Attachment 6

Site Assessment – Geotech Report and Certification by a Structural Engineer, Foundation Certification, and Tower Certification

Geotechnical Report Submittal

Alan Moore

From: Alan Moore
Sent: Monday, August 18, 2025 2:32 PM
To: Kelly Lockhart - Coles Co Regional Planning; Rick Johnson - Coles Co Highway Dept
Subject: Coles Wind Geotech Report

Good afternoon, Rick and Kelly,

Pursuant to the Coles Wind Ordinance (*Design and Installation, §J - Site Assessment*), Coles Wind is providing you the geotechnical report for all the turbine locations, Project substation, and O&M Building. This report is stamped by an Illinois-licensed professional engineer. This is a revised report that made a handful of clerical revisions; the substance of the report has not changed. The report can be accessed at the following link: https://apexcleanenergy.box.com/s/4jegbiqwd9i9wz010nhys0svbuq8u0fh.

Coles Wind will also provide the report as part of its upcoming Building Permit application.

Please reach out if you have any questions,

Alan

ALAN MOORE
Director of Development

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Alan Moore

From: Alan Moore
Sent: Tuesday, July 29, 2025 8:15 AM
To: Kelly Lockhart - Coles Co Regional Planning; Rick Johnson - Coles Co Highway Dept
Subject: Coles Wind Geotech Report

Good morning, Rick and Kelly,

Pursuant to the Coles Wind Ordinance (*Design and Installation, §J - Site Assessment*), Coles Wind is providing you the geotechnical report for all the turbine locations, Project substation, and O&M Building. This report is stamped by an Illinois-licensed professional engineer. The report can be accessed at the following link: https://apexcleanenergy.box.com/s/4jegbiqwd9i9wz010nhys0svbuq8u0fh. Coles Wind will also provide the report as part of its upcoming Building Permit application.

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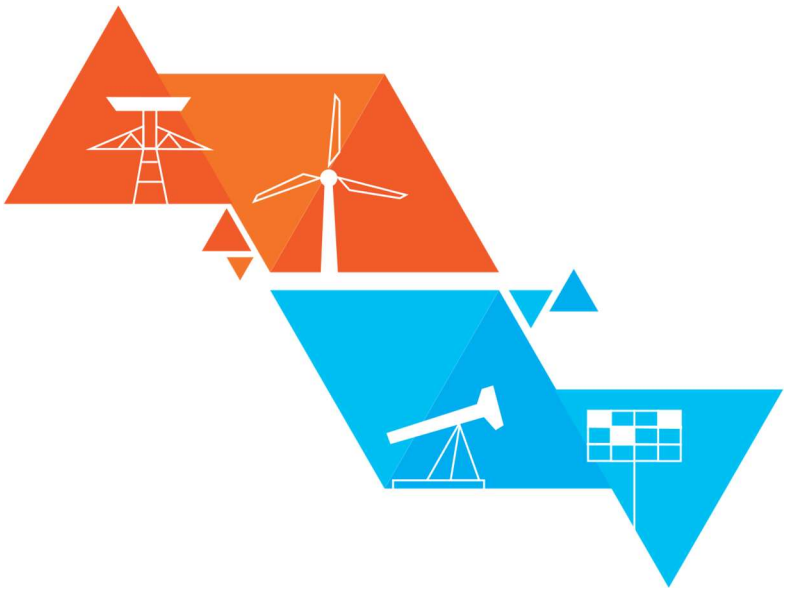
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Geotechnical Report

Coles Wind Project

Coles County, Illinois

Apex Clean Energy, Inc.



Prepared By:

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RRC Project No. GE2109045
August 7, 2025

experience matters

August 7, 2025

Apex Clean Energy
120 Garrett Street, Suite 700
Charlottesville, VA 22902

Attn: Ms. Hunter Tyler

Re: Geotechnical Report
Coles Wind Project
Coles County, Illinois
RRC Project No. GE2502017

RRC Power & Energy, LLC (RRC) has completed subsurface exploration and geotechnical engineering evaluation for the proposed Coles Wind Project. The purpose of this geotechnical engineering study is to explore and evaluate the subsurface conditions at various locations on the site and develop final geotechnical design and construction recommendations for the project. The attached report contains:

- A description of our findings from the field exploration and laboratory-testing program;
- Our engineering interpretation of the results with respect to the project characteristics; and
- Our geotechnical site development and foundation design recommendations for the wind project.

Should you have any questions concerning this Geotechnical Report, please do not hesitate to contact us. Your business is always appreciated.

Sincerely,

RRC Power & Energy, LLC



Jieliang Pan, Ph.D., P.E. (OK)
Geotechnical Engineer

COLES WIND PROJECT
COLES COUNTY, ILLINOIS

REVISION HISTORY

Revision	Description	Performed by	Reviewed by	Issued Date
0	Draft Geotechnical Report	JP	AW	5/23/2025
0	Geotechnical Report	JP	AW	7/16/2025
1	Geotechnical Report	JP	AW	7/21/2025
2	Geotechnical Report	JP	AW	8/7/2025

Prepared by



Jieliang Pan, Ph.D., P.E. (OK)
Geotechnical Engineer



Reviewed by



Alfred William, P.E.
Director of Geotechnical Engineering

FIRM REGISTRATION NO. IL 184.008015-0002

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EXECUTIVE SUMMARY

RRC Power & Energy, LLC (RRC) presents the findings and recommendations of the subsurface exploration and geotechnical engineering evaluation for the proposed Coles Wind Project in Coles County, Illinois.

This geotechnical investigation consisted of geotechnical soil borings, cone penetration tests (CPT), standard penetration tests (SPT), split-spoon sampling, laboratory testing, electrical/thermal resistivity survey/testing, and Multi-Channel-Analysis-of-Surface-Waves (MASW) surveys.

In general, soils at this project site consist primarily of soft to hard clay strata and loose to very dense sand strata. Bedrock was not encountered in any of the borings.

The following is a summary of anticipated soil conditions that should be considered in design and construction:

1. This geotechnical study indicates that subsurface materials are suitable for support of gravity-type turbine foundations. RRC did not identify any known geohazards that would significantly impact the design or construction.

2. Soft to medium stiff clay soils were encountered below the foundation bearing elevation at two turbine sites (GEO-15 and GEO-20). At these locations, rammed-aggregate piers are required to remediate the site to achieve a net allowable bearing capacity of 2,000 psf.

3. Shallow groundwater was measured at each of the piezometers installed at the turbine locations across the site. Groundwater was measured from near the ground surface to a depth of 5 feet below the existing ground surface. Shallow groundwater will likely impact foundation design and construction.

4. Published maps indicate WTG locations are located in an area of “Low” to “High” risk for concrete corrosion. The laboratory test results indicate the soils in the upper 10 feet possess a “Negligible” risk for sulfate exposure and corrosion potential to concrete.

5. Published maps indicate WTG locations are located in an area of “Low” to “High” risk for steel corrosion. The laboratory test results indicate soils within the upper 10 feet exhibit “Corrosive” to “Moderately Corrosive” electrical characteristics with regards to galvanic corrosion of steel. For chlorides, the test results indicate “Non-Aggressive” corrosion potentials to steel.

GEOTECHNICAL REPORT

1.0 INTRODUCTION

RRC completed the authorized subsurface exploration and geotechnical engineering evaluation for the proposed Coles Wind Project. The site is located approximately 8 miles north of the City of Charleston in Coles County, Illinois. The approximate boundaries of the site are shown on Figure 1, Site Location Map.

The purpose of this investigation and report was to:

- Explore subsurface soil, bedrock, and groundwater conditions;
- Conduct field and laboratory tests to characterize the subsurface soil and bedrock properties at selected locations across the site; and
- Provide geotechnical engineering parameters for the design of foundation systems and access roadways.

The recommendations contained in this report are based upon results of field and laboratory testing, engineering analyses, experience with similar soil/bedrock conditions, and our understanding of the proposed project. For the purposes of this report, the term “most recent” when discussing WTG and associated facility layouts refers to the most up-to-date plans provided to RRC by Invenergy. We understand that the turbine array LAY 037 provided on July 7, 2025 to RRC is the most recent array, including ten (10) spare turbines (T9, T14, T16, T24, T27, T32, T37, T41, T42, T50).

Wind projects often go through multiple array layouts. These changes to the array can cause confusion if the turbine names vary between when the geotechnical investigation was conducted and when the geotechnical report is referenced. To mitigate against this, RRC assigns each turbine location a unique geotechnical boring ID (GEO-ID). The Logs of Boring, laboratory test results, thermal resistivity, geophysical reports and tables contained within this report will reference a GEO-ID. Table A1 within Appendix A specifies the coordinates and corresponding turbine name associated with each GEO-ID. The Final turbine name may vary from the turbine name presented in Tables A1 and A2. Therefore, it is critical to reference the coordinates and corresponding GEO-ID when determining what information and recommendations pertain to a specific turbine location.

2.0 PROPOSED CONSTRUCTION

The project will consist of fifty-one (51) wind turbine generators and associated facilities. However, for the purposes of this report, RRC conducted geotechnical analyses at 62 proposed turbine locations, although no more than 51 will be built. These 62 turbine locations are the same locations approved by Coles County in July 2025. The WTG model proposed for the project will be the GE 6.1-158 MW, 117m hub height WTG. The project team anticipates WTGs will be supported on gravity foundation systems with an embedment depth of about 12 feet

below finished grade. RRC assumes finished turbine pad grade will be at or slightly above existing site grades.

3.0 SITE EXPLORATION

As part of the project, associated facilities include a substation, an O&M building and access roadways. Private-access roadways will most likely be surfaced with imported road-base materials from nearby quarry pits.

RRC's subsurface exploration program consisted of:

- Conducted Cone Penetrometer Tests (CPT) at six-two (62) WTG locations;
- Drilled seven (7) conventional (SPT) geotechnical borings at selected WTG locations;
- Drilled two (2) conventional (SPT) borings at O&M building area;
- Installed a total of sixty-three (63) piezometers. Sixty-two (62) piezometers were installed at WTG locations and at one (1) piezometer was installed within the proposed substation area;
- Collected two (2) bulk samples for laboratory thermal resistivity testing; and
- Collected two (2) bulk samples for laboratory California Bearing Ratio (CBR) tests.

Figures 2 to 4 in Appendix A consist of maps for various CPT soundings and SPT borings and sample locations. A summary of subsurface exploration is provided within Table A2 within Appendix A.

3.1 Field Exploration and Testing

RRC geologist staked the boring locations using GPS coordinates provided by Apex Clean Energy, Inc. Drill crews under RRC's direction drilled the borings within 15 feet of each staked location, assuming average GPS accuracy for a hand-held device or smartphone.

3.1.1 CPT Sounding

RRC commissioned Fugro to conduct Cone Penetrometer Test (CPT) soundings using a track-mounted CPT rig. We performed a total of eighty (80) CPT soundings at sixty-two (62) WTG locations. The additional CPT soundings for the second and third attempts were conducted when CPT refusal was encountered shallower than 35 feet. GPS coordinates and depths of each CPT sounding/boring are presented in Table A2 in Appendix A.

The CPT soundings were carried out using an integrated electronic cone system, in accordance with *ASTM D5778: Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils*. The soundings were conducted using a 22-ton track mounted CPT equipment with a cone tip area of 15 cm^2, friction sleeve area of 200 cm^2, and a 60-degree apex angle. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.59.

During a CPT sounding, the cylindrical cone was pneumatically pushed vertically into the ground at a constant rate of penetration of 20 mm/sec; and measurements were made of the cone tip resistance (q_c), the friction sleeve resistance (f_s), and penetration pore-water pressure (u) at 5-cm intervals during penetration, to provide a near-continuous hydro-geologic log.

RRC performed CPT data reduction and interpretation using the Computer Program "CPeT-IT" developed by GeoLogismiki and Gregg Drilling Inc. The geotechnical parameters on the CPT logs are based on published correlations. The CPT logs included interpreted normalized Soil Behavior Type (SBT_n) plots. Note that it is not always possible to clearly identify a soil type based solely on CPT tip resistance, sleeve friction and pore water pressure measurements. Experience and judgment of the CPT logs are often used to estimate the soil behavior type. A summary of CPT correlation equations and formulas used for the estimation of various soil properties are presented in Appendix A, together with the Logs of CPT sounding.

The theoretical relationship for undrained shear strength, s_u, of clay soils and corrected cone tip resistance, q_t, is given by the following equation:

$$s_u = \frac{q_t - \sigma_v}{N_{kt}}$$

Where σ_v is the total overburden stress and N_{kt} is the undrained shear strength cone factor. For estimating the undrained shear strength of clay soils encountered at the project site, RRC recommends using a N_{kt} value of 17.

CPT reports include an *SPT N60 chart*. The N60 is a traditional version of SPT blow counts converted from a cathead SPT tool with a 60% efficiency. Modern SPT values use automatic drop hammers with 95% efficiency or higher. Thus, the N60 chart values are different from N values obtained from the conventional geotechnical borings.

3.1.2 Conventional Geotechnical Borings

RRC conducted conventional borings with an ARDCO C-1000 ATV drill rig. Drillers used air rotary techniques. During the field operations, the drill crew observed groundwater levels. Following the completion of the drilling operations, the drillers backfilled each boring with soil cuttings in accordance with state regulations. At some locations, we added bentonite chips to supplement the soil cuttings.

At thermal resistivity and CBR sampling locations, we collected bulk samples at depths of 1 to 4 feet below existing site grade.

Standard Penetration Test (SPT) samplers obtain disturbed soil samples. RRC documented each penetration resistance value in accordance with *ASTM D1586: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. This test consists of driving the sampler into the ground with a 140-pound hammer free-falling 30 inches. The number of blows required to advance the SPT sampler 18 inches is counted and recorded, with the sum of

the blows to drive the last 12 inches referred to as the standard penetration resistance value (N-value). Results of the field tests are shown on the logs of boring under the "Field Data" column and are preceded by the letter "N." Each soil sample from the SPT samplers collected in the field were visually classified, placed in plastic bags to preserve moisture content, and labeled as to location and depth. All SPT samples were arranged in core boxes and transported to our laboratory facility in Round Rock, Texas for further analysis.

We obtained relatively undisturbed samples of cohesive soils, utilizing hydraulically advanced 3-inch (OD) diameter stainless steel, thin-walled tube (Shelby) samplers in accordance with *ASTM D1587: Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*. We tested Shelby tube samples for consistency using a pocket-sized penetrometer. The penetrometer reading is included on the log of boring preceded by the letter "P." Readings in excess of 4.5 tons per square feet (tsf), if any, indicate that the capacity of the device has been exceeded. Caution that the penetrometer value is not a measure of cohesion or shear strength. The P value is only a general means of assessing relative stiffness. Sufficient material from the lower end of the Shelby tube was removed for visual classification purposes. Both ends of the Shelby tube were sealed using plastic caps and secured with duct tape to prevent moisture loss. Sample location and depth was labeled on the outside surface of the tube. We transported all samples to our facility in Round Rock, Texas for further analysis.

RRC classifies soils in general accordance with the Unified Soil Classification System (USCS); ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). The soil and bedrock classification symbols appear on the logs of boring and are briefly described in Appendix A. Bedrock materials were classified in general accordance with the general notes for rock classification included as part of ASTM D5878: Standard Guides for Using Rock-Mass Classification Systems for Engineering Purposes.

RRC's field geologist prepared field logs for each boring. The logs of boring contain classification of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples.

The project engineer/geologist reviewed all the field logs, soil samples, and lab test data to make appropriate modifications to the logs of boring, as necessary. Final Logs of Boring and laboratory testing are provided in Appendix A. The logs of boring describe the strata encountered, their approximate thickness, SPT results, soil classifications, the various depths at which the samples were obtained, as well as the presence of groundwater.

3.1.3 Standpipe Piezometers

We installed a total of sixty-three (63) temporary standpipe piezometers, one (1) at each WTG, one (1) at the substation area. The piezometers were installed to a depth of about 13 feet below the existing ground surface. Piezometers installed using the CPT rig consist of 3/4-inch diameter, schedule 40 PVC pipe with perforations along the lower 5-feet. The screened portion of the piezometer was backfilled with sand to about one foot above the perforated section. Bentonite was then used to backfill the remaining portion of the piezometer boring to the top of

existing ground surface. The piezometers extend about 2 feet above the ground. Groundwater levels within the temporary piezometers were measured between March 31 and May 10, 2025 and summarized in Table A4 within Appendix A. Refer to Section 4.4 for discussion of groundwater.

3.2 Laboratory Tests

The soil samples were returned to the laboratory, examined by the project engineer/geologist, and applicable laboratory testing was assigned on selected soil samples. RRC commissioned Beyond Engineering & Testing, LLC to conduct laboratory tests. Laboratory testing was performed in general accordance with ASTM and locally accepted practices. The following laboratory methods of analyses were generally utilized, where sample quality allowed:

- Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System): ASTM D2487;
- Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass: ASTM D2216;
- Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils: ASTM D4318;
- Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75-µm) Sieve: ASTM D1140;
- Standard Test Method for Particle-Size Analysis of Soils: ASTM D6913;
- Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort: ASTM D698;
- Standard Test Methods for One Dimensional Swell: ASTM D4546;
- Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading: ASTM D2435;
- Standard Test Methods for Unconfined Compressive Strength of Cohesive Soils: ASTM D2166;
- Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils: ASTM D2850;
- Standard Test Methods for CBR (California Bearing Ratio) of Laboratory-Compacted Soils: ASTM D1883;
- Standard Test Method for Measurement of Soil Resistivity using the Two-Electrode Soil Box Method: ASTM G187;
- Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing: ASTM G51; and
- Sulfate and Chlorides Content: EPA 300/300.1.

4.0 SUBSURFACE CONDITIONS

4.1 Geology

The geologic interpretations contained herein are based on geological maps and literature. In summary, the surficial materials at the project site surface are mostly glacial till deposits. The

following Quaternary Formations are found within the general project site (References 1, 2, and 3) and are described below.

Quaternary Period

- **Loamy Till (tla):** Light brown, gray loam to clay loam, sand, pebbles, boulders. Thickness is variable at 3-60 feet deep.

Pennsylvanian Period

- **Loamy Till (tkb(e)):** Glacial Till consisting of Clay and Silt with rock fragments; thickness ranges up to 45 feet thick.
- **Loamy Till (tkc(e)):** Glacial Till consisting of Clay and Silt with rock fragments; thickness ranges up to 18 feet thick.
- **Loamy Till (tkc(g)):** Glacial Till consisting of Clay and Silt with rock fragments; thickness ranges up to 560 feet thick.
- **Loamy Till (tkd(g)):** Glacial Till consisting of Clay and Silt with rock fragments; thickness ranges up to 560 feet thick.

4.2 Subsurface Stratigraphy

As indicated on the logs of boring and CPT sounding, the soil stratigraphy at the site generally consisted of 2 to 12-inch topsoil underlain by either clay or sand layers. Bedrock was not encountered in any borings. The soil layers can generally be described as:

- Soft to hard, Lean to Fat Clay soils with varying amounts of sand and gravel;
- Loose to very dense, Sand with varying amounts of silt, clay and gravel.

Detailed Logs of Boring and CPT Sounding present detailed stratum descriptions, soil classifications, types of sampling used, laboratory test data, and additional field data. Boring logs are presented in Appendix A. The lines separating stratum types on the Logs of Boring do not necessarily represent distinct lines of demarcation because transitions can be gradual. The Boring Log Key, defining the terms and descriptive symbols used on each log of boring, is also presented in Appendix A.

4.3 Laboratory Test Results

RRC obtained the service of Beyond Engineering & Testing, LLC to conduct laboratory tests. The Laboratory test results indicate the native soils possess in-situ moisture contents in the range from about 12% to 27% with an average of 17%.

The native soils have Plasticity Indices (PI) ranging from 8 to 29 with an average PI of 17. Clay soils with a PI less than 15 are generally considered to exhibit a low expansive potential. Clay soils with a PI greater than 25 are generally considered to exhibit a high expansive potential if their moisture contents are allowed to change significantly.

We performed two (2) moisture/density relationships (Proctors) to determine the maximum dry unit weight and optimum moisture content in accordance with ASTM D698 (standard method). We also conducted Atterberg Limits on the samples to assess soil type. A summary of the test results is presented below.

Table 4.3.1 Summary of Proctors and Atterberg Test Results

Sample Location	Depth (feet)	Material Type	Liquid Limit (%)	Plasticity Index (%)	Maximum Dry Unit Weight (pcf)	Optimum Moisture Content (%)
TR-1a	1.5-5	CL	47	29	103.1	19.4
TR-2	1.5-5	CL	47	29	101.3	19.4

Notes: pcf = pounds per cubic foot; CL = Lean Clay.

Unconsolidated-Undrained (UU) Triaxial tests were performed in accordance with ASTM D2850 on undisturbed soil samples at selected locations. The results are presented in Table 4.3.2.

Table 4.3.2 Summary of Unconsolidated-Undrained Triaxial Test Results

Boring No.	Depth (feet)	Material Type	Confining Pressure (psi)	In-Situ Dry Unit Weight (pcf)	In-Situ Moisture Content (%)	Undrained Shear Strength, S_u (psf)
GEO-02	9	CL	7.5	114.5	16.1	400
GEO-21	9	CL	7.5	118.5	13.4	2,380
GEO-22	12	CL	10	120.3	13.2	1,710
GEO-28	9	CL	7.5	124.8	12.5	3,600
GEO-32	9	CL	7.5	122.7	13.5	2,080
O&M-1	3	CL	2.5	113.6	18.4	1,470
O&M-2	10.5	CL	8.5	122.7	14.4	2,980

Notes: pcf = pounds per cubic foot; CL = Lean Clay.

Results of swell testing performed in accordance with ASTM D4546, on a selected undisturbed soil sample, are summarized in Table 4.3.3. It should be noted that laboratory test results are based on “as received” moisture content at the time of the geotechnical investigation.

Table 4.3.3 Summary of Swell/ Expansion Test Results

Sample Location	Depth (feet)	Material Type	Dry Density (pcf)	Moisture Content (%)	Surcharge Load (psf)	Swell Strain (%)
O&M-1	3	CL	124.8	11.0	400	-0.1

Notes: pcf = pounds per cubic foot; psf = pounds per square foot; Negative swell strain indicates collapse during test; CL = Lean Clay.

One-dimensional Consolidation testing was performed in accordance with ASTM D2435 on relatively undisturbed soil samples. The results from these tests are presented in Table 4.3.4.

Table 4.3.4 Summary of 1-D Consolidation Test

Sample Location	Depth (feet)	Material Type	σ'_{vo} (psf)	p'_c (psf)	C_c	C_r	e_o	OCR
GEO-02	9	CL	1,200	4,500	0.090	0.007	0.377	3.8
GEO-21	9	CL	1,210	9,400	0.122	0.008	0.675	7.8
GEO-22	12	CL	1,630	6,800	0.088	0.009	0.324	4.2
GEO-28	9	CL	1,270	11,000	0.086	0.008	0.342	8.7
GEO-32	9	CL	1,260	9,600	0.109	0.016	0.430	7.6
O&M-1	3	CL	400	8,500	0.085	0.011	0.328	21.3

Notes: psf = pounds per square foot; σ'_{vo}= estimated in-situ Effective Vertical Stress; p'_c = Preconsolidation Pressure; C_c = Compression Index; C_r = Recompression Index; e_o = Initial Void Ratio; OCR = Over-consolidation Ratio; CL = Lean Clay.

We performed California Bearing Ratio (CBR) tests on selected samples. The test specimens are soaked for 96 hours prior to the CBR load test. A summary of the CBR test results is presented in Table 4.3.5. Design CBR values represent strength at 95% compaction relative to the maximum dry density as determined by ASTM D698. CBR increases with increased density.

Table 4.3.5 Summary of CBR Test Results

Sample Location	Depth (feet)	Material Type	Design Dry Unit Weight (pcf)	Design CBR (%)
TR-1a	1.5-5	CL	97.9	2.4
TR-2	1.5-5	CL	96.2	2.3

Notes: pcf = pounds per cubic foot; CL = Lean Clay.

Results of water-soluble sulfate and chloride testing performed on shallow soil samples are summarized in Table 4.3.6.

Table 4.3.6 Summary of Sulfate and Chloride Contents

Sample Location	Depth (feet)	Material Type	Sulfate Contents (% by weight)	Chloride Contents (% by weight)
GEO-02	1-9	CL/CH	0.0088	0.0082
GEO-21	1-9	CL	0.0011	0.0123
GEO-22	1-9	CL	0.0070	0.0099
GEO-23	1-9	CL	0.0021	0.0100
GEO-25	1-9	CL	0.0023	0.0097
GEO-28	1-9	CL	0.0131	0.0073
GEO-32	1-9	CL	0.0016	0.0086
TR-1a	1.5-5	CL	0.0022	0.0097
TR-2	1.5-5	CL	0.0019	0.0101

Notes: CL = Lean Clay; CH = Fat Clay.

Results of minimum resistivity and pH performed on shallow soil samples are summarized in Table 4.3.7.

Table 4.3.7 Summary of Minimum Soil Box Resistivity and pH Tests

Sample Location	Depth (feet)	Material Type	Minimum Soil Box Resistivity (ohm-cm)	pH
GEO-02	1-9	CL/CH	2,483	7.1
GEO-21	1-9	CL	2,589	8.0
GEO-22	1-9	CL	2,257	7.6
GEO-23	1-9	CL	1,752	5.9
GEO-25	1-9	CL	3,350	7.7
GEO-28	1-9	CL	2,273	7.7
GEO-32	1-9	CL	3,395	7.4
TR-1a	1.5-5	CL	1,461	6.7
TR-2	1.5-5	CL	2,102	6.2

Notes: CL = Lean Clay; CH = Fat Clay.

Individual test reports and a summary of laboratory tests are presented in Appendix B.

4.4 Groundwater Conditions

Based upon the information obtained from the borings, piezometers, and historical water data for the region, it is RRC's opinion that static groundwater level will likely have an impact on shallow gravity foundations. We encountered groundwater in all borings completed as part of this study. Groundwater observations for each WTG location and substation area are presented on Table A2 in Appendix A.

RRC installed temporary piezometers within the foundation footprint of sixty-two (62) WTG sites as well as one (1) within substation area. The temporary piezometers were installed to a depth of about 13 feet below existing grade. We recorded piezometer groundwater levels between March 31 and May 10, 2025. These are summarized in Table A4 within Appendix A. The design groundwater level in Table A1 assumes that groundwater might vary by one foot shallower relative to those measured.

We reviewed published water well logs for Coles County, Illinois, available from Illinois State Geological Survey (Reference 4). Historical water well logs within the project site presented the depth from static groundwater levels and were reported to be between 9 and 26 feet below the ground surface. The shallowest groundwater depth was recorded in the year 1991 at about 9 feet below the ground surface at State Well No. 120292344400. The well locations presented on Table A3 in Appendix A are plotted on Figure 8 in Appendix A.

We note that majority of the water wells were installed to deep aquifers below typical turbine foundation depth and indicate piezometric or static groundwater level within those deep aquifers only. The static water levels from the deep wells do not always provide useful groundwater information for shallow aquifers or perched water tables near turbine foundation depths that should be considered in turbine foundation design.

It is imperative to note that the short-term groundwater level observations presented in this study are not an accurate evaluation of groundwater levels. This Report is not to be interpreted as a comprehensive groundwater study. Groundwater levels are highly dependent on climatic and hydrologic conditions before and after construction, and site development including irrigation demands, drainage and other factors. The presence of water during construction can vary relative to this Report. It is understood that the presence of groundwater may influence certain construction activities and long-term performance of foundations and pavements. If a detailed groundwater study is desired, a groundwater hydrologist should be retained to perform these services.

4.5 Geohazard Assessment

The following subject items represent geologic or physical hazards to the project. Within each subject, we address the level of risk associated with the particular hazard relative to this project.

4.5.1 Flood Hazard

We reviewed the floodplain boundary maps available for Coles County from the Federal Emergency Management Agency (FEMA). The turbine sites and Project substation are located within Zone X flood zone. Areas identified as Zone X are outside of the 0.2 annual chance flood zone (500-year floodplain) and are within a minimal flood hazard area.

4.5.2 Expansive Soils

Low to high expansive clay soils exist at this site. Laboratory tests indicate the native clay soils have PI values ranging from 8 to 29 with an average of 17 . Clay soils with a PI greater than 25 are considered ‘highly expansive’. The clay soils are also relatively moist with in-situ moisture contents in the range from about 12% to 27% (average of 17%). Expansive clays undergo shrink and swell when significant moisture changes occur. Therefore, it is important to maintain the clay soils natural moisture during and after construction.

WTG foundation embedment depths are anticipated to be near 12.1 feet below the ground surface. Moisture variations at that depth due to normal climatic variations are low. It is RRC’s opinion that WTG foundations will not experience significant shrink/swell movement provided the recommendations in Section 6.6 are followed.

4.5.3 Frost Penetration Depth

Based on EM 1110-1-1905 (Reference 5), the average frost penetration depth for Coles County is approximately three (3) feet below finished site grade. Therefore, spread or strip footings at the site should have a minimum embedment depth of three (3) feet below finished site grade.

4.5.4 Corrosion Potential

The published map that indicates a range from “Low” to “High” risk for concrete corrosion. Figure 6 in Appendix A is the map that attempts to indicate concrete corrosion risk boundaries. RRC cautions that this published map is only estimates based on soil types and cannot be

precise. The laboratory test results indicate the soils in the upper 10 feet possess a “Negligible” risk for sulfate exposure and corrosion potential to concrete

The published map, presented in Figure 7 for approximate steel corrosion risk boundaries, indicates that the project site has a “Low” to “High” risk for steel corrosion. Again, we caution that this map is not precise and is only generalizations based on soil types. The laboratory test results indicate soils within the upper 10 feet exhibit “Corrosive” to “Moderately Corrosive” electrical characteristics with regards to galvanic corrosion of steel. For chlorides, the test results indicate “Non-Aggressive” corrosion potentials to steel

Section 5.3 discusses laboratory test results in greater detail for concrete and steel corrosion.

4.5.5 Slope Stability

The project site consists of broader flat to gently rolling plains. Where most of the site exhibits gradual to moderate slopes, occasional steeper slopes may exist near drainage features. Based on existing site topography and RRC’s observations during geotechnical field exploration, slope stability is not anticipated to be a major concern for this project site, assuming minimum site grading occurs during construction phase.

4.5.6 Seismicity Hazards

Coles County, Illinois is an area with relatively low seismicity. Specific seismic design values are provided in Section 5.5.

4.6 Geophysical Properties

RRC performed One-Dimensional Multi-Channel Analysis of Subsurface Waves (MASW) surveys at five (5) selected WTG locations in the final phase. The purpose of MASW is to obtain shear wave velocity (Vs) profiles. The survey locations are mapped on Figure 3 in Appendix A. The MASW survey methodologies and results are discussed in Section 4.6.1.

RRC retained the services of Geotherm to conduct two (2) thermal resistivity (TR) tests at the selected locations provided by Apex Clean Energy. Thermal resistivity test methodologies are presented in Section 4.6.2. These locations are mapped on Figure 4 in Appendix A.

4.6.1 MASW Survey

The Multi-Channel-Analysis-of-Surface-Waves (MASW) method is a non-intrusive/non-destructive technique which uses Rayleigh waves to evaluate the stiffness of subsurface strata. Rayleigh waves of different wavelengths (or frequencies) travel at different velocities as they propagate through different soils. The waves also bounce along the surface of different layers, called dispersion. MASW reports are presented in Appendix C.

For a 1-D MASW survey, twenty-four geophones with a 5-foot spacing are laid out in a linear array. The total length of the array is approximately 115 feet. A 16-pound sledgehammer striking a metal plate is employed as the seismic source located 10, 25 and 40 feet away from the first geophone. RRC uses SurfSeis 4.04 software to collect and process the seismic data.

The shear wave velocities are used to determine certain soil and bedrock characteristics based on simple equations. For example, the soil/bedrock shear modulus can be calculated using the following equation:

$$G = \rho V_S^2$$

Where: G = Shear Modulus (psf);
ρ = Mass density (pcf/(ft/sec.2)); and
Vs = Shear wave velocity (ft/sec.)

Young's Modulus, E, can also be calculated from the shear wave velocity data using the following equation:

$$E = 2G(1 + v)$$

Where: E = Young's Modulus (psf);
G = Shear Modulus (psf); and
v = Poisson's Ratio.

The weighted average for measured shear wave velocities below assumed foundation bearing elevation at the project site for selected turbine locations were determined to be in the range of 1,040 to 1,165 feet per second (ft/sec).

The weighted average is calculated based on the following formula based on the 2021 International Building Code (IBC) (Reference 6):

$$\overline{V_S} = \frac{\sum_i^n d_i}{\sum_i^n \frac{d_i}{V_{si}}}$$

Where: d_i = Thickness of any layer between 0 and 100 feet; and
V_{si} = Shear wave velocity of a layer.

Note the measured shear wave velocity using MASW may not be available down to a depth of 100 feet. In the case where measured shear wave velocity is less than 100 feet, the weighted shear wave velocity is calculated based on available depths. Figure 9 within Appendix A shows the weighted average shear wave velocities at selected WTG locations.

To determine the rotational stiffness of the underlying soil and/or structural fill, the parameters outlined in Table 4.6.1.1 can be used to compute the elastic and shear moduli. These values are generic values from published sources and typical for the respective soil type.

Table 4.6.1.1 Recommended Soil Parameters for Rotational Stiffness

Soil/ Material Type	Poisson's Ratio [1]	Average Total Unit Weight (pcf)[1,2]
Saturated Clay and Silt Soils	0.45	115
Unsaturated Clay and Silt Soils	0.35	105
Loose to Medium Dense Sand Soils	0.35	115

Soil/ Material Type	Poisson's Ratio (1)	Average Total Unit Weight (pcf)(1,2)
Medium Dense to Dense Sand Soils	0.30	120
Structural Fill	0.30	120

Note: (1) Based on Reference 7 (see page 123 for Poisson's ratio and page 163 for unit weight).
(2) Based on laboratory measurements (see Section 4.3).

Computed parameters from the MASW surveys represent soil behavior at small strain. The foundation designer should incorporate appropriate reduction factors to determine the rotational stiffness of the foundation system. The MASW survey results are included in Appendix C.

4.6.2 Thermal Resistivity of Soils

RRC obtained the services of Geotherm to conduct in-situ and laboratory thermal resistivity tests. On April 16, 2025, Geotherm conducted in-situ thermal resistivity testing at two (2) selected locations. At each location, a backhoe was used to excavate a test pit to a depth of 5 to 5.5 feet below existing site grade. In addition, Geotherm collected bulk samples to conduct laboratory thermal resistivity dry-out curves at different soil density.

Geotherm conducted in-situ tests at depths of 2, 3, 4 feet below grade. In-situ thermal resistivity and ambient temperature measurements were made using field thermal probes and the Geotherm TPA-2000 equipment. All in-situ thermal resistivity testing was performed in accordance with the IEEE Standard 442-2017. The field thermal resistivity values were measured at the natural soil moisture on that day. Depending on weather and environmental conditions, i.e., drying due to cable heat or other heat source, seasonal drying (drought), artificial draining, water demand of crops, etc., the soil may be drier at certain times of the year. The design thermal resistivity for the native soils should be based on the expected driest conditions.

Laboratory bulk samples are remolded/compacted to about 85% to 95% compaction of the maximum dry density as determined by ASTM D698 at "as-received" or optimum moisture content, whichever is greater. Thermal resistivity samples are then tested at a series of moisture contents from greater of "as-received" or optimum moisture content to 0% moisture content. The tests are conducted in accordance with IEEE standard 442-2017. The result is a thermal resistivity dry-out curve. Thermal resistivity tests results are presented within Appendix C.

Interpretation of the thermal resistivity tests results is beyond the scope of this study and should be performed by the design team.

5.0 GEOTECHNICAL RECOMMENDATIONS

The The project will consist of fifty-one (51) wind turbine generators and associated facilities. However, for the purposes of this report, RRC conducted geotechnical analyses at 62 proposed turbine locations, although no more than 51 will be built. These 62 turbine locations are the same locations approved by Coles County in July 2025. The WTG model proposed for the project will be the GE 6.1-158 MW, 117m hub height WTG. Current designs show gravity

foundations with an embedment depth of 12.1 feet below finished grade. RRC's recommendations provide for an embedment depth of 12.1 feet below natural/existing grade.

The extent and location of site grading is also unknown currently. RRC should be retained to review the civil drawings and cross-sections for each turbine location and other critical areas along the proposed roadways. This will allow us to evaluate the need for additional studies such as slope stability analyses. If current site grade is changed at a WTG location, we can assess whether our original recommendations apply. However, for this current study, we anticipate turbine foundations will bear on native soils with finish grade at or slightly above current existing site grade with minimal slope stability impacts. RRC's geotechnical recommendations presented in this report should be verified when information on the foundation design and site grading become available.

5.1 General Turbine Foundation Expectations

RRC performed bearing capacity and settlement calculations in general accordance with methodologies outlined in the 2nd Edition of *Guidelines for Design of Wind Turbines* (Reference 8). We also used generally accepted standard of care and practice along with experience with similar soil conditions in this type of geological setting. Detailed discussions of bearing capacity and settlement for WTG bearing on native soils are outlined in the following subsections. Natural conditions vary, providing variable soil strengths that provide net allowable bearing capacities ranging from 1,750 to 3,500 psf. RRC's goal is to provide recommendations that allow one or two foundation designs for the entire site.

Table A1, *Summary of Foundation Design Net Allowable Bearing Pressure and Design Groundwater Recommendation*s in Appendix A provides detailed summary of RRC's recommendations for WTGs geotechnical design. A summary of anticipated conditions that will require particular attention in the design and construction is presented below:

- RRC based our design parameters and construction recommendations to allow for foundations to bear at about 12.1 feet below the existing ground surface, for an in-situ net allowable end bearing capacity of 2,000 psf, with a maximum settlement of 2.5 inches and a maximum differential settlement or tilt potential of 0.17 degree across the foundation.

- To be capable of supporting a net allowable bearing capacity of 2,000 psf, alternate foundation designs may be required at two (2) locations (GEO-15, GEO-20). Otherwise, remediation of the foundation supporting soils is necessary.

- T47a and T39a shifted 65 feet from GEO-25 and 60 feet from GEO-32 respectively in Array 37, the recommendations at these two locations are still valid.

- The depths of remediation for supporting a net allowable bearing capacity of 2,000 psf are provided in Table A1. These depths to remediation are based relative to naturally existing grade and foundations bearing about 12.1 feet below grade. If final grade results

in the foundation bearing at a different depth, then adjustments should be made to the depth of remediation.

- Over-excavation and replacement with structural fill materials could be considered for soil improvement depths up to about 4 feet below foundation bearing elevation, if feasible. For soil improvements greater than 4 feet below foundation bearing elevation, the cost for performing over-excavation and replacement will likely be excessive, and therefore, deep soil improvement measures such as Rammed Aggregate Piers (RAP), compaction grouting or other equivalent ground improvement techniques could be considered. The recommended deep soil improvement depths should be verified by the deep soil improvement designer/contractor. If the RAP option is considered, the design-build contractor shall be prepared to drill through shallow hard layers to mitigate target weaker zone at deeper depths. The intent of deep soil improvement is to improve bearing capacity and reduce settlement potential of the underlying subsurface soils. Alternatively, use compaction grouting or alternative methods.

- Shallow groundwater was encountered at depths ranging from 0 to 5 feet at the turbine locations. RRC may monitor the piezometers for groundwater levels and take more readings before construction upon request. The information will help the contractor assess groundwater issues at the time of excavation.

- Turbine foundations located adjacent to natural or man-made slopes should be setback laterally from the top of the slope. The minimum setback distance should be 25 feet from the edge of foundation to the crest of any natural or man-made slopes. Proper drainage measures should be taken to reduce impacts to man-made cut and fill slopes as well as all undisturbed natural slopes.

5.1.1 Bearing Capacity and Settlement of Gravity Foundation System

A net allowable bearing pressure of 2,000 psf can be used for the structural design for turbine foundations. This allowable bearing includes a safety factor of three for general shear failure. This net allowable bearing pressure value may be increased by 25% when considering short duration loading conditions such as extreme wind and seismic forces. Two (2) locations (GEO-15, GEO-20) will require remedial measures outlined in Section 6.6 in order to achieve a net allowable bearing pressure of 2,000 psf.

The estimated total turbine foundation settlement is expected to be on the order of 0.5 to 2.5 inches under normal operating loading conditions at the center of the foundation. The estimated differential settlement or tilt across the foundation diameter is less than 0.17 degree under both dead load and normal operating loading conditions.

Table 5.1.1.1 Geotechnical Design Parameters for Gravity Foundation

Parameters/Soil Type*	Recommended Values
Min. Undrained Shear Strength / Clay	1,000 (psf)
Min. Internal Friction Angle / Sand	30 (deg.)
Min. Net Allowable Bearing Capacity (Normal Operating Load, Fs=3.0)	2,000 (psf)
Shear Wave Velocity for Soils Under Foundation	400 – 900 (ft/sec)
Poisson's Ratio	0.35

*Parameters for bedrock omitted as the interpreted bearing capacity and shear wave velocity for bedrock is much higher than those for soils, which will govern the foundation design.

Table 5.1.1.2 presents a summary of Modulus of Subgrade Reaction for different soil and structural fill materials.

Table 5.1.1.2 Recommended Soil and Structural Fill Design Parameters

Soil/ Material Type	Friction Coefficient[(1)]	Modulus of Subgrade Reaction, k_s[(2)] (pci)
Firm Clay Soils	0.35	75
Stiff to Hard Clay Soils	0.35	100
Medium Dense Sand Soils	0.35	150
Dense to Very Dense Sand Soils	0.45	200
Structural Fill Materials	0.45	300

Note: [(1)] If necessary, lateral passive earth pressures can be considered to develop additional resistance. The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.
[(2)] For 1-ft. X 1-ft. Plate.

To determine the rotational stiffness of the underlying soils/bedrock, the foundation designer should reference the results of the MASW testing performed as part of this study. The results of these surveys completed as part of this study are presented in Appendix C.

5.1.2 Overburden Backfill on Turbine Foundation

The use of native soil/rock as backfill materials placed above and against the side of turbine foundations is acceptable. RRC recommends the backfill materials placed over the turbine foundations be compacted to dry densities of at least 95% of the maximum dry density as determined by ASTM D698. This compaction is necessary to reduce erosion and deter settlement. RRC recommends using an average long-term moisture content of 10% for native soils used as overburden. Contractor should place overburden backfill material in accordance with specifications outlined in Section 6.6.3 of this report.

Using the Standard Proctor tests listed in Table 4.3.1, the recommended over-burden backfill unit weight values for turbine foundation design are presented in Table 5.1.2.1 below. RRC recommends using an average long-term moisture content of 10% for overburden soils.

Table 5.1.2.1 Overburden Backfill Density Range Requirement

Soil/ Material Type	Dry Backfill Unit Weight Lower Limit, γ_d (pcf)	Moist Backfill Unit Weight Range, γ_{total} (pcf)
Native Soils	95	110 - 140

Note: pcf= pounds per cubic foot

These overburden unit weights range from 95% to 100% compaction and moisture from the long-term moisture to slightly greater than optimum moisture content.

5.2 O&M Building Shallow Foundation Systems

Target grade elevations for the proposed O&M buildings were not available during preparation of this report. RRC has assumed the finished grade will be near or slightly above the existing ground surface. Spread or strip footings at the site should have a minimum embedment depth of 3 feet below finished site grade.

The native soils at the O&M Buildings are lean clay. Typically, lean clay soils are of concern for supporting lightly loaded structures on a shallow foundation system due to their expansive nature. The laboratory tests indicated the lean clay soils at the O&M buildings possess an expansive potential when experiencing significant moist changes.

Shallow foundation components should have a minimum embedment of 36-inches below finished site grade for frost protection and may utilize an allowable bearing capacity of up to 2,000 psf. This presumes that footings bear on either undisturbed native soils or on properly compacted Select Fill or Structural Fill, or on flowable fill (controlled low strength material) having compressive strength of at least 150 psi. Mat foundations bearing near the ground surface may use a maximum allowable bearing capacity of 1,800 psf. Table 5.2.1 presents various design parameters associated with shallow foundations.

For reinforced concrete slabs bearing at finished grade, we recommend over-excavation of foundation subgrade soils to a minimum of 3 feet below the finished grade and replacement with non-frost susceptible fill material or flowable fill (controlled low strength material) having compressive strength of at least 150 psi. The non-frost susceptible fill material should be in accordance with Section 6.5 of this report. Other alternatives such as thermal insulation may be used to protect against frost and the contractor or designer of thermal insulation shall be responsible for compliance with local building codes.

Table 5.2.1 Soil Parameters for O&M Buildings

Parameter	Design Value
Design Groundwater Level, ft	1.0
Average Unit Weight, pcf	95
Modulus of Subgrade Reaction of Select Fill Pad, pci	120*
Friction Coefficient at Foundation Base	0.35
Allowable Bearing Pressure for Mat Foundation, psf	1,800
Allowable Bearing Pressure for Continuous and Spread	2,000

Parameter	Design Value
Footings Bearing 3 feet deep, psf	

Notes: pcf = pounds per cubic foot; psf = pounds per square foot; pci = pounds per cubic inch.
* For a 1 ft. x 1 ft. Plate.

5.3 Corrosivity of Soils

Water-soluble sulfate and chloride test results are presented in Table. 4.3.6. The test results indicate the soils in the upper 10 feet possess a “Negligible” risk for sulfate exposure and corrosion potential to concrete. Foundation concrete should be designed in accordance with *ACI 318: Building Code Requirements for Structural Concrete and Commentary*.

Minimum Soil Box Electrical Resistivity and pH testing results are presented in Table 4.3.7 of this report. Soil Box Electrical Resistivity results indicate soils within the upper 10 feet exhibit “Corrosive” to “Moderately Corrosive” electrical characteristics with regards to galvanic corrosion of steel. For chlorides, the test results indicate “Non-Aggressive” corrosion potentials to steel. Cathodic protection for buried metal pipe should be designed by a qualified corrosion engineer.

Table 5.3.1 Effect of Soil Box Electrical Resistivity on Corrosion

Aggressiveness	Resistivity in ohm-cm
Very Corrosive	< 700
Corrosive	700 – 2,000
Moderately Corrosive	2,000 – 5,000
Mildly Corrosive	5,000 – 10,000
Non-Corrosive	> 10,000

5.4 Lateral Earth Pressures

Lateral earth pressures will apply in soil strata. The WTG foundations will be designed to resist all lateral movements; therefore, the “at rest” lateral earth pressure will apply. The following “at rest” equivalent fluid pressures are recommended in Table 5.4.1. RRC applied unit weights listed in Table 5.1.2.1 for overburden backfill soils with minimal compaction and low moisture content. The lightweight range is more conservative and necessary for the “at rest” and “passive” condition. The heavier weights are more conservative for the “active” condition.

Table 5.4.1 Equivalent Fluid Pressures

Soil Type	Condition	Equivalent Fluid Pressure (psf/ft)
Clay Soils ϕ=20°, γ_t=100 to 125 pcf	At Rest, k_o= 0.65	65
	Active, k_a= 0.49	61
	Passive, k_p= 2.04	204
Sand Soils ϕ=34°, γ_t=105 to 130 pcf	At Rest, k_o= 0.44	46
	Active, k_a= 0.28	36
	Passive, k_p= 3.54	372

Passive and active earth pressure resistance will only mobilize after significant movement of the foundation. The passive case occurs where a structural element tends to move into the soil mass. The active case occurs when the element tends to move away from the soil mass. Both cases are applicable for unrestrained foundation elements.

The above earth pressure values do not include safety factors. We recommend a minimum safety factor of 2.0 be applied when using passive earth pressure for lateral load resistance. Surcharge loads should also be considered where appropriate. The values apply only to cases where the ground surface is level. We should be contacted to provide suitable values for cases where the ground surface is sloped. Similarly, if a structure is submerged below water, then the earth pressures change dramatically and require a different analysis.

5.5 Seismic Design

RRC provides seismic design using 2021 International Building Code (IBC) (Reference 6). Based on Logs of Boring data, we recommend using a Site Class D for stiff soils. The Mapped Spectral Response Acceleration for the 1 second (S_1) and short periods (S_S) were computed using ASCE Hazard Tool, which is a web-based application program (Reference 9). The table below summarizes recommended seismic parameters to be used in the design:

Table 5.5.1 Recommended Seismic Parameters

Parameter	Recommended Value
S_S – Mapped Spectral Response Acceleration at Short Period (0.2-Second)	0.243 g
S_1 – Mapped Spectral Response Acceleration at 1-Second Period	0.110 g
F_a (Site Coefficient) – Site Class D	1.6
F_v (Site Coefficient) – Site Class D	2.4
PGA_M – Site Modified Peak Ground Acceleration – Site Class D	0.192 g
Seismic Design Category	C

6.0 FOUNDATION CONSTRUCTION CRITERIA

6.1 Site Preparation

Prior to construction, we recommend adequate positive drainage be provided to maintain a relatively dry condition in the area of proposed construction. This will be very important if any work is attempted during periods of prolonged rainfall or heavy snowfall followed by warmer days. Ponding of water in the areas of construction should be avoided. Winter conditions can also impact the construction process. Newly placed fill should not be placed on frozen subgrade and frozen material should not be used for fill.

During excavation of the turbine foundations, every effort should be made to avoid disturbing subgrade materials at the planned foundation bearing elevation. When the subgrade is disturbed, the resulting surface should be re-compacted to achieve a minimum compaction of 98% of the maximum dry density as determined by ASTM D698 and moisture conditioned within 2% of optimum moisture content or drier. A qualified representative of the geotechnical engineer should verify the stability of the subgrade prior to foundation installation.

6.2 Structural Fill Specifications

Structural fill material should consist of a non-expansive, well-graded material with sufficient binder for compaction purposes and meet the requirements of *Standard Specifications for Road and Bridge Construction* (Adopted January 1, 2022), Illinois Department of Transportation, Article 1004.04, Aggregate Base Course (or better). RRC's intent is to make Structural Fill interchangeable with flexible road base, where convenient.

Structural fill should be compacted to a minimum of 95% of ASTM D1557. The structural fill should be moisture conditioned near optimum, but moisture is not a pass-fail criterion. Typically, 9-inch lifts are maximum, but if a contractor can complete thicker lifts and it can be verified that full densification occurs throughout the lift, then lifts to 12-inches are possible.

6.3 Native Soils as Select Fill below Foundations

RRC understands the importance of using native soils whenever feasible. The following specifications allow reasonable native soil reuse while maintaining structural requirements for end bearing capacity and settlement. Modification of unsuitable foundation soils shall consist of over-excavation and replacement with any of the following materials:

Select Fill are soils that possess the following properties: maximum plasticity index of 15 and a maximum liquid limit of 40, and classify as SC-SM, SC, Sandy CL, well-graded GC, and well-graded GM.

Select Fill placement under turbines should be limited to two-feet thick. Deeper replacement must be approved by the Geotechnical Engineer in order to assess settlement potential for that specific location. Otherwise, use Structural Fill.

All reused and Select Fill soils used under foundations shall be compacted to a minimum of 98% of the maximum dry density as determined by ASTM D698 and shall be moisture conditioned within 3% of optimum moisture content.

When dealing with subgrade pumping, rutting, or moisture, and the remediation has a maximum thickness of 12-inches, then the excavated soils may be scarified and reused to complete the remediation. Deeper remediation requires either Select Fill (2-foot max) or Structural Fill.

6.4 General Use Fill

The use of native clay and sand soils is acceptable as general use fill. The requirements presented in this section are not applicable to materials place above or below any structures or roadways.

All backfill should adhere to the specifications below.

- All general use fill should be free of significant organics, roots, and deleterious materials.
- The general use fill materials should be placed in loose lifts not exceeding 12 inches.
- Each lift of general use fill should be compacted to dry densities of at least 90% of the maximum dry density as determined by ASTM D698. This compaction reduces fill settlement and erosion.

The top surface of the general use fill should have a minimum 2% drainage slope away from structures and roadways to allow surface water drainage. Development of a site grading plan is the responsibility of the Civil Engineer or Hydrology Engineer.

6.5 Non-Frost Susceptible Fill

The non-frost susceptible fill material should consist of well-graded gravel or sand which has less than 5% passing a No. 200 Sieve. This material should classify as either SP, SW, GP, or GW using Table 1 of ASTM D2487. Compact to a minimum of 98% of the maximum dry density as determined by ASTM D698. Moisture content is not a pass/fail criterion for this material.

6.6 Turbine Earthwork Requirements

RRC reviewed each log of boring and CPT sounding for the presence of soft to medium stiff clays, loose sand layer(s) and/or non-competent materials below and near the anticipated foundation bearing elevation. In *Table A1, Summary of Foundation Design Net Allowable Bearing Pressure and Design Groundwater Recommendations* within Appendix A, we list locations that we expect will require remediation. Following are various options and methods to remediate subsurface soils to support the intended gravity foundations. We also present other earthwork requirements related to the turbines, such as overburden backfill and crane pads on overburden fill.

6.6.1 Verification of Turbine Foundation Subgrade

All WTG excavations should be verified that bearing soils are suitable for construction. RRC prefers proof-roll tests to verify the stability of foundation excavations. RRC does anticipate that shallow groundwater might deter proof-roll tests. Where the foundation design allows for relatively soft soils or where shallow groundwater deters the proof-roll, then the Geotechnical Engineer shall consider alternate verification methods. Alternate methods might consist of Dynamic Cone Penetrometer (DCP) for sandy/gravelly soils or Static Cone Penetrometer (SCP) for clay with low sand content. After foundation designs are complete and after the DCP/SCP equipment are known, the geotechnical engineer can devise test specifications.

If an excavation is dry and stable, then perform a proof-roll test. There is a preference to perform a proof-roll test using a fully loaded water truck, or similar equipment. Conduct the proof-roll test in at least two directions with a minimum of two passes per area. Proof-roll tests should not exceed ½-inch of deflection, rutting, or pumping. Areas that fail this proof-roll shall be excavated and the removed soils be recompacted or replaced.

6.6.2 Subgrade Remediation Methods

A representative of the Geotechnical Engineer should observe and verify over-excavations. In some cases, additional over-excavation may be necessary. In some cases, less excavation is sufficient.

In order to disperse the foundation load over a larger area, structural fill pads should be larger than the foundation. Deeper remediation also requires a wider distance. The over-excavated areas should extend laterally a distance such that the edge is at least a distance equal to the pad thickness. Foundation stresses extend downward and outward at a 45-degree angle through the structural fill. For example, a 3-foot-thick remediation will require a pad that is 3 feet beyond the edge of the foundation.

If compacted structural fill or select fill is used below the turbine foundation, the fill thickness shall be kept uniform with a maximum thickness difference of two feet across the foundation footprint. This uniform thickness is to deter differential settlement. Where subgrade is a combination of bedrock and soil, then either excavate the rock or replace the soil with lean concrete or structural fill.

It is possible to encounter suitable soils at shallower depths. It is also feasible to verify that suspect soils are suitable to support the foundation design intent. If Table A1 recommends excavation to a depth, it is because this is the anticipated bottom of the suspect stratum. Contractor may choose to conduct additional tests to verify whether the suspect soils meet strength requirements. These tests should extend through the suspect layer. RRC can recommend Dynamic Cone Penetrometer (DCP) tests and/or Static Cone Penetration (SCP) tests to conduct this verification. Once a foundation design is complete, the geotechnical team can work with the quality assurance team to devise a suitable DCP/SCP test procedure and minimum DCP/SCP test values.

The stability of the subgrade at foundation bearing elevation may be affected by the proximity to shallow groundwater levels and/or “Perched” Groundwater conditions. In areas where bearing capacity and settlement are not the concern, such as a thin layer of mud, the contractor may establish a stable platform using the following options:

- Dewater the site. Means and methods for dewatering are the responsibility of the contractor.
- Use geogrid/geotextile in combination with structural fill to create a stable surface. Obtain design input from the product manufacturer.
- Use coarse rip rap to bridge wet soils. Compact rip rap to bed the aggregate within the wet soils. Cap the rip rap with compacted structural fill then verify overall stability using a proof-roll method.

It is crucial to maintain a uniform foundation subgrade support below the turbine foundation to reduce differential foundation settlement. In areas where a combination of soil and bedrock are exposed at the foundation bearing elevation, the soil portion should be over-excavated to competent bedrock and replaced with either compacted structural fill or lean concrete having a 28-day compressive strength of 1,000 psi or higher. Do not use select fill or native soils. Alternatively, the entire foundation footprint can be over-excavated for a depth of 2 feet below the foundation bearing elevation and replaced with compacted structural fill.

Should boulders be exposed at foundation bearing elevation during excavation, remove the boulder and replace with structural fill. Foundations bearing on exposed boulders have the potential to create point loads at the bottom of the foundations. This increases differential foundation stress.

6.6.3 Excavated Materials as Overburden Backfill

The use of native clay and sand soils is acceptable as overburden backfill materials placed above and against the sides of turbine foundations. All backfill should be free of significant organics, roots, and deleterious materials and should be properly processed and compacted. See specifications below.

Overburden Backfill Placement:

- The backfill materials should be placed in loose lifts not exceeding 12 inches.
- Each lift of backfill should be moisture conditioned, compacted, and tested to meet the minimum and maximum dry and moist unit weight values specified in the foundation design drawings. If not on the drawings, refer to Section 5.1.2 of this report for target overburden weights.
- Each lift of backfill materials over turbine foundations should be compacted to dry densities of at least 95% of the maximum dry density as determined by ASTM D698.

Even if this level of compaction is greater than the minimum target weights from item 2 above. This compaction reduces fill settlement, erosion, and provides support for the transformer.

Poorly graded sand (classified as SP) and gravel are highly permeable and allow water entry. These soils make poor overburden backfill. If overburden material consists of SP or Gravel, then RRC recommends adding a 12-inch-thick clay cap. This clay cap should extend at least five feet beyond the turbine foundation excavation. Alternately, the contractor can consider mixing clayey soils into the overburden backfill materials in order to create a less permeable mixture. The Geotechnical Engineer should be allowed to review such mixtures.

The top surface of the backfill should have a minimum 2% drainage slope away from the turbine to allow surface water runoff.

6.6.4 Crane Pads on Overburden

As modern WTGs become larger and towers taller, crane pad designs require more soil strength to support larger loads. As such, traditional overburden backfill compaction specifications do not always provide sufficient soil strengths. Contractors can either design crane mats that better distribute crane loads, or they can request stricter soil density and strength requirements to support design crane loads. In this *Geotechnical Report*, RRC provides density requirements that we expect can support typical crane loads distributed by mats. Once the contractor is able to assess crane pad design options, the contractor may request modified specifications in the future.

In areas where crane pads extend over the overburden backfill zone, then the crane operator's bearing capacity requirements must apply. As a general guideline, RRC suggests a minimum three feet (in thickness) of the overburden backfill below crane pads be compacted to a minimum of 98% of the maximum dry density as determined by ASTM D698. Moisture condition soils to be dry of optimum, where moisture is not a pass/fail criterion. Refer to Section 7.2 of this Report for additional issues related to crane pads.

6.7 O&M Building Structures

This section provides construction recommendations and specifications related to shallow foundations for structures not consisting of turbines. This section is intended to apply for all electrical Substation and O&M Building structures. If in the future, more specific geotechnical studies for those facilities are conducted, then disregard this section and refer to the recommendations in those more specific studies.

6.7.1 Shallow Foundation Construction

The following construction criteria and general guidance should be observed during foundation construction:

- All foundation excavations should be observed by the engineer's qualified representative to assess proper bearing materials are present at foundation bearing elevation in

accordance with the recommendations given herein, and to assess the need for densification of the subgrade materials. In addition to a geotechnical representative in the field, RRC Geotechnical Engineer will provide consultation during construction upon request.

- Care should be taken to protect the exposed soils from being disturbed, freezing or desiccation.

- The foundation excavation should be sloped sufficiently to create internal sumps for runoff collection and removal. Foundation excavations subject to rainfall and possible deterioration from accumulated water should be protected using a protective “mud-slab” (lean concrete). If surface runoff water or groundwater seepage accumulates at the bottom of the foundation excavation, it should be collected and removed and not allowed to adversely affect the quality of the bearing surface.

- The foundation excavations should be checked for size and cleaned prior to the placement of reinforcing steel. Take precautions during the placement of reinforcement Open Excavations

With all excavations in soils, sloped excavations and trench shields are required for excavations greater than four feet in depth. The contractor’s “Competent Person” (as defined by OSHA) must inspect each trench wall to determine the type of bench or slope that is required. With all excavations, only a “Competent Person” shall determine whether sloped, benched, or trench shields can be used. OSHA and applicable state and local standards should be observed and followed. Site safety is the responsibility of the contractor. For general planning purposes, RRC offers the following:

- The presence of water within any excavation automatically creates a Type C classification. All Type C class excavations require a 1.5H:1V slope or bench.

- The surficial cohesive clay soils across this site are generally soft to medium stiff. This soil type classifies as an OSHA Type B material that requires the excavation’s sidewall be sloped at 1H:1V (or flatter). This does not apply in the presence of free water.

- The sandy soils at the site possess low to zero cohesion. This soil type classifies as an OSHA Type B material that requires the excavation’s sidewall be sloped at a 1H:1V slope (or flatter). The silt content may give the appearance of cohesion when first excavated, but this is not correct.

Protect construction slopes and permanent embankment slopes from surface runoff water. Design site grading to deter surface water from flowing down unprotected slopes. The contractor should avoid surcharge loads, either static or dynamic, adjacent to an excavation slope. Prevent construction equipment from traveling along or near the top of the excavation slope. The contractor’s “Competent Person” must monitor temporary slopes, trenches, and

dewatering during construction in order to detect early warnings of movement. Site safety is the responsibility of the contractor.

6.8 Drainage and Construction Dewatering

Proper drainage should be provided away from the foundation elements during all phases of construction and post-construction grading. Proper drainage is essential to the long-term stability of the structures. Ponding of water near the foundation elements from improper drainage should not be permitted.

Based on the available groundwater information, shallow groundwater should be anticipated for WTG foundation excavations. If rain causes perched water conditions, we anticipate the groundwater re-charge rate should be slow enough to conduct excavation dewatering with conventional sumps and pumps. Means and methods for dewatering are the responsibility of the contractor.

7.0 ACCESS ROADWAYS AND CRANE PADS

Private access roadways will be built for construction and maintenance purposes. Traffic volumes during construction are anticipated to be frequent with heavy equipment utilizing the access roadways. Following the construction period, the traffic volumes will be light and vehicles accessing the roadways will generally consist of pickup trucks and occasional single and multi-axle truck traffic. The section thickness design should be based upon the methodology outlined by the American Association of State Highways and Transportation Officials (AASHTO) for design of aggregate-surfaced roadways (Reference 10).

Crane pads require sufficient bearing capacity to support the large cranes used to lift the turbine sections. The design intent for these crane pads is not related to regular traffic.

7.1 Pavement Section Thickness Recommendations Based on AASHTO 1993

Surficial soils encountered within the borings indicated native soils consisting primarily of clay soils. These materials are generally considered to be poor in terms of supporting vehicular and construction traffic as defined by AASHTO when used for support of pavement structures. The actual pavement thickness should be determined by the design/build contractor, keeping in mind the frequency, duration and requirements of the turbine manufacturer.

CBR tests were performed at two (2) selected locations. The CBRs are soaked and compacted to 95% of the maximum dry density at optimum moisture content as determined by ASTM D698. Soaked CBR values were 2.3% and 2.4% for clay soils. For design purposes, RRC recommends a CBR value of 2.3%, which correlates to a subgrade resilient modulus (MR) value of 4,350 psi. It is important to understand that the CBR value is for soils without topsoil. Leaving topsoil within the road subgrade will significantly reduce the CBR value, thus negating the recommendations below.

RRC anticipates that the project team will use crushed stone for private access roadways. Crushed stone should meet IDOT, Article 1004.04, Aggregate Base Course (or better). The

thickness of the crushed stone base course is dependent on the traffic loads, traffic frequency, duration, and performance expectations. Crushed stone 'pavement' is not an engineered pavement and can be expected to require regular maintenance regardless of thickness. This is especially true if traffic is allowed onto it when saturated.

Table 7.1.1 Summary of Design Parameters

Parameter	Design Value
Modulus of Aggregate Base Layer (E_{BS}) in psi	30,000
CBR Design Value of Subgrade Materials (%)	2.3
Calculated Resilient Modulus of Roadbed Materials (M_R) in psi*	4,350
Allowable Rutting Design Value (Option A) in inches	1.0
Allowable Rutting Design Value (Option B) in inches	2.0

Notes: Mr (psi) = $2{,}555(CBR)^{0.64}$ (AASHTO 1993)

The following table provides a summary of design recommendations for aggregate base course roadways based on the *1993 AASHTO Design Manual* (Reference 10). We used AASHTO's design chart for low-volume aggregate base surface roads, which designs based on acceptable rutting. Traffic 18-kip Equivalent Single-Axle Loads (ESAL) were estimated based upon our experience with similar type projects. For this project we estimate 1,000 ESAL for each turbine. AASHTO's 1993 nomograph from low-volume aggregate pavement design was utilized to calculate the required aggregate base layer thickness for the corresponding ESAL traffic load.

Table 7.1.2 Summary of Aggregate Base Course Thickness (Clay Soil, CBR=2.3%)

ESAL	Aggregate Base Thickness (in.) – 1.0-inch Allowable Rutting	Aggregate Base Thickness (in.) - 2.0-inch Allowable Rutting
1,000	6.0	4.0
5,000	11.0	5.5
10,000	15.5	7.0
15,000	19.0*	8.0

* - Estimated (out of range in nomograph)

RRC cautions that many trucking companies define a 2-inch rut as a failure for a roadway. This amount of rutting is typically rejected by trucking and turbine providers. We provide these values because it is part of the AASHTO method, and it provides the team with comparisons for the performance of different pavement cross-sections.

Prior to the placement of the aggregate base materials along access roadway alignments, stripping and removal of existing vegetation and other deleterious materials from the proposed roadway alignment should be performed. Topsoil and organics could be up to about 24 inches or more in thickness in some areas and should not be allowed for use in structural areas or along roadway alignments. Compact the resulting subgrade to provide a stable surface.

The exposed subgrade should then be proof rolled with a tandem axle dump truck/water truck with a total rear axle load of no less than 40,000 lbs. to assess the presence of soft areas and the need for remedial measures. A proof-roll test should include at least two passes over each area. Ruts and deflections during the proof-roll shall be ½-inch or less. Remove unsuitable soils and process the soils or replace with suitable soils and compact to a minimum compaction of 98% relative to ASTM D698. Moisture is not a criterion for road subgrades.

As an alternative to thick road base sections, the team can consider using geogrid (Tensar Biaxial Type 2 or equivalent) on top of geotextile (Mirafi HP 570 or equivalent) in areas where excessive “pumping” is observed. Aggregate base materials should be compacted to a minimum of 95% of ASTM D1557 where moisture content is not a pass/fail criterion.

Consideration could also be given to performing a cement or lime stabilization for the subgrade soils supporting pavements. A stabilized subgrade will achieve a higher CBR value that in turn allows a reduction in the flexible base course. The flexible base course thickness for a properly stabilized subgrade section could be reduced to about four inches. A formal cement or lime mix design should be performed to determine the lime/cement content, compaction targets, design CBR values and aggregate base thicknesses

7.2 Crane Pads Design and Construction Recommendations

Section 7.2 works in conjunction with Section 6.6.4 within the turbine earthwork requirements. That previous section defines earthwork requirements for the overburden backfill. In areas where the crane pad does not overlap with the overburden backfill, then follow the subgrade requirements below.

The crane pad should extend at least two feet beyond the footprint of the crane tracks. Strip and removal topsoil, vegetation and other deleterious materials. When the subgrade consists of soils, scarify and rework the resulting subgrade to a depth of 12 inches. Compact the reworked soils to a minimum of 98% of the maximum dry density per ASTM D698. This compaction specification is intended to provide an Ultimate bearing capacity of 6,000 psf for the crane pad. Also, the contractor’s use of mats can affect the necessary compaction requirement.

After verifying subgrade density, perform a proof-roll test using a fully loaded water truck, or similar equipment. Conduct the proof-roll in two directions and perform at least two passes per location. Maximum allowable deflection under the proof-roll is one inch. If higher deflections are observed, the subgrade soil should be over-excavated to suitable material and replaced with either Select Fill or Structural Fill, defined in Section 6.3 or Section 6.2 respectively.

Once a suitable subgrade condition has been achieved, use flexible road base aggregate materials (structural fill) to construct the crane pad. The pad should be at least 9-inches thick. The aggregate base should conform to the requirements of Section 6.2 of this report. Compact aggregate base to a minimum of 95% of the maximum dry density as determined in accordance with ASTM D1557. Moisture is not a test criterion. These recommendations are expected to

provide an Ultimate bearing capacity of 6,000 psf at the finished surface. This value assumes a crane track width of six feet, treated as a mat bearing on the ground surface.

For cranes that impart loads in excess of that provided above, alternate designs will be necessary. The crane operators can consider load distribution mats, such as timber mats or composite mats. If crane mats are to be used, RRC should be retained to review the design of the crane mats to check that bearing capacities are met. Otherwise, an alternate crane pad cross section may be necessary.

8.0 LIMITATIONS

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is likely soil conditions will vary between or beyond the points explored. If soil conditions are encountered during construction that differ from those described herein, we should be notified immediately in order to provide supplemental recommendations (if needed). If the scope of the proposed construction, including the proposed loads or structural locations, changes from those described in this report, our data should also be reviewed.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report assume an adequate program of tests and observations will be performed during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the client and only for the purposes stated, within three years from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client, or the client's design team members for this project, who wishes to use this report shall notify RRC of such intended use. Based on the intended use of the report, RRC may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release RRC from any liability resulting from the use of this report by any unauthorized party.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference," as that latter term is used relative to contracts or other matters of law.

9.0 REFERENCES

1. Quaternary Geologic Map of the Des Moines 4 X 6 Quadrangle, United States (GMC-36) Hallberg, G. R., Lineback, J.A., Mickelson, D.M., Knox, J.C., Goebel, J. E., Hobbs, H.C., Whitfield, J.W., Ward, R.A., Boellstorf, J.D., Swinehart, J. S., Dreeszen, V. H., (1:1,000,000; 1991)

2. Quaternary Geologic Map of the Chicago 4º X 6º Quadrangle, Geological Survey (U.S.), et al. United States., map I-1420 (NK-16), 1:1,000,000 , Version 1.1, posted Oct. 2002. U.S. Dept. of the Interior, U.S. Geological Survey, 2002
3. Willman, H.B., and others, (compilers), 1967, Geologic Map of Illinois: Illinois State Geological Survey, 1:500,000, paper.
4. Illinois State Geologic Survey, Geological Records Unit, accessed May 15, 2025 at: https://researchit.illinois.edu/tool-or-service/geological-records-unit/
5. U.S. Army Corps of Engineers, Engineering Manual 1110-1-1905, “Bearing Capacity of Soils,” Washington DC, 1992.
6. International Building Code (IBC) 2021, International Code Council.
7. Bowles, J. E. (1996), "Foundation Analysis and Design," Fifth Edition, McGraw-Hill Companies, Inc.
8. RisØ National Laboratory, Guidelines for Design of Wind Turbines, 2nd Edition, Det Norske Veritas, Copenhagen, 2002.
9. ASCE Hazard Tool at https://ascehazardtool.org/. Accessed on April 8, 2025
10. AASHTO Guide for Design of Pavement Structures, Washington, D.C., 1993.

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APPENDIX A

Revision 2, August 7, 2025

Table A1 - Summary of Foundation Design Net Allowable Bearing Pressure and Design Groundwater Recommendations

GEO ID	Turbine No. (Array 34 - 02.20.2025)	Boring Latitude (Array 34 - 02.20.2025)	Boring Longitude (Array 34 - 02.20.2025)	Turbine No. (Array 37 - 07.07.2025)	Turbine Latitude (Array 37 - 07.07.2025)	Turbine Longitude (Array 37 - 07.07.2025)	Groundwater During Drilling (SPT Boring) (ft)	Groundwater Immediately After Drilling (SPT Boring) (ft)	Minimum Piezometer Groundwater Level (ft)	Estimated Design Groundwater Depth (ft)	In-Situ Net Allowable Bearing Capacity at Foundation Bearing Elevation of 12.1 ft (bgs, psf)	Minimum Ground Improvement Depth (bgs, ft) for Net Allowable Bearing Capacity of 2,000 psf at Foundation Bearing Elevation of 12.1 ft (bgs)	Remarks
GEO-01	1	39.574644	-88.148535	Removed	39.574644	-88.148535			4.0	3.0	2,500		
GEO-02	2	39.565118	-88.132452	48	39.565118	-88.132452	7.5	10	1.8	0.8	2,000		
GEO-03	3	39.591355	-88.161488	Removed	39.591355	-88.161488			4.3	3.3	3,500		
GEO-04	4	39.606469	-88.155401	Removed	39.606469	-88.155401			2.9	1.9	3,250		
GEO-05	5	39.612989	-88.141627	Removed	39.612989	-88.141627			2.9	1.9	3,500		
GEO-06	6	39.618923	-88.122631	31	39.618923	-88.122631			3.7	2.7	2,500		
GEO-07	7	39.641706	-88.161275	Removed	39.641706	-88.161275			3.9	2.9	3,500		
GEO-08	8	39.647149	-88.154455	Removed	39.647149	-88.154455			1.8	0.8	3,500		
GEO-09	9	39.648528	-88.173981	---	---	---			3.5	2.5	3,500		
GEO-10	10	39.626559	-88.229542	Removed	39.626559	-88.229542			3.7	2.7	3,500		
GEO-11	11	39.630431	-88.200456	Removed	39.630431	-88.200456			4.1	3.1	3,500		
GEO-12	12	39.603647	-88.220991	62	39.603647	-88.220991			2.4	1.4	3,500		
GEO-13	13	39.604831	-88.210781	61	39.604831	-88.210781			4.3	3.3	3,500		
GEO-14	14	39.585320	-88.211622	60	39.585320	-88.211622			4.3	3.3	3,500		
GEO-15	15	39.587266	-88.235878	59	39.587266	-88.235878			2.6	1.6	1,750	46	Rammed-Aggregate Piers
GEO-16	16	39.580814	-88.240424	58	39.580814	-88.240424			2.9	1.9	3,500		
GEO-17	17	39.574408	-88.217758	57	39.574408	-88.217758			1.2	0.2	3,500		
GEO-18	18	39.574363	-88.208448	56	39.574363	-88.208448			2.5	1.5	3,500		
GEO-19	19	39.573124	-88.201857	55	39.573124	-88.201857			3.3	2.3	3,500		
GEO-20	20	39.565034	-88.201263	54	39.565034	-88.201263			5.0	4.0	--	34	Rammed-Aggregate Piers
GEO-21	21	39.573270	-88.169910	53	39.573270	-88.169910	19	30	3.3	2.3	3,500		
GEO-22	22	39.565394	-88.152425	52	39.565394	-88.152425	24	NA	4.7	3.7	3,500		
GEO-23	23	39.573187	-88.154941	51	39.573187	-88.154941	9	NA	3.2	2.2	3,500		
GEO-24	24	39.569341	-88.136830	49	39.569341	-88.136830			4.0	3.0	3,500		
GEO-25	25	39.572765	-88.132383	47a*	39.572840	-88.132593	5	NA	3.5	2.5	3,500		DCP/SCP Verification to 30 Inches
GEO-26	26	39.574592	-88.118216	46	39.574592	-88.118216			1.6	0.6	3,500		
GEO-27	27	39.584660	-88.117432	45	39.584660	-88.117432			-0.5	0.0	3,500		
GEO-28	28	39.585767	-88.174319	44	39.585767	-88.174319	39	54	4.2	3.2	3,500		
GEO-29	29	39.589955	-88.172555	43	39.589955	-88.172555			4.0	3.0	3,500		
GEO-30	30	39.591131	-88.167294	Removed	39.591131	-88.167294			3.8	2.8	3,500		
GEO-31	31	39.590992	-88.151334	40	39.590992	-88.151334			1.5	0.5	2,500		
GEO-32	32	39.591143	-88.120681	39a*	39.590987	-88.120622	8	18	3.1	2.1	3,000		DCP/SCP Verification to 30 Inches
GEO-33	33	39.597987	-88.144878	38	39.597987	-88.144878			3.3	2.3	3,250		
GEO-34	34	39.603394	-88.159948	36	39.603394	-88.159948			4.6	3.6	3,500		
GEO-35	35	39.619080	-88.162749	35	39.619080	-88.162749			3.0	2.0	3,500		
GEO-36	36	39.613774	-88.153886	34	39.613774	-88.153886			2.7	1.7	3,000		
GEO-37	37	39.617396	-88.142108	33	39.617396	-88.142108			2.9	1.9	3,500		
GEO-38	38	39.629819	-88.138768	30	39.629819	-88.138768			1.3	0.3	3,500		
GEO-39	39	39.632904	-88.161243	29	39.632904	-88.161243			4.6	3.6	3,500		
GEO-40	40	39.640726	-88.170557	28	39.640726	-88.170557			2.4	1.4	3,500		
GEO-41	41	39.640932	-88.150410	26	39.640932	-88.150410			3.2	2.2	3,500		
GEO-42	42	39.642241	-88.145311	25	39.642241	-88.145311			2.4	1.4	3,500		
GEO-43	43	39.649785	-88.163058	23	39.649785	-88.163058			3.6	2.6	3,500		
GEO-44	44	39.645392	-88.164683	22	39.645392	-88.164683			3.6	2.6	3,500		
GEO-45	45	39.612310	-88.180226	20	39.612310	-88.180226			2.6	1.6	3,500		

Revision 2, August 7, 2025

Table A1 - Summary of Foundation Design Net Allowable Bearing Pressure and Design Groundwater Recommendations

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GEO-46	46	39.612409	-88.188892	19	39.612409	-88.188892			3.1	2.1	3,500		
GEO-47	47	39.621062	-88.198786	18	39.621062	-88.198786			2.7	1.7	3,500		
GEO-48	48	39.614735	-88.208232	17	39.614735	-88.208232			2.6	1.6	3,500		
GEO-49	49	39.613690	-88.220885	Removed	39.613690	-88.220885			2.1	1.1	3,500		
GEO-50	50	39.626564	-88.236070	15	39.626564	-88.236070			0.8	0.0	3,500		
GEO-51	51	39.629093	-88.223195	13	39.629093	-88.223195			3.1	2.1	3,500		
GEO-52	52	39.626261	-88.187792	12	39.626261	-88.187792			2.0	1.0	3,500		
GEO-53	53	39.628019	-88.180345	11	39.628019	-88.180345			3.3	2.3	3,500		
GEO-54	54	39.631708	-88.189183	10	39.631708	-88.189183			3.3	2.3	3,500		
GEO-55	55	39.631481	-88.229020	8	39.631481	-88.229020			1.6	0.6	3,500		
GEO-56	56	39.635483	-88.226039	7	39.635483	-88.226039			3.5	2.5	3,500		
GEO-57	57	39.640777	-88.227044	6	39.640777	-88.227044			2.4	1.4	3,500		
GEO-58	58	39.641917	-88.217304	5	39.641917	-88.217304			1.7	0.7	3,500		
GEO-59	59	39.640117	-88.201895	4	39.640117	-88.201895			3.8	2.8	3,000		
GEO-60	60	39.647183	-88.181358	3	39.647183	-88.181358			1.5	0.5	3,500		
GEO-61	61	39.646727	-88.202823	2	39.646727	-88.202823			1.3	0.3	3,500		
GEO-62	62	39.649995	-88.188005	1	39.649995	-88.188005			2.4	1.4	3,500		

Notes: NE = Not Encountered; NA = Not Available; Estimated Design Groundwater Depth with 1 ft buffer; * - T47a and T39a shifted 65 feet from GEO-25 and 60 feet from GEO-32 respectively in Array 37, the recommendations at these two locations are still valid.

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Table A2 - Summary of Subsurface Exploration and Geographic Coordinates

GEO ID	Turbine No. (Array 34 - 02.20.2025)	Boring Latitude (Array 34 - 02.20.2025)	Boring Longitude (Array 34 - 02.20.2025)	Turbine No. (Array 37 - 07.07.2025)	Turbine Latitude (Array 37 - 07.07.2025)	Turbine Longitude (Array 37 - 07.07.2025)	MASW	Thermal Resistivity Sampling	CBR Sampling	Chemical Sampling	Drilling/ Excavation Date	Air/Mud Rotary (ft)	Total Drilling/ Excavation Footage (ft)	Groundwater During Drilling (ft)	Groundwater Immediately After Drilling (ft)	CPT Sounding & PZ Install Date	CPT 1st Attempt (ft)	CPT 2nd Attempt (ft)	CPT 3rd Attempt (ft)	Total Sounding Depth (ft)	Remarks
GEO-01	1	39.574644	-88.148535	Removed	39.574644	-88.148535										04/01/25	20.7	15.3	43.7	79.7	
GEO-02	2	39.565118	-88.132452	48	39.565118	-88.132452				04/27/25	4/26&4/27/25	59	60.5	7.5	10	03/31/25	18.7	22.1	21.9	62.7	
GEO-03	3	39.591355	-88.161488	Removed	39.591355	-88.161488										04/16/25	41.6			41.6	
GEO-04	4	39.606469	-88.155401	Removed	39.606469	-88.155401										04/17/25	36.3			36.3	
GEO-05	5	39.612989	-88.141627	Removed	39.612989	-88.141627										04/17/25	44.8			44.8	
GEO-06	6	39.618923	-88.122631	31	39.618923	-88.122631										04/18/25	22.4	22.7	58.9	104.0	
GEO-07	7	39.641706	-88.161275	Removed	39.641706	-88.161275										04/21/25	59.7			59.7	
GEO-08	8	39.647149	-88.154455	Removed	39.647149	-88.154455	05/19/25									04/21/25	59.7			59.7	
GEO-09	9	39.648528	-88.173981	---	---	---										04/22/25	59.6			59.6	
GEO-10	10	39.626559	-88.229542	Removed	39.626559	-88.229542	05/19/25									04/23/24	57.9			57.9	
GEO-11	11	39.630431	-88.200456	Removed	39.630431	-88.200456										04/26/25	59.7			59.7	
GEO-12	12	39.603647	-88.220991	62	39.603647	-88.220991										04/30/25	50.5			50.5	
GEO-13	13	39.604831	-88.210781	61	39.604831	-88.210781										04/30/25	45.1			45.1	
GEO-14	14	39.585320	-88.211622	60	39.585320	-88.211622										04/27/25	59.7			59.7	
GEO-15	15	39.587266	-88.235878	59	39.587266	-88.235878										04/29/25	56.1	52.1		108.2	
GEO-16	16	39.580814	-88.240424	58	39.580814	-88.240424										04/29/25	50.0			50.0	
GEO-17	17	39.574408	-88.217758	57	39.574408	-88.217758										04/27/25	59.7			59.7	
GEO-18	18	39.574363	-88.208448	56	39.574363	-88.208448										04/27/25	18.3	59.4		77.7	
GEO-19	19	39.573124	-88.201857	55	39.573124	-88.201857										04/27/25	37.9			37.9	
GEO-20	20	39.565034	-88.201263	54	39.565034	-88.201263										04/27/25	59.7			59.7	
GEO-21	21	39.573270	-88.169910	53	39.573270	-88.169910				04/28/25	04/28/25	59	60.5	19	30	04/01/25	18.0	27.3	17.7	63.0	
GEO-22	22	39.565394	-88.152425	52	39.565394	-88.152425				04/28/25	04/28/25	59	60.5	24	32	04/01/25	23.2	23.0	23.8	70.0	
GEO-23	23	39.573187	-88.154941	51	39.573187	-88.154941				04/27/25	04/27/25	59	60.5	9	NA	04/01/25	16.1	19.4	17.2	52.7	
GEO-24	24	39.569341	-88.136830	49	39.569341	-88.136830										03/31/25	59.7			59.7	
GEO-25	25	39.572765	-88.132383	47a*	39.572840	-88.132593				04/26/25	4/24-4/26/25	59	60	5	NA	03/31/25	16.0	13.9	23.9	53.8	T47a shifted 65 feet from GEO-25
GEO-26	26	39.574592	-88.118216	46	39.574592	-88.118216										04/02/25	46.6			46.6	
GEO-27	27	39.584660	-88.117432	45	39.584660	-88.117432	05/19/25									04/02/25	23.1	59.8		82.9	
GEO-28	28	39.585767	-88.174319	44	39.585767	-88.174319				04/30/25	4/30/2025	59	60.5	39	54	04/16/25	59.7			59.7	
GEO-29	29	39.589955	-88.172555	43	39.589955	-88.172555										04/16/25	45.1			45.1	
GEO-30	30	39.591131	-88.167294	Removed	39.591131	-88.167294										04/16/25	59.3			59.3	
GEO-31	31	39.590992	-88.151334	40	39.590992	-88.151334										04/02/25	59.9			59.9	
GEO-32	32	39.591143	-88.120681	39a*	39.590987	-88.120622				05/01/25	5/1/2025	59.0	59.5	8	18	04/02/25	36.5			36.5	T39a shifted about 60 feet from GEO-32
GEO-33	33	39.597987	-88.144878	38	39.597987	-88.144878										04/02/25	59.8			59.8	
GEO-34	34	39.603394	-88.159948	36	39.603394	-88.159948										04/17/25	39.5			39.5	
GEO-35	35	39.619080	-88.162749	35	39.619080	-88.162749										04/18/25	34.7			34.7	
GEO-36	36	39.613774	-88.153886	34	39.613774	-88.153886										04/17/25	52.8			52.8	
GEO-37	37	39.617396	-88.142108	33	39.617396	-88.142108	05/19/25									04/17/25	55.9			55.9	
GEO-38	38	39.629819	-88.138768	30	39.629819	-88.138768										04/18/25	59.5			59.5	
GEO-39	39	39.632904	-88.161243	29	39.632904	-88.161243										04/18/25	59.7			59.7	
GEO-40	40	39.640726	-88.170557	28	39.640726	-88.170557										04/22/25	59.5			59.5	
GEO-41	41	39.640932	-88.150410	26	39.640932	-88.150410										04/21/25	59.6			59.6	
GEO-42	42	39.642241	-88.145311	25	39.642241	-88.145311										04/18/25	59.7			59.7	
GEO-43	43	39.649785	-88.163058	23	39.649785	-88.163058										04/21/25	59.7			59.7	
GEO-44	44	39.645392	-88.164683	22	39.645392	-88.164683										04/21/25	59.6			59.6	
GEO-45	45	39.612310	-88.180226	20	39.612310	-88.180226	05/19/25									04/26/25	42.6			42.6	
GEO-46	46	39.612409	-88.188892	19	39.612409	-88.188892										04/26/25	48.6			48.6	
GEO-47	47	39.621062	-88.198786	18	39.621062	-88.198786										04/30/25	47.0			47.0	
GEO-48	48	39.614735	-88.208232	17	39.614735	-88.208232										04/29/25	38.9			38.9	
GEO-49	49	39.613690	-88.220885	Removed	39.613690	-88.220885										04/30/25	50.6			50.6	
GEO-50	50	39.626564	-88.236070	15	39.626564	-88.236070										04/24/25	57.6			57.6	
GEO-51	51	39.629093	-88.223195	13	39.629093	-88.223195										04/23/24	60.1			60.1	
GEO-52	52	39.626261	-88.187792	12	39.626261	-88.187792										04/26/25	58.6			58.6	
GEO-53	53	39.628019	-88.180345	11	39.628019	-88.180345										04/26/25	59.6			59.6	
GEO-54	54	39.631708	-88.189183	10	39.631708	-88.189183										04/26/25	59.7			59.7	
GEO-55	55	39.631481	-88.229020	8	39.631481	-88.229020										04/23/24	59.6			59.6	
GEO-56	56	39.635483	-88.226039	7	39.635483	-88.226039										04/23/24	59.3			59.3	
GEO-57	57	39.640777	-88.227044	6	39.640777	-88.227044										04/23/24	32.3	59.4		91.7	
GEO-58	58	39.641917	-88.217304	5	39.641917	-88.217304										04/23/24	59.7			59.7	
GEO-59	59	39.640117	-88.201895	4	39.640117	-88.201895										04/24/25	54.7			54.7	

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Table A2 - Summary of Subsurface Exploration and Geographic Coordinates

GEO ID	Turbine No. (Array 34 - 02.20.2025)	Boring Latitude (Array 34 - 02.20.2025)	Boring Longitude (Array 34 - 02.20.2025)	Turbine No. (Array 37 - 07.07.2025)	Turbine Latitude (Array 37 - 07.07.2025)	Turbine Longitude (Array 37 - 07.07.2025)	MASW	Thermal Resistivity Sampling	CBR Sampling	Chemical Sampling	Drilling/ Excavation Date	Air/Mud Rotary (ft)	Total Drilling/ Excavation Footage (ft)	Groundwater During Drilling (ft)	Groundwater Immediately After Drilling (ft)	CPT Sounding & PZ Install Date	CPT 1st Attempt (ft)	CPT 2nd Attempt (ft)	CPT 3rd Attempt (ft)	Total Sounding Depth (ft)	Remarks
GEO-60	60	39.647183	-88.181358	3	39.647183	-88.181358										04/22/25	59.6			59.6	
GEO-61	61	39.646727	-88.202823	2	39.646727	-88.202823										04/22/25	51.9			51.9	
GEO-62	62	39.649995	-88.188005	1	39.649995	-88.188005										04/22/25	59.7			59.7	
OM-1	OM-1	39.637191	-88.175591							04/29/25	04/29/25	24	25.5	12	16						
OM-1	OM-2	39.636144	-88.175548							04/29/25	04/29/25	24	25.5	10	16						
TR-1a	TR Pit	39.616331	-88.208044					04/16/25	04/16/25	04/16/25	04/16/25		5.5								
TR-2	TR Pit	39.569814	-88.152125					04/16/25	04/16/25	04/16/25	04/16/25		5.0								

Notes: NE = Not Encountered; NA = Not Available

Table A3 - Well Log Information Obtained from the Illinois State Geological Survey, Geological Records Unit

Well Report No. (ISGS)	**Latitude**	**Longitude**	**Elevation** (feet above sea level)	**Well Depth** (feet below land surface)	**Water Level Record** (feet below land surface)	**Date of Record** (MM/DD/YYYY)
120292344400	39.584679	-88.200350	N/D	42	9	04/04/1991
120292362800	39.605816	-88.109362	N/D	50	26	07/25/1993
120292376600	39.577940	-88.171258	N/D	48	18	05/29/1995
120292379500	39.577928	-88.173548	N/D	48	18	05/29/1995
120292432900	39.636315	-88.178052	N/D	42	16	08/18/2003
120412205100	39.652579	-88.154587	N/D	160	20	06/27/1991
121072302000	39.626750	-88.231033	N/D	99	22	11/06/2012

N/D = No Data Available

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Table A4 - Summary of Piezometer Readings

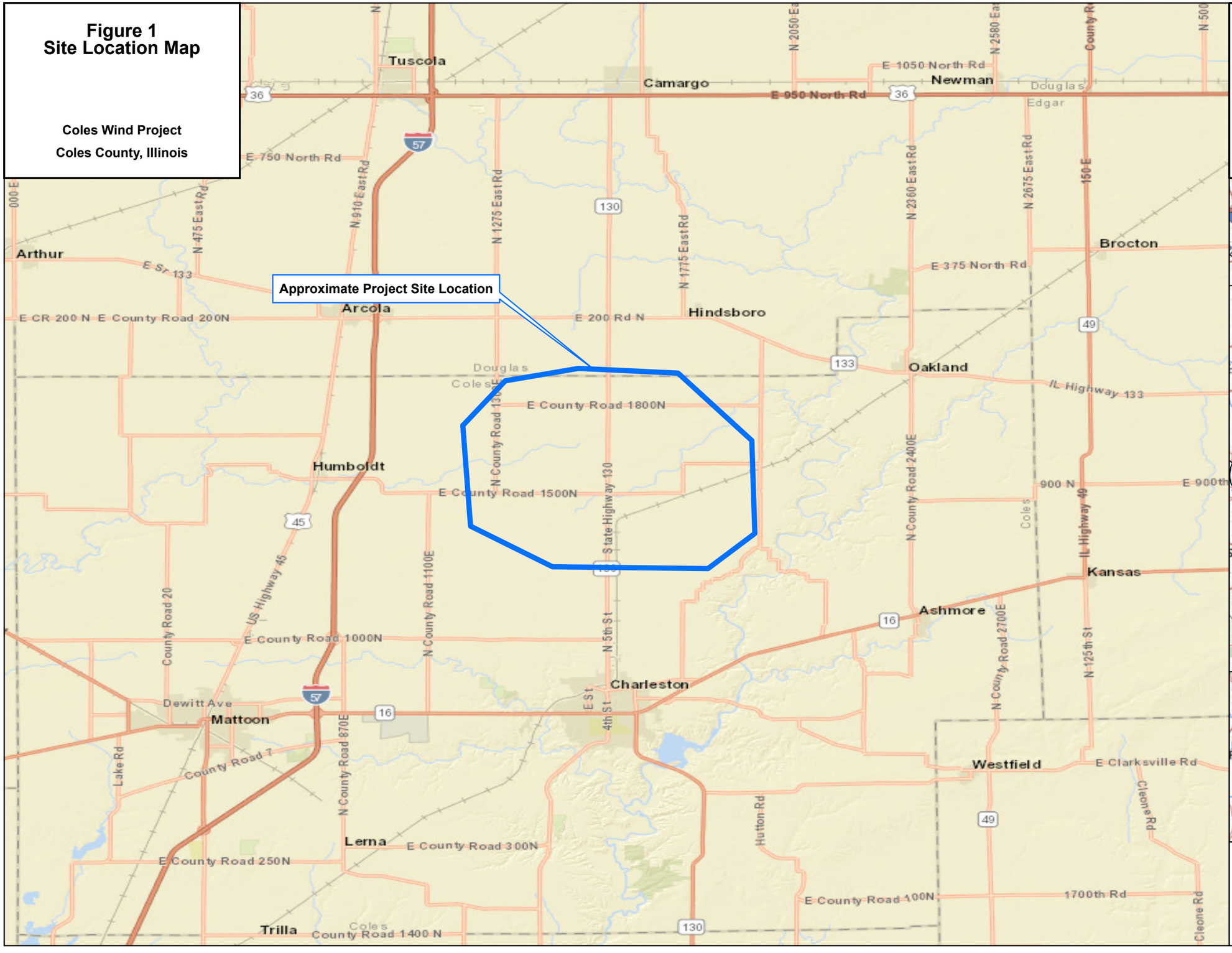
RRC GEO ID	Turbine/Boring ID (Array 34 - 02.20.2025)	Boring Latitude (Array 34 - 02.20.2025)	Boring Longitude (Array 34 - 02.20.2025)	Turbine No. (Array 37 - 07.07.2025)	Turbine Latitude (Array 37 - 07.07.2025)	Turbine Longitude (Array 37 - 07.07.2025)	PZ Install Date	PZ Install Depth (ft, BGS)	PZ Stickup Height (ft, Above BGS)	GWL After PZ Install (ft, BGS)	PZ GWL #1 Date	PZ GWL #1 (ft, BGS)	PZ GWL #2 Date	PZ GWL #2 (ft, BGS)	PZ GWL #3 Date	PZ GWL #3 (ft, BGS)	PZ GWL #4 Date	PZ GWL #4 (ft, BGS)	Min PZ GWL (ft, BGS)	Remarks
GEO-01	1	39.574644	-88.148535	Removed	39.574644	-88.148535	04/01/25	13	2	6.0	04/02/25	5.1	04/23/25	4.3	04/28/25	4.1	05/10/25	4.0	4.0	
GEO-02	2	39.565118	-88.132452	48	39.565118	-88.132452	03/31/25	13	2	7.0	04/01/25	4.0	04/23/25	2.5	04/26/25	2.8	05/10/25	1.8	1.8	
GEO-03	3	39.591355	-88.161488	Removed	39.591355	-88.161488	04/16/25	13	2	8.4	04/17/25	4.5					05/10/25	4.3	4.3	
GEO-04	4	39.606469	-88.155401	Removed	39.606469	-88.155401	04/17/25	13	2	7.6	04/18/25	4.6					05/10/25	2.9	2.9	
GEO-05	5	39.612989	-88.141627	Removed	39.612989	-88.141627	04/17/25	13	2	10.5	04/18/25	2.9					05/09/25	3.0	2.9	
GEO-06	6	39.618923	-88.122631	31	39.618923	-88.122631	04/18/25	13	2	4.5	04/19/25	3.7					05/09/25	3.8	3.7	
GEO-07	7	39.641706	-88.161275	Removed	39.641706	-88.161275	04/21/25	13	2	11.0	04/22/25	4.8					05/09/25	3.9	3.9	
GEO-08	8	39.647149	-88.154455	Removed	39.647149	-88.154455	04/21/25	13	2	8.4	04/22/25	2.8					05/09/25	1.8	1.8	
GEO-09	9	39.648528	-88.173981	---	---	---	04/22/25	13	2	9.1	04/23/25	6.0					05/09/25	3.5	3.5	
GEO-10	10	39.626559	-88.229542	Removed	39.626559	-88.229542	04/23/25	13	2	12.5	04/24/25	8.4					05/10/25	3.7	3.7	
GEO-11	11	39.630431	-88.200456	Removed	39.630431	-88.200456	04/26/25	13	2	8.5	04/27/25	8.0					05/09/25	4.1	4.1	
GEO-12	12	39.603647	-88.220991	62	39.603647	-88.220991	04/30/25	13	2	NE	05/01/25	2.5					05/09/25	2.4	2.4	
GEO-13	13	39.604831	-88.210781	61	39.604831	-88.210781	04/30/25	13	2	NE	05/01/25	4.5					05/10/25	4.3	4.3	
GEO-14	14	39.585320	-88.211622	60	39.585320	-88.211622	04/27/25	13	2	6.1	04/28/25	5.5					05/09/25	4.3	4.3	
GEO-15	15	39.587266	-88.235878	59	39.587266	-88.235878	04/29/25	13	2	9.5	04/30/25	4.0					05/09/25	2.6	2.6	
GEO-16	16	39.580814	-88.240424	58	39.580814	-88.240424	04/29/25	13	2	7.5	04/30/25	3.0					05/09/25	2.9	2.9	
GEO-17	17	39.574408	-88.217758	57	39.574408	-88.217758	04/27/25	13	2	1.6	04/28/25	1.2					05/10/25	2.4	1.2	
GEO-18	18	39.574363	-88.208448	56	39.574363	-88.208448	04/27/25	13	2	3.0	04/28/25	2.5					05/10/25	3.1	2.5	
GEO-19	19	39.573124	-88.201857	55	39.573124	-88.201857	04/27/25	13	2	11.0	04/28/25	10.5					05/10/25	3.3	3.3	
GEO-20	20	39.565034	-88.201263	54	39.565034	-88.201263	04/27/25	13	2	10.5	04/28/25	10.2					05/10/25	5.0	5.0	
GEO-21	21	39.573270	-88.169910	53	39.573270	-88.169910	04/01/25	13	2	10.6	04/02/25	5.8	04/23/25	3.3			05/10/25	n/a	3.3	
GEO-22	22	39.565394	-88.152425	52	39.565394	-88.152425	04/01/25	13	2	10.4	04/02/25	6.7	04/23/25	6.4	04/28/25	4.8	05/10/25	4.7	4.7	
GEO-23	23	39.573187	-88.154941	51	39.573187	-88.154941	04/01/25	13	2	10.1	04/02/25	7.0	04/23/25	3.3	04/27/25	3.5	05/10/25	3.2	3.2	
GEO-24	24	39.569341	-88.136830	49	39.569341	-88.136830	03/31/25	13	2	NE	04/01/25	11.5	04/23/25	4.5	04/24/25	4.5	05/10/25	4.0	4.0	
GEO-25	25	39.572765	-88.132383	47a*	39.572840	-88.132593	03/31/25	13	2	8.0	04/01/25	5.5	04/23/25	3.5	04/24/25	4.6	05/10/25	4.2	3.5	T47a shifted 65 feet from GEO-25
GEO-26	26	39.574592	-88.118216	46	39.574592	-88.118216	04/02/25	13	2	7.3	04/03/25	1.7	05/03/25	2.5			05/10/25	1.6	1.6	
GEO-27	27	39.584660	-88.117432	45	39.584660	-88.117432	04/02/25	13	2	8.1	04/03/25	-0.5	05/03/25	5.5			05/10/25	2.0	-0.5	
GEO-28	28	39.585767	-88.174319	44	39.585767	-88.174319	04/16/25	13	2	8.5	04/17/25	4.8	04/30/25	5.5			05/10/25	4.2	4.2	
GEO-29	29	39.589955	-88.172555	43	39.589955	-88.172555	04/16/25	13	2	8.5	04/17/25	4.5					05/10/25	4.0	4.0	
GEO-30	30	39.591131	-88.167294	Removed	39.591131	-88.167294	04/16/25	13	2	9.0	04/17/25	3.8					05/10/25	3.9	3.8	
GEO-31	31	39.590992	-88.151334	40	39.590992	-88.151334	04/02/25	13	2	9.0	04/03/25	1.8					05/10/25	1.5	1.5	
GEO-32	32	39.591143	-88.120681	39a*	39.590987	-88.120622	04/02/25	13	2	10.3	04/03/25	4.4	05/01/25	3.3			05/10/25	3.1	3.1	T39a shifted 60 feet from GEO-32
GEO-33	33	39.597987	-88.144878	38	39.597987	-88.144878	04/02/25	13	2	10.1	04/03/25	3.5	04/23/25	3.5			05/10/25	3.3	3.3	
GEO-34	34	39.603394	-88.159948	36	39.603394	-88.159948	04/17/25	13	2	8.0	04/18/25	5.4					05/10/25	4.6	4.6	
GEO-35	35	39.619080	-88.162749	35	39.619080	-88.162749	04/18/25	13	2	10.2	04/19/25	3.0					05/10/25	3.2	3.0	
GEO-36	36	39.613774	-88.153886	34	39.613774	-88.153886	04/17/25	13	2	8.1	04/18/25	4.4					05/10/25	2.7	2.7	
GEO-37	37	39.617396	-88.142108	33	39.617396	-88.142108	04/17/25	13	2	7.5	04/18/25	2.9					05/10/25	3.0	2.9	
GEO-38	38	39.629819	-88.138768	30	39.629819	-88.138768	04/18/25	13	2	4.1	04/19/25	1.3					05/09/25	1.5	1.3	
GEO-39	39	39.632904	-88.161243	29	39.632904	-88.161243	04/18/25	13	2	5.4	04/19/25	4.6					05/09/25	4.8	4.6	
GEO-40	40	39.640726	-88.170557	28	39.640726	-88.170557	04/22/25	13	2	8.5	04/23/25	2.4					05/10/25	2.9	2.4	
GEO-41	41	39.640932	-88.150410	26	39.640932	-88.150410	04/21/25	13	2	7.4	04/22/25	3.7					05/09/25	3.2	3.2	
GEO-42	42	39.642241	-88.145311	25	39.642241	-88.145311	04/18/25	13	2	8.5	04/19/25	2.4					05/09/25	2.5	2.4	
GEO-43	43	39.649785	-88.163058	23	39.649785	-88.163058	04/21/25	13	2	10.1	04/22/25	3.6					05/09/25	3.8	3.6	
GEO-44	44	39.645392	-88.164683	22	39.645392	-88.164683	04/21/25	13	2	5.4	04/22/25	3.7					05/09/25	3.6	3.6	
GEO-45	45	39.612310	-88.180226	20	39.612310	-88.180226	04/26/25	13	2	8.6	04/27/25	7.5					05/10/25	2.6	2.6	
GEO-46	46	39.612409	-88.188892	19	39.612409	-88.188892	04/26/25	13	2	10.6	04/27/25	10.0					05/10/25	3.1	3.1	
GEO-47	47	39.621062	-88.198786	18	39.621062	-88.198786	04/30/25	13	2	n/a	05/01/25	n/a					05/09/25	2.7	2.7	
GEO-48	48	39.614735	-88.208232	17	39.614735	-88.208232	04/29/25	13	2	4.4							05/09/25	2.6	2.6	
GEO-49	49	39.613690	-88.220885	Removed	39.613690	-88.220885	04/30/25	13	2	n/a	05/01/25	n/a					05/09/25	2.1	2.1	
GEO-50	50	39.626564	-88.236070	15	39.626564	-88.236070	04/24/25	13	2	0.8	04/25/25	1.5					05/10/25	1.7	0.8	
GEO-51	51	39.629093	-88.223195	13	39.629093	-88.223195	04/23/25	13	2	12.0	04/24/25	4.5					05/10/25	3.1	3.1	
GEO-52	52	39.626261	-88.187792	12	39.626261	-88.187792	04/26/25	13	2	11.0	04/27/25	10.1					05/09/25	2.0	2.0	
GEO-53	53	39.628019	-88.180345	11	39.628019	-88.180345	04/26/25	13	2	11.0	04/27/25	10.0					05/09/25	3.3	3.3	
GEO-54	54	39.631708	-88.189183	10	39.631708	-88.189183	04/26/25	13	2	4.5	04/27/25	4.0					05/09/25	3.3	3.3	
GEO-55	55	39.631481	-88.229020	8	39.631481	-88.229020	04/23/25	13	2	3.5	04/24/25	1.6					05/10/25	2.6	1.6	
GEO-56	56	39.635483	-88.226039	7	39.635483	-88.226039	04/23/25	13	2	4.1	04/24/25	3.5					05/10/25	3.8	3.5	
GEO-57	57	39.640777	-88.227044	6	39.640777	-88.227044	04/23/25	13	2	3.9	04/24/25	2.4					05/10/25	2.7	2.4	
GEO-58	58	39.641917	-88.217304	5	39.641917	-88.217304	04/23/25	13	2	10.4	04/24/25	10.5	04/28/25	2.5			05/10/25	1.7	1.7	
GEO-59	59	39.640117	-88.201895	4	39.640117	-88.201895	04/24/25	13	2	8.8	04/25/25	8.3					05/10/25	3.8	3.8	
GEO-60	60	39.647183	-88.181358	3	39.647183	-88.181358	04/22/25	13	2	7.1	04/23/25	2.3					05/09/25	1.5	1.5	
GEO-61	61	39.646727	-88.202823	2	39.646727	-88.202823	04/22/25	13	2	8.4	04/23/25	4.3	04/28/25	1.3			05/10/25	3.1	1.3	
GEO-62	62	39.649995	-88.188005	1	39.649995	-88.188005	04/22/25	13	2	9.4	04/23/25	8.5	04/28/25	7.2			05/10/25	2.4	2.4	
SUBPZ-1	SUB	39.602662	-88.215148				04/27/25	13	2	11.0	04/28/25	11.0					05/09/25	2.0	2.0	

Note: NE = Not Encountered; BGS = Below Ground Surface

Figure 1
Site Location Map

Coles Wind Project

Coles County, Illinois

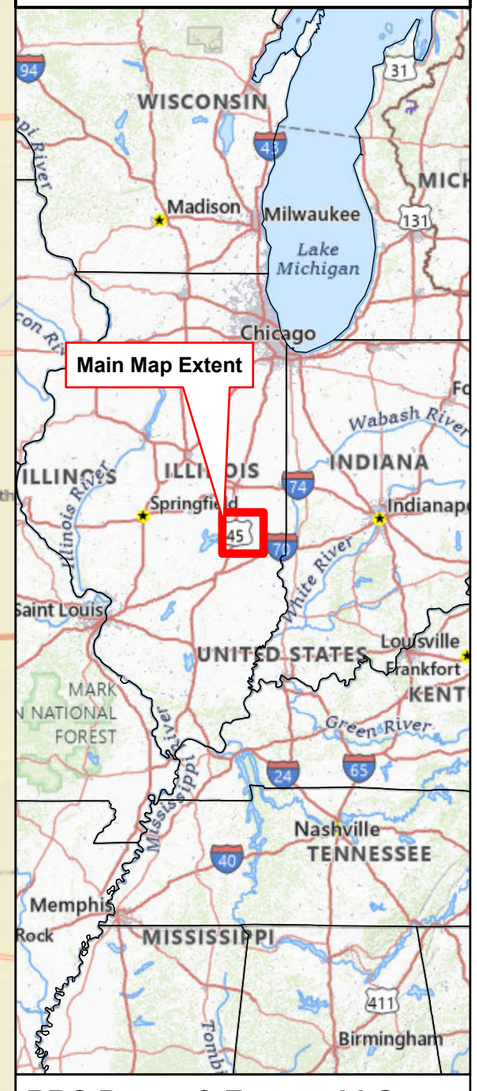


0 3 6 Miles

N

Legend

General Project Site



RRC Power & Energy, LLC

810 Hesters Crossing Rd
Suite 120
Round Rock, TX 78681

Figure 2a
WTG CPT Sounding Locations on a Topographic Map

Coles Wind Project

Coles County, Illinois

0 0.5 1 1.5 Miles

N

Legend

General Project Site

WTG Locations (CPT)

GEO-062 GEO-009 GEO-043 GEO-060 GEO-008 GEO-061 GEO-044 GEO-057 GEO-058 GEO-040 GEO-007 GEO-042 GEO-059 GEO-041 GEO-056 GEO-039 GEO-055 GEO-011 GEO-054 GEO-038 GEO-051 GEO-053 GEO-050 GEO-010 GEO-052 GEO-047 GEO-035 GEO-006 GEO-037 GEO-049 GEO-048 GEO-036 GEO-005 GEO-046 GEO-045 GEO-004 GEO-012 GEO-013 GEO-034 GEO-033 GEO-029 GEO-003 GEO-031 GEO-030 GEO-015 GEO-027 GEO-014 GEO-016 GEO-001 GEO-026 GEO-017 GEO-018 GEO-019 GEO-024 GEO-020

SEVEN HICKORY

MORGAN

Brushton

Fairgrange

Rardin

Creek

Branch

Greasy

Dry

River

RRC Power & Energy, LLC

810 Hesters Crossing Rd
Suite 120
Round Rock, TX 78681

Figure 2b
WTG and O&M SPT Boring Locations on a Topographic Map

Coles Wind Project
Coles County, Illinois

0 0.5 1 1.5 Miles

N

Legend

- General Project Site
- WTG Locations (SPT)
- O&M Boring Locations

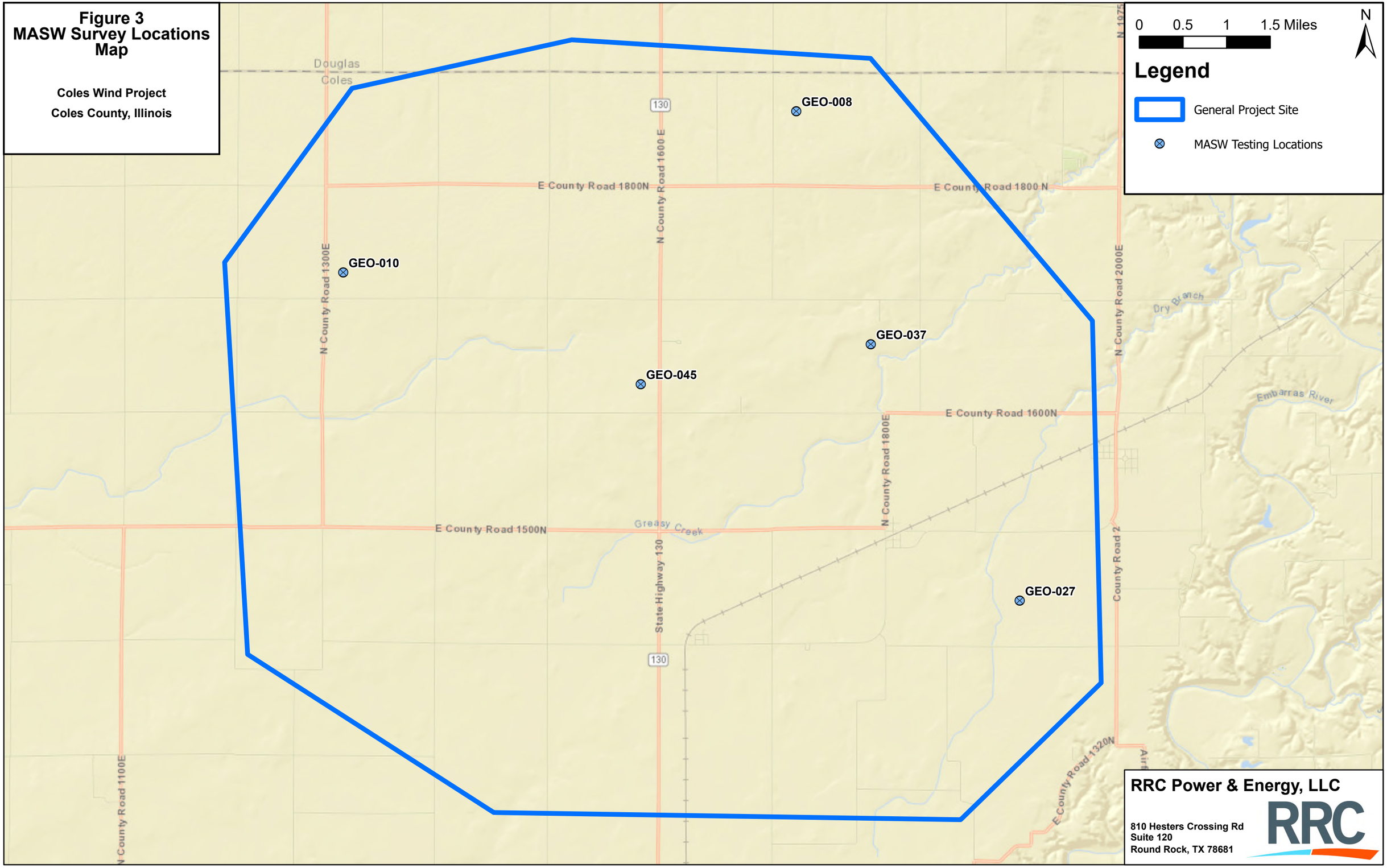
OM-1
OM-2
GEO-028
GEO-021
GEO-023
GEO-025
GEO-022
GEO-002
GEO-032

SEVEN HICKORY
MORGAN
Fairgrange
Brushton
Rardin
Greasy Branch
Dry Creek
Spring Creek
Branch
River

RRC Power & Energy, LLC
810 Hesters Crossing Rd
Suite 120
Round Rock, TX 78681

Figure 3
MASW Survey Locations Map

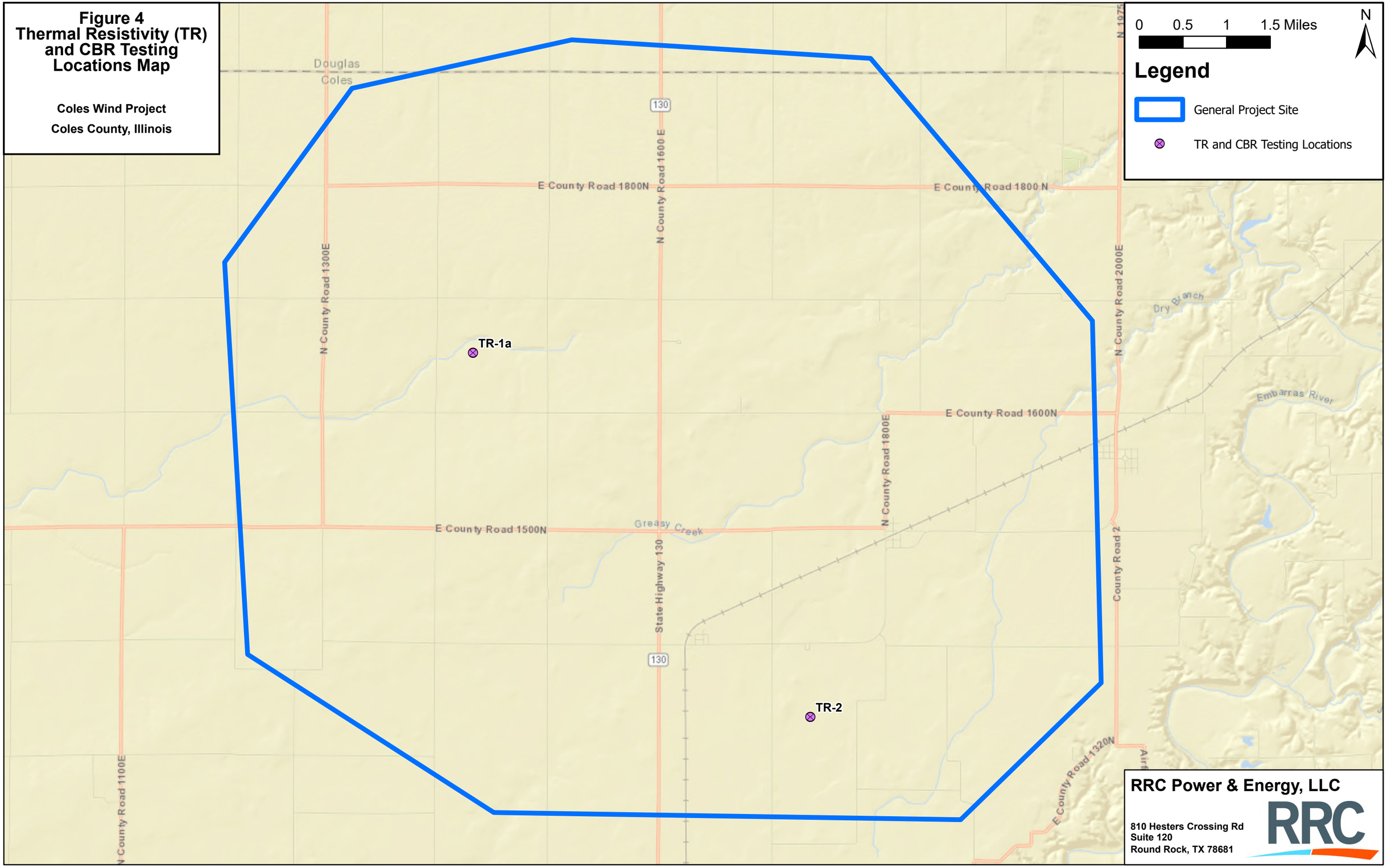
Coles Wind Project
Coles County, Illinois



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810 Hesters Crossing Rd
Suite 120
Round Rock, TX 78681

Figure 4
Thermal Resistivity (TR) and CBR Testing Locations Map

Coles Wind Project
Coles County, Illinois

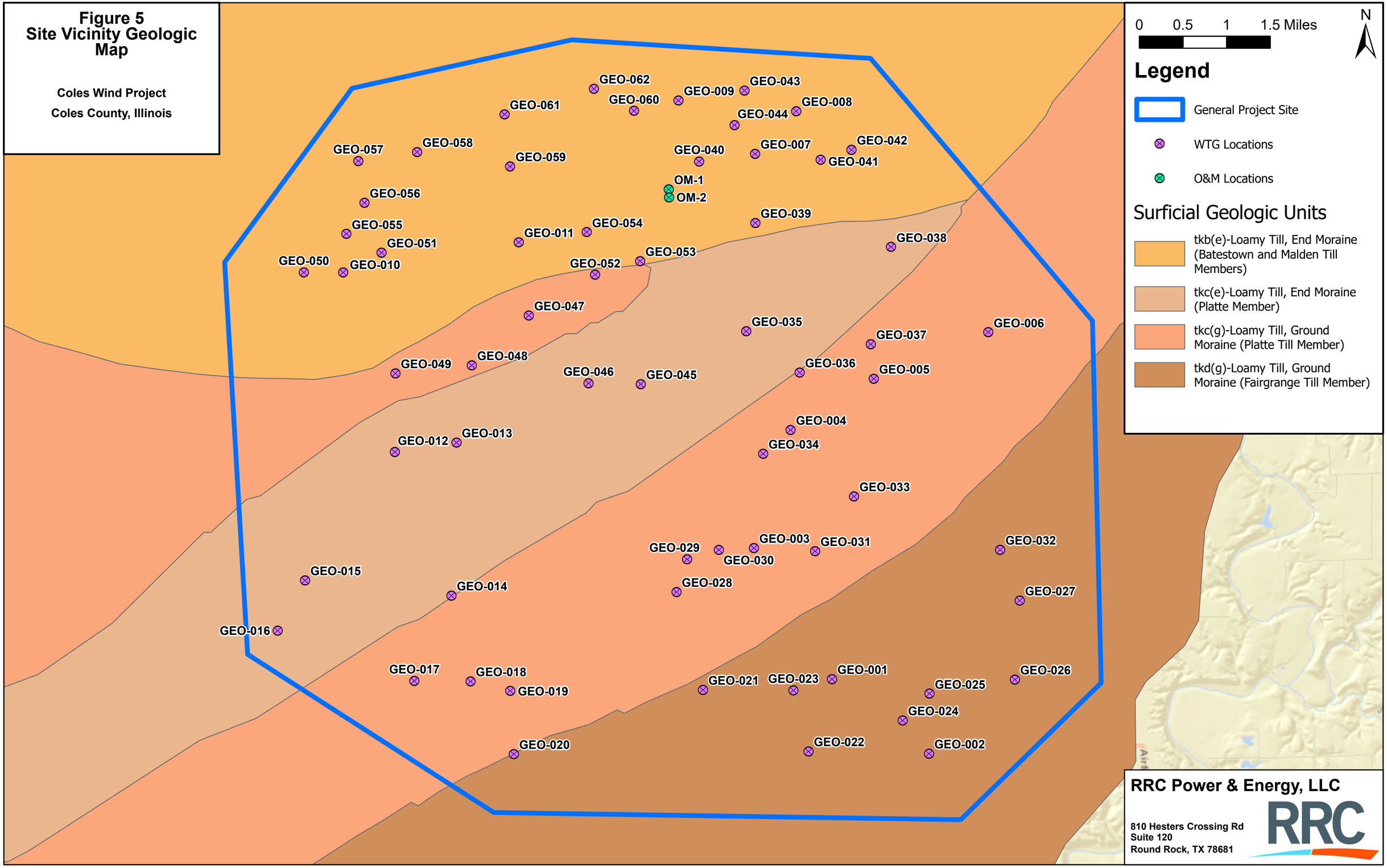


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Round Rock, TX 78681

Figure 5
Site Vicinity Geologic Map

Coles Wind Project

Coles County, Illinois

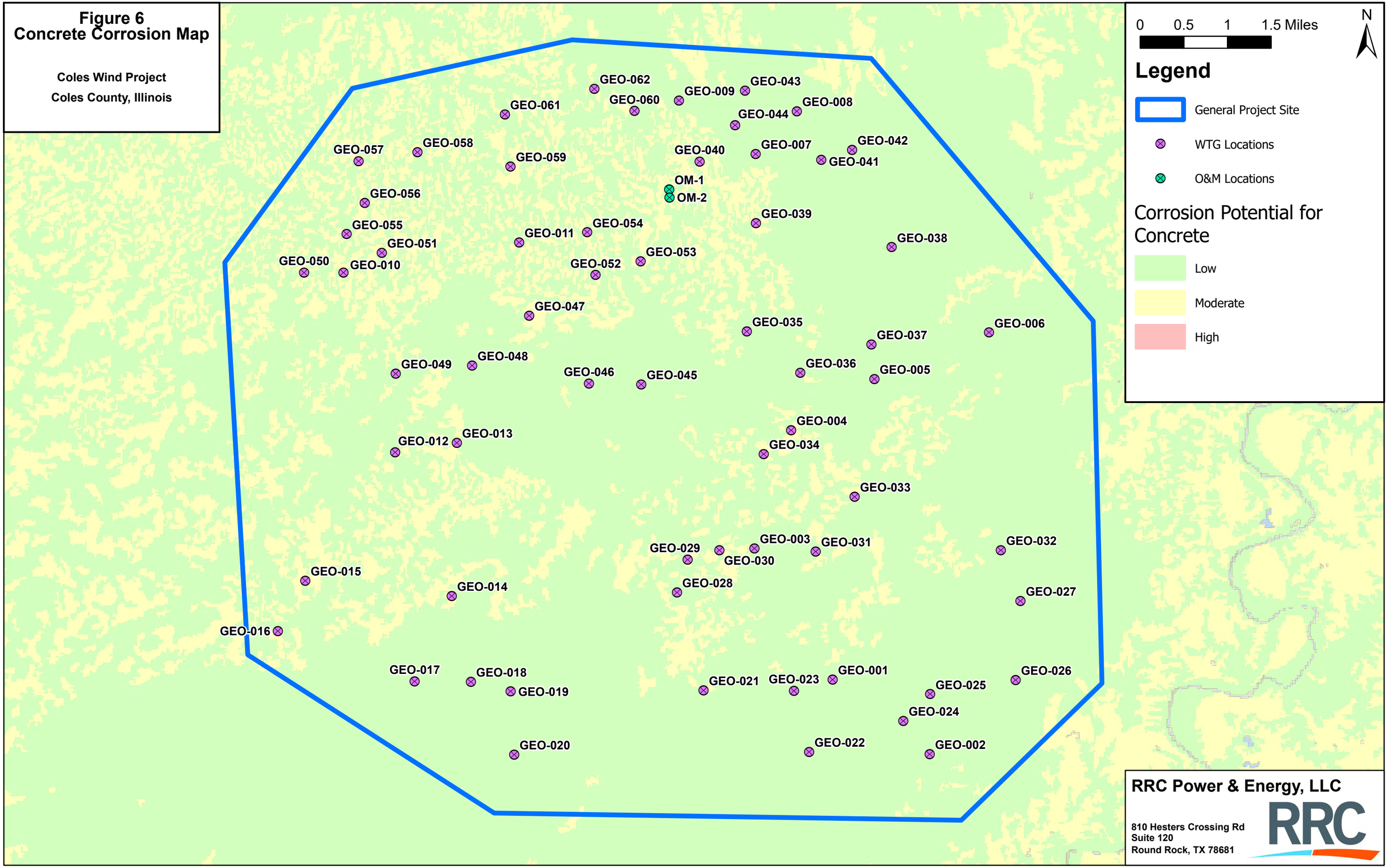


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Round Rock, TX 78681

Figure 6
Concrete Corrosion Map

Coles Wind Project
Coles County, Illinois

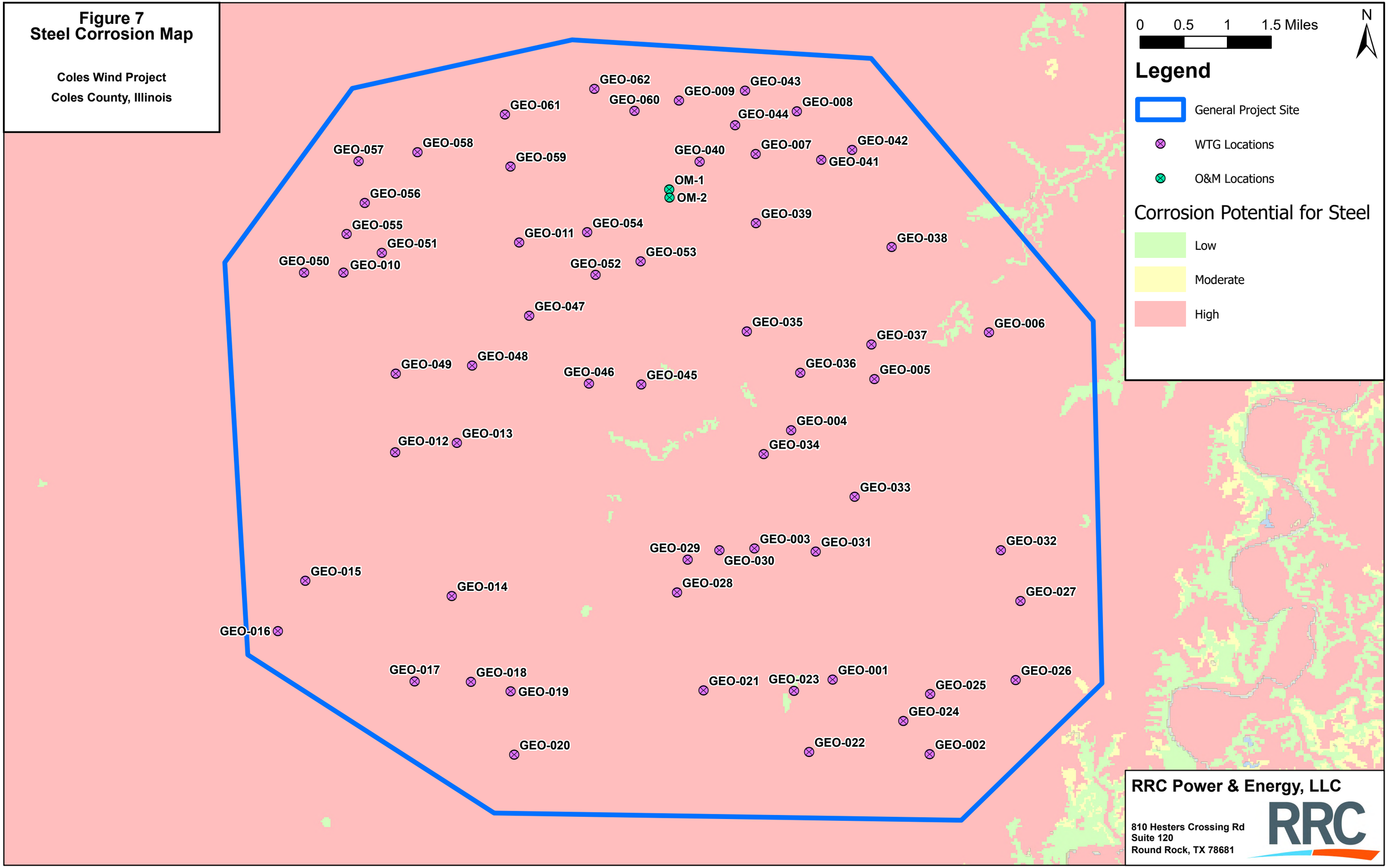


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Figure 7
Steel Corrosion Map

Coles Wind Project
Coles County, Illinois



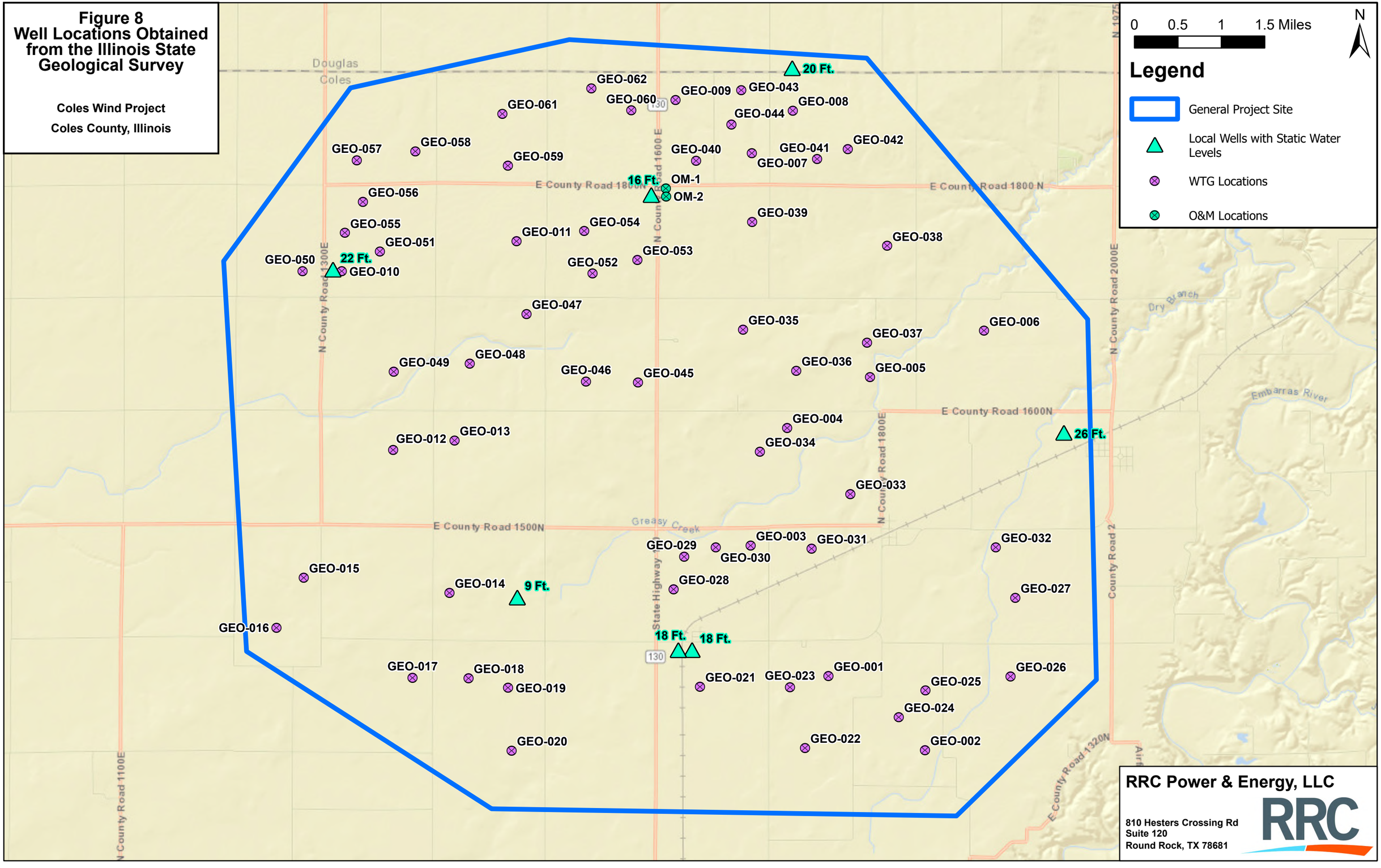
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Round Rock, TX 78681

Figure 8
Well Locations Obtained from the Illinois State Geological Survey

Coles Wind Project

Coles County, Illinois



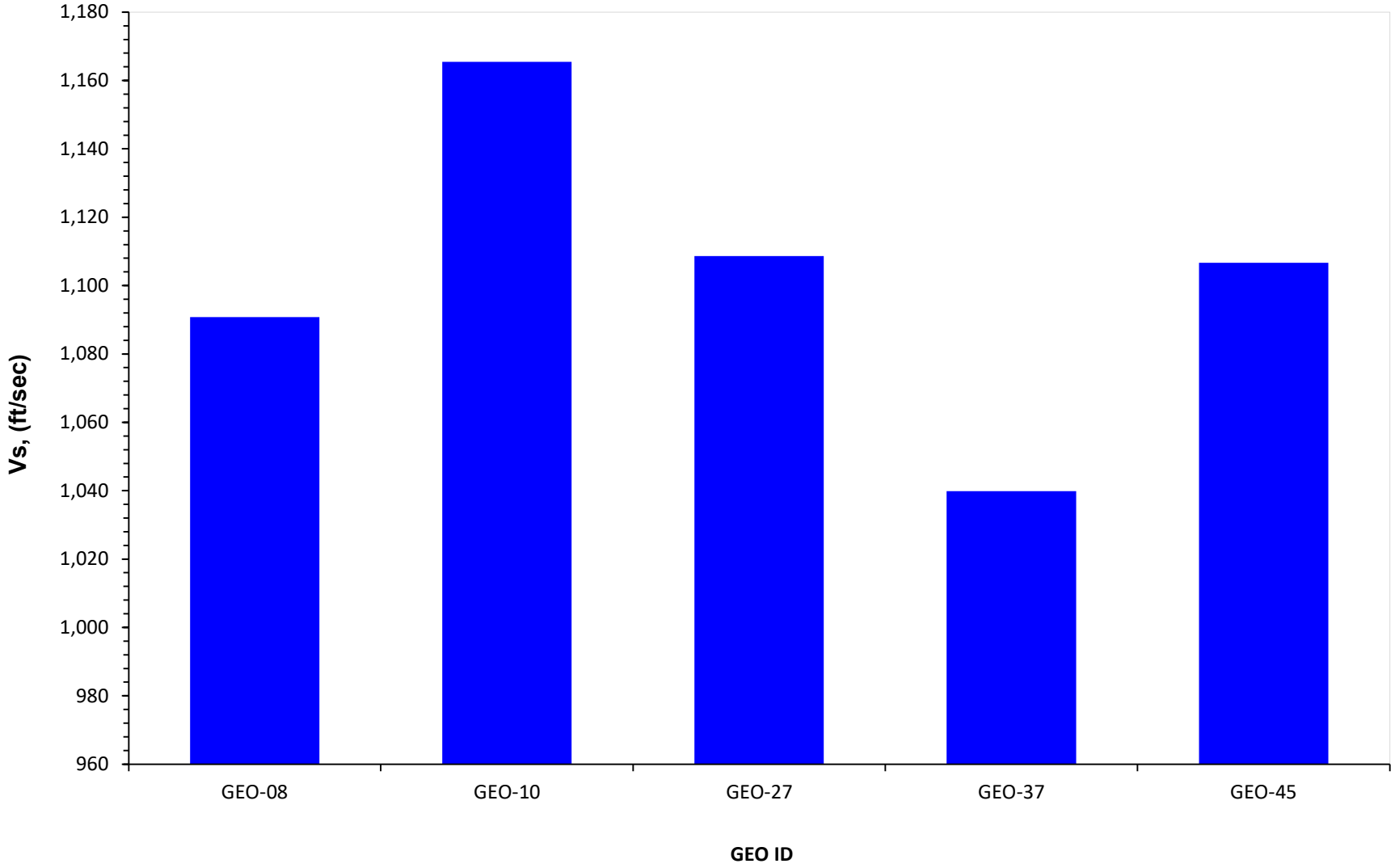
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Suite 120
Round Rock, TX 78681

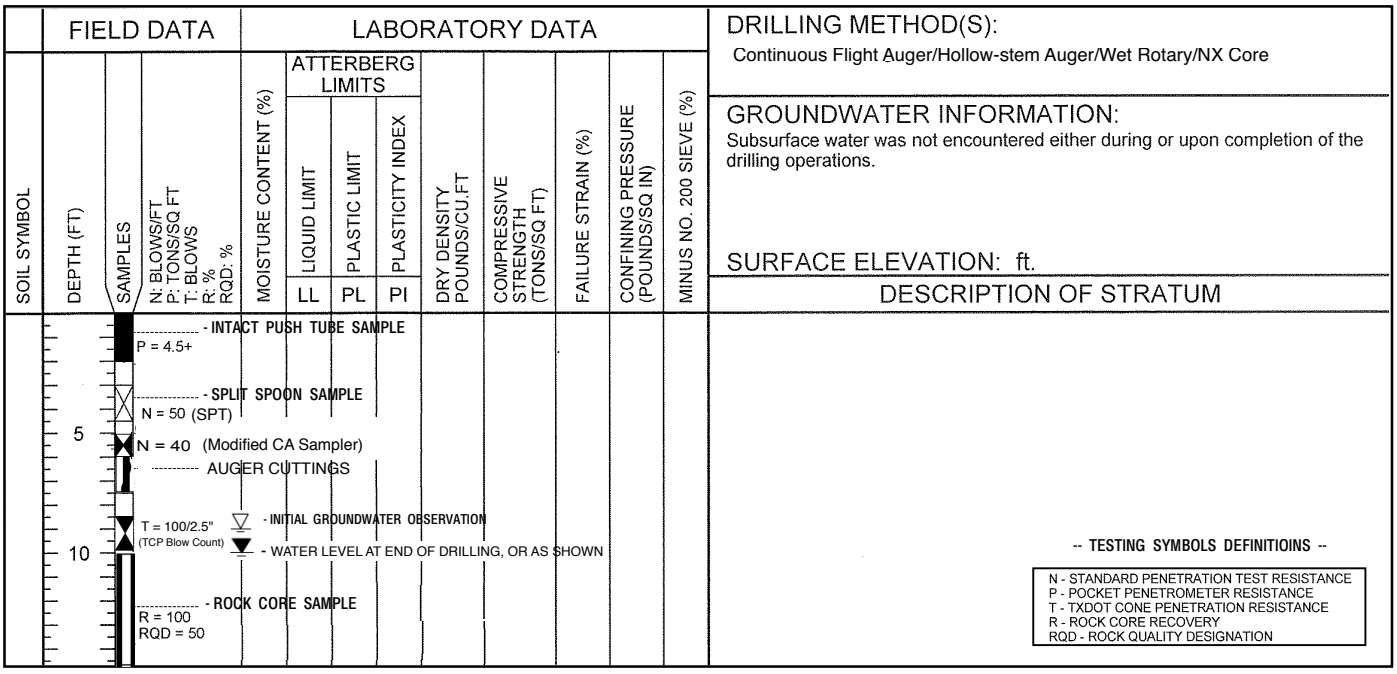
Figure 9
Weighted Average Shear Wave Velocity at MASW Locations

Coles Wind Project
Coles County, Illinois

RRC Power & Energy, LLC
810 Hesters Crossing Rd
Suite 120
Round Rock, TX 78681
Phone: (512) 992-2087



BORING LOG KEY



TYPICAL SOIL AND ROCK SYMBOLS (USCS CLASSIFICATION)

- Lean Clay (CL)
- Fat Clay (CH)
- Silt (ML)
- Elastic Silt (MH)
- Silty Sand (SM)
- Clayey Sand (SC)
- Silty, Clayey Sand (SC-SM)
- Poorly-Graded Sand (SP)
- Well-Graded Sand (SW)
- Poorly-Graded Gravel (GP)
- Well-Graded Gravel (GW)
- Clayey Gravel (GC)
- Silty Gravel (GM)
- Silty Clay (CL-ML)
- Claystone
- BASALT
- Limestone
- Sandstone
- Siltstone
- Fill Material
- Shale

DEGREE OF WEATHERING

1) Unweathered: No evidence of any chemical or mechanical alteration.
2) Slightly weathered: Slight discoloration on surface, slight alteration along discontinuities, less than 10% of the rock volume altered.
3) Moderately weathered: Discoloring evident, surface pitted and altered with alteration penetrating well below rock surfaces, weathering "halos" evident, 10% to 50% of the rock volume altered.
4) Highly weathered: Entire mass discolored, alteration pervading nearly all of the rock with some pockets of slightly weathered rock noticeable, some minerals leached away.
5) Decomposed: rock reduced to a soil with relicit rock texture, generally molded and crumbled by hand.

SOIL STRUCTURE

Calcareous..... Containing calcium carbonate

Slickensided..... The presence of planes of weakness having a slick and glossy appearance

Interbedded..... Alternating layers of varying material

LOG OF BORING GEO-02

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/26/2025 - 4/27/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 7.5 ft. during drilling and measured at 10 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													12 in. Topsoil
			N = 10										LEAN CLAY (CL), trace Sand, brown, stiff, dry to moist, iron stained
	5		N = 7	16									FAT CLAY (CH), trace Sand, brown to light brown, medium stiff, moist, iron stained
			N = 6										LEAN CLAY (CL), with Sand, brown, medium stiff, dry to moist, iron stained
	10		P = 0.75	16	22	11	11	115	0.40	14.8	7.5	58	Grading wet
			N = 17										SANDY LEAN CLAY (CL), brown, soft to hard, moist, iron stained
	15		N = 40										Grading trace Gravel, gray
													Grading brown
	20		N = 82										CLAYEY SAND (SC), trace Gravel, gray to brown, very dense, moist, fine to coarse grained
	25		N = 63										SILTY SAND (SM), with Gravel, brown to gray, very dense, moist, fine to coarse grained
	30		N = 57										POORLY-GRADED SAND (SP-SM) with Silt and Gravel, brown to gray, very dense, moist, fine to coarse grained
	35		N = 14										CLAYEY SAND (SC), with Gravel, gray, medium dense, moist, fine to coarse grained
	40		N = 90/11"										SANDY LEAN CLAY (CL), trace Gravel, gray to brown, hard, moist, iron stained
	45		N = 59										
	50		N = 59										
	55		N = 51										
	60		N = 58										
													Total Depth = 60.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.565118, Long. -88.132452

RENEWABLE LOG - LOG A GNNL01.GDT - 6/6/25 09:58 - C:\USERS\CHRISTIANMIRANDA\RRC COMPANIES\GEOTECHNICAL ENGINEERING - DATABASES\03.GINT\PROJECTS\2025\COLES WIND-GE2502017\COLES WIND-GE2502017.GPJ

LOG OF BORING GEO-21

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/28/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 19 ft. during drilling and measured at 30 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													2 in. Topsoil
			N = 7										LEAN CLAY (CL), trace Sand, brown, medium stiff to very stiff, dry to moist, iron stained
	5		N = 13	14									Grading with Sand
			N = 28										Grading with Gravel
	10		P = 1.75	13	30	22	8	119	2.38	14.8	7.5	93	Grading trace Sand
			N = 28										Grading with Sand, gray
	15		N = 18										
	20		N = 34										SANDY LEAN CLAY (CL), with Gravel, gray, hard, wet
	25		N = 46										
	30		N = 61										SILTY SAND (SM), trace Gravel, gray, very dense, wet, fine to coarse grained
	35		N = 31										SANDY LEAN CLAY (CL), gray, very stiff to hard, moist
	40		N = 26										
	45		N = 22										
	50		N = 26										
	55		N = 34										
	60		N = 37										
													Total Depth = 60.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.573270, Long. -88.169910

RENEWABLE LOG - LOG A GNNL01.GDT - 6/6/25 09:58 - C:\USERS\CHRISTIANMIRANDA\RRC COMPANIES\GEOTECHNICAL ENGINEERING - DATABASES\03.GINT\PROJECTS\2025\COLES WIND-GE2502017\COLES WIND-GE2502017.GPJ

LOG OF BORING GEO-22

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/28/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 24 ft. during drilling and measured at 32 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													10 in. Topsoil
			N = 8										LEAN CLAY (CL), trace Sand, brown to reddish brown, medium stiff to very stiff, dry to moist, iron stained
	5		N = 9	14									
			N = 21										Grading with Sand, trace Gravel
	10		N = 13										Grading light gray to reddish brown
			P = 2.0	13	24	12	12	120	1.71	14.8	10.0	62	SANDY LEAN CLAY (CL), trace Gravel, light gray to reddish brown, stiff, moist, iron stained
	15		N = 35										LEAN CLAY (CL), trace Sand, light gray to reddish brown, very stiff to hard, dry to moist, iron stained
	20		N = 24										Iron stain grades out
	25		N = 52										SANDY LEAN CLAY (CL), gray, hard, wet
	30		N = 66										
	35		N = 62										CLAYEY SAND (SC), light gray to brown, very dense, moist, fine to medium grained
	40		N = 38										SANDY LEAN CLAY (CL), trace Gravel, brown to light gray, very stiff to hard, moist
	45		N = 43										
	50		N = 22										
	55		N = 79										LEAN CLAY (CL), trace Sand, gray to light gray, hard, moist
	60		N = 79										Grading with Sand, brown to light gray
													Total Depth = 60.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.565394, Long. -88.152425

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LOG OF BORING GEO-23

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/27/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 9 ft. during drilling and not measured immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													3 in. Topsoil
			N = 7										LEAN CLAY (CL), with Sand, dark brown to reddish brown, medium stiff to very stiff, dry to moist, iron stained
	5		N = 11	21	49	21	28					85	
			N = 12										Grading light brown to reddish brown
	10		N = 19										Grading wet
			N = 22										Grading light gray to brown
	15		N = 79										SANDY LEAN CLAY (CL), light gray to brown, hard, moist, iron stained
	20		N = 50/5"										Grading reddish brown to brown
	25		N = 55										
	30		N = 63										Grading dark brown to light brown
	35		N = 88/11"										LEAN CLAY (CL), trace Sand and Gravel, light gray to brown, hard, moist
	40		N = 81										SANDY LEAN CLAY (CL), trace Gravel, brown to reddish brown, hard, moist
	45		N = 59										LEAN CLAY (CL), trace Sand, gray to light gray, very stiff to hard, moist
	50		N = 30										Grading with Sand, gray to brown, iron stained
	55		N = 27										CLAYEY SAND (SC), brown to dark brown, medium dense, moist, fine to coarse grained
	60		N = 40										POORLY-GRADED SAND (SP), brown to light gray, dense, moist, fine to medium grained
													Total Depth = 60.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.573187, Long. -88.154941

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LOG OF BORING GEO-25

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/24/2025 - 4/26/2025

DRILLING METHOD(S):
Air Rotary: 0 to 35.5 ft., 37 to 59 ft.; Mud Rotary: 35.5 to 37 ft.

GROUNDWATER INFORMATION:
Groundwater encountered at 5 ft. prior to the introduction of drilling fluid

SURFACE ELEVATION (FT):

FIELD DATA				LABORATORY DATA									
SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													12 in. Topsoil
			N = 5										CLAYEY SAND (SC), dark brown to reddish brown, loose to very dense, dry to moist, fine grained, iron stained
	5		N = 7	18	32	17	15					33	Grading gray to brown Grading wet
			N = 4										
	10		N = 56										Grading fine to medium grained
			N = 36										
	15		N = 80										LEAN CLAY (CL), with Sand, gray to brown, hard, moist
	20		N = 84										CLAYEY SAND (SC), light gray to brown, medium dense to very dense, moist, fine to medium grained
	25		N = 93/9"										
	30		N = 70										
	35		N = 28										Grading trace Gravel, fine to coarse grained
	40		N = 16										SANDY LEAN CLAY (CL), light gray, very stiff, moist
	45		N = 24										CLAYEY SAND (SC), brown to dark brown, medium dense, moist, fine to medium grained
	50		N = 17										LEAN CLAY (CL), trace Sand, brown to light gray, very stiff, moist
	55		N = 83/11"										SANDY LEAN CLAY (CL), trace Gravel, light brown to brown, hard, moist
	60		N = 50/3"										Total Depth = 60 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.572765, Long. -88.132383

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LOG OF BORING GEO-28

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/30/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 39 ft. during drilling and measured at 54 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													10 in. Topsoil
	5		N = 11 N = 9 N = 11	13									LEAN CLAY (CL), trace Sand, light brown to light gray, stiff, dry to moist Grading reddish brown to light gray, iron stained Grading gray to brown
	10		P = 0.75 N = 19	13	31	15	16	125	3.60	14.6	7.5	62	SANDY LEAN CLAY (CL), gray to brown, very stiff, dry to moist, iron stained
	15		N = 21										Grading with Gravel
	20		N = 23										Gravel grades out
	25		N = 22										LEAN CLAY (CL), with Sand, light gray, very stiff to hard, dry to moist
	30		N = 24										Grading trace Sand, light gray to brown, iron stained
	35		N = 25										Grading brown to light brown
	40		N = 28										Grading with Sand, wet
	45		N = 46										Grading trace Gravel, light gray to brown
	50		N = 62										Grading with Coal
	55		N = 53										
	60		N = 63										Grading dark brown to brown
													Total Depth = 60.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.585767, Long. -88.174319

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LOG OF BORING GEO-32

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 5/1/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 8 ft. during drilling and measured at 18 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													12 in. Topsoil
			N = 10										LEAN CLAY (CL), with Sand, light brown to reddish brown, medium stiff to hard, dry to moist, iron stained
	5		N = 7	22	33	15	18					70	
			N = 19										Grading light gray to reddish brown
	10		P = 2.5	14	23	12	11	123	2.08	14.8	7.5	75	Grading wet
			N = 40										Grading trace Sand, gray to brown
	15		N = 50										Grading with Sand
	20		N = 47										Grading with Gravel
	25		N = 23										
	30		N = 26										
	35		N = 44										POORLY-GRADED SAND (SP), light gray to dark brown, dense, moist, fine to coarse grained
	40		N = 26										CLAYEY SAND (SC), gray to brown, medium dense, moist, fine to coarse grained
	45		N = 15										LEAN CLAY (CL), trace Sand, gray to brown, stiff to hard, moist, with occasional Shale fragments
	50		N = 15										Grading light gray, iron stained
	55		N = 50/6"										Grading trace Gravel, light gray to brown
			N = 50/6"										Grading with Gravel
													Total Depth = 59.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.591143, Long. -88.120681

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LOG OF BORING OM-1

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/29/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 12 ft. during drilling and measured at 16 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													3 in. Topsoil
			N = 10										LEAN CLAY (CL), trace Sand, reddish brown to brown, stiff, dry to moist, iron stained
			P = 2.75	18	23	12	11	114	1.47	14.8	2.5	58	SANDY LEAN CLAY (CL), reddish brown to brown, stiff to hard, dry to moist, iron stained
	5		N = 24										
	10		N = 33	12									
			N = 32										LEAN CLAY (CL), with Sand, gray to reddish brown, very stiff to hard, wet, iron stained
	15		N = 29										Grading trace Sand, light gray
	20		N = 22										
	25		N = 20										
													Total Depth = 25.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.637191, Long. -88.175591

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LOG OF BORING OM-2

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017
DATE(S) DRILLED: 4/29/2025

DRILLING METHOD(S):
Air Rotary

GROUNDWATER INFORMATION:
Groundwater encountered at 10 ft. during drilling and measured at 16 ft. immediately after drilling

SURFACE ELEVATION (FT):

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													3 in. Topsoil
			N = 14										LEAN CLAY (CL), trace Sand, brown to reddish brown, medium stiff to stiff, dry to moist, iron stained
			N = 7	23									
	5												
			N = 13										SANDY LEAN CLAY (CL), brown to reddish brown, stiff to very stiff, dry to moist, iron stained
	10		N = 20										Grading wet
			P = 1.75	14	25	14	11	123	2.98	14.8	8.5	68	
	15		N = 30										LEAN CLAY (CL), trace Sand, light gray to brown, very stiff to hard, wet, iron stained
	20		N = 31										
	25		N = 33										
													Total Depth = 25.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.636144, Long. -88.175548

RENEWABLE LOG - LOG A GNNL01.GDT - 6/6/25 09:58 - C:\USERS\CHRISTIANMIRANDA\RRC COMPANIES\GEOTECHNICAL ENGINEERING - DATABASES\03.GINT\PROJECTS\2025\COLES WIND-GE2502017\COLES WIND-GE2502017.GPJ

LOG OF TEST PIT TR-1a

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017

DATE(S) EXCAVATED: 4/16/25

EXCAVATION METHOD(S):
Excavator

GROUNDWATER INFORMATION:
Groundwater encountered at 4.5 ft. during excavation and not measured immediately after excavation

SURFACE ELEVATION:

SOIL SYMBOL	DEPTH (FT)	SAMPLES	FIELD DATA: N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (LL)	ATTERBERG LIMITS: PLASTIC LIMIT (PL)	ATTERBERG LIMITS: PLASTICITY INDEX (PI)	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													6 in. Topsoil
	1		P = 1.75										SANDY LEAN CLAY (CL), brown, stiff, dry to moist
	2		P = 1.75										LEAN CLAY (CL), trace Sand, gray, stiff to very stiff, dry to moist, iron stained
	3		P = 2.0	27	47	18	29					89	
	4		P = 2.5										Grading wet
	5												
													Total Depth = 5.5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.616331, Long. -88.208044

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LOG OF TEST PIT TR-2

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017

DATE(S) EXCAVATED: 4/16/25

EXCAVATION METHOD(S):
Excavator

GROUNDWATER INFORMATION:
Groundwater encountered at 4 ft. during excavation and not measured immediately after excavation

SURFACE ELEVATION:

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ. FT)	STRAIN AT FAILURE (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													5 in. Topsoil
	1		P = 1.75										SANDY LEAN CLAY (CL), brown, stiff, dry to moist
	2		P = 2.0										LEAN CLAY (CL), trace Sand, gray, stiff to very stiff, dry to moist
	3		P = 2.25	25	47	18	29					93	Grading gray to brown
	4		P = 2.5										Grading wet
	5												Total Depth = 5 ft.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:
GPS COORDINATES: Lat. 39.569814, Long. -88.152125

RENEWABLE LOG - TEST PIT - LOG A GNNL01.GDT - 6/3/25 13:56 - C:\USERS\CHRISTIANMIRANDA\RRC COMPANIES\GEOTECHNICAL ENGINEERING - DATABASES\03.GINT\PROJECTS\2025\COLES WIND-GE2502017\COLES WIND-GE2502017.GPJ

Summary of CPT Correlation Equations and Formulas

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236 \right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a} \right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c\_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c\_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$\alpha = 14$ for $Q_{tn} > 14$

$\alpha = Q_{tn}$ for $Q_{tn} \leq 14$

$M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \leq 2.20$

$$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho} \right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot +7 \cdot \log(F_r))} \right]^{1.25}$$ or user defined

$OCR = k_{OCR} \cdot Q_{tn}$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = (1 - \sin\varphi') \cdot OCR^{\sin\varphi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

References

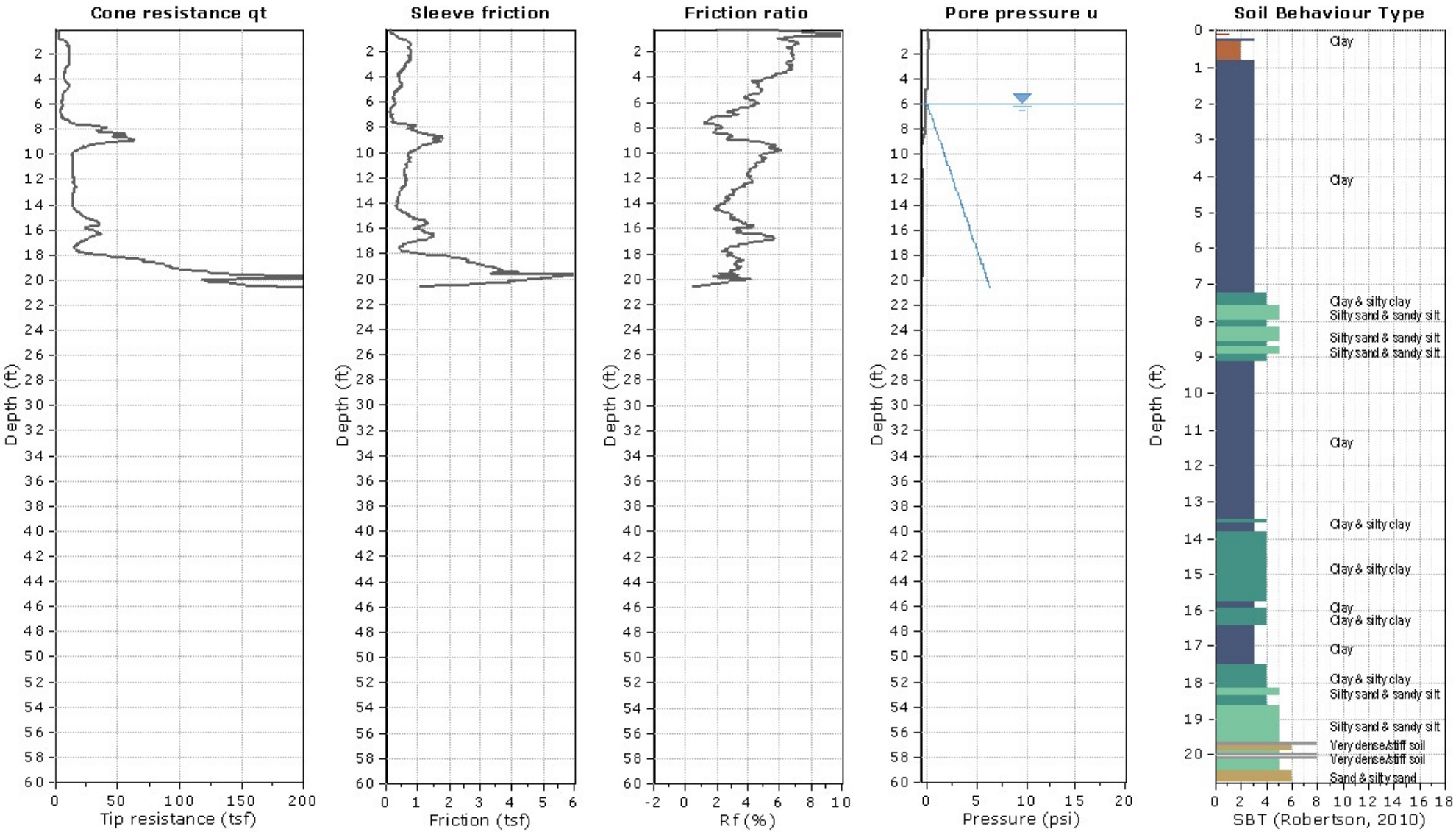
• Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012

• Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

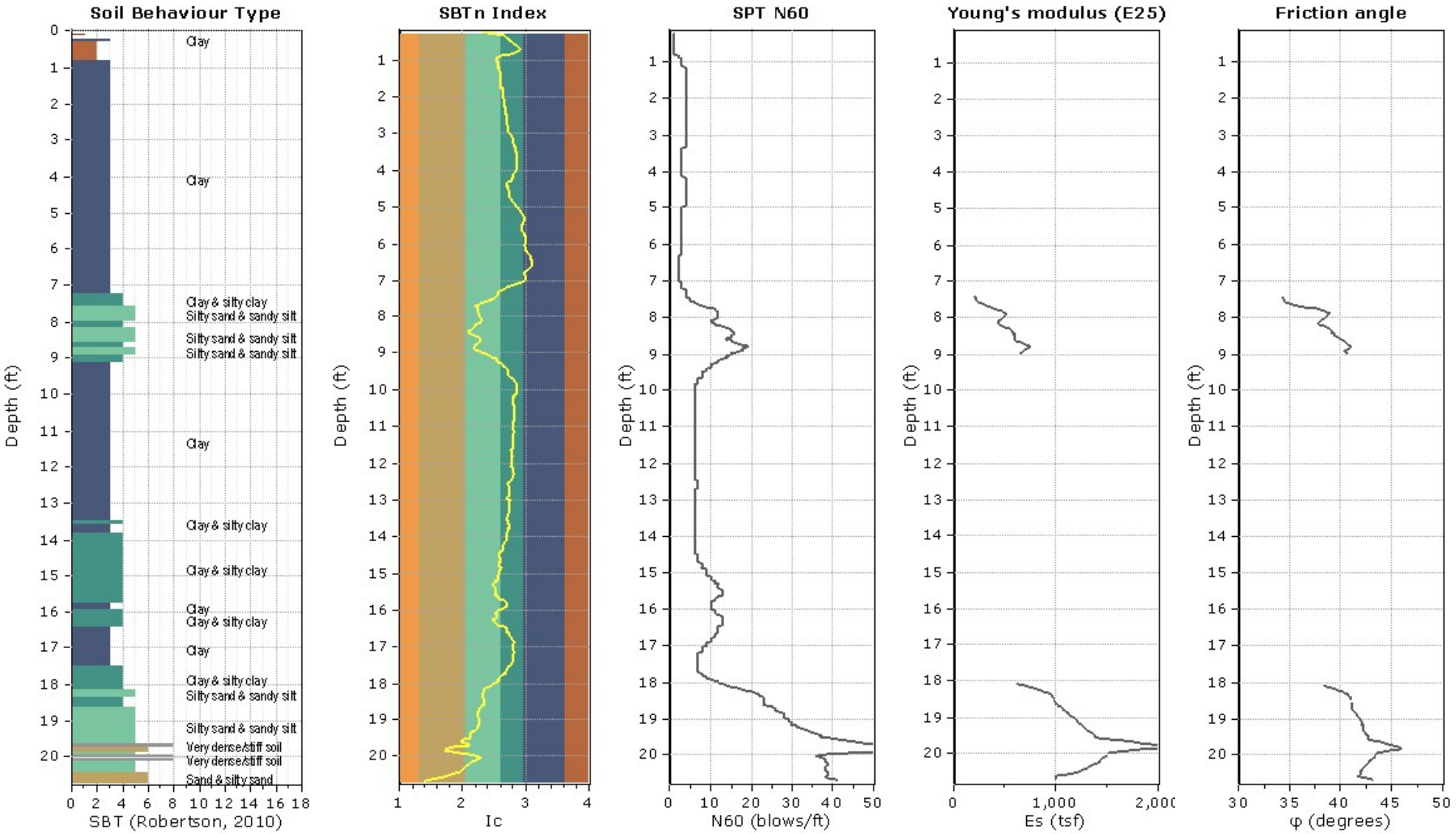
CPT: GEO-01
Total depth: 20.67 ft, Date: 4/1/2025
Coords: lat 39.574644° lon -88.148535°
Cone Type: cpt
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

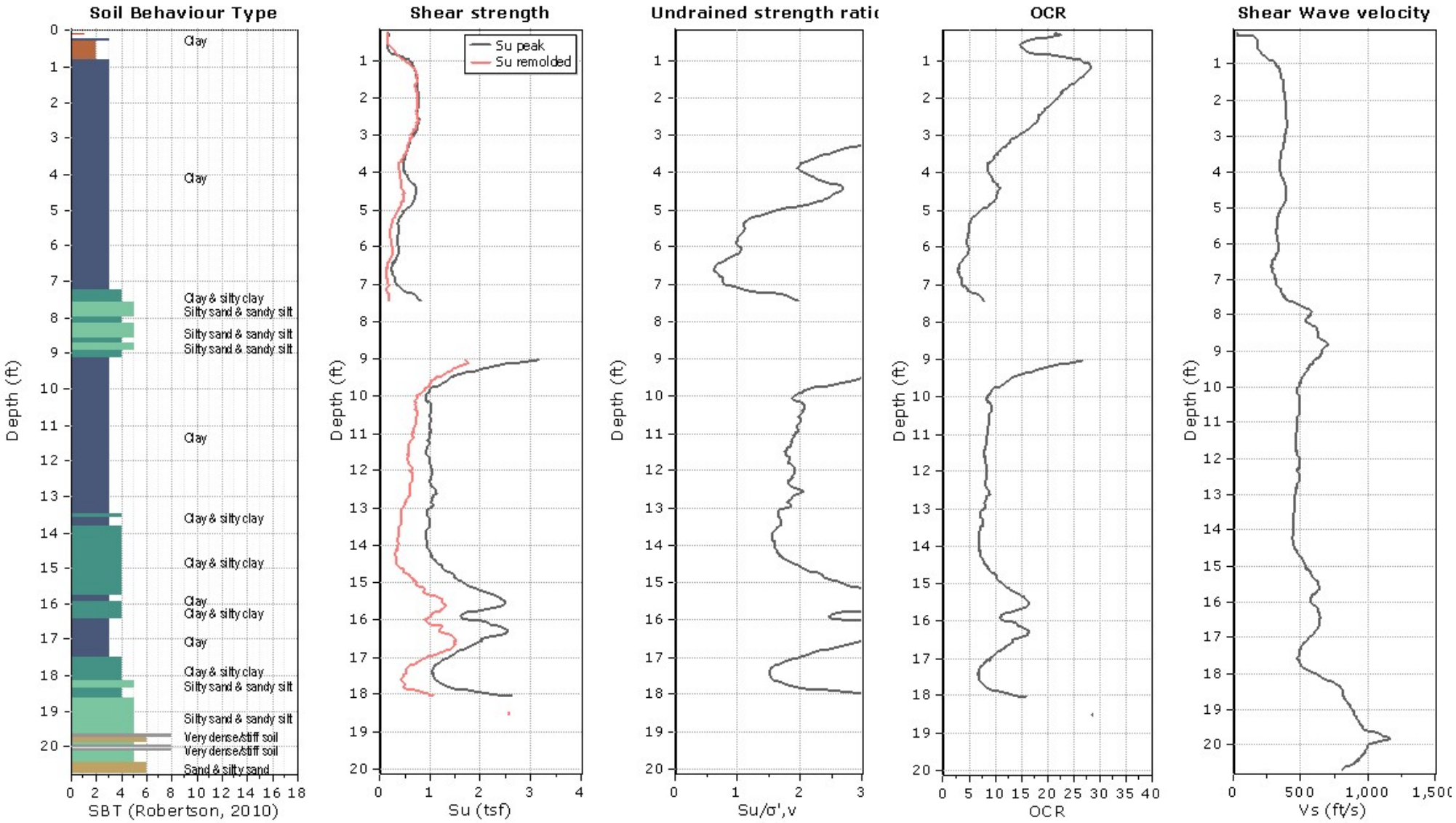
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Total depth: 20.67 ft, Date: 4/1/2025
Coords: lat 39.574644° lon -88.148535°
Cone Type: cpt
Cone Operator: Fugro



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CPT: GEO-01
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Cone Type: cpt
Cone Operator: Fugro

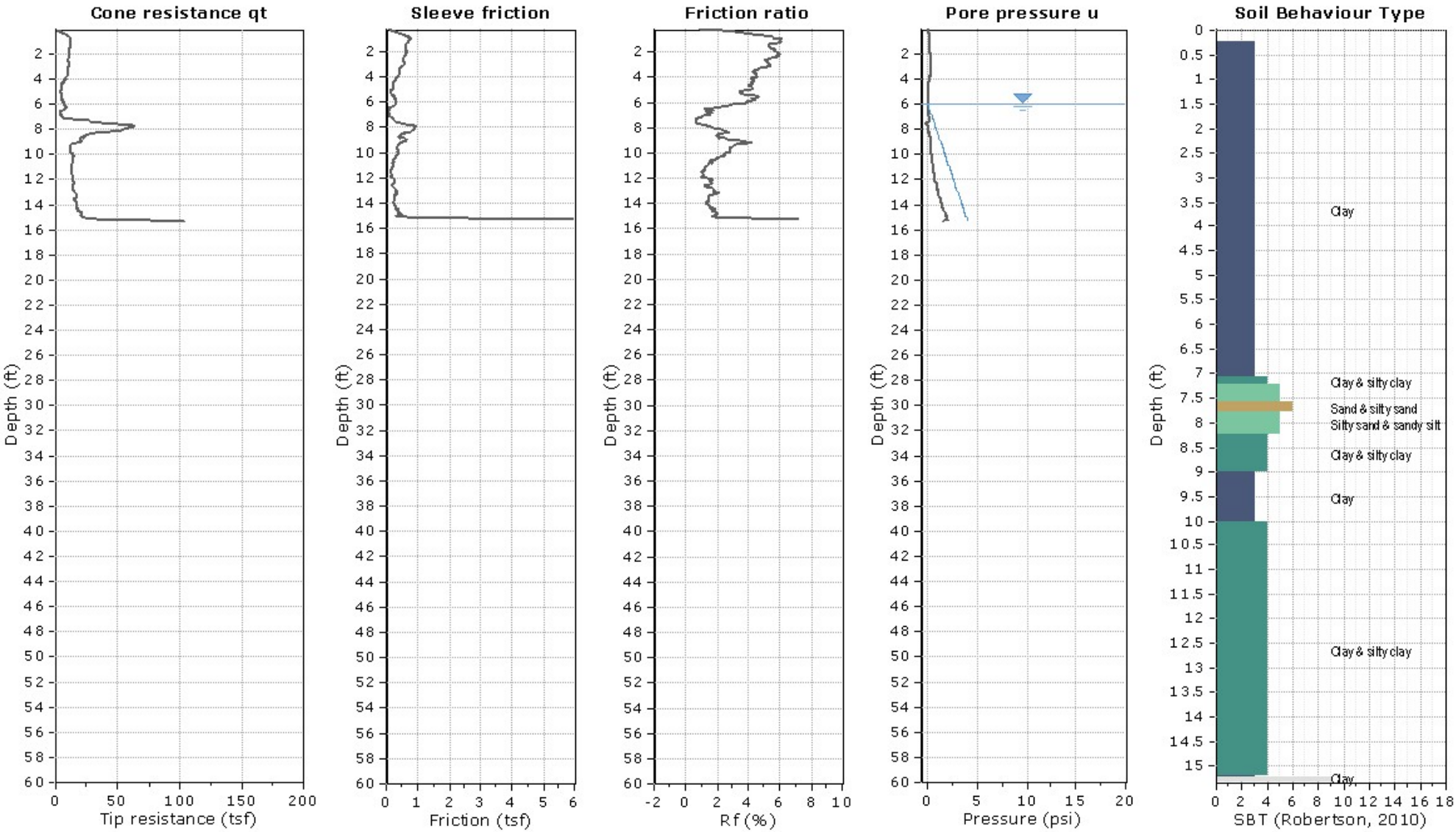
Project: **Coles Wind**
Location: **Coles County, Illinois**



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CPT: GEO-01A
Total depth: 15.29 ft, Date: 4/1/2025
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Cone Type: CPT
Cone Operator: Fugro

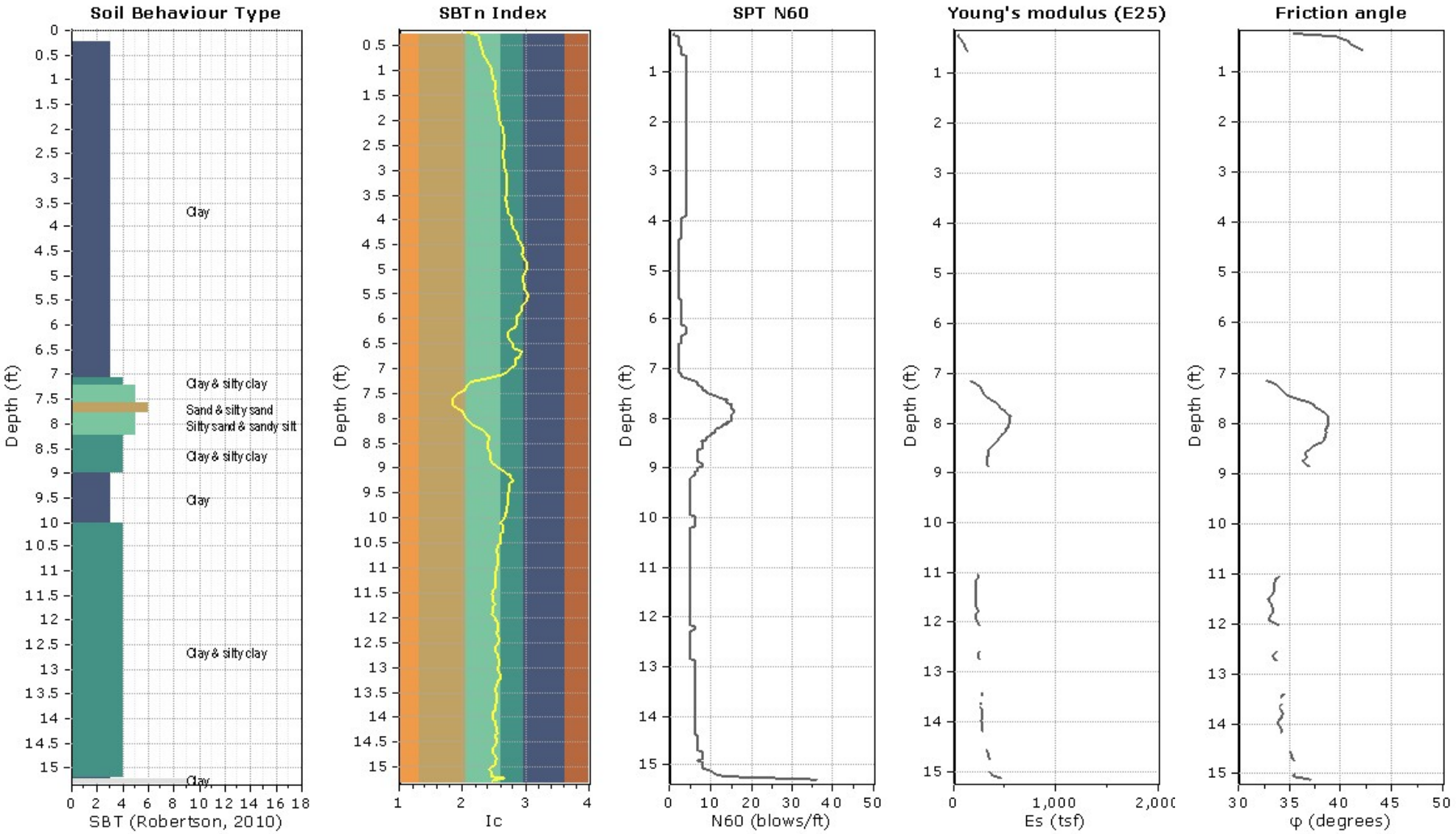
Project: **Coles Wind**
Location: **Coles County, Illinois**



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Project: **Coles Wind**
Location: **Coles County, Illinois**

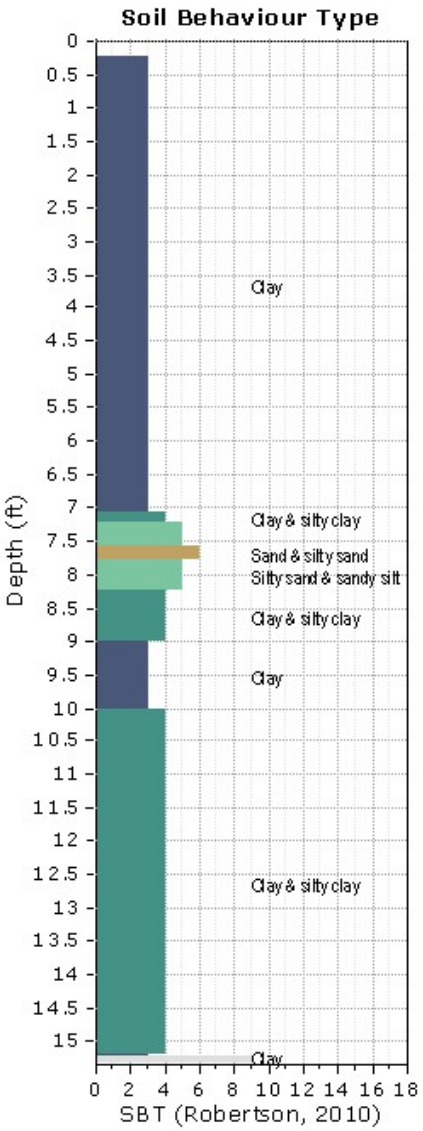
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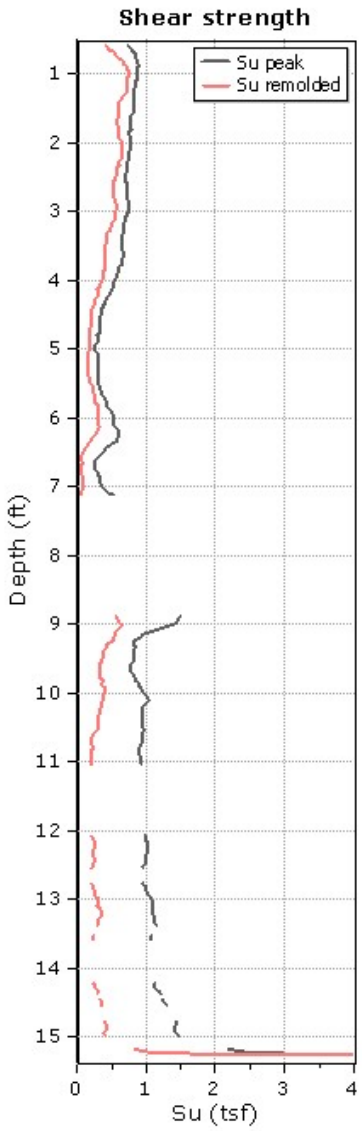


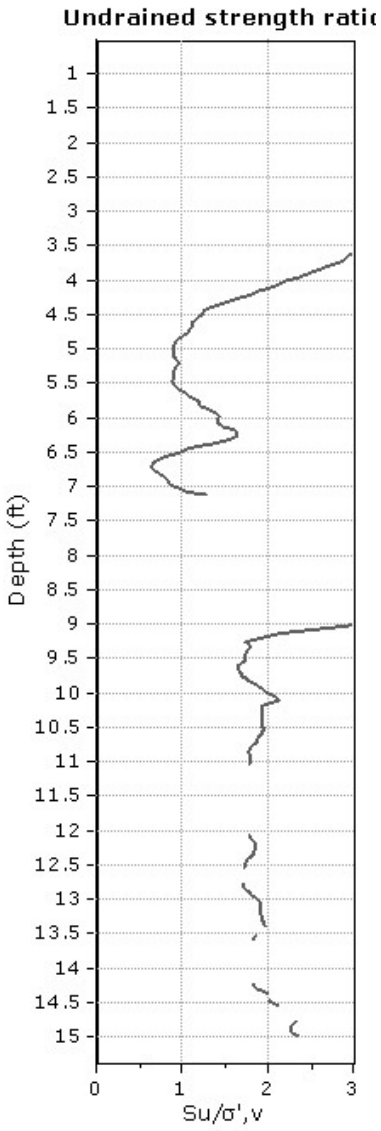
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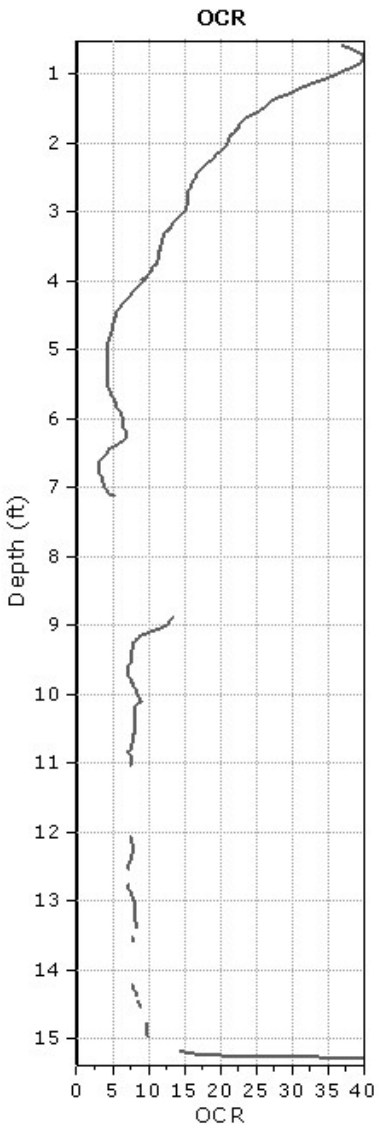
Project: **Coles Wind**
Location: **Coles County, Illinois**

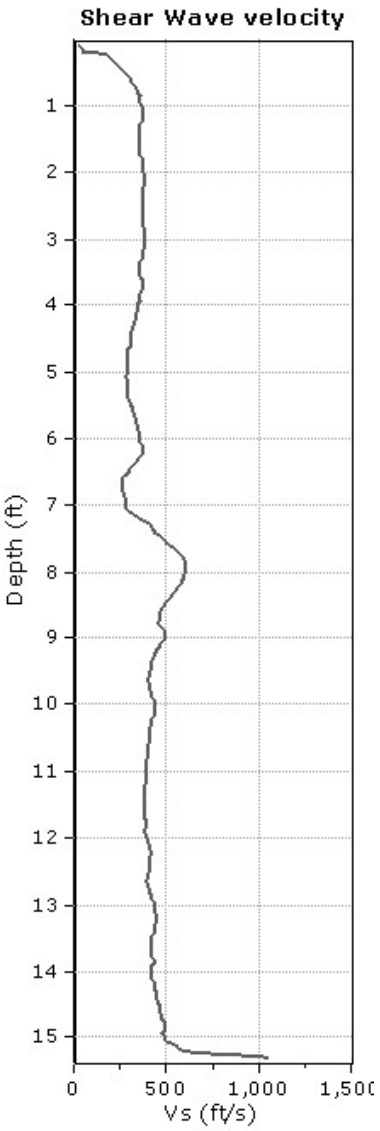
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Cone Type: CPT
Cone Operator: Fugro







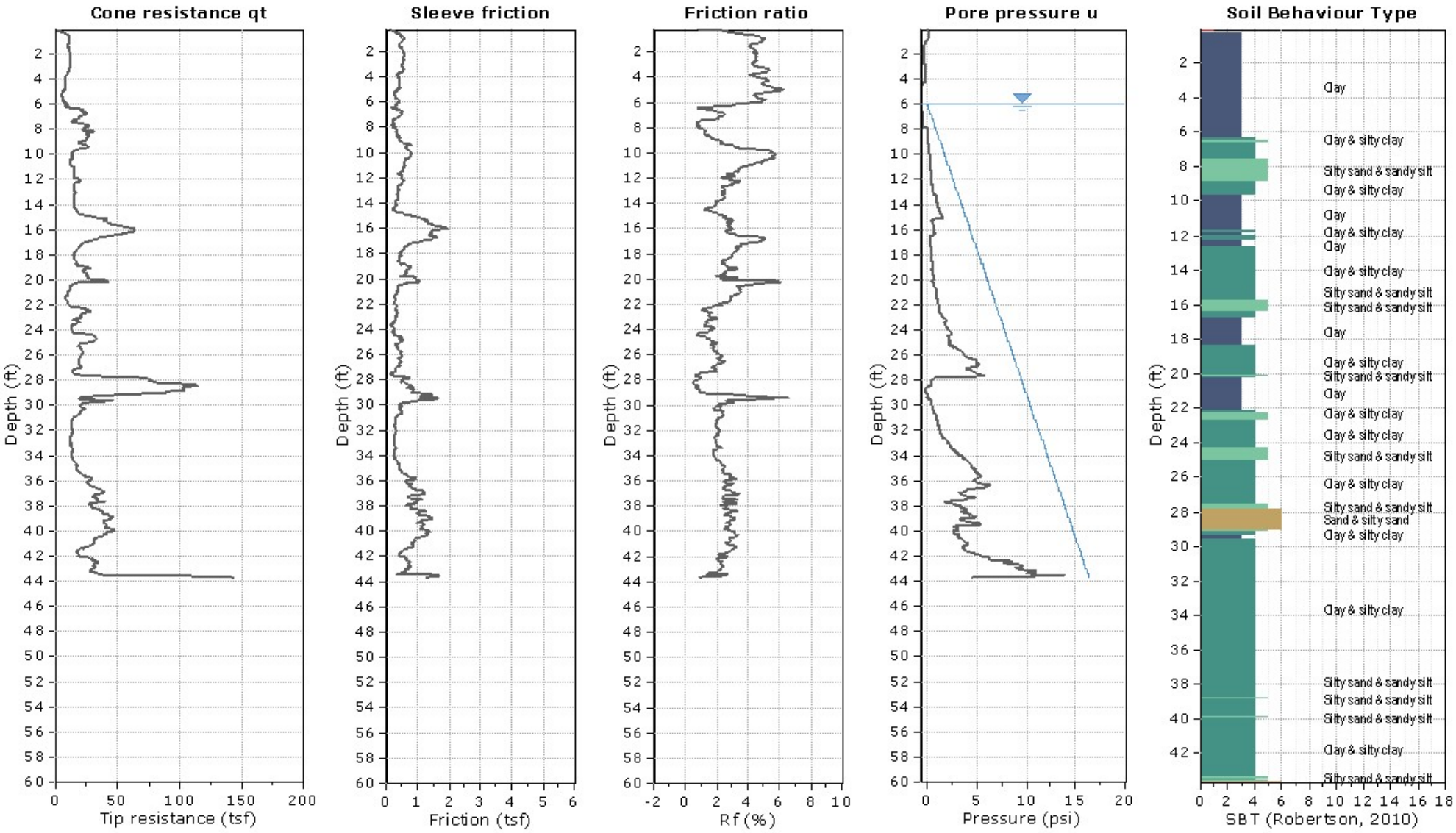




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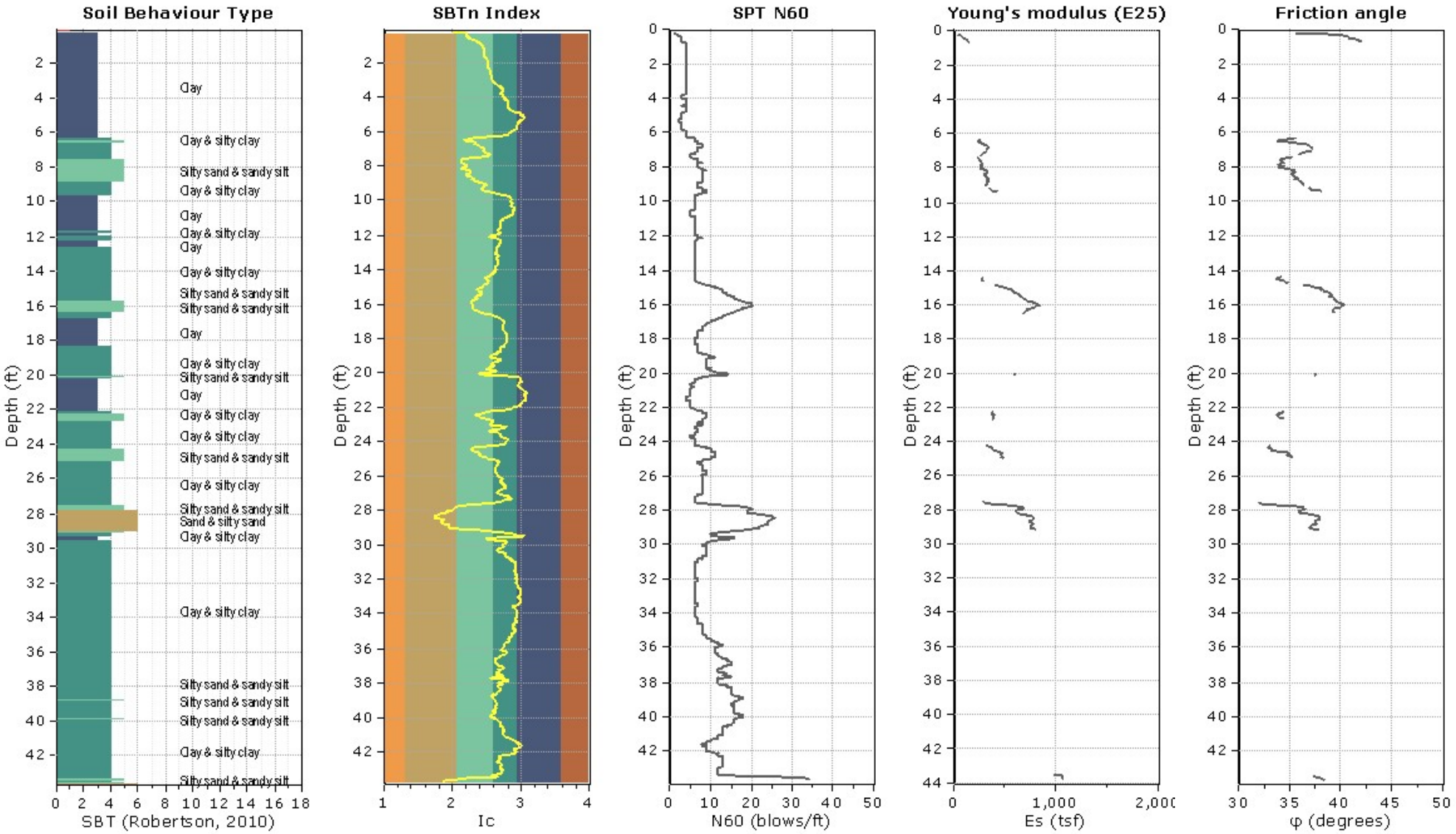
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Cone Type: CPT
Cone Operator: Fugro



