Exhibit Z. Ruston Industrial Park Preliminary Geotechnical Engineering Report

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May 5, 2017

Ruston Industrial Park Preliminary Geotechnical Engineering Report

City of Ruston
P.O. Box 2069
Ruston, LA 71273

Attn: Ms. Kristi Lumpkin

Re: Preliminary Geotechnical Site Characterization Report
Ruston Industrial Park Site
Lincoln Parish, Louisiana
PSI Project Number: 0257655

Dear Ms. Lumpkin:

Professional Service Industries, Inc. (PSI) is pleased to submit our Preliminary Geotechnical Site Characterization Study for the Ruston Industrial Park Site Study. This report includes the results of our field exploration and laboratory testing, as well as information regarding the compatibility of the subject site with industrial development, suitability of soils for building foundations and on-site roadways, requirements for soil augmentation for construction of a typical 100,000 square foot industrial manufacturing building, and depth of groundwater.

We appreciate the opportunity to perform this Preliminary Geotechnical Site Characterization Report. If you have any questions pertaining to this report, please contact our office at (318) 387-2327.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Ali M. Hijazi
Branch Manager

David F. Loyless
Project Manager

Reda M. Bakeer, PhD, PE
Senior Vice President

Name: Reda M. Bakeer, PhD, PE
Date: May 5, 2017
License No.: 27123
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PROJECT INFORMATION

Project Authorization

Table 1 summarizes the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI).

TABLE 1: Project Authorization History

Document and Reference No.	Date	Requested/Provided By
Request for Proposal	2/6/2017	Mr. Joseph Yarbrough of CSRS
PSI Proposal Number: 202000	2/13/2017	Mr. Ali Hijazi of PSI
Notice to Proceed	3/30/2017	Ms. Kristi Lumpkin of the City of Ruston

Project Description

The primary objectives for this preliminary report are to provide general information regarding the compatibility of the subject site with industrial development, suitability of the soils for building foundations and on-site roadways, requirements for soil augmentation for construction of a typical 100,000 square foot industrial manufacturing building, and the depth of groundwater at the time of the investigation. This general geotechnical site characterization report provides an initial baseline of the site subsurface conditions that will likely be encountered during future site development. However, as with any geotechnical investigation, and particularly in this case given the size of the subject site, differences in grades across the site, and the limited number of exploration locations, variations in the subsurface conditions may exist and should be expected between and away from the exploration locations. Additionally, there remains a distinct possibility that other conditions may exist within the boundaries of the site that were not encountered during the field exploration.

PSI was provided with Google Earth location files and site maps depicting the boundaries of the subject site. It is understood that the site will likely be developed as a petrochemical plant, and that it may include structures such as tanks, pipe racks, and manufacturing buildings. Information provided by CSRS indicates that the westernmost portion of the property consisting of about 47 acres is presently in a low-lying area. It is understood that this portion of the site will likely not be utilized for the placement of structures due to its elevation limitations, and therefore, subsurface exploration in this area of the property was not requested at this time.

No site or project specific data with regard to the proposed development or structures was available at the time of this preliminary report. It was requested that PSI perform a limited, preliminary assessment of the site, as the specific sizes, locations, and structural loads of future buildings, equipment, and other features have not been determined at this time. It was further requested that PSI provide the approximate load bearing capacity of a 14-inch square concrete pile, 14-inch diameter steel pipe pile, or other similar commonly-used geotechnical support structures typically used for this type of construction.

Detailed loading information was not provided to PSI prior to the preparation of this report. Based on topographical information provided by the Client, as well as the approximate elevation data obtained from Google Earth, it appears that the present ground surface elevation varies by

up to 80 feet across the site. Therefore, it is anticipated that substantial new cut and/or operations fill may be required to bring the undeveloped areas of the site to relatively level design grades.

The preliminary geotechnical discussion presented in this report is based on the available project information and the subsurface materials described herein. The opinions and information presented in this report are preliminary in nature, are based on a limited geotechnical exploration, and should not be used for design or construction. If any of the information noted above is incorrect, please inform PSI in writing so that we may amend the comments and discussion presented in this report if appropriate and if desired by the Client.

Purpose and Scope of Services

The purpose of this preliminary study was to explore the subsurface conditions at the site and prepare a geotechnical discussion for use in evaluation of the general suitability of the subject property for support of conventional spread footings and deep foundations elements. PSI's contracted scope of services included conducting one soil boring and two Cone Penetrometer Test (CPT) soundings, performing select laboratory testing on the samples obtained from the boring, and preparing this Preliminary Geotechnical Site Characterization Study Report. However, the exploration program was subsequently modified in the field by PSI to include four additional CPT soundings. This report briefly outlines the laboratory testing procedures, presents available project information, describes the site and subsurface conditions, and presents preliminary geotechnical discussions and commentary. It should be noted that results of the analyses included in this report are based on the limited number of borings and CPT soundings performed at random and accessible locations within the approximately 157-acre property and that these values may not be representative of the entire site. They are intended to be used only for feasibility studies, planning, and cost estimating purposes and should not be used in any formal designs unless they are confirmed with a more comprehensive and project-specific geotechnical investigation.

It should be noted that a limited number of borings and soundings were conducted to evaluate the subject property. In view of this, and considering the size of the project site, some variations in subsoil conditions likely exist between and away from the boring/sounding locations. The geotechnical discussion provided in this preliminary report is based on the limited number of borings performed and may not apply to all parts of the site or to a particular structure. Additional borings should be performed within the footprint of each structure prior to design and construction in order to verify the subsoil conditions and develop specific geotechnical recommendations.

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

Additionally, PSI did not provide any service to investigate or detect the presence of moisture, mold, or other biological contaminants within the project area, or any service that was designed or intended to prevent or lower the risk of the occurrence or amplification of the same. The Client should be aware that mold is ubiquitous to the environment, with mold amplification occurring when building materials are impacted by moisture. The Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur or continue to occur in the

presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

FIELD AND LABORATORY PROCEDURES

PSI's contracted scope of services included drilling one traditional rotary boring to a depth of approximately 40 feet and performing two CPT soundings to a depth of about 100 feet each at random and accessible locations within the project site. However, practical refusal was encountered in the CPT soundings (Soundings CPT-1 and CPT-2) at depths ranging from 36 feet to 38 feet, and three additional CPT soundings (Soundings CPT-1-2, CPT-1-3, and CPT-1-4) were conducted in the area of Sounding CPT-1 in an effort to penetrate to the proposed depth of 100 feet. Despite these additional efforts, none of the additional CPT soundings were able to penetrate beyond a depth of approximately 52 feet. In view of the practical refusal conditions encountered at the CPT sounding locations, PSI attempted to extend the traditional auger boring beyond the scope depth of 40 feet. However, the boring encountered auger refusal at a depth of about 50 feet, whereupon a sixth CPT sounding (Sounding CPT-3) was performed in the area of Boring B-1 in an effort to gather data to 100 feet. This additional CPT sounding encountered practical refusal at a depth of about 36 feet. It should be noted that practical refusal is defined by both the subsoil conditions and rig specifications. CPT soundings are terminated when significant penetration resistance is encountered that could damage the electronic sensors of the cone tip or sleeve. Therefore, it is recommended that if future geotechnical investigations of the site require deeper borings or soundings, a heavier drilling rig should be utilized. The Boring/Sounding Location Plan included in the Appendix should be consulted for the approximate relative locations of the boring and soundings.

