Piedmont Geotechnical, Inc.

286 High Rail Terrace, SE • Leesburg, Virginia 20175
540-882-9350 • PiedmontGeo@aol.com

May 14, 2020

NOVA Parks
Attn: Mr. Todd Hafner
5400 Ox Road
Fairfax Station, Virginia 22039

Re: Geotechnical Engineering Evaluation
Rust Nature Sanctuary Dam Outfall Repairs
802 Children's Center Road
Leesburg, Virginia
PGI No. 2820VA

Dear Mr. Hafner:

Piedmont Geotechnical, Inc., has completed the authorized geotechnical engineering review for proposed outfall repairs at an existing dam embankment. The engineering study was authorized to assist NOVA Parks with the replacement of the outfall pipe on the small dam at the eastern edge of the Rust Nature Sanctuary property. More specifically, it was requested that we provide recommendations as to how best backfill around the outfall pipe when it is replaced.

We have appreciated this opportunity to be of service to you. Should you have any questions regarding the report, or if we may be of further service, please contact our office.

Sincerely,

Piedmont Geotechnical, Inc.

Daniel S. Rom, P.E.
Vice President

DSR/jbp

I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the Commonwealth of Virginia, License No. 12511, Expiration Date: September 30, 2020.

PROPOSED OUTFALL REPAIRS
RUST NATURE SANCTUARY DAM
LEESBURG, VIRGINIA
PGI NO. 2820VA

EXISTING SITE CONDITIONS

The pond embankment is a small dam located near the eastern edge of the Rust Nature Sanctuary property, and is believed to be at least 50 years old. Design details are unavailable. A partial grading plan provided to us shows that the water level in the pond is at elevation 435.65, and the top of the embankment is near elevation 442±. Site drainage is easterly. The exposed portion of the outfall pipe showed it to be of corrugated steel with significant rust and physical deterioration. At the time we performed our field work the earthen embankment supported an uncontrolled growth of shrub-like vegetation with occasional small trees.

PROPOSED CONSTRUCTION

The project consists of the design and implementation of repairs to the outfall system at a small dam near the eastern edge of the Rust Nature Sanctuary property in Leesburg, Virginia. In addition to the replacement of the outfall pipe, we understand that the vegetation on the embankment will be brought under control.

FIELD EXPLORATION AND STUDY

The exploration consisted of making two auger borings (B-1 and B-2) in accordance with ASTM D1452 methods. The approximate test locations are illustrated on the Soil Boring Location Plan in the Appendix. Test locations were established by NOVA Parks, and boring depths were controlled by the nature of the underlying soils. The borings were made on May 8, 2020, and were advanced to depths of 8 feet and 11 feet below existing grade levels. At intervals the soil relative density was tested in accordance with ASTM STP 399, *Dynamic Cone for Shallow In-Situ Penetration Testing* (Sowers and Hedges, 1966).

Laboratory testing included sieve analyses, Atterberg Limits, and natural moisture content of selected samples. The tests were conducted to aid in the visual classification of the samples and to estimate soil shear strength and compaction criteria.

SUBSURFACE CONDITIONS

The underlying geologic formation is mapped as late-Proterozoic-age *Metadiabase Dikes* (Zmd). The metadiabase rock is described as dark green-gray, fine- to medium-grained, and massive to schistose

greenstone. The natural soils underlying the site are mapped as *Rohrersville Cobbly Silt Loam* (12B) and, to a lesser extent, *Catoctin Channery Silt Loam* (40D), according to the Natural Resources Conservation Service (NRCS). The 12B soils are derived from alluvium or colluvium from greenstone rock, whereas the 40D soils are residuum derived from greenstone rock. Both soils have relatively high percentages of gravelly and cobbly constituents. The man-made embankment soils are not classified separately by the NRCS. The observed stratification within the fill embankment is briefly described below:

STRATUM I (organic-bearing topsoil) - includes several inches of dark brown, moist organic-bearing topsoil and turf. Stratum I had a depth of about six inches to ten inches at the boring locations. The relative density was judged to be very loose on the basis of ease of excavation.

STRATUM II - consists of brown or yellow-brown, moist Sandy SILT (ML) with inclusions of gray-green Fat CLAY (CH) or Elastic SILT (MH). The stratum extended to depths of 5.5 feet to 8 feet. The relative density was judged to be loose to medium dense on the basis of cone resistance values of 7 blows per increment. Stratum II is judged to be embankment fill.

