PRESENTATION OF SITE INVESTIGATION RESULTS

LDW Upper Reach Pre-Design Investigation

Prepared for:

Anchor QEA

ConeTec Job No: 21-59-22445

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Prepared by:

ConeTec Inc.
1508 O Street SW, Unit 103-104
Auburn, WA 98001

Tel: (253) 397-4861

ConeTecWA@conetec.com
www.conetec.com
www.conetecdataservices.com

CONETEC

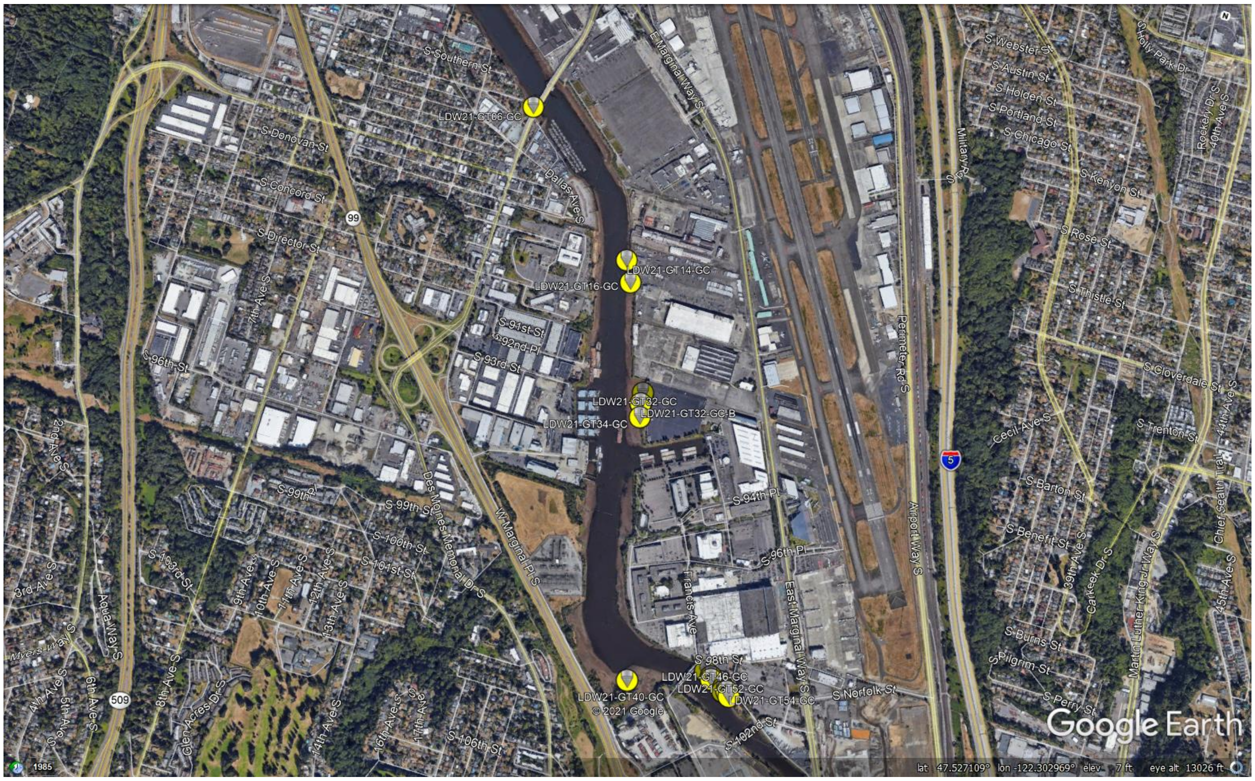
Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for Anchor QEA along mile 3-5 of the Lower Duwamish Waterway Superfund site located in Seattle WA. This work supports the Pre-Design Investigations for the remedial design of the upper reach of the LDW. The program consisted of cone penetration tests, full flow penetration tests & electronic vane testing.

Project Information

Project	
Client	Anchor QEA
Project	LDW Upper Reach Pre-Design Investigation
ConeTec project number	21-59-22445

An aerial overview from Google Earth including the CPTu test locations is presented below.



Rig Description	Deployment System	Test Type
C05-023 Track Rig	Integrated Push System	CPT, BCPT, VST
A07-018 Amphibious Rig	Integrated Push System	CPT
Barge Support	Auxiliary Push Boat	CPT, BCPT, VST

Coordinates			
Test Type	Collection Method	EPSG Number	Comments
CPT, BCPT, VST	Client provided	4326	Coordinates converted from State Plane

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (bar)
681:T375F10U35	681	15	225	375	10	35
Cone 681 was used for all CPTu soundings.						

Cone Penetration Test (CPTu)	
Depth reference	Depths are referenced to the existing mudline at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	• Advanced plots with Ic, Su, phi and N1(60) • Soil Behaviour Type (SBT) scatter plots
Additional comments	A negative water table has been applied to all soundings completed from barge deck. All CPT data files begin at mudline (mudline = 0.0ft)

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behaviour Type Chart based on Q_{tn} (SBT Q_{tn}) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance (q_t) sleeve friction (f_s) and pore pressure (u_2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behaviour type zones and the assumed equilibrium pore pressure profile.

Full-Flow Cone Penetration Test (BCPTu)	
Depth reference	All soundings were started slightly above the mudline in the water column. Mudline is clearly indicated on all plots and clearly visible within the data set.
Unit weight profiles	• A unit weight of 62.43pcf was applied to data collected within the water column above mudline • A unit weight of 111.37pcf was applied to data collected below mudline The unit weight is clearly indicated in the data set.

Electric Field Vane Shear Test (VST)	
Depth reference	Depths are referenced to depth below mudline at the time of each test
Load cell capacity	100 N·m
Load cell location	Uphole
Additional comments	All vane tests were completed from the floating barge platform. The vane test results were affected by barge movement from local waves, local vessel traffic and river flow. Additionally, the vane results were susceptible to elevation charge from either rising or falling tide. Over the course of a vane test the barge would gain/lose approximately 2”-4” of elevation due to tidal effects.

Limitations

This report has been prepared for the exclusive use of Anchor QEA (Client) for the project titled “LDW Upper Reach Pre-Design Investigation". The report’s contents may not be relied upon by any other party without the express written permission of ConeTec Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first appendix. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

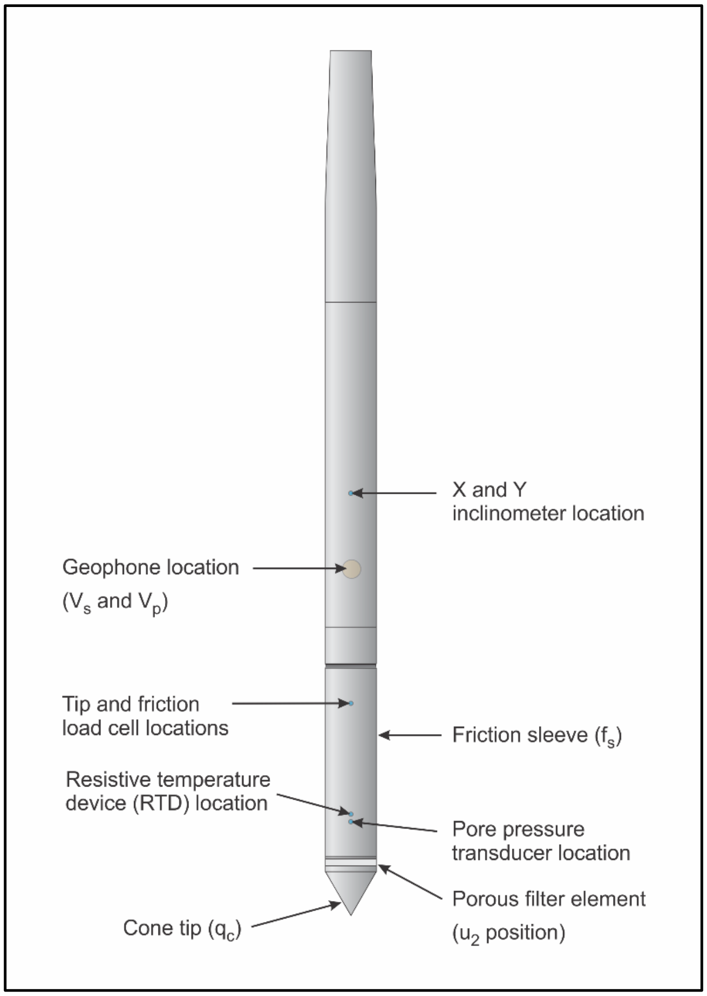


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal interface box and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches (38.1 millimeters) are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson et al. (1986) and Robertson (1990, 2009). It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (R_f) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of files with calculated geotechnical parameters were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the methods used is also included in the data release folder.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

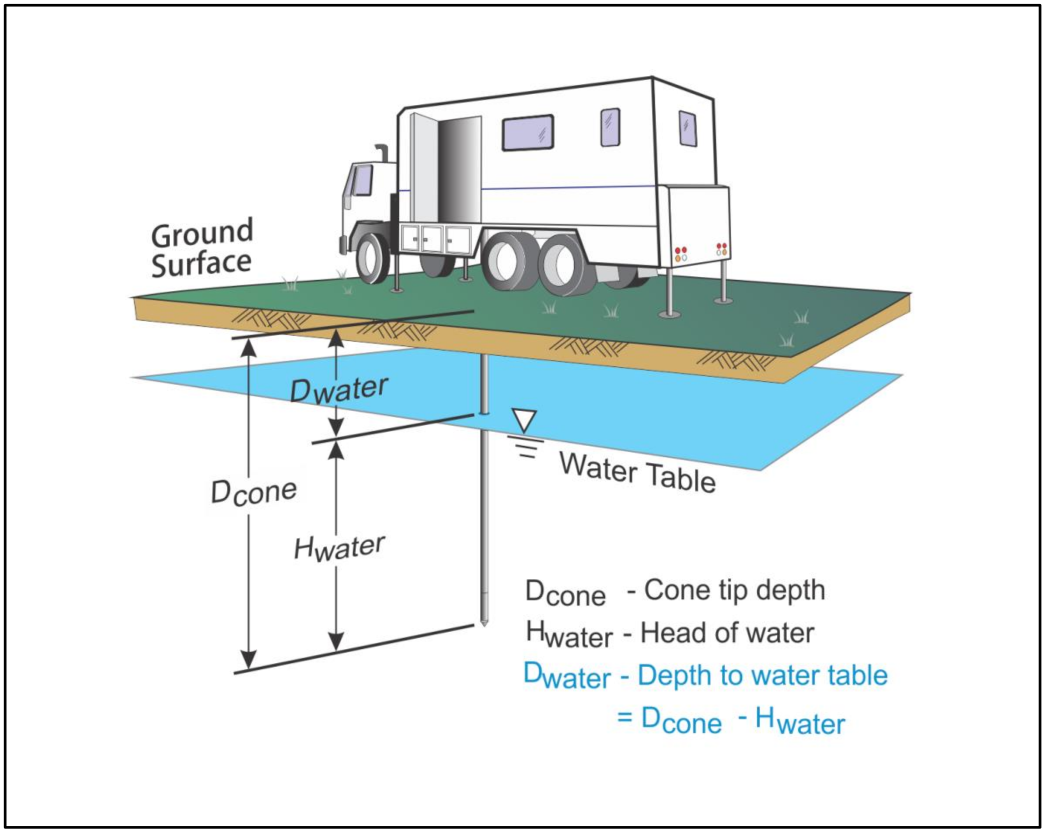


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

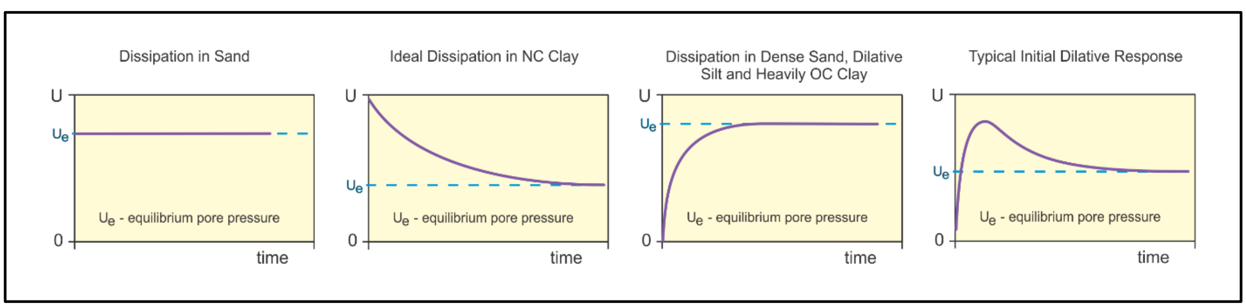


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:
T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby (1991))

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby (1991)), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-12.

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073. DOI: 1063-1073/T98-062.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, "Cone Penetration Testing in Geotechnical Practice", Blackie Academic and Professional.

Mayne, P.W., 2013, "Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests", Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420. DOI: 10.1061/9780784412770.027.

Mayne, P.W. and Peuchen, J., 2012, "Unit weight trends with cone resistance in soft to firm clays", Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, "Interpretation of geotechnical parameters from seismic piezocone tests", CPT'14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158. DOI: 10.1139/T90-014.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 539-550. DOI: 10.1139/T92-061.

Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355. DOI: 10.1139/T09-065.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381. DOI: 10.1139/T98-105.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34. DOI: 10.1680/geot.1991.41.1.17.

Full flow penetration testing (BCPTu) is performed in conjunction with a piezocone penetration test using an integrated electronic piezocone with a spherical attachment and a data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified downhole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in 5 cm^2, 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 5 cm^2 and 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross-sectional area (typically forty-four millimeter diameter over a length of thirty-two millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a sixty-degree apex angle.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard.

For ball full flow penetration tests, the cone tip is replaced with a spherical attachment that can have projected plan areas of 40 cm^2, 60 cm^2, 100 cm^2 or 150 cm^2. The selection of the size is based on soil strength and deployment limitations. An illustration of the piezocone with a spherical attachment is presented in Figure BCPTu.

The specific piezocone and ball area used for each test is described in the ball full flow penetration test summary presented in the relevant appendix.

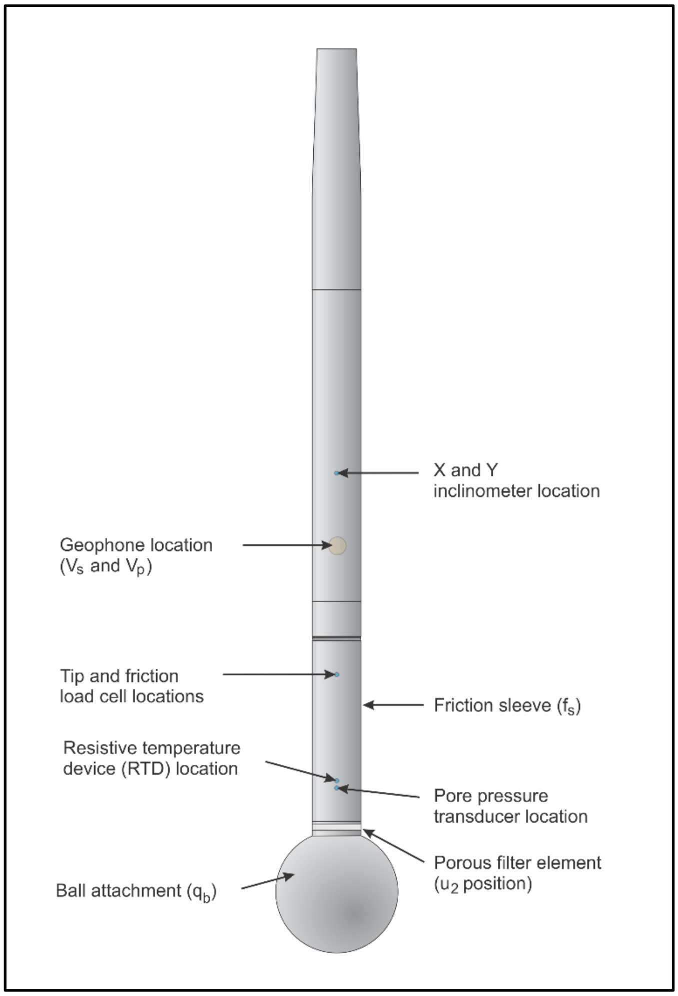


Figure BCPTu. Piezocone penetrometer with a spherical attachment

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a sixteen-bit (or greater) analog to digital (A/D) converter. The data is recorded in fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected ball tip resistance (q_b)
- Sleeve friction (f_s)
- Dynamic pore pressure (u) at the shoulder (u_2) or at the equator of the ball
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

Prior to the start of a BCPTu sounding a suitable cone and spherical attachment are selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the ball hanging freely in a vertical position.

The BCPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically, one-meter length rods with an outer diameter of 38.1 millimeters are added to advance the ball to the sounding termination depth. The test may be interrupted at selected depths to cycle the probe up and down in order to achieve a completely remolded soil state. Cycling is typically conducted during retraction of the ball and the number of conducted cycles is dependent on reaching a consistent tip value. After ball retraction the final baselines are recorded.

The full flow penetration test can be halted at specific depths to carry out pore pressure dissipation (PPD) tests. For each dissipation test the data acquisition system measures and records the variation of the pore pressure (u) with time (t). Pore pressure dissipation data can be interpreted to provide estimates of equilibrium pore pressures (u_{eq}).

Additional information pertaining to ConeTec's full flow penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings verifying compliance with ASTM standards
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs or excessive inclination occurs, equipment damage is likely to take place or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

Full flow penetration tests are conducted to assess the undrained shear strength (Su) of low to medium strength soils. During penetration, the soil flows around the penetrometer significantly reducing the influence of overburden stress as compared to the cone penetration test (CPTu). For the test to be valid, the soil must flow around the penetrometer. Cycling is conducted in order to achieve a completely remolded soil state to provide an indication of sensitivity in soft soils.

The recorded ball tip resistance (q_b) is the total force acting on the piezocone spherical attachment divided by its base area. The ball tip resistance is corrected for pore pressure effects and termed corrected ball tip resistance (q_{bt}) according to the following expression:

$$q_{bt}=q_b+[(1-a)u_2]\frac{A_s}{A_p}$$

where: q_{bt} is the corrected ball tip resistance
q_b is the recorded ball tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)
A_s is the shaft area
A_p is the ball plan area

The undrained shear strength (Su) derived from the full flow penetration test is related to the net ball tip resistance (q_{btnet}) and ball factor (N_{ball}) using the following relationship:

$$Su = \frac{q_{btnet}}{N_{ball}}$$

Due to different geometry and the subdued sleeve and pore pressure response, full flow penetration test results are not used for the interpretation of other geotechnical parameters or for soil classification.

A summary of the BCPTu soundings along with test details and individual plots are provided in the appendices. Tabular results generated for each sounding are provided in Excel format in the data release folder. Information regarding the calculated parameters is also included in the data release folder.

For additional information on full flow penetrometer testing, refer to Weemees et al. (2006).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D5778-12.

Weemees, I., Howie, J., Woeller, D.J., Sharp, J.T., Cargill, E., Greig, J., 2006, “Improved Techniques for the In-Situ Determination of Undrained Shear Strength in Soft Clays,” Sea to Sky Geotechnics, Proceedings of the 59th Canadian Geotechnical Conference, Vancouver, B.C., 1–4 October. BiTech Publishers Ltd., Richmond, B.C. pp. 89–95.

The electric field vane system is manufactured by Adara Systems Ltd., a subsidiary of ConeTec. An illustration of the uphole vane system configuration is presented in Figure eVST.

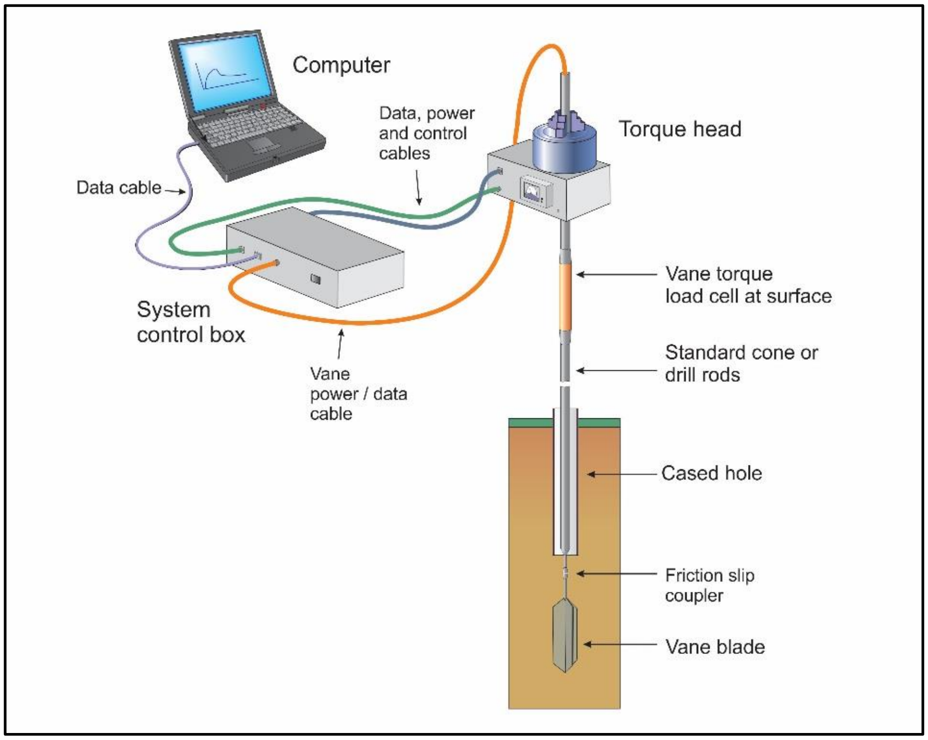


Figure eVST. Illustration of the uphole electric field vane system configuration

The vane system is designed with an array of strain gauges in a load cell that measure the applied torque. The torque signal is amplified and converted to digital data within the tool and transmitted to the data acquisition system through a shielded cable. The system uses a friction slip coupler to permit the free slip or play of approximately fifteen degrees between the rods and the vane blade in order to isolate and record rod friction from the soil before rotation of the vane blade starts. The system is designed to use vane blades of various sizes and configurations that connect to the friction slip coupler. The vane blades manufactured by Adara have dimensions and tolerances that are in general accordance with the current ASTM D2573 standards. In very soft soil conditions and at the request of the client, ConeTec may use a large diameter vane blade that exceeds the ASTM D2573 maximum size specifications in order to maximize torque resolution. In very stiff soil conditions and at the request of the client, ConeTec may use a smaller diameter vane blade than the minimum size specified in ASTM D2573 in order to obtain a peak torque below the capacity of the load cell.

The electric motor (capable of 100 Newton-meters of torque) is designed to clamp onto and rotate the rods and vane blade at a constant rate.

ConeTec's calibration criteria of the load cells are in accordance with the current ASTM D2573 standard.

The data acquisition system consists of a computer that records the vane data every 0.2 degrees of rotation. The system records the following parameters and saves them to a file as the test is conducted:

- Torque in Newton-meters
- Rotation in degrees
- Elapsed time in seconds (from the start of the test)

All testing is performed in accordance to ConeTec's field vane testing operating procedures and in general accordance with the current ASTM D2573 standard. For additional information on vane shear testing refer to Greig et al. (1987).

Prior to the start of a vane shear test profile, a suitable sized vane blade is selected, the vane system is powered on and the vane load cell baseline reading is recorded with the load cell hanging freely in a vertical position.

The vane blade, slip coupler and rods are advanced to the desired test depth through a cased hole, typically using AWJ drill rods or one-meter length rods with an outer diameter of 1.5 inches (38.1 millimeters). Test depths are referenced to the middle of the rectangular portion of the vane blade. The motor rotates the rods at a near constant rate up to and beyond the yield stress (peak) until the load remains near constant (post peak). Following post peak readings, the vane blade is then rapidly rotated clockwise ten times to completely remold the soil. The test procedure is repeated in order to record the remolded strength of the soil. The vane blade is then advanced to the next depth and the procedure is repeated or the vane blade is retracted to allow for drilling and vane blade size changes. Once the vane profile is complete, the final baseline of the load cell is recorded and compared to previous reading as a QA/QC check.

Undrained shear strength from the field vane, $(S_u)_{fv}$, is calculated from torque measurements using the following general equation (ASTM D2573) taking into consideration the case of rectangular or tapered ends at the top and/or bottom of the vane blade.

$$(S_u)_{fv} = \frac{12 \cdot T_{max}}{\pi D^2 \left(\frac{D}{\cos(i_T)} + \frac{D}{\cos(i_B)} + 6H \right)}$$

where:

$(S_u)_{fv}$ = undrained shear strength from the field vane

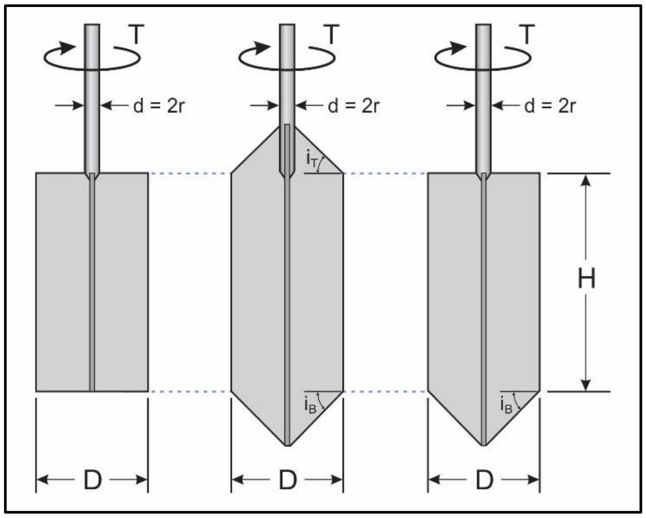
T_{max} = maximum value of torque

D = vane diameter

H = height of the rectangular portion of the vane

i_T = angle of taper at vane top (with respect to horizontal)

i_B = angle of taper at vane bottom (with respect to horizontal)



For rectangular vane blades where H/D = 2, the above equation simplifies to:

$$(S_u)_{fv}=\frac{6 \cdot T_{max}}{7\pi D^3}$$

The recorded rod friction is subtracted from the peak and remolded torque. No correction factors are applied to the vane results to derive the mobilized shear strength ($\tau_{mobilized}$).

A summary of the vane shear tests, a table of results and individual VST plots are provided in the relevant appendices. Tabular data in Excel format is provided in the data release folder.

References

ASTM D2573 / D2573M-18, 2018, "Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils", ASTM International, West Conshohocken, PA. DOI: 10.1520/D2573_D2573M-18.

Greig, J.W., R.G. Campanella and P.K. Robertson, 1987, "Comparison of Field Vane Results With Other In-Situ Test Results", International Symposium on Laboratory and Field Vane Shear Strength Testing, ASTM, Tampa, FL, Proceedings.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi and N(60)Ic/N1(60)Ic
- Soil Behavior Type (SBT) Scatter Plots
- Ball Cone Penetration Test Summary and Plots
- Electronic Vane Test Summary and Results
- Electronic Vane Test Plots

Cone Penetration Test Summary and Standard Cone Penetration Test Plots

ConeTec

Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Start Date: 06-Jul-2021
End Date: 29-Jul-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[3] (deg)	Longitude[3] (deg)	Refer to Notation Number
LDW21-GT06-GC	21-59-22445_CP06	22-Jul-2021	681:T375F10U35	-5.0	31.1	47.52892	-122.31483	
LDW21-GT14-GC	21-59-22445_CP14	08-Jul-2021	681:T375F10U35	-5.6	28.7	47.52477	-122.30819	
LDW21-GT16-GC	21-59-22445_CP16	08-Jul-2021	681:T375F10U35	-8.4	29.8	47.52409	-122.30770	
LDW21-GT17-GC	21-59-22445_CP17	12-Jul-2021	681:T375F10U35	-6.6	30.3			4
LDW21-GT20-GC	21-59-22445_CP20	16-Jul-2021	681:T375F10U35	-6.6	23.0			4
LDW21-GT22-GC	21-59-22445_CP22	13-Jul-2021	681:T375F10U35	-7.7	28.8			4
LDW21-GT27-GC	21-59-22445_CP27	16-Jul-2021	681:T375F10U35	-3.0	30.4			4
LDW21-GT30-GC	21-59-22445_CP30	21-Jul-2021	681:T375F10U35	-7.0	30.1	47.52066	-122.30558	
LDW21-GT31-GC	21-59-22445_CP31	09-Jul-2021	681:T375F10U35	2.0	11.4			4,2
LDW21-GT31-GC-B	21-59-22445_CP31B	13-Jul-2021	681:T375F10U35	-5.0	27.3			4
LDW21-GT32-GC	21-59-22445_CP32	09-Jul-2021	681:T375F10U35	2.0	5.8	47.52028	-122.30553	2
LDW21-GT32-GC-B	21-59-22445_CP32B	21-Jul-2021	681:T375F10U35	-2.0	30.8	47.52030	-122.30555	
LDW21-GT34-GC	21-59-22445_CP34	21-Jul-2021	681:T375F10U35	-2.8	30.3	47.51986	-122.30540	
LDW21-GT40-GC	21-59-22445_CP40	19-Jul-2021	681:T375F10U35	-4.9	31.7	47.51155	-122.30247	
LDW21-GT45-GC	21-59-22445_CP45	28-Jul-2021	681:T375F10U35	-7.2	31.6	47.51254	-122.29899	
LDW21-GT46-GC	21-59-22445_CP46	26-Jul-2021	681:T375F10U35	-13.2	9.8	47.51233	-122.29862	
LDW21-GT47-GC	21-59-22445_CP47	27-Jul-2021	681:T375F10U35	-12.5	31.2	47.51242	-122.29865	
LDW21-GT49-GC	21-59-22445_CP49	28-Jul-2021	681:T375F10U35	-6.5	32.5	47.51235	-122.29820	
LDW21-GT50-GC	21-59-22445_CP50	23-Jul-2021	681:T375F10U35	-11.6	5.5	47.51207	-122.29793	

Job No:	21-59-22445
Client:	Anchor QEA
Project:	LDW Upper Reach Pre-Design Investigation
Start Date:	06-Jul-2021
End Date:	29-Jul-2021

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Latitude[3] (deg)	Longitude[3] (deg)	Refer to Notation Number
LDW21-GT51-GC	21-59-22445_CP51	26-Jul-2021	681:T375F10U35	-6.4	6.6	47.51218	-122.29794	
LDW21-GT52-GC	21-59-22445_CP52	27-Jul-2021	681:T375F10U35	-6.9	30.4	47.51211	-122.29774	
LDW21-GT54-GC	21-59-22445_CP54	27-Jul-2021	681:T375F10U35	-6.0	30.8	47.51197	-122.29758	
Totals	22 soundings				547.89			

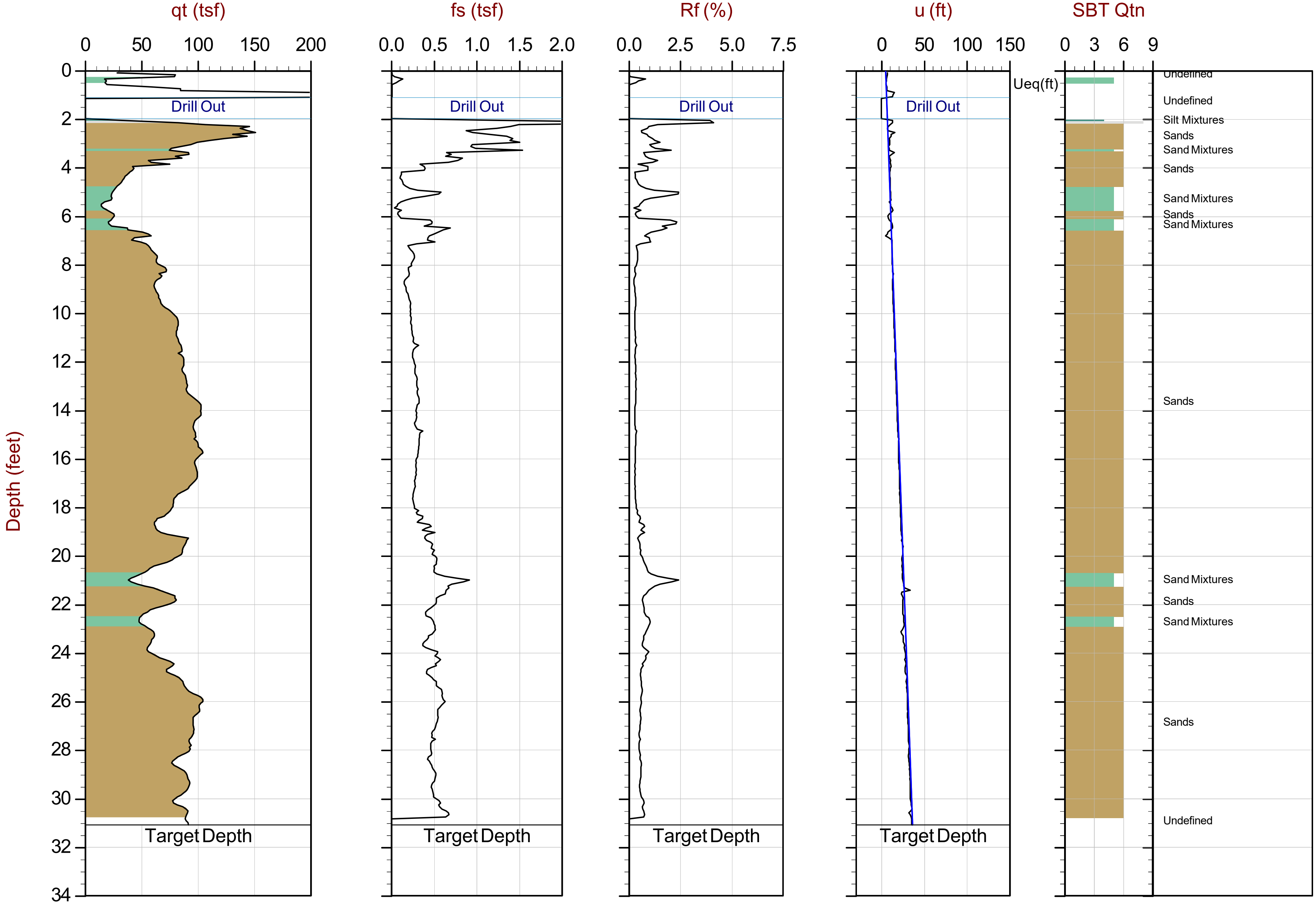
1. Phreatic surface measured from barge deck with weighted tip tape at each location. Hydrostatic profile applied to interpretation tables
2. CPT sounding completed from land based machine - all other locations completed from floating barge platform.
3. Coordinates were provided by client
4. Coordinates currently not available. Coordinates will be provided by client at a later date

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-22 17:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT06-GC
Cone: 681:T375F10U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP06.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52892 Long: -122.31483

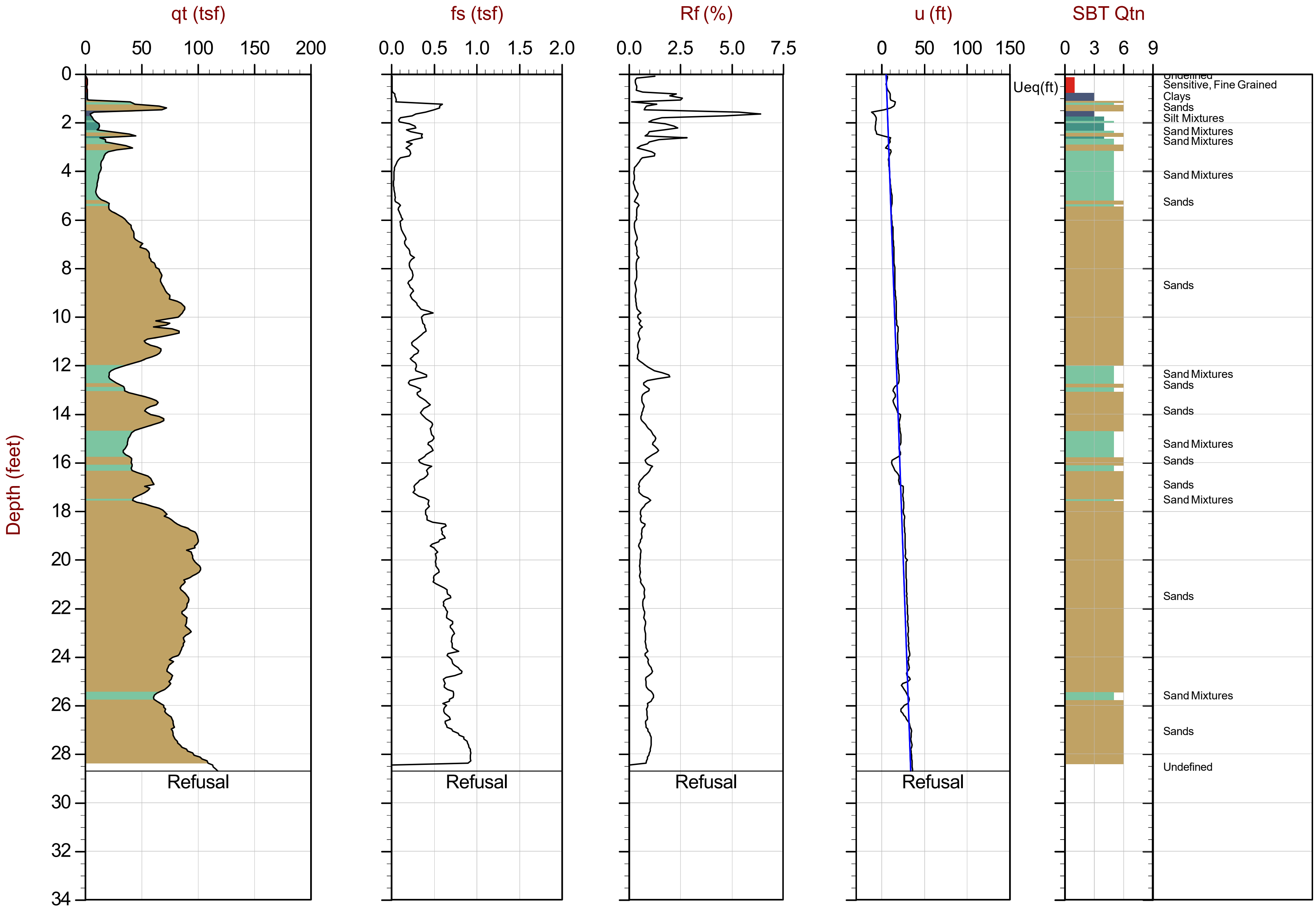
Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 14:11 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT14-GC
Cone: 681:T375F10U35



Max Depth: 8.750 m / 28.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP14.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52477 Long: -122.30819

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

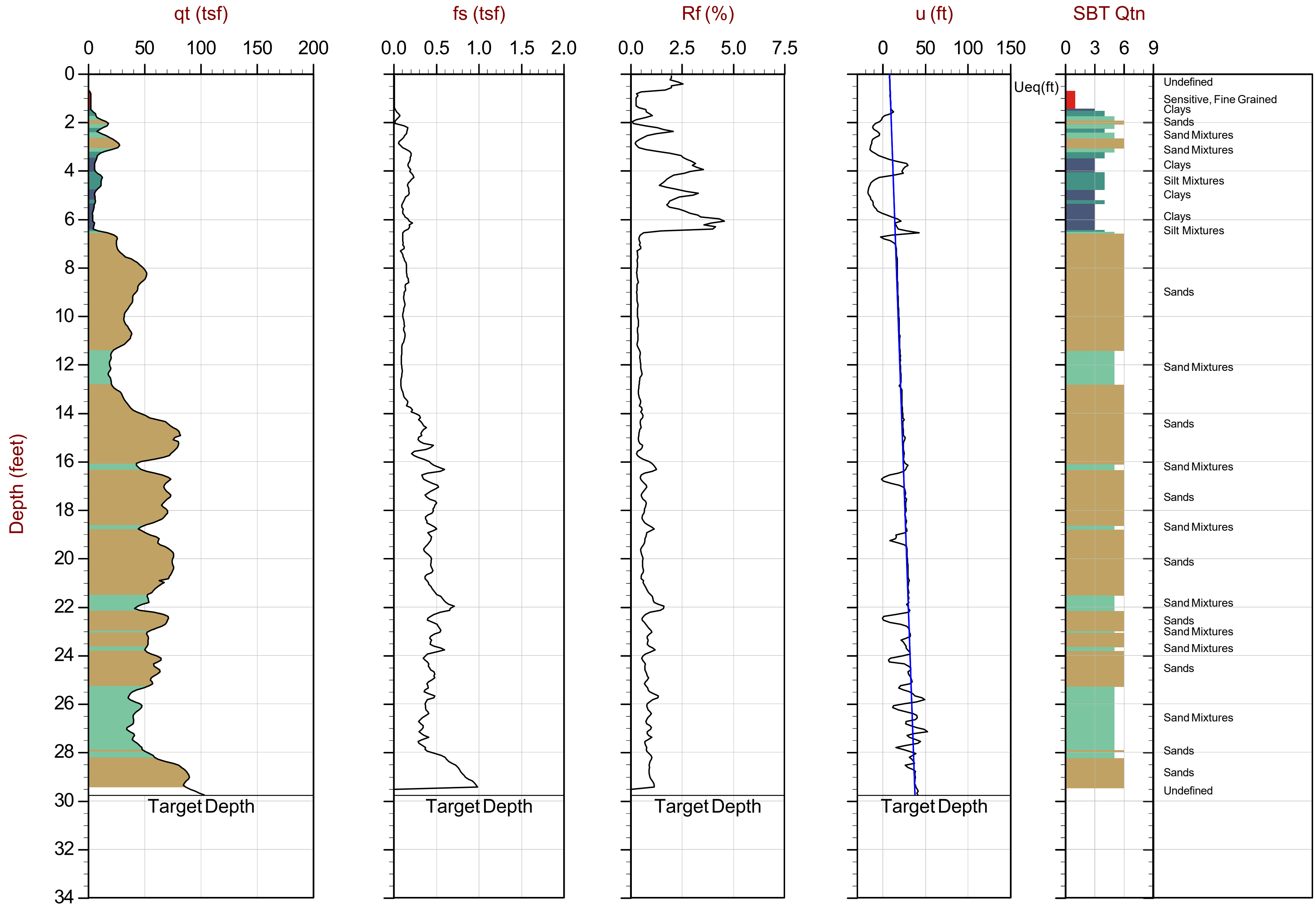
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 16:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT16-GC
Cone: 681:T375F10U35



Max Depth: 9.075 m / 29.77 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP16.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52409 Long: -122.30770