The boring and sounding locations and original depths were selected by PSI and were located in the field by PSI personnel using a site plan and handheld GPS equipment. The boring and soundings were performed using a Geoprobe 7822DT ATV drilling rig. Hollow-stem auger drilling techniques were used to advance the borehole. Samples were generally obtained continuously from the ground surface to a depth of about 10 feet, and at maximum intervals of five feet thereafter.

The soil boring was sampled using the Standard Penetration Test (ASTM D1586) and Shelby Tube samplers (ASTM D1587). The samples were identified according to boring number and depth, placed in polyethylene plastic wrapping to reduce moisture loss, and transported to PSI's laboratory in West Monroe, Louisiana. The CPT soundings were performed in general accordance with ASTM D5778.

All samples obtained during the field exploration were visually classified and evaluated by experienced geotechnical personnel upon arrival at the laboratory. Selected soil samples were tested in the laboratory to determine material properties for our evaluation. The limited laboratory testing program included water content, Atterberg limits, percent passing the U.S. Standard No. 200 sieve, and unconfined compressive strength testing. Additional estimates of unconfined compressive strength were obtained through the use of a hand penetrometer.

The laboratory testing was conducted in general accordance with applicable ASTM procedures. The results of the laboratory tests are presented in the Boring Logs in the Appendix. The

samples which were not altered by laboratory testing will be retained for 60 days from the date of this report and will then be discarded.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The approximately 157-acre site is located on the north side of McDonald Avenue and Beacon Light Road in Ruston, Louisiana. The Latitude and Longitude near the center of the site are approximately N 32.53043° and W 92.59456°, respectively. At the time of PSI's field exploration, the property was heavily-wooded with several cleared access trails which were used to access the randomly selected exploration locations. The property is generally bounded by McDonald Avenue and Beacon Light Road to the south, an existing single-track railroad to the north, and undeveloped properties to the east and west. As previously discussed, some areas of the site appear to vary in elevation by up to 80 feet.

Site Geology

The United States Geological Survey (USGS) maps the site as located within the Cockfield and Cook Mountain Formations. The Cockfield Formation is generally characterized by lignitic clays, silts, and sands, with some sideritic glauconite and ironstone. The Cook Mountain Formation is generally characterized by sideritic clay with some ironstone, as well as clays, fossiliferous marl, and some ironstone concretions. It should be noted that due to the size of the site, practical refusal encountered at relatively shallow depths, variations in geological formations, and limited exploration locations, all of the characteristics of the above formations may not be reflected in the soil borings and CPTu soundings of this limited investigation.

Subsurface Conditions

Based on the field observations and the results of the limited laboratory testing, the soils were classified and the boring and CPT logs were developed. The boring log is presented in the Appendix along with a key to the terms and symbols used on the logs. It should be noted that due to the size of the site, variations existed between the subsoil conditions encountered at the presently accessible boring and CPT locations. In view of the site size and the limited number of borings performed, generalized subsurface profiles for each exploration location are presented in Tables 2 through 5.

TABLE 2: Generalized Soil Profile (Soundings CPT-1 through CPT-1-4)

Depth Range (feet)[1]	Approximate Elevation (feet)[2]	Soil Description
0 to 2	+280 to +278	Medium Dense to Dense Sands
2 to 12	+278 to +268	Firm to Stiff Clays
12 to 14	+268 to +266	Medium Dense to Dense Sands
14 to 35	+266 to +245	Stiff to Very Stiff Clays
35 to 52	+245 to +228	Medium Dense to Very Dense Sands

1. Depth is measured from the existing ground surface at the time of drilling.
2. Elevations are based on the provided topographic map.

TABLE 3: Generalized Soil Profile (Sounding CPT-2)

Depth Range (feet)[1]	Approximate Elevation (feet)[2]	Soil Description
0 to 8	+240 to +232	Firm to Stiff Clays
8 to 10	+232 to +230	Medium Dense to Dense Sands
10 to 16	+230 to +224	Stiff to Very Stiff Clays
16 to 36	+224 to +204	Medium Dense to Very Dense Sands

1. Depth is measured from the existing ground surface at the time of drilling.
2. Elevations are based on the provided topographic map.

TABLE 4: Generalized Soil Profile (Sounding CPT-3 – Vicinity Boring B-1)

Depth Range (feet)[1]	Approximate Elevation (feet)[2]	Soil Description
0 to 9	+215 to +206	Soft to Firm Clays (Potentially Unsuitable Sensitive Soils)
9 to 11	+206 to +204	Medium Dense Sands
11 to 25	+204 to +190	Stiff to Very Stiff Clays
25 to 28	+190 to +187	Medium Dense to Very Dense Sands
28 to 32	+187 to +183	Stiff to Very Stiff Clays
32 to 34	+183 to +181	Medium Dense to Very Dense Sands

1. Depth is measured from the existing ground surface at the time of drilling.
2. Elevations are based on the provided topographic map.

TABLE 5: Generalized Soil Profile (Boring B-1)

Depth Range (feet)[1]	Approximate Elevation (feet)[2]	Soil Description
0 to 2	+215 to +213	Loose Clayey Sand
2 to 13	+213 to +202	Firm to Stiff Sandy Lean Clay
13 to 18	+202 to +197	Medium Dense Clayey Sand
18 to 38	+197 to +177	Stiff to Very Stiff Lean Clay
38 to 50	+177 to +165	Medium Dense to Very Dense Clayey and Silty Sands

1. Depth is measured from the existing ground surface at the time of drilling.
2. Elevations are based on the provided topographic map.

As previously discussed, practical refusal was encountered at relatively shallow depths of 50 feet or less due to encountering a competent granular (sand) stratum at all of the exploration locations. The refusal depth reflects the possible variation in the depth at which the granular stratum begins, which is expected to vary based on geological deposition history and differences in present ground surface throughout the site. While no exploration extended to the full planned penetration of 100 feet, the exploration indicates the presence and continuity of a competent granular stratum. It also indicates that the near-surface soils, except in the area of

Sounding CPT-3, are generally fair in quality and suitable for support of lightly to moderately loaded structures. In addition, the presence of a shallow granular stratum indicates that some heavily loaded structures could be supported on relatively short piles or shafts.

The above subsurface descriptions are of a generalized nature to highlight the major subsurface stratification features and material characteristics at the presently accessible exploration locations. The boring and sounding logs included in the Appendix should be reviewed for specific information at the individual boring/sounding locations. These records include soil descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the logs represent the conditions only at the actual exploration locations. Variations may occur and should be expected between and away from the exploration locations. The stratifications represent the approximate boundary between subsurface materials, but the actual transition may be more gradual.

Water Level Measurements

Free groundwater was encountered in Boring B-1 at approximately 38 feet below the existing ground surface during drilling. Pore pressure data from Sounding CPT-2 indicates the presence of groundwater at a depth of approximately five feet at that location. PSI also attempted to determine the depth to groundwater in soundings CPT-1 and CPT-3 via dissipation tests and pore pressure data; however, based on this information, either groundwater was not encountered, or it had not become fully static at the time of data collection, and therefore was not able to be measured. As previously discussed, ground surface elevations vary significantly across the site.

