Texas Commission on Environmental Quality

Remediation Division Correspondence Identification Form

SITE & PROGRAM AREA IDENTIFICATION

SITE LOCATION		REMEDIATION DIVISION PROGRAM AND FACILITY IDENTIFICATION	
Site Name:	Union Pacific Railroad Houston Wood Preserving Works	Is This Site Being Managed Under A State Lead Contract?	☐ Yes ☑ No
Address 1:	4910 Liberty Road	Program Area:	IHW Corrective Action
Address 2:		Mail Code:	MC-127 (IHW)
Houston	State: Texas	Is This A New Site To This Program Area?	☐ Yes ☑ No
Zip Code: 77026	County: Harris	Additional Information:	SWR No. 31547
TCEQ Region:	Houston - 12	Additional Information:	Permit/ Compliance Plan No. 50343

DOCUMENT(S) IDENTIFICATION

	PHASE OF REMEDIATION	DOCUMENT NAME
1.	Miscellanous	Interim NAPL and TPH-NAPL Assessment Report
2.	Please select a phase of remediati	
3.	Please select a phase of remediati	
4.	Please select a phase of remediati	
5.	Please select a phase of remediati	

CONTACT INFORMATION

☑ I attest that all work has been done in accordance with TCEQ rules

☑ I certify that I am aware misrepresentation of any claim is a violation.

RESPONSIBLE PARTY/APPLICANT/CUSTOMER INFORMATION (IF APPLICABLE)

Union Pacific Railroad

ENVIRONMENTAL CONSULTANT/REPORT PREPARER/AGENT

Golder Associates Inc.

SIGNATURES

DATABASE CODES

Document No.	TCEQ Database Term	Document No.	TCEQ Database Term
1.		4.	
2.		5.	
3.			

GOLDER

INTERIM NON-AQUEOUS PHASE LIQUID (NAPL) AND TOTAL PETROLUEM HYDROCARBON (TPH)-NAPL ASSESSMENT REPORT

Union Pacific Railroad Houston Wood Preserving Works Facility

Submitted to:

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EXECUTIVE SUMMARY

This Interim Non-Aqueous Phase Liquid (NAPL) and Total Petroleum Hydrocarbon(TPH)-NAPL Assessment Report, prepared by Golder Associates Inc. (Golder) on behalf of Union Pacific Railroad (UPRR), details the supplemental NAPL and TPH-NAPL assessments requested by the Texas Commission on Environmental Quality (TCEQ) that were conducted at the UPRR Houston Wood Preserving Works (HWPW) Site (the Site) in 2019 and 2020.

The NAPL assessment consisted of 54 cone-penetrometer testing (CPT)/Tar-specific Green Optical Screening Tool (TarGOST®) laser-induced fluorescence (LIF) borings that were advanced to refine previous assessments of the lateral and vertical extent of Dense NAPL (DNAPL) in the subsurface. TarGOST® borings were advanced in three areas: (1) off-site, generally north of the HWPW Site; (2) along and adjacent to the northern and western perimeter of the Site; and (3) within the Englewood Intermodal Yard in the Site interior. The assessment indicated the following for each area:

- Off-Site: There is no evidence of NAPL present off-site to the north of Liberty Road and north of the Site, within the A-Cohesive Zone (A-CZ) (vadose zone) or the A-Transmissive Zone (A-TZ). TarGOST® data from off-site borings to the north indicate the presence of NAPL in the B-Cohesive Zone/ B-Transmissive Zone (B-TZ/B-CZ), at a general depth of 24 or more feet below ground surface (bgs) and the extent of NAPL in the B-TZ/B-CZ in this area is limited to an approximate distance of 500 feet or less from the Site boundary.
- Northern and Western Perimeter of the Site: The extent of NAPL within the vadose zone, A-TZ, and B-CZ/B-TZ is delineated to the east and west along the northern perimeter of the HWPW site. TarGOST® signals indicating the potential presence of NAPL in the vadose zone and the A-TZ along the northern perimeter are consistent with historical observations, except at CPT-12-20 and CPT-13-20. Previous CPT-Rapid Optical Screening Testing (ROST™) borings had not identified elevated ROST™ responses in the vadose zone and A-TZ near TarGOST® borings CPT-12-20 and CPT-13-20. The extent of NAPL within the vadose zone, A-TZ, and B-CZ/B-TZ is delineated to the north, west, and south at the western perimeter of the HWPW site based on observations in TarGOST® borings, soil borings and groundwater sampling data. In-well DNAPL thickness measurements have been observed in B-CZ/B-TZ monitoring wells MW-12B and MW-41B on the west side of the Site; however, TarGOST® signals from all but two CPT borings in this vicinity did not indicate the potential presence of NAPL in the B-CZ/B-TZ. These data, coupled with the absence of measurable DNAPL in the nearby B-CZ/B-TZ monitoring wells, suggest a very localized area of NAPL in this unit within this area of the Site.
- Englewood Intermodal Yard: TarGOST® data in the Englewood Intermodal Yard indicate that NAPL is present in the vadose zone, the A-TZ, and the B-CZ/B-TZ, mainly near the former lagoon and former aboveground storage tank (AST) areas identified on historical aerials and maps. The TarGOST® data indicated that the extent of NAPL in each zone in the Englewood Intermodal Yard is delineated to the west, south, and east.

Findings were based on a combination of observations made from the CPT/TarGOST® data, previously collected CPT-ROST™ data, observations of DNAPL in monitoring wells, geologic boring logs, and recently collected groundwater data. TarGOST® data that indicate the presence of NAPL will be used in conjunction with other investigation data to support development of the response action objectives and support the remedial design of potential DNAPL recovery activities, which will be presented in the Revised Response Action Plan (RAP).

The TPH-NAPL assessment consisted of 56 soil samples from 28 soil borings to evaluate the horizontal and vertical extent of TPH concentrations in soils and identify possible source characteristics for TPH in soils at the Site. Following TCEQ guidance, a preliminary evaluation of TPH concentrations (TX1005 data) in soils was conducted by comparing the soil results to applicable screening level Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs). Results from the soil assessment indicate that TPH concentrations in soils exceeded applicable screening level TRRP PCLs on the western and northern perimeter of the Site and near the center of the Site in the Englewood Intermodal Yard. The NAPL assessment within the Englewood Intermodal Yard indicated total TPH TX1005 concentrations in eight soil samples exceeded the Tier 1 $Soil_{Res}$ PCL of 10,000 mg/kg, located within the former AST area and general area of the former lagoons within the Englewood Intermodal Yard. At each of these soil boring locations, either NAPL was visually observed or strong hydrocarbon odors were noted on the soil boring logs. The soil TPH TX1005 results are delineated to less than the Tier 1 $Soil_{Res}$ PCL to the north, south, east, and west.

Based on the profile of the predominant peaks in gas chromatograms and fractionation data, the TPH results for the soil samples were assigned four categories of different TPH types. Samples with elevated TX1005 TPH concentrations and different compositional distributions were selected for TX1006 analyses to develop TPH Mixture critical PCLs for each category identified. The soil samples with the highest total TPH concentrations were chosen as representative samples of each category and Tier 1 PCLs for Total TPH Mixture were calculated. The calculated Tier 1 TPH Mixture PCLs were used as critical PCLs to evaluate the total TPH by TX1005 Method soil sample concentration data. None of the soil samples had total TPH concentrations greater than the calculated commercial/industrial Tier 1 TPH Mixture critical PCLs, and therefore there is no Total TPH PCLE Zone for soils at the Site. However, one soil sample collected at DPT-12-20 (8-9 feet below ground surface) (adjacent to CPT-12-19) near the northern perimeter of the Site had total TPH concentrations that exceeded the calculated residential critical PCL. Additional sampling closer to the property boundary north of DPT-12-20 is recommended to evaluate the lateral extent of the total TPH concentrations exceeding the residential Tier 1 TPH Mixture critical PCL in the surface soils.

1.0 INTRODUCTION

This Interim Non-Aqueous Phase Liquid (NAPL) and Total Petroleum Hydrocarbon (TPH)-NAPL Report (Interim NAPL-TPH Report) was prepared by Golder Associates Inc. (Golder), on behalf of Union Pacific Railroad (UPRR), to summarize supplemental NAPL and TPH-NAPL assessments conducted at the UPRR former Houston Wood Preserving Works (HWPW) site (the Site). The supplemental assessments were requested by the Texas Commission on Environmental Quality (TCEQ) in a Technical Notice of Deficiency (TNOD) letter dated April 11, 2019, which included the following comment:

> *General Comments T35(4), T42(4), T44(4), and T45(4): Since the TCEQ is requiring UPRR to conduct further assessment of TPH-NAPL in the Englewood Intermodal Yard cap area as directed in the TCEQ February 6, 2019 letter and a VI assessment as directed in Comment T59 of this NOD, the additional assessment should include a re-assessment of creosote DNAPL using cone penetrometer/ rapid optical screening tool (CPT/ROST™).*

UPRR provided a description of the proposed supplemental NAPL and TPH-NAPL assessments in Worksheet 2.0 of the Conceptual Response Action Plan (RAP) – Revision No. 4 dated July 9, 2019 (Golder, 2019a). TCEQ issued a notice to proceed with proposed additional assessments with certain modifications as requested in a letter dated September 6, 2019. UPRR, Golder, and TCEQ met on September 23, 2019 at the TCEQ Austin Office to discuss the modifications to the assessments. Golder, on behalf of UPRR, submitted a response letter dated October 23, 2019 to the TCEQ September 6, 2019 letter summarizing the modifications agreed upon during the meeting. The TCEQ issued a notice to proceed with proposed NAPL and TPH-NAPL assessments as revised in the October 23, 2019 letter in a letter dated December 13, 2019.

A description of the additional NAPL assessment and TPH-NAPL assessment activities and an evaluation of the data collected are provided in the following sections.

2.0 NAPL ASSESSMENT

In response to the TCEQ's request for re-assessment of Dense NAPL (DNAPL) and to refine the observed subsurface distribution of DNAPL at the Site, Golder conducted the additional DNAPL assessment activities pursuant to the general scope detailed in the Conceptual RAP as modified in the October 23, 2019 letter and approved by TCEQ. A brief summary of the primary objectives of the assessment activities are presented below:

- Refine previous assessments of the lateral and vertical extent of DNAPL in the subsurface;
- Further update the historical DNAPL/subsurface conceptual site model (CSM) by reviewing results from previous investigations (over 90 previous cone-penetrometer testing (CPT)/Rapid Optical Screening Tool™ (ROST™) laser-induced fluorescence (LIF) borings) with the activities conducted as part of this investigation;
- Support design of potential DNAPL recovery activities (e.g., additional recovery wells) or systems, as appropriate; and
- Update the subsurface DNAPL CSM to support the risk-based DNAPL management plan to be developed in accordance with TCEQ guidance provided in RG-366 (Risk-Based NAPL Management; Texas Risk Reduction Program (TRRP-32) (TCEQ, 2013).

This Interim NAPL-TPH Report includes information to address the first two bullets, with the design of potential DNAPL recovery activities and the updated risk-based NAPL management plan to be provided in the Revised RAP that will submitted to the TCEQ by August 31, 2020.

2.1 Background

As discussed in the previous APARs and in the RAP, certain areas of the shallow groundwater bearing units (GWBUs) at the Site contain creosote-related DNAPL and associated dissolved chemicals of concern (COCs) at concentrations above their respective critical Protective Concentration Levels (cPCLs). The sources of DNAPL are likely from former operations at the Site.

Since 1995, site investigations have included activities to evaluate surface and subsurface soils for the presence of NAPL. Specifically, CPT/ROST™ investigations were conducted in 1995, 2001, 2008, and 2013 at the Site using laser-induced fluorescence (LIF) to identify the presence of NAPL (Figure 1). As part of these investigations over 100 CPT/ROST™ borings and over 300 soil borings have been installed at the Site. Based on soil borings, measured DNAPL thicknesses in existing wells, and ROST™ readings, the occurrences of NAPL in the A-Cohesive Zone (A-CZ or vadose zone), the A-Transmissive Zone (A-TZ), B-Cohesive Zone/ B-Transmissive Zone (B-TZ/B-CZ), and C-Transmissive Zone (C-TZ) were described in the updated APAR addendum dated October 22, 2010 (PBW, 2010) and Attachment 2G (Technical Impracticability Demonstration Document) of the Response Action Plan (RAP) Revision 2 dated July 20, 2016 (PBW, 2016). As detailed in these documents, evidence of DNAPL from the ROST™ borings was generally observed in the following areas within these lithologic intervals:

- Vadose zone and the A-TZ - The majority of the elevated ROST™ readings (i.e., >25 units of fluorescence percent response (% RE)) in the vadose zone and A-TZ were located in and around the HWPW Recent Process Area, Original Process Area, and the AST Area (SWMUs 4, 5, and 8, respectively), and extended into the northern portions of the Englewood IM Yard. The elevated ROST™ readings were generally consistent with intervals where NAPL was visually observed in soil borings for A-TZ wells, except for in the Englewood Intermodal Yard area. NAPL was noted on the boring logs for A-TZ wells MW-78A and MW-79A installed in the Englewood Intermodal Yard. However, there were no elevated ROST™ readings in this area of the Site. This may indicate the NAPL may have degraded through natural weathering/depletion process in this area of the Site, and as a result was less likely to be detected with the ROST™ tool.
- B-CZ/B-TZ - The majority of the elevated ROST™ readings in the B-CZ/B-TZ are in the vicinity of SWMUs 4 and 5. However, elevated ROST™ readings were observed in the B-CZ north of the Site at CPT/ROST™ boring CPT-43R-08, near MW-70B. The ROST™ readings in this area are consistent with the observations of NAPL in monitoring well soil borings in the B-CZ (i.e., MW-70B). Elevated ROST™ readings were also noted in the Englewood Intermodal Yard area (CPT-14-13). Monitoring wells MW-74B (installed within an area noted with >25% RE ROST™ readings) and MW-75B were installed in December 2011 in the Englewood Intermodal Yard to evaluate the presence of DNAPL in the B-CZ. NAPL was noted in the boring log in the B-CZ for both wells. However, no DNAPL has been detected in MW-74B during the 19 gauging events performed since well installation. In contrast, no significant ROST™ readings were noted for CPT/ROST™ borings CPT-07-13 or CPT-10-13 in the Englewood Intermodal Yard, but DNAPL has been observed in monitoring well MW-75B located in the immediate vicinity of CPT-07-13. As with the A-TZ, the NAPL in this area may be more degraded through weathering/depletion processes and less likely to be detected with the ROST™ tool. DNAPL has also been observed in wells

MW-12B and MW-41B on the western side of the Site, but minimal ROST™ responses were noted for that area; and
- C-TZ – Despite the C-TZ depth (top of unit approximately 65 feet below ground surface) being near the maximum limit of CPT penetration, 13 CPT/ROST™ borings were able to be advanced into or through the C-TZ. Most CPT borings reach refusal either at the top of the C-TZ or shallower and could not be advance through that unit. For the CPT/ROST™ borings that did advance into the C-TZ, the elevated ROST™ responses were relatively lower than the other GWBUs and centered near SWMU 5 (Original Process Area). DNAPL has been observed in C-TZ wells on the northeastern side of the Site and off-site to the northeast.

Based on this background information, Golder and UPRR working with the TCEQ developed the NAPL assessment plan detailed in the Conceptual RAP and modified in the October 23, 2019 letter to re-evaluate the NAPL at the Site. Details of the NAPL assessment methods are described in the sections below.

2.2 Assessment Methods

As part of the re-assessment of the DNAPL at the Site, Golder evaluated different qualitative NAPL screening tools for possible application at the Site. As discussed in Section 2.1, ROST™ LIF borings had been conducted at the Site during the previous NAPL assessment events. ROST™ LIF readily detects creosote and coal tar in the subsurface. However, the relative response sensitivity of the ROST™ LIF tool for coal tar and creosote is less when compared to responses to petroleum hydrocarbons such as gasoline, diesel fuel, and jet fuel (EPA, 1997). More recently, additional optical screening tools, such as the Tar-specific Green Optical Screening Tool (TarGOST®), have been developed to target heavier end petroleum hydrocarbons including creosote and coal tar. TarGOST® is a proprietary site characterization tool designed by Dakota Technologies (Dakota) for assessing NAPL, including DNAPL commonly encountered at wood treatment sites that used creosote-based preservation. Creosote DNAPLs typically contain large amounts of naturally fluorescent polycyclic aromatic hydrocarbons (PAHs). TarGOST® was specifically designed to screen for heavy molecular weight NAPL phase PAHs versus depth (Dakota, 2020; Attachment A).

As detailed in the Conceptual RAP – Revision 4 (Golder, 2019a), Golder, on behalf of UPRR, proposed to conduct the NAPL assessment using the TarGOST® system with the TarGOST® tool advanced by a CPT rig. Upon TCEQ approval of the proposed scope of work as described above, 54 CPT/TarGOST® borings were collected in three areas of the Site between December 2019 and January 2020:

- Off-site – CPT/TarGOST® borings were advanced within the City of Houston right-of-way (ROW) in the residential area north of the Site.
- Perimeter of the HWPW Site – CPT/TarGOST® borings were advanced along the west side of the Site near monitoring wells MW-41B and MW-12B, in which DNAPL has been observed, and along the north side of the Site between MW-15B and MW-18C.
- Englewood Intermodal Yard – CPT/TarGOST® borings were advanced in the areas of the former ASTs and former lagoons identified on historical aerials and maps in the Englewood Intermodal Yard and along the eastern side of the yard between MW-49B and MW-80B.

The TarGOST® system was installed within probe rods on a 20-ton Geoprobe® 2060CPT rig. Details of the TarGOST® system and setup are provided in the Dakota report provided in Attachment A. The subsurface was logged with the CPT probe and TarGOST® simultaneously. CPT is an in-situ method where a cone is pushed into the ground to collect measurements to identify general soil type. Tip resistance on the cone, friction in the sleeve of the cone, and pore pressure in the soil are recorded as the cone is advanced.

Prior to conducting the CPT/TarGOST® borings, hydrovac excavation methods (i.e., excavation using a high-pressure water probe and vacuum) were used to clear the top 10 feet at each CPT/TarGOST® location for the presence of underground utilities and backfilled with sand at all locations and capped with an asphalt patch at off-site locations before drilling commenced. Each location was drilled to a depth of approximately 65 feet below ground surface (feet bgs) or shallower where the CPT rig reached refusal. Rods were decontaminated with pressurized water as they were removed from the ground. Each location was plugged with bentonite grout tremied from the bottom of the hole to ground surface using a direct push technology (DPT) rig to ensure the CPT holes were properly plugged. In addition, a TarGOST® reading was collected of a sample of the tar-like material that seeps up between the cracks of the Englewood Intermodal Yard in Rows A and B and is provided in Attachment A.

Advancement of the CPT probes was attempted more than once at several locations to reach the targeted depth. These locations are marked with an “A” following the location ID. For example, the rig reached refusal at CPT-19-20 at approximately 31 feet bg. Another attempt was made adjacent to the original location and was labeled CPT-19A-20.

TarGOST® logs collected at the Site are provided in Appendix A of Attachment A. The CPT logs collected at the Site in 2019 and 2020 are provided in Attachment B. CPT/TarGOST® locations were surveyed by a licensed, professional surveyor to Texas State Plane coordinates (NAD 27, Texas South Central, U.S. Feet).

2.3 Data Evaluation

TarGOST® logs provide a qualitative tool for evaluating the potential presence of NAPL in the subsurface. However, interpretation of the TarGOST® logs is needed to evaluate a fluorescence response (i.e., total fluorescence area relative to the total area of the Reference Emitter (%RE)) signal or range of signals that represents a potential for the presence or absence of NAPL. To preliminarily evaluate the potential for NAPL in the subsurface based on the TarGOST® signals, TarGOST® signals were compared to the presence of DNAPL in nearby monitoring wells (CPT-04-20 and monitoring well MW-32B and CPT-06-20 and MW-70B) and/or soil boring logs nearby. Based on CPT/TarGOST® data adjacent to wells with DNAPL, the following general preliminary observations were made:

- Signals over 20%RE may indicate NAPL zones where NAPL could potentially flow into wells completed across those zones (depending on lithological/hydrogeologic and NAPL conditions).
- Signals between 5% and 20%RE may indicate the presence of residual NAPL, but the lower %RE suggests that the NAPL is not likely to flow into a well installed at that location.
- Signals below 5%RE may indicate that no NAPL is present based on a review of TarGOST® data, comparison to existing boring logs, and potential for interferences.

It is important to note that the above general and preliminary observations should only be used as a guide for the purposes of discussing the TarGOST® data in this report. Multiple lines of evidence including TarGOST® data, nearby monitoring wells, and soil borings will be used to confirm the presence or absence of NAPL.

As part of the evaluation, Golder prepared contour maps of the maximum RE% readings from the TarGOST® logs within the vadose zone, the A-TZ, and the B-CZ/B-TZ provided as Figures 2 through 4, respectively. Golder also prepared summary tables (Tables C-1 through C-3 in Attachment C) of the maximum TarGOST® signals (RE%)

detected in two-foot intervals from each CPT/TarGOST® location to the total depth. TarGOST® %RE on the tables are color-coded on a graded scale; with values over 5% highlighted light yellow to yellow as the values increase, and at 20%RE and greater, the color scales from yellow to orange. TarGOST® logs were compared to nearby CPT/ROST™ borings and observations made in boring logs. Select log comparisons and a cross-section of the northern perimeter of the Site are provided in Attachment D.

The evaluation of TarGOST® logs at the Site is organized by the three areas that were evaluated during the 2019/2020 NAPL assessment activities (off-site, perimeter of the HWPW Site, and Englewood Intermodal Yard) and by lithologic intervals (vadose zone, A-TZ, and B-TZ/B-CZ). Of the 54 CPT/TarGOST® borings conducted at the Site, only 8 borings were advanced to the top of the C-TZ and none were able to penetrate through the C-TZ. As a result, the C-TZ is not evaluated in this report. Also, since the CPT/TarGOST® locations were pre-cleared to 8 to 10 feet bgs for utilities via hydro-excavation and backfilled with sand and an asphalt patch, TarGOST® data collected in the pre-cleared interval are considered unreliable and are not evaluated below.

TarGOST® signals vs depth logs, including spatial variability and elevated %RE signals for each of the three areas evaluated are discussed in Section 2.3.1. TarGOST® data are presented on Signal (%RE) vs depth logs and cluster diagrams. Both formats were reviewed and are included in Appendix A of Attachment A. Differences in waveforms and cluster diagrams are described in Section 2.3.2.

2.3.1 TarGOST® Responses

Off-site CPT/TarGOST® Locations

TarGOST® and CPT data were collected at CPT-01-20 through CPT-11-20 north of Liberty Road in the City of Houston right-of-way north of the Site (Figure 1). CPT-23-20 was drilled off-site northeast of the Site. CPT-01-20 through CPT-11-20 and CPT-23-20 ranged in depth from 52 to 60 feet bgs. Refusal was reached at approximately 20 feet bgs at CPT-07-20 during the first attempt. A solid-point tip was advanced past the refusal depth and TarGOST® logging resumed at the original location. Details of TarGOST® signals observed off-site are provided below.

Vadose Zone

As shown on Figure 2 and on Table C-1 of Attachment C, TarGOST® signals in the vadose zone at locations north of the Site were below 5%, which indicates the absence of NAPL and is consistent with previous investigations conducted off-site (PBW, 2010; PBW, 2016).

A-TZ

TarGOST® signals in the A-TZ (top of unit ranges from 11 to 18 feet bgs and bottom ranges from approximately 21 to 25 feet bgs) north of the Site were all below 5%RE (Figure 3; Table C-1 in Attachment C). Based on a combination of observations made in boring logs, previously collected ROST™ data, and the 2019/2020 CPT/TarGOST® data, there is no evidence of off-site NAPL within the A-TZ. Concentrations of chemicals of concerns (COCs) in groundwater samples collected from A-TZ wells during semi-annual monitoring events presented in the Interim Groundwater Monitoring Report (Golder, 2020) were below detection limits or multiple orders of magnitude below applicable TCEQ TRRP critical protective concentration levels (cPCLs). The groundwater data further support the conclusion that NAPL is not present off-site in the A-TZ.

B-CZ/B-TZ

TarGOST® signals exceeding 20%RE were observed in the B-CZ/B-TZ in off-site locations CPT-02-20, CPT-04-20, CPT-06-20, and CPT-08-20, which are located just north of the Site near monitoring wells MW-35B, MW-32B, MW-70B, and MW-71B, respectively (Figure 4; Table C-1 in Attachment C). DNAPL has been observed in wells MW-32B and MW-70B, that are part of the on-going DNAPL recovery program. The highest TarGOST® signals in the B-CZ/B-TZ are generally found at depths consistent with observations of NAPL in boring logs and elevated ROST™ readings discussed in Attachment 2G of the RAP Revision 2 (PBW, 2016). These depths correspond to where thin carbonate clayey gravel and nodule seams (~0.1 feet thick) have been described within the B-CZ. The depths of the TarGOST® signals exceeding 20%RE were generally between 26.9 and 40.7 feet bgs, as detailed below:

- The highest TarGOST® signal in CPT-02-20 was logged approximately 34.91 to 40.68 feet bgs (~20 to 57%RE), which is consistent with the observation of visible NAPL on the boring log of MW-35B (installed in 2007) at 36 feet bgs (Figure D-1 in Attachment D). Even though MW-35B is located within 50 feet of CPT-02-20 and is screened across the interval that had the elevated TarGOST® signal, no in-well NAPL has been noted at MW-35B since installation in 2007, suggesting that notwithstanding the TarGOST® %RE measurements in CPT-02-20, the DNAPL may only be at residual saturation at this location and not migrating.
- The highest TarGOST® signal in CPT-04-20 was logged approximately 26.93 to 31.11 feet bgs (~20 to 52%RE), which is consistent with the interval on boring log of MW-32B where NAPL was noted and the elevated ROST™ responses at CPT-42R-08 in 2008 (Figure D-2 in Attachment D). DNAPL has been regularly detected in MW-32B with in-depth thicknesses ranging from 1 foot to over 5 feet thick during the 1st quarter of 2020.
- The highest TarGOST® signal in CPT-06-20 was logged approximately 25.82 to 29.33 feet bgs (~20 to over 120%) and is consistent with observations (strong odor) noted on the boring log for nearby well MW-70B. This interval is represented by sandy and silty clay with abundant carbonate gravel seems within the clay unit. DNAPL has been detected in MW-70B, which is screened across the interval that had elevated TarGOST® signal (Figure D-3 in Attachment D). DNAPL has been regularly detected in MW-70B with in-depth thicknesses ranging from 3 feet to over 5 feet thick during the 1st quarter of 2020.
- The highest TarGOST® response in CPT-08-20 was near 34.87 feet bgs (~20 to 30%RE). Trace NAPL staining was noted on the boring log of nearby well MW-71B in sand and gravel seams at similar depths. In-well DNAPL has not been observed at MW-71B, suggesting that NAPL will not flow into wells at this location.

TarGOST® signals at CPT-03-20 (north of CPT-04-20) were between ~5 and 9%RE from approximately 29 to 32 feet bgs. NAPL staining was noted on the boring log of MW-68B between 34.5 and 35 feet bgs during installation in 2011, indicating the presence of NAPL then (Figure D-4 in Attachment D). Up until recently, no DNAPL has been observed in adjacent MW-68B. Since January 2020, in-well DNAPL thickness at MW-68B has ranged from less than 1 foot to over 3 feet thick, and the well has been incorporated into the DNAPL recovery well network. The relatively low TarGOST® signals at CPT-03-20 are anomalous when compared to other CPT/TarGOST® locations that were advanced near wells with DNAPL present. This anomaly may be due to isolated pockets of DNAPL within calcareous nodule beds, as noted on the boring log for MW-68B and demonstrates a possible limitation of the TarGOST® technology.

TarGOST® signals at CPT-07-20 (north of CPT-08-20) were between ~5 and 16%RE from approximately 28 to 39 feet bgs. Trace NAPL was noted within this depth interval on the MW-33BR boring log, a well located approximately 240 feet west of CPT-07-20 (Figure 4). DNAPL has not been observed in MW-33BR since installation in 2011. Another monitoring well (MW-87C), located approximately 75 feet north of CPT-07-20, did not have NAPL noted on the boring log (Figure 4).

TarGOST® signals were below 5%RE in the B-CZ/B-TZ at CPT-01-20, CPT-05-20, CPT-09-20, and CPT-10-20. These signals indicate that the extent of NAPL is delineated off-site to the north. The boring log for monitoring well MW-63B installed in 2009 located just north of CPT-05-20 indicated NAPL in the B-CZ; however, no DNAPL has been observed in that well. TarGOST® signals were between 5 and 6%RE near 39.5 feet bgs at CPT-11-20 located east of CPT-09-20. TarGOST® signals at CPT-23-20, located northeast of the CPT-11-20 and the Site, were between ~5 and 7%RE from approximately 32 to 33 feet bgs. Monitoring well MW-54B was installed near CPT-23-20 in February 2020, and there were no observations of impacts in the B-CZ at that location. The relatively low TarGOST® signals at CPT-11-20 and CPT-23-20 coupled with observations in nearby soil borings indicate the extent of the NAPL in the B-CZ/B-TZ is delineated to the northeast.

On-Site - Perimeter of the HWPW Site

TarGOST® locations CPT-12-20 through CPT-21-20 and CPT-56-20 were drilled on-site along the north perimeter of the Site between existing monitoring wells MW-15C and MW-18C (Figure 1) and ranged in total depths from 58 to 62 feet bgs. Refusal was reached at approximately 18 feet bgs at CPT-19-20 and at approximately 25 feet bgs at CPT-20-20 during first attempts. Adjacent locations were cleared, and the CPT/TarGOST® borings were advanced to 58 feet bgs at CPT-19A-20 and 61 feet bgs at CPT-20A-20 before reaching refusal.

TarGOST® locations CPT-24-20 through CPT-27-20 and CPT-54-20 were drilled along the west perimeter of the Site (Figure 1) and ranged in total depths from 32 to 56 feet bgs. Refusal was reached at approximately 37 feet bgs at CPT-24-20 and 31 feet bgs at CPT-27-20 during the first attempts. An adjacent location was cleared, and the rods were advanced to 46 feet bgs at CPT-24A-20 before reaching refusal. A location less than 100 feet south of the original location was cleared, and the CPT rig reached refusal at 32 feet bgs at CPT-27A-20.

Details of TarGOST® signals observed along the northern and western perimeters of the Site are provided below.

Northern Perimeter

Vadose Zone

TarGOST® signals exceeding 20%RE were observed in the vadose zone along the northern perimeter in CPT-12-20, CPT-16-20, CPT-17-20, and CPT-21-20 (Figure 2). The highest TarGOST® signal in the vadose zone along the northern perimeter of the Site was observed at CPT-16-20 approximately 10 feet bgs at 140%RE. The spatial variation of TarGOST® responses within the vadose zone along the northern perimeter of the Site is illustrated in Table C-2 (Attachment C) and on Figure D-6 (Attachment D). TarGOST® signals were greater than 5% within the entire vadose zone interval at CPT-12-20, CPT-13-20, CPT-16-20, and CPT-17-20. Previous CPT-ROST™ borings CPT-18R-95 and CPT-27R-01 located near TarGOST® borings CPT-12-20 and CPT-13-20 (Figure D-6, Attachment D)) did not indicate elevated ROST™ responses in the vadose zone. CPT-ROST™ borings CPT-14R-95 and CPT-16R-95 located near CPT-16-20 and CPT-17-20, respectively (Figure D-6, Attachment D) did indicated ROST™ responses in the vadose zone.

TarGOST® signals were above 5%RE in the vadose zone at the westernmost location CPT-56-20 along the northern perimeter of the Site. Location CPT-56-20 was added after completing CPT-12-20, which indicated elevated TarGOST® signals in the vadose zone. CPT-56-20 TarGOST® signals were detected at about 16%RE in the vadose zone immediately above the A-TZ at approximately 15.5 feet bgs. However, no observations of NAPL were noted in the vadose zone on soil boring logs for monitoring well MW-15A and MW-15B, located approximately 100 feet west of CPT-56-20, indicating the western extent of potential NAPL in the vadose zone.

TarGOST® boring CPT-21-20 is located at the eastern edge of the line of borings conducted along the northern perimeter of the Site. TarGOST® boring CPT-22-19 is located approximately 320 feet southeast of CPT-21-20. None of the TarGOST® signals at CPT-22-19 were greater than 5%RE in the vadose zone (Table C-3 in Attachment C; Figure D-6 in Attachment D). TarGOST® signals at off-site locations CPT-11-20, CPT-22-19, and CPT-23-20 are less than 5%RE in the vadose zone, providing delineation to the east (Figure 2).

A-TZ

TarGOST® signals in the A-TZ near the north perimeter of the Site exceeded 20%RE at (west to east) CPT-56-20, CPT-12-20, CPT-13-20, CPT-15-20, CPT-16-20, and CPT-21-20 (Figure D-6 in Attachment D) and are described in greater detail below.

- CPT-56-20: TarGOST® signals were elevated within the top A-TZ in a thin interval (approximately 16 to 17.3 feet bgs) at CPT-56-20, with signals exceeding 30%RE.
- CPT-12-20: TarGOST® signals were elevated within the entire A-TZ interval (approximately 14 to 22 feet bgs) at CPT-12-20, with signals exceeding 60 to 90%RE at discrete intervals. The highest TarGOST® response was detected near the base of the A-TZ at 90%RE.
- CPT-13-20: The elevated TarGOST® signals were more variable within the A-TZ interval (approximately 16 to 23 feet bgs) at CPT-13-20 compared to CPT-12-20. TarGOST® signals ranged from greater than 100%RE between 16 and 20 feet bgs, to less than 20%RE between 20 and 22 feet bgs, and increased to over 30%RE near the base of the A-TZ.
- CPT-15-20: TarGOST® signals greater than 30%RE were detected near the base of the A-TZ (approximately 26 feet bgs) at CPT-15-20. TarGOST® signals in the A-TZ above 25 feet bgs were generally less than 6%RE.
- CPT-16-20: TarGOST® signals within the A-TZ (approximately 16 to 26 feet bgs) at CPT-16-20 varied with depth. TarGOST® signals in the upper portion of the A-TZ at CPT-16-20 (16 to 20 feet bgs) ranged from below 10%RE to 20%RE. The maximum TarGOST® signal detected at CPT-16-20 was between 20 and 22 feet bgs at approximately 98%RE. Directly below that interval, TarGOST® signals were below 5%RE. TarGOST® signals increase to over 30%RE near the base of the A-TZ (24 to 26 feet bgs).
- CPT-21-20: A spike in TarGOST® signal was detected near the top of the A-TZ at 20 feet bgs at CPT-21-20. TarGOST® signals below 21 feet bgs were below 5% in the A-TZ (approximately 20 to 31.5 feet bgs).

Comparing to the previous CPT-ROST™ borings along the northern perimeter, CPT-ROST™ boring CPT-18R-95 and CPT-27R-01 located near TarGOST® borings CPT-12-20 and CPT-13-20, respectively, did not indicate elevated ROST™ responses in the A-TZ or upper portions of the A-TZ (Figure D-6 in Attachment D). However, CPT-ROST™ boring CPT-16R-95 located near CPT-17-20 (Figure 1; Figure D-6 in Attachment D) and CPT-ROST™ boring CPT-14R-95 located near CPT-16-20 indicated ROST™ responses within the A-TZ. TarGOST® signals at CPT-14-20 and CPT-15-20, which were located between CPT-13-20 and CPT-16-20, respectively, were mostly below 5%RE in the vadose zone and the A-TZ. Soil borings conducted as part of the TPH-NAPL assessment (discussed in Section 3.0) were drilled and sampled next to TarGOST® borings CPT-12-20 (DPT-12-20) and CPT-16-20 (DPT-16-20). Either visually observed NAPL or strong hydrocarbons odors were noted in the two soil borings (Attachment E). The elevated TarGOST® signals within the top of the A-TZ at CPT-12-20, CPT-13-20, and CPT-16-20 may indicate the presence of light NAPL (LNAPL) in those areas. LNAPL had been observed in the A-TZ in a temporary well within the HWPW AST Area (SWMU 8) on the northeast side of the Site (PBW, 2010).

As discussed in the RAP Revision 2 (PBW, 2016) and the updated APAR Addendum (PBW, 2010), NAPL had been noted in the A-TZ on boring logs on the north side of the Site at MW-17, MW-72B, MW-57A, and MW-18A (Figure D-6 in Attachment D). DNAPL had historically been observed in well MW-57A, but has not been detected in the well since 2015. Therefore, the TarGOST® signals indicating the potential presence of NAPL in the A-TZ along the northern perimeter are generally consistent with historical soil boring and monitoring well observations except for the TarGOST® signals at CPT-12-20 and CPT-13-20 (Figure D-6 in Attachment D).

The extent of the TarGOST® signals greater than 5%RE in the A-TZ along the northern perimeter of the Site is not delineated to the west based on the results at CPT-56-20 (~30%RE). However, soil boring logs for monitoring wells MW-15A and MW-15B, located approximately 100 feet west of CPT-56-20, had no observations of NAPL noted indicating the western extent of potential NAPL in the A-TZ. In addition, concentrations of COCs in groundwater samples collected from A-TZ well MW-15A have been below detection limits or below applicable PCLs during recent semi-annual sampling events (Golder, 2020). The extent of the TarGOST® signals greater than 5%RE in the A-TZ along the northern perimeter of the Site to the east appears to be delineated. CPT-22-19, located approximately 320 feet southeast of CPT-21-20, had TarGOST® signals less than 5%RE in the A-TZ (Table C-3 (Attachment C); Figure 3) and serves a delineation point to the east. Off-site locations CPT-11-20, CPT-22-19, and CPT-23-20 (Figure 3) indicate that TarGOST® signals are less than 5%RE in the A-TZ, providing delineation to the northeast.

B-CZ/B-TZ

TarGOST® signals exceeding 20%RE were observed in the B-CZ/B-TZ at CPT-12-20 through CPT-21-20 along the northern perimeter. Elevated TarGOST® signals in the B-CZ/B-TZ near CPT-12-20 through CPT-18 -20 were detected in the underlying clay immediately below the A-TZ (generally between 24 and 34 feet bgs). As shown on Table C-2 (Attachment C) and Figure D-6 (Attachment D), elevated TarGOST® signals in the B-CZ/B-TZ were deeper at CPT-19-20 through CPT-21-20 (between 34 and 42 feet bgs) than at CPT-12-20 through CPT-18-20. In addition, elevated TarGOST® signals over 20% were detected between 50 and 56 feet bgs at CPT-20-20 and CPT-21-20. DNAPL had historically been observed in MW-57B near the north side of the Site and NAPL had been noted in the B-CZ/B-TZ on the boring logs of MW-17C, MW-23C, MW-72B, and MW-57B (Figure D-6 in Attachment D). TarGOST® signals indicating the potential presence of NAPL in the B-CZ/B-TZ along the northern perimeter are generally consistent with historical soil boring and monitoring well observations.

The extent of TarGOST® signals greater than 5%RE in the B-CZ/B-TZ along the northern perimeter of the Site is delineated to the west by CPT-56-20 where TarGOST® signals were below 5%RE. TarGOST® boring CPT-22-19 delineates the extent of TarGOST® signals greater than 5%RE in the B-CZ/B-TZ to the east (Figure 4).

West Perimeter

Vadose Zone

Two of the CPT/TarGOST® borings had signals exceeding 5%RE in the vadose zone at CPT-26-20 (5.93%RE approximately 11.6 feet bgs) and at CPT-27-20 (5.38% approximately 14 feet bgs), and none of the TarGOST® signals in the vadose zone exceeded 20%RE (Table C-2 in Attachment C). The signals detected in CPT-26-20 and CPT-27-20 were just slightly above 5%RE and were within one to two feet of the top of the A-TZ. TarGOST® signals at CPT-24-20, CPT24A-20, CPT-25-20, CPT-27A-20, and CPT-54-20 were all below 5% in the vadose zone. The extent of TarGOST® signals greater than 5%RE in the vadose zone along the west perimeter of the Site is delineated to the south by CPT-27A-20 and to the north by CPT-24-20 and CPT-25-20 and to the west by CPT-54-20 (Figure 2).

A-TZ

On the west side of the Site, TarGOST® signals within the A-TZ were below 5%RE at six of the seven locations. During the first attempt at location CPT-24-20, there were no TarGOST® signals above 5%RE in the A-TZ. Since the boring reached refusal at around 37 feet bgs, the CPT/TarGOST® boring was reattempted. After clearing for utilities, a second attempt was advanced at an adjacent location (CPT-24A-20) less than 10 feet east of the original location to a depth of approximately 46 feet bgs. The TarGOST® signal between 15.5 and 17 feet bgs in the A-TZ sand indicated a ~23%RE response, demonstrating the variability in signals within a relatively small area. Figure 3 includes data collected at CPT-24A-20 to show the maximum TarGOST® signal detected in the area.

The extent of TarGOST® signals greater than 5%RE in the A-TZ is delineated to the south by CPT-25-20, CPT-26-20, CPT-27-20, and CPT-27A-20 and to the west by CPT-54-20. The extent of TarGOST® signals greater than 5%RE is not delineated to the north based on TarGOST® signals at CPT-24A-20 at the top of the A-TZ (approximately 16 feet bgs). However, concentrations of COCs in groundwater samples collected from nearby A-TZ wells, MW-13, MW-95A, and MW-38A, have been below detection limits or multiple orders of magnitude below applicable PCLs during recent semi-annual sampling events presented in the Interim Groundwater Monitoring Report (Golder, 2020). If groundwater was in direct contact with NAPL, concentrations of COCs in groundwater would likely be higher than those observed. No NAPL was noted on the boring logs of MW-13, MW-95A, MW-38A. Monitoring wells MW-13, MW-95A, and MW-38A are all located north and west of CPT-24A-20 (Figure 1 and 3), suggesting that NAPL, if present in the A-TZ, does not likely extend north and west.

B-CZ/B-TZ

During the first attempt at location CPT-27-20, TarGOST® signals above 20%RE in the B-CZ/B-TZ were detected between approximately 26 and 27 feet bgs ranging from ~29 to 34%RE (Table C-2 (Attachment C)). Since the boring reached refusal at around 32 feet bgs, the CPT-TarGOST® boring was reattempted at CPT-27A-20 less than 100 feet south of the original location. Refusal was reached at the second location at approximately the same depth (32 feet bgs). A TarGOST® signal of approximately 7%RE was detected near 32 feet bgs at CPT-27A-20. Both sets of data were used to contour the %RE responses for the B-CZ/B-TZ (Figure 4).

On the west side of the Site, DNAPL has been observed in two monitoring wells MW-12B and MW-41B with some of the thickest in-well measurements of DNAPL observed at the Site (MW-12B with >20 feet thick and MW-41B with >6 feet thick in October 2019). The TarGOST® response observed in CPT-27-20 was a few feet above the screened interval of MW-41B, located approximately 50 feet north of CPT-27-20. Monitoring well P-11 is located within 30 feet northeast of CPT-27A-20; and no DNAPL has been observed in P-11. CPT-54-20 was advanced 150 feet west of CPT-27-20 and CPT-27A-20, but also reached refusal at about 32 feet bgs. No TarGOST® signals above 5%RE were detected at CPT-54-20 (Table C-2 (Attachment C)). The extent of TarGOST® signals greater than 5%RE in the B-CZ/B-TZ along the western perimeter of the Site is delineated to the north and west by CPT-26-20 and CPT-54-20, respectively, where TarGOST® signals were below 5% in the B-CZ/B-TZ. The extent of TarGOST® signals greater than 5%RE was not delineated in the B-CZ/B-TZ to the south based on the CPT-27A-20 signals. However, COC concentrations in groundwater samples from P-11, as well as monitoring well P-12 located southeast of CPT-27A-20, have been below detection limits or multiple orders of magnitude below applicable PCLs during previous semi-annual sampling events (Golder, 2020), suggesting that NAPL likely does not extend south of CPT-27A-20

Although, as noted above, significant in-well DNAPL thickness measurements have been observed in monitoring wells MW-12B and MW-41B, TarGOST® signals in the B-CZ/B-TZ depth interval from all but two CPT borings in this vicinity (CPT-27-20 and CPT-27A-20) were less than 5%RE. In addition, of the 13 CPT/ROST™ locations previously advanced within a 200 ft radius of MW-12B and of MW-41B, one location (CPT-19R-01) had a ROST™ response that indicated the presence of NAPL in the B-TZ/B-CZ (PBW, 2014). These data, coupled with COC concentrations below applicable PCLs (Golder, 2020) and the absence of measurable DNAPL in the six other B-CZ/B-TZ monitoring wells in this vicinity (MW-39B, MW-38B, MW-62B, P-11, and MW-42B), suggest a very localized NAPL in this unit within this area.

Englewood Intermodal Yard

The NAPL assessment conducted in the Englewood Intermodal (IM) Yard consisted of 21 CPT/TarGOST® borings conducted throughout the north and east portions of the Englewood IM Yard (Figure 1). The objective of the assessment was to evaluate the extent of NAPL in the Englewood IM Yard. CPT/TarGOST® locations CPT-28-19 through CPT-46-19 and CPT-55-19 ranged in depth between 23 and 65 feet bgs. CPT/TarGOST® location CPT-37-19 reached refusal at approximately 10 feet bgs. Because of concerns of potential underground utilities in the area, this location was not re-drilled. General observations from the CPT-TarGOST® signals for each zone are provided below.

Vadose Zone

TarGOST® signals above 20%RE were detected in the vadose zone in CPT-29-19, CPT-30-19, CPT-32-19, CPT-35-19, and CPT-42-19 (Figure 2 and Table C-3 (Attachment C)). TarGOST® borings CPT-29-19, CPT-30-19, CPT-31-19, CPT-32-19, and CPT-35-19 are located within the former lagoon area identified on historical aerials and maps of the Englewood IM Yard. CPT-42-19 is located in the area of the former ASTs. TarGOST® signals in the Englewood IM Yard are delineated to 5%RE to the east by CPT-46-19, CPT-45-19, and CPT-41-19, to the south by CPT-40-19, CPT-36-19, CPT-38-19, CPT-55-19, and to the west by CPT-28-19. As discussed in the RAP Revision 0 (PBW, 2014), previous ROST™ borings and soil borings conducted in the HWPW area indicated the presence of NAPL in the vadose zone extending from the HWPW Site into the Englewood IM Yard. Therefore, the extent of the TarGOST® signals above 5%RE to the north likely extend to the north perimeter.

A-TZ

TarGOST® signals greater than 20% were detected in the A-TZ (Figure 3 and Table C-3 (Attachment C)) at the following locations:

- CPT-30-19: The highest TarGOST® signals (>100%RE) within the A-TZ at CPT-30-19 were detected between 18 to 20 feet bgs near the top of the A-TZ. TarGOST® signals decreased with depth within the A-TZ.
- CPT-31-19: The highest TarGOST® signals (>800%RE) within the A-TZ at CPT-31-19 were detected between 24 and 26 feet bgs near the base of the A-TZ. TarGOST® signals near the top of the A-TZ (18 to 20 feet bgs) were also elevated (approximately 93%RE). TarGOST® signals in an interval between 20 and 23 feet bgs in the middle of the A-TZ were below 5%.

- CPT-32-19: TarGOST® signals within the A-TZ at CPT-32-19 ranged from ~17%RE to approximately >200%RE. The highest TarGOST® signals within the A-TZ at CPT-32-19 were near the base of the A-TZ approximately 25 feet bgs.
- CPT-36-19: TarGOST® signals within the A-TZ at CPT-36-19 ranged from below 5%RE to approximately 115%RE, near the base of the A-TZ. between 23 and 24 feet bgs. TarGOST® signals above 23 feet bgs were below 5%. DNAPL has been observed in nearby monitoring well MW-78A (Figure 3). DNAPL thickness at MW-78A has ranged from less than 1 foot to over 3 feet in the 1st quarter of 2020.
- CPT-46-19: The highest TarGOST® signals (~>570%RE) within the A-TZ at CPT-46-19 were detected between 22 and 24 feet bgs near the base of the A-TZ. TarGOST® signals above 23 feet bgs were below 5%RE. MW-49A is located near CPT-46-19 (Figure 3) and is screened from 20 to 30 feet bgs. No in-well DNAPL has been observed at MW-49A since installation in 2007.

The extent of TarGOST® signals greater than 5%RE in the A-TZ are delineated by the following locations where the TarGOST® signals were below 5%RE in the A-TZ to the west by CPT-28-19 and CPT-34-19, to the east by CPT-48-19 and CPT-22-19, and to the south by CPT-38-19, CPT-39-19, CPT-40-19, and CPT-41-19 (Figure 3). . The northern extent of elevated TarGOST® signals in the A-TZ is assumed to extend to the north perimeter of the HWPW.

B-CZ/B-TZ

The highest TarGOST® signals at the Site were detected in B-CZ/B-TZ in the Englewood IM Yard (Figure 4 and Table C-3 (Attachment C)). Intervals within the B-CZ/B-TZ with TarGOST® signals >20%RE were detected at the following locations:

- CPT-29-19: TarGOST® signals were greater than 20%RE between 40 and 47 feet bgs and between 50 and 52 feet bgs. The highest signals in the B-CZ/B-TZ at CPT-29-19 were detected between 43 and 44 feet bgs at 325%RE.
- CPT-30-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to 36 feet bgs, between 40 and 44 feet bgs, and between 50 and 56 feet bgs. The highest signals in the B-CZ/B-TZ at CPT-30-19 were detected between 52 and 53 feet bgs at 813%RE.
- CPT-31-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 35 feet bgs and between 40 and 45 feet bgs. From 24 feet bgs to 34 feet bgs, the maximum TarGOST® signals ranged from ~690 to 987%RE. A TarGOST® signal of ~813%RE was detected around 40 feet bgs.
- CPT-32-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 40 feet bgs. The highest TarGOST® signals within that interval were detected at about 1,298%RE at the base of the A-TZ at approximately 25 feet bgs (Table C-3 (Attachment C)). As shown on Figure 4, the highest TarGOST® response in the B-CZ/B-TZ detected on-site was at CPT-32-19. MW-74B is located within 20 feet of CPT-32-19 and NAPL was noted on the boring log of MW-74B at 23.5 to 24.3 feet bgs, 25.8 to 26.1 feet bgs, and 29 to 35 feet bgs along fractures in a sandy clay. MW-74B is screened from 25.5 to 36.5 feet bgs (Figure D-5 in Attachment D). However, no in-well DNAPL has been observed in this well since installation in 2011.
- CPT-35-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 35 feet bgs and between 41 and 50 feet bgs. The highest signals in the B-CZ/B-TZ at CPT-35-19 were detected between 43 and 48 feet bgs as high as 926%RE.

- CPT-36-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 35 feet bgs. the highest TarGOST® signal was detected at ~873%RE at a depth of approximately 24.5 feet bgs.
- CPT-39-19: TarGOST® signals were greater than 20%RE between 25 and 34 feet bgs, between 40 and 43 feet bgs, and near 50 feet bgs and 57 feet bgs. The highest signals at about 406%RE were detected at approximately 40 feet bgs.
- CPT-40A-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 42 feet bgs. Elevated signals were detected between 26 and 40 feet bgs ranging from 200 to over 895%RE.
- CPT-41-19: TarGOST® signals were greater than 20%RE between 26 and 32 feet bgs and at 37 feet bgs. The highest signals at CPT-41-19 (~60%RE) were detected at approximately 37 feet bgs. Monitoring well MW-75B is located less than 200 feet south of CPT-41-19 and west of CPT-44-19 and is screened from 32.3 to 37.2 feet bgs (Figure 4). DNAPL thickness in MW-75B has ranged from not detected to over 2 feet in the first quarter of 2020. NAPL was noted at 36.4 to 36.8 feet bgs on the boring log of MW-75B during installation in 2011.
- CPT-44-19: TarGOST® signals were greater than 20%RE between 32 and 34 feet bgs at a maximum signal of 22.2%RE.
- CPT-45-19: TarGOST® signals were greater than 20%RE between 31 and 34 feet bgs and between 38 and 40 feet bgs. The highest signals were detected at approximately 39 feet bgs at approximately 73%RE.
- CPT-46-19: TarGOST® signals were greater than 20%RE from the base of the A-TZ to approximately 38 feet bgs. The highest signals were detected at the top of the B-CZ (approximately 435%RE) (Table C-3, Attachment C). Monitoring well MW-49B is located within 30 feet of CPT-46-19 and screened from 30 to 35 feet bgs (Figure 4). DNAPL thickness in MW-49B has ranged from over 5 feet to over 13 feet during the 1st quarter of 2020.

Locations with TarGOST® signals above 100%RE are mainly in the areas of the former ASTs and former lagoons identified on historical aerials and maps in the IM Yard (Figure 4).

The extent of NAPL in the B-CZ/B-TZ is delineated by the following locations where the TarGOST® signals were below 5%RE across the B-CZ/B-TZ: to the west by CPT-28-19, to the east by CPT-22-19, CPT-43-19, CPT-48-19, and to the south by CPT-55-19 and CPT-42-19 (Figure 4).

2.3.2 Variability in TarGOST® Waveforms

The TarGOST® system logs the wavelength light emitted (fluorescence) of the soil after it is exposed to laser excitation light. The light is converted into electrical current pulses that are transformed into digitized transient voltage signals (waveforms). Waveforms from selected depths are called out on the left side of the TarGOST® logs. Four different wavelength bands are represented by different peaks and colors within the waveform call-out. The width of the peaks represents the lifetime of the fluorescence. Dakota produces cluster diagrams (wavelength vs lifetime) to aid in the identification of differences in waveforms between logs or within a single log. Cluster diagrams for TarGOST® borings conducted in 2019 and 2020 are provided in Appendix A of Attachment A.

Variability in TarGOST® waveforms (fluorescence signatures) may occur due to natural weathering/depletion processes, NAPL source material mixing or co-mingling, soil matrix differences, and NAPL compositional differences (Dakota, 2020; Attachment A). After review of the TarGOST® data collected from the Site, Dakota identified the following two waveforms that dominate the data set:

- Waveform #1: Logs that exhibit waveform #1 include the tar-like material from the seeps in the Englewood IM Yard - CPT-12-20, CPT-24A-20, CPT-30-19, CPT-35-19, and CPT-36-19.
- Waveform #2: Waveform #2 mainly differs from waveform #1 due to a slight increase in lifetime of fluorescence (shift up to row 2 from row 1 on cluster diagrams). Logs that exhibit waveform #2 include CPT-27-19, CPT-39-19, CPT-40A-19, CPT-45-19, CPT-46-19.
- The two waveforms are similar and appear closely related and are often seen within the same logs (Dakota, 2020). Logs that exhibit both waveforms include CPT-29-19, CPT-30-19, and CPT-32-19, which are located near the former lagoon areas within the Englewood IM Yard.

Both waveforms were observed throughout the Site. According to Dakota, the different waveforms are likely a result of subtle chemistry differences within the same basic NAPL. However, the origin of these differences is unknown (Dakota, 2020; Attachment A).

The waveforms observed in the vadose zone at CPT-42-19 and CPT-17-20 are different than the waveforms observed in the majority of other logs at the Site. Dakota indicated that the material associated with the waveforms at these locations is likely a lighter NAPL such as diesel (Dakota, 2020, Attachment A). CPT-17-20 was advanced near the former process areas on the HWPW site. CPT-42-19 was advanced in the area of former ASTs in the Englewood IM Yard. Soil samples were collected above the saturated zone at CPT-42-19 and are discussed in Section 3.0.

2.4 Limitations

TarGOST® specifically targets the PAHs found in creosote NAPLs and DNAPLs and does not respond to typical lighter end fuels like gasoline or kerosene unless co-mingled with creosote (Dakota, 2020, Attachment A). As discussed in Section 3.0, some areas in the Englewood Intermodal Yard may have soil impacted by releases of other types of fuel. Thinner, less viscous NAPLs (oil-like material) typically fluoresce at different wavelengths compared to the more viscous tar-like material, which may partially explain the differences in signal that is seen across the Site within the same GWBUs. In addition, soil matrices affect fluorescence. Sands and gravels may have as much as 10 times higher response than clays and silts, which may explain some of the differences in response observed within each log between GWBUs (sandy A-TZ vs the silty clayey B-CZ/B-TZ).

Limestone gravel fill, calcareous sands, buried wood/debris, shell hash, and other materials may result in false positives (Dakota, 2020; Attachment A). Beds of calcareous nodules are common within the B-CZ/B-TZ, especially on the east side of the Site, which was taken into consideration when reviewing the TarGOST® data. Additional limitations are discussed in the Dakota Report in Attachment A.

2.5 NAPL Assessment Conclusions

Since 1995, site investigations, including CPT/ROST^{TM} investigations, were conducted to evaluate surface and subsurface soils for the presence of NAPL. To refine the observed subsurface distribution of DNAPL at the Site, CPT/TarGOST® data were collected in 2019 and 2020. Conclusions are summarized by the areas that were evaluated during the 2019/2020 NAPL Assessment activities (off-site, northern and western perimeter of the HWPW Site, and Englewood Intermodal Yard):

<u>Off-Site</u>

TarGOST® signals in the vadose zone and the A-TZ north of Liberty Road and north of the Site were below 5%RE. Based on a combination of observations made in boring logs, previously collected ROST™ data, and the CPT/TarGOST® data, there is no evidence of off-site NAPL present within the vadose zone or the A-TZ.

For the B-CZ/B-TZ, elevated TarGOST® signals greater than 20%RE in this zone off-site generally corresponds with observations of NAPL in wells, boring logs, and previously collected data. Based on the additional NAPL assessment activities, the extent of NAPL in the B-CZ/B-TZ off-site is 24 feet or deeper and delineated to within approximately 500 feet north of the Site.

On-Site (Northern Perimeter)

TarGOST® signals indicating the potential presence of NAPL in the vadose zone and the A-TZ along the northern perimeter are consistent with historical observations, except at CPT-12-20 and CPT-13-20. Previous CPT-ROST™ borings had not identified elevated ROST™ responses in the vadose zone and A-TZ near TarGOST® borings CPT-12-20 and CPT-13-20. The extent of the potential presence of NAPL in the vadose zone and A-TZ along the northern perimeter is delineated to the west and east by a combination of TarGOST® signals and observations on soil boring logs.

TarGOST® signals indicating the potential presence of NAPL in the B-CZ/B-TZ along the northern perimeter are consistent with historical observations. The extent of TarGOST® signals greater than 5%RE in the B-CZ/B-TZ along the northern perimeter is delineated to the west and east by TarGOST® borings CPT-56-20 and CPT-22-19, respectively.

On-Site (West Perimeter)

TarGOST® signals in the vadose zone along the west perimeter on-site were slightly above 5%RE at CPT-26-20 and CPT-27-20. The extent of TarGOST® signals greater than 5%RE in the vadose zone is delineated to the south by CPT-27A-20 and to the north by CPT-24-20 and to the west by CPT-54-20. None of the TarGOST® borings had %RE signals significantly above 5%RE along the west perimeter, except at CPT-24A-20. A TarGOST® signal between 15.5 and 17 feet bgs at CPT-24A-20 indicated an approximate 23%RE response. TarGOST® signals at CPT-24-20, an adjacent location less than 10 feet from CPT-24A-20, were all below 5%RE, demonstrating the variability in signals within a relatively small area. The extent of TarGOST® signals indicating potential NAPL, if present in the A-TZ, is delineated to the south by CPT-25-20, CPT-26-20, CPT-27-20, and CPT-27A-20, to the west by CPT-54-20, and to the northwest based on observations in soil borings and groundwater sampling data.

Significant in-well DNAPL thickness measurements have been observed in B-CZ/B-TZ monitoring wells MW-12B and MW-41B. However, TarGOST® signals from all but two CPT borings in this vicinity (CPT-27-20 and CPT-27A-20) were less than 5% in the B-CZ/B-TZ. These data, coupled with the absence of measurable DNAPL in the nearby B-CZ/B-TZ monitoring wells (MW-39B, MW-38B, MW-62B, P-11, and MW-42B), suggest a very localized NAPL in this unit within this area of the Site.

Englewood Intermodal Yard

TarGOST® signals above 20%RE were detected in the vadose zone at locations within the former lagoon area identified on historical aerials and maps of the Englewood IM Yard. TarGOST® signals above 20%RE were also detected in the vadose zone at CPT-42-19, which is located in the former ASTs area. Elevated TarGOST® signals were detected in the A-TZ also within the former lagoon area with maximum %RE signals ranging from 115%RE (CPT-36-19) to 839%RE (CPT-31-19). TarGOST® boring CPT-46-19, located east of the former AST area had a signal of 570%RE at the base of the A-TZ.

The highest TarGOST® signals at the Site were detected in the B-CZ/B-TZ in the Englewood IM Yard. Locations with TarGOST® signals above 100%RE were mainly in the former ASTs and former lagoon areas identified on historical aerials and maps, with six TarGOST® locations having signals greater than 800%RE (maximum signal of 1,298%RE at CPT-32-19). Elevated TarGOST® signals were also detected in the B-CZ/B-TZ on the east side of the Englewood IM Yard east of the former AST area at CPT-46-19 (maximum of 435%RE)).

The highest TarGOST® signals detected, 1,298%RE at CPT-32-19, was observed at the base of the A-TZ or top of the B-CZ at approximately 25 feet bgs. DNAPL recovery well MW-74B is located within 20 feet of CPT-32-19 and is screened from 25.5 to 36.5 feet bgs. During well installation, NAPL was noted on the boring log for MW-74B at intervals between 23.5 to 35 feet bgs along fractures in a sandy clay. However, since installation in 2011, no DNAPL has been observed in this well.

In contrast, monitoring well MW-49B, located within 30 feet of CPT-46-19 where TarGOST® signals range from 102%RE to 435%RE, has had DNAPL detected in the well. Also, monitoring well MW-75B, located less than 200 feet from CPT-41-19 where a maximum signal of 61%RE approximately 37 feet bgs was observed, has had DNAPL routinely detected in the well. Monitoring well MW-75B is screened from 32.3 to 37.2 feet bgs, and NAPL was noted at 36.4 to 36.8 feet bgs on the boring log of MW-75B during installation in 2011. Both MW-49B and MW-75B are part of the DNAPL Recovery Well network.

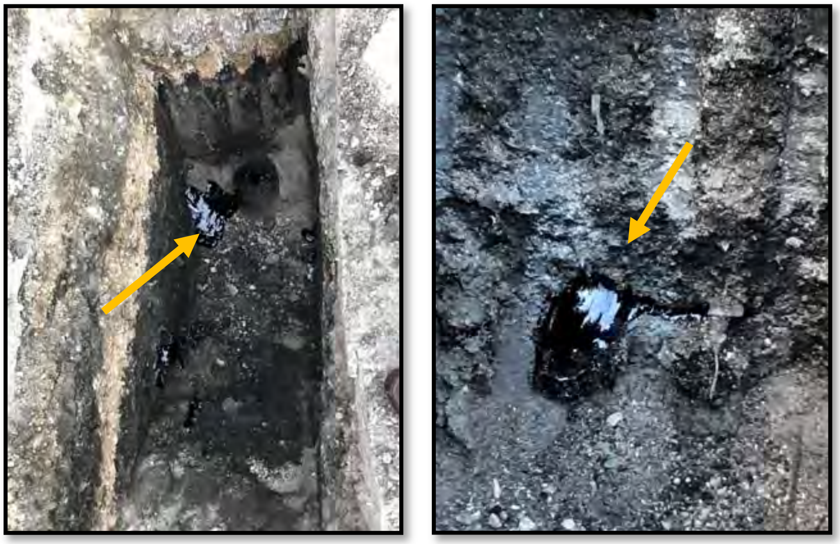
For the Englewood IM Yard, the extent of TarGOST® signals greater than 5%RE in the vadose zone, A-TZ, and B-CZ/B-TZ are delineated to the west, south, and east. The northern extent of elevated TarGOST® signals in the three zones is assumed to extend to the north perimeter of the HWPW.

3.0 TPH-NAPL ASSESSMENT

The objective of the TPH-NAPL assessment was to preliminarily identify potential TPH-NAPL sources within the Englewood IM Yard and evaluate the lateral extent of TPH in soils at the Site. Details on the background, assessment methods, data evaluation, and conclusions are provided in the following sections.

3.1 Background

During the July 2017 quarterly inspection of the capped areas, a tar-like NAPL was observed surfacing within the Englewood IM Yard through the joints and cracks in the concrete and asphalt surfaces primarily in the area shown on Figure 6. In October 2018, Golder personnel documented the excavation of four test pits in the areas where the tar-like NAPL was observed in the Englewood IM Yard, as detailed in the *Monthly Status Update – Soil Cap and Concrete Cap Repairs* dated October 31, 2018 (October 2018 Monthly Update) submitted to the TCEQ (Golder, 2018). The NAPL observed in each test pit visually appeared to be similar at each location and was described as a black, viscous material found within the top 3 feet bgs. Photographs of one of the test pits is provided below.



View of Test Pit B100, note paste-like NAPL seeping in around 3 feet bgs

As part of that test pit evaluation, samples of the tar-like NAPL were collected and analyzed for total petroleum hydrocarbons (TPH) by TX1005 Method, TPH fractionation by TX1006 Method, volatile organic compounds (VOCs) by EPA Method 8260, semi-volatile organic compounds (SVOCS) by EPA Method 8270, and reactivity/ignitability/corrosivity for waste profiling. The four NAPL samples had TPH concentrations ranging from 23,000 mg/kg to 35,000 mg/kg, with the highest concentrations detected in the C_{12}-C_{28} TPH range. Each NAPL sample was also analyzed for TPH fractionation by TX1006 Method. As detailed in the October 2018 Monthly Update (Golder, 2018), the four NAPL samples collected from the test pits appeared to have a similar distribution of TPH fractions. A Tier 1 PCL for Total TPH was established using the TCEQ Tier 1 TPH PCL Calculator (v 2.0 – 12/2016) and the TPH fractionation data collected from the test pits. The 30-Acre C/I Tier 1 $^{Tot}Soil_{Comb}$ PCL of 46,900 mg/kg was established as the appropriate Tier 1 PCL since the TPH concentration is considered protective of the underlying groundwater. None of the NAPL samples themselves had total TPH concentrations greater than the calculated TPH PCL.

Based on the results of the test pit evaluation, Golder, on behalf of UPPR, proposed a NAPL Collection System design as an interim measure as detailed in the October 2018 Monthly Update. The TCEQ approved UPRR to proceed with the interim measure in a letter dated December 6, 2018, with additional comments on the NAPL TPH assessment and requested UPRR submit a schedule "to assess and characterize the extent of environmental media affected with TPH and identify the TPH source area(s)". Golder, on behalf of UPRR, prepared a response letter dated January 9, 2019 (Golder, 2019b) that provided the following information on possible TPH source areas:

- *Based on the analytical data for the tar-like substance (NAPL) and surrounding soils, the NAPL does not appear to be creosote. As discussed in the email from Golder to the TCEQ on October 22, 2018, the specific source of the tar-like substance or NAPL is uncertain. However, historical aerials (see attached Fig XI-A-1d from the RCRA permit renewal showing the 1943 aerial (Attachment C)) indicate two lagoons or ponds in the area of the present-day Englewood Intermodal Yard. Adjacent to the lagoons were three, large, above ground storage tanks (ASTs) that were used for storage of crude oil with an estimated capacity of 55,000 barrels each (based on the description on the 1929 Sanborn Map (Attachment C)). The NAPL appears to be a heavily weathered petroleum hydrocarbon, likely from releases from the ASTs.*

> *The soil and groundwater within the Englewood Intermodal Yard have been extensively investigated over the past 10 years. As discussed in the Response Action Plan (RAP) (Attachment 1A, PBW, November 2014), PBW conducted a soil, groundwater, and cone penetrometer with rapid optical screening tool (CPT/ROST™) investigation in 2013 focused in the Englewood Intermodal Yard area to evaluate the lateral and vertical extent of COCs above TRRP PCLs in soils and preliminarily evaluate the presence of NAPL in the subsurface. The investigation specifically targeted the former AST and lagoon area. The ROST™ data from the investigation was incorporated into the site-wide ROST™ data and presented on Figure 4D – Vadose Zone NAPL Observation and ROST™ Reading (attached under Attachment D) presented in the RAP (November 2014). Additional soil sampling was conducted within the Englewood Intermodal Yard in May 2018 as part of a pavement improvement project where soils beneath the pavement were characterized prior to construction.*

Following the TCEQ's review of the January 9, 2019 response letter, the TCEQ issued a Request for Information comment letter dated February 6, 2019 requesting UPRR to delineate the TPH impacted soils horizontally and vertically in accordance with 30 Texas Administrative Code (TAC) 350.51. Golder, on behalf of UPRR, prepared a response letter dated February 28, 2019 detailing a proposed soil assessment for TPH in and around the Englewood IM Yard, specifically in the areas where the former lagoon and ASTs were assumed to be located. The response letter provided proposed soil boring locations for the TPH assessment and a preliminary schedule, pending TCEQ approval, to address the TCEQ comments. The TCEQ did not issue a follow-up letter, but rather incorporated the February 6, 2019 request for the TPH Assessment into the Technical Notice of Deficiency (TNOD) dated April 11, 2019 , which stated *"the current assessment of the total petroleum hydrocarbon – non-aqueous phase liquid (TPH-NAPL) seep source(s) and extent is insufficient because only a limited soil assessment was performed. Additional soil and groundwater assessments is needed which shall include additional soil borings, well installation and monitoring. Additional assessment is discussed in more detail in comment nos. T35(4), T42(4), T43(3), T44(4), T45(4) and T48(3).*"

Under a cover letter dated July 10, 2019, UPRR submitted a response to the TCEQ TNOD that included the Conceptual Response Action Plan (RAP) dated July 9, 2019 detailing pre-design assessment activities including the proposed *TPH-NAPL Assessment Englewood Intermodal Yard* (Golder, 2019a). The TCEQ issued a letter dated September 6, 2019 detailing additional comments on UPRR's July 10, 2019 Response to the TNOD. The TCEQ's comments on the proposed pre-design TPH-NAPL assessment, included a request for specific additional sample locations. A meeting was held on September 23, 2019 at the TCEQ Austin office between UPRR, TCEQ, and Golder to discuss the requested additional assessment activities. Golder, on behalf of UPRR, then submitted a response letter dated October 23, 2019 confirming the additional TPH assessment locations based on the discussions with the TCEQ on September 23, 2019. The TCEQ issued a letter dated December 13, 2019 providing approval for UPRR to proceed with the TPH-NAPL pre-design assessment activities as revised in the October 23, 2019 letter.

Details of the assessment methods and results are provided in the following sections.

3.2 Assessment Methods

Following TCEQ approval and between December 2019 and February 2020, 56 soil samples from 28 soil borings were collected for TPH analysis to delineate the horizontal and vertical extent of TPH concentrations in soils as described in the October 23, 2019 letter. The soil boring locations are shown on Figure 5. Soil borings were advanced using a hand auger and a track-mounted Geoprobe® DPT rig. To clear the borings of underground utilities, the top 5 to 8 feet of the soil borings were advanced using a hand auger.

Soil borings were drilled to the top of the uppermost GWBU (A-TZ) to assess the surface and subsurface soils at each location. Soil samples were collected continuously for the total depth of each boring and logged by field personnel and field screened using a photoionization detector (PID). Boring logs are provided in Attachment E. Following the collection of soil samples, the soil borings were plugged with bentonite grout. Soil samples were collected in laboratory-supplied containers and placed on wet ice in an insulated cooler. A chain-of-custody record accompanied the samples through receipt at ALS Environmental Laboratory in Houston, Texas.

Based on field observations and lithology, soil samples selected for analysis were collected from 1-foot sub-intervals from each soil boring from within the 0 to 5-foot and the 5-foot to top of the A-TZ depth intervals. Soil samples were analyzed for TPH by Method TX1005. Gas chromatography (GC) graphs from the samples with the highest TPH concentrations were compared to evaluate whether the general hydrocarbon composition of the TPH differed across the sampled areas. Samples with elevated TPH concentrations and different compositional distributions based on the TX1005 results were selected for Method TX1006 analyses to develop site-specific TPH mixture critical PCLs following the TCEQ Guidance Document RG- 366/TRRP-27 (TCEQ, 2010a).

Analytical data from the soil samples collected during the TPH-NAPL assessment were reviewed for adherence to established quality assurance/quality control (QA/QC) criteria, and Data Usability Summary (DUS) was prepared in accordance with TCEQ publication RG-366/TRRP-13 (TCEQ, 2010b) to demonstrate the quality of the laboratory analytical data and present any deviations from the established QA/QC criteria. Copies of the analytical data reports and the DUS are provided in Attachment F.

3.3 Data Evaluation

The TPH data evaluation included the following:

1. Evaluate the lateral extent of the TPH concentrations in soils using the TX1005 analytical data compared to applicable TCEQ TRRP PCLs.
2. Evaluate hydrocarbon types by reviewing the GC chromatograms from the samples with the highest TPH TX1005 concentrations to assess whether the general hydrocarbon composition of the TPH differed across the sampled areas.
3. Samples with elevated TPH concentrations and different compositional distributions based on the TX1005 results were selected for TX1006 analyses. The results from the TPH fractionation by Method TX1006 were used to develop TPH Mixture critical PCLs for each hydrocarbon type using the TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 – 02/2020).
4. The TPH soil PCL Exceedance (PCLE) Zone was then established using the individual TPH Mixture cPCLs.

Discussion on delineation of the TPH concentrations in soils, different hydrocarbon types identified, establishing critical PCLs for the TPH, and TPH soil PCLE Zone are provided in the following sections.

3.3.1 TPH TX 1005 Evaluation

The TPH soil data evaluation followed a "focused on-site soil assessment" as detailed in the TCEQ Guidance Document Affected Property Assessment Requirements under TRRP, RG-366/TRRP-12, Revised May 2010 (TCEQ, 2010c) and 30 TAC §350.51(c), which states "*for soils only, the person can focus the horizontal on-site assessment to define the area exceeding the applicable critical PCL (i.e., residential or commercial/industrial).*"

Therefore, for the purposes of assessing the lateral extent of TPH TX1005 analytical results in soils, the TPH data were initially compared to the following PCLs based on the location of the soil boring:

- Along the perimeter of the Site, soil samples were compared to the Tier 2, residential, 30-acre source area PCLs; or
- Within the interior of the Site, soil samples were compared to the Tier 2, Commercial/Industrial, 30-acre source area PCLs.

A summary of the soil TPH results by TX1005 compared to the applicable PCL based on the location of the soil samples is provided in Table 1 and shown on Figure 6.

Based on the soil TPH TX1005 data, the TPH concentrations were delineated to the applicable TPH TX1005 PCLs at the western perimeter of the Site to the east, south, and west except at location DPT-26-20 (on the western perimeter), which had a TPH C_{12}-C_{28} concentration of 3,300 mg/kg that exceeded the residential PCL of 1,500 mg/kg, but was less than the commercial/industrial PCL of 4,400 mg/kg. Another soil boring, DPT-24-20 located on the west perimeter north of DPT-26-20 had TPH concentrations less than the residential PCLs. The three soil borings along the northern perimeter, DPT-12-20, DPT-16-20, and DPT-21-20 each had TPH concentrations in the C_6-C_{12} and C_{12}-C_{28} ranges that exceeded the residential PCLs. Of those samples, one had a TPH concentration that exceeded the commercial/industrial PCL (DPT-12-20 from 8-9 feet bgs, C_{12}-C_{28} range).

Soil samples were collected from depth intervals corresponding to potential surface and subsurface soil pathways under TRRP to evaluate TPH concentrations vertically to the appropriate PCL, rather than to the higher of the method quantitation level (MQL) or background. For the perimeter locations, the deeper soil samples collected from DPT-12-20 (8-9 feet bgs), DPT-16-20 (14-15 feet bgs), and DPT-26-20 (13-14 feet bgs) had concentrations detected above the MQL. The following TRRP Rule for the vertical delineation was followed: 30 TAC 350.51(d)(4): *If a person has already determined that the groundwater is impacted, then they may satisfy the requirements of this subsection by declaring the entire soil column to the top of the lowest impacted groundwater bearing unit as a soil PCLE zone.* Since the TPH soil boring locations are generally within the groundwater PCLE zones for the three GWBUs (a cumulative groundwater PCLE shown on Figure 5 using the information provided in the Interim Groundwater Monitoring Report (Golder, 2020)), the entire soil column is considered part of the affected property. The only soil boring location that appears to be outside the groundwater PCLE zones is DPT-42-19, but is likely within the overall groundwater affected property.

As part of the NAPL assessment within the Englewood Intermodal Yard, the total TPH TX1005 concentrations in soil samples collected within the vadose zone were also compared to the TCEQ theoretical residual soil saturation limit (Tier 1 $Soil_{Res}$) PCL (10,000 mg/kg) as a possible further preliminary indication of the potential presence of NAPL. Soil borings with at least one soil sample containing TPH TX1005 concentrations above the Tier 1 $Soil_{Res}$ include seven locations in the general area of the former lagoons (DPT-30-19, DPT-32-19, DPT-34-19, DPT-35-19, DPT-36-19, DPT-37-19, and DPT-38-19) and one location within the area of the former ASTs (DPT-42-19) (Table 1; Figure 5). At each of these locations where TPH concentrations were detected greater than 10,000 mg/kg, either NAPL was visually observed or strong hydrocarbon odors were noted on the soil boring logs (Attachment E).

The soil TPH TX1005 results are delineated to less than the Tier 1 $Soil_{Res}$ PCL to the north, south, east, and west (Figure 5). The area where the soil samples indicate TPH concentrations greater than the Tier 1 $Soil_{Res}$ PCL is generally within the TarGOST® 5%RE contour within the vadose zone in the Englewood Intermodal Yard (Figure 2), except at DPT-36-19 and DPT-38-19 that had TarGOST® signals less than 5%RE in the vadose zone. Based on the samples collected as part of this assessment, total TPH concentrations detected above 10,000 mg/kg are typically found in the top six feet bgs. Since the top 8 to 10 feet of soils were cleared for potential utilities for the CPT/TarGOST® borings and backfilled with sand, the TarGOST® signals would not have detected the potential NAPL in the shallow portion of the vadose zone where these TPH concentrations were detected.

The information gathered from the TPH-NAPL assessment in combination with the data from the test pits will be used to develop the NAPL response triggers for the TPH-NAPL area in the Englewood Intermodal Yard following the TCEQ Risk-Based NAPL Management Guidance Document (RG-366/TRRP-32) (TCEQ, 2013). The NAPL response triggers and resulting response action objectives will be detailed in the Revised RAP.

3.3.2 Hydrocarbon Types

GC chromatograms for the TPH TX1005 soil samples collected in 2020 and the associated TPH fractionation data by TX1006 for selected samples were evaluated to provide an interpretation of the hydrocarbon types present in the soil samples. A summary of the soil TPH results by TX1006 is provided in Table 2. A technical memorandum prepared by a Golder chemist summarizing the interpretation of the soil data is provided in Attachment G. Based on the profile of the predominant peaks in the chromatograms and the fractionation data, the TPH results for the soil samples were assigned four categories, which may indicate different TPH types:

- nC_6 to nC_{12} Organics – GC graphs indicate the presence of VOCs;
- $>nC_{12}$ to nC_{28} Organics – appears to be impacted by diesel or other fuels of similar composition.
- $>nC_{12}$ to nC_{28} Organics with High Aromatic Content and low VOC content – typical for creosote; and
- Unresolved complex material (UCM) – potentially may include residual fuel oils (which have common names such as No. 4, 5, and 6 fuel oils) and bunker C or asphalt and lubricating oils.

GC graphs of samples with TPH concentrations below the detection limit or relatively low concentrations (<100 mg/kg) were not included in the hydrocarbon type analysis.

Soil samples falling into each category are listed in Tables 1 through 4 of the technical memorandum in Attachment G and color coded as shown on Figure 6. The general distribution of the different TPH categories appears to generally align with the previous operations at the Site:

- nC_6 to nC_{12} Organics – Observed in DPT-21-20 on the northeast portion of the HWPW Recent Process Area (SWMU 4) where drying agents (e.g., petroleum naphtha consisting of lighter fraction carbon chain compounds, including benzene (PBW, 2010)) were stored and managed during operations. This TPH category was also observed at DPT-38-19 sampled near a former lagoon or pond within the Englewood IM Yard.
- $>nC_{12}$ to nC_{28} Organics – This TPH category appears to be predominately within the former lagoon area, but was also observed in DPT-21-20 on the northeast portion of the HWPW Recent Process Area (SWMU 4) and a lower concentration detected near the southeast end of the Railroad Tie Storage Area (SWMU 12);
- $>nC_{12}$ to nC_{28} Organics with High Aromatic Content and Low VOC Content – Observed within the former HWPW area (along the northern perimeter) and within the former lagoon within the Englewood IM Yard.
- Unresolved complex material (UCM) – Observed predominately in the soil samples collected near the former ASTs within the Englewood IM Yard.

The above categories and descriptions should be considered as preliminary generalizations only. Specific releases of different types of TPH and locations are not known, and the TPH has likely gone through various phases of weathering/depletion and may have been mixed during operations. As such, this evaluation of the specific TPH types and distribution should not be used to identify specific sources at the Site, but rather as a general guide to evaluate the range of TPH characteristics at the Site for establishing critical PCLs for the TPH categories.

3.3.3 Establishing Critical PCLs

The soil samples with the highest total TPH concentrations were chosen as representative samples of each category, analyzed for TPH fractionation by Method TX1006, and Tier 1 PCLs for Total TPH were calculated using the TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 – 02/2020). The calculations are provided in Attachment H. Based on the TPH TX1006 results at each location, the hazard index was less than 10 (§350.76(g)(8)) and the TPH concentration is considered protective of the underlying groundwater, therefore, the soil to groundwater pathway for the TPH mixture is not complete and a ${}^{GW}Soil_{Ing}$ PCL was not calculated (TCEQ, 2010a). The lowest of the PCLs established for the different applicable exposure pathways is the ${}^{Tot}Soil_{Comb}$ pathway PCL and is the critical PCL for each category, as summarized in the following table:

Category	**Location ID**	**Depth Interval (feet bgs)**	**Tier 1 ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\ Mix}$ (30-Acre Residential) (mg/kg)**	**Tier 1 ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\ Mix}$ (30-Acre Commercial/ Industrial) (mg/kg)**
nC_6 to nC_{12} Organics	DPT-38-19	3-4	6,287	16,766
$>nC_{12}$ to nC_{28} Organics	DPT-34-19	4-5	9,600	60,480
$>nC_{12}$ to nC_{28} Organics with High Aromatic Content	DPT-35-19	4-5	7,504	70,247
Unresolved complex material (UCM)	DPT-42-19	4-5	5,797	57,967

The TPH Mixture PCLs listed above were then used as the critical PCLs to evaluate the total TPH by TX1005 Method soil sample concentration data. Following the same procedures for assessing the TPH by TX1005 data, the TPH data were evaluated against the critical PCLs by comparing to the following PCLs based on the location of the soil boring:

- Along the perimeter of the Site, soil sample results for total TPH were compared to the Residential Tier 1, ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$, and
- Within the interior of the Site, soil samples were compared to the C/I ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix.}$

3.3.4 TPH PCLE Zone

The total TPH concentrations for the soil samples in each category were compared to the calculated critical PCLs for each category detailed in Section 3.3.3 (Table 3). None of the soil samples had total TPH concentrations greater than the calculated C/I $^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix,}$ and therefore there is no Total TPH PCLE Zone for soils at the Site. However, one soil sample collected from the perimeter had total TPH concentrations that exceeded the applicable calculated Residential Tier 1, $^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$.

Total TPH concentration in the soil sample collected at DPT-12-20 (8-9 feet bgs) (8,070 mg/kg) exceeded the Residential Tier 1, $^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$ for the >nC_{12} to nC_{28} Organics with High Aromatic Content Category of 7,504 mg/kg. This soil sample had total TPH concentrations less than the applicable calculated C/I $^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$ (70,247 mg/kg). Based on this TPH result, additional sampling closer to the property boundary north of DPT-12-20 is recommended to evaluate the lateral extent of the total TPH concentrations in the surface soils.

3.4 TPH Assessment Conclusions

The TPH-NAPL Assessment followed the procedures outlined in the TCEQ Guidance Document RG- 366/TRRP-27 (TCEQ, 2010a). Based on the assessment, the following conclusions were developed:

- Delineation of TPH in soils using the TPH TX1005 data from the 56 soil samples indicated that the TPH concentrations were not delineated to the applicable TPH TX1005 PCLs on the western and northern perimeter of the Site. Surface soil sample from DPT-26-20 (2-3 feet) had a TPH C_{12}-C_{28} concentration of 3,300 mg/kg that exceeded the residential PCL but was less than the commercial/industrial PCL of 4,400 mg/kg. Soil boring DPT-24-20 located on the western perimeter north of DPT-26-20 had TPH concentrations less than the residential PCLs. Soil borings along the northern perimeter DPT-12-20, DPT-16-20, and DPT-21-20 each had TPH concentrations in the C_6-C_{12} and C_{12}-C_{28} ranges that exceeded the residential PCLs. Of those samples, only one had a TPH concentration that exceeded the commercial/industrial PCL (DPT-12-20 from 8-9 feet bgs, C_{12}-C_{28} range).

- The TPH-NAPL assessment within the Englewood Intermodal Yard indicated total TPH TX1005 concentrations in eight soil samples exceeded the Tier 1 $Soil_{Res}$ PCL of 10,000 mg/kg. Except for one location (DPT-42-19) located within the former AST area, the other seven locations are in the general area of the former lagoons. At each of these soil boring locations, either NAPL was visually observed or strong hydrocarbon odors were noted on the soil boring logs. The soil TPH TX1005 results are delineated to less than the Tier 1 $Soil_{Res}$ PCL to the north, south, east, and west. The information gathered from the TPH-NAPL assessment will be used to develop the NAPL response triggers for the TPH-NAPL area in the Englewood Intermodal Yard following the TCEQ guidance. The NAPL response triggers and resulting response action objectives will be detailed in the Revised RAP.

- An evaluation conducted by Golder indicated the following four different categories of TPH mixtures based on the TPH TX1005 predominant peaks in the GC graphs and fractionation data:
  - nC_6 to nC_{12} Organics – GC graphs indicate the presence of VOCs;
  - >nC_{12} to nC_{28} Organics – appears to be impacted by diesel or other fuels of similar composition;
  - >nC_{12} to nC_{28} Organics with High Aromatic Content and low VOC content – typical for creosote; and

  - Unresolved complex material (UCM) – potentially may include residual fuel oils (which have common names such as No. 4, 5, and 6 fuel oils) and bunker C or asphalt and lubricating oils.

- Using these four categories and representative TX1006 analytical data for each category, TPH mixture PCLs were calculated following TCEQ guidance. The TPH mixture PCL analysis indicated that the soil to groundwater pathway for the TPH mixture is not complete, and therefore the ${}^{Tot}Soil_{Comb}$ pathway PCL is the critical PCL for each TPH category.

- The developed TPH Mixture critical PCLs (${}^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$) were used to evaluate the total TPH by TX1005 Method soil sample concentration data based on the identified TPH category for each sample. None of the soil samples had total TPH concentrations greater than the calculated C/I ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$, and therefore there is not a Total TPH PCLE Zone for soils at the Site. However, DPT-12-20 (8-9 feet bgs) soil sample collected from the northern perimeter had total TPH concentrations that exceeded the applicable calculated Residential Tier 1, ${}^{Tot}Soil_{Comb}$ $PCL_{TPH\text{-}Mix}$. for the >nC_{12} to nC_{28} Organics with High Aromatic Content Category.

- Additional sampling closer to the property boundary north of DPT-12-20 is recommended to evaluate the lateral extent to the total TPH concentrations in the surface soils.

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TABLES

TABLE 1
SUMMARY OF SOIL TPH CONCENTRATIONS BY METHOD TX1005
UPRR HOUSTON WOOD PRESERVING WORKS

Perimeter/ Interior Location	Location ID	Sample Depth (ft bgs)	Sample Date	nC6 to nC12	>nC12 to nC28	>nC28 to nC35	Total TPH
			Residential Assessment Level (mg/kg)	**4.7E+02**	**1.5E+03**	**1.5E+03**	
			Commercial/Industrial PCL (mg/kg)	**1.4E+03**	**4.4E+03**	**4.4E+03**	
Perimter Sample Locations							
P	DPT-12-20	4-5	1/30/2020	290	2,300	120	2,710
P	DPT-12-20	8-9	1/30/2020	1,300	6,500	270	8,070
P	DPT-16-20	4-5	1/30/2020	270	860	28	1,160
P	DPT-16-20	14-15	1/30/2020	1,300	3,100	120	4,520
P	DPT-21-20	3-4	1/30/2020	1,300	2,800	97	4,200
P	DPT-21-20	5-6	1/30/2020	48	110	22	180
P	DPT-24-20	4-5	1/29/2020	<7.6	<10	<10	<7.6
P	DPT-24-20	8-9	1/29/2020	<7.0	<9.2	<9.2	<7.0
P	DPT-26-20	2-3	1/28/2020	170	3,300	440	3,910
P	DPT-26-20	13-14	1/29/2020	<8.2	14	<11	14
P	DPT-43-19	2-3	2/4/2020	7	430	550	987
P	DPT-43-19	12-13	2/4/2020	<7.6	<10	<10	<7.6
P	DPT-45-19	1-2	2/5/2020	9	170	250	428
P	DPT-45-19	8-9	2/5/2020	<6.4	<8.4	<8.4	<6.4
P	DPT-46-19	2-3	1/30/2020	<6.5	<8.5	<8.5	<6.5
P	DPT-46-19	9-10	1/31/2020	<6.4	<8.4	<8.4	<6.4
P	DPT-55-19	3-4	12/16/2019	<8.6	<11	<11	<8.6
P	DPT-55-19	12.3-13.3	12/16/2019	<9.4	<12	<12	<9.4
P	SB-218	15-16	12/19/2019	<6.7	<8.8	<8.8	<6.7
P	SB-218	2.25-3	12/19/2019	<6.9	150	130	280
P	SB-219	2-3	2/3/2020	<79	1,400	980	2,380
P	SB-219	7-8	2/4/2020	<6.6	<8.7	<8.7	<6.6
P	SB-220	4-5	2/3/2020	<7.0	<9.2	<9.2	<7.0
P	SB-220	8-9	2/4/2020	<7.8	19	<10	19
P	SB-221	4-5	12/16/2019	<8.5	<11	<11	<8.5
P	SB-221	9-10	12/16/2019	<8.2	<11	<11	<8.2
Interior Sample Locations							
I	DPT-28-19	4-5	2/6/2020	<7.5	<9.8	<9.8	<7.5
I	DPT-28-19	7-8	2/5/2020	<7.6	31	41	72
I	DPT-29-19	4-5	2/5/2020	650	2,600	970	4,220
I	DPT-29-19	9-10	2/5/2020	230	1,100	200	1,530
I	DPT-30-19	4-5	2/3/2020	220	9,300	3,000	12,500
I	DPT-30-19	13-14	2/5/2020	810	3,400	510	4,720
I	DPT-32-19	2-3	2/4/2020	1,300	8,700	1,800	11,800
I	DPT-32-19	11-12	2/4/2020	890	5,600	950	7,440
I	DPT-34-19	4-5	12/18/2019	<450	15,000	4,500	19,500
I	DPT-34-19	5-6	12/18/2019	<82	3,800	1,200	5,000
I	DPT-35-19	4-5	12/19/2019	900	13,000	2,900	16,800
I	DPT-35-19	6-7	12/19/2019	200	1,200	170	1,570
I	DPT-36-19	3-4	2/5/2020	140	7,100	1,600	8,840
I	DPT-36-19	5-6	2/5/2020	130	9,100	2,700	11,900
I	DPT-37-19	4-5	2/6/2020	880	9,600	1,500	12,000
I	DPT-37-19	7-8	2/4/2020	270	1,800	270	2,340
I	DPT-38-19	3-4	12/16/2019	5,000	6,400	3,100	14,500
I	DPT-38-19	5-6	12/16/2019	1,400	4,700	1,700	7,800
I	DPT-39-19	2-3	12/17/2019	<7.4	600	360	960
I	DPT-39-19	7-8	12/17/2019	<7.6	<10	<10	<7.6
I	DPT-40-19	7-8	12/18/2019	<7.0	35	23	58
I	DPT-40-19	1.25-2	12/18/2019	170	6,500	1,300	7,970
I	DPT-41-19	1-2	2/6/2020	8	130	170	308
I	DPT-41-19	5-6	2/6/2020	<6.4	<8.4	<8.4	<6.4
I	DPT-42-19	4-5	12/17/2019	<120	15,000	3,200	18,200
I	DPT-42-19	7-8	12/17/2019	140	960	210	1,310
I	SB-216	3-4	1/29/2020	<8.5	<11	<11	<8.5
I	SB-216	7-8	1/29/2020	27	360	<9.7	387
I	SB-217	3-4	1/29/2020	<8.7	<12	<12	<8.7
I	SB-217	8-9	1/29/2020	<7.7	<10	<10	<7.7

Notes:

1. All values in milligrams per kilogram (mg/kg).
2. Concentrations greater than applicable residential assessment level (RAL) are highlighted light yellow. RALs based on the lower of the Tier 2 ^{GW}Soil or Tier 1 ^{Tot}Soil$_{Comb}$ PCLs (TRRP PCLs published November 2019).
3. Concentrations greater than applicable commercial/industrial (C/I) PCL are highlighted light orange. C/I PCLs based on the lower of the Tier 2 GWSoil or Tier 1 TotSoilComb PCLs (TRRP PCLs published November 2019).
4. Total TPH concentrations greater than 10,000 mg/kg (Tier 1 SoilRes PCL) in the vadose zone are highlighted blue.
5. Soil samples considered "interior", the analytical reults were compared to the C/I PCLs only under the focused on-site assessment.
6. J = Estimated value; < = Compound not detected at the specified detection limit.

TABLE 2
SUMMARY OF SOIL TPH CONCENTRATIONS BY METHOD TX1006
UPRR HOUSTON WOOD PRESERVING WORKS

Location ID	DPT-12-20	DPT-21-20	DPT-26-20	DPT-29-19	DPT-30-19	DPT-32-19	DPT-34-19	DPT-35-19	DPT-36-19	DPT-38-19	DPT-38-19	DPT-39-19	DPT-42-19	DPT-42-19
Sample Depth (ft bgs)	8-9	3-4	2-3	4-5	4-5	2-3	4-5	4-5	5-6	3-4	5-6	2-3	4-5	7-8
Sample Date	1/30/2020	1/30/2020	1/28/2020	2/5/2020	2/3/2020	2/4/2020	12/18/2019	12/19/2019	2/5/2020	12/16/2019	12/16/2019	12/17/2019	12/17/2019	12/17/2019
6 C aliphatics	<52	<26	<33	<26	<80	<110	<300	<79	<48	<62	<60	<5.0	<78	<51
>6-8 C aliphatics	<52	<26	<33	<26	<80	<110	<300	<79	<48	<62	<60	<5.0	<78	<51
>8-10 C aliphatics	<52	**53**	<33	<26	<80	<110	<300	<79	<48	**630**	**260**	<5.0	<78	<51
>10-12 C aliphatics	<52	**38 J**	<33	<26	<80	<110	<300	<79	<48	210	<60	<5.0	<78	<51
>12-16 C aliphatics	**110**	**36 J**	<33	<26	**200**	**280**	<300	**300**	**480**	<62	<60	**13**	**2,600**	**580**
>16-21 C aliphatics	**58 J**	**27 J**	<33	<26	**520**	**260**	**640**	**600**	**830**	**220**	**250**	**140**	**2,400**	**190**
>21-35 C aliphatics	**52 J**	<26	<33	**220**	**1,100**	**340**	**1,900**	**1,200**	**770**	**880**	**540**	**680**	**4,000**	**320**
Total Aliphatic Fraction	**220**	**154**	<33	**220**	**1,820**	**880**	**2,540**	**2,100**	**2,080**	**1,940**	**1,050**	**833**	**9,000**	**1,090**
>7-8 C aromatics	<52	<26	<33	<26	<80	<110	<300	<79	<48	<62	<60	<5.0	<78	<51
>8-10 C aromatics	<52	470	<33	**30 J**	<80	<110	<300	<79	<48	**490**	**120**	<5.0	<78	<51
>10-12 C aromatics	**1,100**	**440**	**76**	**420**	**150 J**	**1,200**	<300	**470**	<48	**1,400**	**390**	<5.0	<78	<51
>12-16 C aromatics	**2,000**	**710**	**1,400**	**1,100**	**590**	**2,700**	<300	**810**	**460**	**320**	**370**	**22**	**1,900**	<51
>16-21 C aromatics	**2,600**	**1,100**	**1,700**	**330**	**1,800**	**4,100**	**1,600**	**2,200**	**1,300**	**770**	**700**	**140**	**4,500**	<51
>21-35 C aromatics	**990**	**390**	**550**	**760**	**2,000**	**3,100**	**1,800**	**2,200**	**2,400**	**700**	**440**	**680**	**8,400**	**460**
Total Aromatic Fraction	**6,690**	**3,110**	**3,730**	**2,640**	**4,540**	**11,100**	**3,400**	**5,680**	**4,160**	**3,680**	**2,020**	**842**	**14,800**	**460**
Total Petroleum Hydrocarbons	**6,900**	**3,300**	**3,700**	**2,800**	**6,300**	**12,000**	**5,900**	**7,800**	**6,300**	**5,600**	**3,100**	**1,700**	**24,000**	**1,500**

Notes:

1. mg/kg - milligrams per kilogram
2. Results not offered for accreditation
3. Lab Qualifiers:
    - < = analyzed but not detected above the listed Method Detection Limit (MDL)
    - J = analyte detected below Sample Quantitation Limit but above the MDL

TABLE 3
SUMMARY OF TPH CATEGORIES AND TPH MIXTURE PCL EVALUATION
UPRR HOUSTON WOOD PRESERVING WORKS

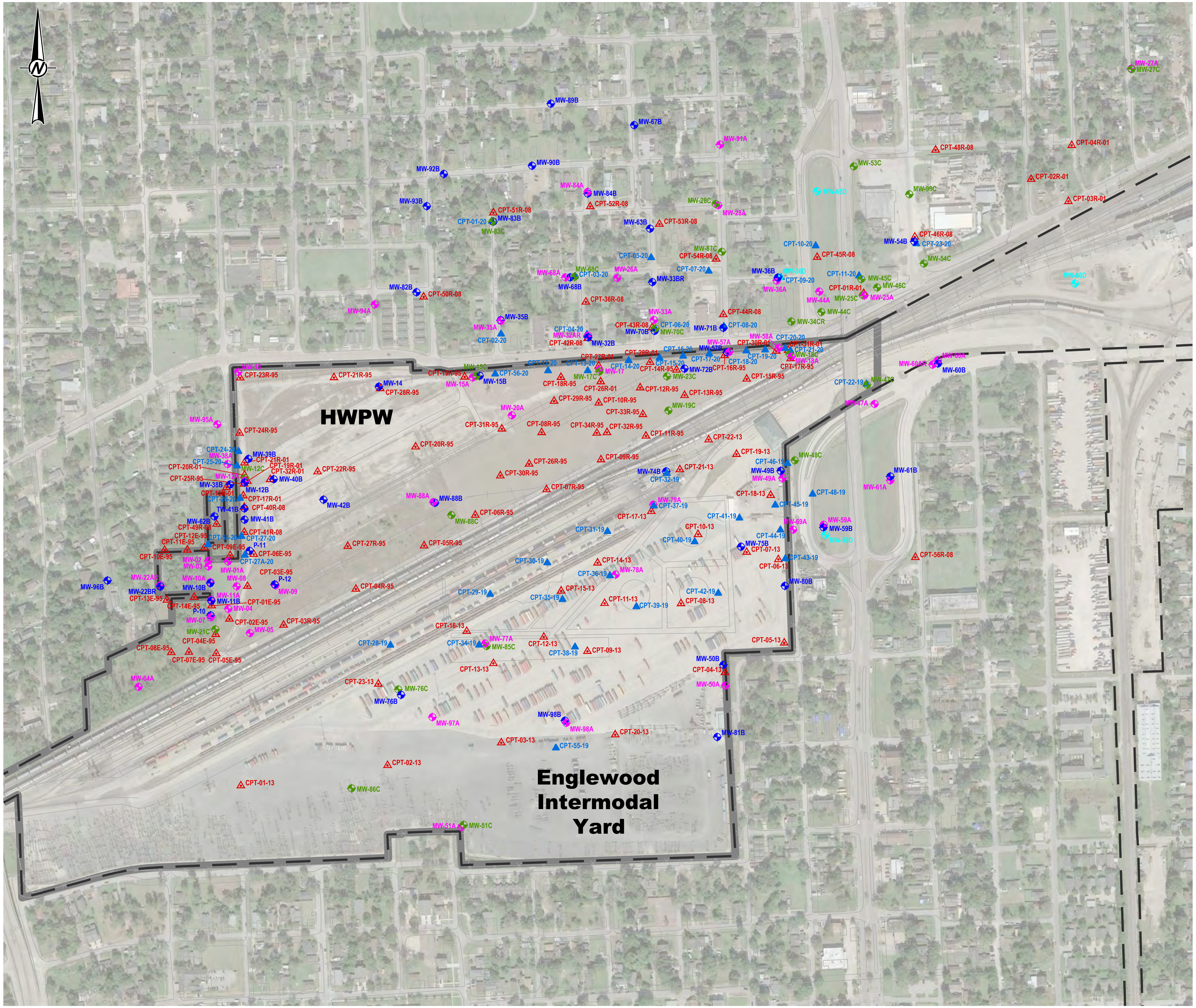
Location ID	Perimter/ Interior Location	Sample Depth (ft bgs)	Sample Date	nC6 to nC12	>nC12 to nC28	>nC28 to nC35	Total Petroleum Hydrocarbon
nC6 to nC12 Category							
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre Residential) (mg/kg)							6,287
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre C/I) (mg/kg)							16,766
DPT-21-20	P	3-4	1/30/2020	**1300**	**2800**	**97 J**	**4200**
DPT-38-19	I	5-6	12/16/2019	**1400**	**4700**	**1700**	**7800**
DPT-38-19	I	3-4	12/16/2019	**5000**	**6400**	**3100**	**14500**
>nC12 to nC28 Organics Category							
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre Residential) (mg/kg)							9,600
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre C/I) (mg/kg)							60,480
DPT-21-20	P	5-6	1/30/2020	**48**	**110**	**22 J**	**180**
DPT-30-19	I	4-5	2/3/2020	**220 J**	**9300**	**3000**	**12500**
DPT-34-19	I	4-5	12/18/2019	<450	**15000**	**4500**	**19500**
DPT-34-19	I	5-6	12/18/2019	<82	**3800**	**1200**	**5000**
DPT-36-19	I	3-4	2/5/2020	**140 J**	**7100**	**1600**	**8840**
DPT-37-19	I	4-5	2/6/2020	**880 J**	**9600**	**1500**	**12000**
DPT-37-19	I	7-8	2/4/2020	**270**	**1800**	**270**	**2340**
DPT-40-19	I	1.25-2	12/18/2019	**170 J**	**6500**	**1300**	**7970**
SB-216	I	7-8	1/29/2020	**27 J**	**360**	<9.7	**387**
>nC12 to nC28 Organics with High Aromatic Content Category							
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre Residential) (mg/kg)							7,504
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre C/I) (mg/kg)							70,247
DPT-12-20	P	4-5	1/30/2020	**290**	**2300**	**120 J**	**2710**
DPT-12-20	P	8-9	1/30/2020	**1300**	**6500**	**270 J**	**8070**
DPT-16-20	P	4-5	1/30/2020	**270**	**860**	**28 J**	**1160**
DPT-16-20	P	14-15	1/30/2020	**1300**	**3100**	**120 J**	**4520**
DPT-26-20	P	2-3	1/28/2020	**170 J**	**3300**	**440**	**3910**
DPT-29-19	I	4-5	2/5/2020	**650**	**2600**	**970**	**4220**
DPT-29-19	I	9-10	2/5/2020	**230 J**	**1100**	**200 J**	**1530**
DPT-30-19	I	13-14	2/5/2020	**810**	**3400**	**510**	**4720**
DPT-32-19	I	2-3	2/4/2020	**1300**	**8700**	**1800**	**11800**
DPT-32-19	I	11-12	2/4/2020	**890**	**5600**	**950**	**7440**
DPT-35-19	I	4-5	12/19/2019	**900**	**13000**	**2900**	**16800**
DPT-35-19	I	6-7	12/19/2019	**200 J**	**1200**	**170 J**	**1570**
Unresolved Complex Material Category							
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre Residential) (mg/kg)							5,797
Tier 1 $^{Tot}Soil_{Comb}$ PCL$_{TPH\ Mix}$ (30-Acre C/I) (mg/kg)							57,967
DPT-36-19	I	5-6	2/5/2020	**130 J**	**9100**	**2700**	**11900**
DPT-39-19	I	2-3	12/17/2019	<7.4	**600**	**360**	**960**
DPT-41-19	I	1-2	2/6/2020	**8.1 J**	**130**	**170**	**308**
DPT-42-19	I	4-5	12/17/2019	<120	**15000**	**3200**	**18200**
DPT-42-19	I	7-8	12/17/2019	**140 J**	**960**	**210 J**	**1310**
DPT-43-19	P	2-3	2/4/2020	**7 J**	**430**	**550**	**987**
DPT-45-19	P	1-2	2/5/2020	**8.5 J**	**170**	**250**	**428**
SB-218	I	2.25-3	12/19/2019	<6.9	**150**	**130**	**280**
SB-219	I	2-3	2/3/2020	<79	**1400**	**980**	**2380**

Notes:

1. All values in milligrams per kilogram (mg/kg).
2. Concentrations greater than applicable critical PCLs are highlighted light gray (depending on location).
3. Tier 1 PCLs for Total TPH were calculated using the TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 – 02/2020) for TCEQ Method 1006 Data for each TPH Category.

4. J = Estimated value; < = Compound not detected at the specified detection limit.
5. Soil samples considered "interior" (I), the analytical reults were compared to the C/I PCLs only, locations at the "perimter" (P) were also compared to residential PCLs.