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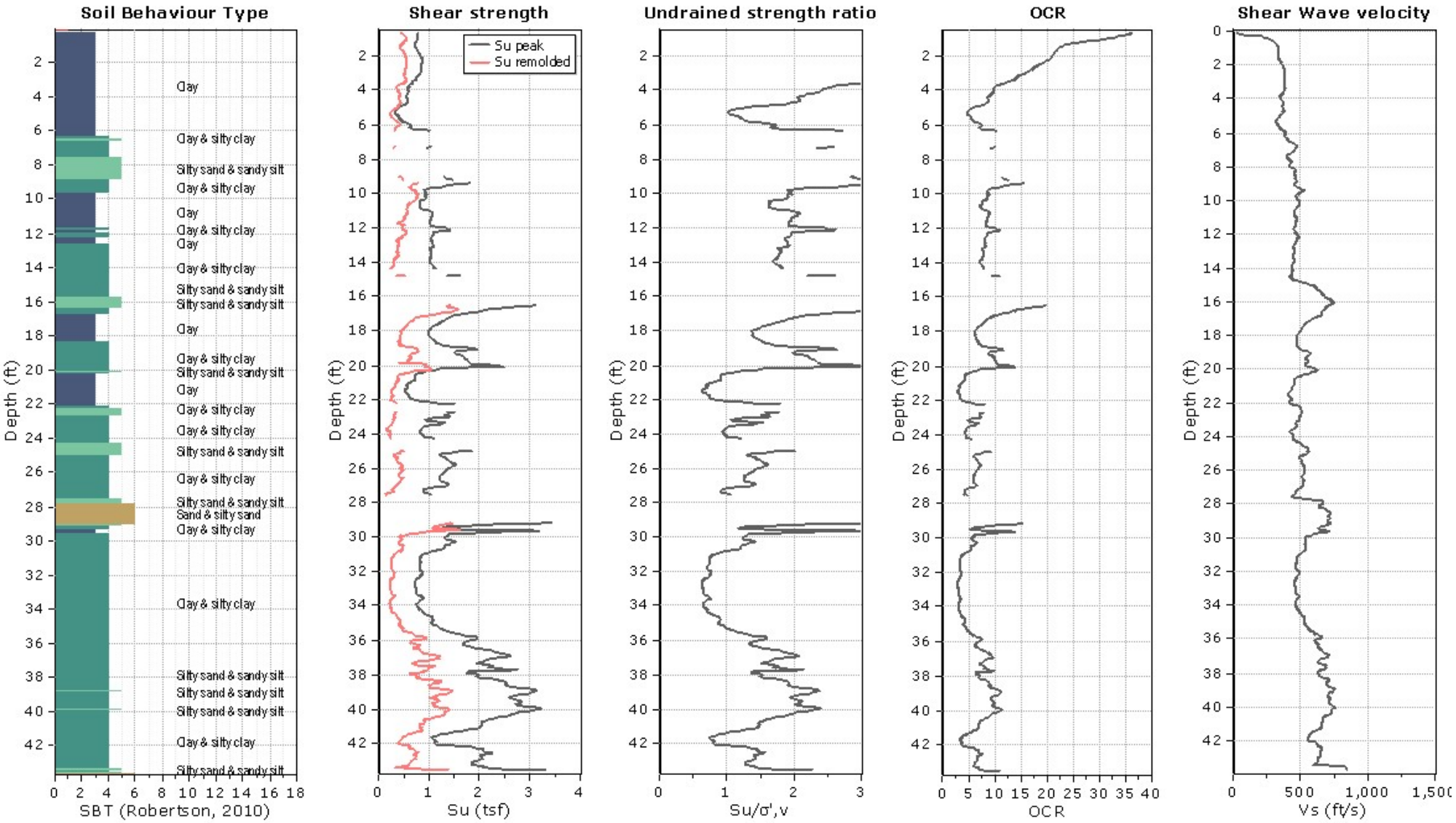
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Cone Type: CPT
Cone Operator: Fugro



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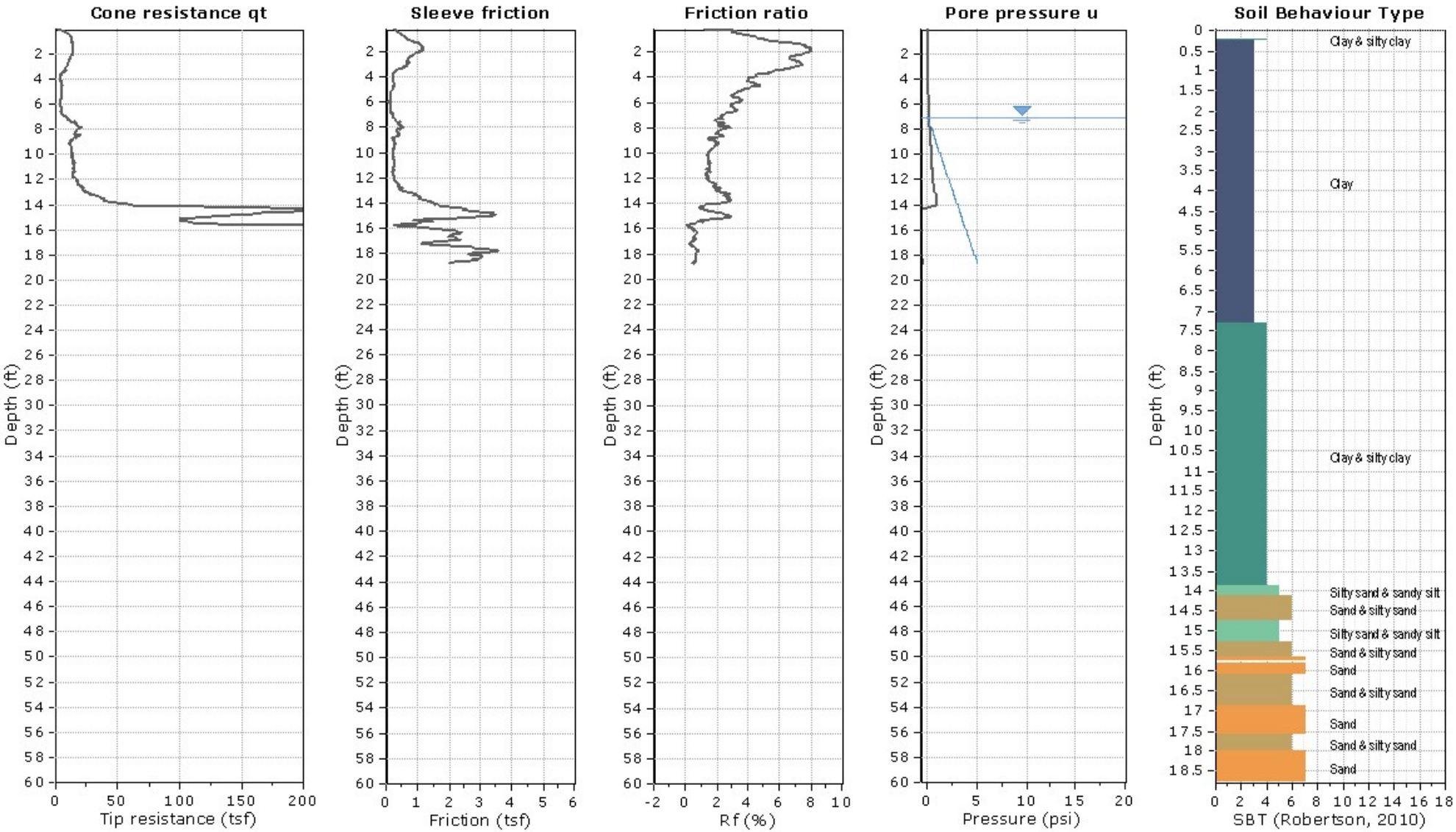
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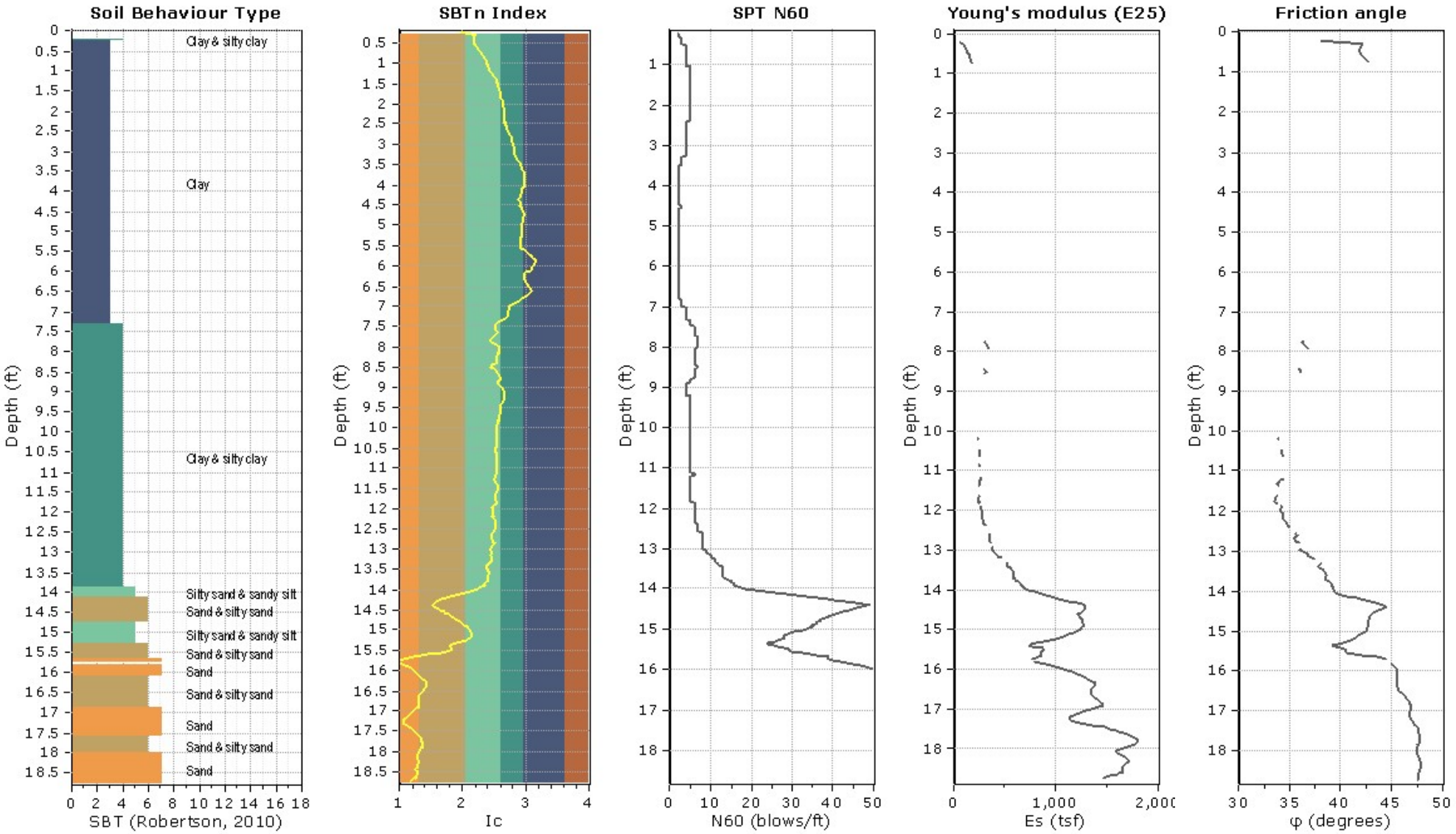
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Coords: lat 39.565118° lon -88.132452°
Cone Type: CPT
Cone Operator: Fugro



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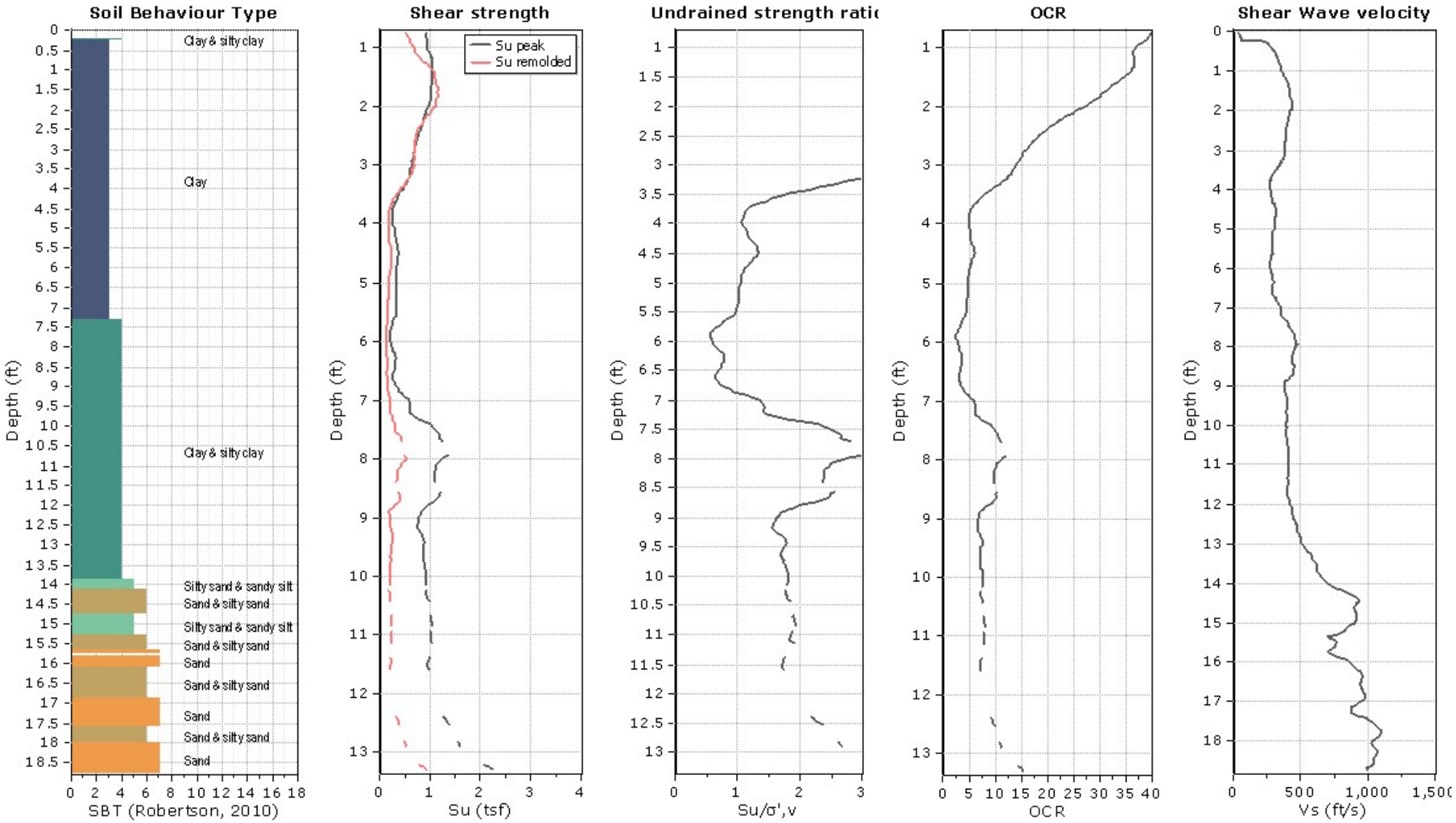
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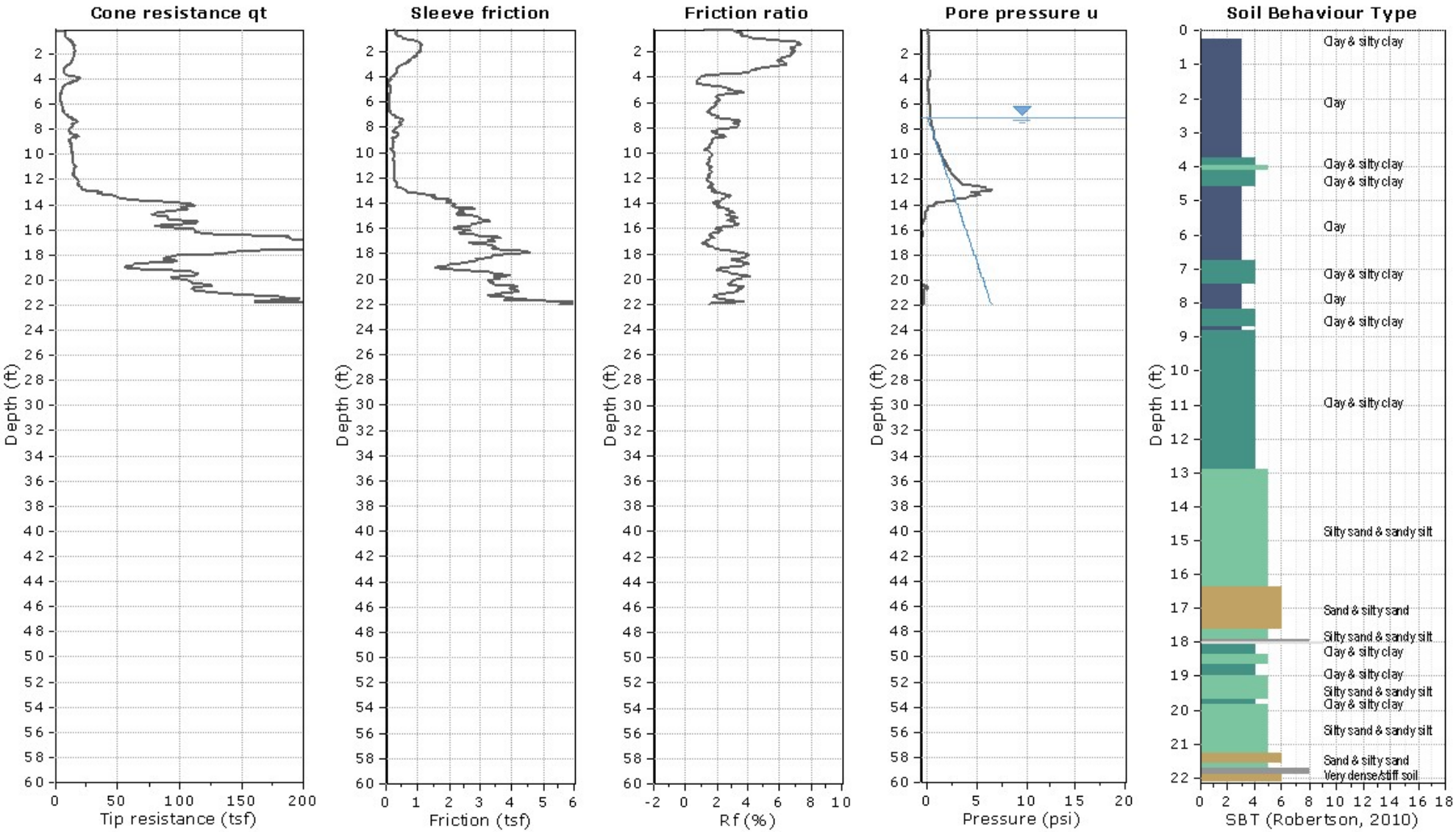
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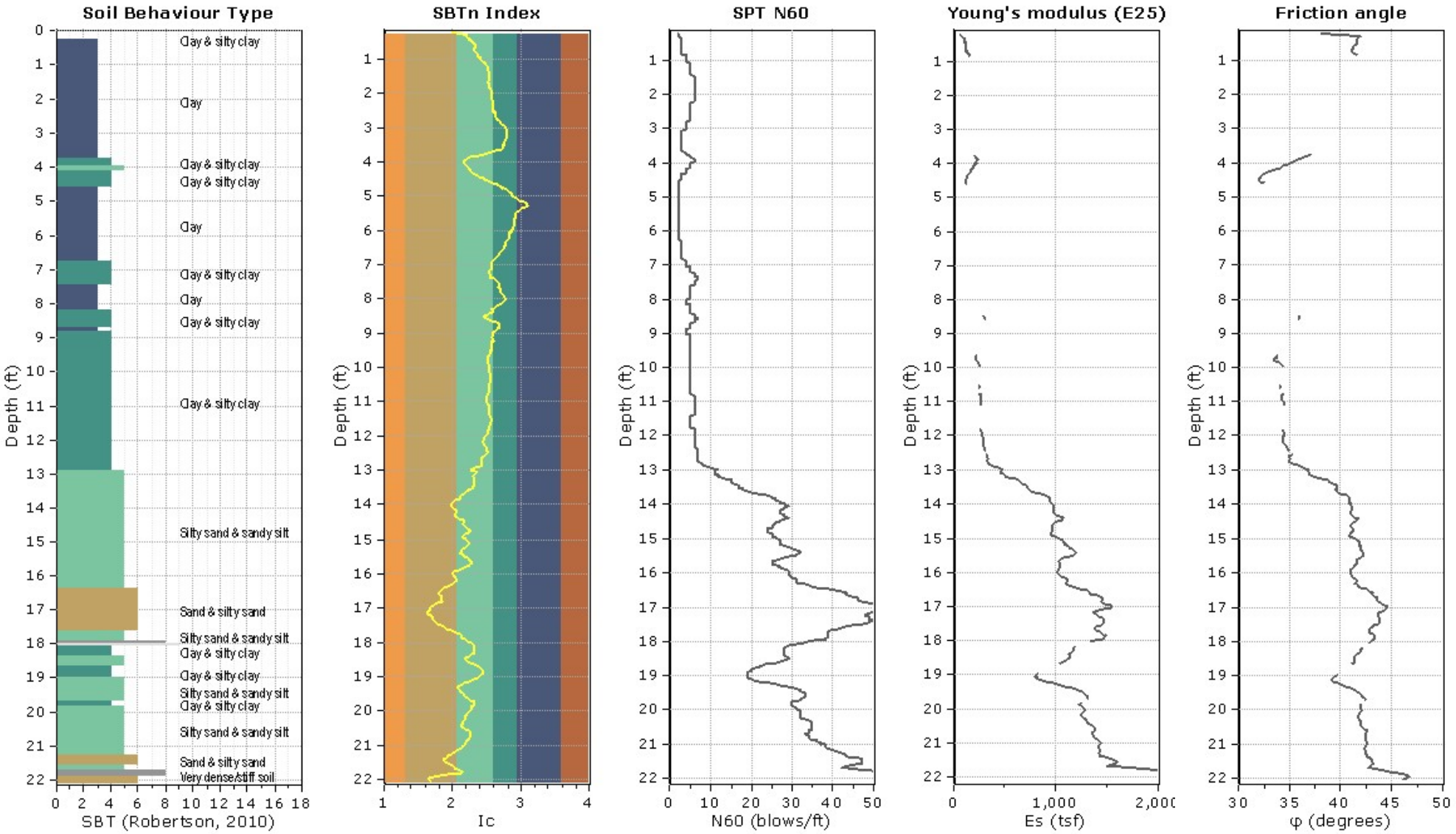
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Cone Operator: Fugro



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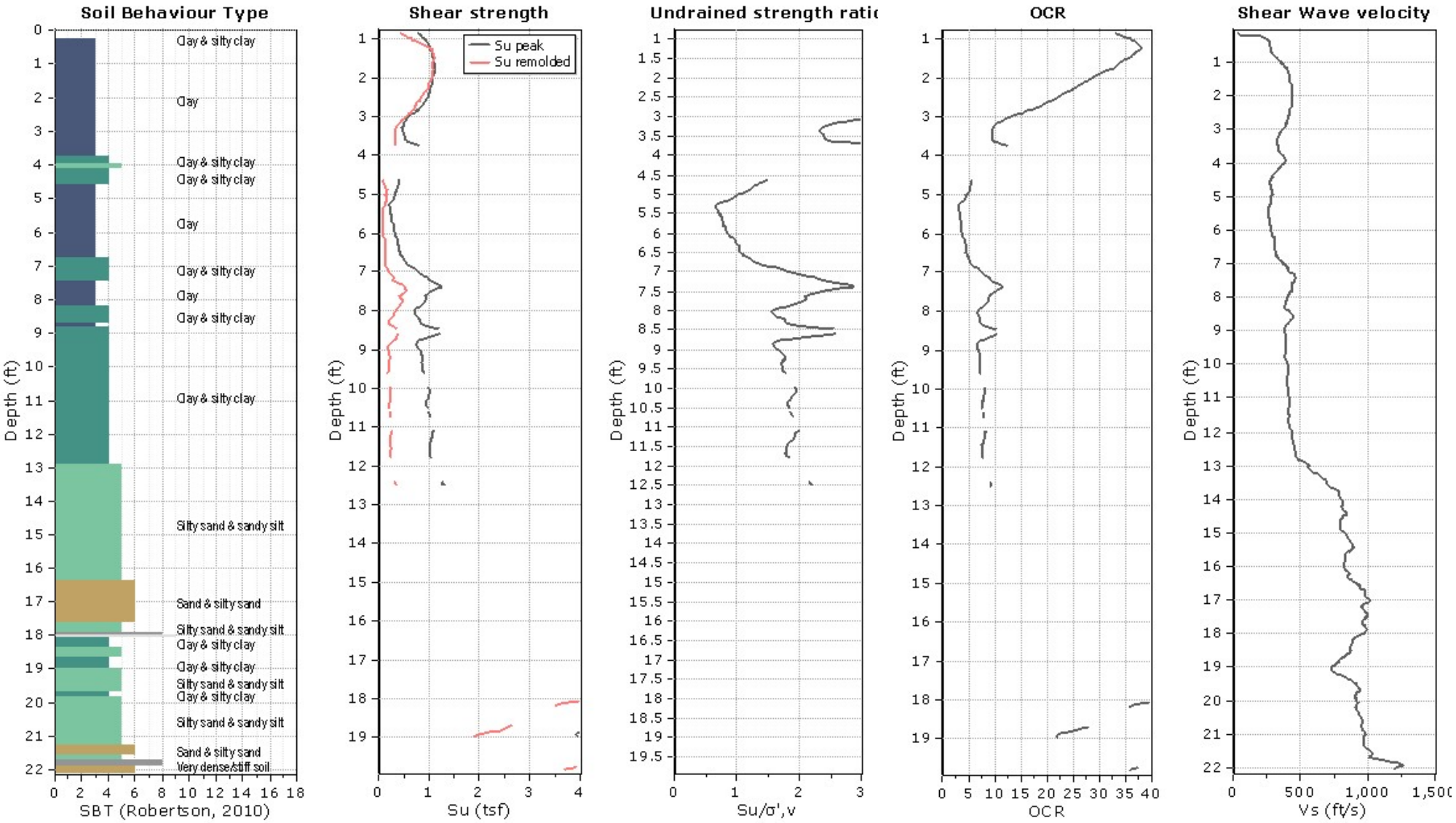
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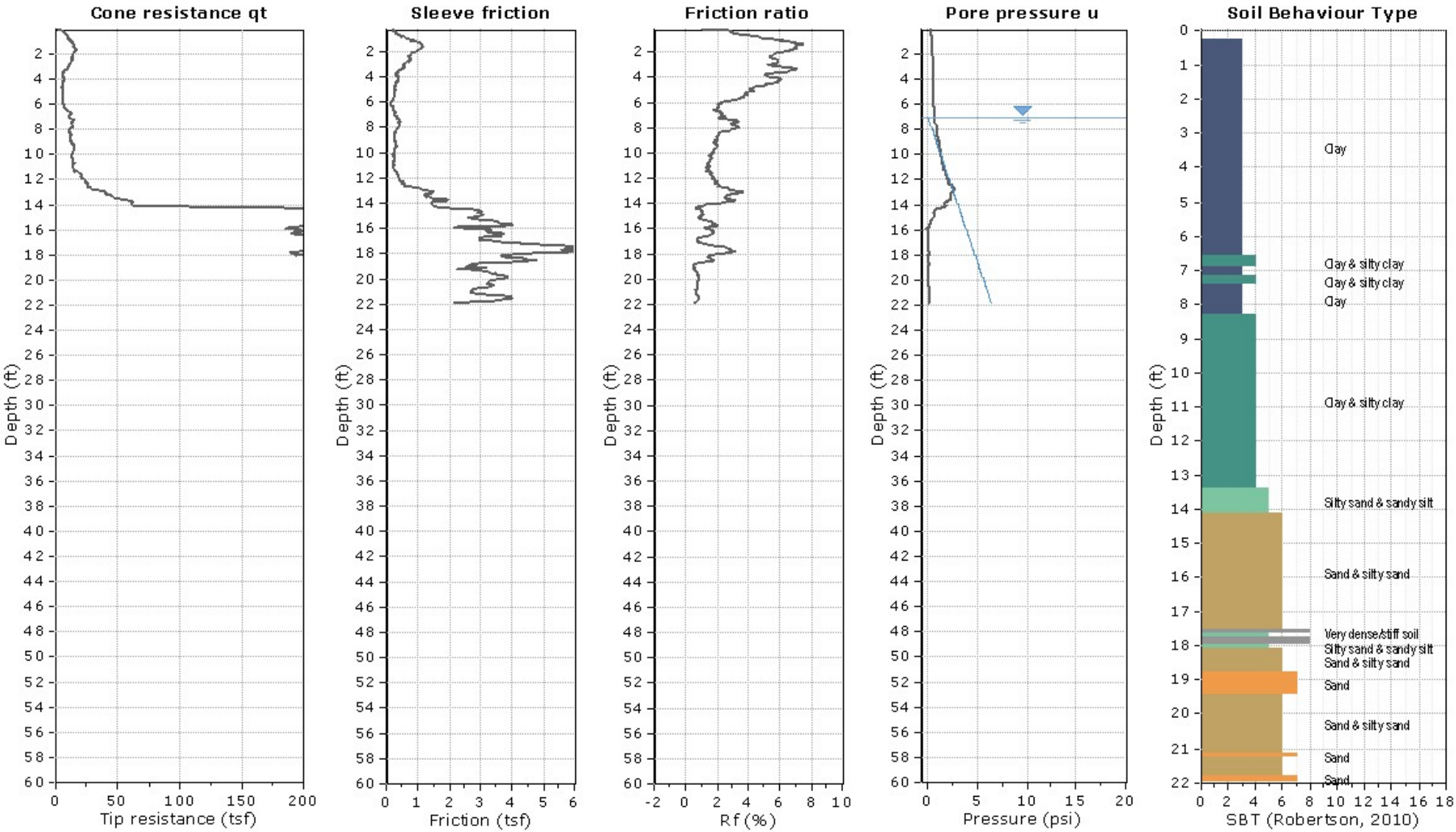
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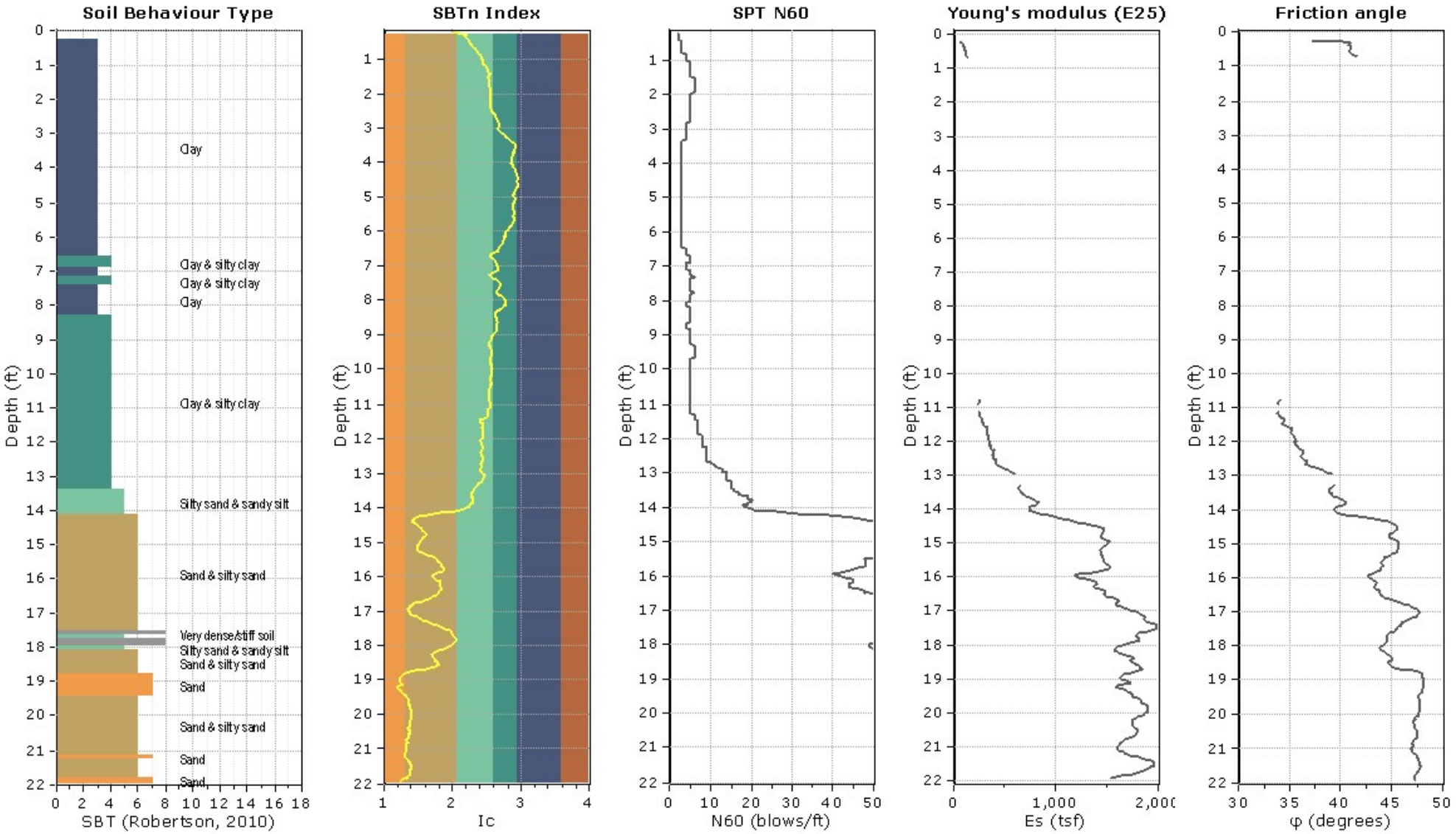
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Cone Operator: Fugro



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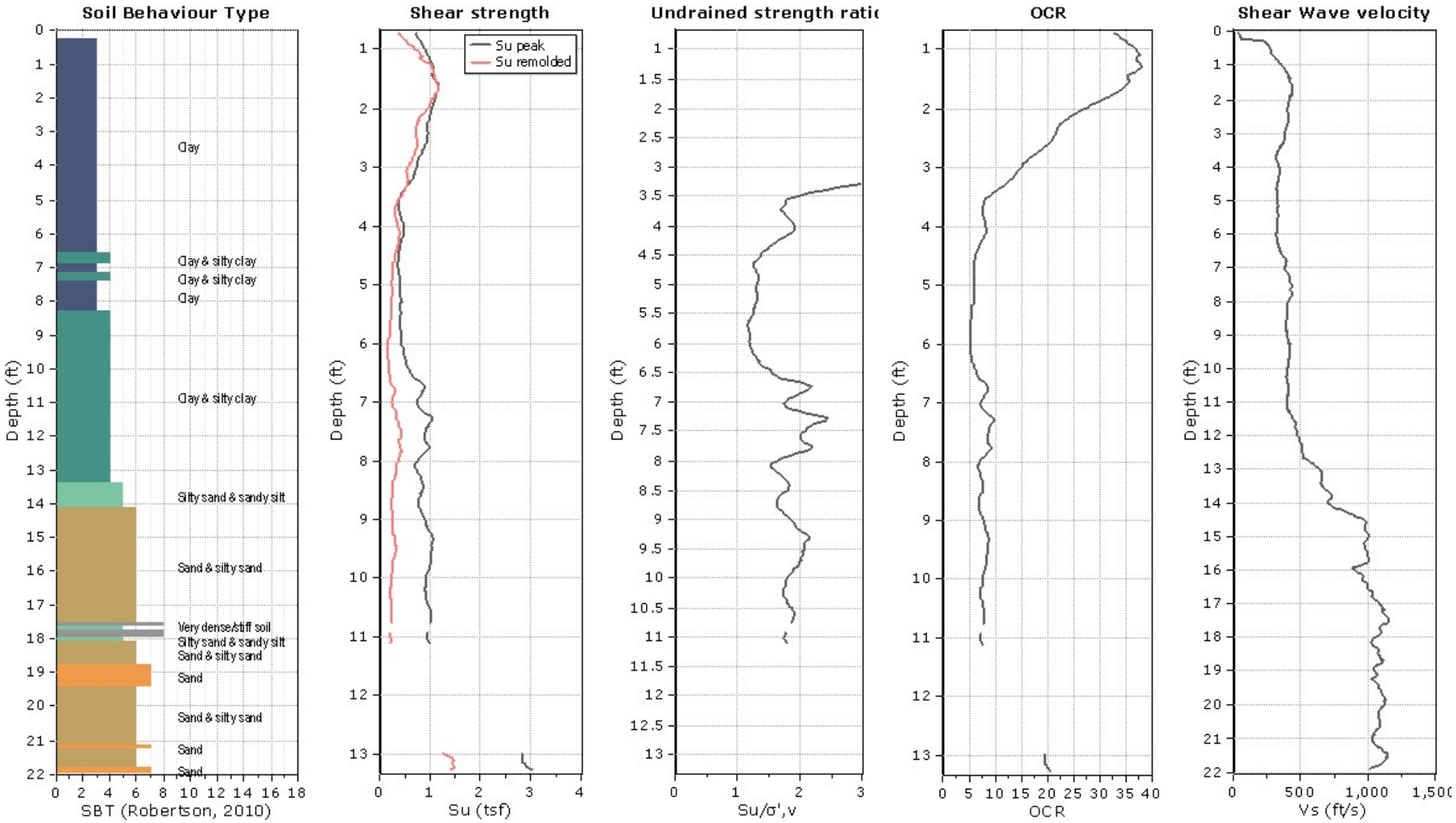
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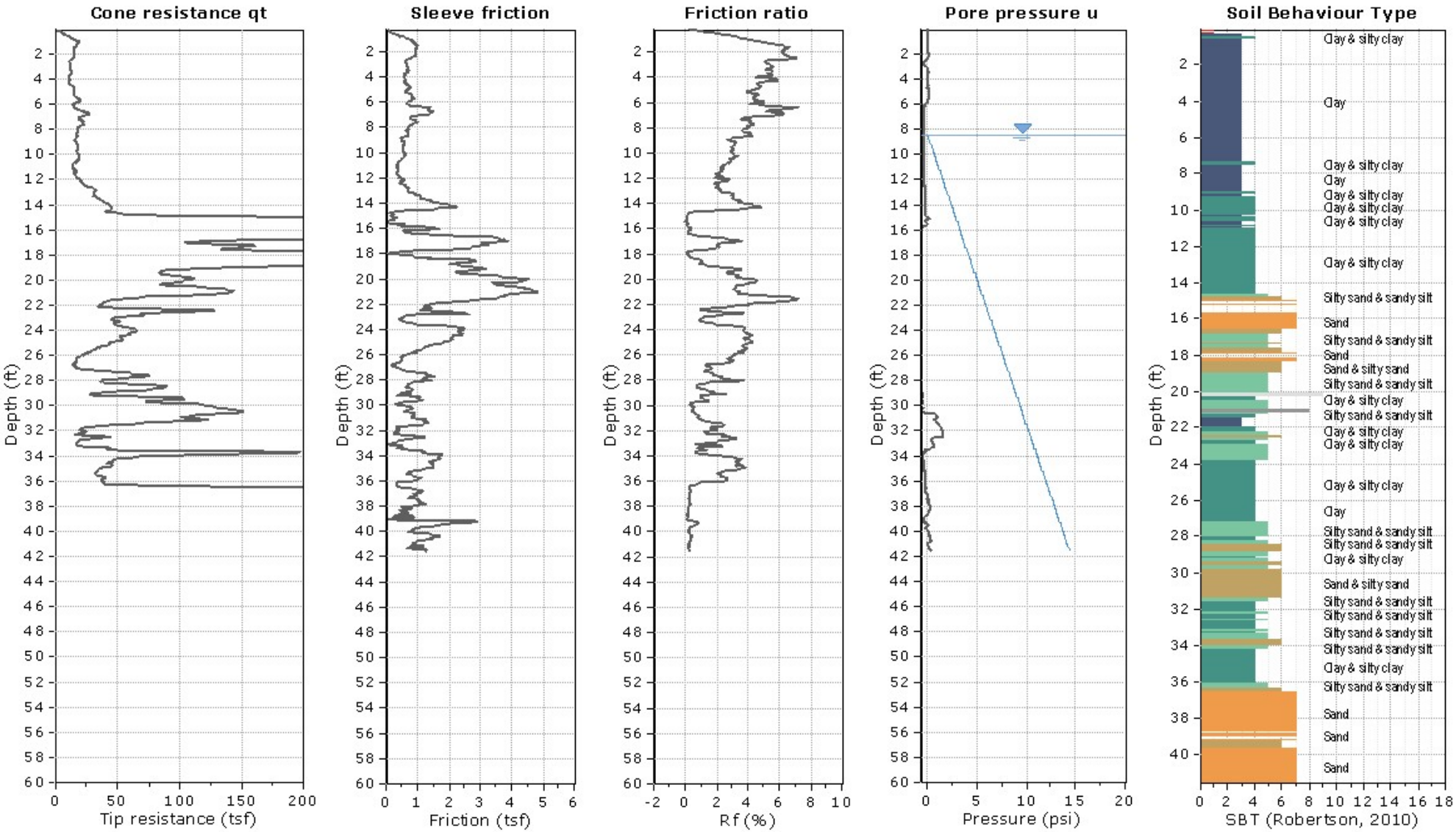
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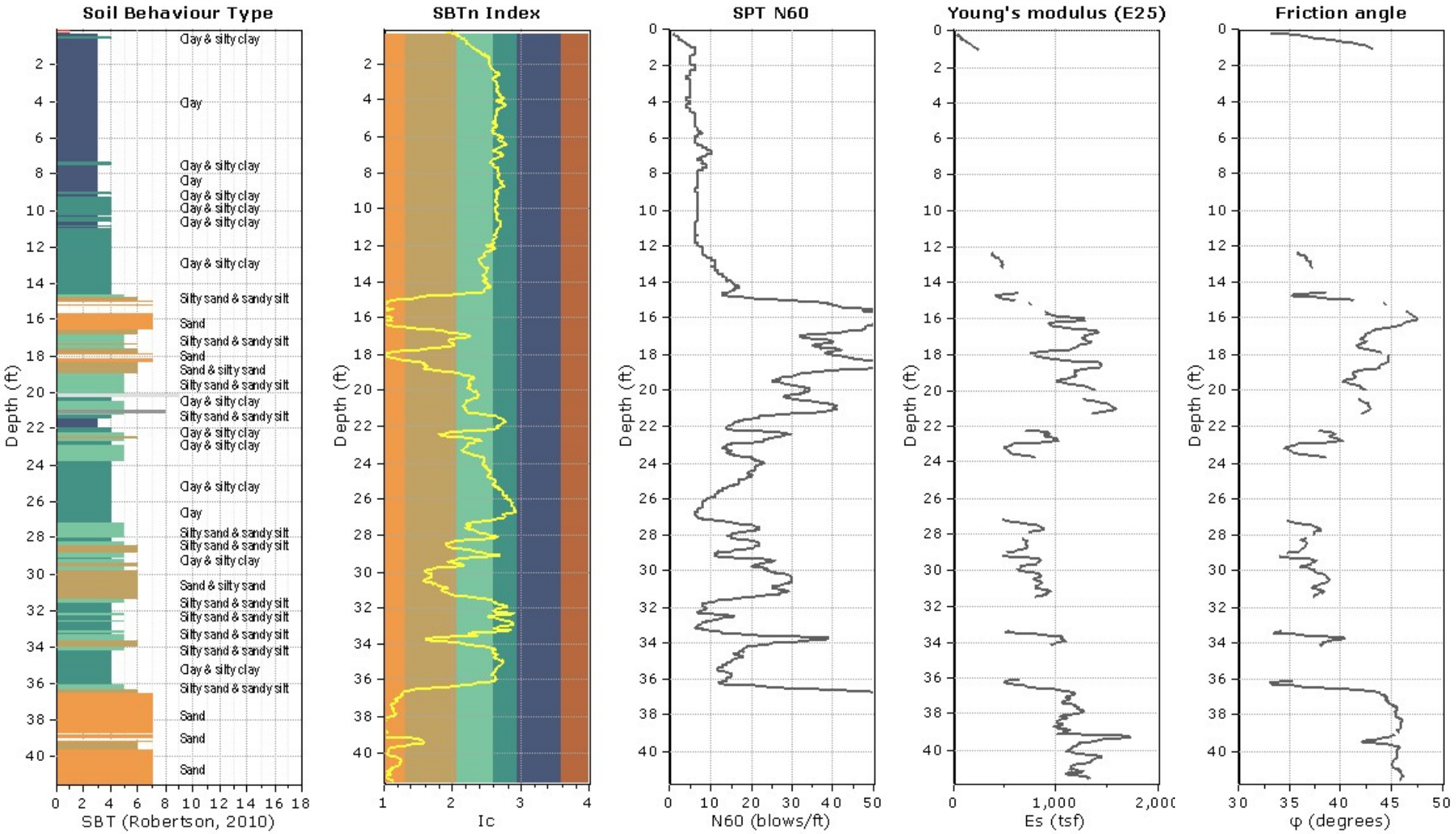
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Coords: lat 39.591355° lon -88.161488°
Cone Type: CPT
Cone Operator: Fugro



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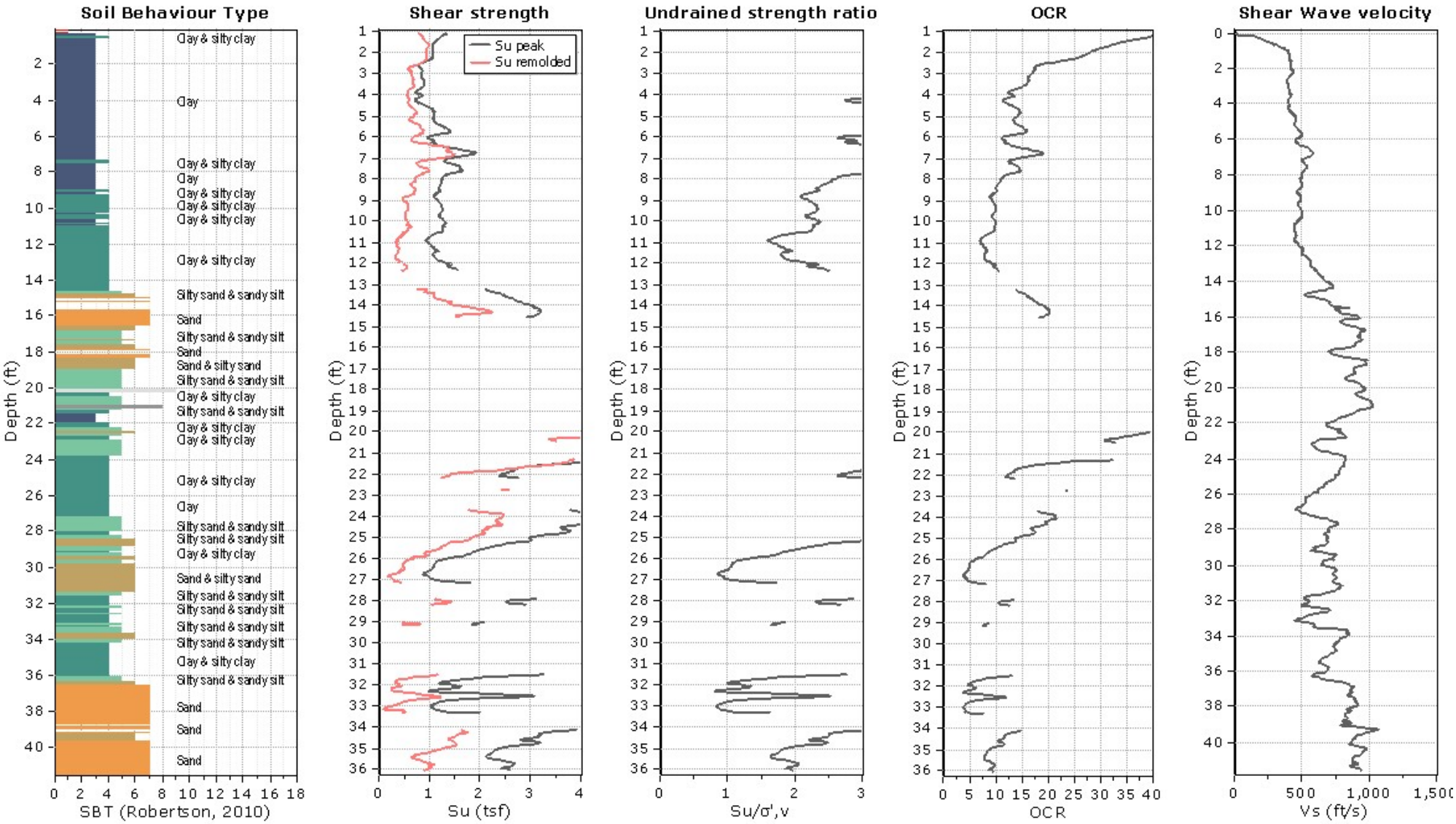
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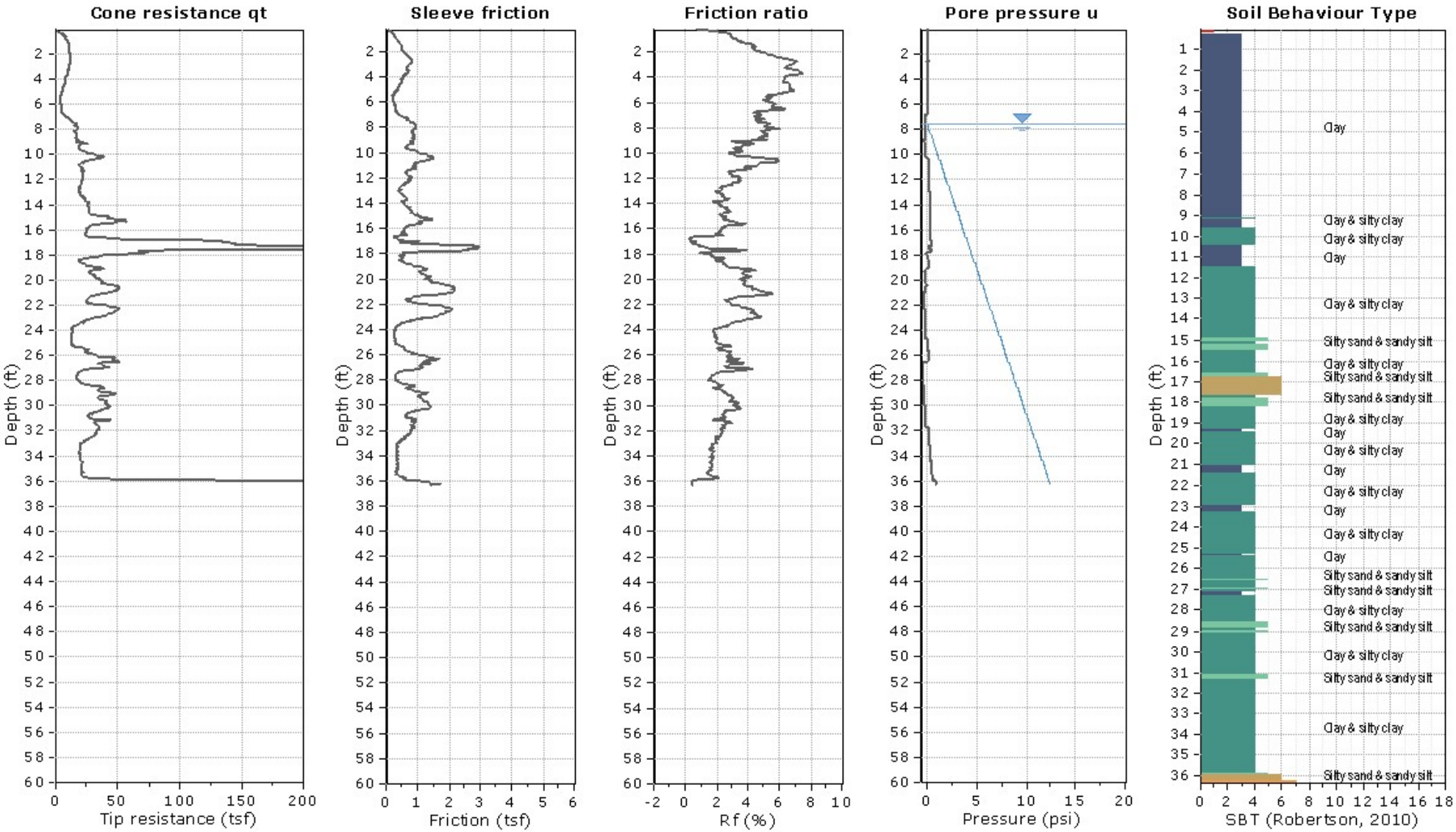
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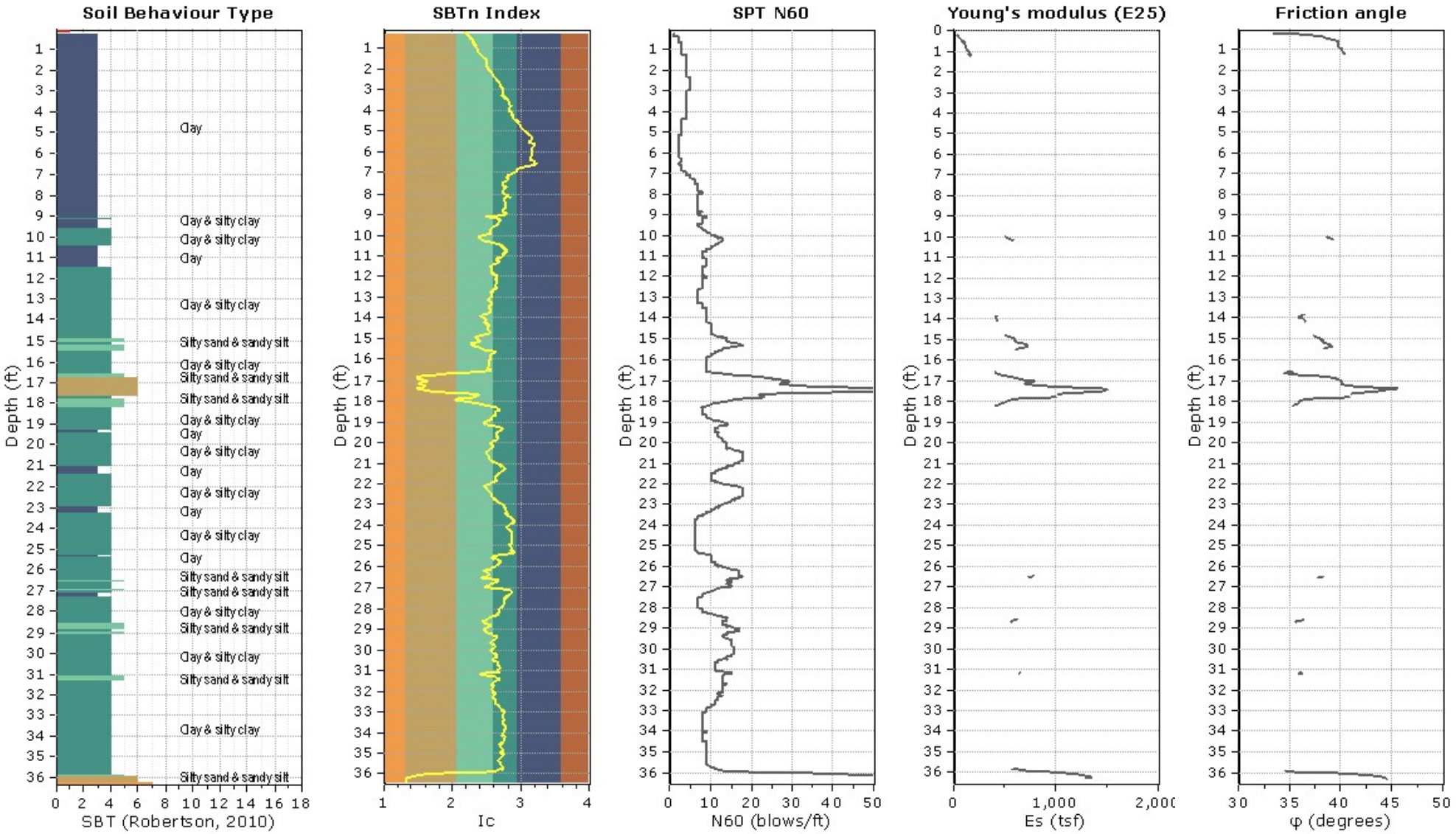
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Cone Type: CPT
Cone Operator: Fugro



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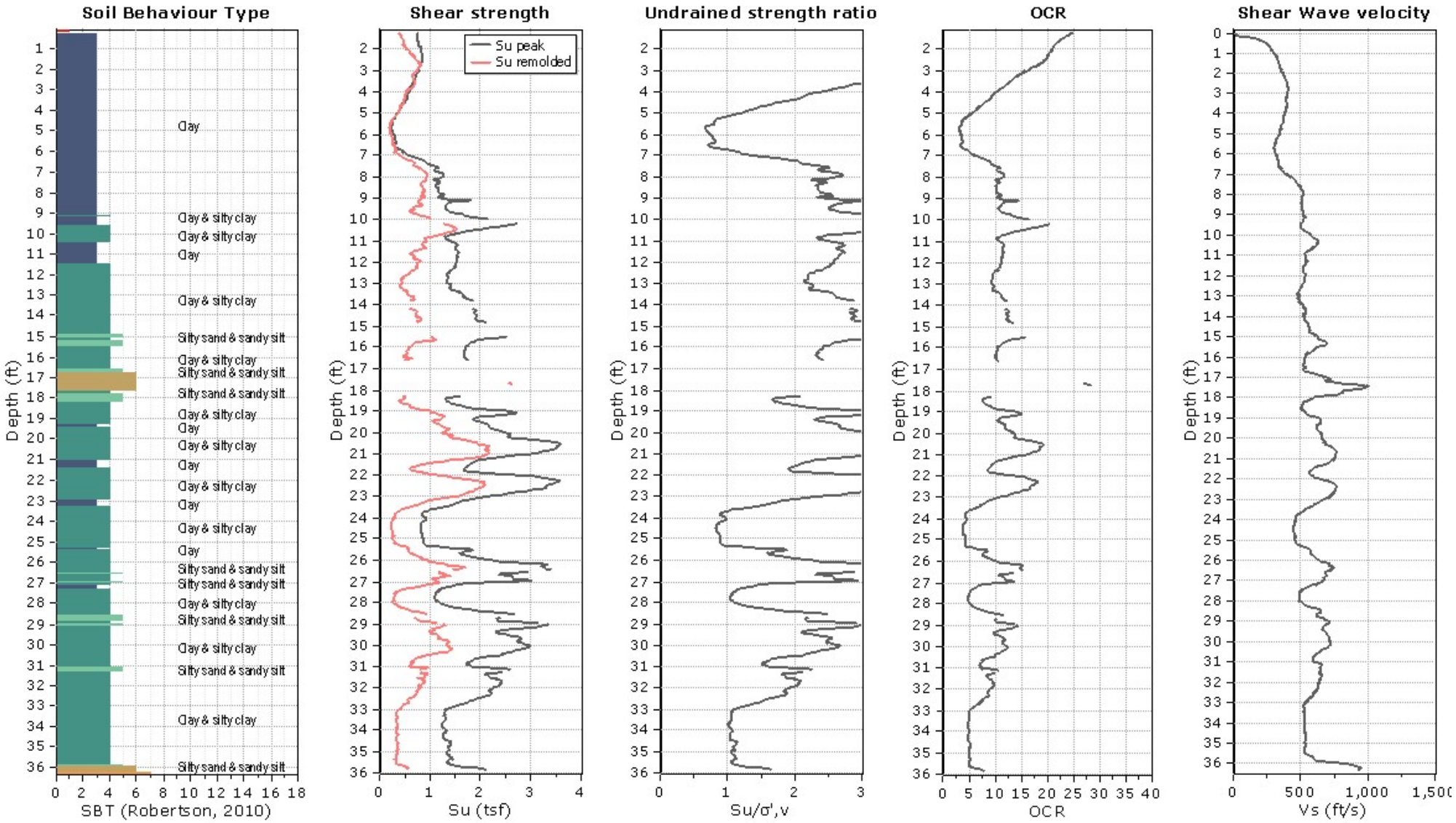
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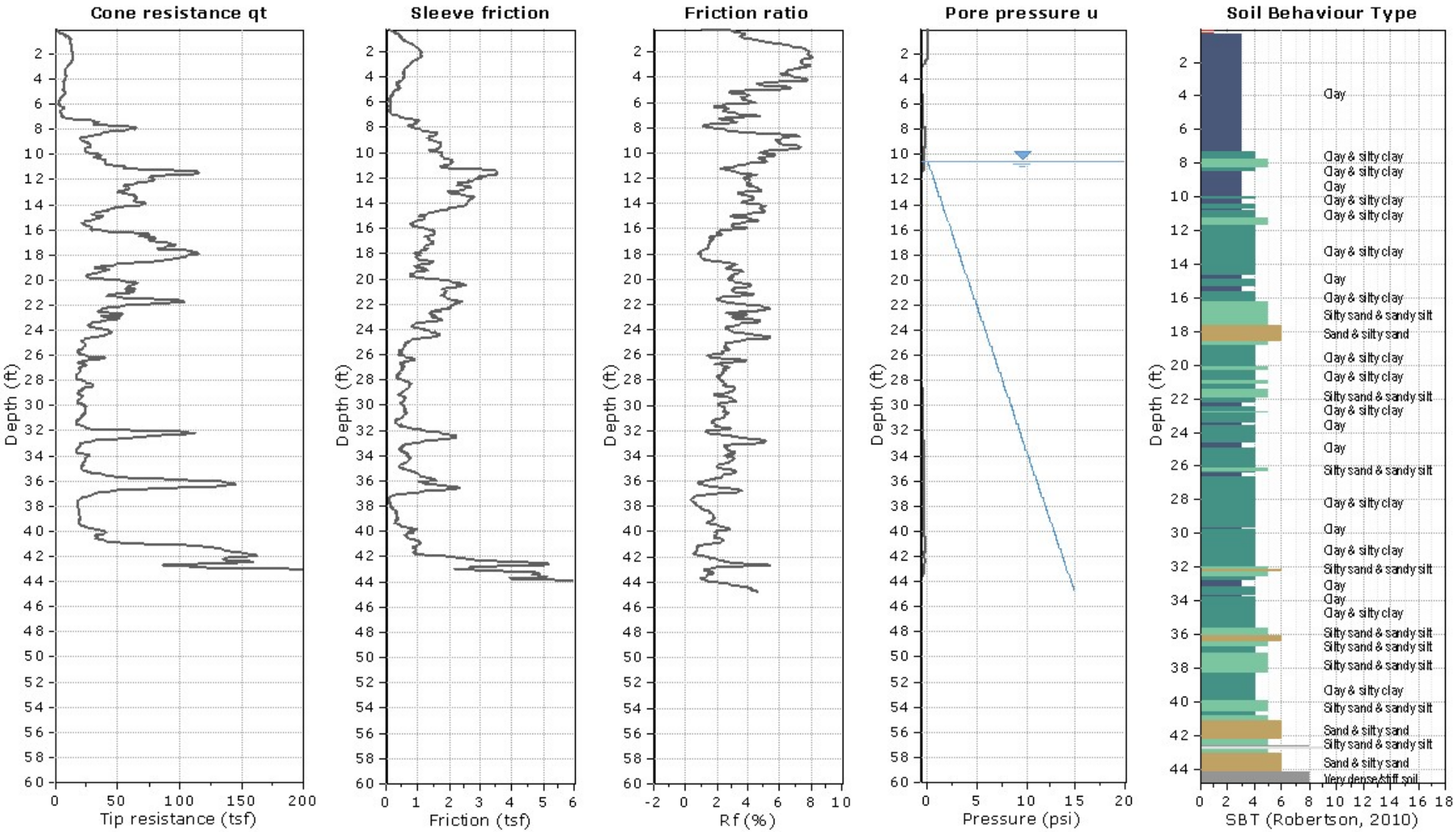
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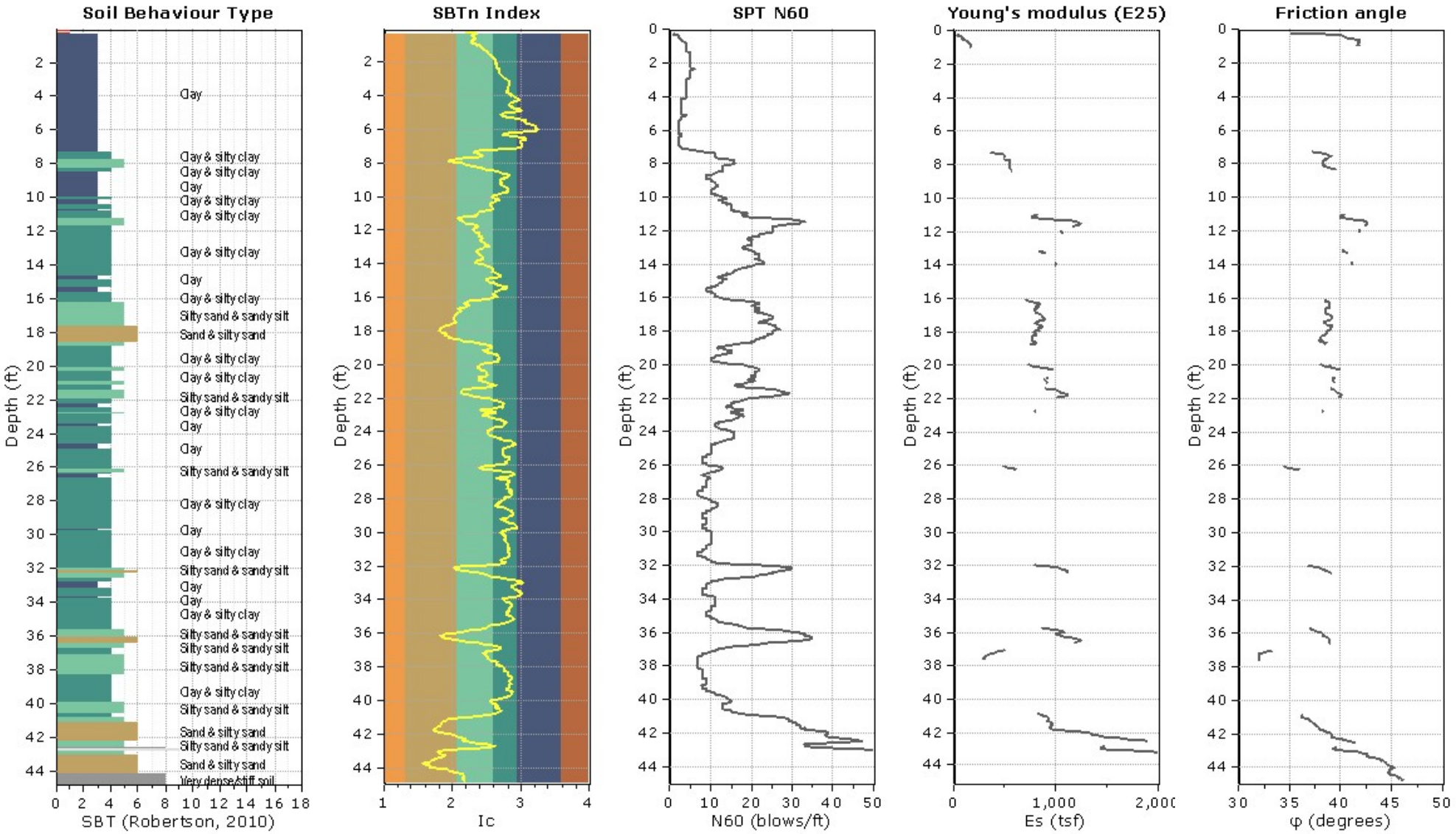
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Coords: lat 39.612989° lon -88.141627°
Cone Type: CPT
Cone Operator: Fugro



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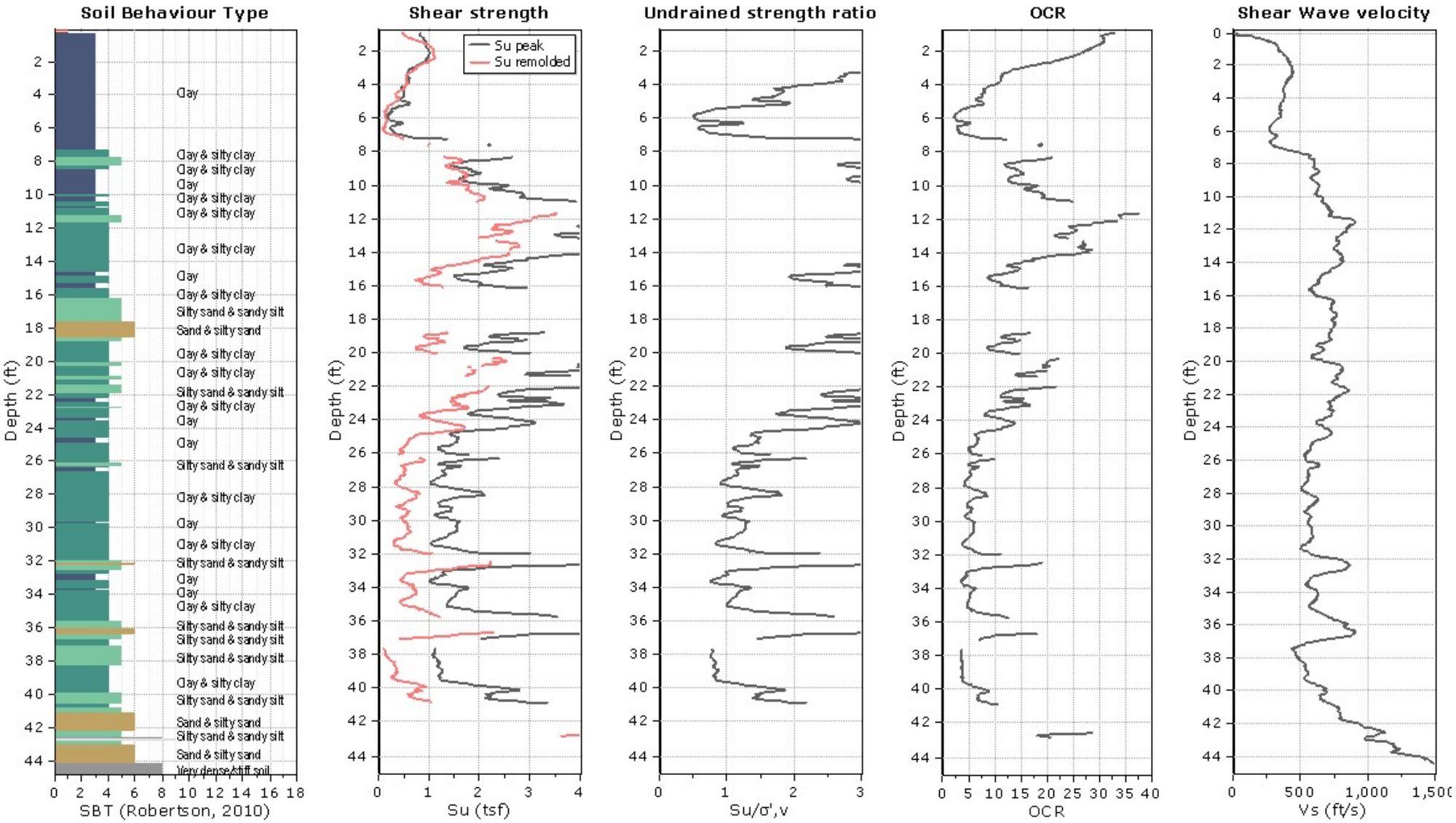
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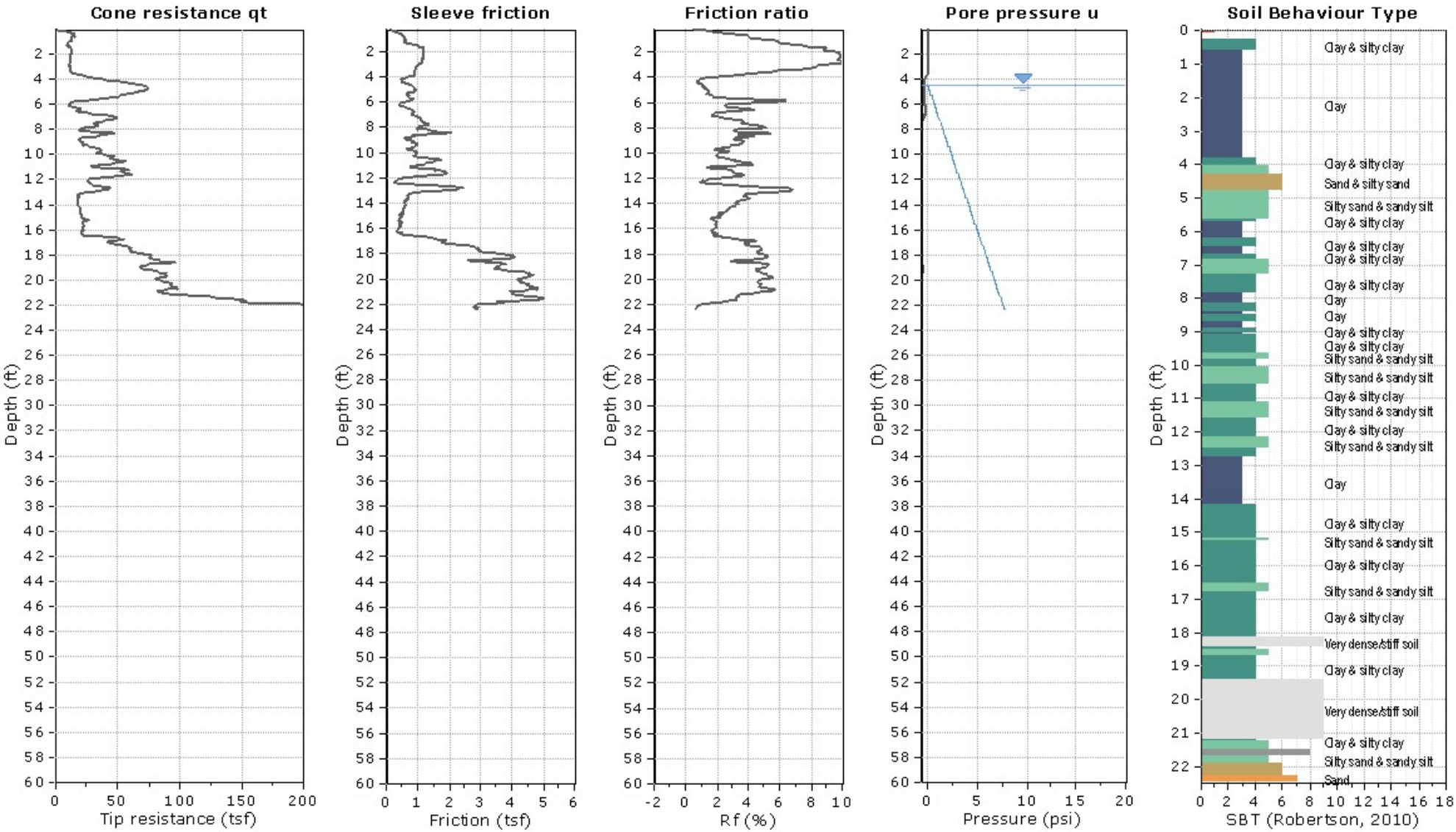
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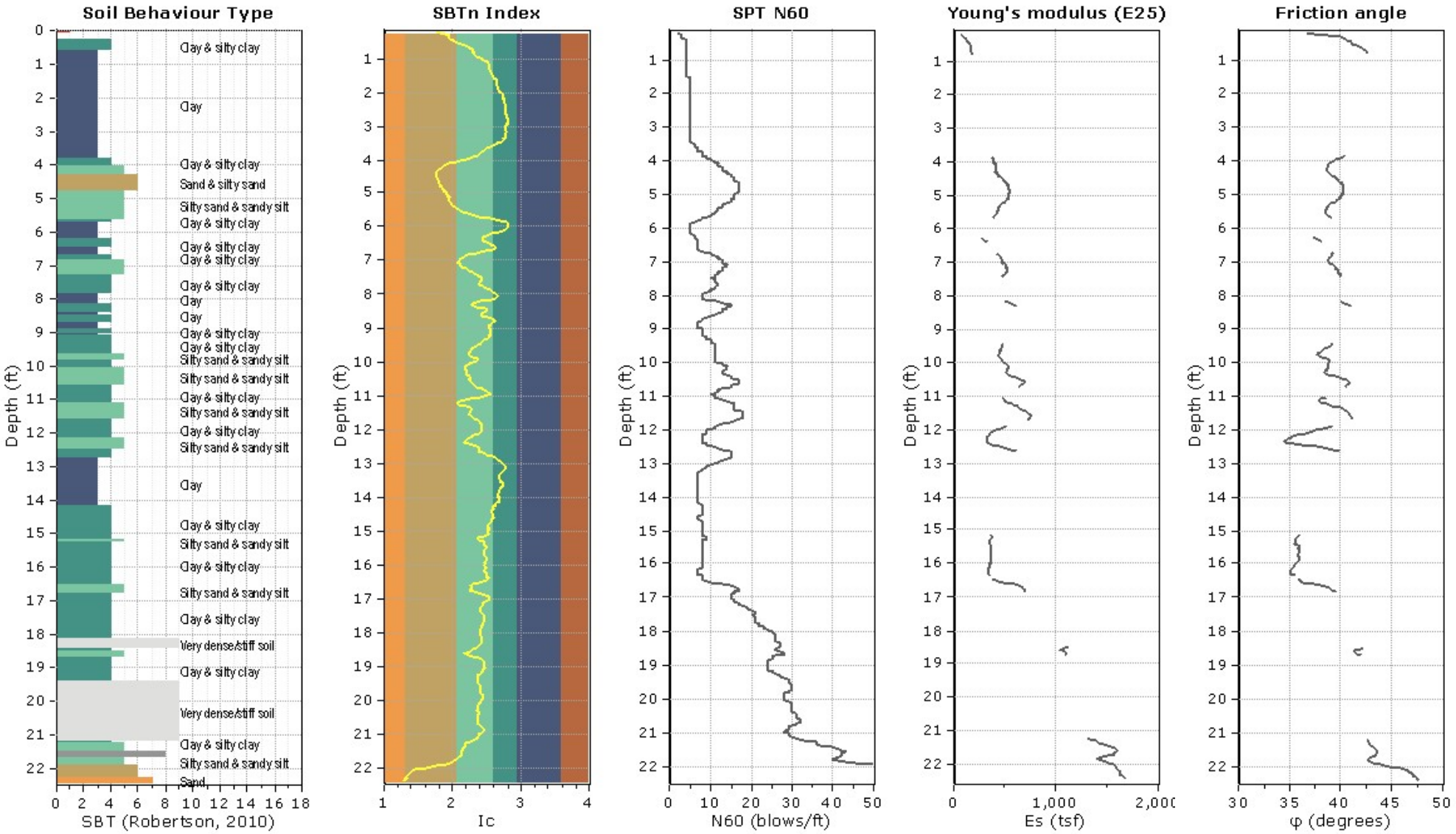
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Coords: lat 39.618923° lon -88.122631°
Cone Type: CPT
Cone Operator: FUGRO



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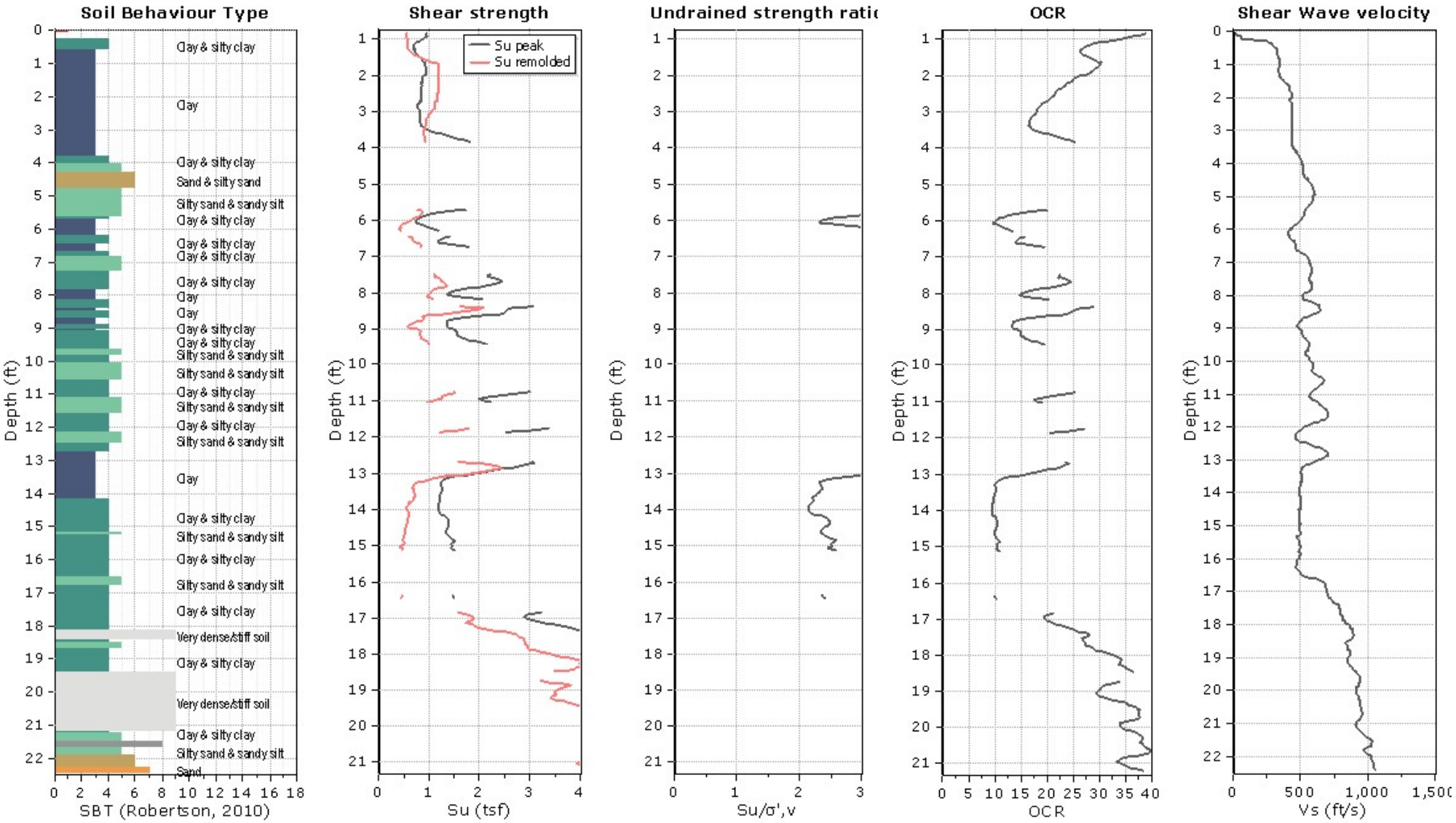
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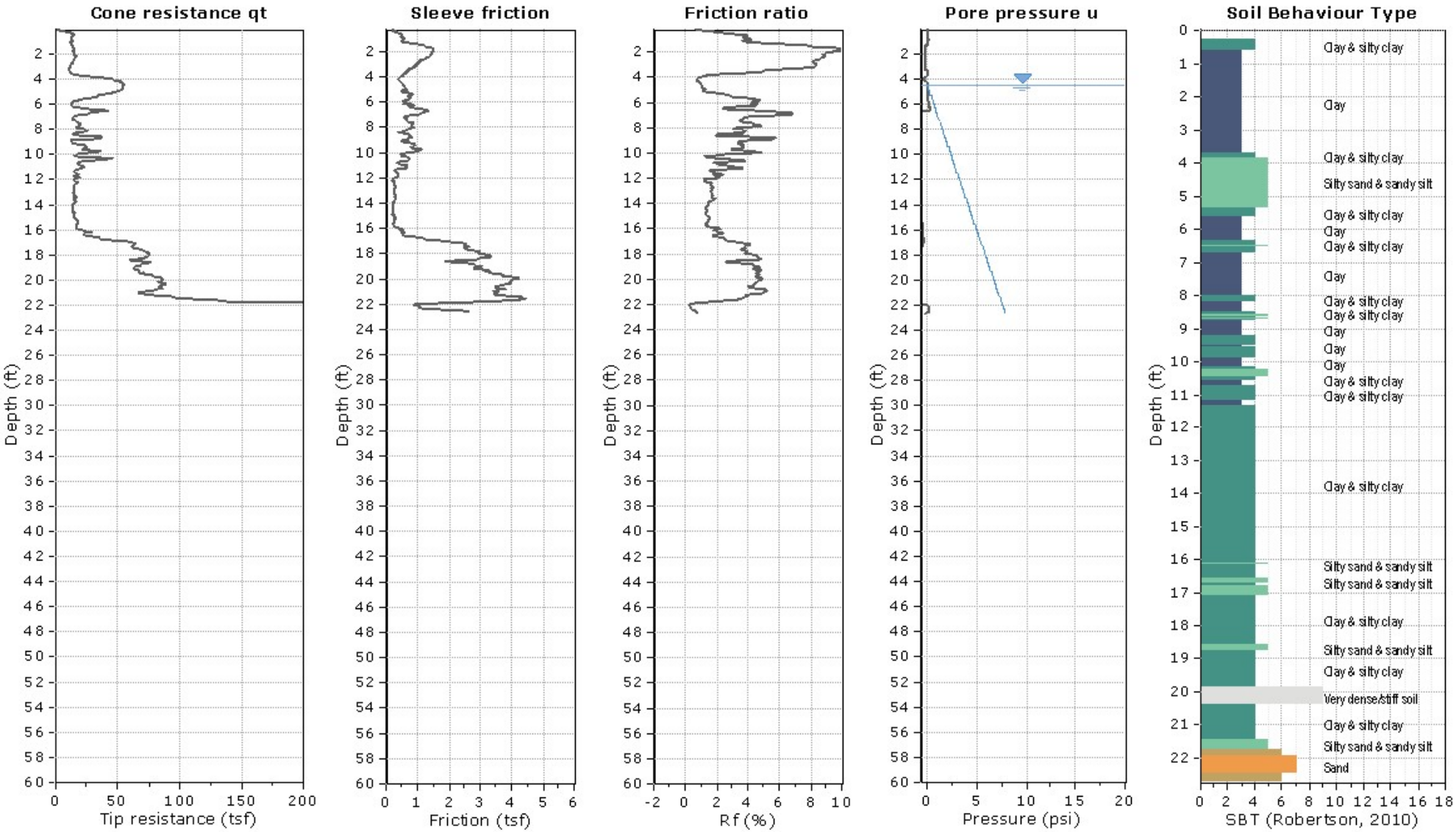
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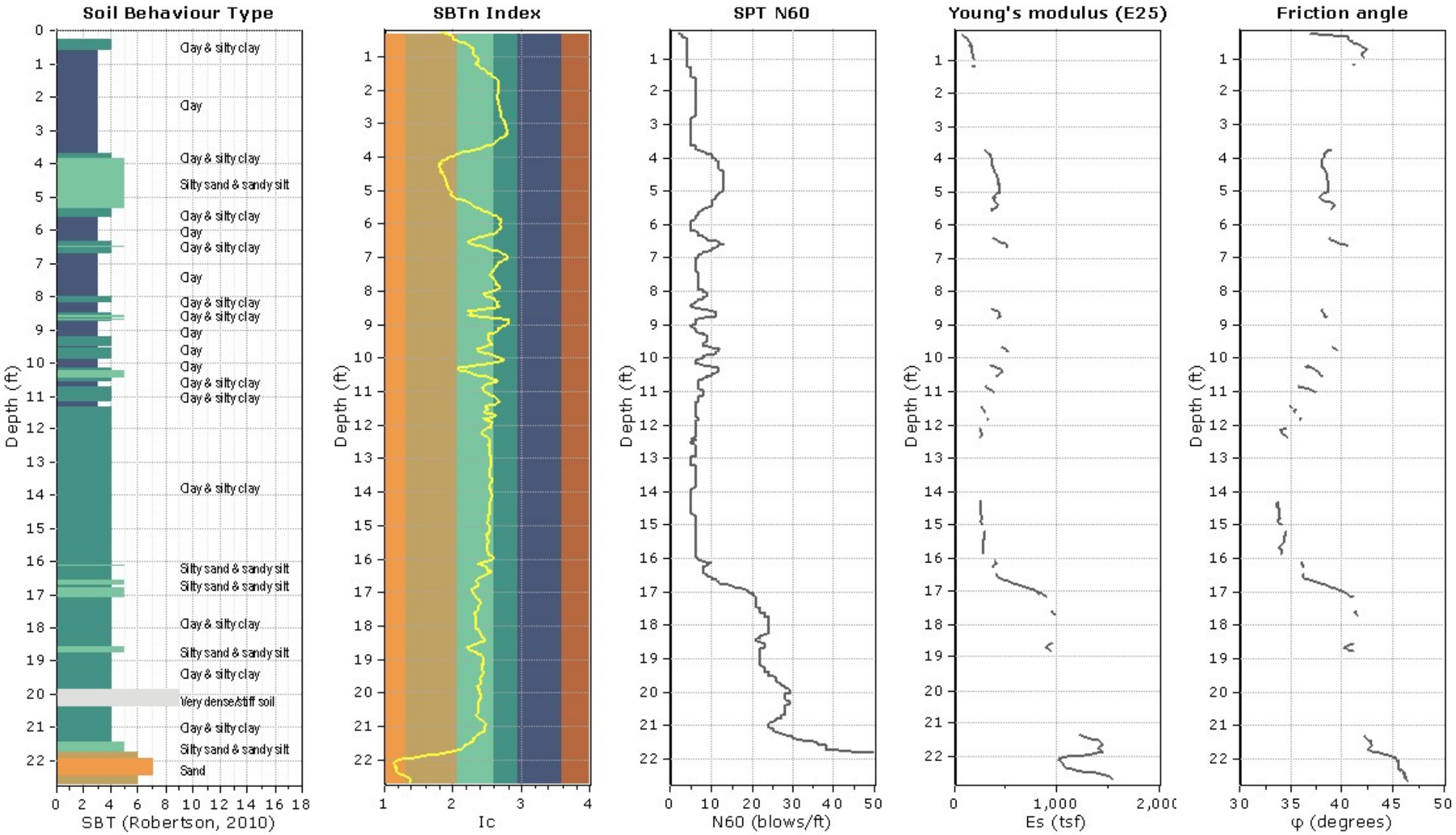
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Coords: lat 39.618923° lon -88.122631°
Cone Type: CPT
Cone Operator: FUGRO



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Project: **Coles Wind**
Location: **Coles County, Illinois**

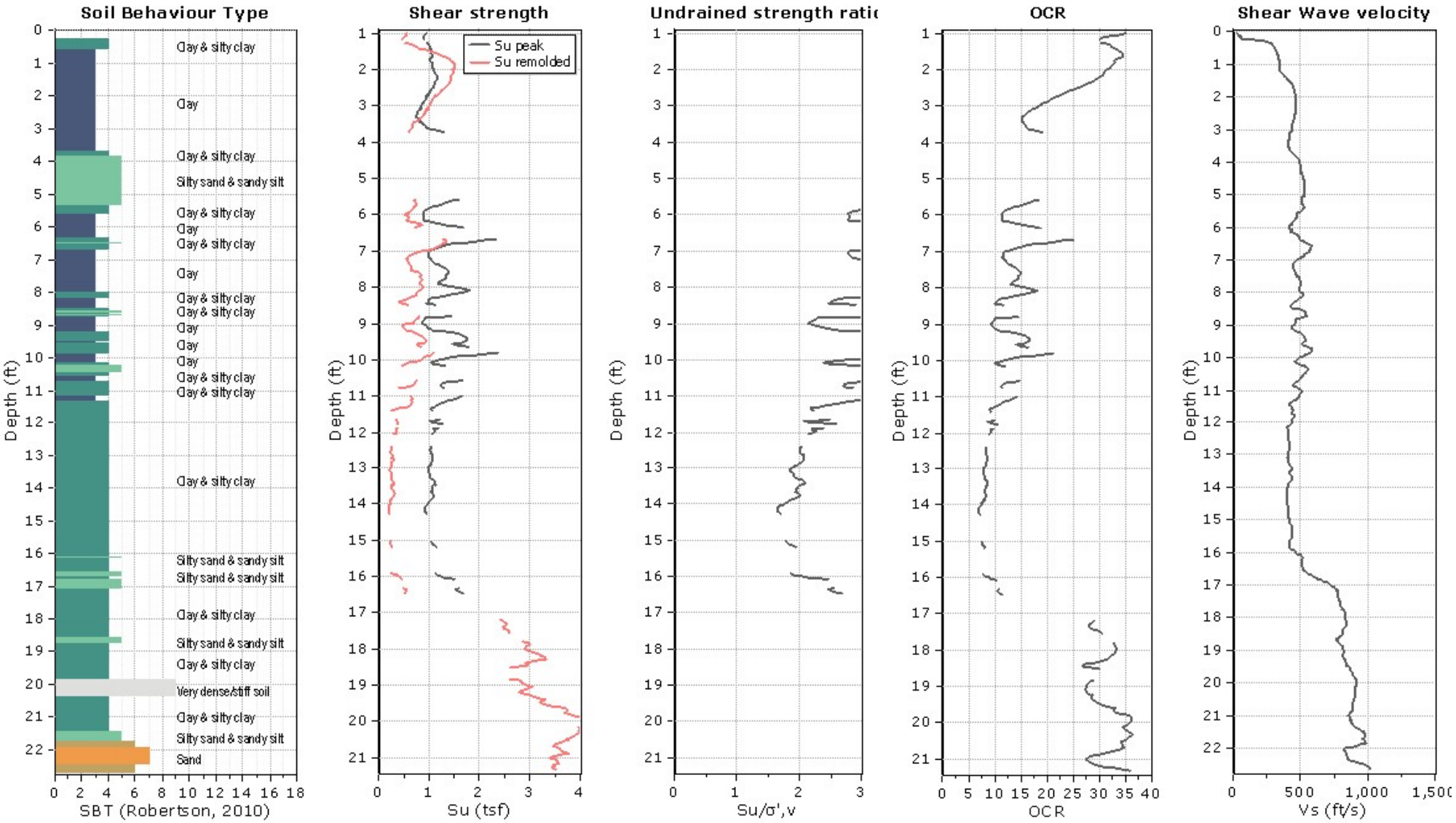
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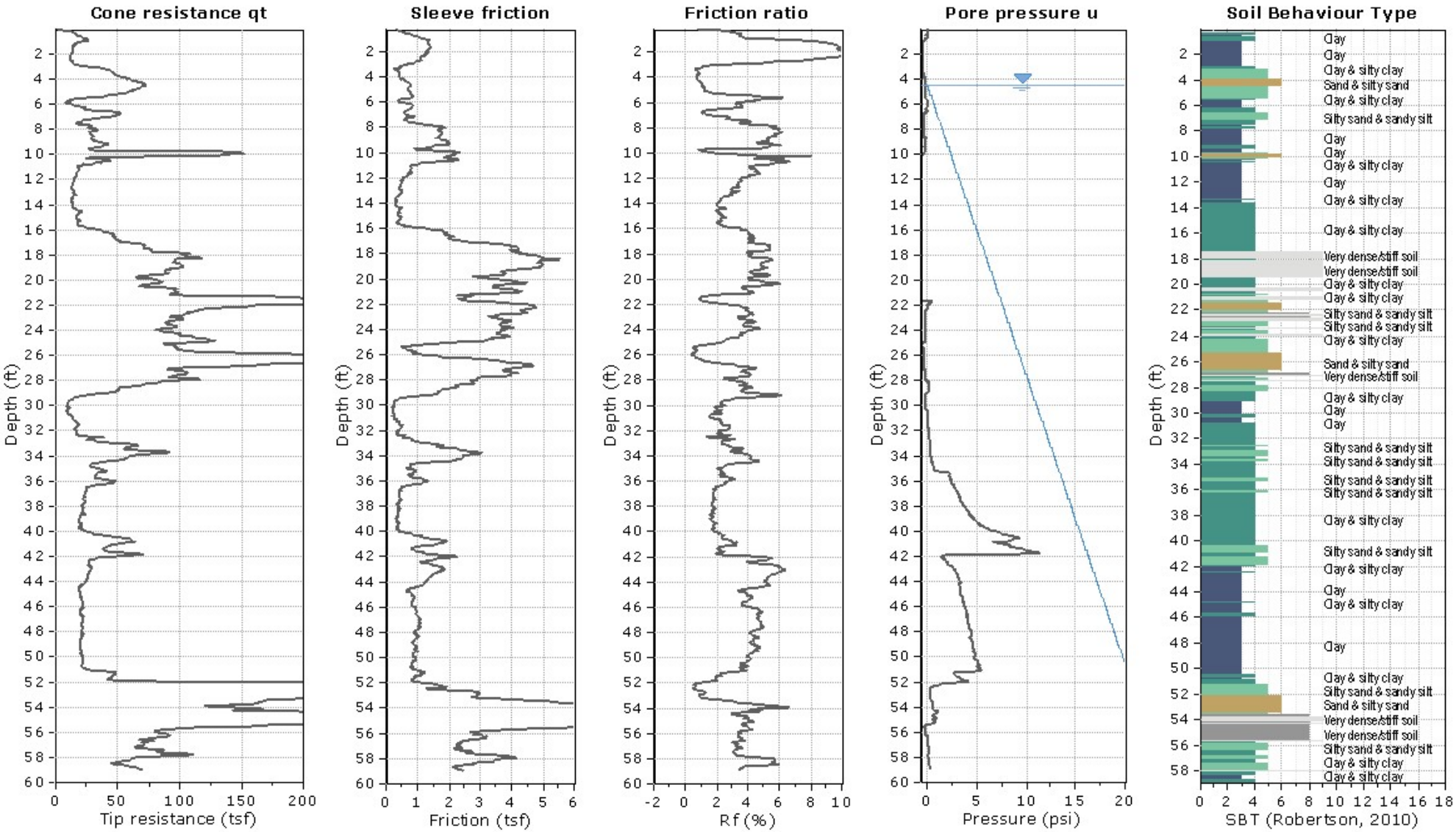
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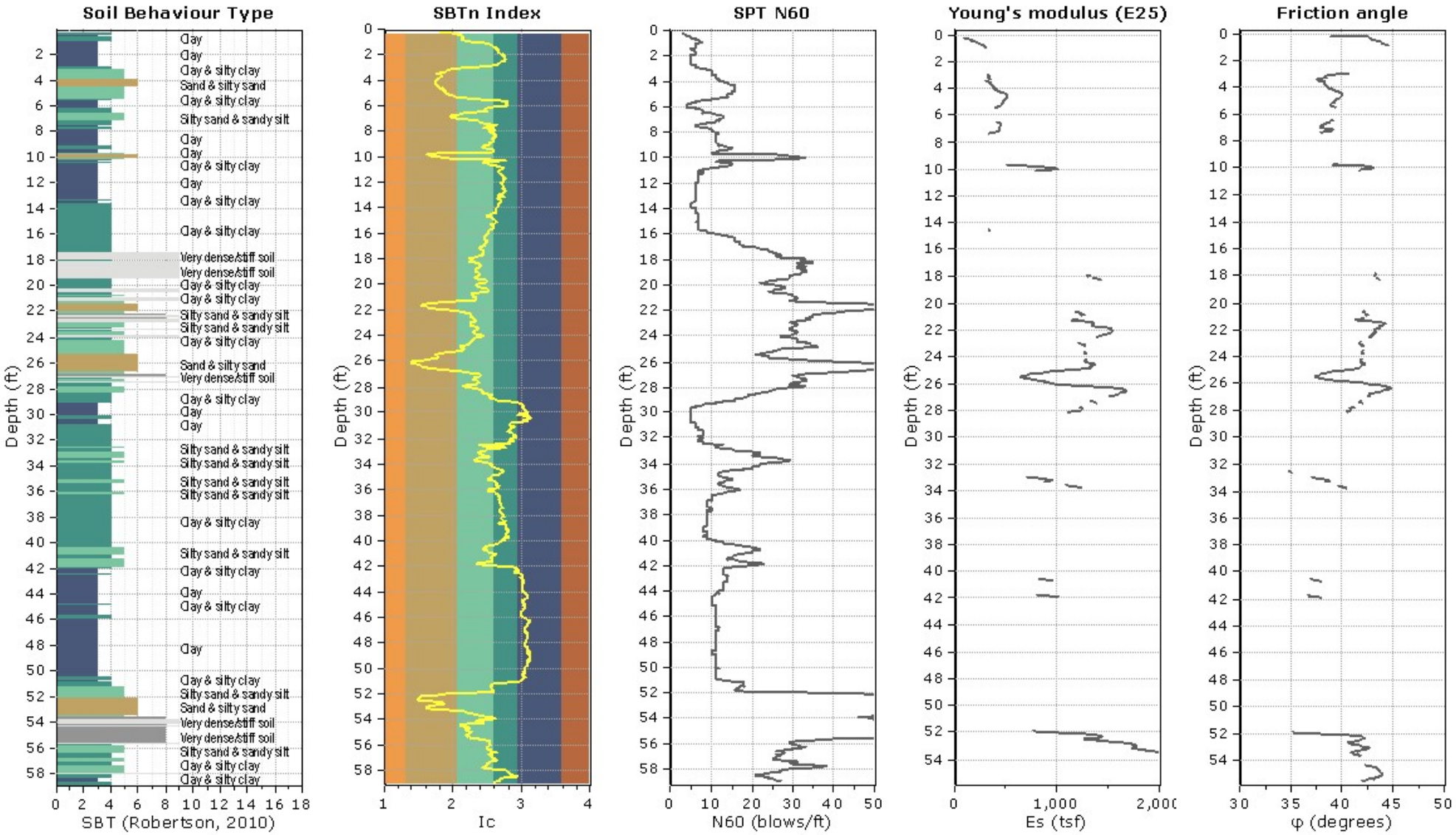
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Coords: lat 39.618923° lon -88.122631°
Cone Type: CPT
Cone Operator: FUGRO



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CPT: GEO-06B
Total depth: 58.92 ft, Date: 4/18/2025
Coords: lat 39.618923° lon -88.122631°
Cone Type: CPT
Cone Operator: FUGRO

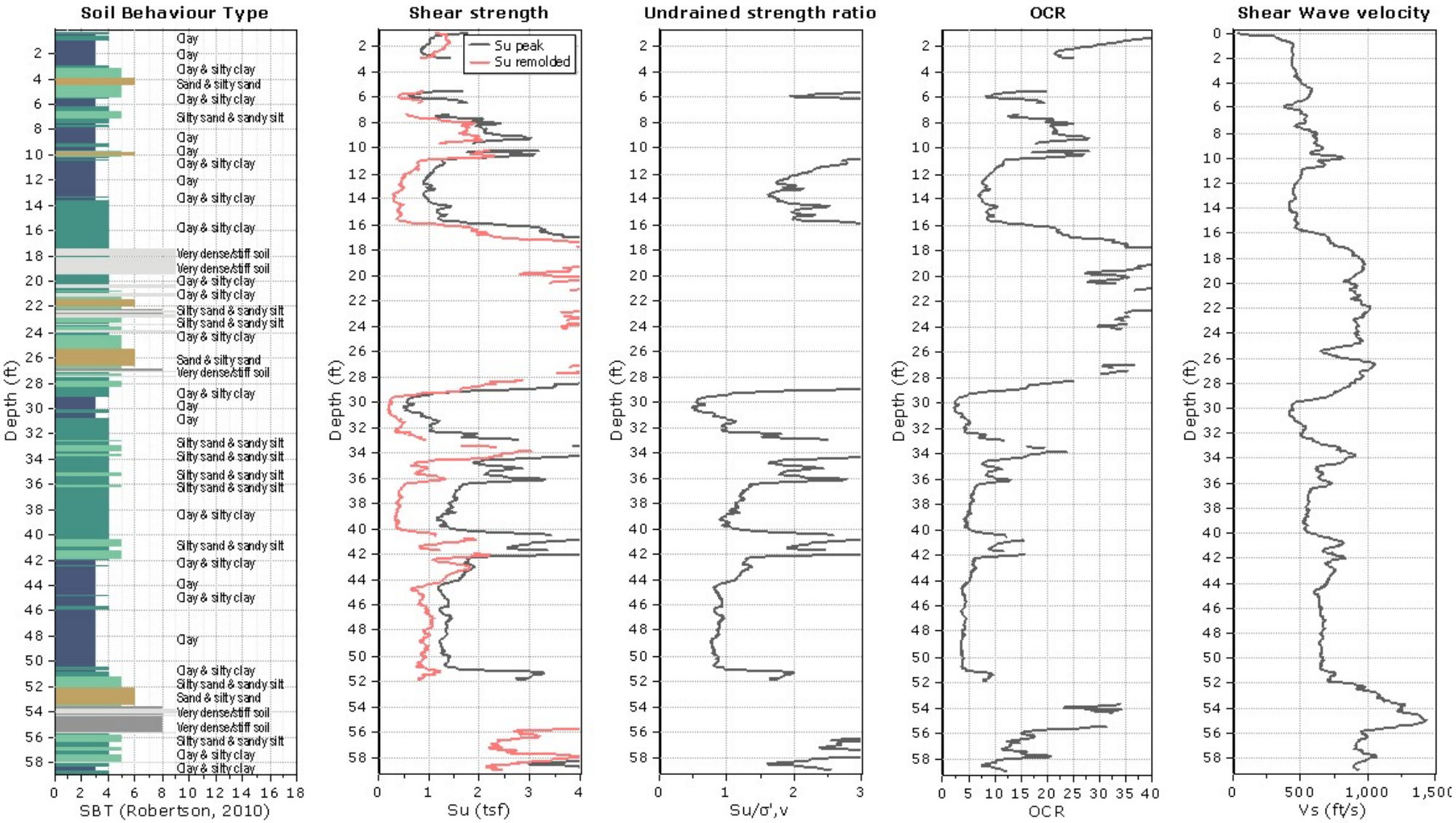
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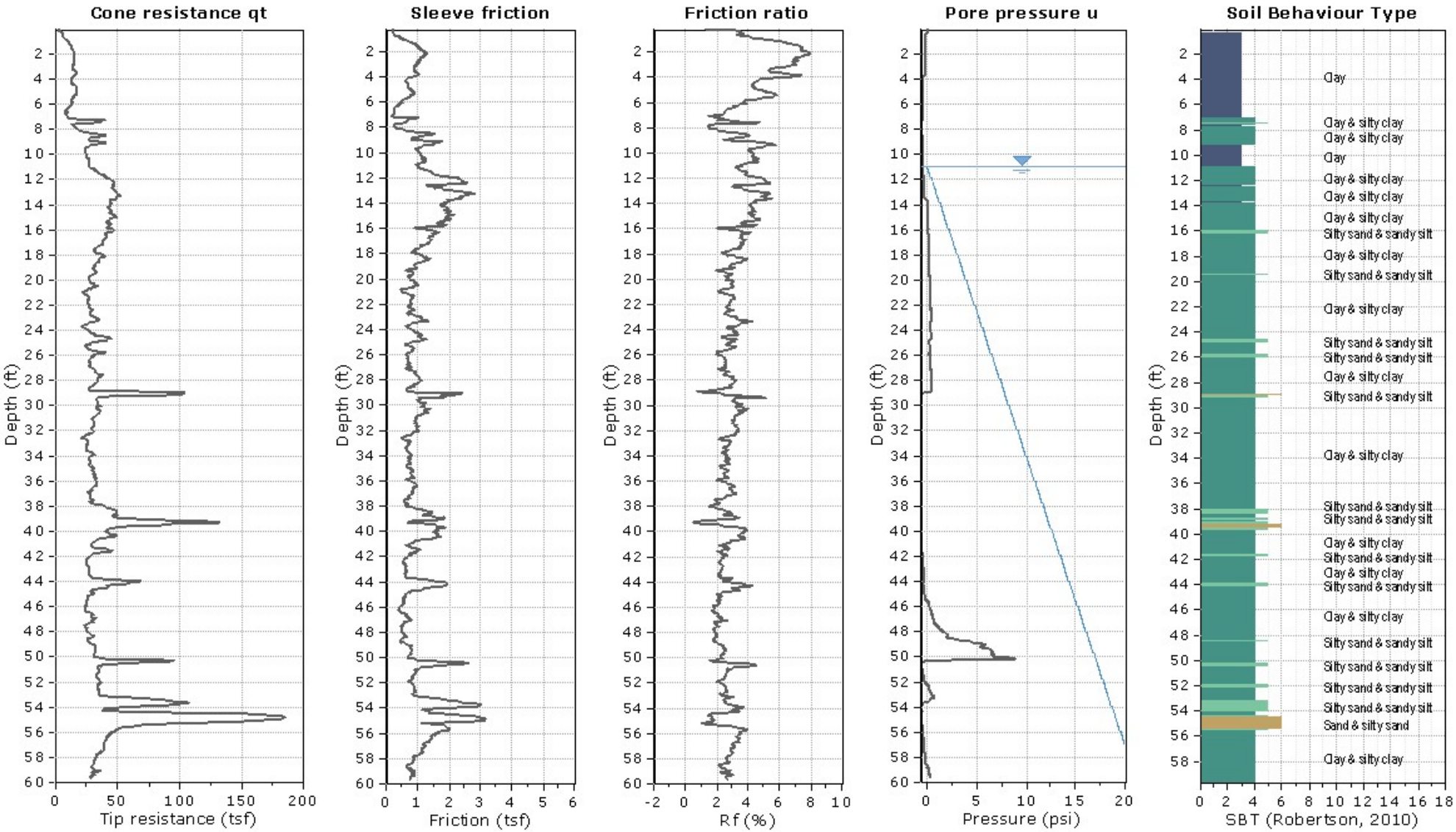
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Cone Type: CPT
Cone Operator: FUGRO



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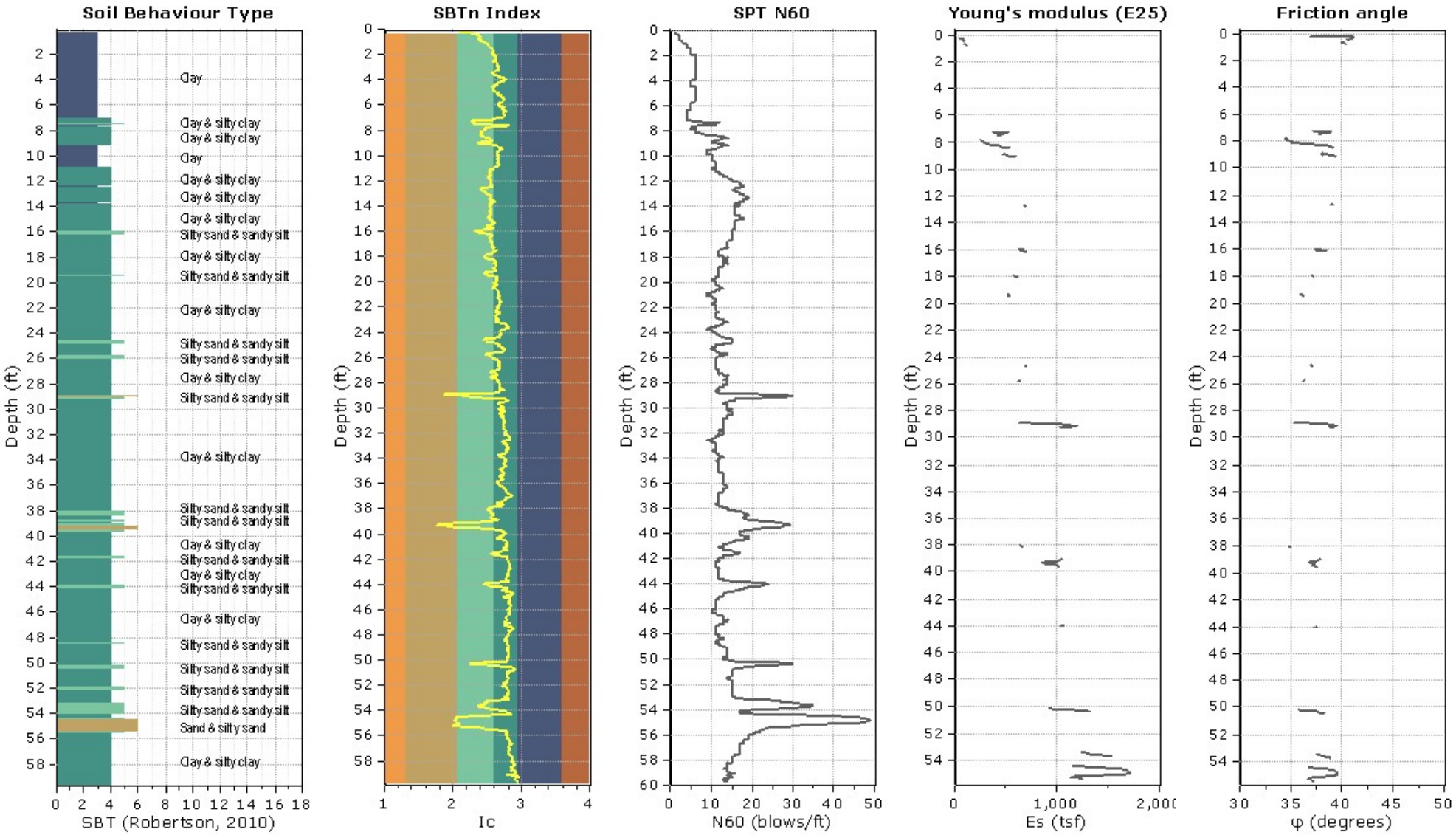
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Coords: lat 39.641706° lon -88.161275°
Cone Type: CPT
Cone Operator: FUGRO



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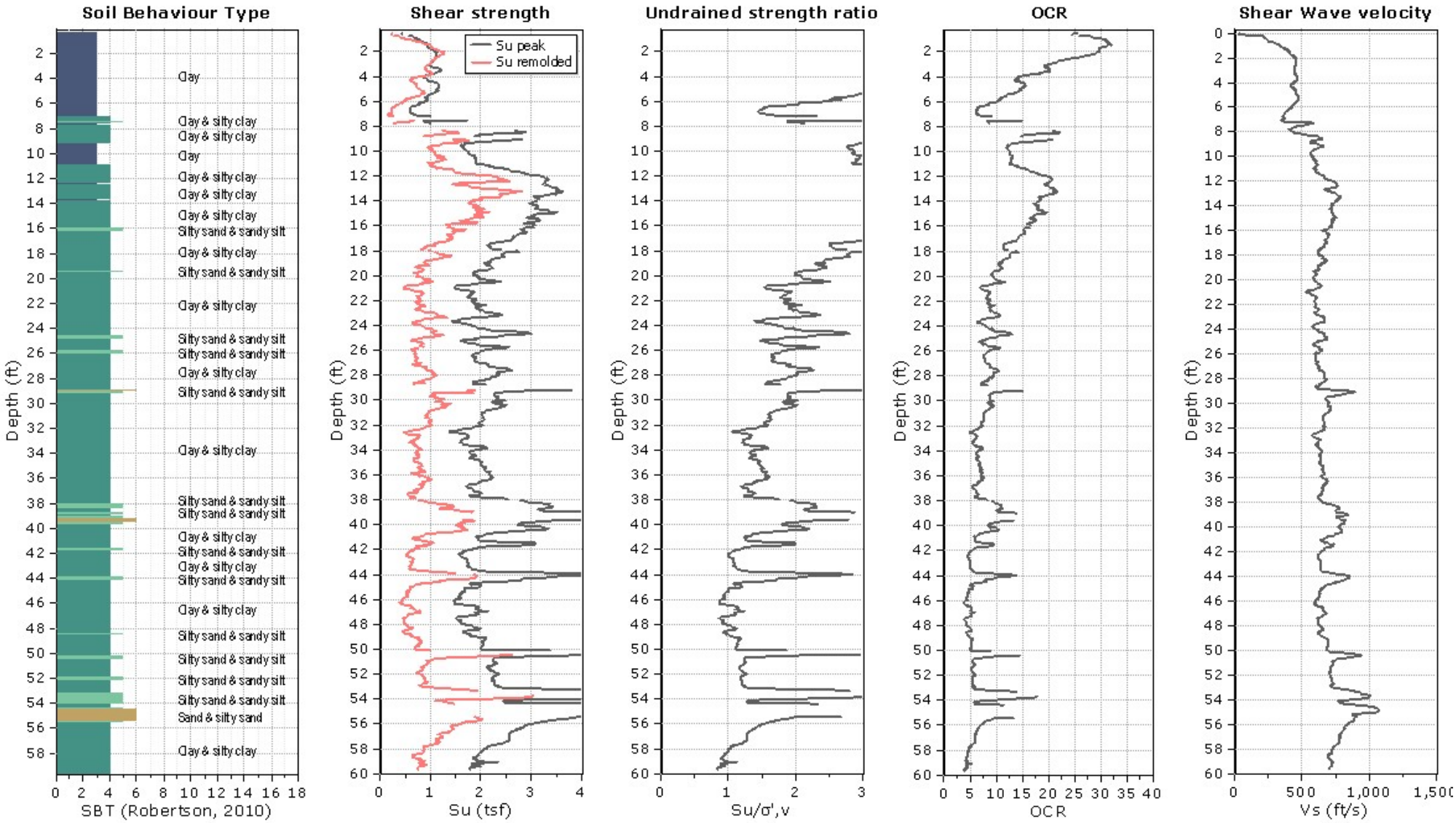
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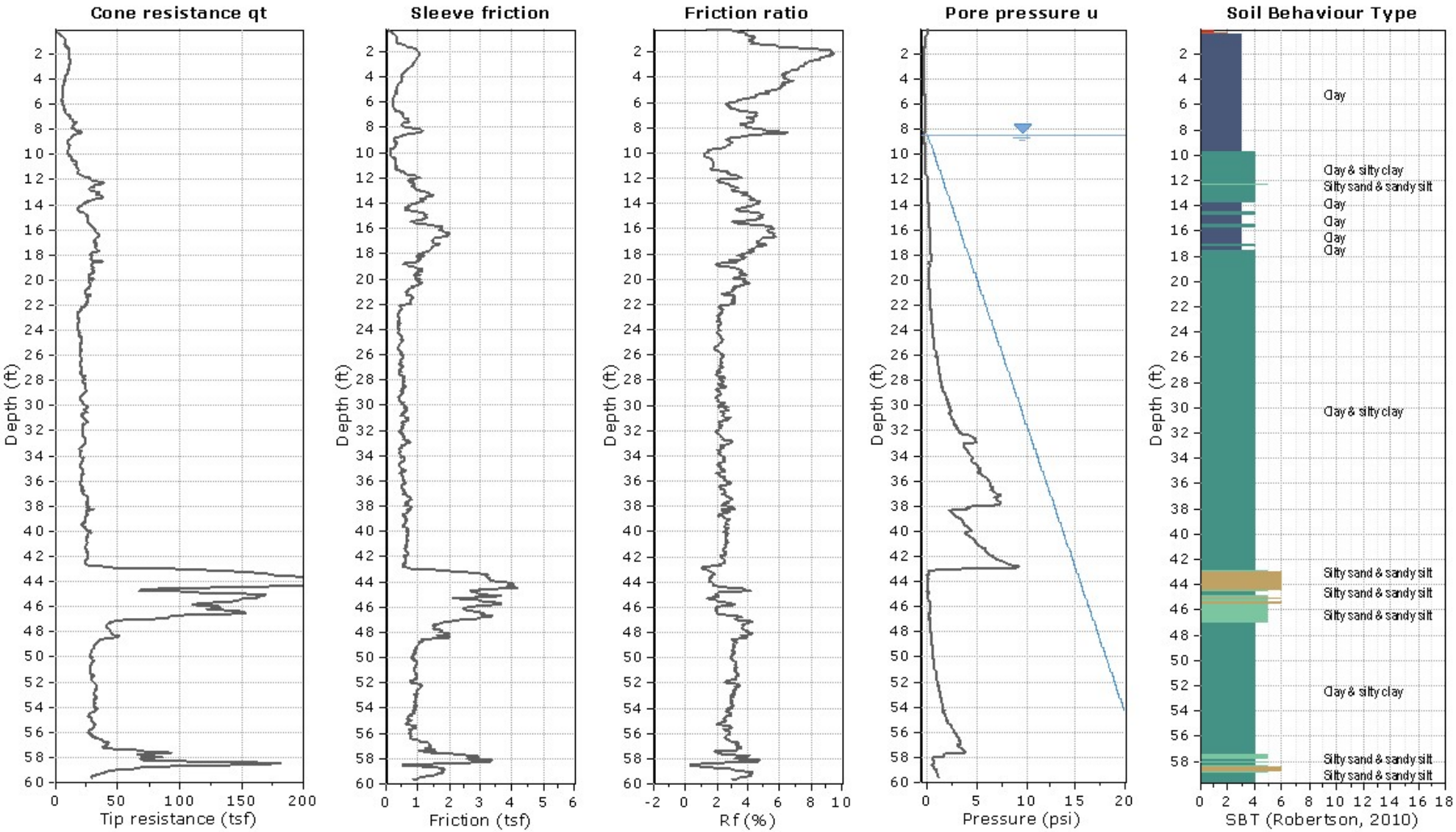
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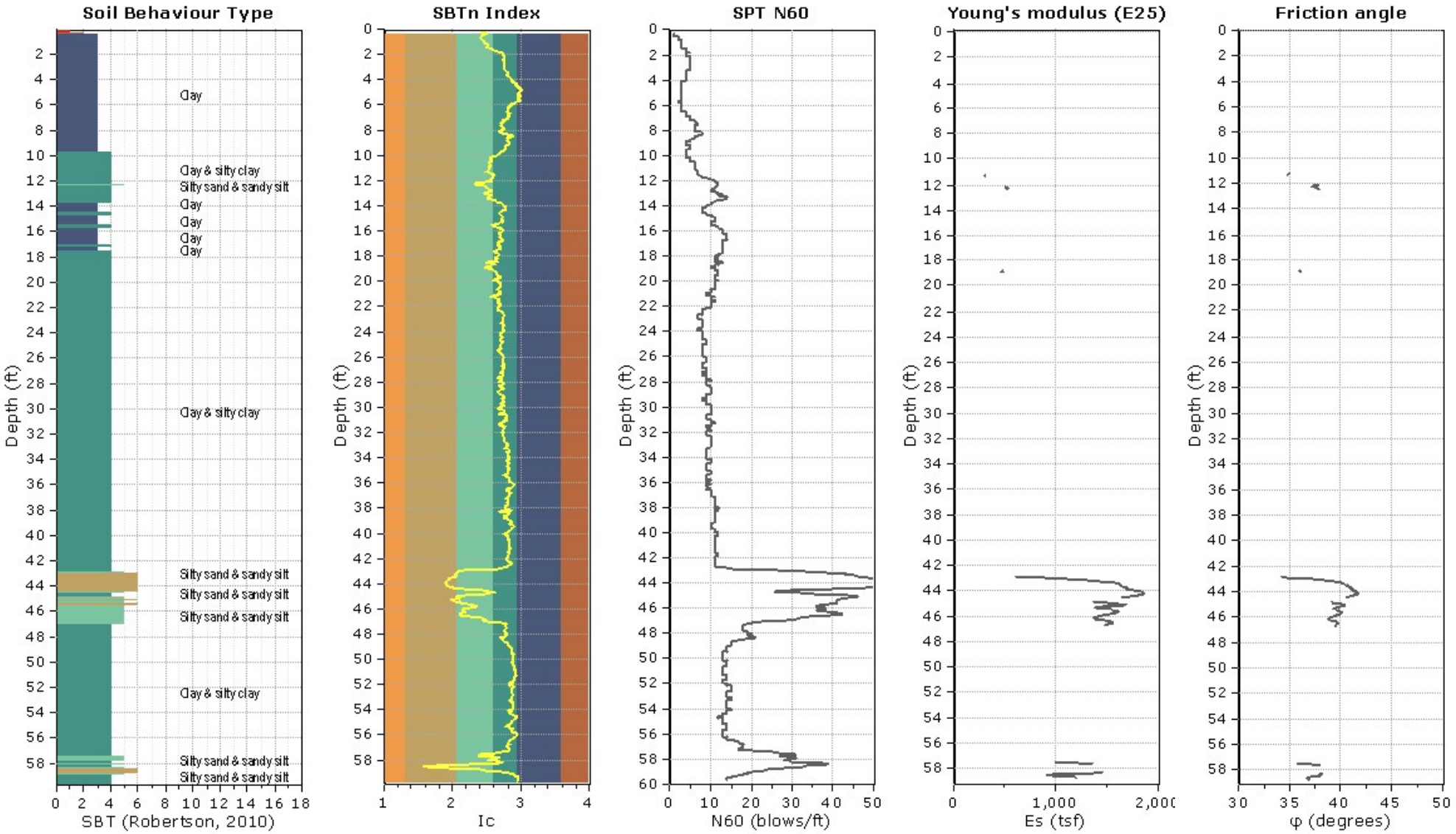
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Coords: lat 39.647149° lon -88.154455°
Cone Type: CPT
Cone Operator: FUGRO



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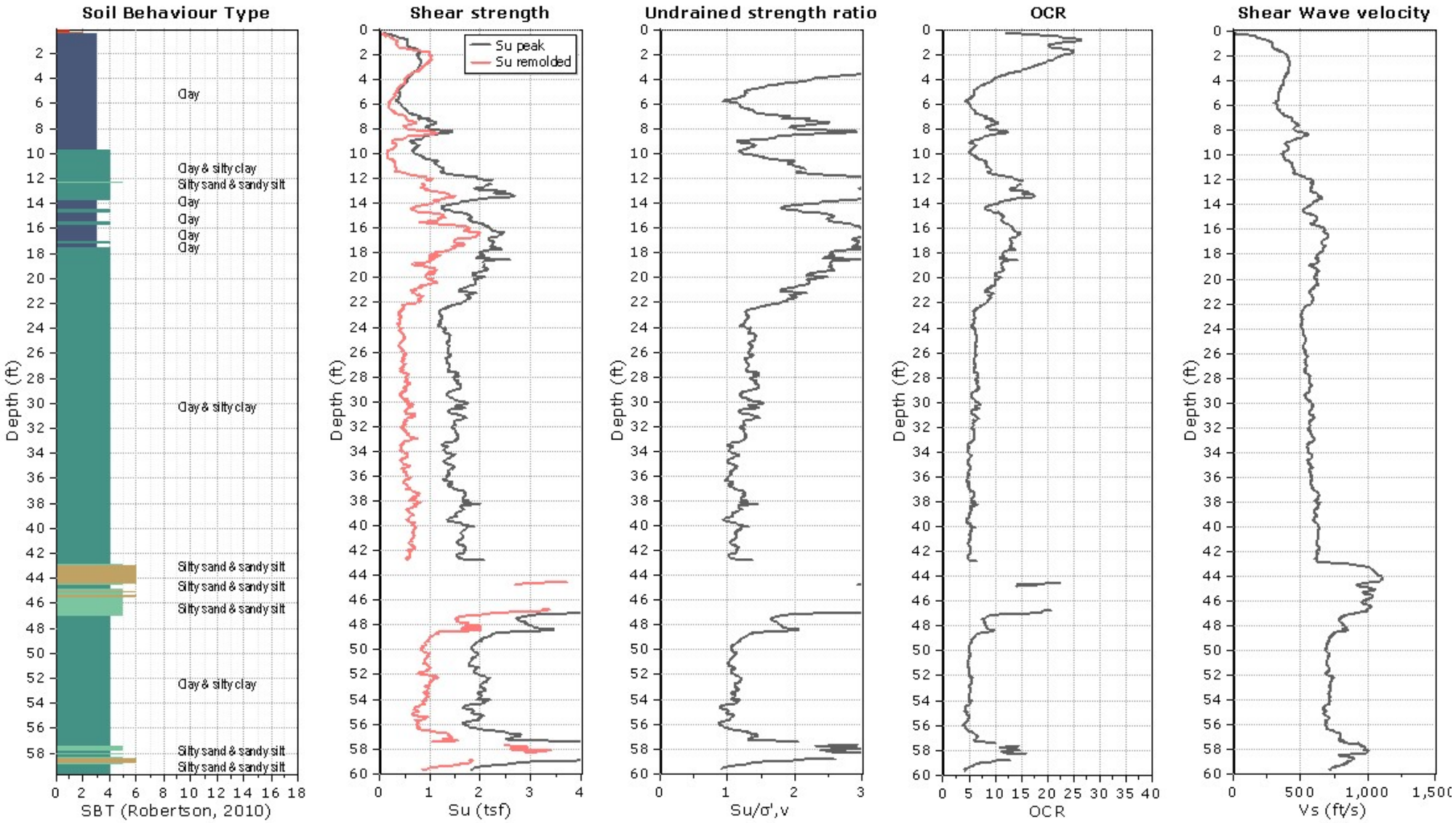
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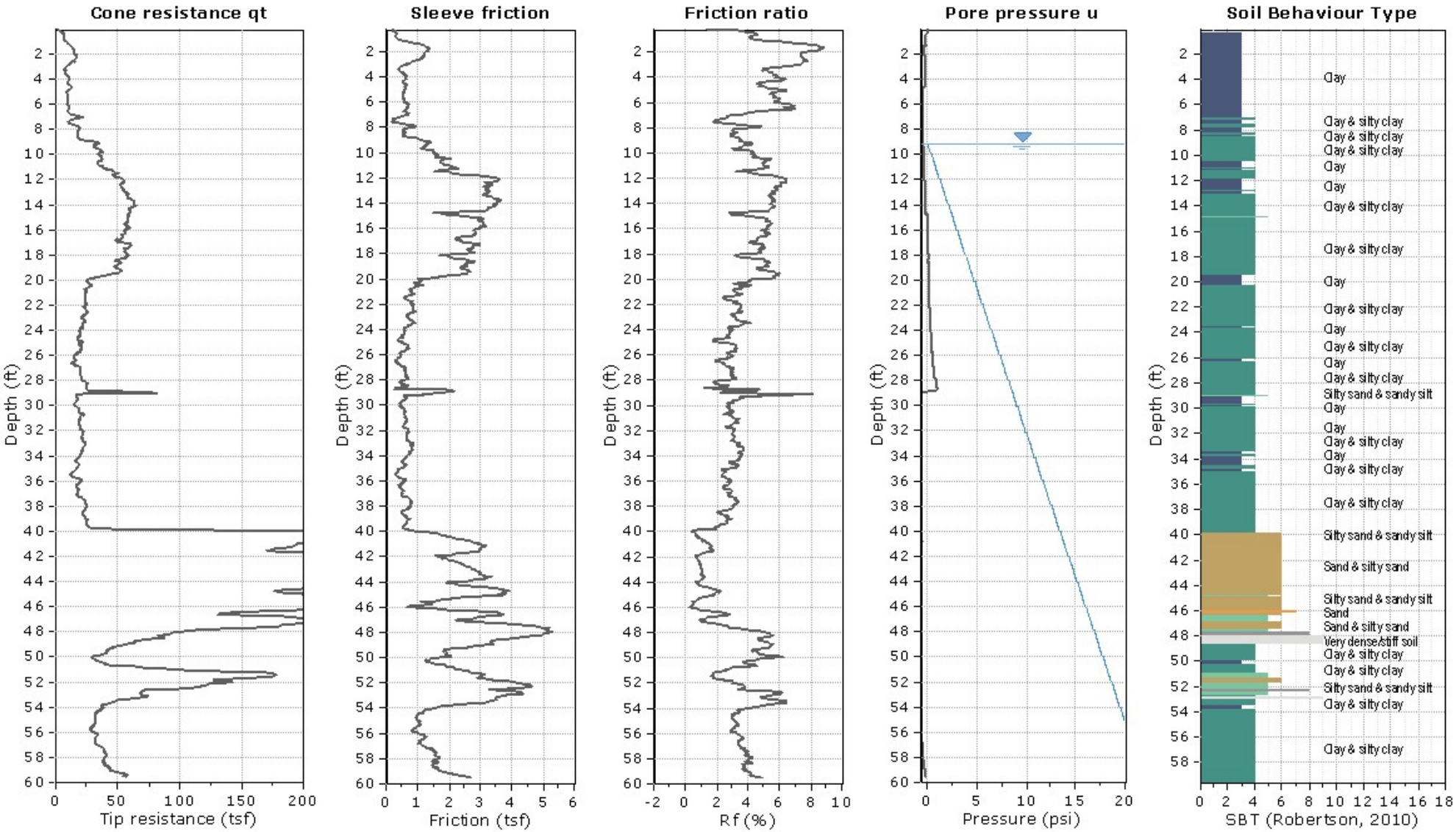
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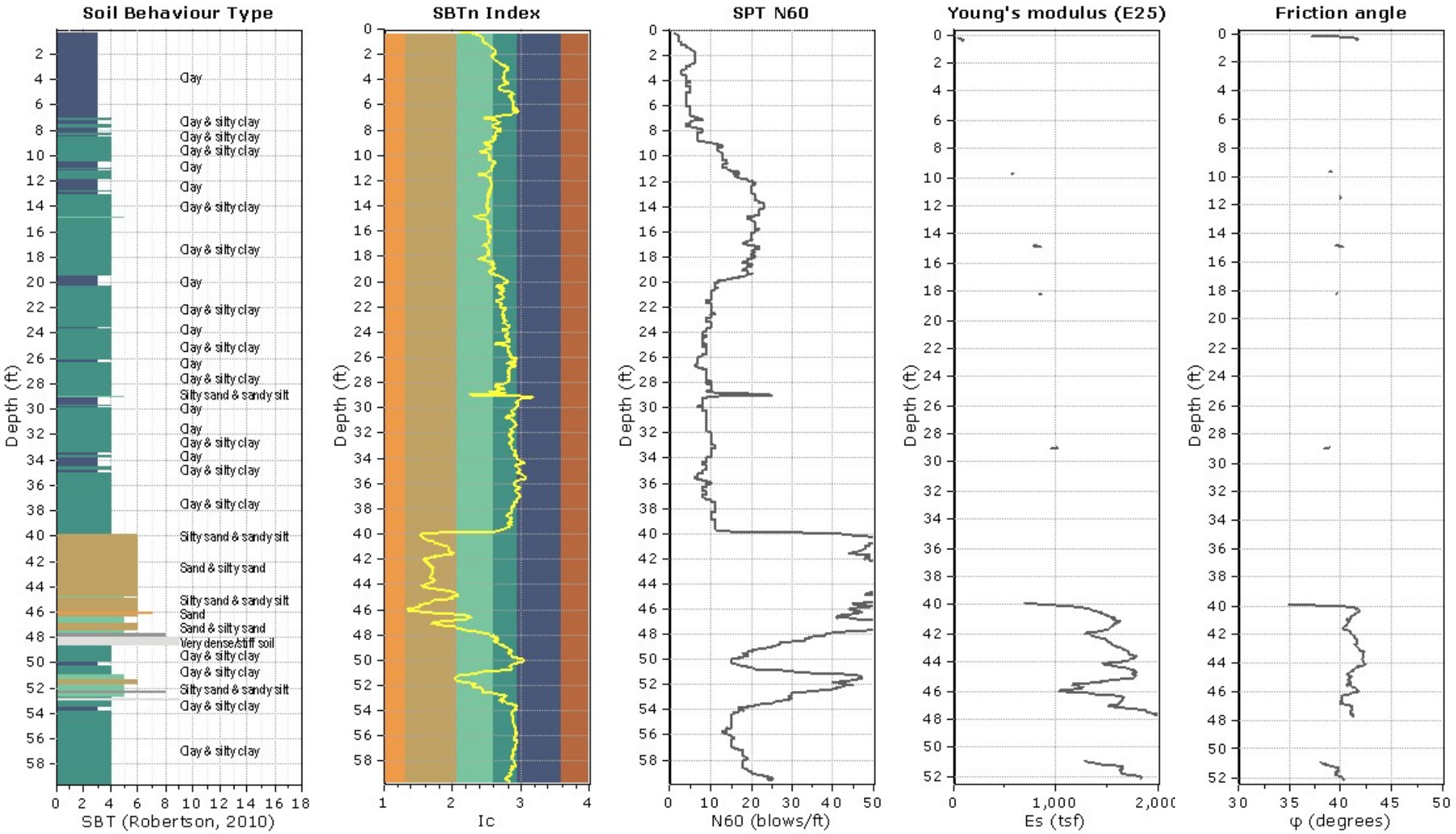
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Coords: lat 39.648528° lon -88.173981°
Cone Type: CPT
Cone Operator: FUGRO



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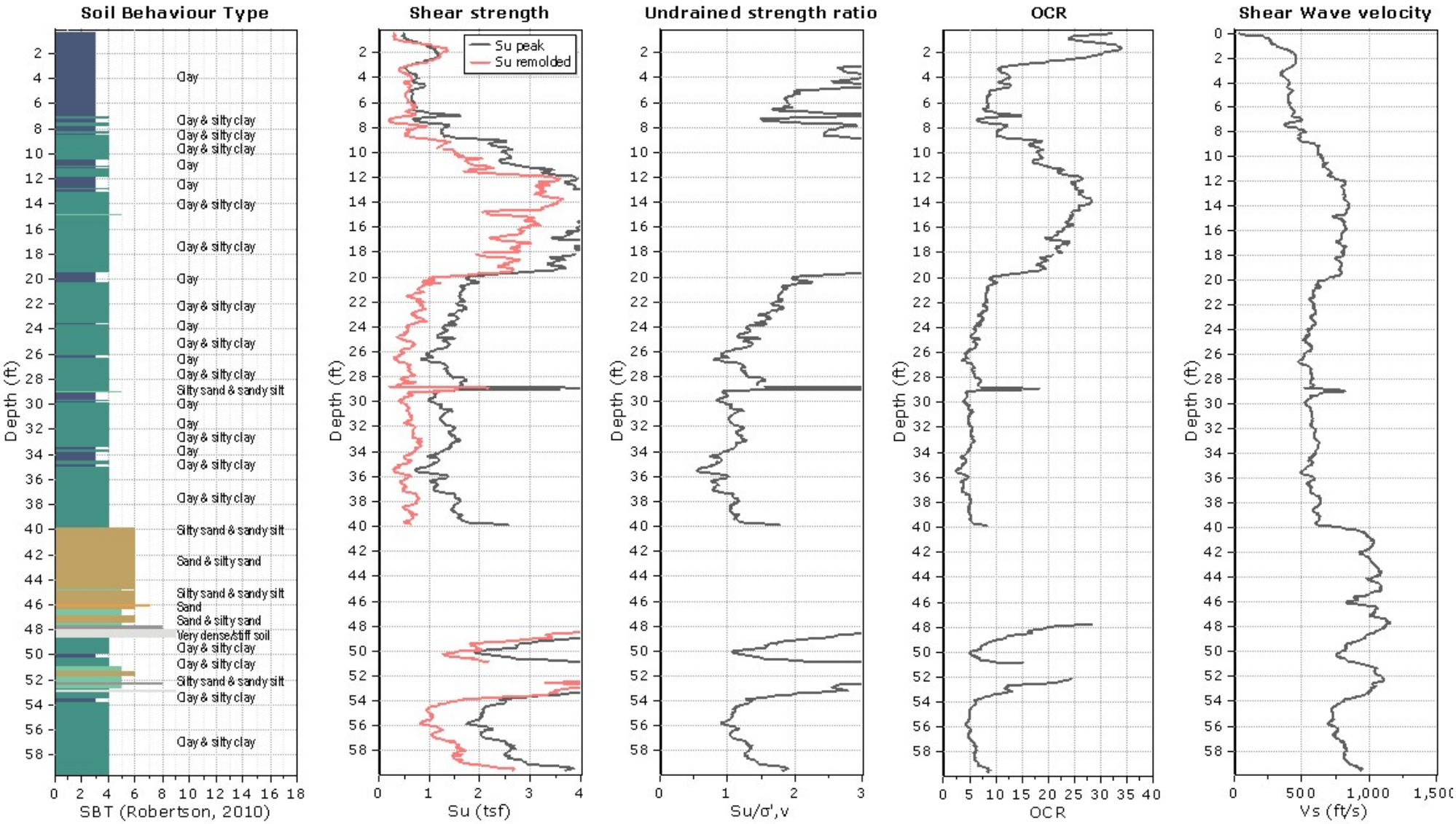
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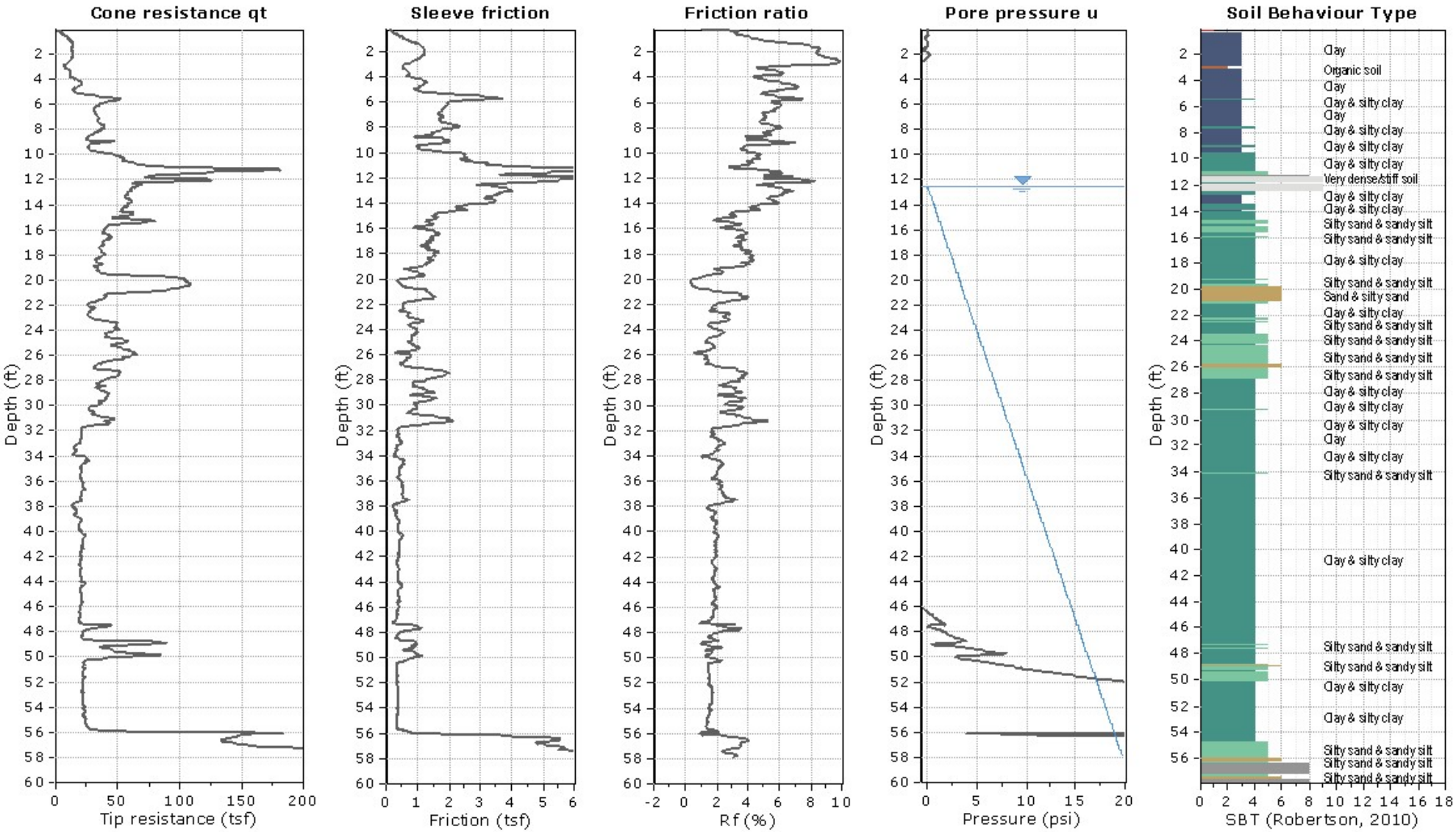
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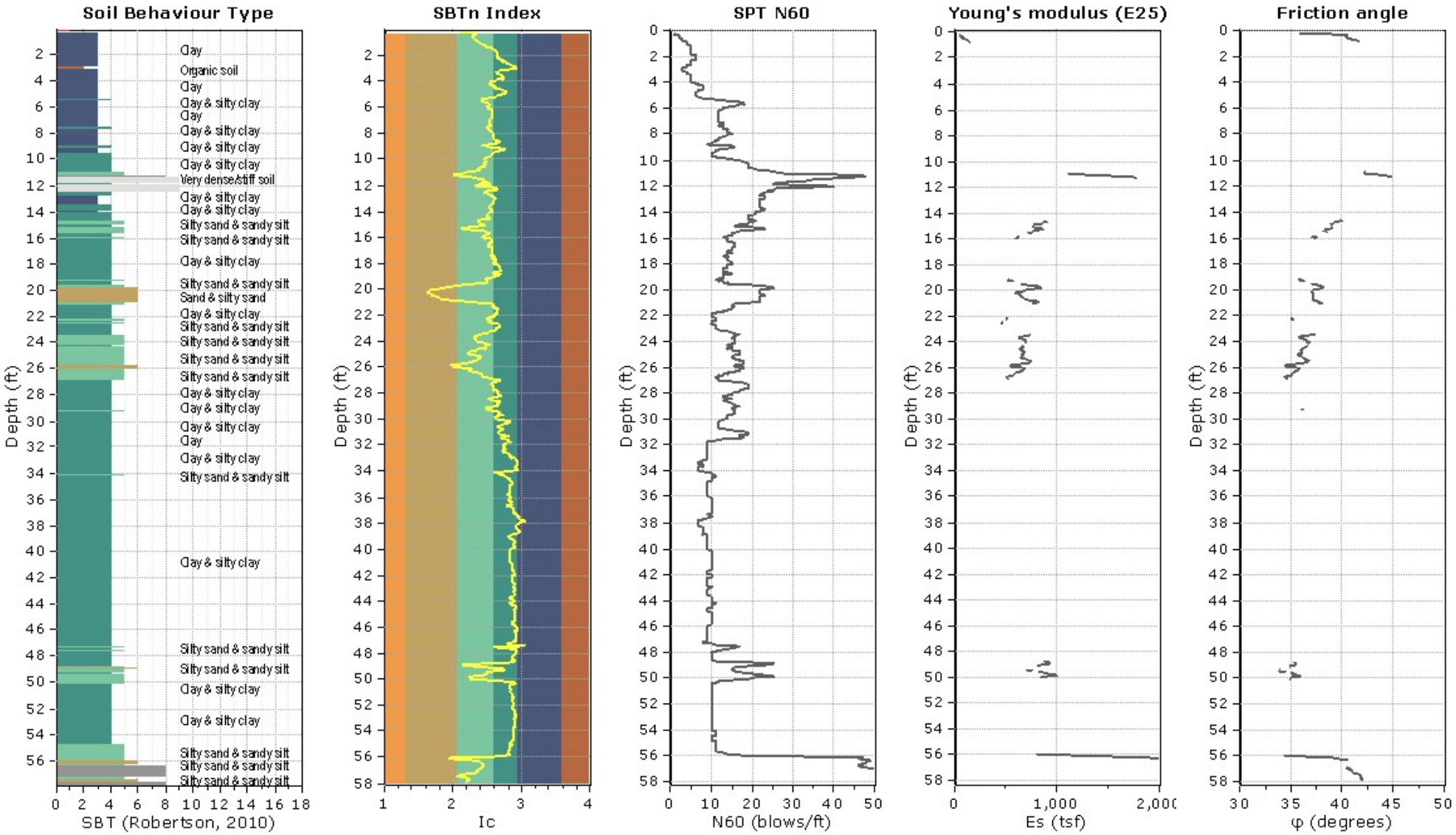
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Coords: lat 39.626559° lon -88.229542°
Cone Type: CPT
Cone Operator: Fugro



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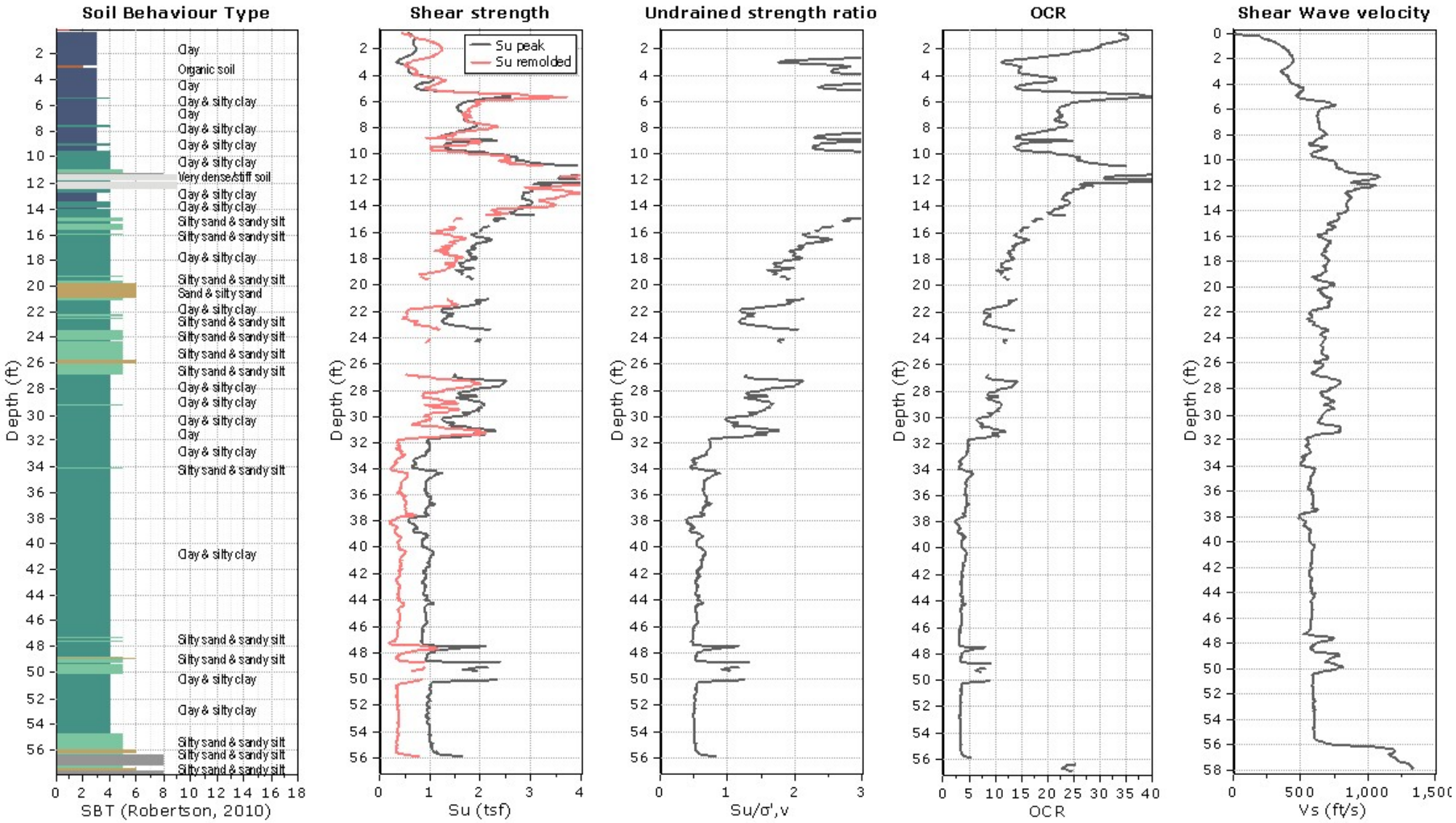
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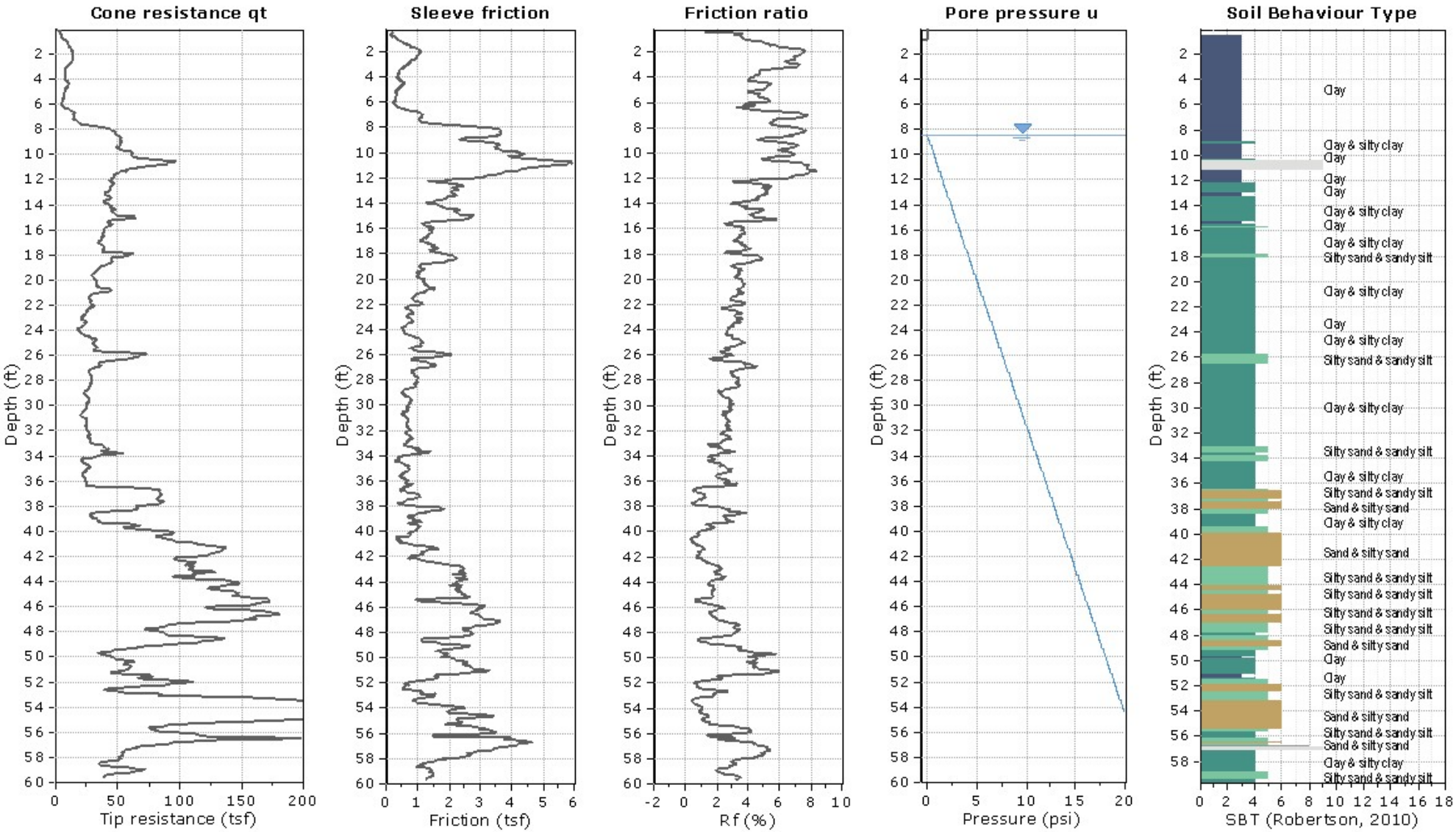
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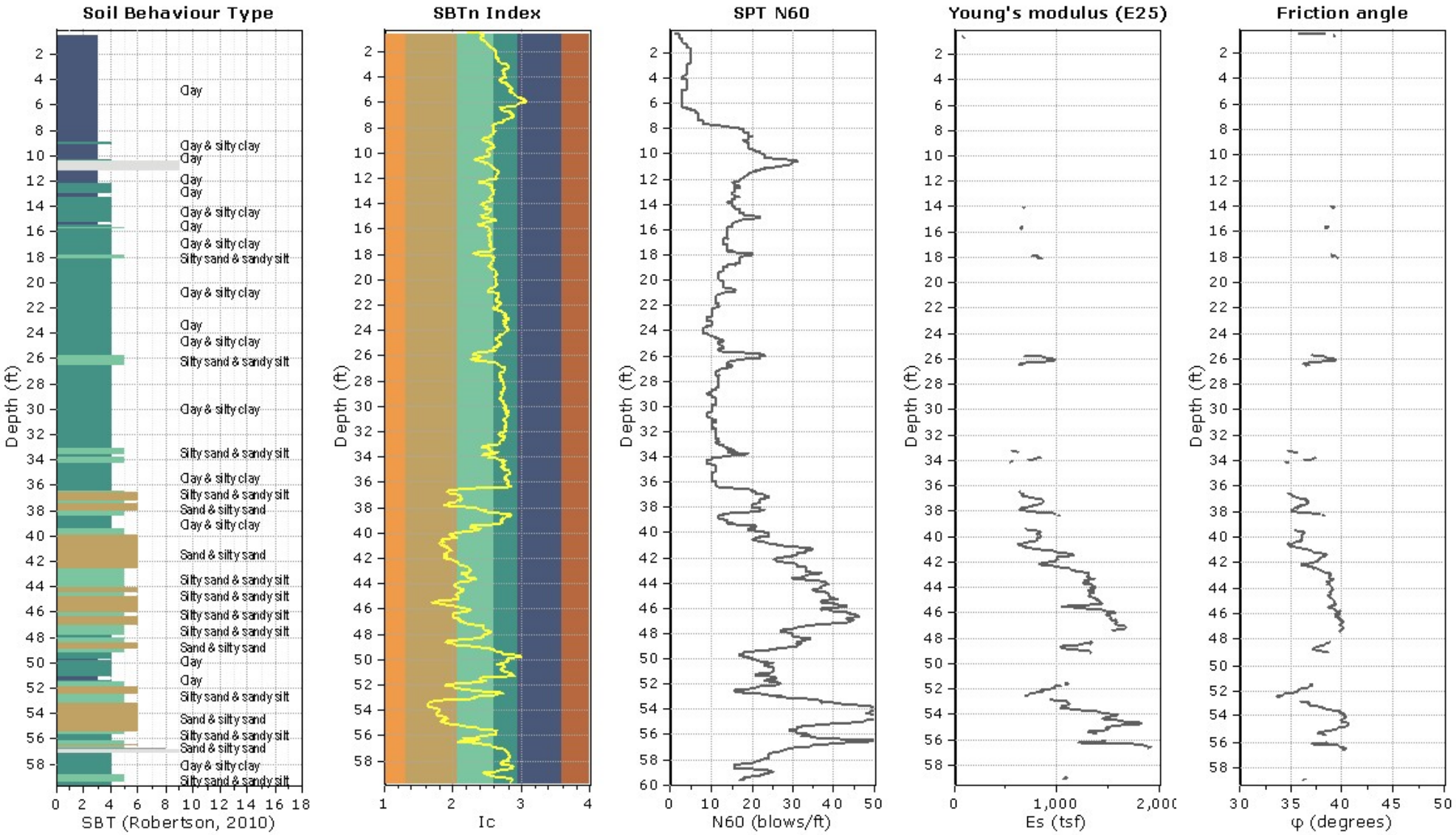
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Coords: lat 39.630431° lon -88.200456°
Cone Type: CPT
Cone Operator: Fugro



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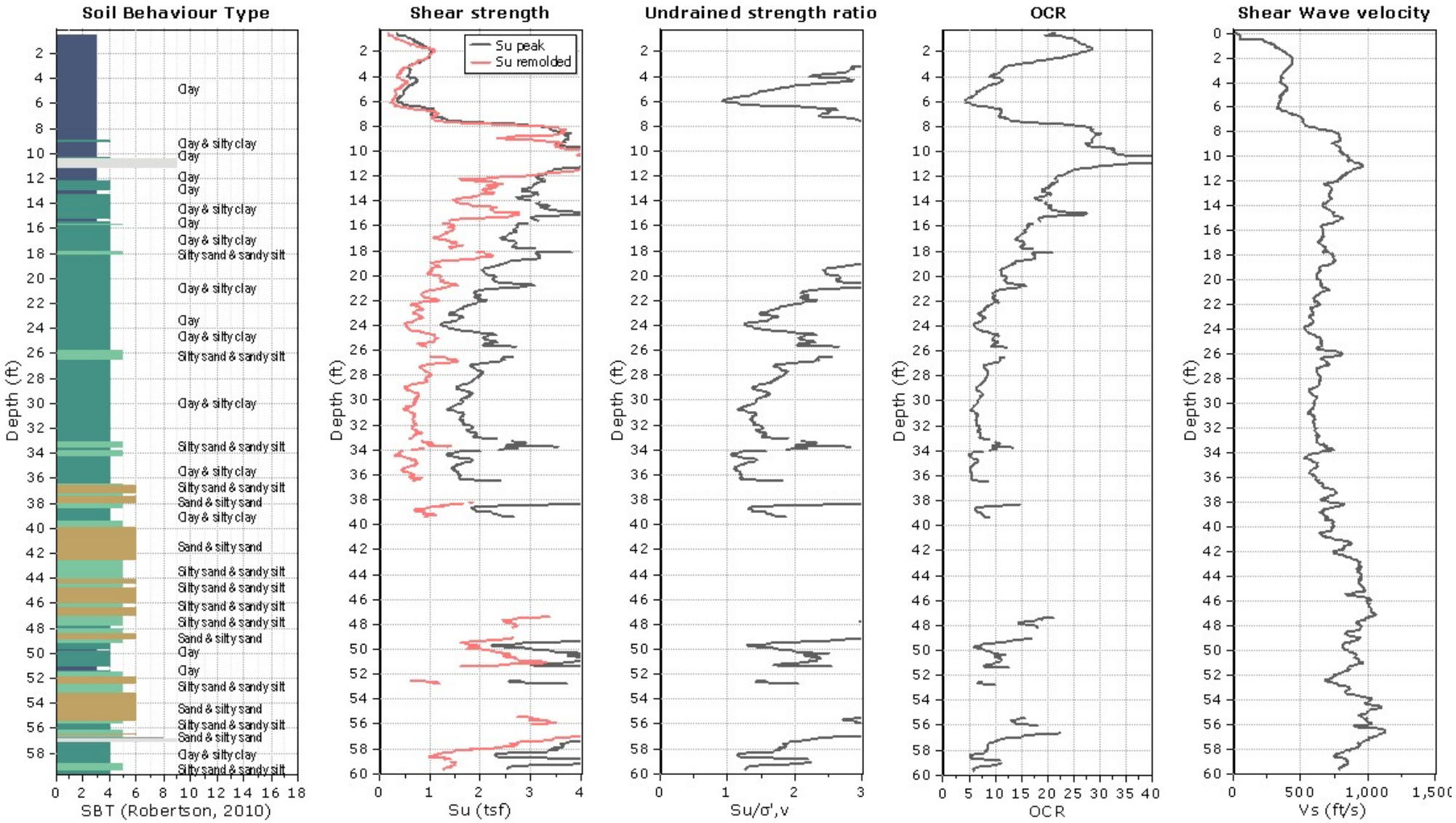
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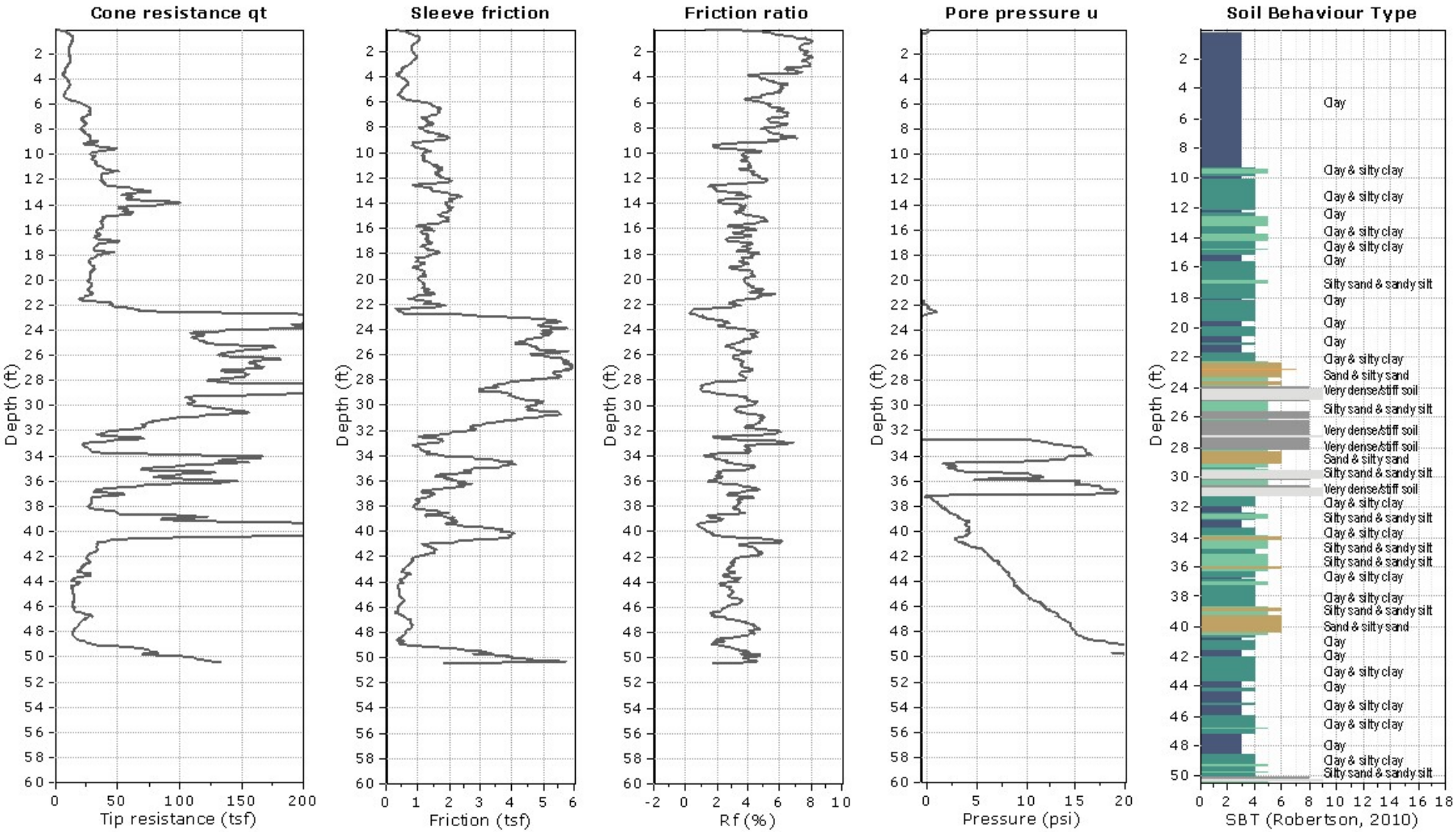
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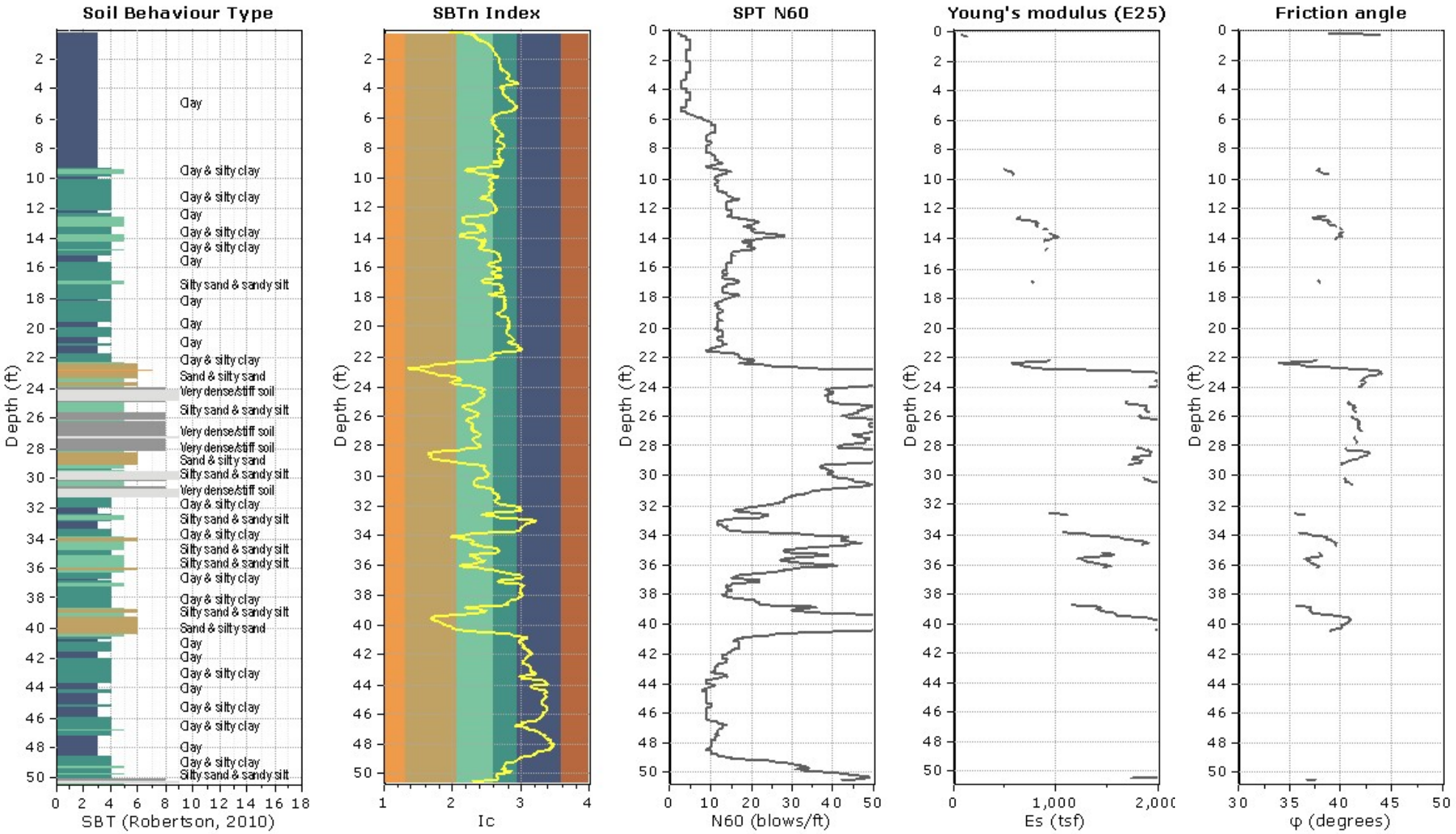
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Coords: lat 39.603647° lon -88.220991°
Cone Type: CPT
Cone Operator: Fugro



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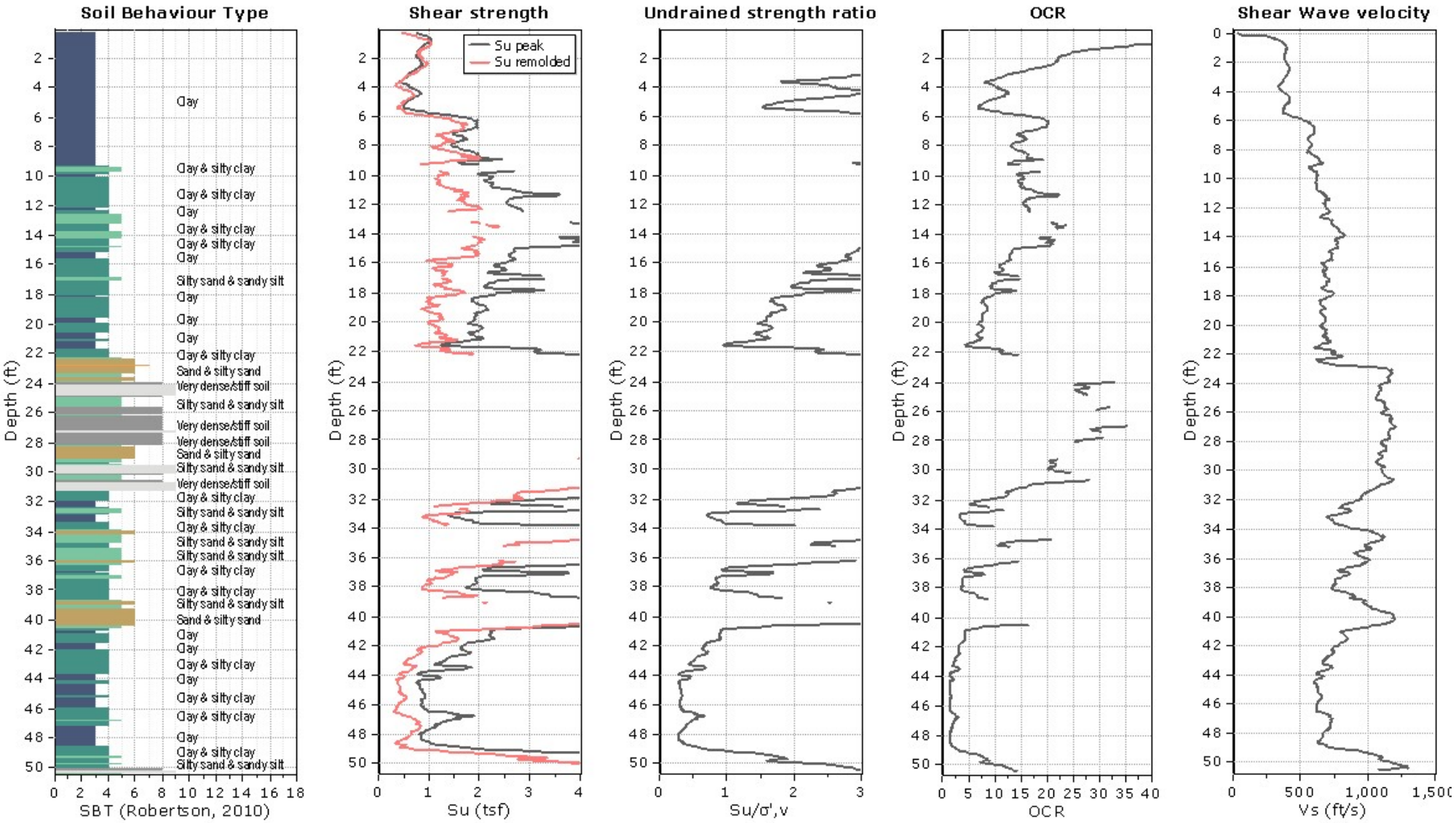
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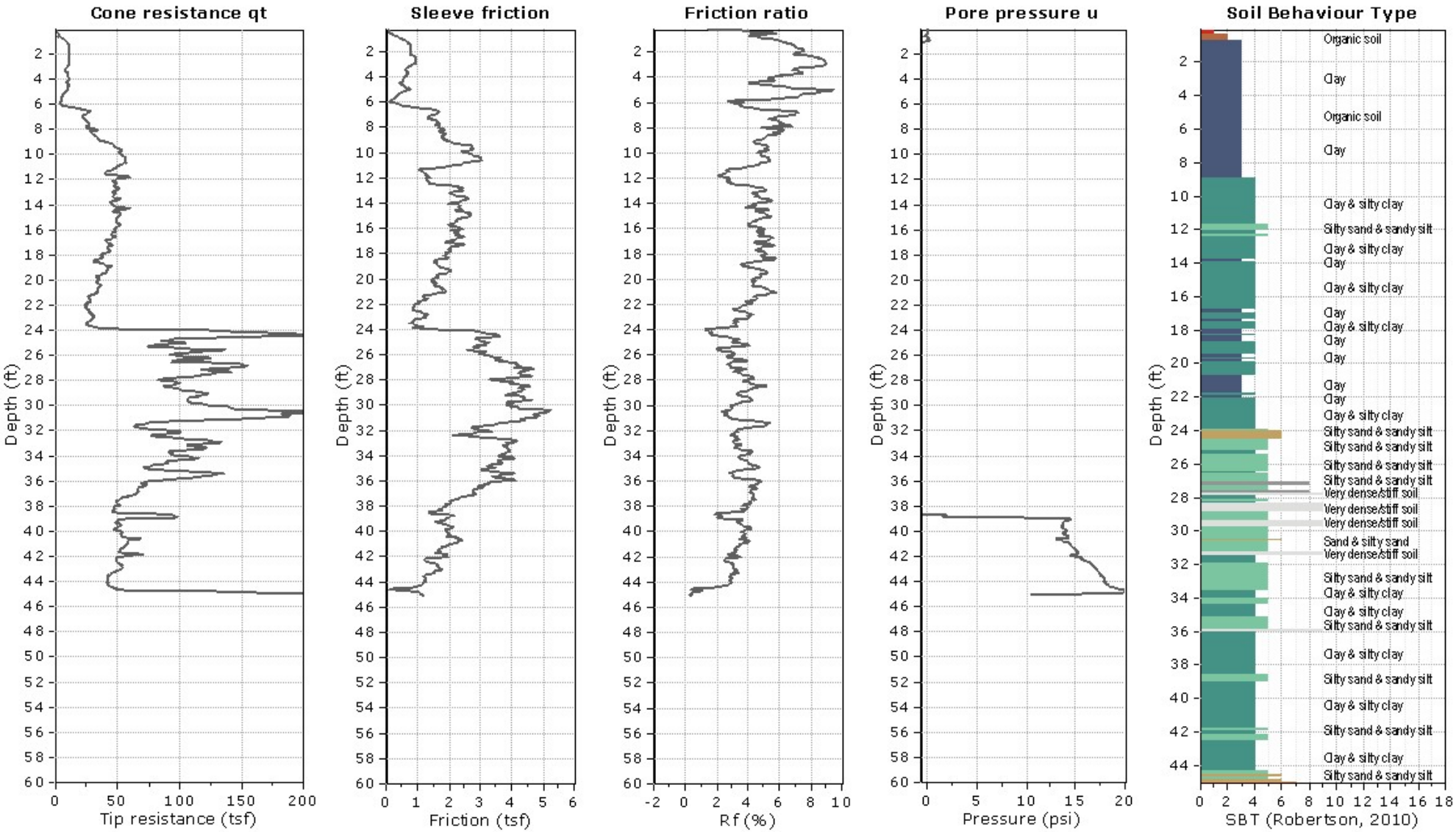
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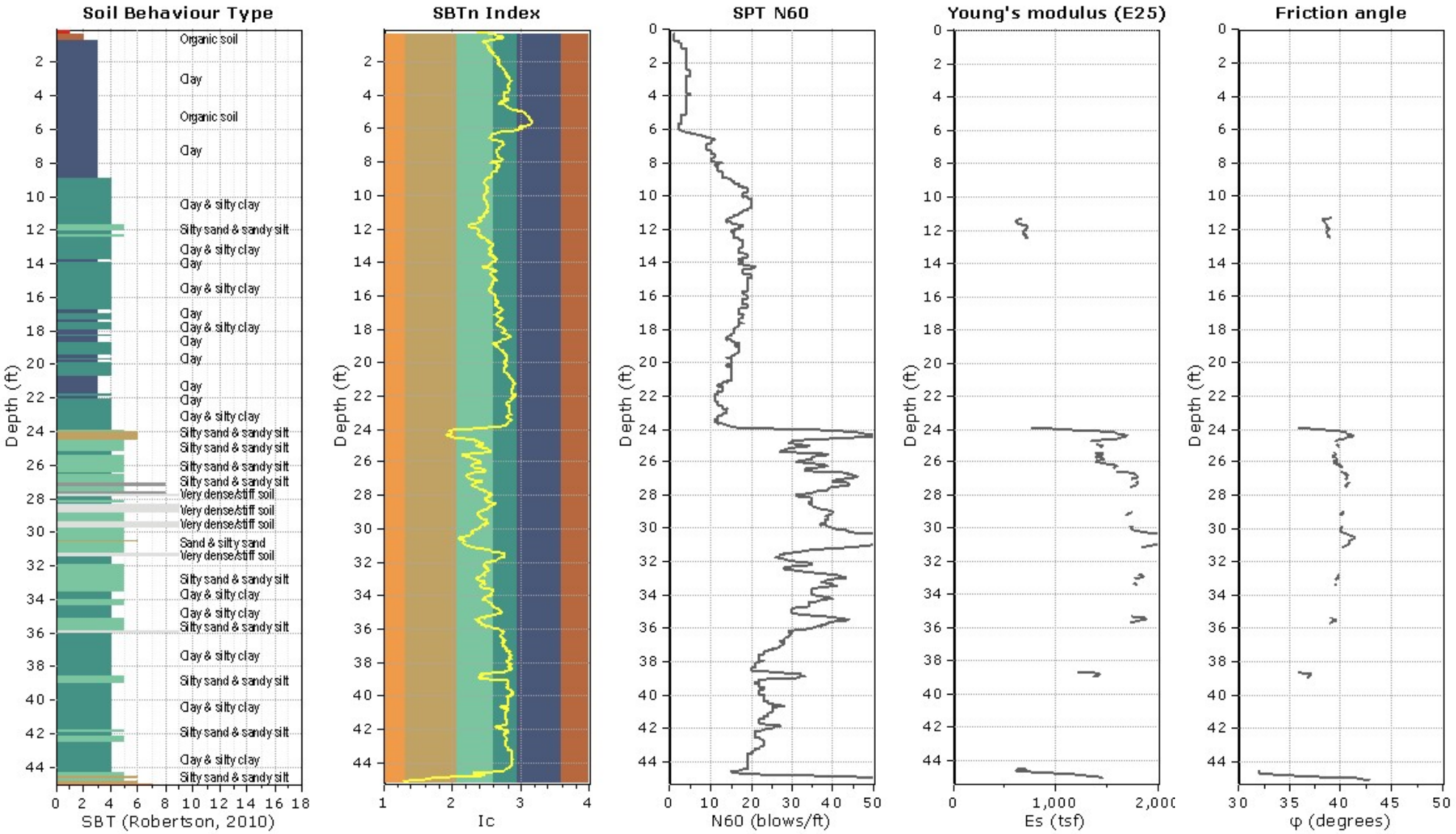
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Coords: lat 39.604831° lon -88.210781°
Cone Type: CPT
Cone Operator: Fugro