It should be noted that the groundwater information presented in this report is based on site conditions that were present at the time of our relatively short field activities at the presently accessible areas of the site. Groundwater can fluctuate based on variations in rainfall, evaporation, surface runoff and other hydro-geologic factors. In addition, a perched groundwater condition could develop in parts of the site when rainwater becomes entrapped in the silty sands underlain by less permeable lean clays. Considering the size of the site, the large variations in elevation and subsoil types and stratification, and the limited number of exploration locations, it is likely that the depth and/or elevation of groundwater could vary across the site. PSI recommends that the Contractor determine the actual groundwater depth at the time of construction activities.

GEOTECHNICAL DISCUSSION

The types and depth of foundations suitable for a given structure depend primarily on several factors including the subsurface conditions, the function of the structure, the loads it may carry, the cost of the foundation, the amount of fill or excavation needed, and the criteria set by the Design Engineer with respect to vertical and differential movement which the structure can withstand without damage.

Based on the field and laboratory test results, it is believed that either deep or shallow foundation systems are suitable for use at the subject site, depending on the structure type, anticipated loads, and required cut/fill within its footprint. Based on the provided topography information, as well as Google Earth elevation data, it appears that the subject area varies as much as 80 feet across the site; therefore, it is anticipated that some degree of cut and/or fill may be required to bring the site to design grades. This may influence the selection of the appropriate foundation system.

Based on the limited field exploration and the field and laboratory test results, the proposed site is generally considered compatible for industrial development, depending on the function and anticipated loads of the proposed structure(s). In addition, the soils at the boring/sounding locations indicate that they are suitable for building foundations and/or construction of on-site roadways following proper preparation and the required cut/fill in the areas of the specific structures. However, as stated previously, the information presented in this preliminary report is provided for planning purposes only; they are based on a very limited geotechnical exploration and are not intended for use in final design and construction. A detailed geotechnical investigation will be necessary prior to design of any proposed structures.

The choice of the type of foundation to be used for support of a specific structure should be based on the tolerance criteria for the performance of the structure and economics of construction. Ground-supported shallow foundations or surface improvements will likely be governed by the anticipated loads and settlement tolerances, particularly where a significant amount of new fill is placed. The preliminary allowable bearing capacities for shallow foundations provided in this report are based on the existing site grades at the exploration locations, and may not reflect the bearing capacities at the final design elevation(s) once site grading has been performed. Due to the presence of medium dense to dense sands encountered at relatively shallow depths, it is believed that driven piles will be difficult to install without performing predrilling to avoid damaging the piles, and therefore, if deep foundations are to be used for support of a given structure, consideration could be given to the use of straight-sided drilled shafts, auger cast-in-place (ACIP) piles, open-ended steel pipe piles, or steel H-piles. Timber piles with tips driven to firm embedment into a competent sand stratum could also be an option.

Site Preparation

Prior to construction, positive drainage and collection of surface water should be established throughout the site and maintained throughout the duration of the construction period. Site preparation requirements will vary throughout the relatively large property and will depend on the structure type, foundation system, amount of cut/fill, etc., and should be established once a specific project features have been identified.

As previously discussed, at the time of PSI's field exploration, the site was heavily-wooded. It should be noted that the moisture demands of trees depend on their species and maturity, as well as the lateral and vertical extents of their root systems. Cutting existing trees in the vicinity of a foundation system could trigger volumetric changes in the surrounding soils within the influence zones of the tree root systems. In view of this, development plans should consider the impact of the trees on the long-term performance of any planned structures and their foundation systems. Mature trees which are to be removed should be cut as far in advance of construction as practical to allow for the groundwater at the site to stabilize prior to proceeding with construction of the foundations.

Shallow Foundations

Provided the site is properly prepared, it is believed that shallow foundation systems using spread and/or continuous footings bearing at least 24 inches below final grade could be designed for a minimum net allowable soil bearing capacity of 1,500 psf. However, as previously discussed, these values are based on the near-surface soils encountered at the boring locations, which were performed at varying elevations across the subject site, and a detailed geotechnical investigation should be performed prior to the design or construction of any specific structure(s).

Deep Foundations

As previously discussed, due to the presence of medium dense to dense sands encountered at relatively shallow depths, it is believed that driven piles will be difficult to install, and therefore, if deep foundations are to be used for support of a given structure, consideration could be given to the use of straight-sided drilled shafts, ACIP piles, open-ended steel pipe piles, or steel H-piles.

In view of the significant variations in surface elevation and subsurface materials encountered across the subject site, PSI has provided separate capacity recommendations for 14-inch diameter straight-sided drilled shafts or ACIP piles installed at each of the exploration locations for use in feasibility studies, planning, and cost estimating pruposes. These allowable capacity estimates are based on the results of our limited field and laboratory testing and assume proper design and installation. The allowable axial capacity in compression is the summation of the allowable friction resistance and the allowable end-bearing resistance. The allowable axial capacity in tension (uplift) is the allowable frictional resistance and the effective weight of the shaft, neglecting the end-bearing component. The allowable capacities were estimated using factors of safety of 2.0 for compression and 3.0 for tension, which assumes that a static load test will be performed. If a field load test is not performed, PSI recommends using a factor of safety of 3.0 for compression to determine the allowable capacities. In areas that receive multiple feet of fill, deeper minimum embedments may be required to assure stability of the shafts or piles to account for lateral loads and downdrag.

TABLE 6: Estimated Allowable Capacities for Straight-Sided Drilled Shafts or ACIP Piles (CPT-1 Area)

Embedment Depth (feet)*	14-inch Diameter (tons)	
	Compression	Tension
15	10	5
20	15	8
25	25	12
30	30	15
35	35	20
40	50	30
45	65	40
50	80	50

* Embedment depth is based on the existing grade at the exploration location at the time of the field exploration.

TABLE 7: Estimated Allowable Capacities for Straight-Sided Drilled Shafts or ACIP Piles (CPT-2 Area)

Embedment Depth (feet)*	14-inch Diameter (tons)	
	Compression	Tension
15	10	5
20	20	10
25	30	15
30	40	25
35	55	30

* Embedment depth is based on the existing grade at the exploration location at the time of the field exploration.

TABLE 8: Estimated Allowable Capacities for Straight-Sided Drilled Shafts or ACIP Piles (B-1 Area)

Embedment Depth (feet)*	14-inch Diameter (tons)	
	Compression	Tension
15	10	5
20	15	10
25	25	12
30	30	15
35	35	20
40	45	25
45	60	35
50	75	45

