GEOTECHNICAL DESIGN REPORT
EASTPORT BREAKWATER FACILITY
MAINE DOT PIN 18436.00
EASTPORT, MAINE

FINAL

PREPARED FOR:
Childs Engineering Corporation, Inc.

PREPARED BY:
GZA GeoEnvironmental, Inc.
Providence, Rhode Island

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GZA
GeoEnvironmental, Inc.

Engineers and Scientists

July 25, 2014

File No. 03.0033940.00
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Mr. Craig Sams, P.E.
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Re: Geotechnical Design Report
Eastport Breakwater Facility
Eastport, Maine

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Dear Craig:

GZA GeoEnvironmental, Inc. (GZA) is pleased to provide you with this Geotechnical Design Report for the Eastport Breakwater Facility in Eastport, Maine. Our work was completed in accordance with GZA's proposal dated June 10, 2013.

It has been a pleasure serving you on this project. If you have any questions regarding the report, or if we can provide further assistance, please do not hesitate to contact the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

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1.0 INTRODUCTION

This report presents the results of GZA's geotechnical evaluation based on the following subsurface exploration programs at the Eastport Breakwater Facility in Eastport, Maine:

- 2013 - Schonewald Engineering Associates, Inc. (SEA)
- 1983 - Morrison Geotechnical Engineering (MGE)

Our services were provided in accordance with our proposal dated June 10, 2013 and the attached Limitations contained in **Appendix A** of the report.

1.1 OBJECTIVES AND SCOPE OF SERVICES

The objectives of our work were to evaluate subsurface conditions and provide geotechnical engineering recommendations for the proposed Eastport Breakwater replacement, including assessment of subsurface conditions for the new pile supported pier foundations and solid wave attenuation system. To meet these objectives, GZA completed the following Scope of Services:

- Conducted a site visit to observe the existing conditions at the site;
- Conducted an evaluation of the subsurface exploration program consisting of eleven test borings performed by SEA in 2013 and eight test borings performed by MGE in 1983;
- Developed geotechnical engineering recommendations and assessed pile foundation alternatives; and
- Prepared this report summarizing our findings and design recommendations.

1.2 BACKGROUND

The Eastport Breakwater Facility is located in Cobscook Bay and serves a wide variety of vessels. The facility is owned by the Eastport Port Authority and represents an economic asset to Downeast Maine and the Eastport community. The facility was originally constructed in 1962 and consisted of a sheet pile cell approximately 400 feet long and 50 feet wide with the interior filled with large stone. The rectangular sheet pile cell was tied together transversely with steel tendons. In 1985, a facility addition was constructed that increased the deck width from 50 feet to 90 feet. The new addition was an open wharf constructed offshore of the breakwater, and consisted of concrete filled steel pipe-pile bents with reinforced concrete caps and deck. The 1985 addition added a three panel fender system for larger vessels to breast against. In 1983, the berth offshore of the breakwater/wharf facility was dredged to elevation -40.0 feet mean low water (MLW) and is currently at approximately elevation -50 feet referenced to the North American Vertical Datum of 1988 (NAVD88). The Eastport Facility location is shown on **Figure 1, Site Locus**.

Maine Department of Transportation (Maine DOT) is proposing to demolish the original 1962 breakwater facility and construct a new 50 foot by 500 foot pier connecting to the east side of the 1985 addition. A new approach trestle is proposed from landside to the new pier. Additionally, a wave attenuation system is proposed to protect the small craft harbor and is planned to be constructed west of the existing 1985 addition and south of the new proposed approach trestle. A new fender system is proposed along the eastern face of the new pier.

All elevations in this report (unless otherwise noted) are referenced to NAVD 88. Elevations in the historic borings and drawings from 1983 and 1985 were noted relative to MLW and have been approximately converted to NAVD88 (MLW -9.5' = NAVD88).

2.0 SUBSURFACE EXPLORATIONS

2.1 PREVIOUS EXPLORATION PROGRAM

In 1983, a subsurface exploration program was performed at the site by Guild Drilling of East Providence, Rhode Island, on behalf of Morrison Geotechnical Engineering of Winslow, Maine. The subsurface exploration program consisted of 8 test borings designated B-1 through B-8 drilled in the vicinity of the 1962 breakwater structure for the 1985 addition to the pier facility. Boring logs and an exploration location plan prepared by Morrison Geotechnical Engineering were included in the documents provided by Maine DOT for this project. Based on a review of the data, the borings were drilled to depths ranging between approximately 12.5 and 54.5 feet below the mudline. All explorations were terminated below the then-proposed dredge depth at elevation -40' MLW (approx. -50' NAVD88). It appears that some of the explorations were terminated at refusal on an apparent hard layer or bedrock. Some of the other explorations were terminated when all of the available drill rods were utilized. Bedrock was only sampled in boring B-7 and classified as "gray Basalt with Crystals."

Copies of the 1983 boring logs and a dredging plan illustrating the locations of the explorations are included in **Appendix B**.

2.2 CURRENT EXPLORATION PROGRAM

GZA reviewed the recent subsurface exploration program conducted by Schonewald Engineering Associates, Inc. (SEA). The exploration program consisted of eleven test borings designated MB-EAST-101 through MB-EAST-110 and the borings were drilled to total depths ranging from 21.7 to 111.8 feet below the mudline. Due to an anchor line break, the barge drifted and broke off the casing at boring MB-EAST-108. The boring was re-positioned and re-drilled as boring MB-EAST-108A. Maine Test Boring, Inc. of Hermon, Maine coordinated utility clearance and provided drilling services. Their work was completed between May 28, 2013 and June 17, 2013.

All of the test borings were drilled using a barge-mounted CME 45C modified drill rig. The locations of the test borings were determined by optical survey by CES, Inc. Mudline elevations at the explorations were calculated by SEA based on barge deck elevations surveyed by CES, Inc. using optical survey methods. The boring locations are shown on **Figure 2, Exploration Location Plan.**

All borings were drilled using drive and wash drilling techniques, 4-inch or 3-inch casing, and a split spoon soil sampler or NQ2 (2-inch ID double-tube) core barrel with wire-line rock coring equipment. Standard penetration testing (SPT) and split-spoon sampling were performed at 5-foot typical intervals in the borings using a rope, cathead, and a safety hammer. At some boring locations the sampling interval was increased to 10-feet or more. The SPT test consists of driving a 1-3/8-inch inside diameter standard split-spoon sampler, at least 18 inches, with a 140-pound hammer dropping from a height of 30 inches. The SPT N-value is the number of blows required to drive the sampler from the 6 to 18 inch penetration interval. Rock cores were drilled at all of

the boring locations to confirm the top of bedrock elevation, and to classify type and quality of the bedrock.

SEA personnel monitored the drilling work, visually classified the soil and rock samples, recorded inferred bedrock depths, calculated Rock Quality Designation (RQD) for the bedrock cores, and prepared logs of each boring that are included in **Appendix B**.

3.0 LABORATORY TESTING

No laboratory testing was completed for the soil or rock samples at the time of this report.

4.0 SUBSURFACE CONDITIONS

4.1 SURFICIAL AND BEDROCK GEOLOGY

Surficial and bedrock geology data reviewed for the site included

- "Areal Geology Map of the Eastport Quadrangle, Washington County, Maine", by F.C. Robinson, Nathaniel M. Jones, and C.S. Hichborn, U.S. Geological Survey, 1913;
- "Surficial Geology Map of the Eastport Quadrangle, Washington County, Maine", by F.C. Robinson, Nathaniel M. Jones, and C.S. Hichborn, U.S. Geological Survey, 1913;
- "Structure Sections Map of the Eastport Quadrangle, Washington County, Maine", by F.C. Robinson, Nathaniel M. Jones, and C.S. Hichborn, U.S. Geological Survey, 1913.

Based on the available literature, surficial geologic units mapped in the Eastport area include Marine Clay deposits, Marine-glacial Sand and Gravel deposits, and Glacial Till overlying bedrock. The following are brief descriptions of the units.

- The Marine Clay deposits are described as "fine gray to bluish clay with some red bands; sandy in places". These sediments were deposited on the sea floor during late-glacial marine submergence.
- The Marine-glacial Sand and Gravel deposits are described as "glacial outwash deposited in ocean water, or otherwise modified by marine agencies."
- The Glacial Till deposits are described as "gray bowlder clay, locally sandy and generally thin, with numerous outcrops of bedrock". The deposit is generally a blanket deposit directly over bedrock.
- Bedrock at the site is mapped as the Eastport Formation. The Eastport Formation consists of "diabase and rhyolite flows and tuffs and subordinate amounts of shale and limestone."

4.2 SUBSURFACE SOILS

Based on the recent borings, four primary soil units, "Marine Mudline Material", "Marine Deposits", "Marine-Glacial Sand and Gravel", and "Glacial Till" were encountered at the test borings. The Marine Mudline material (Muck) was encountered at boring locations MB-EAST-101, MB-EAST-102, and MB-EAST-110 and the Marine Deposits at a depth of 5 feet below the

mudline at boring location MB-EAST-106. A thick layer of Marine-Glacial Sand and Gravel was encountered at all boring locations. In borings MB-EAST-103 through MB-EAST-108, the Marine Glacial Sand and Gravel was underlain by Glacial Till that extended to the top of bedrock. The encountered thicknesses and generalized descriptions of the soil units are summarized in the following table. Detailed descriptions of the materials encountered at specific locations are provided on the boring logs included in **Appendix C**. Interpretive soil profiles were developed and are shown in **Figure 3 – Subsurface Profile Section A-A', Figure 4 – Subsurface Profile Section B-B', and Figure 5 – Subsurface Profile Section C-C'**. The generalized subsurface conditions are summarized in the table below.

GENERALIZED SUBSURFACE CONDITIONS		
Strata Designation	**Approximate Encountered Thickness**	**Generalized Description**
Marine Mudline Material	1' to 2.5' (MB-EAST-101,102,110)	Black MUCK, occasionally with trace Wood.
Marine Deposits	6' (MB-EAST-106 only)	Gray, Clayey SILT, trace fine Sand.
Marine-Glacial Sand and Gravel	29' to 45' (all borings)	Brown, loose to dense, fine to coarse SAND, little to some Gravel, trace to little Silt, with Cobbles and Boulders.
Glacial Till	2' (MB-EAST-103) 18' to 31' (MB-EAST-104 through 108)	Brown, dense to very dense, GRAVELLY SAND, trace to little Silt, with Cobbles and Boulders.
Bedrock	Top of Bedrock encountered @ El. -41.9 to -126.4 ft (NAVD88)	BASALT, very hard, fresh to slightly weathered, very close to moderately spaced fractures

4.2.1 Marine Mudline Material

Dredging has previously been performed along the eastern side of the 1985 pier addition. Borings MB-EAST-101 through MB-EAST-103 and MB-EAST-110 are located outside of this dredge area. A thin layer of marine muck or soft material at the mudline was inferred at these borings based on penetration rate of the drill casing. No marine mudline material was encountered within the dredged area at borings MB-EAST-104 through MB-EAST-109.

4.2.2 Marine Deposits

A thin layer of clayey silt was encountered only at boring MB-EAST-106, at relatively shallow depth below the mudline. The marine deposit appeared to be about 6 feet in thickness and was inferred to be relatively soft, based on drilling behavior. No other soft marine deposits were reported in the remaining borings.

4.2.3 Marine-Glacial Sand and Gravel Deposits

An extensive layer of marine-glacial sand and gravel outwash was encountered at all of the borings. The thickness of this layer ranged between 33 feet and 45 feet in the borings located in the area east of the existing pier (MB-EAST-104 through MB-EAST-108) and between 9 feet and 25 feet in thickness in the borings located north, west, and south of the existing pier (borings MB-EAST-101 through MB-EAST-103, MB-EAST-109, and MB-EAST-110). SPT N-values

through the outwash deposits ranged from 7 to 49 blows per foot. The majority of recorded SPT-N values indicated medium dense to dense consistency of the sand and gravel deposit.

Cobbles, boulders, or obstructions were inferred throughout the outwash material due to refusal of the split spoon sampler, refusal of the drill casing, and due to slow drilling progress with the roller bit or drill casing. Boulders and cobbles were noted in borings MB-EAST-101 and MB-EAST-110. Casing blows in excess of 100 blows per foot were noted in borings MB-EAST-101, 104, 107, 108, and 110. Refusals of the roller bit or drill casing on apparent boulders and cobbles in the Marine Glacial Sand and Gravel were noted in borings MB-EAST-101 and MB-EAST-110. Refusal of the split spoon sampler was noted in boring MB-EAST-102. Difficult drilling conditions were indicated in borings MB-EAST-101, MB-EAST-109, and MB-EAST-110 at various depths within the outwash.

4.2.4 Glacial Till

A stratum of glacial till was encountered in the borings MB-EAST-103 through MB-EAST-108. In boring MB-EAST-103, the glacial till appeared to be relatively thin at approximately 2 feet. In the area east of the existing pier (MB-EAST-104 through MB-EAST-108) the thickness of the glacial till layer ranged between 18 feet and 31 feet. SPT N-values through the glacial till ranged from 36 to 83 blows per foot. The majority of recorded SPT-N values indicated very dense consistency of the glacial till deposit.

Cobbles, boulders, or obstructions were inferred throughout the glacial till due to refusal of the split spoon sampler, refusal of the drill casing, and due to slow drilling progress with the roller bit or drill casing. Boulders and cobbles were noted in borings MB-EAST-103, MB-EAST-105, and MB-EAST-106. Casing blows in excess of 100 blows per foot were noted in borings MB-EAST-104, 105, 106, 107, and 108. Refusals of the roller bit or drill casing on apparent boulders and cobbles were noted in borings MB-EAST-103 and MB-EAST-108. "Boney Material" suggesting boulders and cobbles in the glacial till was noted in MB-EAST-106. Very difficult drilling was reported in the glacial till at boring MB-EAST-107. Marginally or minor cemented conditions of the till were reported in boring MB-EAST-105. Refusal of the split spoon sampler was noted in borings MB-EAST-103. Very difficult drilling conditions in the glacial till were indicated in boring MB-EAST-107.

4.3 BEDROCK

Bedrock was encountered in all of the recent boring locations. The top of the bedrock in the area of the new proposed pier (MB-EAST-104 to MB-EAST-108) was inferred between approximately 50 and 76 feet below the mudline, corresponding to approximate elevations -101' to -123'. In the area of the proposed approach trestle (MB-EAST-101, MB-EAST-109, and MB-EAST-110), the top of bedrock was indicated between approximately 11 and 27 feet below the mudline, corresponding to approximate elevations -48' to -50'. Bedrock was cored in all test borings except MB-EAST-108. The primary rock type encountered was very hard, fresh to moderately weathered, aphanitic, greenish gray, BASALT with predominantly low to high angle quartzite veins. Joints were very close to moderately spaced, low to high dip angle, undulating, rough, fresh to slightly discolored, and tight to partly open, with slight iron staining on joint faces and occasional silt infilling.

At boring MB-EAST-101, a layer of felsic-rich GABBRO with abundant microcline and plagioclase was encountered within the BASALT bedrock between 35.1 and 36.7 feet below mudline. At borings MB-EAST-106 and MB-EAST-107, a layer of medium to soft, moderately to

highly weathered, aphanitic to fine grained, porphyritic CONGLOMERATE was encountered with highly fractured and broken joints. The layer was located above the basalt bedrock.

On the boring log for MB-EAST-109, bedrock was reported at elevation -49.6 (NAVD88) which represents an abrupt variation with the refusal elevation of -87' (NAVD88 converted from MLW) reported in historic boring B-3, which is located approximately 40' south of MB-EAST-109.

Recovery of the bedrock cores generally ranged from 83 to 100 percent with one exception in Boring MB-EAST-108A, where the rock core recovery of 52 and 77 percent was measured in two core runs approximately 23 to 28 feet below the top of apparent bedrock. Rock Quality Designation (RQD) values of the bedrock sampled ranged between 0 and 77 percent with an average RQD of approximately 30 percent, generally indicating poor rock quality. The RQD is the percentage of recovered rock that is greater than 4 inches long, relative to the total penetration, and is a rough measure of the overall quality of the bedrock.

5.0 ENGINEERING EVALUATIONS AND DESIGN RECOMMENDATIONS

GZA completed geotechnical engineering evaluations based on the available subsurface exploration data, the proposed breakwater replacement schematics provided by Maine DOT, and preliminary design information provided by CEC.

Per the documents provided by Maine DOT, the proposed construction includes the demolition and removal of the 1962 solid-fill sheet pile breakwater and the construction a new 500 foot long by 50 foot wide section of pile supported pier (2014 section) east of the 1985 pier addition. To provide access to the new and existing pier sections, a 40 foot wide and approximately 300 foot long pile supported approach trestle is proposed in the alignment of the 1962 solid-fill sheet pile approach breakwater, connecting the new pier section to the shoreline and Water Street.

It is GZA's understanding that the foundation elements for the new pier addition will be subjected to large compression loads due to the dead load of the pier structure and live loads from the design vehicles and operating conditions. Lateral berthing loads, seismic loads, and wave and wind loads will be resisted by a combination of the vertical foundation elements in bending and battered foundation elements in axial tension and compression.

5.1 PIER FOUNDATION ALTERNATIVES

A deep foundation system consisting of driven displacement piles, drilled caissons, or rock socketed piles is feasible for the new pier. The type of pile, capacity, and installation method will generally be determined by the subsurface conditions and the economics of axial and lateral load versus the number of piles required. The use of battered piles may generate axial tension loads on adjacent vertical piles or opposing battered piles.

Pre-Cast Concrete Piles

Pre-cast concrete piles would be difficult to use because of the anticipated sloping bedrock surface and relatively shallow overburden in some areas of the new approach trestle. Pre-cast concrete piles may also be difficult to utilize due to the difficulty of anchoring and post-tensioning the concrete piles to resist tensile loads. Due to the long overall lengths of the

majority of the piles, a splicing detail would need to be cast into the pre-cast concrete piles and would be required to join the pre-stressed pile sections.

The highly variable bedrock elevations also make it difficult to predetermine the pile lengths for fabrication, and would probably result in a significant number of cut-offs and build-ups which are more difficult and costly for precast concrete than for steel.

Steel H-Piles

Steel H-piles are not considered a preferred pile type for exposed marine applications due to their susceptibility to corrosion. Because of double sided exposure of the sections, actual loss of member thickness occurs at twice the rate of a concrete-filled pipe pile.

Concrete Filled Composite Piles

Due to anticipated hard driving conditions in the relatively dense subsurface materials, it is expected that the capacity of concrete filled composite piles, such as fiberglass reinforced polymer (FRP) piles would be limited by the allowable stress in the FRP material during driving. This concern would also be significant for potential point loading conditions that may occur during driving of battered piles or otherwise where the pile tips impact a sloping bedrock surface.

Drilled Caissons / Monopiles

Large diameter drilled caissons or driven monopiles are considered to be a feasible foundation alternative from a technical perspective. However, they are not considered economically competitive for the pier foundations due to the large pile diameters that would be required to resist lateral berthing loads with exposed pile lengths on the order of approximately 70 feet. In addition to the cost of the piles, installation costs are also expected to be considerable due to the need for specialized pile hammers or pile top drills for the large diameter piles or caisson casings.

