377	0.156	0.68	1.07	2.69	2.00	1.53	0.47	1.88	17.8	0.73

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.161	54.609	47.869	1.82	6.11	0.69	1.05	2.69	2.00	1.53	0.47	1.89	18.0	0.74
0.166	54.841	47.916	1.92	6.11	0.70	1.05	2.70	2.00	1.52	0.47	1.90	18.1	0.74
0.177	55.305	48.011	2.13	6.13	0.71	1.03	2.70	1.99	1.51	0.48	1.92	18.4	0.75
0.188	55.770	48.081	2.33	6.14	0.72	1.02	2.71	1.99	1.51	0.48	1.94	18.7	0.75
0.198	56.350	48.483	2.53	6.15	0.78	0.97	2.72	1.94	1.45	0.49	2.01	19.6	0.80
0.209	56.756	48.530	2.73	6.16	0.79	0.96	2.73	1.94	1.45	0.49	2.03	19.8	0.80
0.219	57.221	48.553	2.93	6.18	0.79	0.96	2.74	1.95	1.45	0.50	2.04	20.0	0.80
0.230	57.685	48.553	3.14	6.19	0.79	0.96	2.75	1.96	1.46	0.50	2.05	20.1	0.79
0.241	58.149	48.553	3.34	6.20	0.79	0.96	2.76	1.97	1.46	0.51	2.06	20.2	0.78
0.251	58.729	48.860	3.54	6.22	0.84	0.91	2.77	1.93	1.42	0.51	2.12	21.0	0.82
0.262	59.252	48.813	3.74	6.23	0.83	0.92	2.78	1.95	1.43	0.52	2.12	21.1	0.80
0.272	60.354	48.530	3.95	6.24	0.79	0.96	2.80	2.01	1.49	0.53	2.10	20.8	0.75
0.283	61.515	48.624	4.15	6.26	0.80	0.95	2.83	2.03	1.49	0.54	2.14	21.3	0.74
0.294	62.095	48.577	4.35	6.27	0.80	0.95	2.84	2.04	1.50	0.55	2.14	21.3	0.73
0.304	62.676	48.789	4.55	6.28	0.83	0.92	2.85	2.02	1.47	0.55	2.19	22.0	0.75
0.315	63.198	48.742	4.76	6.30	0.82	0.93	2.86	2.04	1.48	0.56	2.20	22.0	0.74
0.325	63.836	48.601	4.96	6.31	0.80	0.95	2.87	2.07	1.51	0.56	2.18	21.8	0.71
0.336	64.359	48.837	5.16	6.32	0.83	0.92	2.88	2.05	1.48	0.57	2.24	22.5	0.74
0.347	64.881	48.742	5.36	6.34	0.82	0.93	2.89	2.07	1.50	0.57	2.23	22.4	0.72
0.357	65.461	48.553	5.56	6.35	0.79	0.96	2.90	2.11	1.53	0.58	2.21	22.1	0.69
0.368	66.274	48.719	5.77	6.36	0.82	0.93	2.92	2.10	1.52	0.58	2.25	22.7	0.70
0.378	66.970	48.553	5.97	6.38	0.79	0.96	2.93	2.14	1.55	0.59	2.24	22.5	0.67
0.389	67.666	48.719	6.17	6.39	0.82	0.93	2.94	2.13	1.53	0.60	2.28	23.0	0.68
0.400	68.189	48.671	6.37	6.40	0.81	0.94	2.95	2.14	1.54	0.60	2.28	23.0	0.67
0.410	68.479	48.648	6.58	6.42	0.81	0.94	2.96	2.15	1.55	0.60	2.28	23.0	0.67
0.421	68.711	48.907	6.78	6.43	0.84	0.91	2.96	2.12	1.51	0.61	2.34	23.6	0.70
0.431	68.943	48.860	6.98	6.45	0.84	0.91	2.96	2.13	1.52	0.61	2.33	23.5	0.69
0.442	69.233	48.813	7.18	6.46	0.83	0.92	2.97	2.14	1.53	0.61	2.32	23.5	0.68
0.453	69.582	48.766	7.39	6.47	0.82	0.93	2.97	2.15	1.54	0.61	2.32	23.4	0.67
0.463	69.930	48.837	7.59	6.49	0.83	0.92	2.98	2.14	1.53	0.61	2.34	23.7	0.68
0.474	70.336	48.766	7.79	6.50	0.82	0.93	2.98	2.16	1.54	0.62	2.33	23.6	0.67
0.484	70.742	48.695	7.99	6.52	0.81	0.94	2.99	2.18	1.56	0.62	2.33	23.5	0.66
0.495	71.265	48.931	8.20	6.53	0.85	0.90	3.00	2.15	1.53	0.62	2.38	24.1	0.68
0.506	71.671	48.837	8.40	6.55	0.83	0.92	3.00	2.17	1.54	0.63	2.37	24.0	0.66
0.516	73.180	48.671	8.60	6.56	0.81	0.94	3.03	2.22	1.58	0.64	2.37	24.0	0.63
0.527	74.398	48.506	8.80	6.57	0.79	0.96	3.06	2.27	1.62	0.65	2.36	23.9	0.60
0.537	75.327	48.388	9.00	6.59	0.77	0.98	3.07	2.31	1.64	0.66	2.35	23.8	0.58
0.548	76.023	48.365	9.21	6.60	0.76	0.98	3.09	2.32	1.65	0.67	2.36	23.9	0.57
0.559	76.487	48.341	9.41	6.62	0.76	0.99	3.09	2.33	1.66	0.67	2.36	23.9	0.57
0.569	77.010	48.601	9.61	6.63	0.80	0.95	3.10	2.30	1.63	0.68	2.43	24.6	0.59
0.580	77.648	48.553	9.81	6.65	0.79	0.96	3.11	2.32	1.64	0.68	2.43	24.6	0.58

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1/s3	Friction Angle (deg)	Pressure Parameter A (-)
0.590	78.170	48.483	10.02	6.66	0.78	0.97	3.12	2.34	1.65	0.69	2.42	24.5	0.57
0.601	78.751	48.388	10.22	6.68	0.77	0.98	3.13	2.36	1.67	0.69	2.41	24.4	0.56
0.612	79.331	48.317	10.42	6.69	0.76	0.99	3.14	2.38	1.69	0.70	2.41	24.4	0.54
0.622	79.969	48.247	10.62	6.71	0.75	1.00	3.15	2.40	1.70	0.70	2.40	24.3	0.53
0.633	80.492	48.176	10.83	6.72	0.74	1.01	3.16	2.42	1.72	0.71	2.40	24.3	0.52
0.643	80.956	48.317	11.03	6.74	0.76	0.99	3.17	2.41	1.70	0.71	2.43	24.7	0.53
0.654	81.130	48.317	11.23	6.75	0.76	0.99	3.17	2.41	1.70	0.71	2.43	24.7	0.53
0.665	81.362	48.294	11.43	6.77	0.75	0.99	3.17	2.41	1.70	0.71	2.43	24.6	0.53
0.675	81.594	48.270	11.63	6.79	0.75	1.00	3.17	2.42	1.71	0.71	2.43	24.6	0.53
0.686	82.001	48.247	11.84	6.80	0.75	1.00	3.17	2.43	1.71	0.71	2.43	24.6	0.52
0.696	82.407	48.223	12.04	6.82	0.74	1.00	3.18	2.44	1.72	0.72	2.43	24.6	0.52
0.707	82.755	48.176	12.24	6.83	0.74	1.01	3.18	2.45	1.73	0.72	2.42	24.5	0.51
0.718	83.277	48.483	12.44	6.85	0.78	0.97	3.19	2.41	1.69	0.72	2.49	25.3	0.54
0.728	83.742	48.435	12.65	6.86	0.77	0.97	3.20	2.42	1.70	0.73	2.49	25.3	0.53
0.739	84.206	48.365	12.85	6.88	0.76	0.98	3.20	2.44	1.71	0.73	2.48	25.2	0.53
0.749	84.728	48.317	13.05	6.90	0.76	0.99	3.21	2.45	1.72	0.73	2.48	25.2	0.52
0.760	85.599	48.011	13.25	6.91	0.71	1.03	3.23	2.51	1.77	0.74	2.43	24.6	0.48
0.771	86.585	48.223	13.46	6.93	0.74	1.00	3.24	2.50	1.75	0.75	2.49	25.3	0.50
0.781	87.398	48.081	13.66	6.94	0.72	1.02	3.26	2.53	1.78	0.75	2.47	25.1	0.48
0.792	88.036	48.058	13.86	6.96	0.72	1.03	3.27	2.55	1.79	0.76	2.48	25.1	0.47
0.802	88.616	48.129	14.06	6.98	0.73	1.02	3.28	2.54	1.78	0.76	2.50	25.4	0.48
0.813	88.965	48.058	14.26	6.99	0.72	1.03	3.28	2.56	1.79	0.77	2.49	25.3	0.47
0.824	89.313	48.034	14.47	7.01	0.72	1.03	3.28	2.57	1.80	0.77	2.49	25.3	0.47
0.834	89.835	47.916	14.67	7.03	0.70	1.05	3.29	2.59	1.82	0.77	2.47	25.1	0.45
0.845	90.357	47.798	14.87	7.04	0.68	1.07	3.30	2.61	1.84	0.77	2.45	24.9	0.44
0.855	90.938	47.727	15.07	7.06	0.67	1.08	3.30	2.63	1.85	0.78	2.45	24.8	0.43
0.866	91.518	47.727	15.28	7.08	0.67	1.08	3.31	2.64	1.86	0.78	2.46	24.9	0.43
0.877	91.866	47.680	15.48	7.09	0.67	1.08	3.32	2.65	1.87	0.78	2.45	24.8	0.42
0.887	92.272	47.680	15.68	7.11	0.67	1.08	3.32	2.65	1.87	0.79	2.45	24.9	0.42
0.898	92.679	47.987	15.88	7.13	0.71	1.04	3.33	2.61	1.83	0.79	2.52	25.6	0.45
0.909	93.085	47.916	16.09	7.14	0.70	1.05	3.33	2.63	1.84	0.79	2.51	25.5	0.44
0.919	93.549	47.869	16.29	7.16	0.69	1.05	3.33	2.64	1.85	0.79	2.50	25.4	0.44
0.930	94.071	47.798	16.49	7.18	0.68	1.07	3.34	2.66	1.86	0.80	2.50	25.3	0.43
0.940	94.652	47.727	16.69	7.20	0.67	1.08	3.35	2.68	1.88	0.80	2.49	25.3	0.42
0.951	95.116	47.680	16.89	7.21	0.67	1.08	3.35	2.69	1.89	0.80	2.48	25.2	0.41
0.962	95.638	47.609	17.10	7.23	0.66	1.09	3.36	2.71	1.90	0.81	2.48	25.1	0.41
0.972	96.161	47.538	17.30	7.25	0.65	1.10	3.37	2.72	1.91	0.81	2.47	25.1	0.40
0.983	96.683	47.468	17.50	7.27	0.64	1.11	3.37	2.74	1.93	0.81	2.46	25.0	0.39



SAMPLE INFORMATION

Boring: GEI-421 Sample: U1 Depth (ft): 68.9 ft Test R'1
 Type: 2.8-inch diameter Shelby tube sample
 Description: Dark-gray Organic SOIL (OH)

SPECIMEN INFORMATION (after saturation)

Height: 5.900 in Dia.: 2.840 in Area: 6.435 sq. in
 Water Content: 48.0% Dry Unit Weight: 72.2 pcf

TEST SUMMARY (end of test)

Effective Confining Stress: 2.13 ksf vertical, 2.13 ksf horiz.
 Water Content: 48.0 % Dry Unit Weight: 73.9 pcf
 B Coefficient: 0.98 Strain Rate: 0.016 %/min
 Peak Shear Stress: 0.57 ksf @ 4.1 % Strain
 Peak Friction Angle: 23.0 deg. @ 15.8 % Strain



Failure Sketch

REMARKS:

Operator: E. Fazlic
 Checked: D. Aghjayan
 Test Date: 21-Sep-2017

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut
 Stantec Consulting Services, Inc.



CONSOLIDATED ISOTROPIC
 UNDRAINED TRIAXIAL COMPRESSION
 with Pore Pressure Measurements

Project 1702805 October 2017 Fig.

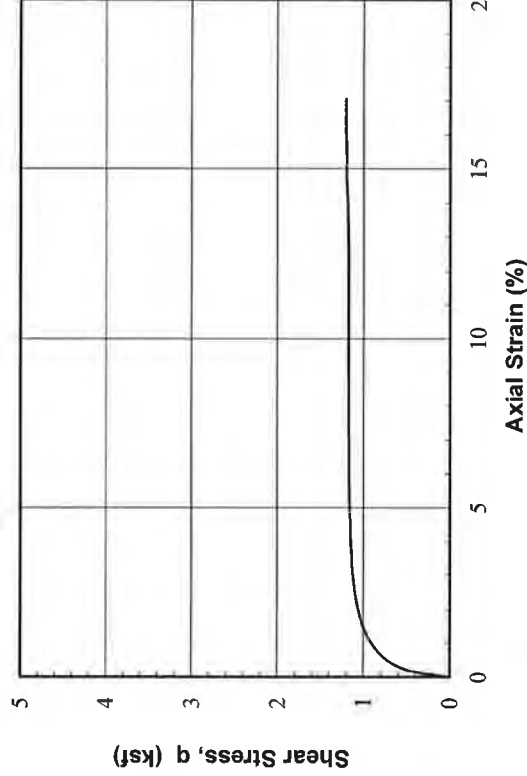
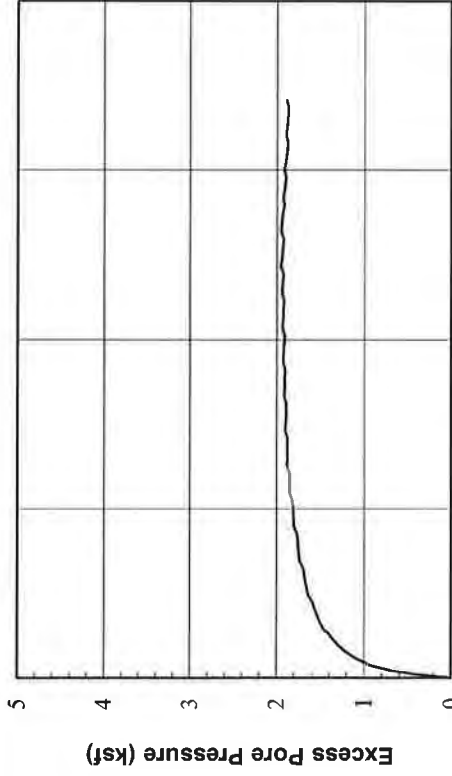
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GEI Consultants, Inc. 400 Unicorn Park Drive, Woburn, MA 01801

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Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	sl'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.151	79.331	58.585	1.81	6.45	0.96	1.18	3.20	2.24	1.71	0.53	1.90	18.1	0.90
0.157	79.853	58.609	1.91	6.46	0.96	1.17	3.21	2.25	1.71	0.54	1.92	18.3	0.90
0.169	80.782	58.939	2.12	6.47	1.01	1.12	3.23	2.22	1.67	0.55	1.97	19.1	0.92
0.181	81.420	58.939	2.32	6.48	1.01	1.12	3.24	2.23	1.68	0.55	1.98	19.2	0.91
0.192	82.001	58.963	2.52	6.50	1.01	1.12	3.25	2.24	1.68	0.56	1.99	19.4	0.91
0.204	82.407	59.199	2.72	6.51	1.05	1.09	3.26	2.21	1.65	0.56	2.03	19.9	0.93
0.216	82.755	59.199	2.92	6.52	1.05	1.09	3.26	2.21	1.65	0.56	2.04	20.0	0.93
0.228	83.045	59.482	3.12	6.54	1.09	1.05	3.27	2.18	1.61	0.57	2.08	20.5	0.96
0.240	83.219	59.411	3.32	6.55	1.08	1.06	3.27	2.19	1.62	0.57	2.07	20.4	0.95
0.252	83.277	59.364	3.52	6.56	1.07	1.06	3.27	2.20	1.63	0.57	2.06	20.3	0.95
0.264	83.451	59.624	3.73	6.58	1.11	1.03	3.27	2.16	1.59	0.57	2.10	20.8	0.98
0.276	83.568	59.553	3.93	6.59	1.10	1.04	3.27	2.17	1.60	0.57	2.09	20.7	0.97
0.287	83.742	59.836	4.13	6.61	1.14	1.00	3.27	2.13	1.56	0.57	2.14	21.3	1.00
0.299	83.742	59.742	4.33	6.62	1.13	1.01	3.27	2.14	1.58	0.57	2.12	21.1	0.99
0.311	83.800	59.671	4.53	6.63	1.11	1.02	3.27	2.15	1.58	0.57	2.11	20.9	0.99
0.323	83.858	59.907	4.73	6.65	1.15	0.99	3.26	2.12	1.55	0.57	2.15	21.4	1.02
0.335	83.858	59.836	4.93	6.66	1.14	1.00	3.26	2.12	1.56	0.56	2.13	21.2	1.01
0.347	84.032	60.119	5.14	6.68	1.18	0.95	3.26	2.08	1.52	0.56	2.18	21.8	1.04
0.359	84.032	59.978	5.34	6.69	1.16	0.98	3.26	2.10	1.54	0.56	2.16	21.5	1.03
0.371	84.032	59.883	5.54	6.70	1.15	0.99	3.26	2.11	1.55	0.56	2.14	21.3	1.02
0.382	84.090	60.119	5.74	6.72	1.18	0.95	3.26	2.08	1.52	0.56	2.18	21.7	1.05
0.394	84.148	60.025	5.94	6.73	1.17	0.97	3.26	2.09	1.53	0.56	2.16	21.5	1.04
0.406	84.206	59.931	6.14	6.75	1.15	0.98	3.25	2.10	1.54	0.56	2.14	21.3	1.03
0.418	84.322	60.143	6.34	6.76	1.18	0.95	3.25	2.07	1.51	0.56	2.18	21.8	1.06
0.430	84.380	60.049	6.54	6.78	1.17	0.96	3.25	2.08	1.52	0.56	2.16	21.5	1.04
0.442	84.438	60.285	6.75	6.79	1.20	0.93	3.25	2.05	1.49	0.56	2.20	22.0	1.08
0.454	84.496	60.167	6.95	6.81	1.19	0.95	3.25	2.07	1.51	0.56	2.18	21.8	1.06
0.466	84.554	60.072	7.15	6.82	1.17	0.96	3.25	2.08	1.52	0.56	2.16	21.5	1.05
0.477	84.612	60.285	7.35	6.84	1.20	0.93	3.25	2.05	1.49	0.56	2.20	22.0	1.08
0.489	84.670	60.190	7.55	6.85	1.19	0.94	3.25	2.06	1.50	0.56	2.18	21.8	1.07
0.501	84.728	60.426	7.75	6.87	1.22	0.91	3.25	2.02	1.47	0.56	2.22	22.3	1.10
0.513	84.786	60.285	7.95	6.88	1.20	0.93	3.25	2.04	1.49	0.56	2.19	22.0	1.08
0.525	84.844	60.190	8.15	6.90	1.19	0.94	3.24	2.05	1.50	0.56	2.18	21.7	1.07
0.537	84.960	60.403	8.36	6.91	1.22	0.91	3.24	2.02	1.47	0.56	2.21	22.2	1.10
0.549	85.134	60.285	8.56	6.93	1.20	0.93	3.25	2.04	1.49	0.56	2.19	21.9	1.08
0.561	85.250	60.521	8.76	6.94	1.24	0.90	3.25	2.01	1.45	0.56	2.24	22.5	1.11
0.573	85.309	60.379	8.96	6.96	1.22	0.92	3.24	2.03	1.47	0.55	2.21	22.1	1.10
0.584	85.367	60.261	9.16	6.97	1.20	0.93	3.24	2.04	1.49	0.55	2.19	21.9	1.08
0.596	85.483	60.473	9.36	6.99	1.23	0.90	3.24	2.01	1.46	0.55	2.23	22.3	1.11
0.608	85.599	60.355	9.56	7.00	1.21	0.92	3.24	2.03	1.48	0.55	2.20	22.1	1.09
0.620	85.773	60.591	9.77	7.02	1.25	0.89	3.24	2.00	1.44	0.55	2.25	22.6	1.12

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.632	85.831	60.450	9.97	7.03	1.23	0.91	3.24	2.02	1.46	0.55	2.22	22.3	1.11
0.644	85.947	60.332	10.17	7.05	1.21	0.92	3.24	2.03	1.48	0.55	2.20	22.0	1.09
0.656	86.063	60.544	10.37	7.07	1.24	0.89	3.24	2.00	1.45	0.55	2.24	22.5	1.12
0.668	86.237	60.426	10.57	7.08	1.22	0.91	3.24	2.02	1.47	0.55	2.22	22.2	1.10
0.679	86.295	60.568	10.77	7.10	1.24	0.89	3.24	2.00	1.44	0.55	2.24	22.6	1.12
0.691	86.353	60.497	10.97	7.11	1.23	0.90	3.24	2.01	1.45	0.55	2.23	22.4	1.12
0.703	86.411	60.379	11.17	7.13	1.22	0.92	3.24	2.02	1.47	0.55	2.20	22.1	1.10
0.715	86.585	60.591	11.38	7.15	1.25	0.89	3.24	1.99	1.44	0.55	2.25	22.6	1.13
0.727	86.701	60.473	11.58	7.16	1.23	0.90	3.24	2.01	1.46	0.55	2.22	22.3	1.11
0.739	86.817	60.355	11.78	7.18	1.21	0.92	3.24	2.03	1.47	0.55	2.20	22.0	1.10
0.751	86.933	60.544	11.98	7.20	1.24	0.89	3.24	2.00	1.45	0.55	2.24	22.5	1.12
0.763	87.049	60.426	12.18	7.21	1.22	0.91	3.24	2.02	1.46	0.55	2.21	22.2	1.11
0.774	87.108	60.615	12.38	7.23	1.25	0.88	3.24	1.99	1.44	0.55	2.25	22.6	1.13
0.786	87.224	60.450	12.58	7.25	1.23	0.91	3.24	2.01	1.46	0.55	2.22	22.2	1.11
0.798	87.340	60.686	12.78	7.26	1.26	0.87	3.24	1.98	1.42	0.55	2.26	22.8	1.14
0.810	87.456	60.521	12.99	7.28	1.24	0.90	3.24	2.00	1.45	0.55	2.23	22.4	1.12
0.822	87.572	60.403	13.19	7.30	1.22	0.91	3.24	2.02	1.47	0.55	2.21	22.1	1.11
0.834	87.862	60.591	13.39	7.31	1.25	0.89	3.24	1.99	1.44	0.55	2.25	22.6	1.13
0.846	88.036	60.497	13.59	7.33	1.23	0.90	3.24	2.01	1.45	0.55	2.23	22.4	1.11
0.858	88.210	60.686	13.79	7.35	1.26	0.87	3.24	1.98	1.43	0.55	2.27	22.8	1.14
0.869	88.326	60.568	13.99	7.36	1.24	0.89	3.24	2.00	1.44	0.55	2.24	22.6	1.12
0.881	88.500	60.473	14.19	7.38	1.23	0.90	3.24	2.01	1.46	0.55	2.23	22.3	1.11
0.893	88.732	60.639	14.40	7.40	1.25	0.88	3.24	1.99	1.43	0.56	2.26	22.8	1.13
0.905	88.849	60.521	14.60	7.42	1.24	0.90	3.24	2.01	1.45	0.55	2.24	22.5	1.11
0.917	89.023	60.709	14.80	7.43	1.26	0.87	3.24	1.98	1.43	0.56	2.28	22.9	1.14
0.929	89.139	60.568	15.00	7.45	1.24	0.89	3.24	2.00	1.45	0.56	2.25	22.6	1.12
0.941	89.313	60.473	15.20	7.47	1.23	0.90	3.25	2.01	1.46	0.56	2.23	22.4	1.11
0.953	89.487	60.639	15.40	7.49	1.25	0.88	3.25	1.99	1.44	0.56	2.26	22.8	1.13
0.964	89.603	60.521	15.60	7.50	1.24	0.90	3.25	2.01	1.45	0.56	2.24	22.5	1.11
0.976	89.777	60.709	15.80	7.52	1.26	0.87	3.25	1.98	1.43	0.56	2.28	23.0	1.14
0.988	89.835	60.568	16.01	7.54	1.24	0.89	3.24	2.00	1.45	0.56	2.25	22.6	1.12
1.000	89.951	60.450	16.21	7.56	1.23	0.91	3.24	2.02	1.46	0.56	2.22	22.3	1.11
1.012	90.183	60.639	16.41	7.58	1.25	0.88	3.25	1.99	1.44	0.56	2.26	22.8	1.13
1.024	90.241	60.521	16.61	7.60	1.24	0.90	3.24	2.01	1.45	0.56	2.24	22.5	1.11
1.036	90.415	60.709	16.81	7.61	1.26	0.87	3.24	1.98	1.43	0.56	2.28	22.9	1.14
1.048	90.473	60.568	17.01	7.63	1.24	0.89	3.24	2.00	1.44	0.55	2.25	22.6	1.12
1.060	90.590	60.450	17.21	7.65	1.23	0.91	3.24	2.02	1.46	0.55	2.22	22.3	1.11
1.071	90.822	60.615	17.42	7.67	1.25	0.88	3.24	1.99	1.44	0.56	2.26	22.7	1.13



SAMPLE INFORMATION

Boring: GEI421 Sample: U2 Depth (ft): 85.7 ft Test: R2
 Type: 2.8-inch diameter Shelby tube sample
 Description: Dark-gray Organic SOIL (OH)

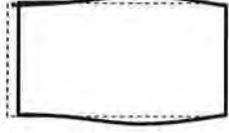
SPECIMEN INFORMATION (after saturation)

Height: 5.599 in Dia.: 2.836 in Area: 6.435 sq in
 Water Content: 55.6% Dry Unit Weight: 66.3 pcf

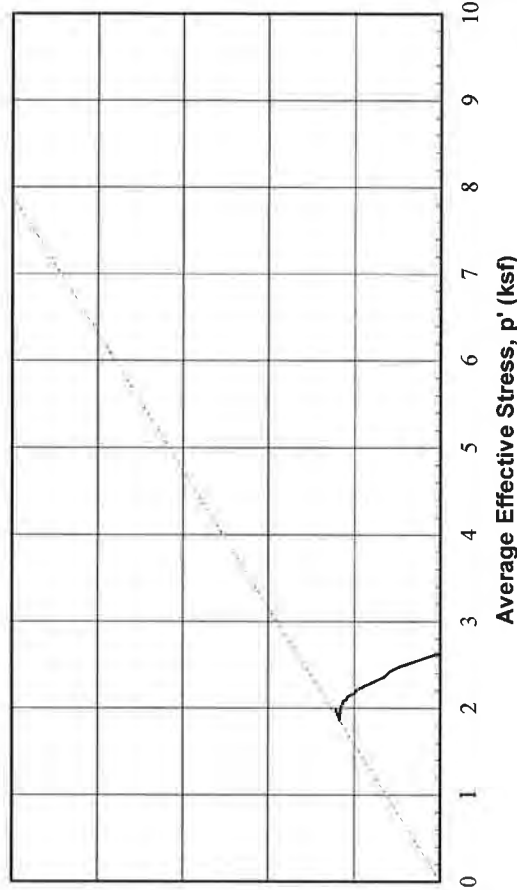
TEST SUMMARY (end of test)

Effective Confining Stress: 2.64 ksf vertical, 2.64 ksf horiz.
 Water Content: 52.7 % Dry Unit Weight: 68.5 pcf
 B Coefficient: 0.99 Strain Rate: 0.014 %/min
 Peak Shear Stress: 1.21 ksf @ 17.0 % Strain
 Peak Friction Angle: 39.3 deg @ 12.2 % Strain

REMARKS:



Failure Sketch



Operator: E. Fazlic
 Checked: D. Aghajyan
 Test Date: 27-Sep-2017

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut
 Stantec Consulting Services, Inc.



