

GEOTECHNICAL ENGINEERING SERVICES

HAVERSTRAW – ATHLETIC COMPLEX

WEST HAVERSTRAW, ROCKLAND COUNTY, NY



Submitted To:

Suburban Consulting Engineers, Inc.
2430 US Highway 32, Building A
Wall, New Jersey 08736

Frederick A. Brinker, PE
PE 040481E

SUBCE 19004.01
October 14, 2019
Revised July 1, 2020



PARTNERS FOR WHAT'S POSSIBLE

pennoni.com

October 14, 2019
Revised July 1, 2020

SUBCE19004.01

Mr. Robert Gregoria, PE, LEED GA, Branch Manager
Suburban Consulting Engineers, Inc.
2430 Highway 34, Building A
Wall, New Jersey 08736

**Re: Geotechnical Engineering Services
Haverstraw – Athletic Complex
Haverstraw, NY**

Dear Mr. Gregoria:

We are pleased to submit our revised geotechnical engineering report for the referenced project which includes supplemental exploratory test pit and infiltration data. Work was initiated in general accordance with your request and subsequent authorization to proceed.

We trust that the information presented herein is what you require at this time and we thank you for the opportunity to assist you with this project. If you have any questions, or if you need any further assistance with this project, please contact this office at your earliest convenience.

Respectfully yours,

PENNONI ASSOCIATES INC.

A handwritten signature in blue ink, appearing to read "E. Brinker".

Eli G. Brinker
Graduate Professional

A handwritten signature in blue ink, appearing to read "Frederick A. Brinker".

Frederick A. Brinker, PE
Associate Vice President
Geotechnical Division Manager

CONTENTS

SECTION	PAGE
EXECUTIVE SUMMARY	1
1.1. LOCATION	2
1.2. PROPOSED CONSTRUCTION	2
1.3. OBJECTIVES	2
2. FIELD AND LABORATORY WORK	2
2.1. FIELD WORK	2
2.2. LABORATORY WORK	3
3. SITE CHARACTERISTICS	3
3.1. SURFACE FEATURES	3
3.2. GEOLOGY	3
3.3. SUBSOILS	3
3.4. GROUND WATER	4
3.5. INFILTRATION TESTING	4
4. ANALYSES AND RECOMMENDATIONS	5
4.1. SEISMIC SITE CLASS	5
4.2. SITEWORK	5
4.2.1. EARTHWORK	5
4.2.2. ROCK	6
4.3. FOUNDATIONS	6
4.4. SETTLEMENT	7
4.5. GROUND FLOOR SLAB	7
4.6. GROUND WATER AND SURFACE WATER MANAGEMENT	7
5. RECOMMENDATIONS FOR FURTHER GEOTECHNICAL SERVICES	8
6. LIMITATIONS	8

APPENDICES

APPENDIX A – Field Data

Boring Location Plan
Boring Logs
Test Pit Logs
Test Pit/Boring Log Key Sheet

Drawing No. LP-1
B-1 through B-6
TP-1 through TP-9

APPENDIX B – Laboratory Data

Summary of Laboratory Test Data
Gradation Curves
Laboratory Testing Procedures

Table L-1
S-1

APPENDIX C – Important Information about this Geotechnical Engineering Report

EXECUTIVE SUMMARY

Pennoni has completed our geotechnical study and supplemental field exploration for the recently finalized proposed Athletic Complex Project located in West Haverstraw, New York. The purpose of this study was to determine subsurface conditions at the project site, evaluate these conditions with respect to the proposed construction, and provide engineering recommendations for foundation design and construction. Additionally, as part of the supplemental field exploration infiltration testing was conducted.

This Athletic Complex will include athletic fields, playgrounds, pavilions, an indoor multi-purpose athletic facility, parking lots, a field house, a walking path with pedestrian crossings, lighting, concession and service buildings, a future multi-use building, and grandstands. The site currently consists of an open grass land with wooded areas to the northwest and east, with wet areas within the wooded areas. At the time of this report structural loads for the structures were not available, however, we anticipate lightly loaded structures based on our experience on similar projects.

On September 10, 2019, 6 borings were drilled on the project site by Geo-Environmental Drilling, Inc. A supplemental exploration was carried out on June 11, 2020. Appendix A includes the boring logs, supplemental test pit logs, and Location Plan Drawing No. LP-1.

Based on the results of our field explorations, laboratory testing, engineering analyses, and our experience, we conclude that construction of the proposed Athletic Complex is feasible. On-site inert soils can be used in compacted load bearing fills. In our professional opinion, shallow spread footings should be used for foundation support for the new Athletic Complex structures as necessary. Detrimental long-term post-construction settlements are not expected if the recommendations presented in this report are followed. The floor slabs can be constructed on firm/dense natural soils, on compacted on-site soils and/or on imported load bearing compacted fill. Perched water and/or seepage may be encountered in excavations on the order of 8 to 13 feet deep. It is possible that water could be encountered in shallow excavations as well.

This report provides a more detailed summary of the field and laboratory testing programs as well as a discussion of the conclusions and recommendations pertaining to the design and construction of the proposed Athletic Complex.

1. INTRODUCTION

1.1. LOCATION

The site is located in Rockland County, West Haverstraw, NY. The project site is an undeveloped lot bounded by Central Highway to the west, Cinder Road to the south, and Chapel Street to the east. Helen Hayes Hospital is to the east of the site and North Rockland Central School District to the south of the site across from Cinder Road.

1.2. PROPOSED CONSTRUCTION

This new Athletic Complex will include athletic fields, playgrounds, pavilions, an indoor multi-purpose athletic facility, parking lots, a field house, a walking path and boardwalk trails, lighting, concession and service buildings, a future multi-use building, and grandstands. To our understanding, the layout of the Complex has not been finalized at this time and the conceptual Complex plan included in the request is likely to change. Structural loads for the Complex have not been provided at this time, however, we anticipate lightly loaded structures based on our experience on similar projects.

1.3. OBJECTIVES

Our objectives were to determine the subsurface conditions at the project site, evaluate these conditions with respect to the proposed construction, and present recommendations regarding:

- Impacts of subsurface conditions on site development;
- Foundation design, including discussion of alternate solutions if applicable, allowable bearing capacity and anticipated total and differential settlement amounts;
- Design frost depths;
- Ground floor slab design;
- Soil Site Classification in accordance with Table 1613.5.2 of the 2015 International Building Code (IBC);
- Ground water conditions and influence on design and construction of proposed development;
- Use of in-situ materials for control fill, including compaction requirements;
- Later Earth Pressure Parameters;
- Removal or treatment of objectionable material; and
- Quality assurance, field-testing and monitoring during construction.

