Loureiro
Engineering • Construction • EH&S • Energy
Waste • Facility Services • Laboratory

SENT VIA E-MAIL

May 12, 2020

General Dynamics/Electric Boat
Materials Management Dept. 330
75 Eastern Point Road
Groton, CT 06340

Attn: Mr. Paul Williams

RE: Environmental and Geotechnical Services – Geotechnical Report
New Office Building Eastern Point Road
Groton, Connecticut

Dear Mr. Williams:

As you are aware, Loureiro Engineering Associates, Inc. (hereinafter, "Loureiro") has been performing a subsurface investigation and geotechnical assessment to provide an understanding of subsurface conditions and how those conditions will affect the design of a to be constructed office building at the 75 Eastern Point Road facility in Groton, Connecticut (hereinafter the Site). The purpose of this correspondence is to provide an interim status on information obtained to date. The information obtained to date is associated with the geotechnical investigation portion of this project.

The geotechnical engineering report has been prepared as a separate document and is attached to this letter. It will be incorporated into the comprehensive environmental investigation and geotechnical assessment report.

Environmental soil data is expected to be received from the laboratory tomorrow morning (March 13th) and the final report is anticipated to be completed on Thursday, March 14th. Please let us know if this meets your scheduling requirements.

Thank you.

Sincerely,

LOUREIRO ENGINEERING ASSOCIATES, INC.

John A. Bondos, Jr., L.E.P.
Senior Project Manager

cc: Michael Pacheco, General Dynamics/Electric Boat
Brian Cutler, P.E., L.E.P., Loureiro

Attachment

Attachment

Geotechnical Engineering Report

GEO DESIGN

GEODesign, Inc.
984 Southford Rd.
Middlebury, CT 06762
(203) 758-8836

May 11, 2020
File No. 3901-010.00

Mr. John A. Bondos, Jr., Sr. Project Manager
Loureiro Engineering Associates
100 Northwest Drive
Plainville, CT 06062

Email: jabondos@loureiro.com

Re: Geotechnical Engineering Report
6 Story Building # 604, 75 Eastern Point Road
Groton, CT

Dear Mr. Bondos:

GEODesign, Inc. (GEODesign) is pleased to submit this geotechnical engineering report for a proposed new six-story building to be constructed at 75 Eastern Point Road in Groton, Connecticut (see attached Figure 1 location plan in Appendix 1).

BACKGROUND

Elevations included in this report are in feet and based on the March 13, 2020 Partial Site Plan provided by Loureiro Engineering Associates.

Please refer to Figure 2 site plan (Appendix 1). The site is an open area sloping down to the west. An existing building is located south of the proposed building and Eastern Point Road is on the east side. Current side grades range from El. 69 on the west and El. 82 on the east.

The new 6-story building will be approximately 10,000 square feet and will have a basement. We currently do not have details of the grading, and basement slab elevation. We are assuming for this report that the finished slab elevation of the basement will be about El. 69 as this would permit a full basement to the east with “walk-out” to the west.

PURPOSE AND SCOPE

We completed a subsurface exploration program and geotechnical evaluation for the proposed building. Our services included characterizing the subsurface conditions within the footprint of the proposed building, performing geotechnical engineering analyses, and providing geotechnical design and construction recommendations.

Our services were provided in accordance with our April 13, 2020 proposal. Our recommendations are based in part on guidance from the 2015 International Building Code (IBC) and the 2018 Connecticut State Building Code.

TEST BORINGS

Five test borings (B-1 through B-5) were drilled at the locations shown on Figure 2 on May 4 and 5, 2020. A GEODesign representative observed and logged the borings. Boring logs are included in Appendix 2.

We estimated the approximate ground surface elevation at each boring from the referenced topographic mapping. The locations of the borings and their elevations should be considered approximate consistent with the method used to locate them. Boring locations were selected to avoid utilities. We understand that there are numerous buried utilities at the site.

Hollow-stem-auger drilling methods were used to advance the borings to depths of approximately 7.5 to 21.2 feet below current site grades.

Representative samples were obtained by split-barrel sampling procedures in general accordance with ASTM D-1586. The split-barrel sampling procedure utilizes a standard 2-inch O.D. split-barrel sampler that is driven into the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the middle 12-inches of a normal 24-inch penetration is recorded as the Standard Penetration Resistance Value (N). The blows (i.e. the "N" values) are indicated on the boring logs at their depth of occurrence and provide an indication of the relative consistency of the material.

A groundwater observation well was installed in boring B-3.

Three sieve analyses were performed on two samples of Fill and one sample of natural Glacial Till soil below the Fill the results are attached Appendix 3.

SUBSURFACE CONDITIONS

Geology

Published surficial geological data (1:125,000 scale, Surficial Materials Map of Connecticut, Janet Radway Stone, 1992) and published bedrock geological data (1:125,000 scale, Bedrock Geologic Map of Connecticut, John Rodgers, 1985) were reviewed.

The surficial materials are mapped as Glacial Till which is described as a variable mixture of gravel, sand, silt, and clay that is intermixed with cobbles and boulders.

The bedrock is mapped as granitic New London Gneiss.

General Subsurface Profile

The generalized subsurface profile, as inferred from the subsurface explorations, in order of increasing depth consists of Topsoil overlying human-placed Fill overlying Glacial Till, consistent with the published surficial geologic mapping. Bedrock was not encountered in the test borings or at the levels of expected foundations.

Topsoil, Fill

Up to 6 inches of Topsoil overlying granular Fill.

The Fill stratum ranges from 4 to 12 feet thickness and generally consisted of loose to very dense, brown fine to medium Sand with varying amounts of Gravel and Silt. Trace amounts of brick, concrete and glass were observed in the Fill. The Fill also contained trace organics and decomposed wood.

The bottom of Fill ranges from El. 72 to 63.5.

Glacial Till

The Glacial Till generally consisted of medium dense to very dense light brown to gray fine to medium Sand with little to trace amounts of Gravel and Silt. Boulders were inferred in the Glacial Till in borings B-1 and B-3 and penetrated by a core barrel. Inferred boulder zones were about 1.5 to 2.3 feet thick.

Bedrock

Bedrock was not encountered or cored within the boring depths. Given that Glacial Till normally transitions to bedrock and the surface of the bedrock can vary, it is possible that bedrock could be encountered between borings.

Auger and Split Spoon Sampler Refusals

Split spoon sampler refusal was encountered in borings B-1, B-2 and B-3 and auger refusal was encountered in borings B-4 and B-5.

