REPORT

Geotechnical Exploration
Water Storage Tank
3090 Gees Mill Road
Rockdale County
Conyers, Georgia

Project Number
2014.5138.01

November 28, 2014

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November 28, 2014

Mr. Pavel Vayner
Rockdale County Water Recourses
Water Treatment – Gees Mill
3090 Gees Mill Road
Conyers, GA 30012

Via E-mail: pavel.vayner@rockdalecounty.com

RE: Report of Geotechnical Exploration
Water Storage Tank
3090 Gees Mill Road
Conyers, Rockdale County, Georgia
Project No. 2014.5138.01

Dear Mr. Vayner:

United Consulting is pleased to submit this report of geotechnical exploration for the above referenced project. We appreciate the opportunity to assist you with this project and look forward to working with you during design development and construction phase. Please contact us if you have any questions regarding this report or if we can be of further assistance.

UNITED CONSULTING

GEORGIA REGISTERED NO. 23121 PROFESSIONAL ENGINEER MEHDI MOAZZAMI

Mehdi Moazzami, P.E.
Senior Geotechnical Engineer

Chris L. Roberds, P.G.
Senior Executive Vice President

NP/MM/CLR/nj

ucblade10/sites/Geotechenv/10015/2014.5138.01/Geotechnical Documents/2014.5138.01.geo.doc

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EXECUTIVE SUMMARY

United Consulting has completed a Geotechnical Exploration for the proposed 10 million gallon water storage tank to be located at 3090 Gees Mill Road in the city of Conyers, Rockdale County, Georgia. The results of this exploration are briefly summarized below. The text of the report should be reviewed for a discussion of these items.

1. A complete geotechnical engineering service is performed through the Observational Method as an indivisible two-phase process. The first phase provides advice about project specific risks and represents our firm's opinion of subsurface conditions with preliminary recommendations. Field observation during construction comprises the second phase of our service and provides us the opportunity to assess the reliability of the subsurface data and the appropriateness of our preliminary recommendations. Actual conditions may differ from those encountered in the exploration phase.

2. Up to thirteen (13) feet of fill was encountered in the borings drilled within the site. The fill contained a high concentration of boulder-sized rocks and concrete debris. Based on the provided topographic site plan and finished floor elevations, the fill will be removed from within the water tank footprint during construction.

3. Partially weathered rock (PWR) was encountered in the borings at depths ranging from 1 to 18 feet. Auger refusal occurred in the borings at depths ranging from 2 to 32 feet. Based on the existing site elevation and proposed FFE, difficult excavation associated with PWR and rock should be anticipated over most of the water tank footprint.

4. Provided the site is prepared as recommended, the proposed water tank may be supported on a shallow foundation system such as slab on grade and perimeter footings. We recommend a uniform modulus of vertical subgrade reaction of 30 pci for design of slab-on-grade. The shallow foundation under perimeter footing could be designed for allowable soil bearing pressure of 4,000 psf.

5. Partially weathered rock (PWR) or rock was encountered at or above the proposed tank FFE. To mitigate the high cost of isolated excavations in PWR and rock and avoid possible damage to under floor piping laid over an irregular rock surface, we suggest in the areas of the storage tank where PWR or rock is present at or above the foundation bearing level, the storage tank area be excavated to a level of 2 to 3 feet below the bottom of footings and under-floor utilities and brought back to grade with soils compacted to 98% of the material standard Proctor maximum dry density.

6. Groundwater was not encountered in the borings at the time of drilling.

PROJECT INFORMATION

The project site is located at 3090 Gees Mill Road in Conyers, Rockdale County, Georgia. At the time of drilling operations, the project site consisted of a wooded tract of land located to the south of an existing storage tank. The project site was bounded to the west and south by a wooded area, to the east by a lake, and to the north by the existing water tank. Based on the provided topographic site plan, there is a steep slope from northeast to southwest near the center of the proposed tank. At the time of our visit, a large quantity of boulder rocks and concrete debris was observed in the high elevation portion of the site (north and northeast of the proposed tank).

The proposed development consists of the construction of a 10 million gallons water tank. We understand that the water tank will be 25 feet high with a diameter of 270 feet. As such, the contact pressure below the tank slab will be about 1,560 psf. Based on the provided information, the proposed finished floor elevation of the tank will be at 724± feet above mean sea level (msl). The existing site elevation in the proposed water tank area ranged from 724 to 786 feet above msl. Therefore, cuts on the order of 0 to 64 feet are anticipated to achieve the proposed tank finished grade elevation.

A topographic map of the site was provided by the client to use as a guide to locate the boundaries of the project site. The general locations of the borings are shown on the attached boring location plan (Figure 1).

PURPOSE

The purpose of the Geotechnical Exploration was to explore the soils in the area of the proposed water tan and to provide soil and foundation recommendation for the design of the structure.

SCOPE

The scope of our services included the following items:

1. A visual reconnaissance of the site from a geotechnical standpoint;

2. Drilling five (5) standard penetration test (SPT) and eleven (11) offset borings to determine the nature and condition of the subsurface soils;

3. A visual evaluation of the soil samples obtained during our field testing program;

4. Analyzing the existing soil conditions with respect to the proposed tank structure.

5. Preparing this report to document the results of the field test program, engineering analysis, and to provide recommendations for foundation design, earthwork, and quality control.

