PRELIMINARY FOUNDATION ENGINEERING REPORT

DOVER HIGH SCHOOL

DOVER, NEW HAMPSHIRE

MAY 14, 2015

Prepared For:

HMFH Architects, Inc.
130 Bishop Allen Drive
Cambridge, MA 02139

McPHAIL ASSOCIATES, LLC
2269 Massachusetts Avenue
Cambridge, MA 02140
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(617) 868-1420

PROJECT NO. 5883.2.00

May 14, 2015

HMFH Architects, Inc.
130 Bishop Allen Drive
Cambridge, MA 02139

Attention: Mr. Pip Lewis, AIA

Reference: Dover High School; Dover, New Hampshire
Preliminary Foundation Engineering Report

Ladies and Gentlemen:

Enclosed herein is our Preliminary Foundation Engineering Report for the proposed new Dover High School to be located on the existing high school campus located in Dover, New Hampshire. The geotechnical services were conducted in accordance with our proposal to HMFH Architects, Inc. (HMFH) for preliminary geotechnical engineering services dated December 10, 2014.

Purpose and Scope

Based on two preliminary building layouts provided to us by HMFH, the purpose of our preliminary design study are to obtain initial subsurface information across the proposed building sites and to identify preliminary foundation design considerations associated with the proposed redevelopment of the school facility.

Available Information

Information provided to McPhail Associates, LLC by HMFH included an Existing Conditions Survey entitled “Boundary Survey” dated February 23, 2015 and prepared by Sebago Technics, proposed new building scope options entitled “Base Rehabilitation”, “Reno Add Option”, and “New Construction” dated May 6, 2015, and historic building plans consisting of building plans and borings of the building construction dated 1965 and 1966, eastern building addition from 1989, and southwestern building addition from 2002.

Existing Site Conditions

The Dover High School campus occupies an irregularly shaped site that is bounded by Dover Middle School and the Bellamy River to the north, Durham Road to the southeast, residential properties to the south and Bellamy Road to the west. Currently, the campus is occupied by the existing high school building which is located on the southeastern quadrant of the site with parking areas immediately surrounding and to the south of the existing school. The school fronts to the south onto Alumni Drive which crosses the southern half of the site. Athletic fields are located to the north and west of the existing building. A

separate small school building is located to the southwest of the main high school structure on the south side of Alumni Drive.

Ground surface slopes gently from southwest to the north and east. Ground surface is between approximately Elevation +95 and +100 along Alumni Drive to the west of the existing school and slopes down to about Elevation +80 to the north and to the southeast of the existing school. Directly surrounding the existing high school building, the grades to the south and west of the building are between Elevation +90 and +95 and at about Elevation +85 along the north and east sides of the building. The existing school has two above-grade levels and a partial single below-grade level which is benched into the existing slope. The first floor slab level is understood to be about Elevation +96 and the basement level is at about Elevation +85.

Elevations presented herein are based on the topographic survey provided in the above referenced "Boundary Survey."

Proposed Development

The proposed development schemes currently under consideration consist of three options. The first is to renovate the existing school building which would require temporary structures currently proposed to be located the west of the existing building. The second option is the renovation of the western end of the existing building, demolition of the eastern end of the existing building, and the construction of a new addition to the west of the existing building. Lastly, the third option involves the demolition of the existing school and the construction of a new school building to the west of the existing school. The approximate location of both new construction options are shown on the enclosed Figures 2 and 3. Figure 2 indicates the proposed footprint of the new school building and Figure 3 indicates the footprint of the renovation and new addition.

Both new construction options will consist of a two-level structure and are not anticipated to have below-grade space. The lowest level slab is anticipated to be generally coincident with the existing school first floor level which is at about Elevation +96.

Investigation Procedures

Our preliminary subsurface investigation consisting of eight (8) soil borings was conducted at the site on May 4 and 5, 2015. The boreholes were performed by New England Boring Contractors of Derry, New Hampshire under contract to McPhail Associates, LLC (McPhail). Logs of the soil borings prepared by McPhail are contained in Appendix B and approximate locations of the explorations are as indicated on the enclosed Subsurface Exploration Plan, Figure 2.