CONSOLIDATED ISOTROPIC
 UNDRAINED TRIAXIAL COMPRESSION
 with Pore Pressure Measurements

Project 1702805

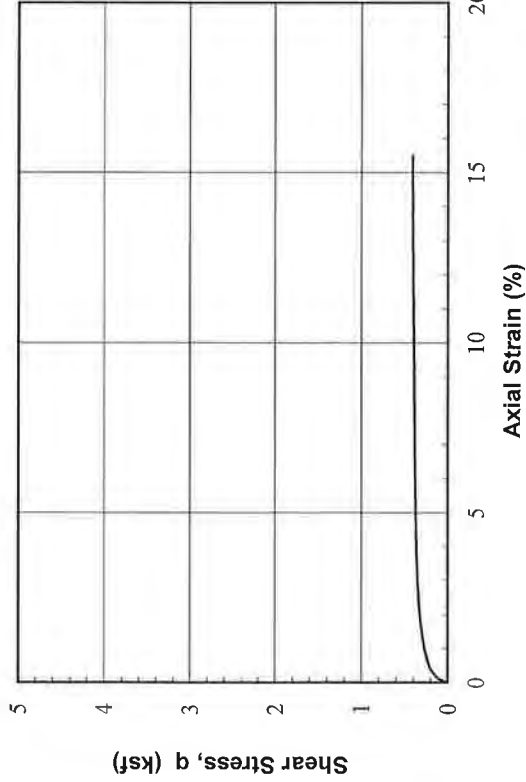
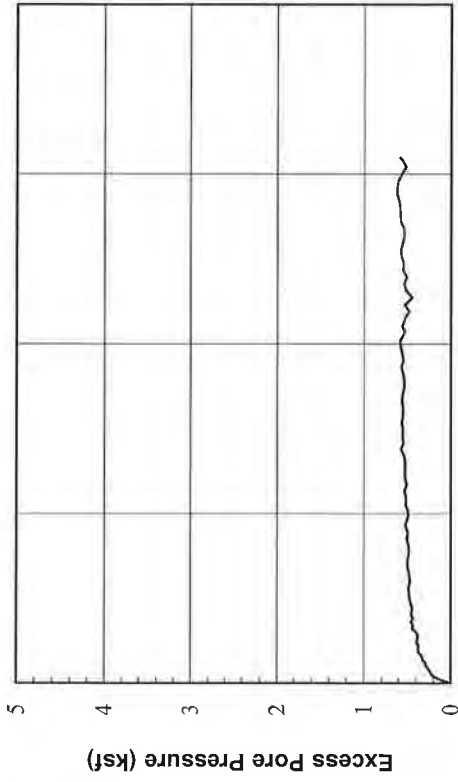
October 2017

Fig.

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Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total Sigma V (ksf)	Sigma V Effective (ksf)	P' (ksf)	q (ksf)	s1/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.180	102.400	60.154	1.82	6.44	1.54	1.10	4.74	3.20	2.15	1.05	2.91	29.3	0.73
0.186	103.350	60.250	1.93	6.44	1.55	1.08	4.76	3.20	2.14	1.06	2.95	29.6	0.73
0.191	104.350	60.365	2.03	6.45	1.57	1.07	4.78	3.21	2.14	1.07	3.00	30.0	0.73
0.203	106.000	60.537	2.23	6.46	1.59	1.04	4.81	3.22	2.13	1.09	3.08	30.7	0.73
0.214	107.440	60.881	2.43	6.48	1.64	0.99	4.84	3.19	2.09	1.10	3.21	31.7	0.75
0.225	108.630	60.977	2.64	6.49	1.66	0.98	4.86	3.20	2.09	1.11	3.27	32.1	0.75
0.237	109.770	61.092	2.84	6.50	1.67	0.96	4.88	3.21	2.08	1.12	3.33	32.5	0.75
0.248	110.750	61.187	3.04	6.52	1.69	0.95	4.90	3.21	2.08	1.13	3.38	32.9	0.75
0.260	111.560	61.264	3.24	6.53	1.70	0.94	4.91	3.21	2.07	1.14	3.42	33.2	0.75
0.271	112.260	61.551	3.45	6.54	1.74	0.90	4.92	3.18	2.04	1.14	3.54	34.0	0.76
0.282	112.830	61.608	3.65	6.56	1.75	0.89	4.93	3.18	2.03	1.15	3.58	34.3	0.76
0.294	113.370	61.665	3.85	6.57	1.76	0.88	4.94	3.18	2.03	1.15	3.61	34.5	0.76
0.305	113.890	61.704	4.05	6.59	1.76	0.88	4.94	3.18	2.03	1.15	3.63	34.6	0.77
0.316	114.350	61.761	4.26	6.60	1.77	0.87	4.95	3.18	2.02	1.15	3.66	34.8	0.77
0.328	114.860	61.991	4.46	6.61	1.80	0.83	4.95	3.15	1.99	1.16	3.78	35.5	0.78
0.339	115.270	62.010	4.66	6.63	1.81	0.83	4.96	3.15	1.99	1.16	3.79	35.6	0.78
0.350	115.650	62.048	4.86	6.64	1.81	0.83	4.96	3.15	1.99	1.16	3.81	35.8	0.78
0.362	115.980	62.067	5.07	6.66	1.82	0.82	4.96	3.15	1.99	1.16	3.83	35.8	0.78
0.373	116.270	62.086	5.27	6.67	1.82	0.82	4.96	3.15	1.98	1.16	3.84	35.9	0.78
0.384	116.630	62.297	5.47	6.68	1.85	0.79	4.97	3.12	1.95	1.16	3.95	36.6	0.79
0.396	116.950	62.297	5.68	6.70	1.85	0.79	4.97	3.12	1.96	1.17	3.95	36.6	0.79
0.407	117.250	62.297	5.88	6.71	1.85	0.79	4.97	3.12	1.95	1.17	3.97	36.7	0.79
0.418	117.570	62.316	6.08	6.73	1.85	0.75	4.97	3.09	1.92	1.17	4.11	37.5	0.81
0.430	117.950	62.564	6.28	6.74	1.89	0.75	4.98	3.10	1.93	1.17	4.08	37.3	0.80
0.441	118.170	62.507	6.49	6.76	1.88	0.76	4.98	3.10	1.93	1.17	4.07	37.2	0.80
0.452	118.440	62.488	6.69	6.77	1.88	0.76	4.98	3.10	1.93	1.17	4.07	37.2	0.80
0.464	118.660	62.488	6.89	6.79	1.88	0.76	4.98	3.10	1.93	1.17	4.07	37.2	0.80
0.475	118.930	62.488	7.09	6.80	1.88	0.76	4.98	3.10	1.93	1.17	4.07	37.2	0.80
0.487	119.310	62.698	7.30	6.82	1.91	0.73	4.98	3.07	1.90	1.17	4.20	38.0	0.81
0.498	119.580	62.660	7.50	6.83	1.90	0.74	4.98	3.08	1.91	1.17	4.17	37.8	0.81
0.509	119.880	62.641	7.70	6.85	1.90	0.74	4.98	3.08	1.91	1.17	4.16	37.8	0.81
0.521	120.150	62.622	7.91	6.86	1.90	0.74	4.98	3.09	1.91	1.17	4.15	37.7	0.81
0.532	120.360	62.603	8.11	6.88	1.89	0.75	4.98	3.09	1.92	1.17	4.14	37.7	0.81
0.543	120.660	62.794	8.31	6.89	1.92	0.72	4.98	3.06	1.89	1.17	4.26	38.3	0.82
0.555	120.880	62.756	8.51	6.91	1.91	0.72	4.98	3.07	1.90	1.17	4.24	38.2	0.82
0.566	121.150	62.737	8.72	6.92	1.91	0.73	4.98	3.07	1.90	1.17	4.23	38.1	0.82
0.577	121.480	62.717	8.92	6.94	1.91	0.73	4.98	3.07	1.90	1.17	4.22	38.1	0.81
0.589	121.750	62.698	9.12	6.95	1.91	0.73	4.98	3.08	1.90	1.17	4.20	38.0	0.81
0.600	122.130	62.870	9.32	6.97	1.93	0.71	4.99	3.06	1.88	1.17	4.32	38.6	0.82
0.611	122.370	62.832	9.53	6.98	1.93	0.71	4.99	3.06	1.89	1.17	4.29	38.5	0.82
0.623	122.610	62.813	9.73	7.00	1.92	0.72	4.99	3.06	1.89	1.17	4.28	38.4	0.82

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	sl'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.634	122.860	62.775	9.93	7.02	1.92	0.72	4.99	3.07	1.89	1.17	4.26	38.3	0.82
0.645	123.100	62.756	10.13	7.03	1.91	0.72	4.98	3.07	1.90	1.17	4.24	38.2	0.82
0.657	123.400	62.928	10.34	7.05	1.94	0.70	4.99	3.05	1.87	1.17	4.36	38.8	0.83
0.668	123.700	62.890	10.54	7.06	1.93	0.70	4.99	3.05	1.88	1.17	4.33	38.7	0.82
0.679	124.000	62.851	10.74	7.08	1.93	0.71	4.99	3.06	1.88	1.17	4.31	38.6	0.82
0.691	124.210	62.832	10.95	7.10	1.93	0.71	4.99	3.06	1.89	1.17	4.29	38.5	0.82
0.702	124.460	62.794	11.15	7.11	1.92	0.72	4.99	3.07	1.89	1.17	4.27	38.3	0.82
0.714	124.700	62.966	11.35	7.13	1.94	0.69	4.99	3.04	1.87	1.17	4.38	38.9	0.83
0.725	124.940	62.928	11.55	7.14	1.94	0.70	4.98	3.05	1.87	1.17	4.36	38.8	0.83
0.736	125.240	62.890	11.76	7.16	1.93	0.70	4.99	3.05	1.88	1.17	4.33	38.7	0.82
0.748	125.510	62.851	11.96	7.18	1.93	0.71	4.99	3.06	1.88	1.17	4.31	38.5	0.82
0.759	125.870	63.062	12.16	7.19	1.96	0.68	4.99	3.03	1.85	1.17	4.46	39.3	0.83
0.770	126.160	62.985	12.36	7.21	1.95	0.69	4.99	3.04	1.87	1.17	4.40	39.0	0.83
0.782	126.430	62.928	12.57	7.23	1.94	0.70	4.99	3.05	1.87	1.17	4.36	38.8	0.83
0.793	126.760	62.890	12.77	7.24	1.93	0.70	4.99	3.06	1.88	1.18	4.34	38.7	0.82
0.804	127.080	62.851	12.97	7.26	1.93	0.71	4.99	3.06	1.89	1.18	4.31	38.6	0.82
0.816	127.570	63.043	13.18	7.28	1.96	0.68	4.99	3.04	1.86	1.18	4.45	39.3	0.83
0.827	128.110	63.004	13.38	7.29	1.95	0.69	5.00	3.05	1.87	1.18	4.43	39.2	0.83
0.838	128.600	62.947	13.58	7.31	1.94	0.70	5.00	3.06	1.88	1.18	4.40	39.0	0.82
0.850	129.140	62.890	13.78	7.33	1.93	0.70	5.01	3.07	1.89	1.19	4.36	38.8	0.82
0.861	129.630	62.794	13.99	7.35	1.92	0.72	5.01	3.09	1.91	1.19	4.31	38.5	0.81
0.872	130.200	62.890	14.19	7.36	1.93	0.70	5.02	3.08	1.89	1.19	4.38	38.9	0.81
0.884	130.770	62.794	14.39	7.38	1.92	0.72	5.02	3.10	1.91	1.19	4.32	38.6	0.80
0.895	131.340	62.717	14.59	7.40	1.91	0.73	5.03	3.12	1.92	1.20	4.28	38.4	0.80
0.906	131.880	62.660	14.80	7.42	1.90	0.74	5.03	3.13	1.94	1.20	4.25	38.2	0.79
0.918	132.340	62.813	15.00	7.43	1.92	0.72	5.04	3.11	1.91	1.20	4.35	38.8	0.80
0.929	132.860	62.698	15.20	7.45	1.91	0.73	5.04	3.14	1.93	1.20	4.28	38.4	0.79
0.941	133.320	62.641	15.41	7.47	1.90	0.74	5.04	3.15	1.94	1.20	4.25	38.2	0.79
0.952	133.800	62.564	15.61	7.49	1.89	0.75	5.05	3.16	1.96	1.20	4.21	38.0	0.78
0.963	134.320	62.526	15.81	7.51	1.88	0.76	5.05	3.17	1.96	1.21	4.19	37.9	0.78
0.975	134.860	62.660	16.01	7.52	1.90	0.74	5.06	3.16	1.95	1.21	4.28	38.4	0.79
0.986	135.320	62.603	16.22	7.54	1.89	0.75	5.06	3.17	1.96	1.21	4.25	38.2	0.78
0.997	135.670	62.545	16.42	7.56	1.88	0.75	5.06	3.18	1.97	1.21	4.21	38.0	0.78
1.009	136.000	62.507	16.62	7.58	1.88	0.76	5.06	3.18	1.97	1.21	4.19	37.9	0.78
1.020	136.300	62.450	16.82	7.60	1.87	0.77	5.06	3.19	1.98	1.21	4.15	37.7	0.77
1.031	136.650	62.603	17.03	7.62	1.89	0.75	5.06	3.17	1.96	1.21	4.25	38.2	0.78
1.034	136.700	62.603	17.07	7.62	1.89	0.75	5.06	3.17	1.96	1.21	4.25	38.2	0.78



SAMPLE INFORMATION

Boring: GEI-422 Sample: U1 Depth (ft): 25.2 ft Test: R'3
 Type: 2.8-inch diameter Shelby tube sample
 Description: Dark gray ORGANIC SOIL (OH)

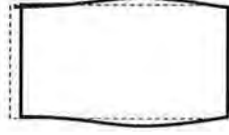
SPECIMEN INFORMATION (after saturation)

Height: 5.645 in Dia: 2.789 in Area: 6.049 sq. in
 Water Content: 62.8% Dry Unit Weight: 61.7 pcf

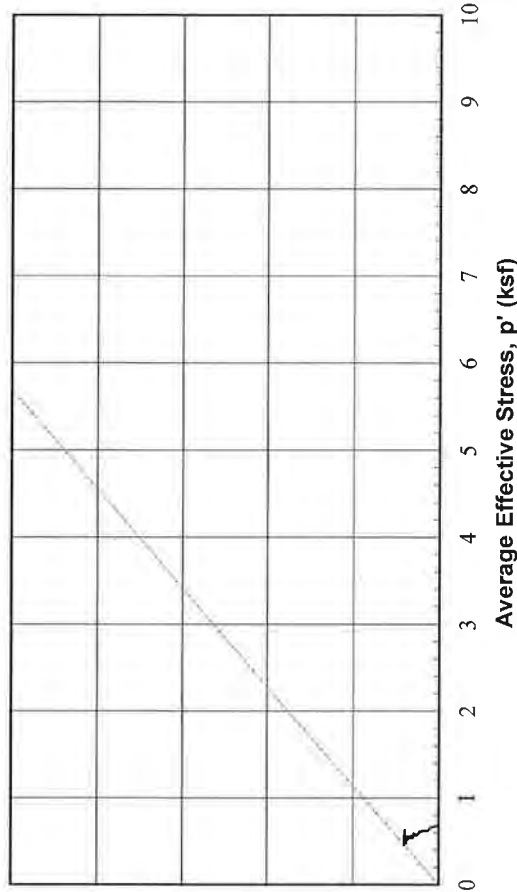
TEST SUMMARY (end of test)

Effective Confining Stress: 0.68 ksf vertical, 0.68 ksf horiz.
 Water Content: 62.8% Dry Unit Weight: 61.7 pcf
 B Coefficient: 0.99 Strain Rate: 0.014 %/min
 Peak Shear Stress: 0.41 ksf @ 15.5 % Strain
 Peak Friction Angle: 61.4 deg. @ 14.6 % Strain

REMARKS: Average friction angle between 5% and 10% strain = 48 deg.



Failure Sketch



Operator: E. Fazlic
 Checked: D. Aghjavan
 Test Date: 27-Sep-2017

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut
 Stantec Consulting Services, Inc.



CONSOLIDATED ISOTROPIC
 UNDRAINED TRIAXIAL COMPRESSION
 with Pore Pressure Measurements

Project 1702805 October 2017 Fig.

10/16/2017 16:42

PROJECT #:

1702805

PROJECT: Electric Boat Assembly Facility

TEST:

R3

BORING: GEI-422

SAMPLE: U1

DEPTH (ft): 25.2 ft

OPER.: E. Fazlic

TEST DATE: 9/27/2017

DCDT No.

10716

DCDT Calibration Factor 9.3997E-05 inch/cnt

Load Cell No.

251674

Load Cell Cal. Factor 0.13652 lb/cnt

Pressure Transducer

GEO2

Pres. Trans. Cal. Factor 0.0065185 psi/cnt

Gravity of Solids

2.60 (assumed)

B value start shear

0.99

Test Stage End off#

1

Stage Strain rate

0.014 %/min

Data Start Row

4

Stage

In situ

After Sampling

In tube before extrusion

Under vac.

End of:

Saturation

Consol. Stage 1

Consol. Stage 2

Consol. Stage 3

Consol. Stage 4

Consol. Stage 5

Consol. Stage 6

This Stage Initial Values

Kc start stage

1.00

Back Pressure

7.11 ksf

SIGMAv'

(ksf)

--

--

--

--

0.72

SIGMAh'

(ksf)

--

--

--

0.72

Height

(in)

--

--

5.906

5.700

Diameter

(in)

--

--

2.876

2.823

Area

(in²)

--

--

6.495

6.260

Water Content

(%)

--

--

71.88

--

Dry Density

(pcf)

--

--

55.4

59.6

Total Density

(pcf)

--

--

95.3

--

Void Ratio

--

--

1.929

1.724

calculated from end of test

61.7

100.4

1.633

61.7

100.4

1.633

61.7

100.4

1.633

61.7

100.4

1.633

Excess

Pore

Pressure

(ksf)

0.00

0.12

0.21

0.24

0.26

0.29

0.30

0.33

0.34

0.37

0.38

0.37

0.40

0.39

0.38

0.41

0.45

0.44

Axial

Strain

(%)

0.00

0.10

0.20

0.30

0.40

0.50

0.60

0.71

0.81

0.91

1.01

1.11

1.21

1.31

1.41

1.51

1.62

1.72

Area

(in²)

6.11

6.11

6.12

6.13

6.13

6.14

6.15

6.15

6.16

6.16

6.17

6.18

6.18

6.19

6.20

6.20

6.21

6.21

Total

SigmaV

(ksf)

0.68

0.88

0.97

1.03

1.08

1.11

1.14

1.16

1.18

1.21

1.22

1.24

1.25

1.26

1.28

1.28

1.30

1.31

SigmaV

Effective

(ksf)

0.68

0.75

0.76

0.80

0.82

0.83

0.84

0.83

0.84

0.83

0.84

0.86

0.85

0.87

0.89

0.88

0.85

0.87

P'

(ksf)

0.68

0.66

0.62

0.62

0.62

0.61

0.61

0.59

0.59

0.57

0.58

0.59

0.57

0.58

0.60

0.58

0.54

0.56

q

(ksf)

0.00

0.10

0.14

0.17

0.20

0.22

0.23

0.24

0.25

0.26

0.27

0.28

0.28

0.29

0.30

0.30

0.31

0.31

s1'/s3'

(deg)

1.00

1.34

1.60

1.78

1.94

2.09

2.20

2.36

2.46

2.69

2.76

2.79

3.00

2.98

2.98

3.19

3.60

3.52

Friction

Angle

(deg)

0.0

8.4

13.3

16.4

18.7

20.7

22.0

23.8

24.9

27.2

27.9

28.1

30.0

29.9

29.8

31.5

34.4

33.9

Pressure

Parameter A

(-)

0.00

0.63

0.72

0.68

0.65

0.66

0.65

0.69

0.68

0.71

0.70

0.67

0.70

0.67

0.65

0.68

0.73

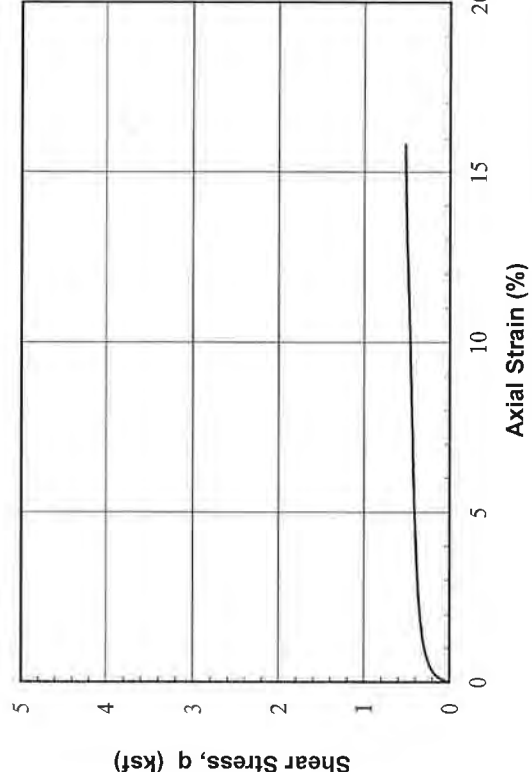
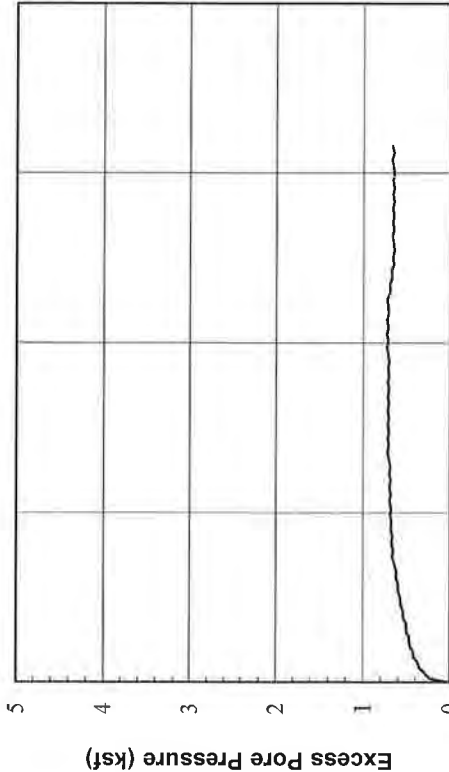
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Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Excess Area (in ²)	Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.158	35.768	52.559	6.22	0.46	0.22	1.31	0.85	0.54	0.32	3.86	36.1	0.73
0.163	36.041	52.383	6.23	0.44	0.25	1.32	0.88	0.56	0.32	3.59	34.4	0.68
0.169	36.451	52.539	6.23	0.46	0.22	1.33	0.87	0.55	0.32	3.89	36.2	0.71
0.180	36.997	52.448	6.25	0.45	0.24	1.34	0.89	0.57	0.33	3.78	35.6	0.68
0.192	37.680	52.604	6.26	0.47	0.21	1.35	0.89	0.55	0.34	4.14	37.6	0.70
0.203	38.089	52.715	6.27	0.48	0.20	1.36	0.88	0.54	0.34	4.43	39.2	0.71
0.215	38.635	52.761	6.29	0.49	0.19	1.37	0.88	0.54	0.35	4.61	40.0	0.71
0.226	39.045	52.630	6.30	0.47	0.21	1.38	0.91	0.56	0.35	4.32	38.6	0.68
0.238	39.454	52.709	6.31	0.48	0.20	1.39	0.91	0.55	0.35	4.55	39.8	0.68
0.249	39.727	52.819	6.33	0.50	0.18	1.39	0.89	0.54	0.36	4.88	41.3	0.70
0.261	40.137	52.826	6.34	0.50	0.18	1.40	0.90	0.54	0.36	4.95	41.6	0.70
0.272	40.410	52.735	6.35	0.49	0.20	1.41	0.92	0.56	0.36	4.71	40.5	0.67
0.284	40.683	52.722	6.37	0.49	0.20	1.41	0.93	0.56	0.36	4.69	40.4	0.67
0.295	40.956	52.878	6.38	0.51	0.17	1.42	0.91	0.54	0.37	5.20	42.6	0.69
0.307	41.229	52.793	6.39	0.50	0.19	1.42	0.93	0.56	0.37	4.95	41.6	0.67
0.318	41.366	53.008	6.41	0.53	0.16	1.42	0.90	0.53	0.37	5.74	44.7	0.71
0.329	41.639	52.826	6.42	0.50	0.18	1.43	0.93	0.55	0.37	5.08	42.2	0.67
0.341	41.775	52.780	6.43	0.49	0.19	1.43	0.93	0.56	0.37	4.95	41.6	0.66
0.352	41.912	52.969	6.45	0.52	0.16	1.43	0.91	0.54	0.37	5.62	44.3	0.70
0.364	42.185	52.950	6.46	0.52	0.16	1.43	0.92	0.54	0.38	5.57	44.1	0.69
0.375	42.321	53.061	6.48	0.53	0.15	1.44	0.90	0.52	0.38	6.07	45.8	0.71
0.387	42.458	52.917	6.49	0.51	0.17	1.44	0.92	0.55	0.38	5.46	43.7	0.68
0.398	42.594	53.041	6.50	0.53	0.15	1.44	0.91	0.53	0.38	5.99	45.6	0.70
0.410	42.731	53.035	6.52	0.53	0.15	1.44	0.91	0.53	0.38	5.97	45.5	0.70
0.421	43.004	53.021	6.53	0.53	0.15	1.44	0.92	0.53	0.38	5.94	45.4	0.69
0.433	43.140	53.080	6.55	0.54	0.15	1.45	0.91	0.53	0.38	6.23	46.3	0.70
0.444	43.277	53.373	6.56	0.58	0.10	1.45	0.87	0.49	0.38	8.38	51.9	0.76
0.456	43.413	53.158	6.57	0.55	0.13	1.45	0.90	0.52	0.38	6.69	47.7	0.72
0.467	43.550	53.224	6.59	0.56	0.12	1.45	0.89	0.51	0.38	7.13	49.0	0.73
0.479	43.686	53.217	6.60	0.56	0.13	1.45	0.89	0.51	0.38	7.10	48.8	0.72
0.490	43.959	53.308	6.62	0.57	0.11	1.45	0.89	0.50	0.39	7.84	50.7	0.74
0.501	44.096	53.204	6.63	0.55	0.13	1.46	0.90	0.51	0.39	7.05	48.7	0.72
0.513	44.232	53.191	6.65	0.55	0.13	1.46	0.90	0.52	0.39	6.97	48.5	0.71
0.524	44.369	53.282	6.66	0.57	0.12	1.46	0.89	0.50	0.39	7.65	50.3	0.73
0.536	44.506	53.250	6.68	0.56	0.12	1.46	0.90	0.51	0.39	7.41	49.7	0.72
0.547	44.642	53.113	6.69	0.54	0.14	1.46	0.92	0.53	0.39	6.52	47.2	0.70
0.559	44.779	53.087	6.71	0.54	0.14	1.46	0.92	0.53	0.39	6.39	46.8	0.69
0.570	45.052	53.184	6.72	0.55	0.13	1.47	0.91	0.52	0.39	6.99	48.6	0.70
0.582	45.052	53.334	6.74	0.57	0.11	1.46	0.89	0.50	0.39	8.17	51.4	0.73
0.593	45.188	53.171	6.75	0.55	0.13	1.47	0.92	0.52	0.39	6.91	48.3	0.70
0.605	45.325	53.269	6.77	0.56	0.12	1.47	0.90	0.51	0.39	7.62	50.2	0.72

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	sl'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.616	45.461	53.393	9.94	6.78	0.58	0.10	1.47	0.89	0.49	0.39	8.80	52.7	0.74
0.628	45.734	53.413	10.14	6.80	0.58	0.10	1.47	0.89	0.49	0.39	9.07	53.3	0.74
0.639	45.734	53.061	10.35	6.81	0.53	0.15	1.47	0.94	0.54	0.39	6.31	46.6	0.68
0.651	45.871	53.243	10.55	6.83	0.56	0.12	1.47	0.91	0.52	0.39	7.45	49.8	0.71
0.662	46.144	53.067	10.75	6.84	0.53	0.15	1.48	0.94	0.54	0.40	6.37	46.8	0.67
0.673	46.280	52.709	10.96	6.86	0.48	0.20	1.48	0.99	0.60	0.40	4.99	41.8	0.61
0.685	46.417	53.061	11.16	6.88	0.53	0.15	1.48	0.94	0.55	0.40	6.35	46.7	0.67
0.696	46.690	52.474	11.36	6.89	0.45	0.23	1.48	1.03	0.63	0.40	4.43	39.2	0.56
0.708	46.963	52.930	11.57	6.91	0.52	0.17	1.49	0.97	0.57	0.40	5.80	44.9	0.64
0.719	47.099	53.139	11.77	6.92	0.55	0.14	1.49	0.94	0.54	0.40	6.86	48.2	0.68
0.731	47.236	52.917	11.97	6.94	0.51	0.17	1.49	0.97	0.57	0.40	5.76	44.7	0.64
0.742	47.372	53.230	12.17	6.95	0.56	0.12	1.49	0.93	0.53	0.40	7.49	49.9	0.69
0.754	47.509	53.165	12.38	6.97	0.55	0.13	1.49	0.94	0.54	0.40	7.04	48.7	0.68
0.765	47.645	53.347	12.58	6.99	0.58	0.11	1.49	0.91	0.51	0.40	8.53	52.2	0.71
0.777	47.919	53.400	12.78	7.00	0.58	0.10	1.49	0.91	0.51	0.41	9.14	53.4	0.72
0.788	48.055	53.256	12.99	7.02	0.56	0.12	1.49	0.93	0.53	0.41	7.75	50.5	0.69
0.800	48.192	53.106	13.19	7.04	0.54	0.14	1.50	0.96	0.55	0.41	6.73	47.8	0.66
0.811	48.192	53.145	13.39	7.05	0.55	0.14	1.49	0.95	0.54	0.41	6.95	48.4	0.67
0.823	48.465	53.400	13.60	7.07	0.58	0.10	1.50	0.91	0.51	0.41	9.18	53.5	0.72
0.834	48.601	53.406	13.80	7.09	0.58	0.10	1.50	0.91	0.51	0.41	9.26	53.6	0.72
0.846	48.601	53.432	14.00	7.10	0.59	0.10	1.50	0.91	0.50	0.41	9.56	54.2	0.72
0.857	48.738	53.530	14.21	7.12	0.60	0.08	1.50	0.90	0.49	0.41	11.07	56.5	0.74
0.868	48.874	53.686	14.41	7.14	0.62	0.06	1.50	0.87	0.47	0.41	14.95	61.0	0.77
0.880	49.011	53.699	14.61	7.15	0.63	0.06	1.50	0.87	0.46	0.41	15.42	61.4	0.77
0.891	49.147	53.589	14.82	7.17	0.61	0.07	1.50	0.89	0.48	0.41	12.28	58.1	0.75
0.903	49.284	53.295	15.02	7.19	0.57	0.11	1.50	0.93	0.52	0.41	8.13	51.3	0.69
0.914	49.420	52.969	15.22	7.20	0.52	0.16	1.50	0.98	0.57	0.41	6.06	45.8	0.64
0.926	49.420	53.250	15.42	7.22	0.56	0.12	1.50	0.94	0.53	0.41	7.74	50.4	0.69
0.930	49.557	53.458	15.50	7.23	0.59	0.09	1.50	0.91	0.50	0.41	9.97	54.8	0.72

10/16/2017 16:43

Operator: E. Fazlic
Checked: D. Aghjavan
Test Date: 5-Oct-2017



SAMPLE INFORMATION

Boring: GEI-422 Sample: U2 Depth (ft): 35.6 ft Test: R'4
Type: 2.8-inch diameter Shelby tube sample
Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION (after saturation)

Height: 5.483 in Dia.: 2.763 in Area: 5.955 sq. in
Water Content: 69.2% Dry Unit Weight: 58.0 pcf

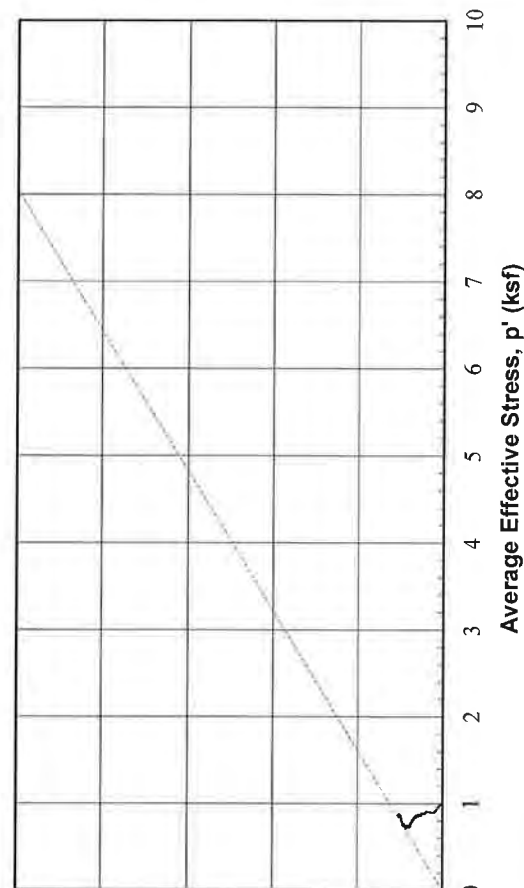
TEST SUMMARY (end of test)

Effective Confining Stress: 1.02 ksf vertical, 1.02 ksf horiz.
Water Content: 66.9 % Dry Unit Weight: 59.3 pcf
B Coefficient: 1 Strain Rate: 0.014 %/min
Peak Shear Stress: 0.52 ksf @ 15.8 % Strain
Peak Friction Angle: 38.4 deg. @ 11.3 % Strain

REMARKS:

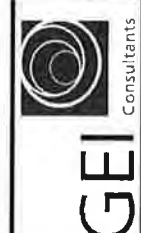


Failure Sketch



General Dynamics
Electric Boat Assembly Facility
Groton, Connecticut

Stantec Consulting Services, Inc.