FIGURES



LEGEND

▬ ▬ ▬	UPRR PROPERTY BOUNDARY
—	ROAD, PARKING LOT, SIDEWALK
—x—x—	FENCE
—+—+—	RAILROAD
⊕	A-TZ MONITORING WELL LOCATION
⊕	B-CZ/B-TZ MONITORING WELL LOCATION
⊕	C-TZ MONITORING WELL LOCATION
⊕	D-TZ MONITORING WELL LOCATION
△	CPT/ROST LOCATION (1995, 2001, 2008 & 2013)
▲	CPT WITH TarGOST LOCATION (2020)

STATE OF TEXAS
ERIC C. MATZNER
GEOLOGY
LIC. # 795
LICENSED
PROFESSIONAL GEOSCIENTIST
5/29/20

0 200 400
1" = 400' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
CPT/TarGOST® LOCATION MAP

CONSULTANT

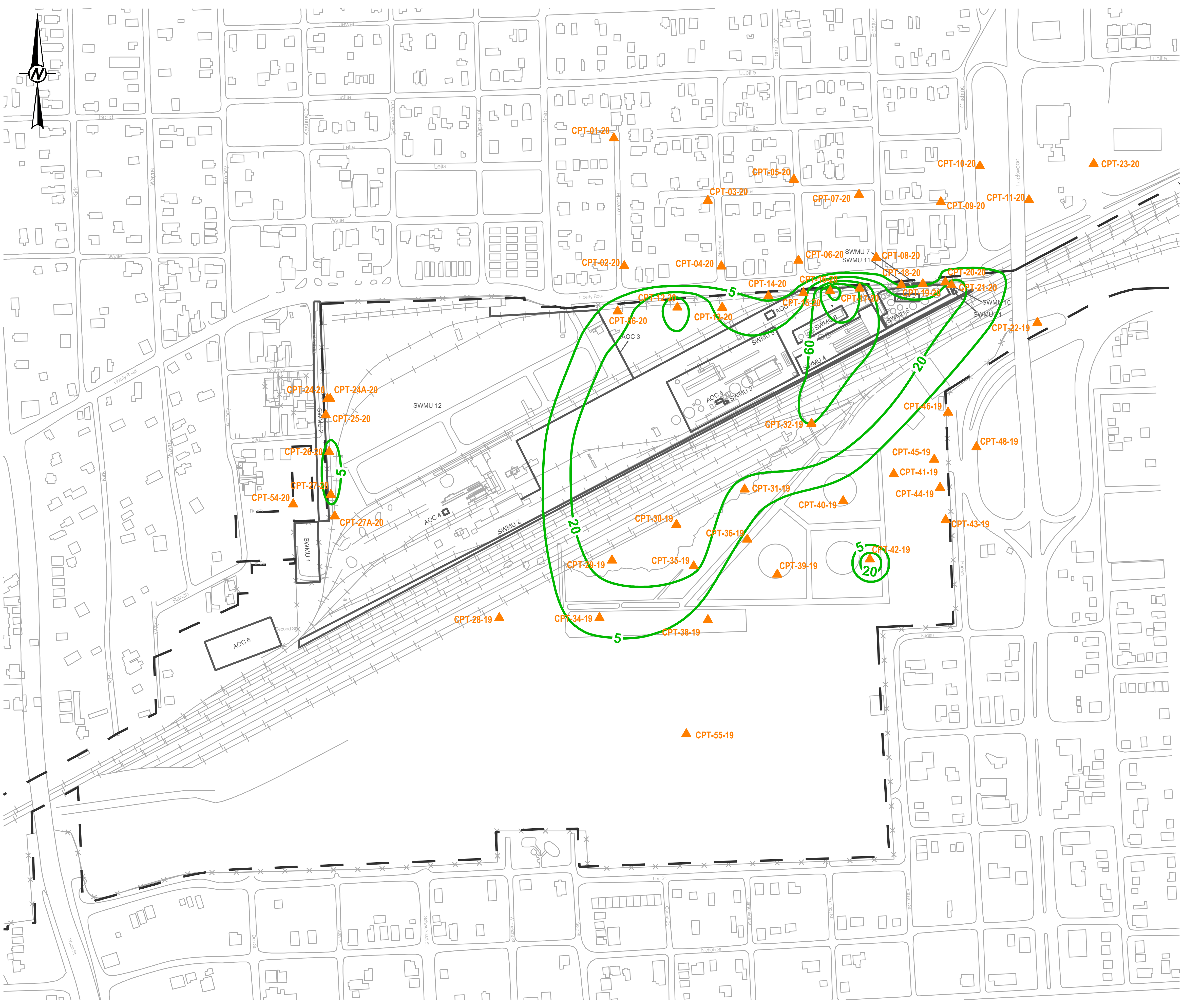
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-29
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	SB
APPROVED	ECM

PROJECT NO.	REV.	FIGURE
19119232	0	1

Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-5 May\ | File Name: FIG 1 - CPT-TarGOST Location Map.dwg | Last Edited By: adiamond Date: 2020-05-29 Time:12:13:10 PM | Printed By: adiamond Date: 2020-05-29 Time:3:47:43 PM

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

▬ ▬	UPRR PROPERTY BOUNDARY
─	ROAD, PARKING LOT, SIDEWALK
─×─×─	FENCE
─┼─┼─	RAILROAD
▭	HISTORIC STRUCTURE AND FEATURE
▲	CPT WITH TarGOST LOCATION
🟩	VADOSE ZONE MAXIMUM TarGOST SIGNAL (%RE) CONTOUR

ERIC C. MATZNER
GEOLOGY
LIC. # 795
5/29/20

REFERENCE(S)
BASE MAP FROM ERM-SOUTHWEST, INC. APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

0 170 350
1" = 350' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
TarGOST® RESPONSE DISTRIBUTION MAP - VADOSE ZONE

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232
REV. 0
FIGURE 2

Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-5 May\ | File Name: FIG 2-4 - TarGOST Response Distribution Map.dwg | Last Edited By: adiamond Date: 2020-05-29 Time:3:49:57 PM | Printed By: adiamond Date: 2020-05-29 Time:3:50:23 PM

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
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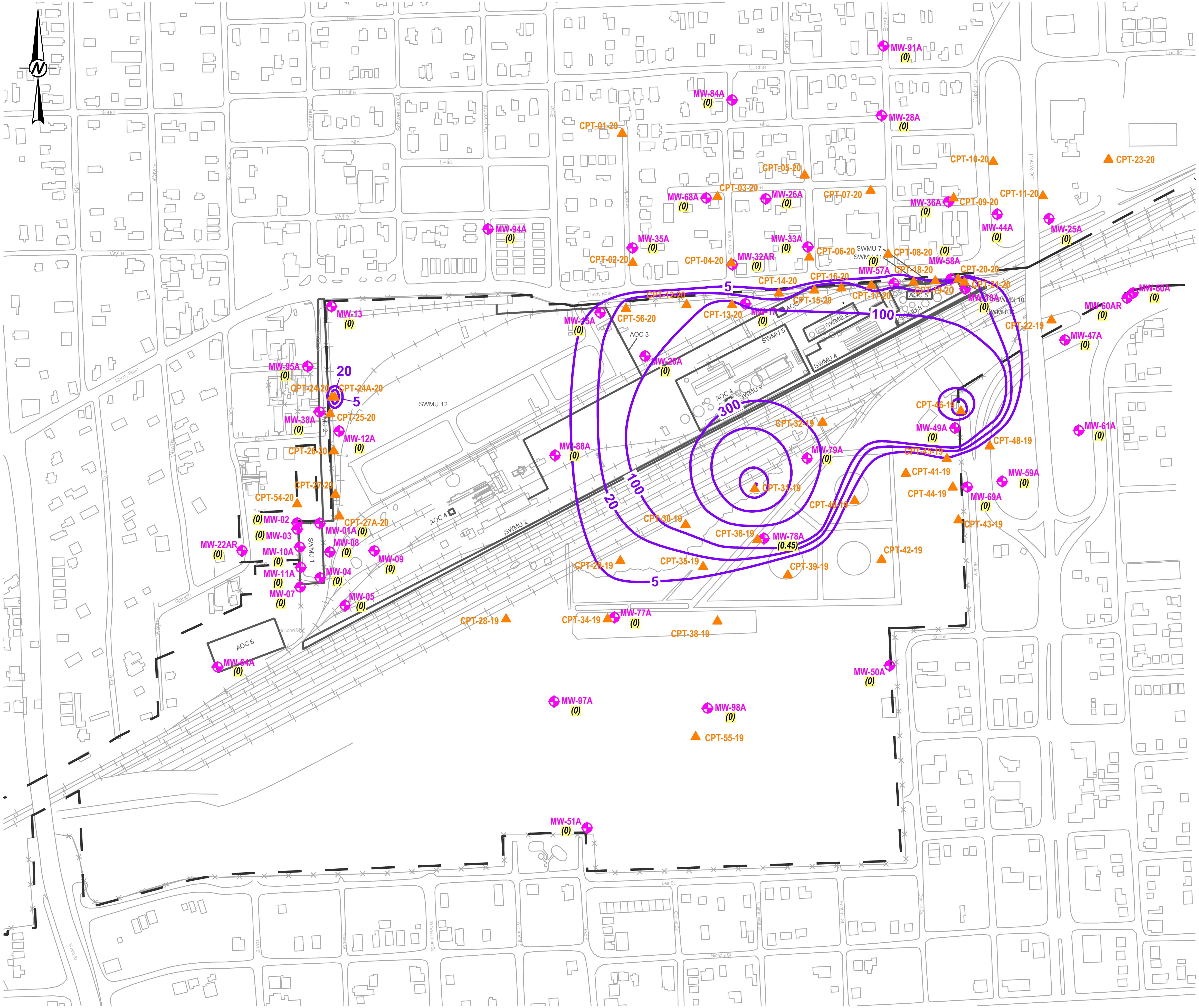


LEGEND

— — —	UPRR PROPERTY BOUNDARY
——	ROAD, PARKING LOT, SIDEWALK
—x—x—	FENCE
—+—+—	RAILROAD
▭	HISTORIC STRUCTURE AND FEATURE
▲	CPT WITH TarGOST LOCATION
⊕	A-TZ MONITORING WELL LOCATION
——	A-TZ MAXIMUM TarGOST SIGNAL (%RE) CONTOUR
(2.25)	IN WELL DNAPL THICKNESS (FT) (JANUARY 2020)

STATE OF TEXAS
ERIC C. MATZNER
GEOLOGY
LIC. # 795
LICENSED
PROFESSIONAL GEOSCIENTIST
5/29/20

REFERENCE(S)
BASE MAP FROM ERM-SOUTHWEST, INC. APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

0 170 350
1" = 350' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
TarGOST® RESPONSE DISTRIBUTION MAP - A-TZ

CONSULTANT

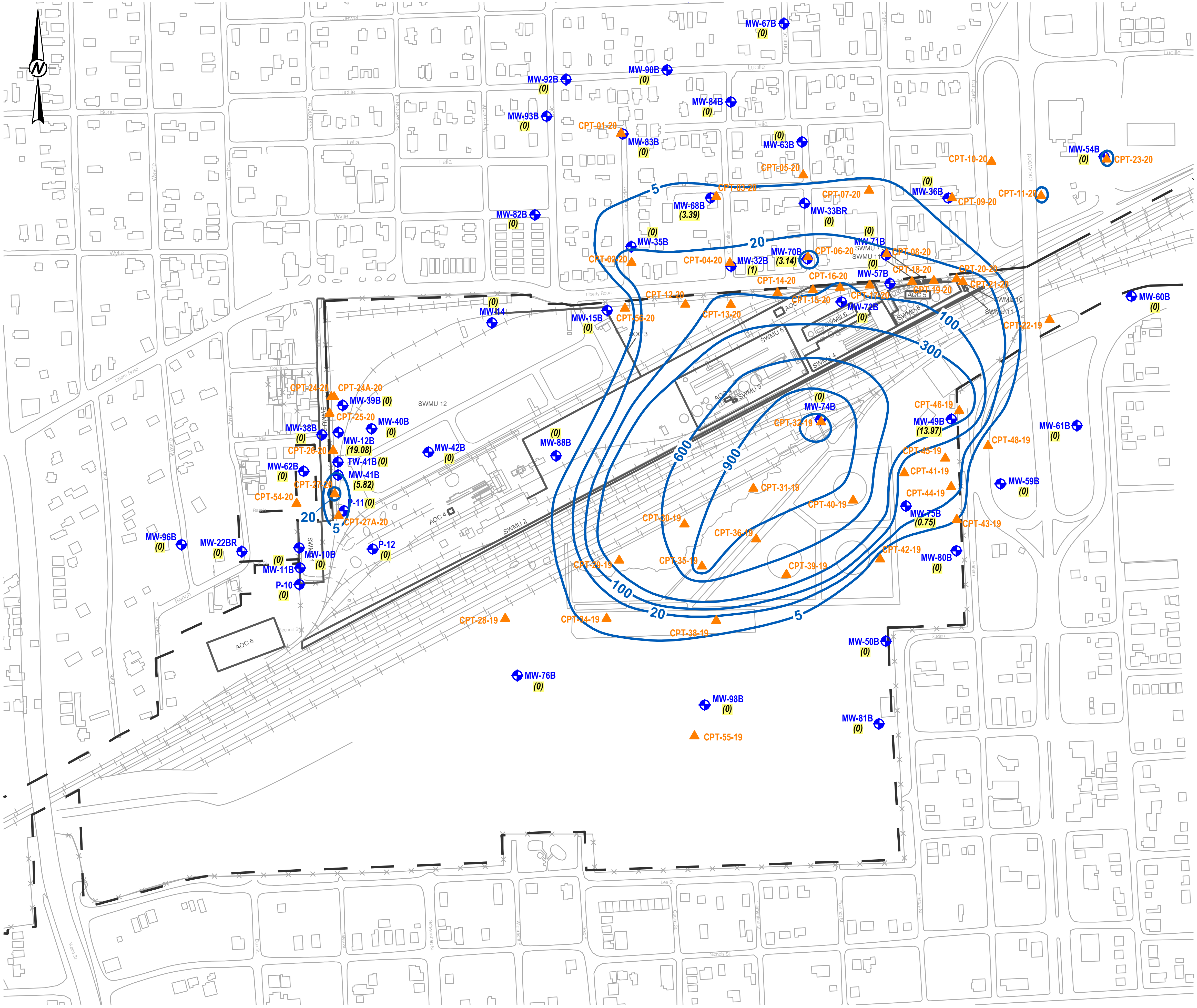
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO.	REV.	FIGURE
19119232	0	3

Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-5 May\ | File Name: FIG 2-4 - TarGOST Response Distribution Map.dwg | Last Edited By: adiamond Date: 2020-05-29 Time:3:49:57 PM | Printed By: adiamond Date: 2020-05-29 Time:3:50:53 PM

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

— — —	UPRR PROPERTY BOUNDARY
———	ROAD, PARKING LOT, SIDEWALK
—×—×—	FENCE
—+—+—	RAILROAD
▭	HISTORIC STRUCTURE AND FEATURE
▲	CPT WITH TarGOST LOCATION
⊕	B-CZ/B-TZ MONITORING WELL LOCATION
———	B-CZ/B-TZ MAXIMUM TarGOST SIGNAL (%RE) CONTOUR
(2.25)	IN WELL DNAPL THICKNESS (FT) (JANUARY 2020)

ERIC C. MATZNER
LIC. # 795
5/29/20

REFERENCE(S)
BASE MAP FROM ERM-SOUTHWEST, INC. APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

0 170 350
1" = 350' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

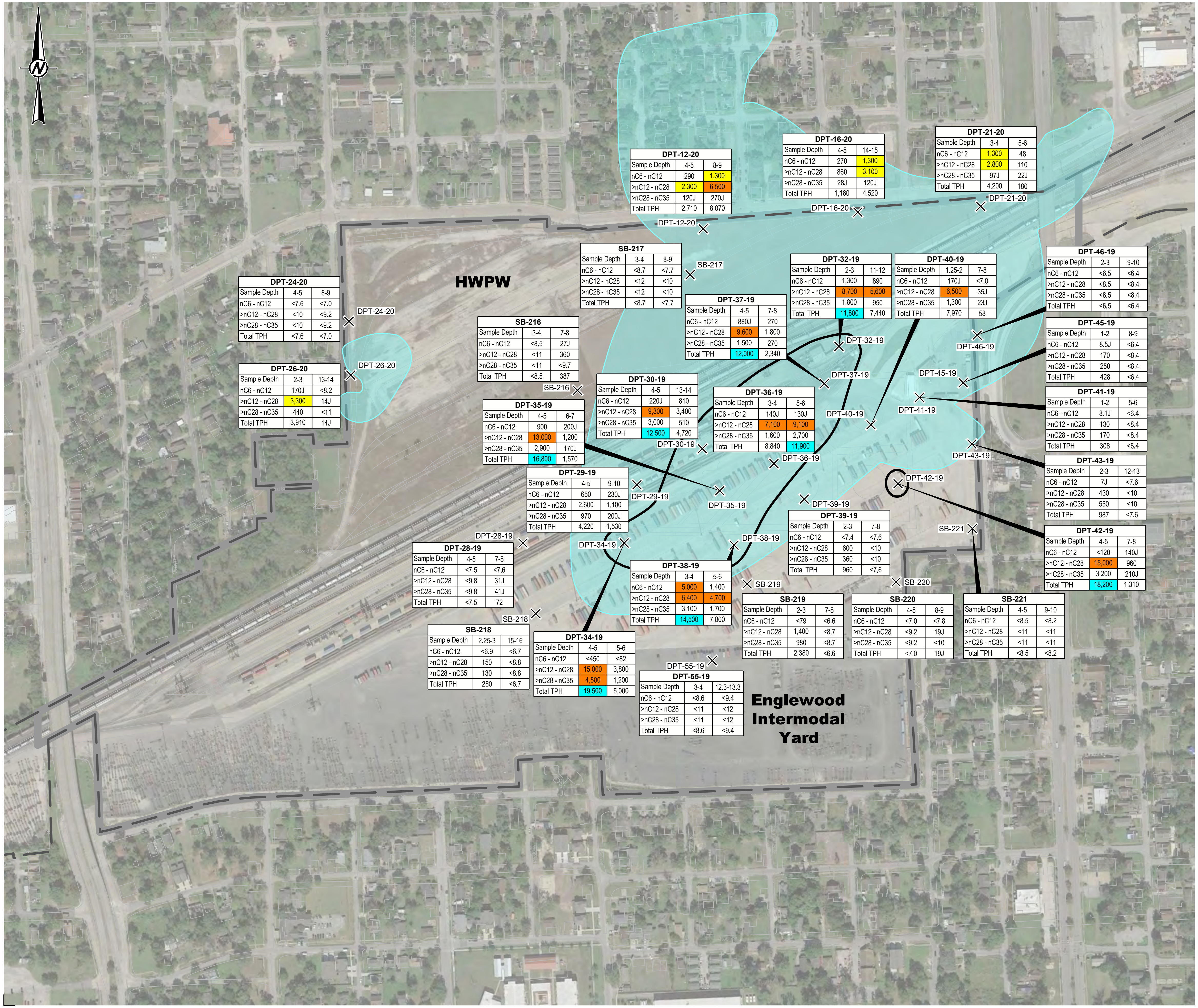
PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
TarGOST® RESPONSE DISTRIBUTION MAP - B-CZ/B-TZ

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO.	REV.	FIGURE
19119232	0	4



DPT-12-20

Sample Depth	4-5	8-9
nC6 - nC12	290	1,300
>nC12 - nC28	2,300	6,500
>nC28 - nC35	120J	270J
Total TPH	2,710	8,070

DPT-16-20

Sample Depth	4-5	14-15
nC6 - nC12	270	1,300
>nC12 - nC28	860	3,100
>nC28 - nC35	28J	120J
Total TPH	1,160	4,520

DPT-21-20

Sample Depth	3-4	5-6
nC6 - nC12	1,300	48
>nC12 - nC28	2,800	110
>nC28 - nC35	97J	22J
Total TPH	4,200	180

SB-217

Sample Depth	3-4	8-9
nC6 - nC12	<8.7	<7.7
>nC12 - nC28	<12	<10
>nC28 - nC35	<12	<10
Total TPH	<8.7	<7.7

DPT-24-20

Sample Depth	4-5	8-9
nC6 - nC12	<7.6	<7.0
>nC12 - nC28	<10	<9.2
>nC28 - nC35	<10	<9.2
Total TPH	<7.6	<7.0

DPT-26-20

Sample Depth	2-3	13-14
nC6 - nC12	170J	<8.2
>nC12 - nC28	3,300	14J
>nC28 - nC35	440	<11
Total TPH	3,910	14J

SB-216

Sample Depth	3-4	7-8
nC6 - nC12	<8.5	27J
>nC12 - nC28	<11	360
>nC28 - nC35	<11	<9.7
Total TPH	<8.5	387

DPT-32-19

Sample Depth	2-3	11-12
nC6 - nC12	1,300	890
>nC12 - nC28	8,700	5,600
>nC28 - nC35	1,800	950
Total TPH	11,800	7,440

DPT-40-19

Sample Depth	1.25-2	7-8
nC6 - nC12	170J	<7.0
>nC12 - nC28	6,500	35J
>nC28 - nC35	1,300	23J
Total TPH	7,970	58

DPT-37-19

Sample Depth	4-5	7-8
nC6 - nC12	880J	270
>nC12 - nC28	9,600	1,800
>nC28 - nC35	1,500	270
Total TPH	12,000	2,340

DPT-46-19

Sample Depth	2-3	9-10
nC6 - nC12	<6.5	<6.4
>nC12 - nC28	<8.5	<8.4
>nC28 - nC35	<8.5	<8.4
Total TPH	<6.5	<6.4

DPT-45-19

Sample Depth	1-2	8-9
nC6 - nC12	8.5J	<6.4
>nC12 - nC28	170	<8.4
>nC28 - nC35	250	<8.4
Total TPH	428	<6.4

DPT-30-19

Sample Depth	4-5	13-14
nC6 - nC12	220J	810
>nC12 - nC28	9,300	3,400
>nC28 - nC35	3,000	510
Total TPH	12,500	4,720

DPT-36-19

Sample Depth	3-4	5-6
nC6 - nC12	140J	130J
>nC12 - nC28	7,100	9,100
>nC28 - nC35	1,600	2,700
Total TPH	8,840	11,900

DPT-35-19

Sample Depth	4-5	6-7
nC6 - nC12	900	200J
>nC12 - nC28	13,000	1,200
>nC28 - nC35	2,900	170J
Total TPH	16,800	1,570

DPT-41-19

Sample Depth	1-2	5-6
nC6 - nC12	8.1J	<6.4
>nC12 - nC28	130	<8.4
>nC28 - nC35	170	<8.4
Total TPH	308	<6.4

DPT-29-19

Sample Depth	4-5	9-10
nC6 - nC12	650	230J
>nC12 - nC28	2,600	1,100
>nC28 - nC35	970	200J
Total TPH	4,220	1,530

DPT-43-19

Sample Depth	2-3	12-13
nC6 - nC12	7J	<7.6
>nC12 - nC28	430	<10
>nC28 - nC35	550	<10
Total TPH	987	<7.6

DPT-39-19

Sample Depth	2-3	7-8
nC6 - nC12	<7.4	<7.6
>nC12 - nC28	600	<10
>nC28 - nC35	360	<10
Total TPH	960	<7.6

DPT-42-19

Sample Depth	4-5	7-8
nC6 - nC12	<120	140J
>nC12 - nC28	15,000	960
>nC28 - nC35	3,200	210J
Total TPH	18,200	1,310

DPT-28-19

Sample Depth	4-5	7-8
nC6 - nC12	<7.5	<7.6
>nC12 - nC28	<9.8	31J
>nC28 - nC35	<9.8	41J
Total TPH	<7.5	72

DPT-38-19

Sample Depth	3-4	5-6
nC6 - nC12	5,000	1,400
>nC12 - nC28	6,400	4,700
>nC28 - nC35	3,100	1,700
Total TPH	14,500	7,800

SB-219

Sample Depth	2-3	7-8
nC6 - nC12	<79	<6.6
>nC12 - nC28	1,400	<8.7
>nC28 - nC35	980	<8.7
Total TPH	2,380	<6.6

SB-220

Sample Depth	4-5	8-9
nC6 - nC12	<7.0	<7.8
>nC12 - nC28	<9.2	19J
>nC28 - nC35	<9.2	<10
Total TPH	<7.0	19J

SB-221

Sample Depth	4-5	9-10
nC6 - nC12	<8.5	<8.2
>nC12 - nC28	<11	<11
>nC28 - nC35	<11	<11
Total TPH	<8.5	<8.2

SB-218

Sample Depth	2.25-3	15-16
nC6 - nC12	<6.9	<6.7
>nC12 - nC28	150	<8.8
>nC28 - nC35	130	<8.8
Total TPH	280	<6.7

DPT-34-19

Sample Depth	4-5	5-6
nC6 - nC12	<450	<82
>nC12 - nC28	15,000	3,800
>nC28 - nC35	4,500	1,200
Total TPH	19,500	5,000

DPT-55-19

Sample Depth	3-4	12.3-13.3
nC6 - nC12	<8.6	<9.4
>nC12 - nC28	<11	<12
>nC28 - nC35	<11	<12
Total TPH	<8.6	<9.4

LEGEND

▬ ▬ ▬	UPRR PROPERTY BOUNDARY
───	ROAD, PARKING LOT, SIDEWALK
─×─×─	FENCE
─┼─┼─	RAILROAD
×	TPH (TX1005) SOIL SAMPLE LOCATION (2019-2020)
🟦	GROUNDWATER PCLE ZONES (A-TZ, B-CZ/B-TZ & C-TZ - JANUARY 2020)
━━━	TOTAL TPH THEORETICAL RESIDUAL SOIL SATURATION LIMIT (10,000 mg/kg)

NOTE(S)

1. SAMPLE INTERVAL IN FEET BELOW GROUND SURFACE (BGS).
2. CONCENTRATIONS GREATER THAN APPLICABLE RESIDENTIAL ASSESSMENT LEVEL (RAL) ARE HIGHLIGHTED YELLOW. RALs BASED ON THE LOWER OF THE TIER 2 ^{GW}SOIL OR TIER 1 ^{Tot}SOIL$_{comb}$ PCLs.
3. CONCENTRATIONS GREATER THAN APPLICABLE COMMERCIAL/INDUSTRIAL (C/I) PCL ARE HIGHLIGHTED ORANGE. C/I PCLs BASED ON THE LOWER OF THE TIER 2 ^{GW}SOIL OR TIER 1 ^{Tot}SOIL$_{comb}$ PCLs.
4. PURSUANT TO 30 TAC §350.51(c), CONCENTRATIONS ALONG THE PERIMETER OF THE SITE ARE COMPARED TO RESIDENTIAL PCLs AND CONCENTRATIONS ON THE INTERIOR OF THE SITE ARE COMPARED TO COMMERCIAL/INDUSTRIAL PCLs.
5. TOTAL TPH CONCENTRATIONS GREATER THAN 10,000 mg/kg (TIER 1 SOIL$_{Res}$ PCL) ARE HIGHLIGHTED BLUE.

ERIC C. MATZNER
GEOLOGY LIC. # 795
5/29/20

0 175 350
1" = 350' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

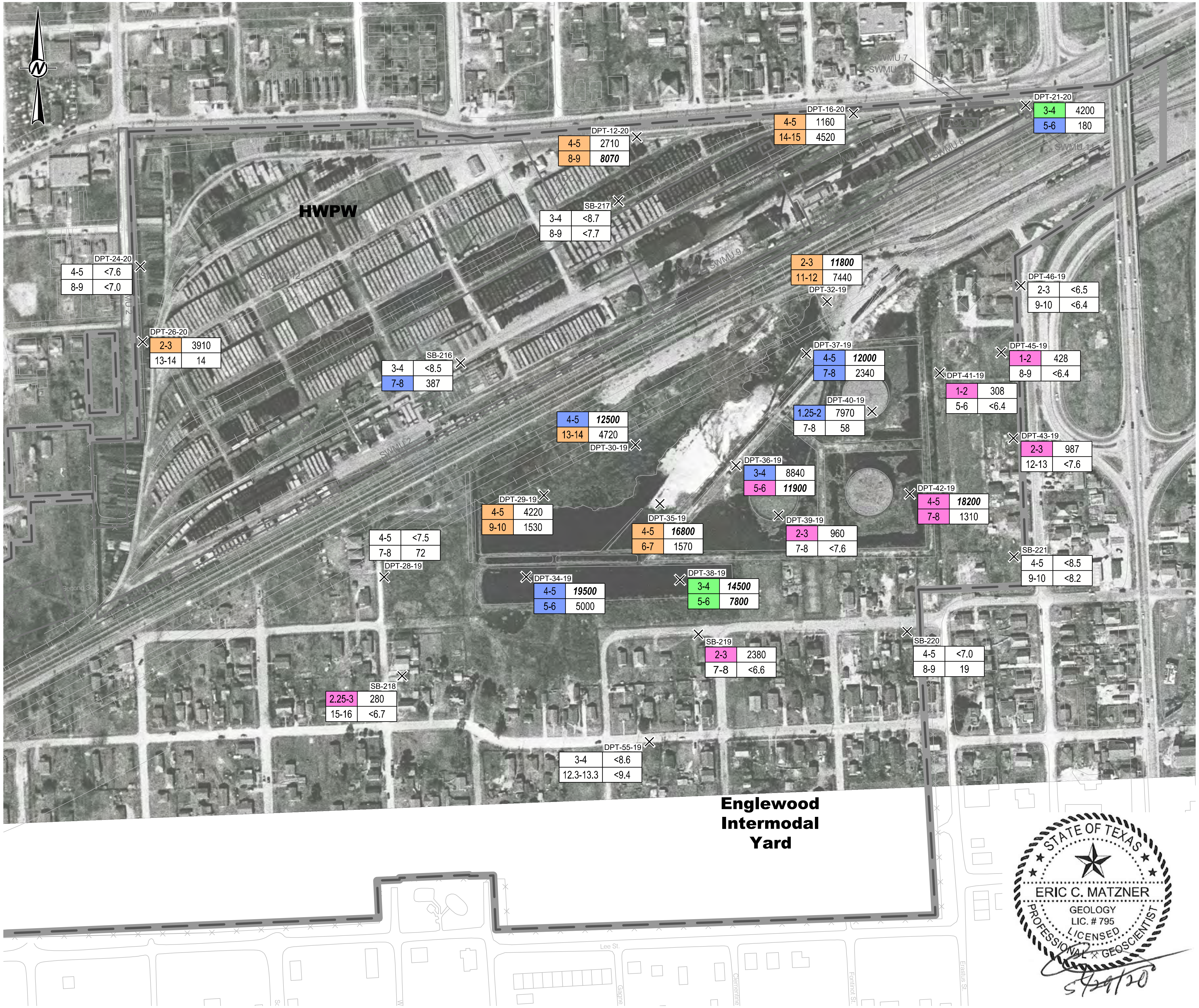
PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
TOTAL PETROLEUM HYDROCARBON (TX1005) CONCENTRATIONS IN SOILS

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232
REV. 0
FIGURE 5



LEGEND

▬ ▬ ▬	UPRR PROPERTY BOUNDARY
───	ROAD, PARKING LOT, SIDEWALK
–x–x–x–	FENCE
–+–+–+–	RAILROAD
☐	HISTORIC STRUCTURE AND FEATURE
✕	TPH SOIL SAMPLE LOCATION (2019-2020)

Category	Tier 1 $^{Tot}Soil_{Comb}$ $PCL_{TPH\ Max}$ (30-Acre Residential) (mg/kg)	Tier 1 $^{Tot}Soil_{Comb}$ $PCL_{TPH\ Max}$ (30-Acre C/I) (mg/kg)
🟩 $_nC_6$ to $_nC_{12}$ Organics	6,287	16,766
🟦 $>_nC_{12}$ to $_nC_{28}$ Organics	9,600	60,480
🟧 $>_nC_{12}$ to $_nC_{28}$ Organics with High Aromatic Content	7,504	70,247
🟪 Unresolved Complex Material (UCM)	5,797	57,967

NOTE(S)

1. SAMPLE INTERVAL IN FEET BELOW GROUND SURFACE (BGS).
2. BOLD AND ITALICIZED RESULTS EXCEEDS APPLICABLE RESIDENTIAL PCL.

Sample Interval (BGS)	TPH Concentration (mg/kg)

REFERENCE(S)

BASE MAP FROM ERM-SOUTHEAST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.
AERIAL IMAGE FROM ADAMS AERIAL SURVEY W.O. #36466, NEG. #938-18, FLYING DATE 2/12/1955.

0 125 250
1" = 250' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
TPH HYDROCARBON TYPES IN SOIL

ERIC C. MATZNER
LIC. # 795
5/29/20

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO.	REV.	FIGURE
19119232	0	6

Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-5 May\ | File Name: FIG 6 - TPH Hydrocarbon Types in Soils.dwg | Last Edited By: adiamond Date: 2020-05-29 Time:8:59:58 AM | Printed By: adiamond Date: 2020-05-29 Time:12:00:47 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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ATTACHMENT A

Dakota Technologies TarGOST® Report

High Resolution Site Characterization Report – TarGOST® Investigation

Client: Golder

Project Name: Houston Wood Preserving Works

Location: Houston, TX

Prepared by:

Dakota Technologies, Inc.
2201-A 12th Street North
Fargo, ND 58102
701.237.4908

February 26, 2020

TABLE OF CONTENTS

APPENDICES

1.0 TarGOST SYSTEM DESCRIPTION AND CALIBRATION

The Tar-specific Green Optical Screening Tool (TarGOST®) is a laser-induced fluorescence (LIF) screening tool specifically designed to detect non-aqueous phase liquid (NAPL) in the subsurface. It responds almost exclusively to heavy molecular weight NAPL/DNAPL phase contaminants including coal tars found at former manufactured gas plants (MGPs) and wood treating sites where creosote NAPL is the compound of concern. It does this by sensing the fluorescence of large polycyclic aromatic hydrocarbons (PAHs) found in heavy petroleum, MGP and creosote NAPLs. The TarGOST® is a modification of the Ultra-Violet Optical Screening Tool (UVOST®) that spun from LIF tools developed in the early 1990's under U.S. Air Force funding. The UVOST platform is a mature technology that has been applied at thousands of sites all over the world. TarGOST® has been in commercial use since 2003 and over 450 sites have been characterized using TarGOST.

The TarGOST system sends laser light through a fiber optic cable strung within probe rods on a direct push drill rig or cone penetrometer rig. The laser excitation light is directed out a sapphire window in the side of the probe. As the probe is advanced, the soil immediately adjacent to the window is exposed to the laser light. If heavy PAH containing NAPLs (i.e. bunker fuel, coal tar, creosote) are present, longer wavelength light is emitted (fluorescence). This "signal" light is transmitted through a return fiber, back to the surface to be analyzed. Responses are indicated in real-time on a graph of signal vs. depth. To aid in identifying relative quantity of the compound present, the main plot of a TarGOST log displays "color mixed" signal consisting of contributions from the scatter channel and three fluorescence channels. Scatter (Sctr), the first (blue) channel in waveform and fluorescence only (Fluor – the sum of the three fluorescence channels) graphs are separately displayed next to the main signal plot. The Fluor graph provides a view of the "true fluorescence" data without correction which is often helpful with lower concentrations of NAPL. The scatter signal by itself aids in detecting crude soil-color-like data and detection of false positives. Additionally, waveform callouts are selected and displayed to the left of the main plot to aid in NAPL or false positive identification.

Prior to conducting each log two measurements, the Reference Emitter (RE) and Background, are recorded. This is a calibration for the response of the system to a standard fluorescent material (the RE) and a measure of the cleanliness of the surfaces in the light path (e.g. fiber optics, mirror, window, filters). It is **not** a method of converting fluorescence to a known concentration but can be used to estimate concentration when carefully correlated with other lines of evidence. All down-hole measurements are subsequently normalized to a percentage of the RE response taken prior to the logging. For example, a 100% RE reading in-situ has a Signal identical to that of RE taken just prior to the log. Background (clean window) measurements are not applied to the data collected (i.e. it is not subtracted as a background) and is taken only as a general data quality measure employed by the operator to ensure there are no significant defects.

RE measurement serves two main purposes:

1) Qualitative examination of the performance of the instrument – The RE needs to be the correct shape to confirm that all four monitored wavelengths (fiber optics, filters, etc.) are intact and functioning properly.
2) Quantitative calibration of the instrument – The RE is used as a guide for the operator to achieve the proper signal intensity (obtained by adjusting laser energy). Keeping the RE waveform intensity in the proper range assures that the instrument is in the optimum range to allow a monotonic response across multiple orders of pore saturation for typical NAPL on typical soils.

RE total fluorescence ideally falls between 1,600 and 2,500pVs for TarGOST. PVs (picovolt-seconds), is a measure of waveform area, or total fluorescence. Precise RE intensity tuning by adjusting the laser excitation light to achieve an exact value is unnecessary because all reported data have been normalized by conversion to a percentage of the RE fluorescence (%RE).

Background values can range from 0 to 50 pVs. As the background increases beyond 50 pVs a change to the optics should be made to ensure the scatter correction applied to the data is effective.

RE and Background values for each boring are shown in the data summary portion of this report. Additional in-depth information about the TarGOST technology, field implementation and limitations are discussed in the TarGOST Guide included in Appendix C.

2.0 DATA PRESENTATION FORMATS

TarGOST data is presented in two formats. Signal (%RE) vs depth logs and clustering diagrams. Both formats are included in Appendix A.

Signal (%RE) vs depth logs are created in the field by the operator for immediate examination. Post-project these logs are reviewed and necessary changes in scaling or waveform callout selections are completed. Two scales have been chosen for your logs:

1) **0-100%RE**- all logs with the x-axis fixed from 0-100%RE. Note that this will cut off signals above 100%RE. This allows for closer examination of smaller signals. The fluorescence only column x-axis is also fixed at 0-20%RE again, this is for closer examination of small signals.
2) **0-Autoscaled high signal**- only logs that had signals over 100%RE will have the x-axis auto scaled to the max RE for that log.

Both sets of logs have a fixed depth scale of 0-65ft at the request of the Golder. More information on Signal vs Depth logs can be found in the TarGOST Reference Log in Appendix B. If other scales are desired, please do not hesitate to contact Dakota at 701-237-4908.

Clustering diagrams are a fast method to survey for differences in waveforms between various locations on site or even between differing response horizons within a single log. Information from all the waveforms of a single TarGOST log are plotted on a 2D surface, allowing a spatial method of grouping or identifying unique and/or dissimilar fluorescence waveforms. Additional information on clustering diagrams can be found in the discussion section of this report.

3.0 DISCUSSION AND COMMENTS

The site was split into two units divided by railroad tracks running SW to NE, the South side of the tracks or Intermodal facility and North side which included the vacant property and locations in the right of way of the neighborhood. For purposes of discussion the data set will be examined as a whole. Likewise, the data is presented as a singular group, not split into the designated North and South sites.

Careful co-sampling, examination, and analysis of soil cores are required to determine what benefit the waveforms (three-dimensional fluorescence signatures) may or may not provide toward identifying certain fluorescence materials encountered in-situ.

3.1 WAVEFORMS

There are two very closely related waveforms that dominate the data set. These waveforms believed to be associated with target NAPL because they match the waveform of a sample that was taken from an area of the site where NAPL material is seeping from the ground. Factors that may contribute to slight variations include instrumental differences, weathering, soil matrix, product mixing or co-mingling, and other NAPL composition differences. All of these can play a role in how a material ultimately fluoresces. An in-depth chemical analysis of samples taken from locations with differing waveforms may provide some answers. Below are examples of these waveforms.

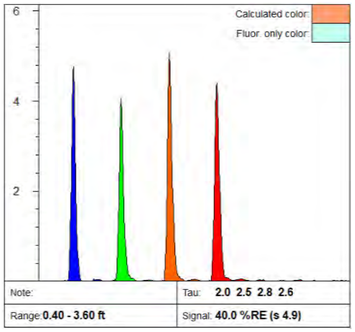


Fig 1a. Material from seep

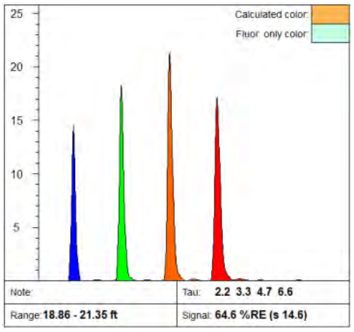


Fig 1b. NAPL waveform #1

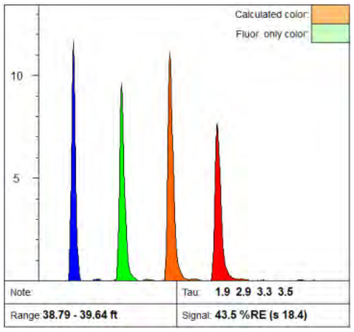
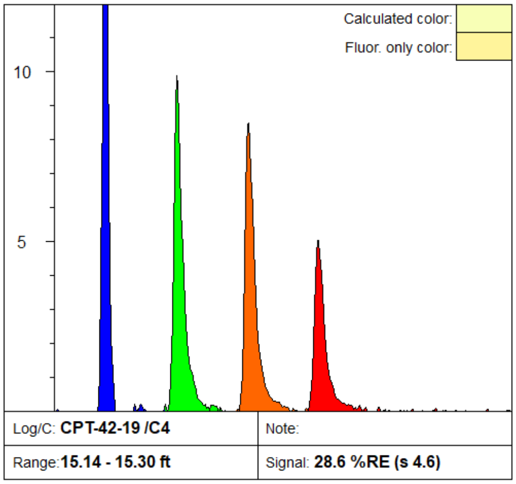


Fig 1c. NAPL waveform #2

Examination of the waveforms starts with overall shape and intensity of the three fluorescence peaks (color-coded green, orange, and red). The seep waveform in Figure 1a has a dominant orange peak with a slightly less intense red and green peaks. The calculated color of the waveform in the main plot as well as the fluorescence only colors are displayed in the upper right corner of each waveform. When reviewing logs look for these colors to indicate fluorescence that matches these waveforms. Also important in waveform examination is lifetime of the fluorescence. This is observed in the "width" of the peaks and is especially evident in the base of each peak. Wider peaks mean longer lifetimes while shorter lifetimes show up as narrow peaks. Changes in lifetimes are easily detected in cluster diagrams discussed in Section 3.2. Figure 1b shows the common NAPL waveform seen across the site we will refer to this as NAPL waveform #1. This waveform is very similar to the seep material, the minor difference is in the intensity of green and red peaks in relation to the dominate orange peak. Again, the calculated colors are displayed, and they are only slightly different than the seep waveform. In figure 1c the red peak is less intense and there is a very subtle increase in lifetime (slight widening of the base of the peaks). This waveform will be referred to as NAPL waveform #2. Often NAPL waveforms 1 and 2 are seen within the same log. This leads one to believe they are closely related – the same basic NAPL with subtle chemistry differences (origins unknown).

There are also a few examples of logs with fluorescence that doesn't appear to be the main NAPL of concern. Below is an example of one of them. Notice the differences in waveform shape from waveforms #1 and #2.

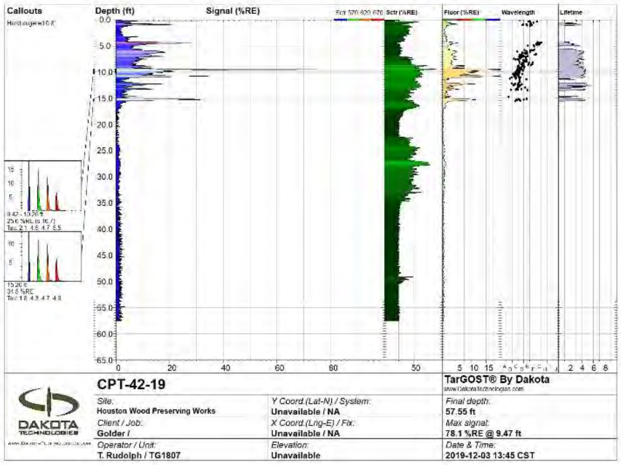


Log/C: **CPT-42-19 /C4**

Note:

Range: **15.14 - 15.30 ft**

Signal: **28.6 %RE (s 4.6)**



CPT-42-19

TarGOST® By Dakota
www.DakotaTechnologies.com

Site: **Houston Wood Preserving Works**

Y Coord.(Lat-N) / System: **Unavailable / NA**

Final depth: **57.55 ft**

Client / Job: **Golder /**

X Coord.(Lng-E) / Fix: **Unavailable / NA**

Max signal: **78.1 %RE @ 9.47 ft**

Operator / Unit: **T. Rudolph / TG1807**

Elevation: **Unavailable**

Date & Time: **2019-12-03 13:45 CST**

This example is from location CPT-42-19 at 15.2ft. The waveform is most intense in the green channel with lessening intensity in the orange and red channels. The lifetime (width of the peaks) is also longer than the NAPL waveforms. Although it is not certain what this waveform represents, it is certain that it is not the same chemistry as the NAPL of concern based on the waveform analysis. This could well be a NAPL, of course, but with markedly different chemsitry (likey lighter – such as diesel). Careful sampling of locations with waveforms of unconfirmed origin like these can answer the uncertainties.

3.2 CLUSTER DIAGRAMS

Clustering diagrams are the fastest method we have found to quickly survey for differences in the waveforms between differing LIF logs or differing response horizons within a single log. These are included for each boring in Appendix A. The diagrams are broken into a 10 x 10 grid using a letter (columns) and number (rows) system. The letters from A to J represents the wavelength (x axis). The numbers 0-9 represent the lifetimes (y axis). This facilitates easy location and discussion of plotted data points. The number and letter values are also plotted on the signal vs depth logs to the far right of the main data. The numbers and letters correspond directly to grid locations on the cluster diagrams.

Cutoff Values

Every waveform of a log is represented by a colored oval on a cluster diagram. Depending on depth and rate of advancement the number of waveforms per log can number in the thousands. Many of these waveforms are of little interest because they are very small (background or clean zones of the log) and don't rise above electronic baseline noise that "confuses" the software that breaks each waveform down into four intensities and three lifetimes. We typically implement a threshold or cutoff value which prevents data that falls below the threshold from being included in the plot and thus eliminates a lot of the scattered confusing data from interfering with the significant signals. Often this value is 5%RE or below. A value of 2%RE was chosen for this data set. The cutoff value, if implemented, is displayed at the bottom of each cluster diagram. Since all the locations were pre-cleared and backfilled the data in the pre-cleared interval is unreliable and may contains false positive fluorescence. For this reason, a cutoff corresponding to the depth of the pre-cleared interval was also implemented. Data points in the 0-10ft or 0-8ft interval were not plotted on cluster diagrams to avoid confusion. This cutoff is also displayed across the bottom of the clustering diagram. Note that all the data (including any pre-cleared interval) is displayed on the depth vs signal plots.

X-Axis: Wavelength

The "center of gravity" of the four peaks of the waveform determines the x-axis position. For example, a clean waveform dominated by the blue (laser scatter peak) plots to the left – while a waveform with dominant orange and red peaks will plot further to the right. The x-axis represents the fluorescence color (yellow on left, red on right).

Y-Axis: Lifetime

The fluorescence channel lifetimes determine the position on the y-axis of the clustering diagram. The longer the combined lifetimes, the higher on the y-axis that waveform's data point is plotted. Laser scatter (blue channel) is ignored here – because the excitation laser time profile doesn't change.

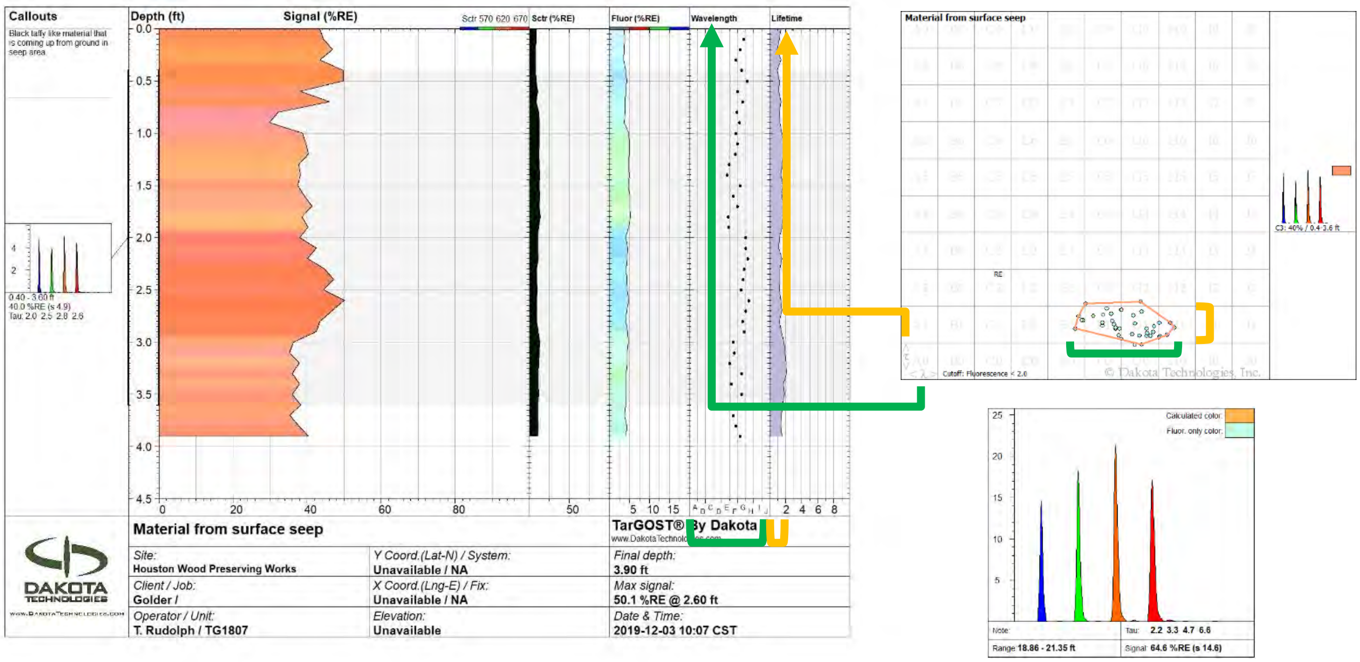
Color

The fill colors used in the log's Fluor (%RE) only column are also used to fill the ovals that represent each waveform. This is done so that one can use the fill color to find the depth in the Fluor (%RE) only column of the TarGOST log where certain ovals originated. For instance, if the fill color of plotted ovals are pink, look for depths at which the Fluor (%RE) only column of the log that was filled with pink. This allows you to target where on the log to make further examination of the waveform to locate sampling depths or otherwise investigate your TarGOST data more fully.

Callout Indicators

The polygons and/or circled data points on the clustering diagrams represent the data points that were selected for waveform callouts on the main log. If a depth range of the log was selected for a callout the software will draw a polygon connecting the min/max of that range for both the x axis and y axis. If a single data point was selected for a callout that data point will be circled. They will be drawn in colors matching that of the fill color for the waveform that was called out. Additionally, the callouts are shown to the right of the diagram. The fill color of the callout is shown along with the depth interval it represents.

The waveforms discussed in Section 3.1 will likely plot in different areas on the cluster plot due to the slight differences in waveform channel strengths and lifetimes. Below is an example of each waveform discussed, a cluster diagram and the corresponding log.

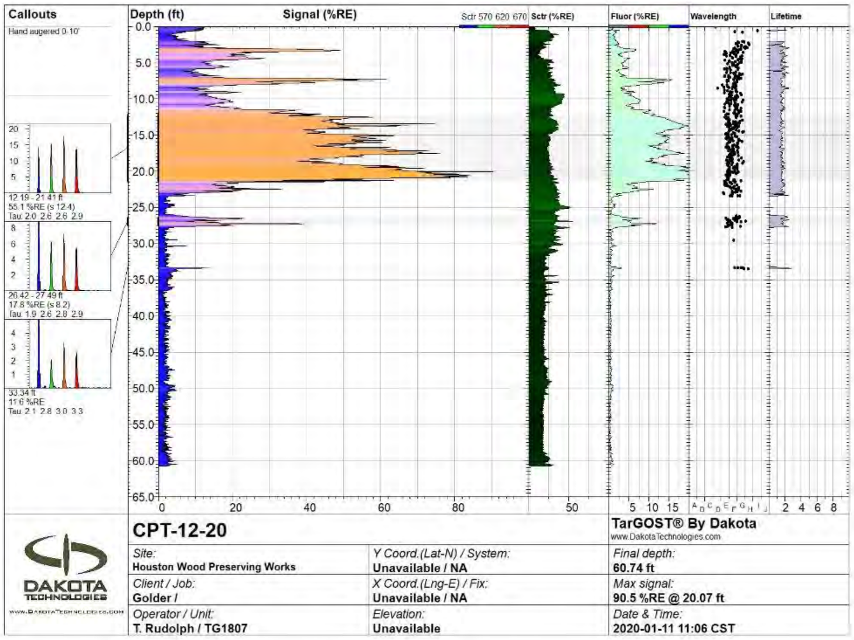


Material from surface seep

Site: Houston Wood Preserving Works
Client / Job: Golder /
Operator / Unit: T. Rudolph / TG1807
Y Coord.(Lat-N) / System: Unavailable / NA
X Coord.(Lng-E) / Fix: Unavailable / NA
Elevation: Unavailable
Final depth: 3.90 ft
Max signal: 50.1 %RE @ 2.60 ft
Date & Time: 2019-12-03 10:07 CST

Note:
Tau: 2.2 3.3 4.7 6.6
Range: 18.86 - 21.35 ft
Signal: 64.6 %RE (s 14.6)

This example from the seep material shows the log (left) cluster diagram (top right) and waveform (bottom right). Notice how the points on the cluster diagram are concentrated mainly into one area E1,F1,G1. In the wavelength column of the log these data points are plotted within the E,F,G columns and the 1 column the lifetime column.



CPT-12-20

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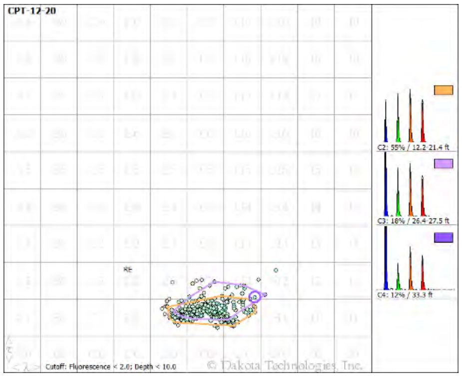
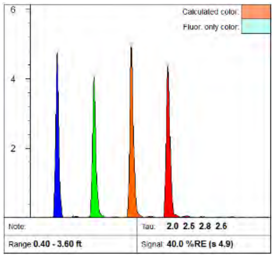
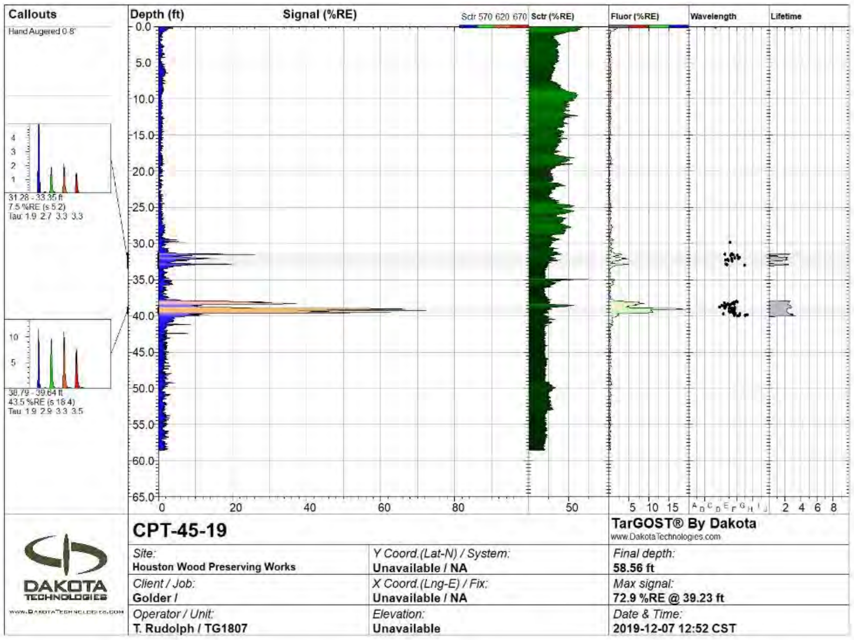
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.74 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **90.5 %RE @ 20.07 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-11 11:06 CST**





CPT-12-20 is an example of NAPL waveform #1. Again, the cluster plot is showing the majority of data points are falling in the E1,F1,G1 locations. This is consistent with material from the seep. Some logs that exhibit this waveform are: CPT-30-19, CPT-35-19, CPT-36-19, CPT-24A-20



CPT-45-19

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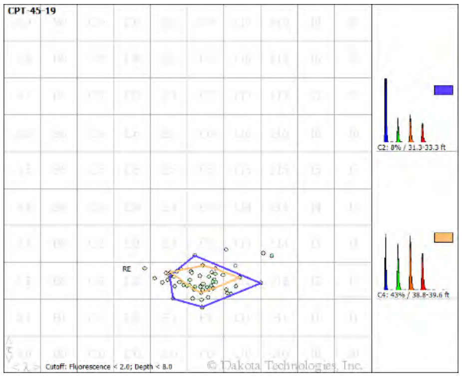
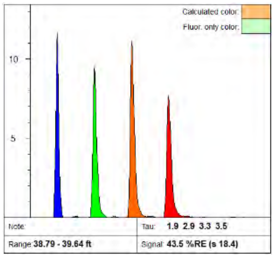
Site: Houston Wood Preserving Works
Y Coord.(Lat-N) / System: Unavailable / NA
Final depth: 58.56 ft
Client / Job: Golder /
X Coord.(Lng-E) / Fix: Unavailable / NA
Max signal: 72.9 %RE @ 39.23 ft
Operator / Unit: T. Rudolph / TG1807
Elevation: Unavailable
Date & Time: 2019-12-07 12:52 CST



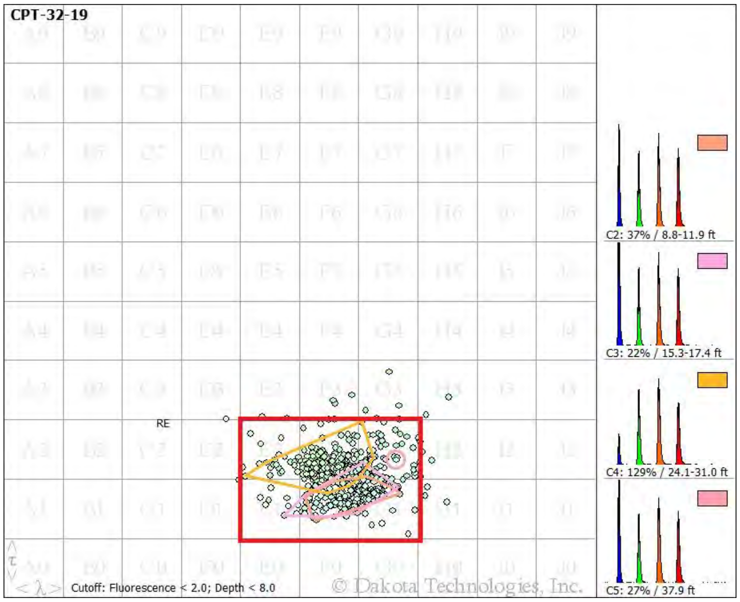


Note:
Tau: 1.9 2.9 3.3 3.5
Range 38.79 - 39.64 ft
Signal 43.5 %RE (s 18.4)

CPT-45-19 is an example of NAPL waveform #2. By only examining the signal vs depth log it appears the signal may be consistent with the previous examples, but the cluster diagram highlights the subtle difference, with waveforms clustering in the E2,F2,G2 location. This is a shift up due to a slight increase in lifetime. Waveform's fluorescence color is similar (the wavelength axis location hasn't changed from the E,F,G columns) but lifetime has increased which moves them from the 1 row up to the 2 row. As stated previously the reason for this modest but noticeable shift is not known. Other logs with this waveform include: CPT-39-19, CPT-40a-19, CPT-46-19, CPT-27-20.

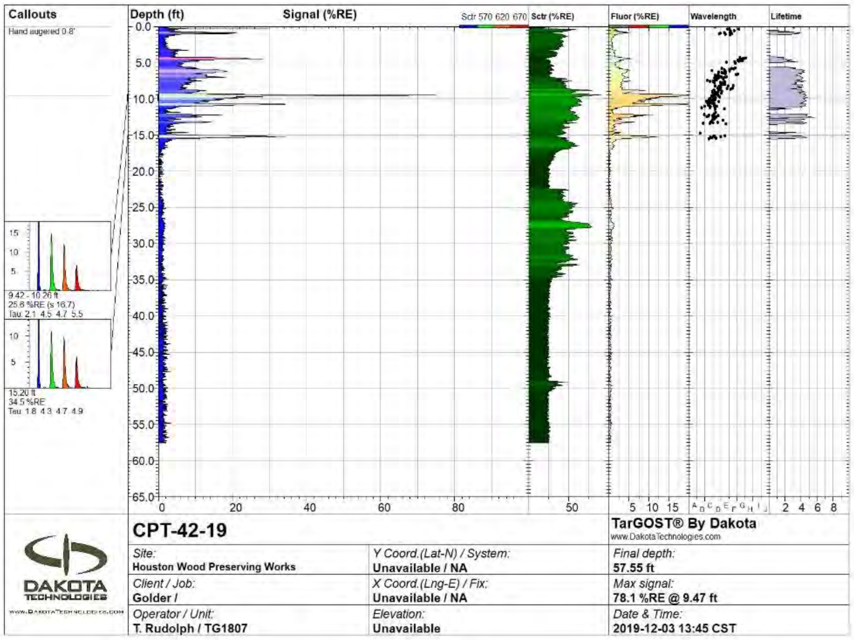
There are several logs in which both NAPL waveforms are present. Examples of those are: CPT-29-19, CPT-30-19, CPT-32-19.

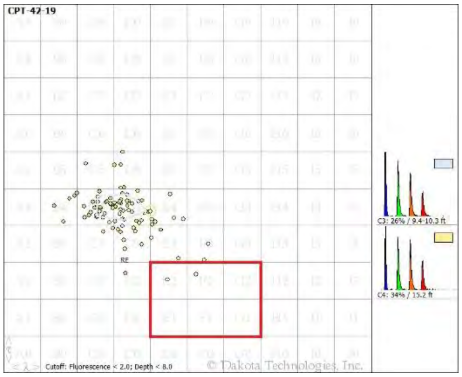
Through the examination of waveforms and clustering diagrams some trends can emerge, and reasonable conclusions can be made. For this data set the common NAPL waveforms plot in the same general areas on the cluster plots – E1,E2,G1,G2,F1,F2.

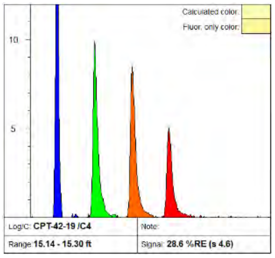


In this example from CPT-32-19 a red box was drawn to highlight the area the data points plot for the 2 NAPL waveforms. While reviewing the logs, focusing on this area in the clustering diagram can aid immensely in identifying potential NAPL.

The final example is from CPT-42-19. For reference, the previously discussed red box is left in place to mark the target NAPL waveform's clustering area.







The fluorescence in this log is clearly different and therefore it is not plotting in the area where the target NAPL waveforms generally fall, but instead is plotting further to the left and higher on the diagram. This indicates a "blue-shift" to the left in the waveform as well as an increase in the average lifetime. The waveform example demonstrates this, with the green channel dominating and the width of the peaks broadening due to a longer fluorescence lifetime. This is obviously not the target NAPL of waveform #1 or #2. Other logs that contain this relatively uncommon waveform are: CPT-17-20 @ 14.5' (callout 2), CPT-21-20 @41' (callout 4).

A few points to consider while interpreting this projects TarGOST logs include:

- All the locations were pre-cleared and backfilled with clean sand. Data collected in that interval is considered unreliable. For that reason, signals and waveforms in that interval aren't discussed in this report.
- CPT data was collecting in conjunction with the TarGOST data. Dakota has limited experience interpreting CPT data and therefore it is not addressed here.
- Sampling was not conducted in conjunction with the TarGOST while Dakota was onsite. If validation sampling is conducted it is important to consider site soil heterogeneity. We have found that often soil structures differ within several feet if not inches. For this reason, it is recommended that while logging with TarGOST an occasional duplicate boring is advanced within a few feet of an original boring. These duplicates give some indication of site heterogeneity and help with interpretation of the data. Although no direct duplicate borings were advanced, several offsets were in areas where target depths were not achieved. To some extent these may be used in the same manner to indicate heterogeneity.

4.0 LIMITATIONS

The analysis and opinions expressed in this report are based upon TarGOST data from the indicated locations and from other information discussed in this report. Exceptions, if any, are discussed in the accompanying comments section of this report. This report is prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted practices. Reported results shall not be reproduced, except in full, without written approval of Dakota. No warranties, expressed or implied are intended or made.

Additionally, the following are known limitations of the TarGOST technology and should be carefully considered while evaluating TarGOST data:

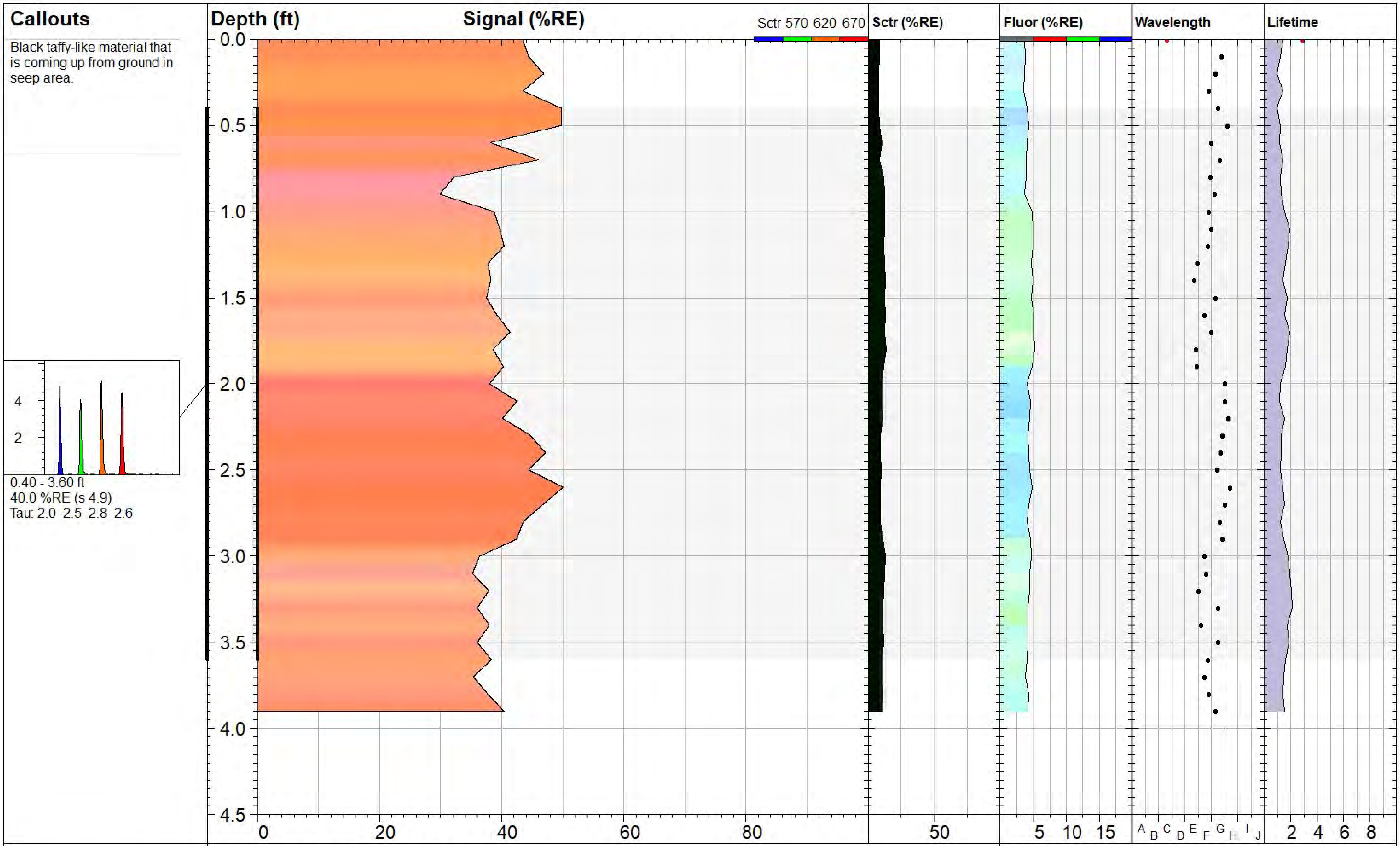
- TarGOST specifically targets the PAHs found in NAPLs such as bunker fuel, former MGP and creosote NAPLs and DNAPLs. There are most certainly other fluorescent molecular structures beside PAHs that contribute in some minor fashion, but the PAHs dominate fluorescence in most NAPLs
- TarGOST can/does detect moderate staining and residual levels of NAPL as well as free phase
- TarGOST is completely “blind” to aqueous (dissolved phase) PAHs with the exception of water near some acid tars
- TarGOST is **not** able to reliably detect “dry” PAHs (dry in the organic solvent sense) that are sorbed to soot, wood chips, and ash. They can generate a small signal, but it is often weak and not easily teased out of the background. Many times, we're left wondering whether a small signal is caused by very high

concentrations of “dry” PAHs on purifier chips or ash/soot or very low (100s of ppm) residual NAPL levels.

- TarGOST’s typical lab-determined LOD for NAPL on site soil is 100-500 ppm (weight of NAPL/weight of soil matrix). The more intensely the NAPL fluoresces, the lower the LOD. Note that this is not the same as weight of Total PAHs /weight of soil matrix (since not all of a NAPL’s mass is due to PAHs).
- TarGOST does, on occasion, respond to mineral or organic matter enough to be a nuisance – even blinding in rare cases. False positives include crushed limestone gravel fill, buried rotting wood/brush debris (the result of major flooding on a gravelly river), seashells (shell hash), sawdust, quick lime, and some “mystery” solids/soils that were not identifiable upon sampling.
- TarGOST has been observed to significantly respond to peat material, but most peats fluoresce weakly – often there is NAPL in the peat so it’s difficult to know for sure whether it’s been the peat or NAPL staining that’s causing the fluorescence.
- TarGOST does not respond to typical lighter end fuels like gasoline or kerosene (diesel is detected however) – unless they contain MGP waste or creosote that they are co-mingled in them.
- TarGOST calibration/setup isn’t identical unit to unit or time after time, so the response for an identical NAPL can vary with optical platform and from lab to field. However, once set up on site, the response remains stable over time and from log-to-log.
- NAPLs can vary greatly in their fluorescence response – even NAPLs found on the same site from the same source. For instance, as NAPL travels it can often leave the “stickier” molecules behind, refining itself along the journey, so the waveform often shifts as the NAPL movies further and further from the original release site.

Appendix A

TarGOST Logs and Clustering Diagrams



Black taffy-like material that is coming up from ground in seep area.

0.40 - 3.60 ft
40.0 %RE (s 4.9)
Tau: 2.0 2.5 2.8 2.6

Material from surface seep

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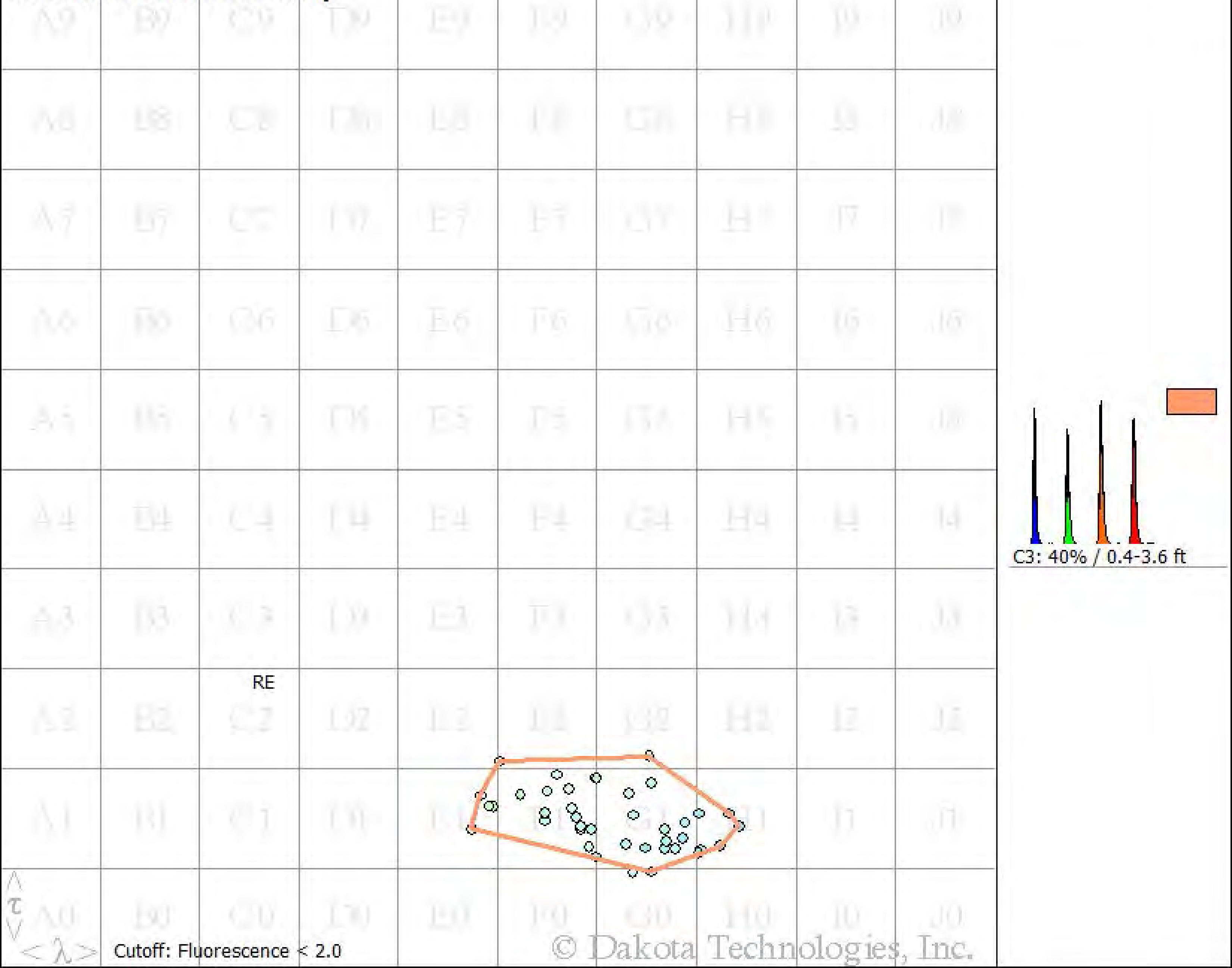
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **3.90 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **50.1 %RE @ 2.60 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-03 10:07 CST**

Material from surface seep



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CPT-01-20

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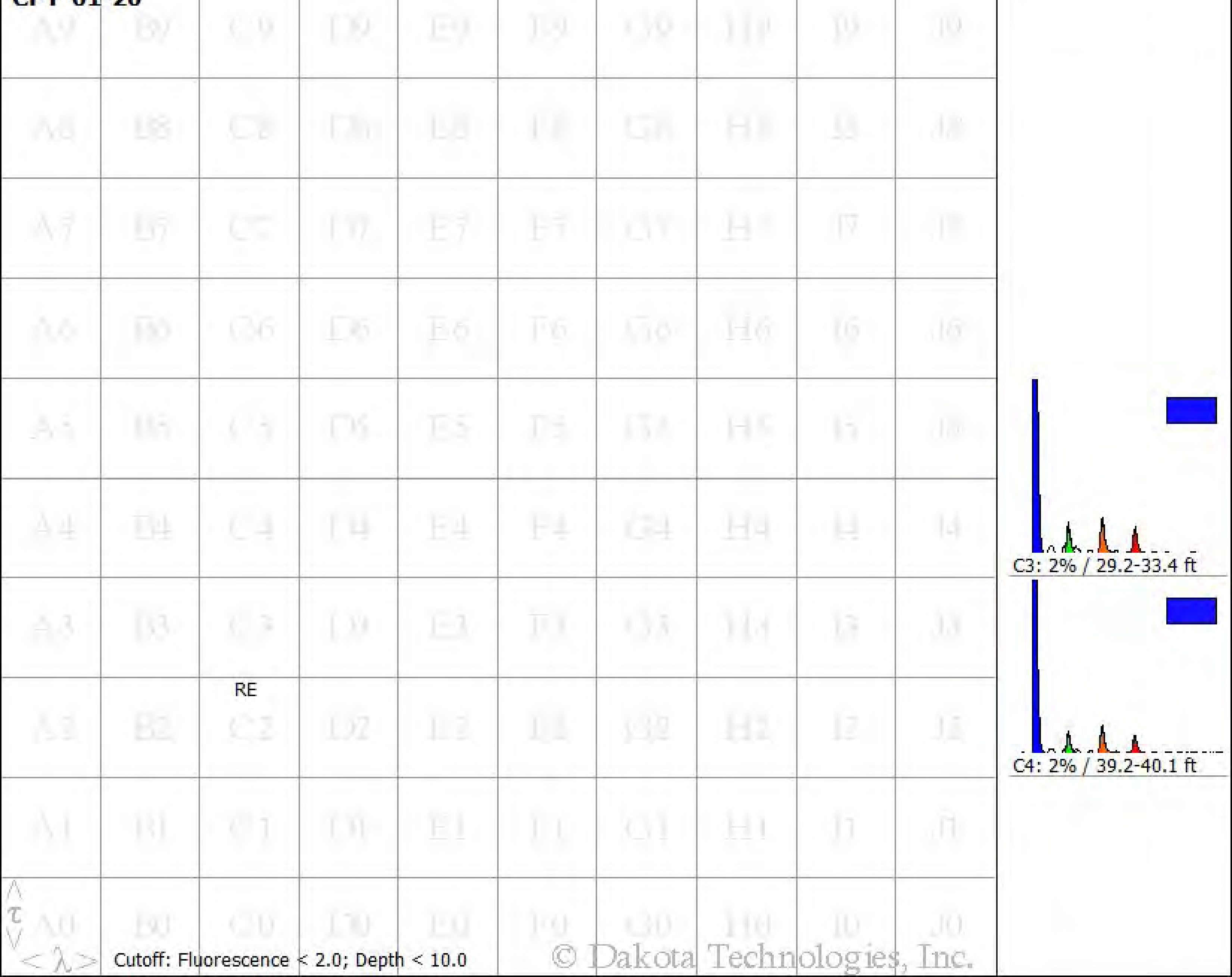
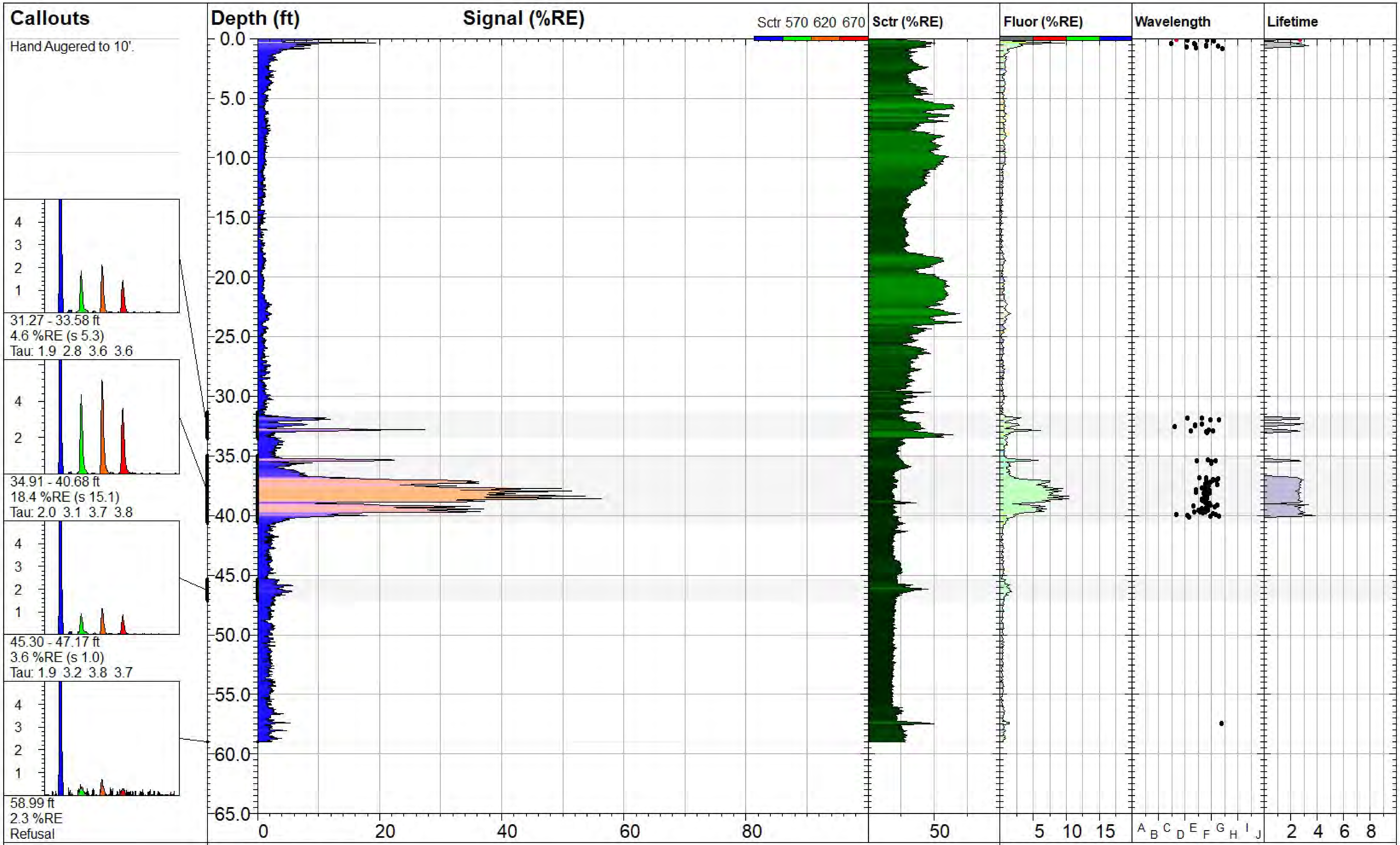
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **56.40 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **11.6 %RE @ 0.25 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-22 10:29 CST**

CPT-01-20


RE
C3: 2% / 29.2-33.4 ft
C4: 2% / 39.2-40.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand Augered to 10'.

31.27 - 33.58 ft
4.6 %RE (s 5.3)
Tau: 1.9 2.8 3.6 3.6

34.91 - 40.68 ft
18.4 %RE (s 15.1)
Tau: 2.0 3.1 3.7 3.8

45.30 - 47.17 ft
3.6 %RE (s 1.0)
Tau: 1.9 3.2 3.8 3.7

58.99 ft
2.3 %RE
Refusal

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CPT-02-20

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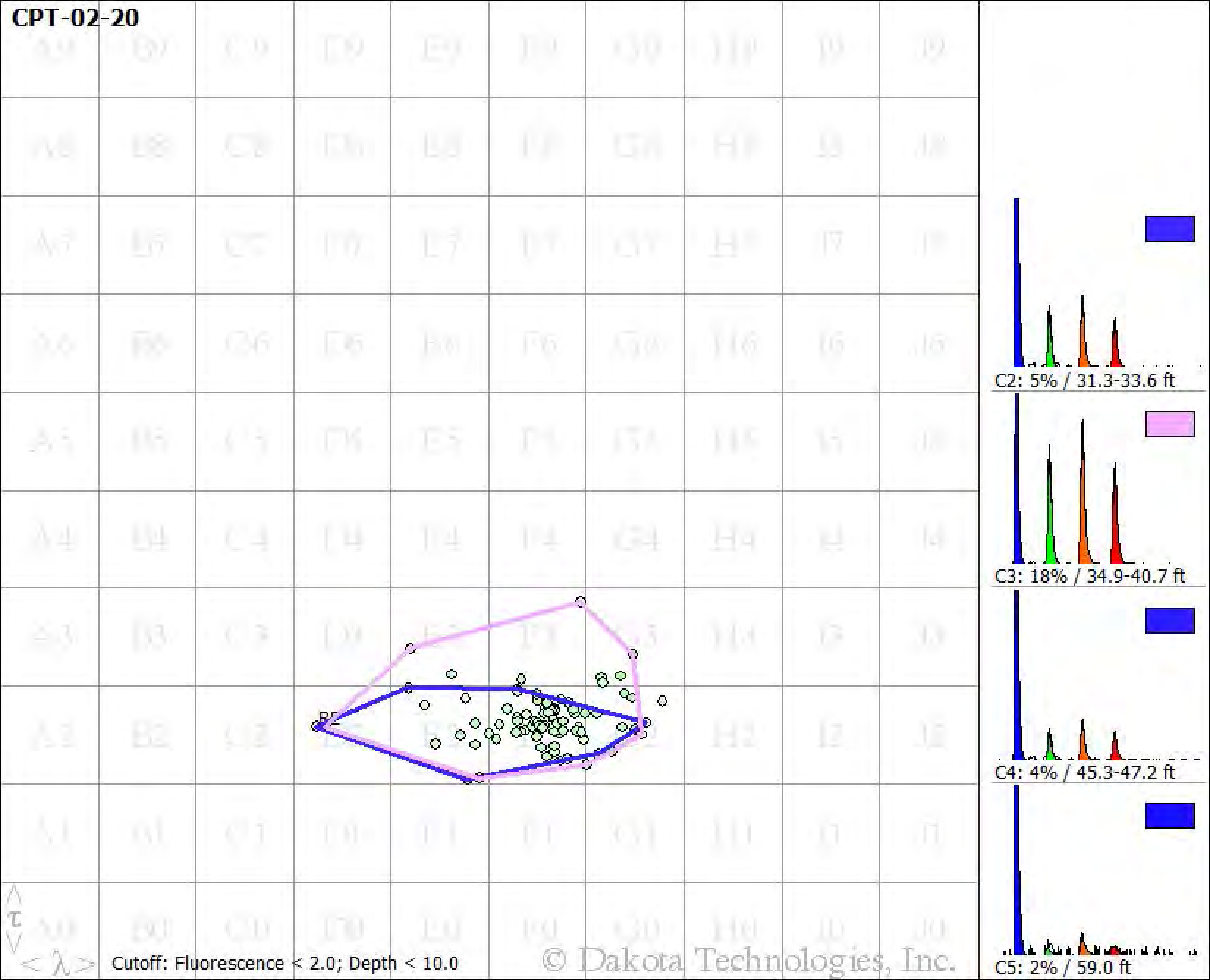
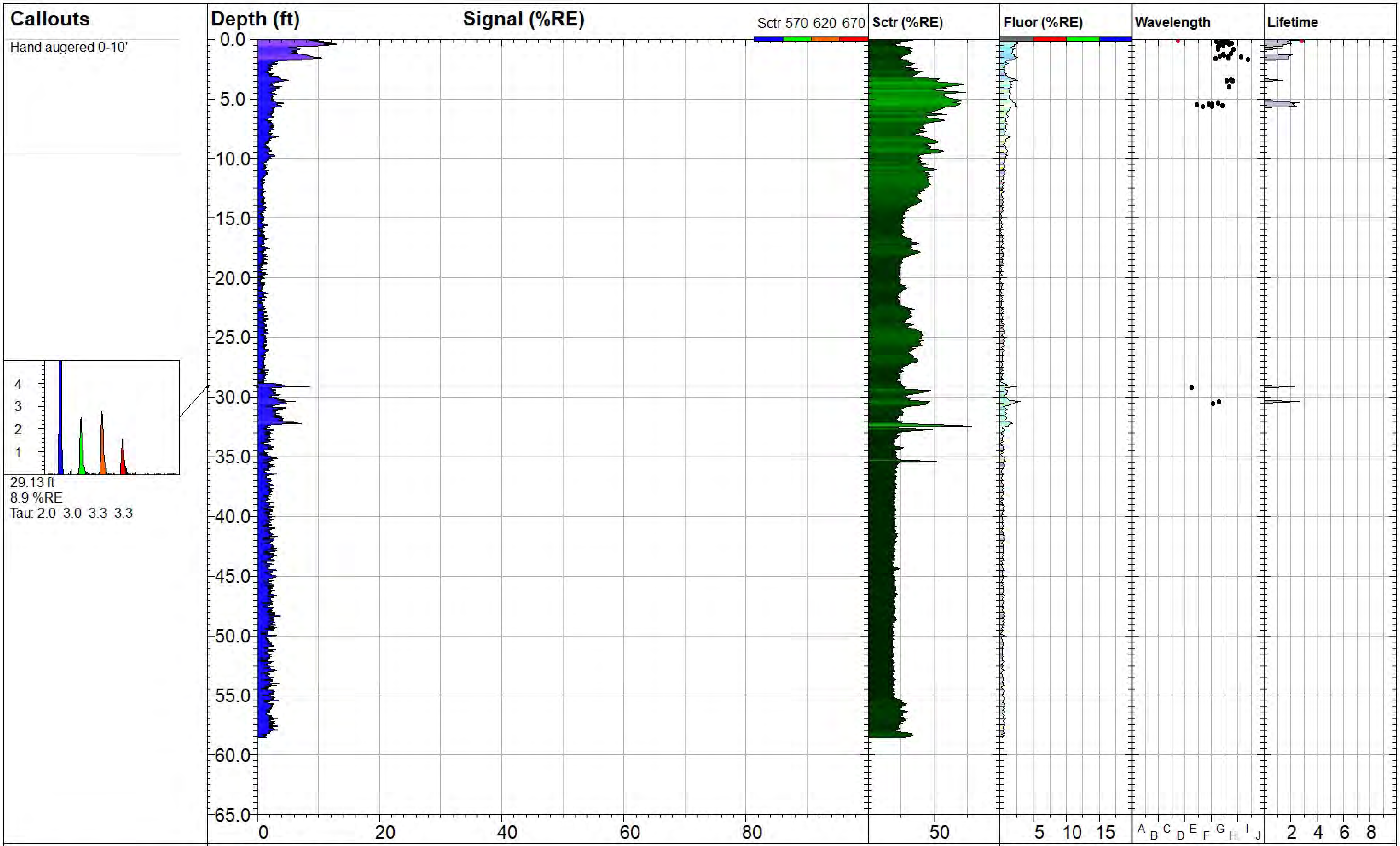
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.99 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **56.7 %RE @ 38.58 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-22 12:01 CST**

CPT-02-20


C2: 5% / 31.3-33.6 ft
C3: 18% / 34.9-40.7 ft
C4: 4% / 45.3-47.2 ft
C5: 2% / 59.0 ft
τ
< λ >
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



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CPT-03-20

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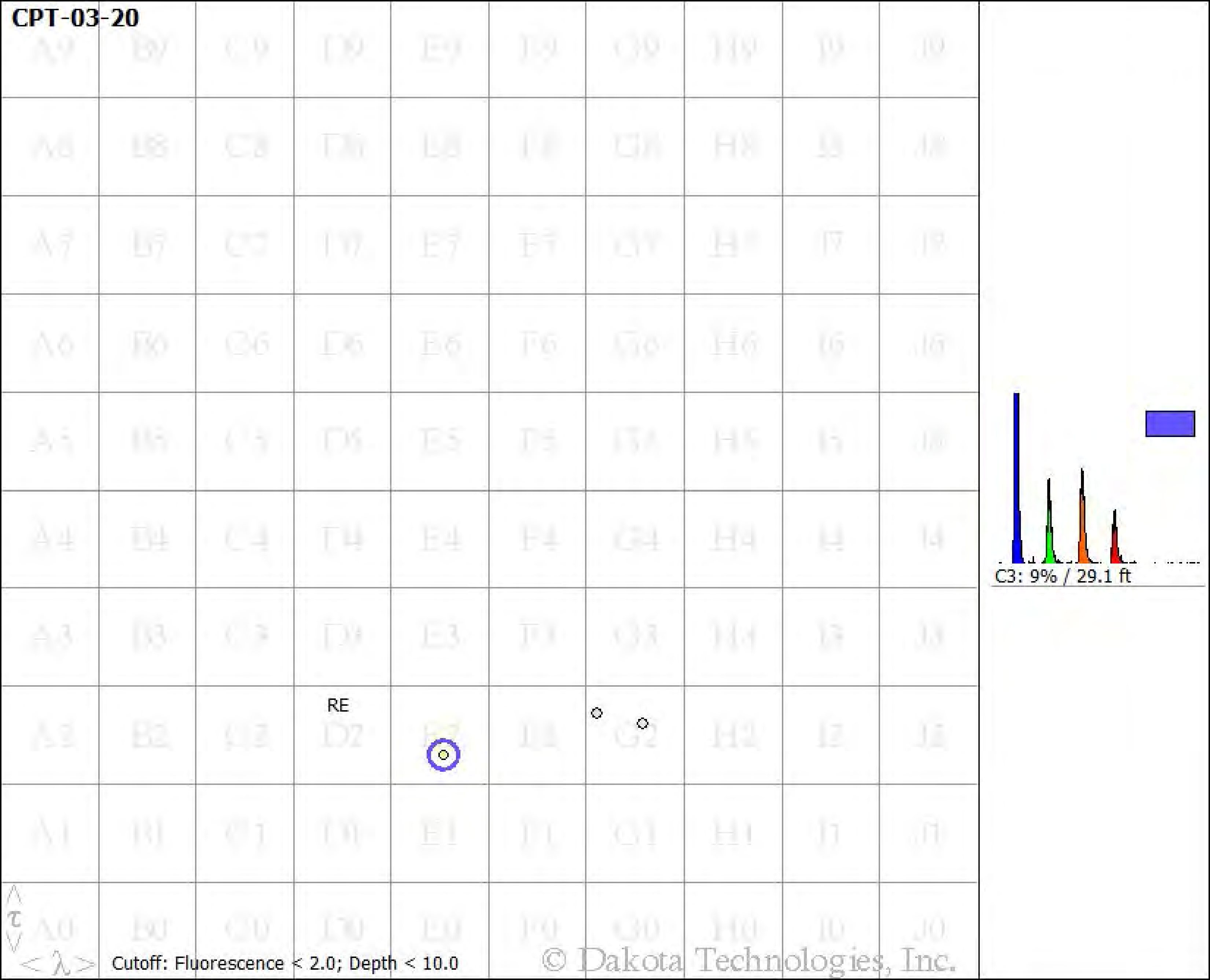
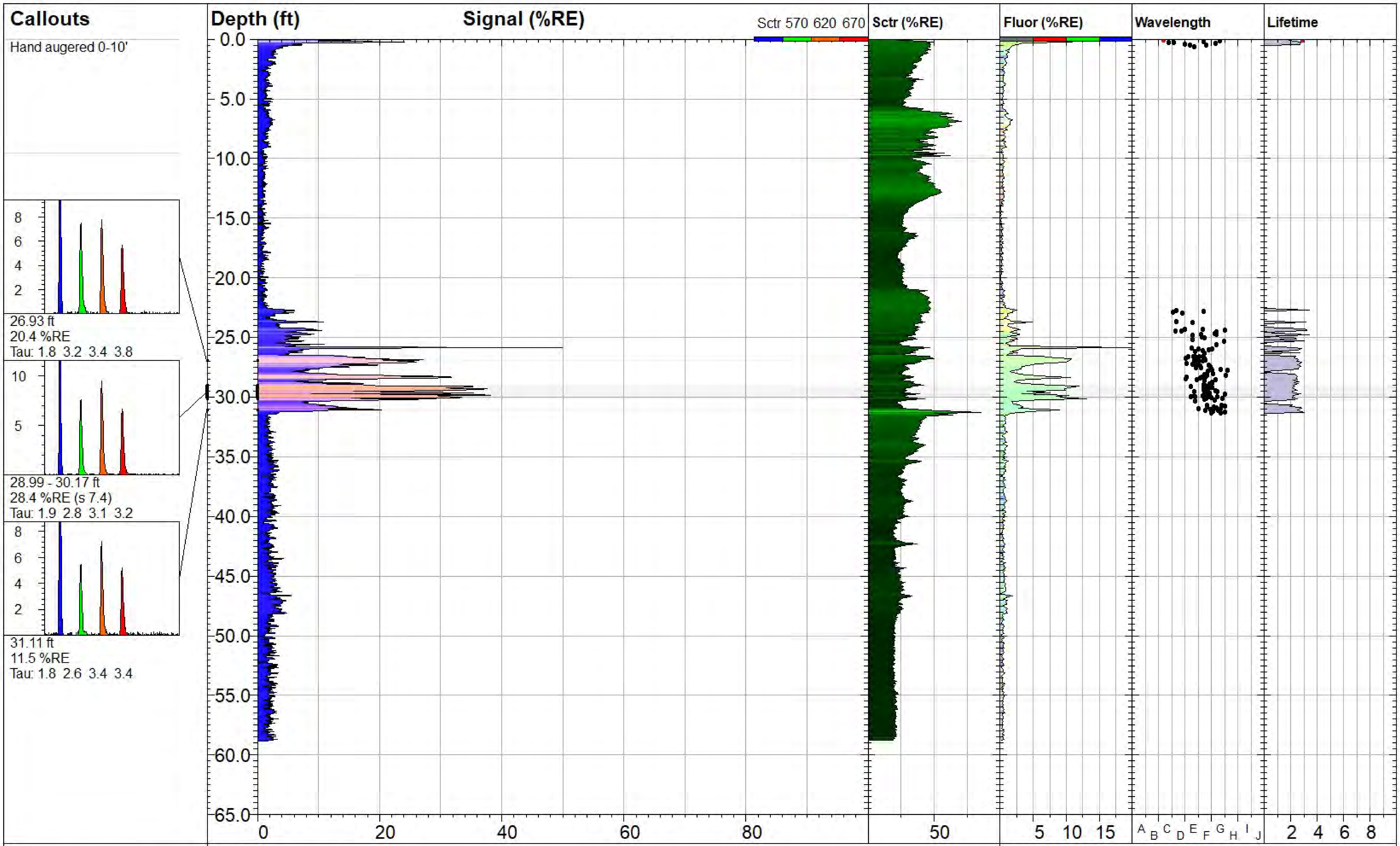
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.53 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **13.0 %RE @ 0.41 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-15 09:31 CST**


CPT-03-20
A9 B9 C9 D9 E9 F9 G9 H9 I9 J9
A8 B8 C8 D8 E8 F8 G8 H8 I8 J8
A7 B7 C7 D7 E7 F7 G7 H7 I7 J7
A6 B6 C6 D6 E6 F6 G6 H6 I6 J6
A5 B5 C5 D5 E5 F5 G5 H5 I5 J5
A4 B4 C4 D4 E4 F4 G4 H4 I4 J4
A3 B3 C3 D3 E3 F3 G3 H3 I3 J3
RE
A2 B2 C2 D2 E2 F2 G2 H2 I2 J2
A1 B1 C1 D1 E1 F1 G1 H1 I1 J1
A0 B0 C0 D0 E0 F0 G0 H0 I0 J0
C3: 9% / 29.1 ft
τ
< λ >
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



CPT-04-20

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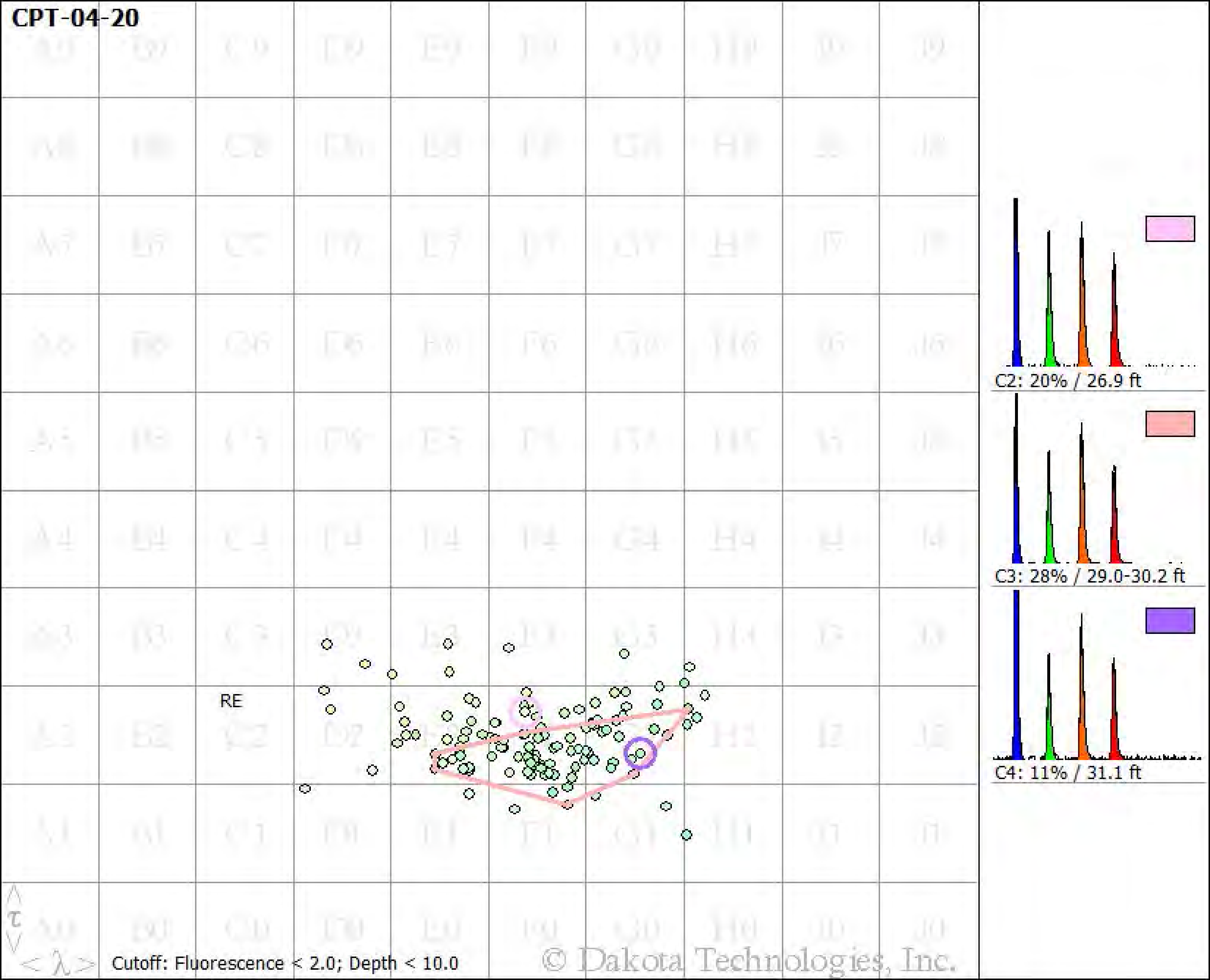
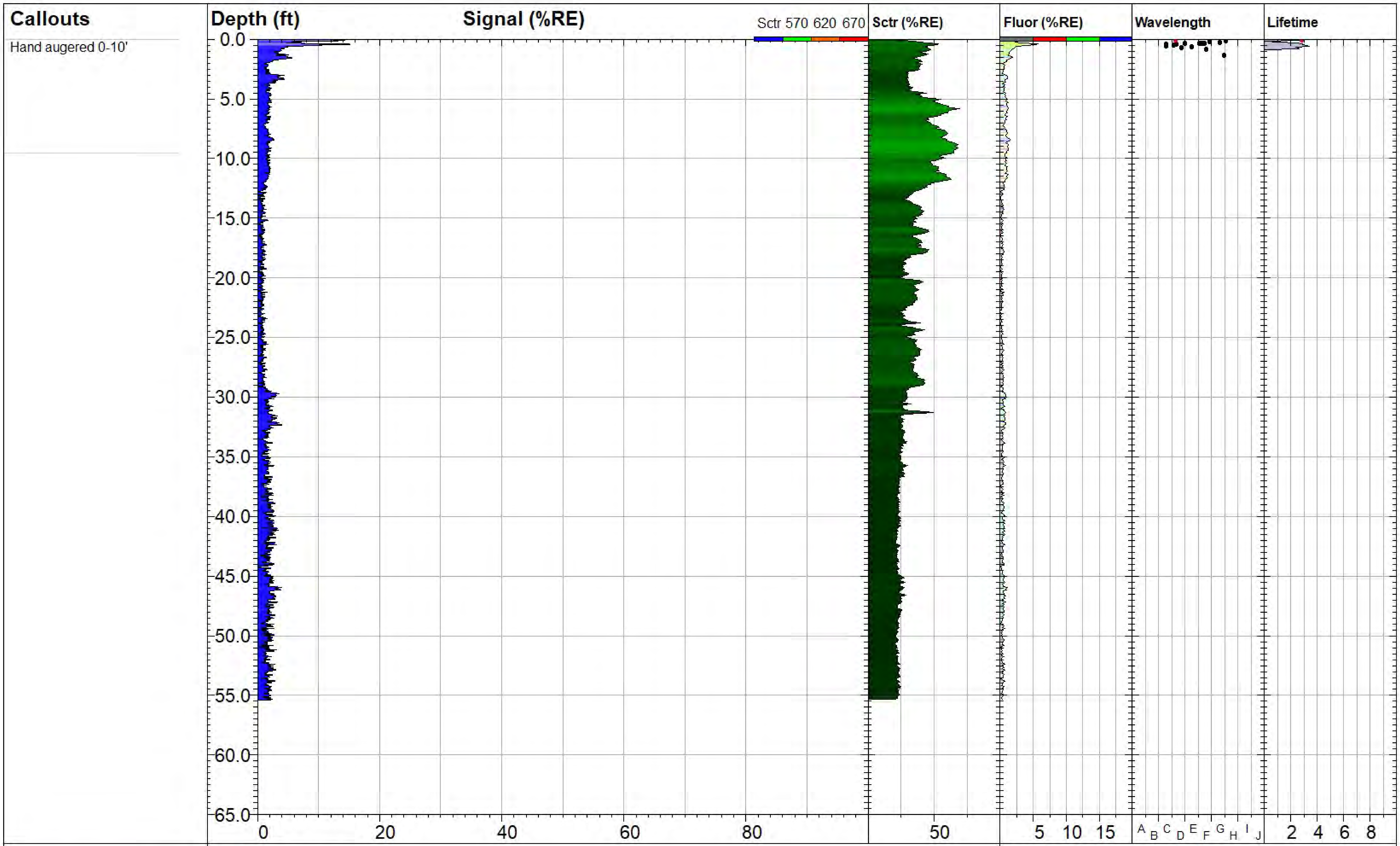
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.82 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **51.6 %RE @ 25.85 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-15 11:09 CST**