SITE GEOLOGY

This Project Site is located in the Piedmont Physiographic Province. The virgin, "residual" soils (or "residuum") native to this region have been formed by the in-place weathering of the parent crystalline rock. A typical residual soil profile consists of a clayey silt zone from the ground surface, underlain by sandy silts and silty sands. These silts and sands often exhibit the banded appearance of the parent rock. Seams of partially weathered rock (PWR) are often encountered with depth until the sound, relatively unaltered parent rock is encountered. Partially weathered rock (PWR) is a term for the residuum that can be penetrated by soil drilling techniques and has standard penetration test resistance N-values in excess of 100 blows per foot (bpf). Auger refusal indicates the depth at which the boring cannot be drilled further using soil drillings tools and techniques. Auger refusal levels may represent the top of massive bedrock, a boulder or other obstructions.

SUBSURFACE CONDITIONS

Initially, the borings encountered a thin layer of topsoil. Below the topsoil layer, borings B-5 and B-5C encountered fill to auger refusal depths of 6 to 7 feet. Borings B-1, B-5A, and B-5D encountered auger refusal (apparently in the fill) at depths of 2, 9, and 5 feet, respectively. Boring B-5B encountered fill to a depth of 13 feet and boring B-1A encountered fill to a depth of 3 feet. The fill encountered generally consisted of very loose to very dense sand with varying amounts of rock fragments, some silt, and trace amounts of clay. The Standard Penetration Test Resistances (N-values) in the fill soils encountered ranged from 4 to over 100 blows per foot (bpf). The high N-values recorded in the fill was generally due to presence of rock and boulders within the fill.

Below the fill in borings B-1A and B-5B and below the topsoil in borings B-1B, B-2, B-2B, B-3, B-3A, B-3B, and B-4, typical residual soils of the Piedmont Physiographic province were encountered. The residual soils encountered consisted of firm to dense sand with some silt and trace amounts of clay. The N-values in the residual soils encountered ranged from 14 to 34 bpf.

Partially weathered rock (PWR) was encountered in borings B-1A, B-2, B-2B, B-3, B-3A, B-4, and B-5B at depths ranging from 1 to 18 feet. The PWR encountered consisted of very dense sand with some silt and rock fragments, and trace amounts of clay. Auger refusal occurred in the borings at depths ranging from 2 to 32 feet.

Groundwater was not encountered in the borings at the time of drilling. However, groundwater levels should be anticipated to fluctuate with the change of seasons, during periods of very low or high precipitation, or due to changes in the flood plain or watershed upstream from the area.

For a more detailed description of the subsurface conditions encountered, please see the attached boring logs included in the Appendix.

DISCUSSION AND RECOMMENDATIONS

The following recommendations are based on our understanding of the proposed construction, the data obtained in our soil test borings, a site reconnaissance, and our experience with soils and subsurface conditions similar to those encountered at the project site.

United Consulting requests the opportunity for a general review of final design and specifications in order to verify that earthwork and foundation recommendations have been properly interpreted and implemented in the design and specifications. We recommend that United Consulting, as the Geotechnical Engineer of Record, be consulted during construction to conduct Geotechnical Controls as the Owner's Representative. The purpose is to verify the similarity of the subsurface conditions on site versus conditions anticipated by the designers.

Existing Fill

Up to thirteen (13) feet of fill was encountered in the borings drilled in the high elevation portion of the site. Due to the presence of boulders, most of the borings, except boring B-5B, drilled in this area encountered refusal within the fill at depths of 6 to 9 feet. Boring B-5B encountered possible residual at a depth of 13 feet. The near surface fill generally consisted of sand with varying amounts of rock fragments. Based on the existing site elevation and the proposed finished floor elevation, the existing fill will be completely removed from the area of the proposed water storage tank during construction.

Difficult Excavation

Partially weathered rock (PWR) was encountered in the borings at depths ranging from 1 to 18 feet. Auger refusal occurred in the borings at depths ranging from 2 to 32 feet. Auger refusal in the high elevation areas of the site was due to boulder within the fill. The presence of the high concentration of boulders within the fill could result in lower excavation rates in the fill.

Auger refusal due to bedrock occurred in most of the borings. In the areas of borings B-1 to B-1B, B-2 to B-2B, and B-5B, the auger refusal depths were about 7 to 26 feet above the proposed tank bottom elevation. In the areas of boring B-4, PWR was encountered a few feet above the tank bottom elevations. As such difficult excavation associated with PWR and rock should be anticipated over most of the proposed tank area.

Please note that due to the geology of the area, depth to bedrock can vary significantly (as indicated by the borings) over short horizontal distances. Therefore, it is not unusual to encounter pinnacles of rock and PWR at depths shallower than those anticipated by the borings. PWR typically requires loosening by ripping with large dozers pulling single tooth rippers in mass excavation or blasting in confined (trench) excavation.

Conventional scrapers and loaders can generally excavate soils. Lower consistency PWR (50/6", 50/5" and 50/4") typically requires loosening by ripping with large dozers pulling single tooth rippers in mass and trench excavation. Denser PWR (50/3" or denser) may be removed by ripping using large dozer pulling single tooth ripper in mass excavation but generally requires blasting in confined (trench) excavation. Relatively sound, massive, rock typically requires blasting for removal in mass or trench excavation.

