



May 17, 2019

Mr. Joseph Banks, AIA, LEED AP
Perkins Eastman
422 Summer Street
Stamford, CT 06901

**RE: Geotechnical Engineering Report
Proposed West Side Elementary School
250 Brandegee Avenue
Groton, Connecticut
MMI #1777-43-01**

Dear Mr. Banks:

Milone & MacBroom, Inc. (MMI) is pleased to submit our geotechnical engineering report for the proposed West Side Elementary School located at 250 Brandegee Avenue in Groton, Connecticut. Refer to Figure 1 – Locus Plan in Appendix 1 for the general location of the project.

Our recommendations are based in part on guidance from the 2018 Connecticut State Building Code, which includes the 2015 International Building Code (IBC) and the 2018 Connecticut Amendments. Design recommendations are based on Allowable Stress Design Methods.

PURPOSE AND SCOPE

MMI performed borings and a geotechnical engineering evaluation for the new elementary school. Our scope of services included characterizing the subsurface conditions at the site, performing geotechnical engineering analyses, and providing geotechnical design and construction recommendations for the project.

SITE DESCRIPTION AND PROPOSED CONSTRUCTION

The existing school site is approximately 40 acres and is bound by Brandegee Avenue to the west, residential and other town-owned parcels to the north and east, and residential developments to the south. Site grades generally slope down from west to east from approximately El. 125 to El. 90.

The project includes the construction of a new elementary school north of the existing school building along with new paved parking and drive aisles. The new school will consist of two new buildings (e.g., east and west) connected by a common hallway with finished floor elevations at approximately El. 120 and El. 105 for the west and east portions of the building, respectively.

The existing school building will be demolished and replaced with parking and circulation improvements. Construction will also include an amphitheater, retaining wall up to 11 feet in exposed height, sidewalks, site utilities, and general landscape improvements.

REGIONAL GEOLOGY

According to published geologic data (1:24,000 scale, Surficial Geologic of the New London Quadrangle, Connecticut-New York, Richard Goldsmith, 1962), the subsurface materials are mapped as till and described as "compact, sandy, and gravelly till. Surface Smooth. Includes a few thin masses of loose till and small lenses of stratified material."

According to the Bedrock Geologic Map of the New London Quadrangle (1:24,000 scale), Connecticut, by Richard Goldsmith (1967), the bedrock consists of New London Gneiss that is described as light grey, medium to fine-grained massive gneissic granodiorite.

SUBSURFACE EXPLORATIONS

MMI performed 21 borings (MM-1 through MM-21) that were drilled by Site, LLC of Beacon Falls, Connecticut, on March 27, April 16, and April 17, 2019. The borings were performed to explore the subsurface conditions for the new building, retaining wall, amphitheater, and paved parking and drive aisles. The borings were located by taping/pacing from existing site features, and approximate boring locations are shown on Figure 2 – Subsurface Exploration Location Plan contained in Appendix 1.

Hollow-stem auger drilling methods were used to advance the borings to depths ranging between approximately 3.4 and 22.3 feet below current site grades. Representative samples were obtained by split-barrel sampling procedures in general accordance with American Society for Testing and Materials (ASTM) Specification D-1586. Logs of the borings are included in Appendix 2.

The split-barrel sampling procedure utilizes a standard 2-inch-outside-diameter (O.D.) split-barrel sampler that is driven into the bottom of the boring with a 140-pound hammer falling 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 are indicated on the boring logs at their depth of occurrence and provide an indication of the relative consistency and density of the material. Groundwater levels were measured using a weighted tape in the open drill holes or inferred from the soil samples during drilling.

SUBSURFACE CONDITIONS

The generalized subsurface profile at the site as interpreted from the subsurface exploration data generally consists of surficial fills over natural soils over bedrock. The surficial fills generally consist of asphalt, topsoil, subsoil, and fill, and the natural soils generally consist of glacial till to the depths explored.

Asphalt and Base Course was encountered at the surface in Borings MM-2 through -5, -9, -16, and -17. The asphalt was approximately 0.3 to 0.4 feet thick, and the base course, where present, was approximately 0.3 to 1.0 feet thick. In general, the base course consists of gray/brown fine to coarse sand, some fine to coarse gravel, little silt.

Topsoil was encountered at the surface of the remaining 14 borings. The topsoil ranged between approximately 0.2 and 2.0 feet thick. In general, the topsoil consists of loose to medium dense, brown, fine to coarse sand, little to some fine to coarse gravel, little to some silt, trace roots.

Subsoil was encountered below the topsoil at each location with the exception of Borings MM-1, -10, -13, -19, and -21. The subsoil generally consists of loose brown fine to medium sand, little to some silt, trace to little fine to coarse gravel, trace roots.

Fill was encountered in Borings MM-10, -11, -14, -18, -19, and -21 below the topsoil. The fill generally consists of loose to medium dense, gray/brown fine to coarse sand and fine to coarse gravel, trace to some silt or fine to medium sand, some silt, trace to little fine to coarse gravel, trace roots. Fill encountered in Boring MM-18 was underlaid by a 4-foot layer of buried subsoil. This buried subsoil consists of loose, light brown, fine to medium sand, some silt, trace roots.

Glacial Till was encountered below the surficial fills in each boring except Borings MM-6 and MM-8. The glacial till is generally described as medium dense to very dense, gray, fine to coarse sand, little to some fine to coarse gravel, trace to some silt.

Bedrock was inferred at each boring location based on spoon and/or auger refusals. Refusal depths ranged from 3.4 to 22.3 feet below existing grades.

Groundwater, where encountered, was generally between 4.3 and 14.9 feet below existing grades or between approximately El. 93.7 and El. 110.0. The groundwater levels appear to follow the site topography but will vary depending on factors such as temperature, season, precipitation, construction activity, and other conditions, which may be different from those at the time of these observations.

Laboratory Testing – Laboratory gradation tests were performed by Tri State Materials Testing Lab, LLC in Berlin, Connecticut, on five representative soil samples to confirm field classifications and to evaluate their frost susceptibility for pavement design. The test results are presented in Appendix 3.

ENGINEERING IMPLICATIONS OF SUBSURFACE CONDITIONS

The surficial fills are not suitable to support the proposed building and must be removed prior to placing any new fill or constructing foundations or slabs for the new building. We recommend the new building be supported by conventional shallow foundations bearing on a prepared subgrade of undisturbed glacial till or compacted granular fill (CGF) over this material.

Pavements can be constructed on either proof-compacted existing fill, undisturbed glacial till, or CGF over these materials.

Where the north side of the existing building is adjacent to the south side of the proposed building (in the approximate area of Boring MM-21), coordination will need to be given to remove existing foundations and adjacent 13 feet of fill from below the proposed building foundations.

On the north end of the eastern portion of the building (in the approximate area of Boring MM-18), existing fill and subsoil extend to about 8.5 feet below existing grades or to about El. 101.5. Therefore, overexcavation of these materials will be required to reach suitable glacial till. Additionally, groundwater was observed at about El. 102 and may be encountered during excavations.

GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

Proposed Building

We recommend supporting the proposed building on conventional shallow spread footing foundations. The footings should bear on undisturbed glacial till or CGF over this material. Where CGF is used beneath the footings, we recommend that it be placed 1 foot beyond the edge of the footings and at a one horizontal to one vertical (1H:1V) slope away and down from the footings.

Exterior footings should be constructed at a minimum depth of 42 inches below final grades to protect against frost. For interior footings, a minimum depth of 12 inches should be maintained below the proposed bottom of concrete floor slab and the top of footings. The minimum isolated footing size should be 2.5 feet, and the minimum wall footing width should be 12 inches.

We recommend a maximum net allowable bearing pressure of 4 kips per square foot (e.g., 2 tons per square foot) for footings with a maximum square size of 9 feet, bearing on undisturbed glacial till or CGF over this material.