2. FIELD AND LABORATORY WORK

2.1. FIELD WORK

On September 10, 2019, six borings were drilled by Geo-Environmental Drilling, Inc. under the direction and observation of Pennoni at the approximate locations presented on Drawing No. LP-1. The boring locations were selected and established by Pennoni personnel based off the design provided at the time. To support the recently finalized layout nine supplemental test pits were completed on June 11, 2020. Appendix A includes the boring logs, test pit logs, and Drawing No. LP-1. A summary of the infiltration results is provided in Section 3.5 of this report.

Our F. Brinker, PE directed the field work; our N. Disessa and P. Fung monitored the drilling of the borings and excavation the test pits/infiltration testing, respectively.

2.2. LABORATORY WORK

The samples collected during the field study were delivered to our laboratory. Representative soil samples were selected and tested to determine moisture contents and gradation analyses of the subsoils. Laboratory testing results as well as a list of testing procedures are presented in Appendix B.

3. SITE CHARACTERISTICS

3.1. SURFACE FEATURES

The site is currently an undeveloped grass field approximately 276 Acres in size. There are trees to the north, northwest, and east with a few trees in the center of the site. There are two wet areas on the site; one of the wet areas is located to the northwest and the other to the east, both are approximately 17 Acres in size. A small stream runs from the northwest corner to the west edge of the site through the wet area located on the northwest part of the site. The ground surface is relatively flat with a small hill to the south of the site at Elev. 166.6. Ground surface elevations vary from Elev. 166.0 to Elev. 154.0 across the site. There were no utilities observed on site.

3.2. GEOLOGY

The project site is located in the Newark Lowland Section of the Upper Late Triassic era of New York. The topography of this area is characterized by rolling lowlands, isolated hills, and valleys with low to moderate relief. The geologic structure of this section is a half-graben characterized by homoclinal low angle northwest dipping beds.

The project site is underlain by the New York Brunswick Formation. This formation consists of a sandstone and conglomerate and is moderately resistant to weathering, typically moderately weathered to a shallow to moderate depth. Fracturing results in joints having a blocky pattern. Natural inert soils are typically derived from the weathering of the underlying bedrock.

Locally, this site contained Sandstone fragments within our soil samples.

3.3. SUBSOILS

In general, the subsoils consisted of silt and fine to medium to coarse sands of a brown to a reddish-brown color, with trace to some fine/coarse gravel, and gray silt and sand with traces of fine to coarse gravel in a few of the boring locations. The gravel and rock fragments were identified to be a Sandstone. The soils appeared to be moderately dry to moist and firm to dense. All borings and test pits encountered topsoil having varying thickness of approximately 4 to 30 inches. Organic materials were observed at boring location B-5, on the edge of the wet area. A brief description of each strata shown in the boring and test pit logs (Appendix A) is provided on the following page.

<u>Stratum</u>	<u>Description</u>
T	Topsoil and Grass
O	Organic Silt / Silty Sand with Some Organic Matter
1	Brown Fine to Medium to Coarse SAND and SILT, Trace of Fine to Coarse Gravel Sized Rock Fragments (Medium Dense)
2	Red SILT AND Fine Sand, Trace of Fine to Coarse Gravel Size Rock Fragments (Dense)
3	Gray Silt and Fine to Coarse Sand, trace of Fine Gravel Size Rock Fragments (Very Dense)

3.4. GROUND WATER

Observations for ground water were made in each of the borings and test pits shortly after completion. Ground water was encountered in borings B-1, B-3, and B-5 at Elev. 149.0, Elev. 140.0, and Elev. 136.0, respectively. Ground water was encountered in Test Pits TP-1, TP-2, TP-4, TP-5, TP-6, and TP-7 at Elev. 149.0, Elev. 147.5, Elev. 147.5, Elev. 150.6, Elev. 147.6, and Elev. 155.0, respectively. These observations are for the times indicated and might not be indicative of seasonal or daily variations in the ground water levels.

3.5. INFILTRATION TESTING

To evaluate the general feasibility for infiltration two infiltration test were attempted at locations TP-1 and TP-2. Testing was performed in general accordance with the New York State Stormwater Design Manual, Appendix D.

Prior to the infiltration testing, test pits were excavated a minimum of 4 ft below the bottom of the proposed stormwater management basin to identify potential limiting zones, if present, and confirm uniformity of the subsoils.

At location TP-1 a limiting layer consisting of a gray hydraulically restrictive clay was observed beneath the topsoil layer. Underlying the clay layer is a silt containing mottling, followed by layers of clayey silt and sand. Groundwater was observed at Elev. 149.0 approximately 0.5 ft below the proposed basin bottom. Due the limiting zone being within 4 ft of the existing ground surface an infiltration test was not conducted.

At location TP-2 the soils underlying the topsoil consisted primarily of sand. Evidence of limiting zones was **not** observed. Upon completion of the limiting zone evaluation the test pit was extended and raised to the testing elevation, Elev. 151.5. A summary table of our findings is presented on the following page.

Test Pit No.	Infiltration Test No.	Testing Elev. (ft)	Soil Stratum Tested	Depth to Limiting Zone (ft)	Infiltration Rate (in./hr)
TP-1	I-1	NT	-	149.0	-
TP-2	I-2	151.5	3	NE	22

4. ANALYSES AND RECOMMENDATIONS

4.1. SEISMIC SITE CLASS

Our borings and test pits disclosed subsurface conditions generally described per the 2015 International Building Code (IBC) as having a soil-profile corresponding to Site Class D – Dense soil. This is consistent with observations made in the test borings and test pits.

4.2. SITEWORK

Currently there are no proposed finish elevations provided for the construction of the Complex. Cuts and fills are expected for major site building features such as athletic fields, maintenance buildings, parking lots, tennis courts, and the indoor multi-purpose athletic facility. Trees that are in locations of proposed structures will need to be cleared.

4.2.1. EARTHWORK

Cuts and fills are expected to be required for this project. Prior to earthwork operations, the topsoil should be striped and stockpiled. We do not anticipate cuts and fills will be greater than 5 feet.

Any exposed subgrade should be proof rolled in the presence of Pennoni personnel in an attempt to disclose unstable surface areas. During proof-rolling, any unstable area found should be stabilized by excavating and replacing those soils with suitable soil that is adequately compacted. This can be accomplished by properly adjusting the moisture content of the subgrade soils and compacting them, or by other methods (placing a geotextile and stone layer, etc.).