Cutoff: Fluorescence < 2.0; Depth < 10.0



CPT-05-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **55.40 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **16.3 %RE @ 0.02 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-14 13:14 CST**

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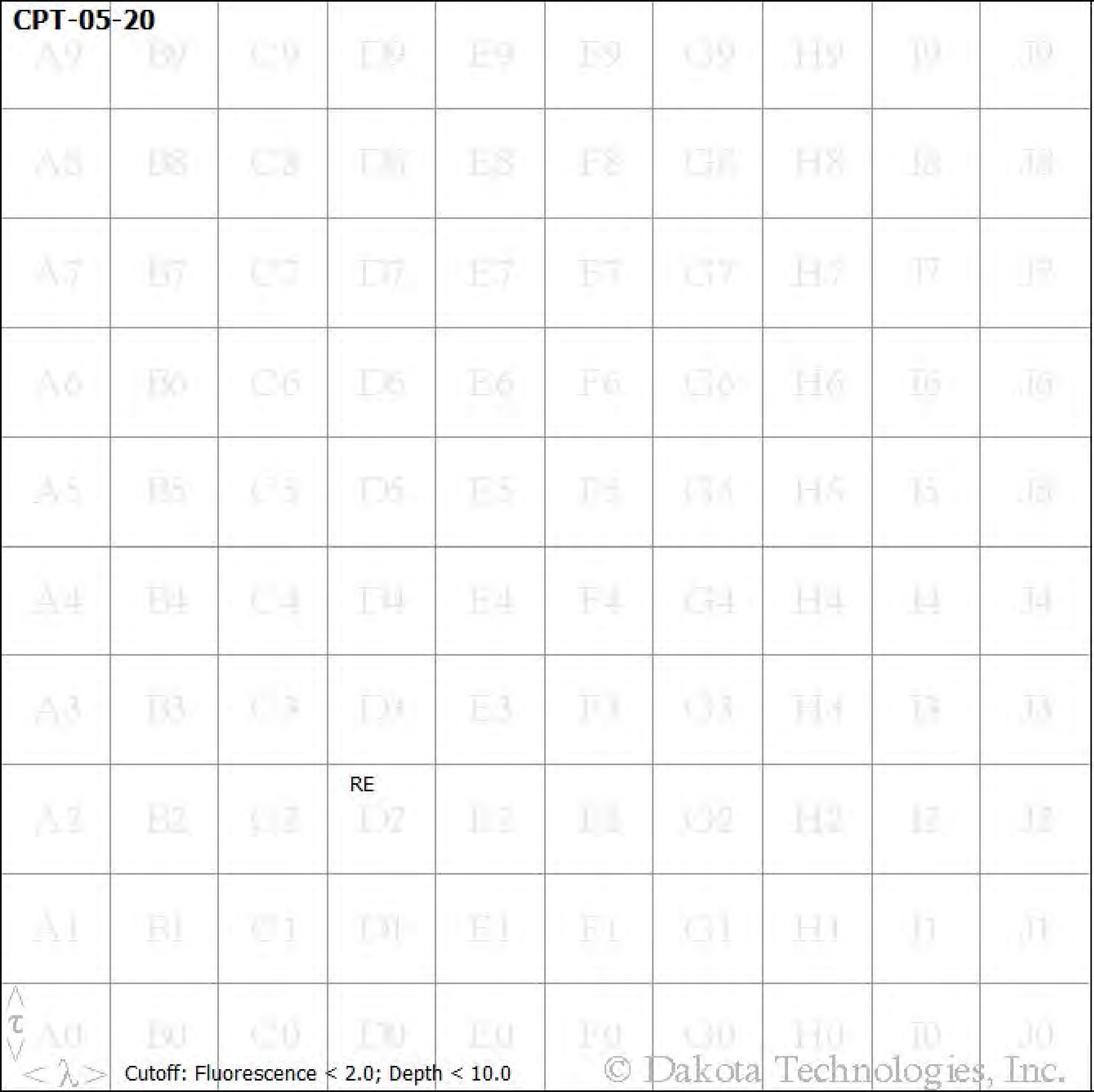
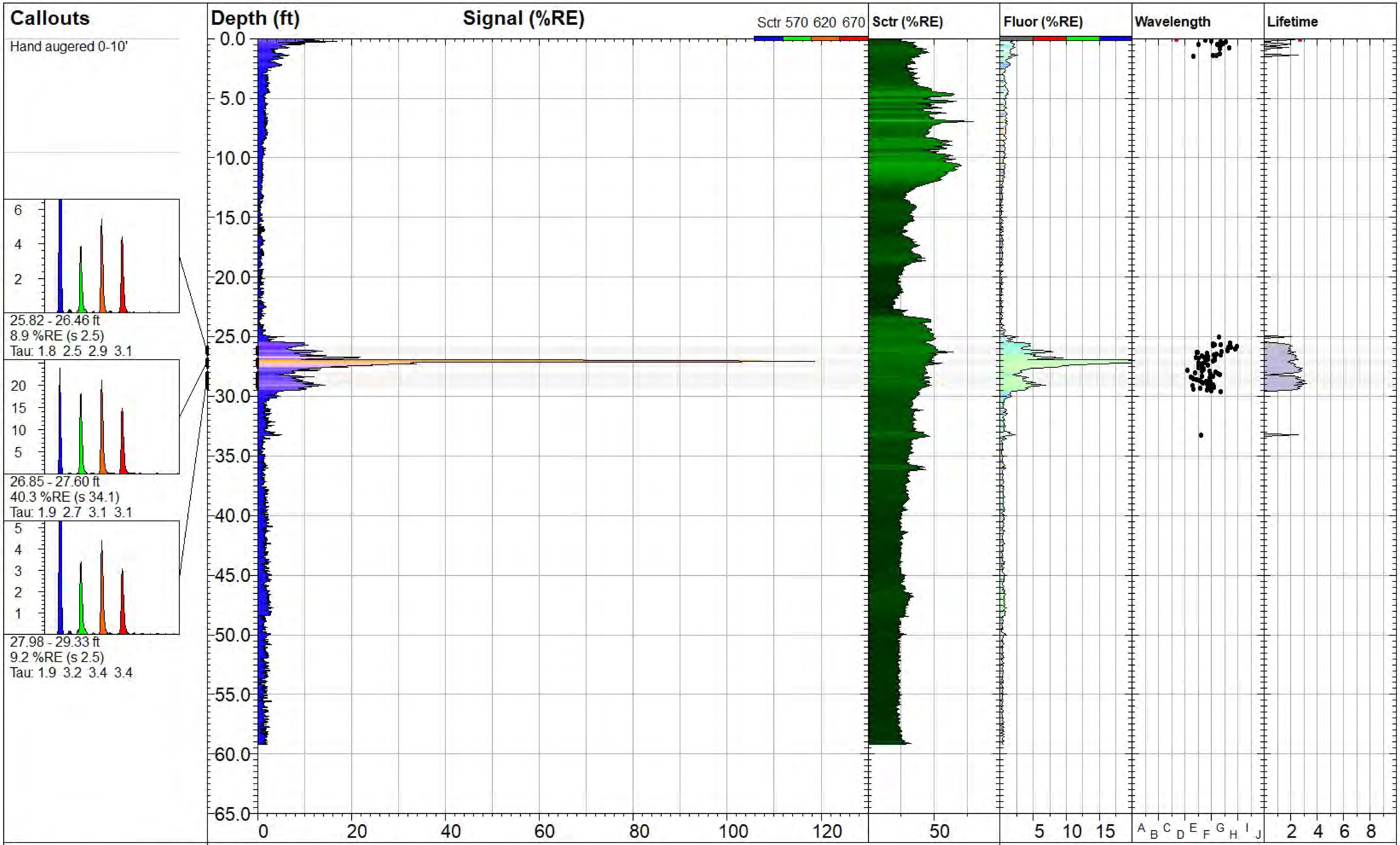


Cutoff: Fluorescence < 2.0; Depth < 10.0



Hand augered 0-10'

25.82 - 26.46 ft
8.9 %RE (s 2.5)
Tau: 1.8 2.5 2.9 3.1

26.85 - 27.60 ft
40.3 %RE (s 34.1)
Tau: 1.9 2.7 3.1 3.1

27.98 - 29.33 ft
9.2 %RE (s 2.5)
Tau: 1.9 3.2 3.4 3.4

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
59.21 ft

Client / Job:
Golder /

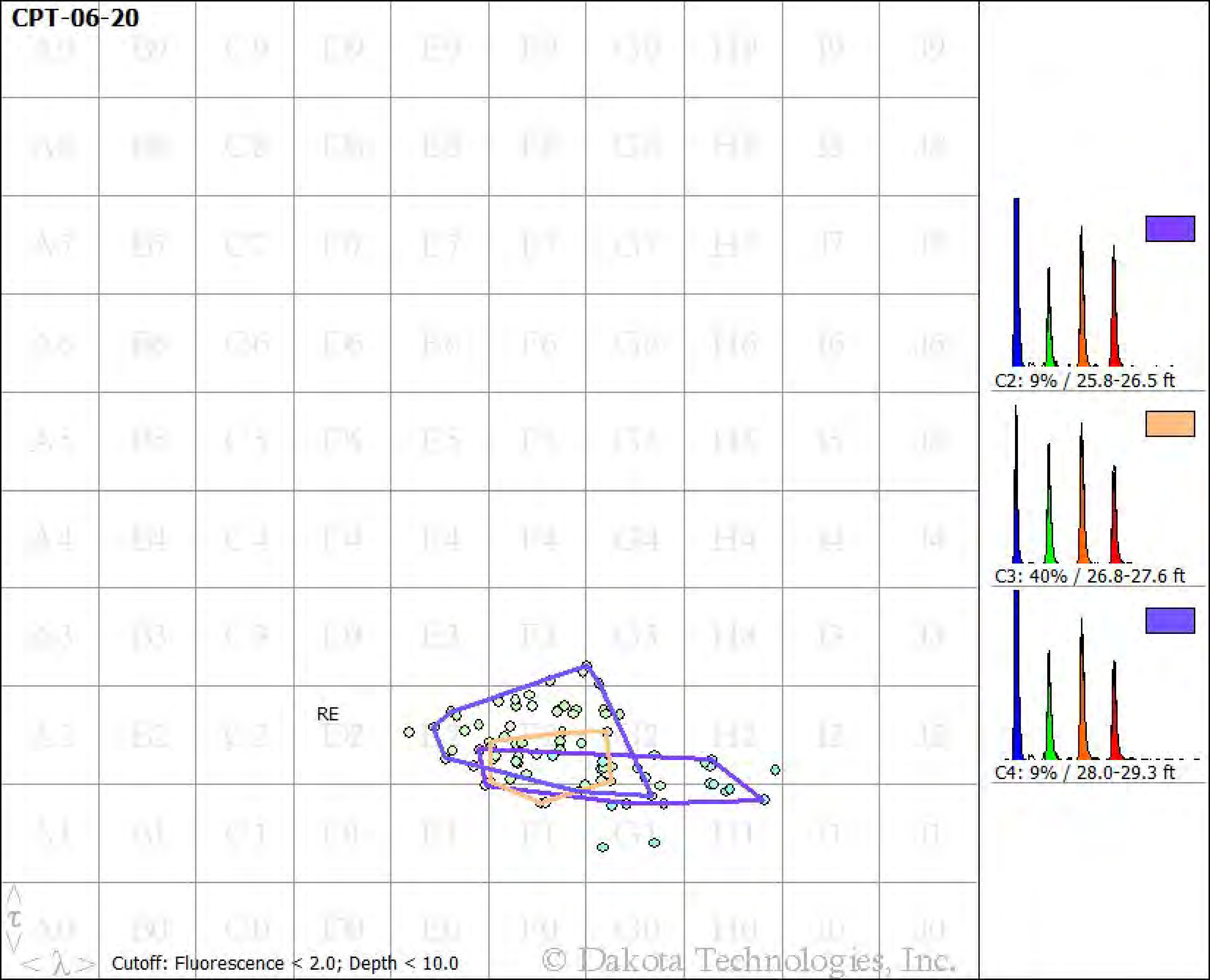
X Coord.(Lng-E) / Fix:
Unavailable / NA

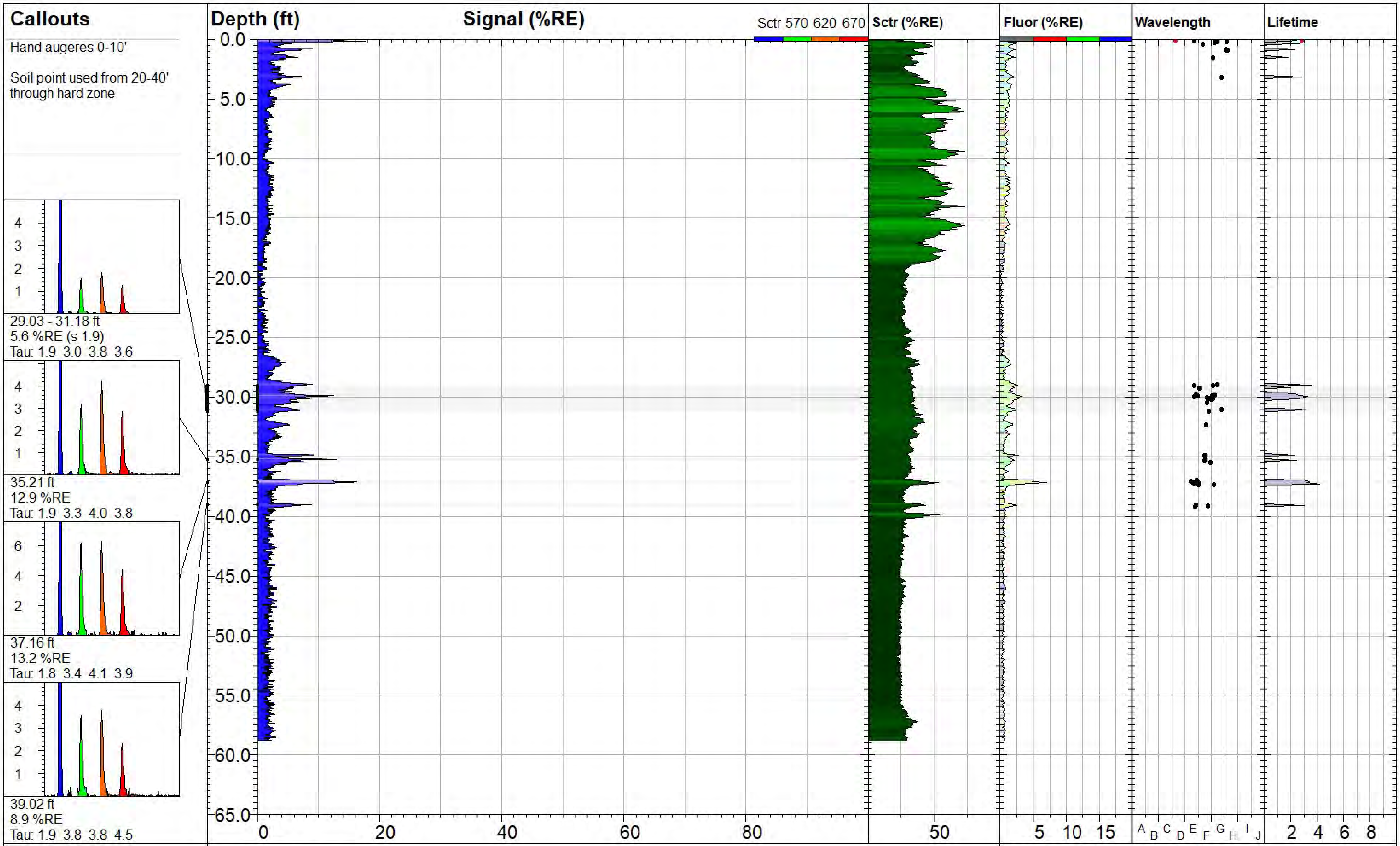
Max signal:
121.3 %RE @ 27.05 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2020-01-15 13:14 CST


CPT-06-20
RE
C2: 9% / 25.8-26.5 ft
C3: 40% / 26.8-27.6 ft
C4: 9% / 28.0-29.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand augeres 0-10'

Soil point used from 20-40' through hard zone

29.03 - 31.18 ft
5.6 %RE (s 1.9)
Tau: 1.9 3.0 3.8 3.6

35.21 ft
12.9 %RE
Tau: 1.9 3.3 4.0 3.8

37.16 ft
13.2 %RE
Tau: 1.8 3.4 4.1 3.9

39.02 ft
8.9 %RE
Tau: 1.9 3.8 3.8 4.5

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CPT-07-20

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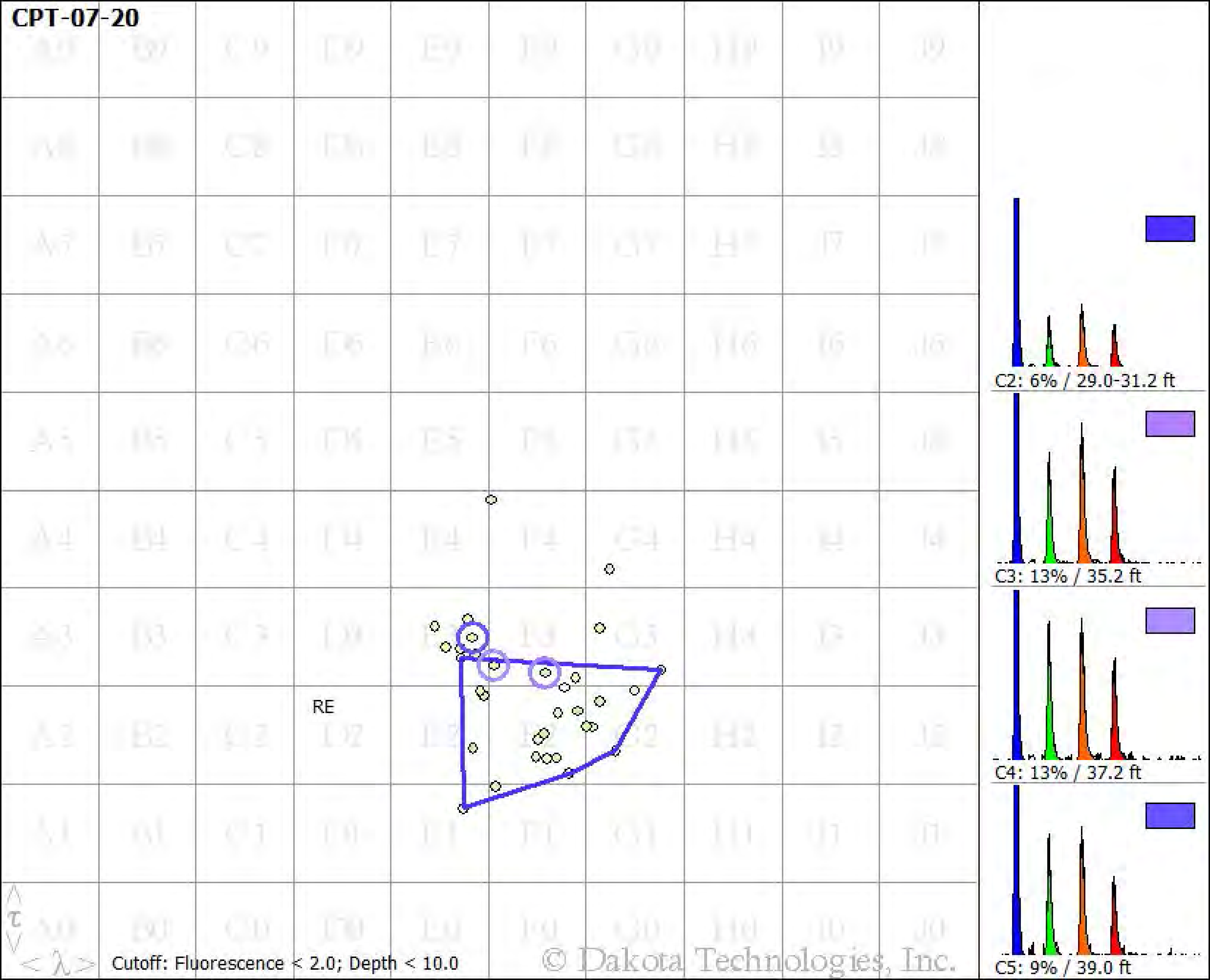
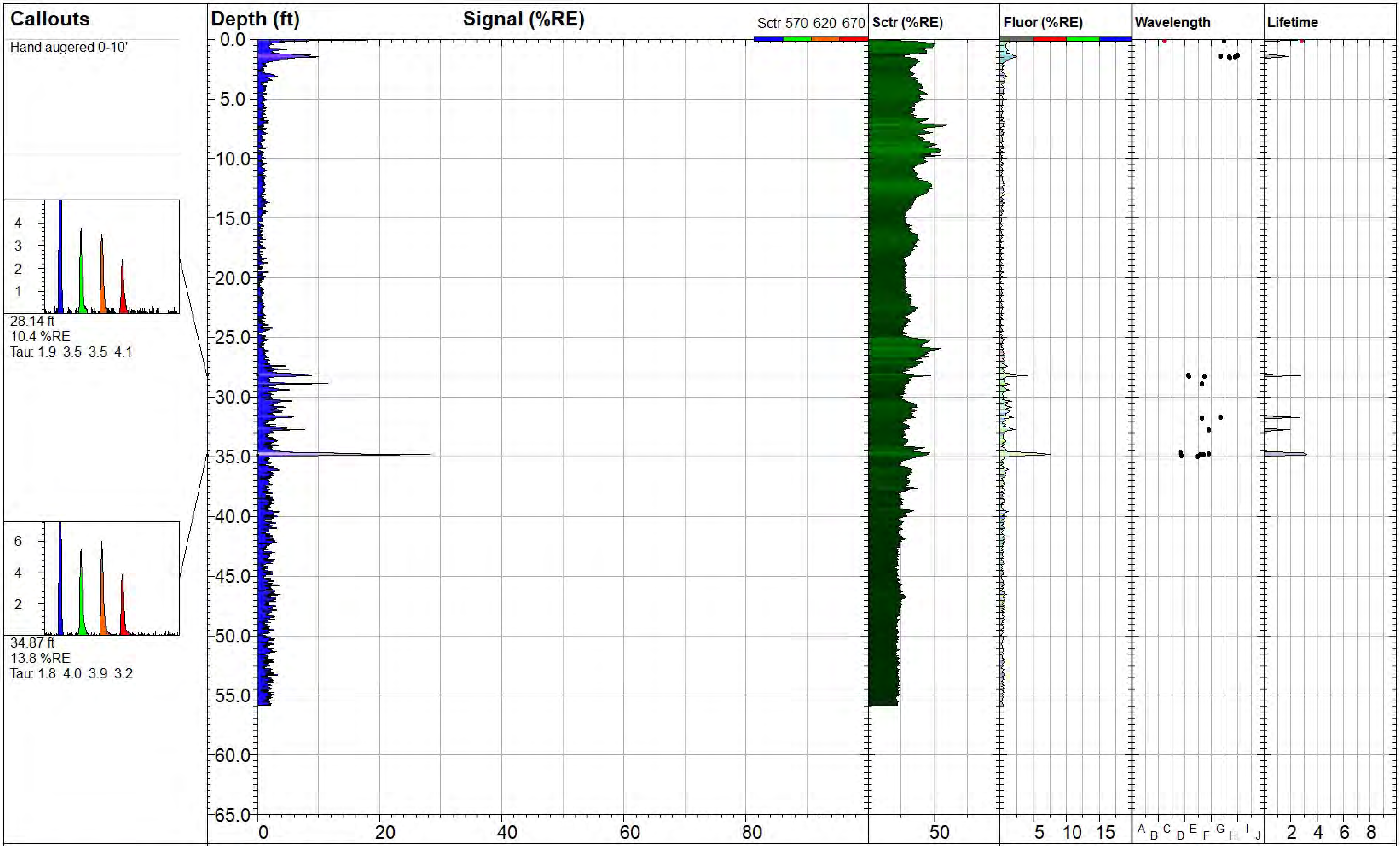
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.75 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **17.7 %RE @ 0.18 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-13 14:02 CST**


CPT-07-20
RE
C2: 6% / 29.0-31.2 ft
C3: 13% / 35.2 ft
C4: 13% / 37.2 ft
C5: 9% / 39.0 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand augered 0-10'

28.14 ft
10.4 %RE
Tau: 1.9 3.5 3.5 4.1

34.87 ft
13.8 %RE
Tau: 1.8 4.0 3.9 3.2

CPT-08-20

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
55.82 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

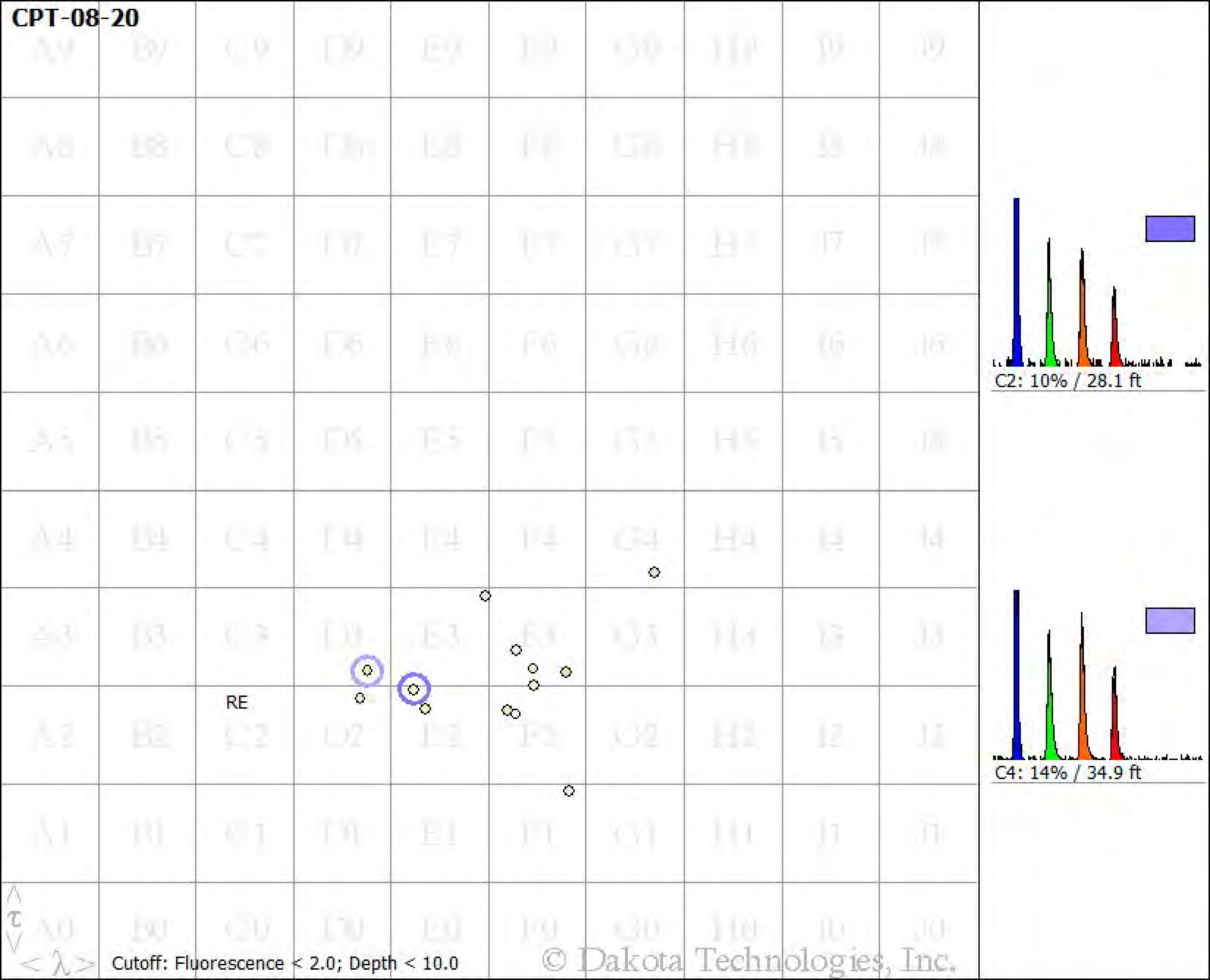
Max signal:
29.1 %RE @ 34.81 ft

Operator / Unit:
T. Rudolph / TG1807

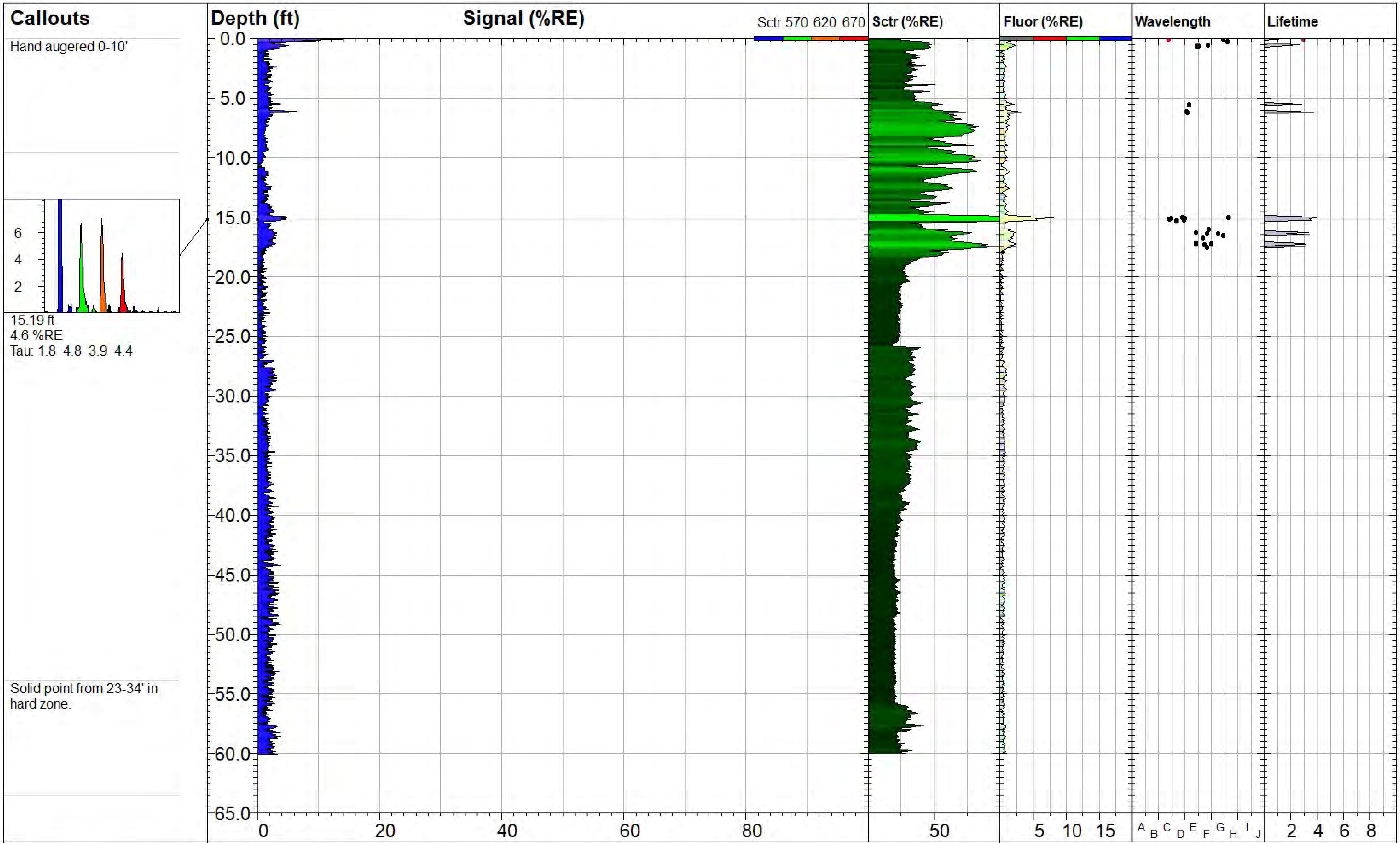
Elevation:
Unavailable

Date & Time:
2020-01-14 11:07 CST

CPT-08-20



Cutoff: Fluorescence < 2.0; Depth < 10.0



Hand augered 0-10'

15.19 ft
4.6 %RE
Tau: 1.8 4.8 3.9 4.4

Solid point from 23-34' in hard zone.

CPT-09-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.06 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **14.3 %RE @ 0.10 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-13 10:41 CST**

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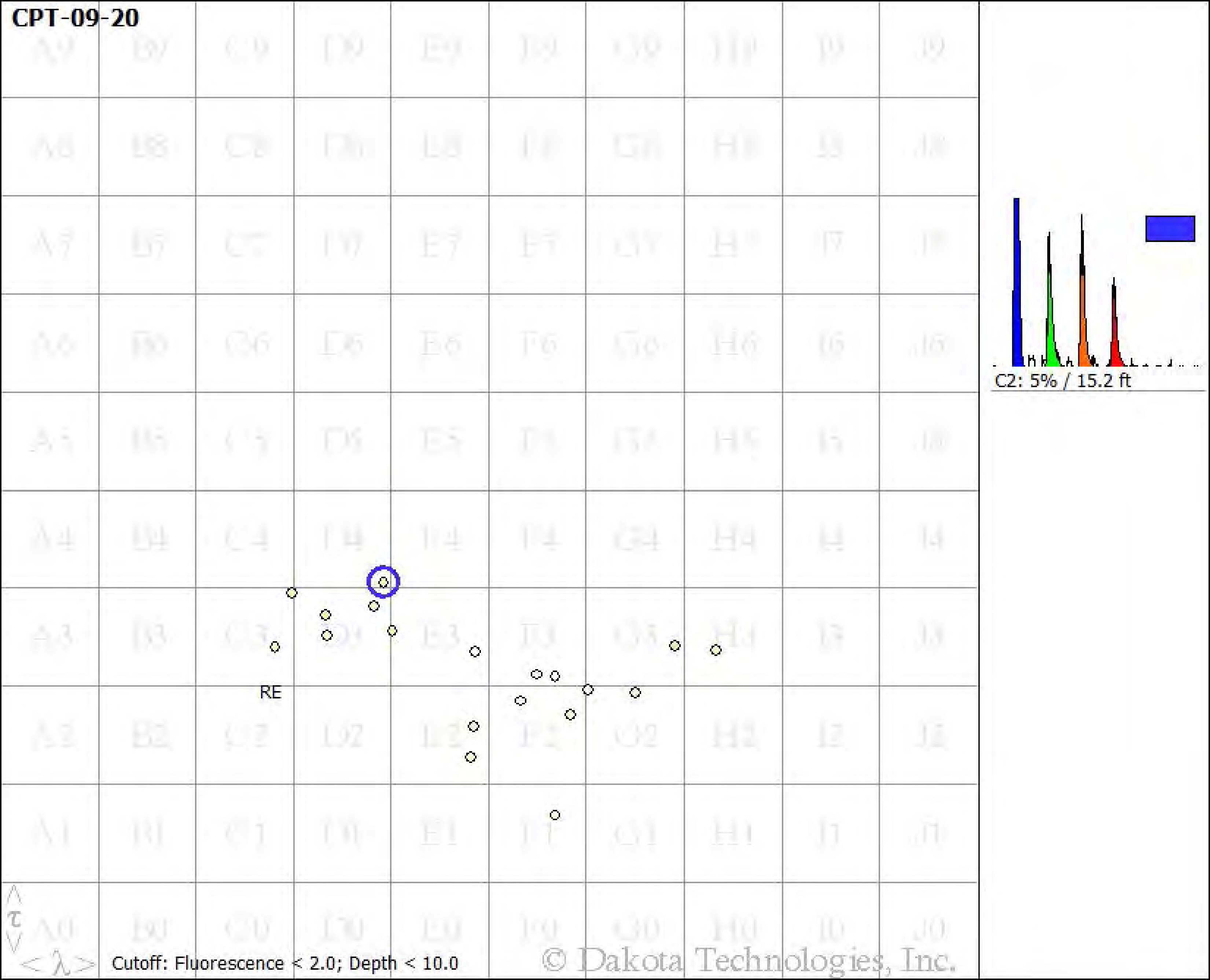
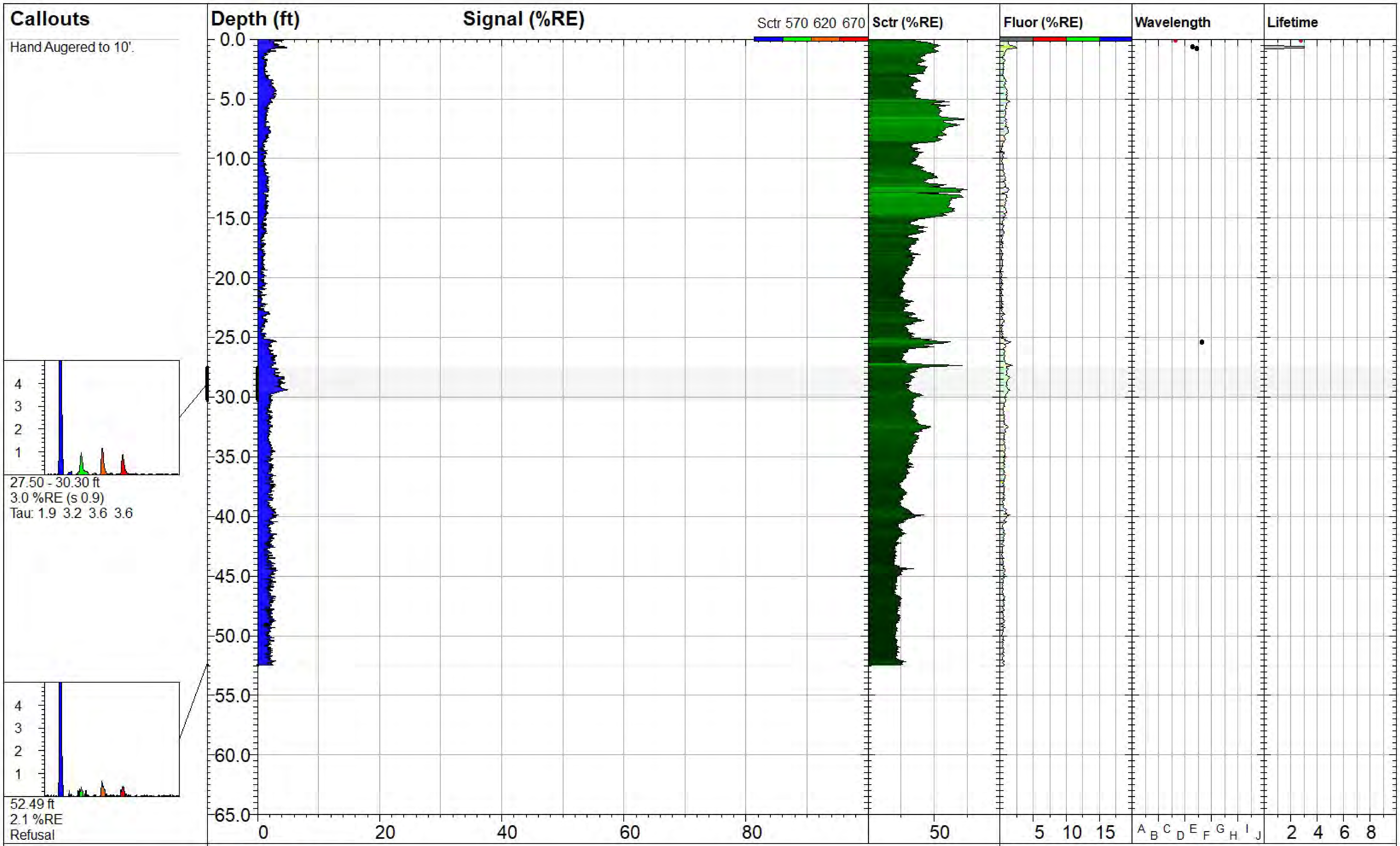

CPT-09-20
RE
C2: 5% / 15.2 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0



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CPT-10-20

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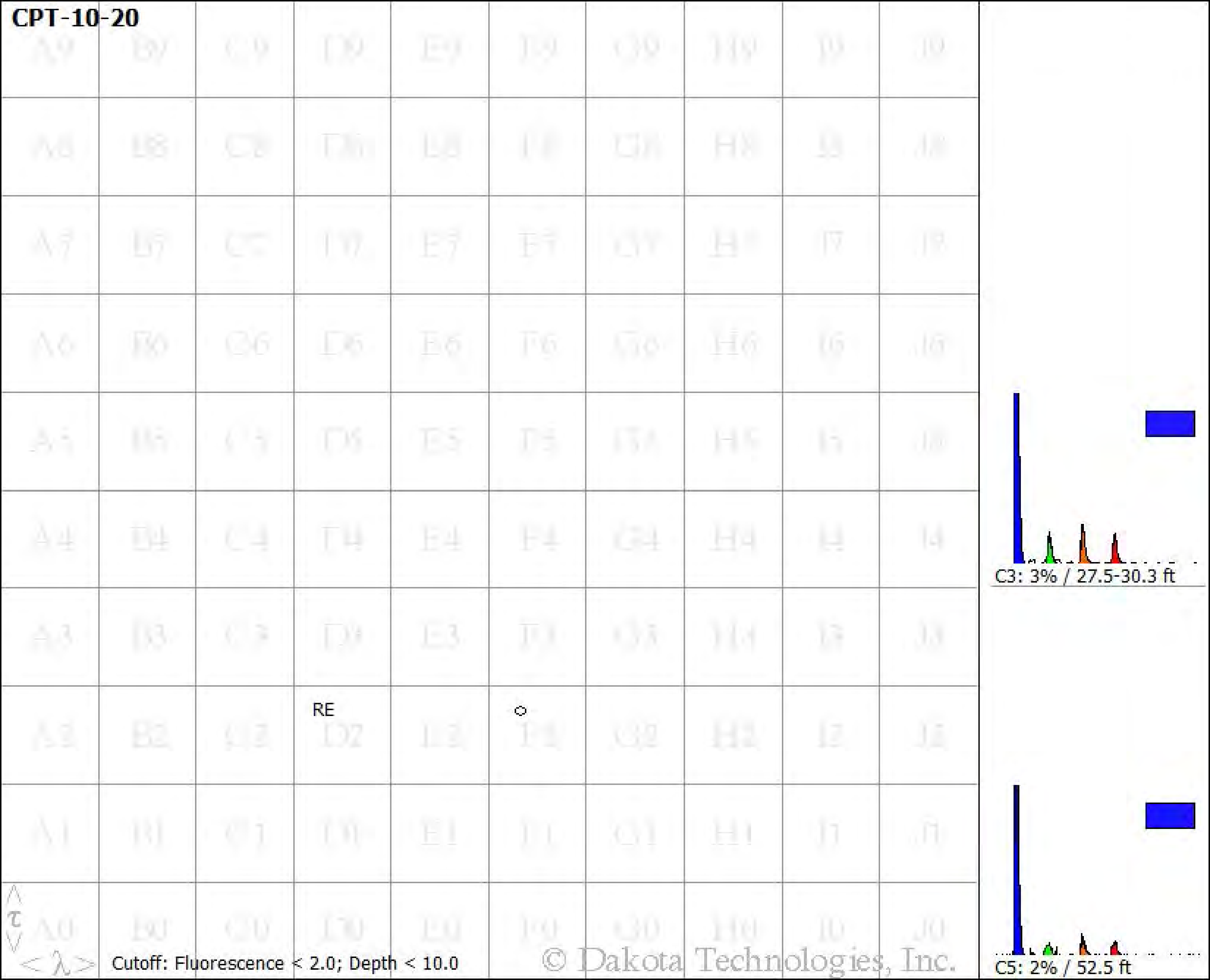
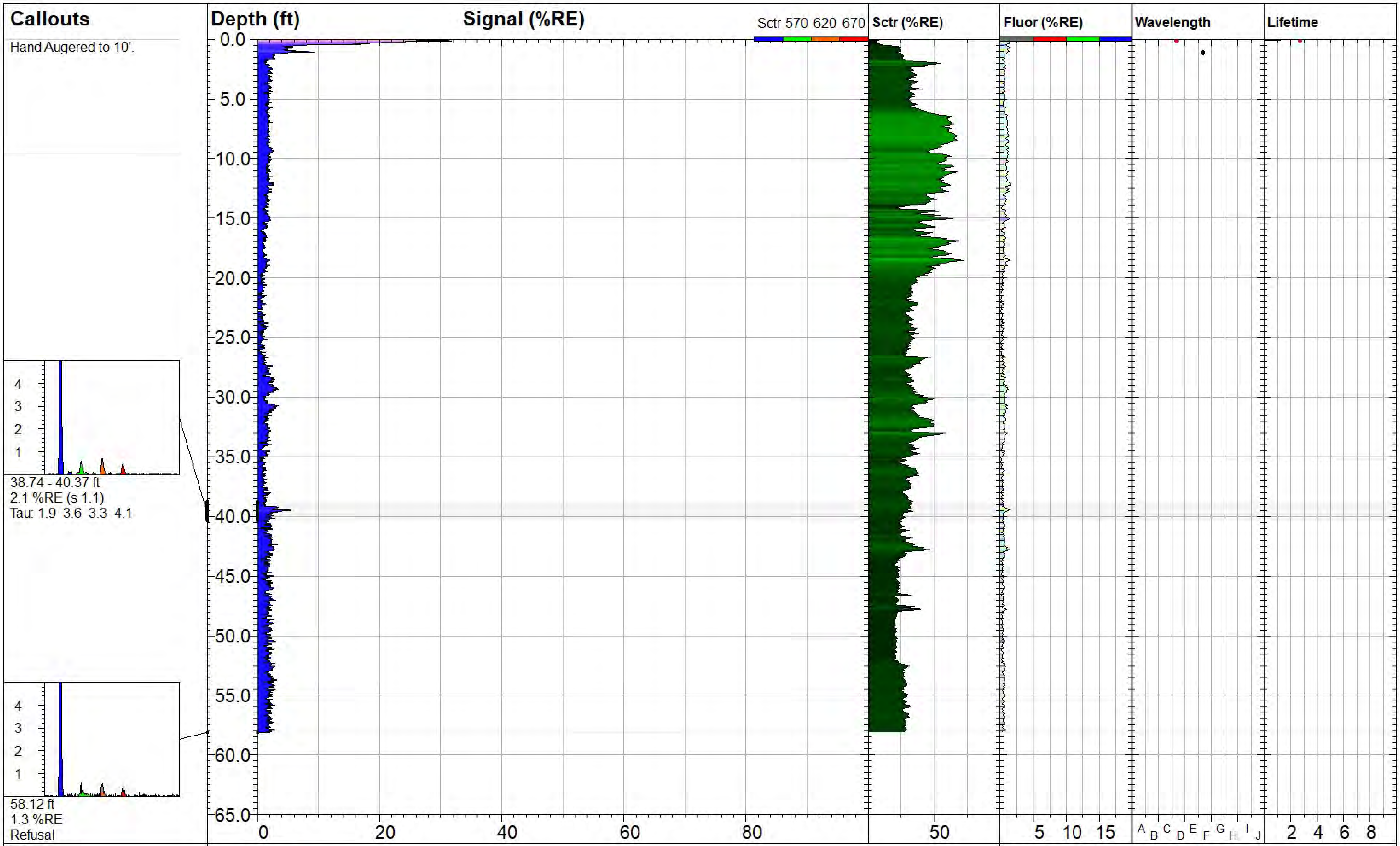
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **52.49 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.9 %RE @ 0.71 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-23 13:29 CST**

CPT-10-20



Cutoff: Fluorescence < 2.0; Depth < 10.0



CPT-11-20

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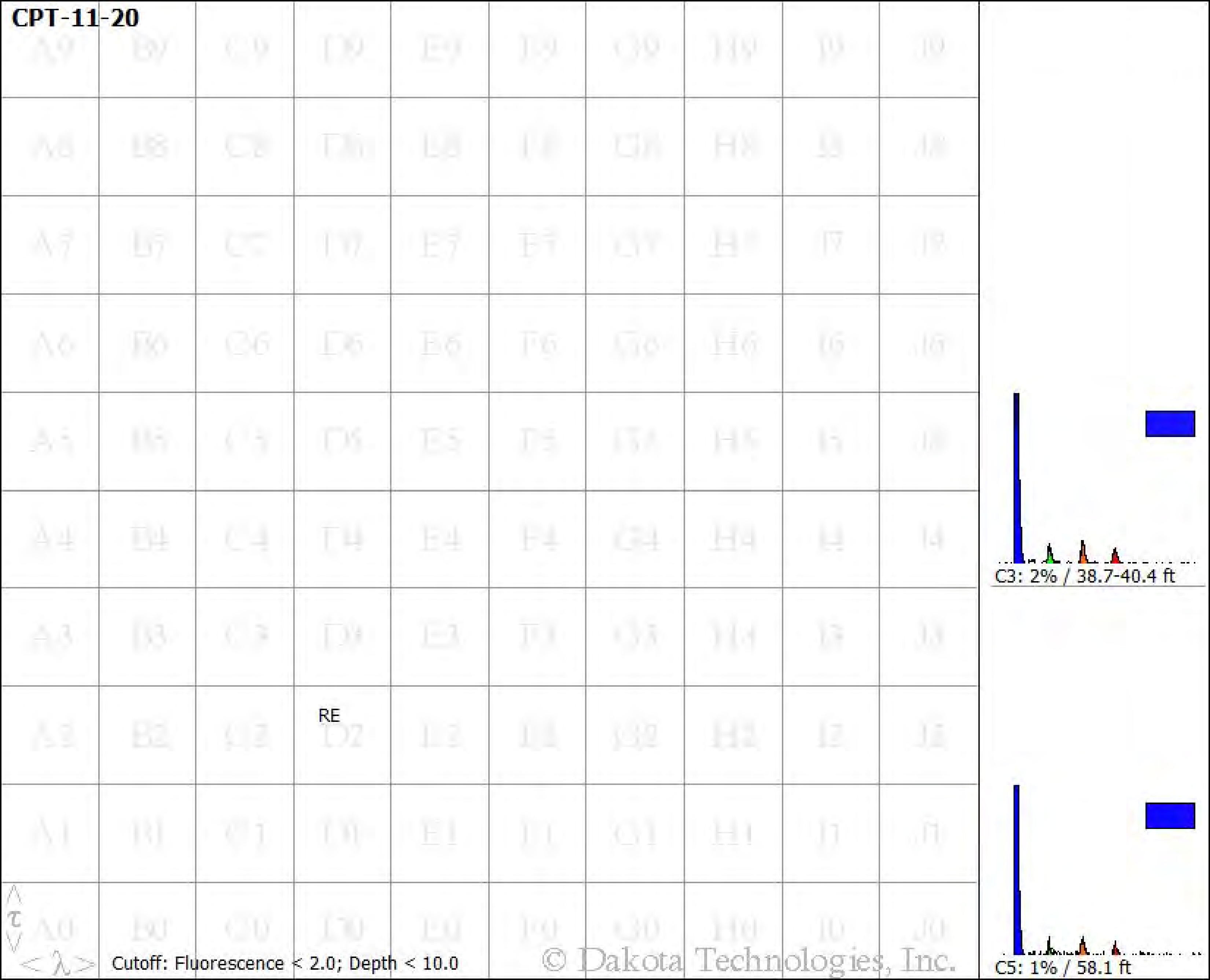
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.12 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **32.4 %RE @ 0.14 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-23 11:37 CST**


CPT-11-20
RE
C3: 2% / 38.7-40.4 ft
C5: 1% / 58.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
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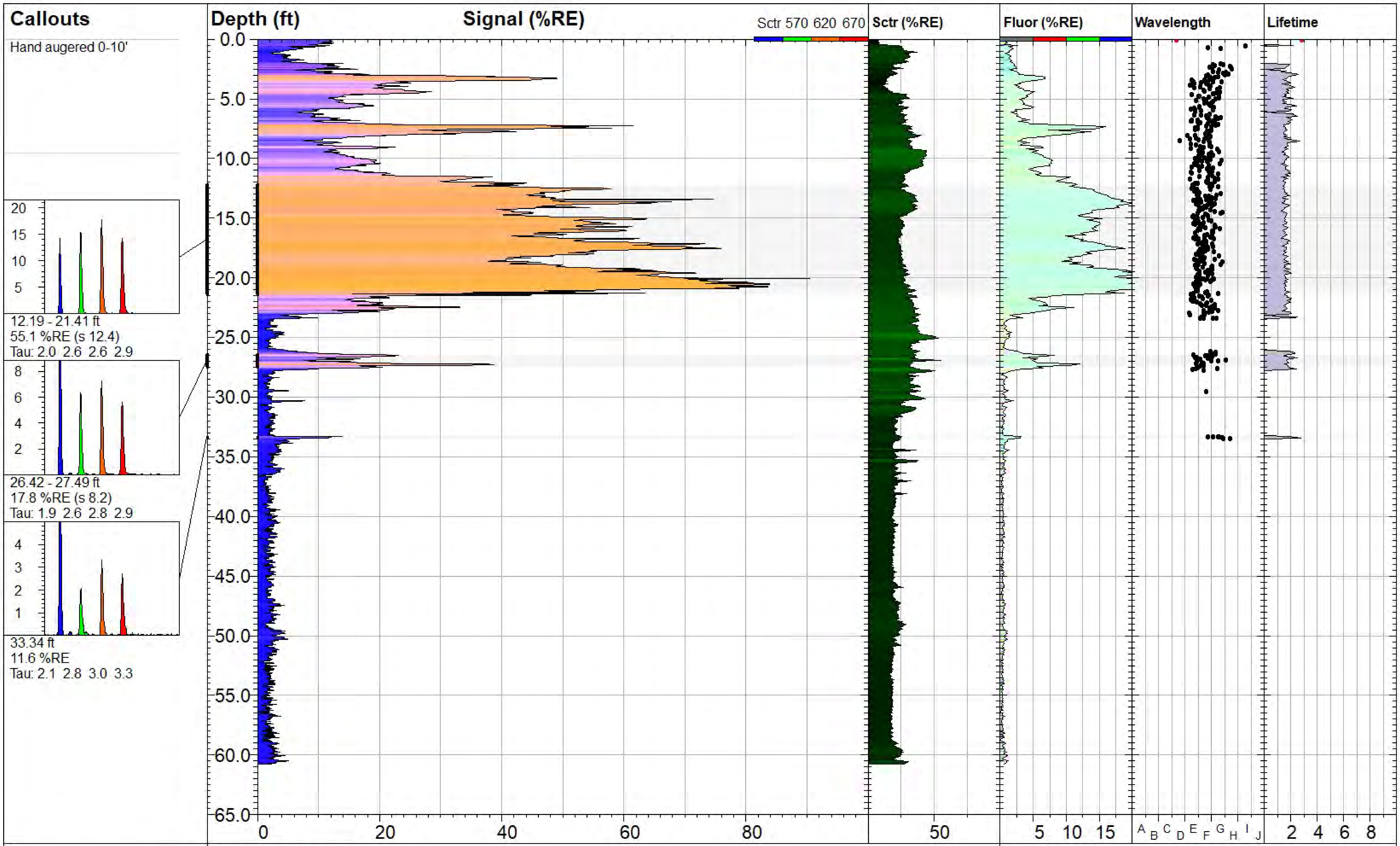

CPT-12-20

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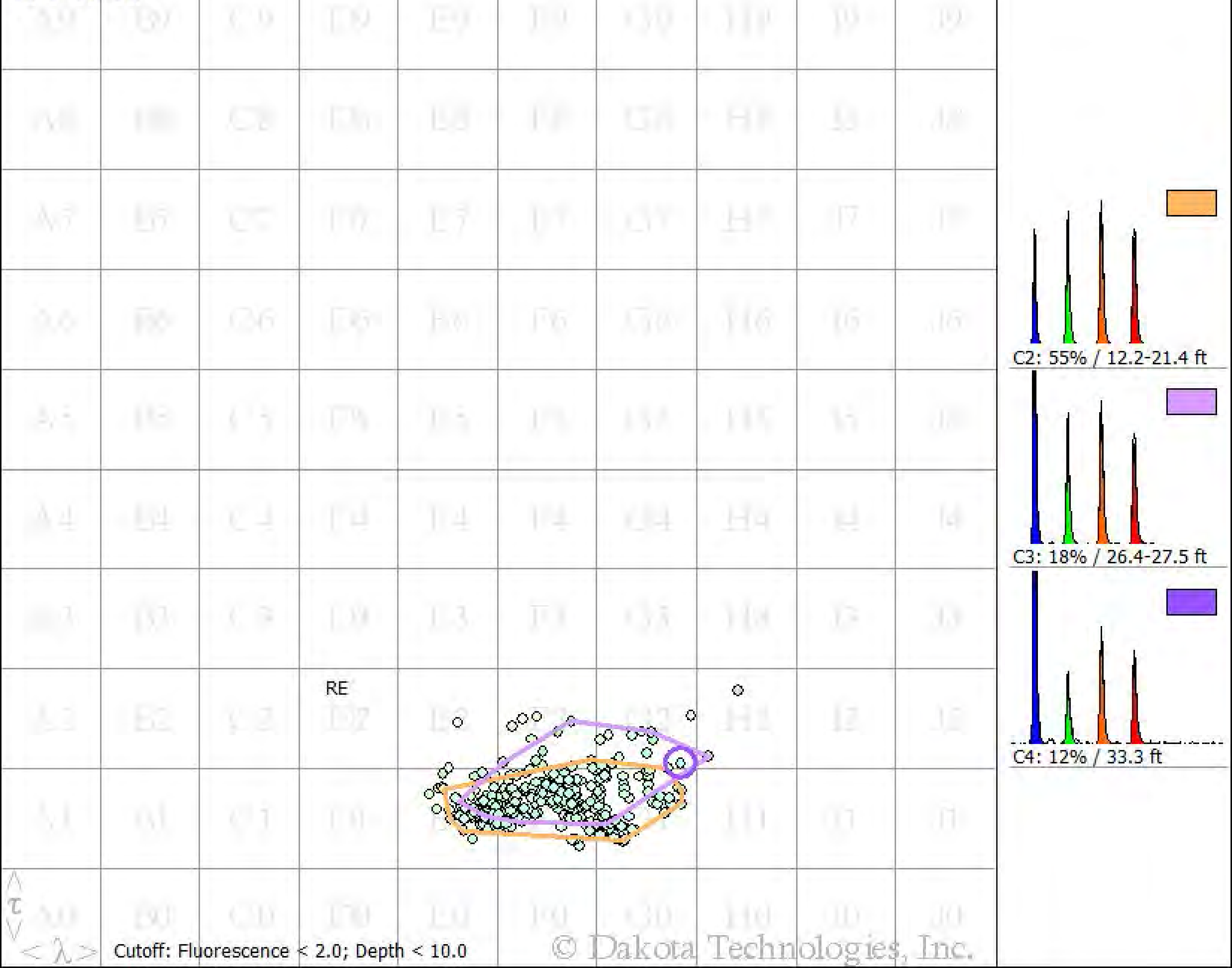
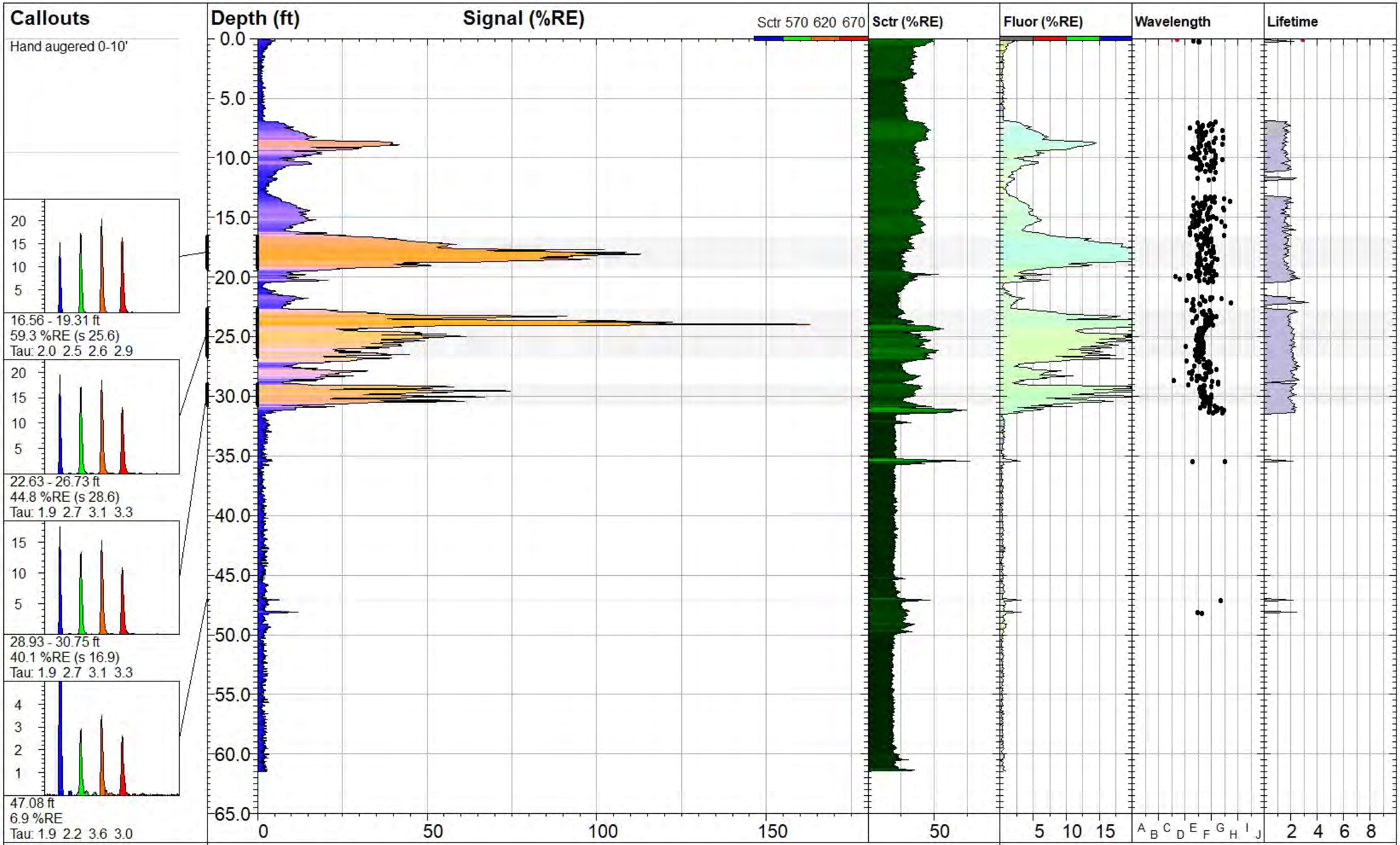
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.74 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **90.5 %RE @ 20.07 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-11 11:06 CST**

CPT-12-20


RE
C2: 55% / 12.2-21.4 ft
C3: 18% / 26.4-27.5 ft
C4: 12% / 33.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand augered 0-10'

16.56 - 19.31 ft
59.3 %RE (s 25.6)
Tau: 2.0 2.5 2.6 2.9

22.63 - 26.73 ft
44.8 %RE (s 28.6)
Tau: 1.9 2.7 3.1 3.3

28.93 - 30.75 ft
40.1 %RE (s 16.9)
Tau: 1.9 2.7 3.1 3.3

47.08 ft
6.9 %RE
Tau: 1.9 2.2 3.6 3.0

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CPT-13-20

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
61.48 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

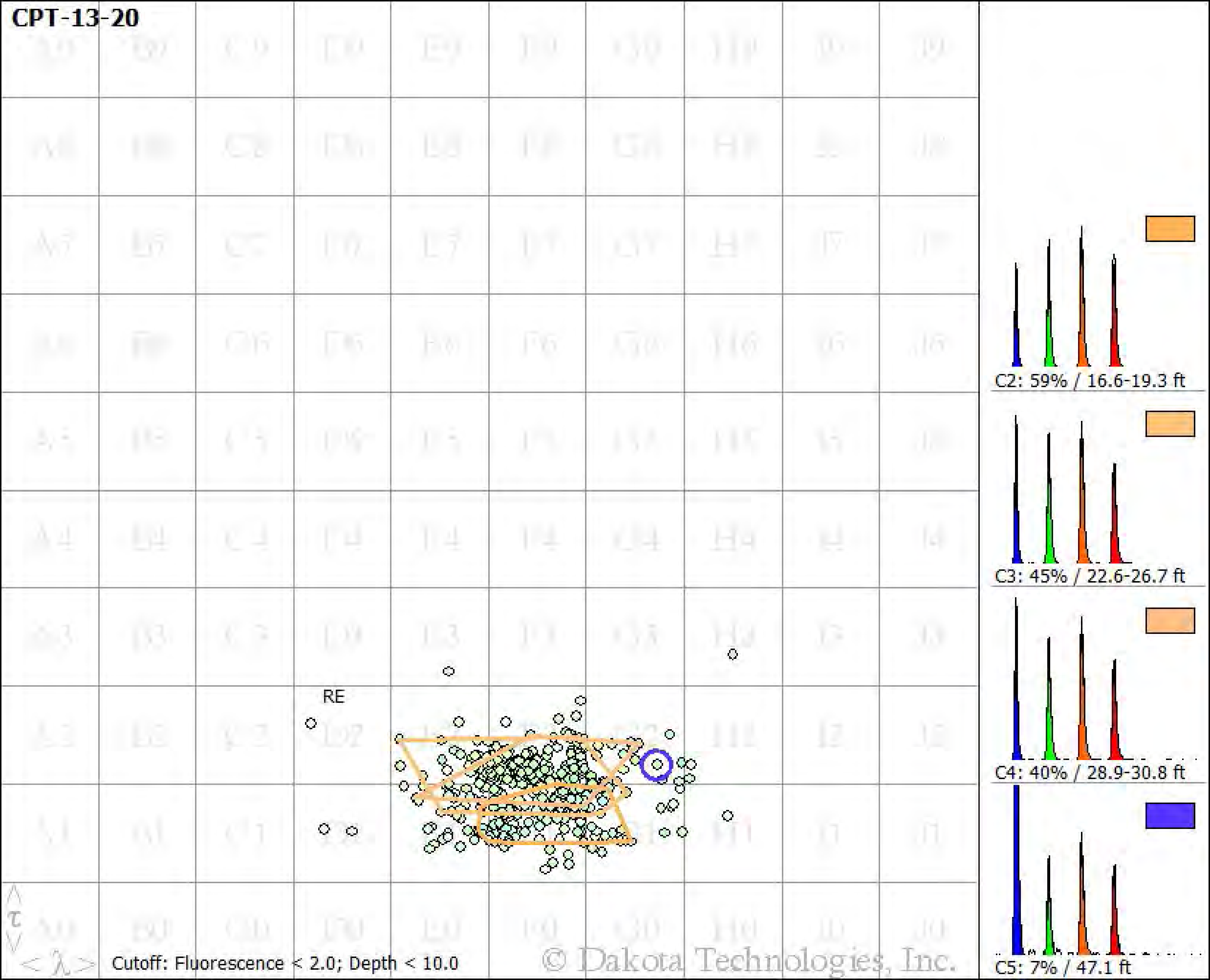
Max signal:
163.0 %RE @ 23.96 ft

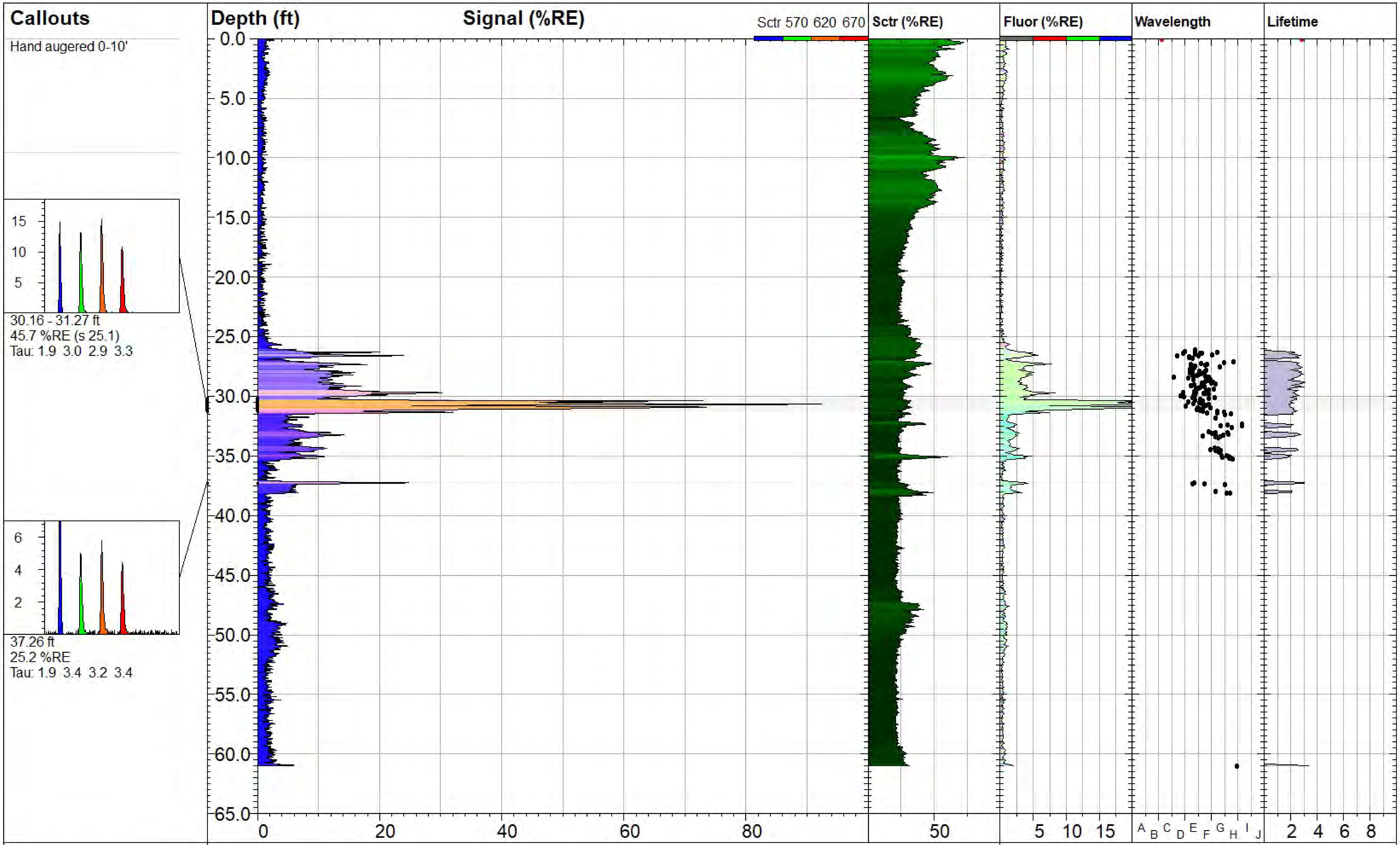
Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2020-01-11 09:50 CST

CPT-13-20


RE
C2: 59% / 16.6-19.3 ft
C3: 45% / 22.6-26.7 ft
C4: 40% / 28.9-30.8 ft
C5: 7% / 47.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0



CPT-14-20

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Site:
Houston Wood Preserving Works

Client / Job:
Golder /

Operator / Unit:
T. Rudolph / TG1807

Y Coord.(Lat-N) / System:
Unavailable / NA

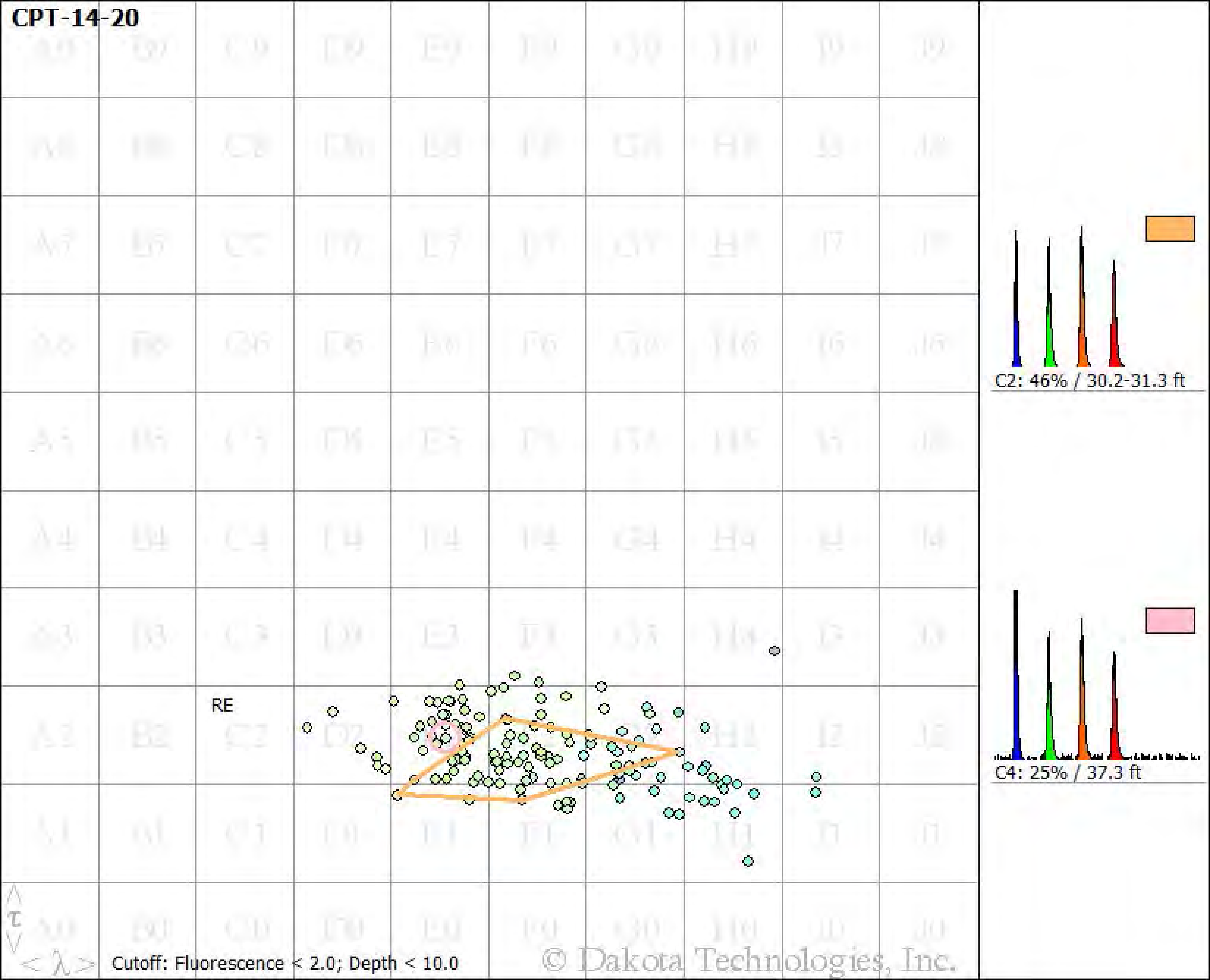
X Coord.(Lng-E) / Fix:
Unavailable / NA

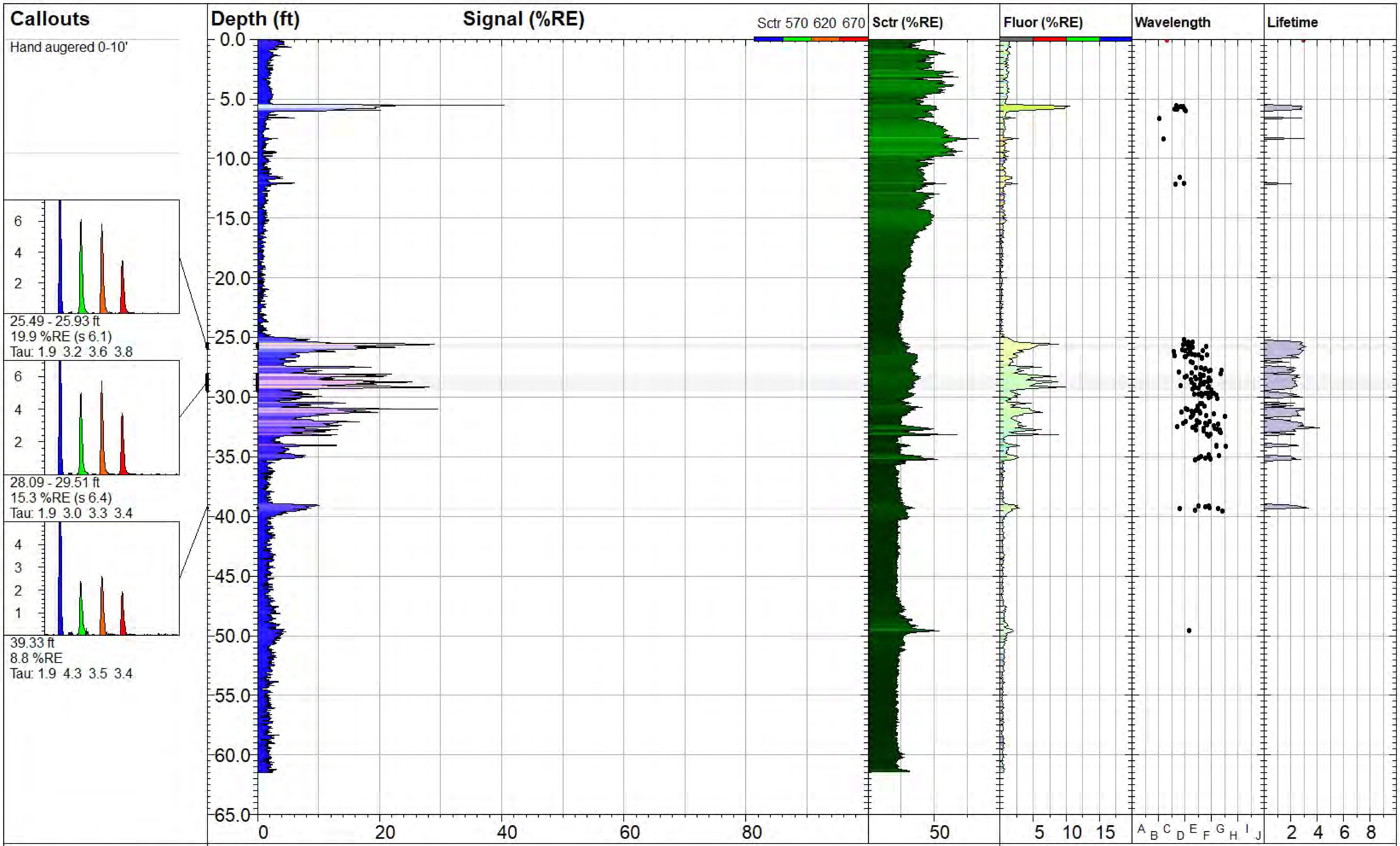
Elevation:
Unavailable

Final depth:
60.97 ft

Max signal:
96.2 %RE @ 30.67 ft

Date & Time:
2020-01-10 14:35 CST


CPT-14-20
RE
C2: 46% / 30.2-31.3 ft
C4: 25% / 37.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand augered 0-10'

25.49 - 25.93 ft
19.9 %RE (s 6.1)
Tau: 1.9 3.2 3.6 3.8

28.09 - 29.51 ft
15.3 %RE (s 6.4)
Tau: 1.9 3.0 3.3 3.4

39.33 ft
8.8 %RE
Tau: 1.9 4.3 3.5 3.4

CPT-15-20

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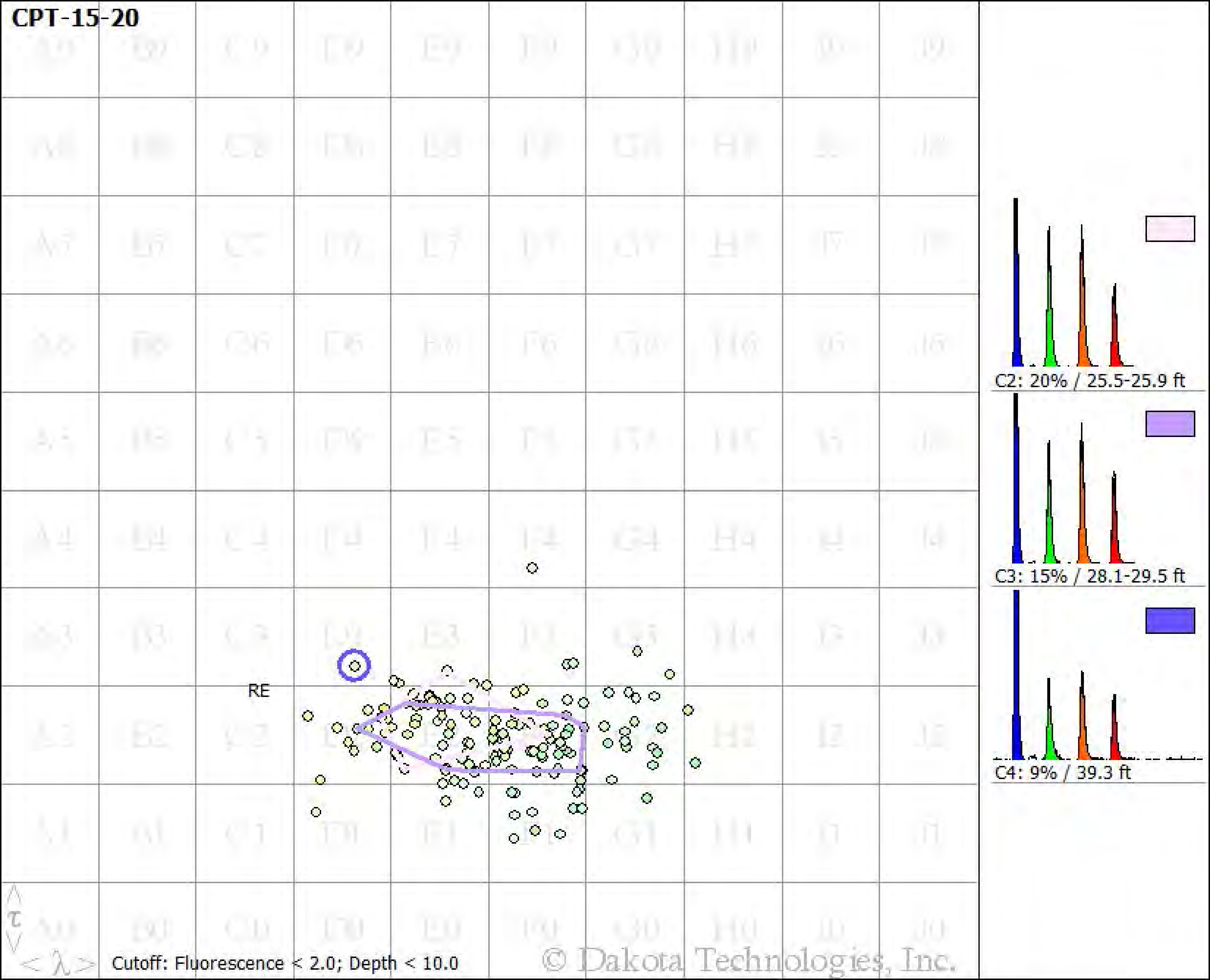
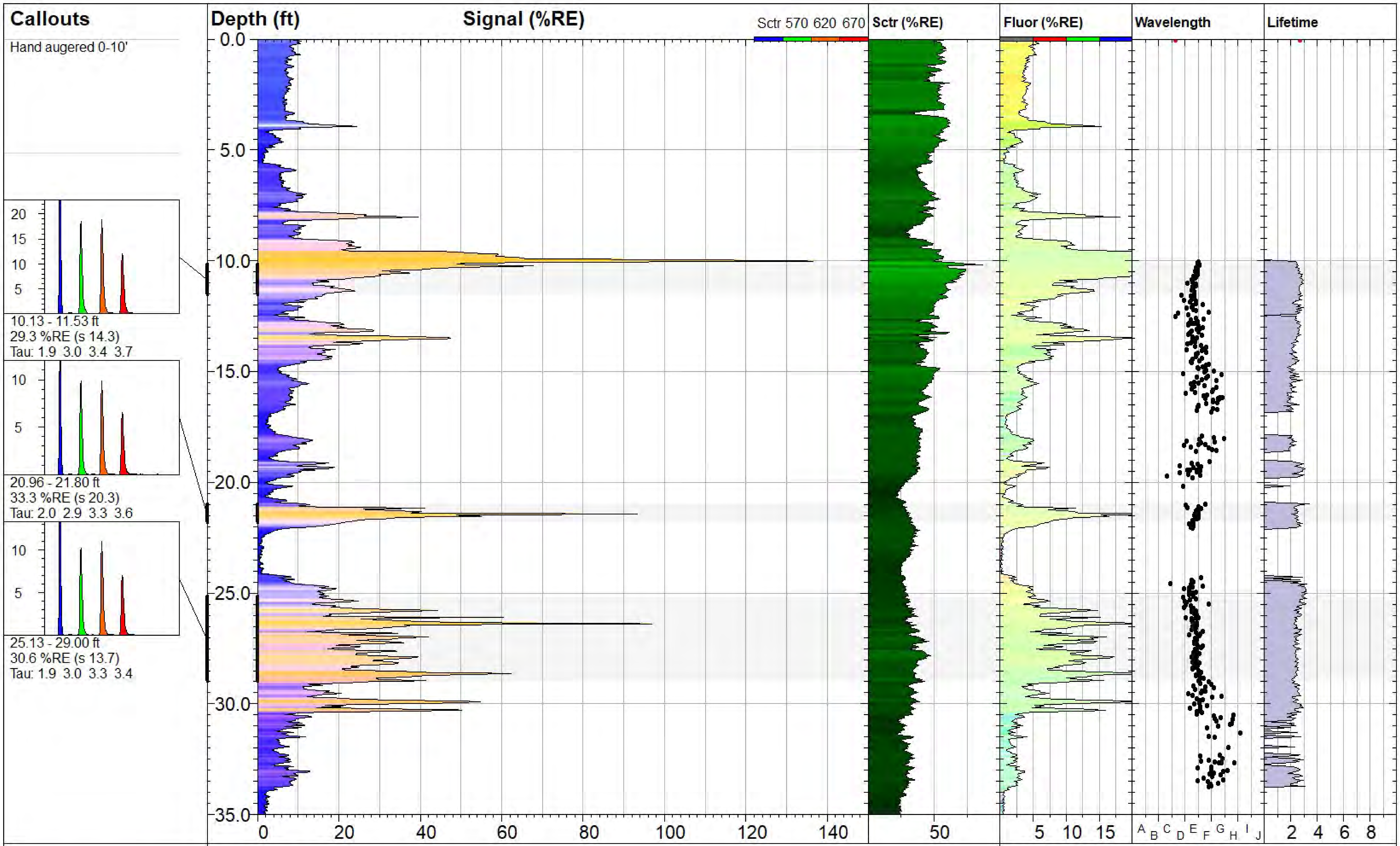
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **61.46 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **40.9 %RE @ 5.52 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-10 12:31 CST**


CPT-15-20
RE
C2: 20% / 25.5-25.9 ft
C3: 15% / 28.1-29.5 ft
C4: 9% / 39.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



CPT-16-20

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
61.16 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

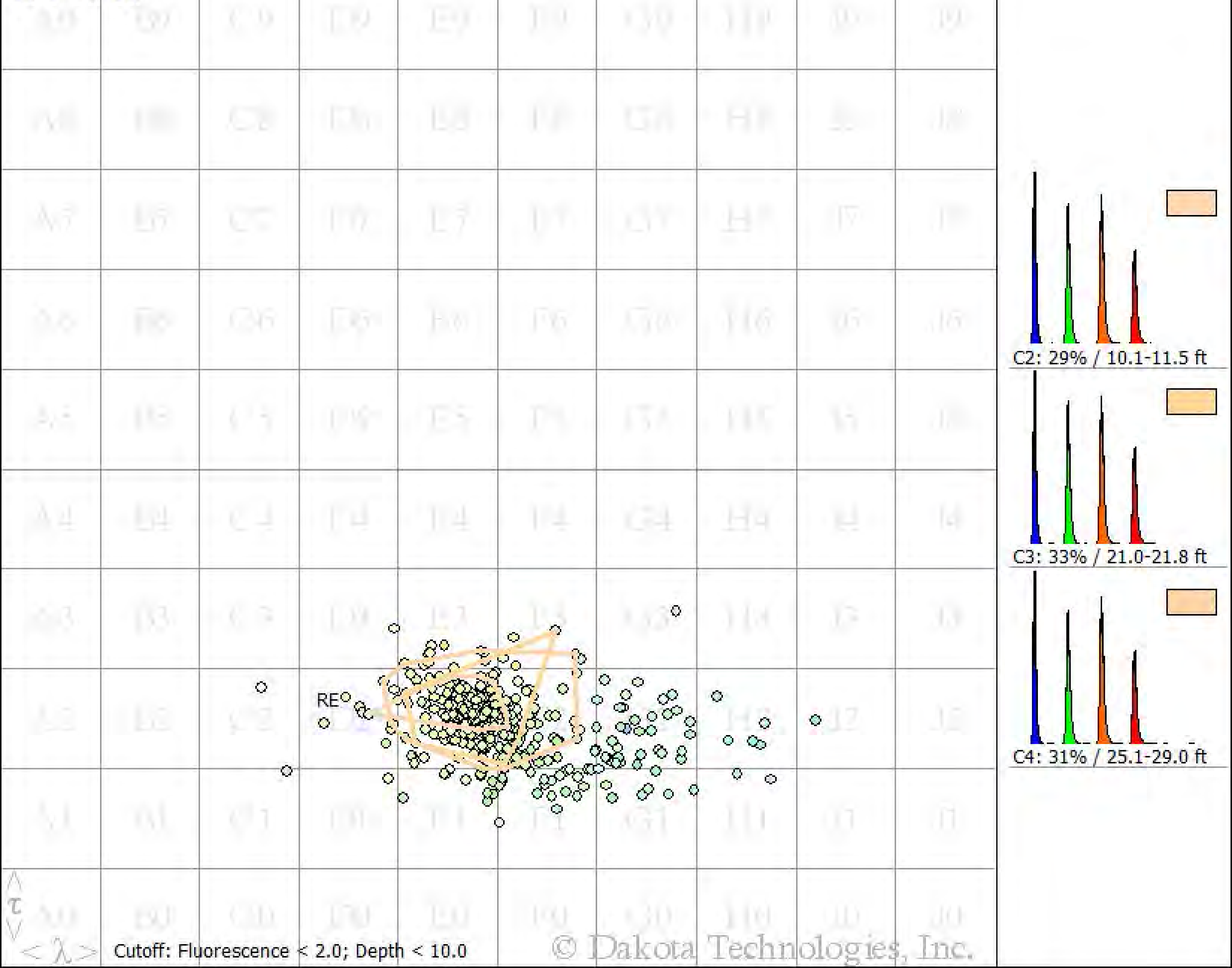
Max signal:
137.4 %RE @ 10.01 ft

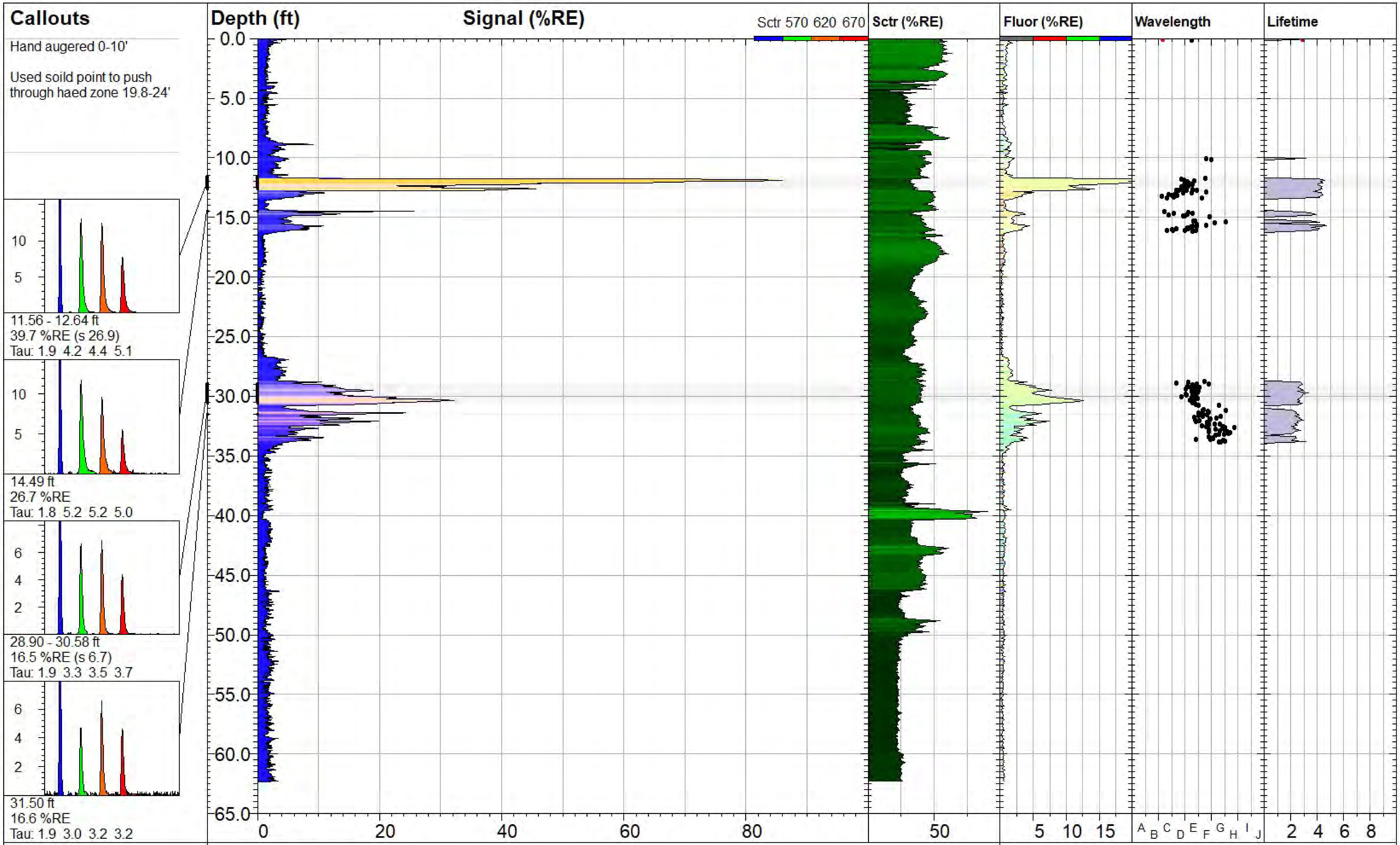
Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2020-01-10 10:47 CST

CPT-16-20


RE
C2: 29% / 10.1-11.5 ft
C3: 33% / 21.0-21.8 ft
C4: 31% / 25.1-29.0 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand augered 0-10'

Used soild point to push through haed zone 19.8-24'

11.56 - 12.64 ft
39.7 %RE (s 26.9)
Tau: 1.9 4.2 4.4 5.1

14.49 ft
26.7 %RE
Tau: 1.8 5.2 5.2 5.0

28.90 - 30.58 ft
16.5 %RE (s 6.7)
Tau: 1.9 3.3 3.5 3.7

31.50 ft
16.6 %RE
Tau: 1.9 3.0 3.2 3.2

CPT-17-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **62.31 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **86.4 %RE @ 11.88 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-10 08:49 CST**

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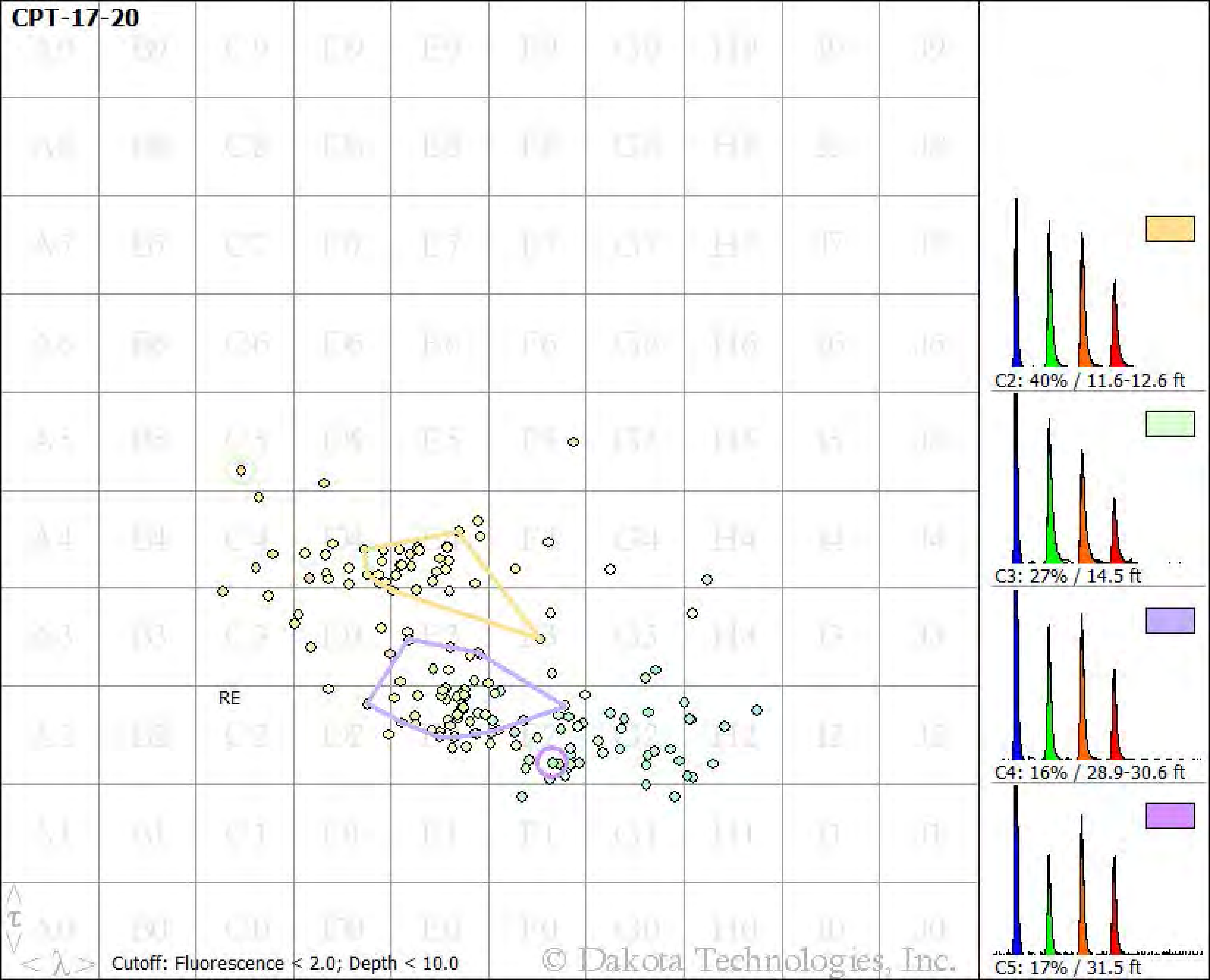
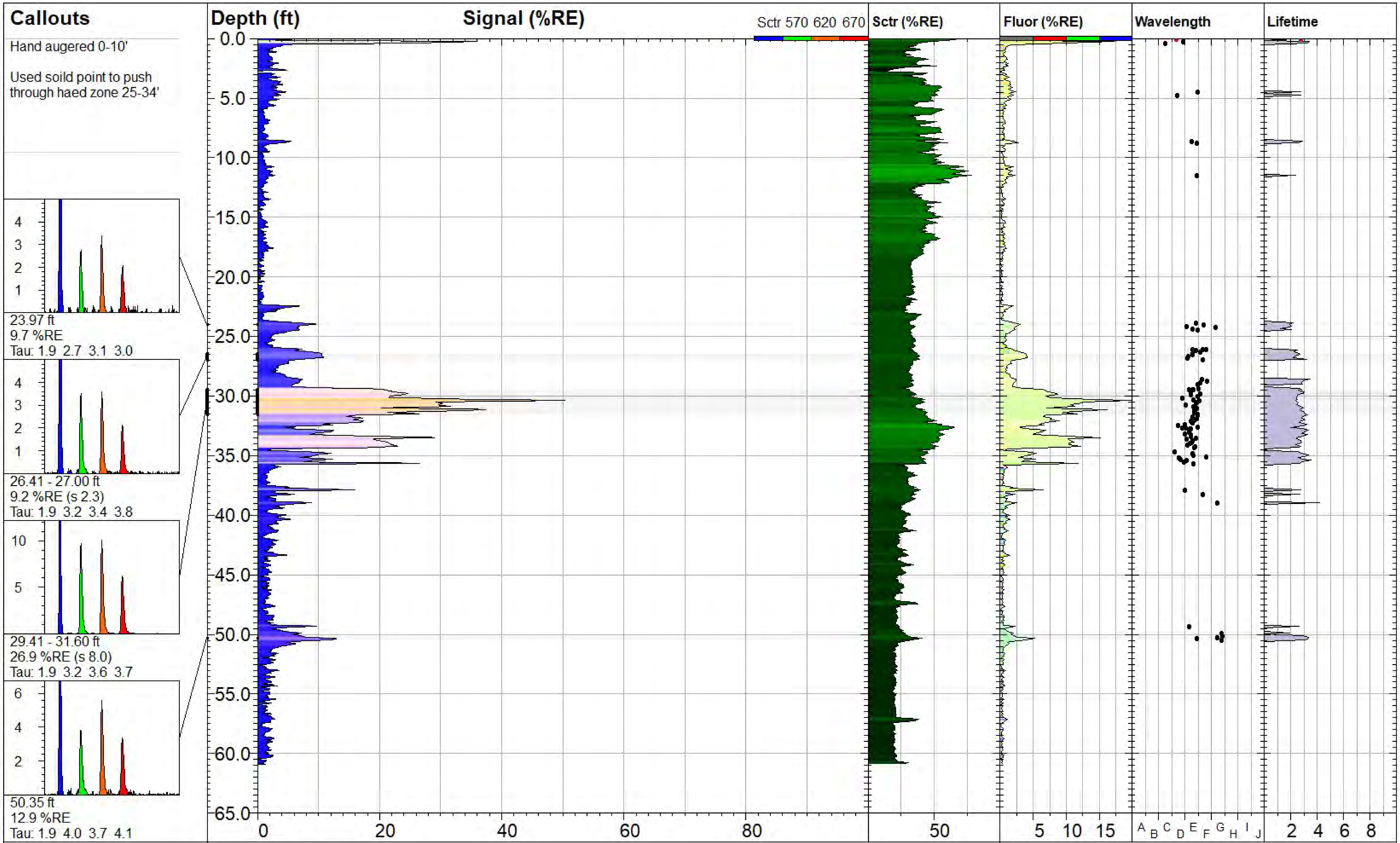

CPT-17-20
RE
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.
C2: 40% / 11.6-12.6 ft
C3: 27% / 14.5 ft
C4: 16% / 28.9-30.6 ft
C5: 17% / 31.5 ft



Hand augered 0-10'

Used soild point to push through haed zone 25-34'

23.97 ft
9.7 %RE
Tau: 1.9 2.7 3.1 3.0

26.41 - 27.00 ft
9.2 %RE (s 2.3)
Tau: 1.9 3.2 3.4 3.8

29.41 - 31.60 ft
26.9 %RE (s 8.0)
Tau: 1.9 3.2 3.6 3.7

50.35 ft
12.9 %RE
Tau: 1.9 4.0 3.7 4.1

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CPT-18-20

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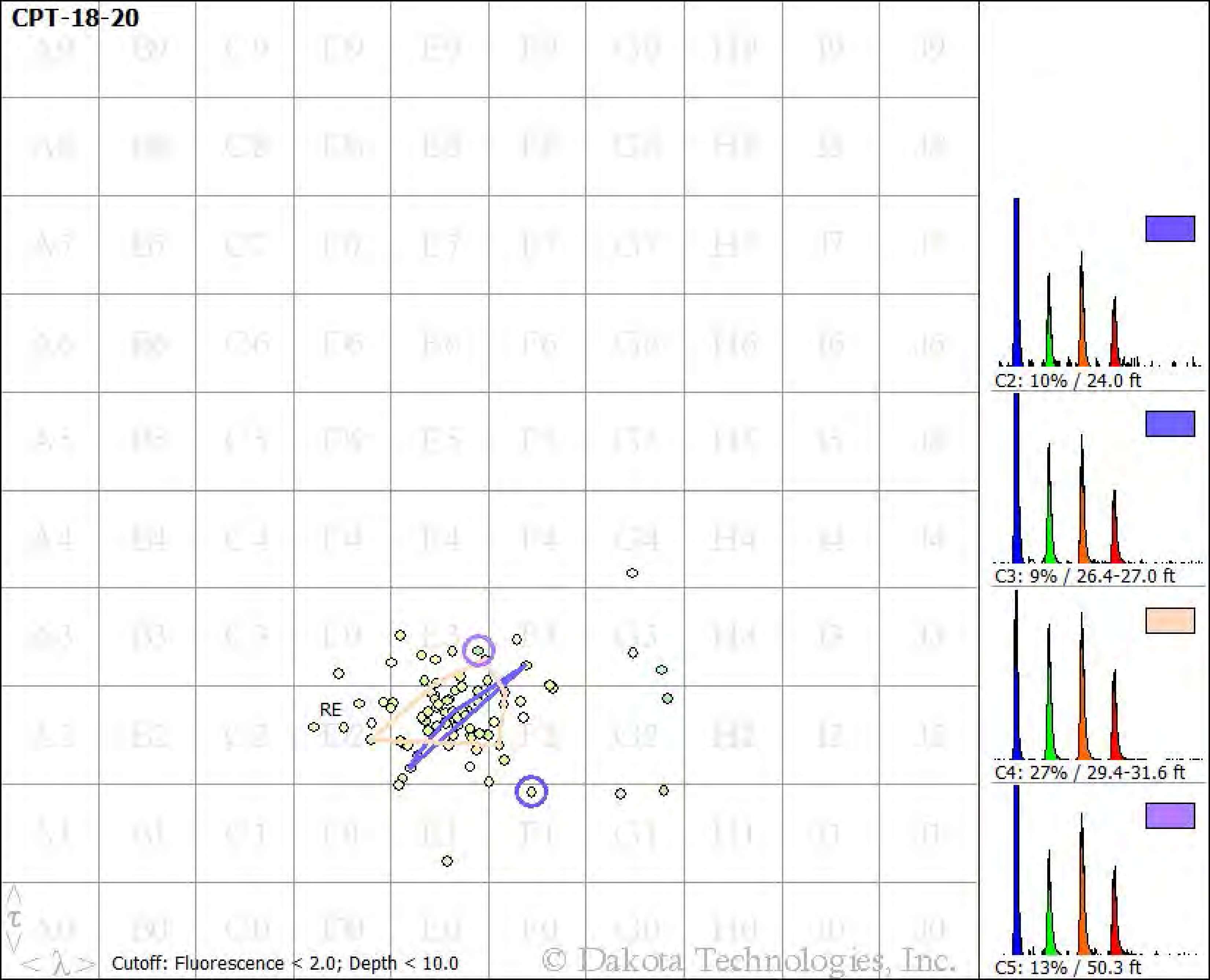
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.92 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **51.0 %RE @ 30.36 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-09 12:32 CST**