Project 1702805

CONSOLIDATED ISOTROPIC
UNDRAINED TRIAXIAL COMPRESSION
with Pore Pressure Measurements

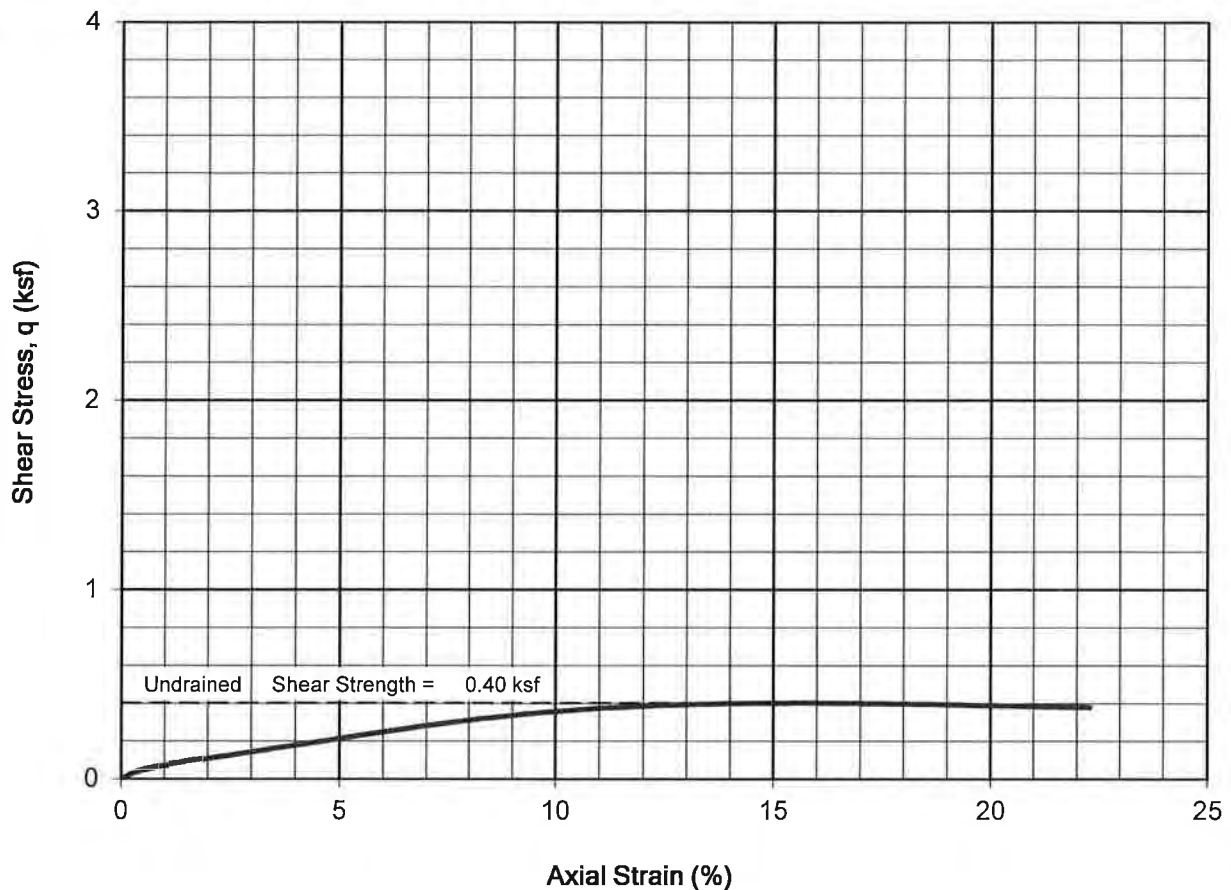
October 2017

Fig.

PROJECT #:	1702805																			
PROJECT:	Electric Boat Assembly Facility																			
TEST:	R'4																			
BORING:	GEI-422																			
SAMPLE:	U2																			
DEPTH (ft):	35.6 ft																			
OPER.:	E. Fazlic																			
TEST DATE:	10/5/2017																			
DCDT No.	146																			
DCDT Calibration Factor	6.5277E-05 inch/cnt																			
Load Cell No.	1890-0004																			
Load Cell Cal. Factor	0.027097 lb/cnt																			
Pressure Transducer	CP-GEI-4																			
Pres. Trans. Cal. Factor	0.019127 psi/cnt																			
Gravity of Solids	2.60 (assumed)																			
B value start shear	1.00																			
Test Stage End of#	1																			
Stage Strain rate	0.014 %/min																			
Data Start Row	4																			
	Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)		Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total Sigma V (ksf)	Sigma V Effective (ksf)	P' (ksf)	q (ksf)	sl ¹ /s3'	Friction Angle (deg)	Pressure Parameter A (-)					
	0.158	7.641	49.118		0.00	6.00	0.00	1.02	1.02	1.02	1.02	0.00	1.00	0.0	0.00					
	0.164	16.773	50.725		0.10	6.00	0.23	0.79	1.24	1.01	0.90	0.11	1.28	7.0	1.06					
	0.169	21.000	51.012		0.20	6.01	0.27	0.75	1.34	1.07	0.91	0.16	1.43	10.2	0.85					
	0.175	23.710	51.222		0.31	6.01	0.30	0.72	1.40	1.10	0.91	0.19	1.54	12.2	0.79					
	0.181	25.661	51.547		0.41	6.02	0.35	0.67	1.45	1.10	0.89	0.22	1.64	14.1	0.81					
	0.186	27.260	51.643		0.51	6.03	0.36	0.66	1.49	1.12	0.89	0.23	1.71	15.3	0.78					
	0.192	28.669	51.739		0.62	6.03	0.38	0.64	1.52	1.14	0.89	0.25	1.78	16.3	0.75					
	0.198	29.753	52.006		0.72	6.04	0.42	0.60	1.55	1.13	0.87	0.26	1.87	17.7	0.79					
	0.203	30.782	52.045		0.82	6.05	0.42	0.60	1.57	1.15	0.87	0.28	1.92	18.4	0.76					
	0.209	31.622	52.102		0.93	6.05	0.43	0.59	1.59	1.16	0.88	0.29	1.97	19.0	0.75					
	0.214	32.408	52.293		1.03	6.06	0.46	0.56	1.61	1.15	0.86	0.29	2.05	20.1	0.78					
	0.220	33.140	52.351		1.13	6.06	0.47	0.55	1.63	1.16	0.86	0.30	2.09	20.7	0.77					
	0.226	33.709	52.370		1.23	6.07	0.47	0.55	1.64	1.17	0.86	0.31	2.12	21.1	0.76					
	0.231	34.251	52.370		1.34	6.08	0.47	0.55	1.65	1.18	0.87	0.32	2.14	21.3	0.74					
	0.237	34.738	52.580		1.44	6.08	0.50	0.52	1.66	1.16	0.84	0.32	2.23	22.4	0.78					
	0.243	35.145	52.599		1.54	6.09	0.50	0.52	1.67	1.17	0.84	0.33	2.25	22.7	0.77					
	0.248	35.578	52.618		1.65	6.10	0.50	0.52	1.68	1.18	0.85	0.33	2.28	23.0	0.76					
	0.254	36.012	52.638		1.75	6.10	0.51	0.51	1.69	1.18	0.85	0.33	2.31	23.3	0.76					

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	sl'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.260	36.418	52.829	1.85	6.11	0.53	0.49	1.70	1.16	0.82	0.34	2.40	24.3	0.79
0.265	36.771	52.848	1.95	6.11	0.54	0.48	1.71	1.17	0.83	0.34	2.42	24.6	0.78
0.271	37.123	52.848	2.06	6.12	0.54	0.48	1.71	1.18	0.83	0.35	2.44	24.7	0.77
0.282	37.773	53.058	2.26	6.13	0.57	0.45	1.73	1.16	0.81	0.35	2.56	26.0	0.80
0.293	38.369	53.077	2.47	6.15	0.57	0.45	1.74	1.17	0.81	0.36	2.60	26.4	0.79
0.305	38.857	53.269	2.67	6.16	0.60	0.42	1.75	1.15	0.79	0.36	2.73	27.6	0.82
0.316	39.318	53.269	2.88	6.17	0.60	0.42	1.76	1.16	0.79	0.37	2.75	27.8	0.81
0.327	39.778	53.460	3.09	6.19	0.63	0.39	1.77	1.14	0.77	0.37	2.90	29.1	0.84
0.339	40.239	53.441	3.29	6.20	0.62	0.40	1.78	1.15	0.78	0.38	2.91	29.2	0.82
0.350	40.645	53.594	3.50	6.21	0.64	0.37	1.78	1.14	0.76	0.38	3.04	30.3	0.84
0.361	41.106	53.766	3.70	6.23	0.67	0.35	1.79	1.12	0.74	0.39	3.21	31.7	0.86
0.372	41.458	53.689	3.91	6.24	0.66	0.36	1.80	1.14	0.75	0.39	3.16	31.3	0.84
0.384	41.756	53.823	4.11	6.25	0.68	0.34	1.81	1.13	0.73	0.39	3.30	32.3	0.86
0.395	42.082	53.747	4.32	6.27	0.67	0.35	1.81	1.14	0.75	0.40	3.24	31.9	0.84
0.406	42.461	53.881	4.53	6.28	0.69	0.33	1.82	1.13	0.73	0.40	3.39	33.0	0.86
0.418	42.786	53.823	4.73	6.29	0.68	0.34	1.82	1.15	0.74	0.40	3.35	32.7	0.84
0.429	43.138	53.938	4.94	6.31	0.69	0.33	1.83	1.14	0.73	0.41	3.49	33.7	0.86
0.440	43.436	53.862	5.14	6.32	0.68	0.34	1.84	1.15	0.74	0.41	3.42	33.2	0.84
0.451	43.816	53.976	5.35	6.33	0.70	0.32	1.84	1.14	0.73	0.41	3.57	34.2	0.85
0.463	44.114	53.900	5.56	6.35	0.69	0.33	1.85	1.16	0.74	0.41	3.50	33.8	0.83
0.474	44.412	53.996	5.76	6.36	0.70	0.32	1.85	1.15	0.73	0.42	3.62	34.6	0.84
0.485	44.710	53.919	5.97	6.38	0.69	0.33	1.86	1.17	0.75	0.42	3.55	34.1	0.83
0.497	45.035	54.015	6.17	6.39	0.71	0.31	1.86	1.16	0.74	0.42	3.68	34.9	0.84
0.508	45.360	53.938	6.38	6.40	0.69	0.33	1.87	1.17	0.75	0.42	3.61	34.5	0.82
0.519	45.658	54.034	6.58	6.42	0.71	0.31	1.87	1.16	0.74	0.43	3.74	35.3	0.83
0.530	46.011	54.168	6.79	6.43	0.73	0.29	1.88	1.15	0.72	0.43	3.94	36.5	0.85
0.542	46.011	54.053	7.00	6.45	0.71	0.31	1.88	1.17	0.74	0.43	3.77	35.5	0.83
0.553	46.255	54.149	7.20	6.46	0.72	0.30	1.88	1.16	0.73	0.43	3.92	36.4	0.84
0.564	46.607	54.053	7.41	6.48	0.71	0.31	1.89	1.18	0.74	0.43	3.81	35.7	0.82
0.576	46.905	54.149	7.61	6.49	0.72	0.30	1.89	1.17	0.73	0.44	3.95	36.6	0.83
0.587	47.230	54.053	7.82	6.50	0.71	0.31	1.90	1.19	0.75	0.44	3.84	35.9	0.81
0.598	47.501	54.149	8.02	6.52	0.72	0.30	1.90	1.18	0.74	0.44	3.98	36.8	0.82
0.609	47.826	54.053	8.23	6.53	0.71	0.31	1.91	1.19	0.75	0.44	3.87	36.1	0.80
0.621	48.178	54.149	8.44	6.55	0.72	0.30	1.91	1.19	0.74	0.45	4.02	37.0	0.81
0.632	48.422	54.053	8.64	6.56	0.71	0.31	1.91	1.20	0.76	0.45	3.90	36.3	0.79
0.643	48.693	54.149	8.85	6.58	0.72	0.30	1.92	1.19	0.74	0.45	4.05	37.1	0.81
0.655	48.964	54.053	9.05	6.59	0.71	0.31	1.92	1.21	0.76	0.45	3.92	36.4	0.79
0.666	49.235	54.129	9.26	6.61	0.72	0.30	1.93	1.20	0.75	0.45	4.04	37.1	0.80
0.677	49.506	54.034	9.47	6.62	0.71	0.31	1.93	1.22	0.77	0.46	3.92	36.4	0.78
0.688	49.804	54.129	9.67	6.64	0.72	0.30	1.93	1.21	0.76	0.46	4.07	37.3	0.79
0.700	50.075	54.206	9.88	6.65	0.73	0.29	1.94	1.21	0.75	0.46	4.20	38.0	0.80

Axial DCDT (inch)	Load Cell (lb)	Pore Pressure (lb/in ²)	Axial Strain (%)	Area (in ²)	Excess Pore Pressure (ksf)	Sigma3 effective (ksf)	Total SigmaV (ksf)	SigmaV Effective (ksf)	P' (ksf)	q (ksf)	s1'/s3'	Friction Angle (deg)	Pressure Parameter A (-)
0.711	50.373	54.110	10.08	6.67	0.72	0.30	1.94	1.22	0.76	0.46	4.07	37.3	0.78
0.722	50.644	54.225	10.29	6.68	0.74	0.28	1.95	1.21	0.75	0.46	4.26	38.3	0.79
0.734	50.888	54.091	10.49	6.70	0.72	0.30	1.95	1.23	0.77	0.46	4.06	37.2	0.77
0.745	51.240	54.206	10.70	6.71	0.73	0.29	1.95	1.22	0.75	0.47	4.26	38.3	0.78
0.756	51.484	54.072	10.91	6.73	0.71	0.31	1.96	1.24	0.78	0.47	4.06	37.2	0.76
0.767	51.864	54.110	11.11	6.74	0.72	0.30	1.96	1.24	0.77	0.47	4.14	37.7	0.76
0.779	52.243	54.187	11.32	6.76	0.73	0.29	1.97	1.24	0.76	0.48	4.28	38.4	0.77
0.790	52.622	53.957	11.52	6.78	0.70	0.32	1.98	1.28	0.80	0.48	3.96	36.7	0.73
0.801	53.056	53.976	11.73	6.79	0.70	0.32	1.98	1.28	0.80	0.48	4.01	36.9	0.73
0.813	53.408	53.804	11.93	6.81	0.67	0.34	1.99	1.31	0.83	0.48	3.81	35.7	0.70
0.824	53.788	53.843	12.14	6.82	0.68	0.34	1.99	1.31	0.83	0.49	3.87	36.1	0.70
0.835	54.167	53.689	12.35	6.84	0.66	0.36	2.00	1.34	0.85	0.49	3.71	35.1	0.67
0.846	54.546	53.747	12.55	6.86	0.67	0.35	2.00	1.34	0.85	0.49	3.79	35.6	0.68
0.858	54.953	53.632	12.76	6.87	0.65	0.37	2.01	1.36	0.87	0.50	3.68	35.0	0.66
0.869	55.305	53.709	12.96	6.89	0.66	0.36	2.02	1.35	0.86	0.50	3.78	35.6	0.66
0.880	55.630	53.804	13.17	6.90	0.67	0.34	2.02	1.35	0.85	0.50	3.90	36.3	0.67
0.892	55.901	53.670	13.38	6.92	0.66	0.36	2.02	1.37	0.87	0.50	3.76	35.4	0.65
0.903	56.199	53.785	13.58	6.94	0.67	0.35	2.03	1.36	0.85	0.50	3.90	36.3	0.67
0.914	56.470	53.670	13.79	6.95	0.66	0.36	2.03	1.38	0.87	0.51	3.78	35.5	0.65
0.925	56.768	53.766	13.99	6.97	0.67	0.35	2.03	1.37	0.86	0.51	3.90	36.3	0.66
0.937	57.012	53.651	14.20	6.99	0.65	0.37	2.04	1.38	0.88	0.51	3.77	35.5	0.64
0.948	57.337	53.747	14.40	7.00	0.67	0.35	2.04	1.37	0.86	0.51	3.89	36.3	0.65
0.959	57.608	53.651	14.61	7.02	0.65	0.37	2.04	1.39	0.88	0.51	3.79	35.6	0.64
0.971	57.879	53.747	14.82	7.04	0.67	0.35	2.05	1.38	0.87	0.51	3.91	36.4	0.65
0.982	58.096	53.651	15.02	7.06	0.65	0.37	2.05	1.40	0.88	0.51	3.81	35.7	0.63
0.993	58.367	53.728	15.23	7.07	0.66	0.36	2.05	1.39	0.87	0.52	3.90	36.3	0.64
1.004	58.665	53.823	15.43	7.09	0.68	0.34	2.06	1.38	0.86	0.52	4.03	37.0	0.65
1.016	58.909	53.689	15.64	7.11	0.66	0.36	2.06	1.40	0.88	0.52	3.88	36.1	0.63
1.025	59.153	53.804	15.81	7.12	0.67	0.34	2.06	1.39	0.87	0.52	4.02	37.0	0.65



SAMPLE INFORMATION

Boring: GEI-420
 Sample: U1
 Depth: 52.9 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION

Height: 5.64 inch
 Diameter: 2.86 inch
 Area: 6.44 in²

Water Content: 61.2 %
 Total Unit Weight: 100.0 pcf
 Dry Unit Weight: 62.0 pcf

TEST SUMMARY

Cell Pressure: 4.50 ksf
 Strain Rate: 1.00 %/min
 Shear Strength: 0.40 ksf
 Failure Strain: 15.1 %

Test Date: 10/11/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Membrane correction applied to test results.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October 2017	Fig.

PROJECT #:	1702805	DCDT No.	147
PROJECT:	General Dynamics	DCDT Cal. Factor	6.71E-05 in/count
	Electric Boat Assembly Facility	Load Cell No.	A8897
	Groton, Connecticut	Load Cell Cal. Factor	5.80E-02 lbf/count
TEST:	Q4	Pressure Transducer	25218
BORING:	GEI-420	Pres. Trans. Cal. Factor	2.36E-02 psi/count
SAMPLE:	U1		
DEPTH (ft) :	52.9		
OPER.:	E. Fazlic	Gravity of Solids	2.7 (assumed)
TEST DATE:	10/11/2017	Stage Strain rate	1.00 %/min

Undrained Shear Strength = 0.40 ksf	Failure Strain=	15.1 %

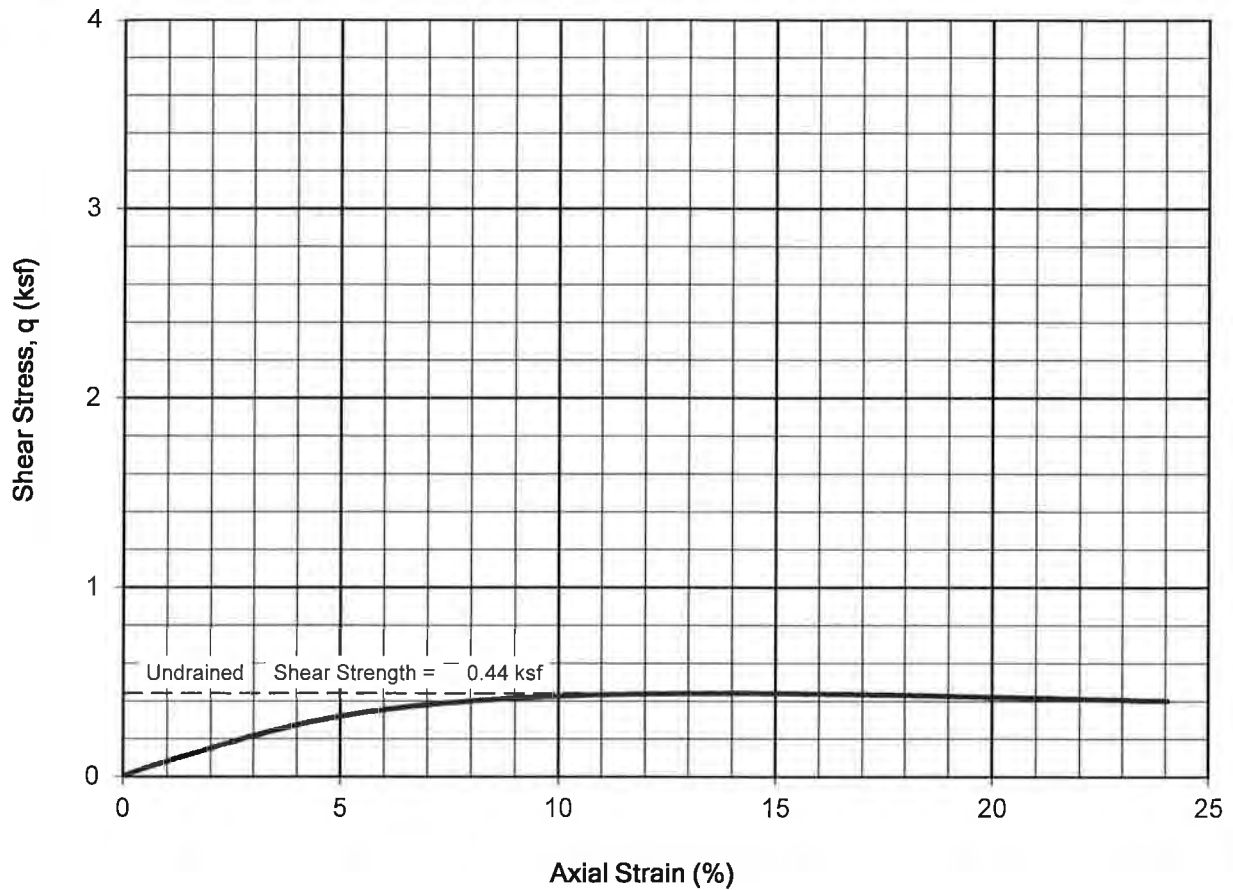
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.827	2.877	6.501	61.78	59.53	96.31	1.718
Trimming					62.98			
Under vac.	0.00	5.644	2.864	6.444				
Cell Pressure	4.50	5.644	2.864	6.444	61.21	62.02	99.98	1.718

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
4	0	0.00000	0.070195	7.3702	6.444	0.00	0.00	0.00
5	6365	0.10608	0.075832	8.5889	6.450	0.10	0.01	0.01
6	12464	0.20773	0.081335	9.5174	6.456	0.20	0.02	0.02
7	19094	0.31823	0.087106	10.33	6.463	0.30	0.03	0.03
8	25194	0.41990	0.092676	10.968	6.469	0.40	0.04	0.04
9	31559	0.52598	0.098313	11.549	6.476	0.50	0.05	0.05
10	37658	0.62763	0.10388	12.071	6.482	0.60	0.05	0.05
11	44023	0.73372	0.10972	12.535	6.489	0.70	0.06	0.06
12	49858	0.83097	0.11509	12.999	6.495	0.80	0.06	0.06
13	55692	0.92820	0.12066	13.406	6.502	0.89	0.07	0.07
14	62057	1.03428	0.1265	13.812	6.508	1.00	0.07	0.07
15	67891	1.13152	0.13207	14.218	6.515	1.10	0.08	0.07
16	73991	1.23318	0.13791	14.566	6.522	1.20	0.08	0.08
17	80091	1.33485	0.14334	14.973	6.528	1.30	0.08	0.08
18	85925	1.43208	0.14898	15.321	6.535	1.40	0.09	0.09
19	91760	1.52933	0.15455	15.669	6.541	1.49	0.09	0.09
20	97594	1.62657	0.16019	16.017	6.548	1.59	0.10	0.09
21	103959	1.73265	0.16596	16.365	6.555	1.70	0.10	0.10
22	109793	1.82988	0.17153	16.714	6.561	1.80	0.10	0.10
23	115628	1.92713	0.1771	17.062	6.568	1.89	0.11	0.10
24	127827	2.13045	0.18837	17.758	6.581	2.09	0.11	0.11
25	140026	2.33377	0.19965	18.454	6.595	2.29	0.12	0.12
26	152491	2.54152	0.21112	19.093	6.609	2.50	0.13	0.13
27	164955	2.74925	0.22246	19.847	6.622	2.70	0.14	0.13
28	176889	2.94815	0.2336	20.486	6.636	2.90	0.14	0.14
29	189089	3.15148	0.24474	21.182	6.649	3.09	0.15	0.15
30	201288	3.35480	0.25602	21.936	6.663	3.29	0.16	0.15
31	213222	3.55370	0.26743	22.633	6.677	3.49	0.16	0.16
32	225421	3.75702	0.27877	23.329	6.691	3.70	0.17	0.17
33	237621	3.96035	0.29011	24.026	6.705	3.90	0.18	0.17
34	249289	4.15482	0.30131	24.722	6.719	4.10	0.19	0.18
35	261223	4.35372	0.31252	25.418	6.733	4.29	0.19	0.19
36	273688	4.56147	0.3238	26.115	6.747	4.49	0.20	0.20
37	286152	4.76920	0.33514	26.869	6.761	4.69	0.21	0.20