The subsurface explorations were monitored by a representative of McPhail who performed field layout, prepared field logs, obtained and visually classified soil samples, monitored

groundwater conditions in the completed explorations, made adjustments to the exploration locations to facilitate access and to avoid damaging the playing fields and determined the required exploration depths based upon the actual subsurface conditions encountered. Field locations of the subsurface explorations were determined by taping from existing site features identified on the referenced site plan provided to us.

The borings were performed using a truck-mounted drill rig and advanced using both hollow stem augers and NW casing with the wet-rotary drilling method to depths ranging from 4.2 to 50 feet below the existing ground surface. Standard 1-3/8-inch I.D. split-spoon samples and standard penetration tests were generally obtained at 5-foot intervals of depth in accordance with the standard procedures described in ASTM D1586.

Subsurface Conditions

Detailed descriptions of the subsurface conditions encountered within each of the boreholes are presented on the boring logs contained in Appendix B. Following is a discussion of the generalized subsurface conditions across the site which are inferred primarily from the recent explorations, and also from our knowledge of local site geology, and is presented relative to each of the three development options discussed above.

Beneath the existing surface treatments consisting of bituminous pavement or landscaping with topsoil, each of the borings encountered a granular fill deposit. The fill was observed to generally consist of a loose to dense, brown, sand and gravel, with some silt, few cobbles and trace amounts of red brick and concrete. The fill deposit varies from about 2 to 10 feet in thickness.

Below the fill deposit, the borings encountered either a marine clay deposit, alluvial deposit, glacial till, or bedrock.

The marine deposit was encountered at boring B-6 located adjacent to the southwest corner of the existing school. The marine deposit was observed to consist of a stiff to very stiff mottled yellow and blue-gray silty clay with trace amounts of sand seams which transitions with depth to a very soft, sensitive, blue-gray silty clay. The surface of the marine clay was encountered at a depth of 5 feet corresponding to Elevation +90.1 and was observed to be 43.2 feet in thickness.

Where encountered, an alluvial deposit was encountered directly below the fill deposit at borings B-2 through B-5 at depths of 3 to 9 feet below the existing ground surface corresponding to Elevation +95.4 at boring B-4 and Elevation +83.1 at boring B-3. The alluvial deposit was observed to consist of a very loose to compact light brown stratified silt and fine sand with a trace to some clay and a trace of gravel. Trace organic fibers were also observed in the alluvial deposit. The alluvial deposit was observed to vary from 4 to 7 feet in thickness.

Beneath the fill deposit in borings B-1, B-7 and B-8, and below either the alluvial or marine deposits in borings B-2 through B-6, each of the borings encountered a glacial till deposit. The glacial till deposit was observed to consist of a loose to very dense, brown to light gray, silty sand and gravel with numerous cobbles and occasional boulders. The surface of the glacial till was observed to vary between depths of 3.1 feet at boring B-8 and 48.2 feet at boring B-6. With the exception of boring B-1, each of the borings was terminated within the glacial till deposit on either a boulder or the possible surface of the underlying bedrock. In boring B-1, the glacial till deposit was observed to be 4.5 feet in thickness.

In boring B-1, a highly to severely fractured, moderately to severely weathered bedrock deposit was encountered. The surface of the weathered bedrock was observed at a depth of 14.5 feet corresponding to Elevation +75.3. Boring B-1 was terminated upon auger refusal at 20.4 feet below the existing ground surface.

Groundwater was observed in the completed boreholes at depths varying from 4 to 26 feet below the existing ground surface. It is anticipated that groundwater is perched on the surface of the relatively impervious marine clay, alluvial and glacial till deposits. It is anticipated that future groundwater levels across the site may vary from those reported herein due to factors such as normal seasonal changes, periods of heavy precipitation, and alterations of existing drainage patterns.