For structures that can tolerate larger deflections, the cantilevered mono pile option may be a feasible alternative.

This may be the case for a wave attenuator system, provided that the wave fence can be installed in an area of relatively shallow water depths to reduce the required pile diameters and steel thicknesses of the monopiles while still achieving tolerable deflections at the pile top. In order to increase the bending capacity of rock socketed, cantilevered king piles or monopiles for a wave attenuator in relatively shallow water, steel H-piles can be centered inside pre-drilled, cantilevered monopiles. The H-piles can be concreted into place to increase the stiffness of the king piles, while maintaining the diameter of the required drill holes and diameter and wall thickness of the pipe piles.

Concrete Filled Steel Pipe Piles

Based upon previous pier installation projects, discussions with Childs Engineering Corporation, and preliminary pier drawings, the preferred deep foundation system consists of concrete-filled steel pipe piles driven to the top of bedrock or socketed into the bedrock. Typical design capacities for driven concrete-filled steel pipe piles can range to approximately 250 to 350 tons per pile depending on the unsupported pile length above the mudline and the diameter and steel thickness of the selected pile. The piles will be supporting relatively large axial loads and may

need to be doweled or socketed into bedrock where shallow sloping rock and thin soil overburden conditions exist.

Steel pile piles lend themselves to be driven either open ended or with a concrete plug at the tip to prevent soil entering the inside of the pile during the driving process. It is expected that batter piles and some of the vertical piles will be subjected to tensile design loads. Due to the large axial tensile loads on the batter piles, these piles will have to be anchored with a rock anchor that is drilled through the center of the pile into the bedrock to resist axial tension loads generated by berthing, wind, seismic and wave loads. Depending on the contractor's means and pile installation methods, anchor installation through the center of the steel pile piles will require either removal of soil from the inside of piles that were driven open-ended, or drilling through a concrete plug pre-installed at the tip of closed ended piles. If tensile loads for vertical piles are minor, these piles may not require rock anchors, and may resist the uplift loads through mobilization of skin friction.

SPIN-FIN™ Piles

A variation of the preferred concrete-filled steel pipe pile foundation system consists of a proprietary pile type known as SPIN-FIN™ piles. Spin-fin piles differ from conventional pipe piles in that steel fins are welded to the lower segment with a helical alignment, giving the pile a screw-like appearance and characteristics. Spin-fin piles can be driven with a conventional impact hammer to the desired pile capacities, and can be utilized for vertical and batter piles that are subject to tension loads.

The dimensions and batter angle of the fins need to be designed for the project specific conditions and are shop or field fabricated and attached to the lower pile segment of the pile. The fins are designed to engage additional soil material and cause an increase in axial compressive and tensile capacity.

Based upon preliminary review of the subsurface conditions at the project site and required tensile capacities of some of the proposed vertical and batter piles, it is anticipated that spin-fin piles may be able to achieve design tensile capacity requirements and potentially eliminate the need for rock anchoring the piles in some or all locations where tensile load capacities are required.

GZA understands that due to the unique deformation characteristics of spin-fin piles, connections of the spin-fin pile to the pier structure typically require special details to develop the pile strength and to resist torsion. Conventional interface details such as short concrete embedment or penetration through piles by deck reinforcing steel are typically not acceptable and a premium should be expected to detail and construct the spin-fin / pier interface.

Since the spin-fin piles are driven with a rotating screw-like action, static pile load tests for these piles typically require special features. Specifically, the tested pile must be restrained against rotation to achieve accurate results. Similarly to conventional pipe piles, pile load tests generally follow ASTM Quick Load Tests Procedures, and can be extended to failure. Dynamic load tests are carried out in the same fashion as for conventional piles.

5.2 GEOTECHNICAL IMPLICATIONS

New Pier

The demolition and removal of the 1962 solid fill breakwater section of the facility will decrease the lateral support for the 1985 pier addition, to which it is tied to. During the design of the new pier addition, the connection of the new structure to the remaining 1985 section should be designed to provide lateral stability to the 1985 section.

The subsurface data in the proposed footprint of the new pier addition indicates that the top of bedrock elevations across this area range between -101.4 feet and -123.2 feet (NAVD88). Assuming a pier deck elevation of approximately 17 to 18 feet (NAVD88), it is anticipated that the total lengths of the pier piles will be between approximately 120 to 140 feet at the center section of the new pier with somewhat shorter piles at the inboard side of the pier and somewhat longer piles at the outboard side due to the top of bedrock sloping downwards from west to east. The exposed pile length is anticipated to be between approximately 60 to 70 feet from the pile cap to the mud line which has been dredged to approximate elevation -50 feet NAVD88 within the footprint of the new pier.

It is anticipated that the piles can either be driven open-ended or closed ended with a concrete plug in the tip of the piles. In either case, hardened driving shoes should be fitted on the outside of the pile tips due to the expected hard driving conditions.

New Approach Trestle

The borings closest to the middle of the approach trestle (MB-EAST-101 and MB-EAST-110) encountered the top of bedrock at approximately the same depth. The two borings closest to the eastern end of the proposed approach trestle (MB-EAST-109 and B3) show top of bedrock at highly variable depth, despite their relative proximity of approximately 40 feet. Based on the subsurface data that is available for the proposed footprint of the new approach trestle, the top of bedrock elevations across this area are expected to range between -45 feet and -55 feet (NAVD88) in the middle and from -45 feet to greater than -80 feet in the eastern portion of the proposed approach trestle. No boring information is available for the western portion of the proposed trestle where the structure will meet the shoreline. The bedrock surface is anticipated to slope gradually upwards towards the shoreline.

Assuming a pier deck elevation of approximately 17 to 18 feet (NGVD88), the total lengths of the approach trestle piles are expected to range between approximately 60 to over 90 feet with somewhat shorter piles towards the landside of the trestle and the longer piles where the approach trestle will connect to the existing and new pier due to the top of bedrock sloping downwards from west to east. The exposed pile length is expected to be between approximately 40 to 55 feet from the pile cap to the mud line.

At a minimum, all driven piles should be fitted with a hardened driving shoe. In more extreme cases, piles may have to be drilled and socketed into bedrock to obtain stability, especially in areas of shallow overburden.

Pile Stability

Based upon bedrock elevations observed within the subsurface explorations, it appears that the bedrock surface is sloping downwards gradually to steeply from west to east along the proposed

alignment of the approach trestle and within the footprint of the new pier addition which may create installation challenges at the time of construction. Where limited thickness of overburden soil and a hard and sloping bedrock surface is present, the pile tip may slide on the bedrock surface, if the confining overburden does not provide sufficient stability for the pile tip. Fitting the driven piles with a hardened driving shoe is recommended to help the piles to "bite" into the bedrock. For batter piles that require anchoring, an outside driving shoe is recommended to allow the anchor to be drilled into the bedrock. For vertical piles that do not experience uplift loads, an H-pile with a hard bite drive shoe could be fitted to the tip of the vertical piles. In extreme cases, piles may have to be drilled and socketed to obtain stability, especially in areas of shallow overburden.

Due to the relatively large unsupported pile length from the mudline to the pier deck, the piles should be analyzed for fixity and for buckling considerations as part of the structural design.

5.3 SUBSURFACE DESIGN PROFILES:

GZA prepared three interpretive subsurface profiles. The profiles are attached as ***Figure 3*** through ***Figure 5***. Based on these interpretive subsurface profiles, GZA developed two design profiles for use in evaluating the soil engineering parameters for the pier foundations for the pier addition and for the approach trestle. For design purposes, the depths and elevations of the identified subsurface layers were conservatively selected. All elevations are referenced to NAVD88.

Deep Profile: Subsurface Profile along approximate center of New Pier Addition (Profile A-A')

- Mudline at elevation -53 feet
  (varies between approximately -50' and -52', 2 feet of scour considered)
- Medium dense to dense Sand & Gravel to elevation -98 feet
  (varies between approximately -90' and -100')
- Dense to very dense Glacial Till to elevation -118 feet
  (varies between approximately -98' and -122'
- Bedrock below

Shallow Profile: Subsurface Profile along approximate center of Approach Trestle (Profile B-B')

- Mudline at elevation -30 feet
  (varies between approximately -27' and -50')
- Medium dense to dense Sand & Gravel to elevation -45 feet
  (varies between approximately -38' and -90')
- Bedrock below

Lateral pile analyses will be performed by Childs Engineering Corporation (CEC). GZA has performed evaluations for preliminary pile dimensions provided by CEC and developed soil-spring constants (p-y, t-z, and q-w) for the above subsurface design profiles. Recommended geotechnical input parameters for use with analysis software such as STAAD or RISA have been provided to CEC.

5.4 RECOMMENDED SOIL AND ROCK PROPERTIES FOR DESIGN

Based on the subsurface data reported on the boring logs, the existing subgrade materials within the proposed footprint of the pier addition can be classified as medium dense sand & gravel, dense sand & gravel, and bedrock. Soil properties recommended for use in geotechnical evaluations and design are based on test boring data, correlations from standard penetration test

SPT-N values, and local project experience. The following summarizes the soil and bedrock material properties and engineering parameters recommended for use in the design of the pile foundations using geotechnical design software including A-Pile, L-Pile, and for evaluation of the rock anchors.

Sand & Gravel Outwash (mudline to 45 feet depth)

- Assumed Scour depth = 2 feet (no analysis performed)
- Internal Angle of Friction = 34°
- Total Unit Weight = 125 pounds per cubic foot (pcf)
- Bearing Capacity Factor N_q=42
- Modulus of Lateral Subgrade Reaction K = 60 – 70 lb/in
- Lateral Earth Pressure Coefficient, K_{hc} = 1.0 (compression - for open ended piles)
- Lateral Earth Pressure Coefficient, K_{hc} = 1.5 (compression - for closed ended piles)
- Lateral Earth Pressure Coefficient, K_{ht} = 0.6 (tension - for closed ended piles)

Glacial Till (45 feet to top of bedrock)

- Internal Angle of Friction = 36°
- Total Unit Weight = 130 pounds per cubic foot (pcf)
- Bearing Capacity Factor N_q=62
- Modulus of Lateral Subgrade Reaction K = 90 – 100 lb/in
- Lateral Earth Pressure Coefficient, K_{hc} = 1.0 (compression - for open ended piles)
- Lateral Earth Pressure Coefficient, K_{hc} = 1.5 (compression - for closed ended piles)
- Lateral Earth Pressure Coefficient, K_{ht} = 0.6 (tension - for closed ended piles)

Bedrock

- Unit Weight = 160 pcf
- Unconfined Compressive Strength = 10,000 psi
- Poor to fair Quality (based on RQD)
    - potential tensile failure cone in the bedrock at angle of 60° (30° half angle)
    - tip of failure cone approximately at midpoint of bond length
- Ultimate Grout to rock bond stress = 200 psi

5.5 FACTORS OF SAFETY FOR GEOTECHNICAL DESIGN

The geotechnical design of the piles for the pier, approach trestle, and the wave attenuation system were carried out in Allowable Stress Design (ASD). The following factors of safety were used:

- Pile Dead Weight: F.S. = 1.0
- Pile Axial Capacity: F.S. = 2.0 (load test during construction required)
- Grout Bond Stresses: F.S. = 2.0
- Strength of Steel Tendons: F.S. = 1.5 (0.66 * f_y)

5.6 CONCEPT DESIGN OF PILE FOUNDATIONS

Based on the available subsurface data, the design criteria provided by Maine DOT, and pile loads developed by CEC, the following concept design for the pile foundations has been prepared:

New Pier and Approach Trestle Piles:

It is anticipated that the new pier will be supported by vertical and battered steel pile piles. The geotechnical design assumes that vertical piles will be driven open ended to capacity on or near bedrock. Batter piles will be driven open ended or closed ended (concrete plug in pile tip) to capacity on or near bedrock and the tensile loads in the batter piles will be resisted by anchors drilled through the center of the pile into the underlying bedrock. Anchor installation may require removing the soil plug expected to form in open ended piles or drilling through the concrete plug at the tip of the closed ended pile. A summary of the design criteria is provided below:

- Vertical Piles:
  - Up to 306 kip compression load (unfactored)
  - Up to 64 kip tensile load (unfactored)
  - PP20x0.625 (ASTM A352 Grade 3 Modified, 50 ksi yield stress) steel pipe piles
  - Driven (open ended) to capacity on or near bedrock
- Batter Piles (at 3' on 12' batter):
  - Up to 250 kip compression load (unfactored),
  - Up to 176 kip tension load (unfactored)
  - PP20x0.625 (ASTM A352 Grade 3 Modified, 50 ksi yield stress) steel pipe piles
  - Driven (closed ended with 6-foot concrete plug or open ended) to capacity on or near bedrock
  - Anchored with steel tendon to provide tensile capacity
    - anchors drilled through concrete plug or soil plug to at least 30 feet into bedrock
    - Anchors in piles to be proof tested and post-tensioned following the installation of each anchor

Wave Attenuator Piles:

It is expected that the new wave attenuation system will be comprised of vertical steel king piles and sheet pile lagging. Lateral wave loads will be resisted by the pile-reinforced, concrete-filled, steel pipe king piles in bending. The geotechnical design assumes that the vertical mono piles be pre-drilled and socketed into bedrock to achieve the required axial compression capacity and lateral fixity. A minimum embedment depth into the overburden and the bedrock of the pile is required to achieve the required fixity and lateral support of the vertical piles. GZA understands that CEC is evaluating the fixity of the wave attenuator piles. Concrete infill and the installation of a W-section centered inside the pipe pile is assumed for corrosion protection and to add bending resistance. A summary of the preliminary design results is provided below:

- Vertical King Piles: approximately 62 kip compression load
  - PP24x0.625 steel pipe piles, concrete filled
  - PZ27 sheet pile lagging
  - Pre-drilled and rock-socketed
  - Reinforced with W-section and concrete infill

5.7 APPROACH TRESTLE ABUTMENT

No boring information is available in the proposed abutment area. Based on the closest subsurface information available, the abutment walls are likely to bear on medium dense to dense glacial outwash material. The abutment foundations should be designed for an allowable bearing pressure of 4000 pounds per square foot. The abutment walls will need to be designed for lateral earth pressure. The recommended lateral earth pressure coefficient is K_a =0.30 for structural backfill, assuming that the tops of the walls are free to rotate. The abutment should be protected from wave action by placement of rip rap.

6.0 CONSTRUCTION CONSIDERATIONS

Construction considerations are intended to provide a basis for design development and to identify significant issues that may impact project construction. These items are provided in the paragraphs that follow.

6.1 DEMOLITION / REMOVAL OF EXISTING SOILD FILL BREAKWATER

Care will need to be exercised not to damage and impact the existing pier structure during removal of the 1962 solid-fill breakwater. The sequence of construction should provide for construction of the new pier addition, and the connection of the new pier addition to the 1985 section of the existing pier, prior to removal of the 1962 breakwater, which is currently providing lateral support to the 1985 pier section.

6.2 PIER ADDITION

The new pier dimensions are approximately 40 feet wide by 400 feet long. Where the new structure connects to the existing 1985 section of the pier, it is anticipated that partial demolition of the existing concrete deck, concrete pile caps, mooring hardware, and fender system may be required.

6.3 APPROACH TRESTLE

Demolition of the existing solid-fill approach breakwater will be required. Following the excavation of the breakwater fill and removal of the steel sheet piling, dredging of the approach pier footprint may be required to provide the required water depth in the adjacent boat anchorage area. It may be advantageous to excavate as much of the breakwater fill as possible prior to removal of the southern line of sheet piles to prevent breakwater fill from raveling into the boat anchorage area due south of the approach trestle.

The new approach trestle dimensions are approximately 40 feet wide by 260 feet long. It is anticipated that bedrock may be shallow near the shoreline and will limit the achievable pile embedment. The design will need to consider the minimum pile embedment needed to achieve fixity of the pile foundation, and provide alternative means of developing lateral resistance and tip fixity in the event that the required embedment cannot be achieved.

As an alternative, the approach trestle could be repaired by installing new sheetpiles around the perimeter of the current existing sheetpile shell, and new tierods and associated wales to resist the

lateral forces from the breakwater backfill. The new sheetpiles, wales, and tie rods should be designed to withstand the full earth pressure of the breakwater backfill without reliance on the existing and deteriorating sheetpile shell. The annulus between new and old sheetpiles should be filled with free-draining granular backfill or concrete.

6.4 PILES

During the installation of new steel pipe piles, obstructions may be encountered. Provisions to clear obstructions should be included in the technical specifications and be required to be submitted by the contractor. Clearing obstructions could be achieved by internally drilling ahead of the pipe piles if they are not fitted with a concrete plug. Alternatively, additional piles may need to be added in the field to offset misalignment due to obstructions. In these cases, it may be required to locally re-design the pile cap to accept a pile configuration that reflects actual installation conditions.

A program to determine approximate bedrock elevations in the area of the landside connection of the approach pier to Water Street, (consisting of a series of pile probes to apparent refusal), should be performed prior to final bid or should be included into the contract specifications to evaluate the expected pile lengths in areas of shallow sloping rock. Final pile sizing should be performed upon completion of the probes. We recommend that the bid price of the piles be based on a unit price to account for the variable pile lengths expected for portions of the proposed construction. One or more compression load tests will need to be performed during construction to evaluate achievable axial capacity to confirm the design assumptions.

6.5 BATTER PILES

Depending on the final approach trestle design, battered piles may be required along the center of the approach trestle. Batter piles will be required for the pier addition to resist lateral loads.

For the approach trestle, the magnitude of the pile reactions, the depth to bedrock, and the thickness of soil overburden above bedrock will dictate the need for either anchors or sockets. For the pier addition, it is anticipated that sufficient soil overburden above the bedrock is present. All batter piles will be driven to or near the bedrock surface and anchored to the underlying bedrock to provide the required tensile capacity to resist the uplift loads generated by the pier berthing loads.

One or more verification load test on installed anchors will need to be performed during construction to evaluate achievable axial capacity to confirm the design assumptions. All installed anchors should be proof tested as part of the acceptance procedures.

6.6 ROCK ANCHORS

Rock anchors will be required for all batter piles to anchor the pile to bedrock and to resist the pile uplift loads generated by lateral berthing loads. The rock anchors will need to be drilled through the concrete or soil plug at the tip of the pile a specified distance into the underlying bedrock. The annulus between the installed anchor tendon and the bedrock will be grouted. The completed anchor will need to be proof-tested and then either post-tensioned and locked off at the design anchor capacity (plus an allowance for anticipated creep) or cast passively into the pile concrete. If the anchor is post-tensioned, the batter piles will have to be designed for both buckling and compression considering the design compressive load plus the anchor post-tensioning load.

If the pile cannot be driven to the top of bedrock, the anchor drilling may need to be performed with a protective casing from the tip of the pile through the remaining soil overburden to the bedrock surface. The bonded zone of the anchors will be entirely in bedrock.

High capacity (150 ksi) all-thread bars are recommended for the rock anchors with the dimension sized to transfer the design uplift loads. The length of the bonded zone will be sized to provide the required development for load transfer to the grout and the rock, and to activate a rock mass with sufficient dead load to resist the design uplift. Rock anchors should be double corrosion protected.