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
38	298086	4.96810	0.34634	27.624	6.775	4.89	0.22	0.21
39	310286	5.17143	0.35762	28.378	6.789	5.09	0.22	0.22
40	321955	5.36592	0.36883	29.075	6.804	5.29	0.23	0.22
41	333889	5.56482	0.3801	29.829	6.818	5.49	0.24	0.23
42	346088	5.76813	0.39151	30.525	6.833	5.69	0.24	0.24
43	357757	5.96262	0.40272	31.222	6.847	5.89	0.25	0.24
44	369691	6.16152	0.41386	31.976	6.861	6.09	0.26	0.25
45	381625	6.36042	0.4252	32.673	6.876	6.29	0.26	0.26
46	393824	6.56373	0.4366	33.369	6.891	6.49	0.27	0.27
47	406024	6.76707	0.44781	34.065	6.906	6.69	0.28	0.27
48	417958	6.96597	0.45895	34.82	6.920	6.89	0.29	0.28
49	430422	7.17370	0.47043	35.458	6.935	7.09	0.29	0.28
50	442621	7.37702	0.48163	36.097	6.950	7.29	0.30	0.29
51	454821	7.58035	0.49291	36.793	6.965	7.49	0.30	0.30
52	466490	7.77483	0.50418	37.431	6.980	7.69	0.31	0.30
53	478689	7.97815	0.51552	38.07	6.996	7.89	0.32	0.31
54	490358	8.17263	0.52666	38.65	7.011	8.09	0.32	0.31
55	502292	8.37153	0.53787	39.288	7.026	8.29	0.33	0.32
56	514491	8.57485	0.54914	39.869	7.041	8.49	0.33	0.32
57	526425	8.77375	0.56049	40.449	7.057	8.69	0.34	0.33
58	538890	8.98150	0.57189	41.029	7.072	8.89	0.34	0.33
59	551089	9.18482	0.58297	41.552	7.088	9.09	0.35	0.34
60	563553	9.39255	0.59444	42.132	7.103	9.29	0.35	0.34
61	575753	9.59588	0.60565	42.654	7.119	9.49	0.36	0.35
62	587422	9.79037	0.61699	43.177	7.135	9.69	0.36	0.35
63	599356	9.98927	0.62813	43.641	7.150	9.89	0.37	0.36
64	611024	10.18373	0.63941	44.047	7.166	10.09	0.37	0.36
65	622693	10.37822	0.65061	44.511	7.182	10.28	0.37	0.36
66	634893	10.58155	0.66209	44.976	7.199	10.49	0.38	0.37
67	646827	10.78045	0.67316	45.382	7.214	10.68	0.38	0.37
68	658761	10.97935	0.68443	45.788	7.231	10.88	0.38	0.37
69	670960	11.18267	0.69571	46.194	7.247	11.08	0.39	0.37
70	683425	11.39042	0.70712	46.542	7.263	11.29	0.39	0.38
71	695624	11.59373	0.71832	46.891	7.280	11.48	0.39	0.38
72	707558	11.79263	0.72953	47.239	7.296	11.68	0.39	0.38
73	720022	12.00037	0.74114	47.587	7.313	11.89	0.40	0.38
74	731956	12.19927	0.75241	47.935	7.330	12.09	0.40	0.39
75	743625	12.39375	0.76349	48.225	7.346	12.28	0.40	0.39
76	755559	12.59265	0.77463	48.516	7.363	12.48	0.40	0.39
77	767493	12.79155	0.78604	48.748	7.380	12.68	0.40	0.39
78	779693	12.99488	0.79738	49.038	7.397	12.89	0.41	0.39
79	791627	13.19378	0.80845	49.27	7.413	13.08	0.41	0.39
80	803561	13.39268	0.81972	49.502	7.430	13.28	0.41	0.40
81	816025	13.60042	0.83107	49.734	7.448	13.48	0.41	0.40
82	828225	13.80375	0.84227	49.966	7.465	13.68	0.41	0.40
83	840424	14.00707	0.85361	50.199	7.482	13.88	0.41	0.40
84	852358	14.20597	0.86496	50.373	7.500	14.08	0.41	0.40
85	864292	14.40487	0.87623	50.547	7.517	14.28	0.41	0.40
86	875961	14.59935	0.8875	50.721	7.535	14.48	0.41	0.40
87	887895	14.79825	0.89871	50.895	7.552	14.68	0.41	0.40
88	899564	14.99273	0.90998	51.069	7.570	14.88	0.42	0.40
89	911763	15.19605	0.92139	51.243	7.588	15.08	0.42	0.40
90	923432	15.39053	0.93267	51.359	7.606	15.28	0.42	0.40
91	935631	15.59385	0.94394	51.533	7.624	15.48	0.42	0.40
92	947831	15.79718	0.95535	51.649	7.642	15.68	0.42	0.40
93	960030	16.00050	0.96649	51.765	7.660	15.88	0.42	0.40
94	971699	16.19498	0.97756	51.823	7.678	16.08	0.42	0.40
95	984163	16.40272	0.9891	51.94	7.697	16.28	0.42	0.40
96	995832	16.59720	1.0004	51.998	7.715	16.48	0.42	0.40

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
97	1007766	16.79610	1.0117	52.114	7.734	16.68	0.42	0.40
98	1019435	16.99058	1.0229	52.23	7.752	16.88	0.42	0.40
99	1031369	17.18948	1.0339	52.288	7.770	17.08	0.42	0.40
100	1043568	17.39280	1.0453	52.346	7.789	17.28	0.42	0.40
101	1055503	17.59172	1.0567	52.404	7.809	17.48	0.42	0.40
102	1067702	17.79503	1.068	52.462	7.828	17.68	0.41	0.40
103	1079371	17.98952	1.0791	52.52	7.846	17.88	0.41	0.40
104	1091570	18.19283	1.0904	52.636	7.865	18.08	0.41	0.40
105	1103769	18.39615	1.1017	52.694	7.885	18.28	0.41	0.40
106	1115438	18.59063	1.1129	52.81	7.904	18.48	0.41	0.40
107	1127372	18.78953	1.1241	52.81	7.923	18.67	0.41	0.40
108	1139041	18.98402	1.1355	52.81	7.943	18.88	0.41	0.39
109	1150975	19.18292	1.1468	52.81	7.963	19.08	0.41	0.39
110	1162644	19.37740	1.158	52.868	7.982	19.28	0.41	0.39
111	1174843	19.58072	1.1694	52.868	8.002	19.48	0.41	0.39
112	1187043	19.78405	1.1806	52.868	8.022	19.68	0.41	0.39
113	1198977	19.98295	1.192	52.926	8.042	19.88	0.41	0.39
114	1211176	20.18627	1.2032	52.984	8.062	20.08	0.41	0.39
115	1223375	20.38958	1.2144	52.984	8.082	20.27	0.41	0.39
116	1235309	20.58848	1.2257	53.042	8.103	20.47	0.41	0.39
117	1247243	20.78738	1.2369	53.042	8.123	20.67	0.40	0.39
118	1258912	20.98187	1.2481	53.042	8.143	20.87	0.40	0.38
119	1270846	21.18077	1.2594	53.1	8.164	21.07	0.40	0.38
120	1283046	21.38410	1.271	53.1	8.185	21.28	0.40	0.38
121	1294714	21.57857	1.2821	53.158	8.206	21.47	0.40	0.38
122	1306649	21.77748	1.2933	53.216	8.226	21.67	0.40	0.38
123	1318583	21.97638	1.3045	53.274	8.247	21.87	0.40	0.38
124	1330782	22.17970	1.3159	53.332	8.269	22.07	0.40	0.38
125	1342966	22.38277	1.3271	53.332	8.290	22.27	0.40	0.38
126	1344292	22.40487	1.3283	53.332	8.292	22.29	0.40	0.38



SAMPLE INFORMATION

Boring: GEI-420
 Sample: U2
 Depth: 62.8 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION

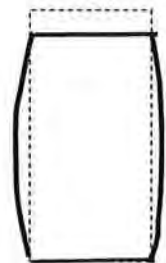
Height: 5.85 inch
 Diameter: 2.87 inch
 Area: 6.47 in²

Water Content: 52.8 %
 Total Unit Weight: 106.1 pcf
 Dry Unit Weight: 69.5 pcf

TEST SUMMARY

Cell Pressure: 1.79 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.44 ksf
 Failure Strain: 13.9 %

Test Date: 10/10/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Membrane correction applied to test results.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October 2017	Fig.

PROJECT #: 1702805
 PROJECT: General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut
 TEST: Q3
 BORING: GEI-420
 SAMPLE: U2
 DEPTH (ft) : 62.8
 OPER.: E. Fazlic
 TEST DATE: 10/10/2017

DCDT No. 147
 DCDT Cal. Factor 6.71E-05 in/count
 Load Cell No. A8897
 Load Cell Cal. Factor 5.80E-02 lbf/count
 Pressure Transducer 25218
 Pres. Trans. Cal. Factor 2.36E-02 psi/count
 Gravity of Solids 2.7 (assumed)
 Stage Strain rate 0.99 %/min

Undrained Shear Strength = 0.44 ksf	Failure Strain=	13.9 %

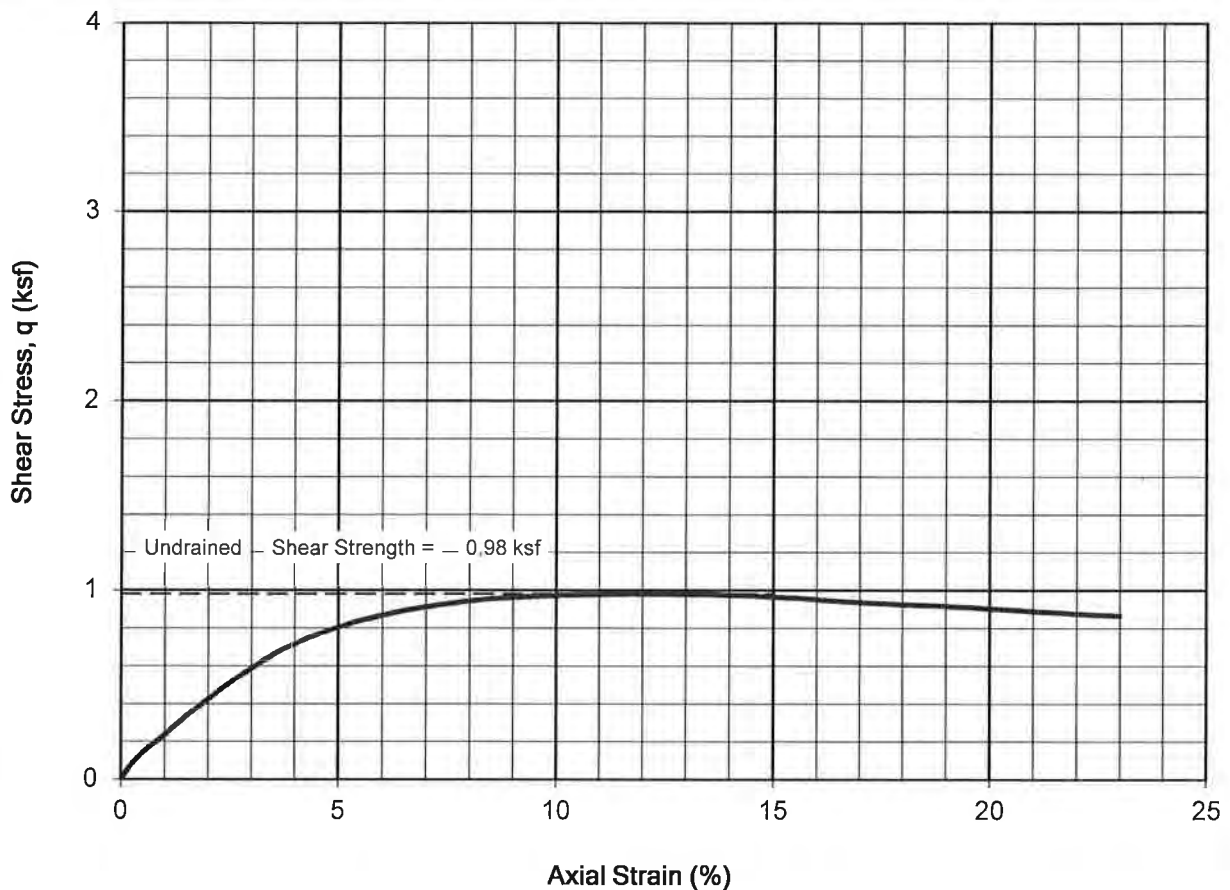
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in ²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.906	2.875	6.491	53.71	68.65	105.52	1.426
Trimings					50.20			
Under vac.	0.00	5.852	2.871	6.473				
Cell Pressure	1.79	5.852	2.871	6.473	52.75	69.47	106.12	1.426

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
4	0	0.00000	0.022951	5.9774	6.473	0.00	0.00	0.00
5	6365	0.10608	0.028924	7.022	6.480	0.10	0.01	0.01
6	12199	0.20332	0.034561	7.8345	6.486	0.20	0.02	0.02
7	18299	0.30498	0.0406	8.705	6.493	0.30	0.03	0.03
8	24664	0.41107	0.046506	9.4013	6.499	0.40	0.04	0.04
9	30498	0.50830	0.05221	10.098	6.506	0.50	0.05	0.05
10	36863	0.61438	0.058116	10.794	6.512	0.60	0.05	0.05
11	42697	0.71162	0.06382	11.433	6.519	0.70	0.06	0.06
12	48797	0.81328	0.069859	12.129	6.526	0.80	0.07	0.07
13	55162	0.91937	0.075832	12.767	6.532	0.90	0.07	0.07
14	60996	1.01660	0.081603	13.464	6.539	1.00	0.08	0.08
15	66831	1.11385	0.087308	14.102	6.545	1.10	0.09	0.09
16	72930	1.21550	0.093079	14.74	6.552	1.20	0.10	0.10
17	79030	1.31717	0.099119	15.379	6.559	1.30	0.10	0.10
18	85130	1.41883	0.10516	16.075	6.566	1.40	0.11	0.11
19	91229	1.52048	0.11086	16.714	6.572	1.50	0.12	0.12
20	97064	1.61773	0.1167	17.352	6.579	1.60	0.12	0.12
21	102898	1.71497	0.12247	17.99	6.585	1.70	0.13	0.13
22	108733	1.81222	0.12818	18.629	6.592	1.80	0.14	0.14
23	115098	1.91830	0.13408	19.267	6.599	1.90	0.15	0.14
24	127297	2.12162	0.14589	20.602	6.612	2.10	0.16	0.16
25	139231	2.32052	0.15757	21.936	6.626	2.30	0.17	0.17
26	151430	2.52383	0.16925	23.213	6.639	2.50	0.19	0.18
27	163629	2.72715	0.18092	24.432	6.653	2.70	0.20	0.20
28	175564	2.92607	0.19267	25.709	6.667	2.90	0.21	0.21
29	187763	3.12938	0.20441	26.927	6.680	3.10	0.23	0.22
30	199697	3.32828	0.21582	28.03	6.694	3.30	0.24	0.23
31	212161	3.53602	0.22783	29.249	6.708	3.50	0.25	0.25
32	224095	3.73492	0.23944	30.351	6.722	3.70	0.26	0.26
33	236295	3.93825	0.25105	31.396	6.736	3.90	0.27	0.27
34	248759	4.14598	0.26273	32.44	6.750	4.10	0.28	0.28
35	260958	4.34930	0.27434	33.485	6.764	4.30	0.29	0.29
36	272893	4.54822	0.28615	34.414	6.778	4.50	0.30	0.30
37	284827	4.74712	0.29776	35.342	6.792	4.70	0.31	0.31

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
38	296761	4.94602	0.30923	36.155	6.806	4.89	0.32	0.31
39	309225	5.15375	0.32125	37.025	6.821	5.10	0.33	0.32
40	321159	5.35265	0.33259	37.838	6.835	5.29	0.34	0.33
41	333359	5.55598	0.34447	38.592	6.850	5.49	0.34	0.34
42	345293	5.75488	0.35621	39.346	6.864	5.69	0.35	0.34
43	357492	5.95820	0.36795	40.043	6.879	5.90	0.36	0.35
44	369161	6.15268	0.37936	40.681	6.893	6.09	0.36	0.36
45	381360	6.35600	0.39104	41.378	6.908	6.29	0.37	0.36
46	393825	6.56375	0.40298	42.016	6.923	6.49	0.37	0.37
47	405759	6.76265	0.41453	42.596	6.937	6.69	0.38	0.37
48	417693	6.96155	0.4262	43.119	6.952	6.89	0.38	0.38
49	429627	7.16045	0.43768	43.641	6.967	7.09	0.39	0.38
50	441561	7.35935	0.44936	44.163	6.982	7.29	0.39	0.39
51	453760	7.56267	0.46117	44.685	6.997	7.49	0.40	0.39
52	465959	7.76598	0.47271	45.15	7.012	7.69	0.40	0.39
53	478159	7.96932	0.48439	45.614	7.027	7.89	0.41	0.40
54	490623	8.17705	0.4962	46.078	7.043	8.09	0.41	0.40
55	502822	8.38037	0.50787	46.484	7.058	8.29	0.41	0.41
56	515287	8.58812	0.51962	46.891	7.074	8.49	0.42	0.41
57	527221	8.78702	0.53136	47.297	7.089	8.69	0.42	0.41
58	538890	8.98150	0.54297	47.703	7.105	8.89	0.42	0.41
59	551089	9.18482	0.55458	47.993	7.120	9.08	0.42	0.42
60	563288	9.38813	0.56612	48.341	7.136	9.28	0.43	0.42
61	575223	9.58705	0.57793	48.69	7.151	9.48	0.43	0.42
62	587157	9.78595	0.58968	49.038	7.167	9.68	0.43	0.42
63	598825	9.98042	0.60135	49.328	7.183	9.88	0.43	0.43
64	611025	10.18375	0.61317	49.618	7.199	10.09	0.44	0.43
65	623224	10.38707	0.62471	49.908	7.215	10.28	0.44	0.43
66	634893	10.58155	0.63632	50.141	7.231	10.48	0.44	0.43
67	647092	10.78487	0.64799	50.373	7.247	10.68	0.44	0.43
68	659291	10.98818	0.6596	50.663	7.263	10.88	0.44	0.43
69	670960	11.18267	0.67121	50.895	7.280	11.08	0.44	0.43
70	683160	11.38600	0.68289	51.127	7.296	11.28	0.45	0.43
71	695359	11.58932	0.6947	51.243	7.313	11.48	0.45	0.43
72	707293	11.78822	0.70651	51.533	7.329	11.68	0.45	0.44
73	719227	11.98712	0.71792	51.707	7.346	11.88	0.45	0.44
74	731161	12.18602	0.72973	51.94	7.362	12.08	0.45	0.44
75	743360	12.38933	0.74134	52.114	7.379	12.28	0.45	0.44
76	755825	12.59708	0.75315	52.288	7.396	12.48	0.45	0.44
77	768289	12.80482	0.7649	52.462	7.413	12.68	0.45	0.44
78	780223	13.00372	0.77644	52.636	7.430	12.88	0.45	0.44
79	791892	13.19820	0.78798	52.81	7.447	13.07	0.45	0.44
80	804092	13.40153	0.79973	52.926	7.464	13.27	0.45	0.44
81	816026	13.60043	0.81134	53.1	7.481	13.47	0.45	0.44
82	828225	13.80375	0.82315	53.216	7.499	13.67	0.45	0.44
83	840159	14.00265	0.83476	53.39	7.516	13.87	0.45	0.44
84	851828	14.19713	0.84637	53.506	7.533	14.07	0.45	0.44
85	864027	14.40045	0.85818	53.622	7.551	14.27	0.45	0.44
86	875961	14.59935	0.86979	53.739	7.569	14.47	0.45	0.44
87	888161	14.80268	0.8816	53.855	7.586	14.67	0.45	0.44
88	900360	15.00600	0.89314	53.913	7.604	14.87	0.45	0.44
89	912559	15.20932	0.90475	54.029	7.622	15.07	0.45	0.44
90	924493	15.40822	0.91663	54.145	7.640	15.27	0.45	0.44
91	936427	15.60712	0.9281	54.261	7.658	15.47	0.45	0.44
92	948361	15.80602	0.93998	54.319	7.676	15.67	0.45	0.44
93	960295	16.00492	0.95146	54.377	7.694	15.87	0.45	0.44
94	972495	16.20825	0.96327	54.435	7.713	16.07	0.45	0.44
95	984164	16.40273	0.97481	54.493	7.731	16.27	0.45	0.44
96	996363	16.60605	0.98649	54.551	7.749	16.47	0.45	0.44

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL		STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb	in ²	%	ksf	ksf
97	1008827	16.81378	0.99823	54.667	7.768	16.67	0.45	0.44
98	1020761	17.01268	1.01	54.725	7.787	16.87	0.45	0.44
99	1032961	17.21602	1.0216	54.783	7.805	17.07	0.45	0.43
100	1044895	17.41492	1.0333	54.841	7.824	17.27	0.45	0.43
101	1056829	17.61382	1.0449	54.899	7.843	17.46	0.45	0.43
102	1069028	17.81713	1.0567	54.957	7.862	17.66	0.45	0.43
103	1080962	18.01603	1.0682	55.015	7.881	17.86	0.45	0.43
104	1092896	18.21493	1.0801	55.073	7.900	18.06	0.45	0.43
105	1104830	18.41383	1.0916	55.073	7.919	18.26	0.45	0.43
106	1116764	18.61273	1.1035	55.131	7.939	18.46	0.45	0.43
107	1128964	18.81607	1.1151	55.131	7.959	18.66	0.44	0.43
108	1141163	19.01938	1.1267	55.189	7.978	18.86	0.44	0.43
109	1153362	19.22270	1.1384	55.247	7.998	19.06	0.44	0.43
110	1165296	19.42160	1.1502	55.247	8.018	19.26	0.44	0.43
111	1177230	19.62050	1.1617	55.305	8.037	19.46	0.44	0.42
112	1189164	19.81940	1.1736	55.305	8.058	19.66	0.44	0.42
113	1201099	20.01832	1.1852	55.305	8.078	19.86	0.44	0.42
114	1212767	20.21278	1.1969	55.363	8.098	20.06	0.44	0.42
115	1224701	20.41168	1.2085	55.422	8.118	20.26	0.44	0.42
116	1236901	20.61502	1.2202	55.422	8.138	20.46	0.44	0.42
117	1248570	20.80950	1.2317	55.422	8.158	20.66	0.44	0.42
118	1261034	21.01723	1.2434	55.48	8.179	20.86	0.44	0.42
119	1273499	21.22498	1.2553	55.538	8.200	21.06	0.44	0.42
120	1285698	21.42830	1.2667	55.596	8.220	21.25	0.43	0.42
121	1297632	21.62720	1.2786	55.654	8.242	21.46	0.43	0.42
122	1309566	21.82610	1.2901	55.654	8.262	21.65	0.43	0.41
123	1321235	22.02058	1.3018	55.654	8.283	21.85	0.43	0.41
124	1333434	22.22390	1.3137	55.654	8.305	22.06	0.43	0.41
125	1344838	22.41397	1.3252	55.654	8.326	22.25	0.43	0.41
126	1356772	22.61287	1.3371	55.712	8.348	22.46	0.43	0.41
127	1368176	22.80293	1.3485	55.712	8.369	22.65	0.43	0.41
128	1380375	23.00625	1.3603	55.77	8.391	22.85	0.43	0.41
129	1392309	23.20515	1.372	55.77	8.413	23.05	0.43	0.41
130	1404508	23.40847	1.3837	55.77	8.435	23.25	0.43	0.40
131	1416707	23.61178	1.3953	55.77	8.456	23.45	0.42	0.40
132	1428642	23.81070	1.407	55.828	8.479	23.65	0.42	0.40
133	1440576	24.00960	1.4187	55.886	8.501	23.85	0.42	0.40
134	1452245	24.20408	1.4303	55.886	8.523	24.05	0.42	0.40



SAMPLE INFORMATION

Boring: GEI-420
 Sample: U5
 Depth: 93.5 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION

Height: 5.96 inch
 Diameter: 2.88 inch
 Area: 6.50 in²

Water Content: 60.5 %
 Total Unit Weight: 100.5 pcf
 Dry Unit Weight: 62.6 pcf

TEST SUMMARY

Cell Pressure: 7.38 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.98 ksf
 Failure Strain: 11.7 %

Test Date: 10/16/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Membrane correction applied to test results.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October 2017	Fig.

PROJECT #: 1702805
 PROJECT: General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut
 TEST: Q5
 BORING: GEI-420
 SAMPLE: U5
 DEPTH (ft) : 93.5
 OPER.: E. Fazlic
 TEST DATE: 10/16/2017

DCDT No. 147
 DCDT Cal. Factor 6.71E-05 in/count
 Load Cell No. A8897
 Load Cell Cal. Factor 5.80E-02 lbf/count
 Pressure Transducer 25218
 Pres. Trans. Cal. Factor 2.36E-02 psi/count
 Gravity of Solids 2.7 (assumed)
 Stage Strain rate 0.99 %/min

Undrained Shear Strength = 0.98 ksf	Failure Strain=	11.7 %

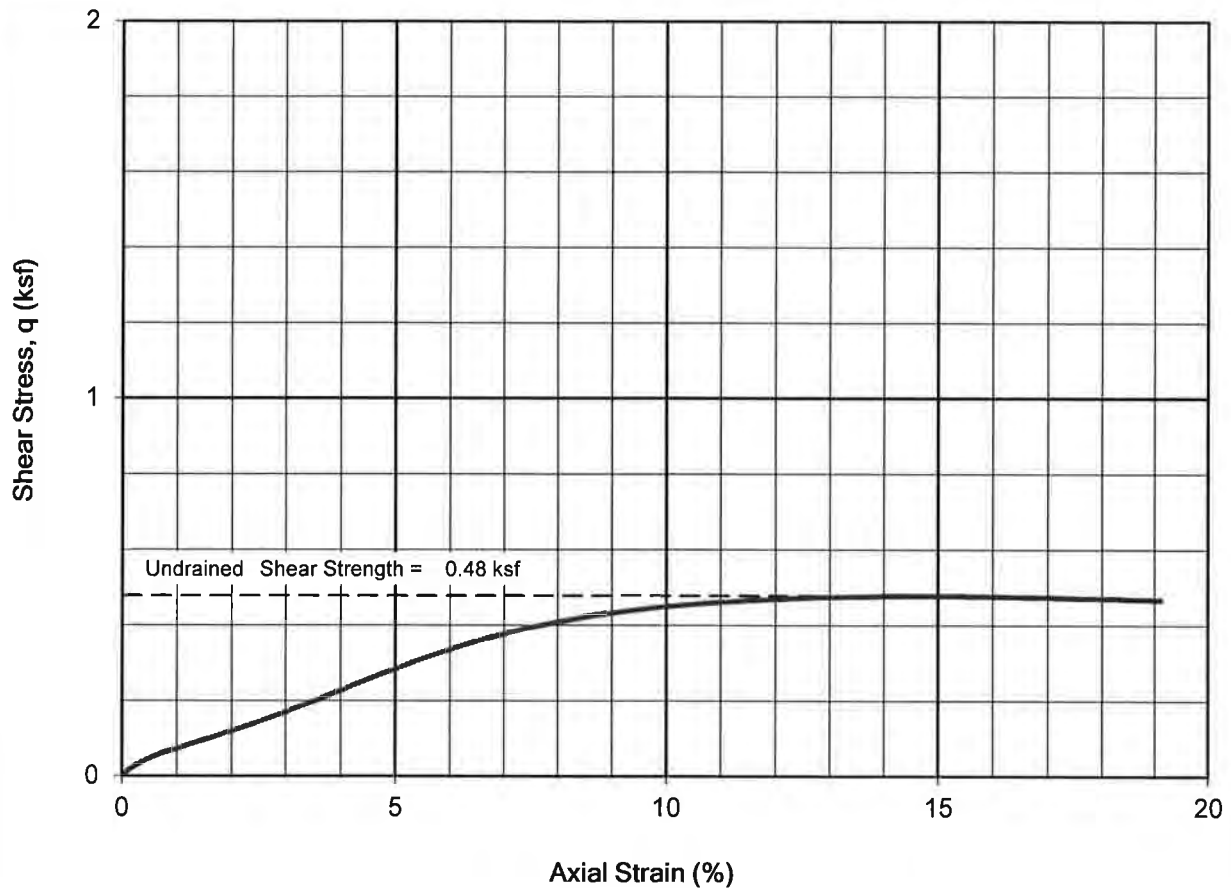
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.984	2.875	6.491	60.82	62.49	100.49	1.692
Trimming					60.13			
Under vac.	0.00	5.961	2.878	6.504				
Cell Pressure	7.38	5.961	2.878	6.504	60.46	62.61	100.47	1.692