Excavation techniques will vary based on the weathering of the materials, fracturing and jointing in the rock, and the overall stratigraphy of the feature. Actual field conditions usually display a gradual weathering progression with poorly defined and uneven boundaries between layers of different materials. We recommend that the following definitions for rock in earthwork excavation be included in bid documents:

In Mass Excavation: Any material occupying an original volume of more than 1 cubic yard which cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 80,000 pounds usable pull (Caterpillar D-8 or larger).

In Trench Excavation: Any material occupying an original volume of more than 1/2 cubic yard which cannot be excavated with a backhoe having a bucket curling rate of not less than 40,000 pounds, using a rock bucket and rock teeth (a John Deere 790 or larger).

Removal of rock by blasting can be very expensive. The costs of excavation vary with the type of material encountered and the quantities to be excavated. Hence, control of quantities is important. You may consider exposing the rock surface prior to blasting so the rock quantities can be more accurately estimated using surveying methods. Leaving soil overburden in place during blasting may result in difficulties in determination of blast rock quantities resulting in greater rock excavation costs. Also, residual soil overburden may increase the confining pressure of the rock and reduce the effectiveness of blast charges. Loose fill or blasting mats can be placed over the blast area to control fly-rock.

We recommend that the surrounding structures be surveyed prior to and upon completion of blasting to document the current conditions of these structures, in order to reduce potential lawsuits.

Ripped PWR and/or blasted rock fragments may be reused and mixed into engineered fill provided that they are pulverized to less than 6 inches in any dimension and fully choked with soil to fill voids between the rock pieces. PWR or rock greater than 12 inches in any dimension may be used in deep fill areas outside the buildings footprint and in non-structural areas and should be well choked with a geotextile fabric or a minimum 6-inch layer of crusher-run or GAB. A minimum of 4 feet of clean fill is recommended over the soil/rock fill.

Site Preparation

As an initial step in site preparation, existing topsoil, trees and their associated root mats should be stripped and disposed offsite. Boulder rocks and concrete debris should be properly disposed. Removal of trees should include removal of their root balls that may extend to several feet below grade.

After lowering the site to achieve the proposed subgrade (anticipated cuts on the order of 0 to 64 feet), the areas underlain by soils, generally the area of borings B-3, should be proofrolled. Proofrolling should be performed under the observation of the Geotechnical Engineer or his representative so that areas, which exhibit "pumping" during proofrolling, may be treated by a method recommended by the Geotechnical Engineer.

Earthwork

The on-site low-plasticity residual soils, if properly moisture conditioned should generally be suitable for reuse as engineered fill. The onsite fill if free of organic should also be suitable for reuse as engineered fill. We recommend that the contractor be equipped for both drying and wetting soils. Also, we recommend that rocks and boulders greater than 6 inches in diameter be separated and properly disposed. Typical restrictions on suitable fill are no organics, plasticity index less than 25, and maximum particle size of four inches, with not more than 30 percent greater than $^{3}/_{4}$-inch. These restrictions should also be applied to the imported borrow soils if needed. Positive drainage should be maintained at all times to prevent saturation of exposed soils in case of sudden rains. Rolling the surface of disturbed soils will also improve runoff and reduce the fill soil moisture and construction delays.

Fill Placement

Moisture-density determinations should be performed for each soil type used, to provide data necessary for quality assurance testing. The natural moisture content at the time of compaction should be within moisture content limits, which will allow the required compaction to be obtained. The contractor should be prepared to increase or decrease soil water content.

The fill should be placed in thin lifts (not to exceed 8 inches) and then compacted. We recommend that fill under the proposed storage tank be compacted to at least 98% of Standard Proctor (ASTM D 698) maximum dry density.

A Geotechnical Engineer, or his representative, on a full-time basis should observe all grading operations. In-place density tests taken by that individual will assess the degree of compaction being obtained. The Geotechnical Engineer should determine the frequency of the testing.

Groundwater Conditions

Groundwater was not encountered in the borings at the time of drilling. Therefore, groundwater is not anticipated to impact construction activities at the project site. Due to the presence of PWR and rock above the proposed FFE/FGE, the site is susceptible to formation of perched

water during periods of wet weather. We recommend that upon the excavation of the slope along the eastern-northeastern boundary of the water tank, a toe drain (See Appendix for a detail) be installed. The toe drain should be installed at a depth of at least 3 feet below the water tank proposed FFE/FGE and be "daylighted" further away from the water tank or discharged into a manhole. Over blasting of the rock in the area of the toe drain will be required.

Foundation Design Recommendations

As previously mentioned, the maximum contact pressure exerted by the tank under overflow conditions would be about 1,560 psf below the slab and not more than 4,000 psf for the perimeter ring foundation. Based on the boring data and our settlement analyses, the existing soils are suitable for support of the proposed tank on a conventional shallow foundation system.

Due to dense material (PWR and rock) present below the proposed water storage tank finished floor elevation, undisturbed samples could not be obtained. Based on our analysis using the soil information obtained from the borings, we anticipate settlement across the tank will be from negligible amount to on the order of 1.5 inches or so. The tank footing should bear at 12 inches below outside finished grades for frost protection.

