ECS Southeast, LLP

Preliminary Geotechnical Engineering Report
Brown Site

Cleveland, Rowan County, North Carolina

ECS Project Number 08:14146

May 11, 2020

ECS SOUTHEAST, LLP

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SC Registered Engineering Firm 3239

May 11, 2020

Mr. Scott Shelton
Salisbury-Rowan Economic Development Commission
204 East Innes Street
Salisbury, North Carolina 28144

Reference: Preliminary Geotechnical Engineering Report
Brown Site
Cleveland, Rowan County, North Carolina

ECS Project No. 08:14146

Dear Mr. Shelton:

ECS Southeast, LLP (ECS) has completed the preliminary subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our proposal (ECS Proposal No. 08:24615P through 24619P) dated March 31, 2020. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration conducted, and our preliminary geotechnical recommendations regarding general site development.

It has been our pleasure to be of service to you during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase and construction phase operations as well to confirm the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report or if we can be of further assistance to you, please contact us.

Respectfully submitted,

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EXECUTIVE SUMMARY

This report contains the results of our preliminary subsurface exploration and geotechnical engineering analysis for the proposed Brown Site Project located in Cleveland, Rowan County, North Carolina. The proposed construction may include an industrial development.

The results of our exploration and preliminary geotechnical recommendations are summarized as follows:

- The subsurface conditions disclosed by the borings typically consisted of surficial organic laden soils underlain by residual soils to the boring termination depths.
    - The residual soils typically consisted of Sandy SILT (ML), Elastic SILT (MH), Sandy CLAY (CL), Fat CLAY (CH), and Silty SAND (SM). Each of the borings was terminated in residual soils at depths ranging from approximately 22.5 to 25 feet below the existing ground surface.
    - Boring B-3 was terminated upon auger refusal (i.e. possible rock) at a depth of approximately 22.5 feet below existing grade.
- Moisture sensitive soils (MH and/or CH soils) were encountered at each boring location and extended to depths ranging from approximately 3 to 12 feet below existing grade. MH soils with a Plasticity Index (PI) of 30 or greater and CH soils should not be used for direct support of project foundations, slabs-on-grade, or pavements. Based on the subsurface conditions encountered during this preliminary exploration and depending on final site grades, the site may require undercutting of high plasticity, moisture sensitive soils or selective filling to prepare the site for direct support of project slabs, foundations, and pavements. A separation of 2 feet between foundations and subgrade elevations in slab and pavement areas is recommended.
- At this time, a preliminary design bearing capacity of 2,000 to 3,000 psf for conventional shallow foundations bearing on low plasticity residual soils or newly placed Structural Fill soils appears feasible.

Specific information regarding the subsurface exploration procedures, the site and subsurface conditions at the time of our exploration, and our conclusions and preliminary recommendations concerning the geotechnical design and construction aspects of the project are discussed in detail in the subsequent sections of this report. Please note this Executive Summary is an important part of this report but should be considered a “summary” only. The subsequent sections of this report constitute our findings, conclusions, and preliminary recommendations in their entirety. Furthermore, ECS should review our findings and preliminary recommendations in their entirety once the final project criteria have been established.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study is to provide preliminary geotechnical information for the feasibility of the anticipated industrial development in Cleveland, Rowan County, North Carolina.

The preliminary recommendations developed for this report are based on project information supplied by Salisbury-Rowan Economic Development Commission. This preliminary report contains the results of our subsurface exploration, site characterization, engineering analyses, and preliminary geotechnical recommendations for the anticipated development.

1.2 SCOPE OF SERVICES

Five (5) widely spaced soil test borings (Borings B-1 through B-5) were performed at locations selected by ECS. This report discusses our exploratory procedures, presents our findings and evaluations and includes the following.

- Information on site conditions including surface geologic information and special site features;
- Description of the field exploration and laboratory tests performed;
- Final logs of the soil borings and records of the field exploration and laboratory tests including a Boring Location Diagram and Site Location Diagram;
- Measurement of the surficial organic laden soils and approximate grade elevation for the top of borings;
- Preliminary geotechnical recommendations regarding site suitability for proposed development;
- Evaluation of the on-site soil characteristics encountered in the soil borings. Specifically, we discuss the suitability of the on-site materials for reuse as Structural Fill to support ground slabs and pavements.

1.3 AUTHORIZATION

Our services were provided in general accordance with ECS Proposal No. 08:24615P through 24618P dated March 31, 2020 as authorized by Mr. Scott Shelton and includes the Terms and Conditions outlined within the agreement.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The subject property is located southwest of the intersection of Statesville Boulevard and Amity Hill Road in Cleveland, Rowan County, North Carolina. The approximately 110.5 acre site is identified as Rowan County Parcel Identification Numbers (PINs) 265 004, 265 018, 265 021, 265 023, and 265 027. The site location can be found in the figure below and on the Site Location Diagram in Appendix A.

Figure 2.1.1 Site Vicinity Map

2.2 PAST SITE HISTORY/USES AND CURRENT SITE CONDITIONS

Based on Google Earth historical imagery, it appears that the majority of the site was used as farmland since at least 1993. An abandoned single-family residence and a barn/storage structure are located in the central portion of the site. A pond area is located in the northern portion of the site. There is also a low-lying area and various drainage features located in the southwest portion of the site. The previous use discussion is not considered a comprehensive or in-depth review of the site history, rather a quick overview of available aerial imagery.