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
4	0	0.00000	0.053619	14.566	6.504	0.00	0.00	0.00
5	6365	0.10608	0.059323	17.932	6.510	0.10	0.04	0.04
6	12995	0.21658	0.065497	20.718	6.517	0.20	0.07	0.07
7	19625	0.32708	0.071403	23.097	6.523	0.30	0.09	0.09
8	25990	0.43317	0.077241	25.128	6.530	0.40	0.12	0.12
9	32354	0.53923	0.083348	27.217	6.537	0.50	0.14	0.14
10	38719	0.64532	0.089321	29.133	6.543	0.60	0.16	0.16
11	44819	0.74698	0.095226	30.99	6.550	0.70	0.18	0.18
12	51184	0.85307	0.1012	32.731	6.556	0.80	0.20	0.20
13	57549	0.95915	0.10724	34.53	6.563	0.90	0.22	0.22
14	64179	1.06965	0.11335	36.329	6.570	1.00	0.24	0.24
15	70809	1.18015	0.11912	38.012	6.576	1.10	0.26	0.26
16	76908	1.28180	0.12496	39.811	6.583	1.20	0.28	0.27
17	83538	1.39230	0.13113	41.726	6.590	1.30	0.30	0.30
18	89373	1.48955	0.1369	43.409	6.596	1.40	0.31	0.31
19	95738	1.59563	0.14287	45.208	6.603	1.50	0.33	0.33
20	101837	1.69728	0.14898	46.949	6.610	1.60	0.35	0.35
21	107672	1.79453	0.15468	48.632	6.616	1.70	0.37	0.37
22	114036	1.90060	0.16079	50.431	6.623	1.80	0.39	0.39
23	119871	1.99785	0.16663	52.114	6.630	1.90	0.41	0.41
24	132070	2.20117	0.17871	55.48	6.643	2.10	0.44	0.44
25	143739	2.39565	0.19059	58.787	6.657	2.30	0.48	0.48
26	155938	2.59897	0.20273	62.095	6.671	2.50	0.51	0.51
27	167872	2.79787	0.21448	65.113	6.684	2.70	0.54	0.54
28	179807	2.99678	0.22656	68.131	6.698	2.90	0.58	0.57
29	192006	3.20010	0.23843	71.032	6.712	3.10	0.61	0.60
30	204470	3.40783	0.25051	73.876	6.726	3.30	0.63	0.63
31	216935	3.61558	0.26253	76.546	6.740	3.50	0.66	0.66
32	228869	3.81448	0.27427	78.925	6.754	3.70	0.69	0.68
33	241333	4.02222	0.28622	81.246	6.768	3.90	0.71	0.71
34	253798	4.22997	0.2983	83.451	6.782	4.11	0.73	0.73
35	265732	4.42887	0.31004	85.425	6.796	4.30	0.75	0.75
36	277931	4.63218	0.32219	87.34	6.811	4.51	0.77	0.76
37	289600	4.82667	0.33406	89.023	6.825	4.70	0.79	0.78

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
38	301269	5.02115	0.34587	90.706	6.839	4.90	0.80	0.80
39	313203	5.22005	0.35775	92.272	6.854	5.10	0.82	0.81
40	325667	5.42778	0.36983	93.781	6.868	5.31	0.83	0.83
41	337867	5.63112	0.38178	95.29	6.883	5.51	0.84	0.84
42	350331	5.83885	0.39372	96.625	6.897	5.71	0.86	0.85
43	362265	6.03775	0.4056	97.96	6.912	5.91	0.87	0.86
44	374730	6.24550	0.41761	99.178	6.927	6.11	0.88	0.87
45	386929	6.44882	0.42969	100.4	6.942	6.31	0.89	0.88
46	398598	6.64330	0.4415	101.44	6.957	6.51	0.90	0.89
47	410532	6.84220	0.45338	102.43	6.971	6.71	0.91	0.90
48	422731	7.04552	0.46553	103.41	6.987	6.91	0.92	0.91
49	434400	7.24000	0.47741	104.34	7.002	7.11	0.92	0.92
50	446334	7.43890	0.48928	105.27	7.017	7.31	0.93	0.92
51	458268	7.63780	0.50123	106.08	7.032	7.51	0.94	0.93
52	470468	7.84113	0.51317	106.9	7.047	7.71	0.94	0.94
53	482932	8.04887	0.52519	107.65	7.063	7.91	0.95	0.94
54	495131	8.25218	0.53707	108.41	7.078	8.11	0.95	0.95
55	507596	8.45993	0.54901	109.1	7.093	8.31	0.96	0.95
56	519530	8.65883	0.56102	109.74	7.109	8.51	0.96	0.96
57	531464	8.85773	0.57277	110.2	7.124	8.71	0.97	0.96
58	543398	9.05663	0.58498	110.73	7.140	8.91	0.97	0.96
59	555332	9.25553	0.59679	111.19	7.156	9.11	0.97	0.96
60	567001	9.45002	0.60867	111.71	7.172	9.31	0.98	0.97
61	579200	9.65333	0.62068	112.18	7.188	9.51	0.98	0.97
62	591400	9.85667	0.63256	112.58	7.204	9.71	0.98	0.97
63	603864	10.06440	0.64464	112.99	7.220	9.92	0.98	0.97
64	615798	10.26330	0.65652	113.45	7.236	10.11	0.98	0.97
65	627997	10.46662	0.6684	113.8	7.252	10.31	0.99	0.98
66	640197	10.66995	0.68034	114.09	7.268	10.51	0.99	0.98
67	651866	10.86443	0.69222	114.38	7.284	10.71	0.99	0.98
68	664065	11.06775	0.70437	114.73	7.301	10.92	0.99	0.98
69	675734	11.26223	0.71624	115.08	7.317	11.12	0.99	0.98
70	687668	11.46113	0.72812	115.49	7.334	11.32	0.99	0.98
71	699337	11.65562	0.74	115.78	7.350	11.52	0.99	0.98
72	711536	11.85893	0.75195	116.07	7.367	11.72	0.99	0.98
73	724000	12.06667	0.76402	116.3	7.384	11.92	0.99	0.98
74	736465	12.27442	0.77604	116.53	7.401	12.12	0.99	0.98
75	748664	12.47773	0.78792	116.82	7.418	12.32	0.99	0.98
76	760598	12.67663	0.79986	117.05	7.435	12.52	0.99	0.98
77	772798	12.87997	0.81181	117.23	7.452	12.72	0.99	0.98
78	784732	13.07887	0.82362	117.46	7.469	12.92	0.99	0.98
79	796666	13.27777	0.83583	117.63	7.486	13.12	0.99	0.98
80	808600	13.47667	0.84771	117.87	7.504	13.32	0.99	0.98
81	820269	13.67115	0.85952	118.04	7.521	13.52	0.99	0.98
82	832468	13.87447	0.87146	118.16	7.538	13.72	0.99	0.98
83	844932	14.08220	0.88361	118.33	7.556	13.92	0.99	0.98
84	857132	14.28553	0.89549	118.39	7.574	14.12	0.99	0.97
85	869066	14.48443	0.90737	118.56	7.591	14.32	0.99	0.97
86	881265	14.68775	0.91931	118.62	7.609	14.52	0.98	0.97
87	892934	14.88223	0.93119	118.62	7.627	14.72	0.98	0.97
88	904868	15.08113	0.94307	118.62	7.645	14.92	0.98	0.97
89	917067	15.28445	0.95522	118.62	7.663	15.13	0.98	0.96
90	928736	15.47893	0.96709	118.68	7.681	15.33	0.98	0.96
91	940670	15.67783	0.97904	118.68	7.699	15.53	0.97	0.96
92	952604	15.87673	0.99112	118.56	7.718	15.73	0.97	0.96
93	964804	16.08007	1.0029	118.5	7.736	15.93	0.97	0.95
94	977268	16.28780	1.015	118.33	7.755	16.13	0.96	0.95
95	989467	16.49112	1.0268	118.33	7.773	16.33	0.96	0.95
96	1001932	16.69887	1.0388	118.27	7.792	16.53	0.96	0.94

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
97	1013866	16.89777	1.0507	118.21	7.810	16.73	0.96	0.94
98	1025800	17.09667	1.0625	118.21	7.829	16.93	0.95	0.94
99	1037469	17.29115	1.0745	118.21	7.848	17.13	0.95	0.94
100	1049668	17.49447	1.0867	118.27	7.868	17.33	0.95	0.93
101	1061072	17.68453	1.0984	118.33	7.886	17.53	0.95	0.93
102	1073271	17.88785	1.1106	118.33	7.906	17.73	0.94	0.93
103	1085470	18.09117	1.1225	118.33	7.925	17.93	0.94	0.93
104	1097404	18.29007	1.1343	118.39	7.944	18.13	0.94	0.92
105	1109869	18.49782	1.1463	118.45	7.964	18.33	0.94	0.92
106	1122068	18.70113	1.1584	118.56	7.984	18.53	0.94	0.92
107	1134267	18.90445	1.1702	118.56	8.003	18.73	0.94	0.92
108	1145936	19.09893	1.182	118.62	8.023	18.93	0.93	0.92
109	1158136	19.30227	1.1942	118.62	8.043	19.14	0.93	0.91
110	1169804	19.49673	1.2063	118.68	8.063	19.34	0.93	0.91
111	1181473	19.69122	1.2179	118.68	8.083	19.53	0.93	0.91
112	1193142	19.88570	1.2299	118.68	8.103	19.73	0.93	0.91
113	1204811	20.08018	1.2418	118.62	8.123	19.93	0.92	0.90
114	1217010	20.28350	1.2538	118.56	8.144	20.14	0.92	0.90
115	1229210	20.48683	1.2657	118.56	8.164	20.34	0.92	0.90
116	1241674	20.69457	1.2778	118.56	8.185	20.54	0.91	0.90
117	1253873	20.89788	1.2897	118.45	8.206	20.74	0.91	0.89
118	1265807	21.09678	1.3015	118.39	8.226	20.94	0.91	0.89
119	1278007	21.30012	1.3137	118.39	8.247	21.14	0.91	0.89
120	1289676	21.49460	1.3256	118.33	8.268	21.34	0.90	0.88
121	1301345	21.68908	1.3373	118.39	8.289	21.54	0.90	0.88
122	1313013	21.88355	1.3492	118.39	8.310	21.74	0.90	0.88
123	1325213	22.08688	1.3614	118.33	8.332	21.94	0.90	0.88
124	1337412	22.29020	1.3732	118.33	8.353	22.14	0.89	0.87
125	1349346	22.48910	1.3851	118.33	8.375	22.34	0.89	0.87
126	1361810	22.69683	1.3971	118.39	8.396	22.54	0.89	0.87
127	1374010	22.90017	1.4091	118.5	8.418	22.74	0.89	0.87
128	1386209	23.10348	1.421	118.56	8.440	22.94	0.89	0.87
129	1388596	23.14327	1.4236	118.56	8.445	22.98	0.89	0.87



SAMPLE INFORMATION

Boring: GEI-421
 Sample: U1
 Depth: 68.3 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark-gray Organic SOIL (OH)

SPECIMEN INFORMATION

Height: 5.39 inch
 Diameter: 2.88 inch
 Area: 6.51 in²

Water Content: 50.8 %
 Total Unit Weight: 105.3 pcf
 Dry Unit Weight: 69.8 pcf

TEST SUMMARY

Cell Pressure: 5.85 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.48 ksf
 Failure Strain: 14.5 %

Test Date: 9/22/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Sample shorter by ~1 cm upon extrusion. Possibly void present in the tube prior to extrusion.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October 2017	Fig.

PROJECT #:	1702805	DCDT No.	147
PROJECT:	General Dynamics	DCDT Cal. Factor	6.71E-05 in/count
	Electric Boat Assembly Facility	Load Cell No.	A8897
	Groton, Connecticut	Load Cell Cal. Factor	5.80E-02 lbf/count
TEST:	Q1	Pressure Transducer	25218
BORING:	GEI-421	Pres. Trans. Cal. Factor	2.36E-02 psi/count
SAMPLE:	U1		
DEPTH (ft) :	68.3		
OPER.:	E. Fazlic	Gravity of Solids	2.7 (assumed)
TEST DATE:	9/22/2017	Stage Strain rate	0.99 %/min

Undrained Shear Strength = 0.48 ksf	Failure Strain=	14.5 %

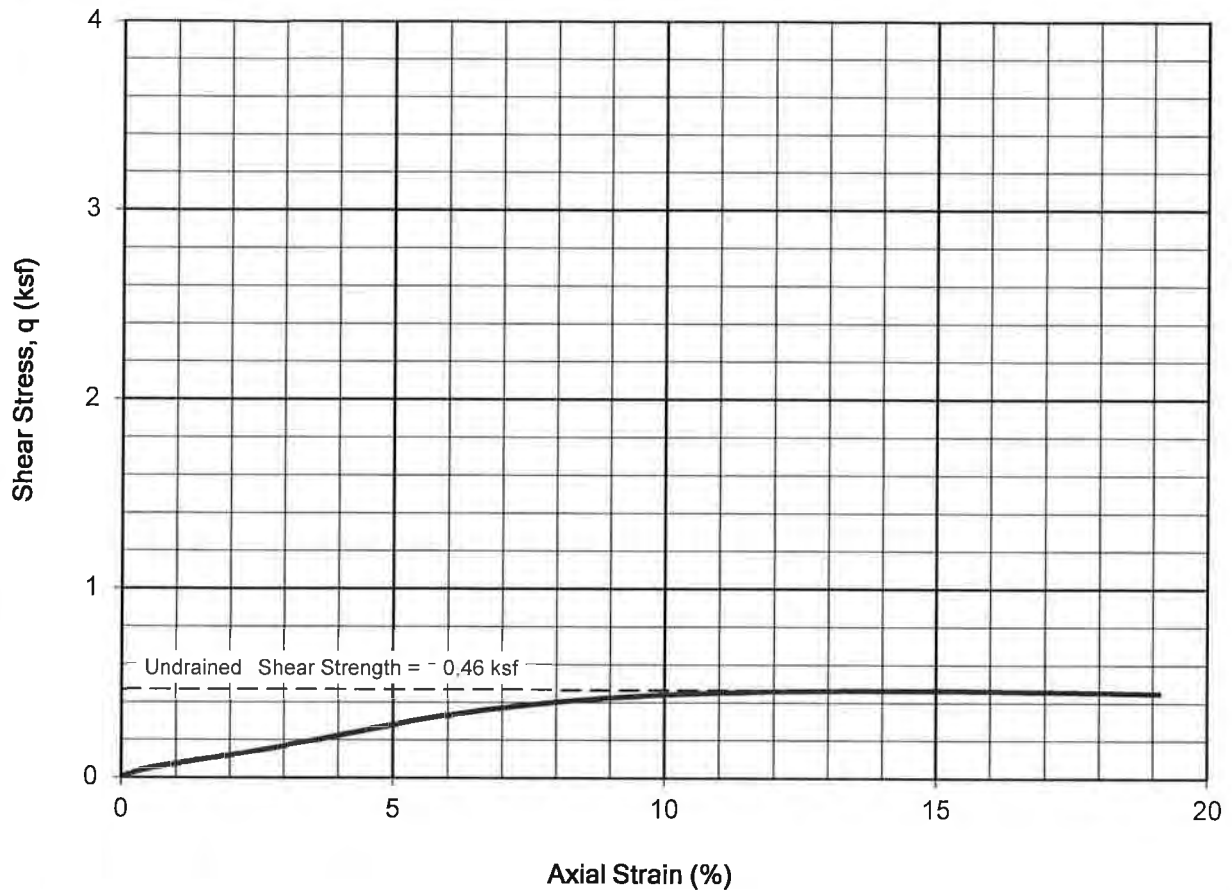
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in ²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.787	2.875	6.491	17.43	65.31	76.70	1.413
Trimming					49.81			
Under vac.	0.00	5.394	2.879	6.512				
Cell Pressure	5.85	5.394	2.879	6.512	50.79	69.85	105.33	1.413

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (not applied) ksf
4	0	0.00000	0.045231	8.5889	6.512	0.00	0.00	0.00
5	6100	0.10167	0.050465	9.8656	6.518	0.10	0.01	0.01
6	12730	0.21217	0.055901	10.852	6.525	0.20	0.02	0.02
7	18829	0.31382	0.061404	11.607	6.532	0.30	0.03	0.03
8	24664	0.41107	0.066571	12.245	6.538	0.40	0.04	0.04
9	31029	0.51715	0.072074	12.883	6.545	0.50	0.05	0.05
10	37128	0.61880	0.077376	13.406	6.551	0.60	0.05	0.05
11	43493	0.72488	0.083013	13.986	6.558	0.70	0.06	0.06
12	49327	0.82212	0.088381	14.392	6.564	0.80	0.06	0.06
13	55162	0.91937	0.093616	14.798	6.571	0.90	0.07	0.07
14	61262	1.02103	0.098984	15.205	6.577	1.00	0.07	0.07
15	67361	1.12268	0.10455	15.669	6.584	1.10	0.08	0.08
16	73196	1.21993	0.10979	16.075	6.591	1.20	0.08	0.08
17	79560	1.32600	0.11536	16.539	6.598	1.30	0.09	0.09
18	85395	1.42325	0.12066	16.946	6.604	1.40	0.09	0.09
19	91229	1.52048	0.12603	17.352	6.611	1.50	0.10	0.10
20	97064	1.61773	0.13133	17.758	6.618	1.60	0.10	0.10
21	103429	1.72382	0.13683	18.222	6.624	1.70	0.10	0.10
22	109528	1.82547	0.14234	18.687	6.631	1.80	0.11	0.11
23	115628	1.92713	0.1477	19.151	6.638	1.90	0.11	0.11
24	127562	2.12603	0.15837	20.079	6.651	2.10	0.12	0.12
25	139761	2.32935	0.16911	20.95	6.665	2.30	0.13	0.13
26	152226	2.53710	0.18012	21.936	6.679	2.50	0.14	0.14
27	164425	2.74042	0.19086	22.923	6.693	2.70	0.15	0.15
28	176889	2.94815	0.20173	23.968	6.707	2.90	0.17	0.17
29	188824	3.14707	0.21233	25.012	6.720	3.10	0.18	0.18
30	201023	3.35038	0.2232	26.057	6.734	3.30	0.19	0.19
31	213487	3.55812	0.23407	27.159	6.748	3.50	0.20	0.20
32	225687	3.76145	0.24481	28.32	6.762	3.70	0.21	0.21
33	238151	3.96918	0.25561	29.423	6.776	3.90	0.22	0.22
34	250085	4.16808	0.26642	30.583	6.790	4.10	0.23	0.23
35	262284	4.37140	0.27716	31.744	6.805	4.30	0.25	0.25
36	275014	4.58357	0.28809	32.847	6.819	4.50	0.26	0.26
37	287479	4.79132	0.29883	33.949	6.833	4.70	0.27	0.27

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(not applied)
			in	lb		%	ksf	ksf
38	300208	5.00347	0.3097	35.11	6.848	4.90	0.28	0.28
39	312673	5.21122	0.32057	36.213	6.862	5.10	0.29	0.29
40	324872	5.41453	0.33118	37.315	6.876	5.30	0.30	0.30
41	337071	5.61785	0.34205	38.36	6.891	5.50	0.31	0.31
42	349801	5.83002	0.35306	39.404	6.906	5.71	0.32	0.32
43	361470	6.02450	0.36366	40.391	6.920	5.90	0.33	0.33
44	373669	6.22782	0.3744	41.378	6.935	6.10	0.34	0.34
45	385868	6.43113	0.3852	42.306	6.950	6.30	0.35	0.35
46	397803	6.63005	0.396	43.235	6.965	6.50	0.36	0.36
47	410267	6.83778	0.40694	44.105	6.980	6.71	0.37	0.37
48	422466	7.04110	0.41761	44.86	6.995	6.90	0.37	0.37
49	434666	7.24443	0.42842	45.672	7.010	7.10	0.38	0.38
50	446865	7.44775	0.43922	46.484	7.025	7.30	0.39	0.39
51	459064	7.65107	0.45029	47.181	7.041	7.51	0.39	0.39
52	470998	7.84997	0.4609	47.877	7.056	7.71	0.40	0.40
53	483197	8.05328	0.47184	48.574	7.071	7.91	0.41	0.41
54	494866	8.24777	0.48244	49.154	7.086	8.11	0.41	0.41
55	507066	8.45110	0.49324	49.734	7.102	8.31	0.42	0.42
56	519265	8.65442	0.50412	50.315	7.117	8.51	0.42	0.42
57	531199	8.85332	0.51505	50.895	7.133	8.71	0.43	0.43
58	543398	9.05663	0.52586	51.417	7.149	8.91	0.43	0.43
59	555598	9.25997	0.53653	51.882	7.165	9.11	0.44	0.44
60	567532	9.45887	0.54727	52.346	7.180	9.31	0.44	0.44
61	579996	9.66660	0.55834	52.81	7.197	9.51	0.44	0.44
62	591930	9.86550	0.56894	53.274	7.212	9.71	0.45	0.45
63	603599	10.05998	0.57975	53.681	7.228	9.91	0.45	0.45
64	615533	10.25888	0.59048	54.087	7.244	10.11	0.45	0.45
65	627467	10.45778	0.60149	54.435	7.261	10.31	0.45	0.45
66	639401	10.65668	0.61223	54.783	7.277	10.51	0.46	0.46
67	651070	10.85117	0.62296	55.131	7.293	10.71	0.46	0.46
68	663269	11.05448	0.6339	55.422	7.310	10.91	0.46	0.46
69	675469	11.25782	0.64477	55.712	7.326	11.12	0.46	0.46
70	687403	11.45672	0.65551	56.002	7.343	11.31	0.46	0.46
71	699602	11.66003	0.66625	56.292	7.359	11.51	0.47	0.47
72	711536	11.85893	0.67692	56.524	7.376	11.71	0.47	0.47
73	723470	12.05783	0.68772	56.814	7.392	11.91	0.47	0.47
74	735669	12.26115	0.69873	57.046	7.410	12.12	0.47	0.47
75	747604	12.46007	0.70933	57.279	7.426	12.31	0.47	0.47
76	759522	12.65870	0.72027	57.511	7.443	12.51	0.47	0.47
77	771456	12.85760	0.73101	57.743	7.460	12.71	0.47	0.47
78	783390	13.05650	0.74188	57.917	7.478	12.92	0.47	0.47
79	795589	13.25982	0.75262	58.091	7.495	13.11	0.48	0.48
80	807789	13.46315	0.76355	58.265	7.512	13.32	0.48	0.48
81	819458	13.65763	0.77416	58.439	7.529	13.51	0.48	0.48
82	831922	13.86537	0.78496	58.613	7.547	13.71	0.48	0.48
83	844121	14.06868	0.79597	58.787	7.565	13.92	0.48	0.48
84	855790	14.26317	0.80664	58.903	7.582	14.12	0.48	0.48
85	867990	14.46650	0.81751	59.02	7.600	14.32	0.48	0.48
86	879924	14.66540	0.82818	59.194	7.618	14.52	0.48	0.48
87	891592	14.85987	0.83898	59.31	7.636	14.72	0.48	0.48
88	903792	15.06320	0.84999	59.426	7.654	14.92	0.48	0.48
89	915461	15.25768	0.86073	59.542	7.672	15.12	0.48	0.48
90	927395	15.45658	0.87146	59.658	7.690	15.32	0.48	0.48
91	939329	15.65548	0.88227	59.774	7.708	15.52	0.48	0.48
92	951528	15.85880	0.89314	59.832	7.727	15.72	0.48	0.48
93	963727	16.06212	0.90388	59.948	7.745	15.92	0.48	0.48
94	975927	16.26545	0.91482	60.006	7.764	16.12	0.48	0.48
95	987595	16.45992	0.92542	60.064	7.782	16.32	0.48	0.48
96	999795	16.66325	0.93636	60.122	7.801	16.52	0.48	0.48

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (not applied) ksf
97	1011729	16.86215	0.94736	60.18	7.820	16.72	0.48	0.48
98	1023663	17.06105	0.95797	60.296	7.838	16.92	0.47	0.47
99	1035332	17.25553	0.96864	60.354	7.857	17.12	0.47	0.47
100	1047531	17.45885	0.97944	60.412	7.876	17.32	0.47	0.47
101	1059730	17.66217	0.99025	60.47	7.895	17.52	0.47	0.47
102	1072195	17.86992	1.0013	60.528	7.915	17.73	0.47	0.47
103	1084129	18.06882	1.012	60.586	7.934	17.92	0.47	0.47
104	1096328	18.27213	1.0229	60.703	7.954	18.13	0.47	0.47
105	1108527	18.47545	1.0335	60.761	7.973	18.32	0.47	0.47
106	1120727	18.67878	1.0444	60.761	7.992	18.52	0.47	0.47
107	1132396	18.87327	1.0551	60.819	8.012	18.72	0.47	0.47
108	1144595	19.07658	1.066	60.877	8.032	18.92	0.47	0.47
109	1155468	19.25780	1.0759	60.935	8.050	19.11	0.47	0.47



SAMPLE INFORMATION

Boring: GEI-421
 Sample: U1
 Depth: 68.3 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION

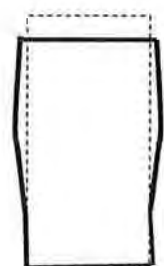
Height: 5.39 inch
 Diameter: 2.88 inch
 Area: 6.51 in²

Water Content: 50.8 %
 Total Unit Weight: 105.3 pcf
 Dry Unit Weight: 69.8 pcf

TEST SUMMARY

Cell Pressure: 5.85 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.46 ksf
 Failure Strain: 14.5 %

Test Date: 9/22/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Sample shorter by ~1 cm upon extrusion. Possibly void present in the tube prior to extrusion. Sample may be disturbed. Membrane correction applied to test results.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October 2017	Fig.