Preliminary Foundation Design Recommendations

Due to the uncontrolled nature of the surficial fill deposit and the very loose nature of the alluvial deposit, it is recommended that support of the proposed building will require the building loads to be transferred to the surface of the underlying glacial till or bedrock surface. With the exception of the deep marine deposit encountered in boring B-6, the borings indicated the surface of the undisturbed natural glacial till deposit at depths less than 13.5 feet below the existing ground surface. Due to the relatively shallow depth to the glacial till deposit across the northern and western halves of the building, a conventional footing foundation system is considered most economically feasible in these areas. It is anticipated that a combination of conventional footings bearing either directly on the undisturbed glacial till deposit or on the existing fill and alluvial soils which have been improved with a ground improvement system such as aggregate piers would be necessary.

For preliminary design purposes we recommend that foundation support for the proposed structure be provided by a conventional spread footing foundation system in conjunction with slab-on-grade construction for the lowest level slab. Spread footings are anticipated to bear in the glacial till or bedrock deposits, or on the fill and alluvial deposits improved with aggregate piers, and should be proportioned utilizing a maximum design bearing pressure of two (2) tons per square foot.

Where the very soft marine clay is present in the area of boring B-6, it is anticipated that a pile foundation system extending to the surface of the glacial till or bedrock will be necessary for support of the proposed building. The type and design capacity of the pile

foundation system would be a function of the proposed building loads. Additionally, the need for a pile foundation would likely be greater and more extensive with the renovation/addition scheme as it extends more into the area of boring B-6 in combination with our understanding that portions of the existing school are pile supported. Alternatively, the new building option is located farther to the west of the school than the addition option and therefore may have either less or no piles depending on the extent of the soft clay deposit.

Ground Improvement

In general, an aggregate pier (AP) cavity is created by driving a specially designed 12 to 16-inch diameter mandrel and tamper foot using a large static force augmented by dynamic vertical impact energy. The APs may also be installed utilizing an auger system to create the cavity and a tamper foot to compact the introduced material. A sacrificial cap is placed at the bottom of the tamper foot to prevent soil from entering. This method of advancement eliminates spoils as all penetrated soils are displaced laterally.

After driving to the design depth, the aggregate is placed inside the mandrel and the mandrel is lifted, leaving the sacrificial cap at the bottom of the cavity. In general, the tamper foot is lifted approximately three feet and then driven and vibrated back down two feet, forming a one-foot thick compacted lift. This process is repeated to the top of the cavity, forming the AP. The compaction densifies the aggregate and increases the lateral stress in the soil matrix beneath the proposed buildings. Thus, the potential for significant settlement is reduced by improving the unsuitable soils to a stiffer composite soil matrix. Based on the results of the explorations, the APs would extend into the glacial till deposit and range up to about 15 to 20 feet in length.

The above described method for AP installation consisting of a mandrel typically produces negligible excess soil spoils. The auger installation method, however, will generate excess soil spoils which will require either on-site reuse of off-site disposal.

Since ground improvement techniques such as APs are typically provided by a design-build consultant, detailed design calculations should be submitted to the Architect for review prior to the beginning of construction. A detailed explanation of the design parameters for capacity and settlement calculations should be included in the design submittal. The design submittal should also include a testing program to demonstrate the capacity of the elements. All calculations and drawings should be prepared and sealed by a Professional Engineer licensed in the State of New Hampshire, and retained by the Contractor who is to perform the work.

The following general criteria should be utilized in the design of APs:

1. APs should extend at least to the surface of the glacial till deposit;
2. The maximum allowable bearing pressure supported on an AP reinforced ground surface which extends to the glacial till deposit should be equal to or less than 2 tons per square- foot (TSF);

3. Estimated long-term settlement for footings should be less than 1-inch;
4. Estimated long-term differential settlement of adjacent footings should be less than 1/2-inch; and
5. A modulus load test should be performed on one of the APs to 150 percent of the maximum design stress.

To control potential cosmetic cracking of the lowest-level slab within areas where the fill and alluvial deposits remain below the slab-on-grade, APs can be installed in a grid pattern for support of the slab. Typically, the APs are installed on an approximately 10-foot square grid which would be designed by the AP Contractor.

General Foundation Recommendations

The lowest-level slab within the conventional footing foundation portion of the building should consist of a conventional slab-on-grade. However, where the proposed building is supported by a pile foundation system, the lowest-level slab should be designed as a structurally-framed slab.

Underslab and perimeter drainage should be provided where the lowest-level slab is greater than 12 inches below the finished exterior grade. If necessary, the underslab drainage system should drain by gravity to a drain line.