STRATUM III - consists of yellow-brown, moist Sandy SILT (ML). The stratum, which included occasional greenstone fragments, was encountered in B-2 below a depth of 8 feet. The relative density was judged to be medium dense on the basis of cone resistance values of 14 to 15 blows per increment. Stratum III is judged to be embankment fill.

STRATUM IV - consists of unclassified dense soil and/or decomposed rock. The material was too dense to be penetrated by hand auger methods. Stratum IV was encountered below Stratum II or III at the boring termination depths. Stratum IV is judged to be original virgin ground corresponding to the NRCS description of Catoctin Channery Silt Loam and USGS description of Metadiabase Dikes .

Free groundwater was not encountered while augering or on completion; however, a small amount of water was observed seeping from a root hole at a depth of 6.5 feet in B-1. Seepage through the existing outfall system was also observed. Seasonal influences such as precipitation, surface runoff, evaporation, and other factors will influence the groundwater level. In order to better define long-term water levels, it would be necessary to monitor conditions over an extended period of time. In our study the boreholes were backfilled on completion with a mixture of soil cuttings and bentonite in order to maintain the integrity of the embankment.

GEOTECHNICAL RECOMMENDATIONS

Stormwater Management Embankment Improvements

The proposed improvements to the existing pond embankment include the replacement of the outfall structure and the removal of vegetation from the embankment. The recommendations which follow apply to embankment preparation, fill placement, and the outfall structure.

Embankment Preparation - If any portion of the embankment subgrade is exposed, all vegetation, root mat, topsoil, and any other compressible or unsuitable material below should be stripped. The clearing should extend at least five feet beyond the toe of the embankment to verify that the entire fill embankment is underlain by suitable natural soils.

After stripping to the desired grade, and prior to fill placement, the stripped surface should be observed by a qualified geotechnical engineer or his authorized representative to aid in identifying localized soft or unsuitable material which must be removed. Objectionable soft or unsuitable material should be removed and replaced with an approved backfill compacted in accordance with the criteria which follow. If any problems are encountered during the earthwork operation, or if site conditions deviate from those encountered during the subsurface exploration, the geotechnical engineer should be notified for additional guidance.

Embankment Fill Placement - We recommend that embankment slopes be designed no steeper than their current configuration. The slope gradients should be feasible using native low- to medium-plasticity soils similar to those sampled in the exploration. It is also recommended that adequate vegetation and erosion control measures be provided to the side slopes.

Embankment fill should consist of soil classified as SC, SM, CL, or ML, per ASTM D2487, with at least 25 percent fines content. Embankment fill soil should be compacted to at least 95 percent of the maximum dry density as obtained in accordance with ASTM D698. Unacceptable fill materials include topsoil, organic soil (OL and OH), high plasticity silt and clay (MH and CH), and excessively coarse-grained soils (SP, SW, GP, GW). Suitable soils are expected to be found on site; however, adjustments to the soil moisture content will generally be required.

In order to establish a vegetative cover on the slopes it is considered acceptable to place a twelve-inch-thick layer of topsoil on the exposed embankment face. The topsoil should be placed in maximum 8-inch loose lifts and should be compacted with at least four passes of a tracked dozer.

Fill soil must not be placed on a frozen surface. All frozen soils must be removed prior to continuation of fill operations. Borrow fill material must not contain frozen soil at the time of placement. All frost-heaved soil must be removed prior to resumption of fill placement. All areas receiving fill should be graded to facilitate positive drainage of free water associated with precipitation and runoff.

All fill materials should be placed in lifts not exceeding 8 inches in loose thickness and moisture-conditioned as stated herein. In some areas excessively soft or loose soils may be encountered for fill subgrades, especially in the winter and spring months. The limits of the fill zones should be well-drained at the time of fill placement; grade control should be maintained throughout the fill placement operations.

We recommend that each soil lift be compacted with a sheepsfoot roller in order to permit adequate bonding between fill lifts. A smooth-drummed roller may be used to seal the fill surface at the end of the construction day or in the threat of precipitation occurs. In such a case the uppermost six inches of the sealed fill must be thoroughly scarified and recompacted with a sheepsfoot roller prior to the placement and compaction of additional fill lifts.

All fill operations should be monitored on a full-time basis by a qualified soil technician to confirm that the minimum compaction requirements are met. A minimum of one compaction test per 2500 square feet of fill area shall be maintained for each lift. The elevation and test location should be clearly identified on the field report.

Drainage Outfall Structure - On the basis of the subsurface exploration and our analyses, we recommend that the outfall structure be supported on spread footing foundations bearing on either suitable firm, natural soil, or on new engineered fill constructed over suitable natural soils. The footings may be designed for a maximum allowable net soil bearing pressure value of 3000 psf.