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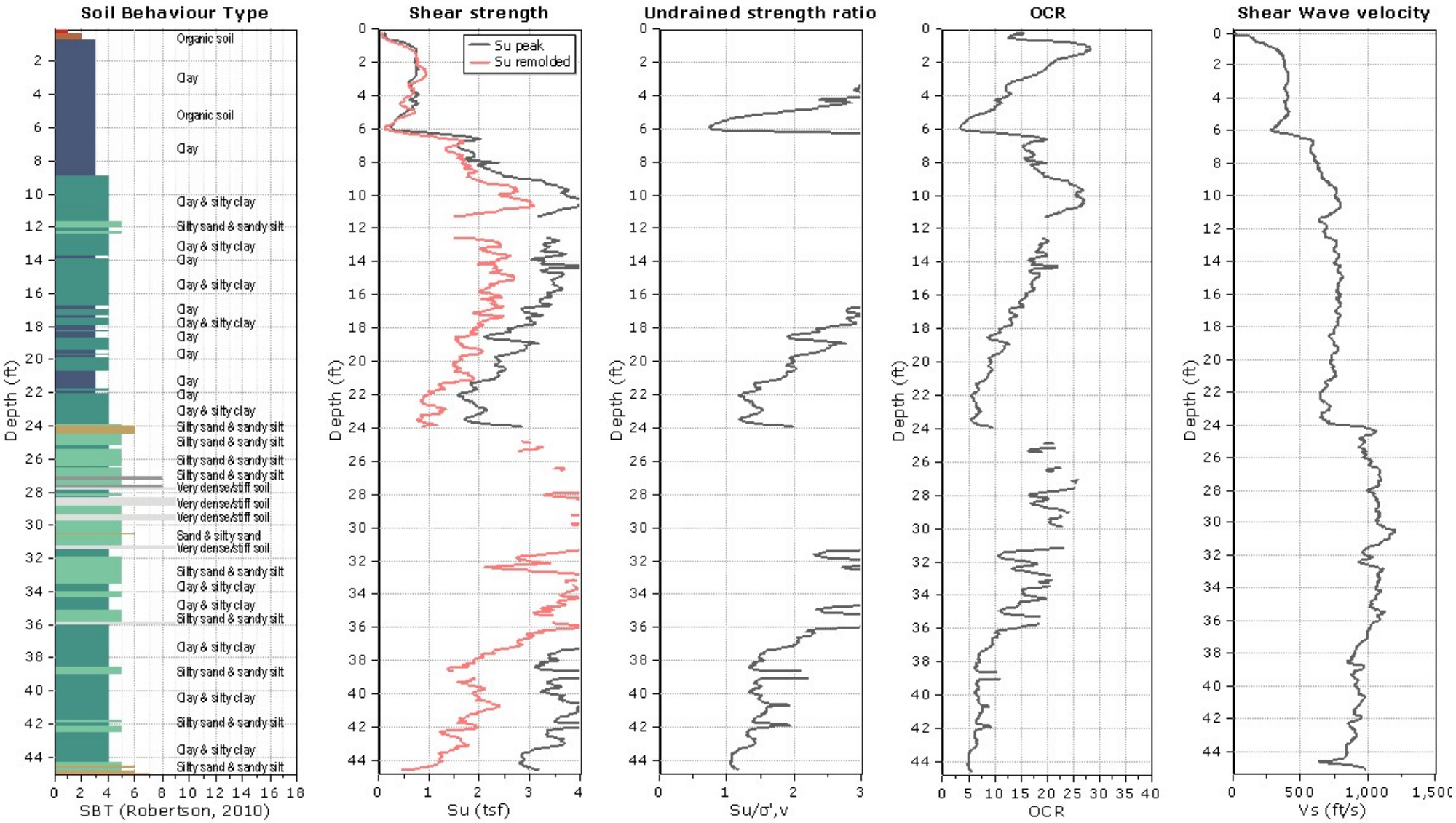
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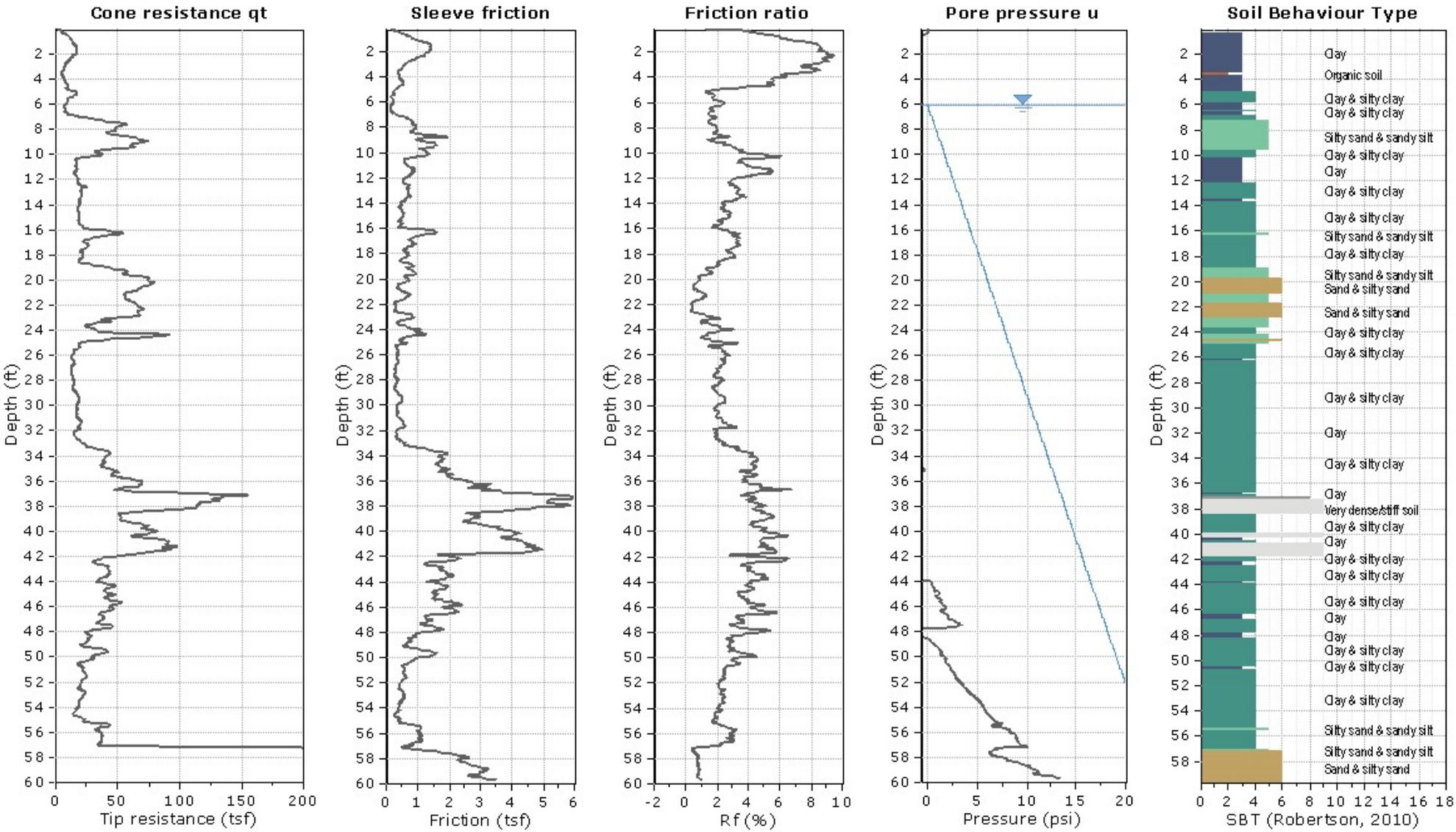
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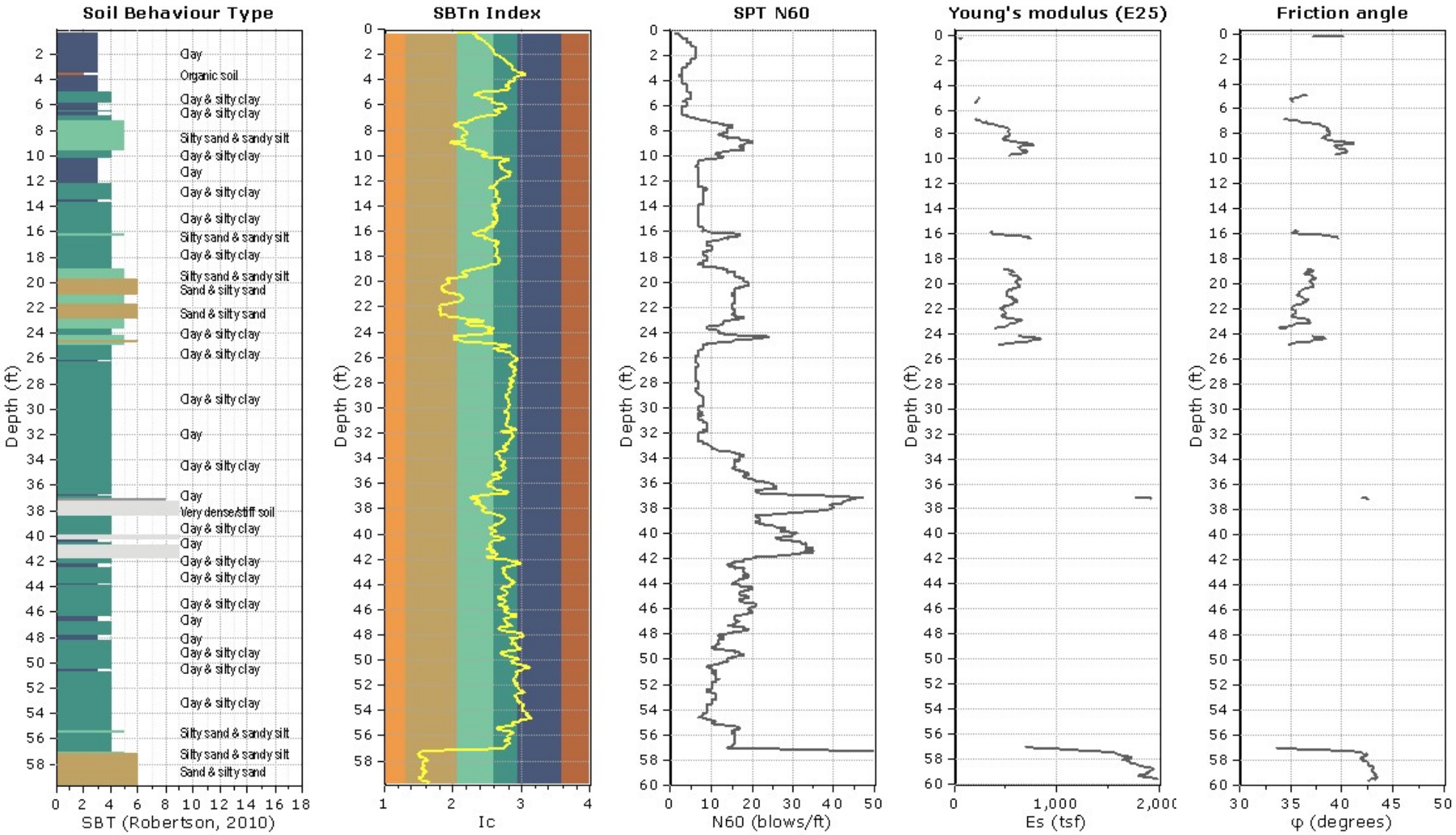
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Coords: lat 39.58532° lon -88.211622°
Cone Type: CPT
Cone Operator: FUGRO



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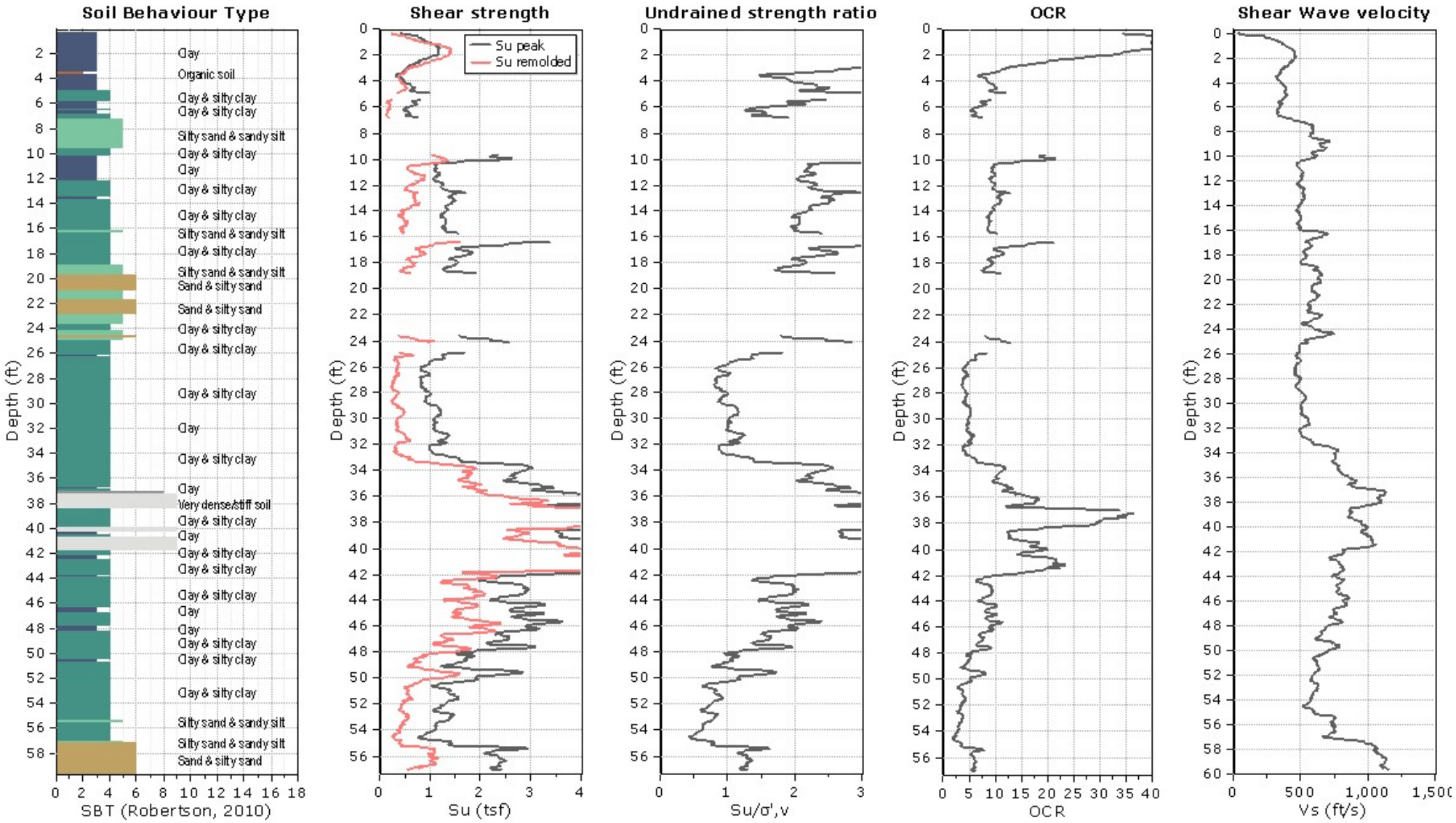
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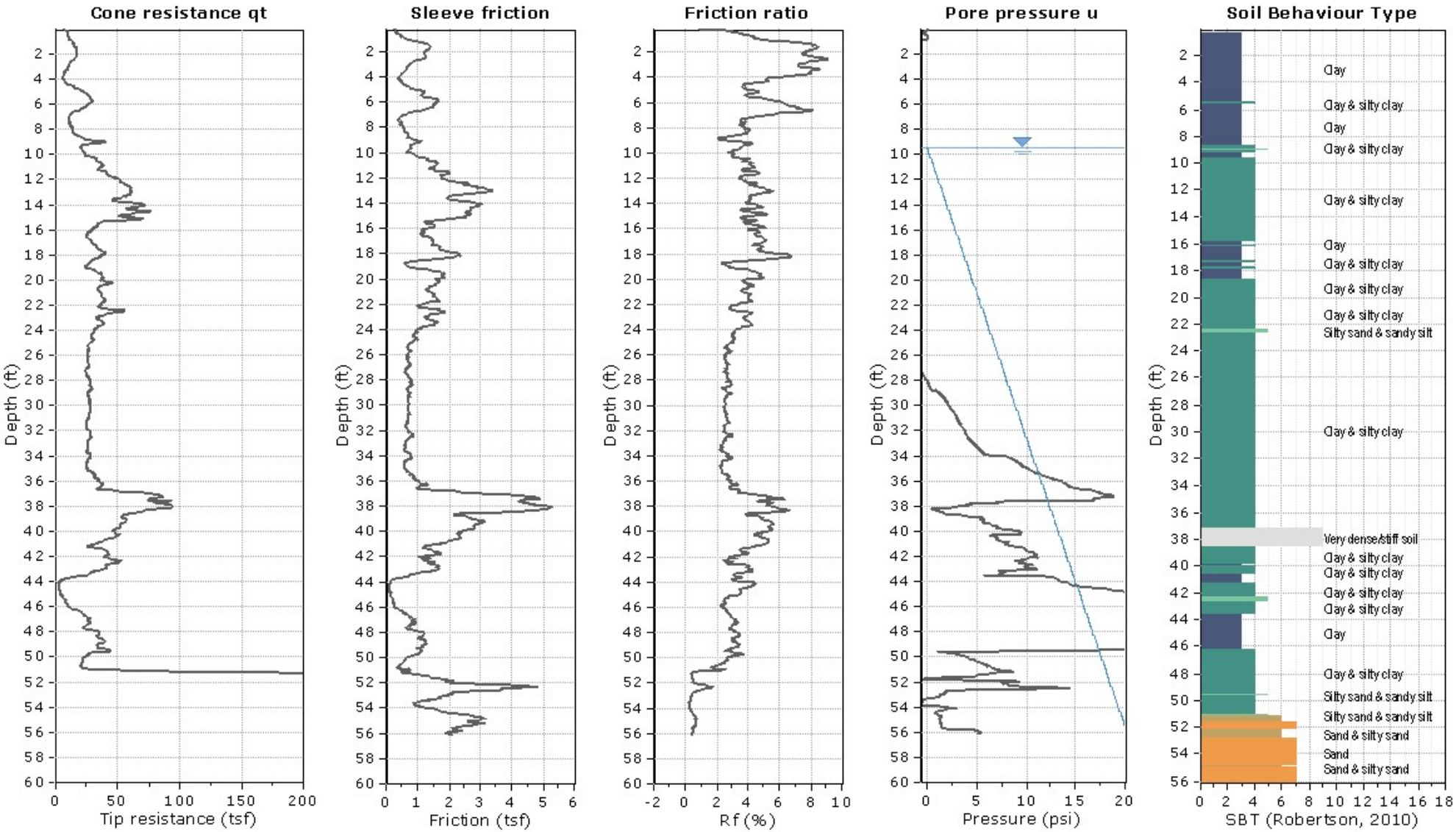
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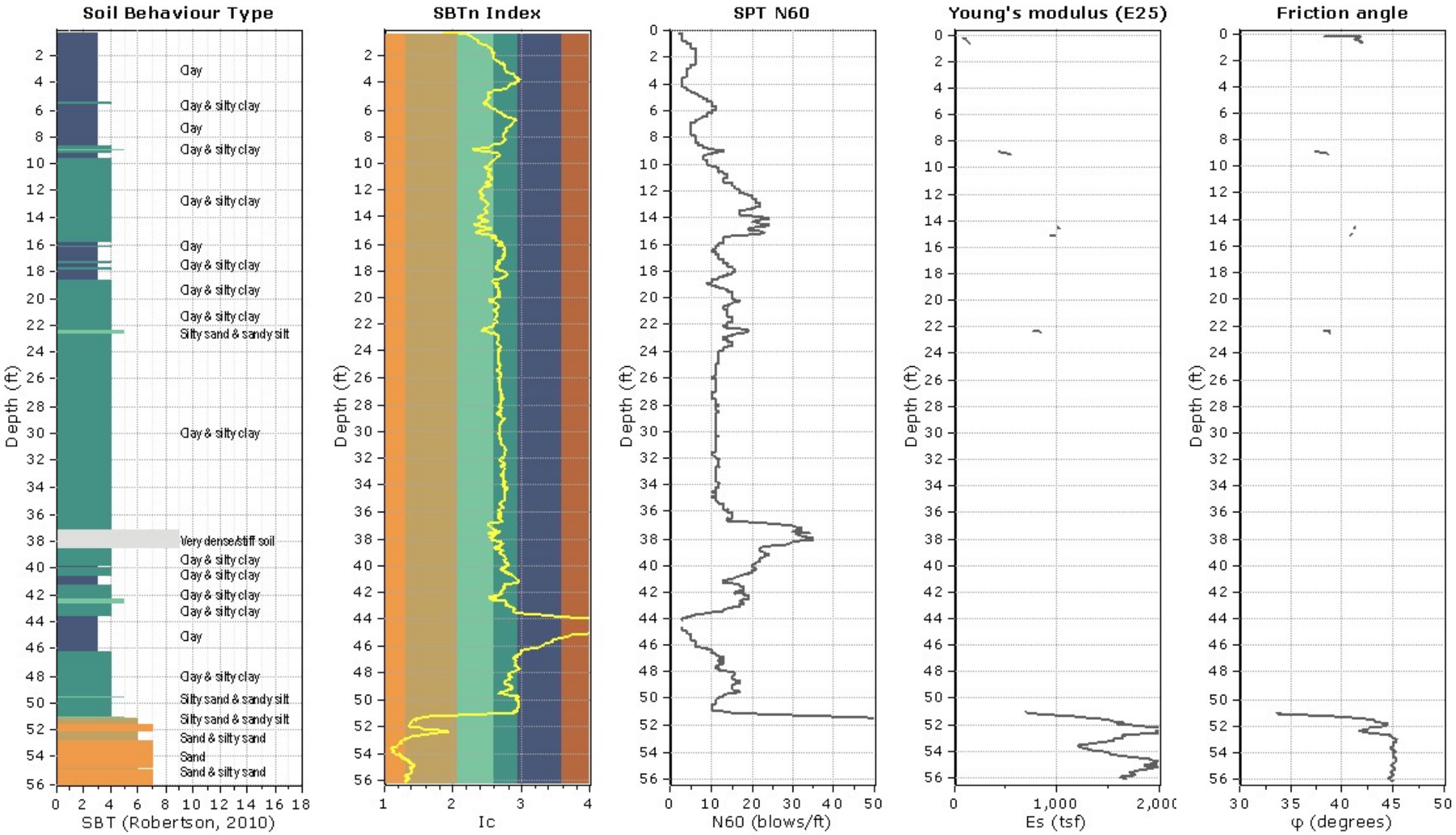
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Coords: lat 39.587266° lon -88.235878°
Cone Type: CPT
Cone Operator: Fugro



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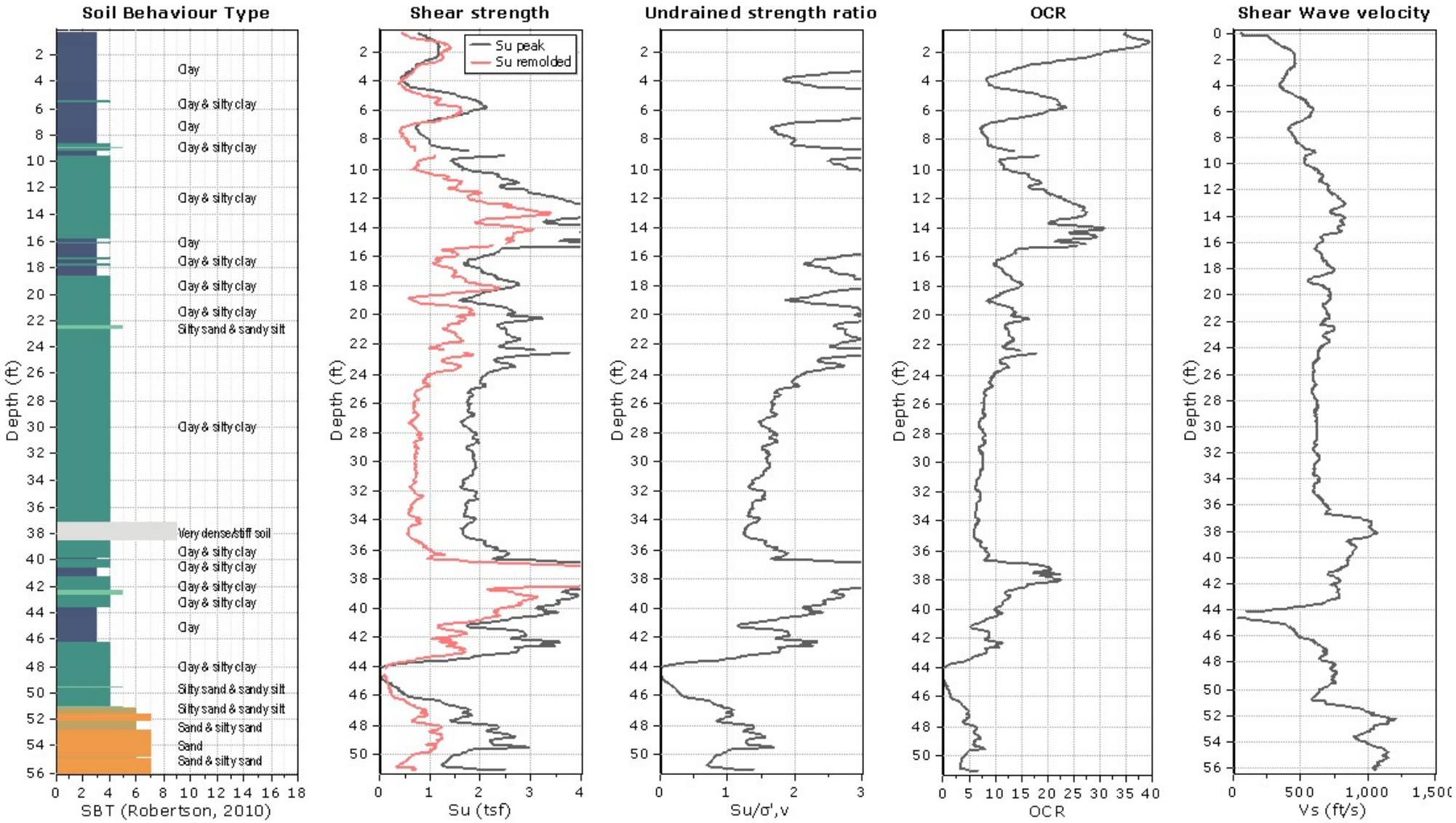
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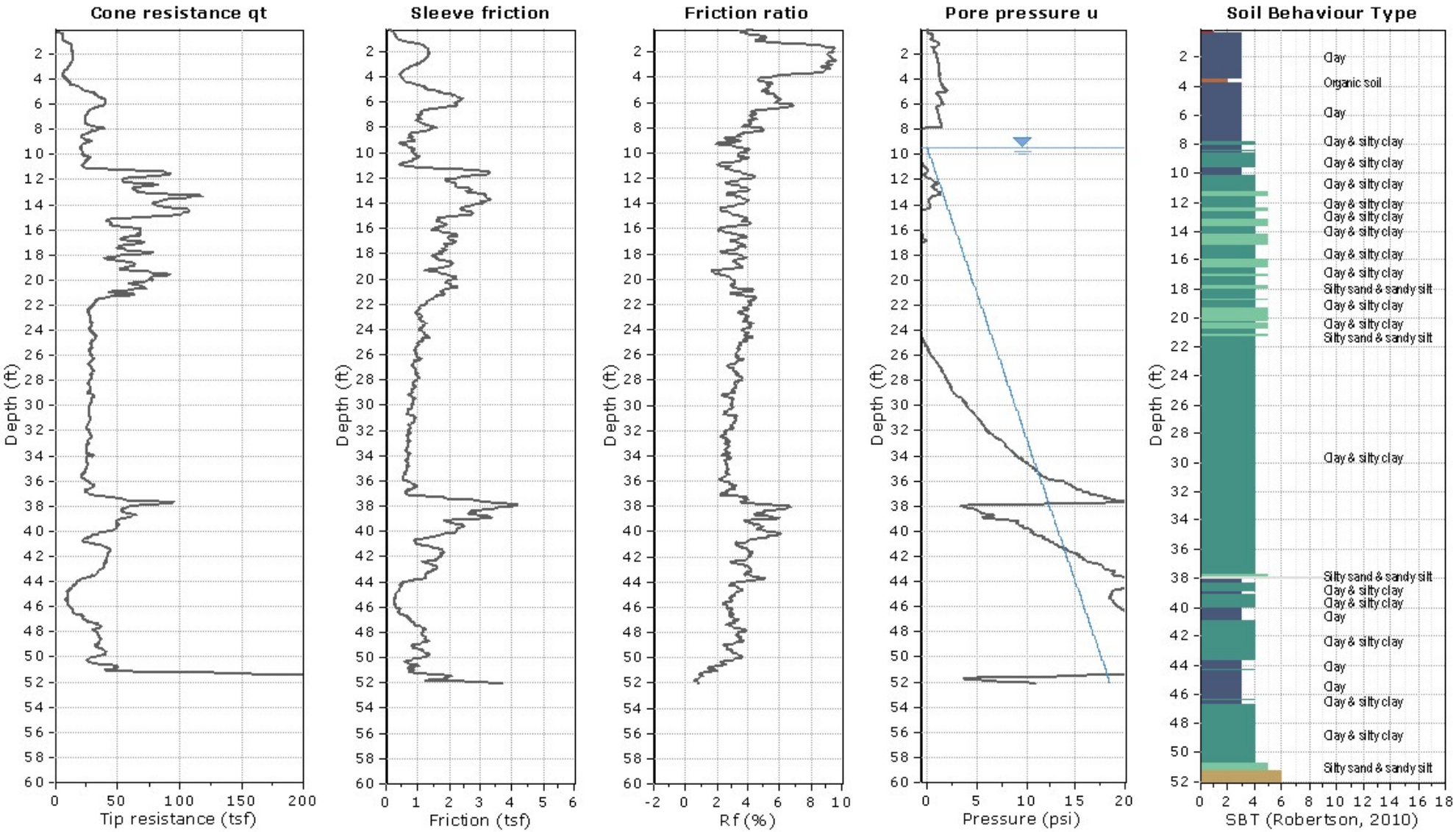
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Total depth: 56.14 ft, Date: 4/29/2025
Coords: lat 39.587266° lon -88.235878°
Cone Type: CPT
Cone Operator: Fugro



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Project: **Coles Wind**
Location: **Coles County, Illinois**

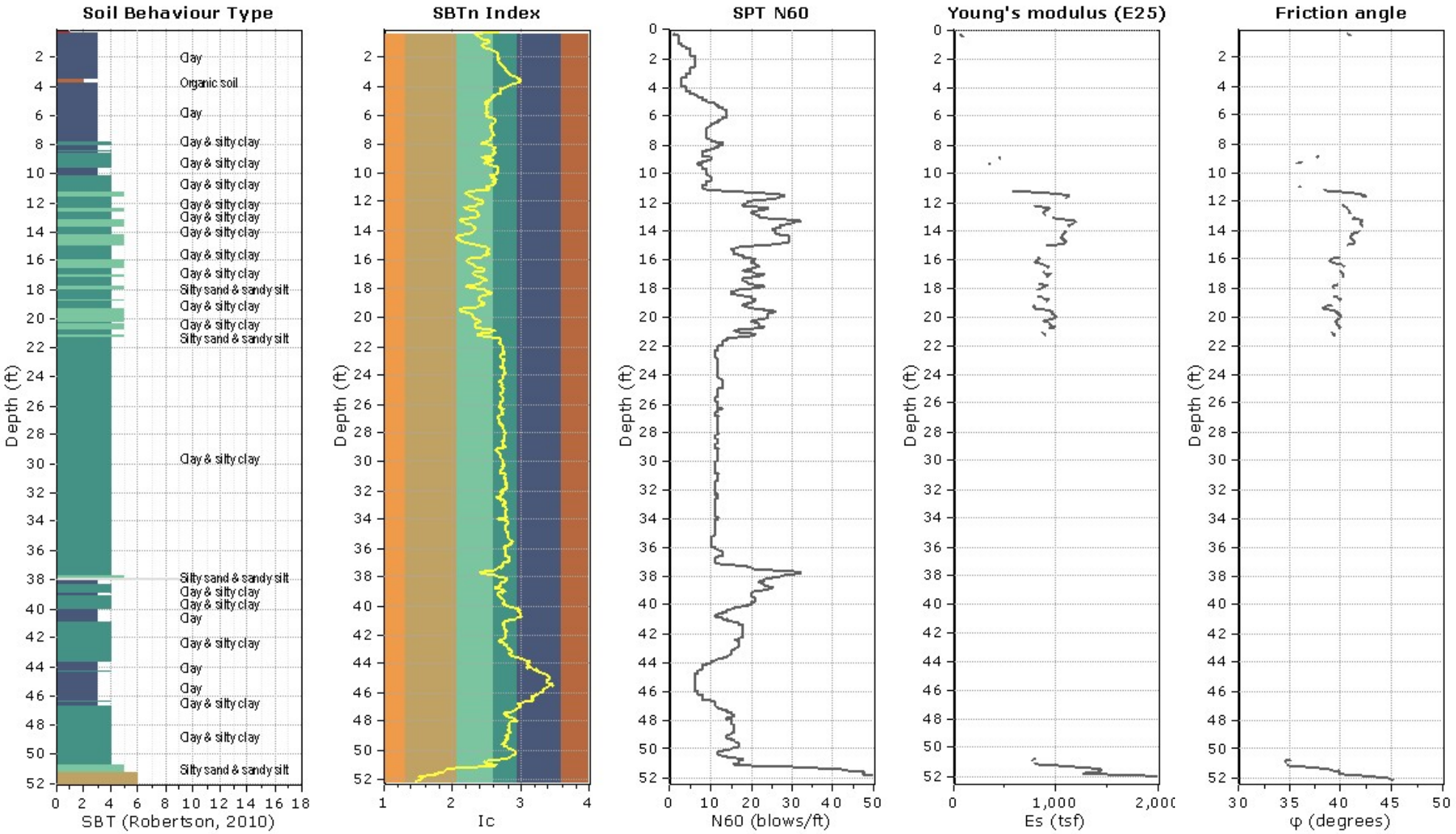
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Cone Type: CPT
Cone Operator: Fugro



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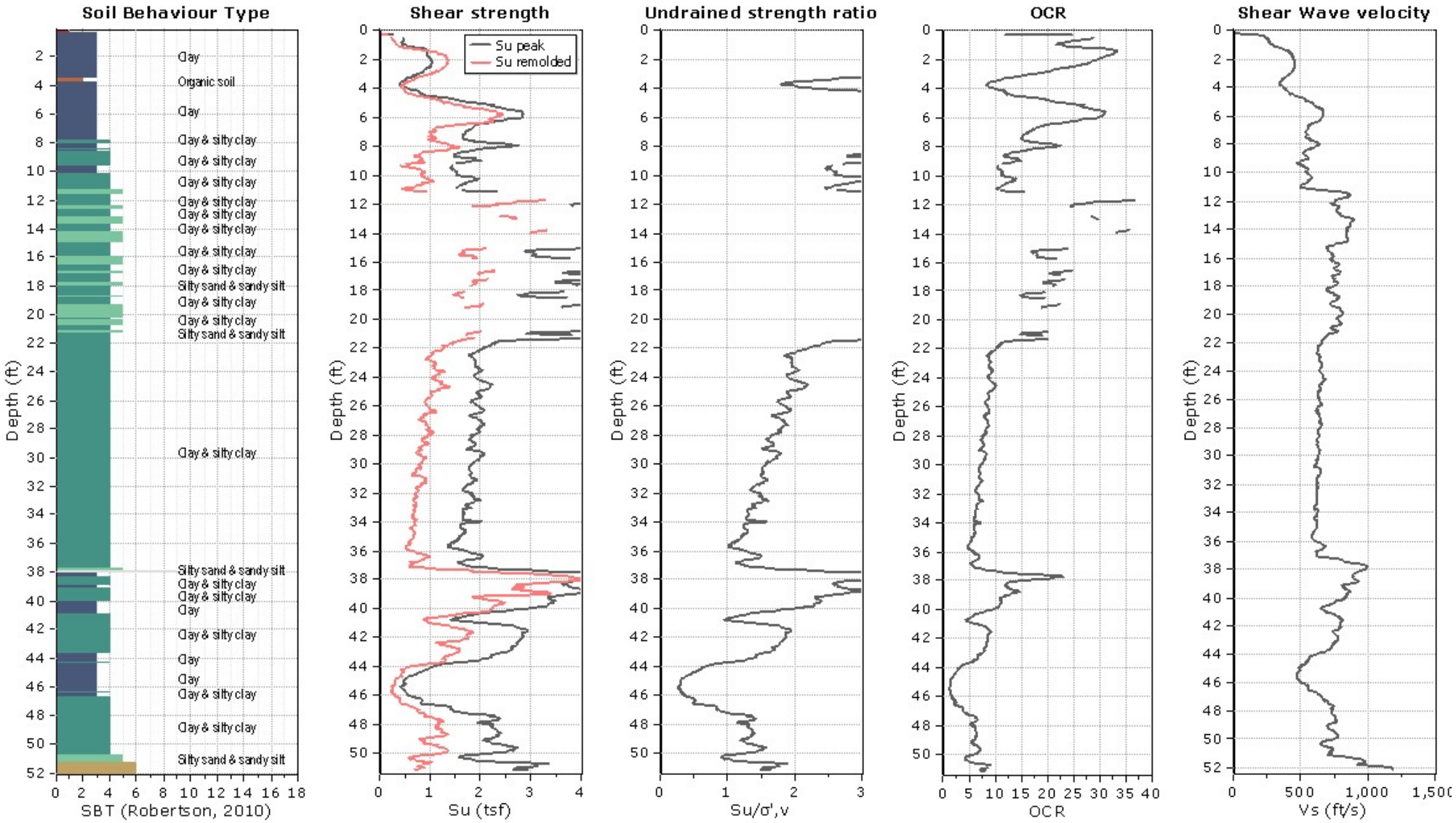
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Cone Type: CPT
Cone Operator: Fugro



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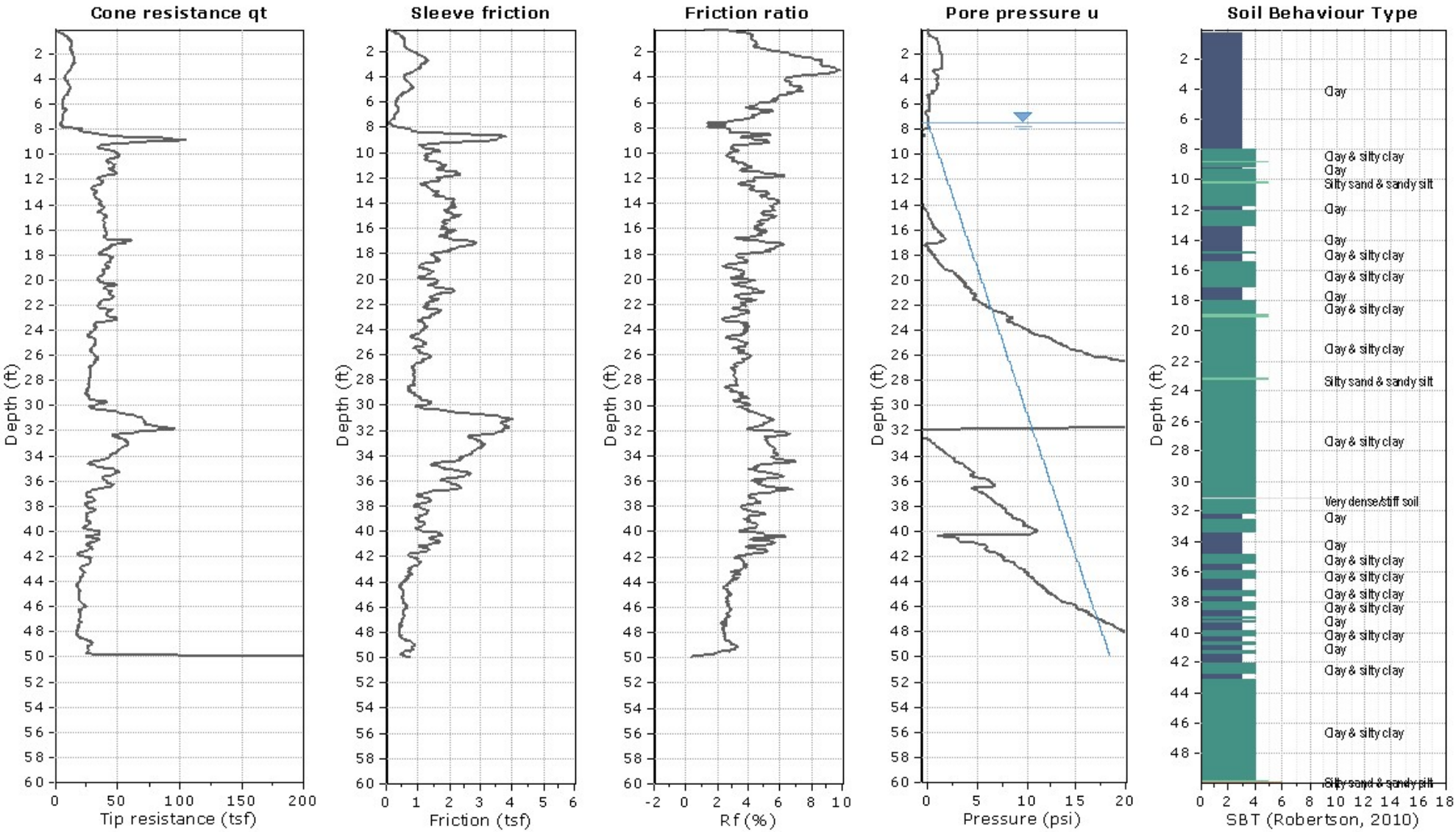
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Cone Type: CPT
Cone Operator: Fugro



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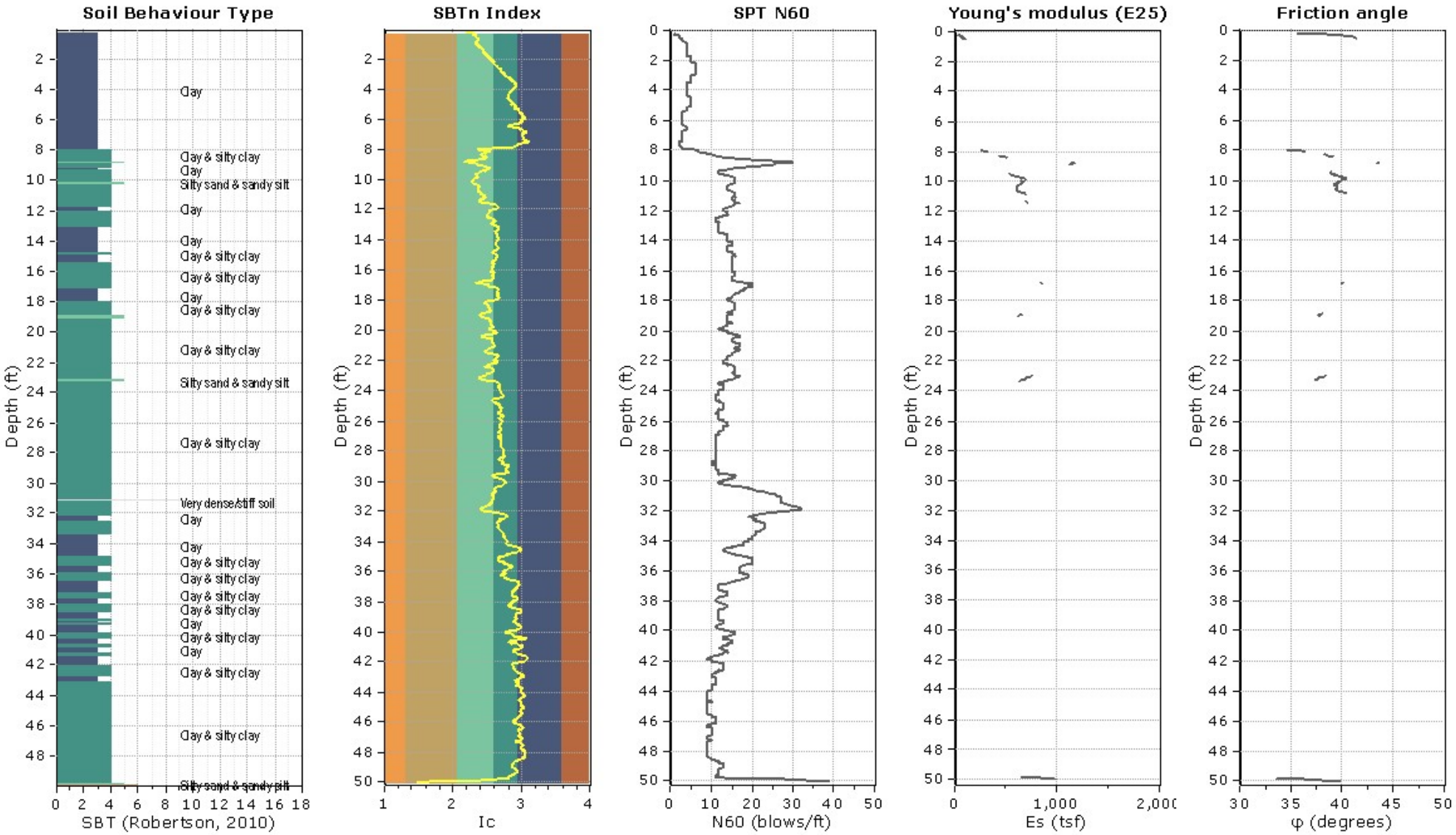
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Cone Type: CPT
Cone Operator: Fugro



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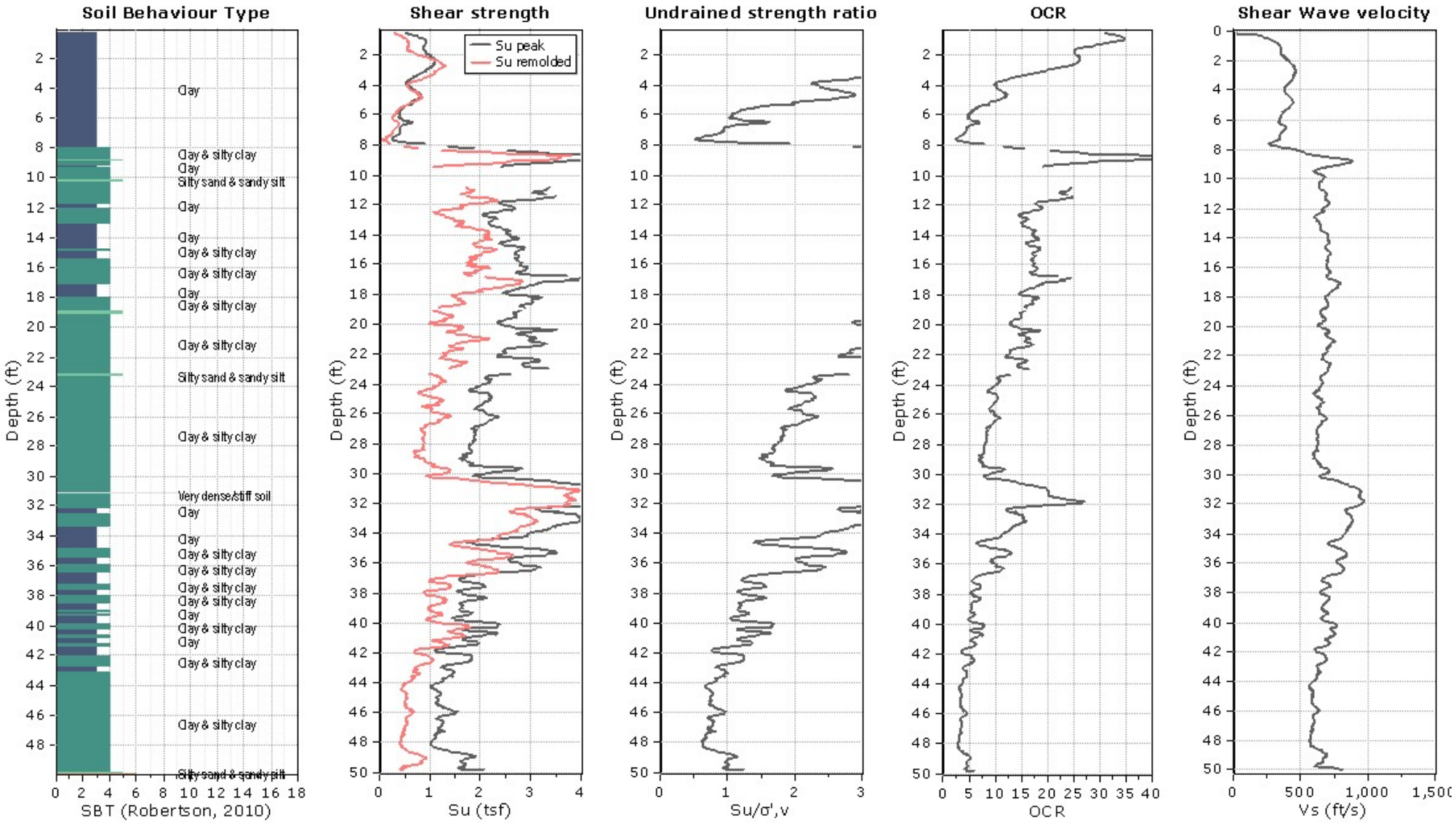
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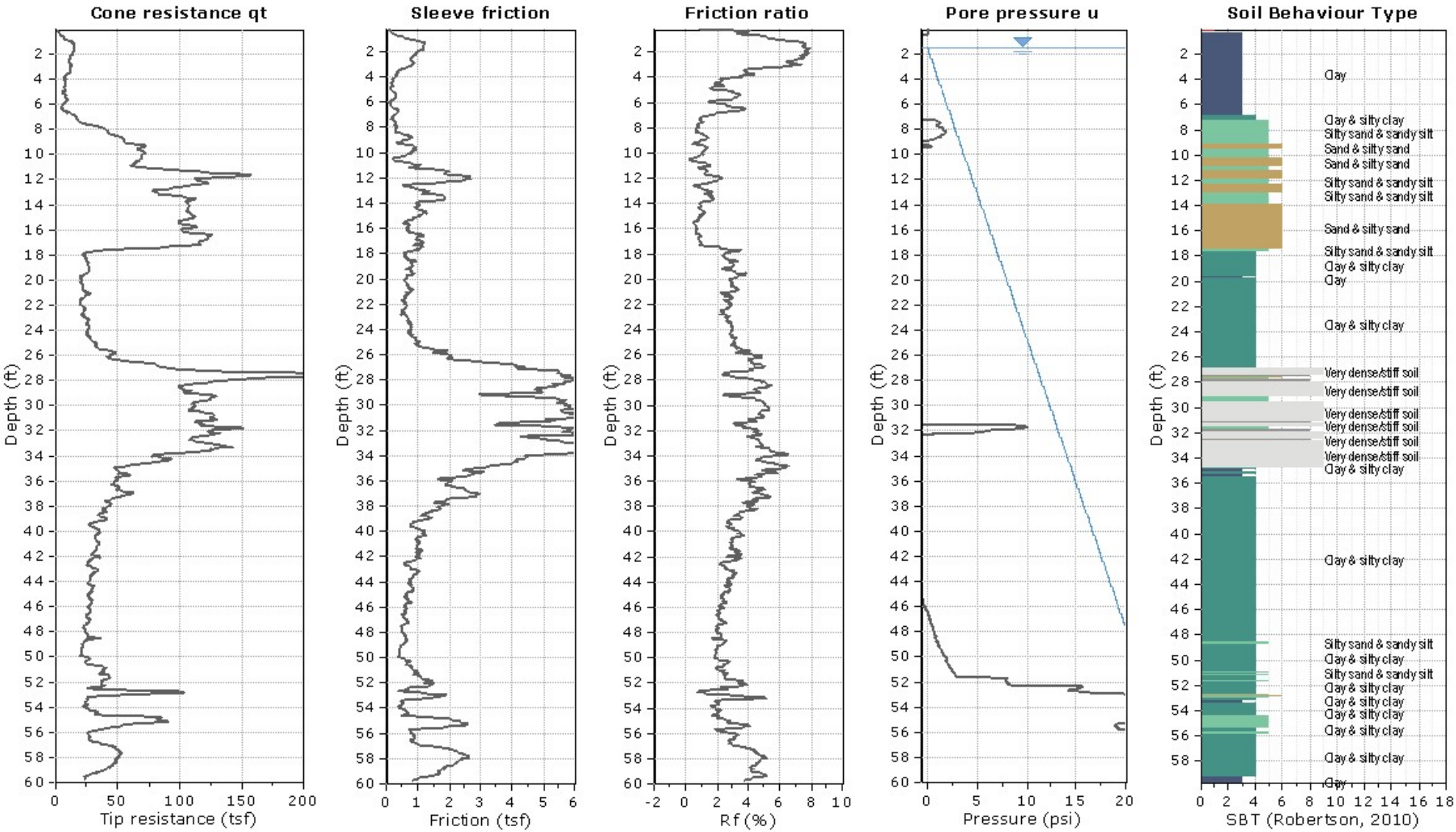
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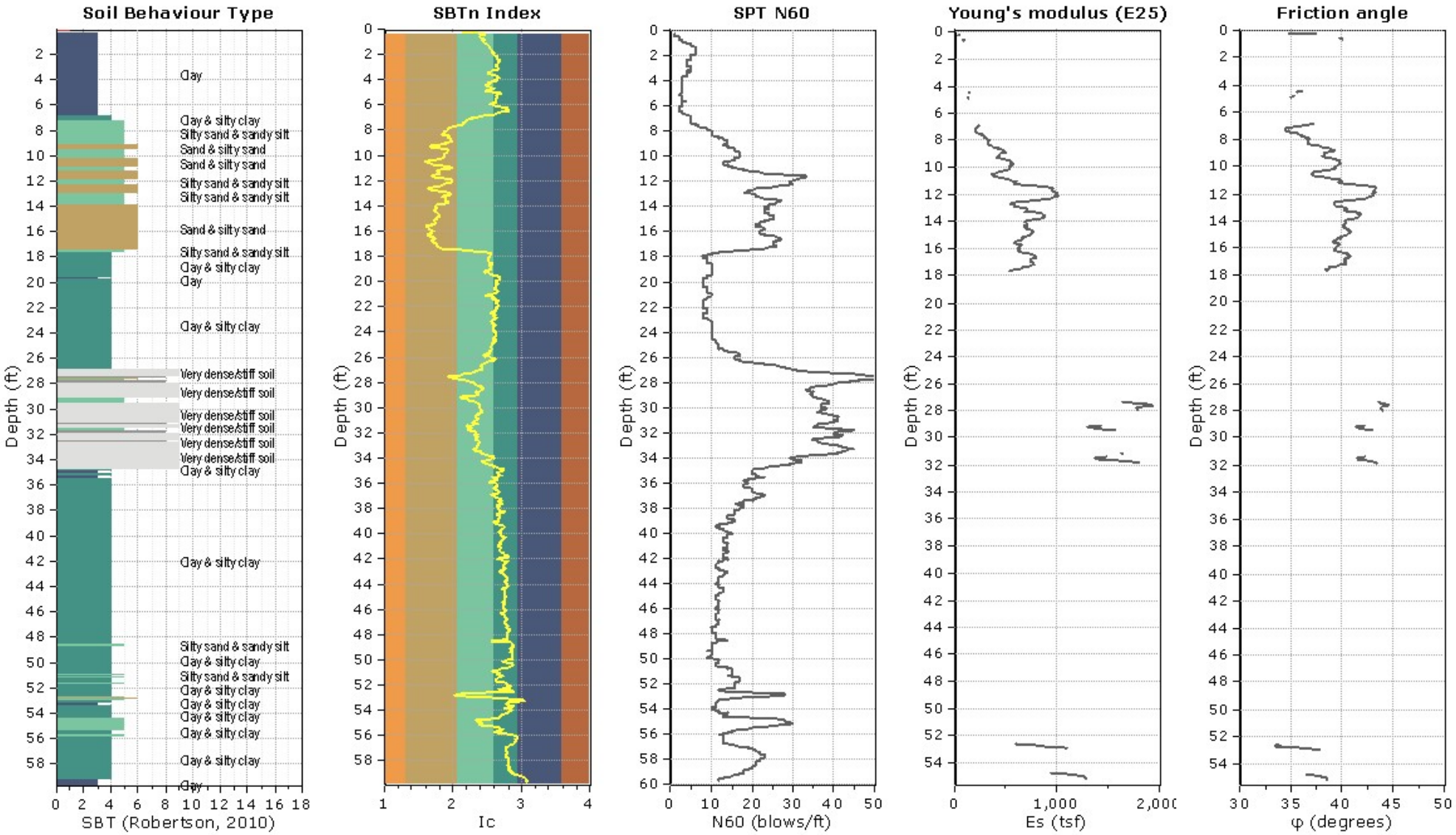
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Coords: lat 39.574408° lon -88.217758°
Cone Type: CPT
Cone Operator: Fugro



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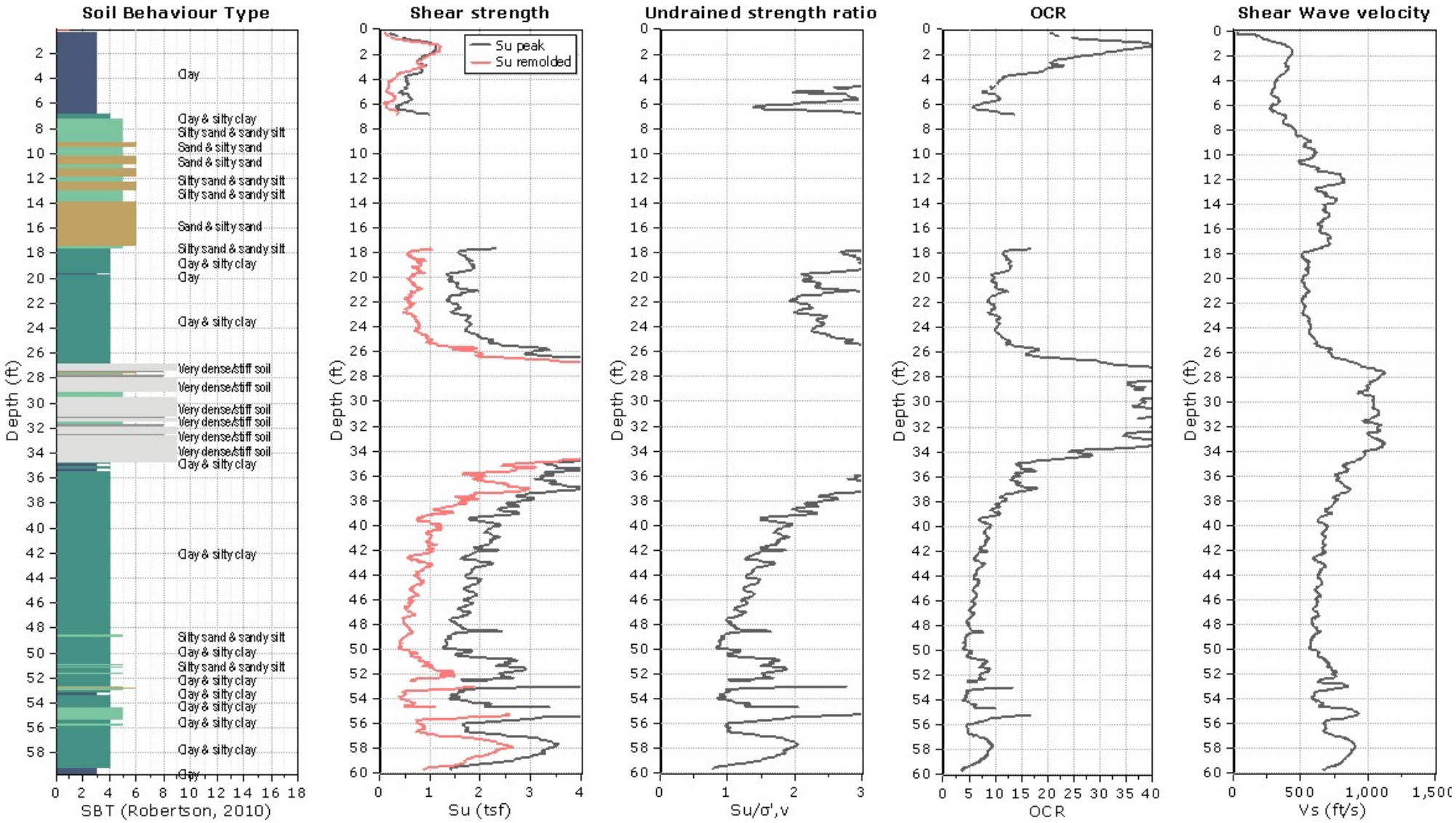
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Cone Type: CPT
Cone Operator: Fugro



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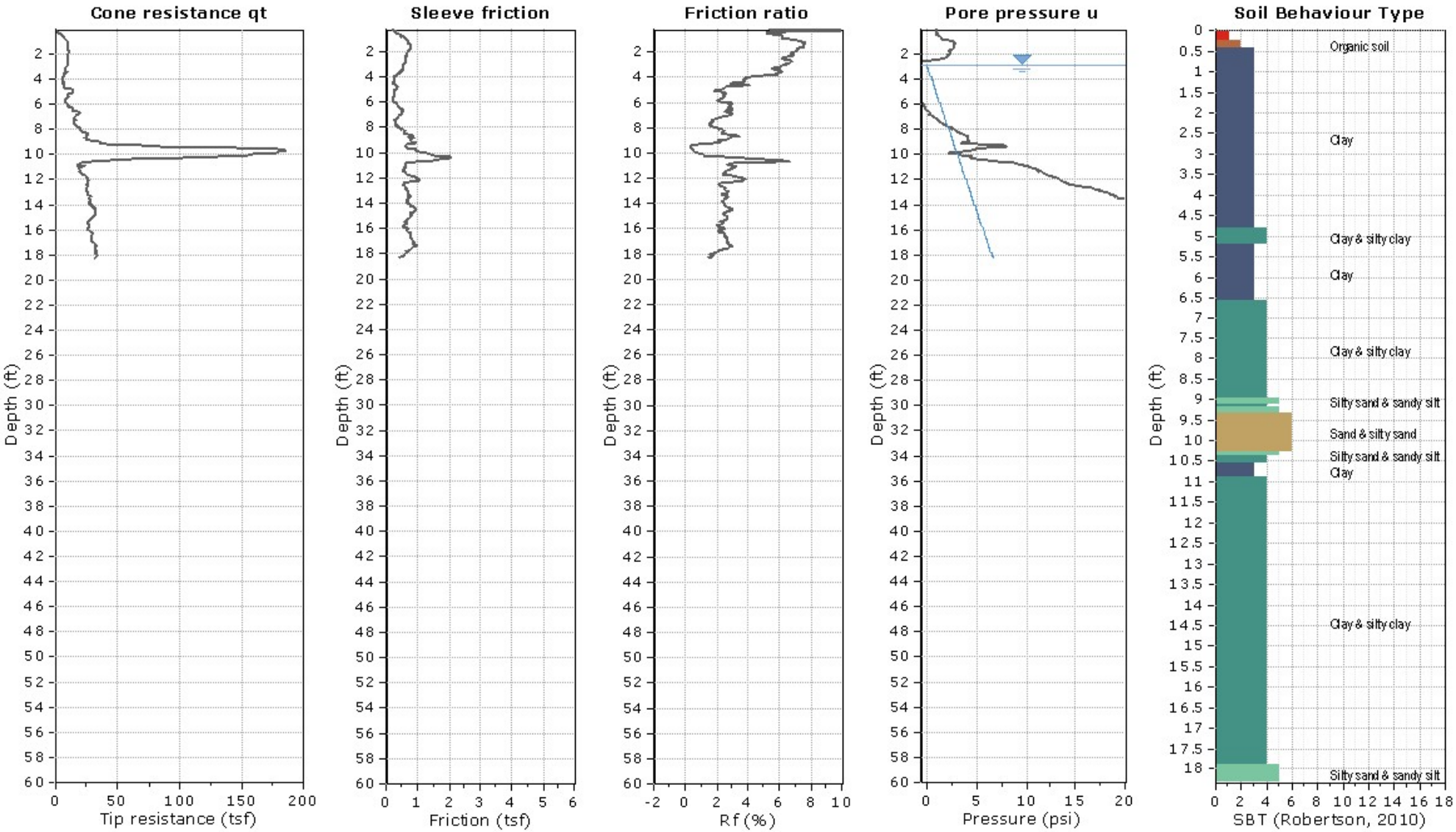
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Cone Operator: Fugro



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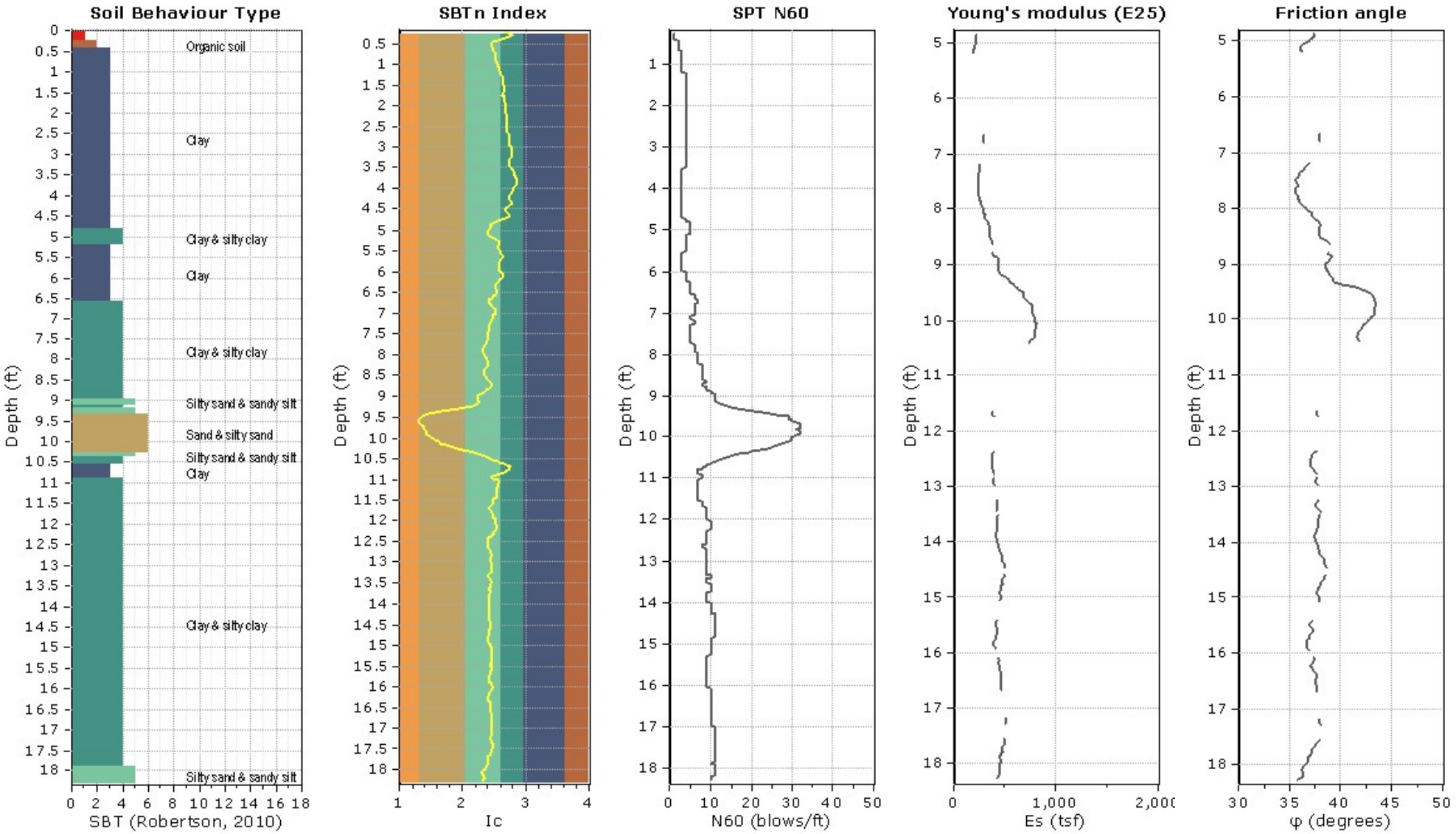
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Cone Type: CPT
Cone Operator: Fugro



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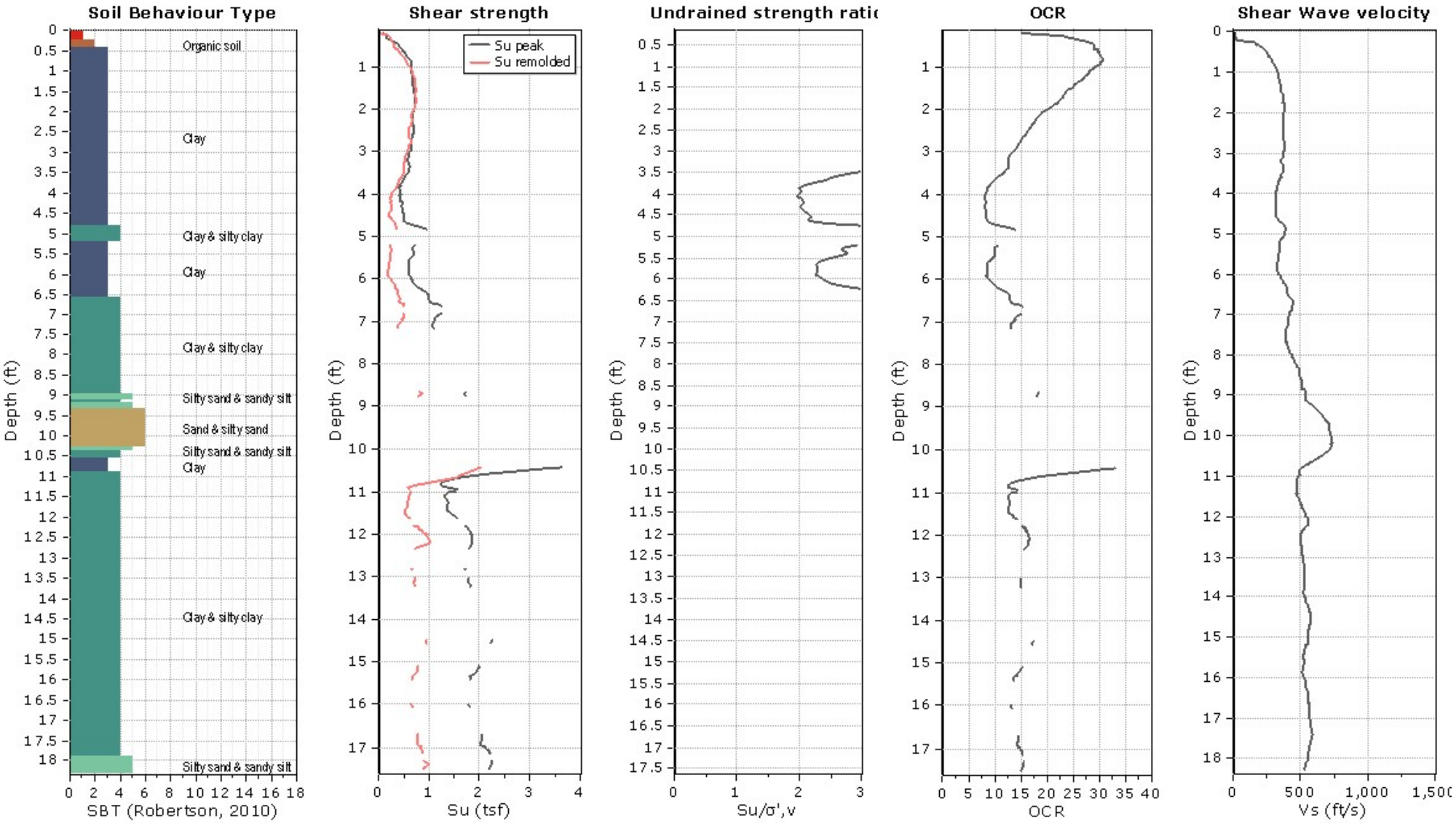
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Cone Operator: Fugro



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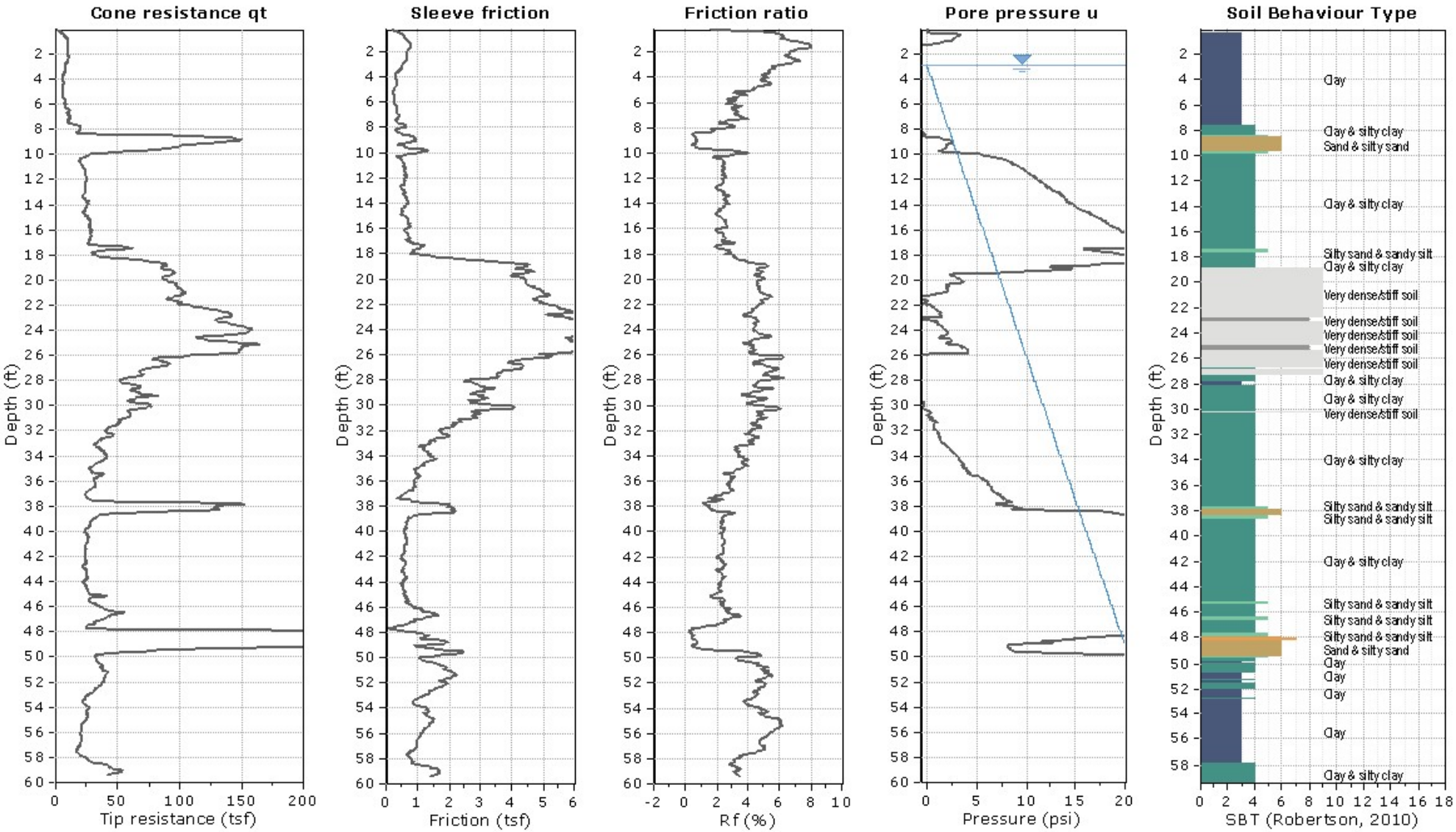
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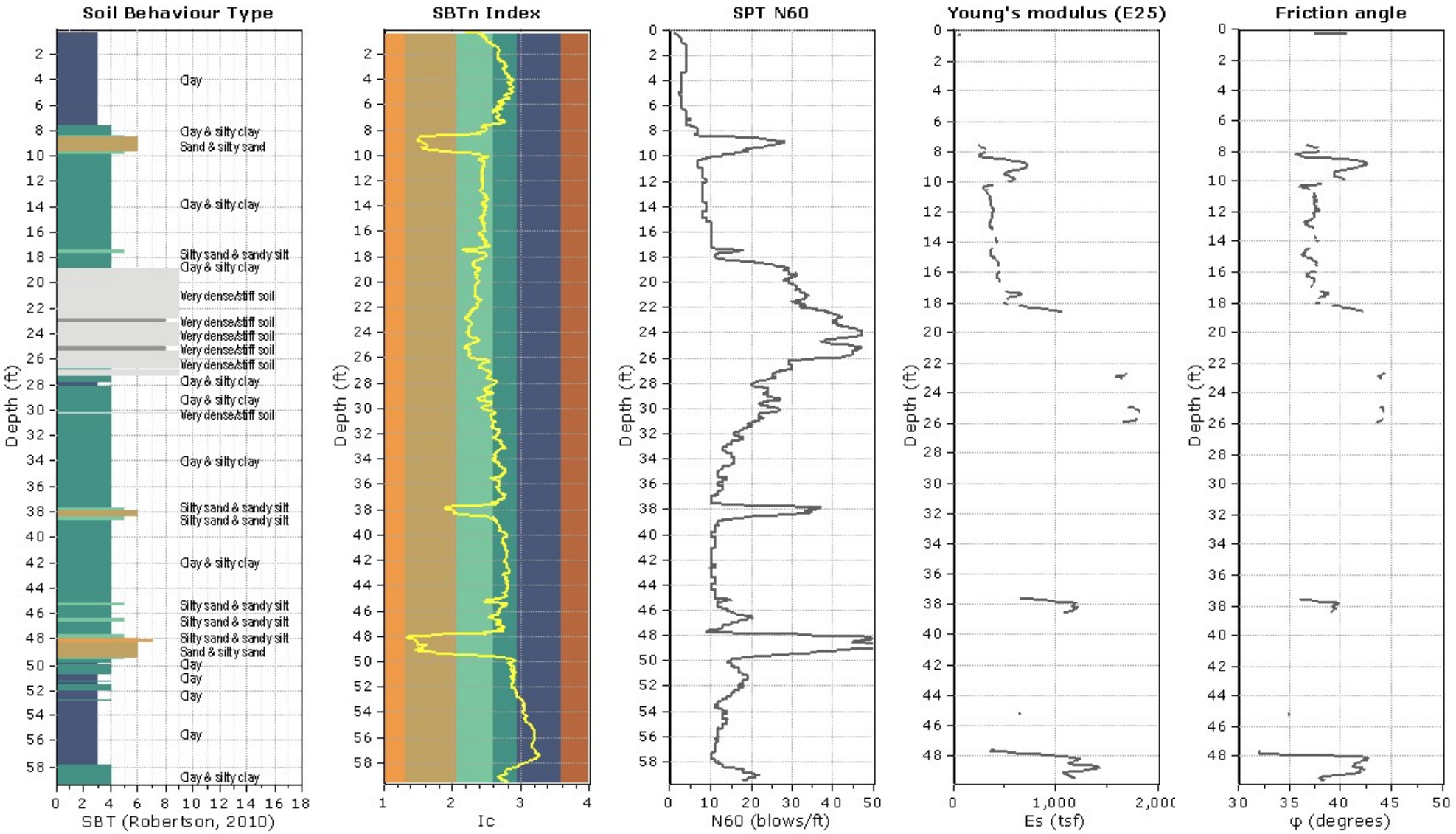
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Cone Type: CPT
Cone Operator: Fugro



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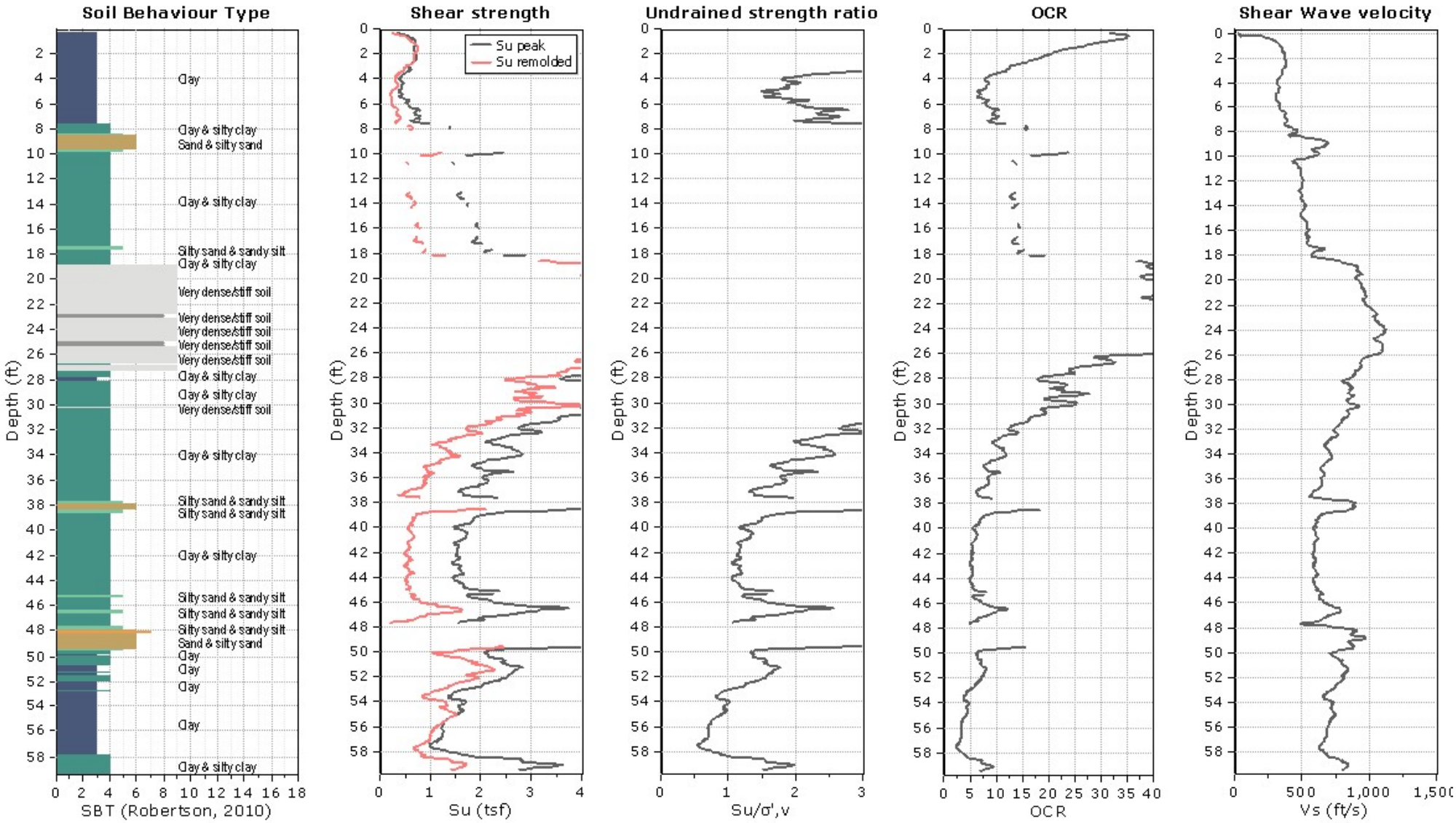
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Cone Operator: Fugro



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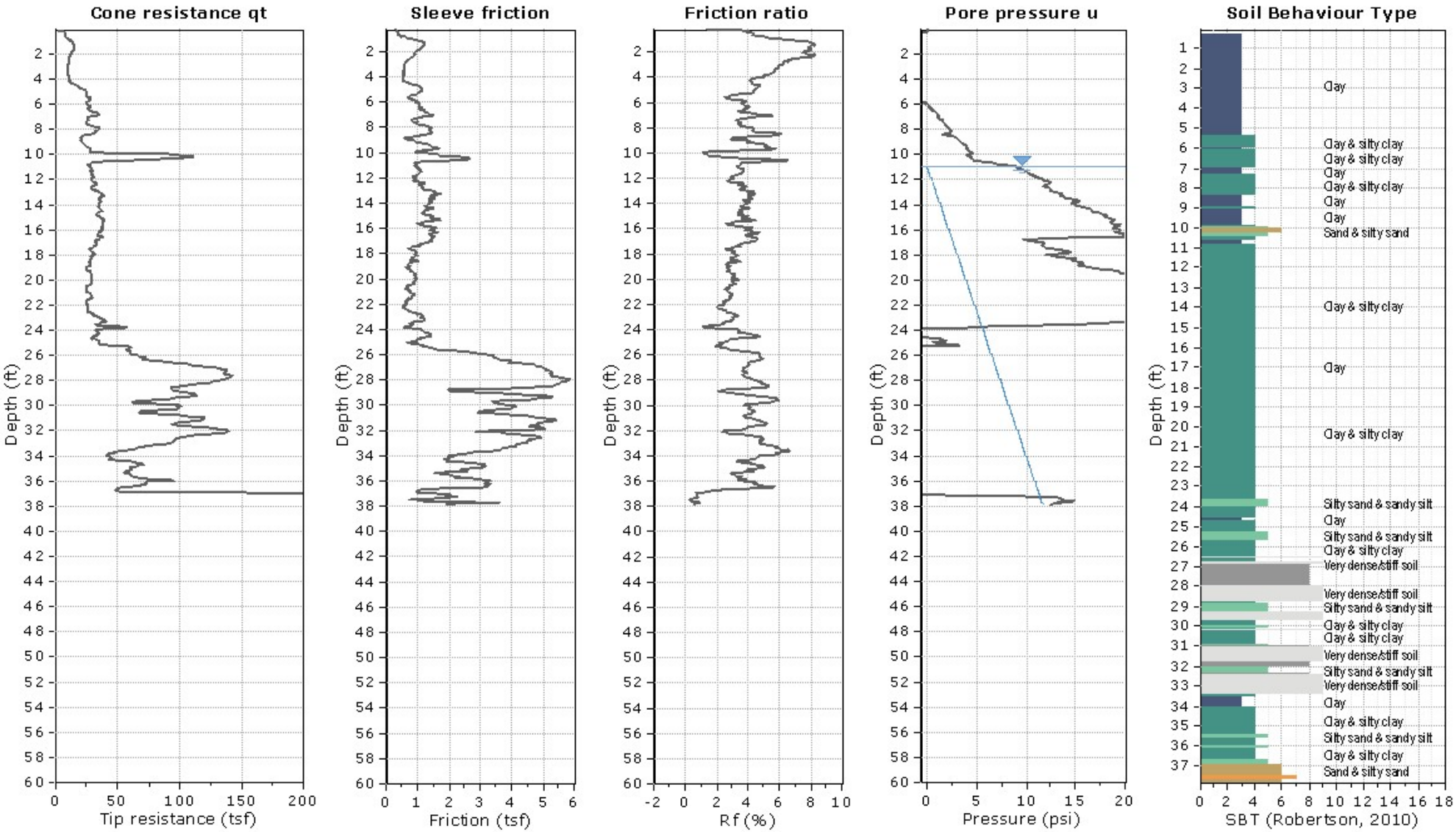
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Cone Operator: Fugro



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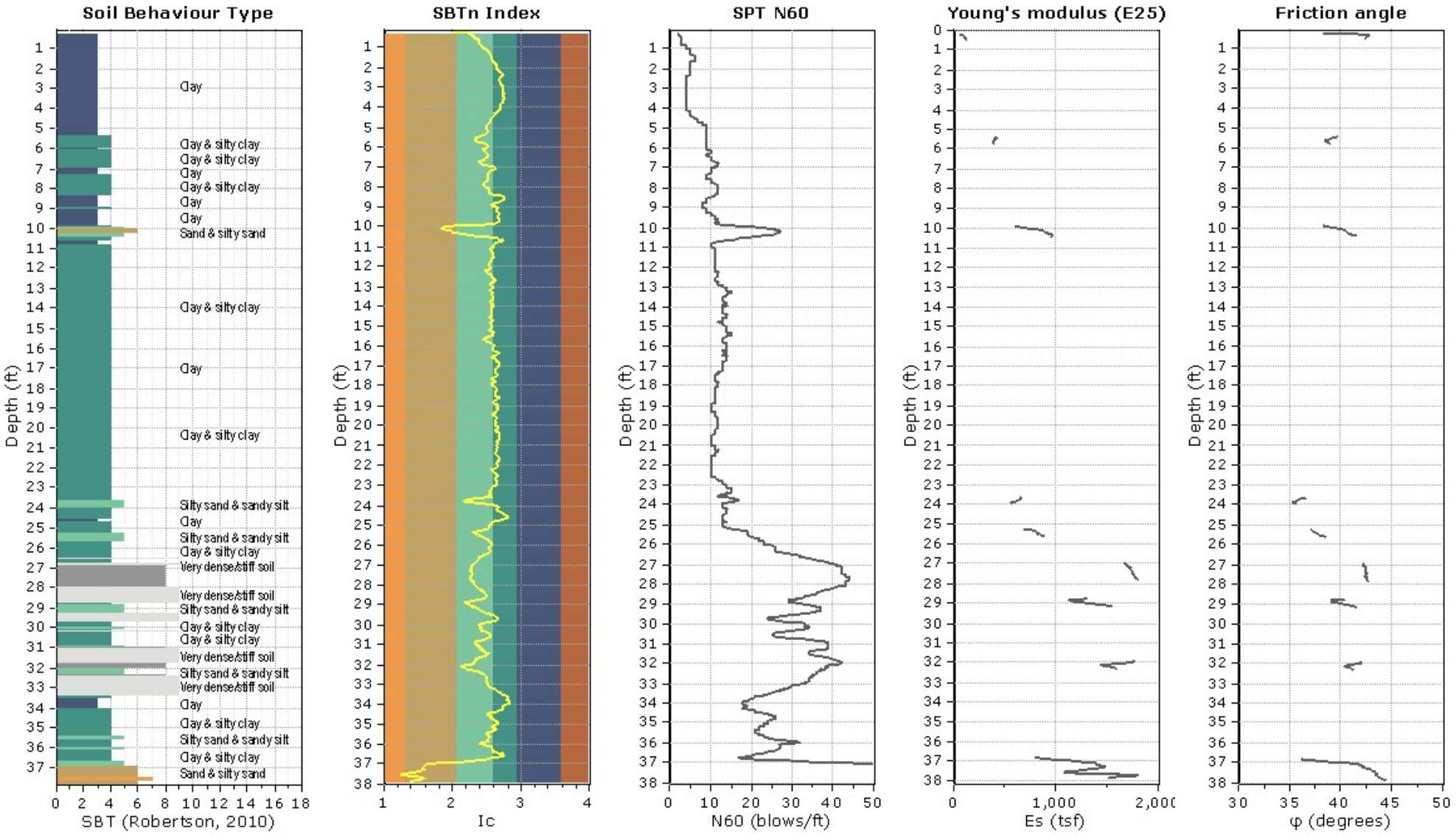
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Cone Type: CPT
Cone Operator: Fugro



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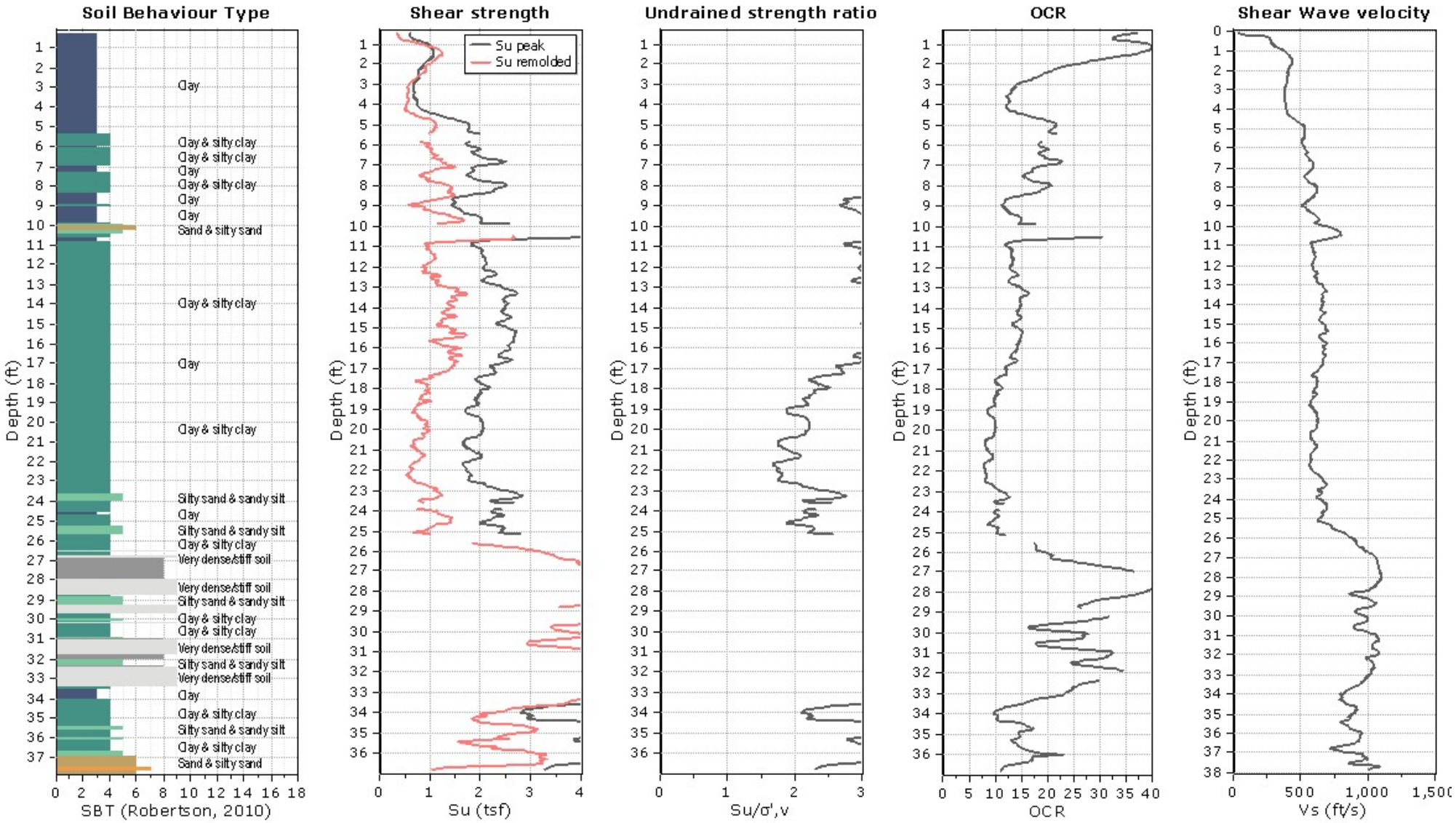
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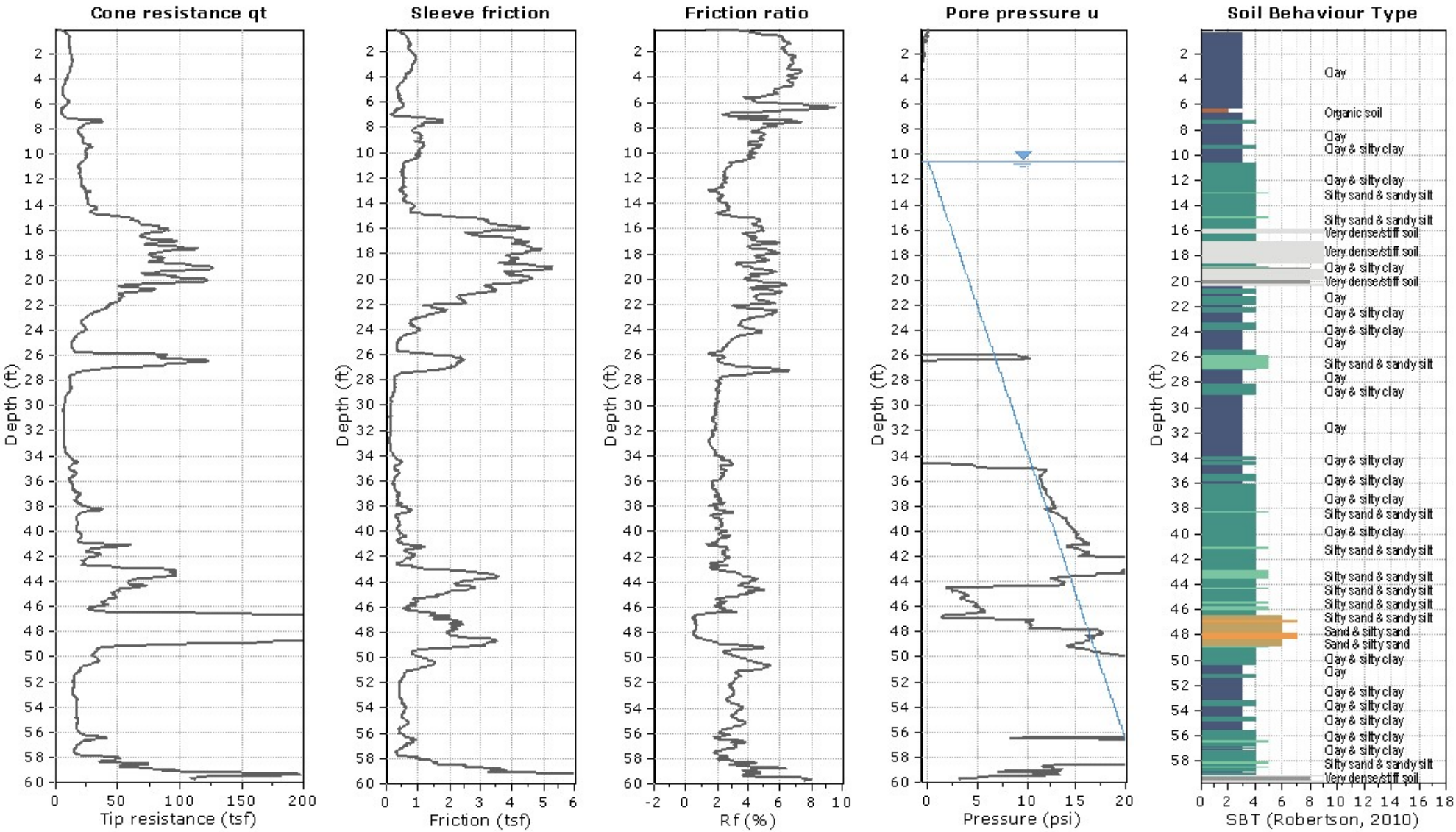
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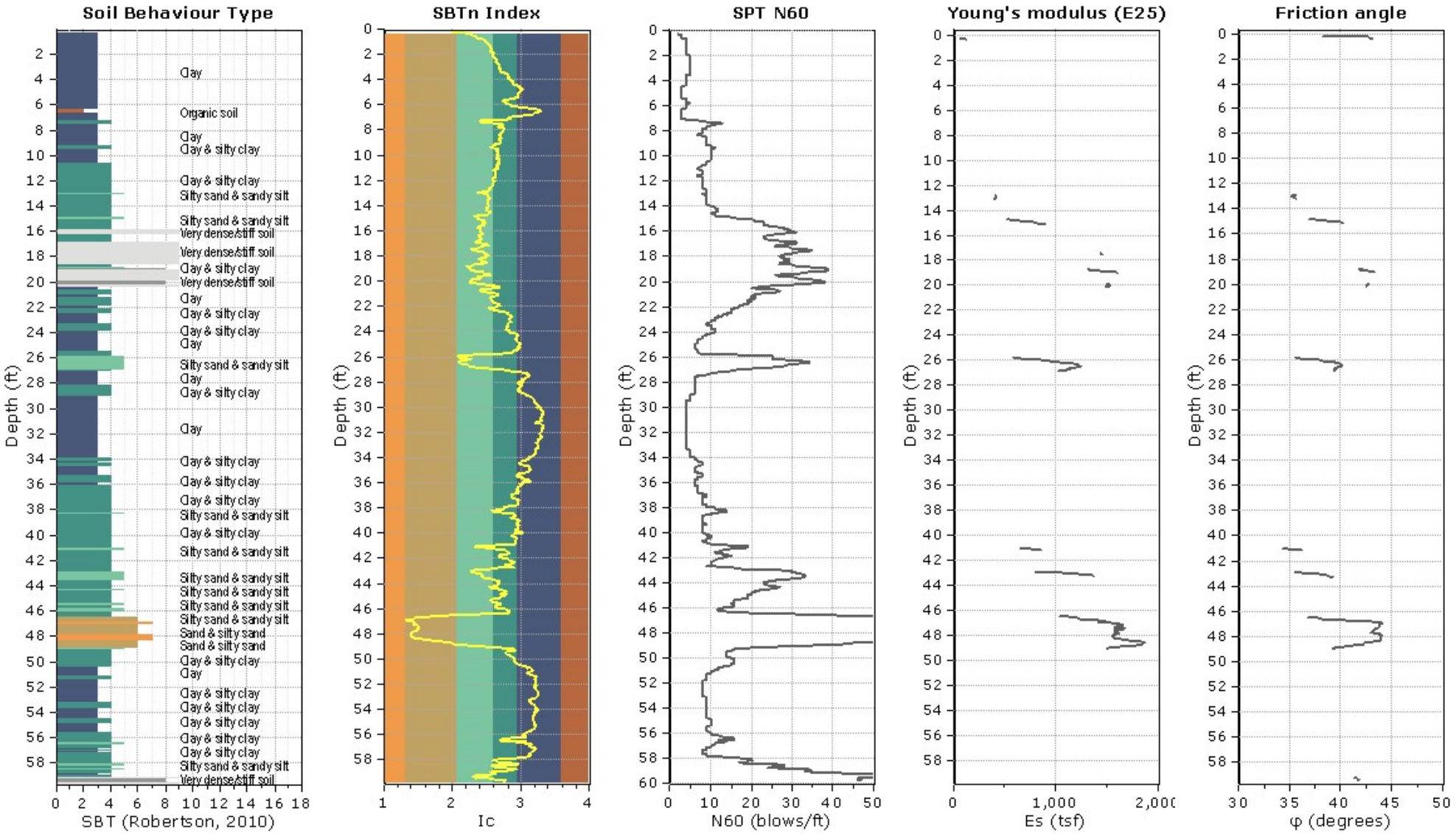
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Cone Type: CPT
Cone Operator: Fugro



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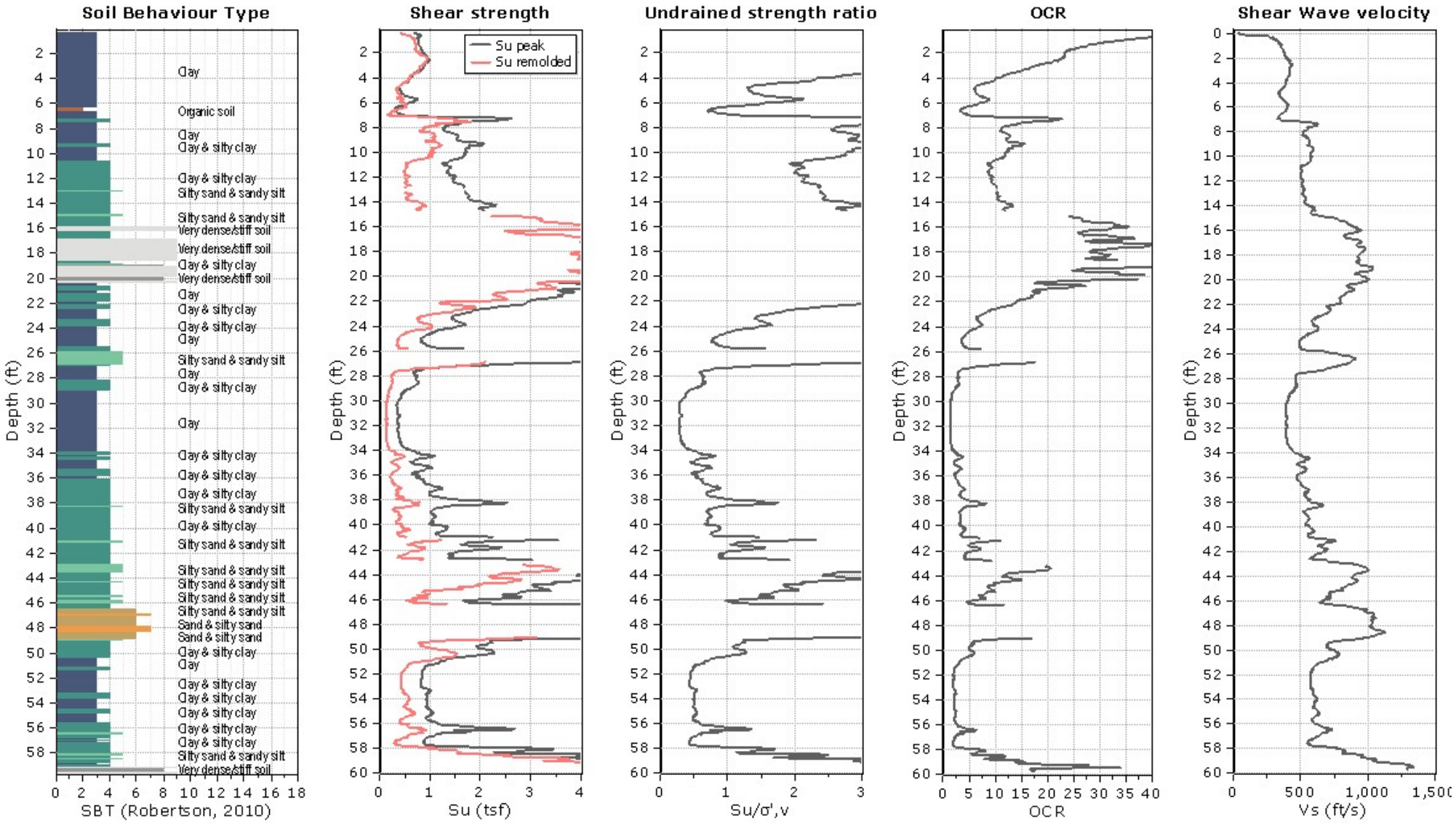
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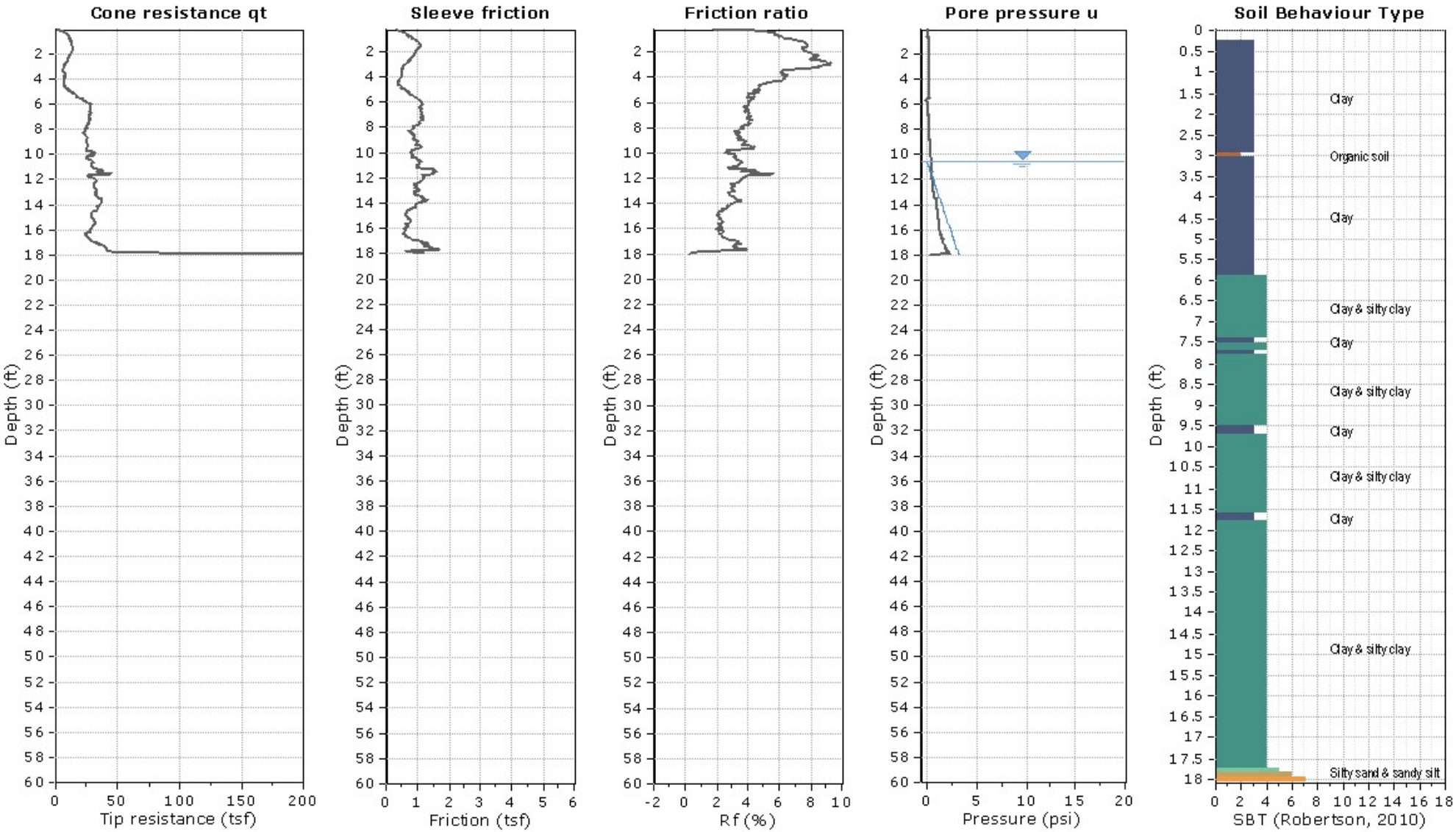
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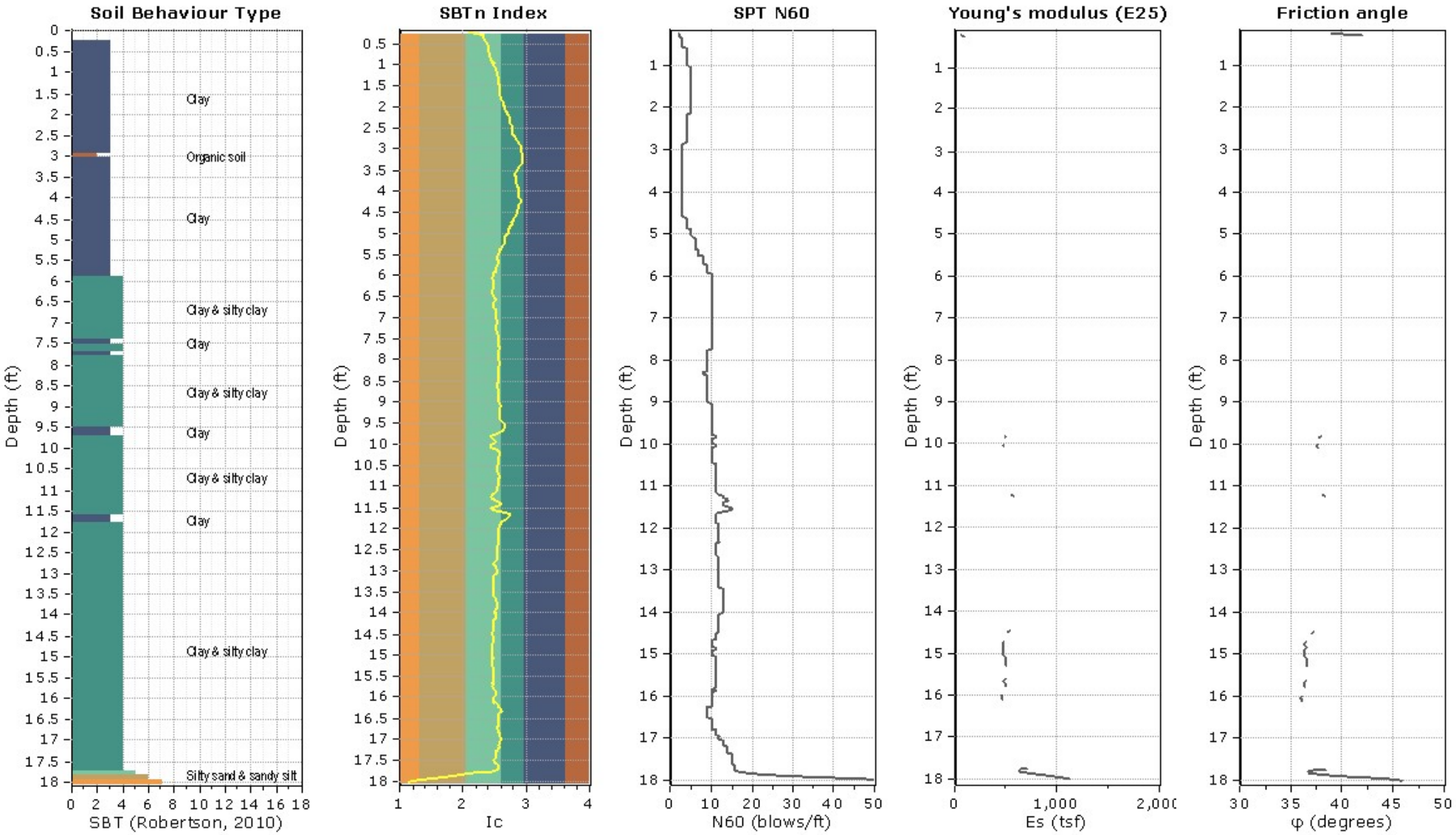
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Coords: lat 39.57327° lon -88.16991°
Cone Type: CPT
Cone Operator: FUGRO



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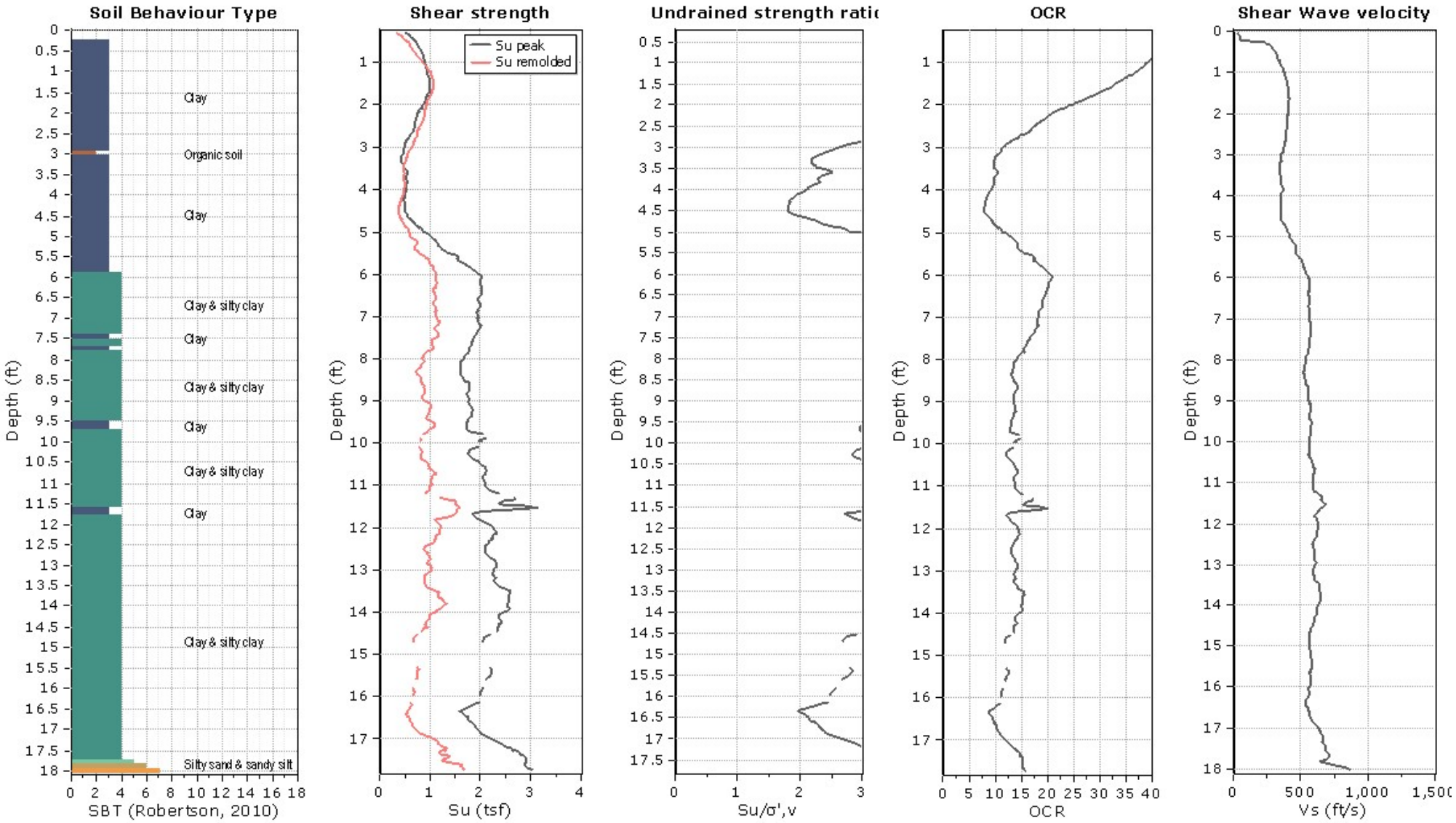
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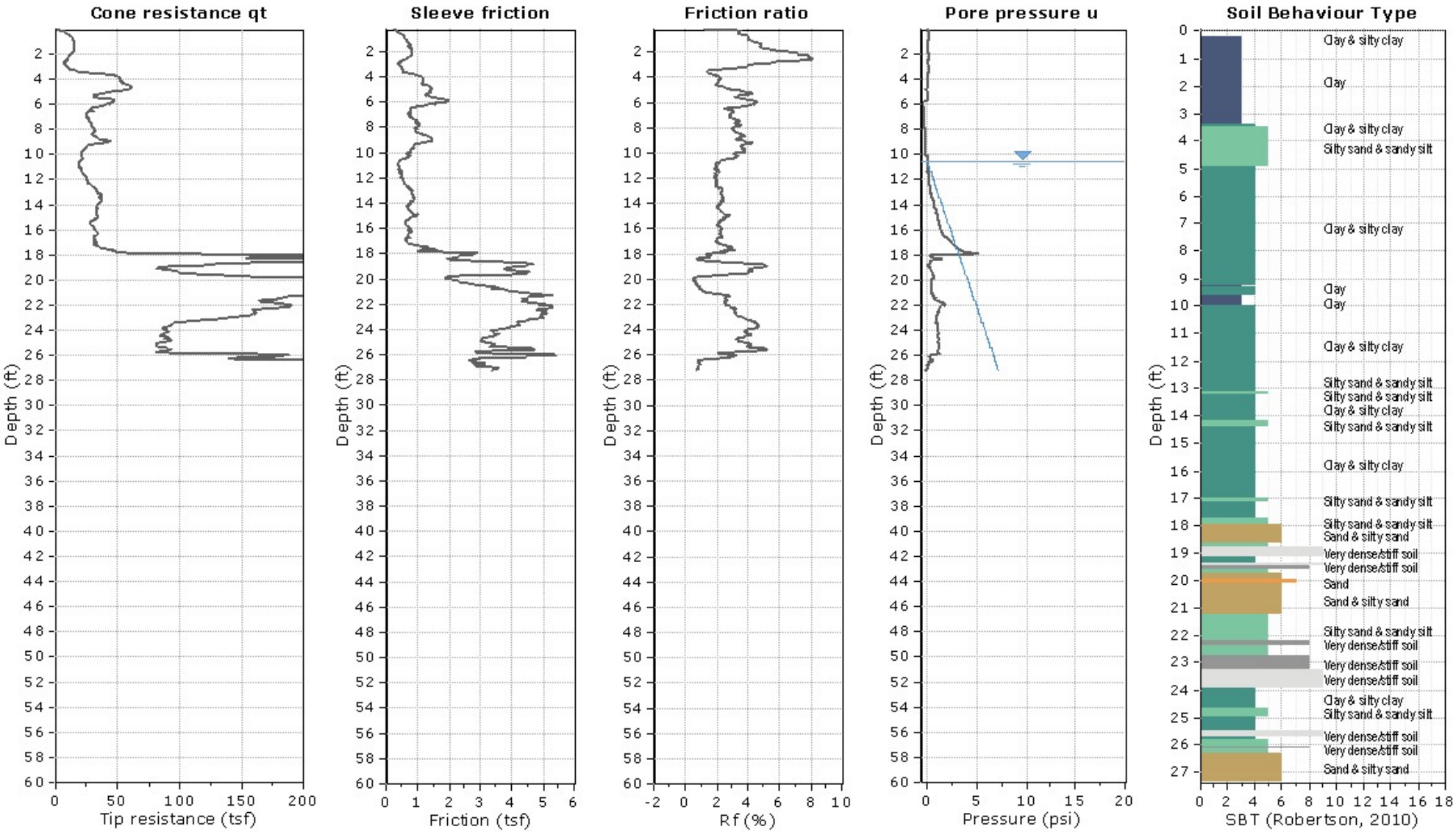
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Cone Operator: FUGRO



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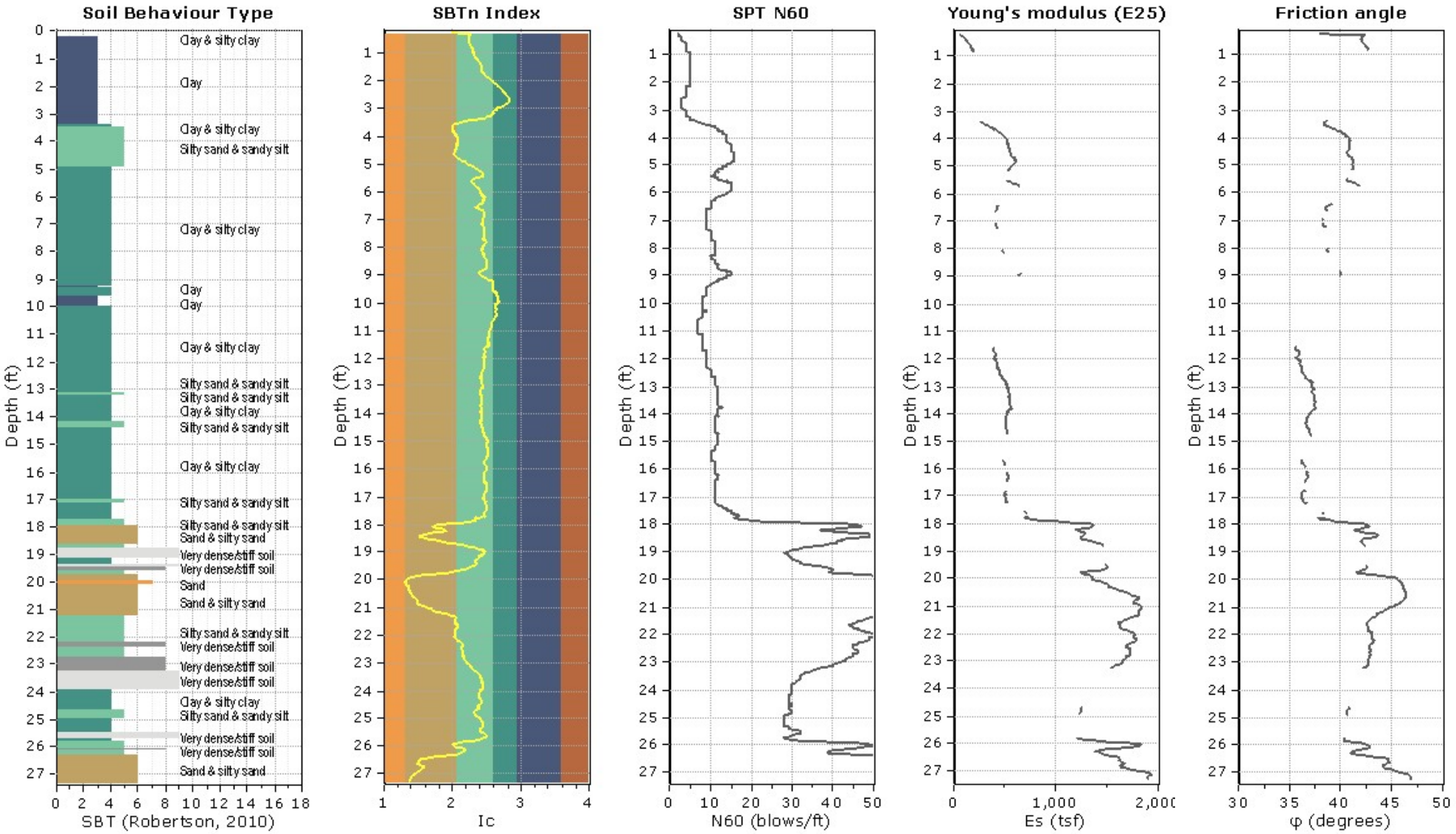
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Coords: lat 39.57327° lon -88.16991°
Cone Type: CPT
Cone Operator: FUGRO



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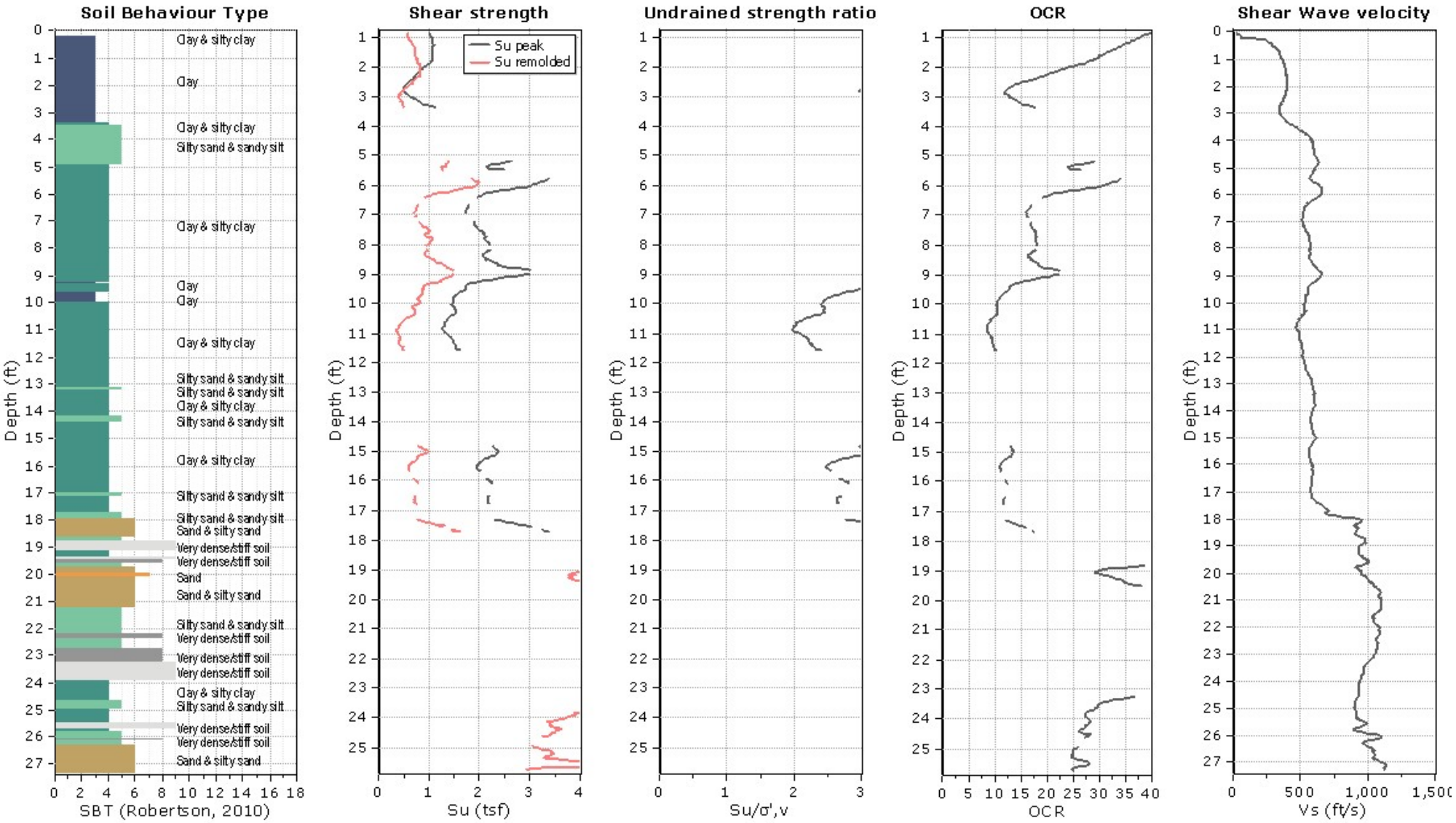
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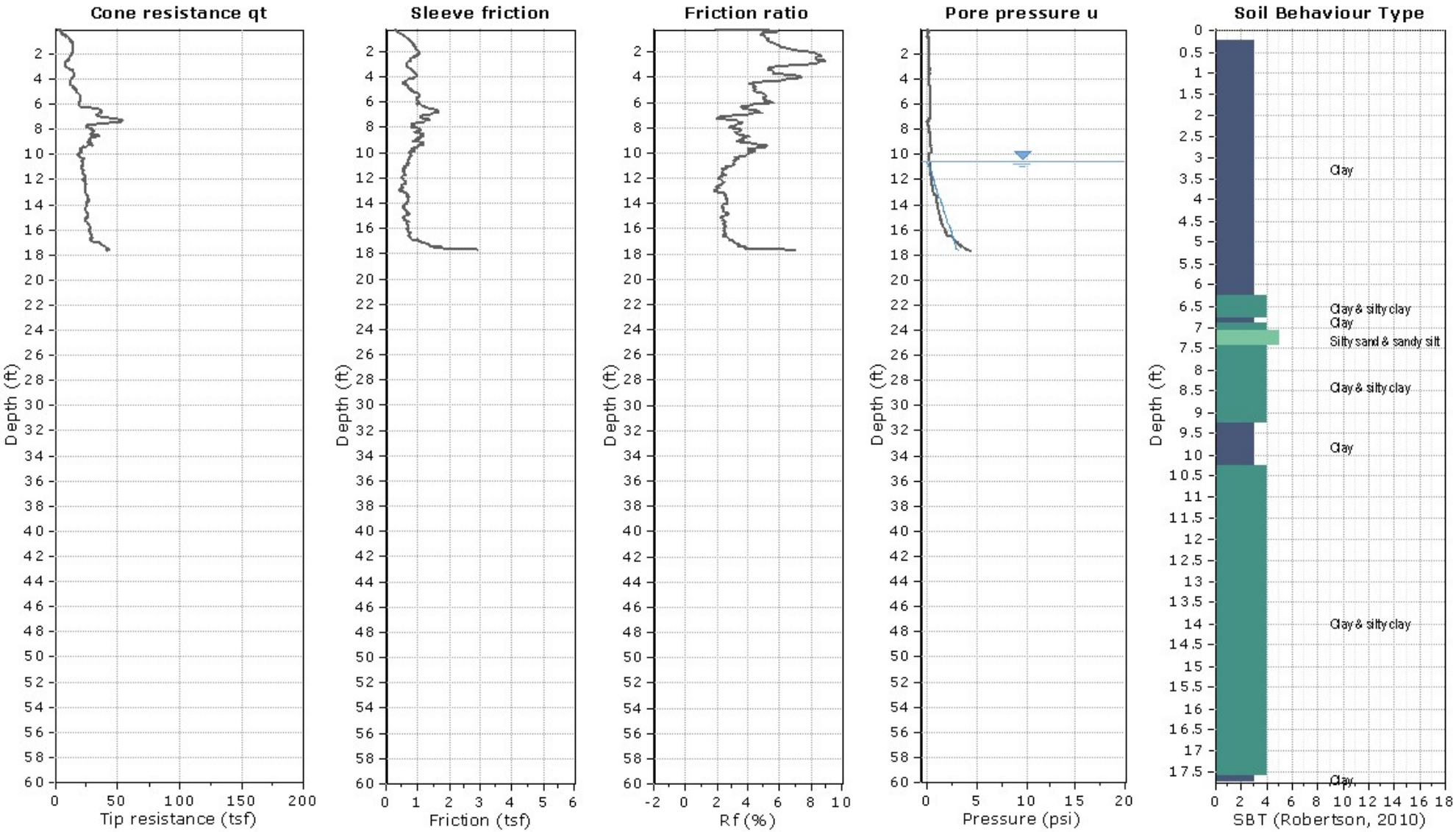
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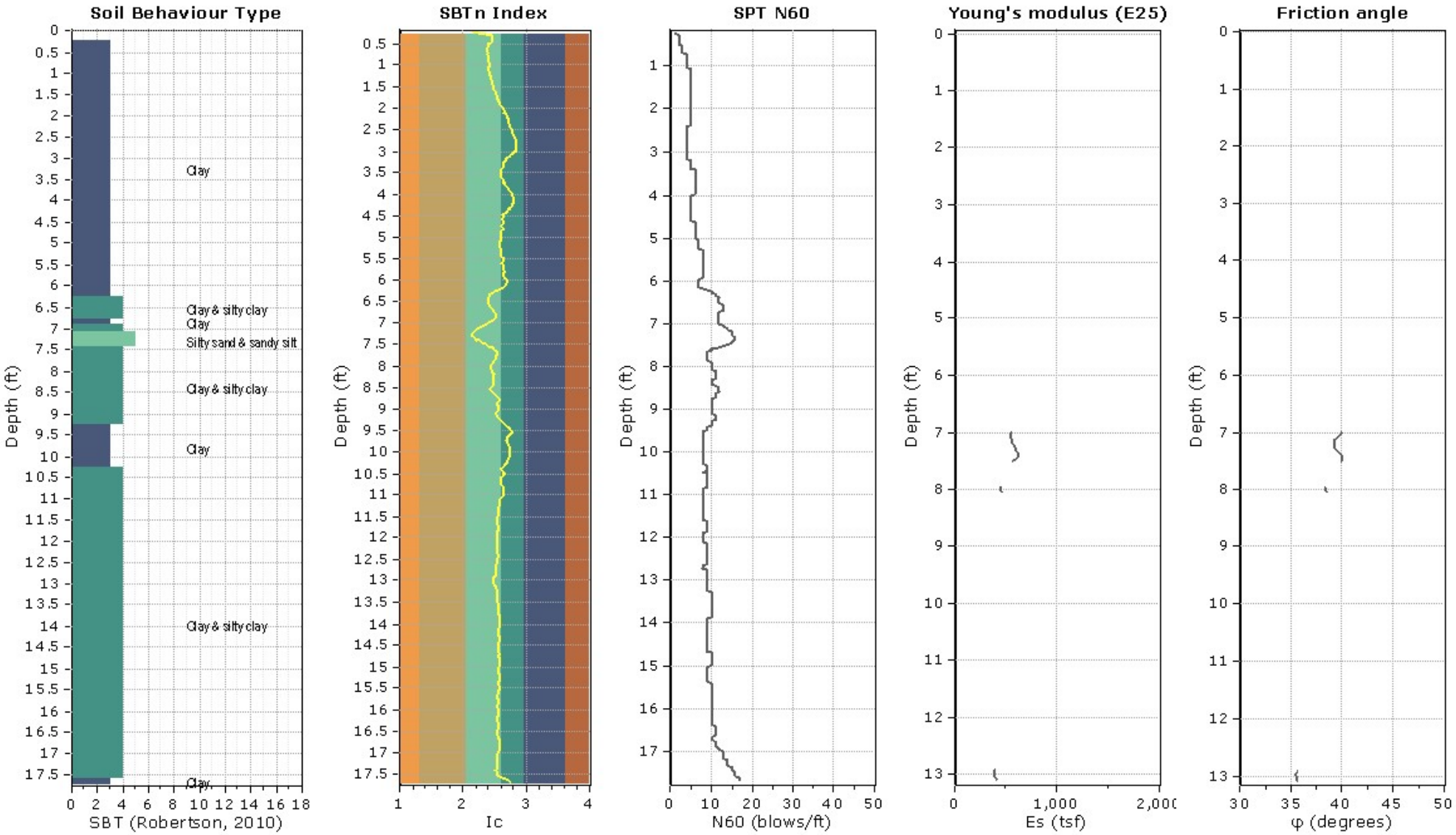
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Coords: lat 39.57327° lon -88.16991°
Cone Type: CPT
Cone Operator: FUGRO



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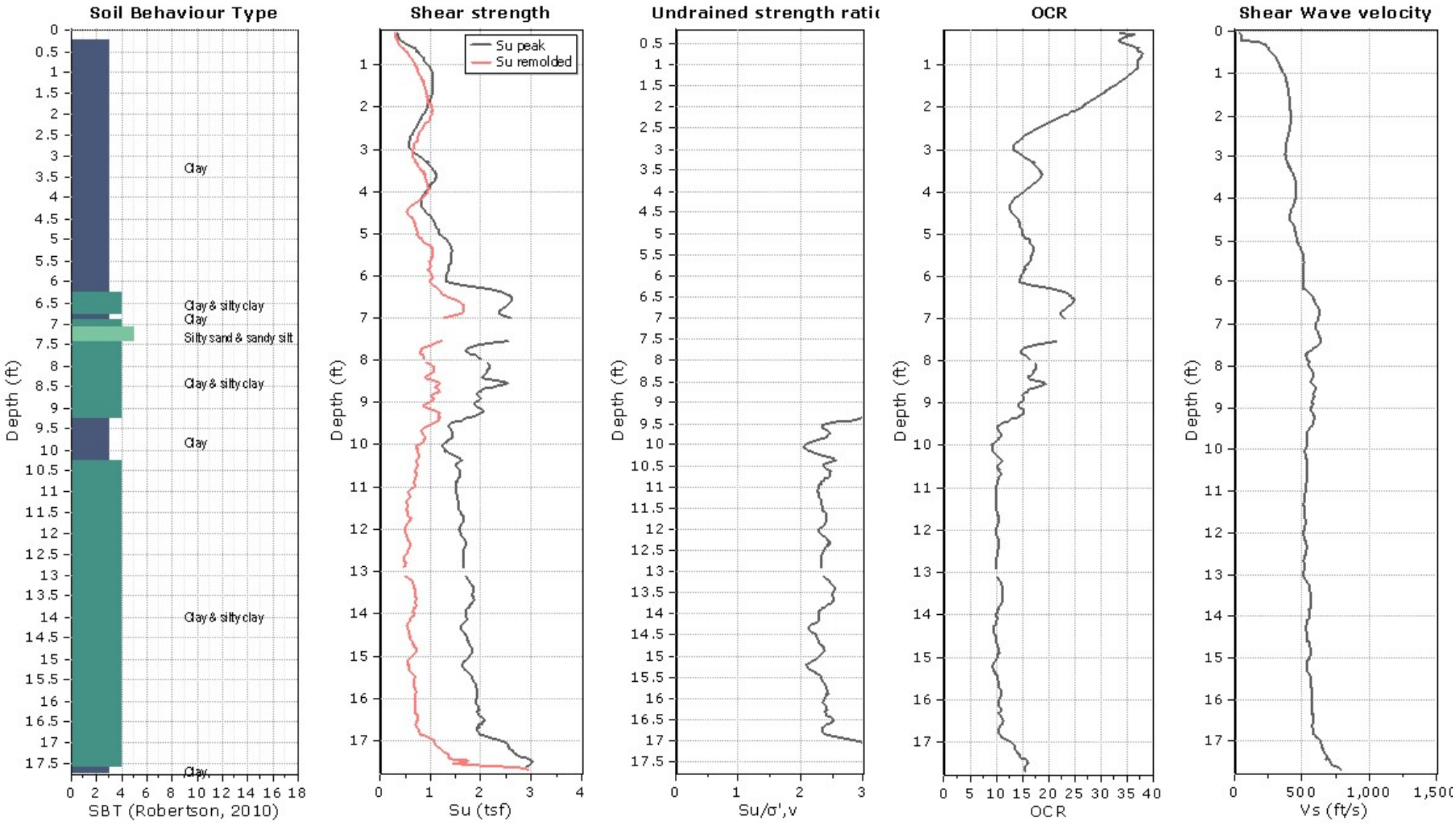
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Coords: lat 39.57327° lon -88.16991°
Cone Type: CPT
Cone Operator: FUGRO



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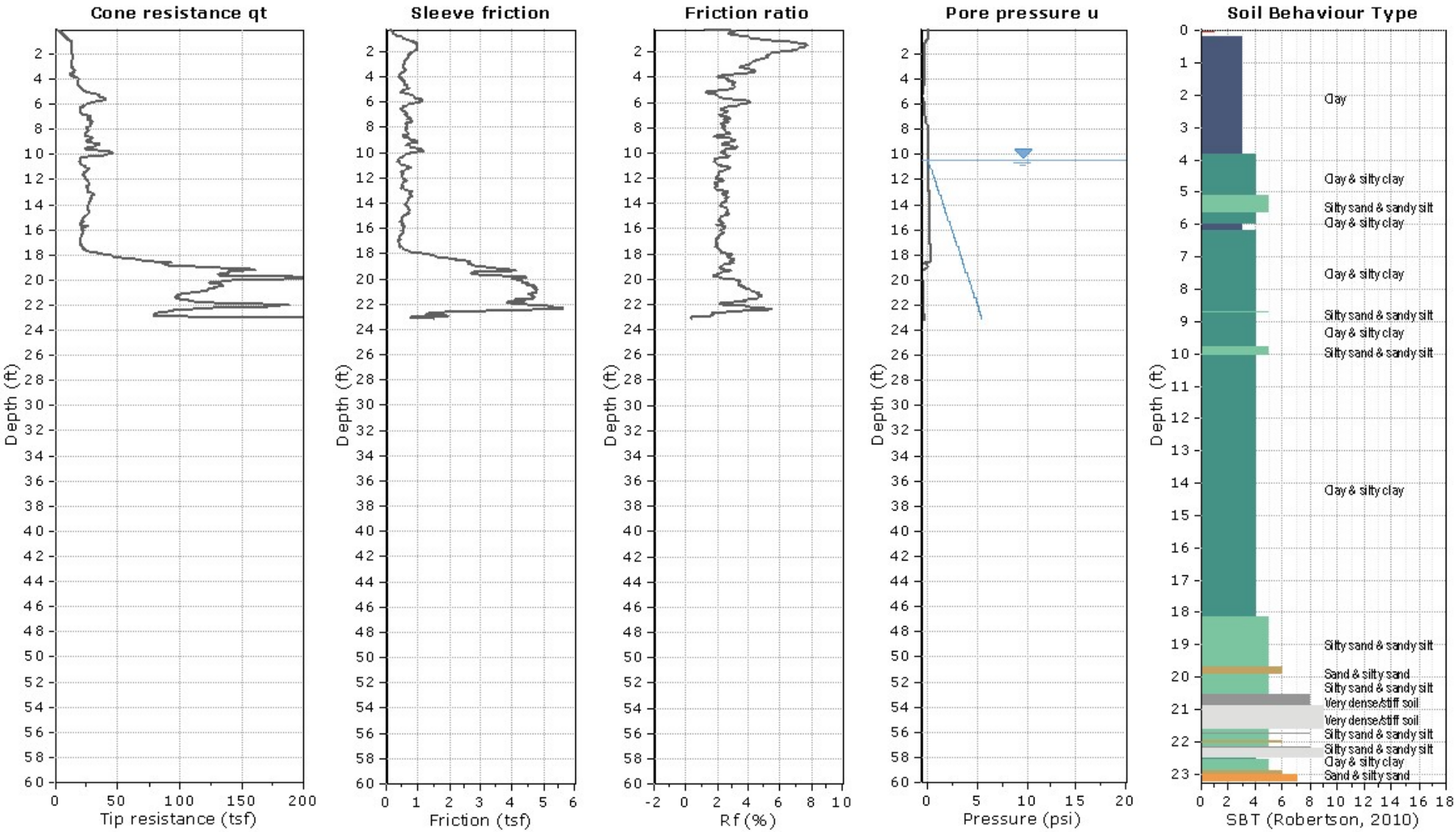
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Cone Operator: FUGRO



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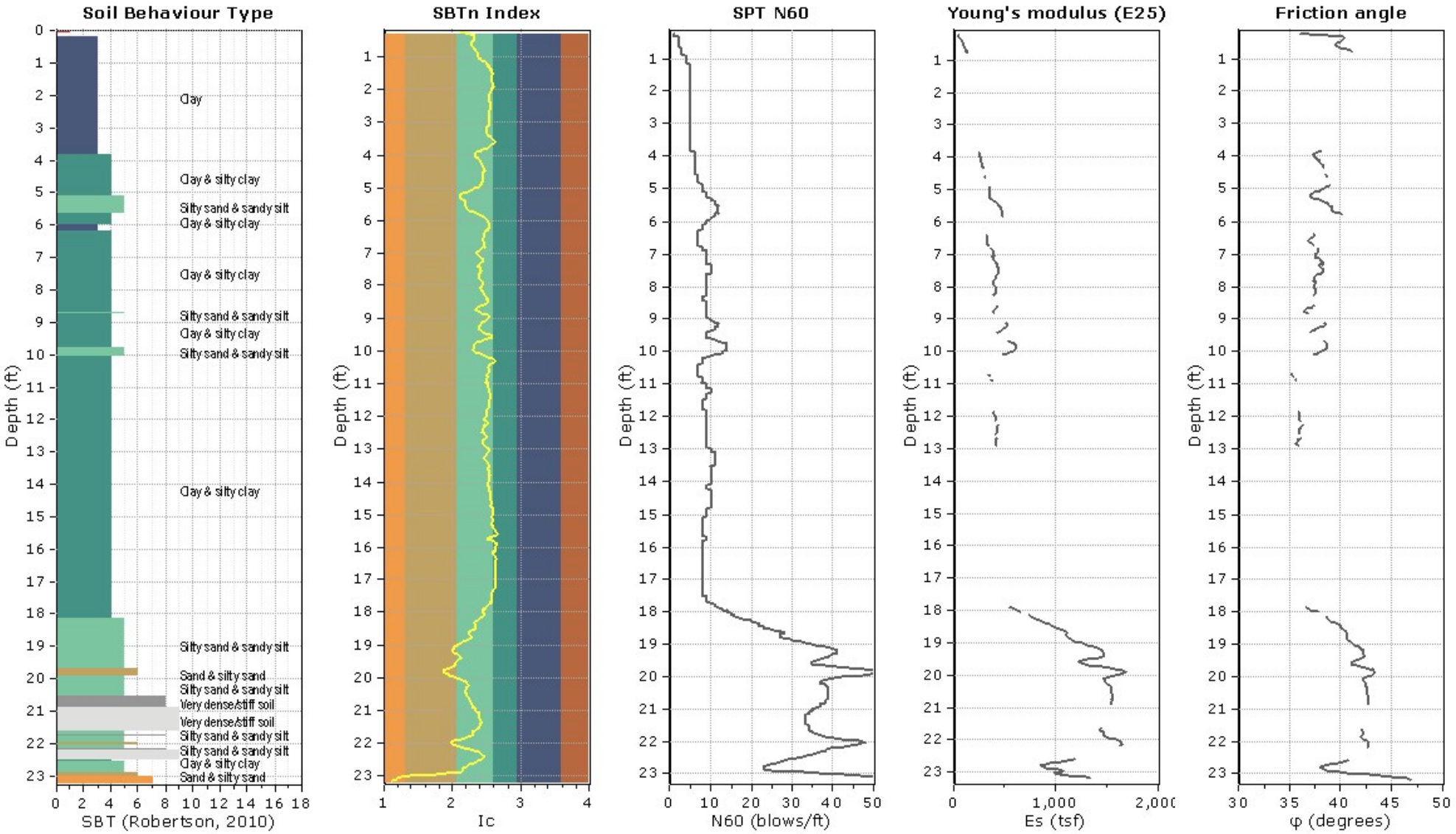
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Cone Type: CPT
Cone Operator: FUGRO



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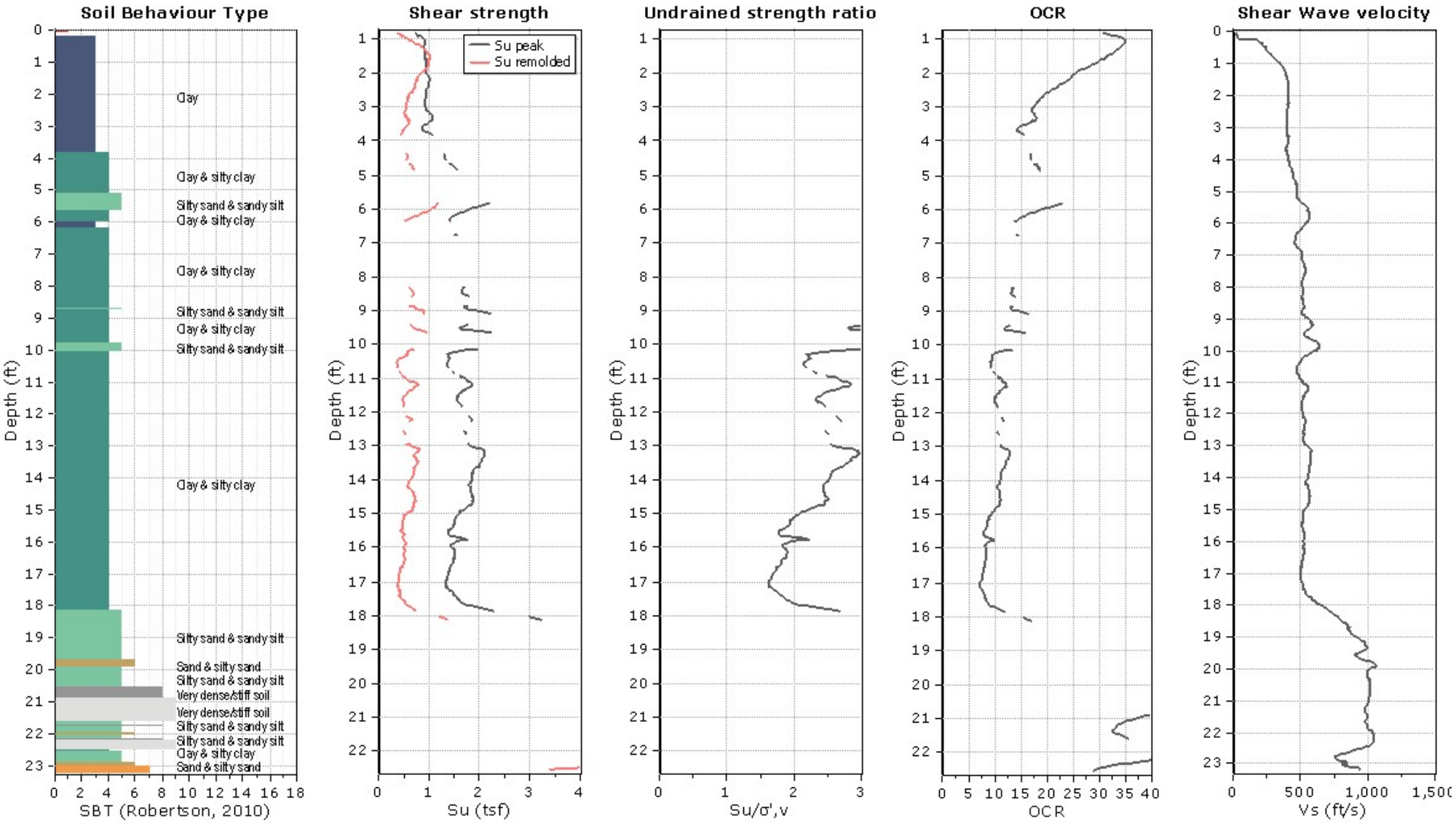
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Coords: lat 39.565394° lon -88.152425°
Cone Type: CPT
Cone Operator: FUGRO



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Project: **Coles Wind**
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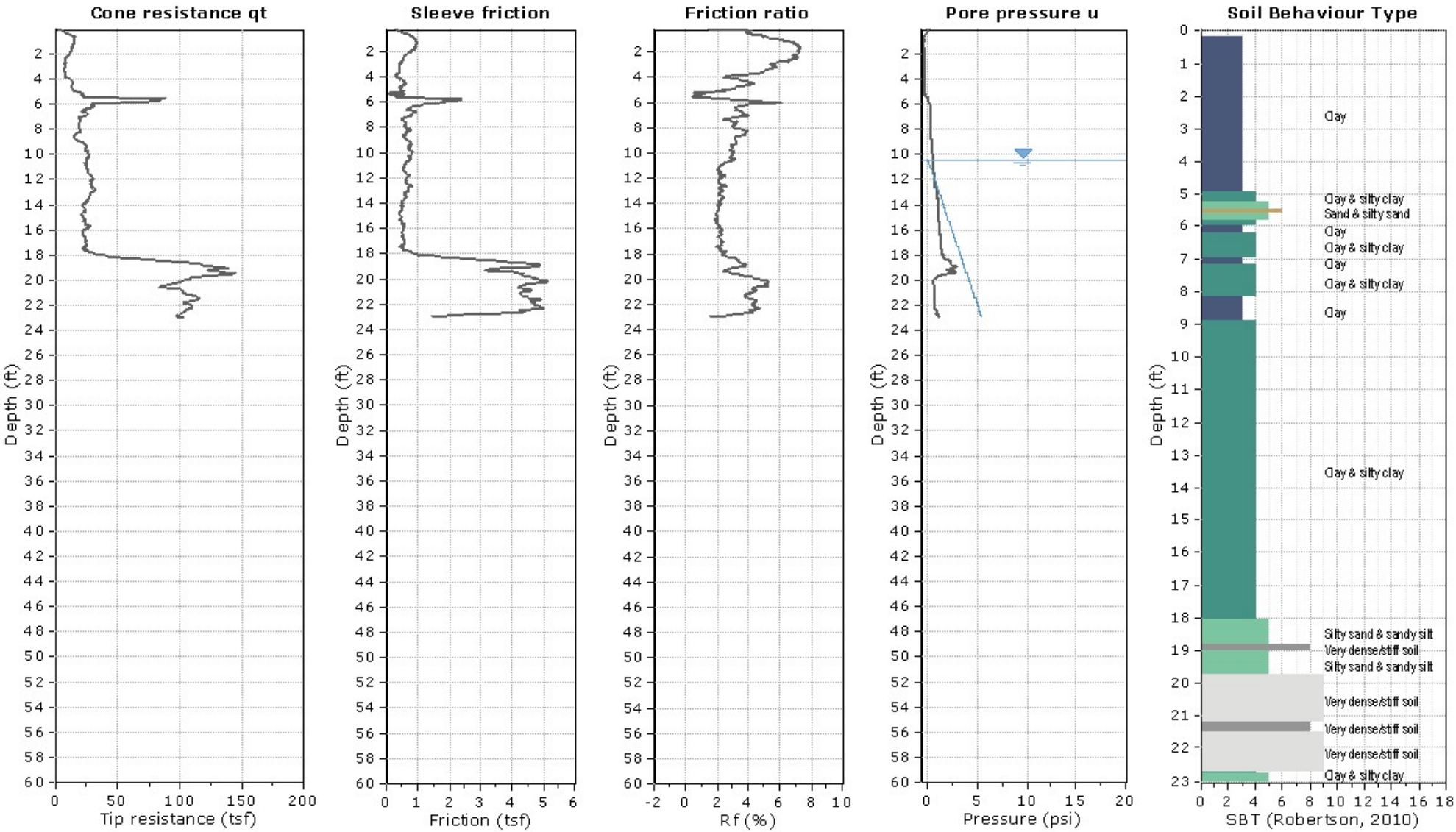
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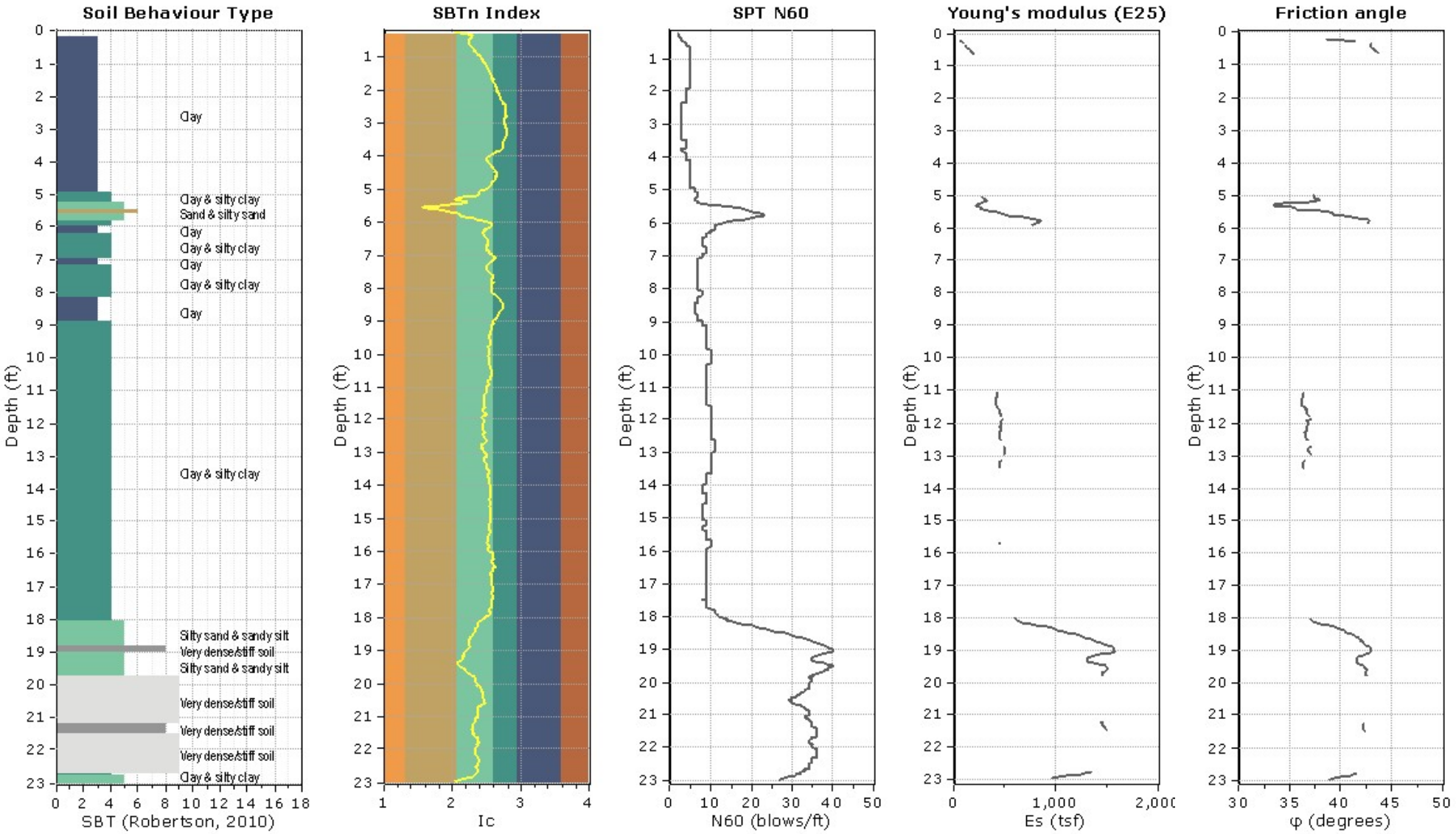
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Cone Type: CPT
Cone Operator: FUGRO



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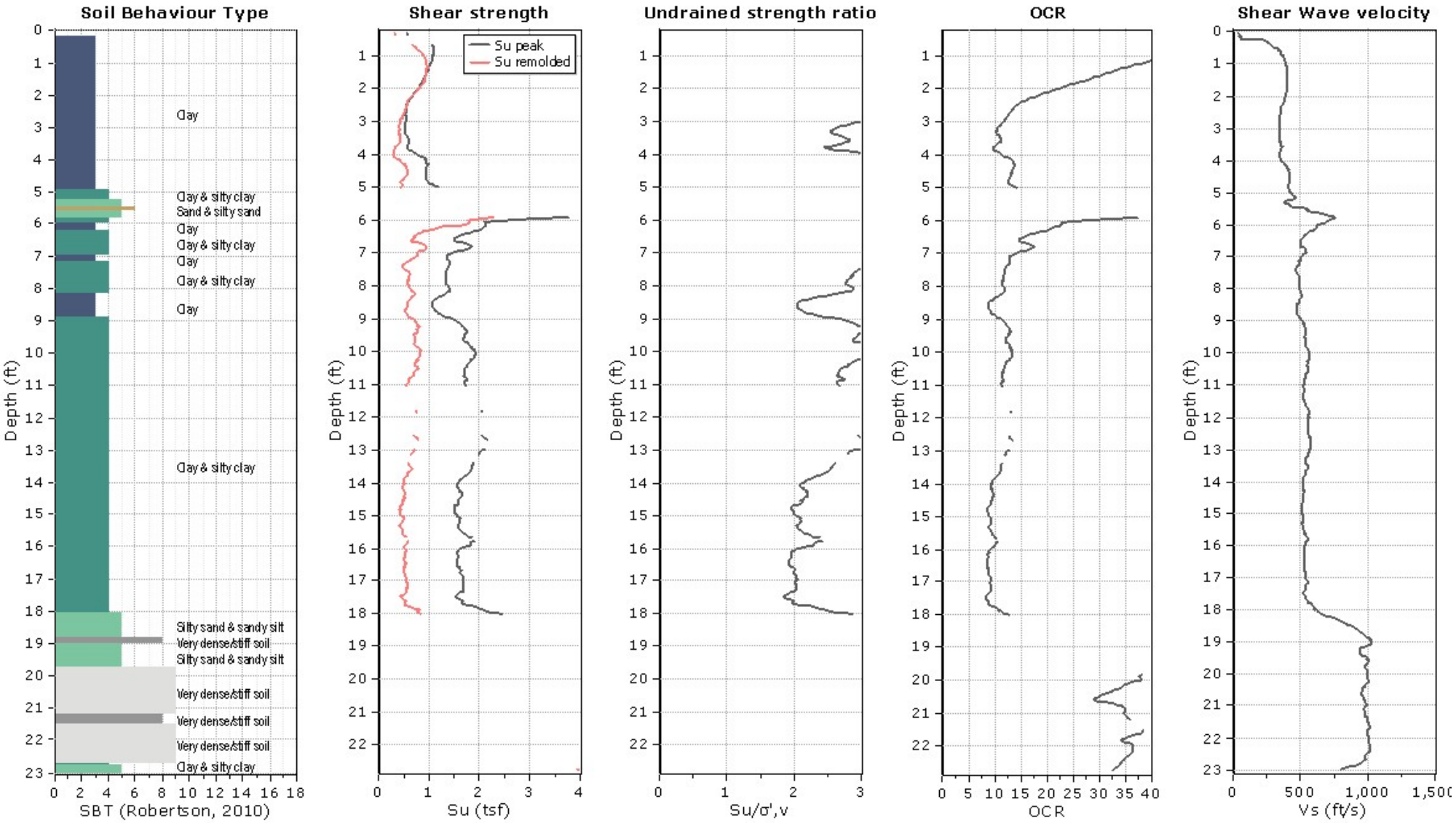
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Cone Type: CPT
Cone Operator: FUGRO



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Cone Operator: FUGRO

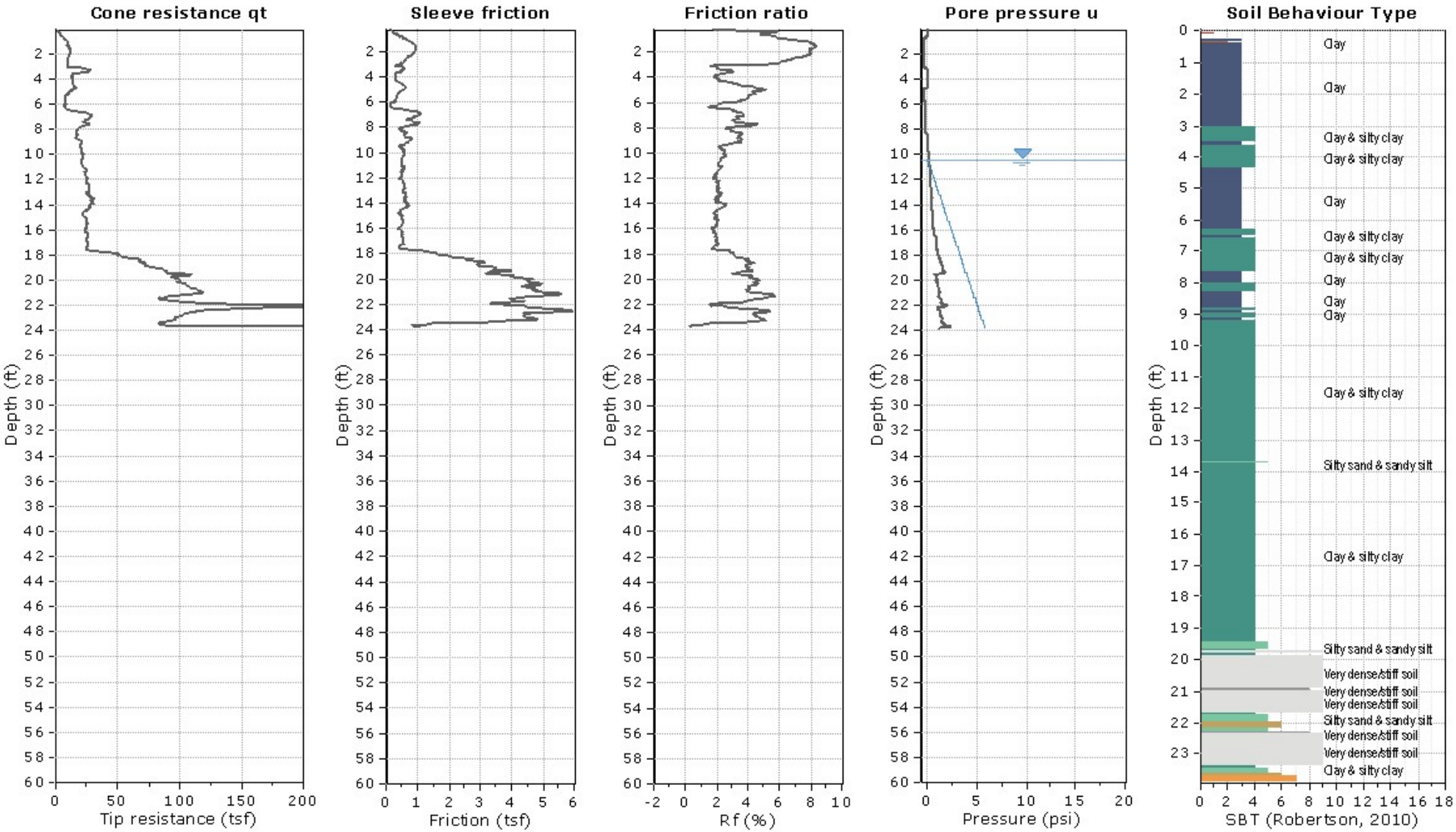
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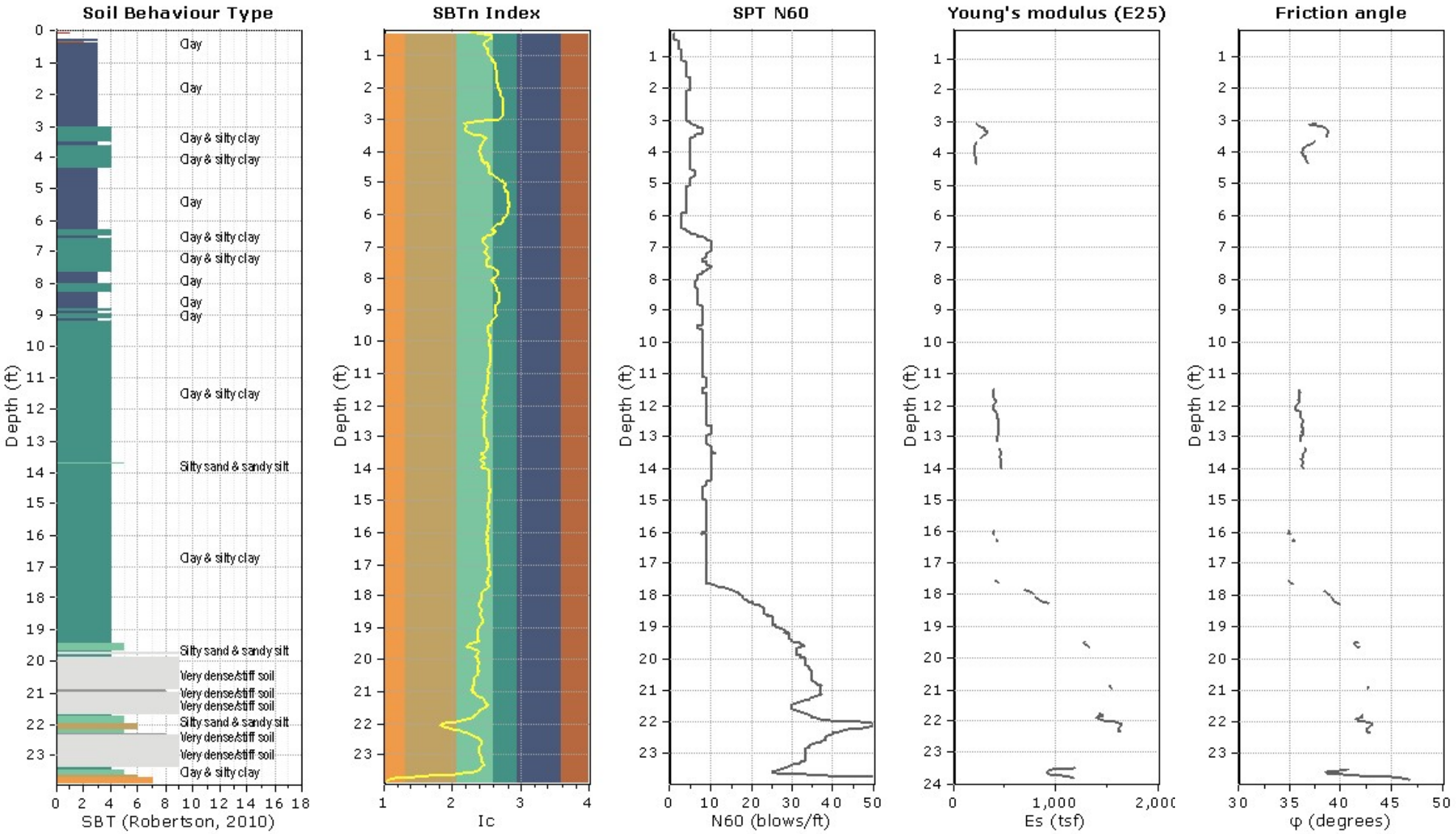
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Cone Type: CPT
Cone Operator: LURGO



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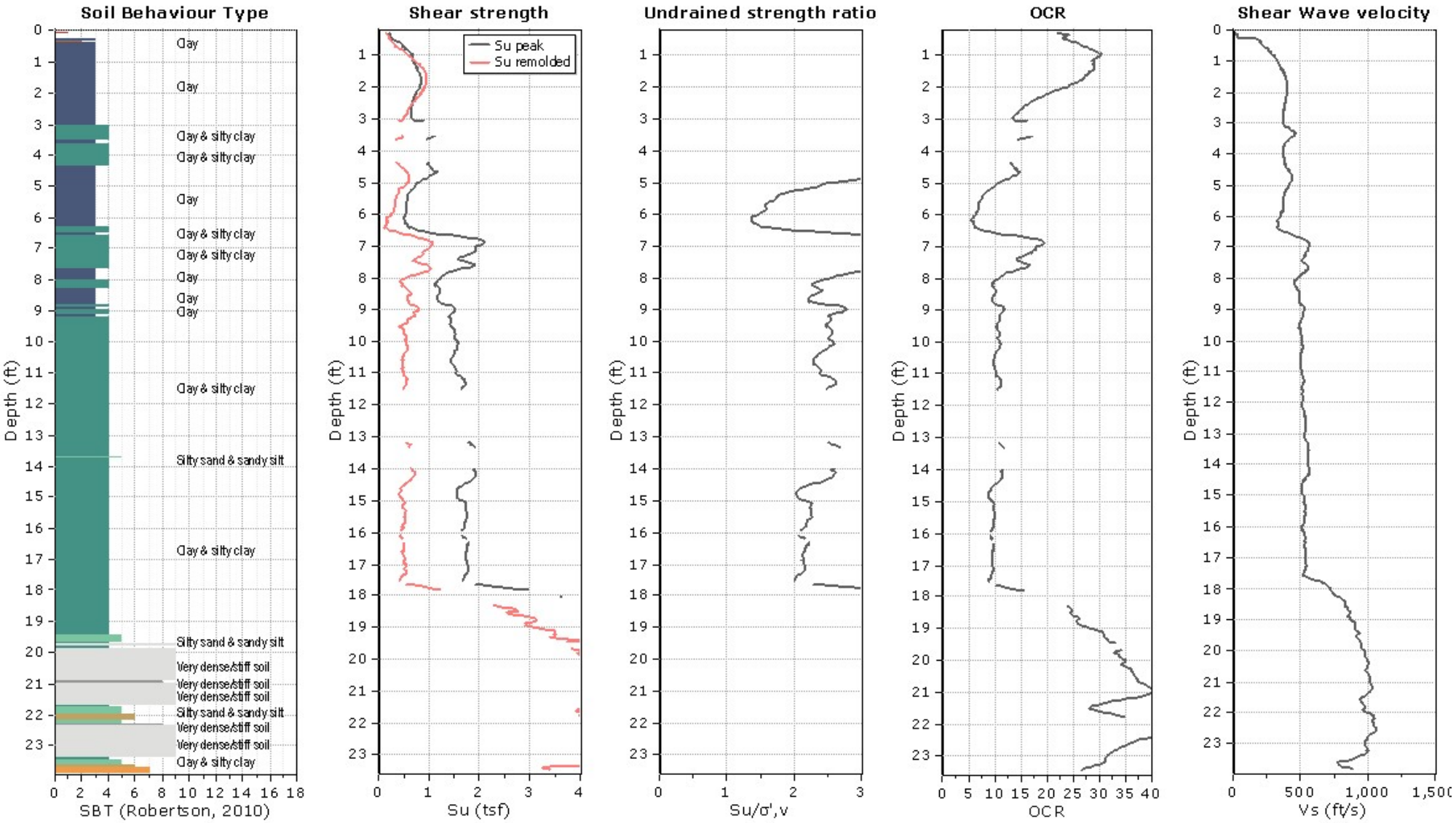
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Cone Type: CPT
Cone Operator: LURGO



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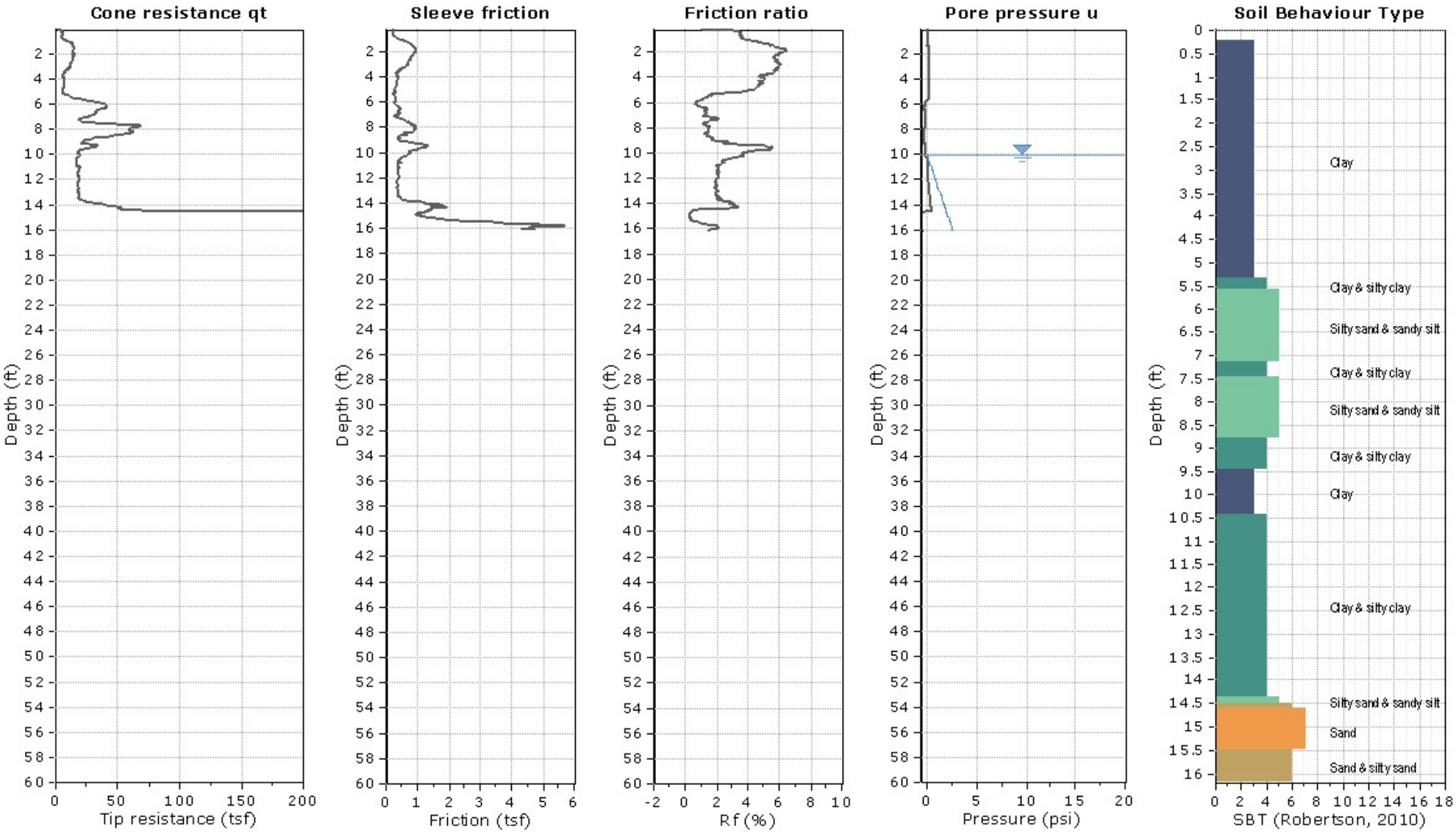
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Cone Type: CPT
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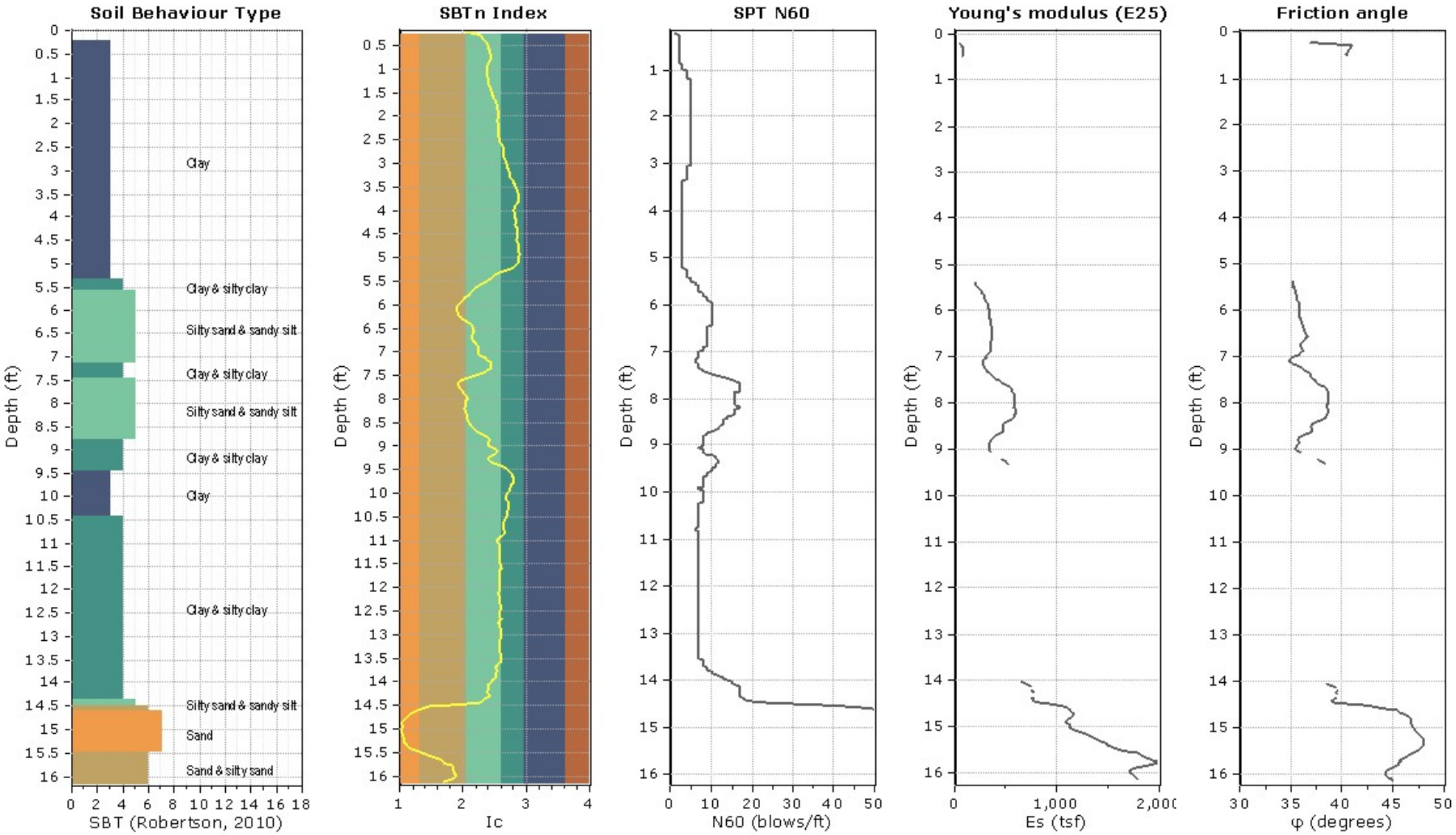
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Cone Type: CPT
Cone Operator:



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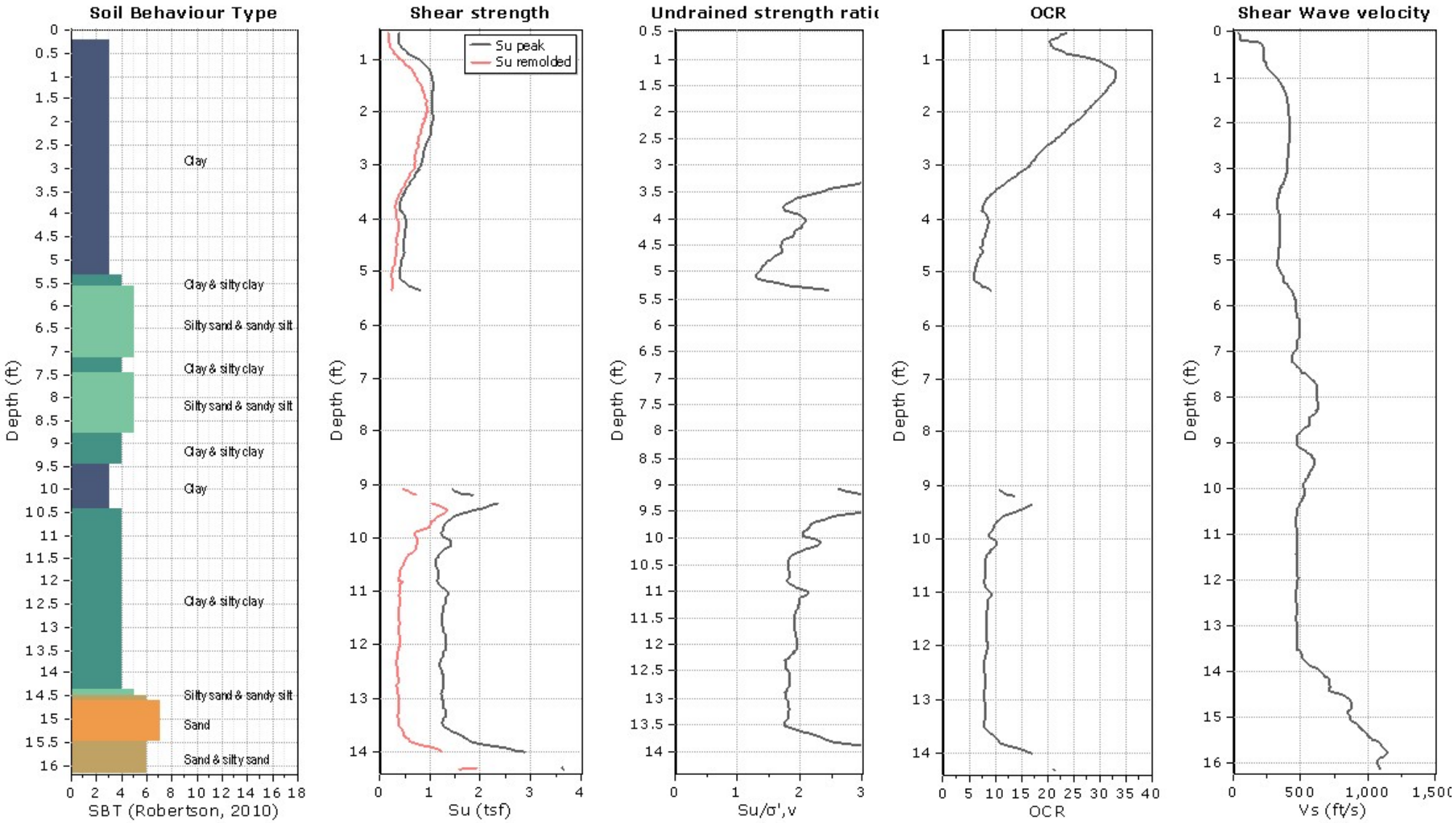
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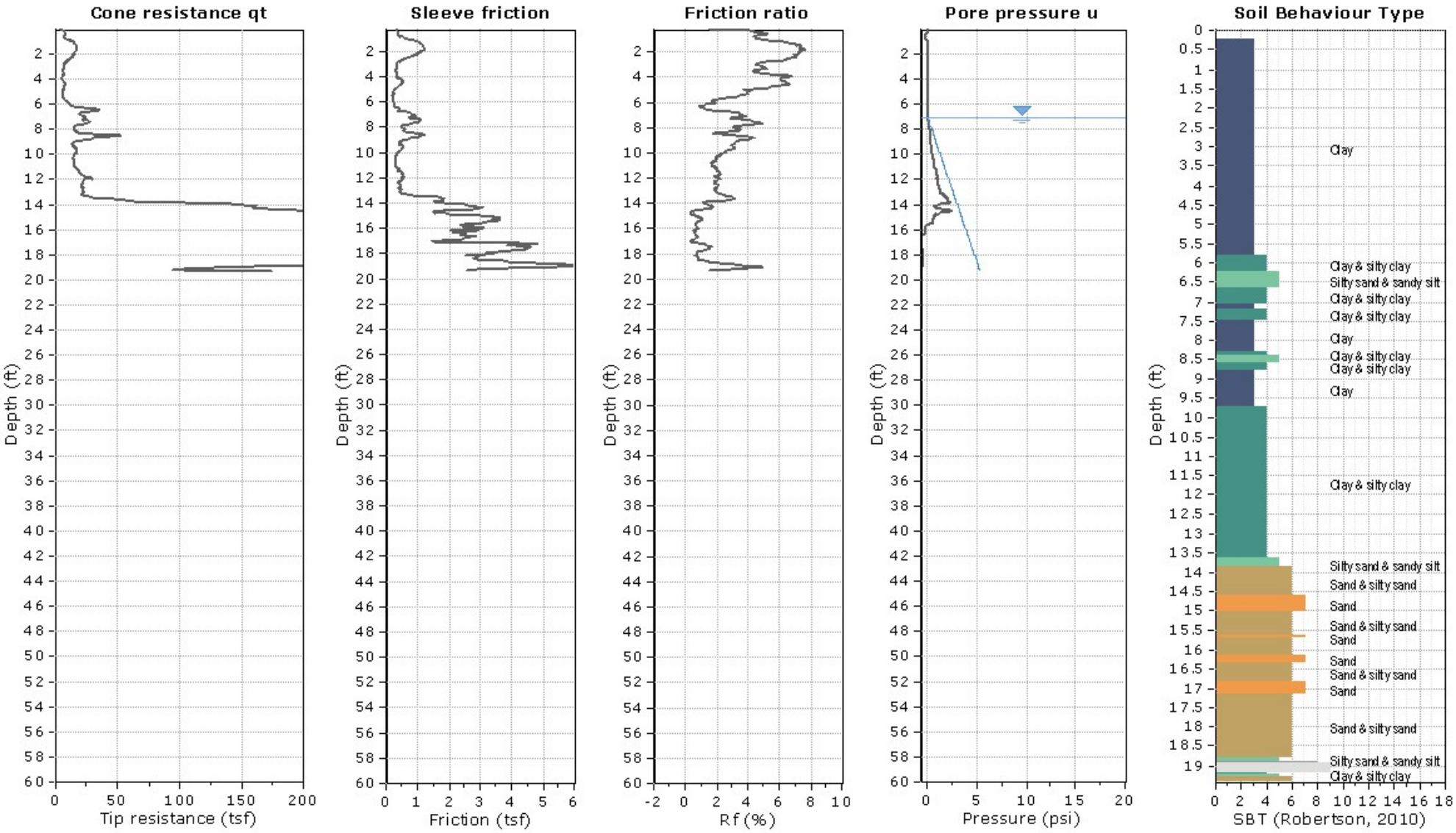
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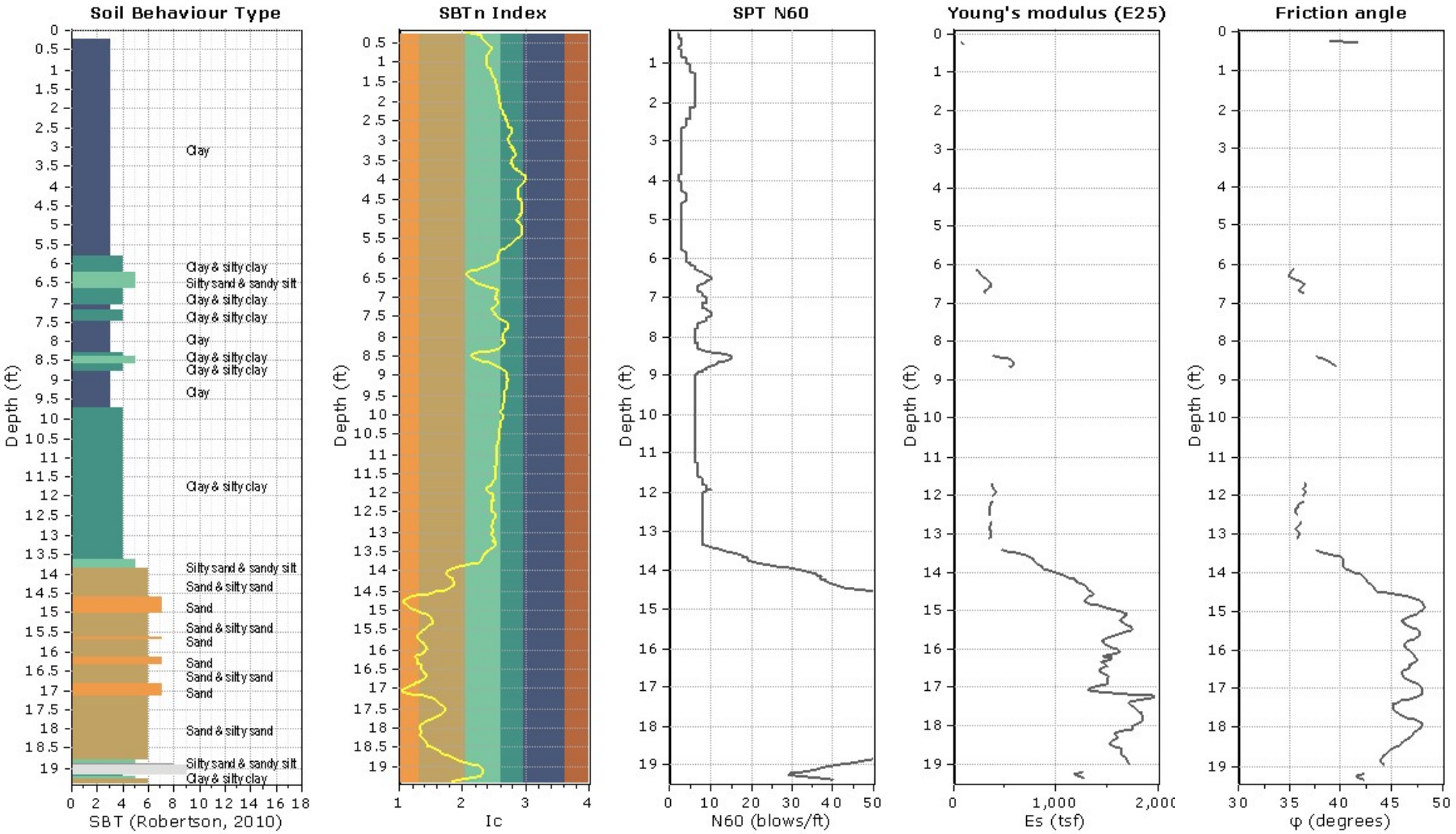
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Cone Type: CPT
Cone Operator: FUGRO



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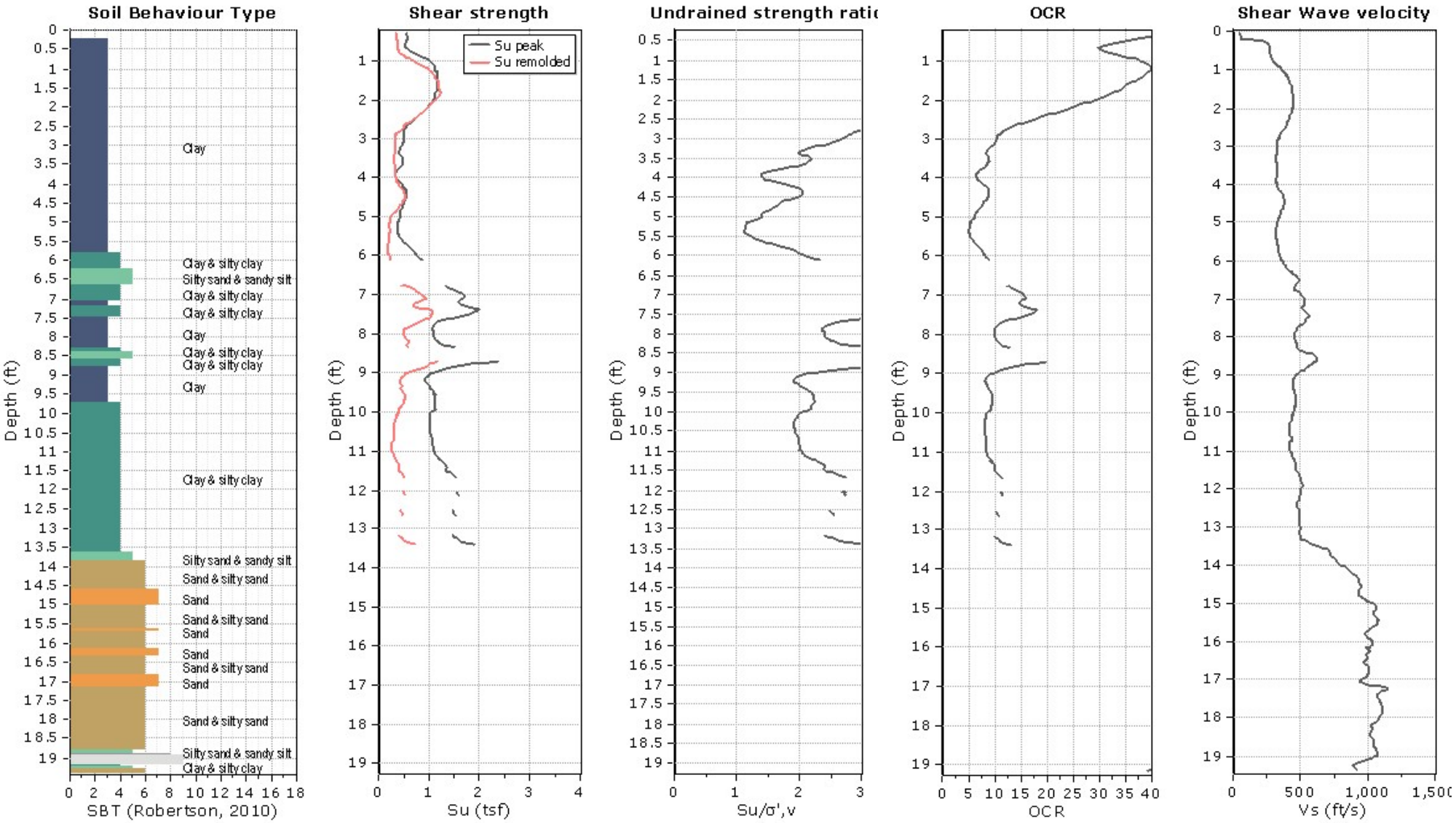
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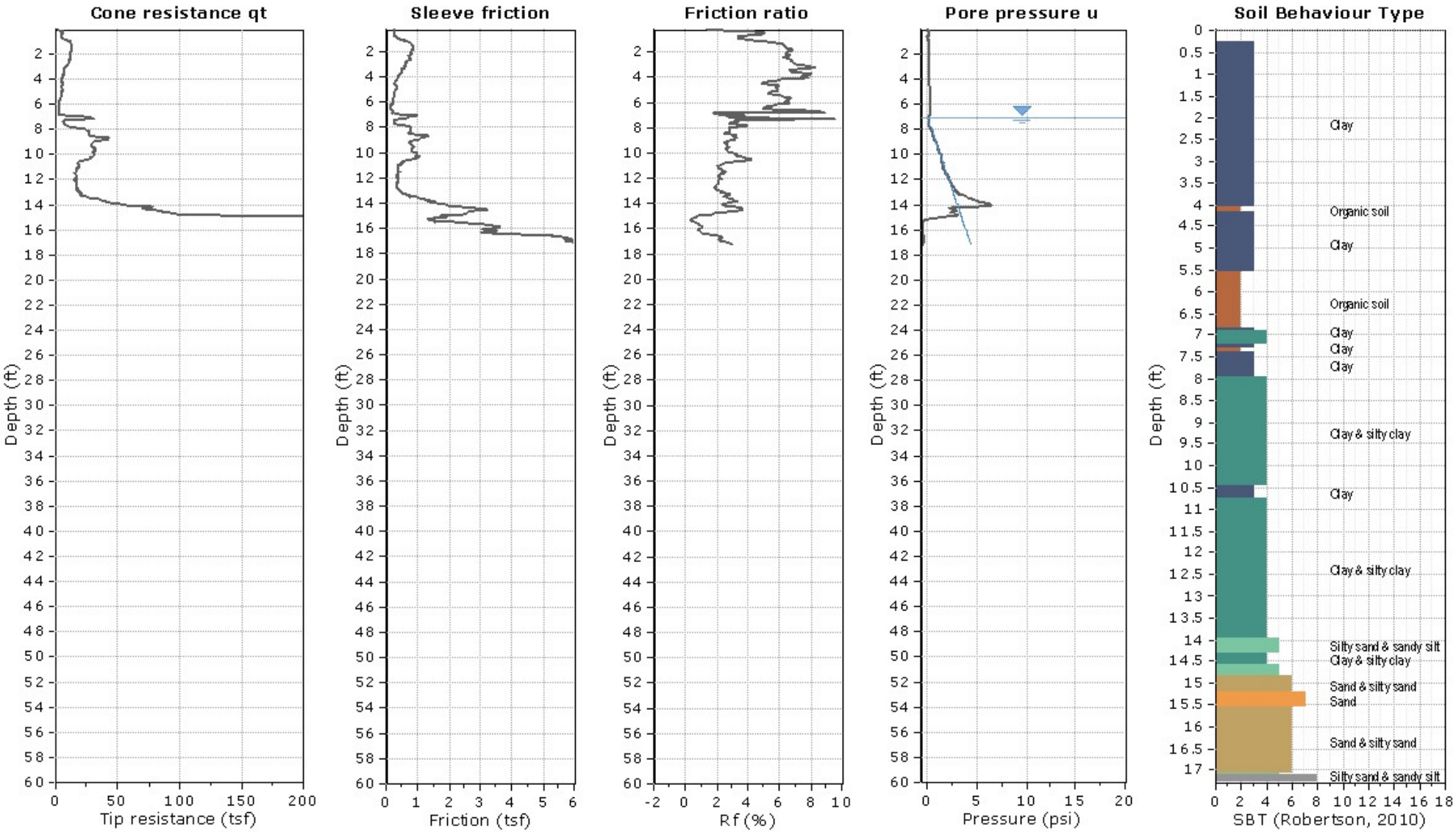
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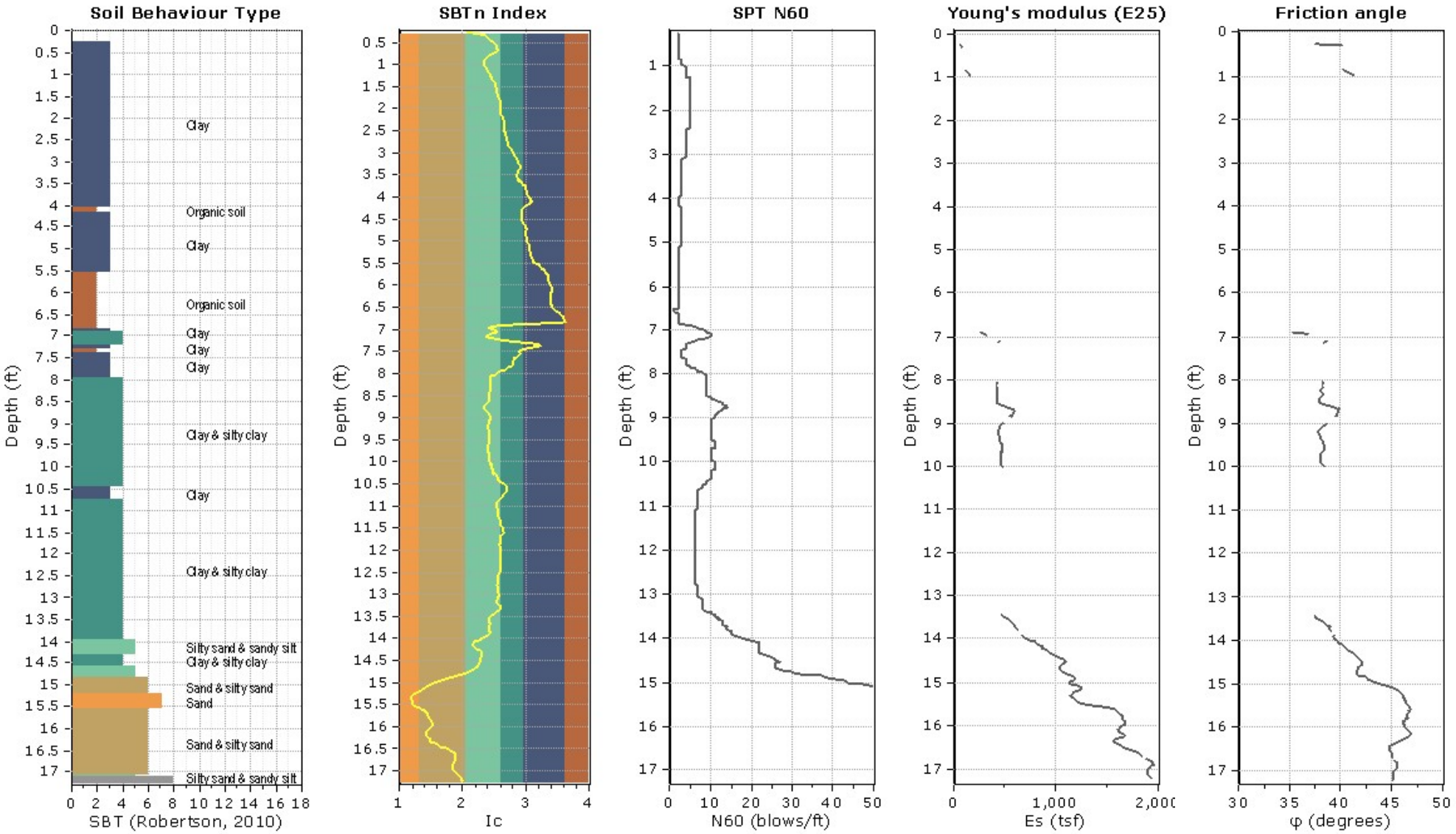
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Cone Type: CPT
Cone Operator: FUGRO



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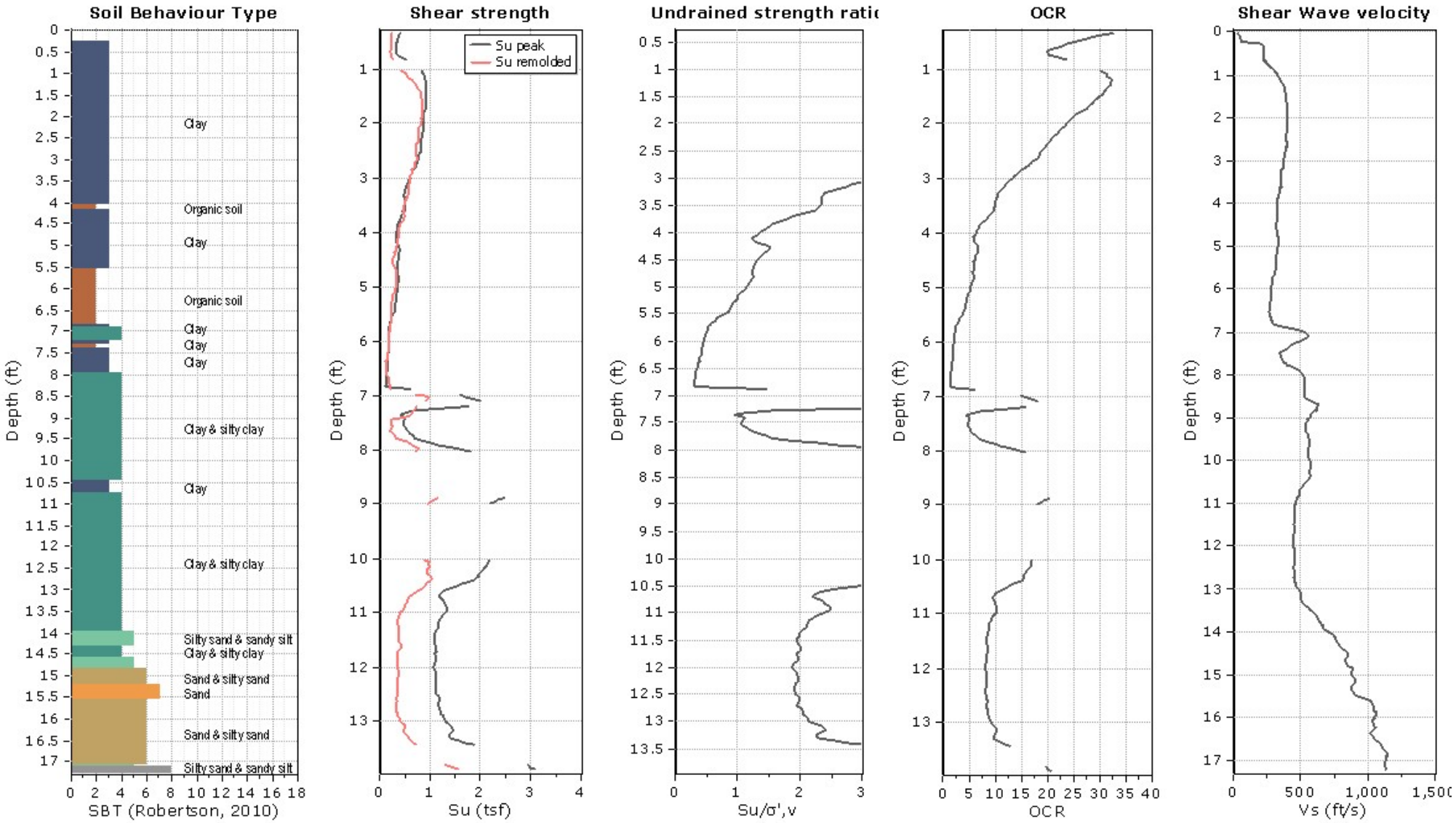
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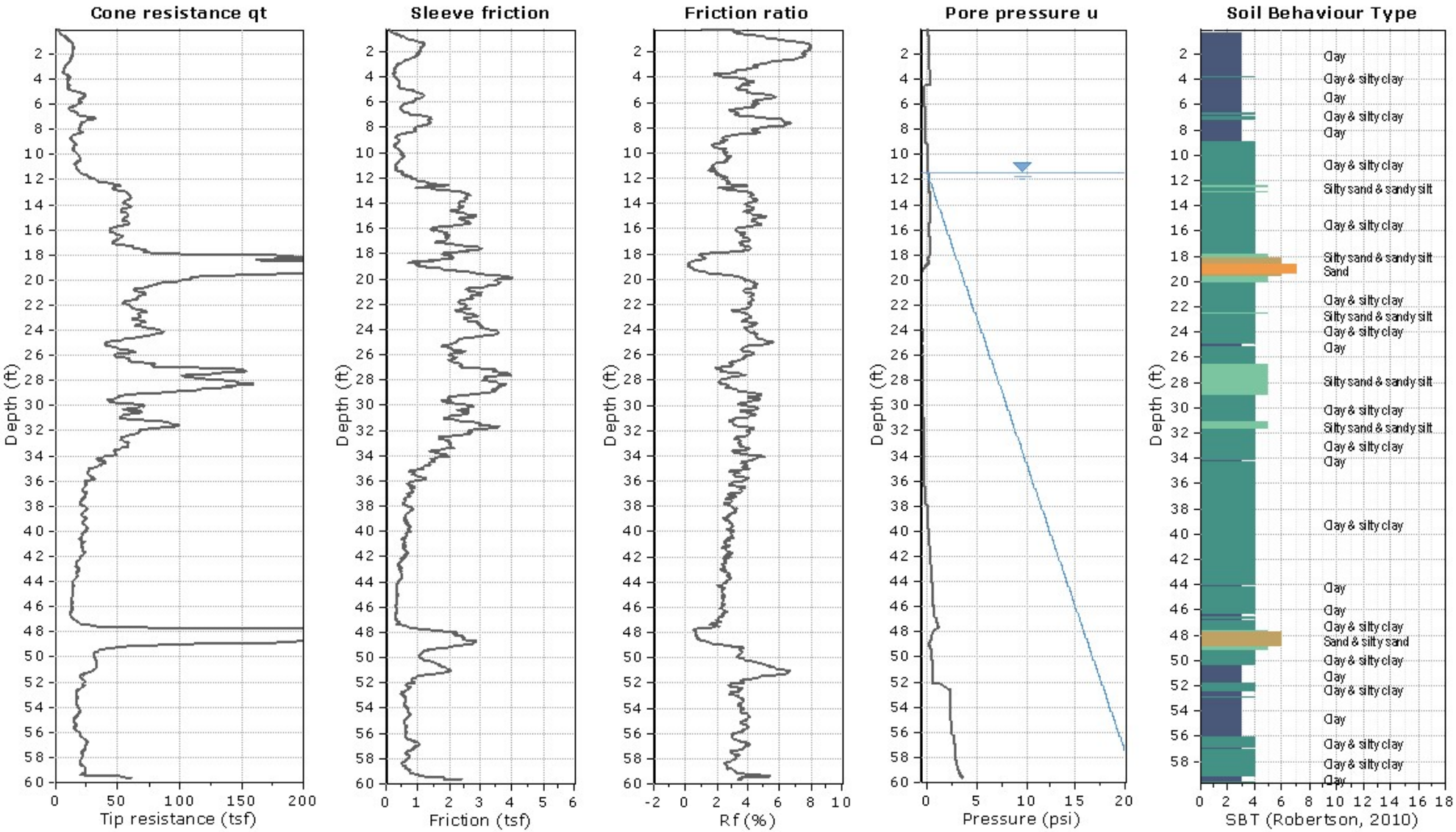
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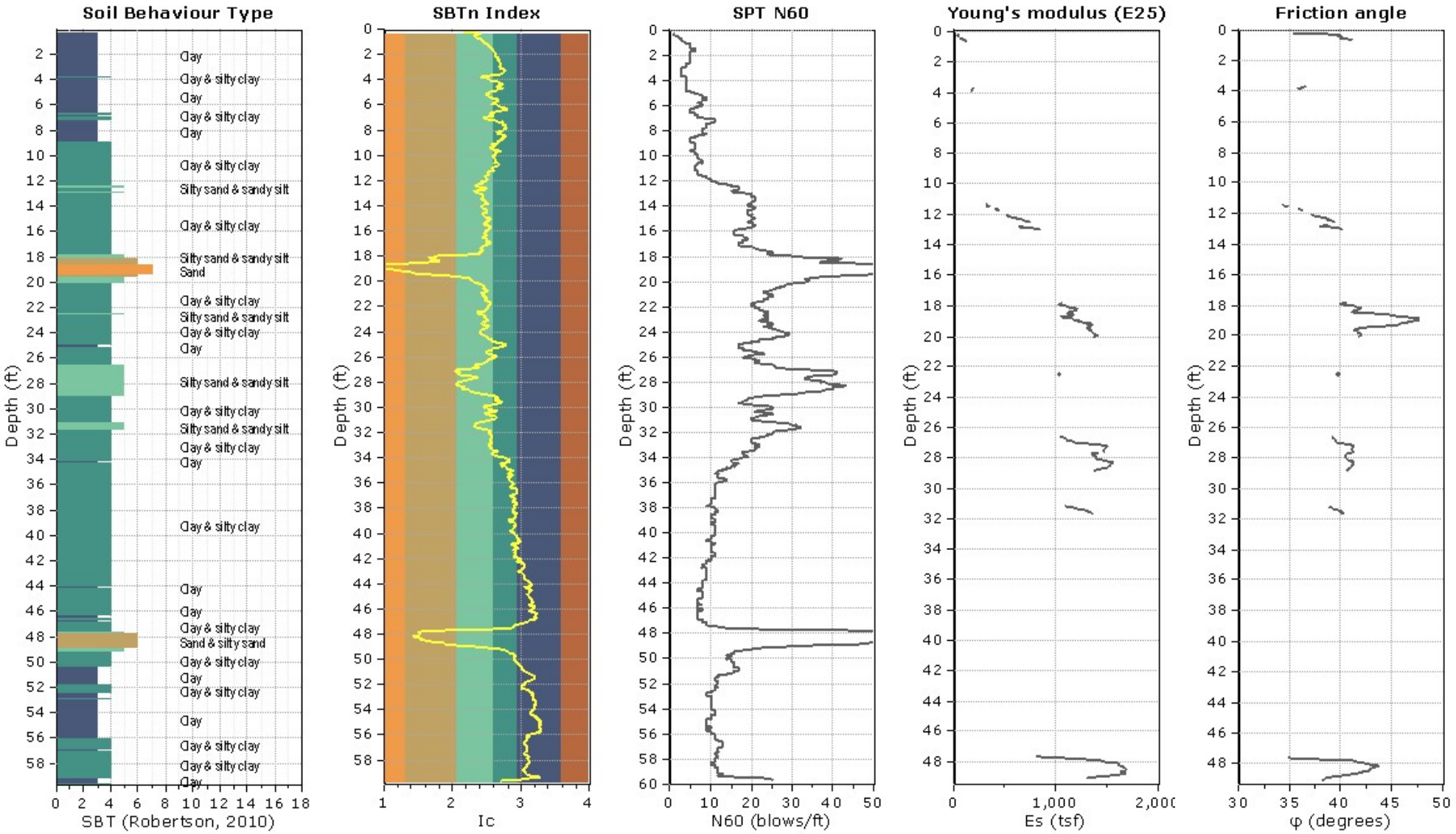
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Coords: lat 39.569341° lon -88.13683°
Cone Type: CPT
Cone Operator: FUGRO



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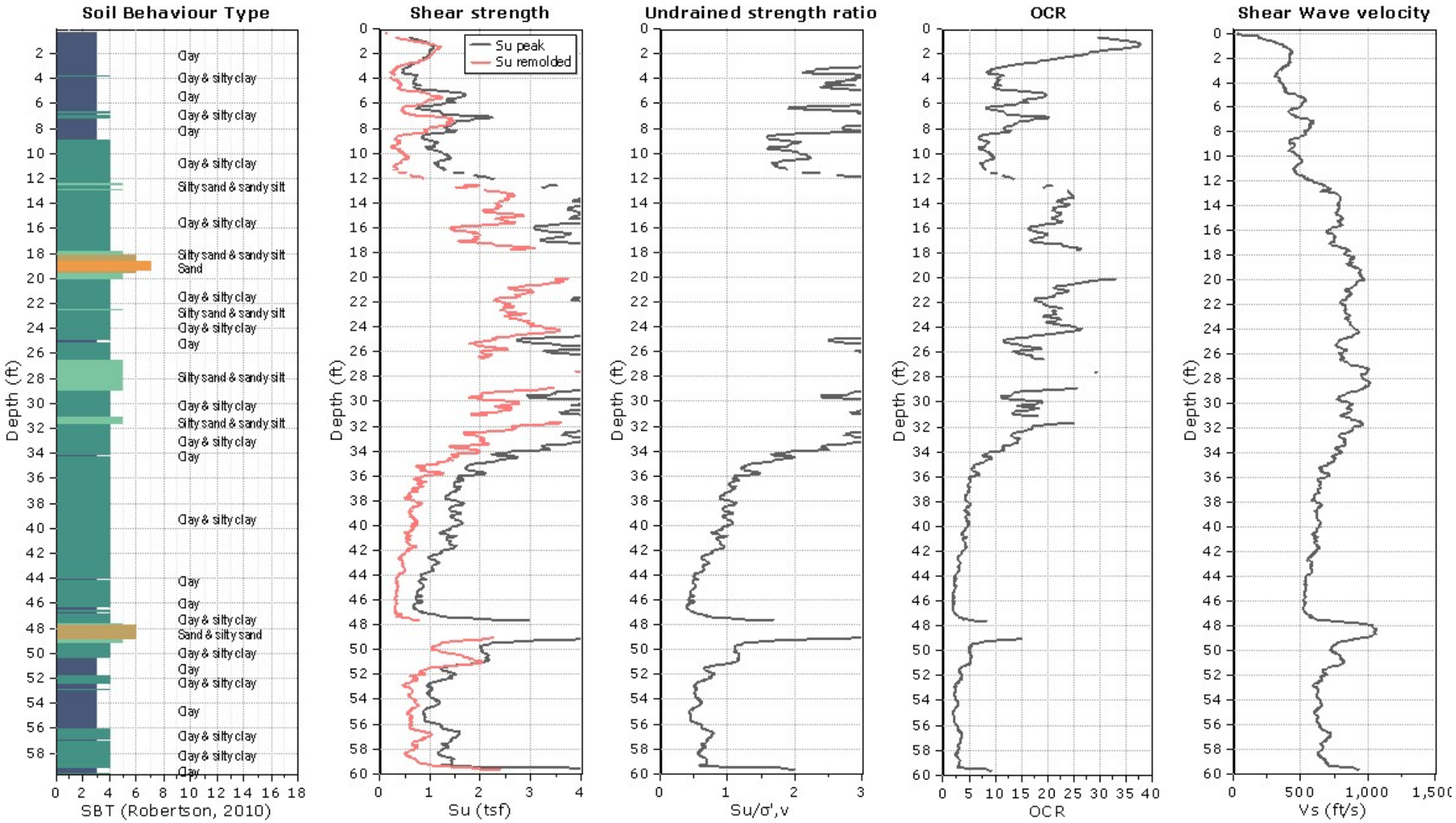
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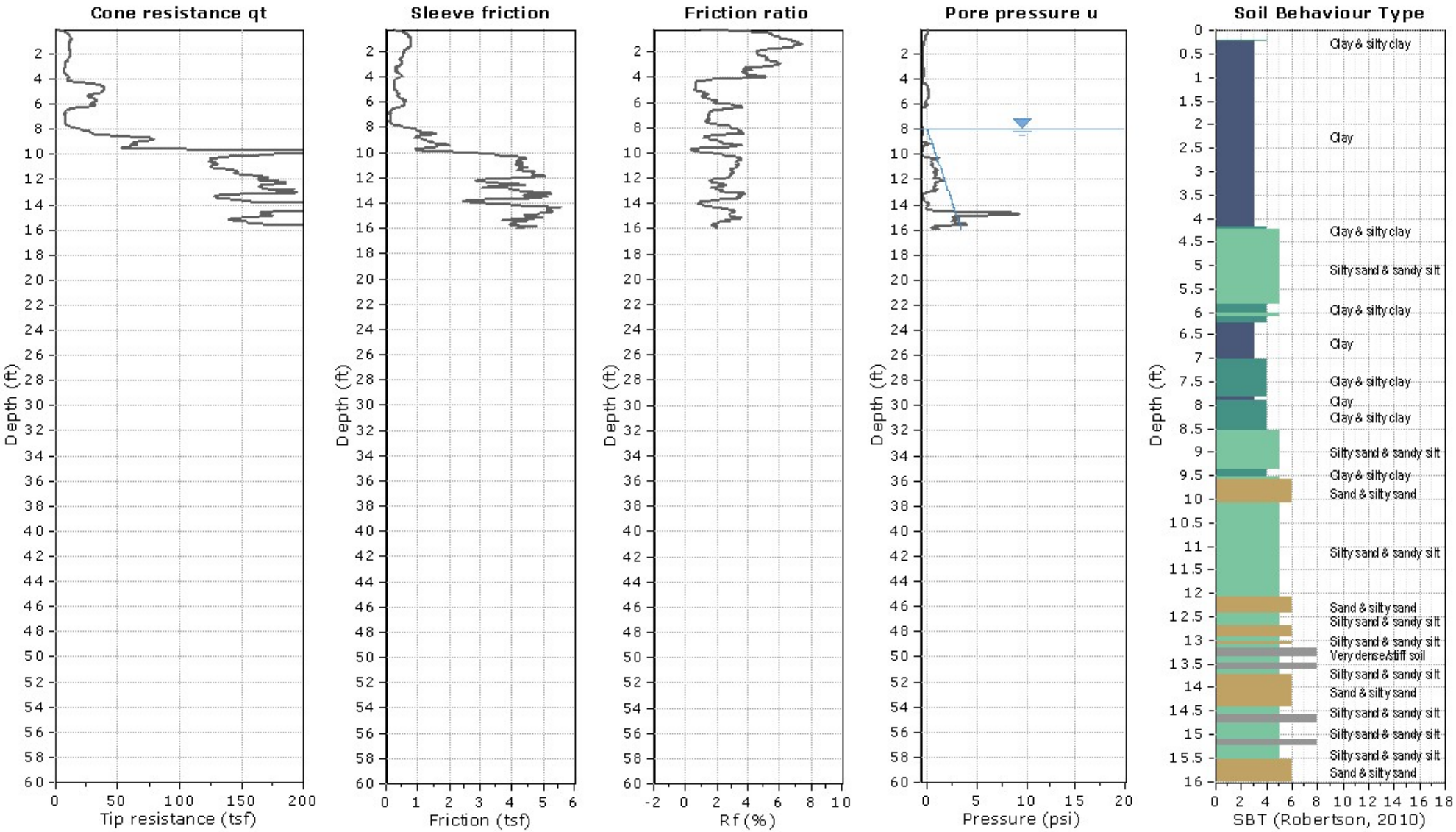
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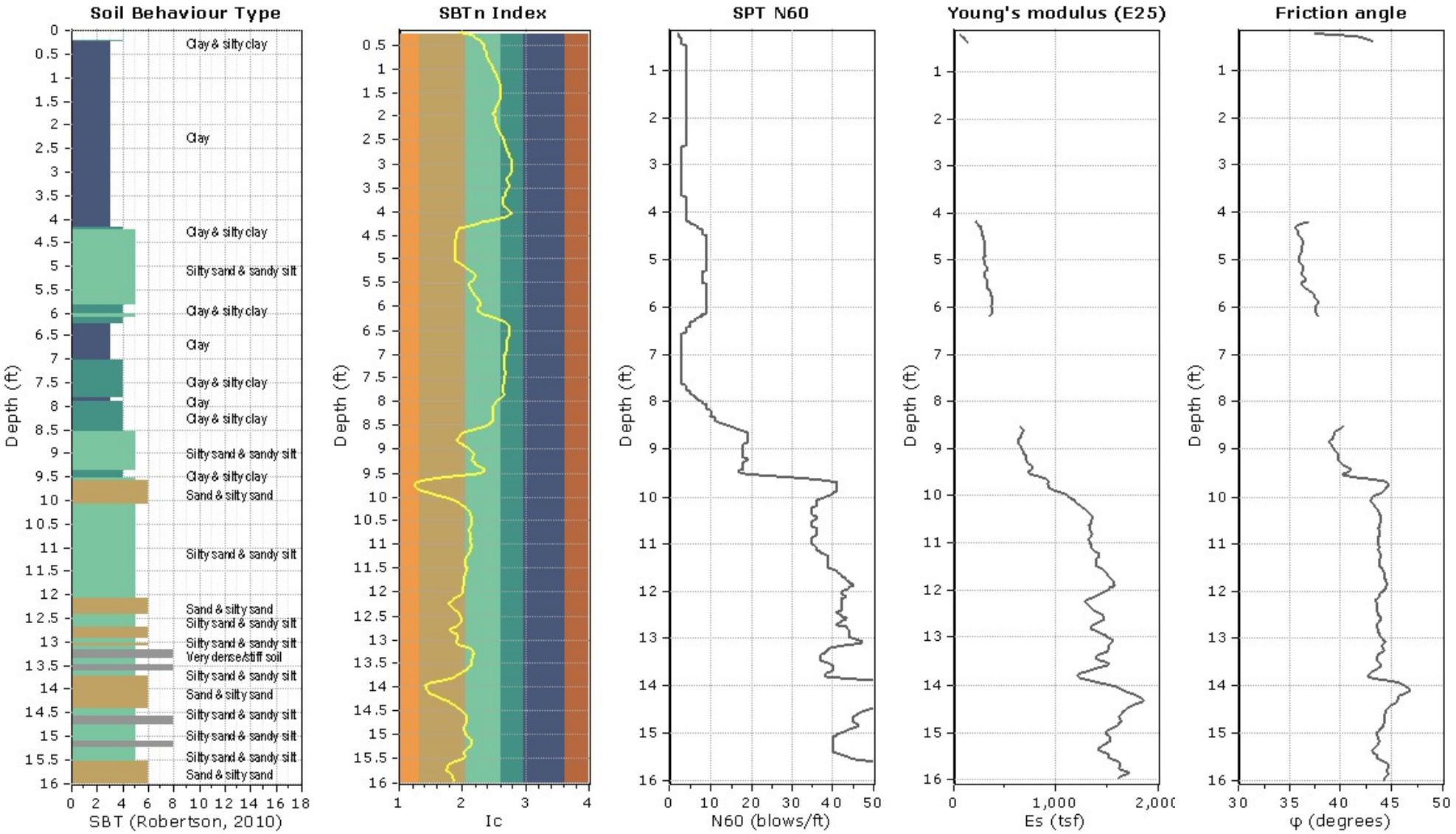
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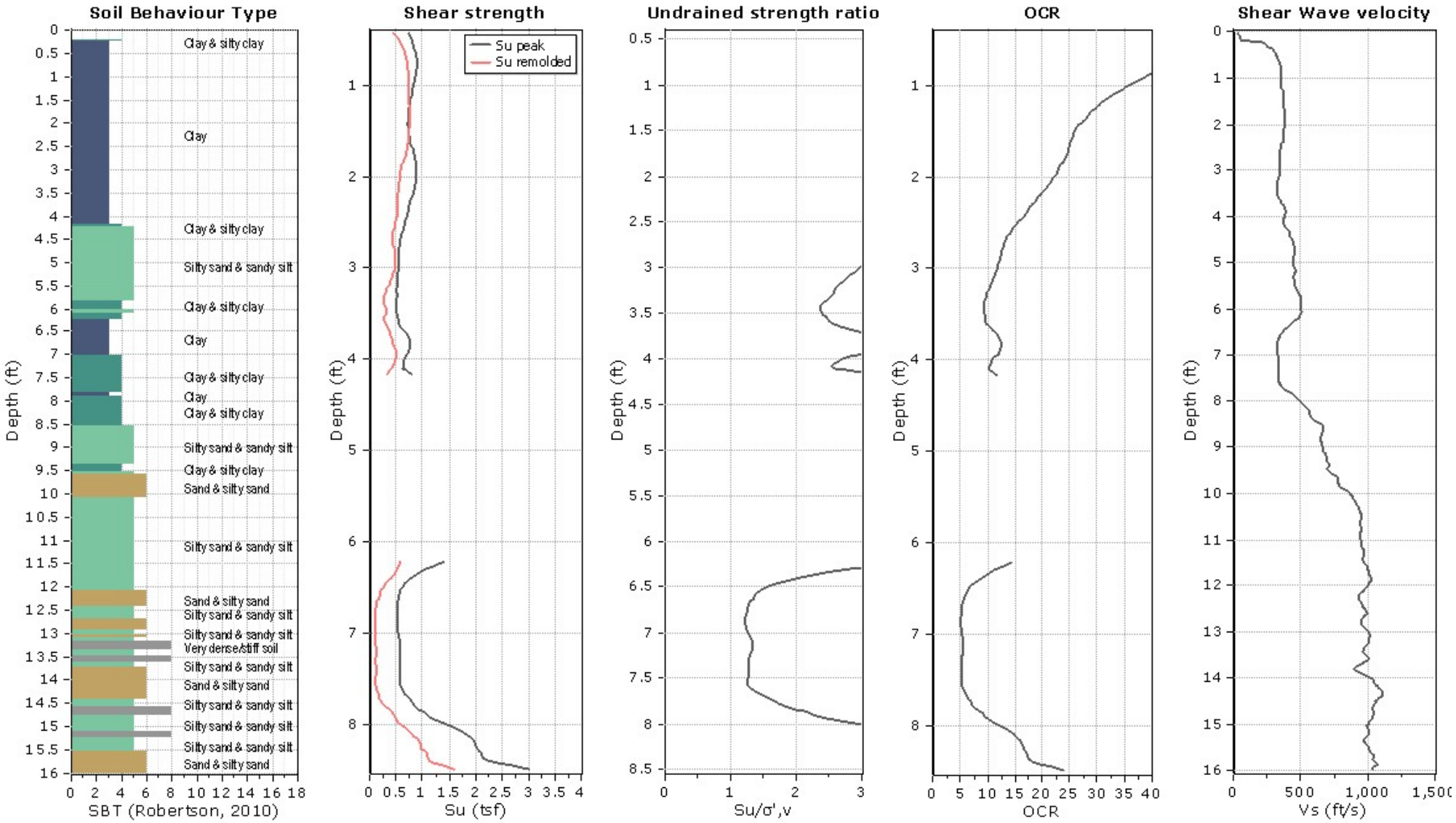
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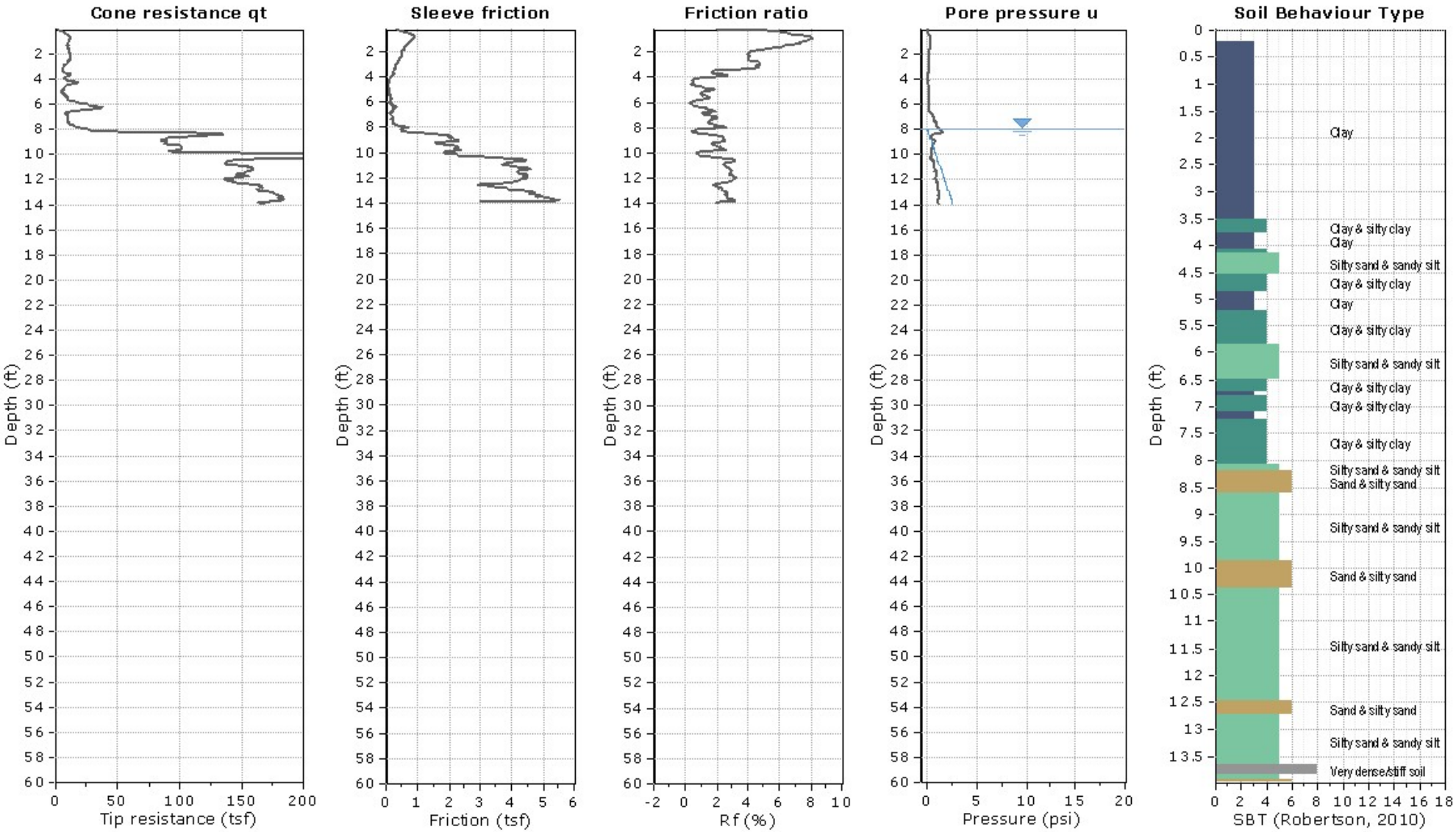
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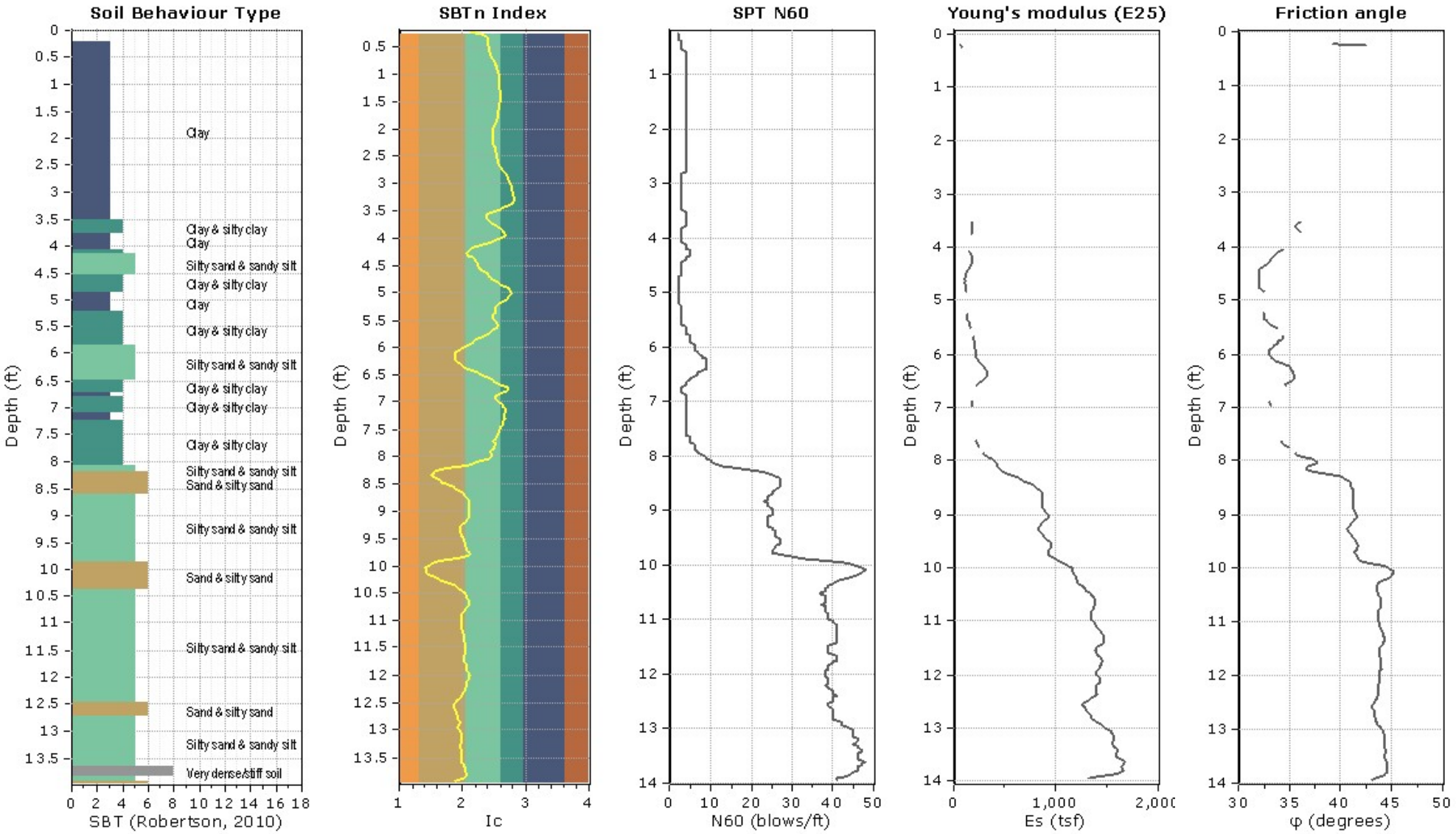
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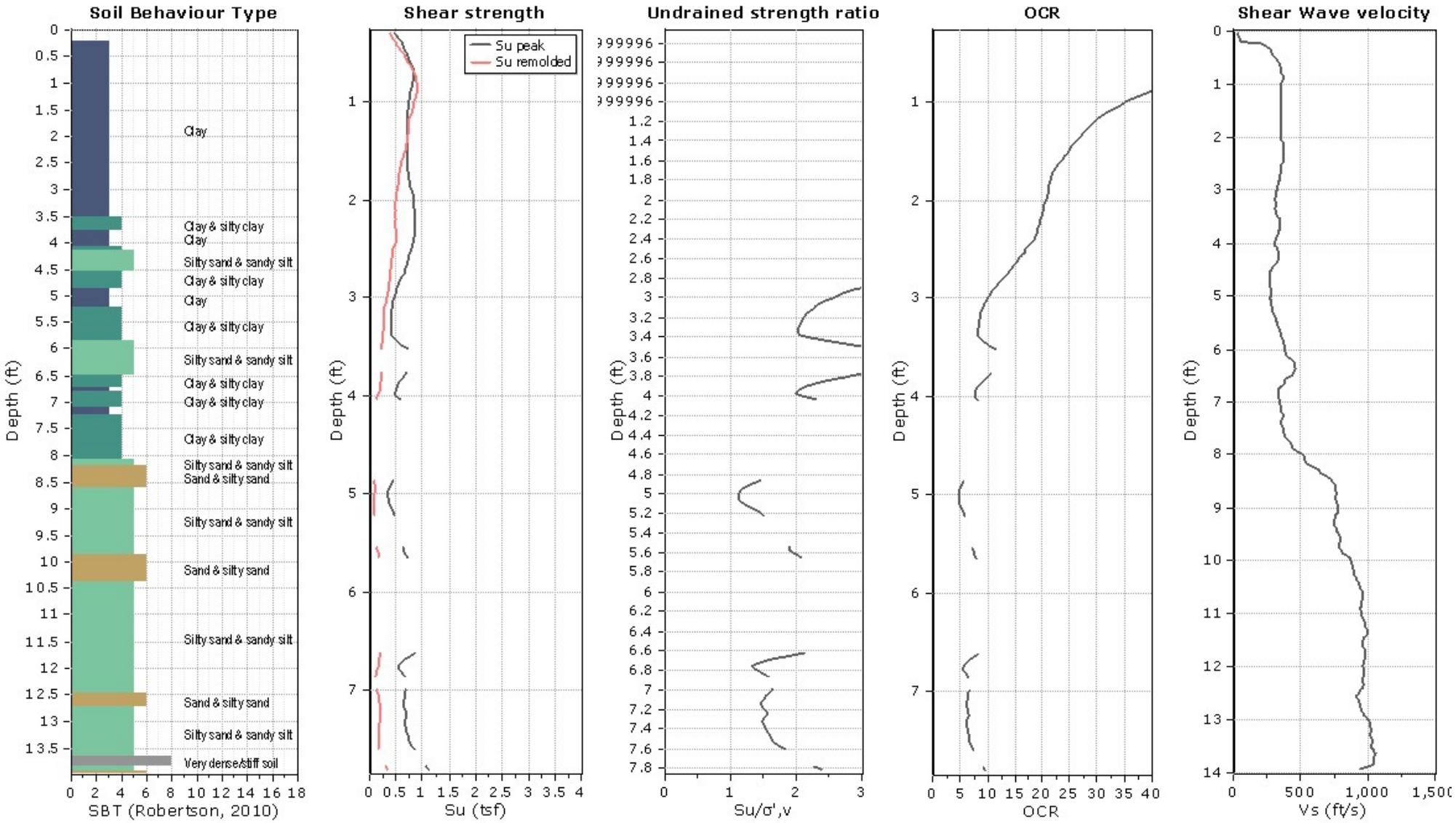
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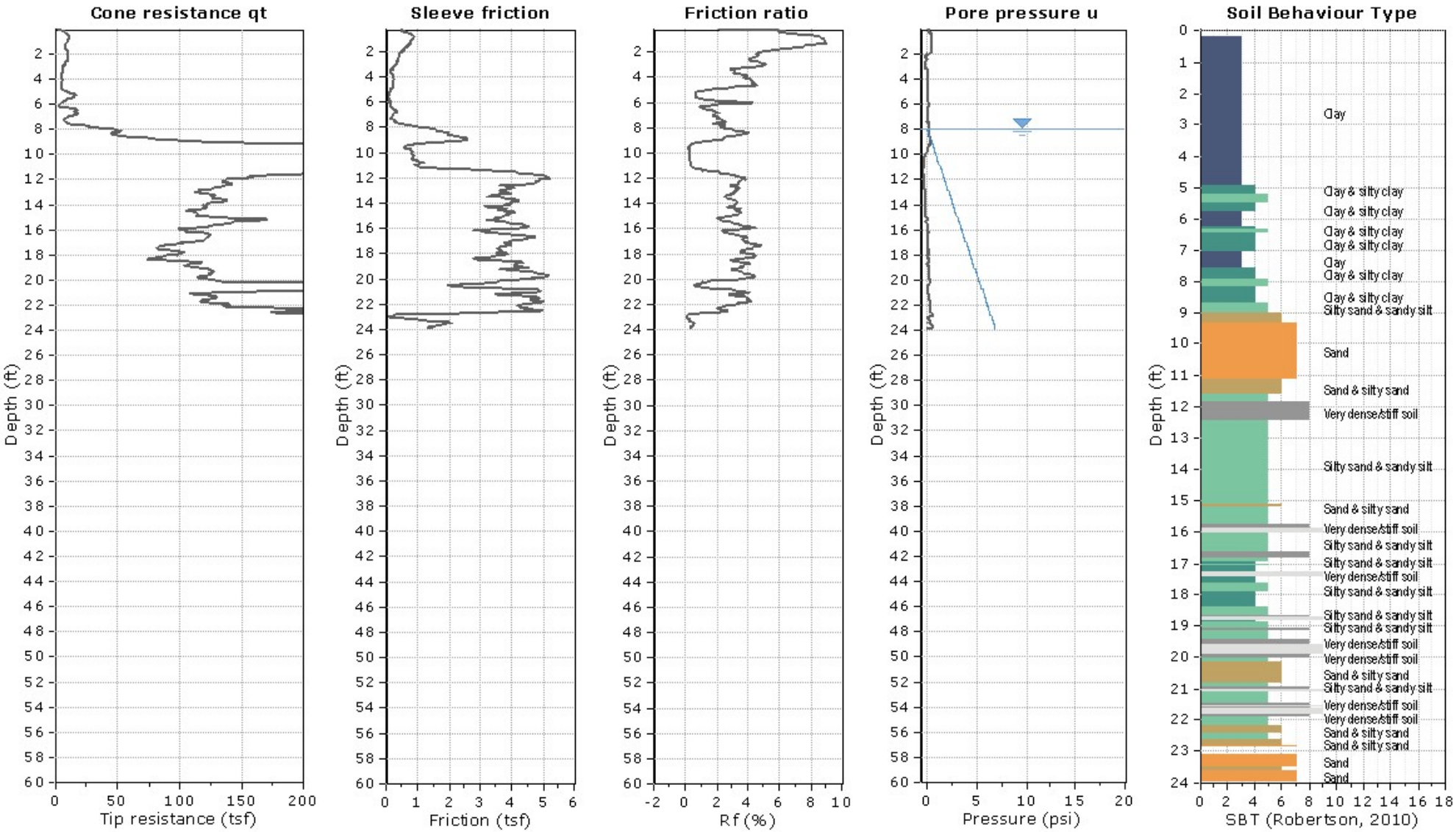
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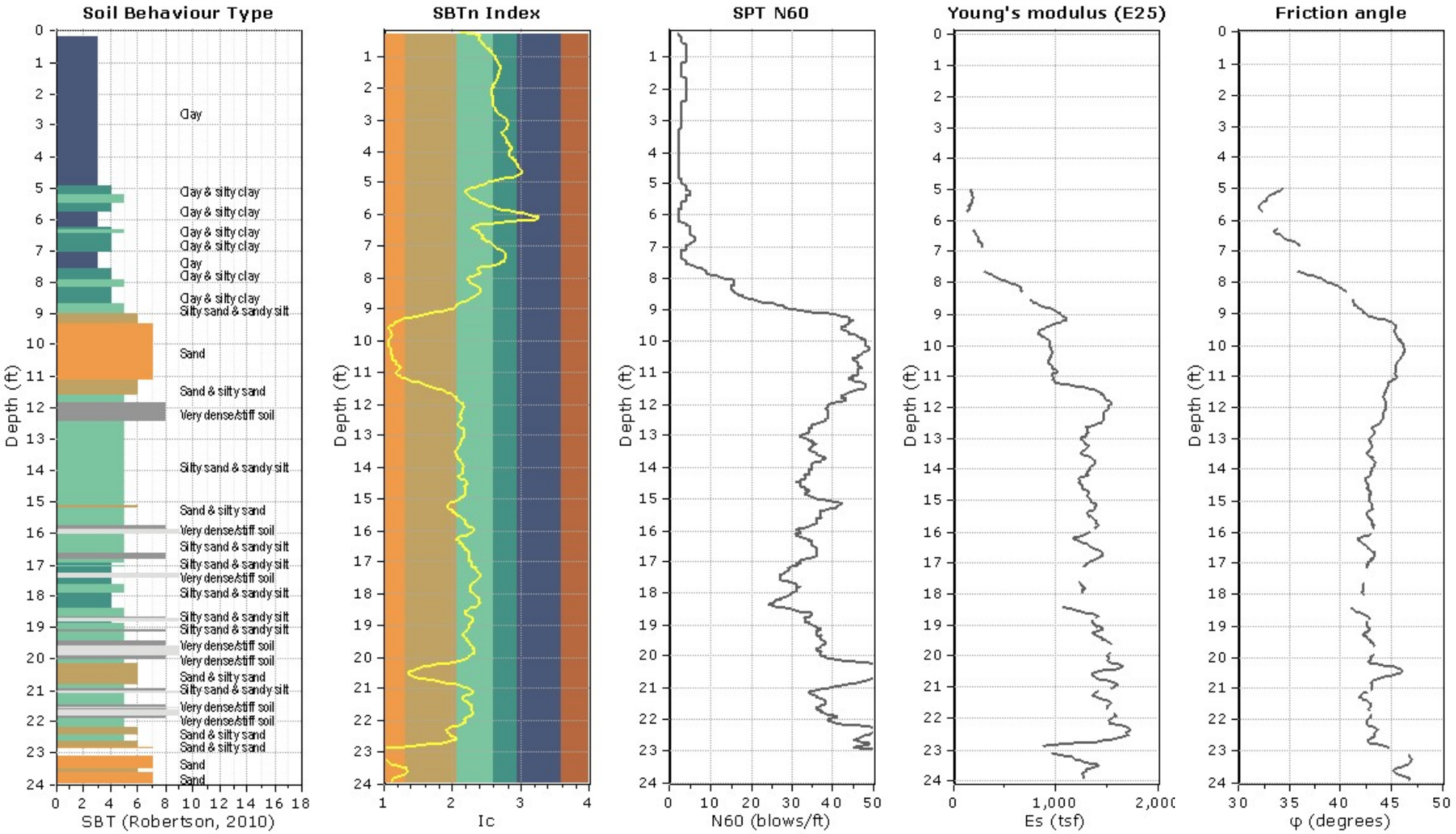
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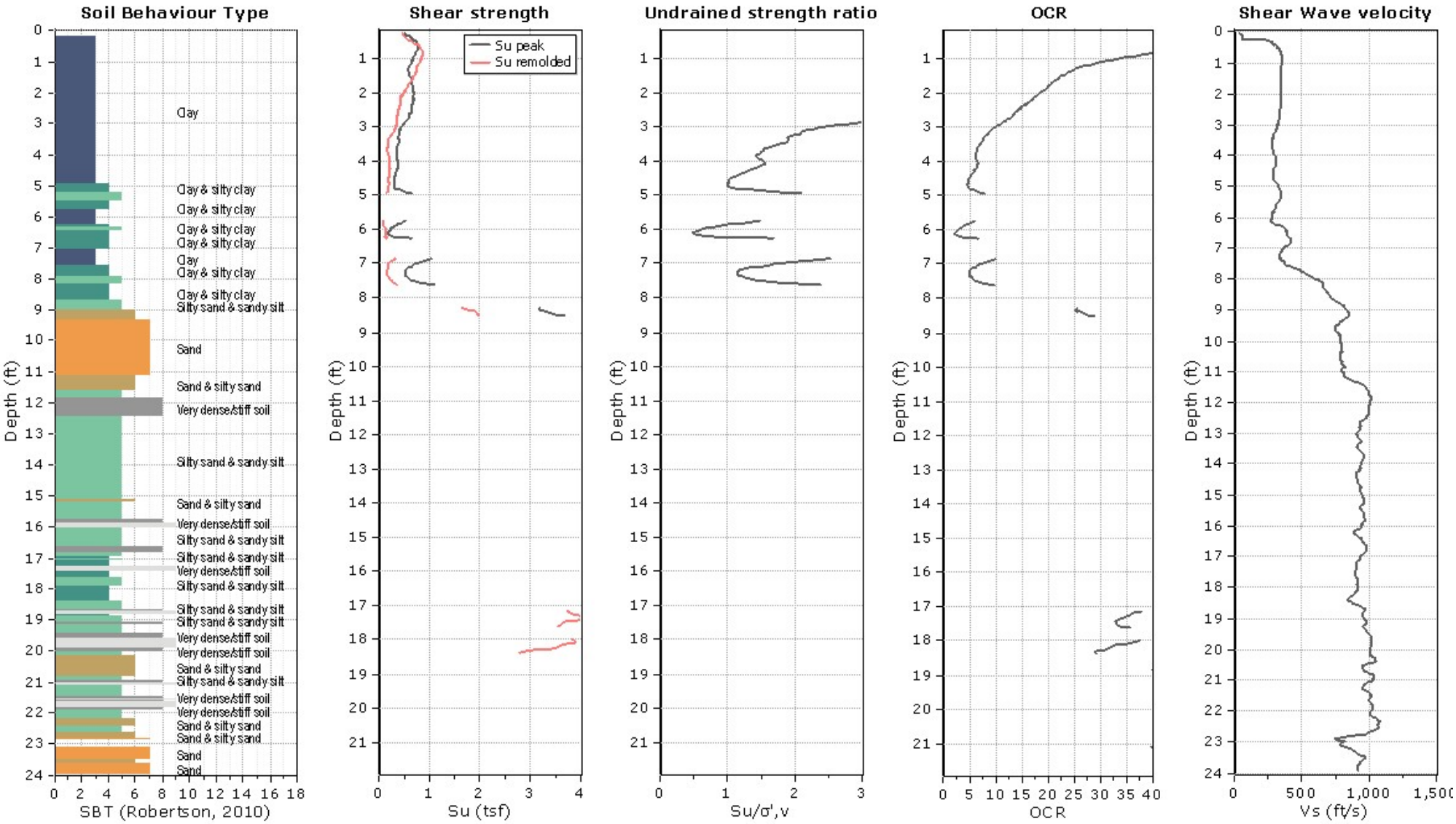
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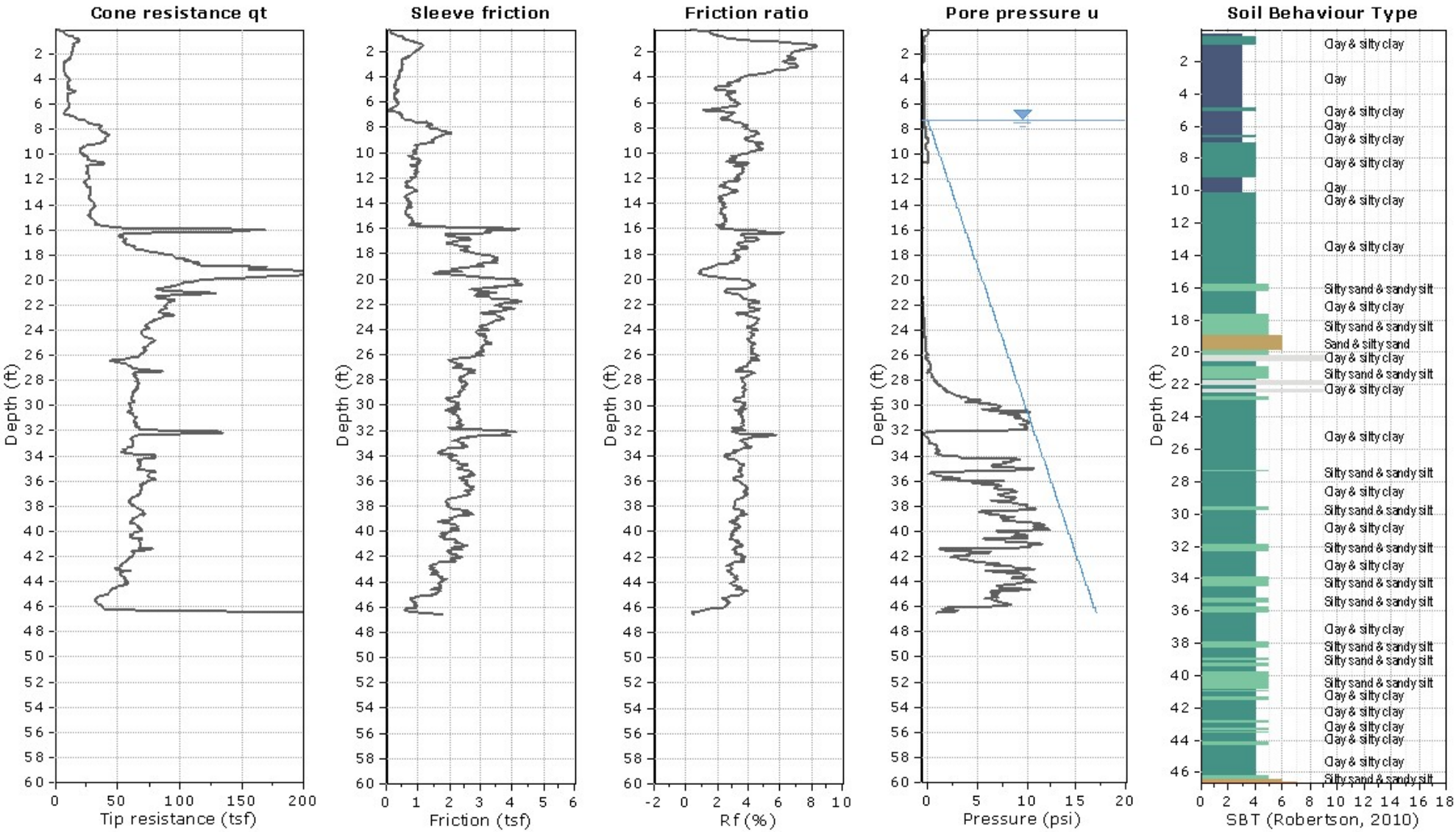
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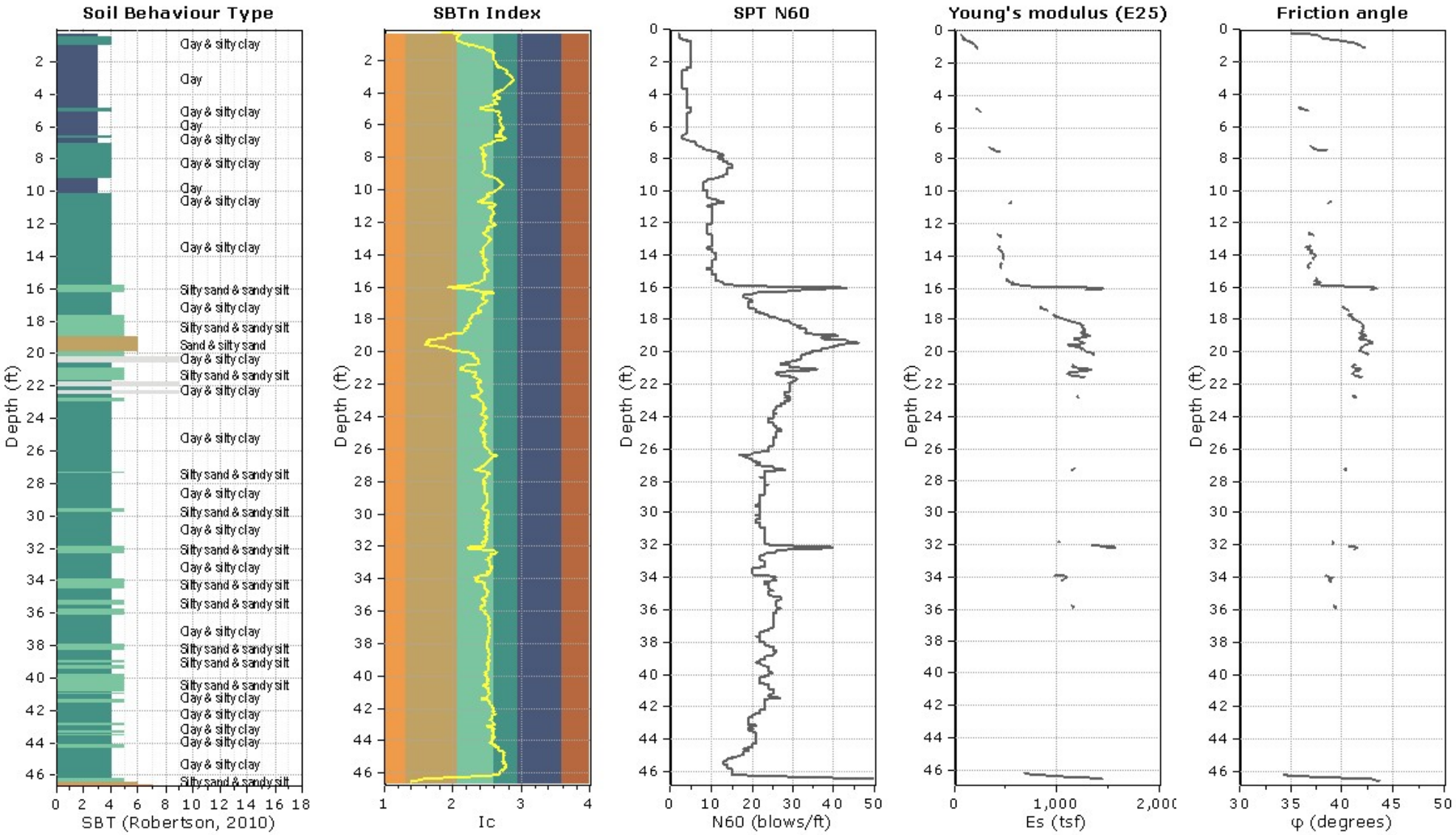
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Cone Operator: FUGRO



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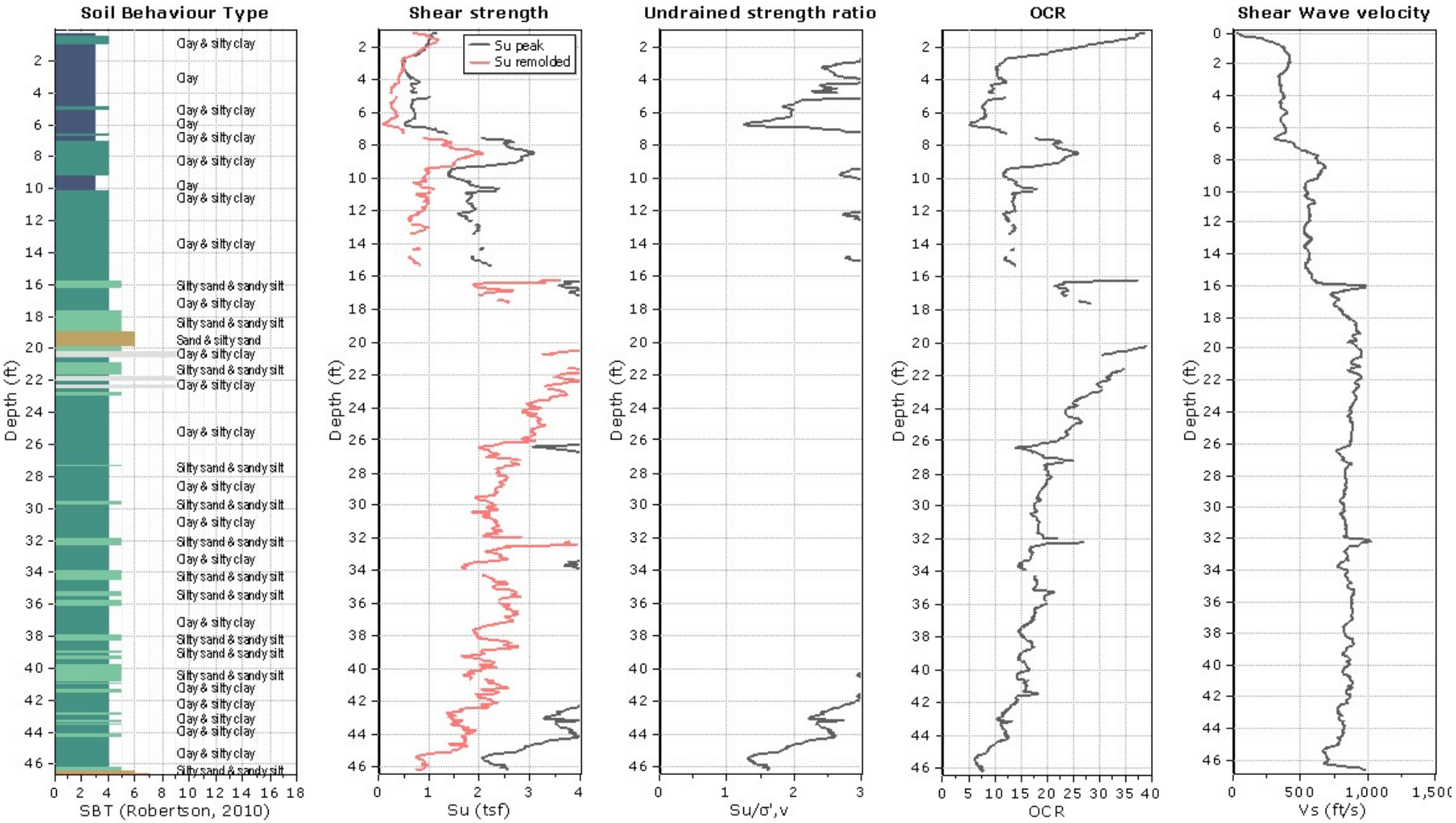
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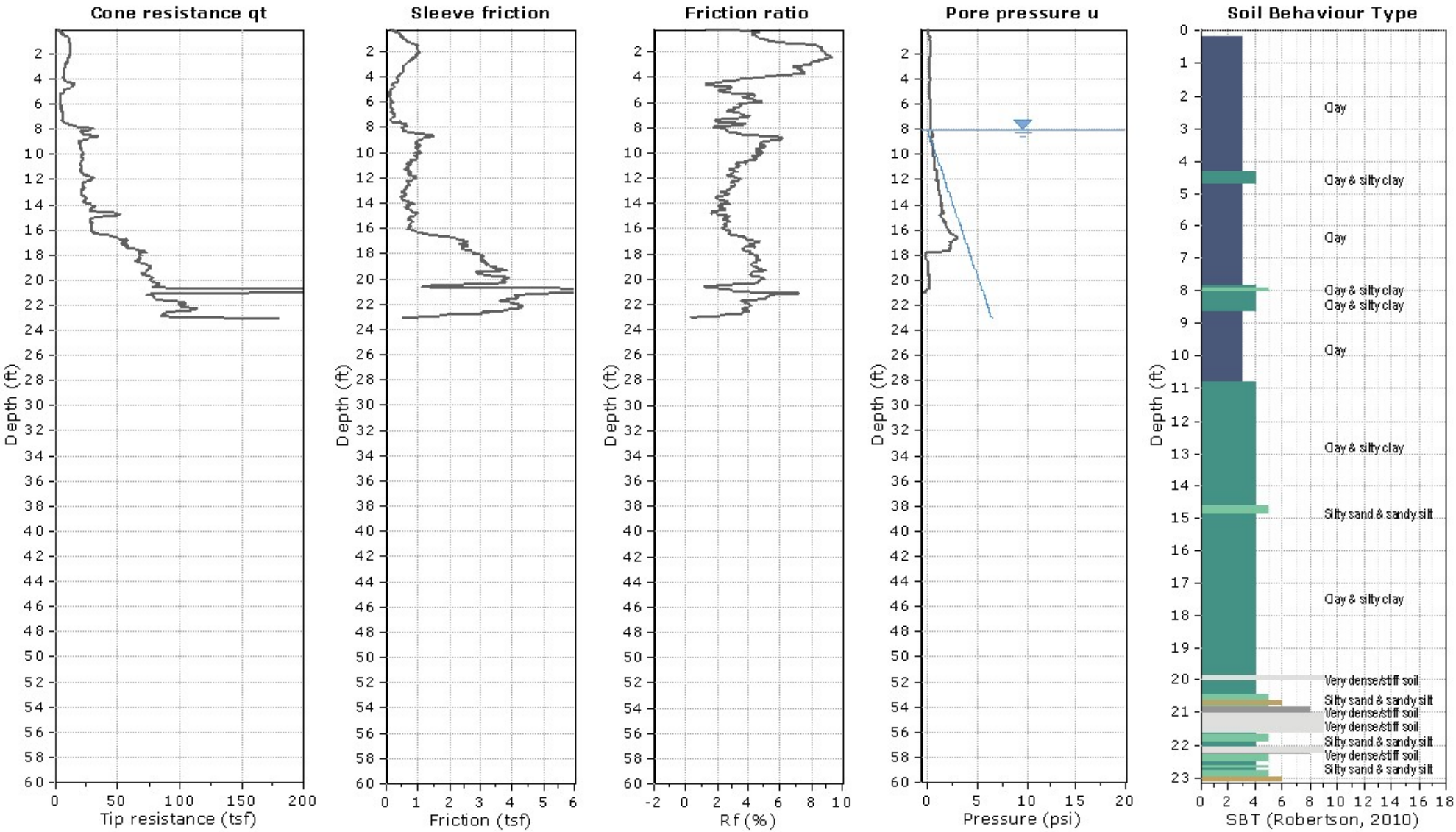
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Cone Operator: FUGRO



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Project: **Coles Wind**
Location: **Coles County, Illinois**

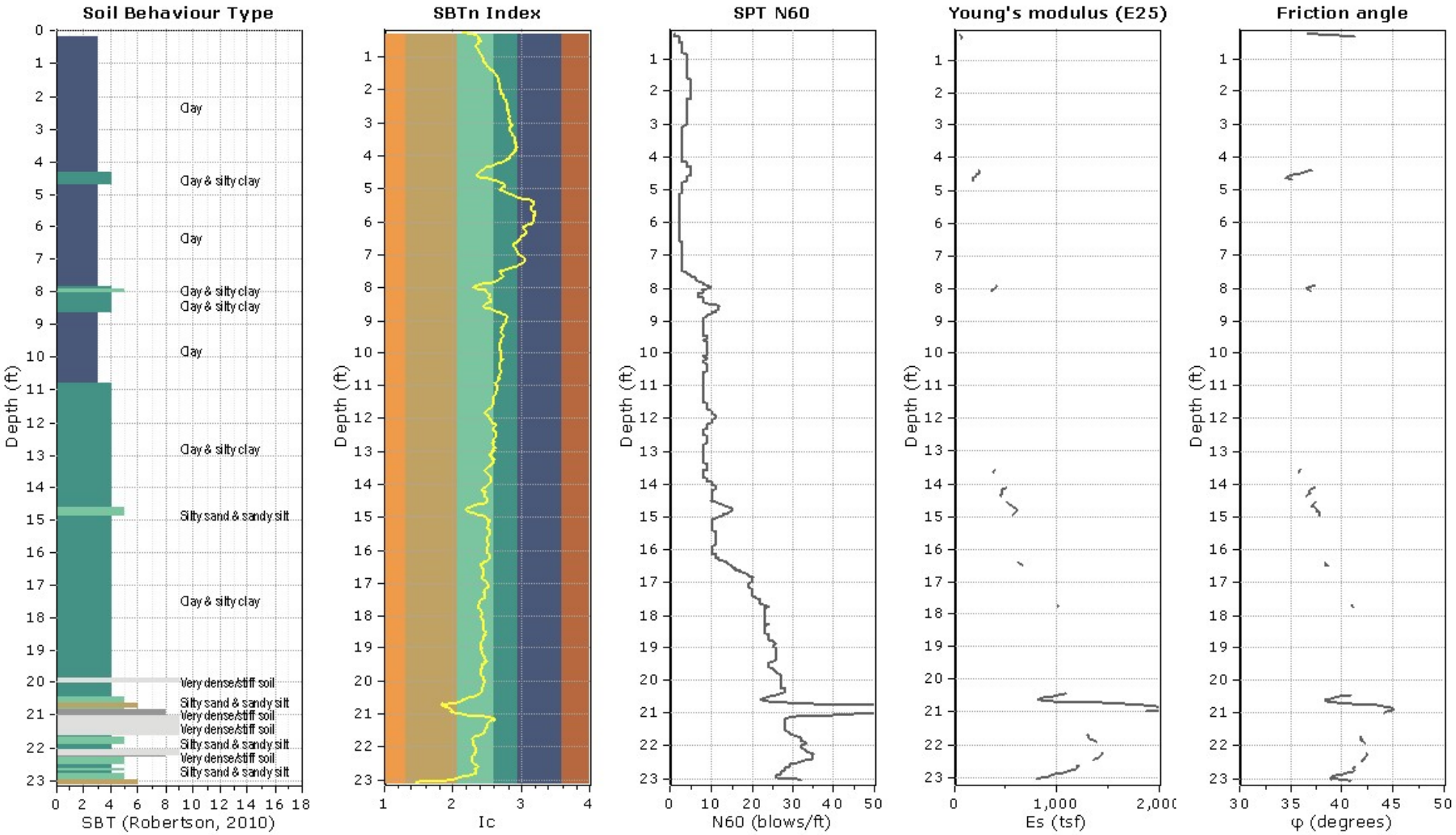
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Cone Type: CPT
Cone Operator: FUGRO



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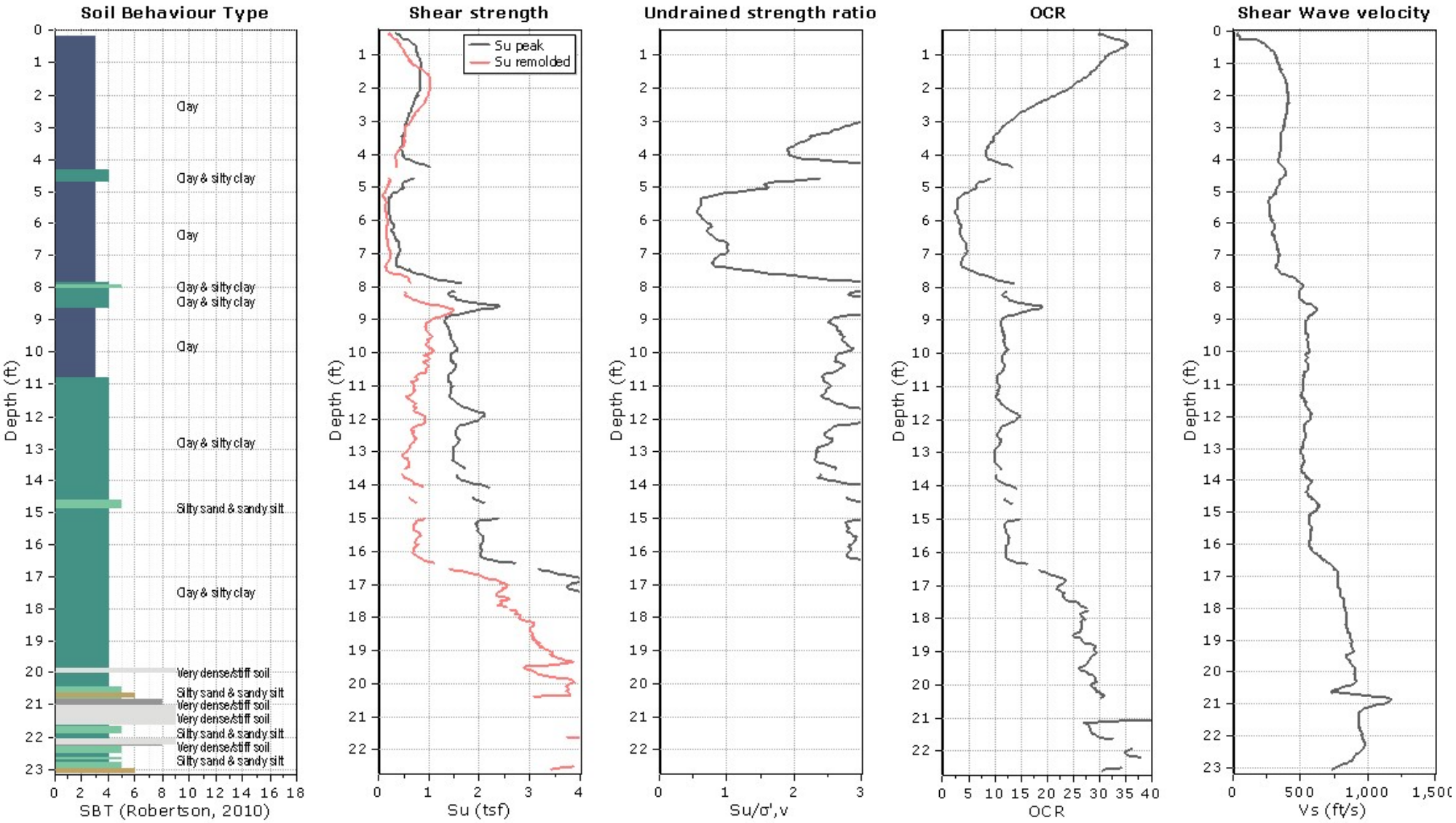
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Cone Operator: FUGRO



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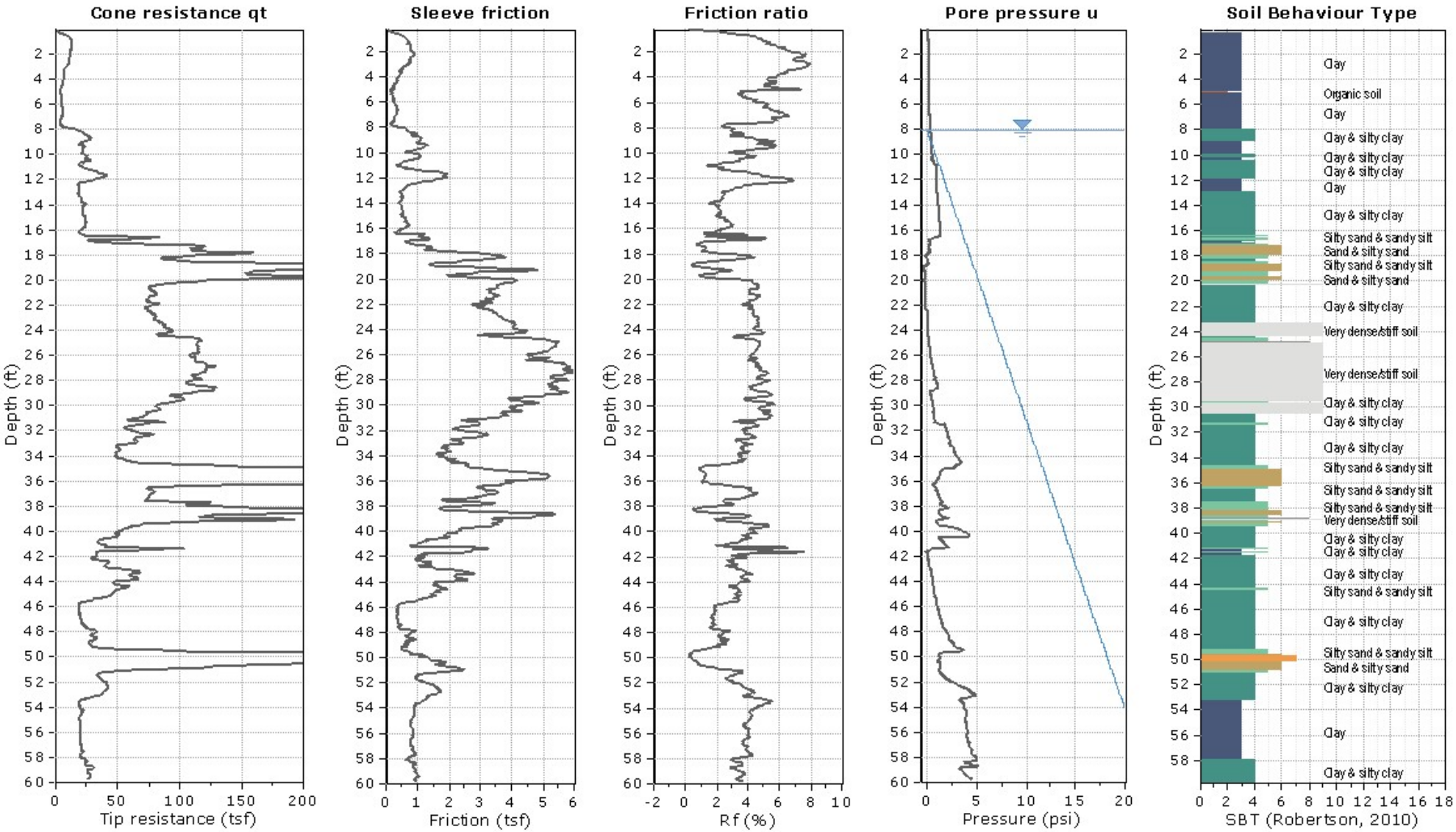
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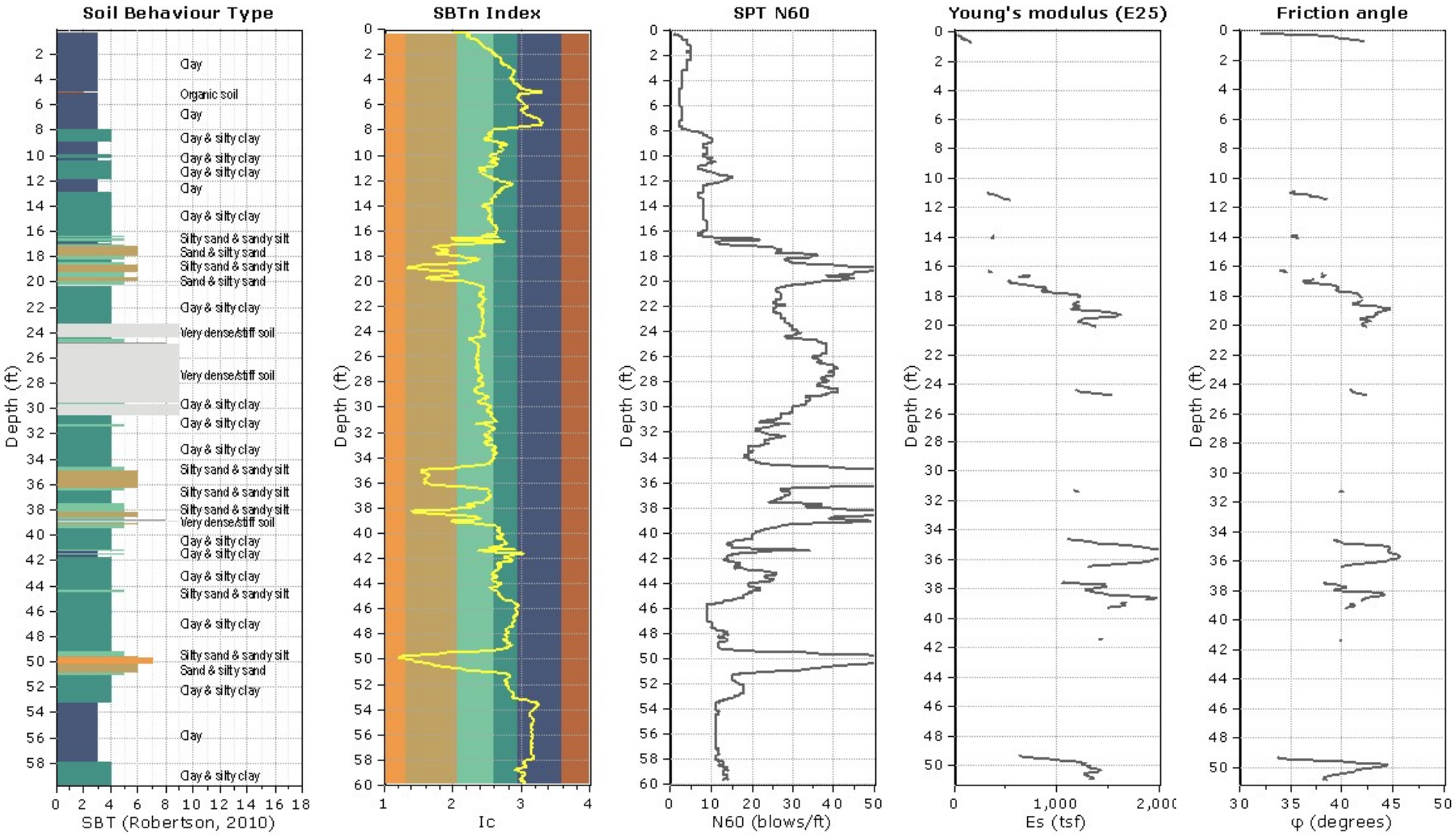
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Cone Type: CPT
Cone Operator: FUGRO



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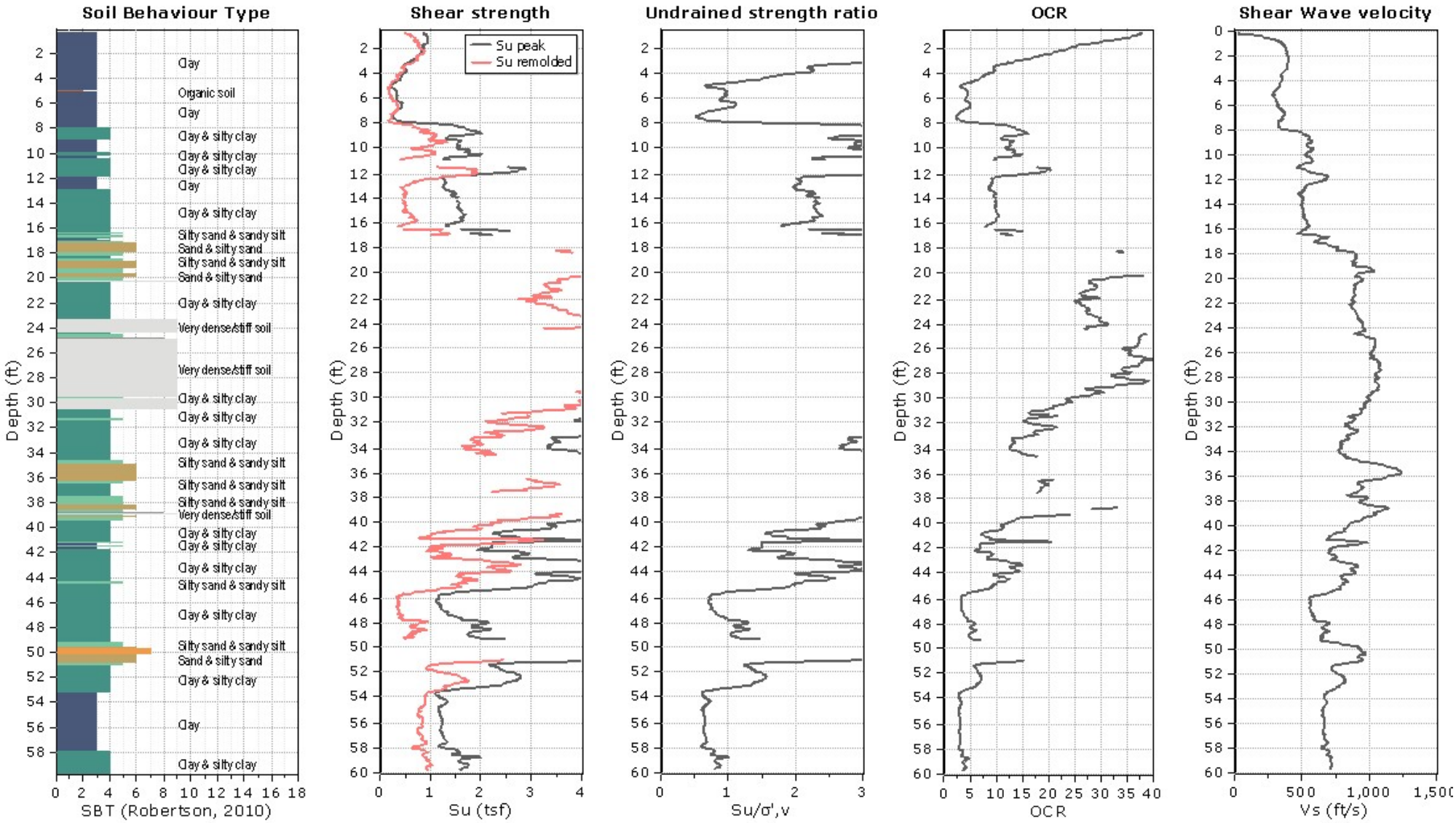
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Cone Operator: FUGRO



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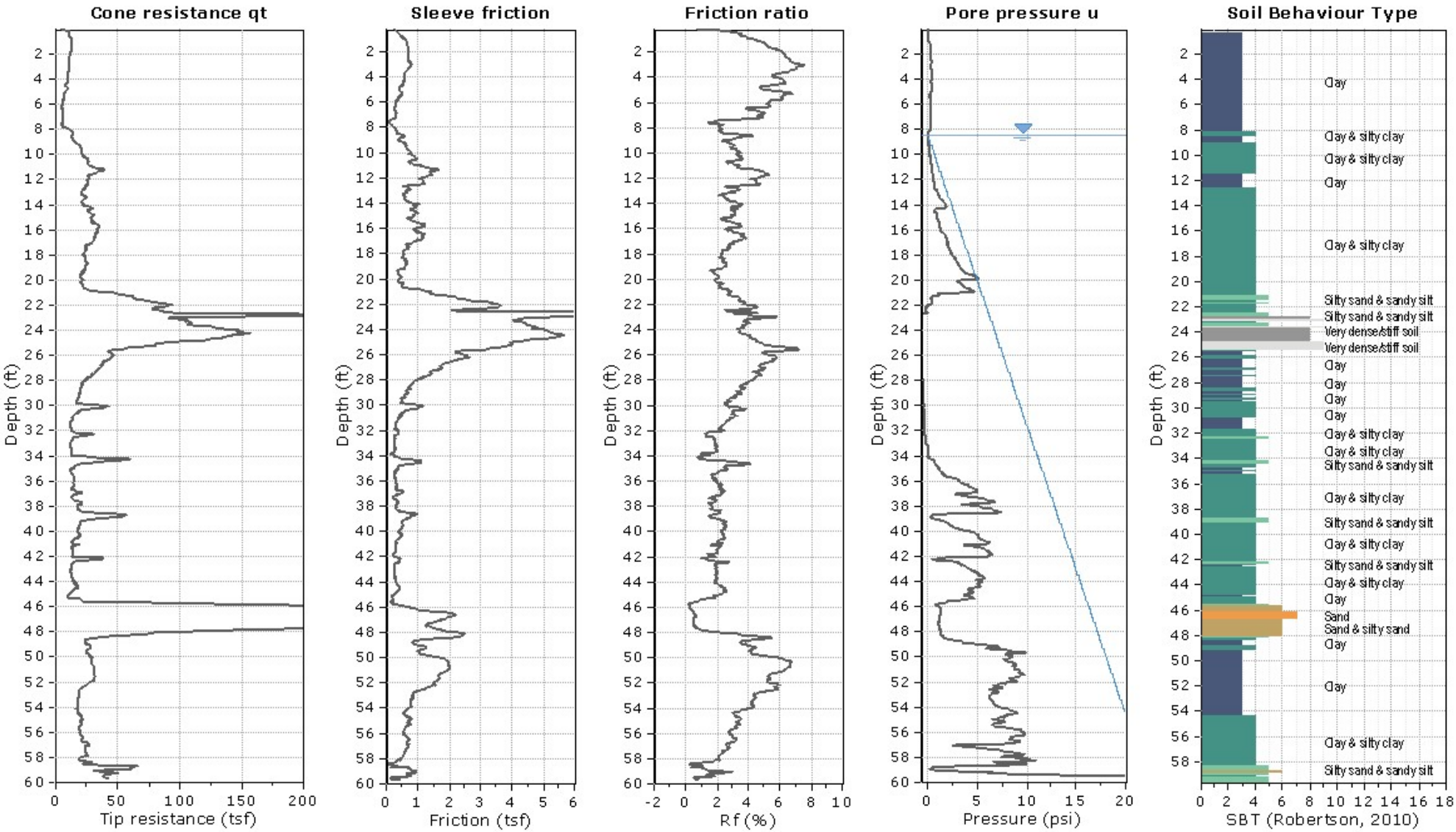
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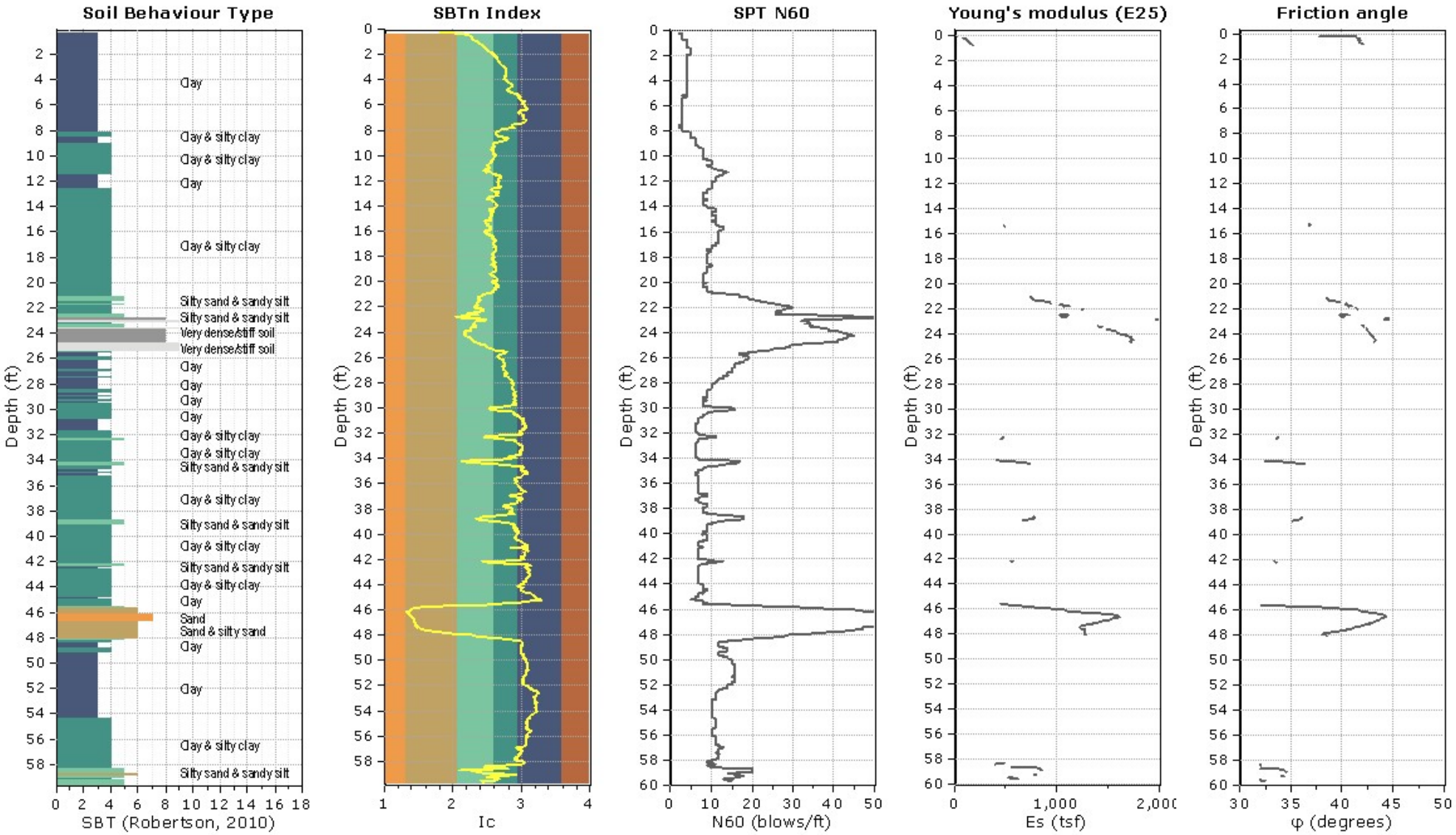
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Cone Type: CPT
Cone Operator: FUGRO



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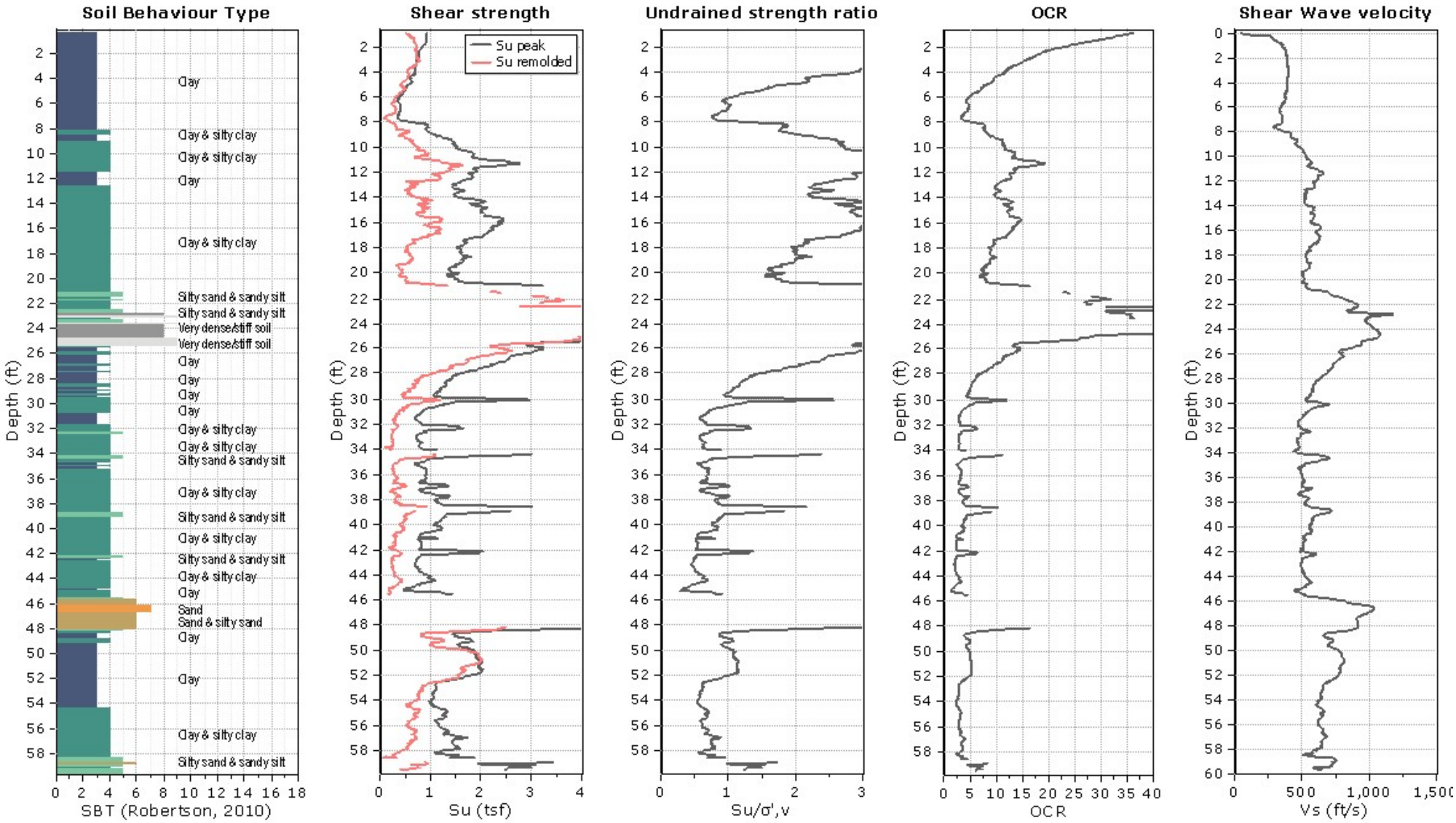
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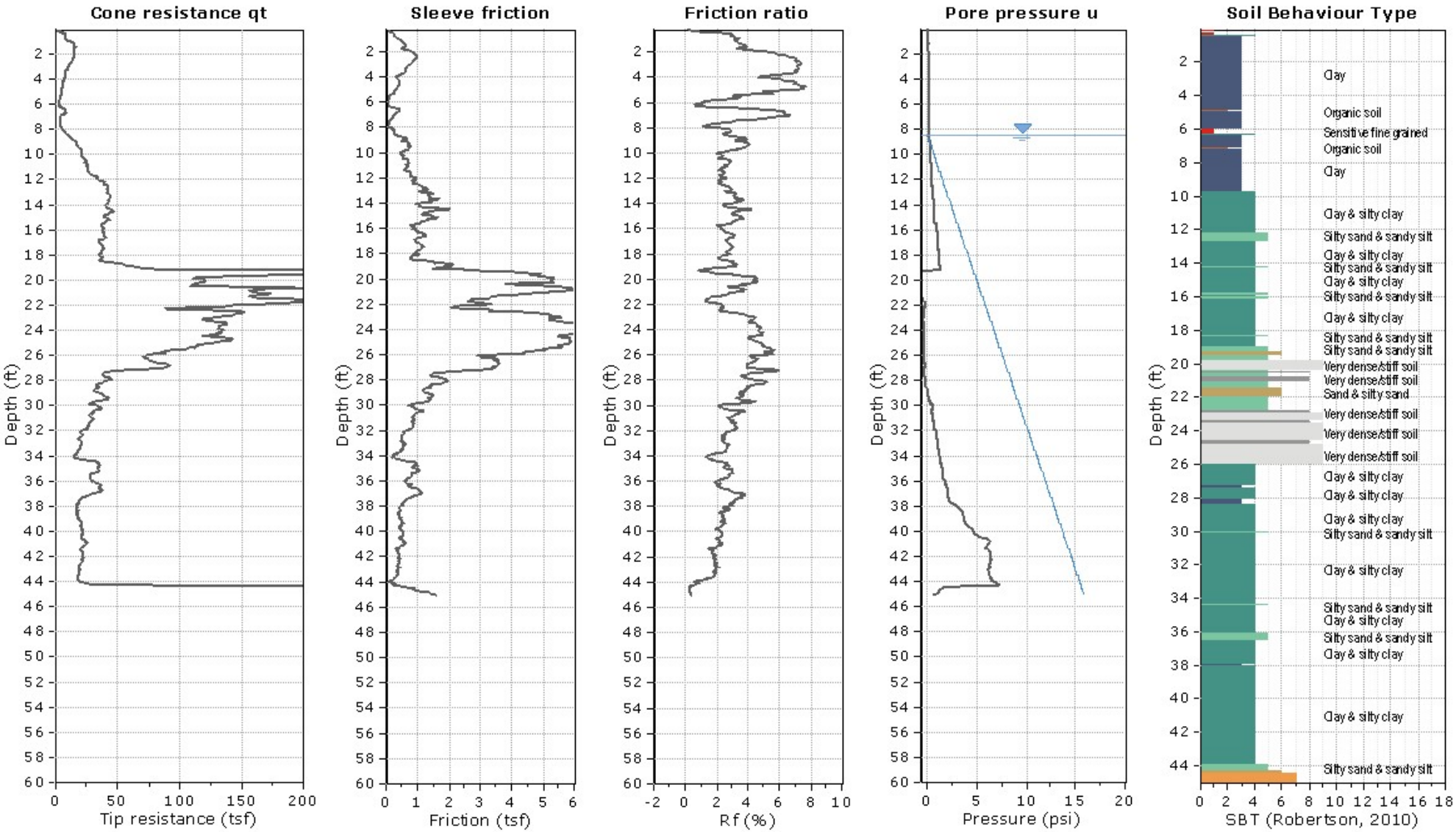
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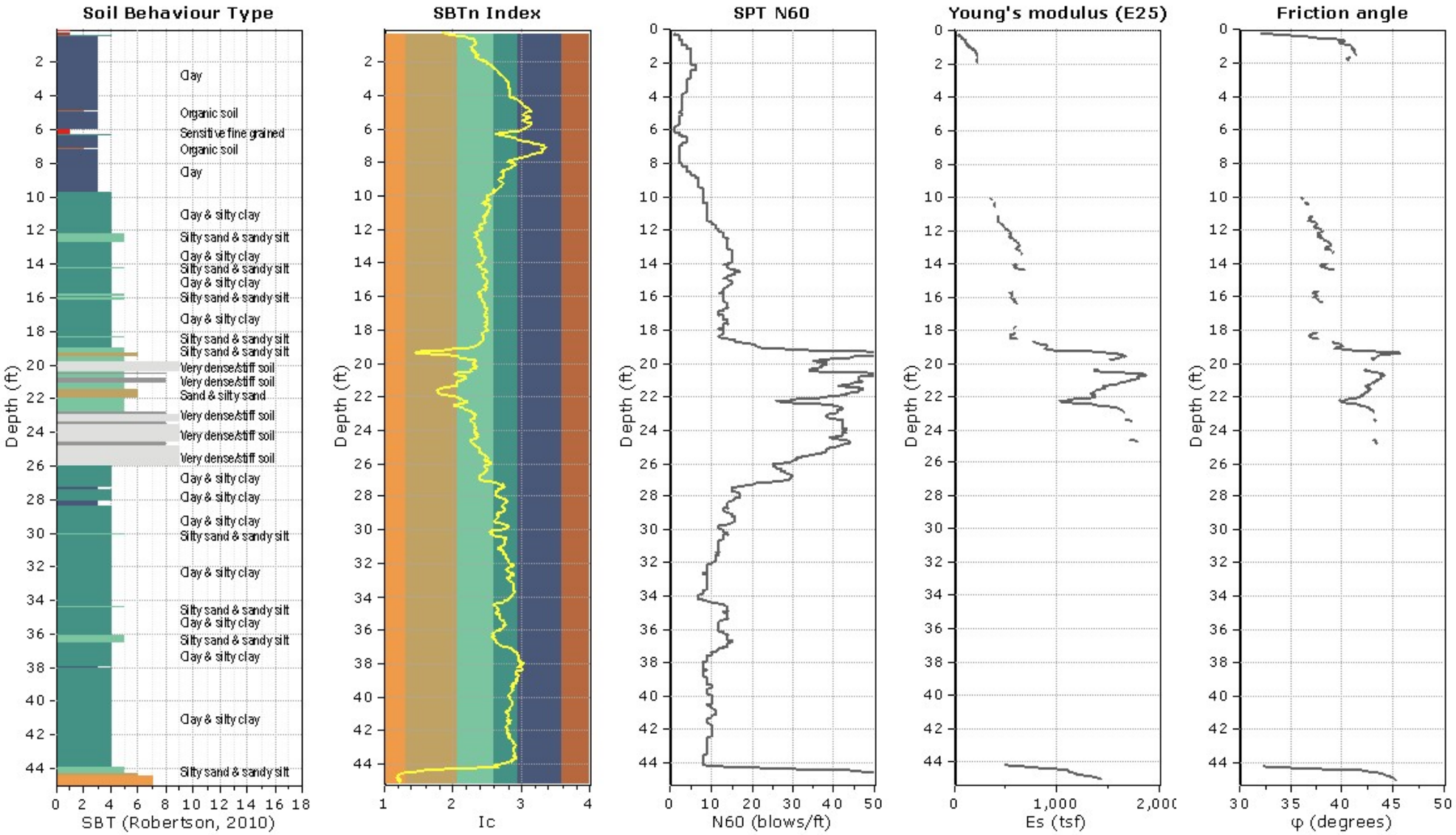
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Cone Operator: FUGRO



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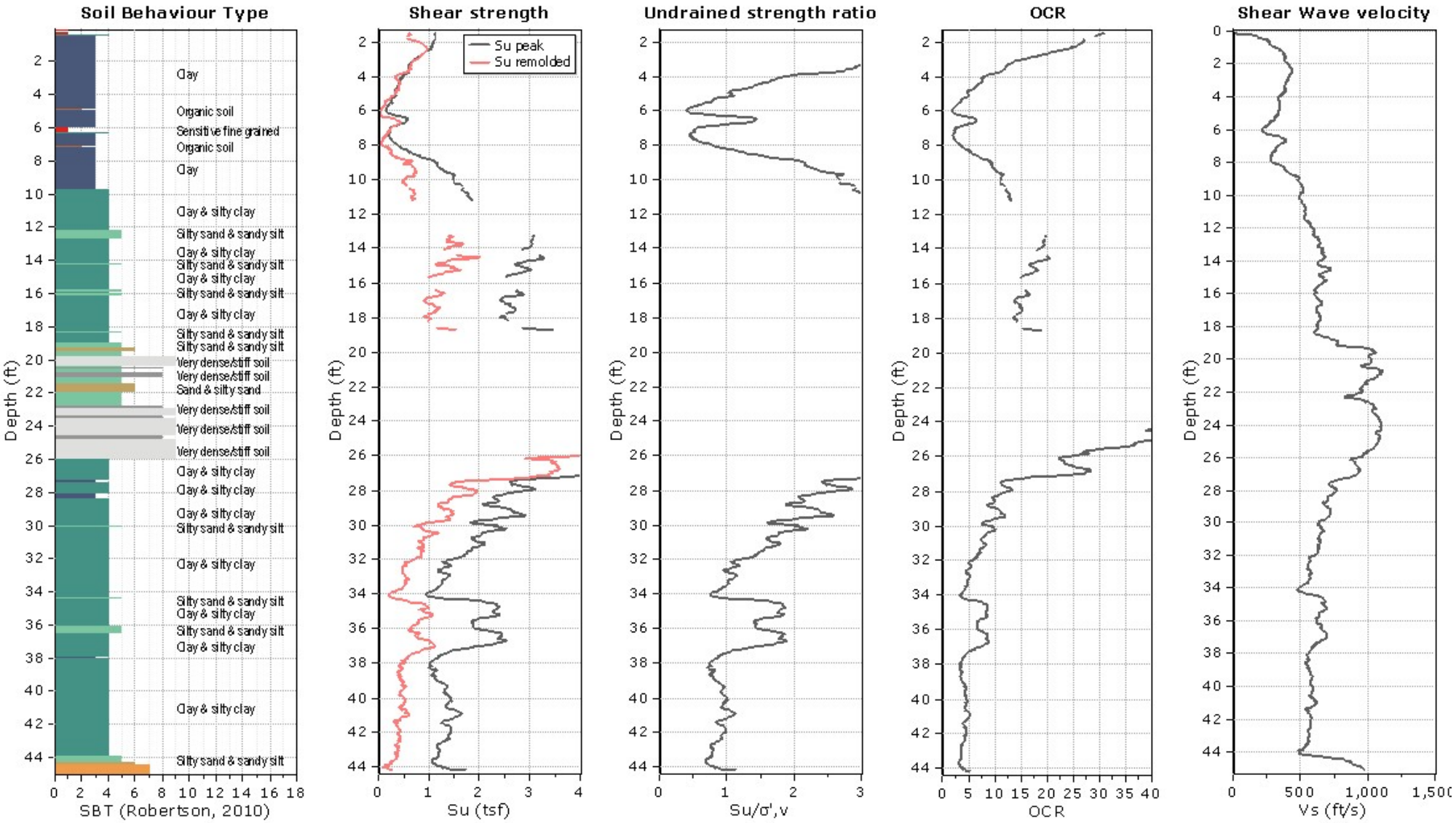
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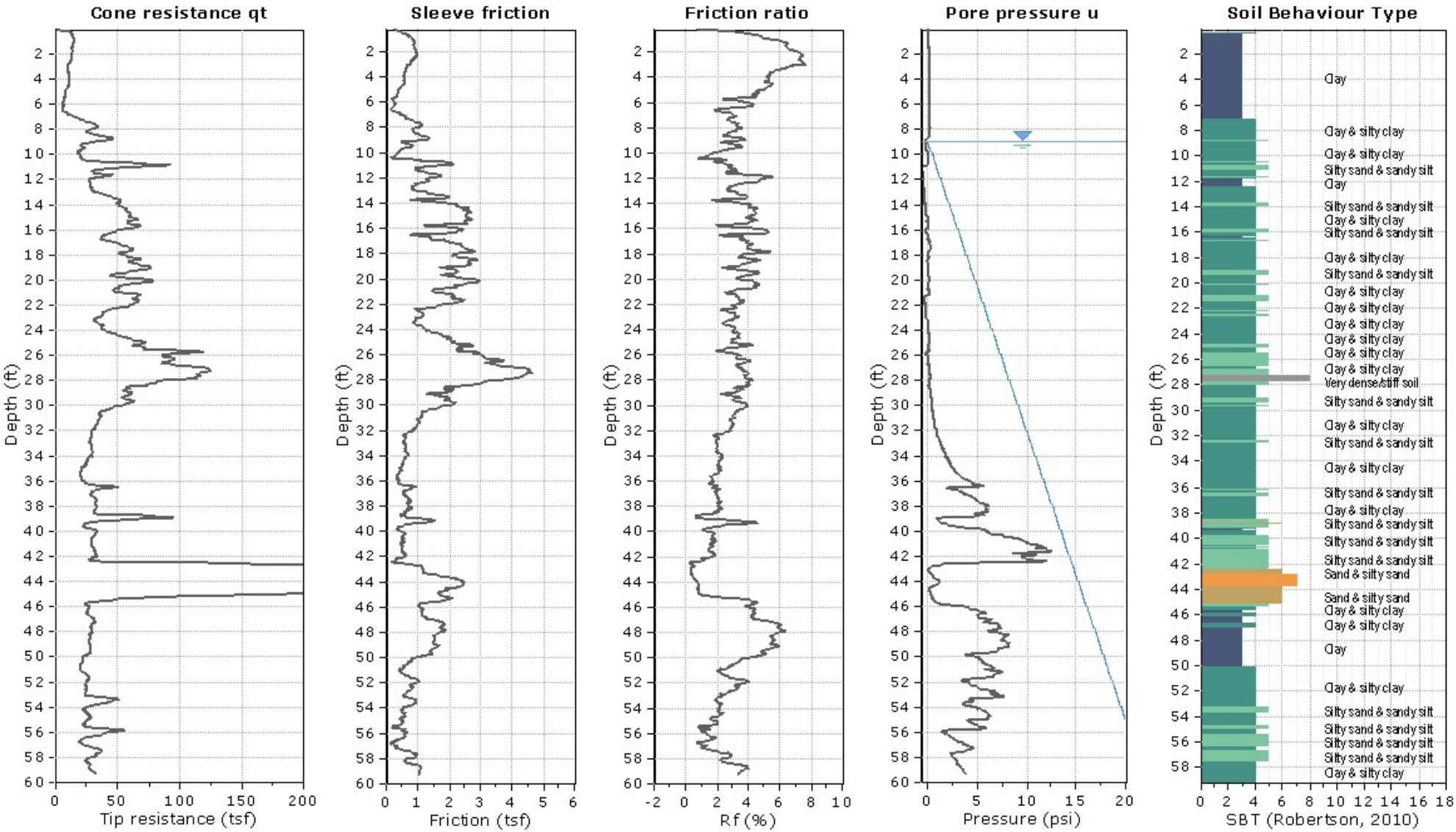
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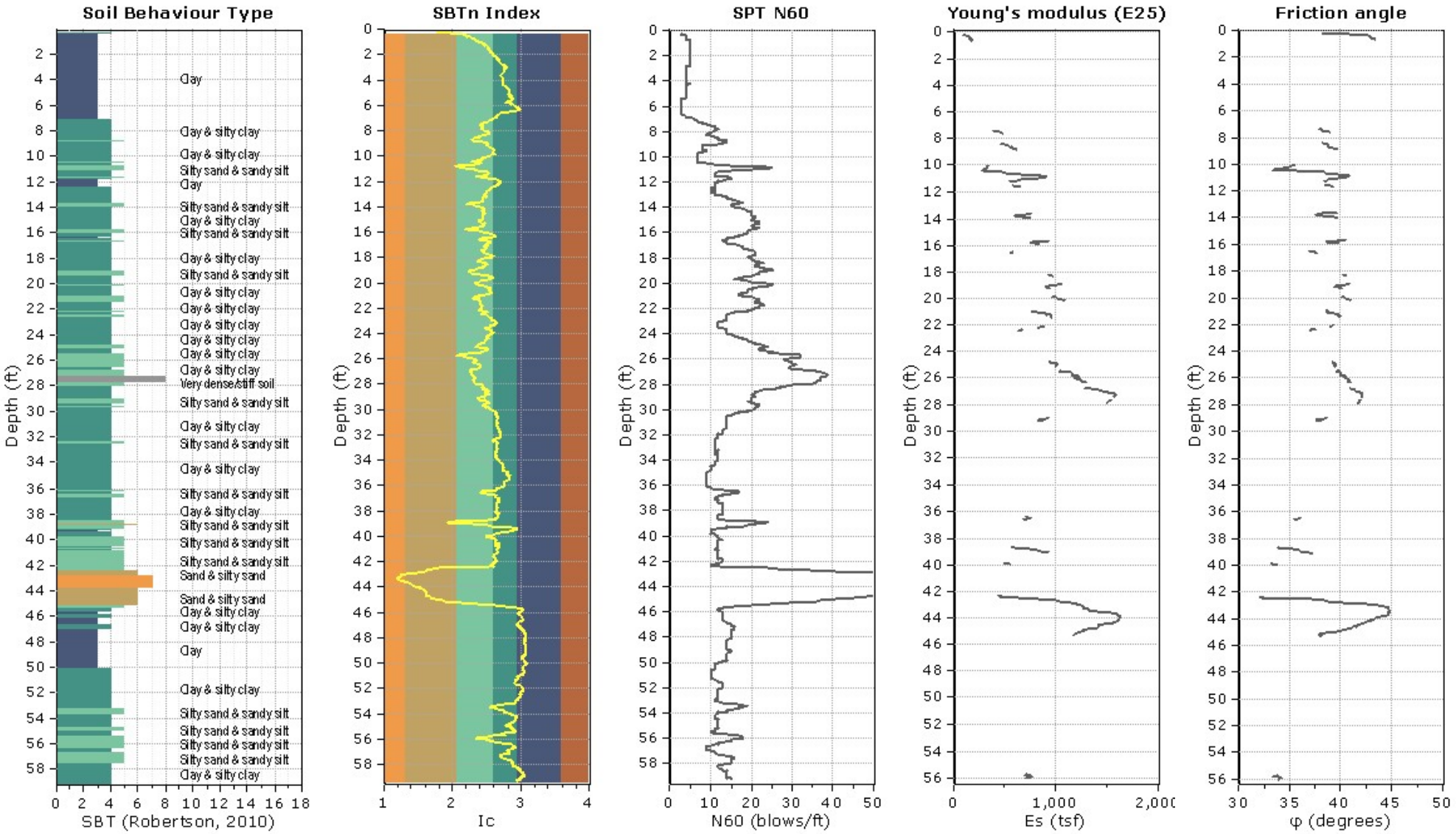
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Cone Type: CPT
Cone Operator: FUGRO



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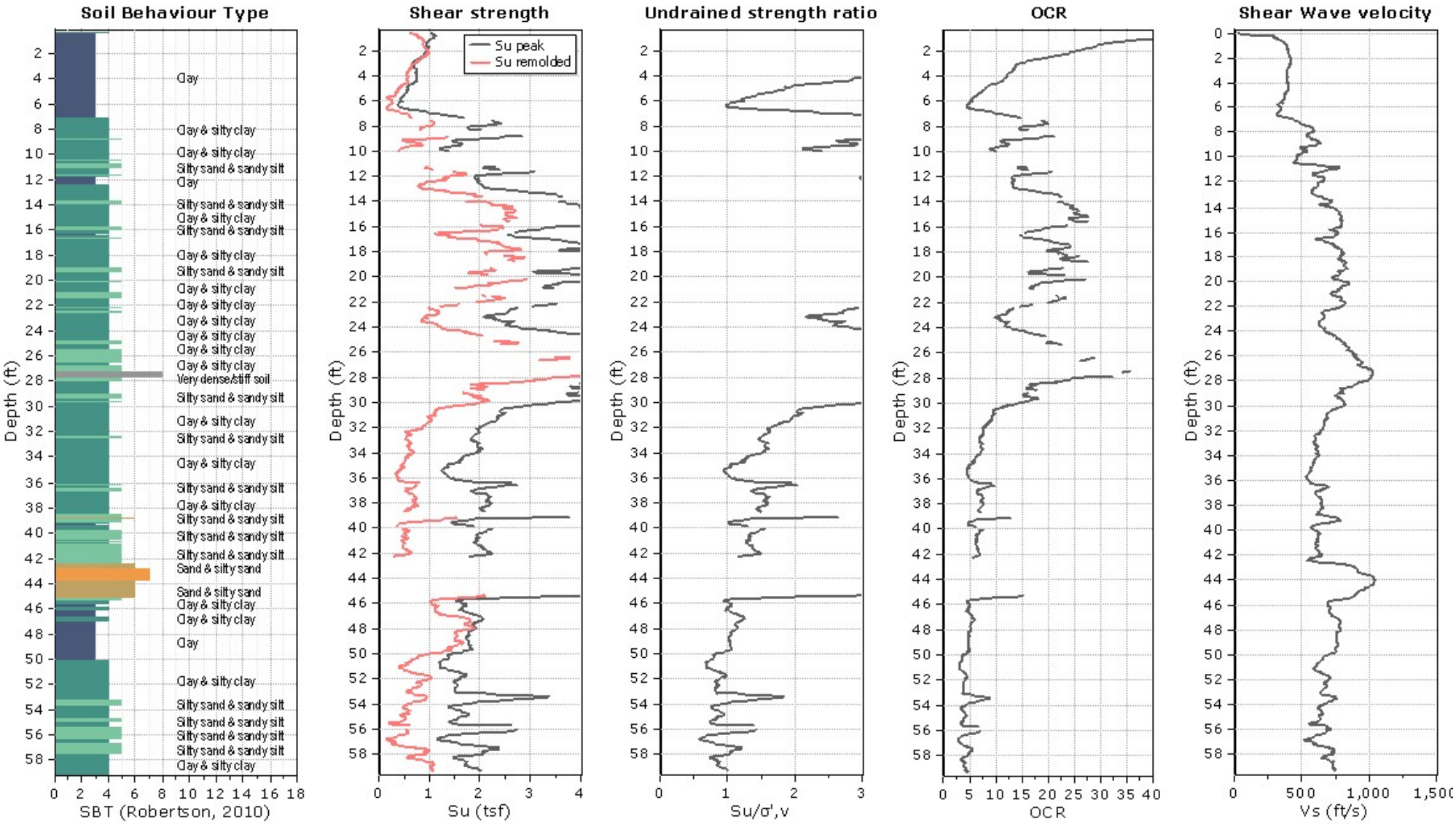
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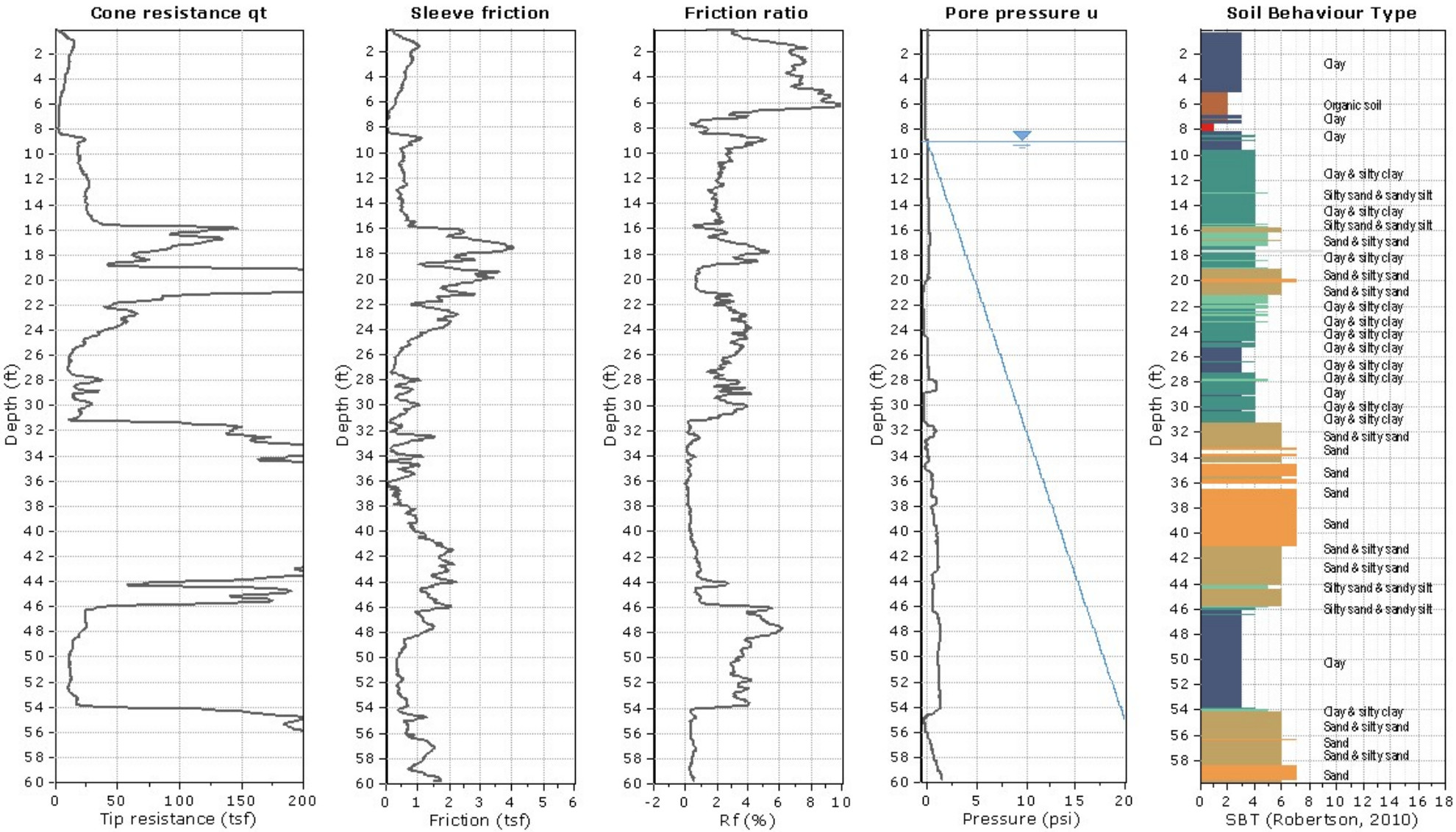
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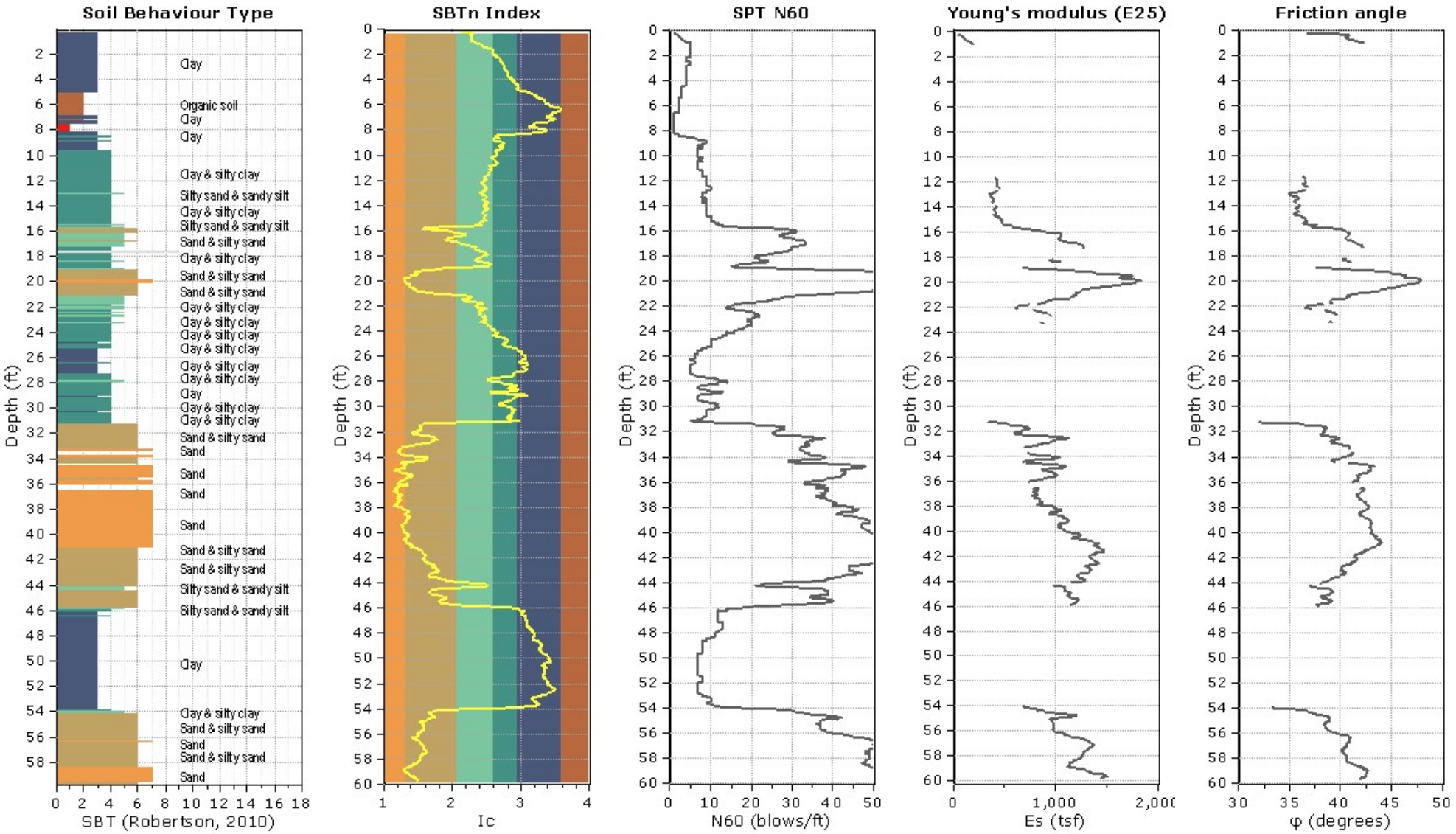
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Cone Type: CPT
Cone Operator: FUGRO



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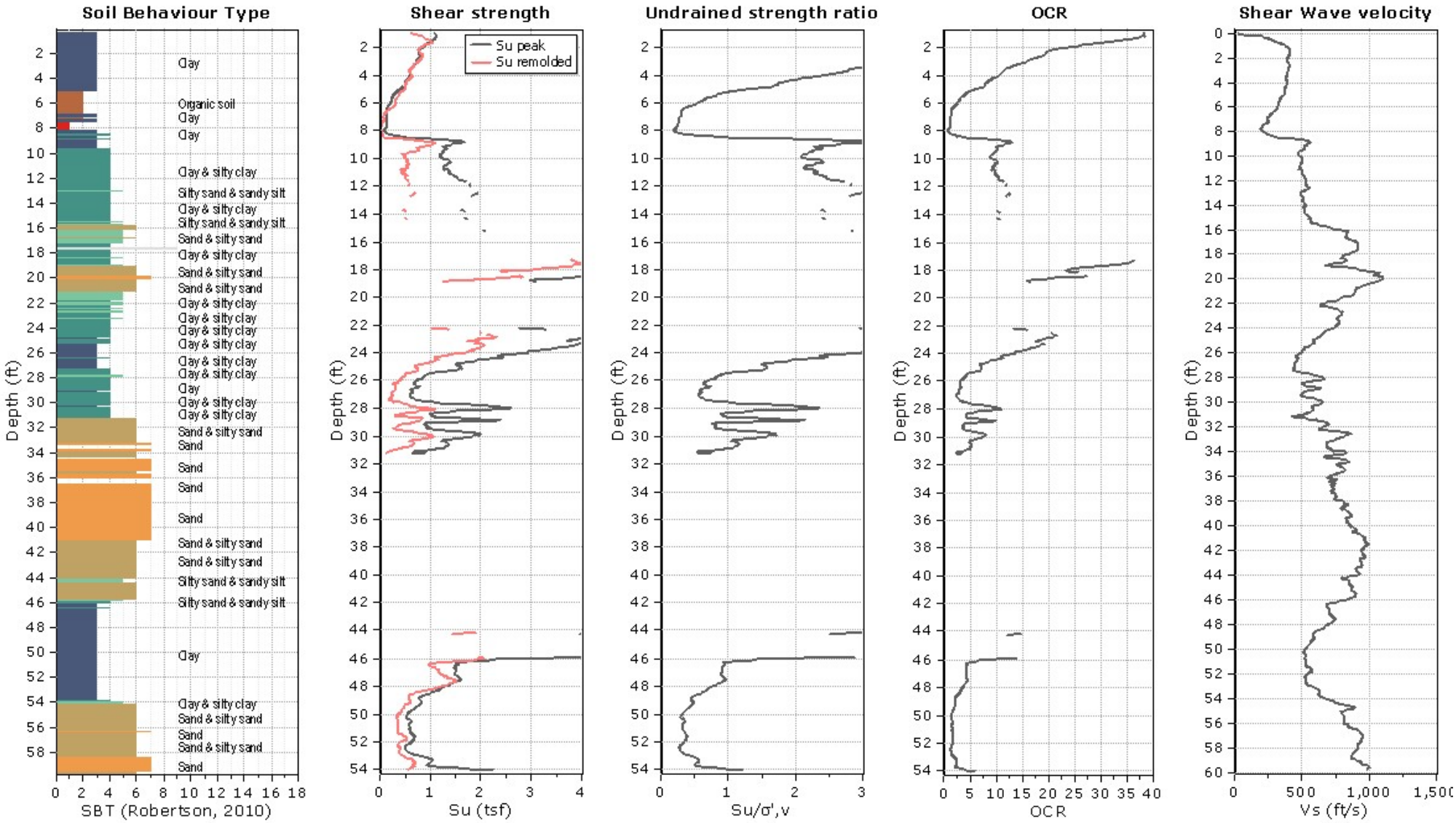
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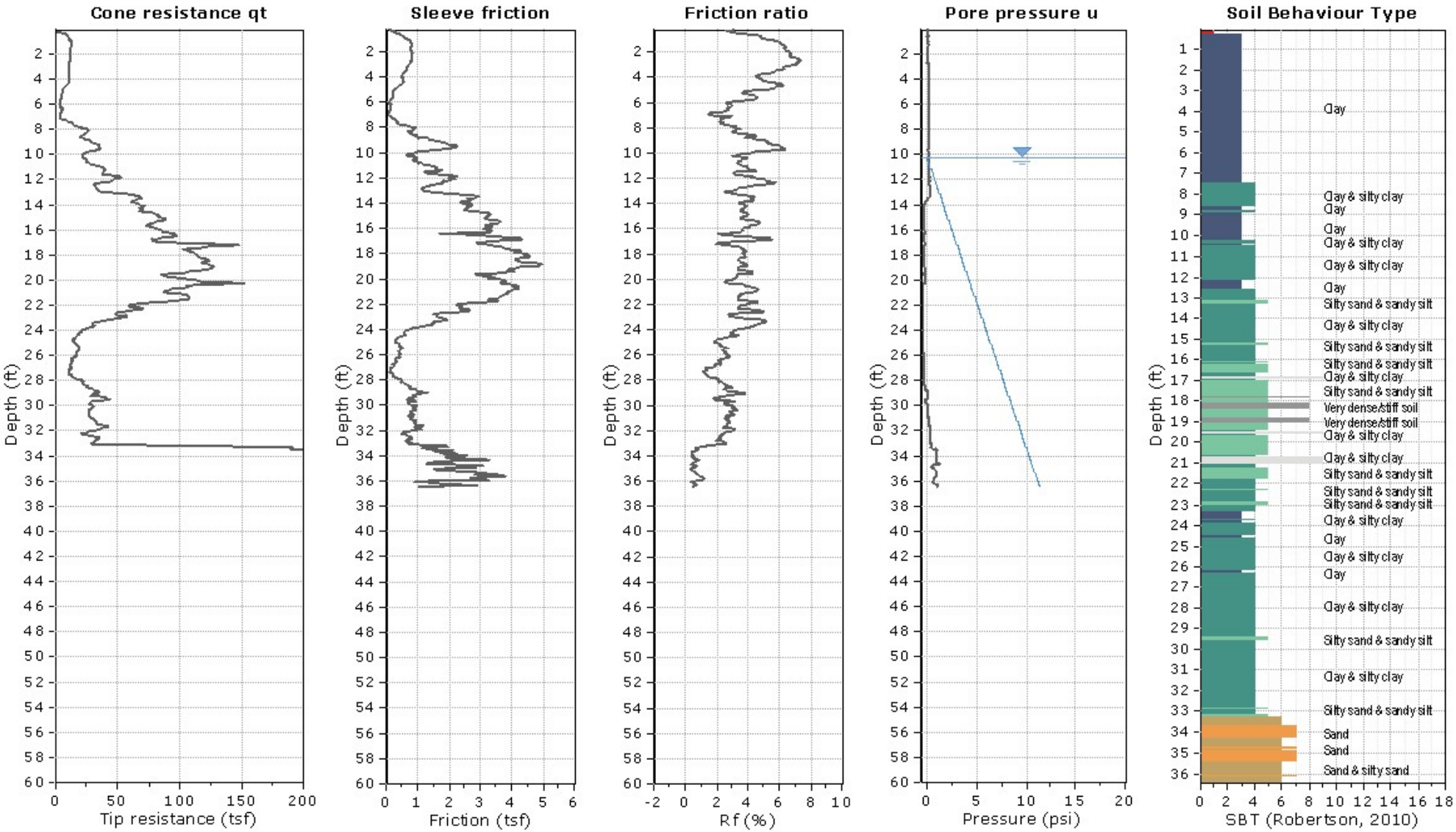
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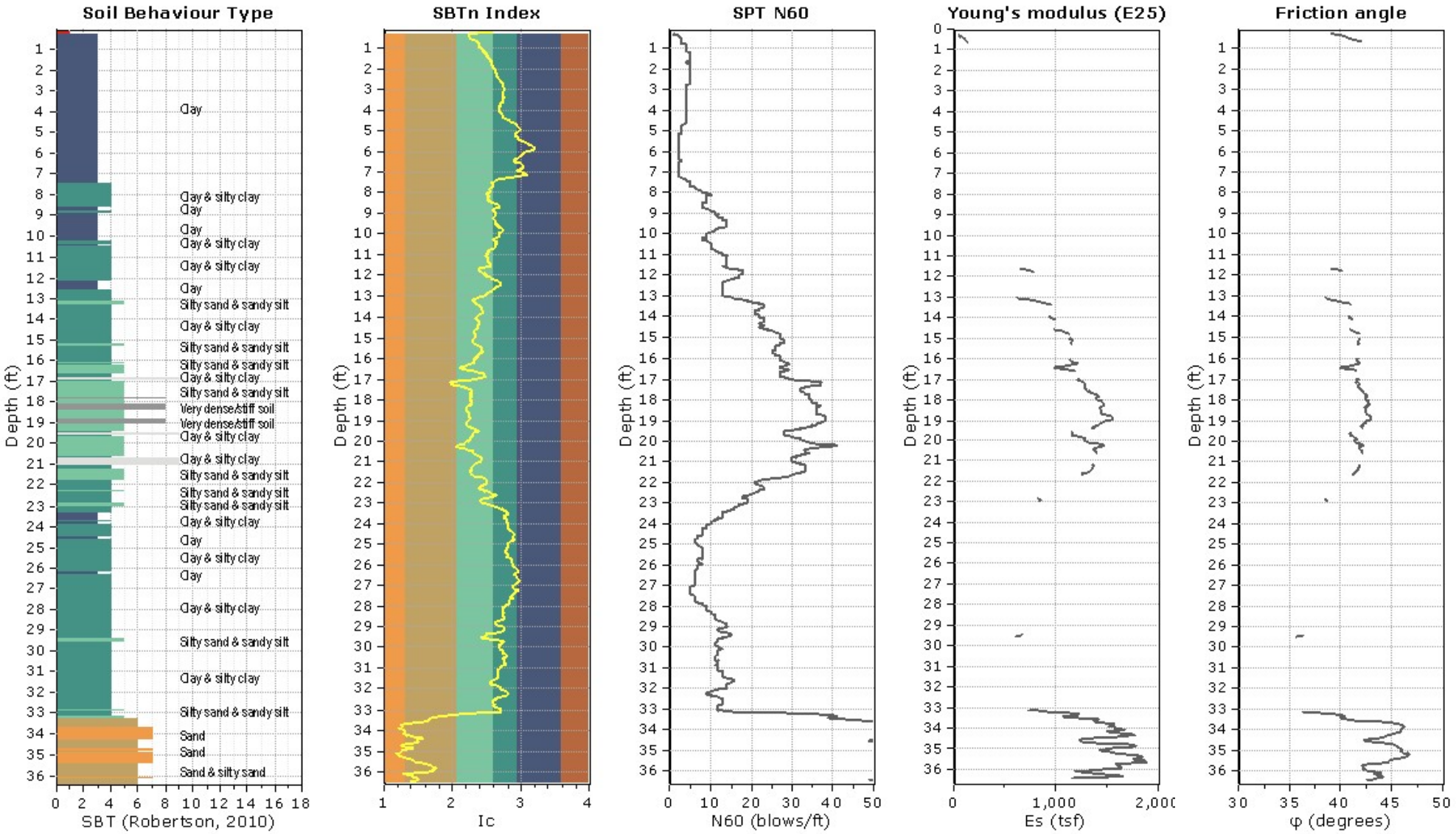
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Cone Type: CPT
Cone Operator: FUGRO



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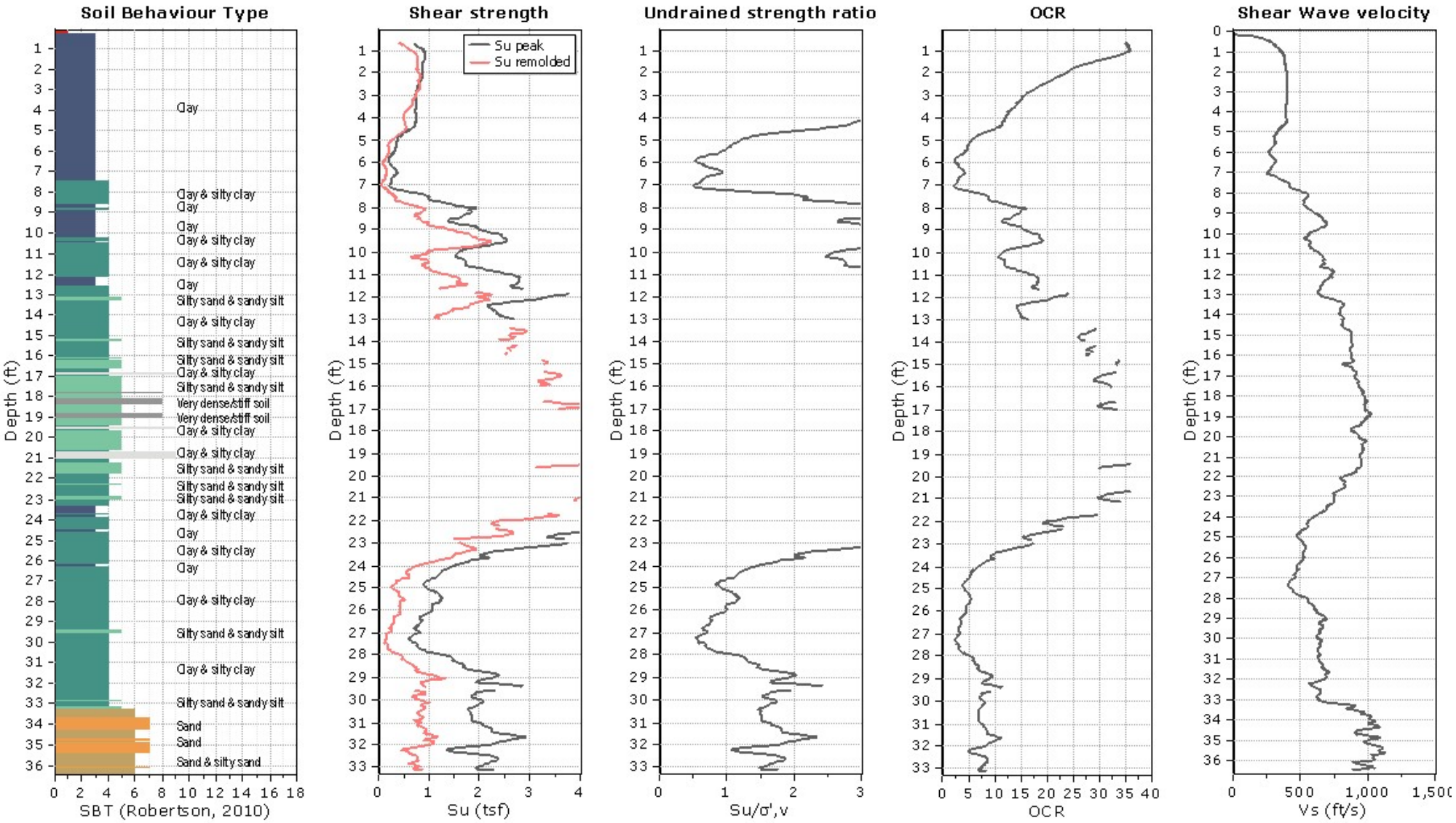
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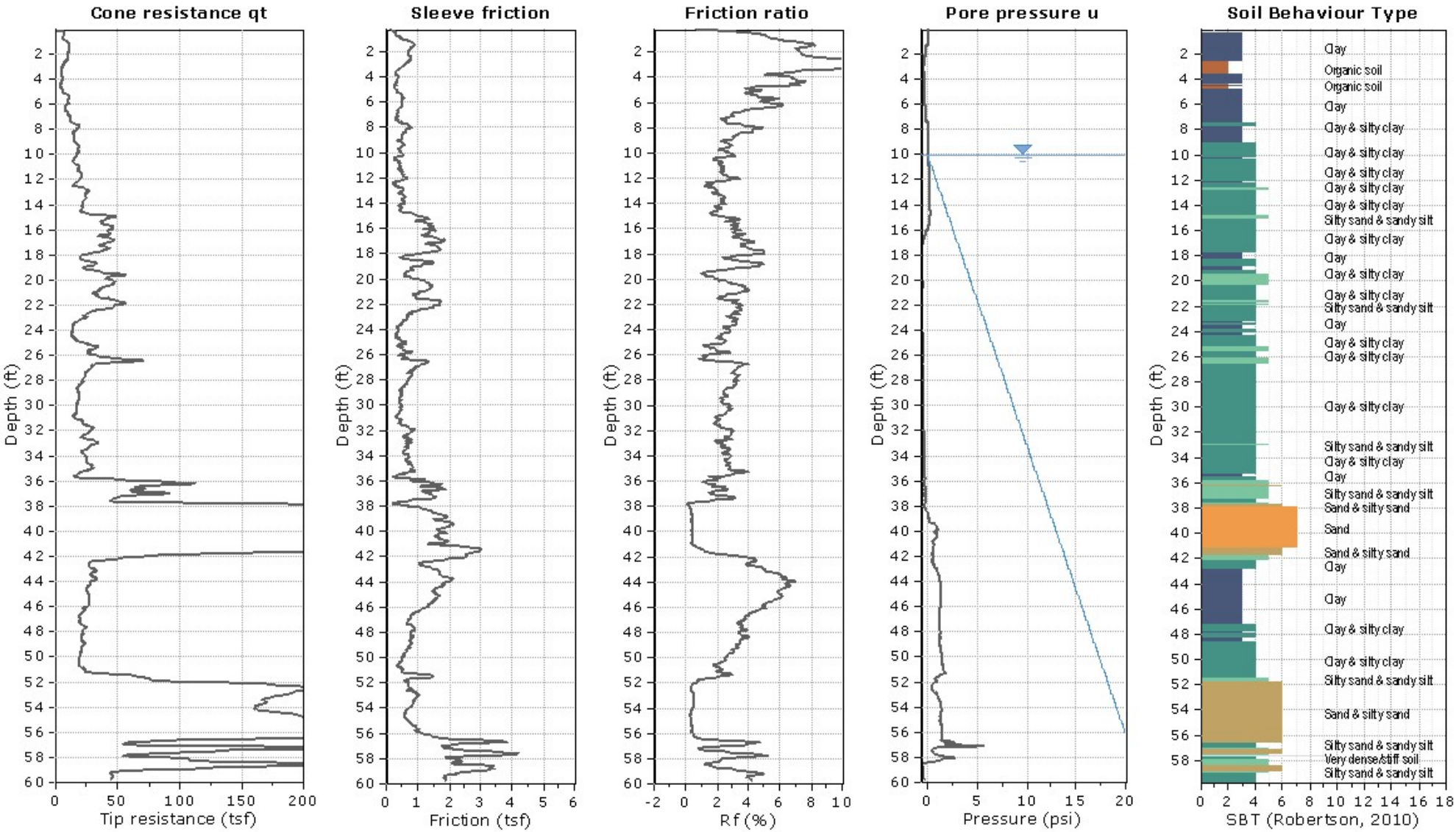
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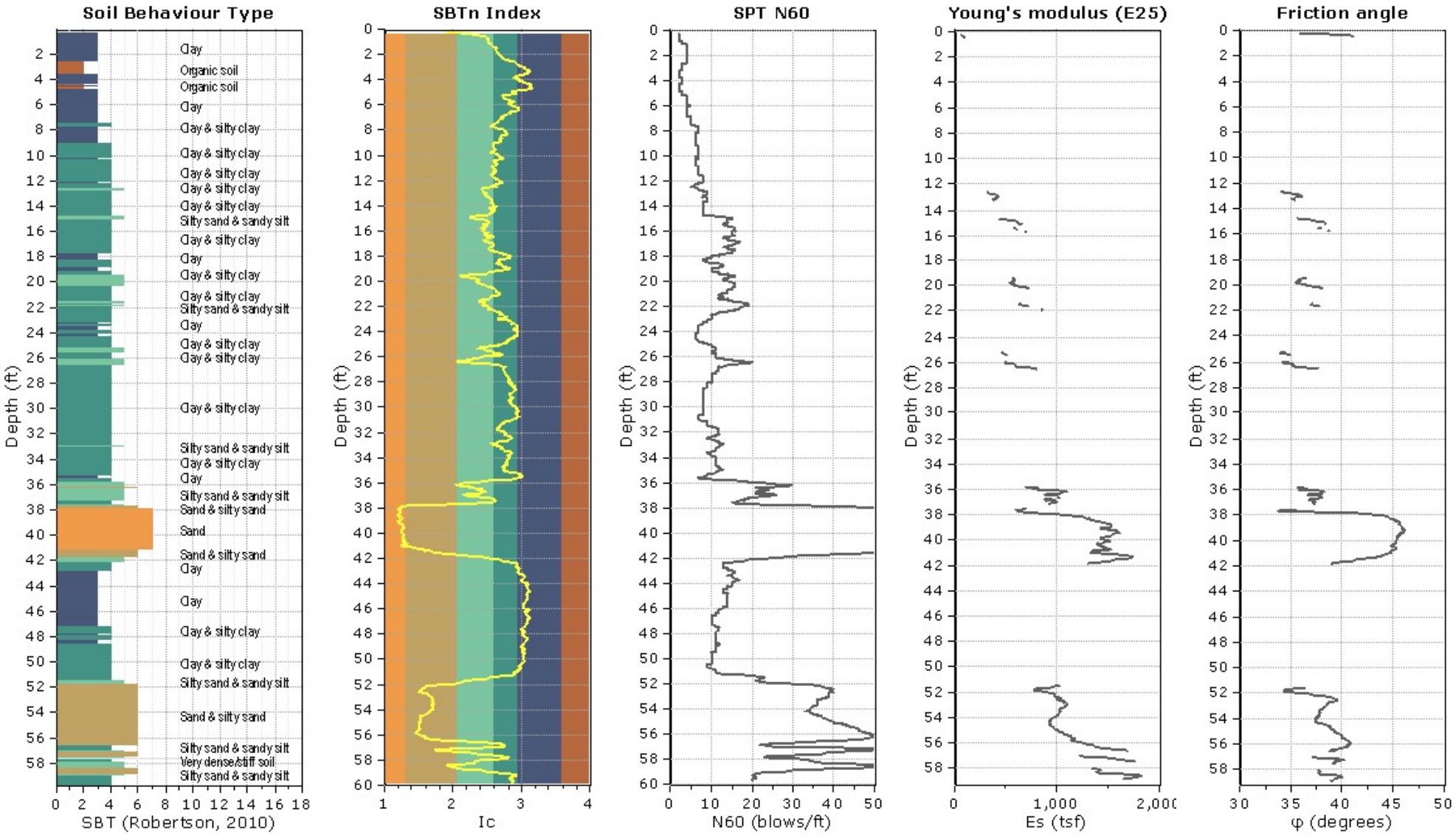
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Cone Type: CPT
Cone Operator: FUGRO



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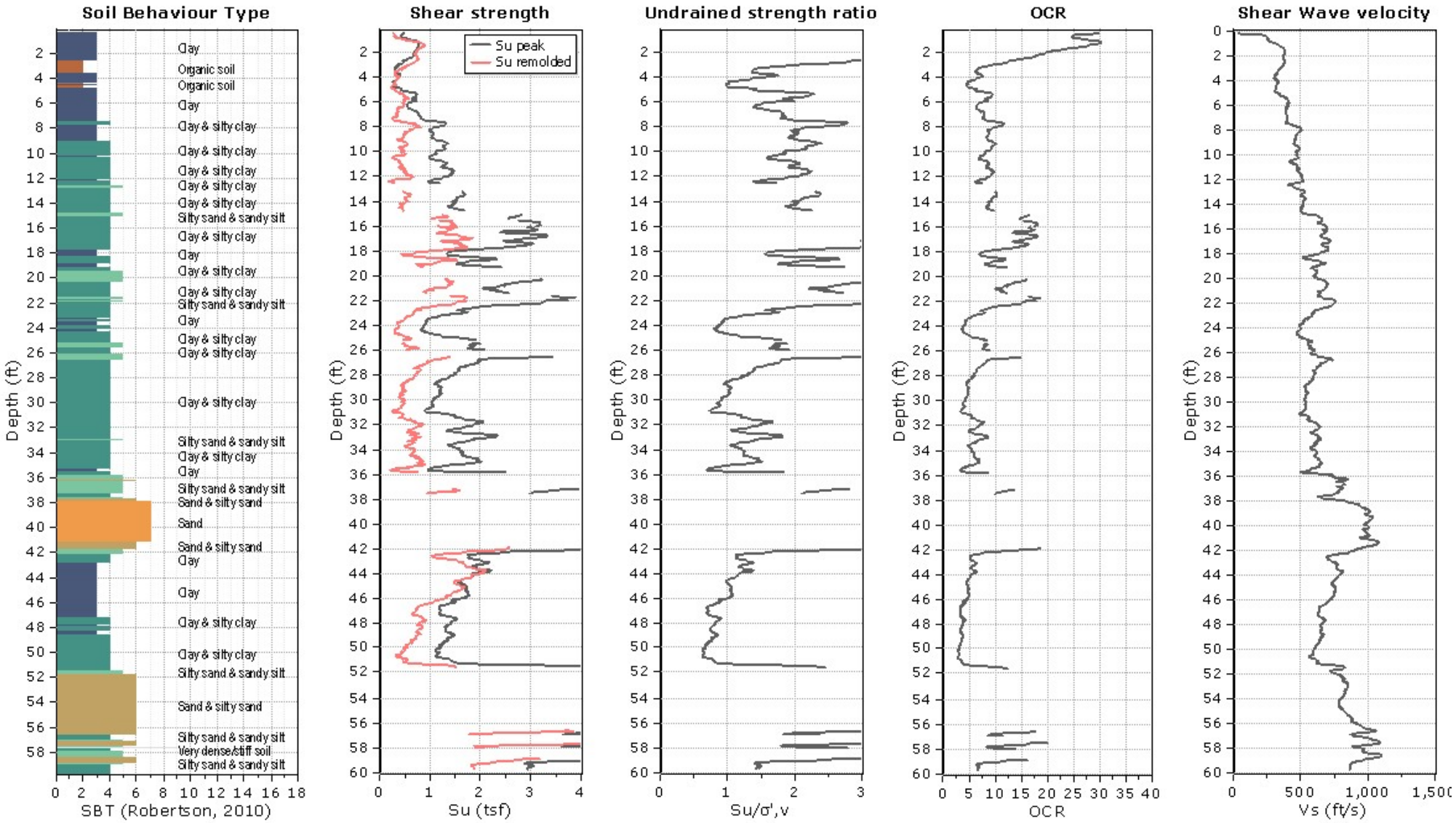
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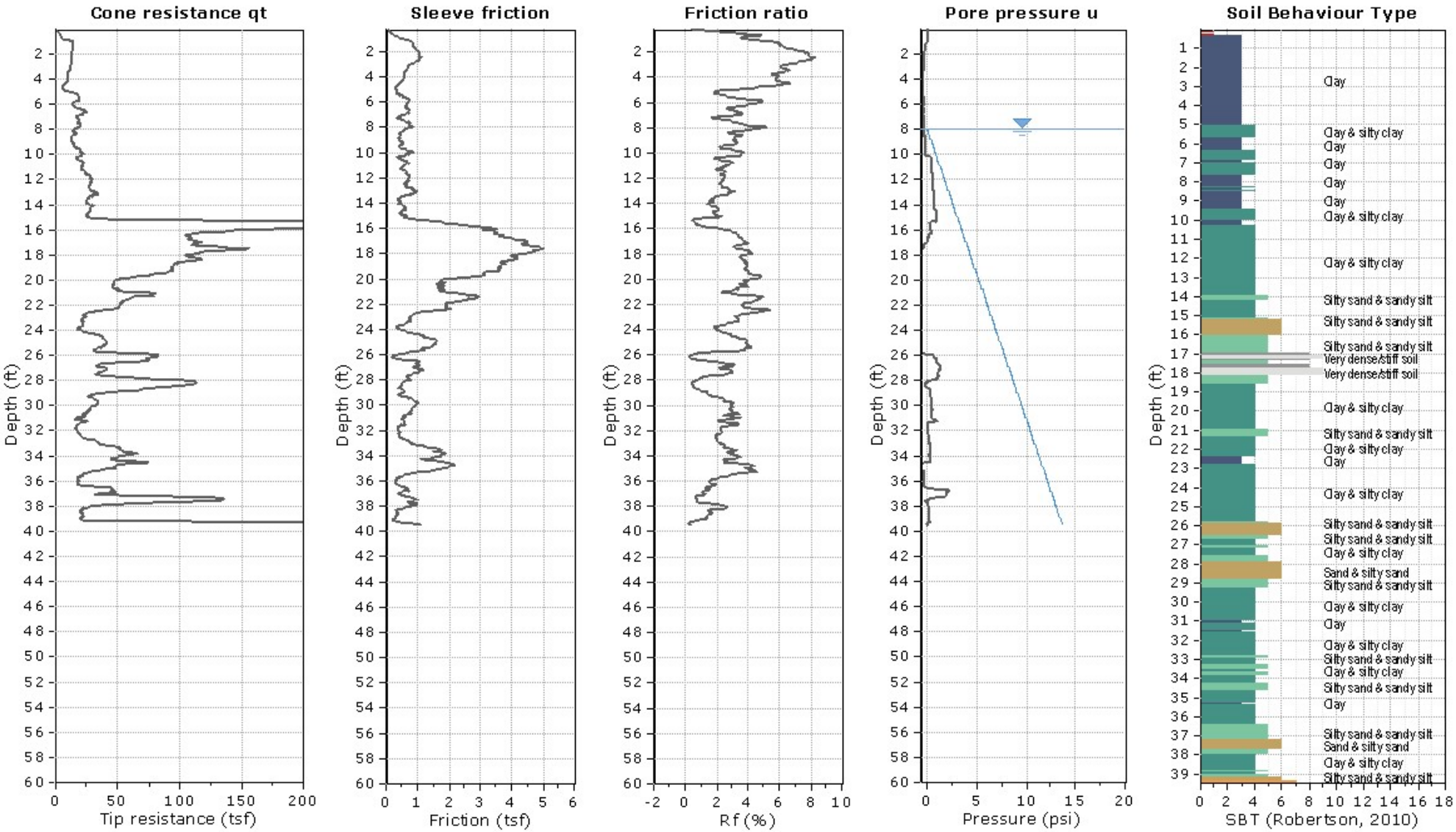
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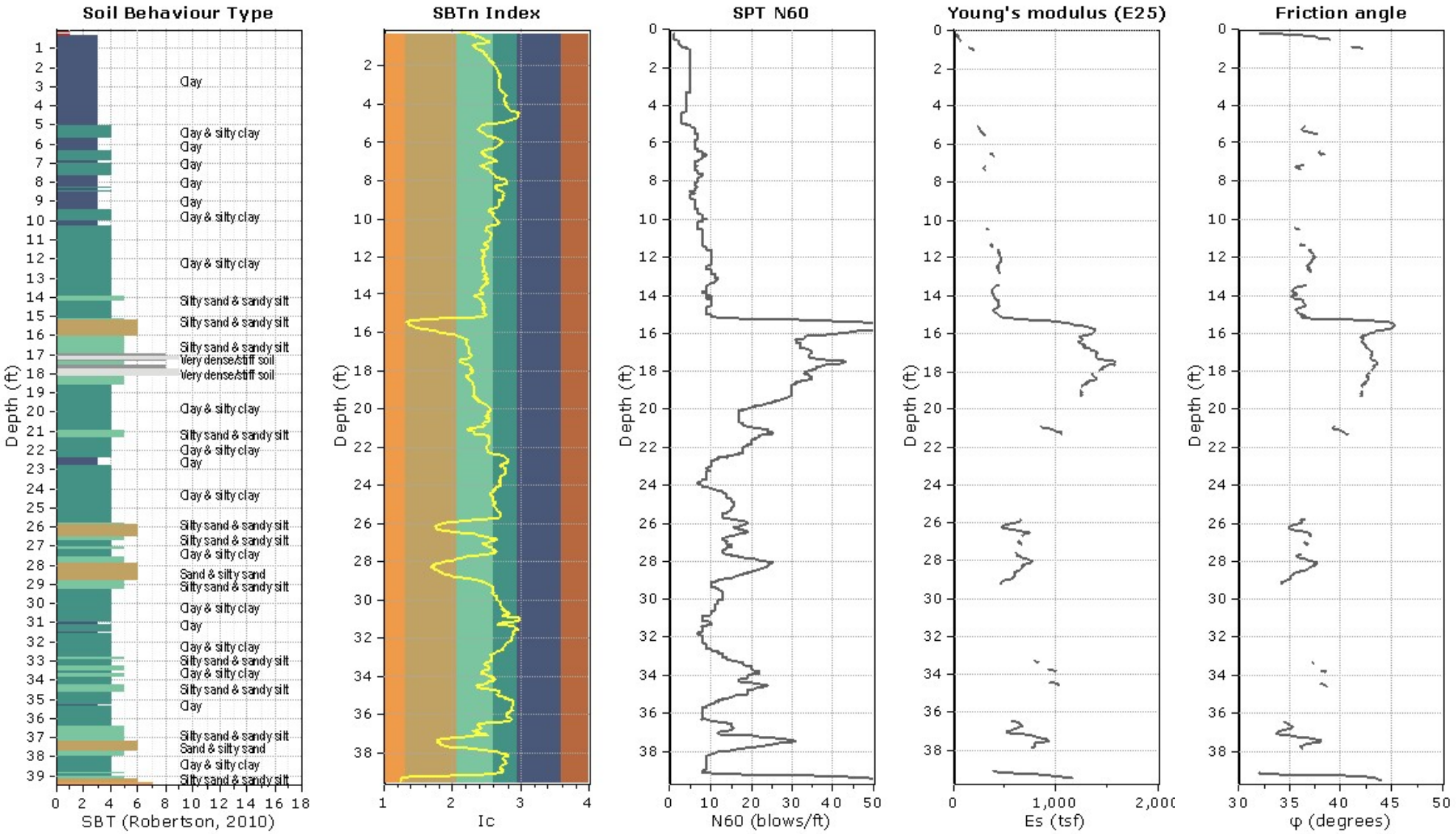
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Cone Operator: FUGRO



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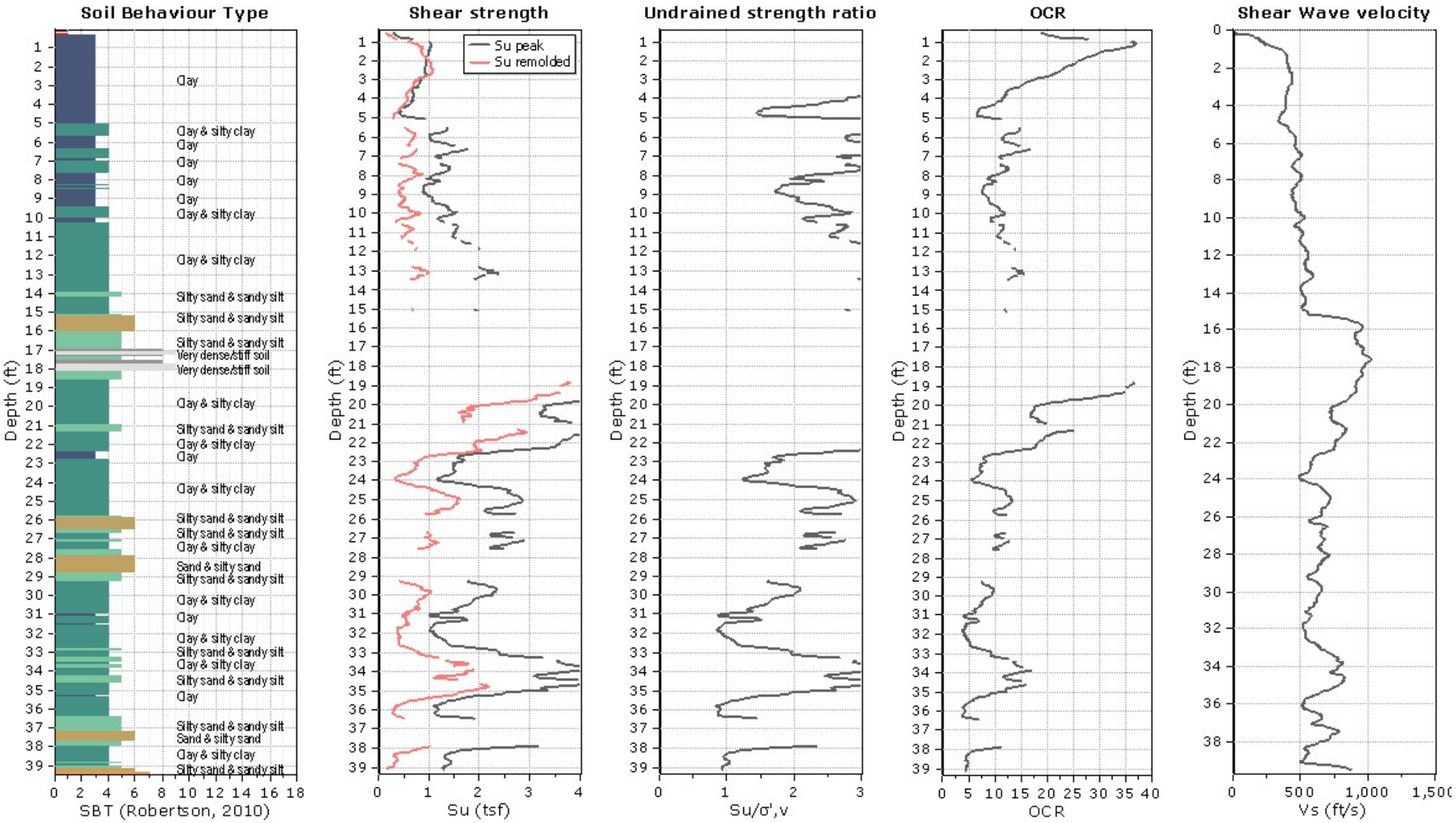
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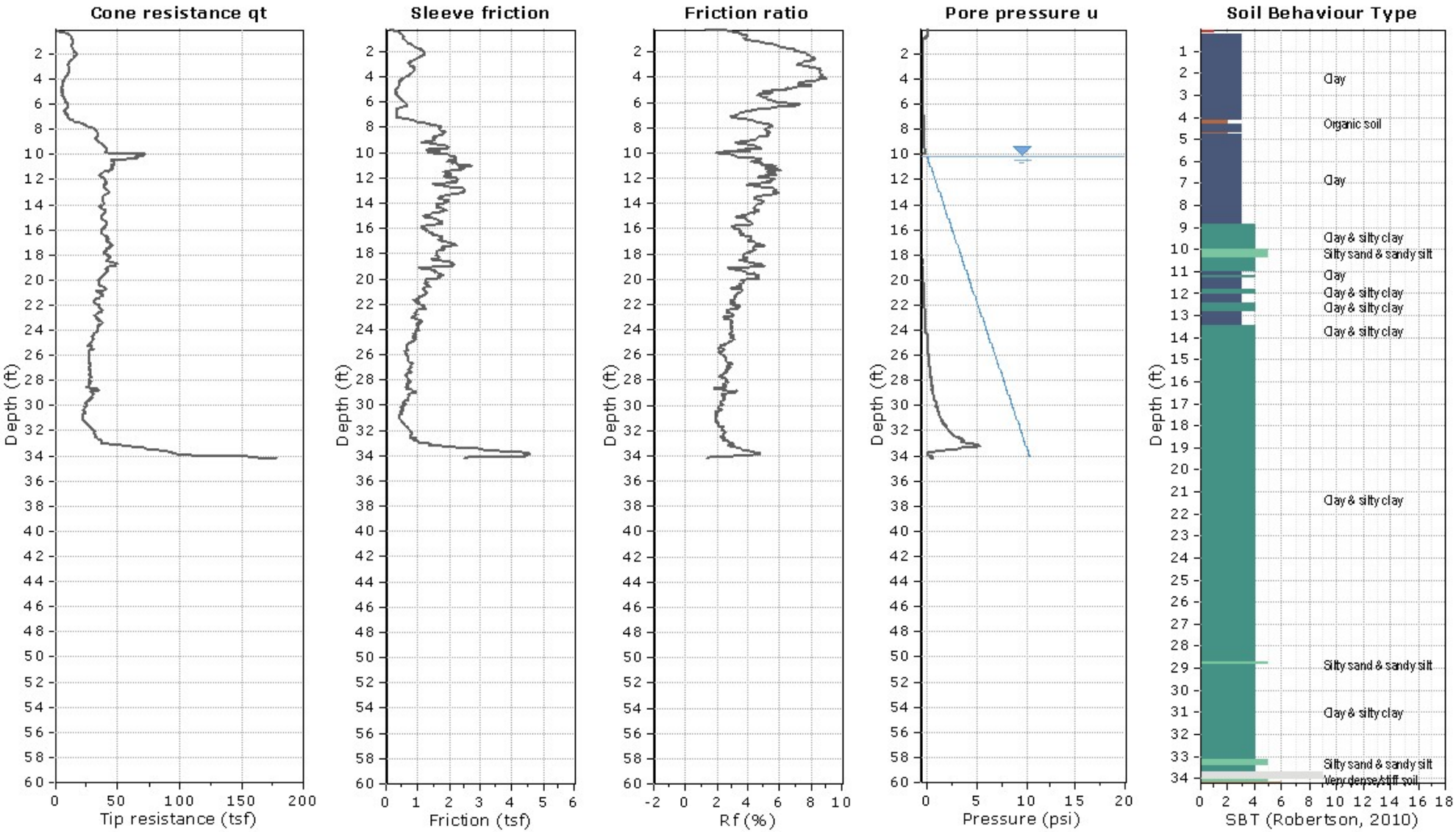
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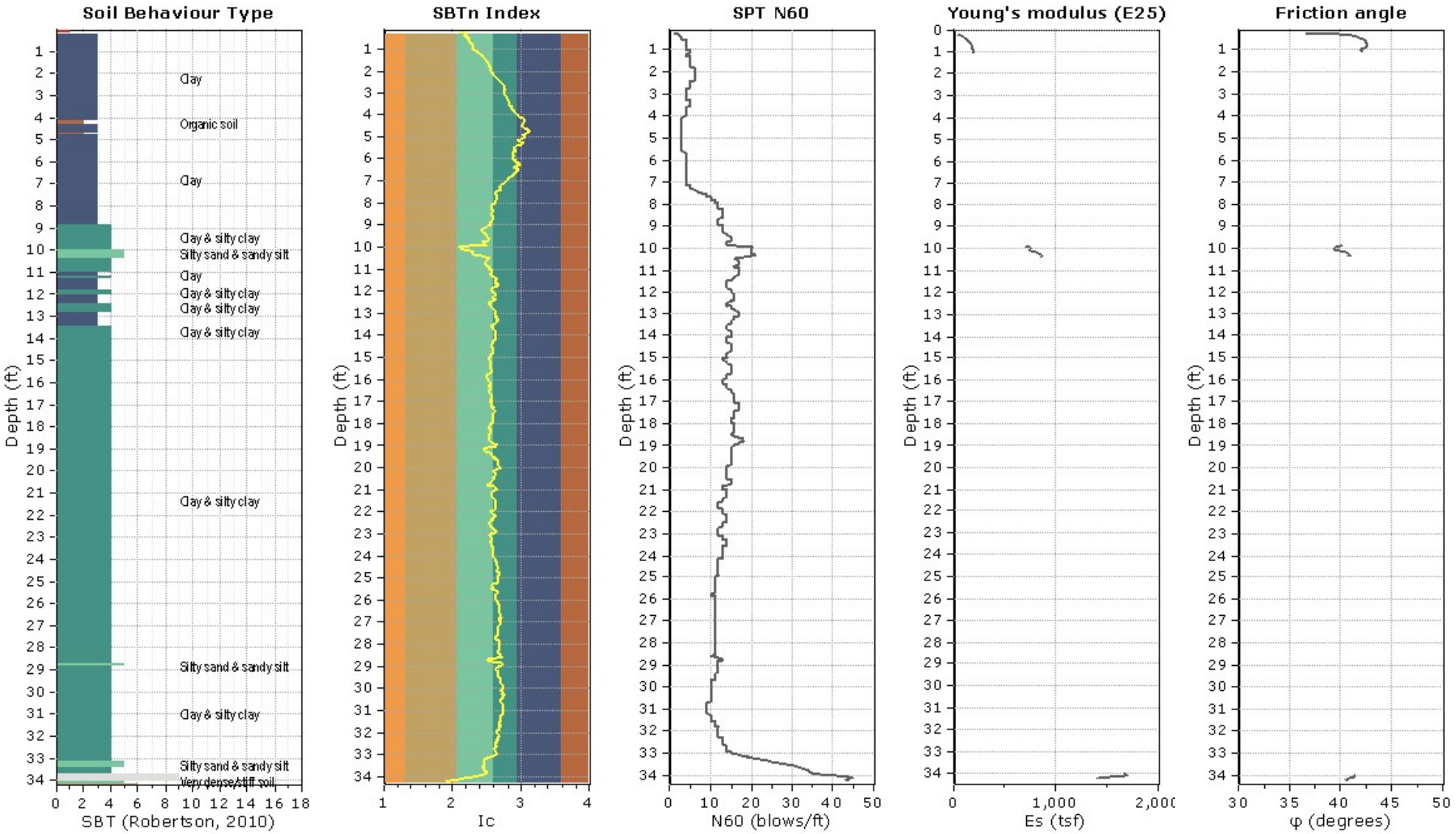
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Cone Type: CPT
Cone Operator: FUGRO