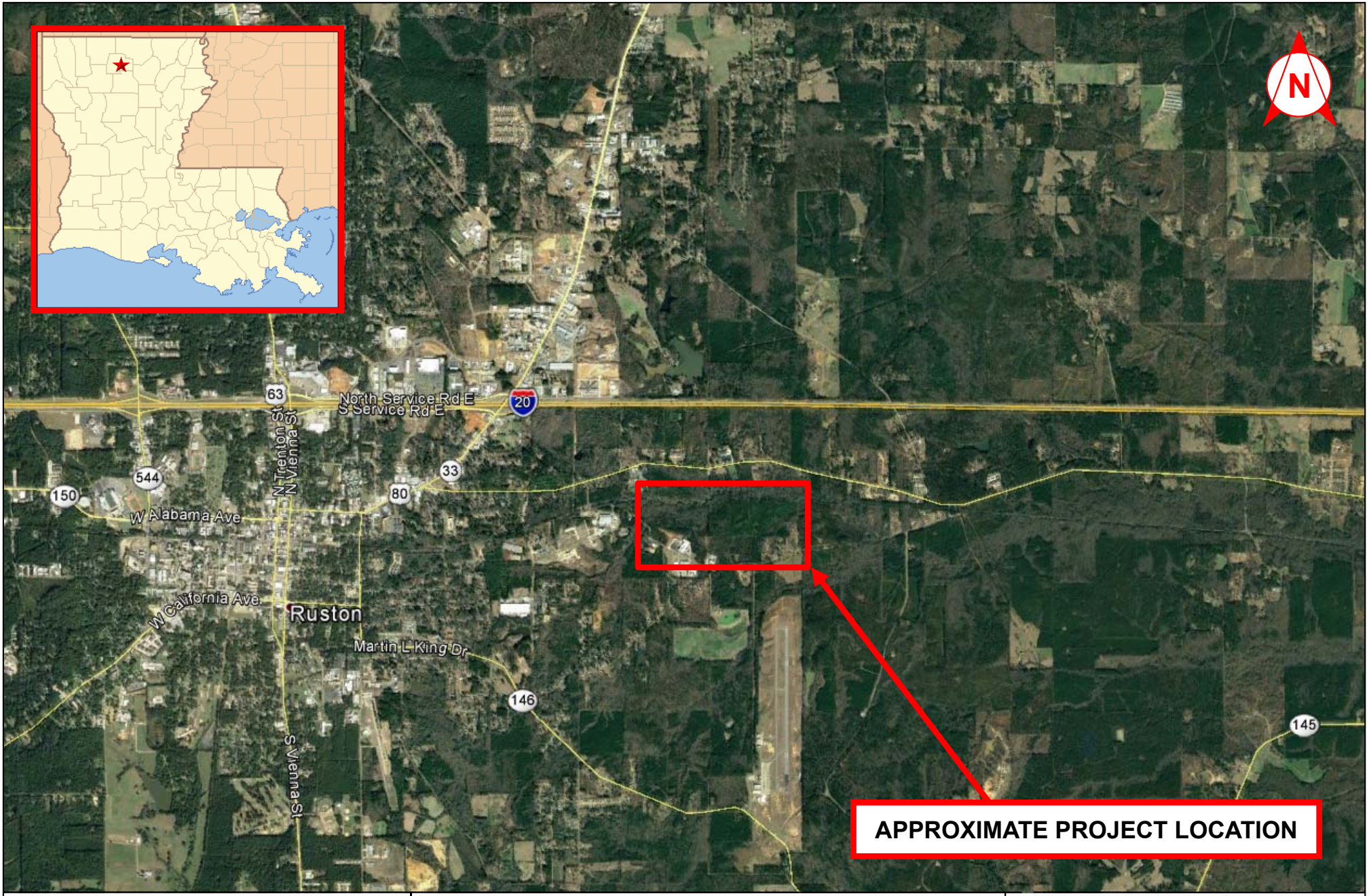
* Embedment depth is based on the existing grade at the exploration location at the time of the field exploration.

As previously discussed, detailed structural loads are not known at this time since no specific project or structures are being considered for construction. In addition, piles longer than 50 feet may be required for support of heavier loads and large spans, which should be determined as part of the full geotechnical investigation once a project is selected for development. Based on topographical information provided by the Client, as well as elevation data obtained from Google Earth, it appears that the area varies in elevation by up to 80 feet across the site. Therefore, it is anticipated that substantial new cut and/or fill may be required to bring the undeveloped areas of the site to design grades. When fill is placed on a site, any underlying compressible soils consolidate, resulting in areal settlement. As these compressible soils consolidate, downdrag (or “negative skin friction”) loads may be imposed on the drilled shafts or ACIP piles, effectively increasing the total downward load. Therefore, additional provisions should be provided to account for downdrag loads, settlement, group effect, lateral loads, dynamic excitation, etc.

REPORT LIMITATIONS

The information and preliminary recommendations presented in this report are based on the available project information and the subsurface materials encountered at the specific exploration locations described in this report. The geotechnical investigation conducted for this report is preliminary in nature and is not to be used for construction. It is not intended to provide any opinions on the geotechnical performance of any specific structure or equipment, as such opinions would require further investigation and specific analyses. The actual conditions in specific areas of the site may vary from those encountered in the borings performed as part of this report. This preliminary report has been prepared for the exclusive use of CSRS and the City of Ruston for the proposed Industrial Park site in Ruston, Louisiana.