Borings B-1, B-2, B-5, and their associated offsets encountered refusal material above the proposed tank FFE of 724. We suggest the areas of the water storage tank where PWR or rock is present at or above the foundation bearing level be excavated to a level below the bottom of footing and under-floor utilities, between 2 to 3 feet but not to exceed 3 feet, and brought back to grade with soil compacted to 98% of the material standard Proctor maximum dry density. This will mitigate the high cost of isolated excavations in PWR and rock, avoid possible damage to piping laid over an irregular rock surface, and decrease the potential for abrupt differential settlement where footings transition from PWR or rock to soil.

Surface water control should be maintained to prevent accumulation of water in footing excavations. Standing water in footing excavations should be removed promptly. Soil softened by the water should be removed, and the Geotechnical Engineer or his representative should re-examine the area. Our representative must evaluate the storage tank footing excavations prior to concrete placement. The conditions observed should be compared to test boring data and design requirements.

Caving Considerations

Due to the presence of existing fill, some caving of excavations should be expected. Flattening of the excavation sidewalls and/or the use of bracing may be needed to maintain stability. All excavations must be performed in accordance with OSHA excavation safety standards.

LIMITATIONS

This report is for the exclusive use of **Rockdale County Water Resources**, and the designers of the project described herein, and may only be applied to this specific project. Our conclusions and recommendations have been prepared using generally accepted standards of Geotechnical Engineering practice in the State of Georgia. No other warranty is expressed or implied. Our firm is not responsible for conclusions, opinions or recommendations of others.

The right to rely upon this report and the data within may not be assigned without UNITED CONSULTING'S written permission.

The scope of this evaluation was limited to an evaluation of the load-carrying capabilities and stability of the subsoils. Oil, hazardous waste, radioactivity, irritants, pollutants, molds, or other dangerous substance and conditions were not the subject of this study. Their presence and/or absence are not implied or suggested by this report, and should not be inferred.

Our conclusions and recommendations are based upon design information furnished us, data obtained from the previously described exploration and testing program and our past experience. They do not reflect variations in subsurface conditions that may exist intermediate of our borings and in unexplored areas of the site. Should such variations become apparent during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon "on-site" observations of the conditions.

If the design or location of the project is changed, the recommendations contained herein, must be considered invalid unless our firm reviews the changes and our recommendations are either verified or modified in writing. When design is complete, we should be given the opportunity to review the foundation plan, grading plan, and applicable portions of the specifications to see if they are consistent with the intent of our recommendations.

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B-2A
B-2
B-2B
B-5D
B-5C
B-5B
B-5A
B-5
B-1A
B-1
B-1B
B-4
B-4A
B-3
B-3A
B-3B
FUTURE 10,000,000 GAL. WATER STORAGE TANK
EXISTING HIGH SERVICE PUMP STATION
36" CUP
PROPOSED GRAVEL ROAD TO BE BUILT AFTER THE TANK GRADING IS COMPLETE
EXISTING 48" WATER LINE
EXISTING FENCE
RELOCATE PORTION OF EXISTING FENCE AS SHOWN
GRAPHIC SC

Legend:

⊕ **Boring Location**

FIG. 1

Client:	ROCKDALE COUNTY WATER RESOURCES
Site:	WATER STORAGE TANK_CONYERS
Title:	Boring Location Plan
Notes:	
Scale:	NTS
Prepared:	NP
Checked:	11/24/2014
Project No.:	2014.5138.01

N

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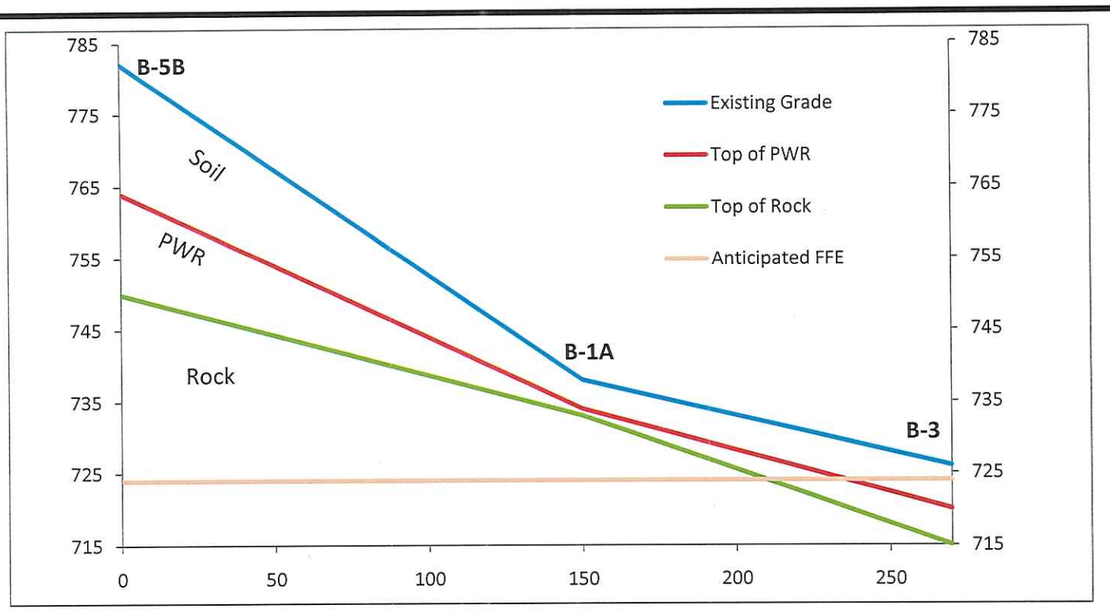