The laboratory test results from this study indicate that the present moisture contents of the near surface fine grained soils vary from 2.6% to 11.8%. These values are at or slightly below the optimum moisture contents normally associated with these soils to achieve the desired degree of compaction. Adjusting the higher moisture contents of the encountered soils in any subgrade preparation should be expected. The fine-grained soils are moisture sensitive; while in a loose, uncompacted state the addition of moisture (precipitation, wetting, etc.) will cause the soil to become difficult to work with. In addition, the soils will most likely be difficult to work with during wet and cold climatic conditions; initiating earthwork during climatic periods not conducive to soil drying should be avoided, if possible. Otherwise incorporating lime/cement stabilization into the schedule and construction costs should be considered.

Imported fill (if required) should be selected from suitable borrow sources and be approved by Pennoni well in advance of fill construction. Granular fill ideally should consist of well-graded material with not more than 15 percent passing the No. 200 sieve and have a plasticity index not greater than 8%; recycled concrete with a gradation similar to that described above with a maximum particle size

of 3 in. can be considered. Other gradations can be considered based on laboratory testing and at the discretion of the Geotechnical Engineer.

Fills using on-site soils or similar soils should be placed in layers not exceeding 8 to 10 in. loose measure. Fills using imported granular soil/aggregate should be placed in layers not exceeding 10 to 12 in. loose measure. These criteria might be adjusted by the geotechnical engineer depending on the conditions present at the time of construction, on the compaction equipment used, and on the fill materials selected. Fills for support of foundations/floor slabs should be compacted to at least 98% of the laboratory maximum dry density determined in accordance with ASTM D 698. Fills for the support of pavements should be compacted to at least 95 percent of the laboratory maximum dry density determined in accordance with ASTM D 698. Load bearing fills should extend a minimum of 5 ft beyond the exterior edge of a loaded area and have side slopes not steeper than 2 horizontal to 1 vertical.

Specifications should indicate that the percentage of maximum dry density attained in the field is not the only criteria to be used for assessing fill compaction. Observation of the behavior of the fill under the loads of construction equipment should also be used. If the test results indicate that the percentage of compaction is being achieved, but the soil mass is moving under the equipment, placement of additional fill should not be continued until the movement is stabilized. Otherwise, settlement of the fill may occur.

4.2.2. ROCK

Refusal of the drilling equipment was encountered at one of the borings, B-1 (Elev. 145.0). Refusal to further drilling is often interpreted as the top of rock. Rock was observed to be a closely fractured sandstone from the samples taken at boring location B-1. A comparison of the bottom elevation of each boring to our estimates of the lowest excavation elevations of the project indicate that rock will not likely impact the proposed site grading or foundation construction.

4.3. FOUNDATIONS

Based on the data disclosed in the borings and test pits from this geotechnical study and our experience, it is our professional opinion the proposed structures can be supported on shallow spread footings bearing on newly placed load-bearing fill or firm/dense native soils.

We recommend that unsuitable soil, if encountered, be removed below new foundations and the floor slab subgrade elevations. The width of the excavation bottom must be equal to the width of the footing plus 1 ft for each 1 ft excavated below the bottom of proposed footing subgrade elevation. The excavation should then be backfilled to the proposed subgrade elevation using suitable on-site soils, or an approved imported processed aggregate in accordance with the compaction recommendations presented herein. Prior to the placement of backfill, all exposed subgrades should be densified with vibratory compaction equipment and the subgrades checked for loose or unstable conditions. Provided these recommendations are followed, the footings can be designed using an allowable net soil bearing capacity up to 3,000 psf.

Continuous and isolated footings should be at least 2 ft wide and 3 ft square, respectively, to prevent localized shear failure in soil. The subgrade of all exterior footings and any other foundation exposed to freezing temperatures, during construction and/or the life of the structure should be established at least 36 in. below adjacent exposed grades or otherwise protected against frost action. Foundation subgrades should be checked by a representative of Pennoni to confirm conditions suitable for support of the design

bearing pressure. Where an area is questionable, it should be further explored and/or remedied by removal and replacement of unsuitable material.

4.4. SETTLEMENT

Settlement of a soil mass is a function of the characteristics of the supporting materials and the stresses imposed on the soils by a structure/foundation. Provided the recommendations presented herein are followed, foundation settlements for building structures are estimated to be 1/2 inch or less. Detrimental post-construction settlements are not expected, if the recommendations presented herein are followed.

4.5. GROUND FLOOR SLAB

The proposed ground floor slabs can be constructed on firm/dense native soils or on newly compacted load bearing fill. A 6 in. thick free-draining granular base course should be placed beneath the floor slabs to provide a uniform bearing surface and to aid in the proper curing of the floor slab concrete. At least 6 in. should be maintained between the bottom of the floor slab and the tops of the foundations to minimize the potential for floor slab cracking at the foundation edges or the slab should be designed accordingly to minimize cracking. The floor slabs should be isolated from other structural elements of the building to allow for independent movements.

4.6. GROUND WATER AND SURFACE WATER MANAGEMENT

The ground water observations made in the borings and test pits indicate that water may be encountered in excavations that reach to depths of 8 to 13 feet, depending on elevation. Depending on grading plan, water may not be encountered in excavations to reach the proposed foundation subgrades and ground floor slab subgrade elevation; however, wet conditions and/or seepage might be encountered depending on the time of the year. Sumps and pumps should be adequate to maintain stable conditions during foundation construction.

The foundation excavations should not be used as a detention basin or sump unless authorized by the Geotechnical Engineer. During construction, surface runoff should be prevented from entering the foundation excavations. Where ponding does occur, the water should be pumped immediately, and grades should then be established to prevent further ponding.

4.7. LATERAL EARTH PRESSURE PARAMETERS

The soil parameters presented below can be used to estimate earth pressures to design below grade walls. If the top of the structure is restrained from movement, thereby preventing the mobilization of active soil pressures, the structure should be designed using the at-rest pressure coefficient.

<i>Parameter</i>	<i>Stratum</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>Imported Aggregate (AASHTO #57) Or Similar</i>
Unit Weight (pcf)	115	115	120	135
Angle of Internal Friction (degrees)	32	35	28	38
Cohesion (psf)	0	0	100	0
Friction Factor	0.6	0.6	0.4	0.5
k_a	0.31	0.31	0.36	0.24
k_o	0.47	0.47	0.53	0.38
k_p	3.25	3.25	2.77	4.20

The earth pressure coefficients assume of vertical walls, horizontal backfill, no surcharges, no wall friction, and a safety factor of 1.0. A clear distance of 10 ft should be maintained during construction, between perimeter walls and stored materials or the wall must be designed to resist the surcharge load from the stored materials. Where sufficient drainage cannot be provided to intercept and re-direct seepage and perched water from structures, hydrostatic pressures must also be considered in the design.