2.3 PROPOSED CONSTRUCTION

Based on the information provided, the site layout and design are currently in the preliminary planning phase which may consist of industrial structures with associated paved parking and drive areas. No additional information has been provided to ECS at this time.

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field data to assist in the determination of preliminary geotechnical recommendations.

3.1.1 Test Borings

The subsurface conditions were explored by drilling a total of five (5) widely spaced soil test borings across the site. A Diedrich-25 ATV-mounted drill was utilized to drill the soil test borings. Each boring was advanced to depths ranging from approximately 22.5 to 25 feet below the current ground surface.

Boring locations were identified in the field by ECS personnel using handheld GPS technology and existing landmarks as reference prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. It should be noted that the site access was limited due to active agricultural activities throughout the site. Ground surface elevations noted on our boring logs were estimated from Rowan County GIS and should be considered approximate.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistance (N-value) was obtained for each sample and listed as blows per foot (bpf), which provides a general indication of soil density or consistency from which various soil parameters can be correlated.

3.2 REGIONAL/SITE GEOLOGY

The site is located in the Piedmont Physiographic Province of North Carolina. The native soils in the Piedmont Province consist mainly of residuum with underlying saprolites weathered from the parent bedrock, which can be found in both weathered and unweathered states. Although the surficial materials normally retain the structure of the original parent bedrock, they typically have a much lower density and exhibit strengths and other engineering properties typical of soil. In a mature weathering profile of the Piedmont Province, the soils are generally found to be finer grained at the surface where more extensive weathering has occurred. The particle size of the soils generally becomes more granular with increasing depth and gradually changes first to weathered and finally to unweathered parent bedrock. The mineral composition of the parent rock and the environment in which weathering occurs largely control the resulting soil's engineering characteristics. The residual soils are the product of the weathering of the parent bedrock.

3.3 SUBSURFACE CHARACTERIZATION

The following table provides generalized characterizations of the soil strata encountered during our subsurface exploration. For subsurface information at a specific location, refer to the Boring Logs presented in Appendix B.

Table 3.3.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Stratum	Description	Ranges of SPT(1) N-values (bpf)
0 to 0.2	N/A	Surficial organic laden soil.(2)	N/A
0.2 to 25	I	RESIDUAL – Sandy SILT (ML), Elastic SILT (MH), Sandy CLAY (CL), Fat CLAY (CH) and Silty SAND (SM)(3)	6 to 34

Notes: (1) Standard Penetration Test in blows per foot (bpf).
(2) Surficial materials were reported by the driller and therefore should not be used in surficial material removal takeoffs. The site has been cultivated/farmed; therefore, surficial organic laden soils may extend to depths of 12 to 18 inches, or deeper, depending on agricultural methods utilized.
(3) Auger refusal (i.e. possible rock) was encountered at Boring B-3 at a depth of approximately 22.5 feet below existing grade.

3.4 GROUNDWATER OBSERVATIONS

Groundwater measurements were attempted at the termination of drilling and prior to demobilization from the site. Groundwater was not encountered in the borings at the time of drilling. Cave-in depths were measured at the boring locations with cave-in depths ranging from approximately 19 to 21.5 feet below existing grades. Cave-in of a soil test boring can be caused by groundwater hydrostatic pressure, weak soil layers, and/or drilling activities (i.e. drilling fluid circulation or advancement of bit).

Fluctuations in the groundwater elevation should be expected depending on precipitation, run-off, utility leaks, and other factors not evident at the time of our exploration. Additionally, an existing pond, low-lying (possible wetland) areas, and various drainage features exist within portions of the site; shallower ground water conditions may exist in the vicinity of these features. Normally, highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall. Depending on time of construction, groundwater may be encountered at shallower depths and locations not explored during this study. If encountered during construction, engineering personnel from our office should be notified immediately.

4.0 LABORATORY SERVICES

The laboratory testing performed for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program. Classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System (USCS) and to quantify and correlate engineering properties.

4.1 SOIL CLASSIFICATION

A geotechnical staff professional visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System and ASTM D2488 (Description and Identification of Soils-Visual/Manual Procedures). After classification, the various soil types were grouped into the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses followed by the soil descriptions on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

4.2 LABORATORY TESTING

In addition to visual classification, ECS performed four (4) natural moisture content tests and two (2) Atterberg limits tests on selected soil samples obtained from within the borings. The natural moisture content was obtained in accordance with ASTM D2216. Atterberg limits tests were performed to determine the liquid and plastic limits of the sample in accordance with ASTM D4318. The results of the laboratory testing are presented on the respective Boring Logs in Appendix B and are summarized in Appendix C.

5.0 PRELIMINARY SITE CONSTRUCTION RECCOMENDATIONS

5.1 FOUNDATIONS AND FLOOR SLABS

Depending on the structure types, finished grades, and relative subsurface profile at the final structure locations, conventional shallow foundations appear feasible for support of the anticipated structures with maximum column loads on the order of 100 to 250 kips. At this time, a preliminary design bearing capacity on the order of 2,000 to 3,000 psf for conventional shallow foundations bearing on low plasticity residual soils or newly placed Structural Fill soils appears feasible. Please note that the provided preliminary bearing capacities may vary once the structure type, finished grades, and locations are finalized.

Concrete slabs-on-grade can be adequately supported on undisturbed residual soils or new properly placed Structural Fill provided the site preparation and fill recommendations outlined herein are implemented.