6.7 WAVE ATTENUATION SYSTEM / BREAKWATER

To achieve the required pile fixity, the vertical king piles of the wave attenuation system will have to be installed to a minimum embedment depth. The required embedment depth will depend on the size and stiffness of the piles. Where the embedment depth can be achieved in the overburden, the vertical piles can resist the design wave loads due to the lateral confinement of the surrounding soil. Where shallow bedrock limits the achievable pile embedment, the vertical piles may need to be socketed into bedrock.

If pipe piles or sheet piles are driven within the footprint of the demolished 1962 breakwater, temporary removal of the breakwater fill may be required to install the steel pilings into the subgrade. The breakwater fill is described as "large stone", and could complicate the accurate driving or even prevent the pilings from being installed if the size of the individual particles is large enough to obstruct the piles.

6.8 REUSE OF EXISTING BREAKWATER FILL

Based on historical drawings of the existing facility, the solid-fill breakwater was constructed using “large stone” as backfill. Depending on the nature of the backfill, it may be possible to re-use the material as scour protection layer of for backfill behind the approach trestle abutment. The material should be visually observed and classified during excavation to determine if there are beneficial uses.

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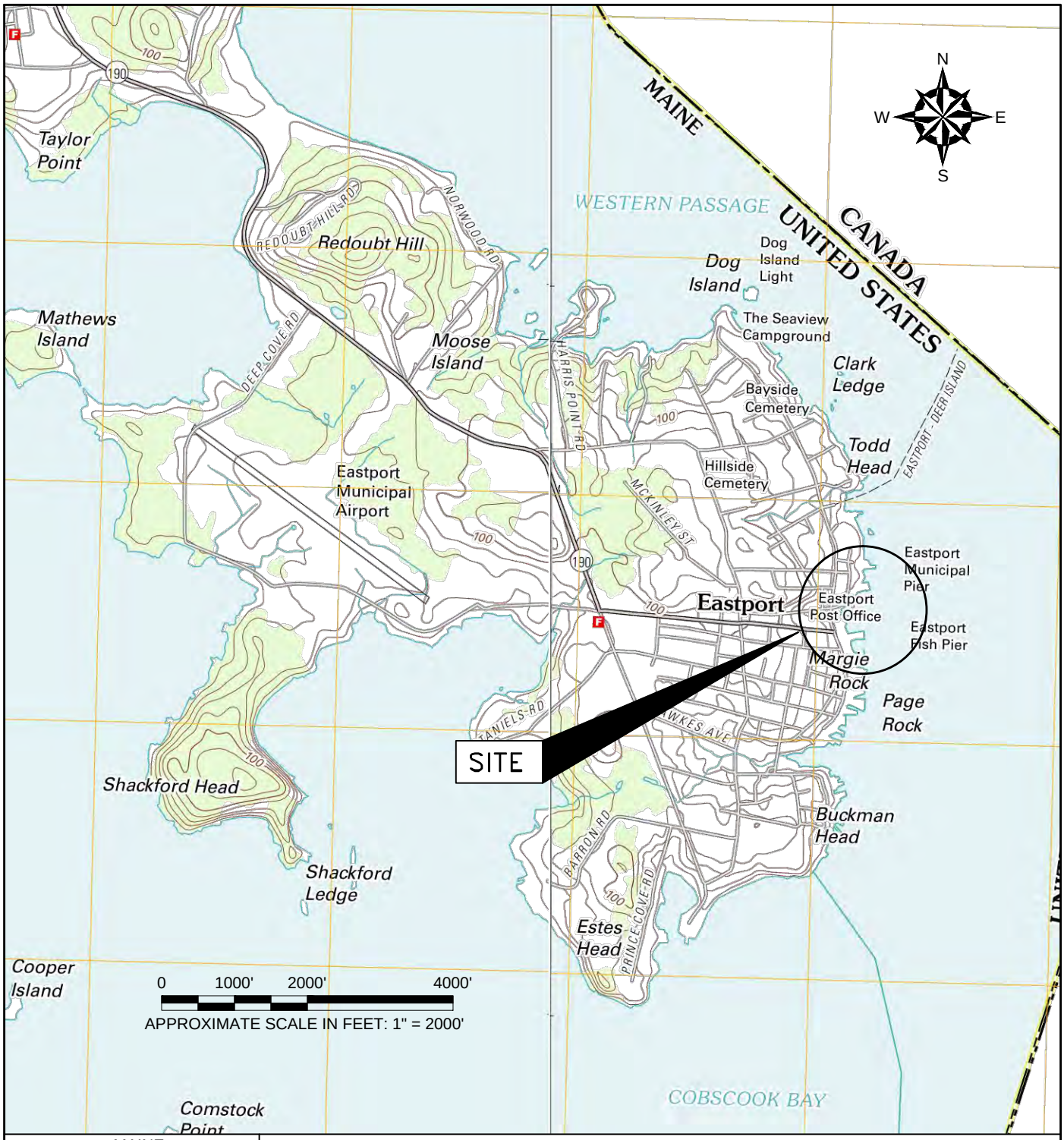
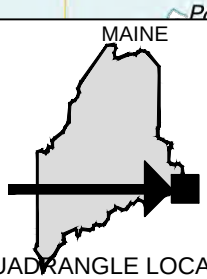
FIGURES





QUADRANGLE LOCATION

SOURCE:

BASE MAP FROM THE FOLLOWING USGS QUADRANGLE MAP:
EASTPORT OE E, ME–NB (2011)
EASTPORT, ME–NB (2011)

DIGITAL TOPOGRAPHIC MAPS PROVIDED BY USGSSTORE.GOV.
CONTOUR ELEVATIONS REFERENCE NAVD 88,
CONTOURS ARE SHOWN IN FEET AT 10 FOOT INTERVALS

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EASTPORT BREAKWATER REPLACEMENT
EASTPORT, MAINE

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

PREPARED FOR:
MAINE
DEPARTMENT OF TRANSPORTATION

LOCUS PLAN

PROJ MGR: AH	REVIEWED BY: DRC	CHECKED BY: CLS	FIGURE
DESIGNED BY: AH	DRAWN BY: SBB	SCALE: 1" = 2000'	1
DATE: SEPT 2013	PROJECT NO. 33940.00	REVISION NO. 0	SHEET NO.

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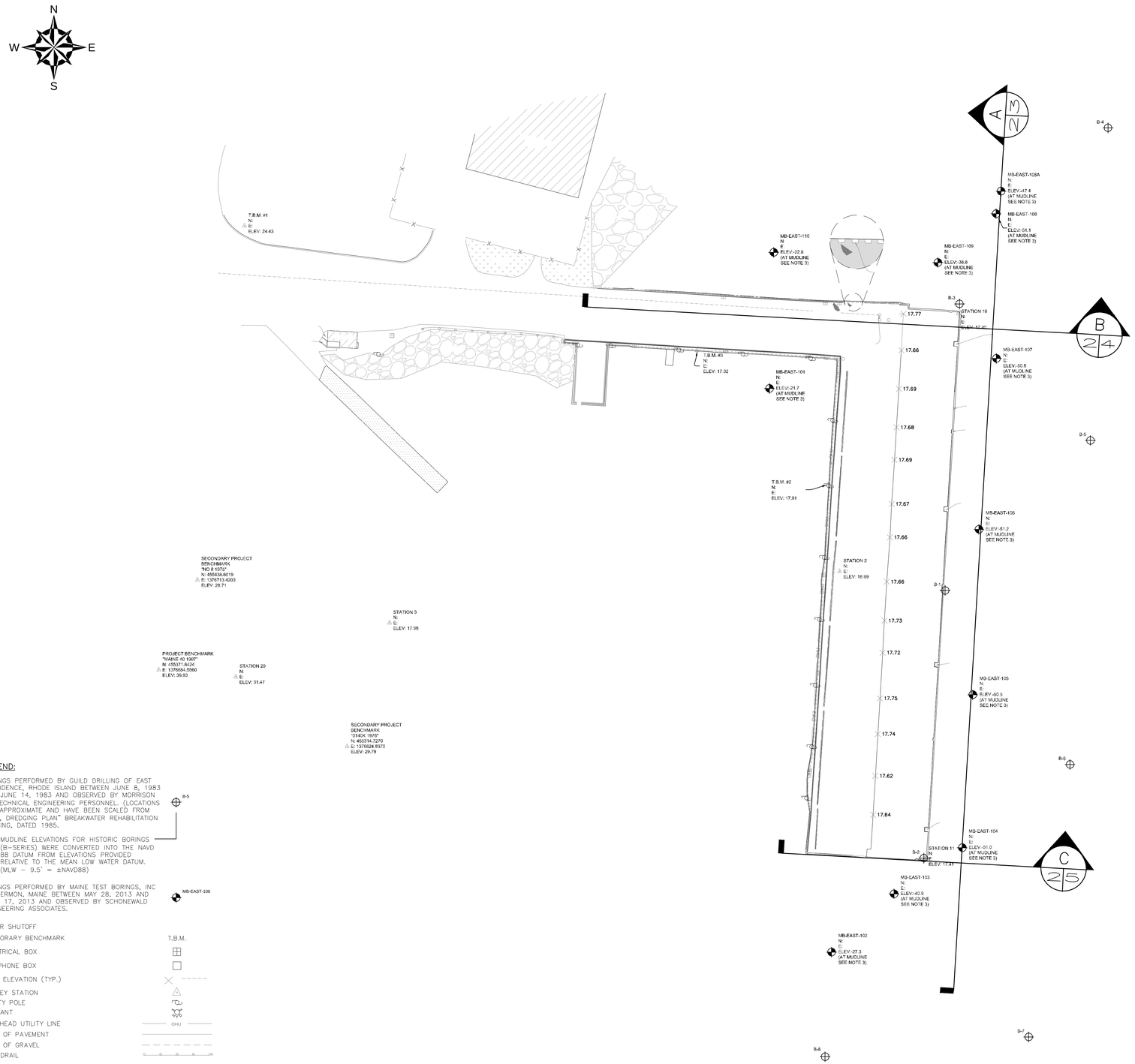

PLAN REFERENCE:

1. REFERENCE IS MADE TO A SURVEY PLAN ENTITLED "EAST PORT PORT AUTHORITY SITE PLAN" PREPARED BY CES, DATED JUNE 28, 2013. SURVEY NOTES TAKEN FROM SITE PLAN.

2. REFERENCE IS MADE TO A PLAN ENTITLED "CONTRACT DRAWINGS EASTPORT PORT AUTHORITY, BREAKWATER REHABILITATION EASTPORT, MAINE, CONTRACT NO. 83-2" PREPARED BY MORRISON GEOTECHNICAL ENGINEERING, STAMPED DATE AUGUST 15, 1986 AND NOTED AS "RECORD DRAWING."

SURVEY NOTES:

1. THIS PLAN IS ORIENTED TO GRID NORTH – NAD 83, MAINE EAST ZONE. ELEVATIONS SHOWN ARE REFERENCED TO THE NAVD 88 DATUM. PROJECT BENCHMARKS ARE:

   VERTICAL:

   A. A USGS SURVEY DISK STAMPED "MAINE 40 1907" AND DESCRIBED BY COAST AND GEODETIC SURVEY 1946 AT EASTPORT, WASHINGTON COUNTY, IN THE WEST SIDE OF THE POST OFFICE AND CUSTOM HOUSE, 14.2 FEET NORTH OF THE SOUTH END OF THE BUILDING, AND ABOUT 3-1/2 FEET ABOVE GROUND. A UNITED STATE GEOLOGICAL SURVEY STANDARD DISK, STAMPED 40 AND SET VERTICALLY.
   (PID: PD0003)
   PUBLISHED ELEVATION: 39.93 FEET (NAVD 88)

   B. A NOS SURVEY DISK STAMPED "0140K 1976" AND DESCRIBED BY NATIONAL GEODETIC SURVEY 1978 AT EASTPORT, 107.8 FEET SOUTH OF AND ACROSS THE STREET FROM THE SOUTH CORNER OF THE POST OFFICE AT EASTPORT, 5.8 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF CURB STONE, AT THE NORTH END OF THE GRANITE STEP, AT THE ENTRANCE TO THE BANGOR ELECTRIC COMPANY OFFICE.
   (PID: PD0524)
   PUBLISHED ELEVATION: 29.80 FEET (NAVD 88)

   C. A NOS SURVEY DISK STAMPED "NO 8 1975" AND DESCRIBED BY NATIONAL GEODETIC SURVEY 1978 AT EASTPORT, 5.2 FEET EAST OF THE NORTHEAST CORNER OF THE POST OFFICE, IN TOP OF A CURVED SECTION OF CURB.
   (PID: PD0520)
   PUBLISHED ELEVATION: 28.74 (NAVD 88)

   FOR COMPARISON TO ELEVATIONS DEPICTED ON PLAN REFERENCE 1, THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) WEBSITE STATES:

   "MEAN SEA LEVEL (MSL) IS A TIDAL DATUM DETERMINED OVER A 19-YEAR NATIONAL TIDAL DATUM EPOCH. IT PERTAINS TO LOCAL MEAN SEA LEVEL AND SHOULD NOT BE CONFUSED WITH THE FIXED DATUMS OF NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)."

   "NAVD88 IS A FIXED DATUM DERIVED FROM A SIMULTANEOUS, LEAST SQUARES, MINIMUM CONSTRAINT ADJUSTMENT OF CANADIAN/MEXICAN/UNITED STATES LEVELING OBSERVATIONS. LOCAL MEAN SEA LEVEL OBSERVED AT FATHER POINT/RIMOUSKI, CANADA WAS HELD FIXED AS THE SINGLE INITIAL CONSTRAINT. NAVD88 REPLACES NGVD29 AS THE NATIONAL STANDARD GEODETIC REFERENCE FOR HEIGHTS."

   FOR THE TIDAL EPOCH 1983-2001 (19 YEARS), THE NOAA WEBSITE PROVIDES THE FOLLOWING COMPARISON TO MEAN LOWER LOW WATER (MLLW), IN METERS (AND CONVERTED TO U.S. SURVEY FEET).

HIGHEST OBSERVED WATER LEVEL (01/10/1997)		=	7.383	(24.222)
MEAN HIGHER HIGH WATER	MHHW	=	5.874	(19.272)
MEAN HIGH WATER	MHW	=	5.729	(18.796)
NORTH AMERICAN VERTICAL DATUM	NAVD88	=	3.029	(9.938)
MEAN SEA LEVEL	MSL	=	2.958	(9.705)
MEAN TIDE LEVEL	MTL	=	2.932	(9.619)
MEAN LOW WATER	MLW	=	0.136	(0.446)
MEAN LOWER LOW WATER	MLLW	=	0.000	(0.000)
LOWEST OBSERVED WATER LEVEL (08/09/1972)		=	−1.426	(−4.678)

   THIS COMPARISON HIGHLIGHTED AN ELEVATION ERROR WITH THE ORIGINAL VERSION OF THIS (CES) PLAN. SPECIFICALLY, THE PUBLISHED ELEVATION OF THE PROJECT BENCHMARK (MAINE 40 1907) WAS CONFUSED WITH ANOTHER BENCHMARK, FORMERLY LOCATED AT THE EASTPORT POST OFFICE, BUT WHICH NO LONGER EXISTS. A DIFFERENCE OF 3.18 FEET WAS FOUND AND IS CORRECTED BY THE DATA DEPICTED HEREON.

   HORIZONTAL:

   A. A NATIONAL GEODETIC SURVEY DISK STAMPED "EPM A 1995" AND DESCRIBED BY JE CHANCE AND ASSOCIATES 1995 AS "SET FLUSH IN THE TOP OF A ROCK LEDGE" AT THE EASTPORT MUNICIPAL AIRPORT.
   (PID: AB2646)
   PUBLISHED NORTHING: 456308.323 FEET (NAD 83, MAINE EAST ZONE)
   PUBLISHED EASTING: 1369779.744 FEET (NAD 83, MAINE EAST ZONE)

   B. A NATIONAL GEODETIC SURVEY DISK STAMPED "EPM B 1995" AND DESCRIBED BY JE CHANCE AND ASSOCIATES 1995 AS "SET FLUSH IN A MASSIVE ROCK OUTCROP AT TOP OF KNOLL" AT THE EASTPORT MUNICIPAL AIRPORT.
   (PID: AB2647)
   PUBLISHED NORTHING: 455370.1752 FEET (NAD 83, MAINE EAST ZONE)
   PUBLISHED EASTING: 1371140.834 FEET (NAD 83, MAINE EAST ZONE)

2. TEMPORARY BENCHMARKS (T.B.M.):

   T.B.M. #1 = PK NAIL FOUND 1 FOOT ABOVE GRADE IN THE WESTERLY FACE OF A POLE.
   ELEVATION = 24.43 FEET (NAVD 88)

   T.B.M. #2 = 6" NAIL SET IN A POLE.
   ELEVATION = 17.91 FEET (NAVD 88)

   T.B.M. #3 = NAIL IN WOOD BUMPER WITH DISK "USC&GS BM"
   ELEVATION = 17.32 FEET (NAVD 88)

3. "MUDLINE" ELEVATIONS WERE CALCULATED BY SCHONEWALD EA, BASED UPON SURVEYED BARGE DECK ELEVATIONS (RELATIVE TO NAVD 88) PROVIDED BY CES AND WATER DEPTH AT THE TIME OF THE SURVEY.

4. THIS PLAN WAS PREPARED TO DEPICT EXISTING CONDITIONS (AS OF JUNE 19, 2013.)

0 20' 40' 80' 120'
SCALE IN FEET 1" = 40'

LEGEND:

BORINGS PERFORMED BY GUILD DRILLING OF EAST PROVIDENCE, RHODE ISLAND BETWEEN JUNE 8, 1983 AND JUNE 14, 1983 AND OBSERVED BY MORRISON GEOTECHNICAL ENGINEERING PERSONNEL. (LOCATIONS ARE APPROXIMATE AND HAVE BEEN SCALED FROM "C-2, DREDDING PLAN" BREAKWATER REHABILITATION DRAWING, DATED 1985. — B-5

MUDLINE ELEVATIONS FOR HISTORIC BORINGS (B-SERIES) WERE CONVERTED INTO THE NAVD 88 DATUM FROM ELEVATIONS PROVIDED RELATIVE TO THE MEAN LOW WATER DATUM. (MLW – 9.5' = ±NAVD88)

BORINGS PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN MAY 28, 2013 AND JUNE 17, 2013 AND OBSERVED BY SCHONEWALD ENGINEERING ASSOCIATES. — MB-EAST-106

WATER SHUTOFF
TEMPORARY BENCHMARK — T.B.M.
ELECTRICAL BOX
TELEPHONE BOX
SPOT ELEVATION (TYP.)
SURVEY STATION
UTILITY POLE
HYDRANT
OVERHEAD UTILITY LINE — OHU
EDGE OF PAVEMENT
EDGE OF GRAVEL
GUARDRAIL

NO.	ISSUE/DESCRIPTION	BY	DATE

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EASTPORT BREAKWATER REPLACEMENT
EASTPORT, MAINE

SUBSURFACE PROFILE KEY PLAN AND EXPLORATION LOCATION PLAN

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

PREPARED FOR:
MAINE
DEPARTMENT OF TRANSPORTATION

PROJ MGR: AH	REVIEWED BY: CLS	CHECKED BY: MEA	FIGURE
DESIGNED BY: AH	DRAWN BY: SBB	SCALE: 1: = 40'	2
DATE: JULY 21, 2014	PROJECT NO. 33940.00	REVISION NO. 0	SHEET NO.