5. RECOMMENDATIONS FOR FURTHER GEOTECHNICAL SERVICES

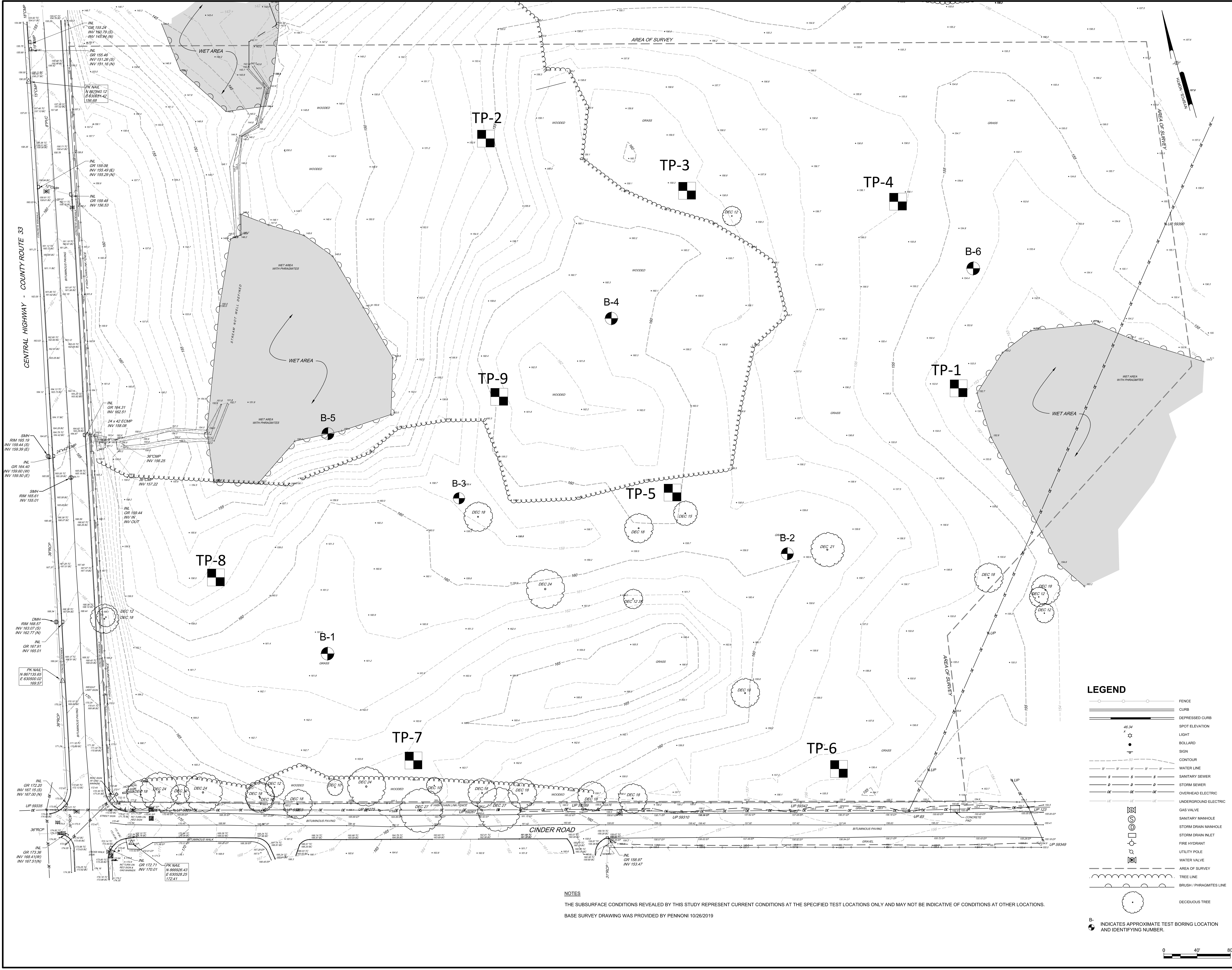
Our experience on numerous construction projects is that the interests of the project team are best served by retaining the Geotechnical Engineer to provide construction observations during earthwork and foundation construction operations. To determine if soils, other materials, and ground water conditions encountered during construction are similar to those encountered in the test borings and test pits, and that they have comparable engineering properties or influences on the design of the structures, we recommend that Pennoni should provide field observation services during excavation; construction of compacted fill; preparation of foundation and floor slabs subgrades; and installation/construction of foundations, and floor slabs. Pennoni's Geotechnical Technology should review specifications for earthwork and foundation design/construction when they are prepared.

6. LIMITATIONS

This work has been done in accordance with our authorized scope of work and in accordance with generally accepted professional practice in the fields of geotechnical and foundation engineering. This warranty is in lieu of all other warranties either expressed or implied. Our conclusions and recommendations are based on the data revealed by this exploration. We are not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications. This report is intended for use with regard to the specific project described herein; any changes in loads, structures, or locations should be brought to our attention so that we may determine how they may affect our conclusions. An attempt has been made to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, we should be notified so that modifications to this report can be made, if necessary. If we do not review relevant construction documents and witness the relevant construction operations, then we cannot be responsible for any problems that may result from misinterpretation or misunderstanding of this report or failure to comply with our recommendations.

APPENDICES

APPENDIX A - Field Data



NOTES

THE SUBSURFACE CONDITIONS REVEALED BY THIS STUDY REPRESENT CURRENT CONDITIONS AT THE SPECIFIED TEST LOCATIONS ONLY AND MAY NOT BE INDICATIVE OF CONDITIONS AT OTHER LOCATIONS.

BASE SURVEY DRAWING WAS PROVIDED BY PENNONI 10/26/2019

LEGEND

- FENCE
- CURB
- DEPRESSED CURB
- SPOT ELEVATION
- LIGHT
- BOLLARD
- SIGN
- CONTOUR
- WATER LINE
- SANITARY SEWER
- STORM SEWER
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC
- GAS VALVE
- SANITARY MANHOLE
- STORM DRAIN MANHOLE
- STORM DRAIN INLET
- FIRE HYDRANT
- UTILITY POLE
- WATER VALVE
- AREA OF SURVEY
- TREE LINE
- BRUSH / PHRAGMITES LINE
- DECIDUOUS TREE

B- INDICATES APPROXIMATE TEST BORING LOCATION AND IDENTIFYING NUMBER.