We anticipate that the footings will experience up to approximately 1 inch of total settlement and up to approximately ½ inch of differential settlement. Settlements should occur as the loads are applied and will be complete at the end of construction. We recommend a maximum coefficient of friction of 0.45 between foundations and the recommended bearing strata.

For slab on grade, we recommend placing the concrete floor slab over a minimum 6-inch thick base course layer of compacted sand and gravel. The subgrade modulus for the recommended subgrade and base course is 175 pounds per cubic inch.

Perimeter foundation drains and dampproofing of the slab on grade are recommended. The foundation drains should consist of 4-inch-diameter perforated polyvinyl chloride pipe, surrounded by at least 6 inches of crushed stone, wrapped in nonwoven filter fabric. Foundation drain inverts should be set flush with bottom of footing level. The drains should be gravity drained to daylight or to the site drainage system. Slab dampproofing should be installed between the slab and base course and consist of not less than 6-mil polyethylene with joints lapped at least 6 inches. Other approved methods or materials may be considered or as detailed by the structural engineer.

Lateral Earth Pressures

We anticipate that there will be areas where retaining walls will be required to accommodate changes in grade. Cantilevered walls that are free to rotate at the top and are not braced should be designed to resist an equivalent active static horizontal fluid pressure equal to 37 pounds per square foot (psf) (based on $\phi = 33^\circ$, $c = 0$ psf, $K_a = 0.29$, and $Y = 125$ pounds per cubic foot [pcf]). Braced walls should be designed to resist an equivalent at-rest static horizontal fluid pressure equal to 57 psf (based on $\phi = 33^\circ$, $c = 0$ psf, $K_o = 0.45$, and $Y = 125$ pcf). This assumes no unbalanced hydrostatic pressures (free-draining backfill), seismic forces, or traffic surcharge loads. We recommend using a traffic surcharge load of 250 psf.

Seismic Site Class and Liquefaction Potential

The average Standard Penetration Test "N" value over a 100-foot depth below the building is greater than 50 blows per foot. Thus, the site class for the proposed structure is "C" (very dense soil and soft rock) profile per the IBC. According to the 2018 Connecticut Building Code for Groton, Connecticut, S_s is 0.160g, and S_1 is 0.058g. We calculated S_{MS} as 0.19, S_{M1} as 0.10g, S_{DS} as 0.13g, and S_{D1} as 0.070g.

Based on the standard penetration test results, estimated depth to groundwater, soil classifications, and expected peak ground acceleration at this locale, it is our opinion that site soils are not prone to liquefaction.

Asphalt Pavement

Pavement sections should be constructed on a prepared subgrade of proof-compacted existing fill, glacial till, or CGF over these materials. We recommended a pavement section consisting of a finish course of 1.5 inches, over a binder course of 1.5 inches, over 8 inches of processed aggregate base.

MATERIALS AND COMPACTION REQUIREMENTS

Based on the information contained on the boring logs, the deep existing fill encountered in Boring MM-21 appears suitable for reuse in structural areas (as backfill below footings, slab, or pavements or to backfill around footings). However, existing fill encountered in Boring MM-11 contains elevated levels of fines and is not suitable for reuse in structural areas but may be suitable for reuse as ordinary fill in nonload-bearing areas. The glacial till was observed to have varying amounts of fines and may or may not be suitable in structural areas.

In general, materials may be reused, assuming they meet the following gradations, required compaction, and optimum moisture contents ($\pm 2\%$). Modified proctors and sieves should be obtained for differing materials to ensure proper compaction requirements are being met.

CGF for use as structural fill should consist of inorganic soil that is free of clay, loam, ice and snow, tree stumps, roots, and other organic matter and graded within the following limits:

Sieve Size	Percent Finer by Weight
4 inches	100
No. 4	50 – 85
No. 10	25 – 75
No. 40	10 – 50
No. 100	8 – 35
No. 200	0 – 10

Sand and gravel for use as slab base course should consist of hard, durable sand and gravel that is free of ice, clay, shale, roots, sod, rubbish, and other organic matter and graded within the following limits:

Sieve Size	Percent Finer by Weight
2 inches	100
1/2 inch	50 – 85
No. 4	40 – 75
No. 40	10 – 35
No. 200	0 – 10

Crushed stone for use around drains and below foundations and slabs should consist of sound, tough, durable rock that is graded within the following limits:

Sieve Size	Percent Finer by Weight
3/4 inch	100
1/2 inch	85 – 100
3/8 inch	15 – 45
No. 4	0 – 15
No. 8	0 – 5

Processed aggregate base shall meet the requirements of Connecticut Department of Transportation Form 817 Specification M.05 with the following gradation. The processed aggregate base should be spread uniformly. The thickness of each course should not be more than 4 inches after compaction unless otherwise ordered.

Sieve Size	Percent Finer by Weight
2½ inches	100
2 inches	95 – 100
3/4 inch	50 – 75
1/4 inch	25 – 45
No. 40	5 – 20
No. 100	2 – 12

We recommend a minimum in-place dry density of 95 percent as per ASTM D1557 for material placed below foundations, floor slabs, and pavements. Materials should be placed within 2 percent of their optimum moisture content. We recommend a maximum loose lift thickness of 10 inches.

CONSTRUCTION CONSIDERATIONS

Site Preparation

We recommend the site be cleared of existing asphalt, topsoil, subsoil, and previous structures. The exposed subgrades should be proof rolled with a large double-drum roller prior to any construction.

Subgrade Preparation

Final subgrades should be free of water, ice, frozen soil, and loose soils prior to placing additional fill or concrete. We recommend the use of smooth-edged excavator buckets to make the final excavation to help protect the subgrade, followed by proof compaction of the exposed subgrade. Concrete should be placed as soon as possible after excavation so that disturbance of bearing materials does not occur. Should the materials at bearing level become disturbed, the affected materials should be removed prior to placing concrete. A 4-inch-thick layer of crushed stone may be used to protect footing subgrades that are expected to be open for an extended period.

General Excavation

All excavations should be sloped or shored in accordance with local, state, and federal regulations, including the Occupational Safety and Health Administration (29 CFR Part 1926) excavation trench safety standards. Excess soils should be disposed of in accordance with federal, state, and local regulations.

Freezing Conditions

All foundation and slab-on-grade subgrades should be free of frost before placement of reinforcing steel and concrete. Frost-susceptible soils that have frozen should be removed and replaced with compacted structural fill. The footing and the soil adjacent to the footing should be protected from freezing until they are backfilled.

Dewatering

Based on groundwater observations at the time of drilling, groundwater was encountered within 1 to 2 feet of anticipated excavation depths. The contractor should be prepared to control groundwater seepage and surface water by means of shallow trenches, sumps, and grading the excavations to low points.

CONSTRUCTION DOCUMENTS AND PLANS

Project plans should be provided to MMI to review for conformance with the geotechnical recommendations contained herein. If changes are made to the location or type of structure, the recommendations in this report will need to be reviewed.

CONSTRUCTION QUALITY CONTROL

We recommend that MMI make field observations of excavations and foundation preparation to monitor actual conditions for compliance with our recommendations and the project specifications. Specifically, we recommend field observation of footing subgrades, removal of unsuitable materials, fill placement, and compaction. We can also assist in classifying material on site for segregation and/or mixing for reuse on site.

LIMITATIONS

This report is subject to the limitations included in Appendix 4. Thank you for the opportunity to be of service. Please feel free to call either of the undersigned if you have any questions.

Very truly yours,

MILONE & MACBROOM, INC.