Moisture sensitive soils (MH and/or CH) were encountered at each boring location. Depending on the final foundation and slab-on-grade elevations, moisture sensitive soils may be present at the design footing and subgrade elevations. Moisture sensitive soils encountered within proposed structural areas should be undercut and replaced with low plasticity Structural Fill to a minimum depth of 2 feet below foundations and final slab-on-grade subgrade elevations.

Further discussions with the design team are recommended. More specific bearing pressure, settlement, floor slab, and any potential groundwater recommendations can be provided once loading information, finished grades, and bearing elevations of the proposed structures are known and additional field testing has been performed.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 Moisture Sensitive Soils

Moisture sensitive soils (MH and/or CH) were encountered at each boring location at depths ranging from approximately 3 to 12 feet below existing grade. Moisture sensitive, high plasticity soils are those soil materials classified as Elastic SILT (MH) with a PI greater than 30 and Fat CLAY (CH).

MH soils (PI > 30) and CH soils should not be used for direct support of project foundations, slabs-on-grade, or pavements. MH soils (PI > 30) or CH soils encountered within proposed structural areas during mass grading operations should be undercut and replaced with low plasticity Structural Fill to a minimum depth of 2 feet below foundations and subgrade elevations in slab and pavement areas. Upon completion of the undercut, the resulting subgrade soils should be evaluated for stability prior to placement of Structural Fill. Due to the widely spaced soil borings and limited laboratory testing, the extents of the moisture sensitive soils is not well defined at the time of this preliminary report. ECS recommends that additional soil borings and laboratory testing be performed during the design phase of the project to more accurately define the horizontal and vertical limits of moisture sensitive soils.

Structural Fill: High plasticity soils (MH and CH) do not satisfy the specification criteria for satisfactory materials. Given the presence of moisture sensitive soils on this site, and to reduce the amount of import material to the site, the Owner can consider allowing soils with a maximum Liquid Limit of 65 and maximum Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas.

5.2.2 Below Grade Excavation

We anticipate a majority of the near-surface subgrade soils at the site can be excavated with backhoes, front-end loaders, scrapers, or other similar equipment using conventional means and methods. Information regarding the depth of the planned foundations and utilities was not provided at the time of this report. Auger refusal (i.e. possible rock) was encountered at Boring B-3 at a depth of approximately 22.5 feet below existing grade. ECS recommends additional subsurface exploration to further evaluate the excavation characteristics of the subgrade soils within planned cut areas.

The weathering process in the Piedmont geology can be erratic and significant variations of the depths of the more dense materials can occur in relatively short distances. In some cases, isolated boulder or think rock seams may be presented in the soil matrix.

5.2.3 Dewatering Considerations

Based on provided site information, the potential for groundwater and perched water conditions can occur in the vicinity of existing pond and low lying (wet) areas; therefore, temporary dewatering may be necessary during construction. If encountered during construction activities, water and/or groundwater should be lowered and continuously maintained at a minimum depth of 2 feet below the working elevations to permit subgrade preparation and utility installation. If required, the temporary dewatering system should be installed and operation prior to excavation beneath the water table. Additional subsurface exploration including test borings, piezometer installation and/or seasonal high water table determinations should be performed to further explore groundwater conditions within the site.

5.3 GENERAL CONSTRUCTIONS CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas provided it meets project specifications and is free of soil contamination.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The Contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The Contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Erosion Control: The surface soils may be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. Erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

6.0 CLOSING

ECS has prepared this report of findings, evaluations, and preliminary recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