0 40' 80'

PENNONI ENGINEERING & SURVEYING
NEW YORK, P.C.
31 W. 34th Street, 8th Floor, #8038
New York, NY 10001
T 212.237.7600 F 212.465.1730

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR AND OWNER MUST BE NOTIFIED OF ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK.

HAVERSTRAW - ATHLETIC COMPLEX
CENTRAL HIGHWAY AND CINDER ROAD
VILLAGE OF WEST HAVERSTRAW, ROCKLAND CO., NY

BORING/TEST PIT LOCATION PLAN

SUBURBAN CONSULTING ENGINEERS, INC.
2430 US HIGHWAY 32 BUILDING A
WALL N.J. 07726

MM	BY	REVISIONS	DATE
07/02/20			

PROJECT: SUBCE 19004

DATE: 2019 10 09

DRAWING SCALE: 1"= 40'

DRAWN BY: EGB

APPROVED BY: FAB

LP-1

SHEET 1 OF 1

ALL DOCUMENTS PREPARED BY PENNONI ASSOCIATES ARE INSTRUMENTS OF SERVICE IN RESPECT OF THE PROJECT. THEY ARE NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE BY OWNER OR OTHERS ON OR EXTENSION OF THE PROJECT OR ON ANY OTHER PROJECT. ANY REUSE WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY PENNONI ASSOCIATES FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT OWNERS SOLE RISK AND WITHOUT LIABILITY OR LOSS. EXPOSURE TO PENNONI ASSOCIATES AND OWNER SHALL INDEMNIFY AND HOLD HARMLESS PENNONI ASSOCIATES FROM ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING OUT OF OR RESULTING THEREFROM.



TEST BORING LOG

TEST BORING B-1

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLC PROJECT NAME Haverstraw - Athletic Complex
PROJECT NUMBER SUBCE19004 PROJECT LOCATION West Haverstraw, NY
DATE STARTED 9/10/19 COMPLETED 9/10/19 GROUND ELEVATION 162.0'
DRILLING CONTRACTOR Geo-Environmental Drilling, Inc. WATER ENCOUNTERED:
DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem Augers ☒ DURING DRILLING 13.0' / Elev 149.0'
DRILLER / HELPER Mario AT END OF DRILLING ---
LOGGED BY N. Di Sessa CHECKED BY F. Brinker AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0						Depth	Elev.
	☒ 1	10	3-5-6-7		T	0.2' Topsoil	161.8'
	☒ 2	10	9-9-10-11			Brown F/M/C SAND, some F/C Gravel sized rock, trace Silt	
5	☒ 3	12	19-15-10-11				
	☒ 4	10	8-9-7-3		1		
10	☒ 5	22	5-9-9-7				
	☒ 6	19	1-2-2-2			13.0	149.0
15					2	Red SILT and F/M SAND	Water at 13'
	☒ 7	0	50/0			17.0	145.0
Borehole terminated at 17.0 feet.							
Drilling refusal							

NOTES:



TEST BORING LOG

TEST BORING B-2

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Haverstraw - Athletic ComplexPROJECT NUMBER SUBCE19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 9/10/19COMPLETED 9/10/19GROUND ELEVATION 160.0'DRILLING CONTRACTOR Geo-Environmental Drilling, Inc.

WATER ENCOUNTERED:

DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem AugersDURING DRILLING ---DRILLER / HELPER MarioAT END OF DRILLING ---LOGGED BY N. Di SessaCHECKED BY F. BrinkerAFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER		RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0							Depth _____ Elev. _____	
5		1	12	5-5-3-5		1	0.2 Topsoil 159.8	Damp Perched water 6'-8' Sample moist
		2	12	6-7-5-3			Brown SILT and F/C SAND, some F/C Gravel Sized Rock	
		3	22	9-9-9-7				
		4	20	2-2-5-9				
		5	20	8-10-11-10				
15							13.0 147.0	Wet spoon (sample dry) Very stiff
		6	21	12-15-18-19	3	Gray SILT, some Fine Sand, trace Fine Gravel		
20		7	18	10-8-14-33			20.0 140.0	

Borehole terminated at 20.0 feet.

NOTES:



TEST BORING LOG

TEST BORING B-3

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Haverstraw - Athletic ComplexPROJECT NUMBER SUBCE19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 9/10/19COMPLETED 9/10/19GROUND ELEVATION 159.0'DRILLING CONTRACTOR Geo-Environmental Drilling, Inc.

WATER ENCOUNTERED:

DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem Augers ☒ DURING DRILLING 19.0' / Elev 140.0'DRILLER / HELPER MarioAT END OF DRILLING ---LOGGED BY N. Di SessaCHECKED BY F. BrinkerAFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0						Depth _____ Elev. _____	
	☒ 1	6	3-4-3-5		T	0.2' Topsoil	
	☒ 2	8	5-4-4-8			Brown M/F/C SAND, some Silt, little Fine Gravel	
5	☒ 3	14	10-10-7-9		1		
	☒ 4	18	8-5-6-6				Some moisture in tip
10	☒ 5	14	8-5-6-24				Perched water 9.5'-10'
	☒ 6	20	5-6-9-10			13.0 Red Fine SAND AND SILT, trace Fine Gravel	
15							Dry
	☒ 7	20	51-26-25-25		2		
	☒ 8	20	12-14-15-19				+some Fine Gravel
20						21.0	Water at 19'

Borehole terminated at 21.0 feet.

NOTES:



TEST BORING LOG

TEST BORING B-4

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLC PROJECT NAME Haverstraw - Athletic Complex
PROJECT NUMBER SUBCE19004 PROJECT LOCATION West Haverstraw, NY
DATE STARTED 9/10/19 COMPLETED 9/10/19 GROUND ELEVATION 161.0'
DRILLING CONTRACTOR Geo-Environmental Drilling, Inc. WATER ENCOUNTERED: _____
DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem Augers DURING DRILLING ---
DRILLER / HELPER Mario AT END OF DRILLING ---
LOGGED BY N. Di Sessa CHECKED BY F. Brinker AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0						Depth Elev.	
	1	18	4-5-9-10		T	0.2 Topsoil 160.8	Powdery
	2	16	15-15-27-20			Brown SILT AND F/M SAND, little F/C Gravel	
5	3	22	14-14-14-14		1		Dry and loose
	4	20	15-15-17-16			8.0 153.0	+trace Fine Gravel
10	5	16	10-10-17-13			Red Fine SAND and SILT, trace F/C Gravel	
					2		
	6	0	60/0			13.0 148.0	Spoon refusal (60/0) at 13'

Borehole terminated at 13.0 feet.