Marie G. Bartels, PE
Geotechnical Engineer

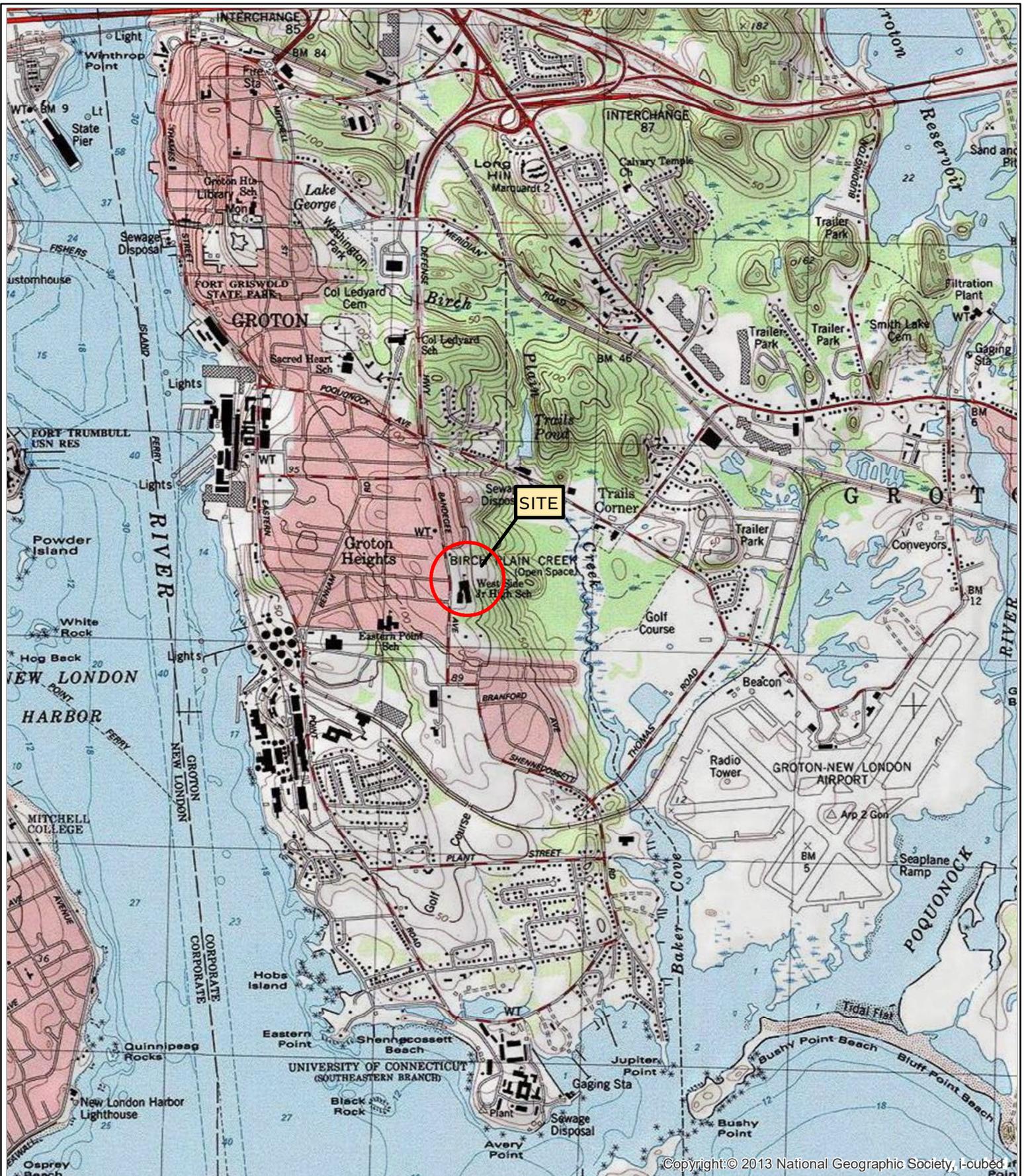


Joseph W. Kidd, PE
Senior Geotechnical Manager

Attachments: Appendix 1 – Figures
 Appendix 2 – Boring Logs
 Appendix 3 – Laboratory Test Results
 Appendix 4 – Limitations

1777-43-01-m1719-ltr.docx

APPENDIX 1
FIGURES



Copyright © 2013 National Geographic Society, i-cubed

SOURCE(S):
2013, National Geographic Society, USA Topographic Map

FIGURE 1 - LOCUS PLAN

LOCATION:
250 BRANDEGEE AVENUE
GROTON, CONNECTICUT



GEOTECHNICAL ENGINEERING SERVICES

Map By: J.M.
CHECKED: J.K.
MMI#: 1777-43
DATE: 3/19/2019
Scale: 1 inch = 2,000 feet

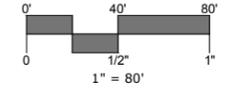
MILONE & MACBROOM
99 REALTY DRIVE, CHESHIRE, CT
(203) 271-1773
WWW.MMINC.COM

LEGEND:

-  BORING BY MILONE & MACBROOM, INC.
- MM-1

NOTES:

1. BASEMAP DEVELOPED FROM AN ELECTRONIC FILE BY PERKINS EASTMAN TITLED "SITE PLAN - UTILITIES" AND DATED 5/1/2019.
2. BORINGS BY MILONE & MACBROOM, INC. WERE PERFORMED BY SITE, LLC OMN 3/27/2019 AND 4/16/2019 - 4/17/2019.
3. THE LOCATIONS OF THE BORINGS WERE DETERMINED BY TAPING/PACING FROM EXISTING SITE FEATURES. THESE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.



DESCRIPTION	DATE	BY

SUBSURFACE EXPLORATION LOCATION PLAN
PROPOSED WEST SIDE ELEMENTARY SCHOOL
 250 BRANDEGEE AVENUE
 GROTON, CONNECTICUT

JWK	RDG	JWK
DESIGNED	DRAWN	CHECKED
SCALE: 1"=80'		
DATE: MAY 15, 2019		
PROJECT NO.: 1777-43		

FIG. 2

APPENDIX 2
TEST BORING LOGS

TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-1	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±122.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	15	2	S-1: Medium dense, dark brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace Roots.	2.0'	TOPSOIL	120.0'	
			4					
			9					
			9					
2			12	S-2: Dense, gray, fine to coarse GRAVEL, some fine to coarse Sand, trace Silt.	4.0'	GLACIAL TILL	118.0'	
3	S-2	14	16					
			22					
			21					
4				Bottom of Exploration ±4.0'				
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-2	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±118.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL.	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		±8.0'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	8	24	S-1: Medium dense, Top 4": ASPHALT. Bottom 4": Gray-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt.	0.3'	ASPHALT	117.7'	
			6		0.6'	BASE COURSE	117.4'	
			12					
2	S-2	10	9	S-2: Medium dense, gray, fine to coarse SAND, some fine to coarse Gravel, trace Silt.				
			6					
			12					
3	S-3	20	12	S-3: Very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.				
			10					
			18					
4	S-4	15	30	S-4: Very dense, gray, fine to coarse SAND, little fine to coarse Gravel, trace Silt.				
			23					
			24					
5	S-5	7	44	S-5: Very dense, gray, fine to coarse SAND, little fine to coarse Gravel, little Silt.				
			100/5"					
6	S-6	1	50/1"	S-6: Very dense, gray, fine to coarse GRAVEL, little fine to coarse Sand.				
8					8.0'	G.W.T. ▼	110.0'	
10						GLACIAL TILL		
19					19.5'		98.5'	1
20				Bottom of Exploration ±19.5'				