CPT-18-20
RE
C2: 10% / 24.0 ft
C3: 9% / 26.4-27.0 ft
C4: 27% / 29.4-31.6 ft
C5: 13% / 50.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
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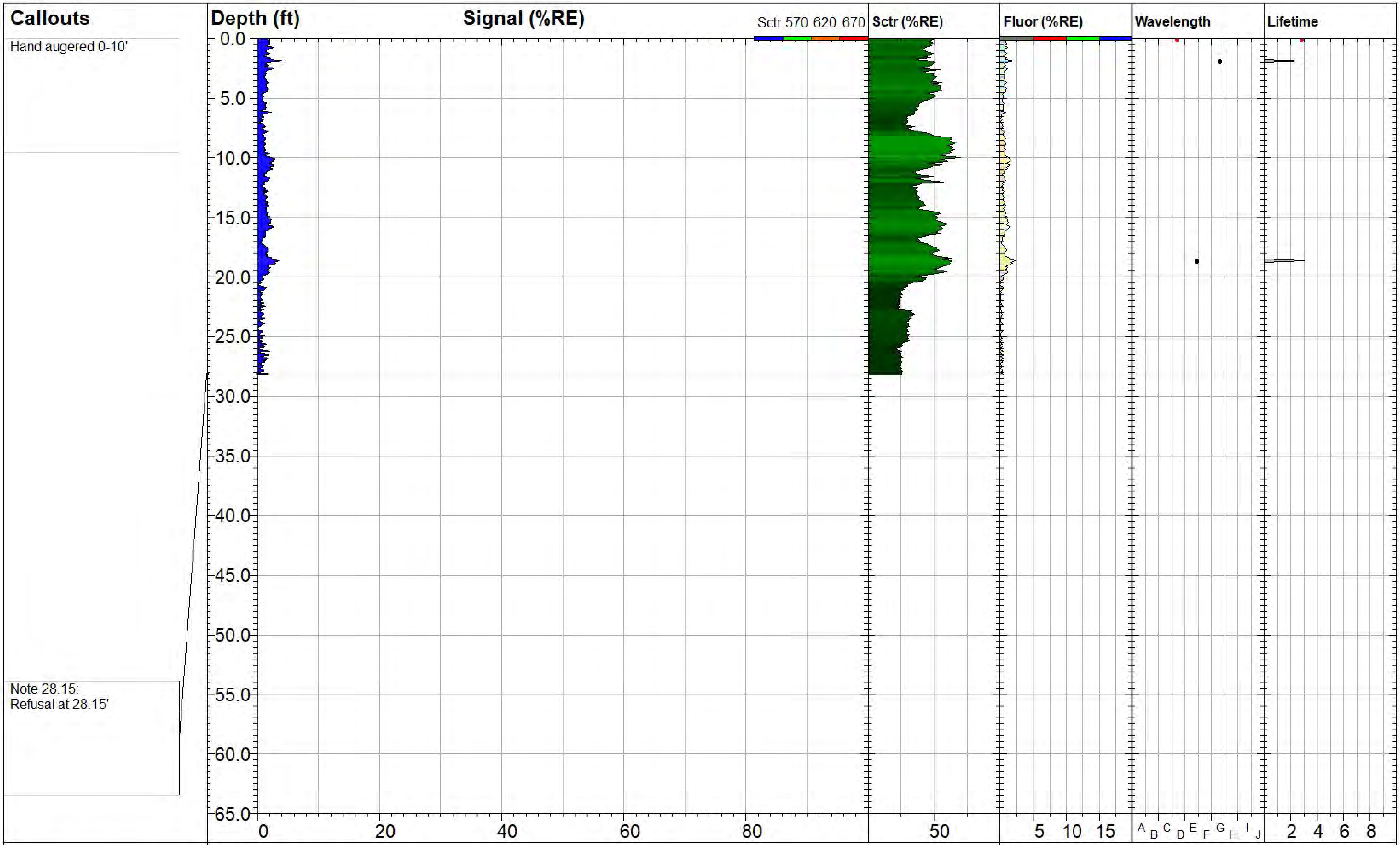

CPT-19-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **28.15 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.4 %RE @ 1.87 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-09 09:21 CST**

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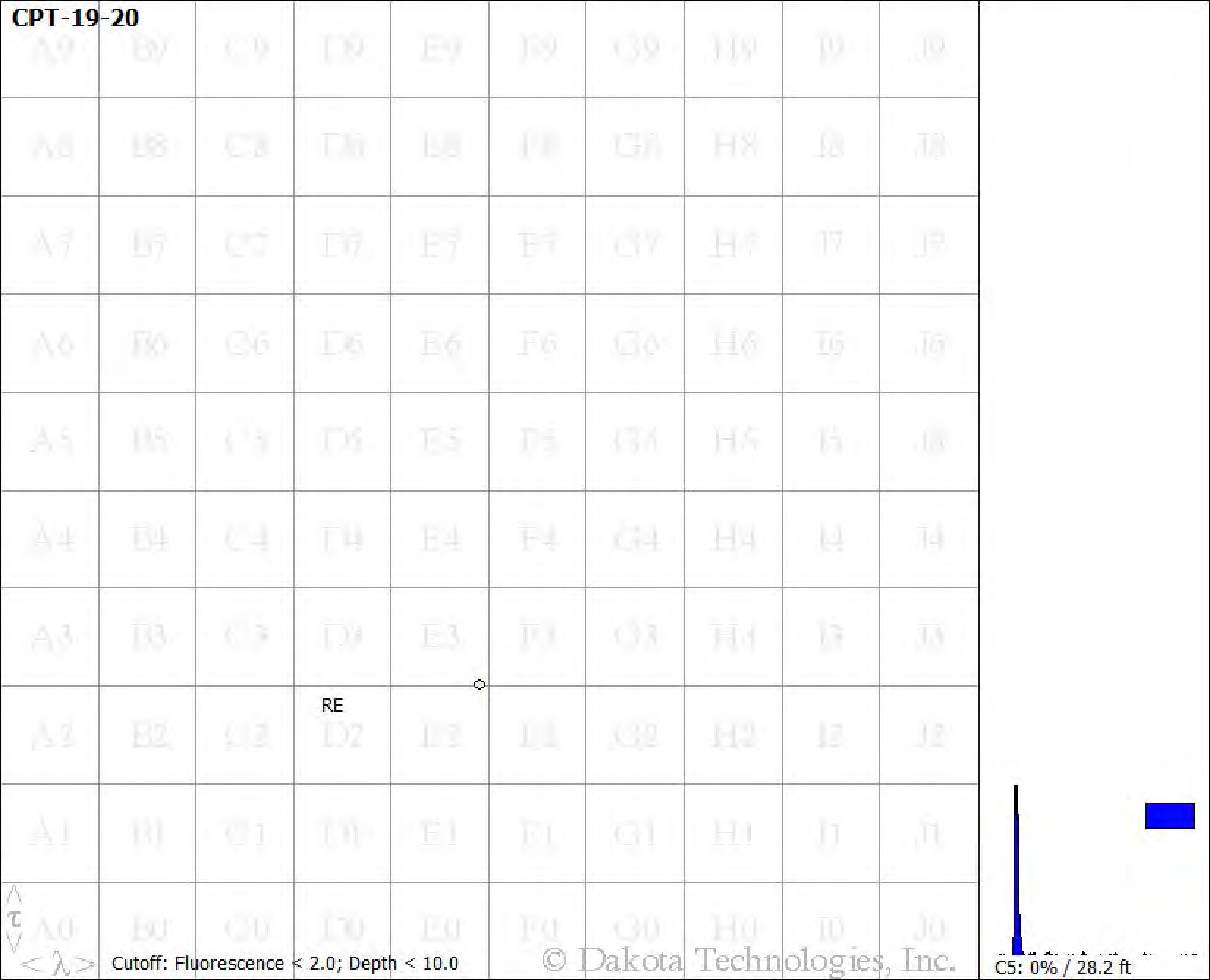
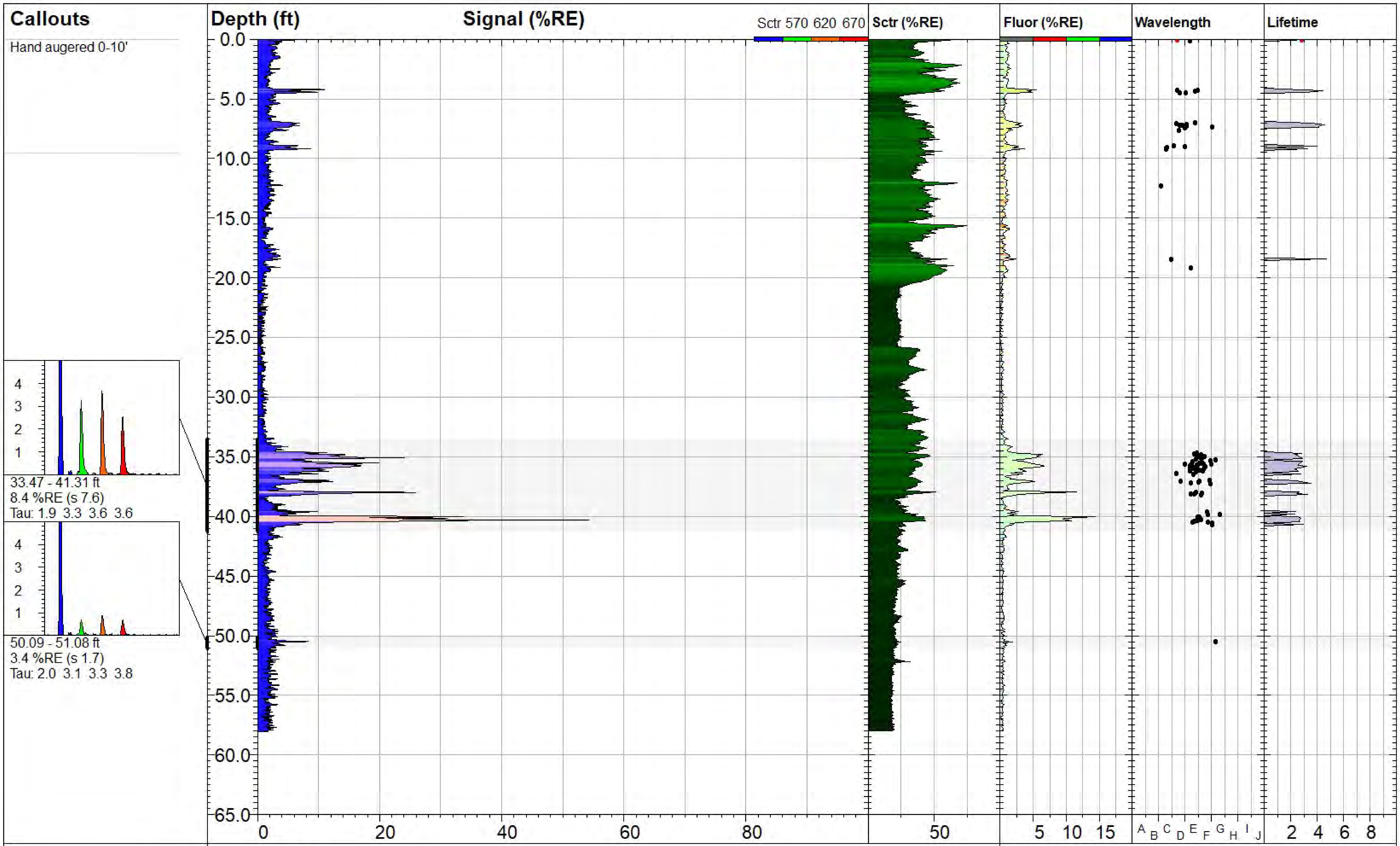

CPT-19-20
RE
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.
C5: 0% / 28.2 ft
τ
λ



CPT-19A-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.02 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **55.0 %RE @ 40.30 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-21 11:08 CST**

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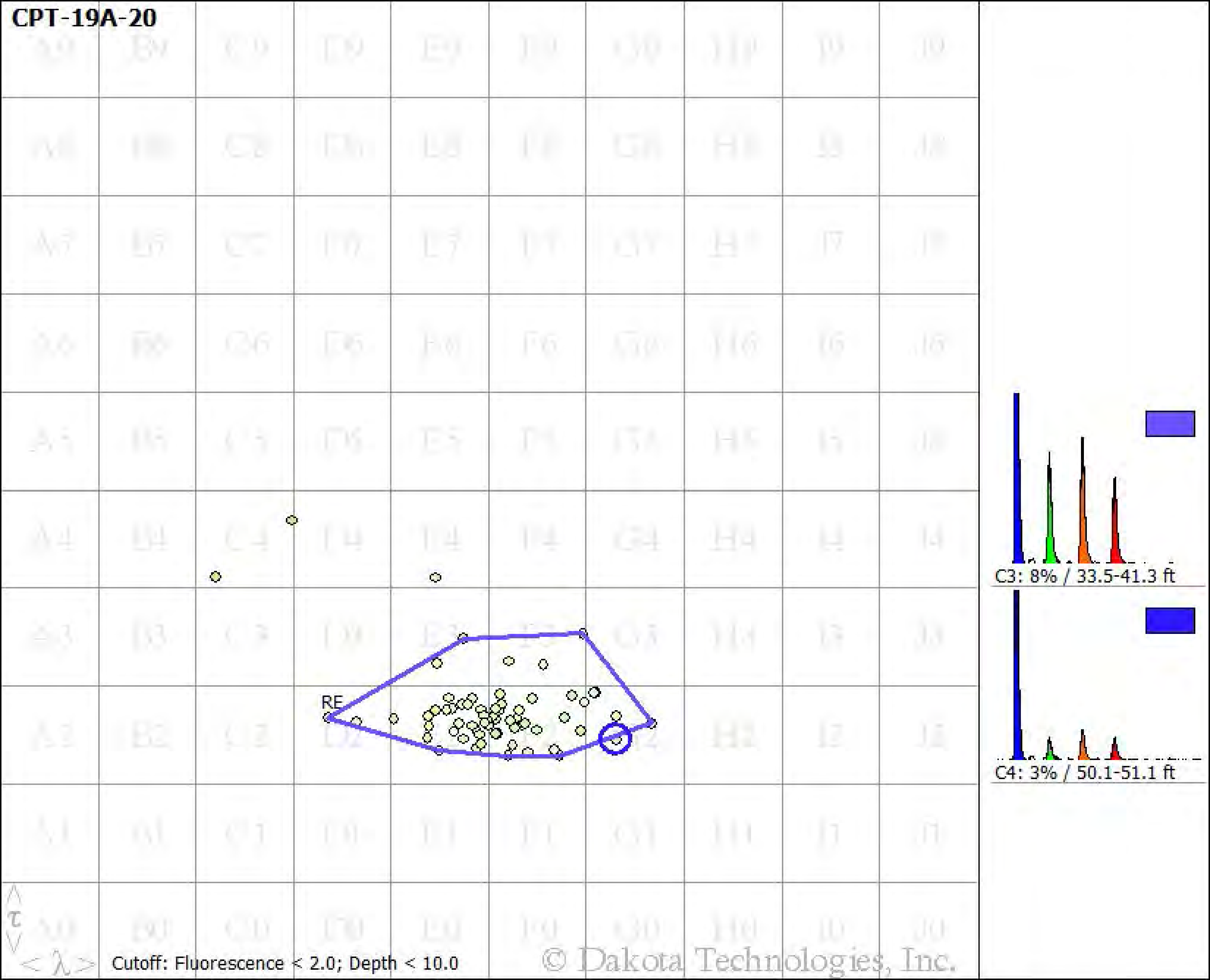
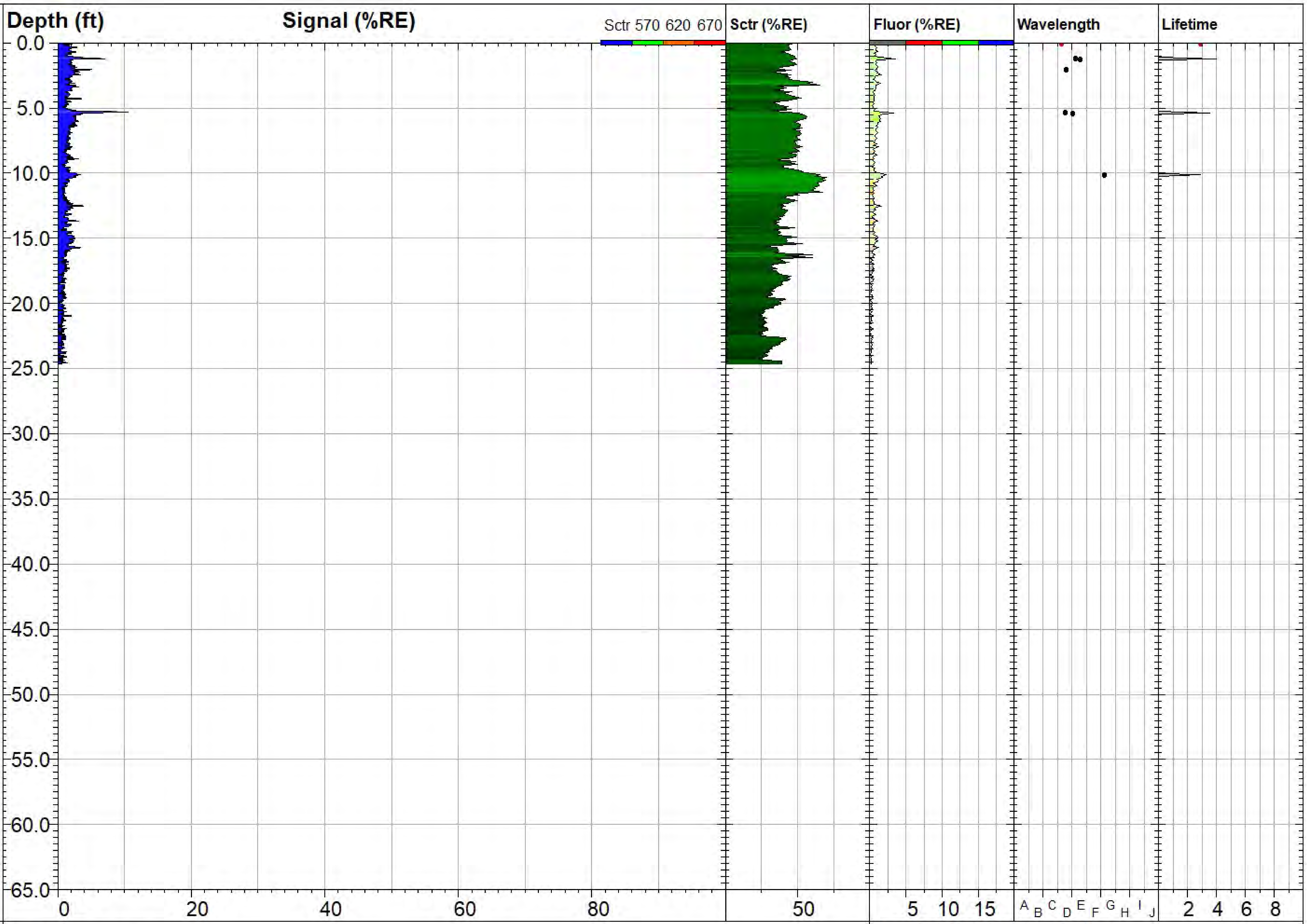
CPT-19A-20


RE
C3: 8% / 33.5-41.3 ft
C4: 3% / 50.1-51.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.

Callouts

Hand augered 0-10'

refusal @ 24.61'



CPT-20-20

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
24.61 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
10.5 %RE @ 5.30 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2020-01-08 13:42 CST

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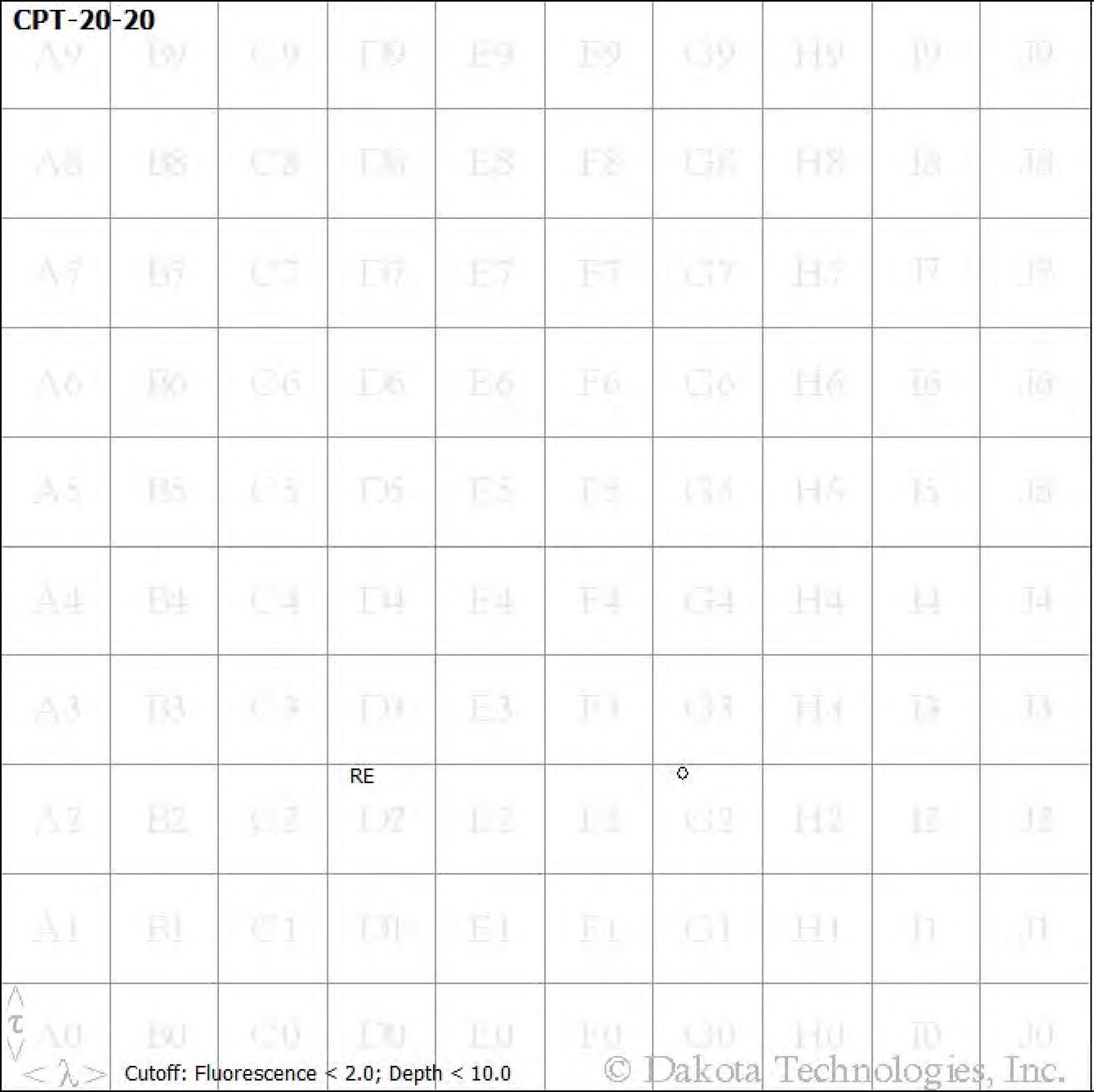
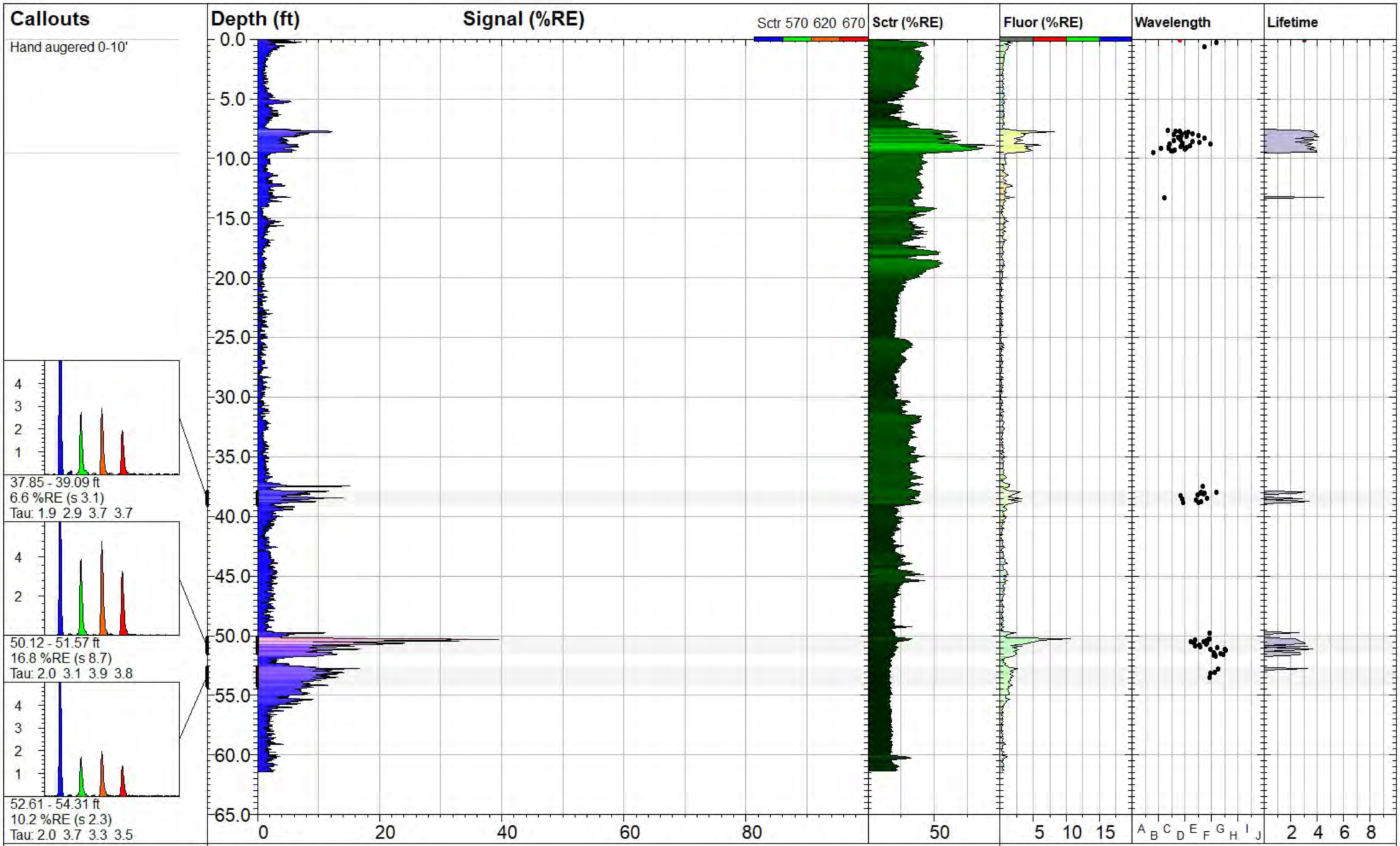

CPT-20-20
RE
λ
τ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



CPT-20A-20

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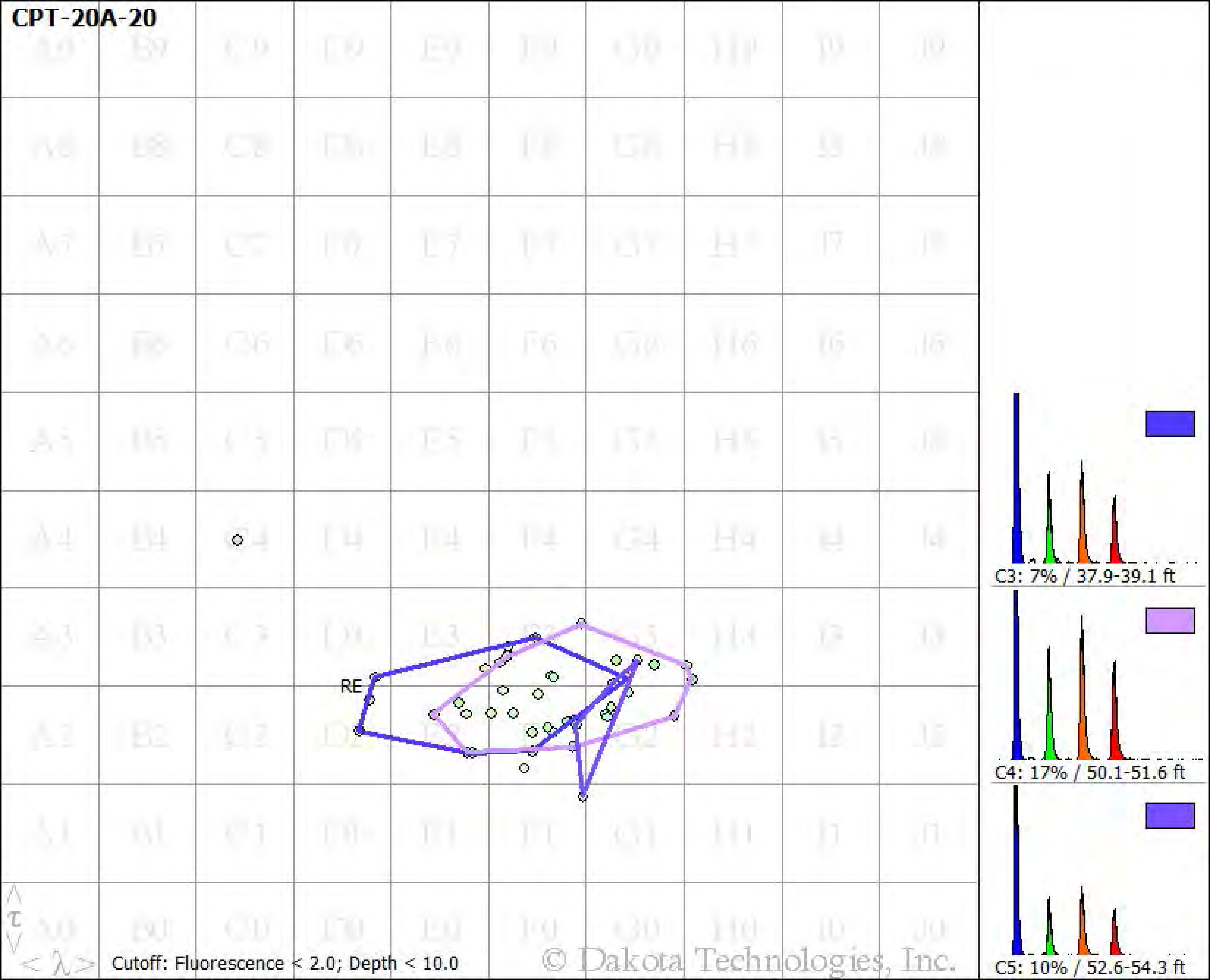
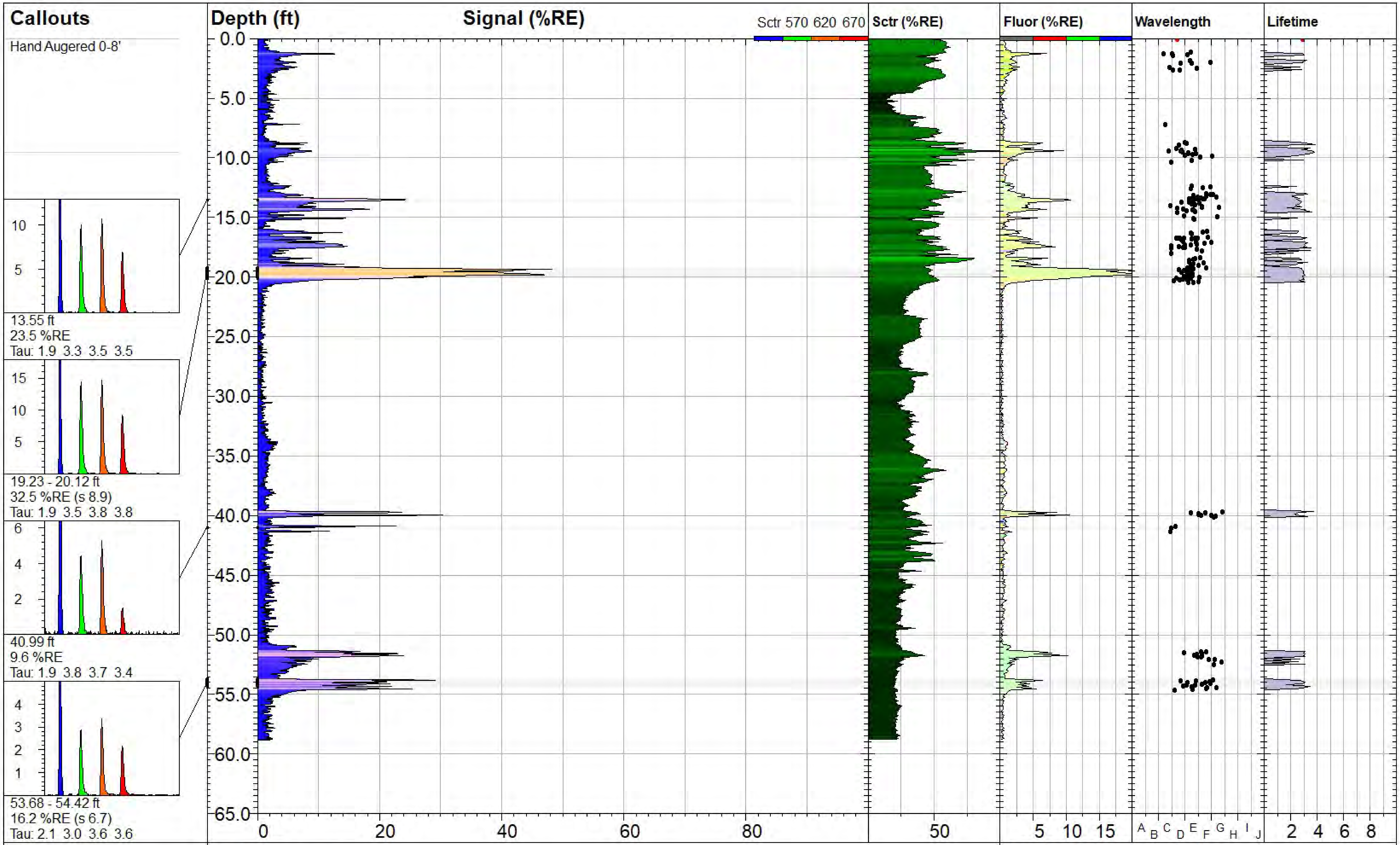
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **61.39 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **39.6 %RE @ 50.33 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-21 09:32 CST**

CPT-20A-20
RE
C3: 7% / 37.9-39.1 ft
C4: 17% / 50.1-51.6 ft
C5: 10% / 52.6-54.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand Augered 0-8'

13.55 ft
23.5 %RE
Tau: 1.9 3.3 3.5 3.5

19.23 - 20.12 ft
32.5 %RE (s 8.9)
Tau: 1.9 3.5 3.8 3.8

40.99 ft
9.6 %RE
Tau: 1.9 3.8 3.7 3.4

53.68 - 54.42 ft
16.2 %RE (s 6.7)
Tau: 2.1 3.0 3.6 3.6

CPT-21-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.84 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **48.9 %RE @ 19.34 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-08 11:53 CST**

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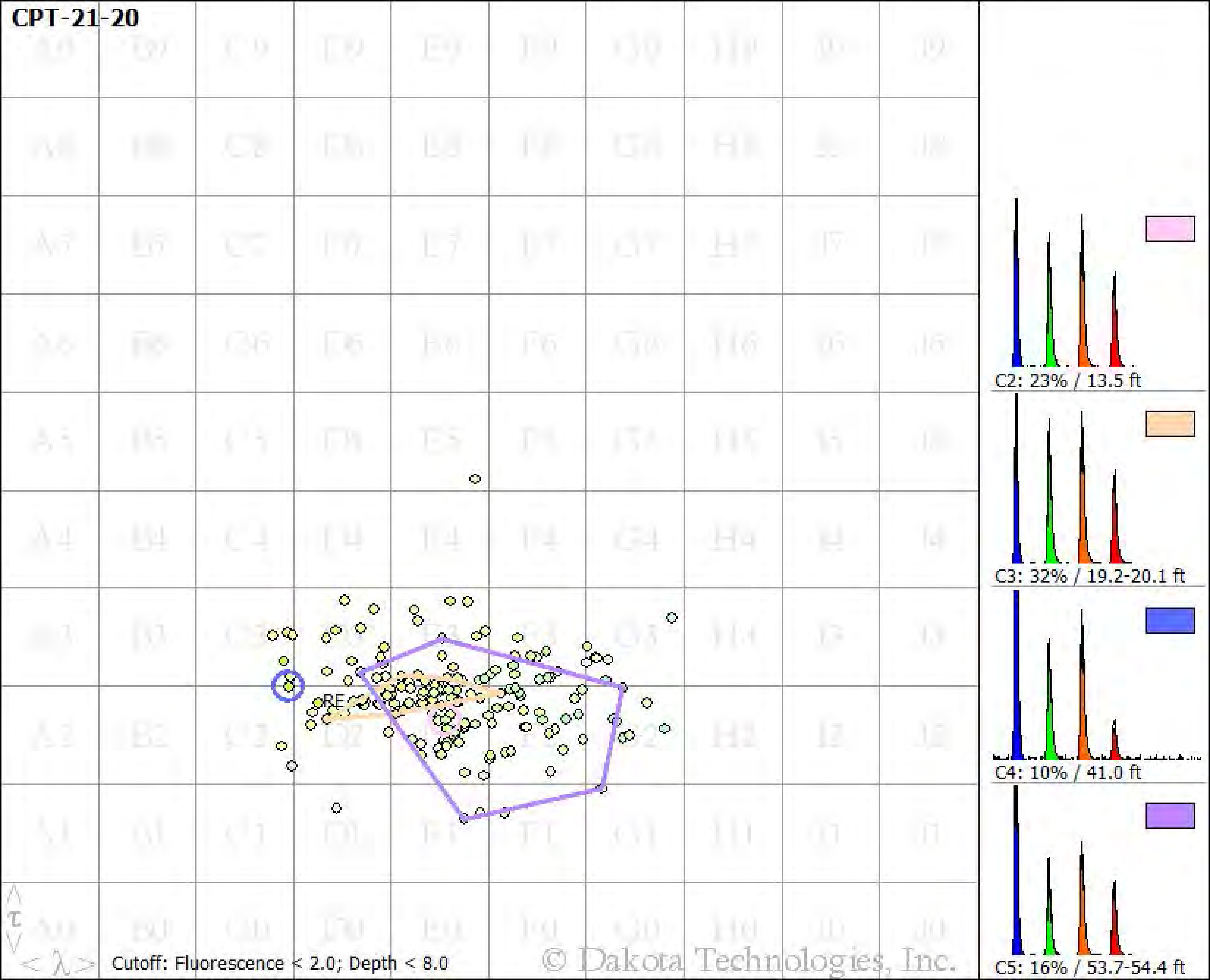
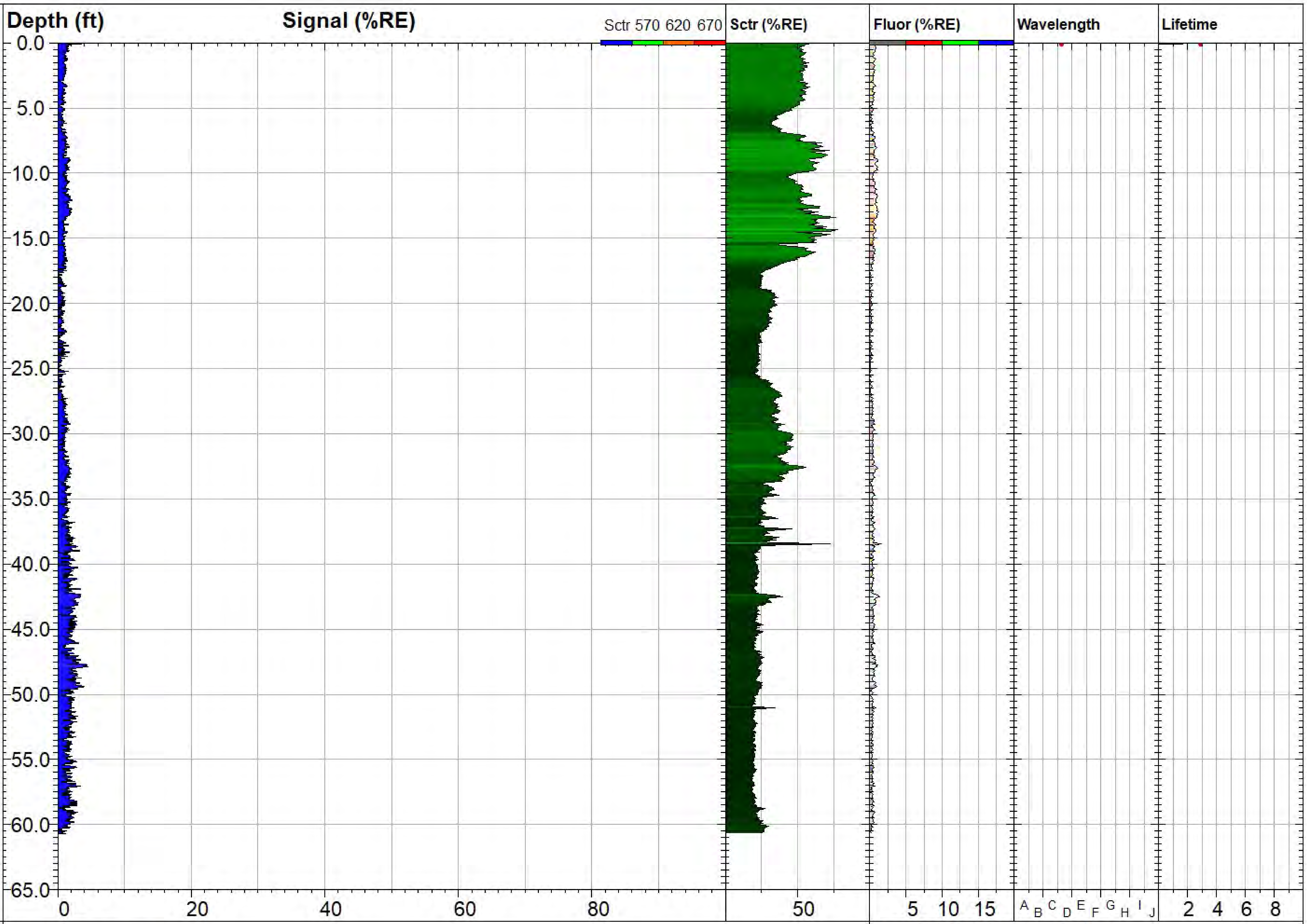
CPT-21-20



Cutoff: Fluorescence < 2.0; Depth < 8.0

Callouts

Hand augered 0-10'



CPT-22-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.68 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.5 %RE @ 47.88 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-08 10:16 CST**

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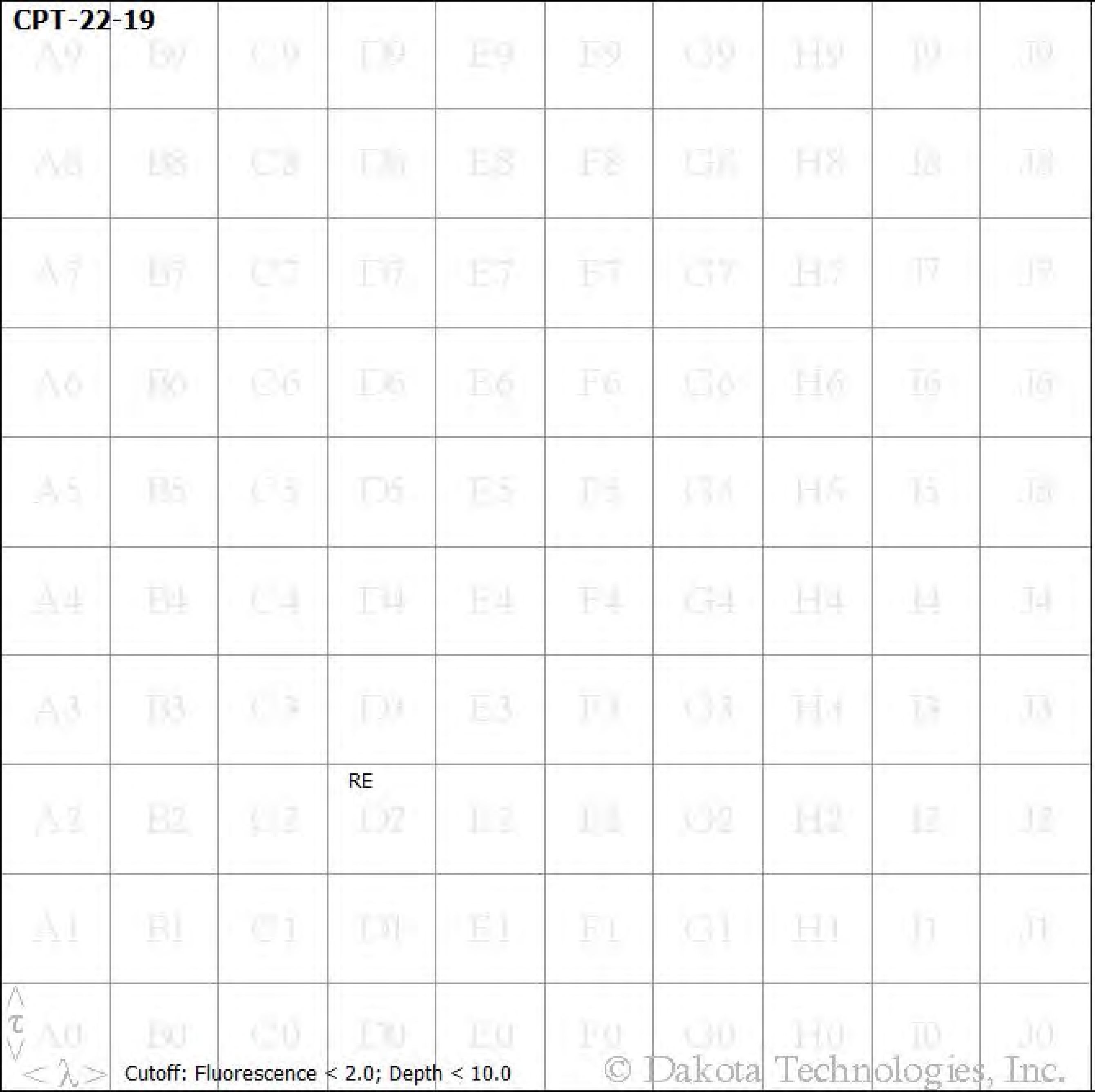
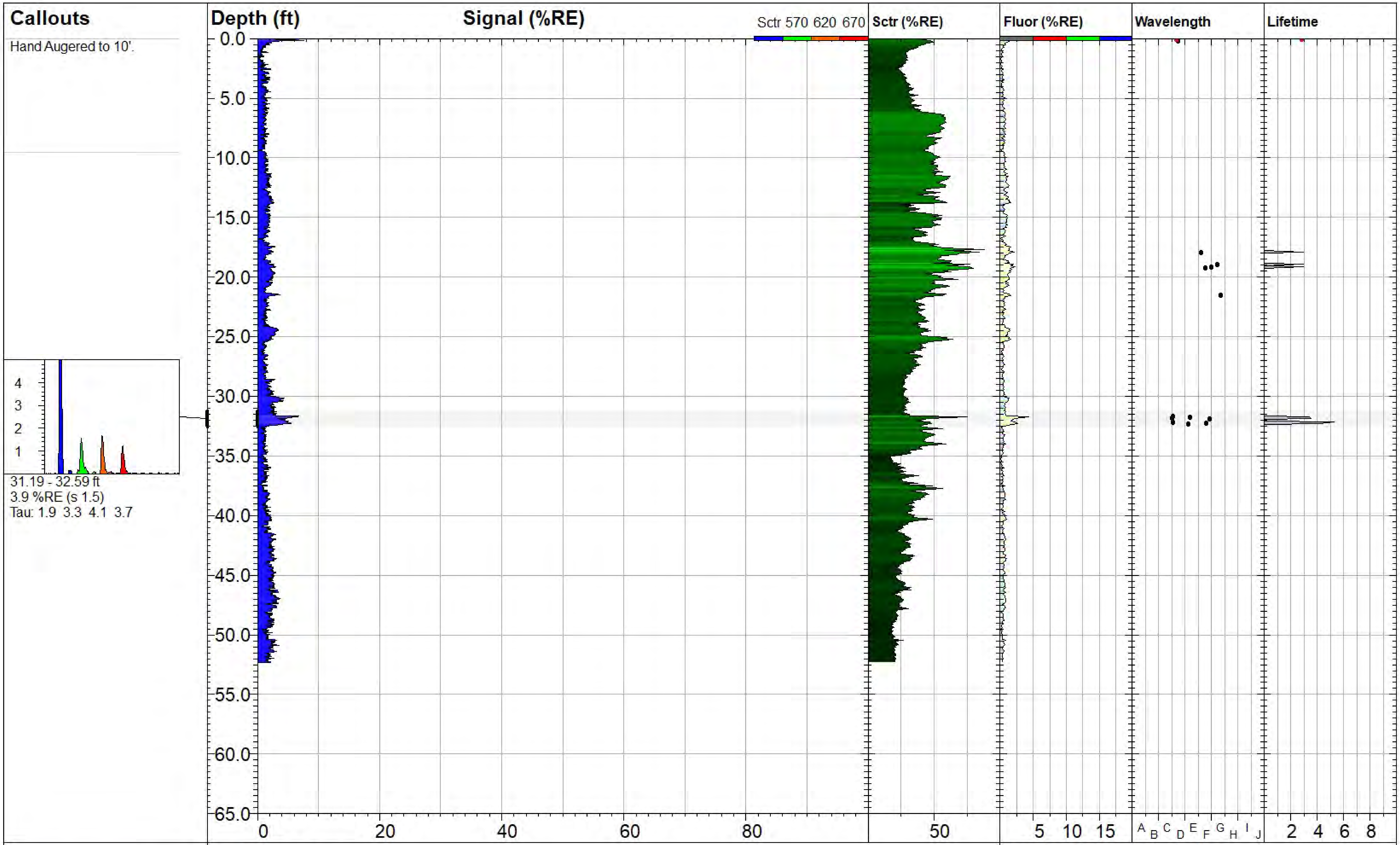
CPT-22-19



Cutoff: Fluorescence < 2.0; Depth < 10.0



Hand Augered to 10'.

31.19 - 32.59 ft
3.9 %RE (s 1.5)
Tau: 1.9 3.3 4.1 3.7

CPT-23-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **52.29 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **7.6 %RE @ 0.14 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-23 10:05 CST**

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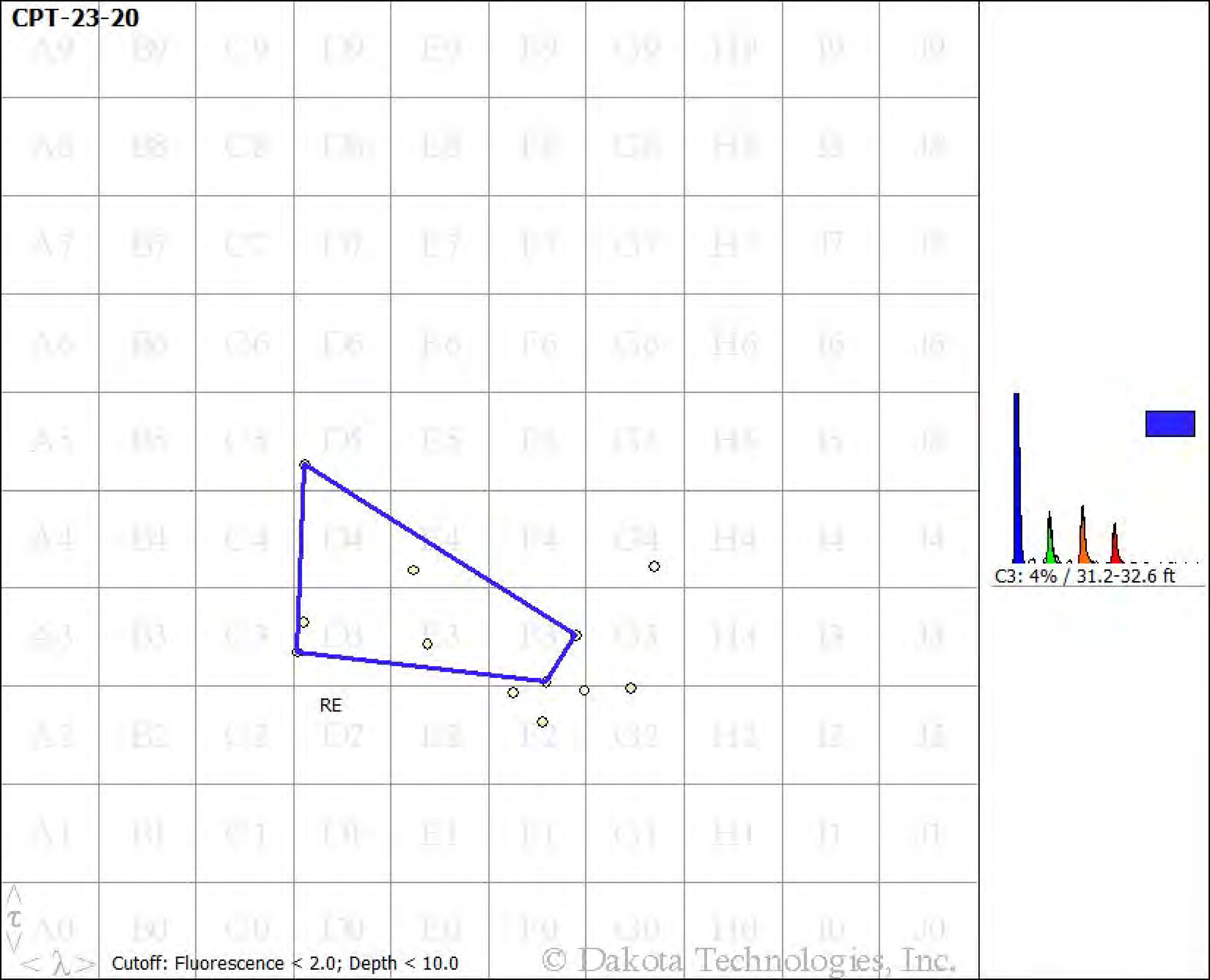
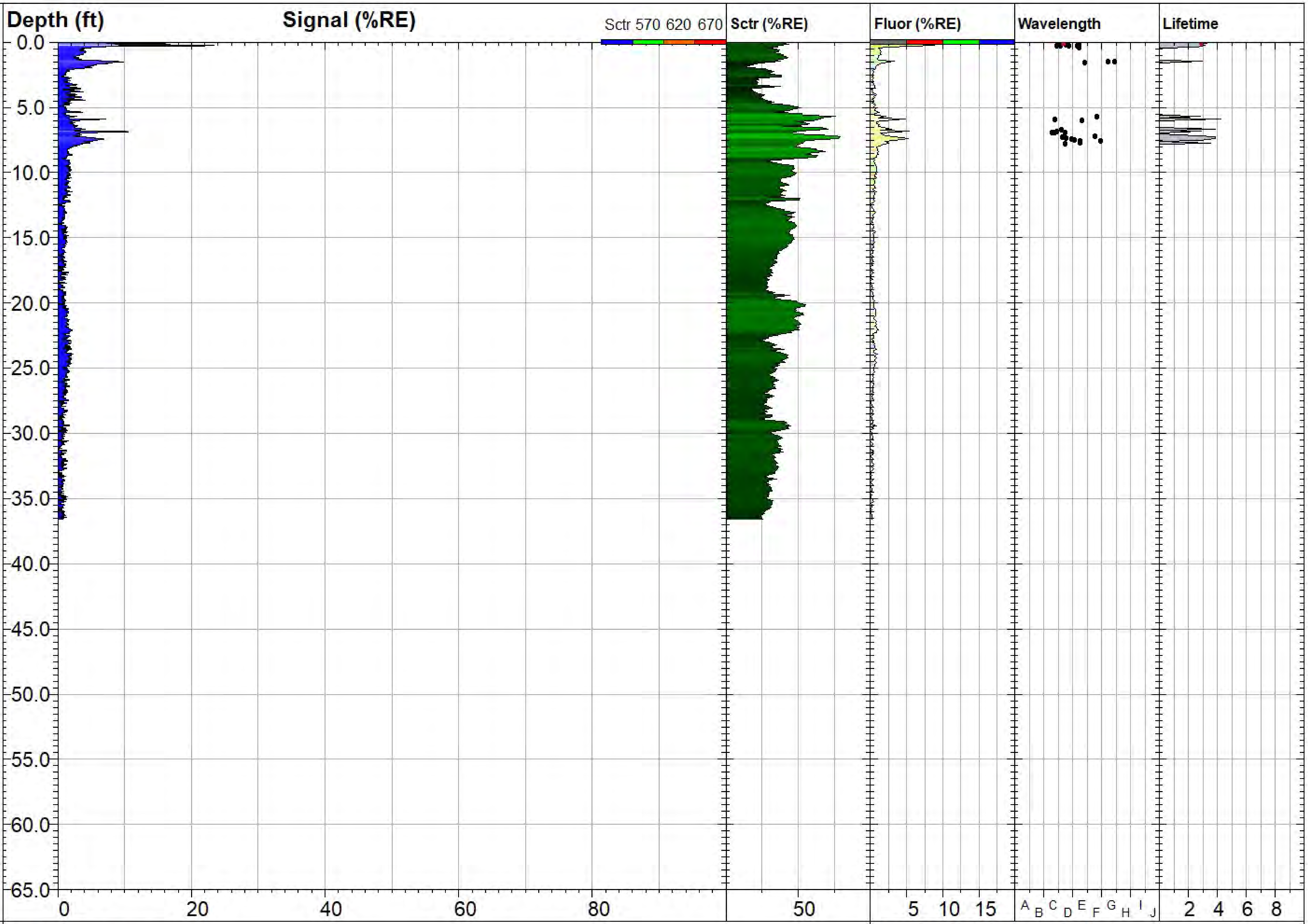

CPT-23-20
RE
C3: 4% / 31.2-32.6 ft
Cutoff: Fluorescence < 2.0; Depth < 10.0
τ
λ
© Dakota Technologies, Inc.

Callouts

Hand augered 0-10'



CPT-24-20

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **36.59 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **24.1 %RE @ 0.26 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-11 13:36 CST**

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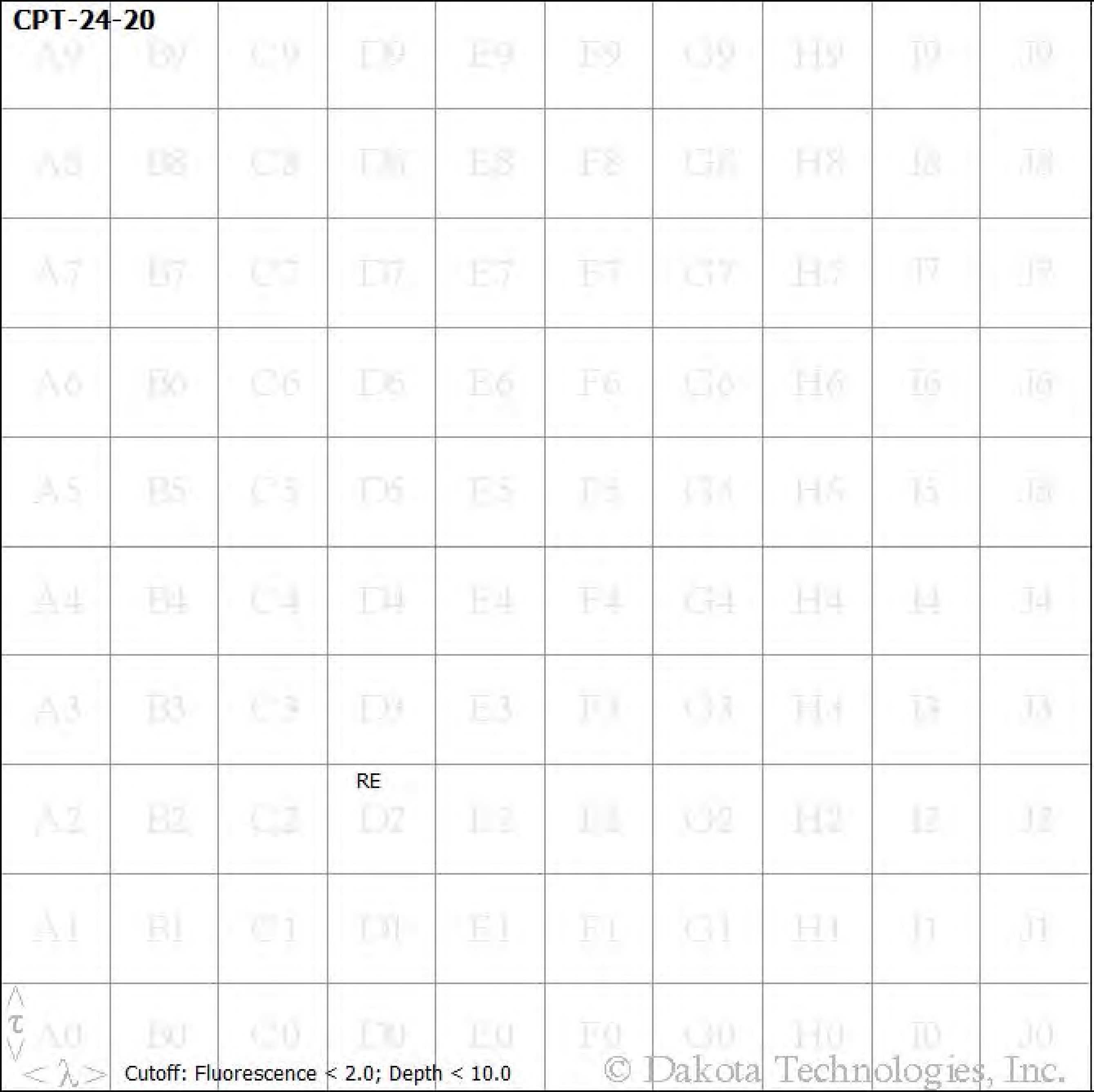
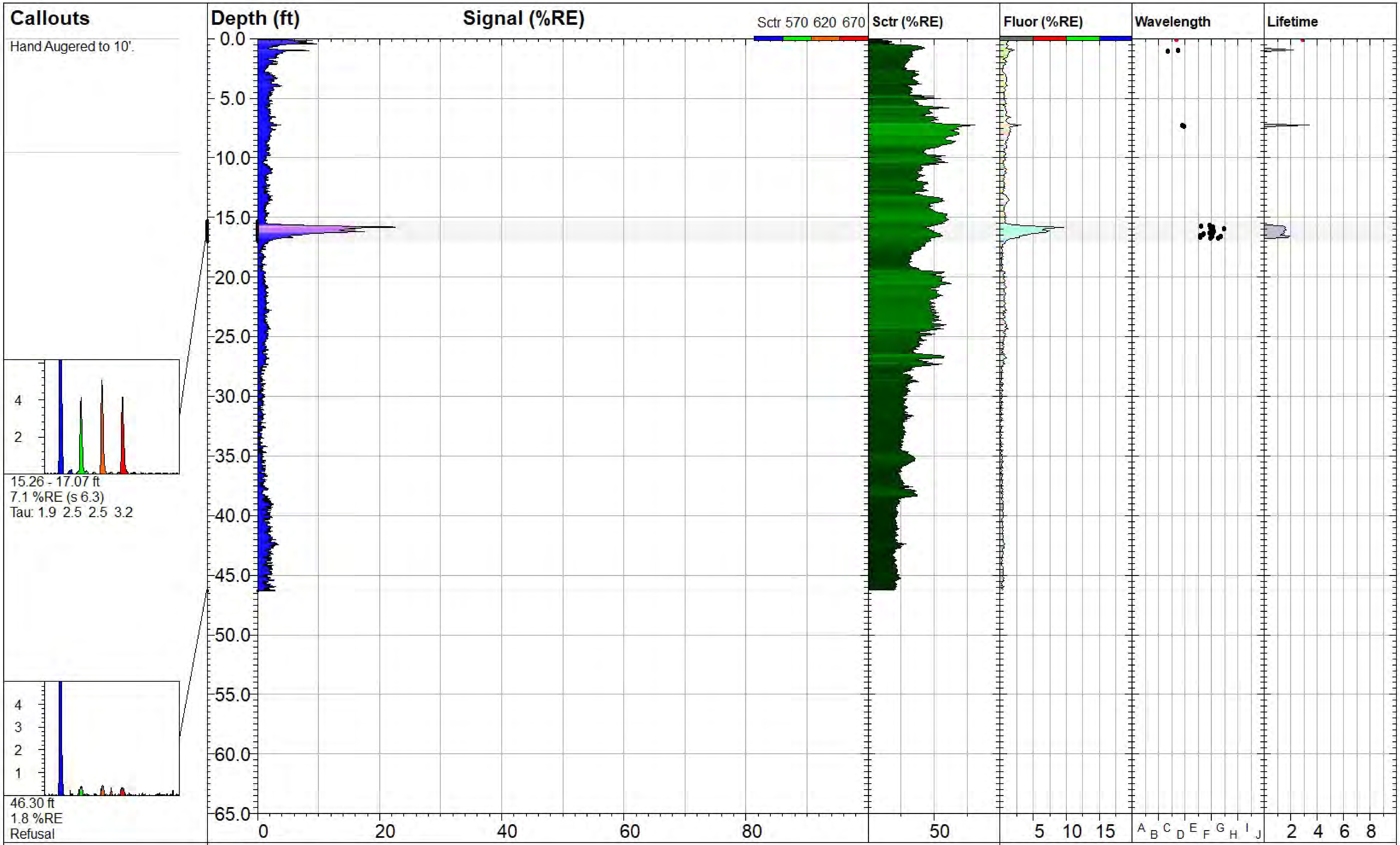

CPT-24-20
RE
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand Augered to 10'.

15.26 - 17.07 ft
7.1 %RE (s 6.3)
Tau: 1.9 2.5 2.5 3.2

46.30 ft
1.8 %RE
Refusal

CPT-24A-20

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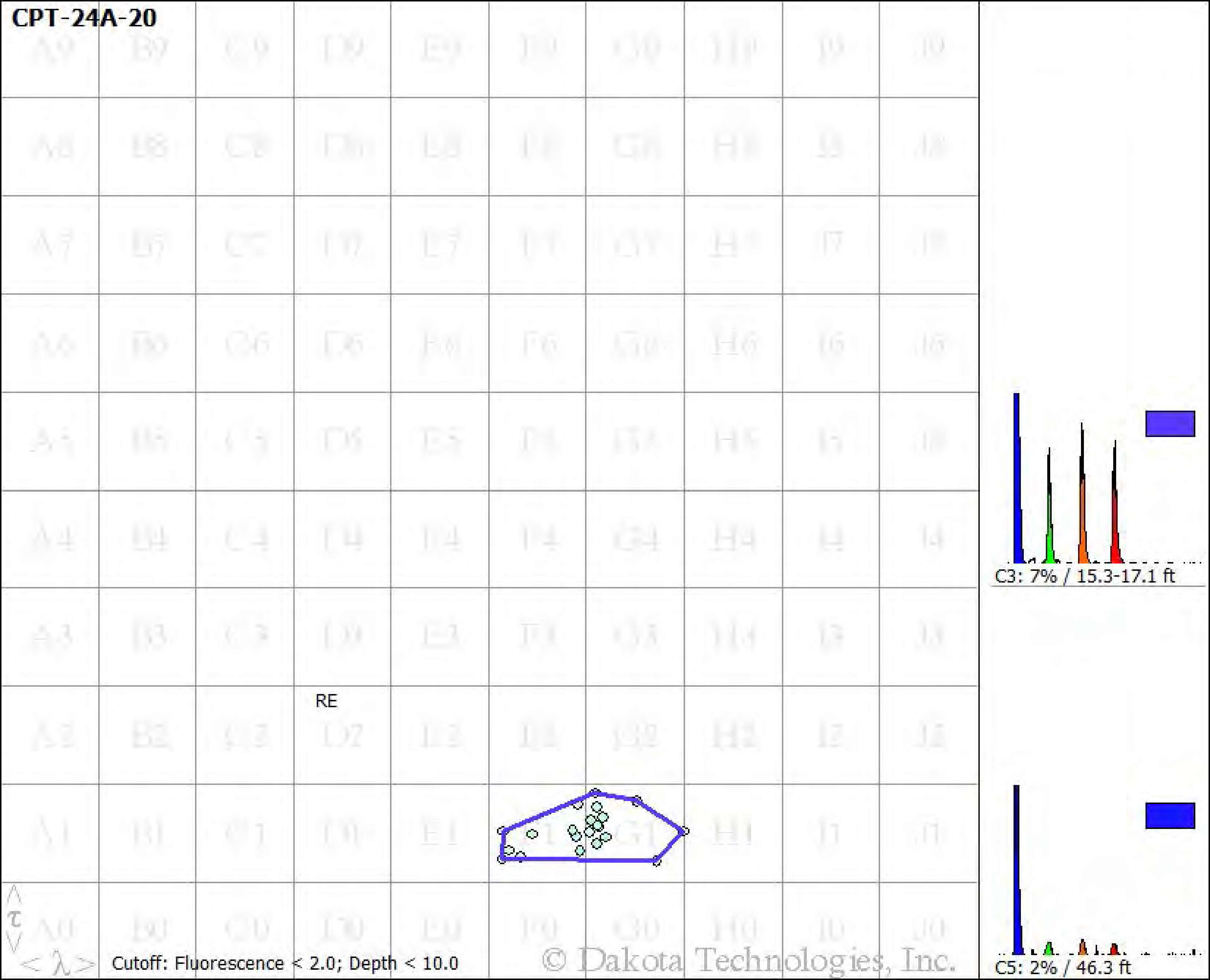
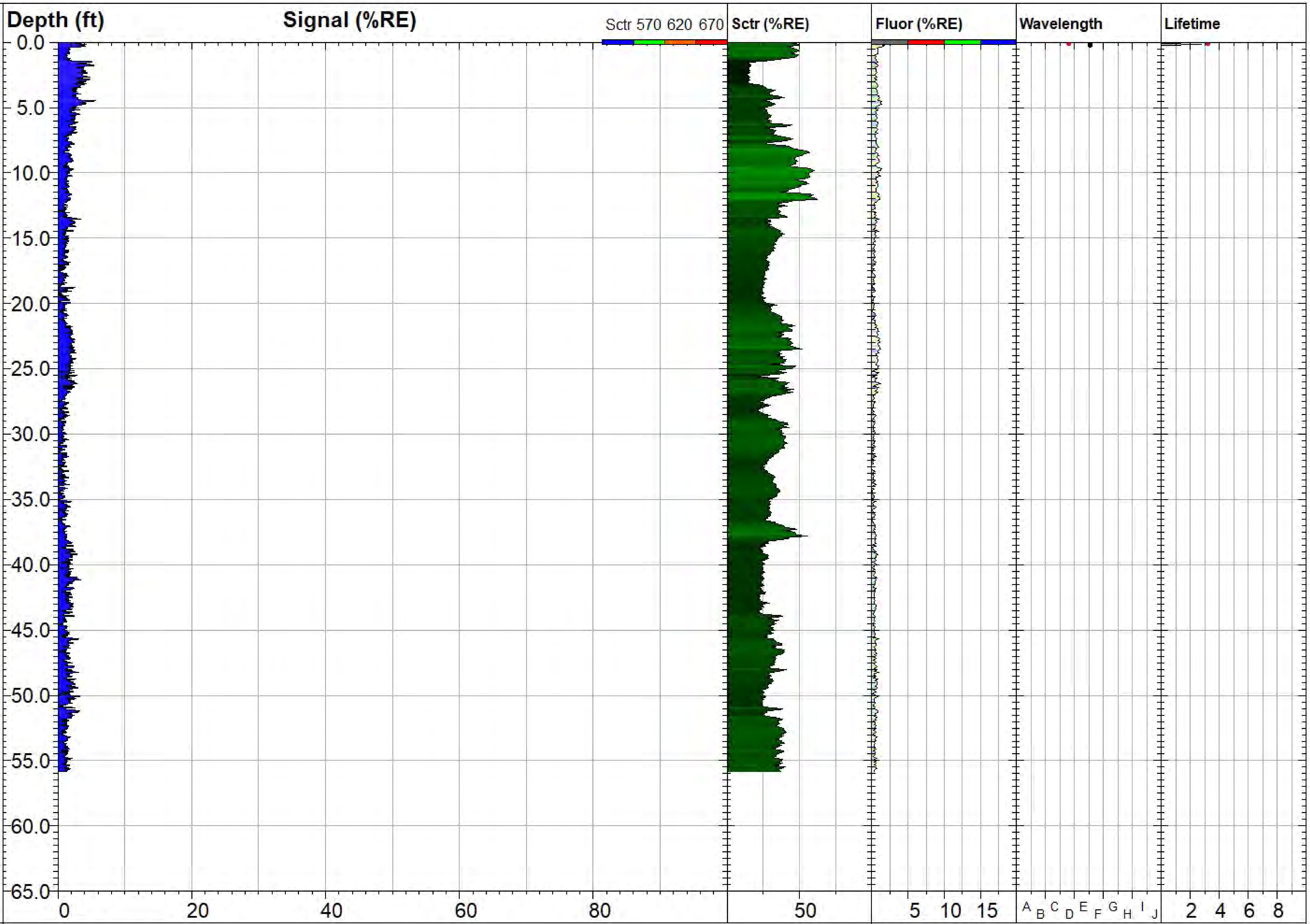
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **46.30 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **22.7 %RE @ 15.81 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-27 10:50 CST**


CPT-24A-20
RE
C3: 7% / 15.3-17.1 ft
C5: 2% / 46.3 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.

Callouts

Hand augered 0-10'

Soild point used to get through hard layer 31-43'



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CPT-25-20

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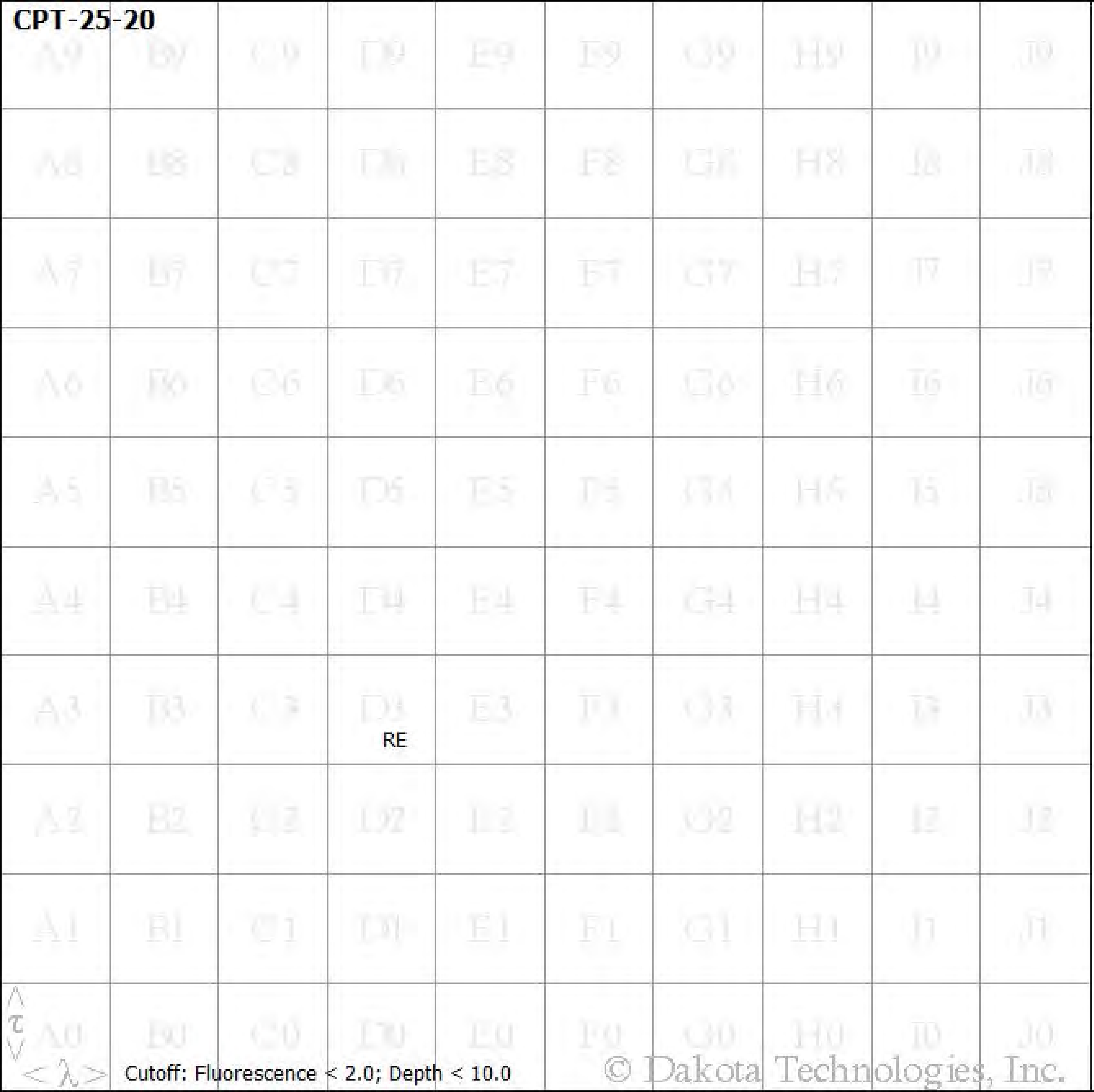
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **55.85 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **5.8 %RE @ 4.47 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-12 09:31 CST**


CPT-25-20
A9 B9 C9 D9 E9 F9 G9 H9 I9 J9
A8 B8 C8 D8 E8 F8 G8 H8 I8 J8
A7 B7 C7 D7 E7 F7 G7 H7 I7 J7
A6 B6 C6 D6 E6 F6 G6 H6 I6 J6
A5 B5 C5 D5 E5 F5 G5 H5 I5 J5
A4 B4 C4 D4 E4 F4 G4 H4 I4 J4
A3 B3 C3 D3 E3 F3 G3 H3 I3 J3
RE
A2 B2 C2 D2 E2 F2 G2 H2 I2 J2
A1 B1 C1 D1 E1 F1 G1 H1 I1 J1
A0 B0 C0 D0 E0 F0 G0 H0 I0 J0
< τ >
< λ >
Cutoff: Fluorescence < 2.0; Depth < 10.0
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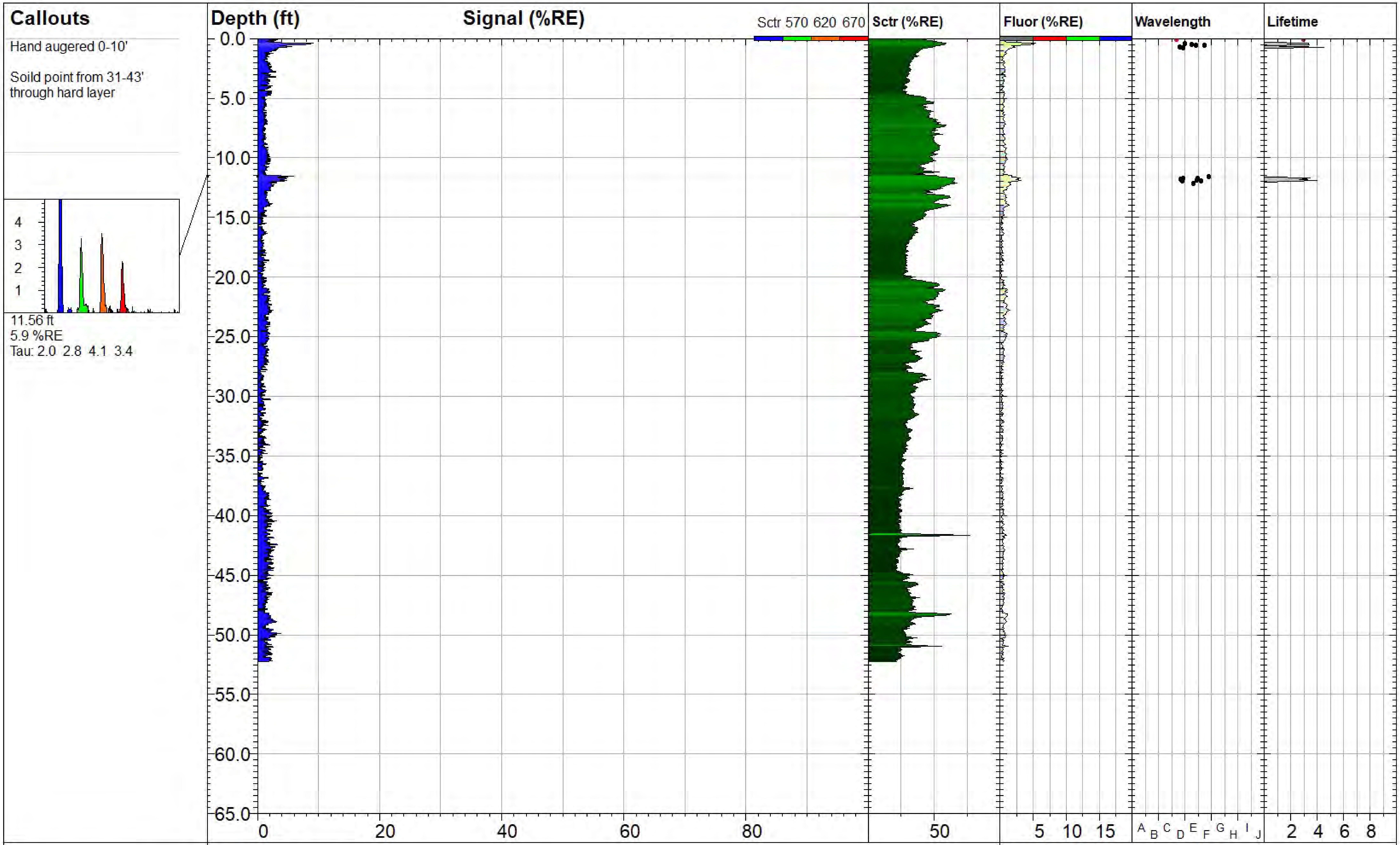

Hand augered 0-10'

Soild point from 31-43'
through hard layer

11.56 ft
5.9 %RE
Tau: 2.0 2.8 4.1 3.4

CPT-26-20

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
52.27 ft

Client / Job:
Golder /

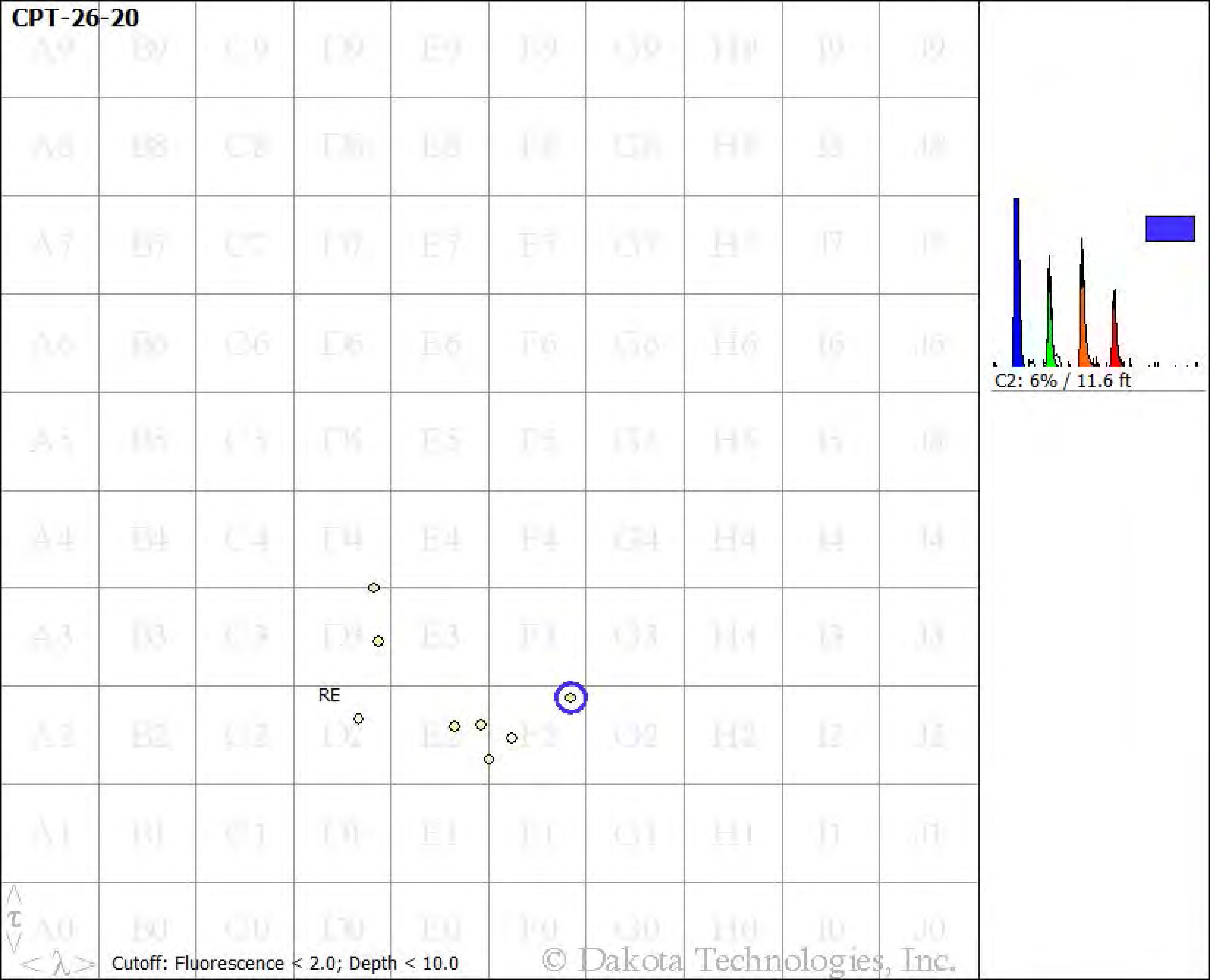
X Coord.(Lng-E) / Fix:
Unavailable / NA

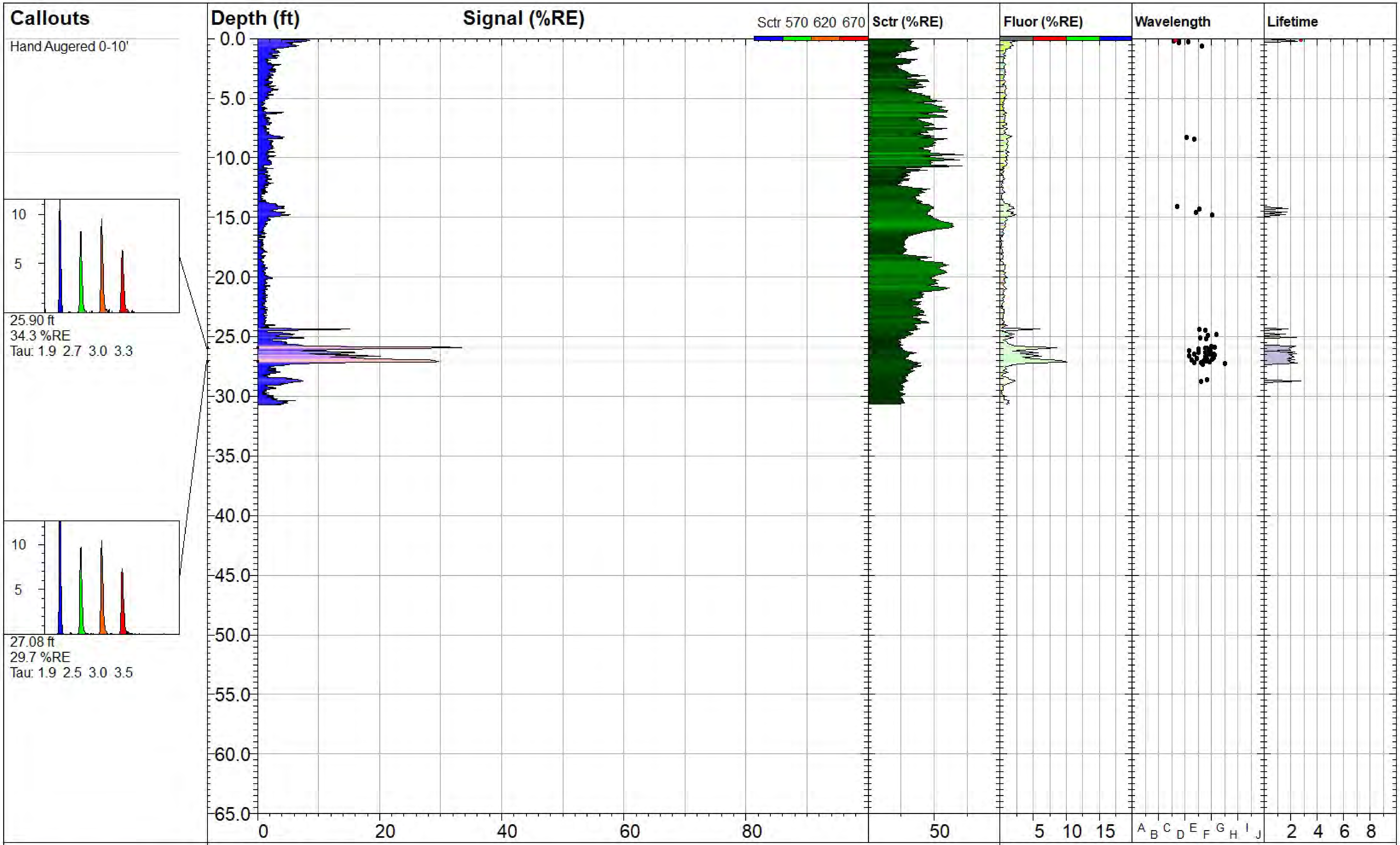
Max signal:
9.1 %RE @ 0.39 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2020-01-12 11:26 CST


CPT-26-20
RE
C2: 6% / 11.6 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
© Dakota Technologies, Inc.



Hand Augered 0-10'

25.90 ft
34.3 %RE
Tau: 1.9 2.7 3.0 3.3

27.08 ft
29.7 %RE
Tau: 1.9 2.5 3.0 3.5

CPT-27-20

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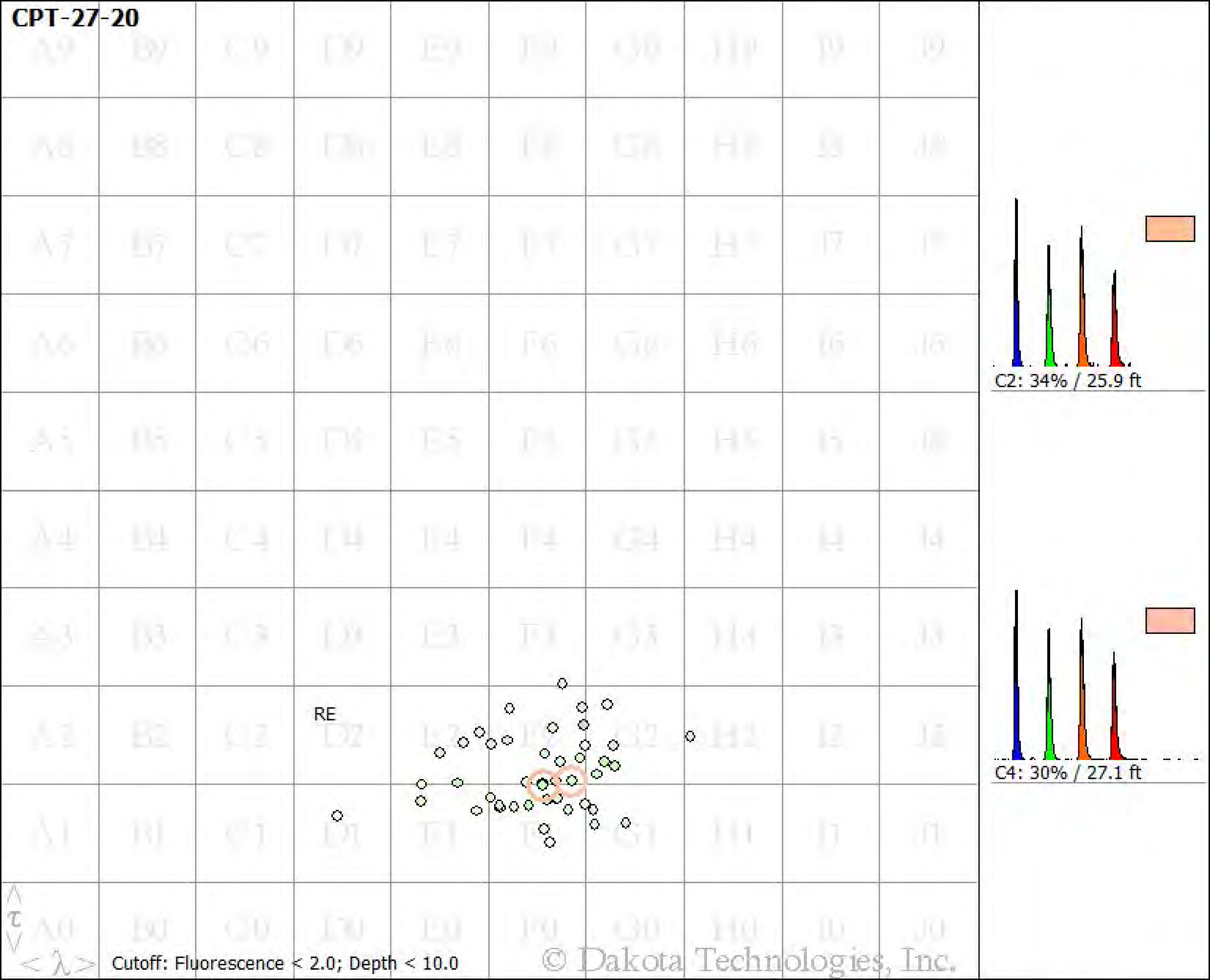
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **30.69 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **34.3 %RE @ 25.90 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-12 14:08 CST**


CPT-27-20
RE
C2: 34% / 25.9 ft
C4: 30% / 27.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
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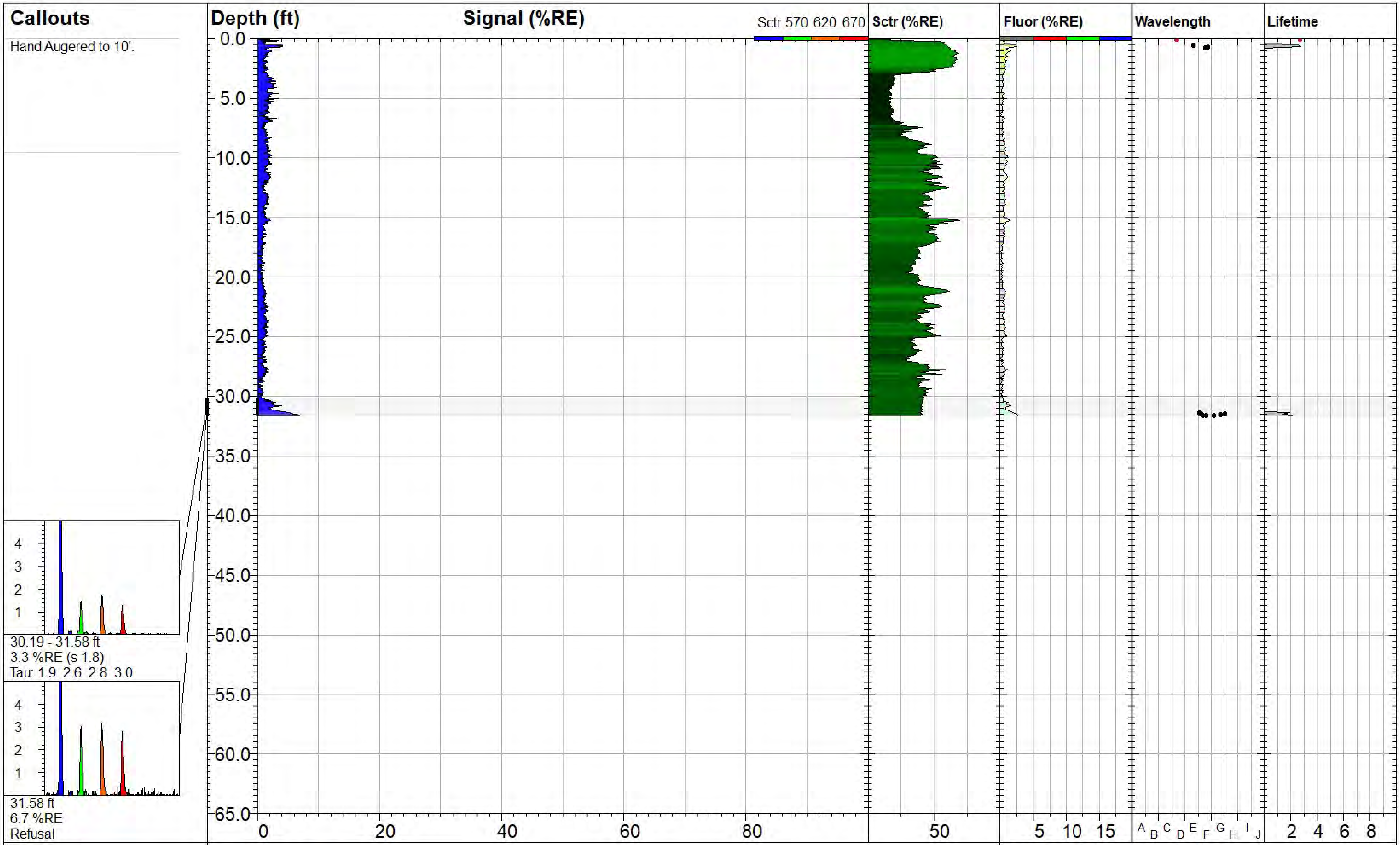

Hand Augered to 10'.