Appendix



PRELIMINARY GEOTECHNICAL SITE CHARACTERIZATION STUDY

PROPOSED INDUSTRIAL PARK SITE

RUSTON, LOUISIANA

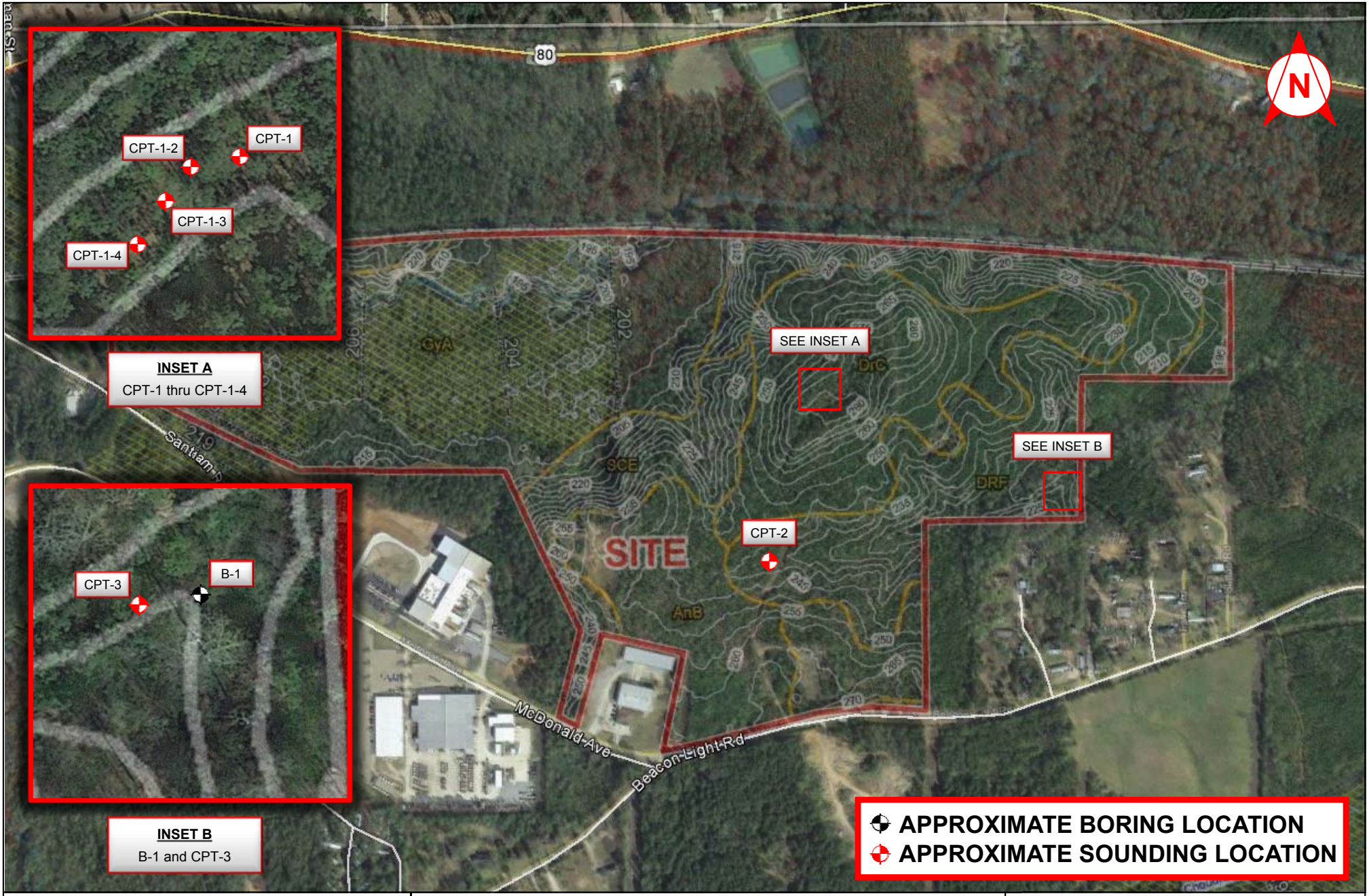
SITE VICINITY MAP

PSI PROJECT NO.: 0257655

GOOGLE EARTH IMAGERY DATE: 1/26/2015

psi Information To Build On

Engineering • Consulting • Testing



PRELIMINARY GEOTECHNICAL SITE CHARACTERIZATION STUDY

PROPOSED INDUSTRIAL PARK SITE

RUSTON, LOUISIANA

BORING/SOUNDING LOCATION PLAN

PSI PROJECT NO.: 0257655

GOOGLE EARTH IMAGERY DATE: 1/26/2015

psi Information To Build On

Engineering • Consulting • Testing

LOG OF BORING B-1

Ruston Industrial Park Site
Ruston, Louisiana

TYPE OF BORING: Hollow Stem Auger | LOCATION: See Boring Location Plan | PSI Project No.: 0257655

DEPTH, FT.	SOIL TYPE	USCS SYMBOL	SAMPLES	SOIL DESCRIPTION	N-BLOWS/FT.	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	% PASSING No. 200 SIEVE	SHEAR STRENGTH (tsf) ○ HP ● UC △ TV ▲ UU 0.0 1.0 2.0 3.0	SHEAR STRENGTH (tsf) HAND PEN (tsf)	UC (tsf)	TORVANE (tsf)	UU (tsf)	UNIT DRY WEIGHT (pcf)
		SC		Loose Dark Red **CLAYEY SAND**	4	10				25						
2.5		CL		Firm to Stiff Reddish Tan **SANDY LEAN CLAY**	5	25				50						
5.0					7	29	39	26	13							
7.5						27	43	22	21		● ⊕	1.75	0.83			98
10.0						22					⊕	1.75				
12.5		SC		Medium Dense Red **CLAYEY SAND**	11	21				31						
15.0																
17.5		CL		Stiff to Very Stiff Dark Gray **LEAN CLAY**	15	24	32	18	14							
20.0																
22.5					12	24										
25.0																
27.5					16	24	45	23	22							
30.0																
32.5					18	28										
35.0																
37.5		SC		Very Dense Tan **CLAYEY SAND**	59	25				30						
40.0																
42.5		SM		Very Dense Tan **SILTY SAND**	61	25										
45.0																
47.5		SC		Medium Dense Dark Gray **CLAYEY SAND**	19	31				28						
50.0				Boring Terminated at 50 Feet												

DEPTH OF BORING: 50 FEET
DATE DRILLED: 4/20/17
NOTE:

▽ GROUNDWATER DURING DRILLING: 38 Feet
▼ GROUNDWATER UPON COMPLETION: Not Measured
▼ DELAYED GROUNDWATER: N / A

BORINGLOG_WESTMONROE - PSIHOUSTON.GDT - 4/26/17 16:18 - 0257

psi Information To Build On
Engineering • Consulting • Testing
Professional Service Industries, Inc.
1853 New Natchitoches Road
West Monroe, Louisiana 71292
Telephone: (318) 387-2327

Information To Build On
Engineering • Consulting • Testing

CPT: CPT-1

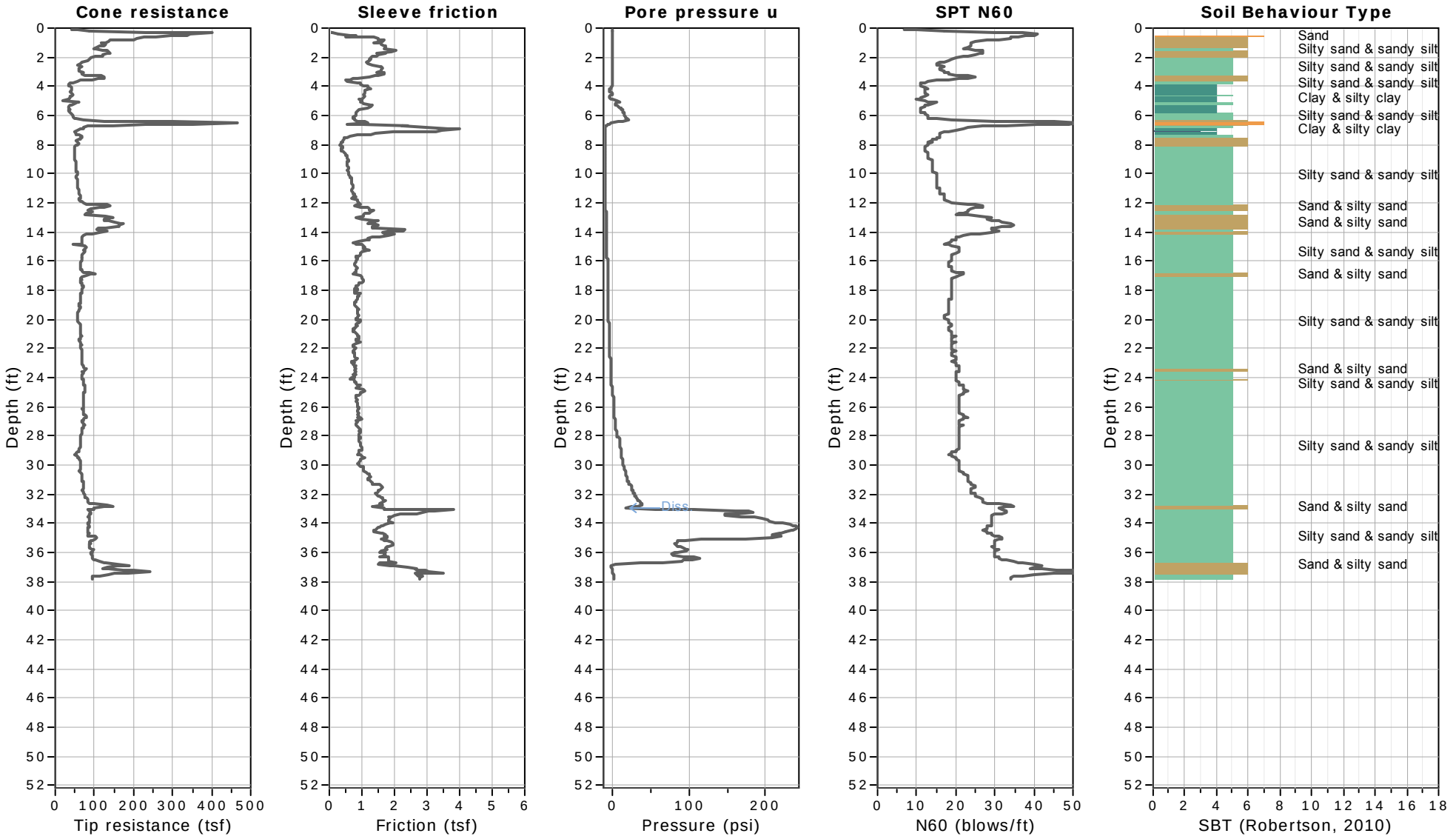
Total depth: 37.80 ft, Date: 4/10/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