Groundwater

Free groundwater was not observed during drilling or in the observation well installed in Boring B-3 after a few days stabilization time. However, a wet sample was observed at a depth of 17 feet during drilling and may be indicative of the long term groundwater level, or capillary action from

a deeper level. The depth to groundwater will vary by location and factors such as seasonal variations, temperature, rainfall and other factors that differ from the conditions at the time the subsurface explorations were made.

GEOTECHNICAL RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

Building Foundations

Existing surficial fill material and the organic soils are presumptively unsuitable for support of structures. The underlying glacial till soils are suitable bearing materials for normal shallow, reinforced concrete footings and basement retaining walls.

A bearing pressure of 6,000 pounds per square foot (psf) is recommended for foundation design. Regardless of actual bearing pressure, no isolated (column) footing should be less than 30 inches square and no continuous (wall) footing should be less than 24 inches wide.

Exterior footings and footings in areas otherwise subjected to freezing temperatures must be embedded at least 3.5 feet below grade consistent with building code frost protection requirements. Interior footings in heated areas shall bear no less than 18 inches below the top of the finished slab. A leveling mat of at least 6 inches of compacted Structural Fill or Crushed Stone should be provided below footings in areas where bedrock is present.

Earthquake Design

The project site is considered Site Class “C” (very dense soil) per the 2015 International Building Code (IBC) and ASCE 7-10, Chapter 20. Per Appendix N to the 2018 Connecticut Building Code, S_s equals 0.160 and S_1 equals 0.058 for Groton.

Site soils are not susceptible to liquefaction for the design earthquake.

Building Slab

We do not have information on slab loading. As a minimum, we recommend a slab base course consisting of a minimum of at least 6 inches of freshly placed off-site compacted Gravel Fill or Crushed Stone that is proof compacted with a vibratory plate or roller compactor immediately before final preparations for slab concrete.

A subgrade modulus of 300 lbs/in^3 may be assumed for slab design.

Vapor barrier requirements of the Building Code should be observed.

Design for Lateral Load

The basement walls and any loading docks will be subject to unbalanced earth loads. Such walls that are subject to unbalanced earth loadings should be designed for the following minimum lateral soil pressures (calculated on the basis of an equivalent fluid pressure in pounds per cubic foot):

- Active Case = 35 pcf
- At Rest Case = 60 pcf

The active case would apply to most situations of site retaining walls with level backfill, truck docks and the like. The at-rest case should be used for those cases where walls are braced, such as basement walls, elevator and sump pits. The above pressures are generally based on an assumed level backfill with a total weight of 125 to 130 pcf and an internal friction angle of 33 to 34 degrees. Corresponding active and at-rest earth pressure coefficients are 0.28 and 0.46, respectively. Also refer to IBC Article 1610.1 for building code requirements regarding application of active and at-rest earth pressures.

Walls subject to surcharge loads from adjacent slabs, loading docks or other live or dead loads must also be designed for an additional uniform lateral pressure over the entire height of the wall equal to the applicable earth pressure coefficient (active or at-rest case, as applicable) times the magnitude of the surcharge.

The foregoing recommendations do not include hydrostatic pressures on the walls. To achieve this condition, free draining backfill must be used for wall backfill and foundation drains must be provided. Damp-proofing should be considered for the backfilled side of the loading dock walls.

For cases where passive earth pressure is considered to counteract lateral loads, the recommended maximum allowable lateral passive soil pressure (calculated on the basis of an equivalent fluid pressure in pounds per cubic foot) is 150 pcf consistent with materials class “5” per Table 1806.2 of the Connecticut Building Code. This corresponds to roughly one-third of the theoretical passive earth pressure for a passive earth pressure coefficient of 3.33. The allowable passive pressure is limited to one-third of the theoretical in consideration of the very large strains necessary to develop full passive earth pressure.

The recommended maximum coefficient of friction between foundations and Gravel Fill/Crushed Stone bearing pad is 0.35 per Table 1806.2 of the Connecticut Building Code.

Excavation

Most earth excavations will be in the existing fill material which is judged to be Type “C” soils and thus may be sloped at 1.5H:1V in temporary excavations when seepage is not present. Permanent cut

and fill slopes in soil should not be steeper than 2H:1V. It is expected that the general excavation for this project can be conducted open cut.

The general water table is inferred to be below expected excavation levels. Some seepage of perched water from excavation slopes could occur. Construction dewatering will mostly be concerned with control of precipitation and water from construction activities. Excavations should be protected from run-on of surface drainage.

Note that very dense sandy glacial till soils and indications of boulders are present and as such the potential for difficult excavation and wear and tear on construction equipment. Actual conditions will not be evident until construction and general excavation when large areas are opened up. We recommend that test pits be excavated prior to construction to explore excavation conditions prior to general excavation.

Also note per the sieve results that the existing fill material has elevated silt content and will be sensitive to moisture, making such soils difficult to place and compact when wet.

Fill and Backfill

Structural Fill to be used below structures and pavement and other applications as detailed shall be substantially free of ash, refuse, trash, ice, snow, stumps, roots, and organic materials. Where placed more than two feet below finished grade, Structural Fill may include concrete or masonry rubble if broken up to the herein specified size limitations and if there are no exposed steel reinforcing bars. Structural Fill shall not include asphalt or bituminous rubble except in locations directly below proposed paved areas or buildings. Structural Fill obtained from on-site sources shall be friable soil that can be spread and compacted to specifications and form a stable embankment. Structural Fill obtained from off-site sources shall be well graded within the following limits:

Sieve Size	Percent Passing by Weight
6”	100
No. 10	30-95
No. 40	10-70
No. 200	0-15

Select Fill for use as backfill behind drained walls and other applications requiring free draining, non-frost susceptible backfill shall be free of ice, snow, roots, sod, rubbish and other deleterious or organic matter and shall conform to the following gradation requirements.

Sieve Size	**Percent Passing by Weight**
6”	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

Ordinary Fill for use as fill or backfill where other materials are not specified shall be friable, non-plastic, inorganic soil containing no stone greater than 2/3 of the required loose lift thickness and not more than 35 percent passing the No. 200 sieve. Ordinary Fill shall be free of ash, refuse, trash, ice, snow, stumps, roots, and organic materials.

Gravel Fill shall meet the requirement of ConnDOT Form 817, article M.02.01, Grading A or C.

Crushed Stone shall meet the requirements of ConnDOT Form 817, article M.0.01 for sizes No. 6, No. 67 or No. 8.

Processed Aggregate Base shall meet the requirements of ConnDOT Form 817, article M.05.01.

Materials should be placed within 3% of their optimum moisture content and compacted in accordance with the following table.