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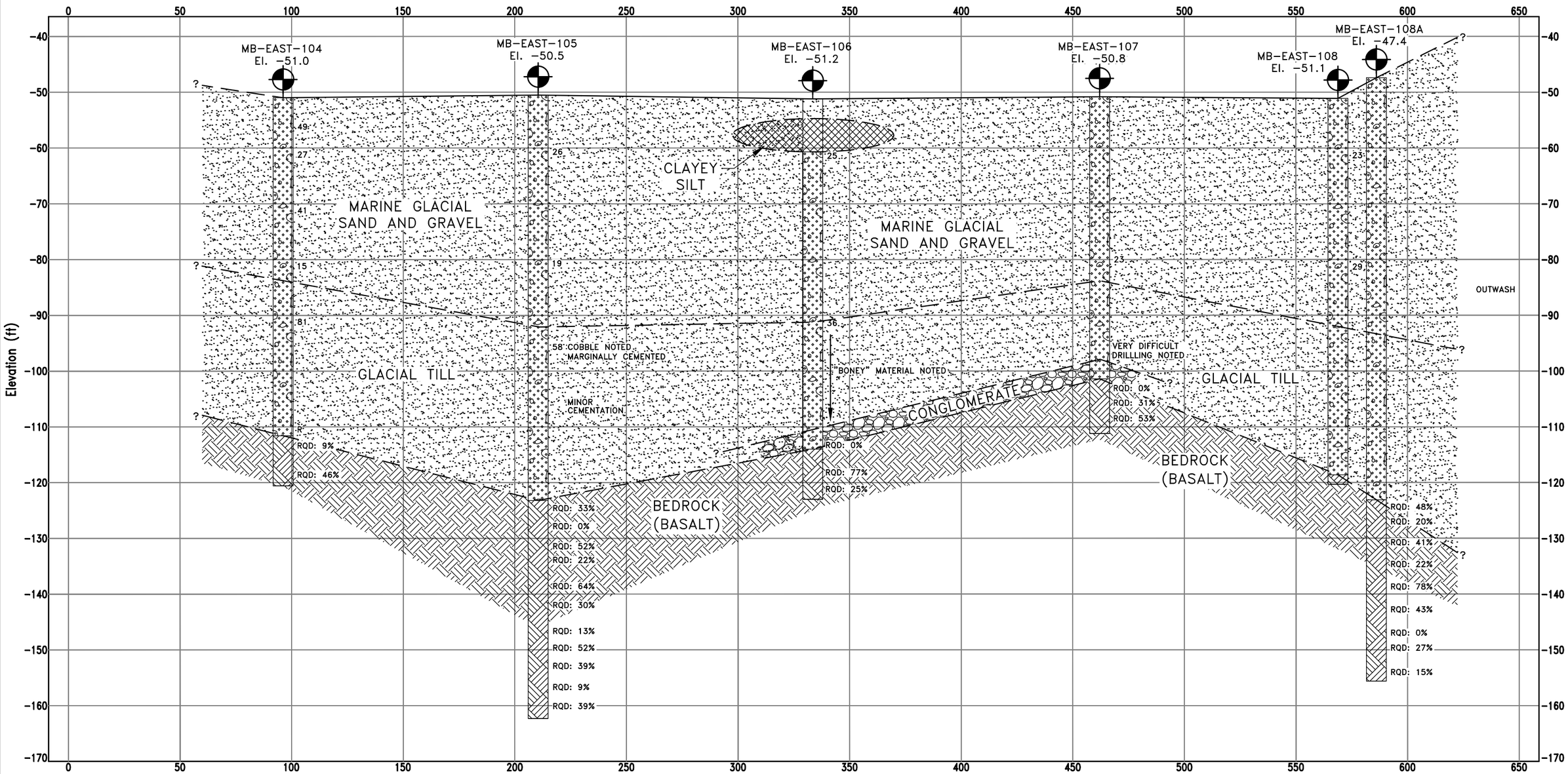

NOTES:

1) THIS GENERALIZED INTERPRETIVE SOIL PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDRIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSACTIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.

2) THE LOCATION AND ELEVATION OF THE BORINGS WERE LOCATED USING OPTICAL SURVEY METHODS AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

3) BORINGS WERE PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN MAY 28, 2013 AND JUNE 17, 2013 AND OBSERVED BY SCHONEWALD ENGINEERING ASSOCIATES.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

MB-EAST-109 — INDICATES BOREHOLE DESIGNATION
El. -38.8 — INDICATES APPROXIMATE GROUND SURFACE ELEVATION (NAVD88)

OUTWASH — 23 — INDICATES STANDARD PENETRATION TEST VALUE (SPT)

BEDROCK — RQD: 27% — INDICATES ROCK QUALITY DESIGNATION (RQD)

Prepared By: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	Eastport Breakwater Replacement Eastport, Maine Maine Department of Transportation	Project No.: 33940.00 File Name: 33940.00_F1-5_R0.dwg
Project Mgr.: AH Designed By: SMF Reviewed By: CLS Drawn By: SBB Revision No.: 1 Date: 7/21/14	Title: INTERPRETIVE SUBSURFACE – PROFILE A-A'	Figure No.: 3

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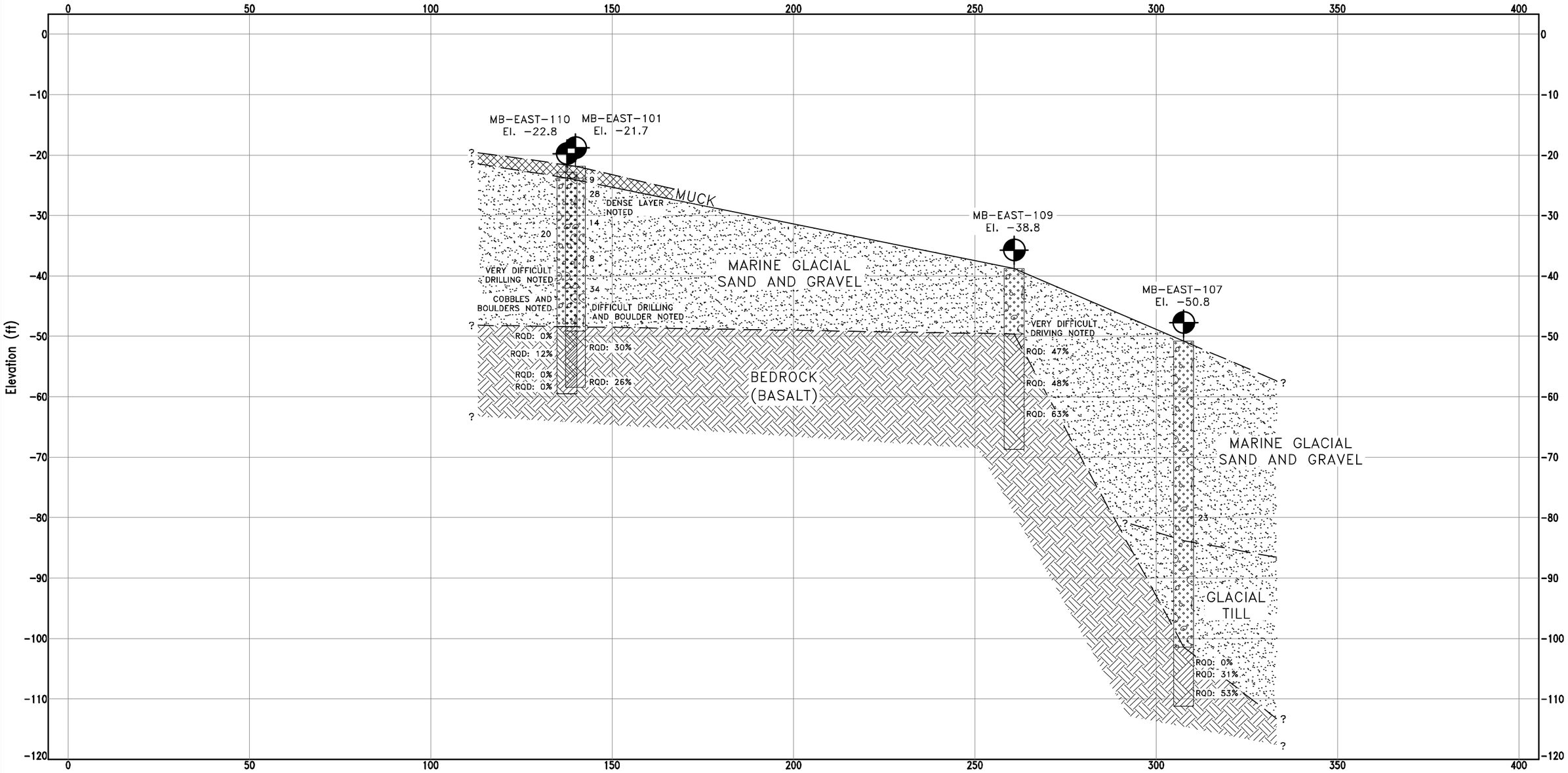

NOTES:

1) THIS GENERALIZED INTERPRETIVE SOIL PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDRIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSACTIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.

2) THE LOCATION AND ELEVATION OF THE BORINGS WERE LOCATED USING OPTICAL SURVEY METHODS AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

3) BORINGS WERE PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN MAY 28, 2013 AND JUNE 17, 2013 AND OBSERVED BY SCHONEWALD ENGINEERING ASSOCIATES.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

MB-EAST-109 — INDICATES BOREHOLE DESIGNATION
El. -38.8 — INDICATES APPROXIMATE GROUND SURFACE ELEVATION (NAVD88)

OUTWASH
23 — INDICATES STANDARD PENETRATION TEST VALUE (SPT)

BEDROCK
RQD: 27% — INDICATES ROCK QUALITY DESIGNATION (RQD)

Prepared By: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	Eastport Breakwater Replacement Eastport, Maine Maine Department of Transportation	Project No.: 33940.00 File Name: 33940.00_F1-5_R0.dwg
Project Mgr.: AH Designed By: SMF Reviewed By: CLS Drawn By: SBB Revision No.: 1 Date: 7/21/14	Title: INTERPRETIVE SUBSURFACE - PROFILE B-B'	Figure No.: 4

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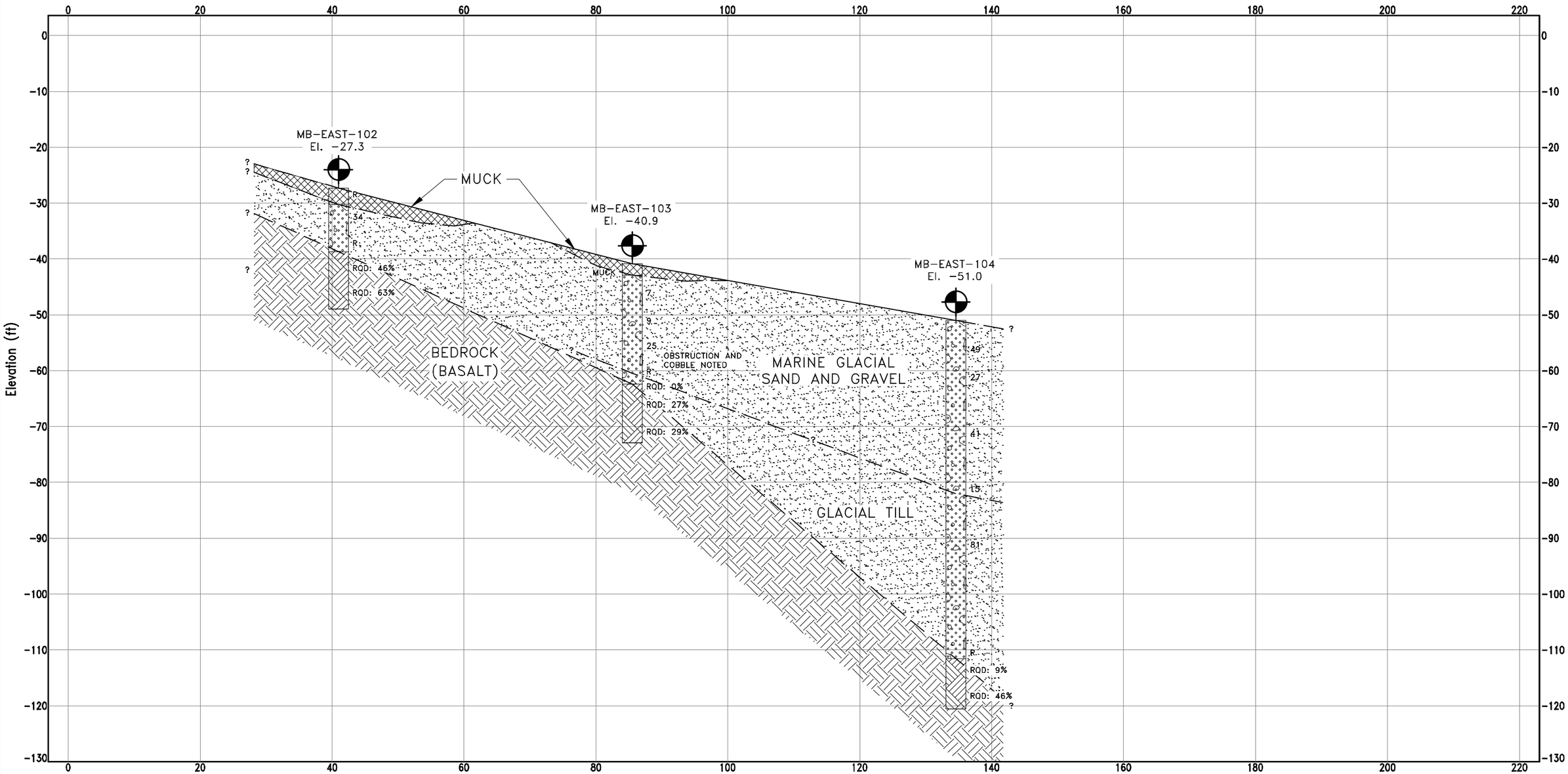

NOTES:

1) THIS GENERALIZED INTERPRETIVE SOIL PROFILE IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDRIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSACTIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE EXPLORATION LOGS.

2) THE LOCATION AND ELEVATION OF THE BORINGS WERE LOCATED USING OPTICAL SURVEY METHODS AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

3) BORINGS WERE PERFORMED BY MAINE TEST BORINGS, INC OF HERMON, MAINE BETWEEN MAY 28, 2013 AND JUNE 17, 2013 AND OBSERVED BY SCHONEWALD ENGINEERING ASSOCIATES.

4) UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LEGEND:

MB-EAST-109 — INDICATES BOREHOLE DESIGNATION
El. -38.8 — INDICATES APPROXIMATE GROUND SURFACE ELEVATION (NAVD88)

OUTWASH
23 — INDICATES STANDARD PENETRATION TEST VALUE (SPT)

BEDROCK
RQD: 27% — INDICATES ROCK QUALITY DESIGNATION (RQD)

Prepared By: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	Eastport Breakwater Replacement Eastport, Maine Maine Department of Transportation	Project No.: 33940.00 File Name: 33940.00_F1-5_R0.dwg
Project Mgr.: AH Designed By: SMF Reviewed By: CLS Drawn By: SBB Revision No.: 1 Date: 7/21/14	Title: INTERPRETIVE SUBSURFACE - PROFILE C-C'	Figure No.: 5

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APPENDIX A

LIMITATIONS

LIMITATIONS

Explorations

1. The analyses and recommendations in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by GZA GeoEnvironmental, Inc. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Construction

5. It is recommended that this firm be retained to provide soil engineering services during construction of the excavation and foundation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

Use of Report

6. This soil and foundation engineering report has been prepared for this project by GZA GeoEnvironmental, Inc. This report is for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. This report has been prepared for this project by GZA GeoEnvironmental, Inc. for the exclusive use of Childs Engineering Corporation and their project team for specific application to the Eastport Breakwater Project in Eastport, Maine in accordance with generally accepted soil and foundation engineering practices. No Warranty, express or implied, is made.

APPENDIX B

BORING LOGS

1983 – MORRISON GEOTECHNICAL ENGINEERING
2013 – SCHONEWALD ENGINEERING ASSOCIATES

WATER STREET

RETAINING WALL

WHARF

0.0 M.L.W.

DREDGE AREA TO EL -12 M.L.W. (ROCK BELOW NOTE #3 DOES NOT APPLY TO THIS AREA)

2 ON 1

EL. -12 M.L.W.

EXISTING BOAT ANCHORAGE
-14 FT. M.L.W. ZONE

EXISTING BOAT ANCHORAGE
-10 FT. M.L.W.

COAST GUARD AREA

HOLMES PACKING CORP.

M.L.W.

PROPOSED -12 M.L.W. CHANNEL

PROPOSED MOORING DOLPHIN A

-12± M.L.W.

AREA REPORTEDLY DREDGED AS PART OF THE FISH PIER WORK

STA. 7+00

STA. 8+00

B-8

STA. 9+00

STA. 10+00

STA. 11+00

STA. 12+00

STA. 13+00

STA. 14+00

STA. 15+00

STA. 16+00

EL. 24.9'

EL. 25.0'

EL. 25.1'

EL. 25.7'

EL. 25.6'

EL. 26.1'

EL. 25.5'

EL. 25.6'

EXISTING BREAKWATER

NO DREDGE

1.5 ON 1 (APPROX.)

B-2

B-1

B-3

EL. -40' M.L.W.

B.M. ELEV. 25.60 M.L.W.

PROPOSED MOORING DOLPHIN "B"
STA. 15+50

3 ON 1 (APPROX.)

STA. 15+55

DREDGE LINE

DREDGE LINE

EXISTING FISH PIER

STA. 8+37

3 ON 1 (APPROX.)

APPROXIMATE LIMIT WHERE BEDROCK EXCAVATION MAY BE NECCESSARY

AREA TO BE DREDGED

DREDGE TO -40 M.L.W.

B-7

B-6

B-5

B-4

-10 -20 -30 -40 -50 -60 -70

NOTES:

1. ALL ELEVATIONS REFERENCE TO MEAN LOW WATER (M.L.W. = 0.00)
2. CONTOUR INFORMATION FROM:

   FATHOMETER STUDY BY MORRISON GEOTECHNICAL ENGINEERING

   U.S. ARMY ENGINEER DIVISION, NEW ENGLAND, CORPS OF ENGINEERS, BREAKWATER AND FISHING LANDING PLAN PORT, MAY 1961, DRAWING NO. 1457 D-9-4.

   PROOF MARINE, INC., SOUNDINGS AND SWEEP DATA, DATED AUGUST 19, 1982.
3. NO MATERIAL SHALL REMAIN ABOVE ELEVATIONS INDICATED WITHIN THE AREAS TO BE DREDGED.
4. NO PAYMENT WILL BE MADE FOR EXCAVATION OF SOIL OR ROCK BELOW THE ELEVATION INDICATED.