Additional subsurface explorations will be necessary to further delineate the areas of the proposed building which will require ground improvement and pile foundations.

Final Comments

Based on our current understanding of the project scope, it is recommended that McPhail Associates, LLC. be retained to prepare a final foundation engineering report once the details of the proposed school are finalized. The final report would provide final foundation recommendations based on the specific project design requirements.

It is also recommended that McPhail Associates, LLC be retained to provide design assistance to the design team during the final design phase of this project. The purpose of this involvement would be to review the structural foundation drawings and foundation notes for conformance with the recommendations herein, and to generate or review the earthwork specification section for inclusion into the Contract Documents for construction.

We trust that the above preliminary information is sufficient for your present requirements. Should you have any questions concerning the recommendations presented herein, please do not hesitate to call us.

Very truly yours,

McPHAIL ASSOCIATES, LLC

Jason S. Huestis

Ambrose J. Donovan, P.E.

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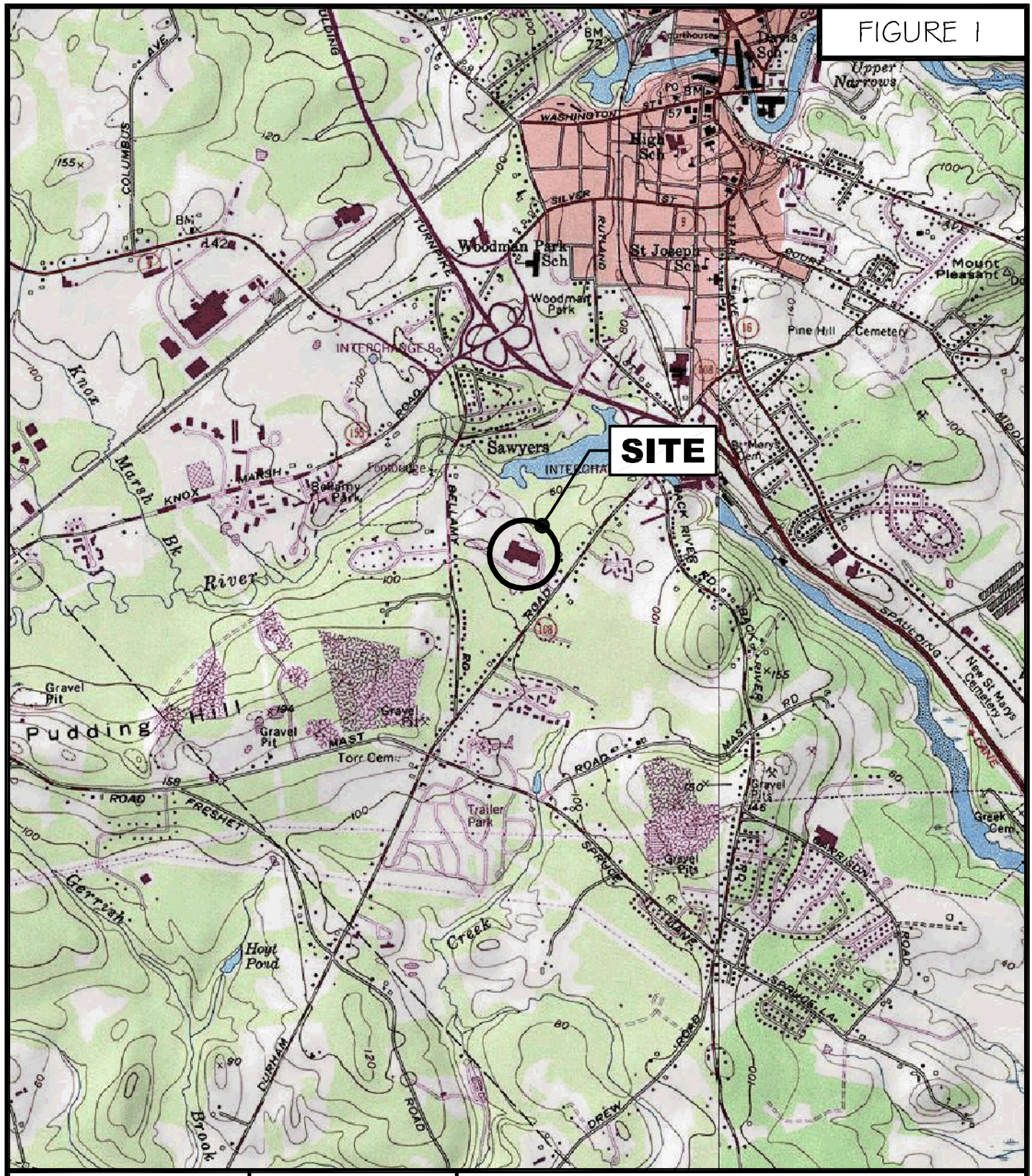
JSH/ajd