Compaction Method	Maximum Stone Size*	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures and Pavement	Less Critical Area	Below Structures and Pavement	Less Critical Area
Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	6	4
Hand-operated vibratory drum rollers weighing at least 1,000# in confined areas	6"	8"	10"	6	4
Light vibratory drum roller minimum dynamic force 3,000#/ft. drum width	6"	10"	12"	6	4
Medium vibratory drum roller minimum dynamic force 5,000#/ft. drum width	8"	12"	16"	6	6
Heavy vibratory drum roller minimum dynamic force 8,000#/ft. drum width	10"	16"	18"	6	6

* And no more than two-thirds (2/3) loose lift thickness.

We recommend a minimum in-place dry density of 95-percent as per ASTM D1557 for material placed below foundations and slabs. We recommend a minimum in-place dry density of 92-percent as per ASTM D1557 for material placed below paved areas and as backfill exterior to foundations.

CONSTRUCTION DOCUMENTS AND SPECIAL INSPECTIONS

GEODesign remains available to collaborate with the design team to finalize design details and address geotechnical related issues that arise during design development. GEODesign's involvement is recommended in regard to preparation of project technical specifications for earthwork, and review of construction drawings and related technical specification sections prepared by other design team members.

GEODesign notes that it is generally not recommended that the geotechnical engineering report be included in the bid documents since it contains interpretive information and may include concepts or recommendations that were not incorporated into the final project design. Instead, certain factual subsurface exploration data (borings and test pit logs, laboratory test results, and the like) should be extracted from the geotechnical engineering report and included in the bidder's information. The geotechnical report text itself is best not included in the bid documents, but should be referenced and made available for the bidder's information only.

Consistent with building code requirements, placement of structural fill supporting building foundations and preparation of footing subgrades are subject to "special inspection" requirements. The geotechnical Special Inspector must review excavated subgrades for foundations and slabs and determine any requirements to additional excavation and replacement of unsuitable material.

On this project, GEODesign's involvement during construction is further recommended in regard to review of re-use of on-site materials.

This report and GEODesign's services are subject to the limitations outlined in Appendix 4.

Sincerely,

GEODesign, Inc.

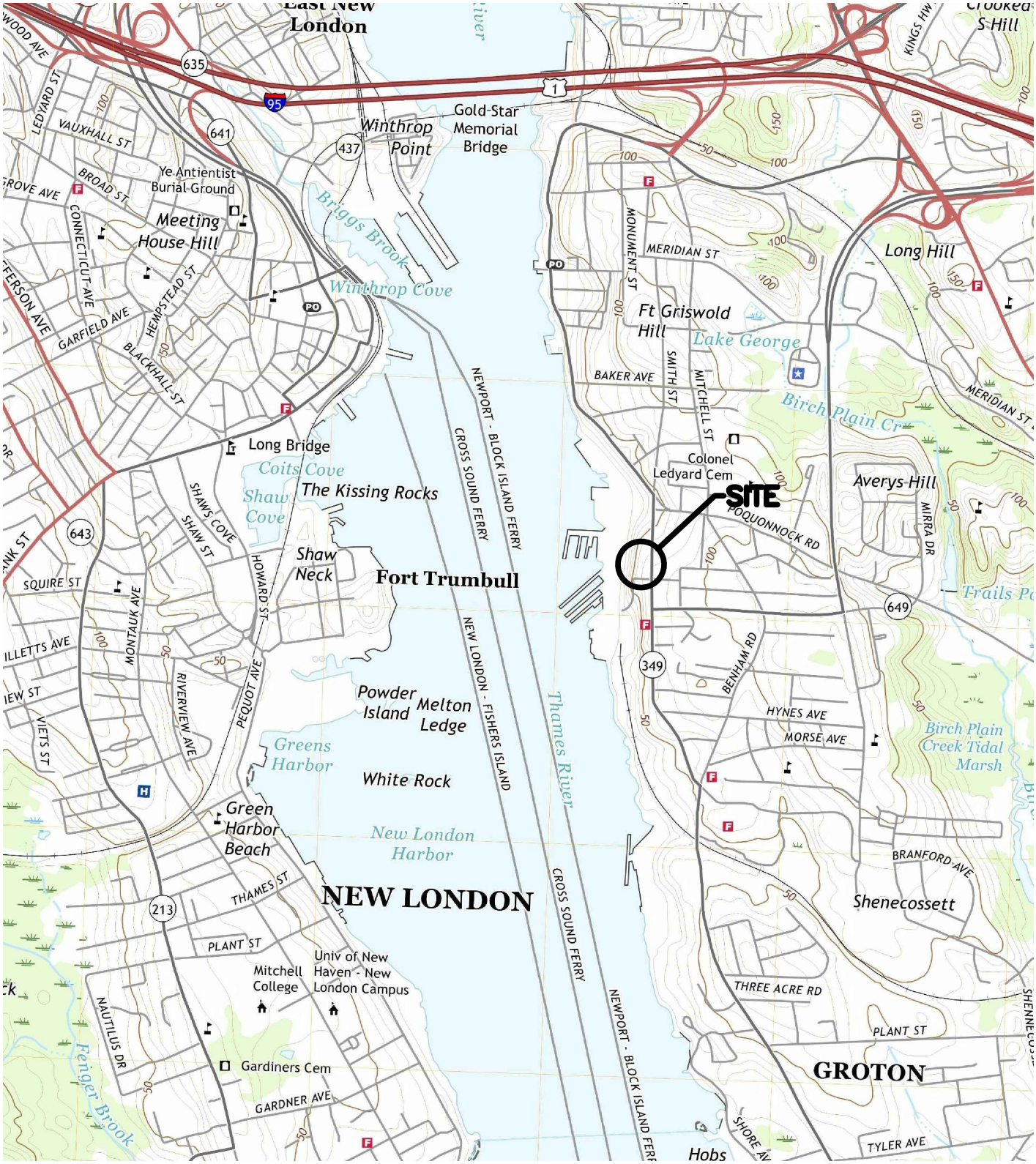
Theodore von Rosenvinge, P.E.
Senior Principal

Appendices:

	Appendix 1	Figures
	Appendix 2	Boring Logs
	Appendix 3	Laboratory Results
	Appendix 4	Limitations