Remarks: 1. Auger refusal at ±19.5'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-3	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±116.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		±8.4'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	20	60	S-1: Medium dense, Top 4": ASPHALT. Middle 12": Gray-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. Bottom 4": Brown, fine to coarse SAND, little fine coarse Gravel, little Silt.	0.3'	ASPHALT	115.7'		
			14						
			13			1.3'	BASE COURSE	114.7'	
2			12	S-2: Medium dense, Top 4": Brown, fine to coarse SAND, little fine to coarse Gravel, little Silt. Bottom 16": Gray, fine to coarse SAND, some fine to coarse Gravel, little Silt.					
3	S-2	20	7						
4			9						
5			10	S-3: Dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.					
6	S-3	2	14						
7			20						
8			14	S-4: Medium dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little Silt.					
9									
10									
11	S-4	14	14	S-5: Dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little Silt.					
12			13						
13			14						
14			17	Bottom of Exploration ±16.8'					
15									
16	S-5	18	23						
17			23						
18			25						
19			50/4"		16.8'		99.2'	1	
20									
21									
22									

8.4' G.W.T. ▼ 107.6'

GLACIAL TILL

Remarks: 1. Auger refusal at ±17.0'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-4	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±121.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	12	26	S-1: Dense, Top 4": ASPHALT. Bottom 8": Gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt.	0.3'	ASPHALT	120.7'	
			21		1.0'	BASE COURSE	120.0'	
			22					
2	S-2	14	34	S-2: Dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little Silt.				
			19					
			28					
3	S-3	16	17	S-3: Medium dense, gray, fine to coarse SAND, some fine to coarse Gravel, little Silt.				
			22					
			9					
6			10					
7			12					
8			20					
9								
10				Bottom of Exploration ±9.3'	9.3'		111.7'	1
11								2
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks: 1. Top of inferred bedrock at ±8.9'. 2. Auger refusal at ±9.3'.	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-5	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±121.5'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	10	3	Top 4": ASPHALT. Bottom 2": Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt. S-1: Medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, little Silt.	0.3'	ASPHALT	121.2'	
2			8					
3			10					
4	S-2	15	6	S-2: Dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.	4.3'	GLACIAL TILL	117.2'	
5			7					
6			18					
7			29					
8			50/3"					
9				Bottom of Exploration ±4.3'				
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-6	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±120.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	10	5	S-1: Loose, brown, fine to coarse SAND, little fine Gravel, little Silt, trace Roots.	1.0'	TOPSOIL	119.0'	
			3					
			2					
2			2	S-2: Loose, brown, SILT, little fine to medium Sand.	4.0'	SUBSOIL		
3	S-2	14	2					
			3					
4			8					
5				Bottom of Exploration ±4.0'				
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-7	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±119.5'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	16	1	S-1: Loose, dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots.	1.3'	TOPSOIL	118.2'		
2			2						
3	S-2	14	7		S-2: Loose, Top 5": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 9": Gray-brown, SILT and fine to coarse Sand, little, trace fine Gravel.	2.4'	SUBSOIL	117.1'	
4			3						
5			2			4.0'	GLACIAL TILL	115.5'	
6				Bottom of Exploration ±4.0'					
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									

Remarks:	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-8	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±116.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	12	1	S-1: Loose, dark brown, fine to coarse SAND, some Silt, little fine Gravel, trace Roots.	2.0'	TOPSOIL	114.0'	
			3					
			4					
			7					
2			4	S-2: Loose, brown, fine to coarse SAND, some Silt, trace fine Gravel.	4.0'	SUBSOIL	112.0'	
3	S-2	10	3					
			3					
			3					
4				Bottom of Exploration ±4.0'				
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks:	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



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Cheshire, CT 06410
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PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-9	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: R. GOWISNOCK	
DATE: MARCH 27, 2019	GROUND SURFACE ELEVATION: ±121.5'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-03-27		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	12	17	S-1: Medium dense, Top 4": ASPHALT. Bottom 8": Gray-brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.	0.3'	ASPHALT	121.2'		
			9		1.0'	BASE COURSE	120.5'		
			8						
2	S-2	15	21	S-2: Very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.		GLACIAL TILL			
			26						
			24						
3	S-3	15	27	S-3: Dense, gray, fine to coarse SAND, some fine to coarse Gravel, trace Silt.		GLACIAL TILL			
			23						
			13						
4	S-4	10	14	S-4: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, trace Silt.		GLACIAL TILL			
			17						
			20						
5									
6									
7									
8									
9									
10									
11			37						
12			50/4"		11.5'		110.0'	1	
				Bottom of Exploration ±11.5'					2
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									

Remarks: 1. Bedrock inferred at ±11.3'. 2. Auger refusal at ±11.5'.	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-10	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±112.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		±12.0'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	14	1	S-1: Loose, Top 3": Dark brown, fine to medium SAND, some Silt, trace Roots. Bottom 11": Brown, fine to medium SAND, some Silt, little fine to coarse Gravel, trace Roots.	2.0'	TOPSOIL	110.0'	
			3					
			2					
			4					
2	S-2	1	50/1"	S-2: Very dense, brown, fine to medium SAND, some Silt, little fine to coarse Gravel, trace Roots.		FILL		
3								
4								
5								
6	S-3	11	2	S-3: Loose, Top 7": Brown, fine to medium SAND, some Silt, little fine to coarse Gravel, trace Roots. Bottom 4": Light brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt.	6.5'		105.5'	
			2					
			5					
			9					
10				S-4: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.		GLACIAL TILL		
11	S-4	17	26					
			29					
			21					
12			18		12.0'	G.W.T. ▼	100.0'	
15				S-5: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.				
16	S-5	24	17					
			24					
			26					
17			50/1"		16.6'		95.4'	
18				Bottom of Exploration ±16.6'				
19								
20								
21								
22								

Remarks: 1. Auger refusal at ±16.6'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-11	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±100.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		±5.0'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	14	6	S-1: Dense, Top 2": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Middle 8": Brown, fine to coarse SAND and fine to coarse GRAVEL little Silt. Bottom 4": Gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	0.2'	TOPSOIL	99.8'	
			13		0.9'	SUBSOIL	99.1'	
			18					
2	S-2	17	27	S-2: Medium dense, Top 5": Gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt. Bottom 12": Brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots.	5.0'	FILL	95.0'	
			29					
			9					
3	S-3	13	5	S-3: Loose, brown, fine to coarse SAND, some Silt, trace fine Gravel.	8.0'	GLACIAL TILL	92.0'	
			7					
			2					
4	S-4	22	2	S-4: Very dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.	19.6'		80.4'	1
			4					
			24					
5	S-5	20	26	S-5: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.	Bottom of Exploration ±19.6'			
			28					
			24					
17			19					

Remarks: 1. Auger refusal at ±19.6'.	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-12	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±97.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	13	2	S-1: Medium dense, Top 4": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 9": Brown, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace Roots.	0.3'	TOPSOIL	96.7'		
			5						
			5						
2			11	S-2: Dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.	2.0'	SUBSOIL	95.0'		
3	S-2	16	17						
4			21						
5			28						
6	S-3	10	13	S-3: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.					
7			50/4"						
8				Bottom of Exploration ±6.7'	6.7'		90.3'	1	
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									

Remarks: 1. Auger refusal at ±6.7'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-13	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±95.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	16	WOH	S-1: Loose, Top 6": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 10": Brown, fine to medium SAND and SILT, little fine to coarse Gravel.	2.0'	TOPSOIL	93.0'		
2			2						
3	S-2	5	6	S-2: Very dense, gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	3.4'	GLACIAL TILL	91.6'		
4			50/5"						
5				Bottom of Exploration ±3.4'					
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									