Principal spillways for the pond, *if included in the design*, should be designed in accordance with applicable County Standards. The design should include placing a concrete cradle beneath the upstream two-thirds (2/3) of the pipe as measured from the riser or inlet structure. The downstream one-third (1/3) of the pipe should be surrounded by a 12-inch layer of open-graded coarse aggregate (VDOT No. 57 or 78 stone) wrapped in a suitable non-woven geotextile having an apparent opening size (AOS) of 70. A drainage blanket at the downstream end of the pipe will serve to collect any seepage along the conduit which could result in a soil piping failure. The drainage pipe should be daylighted through the endwalls into slotted piping.

If existing fill or unsuitable soil types for bearing conditions are found to exist at the foundation level, the base of the excavation should be lowered to suitable bearing. Alternatively, the original bottom-of-footing elevation can be restored by the placement of lean (1000 psi) concrete after the unsuitable soils are removed.

Fill materials should be placed and compacted to the same compaction criteria as embankment fill. It must be recognized that the soil will probably be moisture- and disturbance-sensitive. Therefore, excavation for the outfall structure should proceed expeditiously in order to minimize exposure of the bedding soils. The foundation excavation should be observed and the bearing pressure of the footing subgrade tested by an authorized individual.

Groundwater and Drainage

The extent of construction dewatering will depend on the depth of excavation and prevailing weather conditions. Although hydrostatic groundwater was not encountered within the limited boring depths, there is the potential for groundwater intrusion from perched water near the base of the embankment. The subgrade soils are susceptible to deterioration from water infiltration and effects of construction traffic. For these reasons, the contractor must be prepared to provide construction dewatering.

Adequate drainage must be provided to minimize any increase in moisture content of the foundation soils, and ponding of water must be avoided. The site drainage shall also be such that the runoff onto adjacent properties is controlled properly.

REMARKS

This report has been prepared solely and exclusively to provide guidance to design professionals in developing plans and specifications. It has not been developed to meet the needs of others, such as contractors, and applications of this report for other than its intended purpose could result in substantial difficulties. The consulting engineer cannot be held accountable for problems which occur due to application of this report to other than its intended purpose.

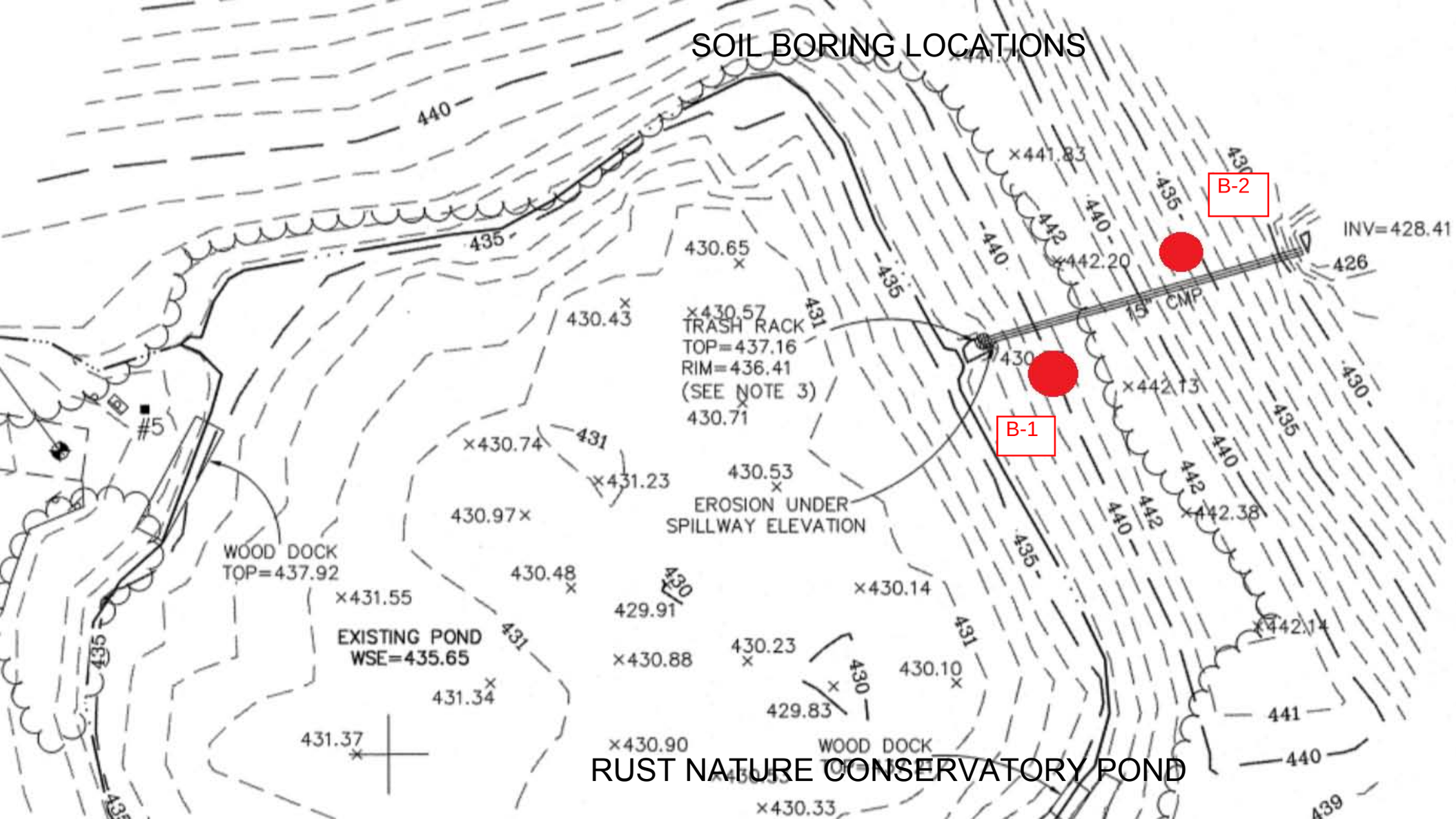
These stated requirements are, of necessity, based on the limited concepts made available to us at the time of the writing of this report and on-site conditions, surface and subsurface, that existed at the time the exploratory borings were made. Further assumption has been made that the limited exploration, in relation both to the areal extent of the site and to depth, is representative of conditions across the site. If conditions contrary to those reported herein are encountered during the design or construction phase our analyses must be reviewed and revised as necessary. It is also recommended that we be given the opportunity to review the plans and specifications in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties implied or expressed.