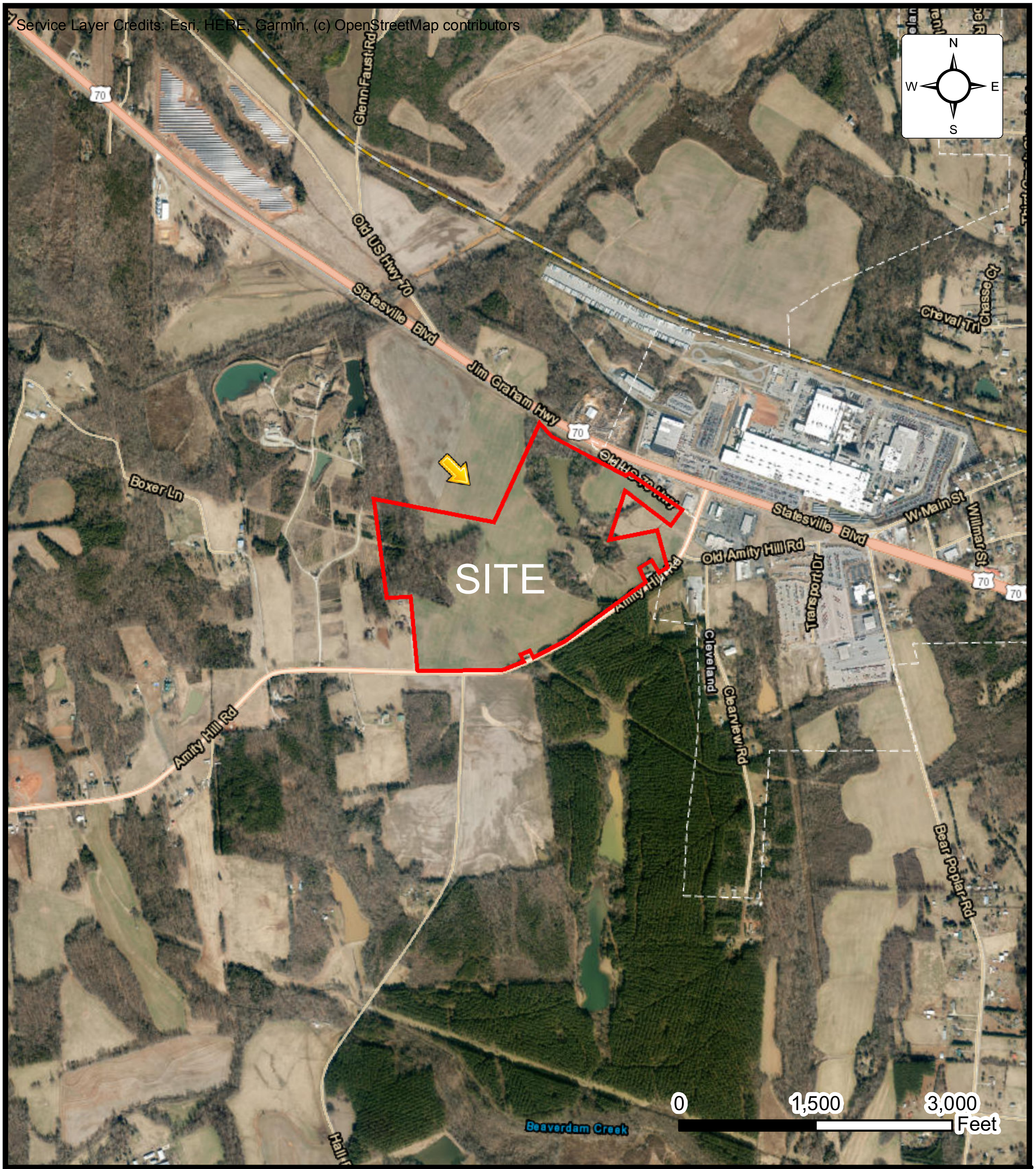
We recommend that ECS be allowed to review the project’s plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram

Boring Location Diagram

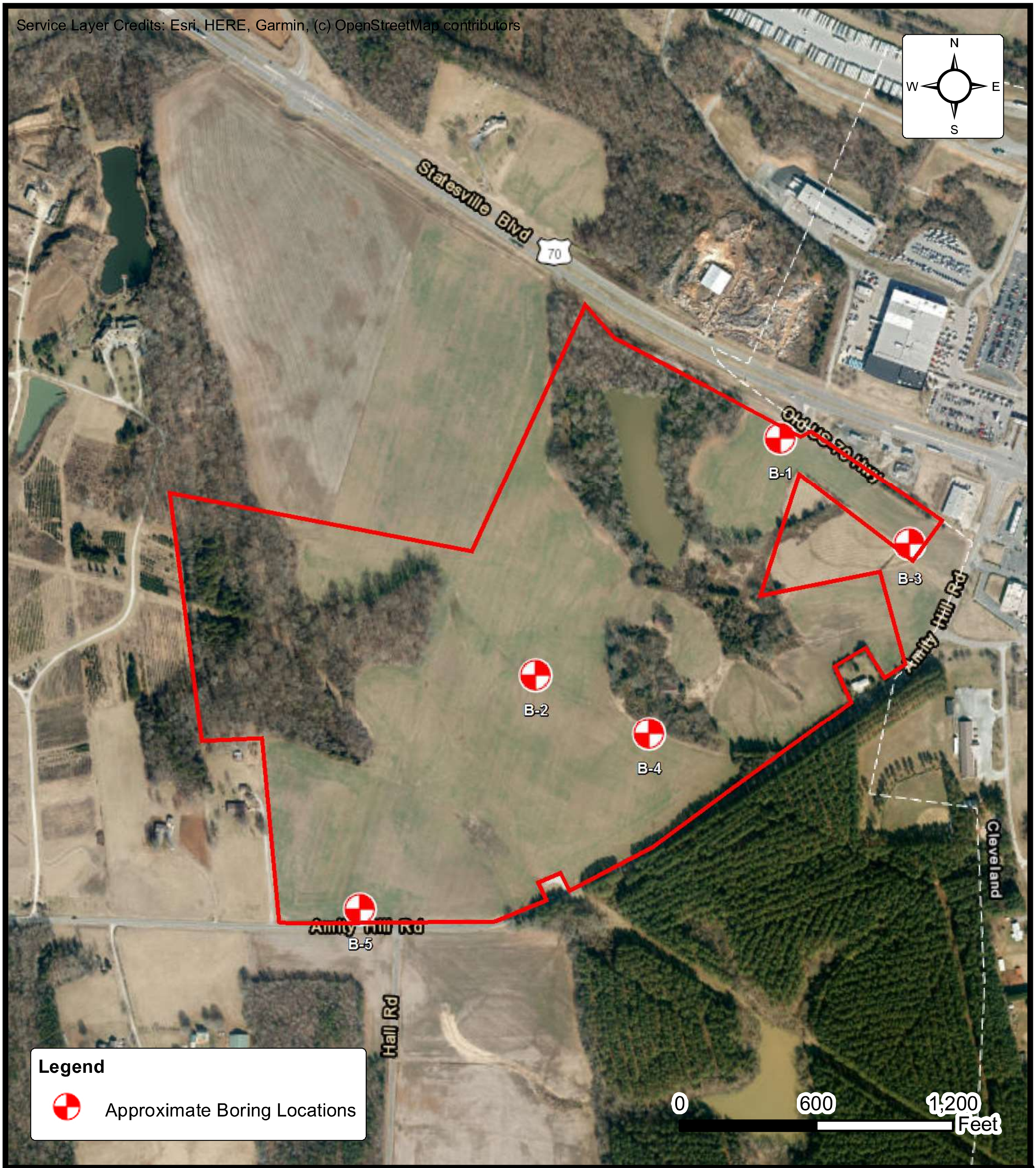

Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors

ENGINEER	CJC2
SCALE	AS NOTED
PROJECT NO.	08:14146
FIGURE	1
DATE	5/11/2020

Site Location Diagram
BROWN SITE

AMITY HILL ROAD, CLEVELAND, NORTH CAROLINA

SALISBURY-ROWAN EDC



Boring Location Diagram
BROWN SITE

AMITY HILL ROAD, CLEVELAND, NORTH CAROLINA

SALISBURY-ROWAN EDC

ENGINEER
CJC2

SCALE
AS NOTED

PROJECT NO.
08: 14146

FIGURE
2

DATE
5/11/2020

APPENDIX B – Field Operations

Reference Notes for Boring Logs

Boring Logs (B-1 through B-5)

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

■		**ASPHALT**
▨		**CONCRETE**
▨		**GRAVEL**
▨		**TOPSOIL**
□		**VOID**
▦		**BRICK**
▨		**AGGREGATE BASE COURSE**
▨	**FILL**[3]	**MAN-PLACED SOILS**
▨	**GW**	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
▨	**GP**	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
▨	**GM**	**SILTY GRAVEL** gravel-sand-silt mixtures
▨	**GC**	**CLAYEY GRAVEL** gravel-sand-clay mixtures
▨	**SW**	**WELL-GRADED SAND** gravelly sand, little or no fines
▨	**SP**	**POORLY-GRADED SAND** gravelly sand, little or no fines
▨	**SM**	**SILTY SAND** sand-silt mixtures
▨	**SC**	**CLAYEY SAND** sand-clay mixtures
▥	**ML**	**SILT** non-plastic to medium plasticity
▥	**MH**	**ELASTIC SILT** high plasticity
▨	**CL**	**LEAN CLAY** low to medium plasticity
▨	**CH**	**FAT CLAY** high plasticity
▨	**OL**	**ORGANIC SILT or CLAY** non-plastic to low plasticity
■	**OH**	**ORGANIC SILT or CLAY** high plasticity
▨	**PT**	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		**PARTICLE SIZES**
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	**SPT[5] (BPF)**	**CONSISTENCY[7] (COHESIVE)**
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	**DENSITY**
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	**COARSE GRAINED (%)[8]**	**FINE GRAINED (%)[8]**
Trace	≤5	≤5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15 - 25
Adjective *(ex: "Silty")*	≥25	≥30

WATER LEVELS[6]

▽	WL	Water Level (WS)(WD) (WS) While Sampling (WD) While Drilling
▽	SHW	Seasonal High WT
▼	ACR	After Casing Removal
▽	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

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[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09 Note 16.*

[8] *Percentages are estimated to the nearest 5% per ASTM D 2488-09.*

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CLIENT
Salisbury-Rowan EDC

Job #: 08:14146

BORING # B-1

SHEET 1 OF 1

PROJECT NAME
Brown Site

ARCHITECT-ENGINEER

SITE LOCATION
Amity Hill Road, Cleveland, Rowan County, NC

NORTHING

EASTING

STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% × WATER CONTENT% ● LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL ENGLISH UNITS