FIGURE 1



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SCALE 1:25,000

PROJECT LOCATION PLAN

DOVER HIGH SCHOOL

DOVER NEW HAMPSHIRE

FIGURE 2

NORTH

B-1

B-2

B-3

B-4

B-5

B-6

B-7

B-8

APPROXIMATE LIMITS OF PROPOSED BUILDING OPTION 1

APPROXIMATE LIMITS OF EXISTING SCHOOL BUILDING

GRAPHIC SCALE

100 0 100 200

LEGEND

— APPROXIMATE LOCATION OF BORING PERFORMED BY NEW ENGLAND BORING ON MAY 4 AND 5, 2015 FOR McPHAIL ASSOCIATES, LLC

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "BOUNDARY SURVEY" DATED FEBRUARY 23, 2015 BY SEBAGO TECHNICS

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DOVER HIGH SCHOOL

DOVER NEW HAMPSHIRE

SUBSURFACE EXPLORATION PLAN - OPTION 1

FOR

HMFH ARCHITECTS, INC.

BY

McPHAIL ASSOCIATES, LLC

Date: MAY 2015	Dwn: F.G.P.	Chkd: J.S.H.	Scale: 1" = 100'
Project No: 5883			

FILE NAME: H:\Acad\OB5\5883\5883-F02.dwg

FIGURE 3

NORTH

B-1

B-2

B-3

B-4

B-5

B-6

B-7

B-8

APPROXIMATE LIMITS OF PROPOSED BUILDING OPTION 2

APPROXIMATE LIMITS OF EXISTING SCHOOL BUILDING

GRAPHIC SCALE

100 0 100 200

LEGEND

— APPROXIMATE LOCATION OF BORING PERFORMED BY NEW ENGLAND BORING ON MAY 4 AND 5, 2015 FOR McPHAIL ASSOCIATES, LLC

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "BOUNDARY SURVEY" DATED FEBRUARY 23, 2015 BY SEBAGO TECHNICS

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DOVER HIGH SCHOOL

DOVER NEW HAMPSHIRE

SUBSURFACE EXPLORATION PLAN - OPTION 2

FOR

HMFH ARCHITECTS, INC.

BY

McPHAIL ASSOCIATES, LLC

Date: MAY 2015	Dwn: F.G.P.	Chkd: J.S.H.	Scale: 1" = 100'
Project No: 5883			

FILE NAME: H:\Acad\JOBS\5883\5883-F03.dwg

APPENDIX A:

LIMITATIONS

LIMITATIONS

This preliminary report has been prepared on behalf of and for the exclusive use of HMFH Architects, Inc. for specific application to the proposed Dover High School development to be located at 25 Alumni Drive in Dover, New Hampshire in accordance with generally accepted soil and geotechnical engineering practices. No other warranty, expressed or implied, is made.

The recommendations contained in this report are for preliminary pricing and design purposes only. Final subsurface exploration program and foundation engineering analyses will be required for the design and construction of the proposed project. In the event that any changes in nature, design, or location of the proposed construction are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by McPhail Associates.

The preliminary analyses and recommendations presented in this report are based upon the data obtained from the preliminary subsurface explorations performed at the approximate locations indicated on the enclosed plan. If variations in the nature and extent of subsurface conditions between the widely spaced explorations become evident during the course of construction, it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of any variations.