APPENDIX

1. Soil Boring Location Plan
2. Soil Boring Logs
3. Laboratory Test Results
4. Unified Soil Classification
5. Field Classification
6. Important Information About this Geotechnical Report

SOIL BORING LOCATIONS



RUST NATURE CONSERVATORY POND

Project: **Rust Nature Sanctuary Dam** Project Location: **802 Children's Center Road, Leesburg, Virginia** Project Number: **2820VA**	Log of Boring B-1 **Sheet 1 of 1**

Date(s) Drilled **May 8, 2020**	Logged By **D. Rom**	Checked By **DSR**
Drilling Method **ASTM D1452**	Drill Bit Size/Type **6-in**	Total Depth of Borehole **8 feet bgs**
Drill Rig Type **Hand Auger**	Drilling Contractor **Soil Tech, Inc.**	Approximate Surface Elevation **440**
Groundwater Level and Date Measured **seepage at 6.5 feet**	Sampling Method(s) **grab**	Hammer Data
Borehole Backfill **cuttings & bentonite**	Location **see plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
440	0						Dark brown, moist, organic topsoil - unclassified	
439.2	0.8				ML		Brown, moist, medium dense Sandy SILT with inclusions of green-gray Fat CLAY or Elastic SILT, trace Gravel	
435	5							
			1	13/13	ML		Gray, moist, medium dense Sandy SILT seepage at root ▽	
432	8						Soil boring terminated at 9 feet Refusal on rock	Embankment fill to 8 feet
430	10							
425	15							
420	20							
415	25							
410	30							

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Project: **Rust Nature Sanctuary Dam** Project Location: **802 Children's Center Road, Leesburg, Virginia** Project Number: **2820VA**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **May 8, 2020**	Logged By **D. Rom**	Checked By **DSR**
Drilling Method **ASTM D1452**	Drill Bit Size/Type **6-in**	Total Depth of Borehole **11 feet bgs**
Drill Rig Type **Hand Auger**	Drilling Contractor **Soil Tech, Inc.**	Approximate Surface Elevation **436**
Groundwater Level and Date Measured **dry at completion**	Sampling Method(s) **grab**	Hammer Data
Borehole Backfill **cuttings & bentonite**	Location **see plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
436	0							
435.5	0.5				ML		Dark brown, moist, organic topsoil - unclassified Yellow-brown, moist, loose Sandy SILT with inclusions of green-gray Fat CLAY or Elastic SILT, little Gravel	
431	5		1	7/7				
					ML		Yellow-brown, moist, medium dense SILT, trace Sand, occasional greenstone fragments below 9.5 feet	Embankment Fill to 8 feet
426	10		2	15/14				
425	11						Soil boring terminated at 11 feet Refusal on rock	
421	15							
416	20							
411	25							
406	30							