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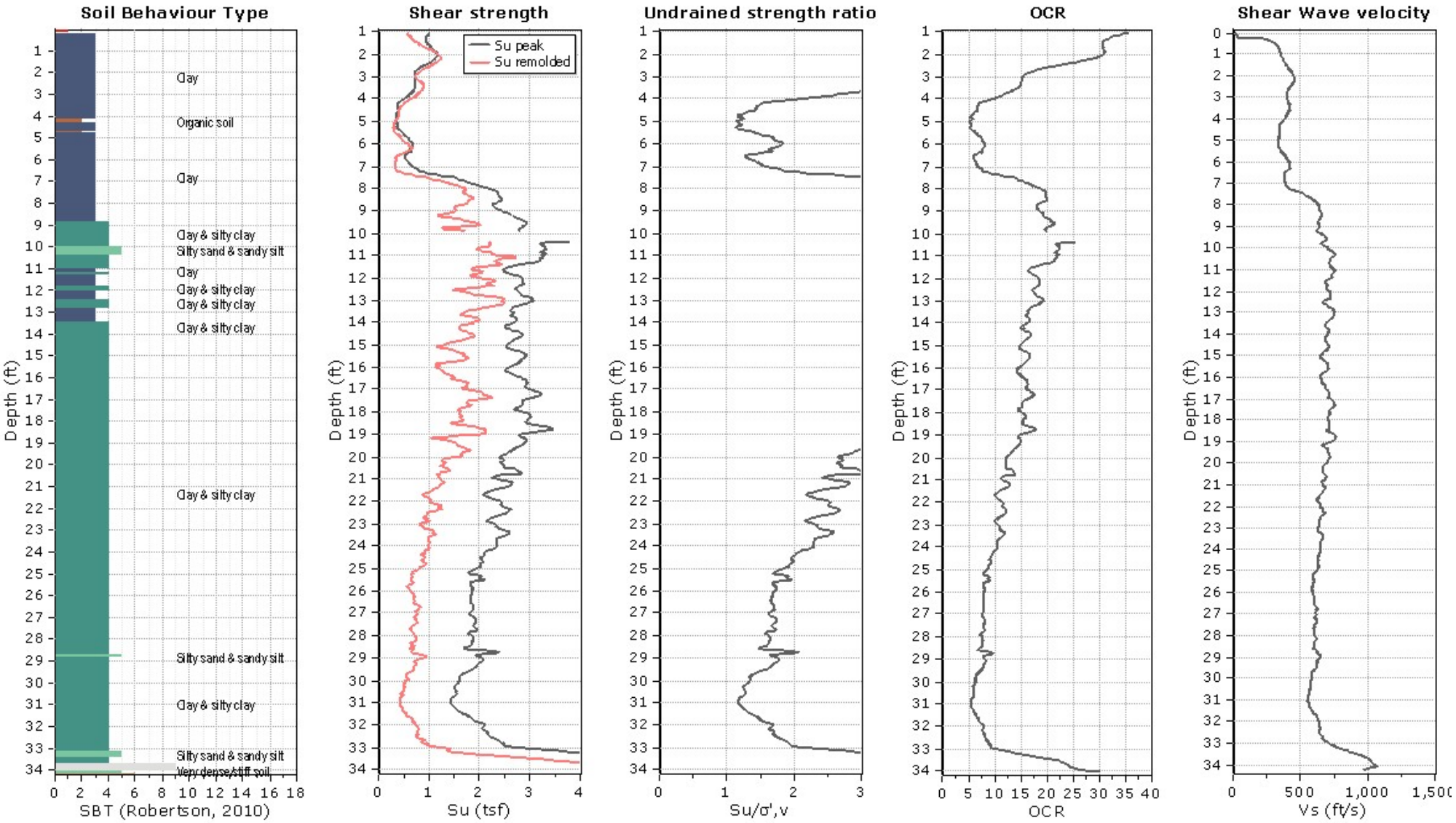
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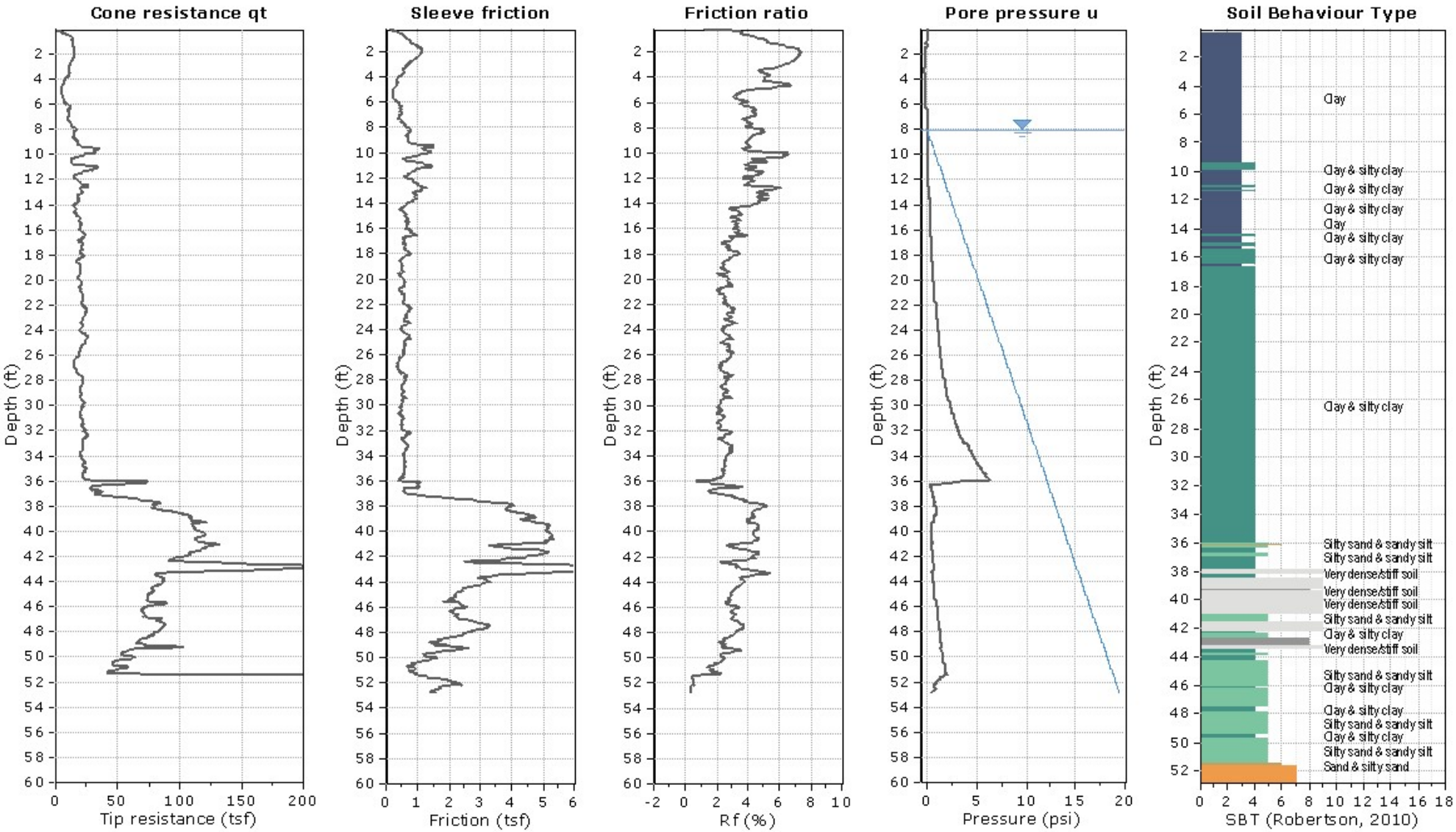
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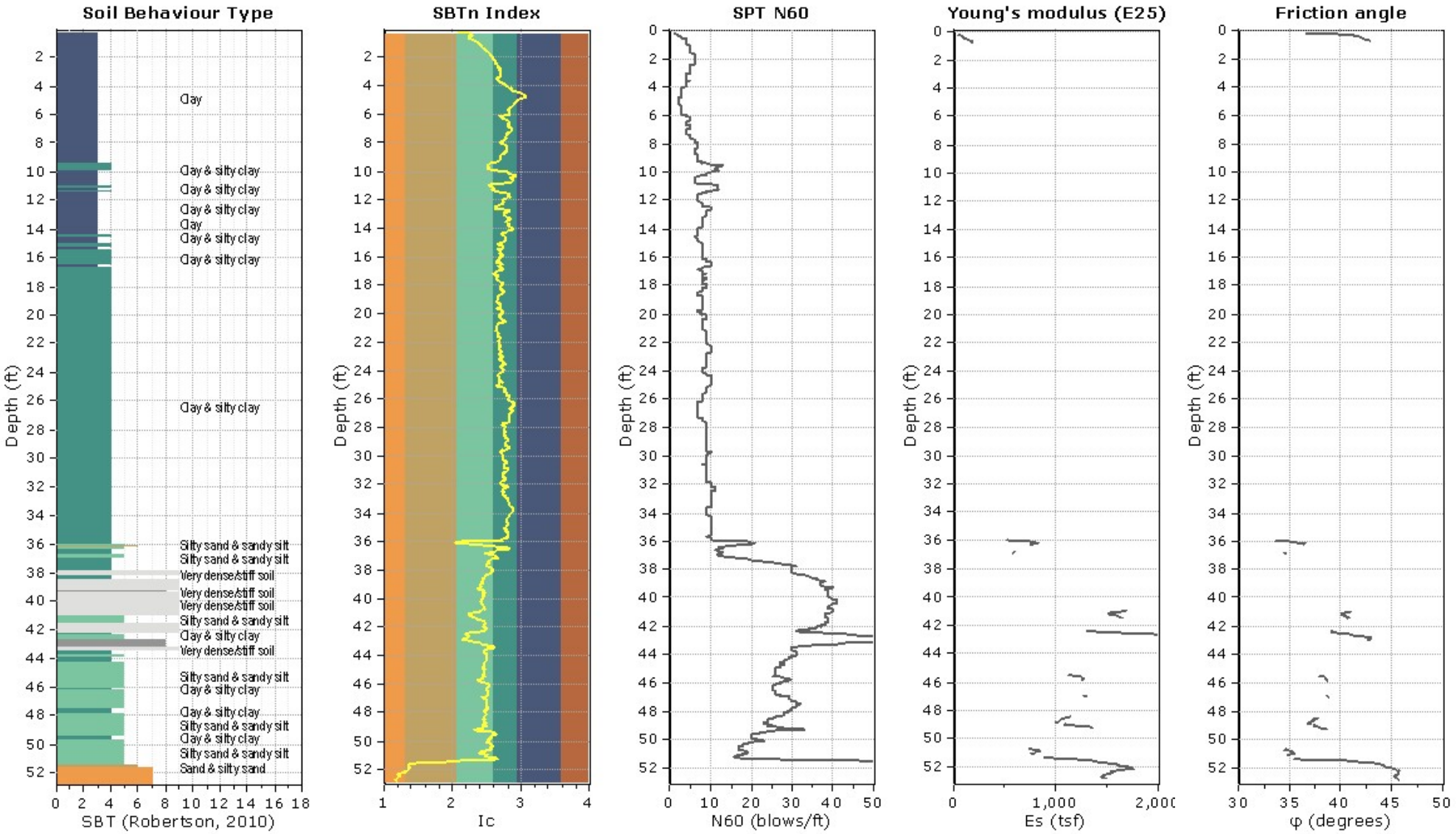
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Cone Operator: FUGRO



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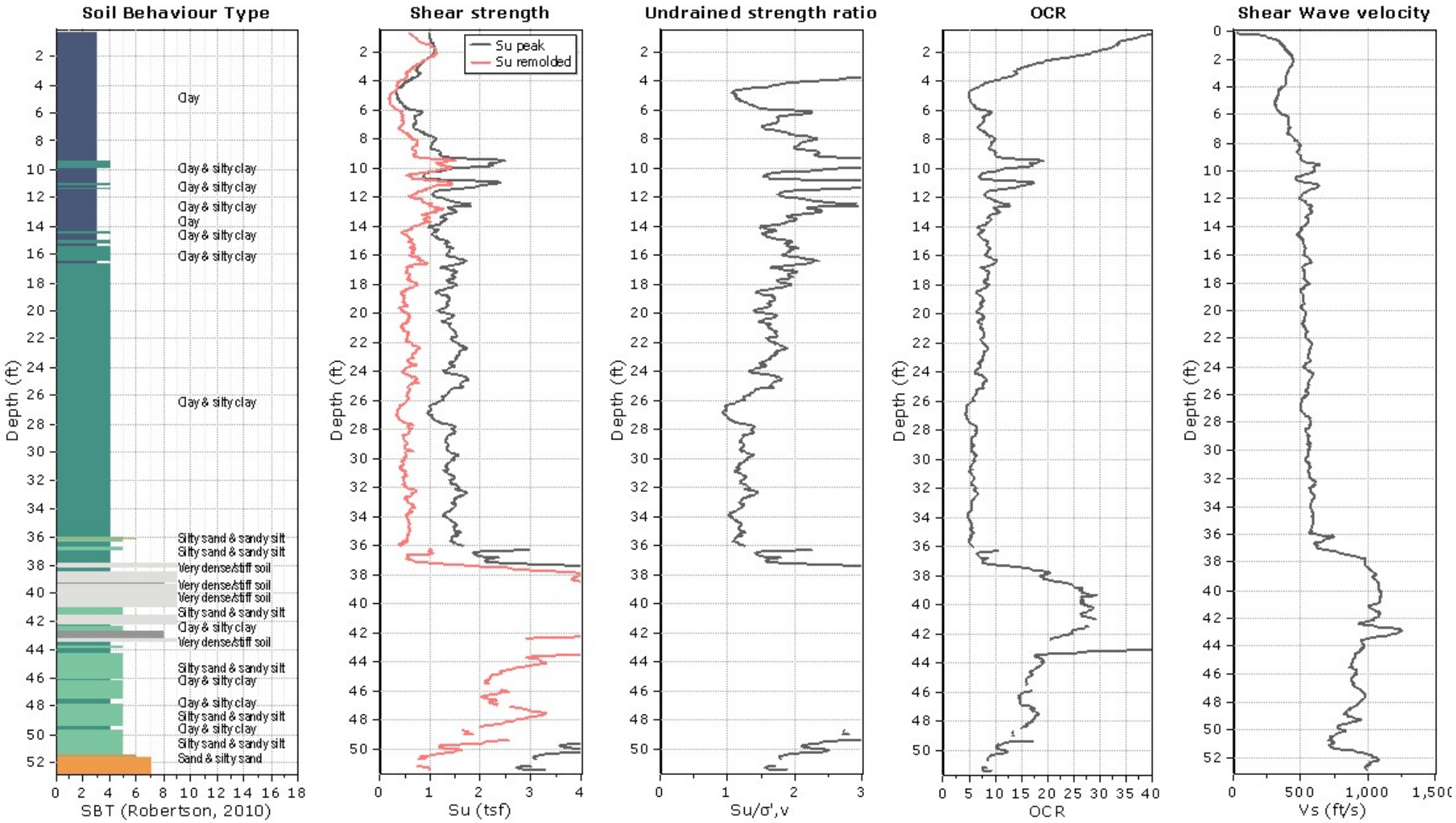
CPT: GEO-36
Total depth: 52.82 ft, Date: 4/17/2025
Coords: lat 39.613774° lon -88.153886°
Cone Type: CPT
Cone Operator: FUGRO



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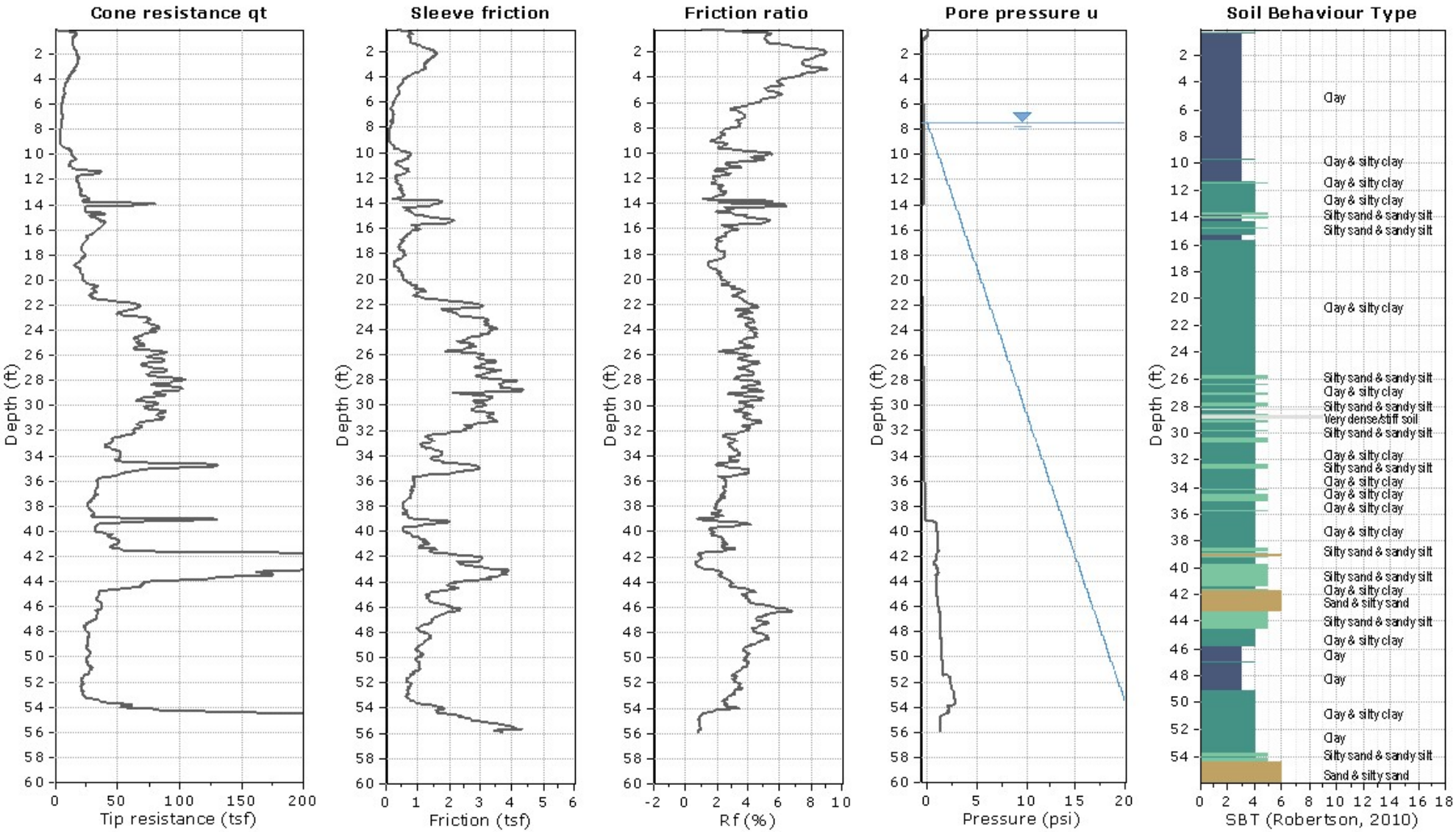
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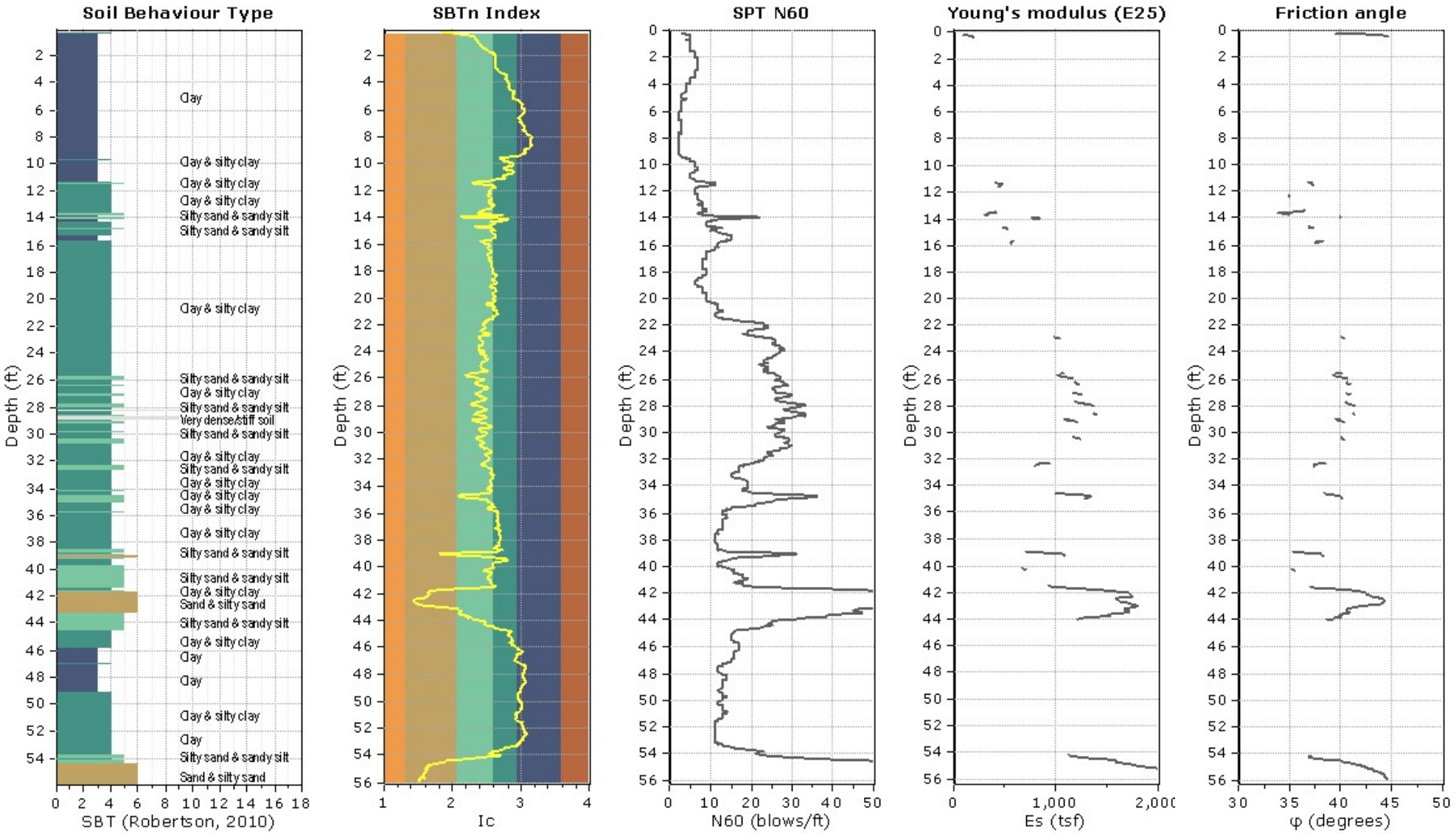
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Coords: lat 39.617396° lon -88.142108°
Cone Type: CPT
Cone Operator: FUGRO



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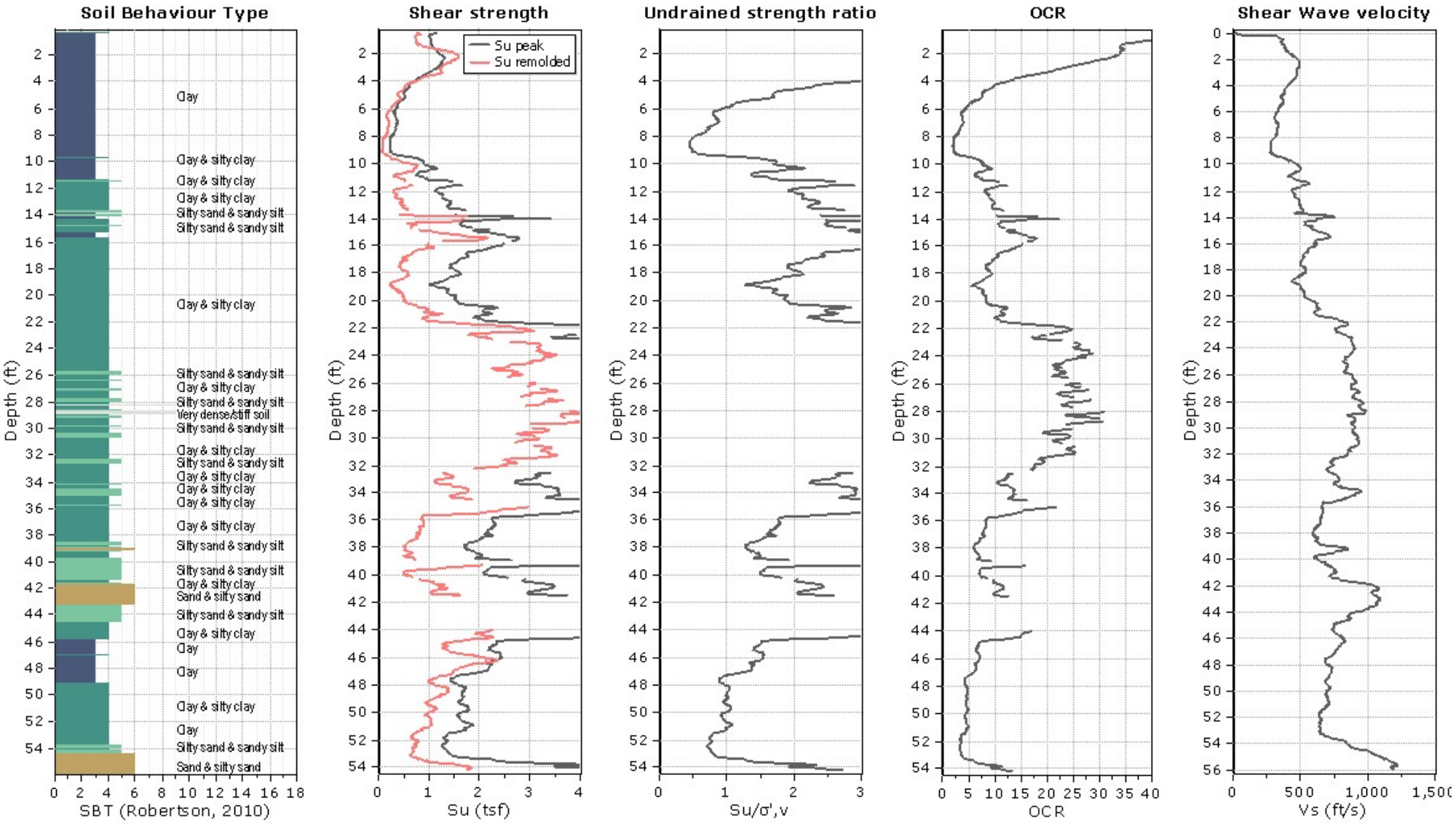
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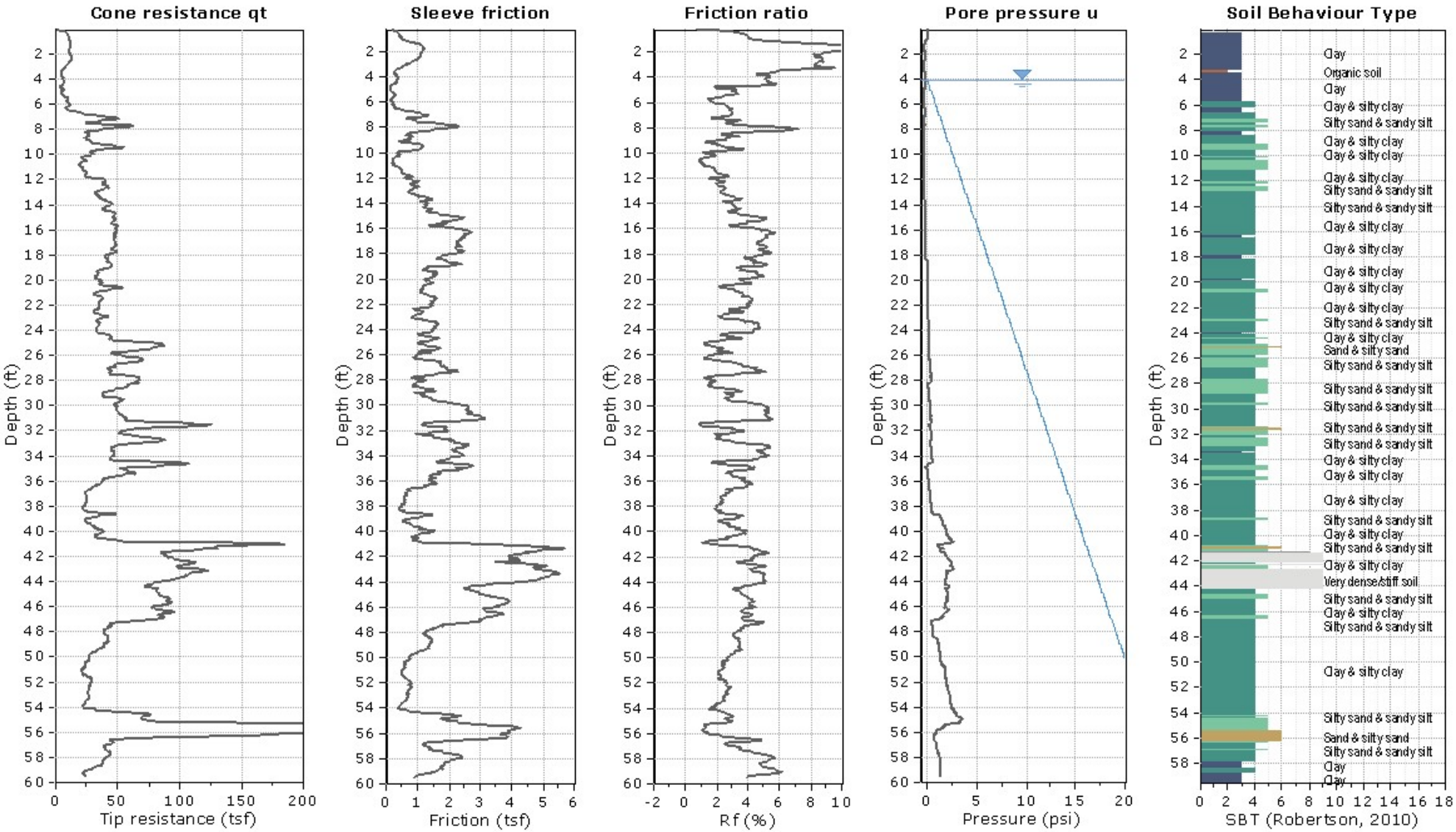
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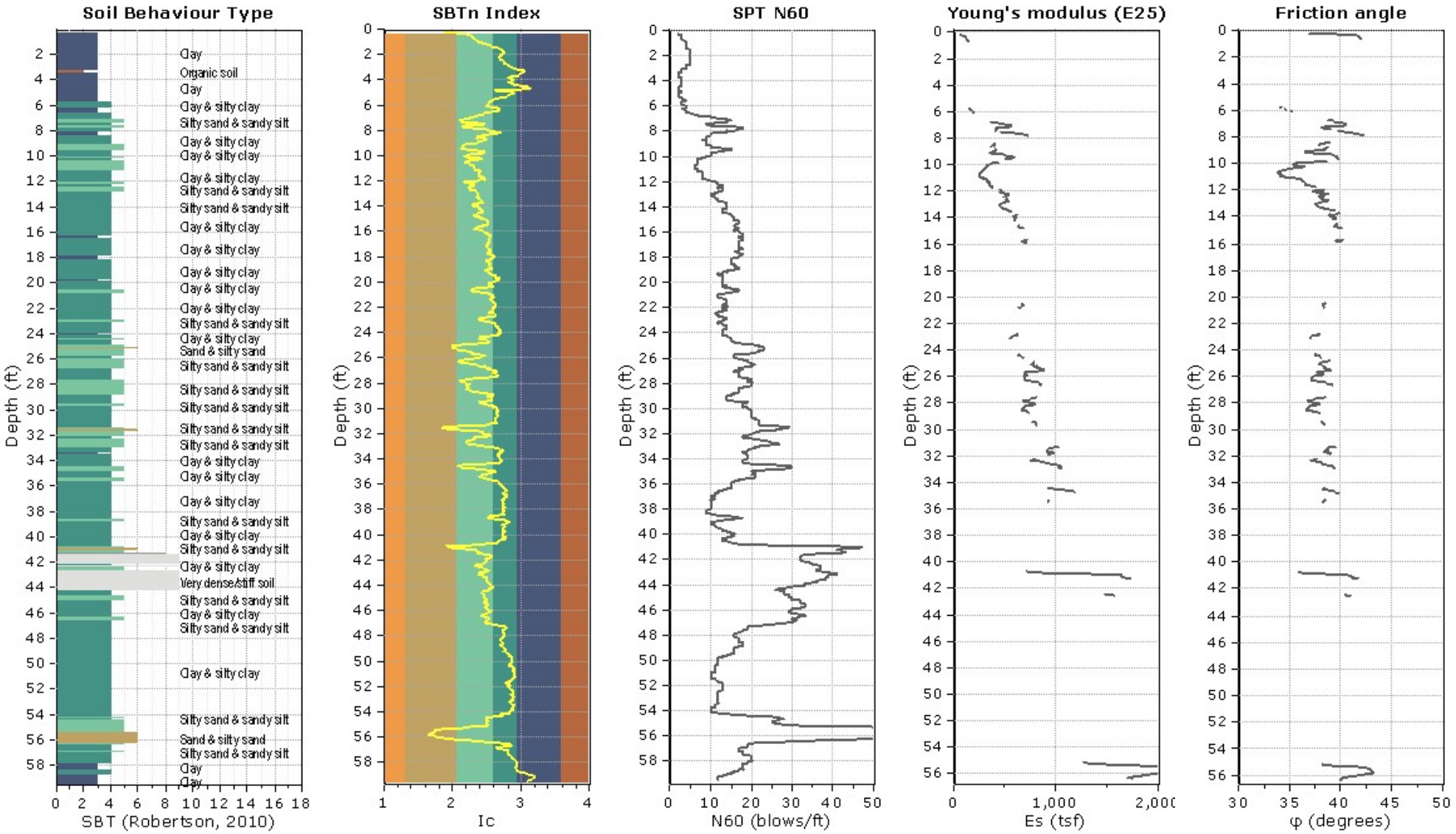
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Coords: lat 39.629819° lon -88.138768°
Cone Type: CPT
Cone Operator: FUGRO



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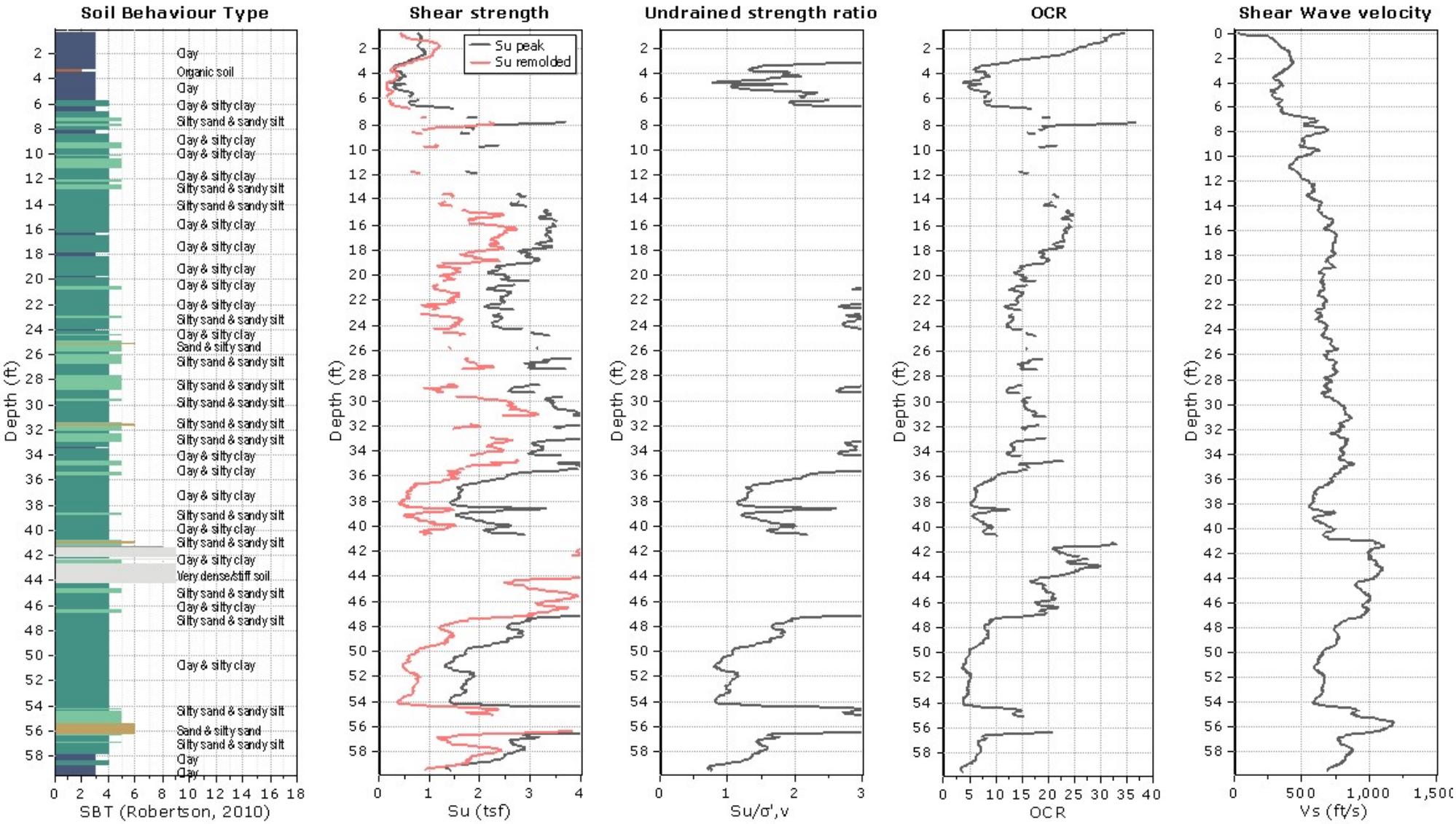
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Cone Type: CPT
Cone Operator: FUGRO



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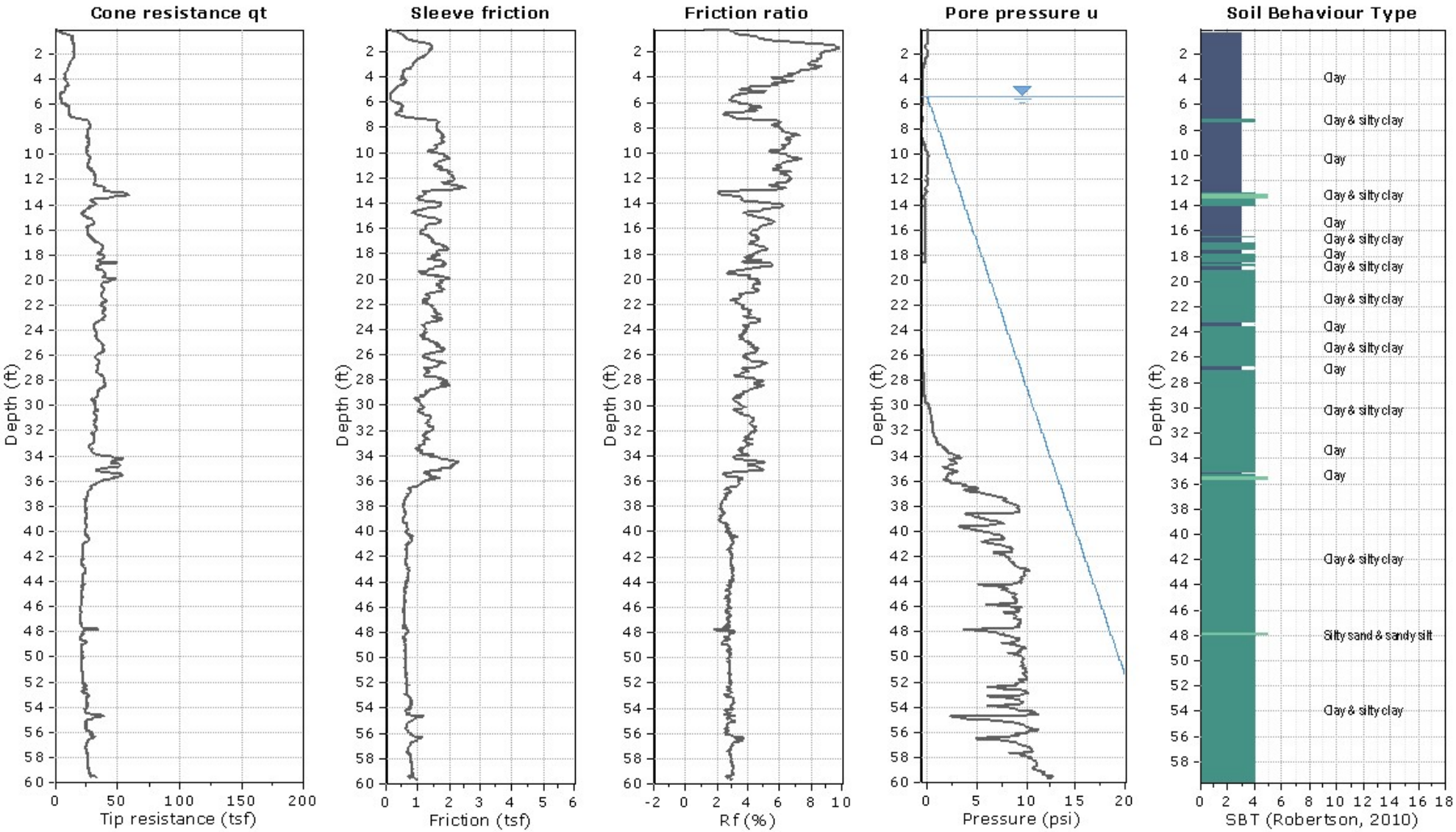
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Coords: lat 39.629819° lon -88.138768°
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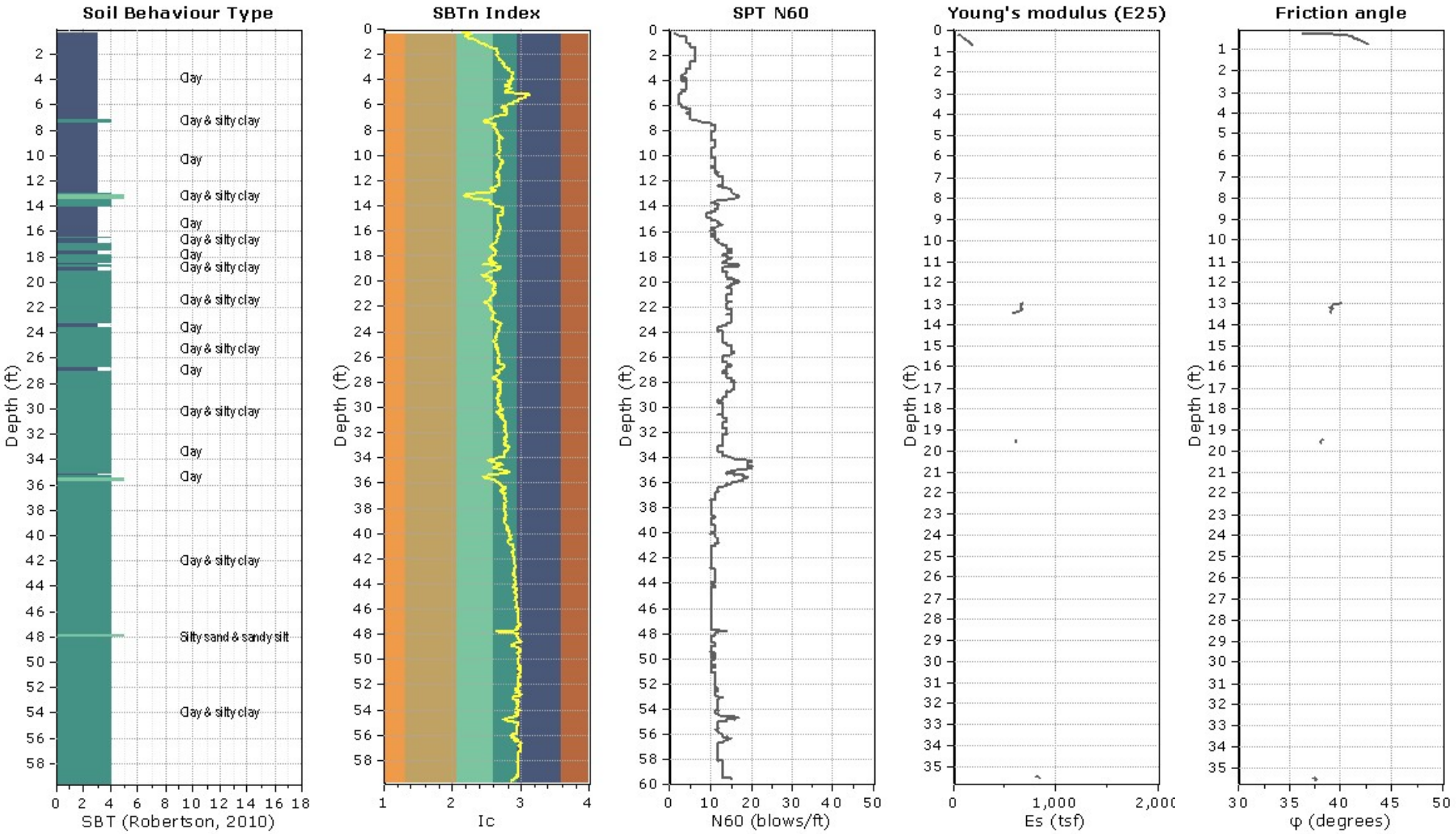
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Coords: lat 39.632904° lon -88.161243°
Cone Type: CPT
Cone Operator: FUGRO



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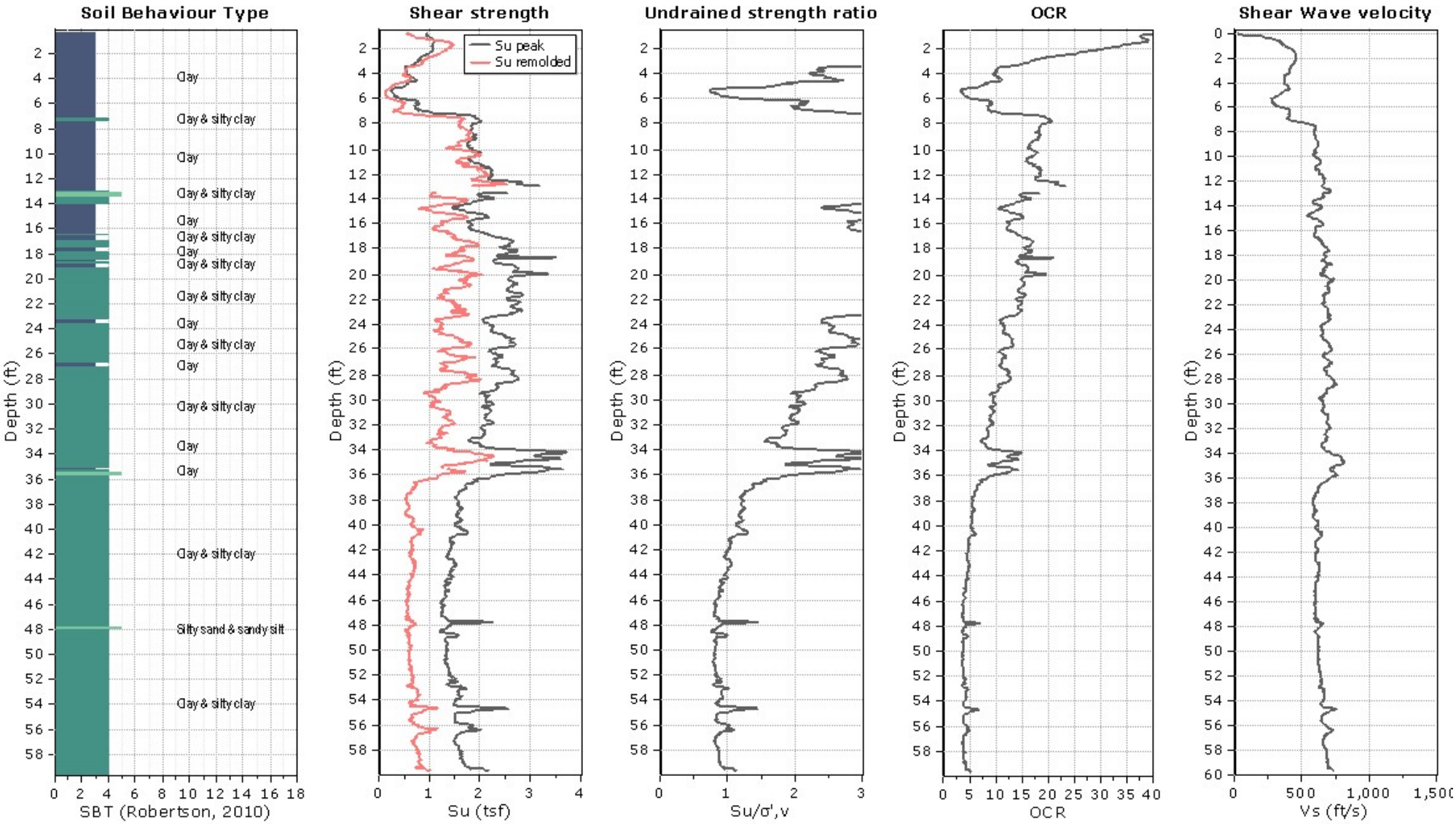
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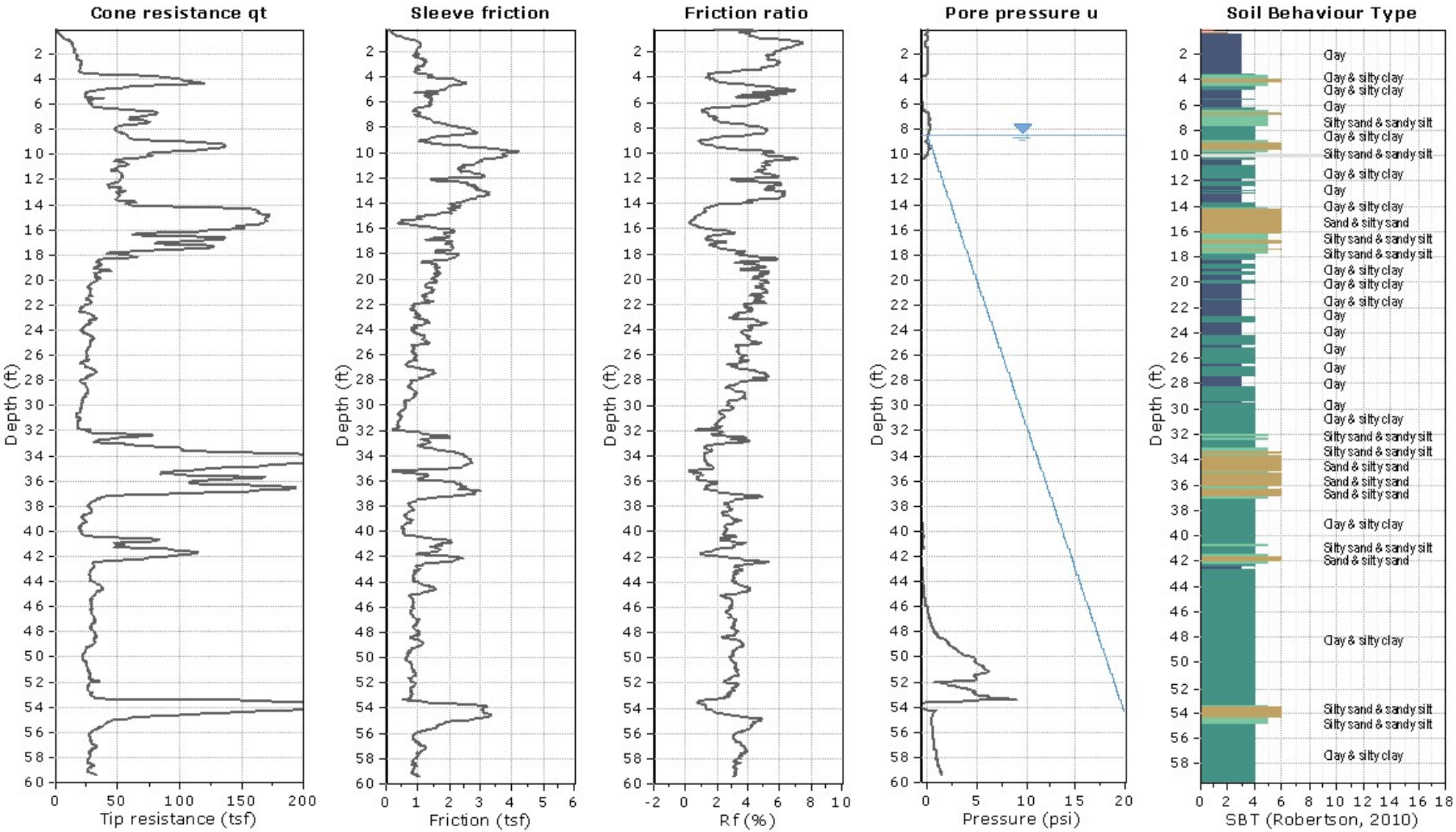
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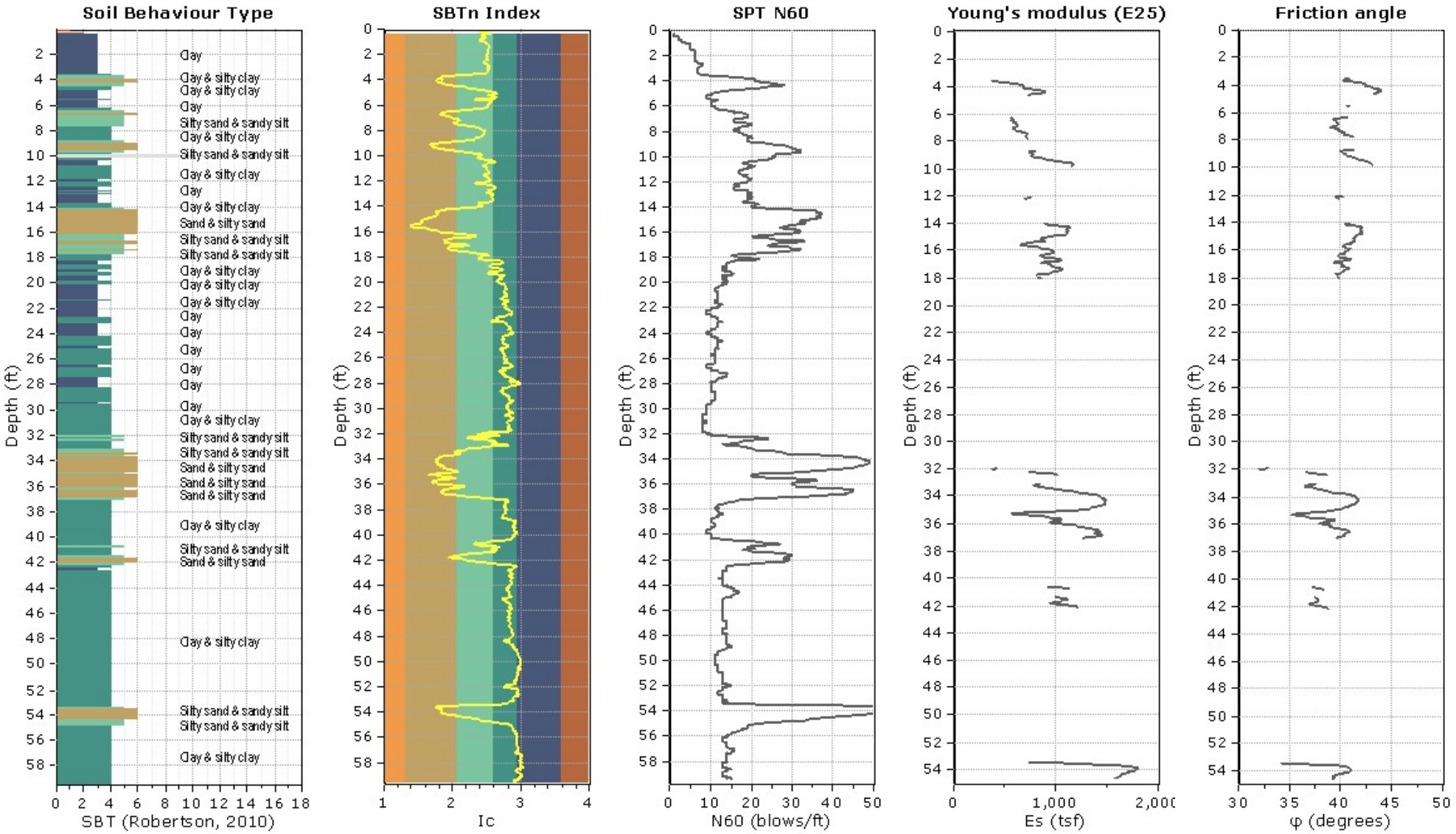
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Total depth: 59.45 ft, Date: 4/22/2025
Coords: lat 39.640726° lon -88.170557°
Cone Type: CPT
Cone Operator: Fugro



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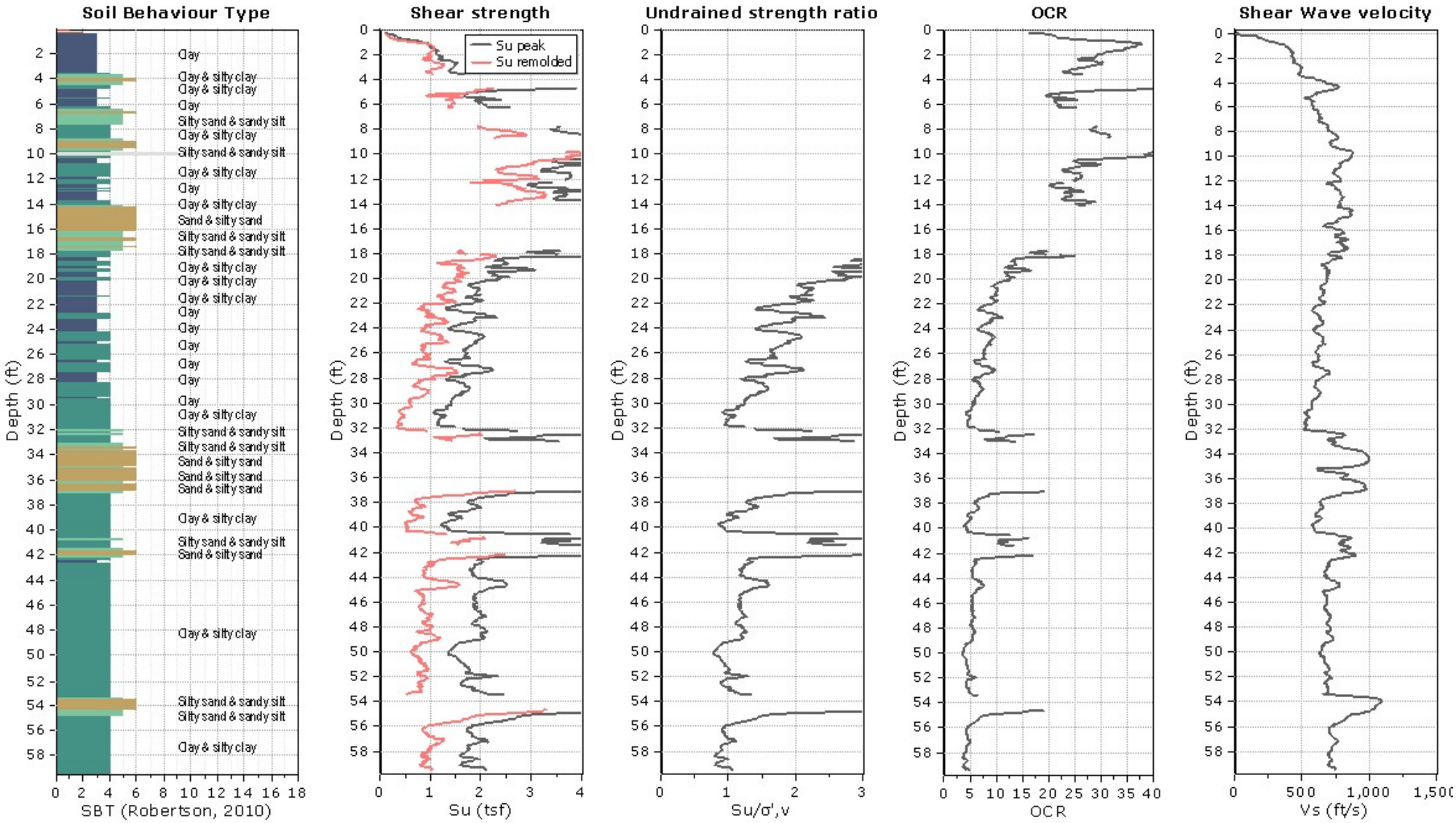
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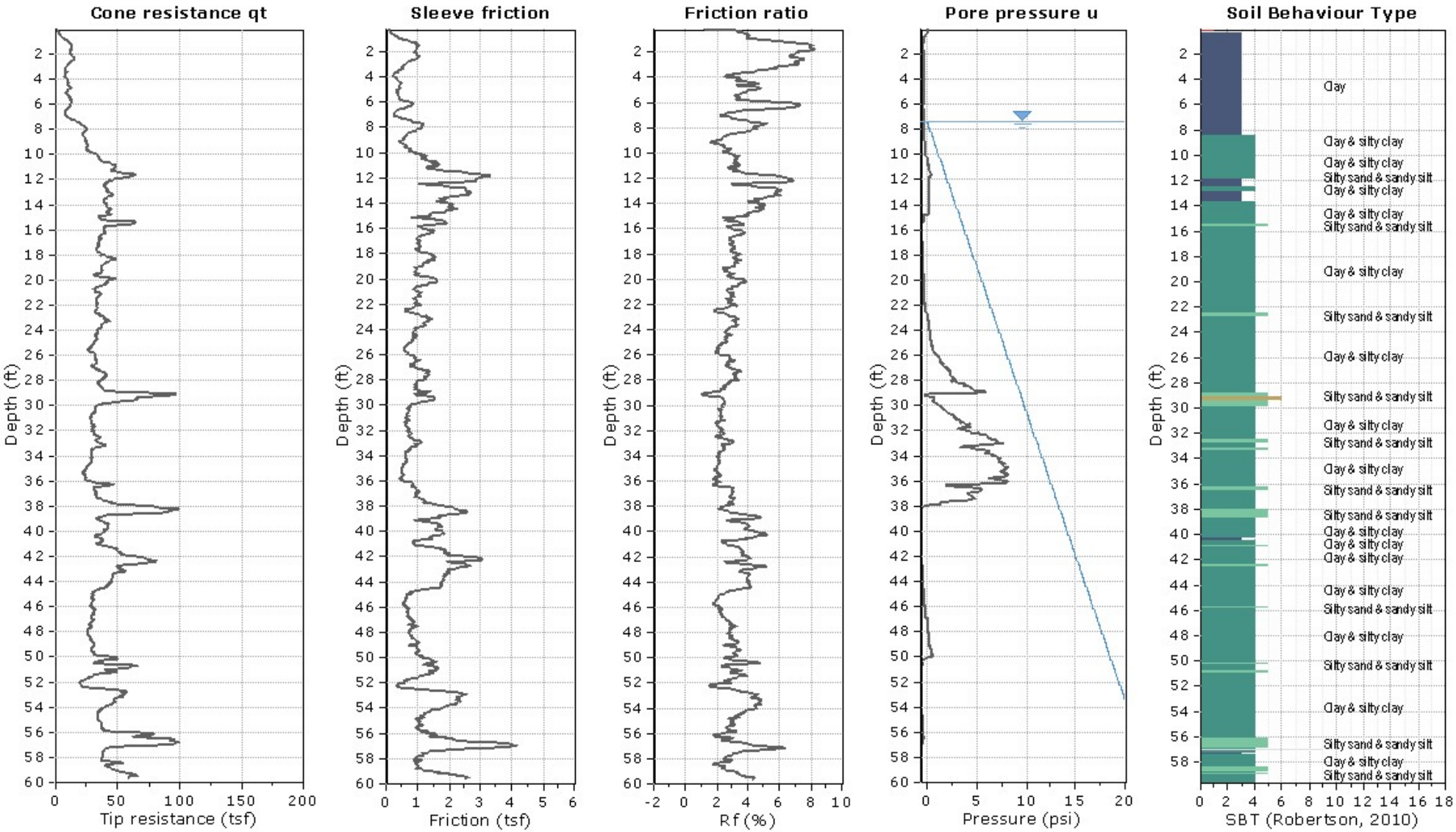
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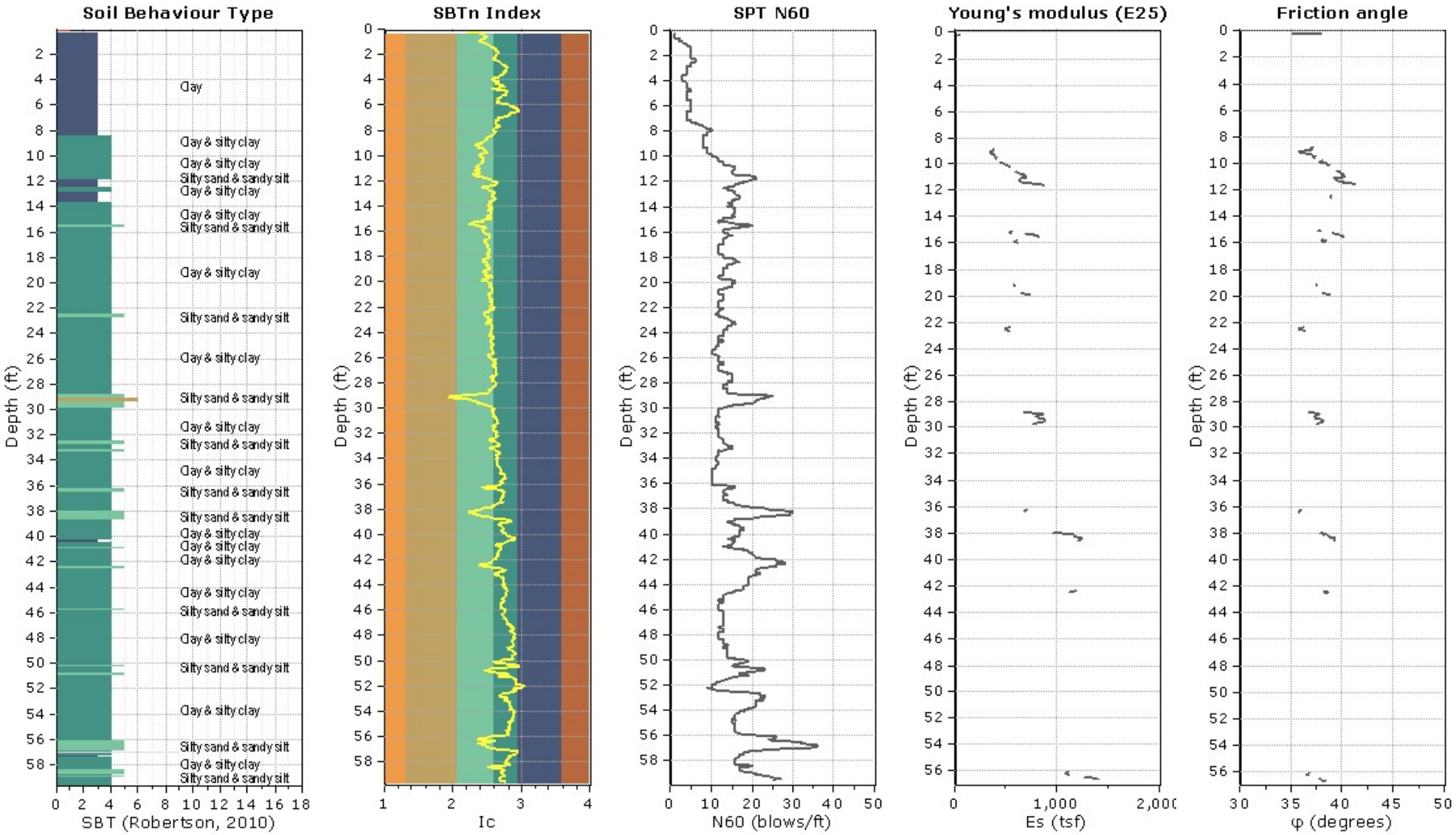
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Cone Type: CPT
Cone Operator: FUGRO



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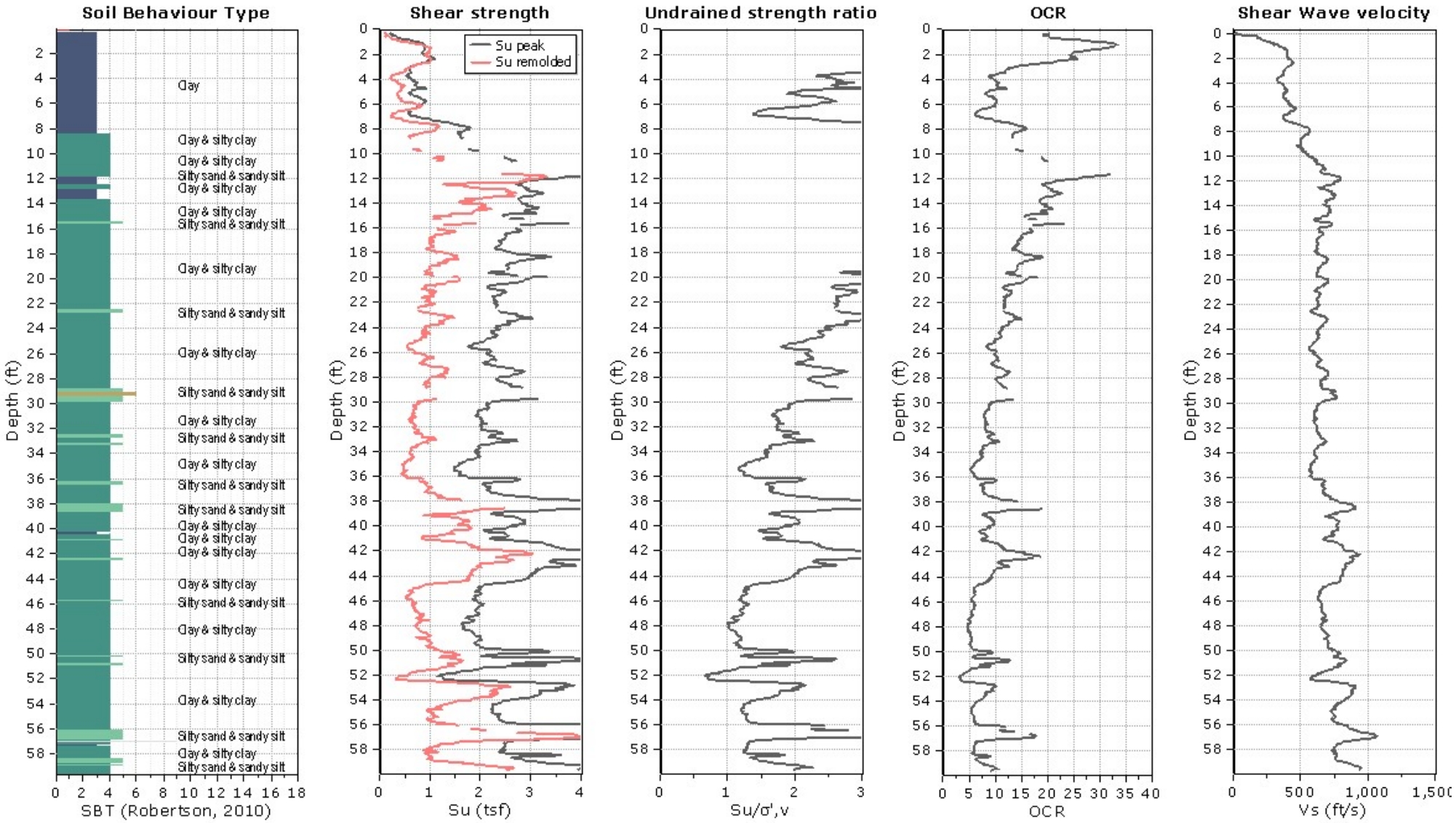
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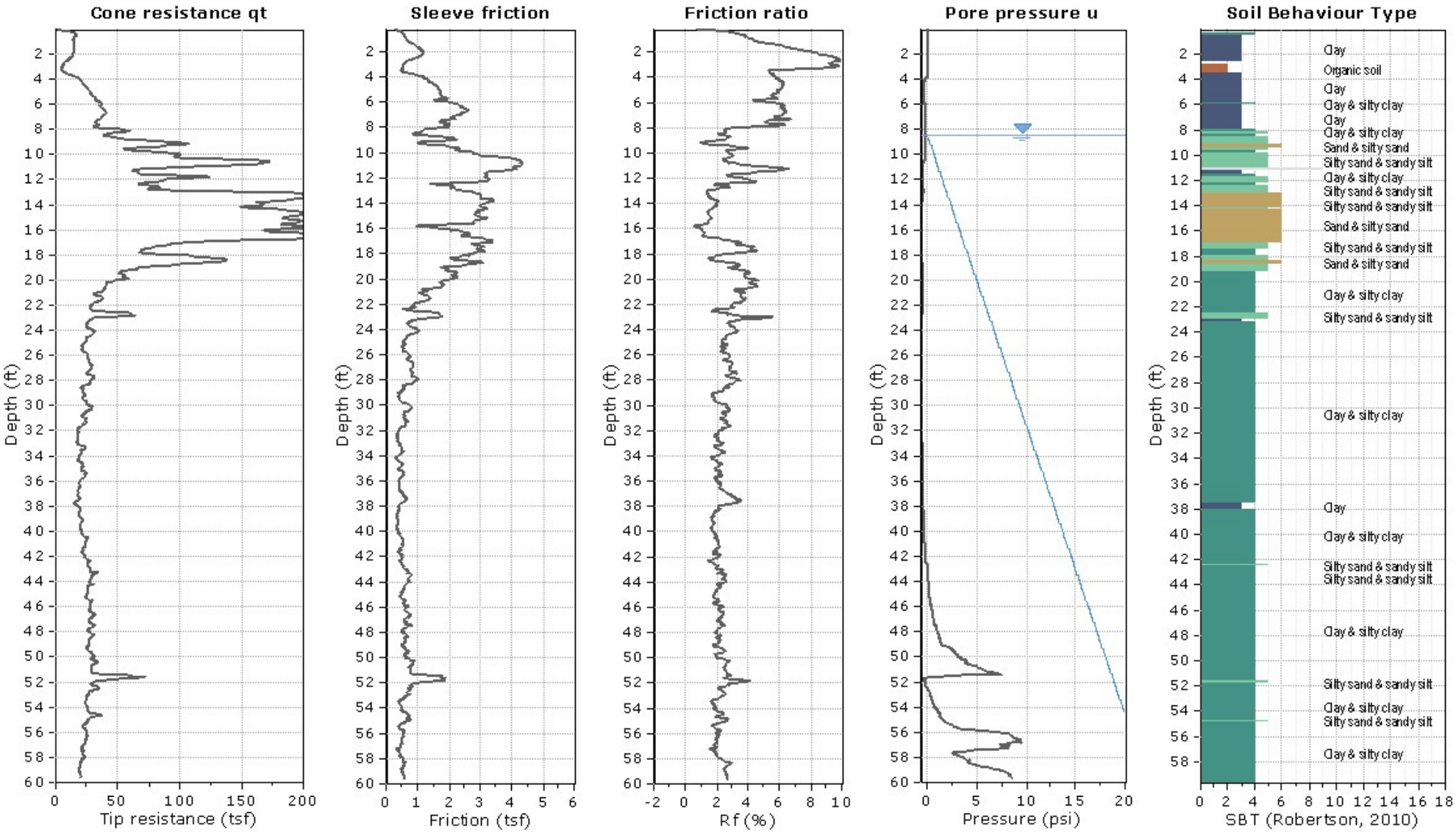
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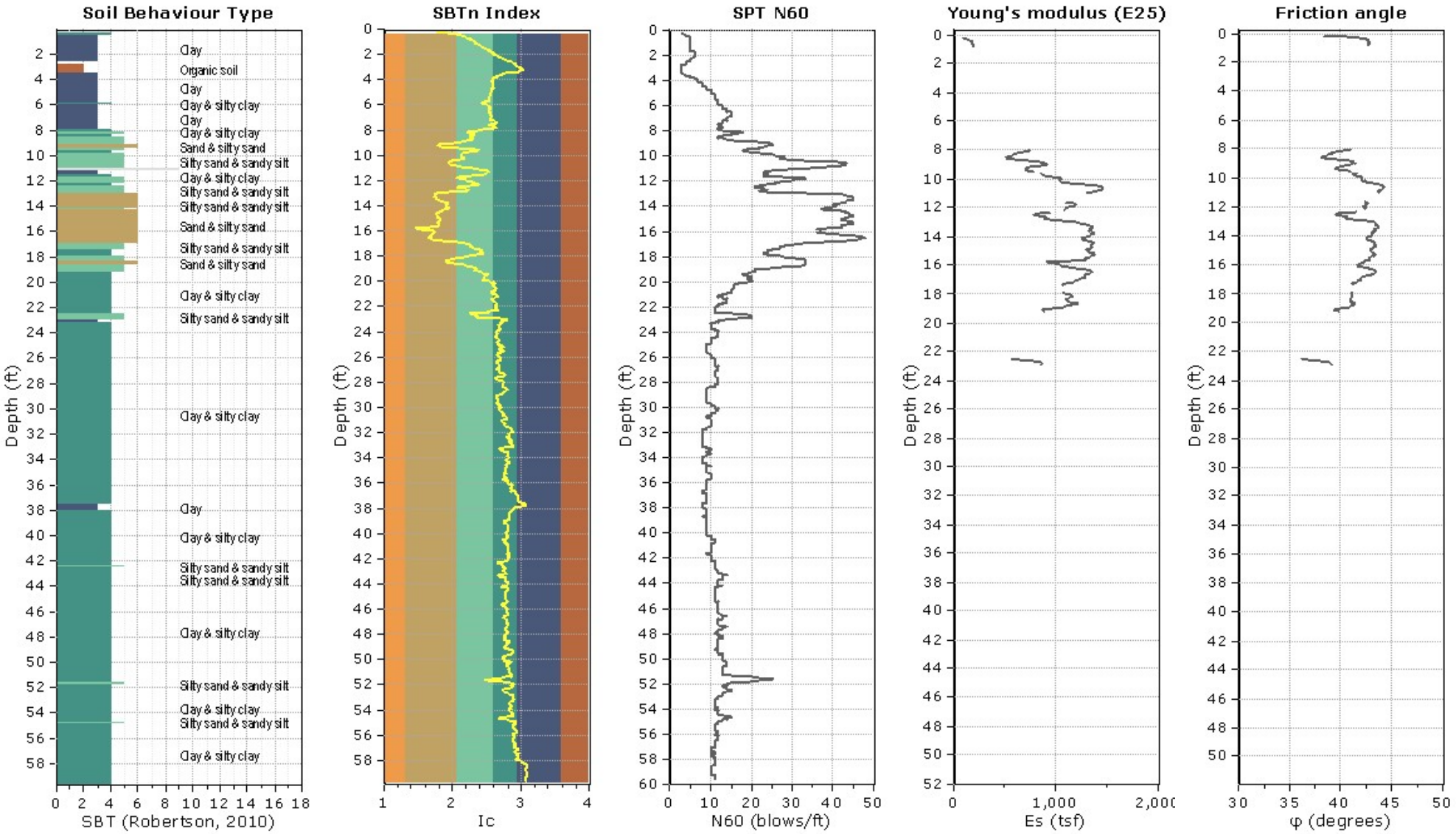
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Coords: lat 39.642241° lon -88.145311°
Cone Type: CPT
Cone Operator: FUGRO



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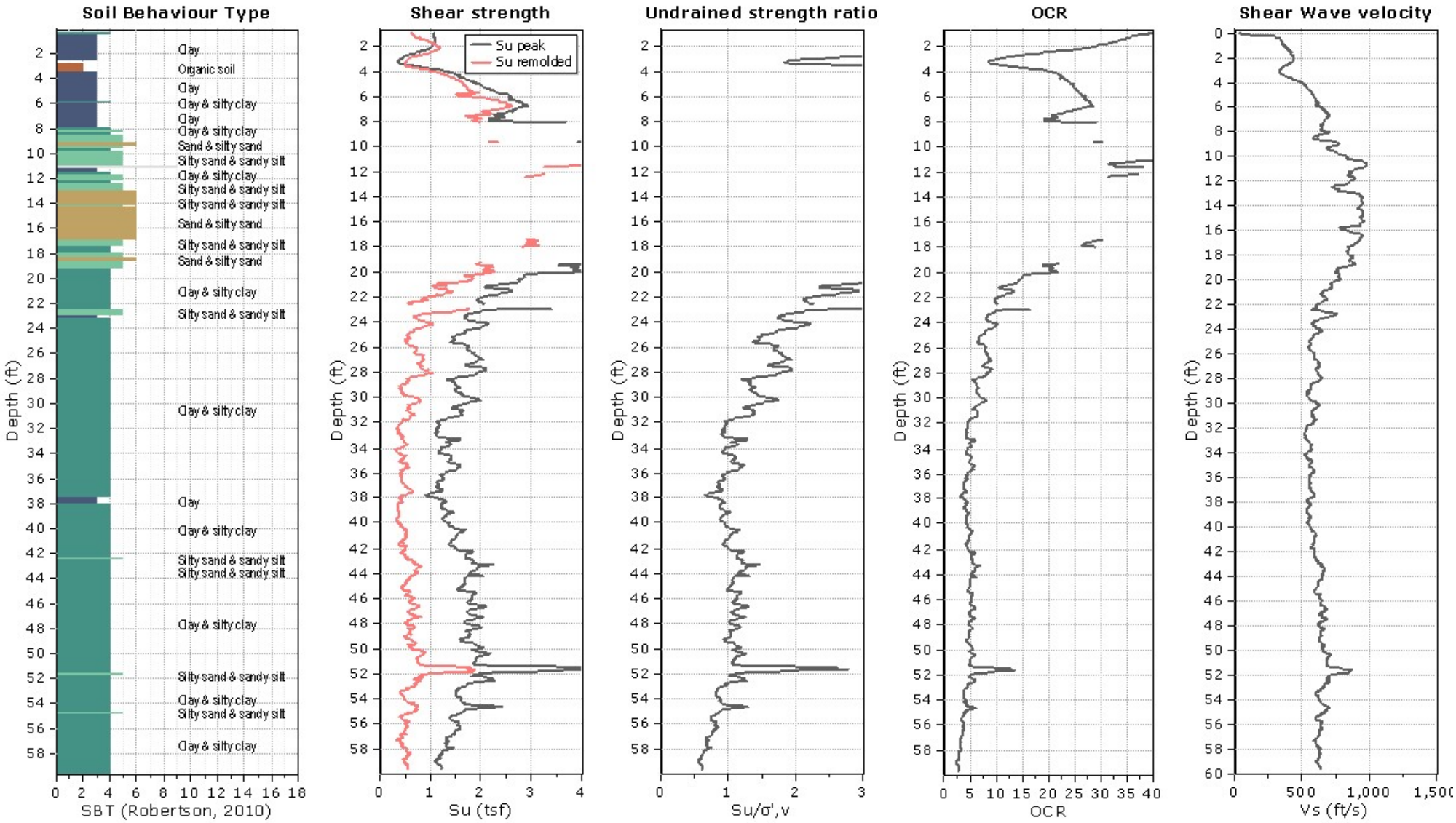
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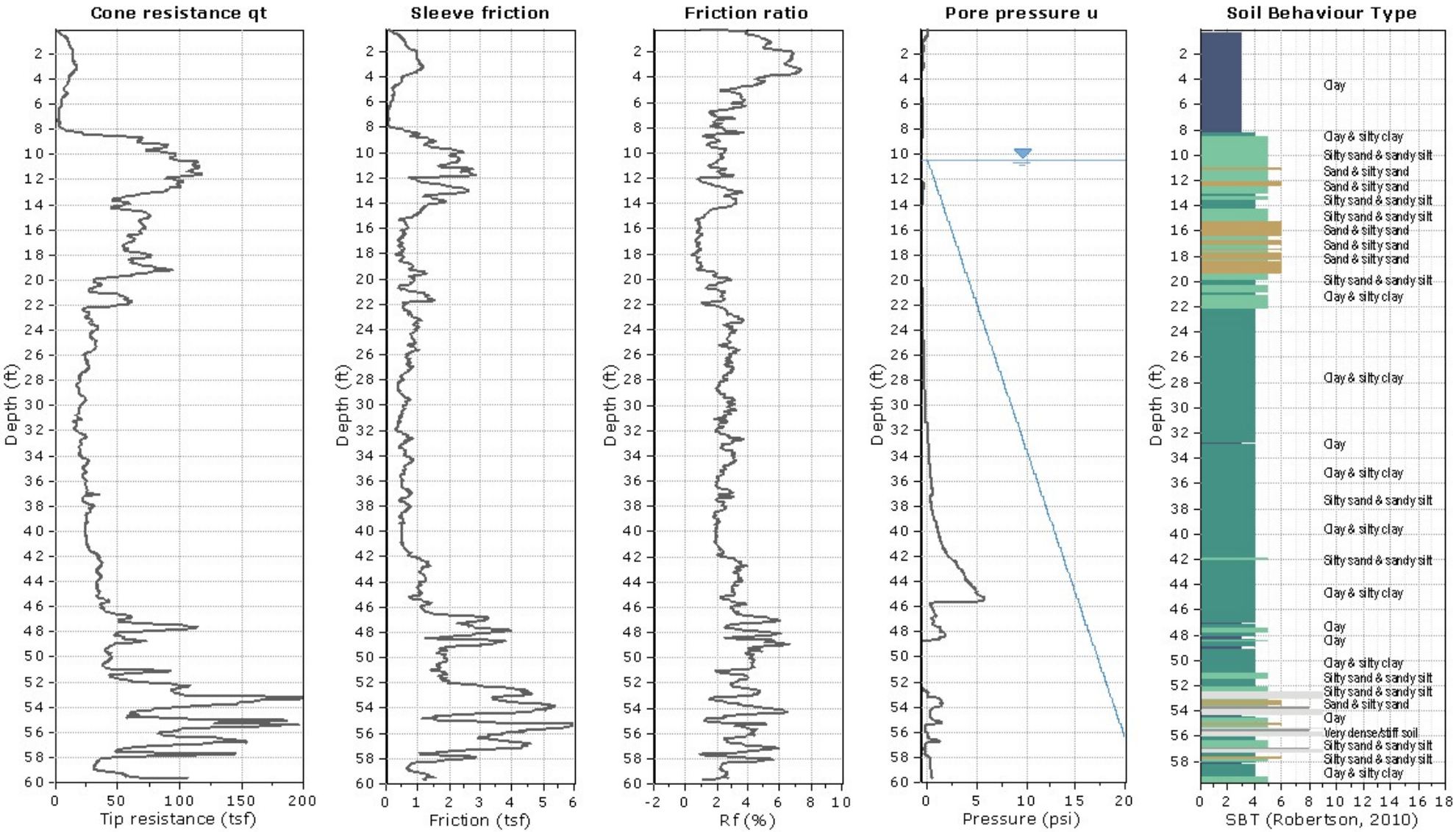
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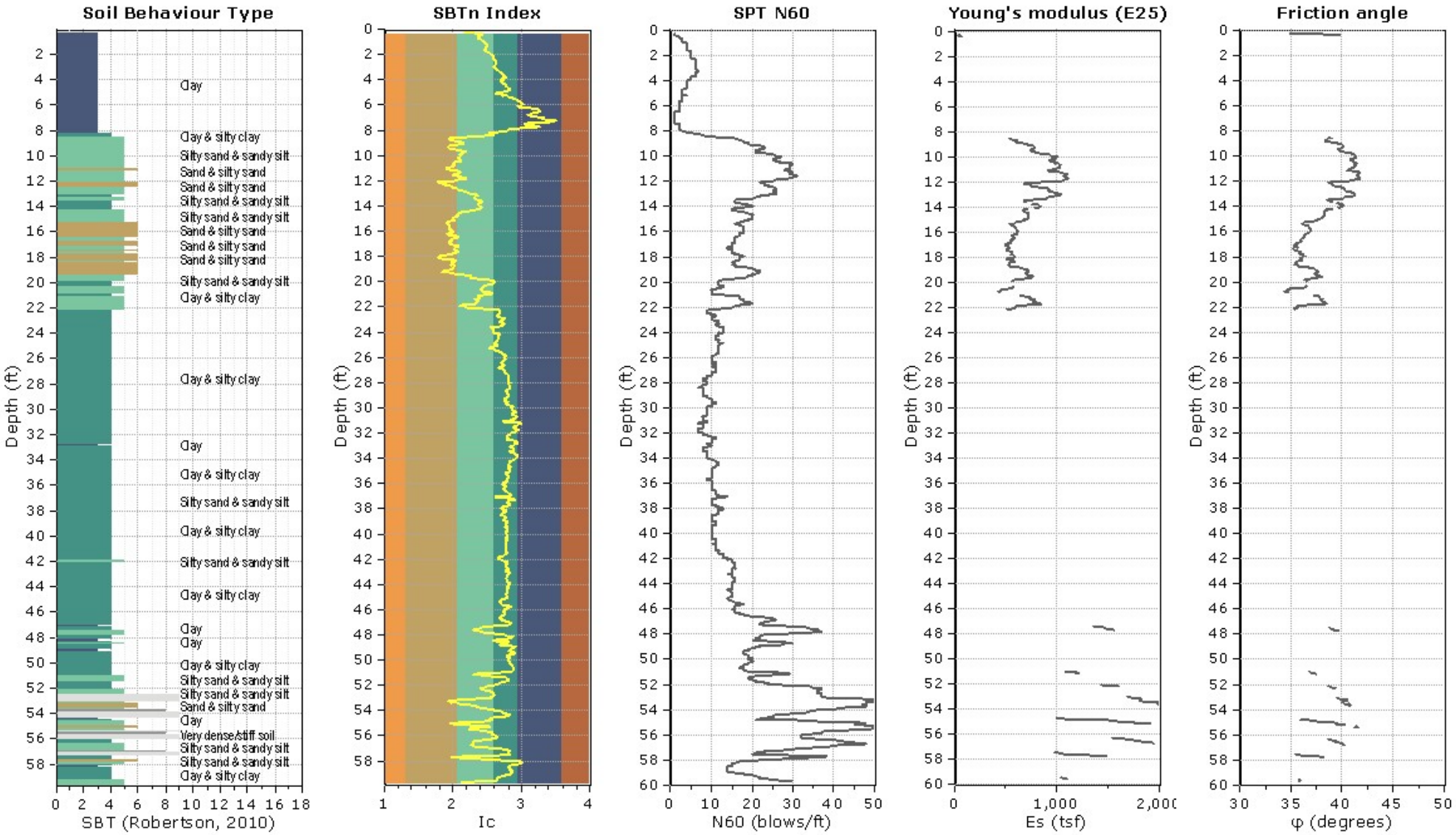
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Cone Type: CPT
Cone Operator: Fugro



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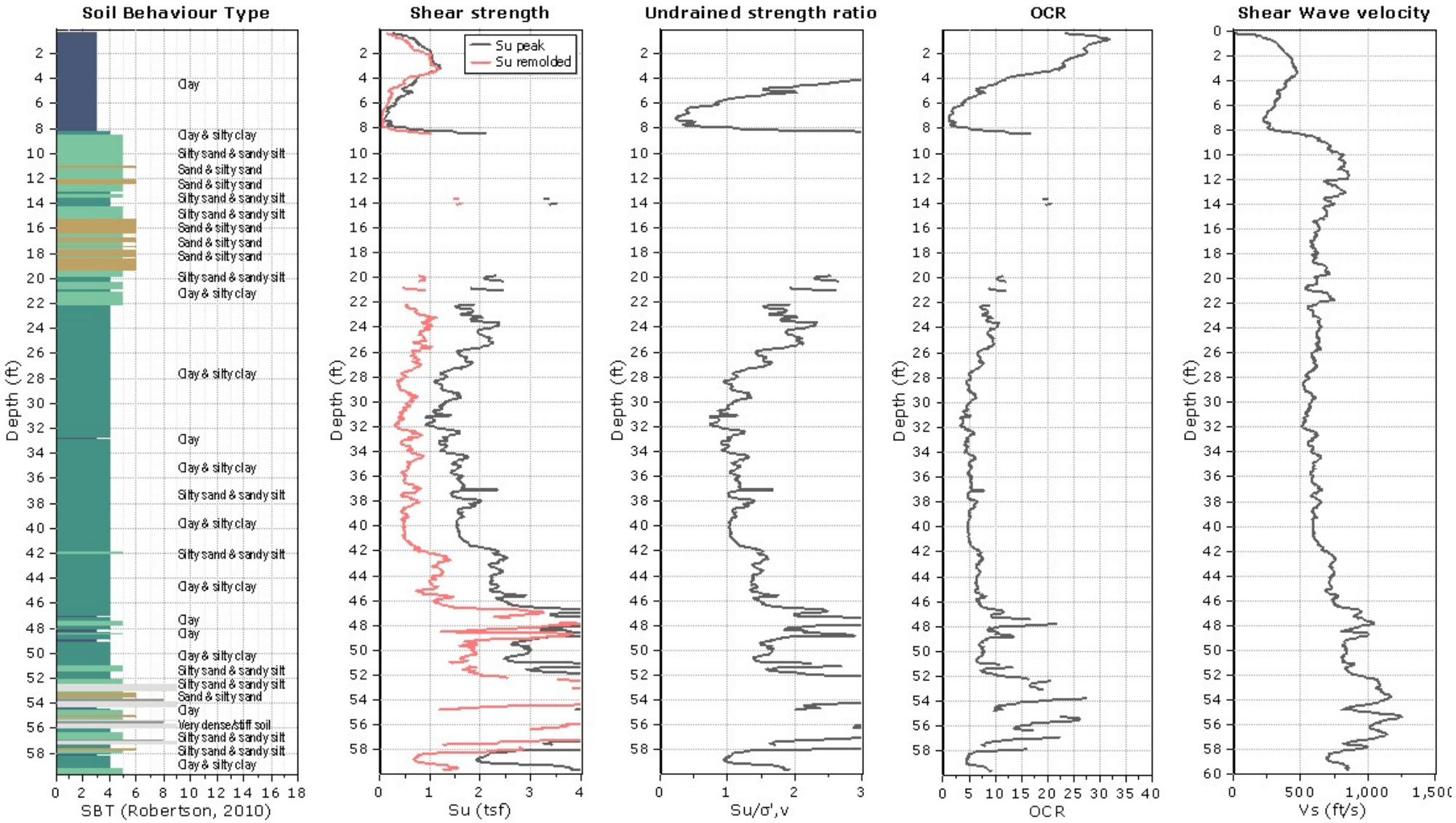
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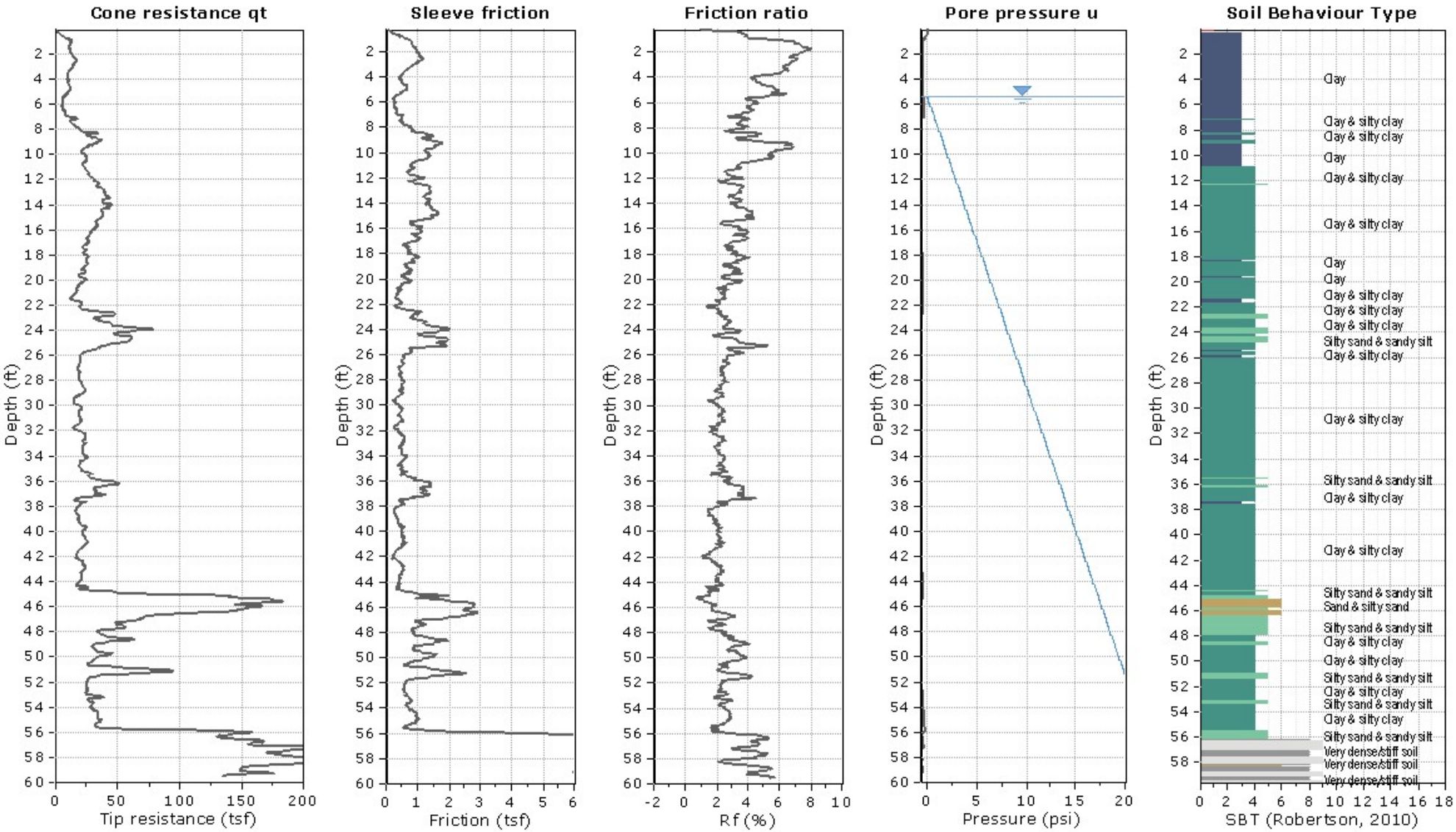
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Cone Operator: Fugro



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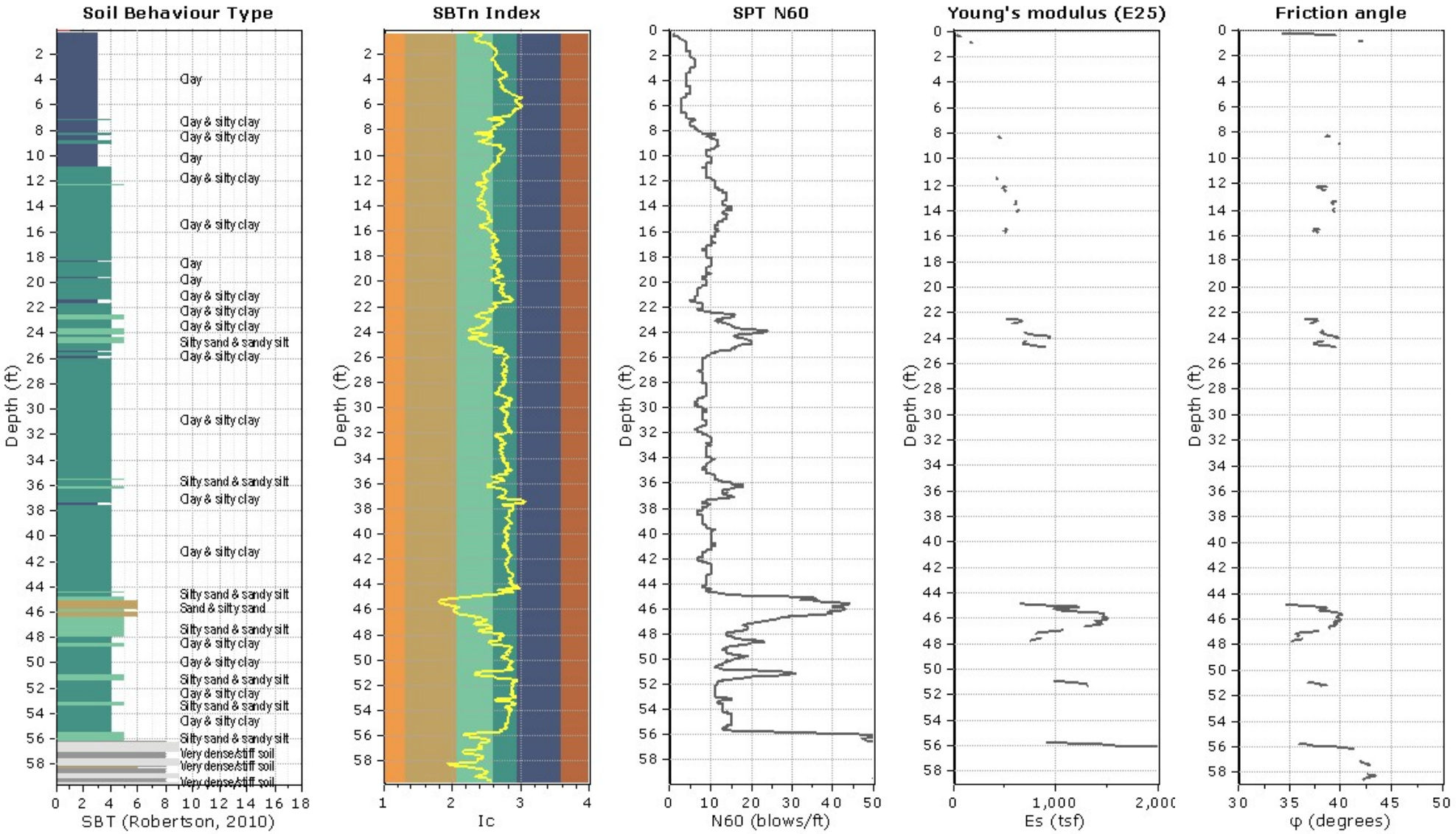
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Coords: lat 39.645392° lon -88.164683°
Cone Type: CPT
Cone Operator: Fugro



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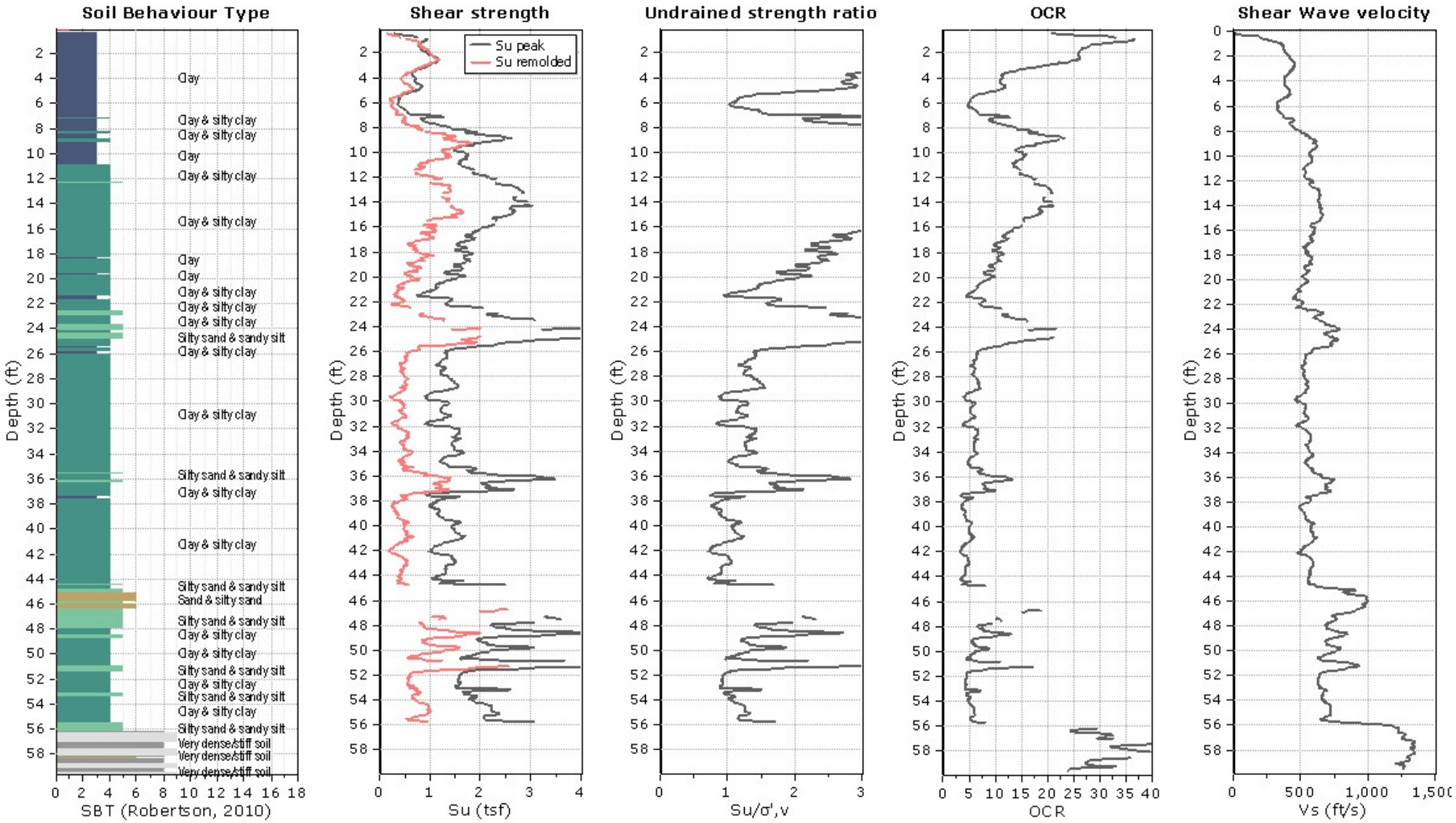
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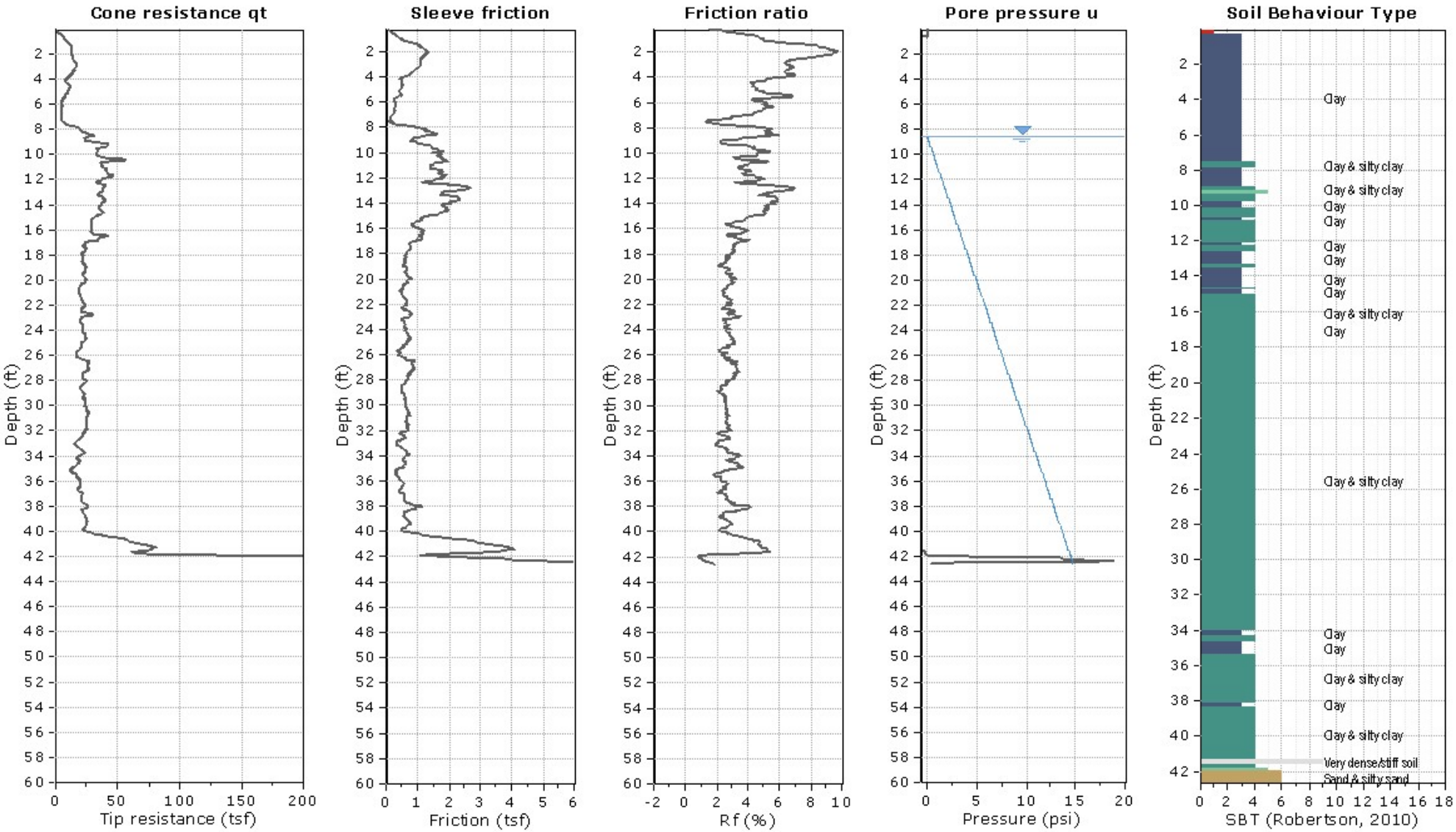
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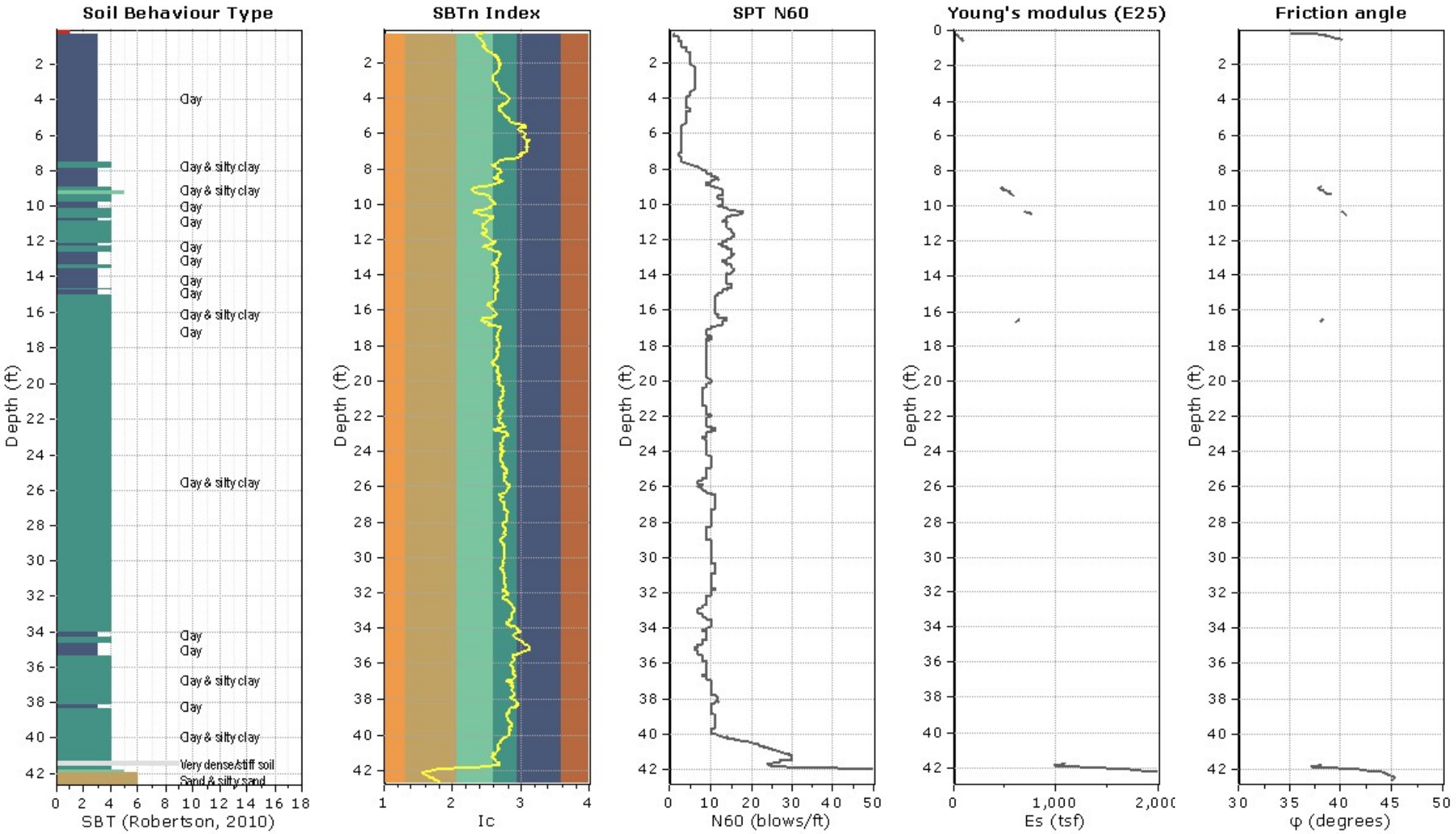
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Coords: lat 39.61231° lon -88.180226°
Cone Type: CPT
Cone Operator: Fugro



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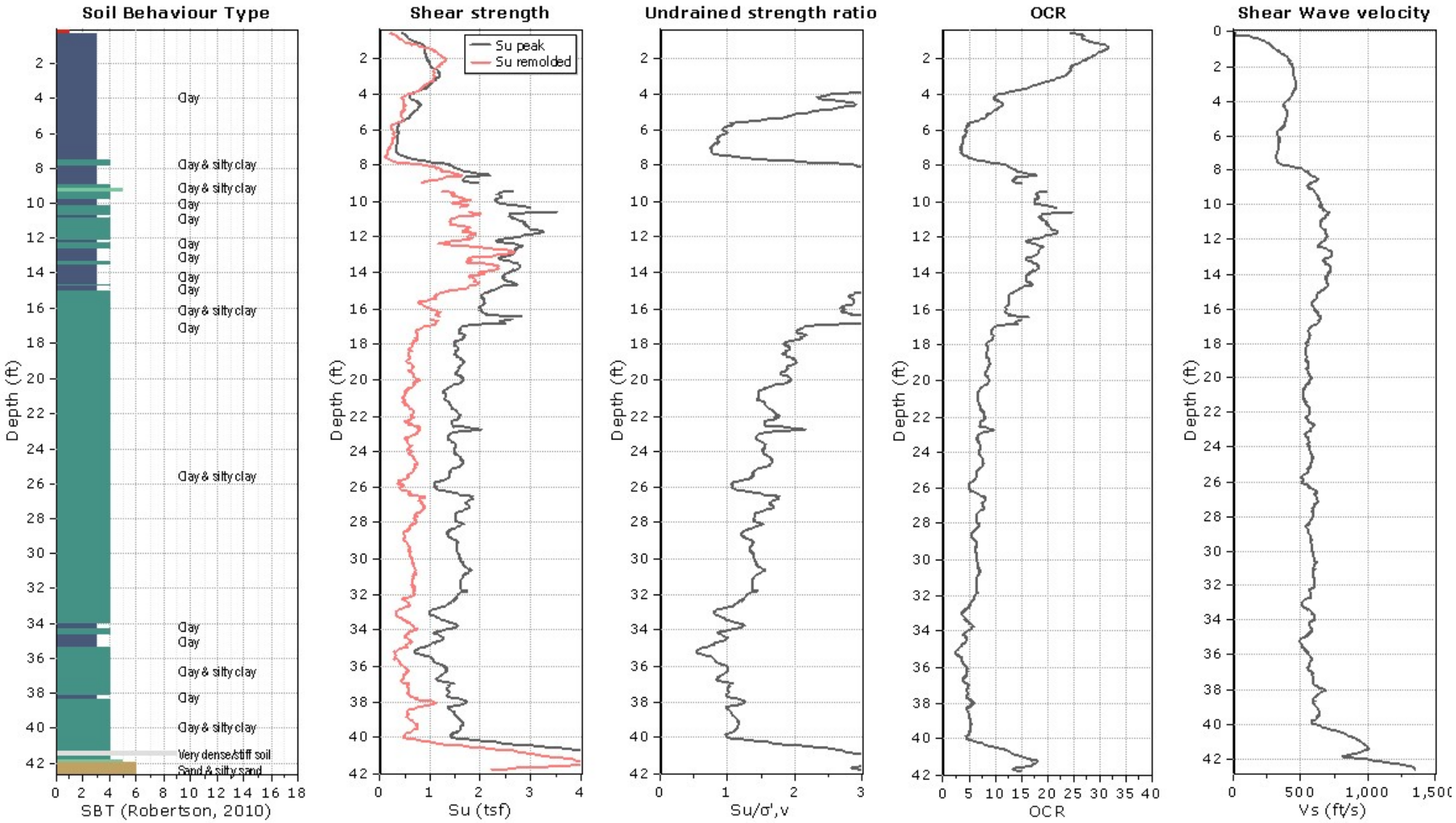
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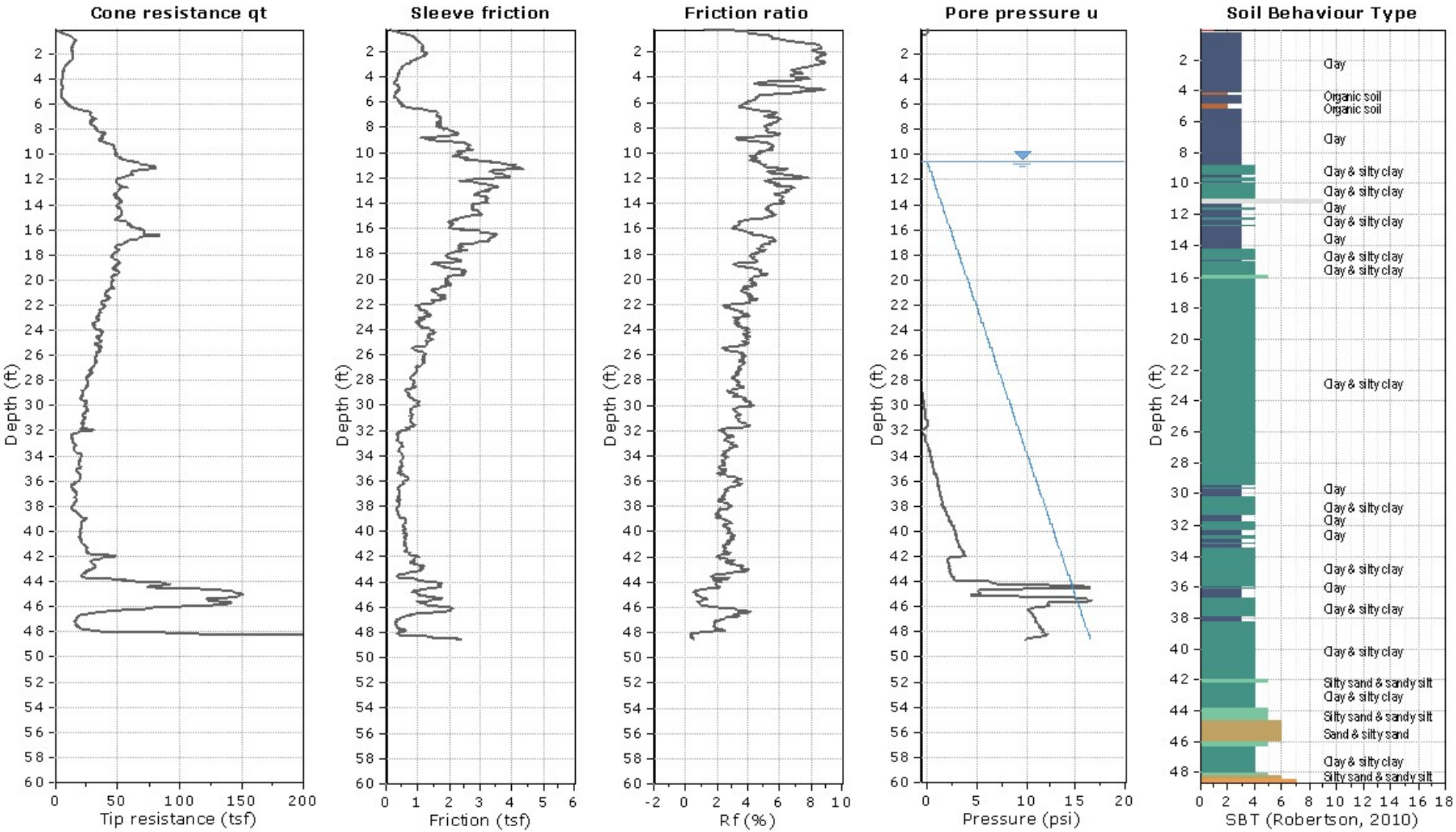
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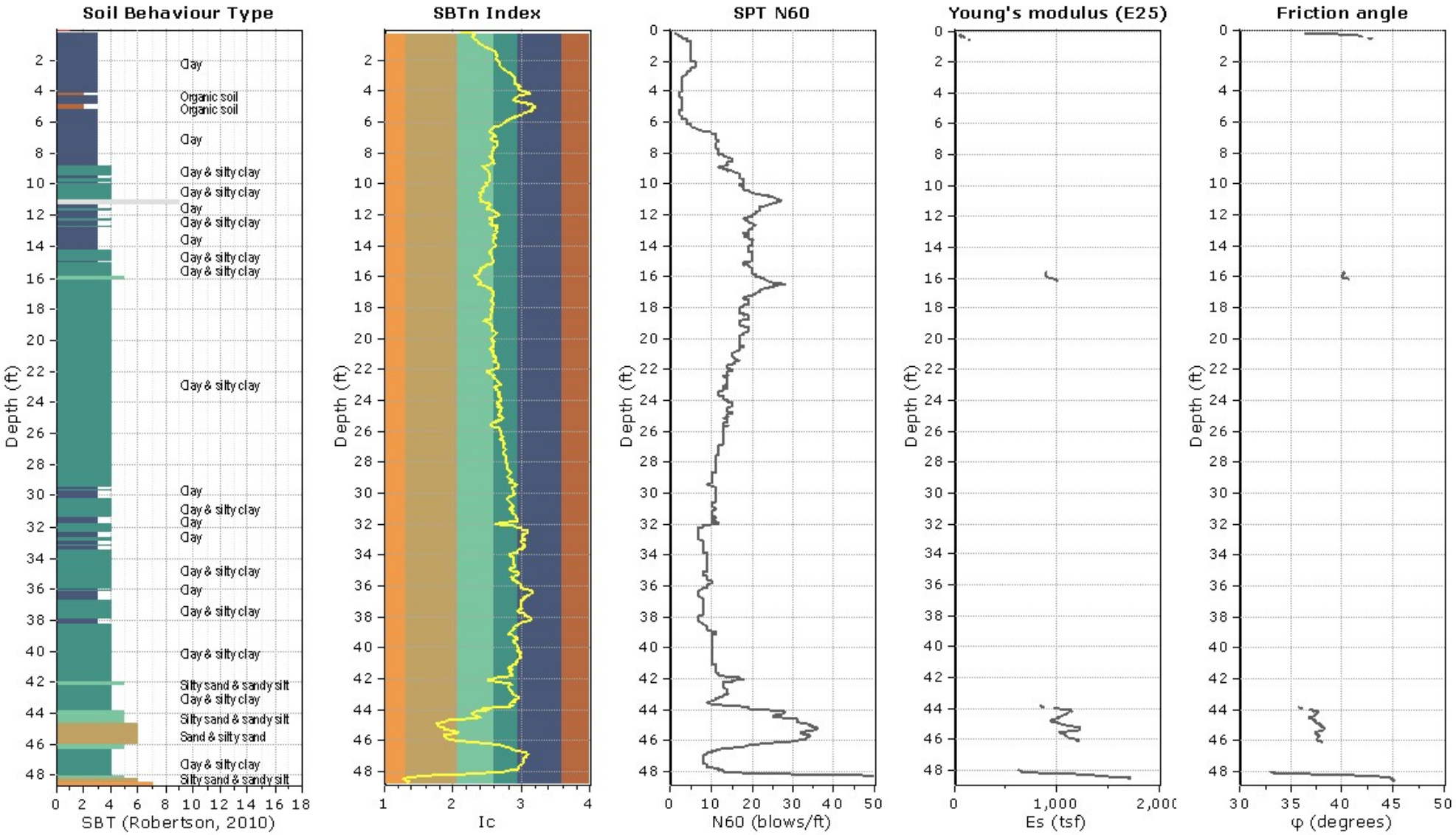
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Coords: lat 39.612409° lon -88.188892°
Cone Type: CPT
Cone Operator: Fugro



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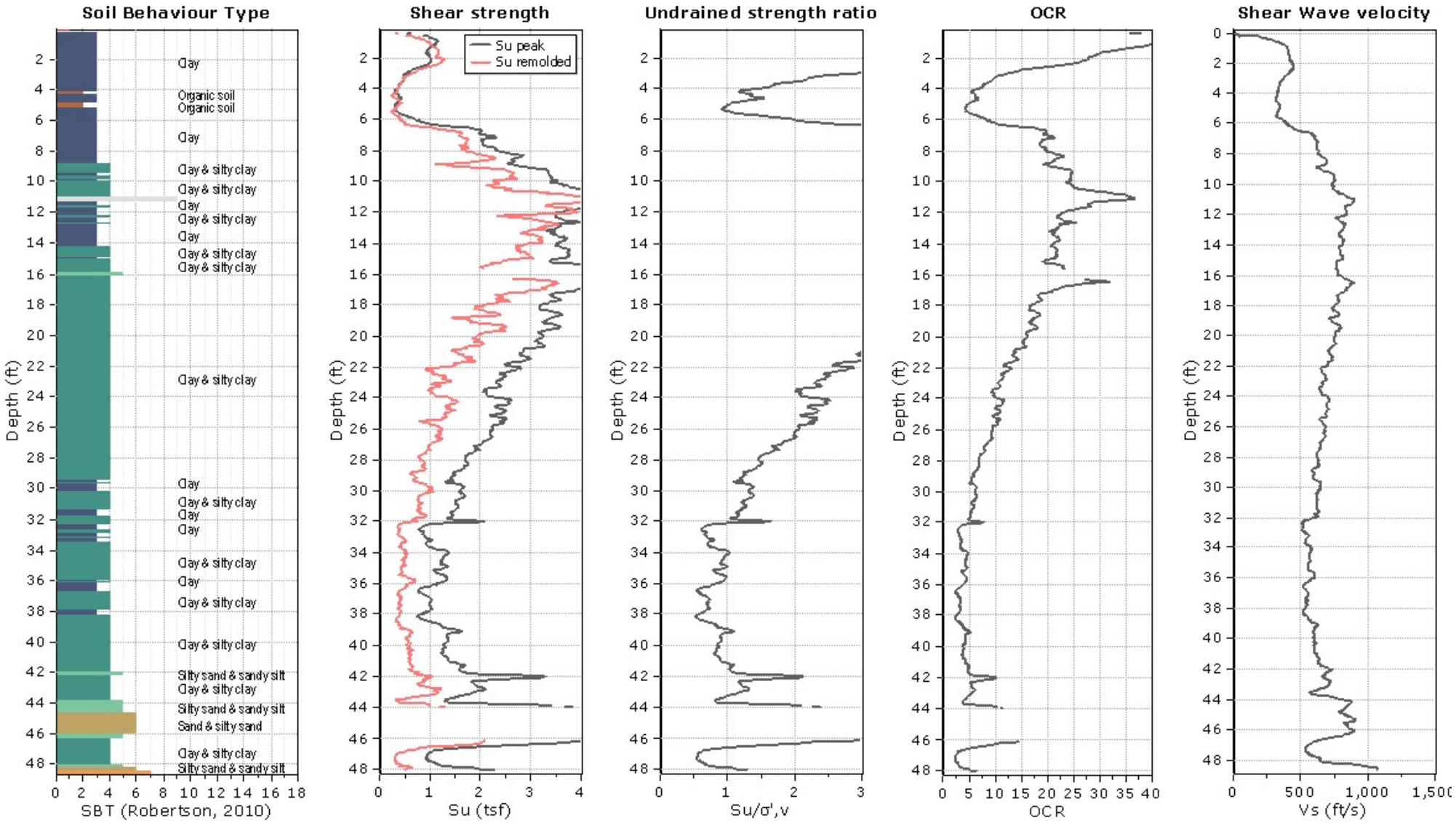
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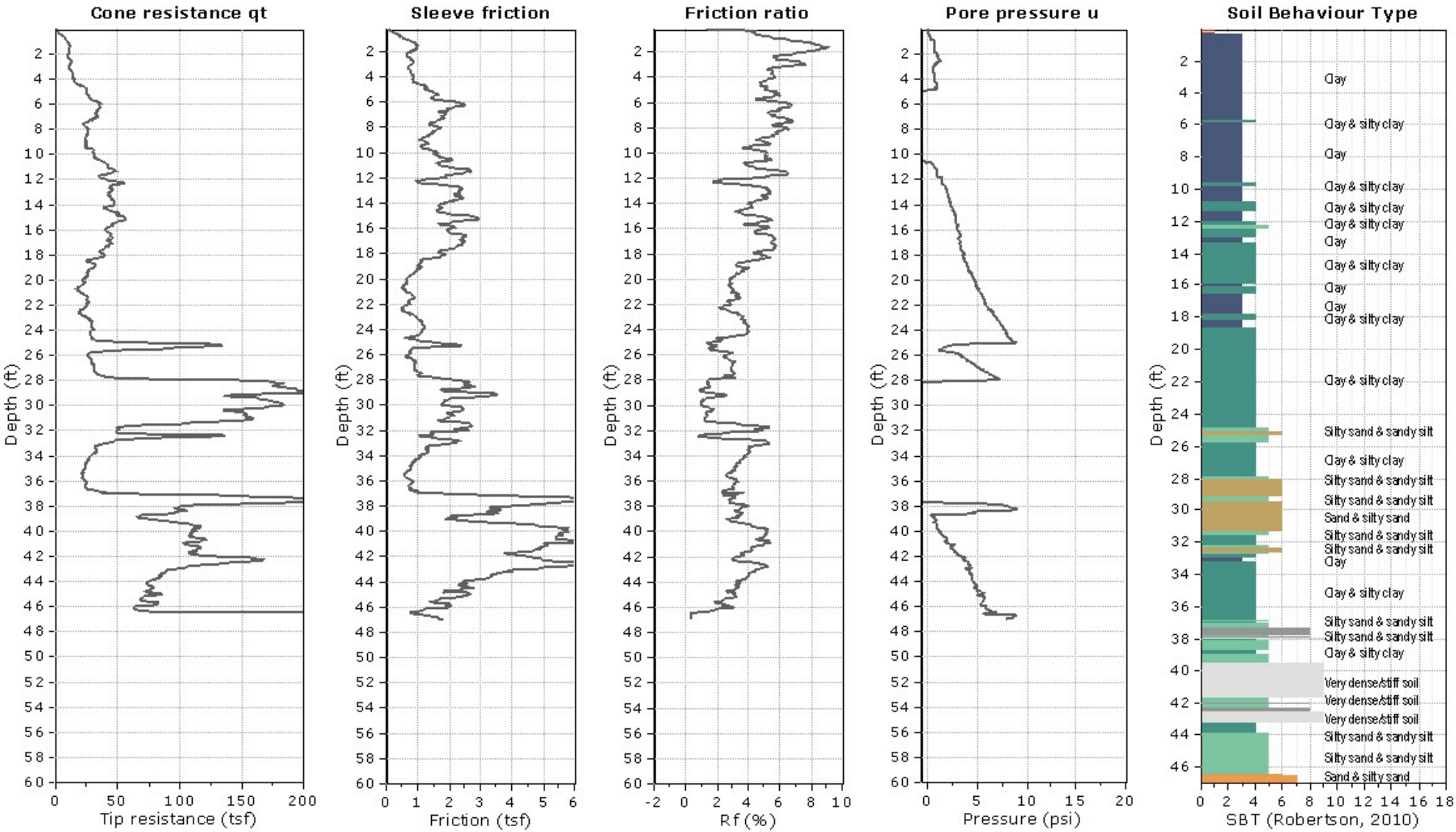
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Cone Operator: Fugro



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Project: **Coles Wind**
Location: **Coles County, Illinois**

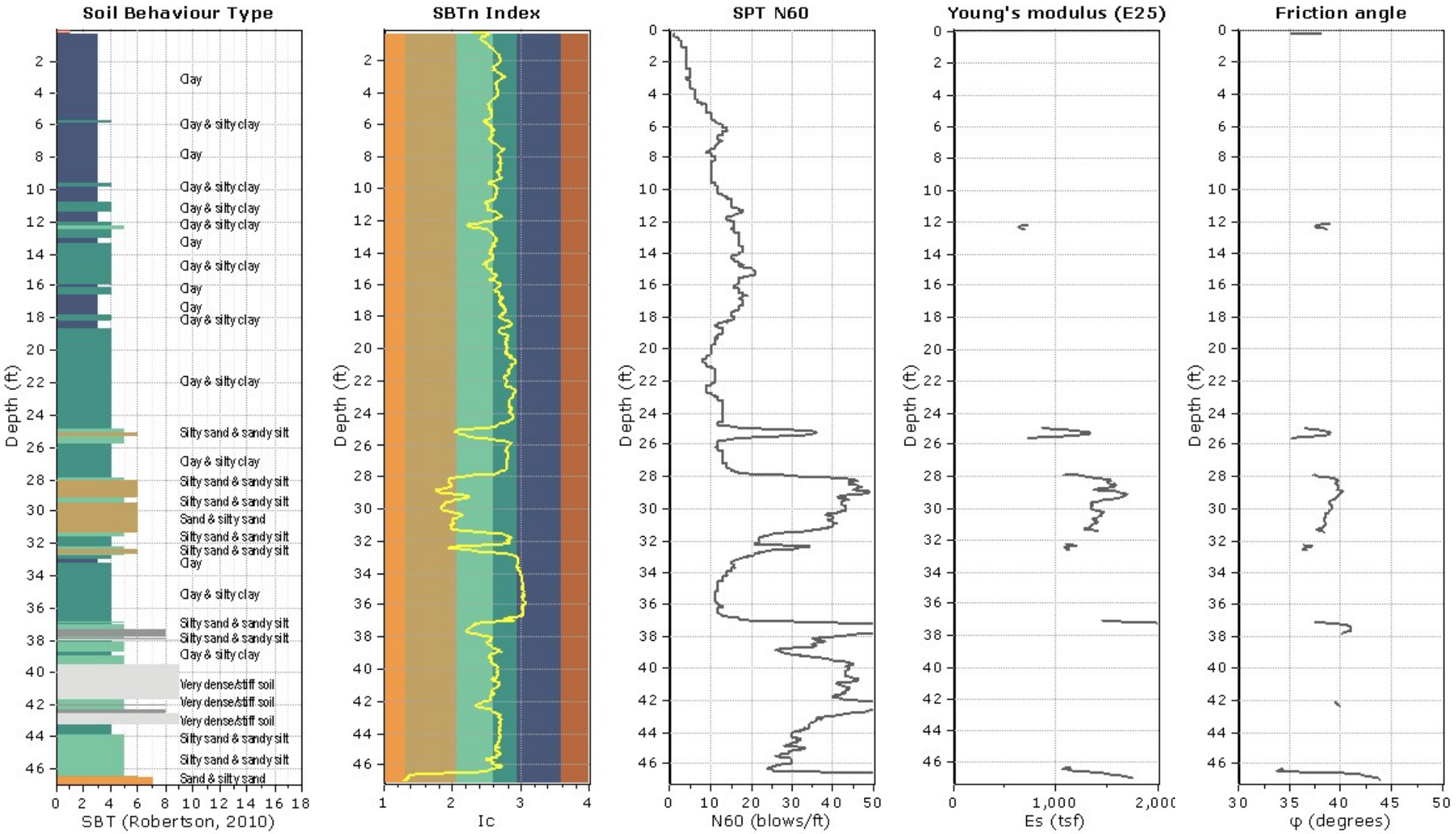
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Coords: lat 39.621062° lon -88.198786°
Cone Type: CPT
Cone Operator: Fugro



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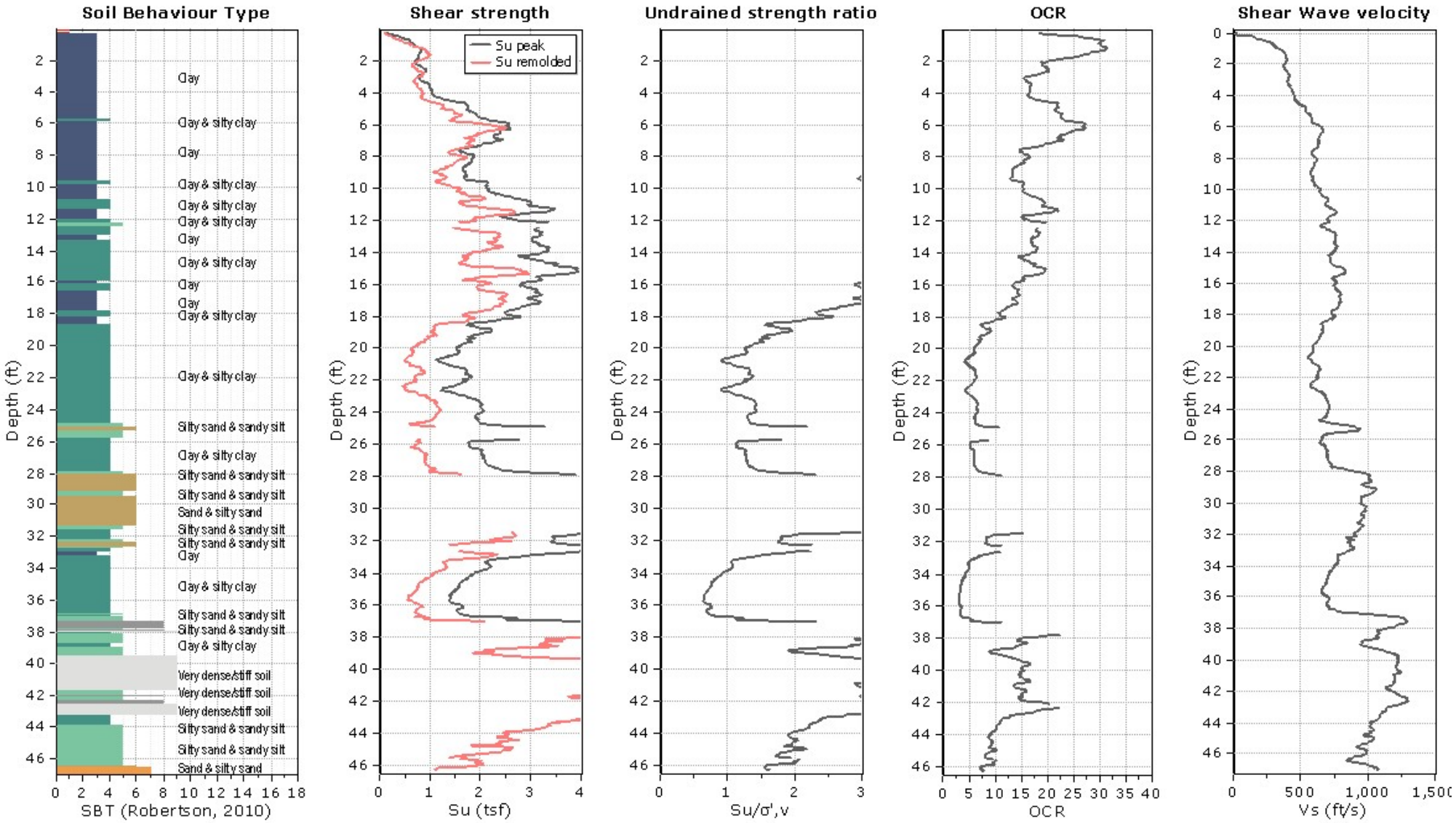
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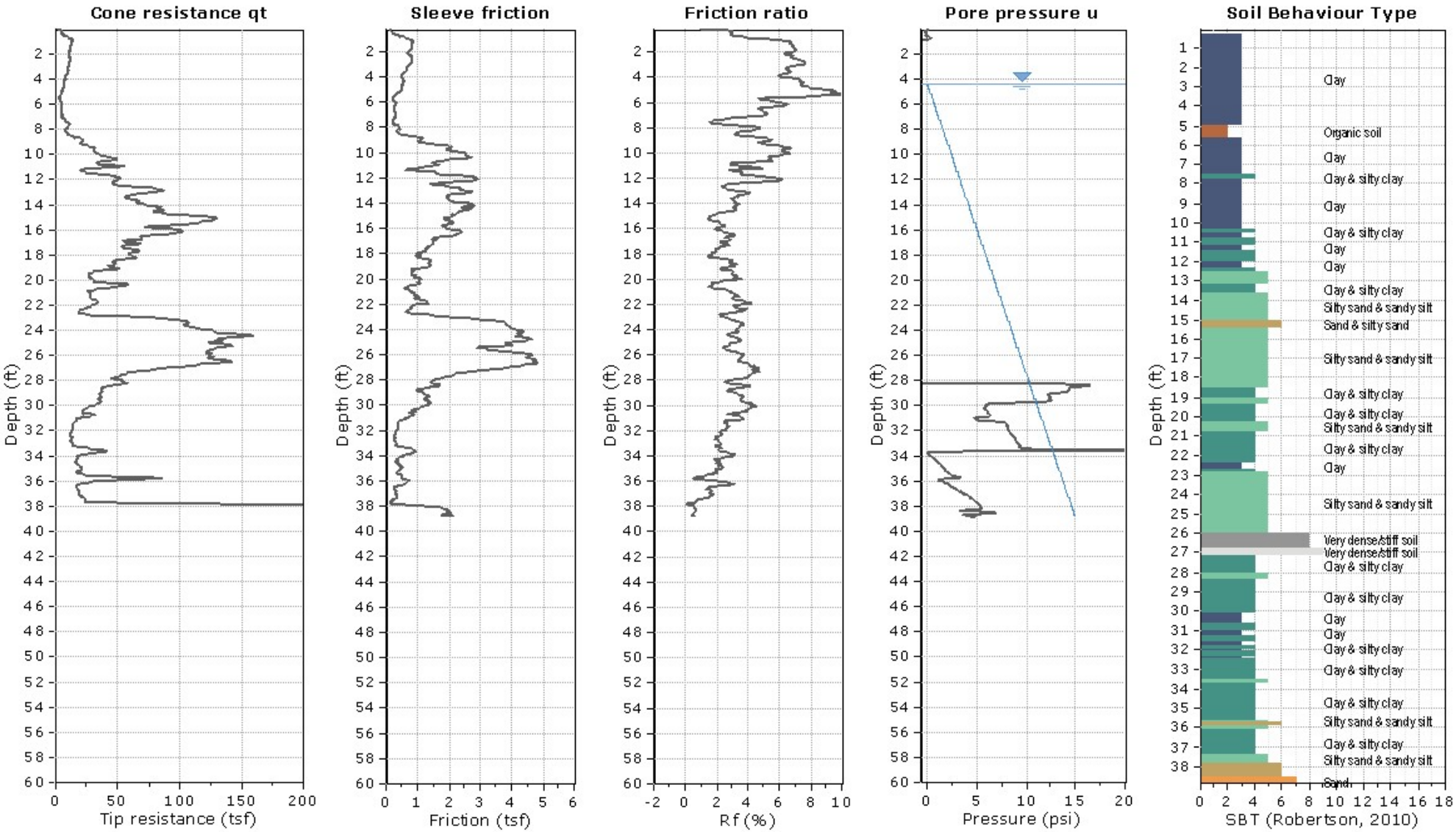
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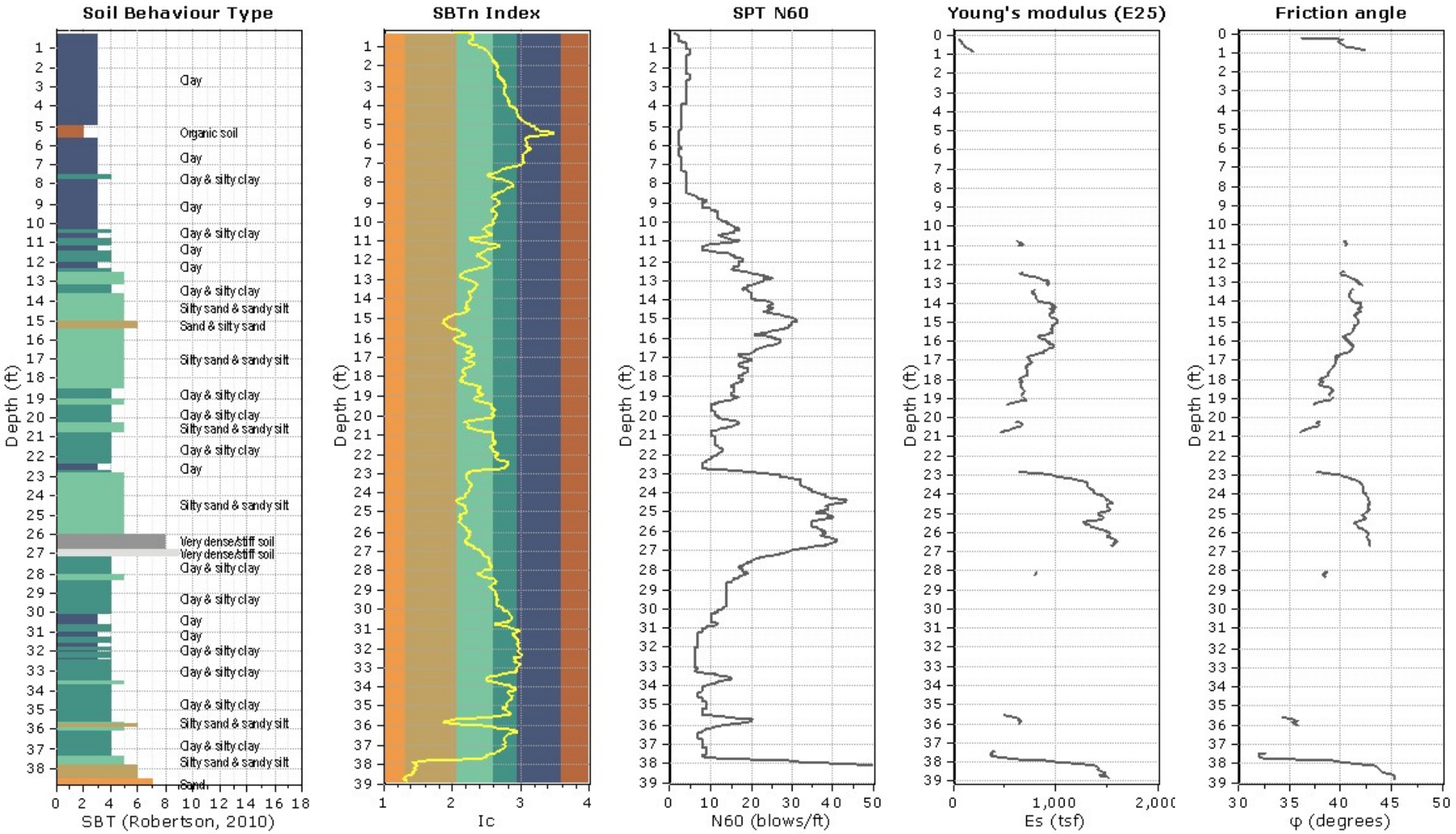
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Coords: lat 39.614735° lon -88.208232°
Cone Type: CPT
Cone Operator: Fugro



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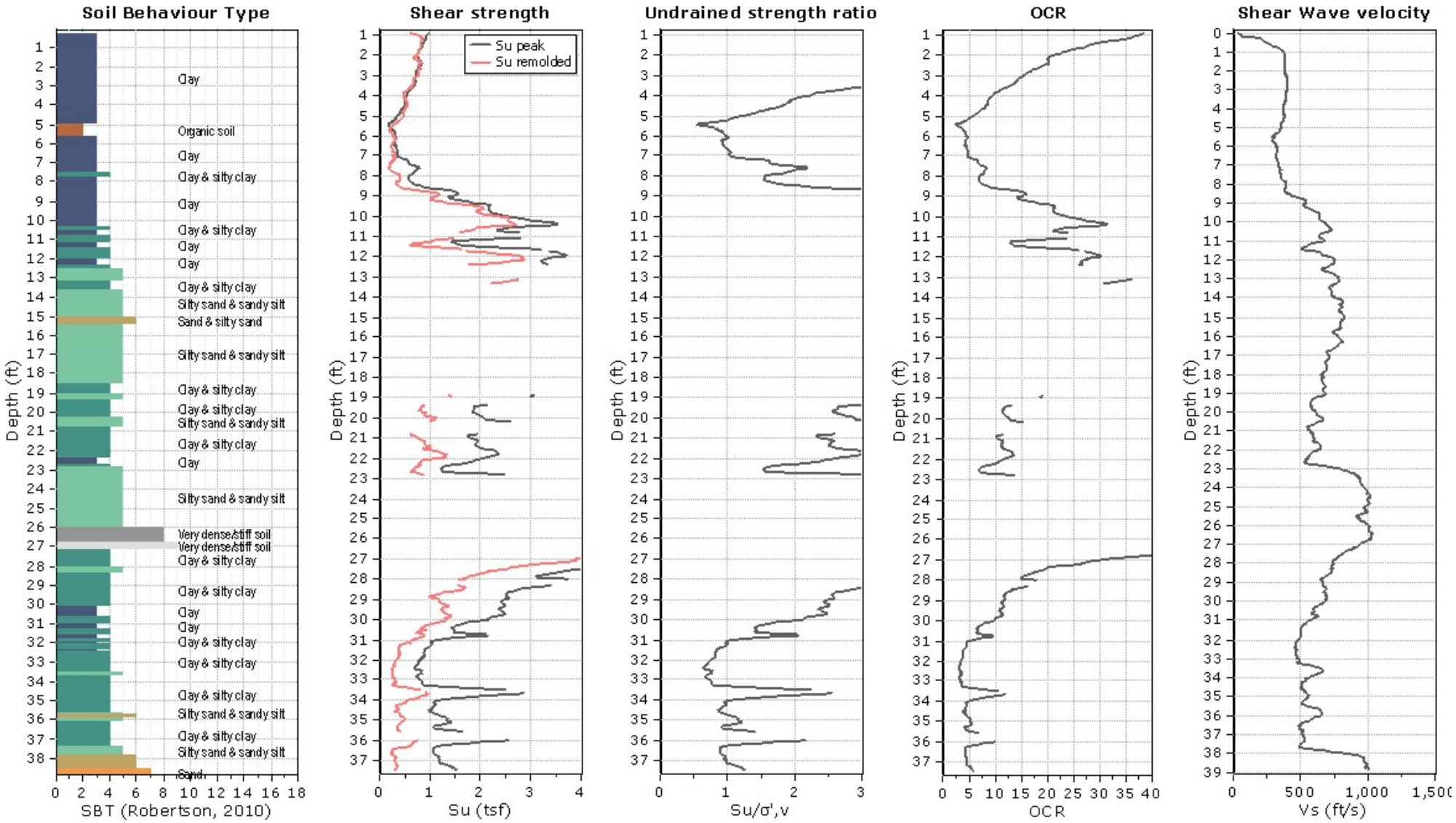
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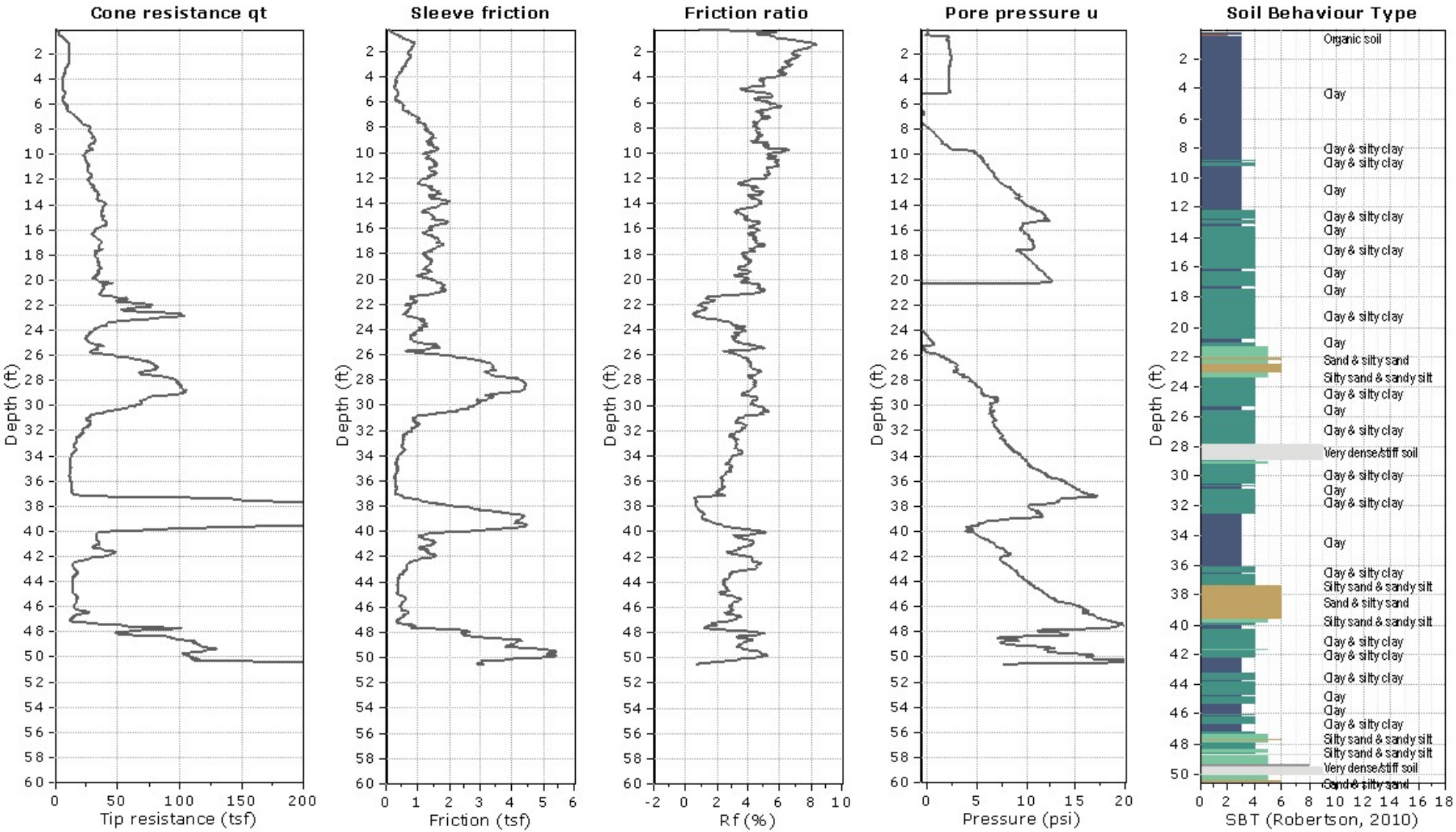
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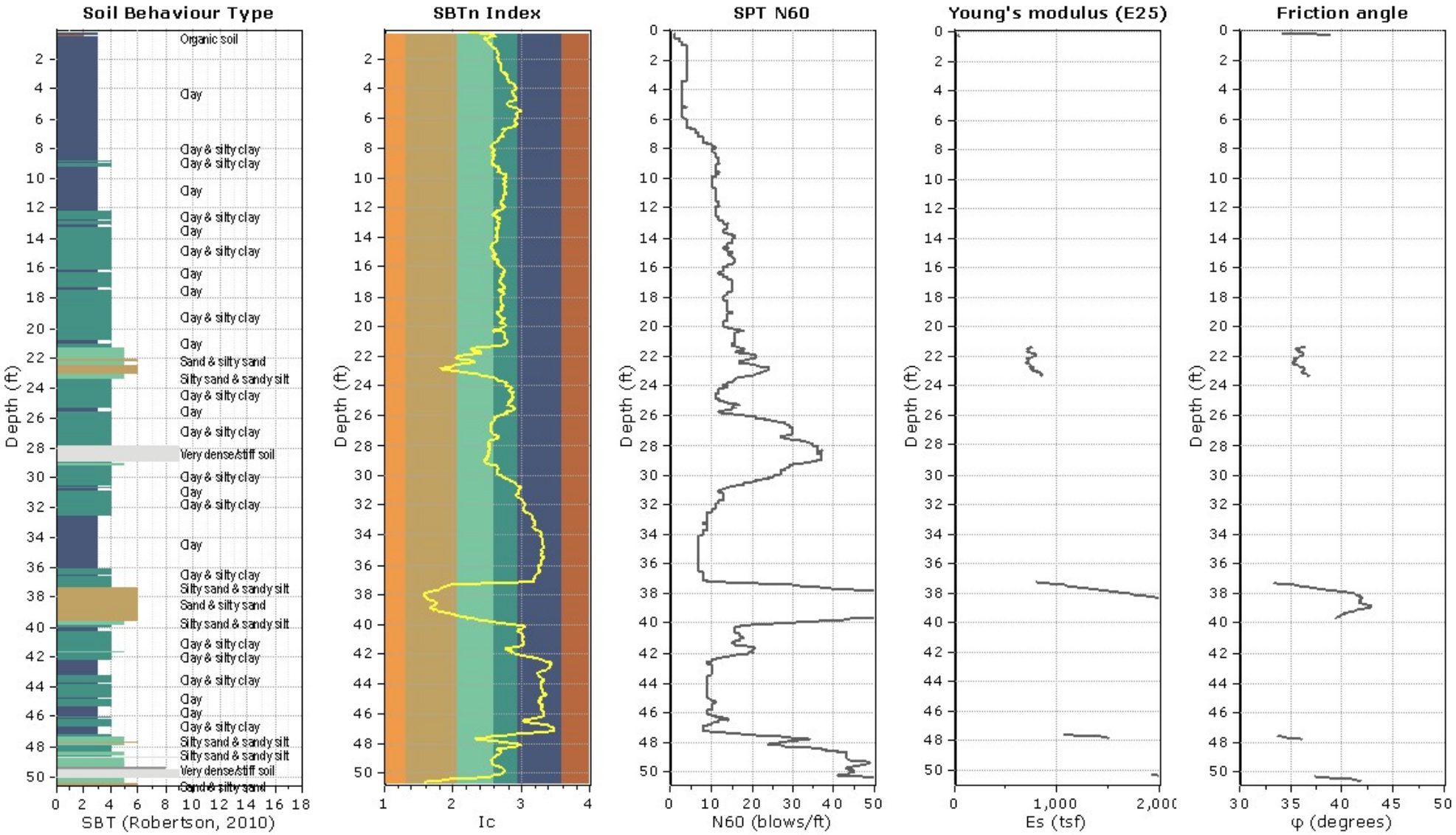
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Coords: lat 39.61369° lon -88.220885°
Cone Type: CPT
Cone Operator: Fugro



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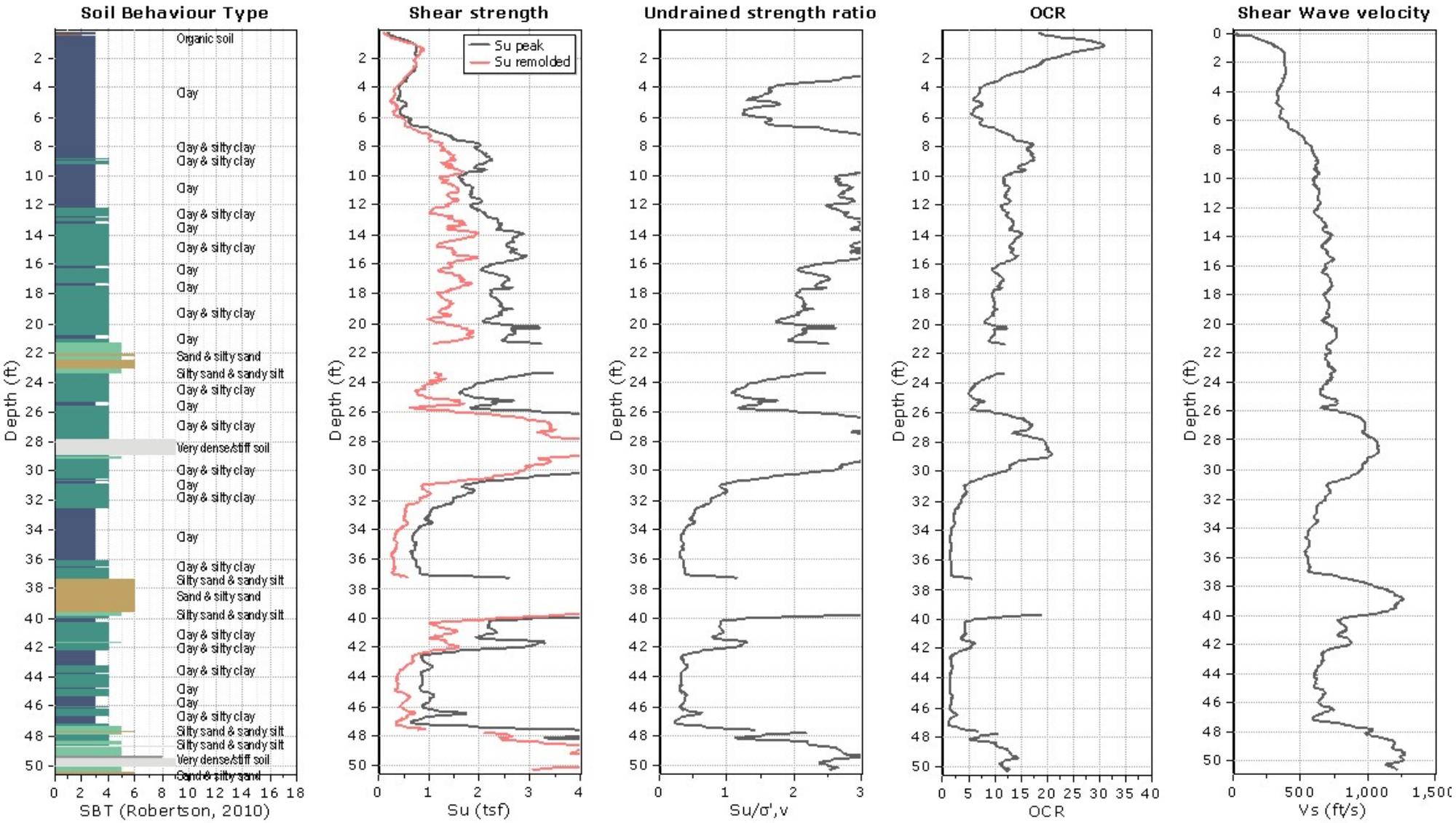
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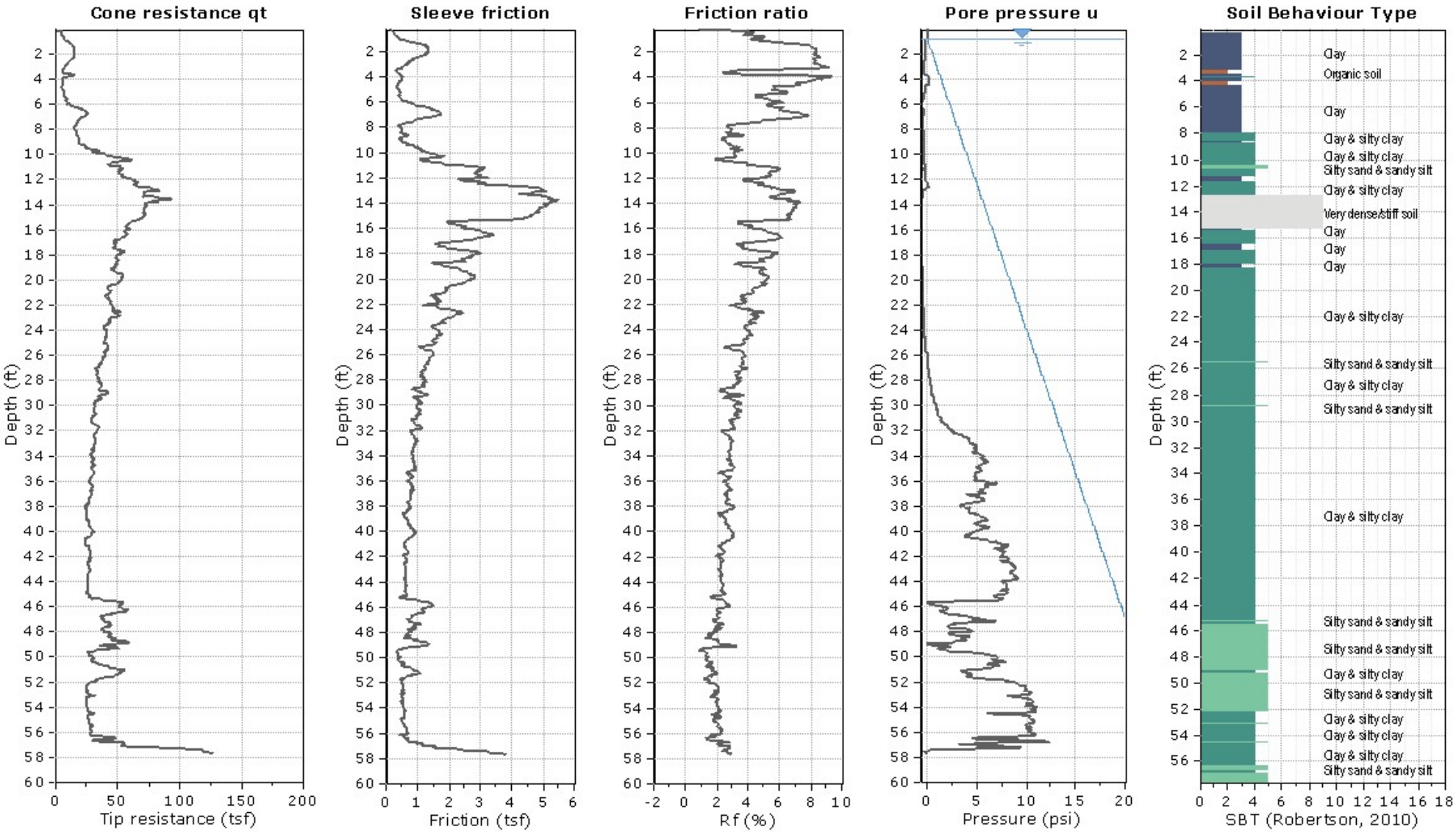
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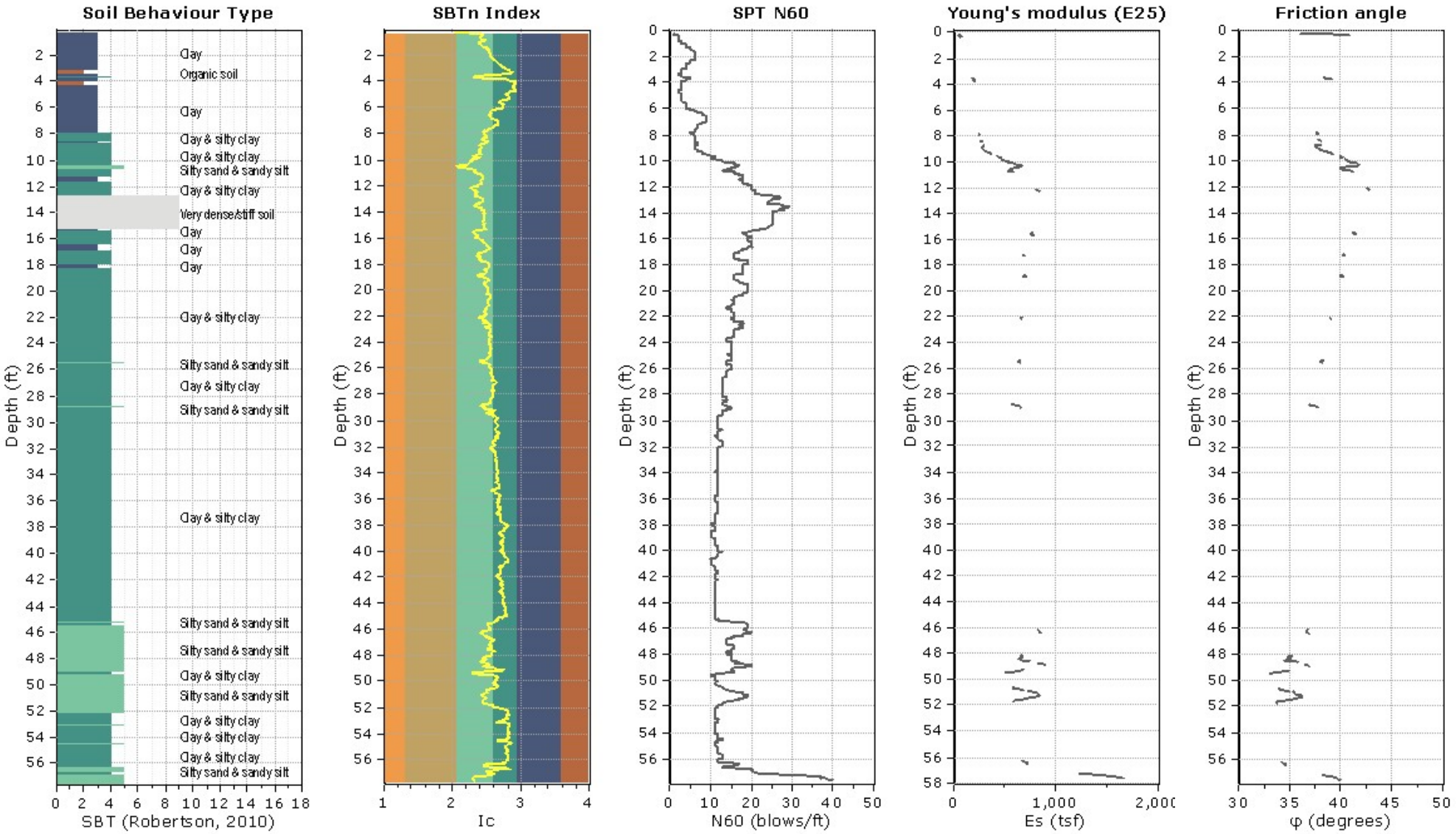
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Total depth: 57.64 ft, Date: 4/24/2025
Coords: lat 39.626564° lon -88.23607°
Cone Type: CPT
Cone Operator: Fugro



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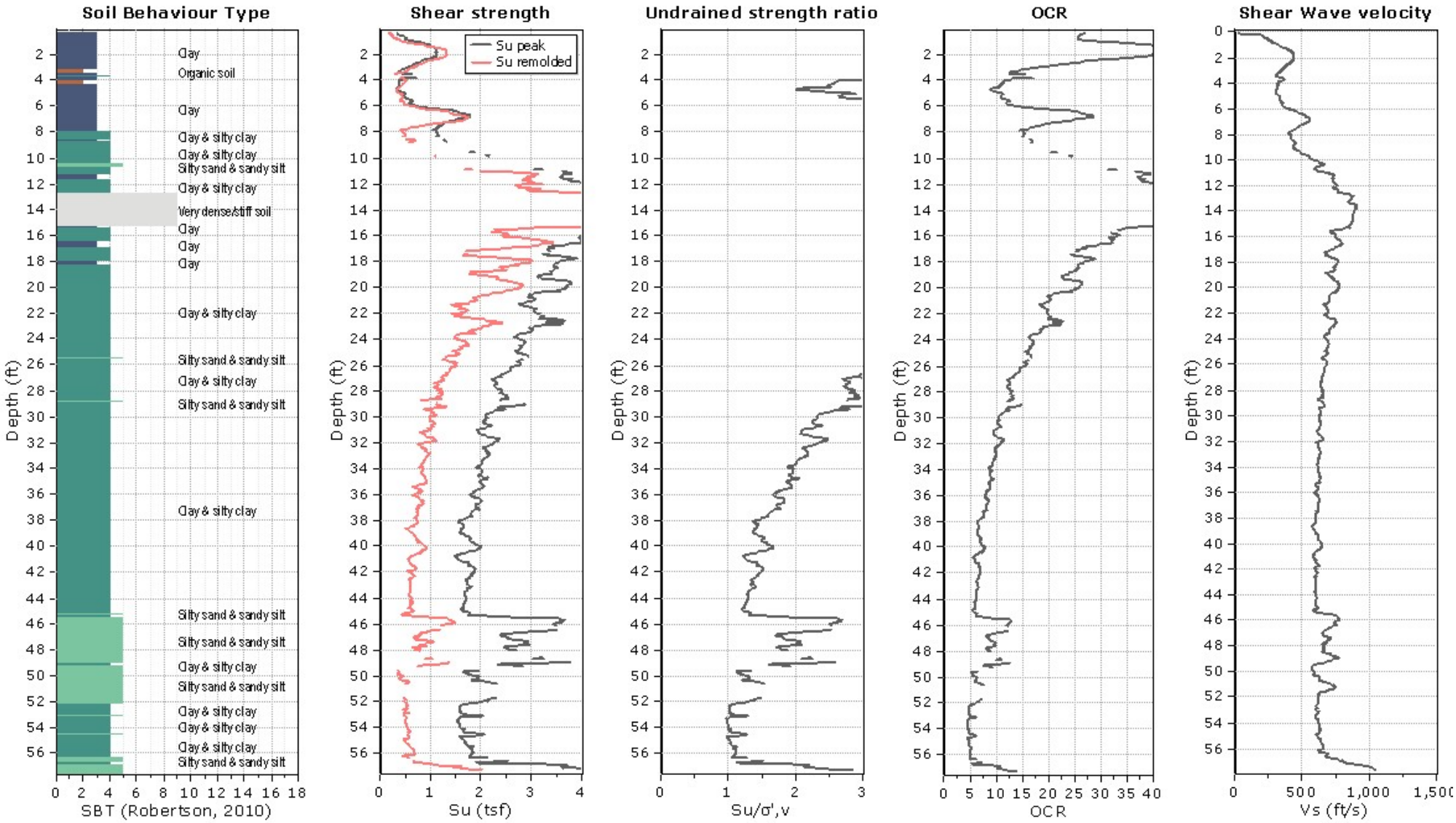
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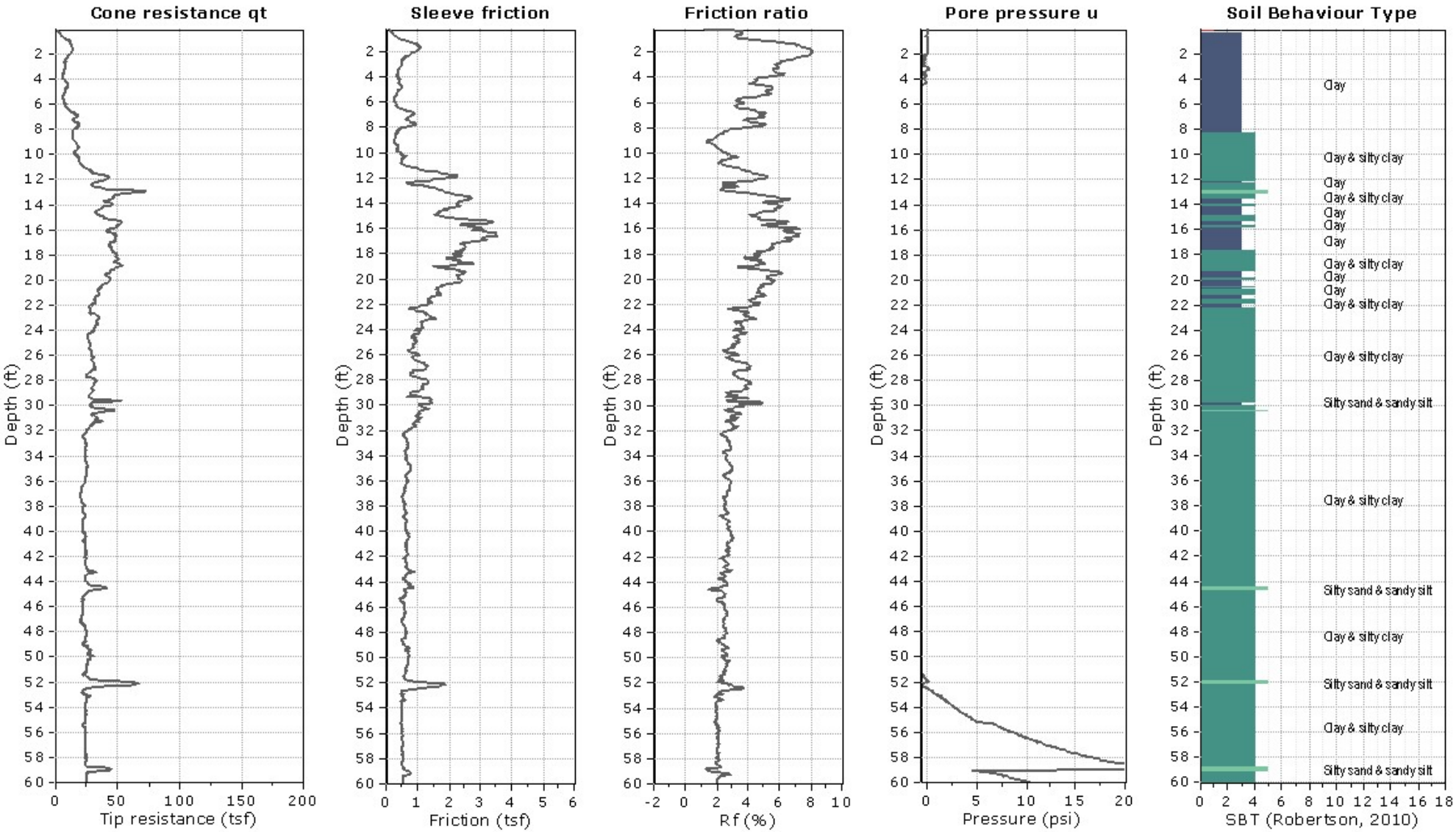
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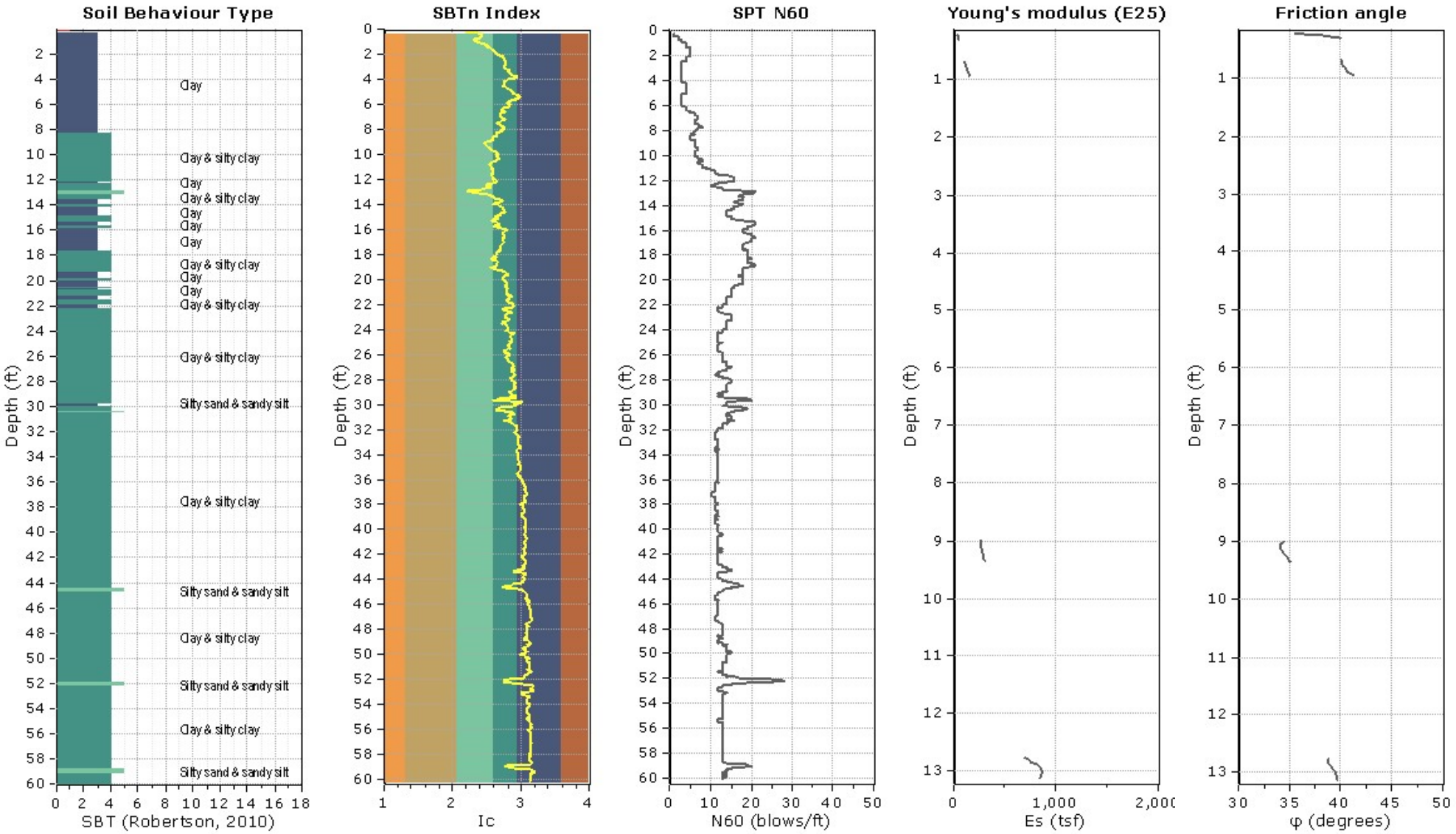
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Total depth: 60.10 ft, Date: 4/23/2025
Coords: lat 39.629093° lon -88.223195°
Cone Type: CPT
Cone Operator: Fugro