APPENDIX B:

BORING LOGS B-1 THROUGH B-8
PREPARED BY MCPHAIL ASSOCIATES, LLC

Project:	Dover High School	**Job #:**	5883.2.00
Location:	25 Alumni Drive	**Date Started:**	5-4-15
City/State:	Dover, New Hampshire	**Date Finished:**	5-4-15

Boring No.

B-1

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 89.8

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	11	78.8	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
			0.5 / 89.3	(TOPSOIL)	2	S-1	6/6	0.0-0.5	1	Very loose, brown, loamy SILT, some sand, gravel, trace roots.
1	89				16	S-1A	18/9	0.5-2.0	4 9 7	Compact, brown, SAND and GRAVEL, some silt, few cobbles, trace concrete.
2	88									
3	87									
4	86									
5	85			(FILL)						
6	84				55	S-2	24/10	5.0-7.0	23 36 19 16	Very dense, gray to brown, sandy GRAVEL, some silt, few cobbles.
7	83									
8	82									
9	81									
10	80		10.0 / 79.8							
11	79				57	S-3	24/13	10.0-12.0	6 10 47 21	Very dense, brown, silty SAND and GRAVEL, trace clay, few cobbles.
12	78			(GLACIAL TILL)						
13	77									
14	76		14.5 / 75.3							
15	75				26	S-4	10/10	15.0-15.8	13 100/4"	Very dense, gray to brown, fractured sandy GRAVEL, trace silt, numerous cobbles.
16	74									
17	73									
18	72			(WEATHERED BEDROCK)						
19	71									
20	70		20.4 / 69.4		0	S-5	1/1	20.0-20.1	100/1"	Very dense, gray to brown, fractured sandy GRAVEL, trace silt, numerous cobbles.
21	69									
22	68									
	67									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal in weathered bedrock at 20.4'.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-4-15
Date Finished: 5-4-15

Boring No. B-2

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 89.7

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	4	85.7	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
1	89				10	S-1	24/15	0.0-2.0	3 5 5 7	Compact, brown, silty SAND, trace to some gravel, trace roots.
2	88			(FILL)						
3	87		3.0 / 86.7							
4	86									
5	85									
6	84				8	S-2	24/21	5.0-7.0	4 4 4 4	Loose, stratified, light brown, sandy SILT, trace clay.
7	83			(ALLUVIUM)						
8	82									
9	81									
10	80		10.0 / 79.7							
11	79				36	S-3	17/14	10.0-11.4	6 30 100/5"	Very dense, brown, silty SAND and GRAVEL, numerous cobbles.
12	78			(GLACIAL TILL)						
13	77									
14	76		13.9 / 75.8							
15	75									
16	74									
17	73									
18	72									
19	71									
20	70									
21	69									
22	68									
	67									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock surface 13.9'.

Weather: P. Cloudy

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2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-5-15
Date Finished: 5-5-15

Boring No. B-3

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 92.1

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-5-15	15	77.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
			0.5 / 91.6	(TOPSOIL)						
1	91				8	S-1	24/12	0.0-2.0	2 4 4 7	Loose, brown, silty SAND, some gravel, trace roots.
2	90									
3	89									
4	88									
5	87			(FILL)						
6	86				10	S-2	24/17	5.0-7.0	10 7 3 3	Compact, brown, gravelly SAND, trace concrete, brick fragments.
7	85									
8	84									
9	83		9.0 / 83.1							
10	82				2	S-3	24/15	10.0-12.0	1/12" 1 1	Very loose, stratified, brown sandy SILT with interbedded, mottled yellow and blue-gray silty CLAY, trace organic fibers.
11	81			(ALLUVIUM)						
12	80									
13	79		13.5 / 78.6							
14	78			(GLACIAL TILL)						
15	77		15.4 / 76.7		0	S-4	3/3	15.0-15.3	100/3"	Very dense, gray, silty SAND and GRAVEL, numerous cobbles, trace clay.
16	76									
17	75									
18	74									
19	73									
20	72									
21	71									
22	70									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock surface 15.4'.