NOTES:



TEST BORING LOG

TEST BORING B-5

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLC PROJECT NAME Haverstraw - Athletic Complex
PROJECT NUMBER SUBCE19004 PROJECT LOCATION West Haverstraw, NY
DATE STARTED 9/10/19 COMPLETED 9/10/19 GROUND ELEVATION 149.0'
DRILLING CONTRACTOR Geo-Environmental Drilling, Inc. WATER ENCOUNTERED:
DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem Augers ☒ DURING DRILLING 13.0' / Elev 136.0'
DRILLER / HELPER Mario AT END OF DRILLING ---
LOGGED BY N. Di Sessa CHECKED BY F. Brinker AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0						Depth Elev.	
	☒ 1	6	1-1-1-1		T	0.5 Topsoil 148.5	
	☒ 2	14	4-2-10-12		O	3.0 Black organic SILT 146.0	
5	☒ 3	24	11-13-13-15			Gray M/F/C SAND, some F/C Gravel	All wet
	☒ 4	14	6-4-2-2				
10	☒ 5	4	8-5-4-3				
					3		
	☒ 6	5	7-7-7-9				Fines may have been washed out
15							
	☒ 7	24	20-22-21-21		2	19.0 130.0 20.0 Red Fine SAND and SILT 129.0	
20							

Borehole terminated at 20.0 feet.

NOTES:



TEST BORING LOG

TEST BORING B-6

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLC PROJECT NAME Haverstraw - Athletic Complex
PROJECT NUMBER SUBCE19004 PROJECT LOCATION West Haverstraw, NY
DATE STARTED 9/10/19 COMPLETED 9/10/19 GROUND ELEVATION 154.5'
DRILLING CONTRACTOR Geo-Environmental Drilling, Inc. WATER ENCOUNTERED:
DRILLING METHOD Soil Mech Continuous Split Spoon/ Solid Stem Augers DURING DRILLING ---
DRILLER / HELPER Mario AT END OF DRILLING ---
LOGGED BY N. Di Sessa CHECKED BY F. Brinker AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in.)	BLOW COUNTS	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0						Depth	Elev.
	1	20	3-4-7-9		T	0.5 Topsoil	154.0
	2	20	5-9-6-6		1	Brown Fine SAND and SILT, trace Coarse Gravel	
5	3	2	3-5-3-3			6.0	148.5
	4	24	1-3-8-13			Red Fine SAND and SILT, trace F/c Gravel Sized Rock	
10	5	24	10-12-20-15				
					2		
	6	22	17-24-35-33				
15	7	14	23-15-31-50/5			17.0	137.5
Borehole terminated at 17.0 feet.							Refusal at 17'

NOTES:



TEST PIT LOG

Test Pit TP-1

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 153.5'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe▽ DURING EXCAVATION 4.5' / Elev 149.0'

OPERATOR / HELPER _____

▼ AT END OF EXCAVATION 6.0' / Elev 147.5'LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Top Soil	
			C	Gray CLAY	152.5
			1	Tan SILT	151.5
			2	Reddish-Brown CLAYEY SILT	149.5
5			1	Brown to L. Brown CLAYEY SILT and SAND	147.5
10				10.0	143.5

Test Pit terminated at 10.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-2

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 155.5'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe▽ DURING EXCAVATION 8.0' / Elev 147.5'

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Topsoil	
				1.0	154.5
				Tan CLAYEY SAND, some gravel	
				2.0	153.5
				Light Brown to Brown SAND and SILT, little gravel	
5			1		
▽					
				9.0	146.5

Test Pit terminated at 9.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-3

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 159.3'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe

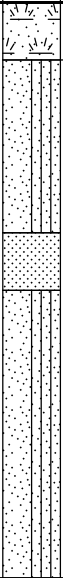
DURING EXCAVATION _____

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Topsoil	
				1.0	158.3
				Light Brown SAND and SILT	
				4.0	155.3
5				Brown to gray SILT	
				5.0	154.3
			1	Brown SAND and SILT	
10				10.0	149.3

Test Pit terminated at 10.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-4

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 156.5'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe▽ DURING EXCAVATION 9.0' / Elev 147.5'

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Topsoil	
				1.0	155.5
				Light Brown/Tan CLAYEY SILT	
				2.5	154.0
				Brown SAND and SILT	
5			1		
10				10.0	146.5

Test Pit terminated at 10.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-5

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 159.6'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe▽ DURING EXCAVATION 9.0' / Elev 150.6'

OPERATOR / HELPER _____

▼ AT END OF EXCAVATION 10.0' / Elev 149.6'LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Topsoil	
				2.0	157.6
				Light Brown SAND and SILT	
				4.0	155.6
5				Brown SAND, little silt, little gravel	
			1	6.0	153.6
				Grayish-brown CLAYEY SAND, some gravel	
				7.5	152.1
				Grayish-Brown SAND, some gravel	
10 ▼				10.0	149.6

Test Pit terminated at 10.0 feet.

NOTES:

NOTES:



TEST PIT LOG

Test Pit TP-7

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 165.0'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

▽ DURING EXCAVATION 10.0' / Elev 155.0'EXCAVATION METHOD Rubber Tire Backhoe

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth _____ Elev. _____	
			T	Topsoil	
				2.0 _____ 163.0	
				Brown to reddish brown SAND and SILT, trace gravel	
5			2		
				7.0 _____ 158.0	
				Reddish-Brown GRAVELLY SAND	
10 ▽				10.0 _____ 155.0	

Test Pit terminated at 10.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-8

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 158.0'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe

DURING EXCAVATION _____

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth	Elev.
			T	Topsoil	
				1.5	156.5
5			3	Brown to gray SAND and SILT, some gravel	
				8.0	150.0
10				Gray GRAVELY SAND	
				10.0	148.0

Test Pit terminated at 10.0 feet.