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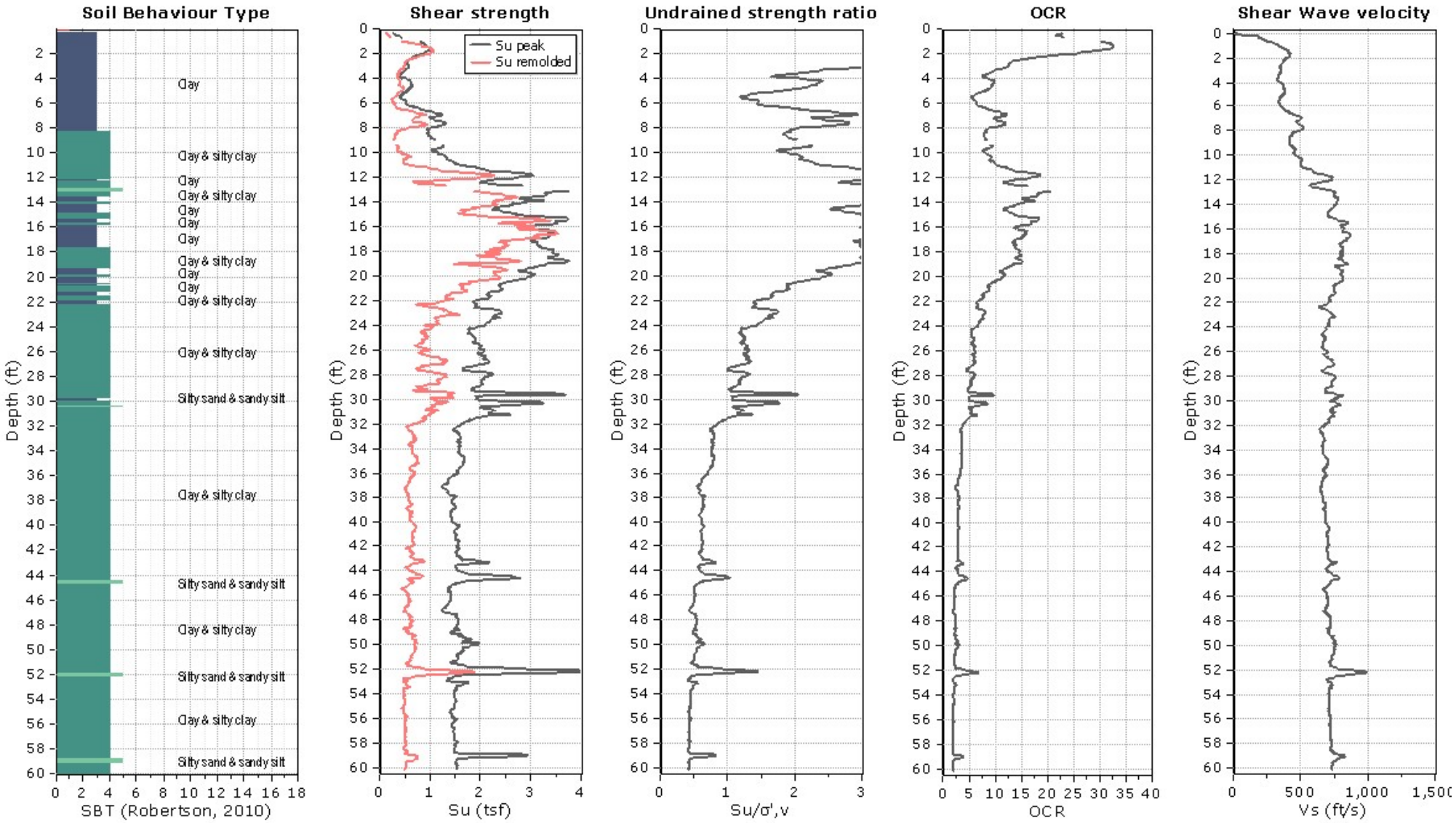
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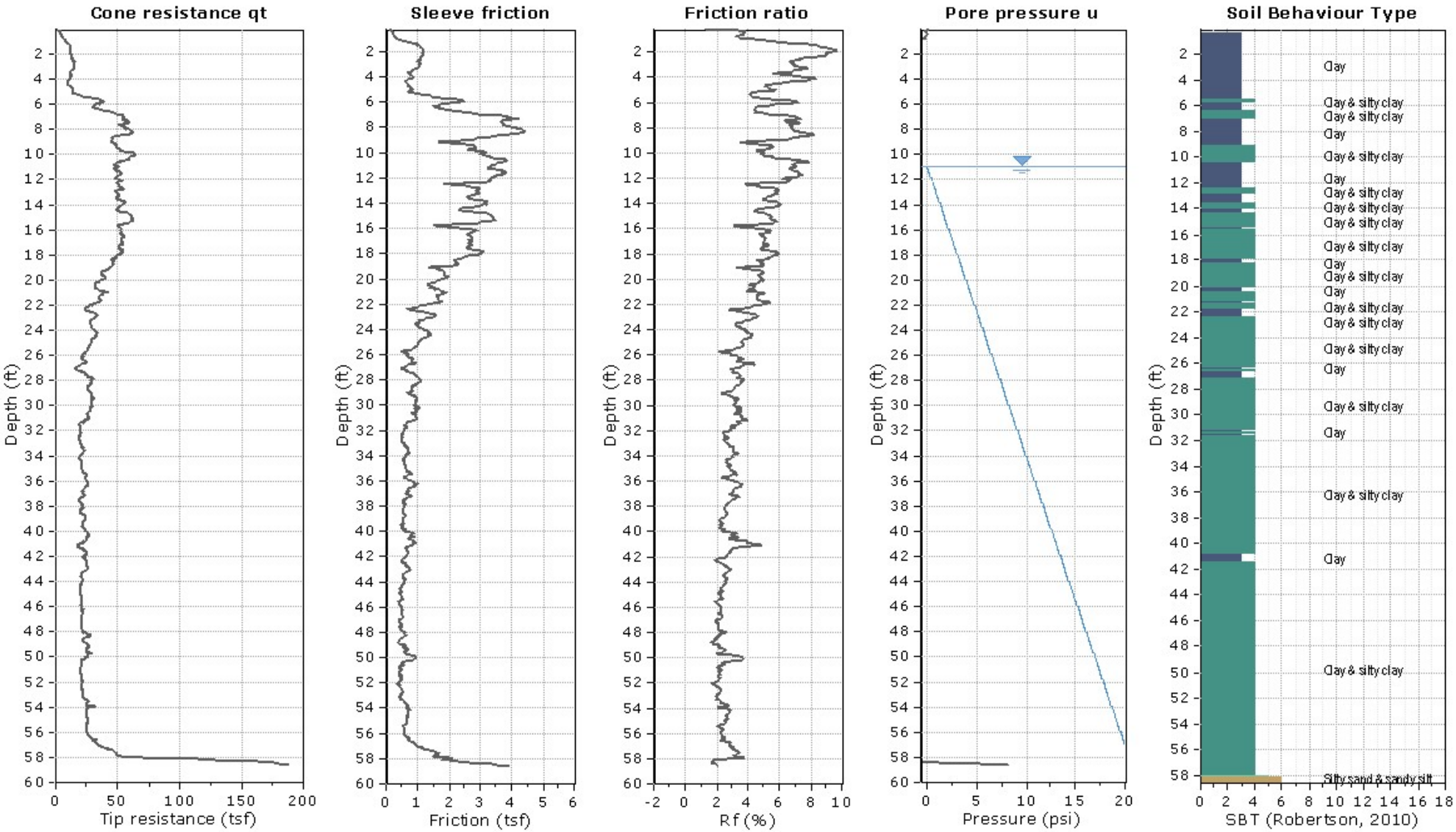
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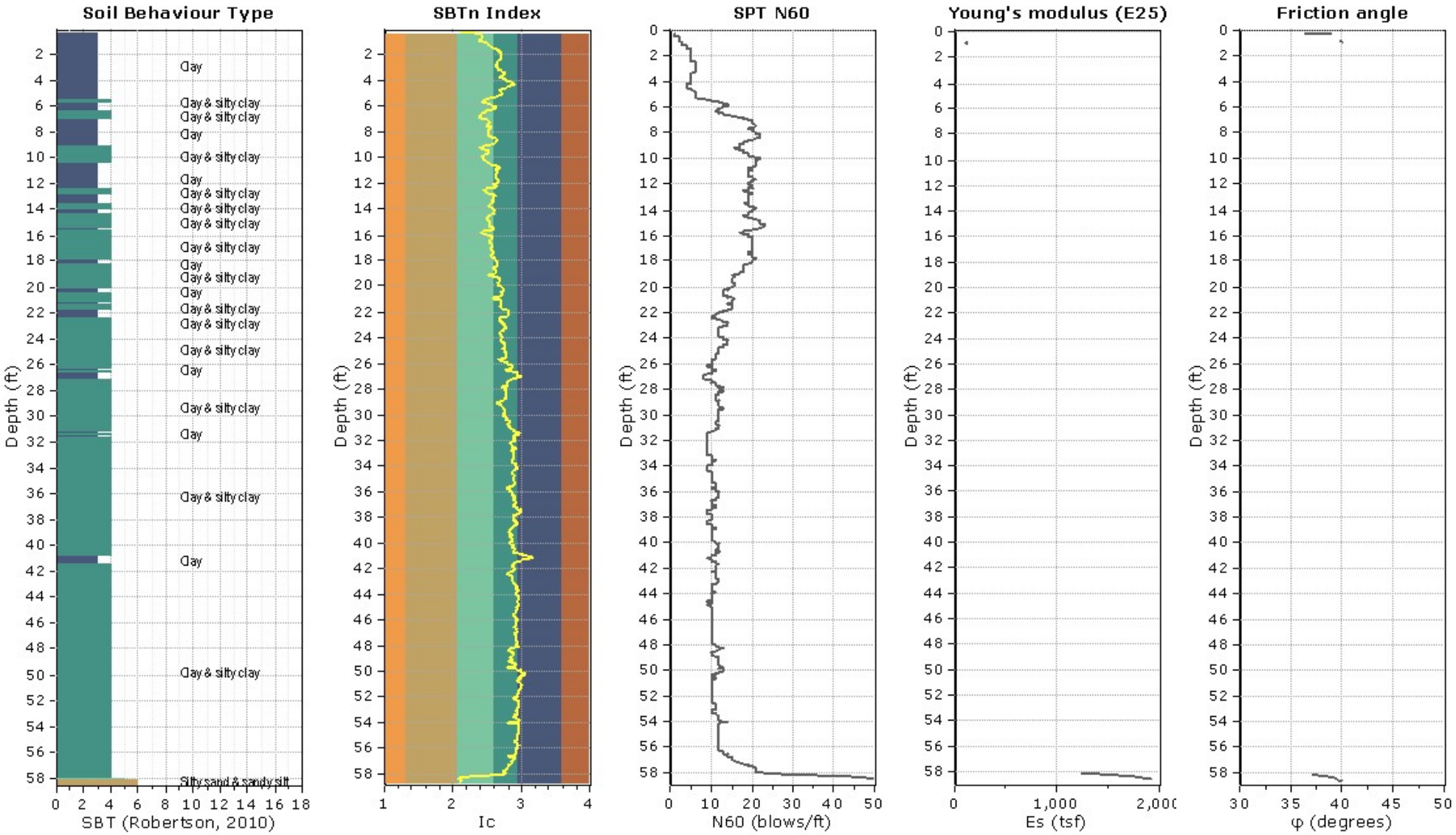
CPT: GEO-52
Total depth: 58.60 ft, Date: 4/26/2025
Coords: lat 39.626261° lon -88.187792°
Cone Type: CPT
Cone Operator: Fugro



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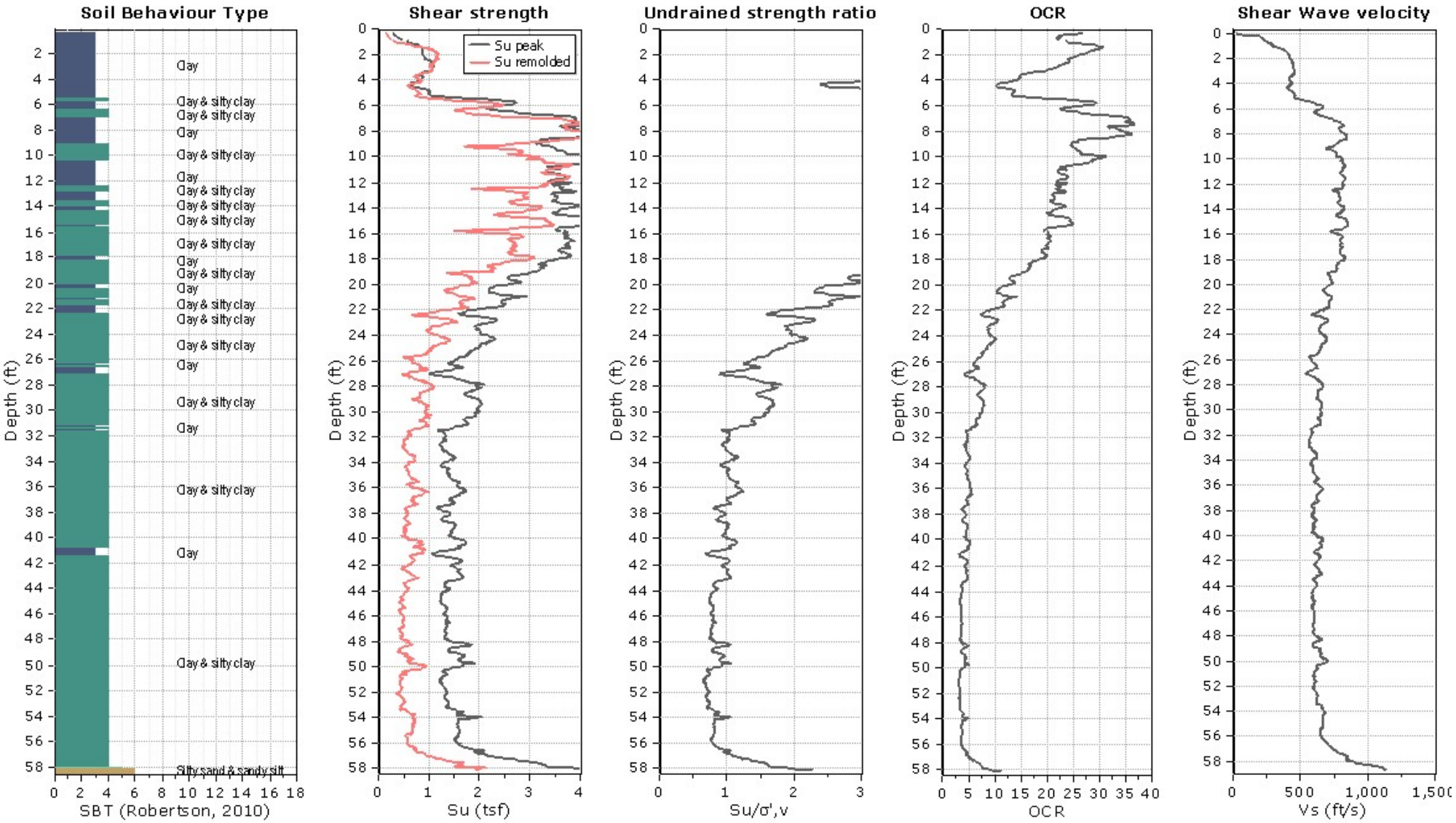
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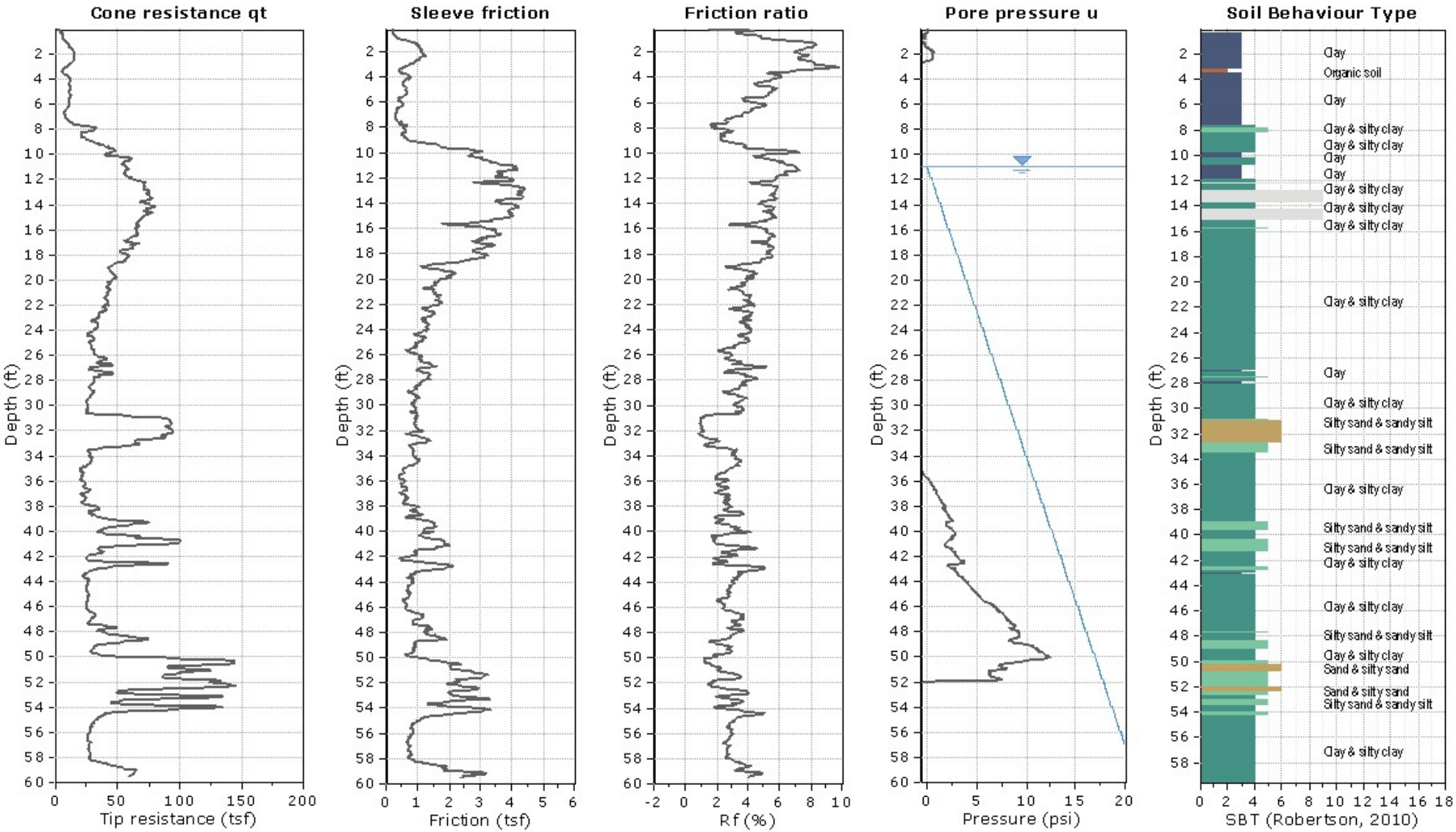
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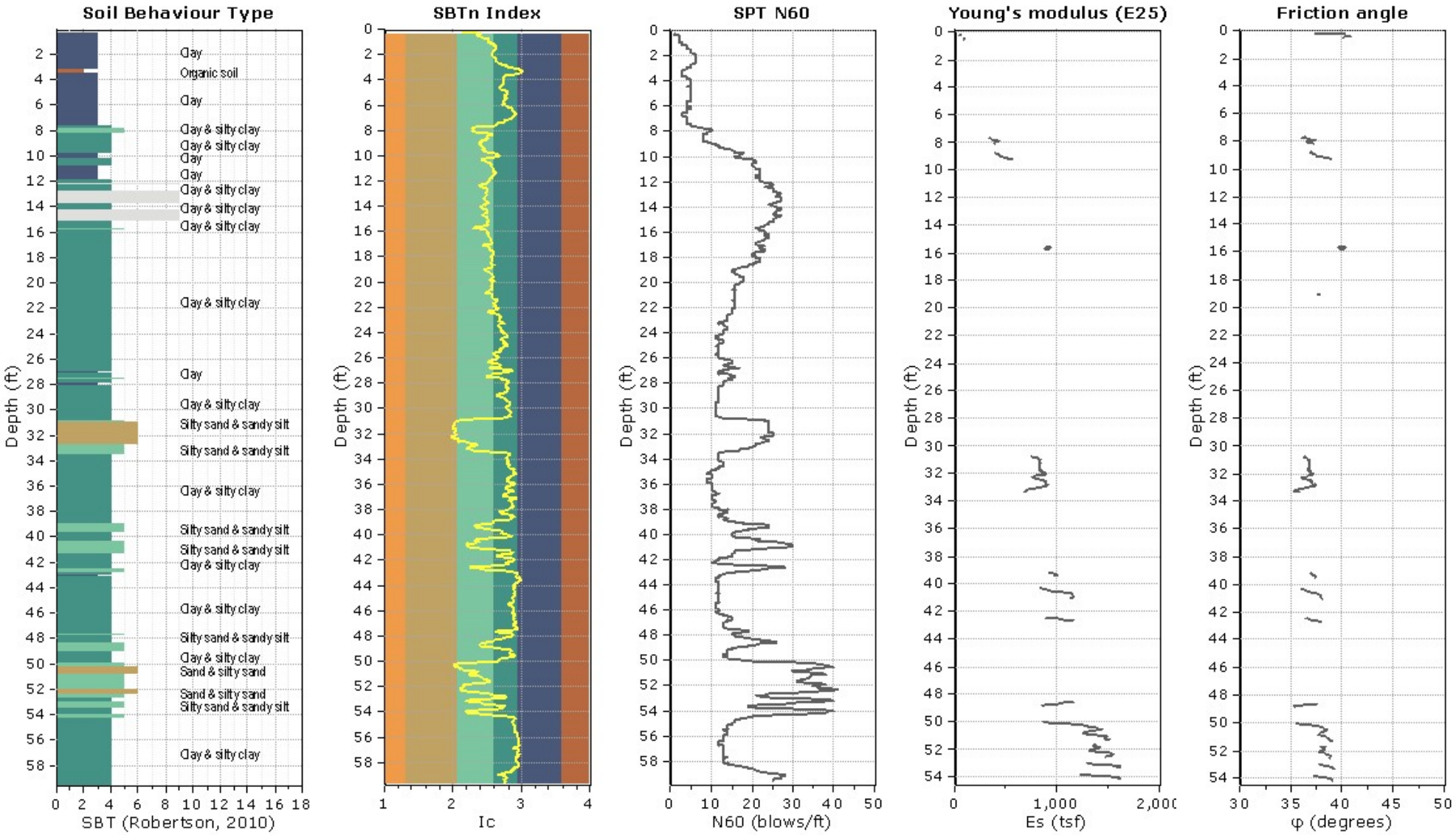
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Coords: lat 39.628019° lon -88.180345°
Cone Type: CPT
Cone Operator: Fugro



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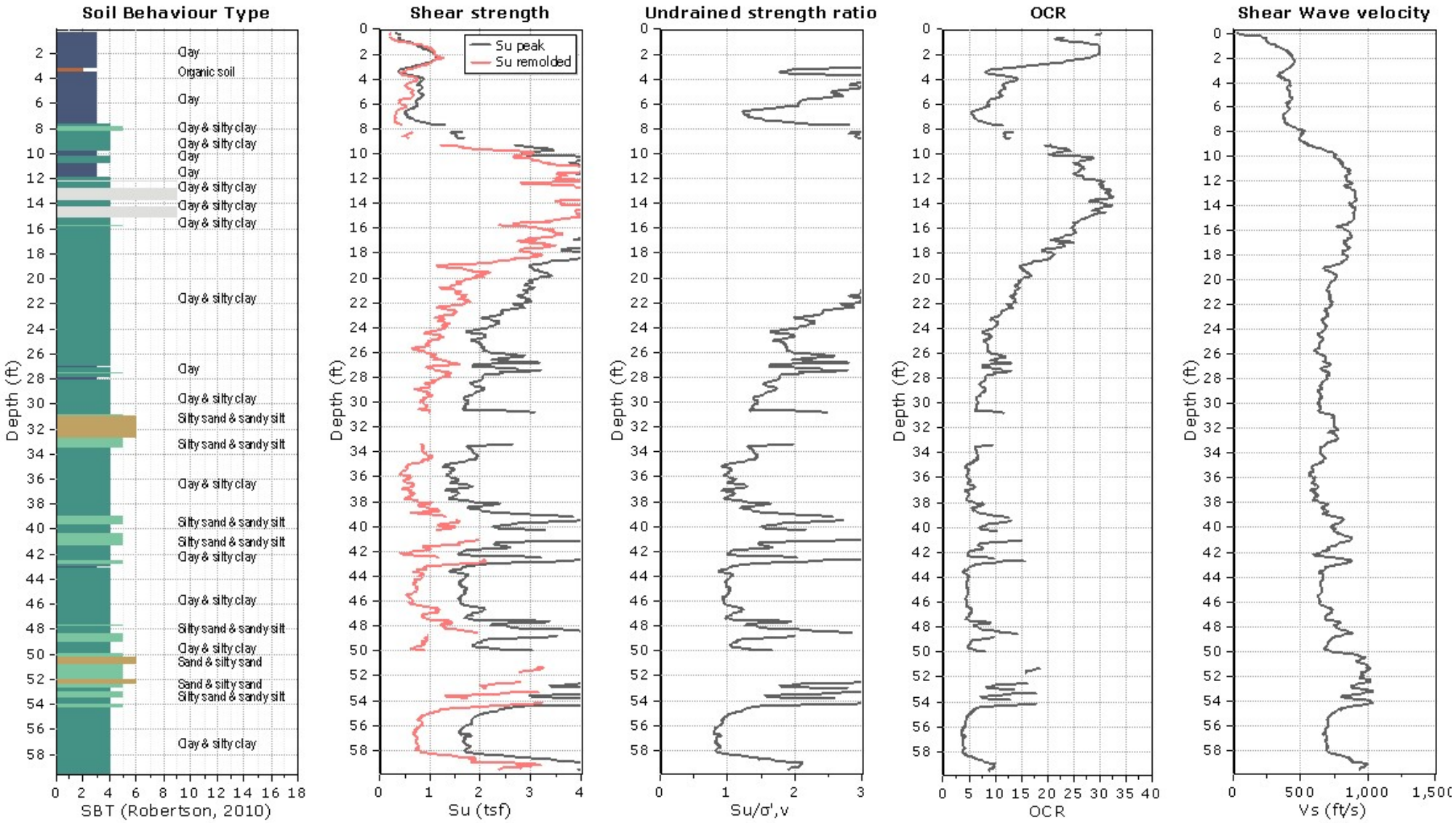
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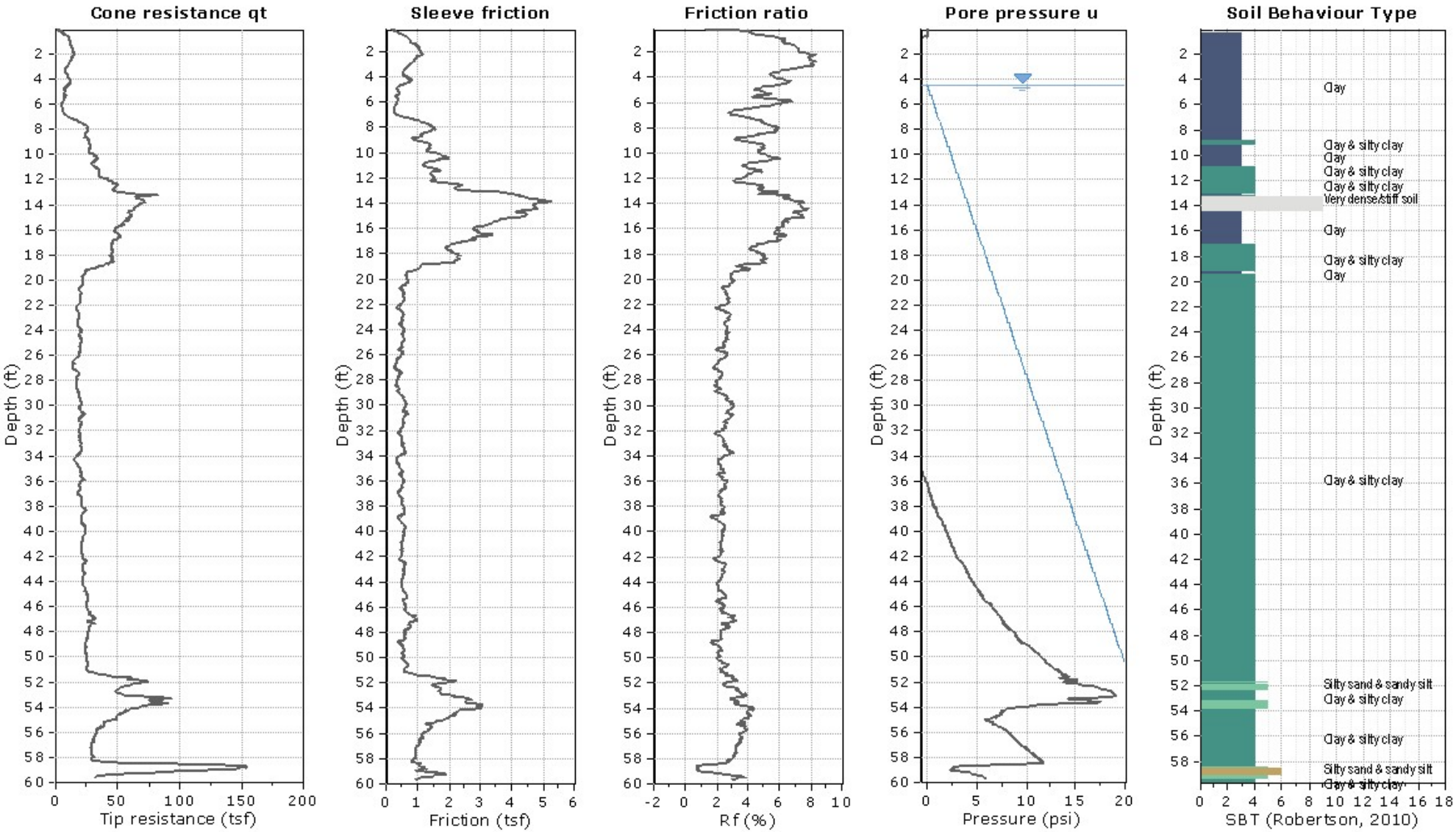
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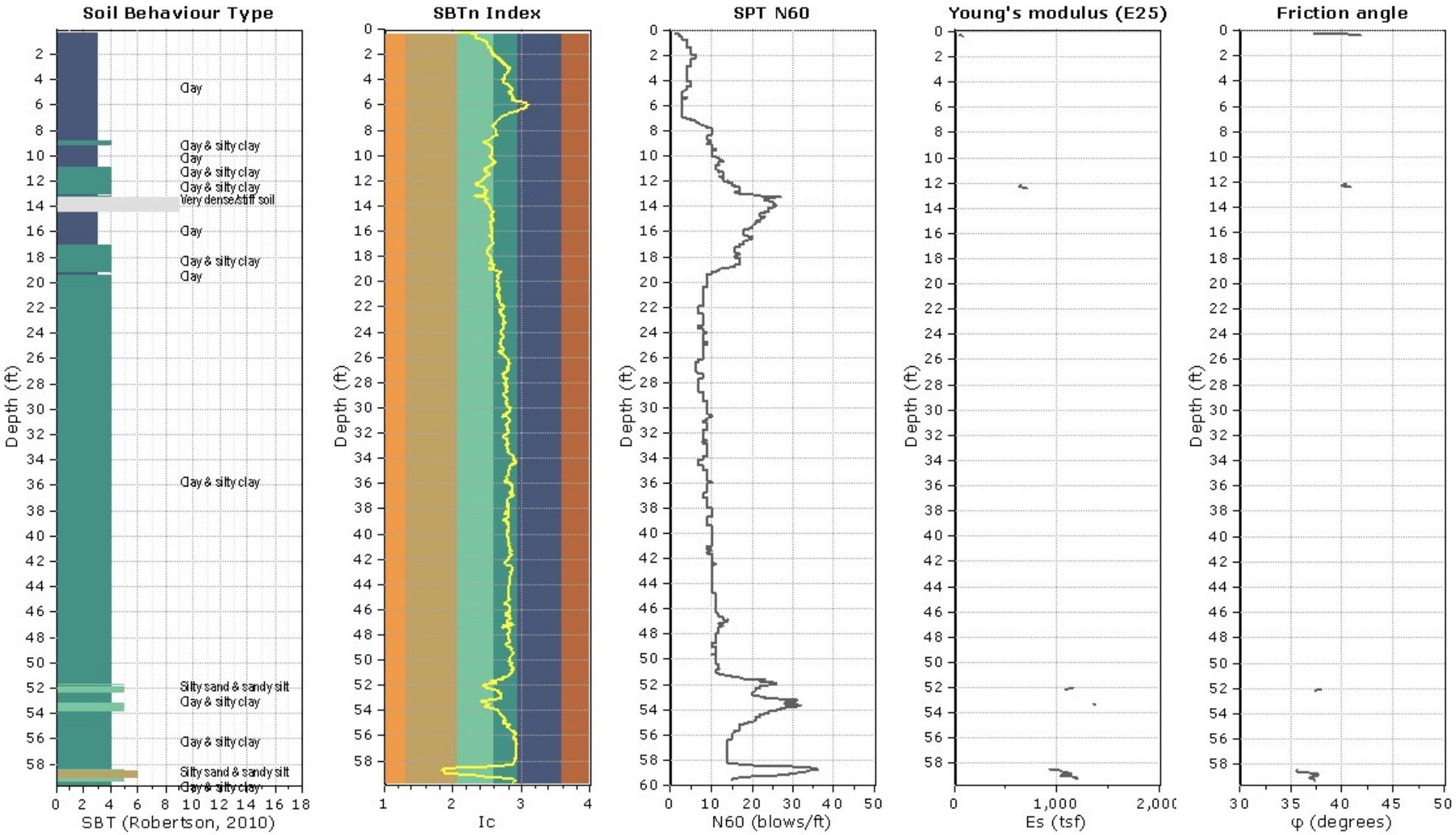
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Coords: lat 39.631708° lon -88.189183°
Cone Type: CPT
Cone Operator: Fugro



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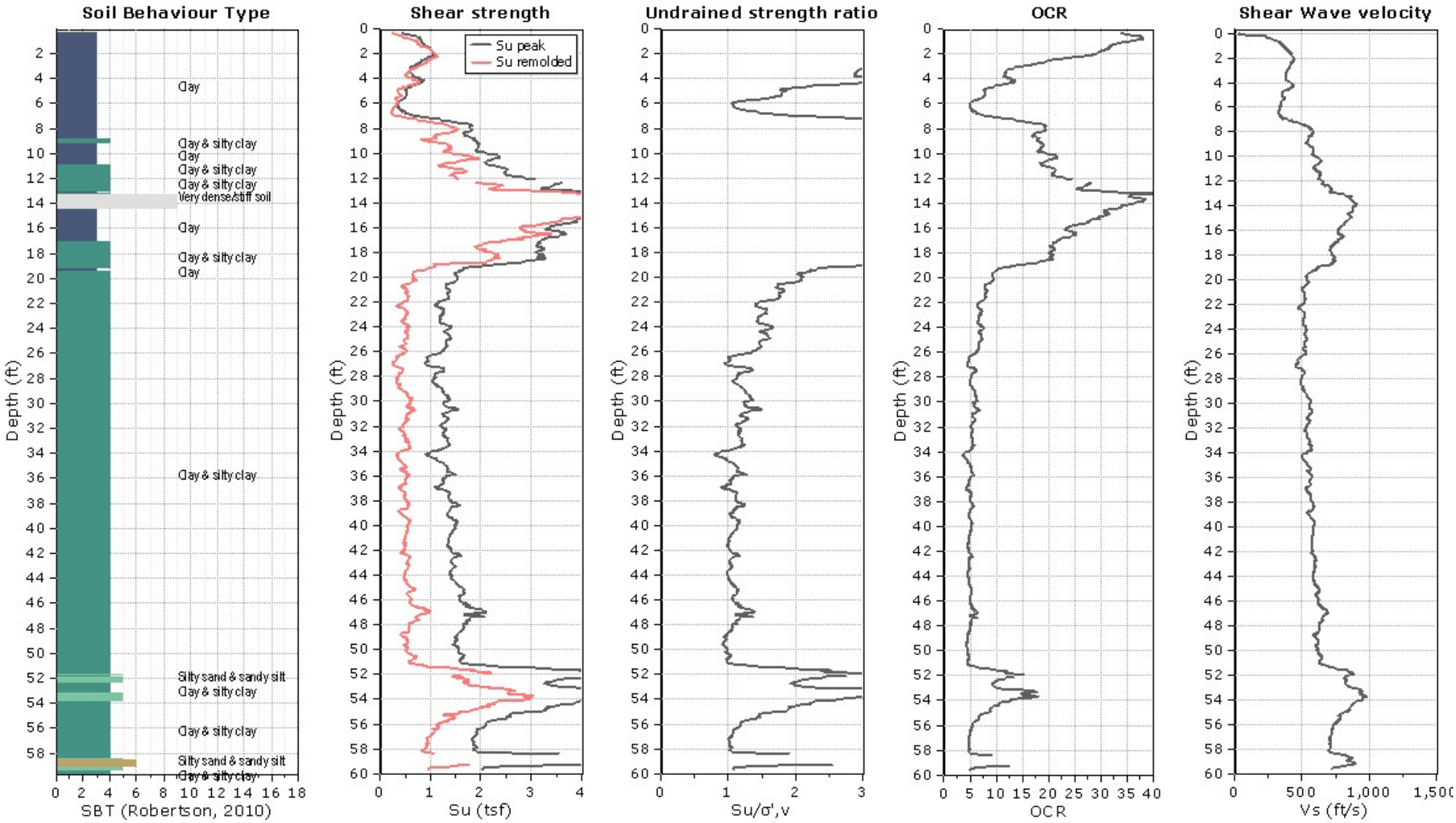
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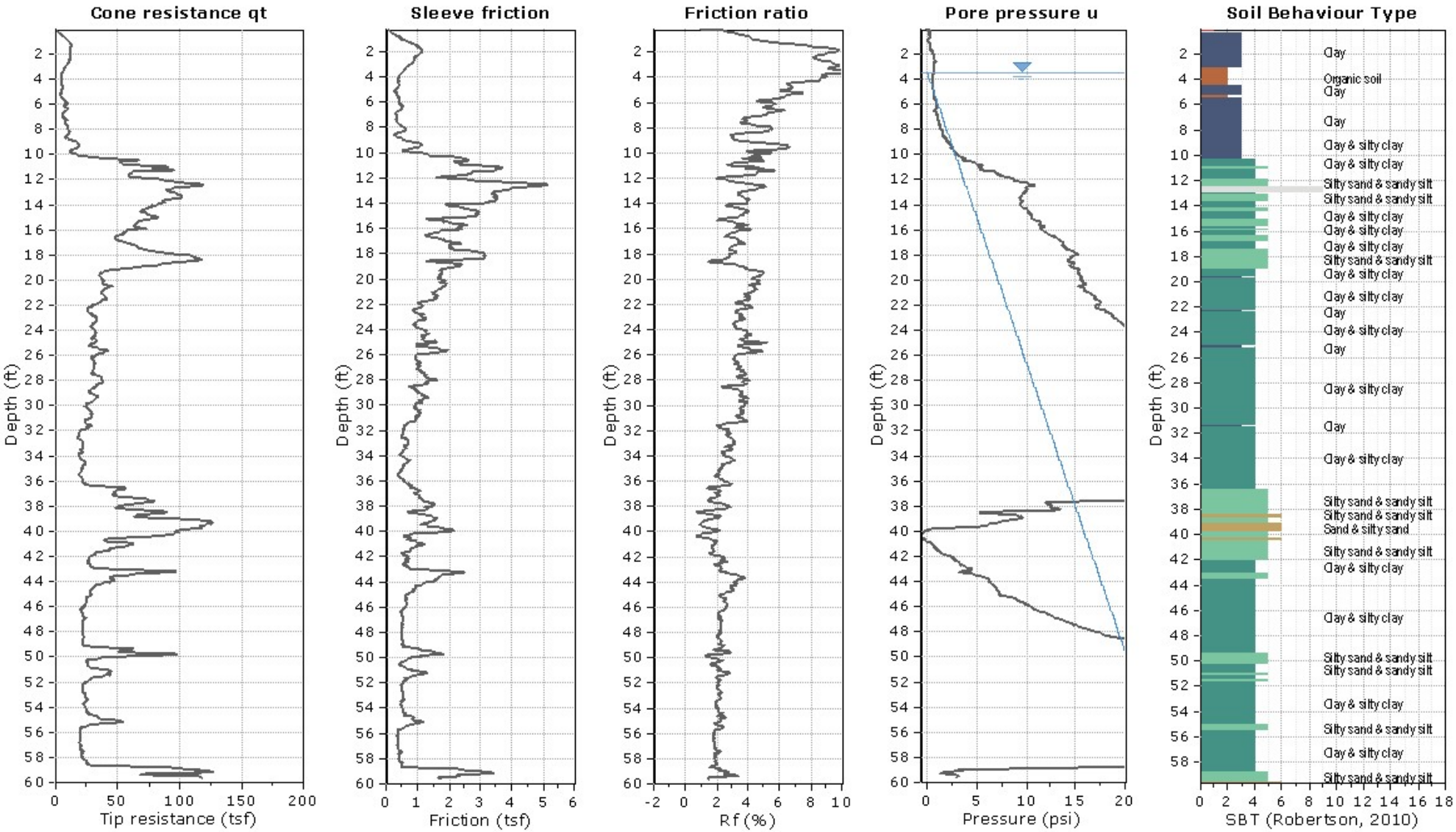
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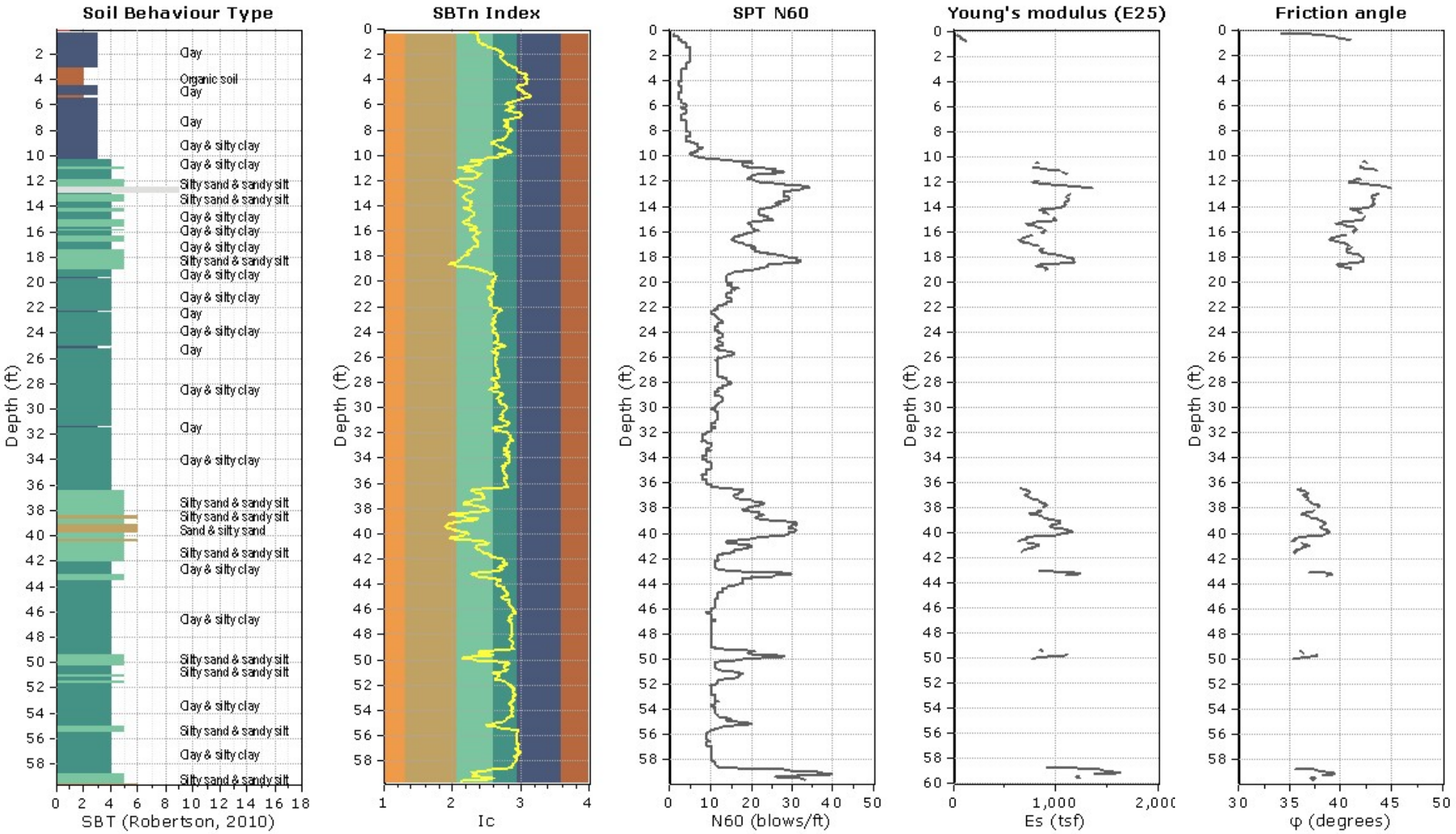
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Cone Type: CPT
Cone Operator: Fugro



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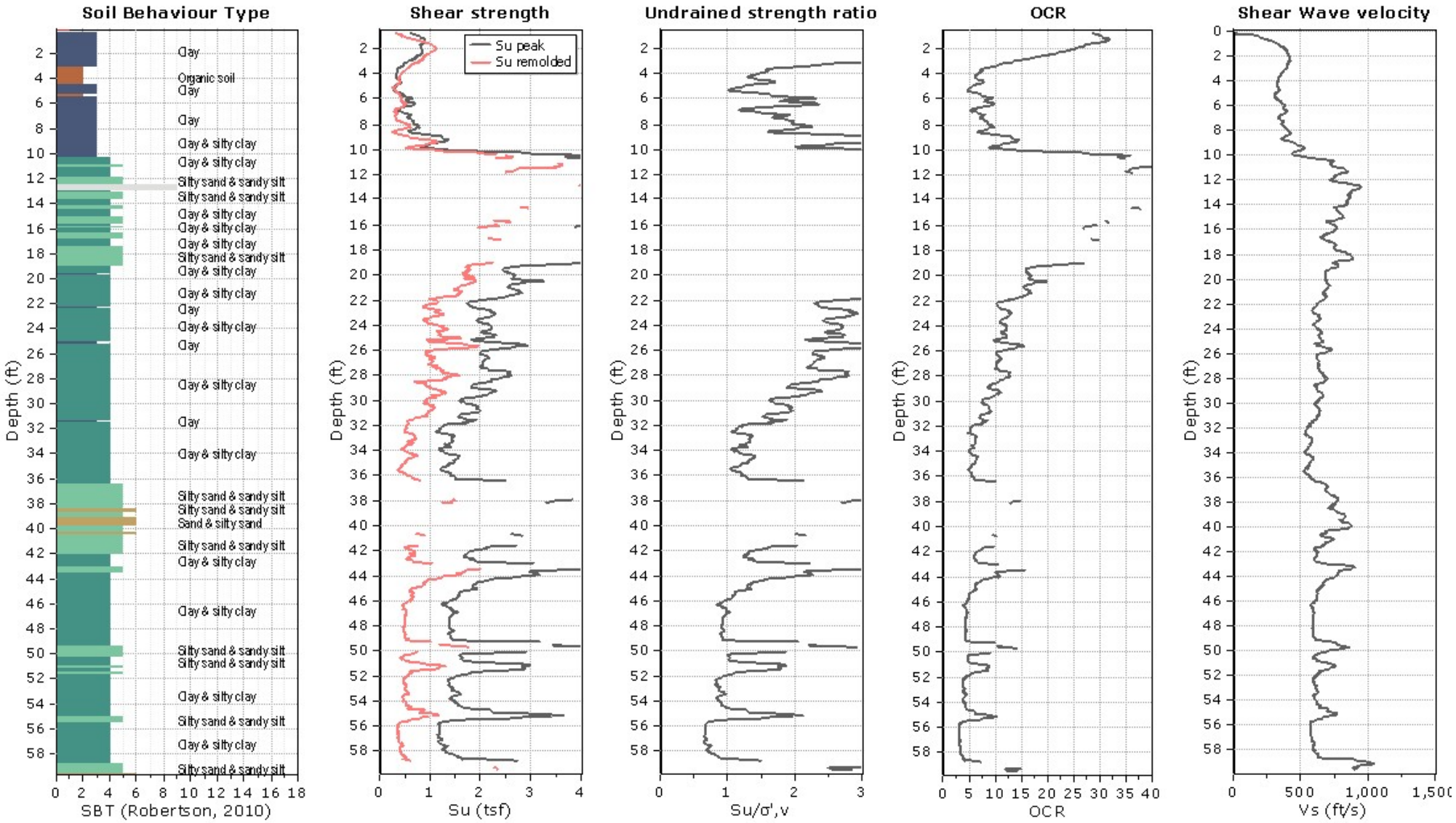
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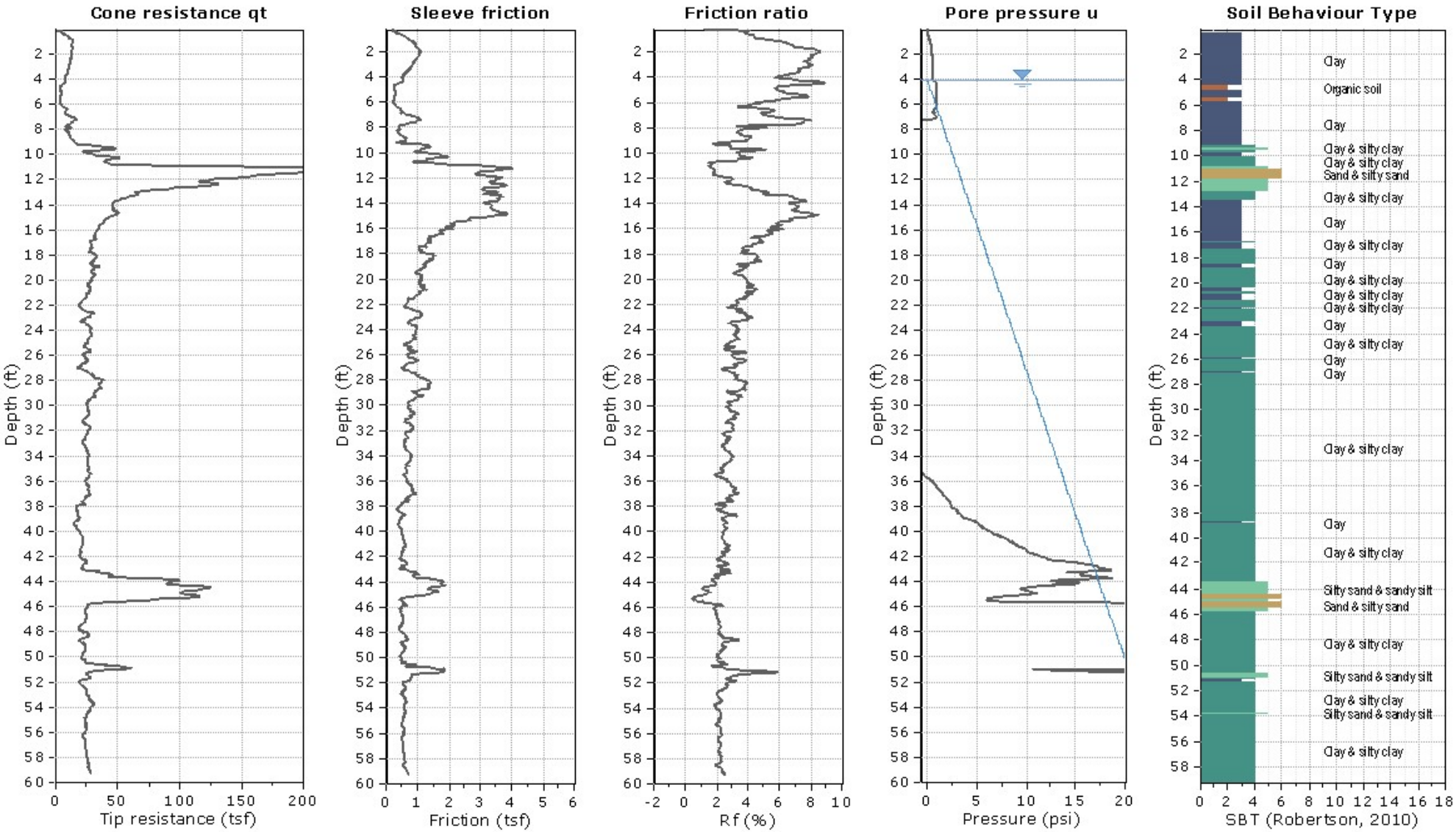
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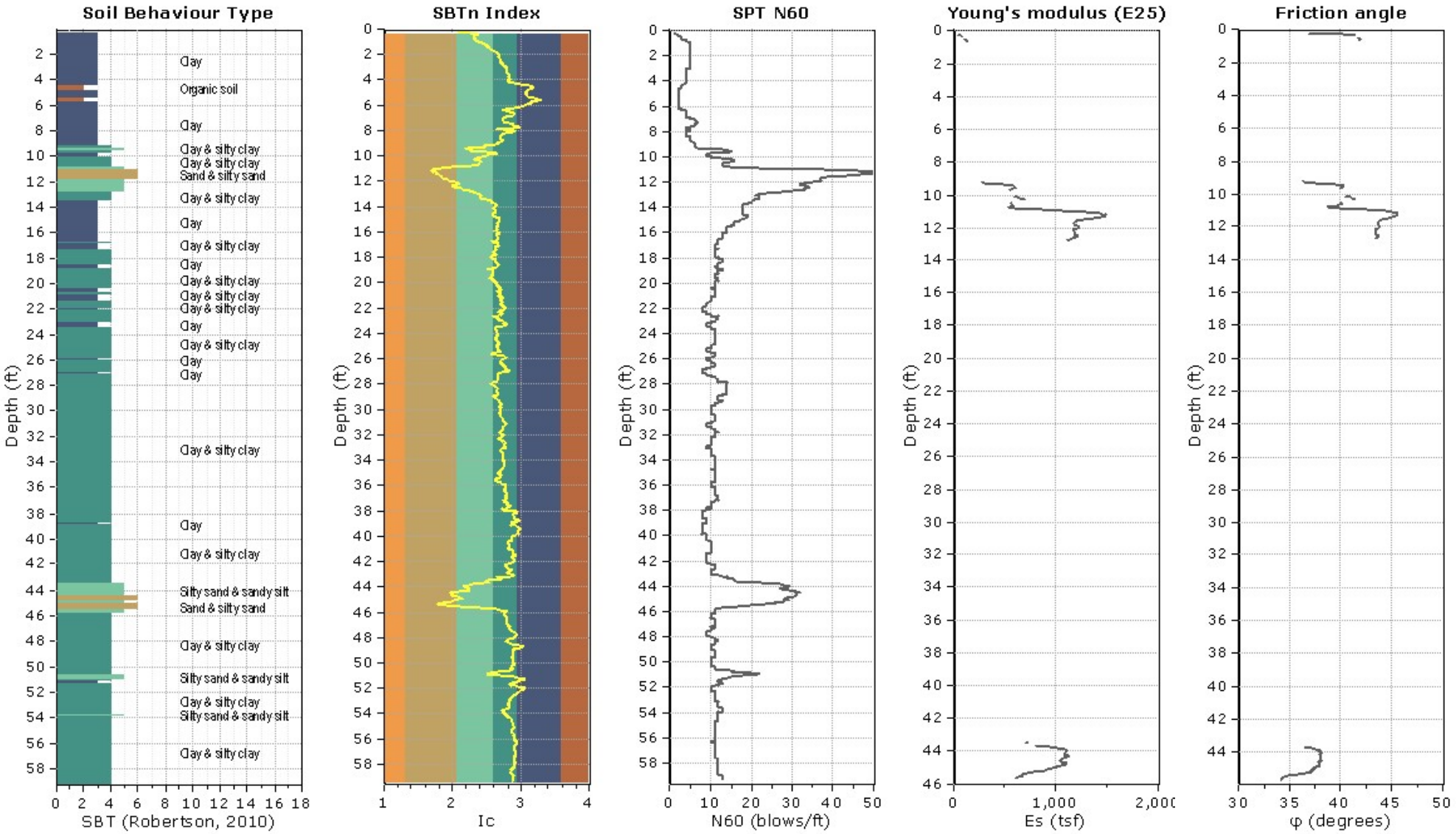
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Cone Type: CPT
Cone Operator: Fugro



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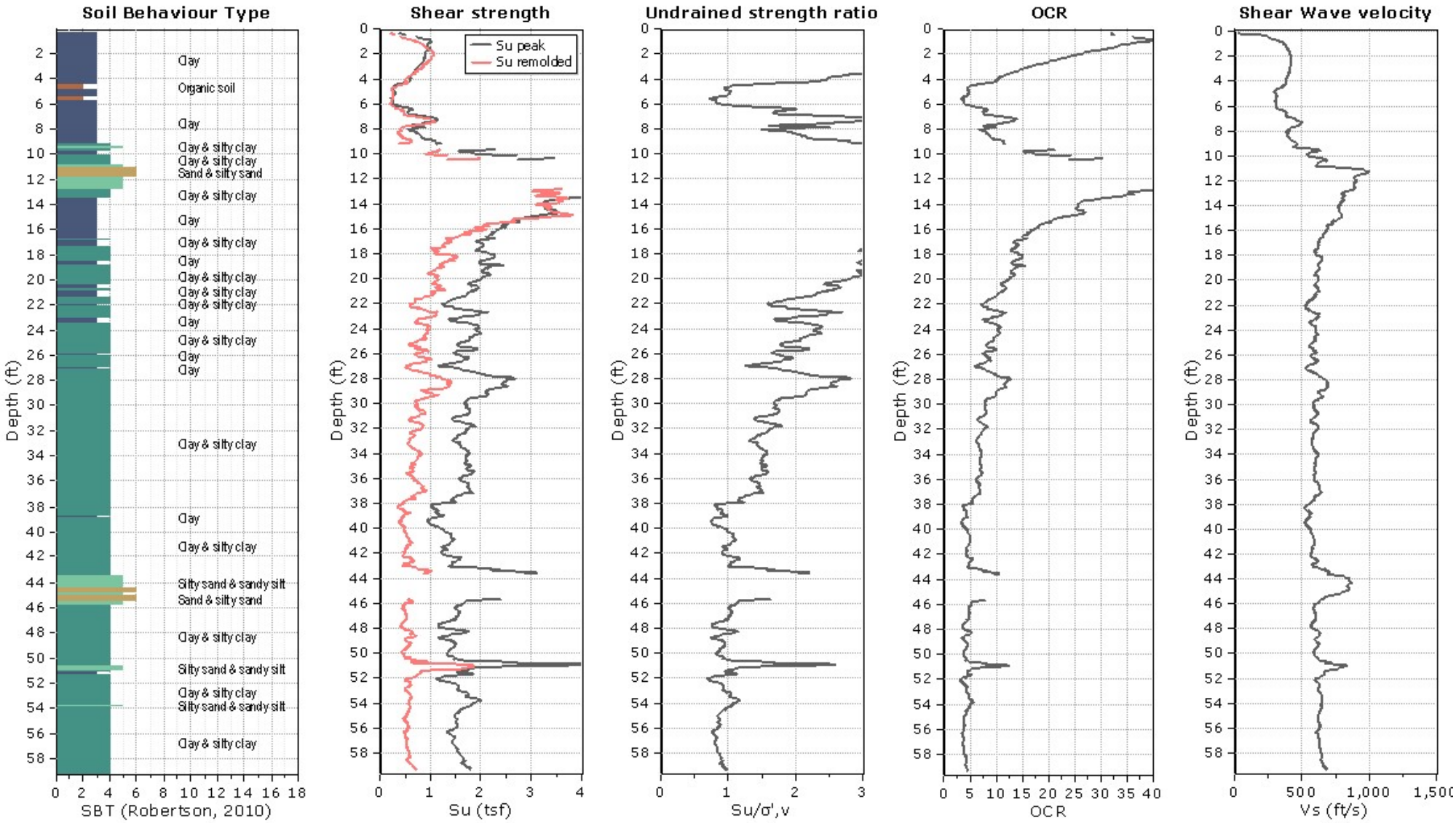
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Cone Operator: Fugro



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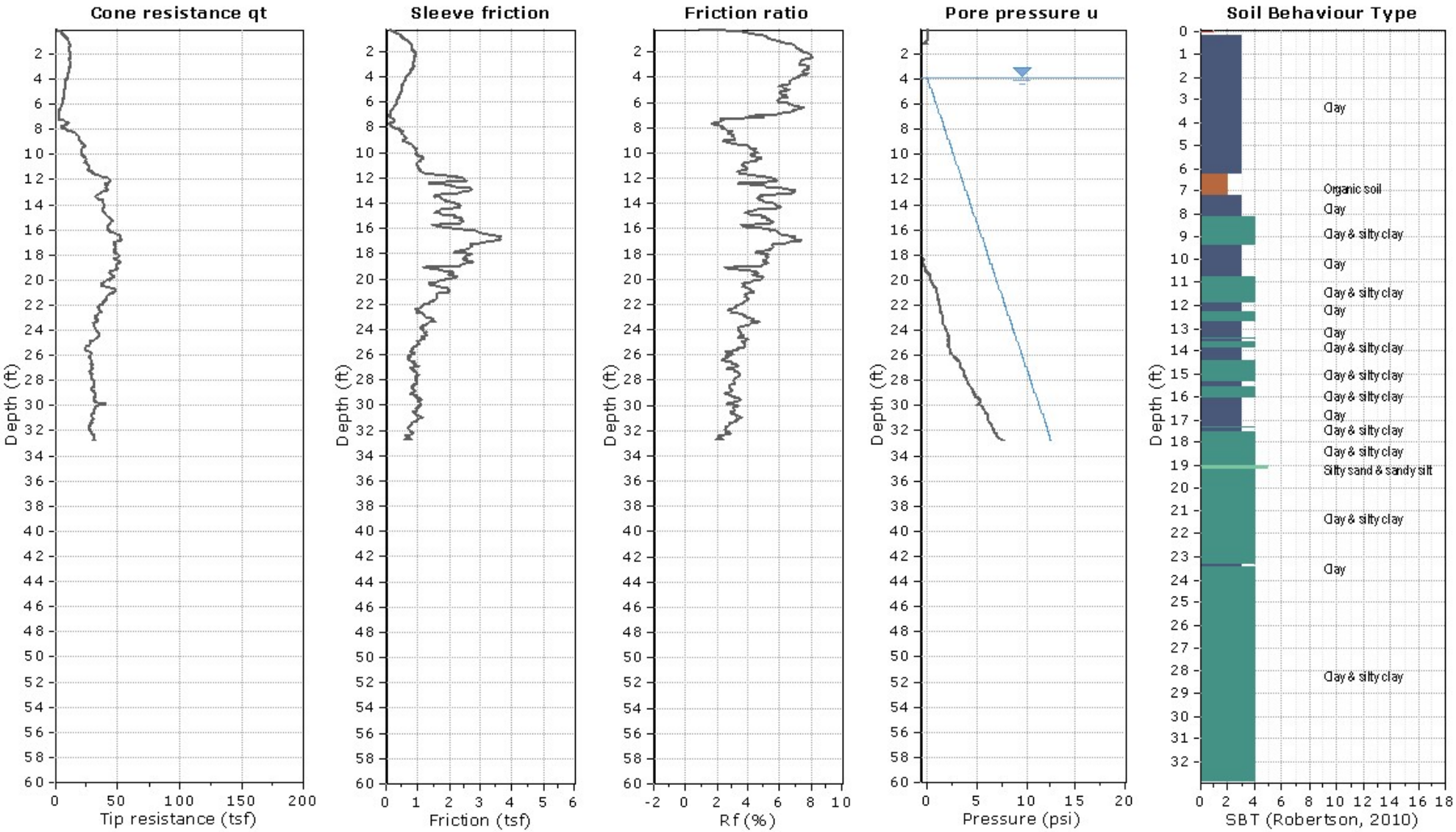
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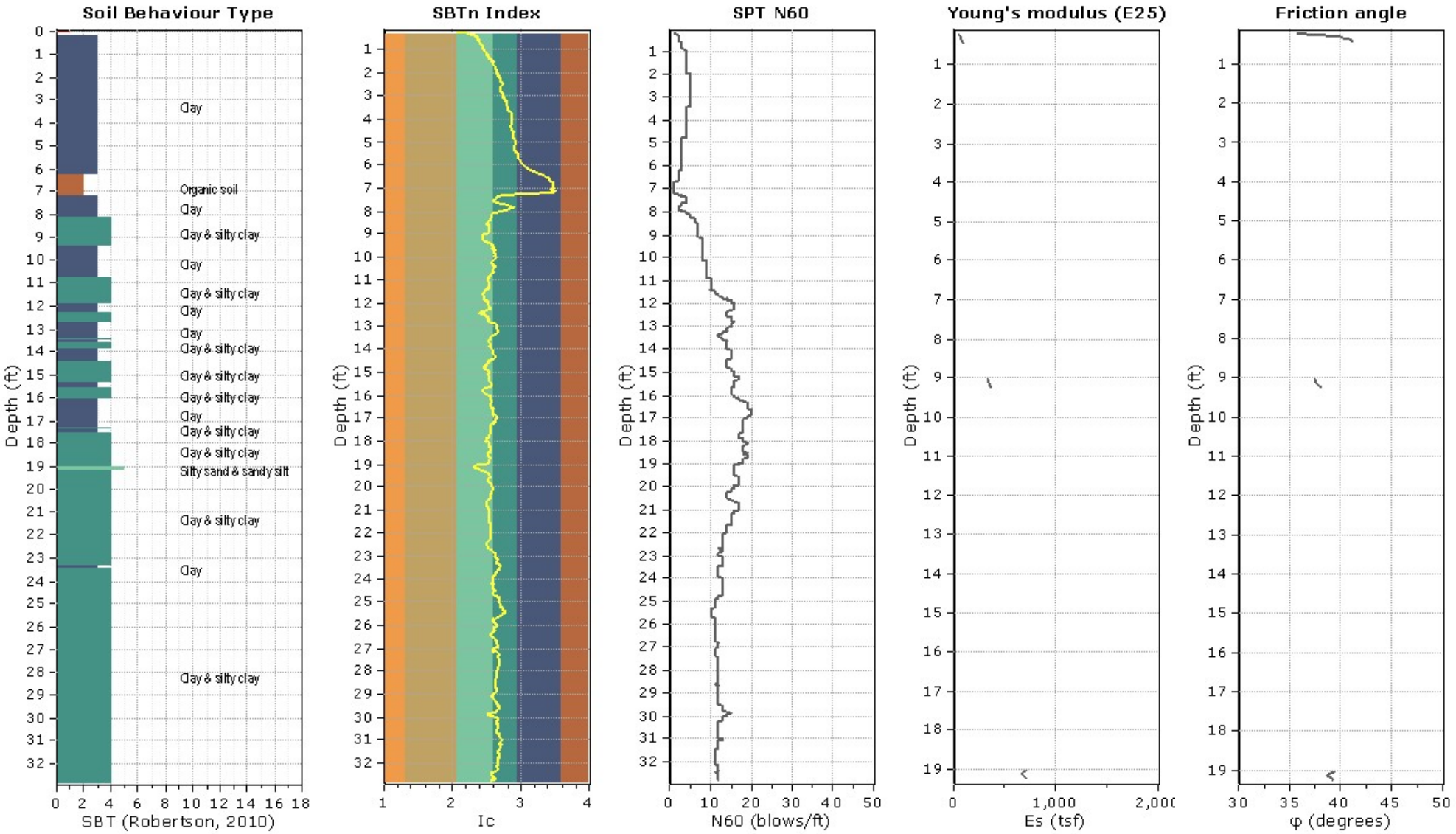
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Cone Type: CPT
Cone Operator: Fugro



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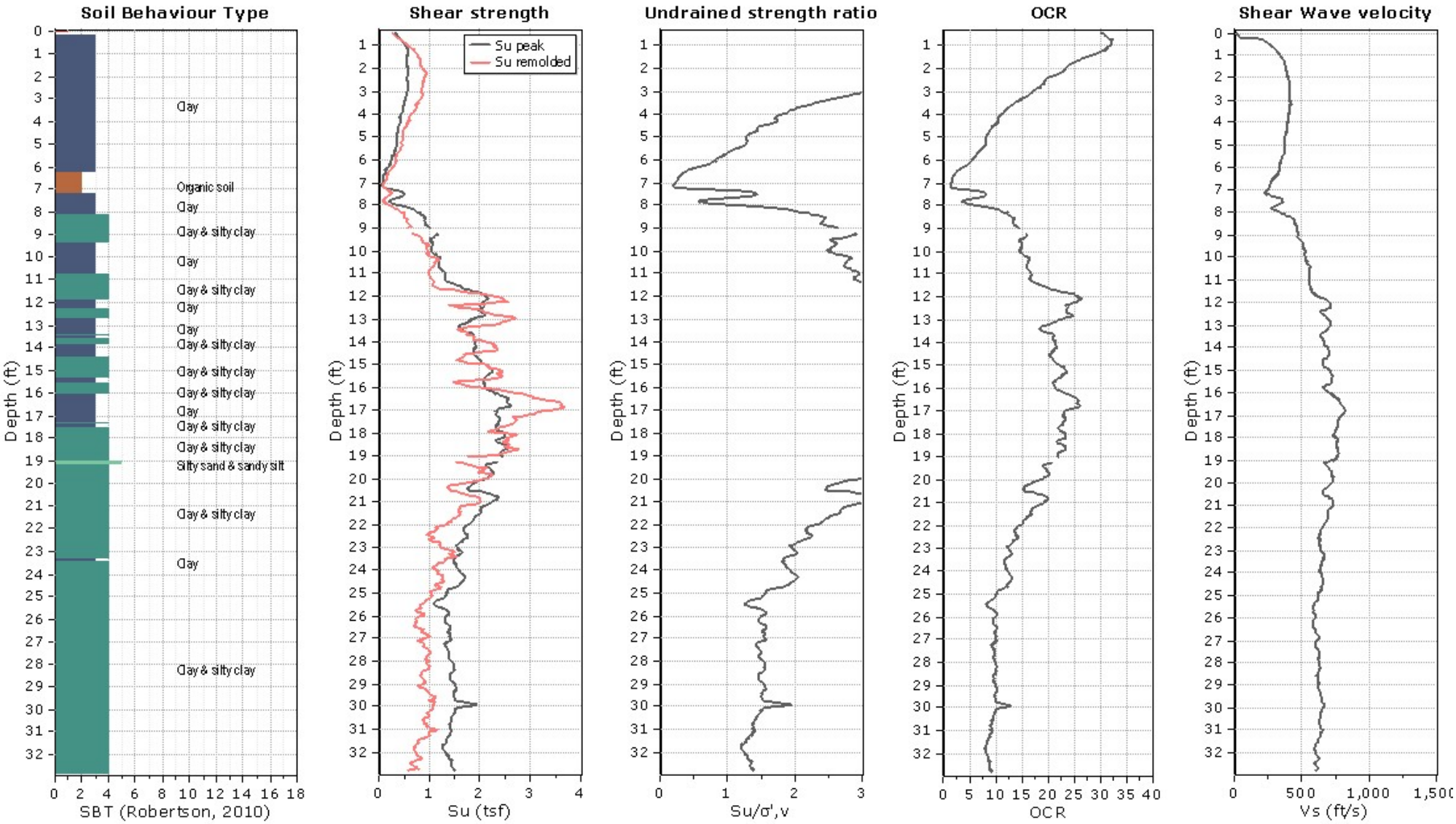
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Total depth: 32.78 ft, Date: 4/23/2025
Coords: lat 39.640777° lon -88.227044°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

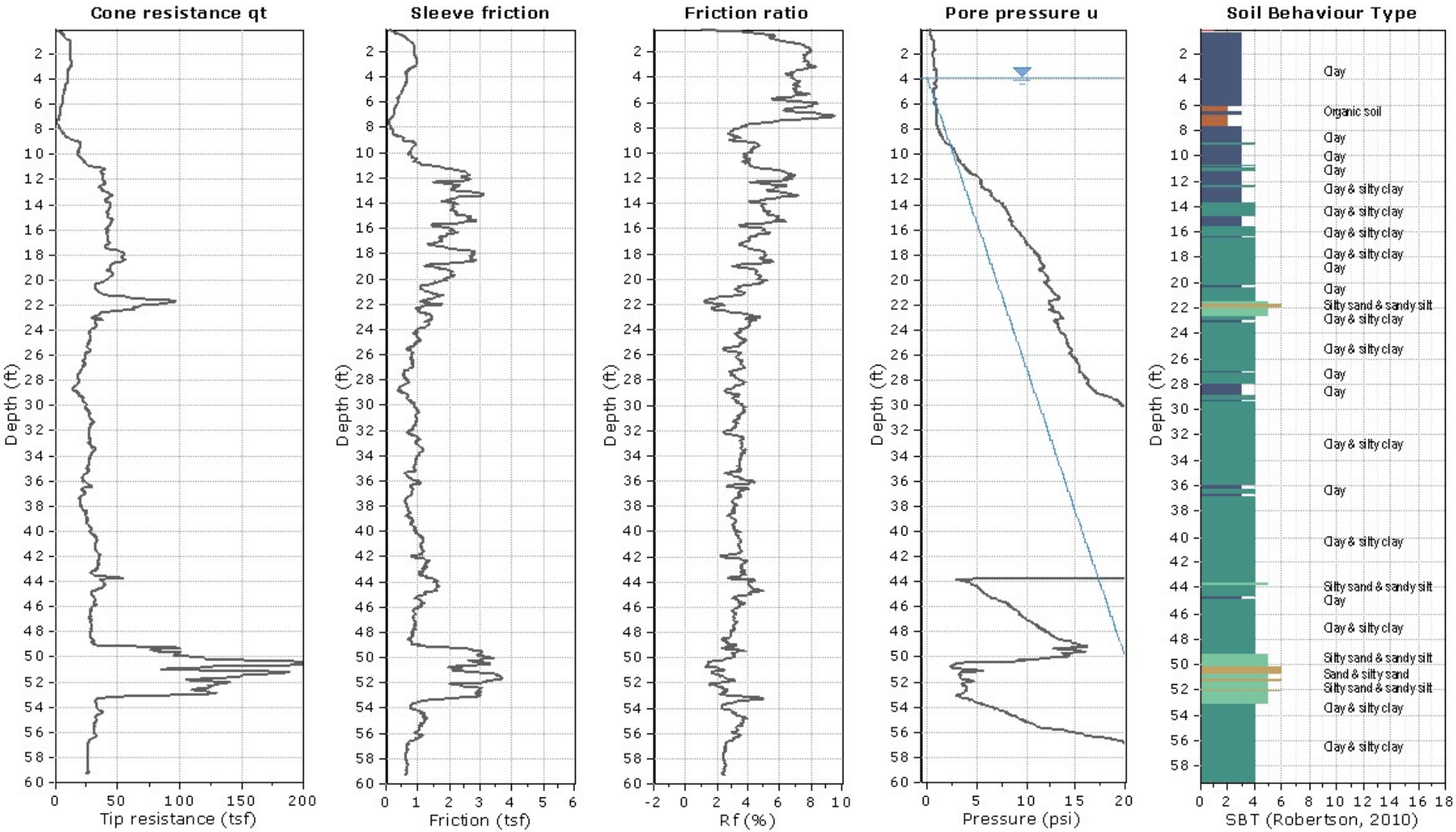
CPT: GEO-57
Total depth: 32.78 ft, Date: 4/23/2025
Coords: lat 39.640777° lon -88.227044°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

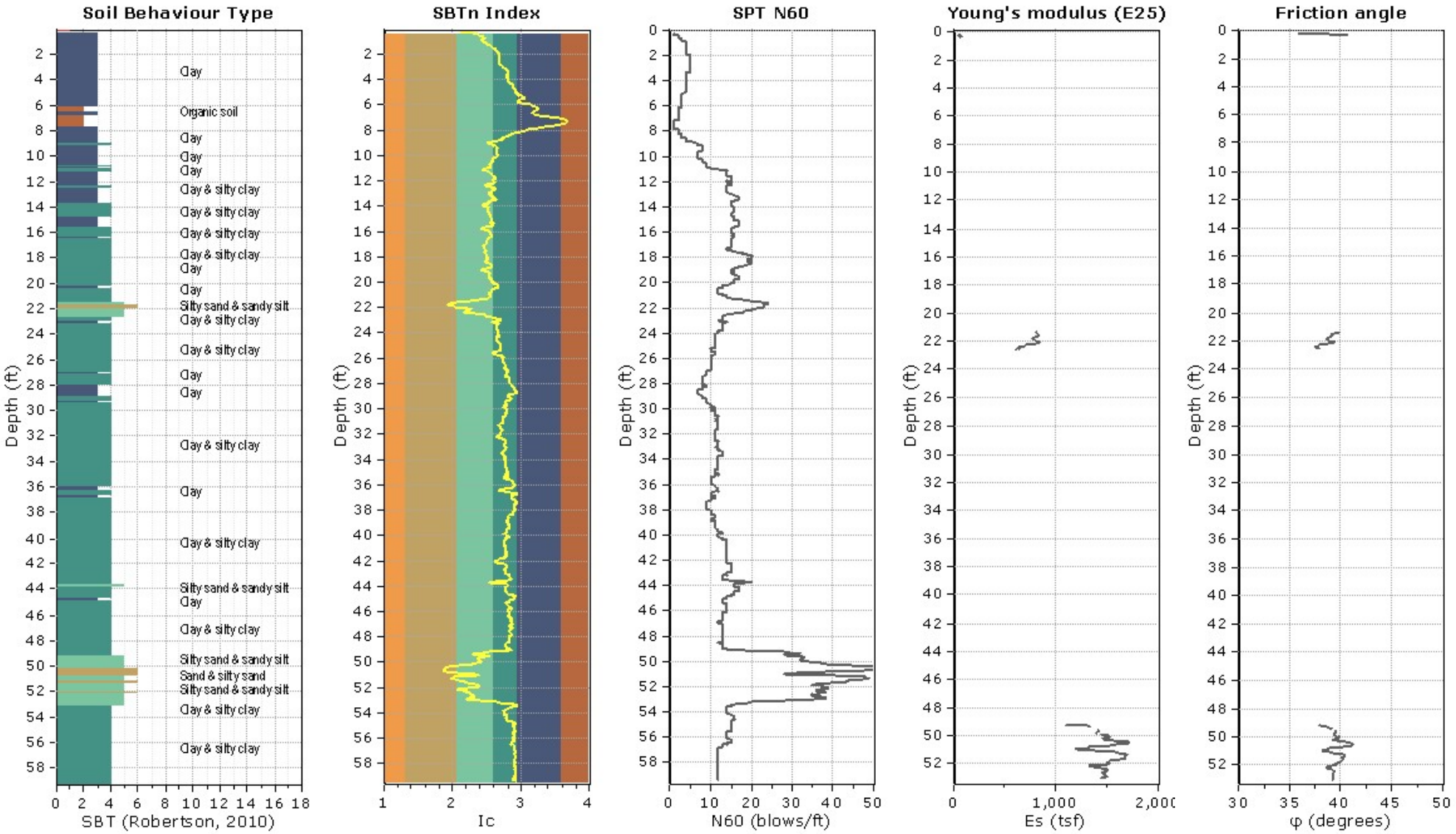
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Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

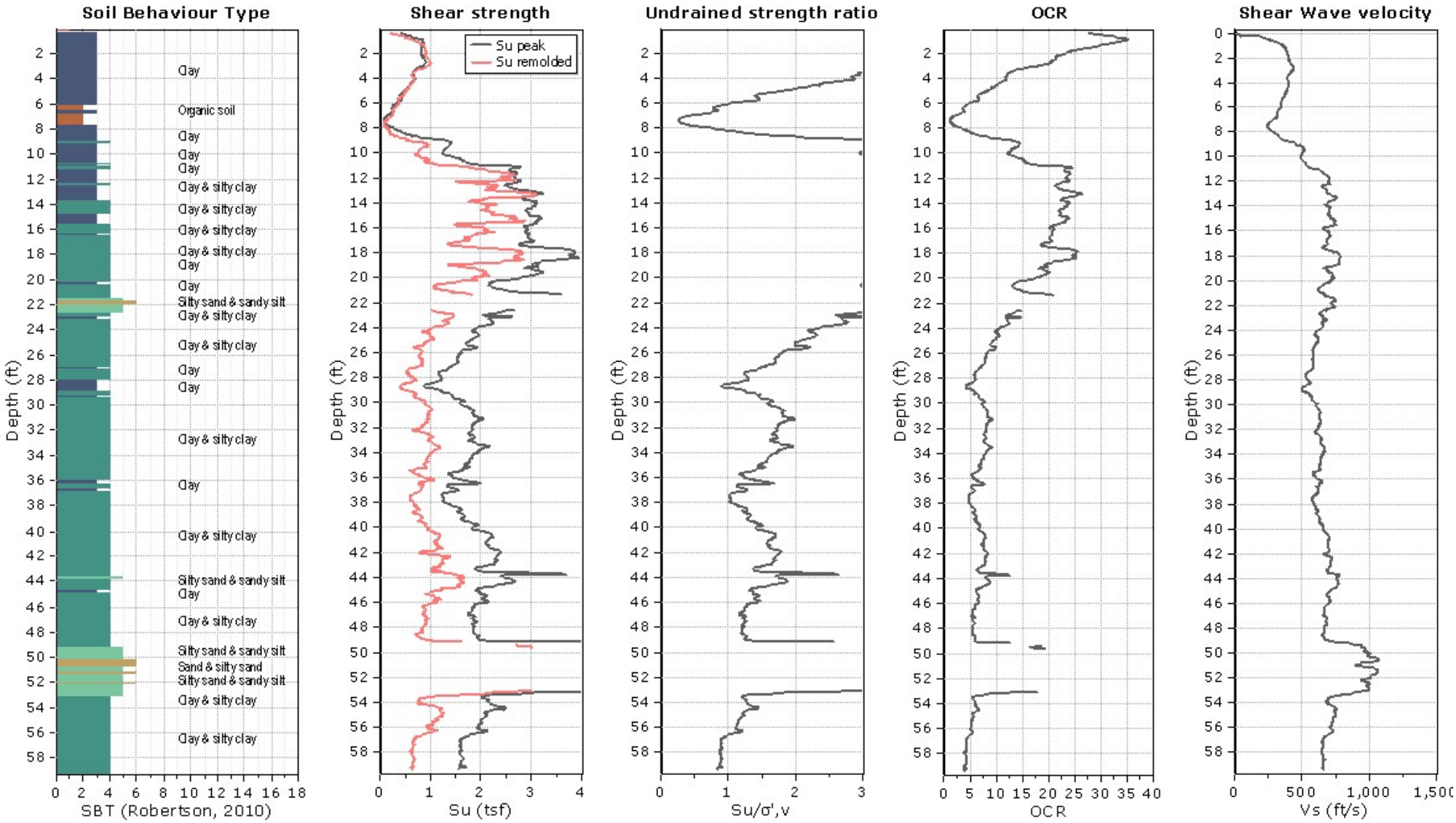
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Coords: lat 39.640777° lon -88.227044°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

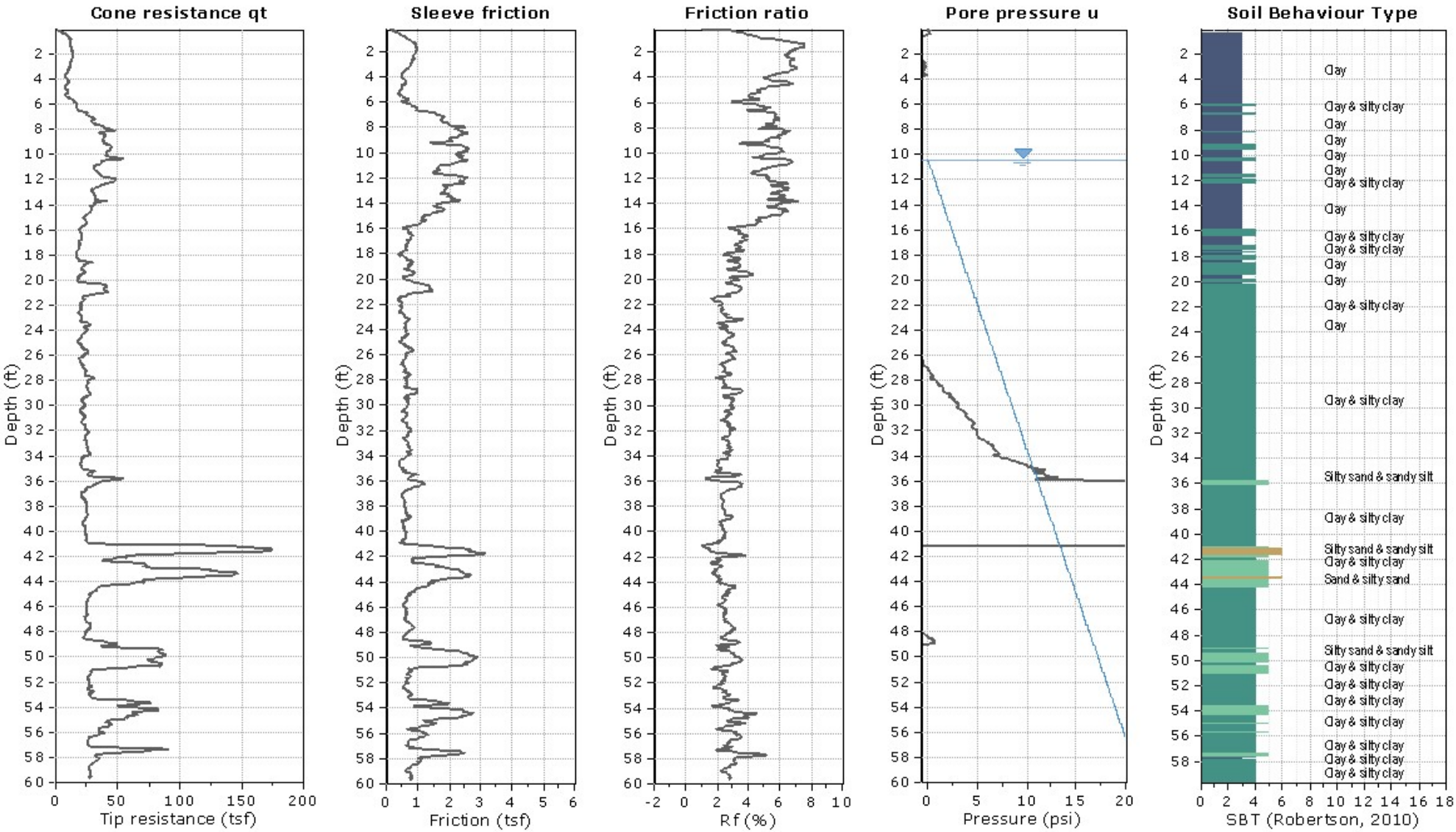
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Total depth: 59.35 ft, Date: 4/23/2025
Coords: lat 39.640777° lon -88.227044°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

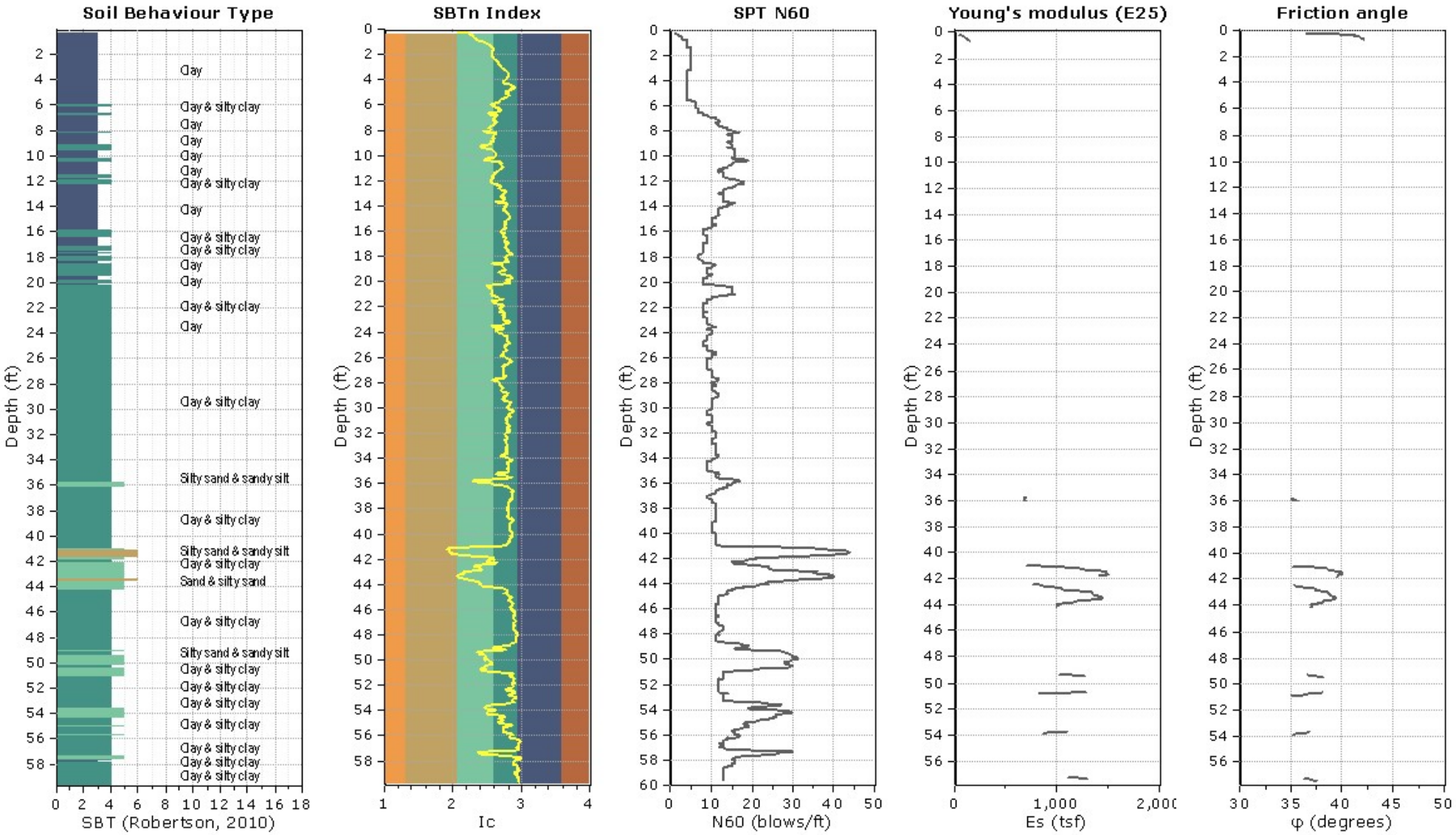
CPT: GEO-58
Total depth: 59.68 ft, Date: 4/23/2025
Coords: lat 39.641917° lon -88.217304°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

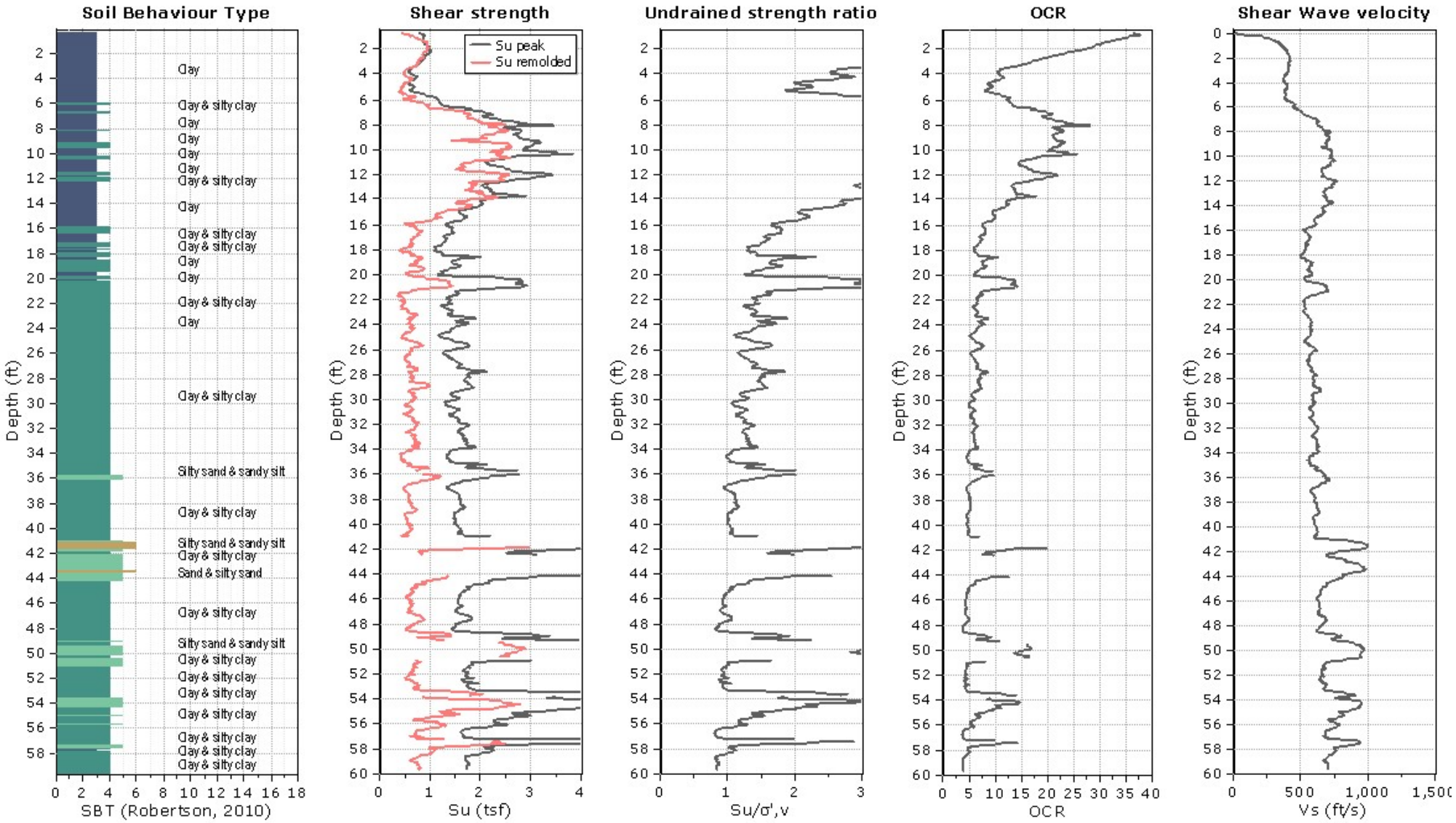
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Total depth: 59.68 ft, Date: 4/23/2025
Coords: lat 39.641917° lon -88.217304°
Cone Type: CPT
Cone Operator: Fugro



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rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

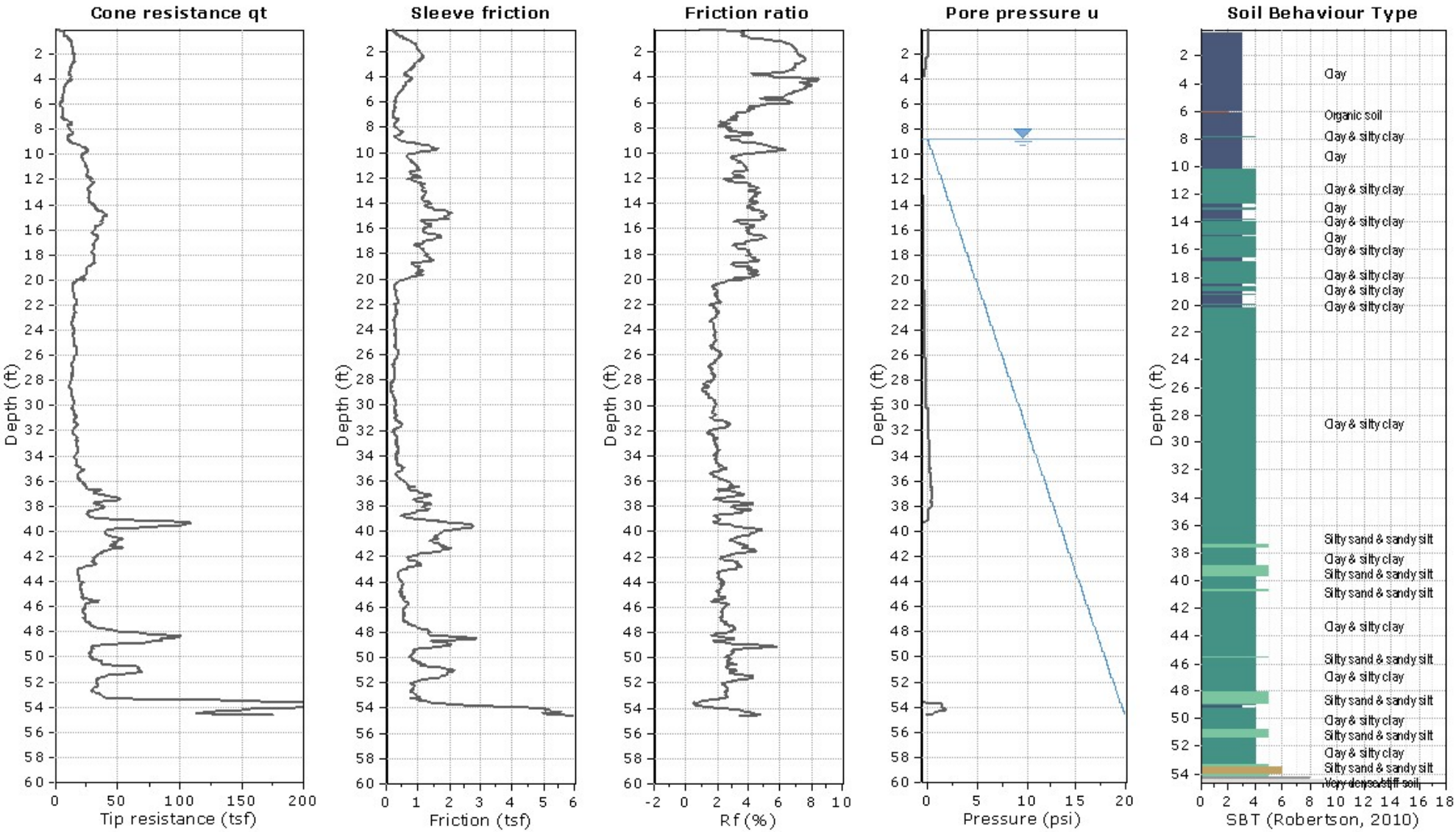
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Total depth: 59.68 ft, Date: 4/23/2025
Coords: lat 39.641917° lon -88.217304°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

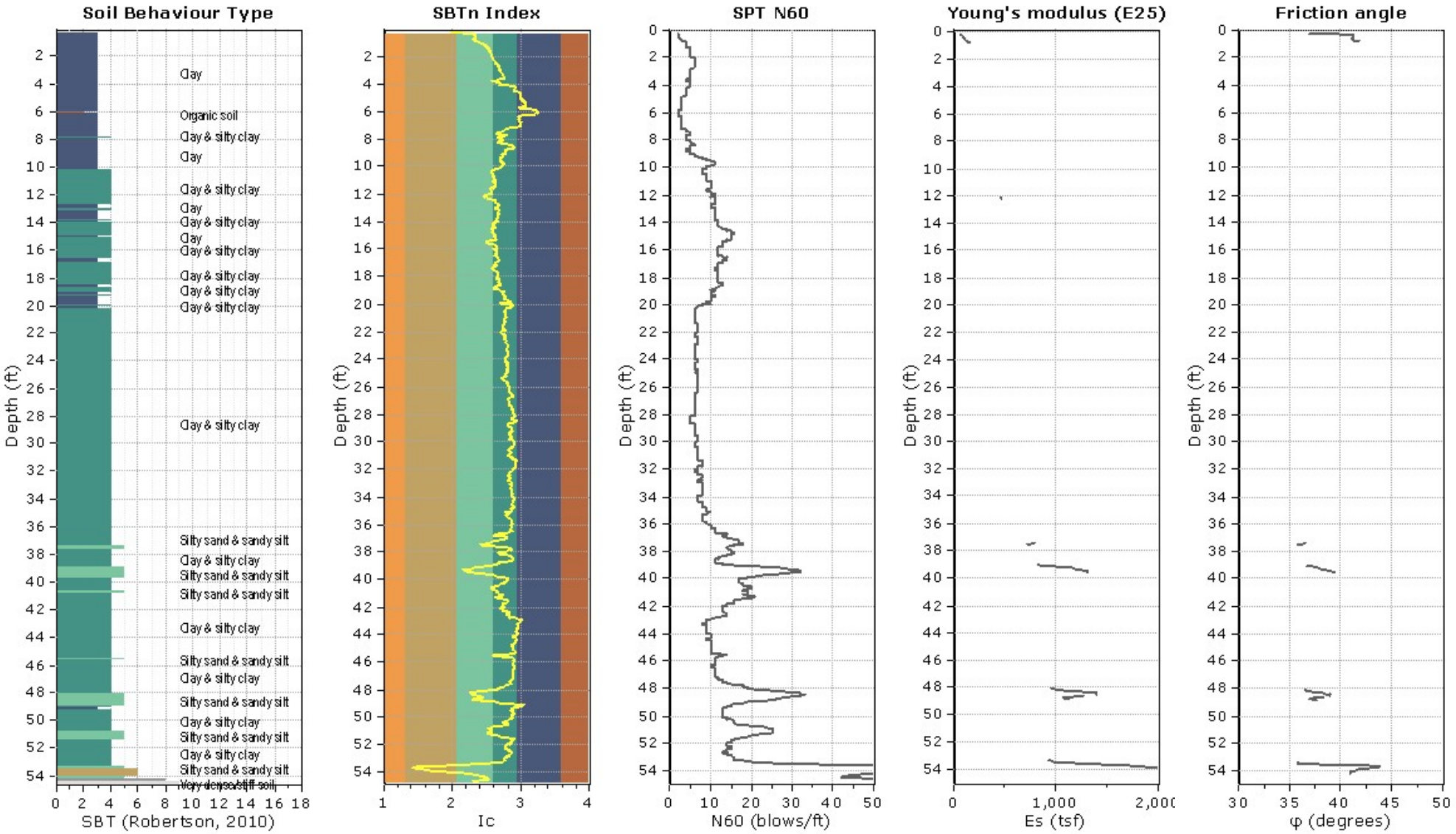
CPT: GEO-59
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Coords: lat 39.640117° lon -88.201895°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

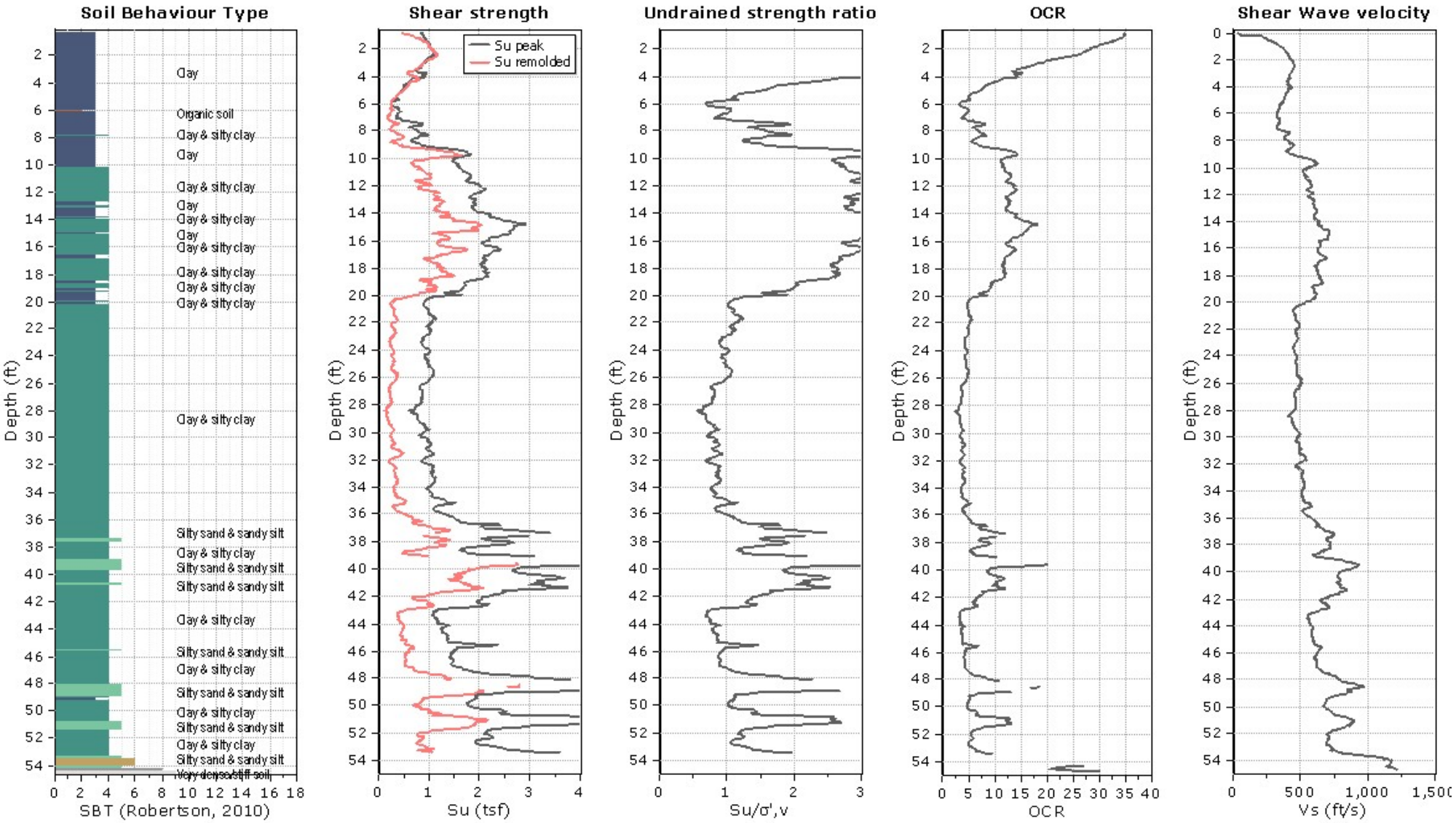
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Total depth: 54.66 ft, Date: 4/24/2025
Coords: lat 39.640117° lon -88.201895°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

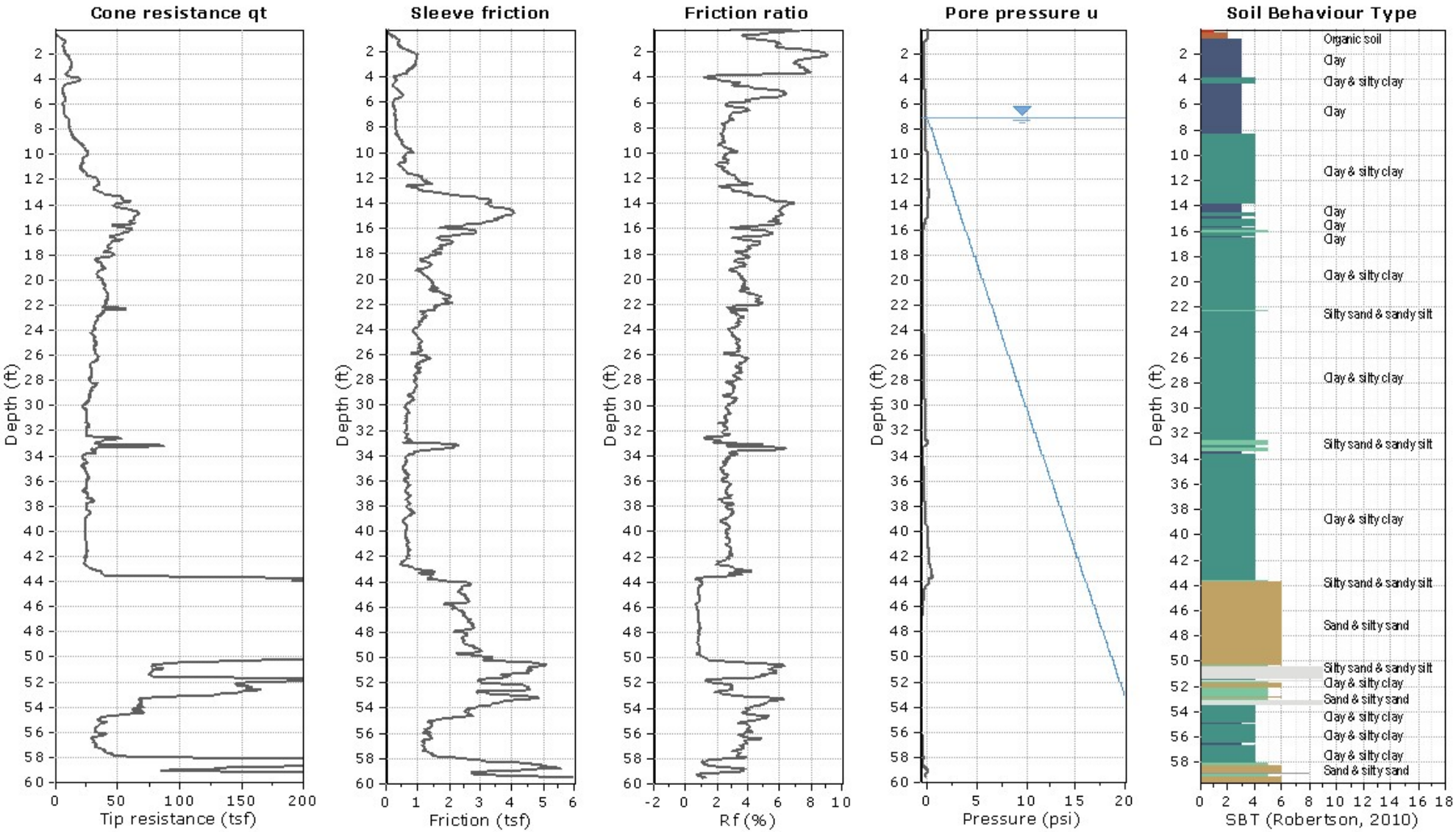
CPT: GEO-59
Total depth: 54.66 ft, Date: 4/24/2025
Coords: lat 39.640117° lon -88.201895°
Cone Type: CPT
Cone Operator: Fugro



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

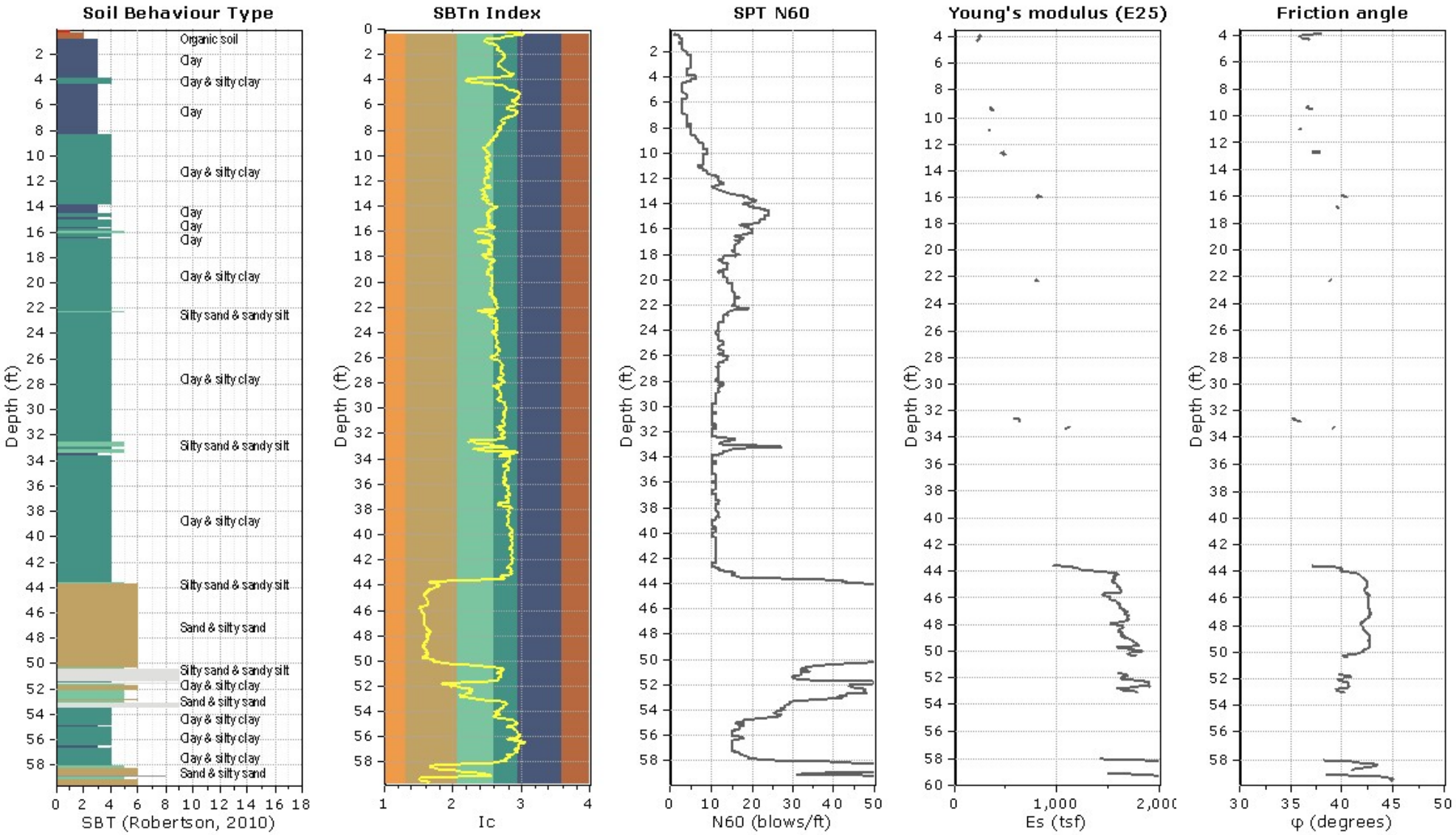
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Coords: lat 39.647183° lon -88.181358°
Cone Type: CPT
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

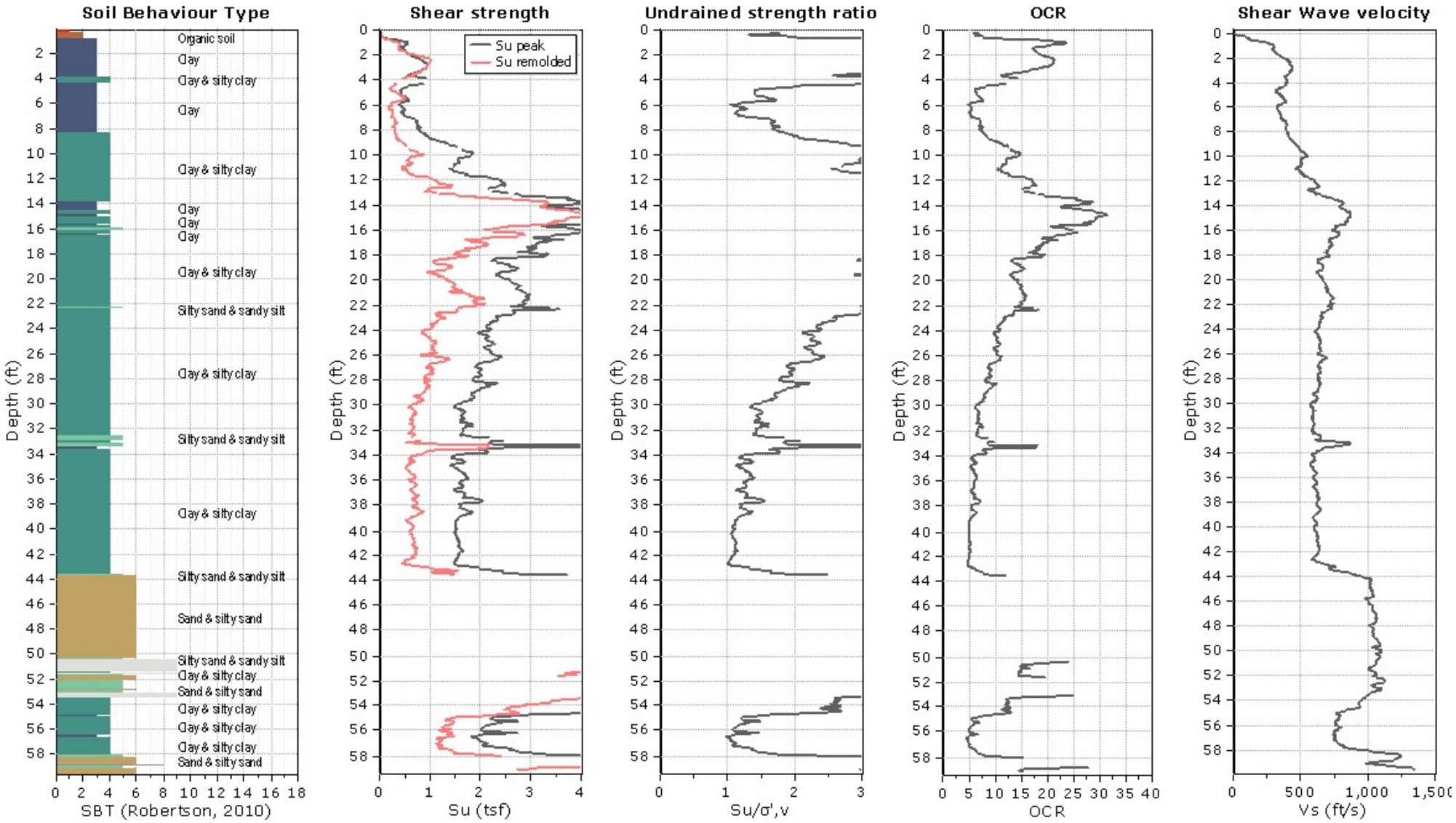
CPT: GEO-60
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Coords: lat 39.647183° lon -88.181358°
Cone Type: CPT
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
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Project: **Coles Wind**
Location: **Coles County, Illinois**

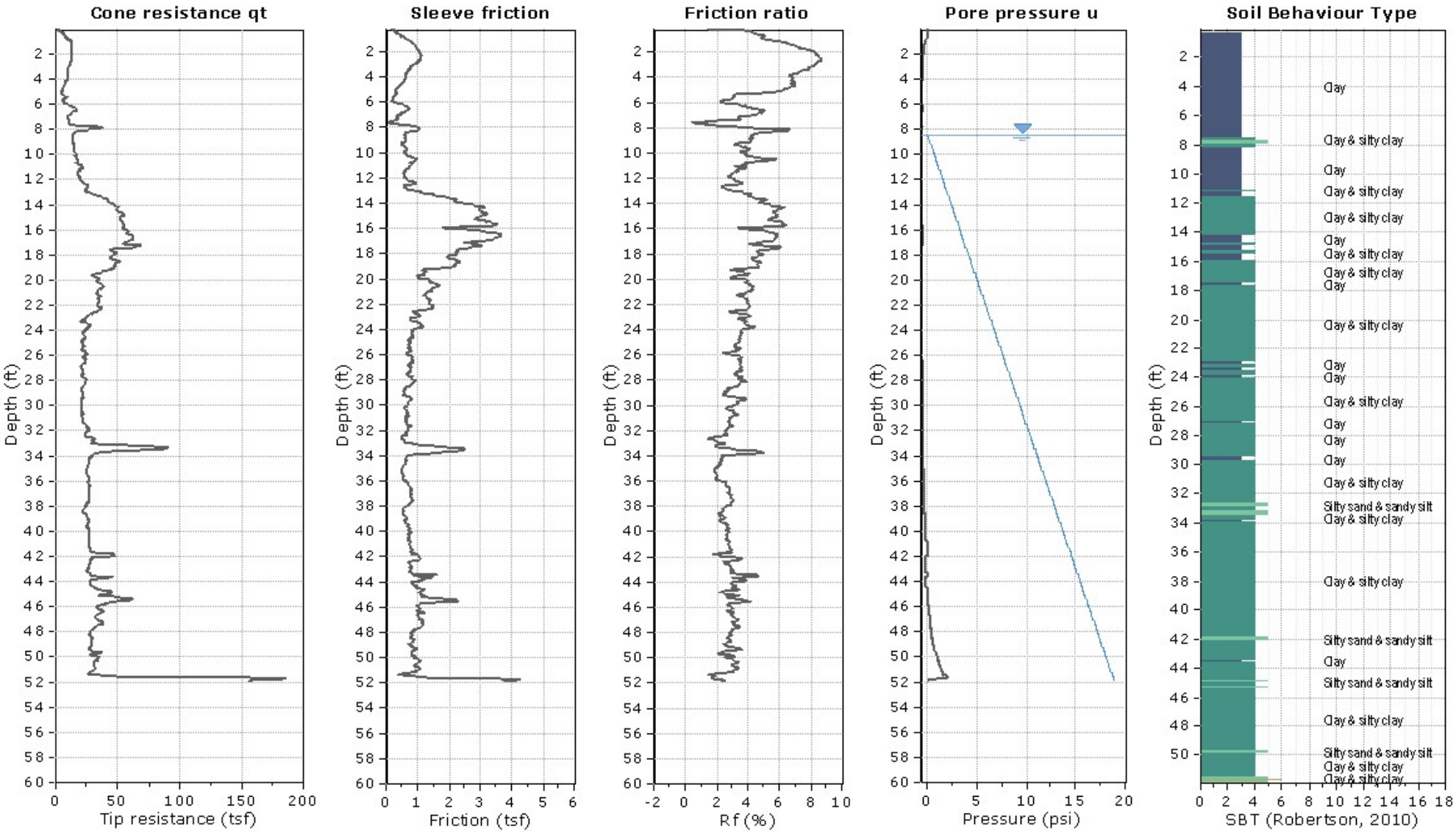
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Cone Type: CPT
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
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Project: **Coles Wind**
Location: **Coles County, Illinois**

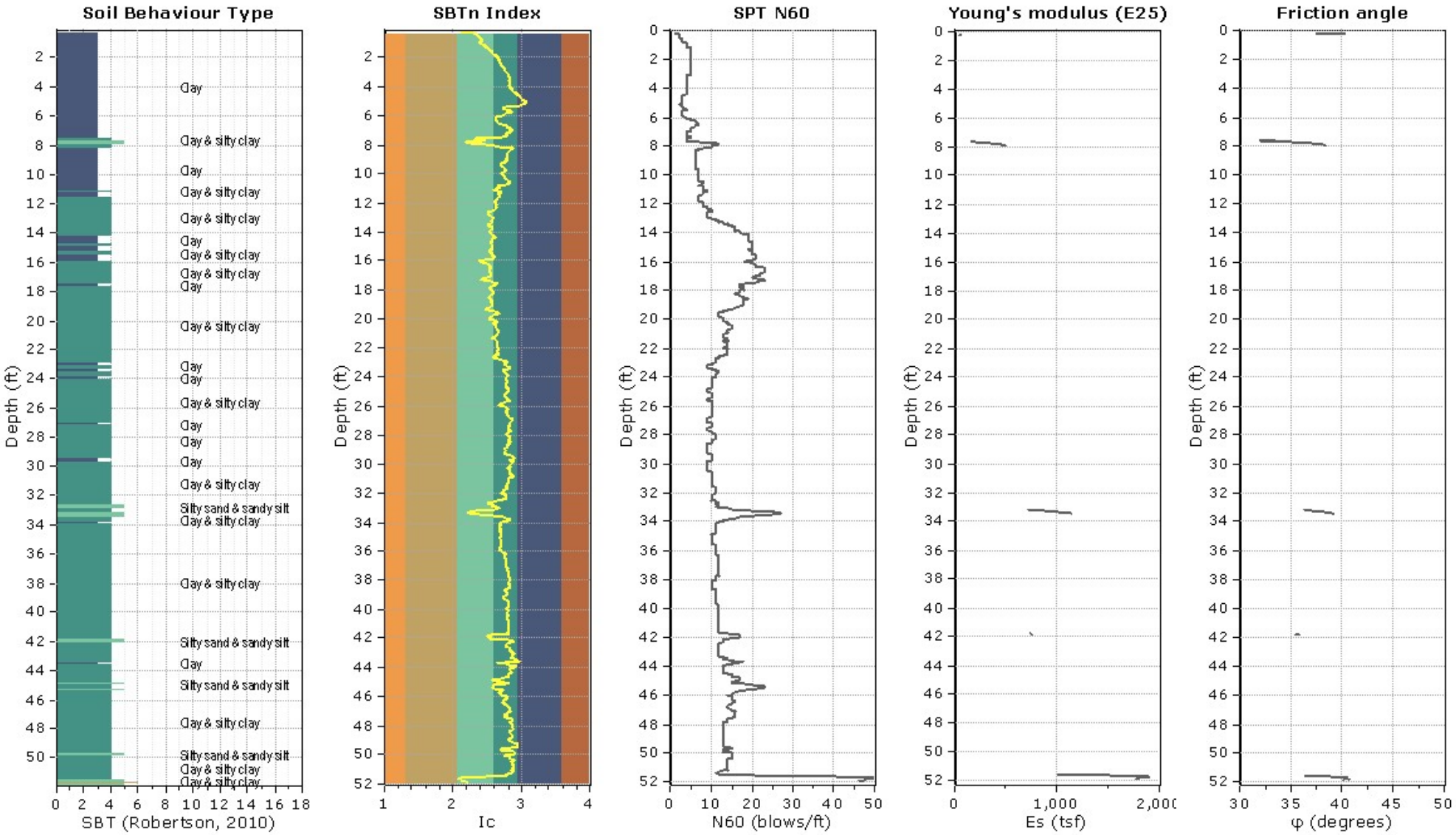
CPT: GEO-61
Total depth: 51.90 ft, Date: 4/22/2025
Coords: lat 39.646727° lon -88.202823°
Cone Type: cpt
Cone Operator: FUGRO



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810 Hesters Crossing Rd, Suite 120
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Project: **Coles Wind**
Location: **Coles County, Illinois**

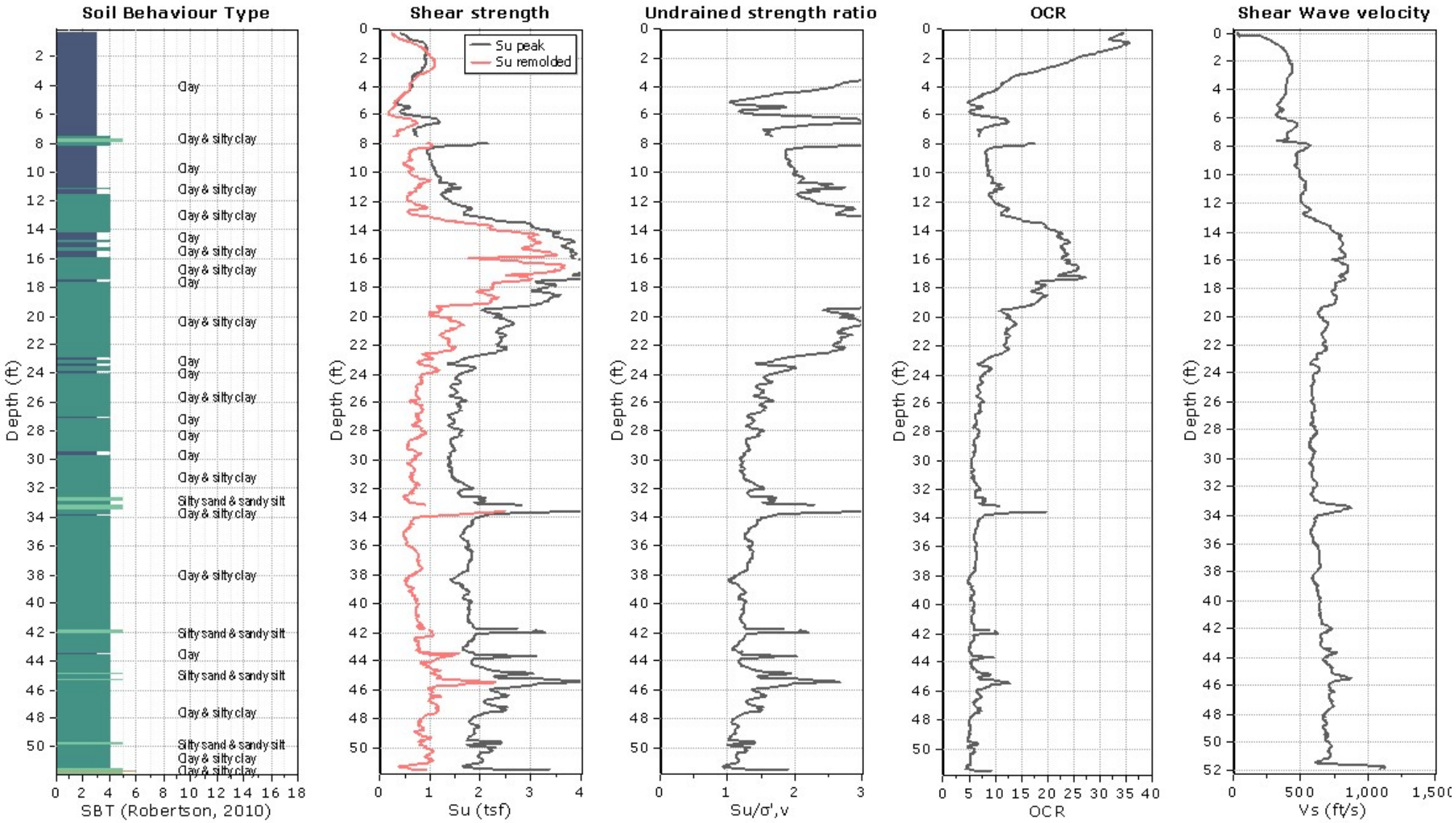
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Total depth: 51.90 ft, Date: 4/22/2025
Coords: lat 39.646727° lon -88.202823°
Cone Type: cpt
Cone Operator: FUGRO



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810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
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Project: **Coles Wind**
Location: **Coles County, Illinois**

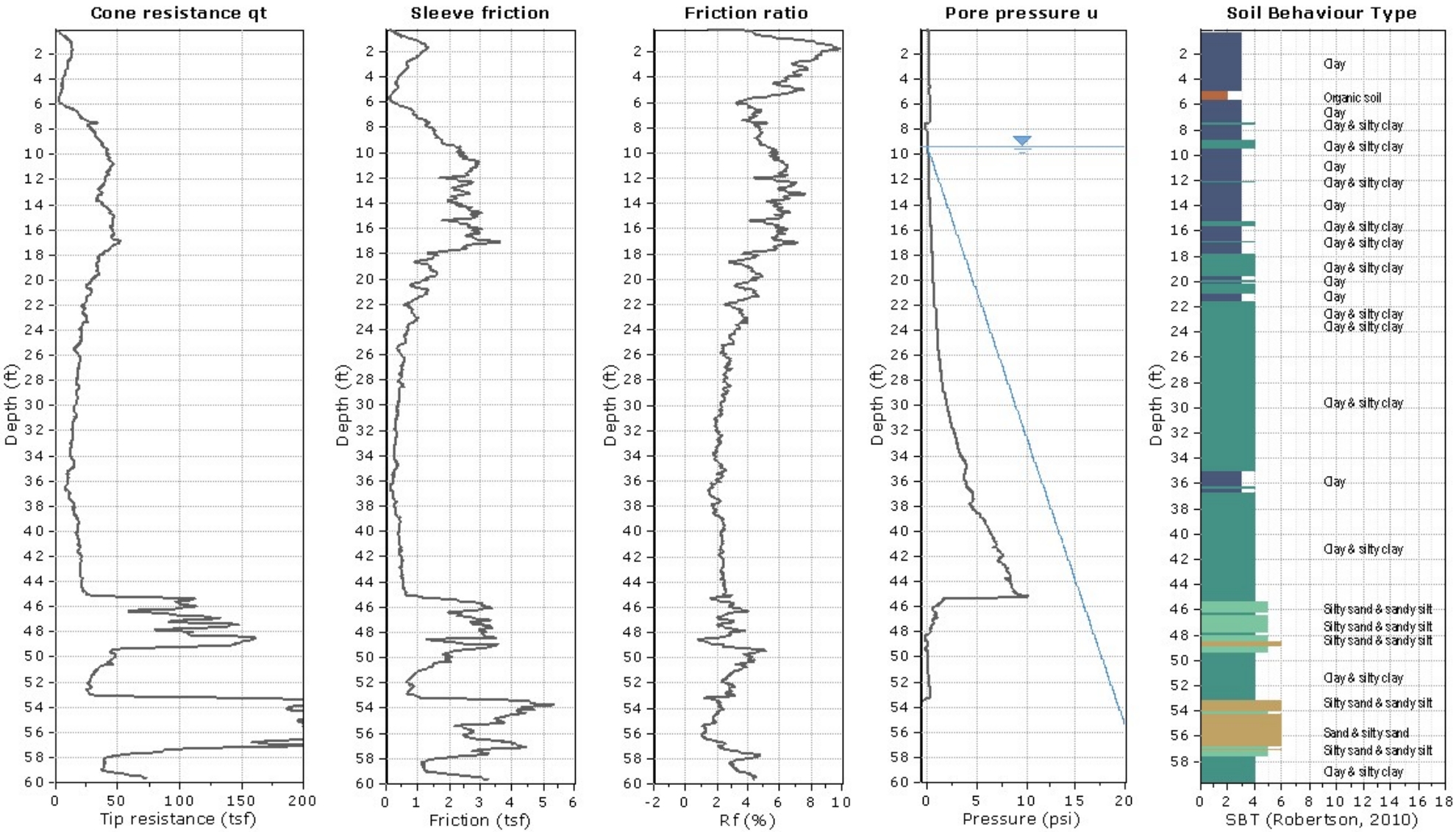
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Total depth: 51.90 ft, Date: 4/22/2025
Coords: lat 39.646727° lon -88.202823°
Cone Type: cpt
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

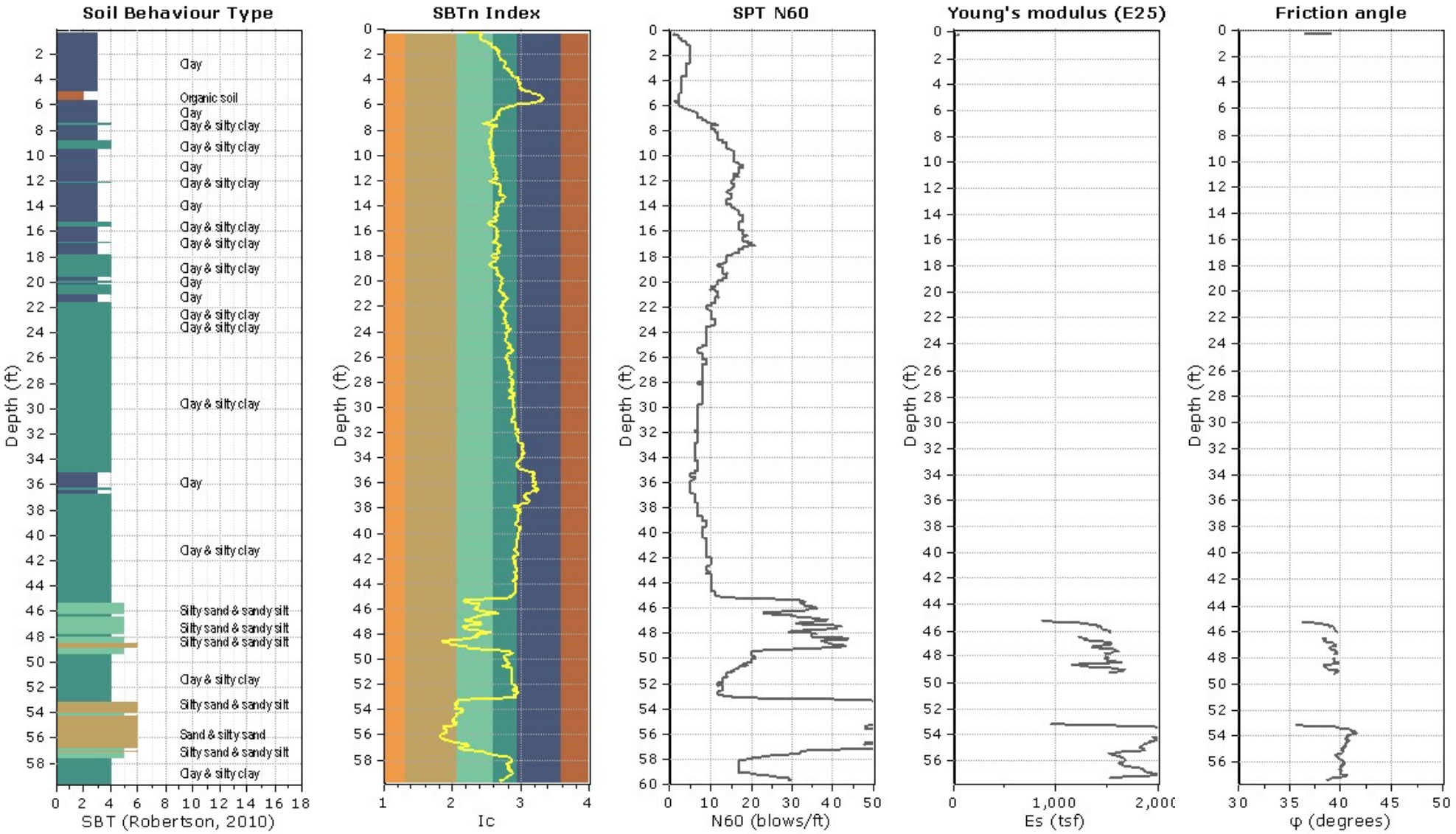
CPT: GEO-62
Total depth: 59.68 ft, Date: 4/22/2025
Coords: lat 39.649995° lon -88.188005°
Cone Type: cpt
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

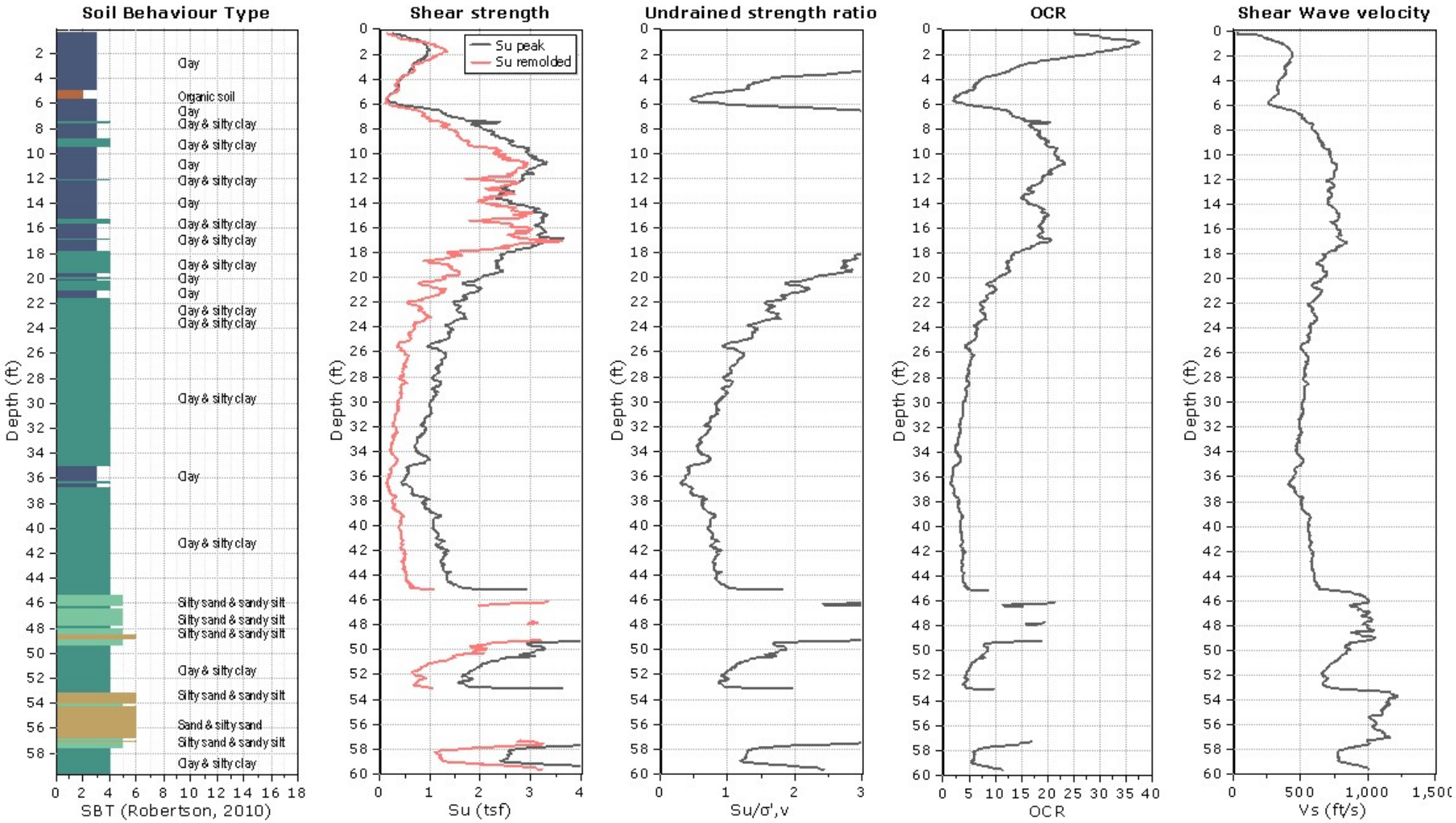
CPT: GEO-62
Total depth: 59.68 ft, Date: 4/22/2025
Coords: lat 39.649995° lon -88.188005°
Cone Type: cpt
Cone Operator: FUGRO



RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
rrccompanies.com

Project: **Coles Wind**
Location: **Coles County, Illinois**

CPT: GEO-62
Total depth: 59.68 ft, Date: 4/22/2025
Coords: lat 39.649995° lon -88.188005°
Cone Type: cpt
Cone Operator: FUGRO



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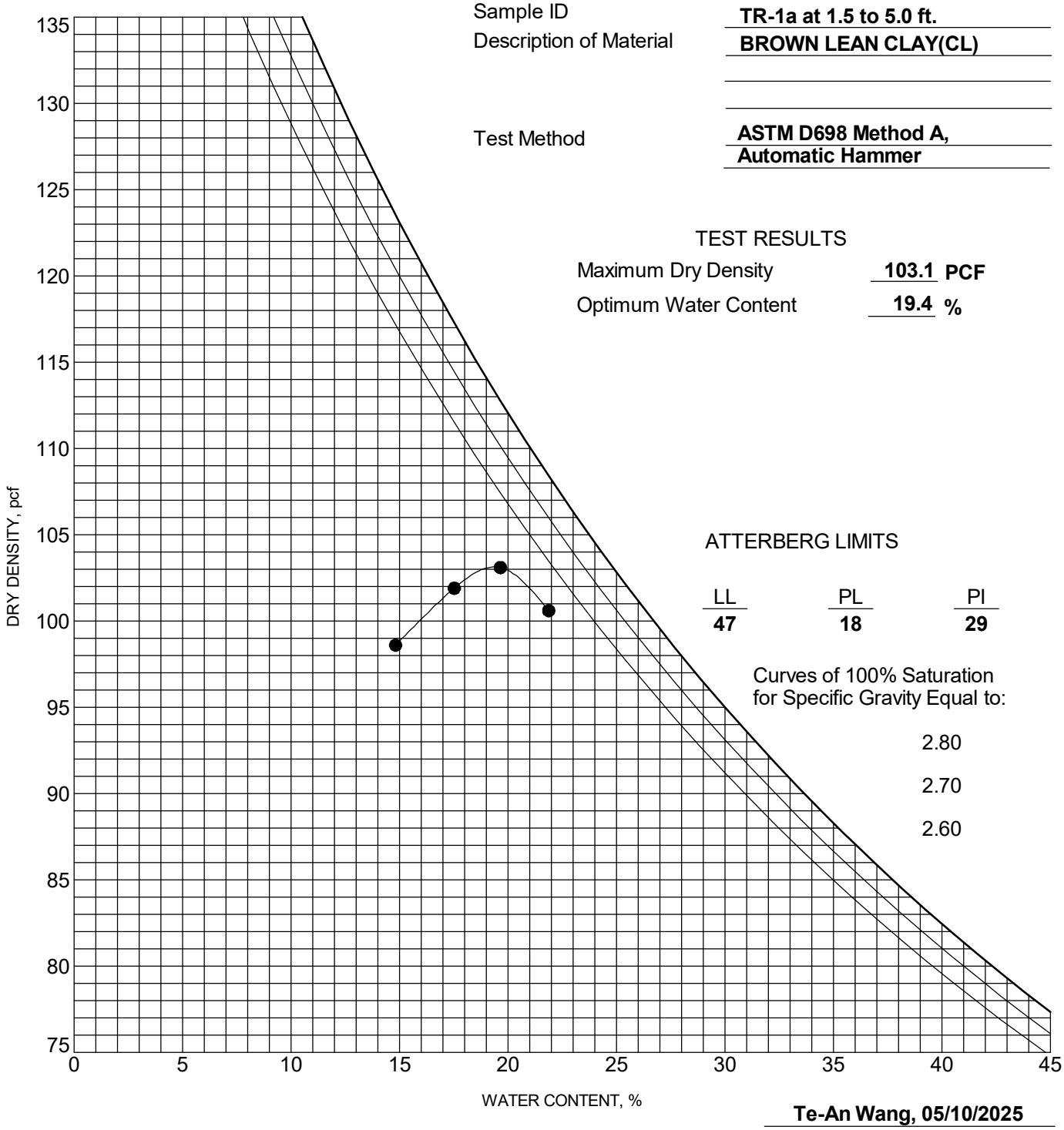
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78661
512.992.2087

APPENDIX B

MOISTURE-DENSITY RELATIONSHIP

Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
Telephone: (512) 358-6048

CLIENT: RRC Power & Energy, LLC
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017



Sample ID: **TR-1a at 1.5 to 5.0 ft.**
Description of Material: **BROWN LEAN CLAY(CL)**

Test Method: **ASTM D698 Method A, Automatic Hammer**

TEST RESULTS

Maximum Dry Density	**103.1**	**PCF**
Optimum Water Content	**19.4**	**%**

ATTERBERG LIMITS

LL	PL	PI
47	**18**	**29**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60

Te-An Wang, 05/10/2025
Analysis & Quality Review/Date

Specimens prepared by: T.W.

The results shown on this report are for the exclusive use of the client for whom they were obtained and apply only to the sample tested and / or inspected. They are not intended to be indicative of qualities of apparently identical products. The use of our name must recieve prior written approval. Reports must be reproduced in their entirety. Unauthorized use or copying of this document is strictly prohibited by anyone other than the client for the specific project.

MOISTURE-DENSITY RELATIONSHIP

Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
Telephone: (512) 358-6048

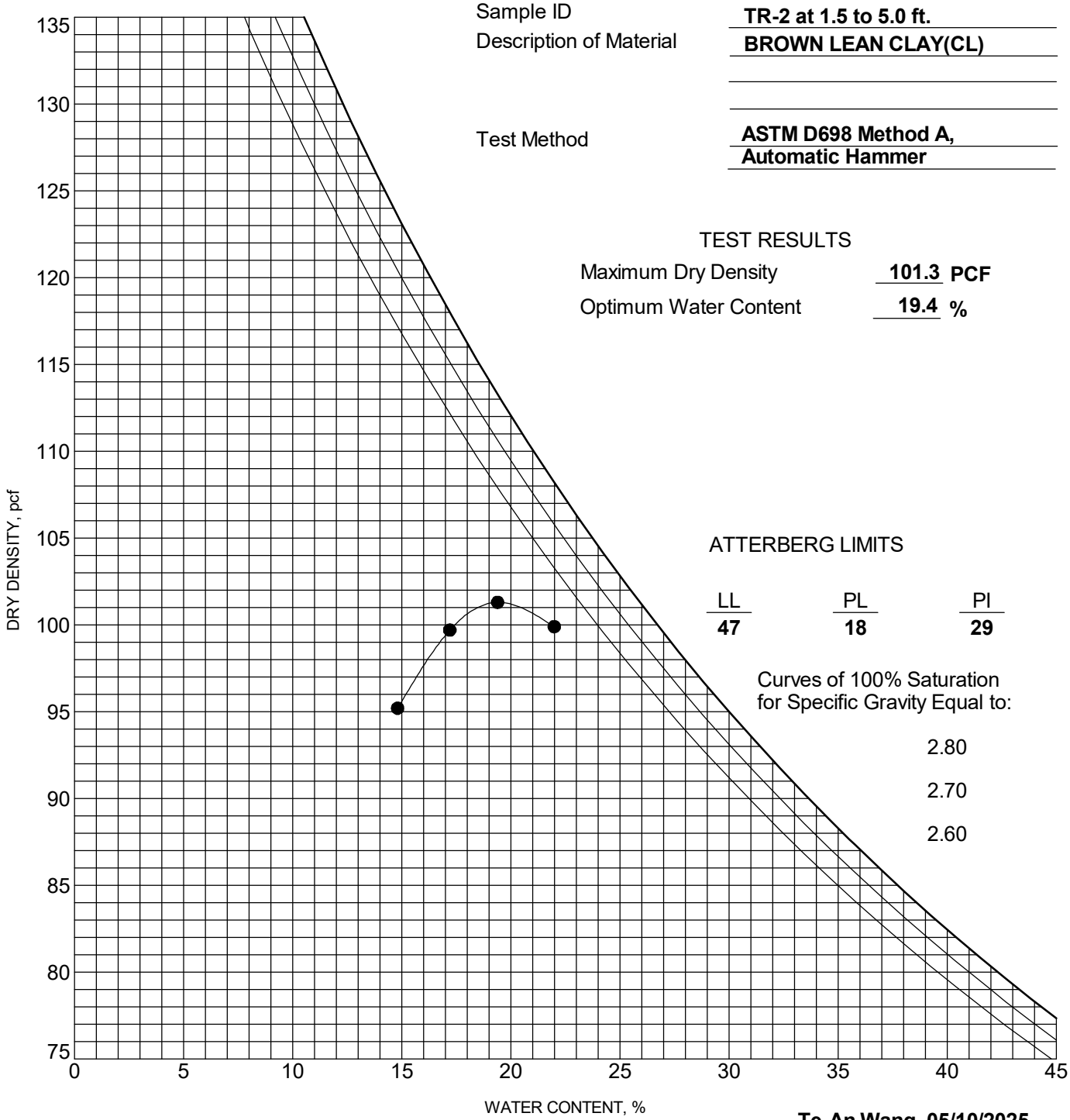
CLIENT: RRC Power & Energy, LLC
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017

Sample ID: **TR-2 at 1.5 to 5.0 ft.**
Description of Material: **BROWN LEAN CLAY(CL)**

Test Method: **ASTM D698 Method A, Automatic Hammer**

TEST RESULTS

Maximum Dry Density	**101.3**	**PCF**
Optimum Water Content	**19.4**	**%**



ATTERBERG LIMITS

LL	PL	PI
47	**18**	**29**

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60

Te-An Wang, 05/10/2025
Analysis & Quality Review/Date

Specimens prepared by: T.W.

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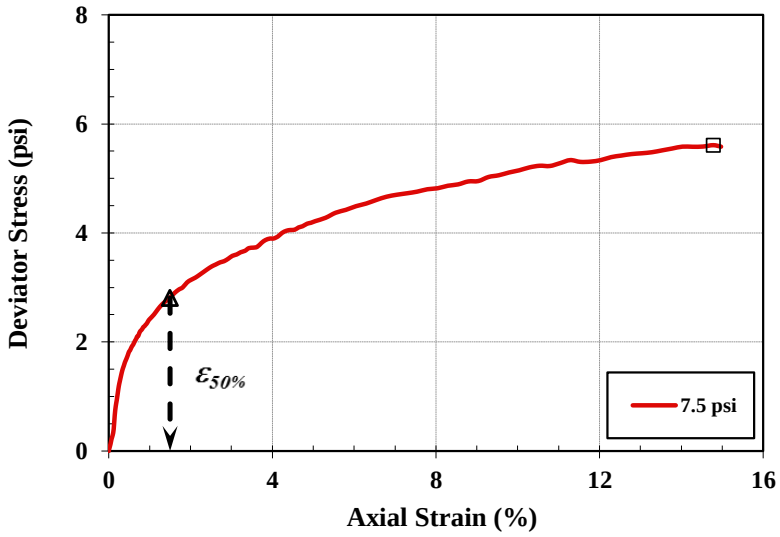
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: GEO-02 at 9 ft

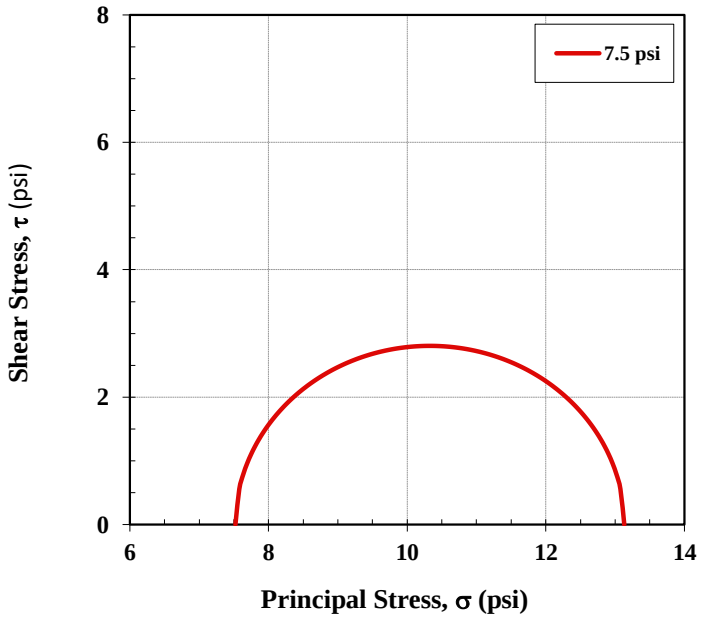
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/21/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		7.5
Avg. Diameter (in)	D_o	2.88
Avg. Height (in)	H_o	5.41
In-situ Water Content (%)	w_o	16.1
Total Unit Weight (pcf)	γ_{total}	133.0
Dry Unit Weight (pcf)	γ_{dry}	114.5
Saturation (%)	S_r	92.4
Void Ratio	e_o	0.47
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	5.6
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	1.5
Total Stresses at Failure	
Major Principal Stress Corrected, σ_{1C} (psi)	13.1
Minor Principal Stress, σ_3 (psi)	7.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	0.40

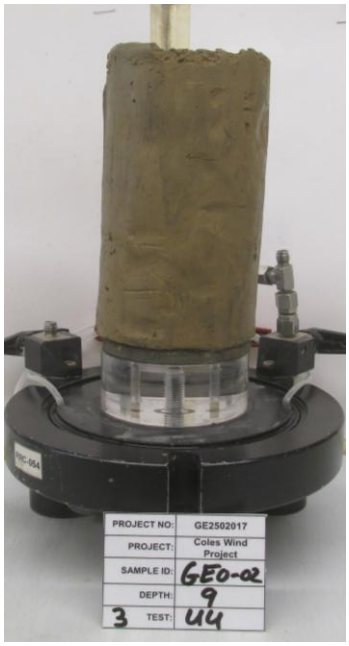
Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/22/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client:	RRC Power & Energy, LLC	Project No.:	GE2502017
Project:	Coles Wind Project	Test Method:	ASTM D2850
Specimen:	GEO-02 at 9 ft	Test Date:	05/21/25





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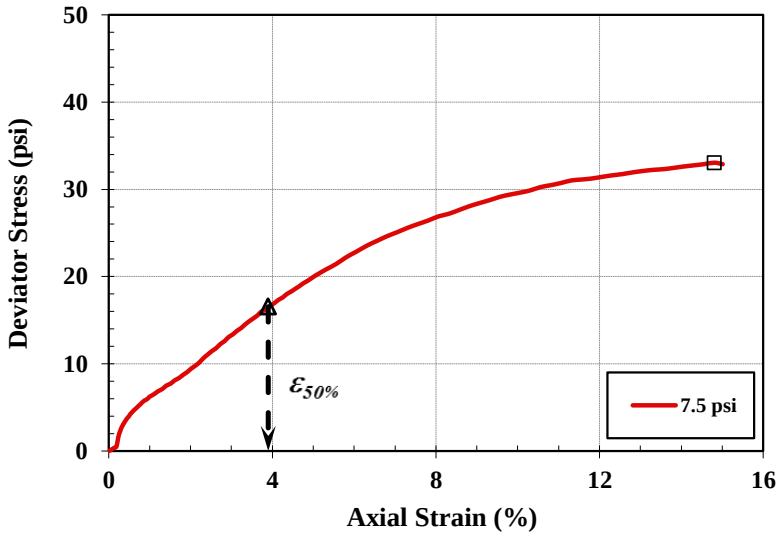
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: GEO-21 at 9 ft

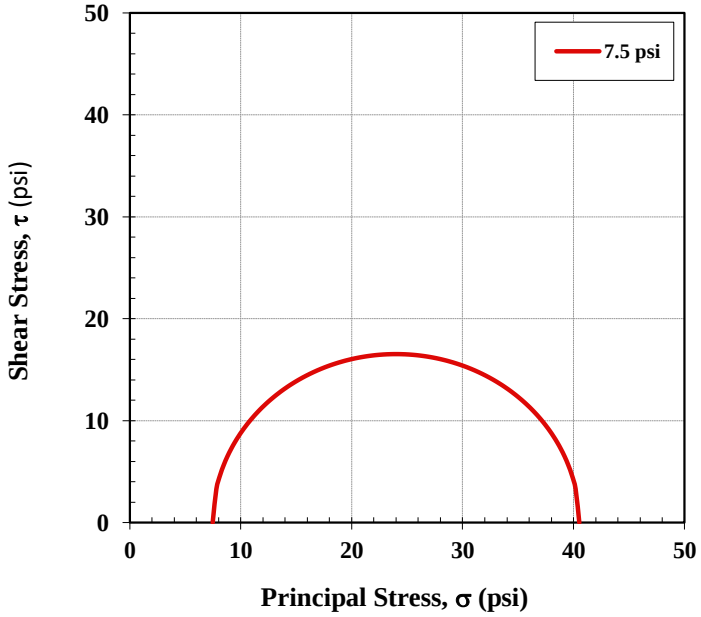
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/21/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		7.5
Avg. Diameter (in)	D_o	2.84
Avg. Height (in)	H_o	5.63
In-situ Water Content (%)	w_o	13.4
Total Unit Weight (pcf)	g_{total}	134.4
Dry Unit Weight (pcf)	g_{dry}	118.5
Saturation (%)	S_r	85.7
Void Ratio	e_o	0.42
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	33.1
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	3.9
Total Stresses at Failure	
Major Principal Stress Corrected, s_{1C} (psi)	40.5
Minor Principal Stress, s_3 (psi)	7.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	2.38

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/22/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Specimen: GEO-21 at 9 ft

Project No.: GE2502017
Test Method: ASTM D2850
Test Date: 05/21/25





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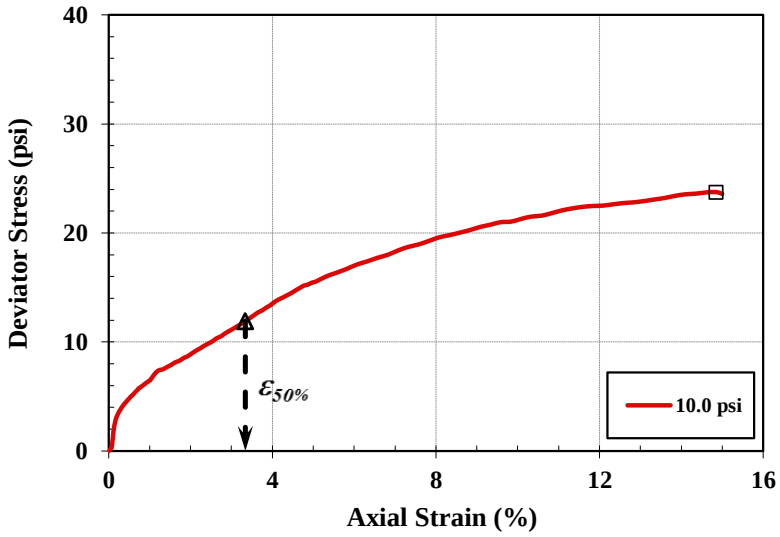
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: GEO-22 at 12 ft

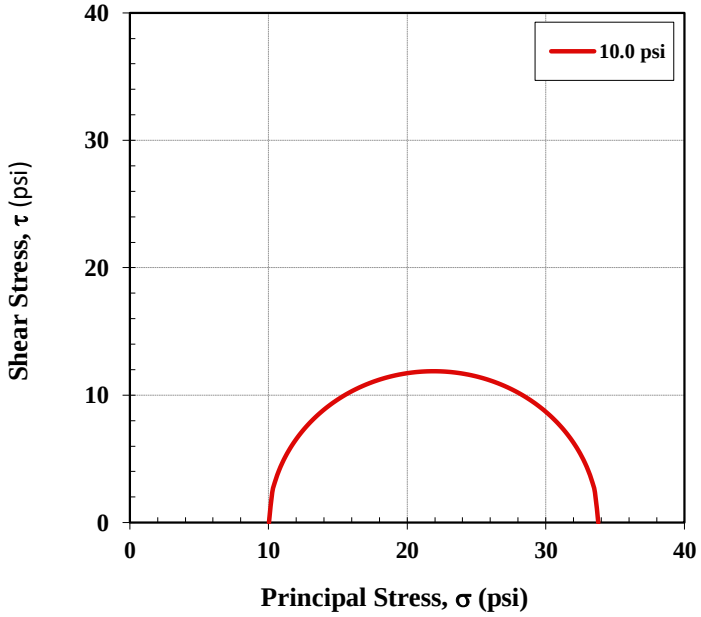
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/21/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		10.0
Avg. Diameter (in)	D_o	2.83
Avg. Height (in)	H_o	5.67
In-situ Water Content (%)	w_o	13.2
Total Unit Weight (pcf)	g_{total}	136.1
Dry Unit Weight (pcf)	g_{dry}	120.3
Saturation (%)	S_r	88.6
Void Ratio	e_o	0.40
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	23.8
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	3.3
Total Stresses at Failure	
Major Principal Stress Corrected, s_{1C} (psi)	33.8
Minor Principal Stress, s_3 (psi)	10.0

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	1.71

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/22/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Specimen: GEO-22 at 12 ft

Project No.: GE2502017
Test Method: ASTM D2850
Test Date: 05/21/25





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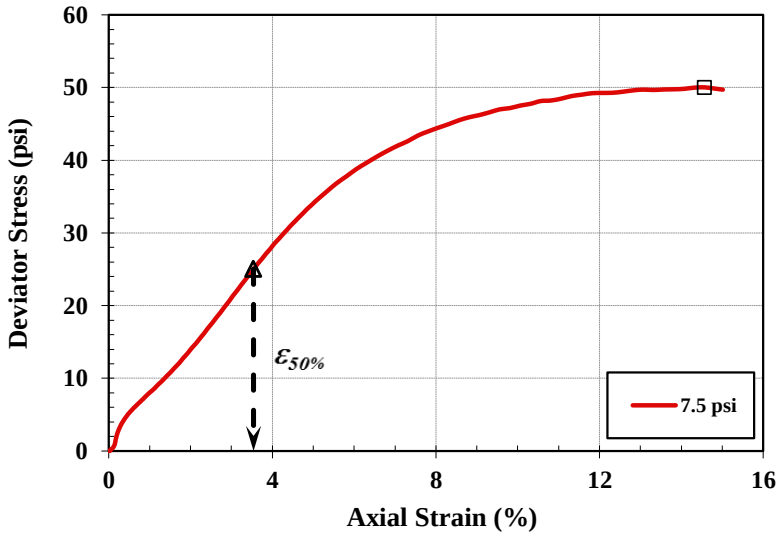
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: GEO-28 at 9 ft

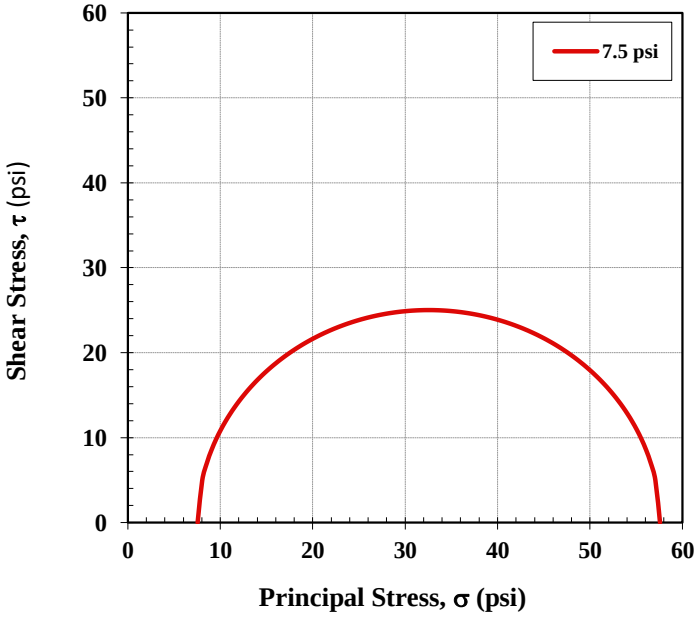
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/22/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		7.5
Avg. Diameter (in)	D_o	2.85
Avg. Height (in)	H_o	5.59
In-situ Water Content (%)	w_o	12.5
Total Unit Weight (pcf)	g_{total}	140.4
Dry Unit Weight (pcf)	g_{dry}	124.8
Saturation (%)	S_r	96.3
Void Ratio	e_o	0.35
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	50.0
Axial Strain at Failure (%)	14.6
Axial Strain at 50% of q_u , ε_{50} (%)	3.5
Total Stresses at Failure	
Major Principal Stress Corrected, s_{1C} (psi)	57.6
Minor Principal Stress, s_3 (psi)	7.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	3.60

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/23/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Specimen: GEO-28 at 9 ft

Project No.: GE2502017
Test Method: ASTM D2850
Test Date: 05/22/25





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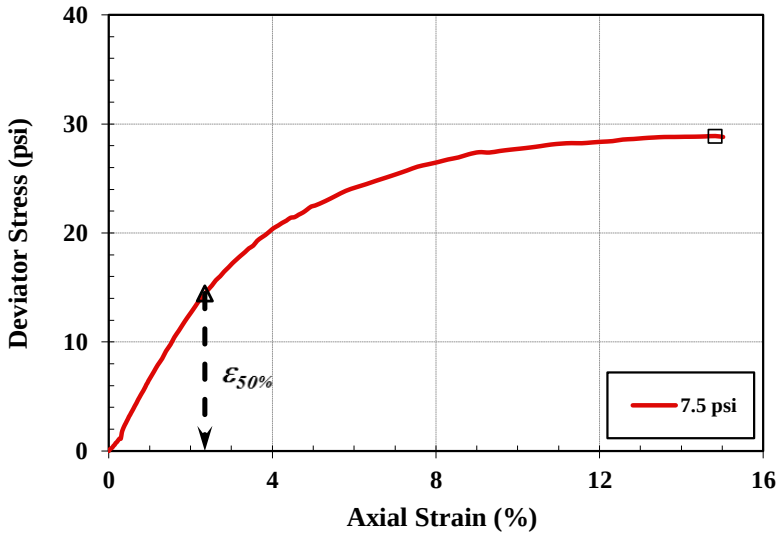
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: GEO-32 at 9 ft

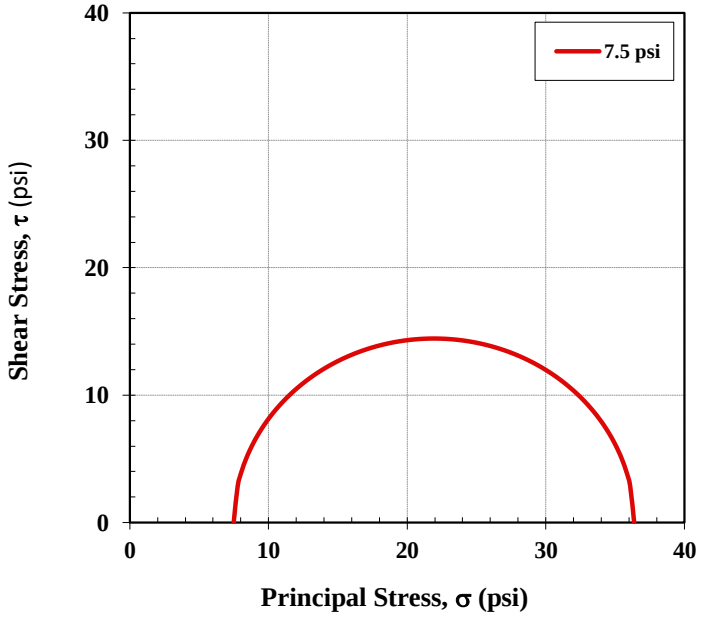
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/22/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		7.5
Avg. Diameter (in)	D_o	2.89
Avg. Height (in)	H_o	5.60
In-situ Water Content (%)	w_o	13.5
Total Unit Weight (pcf)	γ_{total}	139.3
Dry Unit Weight (pcf)	γ_{dry}	122.7
Saturation (%)	S_r	97.8
Void Ratio	e_o	0.37
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	28.9
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	2.4
Total Stresses at Failure	
Major Principal Stress Corrected, σ_{1C} (psi)	36.4
Minor Principal Stress, σ_3 (psi)	7.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	2.08

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/23/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Specimen: GEO-32 at 9 ft

Project No.: GE2502017
Test Method: ASTM D2850
Test Date: 05/22/25





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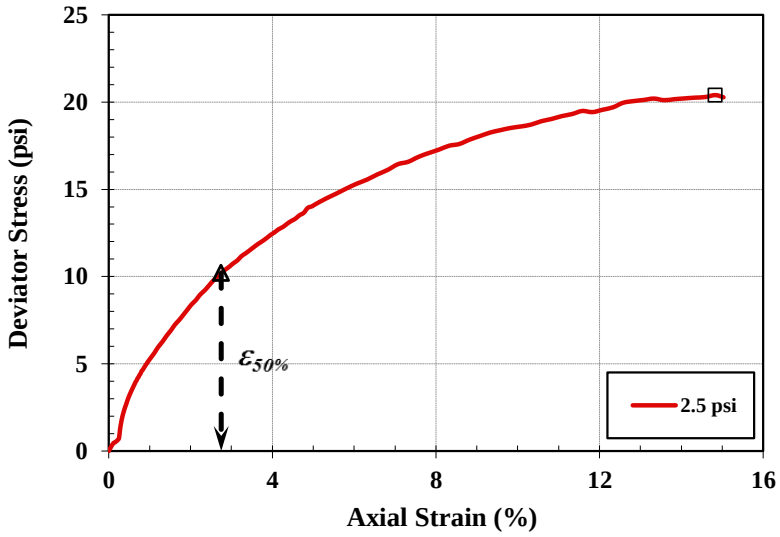
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: OM-1 at 3 ft

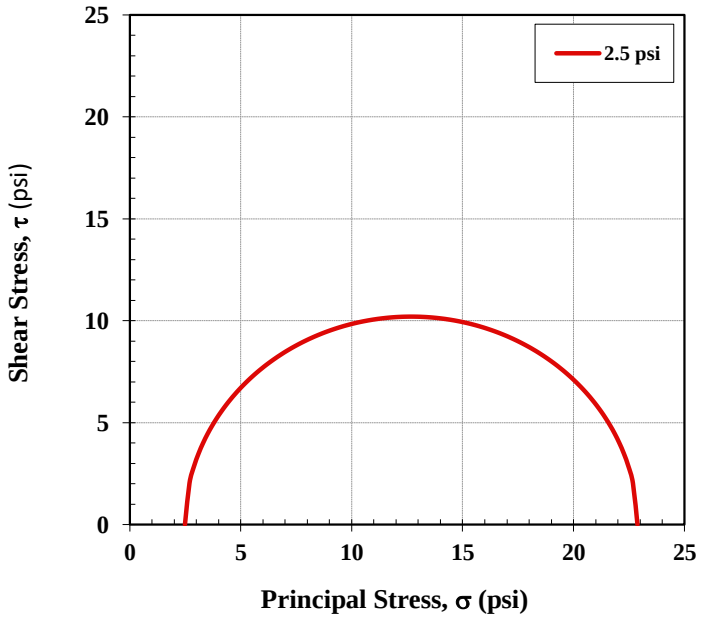
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/22/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		2.5
Avg. Diameter (in)	D_o	2.87
Avg. Height (in)	H_o	5.57
In-situ Water Content (%)	w_o	18.4
Total Unit Weight (pcf)	g_{total}	134.5
Dry Unit Weight (pcf)	g_{dry}	113.6
Saturation (%)	S_r	100.0
Void Ratio	e_o	0.48
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	20.4
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	2.8
Total Stresses at Failure	
Major Principal Stress Corrected, s_{1C} (psi)	22.9
Minor Principal Stress, s_3 (psi)	2.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	1.47

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/23/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client:	RRC Power & Energy, LLC	Project No.:	GE2502017
Project:	Coles Wind Project	Test Method:	ASTM D2850
Specimen:	OM-1 at 3 ft	Test Date:	05/22/25





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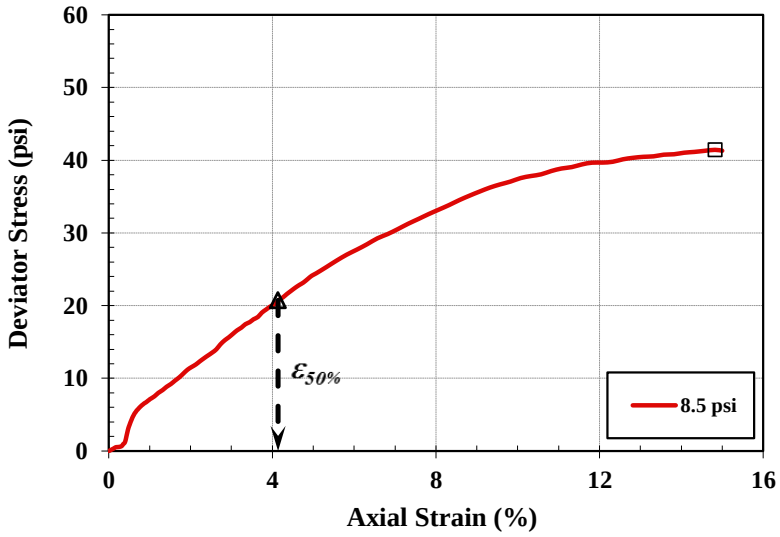
Unconsolidated-Undrained Triaxial Compression Test

Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No.: OM-2 at 10.5 ft

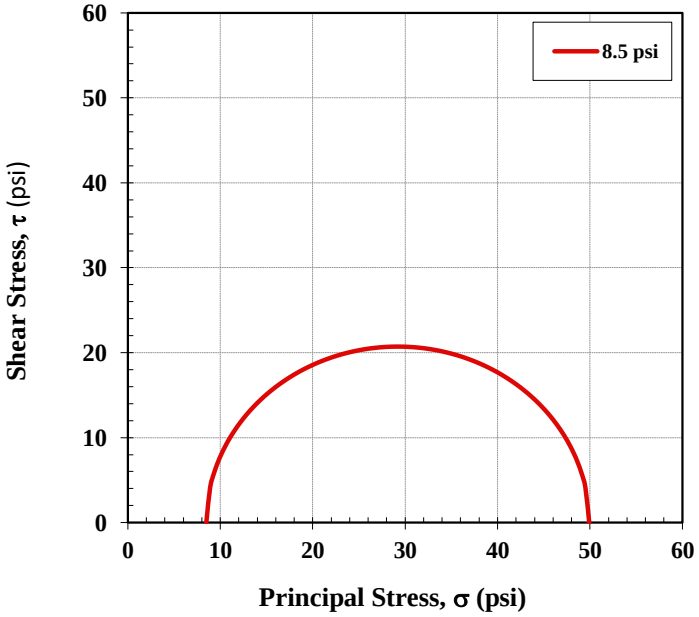
Project No.: GE2502017
Type of Test: Q-Test
Test Date: 5/22/2025

Type of Specimen: Shelby Tube
Strain Rate: 1.0 %/min
Test Method: ASTM D2850

Principal Stress Difference vs. Axial Strain



Mohr Circles (Total Stress) for Peak Stress at Failure



Initial Specimen Conditions		
Confining Pressure (psi)		8.5
Avg. Diameter (in)	D_o	2.87
Avg. Height (in)	H_o	5.59
In-situ Water Content (%)	w_o	14.4
Total Unit Weight (pcf)	γ_{total}	140.4
Dry Unit Weight (pcf)	γ_{dry}	122.7
Saturation (%)	S_r	100.0
Void Ratio	e_o	0.37
Specific Gravity (Assumed)	G_s	2.70

Stresses at Failure	
Maximum Deviator Stress (psi)	41.4
Axial Strain at Failure (%)	14.8
Axial Strain at 50% of q_u , ε_{50} (%)	4.1
Total Stresses at Failure	
Major Principal Stress Corrected, σ_{1C} (psi)	49.9
Minor Principal Stress, σ_3 (psi)	8.5

Test Results	
Unconsolidated-Undrained Compressive Strength at Failure, $\sigma_{1C} - \sigma_3$ **(tsf)**	2.98

Note: Failure was determined at the maximum deviator stress or deviator stress at 15 % axial strain, whenever is obtained first.

Kainat Batool, 05/23/25
Analysis & Quality Review/Date
Specimen Prepared by: A.B.

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Unconsolidated-Undrained Triaxial Compression Test Appendix

Client:	RRC Power & Energy, LLC	Project No.:	GE2502017
Project:	Coles Wind Project	Test Method:	ASTM D2850
Specimen:	OM-2 at 10.5 ft	Test Date:	05/22/25





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Beyond Engineering Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

One-Dimensional Swell or Collapse of Soils

Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: OM-1 at 3 ft

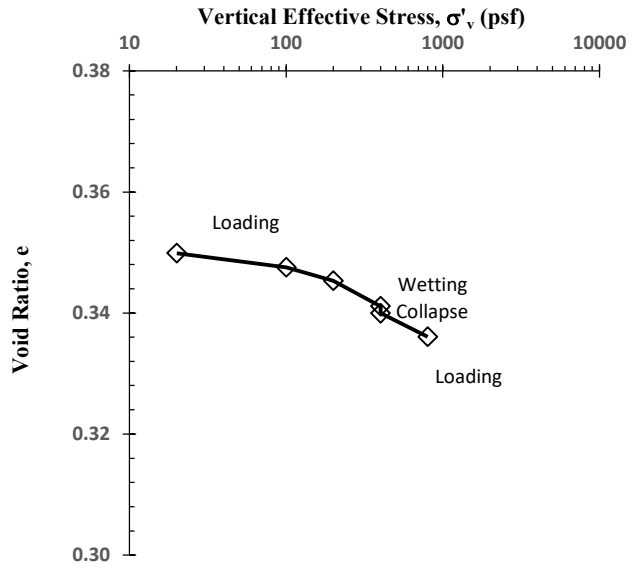
Beyond Project No.: GE2502017
Test Method: ASTM D4546, Method C
Test Date: 5/21/25-5/23/25

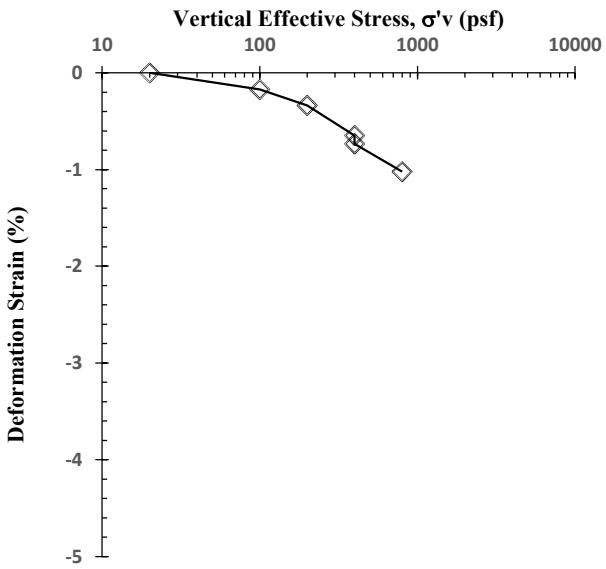
Specimen Conditions	
Avg. Water Content of Trimmings (%)	11.0
Final Specimen Water Content (%)	12.0
Initial Specimen Height (in)	0.802
Final Specimen Height (in)	0.793
Initial Dry Unit Weight, γ_o (pcf)	124.8
Final Dry Unit Weight, γ_f (pcf)	126.1
Initial Void Ratio, e_o	0.350
Final Void Ratio, e_f	0.336
Initial Degree of Saturation (%)	84.7
Final Degree of Saturation (%)	96.0
Collapse Strain (%)	-0.1

Specimen was inundated with tap water during testing. Loading increment duration was minimum 24 hours. . The calculation included the machine deflections that measured in each loading steps.

Gs assumed to be 2.70

Specimen Diameter: 2.501 inches





	Dry				Inundated	
Stage No.	1	2	3	4	5	6
σ'_v (psf)	20	100	200	400	400	800
Height (inch)	0.802	0.800	0.799	0.796	0.796	0.793
Void Ratio, e	0.350	0.348	0.345	0.341	0.340	0.336
Axial Strain (%)	0.00	-0.17	-0.34	-0.65	-0.73	-1.02

Huamiao Cao, P.E. 6/2/25
Analysis & Quality Review/Date
Specimen prepared and tested by: J.Z.