Appendix 1

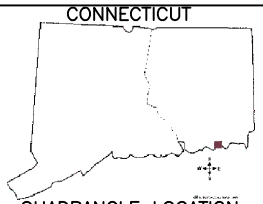
Figures



GEO DESIGN

984 SOUTHFORD ROAD
MIDDLEBURY, CT 06762
203.758.8836
geocompanies.com

CONNECTICUT



QUADRANGLE LOCATION

75 EASTERN POINT ROAD
GROTON, CONNECTICUT

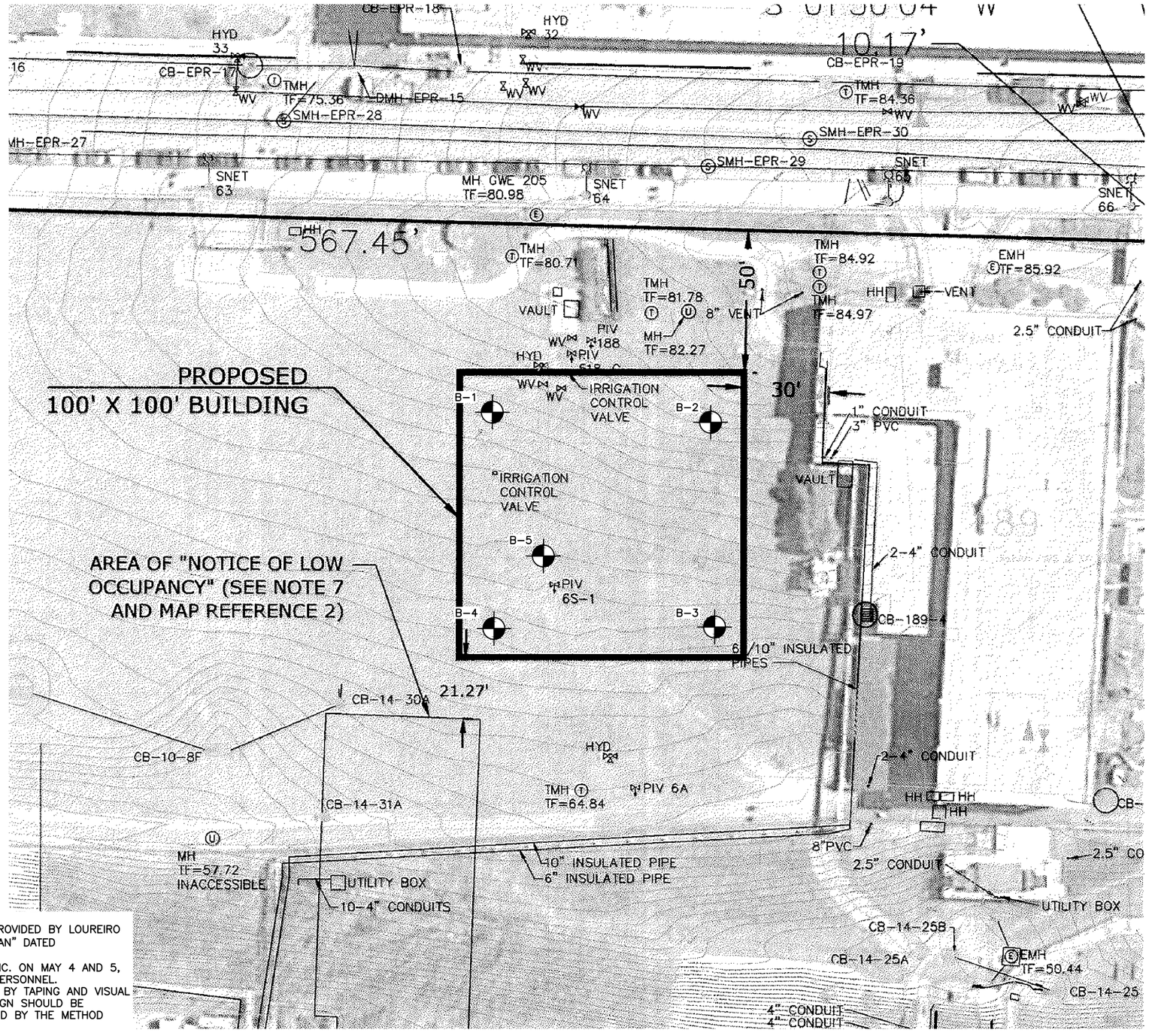
REFERENCE:
U.S.G.S. 7.5 MINUTE QUADRANGLE: NEW LONDON, CT.
FIGURE WAS CREATED USING U.S.G.S. TOPOGRAPHICAL MAP.

SCALE IN FEET

0 1000 2000 4000

DRAWN BY:	LTB
REVIEWED BY:	TvR
PROJECT NO.	3901-010.00
DATE	4/20/2020
FIGURE NO.	1

M:\CL\3901 Loureiro\010\CAD\figures.dwg CAD2 4/20/2020 11:28 AM GEO Standard Pen Table.ctb



LEGEND

B-1 — TEST BORING NO. AND LOCATION BY GEODESIGN, INC.

NOTES:

1. BASE MAP DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY LOUREIRO ENGINEERING ASSOCIATES ENTITLED "PARTIAL SITE PLAN" DATED 03/13/2020. ORIGINAL SCALE 1"=40'.
2. BORINGS WERE PERFORMED BY GENERAL BORINGS INC. ON MAY 4 AND 5, 2020 AND OBSERVED AND LOGGED BY GEODESIGN PERSONNEL.
3. THE LOCATIONS OF THE BORINGS WERE DETERMINED BY TAPING AND VISUAL ESTIMATES FROM EXISTING SITE FEATURES. THIS DESIGN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

DESIGNED BY TvR						
DRAWN BY LTB						
CHECKED BY TvR	NO.	DATE	REVISIONS	DRWN	CHKD	APPVD
APPROVED BY TvR						

SCALE 1" = 40'
40 20 0 40

GEO DESIGN
984 SOUTHFORD ROAD
MIDDLEBURY, CT 06762
203.758.8836
geocompanies.com

PROJECT: 6 STORY BUILDING #604
75 EASTERN POINT ROAD
GROTON, CT

PROJECT NO. 3901-010.00

SCALE 1"=40' DATE 5/6/2020

DWG. TITLE: BORING LOCATION PLAN

FIGURE NO. 2

Appendix 2

Boring Logs

GEO DESIGN
Geotechnical | Construction | Environmental
Engineers and Scientists
984 Southford Road - Middlebury, CT 06762
Telephone: (203) 758-8836 Fax: (203) 758-8842

BORING LOG

Project Name

Proposed 6 Story Building #604
75 Eastern Point Road
Groton, Connecticut

Boring No.: **B-1**
Page No.: 1 of 1
File No.: 3901-010.00
Checked By: TvR

Boring Company:	General Borings, Inc.			Casing:	Sampler:	Groundwater Observations	
Foreman:	Jim Casson		Type:	H.S.A.	SS	Date / Depth (ft) / Elev. (ft) / Notes	
GeoDesign Rep.:	Robert Marshall		I.D.:	3.25 in.	1.38 in.		
Date Started:	May 4, 2020	Date Finished: May 4, 2020	Hammer Wt.:	N/A	140 lbs	5/4/20	None observed
N. Coordinate:		E. Coordinate:	Hammer Fall:	N/A	30 in.		
Ground Surface Elevation (feet):	76		Rig Type:	Diedrich D50 Track			
Station:	Offset: ft		Hammer Type:	Automatic - Hydraulic			