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

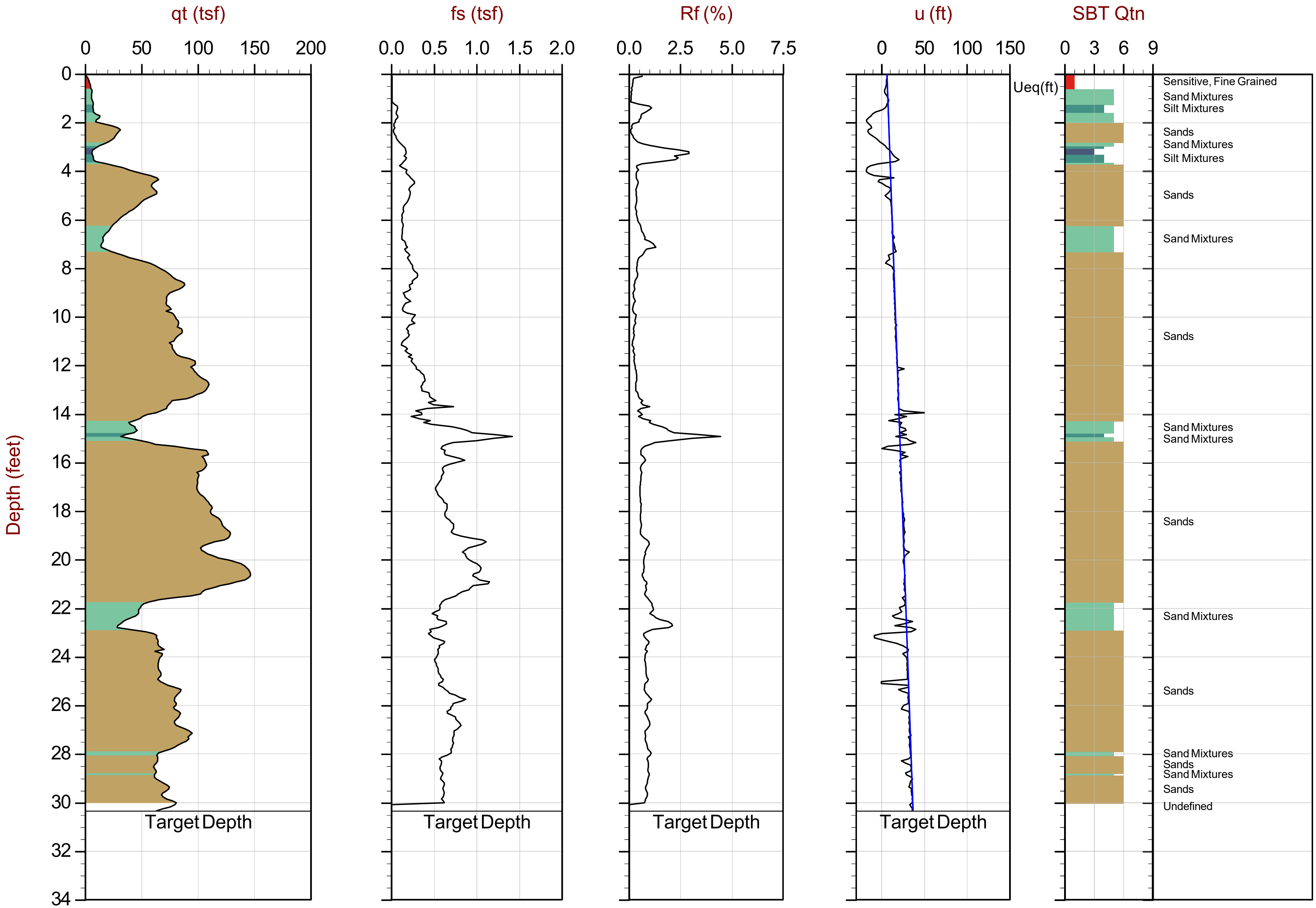
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-12 19:15 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT17-GC
Cone: 681:T375F10U35



Max Depth: 9.250 m / 30.35 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP17.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

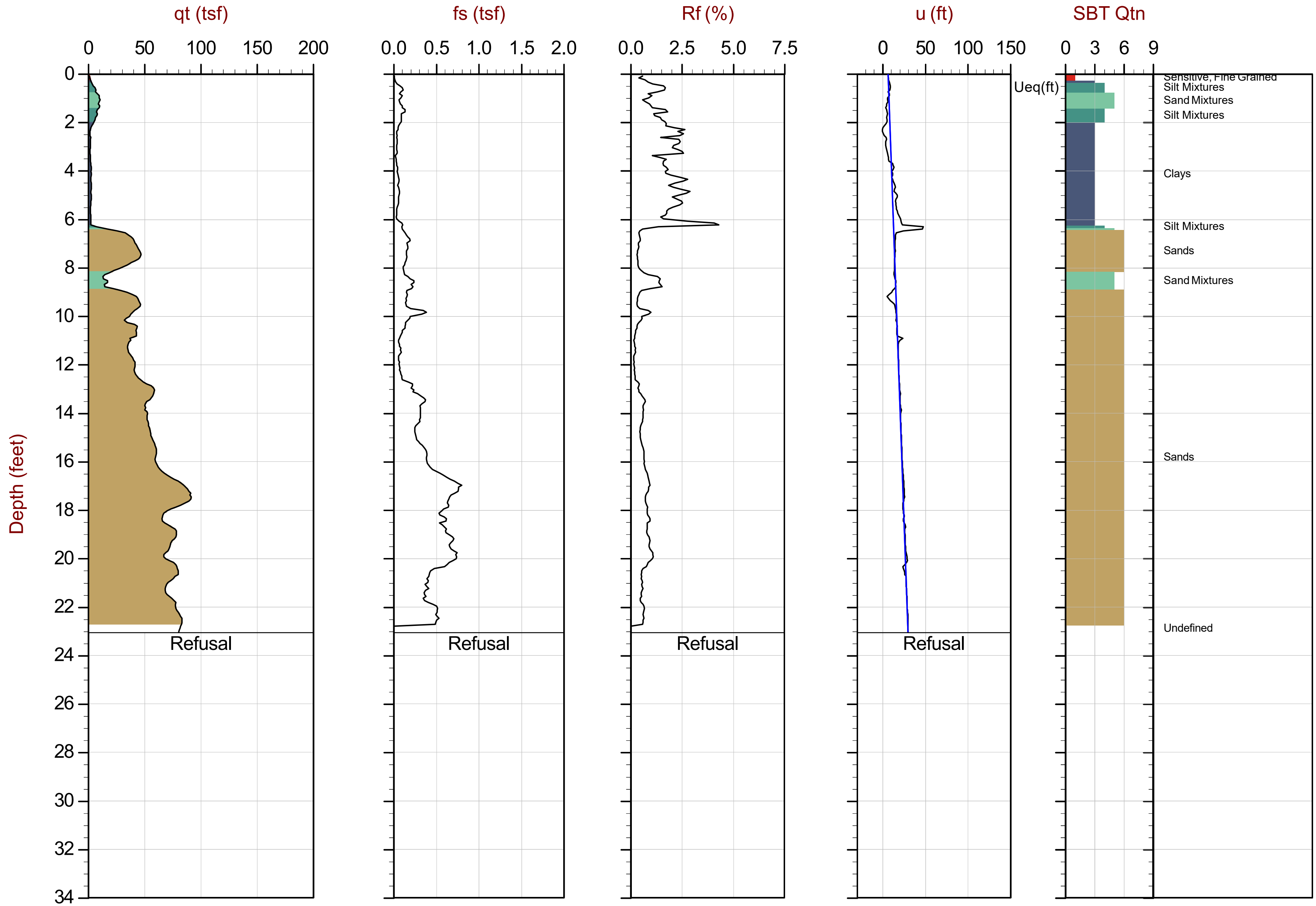
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 09:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT20-GC
Cone: 681:T375F10U35



Max Depth: 7.025 m / 23.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP20.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

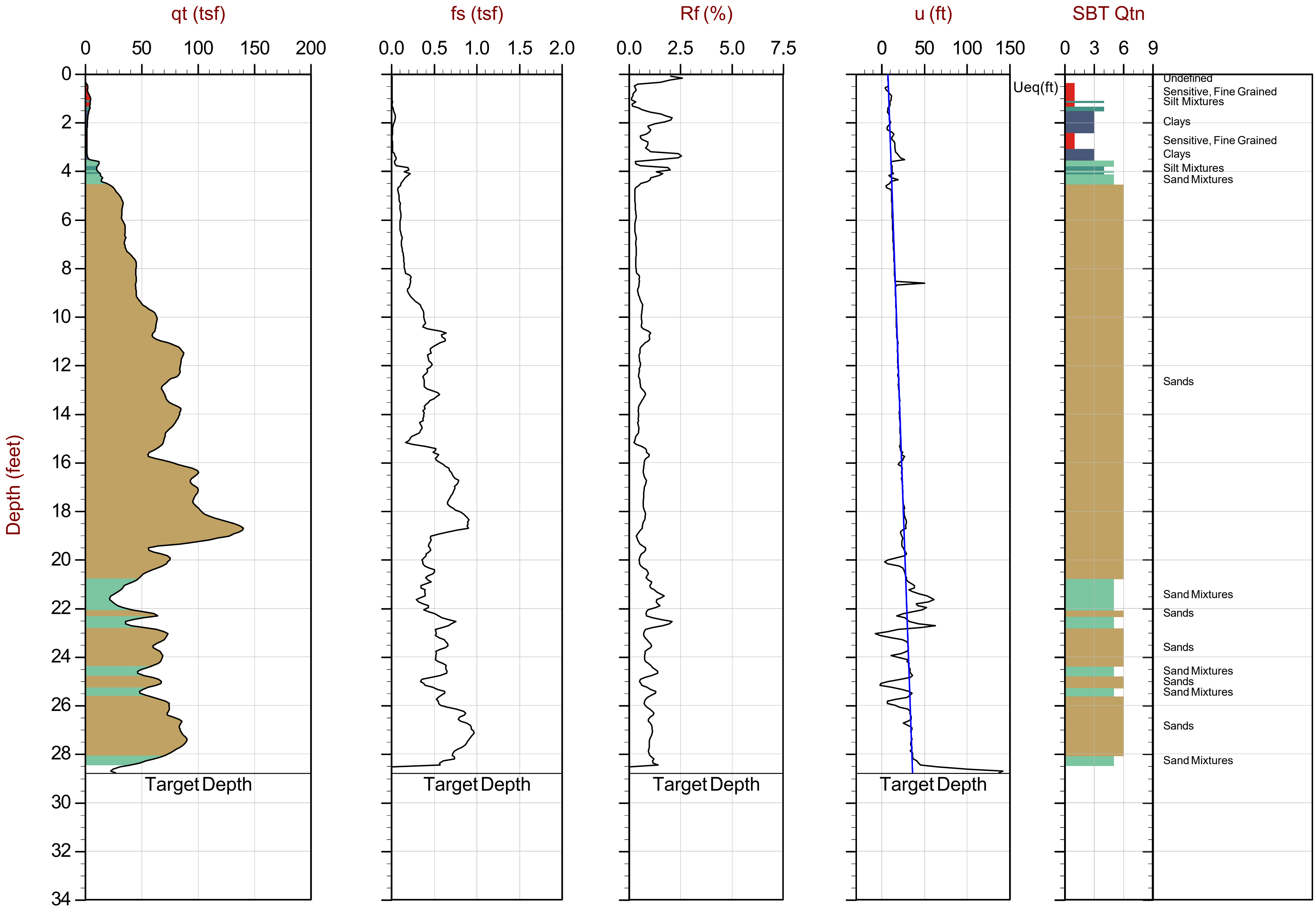
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-13 19:06 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT22-GC
Cone: 681:T375F10U35



Max Depth: 8.775 m / 28.79 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP22.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

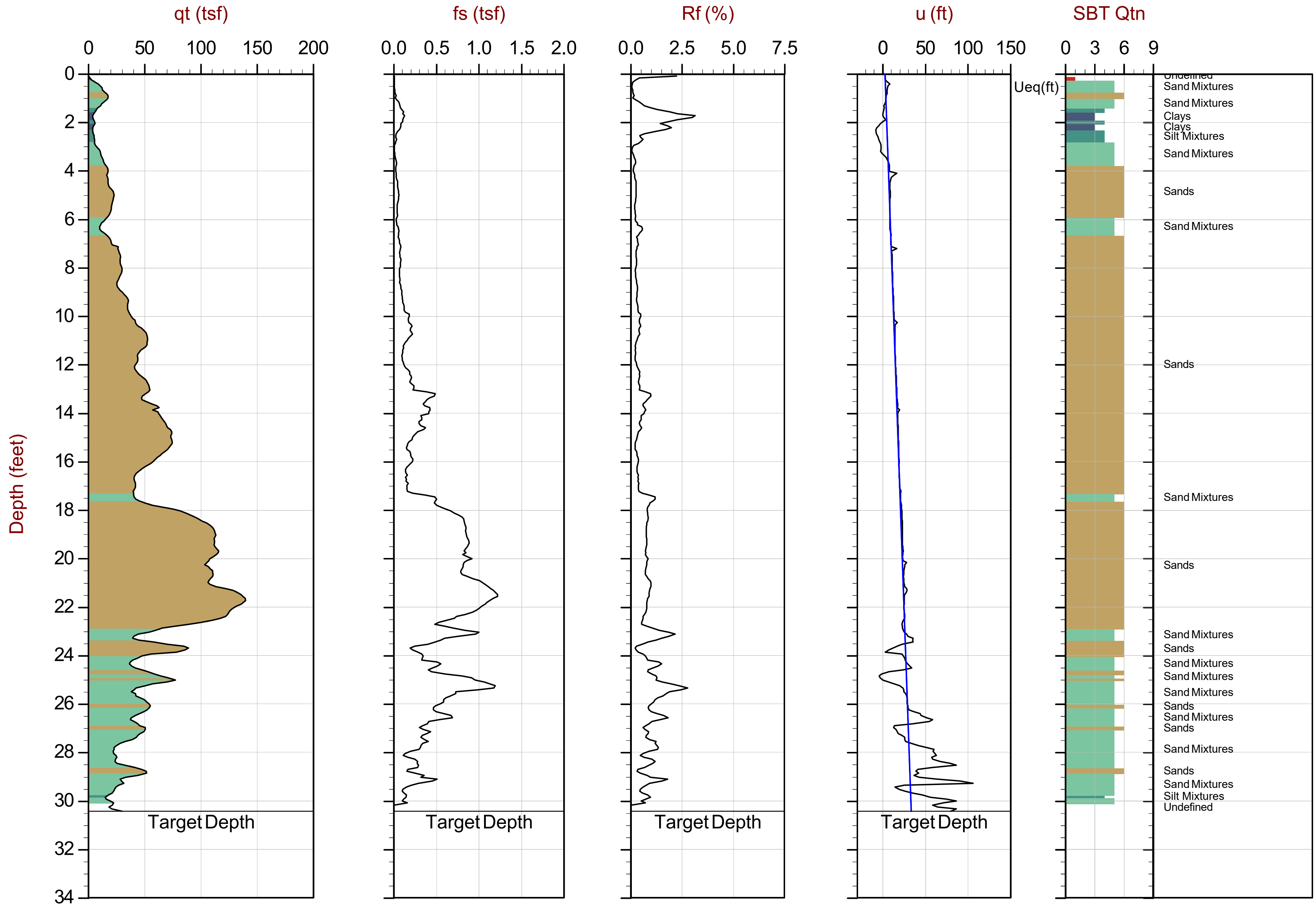
Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 08:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT27-GC
Cone: 681:T375F10U35



Max Depth: 9.275 m / 30.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP27.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

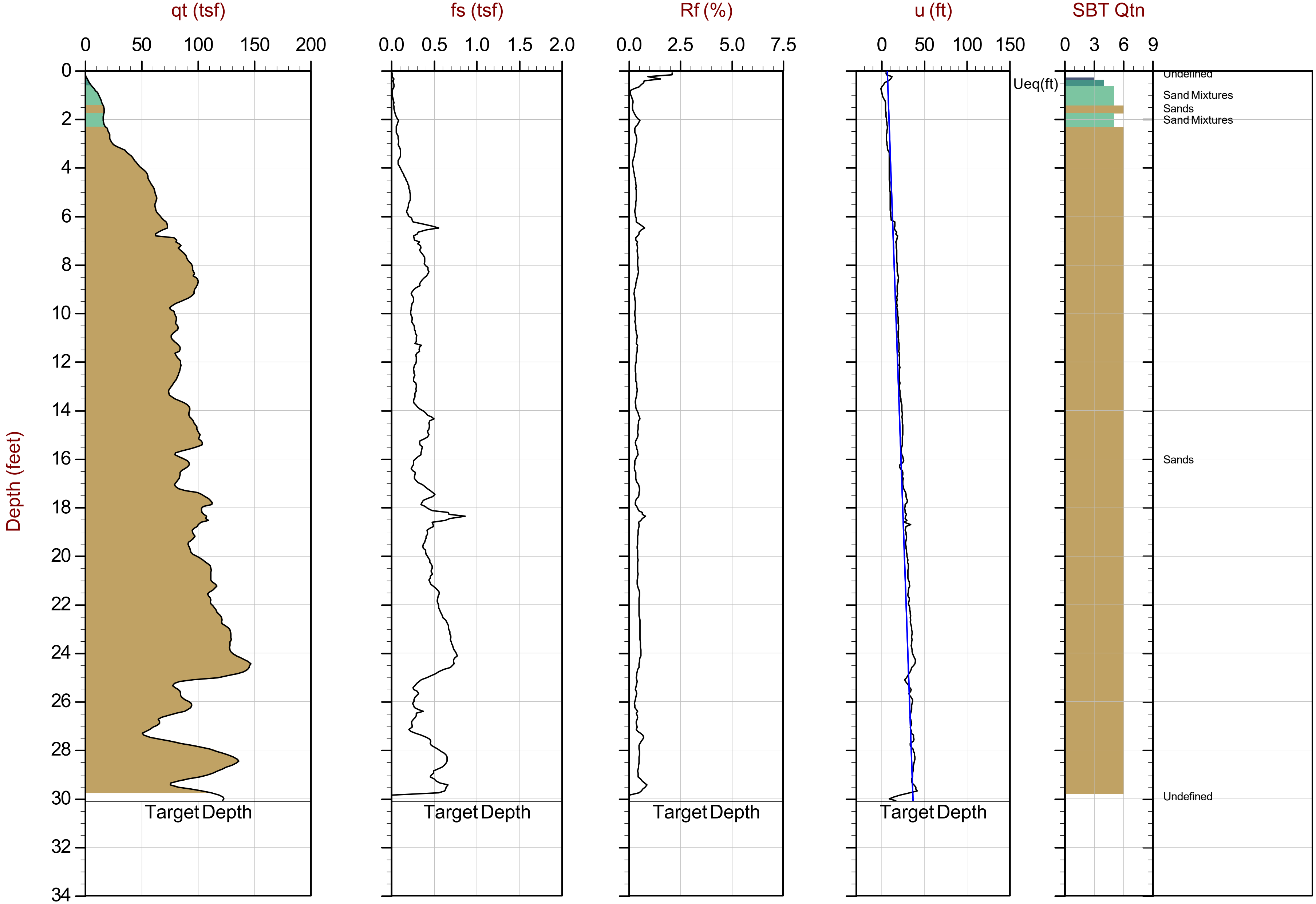
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 15:09 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT30-GC
Cone: 681:T375F10U35



Max Depth: 9.175 m / 30.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP30.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52066 Long: -122.30558

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

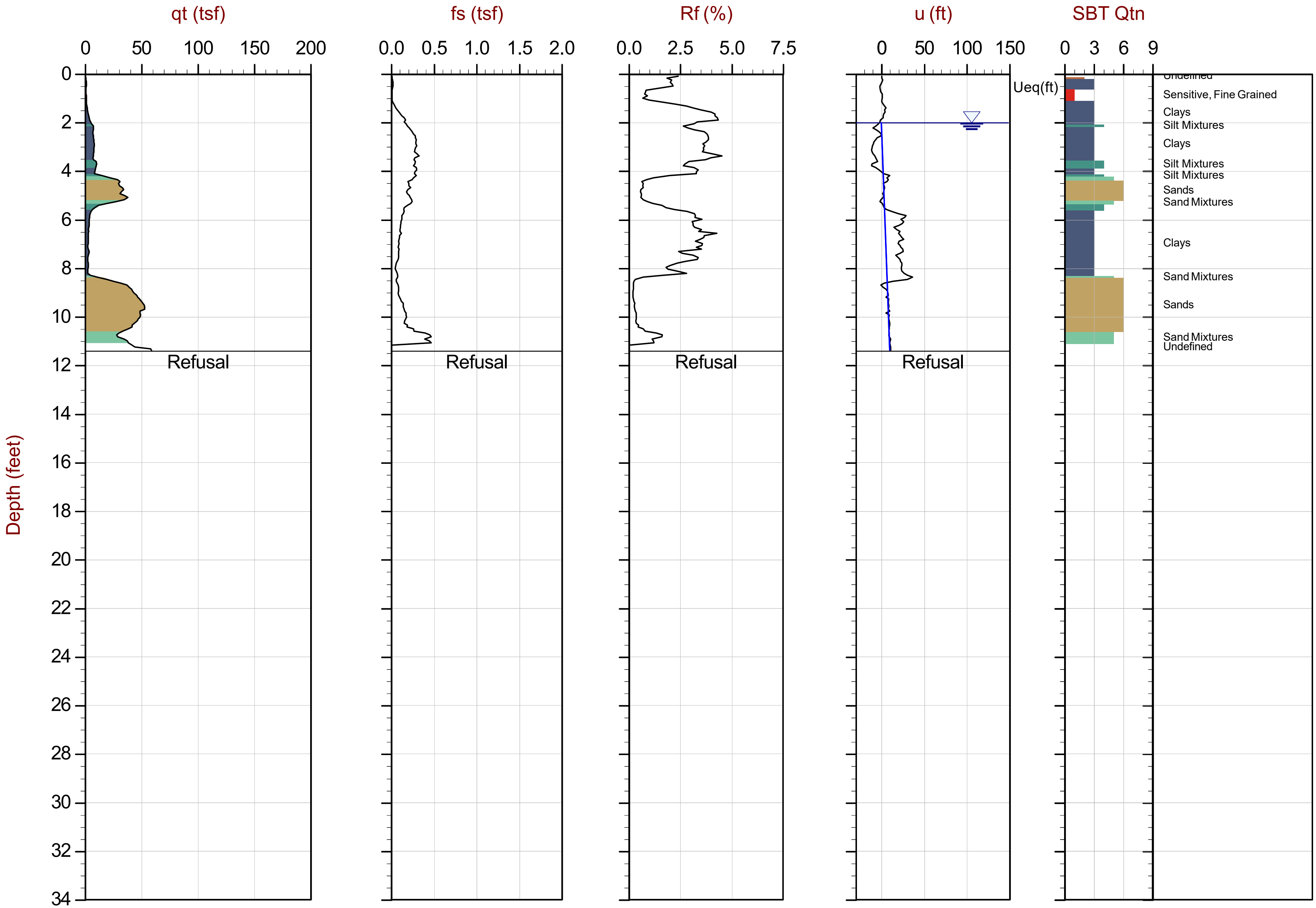
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-09 10:35 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT31-GC

Cone: 681:T375F10U35



Max Depth: 3.475 m / 11.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP31.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

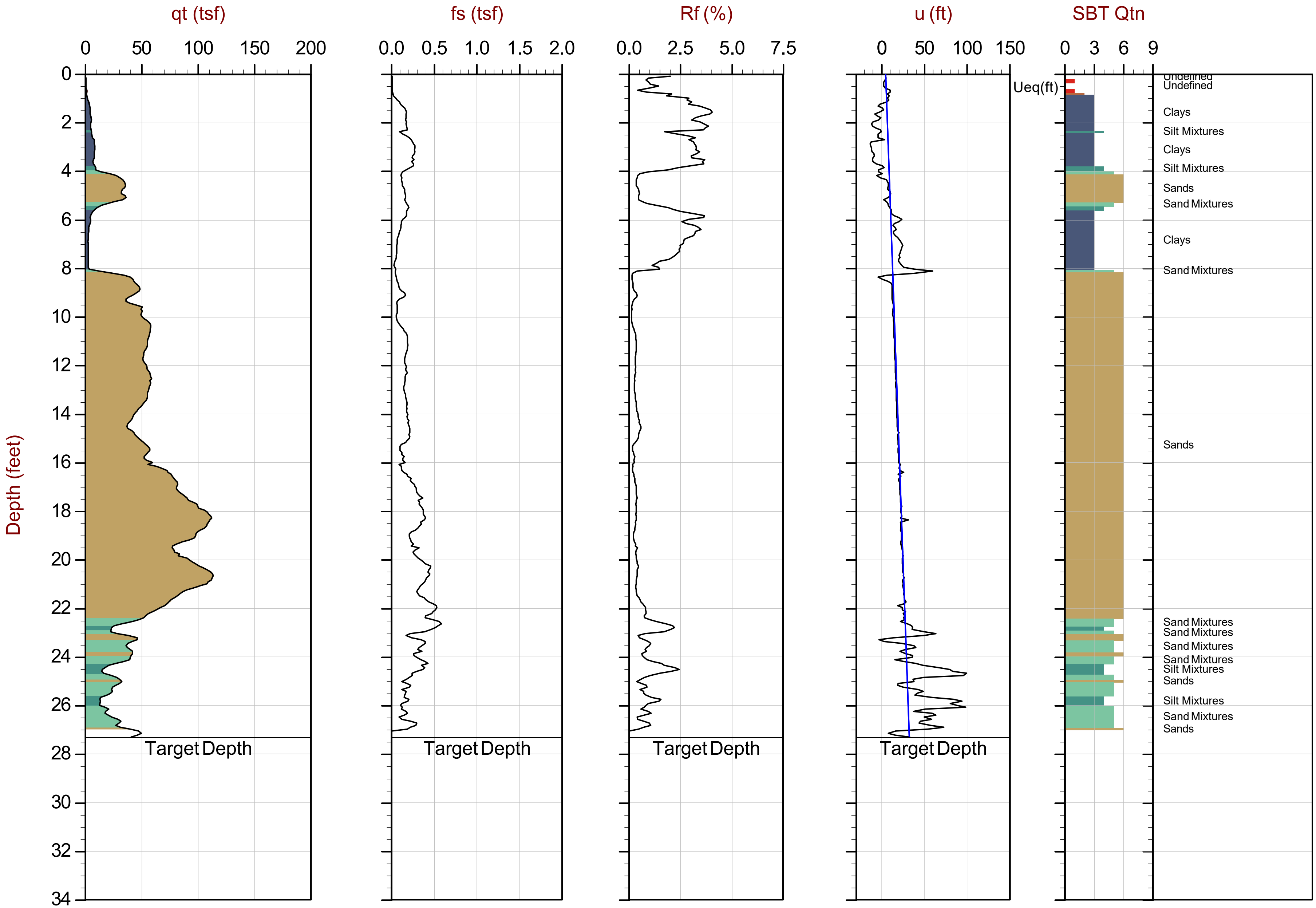
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-13 17:56 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT31-GC-B

Cone: 681:T375F10U35



Max Depth: 8.325 m / 27.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP31B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

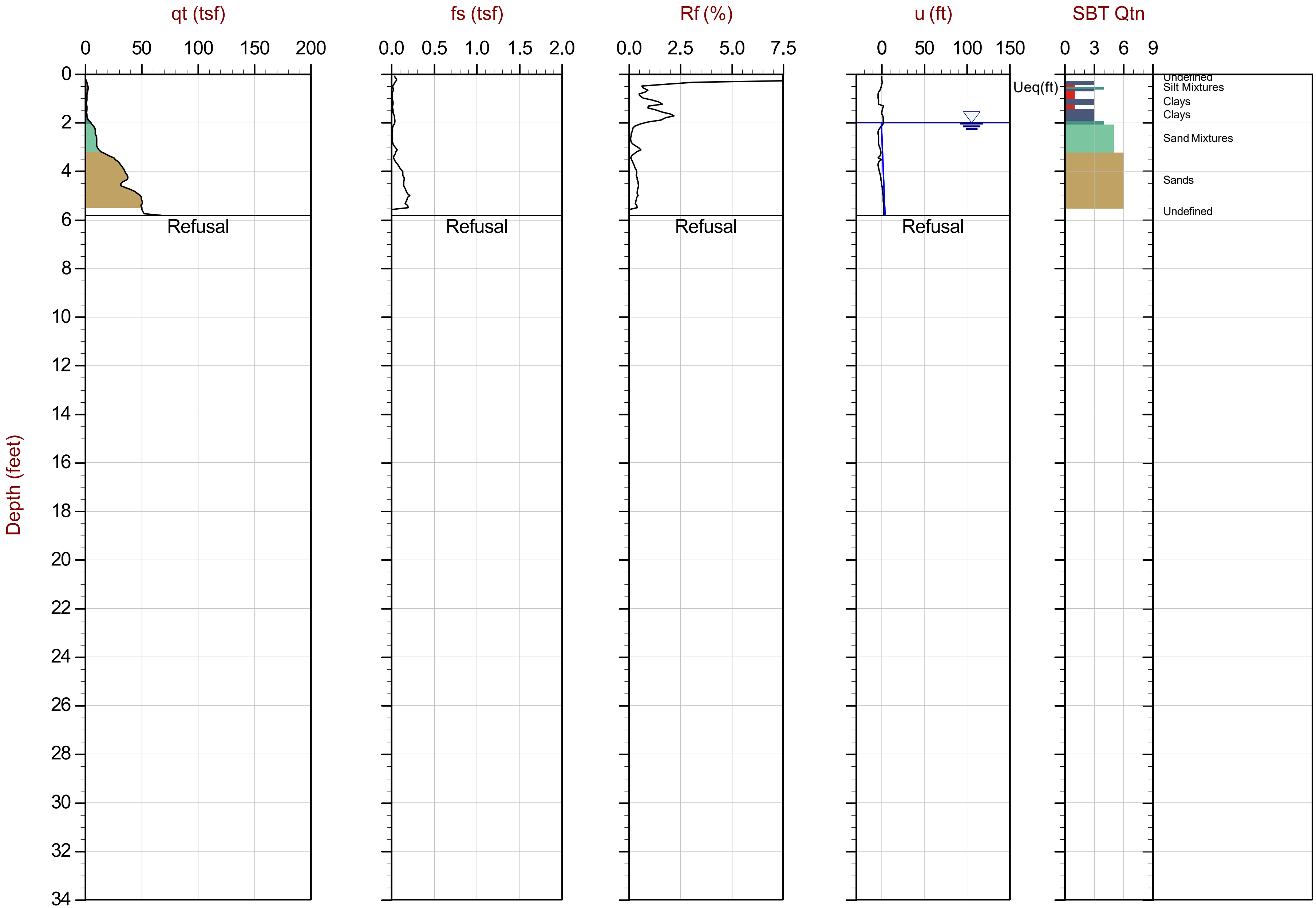
Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No: 21-59-22445 Date: 2021-07-09 11:18 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT32-GC
Cone: 681:T375F10U35

Anchor QEA



Max Depth: 1.775 m / 5.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP32.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52028 Long: -122.30553

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

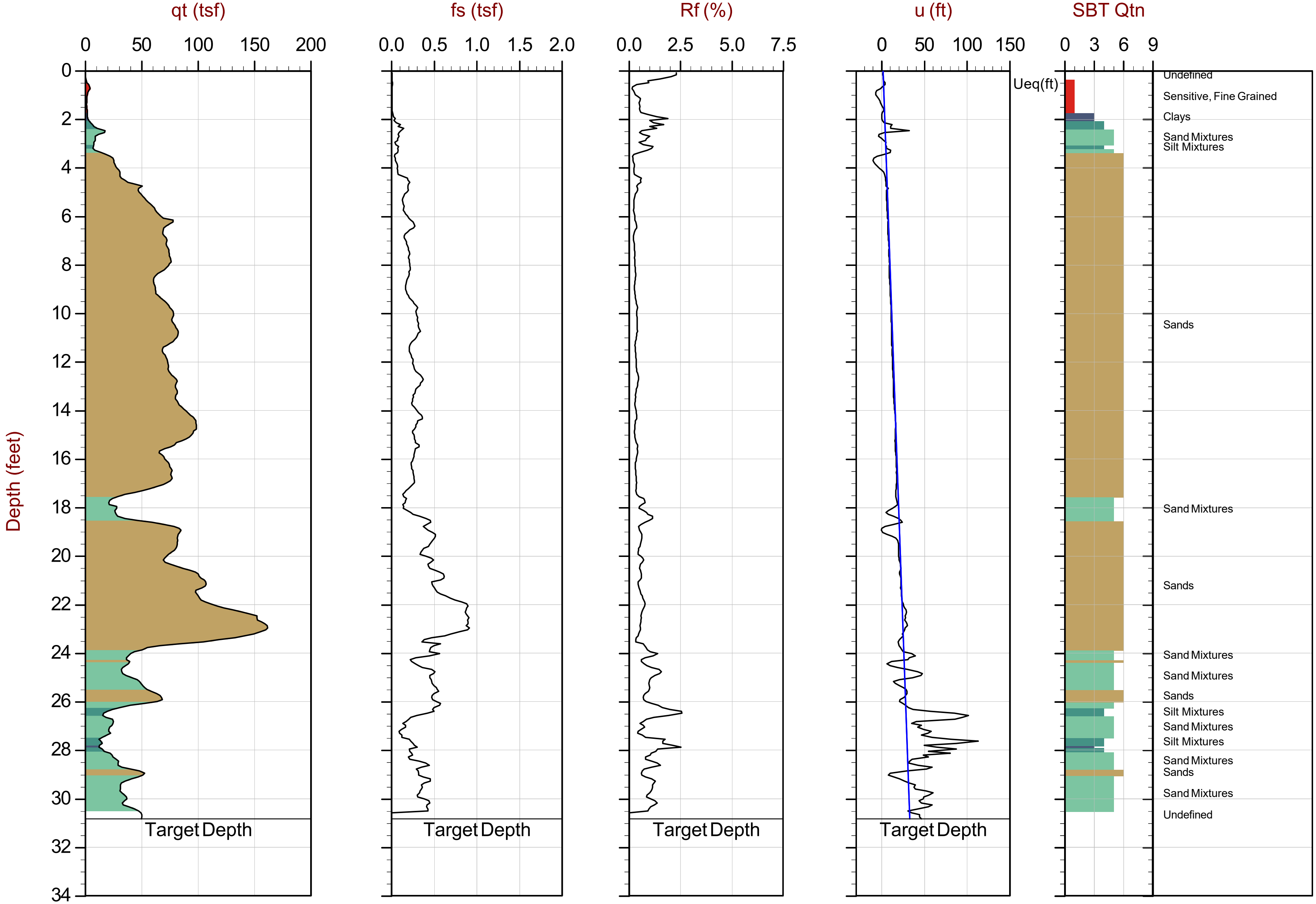
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 13:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT32-GC-B
Cone: 681:T375F10U35



Max Depth: 9.400 m / 30.84 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP32B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52030 Long: -122.30555

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

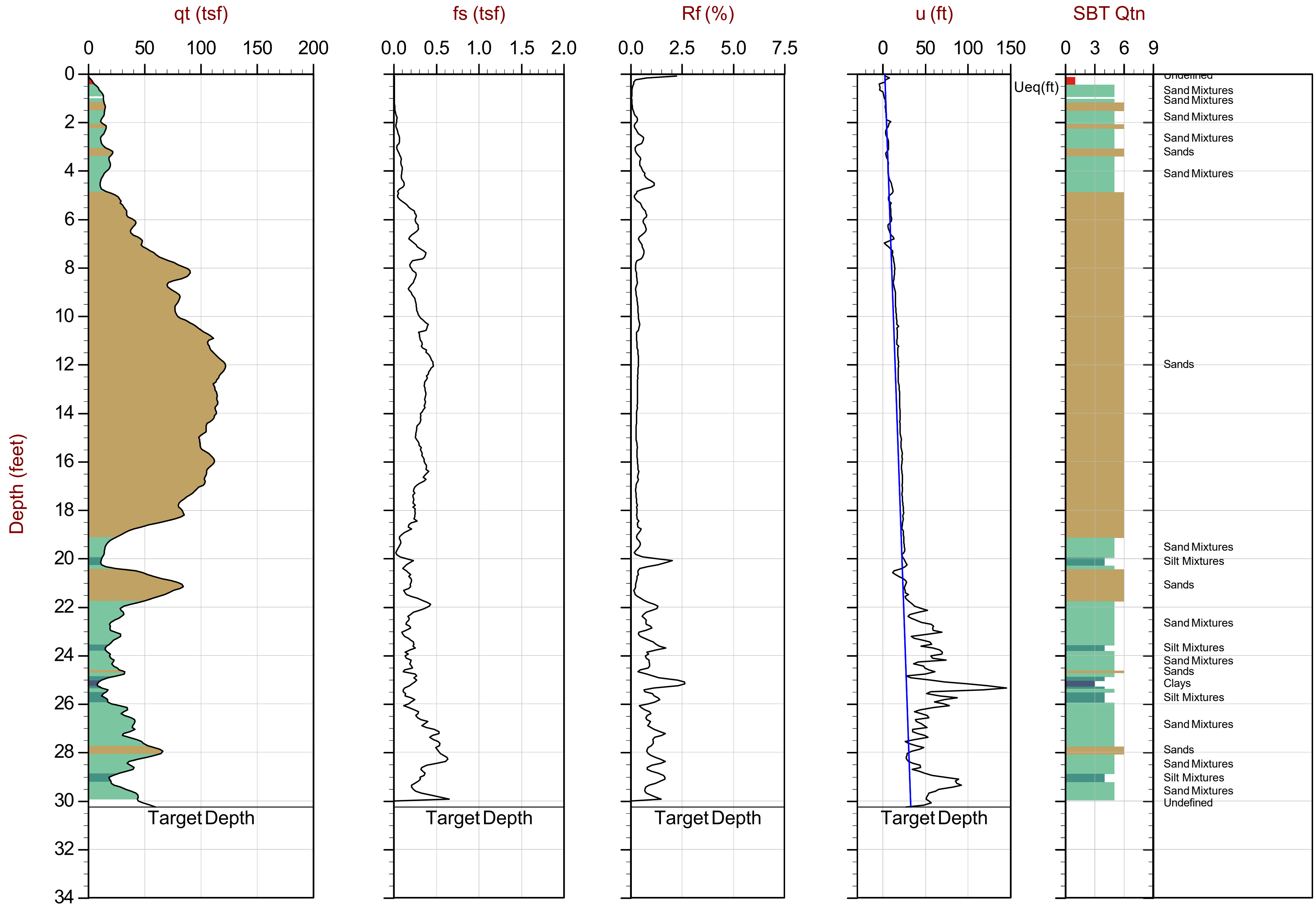
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 14:17 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT34-GC
Cone: 681:T375F10U35



Max Depth: 9.225 m / 30.27 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP34.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51986 Long: -122.30540

Equilibrium Pore Pressure (Ueq) — Assumed Ueq — Dissipation, Ueq achieved — Dissipation, Ueq not achieved — Hydrostatic Line

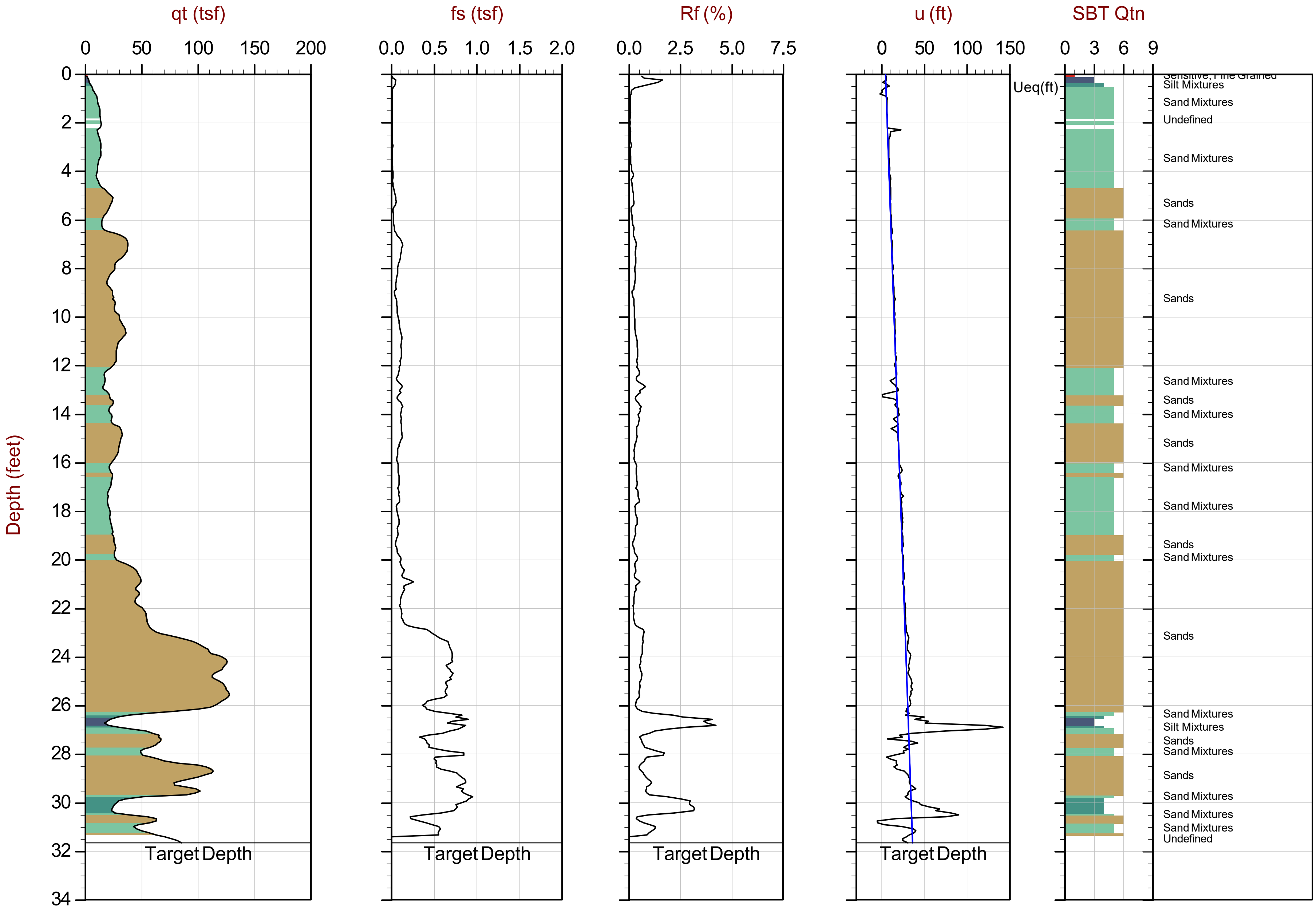
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-19 13:58 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT40-GC
Cone: 681:T375F10U35



Max Depth: 9.650 m / 31.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP40.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51155 Long: -122.30247