Information To Build On
Engineering • Consulting • Testing

CPT: CPT-1-2

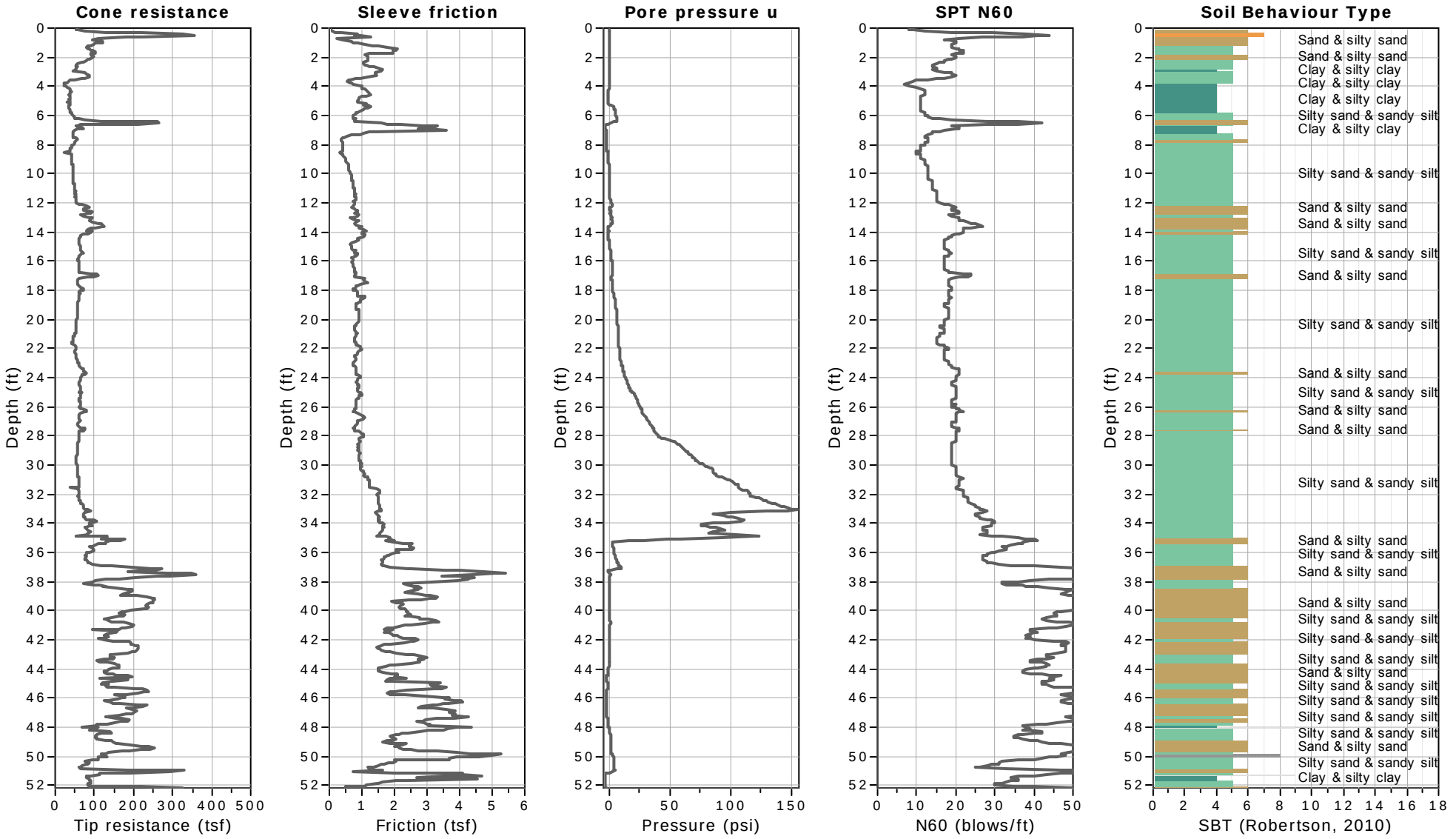
Total depth: 52.17 ft, Date: 4/10/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



Information To Build On
Engineering • Consulting • Testing

CPT: CPT-1-3

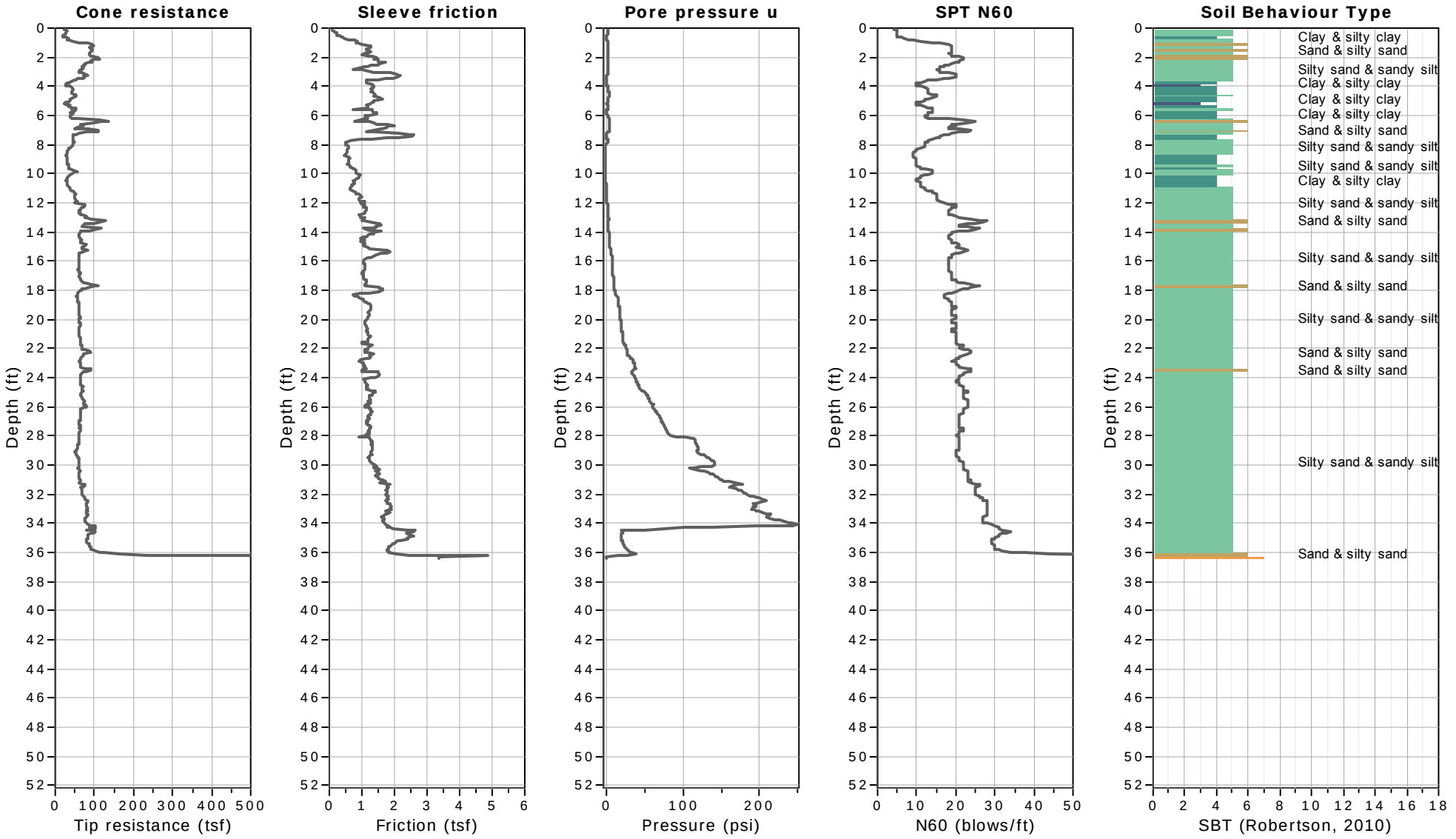
Total depth: 36.42 ft, Date: 4/18/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