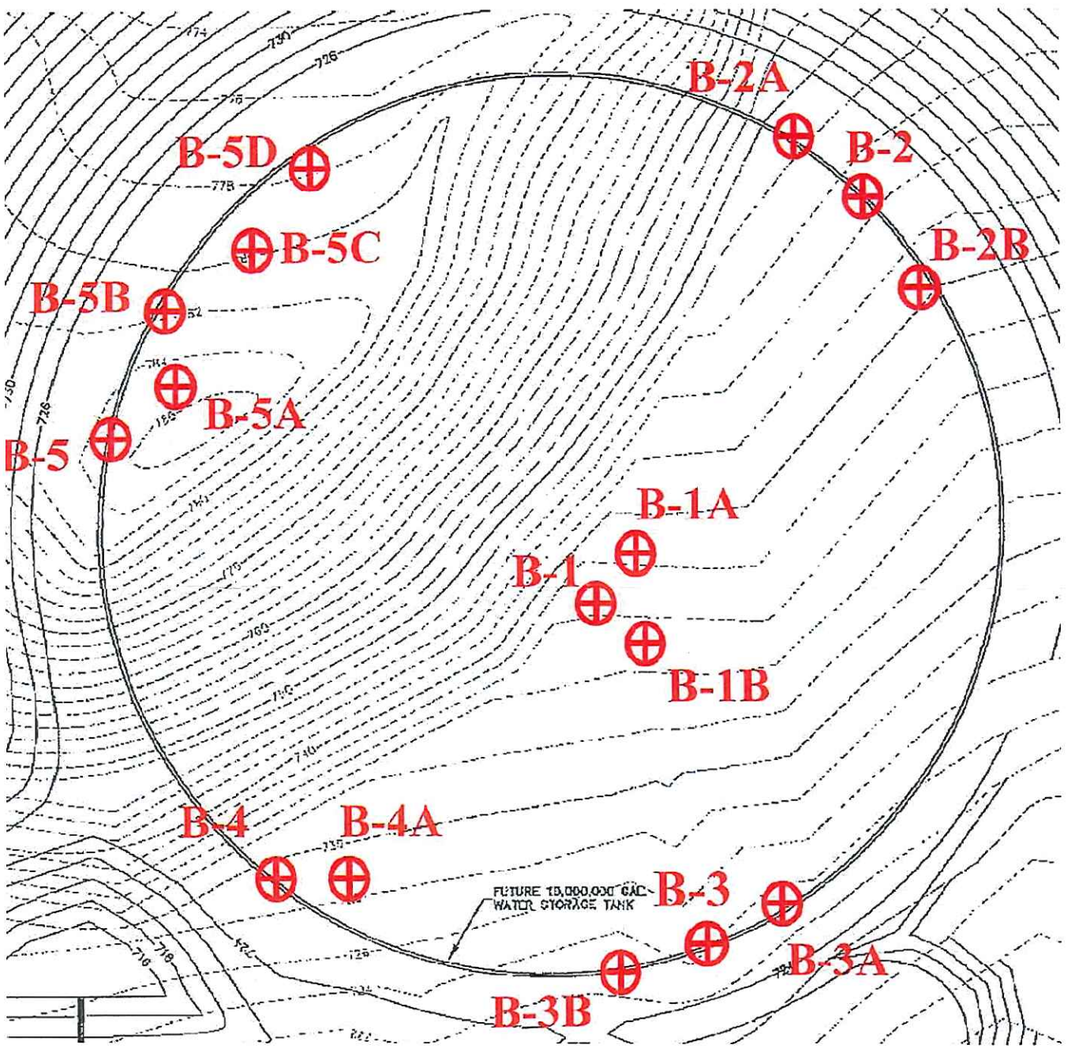

We're here for you UNITED CONSULTING	N	Scale: NTS	Notes:	Client:	ROCKDALE COUNTY WATER RESOURCES
		Prepared: HG		Site:	WATER STORAGE TANK, CONYERS
		Checked: 12/01/2014		Title:	WATER TANK SUBSURFACE PROFILE
		Project No.: 2014.5138.05			FIG. 2

APPENDIX

General Notes/Narrative of Drilling Operations
Logs of Boring (16)
Exploration Procedure
French Drain Detail

GENERAL NOTES

The soil classifications noted on the Boring Logs are visual classifications unless otherwise noted. Minor constituents of a soil sample are termed as follows:

Trace	0 - 10%
Some	11 - 35%
Suffix "y" or "ey"	36 - 49%

LEGEND

Split Spoon Sample obtained during Standard Penetration Testing

Relatively Undisturbed Shelby Tube Sample

Groundwater Level at Time of Boring Completion

Groundwater Level at 24 hours (or as noted) after Termination of Boring

w	Natural Moisture Content	
LL	Liquid Limit	
PL	Plastic Limit	Atterberg Limits
PI	Plasticity Index	
PF	Percent Fines (Percent Passing #200 Sieve)	
γ_d	Dry Unit Weight (Pounds per Cubic Foot or PCF	
γ_m	Moist or In-Situ Unit Weight (PCF)	
γ_{sat}	Saturated Unit Weight (PCF)	

BORING LOG DATA AND NARRATIVE OF DRILLING OPERATIONS

The test borings were made by mechanically advancing helical hollow stem augers into the ground. Samples were covered at regular intervals in each of the borings following established procedures for performing the Standard Penetration Test in accordance with ASTM Specification D-1586. Soil samples were obtained with a standard 1.4" I.D. x 2.0" O.D. split barrel sampler. The sampler is first seated 6" to penetrate any loose cuttings and then driven an additional foot with the blows of a 140 pound hammer freely falling a distance of 30". The number of blows required to drive the sampler each six inches is recorded on the Boring Logs. The total number of blows required to drive the sampler the final foot is designated the "standard penetration resistance." This driving resistance, known as the "N" value, is a measure of the relative density of granular soils and is an indication of the consistency of cohesive deposits.