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Beyond Engineering Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

One-Dimensional Swell or Collapse of Soils

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D4546, Method C
Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-5/23/25



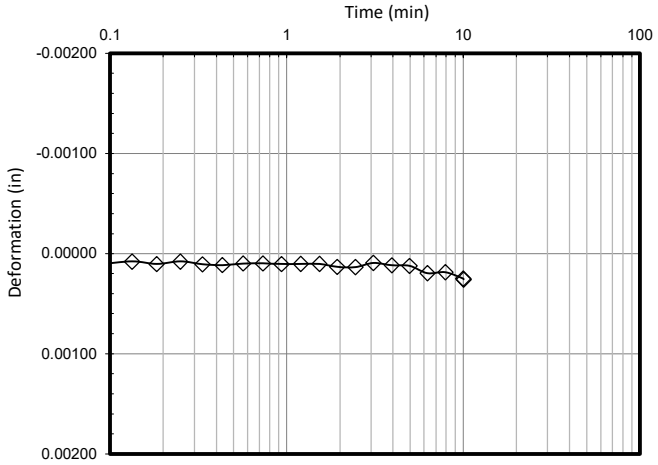


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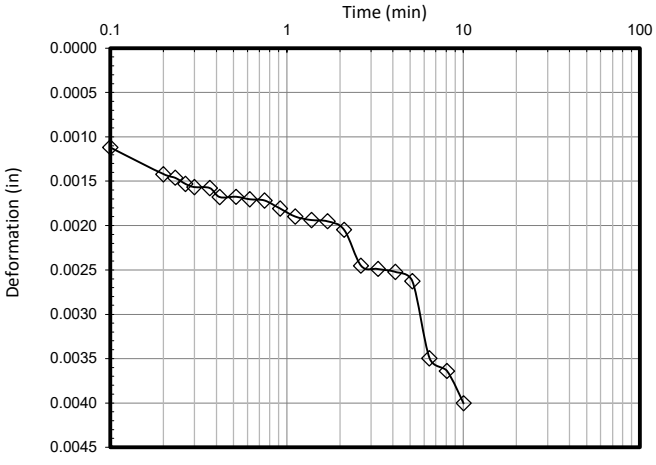
One-Dimensional Swell or Collapse of Soils

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D4546, Method C
Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-5/23/25

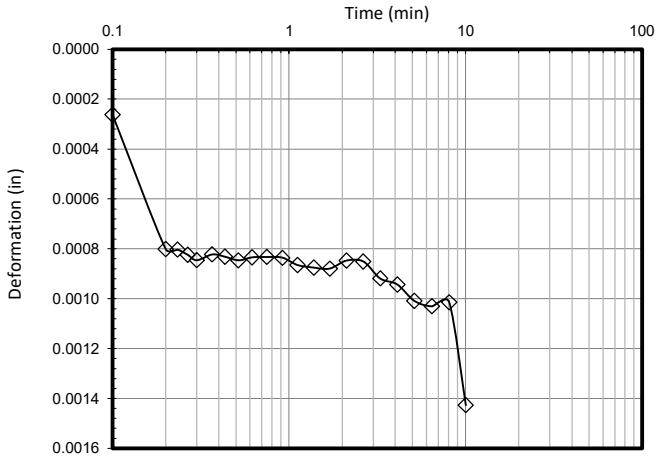
20-psf Load (Seating Load)



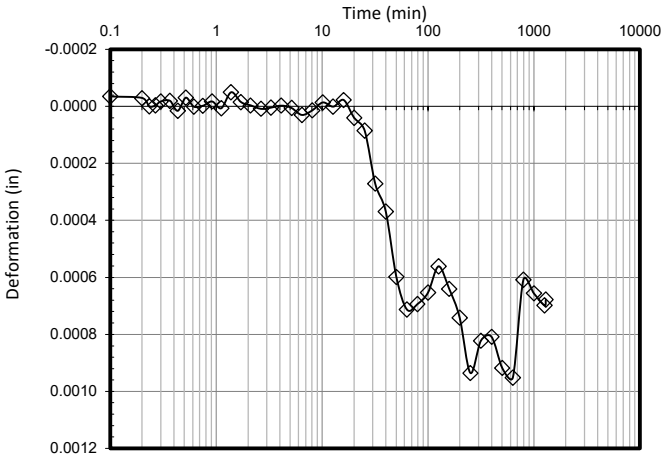
400-psf Load



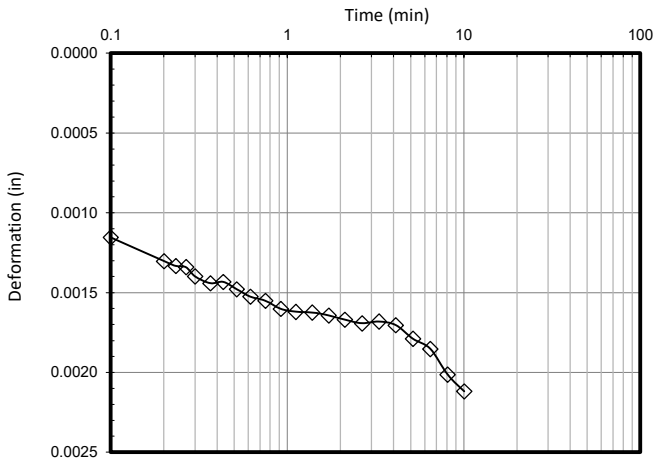
100-psf Load



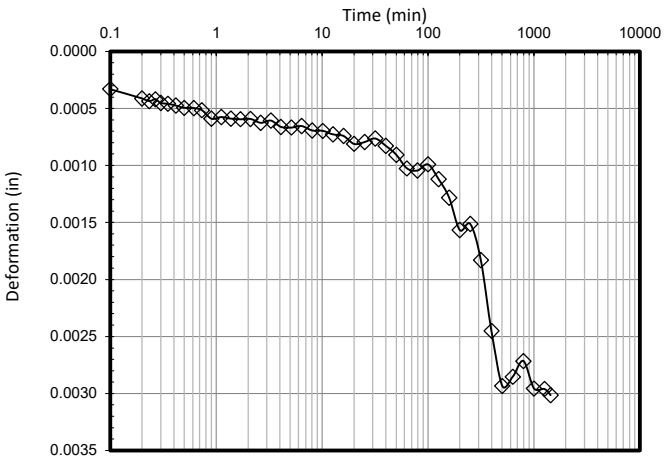
400-psf Load (inundated)



200-psf Load



800-psf Load (inundated)



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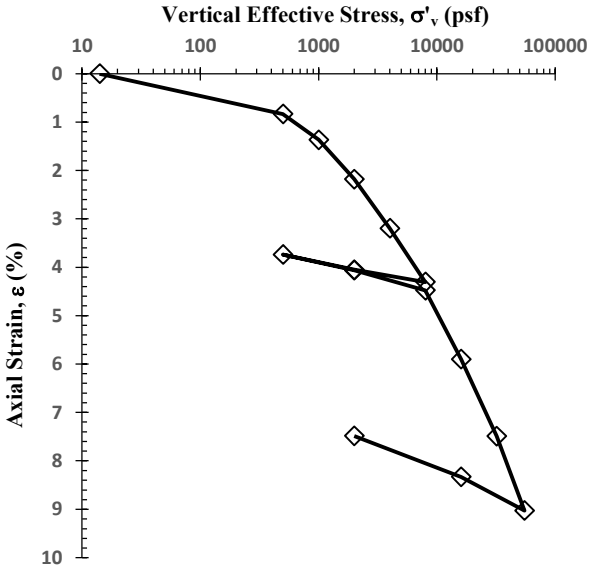
One-Dimensional Consolidation Properties of Soil

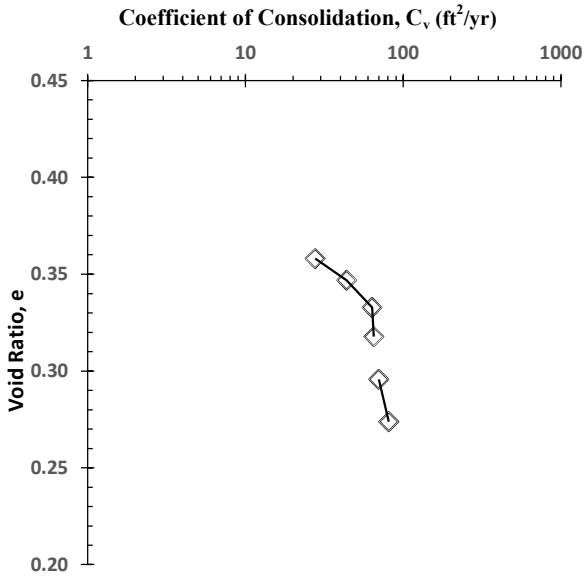
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: GEO-02 at 9 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/20/25-6/6/25

Specimen Conditions	
Initial Specimen Water Content (%)	13.8
Final Specimen Water Content (%)	10.6
Initial Specimen Height (in)	0.889
Final Specimen Height (in)	0.823
Initial Dry Unit Weight, g_o (pcf)	122.4
Final Dry Unit Weight, g_f (pcf)	132.3
Initial Void Ratio, e_o	0.377
Final Void Ratio, e_f	0.274
Initial Degree of Saturation (%)	99.0
Preconsolidation Pressure, p'_c (psf)	4500
"Swell Pressure" (psf)	14

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.495 inches





σ'_v (psf)	14	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	27.7	43.9	63.4	65.1	-	-	-	-
Axial Strain (%)	0.00	0.83	1.37	2.18	3.20	4.30	4.05	3.74	4.06	4.48
e	0.377	0.365	0.358	0.347	0.333	0.318	0.321	0.325	0.321	0.315

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	69.9	81.1	-	-	-
Axial Strain (%)	5.90	7.49	9.03	8.33	7.49
e	0.296	0.274	0.253	0.262	0.274

Compression Index, C_c	0.090
Recompression Index, C_r	0.007
Swell Index, C_s (1st Rebound)	0.006
Swell Index, C_s (2nd Rebound)	0.015

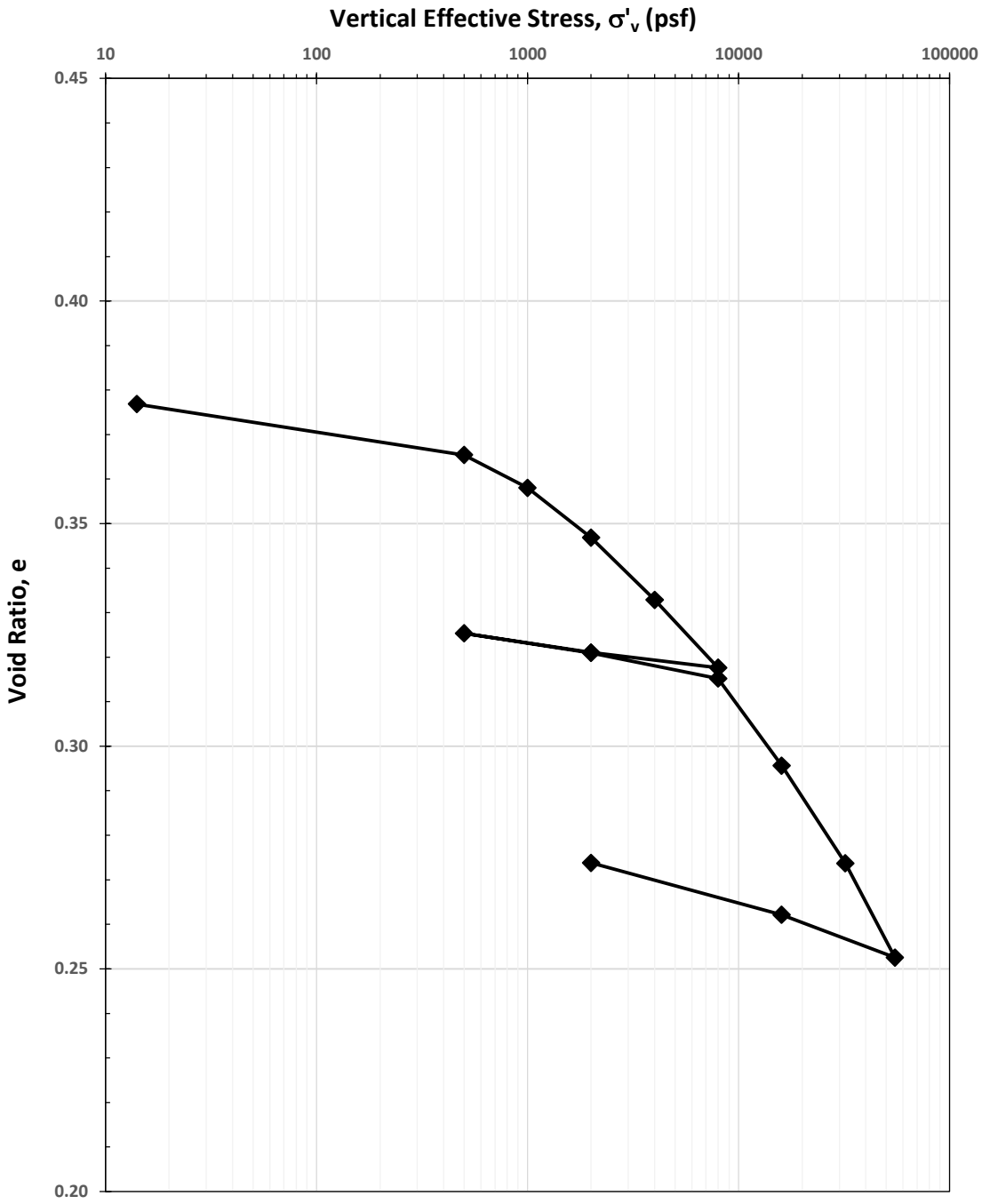
Huamiao Cao, P.E. 6/6/25
Analysis & Quality Review/Date

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Beyond Engineering Testing, LLC
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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-02 at 9 ft	**Test Date:**	5/20/25-6/6/25



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One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-02 at 9 ft	**Test Date:**	5/20/25-6/6/25





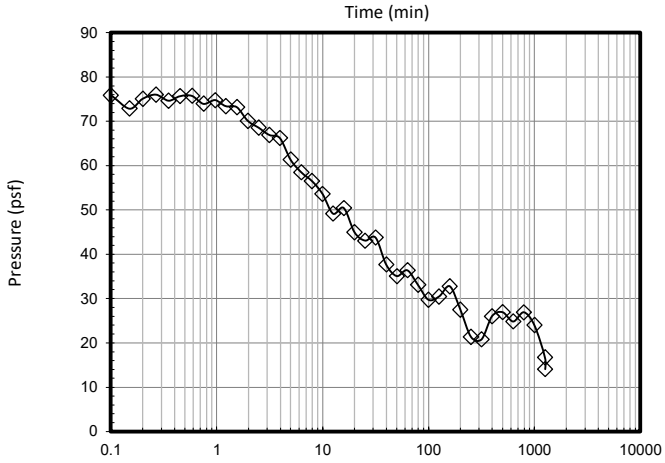
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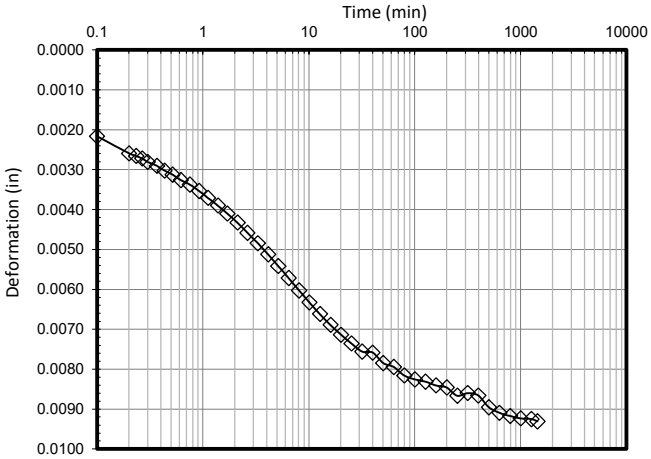
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-02 at 9 ft	**Test Date:**	5/20/25-6/6/25

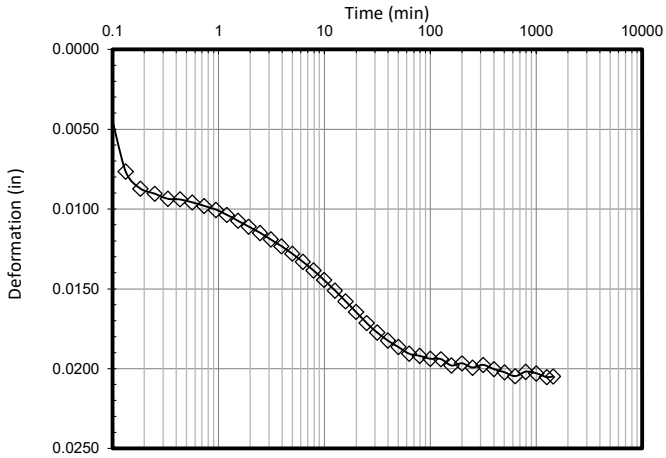
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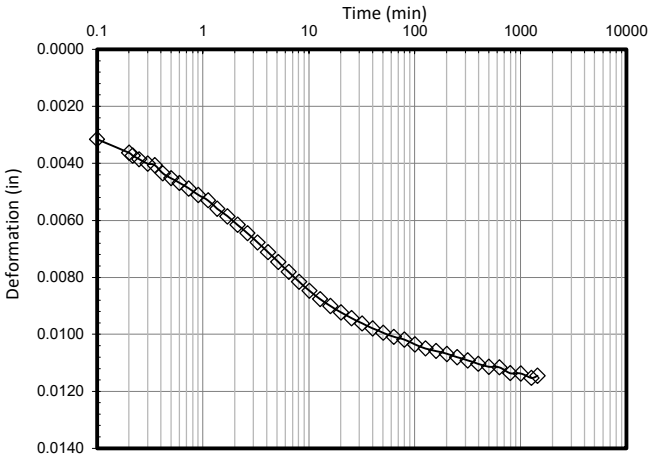
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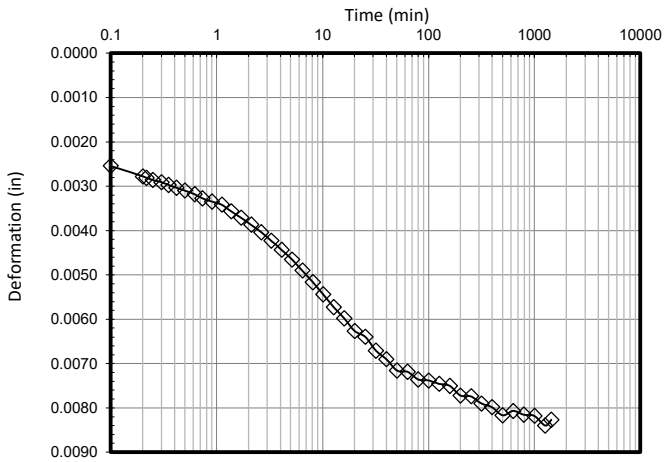
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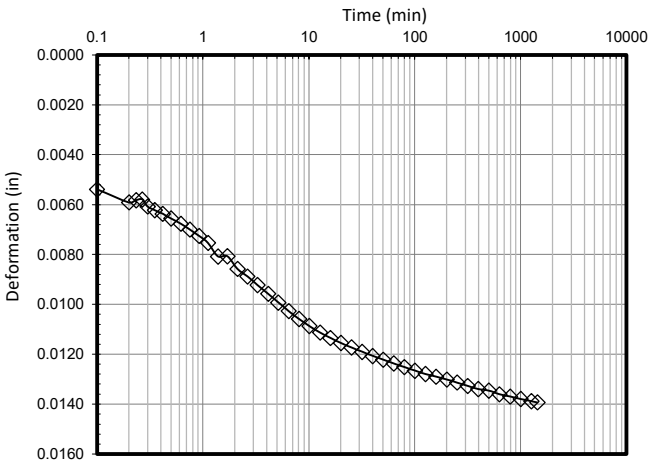
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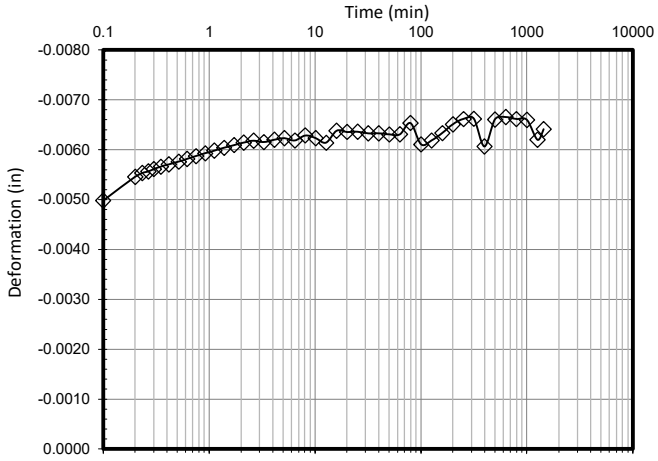


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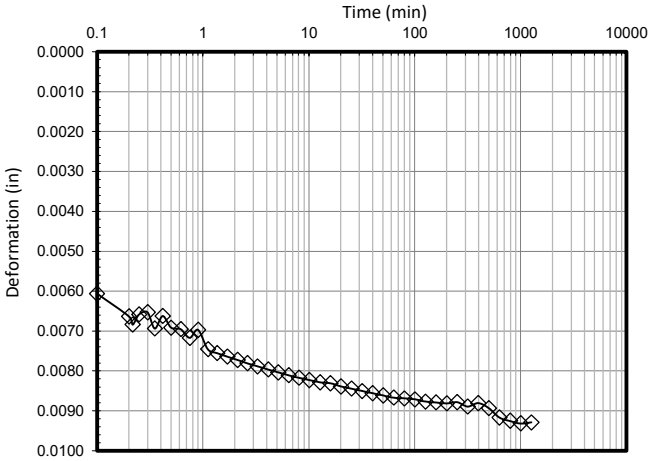
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-02 at 9 ft	**Test Date:**	5/20/25-6/6/25

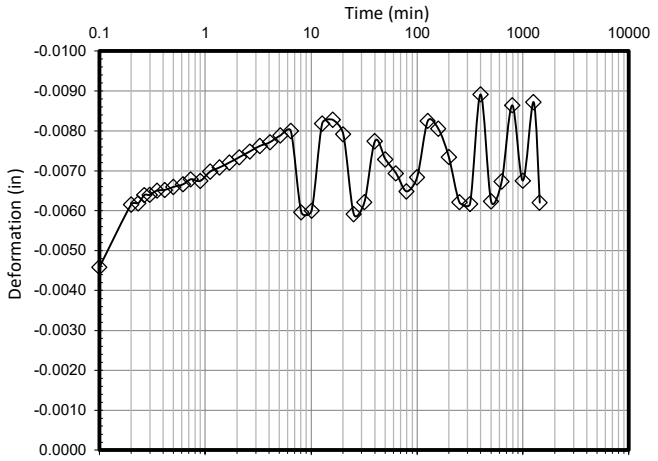
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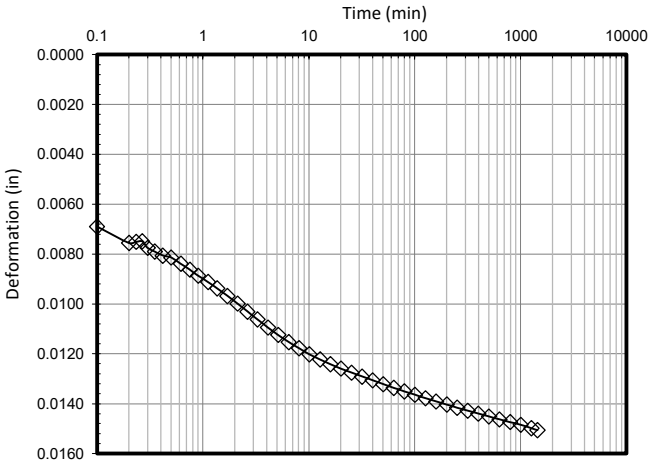
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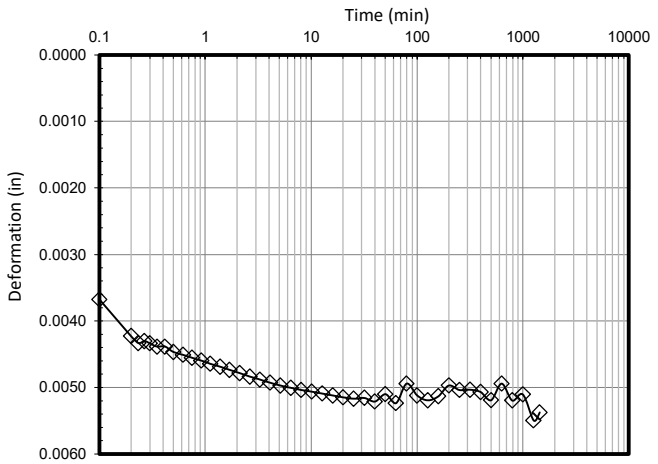
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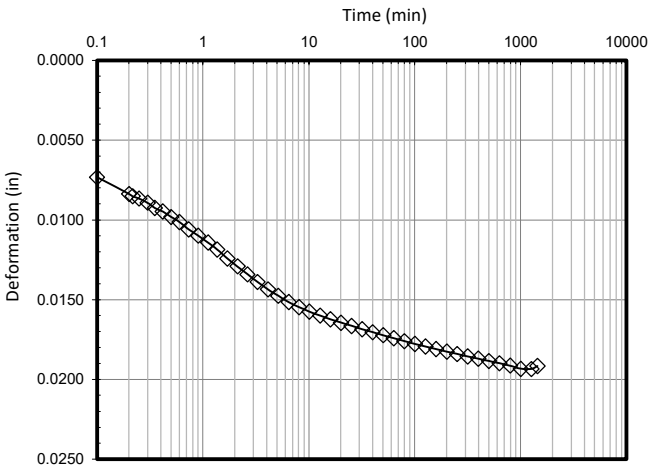
16000-psf Load



2000-psf Load



32000-psf Load

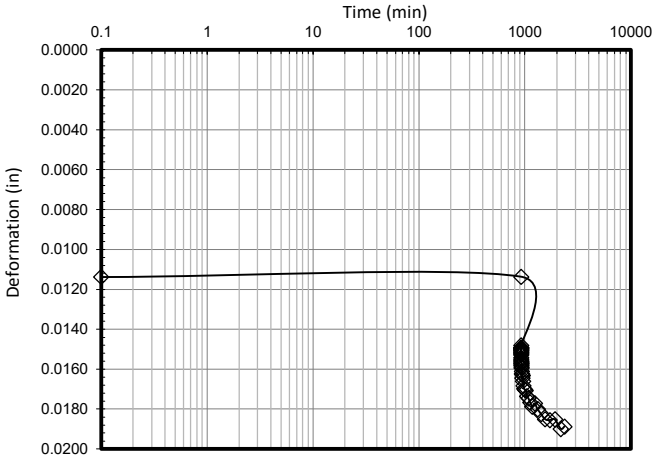


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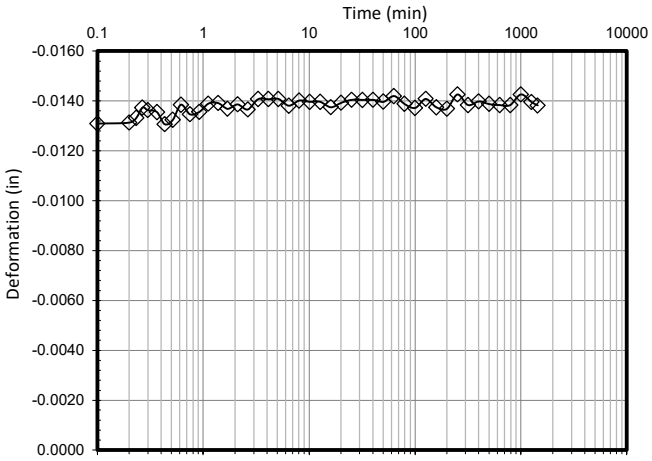
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-02 at 9 ft	**Test Date:**	5/20/25-6/6/25

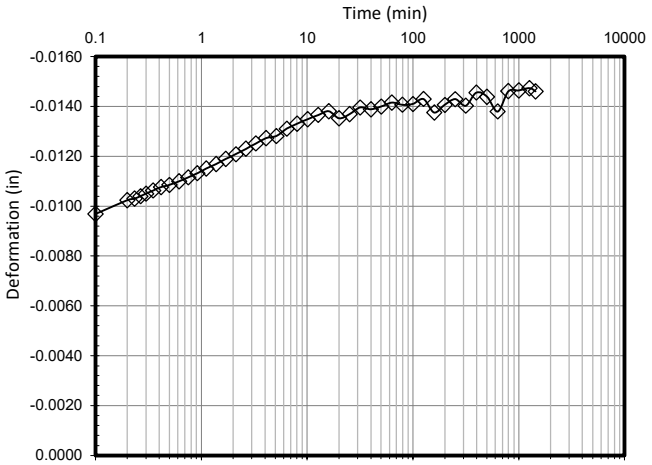
55000-psf Load



16000-psf Load



2000-psf Load



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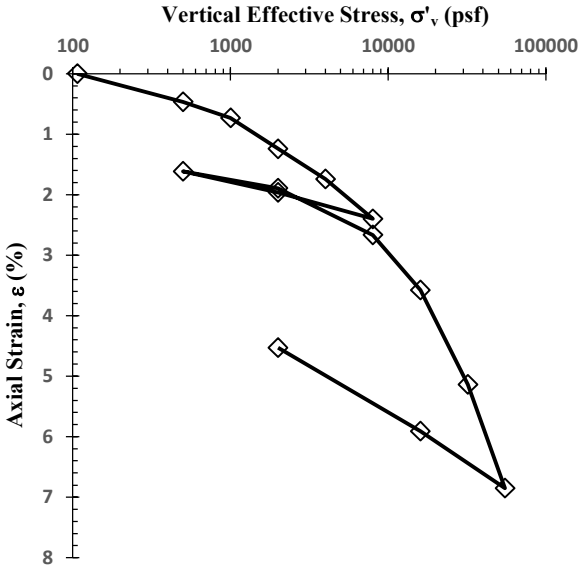
One-Dimensional Consolidation Properties of Soil

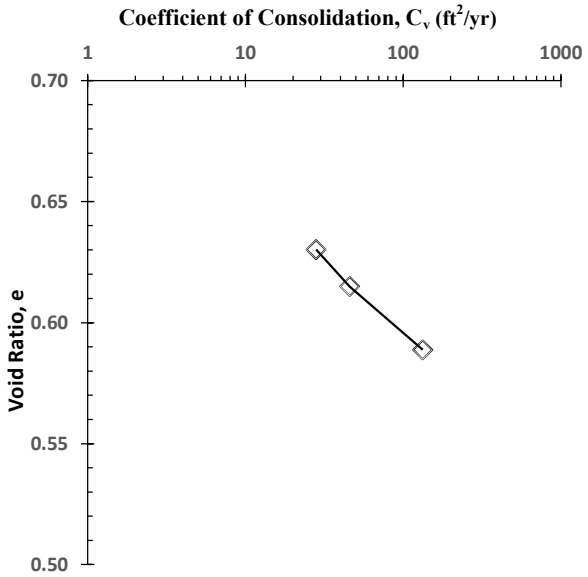
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: GEO-21 at 9 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/20/25-6/5/25

Specimen Conditions	
Initial Specimen Water Content (%)	23.2
Final Specimen Water Content (%)	23.6
Initial Specimen Height (in)	0.907
Final Specimen Height (in)	0.866
Initial Dry Unit Weight, g_o (pcf)	100.6
Final Dry Unit Weight, g_f (pcf)	105.4
Initial Void Ratio, e_o	0.675
Final Void Ratio, e_f	0.599
Initial Degree of Saturation (%)	92.9
Preconsolidation Pressure, p'_c (psf)	9400
"Swell Pressure" (psf)	107

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.498 inches





σ'_v (psf)	107	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	-	-	-	-	-	-	-	28.0
Axial Strain (%)	0.00	0.46	0.73	1.24	1.74	2.40	1.96	1.62	1.89	2.67
e	0.675	0.667	0.663	0.654	0.646	0.635	0.642	0.648	0.643	0.630

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	45.8	133.0	-	-	-
Axial Strain (%)	3.57	5.14	6.85	5.91	4.53
e	0.615	0.589	0.560	0.576	0.599

Compression Index, C_c	0.122
Recompression Index, C_r	0.008
Swell Index, C_s (1st Rebound)	0.011
Swell Index, C_s (2nd Rebound)	0.027

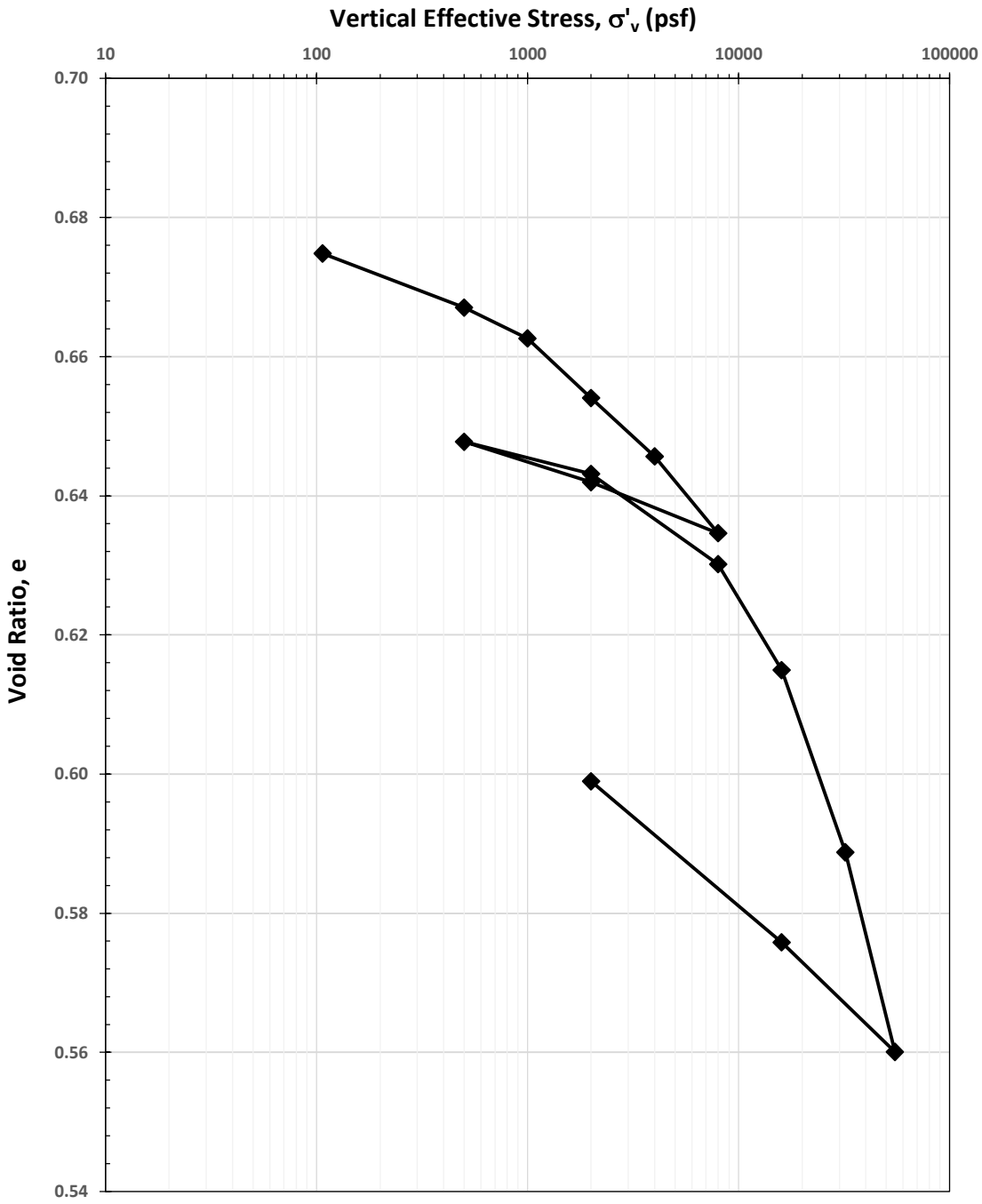
Huamiao Cao, P.E. 6/6/25
Analysis & Quality Review/Date

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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-21 at 9 ft	**Test Date:**	5/20/25-6/5/25



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One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-21 at 9 ft	**Test Date:**	5/20/25-6/5/25





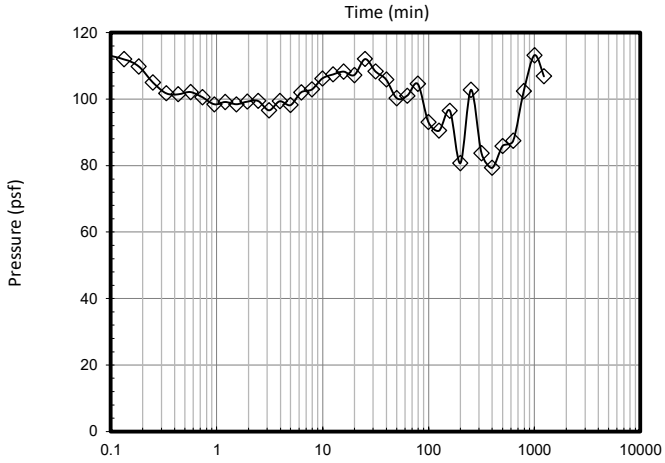
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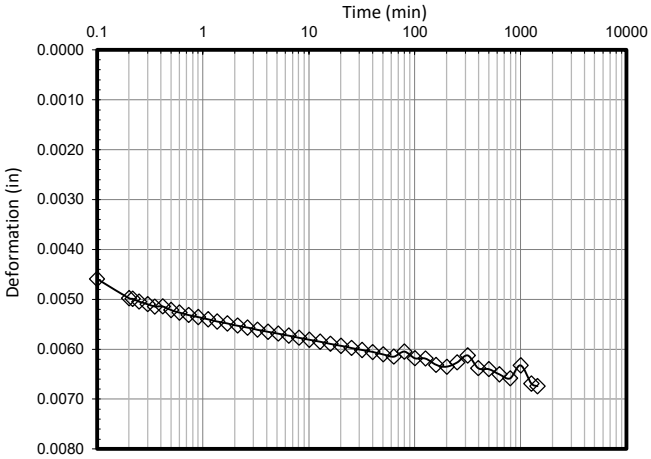
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-21 at 9 ft	**Test Date:**	5/20/25-6/5/25

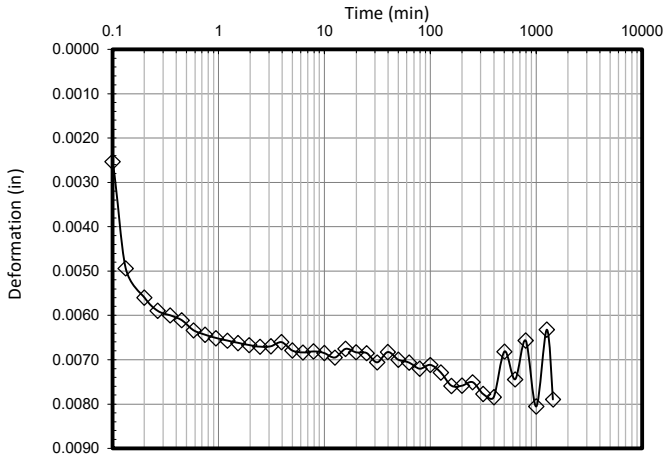
Swell Pressure Measurement



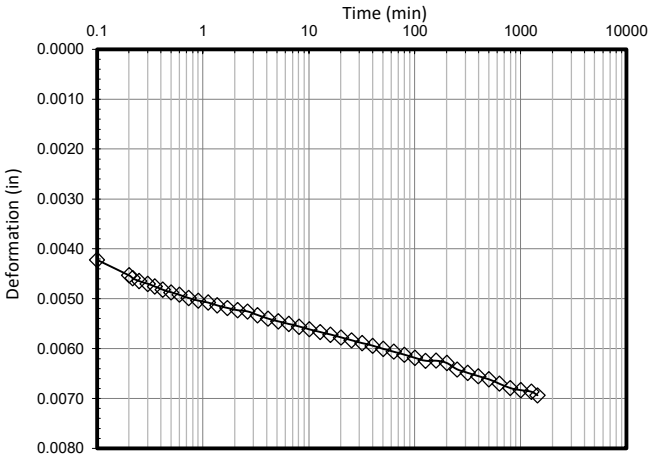
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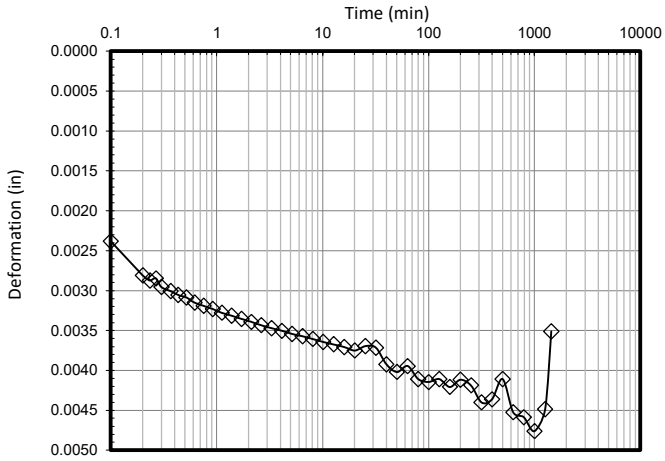
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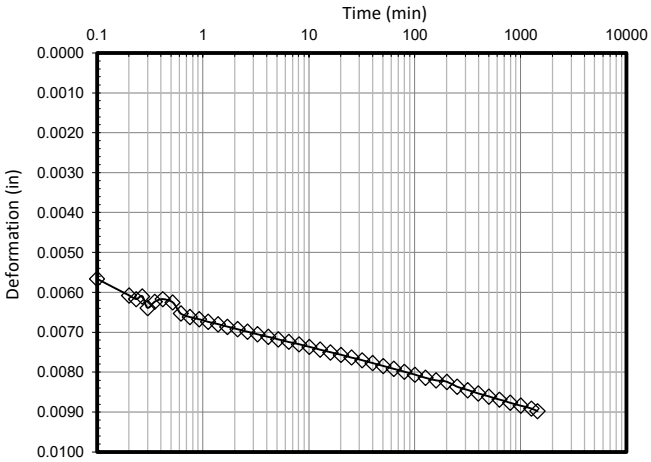
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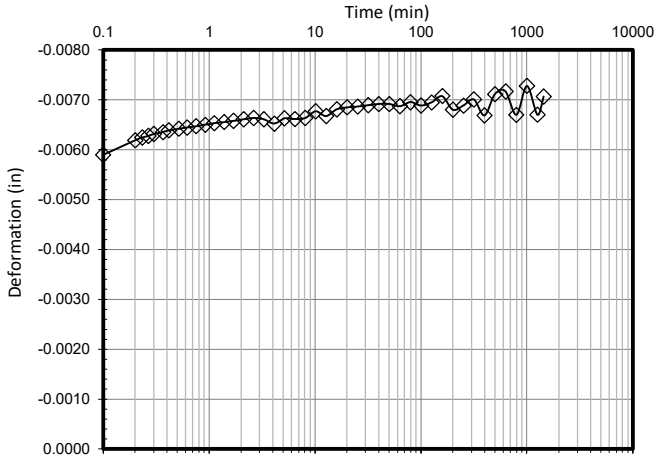


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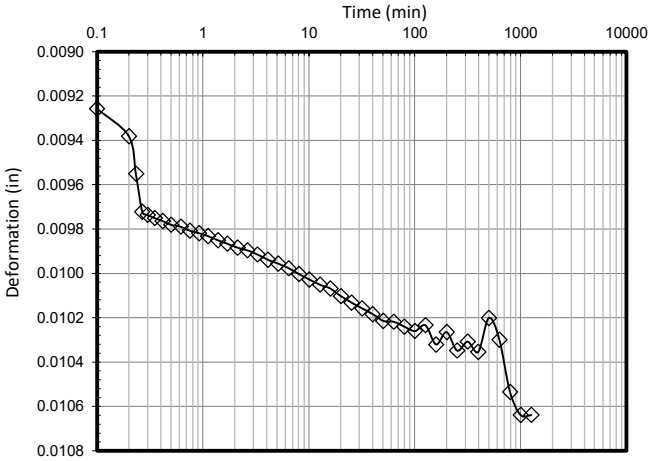
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-21 at 9 ft	**Test Date:**	5/20/25-6/5/25

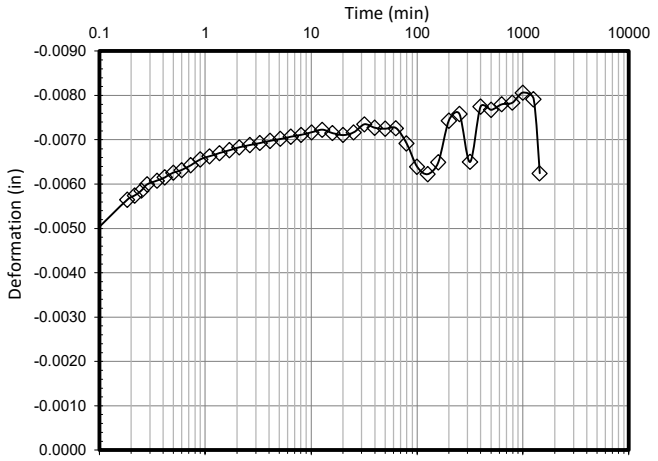
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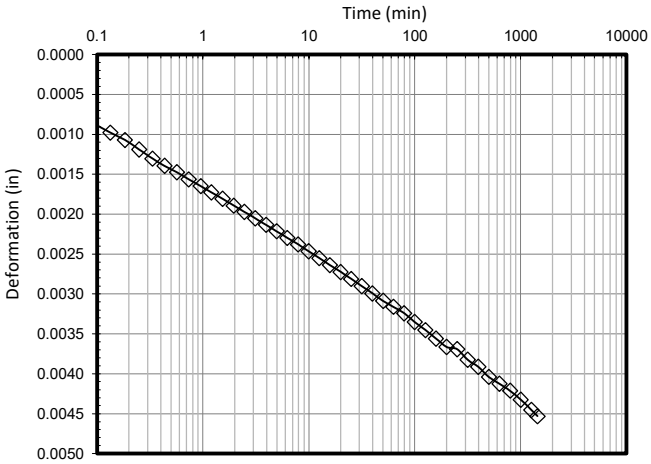
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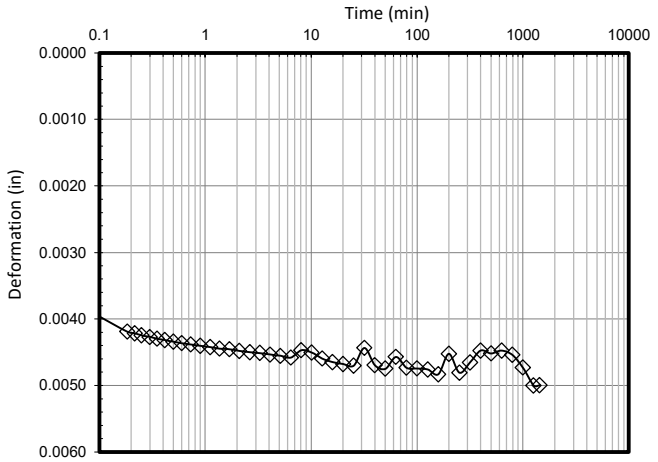
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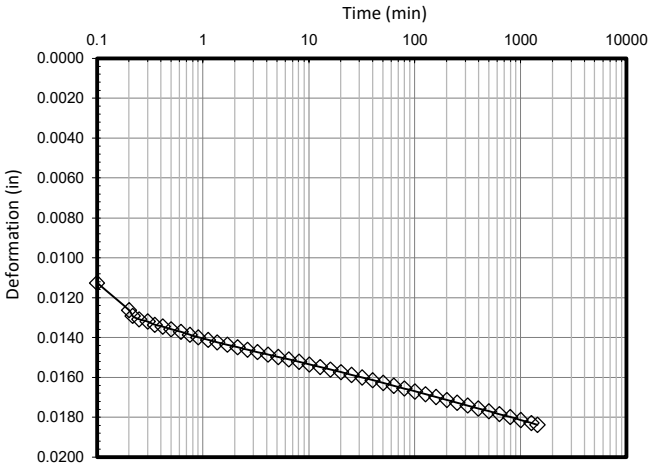
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2000-psf Load



32000-psf Load

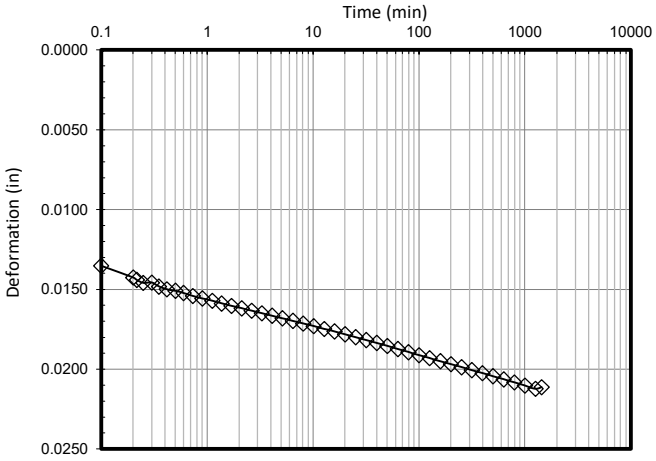


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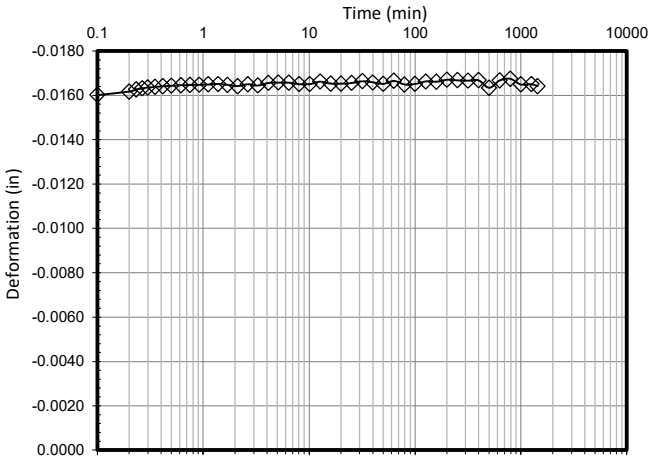
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-21 at 9 ft	**Test Date:**	5/20/25-6/5/25

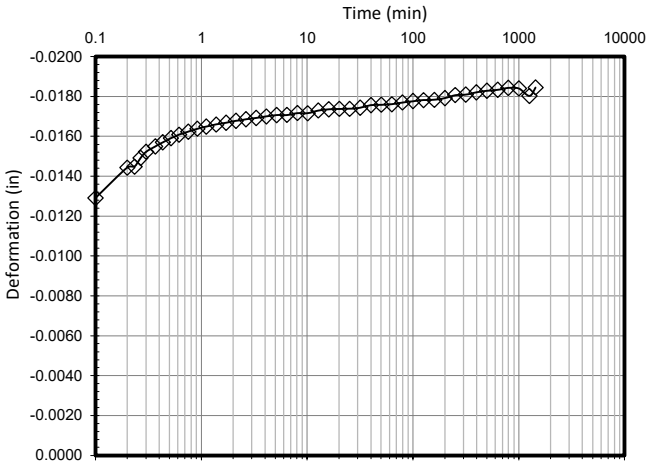
55000-psf Load



16000-psf Load



2000-psf Load



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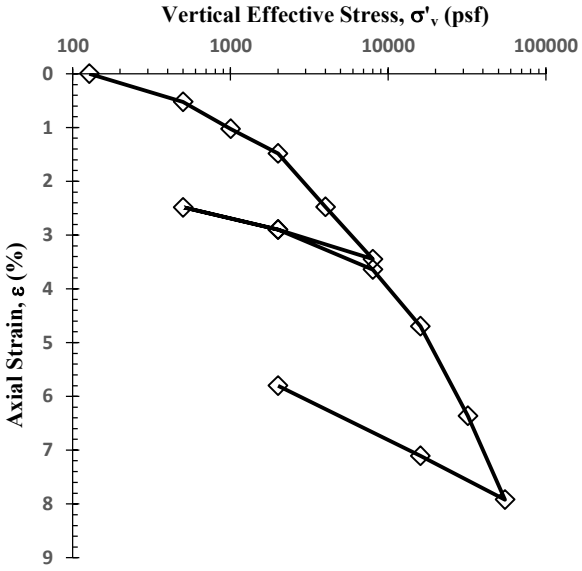
One-Dimensional Consolidation Properties of Soil

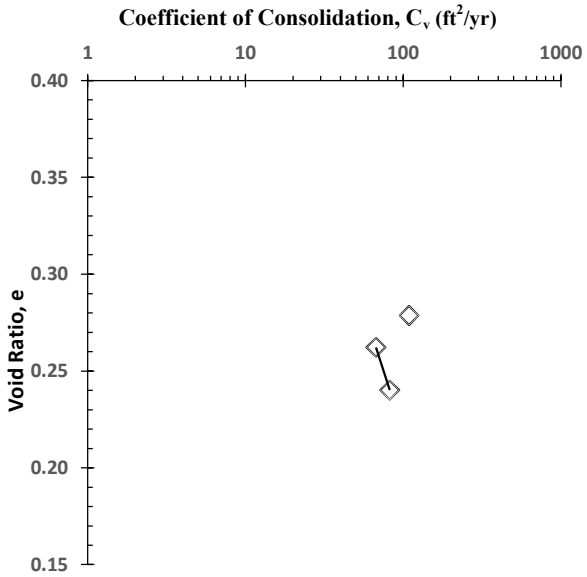
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: GEO-22 at 12 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/20/25-6/5/25

Specimen Conditions	
Initial Specimen Water Content (%)	11.3
Final Specimen Water Content (%)	10.6
Initial Specimen Height (in)	0.884
Final Specimen Height (in)	0.833
Initial Dry Unit Weight, g_o (pcf)	127.2
Final Dry Unit Weight, g_f (pcf)	135.1
Initial Void Ratio, e_o	0.324
Final Void Ratio, e_f	0.248
Initial Degree of Saturation (%)	94.3
Preconsolidation Pressure, p'_c (psf)	6800
"Swell Pressure" (psf)	127

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.496 inches





σ'_v (psf)	127	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	-	-	-	109.1	-	-	-	-
Axial Strain (%)	0.00	0.52	1.02	1.48	2.48	3.45	2.90	2.48	2.90	3.64
e	0.324	0.317	0.311	0.305	0.292	0.279	0.286	0.291	0.286	0.276

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	67.2	82.1	-	-	-
Axial Strain (%)	4.70	6.36	7.92	7.11	5.80
e	0.262	0.240	0.219	0.230	0.248

Compression Index, C_c	0.088
Recompression Index, C_r	0.009
Swell Index, C_s (1st Rebound)	0.011
Swell Index, C_s (2nd Rebound)	0.019

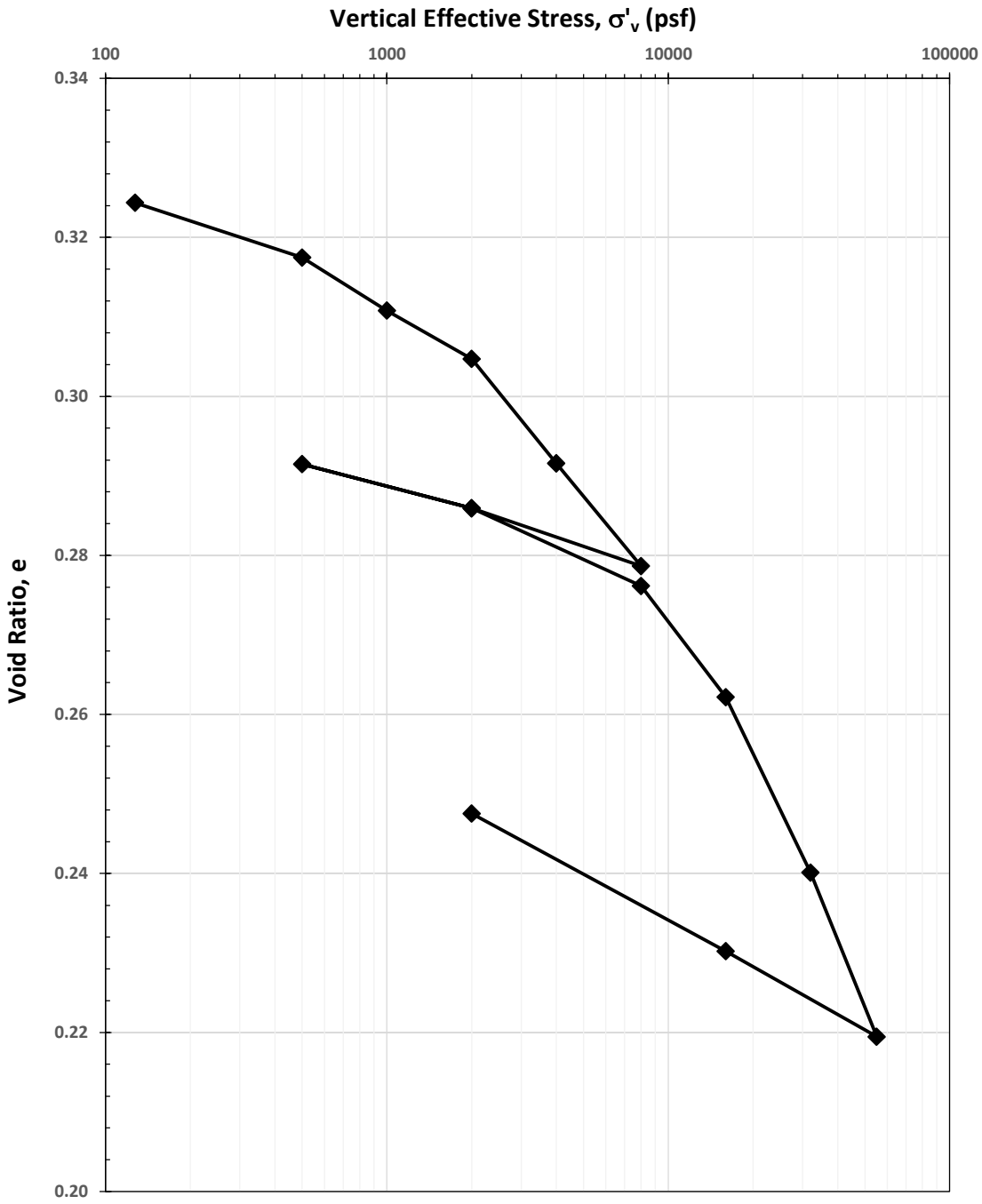
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Analysis & Quality Review/Date

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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-22 at 12 ft	**Test Date:**	5/20/25-6/5/25



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One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-22 at 12 ft	**Test Date:**	5/20/25-6/5/25





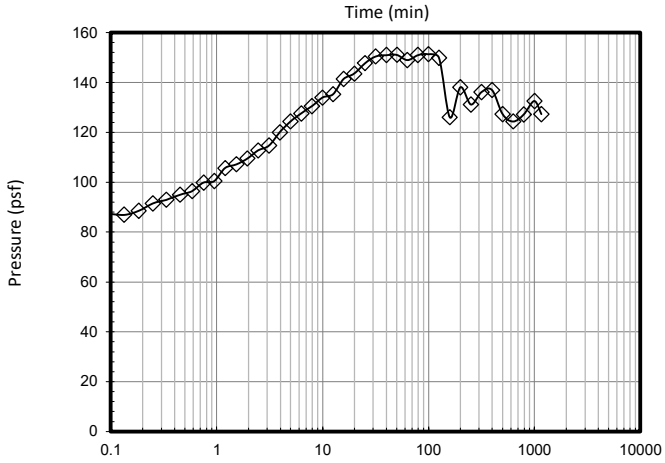
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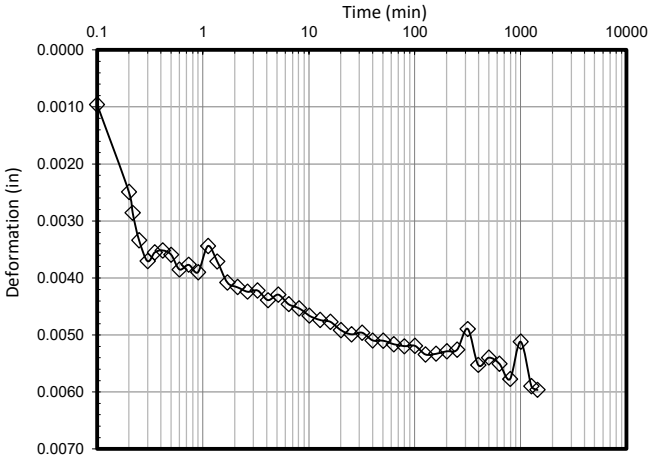
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-22 at 12 ft	**Test Date:**	5/20/25-6/5/25

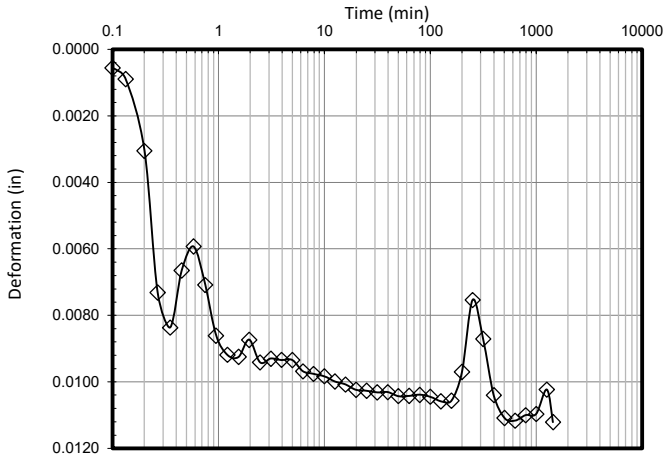
Swell Pressure Measurement



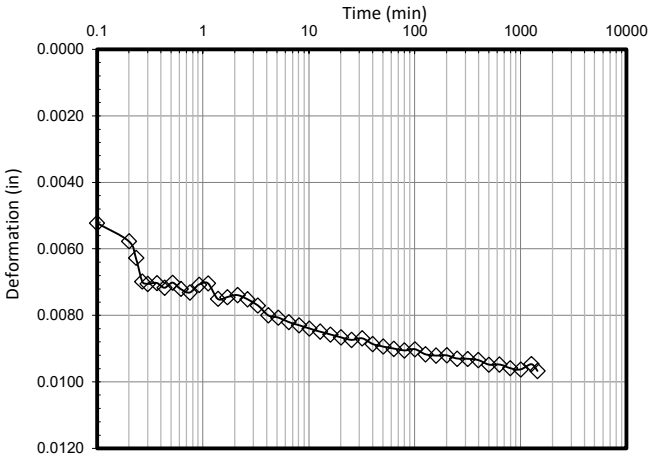
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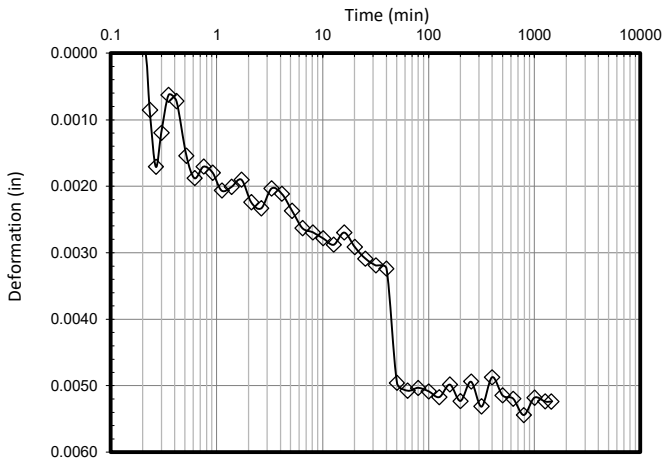
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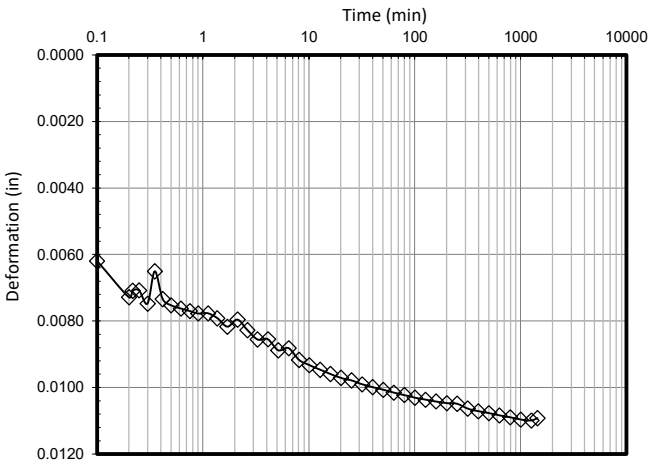
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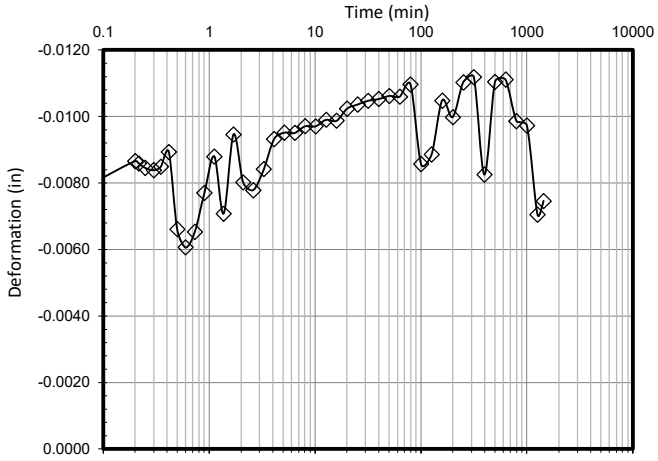


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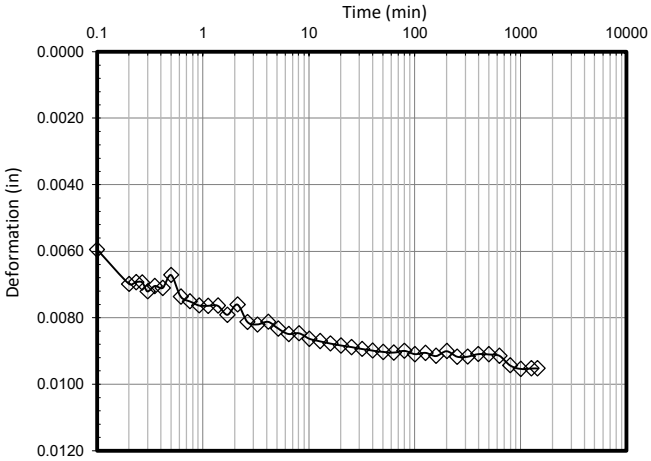
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-22 at 12 ft	**Test Date:**	5/20/25-6/5/25

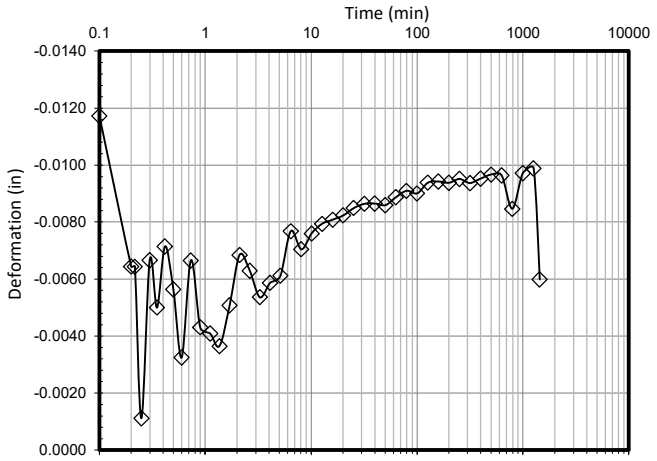
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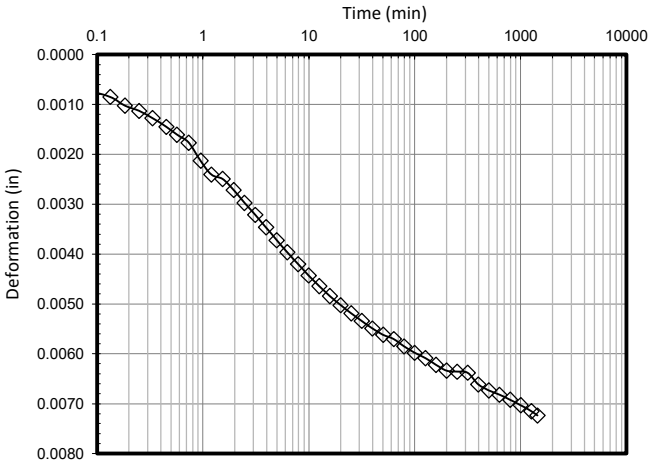
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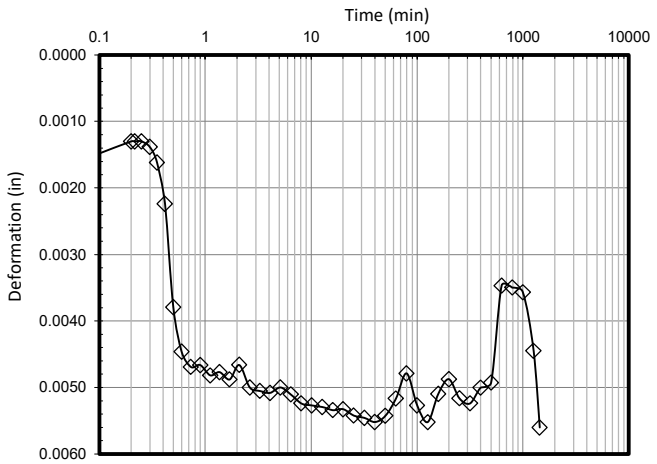
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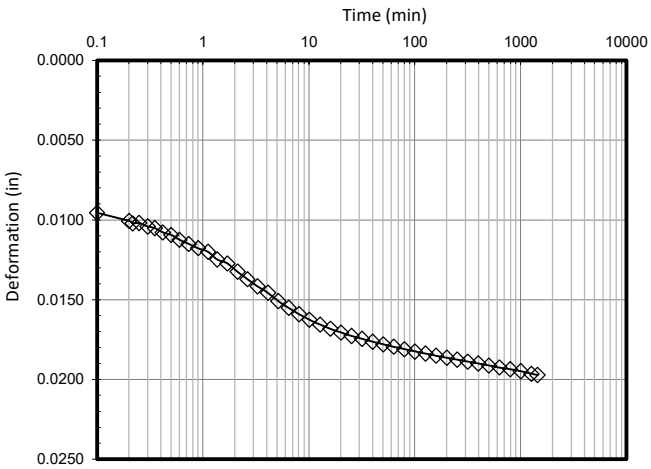
16000-psf Load



2000-psf Load



32000-psf Load

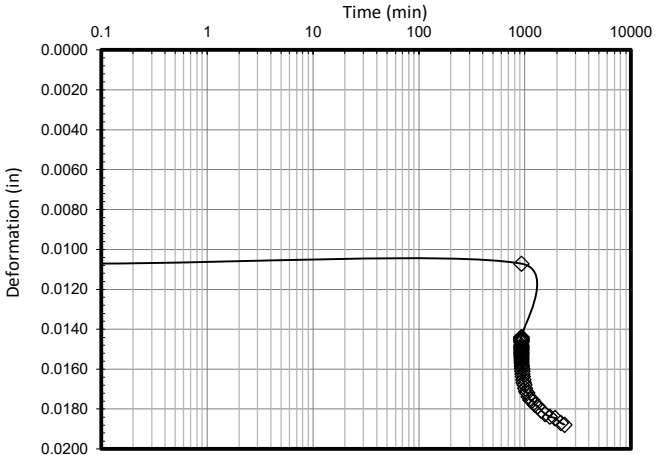


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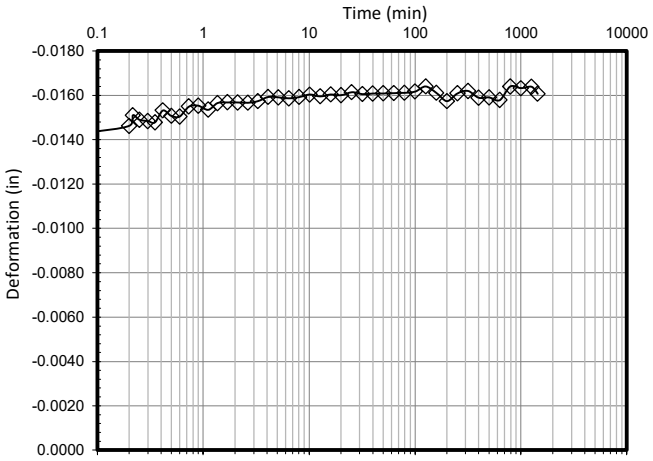
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-22 at 12 ft	**Test Date:**	5/20/25-6/5/25

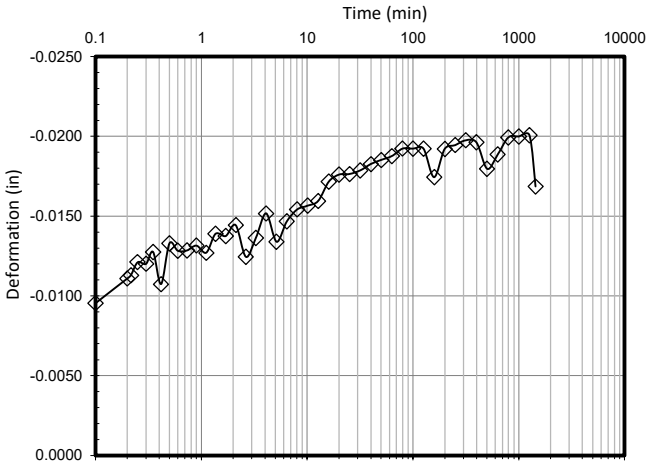
55000-psf Load



16000-psf Load



2000-psf Load



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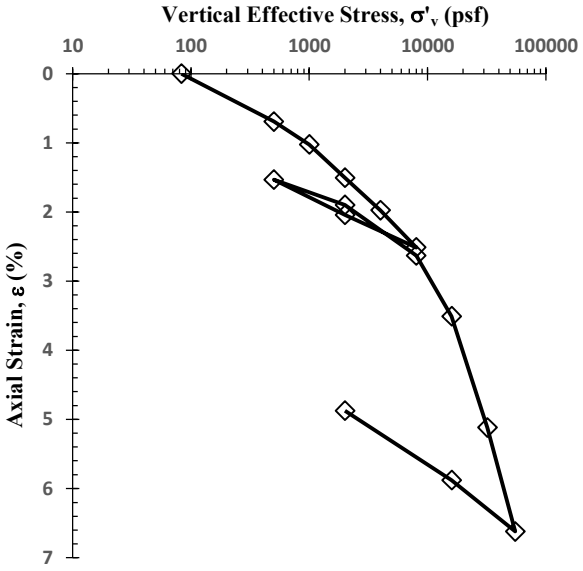
One-Dimensional Consolidation Properties of Soil

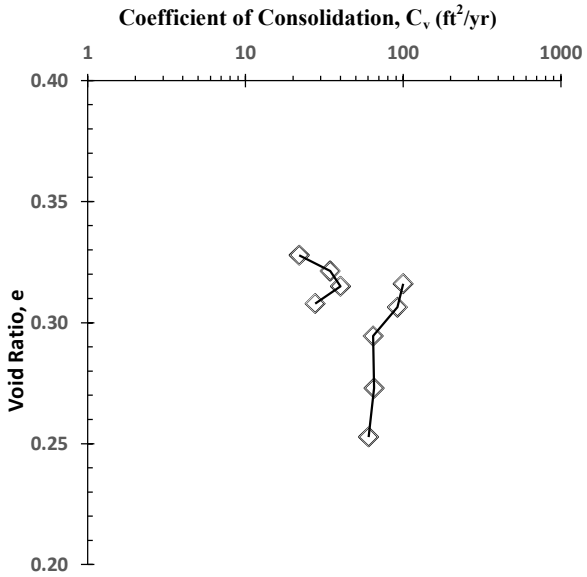
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: GEO-28 at 9 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/21/25-6/5/25

Specimen Conditions	
Initial Specimen Water Content (%)	12.5
Final Specimen Water Content (%)	10.3
Initial Specimen Height (in)	0.900
Final Specimen Height (in)	0.856
Initial Dry Unit Weight, g_o (pcf)	125.6
Final Dry Unit Weight, g_f (pcf)	132.0
Initial Void Ratio, e_o	0.342
Final Void Ratio, e_f	0.276
Initial Degree of Saturation (%)	98.8
Preconsolidation Pressure, p'_c (psf)	11000
"Swell Pressure" (psf)	83

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.492 inches





σ'_v (psf)	83	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	21.9	34.4	40.0	27.7	-	-	100.0	92.0
Axial Strain (%)	0.00	0.69	1.02	1.51	1.98	2.51	2.04	1.53	1.90	2.63
e	0.342	0.332	0.328	0.321	0.315	0.308	0.314	0.321	0.316	0.306

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	64.5	65.5	60.4	-	-
Axial Strain (%)	3.51	5.12	6.62	5.88	4.88
e	0.294	0.273	0.253	0.263	0.276

Compression Index, C_c	0.086
Recompression Index, C_r	0.008
Swell Index, C_s (1st Rebound)	0.011
Swell Index, C_s (2nd Rebound)	0.016

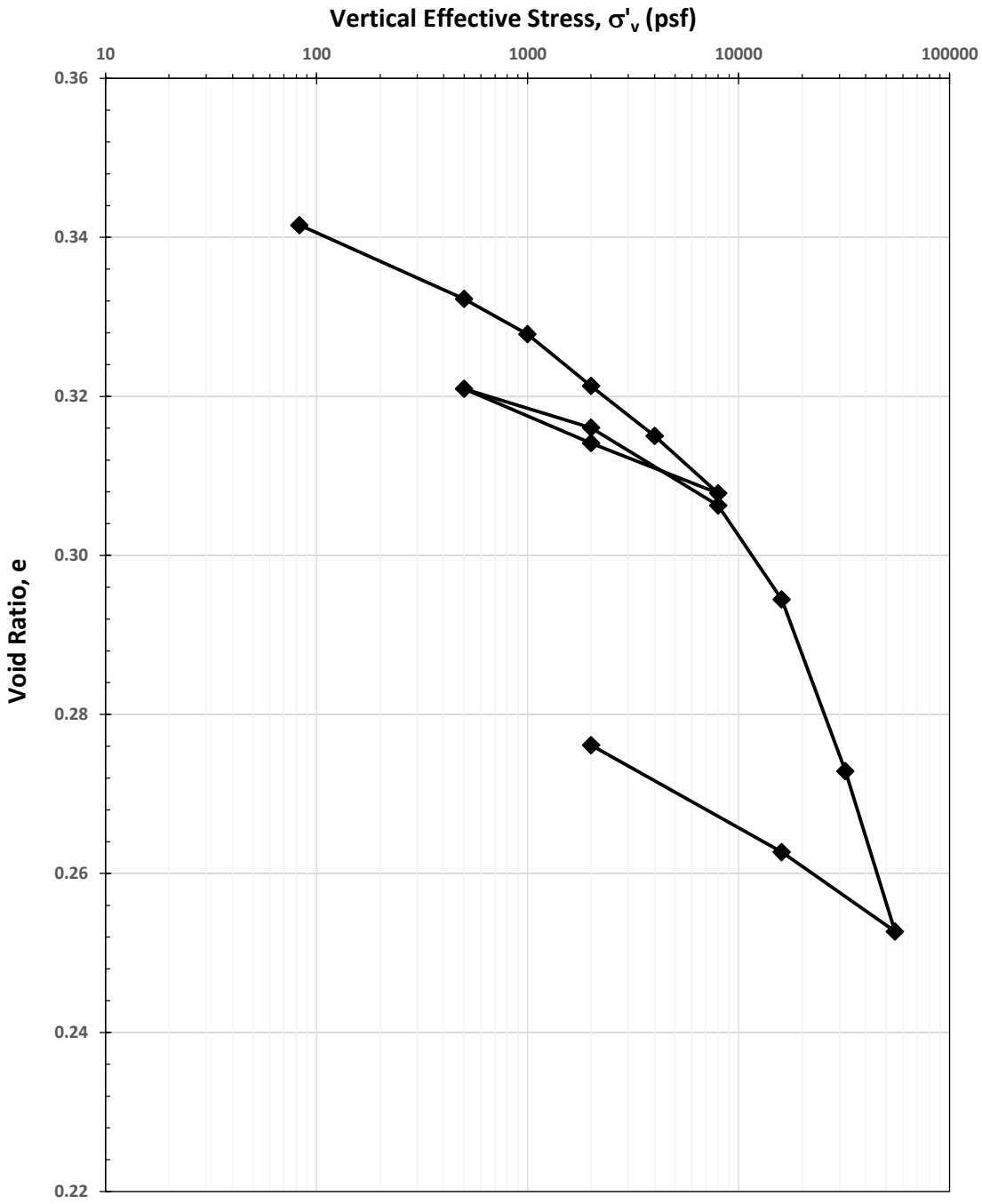
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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-28 at 9 ft	**Test Date:**	5/21/25-6/5/25



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One-Dimensional Consolidation Properties of Soil Appendix

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Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-28 at 9 ft	**Test Date:**	5/21/25-6/5/25





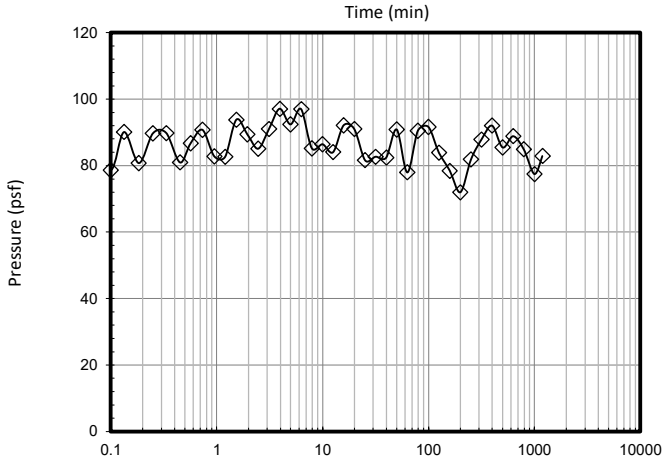
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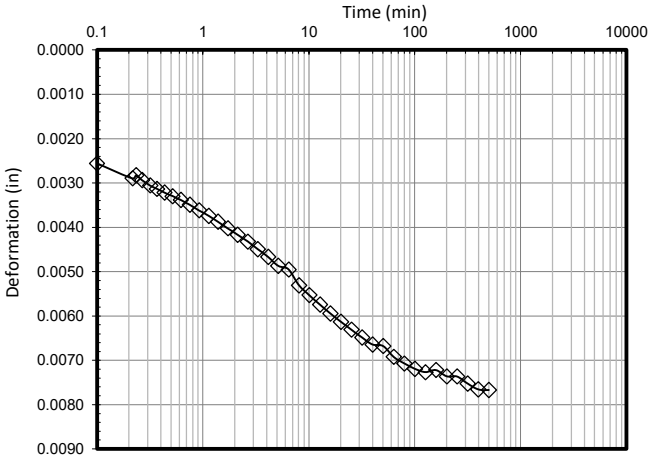
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-28 at 9 ft	**Test Date:**	5/21/25-6/5/25

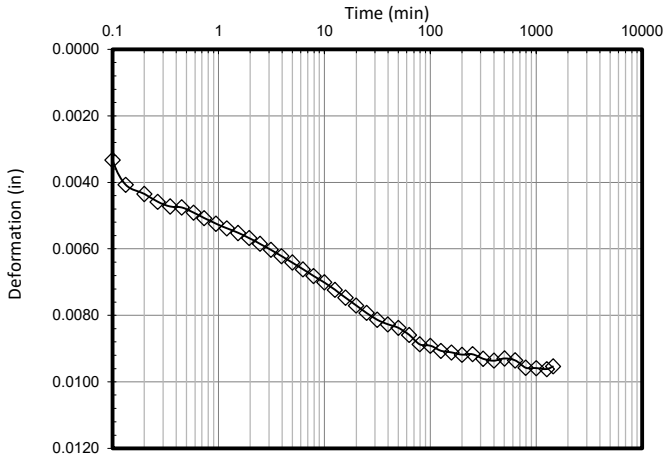
Swell Pressure Measurement



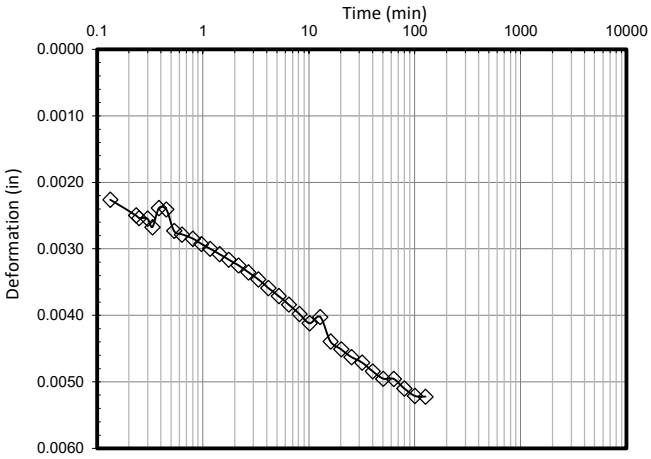
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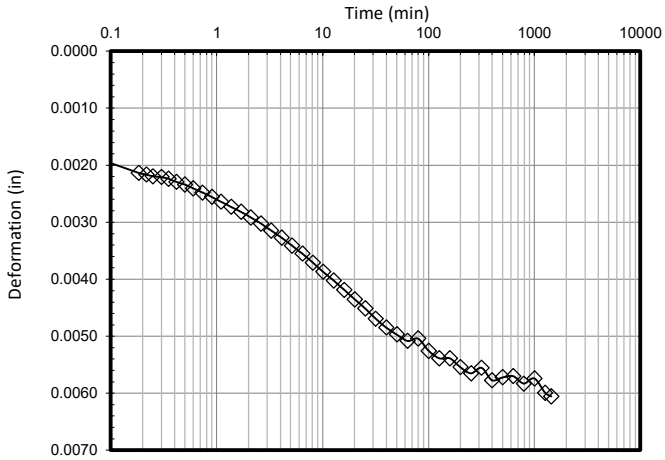
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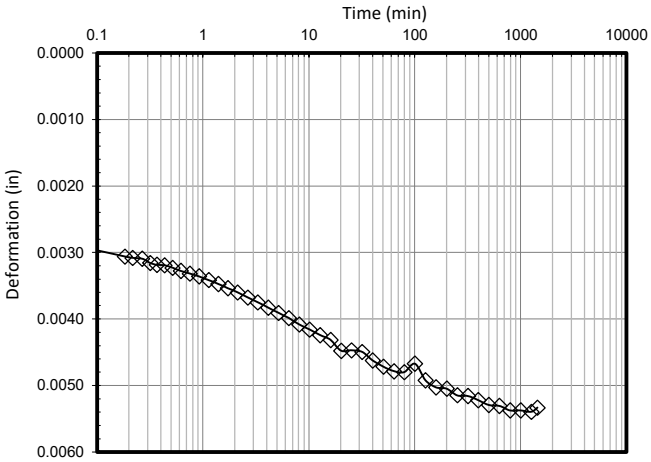
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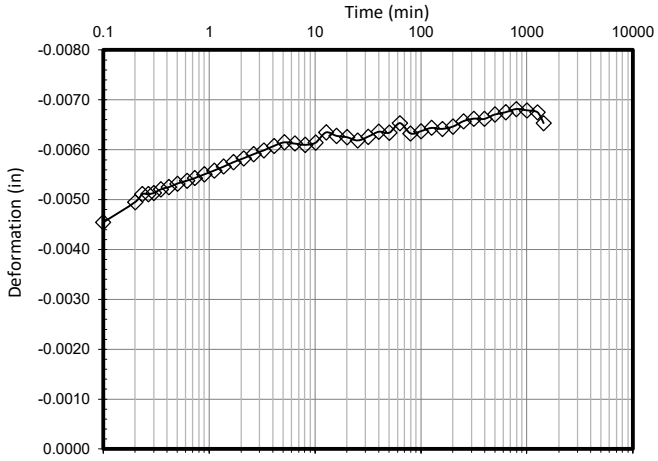


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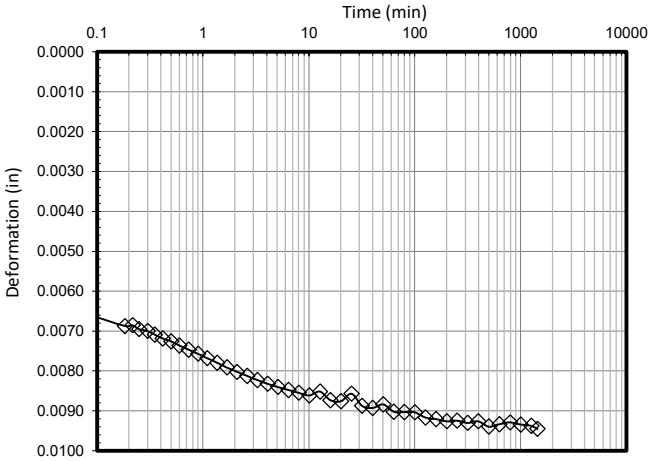
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-28 at 9 ft	**Test Date:**	5/21/25-6/5/25

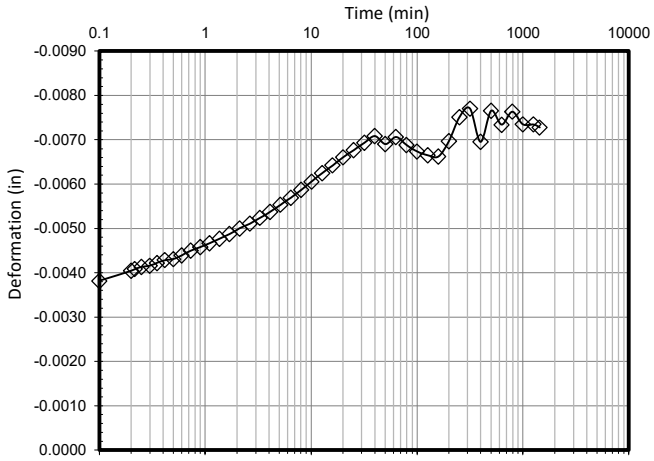
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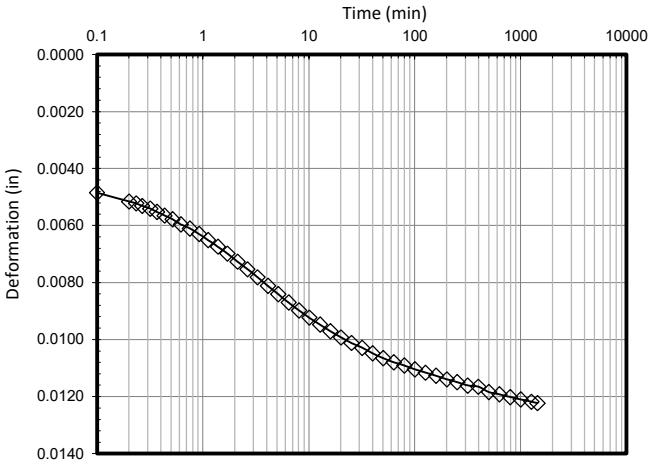
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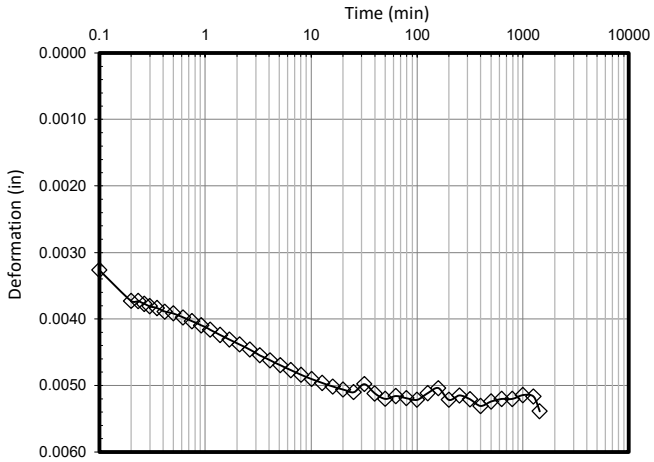
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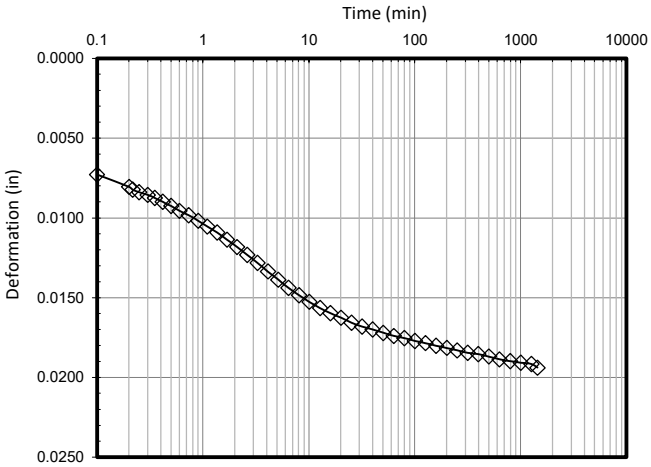
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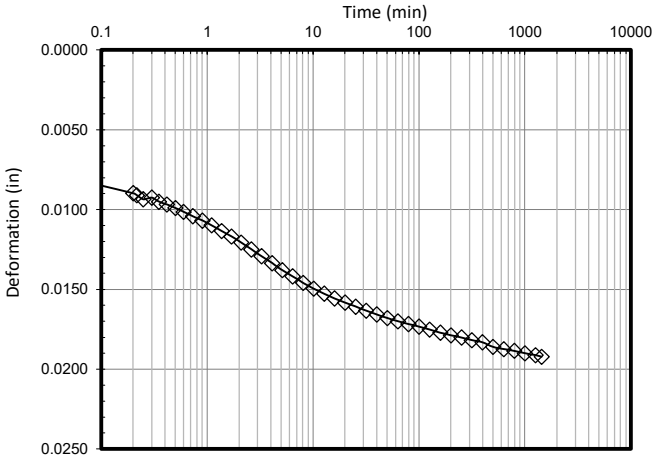


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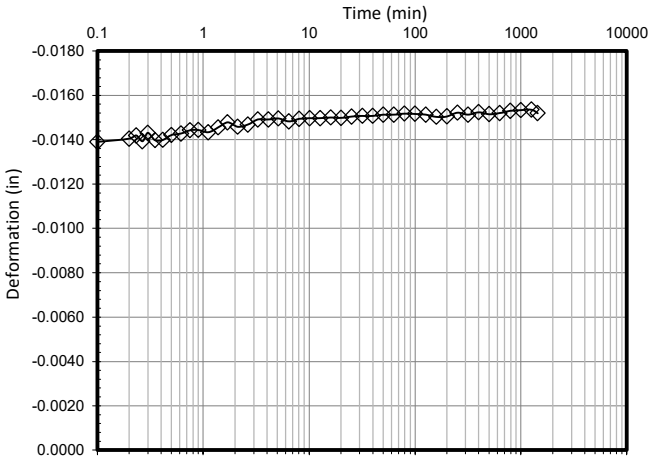
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-28 at 9 ft	**Test Date:**	5/21/25-6/5/25

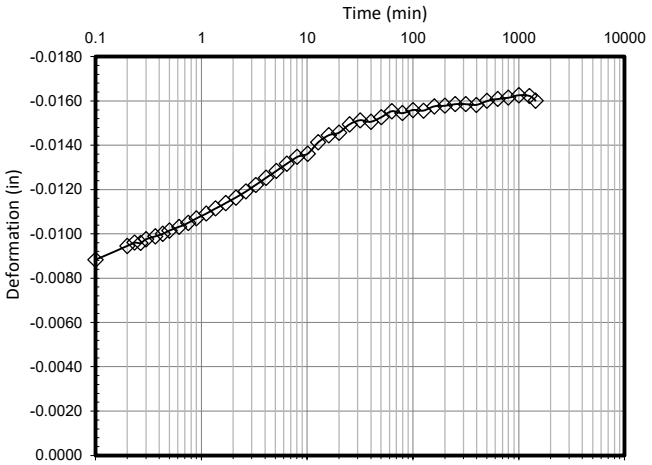
55000-psf Load



16000-psf Load



2000-psf Load



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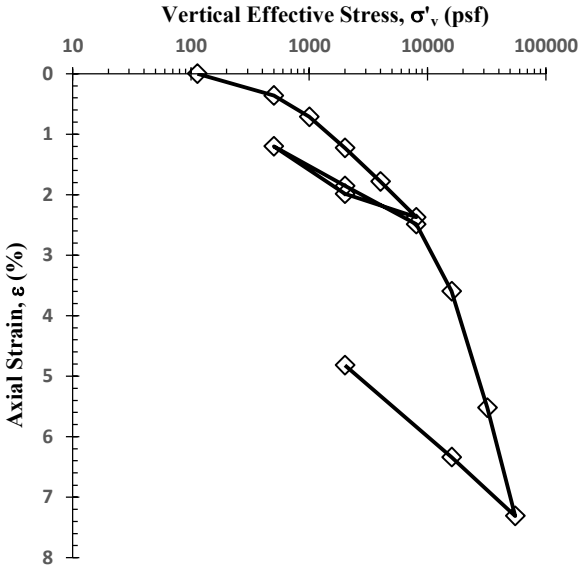
One-Dimensional Consolidation Properties of Soil

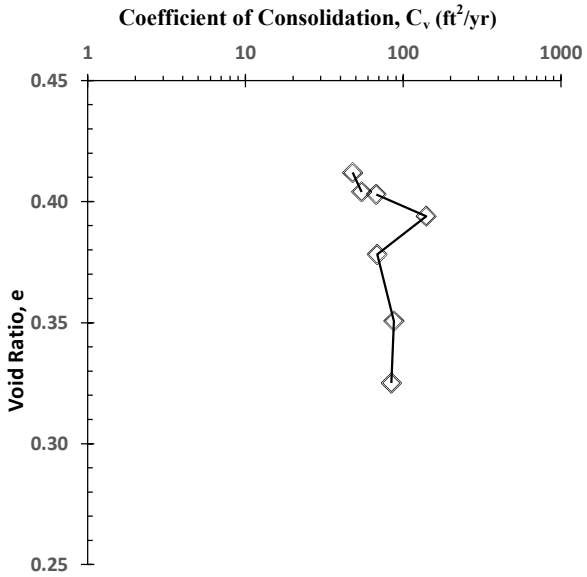
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: GEO-32 at 9 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/21/25-6/5/25

Specimen Conditions	
Initial Specimen Water Content (%)	15.5
Final Specimen Water Content (%)	13.5
Initial Specimen Height (in)	0.904
Final Specimen Height (in)	0.861
Initial Dry Unit Weight, g_o (pcf)	117.9
Final Dry Unit Weight, g_f (pcf)	123.8
Initial Void Ratio, e_o	0.430
Final Void Ratio, e_f	0.361
Initial Degree of Saturation (%)	97.5
Preconsolidation Pressure, p'_c (psf)	9600
"Swell Pressure" (psf)	113

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.494 inches





σ'_v (psf)	113	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	-	47.8	54.5	-	-	-	67.4	139.8
Axial Strain (%)	0.00	0.36	0.71	1.23	1.78	2.37	1.98	1.20	1.86	2.49
e	0.430	0.424	0.419	0.412	0.404	0.396	0.401	0.412	0.403	0.394

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	68.3	87.5	84.2	-	-
Axial Strain (%)	3.59	5.52	7.31	6.34	4.82
e	0.378	0.351	0.325	0.339	0.361

Compression Index, C_c	0.109
Recompression Index, C_r	0.016
Swell Index, C_s (1st Rebound)	0.014
Swell Index, C_s (2nd Rebound)	0.025

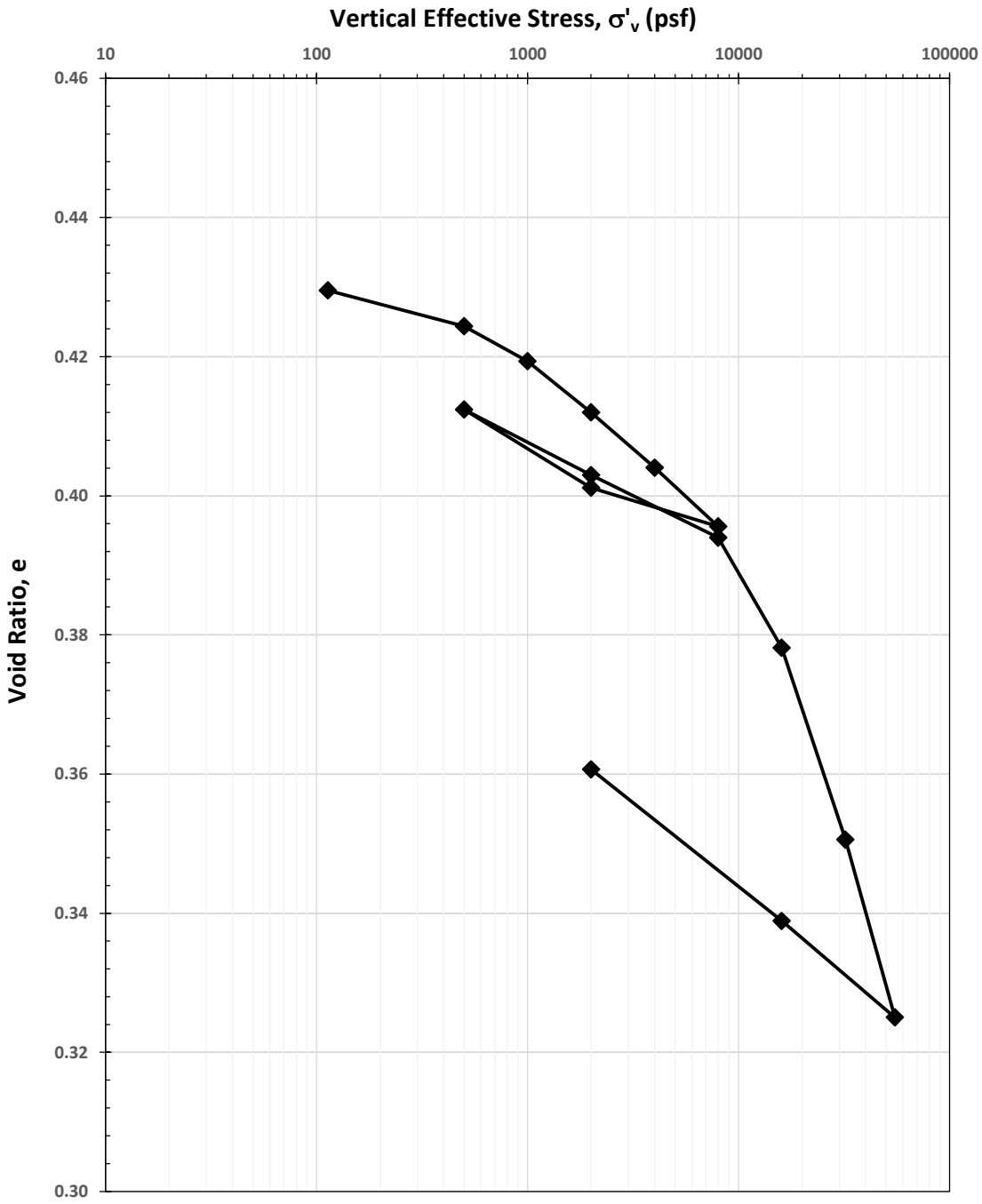
Huamiao Cao, P.E. 6/6/25
Analysis & Quality Review/Date

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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-32 at 9 ft	**Test Date:**	5/21/25-6/5/25



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Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-32 at 9 ft	**Test Date:**	5/21/25-6/5/25





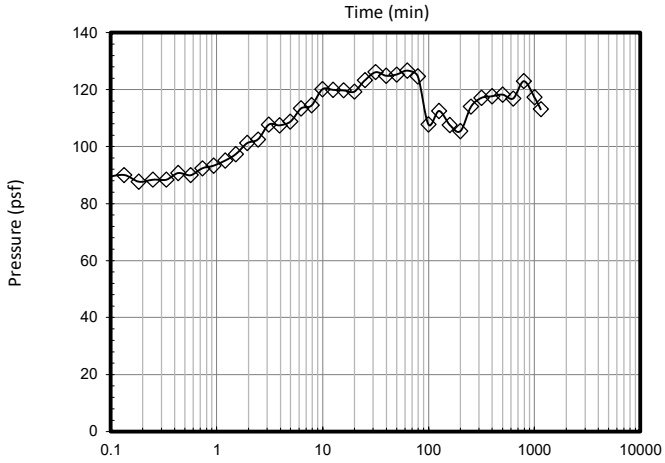
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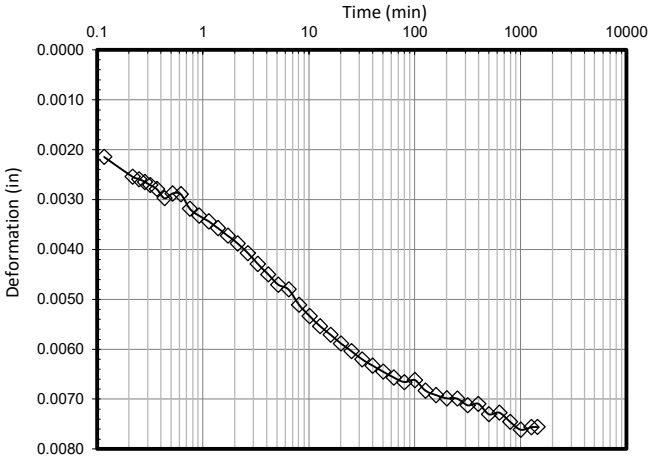
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-32 at 9 ft	**Test Date:**	5/21/25-6/5/25

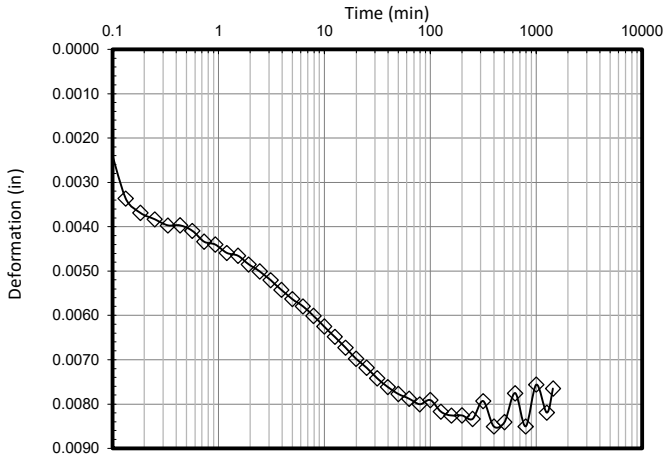
Swell Pressure Measurement



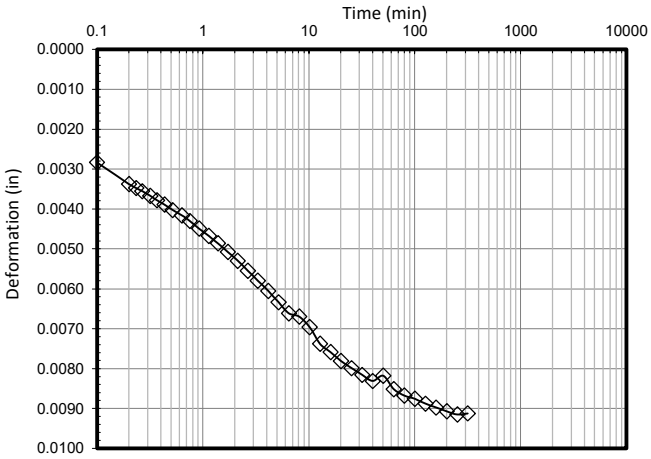
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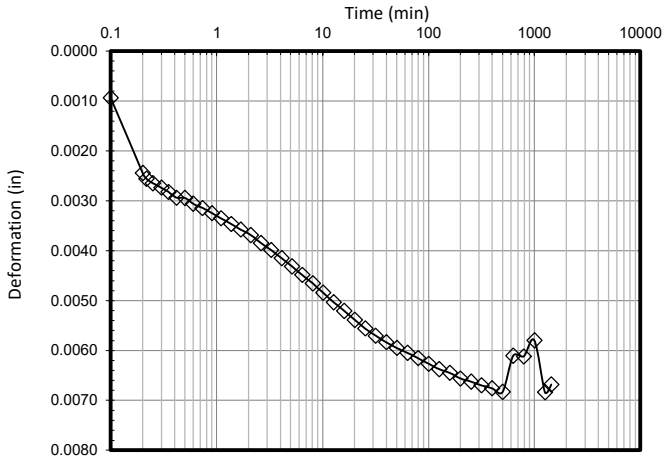
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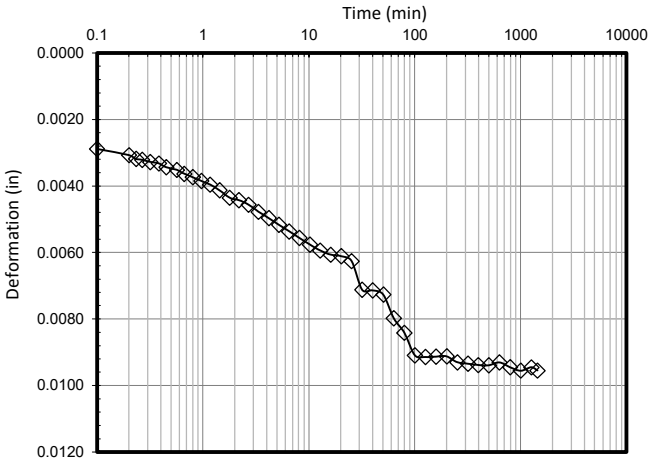
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1000-psf Load



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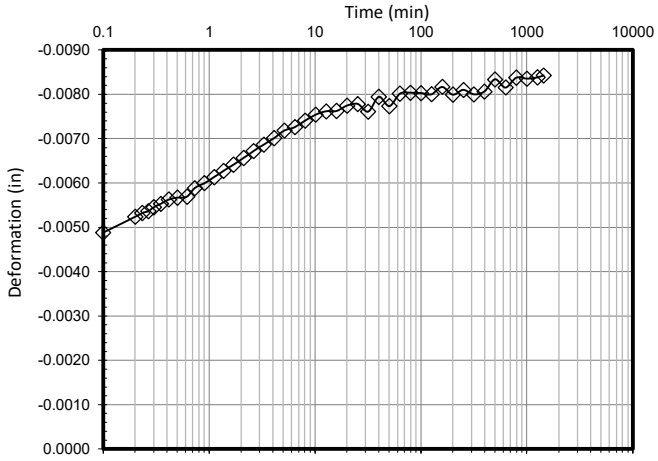


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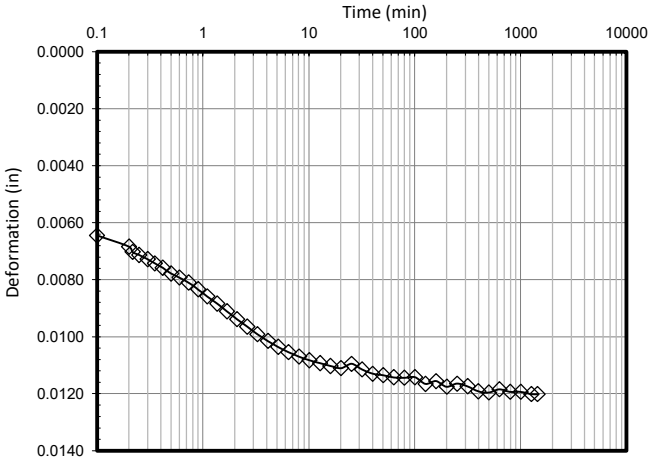
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-32 at 9 ft	**Test Date:**	5/21/25-6/5/25

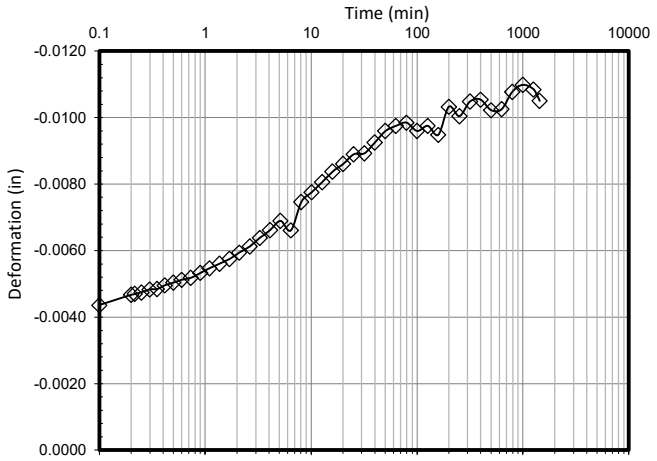
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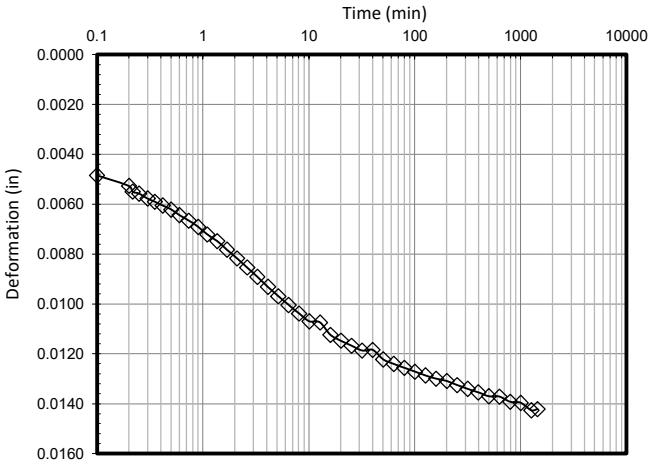
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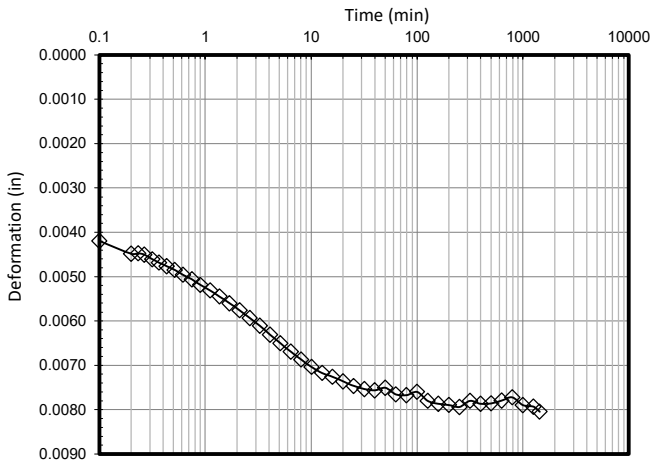
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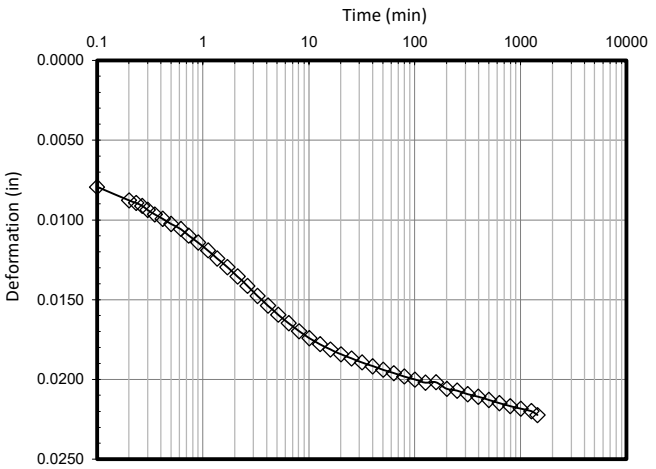
16000-psf Load



2000-psf Load



32000-psf Load

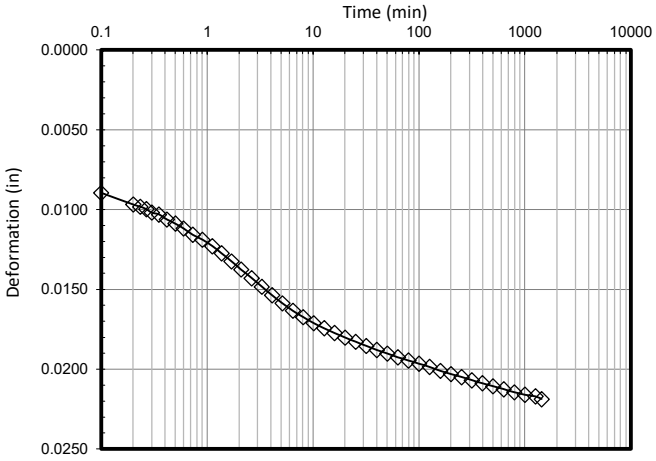


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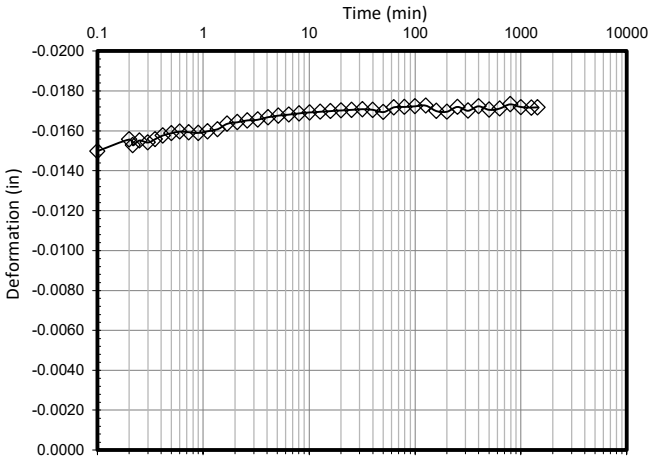
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	GEO-32 at 9 ft	**Test Date:**	5/21/25-6/5/25

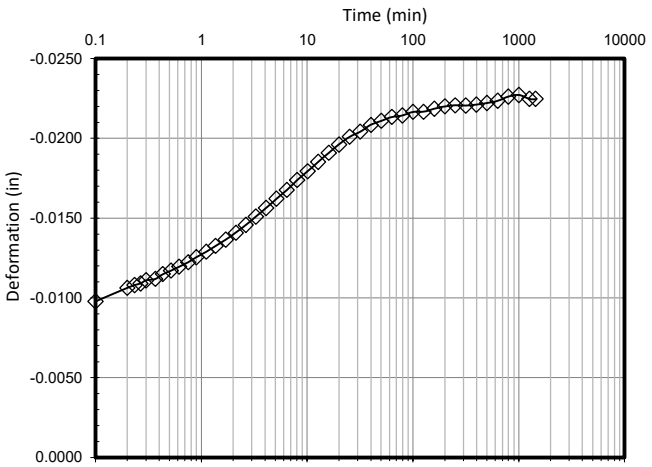
55000-psf Load



16000-psf Load



2000-psf Load



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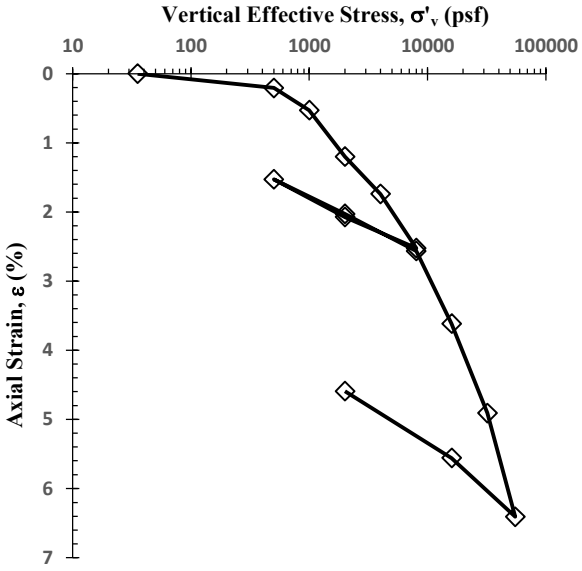
One-Dimensional Consolidation Properties of Soil

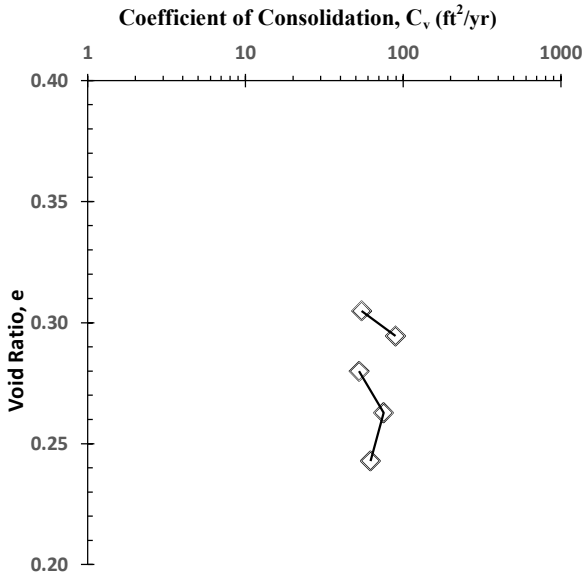
Client: RRC Power & Energy, LLC
Project Name: Coles Wind Project
Sample ID: OM-1 at 3 ft

Beyond Project No.: GE2502017
Test Method: ASTM D2435, Method A
Test Date: 5/21/25-6/5/25

Specimen Conditions	
Initial Specimen Water Content (%)	11.4
Final Specimen Water Content (%)	10.4
Initial Specimen Height (in)	0.887
Final Specimen Height (in)	0.846
Initial Dry Unit Weight, g_o (pcf)	126.9
Final Dry Unit Weight, g_f (pcf)	133.0
Initial Void Ratio, e_o	0.328
Final Void Ratio, e_f	0.267
Initial Degree of Saturation (%)	93.8
Preconsolidation Pressure, p'_c (psf)	8500
"Swell Pressure" (psf)	35

Specimen was trimmed using a trimming turntable.
Specimen was inundated with tap water during testing.
Coefficient of Consolidation was determined using the Log Time Method. Loading increment duration was 24 hours. The calculation was included the machine deflections that were measured in each loading step.
G_s (assumed) 2.70
Preconsolidation pressure was determined by using the Casagrande construction technique
Compression Index, C_c & Recompression Index, C_r calculated in accordance with void ratio (Δe).
Specimen Diameter: 2.497 inches





σ'_v (psf)	35	500	1000	2000	4000	8000	2000	500	2000	8000
C_v (ft^2/yr)	-	-	-	-	54.6	89.5	-	-	-	-
Axial Strain (%)	0.00	0.21	0.53	1.20	1.74	2.52	2.07	1.53	2.03	2.57
e	0.328	0.325	0.321	0.312	0.305	0.294	0.300	0.308	0.301	0.294

σ'_v (psf)	16000	32000	55000	16000	2000
C_v (ft^2/yr)	52.5	75.1	61.9	-	-
Axial Strain (%)	3.62	4.91	6.41	5.56	4.59
e	0.280	0.263	0.243	0.254	0.267

Compression Index, C_c	0.085
Recompression Index, C_r	0.011
Swell Index, C_s (1st Rebound)	0.011
Swell Index, C_s (2nd Rebound)	0.017

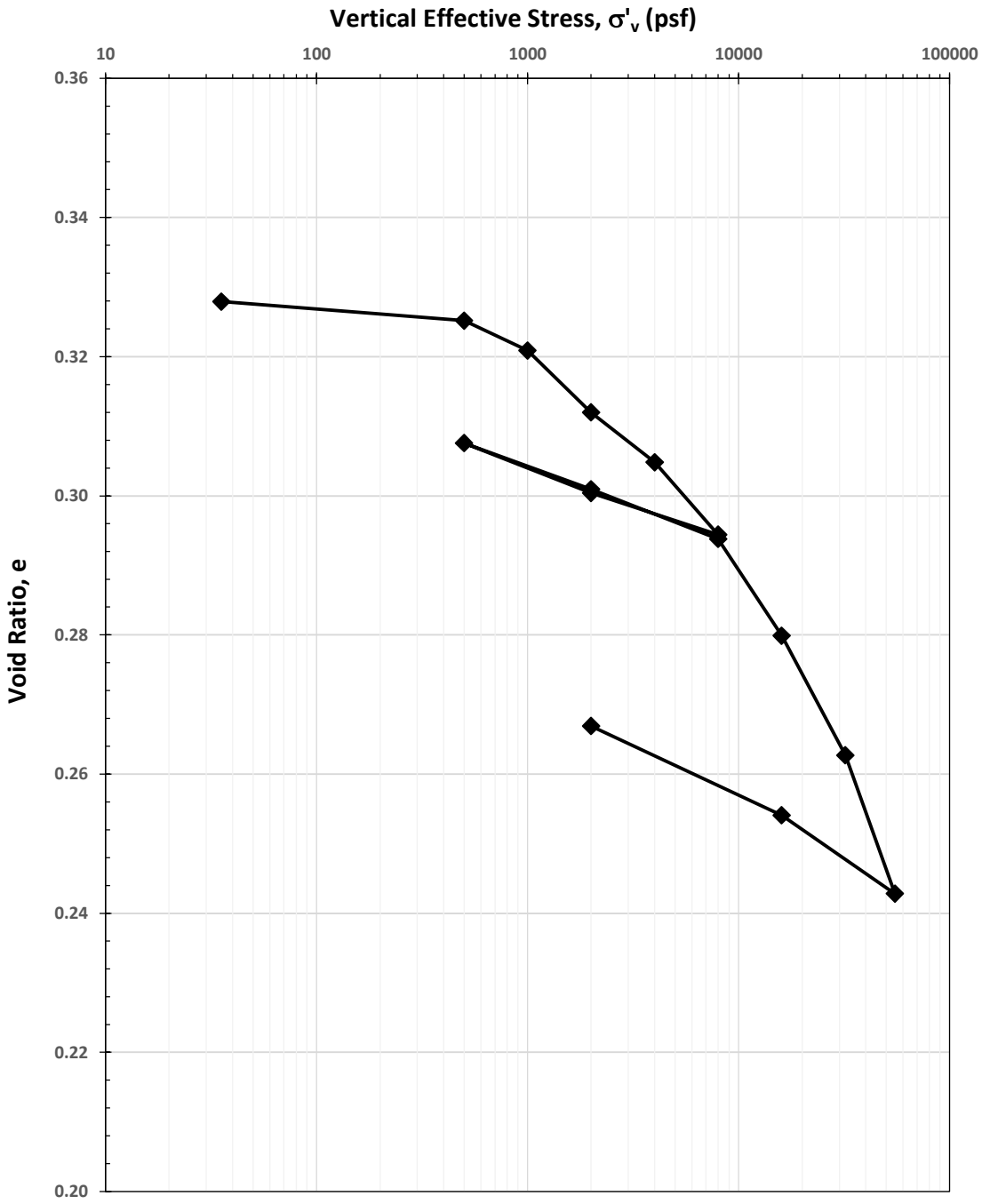
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One-Dimensional Consolidation Properties of Soil

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-6/5/25



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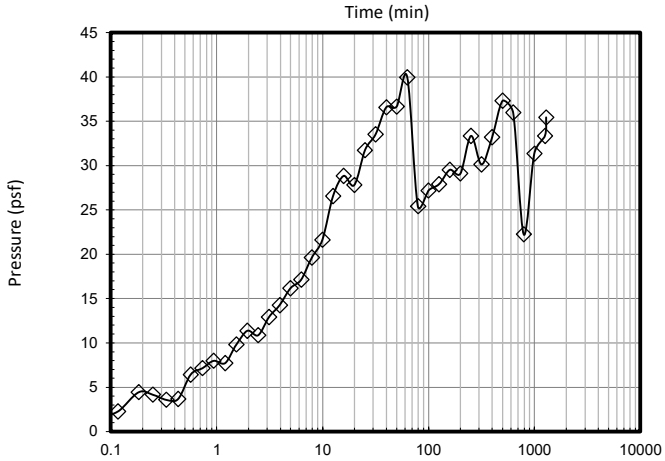
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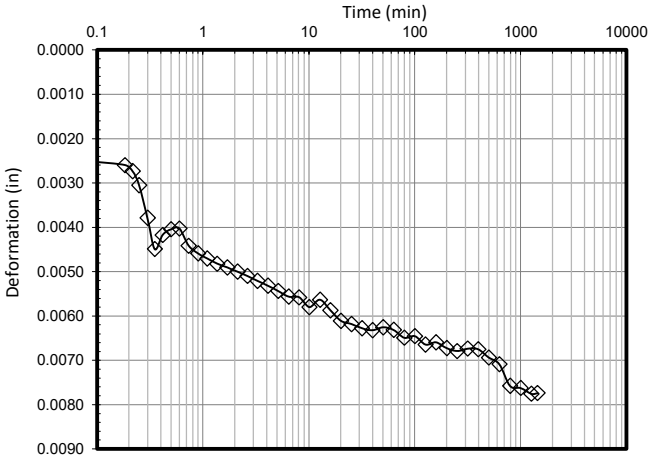
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Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-6/5/25

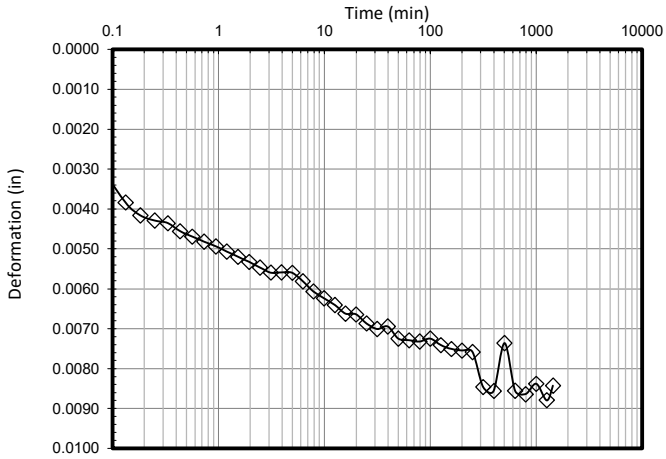
Swell Pressure Measurement



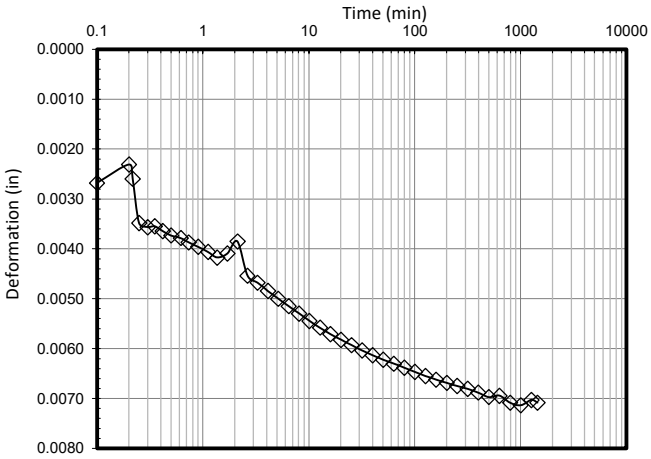
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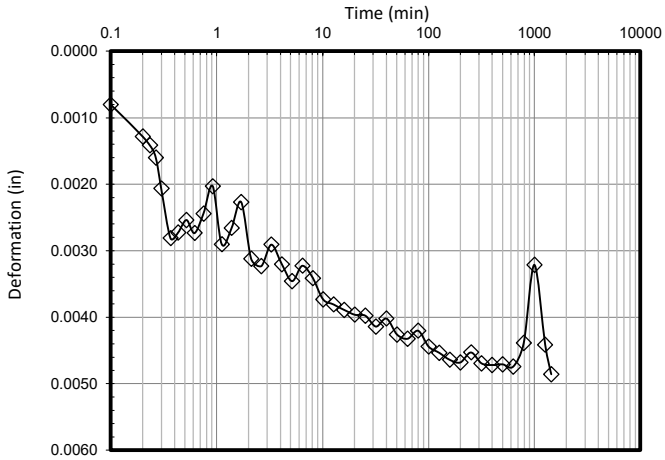
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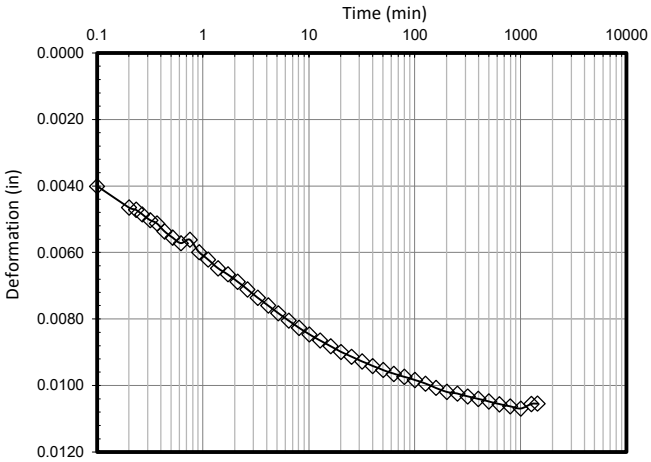
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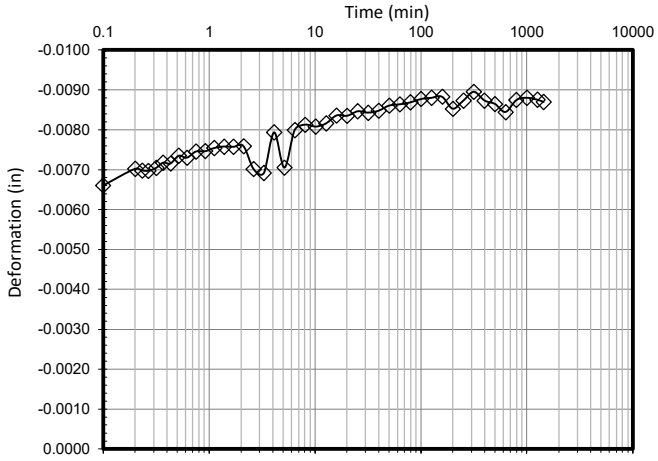


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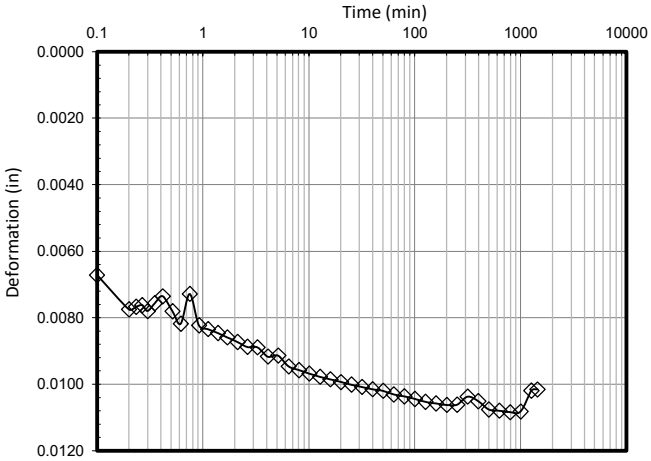
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-6/5/25

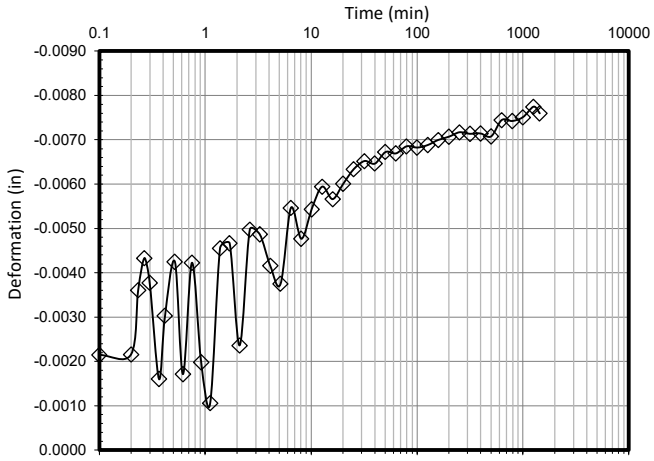
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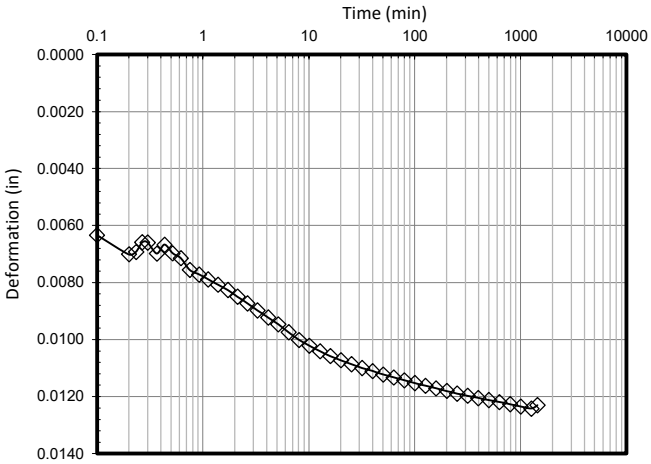
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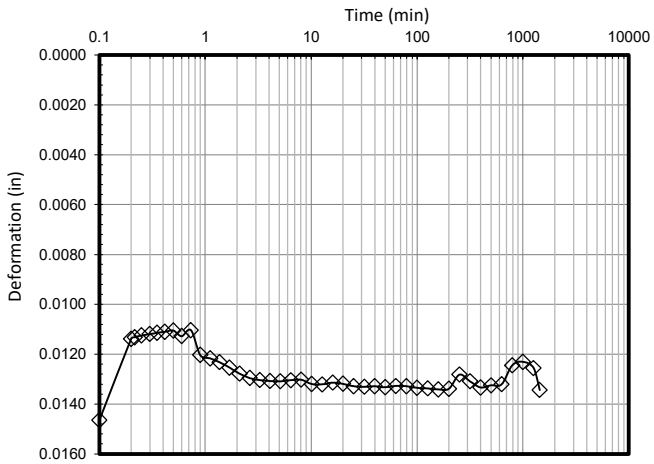
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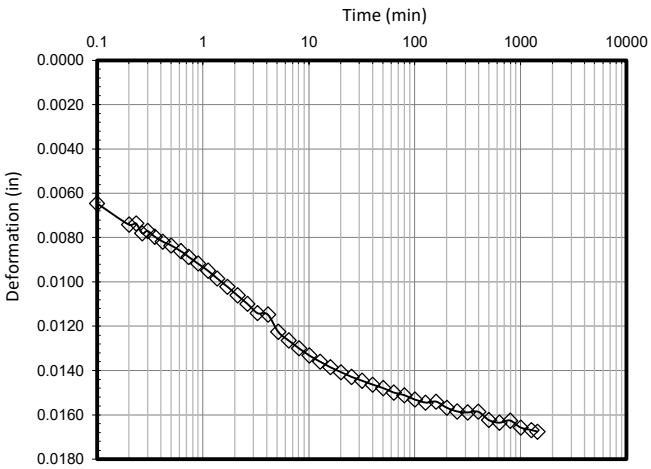
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2000-psf Load



32000-psf Load

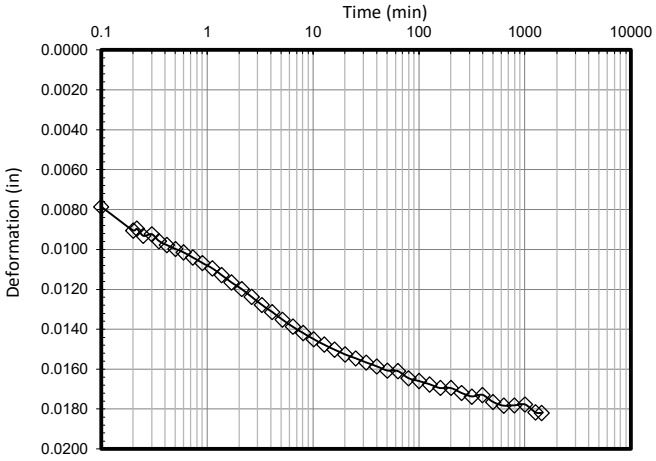


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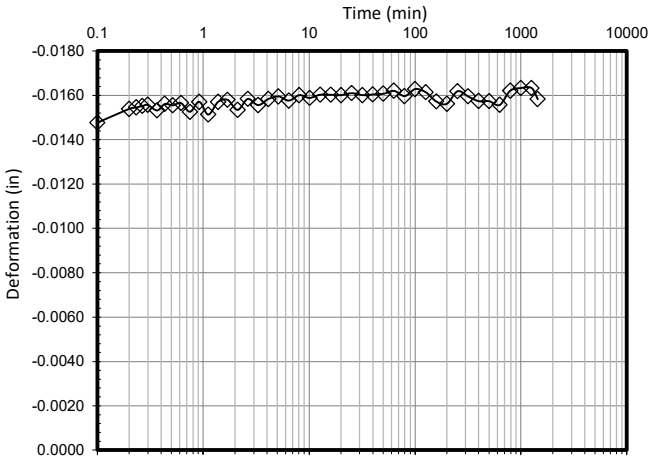
One-Dimensional Consolidation Properties of Soil Appendix

Client:	RRC Power & Energy, LLC	**Beyond Project No.:**	GE2502017
Project Name:	Coles Wind Project	**Test Method:**	ASTM D2435, Method A
Sample ID:	OM-1 at 3 ft	**Test Date:**	5/21/25-6/5/25

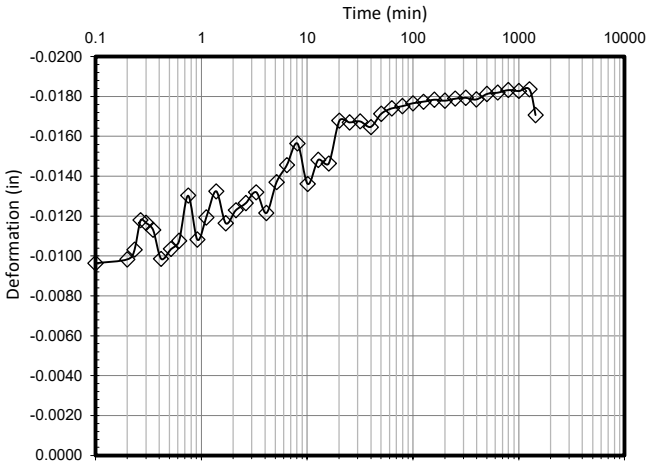
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16000-psf Load



2000-psf Load



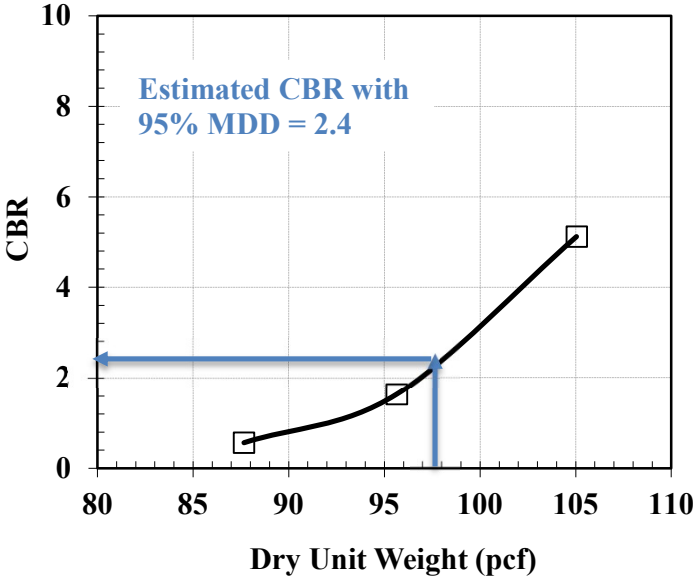
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CBR (California Bearing Ratio) Test

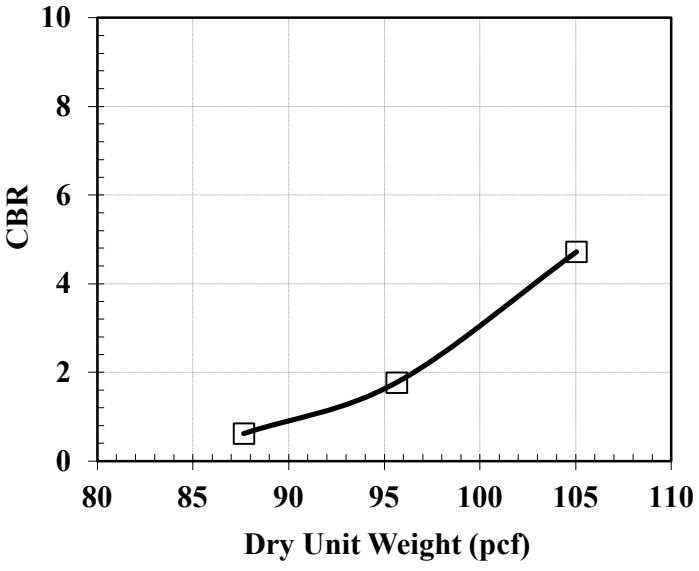
Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No: TR-1a at 1.5-5 ft

Beyond Project No.: GE2502017
Test Method: ASTM D1883
Test Date: 5/27/2025
Rate of Penetration: 0.05 in/min

CBR for 0.100-in Penetration



CBR for 0.200-in Penetration



Initial Conditions			
Specimen No.	1	2	3
Blows per Layer	10	25	60
Surcharge Weight (lbs)	10	10	10
Water Content (%)	18.9	19.0	18.2
Dry Unit Weight (pcf)	87.7	95.6	105.0
Percent Compaction (%)	85.0	92.8	101.9
Final Conditions (soaked)			
Water Content (%) at top 1-in layer after soaking	30.1	29.4	25.0
Swell (% of initial height)	2.7	2.5	1.3
Bearing Ratio of Sample at 0.100 in penetration	0.6	1.6	5.1
Bearing Ratio of Sample at 0.200 in penetration	0.6	1.8	4.7

Note: Soil specimens were molded to a range of densities using 10, 25 and 60 blows at optimum moisture content as per ASTM D 1883 to develop the CBR versus dry density curve. It was allowed the specimens to soak for 96 hrs prior bearing test. Removed the free water and allow the specimens to drain out for 15 min. The 10-lbs surcharge load was placed during bearing test.

HuaMiao Cao, P.E., 5/28/25

Analysis & Quality Review/Date

Specimens prepared and tested by: A.S.

The results shown on this report are for the exclusive use of the client for whom they were obtained and apply only to the sample tested and / or inspected. They are not intended to be indicative of qualities of apparently identical products. The use of our name must recieve prior written approval. Reports must be reproduced in their entirety. Unauthorized use or copying of this document is strictly prohibited by anyone other than the client for the specific project.

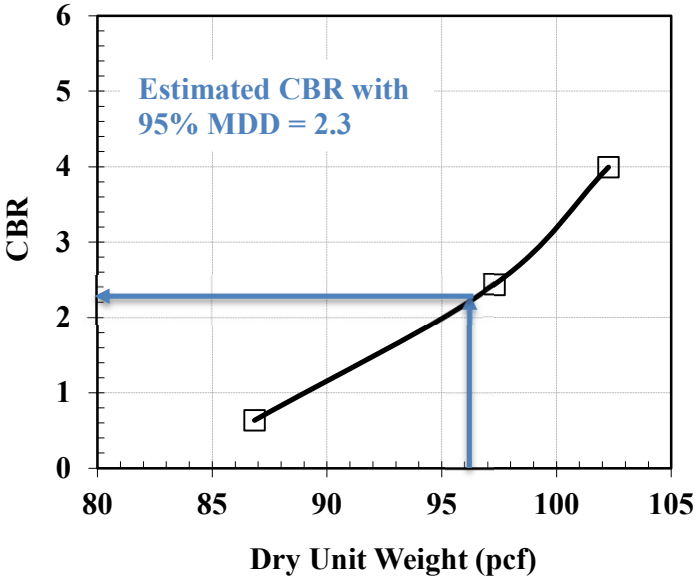
Beyond Engineering & Testing, LLC
3801 Doris Lane, Suite B
Round Rock, TX 78664
(512) 358-6048

CBR (California Bearing Ratio) Test

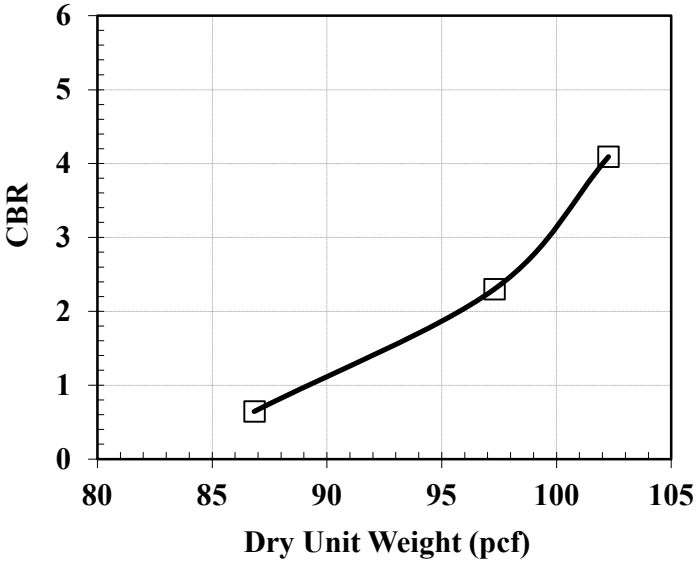
Client: RRC Power & Energy, LLC
Project: Coles Wind Project
Sample No: TR-2 at 1.5-5 ft

Beyond Project No.: GE2502017
Test Method: ASTM D1883
Test Date: 5/27/2025
Rate of Penetration: 0.05 in/min

CBR for 0.100-in Penetration



CBR for 0.200-in Penetration



Initial Conditions			
Specimen No.	1	2	3
Blows per Layer	10	25	60
Surcharge Weight (lbs)	10	10	10
Water Content (%)	20.2	19.2	19.8
Dry Unit Weight (pcf)	86.8	97.3	102.3
Percent Compaction (%)	85.7	96.0	100.9
Final Conditions (soaked)			
Water Content (%) at top 1-in layer after soaking	33.8	28.0	24.9
Swell (% of initial height)	2.2	1.7	1.3
Bearing Ratio of Sample at 0.100 in penetration	0.6	2.4	4.0
Bearing Ratio of Sample at 0.200 in penetration	0.6	2.3	4.1

Note: Soil specimens were molded to a range of densities using 10, 25 and 60 blows at optimum moisture content as per ASTM D 1883 to develop the CBR versus dry density curve. It was allowed the specimens to soak for 96 hrs prior bearing test. Removed the free water and allow the specimens to drain out for 15 min. The 10-lbs surcharge load was placed during bearing test.

HuaMiao Cao, P.E., 5/28/25
Analysis & Quality Review/Date
Specimens prepared and tested by: A.S.

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SUMMARY OF LABORATORY RESULTS

RRC Power & Energy, LLC
810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78681
Telephone: (512) 992-2087

CLIENT: Apex Clean Energy
PROJECT: Coles Wind Project
LOCATION: Coles County, IL
NUMBER: GE2502017

Borehole	Depth (ft)	USCS	Water Content (%)	Dry Unit Weight (pcf)	< No. 200 (%)	LL	PL	PI	Compressive Strength (tsf)	Strain at Failure (%)	Confining Pressure (psi)	Chlorides (%/weight)	Sulfates (%/weight)	pH	Minimum Resistivity (ohm-cm)
GEO-02	1.0		16									0.0082	0.0088	7.1	2,483
GEO-02	9.0	CL	16	115	58	22	11	11	0.40	14.8	7.5				
GEO-21	1.0		14									0.0123	0.0011	8.0	2,589
GEO-21	9.0	CL	13	119	93	30	22	8	2.38	14.8	7.5				
GEO-22	1.0		14									0.0099	0.0070	7.6	2,257
GEO-22	12.0	CL	13	120	62	24	12	12	1.71	14.8	10.0				
GEO-23	1.0	CL	21		85	49	21	28				0.0100	0.0021	5.9	1,752
GEO-25	1.0	SC	18		33	32	17	15				0.0097	0.0023	7.7	3,350
GEO-28	1.0		13									0.0073	0.0131	7.7	2,273
GEO-28	9.0	CL	13	125	62	31	15	16	3.60	14.6	7.5				
GEO-32	1.0	CL	22		70	33	15	18				0.0086	0.0016	7.4	3,395
GEO-32	9.0	CL	14	123	75	23	12	11	2.08	14.8	7.5				
OM-1	3.0	CL	18	114	58	23	12	11	1.47	14.8	2.5				
OM-1	9.0		12												
OM-2	1.0		23												
OM-2	10.5	CL	14	123	68	25	14	11	2.98	14.8	8.5				
TR-1a	1.5	CL	27		89	47	18	29				0.0097	0.0022	6.7	1,461
TR-2	1.5	CL	25		93	47	18	29				0.0101	0.0019	6.2	2,102

ND Not Detected; **D** Diluted;
*Denotes Total Unit Weight

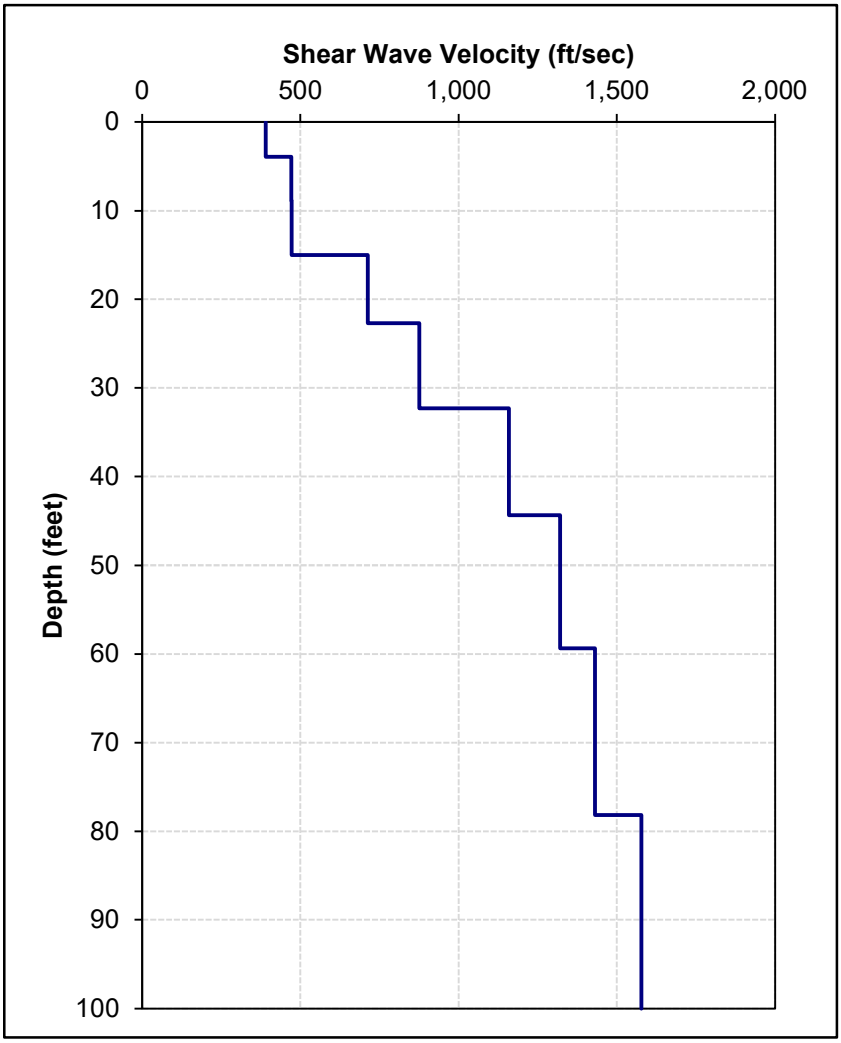
www.RRCcompanies.com

810 Hesters Crossing Rd, Suite 120
Round Rock, TX 78661
512.992.2087

APPENDIX C

Multi-Channel Analysis of Surface Waves (MASW) Survey Results for WTG No. GEO-08

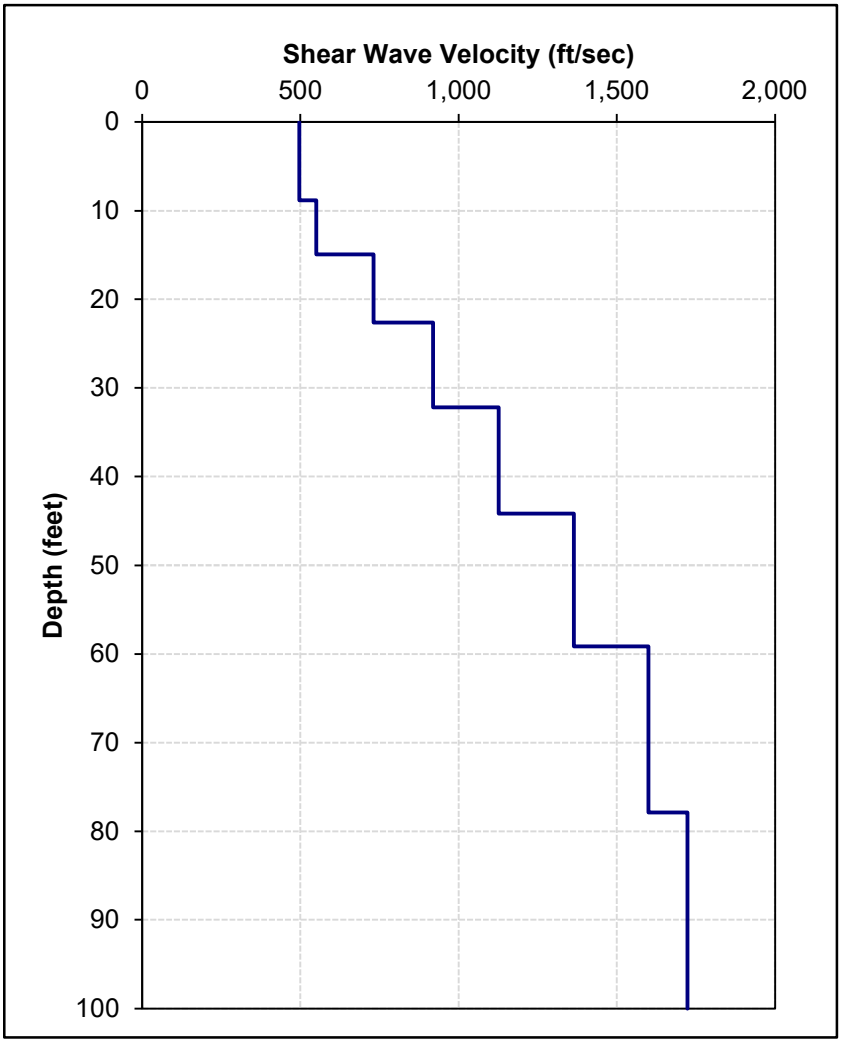
Depth (ft)	Shear Wave Velocity (ft/sec)
3.9	390
8.9	470
15.0	472
22.7	713
32.3	875
44.4	1,159
59.4	1,321
78.2	1,431
100.0	1,577



Note:
1. Data collected on May 19, 2025
2. SurfSeis v. 4.2.4.5 computer software developed by Kansas Geological Survey was used to process the field data.

Multi-Channel Analysis of Surface Waves (MASW) Survey Results for WTG No. GEO-10

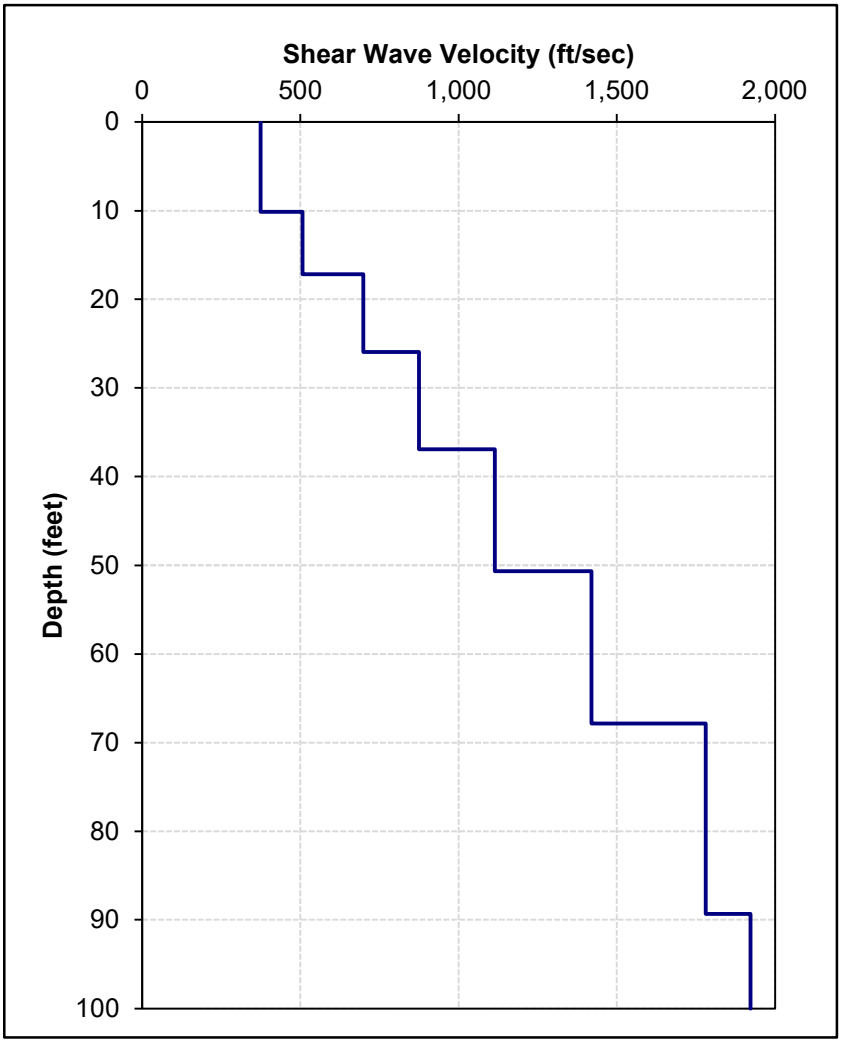
Depth (ft)	Shear Wave Velocity (ft/sec)
3.9	496
8.8	497
15.0	550
22.6	730
32.2	919
44.2	1,126
59.2	1,364
77.9	1,601
100.0	1,723



Note:
1. Data collected on May 19, 2025
2. SurfSeis v. 4.2.4.5 computer software developed by Kansas Geological Survey was used to process the field data.

Multi-Channel Analysis of Surface Waves (MASW) Survey Results for WTG No. GEO-27

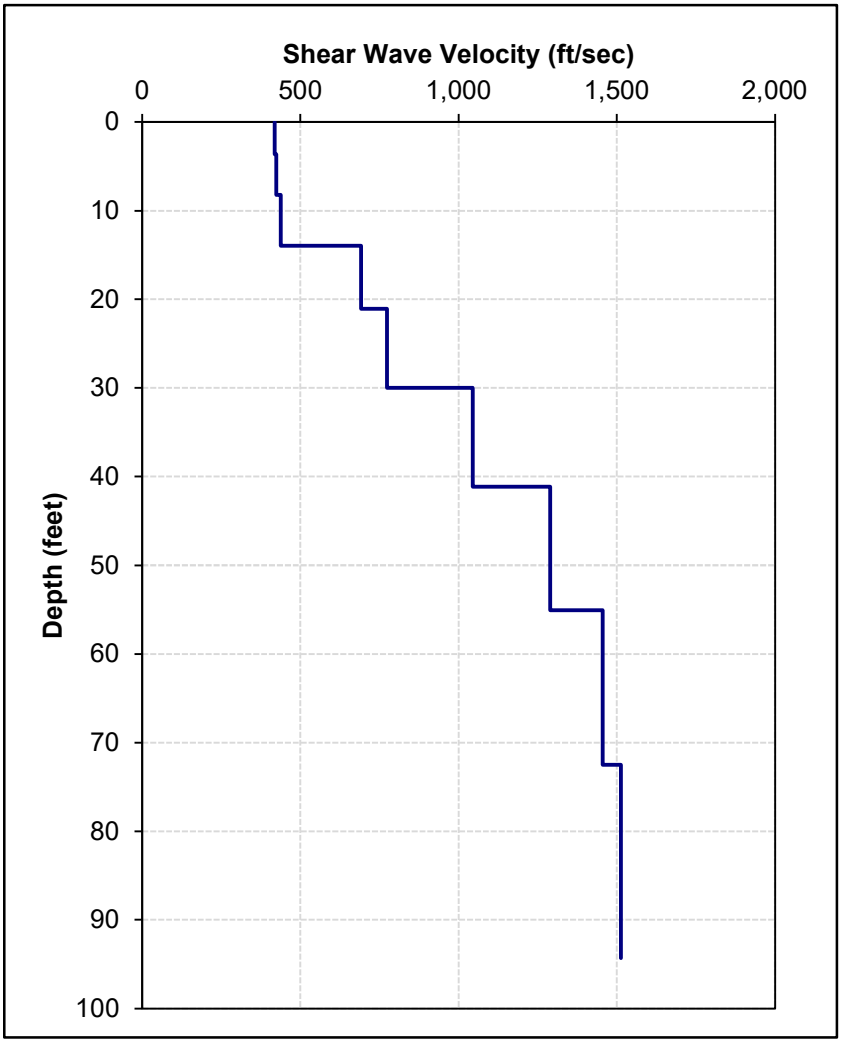
Depth (ft)	Shear Wave Velocity (ft/sec)
4.5	374
10.1	374
17.2	507
26.0	699
36.9	874
50.7	1,114
67.9	1,420
89.3	1,780
100.0	1,923



Note:
1. Data collected on May 19, 2025
2. SurfSeis v. 4.2.4.5 computer software developed by Kansas Geological Survey was used to process the field data.

Multi-Channel Analysis of Surface Waves (MASW) Survey Results for WTG No. GEO-37

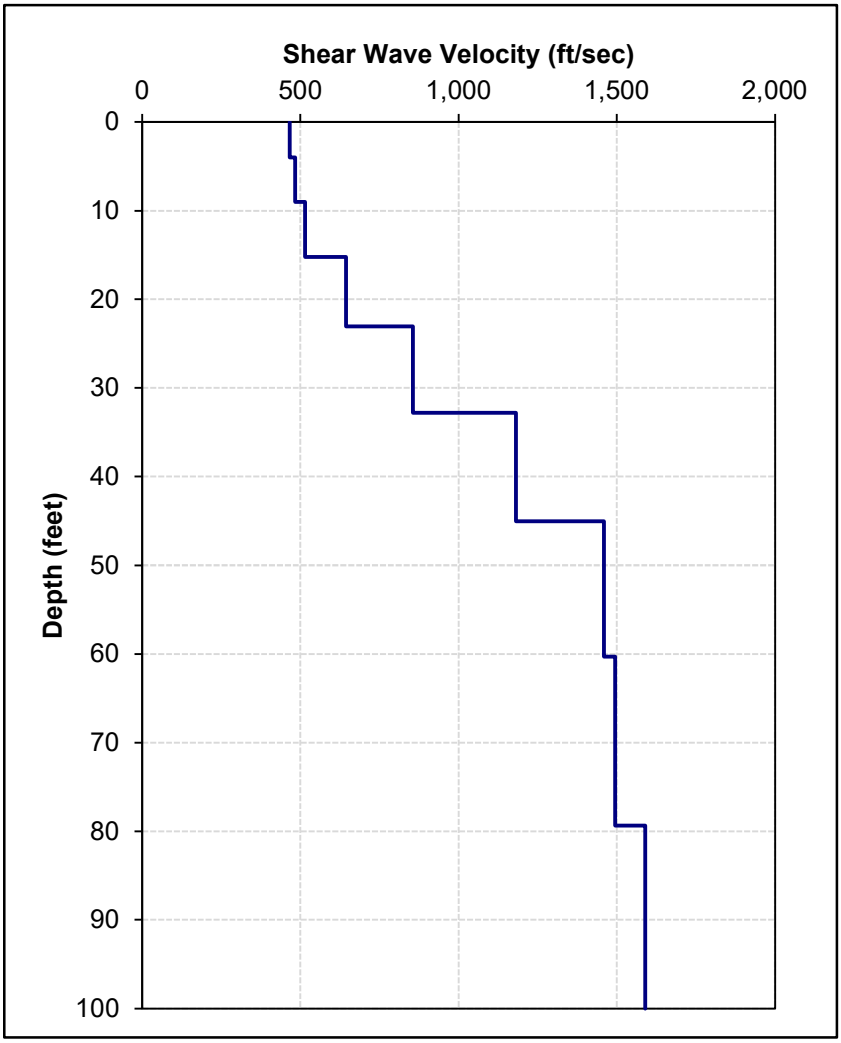
Depth (ft)	Shear Wave Velocity (ft/sec)
3.7	418
8.2	424
13.9	438
21.1	691
30.0	773
41.2	1,045
55.1	1,290
72.5	1,455
94.3	1,513



Note:
1. Data collected on May 19, 2025
2. SurfSeis v. 4.2.4.5 computer software developed by Kansas Geological Survey was used to process the field data.

Multi-Channel Analysis of Surface Waves (MASW) Survey Results for GEO-45

Depth (ft)	Shear Wave Velocity (ft/sec)
4.0	466
9.0	483
15.3	515
23.1	644
32.8	855
45.0	1,181
60.3	1,459
79.4	1,495
100.0	1,590



Note:
1. Data collected on May 19, 2025
2. SurfSeis v. 4.2.4.5 computer software developed by Kansas Geological Survey was used to process the field data.

21239 FM529 Rd., Bldg F
Cypress, TX 77433
info@geothermusa.com
http://www.geothermusa.com

SOIL THERMAL SURVEY AND LABORATORY TESTING
COLES WIND PROJECT
COLES COUNTY, ILLINOIS

JUNE 2025

Prepared for:

RRC Power & Energy, LLC
810 Hesters Crossing Road, Suite 120
Round Rock, TX 78681

Submitted by:

GEOTHERM USA, LLC

Introduction: A field thermal resistivity survey of native soils was performed for the proposed underground power cables at **Coles Wind near Coles County, Illinois.** In-situ thermal resistivity and ambient temperature measurements were conducted at two (2) locations across the project site. The fieldwork was carried out on April 16th, 2025. **RRC** marked the test locations, obtained permits, cleared services, provided a backhoe with operator and collected soil samples.

Field Testing and Soil Sampling: In-situ thermal testing was carried out at two (2) test pit locations. A backhoe was used to dig test pits, and ambient temperature and thermal resistivity measurements were conducted at three (3) depths below the estimated final grade **(Table 1)**. In addition, samples for laboratory testing - moisture content, density and thermal dryout characterization were taken.

In-situ thermal tests were conducted in accordance with the IEEE Standard (**IEEE-442-2017**) using thermal probes and the *Geotherm* **TPA-2000** using a portable power source. All laboratory geotechnical testing was conducted in accordance with **ASTM**. Soil descriptions were provided by **RRC,** and the test locations are referenced by the numbers given by **RRC**.

The field thermal resistivity values were measured at the in-situ soil moisture on that day. Depending on weather and environmental conditions, such as drying due to cable heat or other heat sources, seasonal drying (drought), artificial draining, etc., the soil may be drier at certain times of the year. Therefore, the design thermal resistivity for the native soils should be based on the driest expected conditions.

The test report contains factual information on the subsurface conditions at the specific borehole and test pit locations, and no warrantee is expressed or implied that materials or conditions other than those described may not be encountered along the cable routes.

Laboratory Testing: The tests included the measurement of moisture content, density and thermal dryout characterization (thermal resistivity as a function of moisture content). Bulk samples from 1.5 - 5 ft were reconstituted at greater of the 'optimum' or the 'as received' moisture content, and at 85% and 95% of the standard Proctor dry density **provided by RRC**. All thermal tests were conducted in accordance with IEEE standard442-2017. The test results are given in **Table 2** and the thermal dryout curves are presented in **Figures 1 and 2.** Laboratory thermal resistivity measurements were conducted at the ambient temperature of 22°C.

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Nimesh Patel

Geotherm

TABLE 1 – In-Situ Test Results

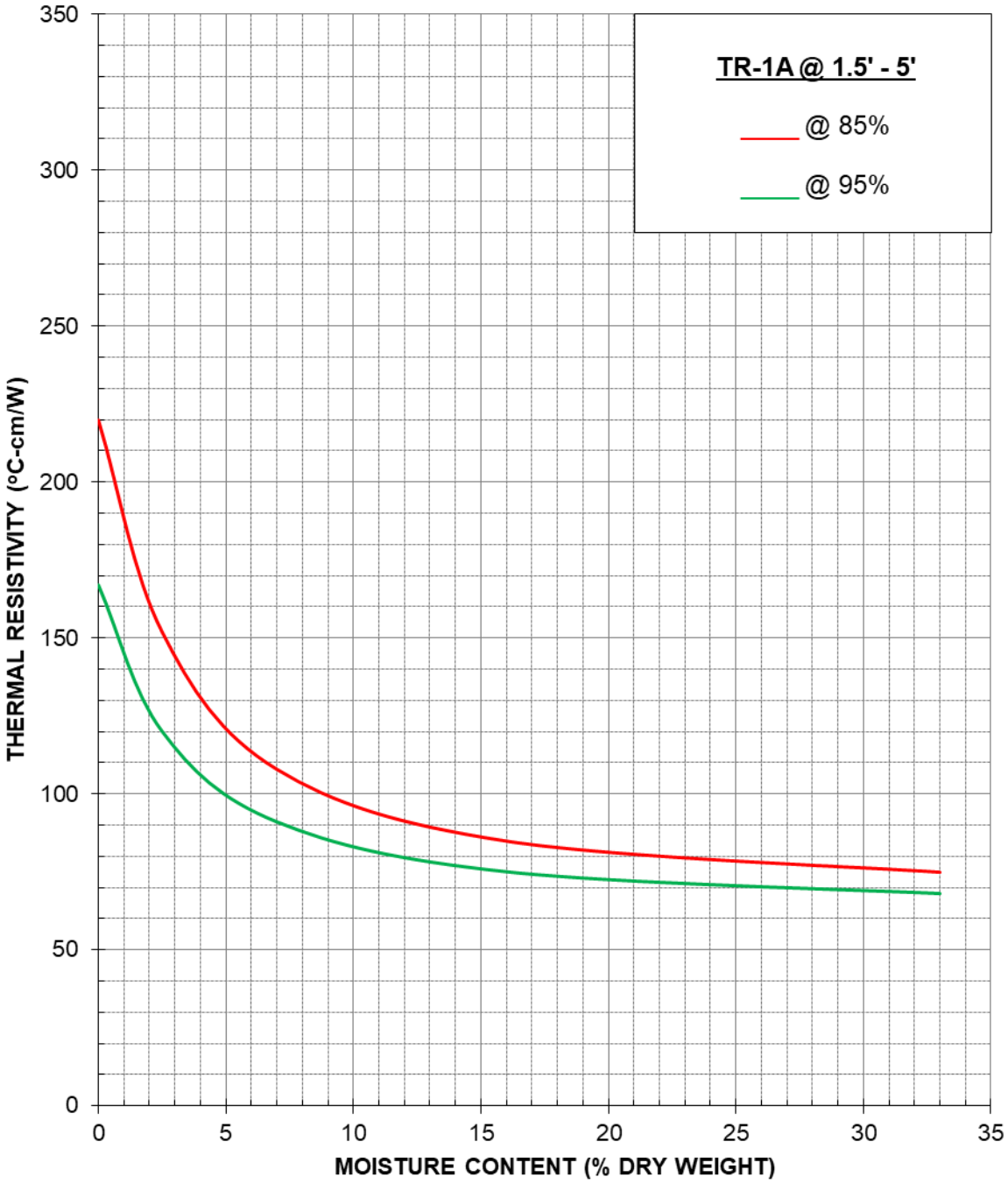
Test Pit Coordinates			Depth (ft.)	Ambient Temperature (°C)	In-situ Thermal Resistivity (°C-cm/W)
Boring ID	Latitude	Longitude			
TR1A	39.616331	-88.208044	2	9.2	79
			3	10.9	66
			4	8.7	67
TR-2	39.569814	-88.152125	2	8.7	74
			3	10.7	63
			4	8.7	69

Table 2 – Laboratory Testing

Sample ID	Depth (ft)	Compaction (%)	Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (lb/ft^3)	Soil Description (RRC)
			Wet	Dry			
TR-1A	1.5 - 5	85	75	220	33	88	Lean Clay (CL)
TR-1A	1.5 - 5	95	68	167	33	98	Lean Clay (CL)
TR-2	1.5 - 5	85	81	240	31	86	Lean Clay (CL)
TR-2	1.5 - 5	95	73	182	31	96	Lean Clay (CL)

Geotherm

THERMAL DRYOUT CURVES



RRC Power & Energy (Project No. GE2502017)

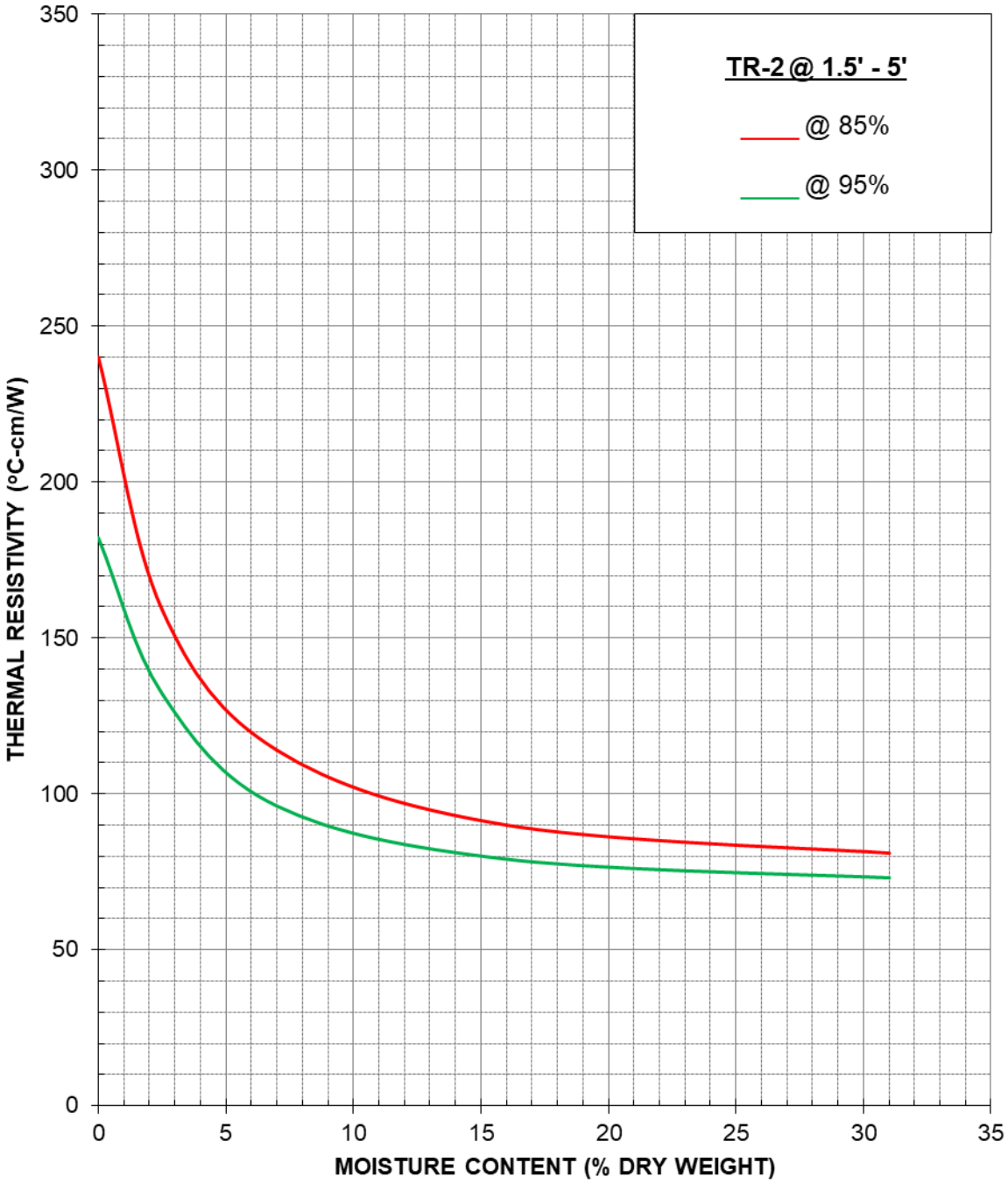
Coles Wind Project – Coles County, IL

Thermal Resistivity Report

June 2025 **Figure 1**

Geotherm

THERMAL DRYOUT CURVES



RRC Power & Energy (Project No. GE2502017)

Coles Wind Project – Coles County, IL

Thermal Resistivity Report

June 2025 **Figure 2**

Foundation Certification

COLES WIND PROJECT

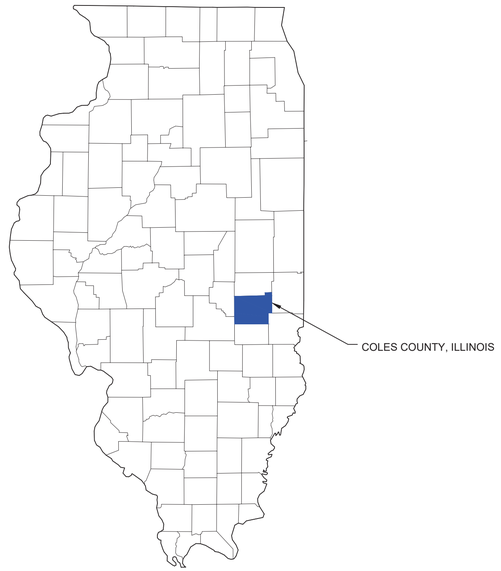
STRUCTURAL PLANS / ISSUED FOR CONSTRUCTION

STRUCTURAL DRAWING LIST			
DRAWING NO.	**DESCRIPTION/TITLE**	**REV**	**DATE**
S-1	COVER SHEET	1	8/22/2025
S-2	81'-0" DIAMETER FOUNDATIONS PLAN SHEET (TYPE GE 6.1-1)	1	8/22/2025
S-3	83'-0" DIAMETER FOUNDATIONS PLAN SHEET (TYPE GE 6.1-2)	1	8/22/2025
S-4	81'-0" & 83'-0" DIAMETER FOUNDATIONS SECTION SHEET (GE 6.1-1 & 2)	1	8/22/2025
S-5	81'-0" & 83'-0" DIAMETER FOUNDATIONS DETAIL SHEET - 1 (GE 6.1-1 & 2)	0	8/12/2025
S-6	81'-0" & 83'-0" DIAMETER FOUNDATIONS DETAIL SHEET - 2 (GE 6.1-1 & 2)	1	8/22/2025
S-7	SPECIFICATION SHEET 1	0	8/12/2025
S-8	SPECIFICATION SHEET 2	0	8/12/2025
S-9	SPECIFICATION SHEET 3	0	8/12/2025
S-10	SPECIFICATION SHEET 4	0	8/12/2025
S-11	TURBINE LOCATION TABLE	0	8/12/2025

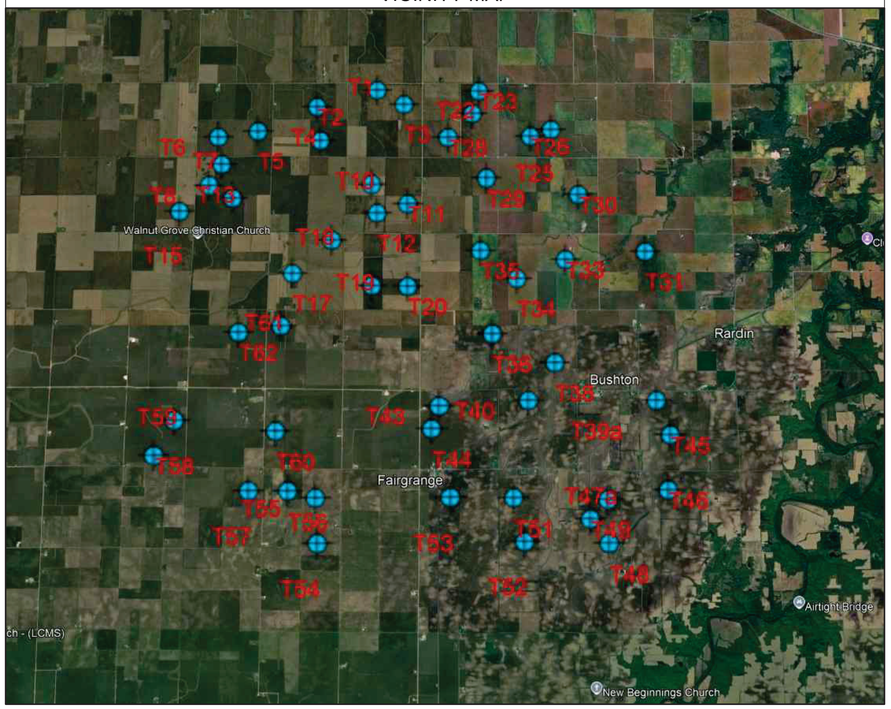
ABBREVIATIONS

ALTER.	ALTERNATE	MAX.	MAXIMUM
B.O.	BOTTOM OF	MPH.	MILES PER HOUR
C.C.	CENTER-TO-CENTER	NOM.	NOMINAL
℄	CENTER LINE	N.T.S.	NOT TO SCALE
CLR.	CLEAR	O.C.	ON CENTER
CU. YDS.	CUBIC YARDS	O.D.	OUTSIDE DIAMETER
EL.	ELEVATION	PED.	PEDESTAL
EQ.	EQUAL	PSF	POUND PER SQUARE FOOT
E.W.	EACH WAY	PCF	POUNDS PER CUBIC FOOT
F.S.	FACTOR OF SAFETY	PSI	POUNDS PER SQUARE INCH
FT	FEET	R	RADIUS
GAL.	GALLON	T&B	TOP AND BOTTOM
I.D.	INSIDE DIAMETER	T.O.C.	TOP OF CONCRETE
LBS.	POUNDS	TYP.	TYPICAL
LB/YD^3	POUNDS PER CUBIC YARD	U.N.O.	UNLESS NOTED OTHERWISE
LB/FT^2/H	POUNDS PER SQUARE FT/HOUR	W/	WITH
kN	KILONEWTON	YDS	YARDS
MIN.	MINIMUM	Ø	DIAMETER

STATE MAP



VICINITY MAP



NORTH

RRC POWER & ENERGY, LLC
810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
PHONE (512) 992-2087
www.RRCcompanies.com

CONFIDENTIAL
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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE
OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED
STRUCTURAL
ENGINEER
STATE OF ILLINOIS

8/22/2025

Troy R Crook

REV	DATE	ISSUE DESCRIPTION
1	8/22/2025	REVISED S-2, S-3, S-4, S-6,
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

COVER SHEET

DRAWING No. S-1

SHEET: REV. 1

CADFILE: COLES DRAWING SET_IFC

LAST SAVED BY: MARCHENKEL ON 8/22/2025 12:33:43 PM

C:\USERS\MARCHENKEL\RRC COMPANIES\STRUCTURAL ENGINEERING - COLES-GE2502017\DRAWING FILES\COLES DRAWING SET_IFC.DWG

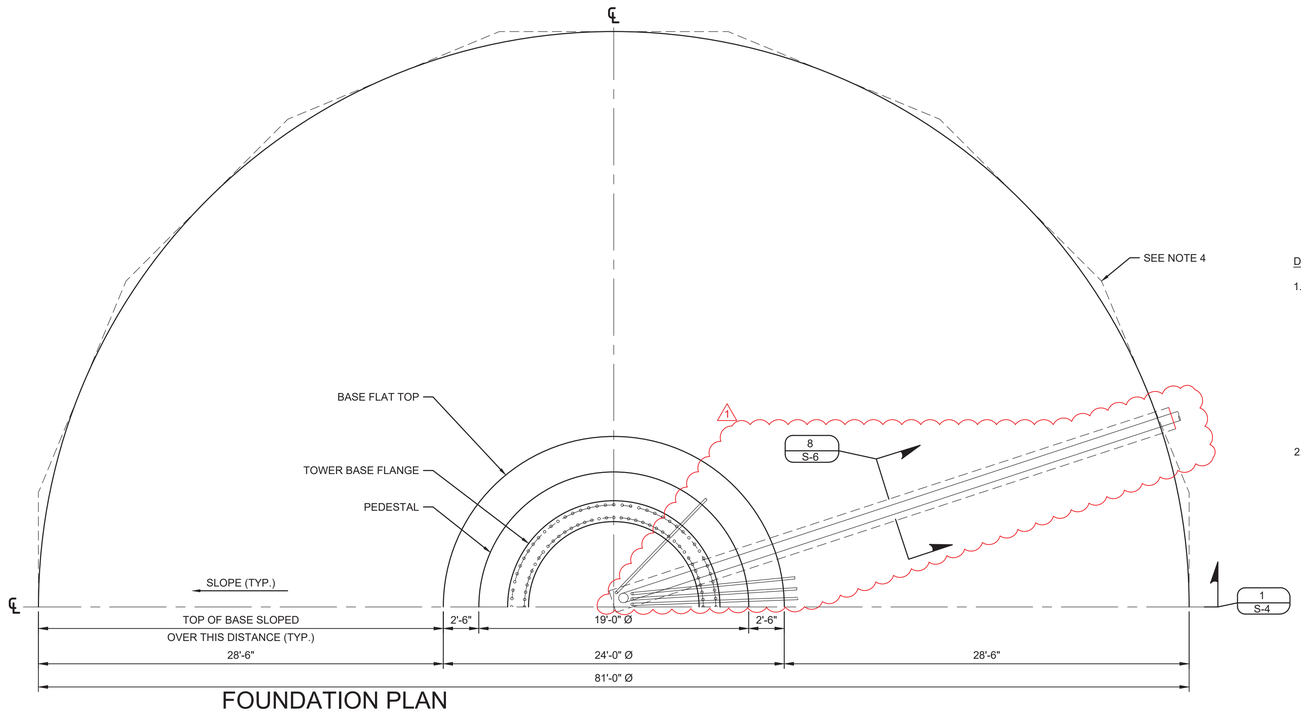


PLAN NORTH

REFER TO GENERAL ARRANGEMENT DRAWINGS FOR FOUNDATION ALIGNMENT ON SITE

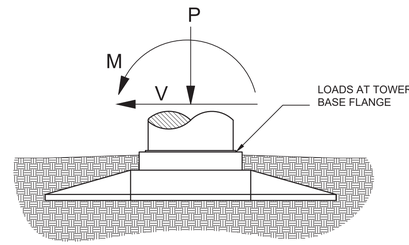
NOTES:

1. ELECTRICAL CONDUITS ARE SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL DRAWINGS FOR EXACT SIZE, LOCATION, AND PLACEMENT.
2. CLEAR SPACE BETWEEN ANCHOR BOLTS IS 3 7/8". CONDUIT SIZE SHALL CONSIDER AVAILABLE CLEAR SPACE WHEN ROUTING CONDUITS THROUGH ANCHOR BOLT CAGE.
3. THE LARGE ELECTRICAL CONDUIT GROUP SHALL NOT OCCUPY MORE THAN THREE (3) CONSECUTIVE ANCHOR BOLT SPACES. AN EMPTY ANCHOR BOLT SPACE IN BETWEEN THE CONDUITS SHALL BE INCLUDED WHEN FOUR (4) OR MORE BOLT SPACES MUST BE OCCUPIED BY THE LARGE CONDUIT GROUPING.
4. FOUNDATION MAY BE FORMED WITH EITHER CIRCULAR FORMS OR 16, 20, OR 24 EQUAL LENGTH STRAIGHT SIDES AT CONTRACTOR'S DISCRETION WITH THE CENTER OF THE FLAT-TO-FLAT INSIDE FORM DIAMETER EQUAL TO THE CIRCULAR DIAMETER SHOWN ABOVE. THE ESTIMATED BASE CONCRETE VOLUME SHOWN IN THESE DRAWINGS IS BASED ON USING CIRCULAR FORMS. USING STRAIGHT EDGE FORMS AS DESCRIBED PREVIOUSLY WILL RESULT IN AN INCREASE IN THE REQUIRED CONCRETE VOLUME.



FOUNDATION PLAN

SCALE: 3/16" = 1'-0"



FOUNDATION DESIGN LOADS

SCALE: N.T.S.

DESIGN CRITERIA

1. FOUNDATION DESIGN LOADS

   EXTREME CHARACTERISTIC LOADS (UNFACTORED) LOCATED AT THE BOTTOM OF THE TOWER BASE FLANGE:

NORMAL EXTREME:	ABNORMAL EXTREME:
P = 1,362.6 kips (6,061.3 kN)	P = 1,366.1 kips (6,076.5 kN)
V = 200.0 kips (889.5 kN)	V = 264.0 kips (1,174.2 kN)
M = 83,517.8 k-ft (113,234.9 kN-m)	M = 105,290.7 k-ft (142,755.0 kN-m)

2. ESTIMATED STRUCTURAL MATERIAL QUANTITIES

a. BASE CONCRETE:	917.2 CU. YDS. (MIN.*)
b. PEDESTAL CONCRETE:	40.9 CU. YDS. (MIN.*)
c. LEAN CONCRETE:	31.8 CU. YDS.**
d. GROUT:	25.1 CU. FT.

* ENSURE CORRECT REBAR PLACEMENTS AND DO NOT EXCEED SPECIFIED CONCRETE CLEAR COVER TOLERANCES.

** CONDUIT TRENCHES ARE NOT INCLUDED IN THE LEAN CONCRETE VOLUME.

NOTE: CONCRETE QUANTITIES ARE "NEAT" QUANTITIES. ADDITIONAL LEAN CONCRETE WILL BE REQUIRED TO EXTEND THE MUD MAT PAST THE FOUNDATION EDGE TO FACILITATE CONSTRUCTION. 100% OF THE TURBINE FOUNDATION FOOTPRINT SHALL BEAR ON THE MUD MAT DURING CONSTRUCTION.

	GRADE 60	GRADE 80
d. STEEL REINFORCEMENT:	37,500 LBS.	68,900 LBS.
EST. LAP REINFORCEMENT*: (Δ0)	900 LBS.	4,400 LBS.
TOTAL:	38,400 LBS.	73,300 LBS.

NOTE: ESTIMATED MATERIAL QUANTITIES DO NOT INCLUDE ANY MATERIAL REQUIRED FOR INSTALLATION PURPOSES (STANDEES, DOBIES, ETC.)

* LAPS ARE REQUIRED FOR THE CIRCUMFERENTIAL REINFORCING. QUANTITY OF LAPS TO BE DETERMINED BY CONTRACTOR & SUPPLIER.