CPT: CPT-1-4

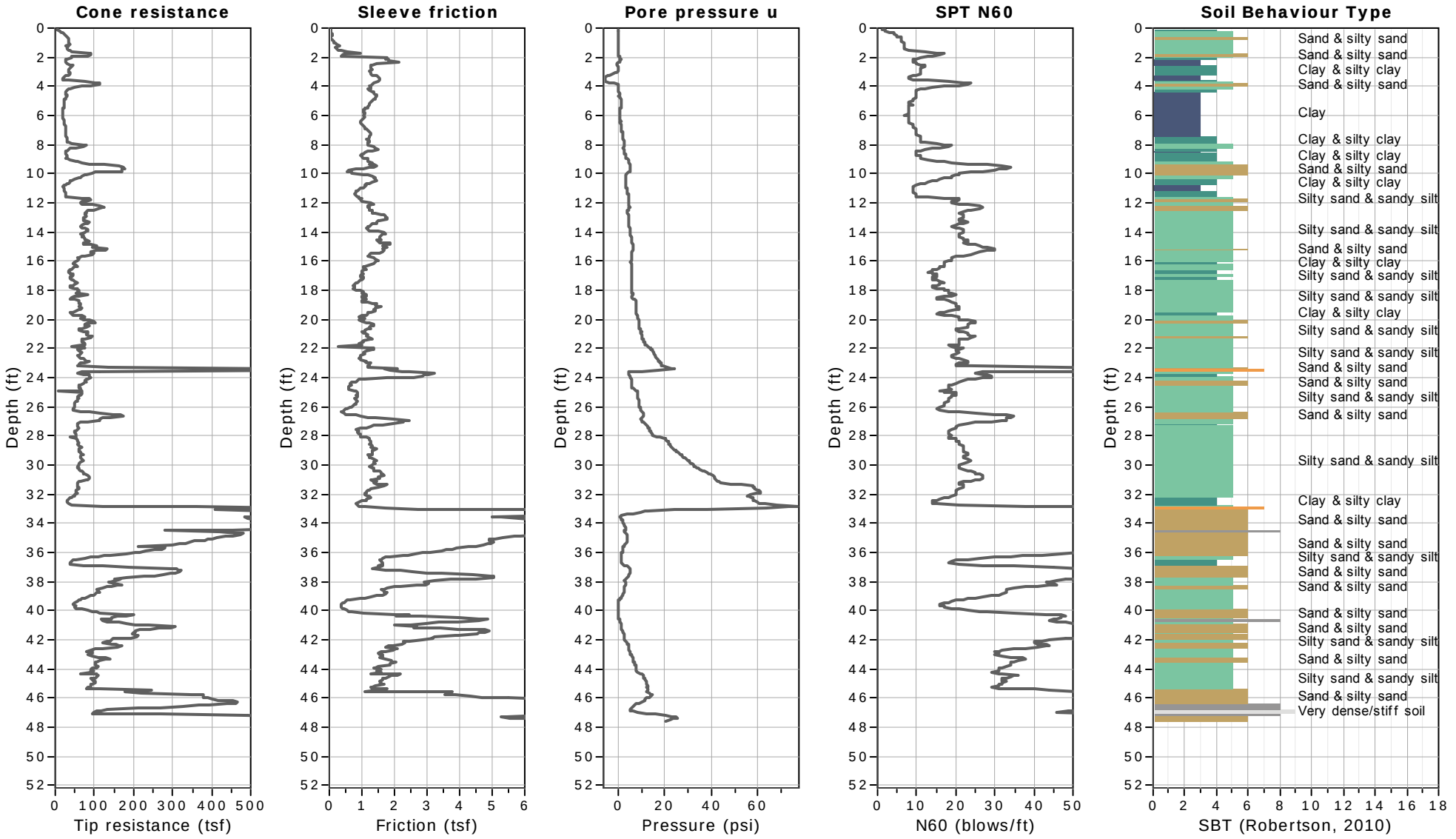
Total depth: 47.57 ft, Date: 4/18/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