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Project: **Rust Nature Sanctuary Dam**
Project Location: **802 Children's Center Road, Leesburg, Virginia**
Project Number: **2820VA**

Key to Log of Boring

Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Artificial Fill

SILT, SILT w/SAND, SANDY SILT (ML)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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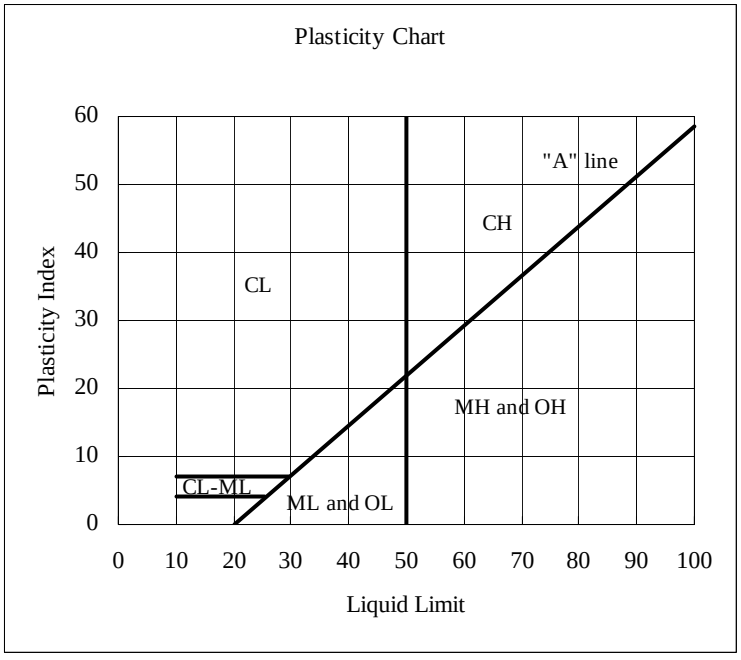
Figure B-1

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

Major Divisions			Group Symbols		Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 Sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols [b]	$C_u = D_{60}/D_{10}$ greater than 4 $C_c = (D_{30})^2/(D_{10}xD_{60})$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or P.I. less than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ greater than 6 $C_c = (D_{30})^2/(D_{10}xD_{60})$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in CL-ML zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 Sieve)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly Organic soils		Pt		Peat and other highly organic soils			



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder. (From Table 2.16 - Winterkorn and Fang, 1975)

Piedmont Geotechnical, Inc.

14735 Wrights Lane • Waterford, Virginia 20197-1601
540-882-9350 • FAX 540-882-3629

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COARSE-GRAINED SOILS
(Silt, Sand, Gravel, and Combinations)

Density

Very Loose	≤5 blows/ft
Loose	6 to 10 blows/ft
Medium Dense	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	≥51 blows/ft

Relative Proportions

Descriptive Term	Percent
Trace	1-10
Little	11-20
Some	21-35
And	36-50

Particle Size Identification

Boulders	≥8 inch diameter	
Cobbles	3 to 8 inches diameter	
Gravel	Coarse	1-3 in
	Medium	½ - 1 in
	Fine	¼ - ½ in
Sand	Coarse	0.6mm - ¼ in
	Medium	0.2mm - 0.6mm (broom straw dia)
	Fine	0.05mm - 0.2mm (human hair dia)
Silt		0.6mm - 0.002mm (can't see grains)

FINE-GRAINED SOILS
(Clay, Silt, and Combinations)

Consistency

Very Soft	≤3 blows/ft
Soft	4 to 5 blows/ft
Medium Stiff	6 to 10 blows/ft
Stiff	11 to 15 blows/ft
Very Stiff	16 to 30 blows/ft
Hard	≥31 blows/ft

Plasticity

Degree of Plasticity	Plasticity Index
None to slight	0-4
Slight	5-7
Medium	8-22
High to Very High	>22

Classifications on logs are made by visual inspection of samples.

Standard Penetration Test - Driving a 2.0-inch OD, 1⅜-inch ID, sampler a distance of 1.0 foot into undisturbed soil with a 140-pound hammer free-falling a distance of 30.0 inches. It is customary for Piedmont Geotechnical, Inc., to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded on the boring log for each 6 inches of penetration (Example - 7/9/10). The Standard Penetration resistance value can be obtained by adding the last two figures (i.e. 9 + 10 = 19 blows/ft). (ASTM D-1586-84)

Stratum Changes - In the column "Soil Descriptions" on the boring log, the horizontal lines represent stratum changes. A solid line (—) represents an actually observed change, and a dashed line (---) represents an estimated change.