The Following table describes soil consistencies and relative densities based on standard-penetration resistance values (N) determined by the Standard Penetration Test.

	"N"	Consistency
	0-2	Very Soft
	3-4	Soft
	5-8	Firm
Clay and Silt	9-15	Stiff
	16-30	Very Stiff
	Over 31	Hard

	"N"	Relative Density
	0-4	Very Loose
	5-10	Loose
	11-19	Firm
Sand	20-29	Medium Dense
	30-49	Dense
	50+	Very Dense

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625 HOLCOMB BRIDGE ROAD
NORCROSS, GEORGIA 30071
(770)209-0029, FAX (770)582-2800

BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-1
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
	3" Topsoil	0						
735	Straight auger to 2 feet.							
	AUGER REFUSAL AT 2 FEET.	5						No groundwater encountered at the time of drilling.
730		10						
725								
FFE=724		15						
720		20						
715		25						
710		30						
705		35						
700		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-1A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
	3" Topsoil	0						
	Sand-some silt, trace clay; very loose; brown (Fill).		1		2-2-2	5"		Offset 20 feet southeast of B-1
735	Sand-some silt, trace clay; dense; brown (Residual)	5	2		19-50/1	4"		
	Partially weathered rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.							No groundwater encountered at the time of drilling.
730	AUGER REFUSAL AT 5 FEET.	10						
725								
FFE=724		15						
720		20						
715		25						
710		30						
705		35						
700		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES
BORING NO.: B-1B
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA
DATE: 11/20/14
JOB NO.: 2014.5138.01
DRILLER: DAVE
RIG: CME57
LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOWS/6"	SAMPLES RECOV.	SAMPLES W	NOTES
735	3" Topsoil	0						
	Sand-some silt, trace clay; dense; brown (Residual).		1		7-11-23	3"		
	AUGER REFUSAL AT 3 FEET.							No groundwater encountered at the time of drilling.
730		5						
725								
FFE=724		10						
720		15						
715		20						
710		25						
705		30						
700		35						
695		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES
BORING NO.: B-2
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA
DATE: 11/20/14
JOB NO.: 2014.5138.01
DRILLER: DAVE
RIG: CME57
LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
745	3" Topsoil	0						
	Sand-some silt, trace clay and mica; firm; brown (Residual).		1		4-5-12	6"		
740	Partially weathered rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.	5	2		50/2	1"		No groundwater encountered at the time of drilling.
	AUGER REFUSAL AT 5 FEET.							
735		10						
730		15						
725		20						
FFE=724								
720		25						
715		30						
710		35						
705		40						FFE = Finish Floor Elevation

UNITED CONSULTING
625 HOLCOMB BRIDGE ROAD
NORCROSS, GEORGIA 30071
(770)209-0029, FAX (770)582-2800

BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES BORING NO.: B-2A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA DATE: 11/20/14
JOB NO.: 2014.5138.01 DRILLER: DAVE RIG: CME57 LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
	3" Topsoil	0						Offset 30 feet northeast of B-2
	Straight auger to 4 feet.							
745								
	AUGER REFUSAL AT 4 FEET.	5						No groundwater encountered at the time of drilling.
740								
		10						
735								
		15						
730								
		20						
725								
FFE=724		25						
720								
		30						
715								
		35						
710								
		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-2B
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
740	3" Topsoil	0						
	Sand-some silt, trace clay and mica; medium dense; brown (Residual).		1		10-17-50/1	6"		Offset 30 feet southwest of B-2
	Partially weathered rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.	5	2		50/1	0		No groundwater encountered at the time of drilling.
735	AUGER REFUSAL AT 4 FEET.							
730		10						
725		15						
FFE=724								
720		20						
715		25						
710		30						
705		35						
700		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-3
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
725	3" Topsoil	0						
724	Sand-some silt, trace clay and mica; dense; brown (Residual).		1		9-11-22	12"		
720	Partially weathered rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.	5	2		50/2	1"		No groundwater encountered at the time of drilling.
	AUGER REFUSAL AT 5.5 FEET.							
715		10						
710		15						
705		20						
700		25						
695		30						
690		35						
685		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-3A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
725	3" Topsoil	0						Offset 20 feet south of B-3
FFE=724	Straight auger to 8.5 feet.							
720		5						
715	Partially weathered rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.	10	1		50/5	2"		No groundwater encountered at the time of drilling.
	AUGER REFUSAL AT 10 FEET.							
710		15						
705		20						
700		25						
695		30						
690		35						
685		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-3B
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOWS/6"	SAMPLES RECOV.	SAMPLES W	NOTES
725 FFE=724	3" Topsoil	0						Offset 20 feet north of B-3
	Straight auger to 8 feet.							
720		5						
	AUGER REFUSAL AT 8 FEET.							No groundwater encountered at the time of drilling.
715		10						
710		15						
705		20						
700		25						
695		30						
690		35						
685		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-4
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
730	3" Topsoil	0						
	Sand-some silt, trace clay; firm; brown (Residual).		1		4-6-8	10"		
725	Partially weathered rock sampled as: sand- some silt and rock fragments, trace clay; very dense; tan.	5	2		50/5	2"		
FFE=724								
720		10	3		21-50/5	6"		
	AUGER REFUSAL AT 10 FEET.							No groundwater encountered at the time of drilling.
715		15						
710		20						
705		25						
700		30						
695		35						
690		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-4A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOWS/6"	SAMPLES RECOV.	SAMPLES W	NOTES
730	3" Topsoil	0						Offset 20 feet South of B-4
	Straight auger to 10 feet.							
725		5						
FFE=724								
720		10						
	AUGER REFUSAL AT 10 FEET.							No groundwater encountered at the time of drilling.
715		15						
710		20						
705		25						
700		30						
695		35						
690		40						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
785	3" Topsoil	0						
	Sand-significant rock fragments, some silt, trace clay; very dense; brown and tan (Fill).		1		50/5	3"		High N-value due to boulders
	-some rock fragments; very dense	5	2		24-27-32	6"		
780	AUGER REFUSAL AT 7 FEET.							No groundwater encountered at the time of drilling.
775		10						
770		15						
765		20						
760		25						
755		30						
750		35						
745		40						