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

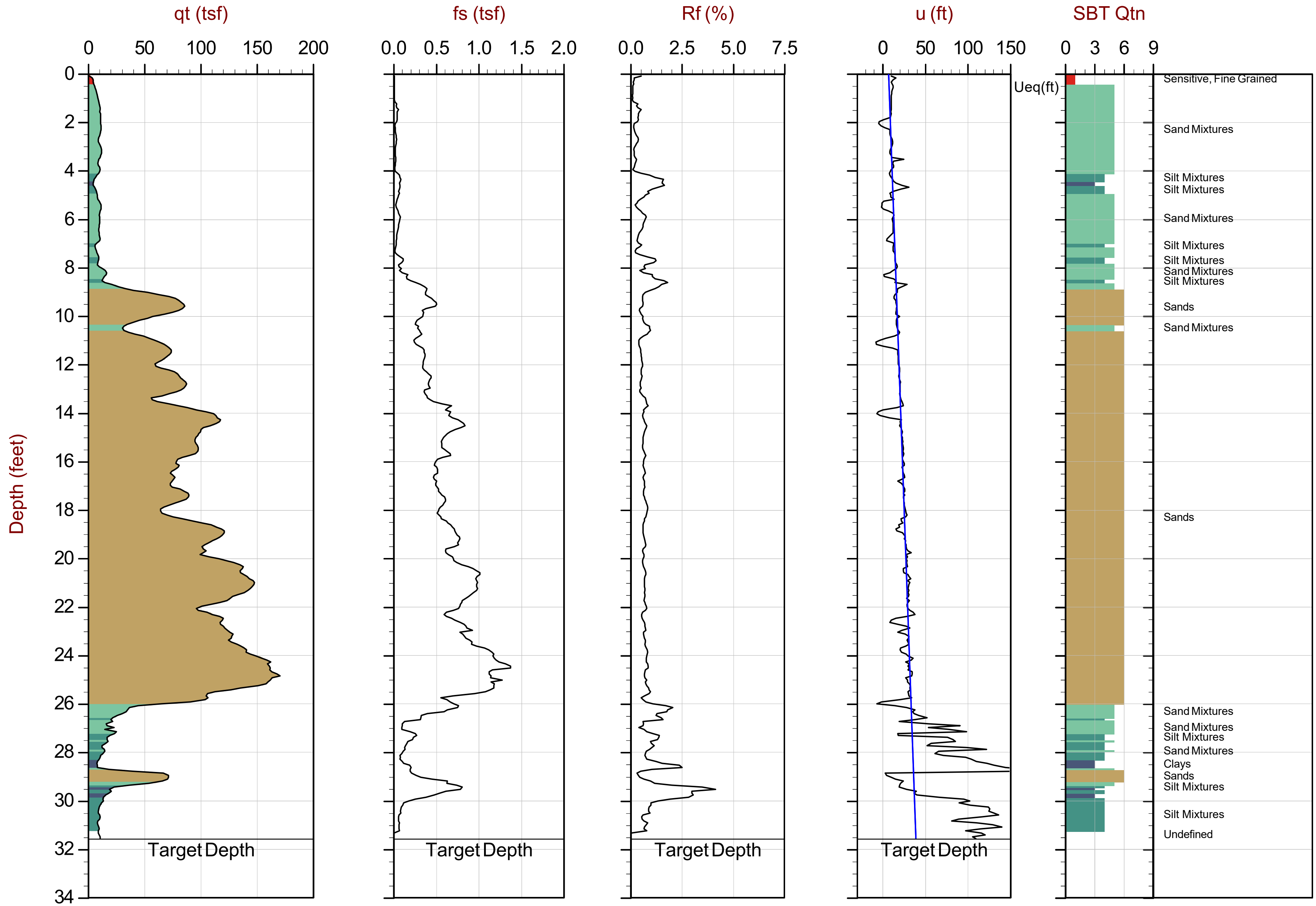
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-28 18:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT45-GC
Cone: 681:T375F10U35



Max Depth: 9.625 m / 31.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP45.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51253 Long: -122.29899

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

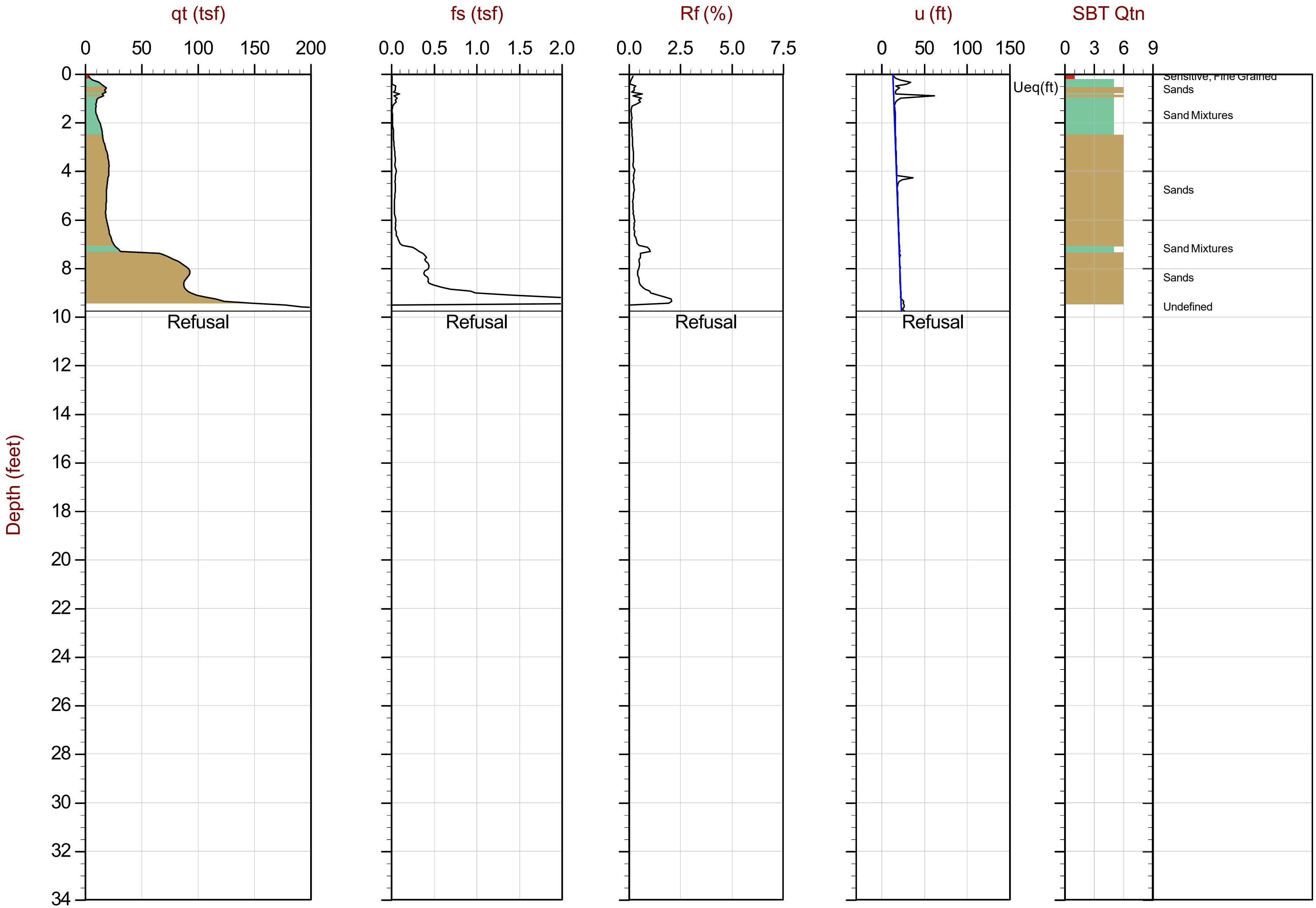
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 09:49 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT46-GC
Cone: 681:T375F10U35



Max Depth: 2.975 m / 9.76 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP46.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51233 Long: -122.29862

Equilibrium Pore Pressure (Ueq) — Assumed Ueq — Dissipation, Ueq achieved — Dissipation, Ueq not achieved — Hydrostatic Line

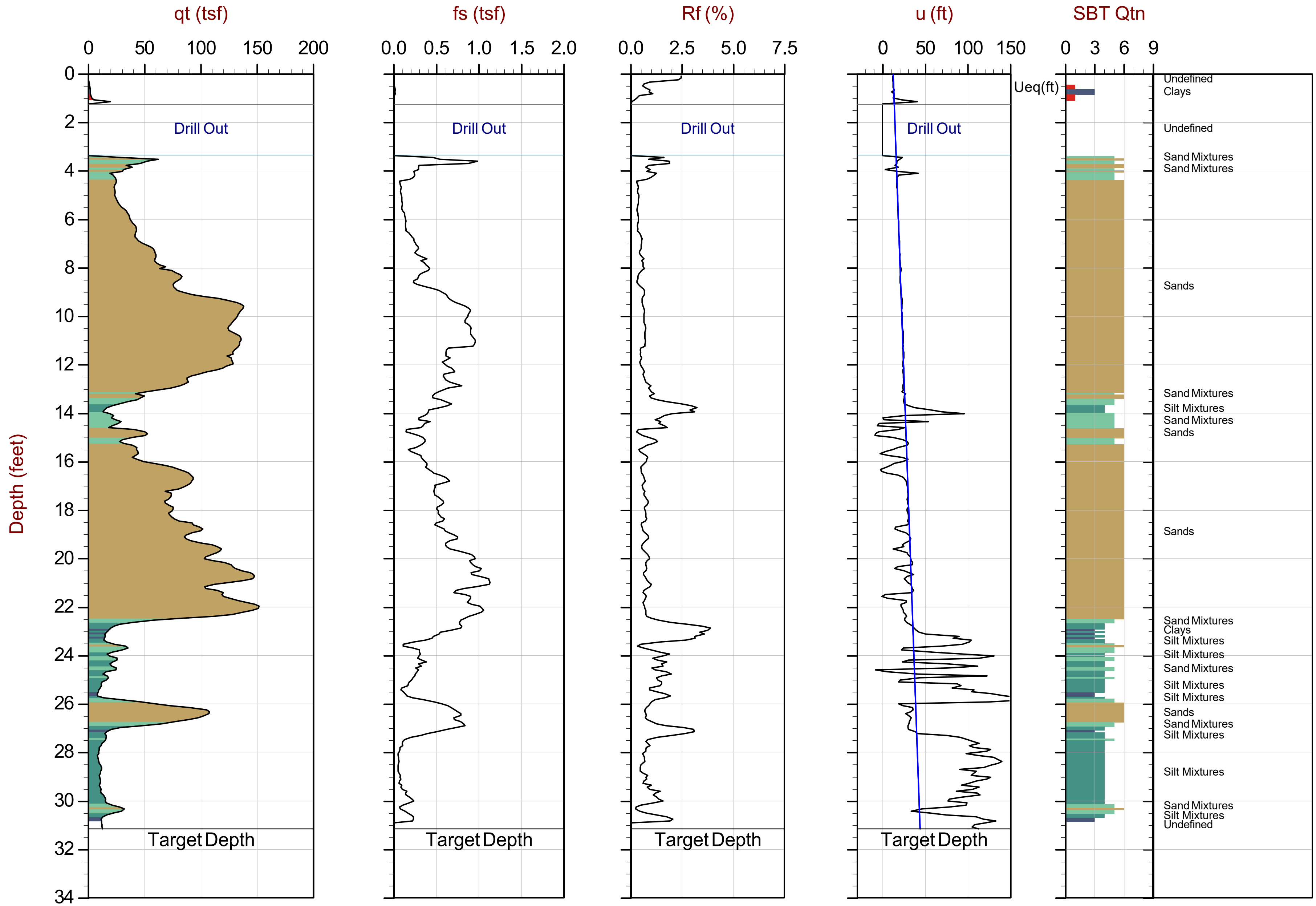
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 20:39 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT47-GC
Cone: 681:T375F10U35



Max Depth: 9.500 m / 31.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP47.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51242 Long: -122.29865

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

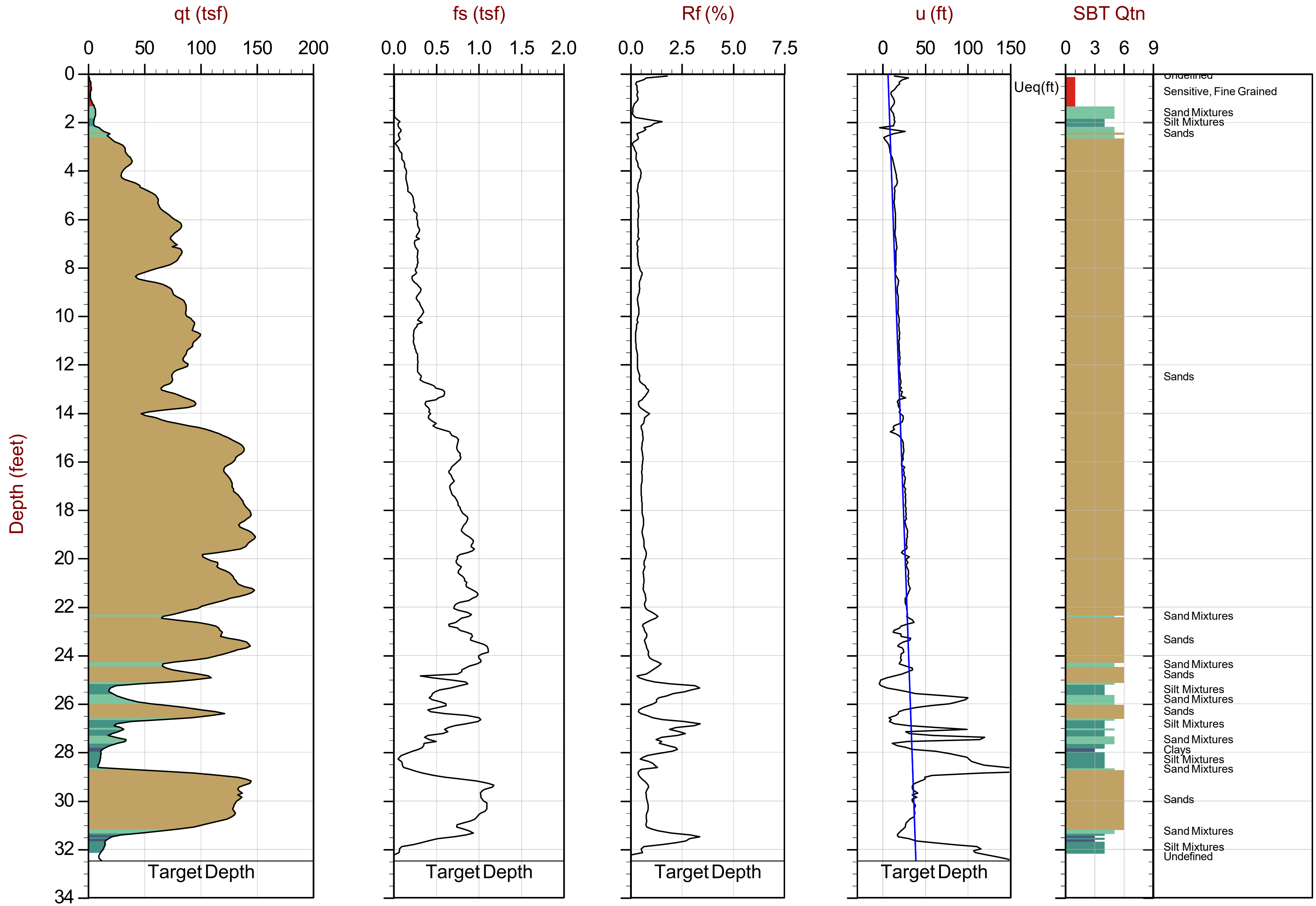
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-28 19:27 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT49-GC
Cone: 681:T375F10U35



Max Depth: 9.900 m / 32.48 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP49.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51235 Long: -122.29820

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

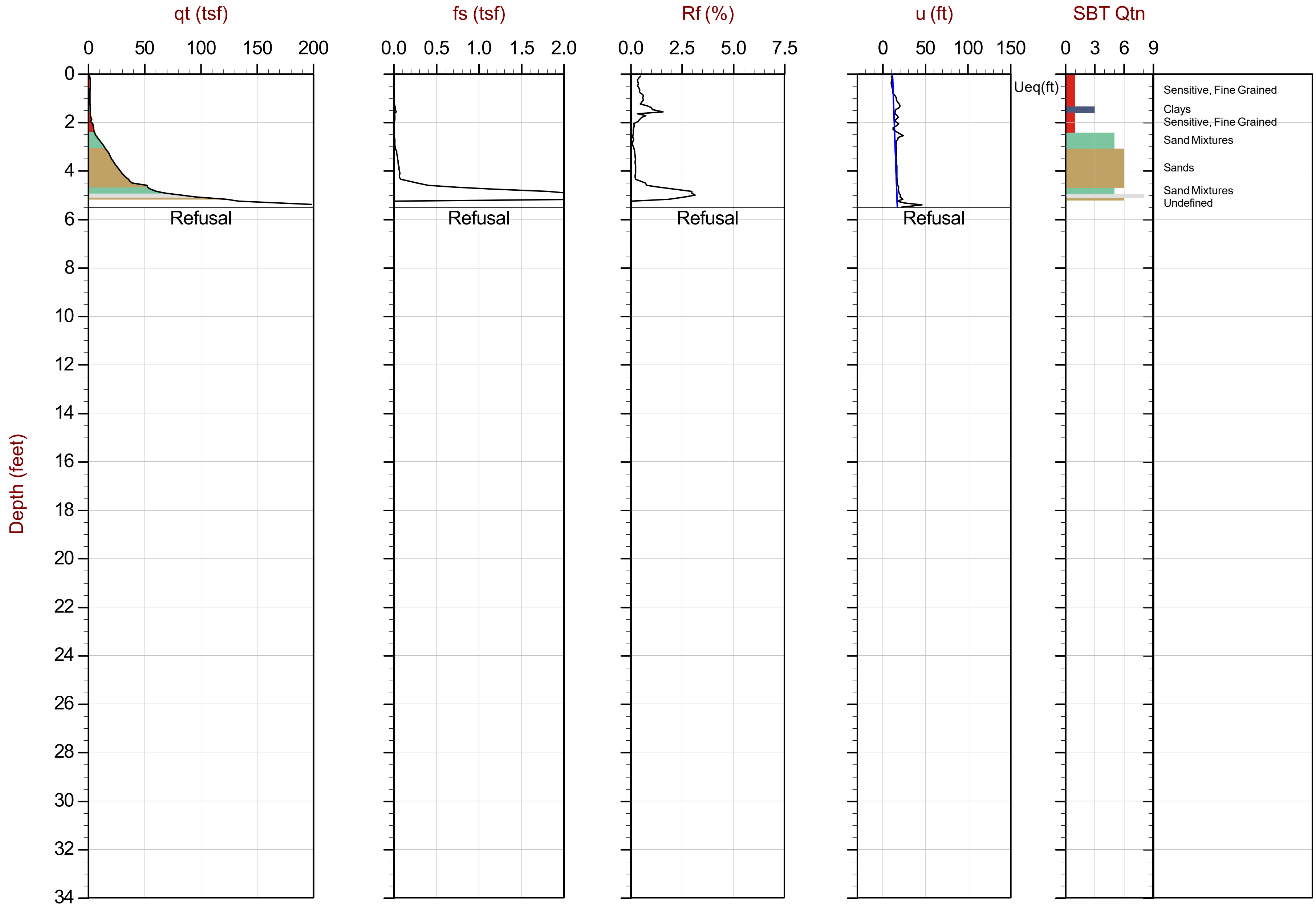
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-23 15:21 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT50-GC
Cone: 681:T375F10U35



Max Depth: 1.675 m / 5.50 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP50.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51207 Long: -122.29793

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

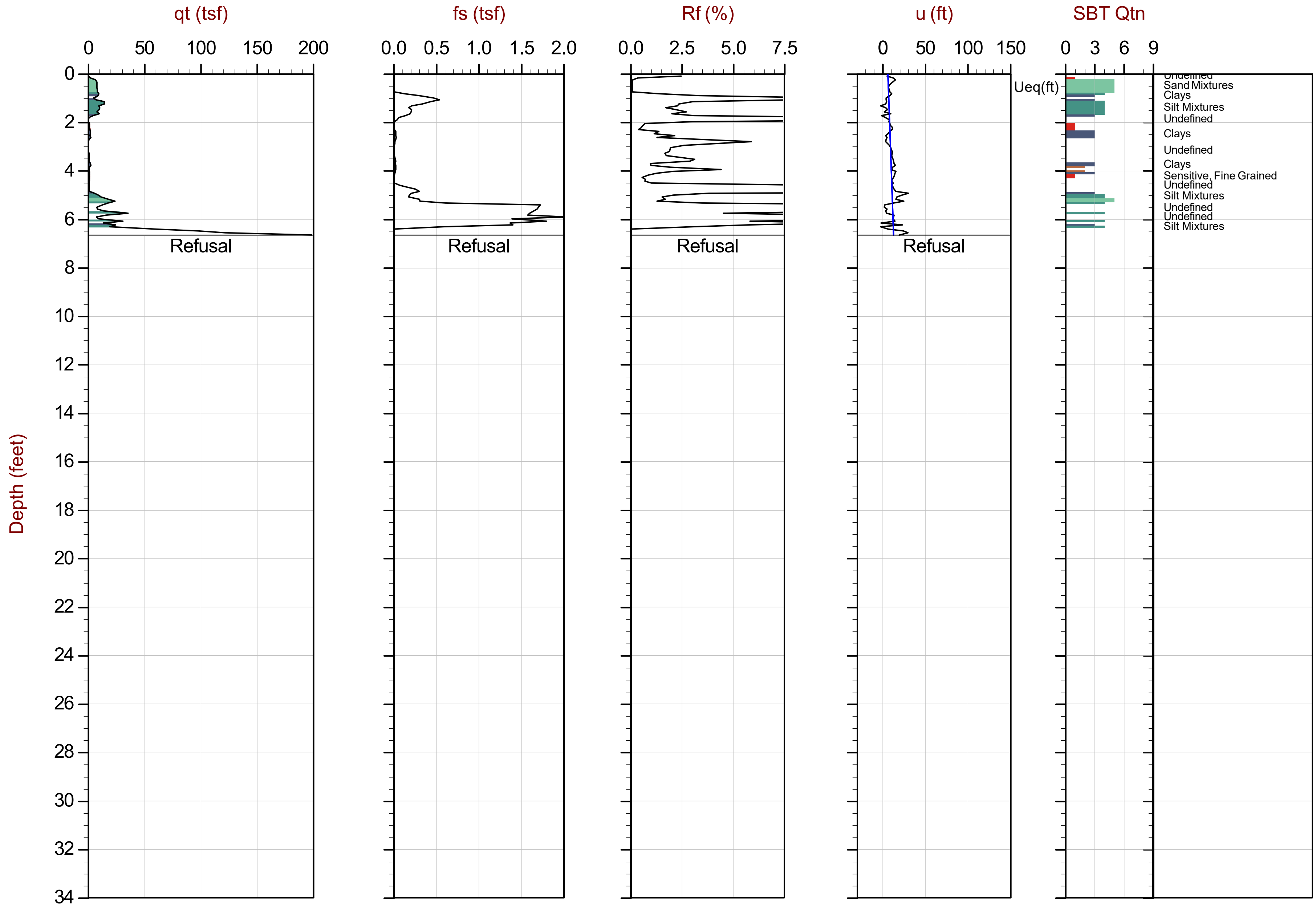
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 19:23 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT51-GC
Cone: 681:T375F10U35



Max Depth: 2.025 m / 6.64 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP51.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51218 Long: -122.29794

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

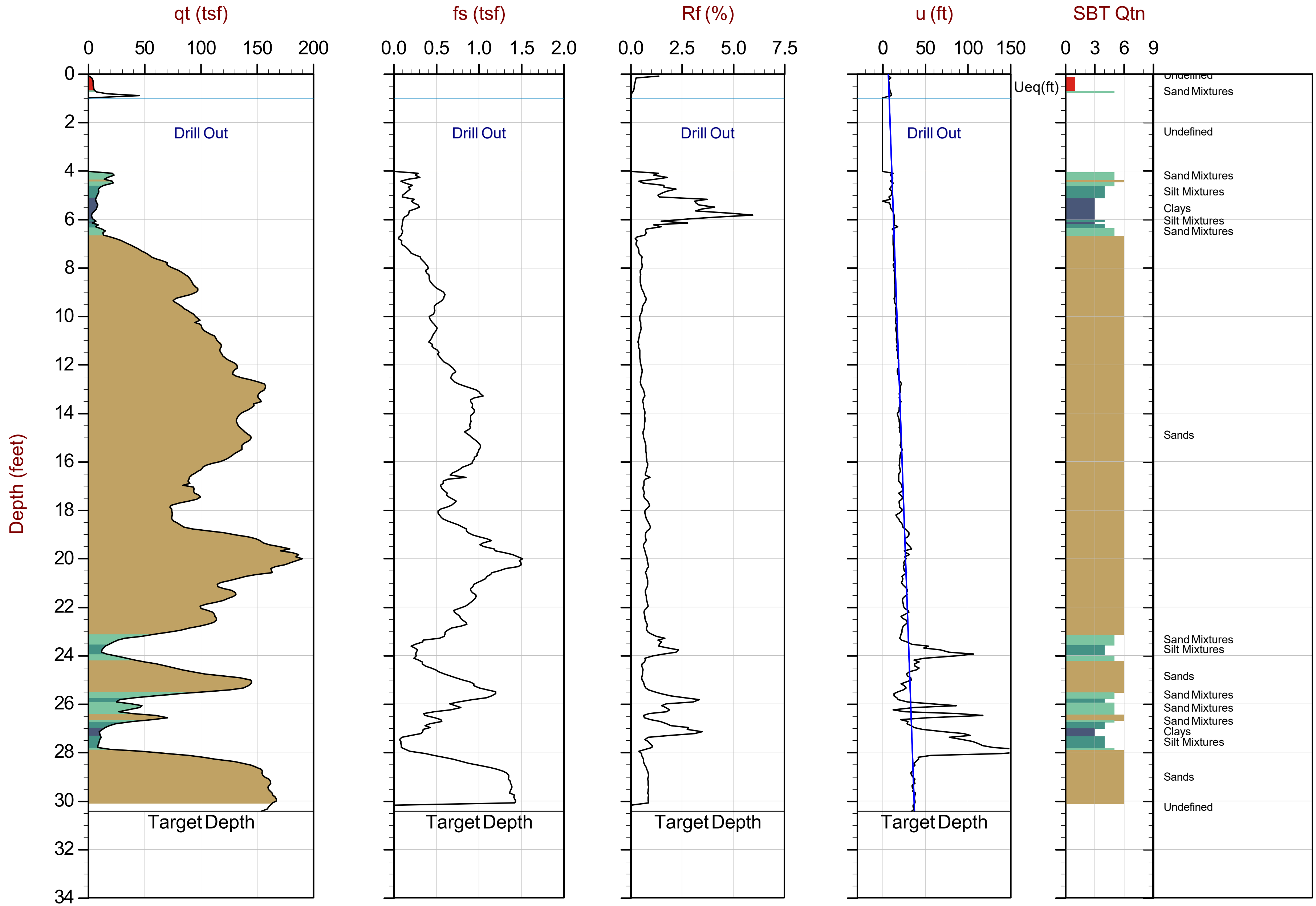
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 19:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT52-GC
Cone: 681:T375F10U35



Max Depth: 9.275 m / 30.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP52.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51211 Long: -122.29774

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

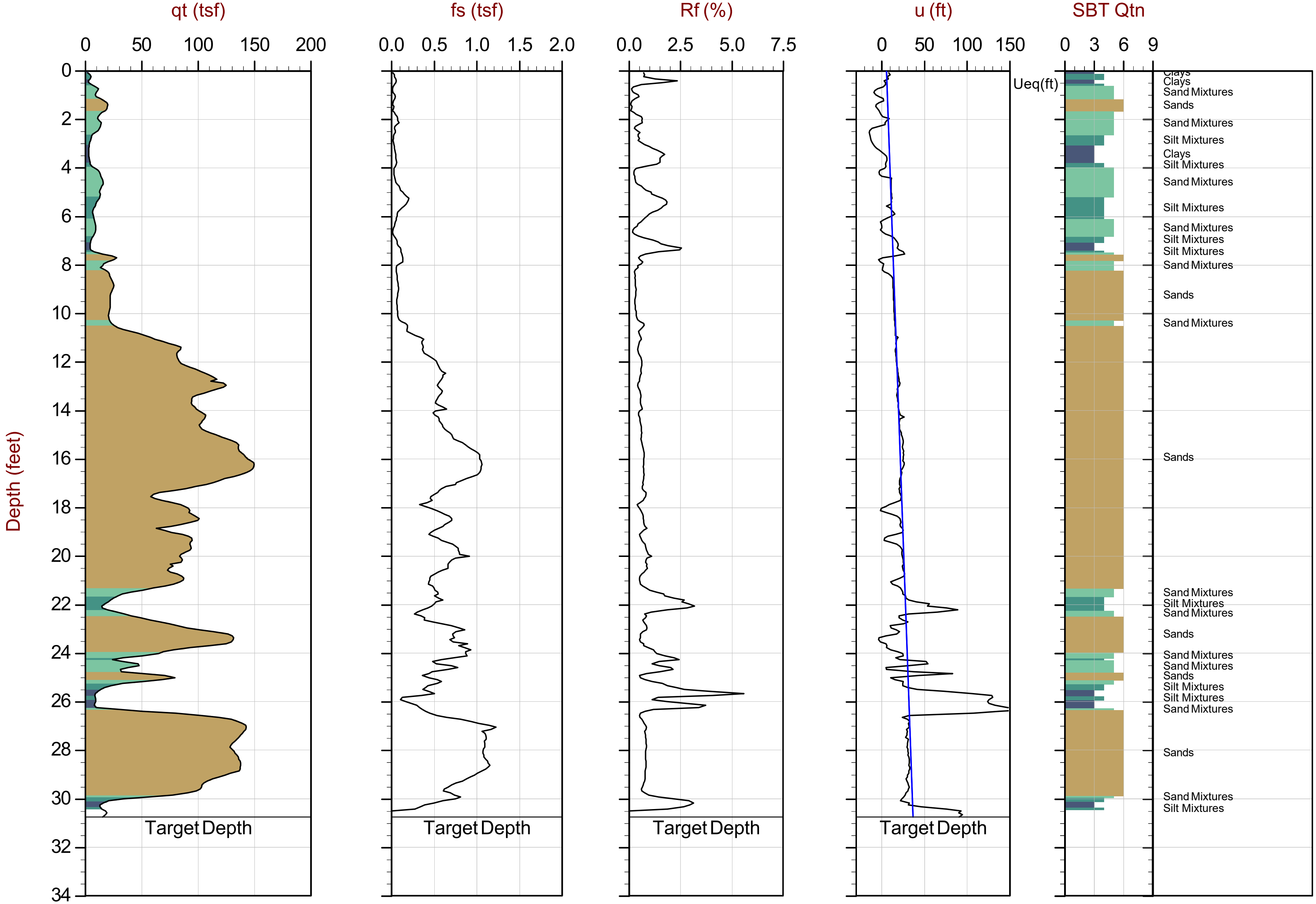
ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 18:31 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT54-GC

Cone: 681:T375F10U35



Max Depth: 9.375 m / 30.76 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP54.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51197 Long: -122.29758

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Advanced Cone Penetration Test Plots with Ic, Su, Phi and N(60)/N1(60)

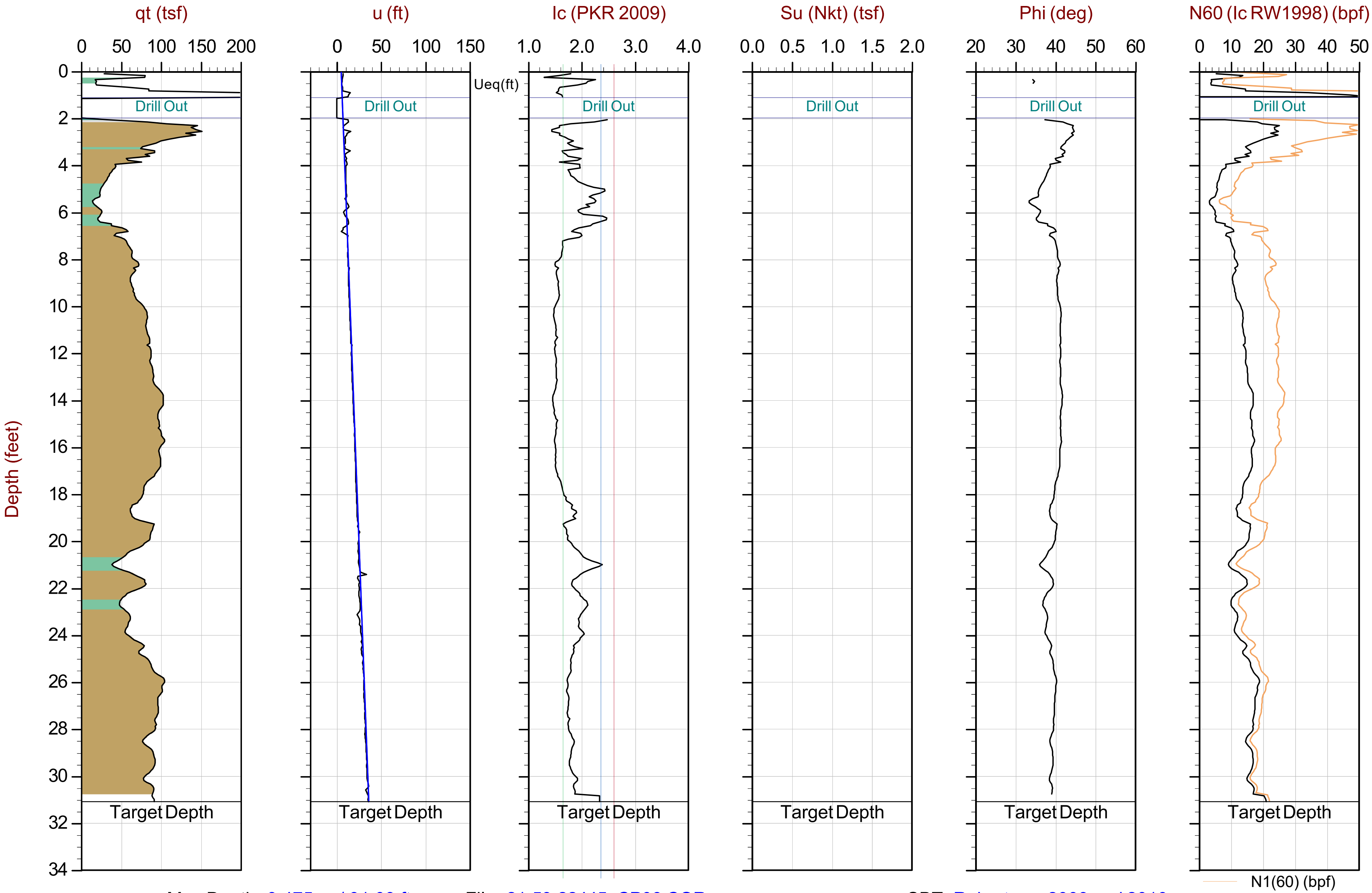
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-22 17:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT06-GC

Cone: 681:T375F10U35



Max Depth: 9.475 m / 31.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP06.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52892 Long: -122.31483

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

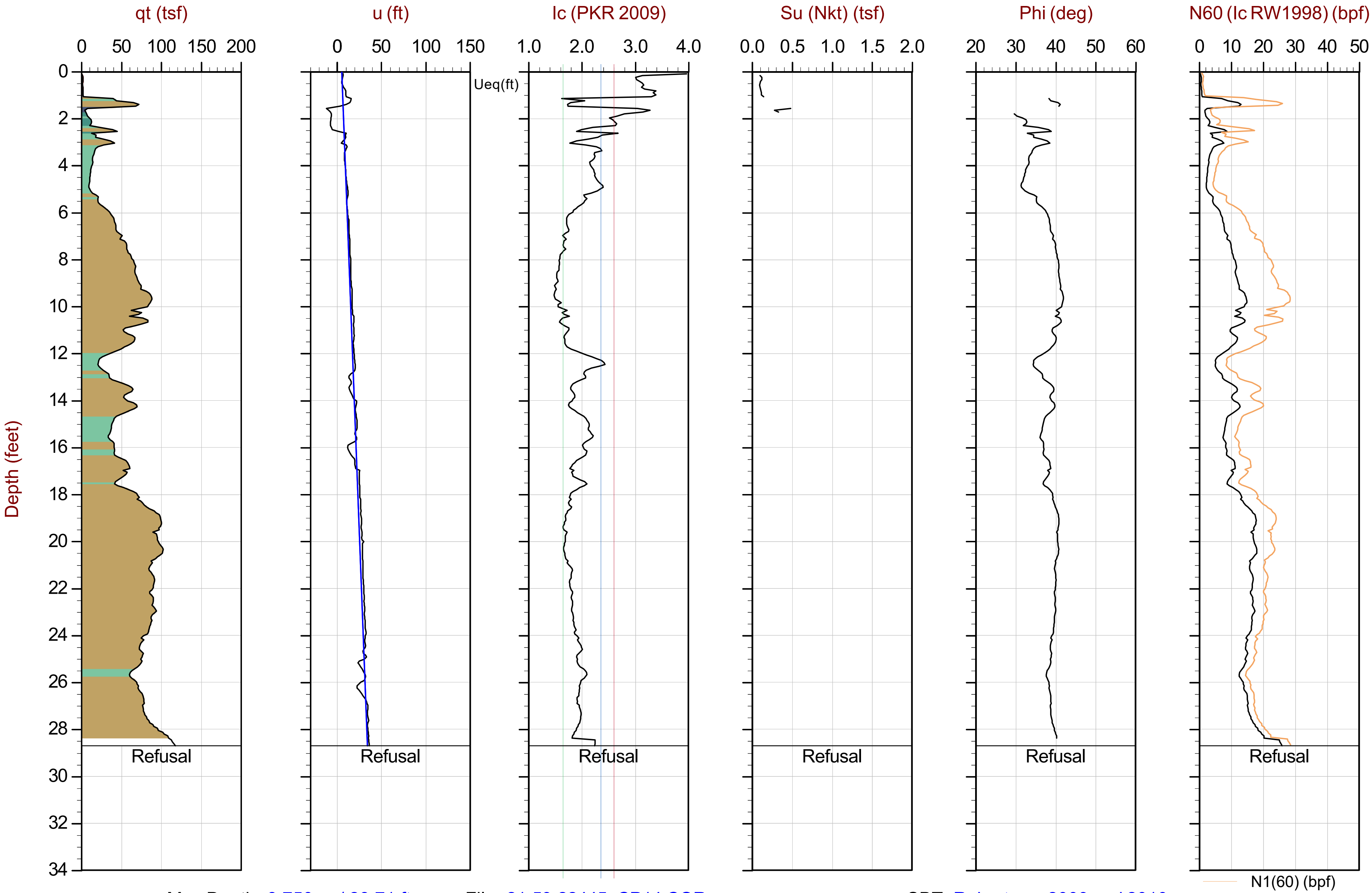
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 14:11 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT14-GC
Cone: 681:T375F10U35



Max Depth: 8.750 m / 28.71 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP14.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52477 Long: -122.30819

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

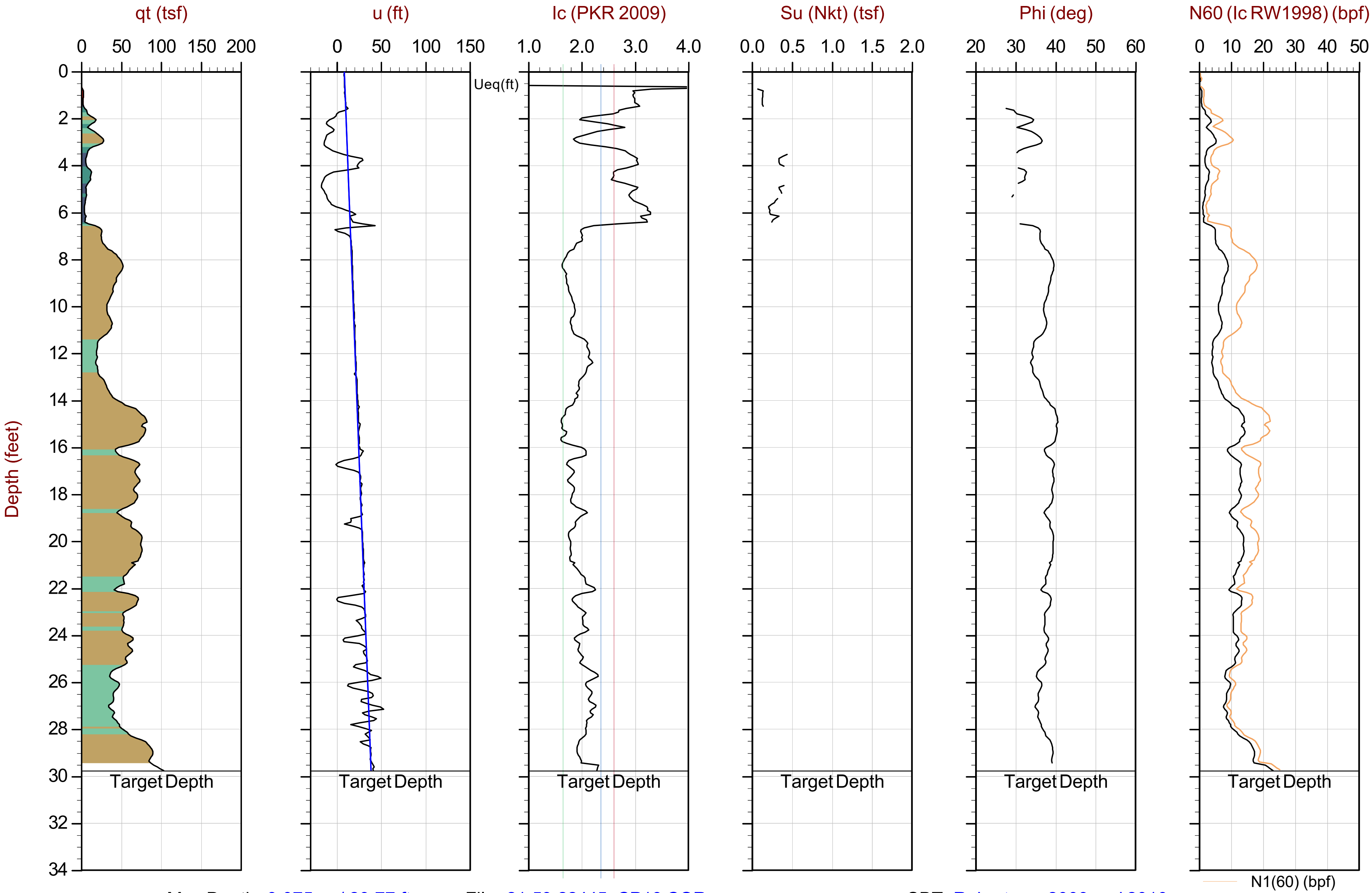
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 16:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT16-GC

Cone: 681:T375F10U35



Max Depth: 9.075 m / 29.77 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP16.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52409 Long: -122.30770