Remarks: 1. Spoon refusal at ±3.4'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-14	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±109.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	18	2 6 9	S-1: Medium dense, Top 4": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 14": Brown, fine to medium SAND, some Silt, little fine to coarse Gravel.	0.3'	TOPSOIL	108.7'	
2			10				SUBSOIL	
3	S-2	13	6 15 12	S-2: Medium dense, Top 7": Brown, fine to coarse SAND, some Silt, trace fine Gravel trace Roots. Bottom 6": Gray-brown, fine to coarse GRAVEL, some Silt, little fine to medium Sand.	2.6'		106.4'	
4			8				FILL	
5								
6	S-3	12	1 2 3	S-3: Loose, gray-brown, fine to medium SAND, some Silt, little fine Gravel, trace Roots.				
7						7.0'		102.0'
8								
9								
10								
11	S-4	20	23 28 27 26	S-4: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, little Silt.				
12								
13								
14								
15								
16	S-5	18	13 19 17 12	S-5: Dense, gray, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.				
17								
18								
19								
20								
21	S-6	10	15 50/4"	S-6: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, some Silt.				
22						20.9'		88.1'
Bottom of Exploration ±20.9'								

Remarks: 1. Auger refusal at ±20.9'.	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
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PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-15	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 16, 2019	GROUND SURFACE ELEVATION: ±114.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-16		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	17	4	S-1: Medium dense, Top 4": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 13": Brown, fine to coarse SAND, some Silt, trace fine Gravel.	0.3'	TOPSOIL	113.7'		
2			8		S-2: Medium dense, Top 10": Gray-brown, fine to coarse SAND, some Silt, little fine to coarse Gravel. Bottom 8": Gray-brown, fine to coarse SAND, some Silt, trace fine to coarse Gravel.	2.8'	SUBSOIL	111.2'	
3	S-2	18	9						
4			6						
5			3	S-3: Dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.					
6	S-3	21	13						
7			23						
8			27						
9				S-4: Dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.					
10			15						
11	S-4	22	20						
12			16						
13			20	S-5: Dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.					
14									
15									
16	S-5	22	7						
17			13						
18			18	S-6: Very dense, gray, fine to coarse SAND, some Silt, little fine to coarse Gravel.					
19			26						
20									
21	S-6	9	27						
22			50/4"	Bottom of Exploration ±20.8'					

Remarks: 1. Auger refusal at ±20.8'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-16	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±120.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	14	6	Top 5": ASPHALT. Bottom 1": Gray, fine to coarse SAND, little fine Gravel, little Silt.	0.4'	ASPHALT	119.6'		
2			11	S-1: Dense, Top 8": Gray, fine to coarse SAND, little fine Gravel, little Silt.	1.4'	BASE COURSE	118.6'		
3			35	Bottom 6": Gray, fine to coarse GRAVEL, some fine to coarse Sand, little Silt.					
4			53						
5	S-2	11	44	S-2: Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, little Silt.		GLACIAL TILL			
6			39						
7			50/2"						
8	S-3	14	51	S-3: Very dense, gray, fine to coarse SAND and fine to coars GRAVEL, little Silt.					
9			31						
10			53						
11			50/1"					6.7'	113.3'
12				Bottom of Exploration ±6.7'					
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									

Remarks: 1. Auger refusal at ±6.7'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-17	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±117.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		±8.5'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	14	5	Top 3": ASPHALT. Bottom 3": Dark brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt.	0.3'	ASPHALT	116.7'	
2			9		0.6'	BASE COURSE	116.4'	
3	S-2	19	9	S-1: Medium dense, Top 7": Gray-brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt. Bottom 7": Gray, fine to coarse SAND, some fine to coarse Gravel, trace Silt.		GLACIAL TILL		
4			11					
5			16					
6	S-3	21	12	S-2: Medium dense, gray, fine to coarse SAND, little Silt, little fine Gravel.				
7			12					
8			13					
9	S-4	15	9	S-3: Dense, gray-brown, fine to coarse SAND, some Silt, little fine to coarse Gravel.				
10			14					
11			17					
12			15					
13			5	S-4: Dense, gray, fine to coarse GRAVEL and fine to coarse SAND, little Silt.	8.5'	G.W.T. ▼	108.5'	
14		17			12.8'		104.2'	1
15		16						
16		18						
17				Bottom of Exploration ±12.8'				
18								
19								
20								
21								
22								

Remarks: 1. Auger refusal at ±12.9'

COHESIONLESS SOILS	COHESIVE SOILS	SAMPLE TYPE	PROPORTIONS
N = 0 - 4 = VERY LOOSE	N = 0 - 2 = VERY SOFT	C = ROCK CORE	trace = <10%
4-10 = LOOSE	2 - 4 = SOFT	S = SPLIT SPOON	little = 10% - 20%
10-30 = MEDIUM DENSE	4 - 8 = MEDIUM	UP = UNDISTURBED PISTON	some = 20% - 35%
30-50 = DENSE	8 - 15 = STIFF	UT = UNDISTURBED THINWALL	and = 35% - 50%
50+ = VERY DENSE	15-30 = VERY STIFF		
	30 + = HARD		

TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-18	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±110.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		±8.0'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark	
1	S-1	20	1	S-1: Medium dense, Top 11": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 9": Brown, fine to medium SAND, some Silt, trace fine Gravel.	0.9'	TOPSOIL	109.1'		
2			4						
3	S-2	3	7		S-2: Medium dense, gray, fine to coarse GRAVEL, little fine to coarse Sand, little Silt.				
4			10						
5			5						
6	S-3	17	8	S-3: Loose, light brown, fine to medium SAND, some Silt, trace Roots.					
7			9						
8			4			8.0'	G.W.T. ▼ 102.0'		
9			9			8.5'	101.5'		
10				S-4: Dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little Silt.					
11	S-4	16	5						
12			15						
13			19						
14			20		13.7'	GLACIAL TILL	96.3'	1	
15				Bottom of Exploration ±13.7'					
16									
17									
18									
19									
20									
21									
22									

Remarks: 1. Auger refusal at ±13.7'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-19	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±98.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		±4.3'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	11	1	S-1: Dense, Top 6": Dark brown, fine to medium SAND, some Silt, little fine Gravel, trace Roots. Bottom 5": Gray-brown, fine to coarse SAND, some fine to coarse Gravel, some Silt.	0.5'	TOPSOIL	97.5'	1
			20					
2	S-2	15	11	S-2: Dense, gray-brown, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	2.0'	FILL	96.0'	
			8					
3	S-2	15	17		4.3'	GLACIAL TILL	93.7'	
			16					
4			15			G.W.T. ▼		
5	S-3	3	50/3"	S-3: Very dense, gray, fine to coarse GRAVEL and fine to coarse SAND, trace Silt.	5.3'		92.7'	
6				Bottom of Exploration ±5.3'				
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks: 1. Auger refusal at ±5.3'.	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-20	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±106.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		NOT ENCOUNTERED	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	16	1	S-1: Medium dense, Top 8": Dark brown, fine to medium SAND, some Silt, little fine Gravel, trace Roots. Bottom 8": Gray-brown, fine to medium SAND, some Silt, little fine to coarse Gravel, trace Roots.	0.7'	TOPSOIL	105.3'	1
			4		SUBSOIL	104.0'		
			7					
			13					
2	S-2	16	15	S-2: Very dense, gray, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.	2.0'	GLACIAL TILL	101.5'	
			23					
			34					
			40					
4				Bottom of Exploration ±4.5'	4.5'			
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Remarks: 1. Auger refusal at ±4.5'	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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TEST BORING LOG



99 Realty Drive
Cheshire, CT 06410
(203) 271-1773

PROJECT: PROPOSED WEST SIDE ELEMENTARY SCHOOL	BORING NO.: MM-21	SHEET: 1 of 1
LOCATION: 250 BRANDEGEE AVENUE, GROTON, CT	CONTRACTOR: SITE, LLC	
PROJ. NO: 1777-43	FOREMAN: J. DEANGELIS	
CLIENT: PERKINS EASTMAN	INSPECTOR: J. MONTAGNO	
DATE: APRIL 17, 2019	GROUND SURFACE ELEVATION: ±120.0'	