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		1	SS	24	24	0	3	13	39	37		ND	Topsoil 75.5		Very dense, Top 6" Brown TOPSOIL
													Fill		Bottom 18": Brown fine to medium SAND, little fine to coarse Gravel, little Silt, trace Concrete, Brick, Asphalt Fragments
													4.0		
5													Cobble 72.0		
		2	SS	9	3	5	47	50/3"				ND	Glacial Till 71.5		Very dense (spoon refusal), gray fine to medium SAND and fine to coarse GRAVEL, little (-) Silt (Mica Schist in tip of spoon)
10													10.2		
		3	SS	4	1	10	50/4"					3.0	Boulder 65.8		Very dense (spoon refusal), gray fine SAND, little fine Gravel, trace Silt
		1	C	24	18	10.5					3				Granitic Boulder Fragments
		4	SS	17	12	12.5	25	47	50/5"		1	ND	12.5		
													63.5		Very dense (spoon refusal), gray fine to medium SAND, little fine to coarse Gravel, trace Silt
													13.9		
15													Bottom of Exploration at 13.9 ft 62.1		
20															
25															
30															

Remarks

1. Soil samples screened in the field using a MiniRae 2000 portable VOC monitor calibrated to an isobutylene standard where ND indicates no detection.
2. Augers advanced into Mica Schist from 6 to 6.5 feet refusal; boring relocated 4 feet south with obstruction from 6.5 to 7 feet.
3. Augered into inferred rock from 10.2 to 10.5 feet then cored boulder to 12.5 feet then sampled open hole 12.5 to 13.9 feet, attempted additional auger advance with auger refusal at 10.6 feet.

Notes:
1) Soil Samples screened in the field using a calibrated Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. ND = None Detected; NR = Not Recorded; NA = Not Applicable; OR = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors over time. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

GEO DESIGN
Geotechnical | Construction | Environmental
Engineers and Scientists
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BORING LOG

Project Name

Proposed 6 Story Building #604
75 Eastern Point Road
Groton, Connecticut

Boring No.: **B-2**
Page No.: 1 of 1
File No.: 3901-010.00
Checked By: TvR

Boring Company: General Borings, Inc.
Foreman: Jim Casson
GeoDesign Rep.: Robert Marshall
Date Started: May 5, 2020 Date Finished: May 5, 2020
N. Coordinate: E. Coordinate:
Ground Surface Elevation (feet): 80
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	N/A	140 lbs
Hammer Fall:	N/A	30 in.
Rig Type:	Diedrich D50 Track	
Hammer Type:	Automatic - Hydraulic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
5/5/20			15 min, none observed

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		1	SS	24	24	0	5	13	14	7		ND	Topsoil		Medium dense, brown Top 6": TOPSOIL
													Fill 79.5		Bottom 18": fine to medium SAND, little Silt, little fine to coarse Gravel
		2	SS	24	20	2	8	9	16	23		ND			Medium dense, brown fine to medium SAND, little fine to coarse Gravel, little Silt, trace Topsoil
5		3	SS	24	16	4	21	14	9	8		ND			Medium dense, Top 8": Brown similar to above
															Bottom 8": Light brown fine SAND, some fine to coarse Gravel, little (-) Silt, trace (-) Organics
		4	SS	24	14	6	7	12	13	10		ND			
															Medium dense, brown to light brown fine to medium SAND, little fine to coarse Gravel, little Silt
		5	SS	24	2	8	6	3	2	1		ND			
10															Loose, brown coarse CONCRETE Fragments, some fine to medium Sand, little Silt
		6	SS	24	3	10	10	16	8	15		ND			
													12.0		Medium dense, brown fine to medium SAND, little silt, trace Glass, trace Metal shards
		7	SS	24	15	12	15	19	21	45		ND	Glacial Till 68.0		Dense, gray-brown fine to medium SAND, some (-) fine to coarse Gravel, little (-) Silt
15															
		8	SS	3	2	15	50/3"					ND			Very dense (spoon refusal), gray fine to medium SAND, little fine Gravel, little Silt (pulverized Mica Schist)
20															
		9	SS	14	12	20	35	65	50/2"			ND	21.2		Very dense (spoon refusal), gray fine to medium SAND, little fine to coarse Gravel, trace (+) Silt, damp
													Bottom of Exploration at 20.2 ft 58.8		
25															
30															

Remarks

1. Soil samples screened in the field using a MiniRae 2000 portable VOC monitor calibrated to an isobutylene standard where ND indicates no detection.
2. Spoon bouncing from 10 to 11 feet.

Notes:
1) Soil Samples screened in the field using a calibrated Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. ND = None Detected; NR = Not Recorded; NA = Not Applicable; OR = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors over time. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

BORING LOG

GEO DESIGN

Geotechnical | Construction | Environmental
Engineers and Scientists
984 Southford Road - Middlebury, CT 06762
Telephone: (203) 758-8836 Fax: (203) 758-8842

Project Name

Proposed 6 Story Building #604
75 Eastern Point Road
Groton, Connecticut

Boring No.: **B-3**
Page No.: 1 of 1
File No.: 3901-010.00
Checked By: TvR

Boring Company: General Borings, Inc.
Foreman: Jim Casson
GeoDesign Rep.: Robert Marshall
Date Started: May 4, 2020 Date Finished: May 4, 2020
N. Coordinate: E. Coordinate:
Ground Surface Elevation (feet): 70
Station: Offset: ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	N/A	140 lbs
Hammer Fall:	N/A	30 in.
Rig Type:	Diedrich D50 Track	
Hammer Type:	Automatic - Hydraulic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
5/4/20	17.0	53.0	Wet sample
5/5/20			Dry @ 20', in well
5/8/20			Dry @ 20' 4 day stabilization