LEGEND

- B-X BORING NUMBER
- BORING LOCATION
- PROPOSED NEW DECK ADDITION
- 40 EXISTING CONTOUR
- BASELINE LAYOUT
- APPROXIMATE ELEVATION OF BITUMINOUS CONCRETE SURFACE AT INSIDE EDGE OF SHEETING

CONTOUR INTERVAL: 2 FEET

NOTE
FOR FINAL DREDGED ELEVATIONS, SEE DRAWING C-5, FINAL DREDGING PLAN

RECORD DRAWING

THIS RECORD DRAWING HAS BEEN PREPARED TO SHOW THOSE CHANGES MADE DURING THE CONSTRUCTION PROCESS, BASED ON THE NOTES BY THE ENGINEER AND MARKED - UP PRINTS, DRAWINGS, AND OTHER DATA FURNISHED BY THE CONTRACTOR TO THE ENGINEER AND WHICH THE ENGINEER CONSIDERS SIGNIFICANT.

REVISIONS

NO.	DESCRIPTION	DATE	APPD
3	RECORD DRAWING		
2	EDA PROJECT NUMBER ADDED	8/22/84	
1	NOTE ADDED, ELEVATIONS ADDED.		
	CONTOURS NEAR BREAKWATER REVISED	5/14/84	

SCALE: 1"=40'
DATE: 4/13/84
DRAWN BY: CL
CHECKED BY: DET

STATE OF MAINE
BERNARD J. MORRISON
NO. 2464
REGISTERED PROFESSIONAL ENGINEER

MORRISON GEOTECHNICAL ENGINEERING
WINSLOW, MAINE 04902

REG. PROF. ENG. NO. 2464 DATE

EASTPORT PORT AUTHORITY
EDA NO. 01 01 02573
BREAKWATER REHABILITATION PROJECT
CONTRACT NO. 83-2
PORT OF EASTPORT
DREDGING PLAN

SHEET NO. C-2 OF 5
MGE JOB NO. 1809
GEC JOB NO. 543-83

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 2
DATE
HOLE NO. B-1
LINE & STA.
OFFSET
SURF. ELEV. -27' MLW

TO Morrison Geotechnical Engineering
ADDRESS Winslow, Maine
PROJECT NAME Proposed Dock
LOCATION Eastport, Maine
REPORT SENT TO above
PROJ. NO.
SAMPLES SENT TO Taken at Site
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ___ Hours
At ___ after ___ Hours

Rods "AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I.D.	2½"	1 3/8"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/8/83	a.m. p.m.
COMPLETE	6/8/83	a.m. p.m.
TOTAL HRS.		

BORING FOREMAN J. Phillips
INSPECTOR ~~P. Foster~~
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	WOR	WOH&R	3			Brown fine to coarse SAND, tr. fine gravel, tr. silt Casing dropped 1' while washing out	1	24"	4"
		6'	Robbed Sample						Sand ran 1'9" into casing @ 6'	2	-	12'
		10'-11'6"	D	7	6	6				3	18"	6"
								13'				
		15'-16'6"	D	30	17	7		16'	Brown fine to coarse SAND, little fine to medium gravel, little silt	4	18"	13"
		20'-21'6"	D	1	2	3			Gray silty CLAY, tr. sand lenses	5	18"	18"
								25'6"				
		25'-26'6"	D	1	6	26			Brown fine to coarse SAND, trace silt	6	18"	12"
		30'-	No sample						(Sand ran into casing 2' at 30')			
		35'-36'6"	D	16	17	26		36'		7	18"	18"
									Brown fine to medium SAND, little silt, tr. fine gravel (sand ran into casing 5')			

GROUND SURFACE TO 50' USED 2½" CASING: THEN OER to 54'6"

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 43'6"
Rock Coring
Samples 8

HOLE NO B-1

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 2 OF 2
DATE
HOLE NO. B-1
LINE & STA.
OFFSET
SURF. ELEV.

TO
PROJECT NAME
REPORT SENT TO
SAMPLES SENT TO

ADDRESS
LOCATION
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS

At _____ after _____ Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

	Date	Time
START		a.m. p.m.
COMPLETE		a.m. p.m.
TOTAL HRS.		

BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		40'		No	Sample							
		45'-46'6"	D	21	22	53			Brown fine to medium SAND, little silt, trace of fine gravel, trace of cobbles	8	18"	3"
									(Drove O.E. Rod (AW) from 46'6" to Refusal at 54'6")			
								54'6"	Refusal - Bottom of Boring 54'6"			
									WOR=Weight of Rods WOH&R = Weight of Hammer & Rods			

GROUND SURFACE TO _____ USED _____ "CASING: THEN _____

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring
Rock Coring
Samples

HOLE NO B-1

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 2
DATE
HOLE NO. B-2
LINE & STA.
OFFSET
SURF. ELEV. -28' MLW

TO Morrison Geotechnical Eng.
PROJECT NAME Proposed Dock
REPORT SENT TO above
SAMPLES SENT TO Taken at Site

ADDRESS Winslow, Maine
LOCATION Eastport, Maine
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ____ Hours
At ____ after ____ Hours

Rods "AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I.D.	2½"	1 3/8"	
Hammer Wt	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/11/83	a.m. p.m.
COMPLETE	6/11/83	a.m. p.m.
TOTAL HRS.		

BORING FOREMAN J. Phillips
INSPECTOR P. Foster
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	WOH&R	1	0				-	24"	0
						1			Brown fine to coarse SAND,			
		2'-4'	D	1	2	3			trace fine gravel, tr. silt	1	24"	6"
						3						
		5'-7'	D	3	3	2				2	24"	6"
						2						
								8'	(Casing drove harder)			
		9'6"-11'6"	D	6	8	9				3	24"	6"
						11						
		14'6"-16'6"	D	4	3	6				4	24"	12"
						7						
		21'-23'	D	6	11	12				5	24"	9"
						14						
								23'6"	(Casing drove harder)			
									Cobble- broke w/chopping bit			
		26'-26'6"	(Cobble)									
		27'-29'	D	22	24	16				6	24"	18"
						15						
		32'6"-34'6"	D	6	6	7				7	24	12"
						8						
		37'6"-39'7"	D	6	6	7				8	24"	18"
						8						

GROUND SURFACE TO 46'6" USED 2½" CASING: THEN Refusal

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 46'6"
Rock Coring
Samples 8

HOLE NO. B-2

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 2 OF 2
DATE
HOLE NO. B-2
LINE & STA.
OFFSET
SURF. ELEV.

TO
PROJECT NAME
REPORT SENT TO
SAMPLES SENT TO

ADDRESS
LOCATION
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS

At _____ after _____ Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

	Date	Time
START		a.m. p.m.
COMPLETE		a.m. p.m.
TOTAL HRS.		

BORING FOREMAN
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strato Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		42'6"-46'6"	(Casing to refusal)						Sand ran into casing (no sample)			
								46'6"				
									Bottom of Boring 46'6" Refusal			

GROUND SURFACE TO _____ USED _____ "CASING: THEN _____

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" foll on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring
Rock Coring
Samples

HOLE NO B-2

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 2
DATE
HOLE NO. B-3
LINE & STA.
OFFSET
SURF. ELEV. -26.5' MLW

TO Morrison Geotechnical Engineering
PROJECT NAME Proposed Dock
REPORT SENT TO above
SAMPLES SENT TO Taken at Site

ADDRESS Winslow, Maine
LOCATION Eastport Maine
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ____ Hours
At ____ after ____ Hours

Rods "AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	Hi Core 200
Size I.D.	2½"	1 3/8"	1 3/8"
Hammer Wt	300#	140#	BIT
Hammer Fall	24"	30"	Dia.

	Date	Time
START	6/9/83	a.m. p.m.
COMPLETE	6/9/83	a.m. p.m.
TOTAL HRS.		

BORING FOREMAN J. Phillips
INSPECTOR P. Foster
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	WOH&R					Brown fine to coarse SAND, little silt, trace fine gravel	-	24"	0
		3'-5'	D	6	6	6				1	24"	8"
						6						
		8'-10'	D	22	11	10				2	24"	12"
						12						
		15'-17'	D	27	17	19				3	24"	8"
						17						
		22'-24'	D	17	19	15				4	24"	9"
						17						
		28'-30	D	11	9	10						
						11				5	24"	3"
								32'	Sand ran 6' into casing. Bobbed spoon for sample No rec.			
		35'6"-37'7"	C						Brown fine to medium SAND, trace of silt (indicated by casing wash)	C	25"	25'

GROUND SURFACE TO 35'6" USED BW "CASING: THEN Cored & AW O.E. Rod to Refusal

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 49'5"
Rock Coring 2'1"
Samples 5

HOLE NO. B-3

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 2 OF 2
DATE
HOLE NO. B-3
LINE & STA.
OFFSET
SURF. ELEV.

TO
PROJECT NAME
REPORT SENT TO
SAMPLES SENT TO

ADDRESS
LOCATION
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS

At _____ after _____ Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

	Date	Time
START		a.m. p.m.
COMPLETE		a.m. p.m.
TOTAL HRS.		
BORING FOREMAN		
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
									Drove O. E. Rod to Refusal at 51'6" - Material became denser from 45'			
								51'6"	Refusal - Bottom of Boring 51'6"			

GROUND SURFACE TO _____ USED _____ "CASING: THEN _____

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring
Rock Coring
Samples

HOLE NO B-3

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 2
DATE
HOLE NO. B-4
LINE & STA.
OFFSET
SURF. ELEV. -31' MLW

TO Morrison Geotechnical Engineering
PROJECT NAME Proposed Dock
REPORT SENT TO above
SAMPLES SENT TO Taken at Site

ADDRESS Winslow, Maine
LOCATION Eastport, Maine
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ____ Hours
At ____ after ____ Hours

Rods-"AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I.D.	2½"	1 3/8"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/13/83	a.m. p.m.
COMPLETE	6/13/83	a.m. p.m.
TOTAL HRS.		

BORING FOREMAN J. Phillips
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	woh&r	1	2			Brown fine to medium SAND, trace of fine to medium gravel, trace of silt	1	24"	8"
						5						
		6'-8'	D	51	18	15			(Pushed Cobble)	2	24"	8"
						8						
		11'-13'	D	15	7	7				3	24"	24"
						8						
		16'-18'	D	9	5	6				4	24'	5"
						9		19'				
		22'-24'	D	21	15	18			Brown fine to medium SAND, little silt, trace of fine to medium gravel	5	24'	11"
						18						
		28'-30'	D	79	18	11				6	24'	6"
						9						
		33'6"-35'6"	D	15	10	9				7	24'	14"
						12						

GROUND SURFACE TO 47' USED BW "CASING: THEN Sampled & O.E. Rod

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 31'6"
Rock Coring
Samples 9

HOLE NO. B-4

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 2 OF 2
DATE
HOLE NO. B-4
LINE & STA.
OFFSET
SURF. ELEV.

TO
PROJECT NAME
REPORT SENT TO
SAMPLES SENT TO

ADDRESS
LOCATION
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS

At _____ after _____ Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR.
Type			
Size I D.			
Hammer Wt			BIT
Hammer Fall			

	Date	Time
START		a.m. p.m.
COMPLETE		a.m. p.m.
TOTAL HRS.		
BORING FOREMAN		
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		39'6"-41'6"	D	31	21	24			Brown fine to medium SAND, little silt, trace of fine to medium gravel	8	24'	8"
						19						
		47'-49'	D	14	11	12				9	24'	11"
						12						
		49'-51'6"	Drove O.E. Rod									
								51'6"				
									Bottom of Boring 51'6" (ran out of rods)			

GROUND SURFACE TO _____ USED _____ "CASING: THEN _____

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50 + Very Dense

Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff
30 + Hard

SUMMARY:
Earth Boring
Rock Coring
Samples

HOLE NO B-4

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 1
DATE
HOLE NO. B-5
LINE & STA.
OFFSET
SURF. ELEV. -45' MLW

TO Morrison Geotechnical Engineering
ADDRESS Winslow, Maine
PROJECT NAME Proposed Dock
LOCATION Eastport, Maine
REPORT SENT TO above
PROJ. NO.
SAMPLES SENT TO Taken at Site
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At _____ after _____ Hours
Tidal
At _____ after _____ Hours

Rods-"AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I.D.	2½"	1 3/8"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/14/83	a.m. p.m.
COMPLETE	6/14/83	a.m. p.m.
TOTAL HRS.		
BORING FOREMAN	J. Phillips	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	woh&r	1	2			Brown fine to medium SAND, trace of fine to medium gravel, trace of silt	1	24'	11"
						2						
		6'6"-8'6"	D	4	5	4				2	24'	8"
						5						
		11'-13'	D	13	19	10			" some silt	3	24'	18"
						9						
								15'				
		15'6"-17'	D	4	8	8			Brown fine SAND, trace of silt (possible wash)	4	18'	18"
									Note: Client wanted to core hole. Tide was rising. Drove O.E. Rod in an attempt to fine refusal before tide rose another 15'. This was to utilize all the rods at the lowest tide			
								44'				
									Bottom of Boring 44' (no refusal)			

GROUND SURFACE TO 15'6" USED BW "CASING: THEN Sampled then drove O.E. Rod

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 44'
Rock Coring
Samples 4

HOLE NO B-5

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO. B-6
LINE & STA.
OFFSET
SURF. ELEV. -39' MLW

TO Morrison Geotechnical Engineering
PROJECT NAME Proposed Dock
REPORT SENT TO above
SAMPLES SENT TO Taken at Site

ADDRESS Winslow, Maine
LOCATION Eastport, Maine
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ___ Hours
At ___ after ___ Hours

Rods-"AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I.D.	2½"	1 3/8"	
Hammer Wt.	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/12/83	a.m. p.m.
COMPLETE	6/12/83	a.m. p.m.
TOTAL HRS.		

BORING FOREMAN J. Phillips
INSPECTOR
SOILS ENGR.

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	To 12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	1	3	3			Brown fine to medium SAND, trace of fine to medium gravel	1	24"	14"
						1						
		5'-7'	D	5	7	6				2	24"	15"
						7						
		10'-12'	D	8	5	5				3	24"	8"
						6						
		16'6"-18'6"	D	9	6	6				4	24"	12"
						7						
		21'6"-23'6"	D	10	19	35			" trace of cobbles	5	24"	12"
						23						
		26'6"-28'6"	D	100	20	16			(pushed cobble)	6	24"	12"
						20						
									(Drove casing to 39'6")			
									(Drove O.E. Rod (AW) to 50')			
								50'				
									Bottom of Boring 50' (ran out of rods)			

GROUND SURFACE TO 39'6" USED BW "CASING: THEN Drove O.E. Rod to 50'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 50'
Rock Coring
Samples 6

HOLE NO. B-6

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 1
DATE
HOLE NO. B-7
LINE & STA.
OFFSET
SURF. ELEV. -29.5' MLW

TO Morrison Geotechnical Engineering
PROJECT NAME Proposed Dock
REPORT SENT TO above
SAMPLES SENT TO Taken at Site

ADDRESS Winslow, Maine
LOCATION Eastport, Maine
PROJ. NO.
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ___ Hours
At ___ after ___ Hours

	CASING	SAMPLER	CORE BAR.
Rods-"AW"			Hi Core
Type	BW	S/S	200
Size I.D.	2½"	1 3/8"	1 3/8"
Hammer Wt	300#	140#	BIT
Hammer Fall	24"	30"	Dia.

	Date	Time
START	6/10/83	a.m. p.m.
COMPLETE	6/10/83	a.m. p.m.
TOTAL HRS.		
BORING FOREMAN	J. Phillips	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No	Pen	Rec.
		0'-2'	D	woh	& r	2			Brown fine to coarse SAND, trace of silt, trace of cobbles	1	24'	8"
						3						
		5'-7'	D	5	6	7				2	24'	12"
						7		7'6"	(refusal)			
		7'6"-12'6"	C						Gray BASALT with Crystals	C	5'	5'
								12'6"				
									Bottom of Boring 12'6"			

GROUND SURFACE TO 7'6" USED BW "CASING: THEN Cored

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency		
0-10	Loose	0-4	Soft	30 + Hard
10-30	Med. Dense	4-8	M/Stiff	
30-50	Dense	8-15	Stiff	
50 +	Very Dense	15-30	V-Stiff	

SUMMARY:
Earth Boring 7'6"
Rock Coring 5'
Samples 2

HOLE NO. B-7

GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R I

SHEET 1 OF 1
DATE
HOLE NO. B-8
LINE & STA.
OFFSET
SURF. ELEV. -18' MLW

TO Morrison Geotechnical Engineering
ADDRESS Winslow, Maine
PROJECT NAME Proposed Dock
LOCATION Eastport, Maine
REPORT SENT TO above
PROJ. NO.
SAMPLES SENT TO Taken at Site
OUR JOB NO. 84-8

GROUND WATER OBSERVATIONS
At Tidal after ___ Hours
At ___ after ___ Hours

Rods-"AW"	CASING	SAMPLER	CORE BAR.
Type	BW	S/S	
Size I D.	2½"	1 3/8"	
Hammer Wt	300#	140#	BIT
Hammer Fall	24"	30"	

	Date	Time
START	6/14/83	a.m. p.m.
COMPLETE	6/14/83	a.m. p.m.
TOTAL HRS.		
BORING FOREMAN	J. Phillips	
INSPECTOR		
SOILS ENGR.		