NOTES:



TEST PIT LOG

Test Pit TP-9

PAGE 1 OF 1

CLIENT Suburban Consulting Engineers LLCPROJECT NAME Helen Hayes ParkPROJECT NUMBER SUBCE 19004PROJECT LOCATION West Haverstraw, NYDATE STARTED 6/11/20COMPLETED 6/11/20GROUND ELEVATION 160.4'EXCAVATION CONTRACTOR N/A

WATER ENCOUNTERED:

EXCAVATION METHOD Rubber Tire Backhoe

DURING EXCAVATION _____

OPERATOR / HELPER _____

AT END OF EXCAVATION _____

LOGGED BY P. FungCHECKED BY M. Morykin

AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0				Depth _____ Elev. _____	
			T	Topsoil	
			1	Tan SAND and SILT	
			2	Red CLAYEY SILT	
				Tan to brown GRAVELY SAND and SILT	
5			1		
					
					
					
					
					
					
					
					
10				10.0	150.4

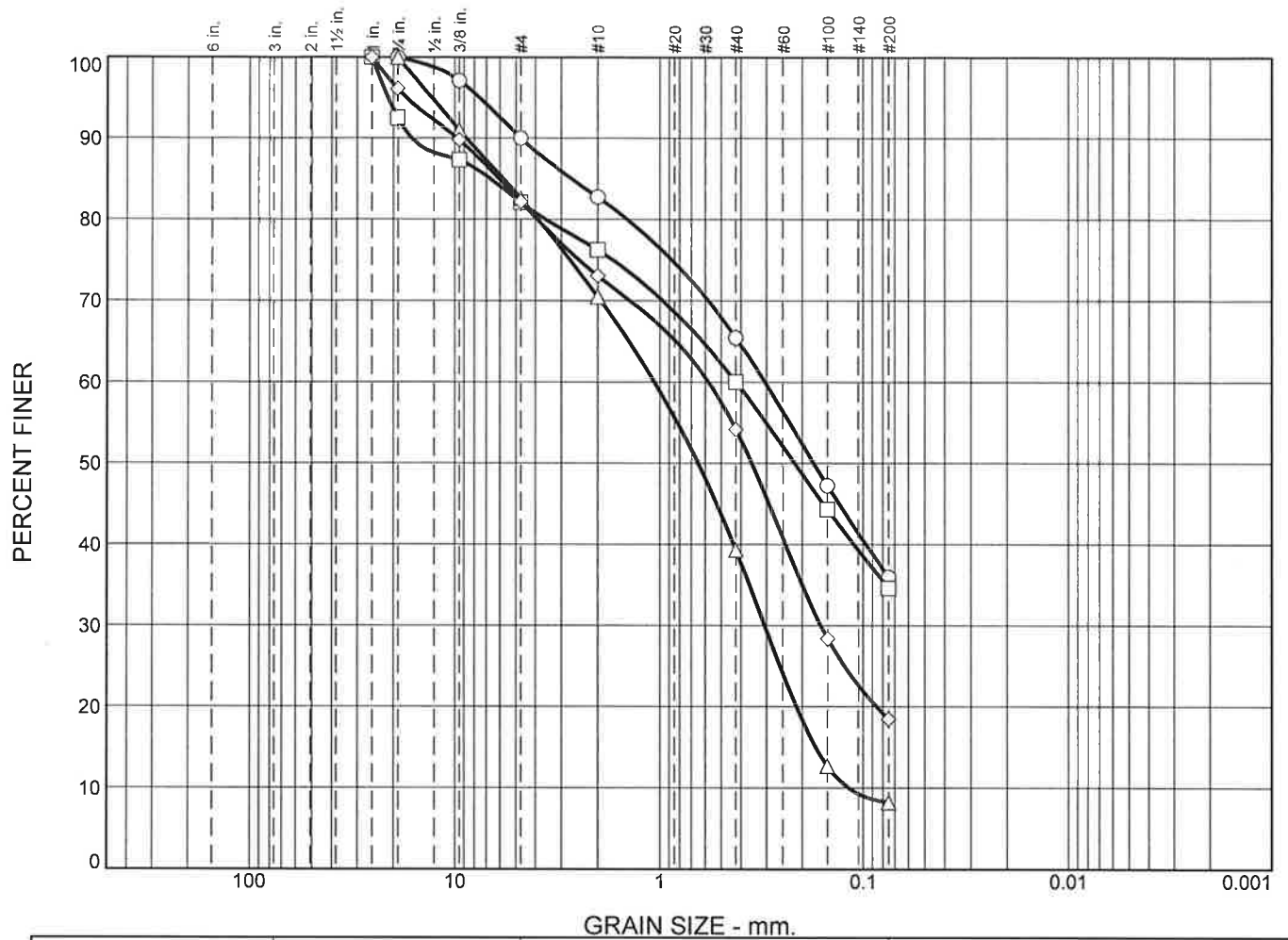
Test Pit terminated at 10.0 feet.

NOTES:

APPENDIX B - Laboratory Data

[illegible]

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	10.0	7.2	17.3	29.5	36.0	
□	0.0	7.5	10.4	5.9	16.2	25.4	34.6	
△	0.0	0.0	17.4	12.1	31.2	31.1	8.2	
◇	0.0	3.9	13.9	9.1	18.9	35.8	18.4	

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-2	S-2	2-4	F/M/C SAND & SILT, LITTLE FINE GRAVEL	
□	B-2	S-1	0-2	F/M/C SAND, SOME SILT, LITTLE F/C GRAVEL	
△	B-3	S-2	2-4	M/F/C SAND, LITTLE FINE GRAVEL, TRACE SILT	
◇	B-4	S-2	2-4	F/M/C SAND, LITTLE SILT, LITTLE F/C GRAVEL	

PENNONI ASSOCIATES INC.