PROJECT #:	1702805	DCDT No.	147
PROJECT:	General Dynamics	DCDT Cal. Factor	6.71E-05 in/count
	Electric Boat Assembly Facility	Load Cell No.	A8897
	Groton, Connecticut	Load Cell Cal. Factor	5.80E-02 lbf/count
TEST:	Q1	Pressure Transducer	25218
BORING:	GEI-421	Pres. Trans. Cal. Factor	2.36E-02 psi/count
SAMPLE:	U1		
DEPTH (ft) :	68.3		
OPER.:	E. Fazlic	Gravity of Solids	2.7 (assumed)
TEST DATE:	9/22/2017	Stage Strain rate	0.99 %/min

Undrained Shear Strength = 0.46 ksf	Failure Strain=	14.5 %

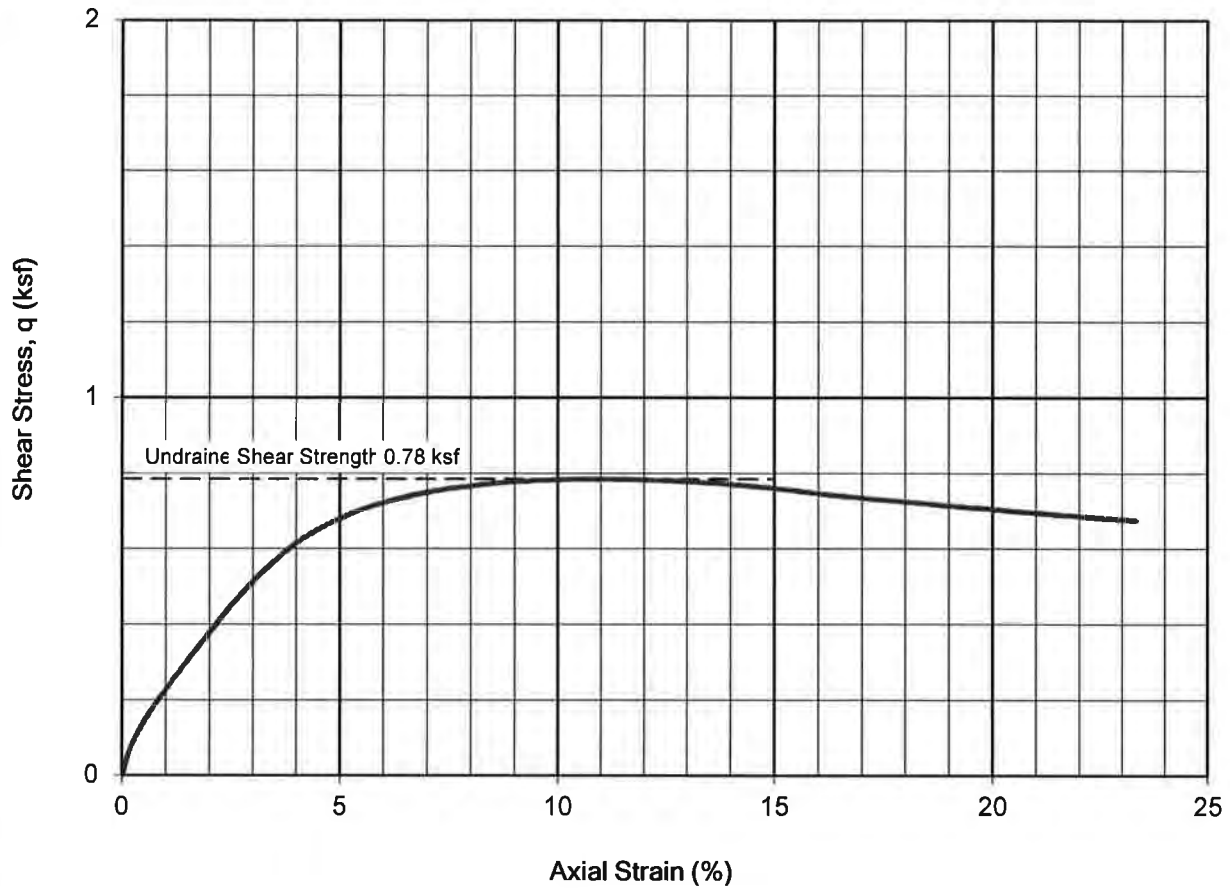
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.787	2.875	6.491	17.43	65.31	76.70	1.413
Trimings					49.81			
Under vac.	0.00	5.394	2.879	6.512				
Cell Pressure	5.85	5.394	2.879	6.512	50.79	69.85	105.33	1.413

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
4	0	0.00000	0.045231	8.5889	6.512	0.00	0.00	0.00
5	6100	0.10167	0.050465	9.8656	6.518	0.10	0.01	0.01
6	12730	0.21217	0.055901	10.852	6.525	0.20	0.02	0.02
7	18829	0.31382	0.061404	11.607	6.532	0.30	0.03	0.03
8	24664	0.41107	0.066571	12.245	6.538	0.40	0.04	0.04
9	31029	0.51715	0.072074	12.883	6.545	0.50	0.05	0.05
10	37128	0.61880	0.077376	13.406	6.551	0.60	0.05	0.05
11	43493	0.72488	0.083013	13.986	6.558	0.70	0.06	0.06
12	49327	0.82212	0.088381	14.392	6.564	0.80	0.06	0.06
13	55162	0.91937	0.093616	14.798	6.571	0.90	0.07	0.07
14	61262	1.02103	0.098984	15.205	6.577	1.00	0.07	0.07
15	67361	1.12268	0.10455	15.669	6.584	1.10	0.08	0.08
16	73196	1.21993	0.10979	16.075	6.591	1.20	0.08	0.08
17	79560	1.32600	0.11536	16.539	6.598	1.30	0.09	0.09
18	85395	1.42325	0.12066	16.946	6.604	1.40	0.09	0.09
19	91229	1.52048	0.12603	17.352	6.611	1.50	0.10	0.09
20	97064	1.61773	0.13133	17.758	6.618	1.60	0.10	0.10
21	103429	1.72382	0.13683	18.222	6.624	1.70	0.10	0.10
22	109528	1.82547	0.14234	18.687	6.631	1.80	0.11	0.11
23	115628	1.92713	0.1477	19.151	6.638	1.90	0.11	0.11
24	127562	2.12603	0.15837	20.079	6.651	2.10	0.12	0.12
25	139761	2.32935	0.16911	20.95	6.665	2.30	0.13	0.13
26	152226	2.53710	0.18012	21.936	6.679	2.50	0.14	0.14
27	164425	2.74042	0.19086	22.923	6.693	2.70	0.15	0.15
28	176889	2.94815	0.20173	23.968	6.707	2.90	0.17	0.16
29	188824	3.14707	0.21233	25.012	6.720	3.10	0.18	0.17
30	201023	3.35038	0.2232	26.057	6.734	3.30	0.19	0.18
31	213487	3.55812	0.23407	27.159	6.748	3.50	0.20	0.19
32	225687	3.76145	0.24481	28.32	6.762	3.70	0.21	0.21
33	238151	3.96918	0.25561	29.423	6.776	3.90	0.22	0.22
34	250085	4.16808	0.26642	30.583	6.790	4.10	0.23	0.23
35	262284	4.37140	0.27716	31.744	6.805	4.30	0.25	0.24
36	275014	4.58357	0.28809	32.847	6.819	4.50	0.26	0.25
37	287479	4.79132	0.29883	33.949	6.833	4.70	0.27	0.26

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
38	300208	5.00347	0.3097	35.11	6.848	4.90	0.28	0.27
39	312673	5.21122	0.32057	36.213	6.862	5.10	0.29	0.28
40	324872	5.41453	0.33118	37.315	6.876	5.30	0.30	0.30
41	337071	5.61785	0.34205	38.36	6.891	5.50	0.31	0.31
42	349801	5.83002	0.35306	39.404	6.906	5.71	0.32	0.32
43	361470	6.02450	0.36366	40.391	6.920	5.90	0.33	0.32
44	373669	6.22782	0.3744	41.378	6.935	6.10	0.34	0.33
45	385868	6.43113	0.3852	42.306	6.950	6.30	0.35	0.34
46	397803	6.63005	0.396	43.235	6.965	6.50	0.36	0.35
47	410267	6.83778	0.40694	44.105	6.980	6.71	0.37	0.36
48	422466	7.04110	0.41761	44.86	6.995	6.90	0.37	0.37
49	434666	7.24443	0.42842	45.672	7.010	7.10	0.38	0.37
50	446865	7.44775	0.43922	46.484	7.025	7.30	0.39	0.38
51	459064	7.65107	0.45029	47.181	7.041	7.51	0.39	0.39
52	470998	7.84997	0.4609	47.877	7.056	7.71	0.40	0.39
53	483197	8.05328	0.47184	48.574	7.071	7.91	0.41	0.40
54	494866	8.24777	0.48244	49.154	7.086	8.11	0.41	0.40
55	507066	8.45110	0.49324	49.734	7.102	8.31	0.42	0.41
56	519265	8.65442	0.50412	50.315	7.117	8.51	0.42	0.41
57	531199	8.85332	0.51505	50.895	7.133	8.71	0.43	0.42
58	543398	9.05663	0.52586	51.417	7.149	8.91	0.43	0.42
59	555598	9.25997	0.53653	51.882	7.165	9.11	0.44	0.43
60	567532	9.45887	0.54727	52.346	7.180	9.31	0.44	0.43
61	579996	9.66660	0.55834	52.81	7.197	9.51	0.44	0.43
62	591930	9.86550	0.56894	53.274	7.212	9.71	0.45	0.44
63	603599	10.05998	0.57975	53.681	7.228	9.91	0.45	0.44
64	615533	10.25888	0.59048	54.087	7.244	10.11	0.45	0.44
65	627467	10.45778	0.60149	54.435	7.261	10.31	0.45	0.44
66	639401	10.65668	0.61223	54.783	7.277	10.51	0.46	0.45
67	651070	10.85117	0.62296	55.131	7.293	10.71	0.46	0.45
68	663269	11.05448	0.6339	55.422	7.310	10.91	0.46	0.45
69	675469	11.25782	0.64477	55.712	7.326	11.12	0.46	0.45
70	687403	11.45672	0.65551	56.002	7.343	11.31	0.46	0.45
71	699602	11.66003	0.66625	56.292	7.359	11.51	0.47	0.46
72	711536	11.85893	0.67692	56.524	7.376	11.71	0.47	0.46
73	723470	12.05783	0.68772	56.814	7.392	11.91	0.47	0.46
74	735669	12.26115	0.69873	57.046	7.410	12.12	0.47	0.46
75	747604	12.46007	0.70933	57.279	7.426	12.31	0.47	0.46
76	759522	12.65870	0.72027	57.511	7.443	12.51	0.47	0.46
77	771456	12.85760	0.73101	57.743	7.460	12.71	0.47	0.46
78	783390	13.05650	0.74188	57.917	7.478	12.92	0.47	0.46
79	795589	13.25982	0.75262	58.091	7.495	13.11	0.48	0.46
80	807789	13.46315	0.76355	58.265	7.512	13.32	0.48	0.46
81	819458	13.65763	0.77416	58.439	7.529	13.51	0.48	0.46
82	831922	13.86537	0.78496	58.613	7.547	13.71	0.48	0.46
83	844121	14.06868	0.79597	58.787	7.565	13.92	0.48	0.46
84	855790	14.26317	0.80664	58.903	7.582	14.12	0.48	0.46
85	867990	14.46650	0.81751	59.02	7.600	14.32	0.48	0.46
86	879924	14.66540	0.82818	59.194	7.618	14.52	0.48	0.46
87	891592	14.85987	0.83898	59.31	7.636	14.72	0.48	0.46
88	903792	15.06320	0.84999	59.426	7.654	14.92	0.48	0.46
89	915461	15.25768	0.86073	59.542	7.672	15.12	0.48	0.46
90	927395	15.45658	0.87146	59.658	7.690	15.32	0.48	0.46
91	939329	15.65548	0.88227	59.774	7.708	15.52	0.48	0.46
92	951528	15.85880	0.89314	59.832	7.727	15.72	0.48	0.46
93	963727	16.06212	0.90388	59.948	7.745	15.92	0.48	0.46
94	975927	16.26545	0.91482	60.006	7.764	16.12	0.48	0.46
95	987595	16.45992	0.92542	60.064	7.782	16.32	0.48	0.46
96	999795	16.66325	0.93636	60.122	7.801	16.52	0.48	0.46

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
97	1011729	16.86215	0.94736	60.18	7.820	16.72	0.48	0.46
98	1023663	17.06105	0.95797	60.296	7.838	16.92	0.47	0.46
99	1035332	17.25553	0.96864	60.354	7.857	17.12	0.47	0.46
100	1047531	17.45885	0.97944	60.412	7.876	17.32	0.47	0.46
101	1059730	17.66217	0.99025	60.47	7.895	17.52	0.47	0.46
102	1072195	17.86992	1.0013	60.528	7.915	17.73	0.47	0.46
103	1084129	18.06882	1.012	60.586	7.934	17.92	0.47	0.46
104	1096328	18.27213	1.0229	60.703	7.954	18.13	0.47	0.45
105	1108527	18.47545	1.0335	60.761	7.973	18.32	0.47	0.45
106	1120727	18.67878	1.0444	60.761	7.992	18.52	0.47	0.45
107	1132396	18.87327	1.0551	60.819	8.012	18.72	0.47	0.45
108	1144595	19.07658	1.066	60.877	8.032	18.92	0.47	0.45
109	1155468	19.25780	1.0759	60.935	8.050	19.11	0.47	0.45



SAMPLE INFORMATION

Boring: GEI-421
 Sample: U2
 Depth: 85.1 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark-gray Organic SOIL (OH)

SPECIMEN INFORMATION

Height: 5.62 inch
 Diameter: 2.85 inch
 Area: 6.39 in²

Water Content: 60.0 %
 Total Unit Weight: 100.8 pcf
 Dry Unit Weight: 63.0 pcf

TEST SUMMARY

Cell Pressure: 7.10 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.78 ksf
 Failure Strain: 11.1 %

Test Date: 9/27/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: #

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October, 2017	Fig.

PROJECT #:	1702805	DCDT No.	147
PROJECT:	General Dynamics	DCDT Cal. Factor	6.71E-05 in/count
	Electric Boat Assembly Facility	Load Cell No.	A8897
	Groton, Connecticut	Load Cell Cal. Factor	5.80E-02 lbf/count
TEST:	Q2	Pressure Transducer	25218
BORING:	GEI-421	Pres. Trans. Cal. Factor	2.36E-02 psi/count
SAMPLE:	U2		
DEPTH (ft) :	85.1		
OPER.:	E. Fazlic	Gravity of Solids	2.7 (assumed)
TEST DATE:	9/27/2017	Stage Strain rate	0.99 %/min

Undrained Shear Strength = 0.78 ksf	Failure Strain=	11.1 %

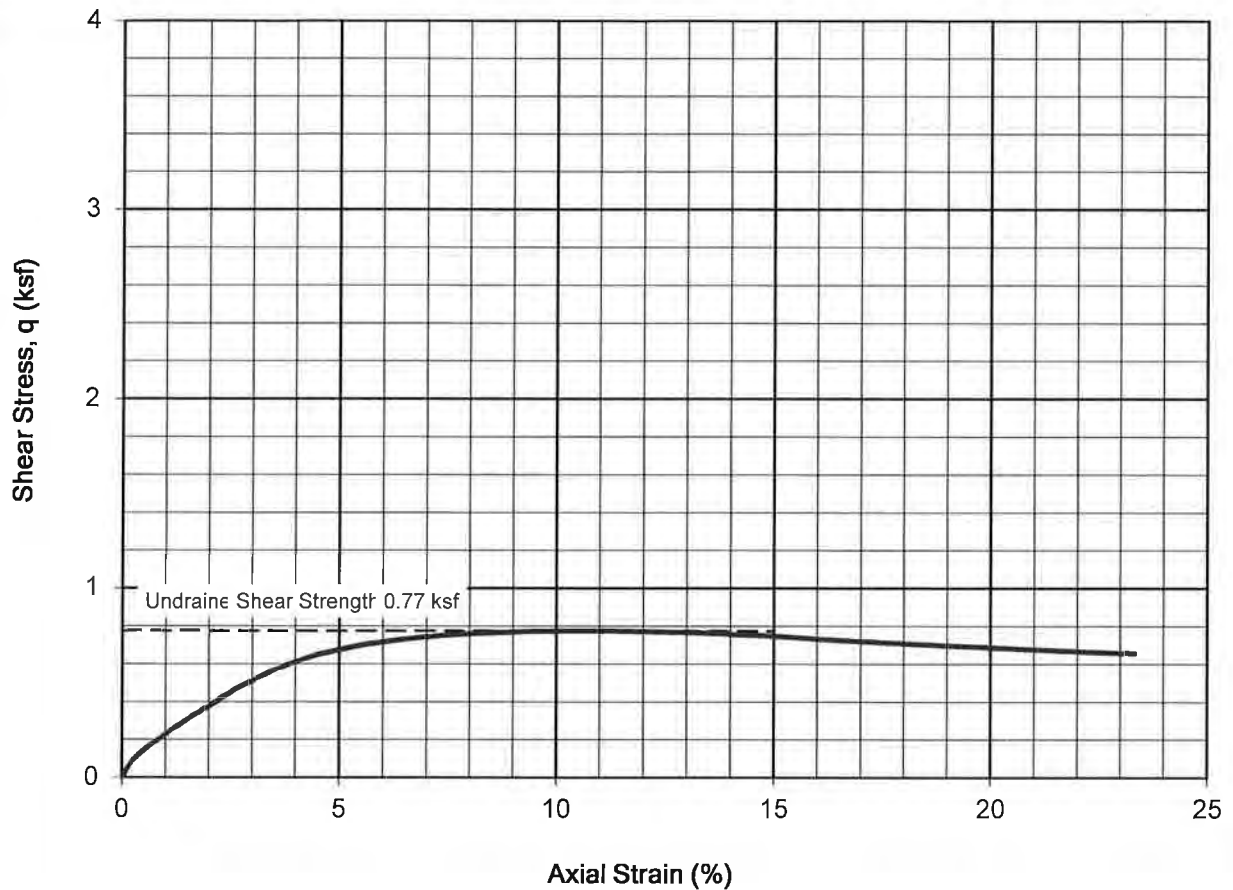
Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in ²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.551	2.873	6.482	60.29	62.77	100.62	1.676
Trimings					59.75			
Under vac.	0.00	5.615	2.852	6.387				
Cell Pressure	7.10	5.615	2.852	6.387	60.00	62.99	100.78	1.676

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (not applied) ksf
4	0	0.00000	0.029125	14.508	6.387	0.00	0.00	0.00
5	6895	0.11492	0.034695	18.338	6.393	0.10	0.04	0.04
6	14055	0.23425	0.040533	21.298	6.400	0.20	0.08	0.08
7	20685	0.34475	0.046036	23.445	6.406	0.30	0.10	0.10
8	27316	0.45527	0.051472	25.36	6.412	0.40	0.12	0.12
9	34211	0.57018	0.05731	27.217	6.419	0.50	0.14	0.14
10	40310	0.67183	0.062679	28.842	6.425	0.60	0.16	0.16
11	46940	0.78233	0.068316	30.467	6.431	0.70	0.18	0.18
12	53040	0.88400	0.073953	31.976	6.438	0.80	0.20	0.20
13	59670	0.99450	0.079724	33.543	6.445	0.90	0.21	0.21
14	65770	1.09617	0.085361	34.994	6.451	1.00	0.23	0.23
15	71869	1.19782	0.090797	36.387	6.457	1.10	0.24	0.24
16	78234	1.30390	0.096568	37.838	6.464	1.20	0.26	0.26
17	84334	1.40557	0.102	39.114	6.471	1.30	0.27	0.27
18	90699	1.51165	0.10784	40.565	6.477	1.40	0.29	0.29
19	96798	1.61330	0.11321	41.9	6.484	1.50	0.30	0.30
20	103163	1.71938	0.11905	43.293	6.491	1.60	0.32	0.32
21	109528	1.82547	0.12469	44.685	6.497	1.70	0.33	0.33
22	115628	1.92713	0.13026	46.02	6.504	1.80	0.35	0.35
23	121993	2.03322	0.13576	47.355	6.510	1.90	0.36	0.36
24	134457	2.24095	0.14717	50.141	6.524	2.10	0.39	0.39
25	146391	2.43985	0.15811	52.868	6.537	2.30	0.42	0.42
26	158590	2.64317	0.16945	55.422	6.550	2.50	0.45	0.45
27	170790	2.84650	0.18065	57.975	6.564	2.70	0.48	0.48
28	182724	3.04540	0.19186	60.354	6.577	2.90	0.50	0.50
29	194923	3.24872	0.20327	62.676	6.591	3.10	0.53	0.53
30	206857	3.44762	0.21421	64.765	6.604	3.30	0.55	0.55
31	218791	3.64652	0.22535	66.796	6.618	3.49	0.57	0.57
32	230990	3.84983	0.23662	68.711	6.632	3.70	0.59	0.59
33	243190	4.05317	0.24803	70.568	6.646	3.90	0.61	0.61
34	254859	4.24765	0.25897	72.135	6.659	4.09	0.62	0.62
35	267058	4.45097	0.27018	73.644	6.673	4.29	0.64	0.64
36	279522	4.65870	0.28152	75.037	6.687	4.49	0.65	0.65
37	291722	4.86203	0.29279	76.313	6.701	4.70	0.66	0.66

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(not applied)
			in	lb		%	ksf	ksf
38	303390	5.05650	0.3038	77.474	6.715	4.89	0.68	0.68
39	315590	5.25983	0.31514	78.577	6.729	5.09	0.69	0.69
40	327259	5.45432	0.32628	79.621	6.743	5.29	0.70	0.70
41	339193	5.65322	0.33749	80.55	6.758	5.49	0.70	0.70
42	351127	5.85212	0.34889	81.478	6.772	5.69	0.71	0.71
43	363061	6.05102	0.35997	82.233	6.786	5.89	0.72	0.72
44	375260	6.25433	0.37111	82.987	6.801	6.09	0.72	0.72
45	387194	6.45323	0.38225	83.742	6.815	6.29	0.73	0.73
46	399394	6.65657	0.39352	84.438	6.830	6.49	0.74	0.74
47	411858	6.86430	0.40486	85.134	6.845	6.69	0.74	0.74
48	423527	7.05878	0.41587	85.715	6.859	6.89	0.75	0.75
49	435726	7.26210	0.42721	86.295	6.874	7.09	0.75	0.75
50	447925	7.46542	0.43842	86.817	6.889	7.29	0.76	0.76
51	459594	7.65990	0.44949	87.34	6.903	7.49	0.76	0.76
52	471794	7.86323	0.46076	87.804	6.918	7.69	0.76	0.76
53	483993	8.06655	0.47224	88.21	6.934	7.89	0.77	0.77
54	495662	8.26103	0.48324	88.674	6.949	8.09	0.77	0.77
55	507861	8.46435	0.49452	89.081	6.964	8.29	0.77	0.77
56	519530	8.65883	0.50559	89.487	6.979	8.49	0.77	0.77
57	531729	8.86215	0.51673	89.835	6.994	8.68	0.78	0.78
58	543928	9.06547	0.52794	90.125	7.009	8.88	0.78	0.78
59	556393	9.27322	0.53928	90.473	7.025	9.09	0.78	0.78
60	568062	9.46770	0.55042	90.764	7.040	9.28	0.78	0.78
61	579996	9.66660	0.56156	91.112	7.056	9.48	0.78	0.78
62	591665	9.86108	0.57277	91.344	7.071	9.68	0.78	0.78
63	603599	10.05998	0.58397	91.576	7.087	9.88	0.78	0.78
64	615533	10.25888	0.59538	91.866	7.103	10.08	0.78	0.78
65	627467	10.45778	0.60652	92.098	7.119	10.28	0.78	0.78
66	639401	10.65668	0.61773	92.272	7.134	10.48	0.78	0.78
67	651600	10.86000	0.629	92.447	7.150	10.68	0.78	0.78
68	663800	11.06333	0.64021	92.621	7.166	10.88	0.78	0.78
69	675999	11.26665	0.65128	92.795	7.182	11.08	0.78	0.78
70	687933	11.46555	0.66242	92.969	7.198	11.28	0.78	0.78
71	700132	11.66887	0.67376	93.085	7.215	11.48	0.78	0.78
72	712332	11.87220	0.68504	93.259	7.231	11.68	0.78	0.78
73	724000	12.06667	0.69611	93.375	7.247	11.88	0.78	0.78
74	736200	12.27000	0.70759	93.491	7.264	12.08	0.78	0.78
75	747869	12.46448	0.71866	93.607	7.281	12.28	0.78	0.78
76	759803	12.66338	0.72973	93.665	7.297	12.48	0.78	0.78
77	771737	12.86228	0.74094	93.781	7.314	12.68	0.78	0.78
78	783936	13.06560	0.75228	93.897	7.331	12.88	0.78	0.78
79	796135	13.26892	0.76349	93.897	7.348	13.08	0.78	0.78
80	808335	13.47225	0.77476	94.013	7.365	13.28	0.78	0.78
81	820269	13.67115	0.78577	94.013	7.381	13.48	0.78	0.78
82	832203	13.87005	0.79691	94.071	7.398	13.67	0.77	0.77
83	844137	14.06895	0.80838	94.071	7.416	13.88	0.77	0.77
84	856071	14.26785	0.81952	94.013	7.433	14.08	0.77	0.77
85	867740	14.46233	0.83066	94.013	7.450	14.27	0.77	0.77
86	879674	14.66123	0.84187	94.013	7.467	14.47	0.77	0.77
87	891873	14.86455	0.85321	93.955	7.485	14.68	0.76	0.76
88	903542	15.05903	0.86422	93.955	7.502	14.87	0.76	0.76
89	915741	15.26235	0.87549	93.897	7.520	15.07	0.76	0.76
90	927675	15.46125	0.8867	93.839	7.538	15.27	0.76	0.76
91	939875	15.66458	0.89777	93.723	7.555	15.47	0.75	0.75
92	952074	15.86790	0.90918	93.549	7.574	15.67	0.75	0.75
93	963743	16.06238	0.92025	93.433	7.591	15.87	0.75	0.75
94	975942	16.26570	0.93153	93.375	7.609	16.07	0.75	0.75
95	988141	16.46902	0.9428	93.259	7.628	16.27	0.74	0.74
96	999810	16.66350	0.95387	93.201	7.646	16.47	0.74	0.74

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (not applied) ksf
97	1012009	16.86682	0.96528	93.143	7.664	16.67	0.74	0.74
98	1023678	17.06130	0.97629	93.143	7.682	16.87	0.74	0.74
99	1035878	17.26463	0.98756	93.085	7.701	17.07	0.73	0.73
100	1048077	17.46795	0.99877	93.027	7.720	17.27	0.73	0.73
101	1060276	17.67127	1.01	93.027	7.738	17.47	0.73	0.73
102	1072210	17.87017	1.021	92.969	7.757	17.66	0.73	0.73
103	1084410	18.07350	1.0324	92.969	7.776	17.87	0.73	0.73
104	1096609	18.27682	1.0438	92.911	7.795	18.07	0.72	0.72
105	1108278	18.47130	1.0549	92.911	7.814	18.27	0.72	0.72
106	1120212	18.67020	1.0662	92.911	7.833	18.47	0.72	0.72
107	1131615	18.86025	1.0771	92.853	7.852	18.66	0.72	0.72
108	1143284	19.05473	1.0884	92.795	7.872	18.86	0.72	0.72
109	1155484	19.25807	1.0998	92.795	7.891	19.07	0.71	0.71
110	1167152	19.45253	1.1108	92.795	7.910	19.26	0.71	0.71
111	1179352	19.65587	1.1219	92.737	7.930	19.46	0.71	0.71
112	1191816	19.86360	1.1334	92.795	7.950	19.67	0.71	0.71
113	1204015	20.06692	1.1445	92.795	7.970	19.86	0.71	0.71
114	1216215	20.27025	1.1557	92.737	7.990	20.06	0.70	0.70
115	1227884	20.46473	1.1667	92.679	8.009	20.26	0.70	0.70
116	1240083	20.66805	1.1781	92.679	8.030	20.46	0.70	0.70
117	1251752	20.86253	1.1893	92.679	8.050	20.66	0.70	0.70
118	1263686	21.06143	1.2004	92.621	8.070	20.86	0.70	0.70
119	1275355	21.25592	1.2116	92.621	8.090	21.06	0.70	0.70
120	1287554	21.45923	1.2229	92.621	8.111	21.26	0.69	0.69
121	1299753	21.66255	1.2343	92.621	8.132	21.46	0.69	0.69
122	1311687	21.86145	1.2455	92.621	8.153	21.66	0.69	0.69
123	1323621	22.06035	1.2564	92.679	8.173	21.86	0.69	0.69
124	1336086	22.26810	1.2679	92.621	8.194	22.06	0.69	0.69
125	1348020	22.46700	1.279	92.621	8.215	22.26	0.68	0.68
126	1359954	22.66590	1.2901	92.621	8.236	22.46	0.68	0.68
127	1371623	22.86038	1.3012	92.621	8.257	22.65	0.68	0.68
128	1383557	23.05928	1.3124	92.621	8.279	22.85	0.68	0.68
129	1395226	23.25377	1.3238	92.679	8.300	23.06	0.68	0.68
130	1407160	23.45267	1.335	92.679	8.322	23.26	0.68	0.68
131	1410608	23.51013	1.3385	92.679	8.329	23.32	0.68	0.68



SAMPLE INFORMATION

Boring: GEI-421
 Sample: U2
 Depth: 85.1 feet
 Type: 2.8-inch-dia. tube sample

Description: Dark gray ORGANIC SOIL (OH)

SPECIMEN INFORMATION

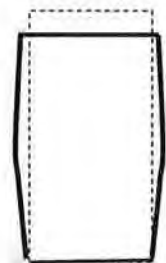
Height: 5.62 inch
 Diameter: 2.85 inch
 Area: 6.39 in²

Water Content: 60.0 %
 Total Unit Weight: 100.8 pcf
 Dry Unit Weight: 63.0 pcf

TEST SUMMARY

Cell Pressure: 7.10 ksf
 Strain Rate: 0.99 %/min
 Shear Strength: 0.77 ksf
 Failure Strain: 10.3 %

Test Date: 9/27/2017
 Tested By: E. Fazlic
 Checked By: D. Aghjayan



Failure Sketch

REMARKS: Membrane correction applied to test results.

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION	
Stantec Consulting Services, Inc.		October, 2017	Fig.