LOCATION OF BORING:

DEPTH	Casing Blows per foot	Sample Depths From – To	Type of Sample	Blows per 6" on Sampler From 0-6	To 6-12	12-18	Moisture Density or Consist.	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc.	SAMPLE No.	Pen	Rec.
		0'-2'	D	woh&r	2	2			Brown silty fine to medium SAND, trace of wood, trace of organics	1	24"	3"
						2		3'				
		6'6"-8'6"	D	2	0	1			Brown fine to medium SAND, trace of fine gravel, trace of silt	2	24"	8"
						4		7'6"				
								11'6"	Brown silty fine to medium SAND			
									Bottom of Boring 11'6" (refusal with casing)			

GROUND SURFACE TO 11'6" USED BW "CASING: THEN Refusal

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used	
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30 +	Hard

SUMMARY:
Earth Boring 11'6"
Rock Coring
Samples 2

HOLE NO B-8

REPORT OF EXPLORATION

HOLE NO. B-1

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-27.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 8, 1983
DRILLING FLUID		DATE COMPLETE	June 8, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	2.0'	WOR/12"/ WOR/ 3	2.0'	3"	S1	Gravel, medium to coarse, some sand, loose, brown, GW-GP
2	Split Spoon	---	---	---	---		S2	Sample of blow back inside casing
3	Split Spoon	10.0'	11.5'	7/6/6	1.5'	4"	S3	Gravel, medium to coarse, some sand, medium, dense, brown
4	Split Spoon	15.0'	16.5'	30/17/7	1.5'	1.0'	S4A	Gravel, fine to coarse, with little sand and trace of silt, dense, brown-gray, GW
							S4B	Silty clay, with trace of sand, stiff, gray, CL
5	Split Spoon	20.0'	21.5'	1/2/3	1.5'	1.5'	S5	Silty clay, with trace of sand, medium, gray, CL
6	Split Spoon	25.0'	26.5'	1/6/26	1.5'	1.0'	S6	Silty clay, with trace of sand, soft, gray, CL
								Sand, fine to coarse, with little gravel, dense, brown, SW

Depth From	Depth To	FIELD LOG OF BORING
0.0'	16.0'	Gravel, fine to coarse, with some sand, very loose to dense, brown with various color stone, GW
16.0'	25.5'	Silty clay, with sand layers, soft to stiff, gray, CL
25.5'	36.0'	Sand, fine to coarse, with trace of gravel and silt, dense, brown, SW
36.0'	50.0'	Silty sand, fine to medium, with trace of gravel and cobbles, dense, brown, SM, (till)
50.0'	54.5'	Drove open ended rods
54.5'		Refusal
		Dredge Depth: 12.5' below mud line

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-1 (con't)

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-27.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 8, 1983
DRILLING FLUID		DATE COMPLETE	June 8, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
7	Split Spoon	35.0'	36.5'	16/17/26	1.5'	1.5'	S7A	Sand, fine to coarse, with little gravel, dense, brown, SW
							S7B	Silty sand, fine, with trace of gravel, dense, brown, SM, (till)
8	Split Spoon	45.0'	46.5'	21/22/53	1.5'	0.25'	S8	Sand, fine to coarse, with trace of silts and gravel, dense, brown, SW

Depth From	Depth To	FIELD LOG OF BORING

GROUNDWATER DATA	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-2

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-27.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 11, 1983
DRILLING FLUID		DATE COMPLETE	June 11, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA

No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	FIELD CLASSIFICATION AND REMARKS
1	Split Spoon	0.0'	2.0'	WOR/1/0/1	2.0'	None		
2	Split Spoon	2.0'	4.0'	1/2/3/3	2.0'	6"	S1	Sand, medium to coarse, with little gravel, loose, brown-red, SW
3	Split Spoon	5.0'	7.0'	3/3/2/2	2.0'	6"	S2	Sand, fine to coarse, with little gravel, loose, brown-red, SW
4	Split Spoon	9.5'	11.5'	6/8/9/11	2.0'	6"	S3	Sand, fine to coarse, with little gravel, loose, brown-red, SW
5	Split Spoon	14.5'	16.5'	4/3/6/7	2.0'	1'	S4	Sandy gravel, fine to coarse, with trace of silts, medium dense, brown with red, GW
6	Split Spoon	21.0'	23.0'	6/11/12/14	2.0'	9"	S5	Sandy gravel, fine to coarse, with trace of silts, medium dense, brown with red, GW
7	Split Spoon	27.0'	29.0'	22/24/15/15	2.0'	1.5'	S6	Sandy gravel to gravelly sand, fine to coarse, with trace silts, brown with red, dense, GW-SW

FIELD LOG OF BORING

Depth From	Depth To	
0.0'	46.5'	Sandy gravel to gravelly sand, fine to coarse, with trace of silts and cobbles, loose to dense, brown with red, GW-SW
46.5'		Refusal
		Dredge Depth: 12.5' below mud line

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-2 (con't)

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-27.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 11, 1983
DRILLING FLUID		DATE COMPLETE	June 11, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
8	Split Spoon	32.5'	34.5'	6/6/7/8	2.0'	1.0'	S7	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, medium dense, brown with red, GW-SW
9	Split Spoon	37.5'	39.5'	6/6/7/8	2.0'	1.5'	S8	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, medium dense, brown with red, GW-SW

Depth From	Depth To	FIELD LOG OF BORING

GROUNDWATER DATA	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-3

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-27.0 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 9, 1983
DRILLING FLUID		DATE COMPLETE	June 9, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	0.2'	WOR/2'	2.0'	None		
2	Split Spoon	3.0'	5.0'	6/6/6/6	2.0'	8"	S1	Sand, fine to coarse, with some gravel and trace of silts, medium dense, brown, SW
3	Split Spoon	8.0'	10.0'	22/11/20/12	2.0'	1.0'	S2	Sand, fine to coarse, with some gravel and trace of silts, medium dense, brown, SW
4	Split Spoon	15.0'	17.0'	22/17/19/17	2.0'	8"	S3	Sand, fine to coarse, with some gravel and trace of silts, dense, brown, SW
5	Split Spoon	22.0'	24.0'	17/19/15/17	2.0'	9"	S4	Sand, fine to coarse, with some gravel and trace of silts, dense, brown, SW
6	Split Spoon	28.0'	30.0'	11/9/10/11	2.0'	3"	S5	Sand, fine to coarse, with some gravel and trace os silts, medium dense, brown, SW
7	B Core	35.5'	37.6'	---	2.1'	2.1'	R1	Boulder, siltstone

Depth From	Depth To	FIELD LOG OF BORING
0.0'	3.0'	Gravelly sand, fine to coarse, with a trace of silts and cobbles, loose to dense, brown with red, SW
35.0'	37.6'	Boulder, siltstone
37.6'	51.5'	Drove open ended rods
51.5'		Refusal
		Dredge Depth: 13' below mud line

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-4

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-31.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 13, 1983
DRILLING FLUID		DATE COMPLETE	June 13, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	2.0'	WOH/1/2/5	2.0'	8"	S1	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW
2	Split Spoon	6.0'	8.0'	5/18/15/8	2.0'	8"	S2	Sandy gravel to gravelly sand, fine to coarse, with trace of pushed cobble, brown with red, medium dense, SW-GW
3	Split Spoon	11.0'	13.0'	9/5/6/9	2.0'	2.0'	S3	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW
4	Split Spoon	16.0'	18.0'	21/15/18/18	2.0'	5"	S4	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW
5	Split Spoon	22.0'	24.0'	79/18/11/9	2.0'	11"	S5	Sandy gravel to gravelly sand, fine to coarse, with little silts, brown with red, loose, SW-GW

Depth From	Depth To	FIELD LOG OF BORING
0.0'	51.5'	Sandy gravel to gravelly sand, fine to coarse, with cobbles and trace of silts, loose to dense, brown with red, GW-SW
51.5'		End of boring
		Dredge Depth: 8.5' below mud line

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-4 (con't)

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-31.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 13, 1983
DRILLING FLUID		DATE COMPLETE	June 13, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
6	Split Spoon	28.0'	30.0'	79/18/ 11/9	2.0'	6"	S6	Sandy gravel to gravelly sand, fine to coarse, with cobbles, brown with red, loose, SW-GW
7	Split Spoon	33.5'	35.5'	15/10/ 9/12	2.0'	14"	S7	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW
8	Split Spoon	39.5'	41.5'	31/21/ 24/19	2.0'	12"	S8	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW
9	Split Spoon	47.0'	49.0'	14/11/ 12/12	2.0'	11"	S9	Sansy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose, SW-GW

Depth From	Depth To	FIELD LOG OF BORING

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

Hole No. B-4 (con't)

REPORT OF EXPLORATION

HOLE NO. B-5

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-42.0 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 14, 1983
DRILLING FLUID		DATE COMPLETE	June 14, 1983
		WEATHER	Sunny with occasional shower

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	2.0'	WOH/1/2/2	2.0'	11"	S1	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown, loose, SW-GW
2	Split Spoon	6.5'	8.5'	4/5/4/5	2.0'	8"	S2	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown, loose, SW-GW
3	Split Spoon	11.0'	13.0'	13/9/ 10/9	2.0'	1.5'	S3	Sandy gravel to gravelly sand, fine to coarse, with some silt, brown, medium dense, SW-GW
4	Split Spoon	15.5'	17.0'	4/8/8	1.5'	1.5'	S4	Wash sample, not representative

Depth From	Depth To	FIELD LOG OF BORING
0.0'	17.0'	Sandy gravel to gravelly sand, fine to coarse, with trace of silt, brown with red, loose to medium dense, SW-GW
17.0'	44.0'	Drove open ended rods
44.0'		End of boring
		No Dredge Required

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-6

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-35.5 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 12, 1983
DRILLING FLUID		DATE COMPLETE	June 12, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 In.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	2.0'	1/3/3/1	2.0'	14"	S1	Sandy gravel to gravelly sand, fine to coarse, brown with red, loose, SW-GW
2	Split Spoon	5.0'	7.0'	5/7/6/7	2.0'	15"	S2	Sandy gravel to gravelly sand, fine to coarse, brown with red, medium dense, SW-GW
3	Split Spoon	10.0'	12.0'	8/5/5/6	2.0'	8"	S3	Sandy gravel to gravelly sand, fine to coarse, brown with red, loose, SW-GW
4	Split Spoon	16.5'	18.5'	9/6/6/7	2.0'	1.0'	S4	Sandy gravel to gravelly sand, fine to coarse, brown with red, loose, SW-GW
5	Split Spoon	21.5'	23.5'	10/19/35/23	2.0'	1.0'	S5	Sandy gravel to gravelly sand, fine to coarse, with cobbles, brown with, red, dense, SW-GW
6	Split Spoon	26.5'	28.5'	100/20/16/20	2.0'	1.0'	S6	Sandy gravel to gravelly sand, fine to coarse, brown with red, pushed cobbles, loose, SW-GW

Depth From	Depth To	FIELD LOG OF BORING
0.0'	28.5'	Sandy gravel to gravelly sand, fine to coarse, with cobbles, brown with red, loose to dense, GW-SW
28.5'	50.0'	Drove open ended rods
50.0'		End of boring
		Dredge Depth: 4.5' below mud line

GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

REPORT OF EXPLORATION

HOLE NO. B-7

OBSERVER	Peter Foster	PROJECT	Eastport P.A. Exp.
DRILL CONTRACTOR	Guild Drilling, Inc.	NO.	1621
DRILLER	John Phillips	LOCATION	Eastport, Maine
TYPE DRILL	Acker Hand Feed	ELEVATION	-30.0 Feet
SIZE & TYPE OF CASING	BW	DATE START	June 10, 1983
DRILLING FLUID		DATE COMPLETE	June 10, 1983
		WEATHER	Sunny

MORRISON GEOTECHNICAL ENGINEERING

SAMPLE DATA								FIELD CLASSIFICATION AND REMARKS
No.	Type Of Sample	Depth of Sample From	Depth of Sample To	Driving Resistance Blows/6 in.	Length Driven	Recovery In. Or %	Sample No.	
1	Split Spoon	0.0'	2.0'	WOH & WOR/ 2/3	2.0'	8"	S1	Sand, fine to coarse with trace of gravel and silt, brown, loose, SW
2	Split Spoon	5.0'	7.0'	5/6/7/7	2.0'	1.0'	S2	Sand, fine to coarse with trace of gravel and silt, brown, medium dense, SW
3	B Core	7.5'	12.5'	--	5.0'	5.0'	R1	Rock, basalt

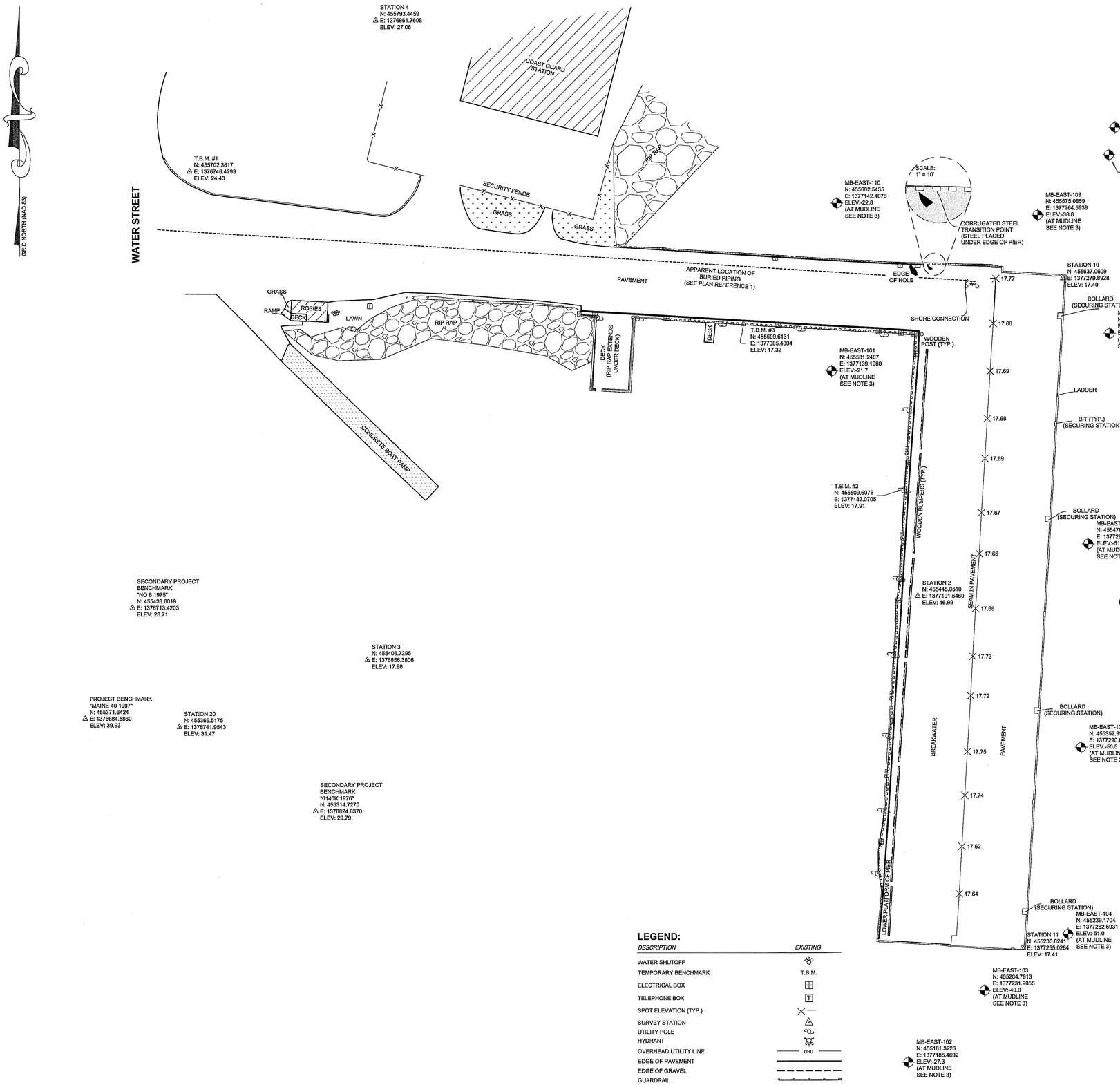
Depth From	Depth To	FIELD LOG OF BORING
0.0'	7.5'	Sand, fine to coarse, with trace of gravel and silt, brown, loose to medium dense, SW
7.5'	12.5'	Bedrock, basalt
12.5'		End of boring
		Dredge Depth: 10' below mud line
		Bedrock excavation will be necessary to obtain desired elevation.

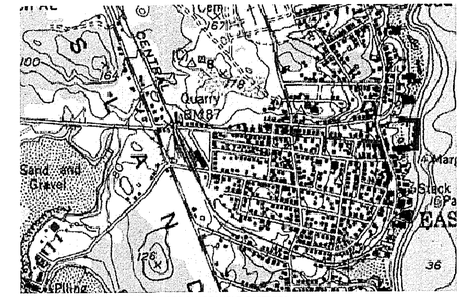
GROUNDWATER DATA

	Date	Time	Depth
At Completion			

LOCATION

Hole No. B-7





LOCATION MAP: USGS QUADRANGLE: EASTPORT, MAINE
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PLAN REFERENCE:

1. REFERENCE IS MADE TO A PLAN ENTITLED "CONTRACT DRAWINGS EASTPORT PORT AUTHORITY, BREAKWATER REHABILITATION EASTPORT, MAINE, CONTRACT NO. 83-2" PREPARED BY MORRISON GEOTECHNICAL ENGINEERING, STAMPED DATE AUGUST 15, 1988 AND NOTED AS "RECORD DRAWING."

NOTES:

1. THIS PLAN IS ORIENTED TO GRID NORTH - NAD 83, MAINE EAST ZONE. ELEVATIONS SHOWN ARE REFERENCED TO THE NAVD 88 DATUM. PROJECT BENCHMARKS ARE:

   VERTICAL:
   A. A USGS SURVEY DISK STAMPED "MAINE 40 1907" AND DESCRIBED BY COAST AND GEODETIC SURVEY 1946 AT EASTPORT, WASHINGTON COUNTY, IN THE WEST SIDE OF THE POST OFFICE AND CUSTOM HOUSE, 14.2 FEET NORTH OF THE SOUTH END OF THE BUILDING, AND ABOUT 3-1/2 FEET ABOVE GROUND. A UNITED STATE GEOLOGICAL SURVEY STANDARD DISK, STAMPED 40 AND SET VERTICALLY.
   (PID: PD0003)
   PUBLISHED ELEVATION: 39.93 FEET (NAVD 88)

   B. A NOS SURVEY DISK STAMPED "0140K 1976" AND DESCRIBED BY NATIONAL GEODETIC SURVEY 1978 AT EASTPORT, 107.8 FEET SOUTH OF AND ACROSS THE STREET FROM THE SOUTH CORNER OF THE POST OFFICE AT EASTPORT, 5.8 FEET SOUTHEAST OF THE SOUTHEAST EDGE OF CURB STONE, AT THE NORTH END OF THE GRANITE STEP, AT THE ENTRANCE TO THE BANGOR ELECTRIC COMPANY OFFICE.
   (PID: PD0524)
   PUBLISHED ELEVATION: 29.80 FEET (NAVD 88)

   C. A NOS SURVEY DISK STAMPED "NO 8 1975" AND DESCRIBED BY NATIONAL GEODETIC SURVEY 1978 AT EASTPORT, 5.2 FEET EAST OF THE NORTHEAST CORNER OF THE POST OFFICE, IN TOP OF A CURVED SECTION OF CURB.
   (PID: PD0520)
   PUBLISHED ELEVATION: 28.74 (NAVD 88)

   FOR COMPARISON TO ELEVATIONS DEPICTED ON PLAN REFERENCE 1, THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) WEBSITE STATES:

   "MEAN SEA LEVEL (MSL) IS A TIDAL DATUM DETERMINED OVER A 19-YEAR NATIONAL TIDAL DATUM EPOCH. IT PERTAINS TO LOCAL MEAN SEA LEVEL AND SHOULD NOT BE CONFUSED WITH THE FIXED DATUMS OF NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)."

   "NAVD88 IS A FIXED DATUM DERIVED FROM A SIMULTANEOUS, LEAST SQUARES, MINIMUM CONSTRAINT ADJUSTMENT OF CANADIAN/MEXICAN/UNITED STATES LEVELING OBSERVATIONS. LOCAL MEAN SEA LEVEL OBSERVED AT FATHER POINT/RIMOUSKI, CANADA WAS HELD FIXED AS THE SINGLE INITIAL CONSTRAINT. NAVD88 REPLACES NGVD29 AS THE NATIONAL STANDARD GEODETIC REFERENCE FOR HEIGHTS."

   FOR THE TIDAL EPOCH 1983-2001 (19 YEARS), THE NOAA WEBSITE PROVIDES THE FOLLOWING COMPARISON TO MEAN LOWER LOW WATER (MLLW), IN METERS (AND CONVERTED TO U.S. SURVEY FEET).