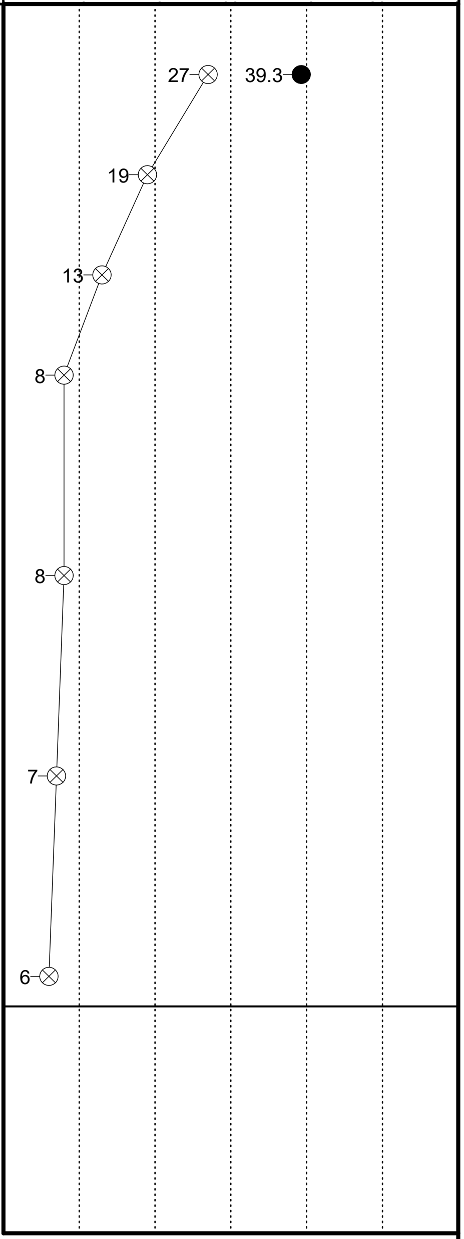
BOTTOM OF CASING ➤ LOSS OF CIRCULATION

SURFACE ELEVATION 776

SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"
				Topsoil Thickness [1.50"]	
S-1	SS	18	18	(MH RESIDUAL) ELASTIC SILT, reddish brown to reddish orange, moist, very stiff	5 12 15
S-2	SS	18	13		3 8 11
S-3	SS	18	14	(ML) SANDY SILT, brownish orange to grayish white, moist, stiff to firm	5 6 7
S-4	SS	18	12		1 4 4
S-5	SS	18	18		4 4 4
S-6	SS	18	13		4 3 4
S-7	SS	18	18		1 3 3
				END OF BORING @ 25.0'	

DEPTH (FT): 0, 5, 10, 15, 20, 25, 30

ELEVATION (FT): 775, 770, 765, 760, 755, 750



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS ☐ WD ☒	BORING STARTED 04/28/20	CAVE IN DEPTH 19.5
WL(SHW) WL(ACR)	BORING COMPLETED 04/28/20	HAMMER TYPE Auto
WL	RIG D-25 FOREMAN D. Hamilton	DRILLING METHOD 2.25 HSA

CLIENT
Salisbury-Rowan EDC

Job #: 08:14146

BORING # B-2

SHEET 1 OF 1

PROJECT NAME
Brown Site

ARCHITECT-ENGINEER

SITE LOCATION
Amity Hill Road, Cleveland, Rowan County, NC

NORTHING

EASTING

STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △

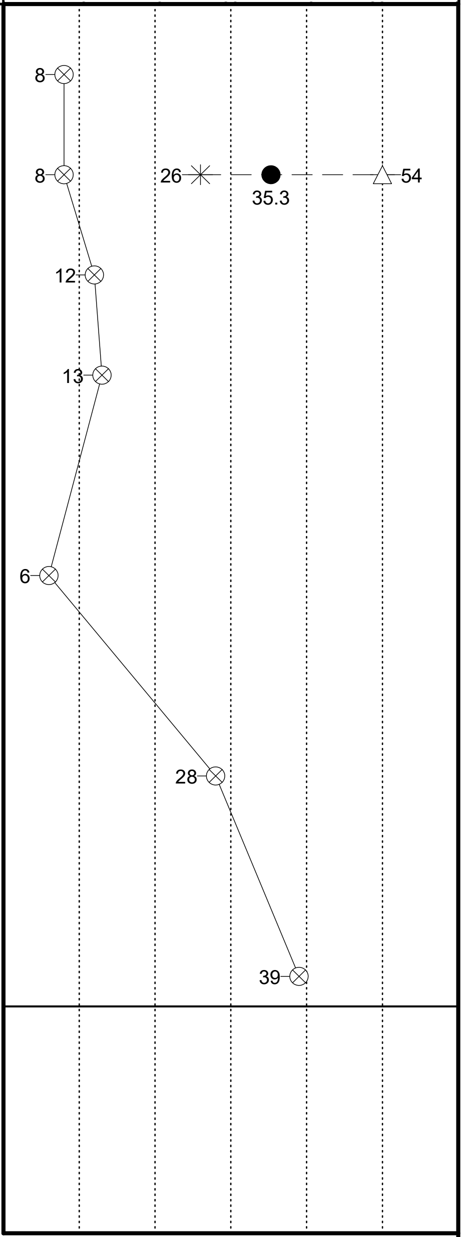
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL ENGLISH UNITS

BOTTOM OF CASING LOSS OF CIRCULATION

SURFACE ELEVATION 766

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [1.50"]			
					(CH RESIDUAL) FAT CLAY, trace organics, trace gravel, dark brown, moist, firm		765	
	S-1	SS	18	18				3 4 4
	S-2	SS	18	10				3 4 4
5								
					(ML) SANDY SILT, brownish orange, moist, stiff		760	
	S-3	SS	18	16				4 5 7
					(CL) LEAN CLAY, grayish brown, moist, stiff			
	S-4	SS	18	6				4 5 8
10							755	
					(ML) SANDY SILT, grayish brown, moist, firm			
	S-5	SS	18	12				2 3 3
15							750	
					(ML) SANDY SILT, trace rock fragments, dark gray, moist, very stiff to hard			
	S-6	SS	18	10				12 24 4
20							745	
	S-7	SS	18	18				10 18 21
25					END OF BORING @ 25.0'		740	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS ☐ WD ☒	BORING STARTED 04/28/20	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 04/28/20	HAMMER TYPE Auto
WL	RIG D-25 FOREMAN D. Hamilton	DRILLING METHOD 2.25 HSA