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
740		45						
735		50						
730		55						
725		60						
FFE=724								
720		65						
715		70						
710		75						
705		80						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES
BORING NO.: B-5A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA
DATE: 11/20/14
JOB NO.: 2014.5138.01 DRILLER: DAVE RIG: CME57 LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
785	3" Topsoil	0						Offset 20 feet southeast of B-5
	Straight auger to 8.5 feet.							
780		5						
	AUGER REFUSAL AT 9 FEET.	10	1		50/0	0		No groundwater encountered at the time of drilling.
775								
770		15						
765		20						
760		25						
755		30						
750		35						
745		40						

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5A
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
740		45						
735		50						
730		55						
725		60						
FFE=724								
720		65						
715		70						
710		75						
705		80						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5B
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
	3" Topsoil	0						
	Straight auger to 8.5 feet.							Offset 20 feet east of B-5A
780		5						
775								
	Sand-significant rock fragments, some silt, trace clay; very dense; tan (Fill).	10	1		21-34-50/4	6"		High N-value due to boulders.
770								
	Sand-some rock fragments and silt, trace clay; firm; brown and tan (Possible Residual)	15	2		9-10-9	6"		
765								
	Partial weather rock sampled as: sand-some silt and rock fragments, trace clay; very dense; tan.	20	3		50/1	0		Sample classification from the materials cut out from auger.
760								
		25	4		50/0	0		
755								
		30	5		50/4	1"		
750	AUGER REFUSAL AT 32 FEET.							No groundwater encountered at the time of drilling.
		35						
745								
		40						

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES
BORING NO.: B-5B
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA
DATE: 11/20/14
JOB NO.: 2014.5138.01 DRILLER: DAVE RIG: CME57 LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
740								
		45						
735								
		50						
730								
		55						
725								
FFE=724								
		60						
720								
		65						
715								
		70						
710								
		75						
705								
		80						FFE = Finish Floor Elevation
700								

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5C
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
780	3" Topsoil	0						
	Sand-significant rock fragments, some silt, trace clay; very dense; brown (Fill).		1		5-5-50/1	6"		High N-value due to boulders
	-trace rock fragments; medium dense	5	2		10-12-13	10"		
775	AUGER REFUSAL AT 6 FEET.							No groundwater encountered at the time of drilling.
770		10						
765		15						
760		20						
755		25						
750		30						
745		35						
740		40						

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES
BORING NO.: B-5C
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA
DATE: 11/20/14
JOB NO.: 2014.5138.01
DRILLER: DAVE
RIG: CME57
LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
735		45						
730		50						
725		55						
FFE=724								
720		60						
715		65						
710		70						
705		75						
700		80						FFE = Finish Floor Elevation

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5D
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	RECOV.	W	NOTES
	3" Topsoil	0						Offset 20 feet east of B-5C
	Straight auger to 5 feet.							
775		5						
	AUGER REFUSAL AT 5 FEET.							No groundwater encountered at the time of drilling.
770		10						
765		15						
760		20						
755		25						
750		30						
745		35						
740		40						

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BORING LOG

CONTRACTED WITH: ROCKDALE COUNTY WATER RESOURCES — BORING NO.: B-5D
PROJECT NAME: WATER STORAGE TANK-CONYERS, GA — DATE: 11/20/14
JOB NO.: 2014.5138.01 — DRILLER: DAVE — RIG: CME57 — LOGGED BY: NP

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	SAMPLES TYPE	SAMPLES BLOWS/6"	SAMPLES RECOV.	SAMPLES W	NOTES
735		45						
730		50						
725								
FFE=724		55						
720		60						
715		65						
710		70						
705		75						
700		80						FFE = Finish Floor Elevation

