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January 22, 2013

Paradigm Engineers and Constructors
P.O. Box 436223
Louisville, Kentucky 40253

Attention: Mr. Blaine Van Gansbeke

Re: Geotechnical Engineering Services
Proposed Entrance Canopy
Overton Brooks VA Medical Center
Shreveport, Louisiana
PSI File Number: 0275738

Dear Mr. Van Gansbeke:

Professional Service Industries, Inc. is pleased to transmit our Geotechnical Engineering Report for the referenced project. This report includes the results of field and laboratory testing, and recommendations for foundation and pavement design, as well as general site development.

We appreciate the opportunity to perform this Geotechnical Study and look forward to future involvement during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Alfred E. Johnson 22 Jan 2013

Alfred E. Johnson, P.E.
Project Engineer

Reviewed by: John O. Gordon, P.E.
Principal Consultant

GEOTECHNICAL ENGINEERING REPORT

PROPOSED ENTRANCE CANOPY
OVERTON BROOKS VA MEDICAL CENTER
SHREVEPORT, LOUISIANA

PSI FILE NUMBER 0275738

PREPARED FOR

PARADIGM ENGINEERS AND CONSTRUCTORS
P.O. BOX 436223
LOUISVILLE, KENTUCKY 40253

BY
PROFESSIONAL SERVICE INDUSTRIES, INC.

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PROJECT INFORMATION

Project Authorization

Professional Service Industries, Inc. (PSI) has completed a geotechnical exploration for the proposed Entrance Canopy to be erected at the VA Medical Center in Shreveport, Louisiana. Our services were authorized by Randy Hudson, General Manager, of Paradigm Engineers and Constructors on January 4, 2013. Work was generally accomplished in accordance with PSI proposal number 85343 dated December 28, 2012.

Project Description

Limited project information and a demolition plan sheet were provided by Paradigm Engineers and Constructors. The proposed canopy will be will be about 180 feet in length. Maximum design loads were not available at the time of this report.

The geotechnical recommendations presented in this report are based on the available project information, equipment locations, and the subsurface materials described in this report. If any of the noted information is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to allow foundation recommendations to be made for the shelter. Our scope of services included drilling 3 soil test borings at the site to depths of 20 feet below the surface, select laboratory testing, and preparation of this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- Foundation types and allowable design parameters.
- Comments regarding factors which will impact construction and performance of the proposed construction.

The scope of services did not include an environmental assessment for determining the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Prior to development of this site, an environmental assessment is advisable.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The proposed shelter is to be located at the northern terminus of Veterans Way at the Overton Brooks VA Medical Center in Shreveport, Louisiana. The site latitude and longitude are approximately N 32.5028°and W 93.7215°, respectively.

Subsurface Conditions

The boring locations and depths were recommended PSI. The borings were advanced utilizing hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished in general accordance with ASTM procedures.

All borings were done below concrete pavement ranging in thickness from 6.5 to 11 inches. Soils encountered in boring B-1 and B-3 generally consisted of stiff and very stiff lean clays throughout the exploration depths. Boring B-2 was composed of very soft to medium lean clay in the upper 18 feet followed by stiff lean clay to boring termination depth.

Select soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished generally in accordance with ASTM procedures.

The previous subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring log included in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, strata limits, penetration resistance, locations of the samples and laboratory test data.

The strata limits shown on the boring logs represent the conditions only at the actual boring locations and indicate the approximate boundary between subsurface materials. Variations may occur and should be expected between boring locations.

Samples not altered by laboratory testing will be retained for 30 days from the date of this report and then discarded.

Groundwater Information

No groundwater was noted in the borings on completion of the drilling operations. Actual groundwater level may vary during other times of the year depending upon climatic and rainfall conditions. We recommend the contractor determine the actual groundwater level at the site at the time of construction.

EVALUATION AND RECOMMENDATIONS

Discussion

Based on the results of our investigation it appears either a shallow foundation system using spread footings or a deep foundation system using drilled and cast in place shafts can be used to support the proposed canopy.

Site Preparation

If footings are used, concrete, soft or unstable soils and any deleterious material in the foundation areas should be stripped. PSI recommends stripping be limited to the portion of the site where work is to commence immediately in order to minimize exposure of the future construction areas to water or excessive drying. After stripping, the exposed soils in the footing bearing area should be scarified to a depth of at least 8 inches below the surface and recompacted to 95% of the Standard Proctor (ASTM D-698) maximum dry density or greater.

Bearing surfaces should be tested and documented by a representative of the geotechnical engineer.

Foundation Recommendations

Spread Footings - Spread footings bearing at least 2 feet below grade may be designed using an allowable bearing capacity of 1,250 pounds per square foot. A minimum dimension of 2 feet is recommended for spread footings.