EQUIPMENT:	AUGER	CASING	SAMPLER	COREBRL	GROUNDWATER DEPTH (FT.)			TYPE OF RIG:
TYPE	HSA	-	SS	-	DATE	TIME	WATER DEPTH	TRACK W/ AUTOHAMMER
SIZE ID (IN.)	2 1/4	-	1 3/8	-	2019-04-17		±14.9'	RIG MODEL:
HMR. WT (LB.)	-	-	140	-				CME-55 LCX
HMR. FALL (IN.)	-	-	30	-				

Depth (FT)	SAMPLE NUMBER	RECOVERY (IN)	BLOWS PER 6"	SOIL AND ROCK CLASSIFICATION-DESCRIPTION BURMISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	DEPTH (FT.)	STRATUM DESCRIPTION	ELEV. (FT.)	Remark
1	S-1	10	2	S-1: Medium dense, Top 3": Dark brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots. Bottom 7": Gray-brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.	0.3'	TOPSOIL	119.7'	1
			8					
2	S-2	7	7	S-2: Medium dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.		FILL		
			5					
			11					
3	S-3	7	12	S-3: Medium dense, gray-brown, fine to coarse SAND and fine to coarse GRAVEL, trace Silt.		FILL		
			12					
			7					
4	S-4	11	5	S-4: Very loose, gray-brown, fine to coarse GRAVEL, little fine to coarse Sand, trace Silt.		FILL		
			6					
			6					
5	S-5	12	5	S-5: Very dense, gray, fine to coarse SAND and fine to coarse GRAVEL, little Silt.		FILL		
			6					
			5					
6								
7								
8								
9								
10								
11			1		11.5'		108.5'	
12			1					
13								
14								
15					14.9'	G.W.T. ▼	105.1'	
16			9					
17			15					
18			50/5"		16.4'		103.6'	
19				Bottom of Exploration ±16.4'				
20								
21								
22								

Remarks: 1. Boring close to utility and existing building with a FFE= 112.0' (Footing elevation at 108.5').	COHESIONLESS SOILS N = 0 - 4 = VERY LOOSE 4-10 = LOOSE 10-30 = MEDIUM DENSE 30-50 = DENSE 50+ = VERY DENSE	COHESIVE SOILS N = 0 - 2 = VERY SOFT 2 - 4 = SOFT 4 - 8 = MEDIUM 8 - 15 = STIFF 15-30 = VERY STIFF 30 + = HARD	SAMPLE TYPE C = ROCK CORE S = SPLIT SPOON UP = UNDISTURBED PISTON UT = UNDISTURBED THINWALL	PROPORTIONS trace = <10% little = 10% - 20% some = 20% - 35% and = 35% - 50%
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APPENDIX 3
LABORATORY TEST RESULTS

GRAIN SIZE DISTRIBUTION TEST DATA

4/29/2019

Client : Milone & MacBroom, Inc
Project : West Side School Groton, CT

Date: 04/29/2019

Location: Onsite

Date: 04/29/2019

Depth: 2' to 4'

Sample Number: 333-19

Material Description: 1.5" Minus gravel with sand, trace fines

Liquid Limit: N/A

Plastic Limit: N/A

USCS Classification: N/A

AASHTO Classification: N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= MM-1, Depth 2' to 4')

Tested by: IC

Checked by: HC

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 306.00
 Tare Wt. = 0.00
 Minus #200 from wash = 6.1%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
326.00	0.00	0.00	1 1/2"	0.00	100.0	0.0
			3/4"	80.30	75.4	24.6
			1/4"	166.60	48.9	51.1
			#4	177.90	45.4	54.6
			#10	204.70	37.2	62.8
			#40	254.10	22.1	77.9
			#100	291.80	10.5	89.5
			#200	304.50	6.6	93.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	24.6	30.0	54.6	8.2	15.1	15.5	38.8			6.6

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
	0.1408	0.2355	0.3576	0.9066	2.7256	6.8386	11.1799	21.8827	25.2588	29.0309	33.2786

Fineness Modulus	C _u	C _c
4.98	79.41	0.52

GRAIN SIZE DISTRIBUTION TEST DATA

4/29/2019

Client: : Milone & MacBroom, Inc
Project: : West Side School Groton, CT
Location: Onsite
Depth: 2.5' to 4.5'

Date: 04/29/2019
Date: 04/29/2019
Sample Number: 334-19

Material Description: Lt. brown silty sand with little gravel

Liquid Limit: N/A

Plastic Limit: N/A

USCS Classification: N/A

AASHTO Classification: N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= MM-5, Depth 2.5' to 4.5')

Tested by: IC

Checked by: HC

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 212.20
 Tare Wt. = 0.00
 Minus #200 from wash = 23.3%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
276.80	0.00	0.00	1 1/2"	0.00	100.0	0.0
			3/4"	13.10	95.3	4.7
			1/4"	45.30	83.6	16.4
			#4	52.90	80.9	19.1
			#10	69.00	75.1	24.9
			#40	128.30	53.6	46.4
			#100	186.00	32.8	67.2
			#200	210.60	23.9	76.1

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	4.7	14.4	19.1	5.8	21.5	29.7	57.0			23.9

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
				0.1244	0.2211	0.3556	0.5982	4.2395	7.2221	11.3077	18.4745

Fineness Modulus
2.50

GRAIN SIZE DISTRIBUTION TEST DATA

4/29/2019

Client : Milone & MacBroom, Inc
Project : West Side School Groton, CT
Location: Onsite
Depth: 2' to 4'

Date: 04/29/2019
Date: 04/29/2019
Sample Number: 335-19

Material Description: Lt. brown silty sand
Liquid Limit: N/A
USCS Classification: N/A

Plastic Limit: N/A
AASHTO Classification: N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= MM-6, Depth 2' to 4')

Tested by: IC

Checked by: HC

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 23.00
 Tare Wt. = 0.00
 Minus #200 from wash = 88.4%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
198.80	0.00	0.00	#4	0.00	100.0	0.0
			#10	0.50	99.7	0.3
			#40	3.20	98.4	1.6
			#100	8.60	95.7	4.3
			#200	22.10	88.9	11.1