Depth (ft)	Casing Blows/ft	Sample Info: Number	Type	Penetration (inches)	Recovery (inches)	Depth (ft)	Blows / 6 inch Interval: 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		1	SS	24	12	0	3	22	26	22		ND	Topsoil 69.6		Dense, Top 5": Brown TOPSOIL
													Fill		Bottom 7": fine to medium SAND, little fine to coarse Gravel, little Silt
		2	SS	24	16	2	13	10	10	14		ND			Medium dense, brown fine to medium SAND, little fine to coarse Gravel, little Silt, trace (-) Wood Fibers
5															
		3	SS	7	1	5	5	10/1"				ND	5.5 Obstruction 64.5		Brown fine to medium SAND, some coarse Gravel, trace Silt, trace Brick Fragments (Fill)
													6.5 Glacial Till 63.5		
10															
		4	SS	24	14	10	9	15	25	46		ND			Dense, light brown fine to medium SAND, little (-) fine Gravel, trace Silt, dry
													12.5 Boulder 57.5		
		1	C	36	10	13					2		14.0 Glacial Till 56.0		Boulder Fragments
15											1				
											1				
		5	SS	16	16	16	32	54	50/4"			ND	▼		Very dense (spoon refusal), light brown fine to medium stratified SAND, trace fine Gravel, trace Silt, wet bottom
20															
		6	SS	10	6	20	36	50/4"				ND	20.8 Bottom of Exploration at 20.8 ft 49.2		Very dense, light brown fine to medium SAND, some fine to coarse Gravel, trace Silt
25															
30															

Well Log

Remarks

1. Soil samples screened in the field using a MiniRae 2000 portable VOC monitor calibrated to an isobutylene standard where ND indicates no detection.
2. Augered through obstruction (probable rock or concrete) 5.5 to 6.5 +/- feet with steel shards in auger cuttings.
3. Auger advanced into inferred rock from 12.5 to 13 feet prior to C-1 at 13 feet through boulder with HSA advanced through boulder.
4. 2" ID PVC piezometer installed upon completion of boring with tip of 10 foot section of slotted screen set at depth of 20 feet, filter sand to 8.5 feet, bentonite seal to 7.5 feet, auger cuttings to surface and flush mount curb box with concrete collar installed.

Notes:
1) Soil Samples screened in the field using a calibrated Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. ND = None Detected; NR = Not Recorded; NA = Not Applicable; OR = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors over time. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

Boring No.: **B-3**

GEO DESIGN
Geotechnical | Construction | Environmental
Engineers and Scientists
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BORING LOG

Project Name

Proposed 6 Story Building #604
75 Eastern Point Road
Groton, Connecticut

Boring No.: **B-4**
Page No.: 1 of 1
File No.: 3901-010.00
Checked By: TvR

Boring Company:	General Borings, Inc.		
Foreman:	Jim Casson		
GeoDesign Rep.:	Robert Marshall		
Date Started:	May 5, 2020	Date Finished:	May 5, 2020
N. Coordinate:		E. Coordinate:	
Ground Surface Elevation (feet):	69		
Station:		Offset:	ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	N/A	140 lbs
Hammer Fall:	N/A	30 in.
Rig Type:	Diedrich D50 Track	
Hammer Type:	Automatic - Hydraulic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
5/5/20			None observed

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		1	SS	24	22	0	4	11	10	16		54.9	Topsoil / Fill 68.7		Medium dense, brown Top 4": TOPSOIL Bottom 18": fine to medium SAND, little fine to coarse Gravel, little Silt, trace Wood, trace Brick Fragments
		2	SS	24	10	2	4	14	13	9		ND			
5		3	SS	24	18	4	11	18	24	23		ND	4.5 Glacial Till 64.5		Medium dense, brown to orange-brown fine to medium SAND and SILT, trace fine Gravel, trace (-) Organics
		4	SS	24	20	6	16	18	15	20		ND			Dense, gray-brown fine to medium SAND, little fine to coarse Gravel, trace Silt
10		5	SS	3	1	10	50/3"					ND	10.5 Bottom of Exploration at 10.5 ft 58.5		Dense, gray fine SAND, little (-) Silt, trace fine Gravel Very dense (spoon refusal), gray fine to medium SAND, trace fine Gravel, trace Silt
15															
20															
25															
30															

Remarks

1. Soil samples screened in the field using a MiniRae 2000 portable VOC monitor calibrated to an isobutylene standard where ND indicates no detection.
2. Auger refusal at 10.5 feet.

Notes:
1) Soil Samples screened in the field using a calibrated Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. ND = None Detected; NR = Not Recorded; NA = Not Applicable; OR = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors over time. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

Boring No.: **B-4**

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BORING LOG

Project Name

Proposed 6 Story Building #604
75 Eastern Point Road
Groton, Connecticut

Boring No.: **B-5**
Page No.: 1 of 1
File No.: 3901-010.00
Checked By: TvR

Boring Company:	General Borings, Inc.		
Foreman:	Jim Casson		
GeoDesign Rep.:	Robert Marshall		
Date Started:	May 5, 2020	Date Finished:	May 5, 2020
N. Coordinate:		E. Coordinate:	
Ground Surface Elevation (feet):	72		
Station:		Offset:	ft

	Casing:	Sampler:
Type:	H.S.A.	SS
I.D.:	3.25 in.	1.38 in.
Hammer Wt.:	N/A	140 lbs
Hammer Fall:	N/A	30 in.
Rig Type:	Diedrich D50 Track	
Hammer Type:	Automatic - Hydraulic	

Groundwater Observations

Date	Depth (ft)	Elev. (ft)	Notes
5/5/20			None observed

Depth (ft)	Casing Blows/ft	Sample Number	Sample Type	Penetration (inches)	Recovery (inches)	Sample Depth (ft)	Blows / 6 inch Interval 0 - 6	6 - 12	12 - 18	18 - 24	Coring Time (min./ft)	PID Reading (ppm)	Strata Description (Depth & Elevation(feet))	Symbol	Sample Description (Classification System: Modified Burmister)
		1	SS	24	24	0	4	9	14	19		ND	Topsoil 71.7 Fill		Medium dense, Top 4": Brown TOPSOIL Bottom 20": Brown to blackish brown fine to medium SAND, some (-) Silt, little fine to coarse Gravel, trace black decomposed Wood at bottom of sample
		2	SS	24	20	2	34	28	26	41		3.3			
													4.0		
5		3	SS	24	18	4	44	49	35	42		ND	Glacial Till 68.0		Very dense, black fine to medium SAND, little Silt, little Wood, creosote odor
		4	SS	10	5	6	37	60/4"				ND			Very dense, gray fine to medium SAND, some fine to coarse Gravel, little Silt
													7.5		Very dense (spoon refusal), gray fine to medium SAND, little fine to coarse Gravel, trace Silt
													Bottom of Exploration at 7.5 ft 64.5		
10															
15															
20															
25															
30															