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

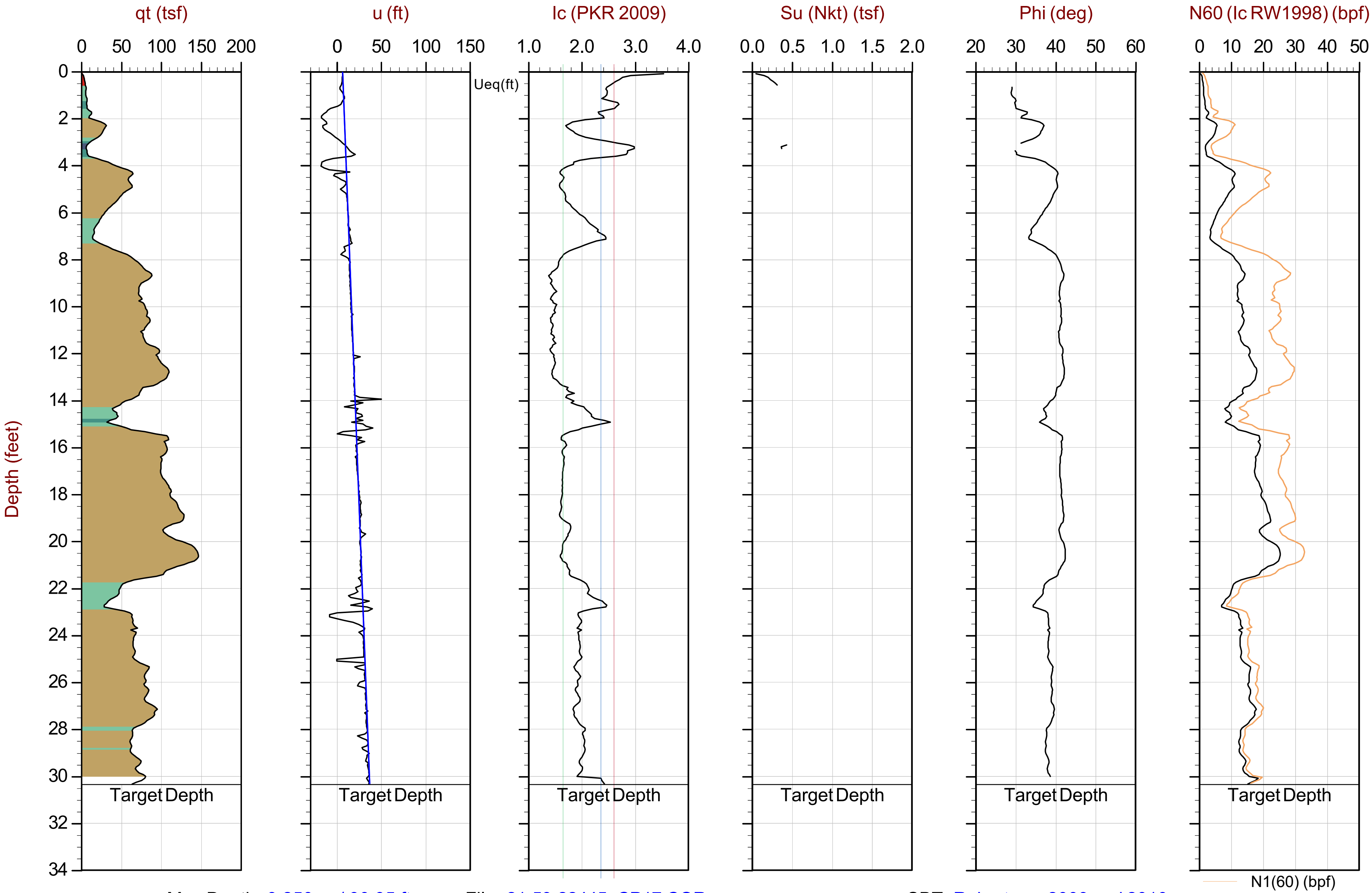
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-12 19:15 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT17-GC
Cone: 681:T375F10U35



Max Depth: 9.250 m / 30.35 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP17.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

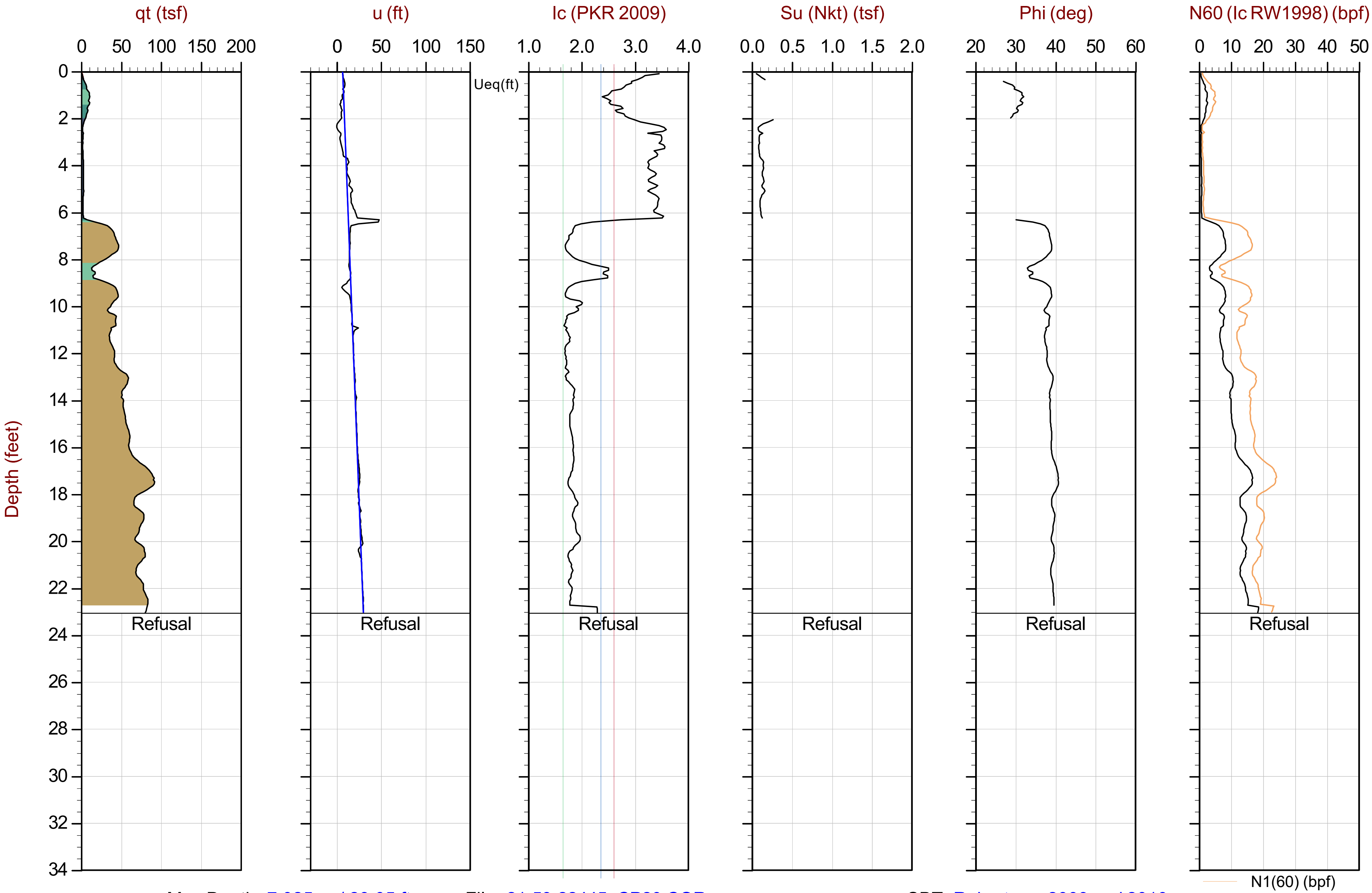
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 09:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT20-GC
Cone: 681:T375F10U35



Max Depth: 7.025 m / 23.05 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP20.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

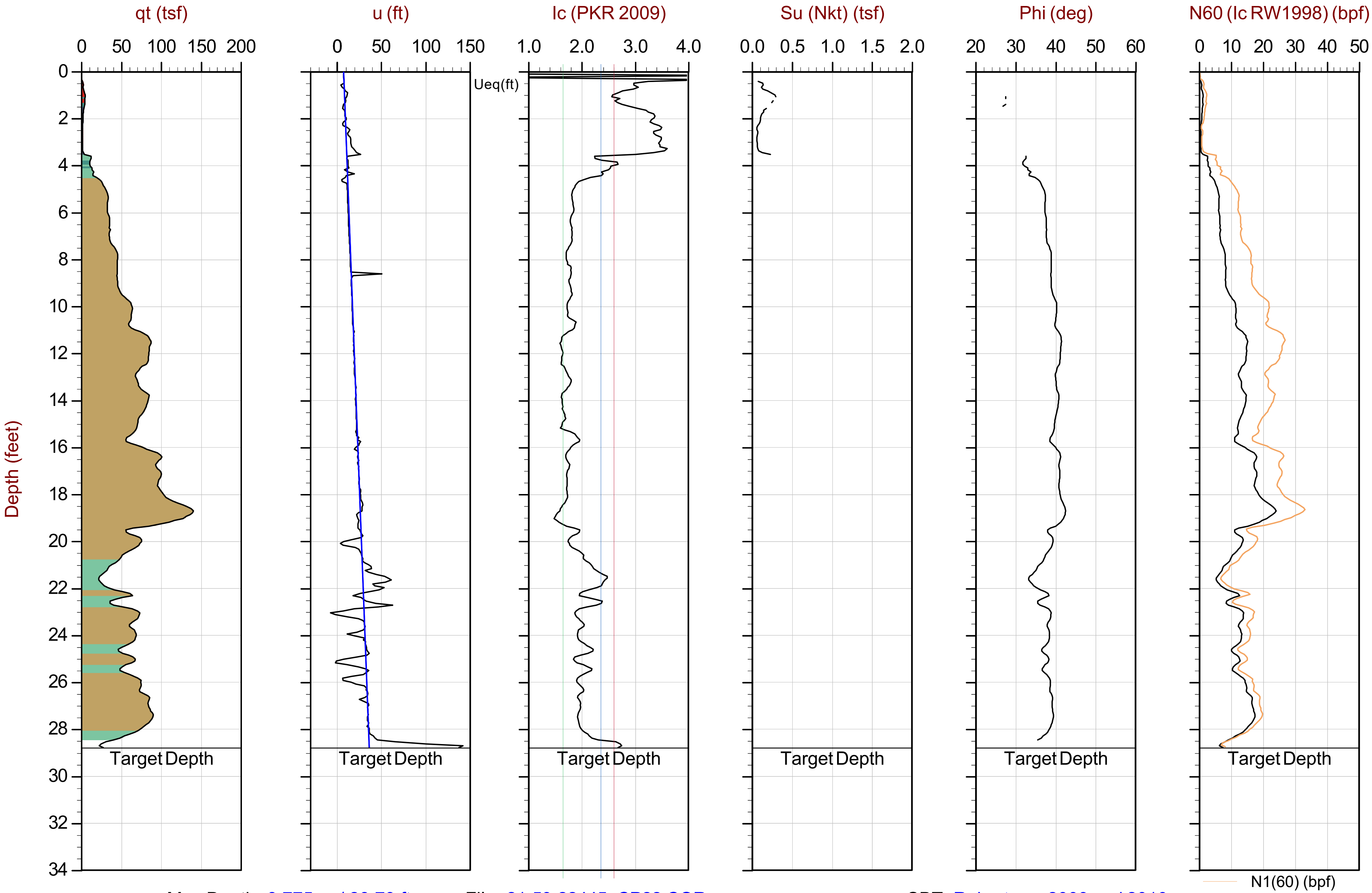
ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-13 19:06 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT22-GC

Cone: 681:T375F10U35



Max Depth: 8.775 m / 28.79 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP22.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

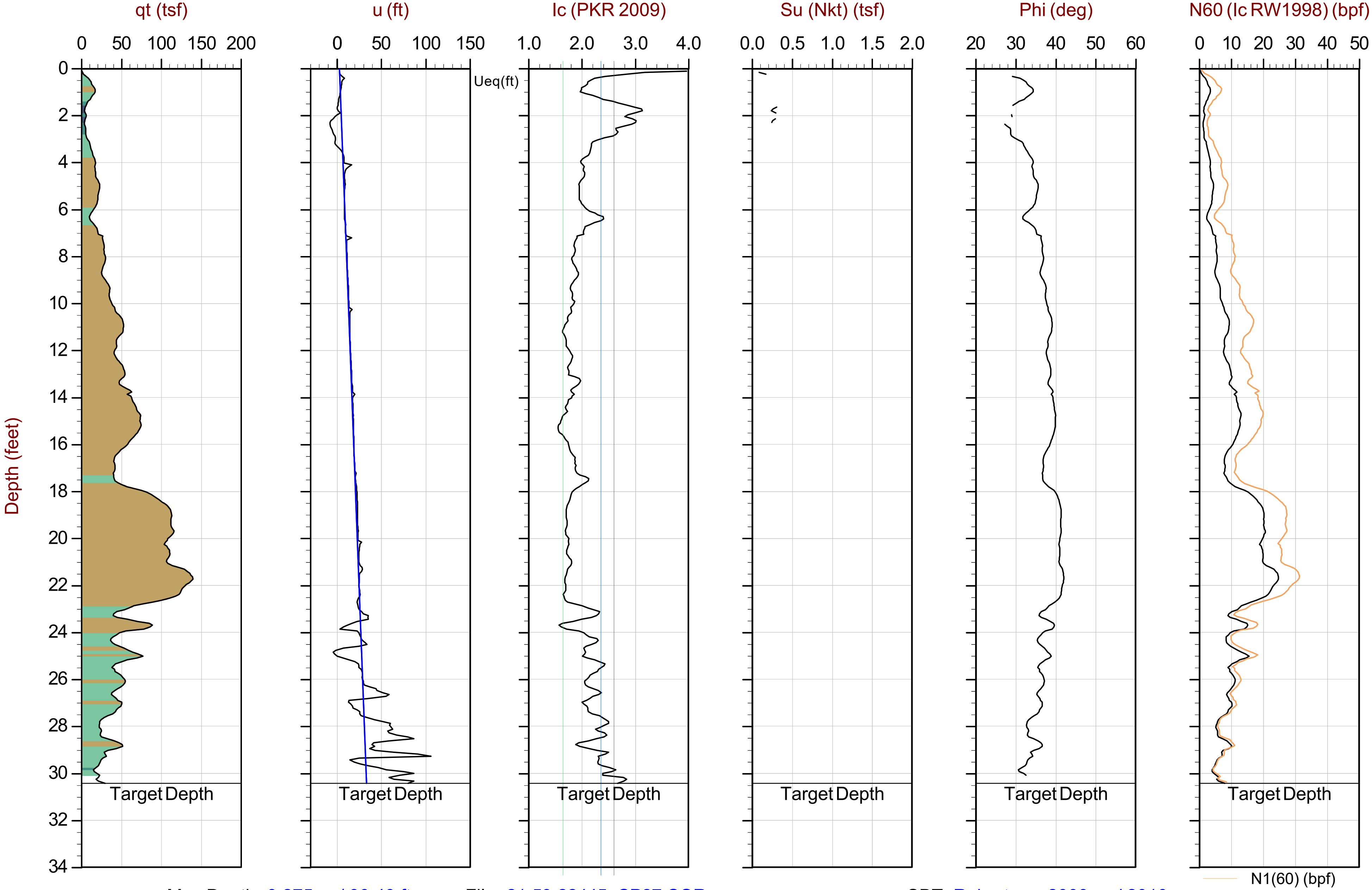
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 08:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT27-GC

Cone: 681:T375F10U35



Max Depth: 9.275 m / 30.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP27.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

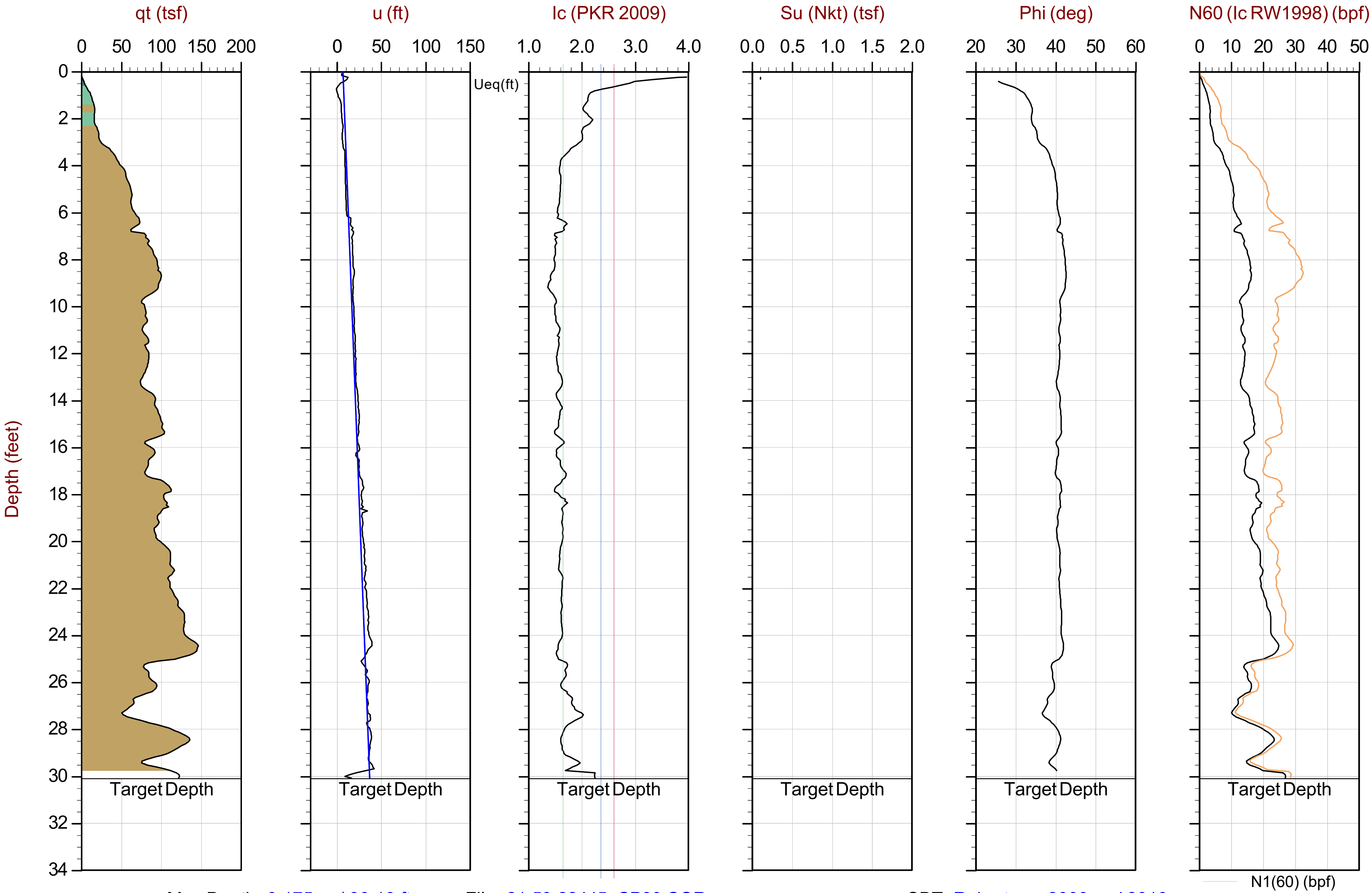
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 15:09 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT30-GC
Cone: 681:T375F10U35



Max Depth: 9.175 m / 30.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP30.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52066 Long: -122.30558

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

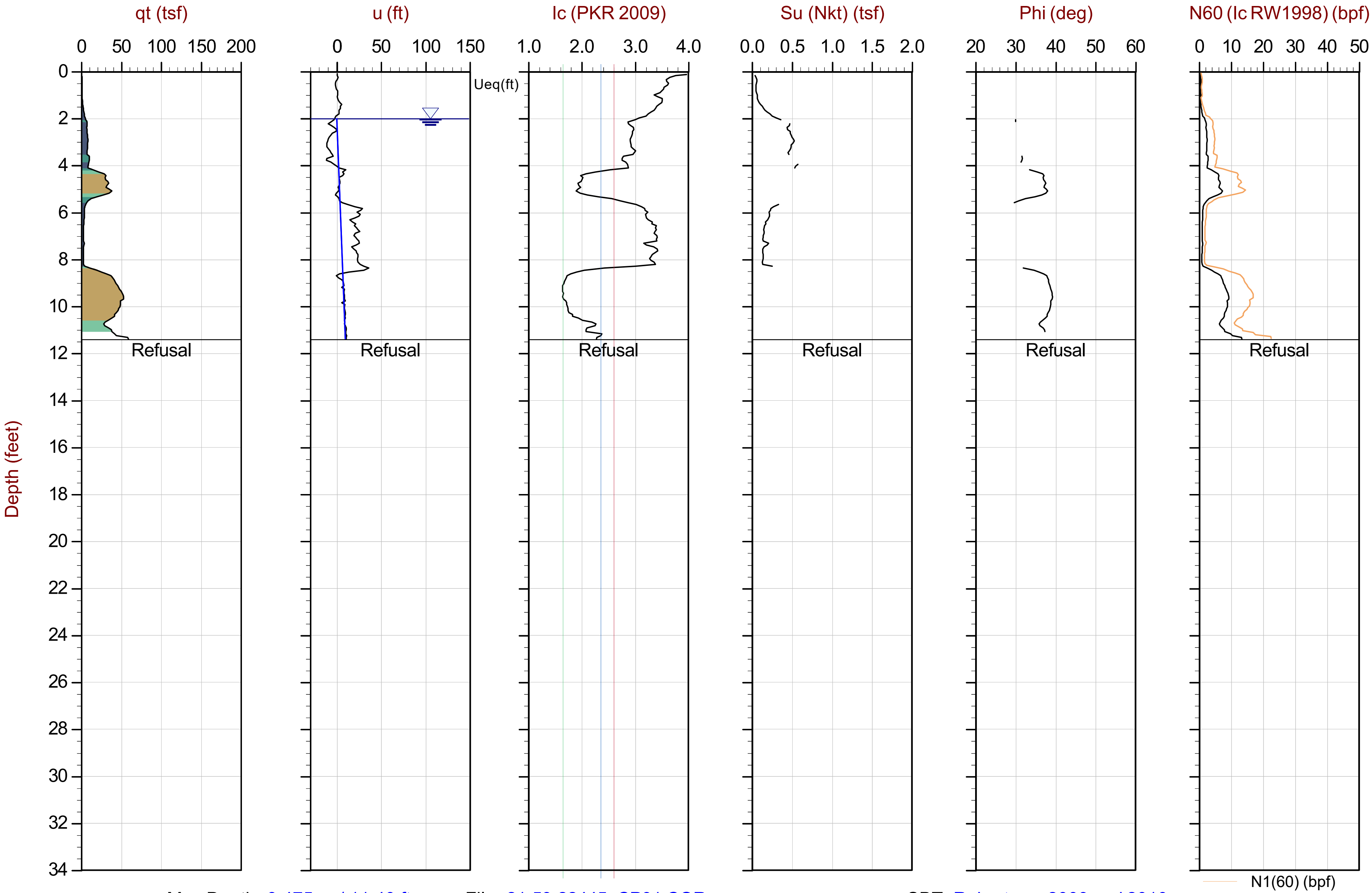
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-09 10:35 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT31-GC
Cone: 681:T375F10U35



Max Depth: 3.475 m / 11.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP31.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

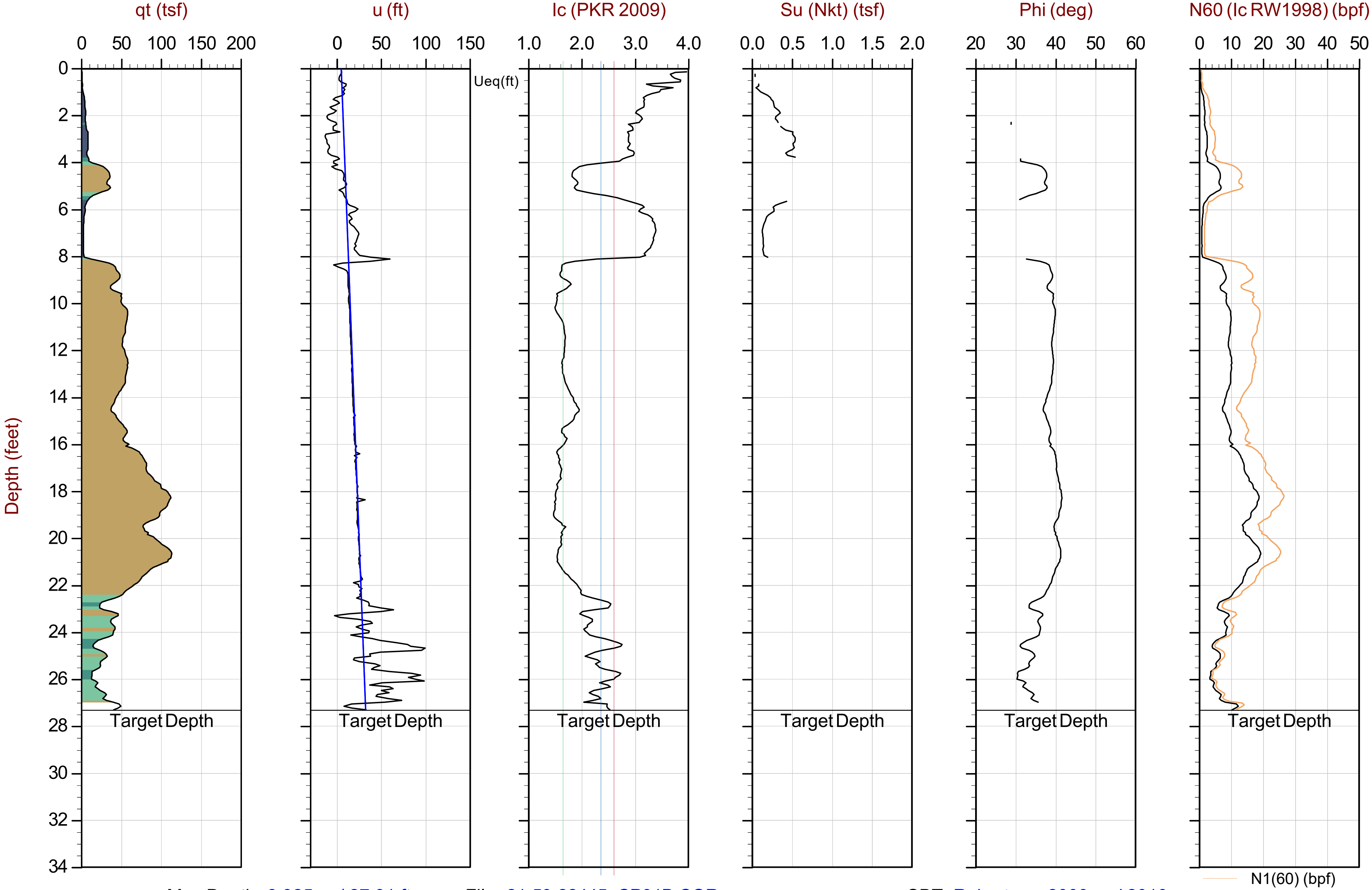
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-13 17:56 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT31-GC-B
Cone: 681:T375F10U35



Max Depth: 8.325 m / 27.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP31B.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

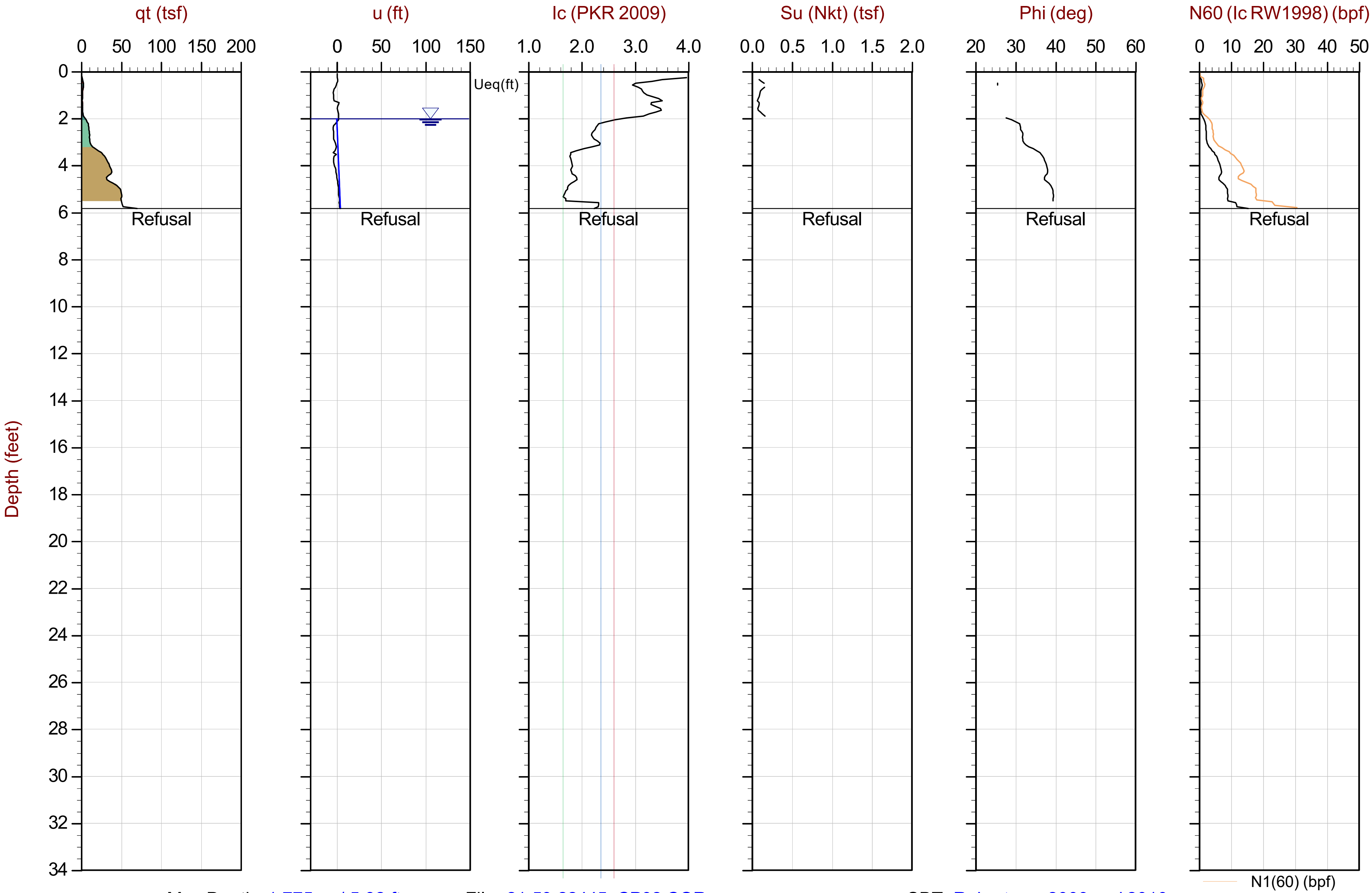
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-09 11:18 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT32-GC
Cone: 681:T375F10U35



Max Depth: 1.775 m / 5.82 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP32.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52028 Long: -122.30553

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

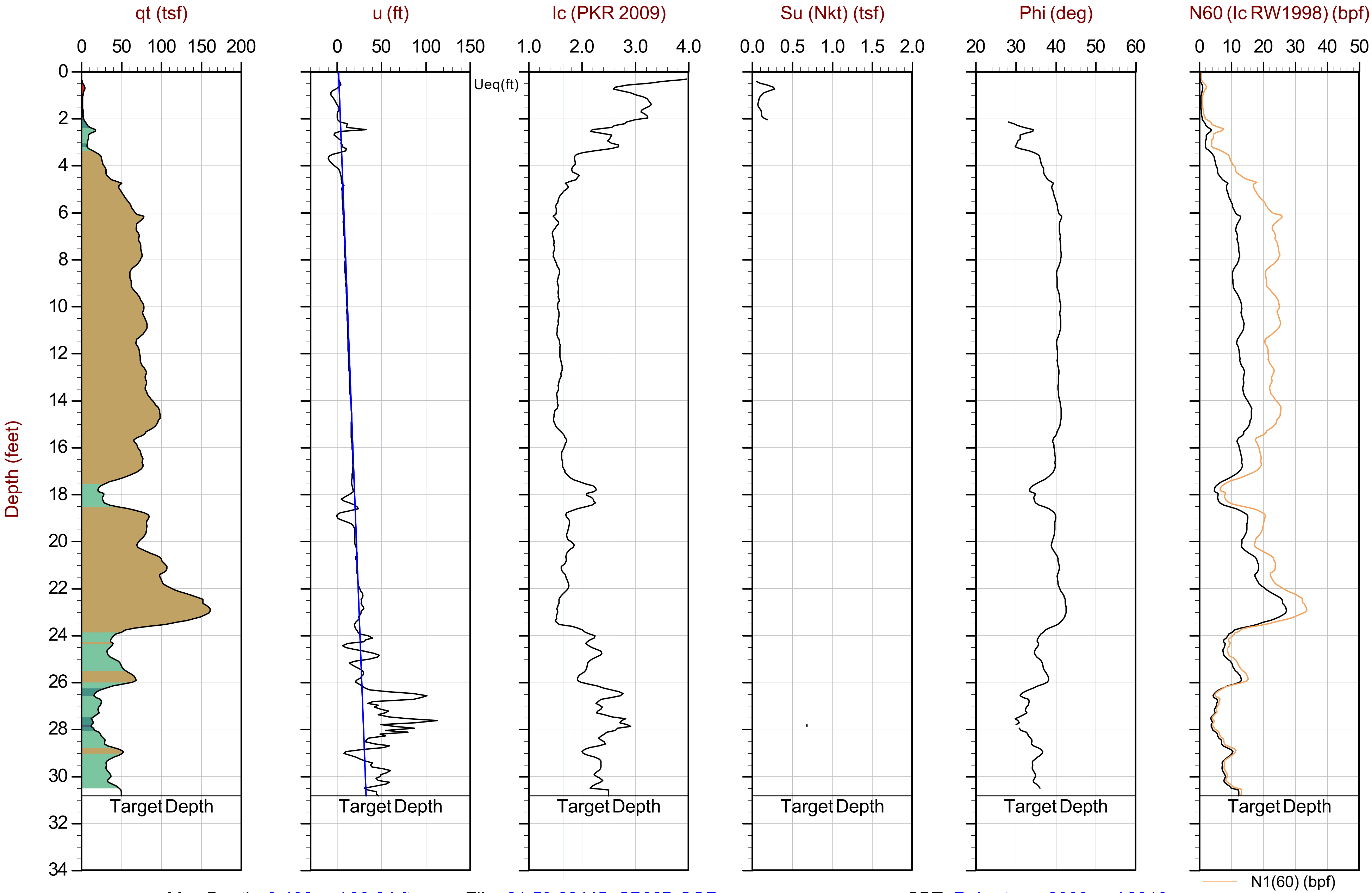
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 13:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT32-GC-B
Cone: 681:T375F10U35



Max Depth: 9.400 m / 30.84 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP32B.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.52030 Long: -122.30555

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

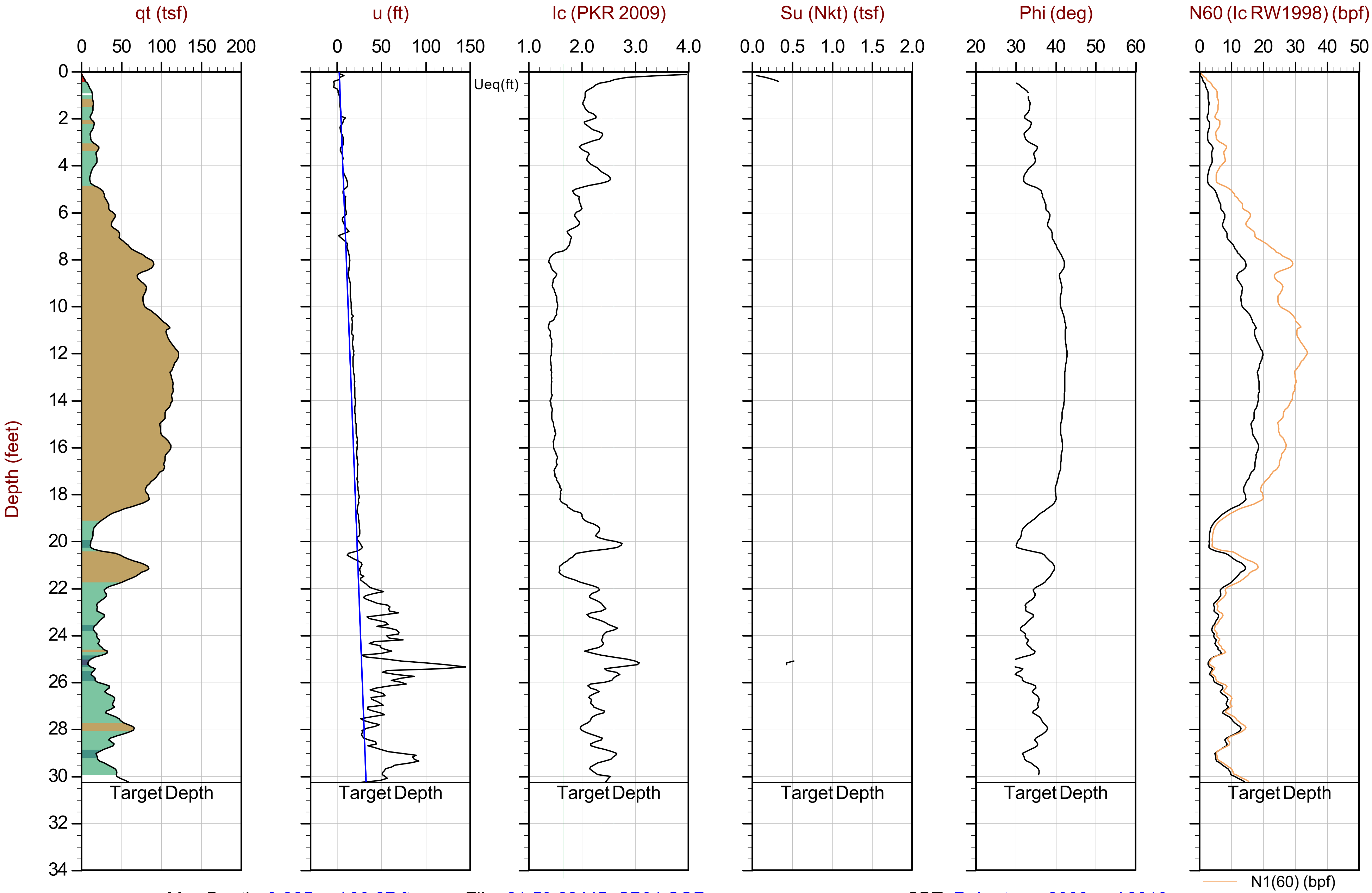
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 14:17 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT34-GC
Cone: 681:T375F10U35



Max Depth: 9.225 m / 30.27 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP34.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51986 Long: -122.30540

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

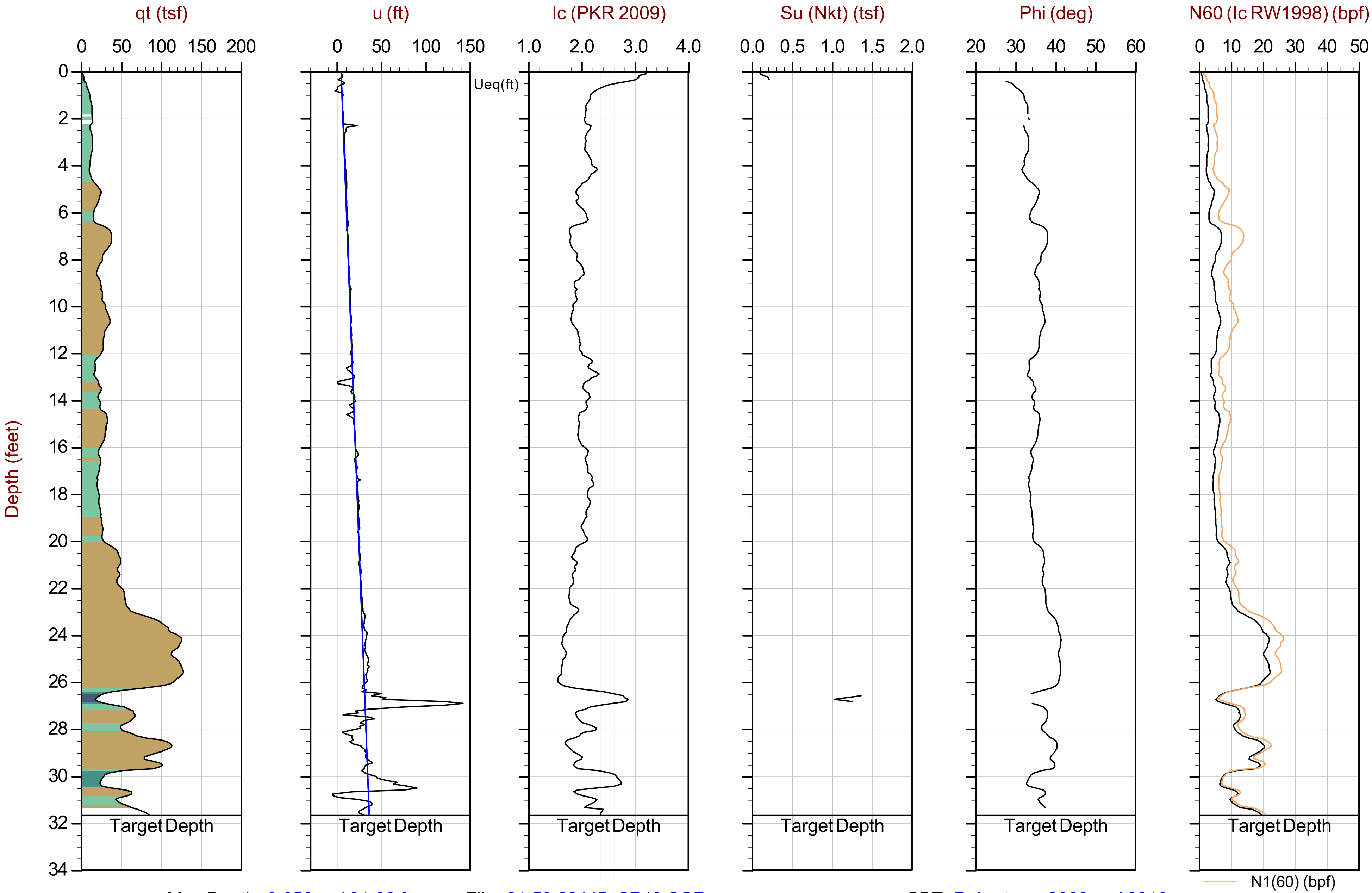
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-19 13:58 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT40-GC
Cone: 681:T375F10U35