HIGHEST OBSERVED WATER LEVEL (01/10/1997)		=	7.383 (24.222)
MEAN HIGHER HIGH WATER	MHHW	=	5.674 (19.272)
MEAN HIGH WATER	MHW	=	5.729 (18.796)
NORTH AMERICAN VERTICAL DATUM	NAVD88	=	3.029 (9.938)
MEAN SEA LEVEL	MSL	=	2.958 (9.705)
MEAN TIDE LEVEL	MTL	=	2.932 (9.619)
MEAN LOW WATER	MLW	=	0.136 (0.446)
MEAN LOWER LOW WATER	MLLW	=	0.000 (0.000)
LOWEST OBSERVED WATER LEVEL (08/09/1972)		=	-1.426 (-4.678)

   THIS COMPARISON HIGHLIGHTED AN ELEVATION ERROR WITH THE ORIGINAL VERSION OF THIS (CES) PLAN. SPECIFICALLY, THE PUBLISHED ELEVATION OF THE PROJECT BENCHMARK (MAINE 40 1907) WAS CONFUSED WITH ANOTHER BENCHMARK, FORMERLY LOCATED AT THE EASTPORT POST OFFICE, BUT WHICH NO LONGER EXISTS. A DIFFERENCE OF 3.18 FEET WAS FOUND AND IS CORRECTED BY THE DATA DEPICTED HEREON.

   HORIZONTAL:
   A. A NATIONAL GEODETIC SURVEY DISK STAMPED "EPM A 1995" AND DESCRIBED BY JE CHANCE AND ASSOCIATES 1995 AS "SET FLUSH IN THE TOP OF A ROCK LEDGE" AT THE EASTPORT MUNICIPAL AIRPORT.
   (PID: AB2646)
   PUBLISHED NORTHING: 456308.323 FEET (NAD 83, MAINE EAST ZONE)
   PUBLISHED EASTING: 1369779.744 FEET (NAD 83, MAINE EAST ZONE)

   B. A NATIONAL GEODETIC SURVEY DISK STAMPED "EPM B 1995" AND DESCRIBED BY JE CHANCE AND ASSOCIATES 1995 AS "SET FLUSH IN A MASSIVE ROCK OUTCROP AT TOP OF KNOLL" AT THE EASTPORT MUNICIPAL AIRPORT.
   (PID: AB2647)
   PUBLISHED NORTHING: 455370.1752 FEET (NAD 83, MAINE EAST ZONE)
   PUBLISHED EASTING: 1371140.834 FEET (NAD 83, MAINE EAST ZONE)

2. TEMPORARY BENCHMARKS (T.B.M.):

   T.B.M. #1 = PK NAIL FOUND 1 FOOT ABOVE GRADE IN THE WESTERLY FACE OF A POLE.
   ELEVATION = 24.43 FEET (NAVD 88)

   T.B.M. #2 = 6" NAIL SET IN A POLE.
   ELEVATION = 17.91 FEET (NAVD 88)

   T.B.M. #3 = NAIL IN WOOD BUMPER WITH DISK "USC&GS BM"
   ELEVATION = 17.32 FEET (NAVD 88)

3. "MUDLINE" ELEVATIONS WERE CALCULATED BY SCHONEWALD EA, BASED UPON SURVEYED BARGE DECK ELEVATIONS (RELATIVE TO NAVD 88) PROVIDED BY CES AND WATER DEPTH AT THE TIME OF THE SURVEY.

4. THIS PLAN WAS PREPARED TO DEPICT EXISTING CONDITIONS (AS OF JUNE 19, 2013.)

LEGEND:

DESCRIPTION	EXISTING
WATER SHUTOFF	
TEMPORARY BENCHMARK	T.B.M.
ELECTRICAL BOX	
TELEPHONE BOX	T
SPOT ELEVATION (TYP.)	
SURVEY STATION	
UTILITY POLE	
HYDRANT	
OVERHEAD UTILITY LINE	OHU
EDGE OF PAVEMENT	
EDGE OF GRAVEL	
GUARDRAIL	

SITE PLAN
FOR
EASTPORT PORT AUTHORITY

PRELIMINARY

P.O. BOX 278, EASTPORT, MAINE 04631
LOCATION OF SUBJECT PROPERTY:
WATER STREET, EASTPORT, WASHINGTON COUNTY, MAINE

GRAPHIC SCALE

30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

CES INC
ENGINEERING · SURVEYING · PLANNING · SCIENCES

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F.207-680-2204

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PO BOX 427
Machias, ME
T.207-255-3070
F.207-255-3247

Bar Harbor
1386 State hwy 102
Bar Harbor, ME
T.207-288-0387
F.207-288-9588

WWW.CES-MAINE.COM

PROJECT TITLE
EASTPORT PORT AUTHORITY
WATER STREET, EASTPORT, WASHINGTON COUNTY, MAINE

SHEET TITLE
SITE PLAN

REV.	DESCRIPTION	DATE	DRAWN BY	CHECKED BY
R0	ELEVATION DATUM CORRECTION (SEE NOTE 1)	9/12/2013	MJP	
R1				
R2				
R3				
R4				
R5				

SCALE	1" = 30'
DATE	JUNE 28, 2013
DRAWN BY	MJP
CHECKED BY	
DESIGNED BY	
APPROVED BY	
JOB NUMBER	10189.002
DRAWING NUMBER	

J:\10189-EASTPORT_PORT_AUTHORITY\002-BREAKWATER SITE PLAN-R02\CAD_DRAWINGS\SURVEY\0189.002 BREAKWATER.DWG , 9/12/2013 12:07 PM

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-101 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-21.7 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/28/13; 1530 - 5/29/13; 1110	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455581, E1377139 (inner harbor)	**Casing ID/OD:**	NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						WOC			0 to 2 feet - muck	
						WOC				
							-23.7		2.0	
	1D	24/9	2.0 - 4.0	6-5-4-10	9	7			1D: Black-brown, loose, fine to coarse SAND, some Gravel, trace Silt.	
						9				
						15				
5	2D	18/6	5.0 - 6.5	15-12-16	28	14			2D: Brown-black, m. dense, fine to coarse Sandy GRAVEL, trace to little Silt. Denser layer from 6 to 7.5 ft.	
						43				
						27				
						20				
						19				
10	3D	24/12	10.0 - 12.0	2-8-6-7	14	WOC			3D: Brown, m. dense, fine to medium SAND, trace Gravel, trace Silt.	
						WOC				
						3				
						8				
						13				
15	4D	24/14	15.0 - 17.0	4-4-4-6	8	WOC			4D: Brown, loose, fine to medium SAND, trace Gravel, trace Silt.	
						14				
						30				
						43				
						47				
20	5D	24/13	20.0 - 22.0	16-17-17-18	34	45			5D: Reddish brown, dense, Gravelly fine to coarse SAND, trace Silt; gravel absent from bottom six inches of sample.	
						30				
						30				
						41				
25						143				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-101 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-21.7 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/28/13; 1530 - 5/29/13; 1110	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455581, E1377139 (inner harbor)	**Casing ID/OD:**	NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25									Very difficult drilling; apparent roller cone and casing refusal at 25.0 ft.; attempt core; pop through boulder at about 26.2 ft.	
									Casing and roller cone refusal at 27.4 ft.	
	R1	60/55	27.8 - 32.8	RQD = 30%			-49.1		27.4	
									R1: V. hard, fresh to slightly weathered, aphanitic, porphyritic, greenish grey, BASALT with occasional weathered (feldspar and mafic) phenocrysts. Predominantly close, low and high angle fractures; undulating, rough, typically discolored (iron/rust), and open, often with lime infilling. Vertical fracture set from 27.8 to 29.7 ft. Core times: 3: 45/ 3:15/2:35/3:25/4:00 min:sec/ft.	
30										
	R2	50/45	32.8 - 37.0	RQD = 26%					R2: similar to R1, except slightly to moderately weathered and v. close, low angle fractures with lime infilling from 33.3 to 35.2 ft. and felsic-rich (GABBRO) layer with abundant microcline and plagioclase from 35.1 to 36.7 ft. Core times: 3:45 3:35/3:15/3:50/jam min:sec/ft.	
35										
							-58.7		37.0	
									Bottom of Exploration at 37.0 feet below ground surface.	
40										
45										
50										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-102 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-27.3 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/29/13; 1240 - 5/29/13; 1740	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455161, E1377185 (southerly	**Casing ID/OD:**	HW (4") and NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Sample Information

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Visual Description and Remarks	Lab. Testing Results
0						WOC		0 to 1 foot - muck	
	1D	24/2	1.0 - 3.0	3/18"-6	0	WOC		1D: Black muck and wood; brown, fine to coarse Sandy GRAVEL, trace Silt in tip of spoon.	
						19	-29.8	2.5	
						25			
						26			
5	2D	24/15	5.0 - 7.0	15-19-15-22	34	WOC		2D: Brown, dense, Gravelly fine to coarse SAND, trace Silt.	
						21			
						41			
						62			
						87			
10	3D	17/17	10.0 - 11.4	18-24-50/5"	>74			3D: Brown, v. dense, Gravelly fine to coarse SAND, trace Silt.	
	R1	60/56	11.7 - 16.7	RQD = 46%			-38.7	11.4	
								R1: V. hard, fresh to slightly weathered, aphanitic to fine grained, porphyritic, greenish grey, BASALT, with numerous weathered phenocrysts presenting as pits and vugs. Predominantly close to moderately spaced, low and high angle fractures; typically undulating, rough, fresh to slightly discolored, and open. Notable high angle fracture set from 13.4 to 15.1 ft; surface discolored (rust/iron), no notable infilling, but calcite rind. Core times: 2:50/4:00/3:20/4:00/5:15 min:sec/ft.	
15	R2	60/60	16.7 - 21.7	RQD = 63%				R2: V. hard, fresh, aphanitic, greenish grey, BASALT. Predominantly close to moderately spaced, low angle fractures; typically undulating, rough, fresh to slightly discolored, and open. Fractures moderately dipping below 20.4 ft. Core times: 4:35/4:25/4:50/5:00/5:30 min:sec/ft.	
20							-49.0	21.7	
								Bottom of Exploration at 21.7 feet below ground surface.	
25									

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-103 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-40.9 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/30/13; 0815 - 5/30/13; 1530	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455205, E1377232	**Casing ID/OD:**	HW (4") and NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						WOC				
						WOC				
						12				
						14				
						18				
5	1D	24/11	5.0 - 7.0	4-3-4-5	7	22			1D: Brown, loose, fine to coarse SAND, some Gravel, trace Silt.	
						19				
						27				
						34				
						38				
10	2D	24/15	10.0 - 12.0	4-4-5-6	9	WOC			2D: Brown, loose, fine to coarse SAND, some Gravel, trace Silt.	
						15				
						33				
						67				
						61				
15	MD	24/0	15.0 - 17.0	11-10-15-14	25	27			MD: no recovery	
						55				
						29				
						30				
	3D	14/8	19.5 - 20.7	67-46-37/2"	>83	34			Casing hesitates at 19.5 ft.; roller cone obstructed by cobble at 19.5 ft; attempt split spoon sample to clear obstruction. 3D: Top of sample: Greenish-grey, angular, GRAVEL; Btm 5 inches: Brown, Gravelly fine to coarse SAND, trace Silt.	
20										
	R1	25/21	21.8 - 23.9	RQD = 0%			-62.4		Casing and roller cone refusal at 21.5 ft. 21.5 R1: V. hard, fresh to slightly weathered, aphanitic, greenish grey, BASALT. Quartzite vein from 23.0 to 23.4 ft. Highly fractured throughout run; typically discolored (iron/rust) fracture surfaces. Core times: 3: 25/ 3:45/jam min:sec/ft.	
	R2	55/54	23.9 - 28.5	RQD = 27%					R2: V. hard, fresh to slightly weathered, aphanitic, greenish grey, BASALT, with numerous predominantly vertical quartzite and calcite	
25										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-103 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-40.9 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/30/13; 0815 - 5/30/13; 1530	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455205, E1377232	**Casing ID/OD:**	HW (4") and NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25									veins and occasional weathered phenocrysts. V. close to close, low angle and near vertical fractures; typically undulating, rough, slightly discolored (rust/iron), and open. Notable near vertical fracture set from 24.5 to 25.2 ft; no visible infilling, but calcite rind. Second vertical fracture set from from 27.4 to 28.5 ft. Core times: 2:55/3:00/3:45/4:30/-- min:sec/ ft.	
	R3	42/42	28.5 - 32.0	RQD = 29%					R3: similar to R2, with numerous weathered phenocrysts from 28.5 to 29.0 ft. and 31.1 to 32.0 ft.; highly fractured from 31.3 to 32.0 ft. Core times: 2:30/2:40 /2:45/-- min:sec/ft.	
30										
							-72.9		32.0 **Bottom of Exploration at 32.0 feet below ground surface.**	
35										
40										
45										
50										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-104 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.0 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/31/13; 0545 - 6/3/13; 1430	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455239, E1377283	**Casing ID/OD:**	HW (4") to 11 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						13				
						14				
						17				
						15				
						24				
5	1D	24/13	5.0 - 7.0	11-26-23-13	49	WOC			1D: Brown, dense, fine to coarse Sandy GRAVEL, trace Silt.	
						51				
						66				
						76				
						75				
10	2D	24/13	10.0 - 12.0	5-6-21-40	27	--			2D: Brown, m. dense, Gravelly fine to coarse SAND, trace Silt.	
						--				
						28				
						30				
						52				
15						59				
						101				
						54				
						51				
						56				
20	3D	24/16	20.0 - 22.0	15-23-18-29	41	32			3D: Brown, dense, fine to medium Sandy GRAVEL, trace coarse Sand, trace Silt.	
						58				
						55				
						37				
25						29				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-104 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.0 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/31/13; 0545 - 6/3/13; 1430	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455239, E1377283	**Casing ID/OD:**	HW (4") to 11 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25						--				
						42				
						47				
						48				
						45				
30	4D	24/4	30.0 - 32.0	22-9-6-8	15	37			4D: Brown, m. dense, fine to coarse SAND, some Gravel, trace Silt.	
						39				
						40				
						41				
						58				
35						53				
						55				
						71				
						76				
						80				
40	5D	24/10	40.0 - 42.0	29-36-45-81	81	38			5D: Brown, v. dense, Gravelly fine to coarse SAND, trace Silt; pushed piece of gravel.	
						55				
						79				
						78				
						79				
45						75				
						91				
						102				
						106				
50						124				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-104 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.0 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	5/31/13; 0545 - 6/3/13; 1430	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455239, E1377283	**Casing ID/OD:**	HW (4") to 11 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
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Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50						58				
						91				
						81				
						65				
						117				
55						121				
						102				
						90				
						76			remnants of silt lens observed in wash water	
						79				
60	6D	7/5	60.0 - 60.6	7-15/1"		--	-111.6		6D: Brown, fine to medium SAND, little Gravel, trace Silt; rock in tip of spoon.	
	R1	53/52	60.6 - 65.0	RQD = 9%					60.6 R1: V. hard, fresh to slightly weathered, aphanitic, greenish grey BASALT; no notable phenocrysts; with numerous near horizontal to near vertical veins of quartzite and/or healed with lime/calcite; calcite rind over quartzite visible in wider veins. V. close to close, predominantly high angle fractures; typically formed along wider, high angle veins; undulating, rough, fresh to slightly discolored, open to moderately wide and typically infilled (healed) with lime/calcite; remnants of quartzite veins visible in wider fractures. Highly fractured from 60.7 to 61.3 ft. and 62.0 to 64.0 ft.; wider fracture from 62.6 to 65.1 ft. Core times: 3:10/3:00/ 3:15/3:25/-- min:sec/ft.	
65	R2	57/53	65.1 - 69.9	RQD = 46%					R2: similar to R1, except close fracture spacing; highly fractured from 69.1 to 69.9 ft. Core times: 2:55/2:45/3:20/3:15/-- min:sec/ft.	
70							-120.9		69.9 **Bottom of Exploration at 69.9 feet below ground surface.**	
75										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-105 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.5 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/4/13; 0620 - 6/5/13; 1130	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455353, E1377291	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						7				
						6				
						11				
						12				
						25				
5						29				
						32				
						35				
						41				
						43				
10	1D	24/12	10.0 - 12.0	5-11-15-11	26	WOC			1D: Brown, m. dense, Gravelly fine to coarse SAND, trace Silt.	
						21				
						23				
						24				
						39				
15						31				
						29				
						27				
						28				
						27				
20						25				
						32				
						38				
						23				
25						24				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-105 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.5 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/4/13; 0620 - 6/5/13; 1130	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455353, E1377291	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25						30				
						31				
						41				
						37				
						38				
30	MD	24/0	30.0 - 32.0	9-9-10-11	19	14			MD: no recovery; sand and gravel in wash water	
						23				
						26				
						27				
						31				
35						31				
						34				
						34				
						40				
						36				
40						45				
						54				
						52				
						117				
						99				
45	2D	24/5	45.0 - 47.0	36-29-29-24	58	wash ahead			2D: Reddish-brown, v. dense, Sandy GRAVEL, trace to little Silt; appears to be marginally cemented; pieces of basalt in tip of spoon - possible cobble.	
50										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-105 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.5 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/4/13; 0620 - 6/5/13; 1130	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455353, E1377291	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50										
						62				
						61				
						69				
						54				
55						38				
						49				
						45				
						48				
						56				
60	3D	24/4	60.0 - 62.0	blowing sand	n/a	37			3D: Brown, fine to medium SAND, little Gravel, trace Silt; minor cementation.	
						37				
						48				
						46				
						48				
65						83				
						85				
						77				
						71				
						76				
70						85				
						92				
	R1	48/48	72.8 - 76.8	RQD = 33%		120[a]	-123.2		a: 120 blows for 8 inches - NW refusal 72.7 R1: V. hard, fresh to slightly weathered, aphanitic, dark grey, BASALT, with minor near horizontal veins of quartzite and high angle cracks. Close, predominantly low angle fractures; undulating, rough, typically discolored (iron/rust), and open. Slightly to moderately weathered and	
75										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-105 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.5 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/4/13; 0620 - 6/5/13; 1130	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455353, E1377291	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
75									highly fractured with significant quartzite veining and rust/iron discoloration from 74.6 to 76.8 ft. Core times: 5:50/3:50/2:50/2:45 min:sec/ft.	
	R2	30/30	76.8 - 79.3	RQD = 0%					R2: V. hard, fresh to slightly weathered, aphanitic, greenish-grey, BASALT, with numerous near horizontal to near vertical veins of quartzite and/or healed with lime/calcite. V. close to highly fractured, with iron/rust discoloration throughout run. Core times: 3:00/3:00/jam min:sec/ft.	
	R3	42/42	79.3 - 82.8	RQD = 52%					R3: V. hard, fresh to slightly weathered, aphanitic, greenish-grey, BASALT, with numerous near horizontal to near vertical cracks and veins of quartzite and/or healed with lime/calcite. Close, predominantly low angle fractures; undulating, rough, with minor iron/rust discoloration, and open. Core times: --/4:10/3:25/5:00 min:sec/ft.	
80										
	R4	45/45	82.8 - 86.6	RQD = 22%					R4: V. hard, fresh to slightly weathered, aphanitic, greenish-grey, BASALT, with numerous near horizontal to near vertical cracks and veins of quartzite and/or healed with lime/calcite. Close, predominantly high angle and lesser low angle fractures; undulating, rough, no notable discoloration, and open, typically with lime (mud) infilling. Highly fractured from 85.1 to 85. 8 ft. Core times: 3:20/2:50/2:45/jam min:sec/ft.	
85										
	R5	53/52	86.6 - 91.0	RQD = 64%					R5: similar to R4, except with close to moderately spaced fractures. Core times: 2:40/2:35/3:15/3:25/-- min:sec/ft.	
90										
	R6	33/33	91.0 - 93.8	RQD = 30%					R6: similar to R4, except porphyritic and with v. close to close fracture spacing. Core times: 2:35/3:00/jam min:sec/ft.	
	R7	30/30	93.8 - 96.3	RQD = 13%					R7: similar to R4, except with v. close to close fracture spacing and more lime (mud) infilling; highly fractured from 95.0 to 96.8 ft. Core times: 3:10/3:20/jam min:sec/ft.	
95										
	R8	48/48	96.3 - 100.3	RQD = 52%					R8: similar to R4, except with v. close to close fracture spacing. Core times: --/5:10/3:20/4:35 min:sec/ft.	
100										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-105 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.5 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/4/13; 0620 - 6/5/13; 1130	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455353, E1377291	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
100	R9	56/52	100.3 - 105.0	RQD = 39%					R9: similar to R4, except with v. close to close fracture spacing; notable quartzite veins at 101.1, 101.3 and 101.6 ft.; highly fractured from 103.8 to 105.0 ft. Core times: 2:00/2:35/2:50/2:30/jam min:sec/ft.	
105	R10	45/44	105.0 - 108.8	RQD = 9%					R10: similar to R4, except with v. close to close fracture spacing; highly fractured from 105.0 to 105.6 and 107.6 to 108.6 ft. Core times: 2:25/ 3:00/2:50/jam min:sec/ft.	
	R11	36/32	108.8 - 111.8	RQD = 39%					R11: similar to R4, except with v. close to close fracture spacing; highly fractured from 109.7 to 110.3 ft. Core times: 1:50/2:25/4:00 min:sec/ft.	
110							-162.3		111.8 **Bottom of Exploration at 111.8 feet below ground surface.**	
115										
120										
125										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-106 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.2 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/5/13; 1300 - 6/6/13; 1105	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455476, E1377295	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
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WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						wash ahead				
							-55.7		4.5 soft material encountered at about 4.5 ft based on drilling behavior	
5										
									material becomes more stiff at about 9.5 feet based on drilling behavior	
10	1D	24/14	10.0 - 12.0	11-10-15-15	25				1D:Grey, Clayey SILT, trace fine Sand.	
							-62.1		10.9 Sample changes at 10.9' to brown, fine to coarse SAND, some Gravel, trace Silt.	
						20				
						37				
						30				
						25				
15						30				
						34				
						34				
						30				
						30				
20						36				
						47				
						51				
						47				
25						67				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-106 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.2 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/5/13; 1300 - 6/6/13; 1105	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455476, E1377295	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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Definitions:
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R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
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Definitions:
-- = not recorded
LL = Liquid Limit
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WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25						53				
						56				
						85				
						72				
						45				
30						50				
						50				
						55				
						61				
						64				
35						84				
						72				
						81				
						95				
						84				
40	2D	24/24	40.0 - 42.0	8-16-20-27	36	48			2D: Brown, dense, fine to medium SAND, little Gravel, trace coarse Sand, trace Silt.	
						33				
						75				
						81				
						65				
45						89			boney material encountered from about 45 ft to bottom of overburden based on drilling behavior	
						116				
						88				
						85				
50						94				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-106 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.2 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/5/13; 1300 - 6/6/13; 1105	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455476, E1377295	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
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Definitions:
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WOC = weight of casing
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Definitions:
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LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50						wash ahead				
55						85				
						79				
						85				
						172	-110.2		59.0	
60						wash ahead			drilling behavior and wash water suggest weathered conglomerate encountered at about 59 ft. NW refusal at 60.2 ft.	
	R1	40/34	61.5 - 64.8	RQD = 0%					roller cone refusal at 61.5 ft. R1: Medium to soft, moderately to highly weathered, aphanitic to fine grained, porphyritic CONGLOMERATE; highly fractured/ broken.	
							-114.0		62.8	
	R2	60/58	64.8 - 69.8	RQD = 77%					R1 (cont'd): Change at 62.8 ft. to: v. hard, fresh to slightly weathered, aphanitic, porphyritic, greyish-green, BASALT; highly fractured to 64.8 ft. Core times: 2:05/3:40/3:40/jam min:sec/ft. R2: V.hard, fresh to slightly weathered, aphanitic, porphyritic, greyish-green, BASALT, with few low to high angle cracks and numerous low to high angle veins, predominantly quartzite, some with rusty margins. Close to moderately spaced, low to high angle fractures, typically formed along veins; undulating, rough, slightly discolored (rust/iron), and partially open to open. Core times: 3:40/3:25/4:05/4:00/3:15 min:sec/ft.	
65										
	R3	24/22	69.8 - 71.8	RQD = 25%					R3: similar to R2, except with close fracture spacing; highly fractured from 69.8 to 70.8 ft. Core times: 3:10/3:20 min:sec/ft.	
70							-123.0		71.8	
									Bottom of Exploration at 71.8 feet below ground surface.	
75										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-107 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/13/13; 1315 - 6/14/13; 1045	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455604, E1377308	**Casing ID/OD:**	HW (4") to 29 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						2				
						29				
						33				
						34				
						25				
5						44				
						53				
						54				
						61				
						72				
10						wash ahead				
						97				
15						104				
						90				
						89				
						107				
						wash ahead				
20										
25						86				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-107 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/13/13; 1315 - 6/14/13; 1045	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455604, E1377308	**Casing ID/OD:**	HW (4") to 29 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
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Definitions:
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R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
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LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25						124				
						111				
						94				
						89				
	1D	24/20	29.0 - 31.0	5-8-15-15	23	wash			1D: Brown, m. dense, fine to medium SAND, little Gravel, trace coarse Sand, trace Silt.	
30						ahead				
						24				
						34				
						44				
						44				
35						45				
						42				
						38				
						47				
						63				
40						58				
						47				
						57				
						69				
						69				
45						46				
						32				
						54				
						60				
50						49/1"			NW refusal at 49.2 ft. roller cone to 50.6 ft; very difficult drilling; wash water changes from red	