PROJECT #:	1702805	DCDT No.	147
PROJECT:	General Dynamics	DCDT Cal. Factor	6.71E-05 in/count
	Electric Boat Assembly Facility	Load Cell No.	A8897
	Groton, Connecticut	Load Cell Cal. Factor	5.80E-02 lbf/count
TEST:	Q2	Pressure Transducer	25218
BORING:	GEI-421	Pres. Trans. Cal. Factor	2.36E-02 psi/count
SAMPLE:	U2		
DEPTH (ft) :	85.1		
OPER.:	E. Fazlic	Gravity of Solids	2.7 (assumed)
TEST DATE:	9/27/2017	Stage Strain rate	0.99 %/min

Undrained Shear Strength = 0.77 ksf	Failure Strain=	10.3 %

Stage	Cell Pressure ksf	Height inch	Diameter inch	Area in ²	Water Content (%)	Dry Density pcf	Total Density pcf	Void Ratio
In situ								
After Sampling								
In tube	0.00	5.551	2.873	6.482	60.29	62.77	100.62	1.676
Trimmings					59.75			
Under vac.	0.00	5.615	2.852	6.387				
Cell Pressure	7.10	5.615	2.852	6.387	60.00	62.99	100.78	1.676

Data Start Row 4

	Time msec	Time minute	AXIAL DCDT in	LOAD CELL lb	AREA in ²	AXIAL STRAIN %	q (SIG1 -SIG3)/2 ksf	qcorrected (applied) ksf
4	0	0.00000	0.029125	14.508	6.387	0.00	0.00	0.00
5	6895	0.11492	0.034695	18.338	6.393	0.10	0.04	0.04
6	14055	0.23425	0.040533	21.298	6.400	0.20	0.08	0.08
7	20685	0.34475	0.046036	23.445	6.406	0.30	0.10	0.10
8	27316	0.45527	0.051472	25.36	6.412	0.40	0.12	0.12
9	34211	0.57018	0.05731	27.217	6.419	0.50	0.14	0.14
10	40310	0.67183	0.062679	28.842	6.425	0.60	0.16	0.16
11	46940	0.78233	0.068316	30.467	6.431	0.70	0.18	0.18
12	53040	0.88400	0.073953	31.976	6.438	0.80	0.20	0.19
13	59670	0.99450	0.079724	33.543	6.445	0.90	0.21	0.21
14	65770	1.09617	0.085361	34.994	6.451	1.00	0.23	0.23
15	71869	1.19782	0.090797	36.387	6.457	1.10	0.24	0.24
16	78234	1.30390	0.096568	37.838	6.464	1.20	0.26	0.26
17	84334	1.40557	0.102	39.114	6.471	1.30	0.27	0.27
18	90699	1.51165	0.10784	40.565	6.477	1.40	0.29	0.29
19	96798	1.61330	0.11321	41.9	6.484	1.50	0.30	0.30
20	103163	1.71938	0.11905	43.293	6.491	1.60	0.32	0.32
21	109528	1.82547	0.12469	44.685	6.497	1.70	0.33	0.33
22	115628	1.92713	0.13026	46.02	6.504	1.80	0.35	0.35
23	121993	2.03322	0.13576	47.355	6.510	1.90	0.36	0.36
24	134457	2.24095	0.14717	50.141	6.524	2.10	0.39	0.39
25	146391	2.43985	0.15811	52.868	6.537	2.30	0.42	0.42
26	158590	2.64317	0.16945	55.422	6.550	2.50	0.45	0.45
27	170790	2.84650	0.18065	57.975	6.564	2.70	0.48	0.47
28	182724	3.04540	0.19186	60.354	6.577	2.90	0.50	0.50
29	194923	3.24872	0.20327	62.676	6.591	3.10	0.53	0.52
30	206857	3.44762	0.21421	64.765	6.604	3.30	0.55	0.54
31	218791	3.64652	0.22535	66.796	6.618	3.49	0.57	0.57
32	230990	3.84983	0.23662	68.711	6.632	3.70	0.59	0.58
33	243190	4.05317	0.24803	70.568	6.646	3.90	0.61	0.60
34	254859	4.24765	0.25897	72.135	6.659	4.09	0.62	0.62
35	267058	4.45097	0.27018	73.644	6.673	4.29	0.64	0.63
36	279522	4.65870	0.28152	75.037	6.687	4.49	0.65	0.65
37	291722	4.86203	0.29279	76.313	6.701	4.70	0.66	0.66

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
38	303390	5.05650	0.3038	77.474	6.715	4.89	0.68	0.67
39	315590	5.25983	0.31514	78.577	6.729	5.09	0.69	0.68
40	327259	5.45432	0.32628	79.621	6.743	5.29	0.70	0.69
41	339193	5.65322	0.33749	80.55	6.758	5.49	0.70	0.70
42	351127	5.85212	0.34889	81.478	6.772	5.69	0.71	0.71
43	363061	6.05102	0.35997	82.233	6.786	5.89	0.72	0.71
44	375260	6.25433	0.37111	82.987	6.801	6.09	0.72	0.72
45	387194	6.45323	0.38225	83.742	6.815	6.29	0.73	0.73
46	399394	6.65657	0.39352	84.438	6.830	6.49	0.74	0.73
47	411858	6.86430	0.40486	85.134	6.845	6.69	0.74	0.74
48	423527	7.05878	0.41587	85.715	6.859	6.89	0.75	0.74
49	435726	7.26210	0.42721	86.295	6.874	7.09	0.75	0.74
50	447925	7.46542	0.43842	86.817	6.889	7.29	0.76	0.75
51	459594	7.65990	0.44949	87.34	6.903	7.49	0.76	0.75
52	471794	7.86323	0.46076	87.804	6.918	7.69	0.76	0.76
53	483993	8.06655	0.47224	88.21	6.934	7.89	0.77	0.76
54	495662	8.26103	0.48324	88.674	6.949	8.09	0.77	0.76
55	507861	8.46435	0.49452	89.081	6.964	8.29	0.77	0.76
56	519530	8.65883	0.50559	89.487	6.979	8.49	0.77	0.77
57	531729	8.86215	0.51673	89.835	6.994	8.68	0.78	0.77
58	543928	9.06547	0.52794	90.125	7.009	8.88	0.78	0.77
59	556393	9.27322	0.53928	90.473	7.025	9.09	0.78	0.77
60	568062	9.46770	0.55042	90.764	7.040	9.28	0.78	0.77
61	579996	9.66660	0.56156	91.112	7.056	9.48	0.78	0.77
62	591665	9.86108	0.57277	91.344	7.071	9.68	0.78	0.77
63	603599	10.05998	0.58397	91.576	7.087	9.88	0.78	0.77
64	615533	10.25888	0.59538	91.866	7.103	10.08	0.78	0.77
65	627467	10.45778	0.60652	92.098	7.119	10.28	0.78	0.77
66	639401	10.65668	0.61773	92.272	7.134	10.48	0.78	0.77
67	651600	10.86000	0.629	92.447	7.150	10.68	0.78	0.77
68	663800	11.06333	0.64021	92.621	7.166	10.88	0.78	0.77
69	675999	11.26665	0.65128	92.795	7.182	11.08	0.78	0.77
70	687933	11.46555	0.66242	92.969	7.198	11.28	0.78	0.77
71	700132	11.66887	0.67376	93.085	7.215	11.48	0.78	0.77
72	712332	11.87220	0.68504	93.259	7.231	11.68	0.78	0.77
73	724000	12.06667	0.69611	93.375	7.247	11.88	0.78	0.77
74	736200	12.27000	0.70759	93.491	7.264	12.08	0.78	0.77
75	747869	12.46448	0.71866	93.607	7.281	12.28	0.78	0.77
76	759803	12.66338	0.72973	93.665	7.297	12.48	0.78	0.77
77	771737	12.86228	0.74094	93.781	7.314	12.68	0.78	0.77
78	783936	13.06560	0.75228	93.897	7.331	12.88	0.78	0.77
79	796135	13.26892	0.76349	93.897	7.348	13.08	0.78	0.77
80	808335	13.47225	0.77476	94.013	7.365	13.28	0.78	0.76
81	820269	13.67115	0.78577	94.013	7.381	13.48	0.78	0.76
82	832203	13.87005	0.79691	94.071	7.398	13.67	0.77	0.76
83	844137	14.06895	0.80838	94.071	7.416	13.88	0.77	0.76
84	856071	14.26785	0.81952	94.013	7.433	14.08	0.77	0.76
85	867740	14.46233	0.83066	94.013	7.450	14.27	0.77	0.75
86	879674	14.66123	0.84187	94.013	7.467	14.47	0.77	0.75
87	891873	14.86455	0.85321	93.955	7.485	14.68	0.76	0.75
88	903542	15.05903	0.86422	93.955	7.502	14.87	0.76	0.75
89	915741	15.26235	0.87549	93.897	7.520	15.07	0.76	0.75
90	927675	15.46125	0.8867	93.839	7.538	15.27	0.76	0.74
91	939875	15.66458	0.89777	93.723	7.555	15.47	0.75	0.74
92	952074	15.86790	0.90918	93.549	7.574	15.67	0.75	0.74
93	963743	16.06238	0.92025	93.433	7.591	15.87	0.75	0.73
94	975942	16.26570	0.93153	93.375	7.609	16.07	0.75	0.73
95	988141	16.46902	0.9428	93.259	7.628	16.27	0.74	0.73
96	999810	16.66350	0.95387	93.201	7.646	16.47	0.74	0.73

	Time	Time	AXIAL	LOAD	AREA	AXIAL	q	qcorrected
	msec	minute	DCDT	CELL	in ²	STRAIN	(SIG1 -SIG3)/2	(applied)
			in	lb		%	ksf	ksf
97	1012009	16.86682	0.96528	93.143	7.664	16.67	0.74	0.72
98	1023678	17.06130	0.97629	93.143	7.682	16.87	0.74	0.72
99	1035878	17.26463	0.98756	93.085	7.701	17.07	0.73	0.72
100	1048077	17.46795	0.99877	93.027	7.720	17.27	0.73	0.72
101	1060276	17.67127	1.01	93.027	7.738	17.47	0.73	0.71
102	1072210	17.87017	1.021	92.969	7.757	17.66	0.73	0.71
103	1084410	18.07350	1.0324	92.969	7.776	17.87	0.73	0.71
104	1096609	18.27682	1.0438	92.911	7.795	18.07	0.72	0.71
105	1108278	18.47130	1.0549	92.911	7.814	18.27	0.72	0.71
106	1120212	18.67020	1.0662	92.911	7.833	18.47	0.72	0.70
107	1131615	18.86025	1.0771	92.853	7.852	18.66	0.72	0.70
108	1143284	19.05473	1.0884	92.795	7.872	18.86	0.72	0.70
109	1155484	19.25807	1.0998	92.795	7.891	19.07	0.71	0.70
110	1167152	19.45253	1.1108	92.795	7.910	19.26	0.71	0.69
111	1179352	19.65587	1.1219	92.737	7.930	19.46	0.71	0.69
112	1191816	19.86360	1.1334	92.795	7.950	19.67	0.71	0.69
113	1204015	20.06692	1.1445	92.795	7.970	19.86	0.71	0.69
114	1216215	20.27025	1.1557	92.737	7.990	20.06	0.70	0.69
115	1227884	20.46473	1.1667	92.679	8.009	20.26	0.70	0.68
116	1240083	20.66805	1.1781	92.679	8.030	20.46	0.70	0.68
117	1251752	20.86253	1.1893	92.679	8.050	20.66	0.70	0.68
118	1263686	21.06143	1.2004	92.621	8.070	20.86	0.70	0.68
119	1275355	21.25592	1.2116	92.621	8.090	21.06	0.70	0.68
120	1287554	21.45923	1.2229	92.621	8.111	21.26	0.69	0.67
121	1299753	21.66255	1.2343	92.621	8.132	21.46	0.69	0.67
122	1311687	21.86145	1.2455	92.621	8.153	21.66	0.69	0.67
123	1323621	22.06035	1.2564	92.679	8.173	21.86	0.69	0.67
124	1336086	22.26810	1.2679	92.621	8.194	22.06	0.69	0.67
125	1348020	22.46700	1.279	92.621	8.215	22.26	0.68	0.66
126	1359954	22.66590	1.2901	92.621	8.236	22.46	0.68	0.66
127	1371623	22.86038	1.3012	92.621	8.257	22.65	0.68	0.66
128	1383557	23.05928	1.3124	92.621	8.279	22.85	0.68	0.66
129	1395226	23.25377	1.3238	92.679	8.300	23.06	0.68	0.66
130	1407160	23.45267	1.335	92.679	8.322	23.26	0.68	0.66
131	1410608	23.51013	1.3385	92.679	8.329	23.32	0.68	0.65

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-420
 Sample: U1
 Depth (ft): 53.8

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 54.4 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS		MINIATURE VANE CONSTANTS :			
Spring No.	Constant (kg.cm/deg.)	Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	0.0089	1	1.27	1.27	4.29
2	0.0248	2	1.27	1.91	5.91
3	0.0268	3	1.27	2.54	7.51
4	0.0529	4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	70	12	0.47	0.08	5.8
2	2	3	85	15	0.58	0.10	5.7
3	2	3	77	14	0.52	0.09	5.5
Average:					0.52	0.09	5.67

Remarks:

Test Date: October 6, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics Electric Boat Assembly Facility Groton, Connecticut		MINIATURE LABORATORY VANE SHEAR TEST	
		Project 1702850	October 2017 Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-420
 Sample: U2
 Depth (ft): 63.9

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 51.2 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS		MINIATURE VANE CONSTANTS			
Spring No.	Constant (kg.cm/deg.)	Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	0.0089	1	1.27	1.27	4.29
2	0.0248	2	1.27	1.91	5.91
3	0.0268	3	1.27	2.54	7.51
4	0.0529	4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	23	4	0.16	0.03	5.8
2	1	3	19	3	0.05	0.01	6.3
3	1	4	270	47	0.14	0.02	5.7
Average:					0.12	0.02	5.94

Remarks:

Sample likely disturbed.

Test Date: October 9, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics Electric Boat Assembly Facility Groton, Connecticut	 GEI Consultants	MINIATURE LABORATORY VANE SHEAR TEST	
		Project 1702850	October 2017
Stantec Consulting Services, Inc.			Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-420
 Sample: U5
 Depth (ft): 93.8

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 61.8 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS	
Spring No.	Constant (kg.cm/deg.)

1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	1	3	145	15	0.35	0.04	9.7
2	1	3	170	23	0.41	0.06	7.4
3	1	3	163	19	0.40	0.05	8.6
Average:					0.39	0.05	8.5

Remarks:

Test Date: October 13, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut



MINIATURE LABORATORY
 VANE SHEAR TEST

Stantec Consulting Services, Inc.

Project 1702805

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U1
 Depth (ft): 69.3

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 51.2 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	80	15	0.54	0.10	5.3
2	2	3	75	11	0.51	0.07	6.8
3	2	3	80	12	0.54	0.08	6.7
Average:					0.53	0.09	6.3

Remarks:

Slight bleeding of water observed during insertion of vane into soil.

Test Date: September 21, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut



MINIATURE LABORATORY
 VANE SHEAR TEST

Stantec Consulting Services, Inc.

Project 1702850

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U1
 Depth (ft): 69.3

Sample Description: Dark-gray ORGANIC SOIL (OH)
 Moisture Content: 51.2 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	80	15	0.54	0.10	5.3
2	2	3	75	11	0.51	0.07	6.8
3	2	3	80	12	0.54	0.08	6.7
Average:					0.53	0.09	6.27

Remarks:

Slight bleeding of water observed during insertion of vane into soil.

Test Date: September 21, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut

Stantec Consulting Services, Inc.



Project 1702850

MINIATURE LABORATORY
 VANE SHEAR TEST

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U2
 Depth (ft): 86.1

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 58.3 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	180	23	1.22	0.16	7.8
2	2	3	168	19	1.14	0.13	8.8
3	2	3	154	17	1.04	0.12	9.1
Average:					1.13	0.13	8.6

Remarks:

Test Date: September 21, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut

Stantec Consulting Services, Inc.



Project 1702850

MINIATURE LABORATORY
 VANE SHEAR TEST

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U2
 Depth (ft): 86.1

Sample Description: Dark-gray ORGANIC SOIL (OH)
 Moisture Content: 58.3 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	180	23	1.22	0.16	7.8
2	2	3	168	19	1.14	0.13	8.8
3	2	3	154	17	1.04	0.12	9.1
Average:					1.13	0.13	8.58

Remarks:

Test Date: September 21, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut



MINIATURE LABORATORY
 VANE SHEAR TEST

Stantec Consulting Services, Inc.

Project 1702850

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U3
 Depth (ft): 92.7

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 44.1 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS		MINIATURE VANE CONSTANTS :			
Spring No.	Constant (kg.cm/deg.)	Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	0.0089	1	1.27	1.27	4.29
2	0.0248	2	1.27	1.91	5.91
3	0.0268	3	1.27	2.54	7.51
4	0.0529	4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	159	14	1.08	0.09	11.4
2	2	3	187	30	1.27	0.20	6.2
3	2	3	176	24	1.19	0.16	7.3
Average:					1.18	0.15	8.3

Remarks:

Test Date: September 22, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics Electric Boat Assembly Facility Groton, Connecticut		MINIATURE LABORATORY VANE SHEAR TEST	
		Project 1702850	October 2017
Stantec Consulting Services, Inc.			Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-421
 Sample: U3
 Depth (ft): 92.7

Sample Description: Dark-gray ORGANIC SOIL (OH)
 Moisture Content: 44.1 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	159	14	1.08	0.09	11.4
2	2	3	187	30	1.27	0.20	6.2
3	2	3	176	24	1.19	0.16	7.3
Average:					1.18	0.15	8.31

Remarks:

Test Date: September 22, 2017
 Tested By: E. Fazlic
 Checked: D. Aghjayan

General Dynamics Electric Boat
 Thames River
 Groton, Connecticut

Stantec
 Boston, Massachusetts



Project 1702850

MINIATURE LABORATORY
 VANE SHEAR TEST

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-422
 Sample: U1
 Depth (ft): 25.2

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 89.8 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	54	7	0.37	0.05	7.7
2	2	3	45	9	0.30	0.06	5.0
3	2	3	49	8	0.33	0.05	6.1
Average:					0.33	0.05	6.3

Remarks:

Test Date: October 3, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut

Stantec Consulting Services, Inc.



Project 1702805

MINIATURE LABORATORY
 VANE SHEAR TEST

October 2017

Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-422
 Sample: U2
 Depth (ft): 35.2

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 77.9 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS		MINIATURE VANE CONSTANTS :			
Spring No.	Constant (kg.cm/deg.)	Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	0.0089	1	1.27	1.27	4.29
2	0.0248	2	1.27	1.91	5.91
3	0.0268	3	1.27	2.54	7.51
4	0.0529	4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	57	11	0.39	0.07	5.2
2	2	3	55	11	0.37	0.07	5.0
Average:					0.38	0.07	5.09

Remarks: Only able to perform two tests because of presence of shells.

Test Date: October 5, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics Electric Boat Assembly Facility Groton, Connecticut		MINIATURE LABORATORY VANE SHEAR TEST	
		Project 1702805	October 2017 Fig.

MINIATURE LABORATORY VANE SHEAR TEST

SAMPLE INFORMATION

Structure: 2.8-inch-diameter tube sample
 Boring: GEI-422
 Sample: U3
 Depth (ft): 46.5

Sample Description: Dark gray ORGANIC SOIL (OH)
 Moisture Content: 82.1 %
 Liquid Limit: --
 Plastic Limit: --

EQUIPMENT PARAMETERS

SPRING CONSTANTS

Spring No.	Constant (kg.cm/deg.)
1	0.0089
2	0.0248
3	0.0268
4	0.0529

MINIATURE VANE CONSTANTS :

Vane	Dia. (cm)	Height (cm)	K (cm ³)
1	1.27	1.27	4.29
2	1.27	1.91	5.91
3	1.27	2.54	7.51
4	2.54	2.54	34.32

TEST DATA

Trial	Spring No.	Vane No.	Peak Rotation (deg.)	Residual Rotation (deg.)	Peak Shear (ksf)	Residual Shear (ksf)	Sensitivity
1	2	3	18	3	0.12	0.02	6.0
2	1	3	27	4	0.07	0.01	6.8
3	1	4	101	9	0.05	0.00	11.2
Average:					0.08	0.01	7.99

Remarks:

Sample likely disturbed.

Test Date: October 13, 2017
 Tested By: E. Fazlic
 Checked: DJA

General Dynamics
 Electric Boat Assembly Facility
 Groton, Connecticut

Stantec Consulting Services, Inc.



Project 1702805

MINIATURE LABORATORY
 VANE SHEAR TEST

October 2017

Fig.



Client:	GEI Consultants, Inc.		
Project:	Electric Boat		
Location:	Groton, CT		Project No: GTX-307237
Boring ID: ---	Sample Type: ---	Tested By: rlc	
Sample ID: ---	Test Date: 11/02/17	Checked By: jsc	
Depth : ---	Test Id: 431474		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
GEI-301	C1	19.85-20.21 ft	165	16209	1	Yes	---
GEI-304	C1	53.62-53.99 ft	183	9428	1	Yes	---
GEI-304	C2	58.62-58.99 ft	161	22340	1	Yes	---
GEI-311	C2	91.61-91.98 ft	166	17014	1	Yes	---
GEI-401	C1	39.54-39.89 ft	165	19809	1	Yes	---

Notes: Density determined on 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.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
(See attached photographs)



Client:	GEI Consultants, Inc.	Project No:	GTX-307237
Project:	Electric Boat		
Location:	Groton, CT		
Boring ID: ---	Sample Type: ---	Tested By:	rlc
Sample ID: ---	Test Date: 11/06/17	Checked By:	jsc
Depth : ---	Test Id: 431466		

Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

Boring ID	Sample Number	Depth	Bulk Density, pcf	Compressive strength, psi	Failure Type	Meets ASTM D4543	Note(s)
GEI-403	C3	66.10-66.41 ft	164	18206	1	Yes	---
GEI-404	C3	56.61-56.97 ft	165	18499	1	Yes	---
GEI-405	C1	41.82-42.19 ft	171	7577	1	Yes	---
GEI-405	C4	52.56-52.91 ft	165	23277	1	Yes	---
GEI-407	C1	58.65-59.01 ft	165	17095	1	Yes	---

Notes: Density determined on 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.
 The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
 Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure
 (See attached photographs)

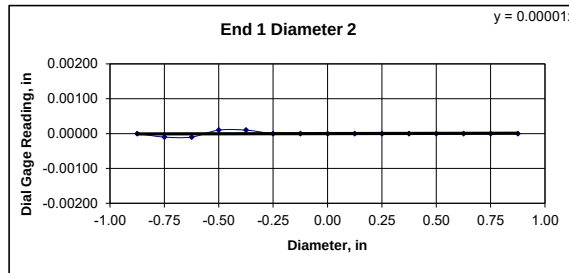
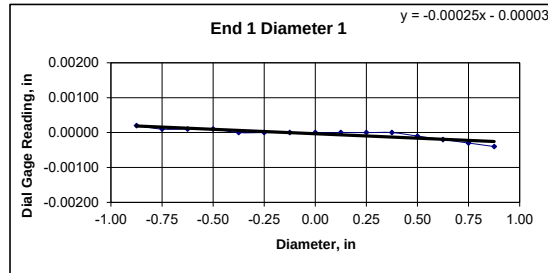


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-301		
Sample ID:	C1		
Depth:	19.85-20.21 ft		
Visual Description:	See photographs		

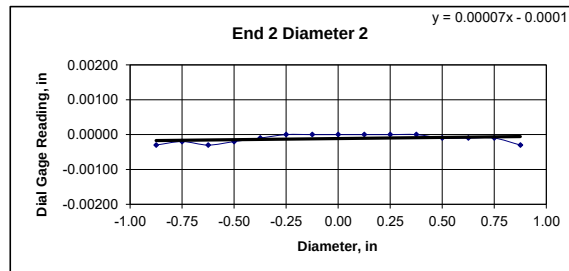
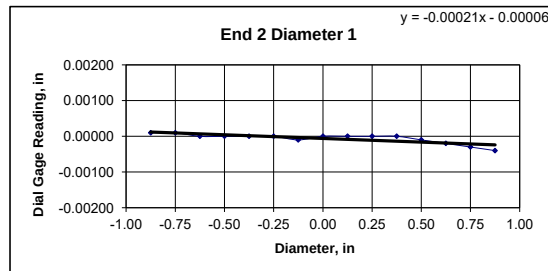
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.13	4.13	4.13	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.97	1.97	1.97	Straightness Tolerance Met? YES	
Specimen Mass, g:	546.78				
Bulk Density, lb/ft ³ :	165				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040
Diameter 2, in (rotated 90°)	0.00000	-0.00010	-0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Difference between max and min readings, in:															
0° = 0.00060 90° = 0.00020															
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	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040
Diameter 2, in (rotated 90°)	-0.00030	-0.00020	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00030
Difference between max and min readings, in:															
0° = 0.0005 90° = 0.0003															
Maximum difference must be $<$ 0.0020 in. Difference = $\pm$ 0.00030															
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	0.00001
Angle of Best Fit Line:	0.00057
End 2:	
Slope of Best Fit Line	0.00007
Angle of Best Fit Line:	0.00401
Maximum Angular Difference:	0.00344
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq$ 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00060	1.970	0.00030	0.017	YES		
Diameter 2, in (rotated 90°)	0.00020	1.970	0.00010	0.006	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00050	1.970	0.00025	0.015	YES		
Diameter 2, in (rotated 90°)	0.00030	1.970	0.00015	0.009	YES		

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-301
Sample ID:	C1
Depth, ft:	19.85-20.21



After cutting and grinding



After break

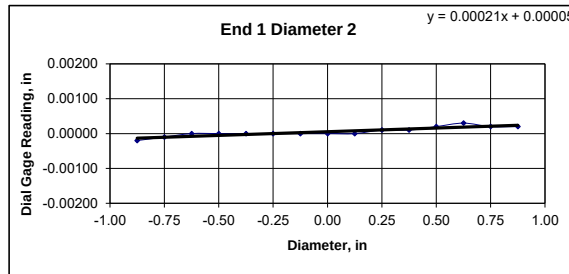
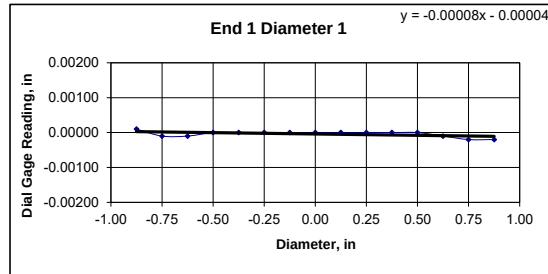


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-304		
Sample ID:	C1		
Depth:	53.62-53.99 ft		
Visual Description:	See photographs		

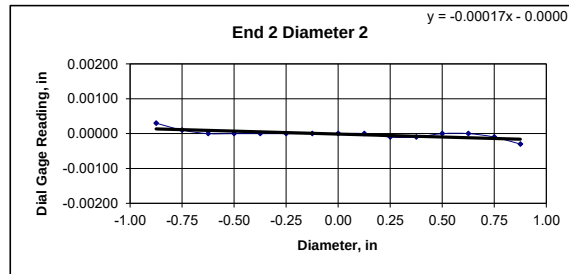
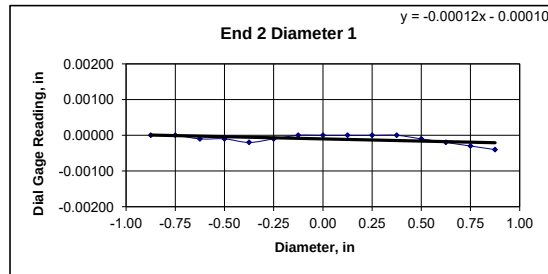
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.23	4.23	4.23	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.98	1.98	1.98	Straightness Tolerance Met? YES	
Specimen Mass, g:	626.29				
Bulk Density, lb/ft ³ :	183				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020
Diameter 2, in (rotated 90°)	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020	0.00030	0.00020	0.00020
Difference between max and min readings, in:															
0° = 0.00030 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	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040
Diameter 2, in (rotated 90°)	0.00030	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	0.00000	0.00000	-0.00010	-0.00030
Difference between max and min readings, in:															
0° = 0.0004 90° = 0.0006															
Maximum difference must be < 0.0020 in. Difference = ± 0.00030															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00008
Angle of Best Fit Line:	0.00458
End 2:	
Slope of Best Fit Line	0.00012
Angle of Best Fit Line:	0.00688
Maximum Angular Difference:	0.00229
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00021
Angle of Best Fit Line:	0.01203
End 2:	
Slope of Best Fit Line	0.00017
Angle of Best Fit Line:	0.00974
Maximum Angular Difference:	0.00229
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?	Maximum angle of departure must be $\leq$ 0.25°
Diameter 1, in		0.00030	1.980	0.00015	0.009	YES	
Diameter 2, in (rotated 90°)		0.00050	1.980	0.00025	0.014	YES	Perpendicularity Tolerance Met? YES
END 2							
Diameter 1, in		0.00040	1.980	0.00020	0.012	YES	
Diameter 2, in (rotated 90°)		0.00060	1.980	0.00030	0.017	YES	



Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-304
Sample ID:	C1
Depth, ft:	53.62-53.99



After cutting and grinding



After break

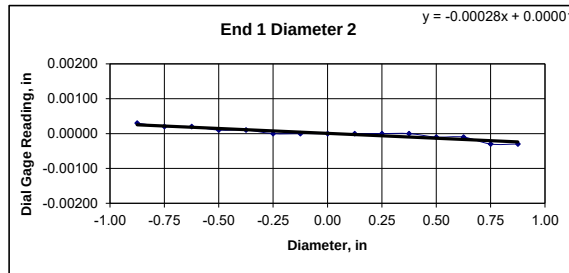
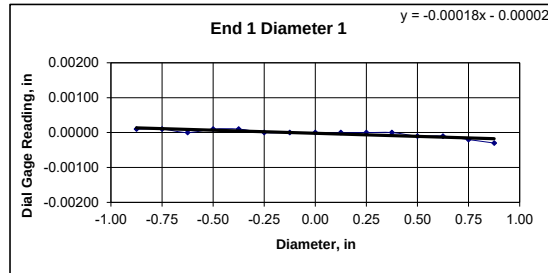


Client:	GEI Consultants, Inc.	Test Date:	11/2/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-304		
Sample ID:	C2		
Depth:	58.62-58.99 ft		
Visual Description:	See photographs		