Ground Water - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, tides, etc., may cause changes in the water levels indicated on the logs.

SUMMARY OF LABORATORY TESTING

RUST NATURE CONSERVATORY

PROJECT NO.	2820VA	**SAMPLE DATE**	-	**JAY KAY TESTING, INC.**
SAMPLES:	2	**LOCATION:**	*Leesburg, VA*	5233 Lehman Road, Suite 110
REPORT:	05/14/20	**REMARKS:**	-	Spring Grove, PA 17362
				Phone: (814) 404-9283

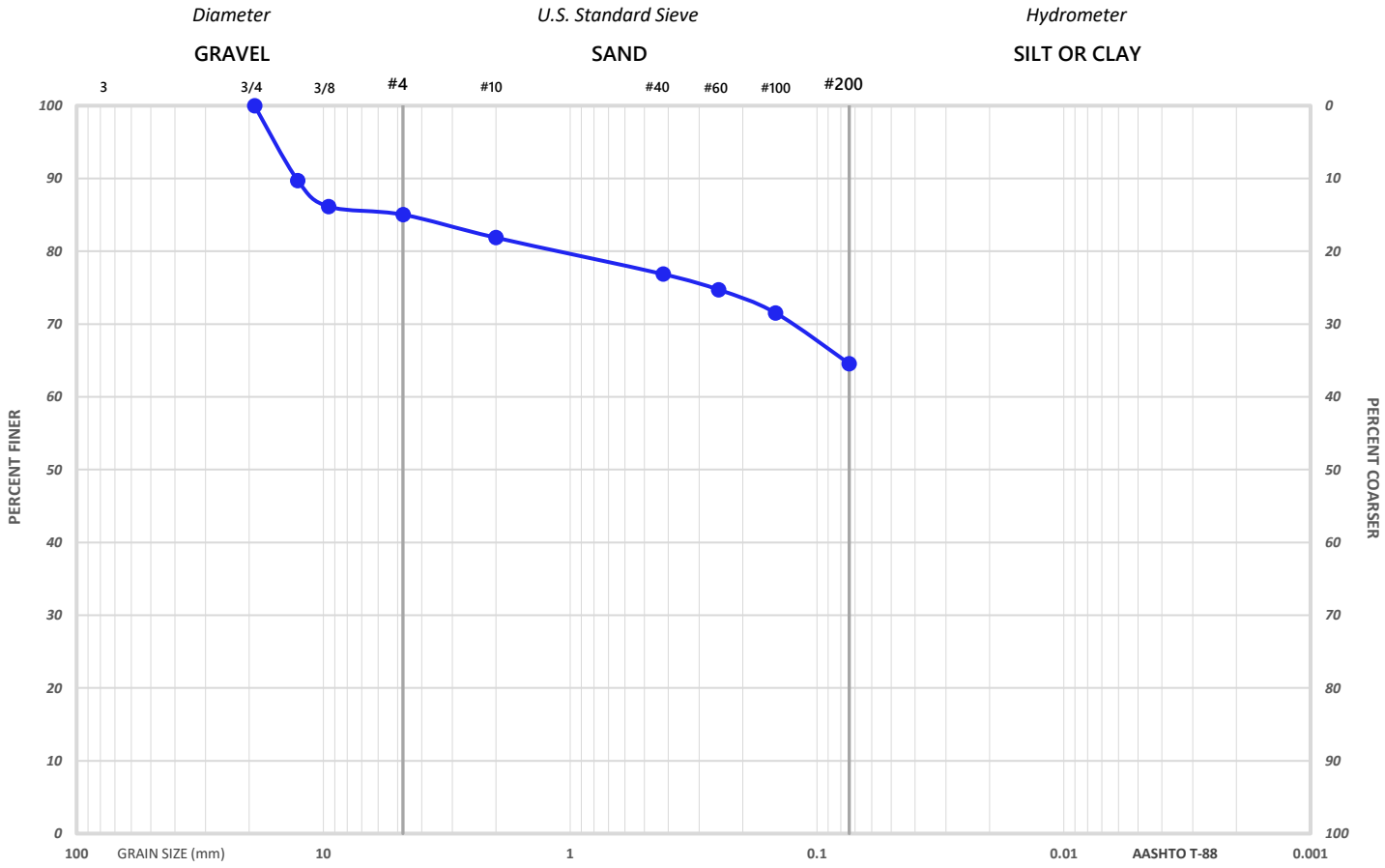
BORING	SAMPLE	DEPTH	MC %	OM %	LL	PL	PI	% FINES	USCS
B-2	Bag	6.0	25.4	-	45	27	18	64.5	ML
B-2	Bag	9.0	25.5	-	31	23	8	86.7	ML