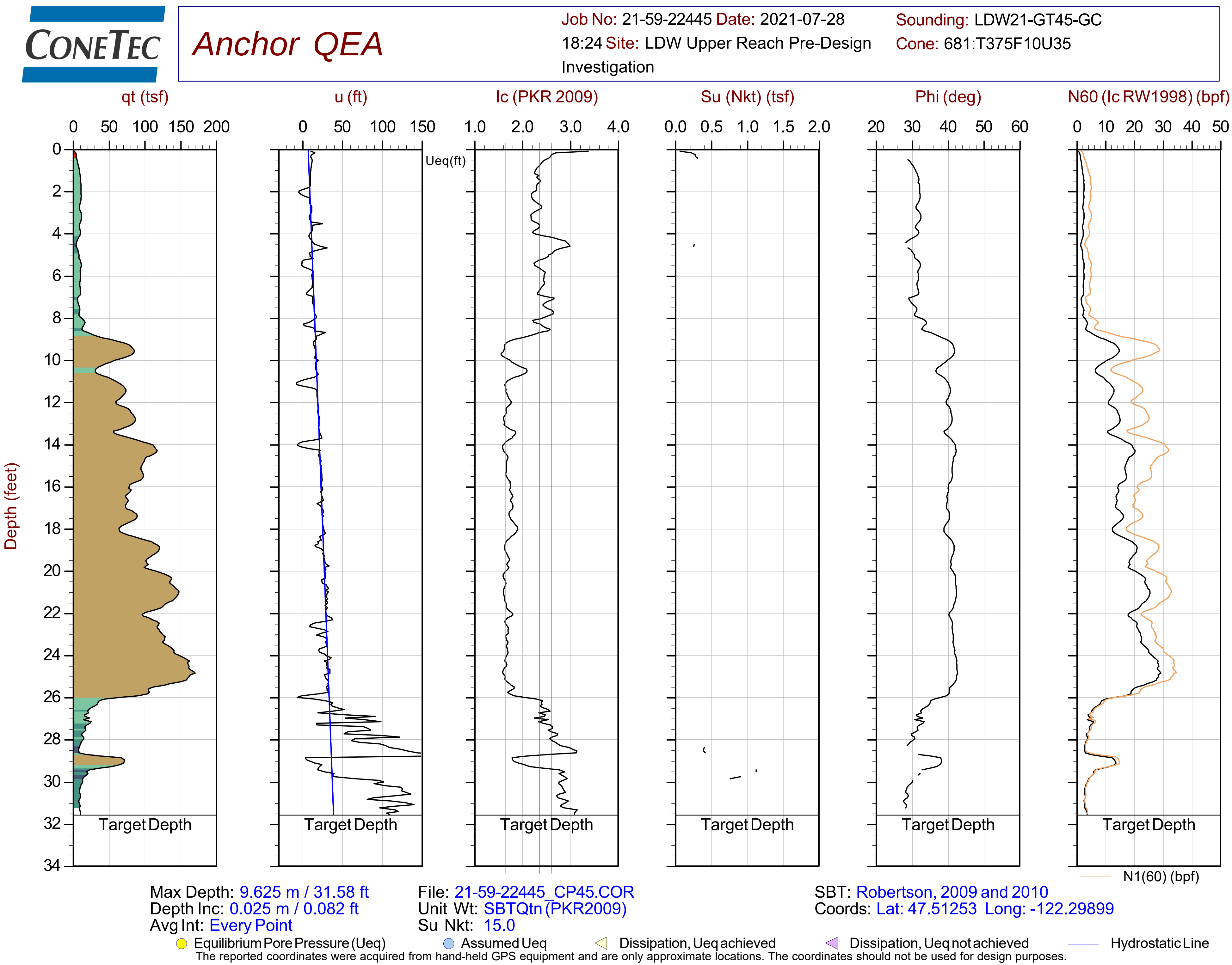
Max Depth: 9.650 m / 31.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP40.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51155 Long: -122.30247

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



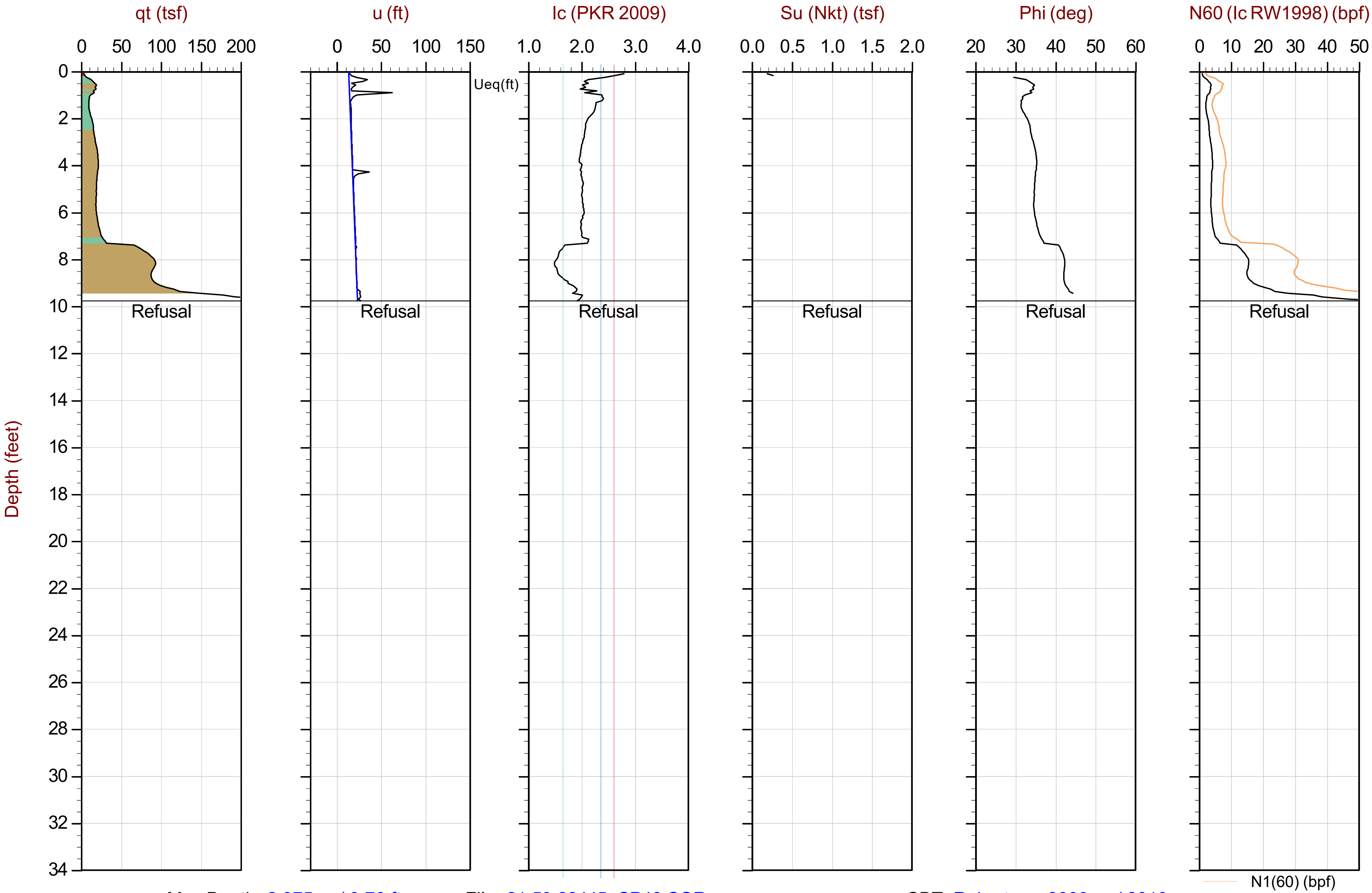
CONETEC
Anchor QEA
Job No: 21-59-22445 Date: 2021-07-28 18:24 Site: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT45-GC
Cone: 681:T375F10U35
qt (tsf)
u (ft)
Ueq(ft)
Ic (PKR 2009)
Su (Nkt) (tsf)
Phi (deg)
N60 (Ic RW1998) (bpf)
N1(60) (bpf)
Depth (feet)
Target Depth
Max Depth: 9.625 m / 31.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 21-59-22445_CP45.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0
SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51253 Long: -122.29899
Equilibrium Pore Pressure (Ueq)
Assumed Ueq
Dissipation, Ueq achieved
Dissipation, Ueq not achieved
Hydrostatic Line
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 09:49 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT46-GC
Cone: 681:T375F10U35



Max Depth: 2.975 m / 9.76 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP46.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51233 Long: -122.29862

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

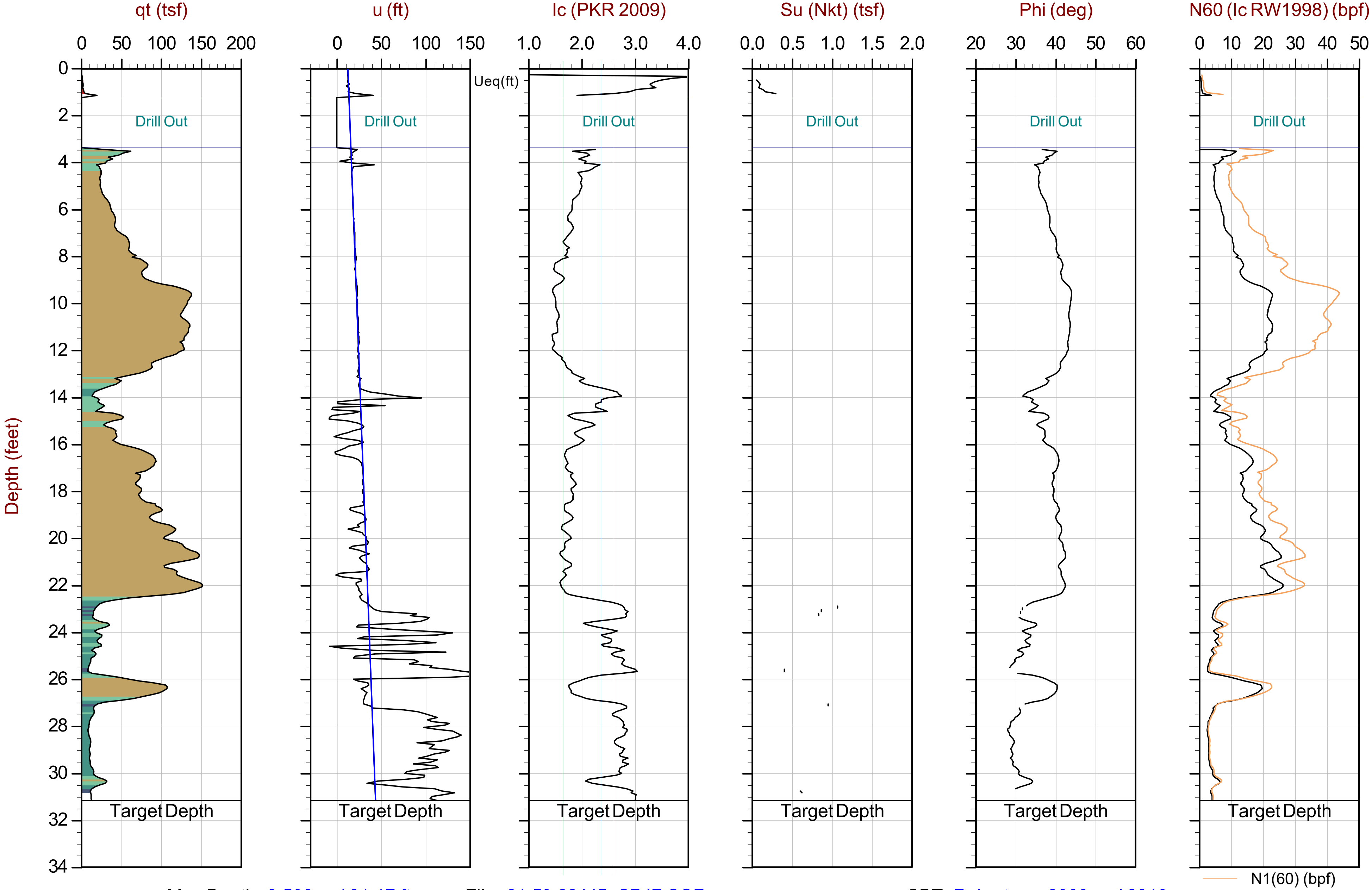
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 20:39 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT47-GC
Cone: 681:T375F10U35



Max Depth: 9.500 m / 31.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP47.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51242 Long: -122.29865

Equilibrium Pore Pressure (Ueq) Assumed Ueq Dissipation, Ueq achieved Dissipation, Ueq not achieved Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

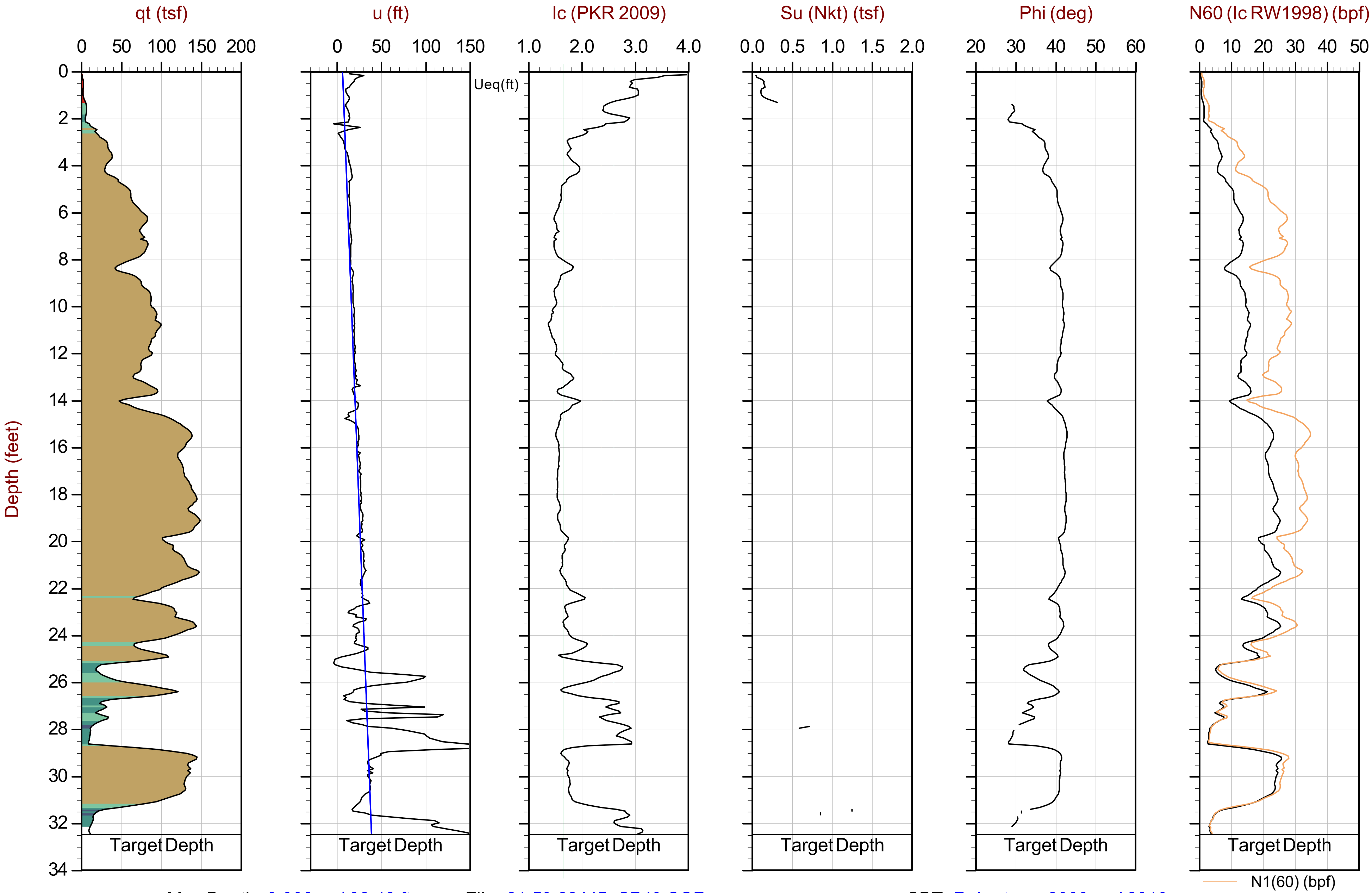
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-28 19:27 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT49-GC

Cone: 681:T375F10U35



Max Depth: 9.900 m / 32.48 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP49.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51235 Long: -122.29820

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

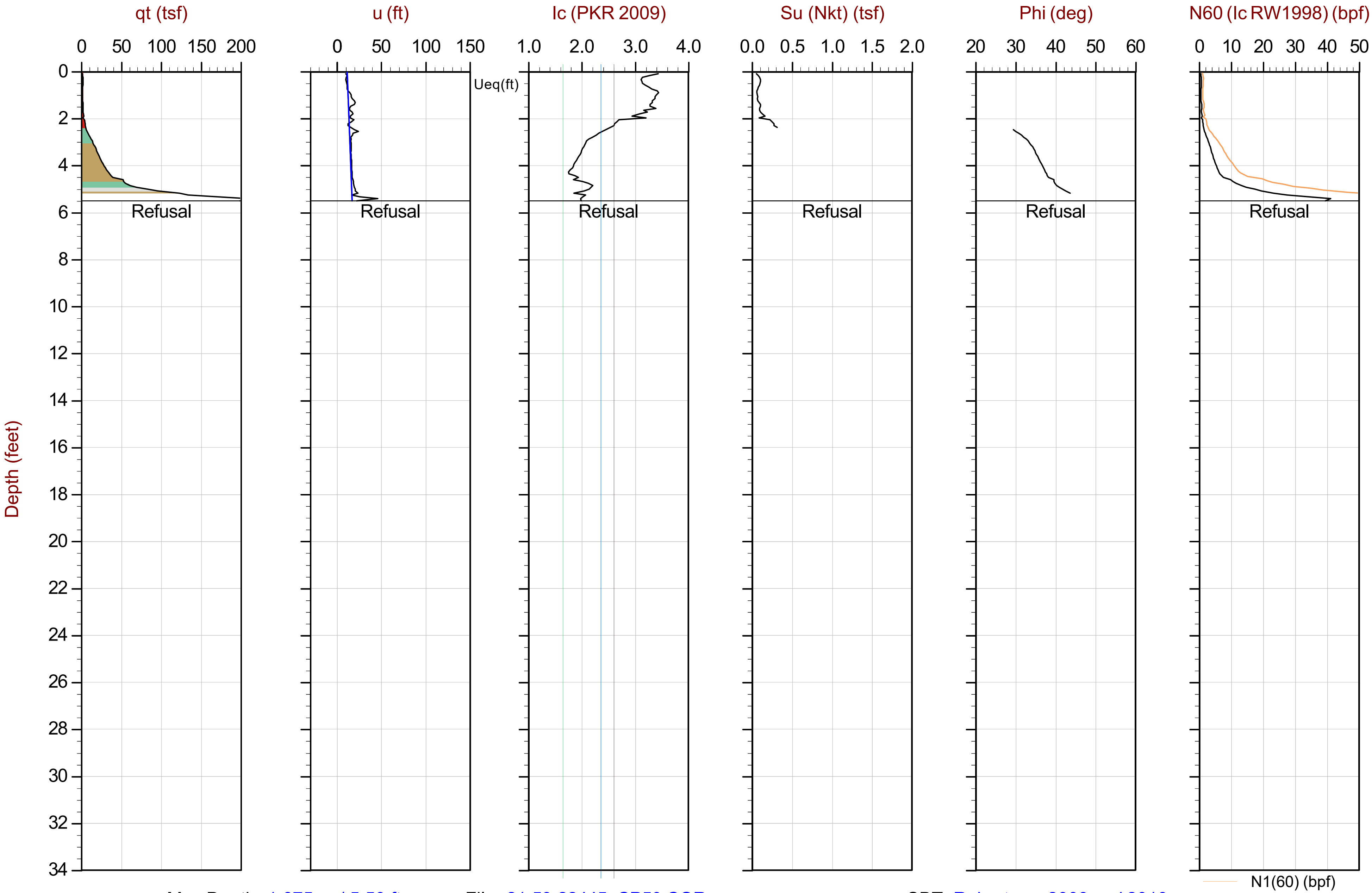
CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-23 15:21 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT50-GC

Cone: 681:T375F10U35



Max Depth: 1.675 m / 5.50 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP50.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51207 Long: -122.29793

Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

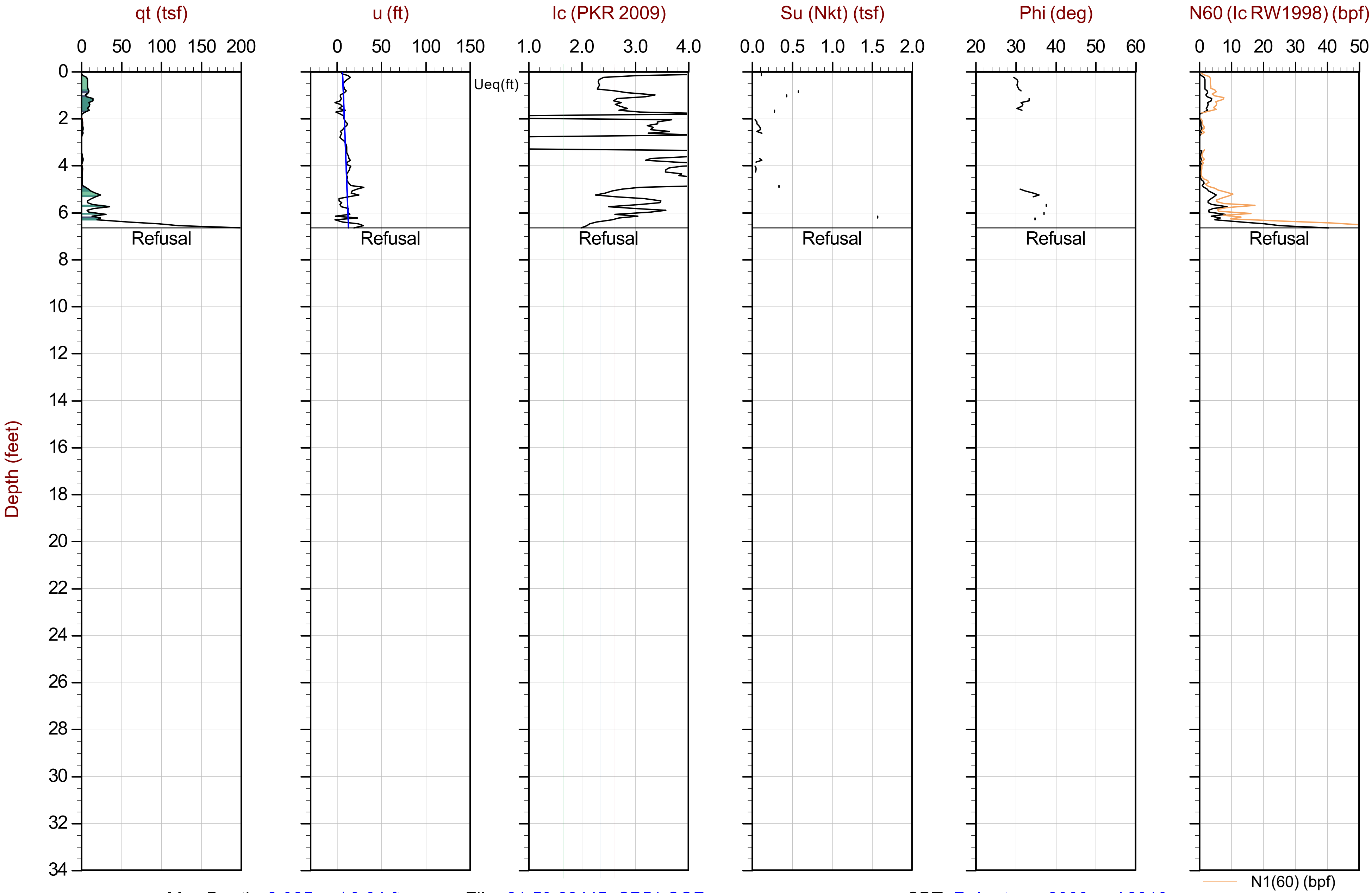
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 19:23 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT51-GC
Cone: 681:T375F10U35



Max Depth: 2.025 m / 6.64 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP51.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51218 Long: -122.29794

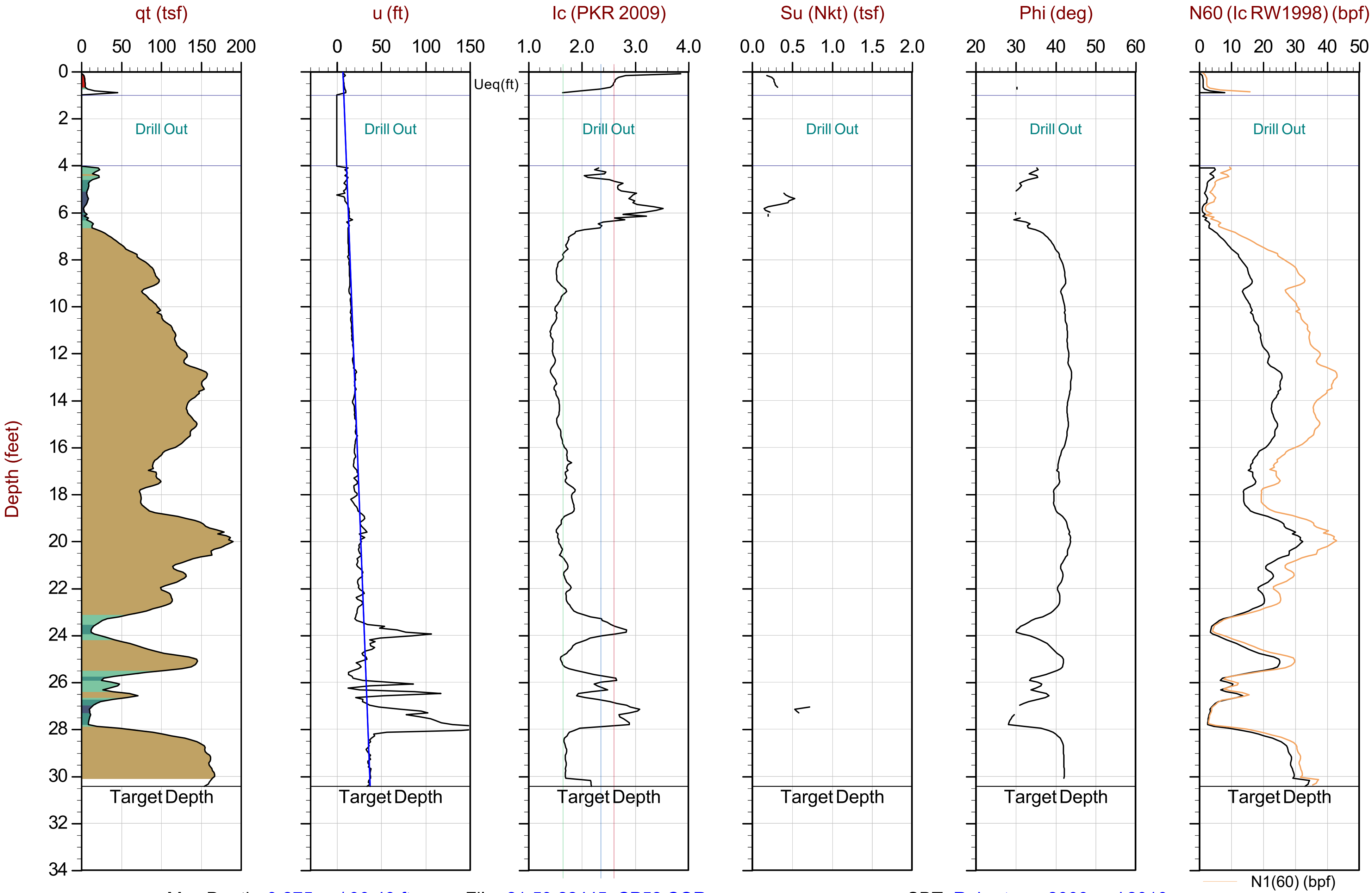
Equilibrium Pore Pressure (Ueq) · Assumed Ueq · Dissipation, Ueq achieved · Dissipation, Ueq not achieved · Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 19:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT52-GC
Cone: 681:T375F10U35



Max Depth: 9.275 m / 30.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP52.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51211 Long: -122.29774

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

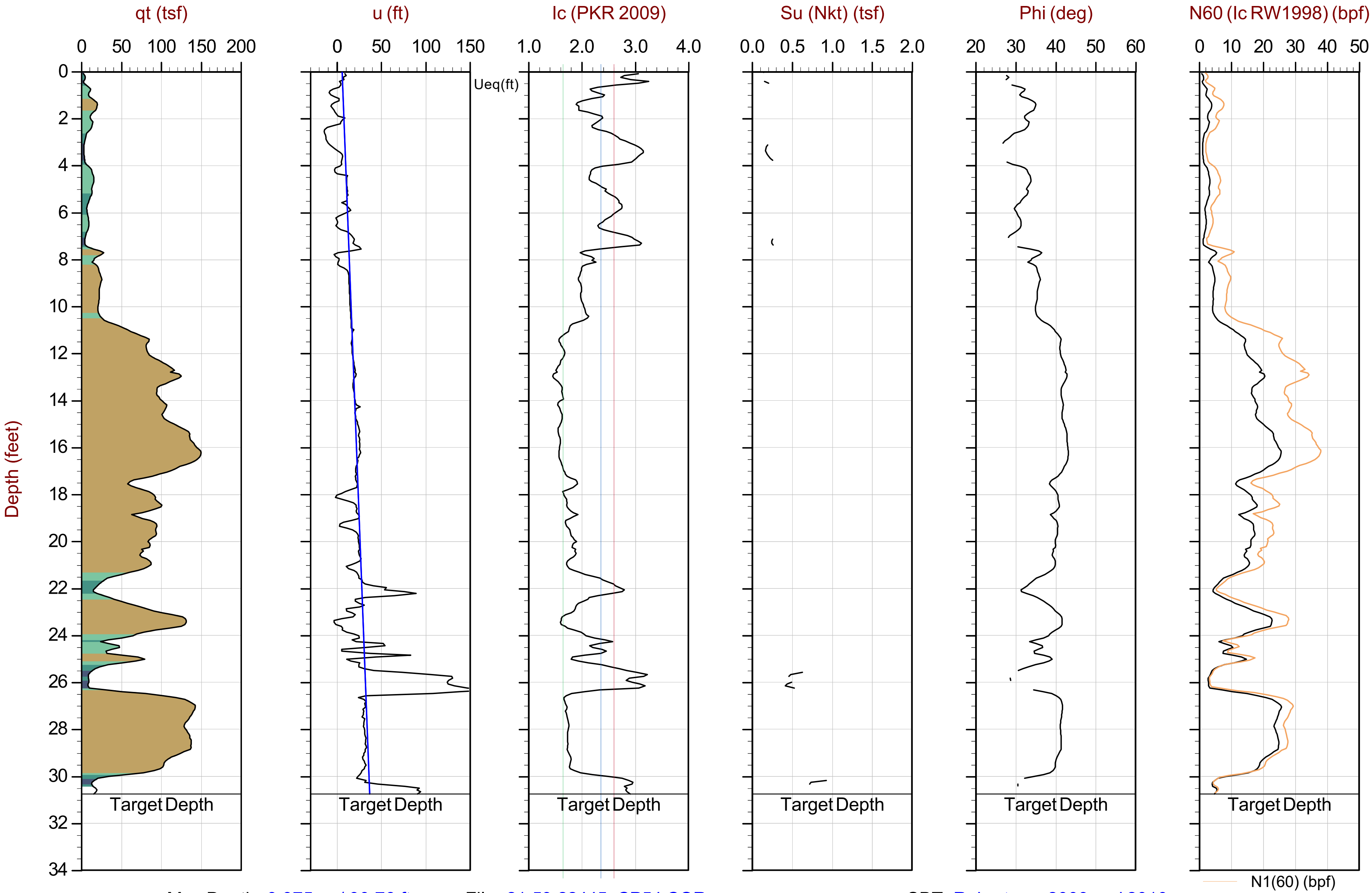
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 18:31 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT54-GC
Cone: 681:T375F10U35



Max Depth: 9.375 m / 30.76 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 21-59-22445_CP54.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 47.51197 Long: -122.29758

Equilibrium Pore Pressure (Ueq) | Assumed Ueq | Dissipation, Ueq achieved | Dissipation, Ueq not achieved | Hydrostatic Line

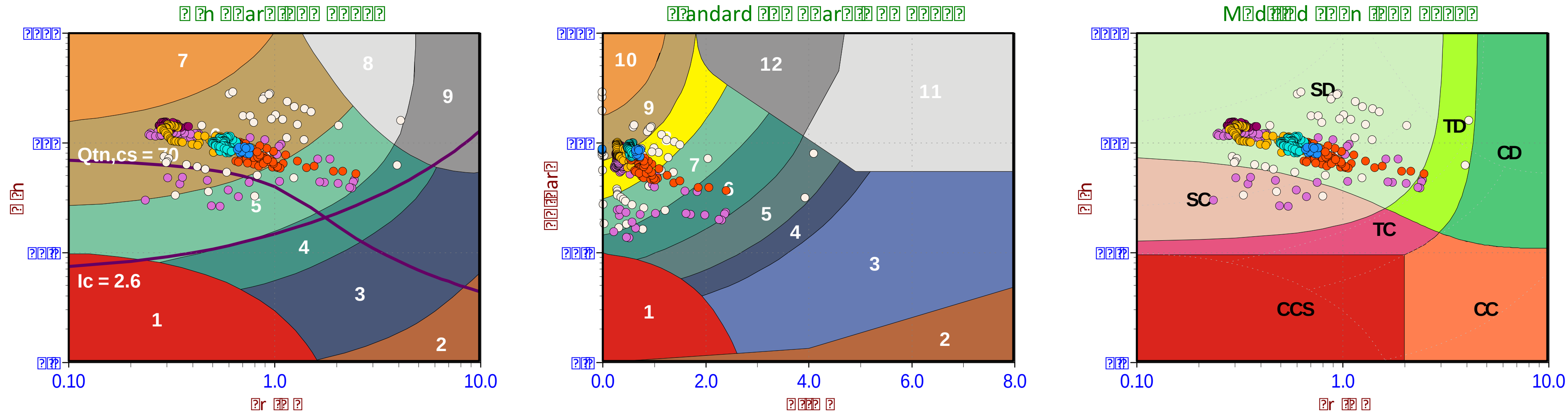
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Soil Behavior Type (SBT) Scatter Plots

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-22 17:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT06-GC
Cone: 681:T375F10U35



Depth Ranges
- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

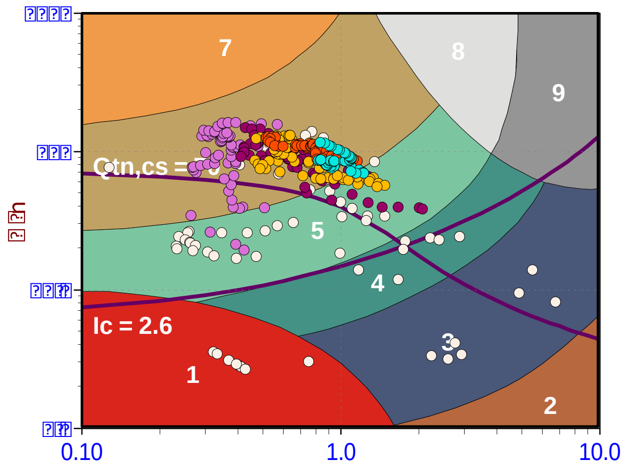
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

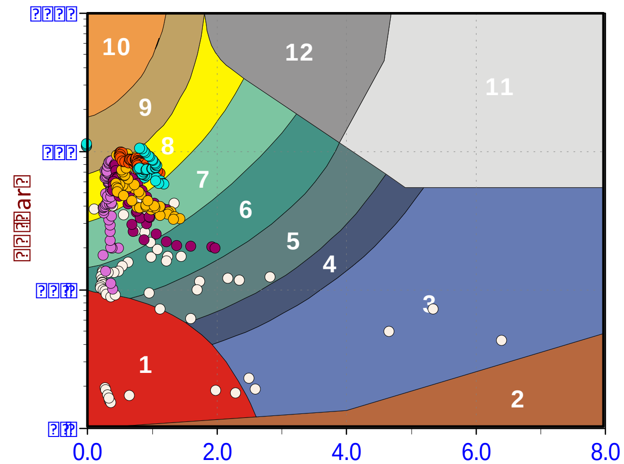
CONETEC

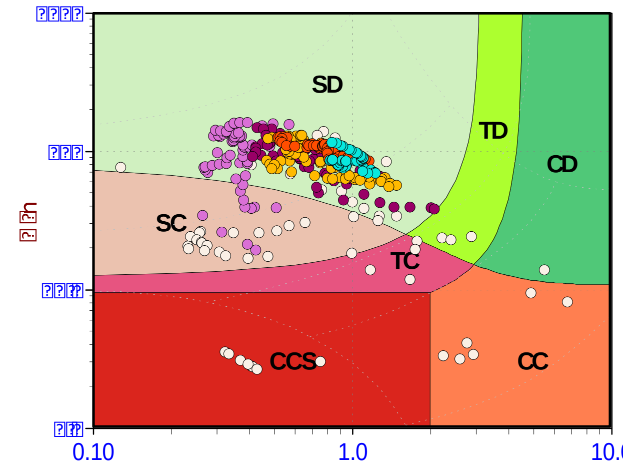
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 14:11 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT14-GC
Cone: 681:T375F10U35







Depth Ranges
- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

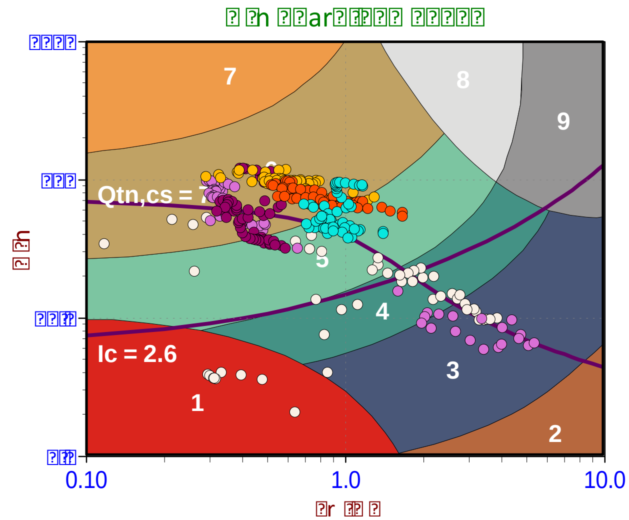
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

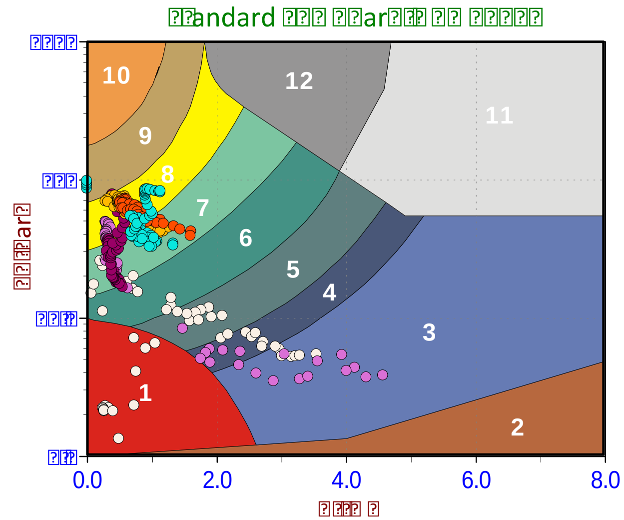
CONETEC

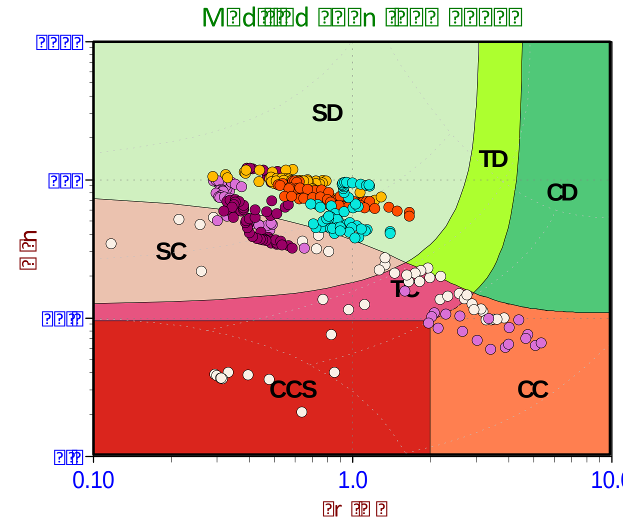
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-08 16:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT16-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

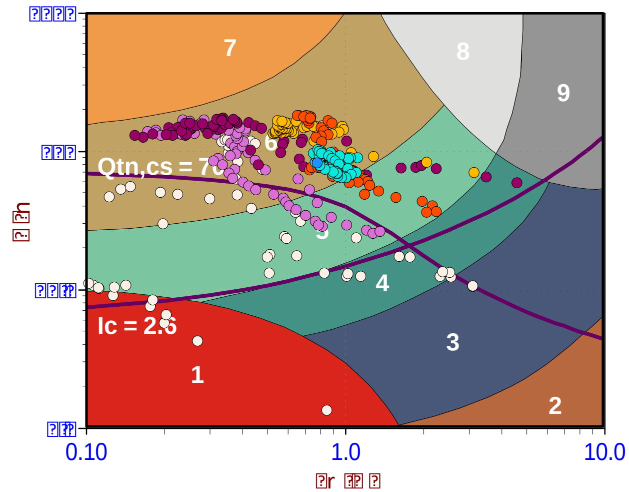
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

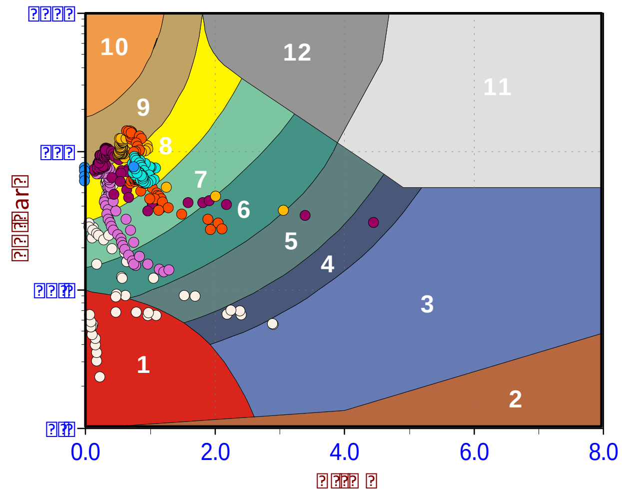
CONETEC

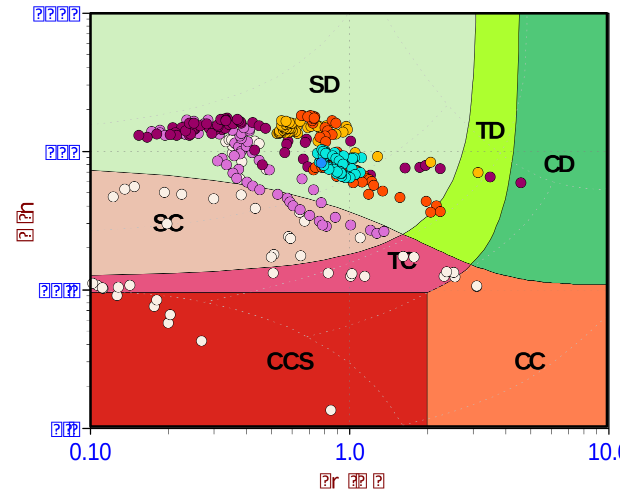
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-12 19:15 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT17-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