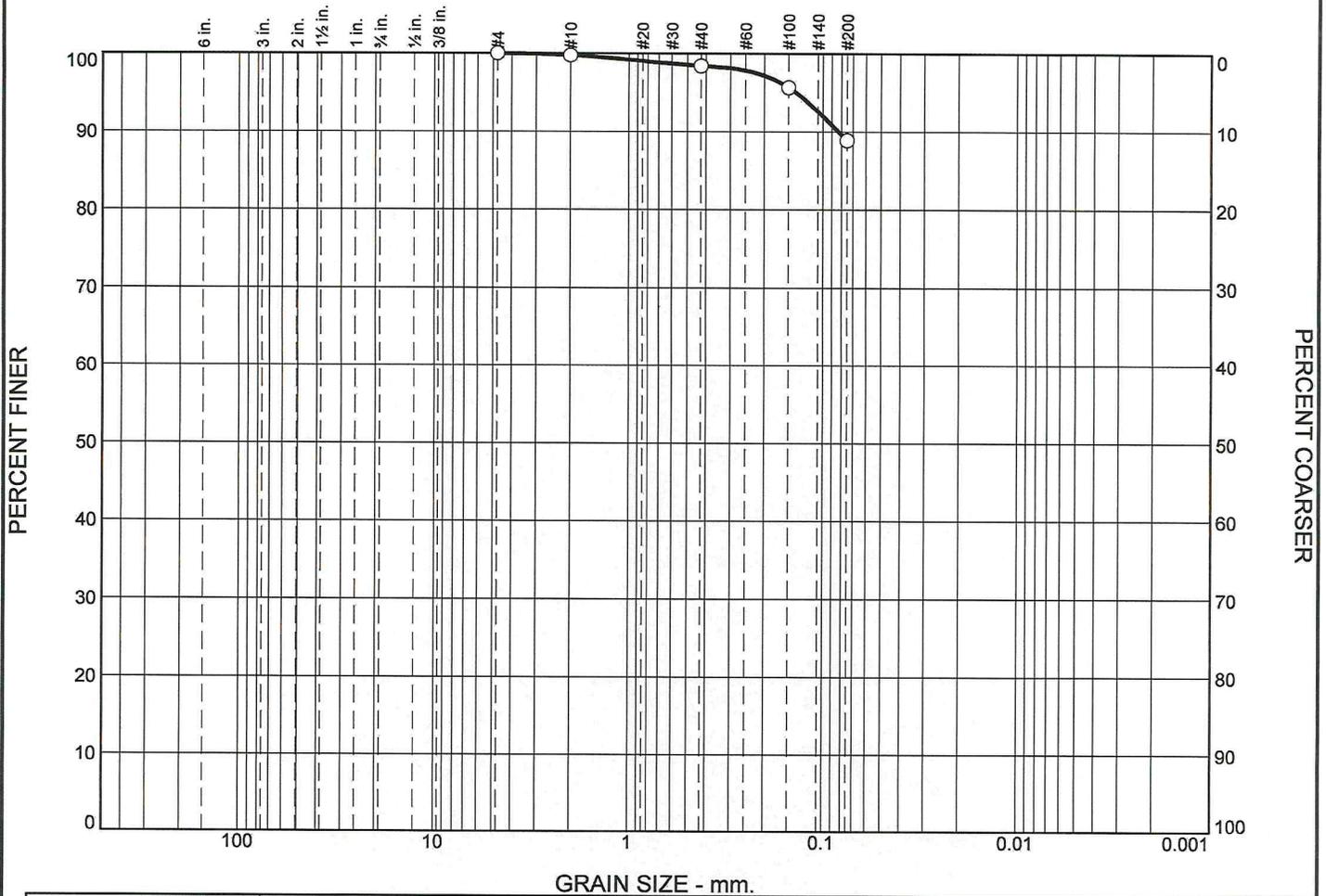
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.3	1.3	9.5	11.1			88.9

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
										0.0828	0.1370

Fineness Modulus
0.08

Particle Size Distribution Report



GRAIN SIZE - mm.										
% +3"	% Gravel		% Sand			% Fines				
	Coarse	Fine	Coarse	Medium	Fine	Silt		Clay		
0.0	0.0	0.0	0.3	1.3	9.5	88.9				
X	LL	PL	D85	D60	D50	D30	D15	D10	C _c	C _u
○	N/A	N/A								

Material Description	USCS	AASHTO
○ Lt. brown silty sand	N/A	N/A

<p>Project No. _____ Client: : Milone & MacBroom, Inc</p> <p>Project: : West Side School Groton, CT</p> <p>○ Source: Onsite Date: 04/29/2019</p>	<p>Remarks:</p> <p>○ ASTM C 136, C 117 (Sample ID= MM-6, Depth 2' to 4')</p>
<p>Tri State Materials Testing Lab</p> <p>Wallingford, Connecticut</p>	

Figure

Tested By: IC Checked By: HC

GRAIN SIZE DISTRIBUTION TEST DATA

4/29/2019

Client : Milone & MacBroom, Inc
Project : West Side School Groton, CT

Date: 04/29/2019

Location: Onsite
Depth: 2' to 4', Bottom 9"

Date: 04/29/2019
Sample Number: 336-19

Material Description: Lt. brown silty sand with trace gravel

Liquid Limit: N/A

Plastic Limit: N/A

USCS Classification: N/A

AASHTO Classification: N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= MM-7, Depth 2' to 4', bottom 9")

Tested by: IC

Checked by: HC

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 78.20
 Tare Wt. = 0.00
 Minus #200 from wash = 57.1%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
182.20	0.00	0.00	3/4"	0.00	100.0	0.0
			1/4"	6.80	96.3	3.7
			#4	8.80	95.2	4.8
			#10	14.50	92.0	8.0
			#40	35.20	80.7	19.3
			#100	59.90	67.1	32.9
			#200	77.50	57.5	42.5

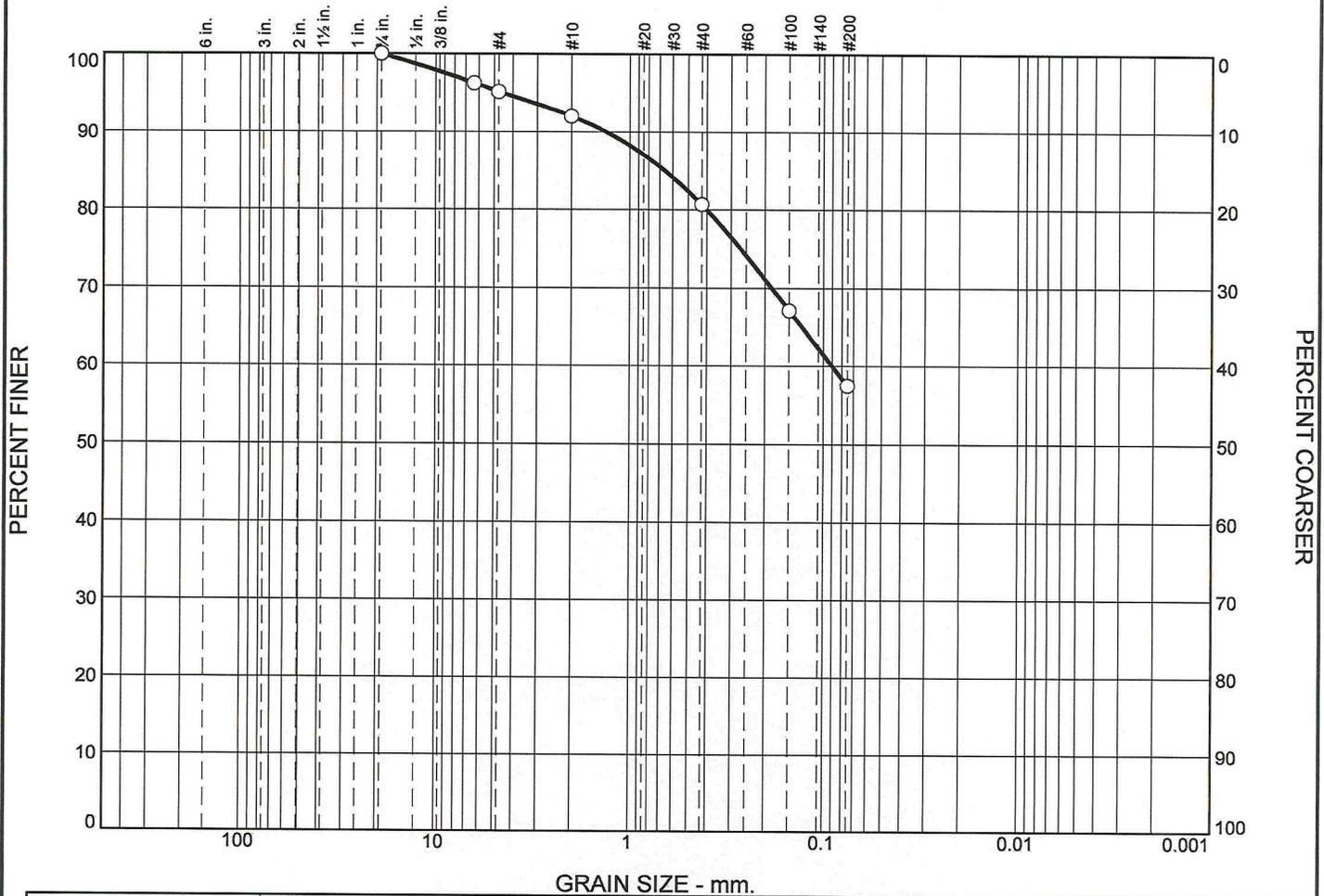
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	4.8	4.8	3.2	11.3	23.2	37.7			57.5