CPT: CPT-2

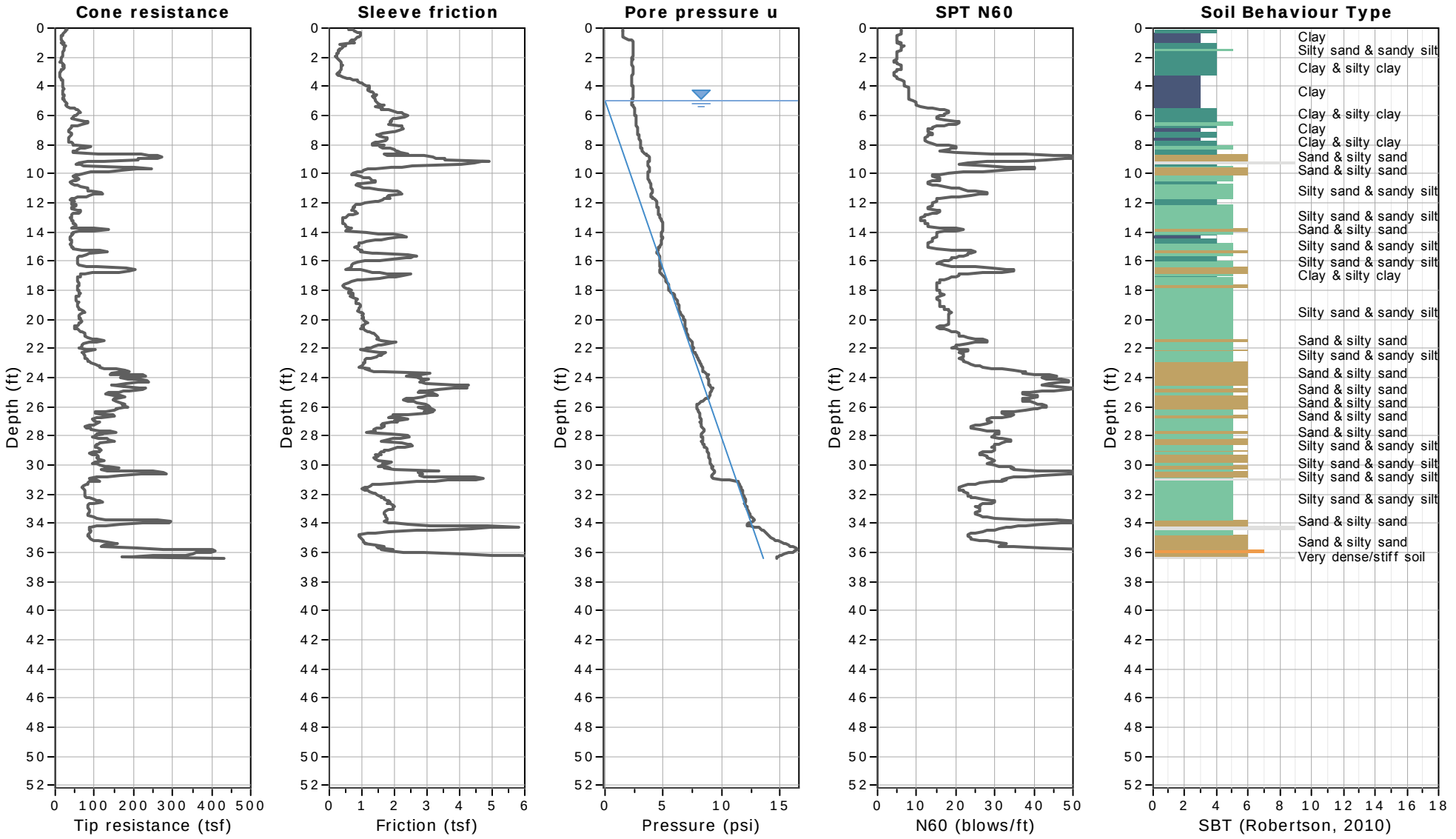
Total depth: 36.42 ft, Date: 4/10/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



Information To Build On
Engineering • Consulting • Testing

CPT: CPT-3

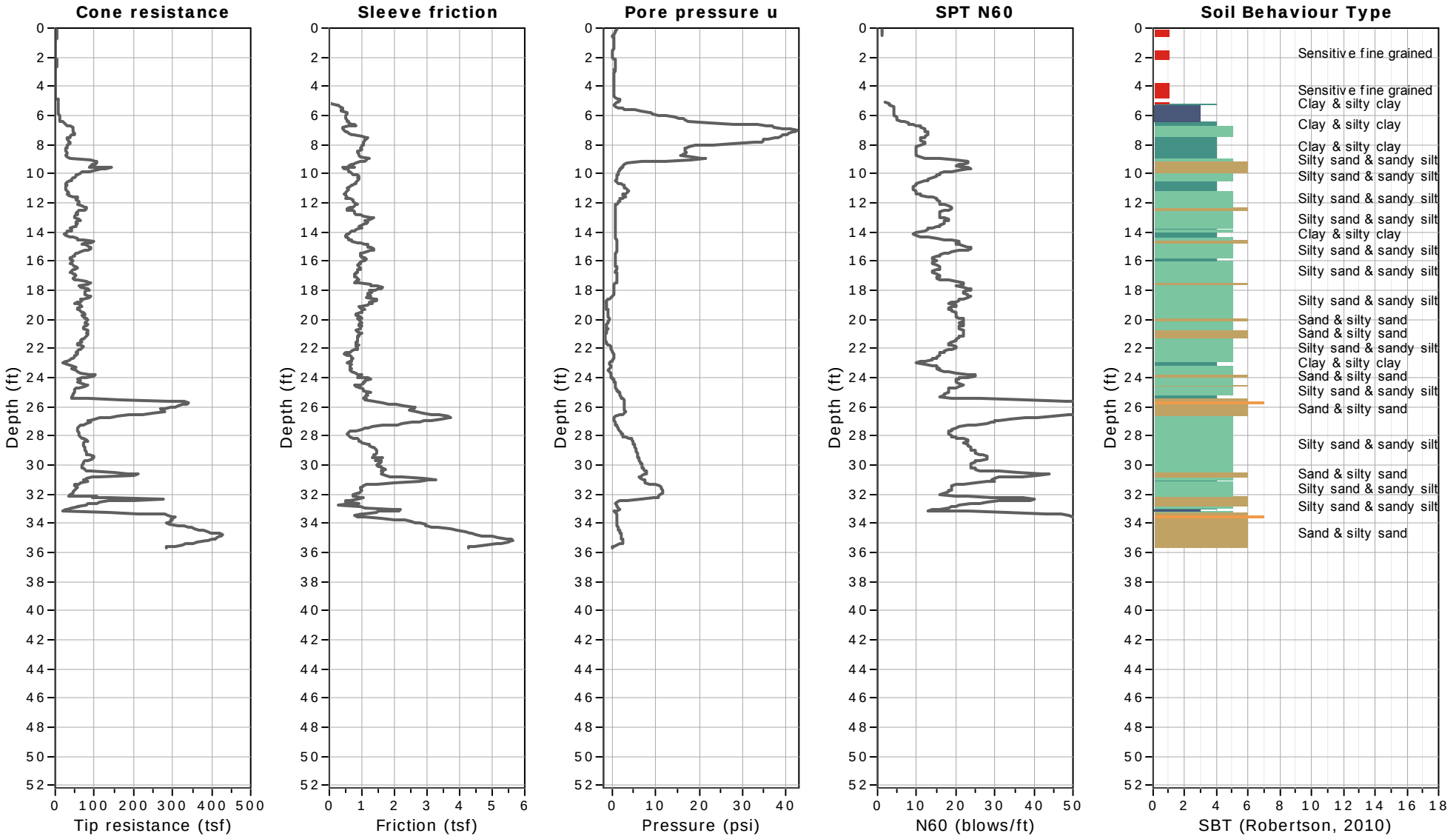
Total depth: 35.70 ft, Date: 4/18/2017

Cone Type: 60° 1.4" Diam. Type 2 Electric Cone Penetrometer

Cone Operator: Dee Keltner

Project: 0257655 - Ruston Industrial Park Site

Location: Ruston, Louisiana



GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

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.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,⧩ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

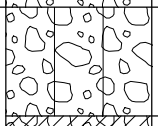
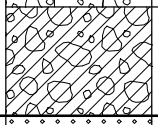
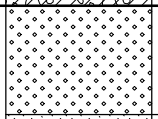
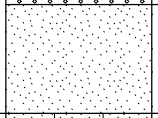
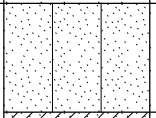
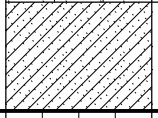
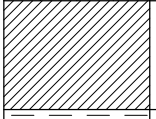
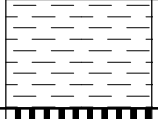
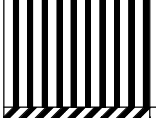
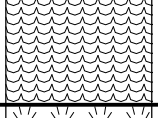
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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 SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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