CLIENT	Job #:	BORING #	SHEET
Salisbury-Rowan EDC	08:14146	B-3	1 OF 1

PROJECT NAME

Brown Site

ARCHITECT-ENGINEER

SITE LOCATION

Amity Hill Road, Cleveland, Rowan County, NC

NORTHING

EASTING

STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – — –   REC% ———

PLASTIC LIMIT% ✕   WATER CONTENT% ●   LIQUID LIMIT% △

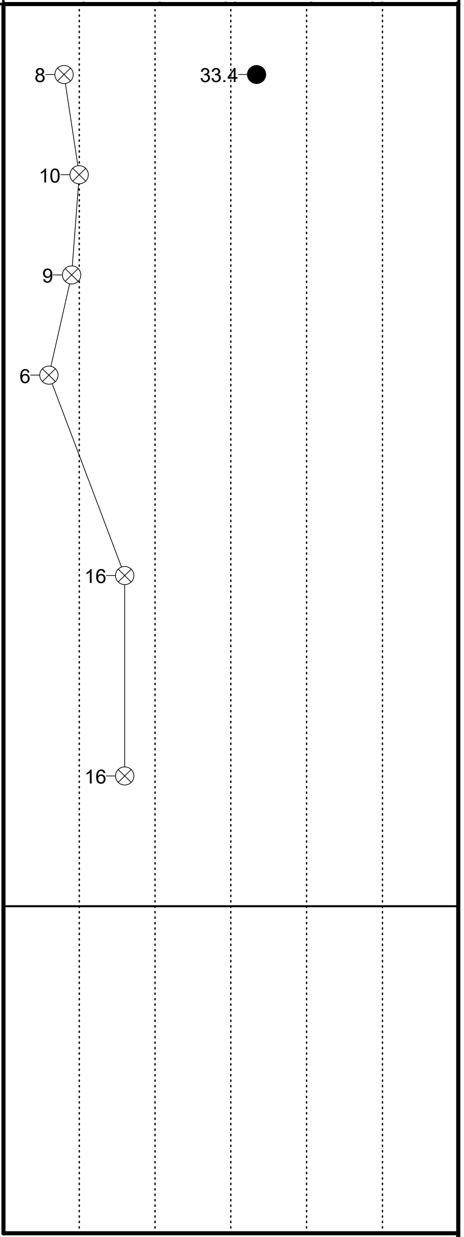
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING   LOSS OF CIRCULATION

SURFACE ELEVATION 772

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [1.50"] (CH RESIDUAL) FAT CLAY, trace organics, dark brown, moist, firm to stiff			
	S-1	SS	18	14			770	1 3 5
	S-2	SS	18	8				2 4 6
5					(CL) SANDY CLAY, trace rock fragments, grayish brown, moist, stiff to firm			
	S-3	SS	18	14			765	3 4 5
	S-4	SS	18	18				2 3 3
10								
					(CL) SANDY CLAY, grayish white, moist, very stiff		760	
	S-5	SS	18	15				6 7 9
15								
					(SM) SILTY FINE TO MEDIUM SAND, grayish brown, moist, medium dense		755	
	S-6	SS	18	16				5 7 9
20								
							750	
					AUGER REFUSAL @ 22.5'			
25								
							745	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS ☐ WD ☒	BORING STARTED 04/28/20	CAVE IN DEPTH 19.0
WL(SHW) WL(ACR)	BORING COMPLETED 04/28/20	HAMMER TYPE Auto
WL	RIG D-25 FOREMAN D. Hamilton	DRILLING METHOD 2.25 HSA

CLIENT
Salisbury-Rowan EDC

Job #: 08:14146

BORING # B-4

SHEET 1 OF 1

PROJECT NAME
Brown Site

ARCHITECT-ENGINEER

SITE LOCATION
Amity Hill Road, Cleveland, Rowan County, NC

NORTHING

EASTING

STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — –   REC% ———

PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △

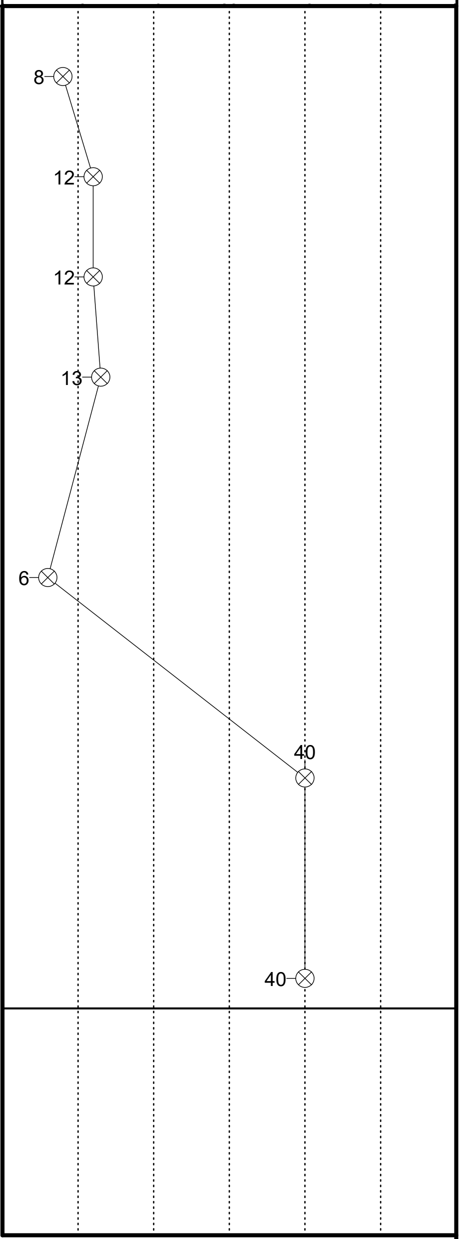
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING   LOSS OF CIRCULATION