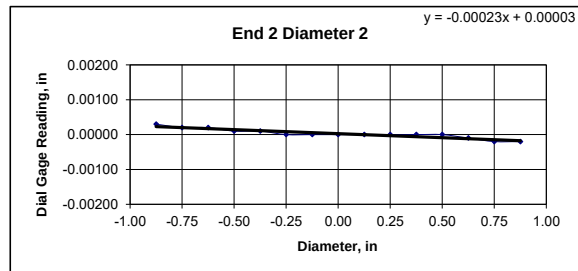
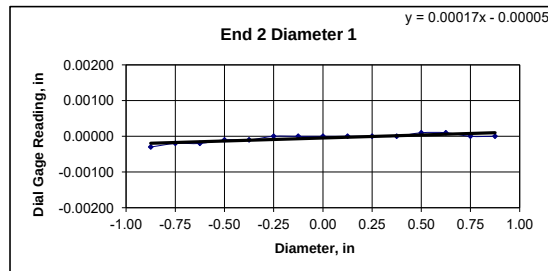
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.20	4.20	4.20	Maximum difference must be < 0.020 in.	
Specimen Diameter, in:	1.98	1.98	1.98	Straightness Tolerance Met? YES	
Specimen Mass, g:	547.38				
Bulk Density, lb/ft ³ :	161				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	0.00010	0.00010	0.00000	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00030
Diameter 2, in (rotated 90°)	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	-0.00030	-0.00030
Difference between max and min readings, in:															
0° = 0.00040 90° = 0.00060															
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	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00030	0.00020	0.00020	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020
Difference between max and min readings, in:															
0° = 0.0004 90° = 0.0005															
Maximum difference must be < 0.0020 in. Difference = ± 0.00030															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00018
Angle of Best Fit Line:	0.01031
End 2:	
Slope of Best Fit Line	0.00017
Angle of Best Fit Line:	0.00974
Maximum Angular Difference:	0.00057
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00028
Angle of Best Fit Line:	0.01604
End 2:	
Slope of Best Fit Line	0.00023
Angle of Best Fit Line:	0.01318
Maximum Angular Difference:	0.00286
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq 0.25^\circ$	
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°)	0.00060	1.980	0.00030	0.017	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00040	1.980	0.00020	0.012	YES		
Diameter 2, in (rotated 90°)	0.00050	1.980	0.00025	0.014	YES		

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/2/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-304
Sample ID:	C2
Depth, ft:	58.62-58.99



After cutting and grinding



After break

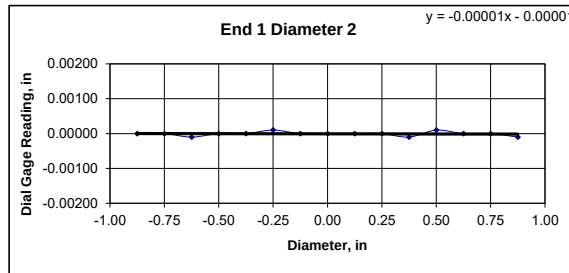
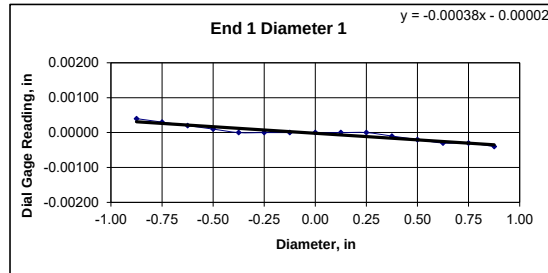


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-311		
Sample ID:	C2		
Depth:	91.61-91.98 ft		
Visual Description:	See photographs		

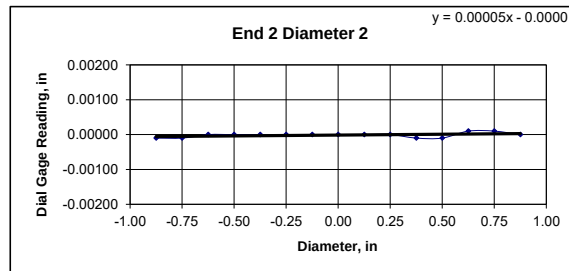
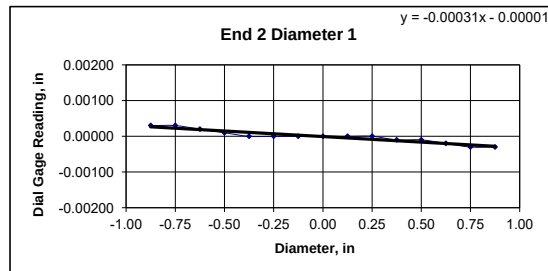
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.29	4.29	4.29	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.99	1.99	1.99	Straightness Tolerance Met? YES	
Specimen Mass, g:	581.72				
Bulk Density, lb/ft ³ :	166				
Length to Diameter Ratio:	2.2	Minimum Diameter Tolerance Met? YES			
		Length to Diameter Ratio 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	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00030	-0.00040
Diameter 2, in (rotated 90°)	0.00000	0.00000	-0.00010	0.00000	0.00000	0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	0.00010	0.00000	0.00000	-0.00010
Difference between max and min readings, in:															
0° = 0.00080 90° = 0.00020															
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	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00030	-0.00030
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	0.00010	0.00010	0.00000
Difference between max and min readings, in:															
0° = 0.0006 90° = 0.0002															
Maximum difference must be < 0.0020 in. Difference = ± 0.00040															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00038
Angle of Best Fit Line:	0.02177
End 2:	
Slope of Best Fit Line	0.00031
Angle of Best Fit Line:	0.01776
Maximum Angular Difference:	0.00401
Parallelism Tolerance Met? Spherically Seated	YES



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00001
Angle of Best Fit Line:	0.00057
End 2:	
Slope of Best Fit Line	0.00005
Angle of Best Fit Line:	0.00286
Maximum Angular Difference:	0.00229
Parallelism Tolerance Met? Spherically Seated	YES

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq$ 0.25°	
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°)	0.00020	1.990	0.00010	0.006	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00060	1.990	0.00030	0.017	YES		
Diameter 2, in (rotated 90°)	0.00020	1.990	0.00010	0.006	YES		

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-311
Sample ID:	C2
Depth, ft:	91.61-91.98



After cutting and grinding



After break

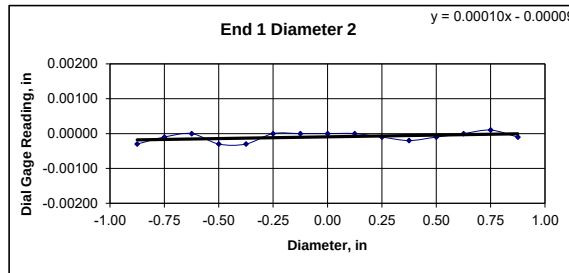
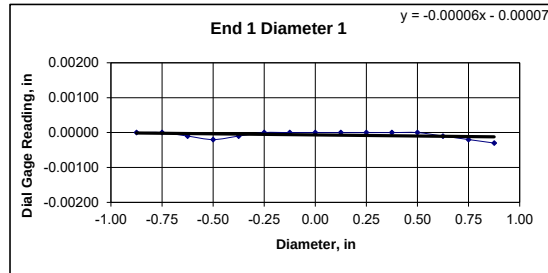


Client:	GEI Consultants, Inc.	Test Date:	11/2/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-401		
Sample ID:	C1		
Depth:	39.54-39.89 ft		
Visual Description:	See photographs		

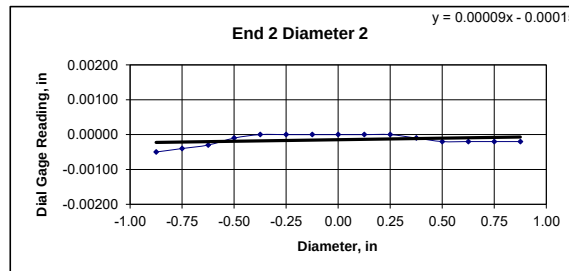
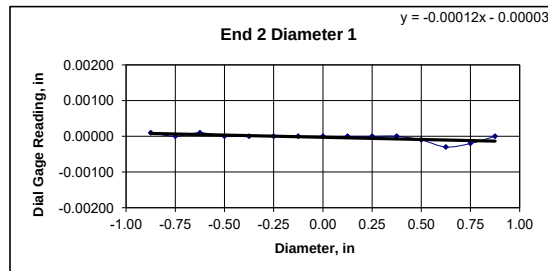
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.10	4.10	4.10	Maximum difference must be < 0.020 in. Straightness Tolerance Met? YES	
Specimen Diameter, in:	1.98	1.98	1.98		
Specimen Mass, g:	548.25				
Bulk Density, lb/ft ³ :	165				
Length to Diameter Ratio:	2.1	Minimum Diameter Tolerance Met? YES	Length to Diameter Ratio 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	0.00000	0.00000	-0.00010	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030
Diameter 2, in (rotated 90°)	-0.00030	-0.00010	0.00000	-0.00030	-0.00030	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00010	0.00000	0.00010	-0.00010
Difference between max and min readings, in: 0° = 0.00030 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	0.00010	0.00000	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00030	-0.00020	0.00000
Diameter 2, in (rotated 90°)	-0.00050	-0.00040	-0.00030	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00020	-0.00020	-0.00020
Difference between max and min readings, in: 0° = 0.0004 90° = 0.0005 Maximum difference must be < 0.0020 in. Difference = $\pm$ 0.00025 Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00006
Angle of Best Fit Line:	0.00344
End 2:	
Slope of Best Fit Line	0.00012
Angle of Best Fit Line:	0.00688
Maximum Angular Difference:	0.00344
Parallelism Tolerance Met? Spherically Seated	YES



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00010
Angle of Best Fit Line:	0.00573
End 2:	
Slope of Best Fit Line	0.00009
Angle of Best Fit Line:	0.00516
Maximum Angular Difference:	0.00057
Parallelism Tolerance Met? Spherically Seated	YES

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)						Maximum angle of departure must be $\leq$ 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00030	1.980	0.00015	0.009	YES	Perpendicularity Tolerance Met? YES	
Diameter 2, in (rotated 90°)	0.00040	1.980	0.00020	0.012	YES		
END 2							
Diameter 1, in	0.00040	1.980	0.00020	0.012	YES		
Diameter 2, in (rotated 90°)	0.00050	1.980	0.00025	0.014	YES		



Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/2/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-401
Sample ID:	C1
Depth, ft:	39.54-39.89



After cutting and grinding



After break

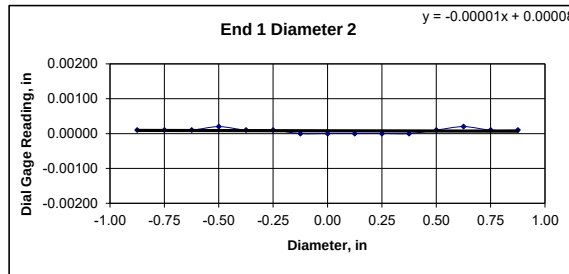
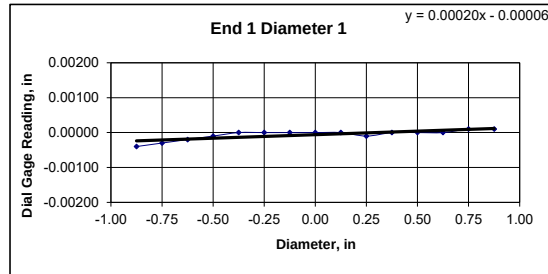


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-403		
Sample ID:	C3		
Depth:	66.10-66.41 ft		
Visual Description:	See photographs		

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

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.20	4.20	4.20	Maximum difference must be < 0.020 in.	
Specimen Diameter, in:	1.99	1.99	1.99	Straightness Tolerance Met? YES	
Specimen Mass, g:	562.62				
Bulk Density, lb/ft ³ :	164				
Length to Diameter Ratio:	2.1	Minimum Diameter Tolerance Met? YES			
		Length to Diameter Ratio Tolerance Met? YES			

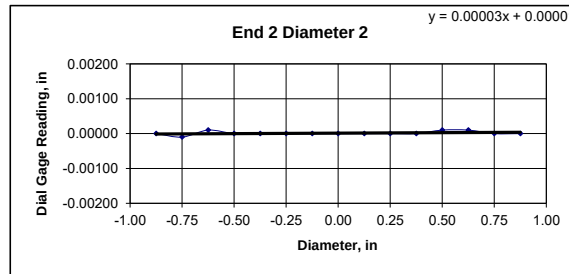
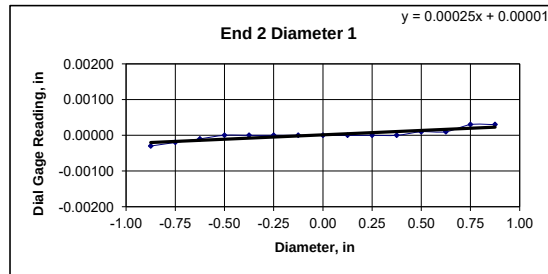
END FLATNESS AND PARALLELISM (Procedure FP1)																
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875	
Diameter 1, in	-0.00040	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00010	0.00010	
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00010	0.00020	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00010	0.00010	
Difference between max and min readings, in:																
0° =												0.00050		90° =		0.00020
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	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00030	0.00030	
Diameter 2, in (rotated 90°)	0.00000	-0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00000	0.00000	
Difference between max and min readings, in:																
0° =												0.0006		90° =		0.0002
Maximum difference must be < 0.0020 in.																
Flatness Tolerance Met? YES																



DIAMETER 1

End 1:		
Slope of Best Fit Line	0.00020	
Angle of Best Fit Line:	0.01146	
End 2:		
Slope of Best Fit Line	0.00025	
Angle of Best Fit Line:	0.01432	
Maximum Angular Difference:	0.00286	

Parallelism Tolerance Met? YES
Spherically Seated



DIAMETER 2

End 1:		
Slope of Best Fit Line	0.00001	
Angle of Best Fit Line:	0.00057	
End 2:		
Slope of Best Fit Line	0.00003	
Angle of Best Fit Line:	0.00172	
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?	Maximum angle of departure must be $\leq$ 0.25°
Diameter 1, in		0.00050	1.990	0.00025	0.014	YES	
Diameter 2, in (rotated 90°)		0.00020	1.990	0.00010	0.006	YES	Perpendicularity Tolerance Met? YES
END 2							
Diameter 1, in		0.00060	1.990	0.00030	0.017	YES	
Diameter 2, in (rotated 90°)		0.00020	1.990	0.00010	0.006	YES	

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-403
Sample ID:	C3
Depth, ft:	66.10-66.41



After cutting and grinding



After break

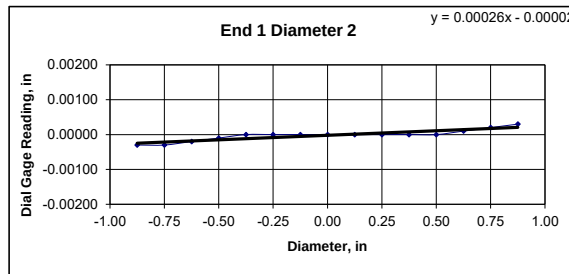
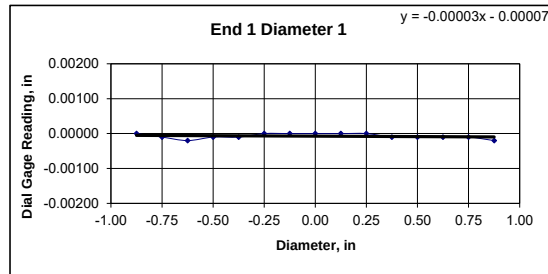


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-404		
Sample ID:	C3		
Depth:	56.61-56.97 ft		
Visual Description:	See photographs		

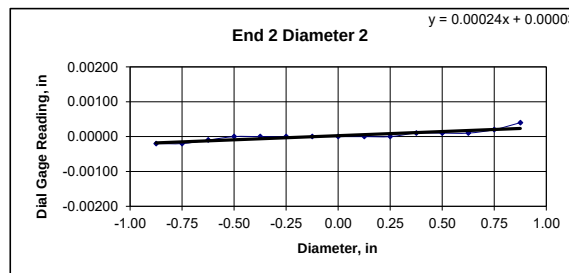
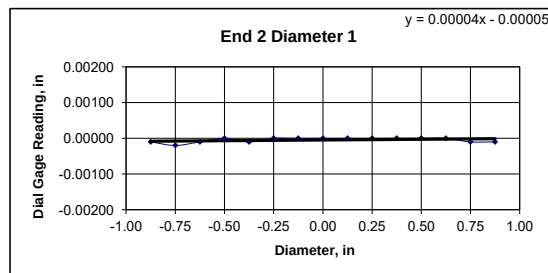
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.19	4.19	4.19	Maximum difference must be < 0.020 in.	
Specimen Diameter, in:	1.99	1.99	1.99	Straightness Tolerance Met? YES	
Specimen Mass, g:	565.24				
Bulk Density, lb/ft ³ :	165				
Length to Diameter Ratio:	2.1	Minimum Diameter Tolerance Met? YES			
		Length to Diameter Ratio 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	0.00000	-0.00010	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00020
Diameter 2, in (rotated 90°)	-0.00030	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00030
Difference between max and min readings, in:															
0° = 0.00020 90° = 0.00060															
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	-0.00010	-0.00020	-0.00010	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010
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	0.00010	0.00020	0.00040
Difference between max and min readings, in:															
0° = 0.0002 90° = 0.0006															
Maximum difference must be < 0.0020 in. Difference = ± 0.00030															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00003
Angle of Best Fit Line:	0.00172
End 2:	
Slope of Best Fit Line	0.00004
Angle of Best Fit Line:	0.00229
Maximum Angular Difference:	0.00057
Parallelism Tolerance Met? Spherically Seated	YES



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	0.00024
Angle of Best Fit Line:	0.01375
Maximum Angular Difference:	0.00115
Parallelism Tolerance Met? Spherically Seated	YES

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq 0.25^\circ$	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00020	1.990	0.00010	0.006	YES		
Diameter 2, in (rotated 90°)	0.00060	1.990	0.00030	0.017	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00020	1.990	0.00010	0.006	YES		
Diameter 2, in (rotated 90°)	0.00060	1.990	0.00030	0.017	YES		

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-404
Sample ID:	C3
Depth, ft:	56.61-56.97



After cutting and grinding



After break

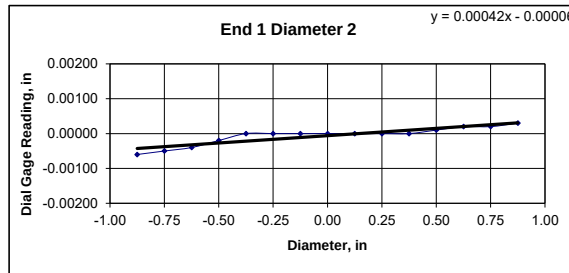
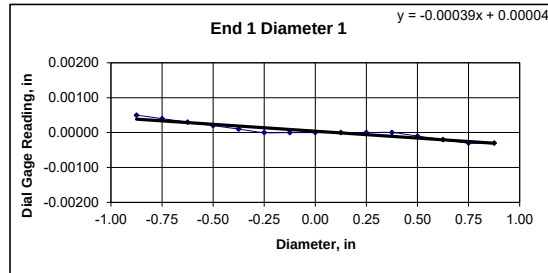


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-405		
Sample ID:	C1		
Depth:	41.82-42.19 ft		
Visual Description:	See photographs		

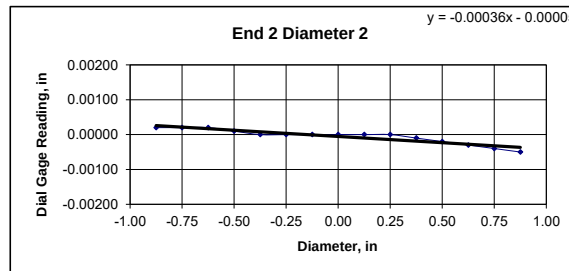
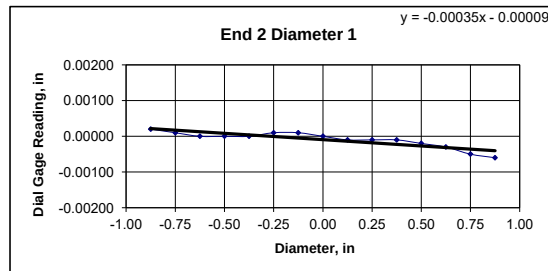
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.21	4.21	4.21	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.99	1.99	1.99	Straightness Tolerance Met? YES	
Specimen Mass, g:	587.95				
Bulk Density, lb/ft ³ :	171				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	0.00050	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00030
Diameter 2, in (rotated 90°)	-0.00060	-0.00050	-0.00040	-0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00030
Difference between max and min readings, in:															
0° = 0.00080 90° = 0.00090															
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	0.00020	0.00010	0.00000	0.00000	0.00000	0.00010	0.00010	0.00000	-0.00010	-0.00010	-0.00010	-0.00020	-0.00030	-0.00050	-0.00060
Diameter 2, in (rotated 90°)	0.00020	0.00020	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00050
Difference between max and min readings, in:															
0° = 0.0008 90° = 0.0007															
Maximum difference must be $<$ 0.0020 in. Difference = $\pm$ 0.00045															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00039
Angle of Best Fit Line:	0.02235
End 2:	
Slope of Best Fit Line	0.00035
Angle of Best Fit Line:	0.02005
Maximum Angular Difference:	0.00229
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00042
Angle of Best Fit Line:	0.02406
End 2:	
Slope of Best Fit Line	0.00036
Angle of Best Fit Line:	0.02063
Maximum Angular Difference:	0.00344
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq$ 0.25°	
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°)	0.00090	1.990	0.00045	0.026	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00080	1.990	0.00040	0.023	YES		
Diameter 2, in (rotated 90°)	0.00070	1.990	0.00035	0.020	YES		



Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-405
Sample ID:	C1
Depth, ft:	41.82-42.19



After cutting and grinding



After break

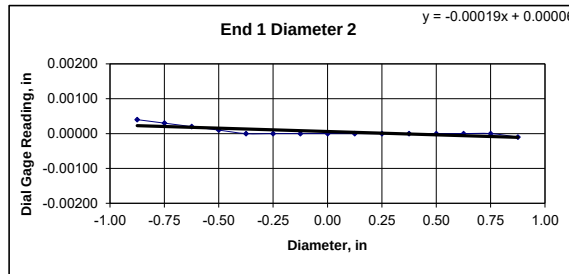
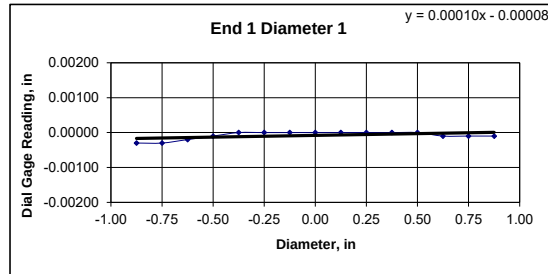


Client:	GEI Consultants, Inc.	Test Date:	11/2/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-405		
Sample ID:	C4		
Depth:	52.56-52.91 ft		
Visual Description:	See photographs		

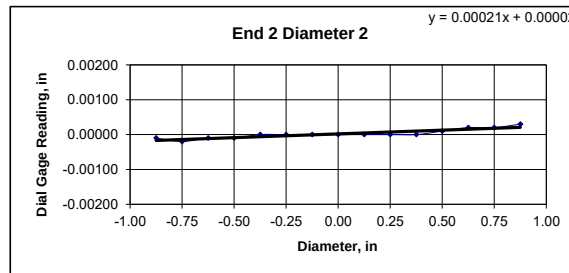
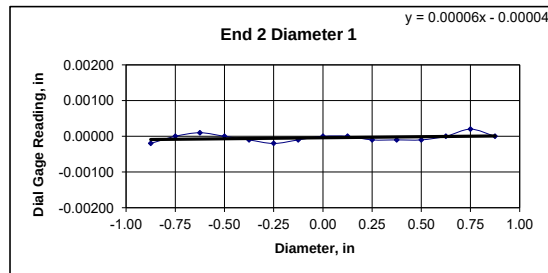
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.15	4.15	4.15	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	2.00	2.00	2.00	Straightness Tolerance Met? YES	
Specimen Mass, g:	565.41				
Bulk Density, lb/ft ³ :	165				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	0.00040	0.00030	0.00020	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010
Difference between max and min readings, in:															
0° = 0.00030 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	-0.00020	0.00000	0.00010	0.00000	-0.00010	-0.00020	-0.00010	0.00000	0.00000	-0.00010	-0.00010	-0.00010	0.00000	0.00020	0.00000
Diameter 2, in (rotated 90°)	-0.00010	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00020	0.00030
Difference between max and min readings, in:															
0° = 0.0004 90° = 0.0005															
Maximum difference must be $<$ 0.0020 in. Difference = $\pm$ 0.00025															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00010
Angle of Best Fit Line:	0.00573
End 2:	
Slope of Best Fit Line	0.00006
Angle of Best Fit Line:	0.00344
Maximum Angular Difference:	0.00229
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00019
Angle of Best Fit Line:	0.01089
End 2:	
Slope of Best Fit Line	0.00021
Angle of Best Fit Line:	0.01203
Maximum Angular Difference:	0.00115
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq$ 0.25°	
END 1	(Calculated from End Flatness and Parallelism measurements above)						
	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00030	2.000	0.00015	0.009	YES		
Diameter 2, in (rotated 90°)	0.00050	2.000	0.00025	0.014	YES		
Perpendicularity Tolerance Met? YES							YES
END 2							
Diameter 1, in	0.00040	2.000	0.00020	0.011	YES		
Diameter 2, in (rotated 90°)	0.00050	2.000	0.00025	0.014	YES		



Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-405
Sample ID:	C4
Depth, ft:	52.56-52.91



After cutting and grinding



After break

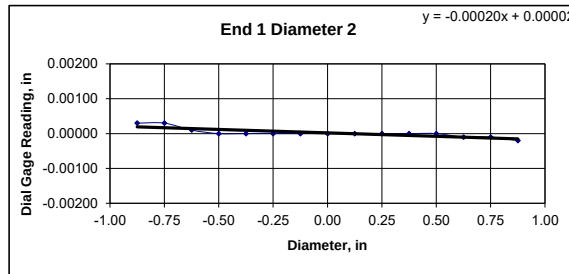
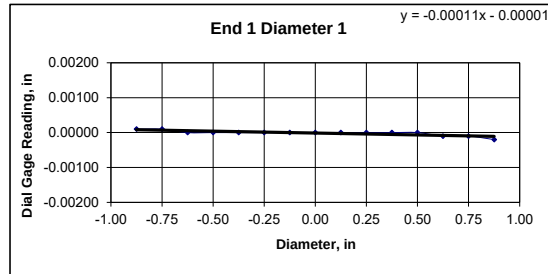


Client:	GEI Consultants, Inc.	Test Date:	11/6/2017
Project Name:	Eelectric Boat	Tested By:	rlc
Project Location:	Groton, CT	Checked By:	jsc
GTX #:	307237		
Boring ID:	GEI-407		
Sample ID:	C1		
Depth:	58.65-59.01 ft		
Visual Description:	See photographs		

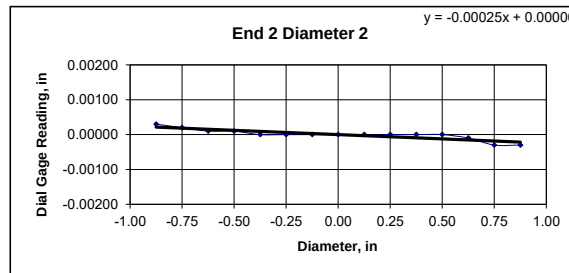
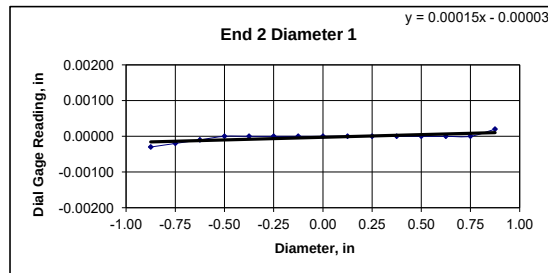
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap $\leq$ 0.02 in.? YES	
Specimen Length, in:	4.16	4.16	4.16	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.99	1.99	1.99	Straightness Tolerance Met? YES	
Specimen Mass, g:	562.45				
Bulk Density, lb/ft ³ :	165				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio 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	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020
Diameter 2, in (rotated 90°)	0.00030	0.00030	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020
Difference between max and min readings, in:															
0° = 0.00030 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	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00020
Diameter 2, in (rotated 90°)	0.00030	0.00020	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00030	-0.00030
Difference between max and min readings, in:															
0° = 0.0005 90° = 0.0006															
Maximum difference must be < 0.0020 in. Difference = ± 0.00030															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00011
Angle of Best Fit Line:	0.00630
End 2:	
Slope of Best Fit Line	0.00015
Angle of Best Fit Line:	0.00859
Maximum Angular Difference:	0.00229
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00020
Angle of Best Fit Line:	0.01146
End 2:	
Slope of Best Fit Line	0.00025
Angle of Best Fit Line:	0.01432
Maximum Angular Difference:	0.00286
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq$ 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00030	1.990	0.00015	0.009	YES		
Diameter 2, in (rotated 90°)	0.00050	1.990	0.00025	0.014	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00050	1.990	0.00025	0.014	YES		
Diameter 2, in (rotated 90°)	0.00060	1.990	0.00030	0.017	YES		

Client:	GEI Consultants, Inc.
Project Name:	Eelectric Boat
Project Location:	Groton, CT
GTX #:	307237
Test Date:	11/6/2017
Tested By:	rlc
Checked By:	jsc
Boring ID:	GEI-407
Sample ID:	C1
Depth, ft:	58.65-59.01



After cutting and grinding



After break