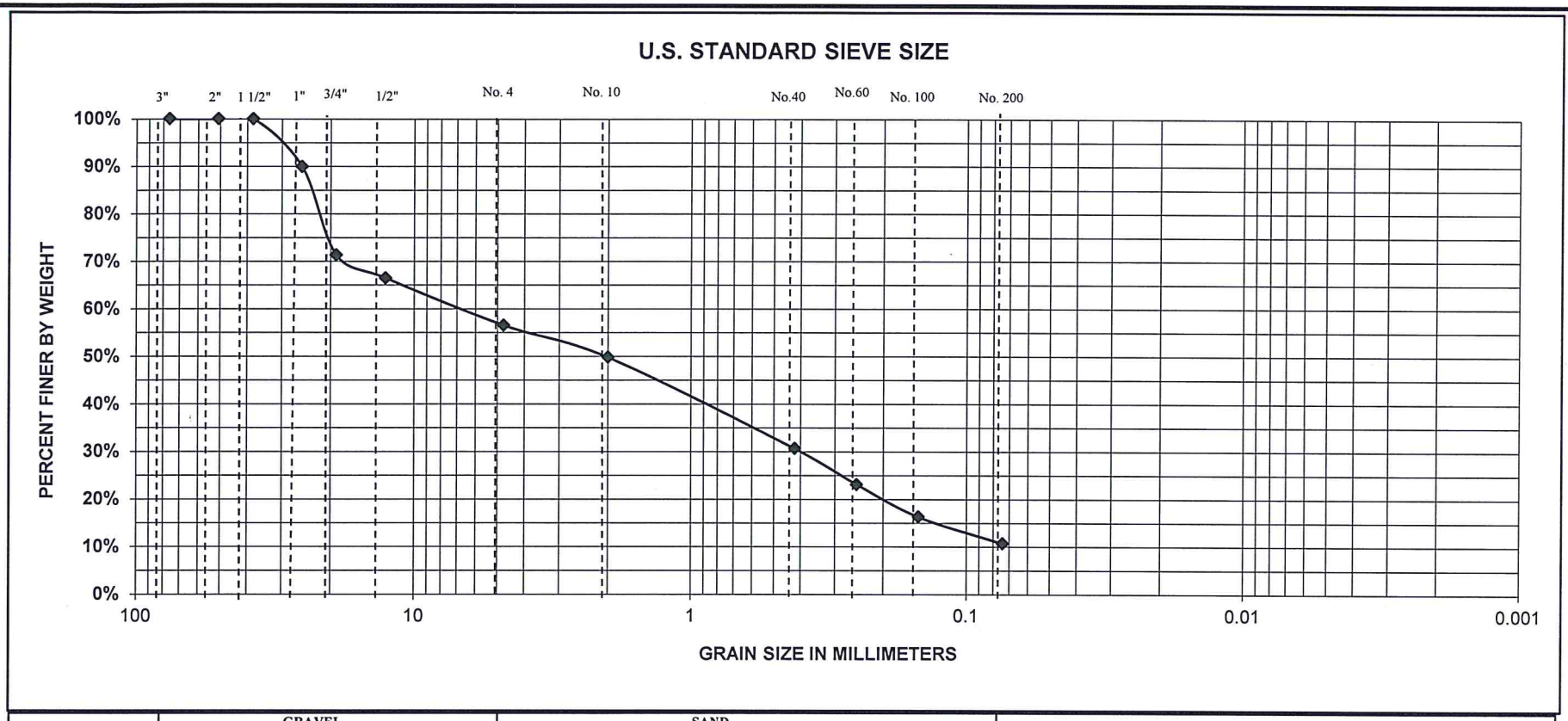
Remarks

1. Soil samples screened in the field using a MiniRae 2000 portable VOC monitor calibrated to an isobutylene standard where ND indicates no detection.
2. Auger refusal at 7.5 feet.

Notes:
1) Soil Samples screened in the field using a calibrated Photoionization Detector (unless otherwise noted in Remarks). The meter was calibrated relative to a benzene in air standard. ND = None Detected; NR = Not Recorded; NA = Not Applicable; OR = Out of Range
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors over time. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) Stratification lines represent approximate boundary between material types, transitions may be gradual.

Appendix 3

Laboratory Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

EB Proposed 6-story Building # 604

BORING NO.	B-1
SAMPLE NO.	S-2
DEPTH	5-5.8'
TECH.	RJM
REVIEWER	TvR
DATE	05/07/20
FILE NO.	3901-010

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
1 of 3	Test boring B-1	Fine to medium SAND and coarse to fine GRAVEL, little (-) Silt, (Natural)

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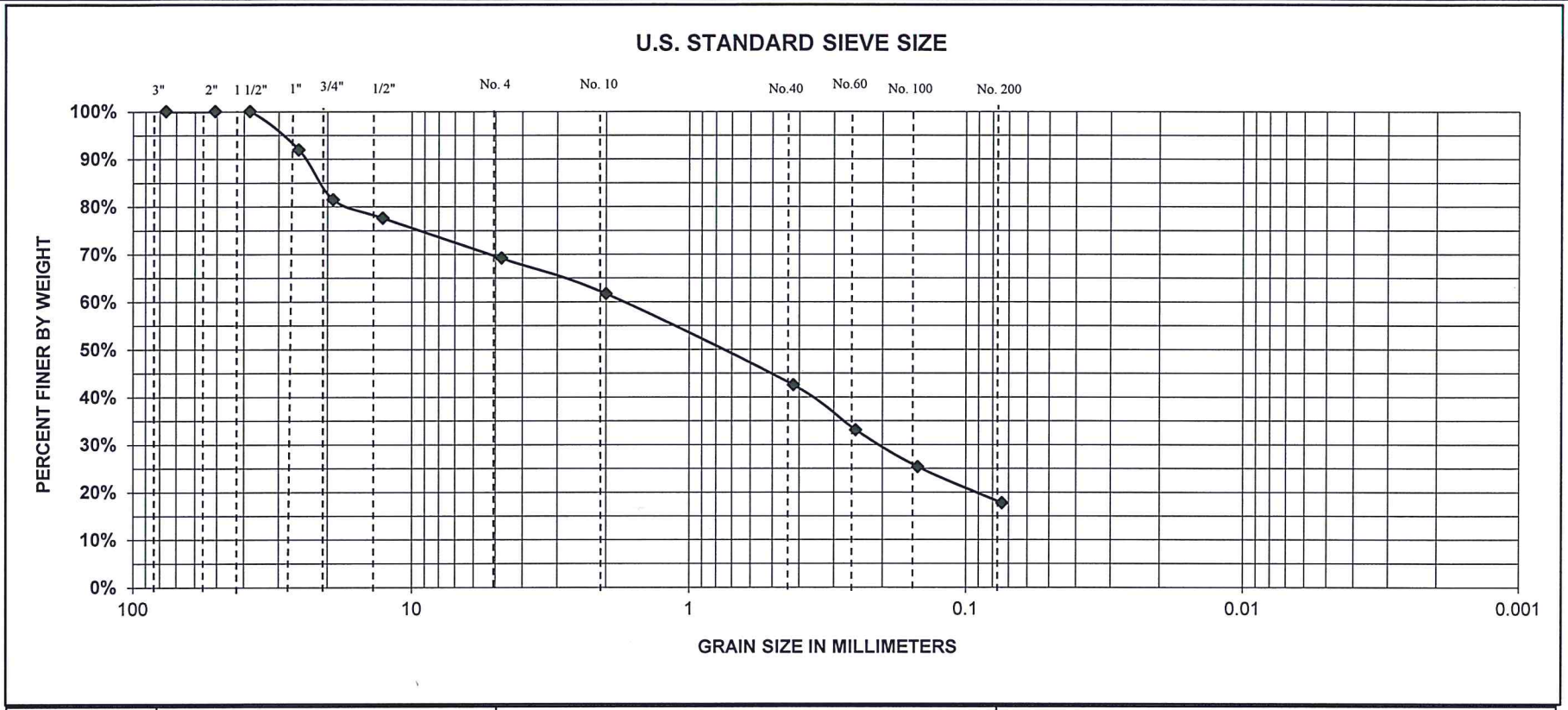