D5	D10	D15	D20	D30	D40	D50	D60	D80	D85	D90	D95
							0.0900	0.4000	0.6581	1.3244	4.5322

Fineness Modulus
0.97

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
<input type="radio"/>	0.0	0.0	4.8	3.2	11.3	23.2	57.5			
<input type="checkbox"/>										
<input checked="" type="checkbox"/>	LL	PL	D₈₅	D₆₀	D₅₀	D₃₀	D₁₅	D₁₀	C_c	C_u
<input type="radio"/>	N/A	N/A	0.6581	0.0900						

Material Description	USCS	AASHTO
<input type="radio"/> Lt. brown silty sand with trace gravel	N/A	N/A

<p>Project No. _____ Client: : Milone & MacBroom, Inc</p> <p>Project: : West Side School Groton, CT</p> <p><input type="radio"/> Source: Onsite Date: 04/29/2019</p>	<p>Remarks:</p> <p><input type="radio"/> ASTM C 136, C 117 (Sample ID= MM-7, Depth 2' to 4', bottom 9")</p>
<p>Tri State Materials Testing Lab</p> <p>Wallingford, Connecticut</p>	

Figure

Tested By: IC Checked By: HC

GRAIN SIZE DISTRIBUTION TEST DATA

4/29/2019

Client : Milone & MacBroom, Inc
Project : West Side School Groton, CT
Location: Onsite
Depth: 2' to 4'

Date: 04/29/2019
Date: 04/29/2019
Sample Number: 337-19

Material Description: Lt. brown silty sand with trace gravel

Liquid Limit: N/A

Plastic Limit: N/A

USCS Classification: N/A

AASHTO Classification: N/A

Testing Remarks: ASTM C 136, C 117 (Sample ID= MM-8, Depth 2' to 4')

Tested by: IC

Checked by: HC

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 159.00
 Tare Wt. = 0.00
 Minus #200 from wash = 28.5%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
222.50	0.00	0.00	3/4"	0.00	100.0	0.0
			1/4"	9.40	95.8	4.2
			#4	12.50	94.4	5.6
			#10	24.70	88.9	11.1
			#40	76.80	65.5	34.5
			#100	132.20	40.6	59.4
			#200	157.50	29.2	70.8

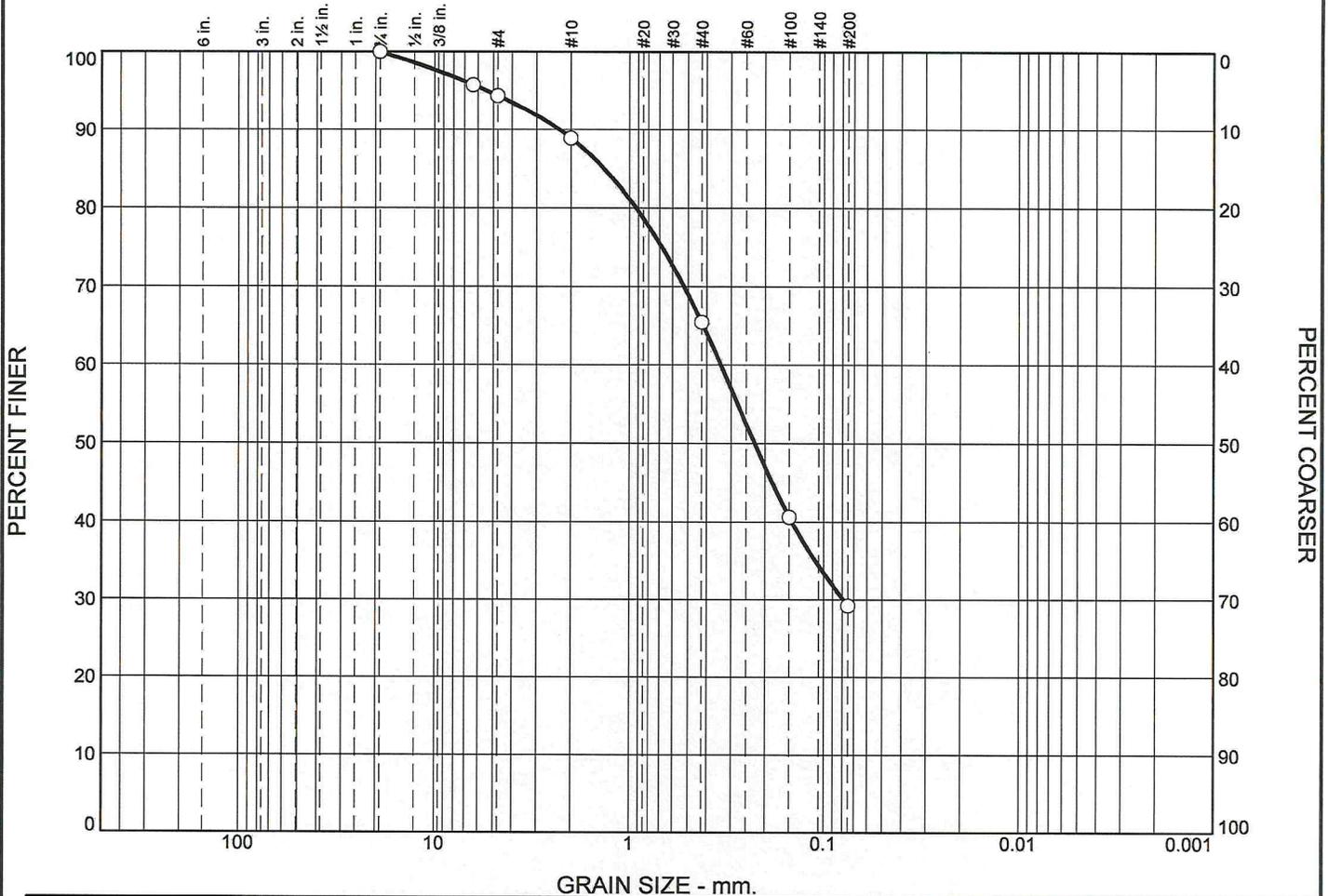
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	5.6	5.6	5.5	23.4	36.3	65.2			29.2

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
				0.0792	0.1457	0.2266	0.3378	0.9248	1.3536	2.2921	5.3852

Fineness Modulus
1.64

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	0.0	5.6	5.5	23.4	36.3	29.2			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	N/A	N/A	1.3536	0.3378	0.2266	0.0792				

Material Description	USCS	AASHTO
○ Lt. brown silty sand with trace gravel	N/A	N/A

Project No. Project: : West Side School Groton, CT Source: Onsite	Client: : Milone & MacBroom, Inc Date: 04/29/2019	Remarks: ○ ASTM C 136, C 117 (Sample ID= MM-8, Depth 2' to 4')
Tri State Materials Testing Lab Wallingford, Connecticut		Figure

Tested By: IC Checked By: HC

APPENDIX 4
LIMITATIONS

GEOTECHNICAL LIMITATIONS

Explorations

1. The analyses and recommendations submitted in this report are based in part on data contained on the subsurface exploration logs. 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 subsurface exploration logs referenced above.
3. Water level readings were reported on the logs referenced above. 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. If any changes in the nature, design or location of the proposed project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by Milone & MacBroom, 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.

Use of Report

5. This report has been prepared for the exclusive use of Perkins Eastman and the design team for specific application to the proposed West Side Elementary School located at 250 Brandegee Avenue in Groton, Connecticut in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.