30.19 - 31.58 ft
3.3 %RE (s 1.8)
Tau: 1.9 2.6 2.8 3.0

31.58 ft
6.7 %RE
Refusal

CPT-27A-20

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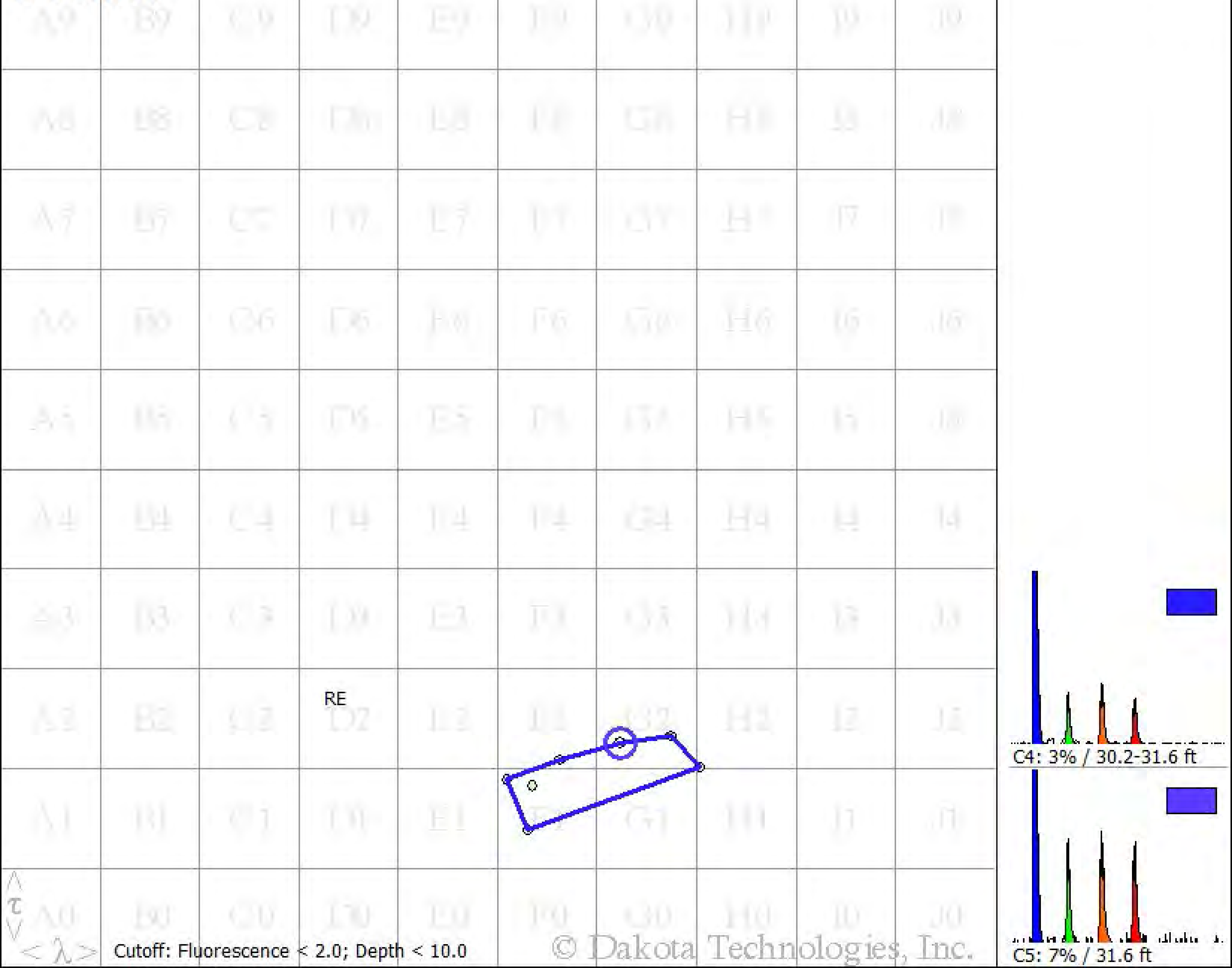
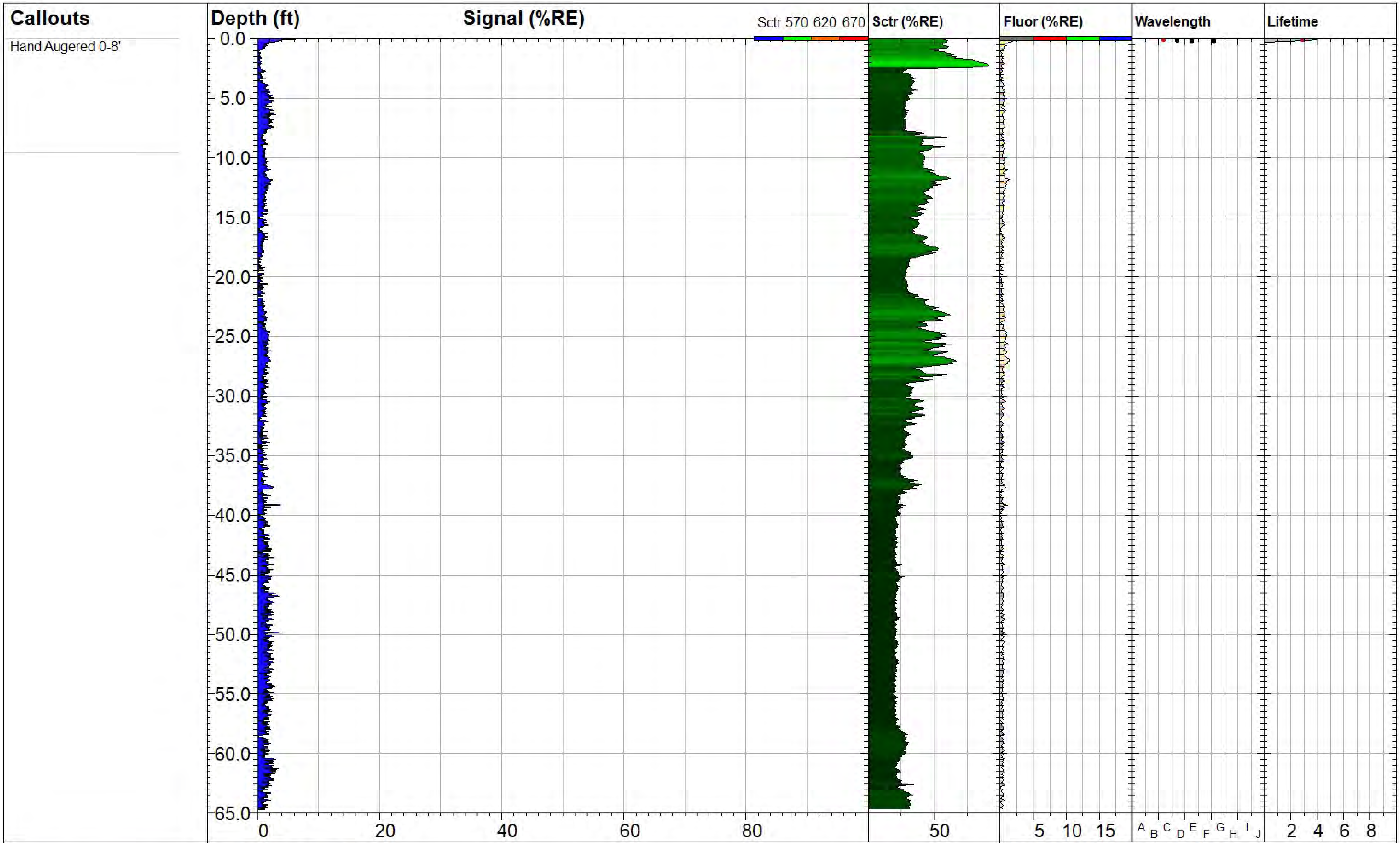
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **31.58 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.9 %RE @ 31.57 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-27 14:03 CST**

CPT-27A-20


RE
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
C4: 3% / 30.2-31.6 ft
C5: 7% / 31.6 ft



CPT-28-19

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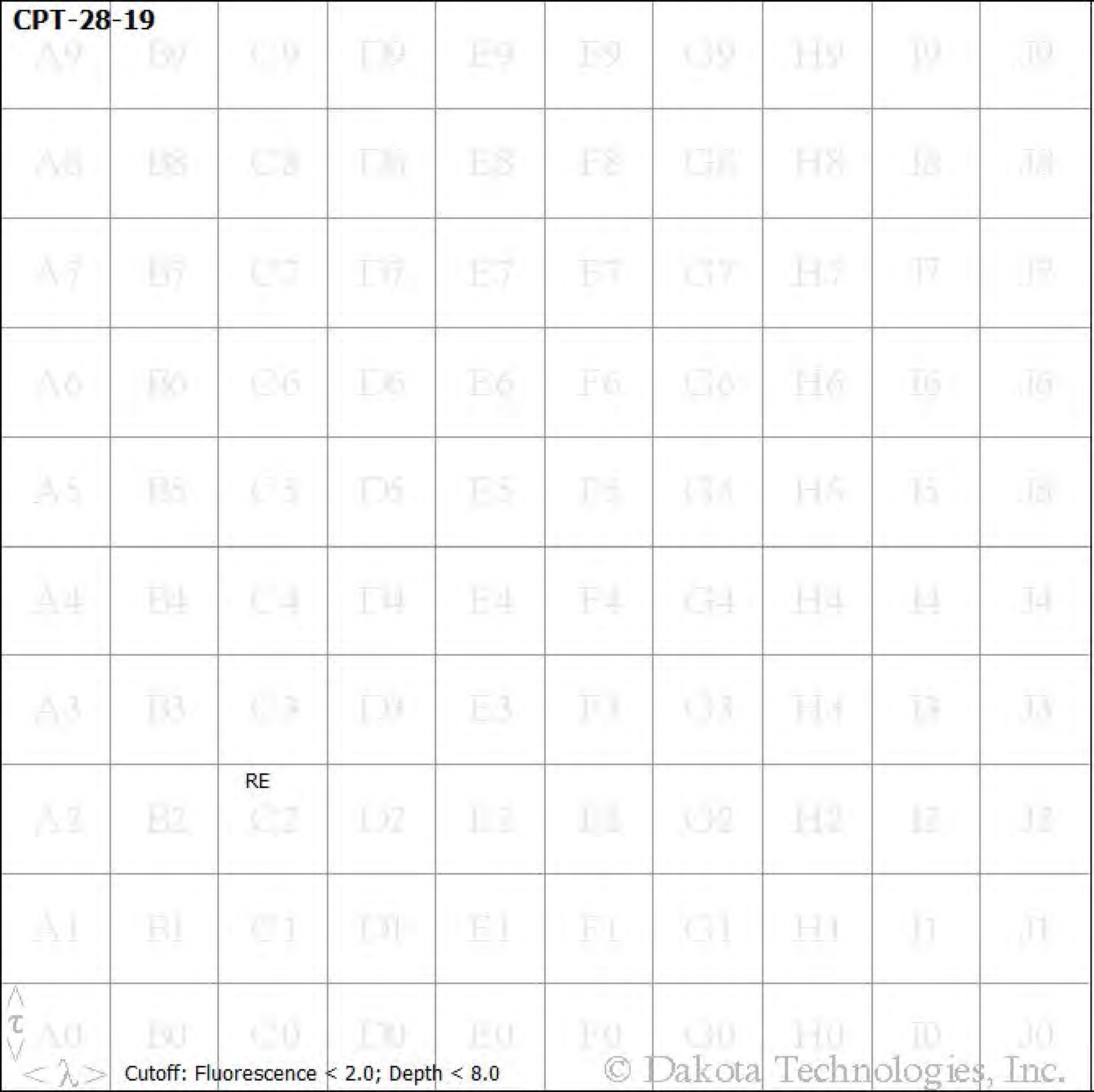
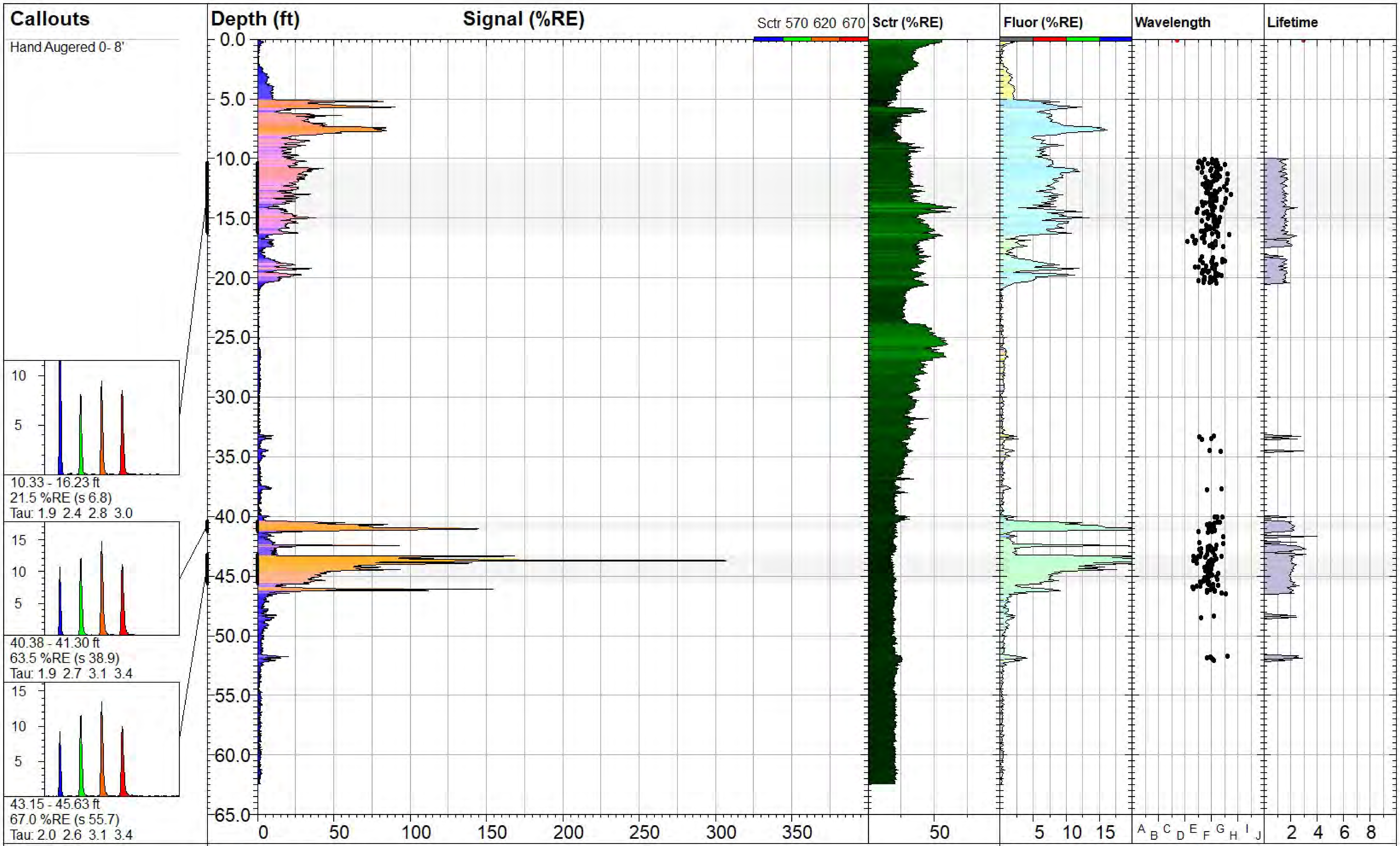
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **64.72 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **6.7 %RE @ 0.03 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-06 14:30 CST**

CPT-28-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



CPT-29-19

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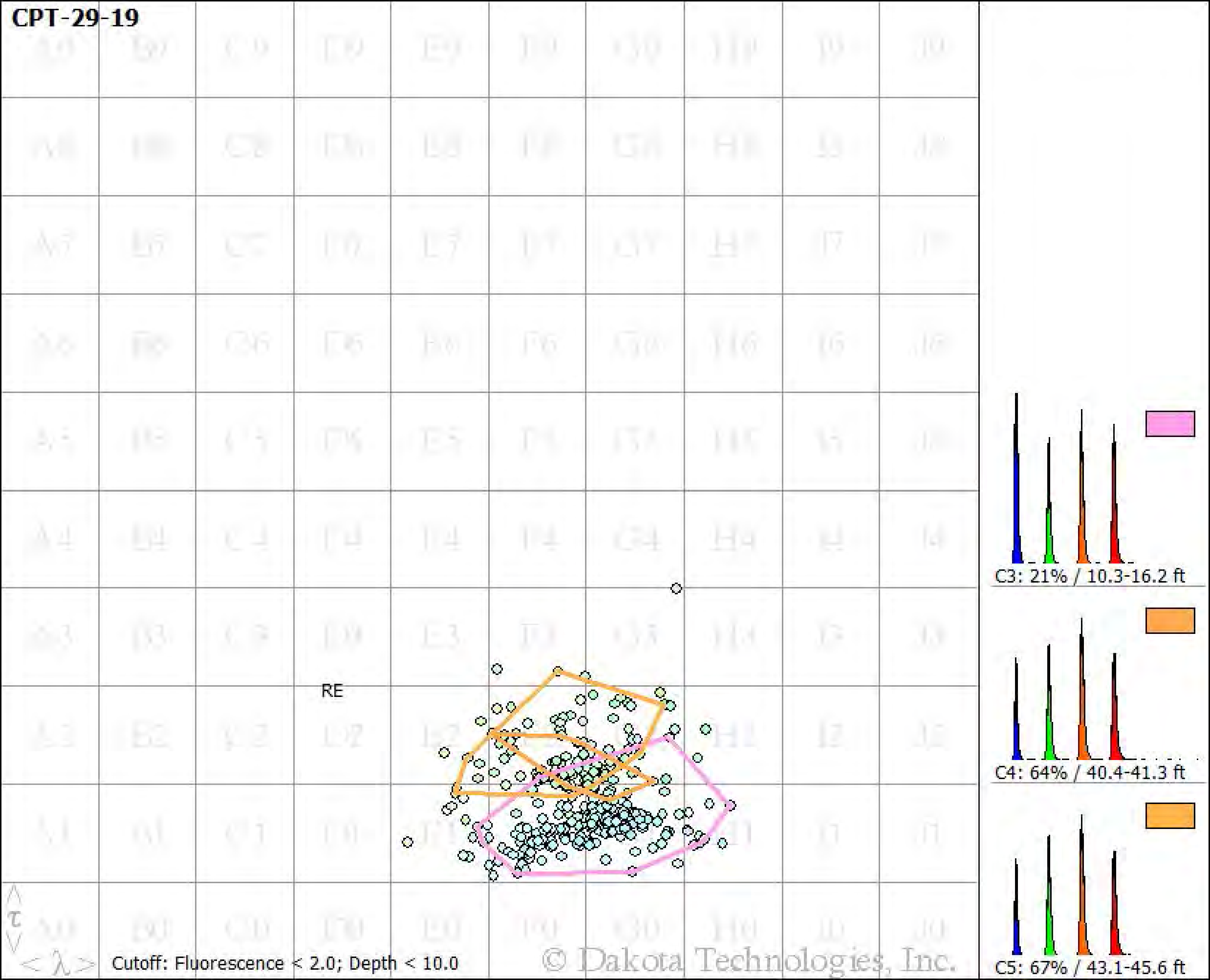
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **62.42 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **325.5 %RE @ 43.69 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-10 09:32 CST**


CPT-29-19
RE
C3: 21% / 10.3-16.2 ft
C4: 64% / 40.4-41.3 ft
C5: 67% / 43.1-45.6 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
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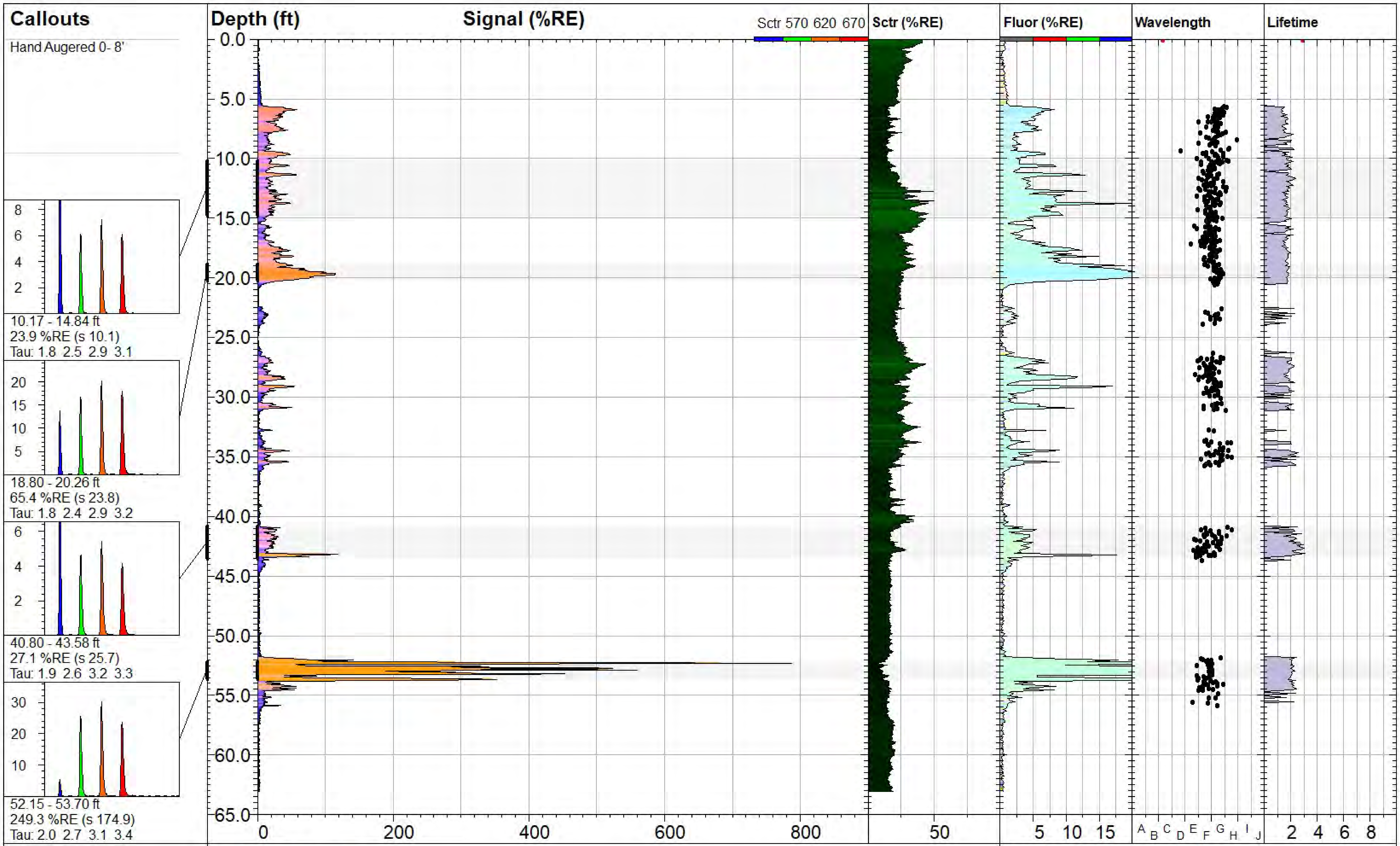

Hand Augered 0- 8'

10.17 - 14.84 ft
23.9 %RE (s 10.1)
Tau: 1.8 2.5 2.9 3.1

18.80 - 20.26 ft
65.4 %RE (s 23.8)
Tau: 1.8 2.4 2.9 3.2

40.80 - 43.58 ft
27.1 %RE (s 25.7)
Tau: 1.9 2.6 3.2 3.3

52.15 - 53.70 ft
249.3 %RE (s 174.9)
Tau: 2.0 2.7 3.1 3.4

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CPT-30-19

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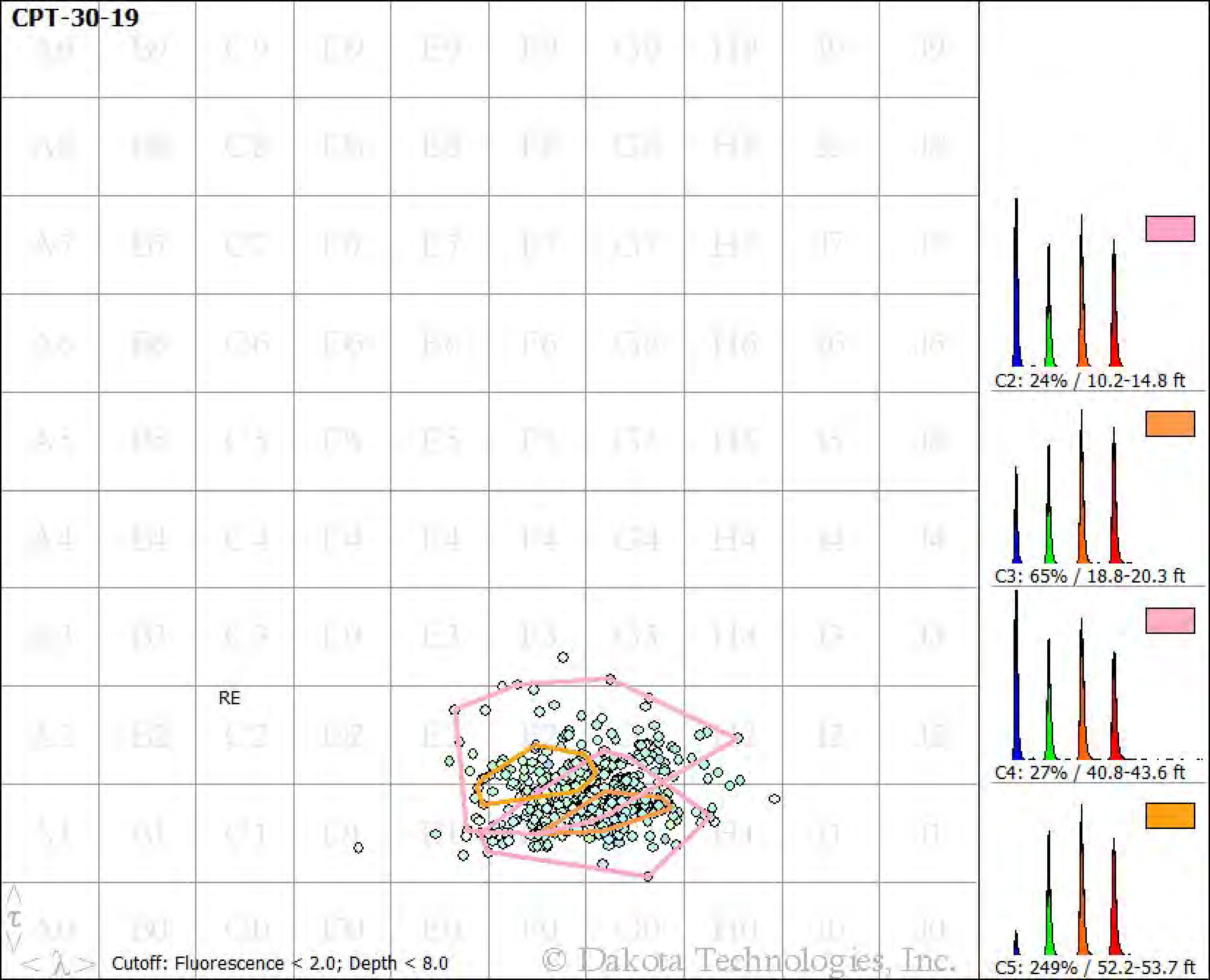
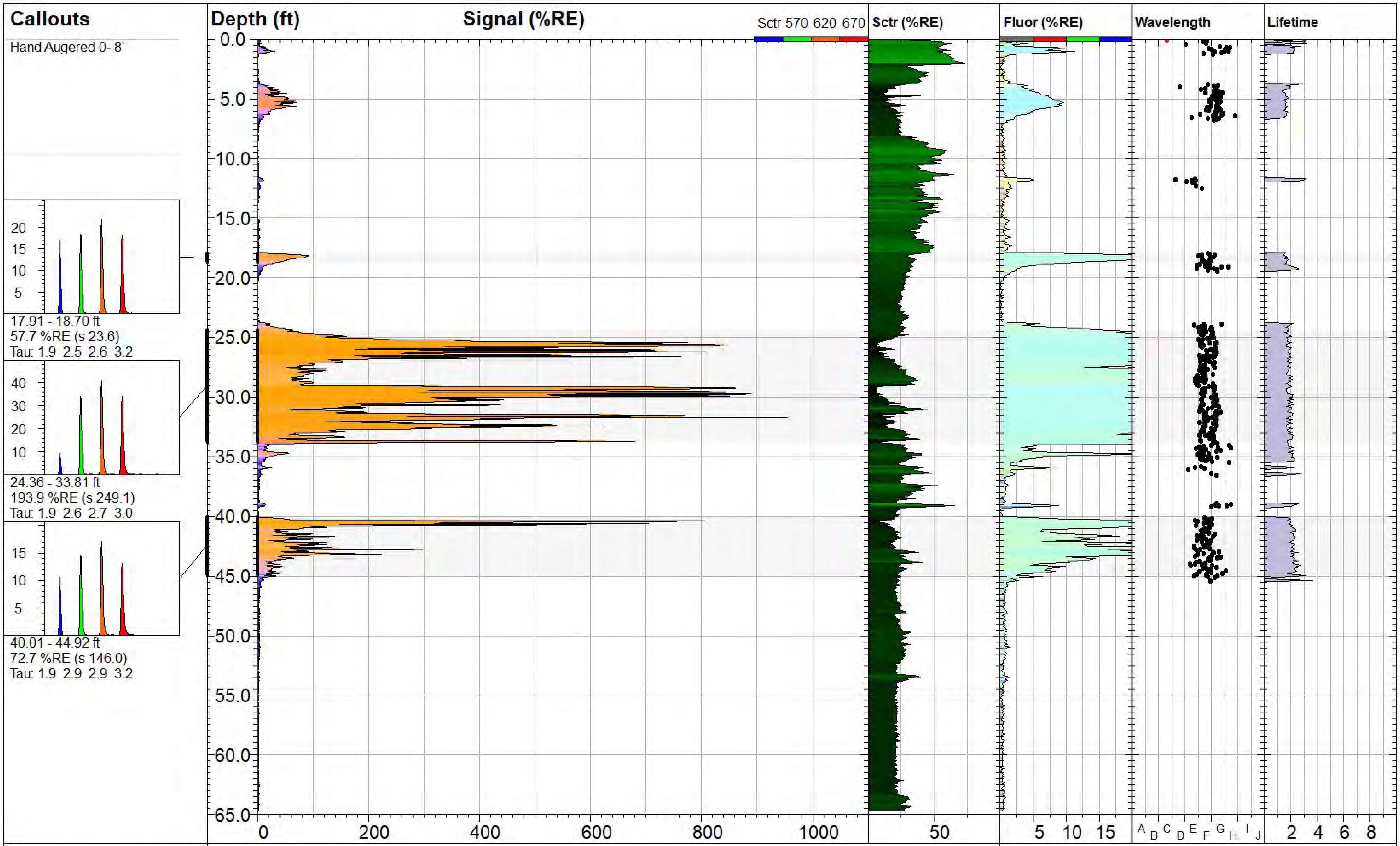
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **63.09 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **813.3 %RE @ 52.31 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-06 11:22 CST**

CPT-30-19


RE
C2: 24% / 10.2-14.8 ft
C3: 65% / 18.8-20.3 ft
C4: 27% / 40.8-43.6 ft
C5: 249% / 52.2-53.7 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0



Hand Augered 0- 8'

17.91 - 18.70 ft
57.7 %RE (s 23.6)
Tau: 1.9 2.5 2.6 3.2

24.36 - 33.81 ft
193.9 %RE (s 249.1)
Tau: 1.9 2.6 2.7 3.0

40.01 - 44.92 ft
72.7 %RE (s 146.0)
Tau: 1.9 2.9 2.9 3.2

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CPT-31-19

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
64.66 ft

Client / Job:
Golder /

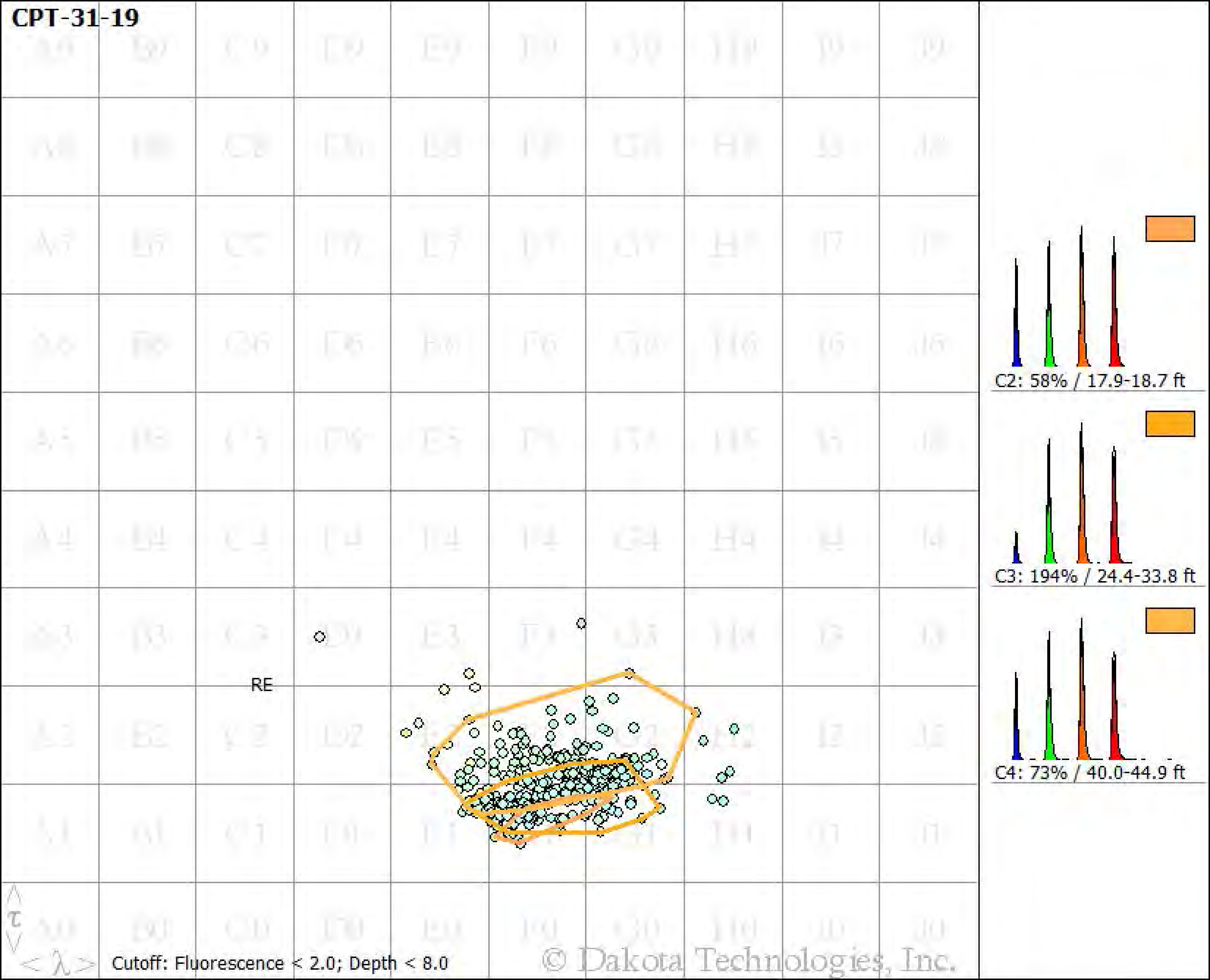
X Coord.(Lng-E) / Fix:
Unavailable / NA

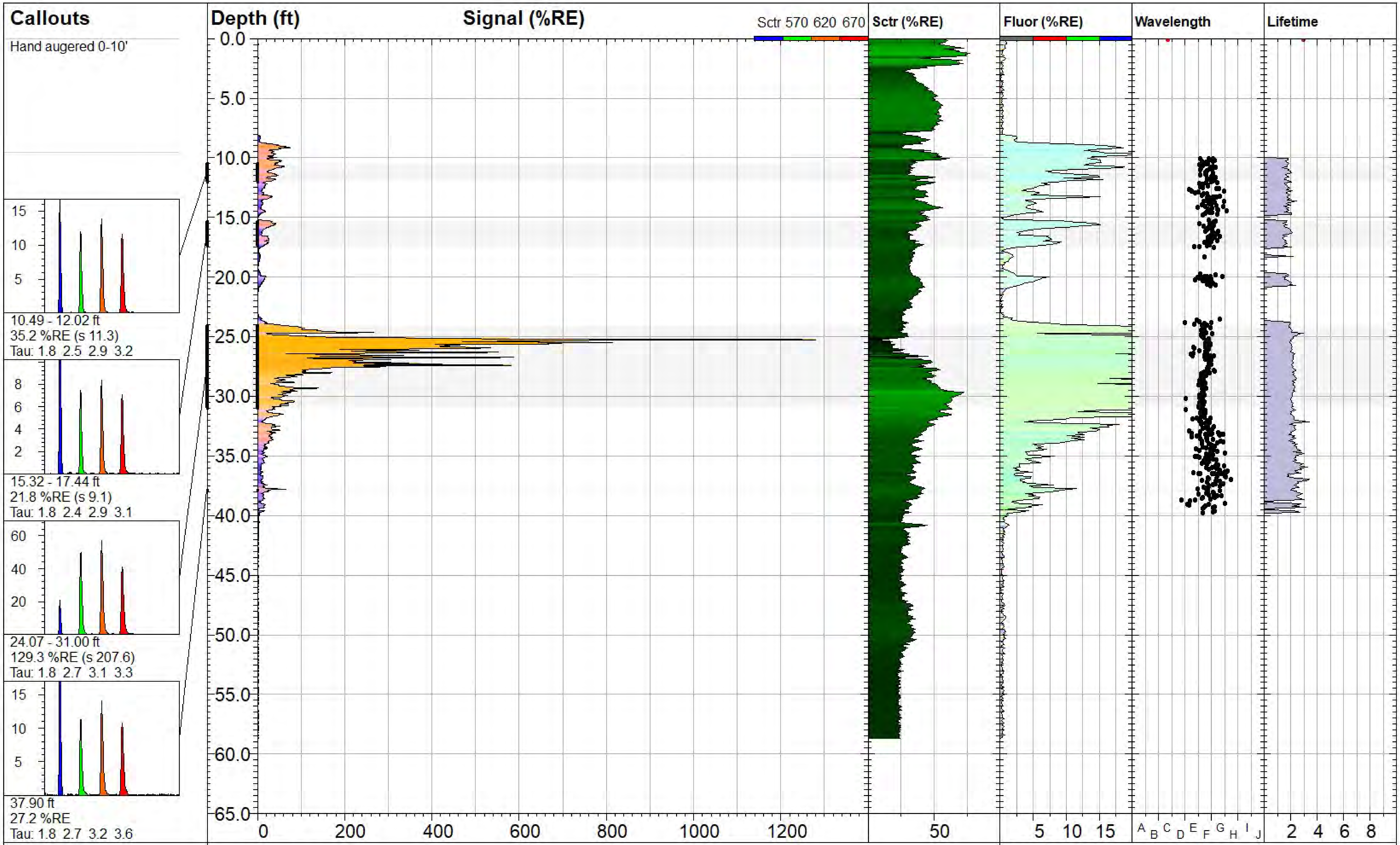
Max signal:
987.1 %RE @ 31.70 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2019-12-06 09:52 CST


CPT-31-19
RE
C2: 58% / 17.9-18.7 ft
C3: 194% / 24.4-33.8 ft
C4: 73% / 40.0-44.9 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



Hand augered 0-10'

10.49 - 12.02 ft
35.2 %RE (s 11.3)
Tau: 1.8 2.5 2.9 3.2

15.32 - 17.44 ft
21.8 %RE (s 9.1)
Tau: 1.8 2.4 2.9 3.1

24.07 - 31.00 ft
129.3 %RE (s 207.6)
Tau: 1.8 2.7 3.1 3.3

37.90 ft
27.2 %RE
Tau: 1.8 2.7 3.2 3.6

CPT-32-19

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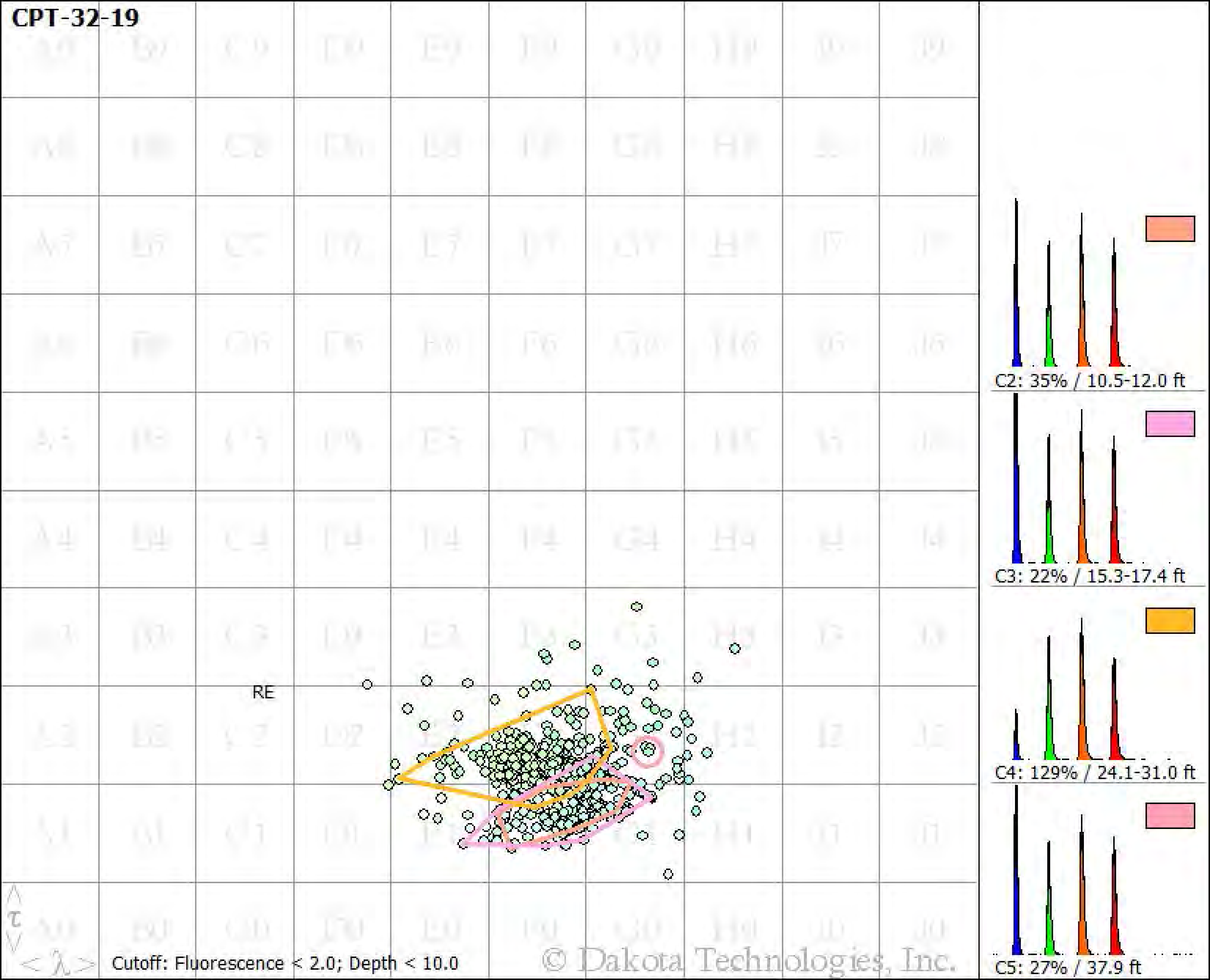
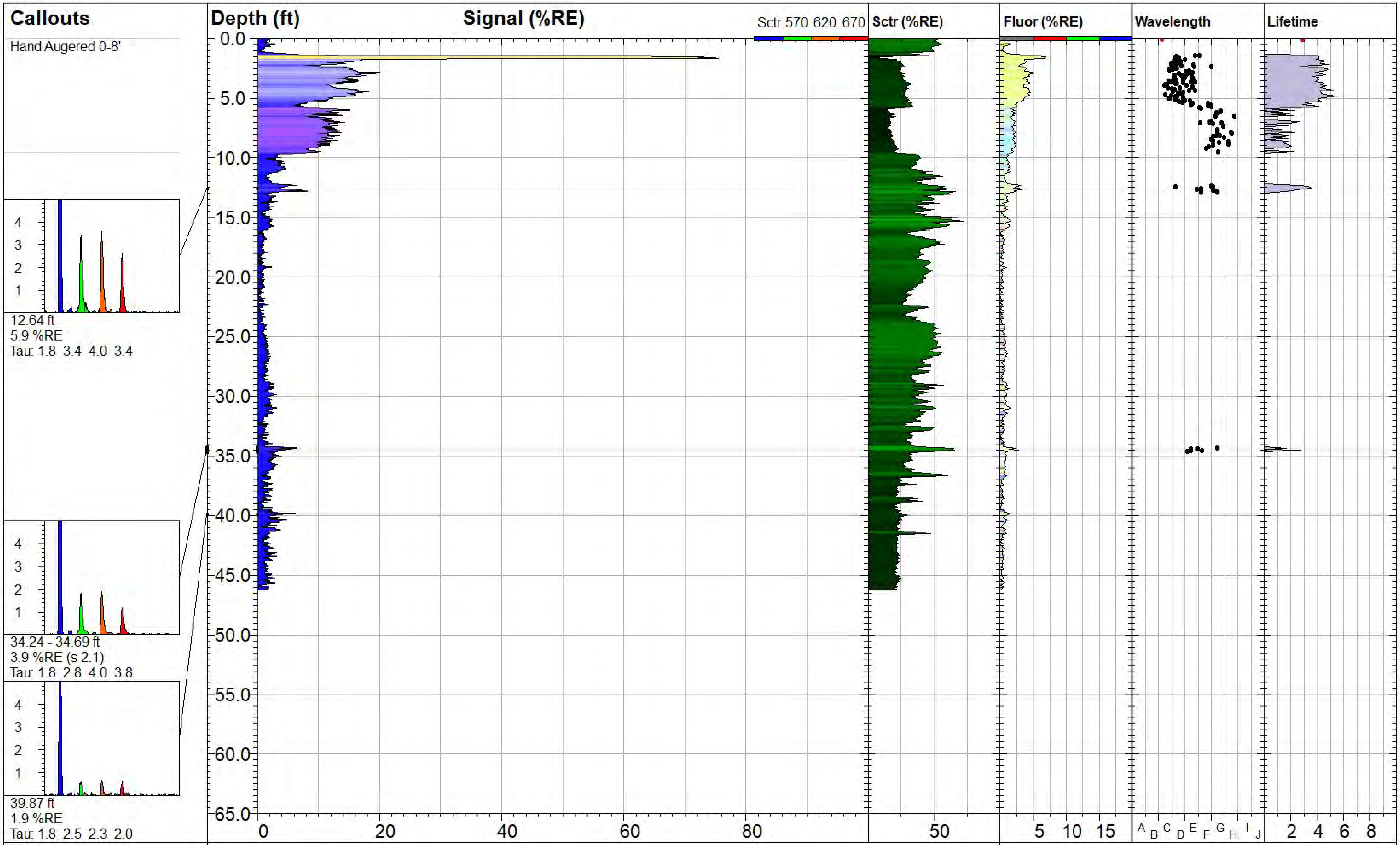
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.71 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **1297.9 %RE @ 25.24 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-09 08:53 CST**

CPT-32-19



Cutoff: Fluorescence < 2.0; Depth < 10.0



Hand Augered 0-8'

12.64 ft
5.9 %RE
Tau: 1.8 3.4 4.0 3.4

34.24 - 34.69 ft
3.9 %RE (s 2.1)
Tau: 1.8 2.8 4.0 3.8

39.87 ft
1.9 %RE
Tau: 1.8 2.5 2.3 2.0

CPT-34-19

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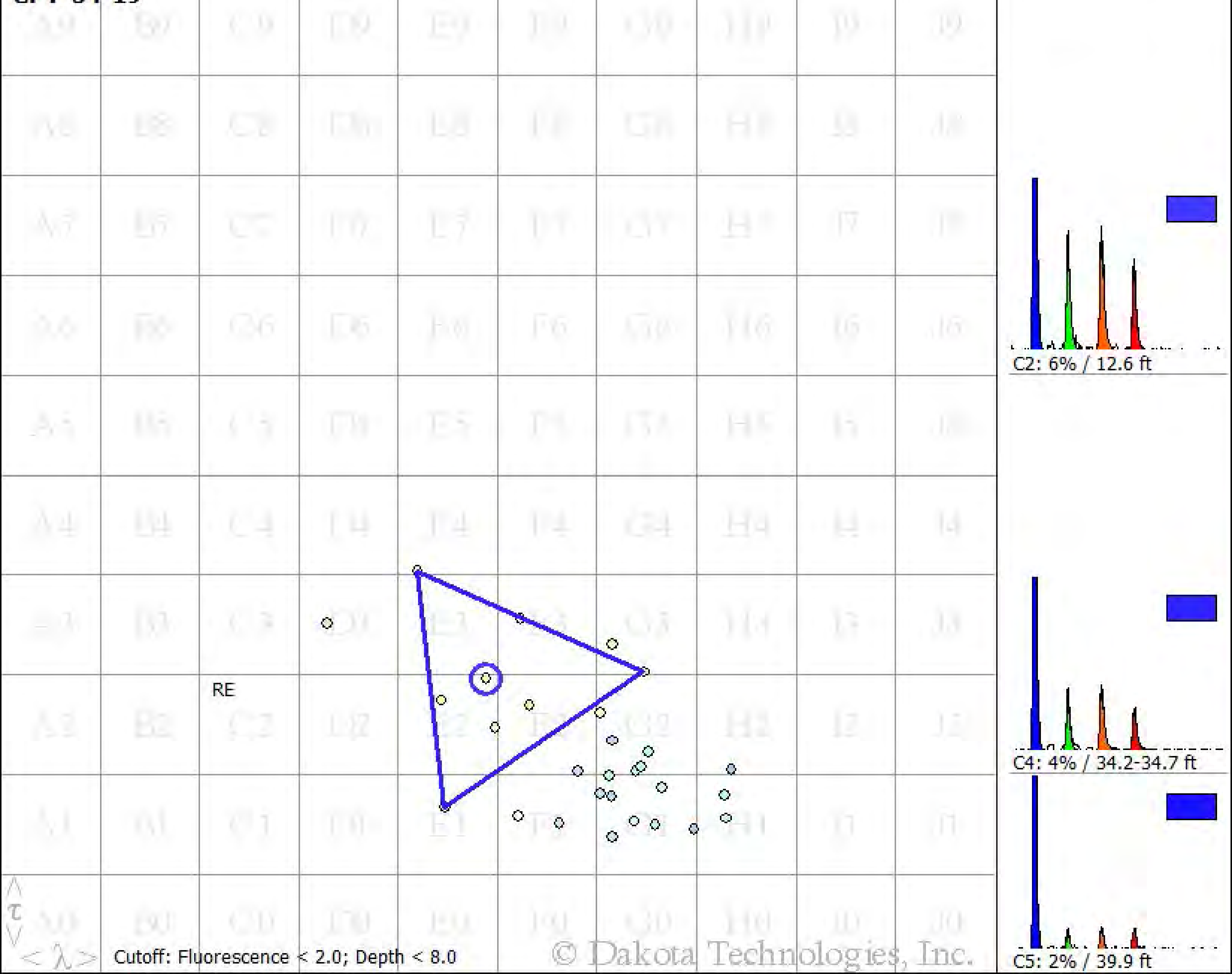
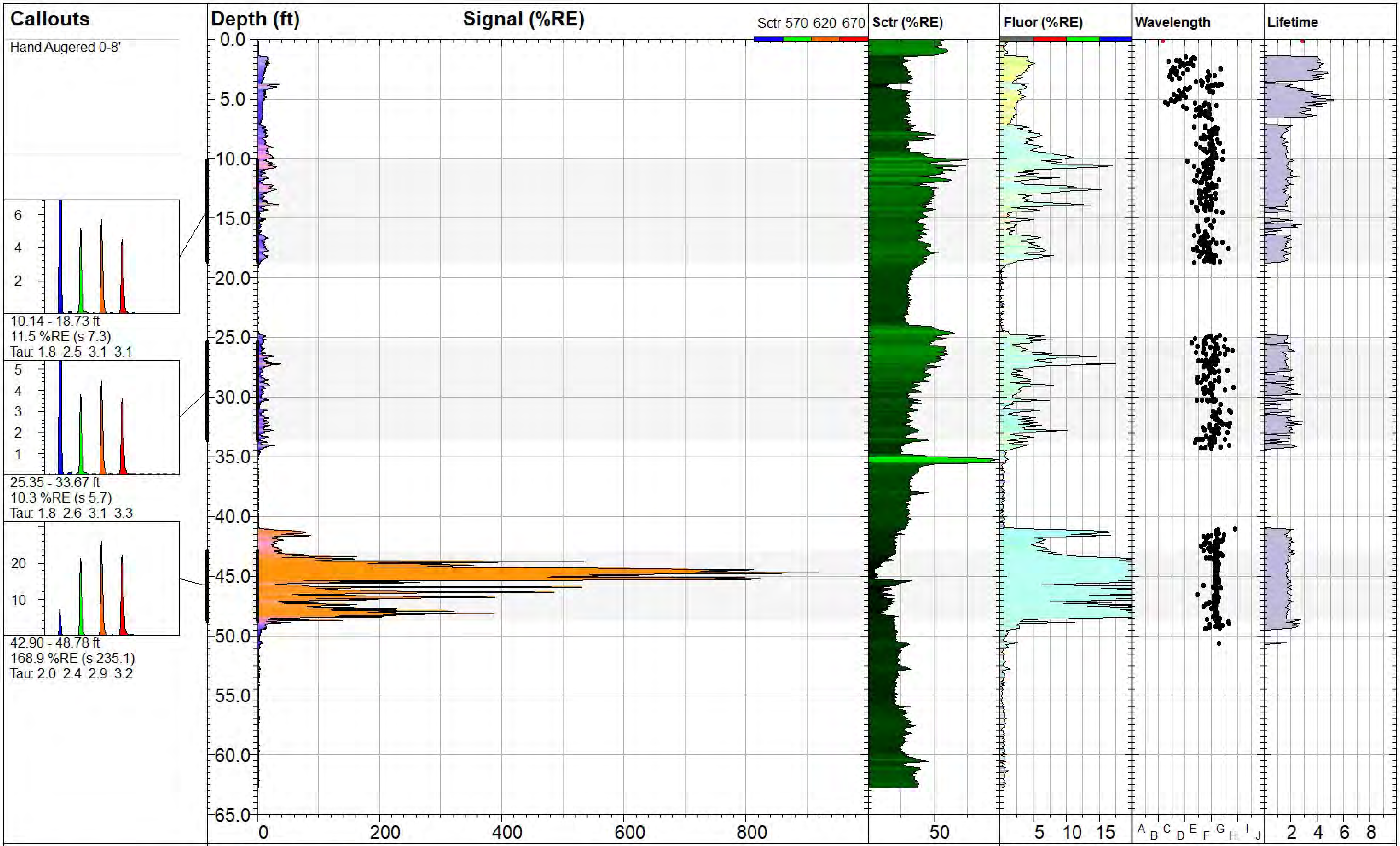
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **46.23 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **75.6 %RE @ 1.64 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-05 13:19 CST**

CPT-34-19


RE
C2: 6% / 12.6 ft
C4: 4% / 34.2-34.7 ft
C5: 2% / 39.9 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



CPT-35-19

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
62.75 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
927.1 %RE @ 44.74 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2019-12-05 11:57 CST

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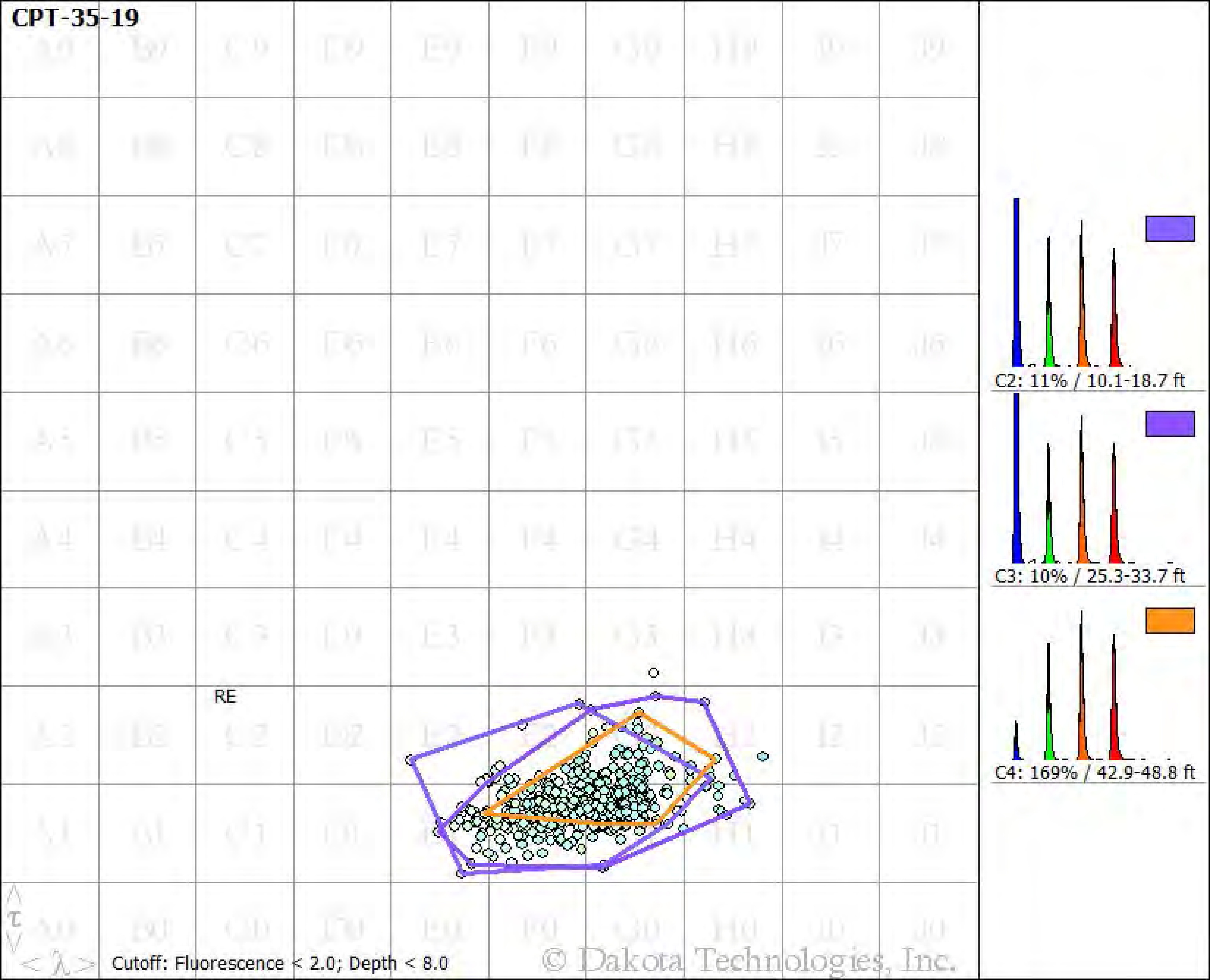
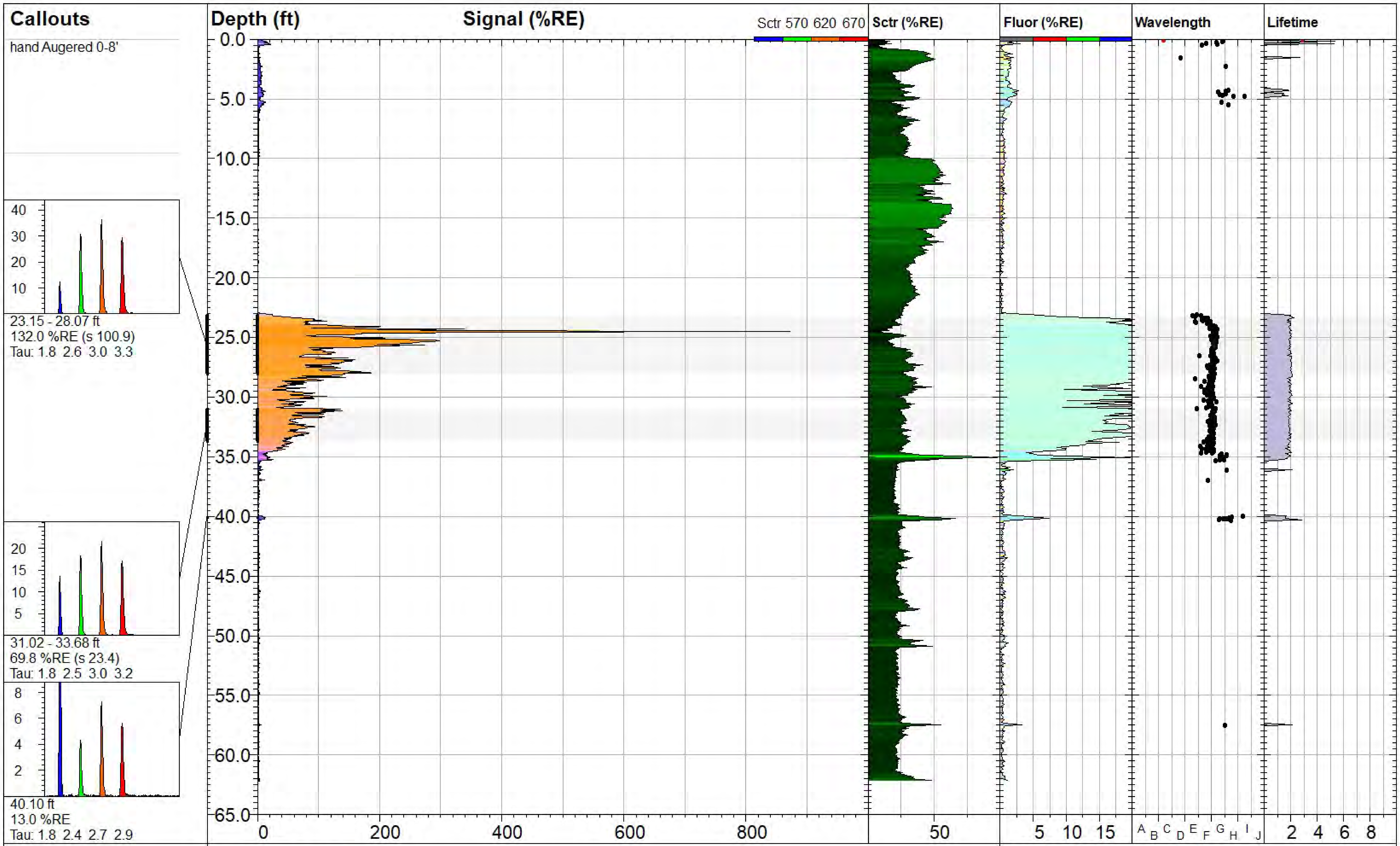
CPT-35-19


RE
C2: 11% / 10.1-18.7 ft
C3: 10% / 25.3-33.7 ft
C4: 169% / 42.9-48.8 ft
< τ >
< λ >
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



hand Augered 0-8'

23.15 - 28.07 ft
132.0 %RE (s 100.9)
Tau: 1.8 2.6 3.0 3.3

31.02 - 33.68 ft
69.8 %RE (s 23.4)
Tau: 1.8 2.5 3.0 3.2

40.10 ft
13.0 %RE
Tau: 1.8 2.4 2.7 2.9

CPT-36-19

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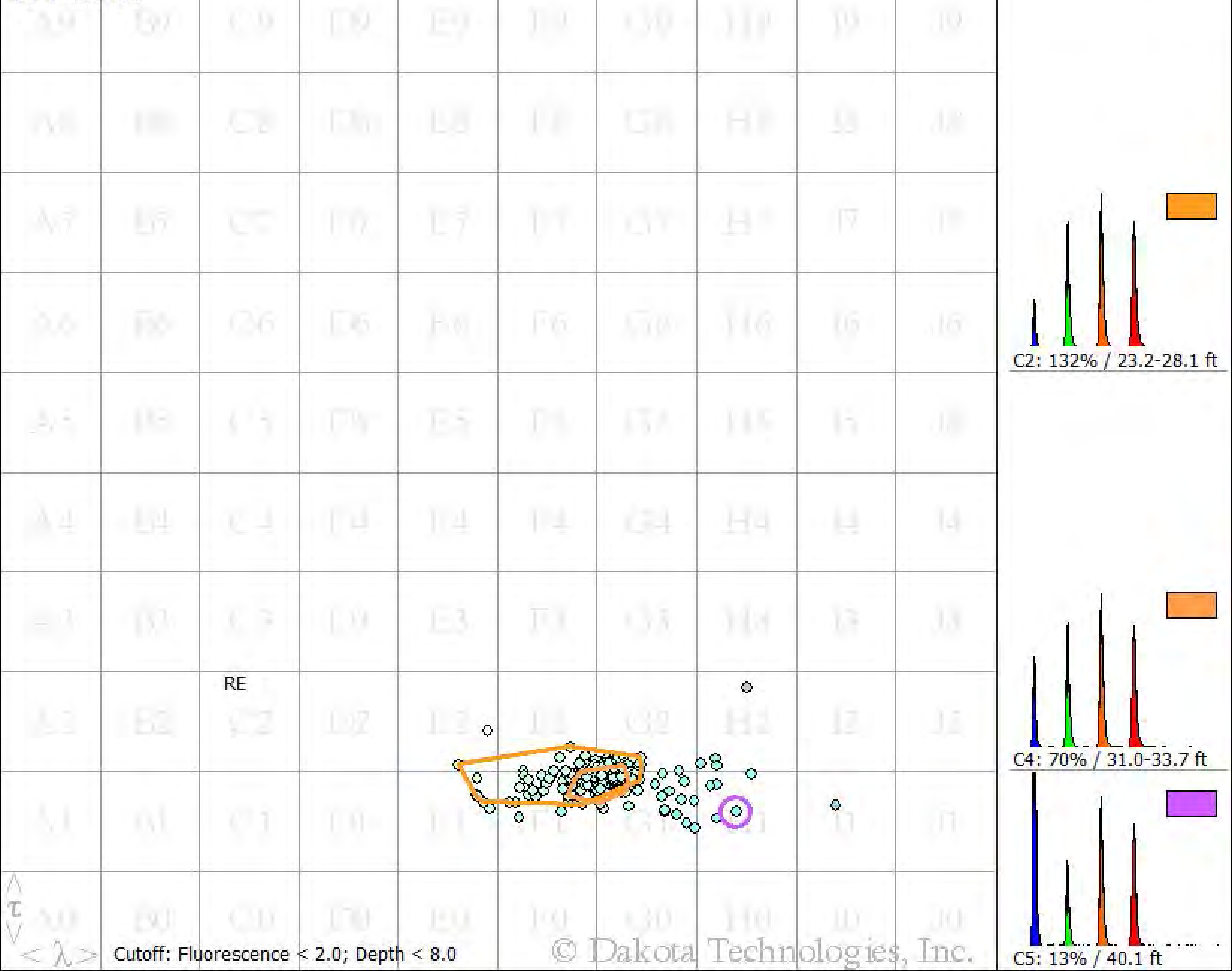
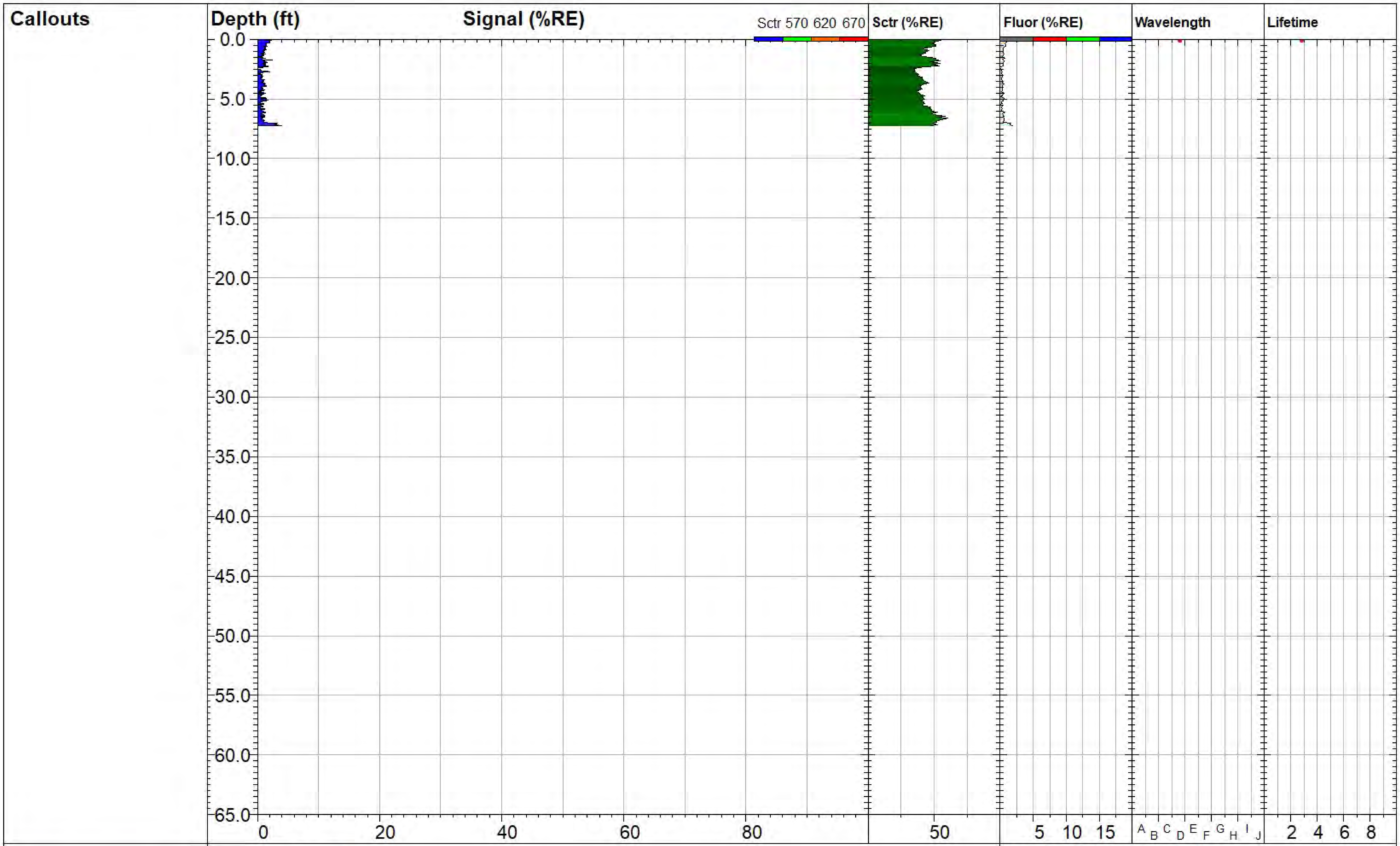
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **62.18 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **874.8 %RE @ 24.50 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-04 12:17 CST**

CPT-36-19


RE
C2: 132% / 23.2-28.1 ft
C4: 70% / 31.0-33.7 ft
C5: 13% / 40.1 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



CPT-37-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **7.26 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.0 %RE @ 7.24 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-06 08:46 CST**

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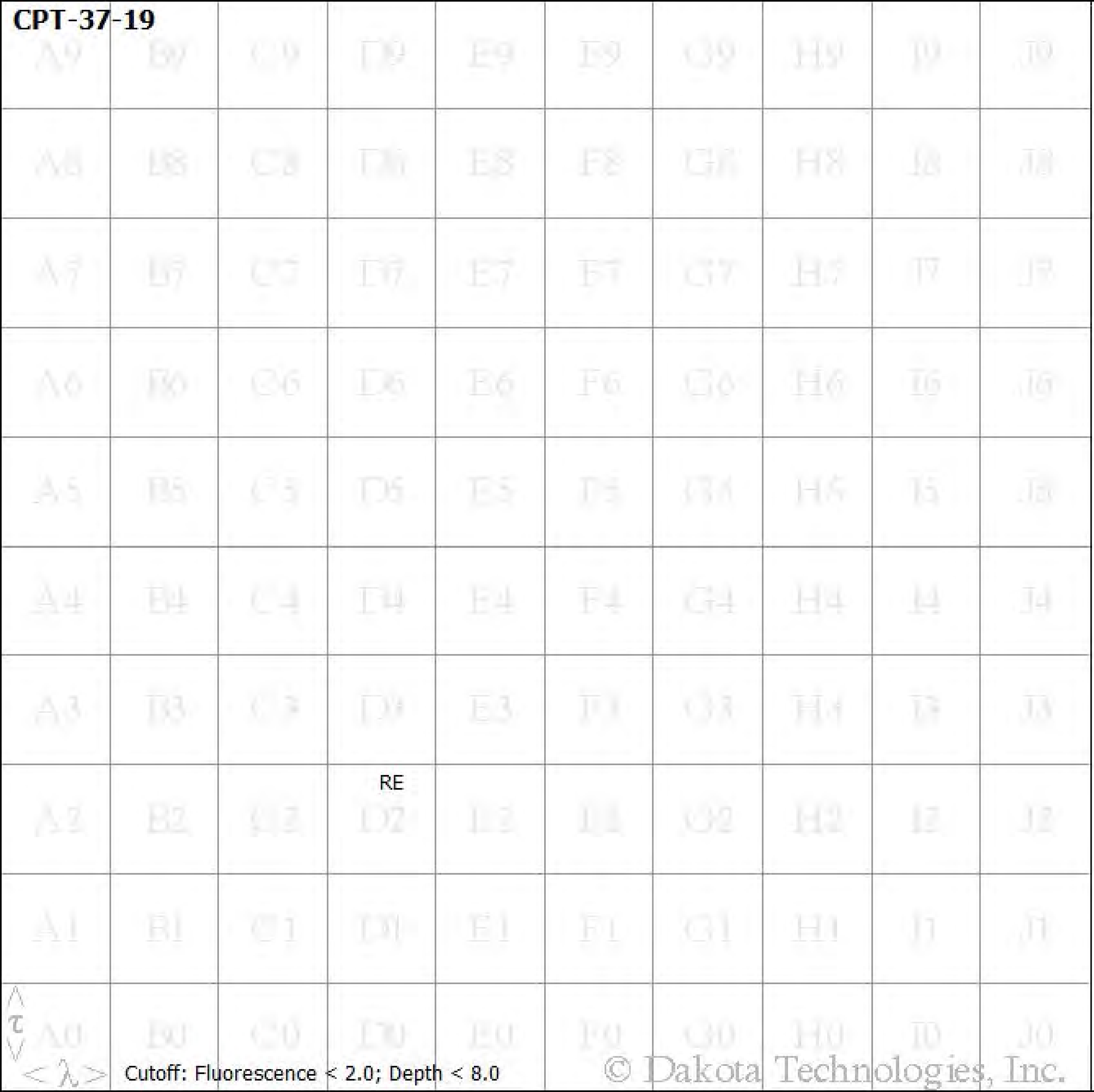
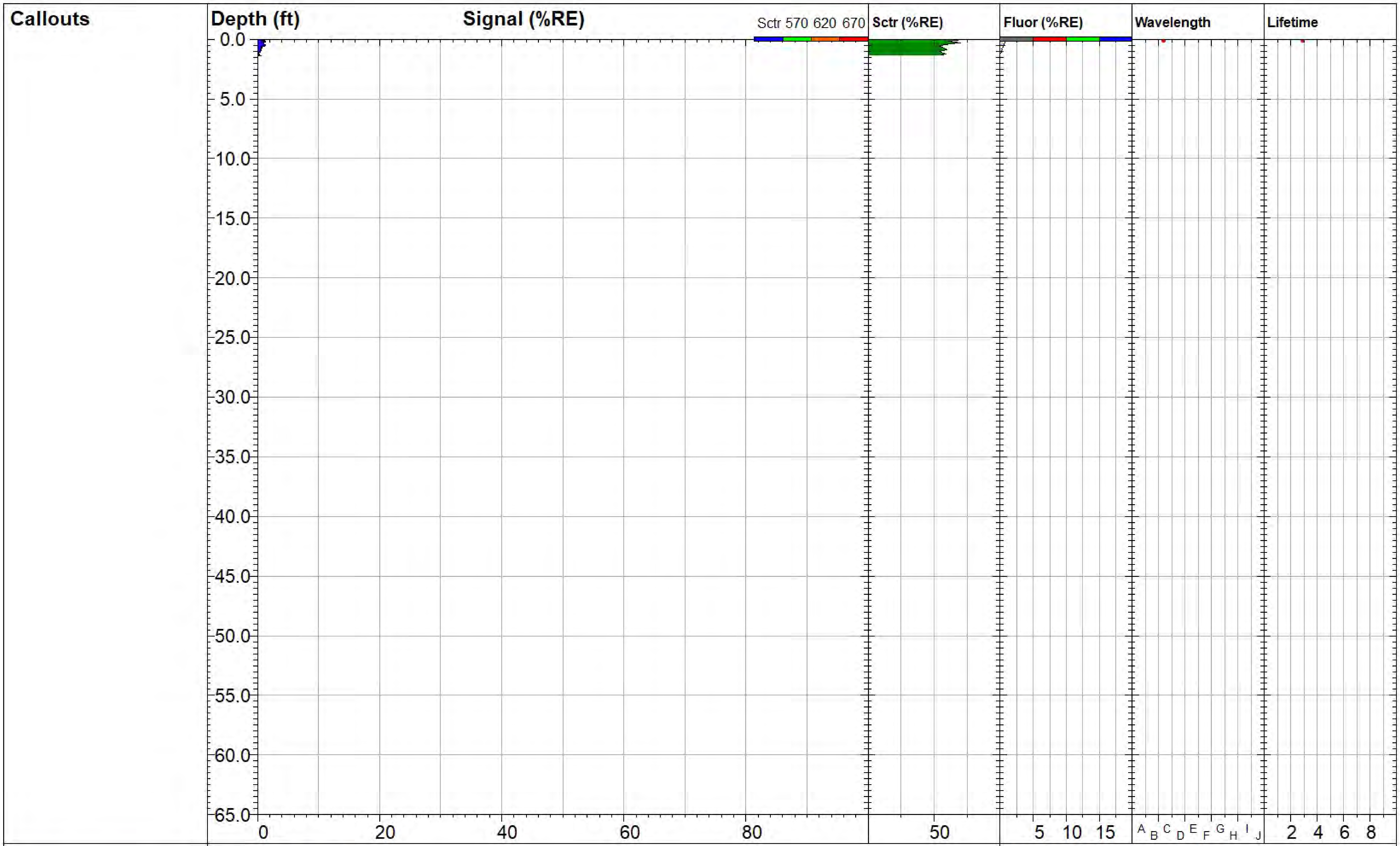
CPT-37-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



CPT-38-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **1.38 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **1.4 %RE @ 0.19 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-04 14:07 CST**

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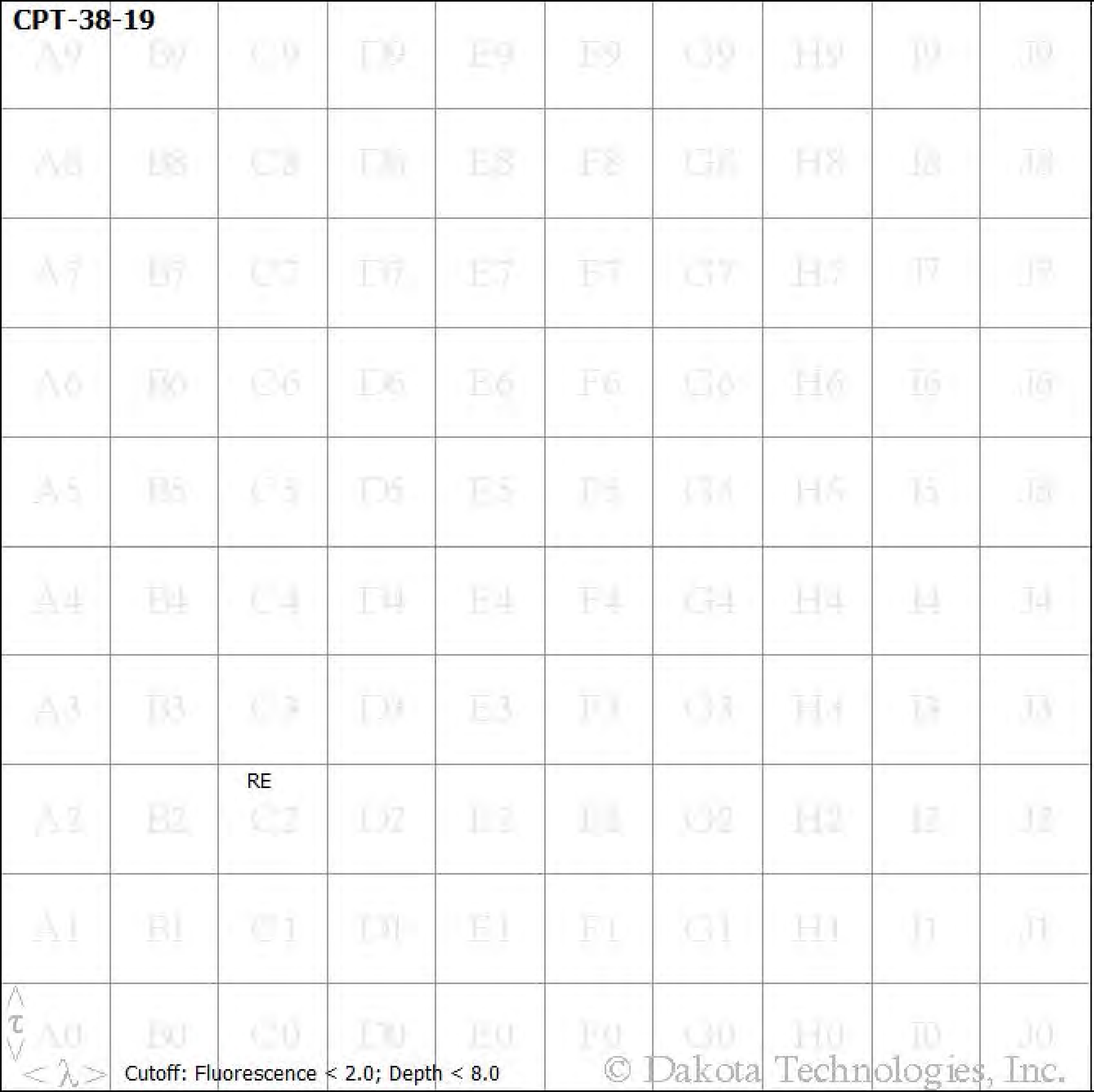
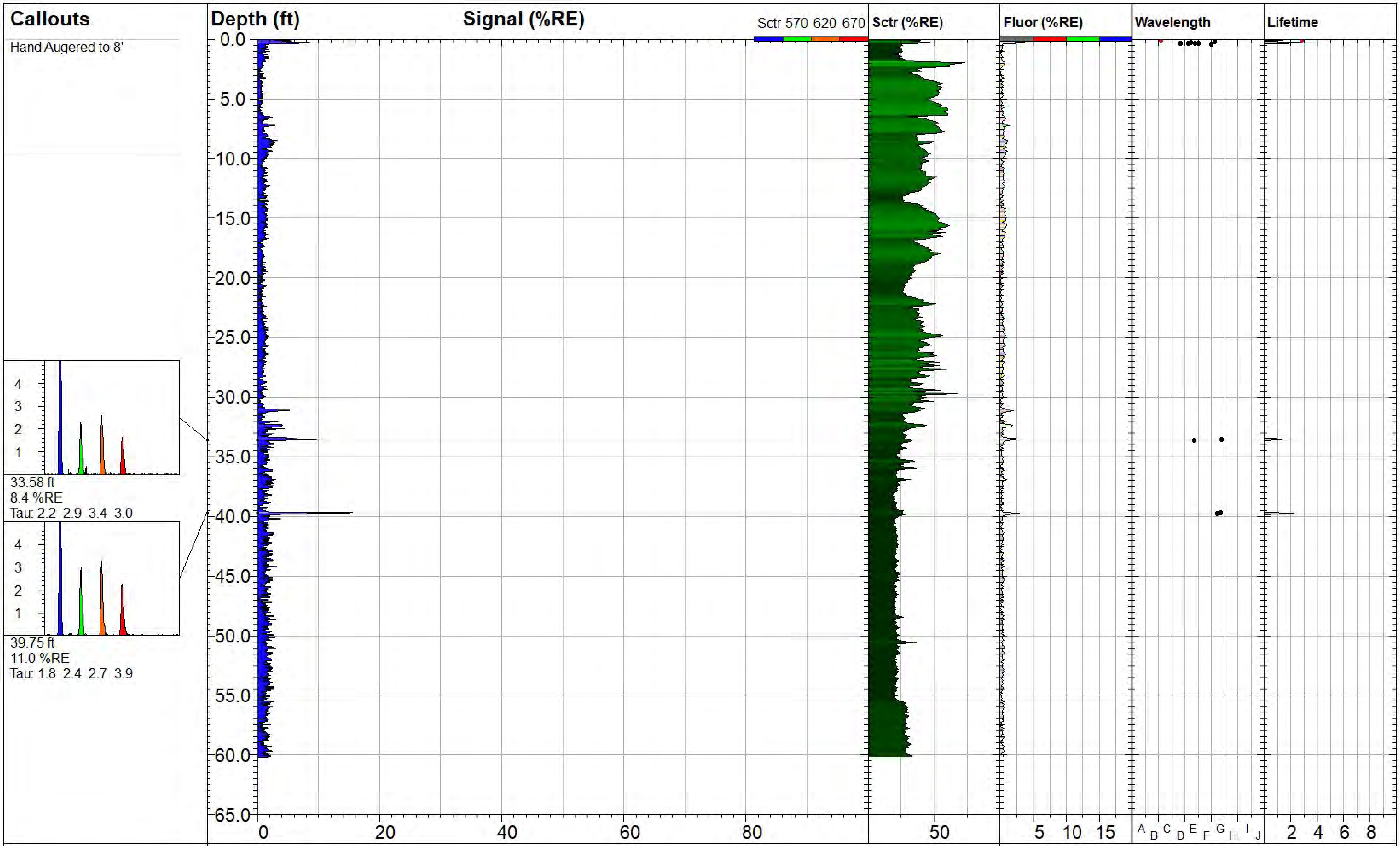
CPT-38-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



Hand Augered to 8'

33.58 ft
8.4 %RE
Tau: 2.2 2.9 3.4 3.0

39.75 ft
11.0 %RE
Tau: 1.8 2.4 2.7 3.9

CPT-38a-19

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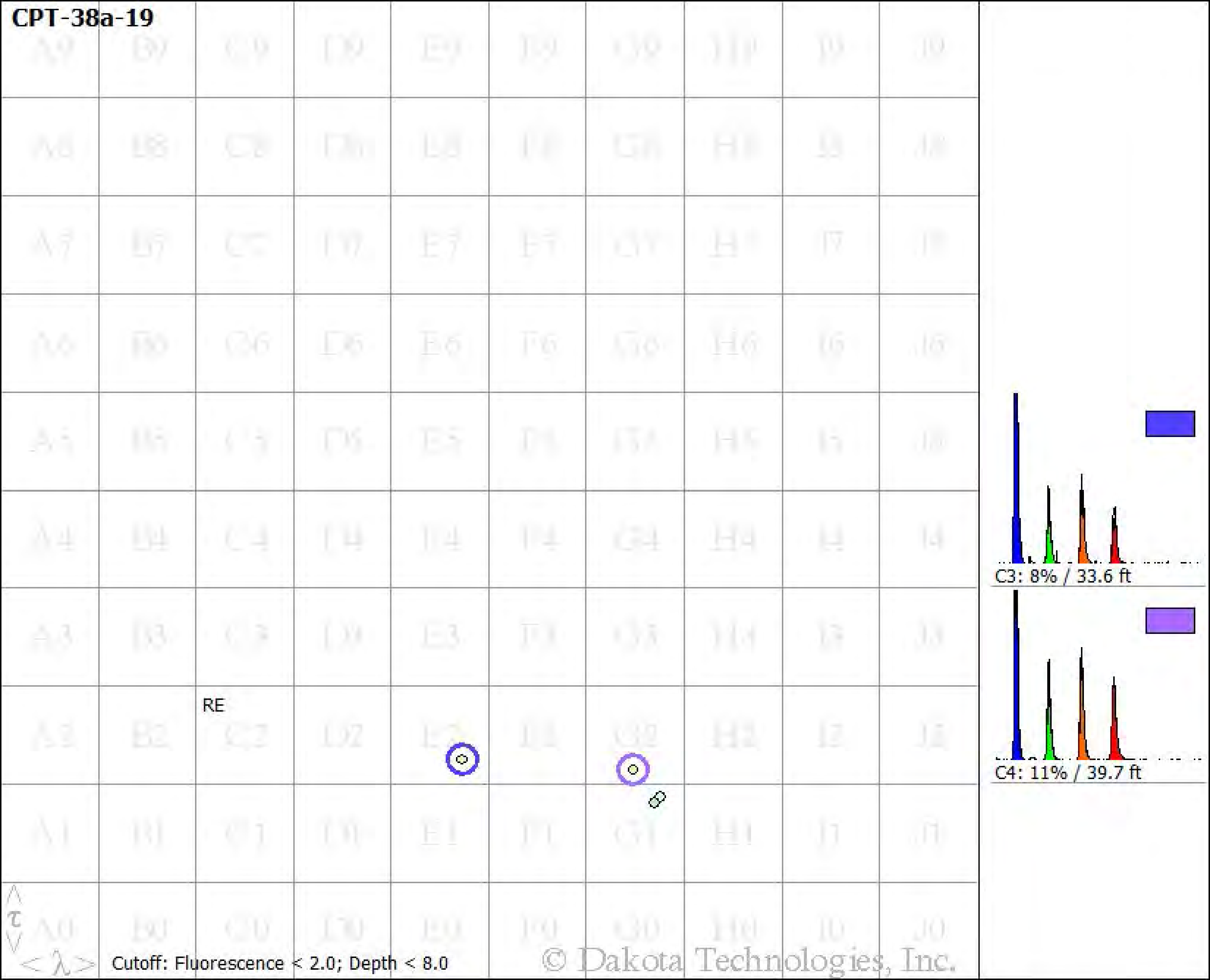
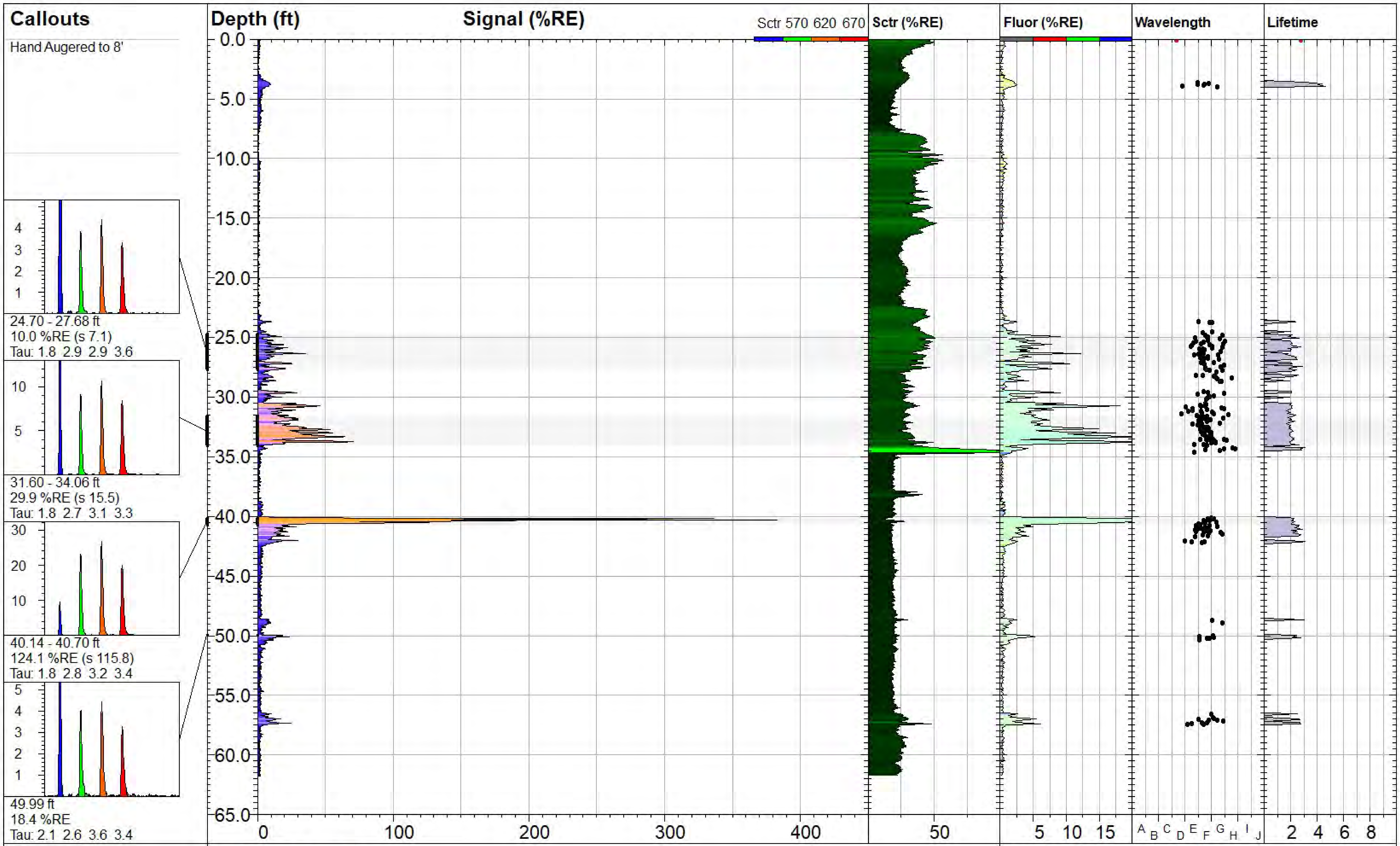
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.18 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **16.3 %RE @ 39.68 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-04 14:34 CST**


CPT-38a-19
RE
C3: 8% / 33.6 ft
C4: 11% / 39.7 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



CPT-39-19

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
61.77 ft

Client / Job:
Golder /

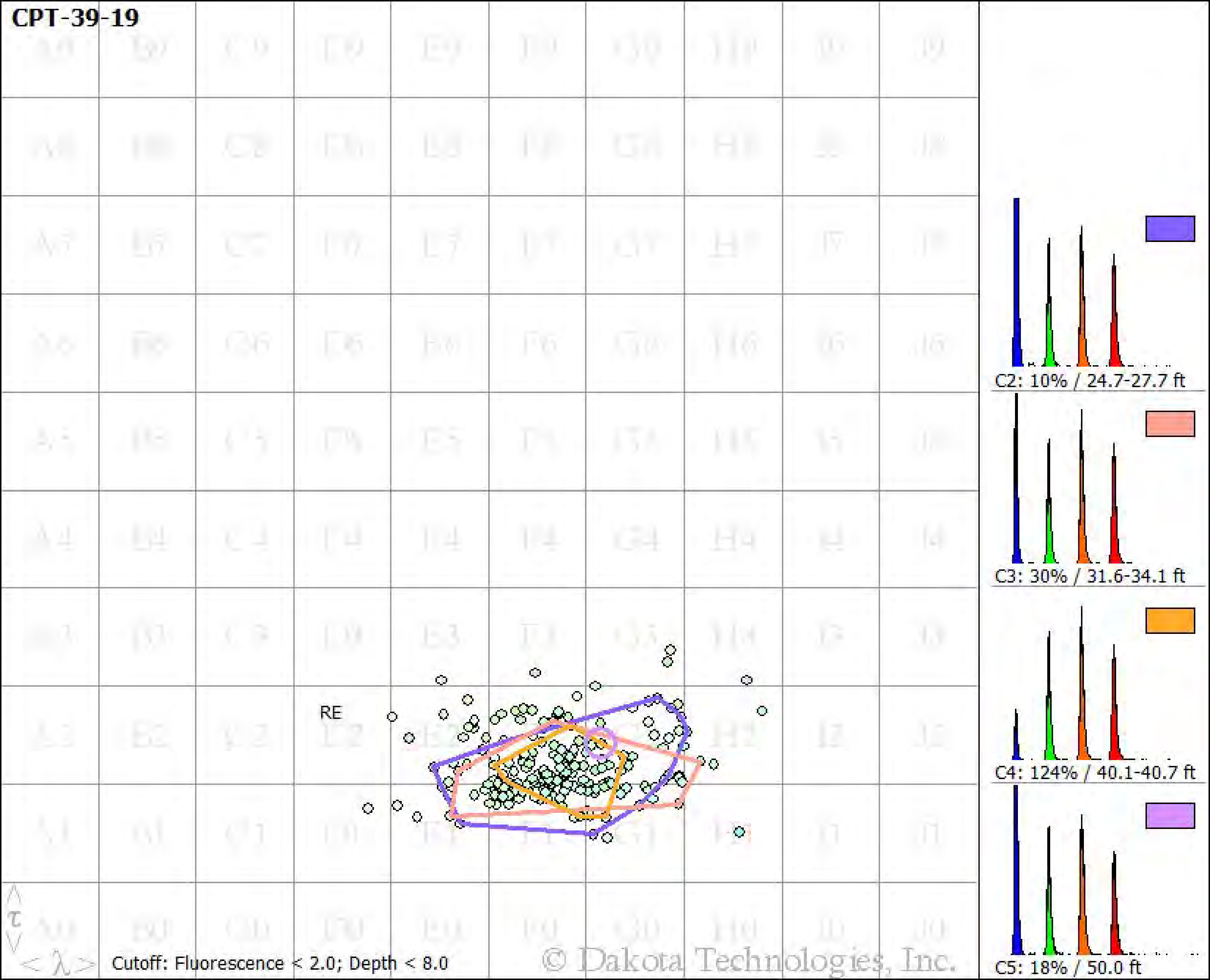
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
405.6 %RE @ 40.31 ft

Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

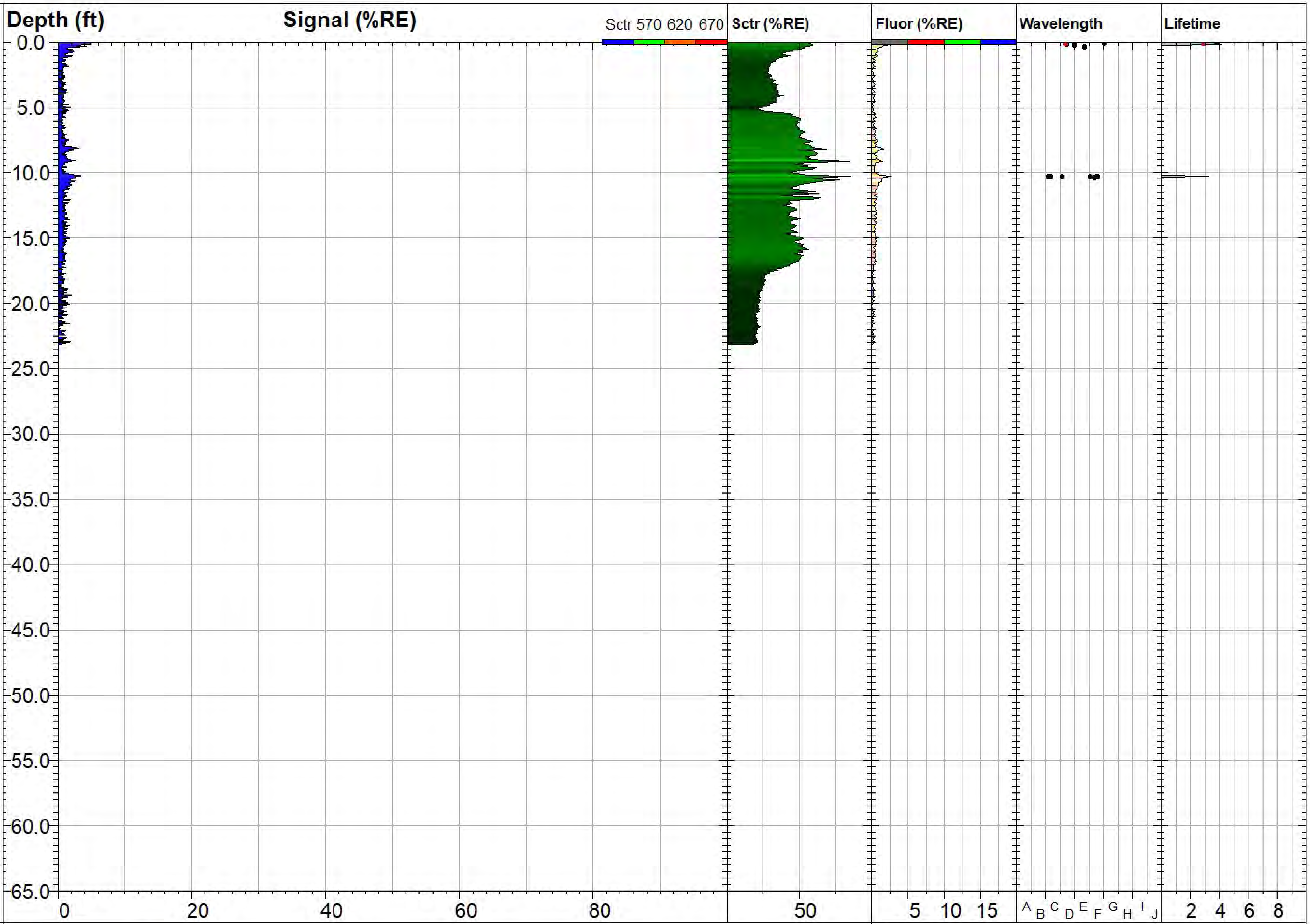
Date & Time:
2019-12-04 10:00 CST


CPT-39-19
RE
C2: 10% / 24.7-27.7 ft
C3: 30% / 31.6-34.1 ft
C4: 124% / 40.1-40.7 ft
C5: 18% / 50.0 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.