Bethlehem, PA

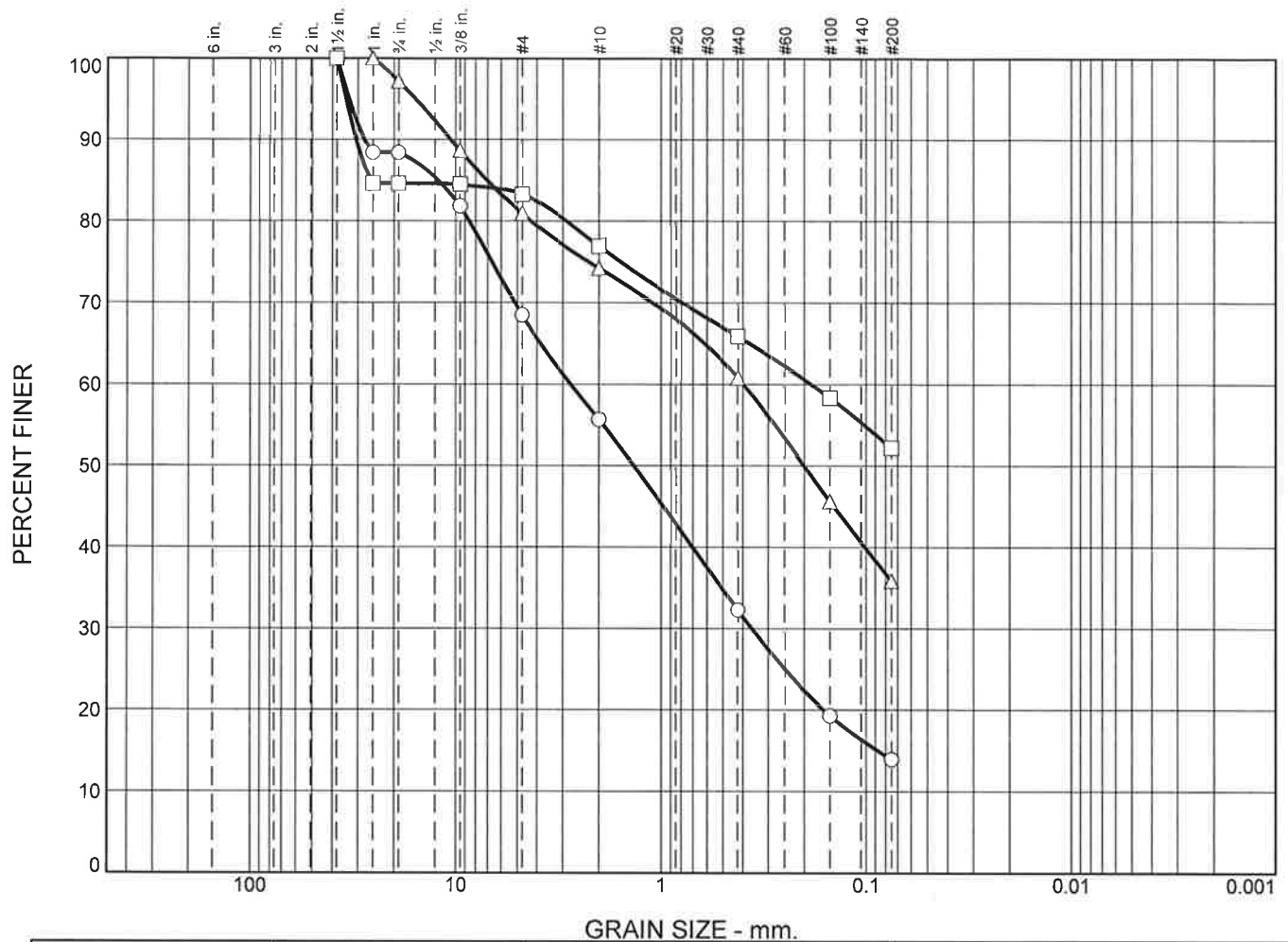
Client: SUBURBAN CONSULTING ENGINEERS, INC.

Project: HAVERSTRAW - ATHLETIC COMPLEX - GEOTECHNICAL

Project No.: SUBCE 19004

Figure S-1

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	11.6	19.9	12.8	23.4	18.3	14.0	
□	0.0	15.4	1.3	6.4	11.1	13.6	52.2	
△	0.0	2.8	16.3	6.7	13.4	24.9	35.9	

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-5	S-3	4-6	M/F/C SAND, SOME F/C GRAVEL, LITTLE SILT	
□	B-5	S-1	0-2	SILT, SOME F/M/C SAND, LITTLE COARSE GRAVEL	
△	B-6	S-2	2-4	F/M/C SAND & SILT, LITTLE FINE GRAVEL	

PENNONI ASSOCIATES INC.

Bethlehem, PA

Client: SUBURBAN CONSULTING ENGINEERS, INC.

Project: HAVERSTRAW - ATHLETIC COMPLEX - GEOTECHNICAL

Project No.: SUBCE 19004

Figure S-2

LABORATORY TESTING PROCEDURES

All testing is either done in accordance with the indicated ASTM Designation-latest edition, or with other standard or generally accepted engineering practice as described:

1. Consolidation Test of Soils
Preparation of samples and testing procedures generally follow the methods described in Lambe, op. Cit. In addition, the time of loading may be selected on the basis of:
 - a. Controlled rate of percent of consolidation
 - b. Controlled pore pressure gradient
 - c. Controlled strain

The method of test is selected to suit the soil type in question and the test is conducted in accordance with generally accepted engineering practice.
2. Atterberg Limits – Plasticity Indices
 - a. Liquid limit of soils, ASTM D 4318
 - b. Plastic limit and plasticity index of soils, ASTM D 4318
 - c. Shrinkage factors of soils, ASTM D 427

(Moisture content is also determined with the Atterberg Limit test, and liquidity index is also computed)
3. Moisture Content of Soil
ASTM D 2216
4. Particle Size Analysis of Soils
ASTM D 421, Dry preparation of soil samples;
ASTM D 422, Sieve and/or hydrometer analysis.
5. Triaxial Compression Test of Soils
Sample preparation, apparatus, and testing generally follow the procedures outlined in Soil Testing for Engineers, T.W. Lambe, John Wiley & Sons, Inc., New York, 1951 and in The Measurement of Soil Properties in the Triaxial Test, Alan W. Bishop & D.J. Henkel, 2nd Edition, St. Martin's Press, New York, 1962
6. Unconfined Compression Strength of Cohesive Soil
ASTM D 2166
7. Specific Gravity of Soils
ASTM D 854
8. Unit Weight Determination of Soils
See ASTM D 2166 for preparation of specimen except that sample size may differ. For moisture content see ASTM D 2216.
9. Visual Identification of Soil Samples
All soil samples are visually identified and/or classified. The classification system used is shown in Table L-1.
10. Identification of Rock
Rock core samples are identified by the character and appearance of newly fractured surfaces of unweathered pieces, by core conditions and characteristics, and by the determination of simple physical and chemical properties.
11. Compaction Test of Soils
 - a. Moisture-density relations of soils using 5.5 lb. hammer and 12 in. drop, ASTM D 698
 - b. Moisture-density relations of soils using 10 lb. hammer and 18 in. drop, ASTM D 1557
12. Maximum and Minimum Densities of Granular Soils
Testing procedures follow D.M. Burmeister, "Suggested Method of Test for Maximum and Minimum Densities of Granular Soils" cited in Proceedings for Testing Soils, Fourth Edition, ASTM, Philadelphia. 1964, pp 175-177.
13. Bearing Ratio of Laboratory Compacted Soils
ASTM D 1883 (Sometimes called California Bearing Ratio or CBR)
14. Organic Content
A modified dichromate oxidation method using ferrous ammonium sulfate is employed in determining the percent of organic matter in soil.

APPENDIX C – Important Information about this Geotechnical Engineering Report

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.*

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2015 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, or its contents, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document as a complement to or as an element of a geotechnical-engineering report. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent or intentional (fraudulent) misrepresentation.