Jay Kay Testing, Inc. (AASHTO-Accredited)

RUST NATURE CONSERVATORY

Boring:	**B-2**	Project No.:	2820VA
Sample:	**Bag**	Sample Date:	-
Depth:	**6.0'**	Location:	*Leesburg, VA*

JAY KAY TESTING, INC.
5233 Lehman Road, Suite 110
Spring Grove, PA 17362
Phone: (814) 404-9283



GRAIN SIZE ANALYSIS

Diameter	75.0	50.8	37.5	25.4	19.0	12.7	9.51	4.75	2.0	0.42	0.25	0.147	0.074
Sieve Size	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	**# 200**
% Passing	-	-	-	-	100.0	89.7	86.1	85.0	81.9	76.9	74.7	71.5	**64.5**

% GRAVEL	% SAND	*Coarse Gravel*	*Fine Gravel*	*Coarse Sand*	*Medium Sand*	*Fine Sand*	CC	CU
15.0	**20.5**	-	15.0	3.1	5.0	12.4	-	-

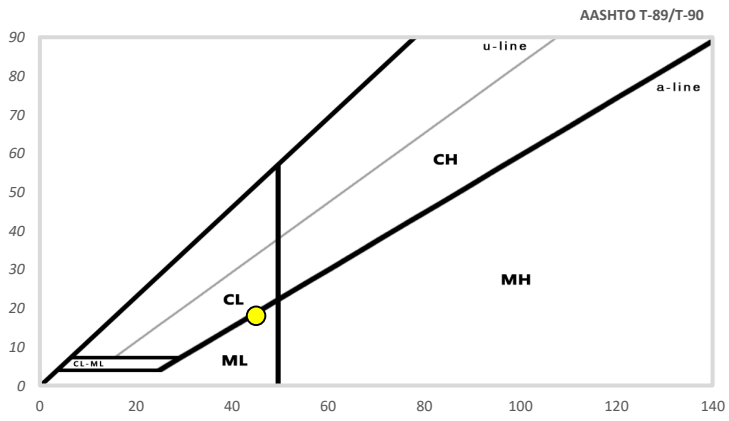
Moisture Content	25.4	Organic Content	-
pH	-	Other	-