Callouts

Hand Augered to 8'

Hydraulic Refusal 23.13'



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CPT-40-19

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
23.13 ft

Client / Job:
Golder /

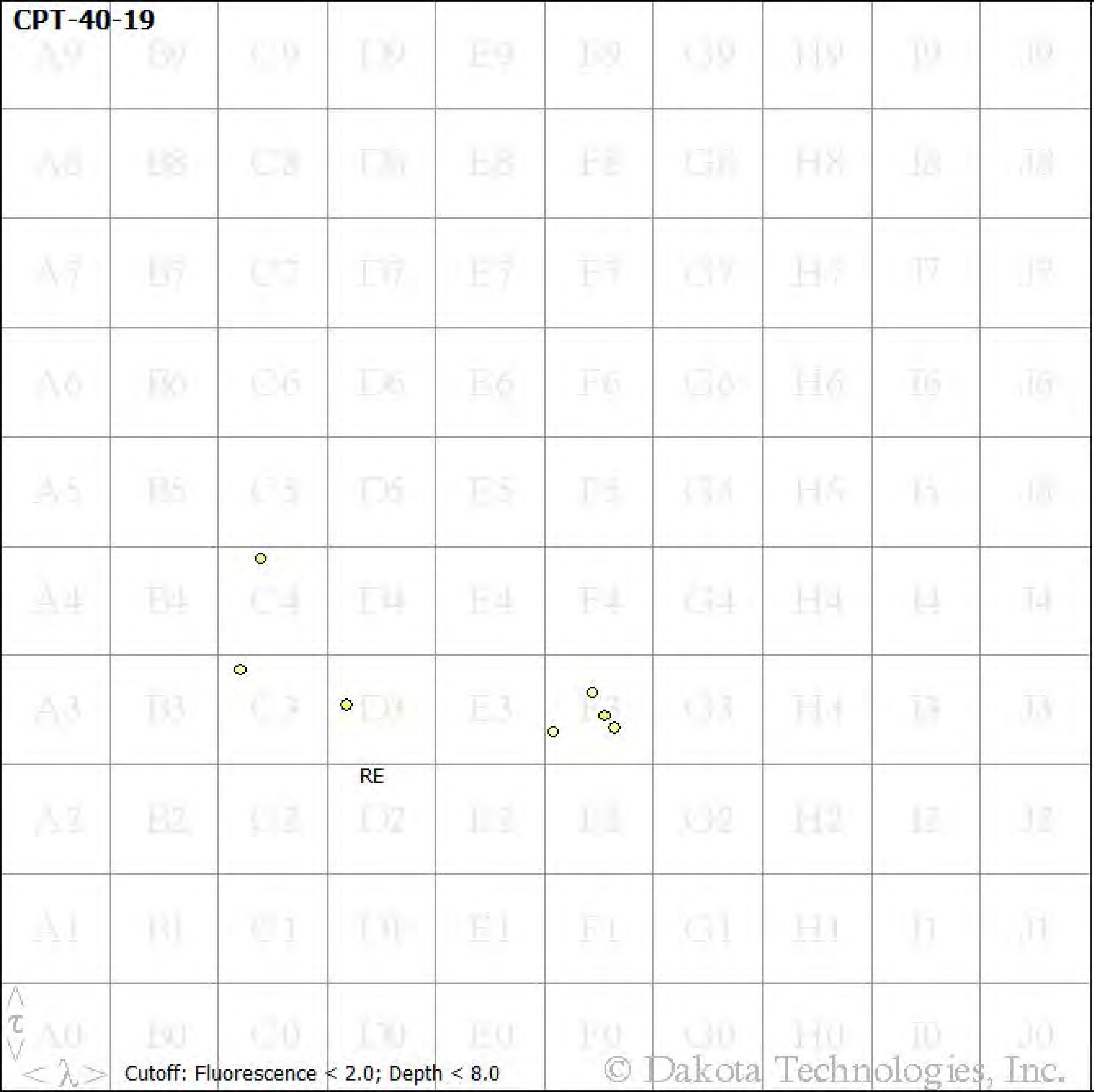
X Coord.(Lng-E) / Fix:
Unavailable / NA

Max signal:
6.4 %RE @ 0.00 ft

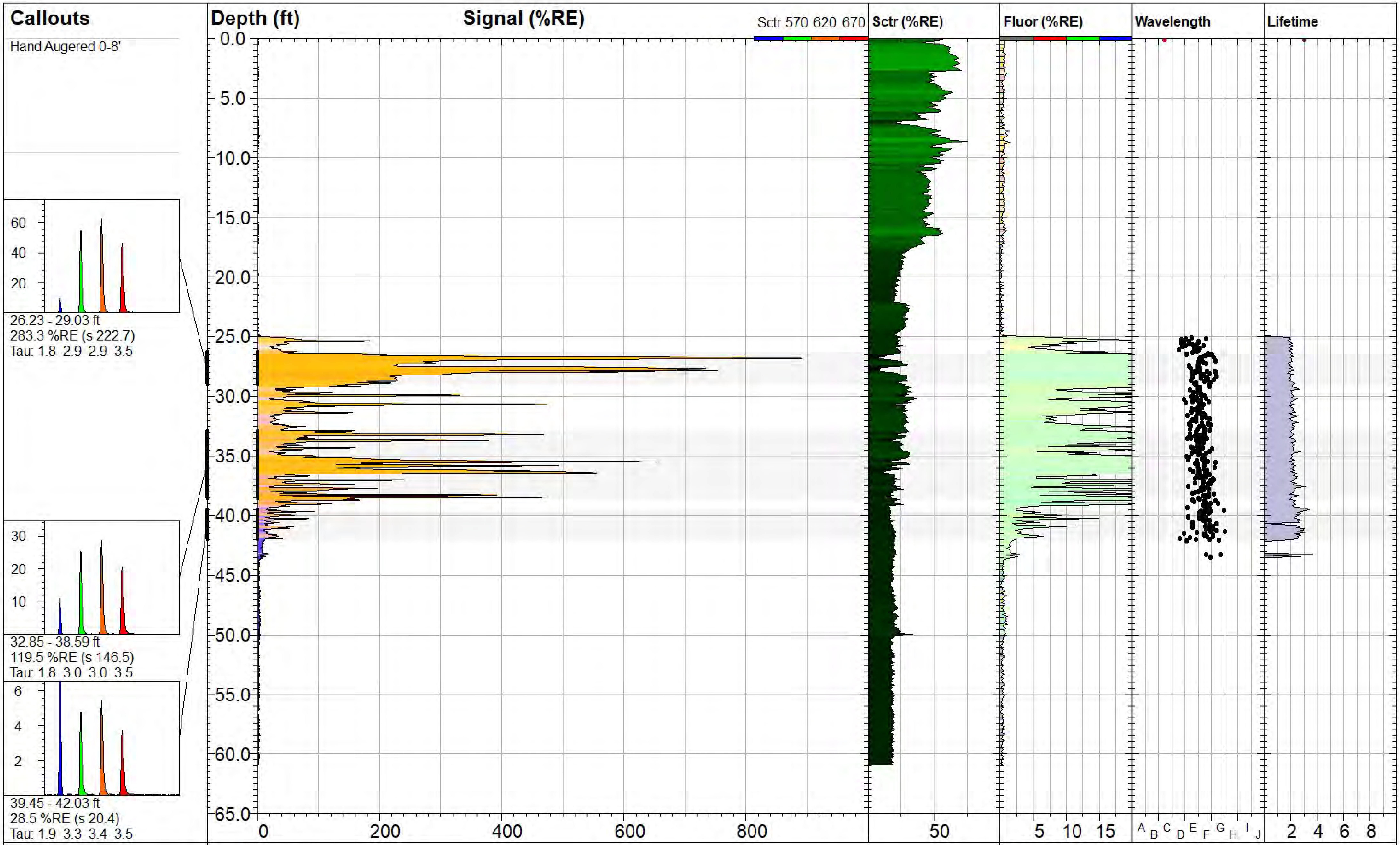
Operator / Unit:
T. Rudolph / TG1807

Elevation:
Unavailable

Date & Time:
2019-12-04 08:18 CST



Cutoff: Fluorescence < 2.0; Depth < 8.0



Hand Augered 0-8'

26.23 - 29.03 ft
283.3 %RE (s 222.7)
Tau: 1.8 2.9 2.9 3.5

32.85 - 38.59 ft
119.5 %RE (s 146.5)
Tau: 1.8 3.0 3.0 3.5

39.45 - 42.03 ft
28.5 %RE (s 20.4)
Tau: 1.9 3.3 3.4 3.5

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CPT-40a-19

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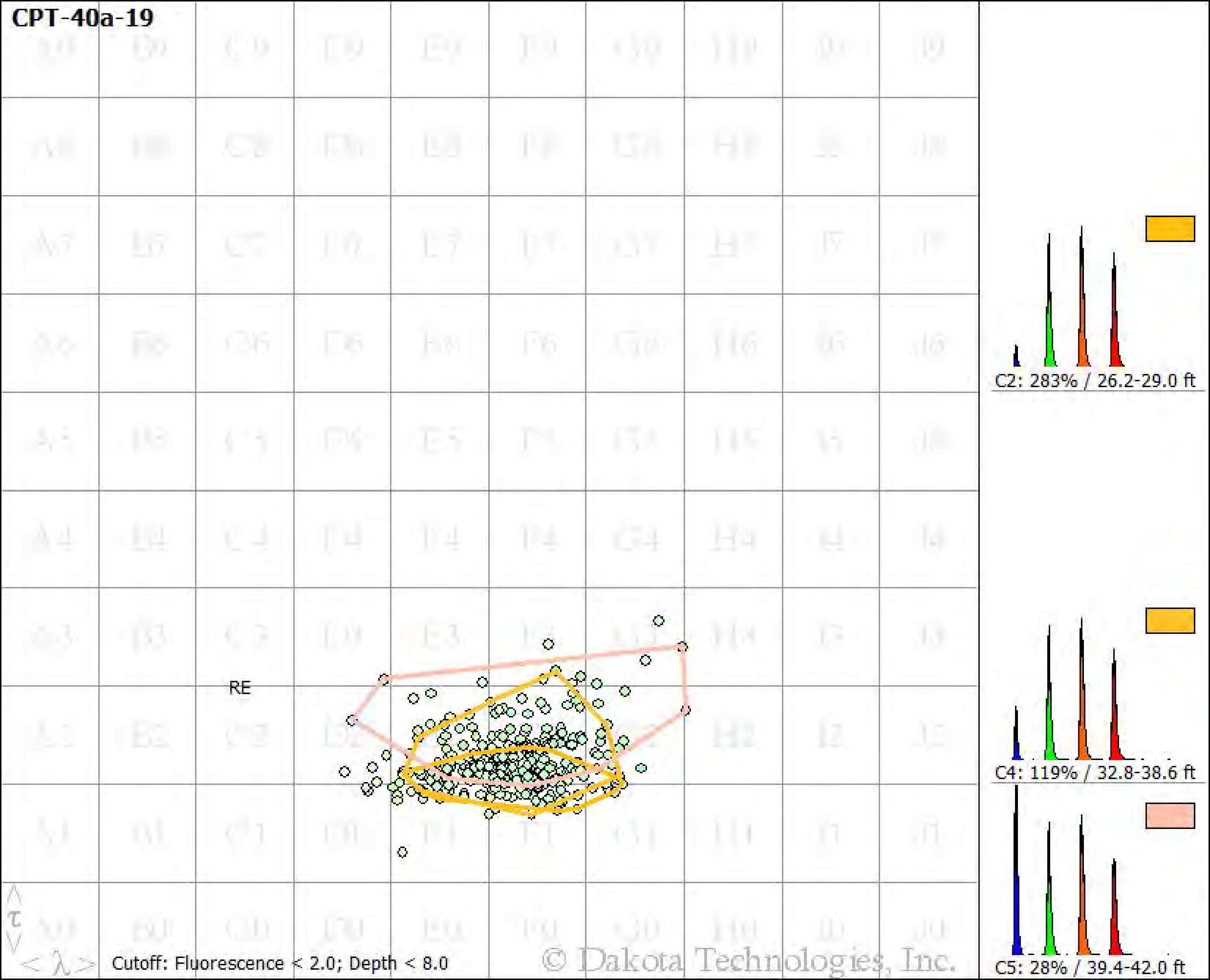
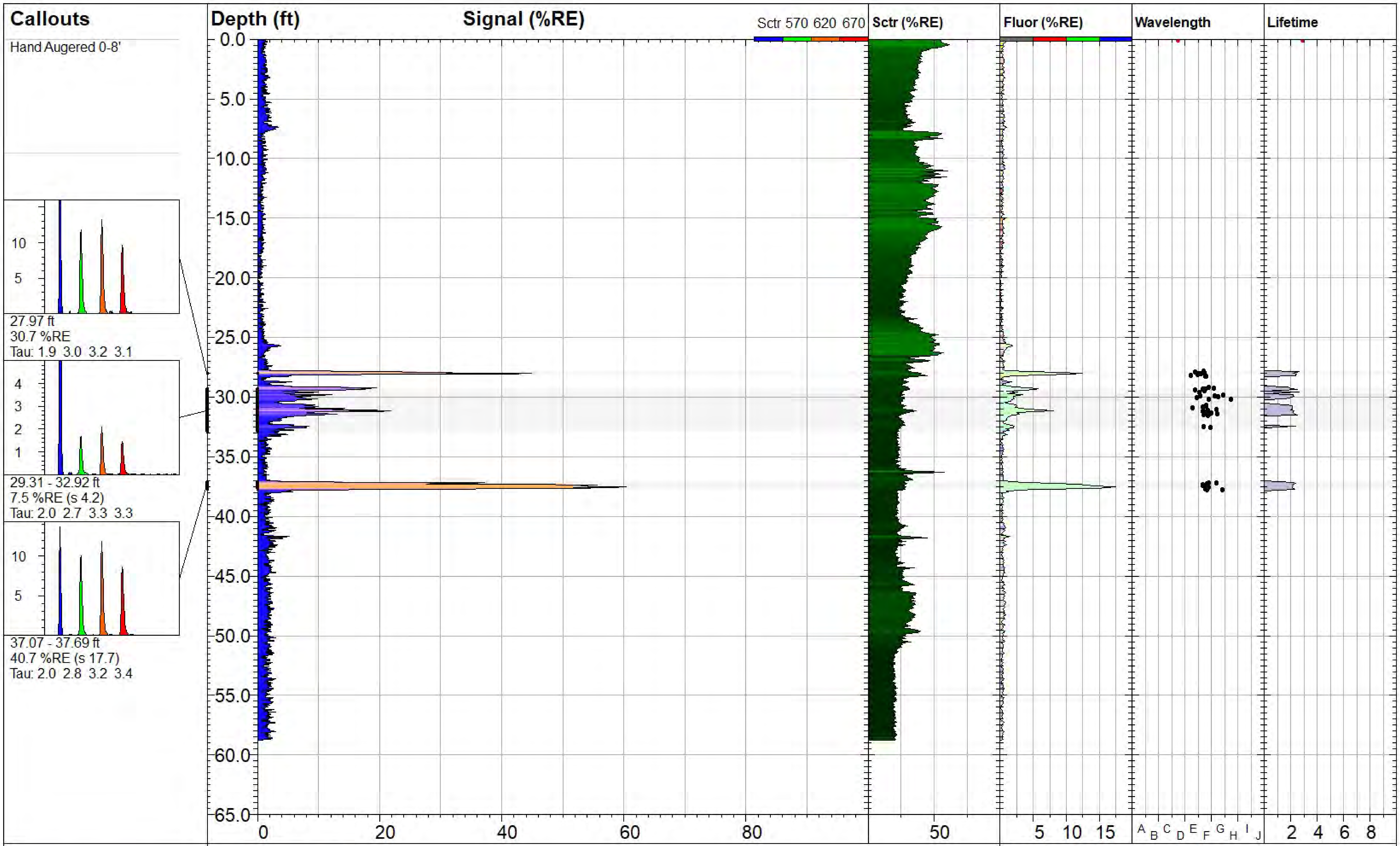
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.94 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **895.2 %RE @ 26.82 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-05 09:39 CST**

CPT-40a-19


RE
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.
C2: 283% / 26.2-29.0 ft
C4: 119% / 32.8-38.6 ft
C5: 28% / 39.4-42.0 ft



CPT-41-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.72 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **60.8 %RE @ 37.54 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-07 08:34 CST**

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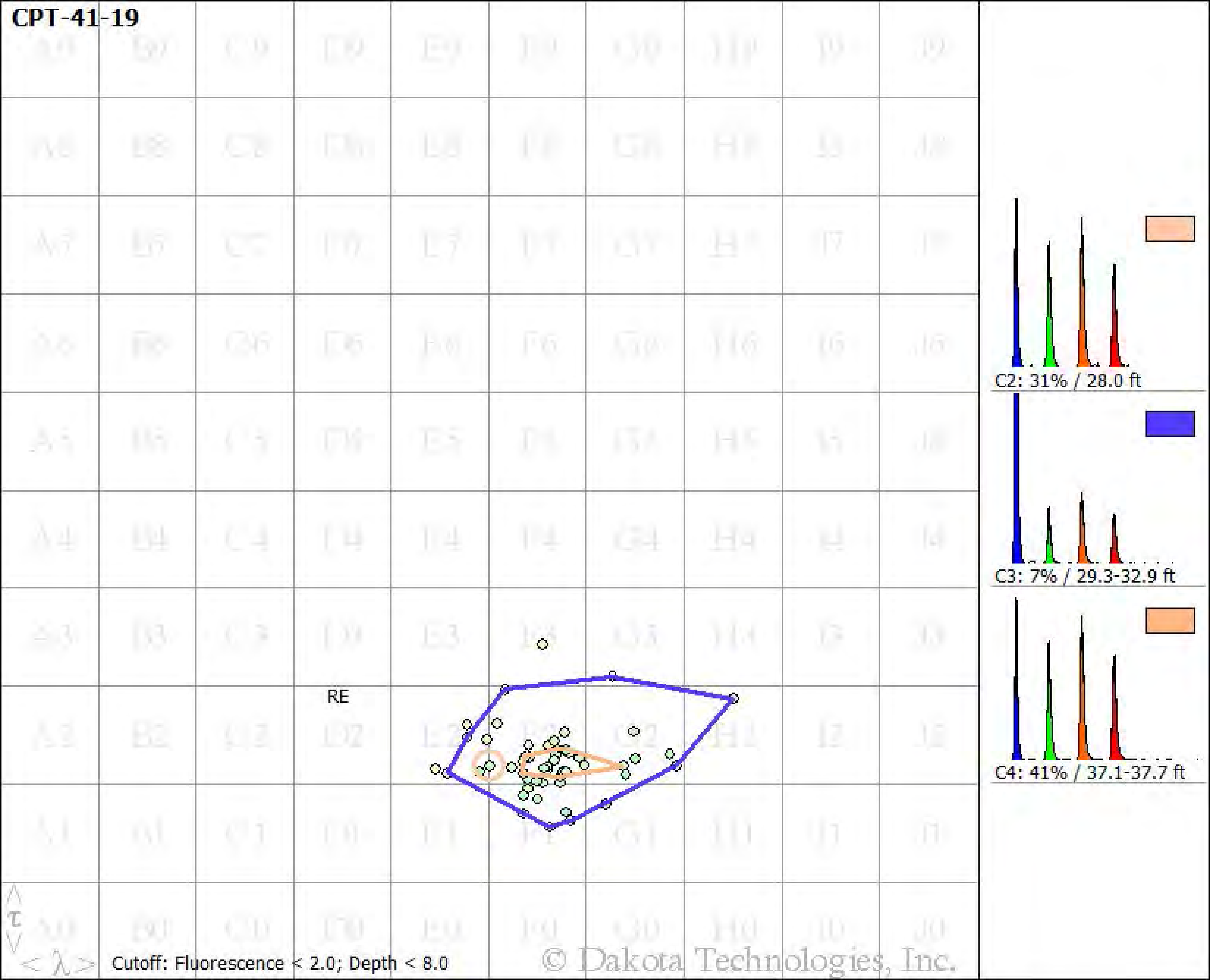
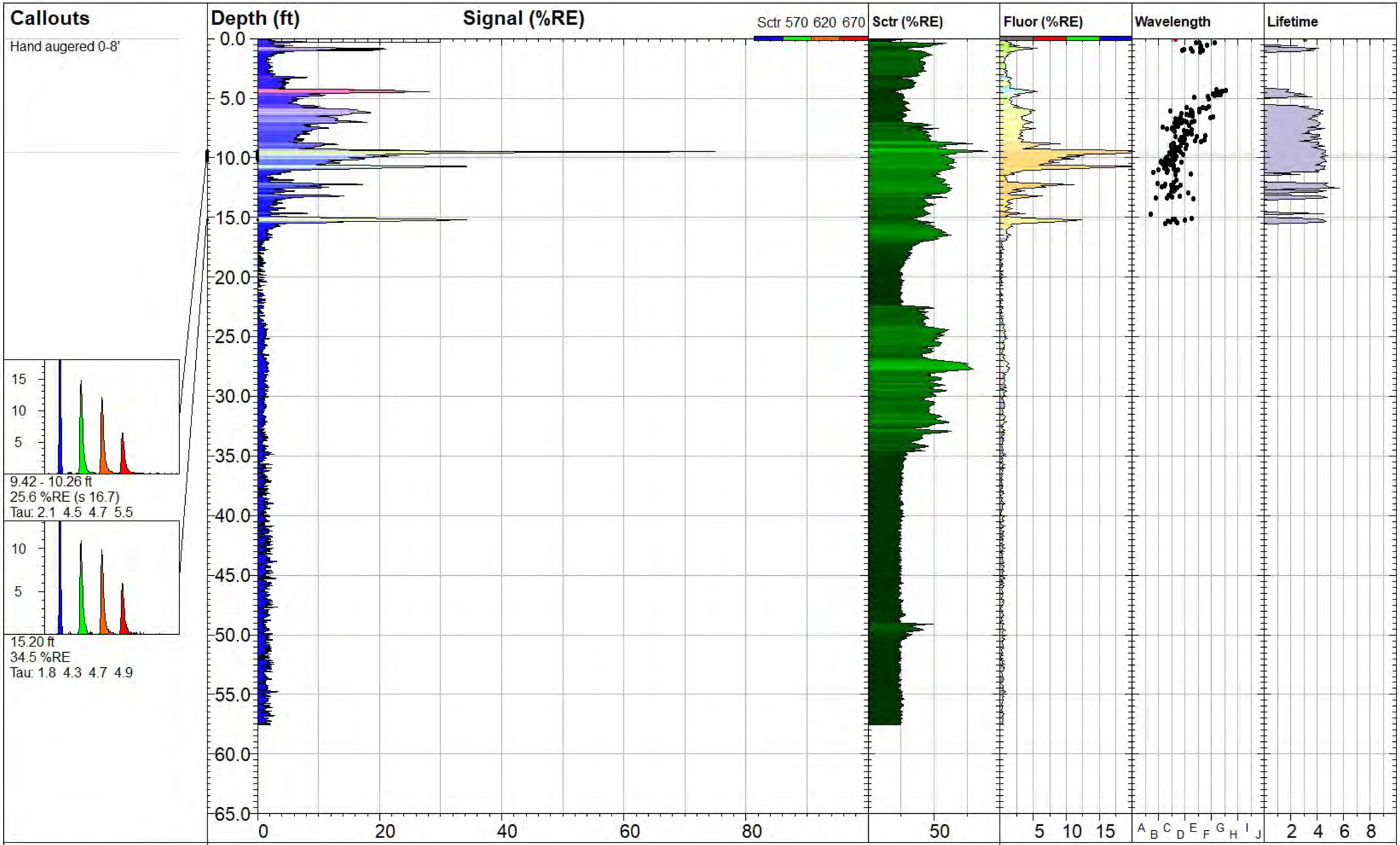
CPT-41-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



CPT-42-19

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Site:
Houston Wood Preserving Works

Y Coord.(Lat-N) / System:
Unavailable / NA

Final depth:
57.55 ft

Client / Job:
Golder /

X Coord.(Lng-E) / Fix:
Unavailable / NA

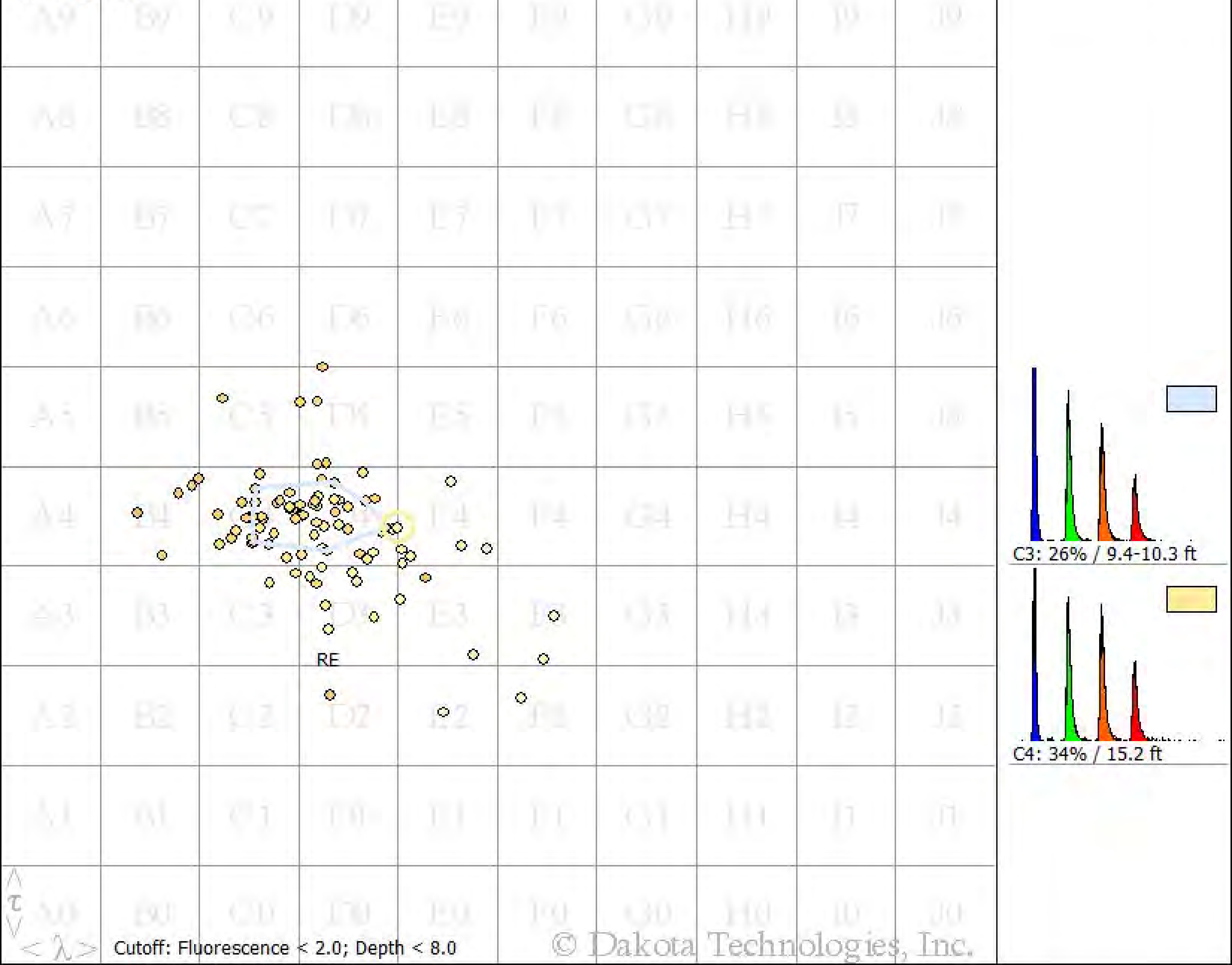
Max signal:
78.1 %RE @ 9.47 ft

Operator / Unit:
T. Rudolph / TG1807

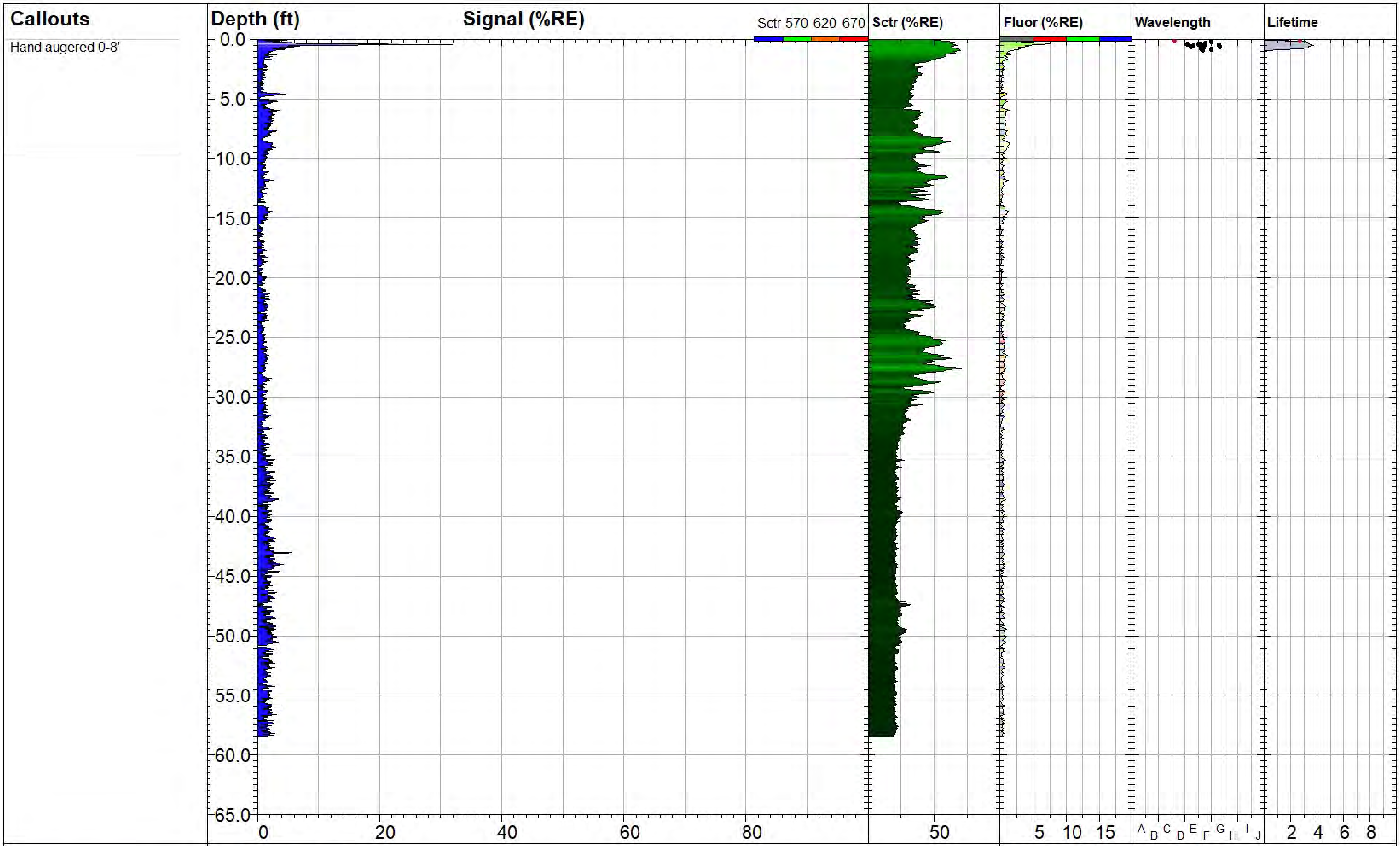
Elevation:
Unavailable

Date & Time:
2019-12-03 13:45 CST

CPT-42-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



Hand augered 0-8'

CPT-43-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.48 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **33.1 %RE @ 0.45 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-03 10:42 CST**

CPT-43-19

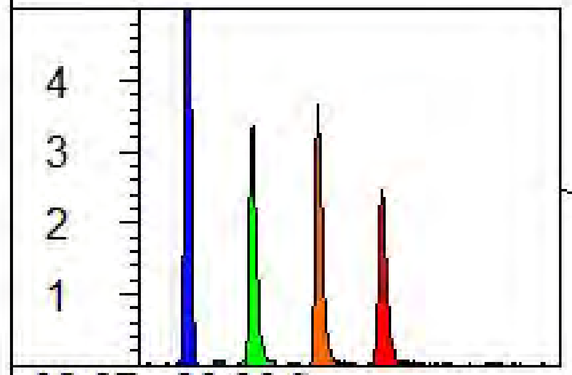
A9	B9	C9	D9	E9	F9	G9	H9	I9	J9
A8	B8	C8	D8	E8	F8	G8	H8	I8	J8
A7	B7	C7	D7	E7	F7	G7	H7	I7	J7
A6	B6	C6	D6	E6	F6	G6	H6	I6	J6
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5
A4	B4	C4	D4	E4	F4	G4	H4	I4	J4
A3	B3	C3	D3	E3	F3	G3	H3	I3	J3
A2	B2	C2	RE D2	E2	F2	G2	H2	I2	J2
A1	B1	C1	D1	E1	F1	G1	H1	I1	J1
A0	B0	C0	D0	E0	F0	G0	H0	I0	J0

^ τ v

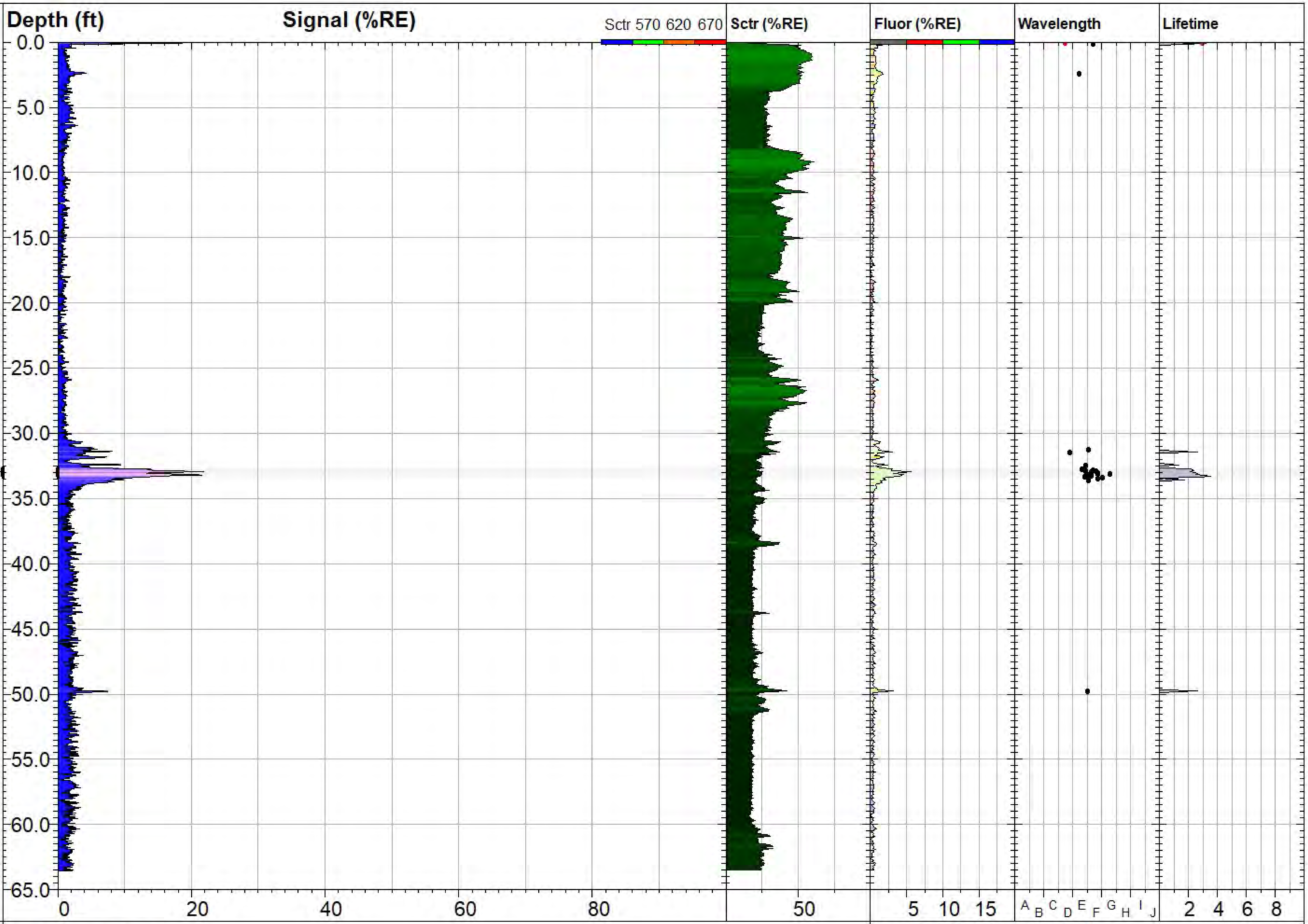
< λ > Cutoff: Fluorescence < 2.0; Depth < 8.0

Callouts

Hand Augered and backfilled with sand to 8' BGS



32.67 - 33.38 ft
15.6 %RE (s 4.1)
Tau: 1.8 2.7 3.4 3.5



CPT-44-19

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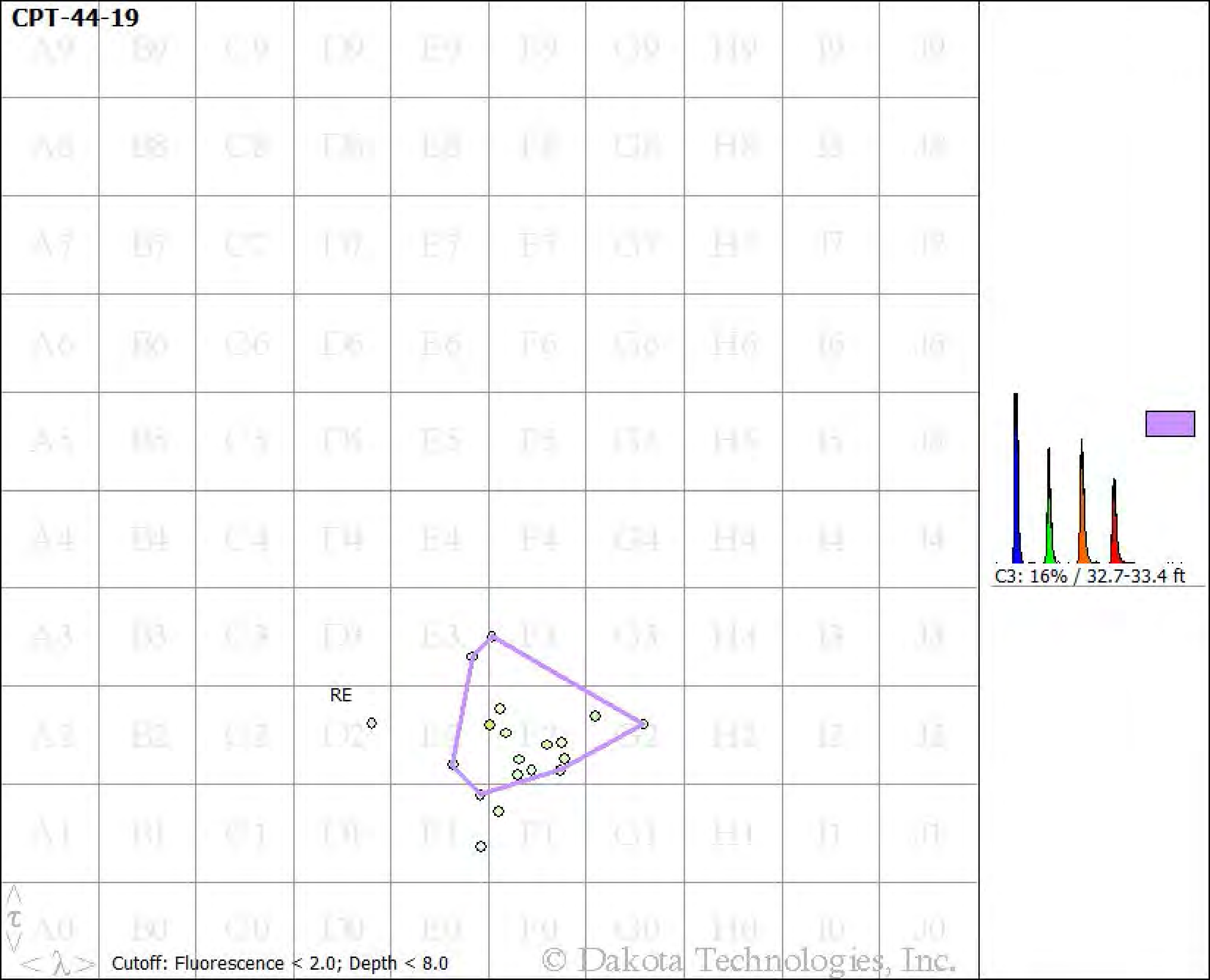
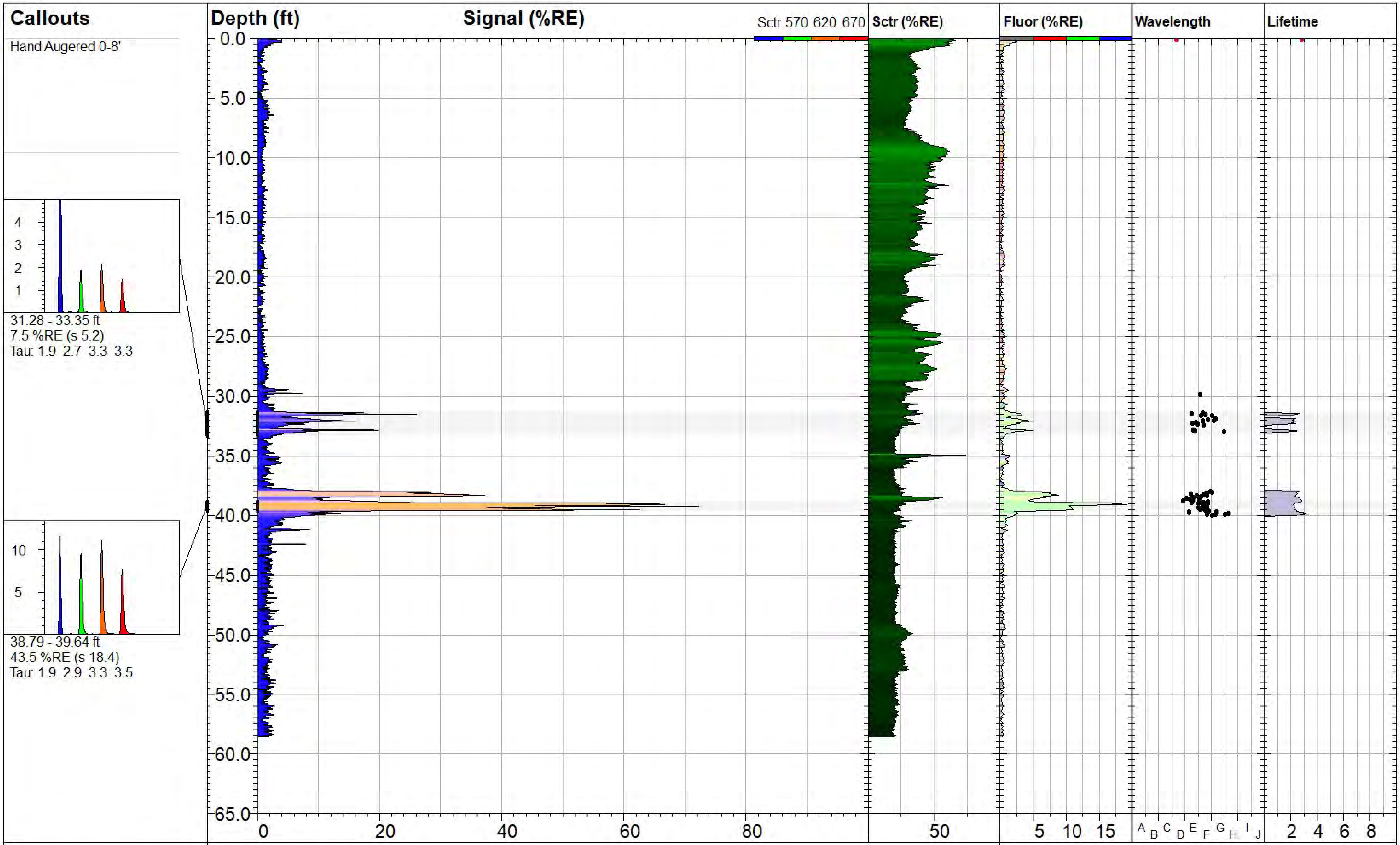
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **63.53 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **22.2 %RE @ 32.93 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-03 09:02 CST**

CPT-44-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



Hand Augered 0-8'

31.28 - 33.35 ft
7.5 %RE (s 5.2)
Tau: 1.9 2.7 3.3 3.3

38.79 - 39.64 ft
43.5 %RE (s 18.4)
Tau: 1.9 2.9 3.3 3.5

CPT-45-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **58.56 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **72.9 %RE @ 39.23 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-07 12:52 CST**

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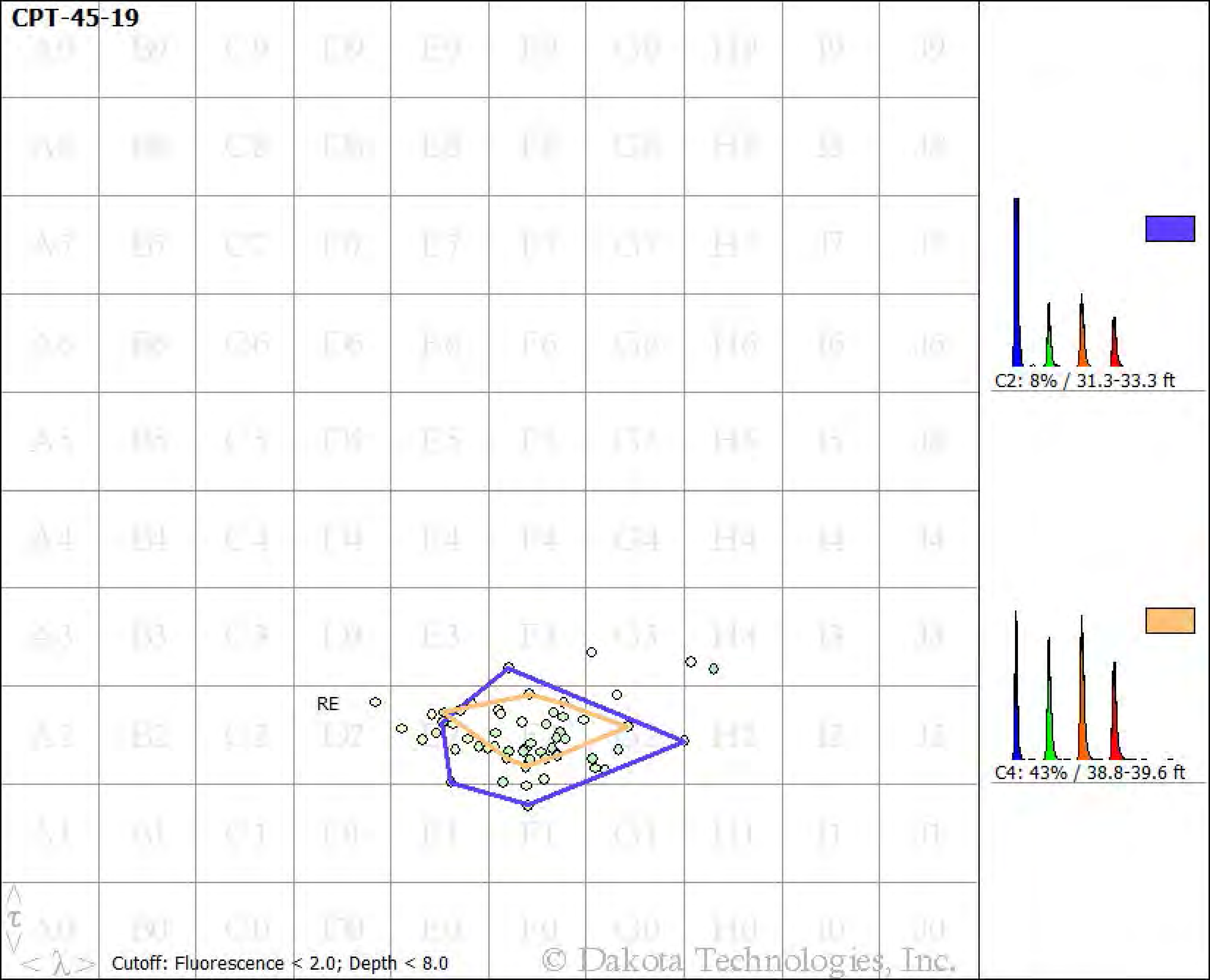
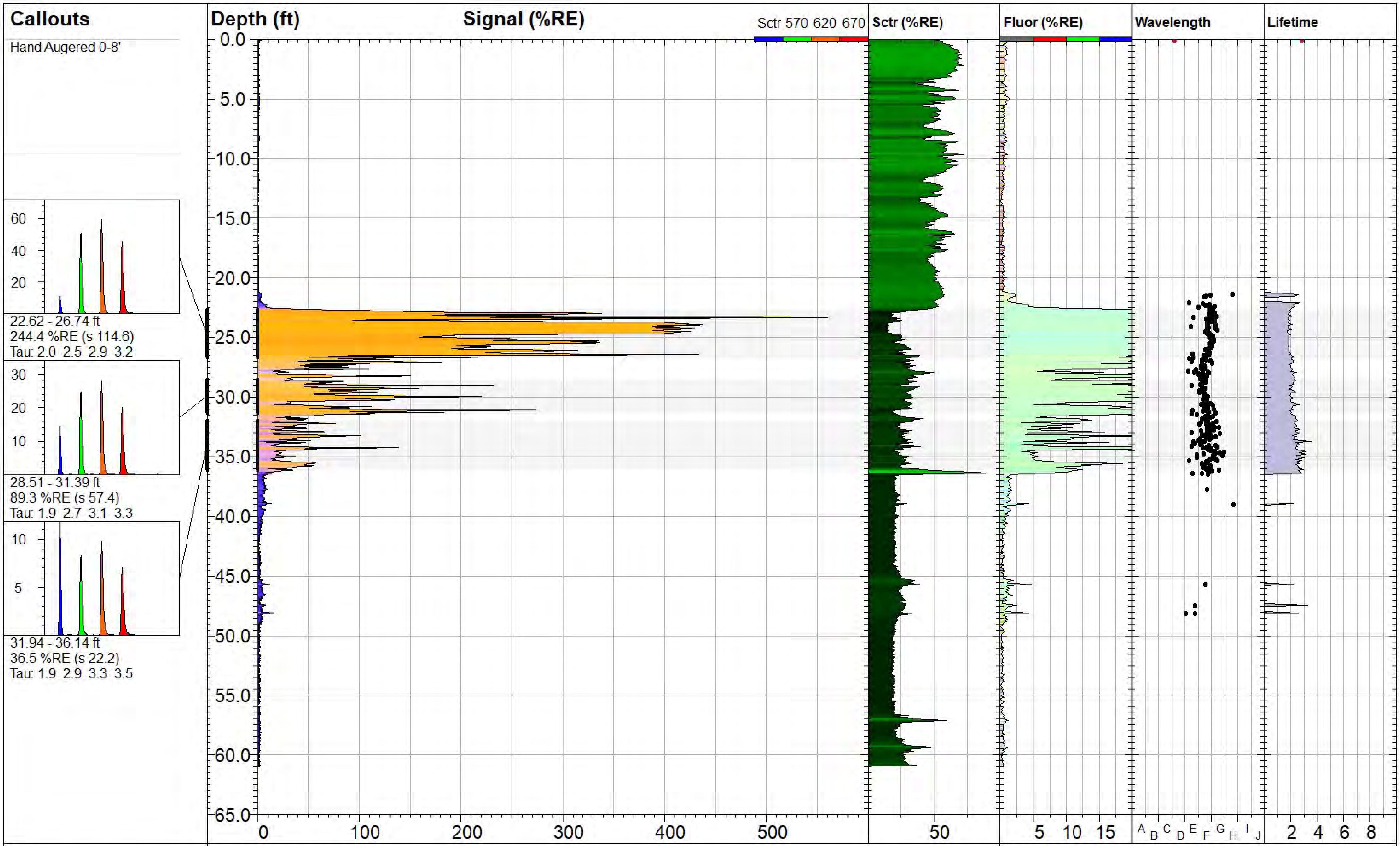

CPT-45-19
RE
C2: 8% / 31.3-33.3 ft
C4: 43% / 38.8-39.6 ft
< τ >
< λ >
Cutoff: Fluorescence < 2.0; Depth < 8.0
© Dakota Technologies, Inc.



CPT-46-19

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Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **60.98 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **569.8 %RE @ 23.33 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-07 10:08 CST**

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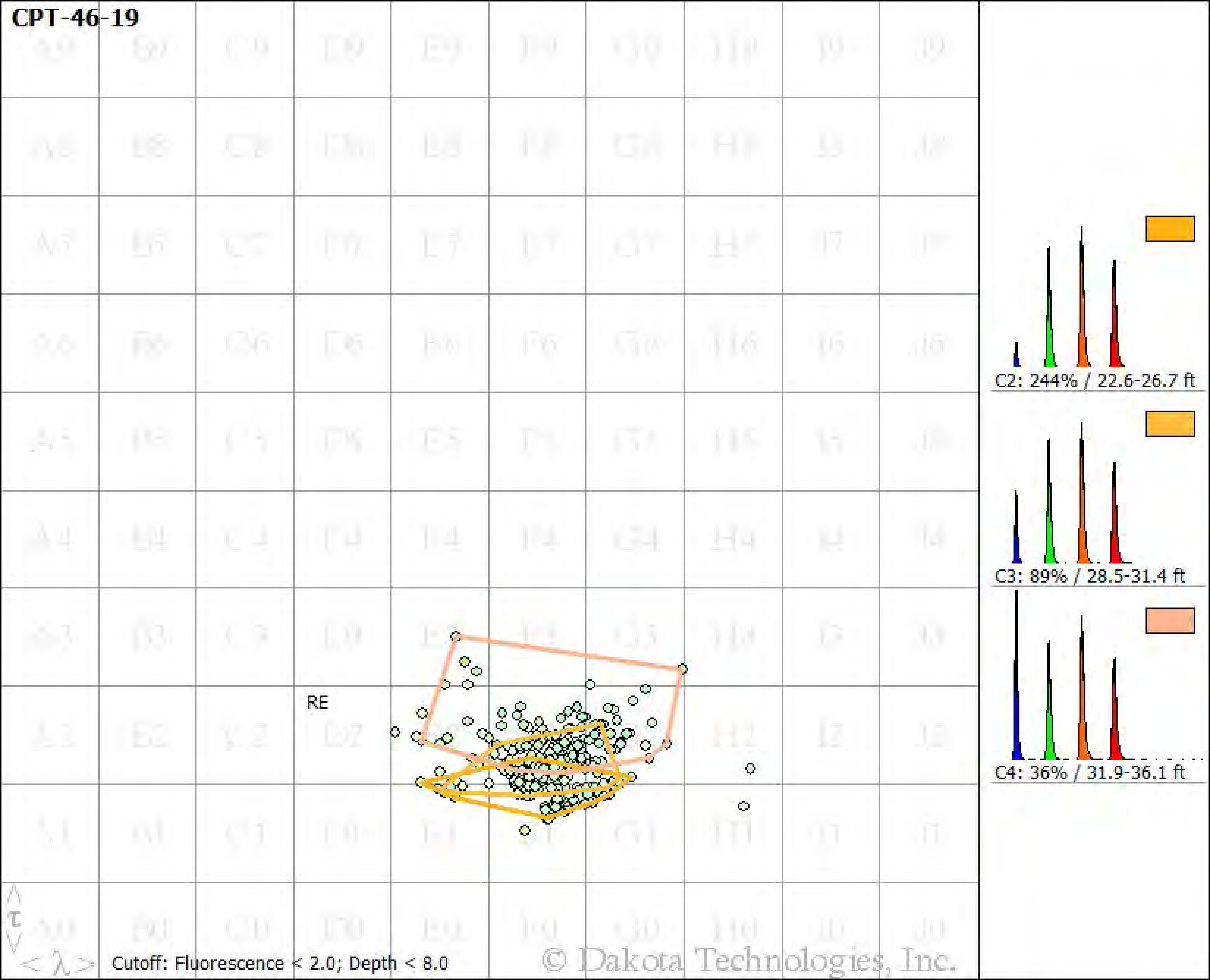
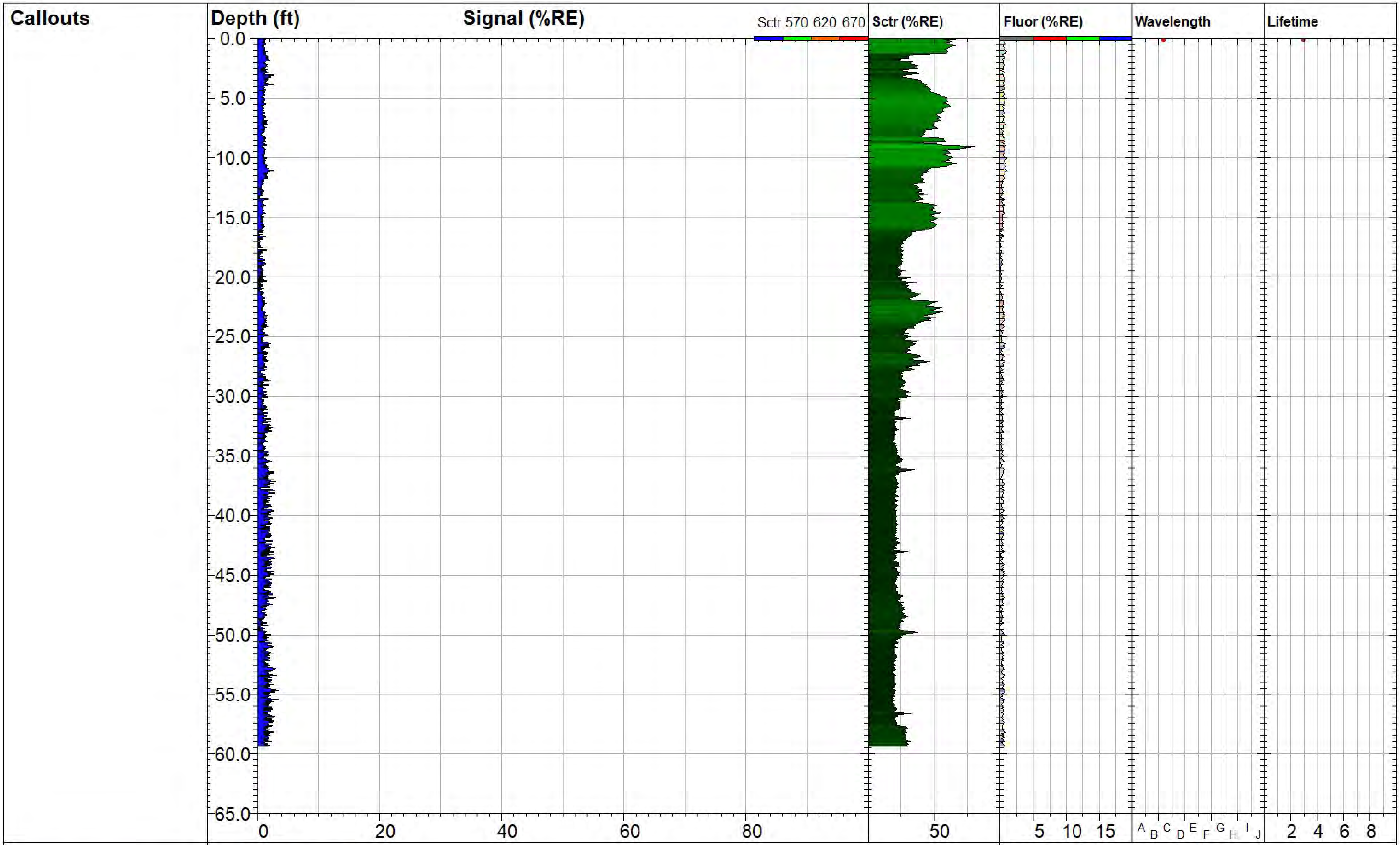


C2: 244% / 22.6-26.7 ft

C3: 89% / 28.5-31.4 ft

C4: 36% / 31.9-36.1 ft

Cutoff: Fluorescence < 2.0; Depth < 8.0



CPT-48-19

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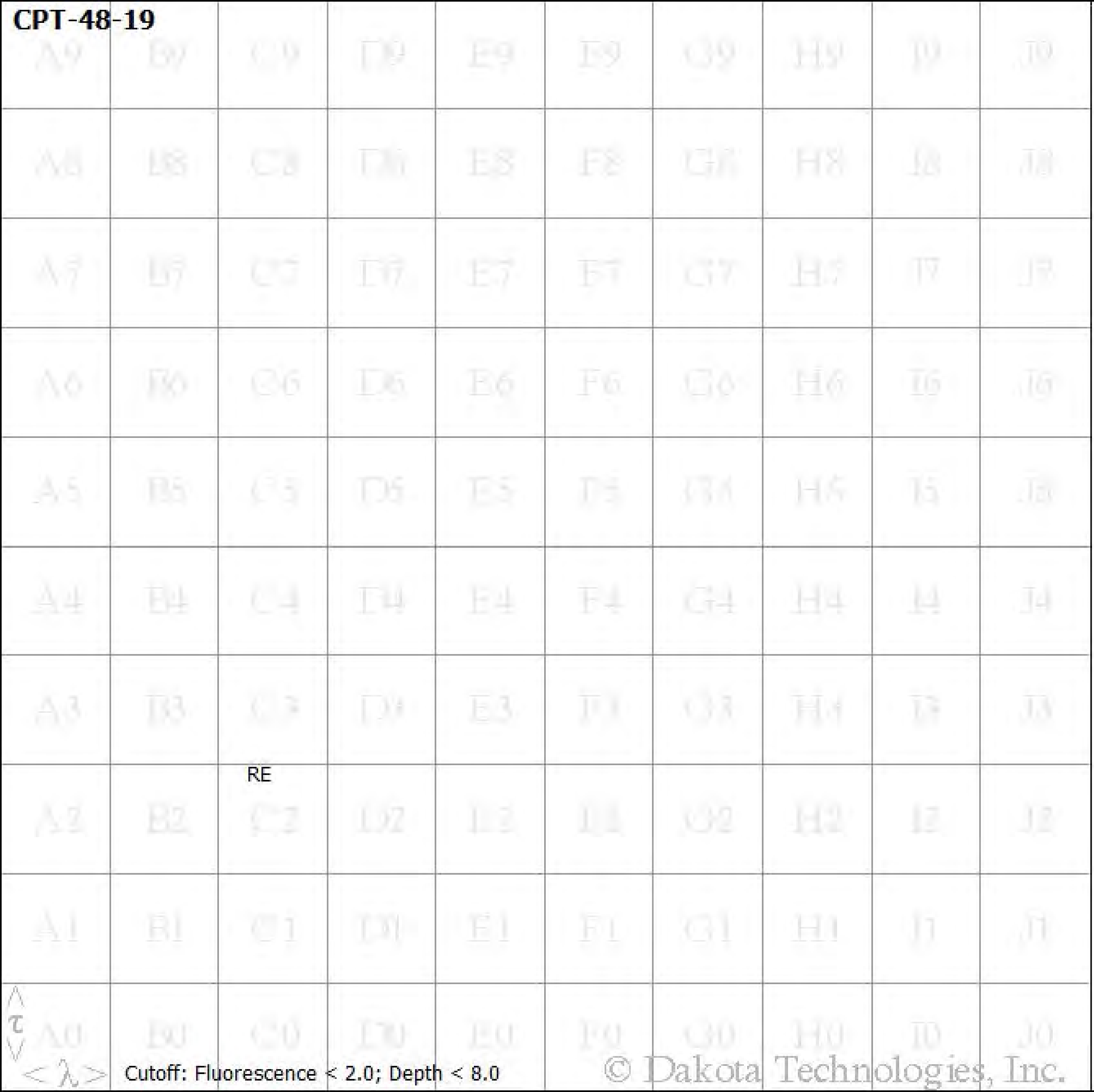
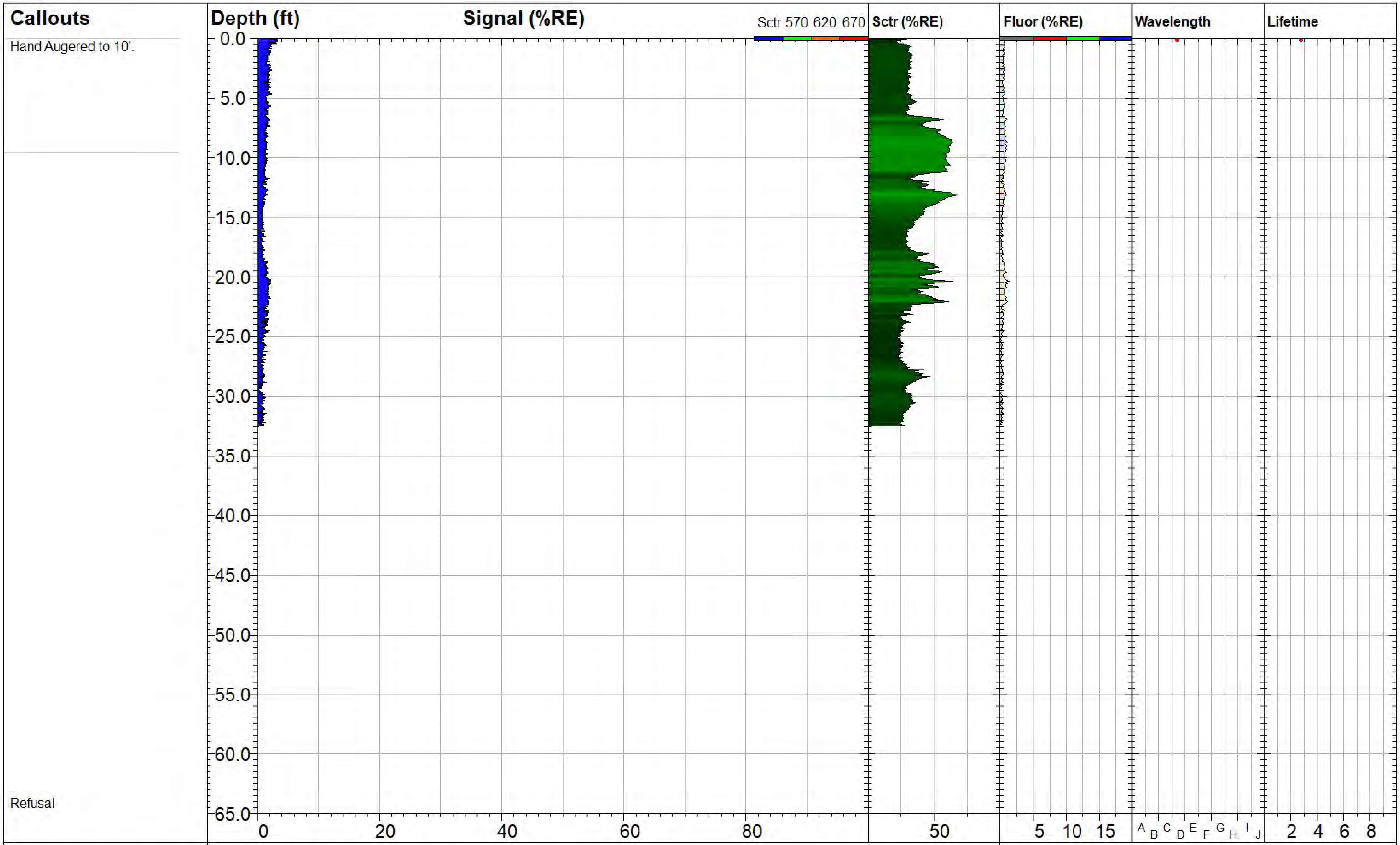
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **59.35 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.9 %RE @ 55.45 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-08 13:49 CST**

CPT-48-19



Cutoff: Fluorescence < 2.0; Depth < 8.0



CPT-54-20

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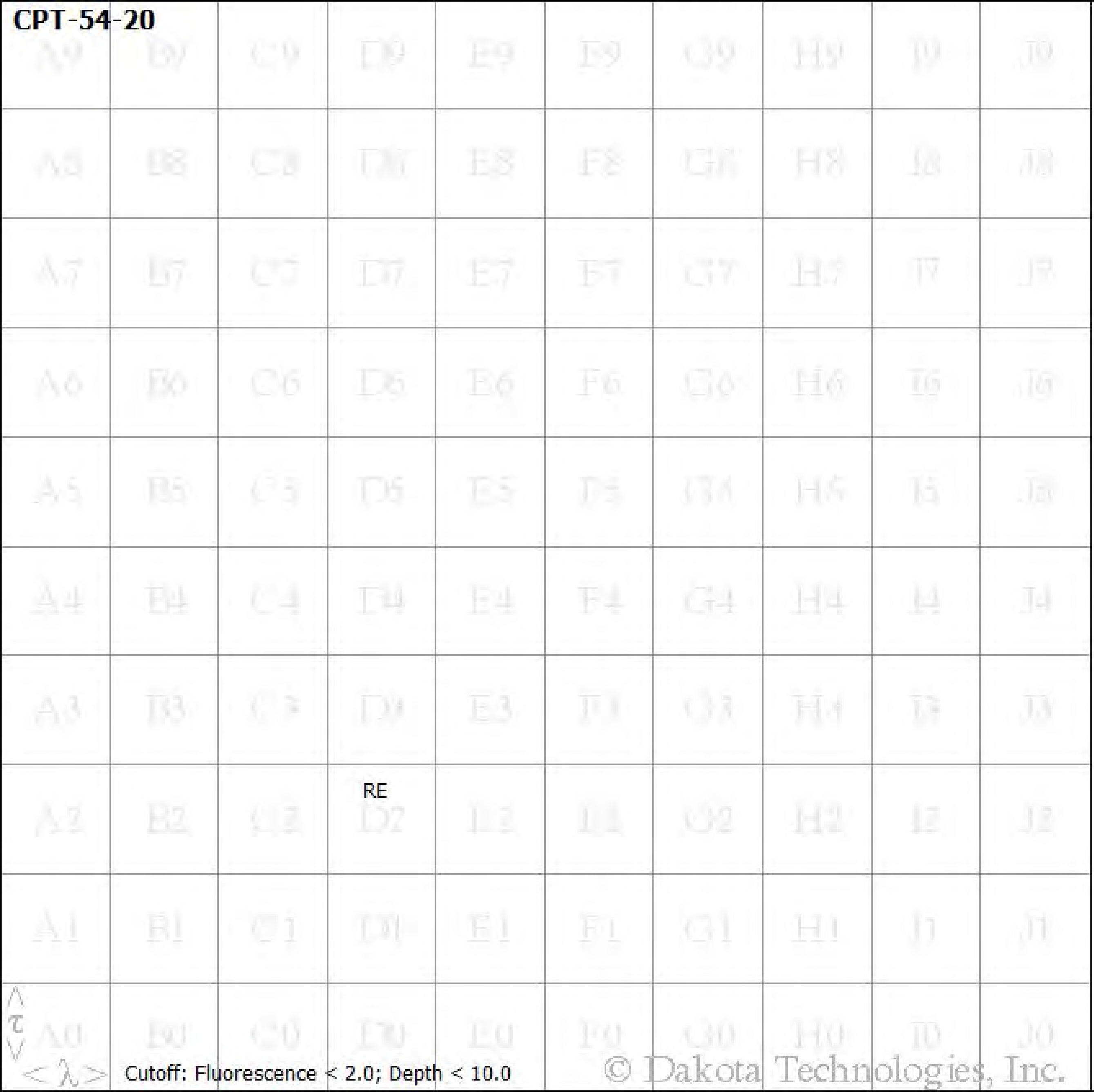
Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **32.48 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **3.3 %RE @ 0.13 ft**
Operator / Unit: **D. Thompson / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2020-01-21 13:56 CST**

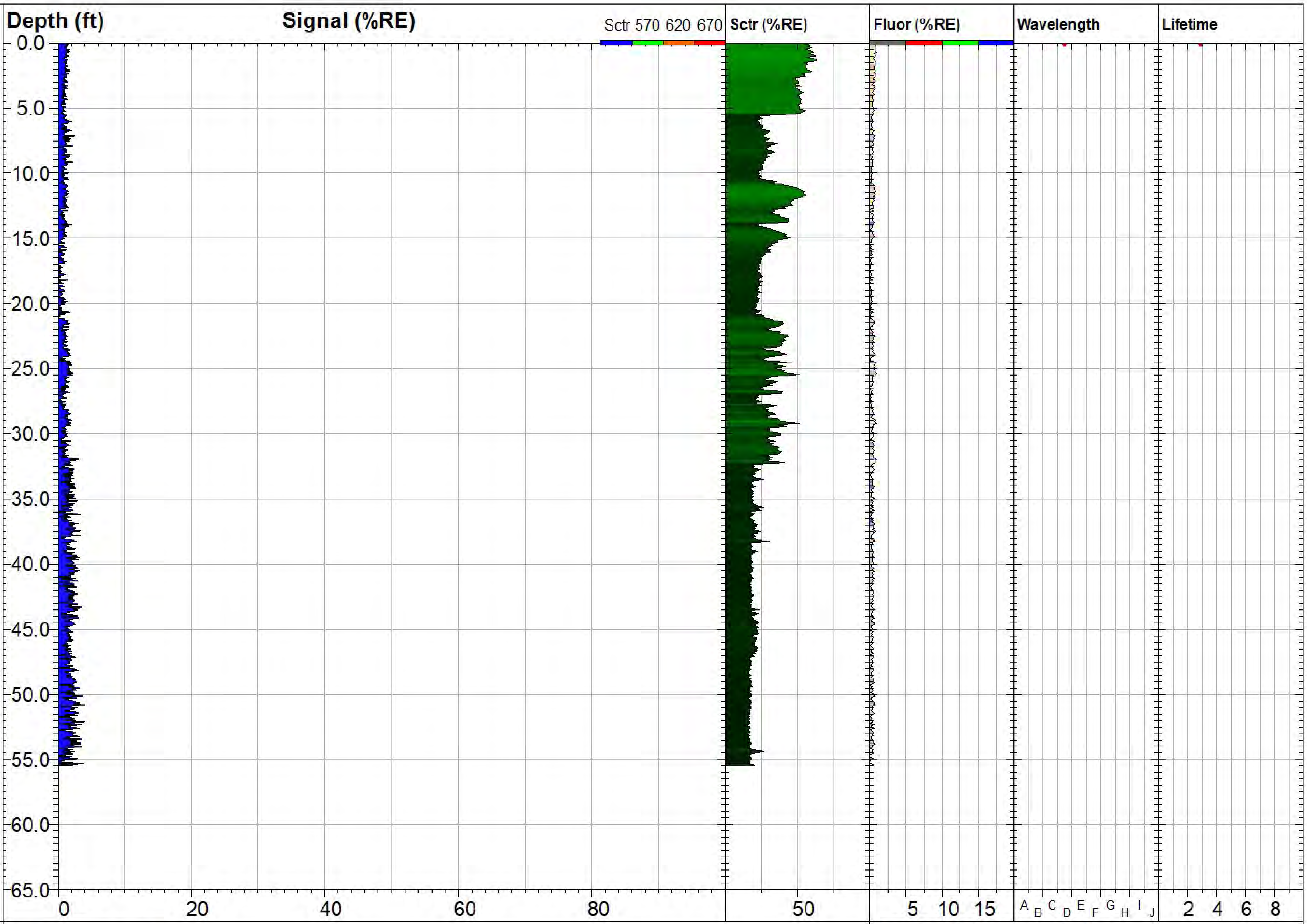
CPT-54-20



Cutoff: Fluorescence < 2.0; Depth < 10.0

Callouts

Hand Augered 0-8'



CPT-55-19

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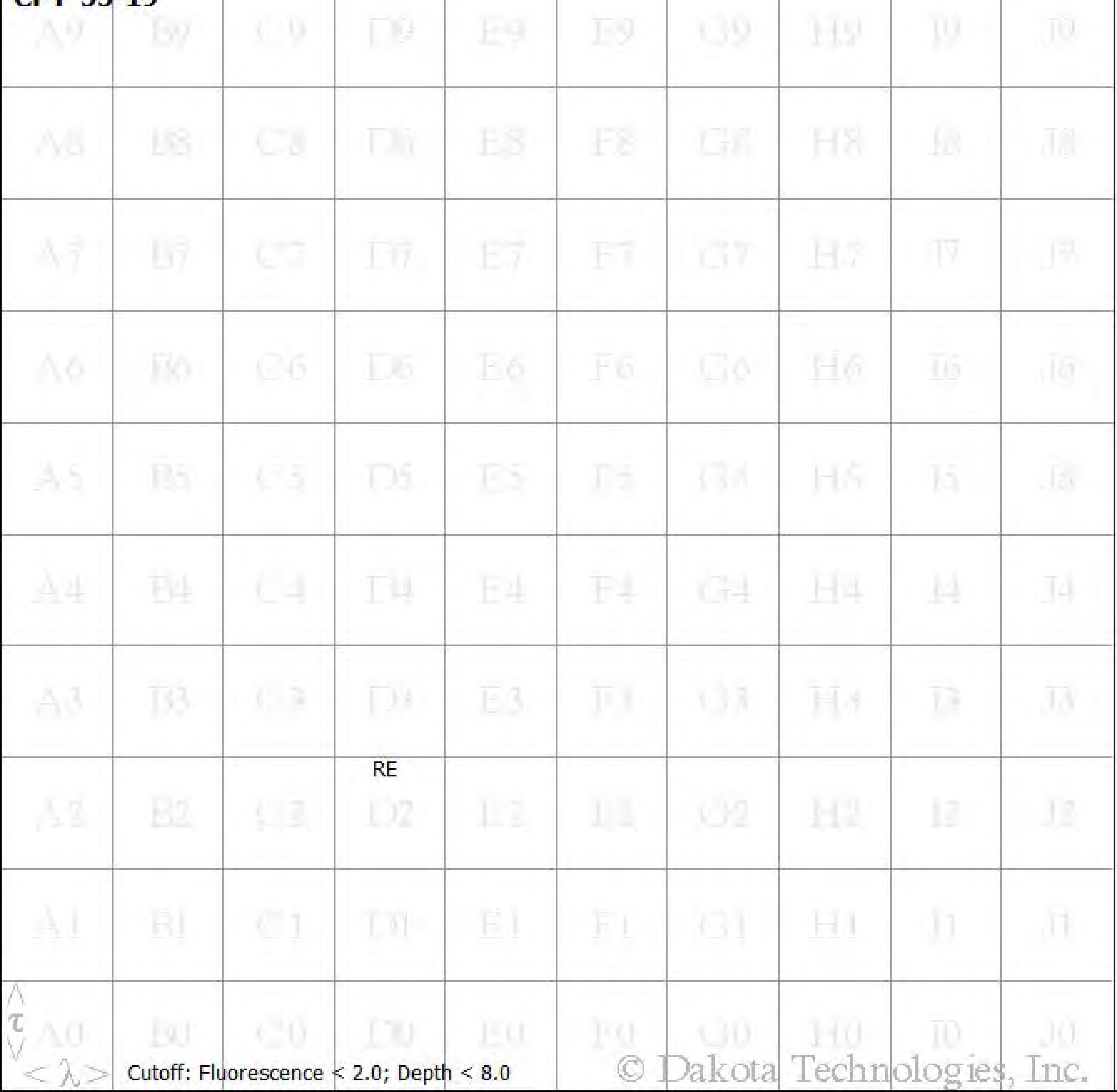
www.DakotaTechnologies.com

Site: **Houston Wood Preserving Works**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **55.48 ft**
Client / Job: **Golder /**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.1 %RE @ 52.13 ft**
Operator / Unit: **T. Rudolph / TG1807**	*Elevation:* **Unavailable**	*Date & Time:* **2019-12-08 08:13 CST**

CPT-55-19



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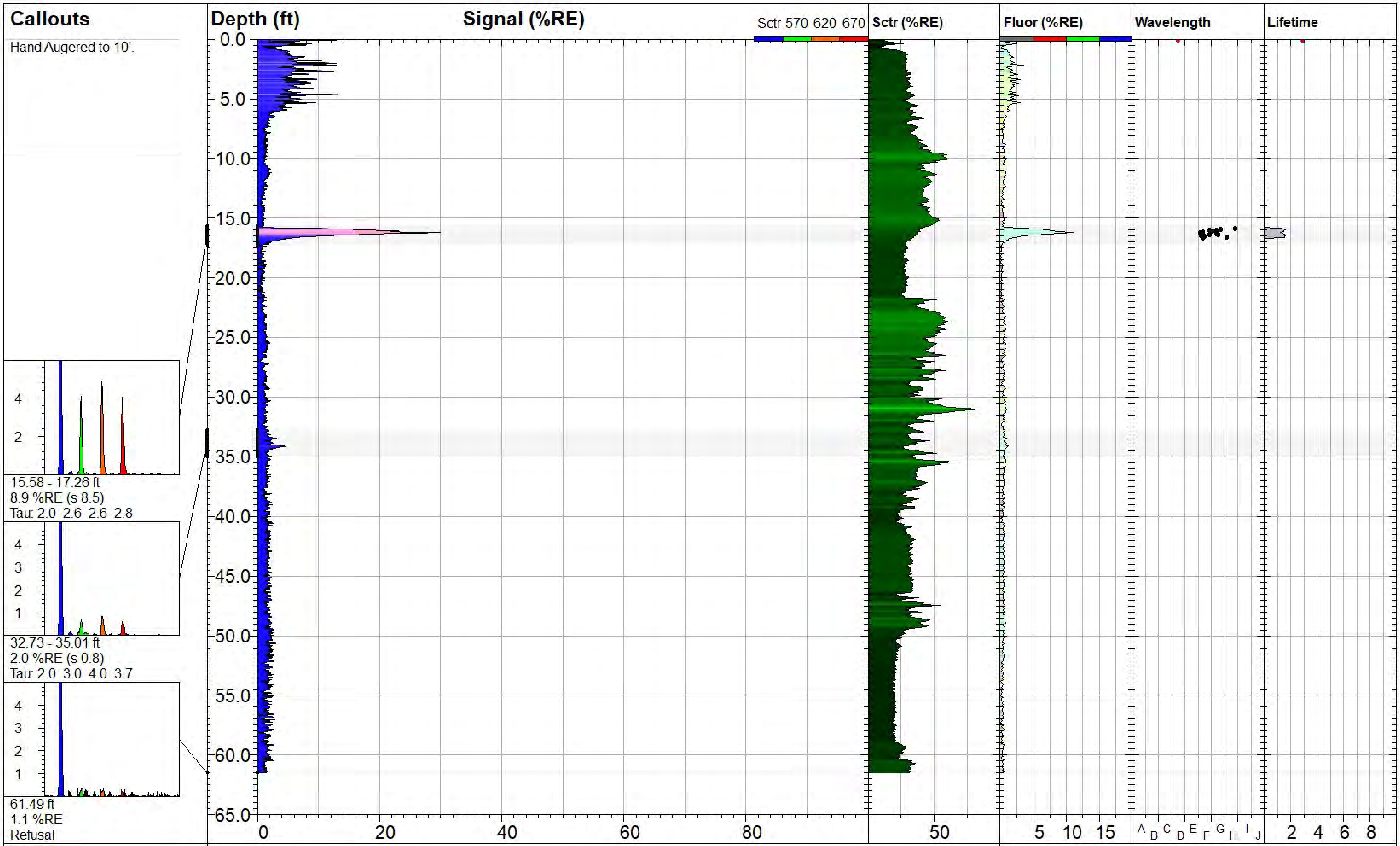

Hand Augered to 10'.

15.58 - 17.26 ft
8.9 %RE (s 8.5)
Tau: 2.0 2.6 2.6 2.8

32.73 - 35.01 ft
2.0 %RE (s 0.8)
Tau: 2.0 3.0 4.0 3.7

61.49 ft
1.1 %RE
Refusal

CPT-56-20

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Site:
Houston Wood Preserving Works

Client / Job:
Golder /

Operator / Unit:
D. Thompson / TG1807

Y Coord.(Lat-N) / System:
Unavailable / NA

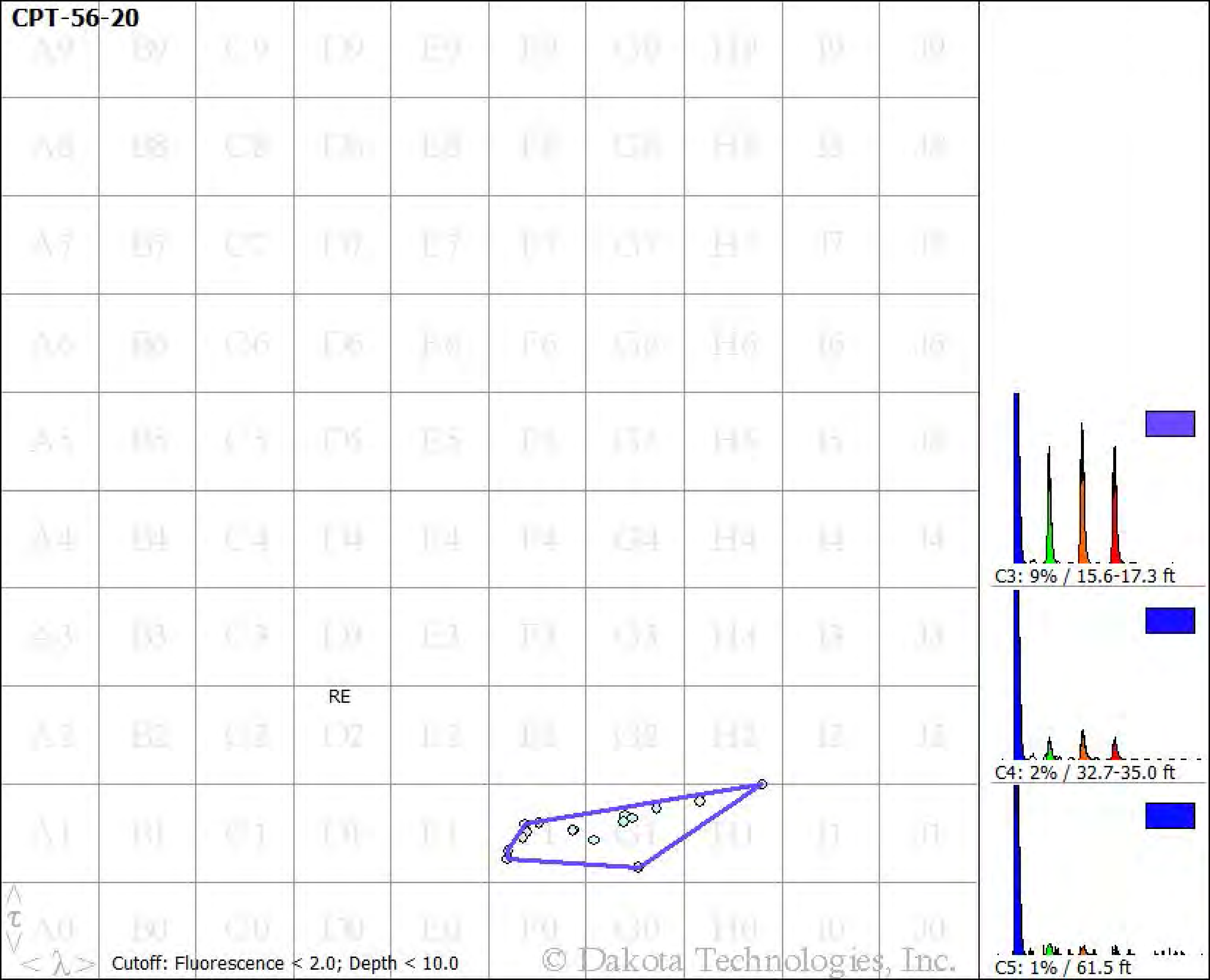
X Coord.(Lng-E) / Fix:
Unavailable / NA

Elevation:
Unavailable

Final depth:
61.49 ft

Max signal:
30.1 %RE @ 16.21 ft

Date & Time:
2020-01-27 09:11 CST


CPT-56-20
RE
C3: 9% / 15.6-17.3 ft
C4: 2% / 32.7-35.0 ft
C5: 1% / 61.5 ft
τ
λ
Cutoff: Fluorescence < 2.0; Depth < 10.0
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Appendix B

TarGOST Reference Log

DAKOTA TECHNOLOGIES

TARGOST REFERENCE

2013-08-09

Main Plot :
Signal (total fluorescence) versus depth where signal is relative to the Reference Emitter (RE). For TarGOST data, the signal is scatter corrected due to tar's non-linear fluorescence with increasing concentration. The fill color is based on relative contribution of each channel's area to the total waveform area (see callout waveform). The channel-to-color relationship and corresponding center wavelengths are given in the upper right corner of the main plot. For TarGOST data, the first channel (blue) is always representative of the scatter.

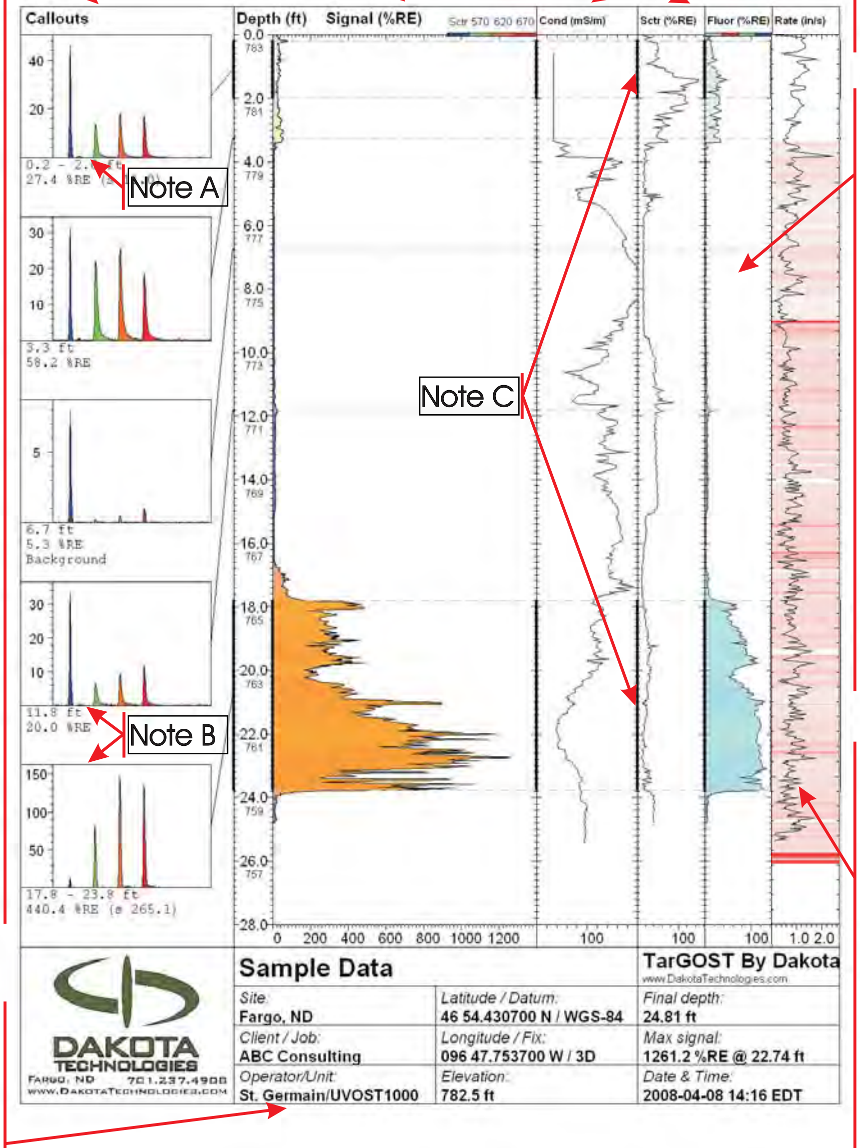
Callouts :
Waveforms from selected depths or depth ranges showing the full mullti-wavelength waveform for that depth.

Each colored area peak is due to light at the four wavelengths. These four peaks / wavelengths are often referred to as channels.

Various products will have a unique waveform fingerprint due to the relative amplitude of the four channels or broadening of one or more channels in the time-domain.

Basic waveform statistics and any operator notes are given below the callout.

Info Box :
Contains pertinent log info including name and location.



Sample Data

TarGOST By Dakota
www.DakotaTechnologies.com

Site: Fargo, ND	*Latitude / Datum:* 46 54.430700 N / WGS-84	*Final depth:* 24.81 ft
Client / Job: ABC Consulting	*Longitude / Fix:* 096 47.753700 W / 3D	*Max signal:* 1261.2 %RE @ 22.74 ft
Operator/Unit: St. Germain/UVOST1000	*Elevation:* 782.5 ft	*Date & Time:* 2008-04-08 14:16 EDT

Conductivity Plot :
The Electrical Conductivity (EC) of the soil can be logged simultaneously with the TarGOST data. EC often provides insight into consolidated versus unconsolidated stratigraphy.

Scatter Plot :
Scatter versus depth where intensity is relative to the scatter level of the Reference Emitter.

Fluorescence Plot :
A plot of the fluorescence signal alone versus depth. The scatter channel is not used in the calculation of signal intensity or coloring. Note the coloring key at the top of the plot. Intensity unit is percent of Reference Emitter fluorescence. Varying soil or product can often be visually pulled-out from the background based on the fill color of this plot if scatter dominates the color of the main plot.

Rate Plot :
The rate of probe advancement. Less than 0.8in (2cm) per second is preferred.
The red fill is the hammer counts, the number of strikes used to advance the probe. The rate and hammer counts can be indicative of various soil conditions.

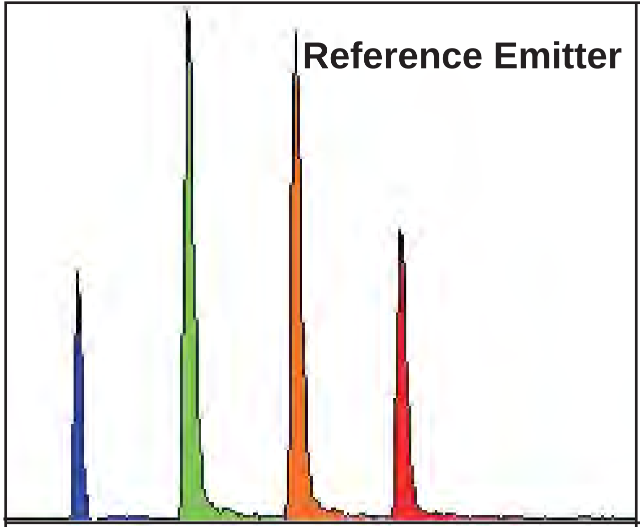
Note A :
Time is along the x axis. No scale is given, but it is constant and is roughly 250ns wide.

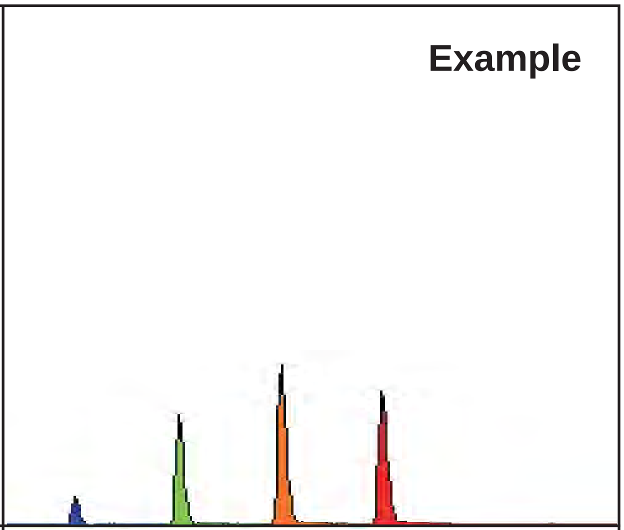
The y axis is in mV and directly corresponds to the amount of light striking the photodetector.

Note B :
These two waveforms show two different products, each with a unique waveform.

Note C :
The top zone has moderate fluorescence, but high scatter while the bottom zone has high fluorescence and low scatter. Note how this impacts the main signal plot.

Waveform Signal Calculation





Channel	Sctr	CH2		CH3		CH4		Fluor		**Total%**
Area (pVs)	255	785	+	772	+	462	=	2019	»	**100/100**
Percent RE	100	38.9		38.2		22.9		100		**100%**

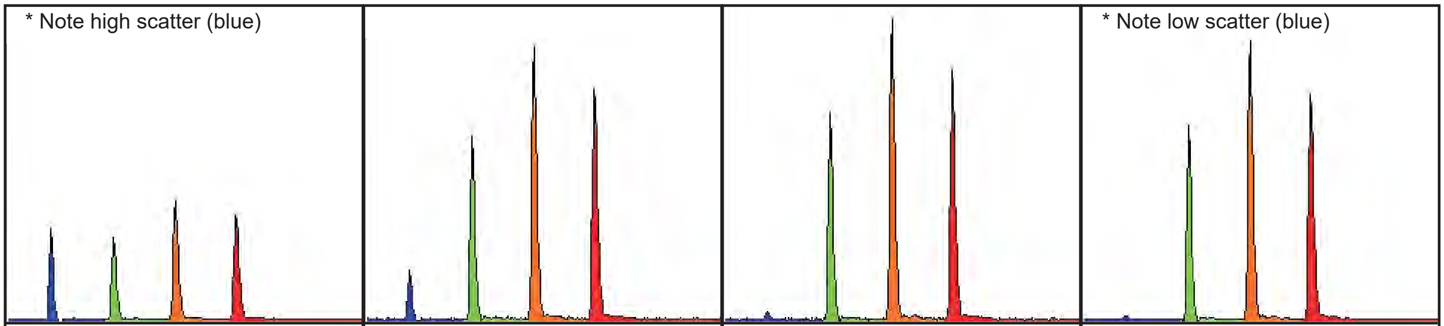
Channel	Sctr	CH2		CH3		CH4		Fluor		**Total%**
Area (pVs)	36	153	+	244	+	226	=	623	»	**31/14**
Percent RE	14.1	7.6		11.1		11.2		31		**219%**

Data Files

***.lif.raw.bin**	Raw data file. Header is ASCII format and contains information stored when the file was initially written (e.g. date, total depth, max signal, gps, etc., and any information entered by the operator). All raw waveforms are appended to the bottom of the file in a binary format.
***.lif.plt**	Stores the plot scheme history (e.g. callout depths) for associated Raw file. Transfer along with the Raw file in order to recall previous plots.
***.lif.jpg**	A jpg image of the OST log including the main signal vs. depth plot, callouts, information, etc.
***.lif.dat.txt**	Data export of a single Raw file. Tab delimited format. No string header is provided for the columns to make importing into some programs easier. Each row is a unique depth reading. The columns are: 1-Depth; 2-Total Signal (%RE); 3-Ch1%; 4-Ch2%; 5-Ch3%; 6-Ch4%; 7-Rate; 8-EC Depth; 9-EC Signal; 10-Hammer Rate Depth; 11-Hammer Rate; 12-Color (RRGGBB).
***.lif.sum.txt**	A summary file for a number of Raw files. ASCII tab delimited format. The file contains a string header. The summary includes one row for each Raw file and contains information for each file including: the file name, gps coordinates, max depth, max signal, and depth at which the max signal occured.

Non-Linear Fluorescence

Due to self-absorption, fluorescence levels (channels 2-4) are not linear with concentration, requiring the use of scatter (channel 1) correction. Creosote on sand, y-axis scaling is equal.



1,000ppm (60%RE) | **10,000ppm (215%RE)** | **100,000ppm (935%RE)** | **Neat (1925%RE)**

Appendix C

TarGOST Guide

DAKOTA
TECHNOLOGIES

TarGOST® Guide

TarGOST®

Tar-specific Green Optical Screening Tool

User Guide

DAKOTA
TECHNOLOGIES

Version 1.1506

Table of Contents

2010-04-22

A Introduction

The Tar-specific Green Optical Screening Tool (TarGOST®) is a laser-induced fluorescence (LIF) screening tool that is specifically designed to detect non-aqueous phase liquid (NAPL) in the subsurface. It responds almost exclusively to NAPLs found at former manufactured gas plants (MGPs) and wood-treating (creosote/pentachlorophenol) sites. It does this by sensing the fluorescence of polycyclic aromatic hydrocarbons (PAHs) and any other fluorescent molecules found in MGP and creosote LNAPLs and DNAPLs. TarGOST is a modified version of Ultra-Violet Optical Screening Tool (UVOST®). Dakota developed the UVOST early in the 1990's with U.S. Air Force funding. The UVOST platform is a mature technology that has been applied at hundreds of petroleum, oil, and lubricant (POL) contaminated sites in the U.S., Europe, and Japan since 1994. TarGOST has been in commercial use since March 2003.

B Principles of Operation

B.1 Components

The following gives an introduction to the basic components of the system.

- **Laser**

  The laser is up-hole and produces concentrated light of one narrow range of wavelengths. For TarGOST, the laser produces short (5 billionths of a second) pulses green light, as opposed to Dakota's UVOST system that uses an ultra-violet laser for excitation.

- **Fiber-Optic Cable**

  The fiber-optic cable is a robust plastic coated metal conduit that houses two fiber optic cables and the wires for the conductivity measurement. This cable is strung through the probe rods prior to field activities. One fiber carries the laser down to the probe while the other returns scattered laser and fluorescent light.

- **Shock Protected Optical Chamber (SPOC)**

The distal end of the fiber optic cable attaches to the SPOC. The SPOC houses a mirror that turns the light and a sapphire window. Light passes through the window and strikes the soil in immediate contact with the window. The resulting scattered and fluorescent light is sent up-hole for measurement. The SPOC has channels that allow the conductivity wiring to pass through to the dipole tip at the bottom of the assembly.

- **Spectrometer**

The TarGOST's custom spectrometer divides the returning light into four distinct wavelength (or color) bands and converts the light into a corresponding electrical current where the current amplitude is proportional to the light amplitude.

- **Analog to Digital Converter**

The A/D converter produces an averaged digital signal from the current provided by spectrometer that can be read by the computer software.

- **Conductivity**

The electrical conductivity of the soil can be logged simultaneously with the LIF information.

- **Depth Meter and Hammer Rate**

Depth is tracked by a string potentiometer system on the direct push equipment to insure that the optical data is tagged with its proper depth. Data density is generally less than one inch. We can also track our Hammer Rate when using a percussion delivery platform.

- **Computer and Software**

All data is logged using Dakota's proprietary Optical Screening Tool (OST) software running on a Windows platform. We use ruggedized field laptops.

B.2 Laser-Induced Fluorescence

The TarGOST system is, in its simplest sense, a front-face fluorometer that is coupled via fiber optics to a sapphire-windowed probe that is advanced into the ground.

> A front-face fluorometer is a device that shines excitation light onto, and collects emission from, the same surface. This is different from conventional fluorometers, which operate with the excitation and emission beams at 90° and usually involve clear liquid analytes.

The TarGOST system makes continuous measurements of the soil matrix as the windowed probe is pushed slowly into the subsurface.

> The measurements are made hundreds of times each second. Each individual measurement begins with a pulse of laser excitation light being launched into one of two optical fibers that are strung through the drill/push rod string. As the rod is advanced into the subsurface, the very fast pulses of laser light (nanoseconds in duration) are directed out the sapphire window and onto the soil surface that is pressed very firmly against the outside of the window.
>
> Pulses of laser light strike whatever is present just outside the surface of the window. Most of the laser light is simply reflected by the soil matrix. However, if oil-like material (OLM) or tar-like material (TLM) containing PAHs (or other fluorescent molecules) are present, the PAHs that exist in these NAPLs absorb some of the light and are driven into an electronically excited state. When these PAHs eventually return to the ground state (this typically takes less than 10 ns), a portion of the PAHs emit red-shifted light (longer wavelength light than the excitation laser). Some of this fluorescence, along with a portion of the reflected excitation laser light, are collected by the SPOC's mirror and focused into the collection optical fiber for return to the TarGOST instrument for detection.

The light returning from the windowed probe is directed into a spectrometer located inside the TarGOST system, yielding a waveform.

> The TarGOST's custom spectrometer divides the returning light into four distinct wavelength (or color) bands and converts the light into a corresponding electrical current pulse where the current amplitude is proportional to the light amplitude. This current pulse is wired into a fast digital storage oscilloscope where it is converted into a transient voltage signal, is digitized, and recorded. This digitized transient is called a waveform.

Figure 1 shows an example waveform. Each peak (or channel) represents a different wavelength band. The laser light that is being reflected from the soil matrix is monitored in the first channel (blue, left-most) and the three fluorescence bands are observed in the three right-most channels (green, orange, and red).

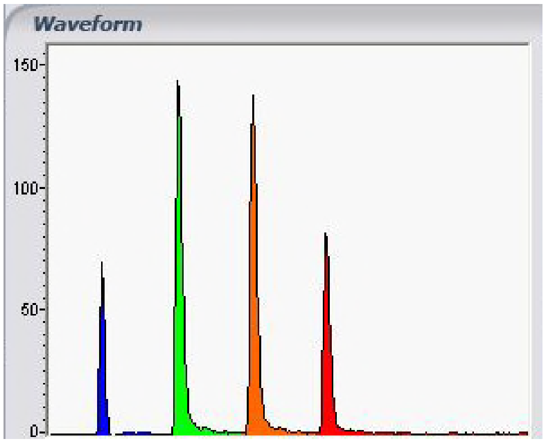


Figure 1. Example TarGOST Waveform

B.3 Scatter Correction

Due to complicated processes such as energy transfer, photon cycling, and other phenomena that "quench" the fluorescence in high NAPL concentration soils, fluorescence often does not scale linearly with concentration. To correct for this inherent property, the TarGOST system scatter corrects the data.

> In calculating the TarGOST total signal, the fluorescence area is divided by the area under the laser scatter channel. This is referred to as scatter-correction or normalization. This is necessary because at very high concentrations the fluorescence does not continue to scale with concentration. The uncorrected TLM curve in Figure 2 illustrates the problem.

The addition of more and more NAPL to a soil sample should (if there were no quenching phenomenon) result in increasing fluorescence, but it only increases up to a certain point where the fluorescence response flattens out or begins to fall.

> This poor type of response is called non-monotonic behavior and is obviously undesirable behavior for a screening tool. The laser scatter correction system is designed to prevent this "roll-over" affect. The scatter correction keeps this from occurring at the high end of concentrations (where soil is heavily contaminated or even saturated with NAPL). The scatter-corrected curves in Figure 2 illustrate the desired effect of scatter correction.
>
> The laser scatter intensity is usually minimal until NAPL concentrations reach the tens or hundreds of thousands PPM level, where the quenching or saturation (non-linearity of fluorescence response) is most pronounced. Laser scatter correction generally doesn't "kick in" until high concentrations are being measured, where fluorescence response flattens out or rolls over. In this way, the scatter corrected fluorescence readings scale relatively well across a wide range of concentrations, from the typical limit of detection (LOD) of 250-500 ppm, to the almost neat NAPL encountered in soil saturated with free product. Remember that TarGOST is designed to respond only to the NAPL impacted soils, not the PAHs attached in "dry" form to soot or dissolved phase PAHs. This makes it ideal for delineating source term areas of mobile MGP NAPL.

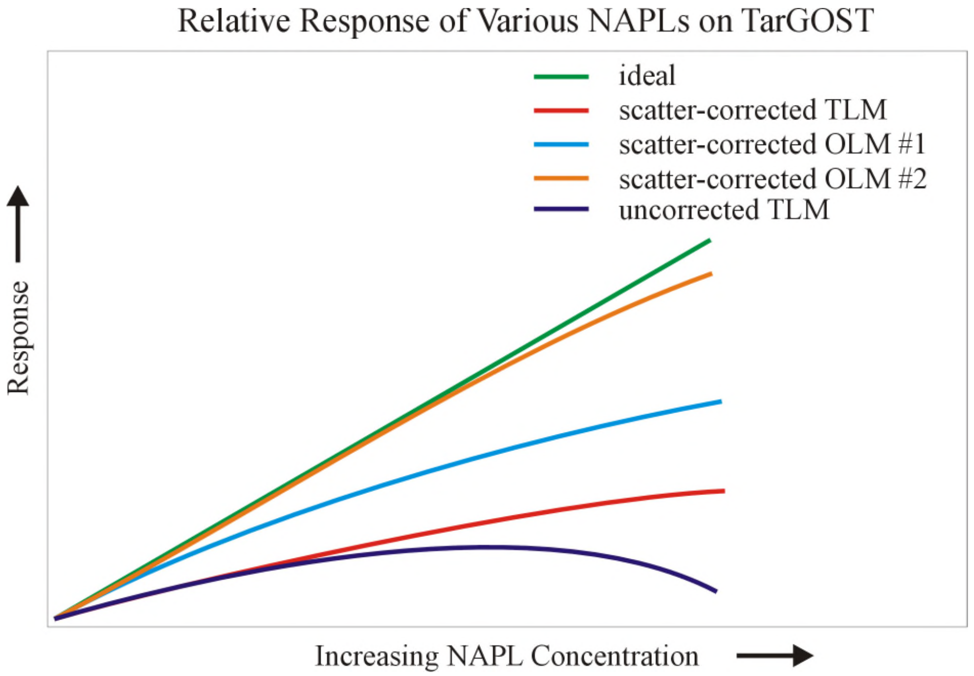


Figure 2. Variability of TarGOST Repsonse

The scatter correction works well, but it isn't perfect.

The TarGOST system is not an analytical instrument like a laboratory GC that sits in a clean, stable environment and only gets fed ultra-clean matrix-isolated analytes. Instead, it is asked to respond faithfully to an analyte that exists in a thousand different forms in an endless number of environments.

At high NAPL concentrations, even small variations in the laser scatter greatly influences the total signal, especially when the laser scatter gets close to zero.

For instance, let's imagine that with neat NAPL in front of the window, the fluorescence channels are averaging around 10,000 pico-Volt seconds (pVs) in area with each pulse of the laser. The laser scatter may be fluctuating between 400 and 800 pVs, because the scattered light is dim from being absorbed by the PAHs. Now, even if the fluorescence stays almost constant at 10,000 pVs every measurement, the relatively large variation in the tiny laser scatter that occurs will create a two or three-fold increase/decrease in total signal, even with the same NAPL sitting on the window. That's why very high readings (>500) often look unstable and jagged – because the laser scatter signal is so weak it "jitters" a lot compared to the fluorescence, causing large variations in signal, even though the fluorescence portion of the waveform is relatively stable. For this reason, any wide swings in large signals should "be taken with a grain of salt".

At low signals (0-100 %RE), it is often helpful to use the Fluor (%RE) or "Fluorescence Only" column of data. At low concentrations the change in scatter from the formation itself might actually "mess with" the Signal, causing it to change for reasons other that NAPL content. The Fluor column is the most reliable indicator of NAPL at near limits of detection quantities.

B.4 Calibration and Signal Calculation

The waveform shapes (the relative amount of signal in each channel or band and the decay time on the right side of each peak) tell us quite a bit about the qualitative nature of what's happening outside the window. But what interests people most is the amount of NAPL that is present vs. depth. We do this by portraying the signal vs. depth in a continuous log format, where the signal is relative to a known fluorescence reference emitter (RE).

To accomplish this we must reduce the waveform to a single quantitative number. We also need to normalize for any energy drift of the laser and optical alignment changes, so it is necessary to calibrate the system prior to each sounding and plot the down-hole data. The RE is a stable and known material that can be applied to the window and measured just prior to each sounding. The signal of the down-hole sample is then plotted as a function of depth and a percent of the RE.

Figure 3 graphically illustrates the calibration waveform and its use in the determination of an example %RE.

The RE both reflects some of the laser light and fluoresces at levels that are in the same general range as soils that are moderately to heavily contaminated with MGP NAPL. The Reference Emitter waveform shown in the figure is an actual RE waveform taken with the TarGOST. By definition the RE will always have a %RE value of 100%. The example waveform on the right is a real waveform of impacted soil; notice the low scatter in the example and its impact on the total signal level of 219%.

To calculate the %RE, the area under the three fluorescence channels of the waveform is determined. As discussed in the previous section on scatter correction, the fluorescence area is divided by the laser scatter area. This fluorescence over scatter value is divided by the corresponding RE value and reported as a percent.

Once the RE is measured, all subsequent measurements can be normalized by this RE waveform, providing an apples-to-apples presentation of the data regardless of laser energy drift or other changes that would cause a difference in raw signal amplitude over time. It may be useful to think of the RE waveform as the equivalent of the single-point 100ppm isobutylene calibration used for hand-held photo-ionization detectors.

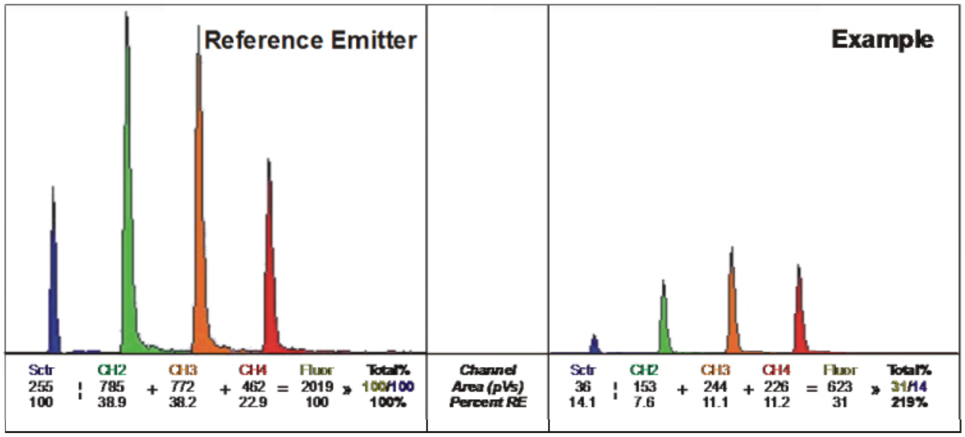


Figure 3. Example %RE Calculation

B.5 *Signal vs. Depth Plotting*

To better appreciate the qualitative information that TarGOST provides, the logs are color-coded by "filling in" the log's x-axis (%RE) with colors generated from the waveform at each and every depth. The color is determined by the amount of signal present in each of the four wavelength channels. See Figure 4 for an example.

This makes the interpretation of the logs easier to see "at-a-glance" as opposed to relying solely on the few selected waveforms to understand the qualitative nature of the data vs. depth. Color-coding alerts the observer to shifts in NAPL types and can also help identify weak interfering minerals like calcite and organic matter, both of which can sometimes (rarely) be mistaken for MGP waste.

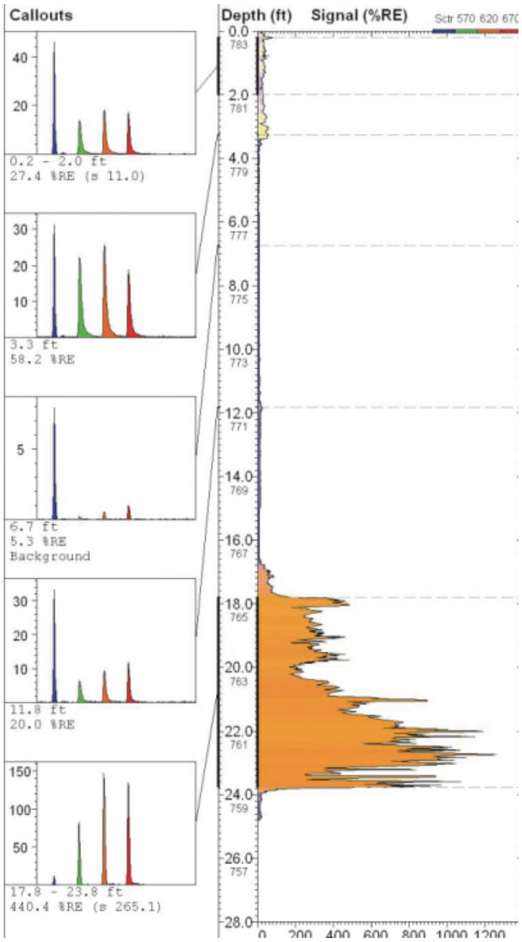


Figure 4. Depth vs %RE and Callouts

B.6 Variability and Preferential Response

NAPLs vary in fluoresce intensity and spectral distribution (color), even NAPLs found at the same site.