The uplift resistance of foundations will be limited to the weight of the foundation concrete and the compacted soil above it. The soil placed over and against the foundations should be compacted to at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density. For design purposes, the ultimate uplift resistance should be based on the effective unit weights of the compacted soil and concrete. Above the free groundwater table, 120 and 150 pounds per cubic foot (pcf) may be used for soil and concrete, respectively. The soil value should be reduced by a factor of safety of 2.0 for the allowable uplift load resistance.

Friction resistance between the base and soil in conjunction with the passive soil resistance will resist the horizontal loads on foundations. For concrete foundations situated 2 feet or deeper in the natural clay soil, the ultimate passive soil resistance value for transient lateral loading is estimated to be 2,500 pounds per square foot. The passive resistance of any un-compacted fill material should be neglected.

A friction coefficient of 0.4 may be used to calculate the ultimate frictional resistance between concrete foundation bases and the underlying clay soil. It should be noted foundations subject to

significant uplift loading may experience reduced frictional resistance due to a lack of normal force. A minimum factor of safety of 2.0 is recommended to arrive at the allowable values.

Based on the boring logs, soft soils will likely be encountered around the location of boring B-2 and possibly elsewhere in which case it may be necessary to undercut soils below the footings to a firmer bearing stratum such as that found at 3 to 4 below grade in boring B-2.

After opening, the footing excavations should be inspected to document that soils loosened during the excavation process have been removed and competent undisturbed soils exist on the bottom and sides of each excavation. After inspection, concrete should be placed as quickly as possible to avoid exposure of the soils to wetting and drying and to reduce relaxation and/or instability of the sides of the excavation.

Drilled Shafts – Shafts used for the canopy should be constructed to achieve a minimum center-to-center spacing of 3 drilled shaft diameters (based on the largest drilled shaft under consideration) between adjacent drilled shafts.

The ultimate values given in the following table should be adjusted by a minimum factor of safety of 2.0 or an appropriate factor of safety as dictated by the relevant standards.

Drilled Shaft Design Parameters

Depth (feet below existing grade)	Ultimate Skin Friction (Kips/Square Foot)	Ultimate End Bearing (Kips per Square Foot)
0 to 4	neglect	neglect
4 to 18	0.28	4.5

*Note: Ultimate end bearing values are only valid below the depth of 4 shaft diameters.

The structural engineer must account for lateral loading of the drilled shafts in the design process. The geotechnical information in the following table provides recommended parameters for use in the program LPILE for lateral load evaluation of the drilled shafts. If desired, PSI can perform a lateral analysis once preliminary foundation sizes and depths are determined.

Drilled Shaft Lateral Design Parameters

Depth (feet below existing grade)	Material	Moist Unit Weight* (pcf)	Cohesion (ksf)	Lateral Soil Modulus (pci)	ϵ_{50} Strain Value
0 to 18	Medium Clay	120	0.50	100	0.01

*If submerged use 58 pcf.

The length of the shaft and the penetration into the bearing stratum should be determined using the recommended side friction and end bearing values. Once the design is finalized, PSI should be given the opportunity to check the final length, embedment depth and bearing elevation.

General Pier (Shaft) Construction Recommendations

The ability of the drilled pier foundations to resist lateral loading and overturning moment is based on mobilization of the full in-situ soil strength from the ground surface to depths below the base of the drilled shaft. Loosening and sloughing of the soils within the sides and/or base of the drilled shaft excavations or failure to remove accumulated loose soils at the base of the drilled shaft excavations will degrade the soil strength and may lead to excessive foundation deflections and unsatisfactory foundation performance.

Concrete placed in the drilled pier excavations should have a high slump (about 6 inches) to minimize the potential for the formation of voids. The concrete mix should be designed to attain the required strength when placed at such a slump. Concrete should be placed via a tremie or pumped to the bottom of the drilled pier excavation.

The above recommendations assume that the drilled piers have adequate structural capacity. The structural components (reinforcing steel and concrete) of the drilled pier foundations should be designed by the project structural engineer.

Upper soils containing sandy seams may tend to slough during shaft construction. Casing may be necessary to reduce the potential sloughing. Further, we note groundwater levels may require dewatering operations be performed to allow drilled shaft construction or the shafts may have to be installed by slurry drilling methods to avoid the requirement for dewatering for shafts extending below the water table. The drilled shaft contractor chosen for this project should be experienced locally with dewatering methods, drilling under slurry, and drilling in the local soil types. Dewatering and slurry drilling methods should be the responsibility of the drilled shaft contractor.

Settlement

Settlement under footings not exceeding the recommended allowable bearing capacity should not exceed 1 inch with differential settlement between adjacent footings being less than one half of the total settlement. Lesser settlement is expected for shafts.