ATTERBERG LIMITS

Liquid Limit	45
Plastic Limit	27
Plasticity Index	18

CLASSIFICATION

AASHTO	A-7-6
USCS	ML



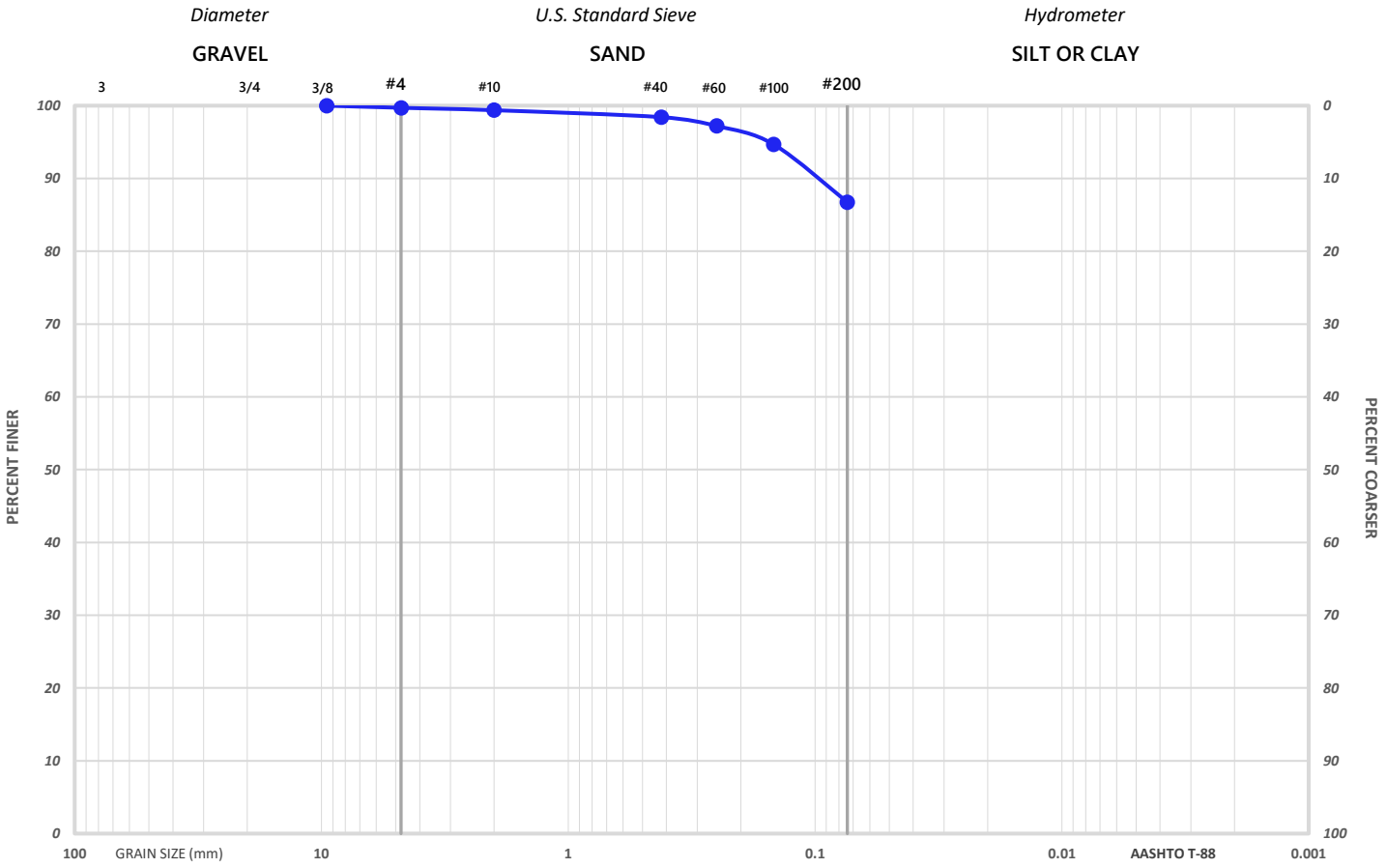
SOIL DESCRIPTION

Brown sandy SILT with gravel

RUST NATURE CONSERVATORY

Boring:	**B-2**	Project No.:	2820VA	
Sample:	**Bag**	Sample Date:	-	
Depth:	**9.0'**	Location:	*Leesburg, VA*	

JAY KAY TESTING, INC.
5233 Lehman Road, Suite 110
Spring Grove, PA 17362
Phone: (814) 404-9283



GRAIN SIZE ANALYSIS

Diameter	75.0	50.8	37.5	25.4	19.0	12.7	9.51	4.75	2.0	0.42	0.25	0.147	0.074
Sieve Size	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	**# 200**
% Passing	-	-	-	-	-	-	100.0	99.7	99.4	98.4	97.2	94.7	**86.7**

% GRAVEL	% SAND	*Coarse Gravel*	*Fine Gravel*	*Coarse Sand*	*Medium Sand*	*Fine Sand*	CC	CU
0.3	**13.0**	-	0.3	0.3	1.0	11.7	-	-

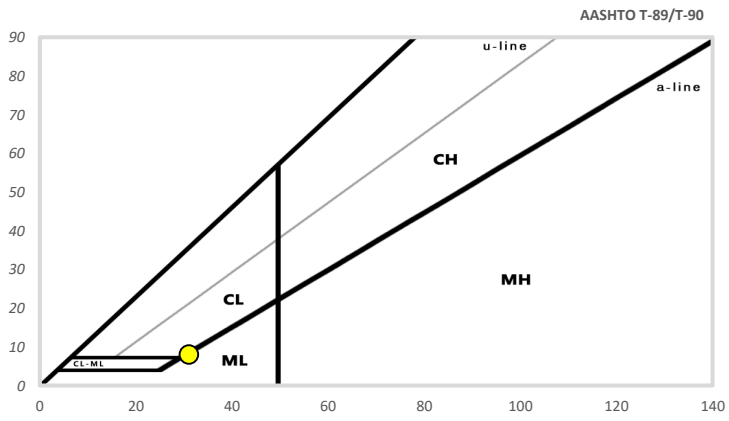
Moisture Content	25.5	Organic Content	-
pH	-	Other	-

ATTERBERG LIMITS

Liquid Limit	31
Plastic Limit	23
Plasticity Index	8

CLASSIFICATION

AASHTO	A-4
USCS	ML



SOIL DESCRIPTION

Brown SILT

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.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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