Figure 2 illustrates conceptually that TarGOST often responds with varying sensitivity toward different NAPLs, depending on their origin and/or variances in the conditions under which they've been exposed in the decades they've spent in the subsurface. For instance, a thick asphaltine TLM will typically fluoresce much less intensely than a less viscous "runny" OLM. This may well be due to the relative abundance of solvent in one matrix vs. the other. The more solvent available (i.e. the less viscous the NAPL), the higher the likelihood of PAHs being able to emit photons (fluoresce) before a non-radiative mechanism allows the PAH to come back down to the ground state without emitting a photon (quenching).

The preferential sensitivity of TarGOST toward the less viscous (more mobile) OLMs is welcomed by most users, since TarGOST seems to accentuate the presence of the more mobile NAPLs.

It is these more mobile NAPLs that are of the highest regulatory/compliance concern. There is an abundance of anecdotal evidence that suggests that some NAPLs may fractionate in the subsurface into OLM and TLM or even DNAPL and LNAPL. Dakota has participated in a number of investigations where a single NAPL body seems to have 'split' into two distinct NAPLs, with both NAPLs having similar but distinct waveform shapes as we moved away from the suspected release point and they appear to form two separate horizons (a "high" and "low" layer). Although there has been plenty of speculation, the exact mechanism for this phenomenon (if it actually occurs) is not known.

TarGOST uses a green laser to excite the larger (4 -5 rings and higher) PAHs that exist almost exclusively in NAPL form, as opposed to smaller (2-3 ring) PAHs that can more readily partition into the groundwater due to their much higher solubilities in water. UVOST on the other hand employs ultra-violet (UV) light which can and does excite the smaller 2-3 ring aqueous phase PAHs and sometimes detects (marginally) high concentrations dissolved phase PAHs such as naphthalenes in the groundwater. When this behavior is combined with UVOST's non-monotonic response for many NAPLs, extremely complicated logs are generated that need to be computer analyzed to separate the NAPL fluorescence contribution from that of the dissolved phase. The dissolved phase signals can even surpass NAPL signals, making confident NAPL delineation almost impossible at many sites. This is especially true for those sites with sand/gravel, where pockets of NAPL are perched in or amongst slow-moving or stagnant groundwater.

It should also be mentioned that TarGOST was designed to exclusively detect high concentration PAH NAPLs ("heavies"). TarGOST has, by design, a very limited response (if any) to lighter fuels. While this is often desirable, there are some cases where TarGOST "missing" lighter fuels is undesirable, but this is a limitation of the TarGOST technology.

C Results

Dakota has years of experience using TarGOST. The system has both been fully tested in the lab and in the field.

C.1 Laboratory Testing

Figure 5 illustrates waveforms that are typical of those generated with TarGOST.

If the soil is free of NAPL, the laser scatter channel (leftmost) is far more intense than the three fluorescence channels. The Clean Sand waveform in the figure illustrates what clean (or very low NAPL) soil typically looks like on the TarGOST system. If NAPL is present, the fluorescence channels begin to grow in comparison to the laser channel. The 1,000ppm and 10,000ppm waveforms in the figure illustrate such a condition. Finally, with pure NAPL on the window, the increase in the fluorescence channels is minimal, but there has been significant loss of signal in the laser reflectance channel, due to absorbance by the PAH-laden NAPL.

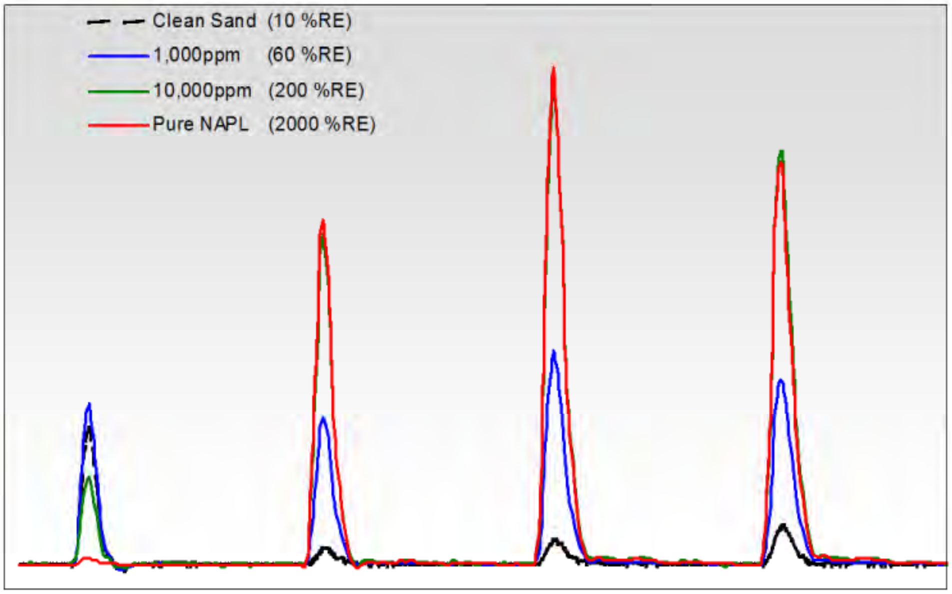


Figure 5. Example TarGOST Waveforms

Lab studies with MGP NAPL on moist Fisher® sea sand (and other soils) consistently demonstrate that TarGOST is capable of linear response vs. NAPL concentration over useful ranges, but some NAPLS are simply better behaved (more/less fluorescent) than others. Figure 6 shows examples of the range we see in TarGOST response for a variety of MGP NAPL on soils.

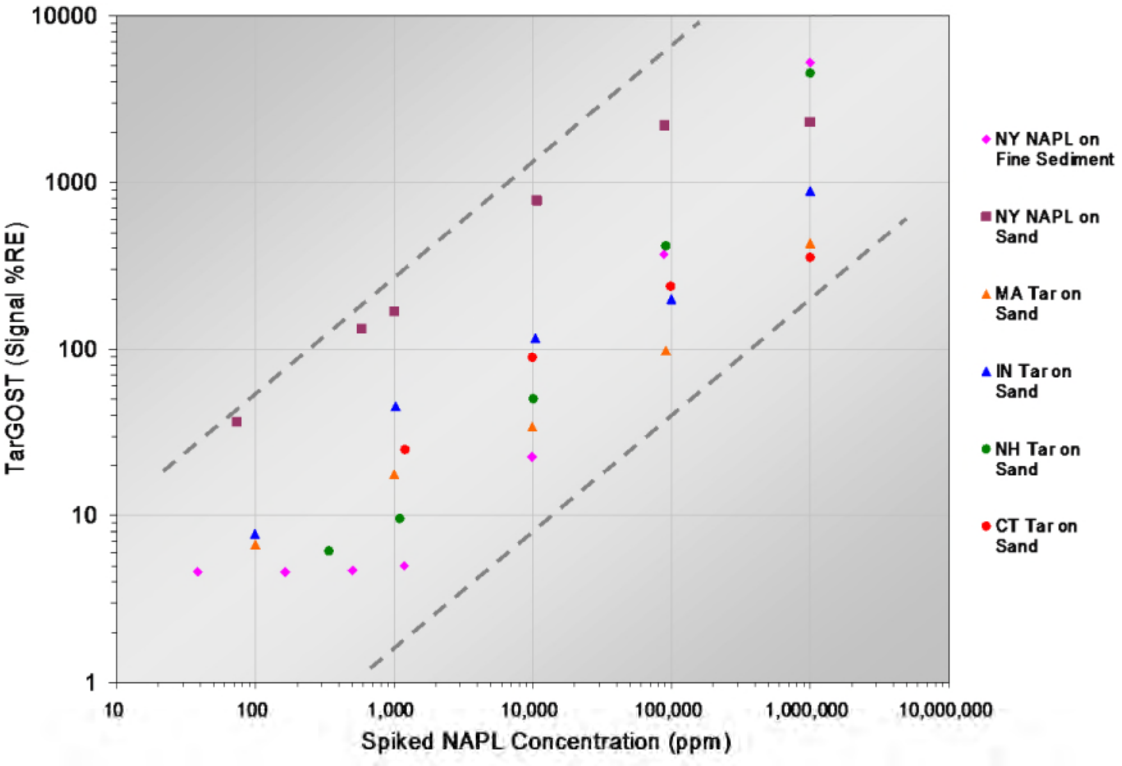
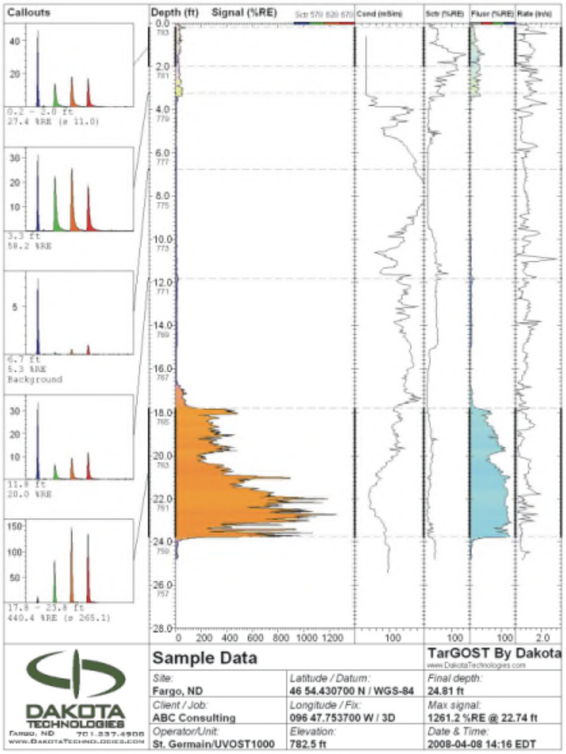


Figure 6. TarGOST response to a variety of MGP NAPLs

C.2 Real-World Data

Dakota has over twenty miles of vertical logging experience using TarGOST. Below are just a few logs of interest gathered over those years.



Sample Data

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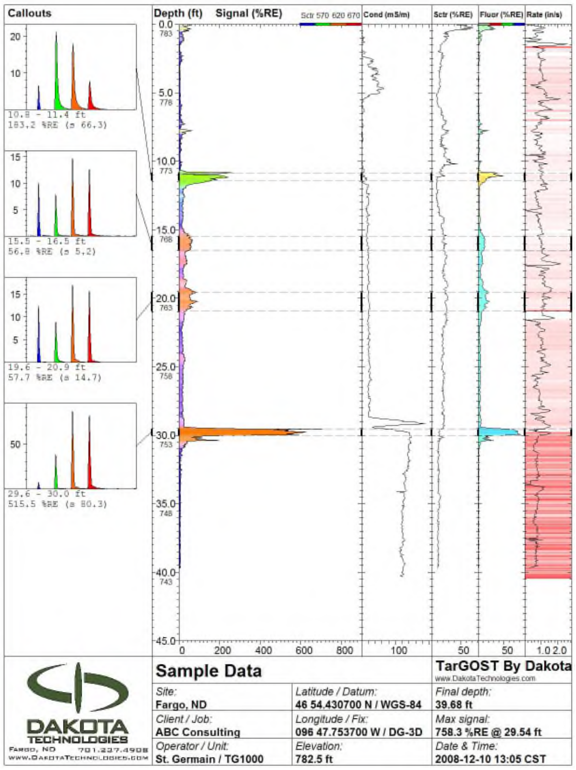
Site: Fargo, ND
Latitude / Datum: 46 54.430700 N / WGS-84
Final depth: 24.81 ft
Client / Job: ABC Consulting
Longitude / Fix: 096 47.753700 W / 3D
Max signal: 1261.2 %RE @ 22.74 ft
Operator/Unit: St. Germain/UVOST1000
Elevation: 782.5 ft
Date & Time: 2008-04-08 14:16 EDT

Figure 7. Example Log with EC

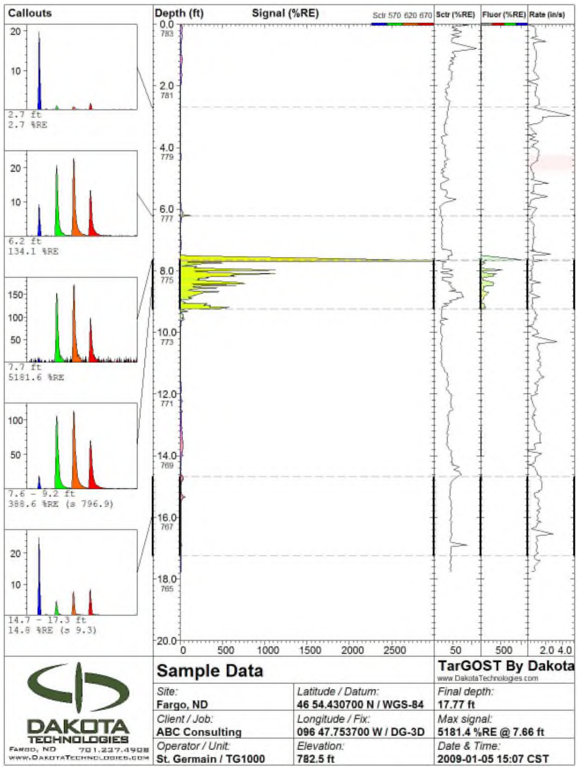


Sample Data

TarGOST By Dakota
www.DakotaTechnologies.com

Site: Fargo, ND
Latitude / Datum: 46 54.430700 N / WGS-84
Final depth: 39.68 ft
Client / Job: ABC Consulting
Longitude / Fix: 096 47.753700 W / DG-3D
Max signal: 758.3 %RE @ 29.54 ft
Operator / Unit: St. Germain / TG1000
Elevation: 782.5 ft
Date & Time: 2008-12-10 13:05 CST

Figure 8. Example data including EC and Hammer Rate (red fill in right panel)



Sample Data

TarGOST By Dakota
www.DakotaTechnologies.com

Site: Fargo, ND
Latitude / Datum: 46 54.430700 N / WGS-84
Final depth: 17.77 ft
Client / Job: ABC Consulting
Longitude / Fix: 096 47.753700 W / DG-3D
Max signal: 5181.4 %RE @ 7.66 ft
Operator / Unit: St. Germain / TG1000
Elevation: 782.5 ft
Date & Time: 2009-01-05 15:07 CST

Figure 9. Example data with very high signal (low scatter)

D Theory and Results Summary

The following bulleted list is meant as a quick reference once the underlying principles of operation and results have been examined.

- TarGOST specifically targets the PAHs found in former MGP and creosote NAPLs and DNAPLs. There are most certainly other fluorescent molecular structures beside PAHs that contribute, but the PAHs dominate in most NAPLs
- TarGOST does detect moderate staining and residual levels of NAPL as well as free phase
- TarGOST is completely “blind” to aqueous (dissolved phase) PAHs
- TarGOST is not able to reliably detect “dry” PAHs (dry in the organic solvent sense) that are sorbed to soot, wood chips, and ash. They can generate a small signal but it is often weak and not easily teased out of the background. Many times we’re left wondering whether a small signal is caused by very high concentrations of “dry” PAHs on purifier chips or ash/soot or very low (100s of ppm) residual NAPL levels.
- TarGOST’s typical lab-determined LOD for NAPL on site soil is 100-500 ppm (weight of NAPL/weight of soil matrix). The more the NAPL fluoresces, the lower the LOD. Note that this is not the same as weight of Total PAHs /weight of soil matrix, since not all of a NAPL is PAHs
- TarGOST does, on occasion, respond to mineral or organic matter enough to be a nuisance. False positives include crushed limestone gravel fill, buried rotting wood/brush debris (the result of major flooding on a gravelly river), sea shells (shell hash), sawdust, quick lime, and some “mystery” solids/soils that were not identifiable
- TarGOST has been observed to significantly respond to peat material , but most peats fluoresce weakly – often there is NAPL in the peat so it’s difficult to know for sure whether it’s been the peat or NPAL staining that’s causing the fluorescence
- TarGOST does not respond to typical lighter end fuels like gasoline or kerosene (diesel can/has been detected) – unless they contain MGP waste or creosote that they are co-mingled in them (pentachlorophenol an obvious example)
- TarGOST is single-point calibrated with a reference emitter (RE) immediately prior to each sounding and the results are always plotted relative to RE (%RE)
- TarGOST calibration/setup isn’t perfect and the response for an identical NAPL can vary with optical platform and from lab to field. However, once set up on site, the response remains stable over time and from log-to-log. Changes to the spectrometer and mirror alignment/collimation SOP in 2007 made significant improvements to the consistency of the response
- NAPLs can vary greatly in their fluorescence response – even NAPLs found on the same site from the same source
- Thinner, less viscous NAPLs typically fluoresce much more (x10) than the more viscous TLMs. Asphalt-like TLMs which are solid/plastic fluoresce very poorly
- Scatter-correction is applied to TarGOST data to reduce/eliminate “response rollover” at high concentrations – but at low concentration (<100% RE) the Fluor (%RE) data column is better for judging “hits”
- Color-coding is determined by the relative waveform areas in each channel and provides “at-a-glance” recognition of waveform consistency or changes
- The waveforms contain both quantitative and qualitative information

E On-Site Fundamentals

E.1 Delivery Platform

Dakota has used its TarGOST systems in conjunction with nearly all commonly available direct-push (CPT and percussion) systems on land, ice, and on the water (barge).

- **Dakota's Probe Rig**

  Dakota owns a Geoprobe® 5400 direct-push probe mounted on a Ford F-550 truck. When we operate our own system (TarGOST and Geoprobe) we generally send two experienced Dakota technicians.

- **Third Party Rig**

  Dakota can rent a probe (for example a track rig) or our customers can hire a third party for the drilling activities. This third party option is generally a good idea when Dakota's mobilization fees are cost prohibitive or a special drilling license is required by the state.

- **Barge**

  Dakota has extensive experience working from barges while providing TarGOST services. Barge sizes have ranged from 16' to 150' and we have worked in water depths of a couple of feet to 50'.

E.2 Pre-Planning

- **Free Sample Check**

  Dakota will gladly look at your sample and let you know if TarGOST is the right choice for you. If your NAPL doesn't respond well with TarGOST, we'll also test your sample with UVOST to see if it is the better solution. Contact us for details, but it generally involves you sending us jars (from 5 to 40 ml) of your test NAPLs in an unrefrigerated shipping container, along with information regarding your site and contact information. In just a few days we'll let you know the results.

- **Probe Rig**

  Arrange for Dakota to probe your site with our self-contained system or hire an outside drilling contractor. Dakota will need to communicate with your potential contractor to determine if they are capable of pushing direct sensing equipment. We have integrated with most Geoprobe models, many AMS probe machines, Marl rigs, homemade probe machines, CME drill rigs, mini CPT skids, tracked CPT machines and several brands of 40 ton CPT trucks.

- **Utility Clearance**

  Dakota personnel have been instructed NOT TO PROCEED until underground utilities have been identified. Please communicate with Dakota to ensure that this is completed.

- **Site Access**

  If any special security, permits or safety clearance is needed for Dakota's personnel or equipment is needed, alert Dakota prior to us showing up on-site.

- **Transport**

The main components of the TarGOST system are housed in a shock-protected enclosure measuring roughly 2x2x2 feet and weighing approximately 100 pounds. In addition to this enclosure, there is a rod-rack with generally four-foot rods, a computer, fiber cables, a generator, tools, spare probes and various peripheral items. When we ship the system, everything fits in a 4x4x4 foot enclosed pallet. A fork lift and secure storage should be arranged near the work site.

Figure 10. TarGOST and all peripherals in an enclosed palette being loaded for transport

- **Hole Locations**

Some customers like to pre-plan the hole locations, mark the site accordingly, and record all relevant x-y and elevation data. A plan of bounding the contamination based on results determined on-site is also viable. Regardless if the hole placement follows a grid or bounding procedure, Dakota strongly prefers to start the job in what is believed to be “the heart” of the contamination. This gives everyone involved a feel for how well the NAPL is going to respond to TarGOST delineation.

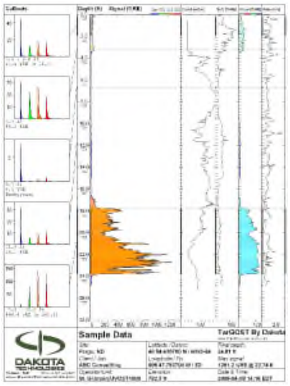
- **Sampling**

Dakota recommends discrete sampling at 10% of the hole locations if semi-quantitative values are to be assigned to the LIF signals. Soil sampling can be reduced to approximately 5% of hole locations as a ground-truthing exercise. If an extensive sampling program is planned the client should consider hiring a more cost effective driller. Remember to build sampling time into you scope of work. Do consider getting TarGOST responses to homogenized splits of your samples. If your site has heterogeneous lithology (very typical), the chance of you sampling soils/NAPL that are representative of that which the TarGOST probe passed through are near zero. If heterogeneity exists, and you try to compare lab results to TarGOST %RE of adjacent logs rather than TarGOST %RE of those same samples, the correlation will be terrible (the expected result).

E.3 Daily Production

Footage

TarGOST productivity can range anywhere from 200 to over 500 ft/day. If the pushes are fairly deep (>30 ft), and the obstructions or rubble are minimal, then the average is on the higher end because we spend a lot more time actually probing, not moving around from location to location and/or trying multiple times to get holes started through rubble. Other factors affecting production are grouting requirements, surface pavement, surface topography and vegetation. We typically can log between 10 and 20 locations a day.



Start-Up Time

When the system first arrives on site, it is powered up and tested for proper function. If it is in Dakota's Geoprobe, the TarGOST is simply powered up and we're ready to begin probing after a very short warm-up. If a CPT or other direct-push machine is used, the TarGOST system is integrated into the delivery platform, rods are strung with the Dakota's optical fiber cable and proper depth measuring connections are made (about a 2 to 3 hour procedure).

Decontamination

Typically Dakota uses a rubber rod wiper to "squeegee" any contaminated mud from the probe. If additional decontamination is required, production rates will be impacted accordingly.

Sampling

If Dakota is contracted to collect soil samples, it will be prudent to do all the sampling at one time, preferably at the end of the job. Using LIF data, impacted zones can be identified and targeted for sampling, eliminating the need for continuous cores.

Barge Productivity

TarGOST operations on a barge usually limit daily production to 50 – 200' of logged depth. Additional factors affecting barge productivity are; location accuracy needed, subsurface conditions, water depth and presence of current or tide.

E.4 Deliverables

JPEG Images

Once a log is completed our TarGOST operators can immediately generate an image of the log. Callouts are used to show the waveform from areas of interest. Along with the %RE versus depth plot, the scatter and the fluorescence levels as a function of depth are provided. Secondary data such as the rate of probe advancement, the amount of hammering required to advance the probe with percussion systems, and conductivity may also be available. At the bottom of the log is the pertinent info for the data such as site name and location as well as basic stats such as total depth. These images can be printed on site.

- **Data in Text Format**

Along with the log image, our customers are given the data in ASCII tab delimited format. No string header is provided for the columns (to make importing into other programs easier). Each row is a unique depth reading. The columns are:

1	2	3	4	5	6	7	8	9	10	11
Depth	Total Signal (%RE)	Ch1 (%RE Sctr)	Ch2 (%RE Fluor),	Ch3 (%RE Fluor),	Ch4 (%RE Fluor),	Push Rate	Cond. Depth	Cond. Signal	Hammer Depth	Hammer Rate

TarGOST data collected with a CPT rig will not include the CPT data as that is an independent acquisition system. Dakota is only responsible for providing the LIF data.

E.5 Post-Investigation

- **Customer Care**

Dakota prides itself on going the extra mile from our customers. Whether it is providing detailed information such as this document, or walking the customer through the data on the phone long after we have left the site, we are committed to our customers being well informed and pleased with our service.

- **Hole Locations**

Once Dakota leaves, our customers may wish to survey all the TarGOST locations if it wasn’t done prior to the job. Getting good positional information, including elevation, is key to any future CAD and visualization efforts.

- **Conceptual Site Model Visualization**

Dakota now provides the capability to view TarGOST/UVOST/ROST site characterization data in static or dynamic format with unparalleled resolution. Dakota can also overlay the site with aerial photographs or building CAD models over GIS terrain data to provide an accurate overall picture of the site with relevant subsurface features.

» 2-D (fence or cross section) and 3-D models such as Plume and Stick provide a variety of methods to best represent the log data
» Capable of vertical resolution less than 1 inch
» Log interpolation between direct push locations using a highly accurate modeling algorithm
» Choose a variety of display formats including static graphics and dynamic video
» Overlay site aerial photographs or satellite images onto the model
» Integrate Dakota’s visual models with client’s existing AutoCAD drawings

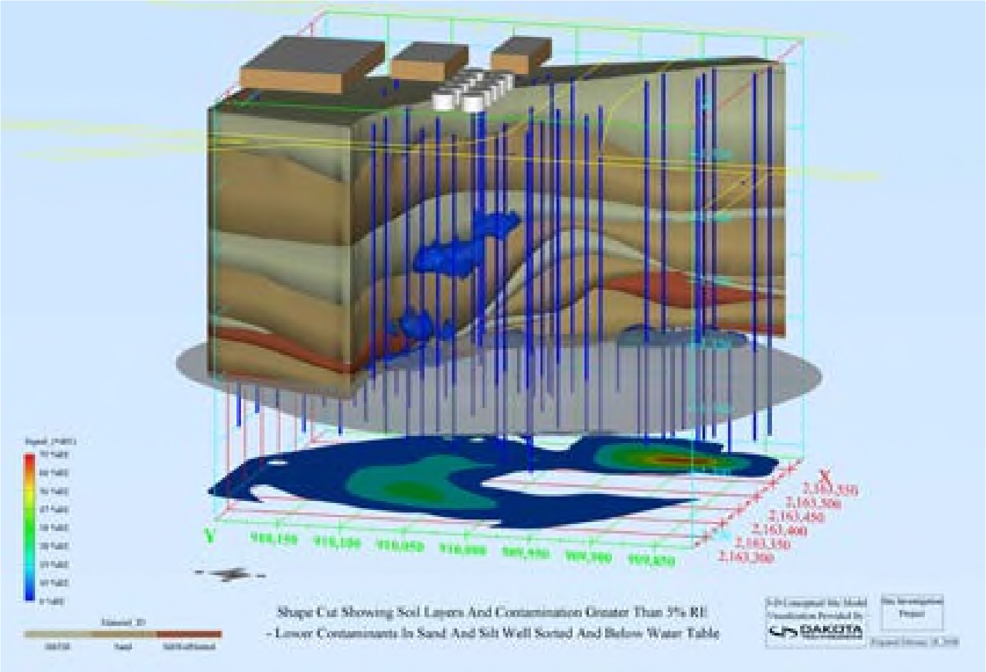


Figure 11. Geology slice and LIF data

Figure 12. 2D overlay of UVOST data and site photo

Appendix D

Field Summary

TarGOST® Field Summary Log

Houston Wood Preserving Works
Houston, TX

File Log ID	Date / Time	Final Depth *(ft)*	Max Signal *(%RE)*	Max Signal Depth *(ft)*	RE Area *(pVs)*	Background Area *(pVs)*
CPT-01-20	1/22/2020 10:29	56.4	12	0.3	2694	25
CPT-02-20	1/22/2020 12:01	59.0	57	38.6	2585	24
CPT-03-20	1/15/2020 9:31	58.5	13	0.4	2149	17
CPT-04-20	1/15/2020 11:09	58.8	52	25.9	2106	17
CPT-05-20	1/14/2020 13:14	55.4	18	0.0	2182	0
CPT-06-20	1/15/2020 13:14	59.2	121	27.1	2126	18
CPT-07-20	1/13/2020 14:02	58.8	20	0.2	2010	0
CPT-08-20	1/14/2020 11:07	55.8	30	34.8	2119	0
CPT-09-20	1/13/2020 10:41	60.1	14	0.1	2110	18
CPT-10-20	1/23/2020 13:29	52.5	5	0.7	2570	23
CPT-11-20	1/23/2020 11:37	58.1	32	0.1	2543	25
CPT-12-20	1/11/2020 11:06	60.7	91	20.1	2096	18
CPT-13-20	1/11/2020 9:50	61.5	163	24.0	2173	17
CPT-14-20	1/10/2020 14:35	61.0	96	30.7	2135	16
CPT-15-20	1/10/2020 12:31	61.5	42	5.5	2109	0
CPT-16-20	1/10/2020 10:47	61.2	140	10.0	2035	0
CPT-17-20	1/10/2020 8:49	62.3	87	11.9	2186	19
CPT-18-20	1/9/2020 12:32	60.9	53	30.4	2049	15
CPT-19-20	1/9/2020 9:21	28.2	4	1.9	2147	16
CPT-19A-20	1/21/2020 11:08	58.0	55	40.3	2684	25
CPT-20-20	1/8/2020 13:42	24.6	11	5.3	1958	18
CPT-20A-20	1/21/2020 9:32	61.4	40	50.3	2476	23
CPT-21-20	1/8/2020 11:53	58.8	49	19.3	2009	13
CPT-22-19	12/8/2019 10:16	60.7	5	47.9	2069	14
CPT-23-20	1/23/2020 10:05	52.3	8	0.1	2514	26
CPT-24-20	1/11/2020 13:36	36.6	24	0.3	2137	19
CPT-24A-20	1/27/2020 10:50	46.3	23	15.8	2605	18
CPT-25-20	1/12/2020 9:31	55.9	6	4.5	2033	18
CPT-26-20	1/12/2020 11:26	52.3	9	0.4	2067	0
CPT-27-20	1/12/2020 14:08	30.7	34	25.9	2069	17
CPT-27A-20	1/27/2020 14:03	31.6	7	31.6	2444	0
CPT-28-19	12/6/2019 14:30	64.7	7	0.0	*2067*	*15*
CPT-29-19	12/10/2019 9:32	62.4	325	43.7	2073	19
CPT-30-19	12/6/2019 11:22	63.1	814	52.3	2017	19
CPT-31-19	12/6/2019 9:52	64.7	987	31.7	2010	16
CPT-32-19	12/9/2019 8:53	58.7	1296	25.3	2057	16
CPT-34-19	12/5/2019 13:19	46.2	76	1.6	2016	12
CPT-35-19	12/5/2019 11:57	62.8	927	44.7	2019	17
CPT-36-19	12/4/2019 12:17	62.2	873	24.5	2071	16
CPT-37-19	12/6/2019 8:46	7.3	4	7.2	1977	16
CPT-38-19	12/4/2019 14:07	1.4	1	0.2	2003	13
CPT-38a-19	12/4/2019 14:34	60.2	16	39.7	2014	15
CPT-39-19	12/4/2019 10:00	61.8	406	40.3	2089	16
CPT-40-19	12/4/2019 8:18	23.1	6	0.0	2052	17
CPT-40a-19	12/5/2019 9:39	60.9	895	26.8	2044	17
CPT-41-19	12/7/2019 8:34	58.7	61	37.5	2077	16
CPT-42-19	12/3/2019 13:45	57.5	78	9.5	1996	11
CPT-43-19	12/3/2019 10:42	58.5	33	0.5	2005	16
CPT-44-19	12/3/2019 9:02	63.5	22	32.9	2031	14
CPT-45-19	12/7/2019 12:52	58.6	73	39.2	2015	14
CPT-46-19	12/7/2019 10:08	61.0	569	23.3	2005	16
CPT-48-19	12/8/2019 13:49	59.4	4	55.5	2026	16
CPT-54-20	1/21/2020 13:56	32.5	3	0.1	2728	25
CPT-55-19	12/8/2019 8:13	55.5	4	52.1	2060	18
CPT-56-20	1/27/2020 9:11	61.5	30	16.2	2726	12
Material from s	12/3/2019 10:07	3.9	50	2.6	2002	13

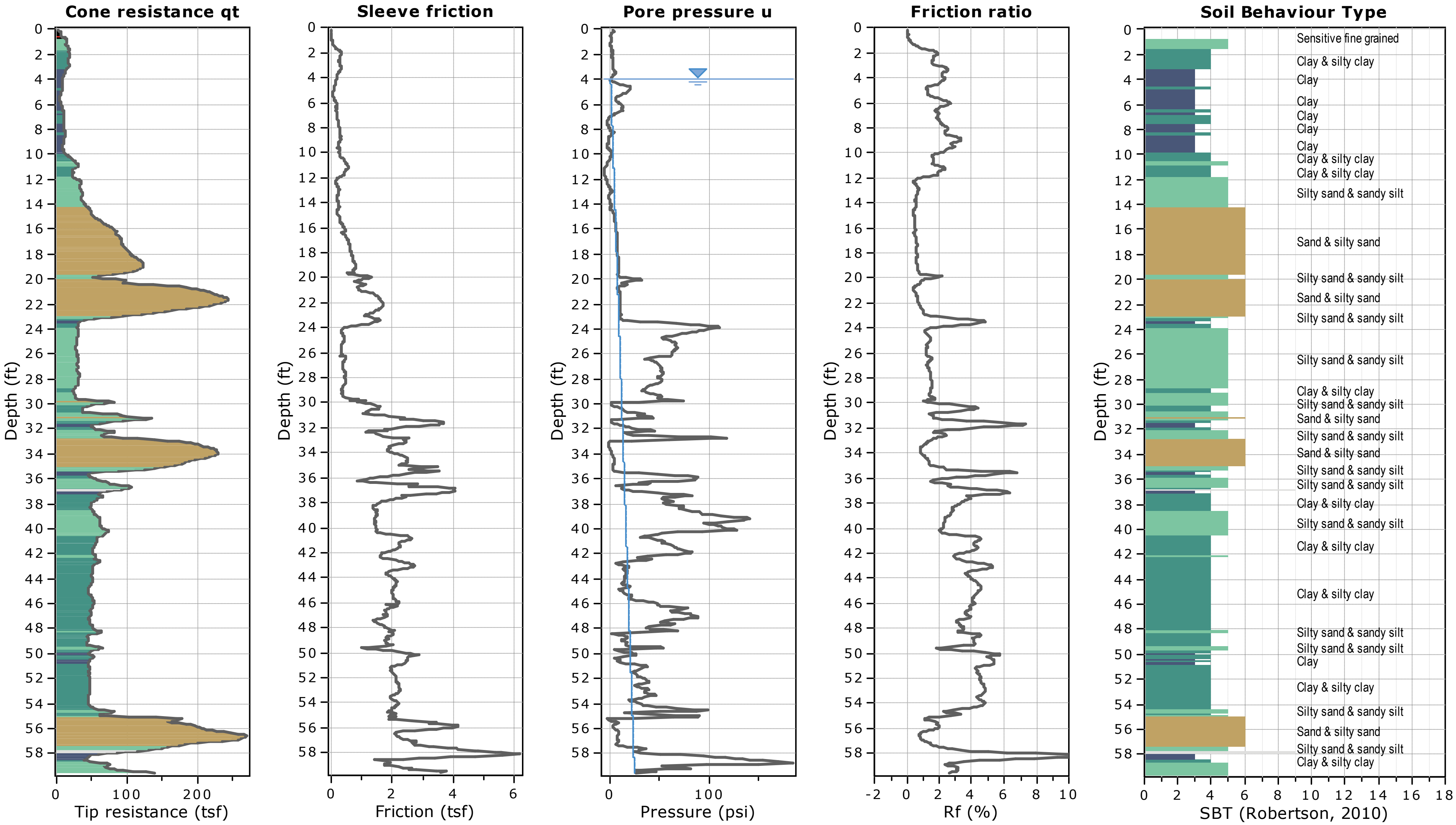
ATTACHMENT B

CPT Logs – 2019-2020

Walker-Hill Environmental
Chris Hayslip
chris@whenv.com
www.whenv.com

Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-01-20
Total depth: 59.58 ft, Date: 1/22/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



Walker-Hill Environmental
Chris Hayslip
chris@whenv.com
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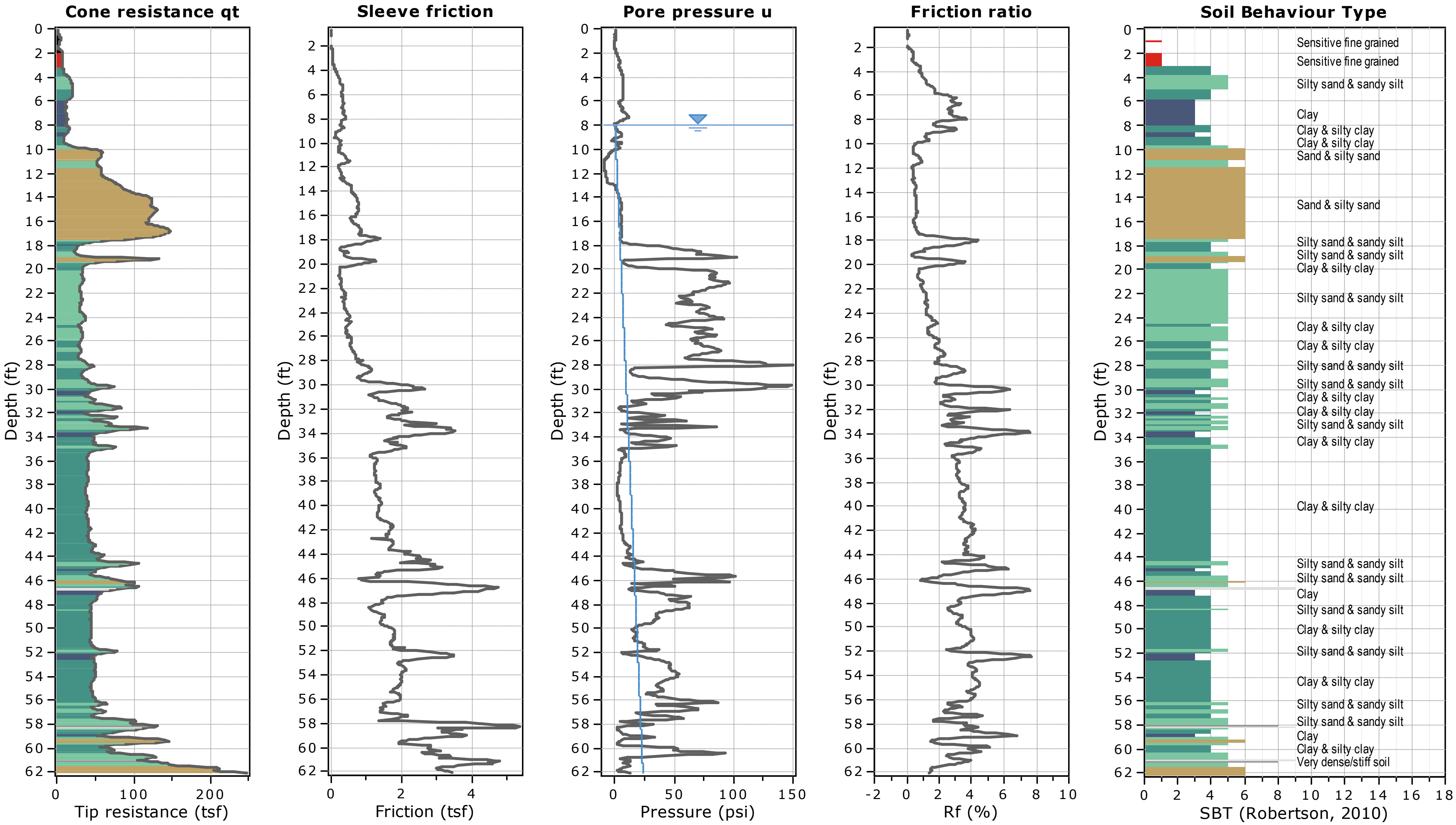
CPT: 19119232-405CPT-02-20
Total depth: 62.07 ft, Date: 1/22/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



Walker-Hill Environmental
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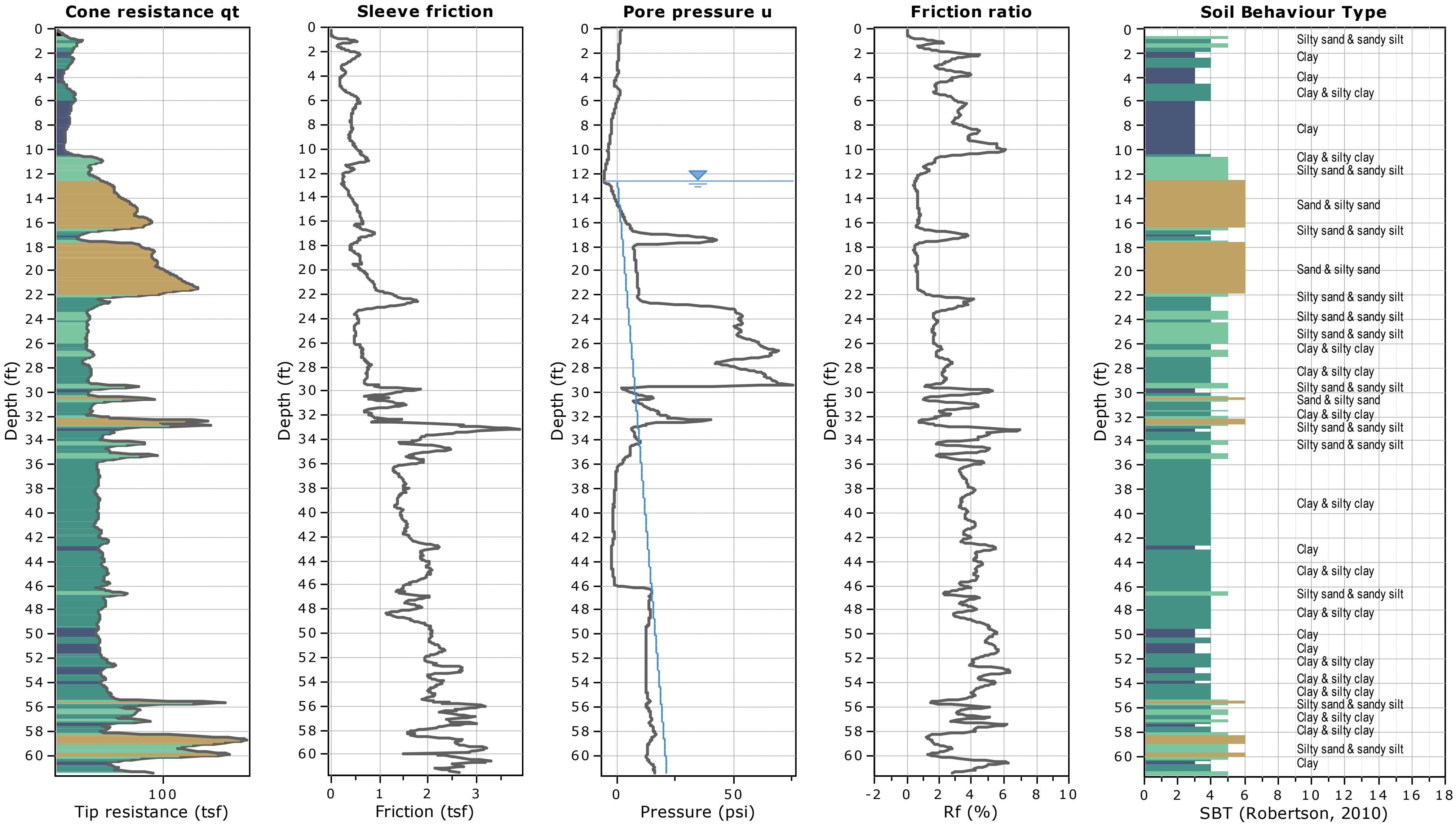
CPT: 19119232-405CPT-03-20

Total depth: 61.48 ft, Date: 1/15/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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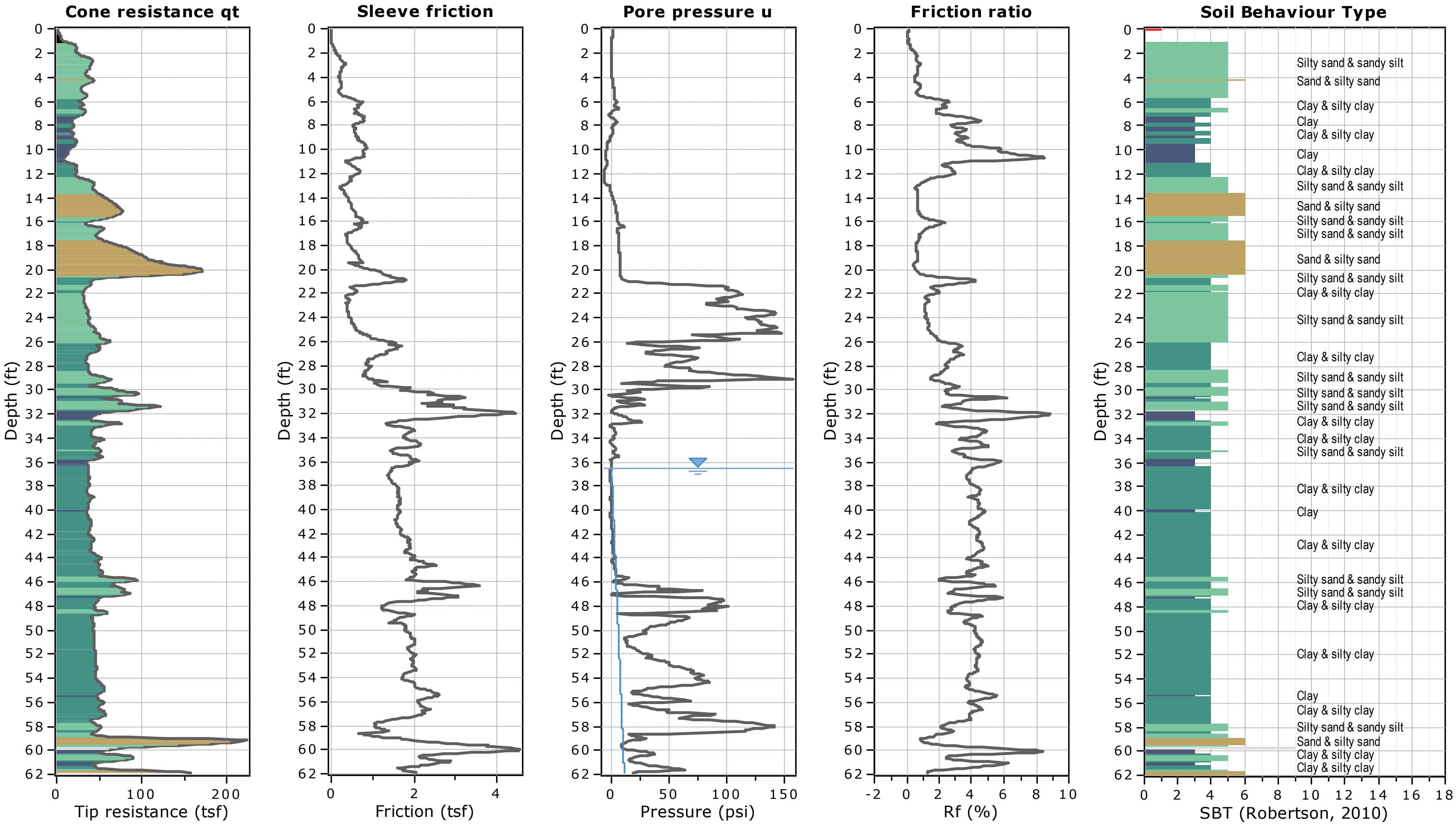
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-04-20
Total depth: 61.88 ft, Date: 1/15/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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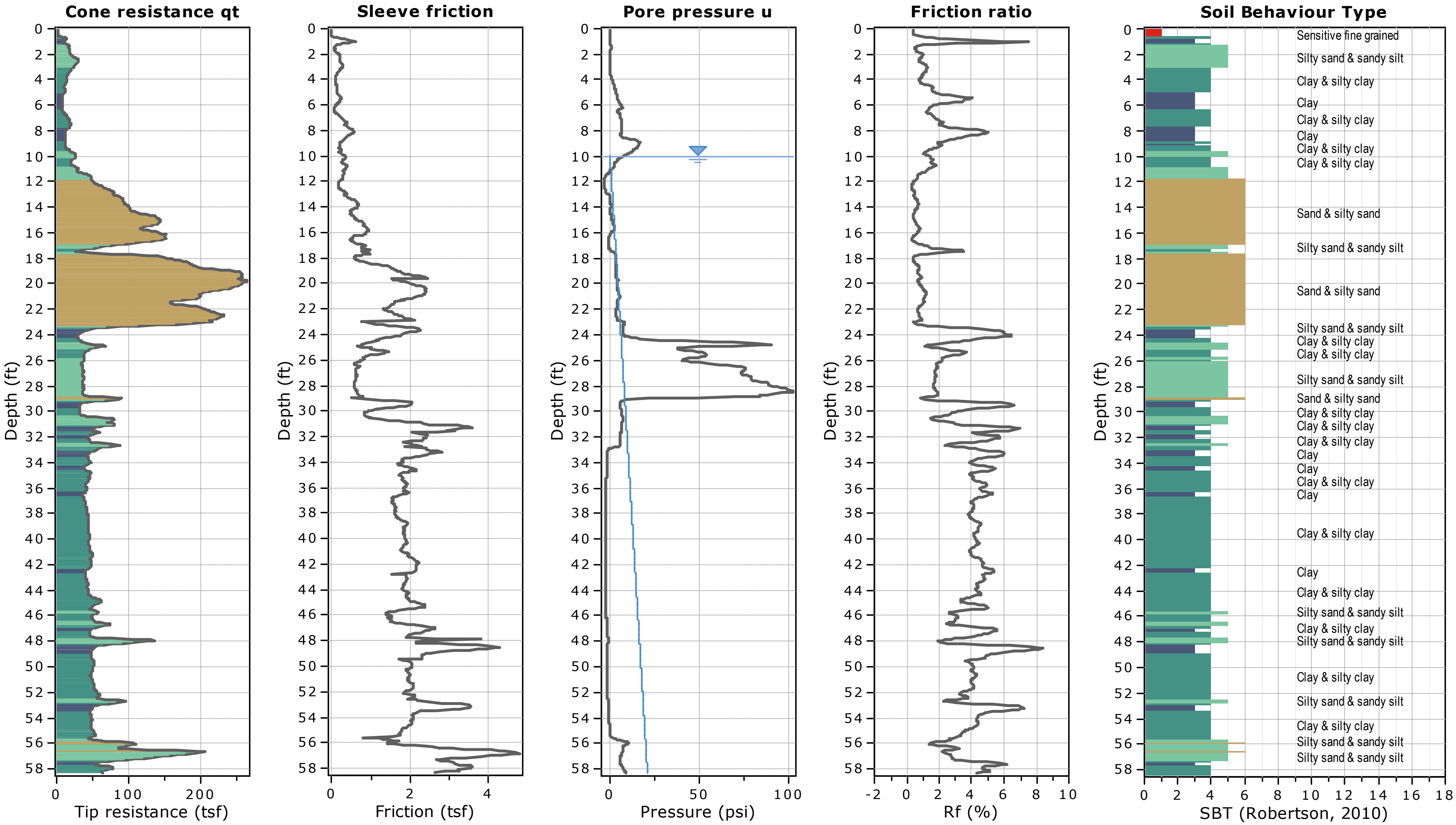
CPT: 19119232-405CPT-05-20

Total depth: 58.33 ft, Date: 1/14/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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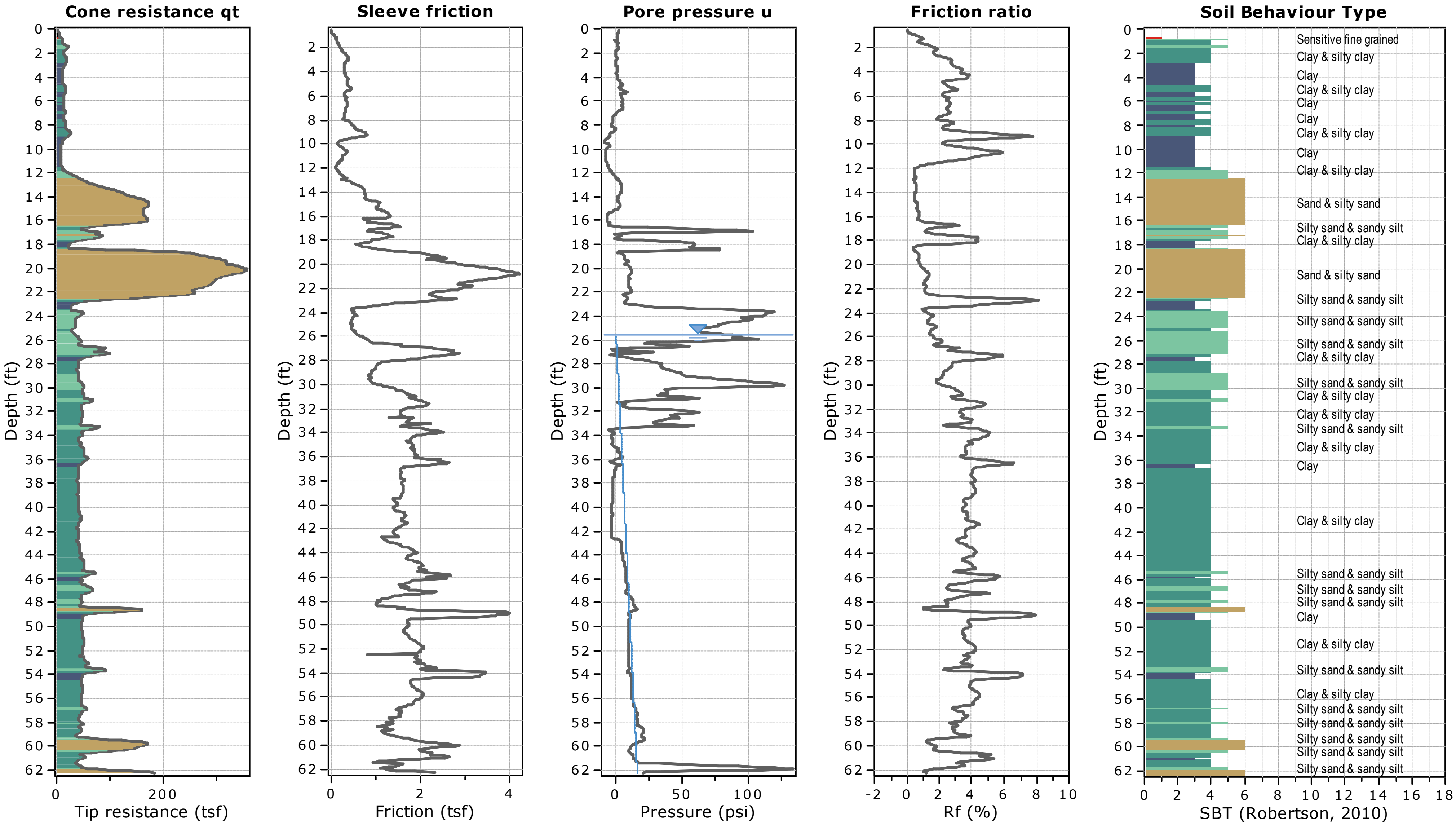
CPT: 19119232-405CPT-06-20
Total depth: 62.27 ft, Date: 1/15/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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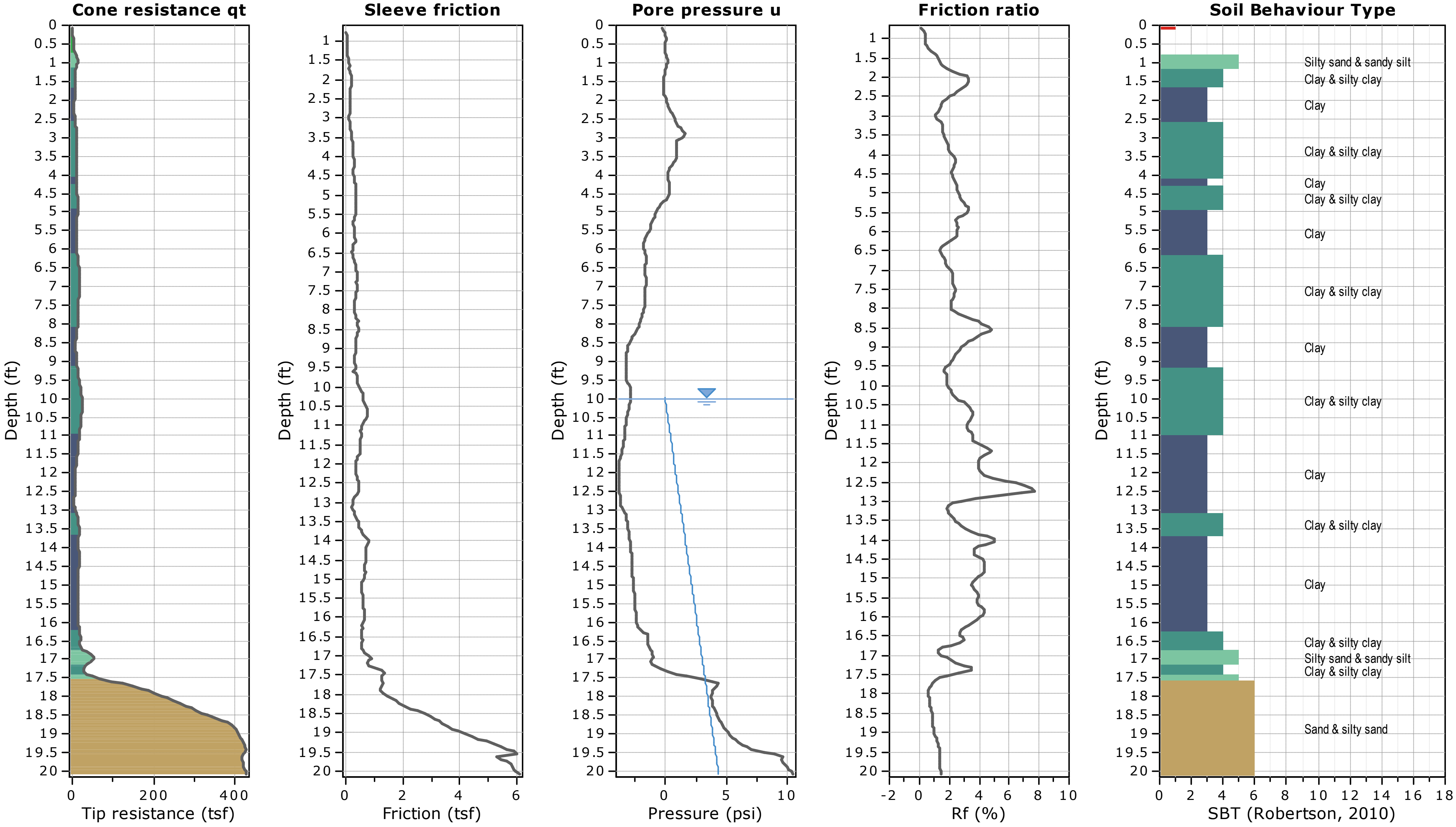
CPT: 19119232-405CPT-07-20
Total depth: 20.08 ft, Date: 1/13/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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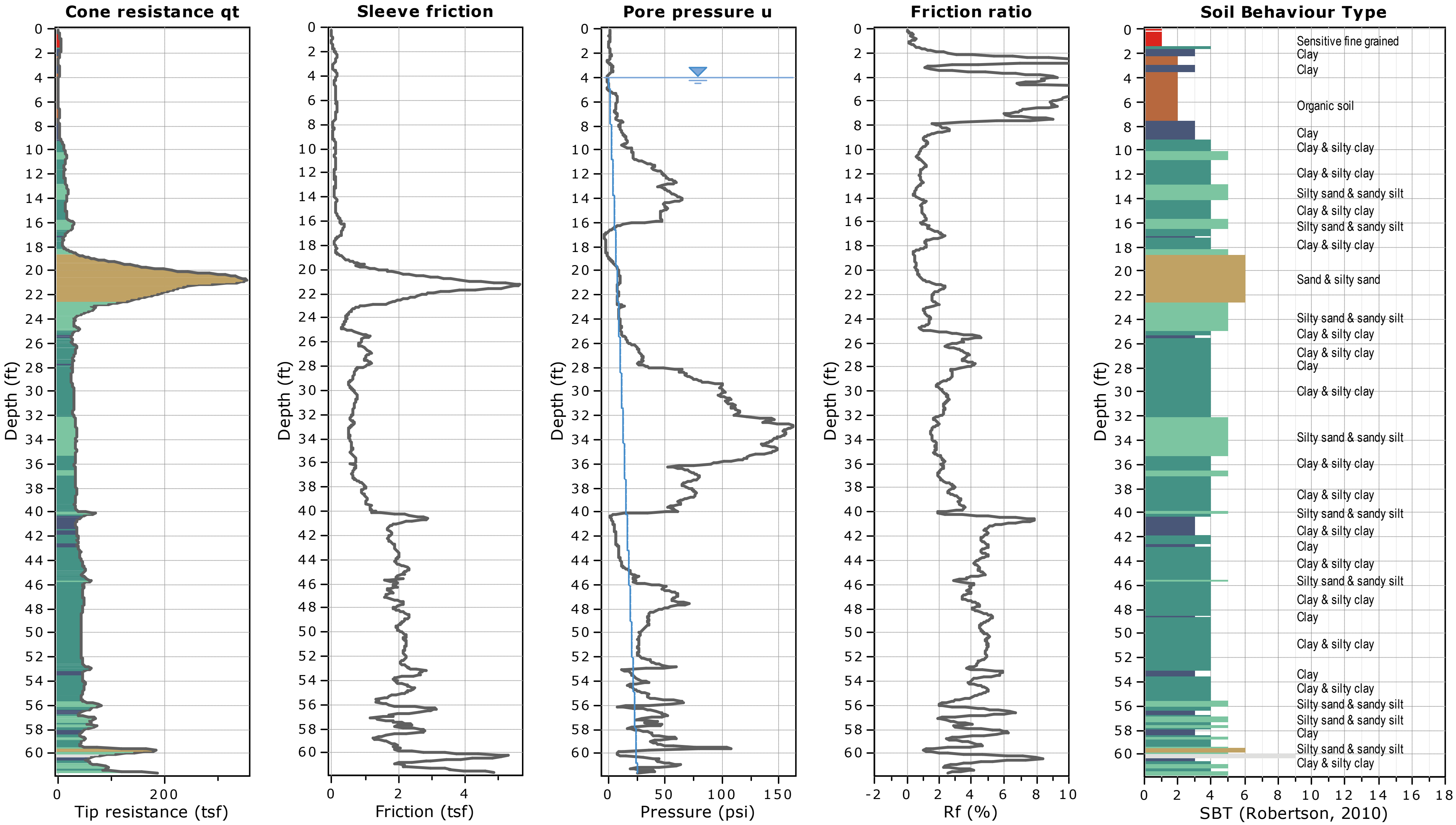
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-07A-20
Total depth: 61.61 ft, Date: 1/14/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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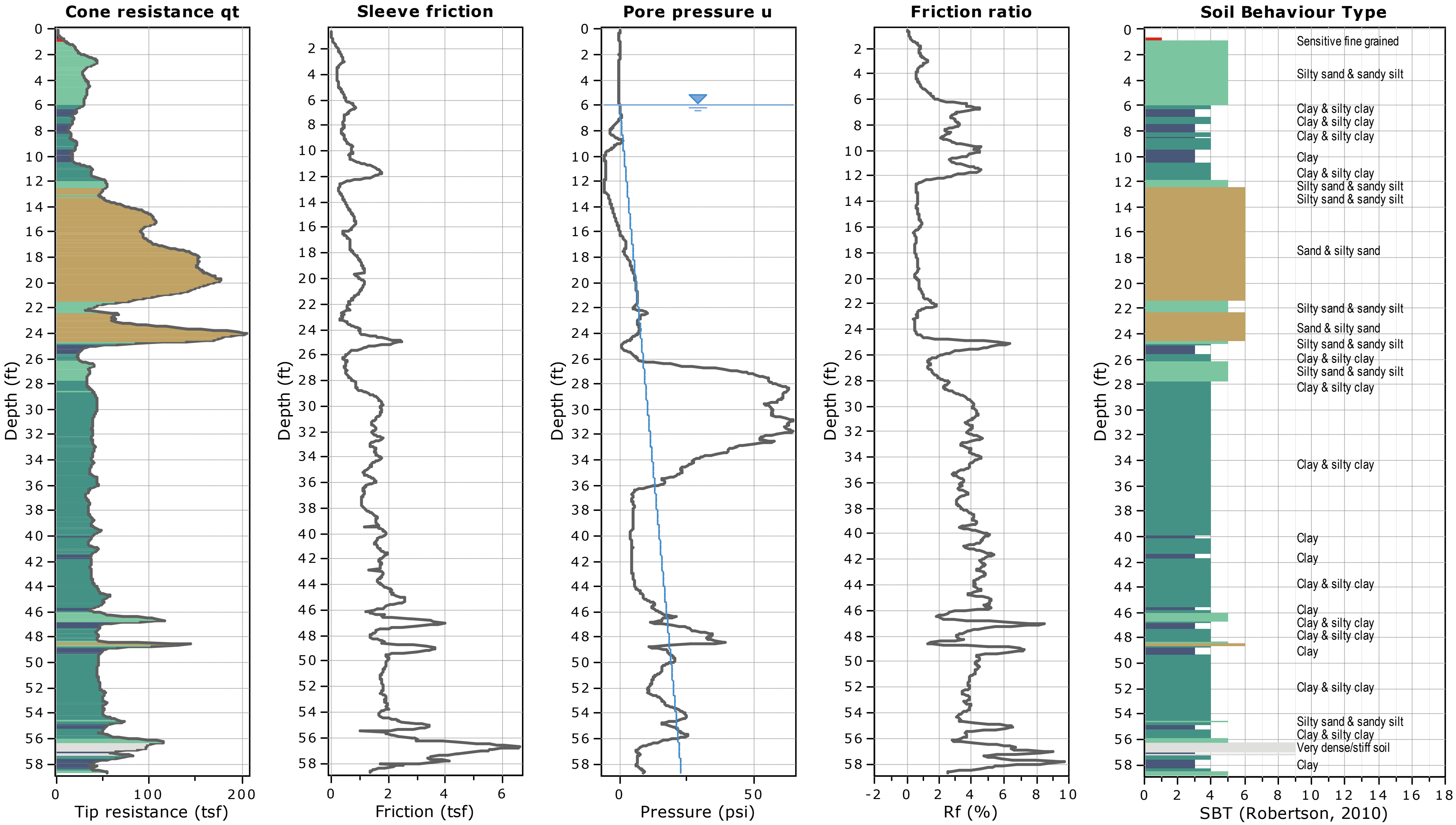
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-08-20
Total depth: 58.73 ft, Date: 1/14/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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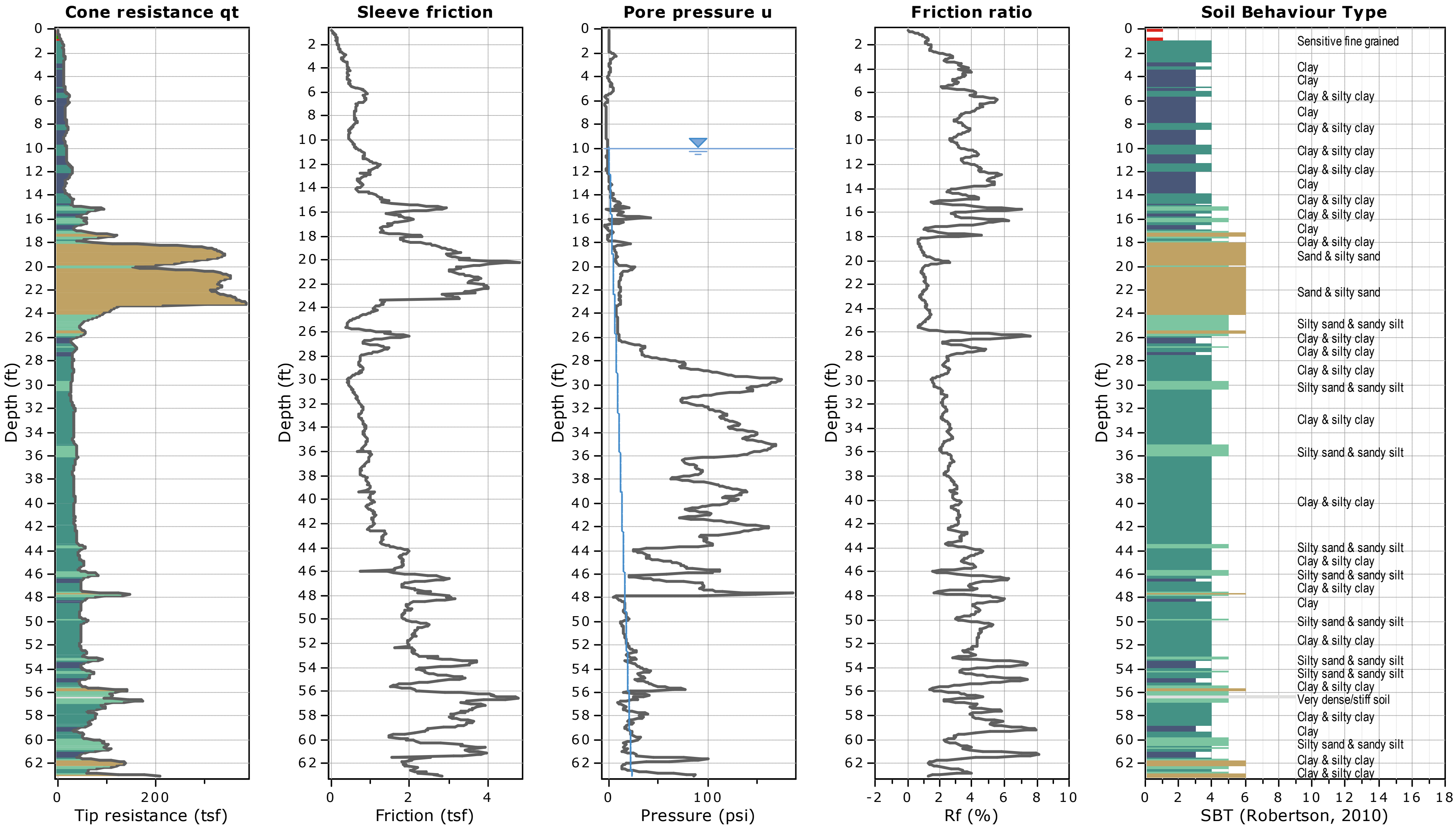
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-09-20
Total depth: 63.06 ft, Date: 1/13/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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CPT: 19119232-405CPT-10-20
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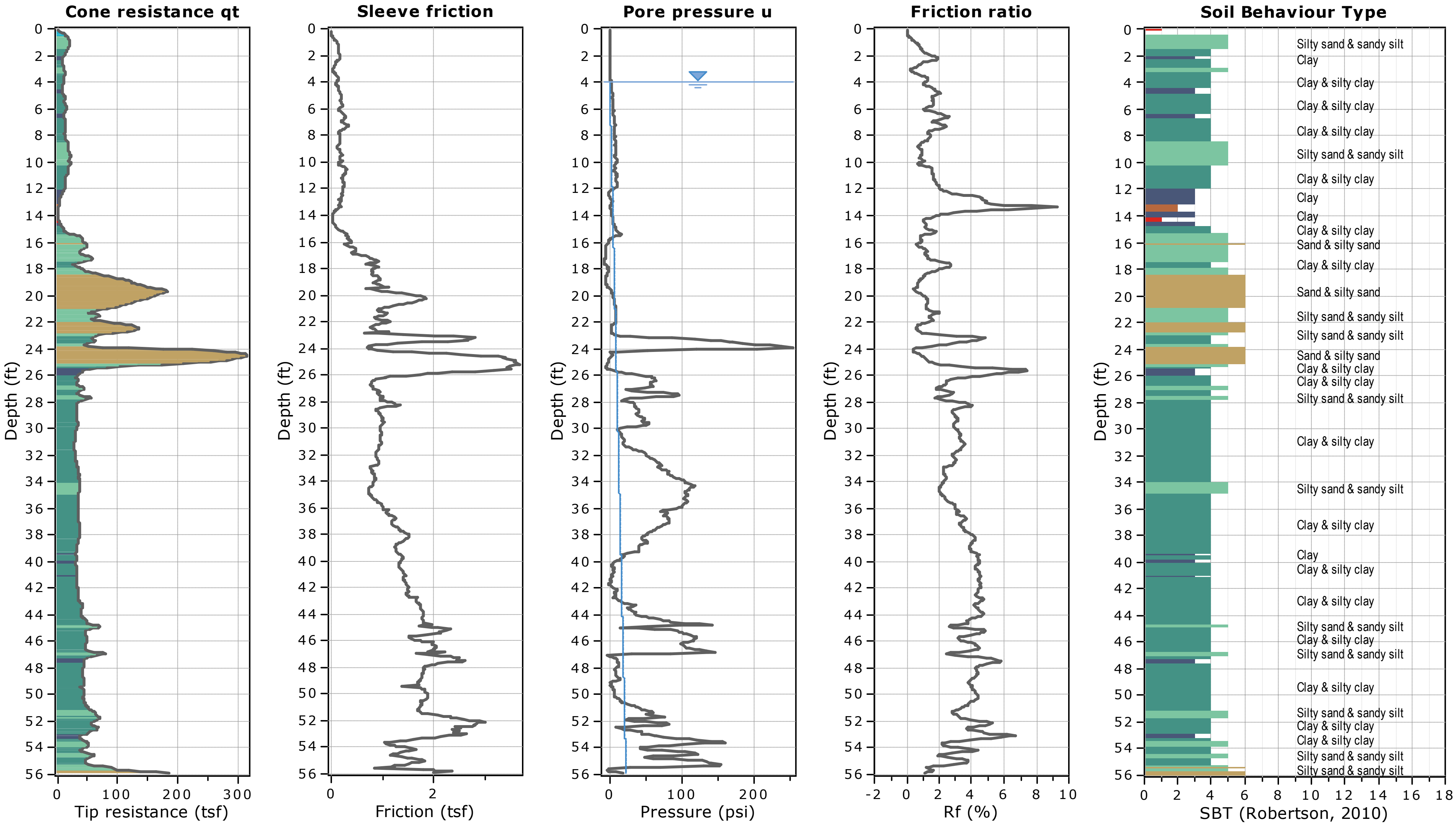
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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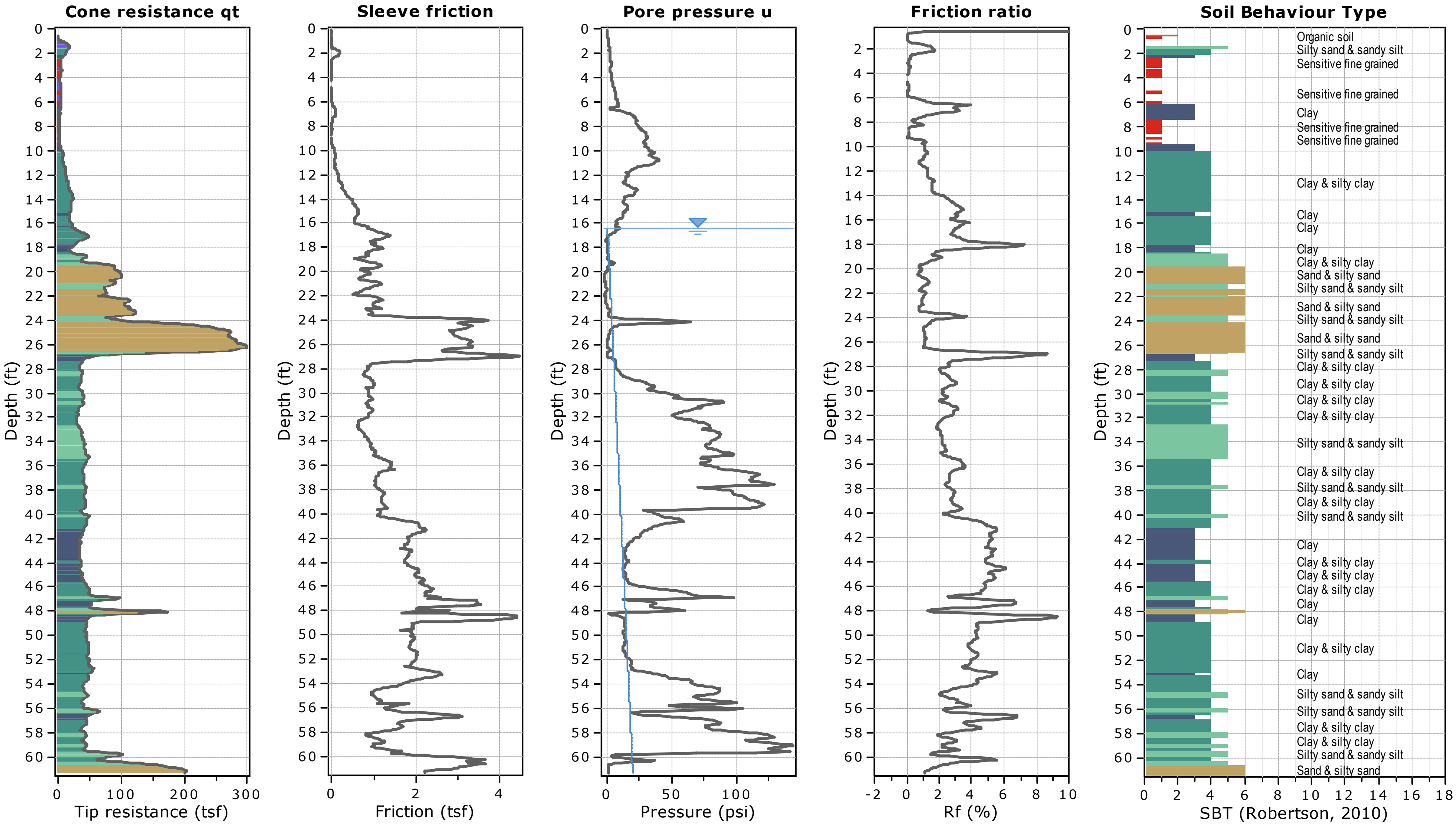
CPT: 19119232-405CPT-11-20
Total depth: 61.35 ft, Date: 1/23/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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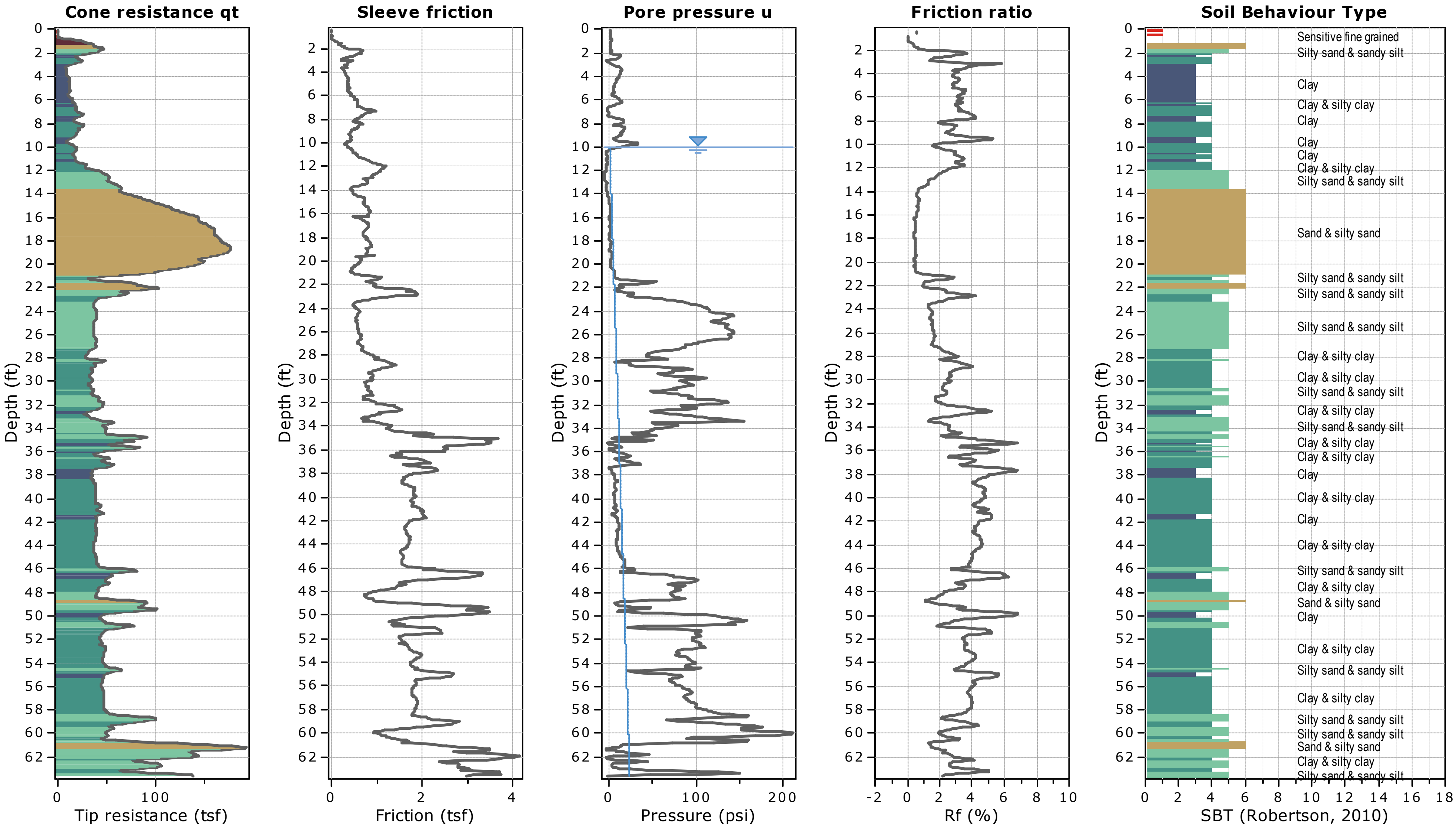
CPT: 19119232-405CPT-12-20
Total depth: 63.65 ft, Date: 1/11/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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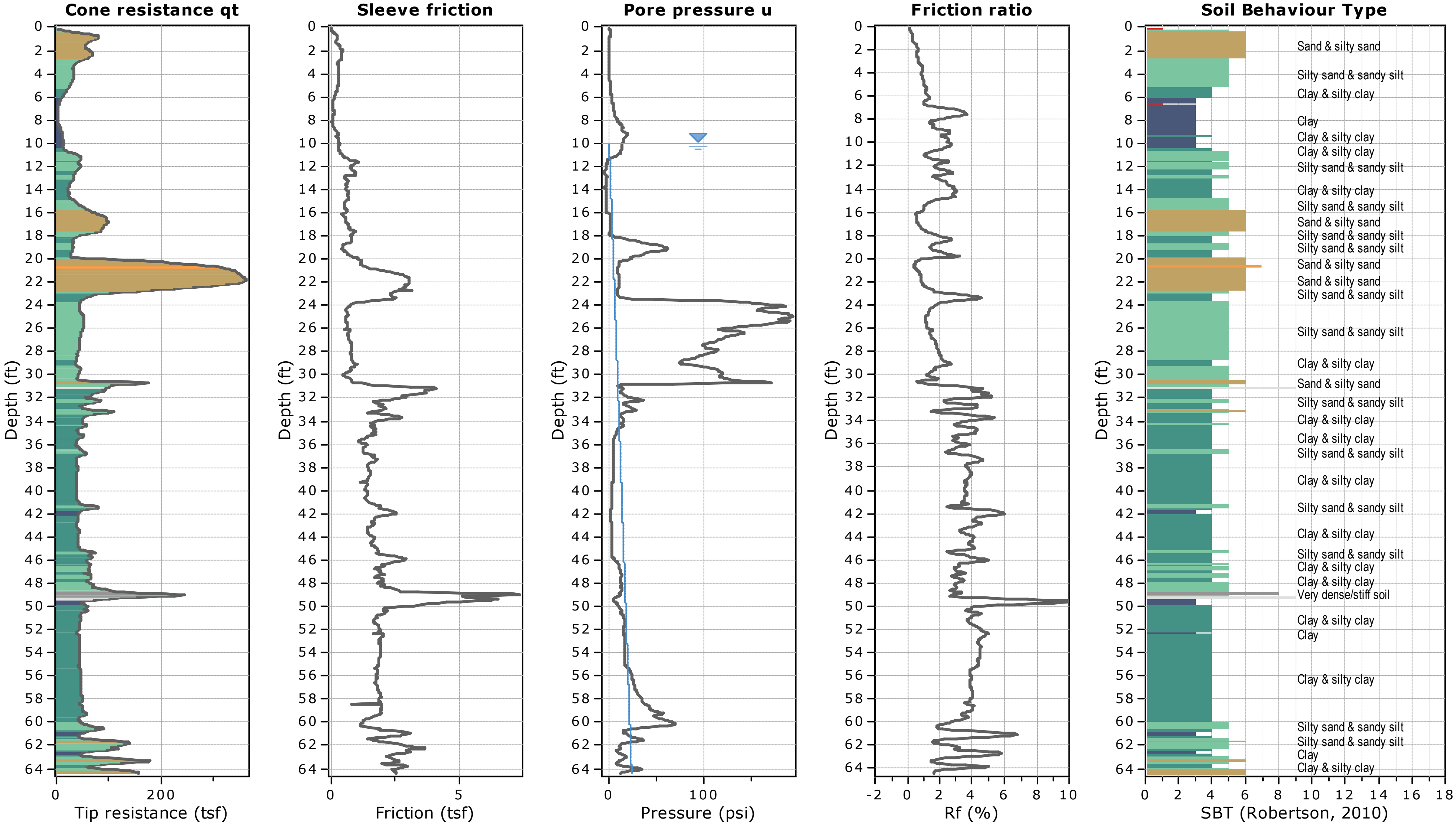
CPT: 19119232-405CPT-13-20
Total depth: 64.44 ft, Date: 1/11/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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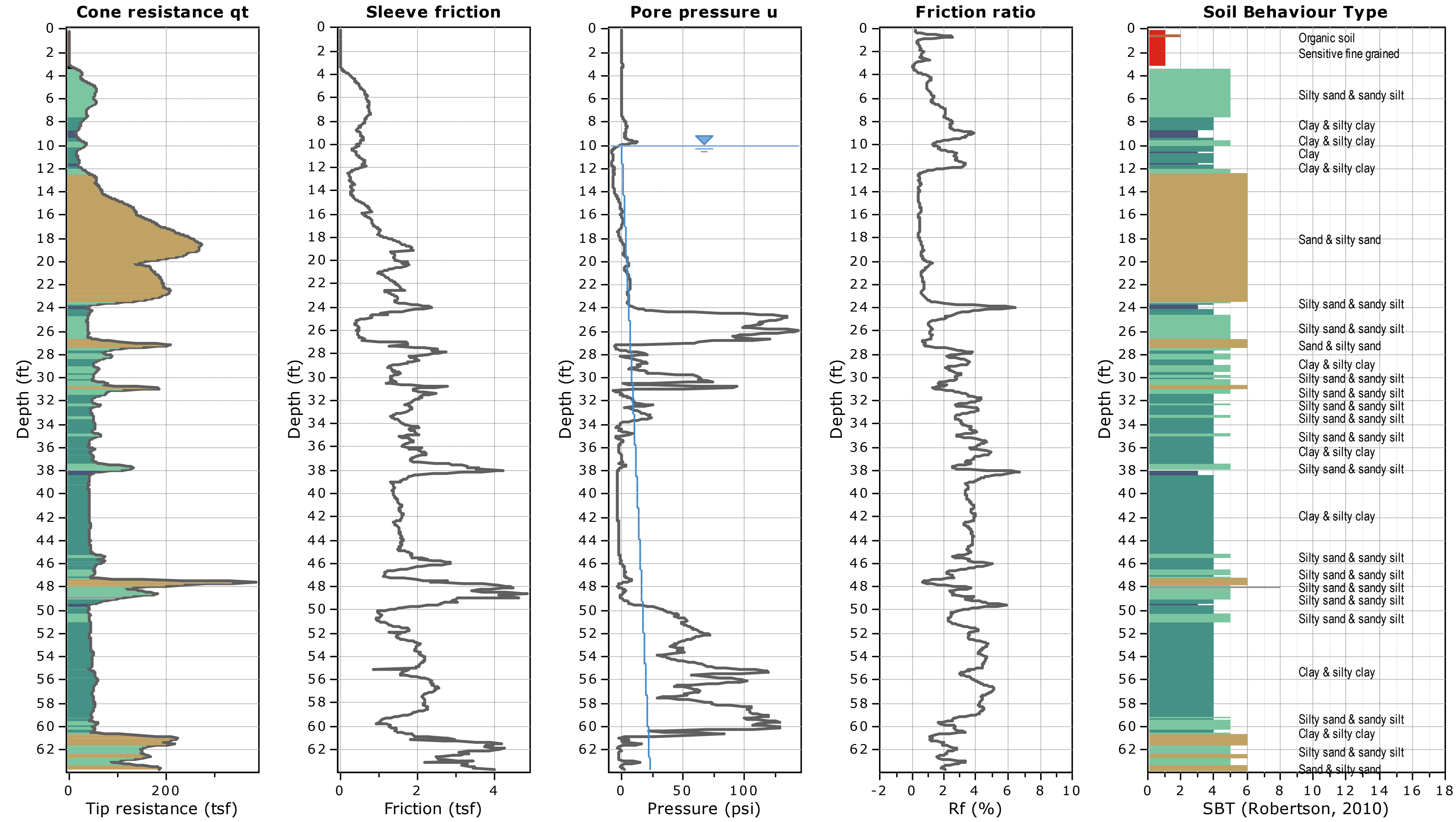
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-14-20
Total depth: 63.71 ft, Date: 1/10/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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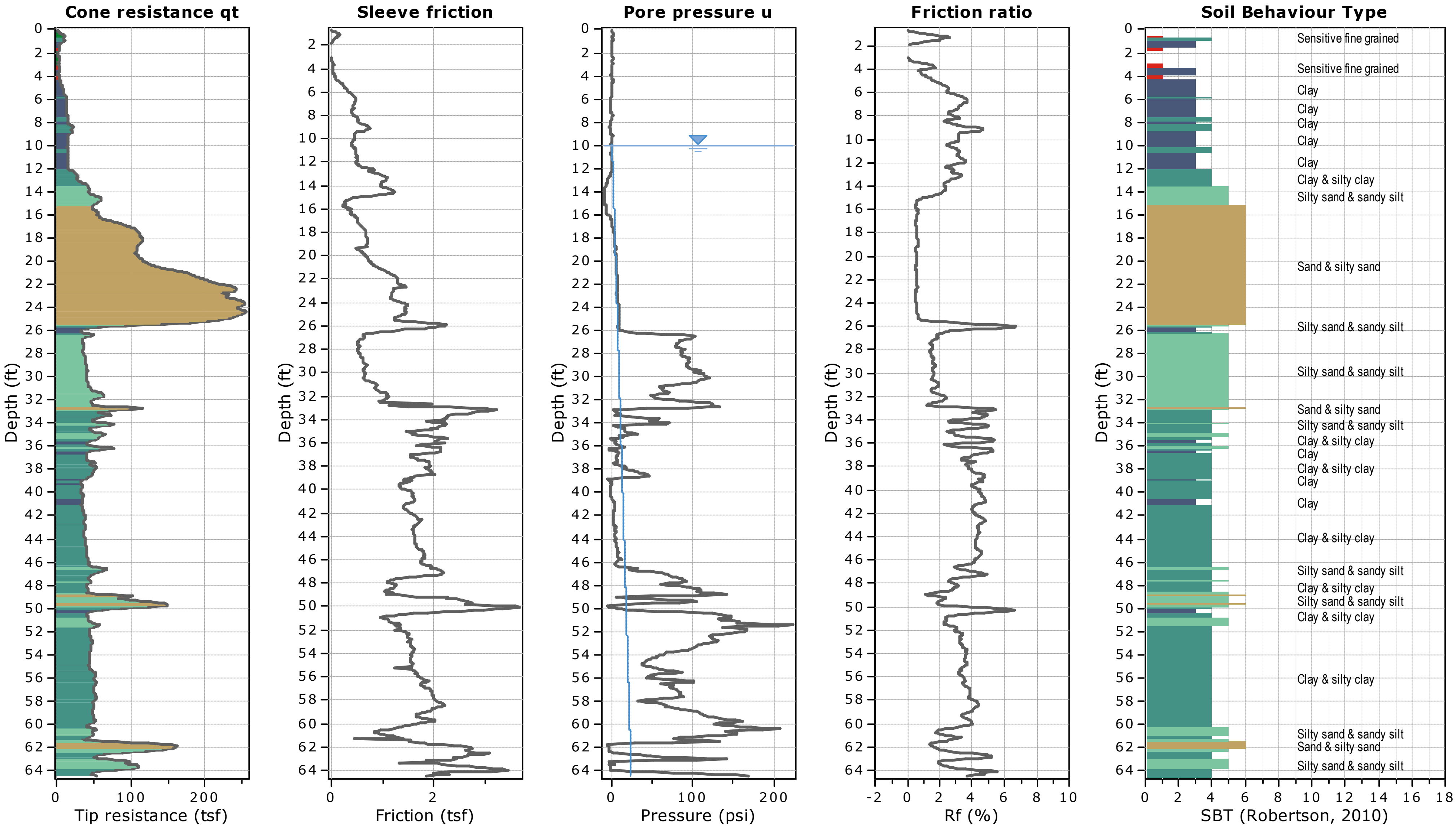
CPT: 19119232-405CPT-15-20