CONSTRUCTION CONSIDERATIONS

It is recommended PSI be retained to provide observation and testing of construction activities involved in the foundations. PSI cannot accept any responsibility for any conditions which deviated

from those described in this report, or for the performance of the foundation if not engaged to also provide construction observation and testing for this project to ensure that the recommendations presented herein are implemented.

Moisture Sensitive Soils/Weather Related Concerns

The upper soils encountered at this site can be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the clay soil can cause significant reduction in the soil strength and support capabilities. In addition, soils which become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be necessary to provide for adequate drainage and rapid runoff of rainwater throughout construction. Excavations should be sloped to a retention area and pumped dry as soon as possible.

Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal safety or other regulations.

REPORT LIMITATIONS

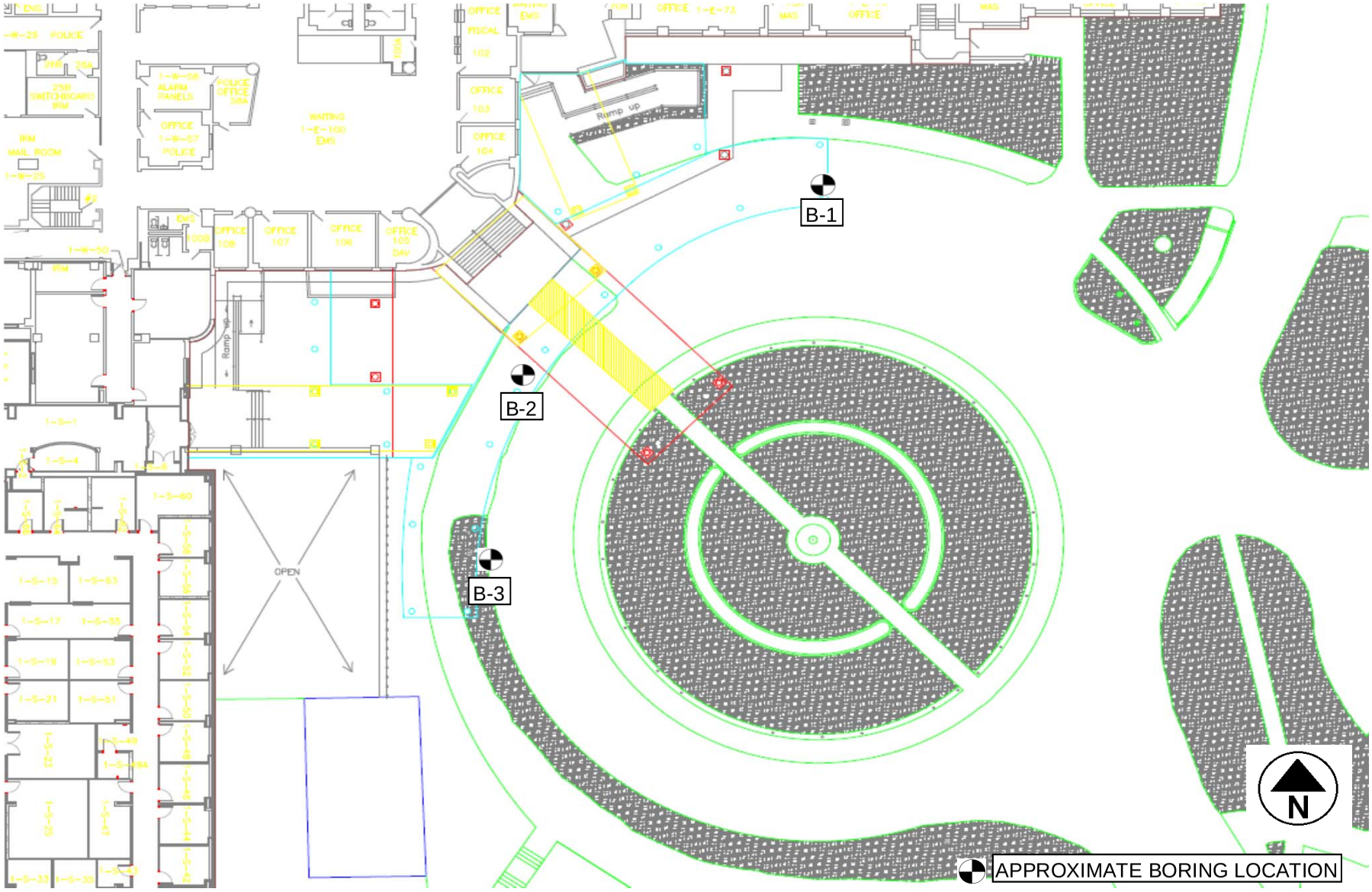
The recommendations submitted in this report are based on the available subsurface information obtained by PSI. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If

PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

PSI warrants the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, PSI should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. Following review, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Paradigm Engineers and Constructors for the specific application to the proposed entrance canopy to be constructed at the Overton Brooks VA Medical Center in Shreveport, Louisiana.