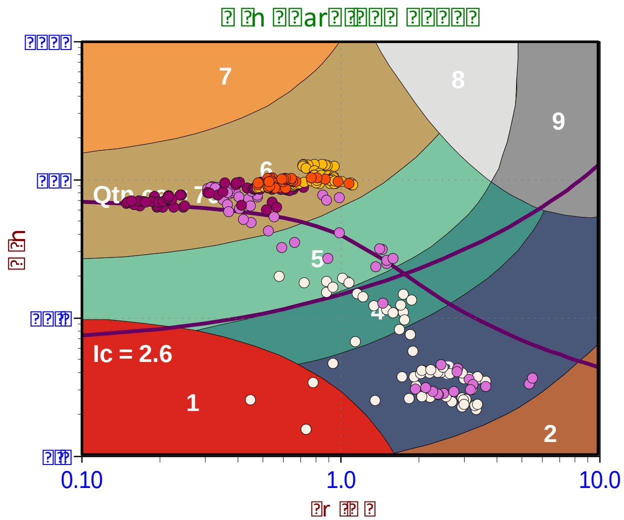
Legend

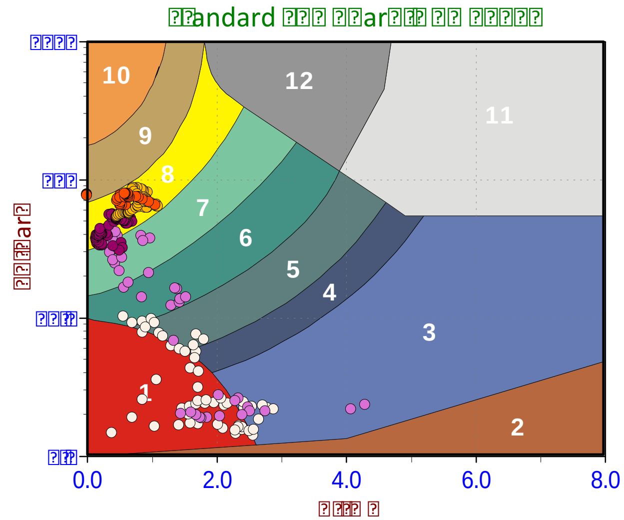
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

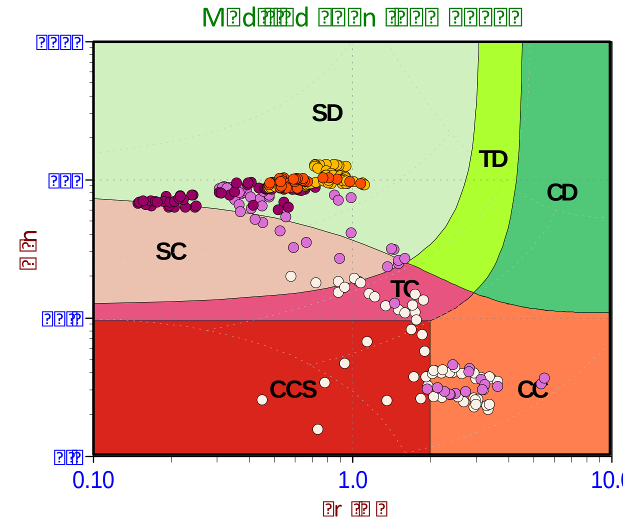
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 09:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT20-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

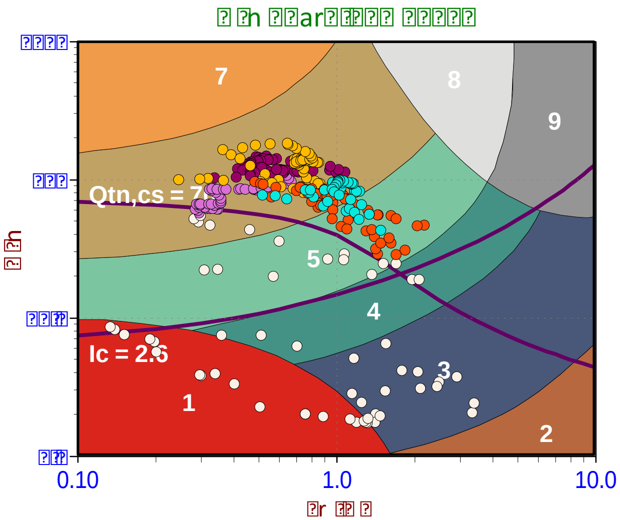
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

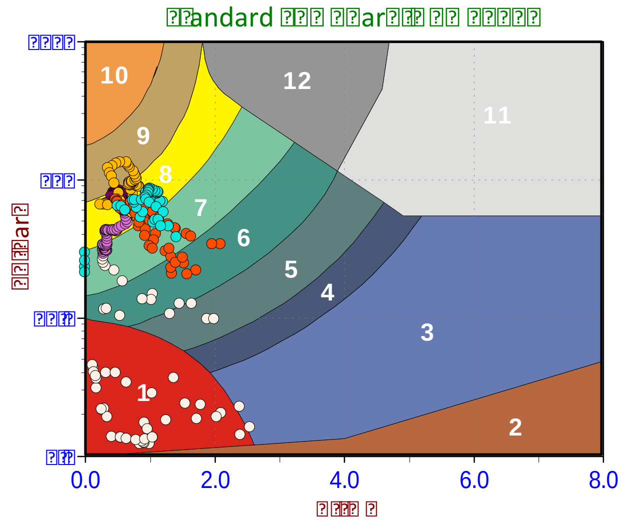
CONETEC

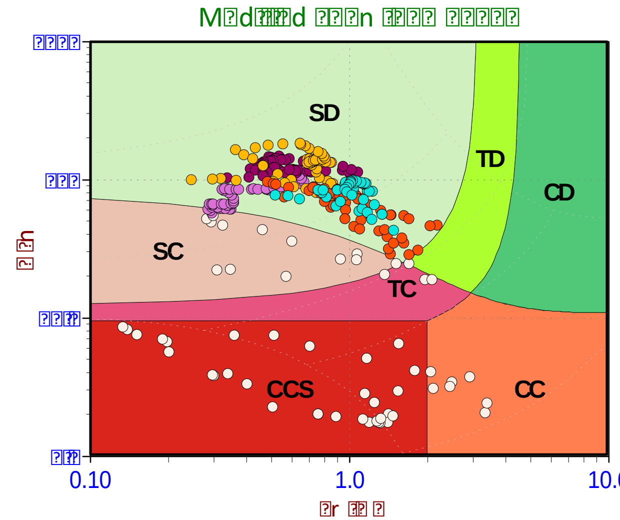
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-13 19:06 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT22-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

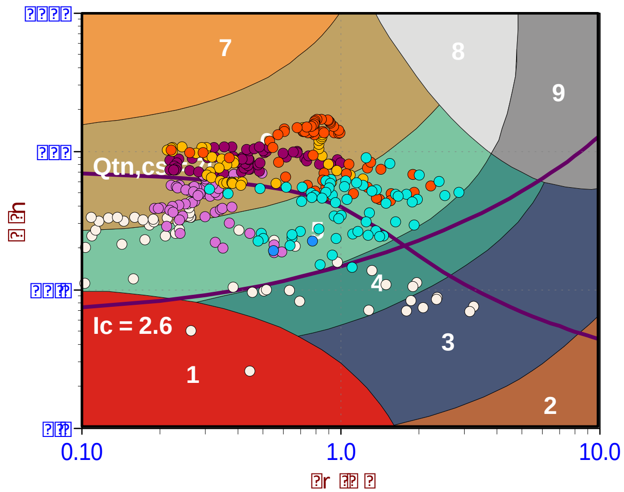
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

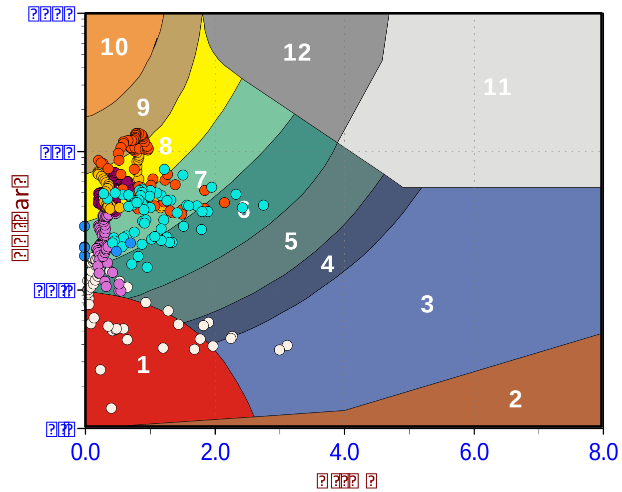
CONETEC

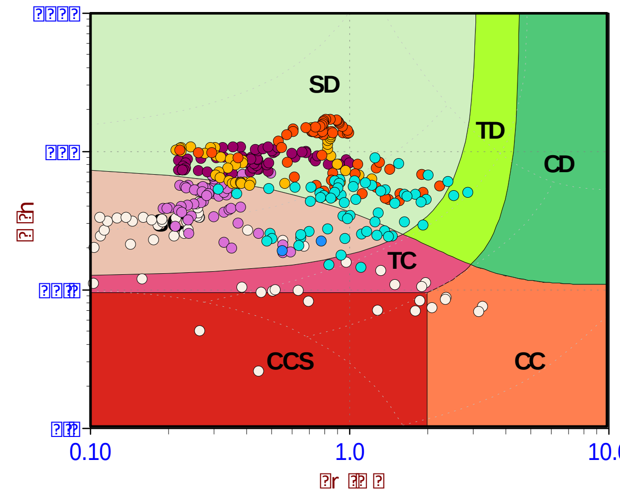
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-16 08:30 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT27-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

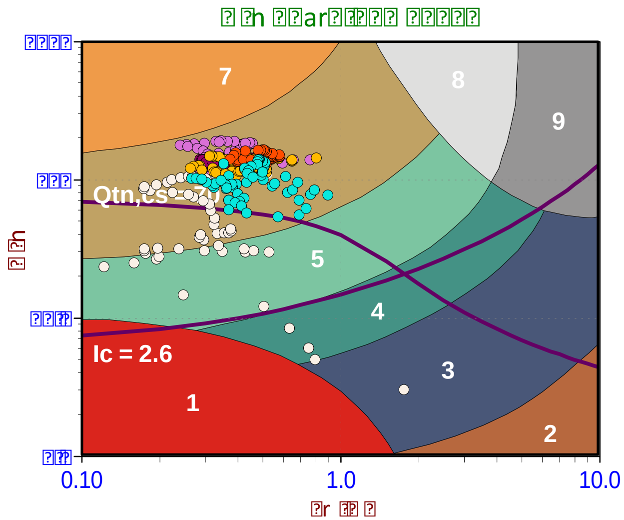
Legend

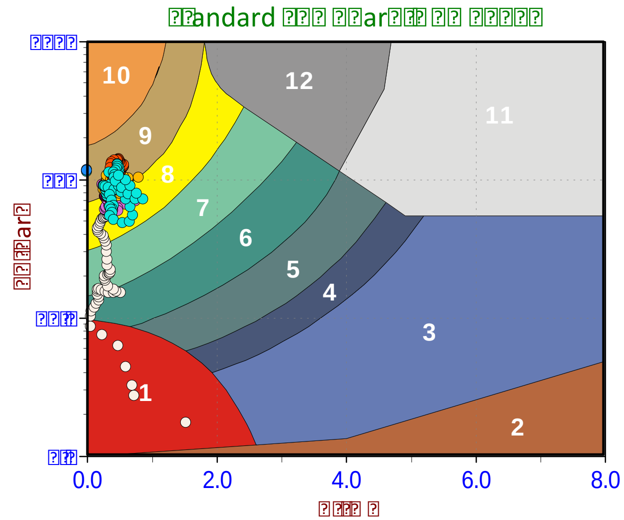
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

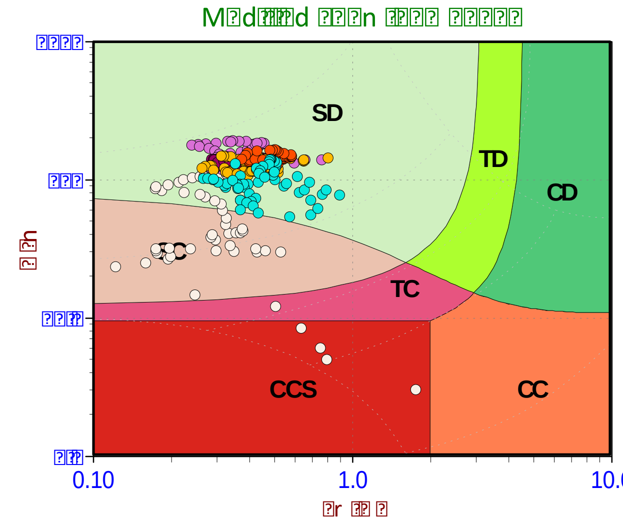
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 15:09 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT30-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

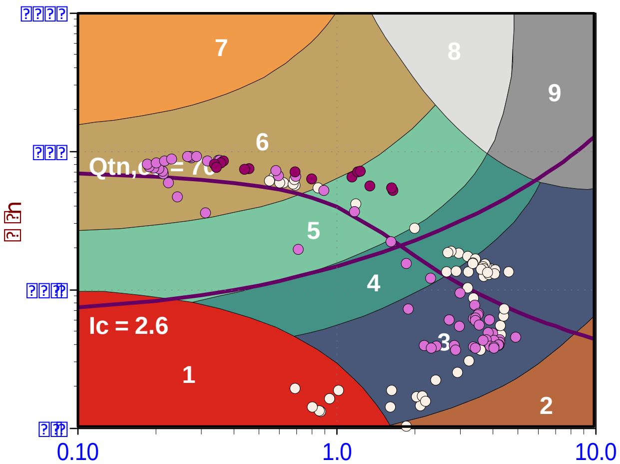
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

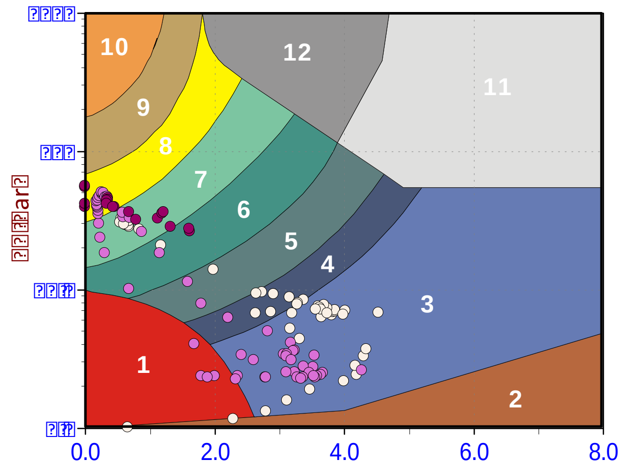
CONETEC

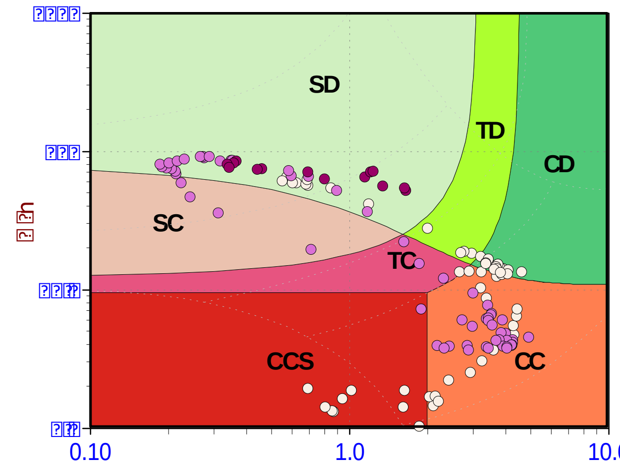
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-09 10:35 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT31-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

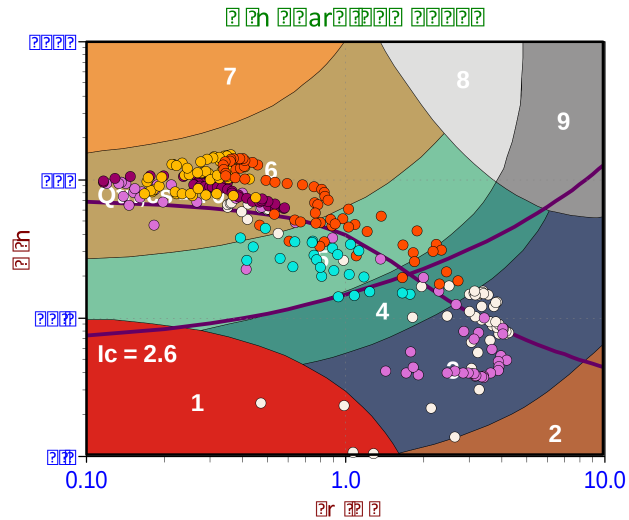
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

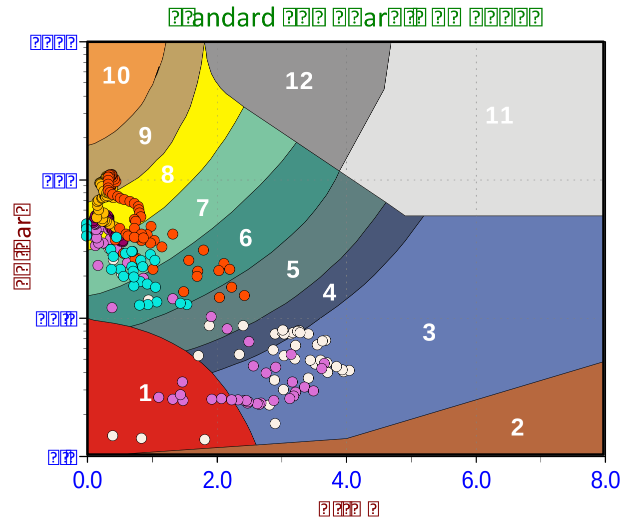
Legend

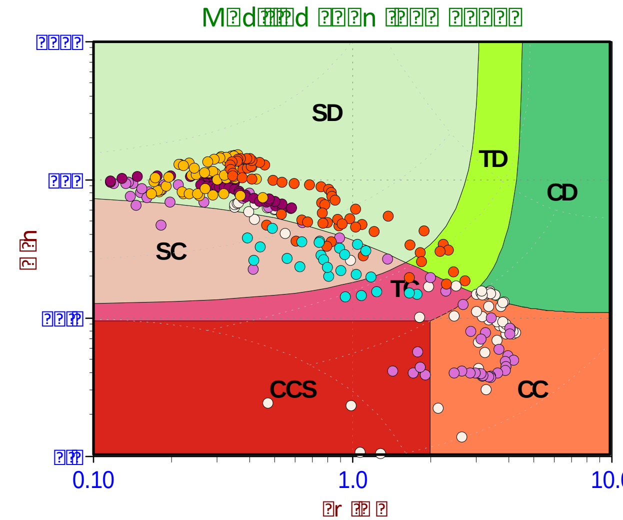
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

CONETEC

Anchor QEA	Job No: 21-59-22445 Date: 2021-07-13 17:56 Site: LDW Upper Reach Pre-Design Investigation	Sounding: LDW21-GT31-GC-B Cone: 681:T375F10U35







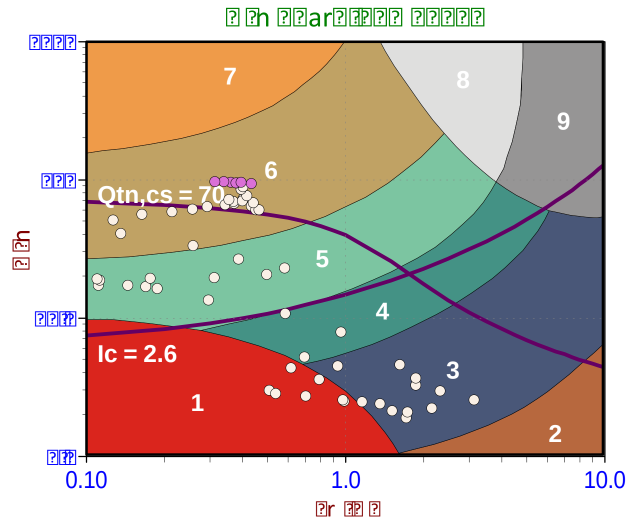
Depth Ranges
- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

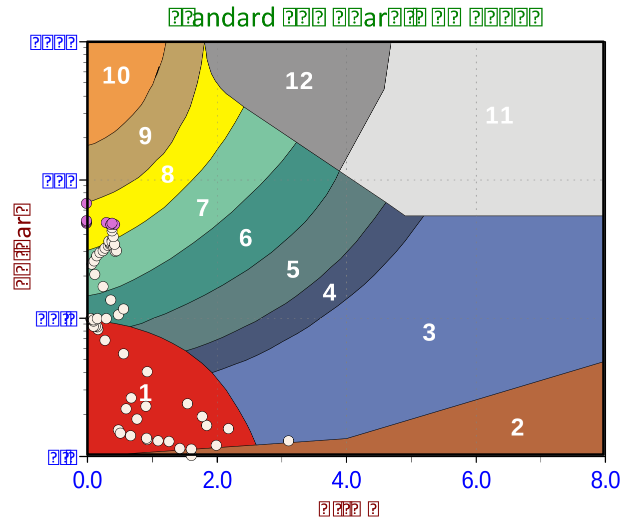
Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

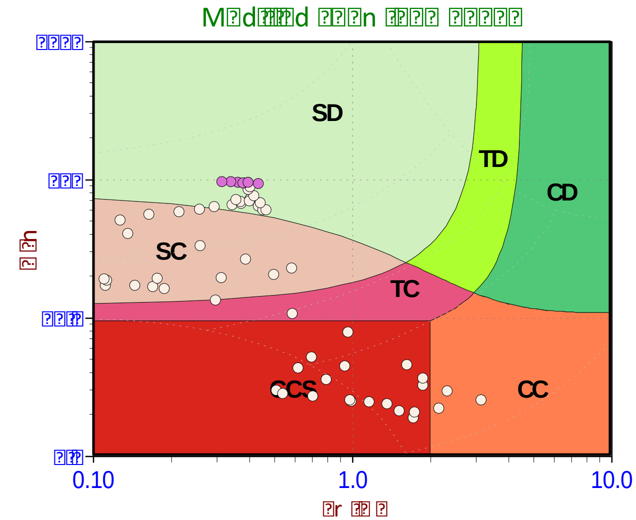
Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Anchor QEA	Job No: 21-59-22445 Date: 2021-07-09 11:18 Site: LDW Upper Reach Pre-Design Investigation	Sounding: LDW21-GT32-GC Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

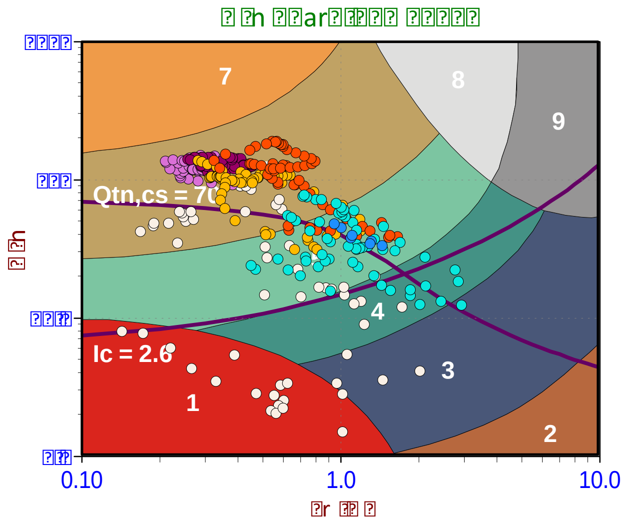
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

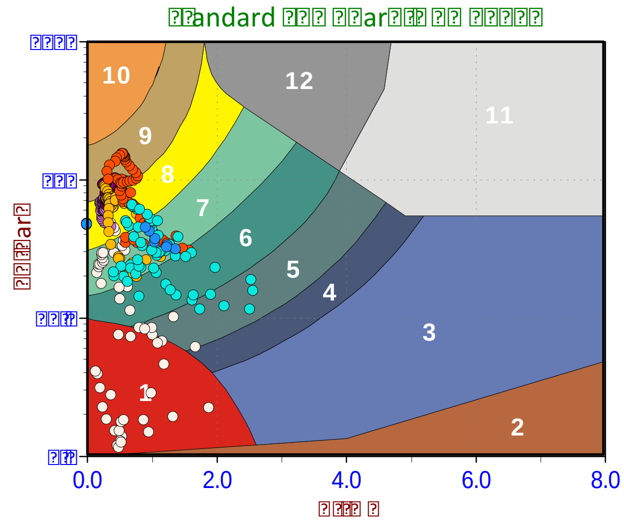
CONETEC

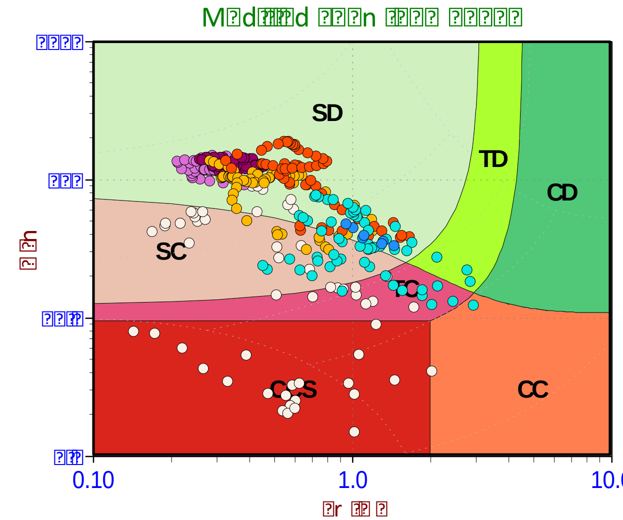
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 13:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT32-GC-B
Cone: 681:T375F10U35







Depth Ranges
- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

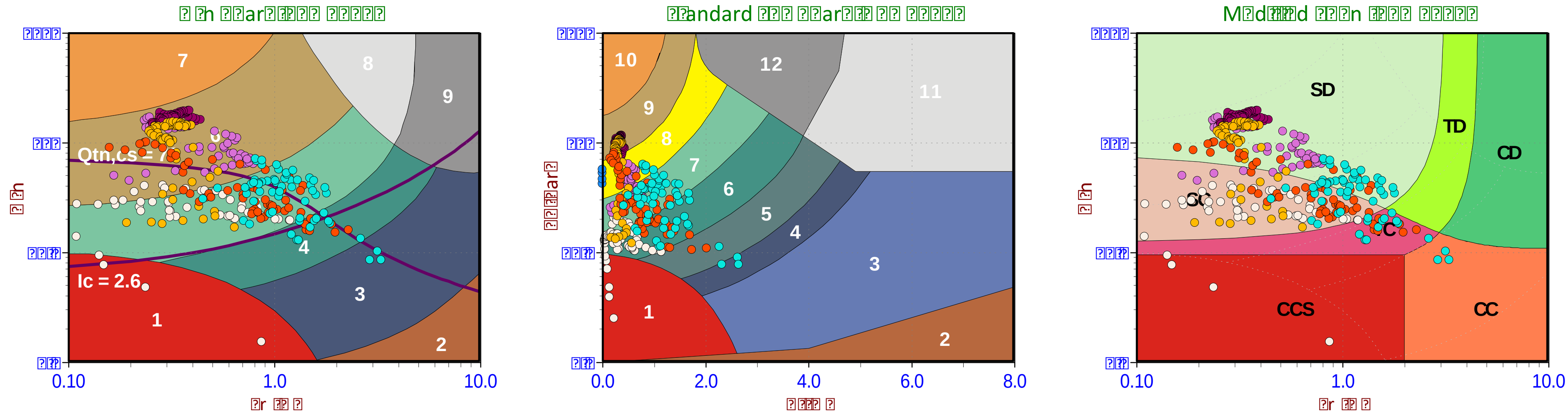
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

CONETEC

Anchor QEA

Job No: 21-59-22445 Date: 2021-07-21 14:17 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT34-GC
Cone: 681:T375F10U35



Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

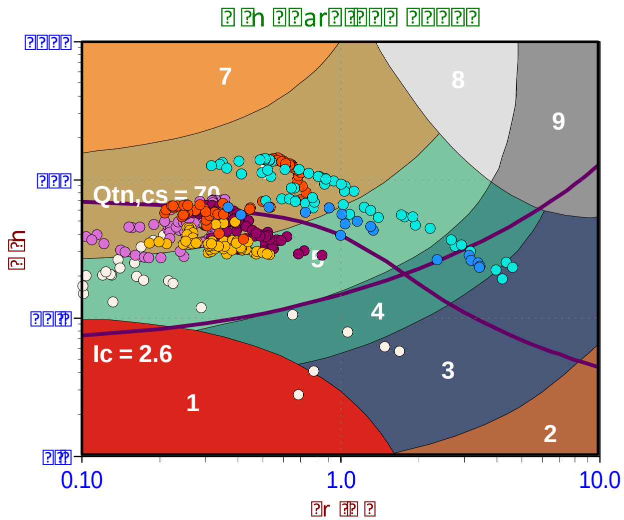
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

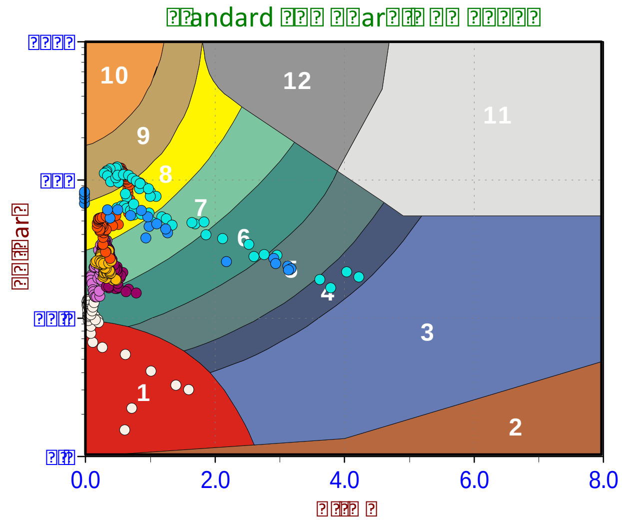
CONETEC

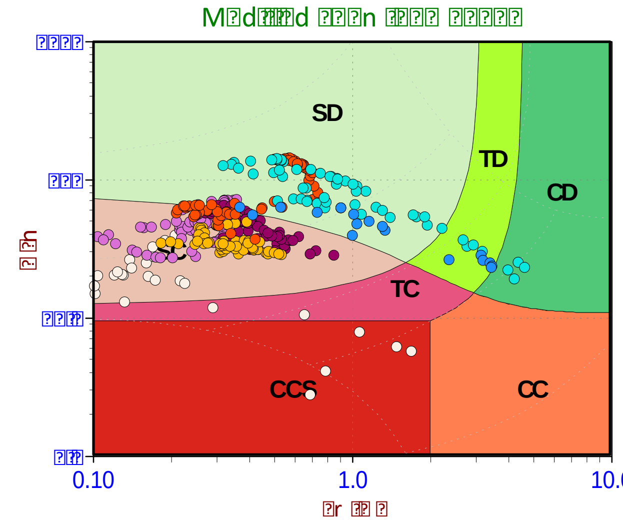
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-19 13:58 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT40-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

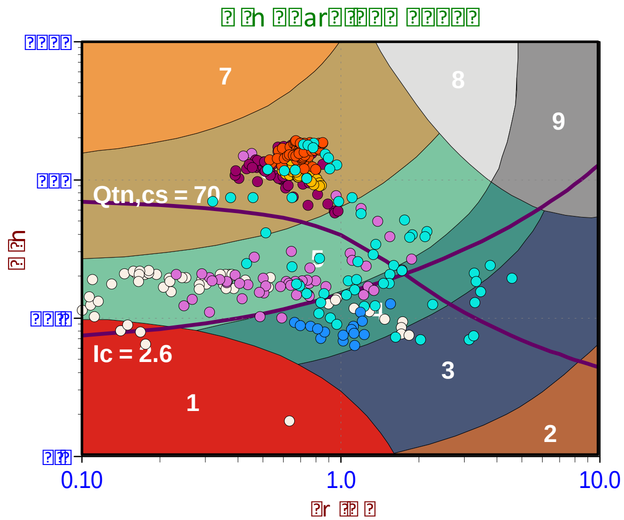
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

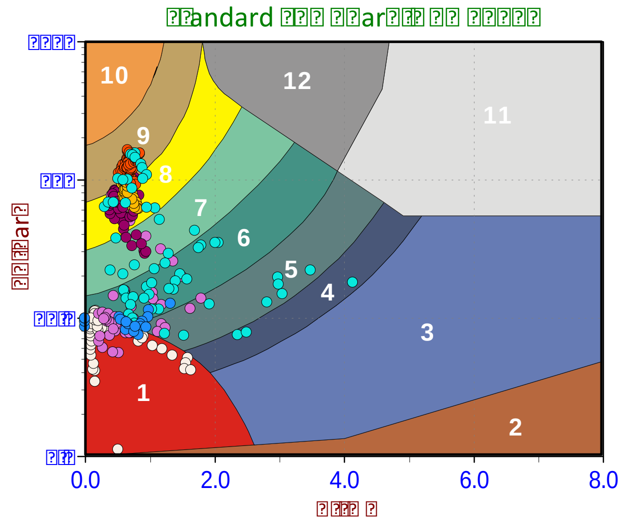
CONETEC

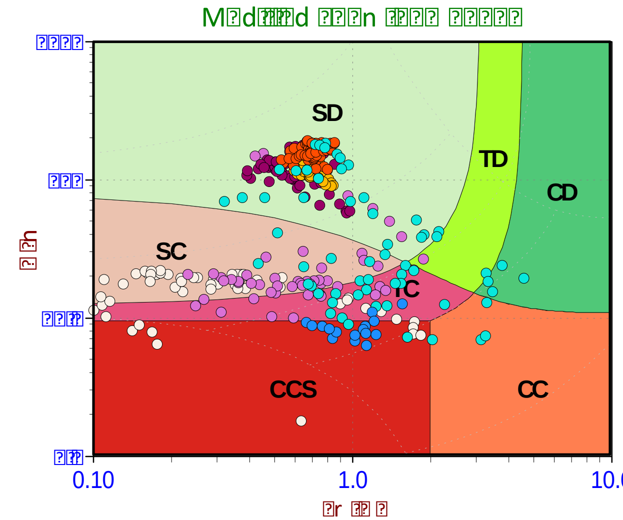
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-28 18:24 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT45-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

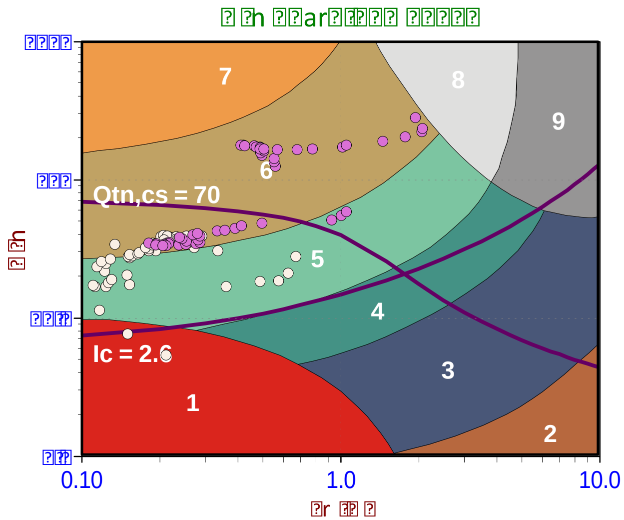
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

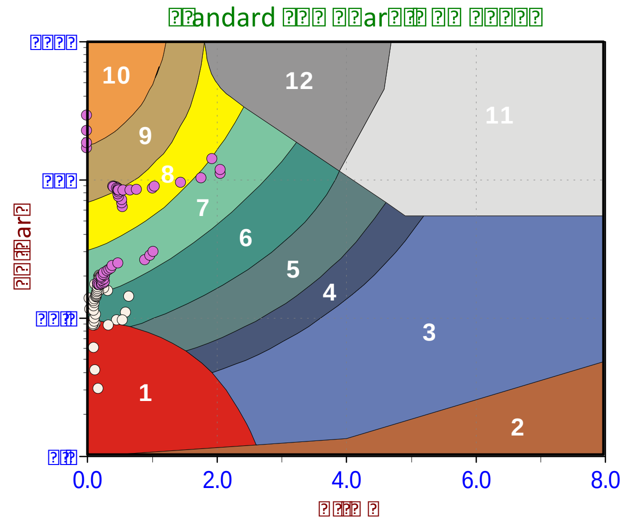
CONETEC

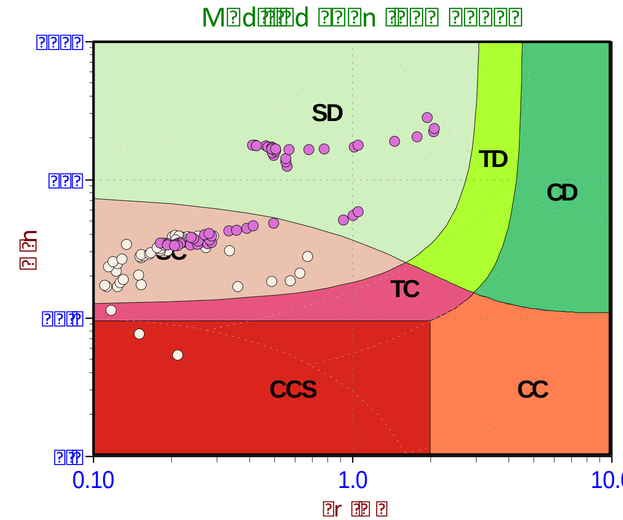
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 09:49 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT46-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

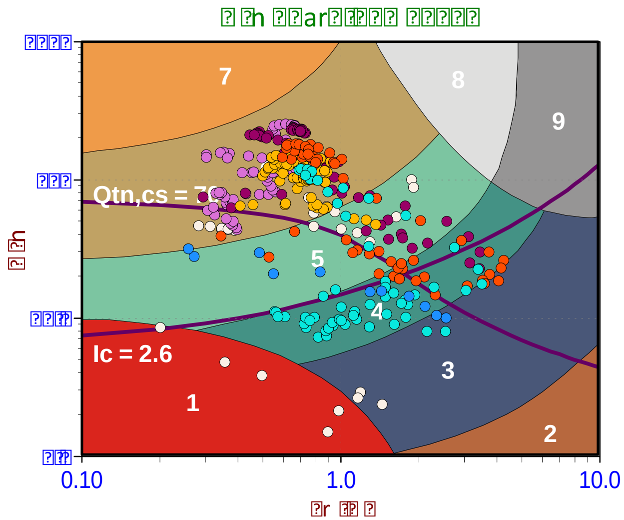
CONETEC

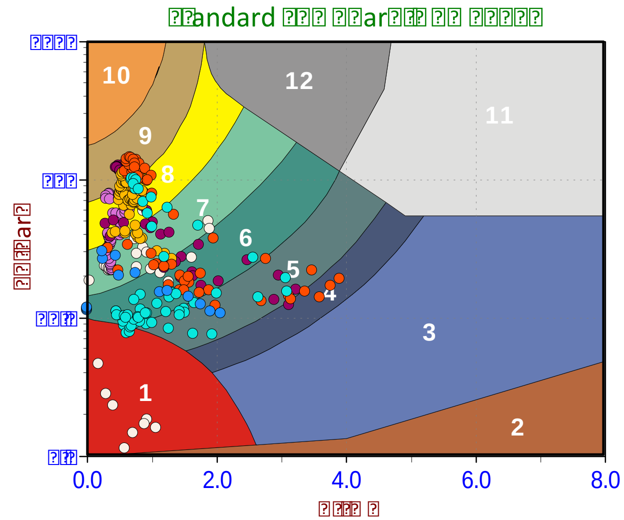
Anchor QEA

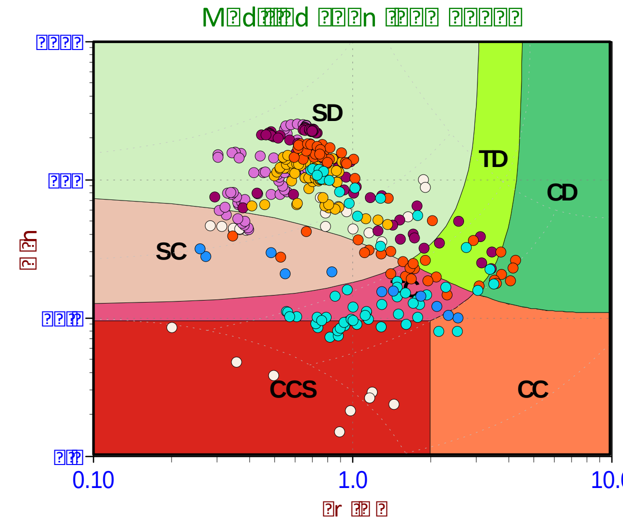
Job No: 21-59-22445 Date: 2021-07-27 20:39 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT47-GC

Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

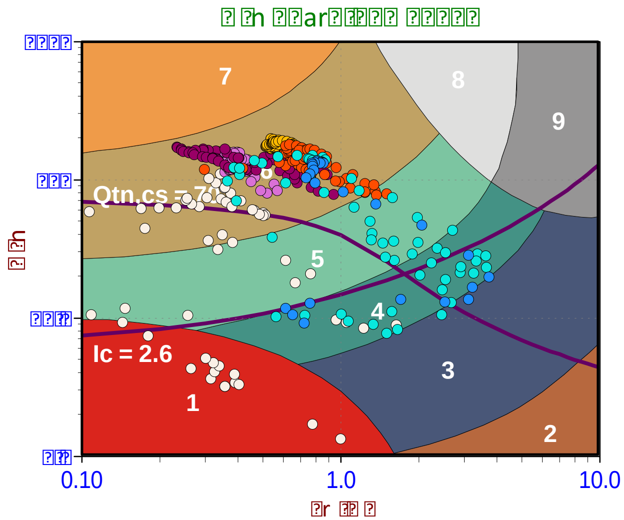
CONETEC

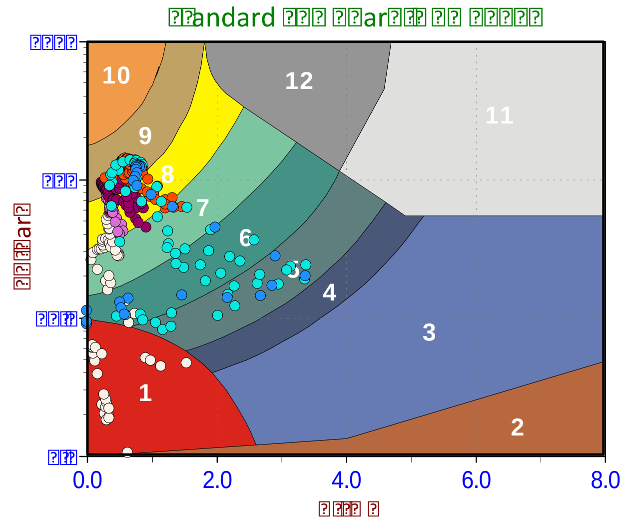
Anchor QEA

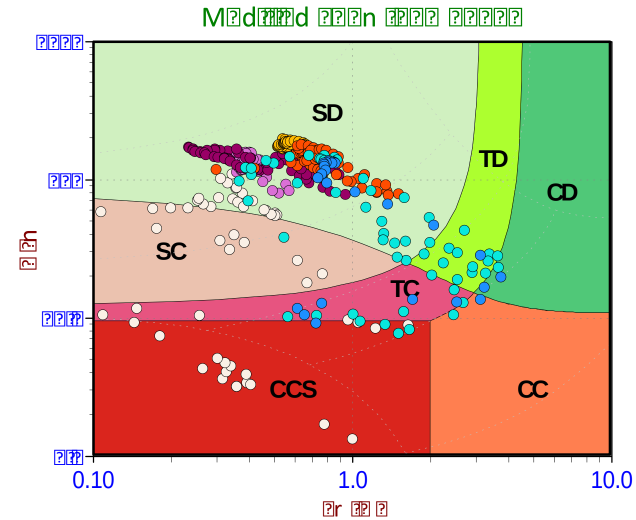
Job No: 21-59-22445 Date: 2021-07-28 19:27 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT49-GC

Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

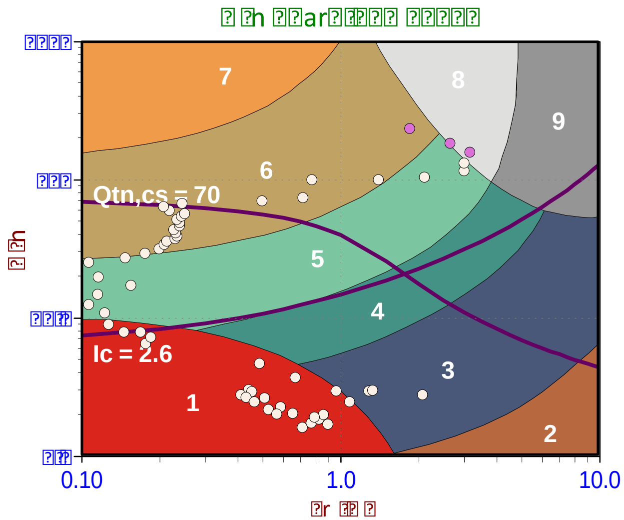
CONETEC

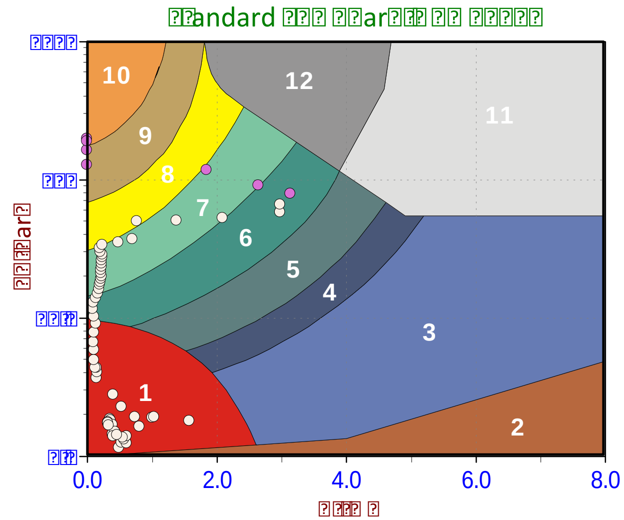
Anchor QEA

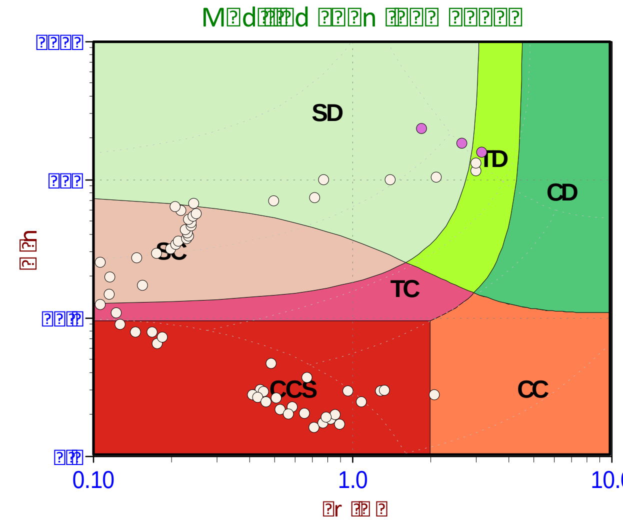
Job No: 21-59-22445 Date: 2021-07-23 15:21 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT50-GC

Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

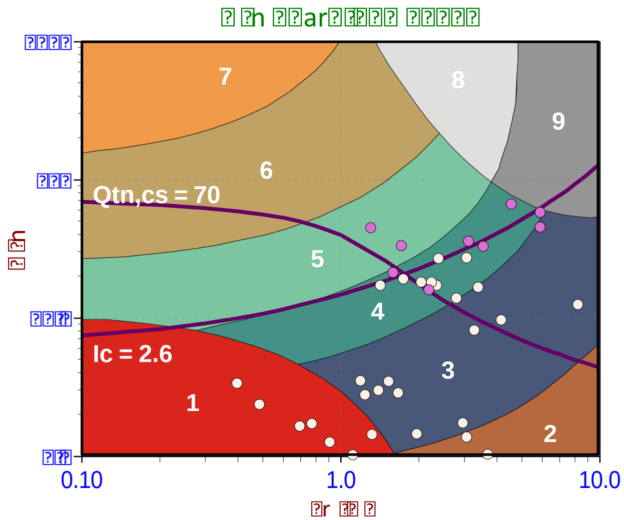
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

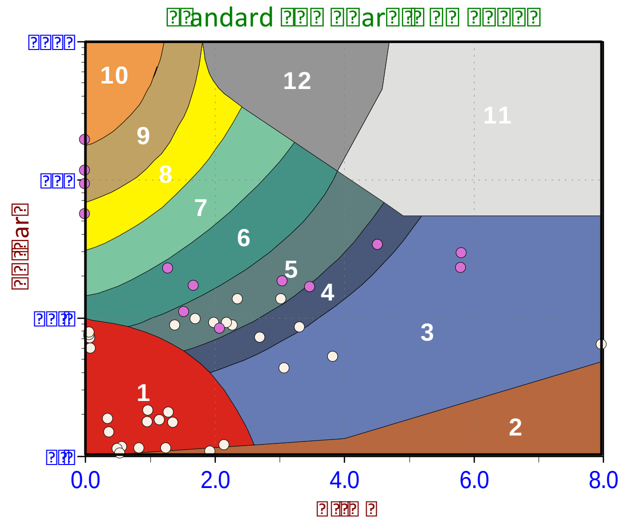
ConeTec

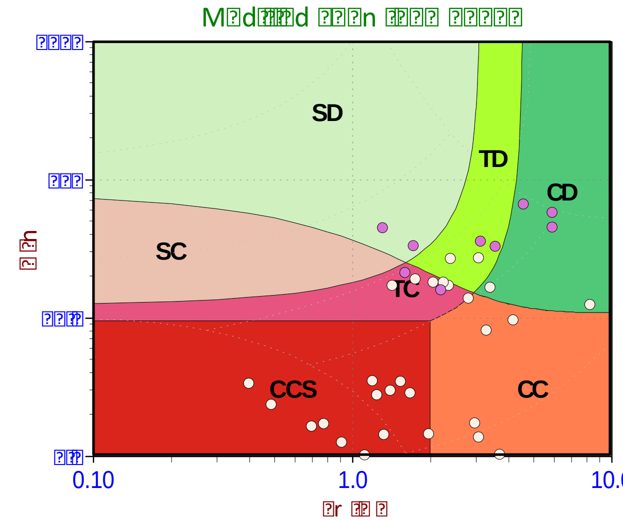
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-26 19:23 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT51-GC
Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

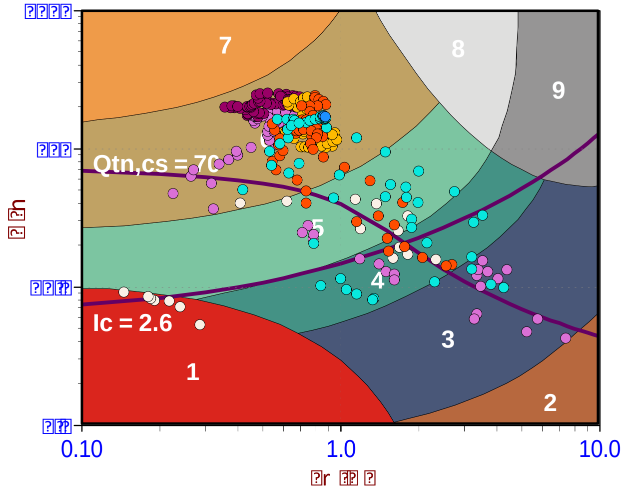
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

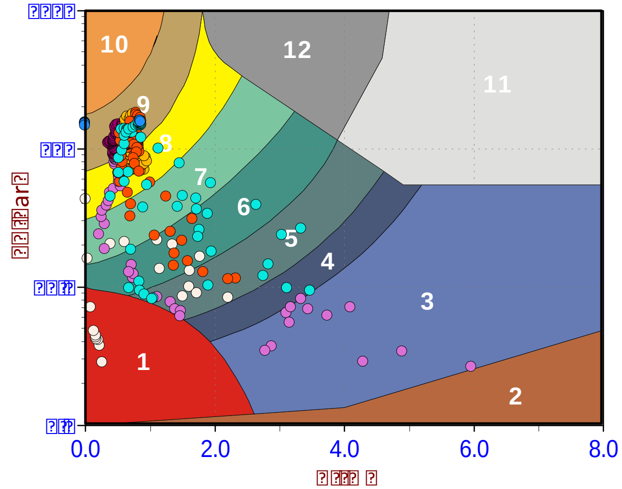
CONETEC

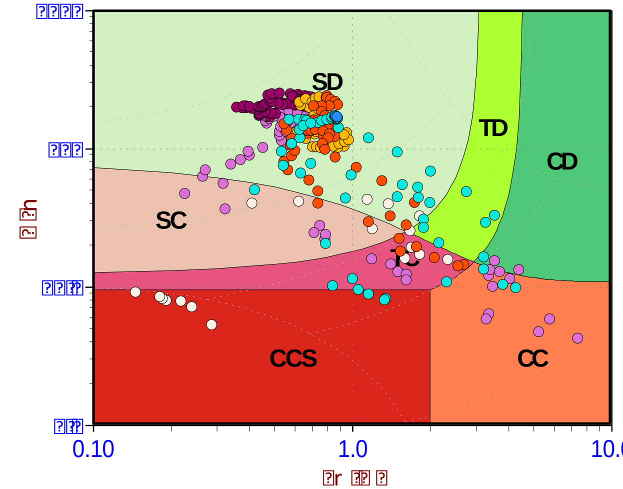
Anchor QEA

Job No: 21-59-22445 Date: 2021-07-27 19:40 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT52-GC
Cone: 681:T375F10U35







Depth Ranges
- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

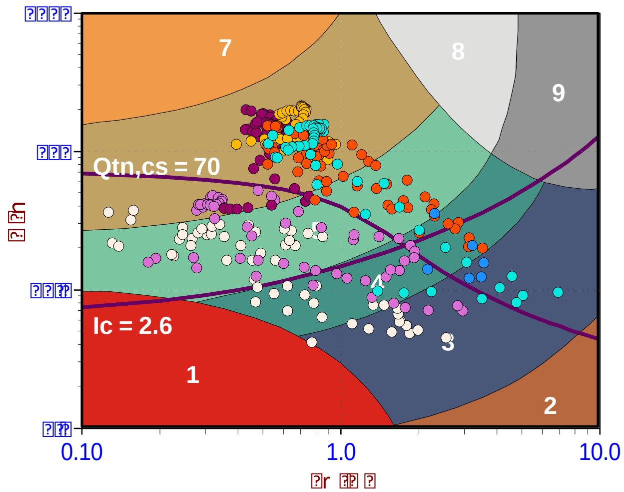
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

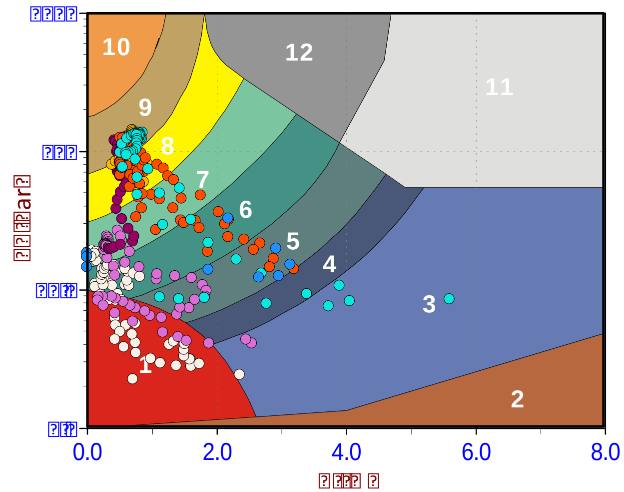
Anchor QEA

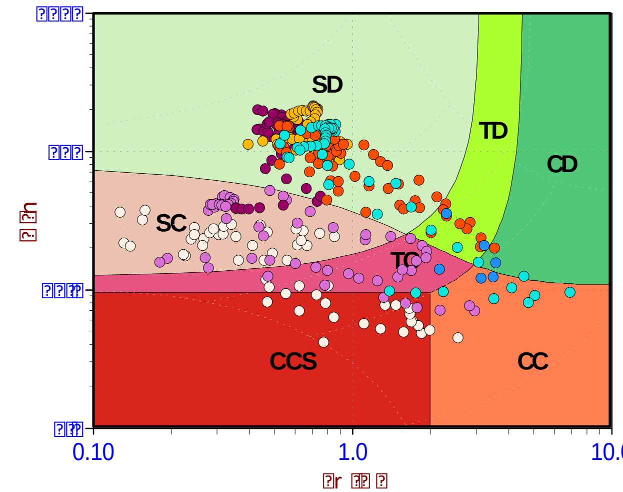
Job No: 21-59-22445 Date: 2021-07-27 18:31 Site: LDW Upper Reach Pre-Design Investigation

Sounding: LDW21-GT54-GC

Cone: 681:T375F10U35







Depth Ranges

- >0.0 to 5.0 ft
- >5.0 to 10.0 ft
- >10.0 to 15.0 ft
- >15.0 to 20.0 ft
- >20.0 to 25.0 ft
- >25.0 to 30.0 ft
- >30.0 to 35.0 ft
- >35.0 to 40.0 ft
- >40.0 to 45.0 ft
- >45.0 to 50.0 ft
- >50.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Ball Full Flow Cone Penetration Test Summary and Plots

Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Start Date: 06-Jul-2021
End Date: 29-Jul-2021

BALL FULL FLOW PENETRATION TEST SUMMARY

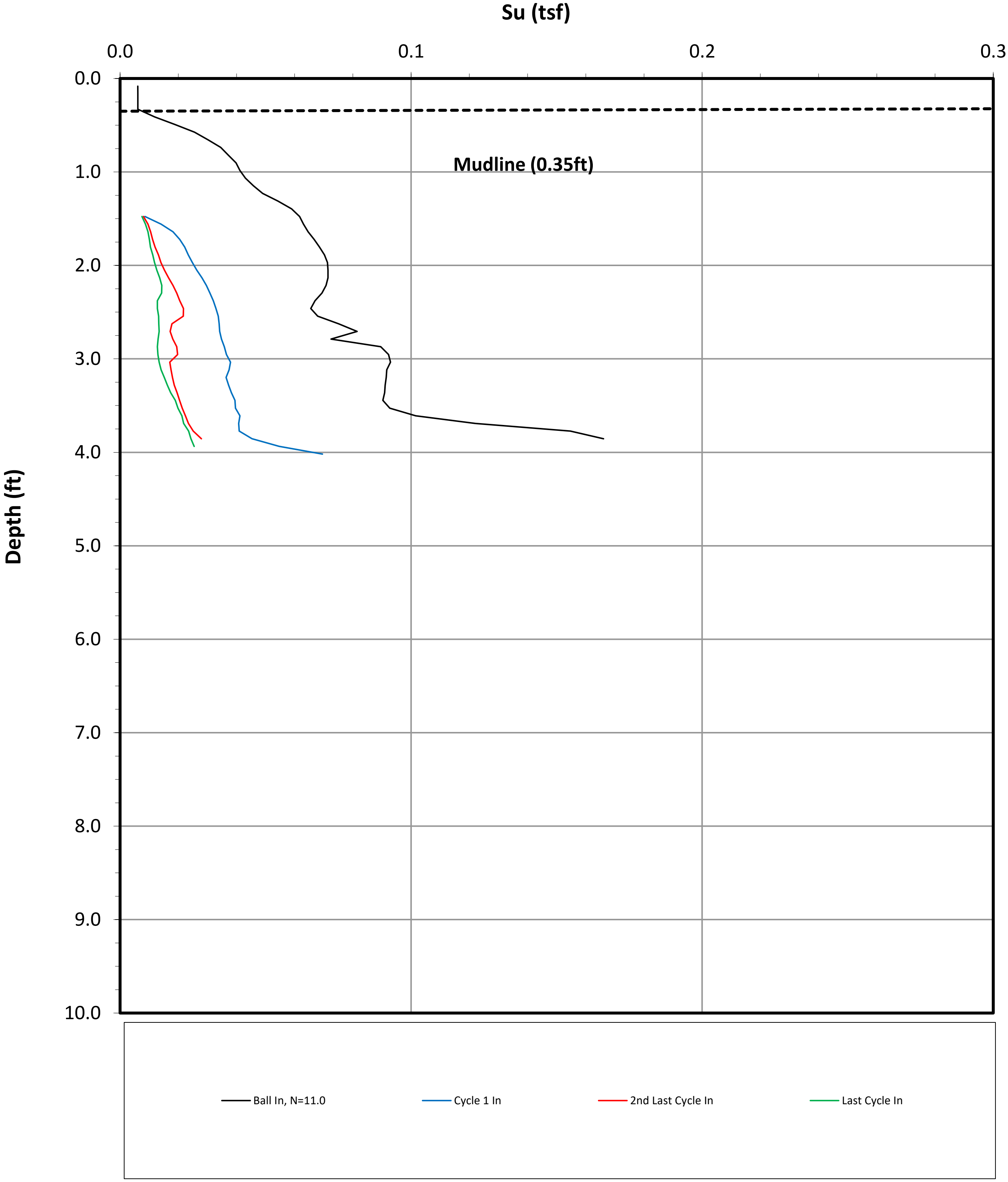
Sounding ID	File Name	Date	Cone	Cone Area (cm^2)	Ball Area (cm^2)	Final Depth (ft)	Cycling Conducted	Latitude[1] (deg)	Longitude[1] (deg)	Refer to Notation Number
LDW21-GT01-FFP	21-59-22445_BP01	14-Jul-2021	681:T375F10U35	15	150	4.0	YES	47.53230	-122.31937	
LDW21-GT03-FFP	21-59-22445_BP03	14-Jul-2021	681:T375F10U35	15	150	5.9	YES	47.52757	-122.31136	
LDW21-GT09-FFP	21-59-22445_BP09	14-Jul-2021	681:T375F10U35	15	150	12.1	YES			2
LDW21-GT11-FFP	21-59-22445_BP11	16-Jul-2021	681:T375F10U35	15	150	9.4	YES	47.52623	-122.30963	
LDW21-GT26-FFP	21-59-22445_BP26	16-Jul-2021	681:T375F10U35	15	150	4.0	YES	47.52150	-122.30687	
LDW21-GT30-31-FFP	21-59-22445_BP30-31	21-Jul-2021	681:T375F10U35	15	150	5.2	YES	47.52051	-122.30581	
LDW21-GT32-34-FFP	21-59-22445_BP32-34	21-Jul-2021	681:T375F10U35	15	150	4.0	YES	47.51999	-122.30585	

1. Coordinates were provided by client
2. Coordinates currently not available. Coordinates will be provided by client at a later date

Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation Sounding
ID: LDW21-GT01-FFP Sounding Date: July 14, 2021

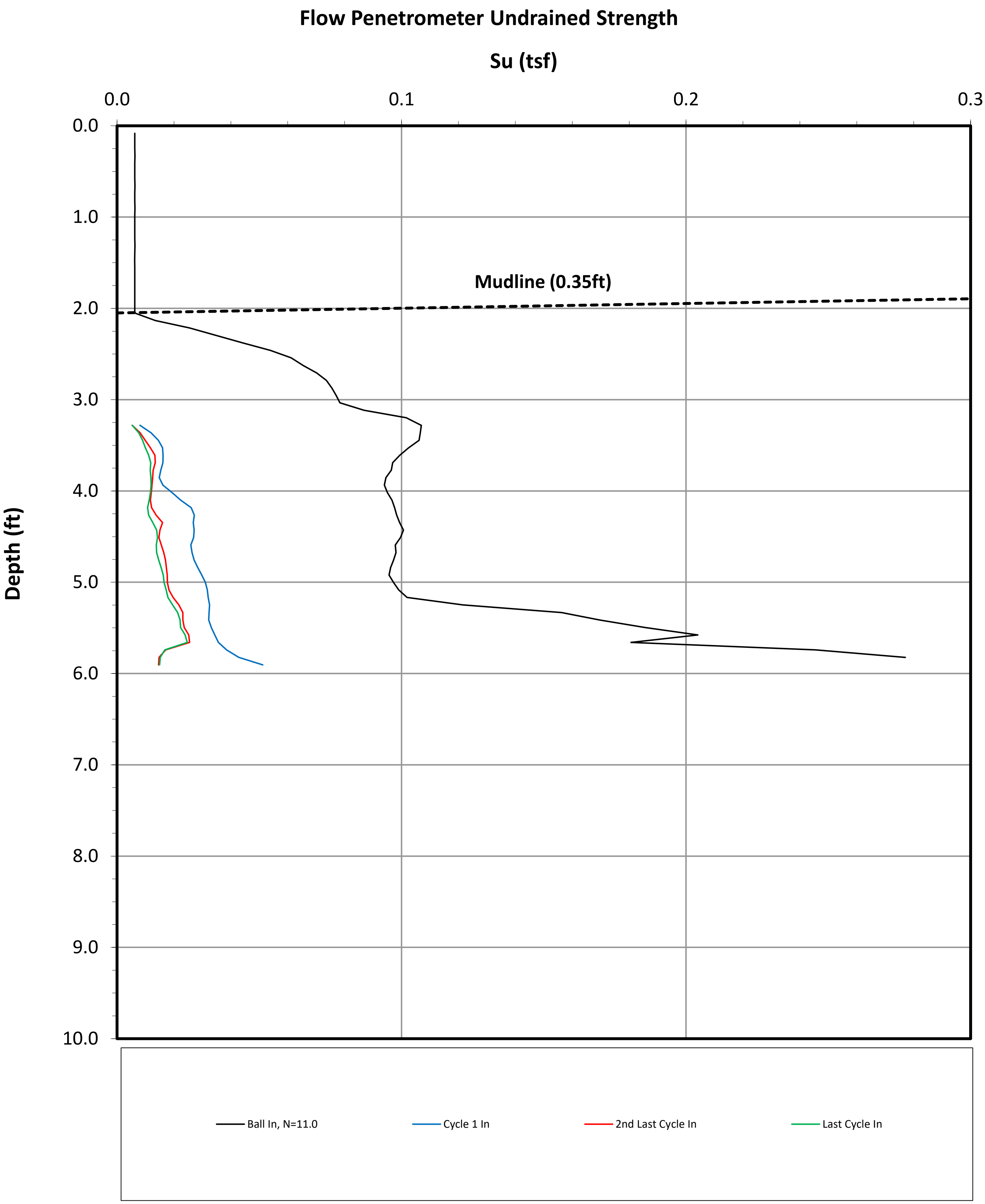
Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.5322979
Long (deg): -122.3193655

Flow Penetrometer Undrained Strength



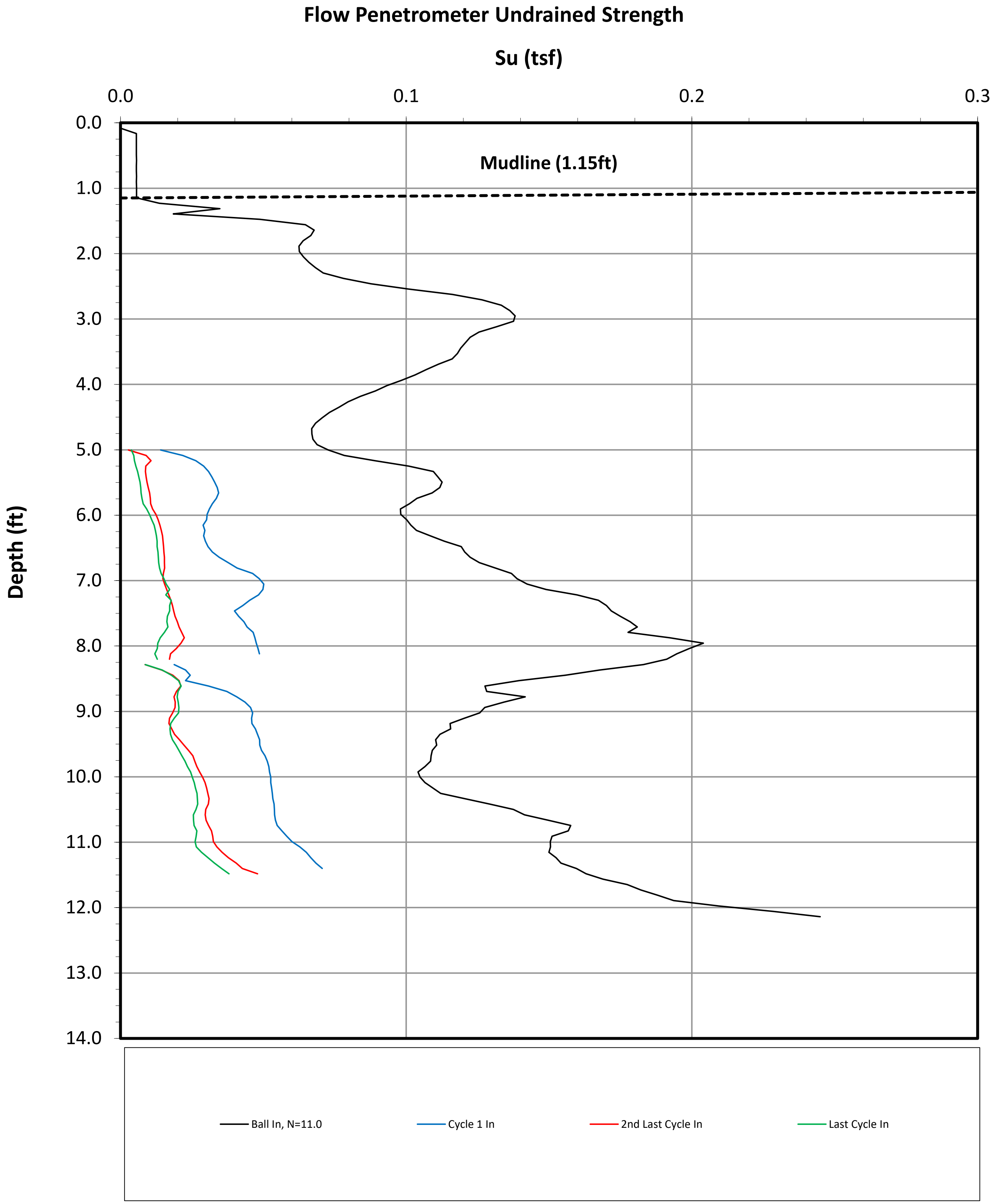
Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Sounding ID: LDW21-GT03-FFP Sounding Date: July 14, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.5275718
Long (deg): -122.3113628



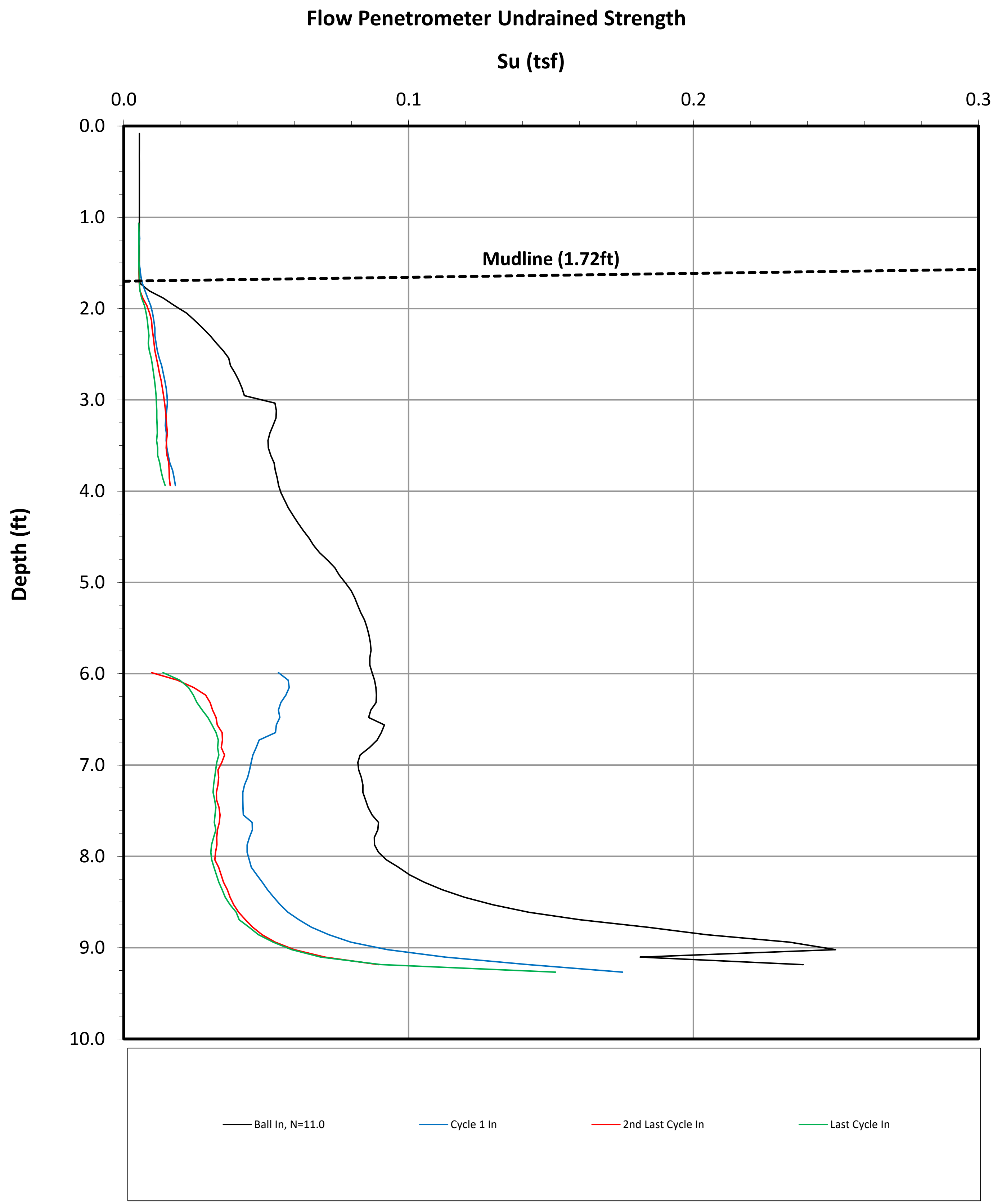
Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation Sounding
ID: LDW21-GT09-FFP Sounding Date: July 14, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg):
Long (deg):



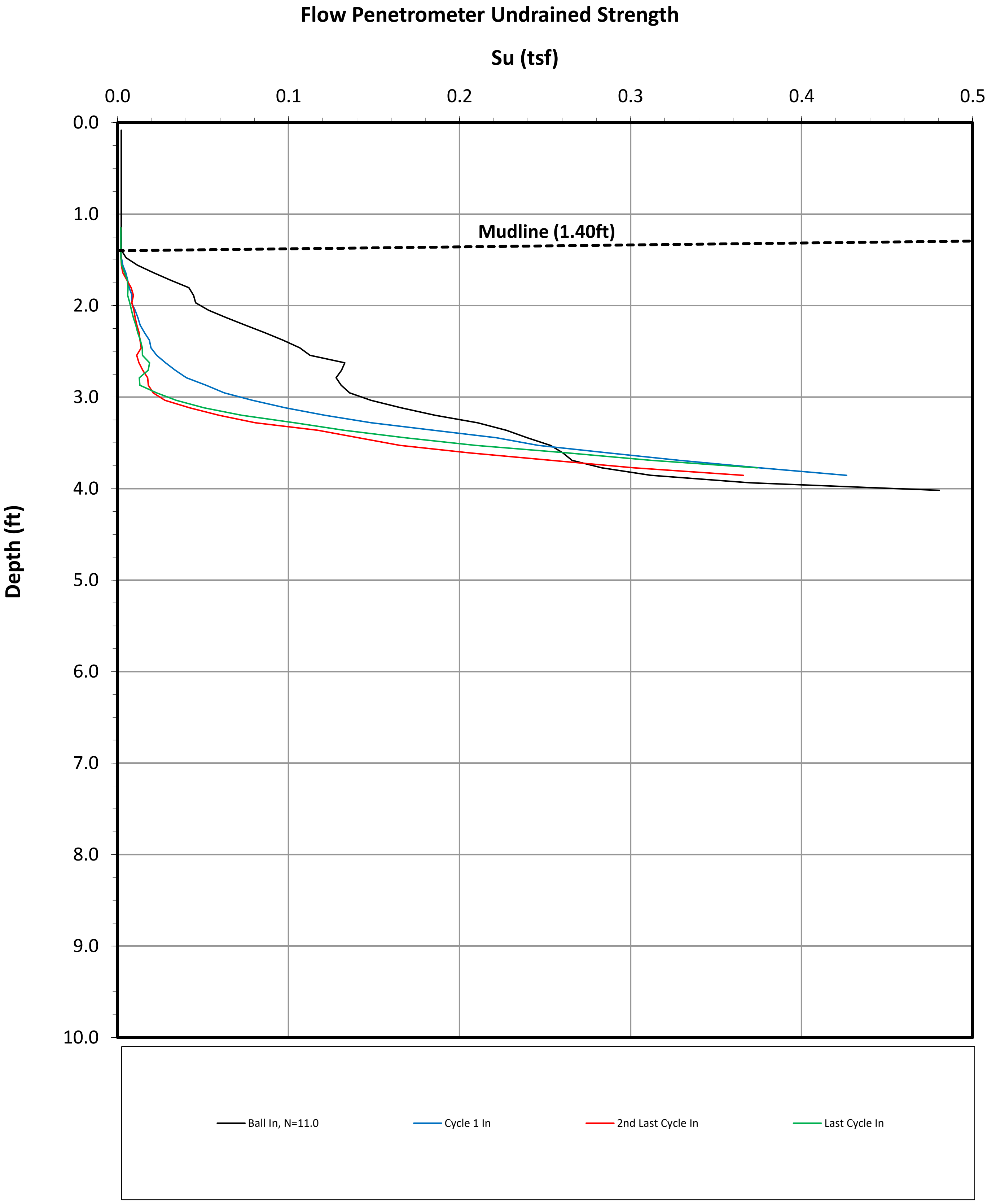
Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation Sounding ID: LDW21-GT11-FFP Sounding Date: July 16, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.5262259
Long (deg): -122.3096315



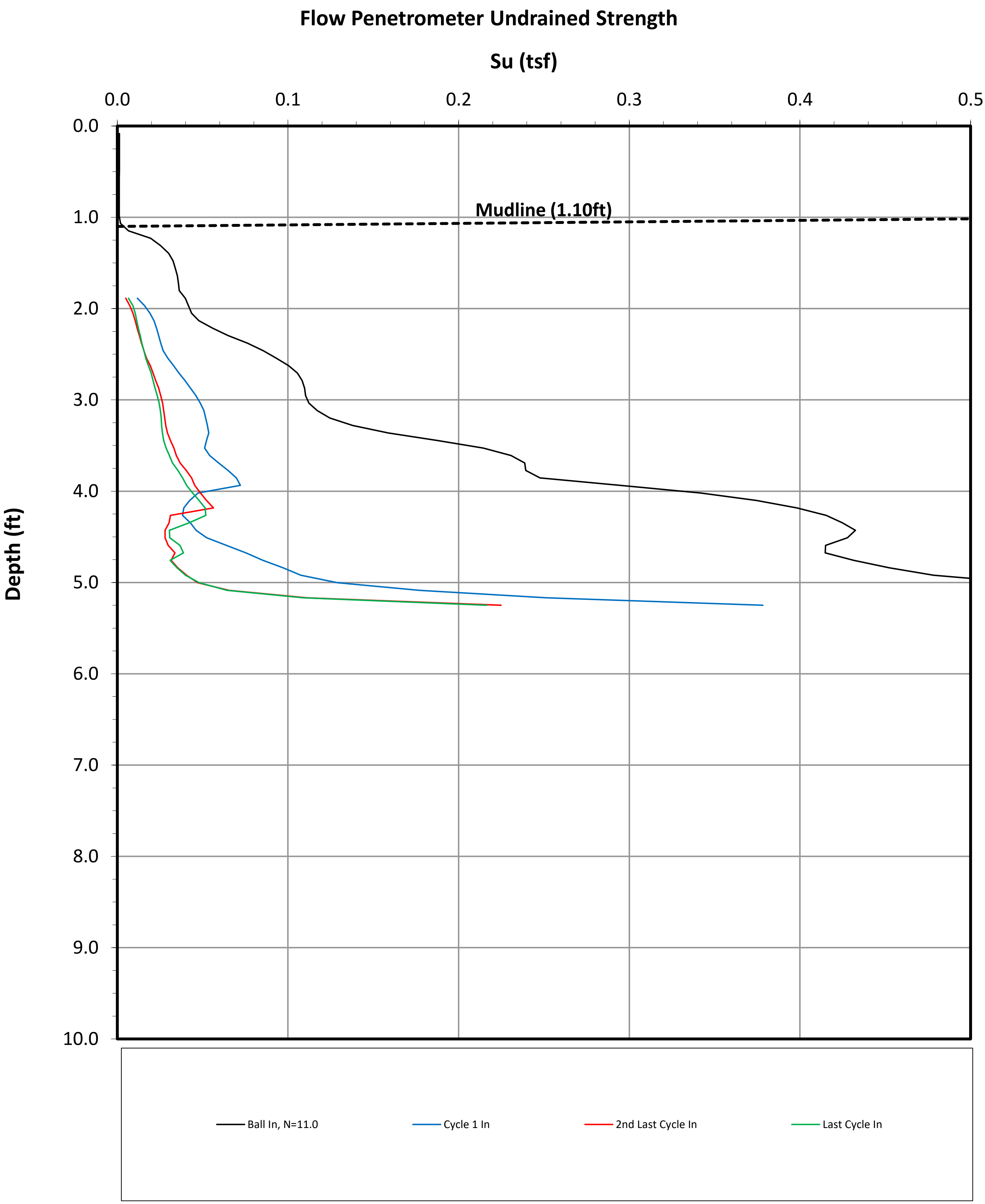
Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation Sounding ID: LDW21-GT26-FFP Sounding Date: July 16, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.5215043
Long (deg): -122.3068749



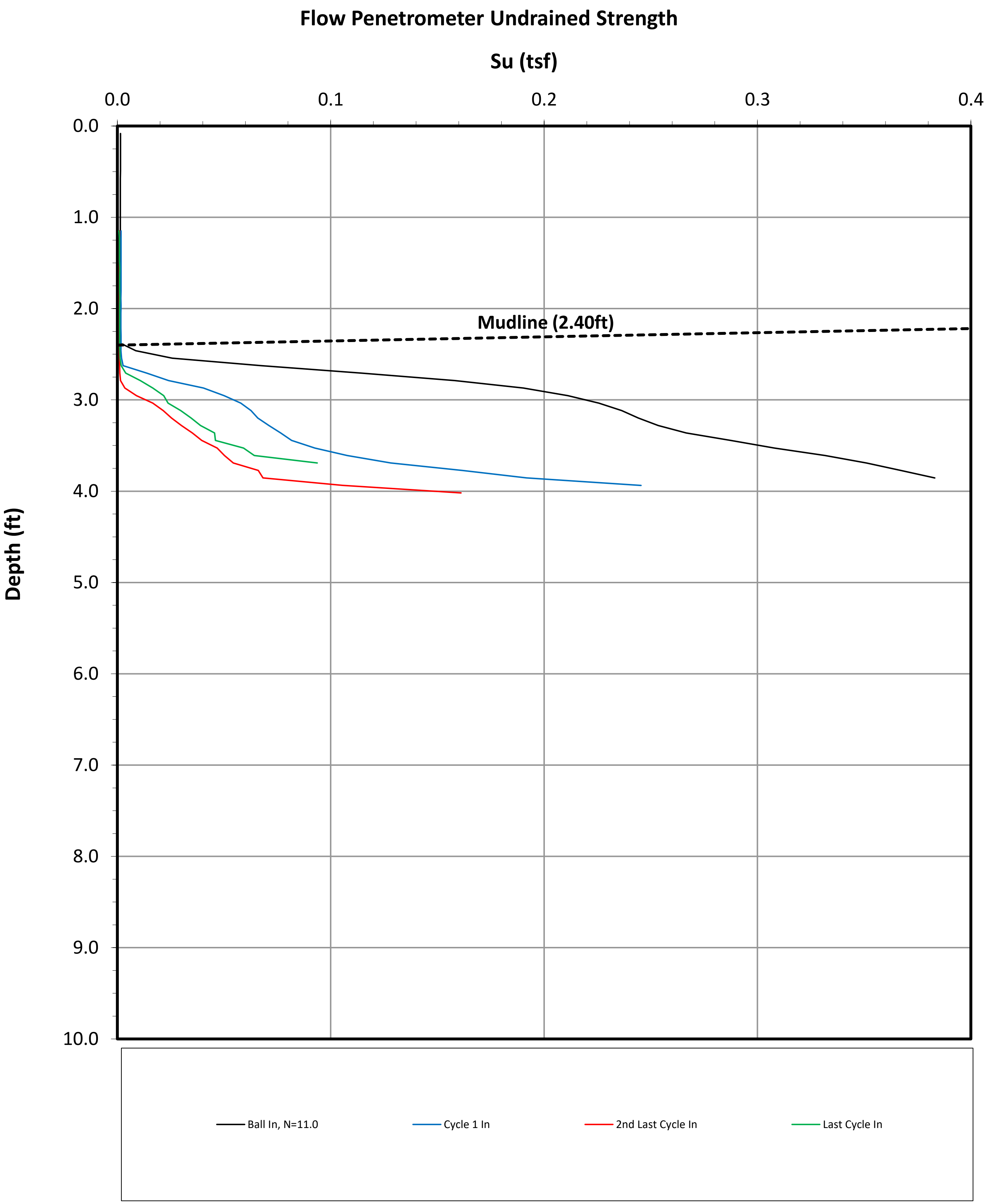
Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Sounding ID: LDW21-GT30-31-FFP Sounding Date: July 21, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.520508
Long (deg): -122.3058147



Job No: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Sounding ID: LDW21-GT32-34-FFP Sounding Date: July 21, 2021

Coordinate System: WGS 84 Lat/Long
Lat (deg): 47.5199896
Long (deg): -122.3058465



Electronic Field Vane Shear Test Profile Summary and Results

	Job Number:	21-59-22445
	Client:	Anchor QEA
	Project:	LDW Upper Reach Pre-Design Investigation
	Start Date:	06-Jul-2021
	End Date:	29-Jul-2021

ELECTRIC FIELD VANE SHEAR TEST SUMMARY

Sounding ID	File Name	Adjacent CPT Sounding ID	Rig	Date From	Date To	Latitude[1]	Longitude[1]	Refer to Notation Number
LDW21-GT04-GV	21-59-22445_VST04	NONE	C05-023	12-Jul-2021	12-Jul-2021			2
LDW21-GT20-GV	21-59-22445_VST20	NONE	C05-023	19-Jul-2021	19-Jul-2021			2
LDW21-GT-26-GV	21-59-22445_VST26	NONE	C05-023	07-Jul-2021	07-Jul-2021	47.521510	-122.306837	
LDW21-GT-26-GV-B	21-59-22445_VST26B	NONE	C05-023	07-Jul-2021	07-Jul-2021	47.521522	-122.306805	
LDW21-GT43-GV	21-59-22445_VST43	NONE	C05-023	22-Jul-2021	22-Jul-2021	47.511105	-122.303294	

1. Coordinates were provided by client
2. Coordinates currently not available. Corrdiantes will be proviced by client at a later date
3. Test depth reference depth below mudline.
4. All vane tests were completed from the floating barge platform. The vane test results were affected by barge movement from local waves, local vessel traffic and river flow. Additionally, the vane results were susceptible to elevation charge from either rising or falling tide. Over the course of a vane test the barge would gain/lose approximately 1”-4” of elevation due to tidal effects.