Weather: P. Cloudy

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CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-5-15
Date Finished: 5-5-15

Boring No. B-4

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 97.4

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-5-15	8.5	88.9	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
0	97		0.5 / 96.9	(TOPSOIL)	4	S-1	6/6	0.0-0.5	2	Loose, brown, sandy SILT, trace gravel and roots.
1	96		2.0 / 95.4	(FILL)	7	S-1A	18/12	0.5-2.0	3 3 4	Loose, orange to brown, silty fine SAND, some gravel, trace organic fibers.
2	95									
3	94									
4	93									
5	92			(ALLUVIUM)	11	S-2	24/24	5.0-7.0	4 5 6 9	Stiff, mottled, yellow and blue-gray silty CLAY, with interbedded stratified fine SAND and SILT seams, trace organic fibers, gravel.
6	91									
7	90									
8	89		8.5 / 88.9							
9	88									
10	87				5	S-3	24/12	10.0-12.0	3 2 3 4	Loose, brown, SAND and GRAVEL, some silt, few fractured cobbles.
11	86			(GLACIAL TILL)						
12	85									
13	84									
14	83		14.3 / 83.1							
15	82									
16	81									
17	80									
18	79									
19	78									
20	77									
21	76									
22	75									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock at 14.3'.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-4-15
Date Finished: 5-4-15

Boring No.
B-5

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 98.5

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	N/A	0.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
	98		0.5 / 98.0	(TOPSOIL)	2	S-1	6/5	0.0-0.5	1	Very loose, brown, loamy SILT, some fine sand, trace gravel, roots.
1	97				17	S-1A	18/8	0.5-2.0	5 10 7	Compact, brown, silty SAND and GRAVEL, few cobbles, trace roots.
2	96			(FILL)						
3	95									
4	94									
5	93		5.0 / 93.5		22	S-2	24/19	5.0-7.0	4 8 14 43	Compact, brown, stratified, silty fine SAND, trace gravel, clay, single cobble bottom 6".
6	92			(ALLUVIUM)						
7	91									
8	90									
9	89		9.0 / 89.5 9.2 / 89.3	(GLACIAL TILL)	0	S-3	2/0	9.0-9.2	100/2"	Very dense, brown, sandy GRAVEL, cobbles.
10	88									
11	87									
12	86									
13	85									
14	84									
15	83									
16	82									
17	81									
18	80									
19	79									
20	78									
21	77									
22	76									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock surface at 9.2'.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-4-15
Date Finished: 5-5-15

Boring No.
B-6

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 95.1

Casing Type/Depth (ft): 4" NW Casing
Casing Hammer (lbs)/Drop (in): 300 lb/24 in
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	26	69.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
1	94				10	S-1	24/15	0.0-2.0	2 3 7 7	Compact, brown SAND, some gravel, trace silt and asphalt fragments.
2	93			(FILL)						
3	92									
4	91									
5	90		5.0 / 90.1		16	S-2	24/19	5.0-7.0	3 7 9 14	Very stiff, mottled yellow and blue-gray silty CLAY, trace fine sand seams, trace organic fibers.
6	89									
7	88									
8	87									
9	86									
10	85				26	S-3	24/22	10.0-12.0	7 10 16 23	Very stiff, mottled yellow and blue-gray silty CLAY, trace fine sand seams, trace organic fibers.
11	84									
12	83									
13	82									
14	81			(MARINE DEPOSIT)						
15	80				18	S-4	24/24	15.0-17.0	6 8 10 11	Very stiff, blue-gray silty CLAY, trace fine sand.
16	79									
17	78									
18	77									
19	76									
20	75				3	S-5	24/24	20.0-22.0	1 2 1 2	Soft, blue-gray silty CLAY.
21	74									
22	73									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Casing advanced to 50' but roller bit unable to be advanced beyond 48.2' due to loss of drilling fluid.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Dover High School	**Job #:**	5883.2.00
Location:	25 Alumni Drive	**Date Started:**	5-4-15
City/State:	Dover, New Hampshire	**Date Finished:**	5-5-15

Boring No.