APPENDIX



psi Information To Build On
Engineering • Consulting • Testing
4123 Curtis Lane
Shreveport, Louisiana 71109

Project Name:	Overton Brooks VAMC New Canopy
Project Location:	Shreveport, Louisiana
PSI Project # :	0275738
Client:	Paradigm Engineers and Contractors
Date:	January 2013

Boring Location Plan

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-1

Project Name: Overton Brooks VAMC New Canopy

Date of Boring: January 13, 2013

Site: Shreveport, Louisiana

Project No: 0275738

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface - 10 inches Concrete/2 inches Gravel											
Stiff Tan Red Sandy Lean Clay (CL)		ST	_	_	3.0	_	22	40	19	69	_
	5	ST	_	_	1.0	_	25	_	_	_	_
Stiff Tan Gray Red Lean Clay (CL)		ST	_	1.12	1.25	100.9	22	42	21	_	_
Becoming Very Stiff	10	ST	_	2.18	3.0	97.2	27	_	_	_	_
Very Stiff Tan Gray Sandy Clay (CL)	15	ST	_	_	4.0	_	21	_	_	_	_
	20	ST	_	_	2.0	_	21	_	_	_	_
Boring Terminated at 20 Feet Groundwater Not Encountered	25 30 35 40 45 50										

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-2

Project Name: Overton Brooks VAMC New Canopy

Date of Boring: January 13, 2013

Site: Shreveport, Louisiana

Project No: 0275738

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface - 11 inches Concrete/5 inches Gravel											
Very Soft Brown Gray Sandy Lean Clay (CL)		SS	2	–	–	–	27	36	16	65	–
Becoming Medium	5	ST	–	0.53	0.5	102.7	23	42	22	–	–
		ST	–	0.50	2.25	99.6	24	–	–	–	–
	10	ST	–	–	0.5	–	26	–	–	–	–
	15	ST	–	–	0.5	–	27	–	–	–	–
Changing to Stiff	20	SS	17	–	–	–	22	–	–	–	–
Boring Terminated at 20 Feet Groundwater Not Encountered	25 30 35 40 45 50										

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-3

Project Name: Overton Brooks VAMC New Canopy

Date of Boring: January 13, 2013

Site: Shreveport, Louisiana

Project No: 0275738

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface - 6.5 inches Concrete											
Stiff Brown Sandy Lean Clay (CL)		SS	11	–	–	–	15	41	20	69	–
		SS	12	–	–	–	12	–	–	–	–
Becoming Very Stiff and Red Brown	5	ST	–	2.36	4.5	111.3	13	41	21	–	–
Changing to Stiff		SS	15	–	–	–	10	–	–	–	–
Gray Brown	10	SS	17	–	–	–	14	–	–	–	–
Very Stiff Brown Gray Clay (CL)	15	SS	25	–	–	–	23	–	–	–	–
	20	ST	–	–	4.5	–	24	–	–	–	–
Boring Terminated at 20 Feet Groundwater Not Encountered	25 30 35 40 45 50										

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N:	Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split-spoon.
Qu:	Unconfined compressive strength, tsf.
Qp:	Penetrometer value, index value of unconfined compressive strength, tsf.
Mc:	Water content, %.
PL:	Plastic limit, %.
LL:	Liquid Limit, %.
PI:	Plasticity Index.
γd:	Natural dry density, pcf.
▽	Groundwater level observed at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon – 1 3/8" I.D., 2" O.D., except where noted.
ST:	Shelby Tube – 3" O.D., except where noted.
AU:	Auger Sample.
DB:	Diamond Bit.
CB:	Carbide Bit.
WS:	Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION (Terzaghi & Peck, 1948)

TERM (COHESIONLESS SOILS)	STANDARD PENETRATION RESISTANCE
Very Loose	0 – 4
Loose	4 – 10
Medium	10 – 30
Dense	30 – 50
Very Dense	Over 50

TERM (COHESIVE SOILS)	Qu – (TSF)
Very Soft	0 – 0.25
Soft	0.25 – 0.50
Medium	0.50 – 1.00
Stiff	1.00 – 2.00
Very Stiff	2.00 – 4.00
Hard	4.00+

PARTICLE SIZE (ASTM D2487 AND D422)

Boulders	≥ 12 in. (300mm)	Medium Sand	<2mm (10 sieve) to 425μm (#40 sieve)
Cobbles	< 12 in.(300mm) to 3 in. (75mm)	Fine Sand	<425μm (#40 sieve) to 75μm (#200 sieve)
Gravel	< 3 in. (75mm) to 4.75mm (#4 sieve)	Silt	<75μm (#200 sieve) to 5μm
Coarse Sand	<4.75mm (#4 sieve) to 2mm (#10 sieve)	Clay	<5μm