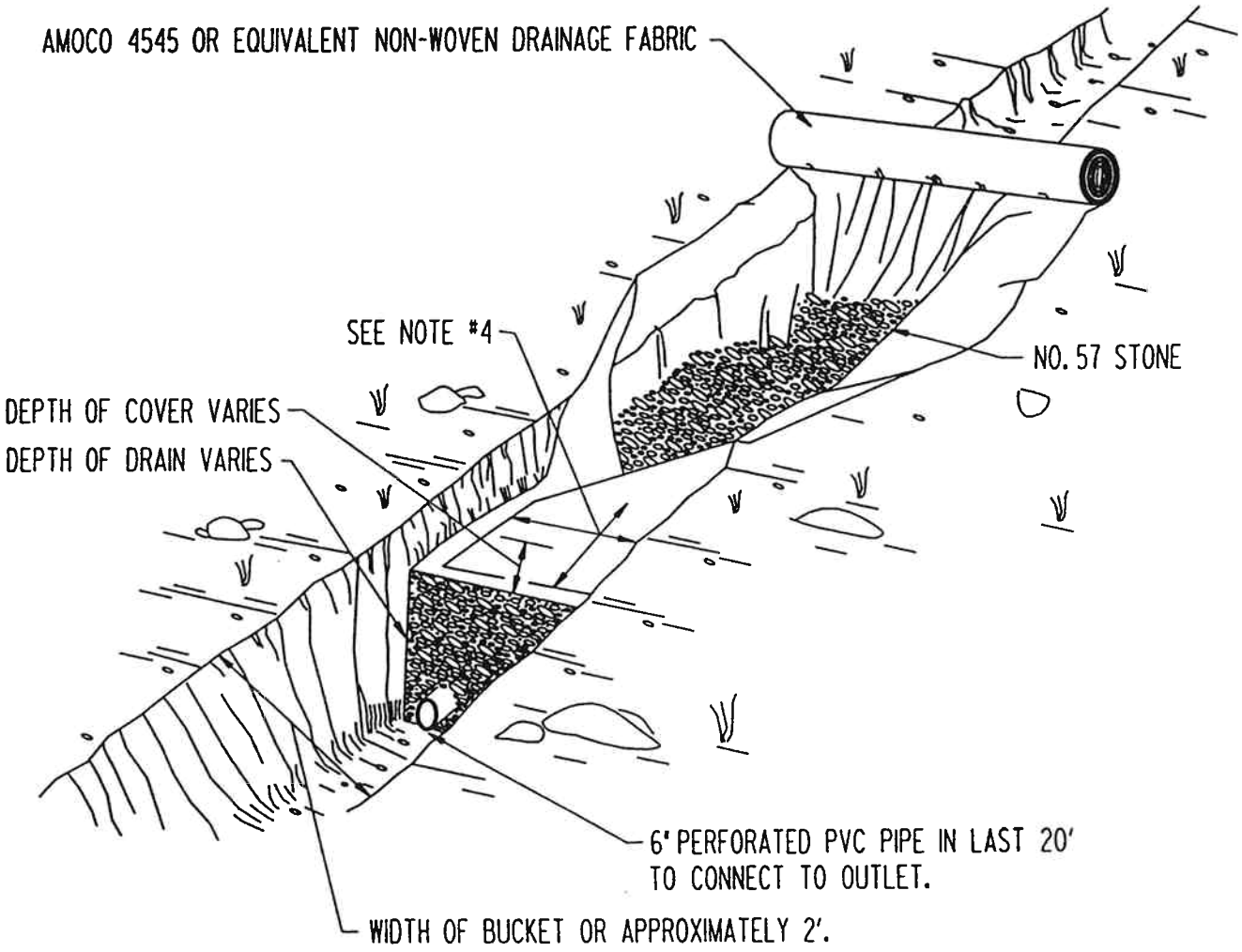
EXPLORATION PROCEDURES

Five (5) SPT (designated as B-1 and B-5) and eleven (11) offset borings were drilled during this subsurface exploration. The approximate locations of the borings are indicated on the attached Boring Location Plan (Figure 1) provided in the Appendix. The SPT borings were performed in general accordance with ASTM D 1586. Soil samples obtained using the split spoon sampler were visually evaluated by the Project Engineer and visually evaluated according to the visual-manual procedure described in ASTM D 2488. A narrative of field operations is included in The Appendix.

Boring locations were determined in the field by the Project Engineer by measuring distances and estimating angles from existing site features and should be considered approximate. The elevations shown on the boring logs were obtained from the provided topographic site plan by interpolation and should be considered *very* approximate.

NOTES:

1. INSTALL TO MINIMUM 1% DOWN GRADIENT.
2. TAMP STONE WITH BACKHOE BUCKET AND COMPACT FILL OVER DRAIN PER SPECIFICATIONS.
3. USE OSHA APPROVED TRENCH BOXES OR OTHER SHORING, AS REQUIRED.
4. LAP FABRIC 2' MINIMUM AT ENDS OF ROLL AND ACROSS TOP.



FRENCH DRAIN DETAIL

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UCOI 109FD

Important Information About Your

Geotechnical Engineering Report

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

The following information is provided to help you manage your risks.

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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the 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.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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 study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 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 construction recommendations included in your report. *Those 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 recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower 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. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing 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 Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors 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 contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors 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 contractors do not 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.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental 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 geoenvironmental 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, a number of 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 ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

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

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