SURFACE ELEVATION 764

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [2.00"]			
	S-1	SS	18	10	(CH RESIDUAL) FAT CLAY, dark brown, moist, firm			3 4 4
	S-2	SS	18	18	(CL) SANDY CLAY, brownish orange to grayish brown, moist, stiff		760	4 5 7
5								
	S-3	SS	18	18				3 5 7
	S-4	SS	18	18	(SM RESIDUAL) SILTY FINE TO MEDIUM SAND, grayish brown, moist, medium dense to loose		755	1 5 8
10								
	S-5	SS	18	6			750	3 3 3
15								
					(SM) SILTY FINE TO MEDIUM SAND, rock fragments, grayish white, moist, dense			
	S-6	SS	18	10			745	17 19 21
20								
	S-7	SS	18	12			740	14 18 22
25					END OF BORING @ 25.0'			
							735	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL   WS ☐   WD ☒

BORING STARTED 04/28/20

CAVE IN DEPTH 21.5

WL(SHW)   WL(ACR)

BORING COMPLETED 04/28/20

HAMMER TYPE Auto

WL

RIG D-25   FOREMAN D. Hamilton

DRILLING METHOD 2.25 HSA

CLIENT	Job #:	BORING #	SHEET
Salisbury-Rowan EDC	08:14146	B-5	1 OF 1

PROJECT NAME: Brown Site

ARCHITECT-ENGINEER:

SITE LOCATION: Amity Hill Road, Cleveland, Rowan County, NC

NORTHING:
EASTING:
STATION:

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — –   REC% ———

PLASTIC LIMIT% ✕   WATER CONTENT% ●   LIQUID LIMIT% △

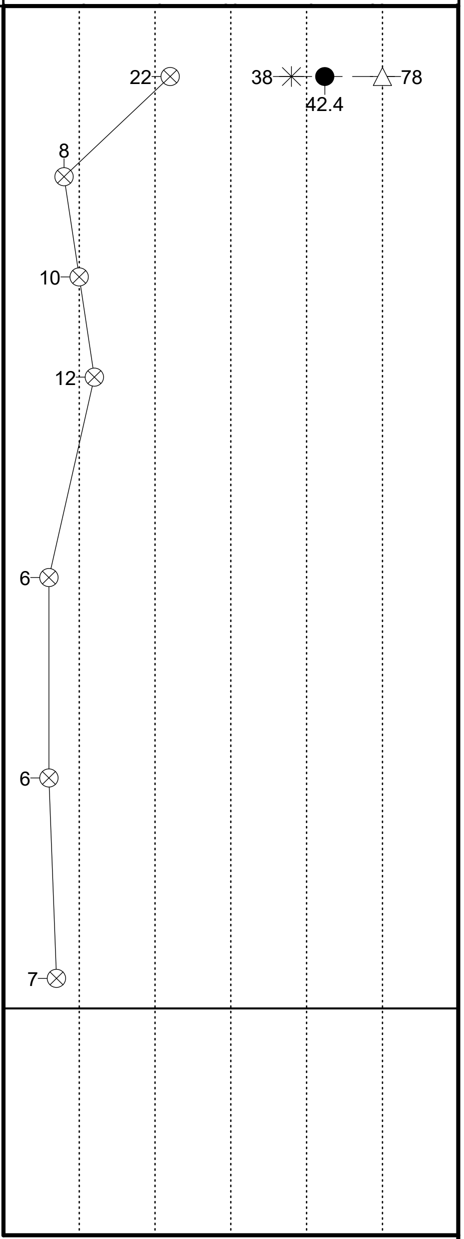
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ➤   LOSS OF CIRCULATION 100%

SURFACE ELEVATION 794

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness [1.50"]			
	S-1	SS	18	9	(MH RESIDUAL) ELASTIC SILT, reddish orange, moist, very stiff			2 10 12
	S-2	SS	18	10	(MH) ELASTIC SILT, reddish orange, moist, firm to stiff		790	4 4 4
5								
	S-3	SS	18	12				3 4 6
	S-4	SS	18	8			785	3 5 7
10								
					(ML) SANDY SILT, grayish brown, moist, firm			
	S-5	SS	18	12			780	3 3 3
15								
	S-6	SS	18	6			775	3 3 3
20								
	S-7	SS	18	9			770	3 4 3
25					END OF BORING @ 25.0'			
							765	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS ☐ WD ☒	BORING STARTED 04/28/20	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 04/28/20	HAMMER TYPE Auto
WL	RIG D-25 FOREMAN D. Hamilton	DRILLING METHOD 2.25 HSA

APPENDIX C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Boring Number	Sample Number	Depth (feet)	MC1 (%)	Soil Type2	Atterberg Limits3			Percent Passing No. 200 Sieve4	Moisture - Density (Corr.)5		CBR Value6	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-1	1.00 - 2.50	39.3									
B-2												
	S-2	3.50 - 5.00	35.3	CH	54	26	28					
B-3												
	S-1	1.00 - 2.50	33.4									
B-5												
	S-1	1.00 - 2.50	42.4	MH	78	38	40					

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 14146
Project Name: Brown Site
PM: Laura E. Hill
PE: Christopher J. Conway
Printed On: May 11, 2020

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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.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in 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.

Geotechnical-Engineering 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 given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives 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 this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- 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. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering 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 subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GBA
GEOPROFESSIONAL
BUSINESS
ASSOCIATION

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