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-107 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-50.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/13/13; 1315 - 6/14/13; 1045	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455604, E1377308	**Casing ID/OD:**	HW (4") to 29 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
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MD = Unsuccessful Split Spoon Sample attempt
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Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50						wash ahead	-101.4		to grey suggesting layer of CONGLOMERATE. 50.6	
	R1	38/38	51.1 - 54.3	RQD = 0%					redrive NW to 50.6; clean out to 51.1 ft. R1: V. hard, fresh to slightly weathered, aphanitic, greenish-grey BASALT, with few low and high angle cracks and quartzite veins. Typically v. close to close, low and high angle fractures; undulating, rough, typically slightly discolored (iron/rust), and open; minor lime infilling. Highly fractured from 51.1 to 51.9 ft. and 53.2 to 53.8 ft. Core times: 1:40/1:55/2:25/-- min:sec/ft.	
	R2	13/12	54.3 - 55.4	RQD = 31%					R2: similar to R1, except more numerous cracks and veins with more lime infilling. Highly fractured from 55.1 to 55.4 ft. Core times: 5:05/-- min:sec/ft.	
55	R3	60/60	55.4 - 60.4	RQD = 53%					R3: similar to R2, except close to moderate fracture spacing; 1/4-inch thick near horizontal clay seam at 58.0 ft. Highly fractured from 59.0 to 59.4 ft. Core times: 3:10/2:10/1:25/1:25/2:00 min:sec/ft.	
60							-111.2		60.4 **Bottom of Exploration at 60.4 feet below ground surface.**	
65										
70										
75										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-108 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.1 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/6/13; 1330 - 6/10/13; 1400	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	not used
Boring Location:	N455711, E1377308	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						50				
						116				
						115				
						83				
						wash ahead				
5						57				
						161				
						wash ahead				
10	1D	24/7	10.0 - 12.0	11-11-12-14	23	13			2D: Reddish-brown, m. dense, Gravelly fine to coarse SAND, trace to little Silt.	
						25				
						31				
						28				
						24				
15						30				
						33				
						32				
						30				
						29				
20						27				
						43				
						46				
						36				
25						32				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-108 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.1 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/6/13; 1330 - 6/10/13; 1400	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	not used
Boring Location:	N455711, E1377308	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
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Definitions:
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WOC = weight of casing
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Definitions:
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WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25						35				
						42				
						48				
						41				
						46				
30	2D	24/24	30.0 - 32.0	9-13-16-28	29	--			2D: Brown, m. dense, fine to coarse SAND, some Gravel, trace Silt; fine to medium Sand in tip of spoon.	
						52				
						70				
						71				
						68				
35						107				
						100				
						33			adjust lines; wash out with NW at 37 ft. BGS	
						50				
						65				
40						73				
						110				
						113			driving HW with NW; clamp HW	
						51				
						53				
45						57				
						58				
						56				
						60				
50						59				

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-108 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-51.1 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/6/13; 1330 - 6/10/13; 1400	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	not used
Boring Location:	N455711, E1377308	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
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Definitions:
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R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
50						60				
						67				
						64				
						72				
						73				
55						114				
						126				
						109				
						134			wash out with NW at 59 ft.	
60						wash ahead				
						78				
						68				
65						90				
						100				
									NW to 67.5 ft.	
									roller cone to 69.2 ft; probable rock	
							-120.3		69.2	
70									**Bottom of Exploration at 69.2 feet below ground surface.** line on barge snagged; anchors and barge dragged approx. 30 ft. westerly; NW and HW broken at mudline; relocate boring to MB-EAST-108A	
75										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-108A **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-47.4 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/10/13; 1430 - 6/11/13; 1755	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455728, E1377312	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
70									MB-EAST-108A located approximately 20 ft. NNE from MB-EAST-108. No testing or sampling in overburden; wash water (sand and gravel) similar to MB-EAST-108.	
75	R1	33/30	75.7 - 78.5	RQD = 48%			-123.1		NW and roller cone refusal at 75.7 ft 75.7 R1: V. hard, fresh to slightly weathered, aphanitic, greenish-grey BASALT, with few high angle cracks and quartzite veins. Close to moderately spaced, low and high angle fractures; undulating, rough, predominantly fresh (few slightly discolored), and open; minor lime (mud) infilling. Highly fractured from 77.5 to 78.5 ft. Core times: 4:15/ 2:50/jam min:sec/ft.	
	R2	40/39	78.5 - 81.8	RQD = 20%					R2: similar to R1, except v. close to close spacing; highly fractured 78.5 to 79.2 ft.; significant moderately dipping quartzite vein at 81.6 ft. Core times: 3:00/2:30/2:20/jam min:sec/ft.	
80	R3	49/47	81.8 - 85.9	RQD = 41%					R3: similar to R1, except numerous low to high angle quartzite veins from 81.8 to 83.4 ft; v. close to moderately spaced fractures; significant quartzite veins at 81.8 and 83.1 ft. Core times: 1:35/2:20/2:10/2:00/-- min:sec/ft.	
85	R4	36/35	85.9 - 88.9	RQD = 22%					R4: similar to R1, except v. close to close spacing. Core times: 2:20/ 2:45/3: 10 min:sec/ft.	
	R5	60/59	88.9 - 93.9	RQD = 78%					R5: similar to R1, except predominantly moderate fracture spacing. Core times: 2:20/1:50/2:25/2:20/2:10 min:sec/ft.	
90	R6	56/55	93.9 - 98.6	RQD = 43%					R6: similar to R1, except large porphyroblast from 96.7 to 97.2 ft.; moderately spaced fractures from 93.9 to 95.8 ft.; predominantly closely	
95										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.
NOTE LOG STARTS AT 70 FEET BGS

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-108A **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-47.4 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/10/13; 1430 - 6/11/13; 1755	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2 - wireline
Boring Location:	N455728, E1377312	**Casing ID/OD:**	HW (4") to 10 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
95									spaced fractures from 95.8 to 98.6 ft.; highly fractured from 96.5 to 96.9 ft; some calcite margins. Core times: 2:50/1:35/1:45/1:40/-- min:sec/ft.	
	R7	19/10	98.6 - 100.2	RQD = 0%					R7: similar to R1, except highly fractured entire length. Core times: - /jam min:sec/ft.	
100	R8	44/34	100.2 - 103.9	RQD = 27%					R8: similar to R1, except porphyritic; v. close to close fracture spacing; highly fractured from 100.2 to 100.8 ft. and 103.5 to 103.9 ft; more clay infilling. Core times: 3:00/1:35/3:10/jam min:sec ft.	
	R9	52/47	103.9 - 108.2	RQD = 15%					R9: similar to R1, except porphyritic with v. close fracture spacing and more lime (mud) infilling; significant high angle quartzite veins at 106.9 and 107.8 ft.; highly fractured from 104.3 to 104.7 ft., 105.4 to 106.0 ft., and 107.2 to 107.8 ft. Core times: 5:15/2:50/2:10/3:50/jam min:sec ft.	
105									unable to continue coring due to high wind and rough water	
							-155.6		108.2 **Bottom of Exploration at 108.2 feet below ground surface.**	
110										
115										
120										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.
NOTE LOG STARTS AT 70 FEET BGS

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-109 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-38.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/17/13; 0930 - 6/17/13; 1600	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455675, E1377265	**Casing ID/OD:**	HW (4") to 10.8 ft/ NW (3") to 11.8	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						16				
						42				
						56				
						51				
						33				
5						128				
						172				
						153				
						215			very difficult driving; attempt to roller cone ahead	
						wash ahead				
10									HW refusal at 10.8 ft; attempt to roller cone through presumed obstruction	
							-49.6		10.8	
	R1	60/58	11.8 - 16.8	RQD = 47%					roller cone refusal at 11.8 ft. R1: V. hard to hard, fresh to slightly weathered, aphanitic to fine grained, porphyritic, greenish-grey BASALT, with a few mafic phenocrysts and a few low and high angle cracks and quartzite veins. Felsic-rich (GABBRO) layer consisting predominantly of microcline and plagioclase, as well as muscovite, from 13.4 to 14.9 ft.; significant high angle quartzite vein centered at 14.2 ft. Close to moderately spaced, low and high angle fractures; undulating, rough, and open, with some lime infilling. Core times: 5:55/4:50/4:30/4:30/4:20 min:sec/ft.	
15										
	R2	60/58	16.8 - 21.8	RQD = 48%					R2: V. hard to hard, fresh to slightly weathered, aphanitic to fine grained, porphyritic, green-pink-grey GABBRO, consisting predominantly of microcline and plagioclase, as well as muscovite and some mafic phenocrysts; few low and high angle cracks and quartzite veins. Significant high angle quartzite vein centered at 18.8 ft. and 1/4-inch wide high angle quartzite vein centered at 19.8 ft. Close to moderately spaced, low and high angle fractures; undulating, rough, and open, with some lime infilling. Core times: 4:00/3:20/1:50/2:05/3:05 min:sec/ft.	
20										
	R3	60/60	21.8 - 26.8	RQD = 63%					R3: Similar to R2, with 1/2-inch wide high angle quartzite vein centered at 23.4 ft. Core times: 2:30/1:55/2:10/2:05/2:30 min:sec/ft.	
25										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-109 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-38.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/17/13; 0930 - 6/17/13; 1600	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455675, E1377265	**Casing ID/OD:**	HW (4") to 10.8 ft/ NW (3") to 11.8	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
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MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
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WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25										
	R4	37/37	26.8 - 29.9	RQD = 0%					R4: Similar to R2, except highly fractured throughout; occasional discolored (rust/iron) fracture surfaces; some lime infilling. Core times: 2:50/3:20/3:40/jam min:sec/ft.	
30							-68.7		29.9 **Bottom of Exploration at 29.9 feet below ground surface.**	
35										
40										
45										
50										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

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SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-110 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-22.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/13/13; 0545 - 6/13/13; 1045	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455683, E1377142	**Casing ID/OD:**	HW (4") to 20 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
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MD = Unsuccessful Split Spoon Sample attempt
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MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
0						WOC	-23.8		0 to 1 foot - muck	
									1.0	
						24				
						26				
						28				
						27				
5						25				
						30				
						21				
						28				
						29				
10	1D	24/12	10.0 - 12.0	8-9-11-10	20	39			1D: Brown, m. dense, Gravelly fine to coarse SAND, trace to little Silt.	
						36				
						35				
						26				
						55				
15						71				
						89				
						61				
						96				
						63				
20						wash ahead			very difficult drilling; roller cone ahead of casing	
									NW and roller cone refusal at 22.6 ft.; attempt core; cobbles and boulders.	
25										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

SCHONEWALD ENGINEERING ASSOCIATES, INC.	**PROJECT:** Maine Department of Transportation Eastport Breakwater Replacement **LOCATION:** Eastport, Maine	**Boring No.:** MB-EAST-110 **WIN:** 18436.00

Driller:	Maine Test Borings	**Elevation (ft.)**	-22.8 ft (mudline) [see remarks]	**Auger ID/OD:**	
Operator:	Enos/ Dube	**Datum:**	NAVD88 / NAD83, Maine East Zone	**Sampler:**	standard split-spoon
Logged By:	Schonewald	**Rig Type:**	CME 45C modified	**Hammer Wt./Fall:**	140 lbs / 30 inches
Date Start/Finish:	6/13/13; 0545 - 6/13/13; 1045	**Drilling Method:**	cased; drive and wash	**Core Barrel:**	NQ2
Boring Location:	N455683, E1377142	**Casing ID/OD:**	HW (4") to 20 ft/ NW (3") to rock	**Water Level*:**	not applicable

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

Definitions:
S_u = Insitu Field Vane Shear Strength (psf)
R = Rock Core Sample
RQD = Rock Quality Designation (%)
WOC = weight of casing
WOH = weight of 140lb. hammer
WOR = weight of rods

Definitions:
-- = not recorded
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
WC = water content, percent
G = grain size analysis

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Lab. Testing Results
25							-48.4		25.6 NW to 25.6 - set into top of rock	
	R1	26/24	26.6 - 28.8	RQD = 0%					R1: V. hard, slightly weathered, aphanitic, porphyritic, green-pink-grey, GABBRO, consisting predominantly of microcline and plagioclase, as well as muscovite, with predominantly mafic phenocrysts and some vugs and pits from weathering of phenocrysts. Highly fractured throughout run; discolored (rust/iron) fracture surfaces and lime infilling typical. Core times: 1:35/1:40/-- min:sec/ft.	
	R2	43/43	28.8 - 32.4	RQD = 12%					R2: Similar to R1, except v. close to close, moderately dipping to near vertical fractures; undulating, rough, discolored and open, with lime infilling. Core times: 1:55/2:05/2:00/jam min:sec/ft.	
30										
	R3	28/28	32.4 - 34.7	RQD = 0%					R3: Similar to R1 and R2, with v. close fracture spacing to highly fractured; cracks that are not yet, but easily separated throughout. Core times: 1:40/1:35/jam min:sec/ft.	
	R4	24/20	34.7 - 36.7	RQD = 0%					R4: Similar to R3, except highly fractured throughout; lime infilling more prevalent. Core times: 1:40/1:50 min:sec/ft.	
35							-59.5		36.7 **Bottom of Exploration at 36.7 feet below ground surface.**	
40										
45										
50										

Remarks:

Mudline elevation updated 8/26/2013 based upon corrected data recevied from CES, Inc.

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