3. STRUCTURAL MATERIAL PROPERTIES

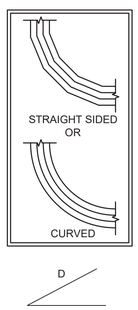
a. BASE CONCRETE STRENGTH (28-DAY):	5,000 PSI
b. PED. CONCRETE STRENGTH (28-DAY):	6,500 PSI
c. LEAN CONCRETE STRENGTH (28-DAY):	2,000 PSI
d. GROUT STRENGTH (MIN. FINAL):	16,650 PSI
e. STEEL REINFORCEMENT (ASTM A615):	GRADE 60 (U.N.O.)
f. EMBEDMENT PLATE (ASTM A572):	1 3/4", GRADE 50
g. ANCHOR BOLTS (ASTM A722):	#14, GRADE 150
h. CONCRETE UNIT WEIGHT RANGE:	145 TO 150 PCF

4. GEOTECHNICAL CONDITIONS

a. MIN. NET ALLOWABLE BEARING CAPACITY (F.S. = 3.0):	2,000 PSF
b. MIN. ALLOWABLE DISTANCE FROM TOP OF EXISTING GRADE TO GROUNDWATER:	≥ 2'-6"
c. MIN. COMPACTED DRY BACKFILL UNIT WEIGHT:	95 PCF
d. MAX. COMPACTED WET BACKFILL UNIT WEIGHT:	140 PCF

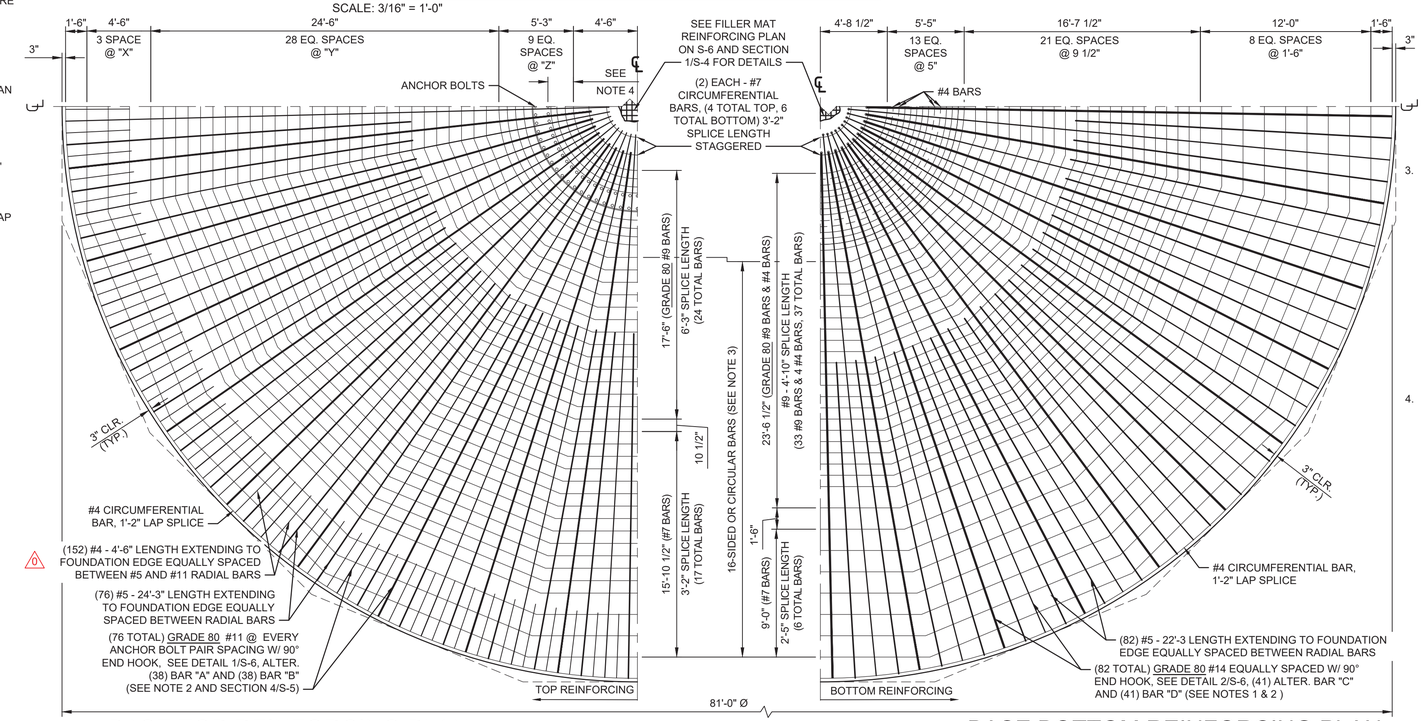
TOP & BOTTOM REINF. NOTES:

1. MAINTAIN ALTERNATING RADIAL BAR PATTERN AROUND THE ENTIRE FOUNDATION.
2. RADIAL BARS SHALL BE PLACED BELOW THE CIRCUMFERENTIAL BARS.
3. CURVED BARS MAY BE USED AS AN ALTERNATIVE TO 16-SIDED BARS BASED ON CONTRACTOR'S PREFERENCE.
4. THE FIRST TOP LAYER #9 HOOP BAR SHALL BE LOCATED 1'-9 9/16" INSIDE THE CENTERLINE OF THE INNER ANCHOR BOLT.
5. AVOID OVERLAP OF ADJACENT LAP SPLICES.



H = HORIZONTAL DIMENSION MEASURED IN PLAN VIEW
D = FIELD DIMENSION MEASURED ALONG SLOPE IN REINFORCEMENT

	H	D
X	1'-6"	1'-6 3/4" (+)
Y	10 1/2"	11" (-)
Z	7"	----



BASE TOP REINFORCING PLAN

SCALE: 3/16" = 1'-0"

BASE BOTTOM REINFORCING PLAN

SCALE: 3/16" = 1'-0"

TYPE GE 6.1-1

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810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
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www.RRCcompanies.com

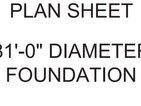
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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS



SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING



REV	DATE	ISSUE DESCRIPTION
1	8/22/2025	CONDUIT UPDATES
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

PLAN SHEET

81'-0" DIAMETER FOUNDATION

DRAWING No.	SHEET:	REV.
S-2		1

CADFILE: COLES DRAWING SET_IFC

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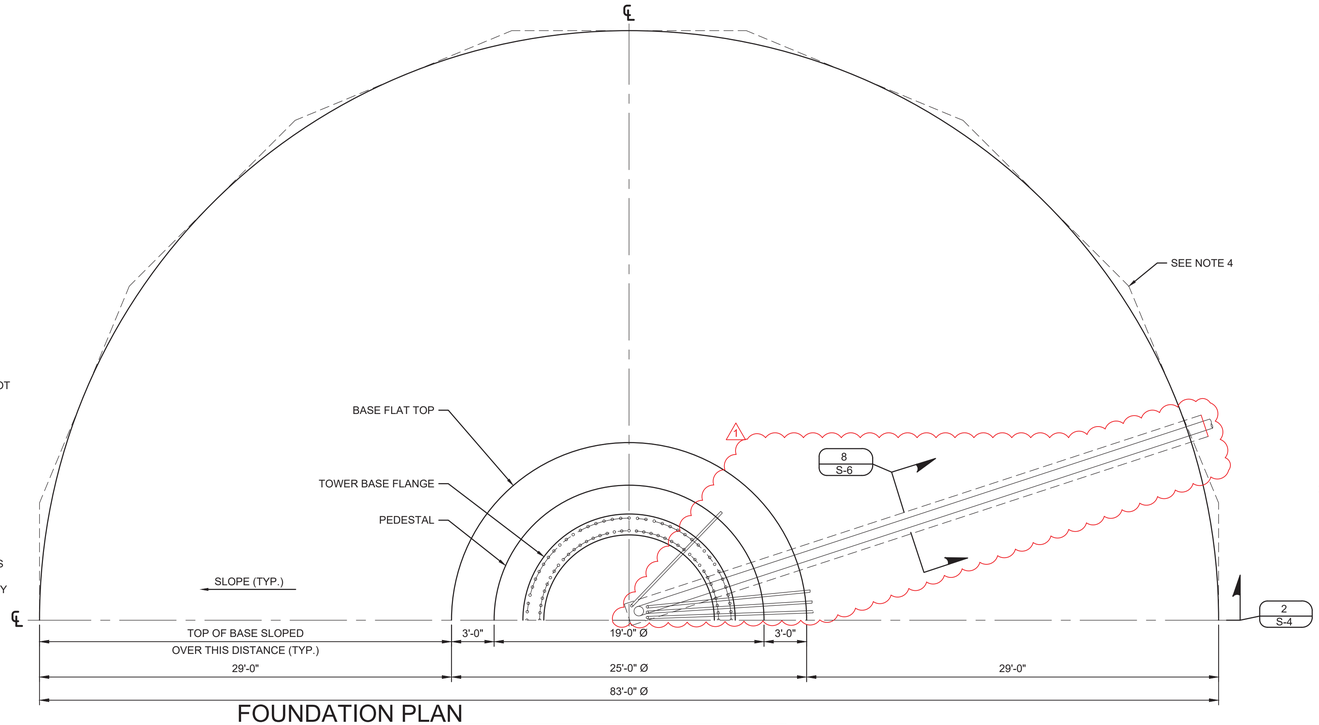


PLAN NORTH

REFER TO GENERAL ARRANGEMENT DRAWINGS FOR FOUNDATION ALIGNMENT ON SITE

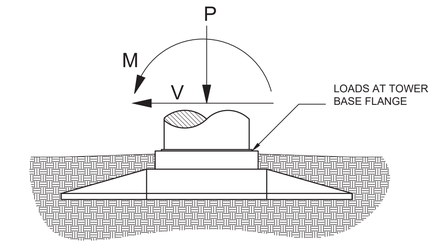
NOTES:

1. ELECTRICAL CONDUITS ARE SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL DRAWINGS FOR EXACT SIZE, LOCATION, AND PLACEMENT.
2. CLEAR SPACE BETWEEN ANCHOR BOLTS IS 3 7/8". CONDUIT SIZE SHALL CONSIDER AVAILABLE CLEAR SPACE WHEN ROUTING CONDUITS THROUGH ANCHOR BOLT CAGE.
3. THE LARGE ELECTRICAL CONDUIT GROUP SHALL NOT OCCUPY MORE THAN THREE (3) CONSECUTIVE ANCHOR BOLT SPACES. AN EMPTY ANCHOR BOLT SPACE IN BETWEEN THE CONDUITS SHALL BE INCLUDED WHEN FOUR (4) OR MORE BOLT SPACES MUST BE OCCUPIED BY THE LARGE CONDUIT GROUPING.
4. FOUNDATION MAY BE FORMED WITH EITHER CIRCULAR FORMS OR 16, 20, OR 24 EQUAL LENGTH STRAIGHT SIDES AT CONTRACTOR'S DISCRETION WITH THE CENTER OF THE FLAT-TO-FLAT INSIDE FORM DIAMETER EQUAL TO THE CIRCULAR DIAMETER SHOWN ABOVE. THE ESTIMATED BASE CONCRETE VOLUME SHOWN IN THESE DRAWINGS IS BASED ON USING CIRCULAR FORMS. USING STRAIGHT EDGE FORMS AS DESCRIBED PREVIOUSLY WILL RESULT IN AN INCREASE IN THE REQUIRED CONCRETE VOLUME.



FOUNDATION PLAN

SCALE: 3/16" = 1'-0"



FOUNDATION DESIGN LOADS

SCALE: N.T.S.

DESIGN CRITERIA

1. FOUNDATION DESIGN LOADS

   EXTREME CHARACTERISTIC LOADS (UNFACTORED) LOCATED AT THE BOTTOM OF THE TOWER BASE FLANGE:

NORMAL EXTREME:	ABNORMAL EXTREME:
P = 1,362.6 kips (6,061.3 kN)	P = 1,366.1 kips (6,076.5 kN)
V = 200.0 kips (889.5 kN)	V = 264.0 kips (1,174.2 kN)
M = 83,517.8 k-ft (113,234.9 kN-m)	M = 105,290.7 k-ft (142,755.0 kN-m)

2. ESTIMATED STRUCTURAL MATERIAL QUANTITIES

a. BASE CONCRETE:	967.6 CU. YDS. (MIN.*)
b. PEDESTAL CONCRETE:	40.9 CU. YDS. (MIN.*)
c. LEAN CONCRETE:	33.4 CU. YDS.**
d. GROUT:	25.1 CU. FT.

* ENSURE CORRECT REBAR PLACEMENTS AND DO NOT EXCEED SPECIFIED CONCRETE CLEAR COVER TOLERANCES.

** CONDUIT TRENCHES ARE NOT INCLUDED IN THE LEAN CONCRETE VOLUME.

NOTE: CONCRETE QUANTITIES ARE "NEAT" QUANTITIES. ADDITIONAL LEAN CONCRETE WILL BE REQUIRED TO EXTEND THE MUD MAT PAST THE FOUNDATION EDGE TO FACILITATE CONSTRUCTION. 100% OF THE TURBINE FOUNDATION FOOTPRINT SHALL BEAR ON THE MUD MAT DURING CONSTRUCTION.

	GRADE 60	GRADE 80
d. STEEL REINFORCEMENT:	36,800 LBS.	71,800 LBS.
EST. LAP REINFORCEMENT*: (0)	800 LBS.	4,800 LBS.
TOTAL:	37,600 LBS.	76,600 LBS.

NOTE: ESTIMATED MATERIAL QUANTITIES DO NOT INCLUDE ANY MATERIAL REQUIRED FOR INSTALLATION PURPOSES (STANDEES, DOBIES, ETC.)

* LAPS ARE REQUIRED FOR THE CIRCUMFERENTIAL REINFORCING. QUANTITY OF LAPS TO BE DETERMINED BY CONTRACTOR & SUPPLIER.

3. STRUCTURAL MATERIAL PROPERTIES

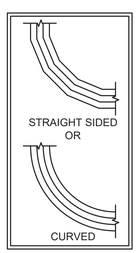
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c. LEAN CONCRETE STRENGTH (28-DAY):	2,000 PSI
d. GROUT STRENGTH (MIN. FINAL):	16,650 PSI
e. STEEL REINFORCEMENT (ASTM A615):	GRADE 60 (U.N.O.)
f. EMBEDMENT PLATE (ASTM A572):	1 3/4", GRADE 50
g. ANCHOR BOLTS (ASTM A722):	#14, GRADE 150
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4. GEOTECHNICAL CONDITIONS

a. MIN. NET ALLOWABLE BEARING CAPACITY (F.S. = 3.0):	2,000 PSF
b. MIN. ALLOWABLE DISTANCE FROM TOP OF EXISTING GRADE TO GROUNDWATER:	≥ 1'-0"
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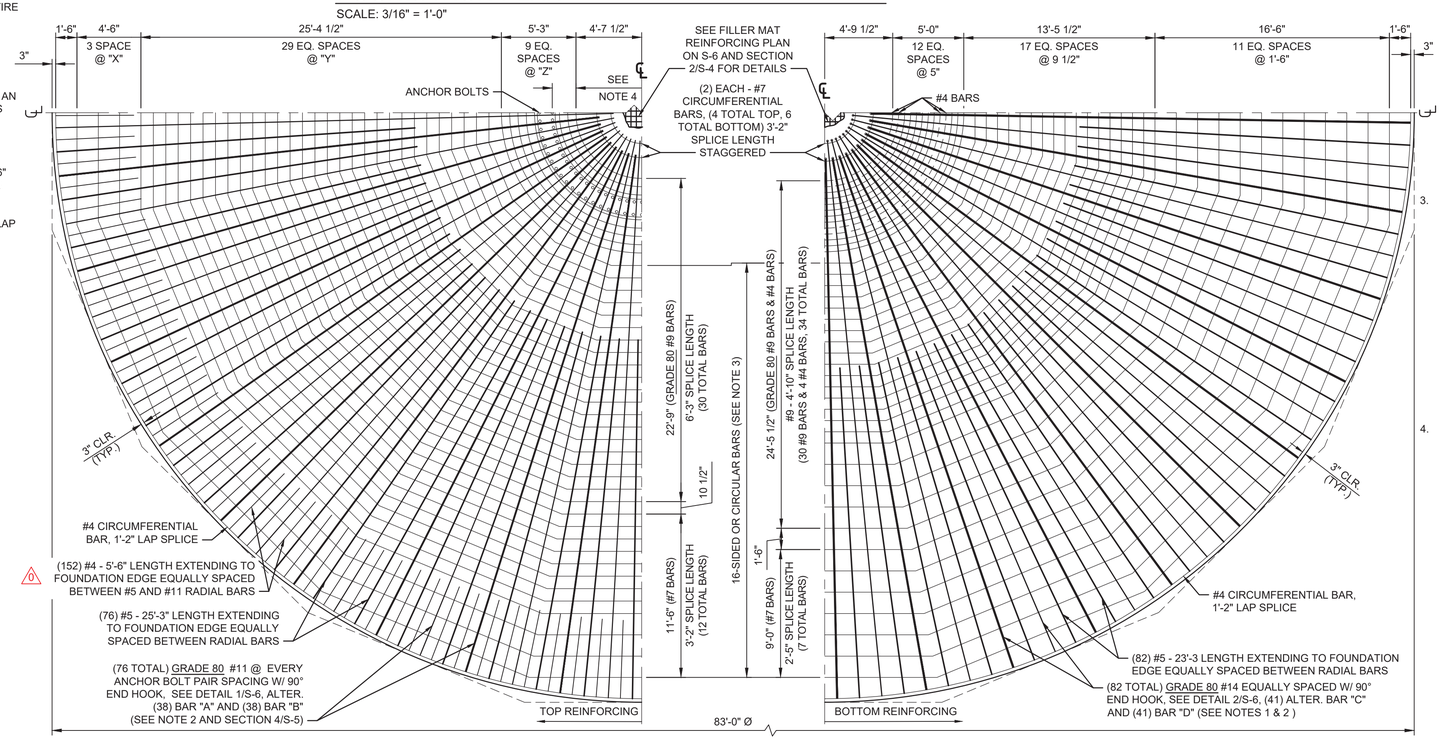
TOP & BOTTOM REINF. NOTES:

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	H	D
X	1'-6"	1'-6 3/4" (-)
Y	10 1/2"	11" (-)
Z	7"	----



BASE TOP REINFORCING PLAN

SCALE: 3/16" = 1'-0"

BASE BOTTOM REINFORCING PLAN

SCALE: 3/16" = 1'-0"

TYPE GE 6.1-2

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810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
PHONE (512) 992-2087
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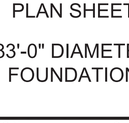
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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

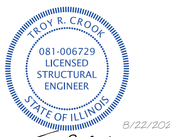
COLES COUNTY, ILLINOIS



SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING



REV	DATE	ISSUE DESCRIPTION
1	8/22/2025	CONDUIT UPDATES
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

PLAN SHEET

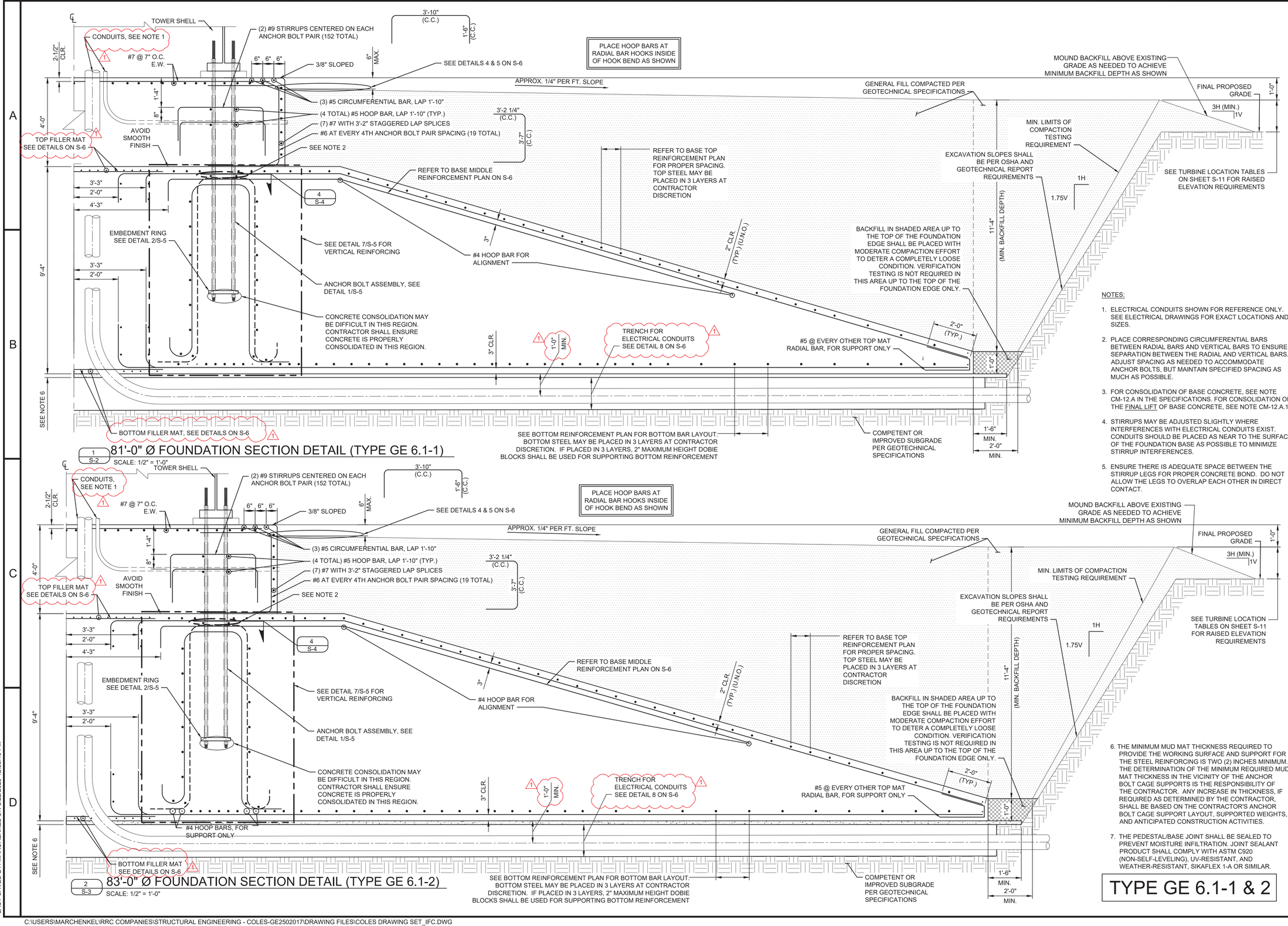
83'-0" DIAMETER FOUNDATION

DRAWING No.	SHEET:	REV.
S-3		1

CADFILE: COLES DRAWING SET_IFC

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81'-0" Ø FOUNDATION SECTION DETAIL (TYPE GE 6.1-1)

1 S-2 SCALE: 1/2" = 1'-0"

83'-0" Ø FOUNDATION SECTION DETAIL (TYPE GE 6.1-2)

2 S-3 SCALE: 1/2" = 1'-0"

NOTES:

1. ELECTRICAL CONDUITS SHOWN FOR REFERENCE ONLY. SEE ELECTRICAL DRAWINGS FOR EXACT LOCATIONS AND SIZES.
2. PLACE CORRESPONDING CIRCUMFERENTIAL BARS BETWEEN RADIAL BARS AND VERTICAL BARS TO ENSURE SEPARATION BETWEEN THE RADIAL AND VERTICAL BARS. ADJUST SPACING AS NEEDED TO ACCOMMODATE ANCHOR BOLTS, BUT MAINTAIN SPECIFIED SPACING AS MUCH AS POSSIBLE.
3. FOR CONSOLIDATION OF BASE CONCRETE, SEE NOTE CM-12.A IN THE SPECIFICATIONS. FOR CONSOLIDATION OF THE FINAL LIFT OF BASE CONCRETE, SEE NOTE CM-12.A.1.
4. STIRRUPS MAY BE ADJUSTED SLIGHTLY WHERE INTERFERENCES WITH ELECTRICAL CONDUITS EXIST. CONDUITS SHOULD BE PLACED AS NEAR TO THE SURFACE OF THE FOUNDATION BASE AS POSSIBLE TO MINIMIZE STIRRUP INTERFERENCES.
5. ENSURE THERE IS ADEQUATE SPACE BETWEEN THE STIRRUP LEGS FOR PROPER CONCRETE BOND. DO NOT ALLOW THE LEGS TO OVERLAP EACH OTHER IN DIRECT CONTACT.
6. THE MINIMUM MUD MAT THICKNESS REQUIRED TO PROVIDE THE WORKING SURFACE AND SUPPORT FOR THE STEEL REINFORCING IS TWO (2) INCHES MINIMUM. THE DETERMINATION OF THE MINIMUM REQUIRED MUD MAT THICKNESS IN THE VICINITY OF THE ANCHOR BOLT CAGE SUPPORTS IS THE RESPONSIBILITY OF THE CONTRACTOR. ANY INCREASE IN THICKNESS, IF REQUIRED AS DETERMINED BY THE CONTRACTOR, SHALL BE BASED ON THE CONTRACTOR'S ANCHOR BOLT CAGE SUPPORT LAYOUT, SUPPORTED WEIGHTS, AND ANTICIPATED CONSTRUCTION ACTIVITIES.
7. THE PEDESTAL/BASE JOINT SHALL BE SEALED TO PREVENT MOISTURE INFILTRATION. JOINT SEALANT PRODUCT SHALL COMPLY WITH ASTM C920 (NON-SELF-LEVELING), UV-RESISTANT, AND WEATHER-RESISTANT, SIKAFLEX 1-A OR SIMILAR.

TYPE GE 6.1-1 & 2

RRC POWER & ENERGY, LLC
810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
PHONE (512) 992-2087
www.RRCcompanies.com

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK 081-006729 LICENSED STRUCTURAL ENGINEER STATE OF ILLINOIS

8/22/2025

REV	DATE	ISSUE DESCRIPTION
1	8/22/2025	CONDUIT UPDATES
0	8/12/2025	ISSUED FOR CONSTUCTION
APPROVED BY:		B. KRAUSE
CHECKED BY:		T. CROOK
DESIGNED BY:		R. EERNISSE
DRAWN BY:		M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

SECTION SHEET

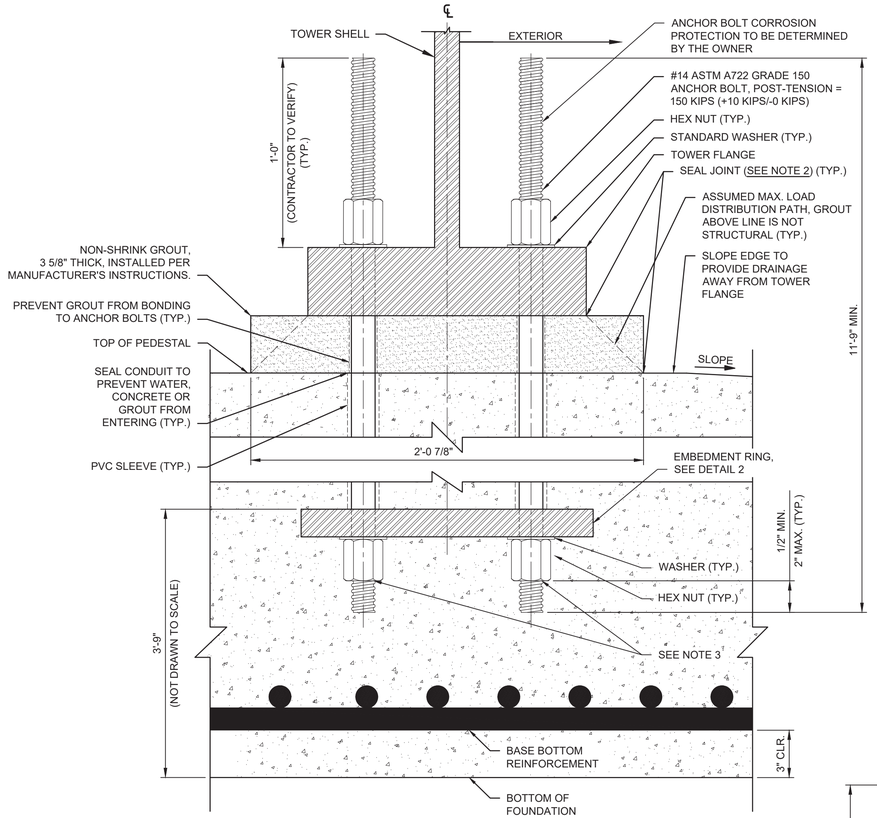
81'-0" & 83'-0" DIAMETER FOUNDATIONS

DRAWING No.	SHEET:	REV.
S-4		1

CADFILE: COLES DRAWING SET_IFC

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1 - ANCHOR BOLT ASSEMBLY
SCALE: 2-1/2" = 1'-0"

ANCHOR BOLT ASSEMBLY NOTES:

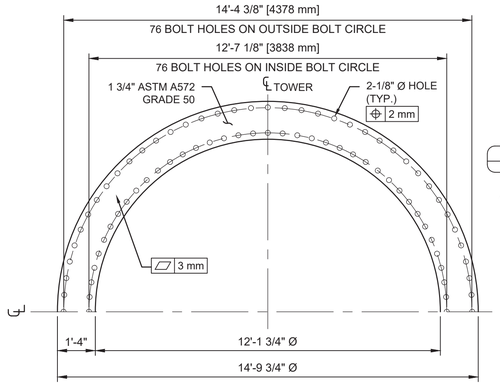
1. PEDESTAL AND VERTICAL REINFORCEMENT NOT SHOWN FOR CLARITY.
2. THE JOINT SEALANT SHALL BE WEATHER-RESISTANT AND UV-RESISTANT.
3. CONTRACTOR SHALL USE NECESSARY METHODS TO RESTRAIN EMBEDMENT PLATE NUT FROM TURNING DURING CONCRETE VIBRATION WITHOUT RESTRICTING INDIVIDUAL VERTICAL ANCHOR BOLT MOVEMENT (FOR EXAMPLE, DO NOT CONTINUOUSLY TIE WITH TIE-WIRE FROM BOLT TO BOLT OR TIE TO THE EMBEDMENT RING).
   A. IF THE ANCHOR BOLTS DROP WHILE REMOVING ANCHOR BOLT NUTS ABOVE THE TEMPLATE RING, NOTIFY THE FOUNDATION ENGINEER OF RECORD IMMEDIATELY.
   B. JAM NUTS, CONTINUOUS TIE WIRE, TACK WELDING, OR OTHER RESTRAINTS THAT PREVENT VERTICAL MOVEMENT OF THE ANCHOR BOLTS SHALL NOT BE USED.

EMBEDMENT RING DETAIL NOTES:

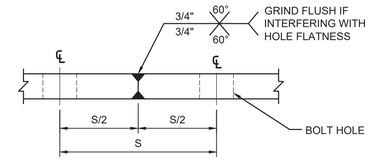
1. SEE DETAIL 1 FOR EMBEDMENT PLATE WELD DETAIL.

TEMPLATE RING DETAIL NOTES:

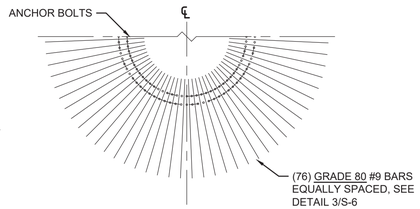
1. THICKNESS: 1" MIN.
2. MATERIAL: ASTM A36 GRADE 36 OR ASTM A572 GRADE 50.
3. HOLES: MATCH EMBEDMENT RING SIZE, NUMBER, AND LOCATIONS.



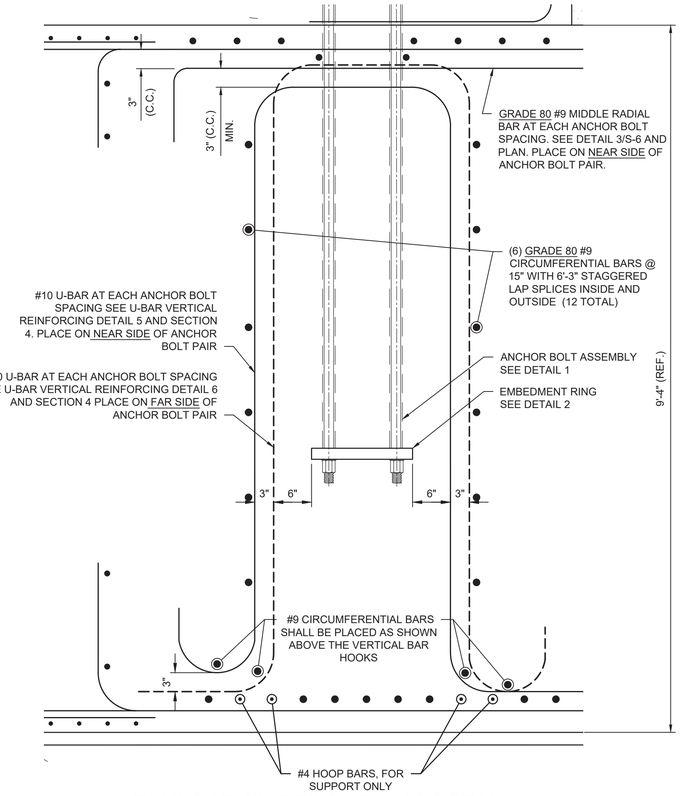
2 - EMBEDMENT RING DETAIL
SCALE: 3/8" = 1'-0"



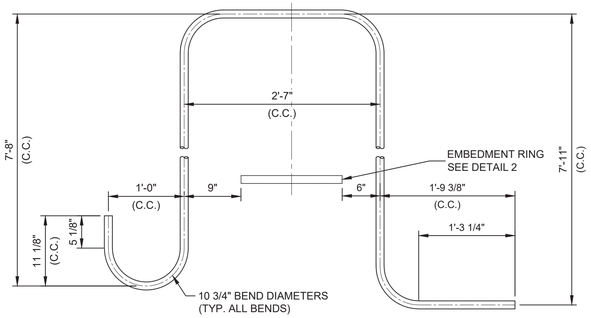
1 - EMBEDMENT PLATE WELD DETAIL
SCALE: NONE



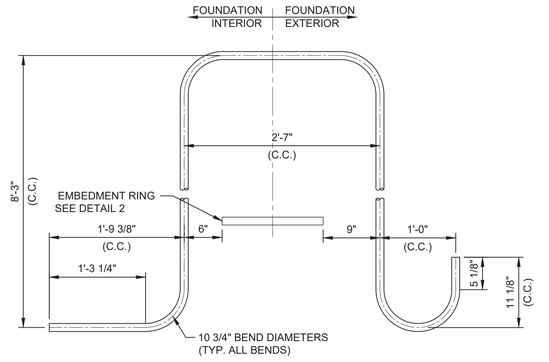
BASE MIDDLE REINFORCING PLAN
SCALE: 1/8" = 1'-0"



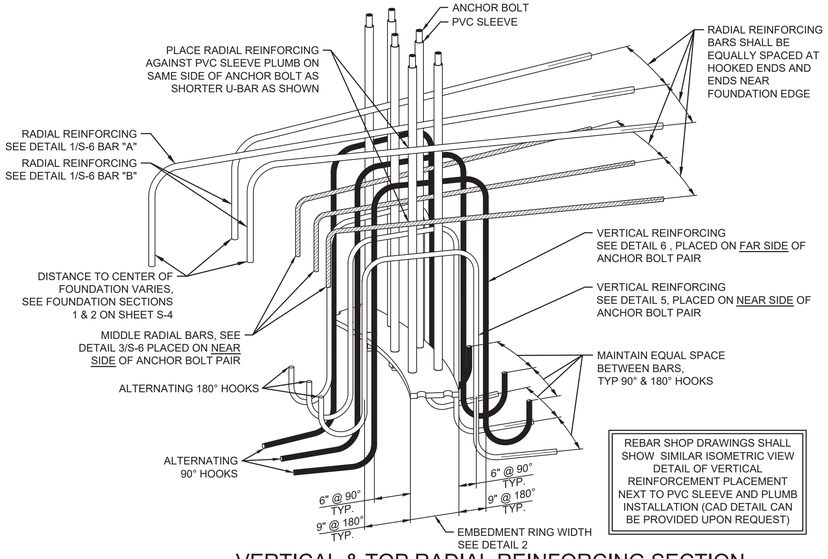
7 - FOUNDATION REINFORCING DETAIL
SCALE: 1" = 1'-0"



5 - U-BAR VERTICAL REINFORCING DETAIL
SCALE: 1" = 1'-0"



6 - U-BAR VERTICAL REINFORCING DETAIL
SCALE: 1" = 1'-0"



REBAR SHOP DRAWINGS SHALL SHOW SIMILAR ISOMETRIC VIEW DETAIL OF VERTICAL REINFORCEMENT PLACEMENT NEXT TO PVC SLEEVE AND PLUMB INSTALLATION (CAD DETAIL CAN BE PROVIDED UPON REQUEST)

4 - VERTICAL & TOP RADIAL REINFORCING SECTION
SCALE: N.T.S.

TYPE GE 6.1-1 & 2

RRC POWER & ENERGY, LLC
810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/12/2025
Troy R Crook

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION
APPROVED BY:		B. KRAUSE
CHECKED BY:		T. CROOK
DESIGNED BY:		R. EERNISSE
DRAWN BY:		M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

DETAIL SHEET - 1

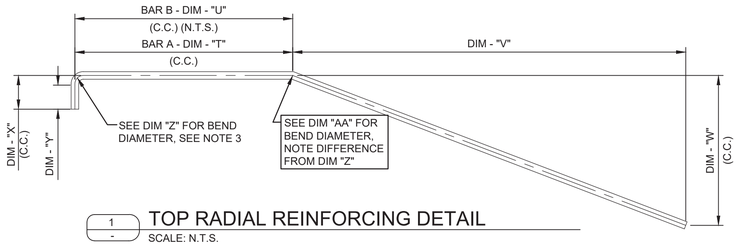
81'-0" & 83'-0" DIAMETER FOUNDATIONS

DRAWING No.	SHEET:	REV.
S-5		0

CADFILE: COLES DRAWING SET_IFC

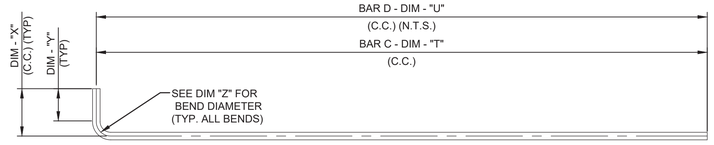
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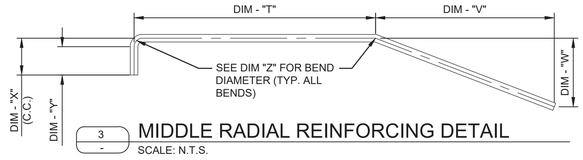
1 - TOP RADIAL REINFORCING DETAIL

SCALE: N.T.S.



2 - BOTTOM RADIAL REINFORCING DETAIL

SCALE: N.T.S.



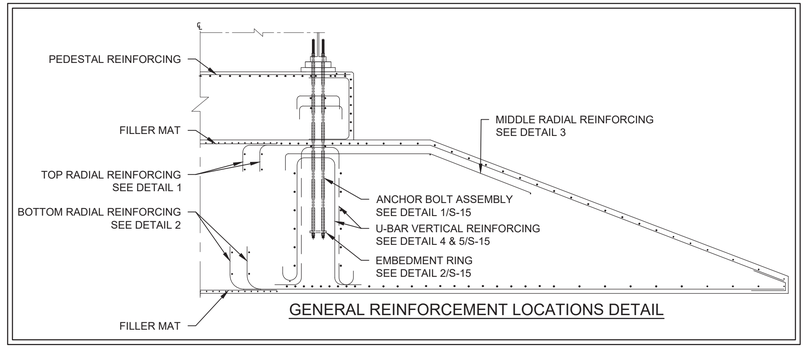
3 - MIDDLE RADIAL REINFORCING DETAIL

SCALE: N.T.S.

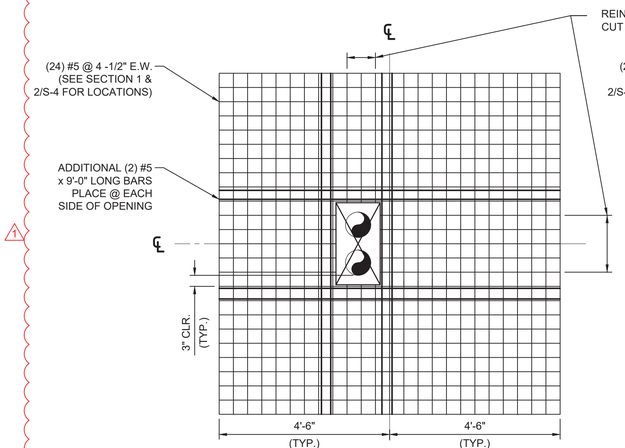
RADIAL REINFORCING DIMENSIONS						
	TYPE GE 6.1-1			TYPE GE 6.1-2		
DIMENSION	TOP	MIDDLE	BOTTOM	TOP	MIDDLE	BOTTOM
T	10'-0"	7'-9"	38'-3"	10'-6"	8'-3"	39'-3"
U	8'-9"	-	37'-0"	9'-3"	-	38'-0"
V	28'-3"	18'-5"	-	28'-9"	18'-3"	-
W	8'-3 1/4"	5'-4 1/2"	-	8'-3 1/4"	5'-3"	-
X	1'-11 3/8"	1'-6 1/2"	2'-6"	1'-11 3/8"	1'-6 1/2"	2'-6"
Y	1'-5"	1'-1 5/8"	1'-8 3/8"	1'-5"	1'-1 5/8"	1'-8 3/8"
Z	1'-0"Ø	9 1/2"	1'-6 1/4"Ø	1'-0"Ø	9 1/2"	1'-6 1/4"Ø
AA	1'-6 1/4"Ø	-	-	1'-6 1/4"Ø	-	-

NOTES:

1. SEE SHEETS S-2 & S-4 FOR TYPE GE 6.1-1 BAR LOCATIONS.
2. SEE SHEETS S-3 & S-4 FOR TYPE GE 6.1-2 BAR LOCATIONS.
3. DIM "Z" MAY BE SUBSTITUTED FOR DIM "AA" WHILE MAINTAINING DIM "Y".



GENERAL REINFORCEMENT LOCATIONS DETAIL

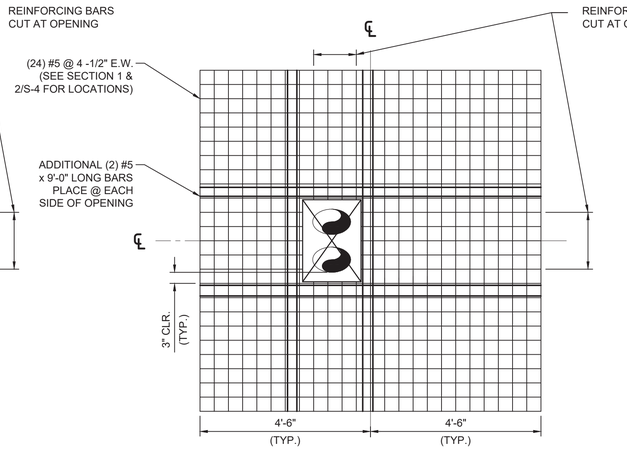


6 - TOP FILLER MAT REINFORCING PLAN

SCALE: 1/2" = 1'-0"

NOTES:

1. DETAIL USED FOR WHEN CONDUITS ARE ROUTED THROUGH BASE.
2. CONDUITS ROTATED FOR CLARITY. REFER TO ELECTRICAL DRAWINGS FOR EXACT LOCATIONS AND SIZES.

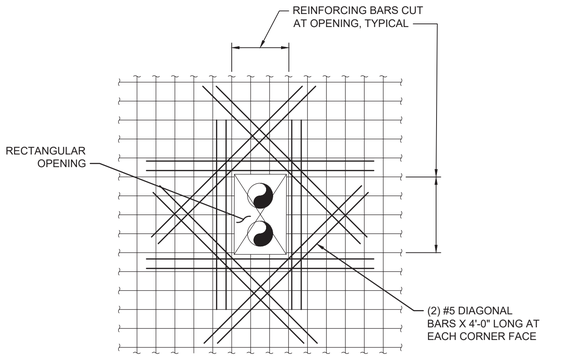


7 - BOTTOM FILLER MAT REINFORCING PLAN

SCALE: 1/2" = 1'-0"

NOTES:

1. DETAIL USED FOR WHEN CONDUITS ARE ROUTED THROUGH BASE.
2. CONDUITS ROTATED FOR CLARITY. REFER TO ELECTRICAL DRAWINGS FOR EXACT LOCATIONS AND SIZES.

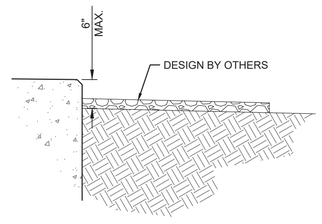


9 - PEDESTAL TOP MAT REINFORCING DETAIL

SCALE: 1/2" = 1'-0"

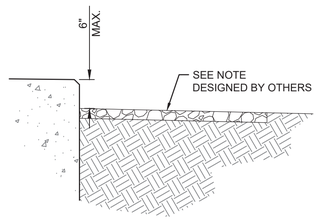
NOTES:

1. THIS DETAIL IS INTENDED TO BE USED WHEN REINFORCEMENT IS REQUIRED TO BE CUT-OFF IN BOTH DIRECTIONS DUE TO A REQUIRED OPENING.
2. ADD 1/2 REINFORCING BARS CUT AT OPENING TO EACH SIDE OF OPENING BETWEEN NORMAL REINFORCING AT 3" C.C. ADDED REINFORCING SHALL EXTEND PAST THE OPENING A MINIMUM OF 6'-0".



4 - ROCK APRON DETAIL OPTION 1

SCALE: N.T.S.

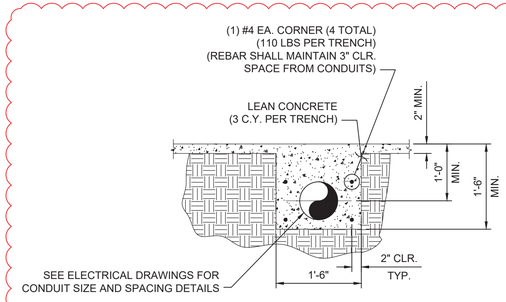


5 - ROCK APRON DETAIL OPTION 2

SCALE: N.T.S.

NOTE:

IF ROCK APRON MATERIAL IS DESIRED TO BE USED WITHIN THE COMPACTED BACKFILL SLOPE, WHICH MUST SHED WATER AWAY FROM THE PEDESTAL, THEN THE PROPOSED ROCK APRON MATERIAL SHALL BE SUBMITTED TO THE GEOTECHNICAL EOR FOR APPROVAL PRIOR TO THAT USE. OTHERWISE, ROCK APRON MATERIAL IS ASSUMED TO BE PLACED ABOVE THE SLOPED COMPACTED BACKFILL MATERIAL AS SHOWN IN OPTION 1.



8 - CONDUIT TRENCH SECTION

SCALE: 3/4" = 1'-0"

TYPE GE 6.1-1 & 2

RRC POWER & ENERGY, LLC
810 HESTERS CROSSING RD, SUITE 120
ROUND ROCK, TX 78681
PHONE (512) 992-2087
www.RRCcompanies.com

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/22/2025
Troy R Crook

REV	DATE	ISSUE DESCRIPTION
1	8/22/2025	CONDUIT UPDATES
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATION

DETAIL SHEET - 2

81'-0" & 83'-0" DIAMETER FOUNDATIONS

DRAWING No. S-6

SHEET:

REV. 1

CADFILE: COLES DRAWING SET_IFC

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ALL CONCRETE CONSTRUCTION SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301 PUBLISHED BY THE AMERICAN CONCRETE INSTITUTE, FARMINGTON HILLS, MICHIGAN, EXCEPT AS MODIFIED BY THESE DESIGN DRAWINGS.

TURBINE REFERENCE DATA:

TR-1 TURBINE TYPE: GE 6.1-158 60 HZ 117M HH CWE IEC S.

TR-2 TOWER FOUNDATION DESIGN LOADINGS: "FOUNDATION LOAD SPECIFICATION FOR WIND TURBINE GENERATOR SYSTEMS, COLES, ILLINOIS (GE PROJECT 1235488), 6.1-158, 60 HZ, 117M HUB HEIGHT, COLD WEATHER EXTREME, IEC CLASS S" BY GE VERNOVA DATED JUNE 13, 2025, REV-. FOUNDATION_LOAD_DRAWING_ 1235488_COLES_6.1-158_117MHH_REV-.

TR-3 TURBINE TOWER FLANGE GEOMETRY: "FOUNDATION LOAD SPECIFICATION FOR WIND TURBINE GENERATOR SYSTEMS, COLES, ILLINOIS (GE PROJECT 1235488), 6.1-158, 60 HZ, 117M HUB HEIGHT, COLD WEATHER EXTREME, IEC CLASS S" FIGURE 4: TOWER T-FLANGE GEOMETRY BY GE VERNOVA DATED JUNE 13, 2025, REV-. FOUNDATION_LOAD_DRAWING_1235488_COLES_ 6.1-158_117MHH_REV-.

TR-4 EVALUATED DESIGN LIFE OF FOUNDATION = 25 YEARS.

FOUNDATION LOADINGS:

FL-1 WIND LOADS DETERMINED BY TURBINE DESIGNER/SUPPLIER.

FL-2 BUILDING CODE SEISMIC PARAMETERS:

A. S_S: 0.243.

B. S_1: 0.110.

C. RISK (OCCUPANCY) CATEGORY: II.

D. SITE CLASSIFICATION: D.

STRUCTURAL CODES:

SC-1 DESIGN BUILDING CODE: INTERNATIONAL BUILDING CODE, 2021 ED.

SC-2 REINFORCED CONCRETE CODE: ACI 318-25.

SC-3 STEEL CODE: AISC 15TH EDITION.

SC-4 ASCE 7-16.

SC-5 FATIGUE CODE: DNVGL-ST-C502, FEBRUARY 2018 EDITION.

SC-6 ADDITIONAL GUIDANCE: DNVGL-ST-0126, DECEMBER 2021 EDITION.

GEOTECHNICAL DATA:

GEOTECHNICAL REPORT AND RECOMMENDATIONS FOR THIS PROJECT ARE BASED ON:

"GEOTECHNICAL REPORT, COLES WIND PROJECT, COLES COUNTY, ILLINOIS" BY RRC POWER & ENERGY, LLC DATED AUGUST 7, 2025, REV. 2, RRC PROJECT NO. GE2109045. (1)

QUESTIONS, COMMENTS, RFI'S, AND SUBMITTALS REGARDING THE GEOTECHNICAL SPECIFICATIONS SHALL BE DIRECTED TO THE GEOTECHNICAL ENGINEER OF RECORD.

GD-1 NET ALLOWABLE BEARING CAPACITY USED FOR FOUNDATION DESIGN CALCULATIONS (F.S. = 3): 2,000 PSF.

A. DURING CONSTRUCTION, THIS DESIGN BEARING CAPACITY IS NOT INTENDED TO BE DIRECTLY TESTED IN THE FIELD WITH SHALLOW PENETRATION TESTING TECHNIQUES. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL DEVELOP A FOUNDATION SUBGRADE VERIFICATION PROCEDURE IN ACCORDANCE WITH THE RECOMMENDED TESTING PROCEDURES AND TARGET SOIL STRENGTH VALUES SPECIFIED BY THE GEOTECHNICAL ENGINEER OF RECORD. THIS SUBGRADE VERIFICATION PROCEDURE SHALL BE REVIEWED AND APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD WHO PREPARED THE GEOTECHNICAL REPORT.

GD-2 THE FOUNDATION SUBGRADE AND EXCAVATION SHALL BE PREPARED IN THE FOLLOWING MANNER:

A. THE EXCAVATION AREA SHALL BE CLEARED OF DELETERIOUS MATERIALS SUCH AS VEGETATION, ROOT SYSTEMS, ORGANIC TOPSOIL, DEBRIS, EXISTING FILL, AND SOFT, FROZEN, OR OTHERWISE UNSUITABLE MATERIALS.

B. ROOT ZONE SOILS, ORGANIC-RICH TOPSOIL (SOIL WITH 5% OR MORE ORGANICS), VEGETATION, AND SOFT OR OTHERWISE UNSUITABLE MATERIALS FROM THE SURFACE OF THE PROPOSED CONSTRUCTION AREAS SHALL BE STOCKPILED FOR POSSIBLE USE AS TOPSOIL OR SHALL BE REMOVED FROM THE SITE. ORGANIC SOILS SHALL NOT BE USED AS BACKFILL BENEATH OR BESIDE THE TURBINE FOUNDATIONS.

C. MODIFICATION OF UNSUITABLE SOILS SHALL CONSIST OF OVER-EXCAVATION AND REPLACEMENT WITH STRUCTURAL FILL MEETING THE CRITERIA SHOWN IN THESE SPECIFICATIONS. WHERE SOFT SOILS EXTEND TO A DEPTH WHERE OVER-EXCAVATION IS NOT ECONOMICAL, STONE COLUMNS SHALL BE USED AS DESIGNED BY A QUALIFIED 3RD PARTY.

D. IF OVER-EXCAVATION IS REQUIRED, EXTEND A MINIMUM OF ONE (1) FOOT PER FOOT (1H:1V) OF OVER-EXCAVATION DEPTH BEYOND THE OUTSIDE EDGES OF THE FOUNDATION FOOTPRINT.

E. A UNIFORM SUBGRADE SUPPORT BELOW THE TURBINE FOUNDATION SHALL BE MAINTAINED TO REDUCE THE POTENTIAL FOR EXCESSIVE DIFFERENTIAL FOUNDATION SETTLEMENT.

1. IF COMPACTED FILL IS USED BELOW THE FOUNDATION, THE THICKNESS OF STRUCTURAL FILL BELOW TURBINE FOUNDATION SHALL BE MINIMUM SIX (6) INCHES.

2. THE STRUCTURAL FILL THICKNESS SHALL BE KEPT AS UNIFORM AS POSSIBLE WITH NO ABRUPT THICKNESS CHANGE, WITH AN OVERALL THICKNESS DIFFERENCE OF TWO (2) FEET OR LESS ACROSS THE TURBINE FOUNDATION FOOTPRINT.

F. IN AREAS WHERE A COMBINATION OF SOIL AND BEDROCK ARE EXPOSED AT THE FOUNDATION BEARING ELEVATION, THE SOIL SUBGRADE SHALL BE OVER-EXCAVATED TO COMPETENT BEDROCK AND REPLACED WITH EITHER LEAN CONCRETE HAVING A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 1,000 PSI OR COMPACTED STRUCTURAL FILL.

1. IF COMPACTED STRUCTURAL FILL IS USED, EITHER THE BEDROCK PORTION OF THE FOUNDATION SUBGRADE MAY BE EXCAVATED OR THE LOWER PORTION OF THE SOIL SUBGRADE EXCAVATION MAY BE FILLED WITH LEAN CONCRETE SO THAT THE STRUCTURAL FILL THICKNESS DIFFERENCE CAN BE KEPT AT TWO (2) FEET OR LESS ACROSS THE FOUNDATION WIDTH.

G. A QUALIFIED GEOTECHNICAL REPRESENTATIVE SHALL BE PRESENT DURING SITE PREPARATION OPERATIONS TO OBSERVE STRIPPING AND GRUBBING DEPTHS, OBSERVE THE REMOVAL OF UNSUITABLE SOILS, OBSERVE THE PREPARATION OF THE SUBGRADE , AND TO VERIFY THAT THE EXPOSED SUBGRADE HAS BEEN PREPARED IN ACCORDANCE WITH THESE SPECIFICATIONS.

H. IF THE FOUNDATION SUBGRADE SOILS ARE DISTURBED DURING EXCAVATION OF THE TURBINE FOUNDATIONS AND PRIOR TO PROOF-ROLL OBSERVATIONS, A QUALIFIED REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL EVALUATE THE NEED FOR REWORKING THE SUBGRADE AND/OR RE-COMPACTION REQUIREMENT.

1. DISTURBED FOUNDATION SUBGRADE SOILS REQUIRING RECOMPACTION SHALL BE COMPACTED TO ACHIEVE A MINIMUM COMPACTION OF 98% OF THE MAXIMUM DRY UNIT WEIGHT AS DETERMINED BY ASTM D698 AND MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM MOISTURE CONTENT.

2. THE RESULTING RE-COMPACTED FOUNDATION SUBGRADE SURFACE SHALL BE TESTED USING NUCLEAR DENSITY GAUGES OR OTHER APPROVED METHOD BY THE GEOTECHNICAL ENGINEER OF RECORD.

3. IF NATIVE SOILS CANNOT BE PROPERLY COMPACTED OR THE THE REMEDIATION DEPTH EXCEEDS 12 INCHES, OVER-EXCAVATE A MINIMUM OF SIX (6) INCHES AND BACKFILL WITH STRUCTURAL FILL (GRANULAR).

I. REQUIRED GROUND IMPROVEMENT TECHNIQUES BEYOND OVER-EXCAVATION (IF ANY) SHALL BE COORDINATED WITH THE GEOTECHNICAL ENGINEER OF RECORD.

J. WHERE THE FOUNDATION SUBGRADES ARE OR BECOME FROZEN, THE FROZEN SOILS SHALL BE COMPLETELY REMOVED FROM BELOW THE FOUNDATION AND ITS OVERSIZE AREA. THE FROZEN SOILS SHALL BE REPLACED BY SUITABLY MOISTURE CONDITIONED AND COMPACTED SOILS. IF THE REPLACEMENT IS PERFORMED IN NEAR- OR BELOW- FREEZING TEMPERATURES, ONLY THE PLACEMENT OF GRANULAR MATERIALS WILL SUFFICE. TURBINE FOUNDATIONS SHALL NOT BE CONSTRUCTED OVER FROZEN SOILS OR A FROZEN MUD MAT.

K. STRIPPING, EXCAVATION, GRADING, AND SUBGRADE PREPARATION SHALL BE PERFORMED IN A MANNER AND SEQUENCE THAT WILL PROVIDE POSITIVE DRAINAGE THROUGHOUT CONSTRUCTION AND PROVIDE PROPER CONTROL OF EROSION.

L. PONDING OF WATER NEAR THE FOUNDATION ELEMENTS FROM IMPROPER DRAINAGE SHALL NOT BE PERMITTED AND ALL DEWATERING IS THE RESPONSIBILITY OF THE CONTRACTOR.

1. IF WATER INFILTRATION IN THE EXCAVATION IS ENCOUNTERED AS DETERMINED BY THE ON-SITE GEOTECHNICAL REPRESENTATIVE, FOUNDATION EXCAVATIONS SHALL INCLUDE THE EXCAVATION OF ONE OR MORE SUMP PITS LOCATED WITHIN THE EXCAVATION AND OUTSIDE OF A 1H:1V AREA EXTENDING DOWN AND AWAY FROM THE OUTER EDGE OF THE MUD MAT THAT WILL SERVE TO COLLECT INFILTRATED OR PRECIPITATED WATER FOR PUMPING.

2. ACCUMULATED WATER SHALL BE REMOVED FROM SUBGRADES AND WORK AREAS IMMEDIATELY PRIOR TO PERFORMING FURTHER WORK IN THE AREA.

3. THE PLANNED SITE WORK AREAS SHALL BE GRADED TO PREVENT WATER FROM PONDING IN CONSTRUCTION AREAS AND/OR FLOWING INTO EXPOSED SUBGRADE AREAS.

4. EXPOSED EXCAVATION SUBGRADE SOILS SHALL BE CROWNED, SLOPED, AND SMOOTH-DRUM ROLLED AT THE END OF THE DAY TO FACILITATE DRAINAGE IF INCLEMENT WEATHER IS FORECASTED.

5. SOILS THAT BECOME DISTURBED OR WEAKENED FROM ACCUMULATED WATER SHALL BE IMPROVED BY AERATION AND RECOMPACTION, CHEMICAL TREATMENT, OR REMOVAL AND REPLACEMENT WITH NEW COMPACTED FILL.

6. CONSIDERATION SHOULD BE GIVEN TO CONSULTING A DEWATERING CONTRACTOR FOR DETERMINING THE MEANS AND METHODS FOR PROPERLY DEWATERING THE FOUNDATION EXCAVATIONS DURING CONSTRUCTION IF DEWATERING IS REQUIRED.

M. THE CONTRACTOR SHALL SUBMIT A SUBGRADE TESTING PROCEDURE TO THE GEOTECHNICAL ENGINEER OF RECORD FOR APPROVAL PRIOR TO CONSTRUCTION.

1. IF PROOF-ROLLING IS APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD, PROOF-ROLLING SHALL BE PERFORMED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER OR QUALIFIED GEOTECHNICAL REPRESENTATIVE USING HEAVY RUBBER-TIRED EQUIPMENT, SUCH AS A LOADED DUMP TRUCK, HAVING A MINIMUM GROSS WEIGHT OF 25-TONS TO ASSESS THE NEED FOR ANY SHALLOW REMEDIAL MEASURES. OTHER HEAVY EQUIPMENT MAY BE ALLOWED BY THE GEOTECHNICAL ENGINEER OF RECORD.

2. IF STATIC OR DYNAMIC CONE PENETROMETER (SCP OR DCP, DEPENDING ON THE SUBGRADE MATERIALS EXPOSED AT THE FOUNDATION BEARING ELEVATION) IS APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD, SCP OR DCP SHALL BE USED TO VERIFY THE FOUNDATION SUBGRADE MEETS OR EXCEEDS THE FOUNDATION DESIGN REQUIREMENTS BASED ON THE CALCULATED LOADS APPLIED BY THE FOUNDATION DESIGNS IN THESE DRAWINGS.

N. EXCAVATION MEANS AND METHODS SHALL BE DETERMINED BY THE CONTRACTOR.

GD-3 STRUCTURAL FILL TO BE PLACED BELOW THE TURBINE FOUNDATION SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D1557 AND MOISTURE CONDITIONED NEAR OPTIMUM MOISTURE CONTENT.

A. STRUCTURAL FILL MATERIAL BELOW THE TURBINE FOUNDATIONS SHALL CONSIST OF NON-EXPANSIVE, WELL-GRADED MATERIAL WITH SUFFICIENT BINDER FOR COMPACTION PURPOSES AND MUST MEET REQUIREMENTS OF STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (ADOPTED JANUARY 1, 2022), ILLINOIS DOT ARTICLE 1004.04, AGGREGATE BASE COURSE OR BETTER.

B. SELECT FILL SOILS MAY BE USED UNDER FOUNDATIONS AND SHALL HAVE A MAXIMUM PLASTICITY INDEX OF 15 AND A MAXIMUM LIQUID LIMIT OF 40 AND CLASSIFY AS SC-SM, SC, SANDY CL, WELL-GRADED GC, OR WELL-GRADED GM.

1. SELECT FILL PLACEMENTS UNDER TURBINES SHALL BE LIMITED TO TWO (2) FEET THICK AND SHALL BE COMPACTED TO A MINIMUM OF 98% OF THE MAXIMUM DRY DENSITY ACCORDING TO ASTM D698 AND MOISTURE CONDITIONED WITHIN 3% OF OPTIMUM MOISTURE CONTENT.

C. THE PROPOSED STRUCTURAL FILL MATERIAL SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD PRIOR TO ITS USE.

D. STRUCTURAL FILL SHALL BE PLACED IN LIFTS HAVING A MAXIMUM THIN, LOOSE LIFTS NOT EXCEEDING TWELVE (12) INCHES PRIOR TO COMPACTING. IF THE TESTING AGENCY CANNOT TEST THIS FULL DEPTH, (I.E., 12-INCH NUCLEAR GAUGE) THEN THE LIFTS SHALL BE REDUCED ACCORDINGLY.

E. STRUCTURAL FILL SHALL BE COMPACTED TO A STABLE SURFACE AND APPROVED BY THE GEOTECHNICAL REPRESENTATIVE.

F. ACTUAL DEPTHS OF SUBEXCAVATIONS SHALL BE VERIFIED BY OBSERVATIONS AND TESTING OF THE FOUNDATION SUBGRADE SOILS AFTER EXCAVATING TO THE DESIGN FOUNDATION SUBGRADE ELEVATION.

G. COMPACTION SHALL ONLY BE CARRIED OUT DURING FAVORABLE WEATHER CONDITIONS, FILL MATERIAL SHALL NOT BE ALLOWED TO FREEZE, AND PLACED FILL MATERIAL SUBGRADES SHALL BE FIRM AND STABLE AFTER PLACEMENT AND COMPACTION. CARE SHALL BE TAKEN THAT FROZEN MATERIALS ARE NOT PLACED AS FILL NOR SHALL NEW FILL BE PLACED ON FROZEN GROUND.

H. STRUCTURAL FILL SHALL BE FREE OF DELETERIOUS, ORGANIC, OR FROZEN MATTER.

I. EACH LIFT OF STRUCTURAL FILL SHOULD BE TESTED FOR UNIT WEIGHT AND MOISTURE CONTENT AT A MINIMUM FREQUENCY OF TWO (2) TESTS PER LIFT. SHOULD THE RESULTS OF THE IN-PLACE UNIT WEIGHT TESTS INDICATE THE SPECIFIED MOISTURE OR COMPACTION REQUIREMENTS HAVE NOT BEEN MET, THE AREA REPRESENTED BY THE TEST SHALL BE REWORKED AND RETESTED AS REQUIRED UNTIL THE SPECIFIED MOISTURE AND COMPACTION REQUIREMENTS ARE ACHIEVED.

GD-4 BACKFILL MATERIAL OVER AND AROUND THE FOUNDATION SHALL HAVE THE MINIMUM DEPTH AS SHOWN ON THESE DESIGN DRAWINGS AND SHALL BE PREPARED ACCORDING TO THE FOLLOWING:

A. MIN. ALLOWABLE COMPACTED DRY UNIT WEIGHT: 95 PCF.

B. MAX. ALLOWABLE COMPACTED WET UNIT WEIGHT: 140 PCF.

C. THE USE OF ON-SITE SAND AND CLAY SOILS AS BACKFILL AGAINST FOUNDATIONS IS CONSIDERED ACCEPTABLE PROVIDED THE MATERIALS ARE PROCESSED AND PLACED IN ACCORDANCE WITH THESE SPECIFICATIONS.

1. FOR STOCK-PILED MATERIALS THAT EXHIBIT ELEVATED MOISTURE CONTENTS CONSIDERATION SHALL BE GIVEN TO DRYING OUT THE MATERIAL PRIOR TO COMPACTING AS BACKFILL OVER THE FOUNDATIONS.

2. METHODS FOR DRYING OUT ANY STOCK-PILED MATERIALS FOR USE AS BACKFILL MATERIAL SHALL BE COORDINATED WITH THE GEOTECHNICAL ENGINEER OF RECORD.

3. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING PROPER COMPACTION OF THE BACKFILL MATERIAL IS ACHIEVED AND THE ALLOWABLE COMPACTED UNIT WEIGHT RANGE IS MAINTAINED DURING CONSTRUCTION ACCORDING TO THESE SPECIFICATIONS.

D. BACKFILL MATERIALS SHALL BE FREE OF ORGANICS, ROOTS, FROZEN MATERIALS AND DELETERIOUS MATERIALS BEFORE THE STOCKPILE IS ALLOWED FOR REUSE.

E. THE PROPOSED BACKFILL MATERIAL SHALL BE APPROVED BY THE GEOTECHNICAL REPRESENTATIVE PRIOR TO ITS USE.

F. BACKFILL MATERIAL PLACED ON TOP AND AROUND THE FOUNDATION SHALL BE IN THIN, LOOSE LIFTS NOT EXCEEDING TWELVE (12) INCHES PRIOR TO COMPACTING. IF THE TESTING AGENCY CANNOT TEST THIS FULL DEPTH, (I.E., 12-INCH NUCLEAR GAUGE) THEN THE LIFTS SHALL BE REDUCED ACCORDINGLY.

G. BACKFILL TO BE PLACED OVER THE TURBINE FOUNDATION SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D698.

H. WHEN OVERBURDEN MATERIAL CONSISTS OF SP OR GRAVEL, A 12-INCH-THICK CLAS CAP SHALL EXTEND A MINIMUM OF FIVE (5) FEET BEYOND THE TURBINE EXCAVATION.

1. ALTERNATIVELY, CLAYEY SOILS CAN BE MIXED INTO THE OVERBURDEN BACKFILL MATERIALS TO CREATE A LESS PERMEABLE MIXTURE WITH APPROVAL OF THE GEOTECHNICAL ENGINEER OF RECORD.

I. EXCAVATED BEDROCK MATERIALS SHALL BE PROCESSED TO A MAXIMUM SIZE OF SIX (6) INCHES PRIOR TO USE WITHIN THE BACKFILL MATRIX. IF OCCASIONAL LARGER PARTICLES ARE ENCOUNTERED, THEY MAY BE NESTED WITHIN THE COMPACTED SOIL, BUT ONLY OUTSIDE OF THE FOUNDATION PERIMETER. THE NUMBER OF NESTED PARTICLES SHOULD NOT INTERFERE WITH THE COMPACTION OF THE SURROUNDING SOILS.

J. REPRESENTATIVE SAMPLES OF FOUNDATION BACKFILL MATERIAL SHALL BE OBTAINED DURING EXCAVATION BY AN EXPERIENCED GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE TO DETERMINE MOISTURE UNIT WEIGHT RELATIONSHIPS AS PER ASTM D698 (STANDARD PROCTOR) AND CLASSIFICATION TESTING AS NECESSARY FOR ACCEPTABILITY. THE TEST FREQUENCY SHALL BE DETERMINED BY THE GEOTECHNICAL ENGINEER AND SHALL COVER ALL SOIL TYPES INTENDED TO BE USED AS FOUNDATION BACKFILL. ALL TESTING SHALL BE COMPLETED BY AN APPROVED, INDEPENDENT TESTING AGENCY.

K. DURING EXCAVATION AND GRADING, PROPOSED BACKFILL MATERIAL NOT IMMEDIATELY PLACED AND COMPACTED SHALL BE STOCKPILED AND PROTECTED FROM MOISTURE BY SEALING THE SURFACE WITH LIGHT COMPACTION.

L. FILL PLACEMENT AT THE SITE SHALL INCLUDE IN-SITU UNIT WEIGHT TESTING TO DOCUMENT THAT PLACEMENT OF THE FILL MATERIAL MEETS OR EXCEEDS THESE PROJECT SPECIFICATIONS. EACH LIFT OF COMPACTED FILL SHALL BE CLOSELY OBSERVED AND TESTED BY AN APPROVED, INDEPENDENT TESTING AGENCY, AT A TEST FREQUENCY OF MINIMUM TWO (2) UNIT WEIGHT TESTS PER LIFT.

1. IF THE RESULTS OF IN-PLACE UNIT WEIGHT TESTS INDICATE THE SPECIFIED COMPACTION LIMITS HAVE NOT BEEN MET, THE AREA REPRESENTED BY THE TEST SHALL BE REWORKED AND RETESTED AS REQUIRED UNTIL THE SPECIFIED COMPACTION REQUIREMENTS ARE ACHIEVED.

M. DURING CONSTRUCTION, THE TOP SURFACE OF THE FILL SHALL BE KEPT WITH SUFFICIENT SLOPE (MINIMUM 2% GRADIENT) TO ALLOW RUNOFF OF WATER DURING RAINFALL WITHOUT INDUCING EROSION.

N. BACKFILL SOILS BELOW PERMANENT EQUIPMENT PADS INSTALLED WITHIN THE BACKFILL ZONE ABOVE THE TURBINE FOUNDATIONS SHALL MEET SPECIFIC GEOTECHNICAL RECOMMENDATIONS IN THE REFERENCED GEOTECHNICAL REPORT FOR MATERIAL REQUIREMENT AND PLACEMENT, INCLUDING THE USE OF NON-FROST SUSCEPTIBLE MATERIAL, IN ADDITION TO MEETING THE GENERAL FOUNDATION BACKFILL SPECIFICATIONS IN THESE DRAWINGS.

1. CONTROLLING APPROPRIATE ALLOWABLE SETTLEMENT OF THE TEMPORARY CRANE PADS DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE SAFE CRANE OPERATION.

i. THE CONTRACTOR SHALL VERIFY THE SOIL REQUIREMENTS BELOW THE CRANE PADS TO CONFIRM THAT THE SOILS CAN PROVIDE APPROPRIATE CAPACITY WITH THE GEOTECHNICAL ENGINEER OF RECORD AND THE CIVIL ENGINEER OF RECORD PRIOR TO CRANE PAD CONSTRUCTION.

ii. ANY PERMANENT DEFORMATION OR SETTLEMENT OF FOUNDATION BACKFILL MATERIAL CAUSED BY CRANE PADS SHALL BE REPAIRED BY THE CONTRACTOR WITHIN SEVEN (7) DAYS OF CRANE PAD REMOVAL AND SHALL SATISFY ALL OF THE GENERAL BACKFILL SPECIFICATIONS IN THESE DRAWINGS AND THE GEOTECHNICAL ENGINEERING REPORT AFTER REPAIR.

GD-5 TURBINE FOUNDATIONS LOCATED ADJACENT TO NATURAL OR MAN-MADE SLOPES SHALL BE LATERALLY SETBACK FROM THE TOP OF THE SLOPE TO MAINTAIN A MINIMUM LATERAL DISTANCE OF 25 FEET FROM THE EDGE OF THE FOUNDATION TO THE TOP EDGE OF THE SLOPE.

A. IN ADDITION, THE TURBINE FOUNDATION SHALL NOT BE LOCATED IN ANY AREA WHERE THE FOUNDATION INFLUENCE ZONE WILL INTERCEPT ANY PORTION OF THE DOWNHILL SLOPE. THE OUTER BOUND OF THE FOUNDATION INFLUENCE ZONE CAN BE ESTABLISHED BY DRAWING A 45-DEGREE ANGLE FROM THE OUTER EDGE OF THE FOUNDATION. IF A PROPOSED TURBINE FOUNDATION WILL VIOLATE THIS CRITERIA, THE FOUNDATION CAN BE MOVED EITHER HORIZONTALLY OR DEEPENED A SUFFICIENT DISTANCE TO MEET THE SETBACK REQUIREMENT PROVIDED THE DEPTH OF BACKFILL OVER THE FOUNDATION DOES NOT EXCEED THE DEPTH SHOWN ON THESE DESIGN DRAWINGS.

B. IN ALL SUCH CASES, PROPER DRAINAGE MEASURES SHALL BE TAKEN TO REDUCE THE IMPACTS TO MAN-MADE CUT AND FILL SLOPES AS WELL AS ALL UNDISTURBED NATURAL SLOPES.

GD-6 A QUALIFIED GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST SHALL BE RETAINED BY THE OWNER TO CONFIRM ALL FOUNDATION GEOTECHNICAL ASPECTS DURING FOUNDATION CONSTRUCTION.

GD-7 ALL SUBGRADES BELOW THE TURBINE FOUNDATIONS SHALL BE VERIFIED BY THE GEOTECHNICAL REPRESENTATIVE PRIOR TO PLACEMENT OF REINFORCING STEEL OR CONCRETE TO CONFIRM THAT THE SUBGRADES WILL APPROPRIATELY SUPPORT THE TURBINE FOUNDATIONS ACCORDING TO THE SUBGRADE TESTING PROCEDURE THAT HAS BEEN APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD.

GD-8 GEOTECHNICAL REPRESENTATIVE SHALL RECORD SOIL DESIGNATION AND ANY PERCHED/GROUNDWATER ENCOUNTERED. ANYTIME WATER ENCOUNTERED IS CONSIDERED TO BE GROUNDWATER AND IS NEARER TO THE NATURAL GROUND SURFACE THAN THE FOUNDATION HAS BEEN DESIGNED FOR AT THAT LOCATION, THE STRUCTURAL ENGINEER SHALL BE CONTACTED IN WRITING WITH RESOLUTION PRIOR TO INSTALLATION OF ANY LEAN CONCRETE MAT, REINFORCING STEEL, OR STRUCTURAL CONCRETE.

A. THE STRUCTURAL ENGINEER OF RECORD SHALL BE NOTIFIED PRIOR TO FOUNDATION CONSTRUCTION IF ANY GRADING CHANGES FROM NATIVE GRADE WILL BE PERFORMED AT ANY TURBINE LOCATIONS THAT COULD RESULT IN CHANGING THE EFFECTIVE GROUNDWATER LEVEL AS MEASURED FROM NATIVE GRADE IN ORDER TO VERIFY THAT THE CORRECT GROUNDWATER LEVEL AND FOUNDATION DESIGN HAS BEEN UTILIZED AT EACH TURBINE LOCATION.

GD-9 SUBGRADE SHALL BE FREE FROM FROST AND ICE PRIOR TO LEAN CONCRETE PLACEMENT.

GD-10 LEAN CONCRETE MAT SHALL BE PLACED AS LEVEL AS POSSIBLE TO ALLOW FOR INSTALLATION OF BOTTOM MAT OF REINFORCING STEEL.

GD-11 FINAL SITE GRADING SHALL ENSURE NO PONDING OCCURS DIRECTLY OVER FOUNDATION EXCAVATION.

GD-12 OVERBURDEN BACKFILL AROUND BASE AND/OR PEDESTAL MAY BE PLACED WHEN CONCRETE COMPRESSIVE STRENGTHS ARE 60% OF THE 28-DAY REQUIREMENTS SPECIFIED ON DESIGN DRAWINGS, THE FOUNDATION BASE CONCRETE HAS CURED FOR A MINIMUM OF 72 HOURS, AND THE FOUNDATION PEDESTAL CONCRETE HAS CURED FOR A MINIMUM OF 48 HOURS.

A. BACKFILL EQUIPMENT SHALL NOT COME IN CONTACT WITH THE FOUNDATION CONCRETE WHILE BACKFILLING AND NO VIBRATORY EQUIPMENT SHALL BE USED TO COMPACT THE BACKFILL UNLESS THERE IS A MINIMUM OF 12 INCHES OF BACKFILL MATERIAL BETWEEN THE FOUNDATION CONCRETE BASE SURFACE AND THE COMPACTION EQUIPMENT AT ALL TIMES. VIBRATORY COMPACTION EQUIPMENT SHALL NOT MAKE DIRECT CONTACT WITH EITHER THE FOUNDATION BASE OR PEDESTAL CONCRETE.

B. THERMOCOUPLE DATA SHALL BE REVIEWED PRIOR TO BACKFILL TO ENSURE MAXIMUM CORE AND DIFFERENTIAL CONCRETE TEMPERATURE LIMITS HAVE NOT BEEN EXCEEDED. IF A TEMPERATURE LIMIT IS EXCEEDED, BACKFILL PLACEMENT SHALL BE PLACED ON HOLD AND THE STRUCTURAL ENGINEER OF RECORD SHALL BE NOTIFIED.

GD-13 WHEN TURBINE IS FULLY ERECTED AND OPERATIONAL, NO DISTURBANCES SHALL BE MADE TO THE BACKFILL MATERIAL DIRECTLY OVER THE FOUNDATION FOOTPRINT.

CONCRETE:

C-1 28-DAY CONCRETE COMPRESSIVE STRENGTH, FOR BASE: 5,000 PSI, FOR PEDESTAL: 6,500 PSI.

C-2 EXPOSURE CLASSES: F2, S0, W1, C1.

C-3 CEMENT: ASTM C150 [TYPE I, TYPE II, OR TYPE I/II] OR ASTM C595 [TYPE IS, TYPE IP, TYPE IL, TYPE IT].

A. WHEN ASTM C595 CEMENT IS USED, LOW (LH) OR MODERATE (MH) HEAT OF HYDRATION CEMENT DESIGNATION RECOMMENDED.

C-4 FLY ASH (IF USED): ASTM C618, CLASS F (CLASS C ONLY WITH APPROVAL).

A. IF AN INCREASE IN ALLOWABLE CONCRETE PLACEMENT TEMPERATURE OF UP TO 15° F IS DESIRED BY THE CONTRACTOR AND ALLOWED BY THE STRUCTURAL ENGINEER OF RECORD AFTER REVIEWING THE SUBMITTED MIX DESIGN, THEN ONE OF THE FOLLOWING OPTIONS MUST BE SATISFIED:

1. THE CONCRETE MIX DESIGN SHALL REQUIRE A MINIMUM 25% FLY ASH REPLACEMENT WHEN USING CLASS F FLY ASH OR A MINIMUM 35% FLY ASH REPLACEMENT WHEN USING CLASS C FLY ASH (CLASS C USED ONLY WITH APPROVAL), OR;

2. SUBMIT CEMENT AND FLY ASH MILL CERTIFICATIONS TO THE STRUCTURAL ENGINEER OF RECORD ON A MONTHLY BASIS DURING CONSTRUCTION TO VERIFY THAT THE INCREASE IN ALLOWABLE PLACEMENT TEMPERATURE IS STILL ALLOWED. CEMENT AND FLY ASH WITH NEW MILL CERTIFICATIONS SHALL NOT BE USED UNTIL APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.

C-5 OTHER SUPPLEMENTARY CEMENTITIOUS MATERIALS (SLAG, SILICA FUME, ETC.) MAY BE USED WITH APPROVAL BY THE STRUCTURAL ENGINEER OF RECORD.

C-6 UNLESS APPROVED OTHERWISE BY THE STRUCTURAL ENGINEER OF RECORD, CONCRETE MIX DESIGN USED FOR THE BASE PORTION OF THE FOUNDATION SHALL INCLUDE A HYDRATION STABILIZER OR SET RETARDER TO EXTEND CONCRETE WORKABILITY.

C-7 AGGREGATE: ASTM C33, SIZE 67 OR 57.

A. WHEN A SINGLE SIZE OR COMBINATION OF TWO OR MORE SIZES OF AGGREGATES IS USED, THE FINAL GRADING SHALL CONFORM TO THE GRADING REQUIREMENTS OF ASTM C33 UNLESS OTHERWISE SPECIFIED OR PERMITTED. AGGREGATES USED IN CONCRETE SHALL BE OBTAINED FROM THE SAME SOURCES AND HAVE THE SAME SIZE RANGES AS THE AGGREGATES USED IN THE CONCRETE REPRESENTED BY SUBMITTED HISTORICAL DATA OR USED IN TRIAL MIXTURES.

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/12/2025

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATIONS

SPECIFICATION SHEET - 1

DRAWING No. S-7 | SHEET: | REV. 1

CADFILE: COLES DRAWING SET_IFC

LAST SAVED BY: MARCHENKEL ON 8/22/2025 12:33:43 PM

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B. SECTION 11.2 OF ASTM C33 SHALL BE REVISED AND IMPLEMENTED AS FOLLOWS: FINE AND COARSE AGGREGATE FOR USE IN CONCRETE SHALL NOT CONTAIN ANY MATERIALS THAT ARE DELETERIOUSLY REACTIVE WITH ALKALINE IN THE CEMENT IN AN AMOUNT SUFFICIENT TO CAUSE EXCESSIVE EXPANSION OF MORTAR OR CONCRETE. IF SUCH MATERIALS ARE PRESENT IN INJURIOUS AMOUNTS, SEPARATE CONSIDERATION NEED BE TAKEN FOR CORRECTIVE ACTION WHICH SHALL CLEARLY DEMONSTRATE THROUGH TESTING SATISFACTORY PERFORMANCE FOR PROJECT DESIGN LIFE.

1. ACCEPTANCE OF AGGREGATE AS IT RELATES TO ALKALI-SILICA REACTIVITY SHALL BE BASED ON ASTM C1260 WITH ADJUSTMENTS MADE TO THE CONCRETE MIX DESIGN PROPORTIONS BASED THE APPROPRIATE PREVENTIVE MEASURES ACCORDING TO ASTM C1778 IF NEEDED.

   i. ALTERNATIVELY, AGGREGATES ARE CONSIDERED NON-REACTIVE IF CONCRETE PRISMS EXPAND LESS THAN 0.04% AFTER ONE YEAR ACCORDING TO ASTM C1293.

2. AGGREGATES SUSCEPTIBLE TO ALKALI-CARBONATE REACTIVITY (ACR), SUCH AS AGGREGATES CONTAINING DOLOMITE, SHALL NOT BE USED IN THE CONCRETE. PRIOR TO RECEIVING APPROVAL OF THE PROPOSED CONCRETE MIX DESIGN FROM THE FOUNDATION DESIGN ENGINEER, THE CONTRACTOR SHALL PROVIDE VERIFICATION THAT NO AGGREGATES SUSCEPTIBLE TO ACR WILL BE USED IN THE CONCRETE. ASTM C586 MAY BE USED TO DETERMINE IF PROPOSED AGGREGATES ARE SUSCEPTIBLE TO ACR.

   i. ALTERNATIVELY, AGGREGATES ARE CONSIDERED NON-REACTIVE IF CONCRETE PRISMS EXPAND LESS THAN 0.04% AFTER ONE YEAR ACCORDING TO ASTM C1293.

C-8 CURING AGENT: ASTM C309, TYPE 2 (WHITE PIGMENTED).

C-9 FOR DURABILITY PURPOSES, WATER/CEMENTITIOUS MATERIAL (W/CM) RATIO SHALL BE DETERMINED IN THE FOUNDATION ENGINEER-APPROVED MIX DESIGN, NOT TO EXCEED 0.45, AND FIELD PERSONNEL SHALL CONFORM TO THE W/CM RATIO AS DETERMINED IN THE FOUNDATION ENGINEER-APPROVED MIX DESIGN.

C-10 SLUMP: UNLESS OTHERWISE SPECIFIED, THE CONCRETE SUPPLIER SHALL SELECT A TARGET SLUMP AT THE TIME OF MIX DESIGN DEVELOPMENT AND SUBMIT FOR APPROVAL. SELECTED TARGET SLUMP SHALL NOT EXCEED NINE (9) INCHES. CONCRETE SHALL NOT SHOW SIGNS OF SEGREGATION. THE TARGET SLUMP VALUE SHALL BE ENFORCED FOR THE DURATION OF THE PROJECT.

C-11 WATER USED FOR MIXING AND TO MAKE ICE SHALL MEET THE REQUIREMENTS OF ASTM C1602. USE POTABLE WATER UNLESS ALTERNATIVE SOURCES OF WATER COMPLYING WITH ASTM C1602 ARE PERMITTED.

A. NON-MUNICIPAL WATER SOURCES, SUCH AS PRIVATE (NON-PUBLIC) WELL WATER SOURCES, SHALL MEET REQUIREMENTS OF ASTM C1602 TABLE 2.

C-12 IF USED, ADMIXTURES SHALL MEET THE REQUIREMENTS OF THE FOLLOWING:

A. AIR-ENTRAINING MIXTURES: ASTM C260.

B. CHEMICAL ADMIXTURES: ASTM C494.

C. CHEMICAL ADMIXTURES FOR USE IN PRODUCING FLOWING CONCRETE: ASTM C1017.

D. ADMIXTURES USED IN CONCRETE SHALL BE THE SAME AS THOSE USED IN THE CONCRETE REPRESENTED BY SUBMITTED FIELD TEST RECORDS OR USED IN TRIAL MIXTURES.

C-13 AIR CONTENT AT POINT OF PLACEMENT: 5% +/- 1.5% FOR FOUNDATION PEDESTAL CONCRETE. NO SPECIFIED AIR CONTENT REQUIRED IN BASE AND LEAN (MUD MAT) CONCRETE.

A. ENTRAPPED AIR ONLY SHALL NOT BE USED WHEN AIR CONTENT HAS BEEN SPECIFIED.

C-14 IF DOBIE BLOCKS ARE USED FOR SUPPORTING BOTTOM REINFORCEMENT, DOBIES SHALL HAVE MINIMUM COMPRESSIVE STRENGTH AS REQUIRED BY THE CONCRETE CAST IN THE BASE.

A. DOBIE BLOCKS SHALL NOT BE MADE OF CLAY.

EXECUTION OF CONCRETE MIXING AND PLACEMENT:

CM-1 UNLESS OTHERWISE SPECIFIED, MEASURE, BATCH, AND MIX CONCRETE MATERIALS AND CONCRETE IN CONFORMANCE WITH ASTM C94.

CM-2 CONCRETE SHALL POSSESS THE SPECIFIED CHARACTERISTICS IN THE FRESHLY MIXED STATE AT THE POINT OF PLACING. TRANSPORT AND DELIVER CONCRETE IN EQUIPMENT CONFORMING TO THE REQUIREMENTS OF ASTM C94.

CM-3 CONCRETE SHALL BE PLACED IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318. PLACEMENT METHOD SHALL ENSURE PROPER CONSOLIDATION OF CONCRETE AS DEFINED BY ACI.

CM-4 SLUMP ADJUSTMENT:

A. WHEN CONCRETE ARRIVES AT THE POINT OF DELIVERY WITH A SLUMP BELOW THAT WHICH WILL RESULT IN THE SPECIFIED SLUMP AT THE POINT OF PLACEMENT AND IS UNSUITABLE FOR PLACING AT THAT SLUMP, THE SLUMP MAY BE ADJUSTED TO THE REQUIRED VALUE BY ADDING WATER UP TO THE AMOUNT ALLOWED IN THE ACCEPTED MIXTURE PROPORTIONS UNLESS OTHERWISE SPECIFIED BY THE ENGINEER.

B. ADDITION OF WATER SHALL BE IN ACCORDANCE WITH ASTM C94.

C. DO NOT EXCEED THE SPECIFIED WATER-CEMENTITIOUS MATERIAL RATIO OR SLUMP.

D. DO NOT ADD WATER TO CONCRETE DELIVERED IN EQUIPMENT NOT ACCEPTABLE FOR MIXING.

E. IF PLASTICIZING OR HIGH-RANGE WATER-REDUCING ADMIXTURES ARE ADDED TO THE CONCRETE AT THE SITE TO ACHIEVE FLOWABLE CONCRETE, DO NOT ADD WATER TO THE CONCRETE.

F. MEASURE SLUMP AND AIR CONTENT OF AIR-ENTRAINED CONCRETE AFTER SLUMP ADJUSTMENTS TO VERIFY COMPLIANCE WITH SPECIFIED REQUIREMENTS.

CM-5 TIME FOR COMPLETION OF DISCHARGE SHALL COMPLY WITH ASTM C94 UNLESS OTHERWISE PERMITTED. WHEN DISCHARGE IS PERMITTED AFTER MORE THAN 90 MINUTES HAVE ELAPSED SINCE BATCHING, VERIFY AIR CONTENT OF AIR-ENTRAINED CONCRETE, SLUMP, AND TEMPERATURE OF CONCRETE AS SPECIFIED.

CM-6 DO NOT PLACE CONCRETE UNTIL DATA ON MATERIALS AND MIXTURE PROPORTIONS ARE ACCEPTED.

CM-7 THE CONTRACTOR SHALL PLACE THE MINIMUM CONCRETE VOLUME FOR THE BASE/PEDESTAL AS SHOWN BY THE DIMENSIONS/ESTIMATED QUANTITIES SHOWN ON THESE DESIGN DRAWINGS.

CM-8 WHEN THE FOUNDATION BASE AND PEDESTAL CONCRETE ARE PLACED IN SEPARATE POURS (NON-MONOLITHICALLY), BASE CONCRETE SHALL CURE FOR A MINIMUM OF 24 HOURS AND UNTIL IT IS OF SUFFICIENT STIFFNESS TO RESIST DAMAGE BEFORE PLACING THE PEDESTAL CONCRETE.

CM-9 WHEN THE FOUNDATION CONCRETE IS PLACED MONOLITHICALLY, THE FOLLOWING PROCEDURES SHALL BE FOLLOWED:

A. IF THE PEDESTAL AND BASE PORTIONS OF THE FOUNDATION HAVE DIFFERENT SPECIFICATIONS, IN ORDER TO HELP ENSURE THE CORRECT CONCRETE MIX IS USED IN THE PEDESTAL, A MINIMUM OF THE LAST SEVEN (7) CUBIC YARDS OF THE BASE CONCRETE PLACED IMMEDIATELY PRIOR TO PLACING THE PEDESTAL CONCRETE SHALL BE PLACED USING THE SAME CONCRETE MIX THAT WILL BE USED IN THE PEDESTAL. ALTERNATIVELY, THE MORE STRINGENT (I.E. HIGHER STRENGTH, AIR ENTRAINED, ETC.) OF THE BASE AND PEDESTAL MIXES MAY BE USED IN BOTH THE BASE AND PEDESTAL WITH APPROVAL FROM THE FOUNDATION ENGINEER OF RECORD.

B. IF THE BASE CONCRETE IS NOT COMPLETELY TOPPED OFF PRIOR TO PLACING THE PEDESTAL CONCRETE, THEN CARE MUST BE TAKEN TO ENSURE THAT THE EXPOSED BASE CONCRETE DOES NOT HARDEN OR BECOME UNWORKABLE WHILE THE PEDESTAL CONCRETE IS BEING PLACED. THE DEPOSITING CONCRETE SPECIFICATIONS IN THESE DRAWINGS SHALL BE MET AT ALL TIMES.

CM-10 CONVEYING EQUIPMENT:

A. RAPIDLY CONVEY CONCRETE FROM MIXER TO THE PLACE OF FINAL DEPOSIT BY METHODS THAT PREVENT SEGREGATION OR LOSS OF INGREDIENTS AND ENSURE THE REQUIRED QUALITY OF CONCRETE. DO NOT USE ALUMINUM PIPES OR CHUTES.

B. CLEAN CONVEYING EQUIPMENT BEFORE EACH PLACEMENT.

C. USE BELT CONVEYORS THAT ARE HORIZONTAL OR AT A SLOPE THAT WILL NOT CAUSE EXCESSIVE SEGREGATION OR LOSS OF INGREDIENTS. USE ACCEPTABLE DISCHARGE BAFFLE OR HOPPER AT THE DISCHARGE END TO PREVENT SEGREGATION. DO NOT ALLOW MORTAR TO ADHERE TO THE RETURN LENGTH OF THE BELT.

D. USE METAL OR METAL-LINED CHUTES HAVING ROUNDED BOTTOMS, AND SLOPED BETWEEN ONE VERTICAL TO TWO HORIZONTAL AND ONE VERTICAL TO THREE HORIZONTAL. CHUTES LONGER THAN 20 FEET LONG AND CHUTES NOT MEETING SLOPE REQUIREMENTS MAY BE USED PROVIDED THE DISCHARGE IS INTO A HOPPER BEFORE DISTRIBUTION INTO THE PLACEMENT AREA.

E. USE PUMPING EQUIPMENT THAT PERMITS PLACEMENT RATES THAT AVOID COLD JOINTS AND PREVENTS SEGREGATION IN DISCHARGE OF PUMPED CONCRETE.

CM-11 DEPOSITING CONCRETE:

A. DEPOSIT CONCRETE CONTINUOUSLY IN ONE LAYER OR IN LAYERS TO HAVE FRESH CONCRETE DEPOSITED ON IN-PLACE CONCRETE THAT IS STILL PLASTIC.

B. DO NOT DEPOSIT FRESH CONCRETE ON CONCRETE THAT HAS HARDENED SUFFICIENTLY TO CAUSE FORMATION OF SEAMS OR PLANES OF WEAKNESS WITHIN THE SECTION.

C. DO NOT USE CONCRETE THAT HAS SURFACE-DRIED, PARTIALLY HARDENED, OR CONTAINS FOREIGN MATERIAL.

D. DEPOSIT CONCRETE AS NEAR AS PRACTICABLE TO THE FINAL POSITION TO AVOID SEGREGATION.

CM-12 CONSOLIDATION PER ACI 309:

A. CONSOLIDATE CONCRETE BY VIBRATION INCLUDING FINAL LIFT OF CONCRETE. THOROUGHLY WORK CONCRETE AROUND REINFORCEMENT AND EMBEDDED ITEMS AND INTO CORNERS OF FORMS, ELIMINATING AIR AND STONE POCKETS THAT MAY CAUSE HONEYCOMBING, PITTING, OR PLANES OF WEAKNESS.

1. FINAL LIFT OF BASE CONCRETE SHALL BE CONSOLIDATED AS SPECIFIED ABOVE. IN ADDITION, DUE TO THE EXTENDED TIME OF EXPOSURE OF THE SECOND TO LAST LIFT, THE NECESSARY EFFORT SHOULD BE TAKEN TO ENSURE THE VIBRATOR IS ALLOWED AMPLE TIME TO PENETRATE THROUGH THE FINAL LIFT INTO THE PREVIOUS LIFT IN ORDER TO ADEQUATELY KNIT THE TWO LAYERS TOGETHER. THIS WILL PROVIDE THE CRITICAL HORIZONTAL SHEAR TRANSFER OF THE TOP MAT OF REINFORCING TO THE CONCRETE BELOW.

B. USE INTERNAL VIBRATORS OF THE LARGEST SIZE AND POWER THAT CAN PROPERLY BE USED IN THE CONCRETE PLACEMENT.

C. DO NOT USE VIBRATORS TO MOVE CONCRETE.

D. VIBRATIONS OF CONCRETE SHALL FOLLOW THE METHOD BELOW:

1. VIBRATION OF CONCRETE SHALL BE INSERTED VERTICALLY, PROCEED RAPIDLY TO THE BOTTOM OF THE FRESH LAYER, AND PENETRATE AT LEAST 6 INCHES INTO THE PRECEDING LAYER INCLUDING FINAL LIFT OF CONCRETE.

2. THE VIBRATOR SHALL BE MANIPULATED IN AN UP-AND-DOWN MOTION, GENERALLY FOR 5 TO 15 SECONDS TO KNIT THE TWO LAYERS TOGETHER. THE VIBRATOR SHALL THEN BE WITHDRAWN GRADUALLY WITH A SERIES OF UP-AND-DOWN MOTIONS. THE DOWN MOTION SHALL BE A RAPID DROP.

3. THE SPACING BETWEEN VIBRATOR INSERTIONS SHALL NOT EXCEED 1.5 TIMES THE VIBRATOR'S RADIUS OF ACTION IN CONCRETE BEING CONSOLIDATED. REFER TO TABLE 5.1 IN ACI 309 OR THE VIBRATOR MANUFACTURER'S DOCUMENTATION FOR THE RADIUS OF ACTION DETAILS.

CM-13 CURING AND PROTECTION:

A. IF BLEED WATER SHEEN IS NOT VISIBLE ON SURFACE OF CONCRETE AFTER STRIKEOFF, PROVIDE INITIAL CURING BY MEANS OF FOGGING OR APPLICATION OF EVAPORATION RETARDER UNTIL FINAL CURING IS APPLIED.

1. IF USED, PROVIDE FOGGING EQUIPMENT FOR COMPLETE COVERAGE OF AREA TO BE CURED. MAINTAIN VISIBLE WATER SHEEN WITHOUT ACCUMULATION OF STANDING WATER ON THE CONCRETE SURFACE UNTIL FINAL SETTING OF CONCRETE.

2. IF USED, EVAPORATION RETARDER SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. DO NOT USE EVAPORATION RETARDER AS AN AID FOR SUBSEQUENT FINISHING OPERATIONS AND TEXTURING.

B. FINAL CURING SHALL CONSIST OF ONE OR MORE OF THE FOLLOWING METHODS:

1. IMMEDIATELY AFTER CONCRETE FINISHING COMPLETELY COVER EACH FOUNDATION WITH OPAQUE WHITE SHEET MATERIAL MEETING THE REQUIREMENTS OF ASTM C171 OR ABSORBANT MATERIAL MEETING THE REQUIREMENTS OF AASHTO M 182 THAT IS KEPT CONTINUOUSLY WET.

   i. THE FOUNDATIONS SHALL BE KEPT COVERED FOR A MINIMUM OF SEVEN (7) DAYS PROVIDED THAT THE CONCRETE SURFACE TEMPERATURE IS AT LEAST 50° F, OR UNTIL THE CONCRETE STRENGTH MEETS OR EXCEEDS 70% OF F'C AS DETERMINED BY THE MATURITY METHOD ACCORDING TO ASTM C1074.

   ii. IF USED, WATER-RETENTION SHEETING MATERIAL SHALL COVER ALL EXPOSED CONCRETE SURFACES. TAPE SHEETING MATERIAL TOGETHER OR LAP SHEETS, REPAIR HOLES AND GAPS, AND KEEP SHEETS IN PLACE.

   iii. IF A CURING COMPOUND WILL NOT BE APPLIED TO THE CONCRETE AFTER REMOVAL OF THE SHEET OR ABSORBANT MATERIAL DESCRIBED ABOVE, THEN AFTER REMOVAL OF THAT MATERIAL AND JUST PRIOR TO BACKFILL PLACEMENT, THE FOUNDATION SURFACE SHALL BE SPRAYED DOWN WITH WATER. ADDITIONALLY, THE BACKFILL MATERIAL PLACED IN CONTACT WITH THE FOUNDATION MUST NOT BE PLACED DRY AND MUST HAVE A MOISTURE CONTENT WITHIN THE SPECIFIED RANGE OF THE GEOTECHNICAL BACKFILL COMPACTION REQUIREMENTS. THE BACKFILL MATERIAL SHALL NOT BE ALLOWED TO DRAW MOISTURE OUT OF THE FOUNDATION CONCRETE AT THE TIME OF BACKFILL PLACEMENT.

2. APPLY CURING COMPOUND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AS SOON AS WATER SHEEN HAS DISAPPEARED FROM THE CONCRETE SURFACE AND AFTER FINISHING OPERATIONS. THE APPLICATION RATE SHALL NOT BE LESS THAN 1 GAL./200 SQUARE FEET. IF THE CONCRETE CONTAINS SILICA FUME, REFER TO CM-13.C.

   i. DO NOT USE CURING COMPOUND ON ANY SURFACE WHERE CONCRETE OR OTHER MATERIAL WILL BE BONDED, UNLESS THE CURING COMPOUND WILL NOT PREVENT BOND OR UNLESS MEASURES ARE TAKEN TO COMPLETELY REMOVE THE CURING COMPOUND FROM AREAS TO RECEIVE BONDED APPLICATIONS.

C. FOR CONCRETE CONTAINING SILICA FUME, USE A CURING PROCEDURE THAT SUPPLIES ADDITIONAL WATER DURING THE ENTIRE CURING PERIOD SUCH AS CONTINUOUS FOGGING, CONTINUOUS SPRINKLING, OR APPLICATION OF ABSORBANT MATERIAL.

1. IF USED, PROVIDE FOGGING EQUIPMENT FOR COMPLETE COVERAGE OF AREA TO BE CURED. MAINTAIN VISIBLE WATER SHEEN ON THE CONCRETE SURFACE UNTIL FINAL SETTING OF CONCRETE.

2. IF USED, CONTINUOUS SPRINKLING SHALL USE EITHER SOAKER HOSES OR LAWN SPRINKLERS. CONCRETE SURFACES SHALL NOT BE ERODED BY RUNNING WATER. KEEP CONCRETE SURFACES CONTINUOUSLY WET.

3. IF USED, ABSORBANT MATERIAL SHALL BE PREDAMPENED BEFORE APPLICATION. KEEP CONCRETE SURFACES CONTINUOUSLY WET. APPLY ADDITIONAL WATER TO ABSORBANT MATERIAL WITHOUT DISPLACING THEM. ABSORBANT MATERIAL SHALL MEET THE REQUIREMENTS OF AASHTO M 182.

4. THESE CURING MEASURES MAY BE TERMINATED WHEN ONE OF THE FOLLOWING CONDITIONS IS SATISFIED:

   i. THE COMPRESSIVE STRENGTH OF LABORATORY-CURED CYLINDERS, REPRESENTATIVE OF THE IN-PLACE CONCRETE, EXCEEDS 85% F'C, PROVIDED THE TEMPERATURE OF THE IN-PLACE CONCRETE HAS BEEN MAINTAINED AT 50° F OR HIGHER DURING CURING.

   ii. CONCRETE STRENGTH REACHED F'C AS DETERMINED BY MATURITY METHOD IN ACCORDANCE WITH ASTM C1074.

D. IMMEDIATELY AFTER PLACEMENT, PROTECT CONCRETE FROM PREMATURE DRYING, EXCESSIVELY HOT OR COLD TEMPERATURES, AND MECHANICAL INJURY.

E. PROTECT CONCRETE DURING THE CURING PERIOD SUCH THAT THE CONCRETE TEMPERATURE DOES NOT FALL BELOW THE REQUIREMENTS SHOWN IN THE COLD WEATHER CONCRETING SECTION.

F. DO NOT ALLOW WINDY CONDITIONS TO CAUSE EXCESSIVE OR ACCELERATED DRYING OF THE FOUNDATION BEFORE BACKFILL IF PLACED OVER THE FOUNDATION.

CM-14 TOP OF BASE SHALL BE FINISHED WITH ROUGH TROWEL FINISH OR ROLLER BUG. TOP OF PEDESTAL SHALL BE FINISHED WITH TROWEL AND BROOM FINISH.

MASS CONCRETING:

MC-1 THE FOLLOWING REQUIREMENTS SHALL BE MET WHEN CONCRETE PLACEMENT IS CONSIDERED TO BE MASS CONCRETE. THE OTHER REQUIREMENTS OF THESE DESIGN DOCUMENTS SHALL BE MET UNLESS MORE STRINGENT REQUIREMENTS FOUND IN THIS SECTION CONTROL.

MC-2 MASS CONCRETING PRECAUTIONS SHALL BE REQUIRED WHEN THE MINIMUM CROSS-SECTIONAL DIMENSION APPROACHES OR EXCEEDS 2-1/2 FEET OR WHEN CEMENT CONTENTS ABOVE 600 LB/YD^3 ARE USED.

MC-3 SUBMIT BRAND NAMES, MANUFACTURER'S CERTIFICATIONS, AND TEST DATA ON HEAT OF HYDRATION.

MC-4 DO NOT USE ASTM C150 TYPE III CEMENT OR ASTM C595 CEMENT WITH HIGH-EARLY STRENGTH (HE) DESIGNATION.

MC-5 DO NOT USE CALCIUM CHLORIDE OR OTHER ACCELERATING ADMIXTURES UNLESS SPECIFICALLY PERMITTED.

MC-6 CONCRETE PLACED IN COLD WEATHER SHALL MEET THE REQUIREMENTS OF THE COLD WEATHER CONCRETING SECTION.

MC-7 PLACE CONCRETE IN LAYERS NOT MORE THAN 18 INCHES THICK. EXTEND VIBRATOR HEADS INTO PREVIOUSLY PLACED LAYER OF PLASTIC CONCRETE.

MC-8 DURING PROTECTION FROM FREEZING AND MOISTURE LOSS, AS REQUIRED BY THE COLD WEATHER CONCRETING AND THE EXECUTION OF CONCRETE MIXING AND PLACEMENT SECTIONS, DO NOT USE STEAM OR OTHER CURING METHODS THAT WILL ADD HEAT TO THE CONCRETE.

MC-9 UNLESS OTHERWISE SPECIFIED, COOL THE CONCRETE GRADUALLY SO THAT THE DROP IN CONCRETE SURFACE TEMPERATURE DURING AND AT THE CONCLUSION OF THE SPECIFIED CURING PERIOD DOES NOT EXCEED 20 °F IN ANY 24 HOUR PERIOD.

MC-10 BASE AND PEDESTAL CONCRETE MIX DESIGN THAT IS CONSIDERED MASS CONCRETE SHALL BE DESIGNED AND SEALED BY A PROFESSIONAL ENGINEER. MIX DESIGN SHALL BE DESIGNED WITH PLACEMENT SPECIFICATIONS TO ENSURE MAXIMUM CONCRETE TEMPERATURE AT THE CORE OF THE FOUNDATION BASE DOES NOT EXCEED 160 °F, UNLESS ALLOWED OTHERWISE BY THE FOUNDATION ENGINEER OF RECORD, AND MAXIMUM TEMPERATURE RANGE FROM THE CORE OF THE BASE/PEDESTAL TO THE BASE/PEDESTAL SURFACE (RESPECTIVELY) DOES NOT HAVE A TEMPERATURE DIFFERENTIAL IN EXCESS OF 35 °F.

A. ACCEPTABLE MATERIALS FOR PREVENTING EXCESSIVE TEMPERATURE DECREASES AND DIFFERENTIALS ARE INSULATING BLANKETS: BATT INSULATION WITH MOISTURE-PROOF COVERING; AND LAYERS OF DRY POROUS MATERIAL SUCH AS STRAW, HAY, OR MULTIPLE LAYERS OF IMPERVIOUS PAPER MEETING ASTM C171.

B. TIMING THE REMOVAL OF THESE PROTECTIVE MEASURES IS CRITICAL AND SHALL BE IMPLEMENTED IN SUCH A WAY AS TO AVOID THERMAL SHRINKAGE CRACKS CAUSED BY A RAPID DECREASE IN CONCRETE SURFACE TEMPERATURE UPON PROTECTION REMOVAL.

C. THE USE OF ICE OR CHILLED WATER IN THE CONCRETE BATCHING PROCESS MUST BE ANTICIPATED AS NEEDED TO ENSURE THE ALLOWABLE CONCRETE PLACEMENT TEMPERATURES AS NOTED IN THE FOUNDATION ENGINEER-APPROVED CONCRETE MIX DESIGN OR AS DETERMINED BY INTERNAL CONCRETE TEMPERATURE MONITORING DATA WITH THE APPROVAL OF THE FOUNDATION ENGINEER ARE NOT EXCEEDED.

HOT WEATHER CONCRETING:

HW-1 THE RECOMMENDATIONS OF ACI 305 SHALL BE FOLLOWED FOR CONDITIONS OF HOT WEATHER CONCRETING.

HW-2 THE TEMPERATURE OF THE CONCRETE AS PLACED SHALL NOT EXCEED THE ALLOWABLE PLACEMENT TEMPERATURE AS NOTED IN THE FOUNDATION ENGINEER-APPROVED CONCRETE MIX DESIGN OR AS DETERMINED BY INTERNAL CONCRETE TEMPERATURE MONITORING DATA WITH THE APPROVAL OF THE FOUNDATION ENGINEER.

A. TEMPERATURE MONITORING PROCEDURE, IF USED, SHALL BE DETERMINED BY THE FOUNDATION ENGINEER OF RECORD.

B. THE USE OF ICE OR CHILLED WATER IN THE CONCRETE BATCHING PROCESS MUST BE ANTICIPATED AS NEEDED TO ENSURE THE ALLOWABLE CONCRETE PLACEMENT TEMPERATURES AS NOTED IN THE FOUNDATION ENGINEER-APPROVED CONCRETE MIX DESIGN OR AS DETERMINED BY INTERNAL CONCRETE TEMPERATURE MONITORING DATA WITH THE APPROVAL OF THE FOUNDATION ENGINEER ARE NOT EXCEEDED.

HW-3 LOSS OF SLUMP, FLASH SET, OR COLD JOINTS SHALL NOT BE ACCEPTABLE.

HW-4 ACCEPTED EVAPORATION CONTROL MEASURES SHALL PROVIDE ADEQUATE PROTECTION OF, AND PREVENT RAPID EVAPORATION FROM, THE FRESH CONCRETE SURFACE.

A. AN EVAPORATION RETARDANT SHALL BE APPLIED TO THE FRESH CONCRETE PRIOR TO APPLICATION OF THE CURING AGENT IF THE CONCRETE AND AIR TEMPERATURES, RELATIVE HUMIDITY OF THE AIR, AND THE WIND SPEED HAVE THE CAPACITY TO EVAPORATE FREE WATER FROM THE FRESH CONCRETE SURFACE AT A RATE THAT IS EQUAL TO OR GREATER THAN 0.2 LB/FT²/H, UNLESS OTHERWISE ACCEPTED BY THE STRUCTURAL ENGINEER OF RECORD.

B. DETERMINE THE EVAPORATION RATE OF SURFACE WATER BY USE OF THE UNO EQUATION AS DESCRIBED IN ACI 305.1-14. THE UNO EQUATION SHALL BE STATED IN THE HOT WEATHER PROCEDURE.

1. THE INPUT DATA FOR THE UNO EQUATION SHALL BE OBTAINED FROM A HANDHELD ANEMOMETER. THE HANDHELD ANEMOMETER SHALL BE CERTIFIED BY THE MANUFACTURER AS ACCURATE TO WITHIN 1.8° F, 5 PERCENT RELATIVE HUMIDITY, AND 1 MPH WIND SPEED. USE EQUIPMENT IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

2. ONCE THE INPUT DATA HAS BEEN OBTAINED FROM THE HANDHELD ANEMOMETER, IT IS ACCEPTABLE TO CALCULATE THE EVAPORATION RATE BY PLUGGING THE INPUT DATA INTO THE ACI MOBILE PHONE APPLICATION OR BY CALCULATOR.

3. THE EVAPORATION RATE SHALL BE CHECKED AS SOON AS REASONABLY POSSIBLE AFTER CONCRETE PLACEMENT HAS FINISHED AND AT LEAST ONCE IN BOTH THE MORNING AND AFTERNOON ON EACH DAY PRIOR TO BACKFILL PLACEMENT.

C. IN LIEU OF CALCULATING THE EVAPORATION RATE, ONE OF THE FOLLOWING OPTIONS MAY BE USED AT THE CONTRACTOR'S DISCRETION:

1. APPLY AN EVAPORATION RETARDANT TO ALL FOUNDATIONS PRIOR TO APPLICATION OF THE CURING AGENT IMMEDIATELY FOLLOWING THE FINISHING OF THE CONCRETE SURFACE BY TRAILING CLOSELY BEHIND THE FINISHING CREW AS THEY WORK AROUND THE FOUNDATION. THE APPROVED CURING AGENT SHALL BE APPLIED WITHIN 12 HOURS AFTER THE APPLICATION OF THE EVAPORATION RETARDANT, OR

2. IMMEDIATELY AFTER CONCRETE FINISHING COMPLETELY COVER EACH FOUNDATION WITH OPAQUE WHITE SHEET MATERIAL MEETING THE REQUIREMENTS OF ASTM C171 OR ABSORBANT MATERIAL MEETING THE REQUIREMENTS OF AASHTO M 182 THAT IS KEPT CONTINUOUSLY WET.

   i. THE FOUNDATIONS SHALL BE KEPT COVERED FOR A MINIMUM OF SEVEN (7) DAYS PROVIDED THAT THE CONCRETE SURFACE TEMPERATURE IS AT LEAST 50° F, OR UNTIL THE CONCRETE STRENGTH MEETS OR EXCEEDS 70% OF F'C AS DETERMINED BY THE MATURITY METHOD ACCORDING TO ASTM C1074.

D. THESE HOT WEATHER EVAPORATION REQUIREMENTS DO NOT ELIMINATE ANY OTHER GENERAL CURING OR MASS CONCRETE CURING REQUIREMENTS IN THESE SPECIFICATIONS.

HW-5 OBTAIN ACCEPTANCE BY THE STRUCTURAL ENGINEER OF RECORD OF HOT WEATHER CONCRETING PROCEDURE.

HW-6 WHEN TEMPERATURE OF STEEL REINFORCEMENT, EMBEDMENTS, OR FORMS IS GREATER THAN 120 °F, FOG STEEL REINFORCEMENT, EMBEDMENTS, AND FORMS WITH WATER IMMEDIATELY BEFORE PLACING CONCRETE. REMOVE STANDING WATER BEFORE PLACING CONCRETE.

COLD WEATHER CONCRETING:

CW-1 THE RECOMMENDATIONS OF ACI 306 SHALL BE FOLLOWED FOR CONDITIONS OF COLD WEATHER CONCRETING.

CW-2 COLD WEATHER CONCRETING SHALL BE IMPLEMENTED WHEN THE AIR TEMPERATURE HAS FALLEN TO, OR IS EXPECTED TO FALL BELOW, 40 °F FOR MORE THAN THREE SUCCESSIVE DAYS. THE TEMPERATURE OF THE CONCRETE SHALL BE PLACED AND MAINTAINED BETWEEN 50 °F AND 70 °F.

CW-3 THE TEMPERATURE OF THE FRESH CONCRETE SHALL BE MEASURED IN ACCORDANCE WITH ASTM C1064.

CW-4 THE TEMPERATURE OF IN-PLACE CONCRETE SHALL BE MEASURED USING EMBEDDED THERMOCOUPLES. THE PLANNED LOCATIONS OF THERMOCOUPLE INSTALLATION SHALL BE SUBMITTED TO THE FOUNDATION ENGINEER OF RECORD AS PART OF A COLD OR MASS CONCRETE PLACEMENT PROCEDURE FOR APPROVAL PRIOR TO CONSTRUCTION. HISTORICAL TEMPERATURE DATA SHALL BE RETAINED BY THE CONTRACTOR AS PART OF THE CONSTRUCTION PROJECT RECORD.

CW-5 MAINTAIN CONCRETE PROTECTION TO PREVENT FREEZING OF THE CONCRETE. REMOVE PROTECTION IN SUCH A MANNER THAT THE MAXIMUM DECREASE IN TEMPERATURE MEASURED AT THE SURFACE OF THE CONCRETE IN A 24 HOUR PERIOD SHALL NOT EXCEED 40 °F.

CW-6 WHEN THE CONCRETE HAS BEEN PROTECTED FOR A MINIMUM OF THREE DAYS AND THE IN-PLACE CONCRETE COMPRESSIVE STRENGTH HAS REACHED AT LEAST 3,500 PSI, PROTECTION MEASURES MAY BE REMOVED.

CW-7 DO NOT PLACE CONCRETE AROUND THE EMBEDMENT RING UNLESS THE EMBEDMENT RING IS AT A TEMPERATURE ABOVE 32 °F.

CW-8 DURING PERIODS NOT DEFINED AS COLD WEATHER, BUT WHEN FREEZING TEMPERATURES MAY OCCUR, PROTECT CONCRETE SURFACES AGAINST FREEZING FOR THE FIRST 24 HOURS AFTER PLACING.

CW-9 THE TEMPERATURE OF THE CONCRETE AT THE POINT OF MIXING (TYPICALLY AT THE BATCH PLANT) SHALL FOLLOW LINES 2, 3 AND 4 OF TABLE 5.1 OF ACI 306 SECTION SIZE 12 TO 36 IN. AND SHALL NOT BE MORE THAN 15°F HIGHER OF THE VALUES LISTED.

A. THE RECOMMENDATIONS IN THE LATEST VERSION OF ACI 306 SHALL BE FOLLOWED FOR HEATING MIXING WATER AND AGGREGATES. AGGREGATES SHALL BE HEATED SUFFICIENTLY TO ELIMINATE ICE, SNOW, AND FROZEN LUMPS PRIOR TO MIXING TO AVOID INCREASES IN ADDITIONAL WATER OF UNKNOWN VOLUME INTO THE CONCRETE MIX.

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/12/2025

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATIONS

SPECIFICATION SHEET - 2

DRAWING No.	SHEET:	REV.
S-8		0

CADFILE: COLES DRAWING SET_IFC

LAST SAVED BY: MARCHENKEL ON 8/22/2025 12:33:43 PM

CW-10 THE CONCRETE SURFACE TEMPERATURE SHALL BE MONITORED AND RECORDED AT LEAST TWICE DAILY FOR THREE DAYS AFTER CONCRETE PLACEMENT.

CW-11 ONLY IF THE TURBINE IS TO BE ERECTED WITHIN 28 DAYS OF FOUNDATION CONCRETE PLACEMENT, THEN THE IN-PLACE CONCRETE STRENGTH SHALL BE DETERMINED AS FOLLOWS:

A. MATURITY METHOD PER ASTM C1074. AS OF THE 2016 UPDATE TO ACI 306, FIELD-CURED CYLINDERS ARE NO LONGER RECOMMENDED TO DETERMINE IN-PLACE CONCRETE STRENGTH. THE MATERIAL STRENGTH SPECIFICATIONS IN THE EXECUTION OF TOWER ERECTION SECTION OF THESE SPECIFICATIONS FOR IN-PLACE STRENGTH SHALL BE SATISFIED. THE FOUNDATION ENGINEER SHALL BE NOTIFIED IN ORDER TO COORDINATE A TESTING AND MEASUREMENT PROCEDURE. AT A MINIMUM, THE TESTING AND MEASUREMENT PROCEDURE SHALL MEET THE FOLLOWING REQUIREMENTS:

1. THE EXECUTION OF THE CONSTRUCTION SEQUENCE SHALL DEPEND ON THE IN-PLACE CONCRETE STRENGTH ACCORDING TO THE SPECIFIED STRENGTHS SHOWN IN SECTIONS "GD" AND "TE" OF THESE SPECIFICATIONS.

2. MATURITY OF THE FIELD-CURED CONCRETE SHALL BE MEASURED/CALCULATED AND USED TO DETERMINE STRENGTH BY COMPARISON TO THE STRENGTH-MATURITY RELATIONSHIP ESTABLISHED FROM THE LAB-CURED CYLINDERS.

3. MATURITY USING THE TIME-TEMPERATURE METHODOLOGY SHALL BE REPORTED IN UNITS OF TEMPERATURE x TIME (FOR EXAMPLE °F*Hr). TEMPERATURE REFERS TO CONCRETE TEMPERATURE AND NOT AIR TEMPERATURE.

4. A DATUM TEMPERATURE OF 32 °F SHALL BE USED. IF SUBSTANTIATING EVIDENCE CAN BE PROVIDED, THEN A LOWER DATUM TEMPERATURE MAY BE USED WITH APPROVAL OF THE STRUCTURAL ENGINEER. ASTM C1074 ANNEX A1.1 MAY BE USED TO ESTABLISH THE DATUM TEMPERATURE.

5. MATURITY METERS/ DATA LOGGERS SHALL BE ENGIUS INTELLIROCK BRAND OR APPROVED EQUIVALENT. IF MATURITY METERS ARE USED, THEN THEY SHALL BE CORRECTED TO INCORPORATE THE 32 °F DATUM TEMPERATURE UNLESS A DIFFERENT DATUM TEMPERATURE IS APPROVED.

6. FOR FIELD CONCRETE NOT CONTINUOUSLY MONITORED WITH DATA LOGGERS, TEMPERATURE READINGS TO BE USED IN MATURITY CALCULATIONS SHALL BE TAKEN AT THE FOLLOWING FREQUENCY:

   i. AT THE TIME OF THE COMPLETION OF THE CONCRETE PLACEMENT.

   ii. MINIMUM EVERY TWELVE (12) HOURS FOR THE FIRST SEVEN (7) DAYS.

   iii. MINIMUM EVERY THREE (3) DAYS AFTER THE FIRST SEVEN (7) DAYS.

   iv. READINGS SHALL OCCUR MORE FREQUENTLY AT THE CONTRACTOR'S DISCRETION IF NEEDED TO SUPPORT THE CONSTRUCTION SCHEDULE. READINGS MAY BE TERMINATED WHEN NO LONGER REQUIRED TO SUPPORT THE CONSTRUCTION SCHEDULE.

7. REUSABLE TEMPERATURE SENSORS SHALL BE PROTECTED FROM DAMAGE AND FREEZING FROM EXTERNAL MOISTURE WHICH COULD CAUSE INACCURATE READINGS.

8. SENSORS SHALL BE PLACED WITHIN THE TOP SIX (6) INCHES OF THE FOUNDATION BASE LOCATED MID-WAY UP THE SLOPE AND WITHIN THE TOP SIX (6) INCHES OF THE FOUNDATION PEDESTAL CONCRETE APPROXIMATELY 24 INCHES TO 36 INCHES FROM THE EDGE OF THE PEDESTAL.

9. SENSORS SHALL BE FULLY SURROUNDED BY CONCRETE AND NOT IN DIRECT CONTACT WITH METALLIC ELEMENTS.

10. CONTRACTOR SHALL PREPARE AND MAINTAIN AN ACCURATE RECORD OF MATURITY CALCULATIONS.

CW-12 CURING SHALL BE IMPLEMENTED IMMEDIATELY AFTER CONCRETE PLACEMENT TO PREVENT SURFACE DRYING AND TO ENSURE SURFACE DURABILITY.

A. IF THE APPROVED CURING AGENT PRODUCT IS NOT DESIGNED TO BE USED IN COLD WEATHER CONDITIONS, THEN THE CONCRETE SHALL BE COVERED BY SHEETS CONFORMING TO ASTM C171 AND AT LEAST 6 MIL THICKNESS IMMEDIATELY AFTER THE FINAL PASS OF THE ROLLER SCREED IN LIEU OF APPLYING THE CURING AGENT. NO PART OF THE CONCRETE SURFACE SHALL BE LEFT EXPOSED DURING THE CURING PERIOD.

B. INSULATING MATERIALS USED SHALL MEET THE RECOMMENDATIONS OF THE LATEST VERSION OF ACI 306.

C. DIRECT FIRED HEATERS SHALL BE VENTED AND NOT USED TO DIRECTLY HEAT THE SURFACE OF THE CONCRETE.

D. THE SCREEDING, CONSOLIDATION, AND CURING STEPS OF CONCRETE CONSTRUCTION SHALL BE PERFORMED AS CLOSELY AS POSSIBLE TO EACH OTHER TO PREVENT DRYING OF THE CONCRETE.

E. AT NO TIME AFTER CONSOLIDATION AND BEFORE CONCRETE PROTECTION MEASURES ARE PLACED SHALL CONCRETE BE LEFT UNPROTECTED THAT ALLOWS THE CONCRETE SURFACE TEMPERATURE TO DROP BELOW 36° F.

F. FOLLOWING THE REMOVAL OF TEMPERATURE PROTECTION, THE APPROVED CURING AGENT SHALL BE APPLIED DURING THE FIRST PERIOD WHERE THE AMBIENT TEMPERATURE RISES ABOVE 32° F.

WET WEATHER CONCRETING:

WW-1 DO NOT BEGIN TO PLACE CONCRETE WHILE RAIN, SLEET, OR SNOW IS FALLING UNLESS ADEQUATE PROTECTION IS PROVIDED AND ACCEPTANCE OF PROTECTION IS OBTAINED BY THE STRUCTURAL ENGINEER OF RECORD.

WW-2 DO NOT ALLOW RAIN WATER TO INCREASE MIXING WATER OR DAMAGE THE SURFACE OF THE CONCRETE.

MATERIAL STORAGE AND HANDLING:

MS-1 STORE CEMENTITIOUS MATERIALS IN DRY, WEATHER-TIGHT BUILDINGS, BINS, OR SILOS THAT WILL EXCLUDE CONTAMINANTS.

MS-2 STORE AND HANDLE AGGREGATE IN A MANNER THAT WILL AVOID SEGREGATION AND PREVENT CONTAMINATION WITH OTHER MATERIALS OR OTHER SIZES OF AGGREGATES. STORE AGGREGATES IN LOCATIONS THAT WILL PERMIT THEM TO DRAIN FREELY. DO NOT USE AGGREGATES THAT CONTAIN FROZEN LUMPS.

MS-3 PROTECT MIXING WATER AND ICE FROM CONTAMINATION DURING STORAGE AND DELIVERY.

MS-4 PROTECT STORED ADMIXTURES AGAINST CONTAMINATION, EVAPORATION, OR DAMAGE. PROVIDE AGITATION EQUIPMENT FOR ADMIXTURES USED IN THE FORM OF SUSPENSIONS OR NONSTABLE SOLUTIONS TO ENSURE UNIFORM DISTRIBUTION OF THE INGREDIENTS. PROTECT LIQUID ADMIXTURES FROM FREEZING AND FROM TEMPERATURE CHANGES THAT WOULD ADVERSELY AFFECT THEIR CHARACTERISTICS.

MS-5 PREVENT BENDING, COATING WITH EARTH, OIL, OR OTHER MATERIAL, OR OTHERWISE DAMAGING THE REINFORCEMENT AND ANCHOR BOLTS.

EXECUTION OF TOWER ERECTION:

TE-1 ANCHOR BOLT POST-TENSIONING, AND BASE AND MID-TOWER SECTIONS CAN BE ERECTED WHEN THE FOUNDATION BASE AND PEDESTAL CONCRETE COMPRESSIVE STRENGTHS HAVE REACHED A MINIMUM OF 70% OF THE 28-DAY REQUIREMENTS.

TE-2 FULL TURBINE TOWER, NACELLE, AND BLADES CAN BE ERECTED WHEN THE FOUNDATION BASE AND PEDESTAL CONCRETE COMPRESSIVE STRENGTHS HAVE REACHED A MINIMUM OF 90% OF THE 28-DAY REQUIREMENTS.

TE-3 THE FULL 28-DAY FOUNDATION BASE AND PEDESTAL CONCRETE COMPRESSIVE STRENGTHS ARE REQUIRED PRIOR TO TURBINE OPERATION.

TE-4 THE STRUCTURAL ENGINEER OF RECORD SHALL BE NOTIFIED OF THE NUMBER OF TOWER SECTIONS TO BE ERECTED PRIOR TO GROUT PLACEMENT IN ORDER TO DETERMINE THE SIZE, NUMBER, AND LOCATIONS OF SHIMS WHEN USED TO SUPPORT THE TOWER.

TE-5 SHIMS USED TO SUPPORT THE TOWER DURING GROUT PLACEMENT SHALL BE MADE OF ASTM-APPROVED STEEL (PREFERABLY CIRCULAR OR WITHOUT SHARP CORNERS) OR OF AN APPROVED MATERIAL THAT APPROPRIATELY SIMULATES THE MODULUS OF ELASTICITY OF THE GROUT.

GROUT:

G-1 GROUT: NON-FERROUS GROUT WITH THE SPECIFIED STRENGTH REQUIRED BELOW:

A. 28-DAY (OR MINIMUM FINAL) STRENGTH: 16,650 PSI.

B. MINIMUM GROUT STRENGTH REQUIRED PRIOR TO ANCHOR BOLT POST-TENSION: 9,000 PSI.

C. MINIMUM GROUT STRENGTH REQUIRED PRIOR TO FULL ERECTION OF TOWER SECTIONS, TURBINE, AND BLADES: 14,985 PSI.

G-2 ONLY EPOXY GROUTS ARE ACCEPTABLE WITH APPROVAL BY STRUCTURAL ENGINEER.

A. WHEN AN EPOXY GROUT IS USED, ANTI-SEIZE BRAND PRODUCT OR SIMILAR MUST BE USED BETWEEN THE GROUT AND THE TOWER FLANGE IN ORDER TO PREVENT THE EPOXY GROUT FROM BONDING TO THE TOWER FLANGE.

B. THE GROUT MUST PROVIDE A MINIMUM EFFECTIVE BEARING AREA OF 85% PER ASTM C1339.

C. MAXIMUM COEFFICIENT OF THERMAL EXPANSION AS DETERMINED BY ASTM C531 SHALL BE 18 x 10^{-6} in/in/°F (32 x 10^{-6} mm/mm/°C).

D. ALLOWABLE SHRINKAGE: 0.00007 IN/IN (MAX.).

G-3 THE 28-DAY (OR MINIMUM FINAL) GROUT STRENGTH IS REQUIRED PRIOR TO TURBINE OPERATION.

G-4 THE CONTRACTOR MAY USE A GROUT THAT REACHES THE REQUIRED GROUT STRENGTH PRIOR TO 28-DAYS AT THEIR DISCRETION TO FACILITATE TOWER AND TURBINE ERECTION.

G-5 GROUT PLACED BELOW THE TOWER FLANGE MUST BE INSTALLED AFTER THE FLANGE/TOWER BASE IS SET IN FINAL POSITION AND GROUT SHALL BE PLACED FROM THE OUTSIDE PERIMETER ONLY. WET SETTING IS NOT PERMITTED.

G-6 GROUT SHALL BE PLACED AT THE FULL SPECIFIED DEPTH. PLACEMENT OF GROUT IN MULTIPLE LIFTS IS NOT PERMITTED.

G-7 CONSULT THE MANUFACTURER OF THE FOUNDATION ENGINEER-APPROVED GROUT PRODUCT CONCERNING THE USE OR NEED FOR EXPANSION JOINTS AS WELL AS PROPER HOT AND COLD WEATHER USE OF THE PRODUCT.

A. GROUT PLACEMENTS UNDER THE TOWER BASE FLANGE THAT ARE TWO (2) OR MORE INCHES IN THICKNESS SHALL USE A MINIMUM OF FOUR (4) EVENLY SPACED EXPANSION JOINTS ORIENTED IN THE RADIAL DIRECTION AROUND THE TOWER SO AS TO SEGMENT THE GROUT PLACEMENT.

G-8 CONTRACTOR SHALL FOLLOW GROUT MANUFACTURER'S RECOMMENDATIONS FOR FIELD QUALITY CONTROL CONSISTENCY TESTING. CONTRACTOR TO CONTACT GROUT MANUFACTURER FOR THOSE REQUIREMENTS.

G-9 ANY PERSON WHO MIXES OR PLACES THE GROUT BELOW THE TOWER FLANGE SHALL HAVE HAD HANDS-ON TRAINING EXPERIENCE FROM A QUALIFIED REPRESENTATIVE OF THE GROUT MANUFACTURER WITH THE PROJECT-APPROVED GROUT PRODUCT PRIOR TO GROUT INSTALLATION.

A. THAT TRAINING SHALL INCLUDE OR SHALL HAVE INCLUDED ALL REQUIREMENTS FOR USING THE GROUT PRODUCT DURING THE ANTICIPATED TEMPERATURE OR WEATHER CONDITIONS FOR THE PROJECT WHEN THE GROUT PLACEMENT TAKES PLACE, SUCH AS HOT WEATHER OR COLD WEATHER CONDITIONS.

G-10 ANY GROUT CRACK REPAIR PRODUCTS SUBMITTED FOR APPROVAL SHALL COMPLY WITH ASTM C881 TYPE IV.

G-11 GROUT JOINT SEALANT PRODUCT SHALL COMPLY WITH ASTM C920 (NON-SELF-LEVELING), UV-RESISTANT, AND WEATHER-RESISTANT (SIKAFLEX 1-A OR SIMILAR).

REINFORCEMENT:

R-1 REINFORCING STEEL: ASTM A615 (GRADE 60 U.N.O.).

R-2 REINFORCEMENT DETAILING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ACI 318.

R-3 MINIMUM DIAMETER OF BENDS IN REINFORCEMENT SHALL CONFORM TO THE FOLLOWING (UNLESS NOTED OTHERWISE):

BAR SIZE	MINIMUM INSIDE BEND DIAMETER
NO. 3 THROUGH 8	SIX BAR DIAMETERS
NO. 9, 10, AND 11	EIGHT AND A HALF BAR DIAMETERS
NO. 14 AND 18	TEN BAR DIAMETERS

R-4 SPACING OF REINFORCEMENT MAY BE ADJUSTED TO ACCOMMODATE CONDUIT INTERFERENCES AND CLEARANCE ISSUES AROUND THE ANCHOR BOLT ASSEMBLY. REINFORCEMENT SPACING SHALL NOT EXCEED 1'-6" OVER A 2'-0" WIDTH AND SHALL MAINTAIN A MINIMUM CLEAR SPACE BETWEEN PARALLEL REINFORCEMENT OF 1.5". THE TOTAL NUMBER OF BARS SHALL BE PROVIDED AS SHOWN ON THESE DESIGN DRAWINGS.

R-5 NO WELDING OF REINFORCING BARS OR TORCHING TO BEND REINFORCING BARS SHALL BE ALLOWED WITHOUT THE SPECIFIC APPROVAL OF THE STRUCTURAL ENGINEER.

R-6 REINFORCEMENT INSTALLER/FABRICATOR IS RESPONSIBLE FOR THE DESIGN AND PLACEMENT OF REINFORCING SUPPORT CHAIRS/DOBIES, ETC. INSTALL REINFORCEMENT SUPPORTS IN ACCORDANCE WITH CRSI RB4.1.

R-7 WHEN CONCRETE IS PLACED, REINFORCEMENT SHALL BE FREE OF MATERIALS DELETERIOUS TO BOND. REINFORCEMENT WITH RUST, MILL SCALE, OR A COMBINATION OF BOTH WILL BE CONSIDERED SATISFACTORY, PROVIDED MINIMUM NOMINAL DIMENSIONS, NOMINAL WEIGHT, AND MINIMUM AVERAGE HEIGHT OF DEFORMATIONS OF A HAND-WIRE-BRUSHED TEST SPECIMEN ARE NOT LESS THAN APPLICABLE ASTM SPECIFICATION REQUIREMENTS.

R-8 SUBMIT REQUEST FOR FIELD CUTTING, INCLUDING LOCATION AND TYPE OF BAR TO BE CUT AND REASON FIELD CUTTING IS REQUIRED.

METALS:

M-1 EMBEDMENT RING:

A. THICKNESS: 1-3/4".

B. MATERIAL: ASTM A572, GRADE 50.

C. FLATNESS: 3mm.

D. REQUIRED WELD MATERIAL STRENGTH: 70 KSI.

M-2 ANCHOR BOLTS:

A. NOMINAL DIAMETER: 1-3/4" (#14).

B. GRADE: ASTM A722 (GRADE 150).

C. POST-TENSION: 150 KIPS, WITH +10 KIPS, -0 KIPS TOLERANCE.

D. MINIMUM REQUIRED LENGTH: 11'-9".

E. ENCASED IN PVC PIPE SLEEVE MEETING ASTM D2241, PVC LENGTH: 9'-7".

F. HEX NUTS: ASTM A29 OR ASTM A576.

G. HARDENED WASHERS: ASTM F436.

H. ANCHOR BOLTS SHALL BE INSTALLED WITH A MINIMUM PROJECTION OF 12" (CONTRACTOR TO VERIFY) ABOVE TOWER FLANGE. THIS DIMENSION SHALL BE INCREASED AS REQUIRED TO SUIT POST-TENSIONING INSTALLATION AND REQUIRED MAINTENANCE.

I. ANCHOR BOLTS SHALL BE INSTALLED WITH MINIMUM ½" AND MAXIMUM 2" PROJECTION BELOW NUT. CONTRACTOR SHALL USE NECESSARY METHODS TO RESTRAIN EMBEDMENT PLATE NUT FROM TURNING DURING CONCRETE VIBRATION WITHOUT RESTRICTING INDIVIDUAL VERTICAL ANCHOR BOLT MOVEMENT (FOR EXAMPLE, DO NOT CONTINUOUSLY TIE WITH TIE-WIRE FROM BOLT TO BOLT OR TIE TO THE EMBEDMENT RING).

J. NO WELDING OF ANCHOR BOLTS IS ALLOWED.

REQUIRED SUBMITTALS:

RS-1 CONCRETE SUPPLIER SHALL SUBMIT A STRUCTURAL MIX DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER IN THE PROJECT STATE FOR APPROVAL PER MINIMUM REQUIREMENTS OF THESE DESIGN DRAWINGS.

RS-2 CONCRETE MIX DESIGN SUBMITTAL TO INCLUDE THE FOLLOWING INFORMATION:

A. AGGREGATES: TYPES, PIT OR QUARRY LOCATIONS, PRODUCERS' NAMES, AGGREGATE SUPPLIER STATEMENT OF COMPLIANCE WITH ASTM C33 AND ASTM C1293 EXPANSION DATA NOT MORE THAN 18 MONTHS OLD.

B. TEST FOR DELETERIOUS AGGREGATE MATERIALS PER ASTM C33.

C. TEST FOR DELETERIOUS EXPANSION PER ASTM C1778.

D. PROPORTIONS OF ALL MATERIALS.

E. CEMENTITIOUS MATERIALS: TYPES, MANUFACTURING LOCATIONS, SHIPPING LOCATIONS, AND CERTIFICATES SHOWING COMPLIANCE WITH ASTM C150, ASTM C595, ASTM C618, ASTM C845, ASTM C989, OR ASTM C1157.

1. INCLUDE Al_2O_3 AND SO_3 CONTENT IN ALL CEMENTITIOUS MATERIAL MILL CERTIFICATES.

F. BRAND, TYPE, PRODUCERS, MANUFACTURER'S TECHNICAL DATA SHEETS, AND CERTIFICATION DATA OF ALL ADMIXTURES TO BE USED.

G. SOURCE OF SUPPLY OF MIXING WATER AND ICE.

H. 28-DAY COMPRESSIVE STRENGTH TEST RESULTS OF TRIAL MIXES MEETING THE REQUIREMENTS OF ACI 318.

I. SLUMP TESTED ACCORDING TO ASTM C143 AND SHALL BE WITHIN +/- 1.5 INCHES THE TARGET SLUMP VALUE.

J. AIR CONTENT TESTED ACCORDING TO ASTM C231, C173, OR C138 AND SHALL BE WITHIN 0.5% OF THE REQUIRED AVERAGE AIR CONTENT.

K. TEMPERATURE TESTED ACCORDING TO ASTM C1064 AND SHALL BE WITHIN 10 °F OF THE INTENDED MAXIMUM TEMPERATURE OF THE CONCRETE AS MIXED AND DELIVERED.

L. SHRINKAGE TEST RESULTS (IF AVAILABLE).

M. STANDARD DEVIATION VALUE FOR CONCRETE PRODUCTION FACILITY (IF AVAILABLE).

RS-3 WHEN THE PROJECT SITE IS EXPECTED TO ENDURE TEMPERATURES BELOW 40 °F, SUBMIT A COLD WEATHER CONCRETING PROCEDURE TO BE APPROVED BY THE PROJECT STRUCTURAL ENGINEER.

A. SUBMIT PROPOSED METHOD OF MEASURING CONCRETE SURFACE TEMPERATURE.

RS-4 SUBMIT A HOT WEATHER CONCRETING PROCEDURE TO BE APPROVED BY THE PROJECT STRUCTURAL ENGINEER.

A. SUBMIT PROPOSED METHOD OF MEASURING CONCRETE SURFACE TEMPERATURE.

B. HOT WEATHER CONCRETING PROCEDURE SHALL INCLUDE, BUT NOT LIMITED TO, THE FOLLOWING ITEMS:

1. MODEL NUMBER OF MANUFACTURER CERTIFIED HANDHELD ANEMOMETER TO BE USED ON THE PROJECT MEETING THE REQUIREMENTS STATED IN THE HOT WEATHER SPECIFICATIONS UNLESS EVAPORATION RETARDANT WILL BE USED ON ALL FOUNDATIONS.

2. UNO EQUATION AND INPUT DATA MEASUREMENT REQUIREMENTS FOR WIND SPEED, TEMPERATURE, AND RELATIVE HUMIDITY AS DESCRIBED IN ACI 305.1-14 UNLESS EVAPORATION RETARDANT OR SHEETING WILL BE USED ON ALL FOUNDATIONS.

3. STRUCTURAL ENGINEER-APPROVED BRAND OF EVAPORATION RETARDANT TO BE USED PRIOR TO APPLICATION OF CURING AGENT IN THE EVENT OF EXCESSIVE EVAPORATION CONDITIONS.

RS-5 SUBMIT A WET WEATHER CONCRETING PROCEDURE TO BE APPROVED BY THE PROJECT STRUCTURAL ENGINEER.

RS-6 PRODUCT TECHNICAL DATA INCLUDING:

A. ACKNOWLEDGMENT THAT PRODUCT SUBMITTED MEETS THE REQUIREMENTS OF THE STANDARD REFERENCED.

B. MANUFACTURER'S INSTALLATION INSTRUCTIONS.

RS-7 REINFORCING STEEL:

A. SUBMIT STEEL REINFORCEMENT MILL CERTIFICATES WITH CRSI PLANT CERTIFICATION.

B. SHOP DRAWINGS SHALL SHOW GRADE, SIZES, NUMBER, CONFIGURATION, SPACING, LOCATION, AND ALL FABRICATION AND PLACEMENT DETAILS. PLACEMENT DETAILS SHALL INCLUDE INSTALLATION OF TOP REINFORCING MAT AROUND ANCHOR BOLT CAGE.

C. SUBMIT A LIST OF SPLICES AND REQUEST TO USE SPLICES NOT INDICATED ON THESE DESIGN DRAWINGS.

D. SUBMIT REQUEST AND PROCEDURE TO FIELD BEND OR STRAIGHTEN REINFORCEMENT PARTIALLY EMBEDDED IN CONCRETE.

E. SHOP DRAWINGS SHALL PROVIDE SUFFICIENT DETAIL TO PERMIT INSTALLATION OF REINFORCEMENT WITHOUT REFERENCING THE CONTRACT DRAWINGS.

F. SUBMIT A REQUEST TO RELOCATE ANY REINFORCEMENT THAT EXCEEDS SPECIFIED PLACEMENT TOLERANCES.

G. OBTAIN APPROVAL OF SHOP DRAWINGS BY STRUCTURAL ENGINEER BEFORE FABRICATION.

RS-8 ANCHOR BOLTS:

A. SUBMIT ANCHOR BOLTS AND ASSOCIATED HARDWARE FOR APPROVAL.

B. SUBMIT MILL CERTIFICATES FOR ANCHOR BOLTS INDICATING YIELD AND ULTIMATE STRENGTHS.

C. SUBMIT A POST-TENSIONING PROCEDURE FOR APPROVAL. PROCEDURE SHALL INCLUDE THE POST-TENSIONING METHOD TO BE USED, AND DEFINED SEQUENCE OF POST-TENSIONING BOLTS. PROCEDURE SUBMITTED SHALL PROVIDE NECESSARY ACCURACY TO MEET POST-TENSION TOLERANCES DEFINED ON THESE DRAWING.

1. TENSION THE ANCHOR BOLTS USING HYDRAULIC JACKS EQUIPPED WITH A PRESSURE GAUGE CALIBRATED TO THE JACK WITHIN AN ACCURACY OF PLUS OR MINUS 2%.

2. CALIBRATE THE GAUGE OR DYNAMOMETER IMMEDIATELY BEFORE USE ON PROJECT.

3. THE PRESSURE GAUGE SHALL HAVE GRADUATIONS NO LARGER THAN 100 PSI.

4. JACKING FORCE REQUIRED TO PRODUCE THE PRESTRESSING FORCE AND CALCULATED ELONGATION SHALL BE STATED IN POST-TENSIONING PROCEDURE.

5. DURING POST-TENSIONING, VISUALLY VERIFY THAT THE PRESTRESSING FORCE IS ADEQUATE BY COMPARING THE MEASURED ELONGATIONS TO THE CALCULATED ELONGATIONS WITHIN 1/16" OR WITHIN 10% WHEN A DIAL INDICATOR IS USED. EACH BOLT SHALL BE PERMANENTLY MARKED IN SOME FASHION THAT INDICATES THE AMOUNT OF ELONGATION THAT CAN BE MEASURED AT A LATER DATE IF NEEDED.

6. THE PROCEDURE SHALL INCLUDE A "10% CHECK" QA/QC PROCESS TO VERIFY POST-TENSION APPLIED AFTER ANCHOR BOLT POST-TENSIONING HAS COMPLETED ON EACH TURBINE. PASSING IS ACHIEVED WHEN THE POST-TENSION VALUES OF 10% OF THE ANCHOR BOLTS, RANDOMLY SELECTED, MEETS OR EXCEEDS 100% OF THE MINIMUM SPECIFIED POST-TENSION VALUE (100% VALUE IS THE MINIMUM SPECIFIED POST-TENSION VALUE WITHOUT INCLUDING THE ALLOWABLE POST-TENSION TOLERANCE INCREASE). AN EQUAL NUMBER OF ANCHOR BOLTS ON THE INSIDE AND OUTSIDE OF THE TOWER SHALL BE TESTED. A HYDRAULIC JACK SHALL BE USED TO PULL EACH OF THE SELECTED ANCHOR BOLTS TO THE 100% MINIMUM SPECIFIED VALUE. WHEN PULLING BOLTS TO THIS POST-TENSION, THERE SHALL BE NO GAPS BETWEEN THE NUTS AND WASHERS, AND THE NUT SHALL NOT BE ABLE TO BE TIGHTENED BY HAND. IF ANY INDIVIDUAL BOLT PER TURBINE FAILS BY LIFTING OFF THE WASHER OR ALLOWING THE NUT TO BE TIGHTENED BY HAND, THE REMAINING 90% OF BOLTS ON THAT PARTICULAR TURBINE FOUNDATION SHALL BE CHECKED. IF THE 100% POST-TENSION VALUE IS NOT MET ON ANY PARTICULAR BOLT, THAT FAILING BOLT SHALL BE POST-TENSIONED TO AT LEAST 100% OF THE ORIGINAL MINIMUM SPECIFIED POST-TENSION WITHOUT EXCEEDING THE ALLOWABLE POST-TENSION TOLERANCE.

D. SUBMIT A CALIBRATION PROCEDURE AND TESTING PROCEDURE PROPOSED FOR APPROVAL.

E. SUBMIT ANCHOR BOLT TEST DATA SHOWING YIELD AND ULTIMATE TENSION VALUES USING RANDOM MATERIAL SAMPLES THAT ARE REPRESENTATIVE OF THE MATERIAL TO BE DELIVERED TO THE PROJECT.

1. TEST A MINIMUM OF FIVE (5) ANCHOR BOLTS PER HEAT RUN IN ACCORDANCE WITH ASTM A370.

RS-9 EMBEDMENT PLATE:

A. SUBMIT MILL CERTIFICATES FOR EMBEDMENT PLATE INDICATING THE MINIMUM YIELD STRENGTH OF THE MATERIALS.

B. SHOW WELD OR SPLICE DETAIL FOR CONNECTING PLATE SEGMENTS.

C. SUBMIT PROPOSED ANCHOR BOLT CAGE SUPPORT DETAILS FOR REVIEW BY THE FOUNDATION ENGINEER.

RS-10 TEMPLATE PLATE: REFER TO NOTES ON EMBEDMENT RING DETAIL.

RS-11 SUBMIT A GROUT PRODUCT TO BE APPROVED BY THE STRUCTURAL ENGINEER.

RS-12 SUBMIT A GROUTING PROCEDURE TO BE APPROVED BY THE STRUCTURAL ENGINEER.

RS-13 SUBMIT TECHNICAL DATA SHEET OF JOINT SEALANT PRODUCT TO BE USED FOR SEALING THE JOINT BETWEEN THE GROUT AND THE TOWER FLANGE.

RS-14 SUBMIT TECHNICAL DATA SHEET OF CONCRETE CURING AGENT TO BE USED.

RS-15 SUBMIT TECHNICAL DATA SHEET OF CONCRETE EVAPORATION RETARDANT TO BE USED.

RS-16 SUBMIT ELECTRICAL DRAWINGS FOR REVIEW TO ASSESS PLACEMENT OF ELECTRICAL CONDUITS IN RELATION TO THE STRUCTURAL COMPONENTS OF THE FOUNDATION DESIGN.

RS-17 THE STRUCTURAL ENGINEER REVIEW OF THE SHOP DRAWINGS DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF THE ACCURACY CONTAINED WITHIN EVERY DOCUMENT SUBMITTED.

RS-18 A SPECIFICATION OF THE INTENDED STRUCTURAL BACKFILL MATERIAL SHALL BE SUBMITTED TO THE GEOTECHNICAL ENGINEER OF RECORD FOR REVIEW AND APPROVAL.

INSTALLATION TOLERANCES:

ALL CONCRETE CONSTRUCTION TOLERANCES SHALL CONFORM TO ALL REQUIREMENTS OF ACI 117 PUBLISHED BY THE AMERICAN CONCRETE INSTITUTE, FARMINGTON HILLS, MICHIGAN, EXCEPT AS MODIFIED BY THESE DESIGN DRAWINGS.

IT-1 OVERALL BASE HEIGHT AND BASE TOP REINFORCEMENT TOLERANCE: +1", -½".

IT-2 TEMPLATE AND EMBEDMENT RING LOCATION IN PLAN: +/- ½".

IT-3 CLEAR COVER TOLERANCES: +1", -½".

IT-4 EMBEDMENT RING ELEVATION DIMENSION FROM SUBGRADE (OR MUDMAT): +/- ½".

IT-5 PEDESTAL DIAMETER: +2", -½".

IT-6 BASE DIAMETER: +3", -1".

IT-7 ANCHOR BOLT PLUMBNESS TOLERANCE: ¼ DEGREE MAXIMUM.

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK 081-006729 LICENSED STRUCTURAL ENGINEER STATE OF ILLINOIS

8/12/2025

Troy R Crook

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATIONS

SPECIFICATION SHEET - 3

DRAWING No.	SHEET:	REV.
S-9		0

CADFILE: COLES DRAWING SET_IFC

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TESTING/INSPECTION REQUIREMENTS:

TI-1 CONTRACTOR SHALL HIRE QUALIFIED TESTING AGENCY TO PERFORM TESTING ON SOILS, CONCRETE AND GROUT AS SPECIFIED IN THIS DESIGN DOCUMENT.

TI-2 CONTRACTOR SHALL SUBMIT ALL TESTING DATA TO ENGINEER AT END OF PROJECT. STRUCTURAL ENGINEER SHALL BE CONTACTED IN WRITING IF ANY OF THE TESTS PERFORMED DO NOT MEET THE SPECIFICATION OF THIS DOCUMENT.

TI-3 CONCRETE TESTING SHALL BE PERFORMED RANDOMLY AND IN ACCORDANCE WITH THE FOLLOWING:

A. OBTAIN CONCRETE SAMPLES IN ACCORDANCE WITH ASTM C172. OBTAIN AT LEAST ONE (1) COMPOSITE SAMPLE FOR EACH 150 CU. YD. IN THE BASE ROUNDED UP TO THE NEAREST WHOLE NUMBER (MINIMUM OF THREE (3) COMPOSITE SAMPLES PER FOUNDATION BASE) AND A MINIMUM OF ONE SAMPLE FOR EACH PEDESTAL.

B. DETERMINE SLUMP OF EACH COMPOSITE SAMPLE TAKEN IN ACCORDANCE WITH ASTM C143.

C. DETERMINE TEMPERATURE OF EACH COMPOSITE SAMPLE TAKEN IN ACCORDANCE WITH ASTM C1064.

D. DETERMINE AIR CONTENT OF EACH COMPOSITE SAMPLE USING ASTM C231, C173, OR C138.

E. TESTING AGENCY SHALL PERFORM CONCRETE COMPRESSIVE STRENGTH TESTS ACCORDING TO ASTM C39.

1. IF 6" X 12" CYLINDERS ARE BEING USED, CONCRETE CYLINDERS SHALL BE TESTED AT THE FOLLOWING TIME INTERVALS:

i. ONE (1) PRIOR TO BACKFILL OPERATIONS.

ii. ONE (1) PRIOR TO ANCHOR BOLT POST-TENSIONING.

iii. ONE (1) PRIOR TO ERECTION OF NACELLE AND ROTOR.

iv. TWO (2) AT 28-DAYS.

v. TWO (2) SPARE CYLINDERS (TO BE TESTED ONLY IF NEEDED).

2. IF 4" X 8" CYLINDERS ARE ALLOWED AND BEING USED (SEE NOTE F BELOW), CONCRETE CYLINDERS SHALL BE TESTED AT THE FOLLOWING TIME INTERVALS:

i. ONE (1) PRIOR TO BACKFILL OPERATIONS.

ii. ONE (1) PRIOR TO ANCHOR BOLT POST-TENSIONING.

iii. ONE (1) PRIOR TO ERECTION OF NACELLE AND ROTOR.

iv. THREE (3) AT 28-DAYS; EXCEPT ONLY TWO (2) ARE REQUIRED IF ACI 318-25 IS APPROVED FOR USE BY THE PROJECT BUILDING OFFICIAL.

v. THREE (3) SPARE CYLINDERS (TO BE TESTED ONLY IF NEEDED); EXCEPT ONLY TWO (2) ARE REQUIRED IF ACI 318-25 IS APPROVED FOR USE BY THE PROJECT BUILDING OFFICIAL.

3. TESTING AGENCY SHALL PROVIDE AIR AND SLUMP TESTING FOR FIRST THREE (3) TRUCKLOADS DELIVERED EACH DAY TO ENSURE BATCH PLANT CONCRETE IS WITHIN THESE SPECIFICATIONS.

F. CONCRETE CYLINDER TESTS SHALL BE PERFORMED USING 6" X 12" CYLINDERS, HOWEVER, 4" X 8" CYLINDERS MAY BE USED PROVIDED THE NOMINAL MAXIMUM COARSE AGGREGATE SIZE IS 1" OR SMALLER (NOMINAL MAXIMUM COARSE AGGREGATE SIZE IS THE FIRST SIEVE SIZE WHERE A PORTION OF THE AGGREGATE IS ALLOWED TO BE RETAINED).

G. THE CONTRACTOR AND CONCRETE TESTING AGENCY SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT FROM VEHICLE DAMAGE THE CONCRETE CYLINDERS THAT ARE CURING ON-SITE NEAR THE FOUNDATION CONSTRUCTION PRIOR TO TRANSPORTATION FOR LAB TESTING.

1. AT A MINIMUM, THE CONTRACTOR OR CONCRETE TESTING AGENCY SHALL PLACE HIGH VISIBILITY ORANGE CAUTION FLAGS (COMMONLY CALLED "SNOW FLAGS") NEXT TO THE CONCRETE CYLINDER CURING COOLERS WITH THE FLAGS BEING PLACED AT A VISIBLE HEIGHT BETWEEN FIVE (5) AND SIX (6) FEET ABOVE GROUND LEVEL OR AT A HEIGHT DETERMINED TO BE EASILY VISIBLE BY VEHICLE DRIVERS. OTHER MEANS OF INCREASING THE VISIBILITY OF OR OTHERWISE PROTECTING THE CONCRETE CYLINDER CURING COOLERS FROM VEHICLE DAMAGE ABOVE AND BEYOND THE FLAGS SHOULD BE CONSIDERED BY THE CONTRACTOR AND THE CONCRETE TESTING AGENCY.

H. THE STRENGTH LEVEL OF CONCRETE WILL BE CONSIDERED SATISFACTORY WHEN:

1. THE AVERAGES OF ALL SETS OF THREE CONSECUTIVE COMPRESSIVE STRENGTH TEST RESULTS MOLDED AND CURED IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM C31 EQUAL OR EXCEED F'C.

2. NO INDIVIDUAL STRENGTH TEST RESULT FALLS BELOW F'C BY MORE THAN 500 PSI WHEN F'C IS 5000 PSI OR LESS, OR BY MORE THAN 0.10F'C WHEN F'C IS MORE THAN 5000 PSI.

I. THERE IS NO TESTING REQUIREMENT FOR THE LEAN (MUD MAT) CONCRETE.

TI-4 GROUT TESTING SHALL BE PERFORMED ACCORDING TO THE FOLLOWING:

A. FOR EPOXY GROUTS, COMPRESSIVE STRENGTH SHALL BE TESTED IN ACCORDANCE WITH ASTM C579, METHOD B, LOAD RATE II.

B. TESTING AGENCY SHALL SAMPLE GROUT FOR COMPRESSIVE STRENGTH TESTS ACCORDING TO ASTM C579, METHOD B (FOR EPOXY GROUT) EXCEPT AS MODIFIED IN THIS SECTION. GROUT CUBES SHALL BE TESTED AT THE FOLLOWING TIME INTERVALS:

1. WHEN AN EPOXY-BASED GROUT IS USED:

i. THREE (3) MIN. TO BE TESTED AT INTERVALS DETERMINED AT THE CONTRACTOR'S DISCRETION PRIOR TO ANCHOR BOLT POST-TENSIONING AND ERECTION OF NACELLE AND ROTOR.

ii. SIX (6) MIN. PRIOR TO TURBINE OPERATION, BUT TESTED NO SOONER THAN SEVEN (7) DAYS AFTER GROUT PLACEMENT.

iii. SIX (6) MIN. SPARE CUBES (TO BE TESTED ONLY IF NEEDED), BUT TESTED NO SOONER THAN SEVEN (7) DAYS AFTER GROUT PLACEMENT.

2. GROUT CUBES MUST ACHIEVE THE STRENGTH SPECIFIED IN THESE DRAWINGS PRIOR TO THESE ERECTION STEPS.

TI-5 AT ANY LOCATION WHERE STRUCTURAL BACKFILL IS REQUIRED UNDER THE FOUNDATION, THE TESTING AGENCY SHALL TEST COMPACTION PERCENT AND MOISTURE CONTENT AT EACH LIFT IN ACCORDANCE WITH THESE DRAWING SPECIFICATIONS.

FOUNDATION MAINTENANCE:

FM-1 AT A MINIMUM, THE FOLLOWING ON-GOING ANCHOR BOLT POST-TENSION MAINTENANCE SCHEDULE AND PROCEDURE SHALL BE FOLLOWED:

A. RANDOMLY CHECK THE POST-TENSION ON 10% OF THE BOLTS ON EACH TURBINE FOUNDATION; CHECK AN EQUAL NUMBER OF BOLTS ON THE INSIDE AND OUTSIDE OF THE TOWER. THE ANCHOR BOLT POST-TENSION VALUES AT EACH TURBINE FOUNDATION SHALL BE CHECKED BY THE OWNER AT THE FOLLOWING INTERVALS:

1. NINETY (90) DAYS AFTER TURBINE OPERATION BEGINS. (BY OWNER)

2. SIX (6) MONTHS AFTER TURBINE OPERATION BEGINS. (BY OWNER)

3. YEARS 1-5: ANNUALLY. (BY OWNER)

4. OVER 5 YEARS: EVERY 2 YEARS. (BY OWNER)

B. PASSING IS ACHIEVED WHEN ALL POST-TENSION VALUES ON THE ANCHOR BOLTS EXCEED 90% OF THE ORIGINAL POST-TENSION VALUE. A HYDRAULIC JACK SHALL BE USED TO PULL EACH OF THE SELECTED ANCHOR BOLTS TO THE 90% VALUE. WHEN PULLING BOLTS TO THIS POST-TENSION, THERE SHALL BE NO GAPS BETWEEN THE NUTS AND WASHERS, AND THE NUT SHALL NOT BE ABLE TO BE TURNED BY HAND. IF ANY INDIVIDUAL BOLT PER TURBINE FAILS BY LIFTING OFF THE WASHER AND ALLOWING THE NUT TO BE TURNED BY HAND, THE REMAINING 90% OF BOLTS ON THAT PARTICULAR TURBINE FOUNDATION SHALL BE CHECKED. IF THE 90% POST-TENSION VALUE IS NOT MET ON ANY PARTICULAR BOLT, THAT FAILING BOLT SHALL BE POST-TENSIONED TO 100% OF THE ORIGINAL REQUIRED POST-TENSION.

FM-2 REGULAR VISUAL INSPECTION OF THE GROUT JOINT SEALANT, GROUT AND EXPOSED PEDESTAL CONCRETE SHALL BE PERFORMED. AT A MINIMUM, THESE INSPECTIONS SHALL OCCUR AT THE SAME FREQUENCY AS ANCHOR BOLT POST-TENSION MAINTENANCE.

A. ANY GAPS IN THE SEALANT OR CRACKS IN THE GROUT AND PEDESTAL CONCRETE SHALL BE DOCUMENTED AND REPAIRED.

NOTICE

THE FOUNDATIONS SHALL BE VISUALLY INSPECTED (NO EXCAVATION EXPECTED UNLESS EVIDENCE OF POSSIBLE FOUNDATION DAMAGE IS APPARENT) PRIOR TO CONTINUING OPERATION AND THE ENGINEER OF RECORD SHALL BE NOTIFIED TO VERIFY THE FOUNDATIONS REMAIN OPERATIONAL IF ANY OF THE FOLLOWING SCENARIOS OCCUR OVER THE LIFE OF THE PROJECT:

A. THE WIND TURBINES EXPERIENCE ANY EXTREME WIND EVENTS WITH WIND SPEEDS THAT ARE GREATER THAN OR EQUAL TO 90% OF THE TURBINE MANUFACTURER'S EXTREME DESIGN WIND SPEED.

1. PRIOR TO PUTTING THE TURBINES INTO SERVICE, DETERMINE FROM THE TURBINE MANUFACTURE THE DESIGN EXTREME WIND SPEED FOR THE TURBINE MODELS USED ON THE PROJECT AS MEASURED AT THE HEIGHT ON THE TURBINE WHERE WIND SPEED MEASUREMENTS CAN EASILY BE RECORDED (TYPICALLY THE TOP OF THE NACELLE).

B. HIGH LOAD EVENTS IN EXCESS OF OR OUTSIDE OF THE DESIGN LOAD EVENTS DEFINED BY THE TURBINE MANUFACTURER'S FOUNDATION LOADING DOCUMENT WHILE IN SERVICE (SUCH AS BLADE STRIKES OR OTHER TURBINE MALFUNCTIONS NOT ACCOUNTED FOR BY THE TURBINE MANUFACTURER'S ORIGINAL DESIGN LOADS AS EXAMPLES).

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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE
OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/12/2025

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATIONS

SPECIFICATION SHEET - 4

DRAWING No. S-10 | SHEET: | REV. 0

CADFILE: COLES DRAWING SET_IFC

LAST SAVED BY: MARCHENKEL ON 8/22/2025 12:33:43 PM

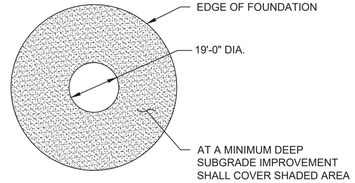
C:\USERS\MARCHENKEL\RRC COMPANIES\STRUCTURAL ENGINEERING - COLES-GE2502017\DRAWING FILES\COLES DRAWING SET_IFC.DWG

LOCATIONS BASED ON "Coles Wind_Table A1_LAY 037_Rev.2.xlsx" RECEIVED ON AUGUST 11, 2025. /0

TURBINE ID	GEOTECH ID	LATITUDE	LONGITUDE	ANTICIPATED GRADING ELEVATION CHANGE (FEET, CUT = -, FILL = +), SEE NOTE 2	DESIGN GROUNDWATER DEPTH (FT. BELOW EXISTING GRADE)	HEIGHT TO RAISE FOUNDATIONS (FT), SEE NOTE 3	DESIGN GROUNDWATER DEPTH AFTER RAISING FOUNDATIONS (FT. BELOW FINAL GRADE)	IN-SITU NET ALLOWABLE BEARING CAPACITY (FS=3.0) (PSF)	MIN. REQUIRED GROUND IMPROVEMENT DEPTH (FT. BELOW NATIVE GRADE) SEE NOTE 1	NET ALLOWABLE BEARING CAPACITY AFTER GROUND IMPROVEMENT (FS=3.0) (PSF)	TURBINE ID	GE 6.1-1 81'-0" DIAMETER FOUNDATION	GE 6.1-2 83'-0" DIAMETER FOUNDATION	COMMENTS
T1	GEO-62	39.649995	-88.188005	0	1.4		1.4	3500			T1		X	
T2	GEO-61	39.646727	-88.202823	0	0.3	1.0	1.3	3500			T2		X	
T3	GEO-60	39.647183	-88.181358	0	0.5	0.5	1.0	3500			T3		X	
T4	GEO-59	39.640117	-88.201895	0	2.8		2.8	3000			T4	X		
T5	GEO-58	39.641917	-88.217304	0	0.7	0.5	1.2	3500			T5		X	
T6	GEO-57	39.640777	-88.227044	0	1.4		1.4	3500			T6		X	
T7	GEO-56	39.635483	-88.226039	0	2.5		2.5	3500			T7	X		
T8	GEO-55	39.631481	-88.229020	0	0.6	0.5	1.1	3500			T8		X	
T10	GEO-54	39.631708	-88.189183	0	2.3	0.5	2.8	3500			T10	X		
T11	GEO-53	39.628019	-88.180345	0	2.3	0.5	2.8	3500			T11	X		
T12	GEO-52	39.626261	-88.187792	0	1.0		1.0	3500			T12		X	
T13	GEO-51	39.629093	-88.223195	0	2.1	0.5	2.6	3500			T13	X		
T15	GEO-50	39.626564	-88.236070	0	0.0	1.0	1.0	3500			T15		X	
T17	GEO-48	39.614735	-88.208232	0	1.6	1.0	2.6	3500			T17	X		
T18	GEO-47	39.621062	-88.198786	0	1.7	1.0	2.7	3500			T18	X		
T19	GEO-46	39.612409	-88.188892	0	2.1	0.5	2.6	3500			T19	X		
T20	GEO-45	39.612310	-88.180226	0	1.6	1.0	2.6	3500			T20	X		
T22	GEO-44	39.645392	-88.164683	0	2.6		2.6	3500			T22	X		
T23	GEO-43	39.649785	-88.163058	0	2.6		2.6	3500			T23	X		
T25	GEO-42	39.642241	-88.145311	0	1.4		1.4	3500			T25		X	
T26	GEO-41	39.640932	-88.150410	0	2.2	0.5	2.7	3500			T26	X		
T28	GEO-40	39.640726	-88.170557	0	1.4		1.4	3500			T28		X	
T29	GEO-39	39.632904	-88.161243	0	3.6		3.6	3500			T29	X		
T30	GEO-38	39.629819	-88.138768	0	0.3	1.0	1.3	3500			T30		X	
T31	GEO-06	39.618923	-88.122631	0	2.7		2.7	2500			T31	X		
T33	GEO-37	39.617396	-88.142108	0	1.9	1.0	2.9	3500			T33	X		
T34	GEO-36	39.613774	-88.153886	0	1.7	1.0	2.7	3000			T34	X		
T35	GEO-35	39.619080	-88.162749	0	2.0	0.5	2.5	3500			T35	X		
T36	GEO-34	39.603394	-88.159948	0	3.6		3.6	3500			T36	X		
T38	GEO-33	39.597987	-88.144878	0	2.3	0.5	2.8	3250			T38	X		
T39a	GEO-32	39.590987	-88.120622	0	2.1	0.5	2.6	3000			T39a	X		SEE NOTE 4
T40	GEO-31	39.590992	-88.151334	0	0.5	0.5	1.0	2500			T40		X	
T43	GEO-29	39.589955	-88.172555	0	3.0		3.0	3500			T43	X		
T44	GEO-28	39.585767	-88.174319	0	3.2		3.2	3500			T44	X		
T45	GEO-27	39.584660	-88.117432	0	0.0	1.0	1.0	3500			T45		X	
T46	GEO-26	39.574592	-88.118216	0	0.6	0.5	1.1	3500			T46		X	
T47a	GEO-25	39.572840	-88.132593	0	2.5		2.5	3500			T47a	X		SEE NOTE 4
T48	GEO-02	39.565118	-88.132452	0	0.8	0.5	1.3	2000			T48		X	
T49	GEO-24	39.569341	-88.136830	0	3.0		3.0	3500			T49	X		
T51	GEO-23	39.573187	-88.154941	0	2.2	0.5	2.7	3500			T51	X		
T52	GEO-22	39.565394	-88.152425	0	3.7		3.7	3500			T52	X		
T53	GEO-21	39.573270	-88.169910	0	2.3	0.5	2.8	3500			T53	X		
T54	GEO-20	39.565034	-88.201263	0	4.0		4.0	--	34	2000	T54	X		
T55	GEO-19	39.573124	-88.201857	0	2.3	0.5	2.8	3500			T55	X		
T56	GEO-18	39.574363	-88.208448	0	1.5	1.0	2.5	3500			T56	X		
T57	GEO-17	39.574408	-88.217758	0	0.2	1.0	1.2	3500			T57		X	
T58	GEO-16	39.580814	-88.240424	0	1.9	1.0	2.9	3500			T58	X		
T59	GEO-15	39.587266	-88.235878	0	1.6	1.0	2.6	1750	46	2000	T59	X		
T60	GEO-14	39.585320	-88.211622	0	3.3		3.3	3500			T60	X		
T61	GEO-13	39.604831	-88.210781	0	3.3		3.3	3500			T61	X		
T62	GEO-12	39.603647	-88.220991	0	1.4		1.4	3500			T62		X	
TOTAL						30 RAISED FOUNDATIONS			2 SUBGRADE IMPROVEMENTS			34	17	51 TURBINES TOTAL

NOTES:

1. FOR ANY LOCATIONS THAT REQUIRE SUBGRADE MATERIAL IMPROVEMENTS, REFER TO THE GEOTECHNICAL SPECIFICATION SECTION OF THESE DRAWINGS FOR THOSE REQUIREMENTS.
   A. AS AN ALTERNATIVE TO OVEREXCAVATION, DEEP SUBGRADE IMPROVEMENT MAY BE USED AS DESIGNED BY A QUALIFIED THIRD PARTY. DEEP SUBGRADE IMPROVEMENT DEPTH SHALL BE DETERMINED BY THE QUALIFIED THIRD PARTY. AT A MINIMUM, ANY SUBGRADE IMPROVEMENT SHALL RESULT IN A UNIFORM BEARING AREA OVER THE SHADED AREA SHOWN IN THE DIAGRAM BELOW.
   B. THE DEPTH OF SUBGRADE IMPROVEMENT SHALL EXTEND TO THE MINIMUM DEPTHS AS SHOWN IN THE TABLE ABOVE UNLESS OTHERWISE APPROVED BY THE GEOTECHNICAL ENGINEER OF RECORD. RRC'S STRUCTURAL ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF THE PLANNED SUBGRADE IMPROVEMENT IN THE FIELD DOES NOT EXTEND TO THE DEPTH SHOWN IN THIS TABLE.
2. IF CONSTRUCTED GRADING ELEVATION CHANGES AT THE CENTER PIN OF THE FOUNDATION ARE DIFFERENT THAN SHOWN IN THE TABLE, THEN NOTIFY THE FOUNDATION DESIGN ENGINEER OF RECORD PRIOR TO FOUNDATION CONSTRUCTION TO VERIFY THE CORRECT FOUNDATION SIZE IS BEING USED AT THE GIVEN LOCATION.
3. FOUNDATION BEARING ELEVATION RAISED TO ADJUST DESIGN GROUNDWATER DEPTH AT THESE LOCATIONS. BACKFILL SHALL BE MOUNDED TO MAINTAIN THE MINIMUM BACKFILL DEPTH ABOVE THE FOUNDATION TOE AS NOTED ON SHEET S-4.
4. DCP/SCP VERIFICATION TESTING REQUIRED TO A DEPTH OF 30 INCHES BELOW THE BEARING ELEVATION AT THIS LOCATION. COORDINATE WITH THE GEOTECHNICAL ENGINEER OF RECORD FOR SPECIFIC TESTING REQUIREMENTS.



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PREPARED FOR:

COLES WIND, LLC.

COLES WIND PROJECT

COLES COUNTY, ILLINOIS

NORTH

SCALE:

0 2"

BAR MUST SCALE 2" FOR FULL SIZE OR 1" FOR HALF SIZE DRAWING

TROY R. CROOK
081-006729
LICENSED STRUCTURAL ENGINEER
STATE OF ILLINOIS
8/12/2025
Troy R Crook

REV	DATE	ISSUE DESCRIPTION
0	8/12/2025	ISSUED FOR CONSTUCTION

APPROVED BY:	B. KRAUSE
CHECKED BY:	T. CROOK
DESIGNED BY:	R. EERNISSE
DRAWN BY:	M. HENKEL

PROJECT NUMBER: GE2502017

DRAWING NAME:

GE 6.1-158 117M HH IECS TURBINE FOUNDATIONS

TURBINE LOCATION TABLE

DRAWING No.	SHEET:	REV.
S-11		1

CADFILE: COLES DRAWING SET_IFC

LAST SAVED BY: MARCHENKEL ON 8/22/2025 12:33:43 PM

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Tower Certification

GE Vernova 6.1-158 Wind Turbine 2024 International Building Code Certification document for 117 m Hub Height Towers

Arsene Professional Engineers Inc.
25442 Burntwood, Laguna Niguel, CA 92677
Tel. 949-374-2405

Owner: Apex Clean Energy
Location: Coles Wind, Coles County, IL

August 11, 2025

651 W. Galena Park Blvd. Ste. 101
Draper, Utah 84020
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Prepared by: FLORIN ARSENE, PE

Reviewed by: WELLS L. HOLMES

IL SE LICENSE # 081.008195
EXPIRATION DATE : 11/30/2026

LICENSED STRUCTURAL ENGINEER
WELLS L. HOLMES
081.008195
STATE OF ILLINOIS

08/21/2025

License Expires: 11-30-2026

Firm License Number: 184.005810 - COA

VSE Project Number: U7144.0005.251

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GE Vernova 6.1-158 Wind Turbine

2024 International Building Code

Certification document for 117 m Hub Height Towers

REVISIONS				
REV	DESCRIPTION	ORIG.	APP.	DATE
0	FINAL FOR CONSTRUCTION	FA		08-11-25

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1 INTRODUCTION

This document contains the strength assessment for the steel tower of the GE Vernova 6.1-158 in IEC Turbine Class S with 117 m hub height located in Coles County, IL. The strength assessment has been carried out to 2024 International Building Code.

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2 PROJECT DATA

2.1 WIND TURBINE DATA

The wind turbine information is shown in Table 1 – Wind Turbine Data.

Table 1 – Wind Turbine Data

Machine Type	GE 6.1-158
Rotor diameter (m)	158.00
Generator power (MW)	6.1
Type class	S, V_{ave} = 8.0 m/s
Hub heights (m)	117
Normal speed range (rpm)	10.1
Number of blades	3
Vertical hub offset (m)	1.918
Tower height (m)	114.305
Outer diameter of tower top flange (mm)	3684
Nacelle and rotor mass (kg)	272,500
Tower Drawings	452W3871, 453W2426, 453W2427, 453W2428, 453W2429, 453W2430
Steel material Yield Strength (MPa)	355.00

*Only during gusts

2.2 FOUNDATION DATA

The minimum requirements for the tower foundation system are shown in Reference 3, Dynamic Stiffness of the Foundation. The foundation needs to meet the following minimum dynamic stiffness requirements:

Translation Stiffness = 1.0×10^{6} kN/m

Rotation Stiffness = 1.5×10^{8} kN-m/rad

2.3 SITE TOPOGRAPHY DATA

The wind turbines locations are in Coles County, IL. There are no wind speed-up effects sed to evaluate any topographic effects factors, in accordance with Section 26.8.1 of ASCE 7-22.

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3 DESIGN STANDARDS

3.1 General

The site is in Coles County, IL. The governing standard is 2024 International Building Code (IBC). 2024 IBC references the ASCE 7-22, "Minimum Design Loads for Buildings and Other Structures".

2024 IBC and ASCE 7-22 do not cover wind turbine generators explicitly. These structures are designed to an international standard IEC 61400-1 "Wind Generator Systems, Part 1: Safety Requirements". This standard is used for determining the extreme and operation wind loads and the associated load factors.

In addition, ASCE/AWEA RP2011, "Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures" is used for load combinations that involve operational wind loads.

The supporting structures are circular tubular towers. We used a more structure specific design standard EN 1993-1-6:2007, "Strength and Stability of Shell Structures" for determining the buckling stress limits of the tower shell.

3.2 Structural Steel Material

The wind turbine tower design uses European steel specifications for the tower sections shell, flanges and bolts.

3.2.1 Tower Shell and Flanges

The steel used is equivalent to ASTM A572 Grade 50. Please find below a comparison between the European specification steel and ASTM A572 Grade 50.

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Parameter	Structural Element	EN 10025	ASTM A572 Grade50
Yield Strength (MPa)	Shell, Flanges, Door Frame	For thicknesses, smaller than and equal to 40 mm the yield strength is 355 MPa. For thicknesses, greater than 40 mm and smaller than 80 mm. the yield strength is 345 MPa.	50 ksi ≈ 344.73 MPa
Tensile Strength (MPa)		For thicknesses, smaller than and equal to 40 mm the tensile strength is 490 MPa. For thicknesses, greater than 40 mm and smaller than 80 mm. the tensile strength is 470 MPa.	65 ksi ≈ 448.16 MPa
CVN		27 J at 0° C	Not specified

3.2.2 Tower High Tensile Bolts

The bolts used are Metric Bolts Grade 10.9. This grade is closest to ASTM A490, but unlike ASTM A490, the bolts can be galvanized.

Parameter	Structural Element	EN 10025	ASTM A490
Nominal Tensile Strength (MPa)	Bolted Flange Connections	750 MPa	113 ksi ≈ 780 MPa

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4 LOADS

4.1 EXTREME WIND LOADS (W)

The tower was designed and certified to IEC Class S, $V_{extreme}$ = 55.86 m/sec (the extreme wind speed is at the hub level). The manufacturer (GE) carried out a comprehensive wind time history analysis and maximum loads (axial load, shear, bending moment and torque) are produced for the entire tower height.

We considered the following parameters for an equivalent 2024 International Building Code and ASCE 7-22 extreme wind load analysis:

Risk Category II

V= 107 mph (3-second gust) – basic wind speed

Exposure C

$z_{alt} = 660ft$

$\alpha = 9.8$

$z_g = 2460ft$

$z = 383.58\text{ft}$

$$K_z = 2.41 \cdot \left(\frac{z}{z_g}\right)^{\frac{2}{\alpha}} = 1.649$$

$K_d = 0.95$

$V = 47.8333m/sec$

$K_{zt} = 1.0$

$K_e = e^{-0.0000362 z_{alt}} = 0.97639$

$q_z = 0.613 \cdot K_z \cdot K_{zt} \cdot K_d \cdot K_e \cdot V^2 = 2145.303\ Pa$

$$V_{hub} = \sqrt{\frac{q_z}{0.613}} = 59.16m/sec$$

The wind loads calculated in accordance with 2024 IBC and ASCE 7-22. These are ultimate loads as the load factor for wind is 1.0.

The tower was designed to IEC 61400-1 standard, for the following wind speed parameters:

$V_{e50} = 55.86m/sec$ annual average wind speed at hub (Ref. 2)

The IEC 61400-1 standard wind load factor is 1.35. This increases the hub extreme wind speed by a factor of $\sqrt{1.35}$:

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$$V_{\text{extreme,modified}} = 55.86 \times \sqrt{1.35} = 64.90\ m/sec$$

The modified hub wind speed used by the IEC 61400-1 standard is greater than the hub wind speed calculated in accordance with 2024 IBC.

Since the tower loads are the result of a comprehensive time history analysis that accounts for any dynamic effects of the wind turbine components, including the tower, IEC loads will be considered for this analysis.

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5 EXTREME LOADS ANALYSIS

5.1 TOWER SHELL ASSESSMENT

The tower shell buckling assessment for the Extreme Wind Load Combination is shown in IEC Certification Design Document (Reference 1), Table 3.1. The maximum shell buckling ratio is 100% (Mid B Section).

5.2 TOWER WELDS ASSESSMENT

Extreme Wind Load Combination assessment is shown in Reference 1, Table 3-3: "Weld Assessments".

The maximum capacity utilization ratio is 100%.

5.3 TOWER FLANGES ASSESSMENT

Extreme Wind Load Combination assessment is shown in Reference 1, Table 5-1: Results of the extreme assessments for the flanges.

The maximum capacity utilization ratio is 89% (Flange MF2).

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6 FATIGUE ASSESSMENT

6.1 DESIGN CERTIFICATION BACKGROUND

The fatigue assessment was carried out by GE as part of preparing the IEC Design certification report. Details of the fatigue calculation are shown in Reference 1.

6.2 FATIGUE ASSESSMENT APPROACH

The fatigue assessment uses the fatigue design criteria from Eurocode 3. This approach is similar to the prescriptions of the US Codes, ANSI/AISC 360-22 and AWS D1.1 as the threshold fatigue stress ranges are similar. The 2024 International Building Code references ANSI/AISC 360-22 and AWS D1.1 code. In addition, for the tower top flange assessment uses transfer functions for the weld and base material principal stresses.

6.3 ASSESSMENT RESULTS

Table 4-1: "Fatigue Assessments of Governing Details" of Reference 1, shows the fatigue assessment for weld bosses at the door section, maximum D = 0.81. This assessment is for a 20-years design life.

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7 CONCLUSIONS

The proposed 117 m hub height towers located in Coles County, IL are adequate to support the loading in accordance with 2024 International Building Code and IEC-61400-1 wind turbine standards.

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8 REFERENCES

1) GE 6.13-158 60Hz Steel Tower for 117mHH IEC WTGS Class S – CWE Certification Document for steel construction 117mHH tower – 5 Sections without Tower Base Ring 452W3871: STW & CWE Document code: GDOC-XXXXXXXX Dated 07/04/2025.
2) Mechanical Load Analysis, Apex Clean Energy, Coles Wind, Illinois, USA Project #1235488, Rev 01, Dated 05/17/2025.
3) Foundation Load Specification for Wind Turbine Generator Systems, Coles, Illinois, (GE Project 1235488), 6.1-158 60Hz, 117 m Nominal Hub Height Cold Weather Extreme IEC Class S, release date 06/13/2025.

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Coordination with Soil and Water Conservation District

Alan Moore

From: Alan Moore
Sent: Wednesday, July 16, 2025 8:21 AM
To: Przygoda, Malina - FPAC-NRCS, IL
Subject: RE: AIMA and Coles County SWCD Guidance
Attachments: Coles Wind LLC (Coles) 10.31.2024 AIMA.pdf

Hi Malina,

Thanks for taking my phone call to discuss the Coles Wind project and any SWCD guidelines for Conservation Practices Impact Mitigation that may apply to the project. Also, thanks for following up on this email thread. Attached for your records, please find the fully executed Coles Wind AIMA. As you recommend, we will make sure that any impacted conservation measures are mitigated or fixed upon completion and that any damaged farm tile is repaired.

Thanks again, if you have any further questions regarding the Coles Wind project, please do not hesitate to reach out.

Regards,

Alan

ALAN MOORE
Director of Development

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From: Przygoda, Malina - FPAC-NRCS, IL <Malina.Przygoda@il.nacdnet.net>
Sent: Monday, July 14, 2025 1:29 PM
To: Alan Moore <alan.moore@apexcleanenergy.com>
Subject: Re: AIMA and Coles County SWCD Guidance

Hello,
You are welcome! It worked out that the previous person in the position I'm in came in the office this morning so I could pick her brain quickly. I will get CC'd through AIMA's email so I shouldn't need you to send me anything.
As soon as IDOA follows up, I will reach out.

Best,
Malina

From: Alan Moore <alan.moore@apexcleanenergy.com>
Sent: Monday, July 14, 2025 11:34 AM
To: Przygoda, Malina - FPAC-NRCS, IL <Malina.Przygoda@il.nacdnet.net>
Subject: RE: AIMA and Coles County SWCD Guidance

Hi Malina,

Thanks for the quick follow up. We have a fully executed AIMA and are committed to repairing any tile that we break for the life of the project – whether that is during construction, operations, or decommissioning.

I am happy to share that AIMA if you need it is included in our SUP application with Coles County.

Let me know if you hear anything additional from your colleagues.

Best,

Alan

ALAN MOORE
Director of Development

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From: Przygoda, Malina - FPAC-NRCS, IL <Malina.Przygoda@il.nacdnet.net>
Sent: Monday, July 14, 2025 12:23 PM
To: Alan Moore <alan.moore@apexcleanenergy.com>
Subject: AIMA and Coles County SWCD Guidance

Hello,
It looks like there likely isn't much on Coles County SWCD's end for you to follow. I have reached out to one of my higher ups to confirm. If you haven't filed an Agricultural Impact Mitigation Agreement (AIMA) with the IDOA, that would be the only required thing we have. It technically is through the IDOA and we are just kept in the loop on the whole thing. I am attaching the application if you need it.
If any current conservation practices are impacted (Field boarders, pollinator habitats, etc.) then we request those are mitigated or fixed when completed. And if any farm tile is damaged, then we would

obviously request that that is fixed. Otherwise, I will keep you posted, but so far it looks like you are in the clear with us.
Best,

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