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

EB Proposed 6-story Building # 604

BORING NO.	B-2
SAMPLE NO.	S-3
DEPTH	4-6'
TECH.	RJM
REVIEWER	TvR
DATE	05/07/20
FILE NO.	3901-010

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
2 of 3	Test boring B-2	Fine to medium SAND, some coarse to fine Gravel, little (-) Silt, trace (-) organics (Fill)

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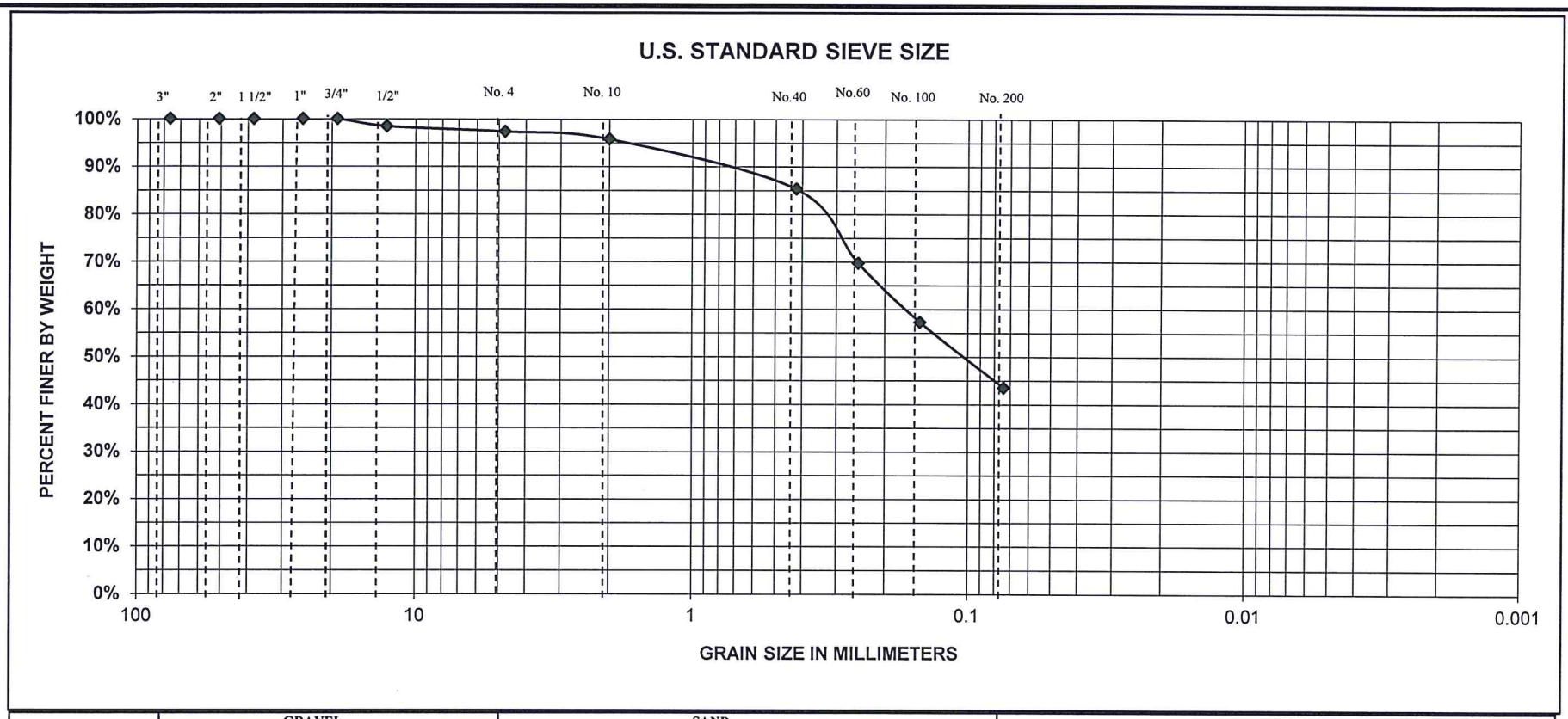

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION TEST

EB Proposed 6-story Building # 604

BORING NO.	B-4
SAMPLE NO.	S-2
DEPTH	2-4'
TECH.	RJM
REVIEWER	TvR
DATE	05/07/20
FILE NO.	3901-010

BURMISTER SOIL CLASSIFICATION SYSTEM

TEST NO.	MATERIAL SOURCE	DESCRIPTION
3 of 3	Test boring B-4	Fine to medium SAND and SILT, trace fine Gravel, trace(-) organics (Fill)

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Appendix 4

Limitations

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Geotechnical Limitations

Explorations

1. The analyses and recommendations submitted in this report are based in part upon the data obtained from widely spaced 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 reevaluate 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 and moisture conditions have been made in the explorations, and from the samples at times and under conditions stated on the 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 and moisture condition 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 is 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 GEODesign, Inc. We recommend that we be provided the opportunity to review and comment on the finalized project design and relevant construction specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

Use of Report

5. This report has been prepared for the exclusive use of Loureiro Engineering Associates, for specific application to the project, as described in GEODesign's scope of services/ contract and related documents, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

6. This report has been prepared for this specific project by GEODesign, 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, unless otherwise specified in the report.

7. Unless otherwise noted, the scope of our services did not include environmental assessment or investigation for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site.