B-6

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 95.1

Casing Type/Depth (ft): 4" NW Casing
Casing Hammer (lbs)/Drop (in): 300 lb/24 in
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	26	69.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
24	71									
25	70				0	S-6	24/24	25.0-27.0	WOR/18" 1	Very soft, blue-gray silty CLAY. Moisture content 34.5%.
26	69									
27	68									
28	67									
29	66									
30	65				0	S-7	24/24	30.0-32.0	WOR/24"	Very soft, sensitive, blue-gray silty CLAY. Moisture content 39.8%.
31	64									
32	63									
33	62									
34	61			(MARINE DEPOSIT)						
35	60				0	S-8	24/24	35.0-37.0	WOR/24"	Very soft, sensitive, blue-gray silty CLAY.
36	59									
37	58									
38	57									
39	56									
40	55				0	S-9	24/24	40.0-42.0	WOR/24"	Very soft, sensitive, blue-gray silty CLAY, trace fine sand lenses.
41	54									
42	53									
43	52									
44	51									
45	50								WOR/24"	Very soft, blue-gray silty CLAY, trace fine sand and gravel. Moisture content 31.7%.

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Casing advanced to 50' but roller bit unable to be advanced beyond 48.2' due to loss of drilling fluid.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Dover High School	**Job #:**	5883.2.00
Location:	25 Alumni Drive	**Date Started:**	5-4-15
City/State:	Dover, New Hampshire	**Date Finished:**	5-5-15

Boring No.

B-6

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 95.1

Casing Type/Depth (ft): 4" NW Casing
Casing Hammer (lbs)/Drop (in): 300 lb/24 in
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-4-15	26	69.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
47	48			(MARINE DEPOSIT)	0	S-10	24/24	45.0-47.0		
48	47		48.2 / 46.9							
49	46			(GLACIAL TILL)						
50	45		50.0 / 45.1							
51	44									
52	43									
53	42									
54	41									
55	40									
56	39									
57	38									
58	37									
59	36									
60	35									
61	34									
62	33									
63	32									
64	31									
65	30									
66	29									
67	28									
68	27									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Casing advanced to 50' but roller bit unable to be advanced beyond 48.2' due to loss of drilling fluid.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-5-15
Date Finished: 5-5-15

Boring No.
B-7

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 97.2

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-5-15	N/A	0.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
	97		0.5 / 96.7	(TOPSOIL)	27	S-1	24/18	0.0-2.0	2 6 21 20	Compact, orange-brown silty SAND and GRAVEL, trace roots, glass fragments, few cobbles.
1	96									
2	95			(FILL)						
3	94		3.4 / 93.8							
4	93		4.2 / 93.0	(BOULDER/GLACIAL TILL)						
5	92									
6	91									
7	90									
8	89									
9	88									
10	87									
11	86									
12	85									
13	84									
14	83									
15	82									
16	81									
17	80									
18	79									
19	78									
20	77									
21	76									
22	75									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock at 4.2'.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Dover High School
Location: 25 Alumni Drive
City/State: Dover, New Hampshire

Job #: 5883.2.00
Date Started: 5-5-15
Date Finished: 5-5-15

Boring No.
B-8

Contractor: New England Boring
Driller/Helper: Brad and John
Logged By/Reviewed By: L. Brown
Surface Elevation (ft): 97.4

Casing Type/Depth (ft): 2.25" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 1 3/8 in Split Spoon
Sampler Hammer (lbs)/Drop (in): 140 lb/30 in

Groundwater Observations

Date	Depth	Elev.	Notes
5-5-15	N/A	0.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
0	97		0.5 / 96.9	(TOPSOIL)						
1	96			(FILL)	20	S-1	24/15	0.0-2.0	2 7 13 20	Compact, light brown, silty SAND and GRAVEL, few cobbles.
2	95									
3	94		3.1 / 94.3							
4	93			(GLACIAL TILL)						
5	92				0	S-2	4/4	5.0-5.3	100/4"	Very dense, dark brown SAND and GRAVEL, some silt, numerous cobbles.
6	91									
7	90									
8	89		8.2 / 89.2							
9	88									
10	87									
11	86									
12	85									
13	84									
14	83									
15	82									
16	81									
17	80									
18	79									
19	78									
20	77									
21	76									
22	75									

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Auger refusal on boulder or possible bedrock at 8.2'.

Weather: P. Cloudy

McPHAIL ASSOCIATES, LLC
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