Job Number: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Start Date: 06-Jul-2021
End Date: 29-Jul-2021

ELECTRIC FIELD VANE SHEAR TEST RESULTS

Sounding ID	File Name	Date	Load Cell Serial Number	Load Cell Location	Casing/Drillout Depth (ft)	Test Depth[1] (ft)	Vane Diameter D (mm)	Vane Height H (mm)	Top Taper Angle i_T (deg)	Bottom Taper Angle i_B (deg)	Vane Factor (kPa/Nm)	Peak Torque (Nm)	Remolded Torque (Nm)	Peak Stress (tsf)	Remolded Stress (tsf)	Peak Frictional Stress (tsf)	Remolded Frictional Stress (tsf)	Su Peak (tsf)	Su Remolded (tsf)	Sensitivity	Refer to Notation Number
LDW21-GT04-GV	21-59-22445_VST04	12-Jul-2021	AVLC009	Surface	N/A	1.50	75	150	45	45	0.6106	10.28		0.07		0.003		0.06			
LDW21-GT04-GV	21-59-22445_VST04	12-Jul-2021	AVLC009	Surface	N/A	2.50	75	150	45	45	0.6106	16.52	2.69	0.11	0.02	0.001	0.002	0.10	0.02	6.83	
LDW21-GT20-GV	21-59-22445_VST20	19-Jul-2021	AVLC009	Surface	N/A	2.50	75	150	45	45	0.6106	67.49	5.27	0.43	0.03	0.003	0.002	0.43	0.03	13.40	
LDW21-GT20-GV	21-59-22445_VST20	19-Jul-2021	AVLC009	Surface	N/A	4.50	75	150	45	45	0.6106	13.50	3.49	0.09	0.02	0.002	0.003	0.08	0.02	4.26	
LDW21-GT-26-GV	21-59-22445_VST26	07-Jul-2021	AVLC013	Surface	N/A	1.17	60	120	45	45	1.1926	3.04	0.47	0.04	0.01	0.004	0.004	0.03	0.00	15.56	
LDW21-GT-26-GV	21-59-22445_VST26	07-Jul-2021	AVLC013	Surface	N/A	3.17	60	120	45	45	1.1926	6.79	2.51	0.08	0.03	0.007	0.008	0.08	0.02	3.36	
LDW21-GT-26-GV	21-59-22445_VST26	07-Jul-2021	AVLC013	Surface	N/A	4.42	60	120	45	45	1.1926	4.23		0.05		0.004		0.05			
LDW21-GT-26-GV-B	21-59-22445_VST26B	07-Jul-2021	AVLC013	Surface	N/A	1.17	75	150	45	45	0.6106	14.96		0.10		0.003		0.09			
LDW21-GT43-GV	21-59-22445_VST43	22-Jul-2021	AVLC009	Surface	N/A	1.08	75	150	45	45	0.6106	43.50	6.22	0.28	0.04	0.003	0.001	0.27	0.04	7.03	
LDW21-GT43-GV	21-59-22445_VST43	22-Jul-2021	AVLC009	Surface	N/A	3.17	75	150	45	45	0.6106	72.29		0.46		0.003		0.46			

1. Test depths are referenced to the middle of the vane.

Job Number: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach Pre-Design Investigation
Start Date: 06-Jul-2021
End Date: 29-Jul-2021

ELECTRIC FIELD VANE SHEAR TEST TIMING

Sounding ID	Date	Test Depth[1] (ft)	Vane Insertion Time (HH:mm)	Peak Test Start Time (HH:mm)	Insertion to Start Interval (min)	Start to Failure Interval (sec)	Peak Test Avg Rate (deg/sec)	Remolding Completion Time (HH:mm)	Remold Test Start Time (HH:mm)	Remolding to Start Interval (min)	Remold Test Avg Rate (deg/sec)	Refer to Notation Number
LDW21-GT04-GV	12-Jul-2021	1.50	17:27	17:27	1	150	0.12					
LDW21-GT04-GV	12-Jul-2021	2.50	18:21	18:23	16	357	0.11	18:32	18:33	27	0.11	
LDW21-GT20-GV	19-Jul-2021	2.50	12:15	12:16	1	686	0.12	12:34	12:35	20	0.11	
LDW21-GT20-GV	19-Jul-2021	4.50	12:49	12:50	36	307	0.11	12:57	12:58	43	0.11	
LDW21-GT-26-GV	07-Jul-2021	1.17	14:08	14:10	2	210	0.08	14:22	14:23	16	0.09	
LDW21-GT-26-GV	07-Jul-2021	3.17	14:33	14:35	28	492	0.08	14:54	14:55	47	0.08	
LDW21-GT-26-GV	07-Jul-2021	4.42	15:08	15:11	63	269	0.08					
LDW21-GT-26-GV-B	07-Jul-2021	1.17	15:57	15:58	1	303	0.10					
LDW21-GT43-GV	22-Jul-2021	1.08	16:06	16:10	4	330	0.12	16:21	16:22	16	0.13	
LDW21-GT43-GV	22-Jul-2021	3.17	16:35	16:36	31	400	0.12					

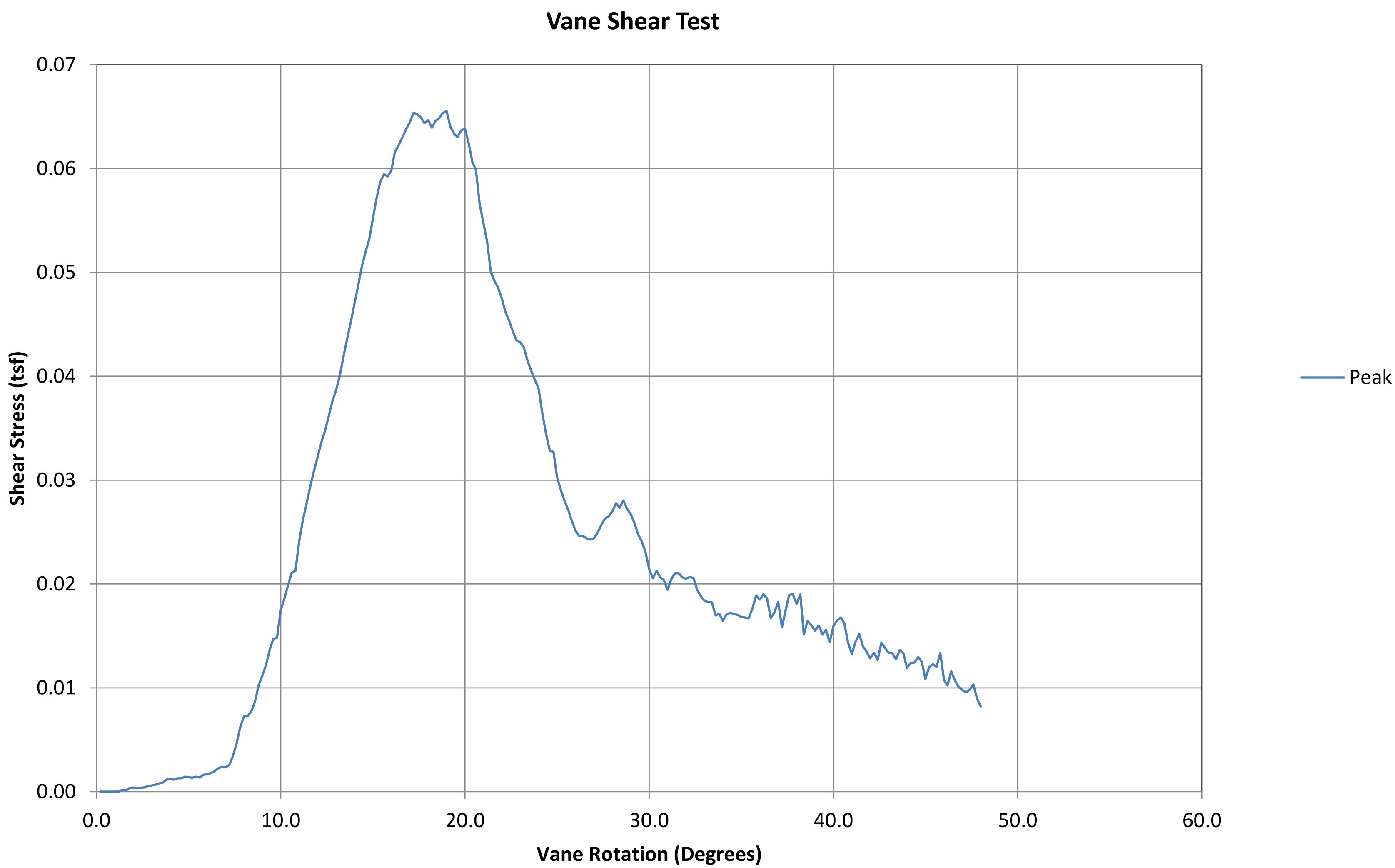
1. Test depths are referenced to the middle of the vane.

Electronic Field Vane Shear Test Plots

Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT04-GV

Test Date: 12-Jul-2021 17:27
Test Depth (ft): 1.50
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

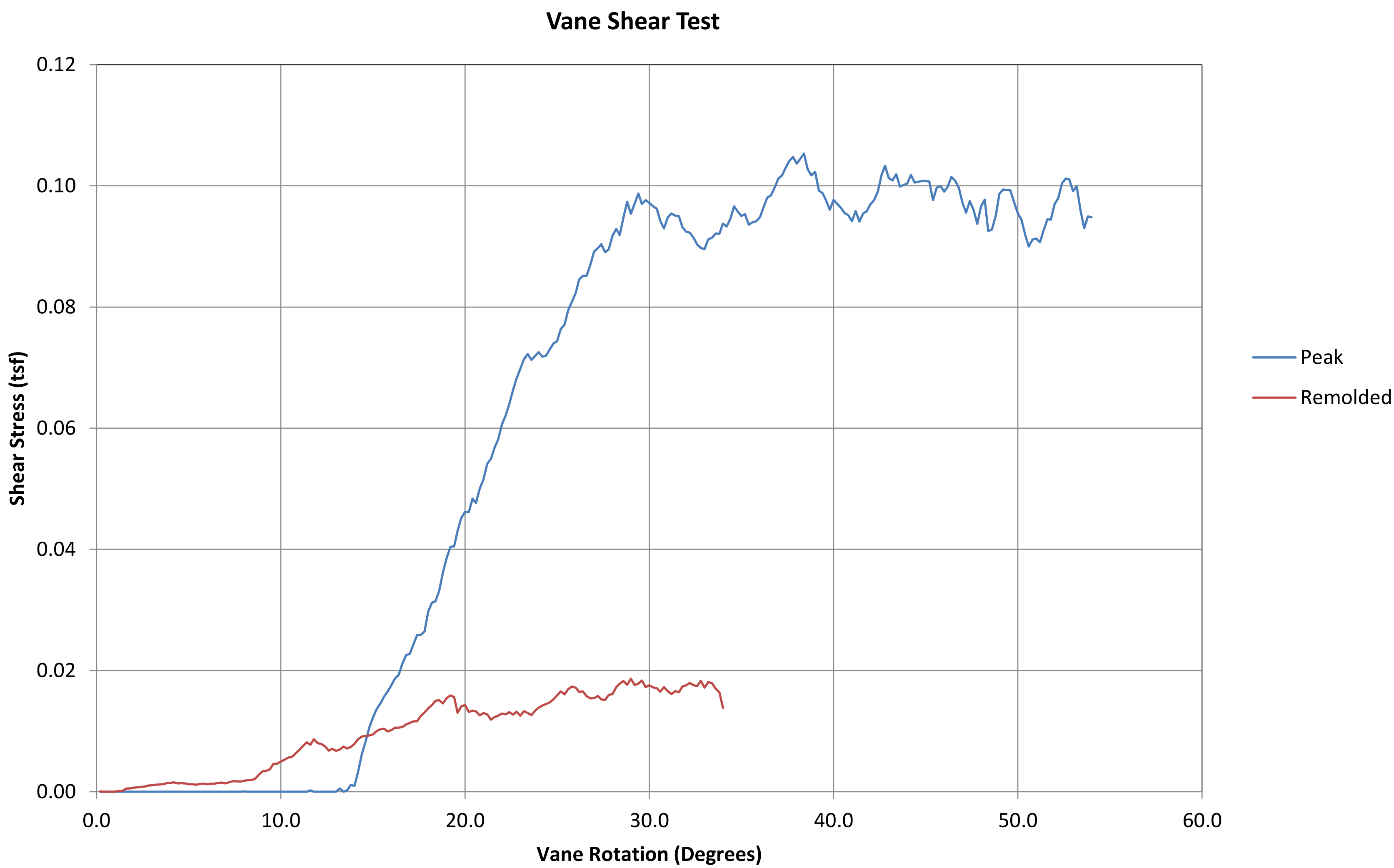
Coordinate System: WGS 84 Lat/Long
Latitude: 0
Longitude: 0



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT04-GV

Test Date: 12-Jul-2021 18:23
Test Depth (ft): 2.50
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

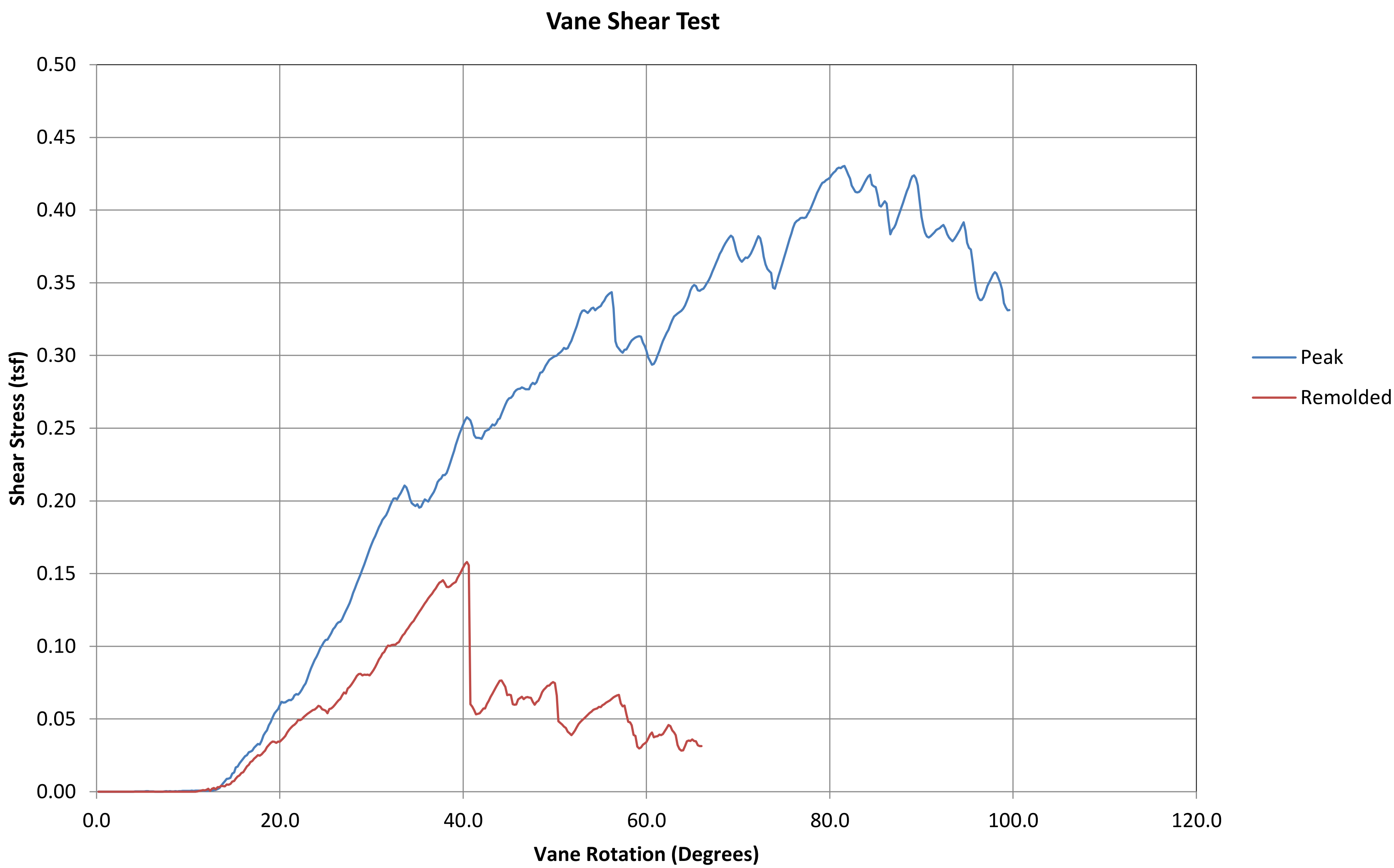
Coordinate System: WGS 84 Lat/Long
Latitude: 0
Longitude: 0



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT20-GV

Test Date: 19-Jul-2021 12:16
Test Depth (ft): 2.50
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

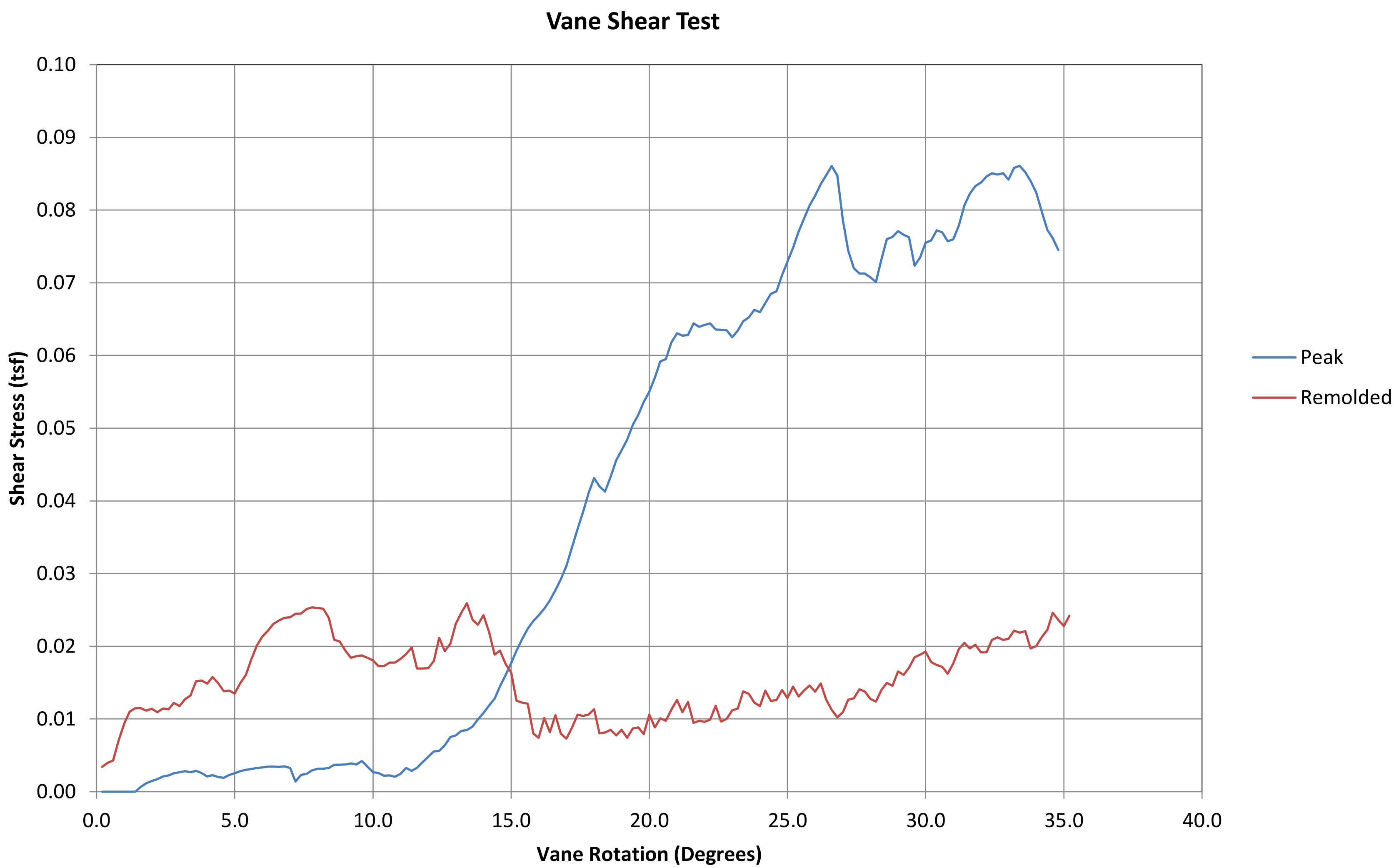
Coordinate System: WGS 84 Lat/Long
Latitude: 0
Longitude: 0



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT20-GV

Test Date: 19-Jul-2021 12:50
Test Depth (ft): 4.50
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

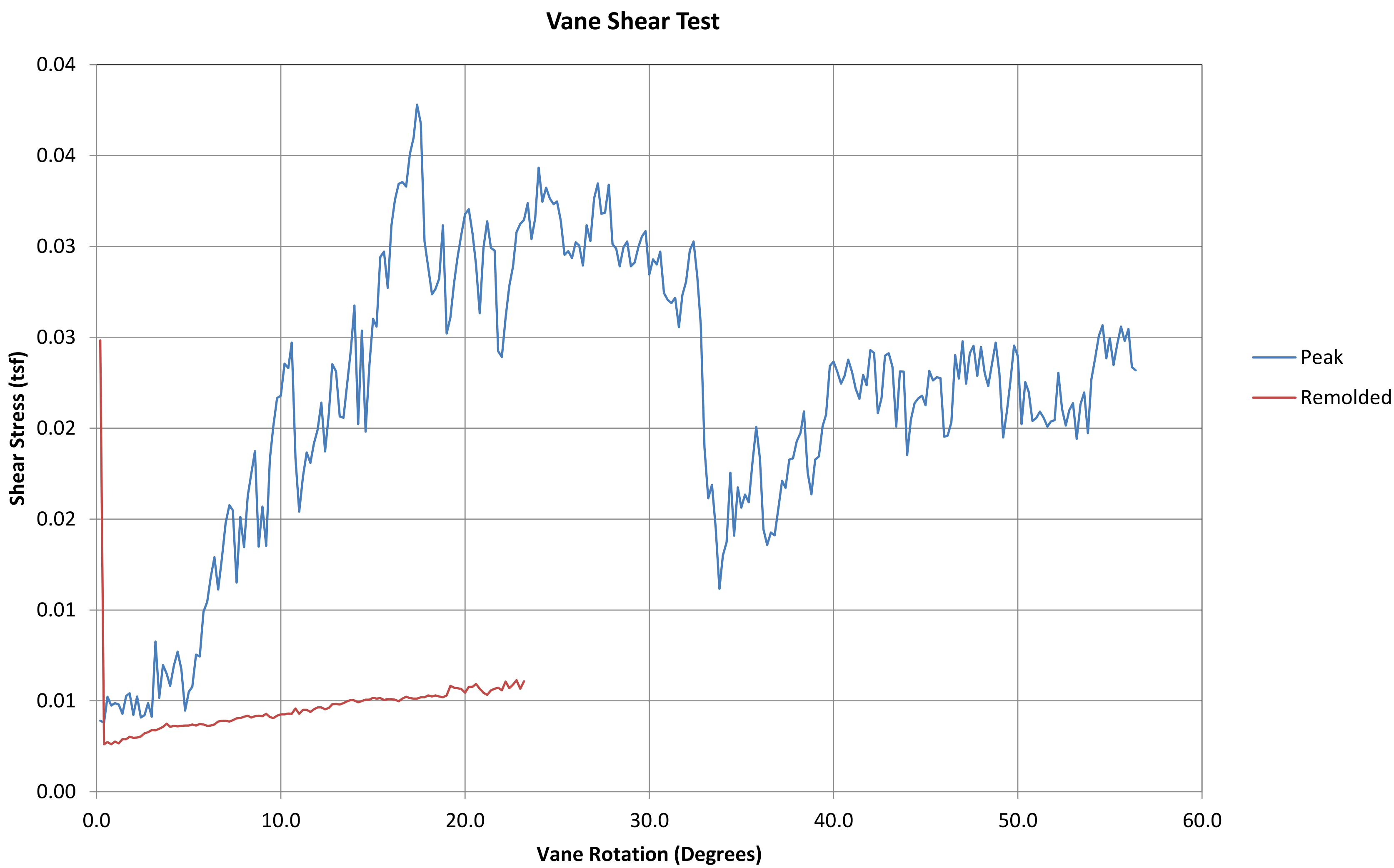
Coordinate System: WGS 84 Lat/Long
Latitude: 0
Longitude: 0



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT-26-GV

Test Date: 07-Jul-2021 14:10
Test Depth (ft): 1.17
Vane Type: Adara solid double tapered 60 x 120 mm (45°, 45°)

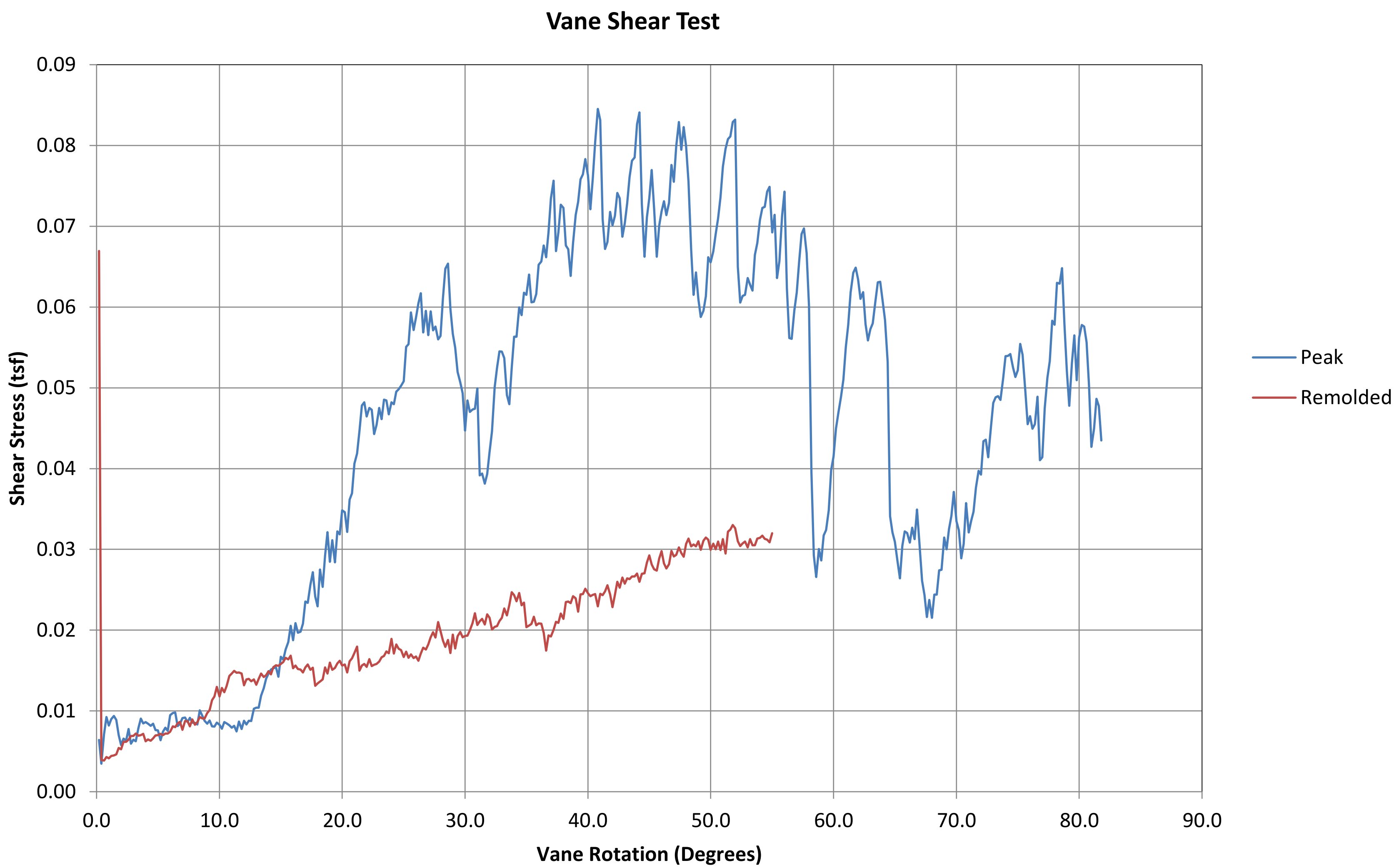
Coordinate System: WGS 84 Lat/Long
Latitude: 47.5215097
Longitude: -122.3068371



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT-26-GV

Test Date: 07-Jul-2021 14:35
Test Depth (ft): 3.17
Vane Type: Adara solid double tapered 60 x 120 mm (45°, 45°)

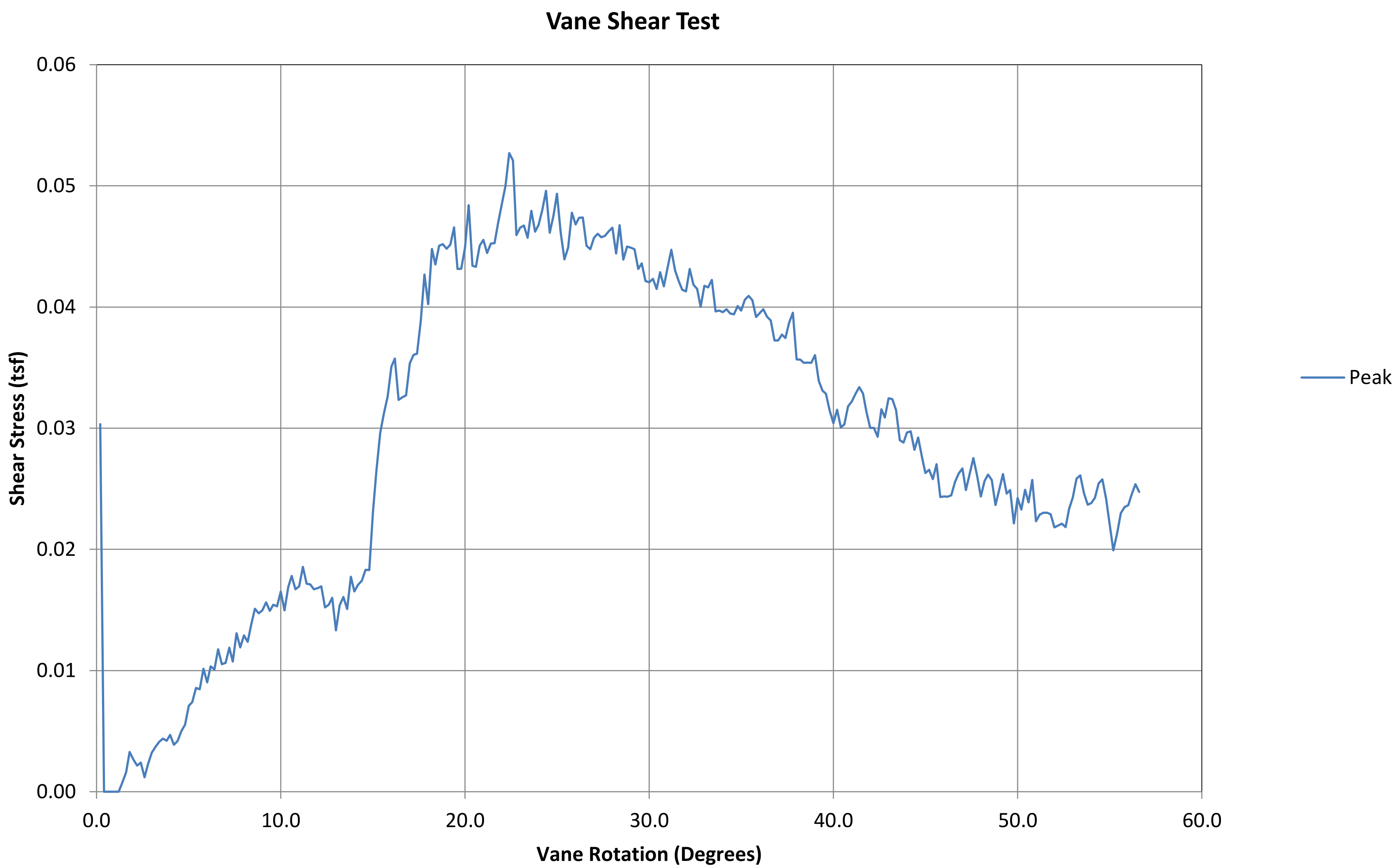
Coordinate System: WGS 84 Lat/Long
Latitude: 47.5215097
Longitude: -122.3068371



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT-26-GV

Test Date: 07-Jul-2021 15:11
Test Depth (ft): 4.42
Vane Type: Adara solid double tapered 60 x 120 mm (45°, 45°)

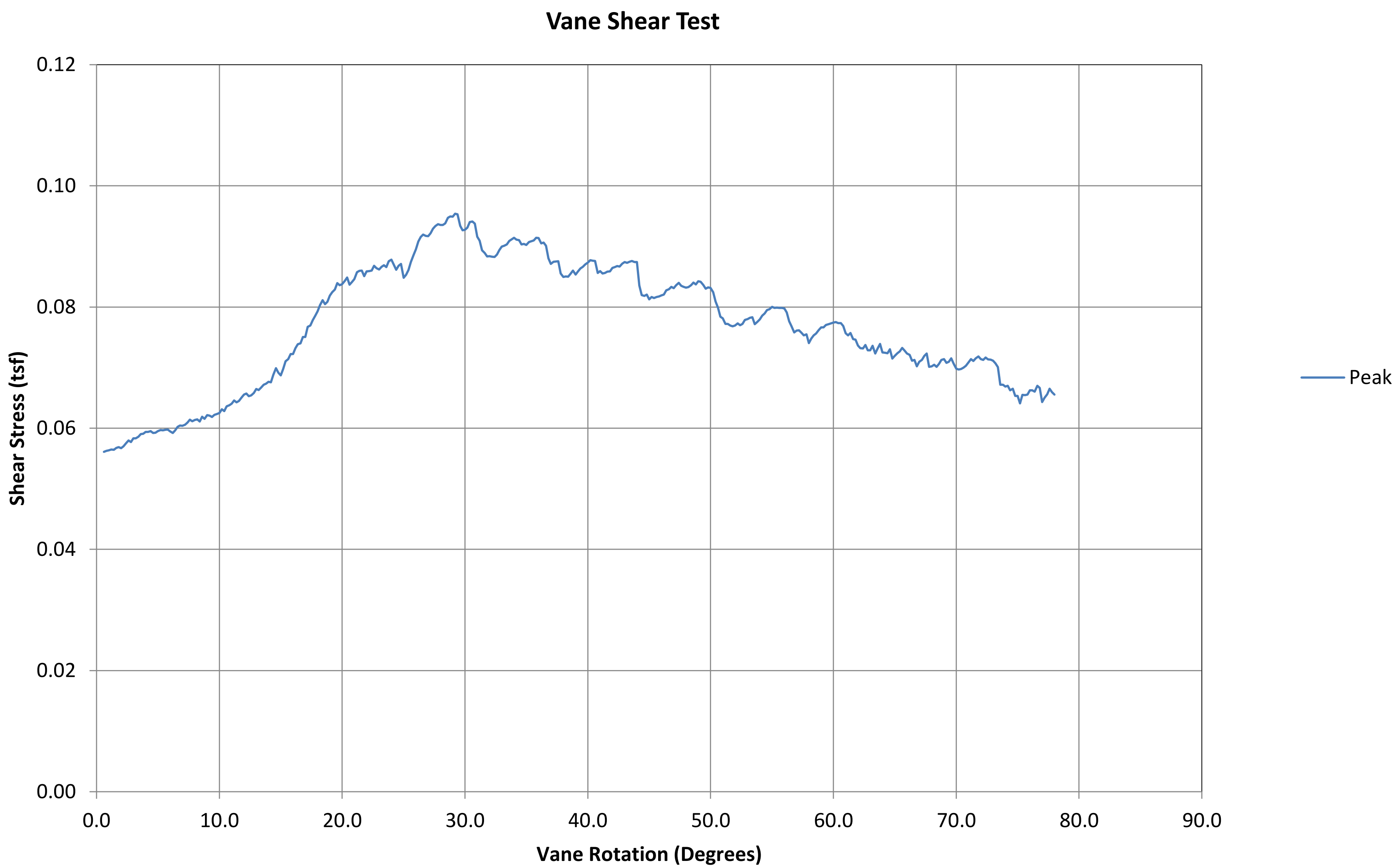
Coordinate System: WGS 84 Lat/Long
Latitude: 47.5215097
Longitude: -122.3068371



Job Number: 21-59-22445
Client: Anchor QEA
Project: LDW Upper Reach
Pre-Design Investigation
Sounding: LDW21-GT-26-GV-B

Test Date: 07-Jul-2021 15:58
Test Depth (ft): 1.17
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

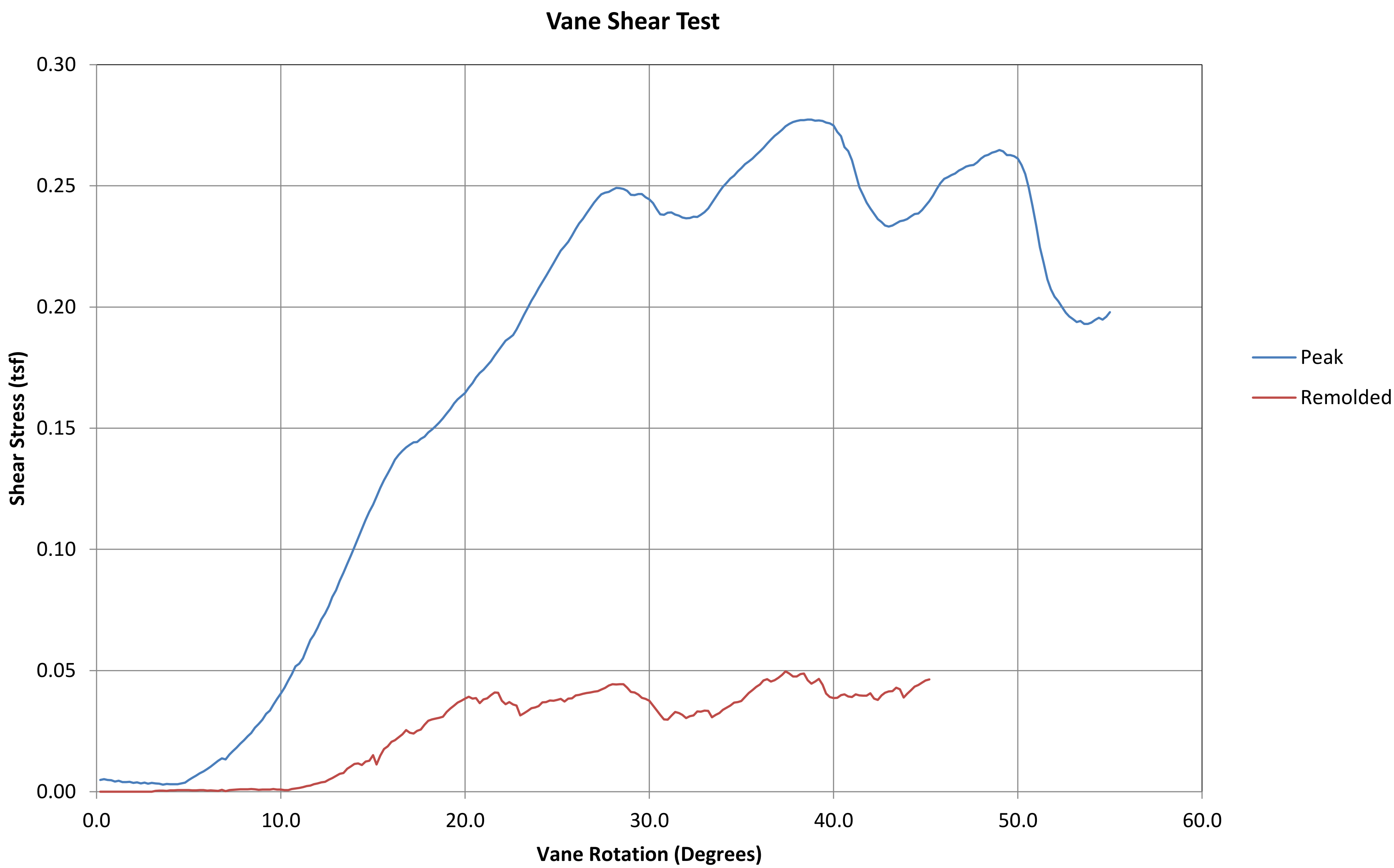
Coordinate System: WGS 84 Lat/Long
Latitude: 47.5215216
Longitude: -122.3068046



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT43-GV

Test Date: 22-Jul-2021 16:10
Test Depth (ft): 1.08
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

Coordinate System: WGS 84 Lat/Long
Latitude: 47.5111048
Longitude: -122.3032936



Job Number: 21-59-22445
Client: Anchor QEA Project: LDW Upper Reach Pre-Design Investigation
Sounding: LDW21-GT43-GV

Test Date: 22-Jul-2021 16:36
Test Depth (ft): 3.17
Vane Type: Adara solid double tapered 75 x 150 mm (45°, 45°)

Coordinate System: WGS 84 Lat/Long
Latitude: 47.5111048
Longitude: -122.3032936