Total depth: 64.50 ft, Date: 1/10/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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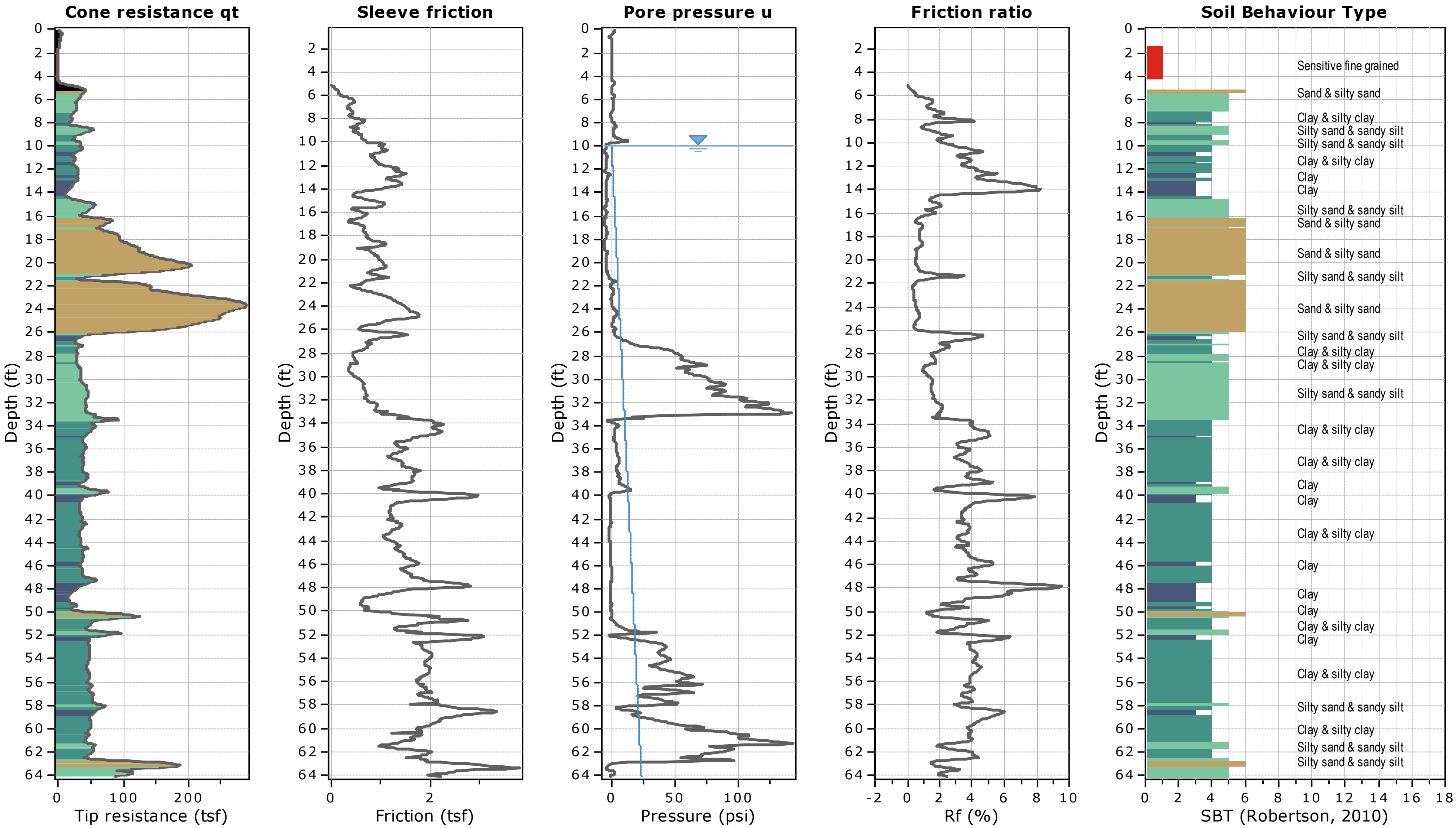
CPT: 19119232-405CPT-16-20
Total depth: 64.11 ft, Date: 1/10/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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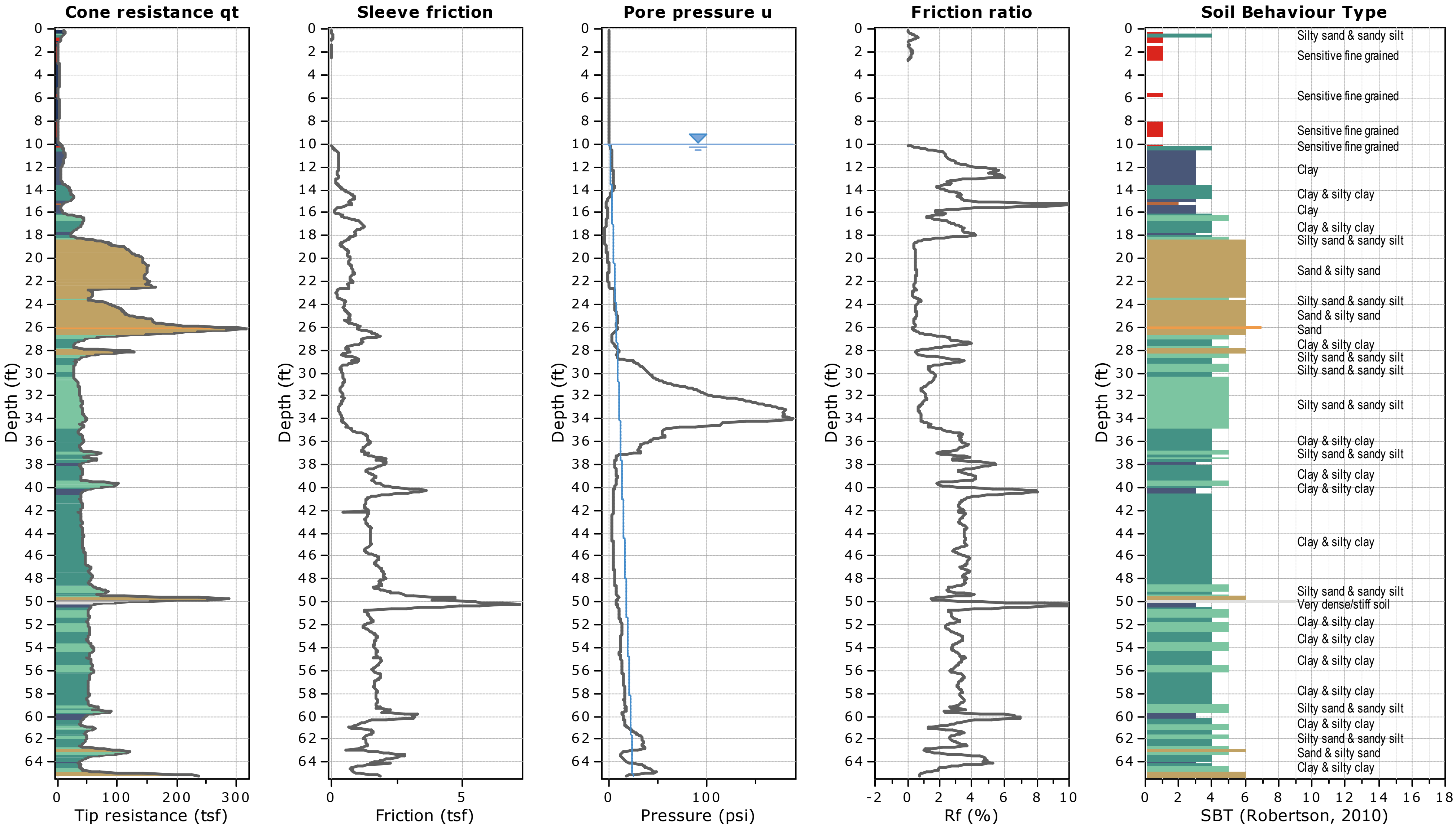
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-17-20
Total depth: 65.22 ft, Date: 1/10/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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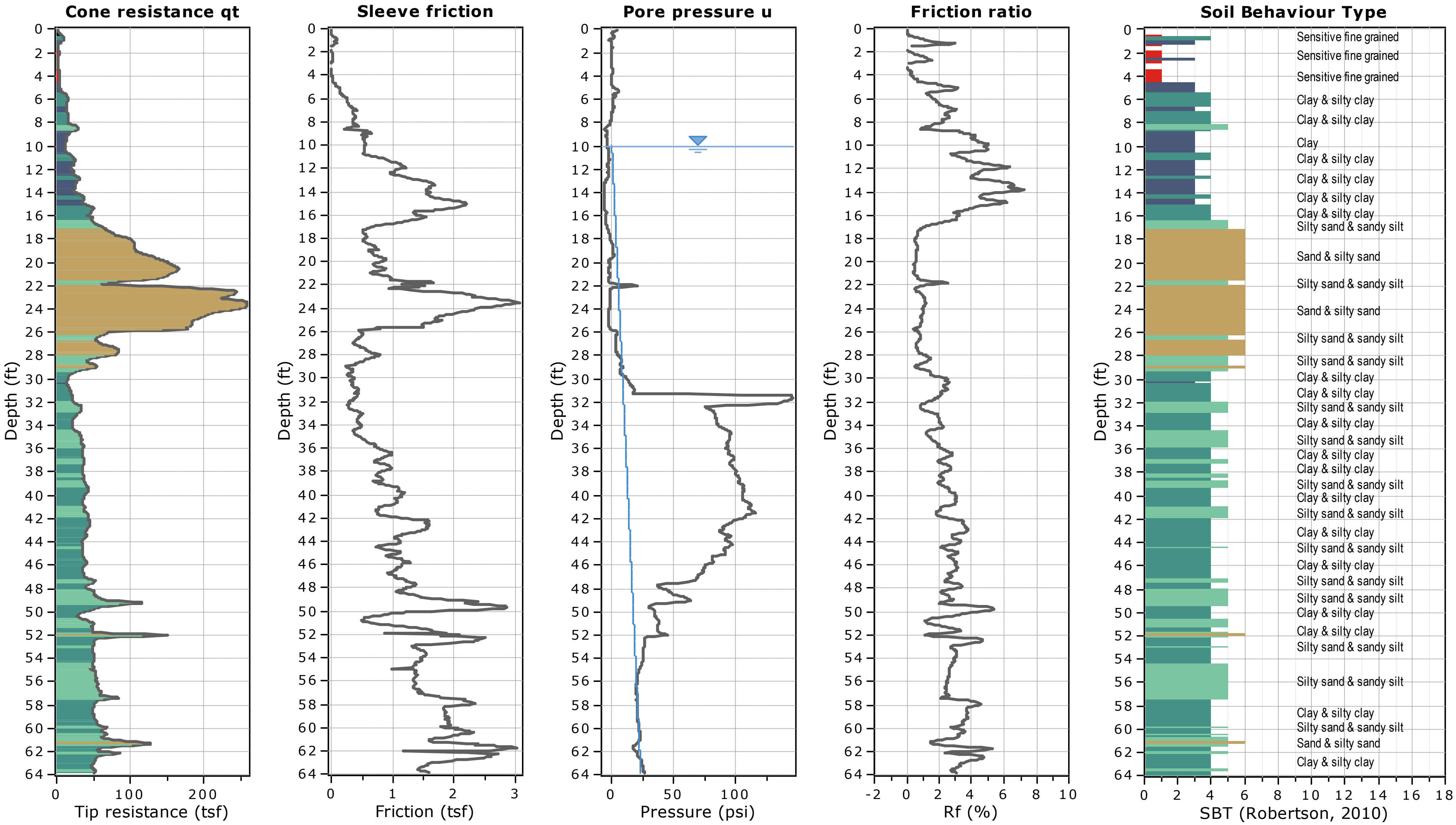
CPT: 19119232-405CPT-18-20
Total depth: 63.85 ft, Date: 1/9/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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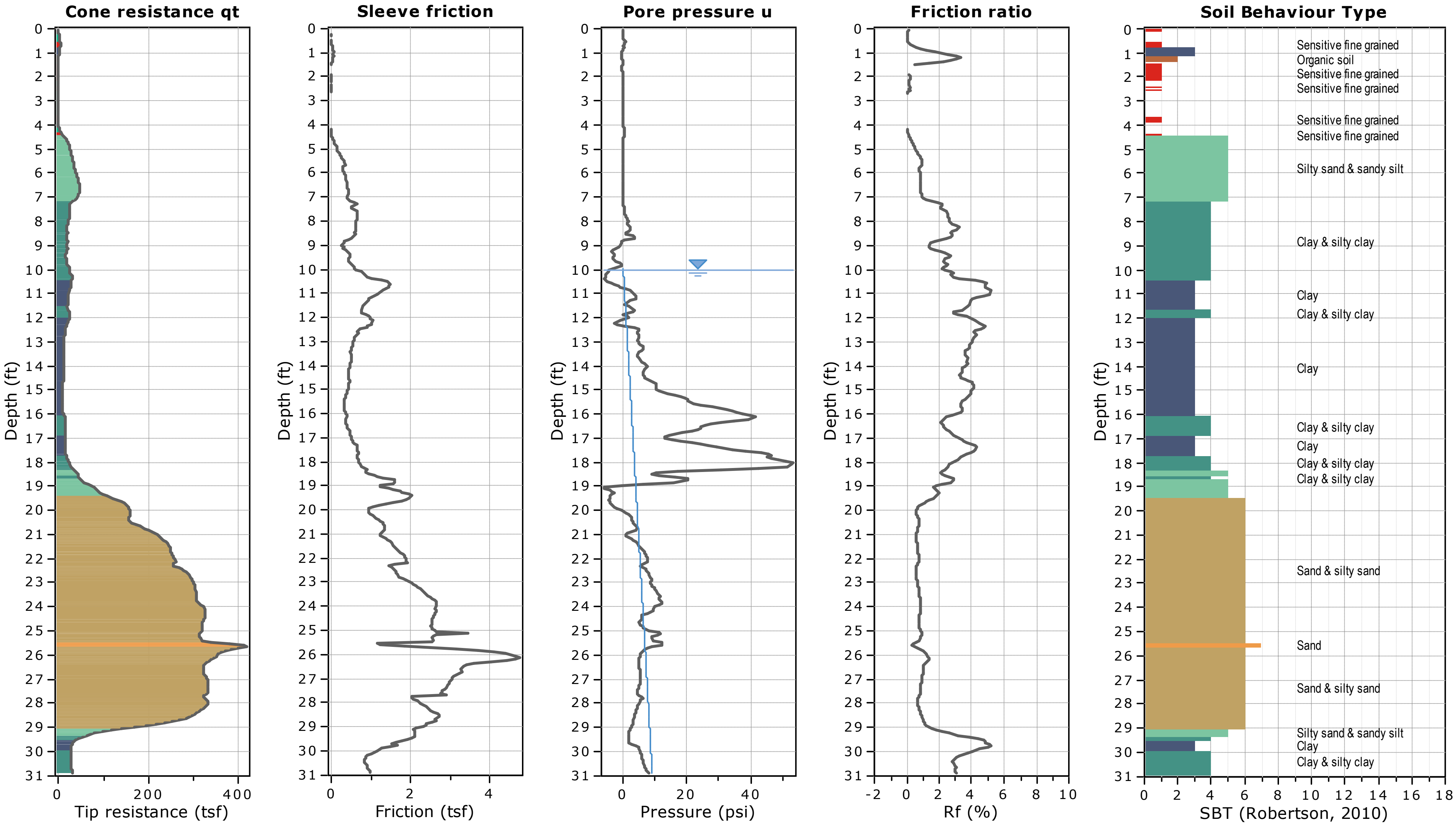
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-19-20
Total depth: 30.91 ft, Date: 1/9/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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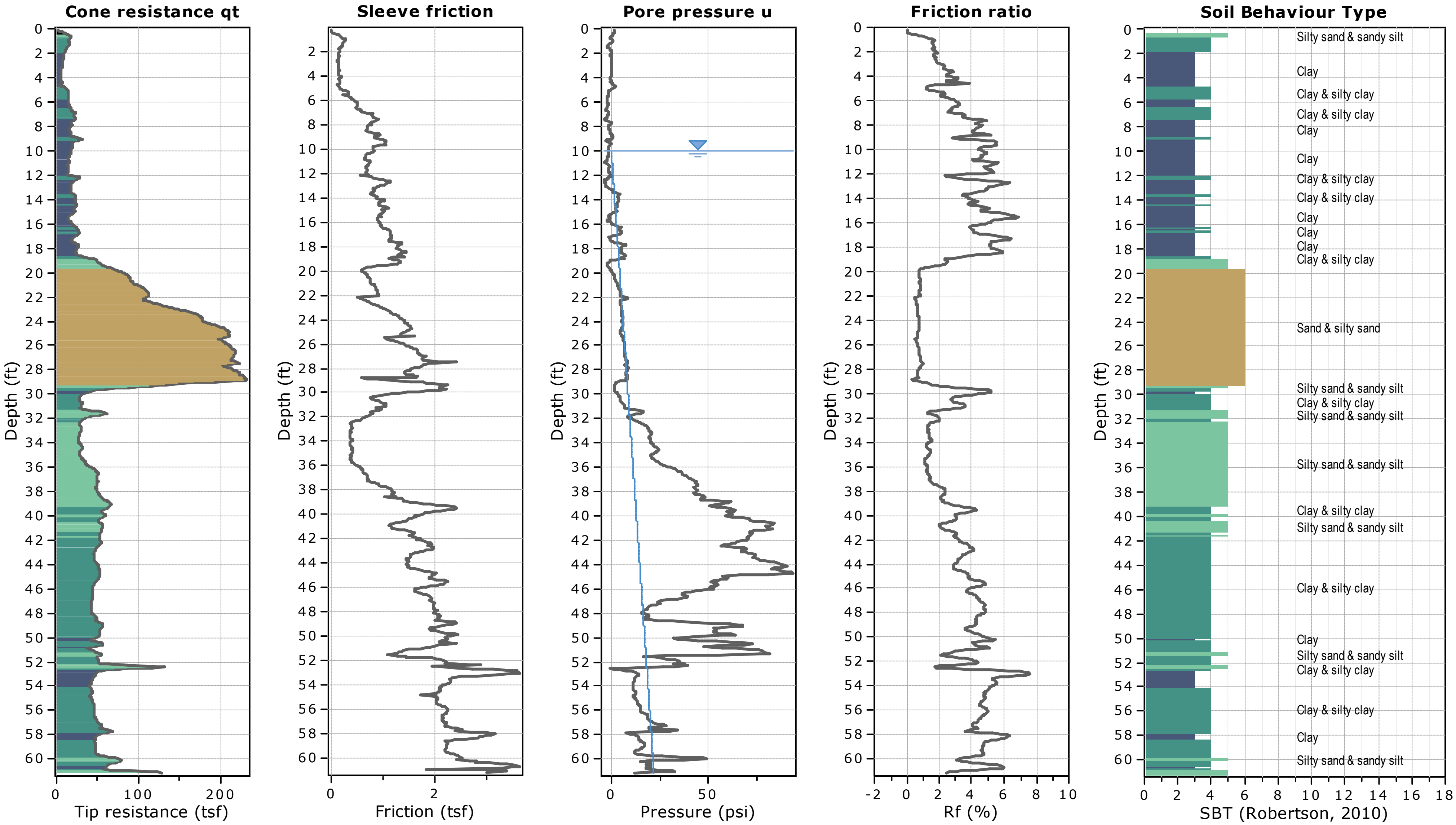
CPT: 19119232-405CPT-19AA-20
Total depth: 61.15 ft, Date: 1/21/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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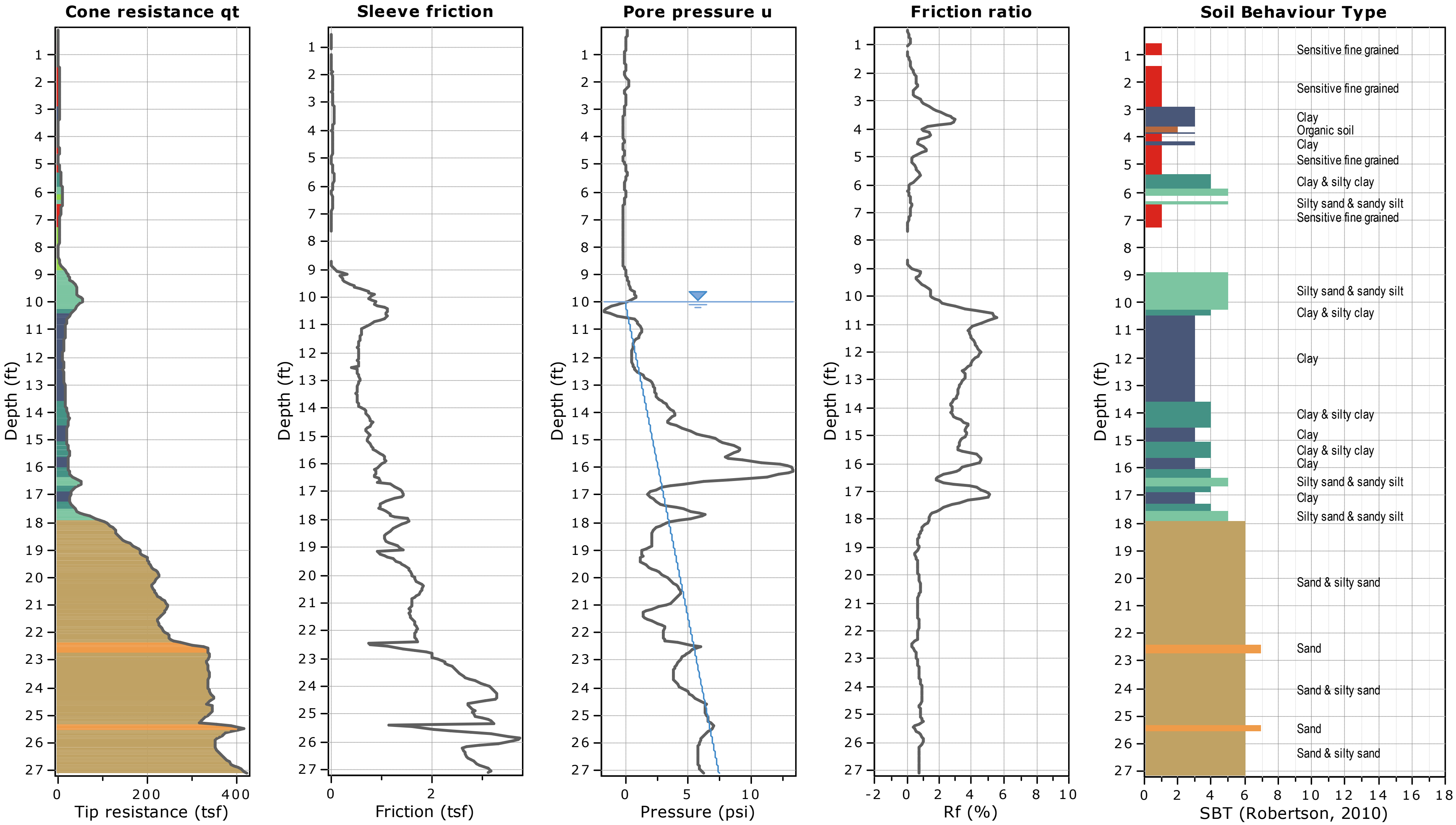
CPT: 19119232-405CPT-20-20
Total depth: 27.10 ft, Date: 1/8/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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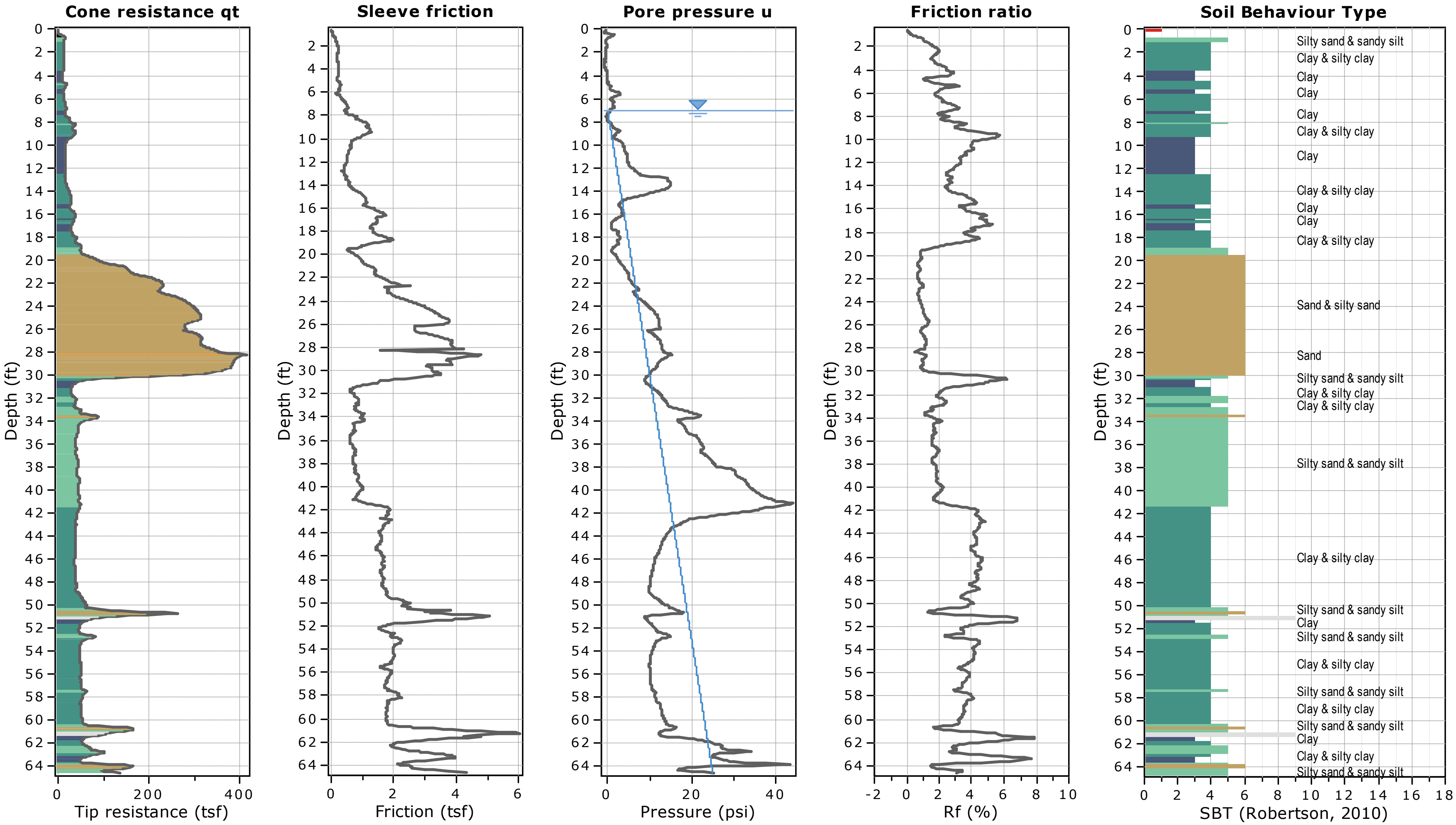
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-20A-20
Total depth: 64.63 ft, Date: 1/21/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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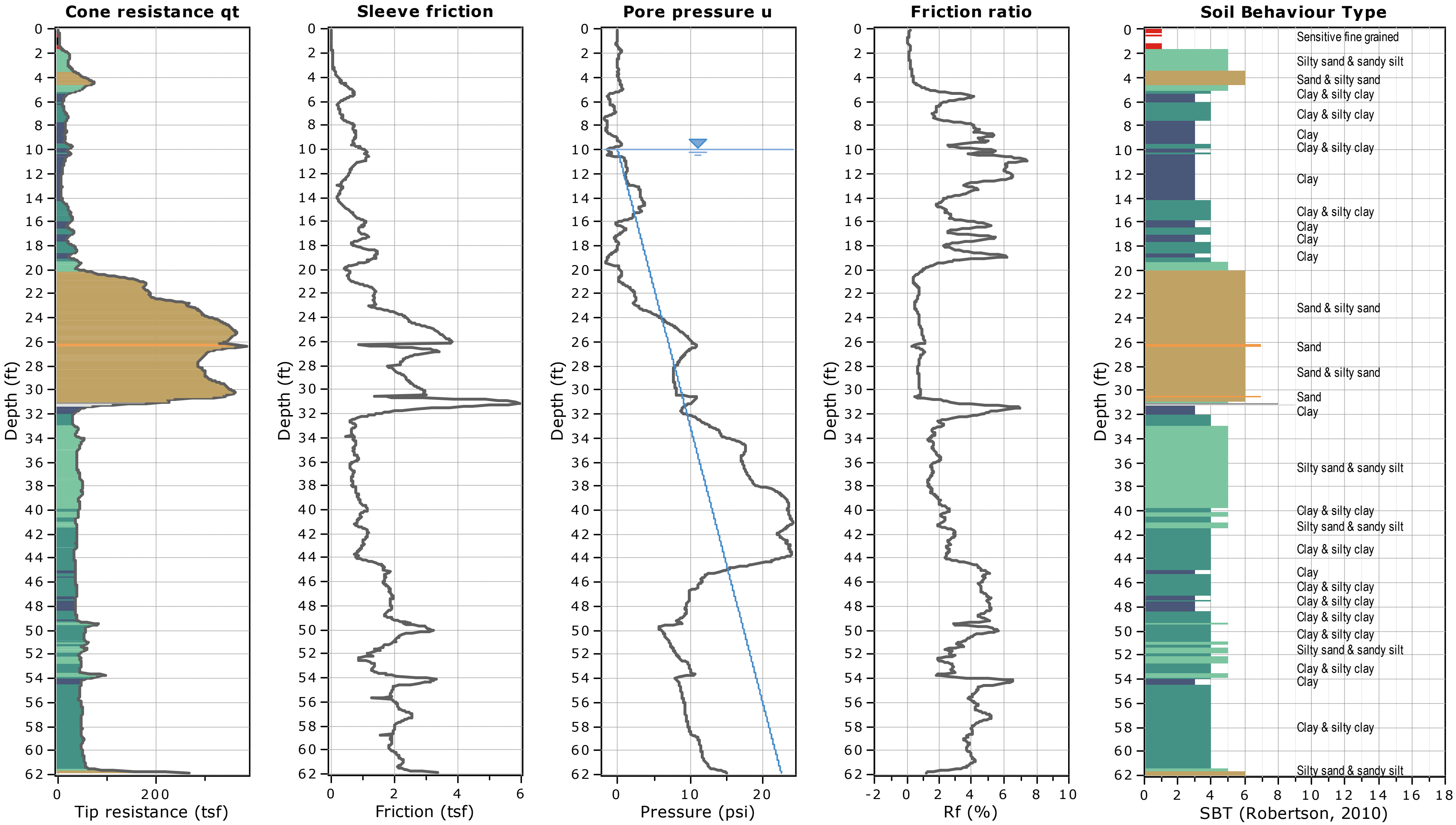
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-21-20
Total depth: 61.88 ft, Date: 1/8/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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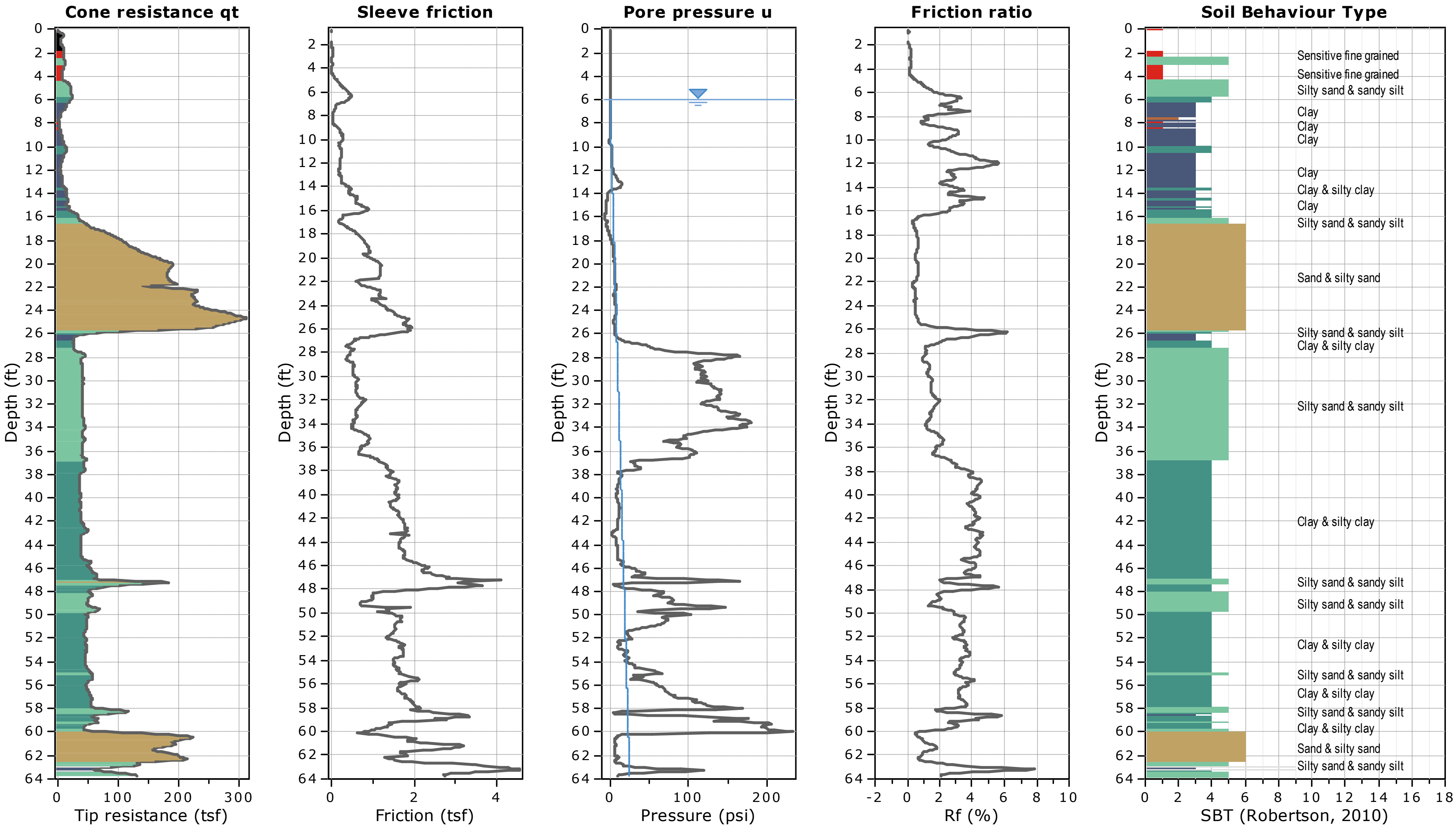
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-22-19
Total depth: 63.78 ft, Date: 12/8/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn



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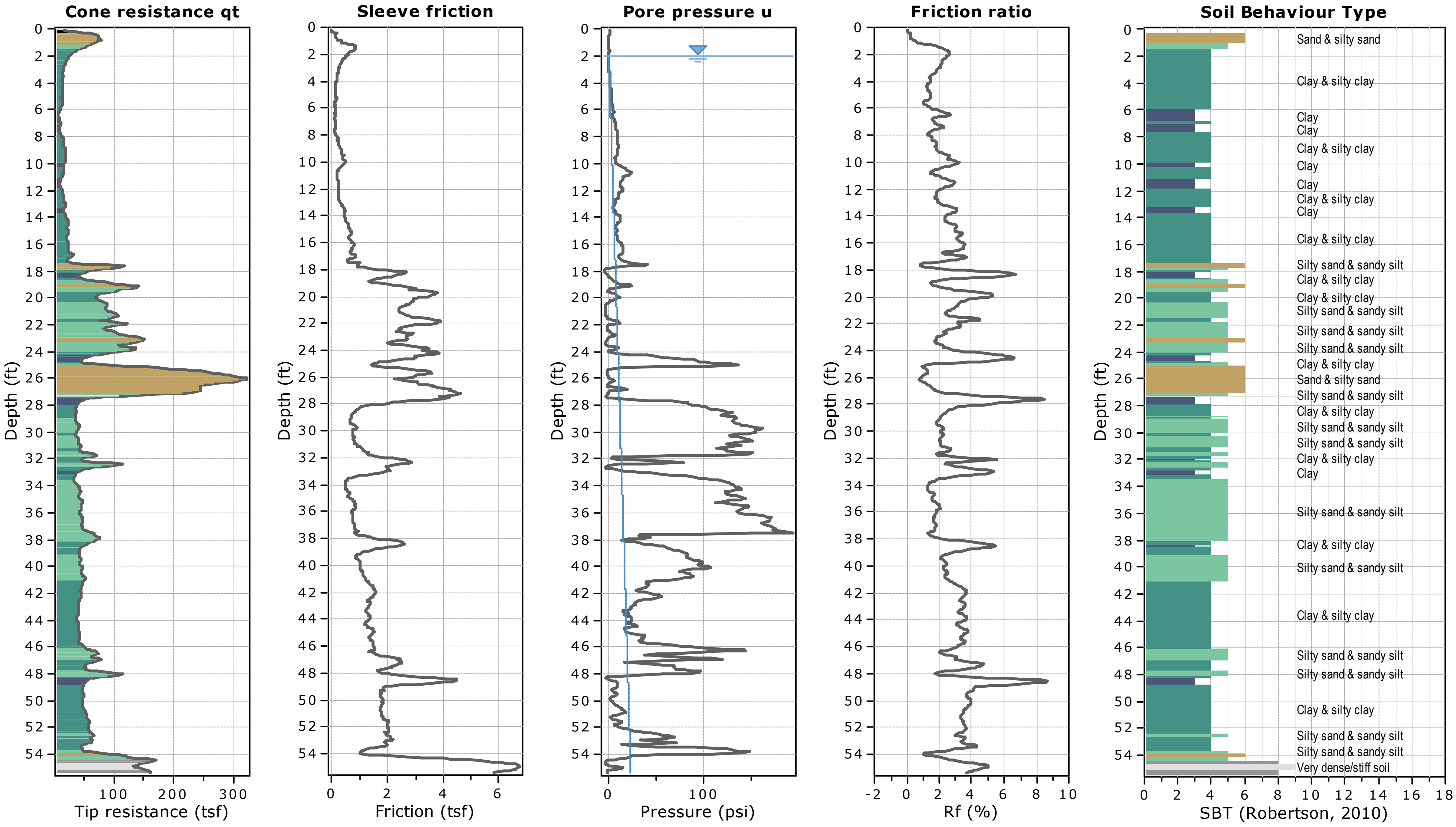
CPT: 19119232-405CPT-23-20
Total depth: 55.38 ft, Date: 1/23/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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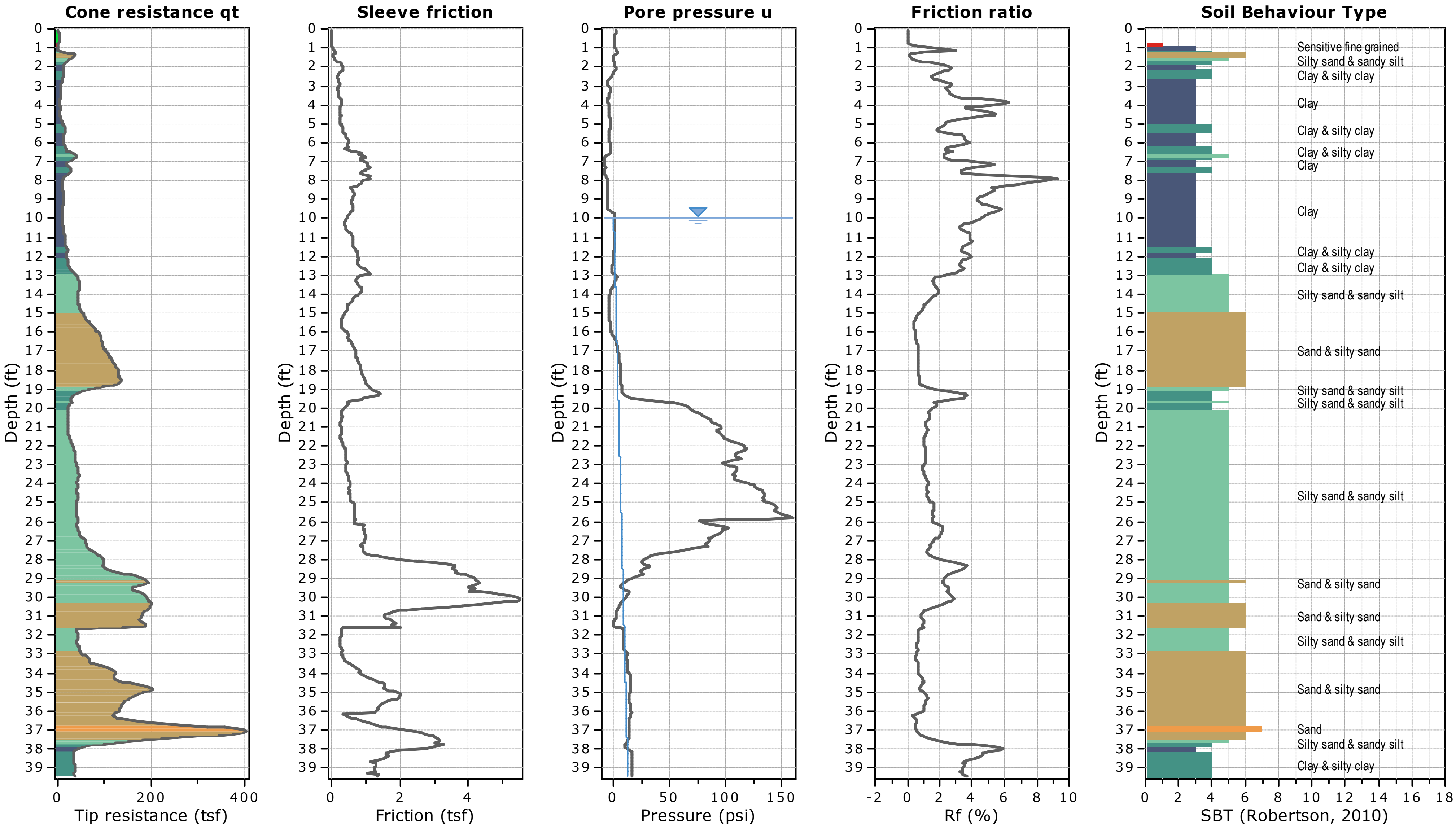
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-24-20
Total depth: 39.44 ft, Date: 1/11/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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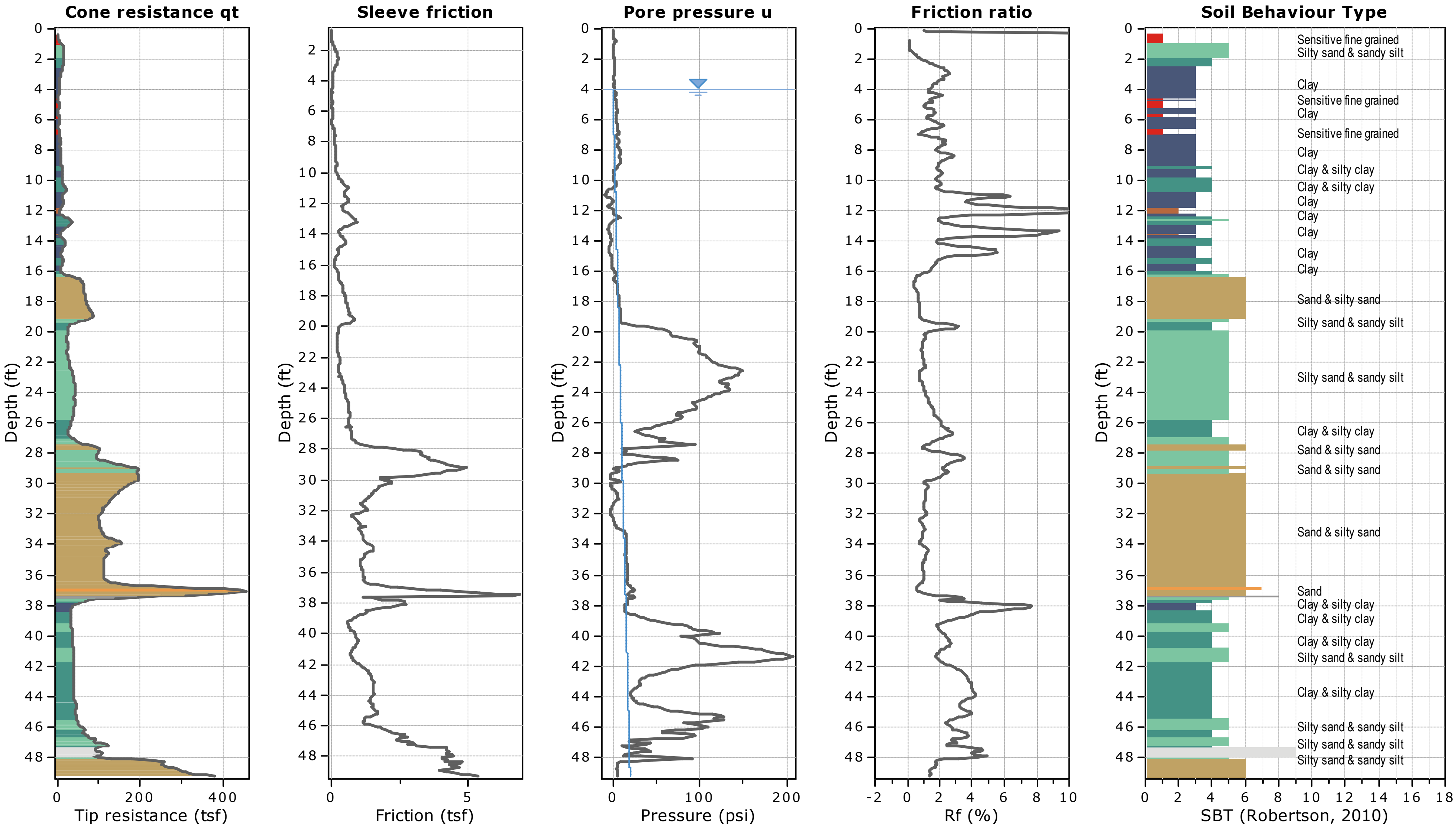
CPT: 19119232-405CPT-24A-20
Total depth: 49.28 ft, Date: 1/27/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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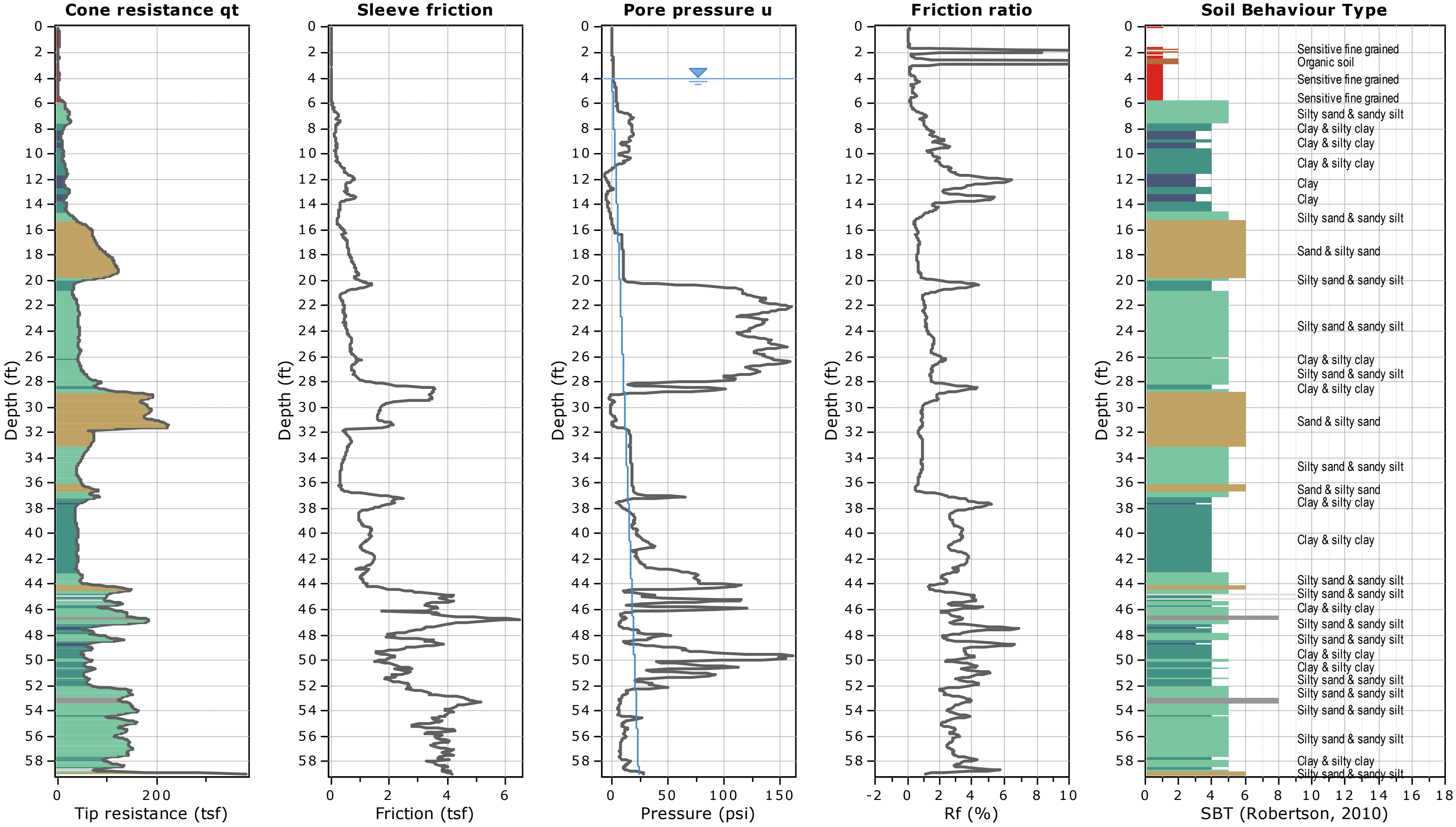
CPT: 19119232-405CPT-25-20
Total depth: 58.99 ft, Date: 1/12/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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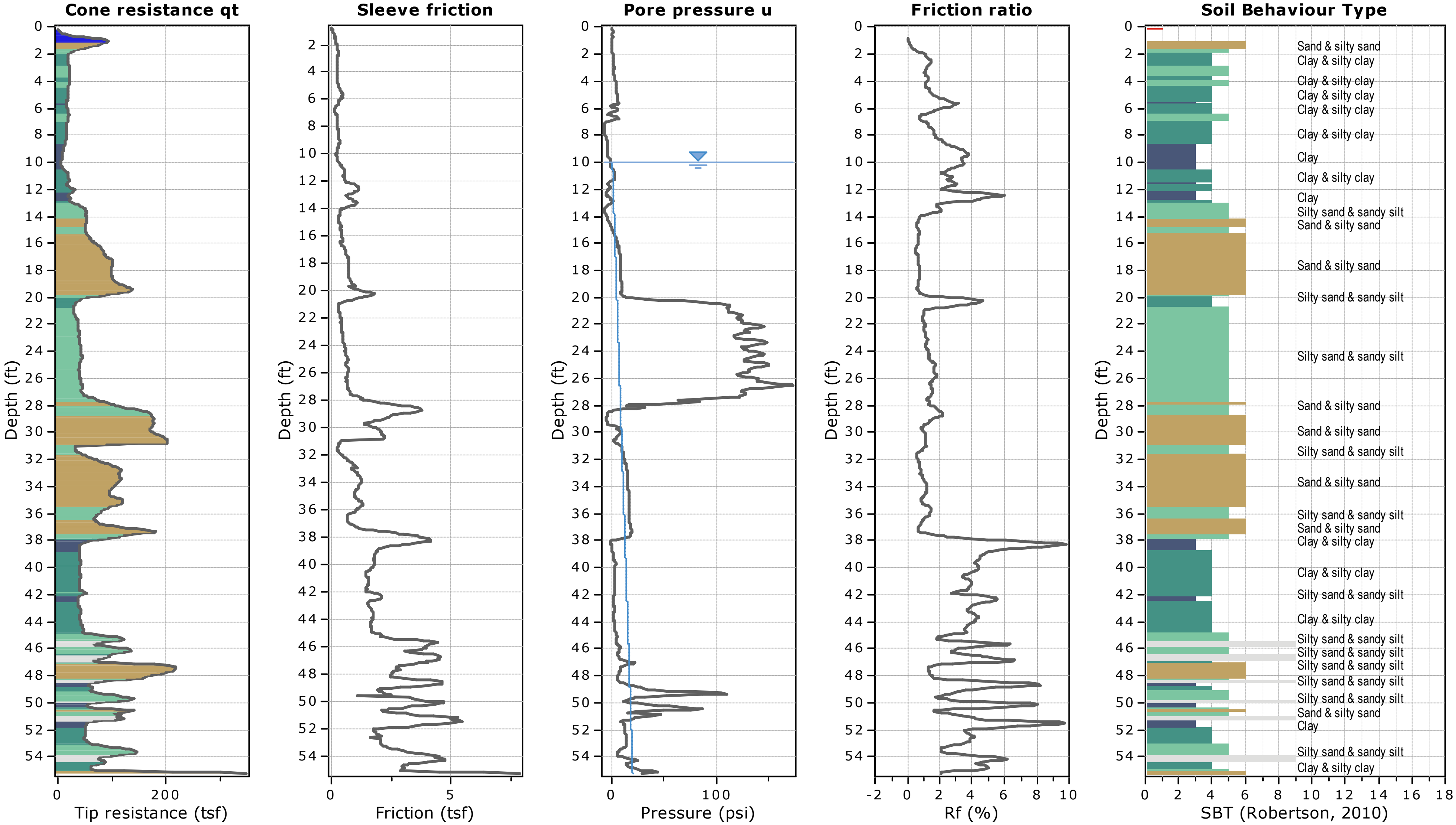
CPT: 19119232-405CPT-26-20
Total depth: 55.25 ft, Date: 1/12/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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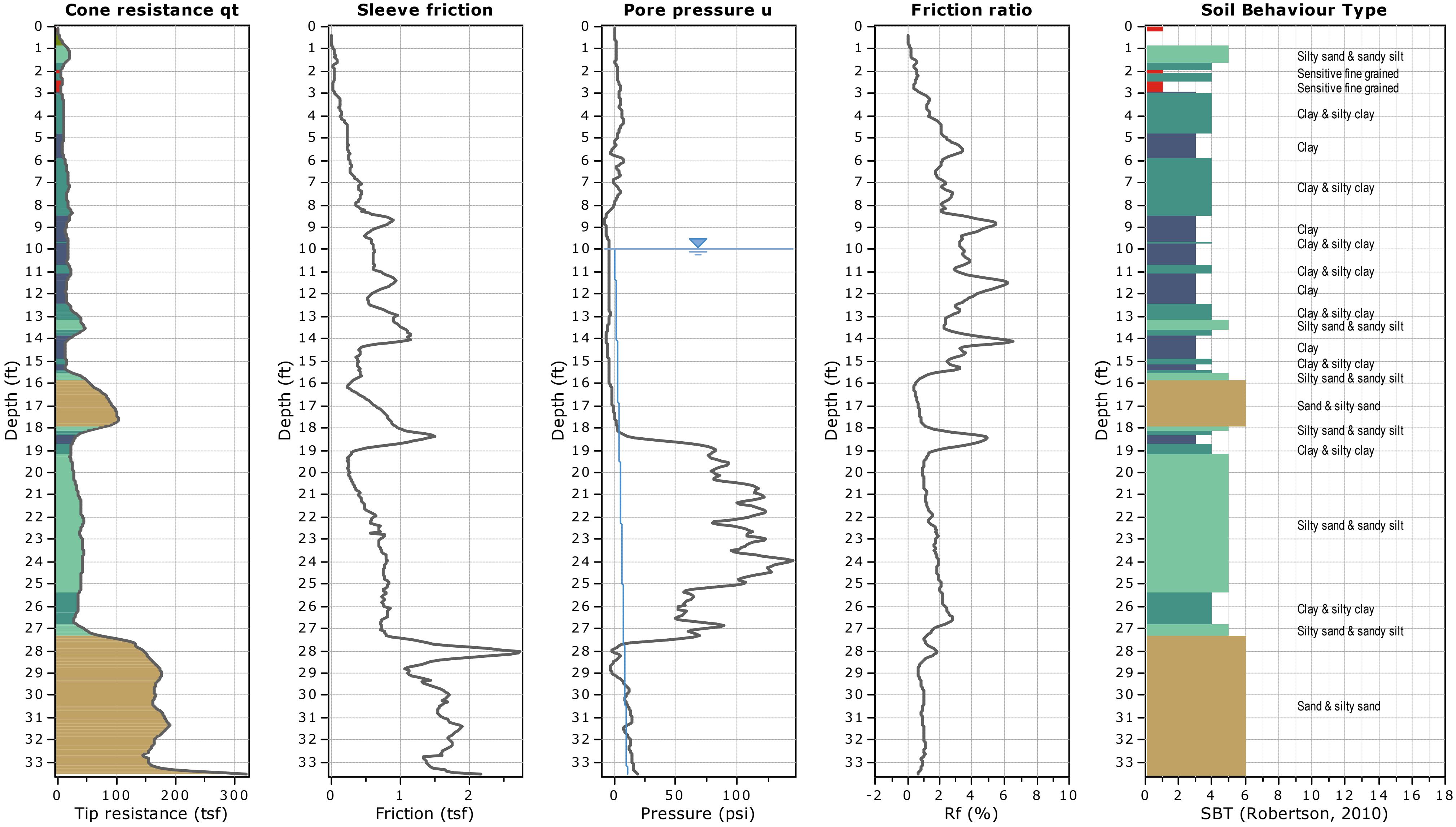
CPT: 19119232-405CPT-27-20
Total depth: 33.53 ft, Date: 1/12/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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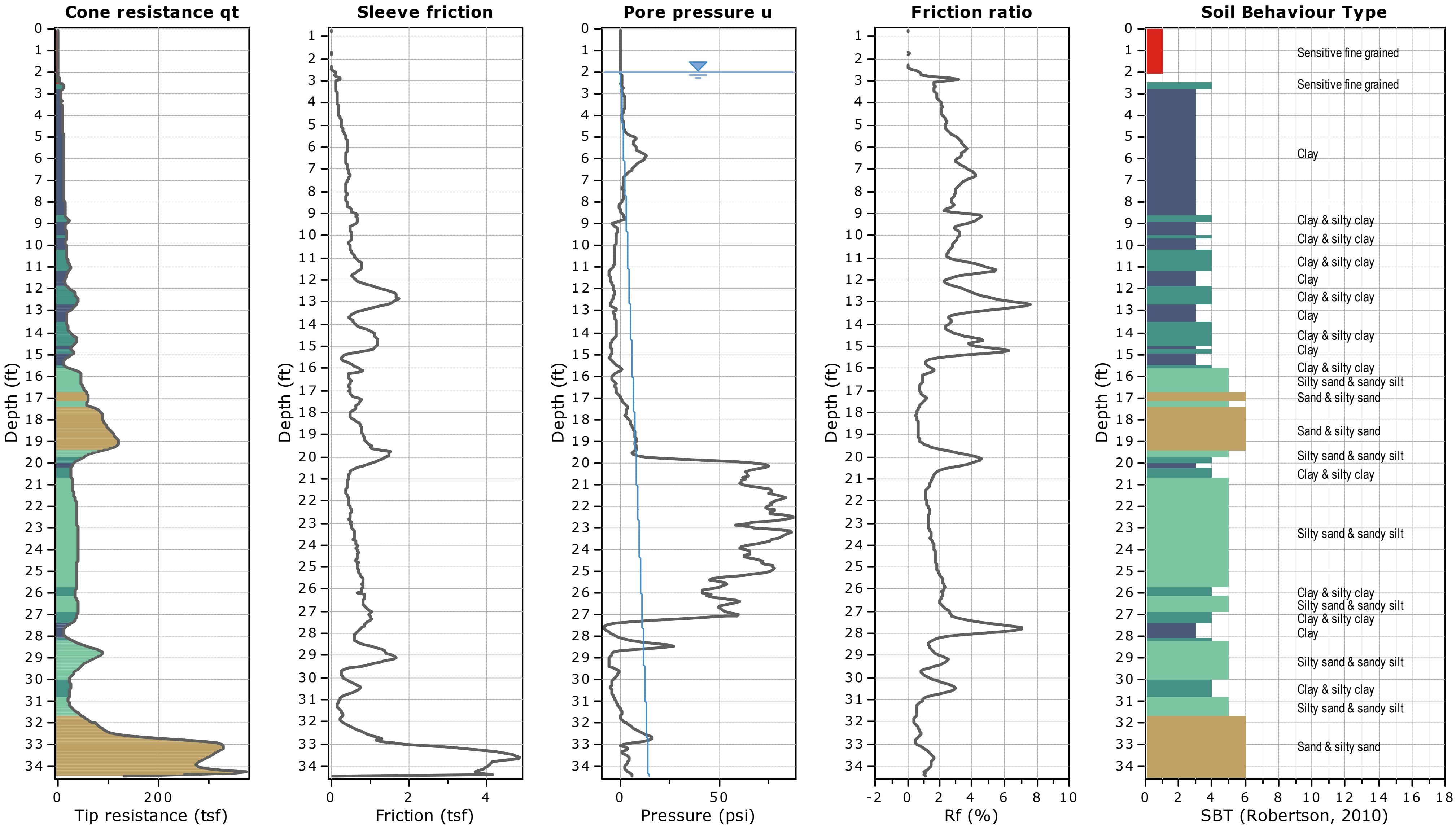
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-27A-20
Total depth: 34.45 ft, Date: 1/27/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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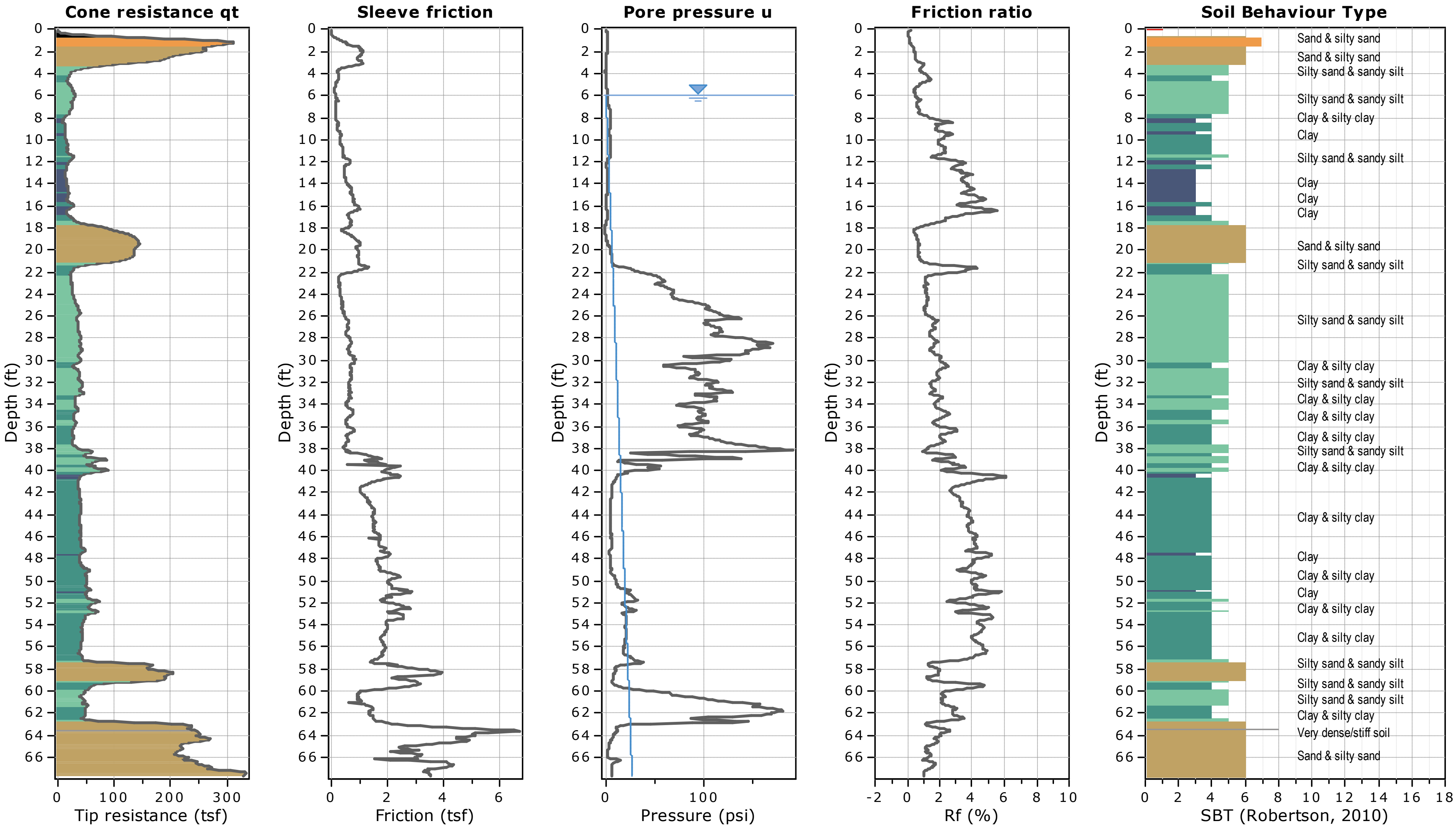
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-28-19
Total depth: 67.72 ft, Date: 12/6/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn



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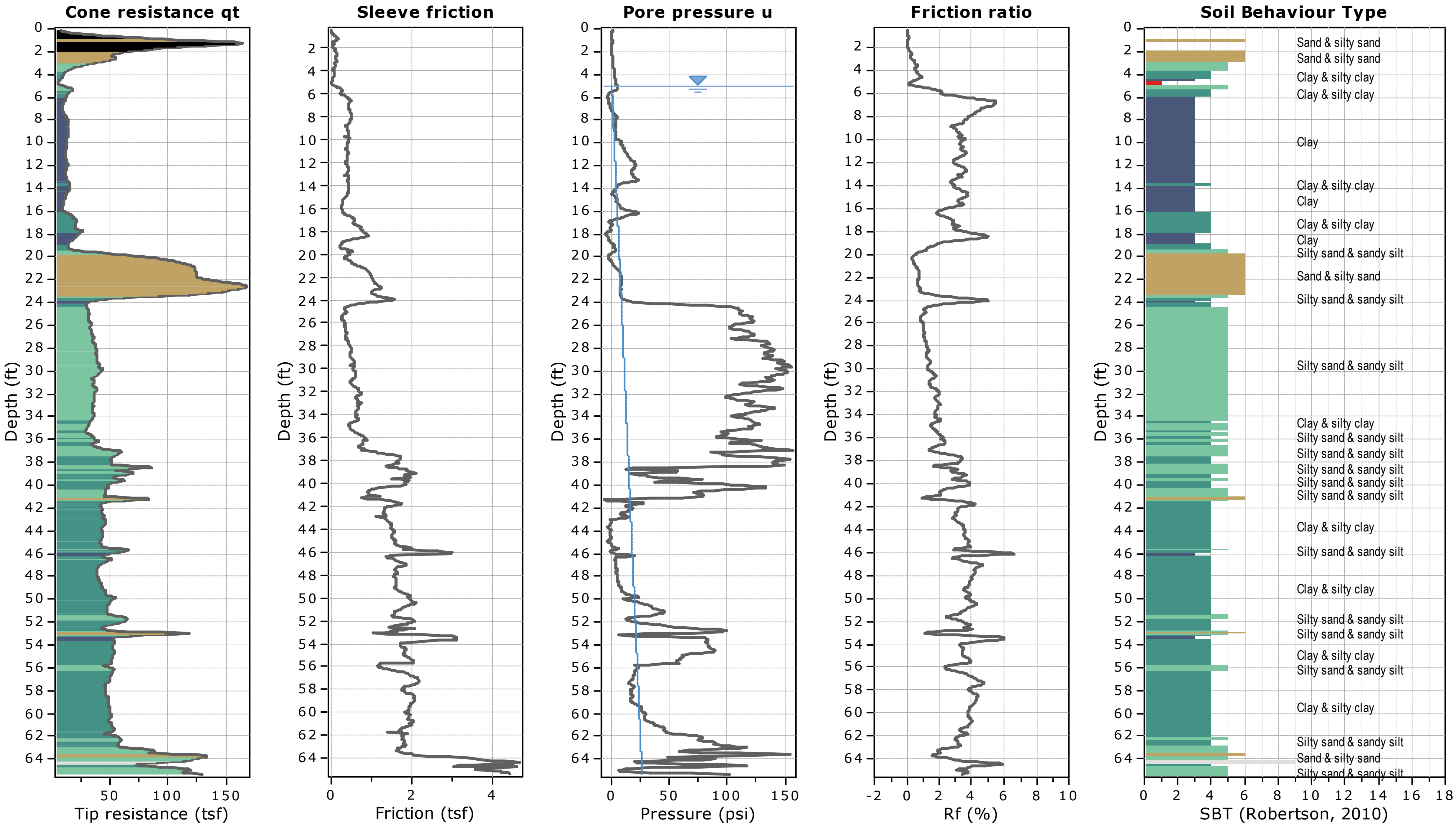
CPT: 19119232-405CPT-29-19
Total depth: 65.35 ft, Date: 12/10/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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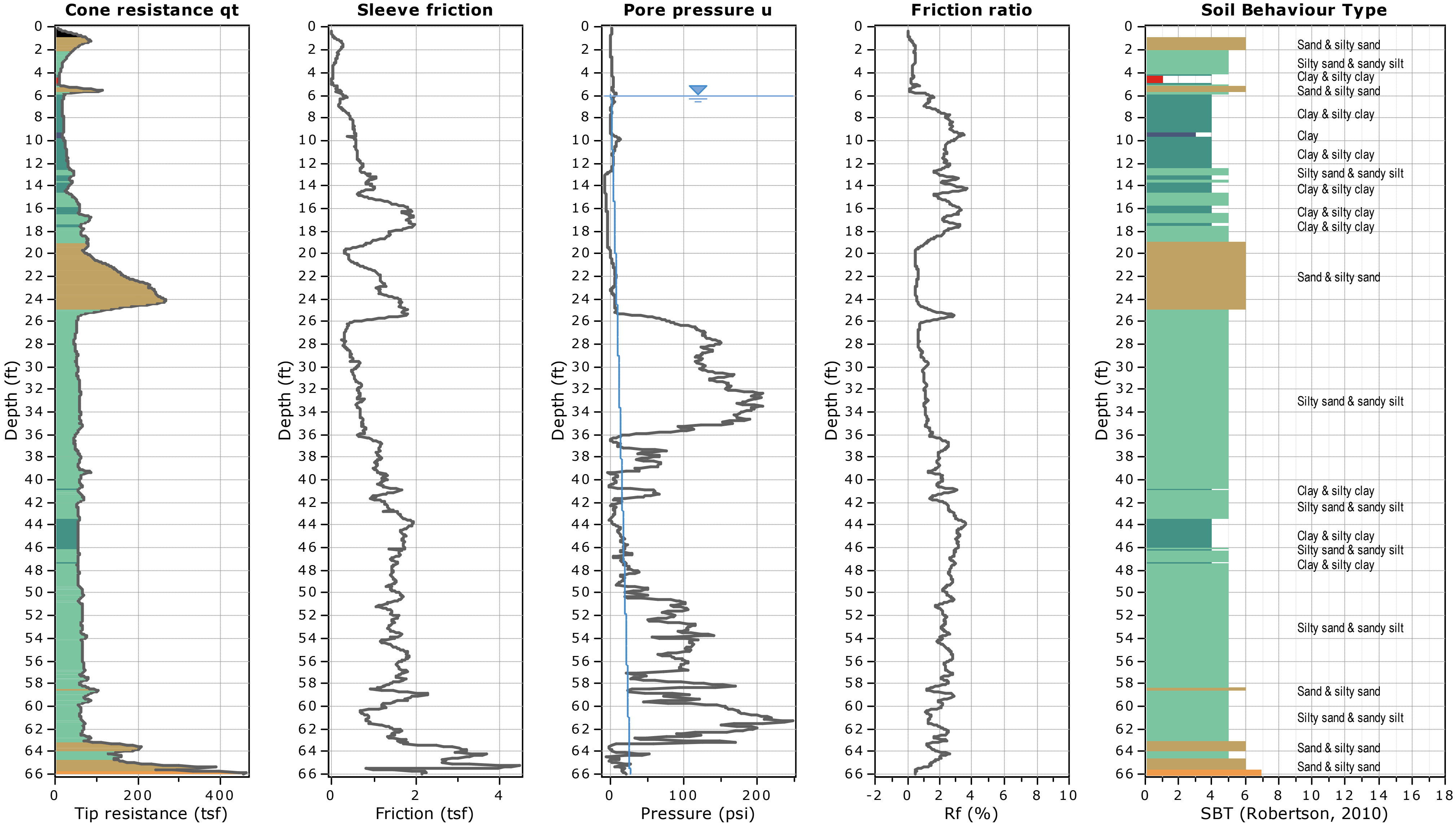
CPT: 19119232-405CPT-30-19

Total depth: 66.01 ft, Date: 12/6/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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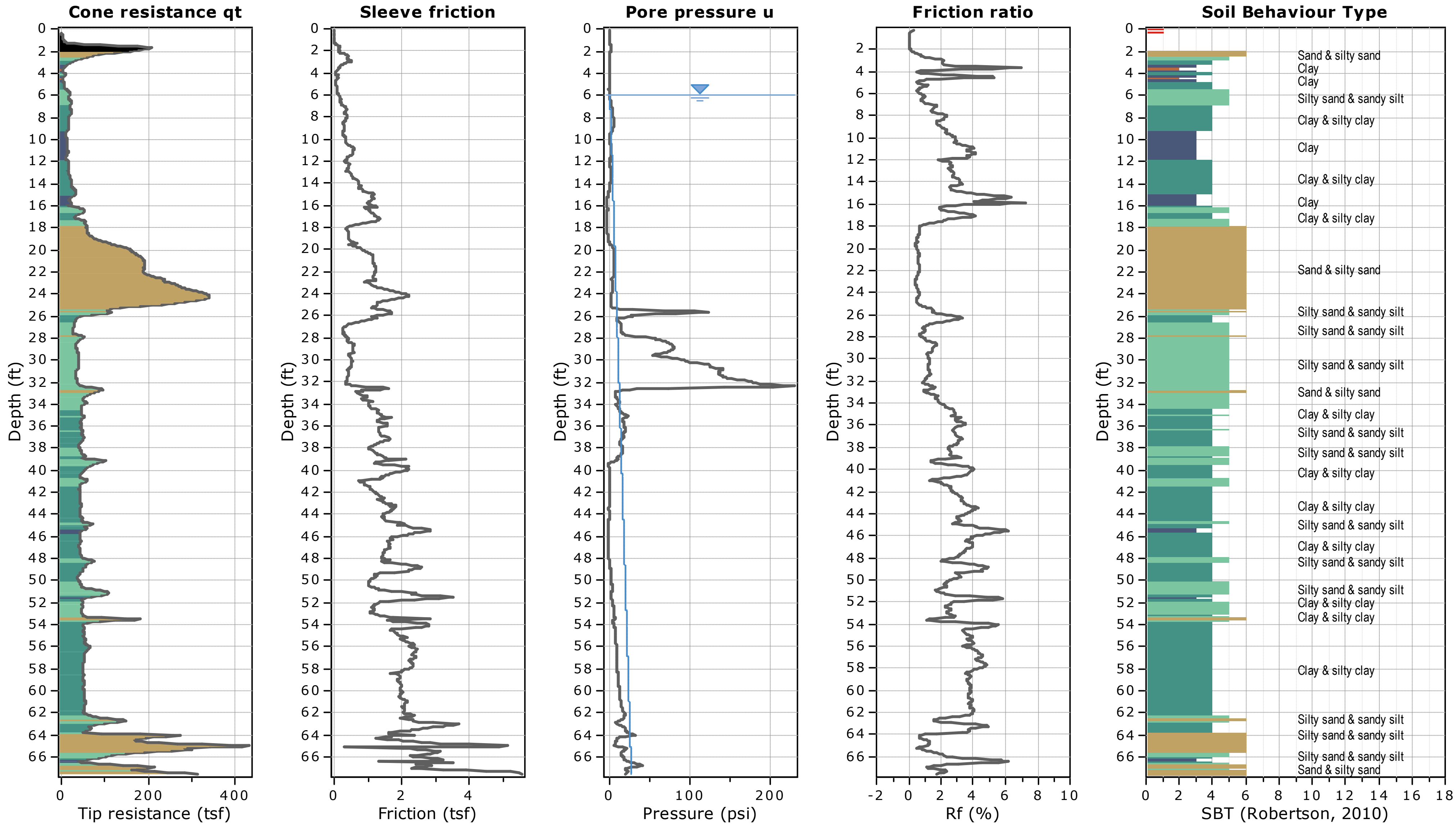
CPT: 19119232-405CPT-31-19
Total depth: 67.59 ft, Date: 12/6/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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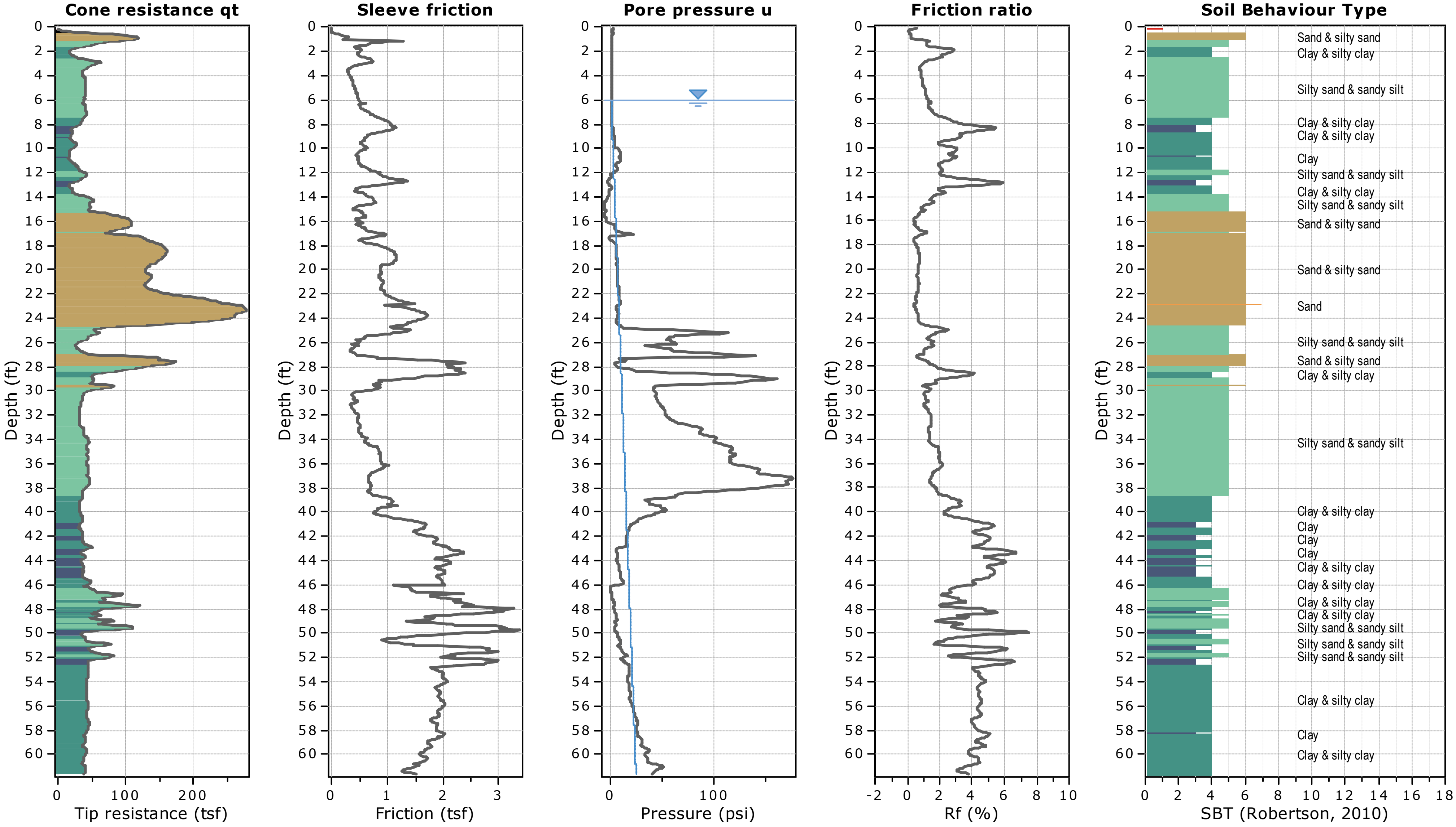
CPT: 19119232-405CPT-32-19
Total depth: 61.61 ft, Date: 12/9/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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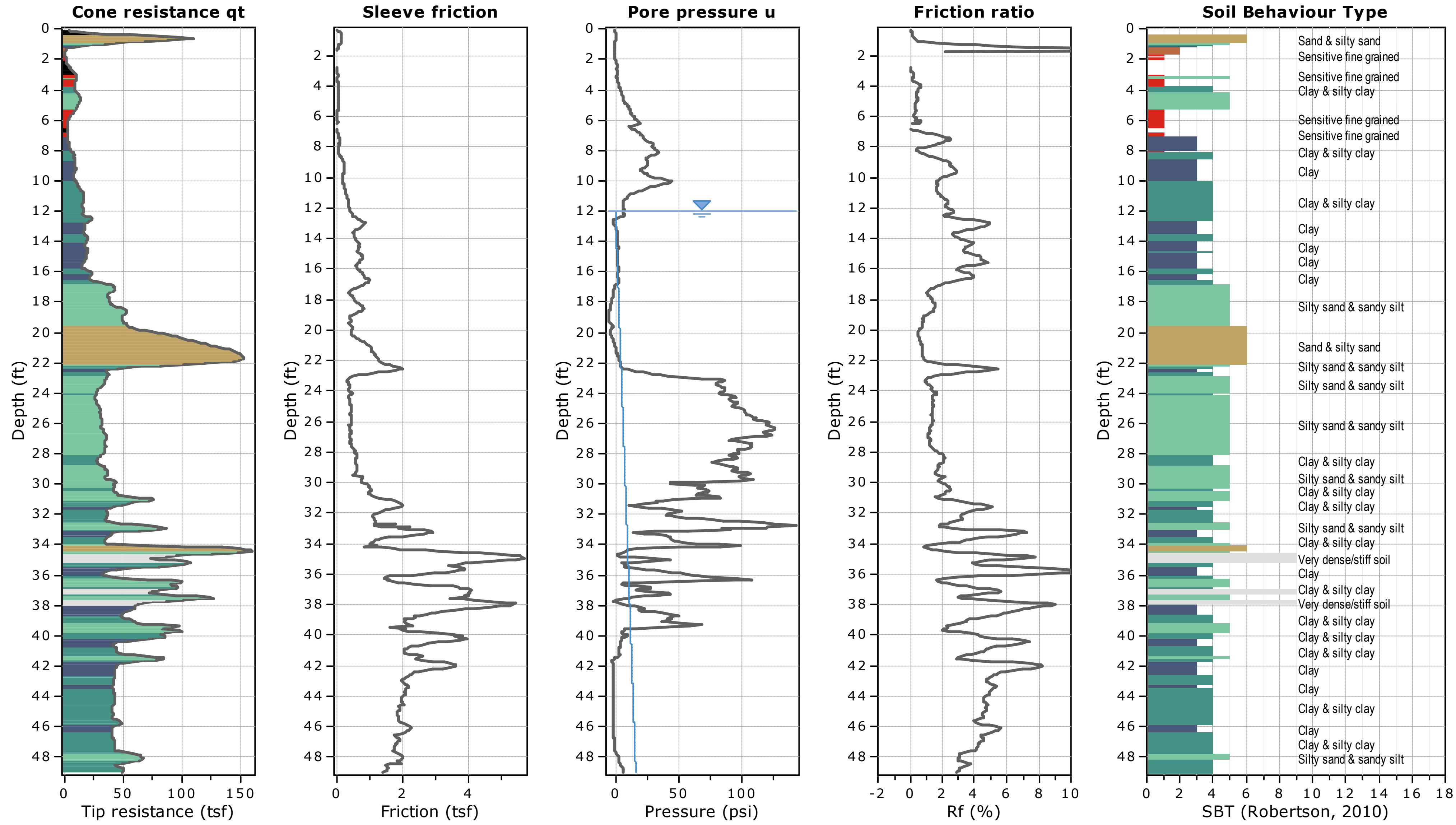
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-34-19
Total depth: 49.02 ft, Date: 12/5/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip



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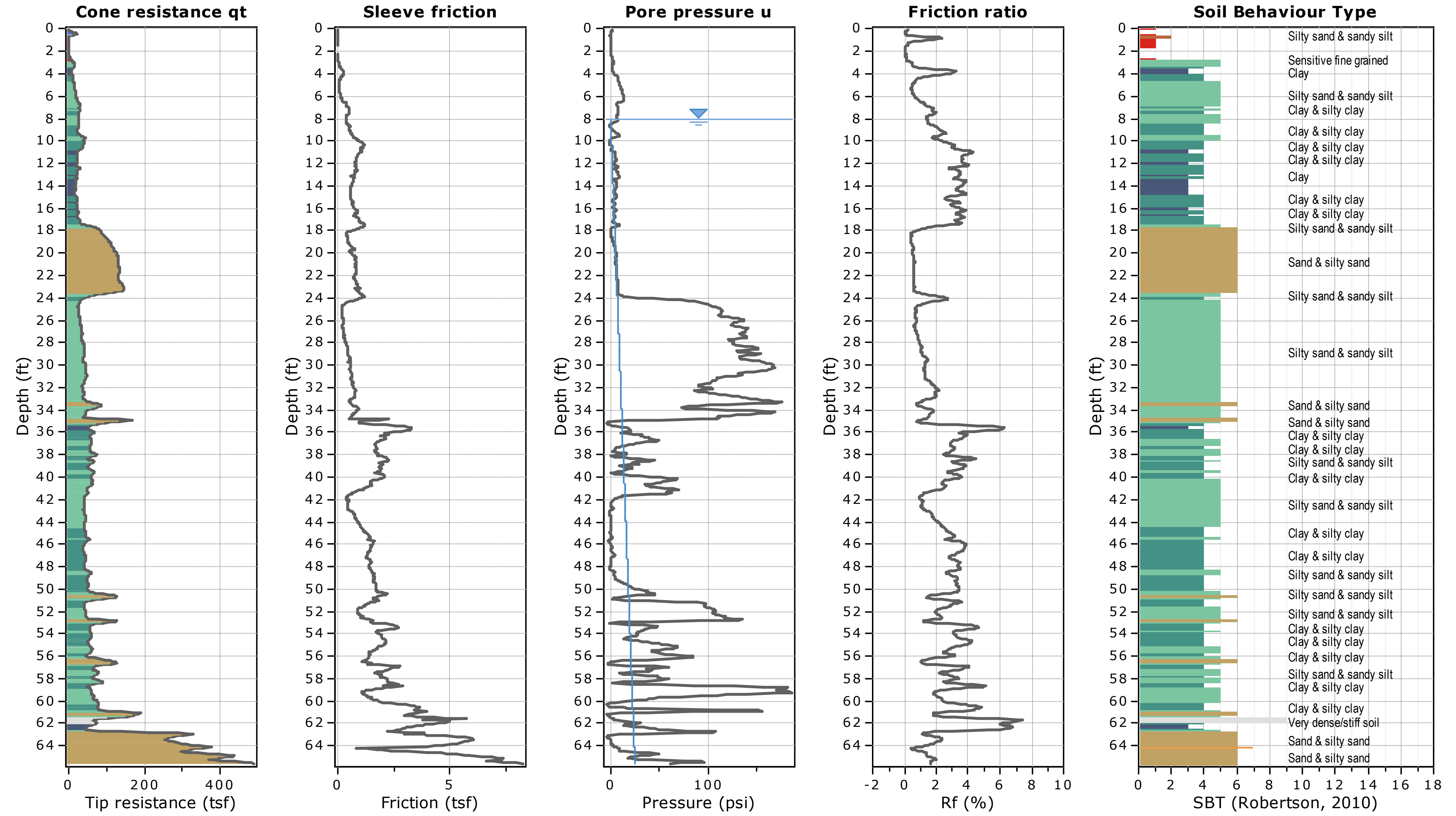
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-35-19
Total depth: 65.62 ft, Date: 12/5/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip



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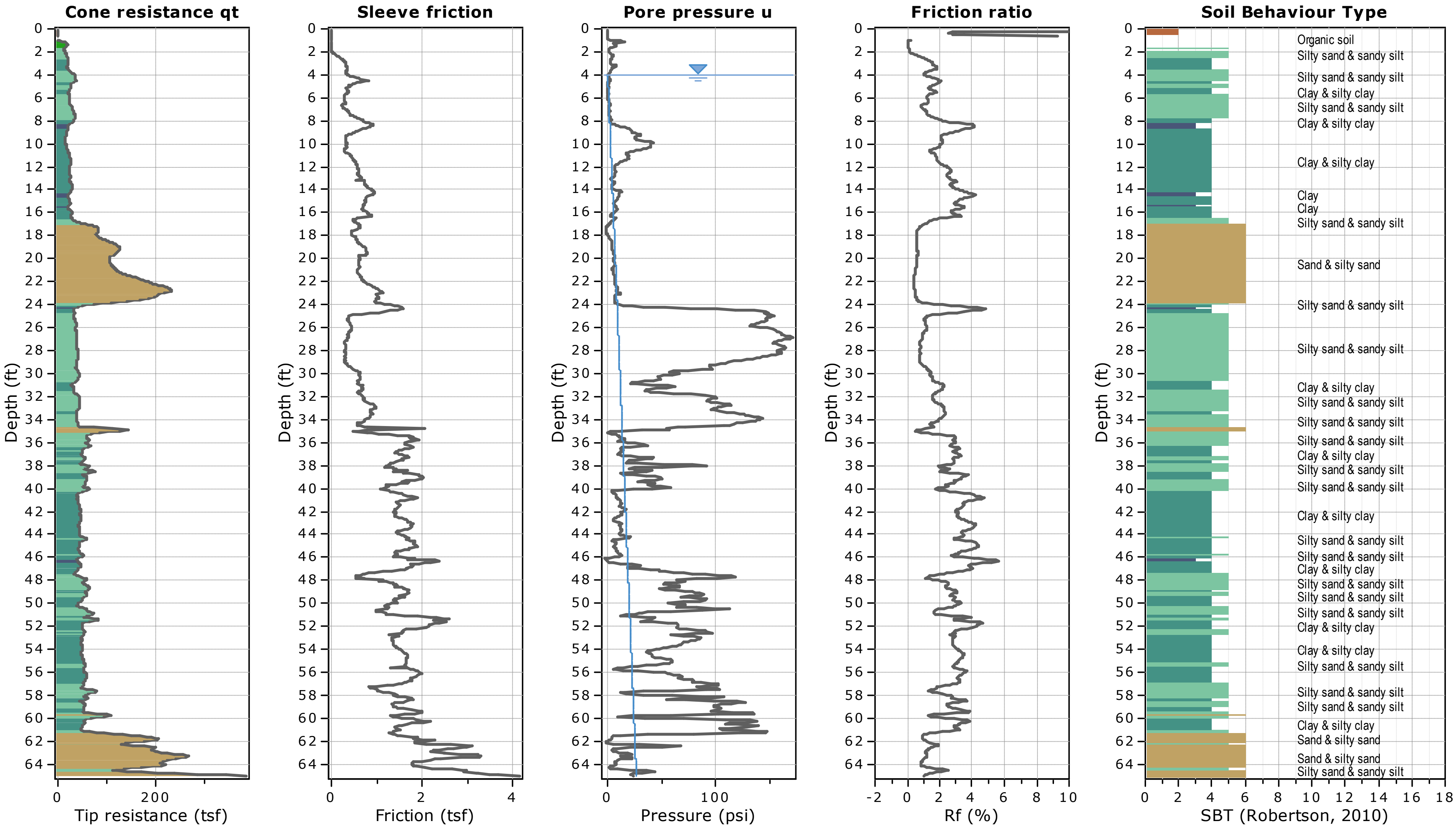
CPT: 19119232-405CPT-36-19
Total depth: 65.03 ft, Date: 12/4/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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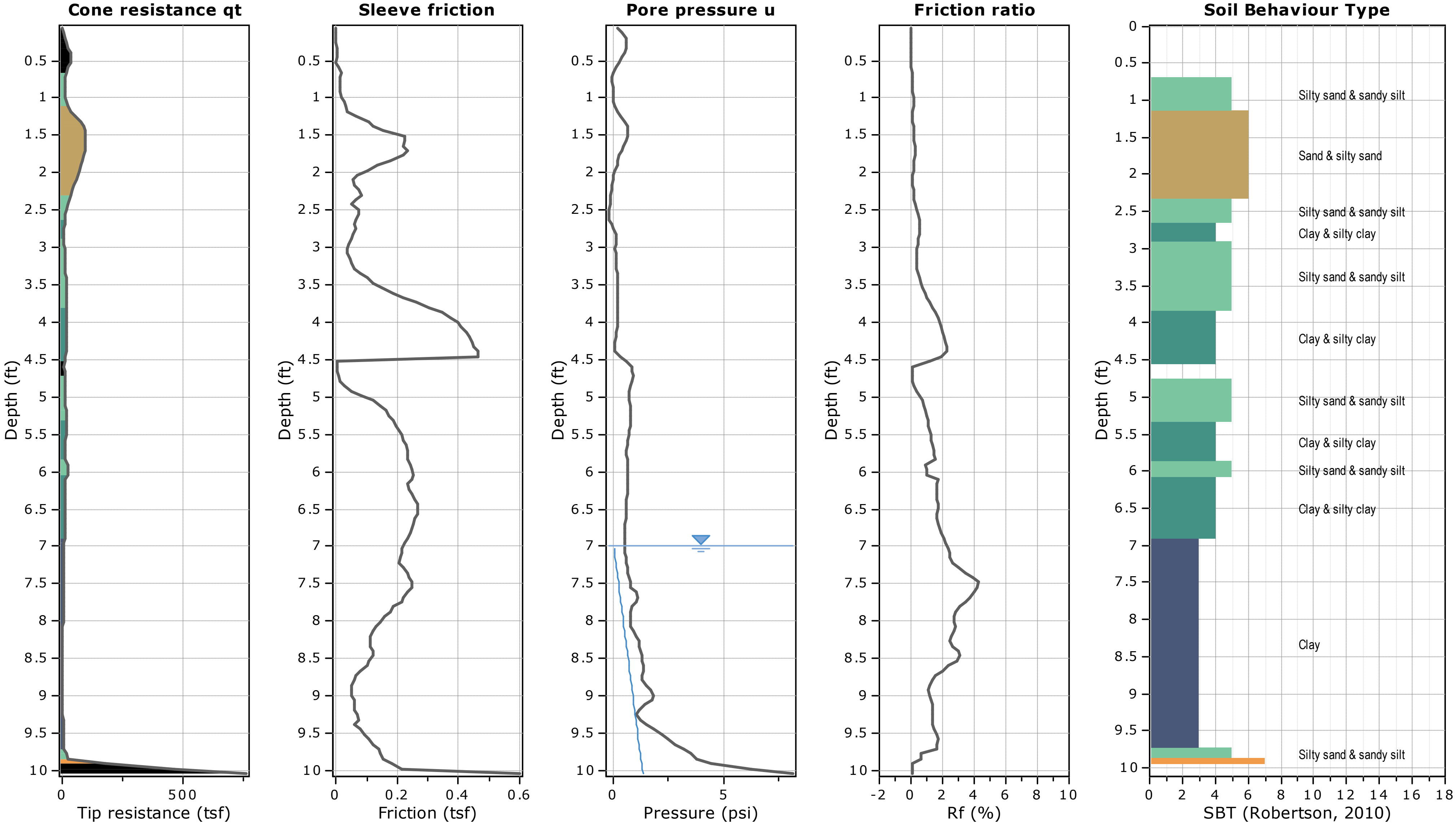
CPT: 19119232-405CPT-37-19
Total depth: 10.04 ft, Date: 12/6/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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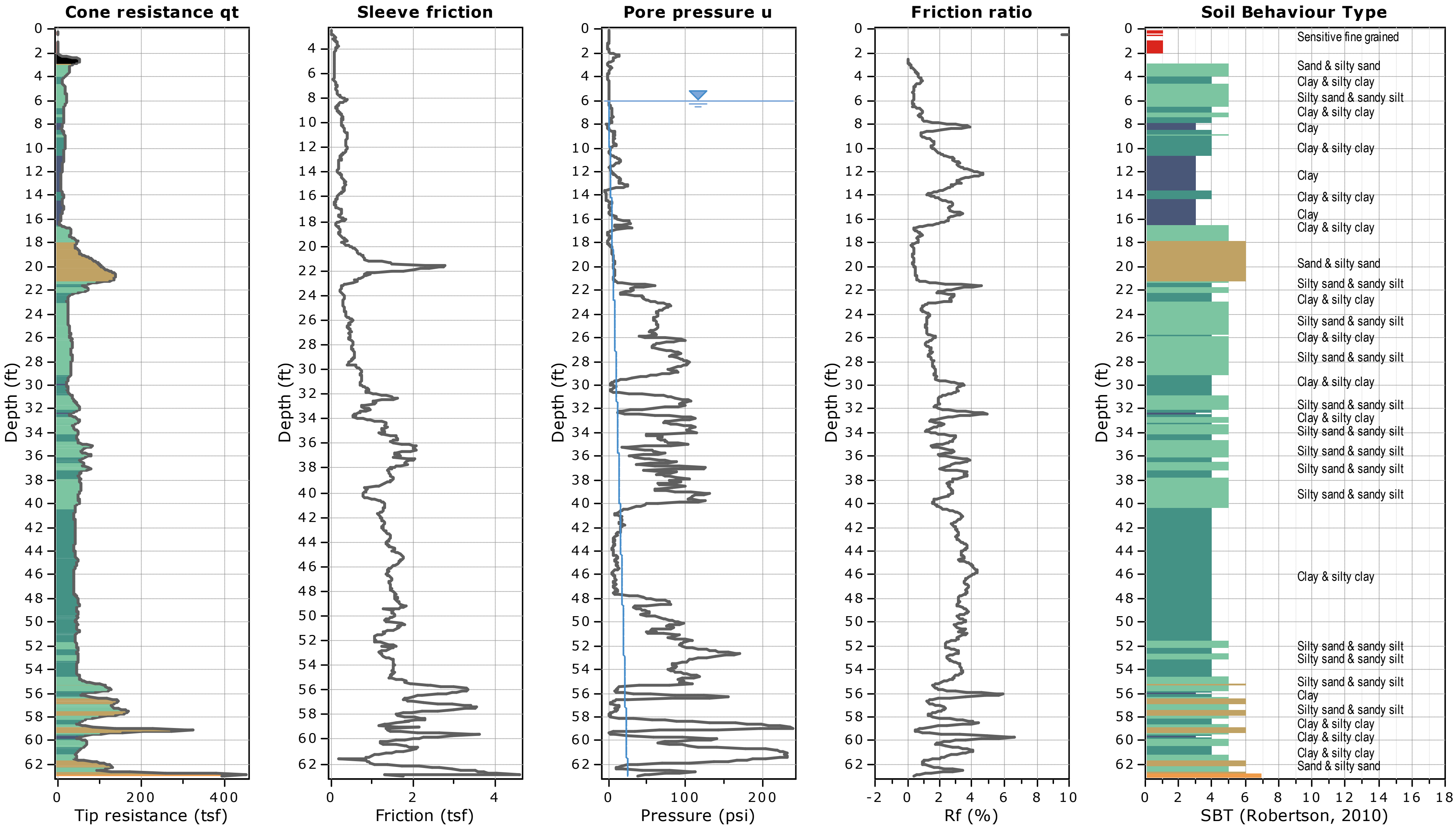
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-38A-19
Total depth: 62.99 ft, Date: 12/4/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip



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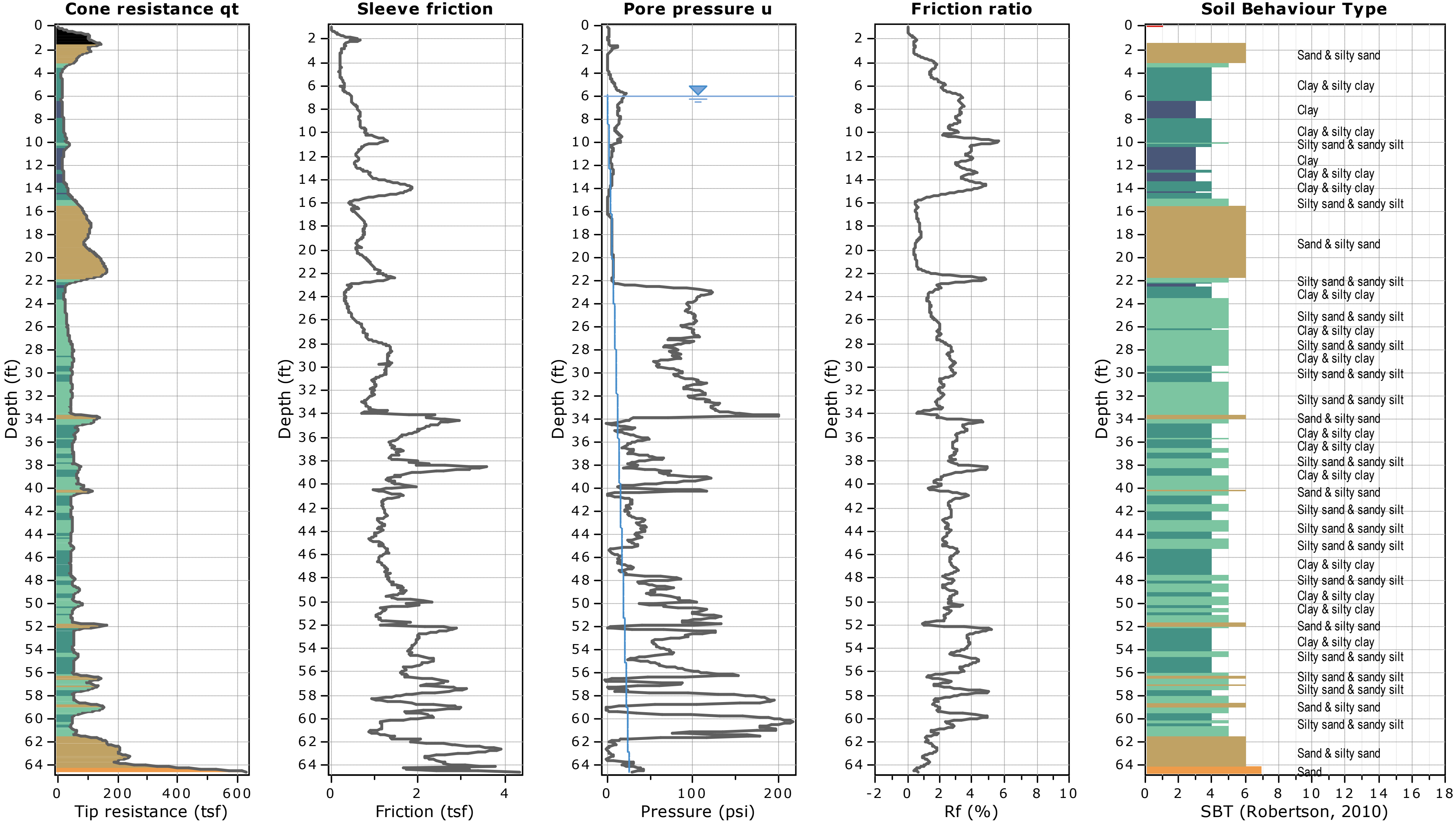
CPT: 19119232-405CPT-39-19
Total depth: 64.57 ft, Date: 12/4/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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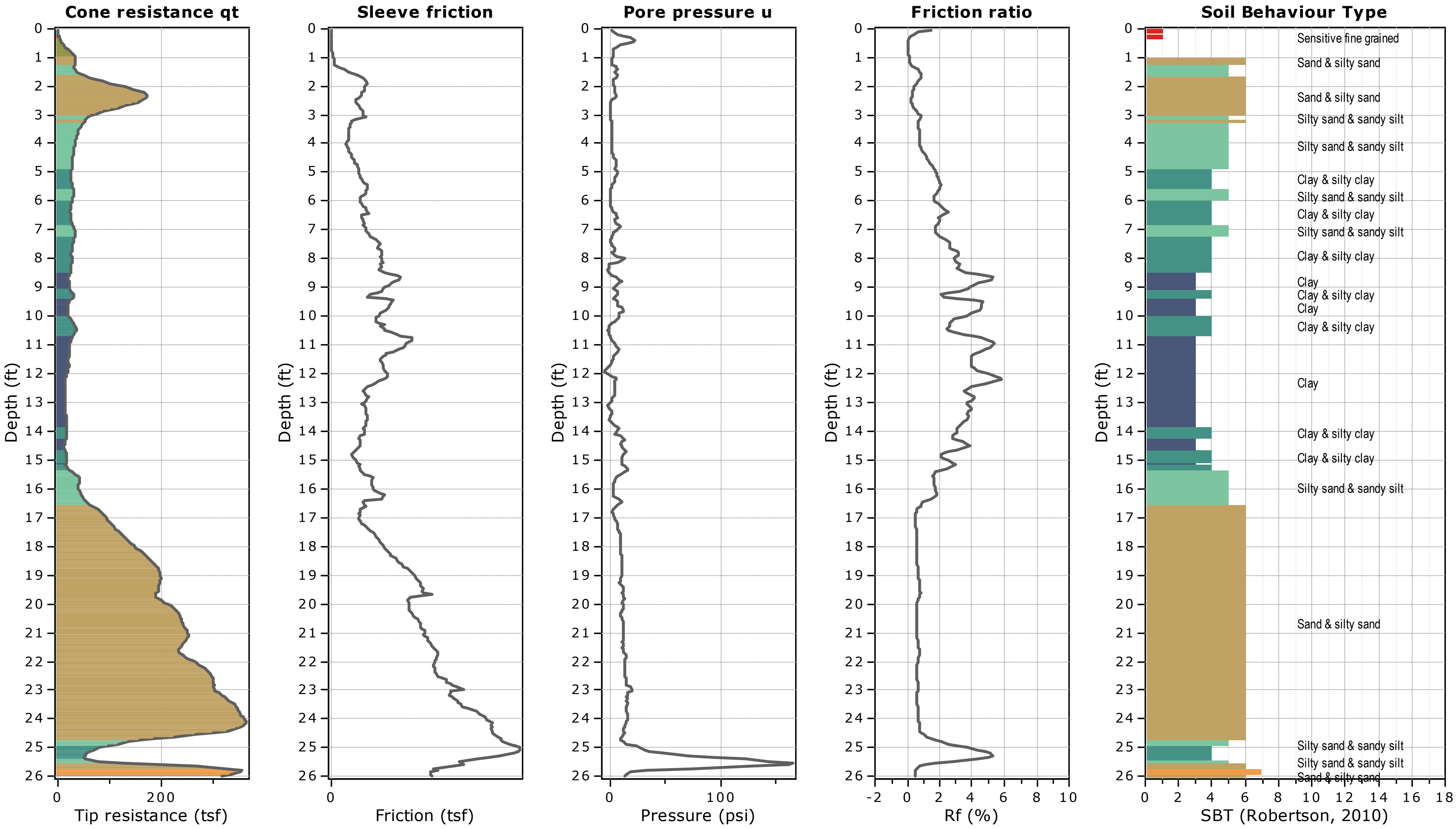
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-40-19
Total depth: 25.98 ft, Date: 12/4/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip



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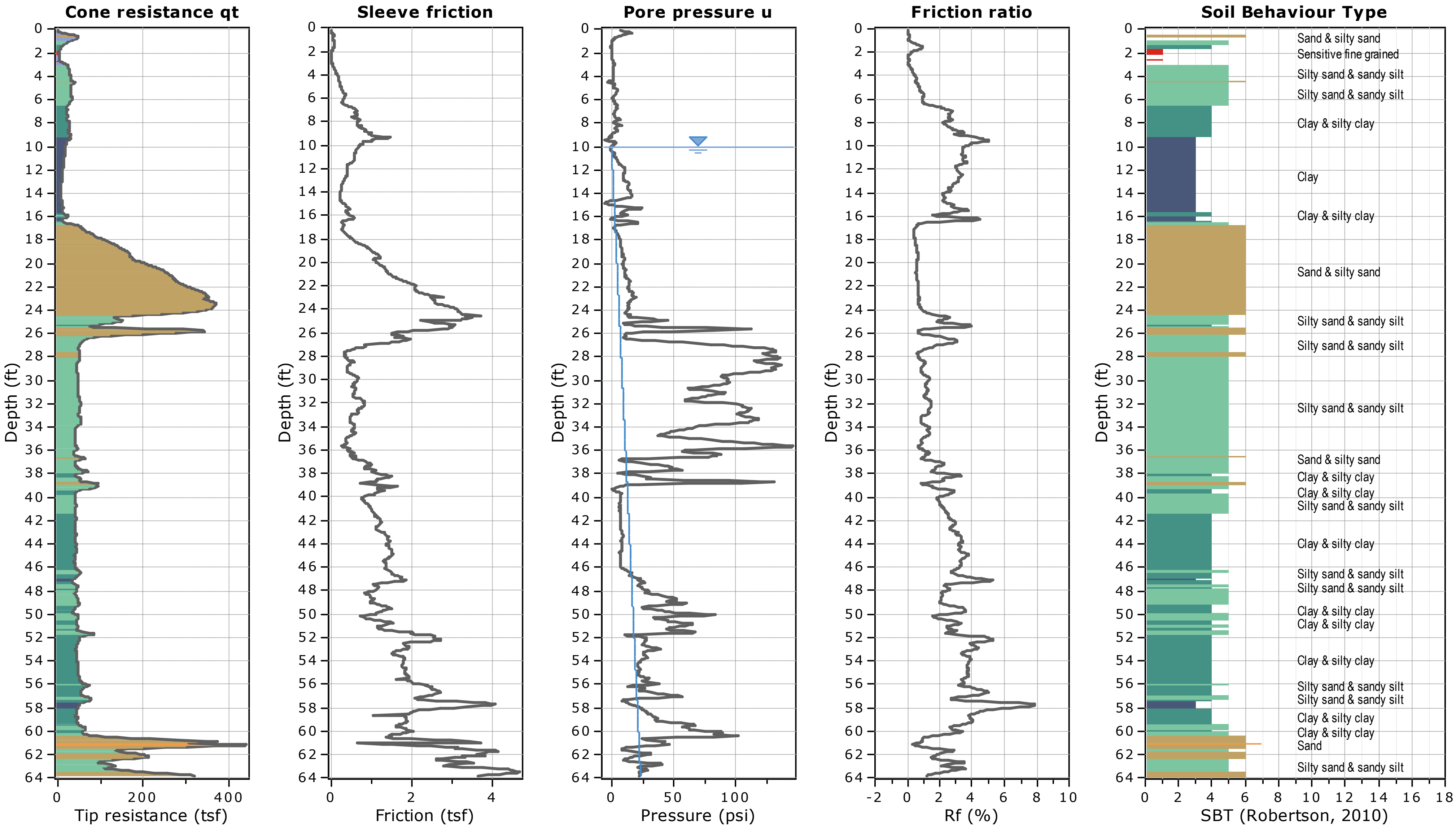
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-40A-19
Total depth: 63.85 ft, Date: 12/5/2019
Cone Type: Gregg
Cone Operator: Chris Hayslip



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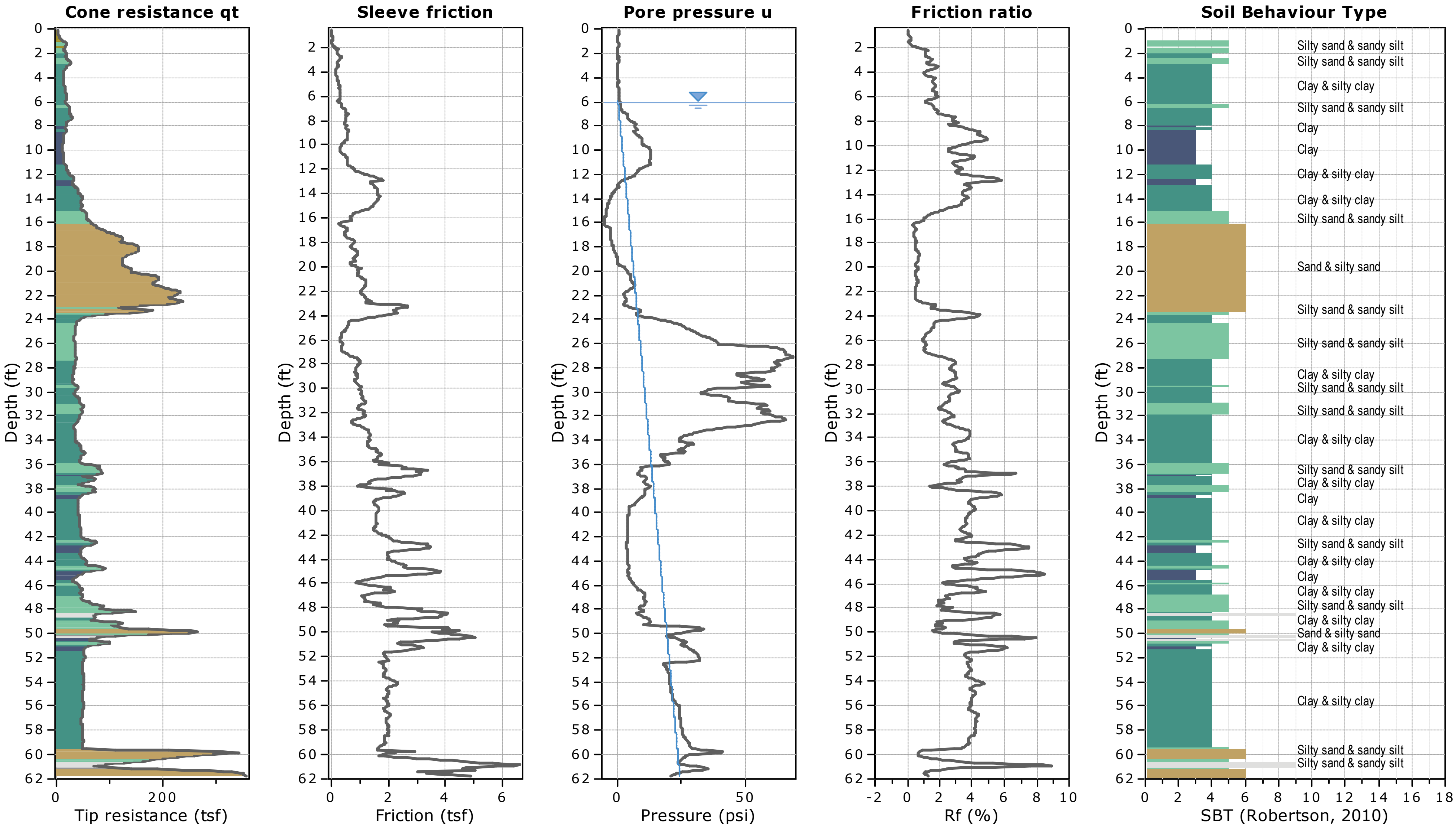
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-41-19
Total depth: 61.81 ft, Date: 12/7/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn



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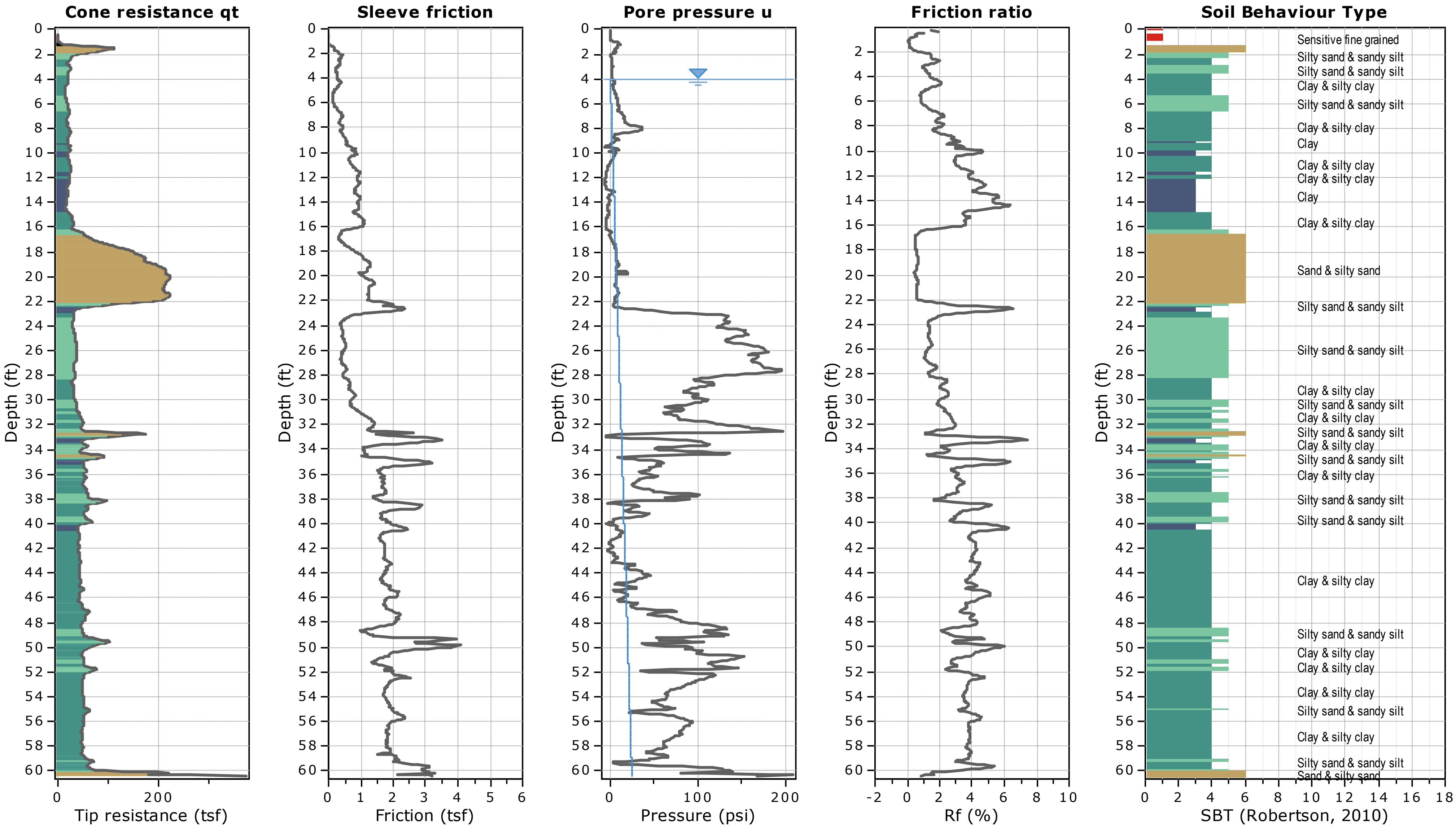
CPT: 19119232-405CPT-42-19

Total depth: 60.43 ft, Date: 12/3/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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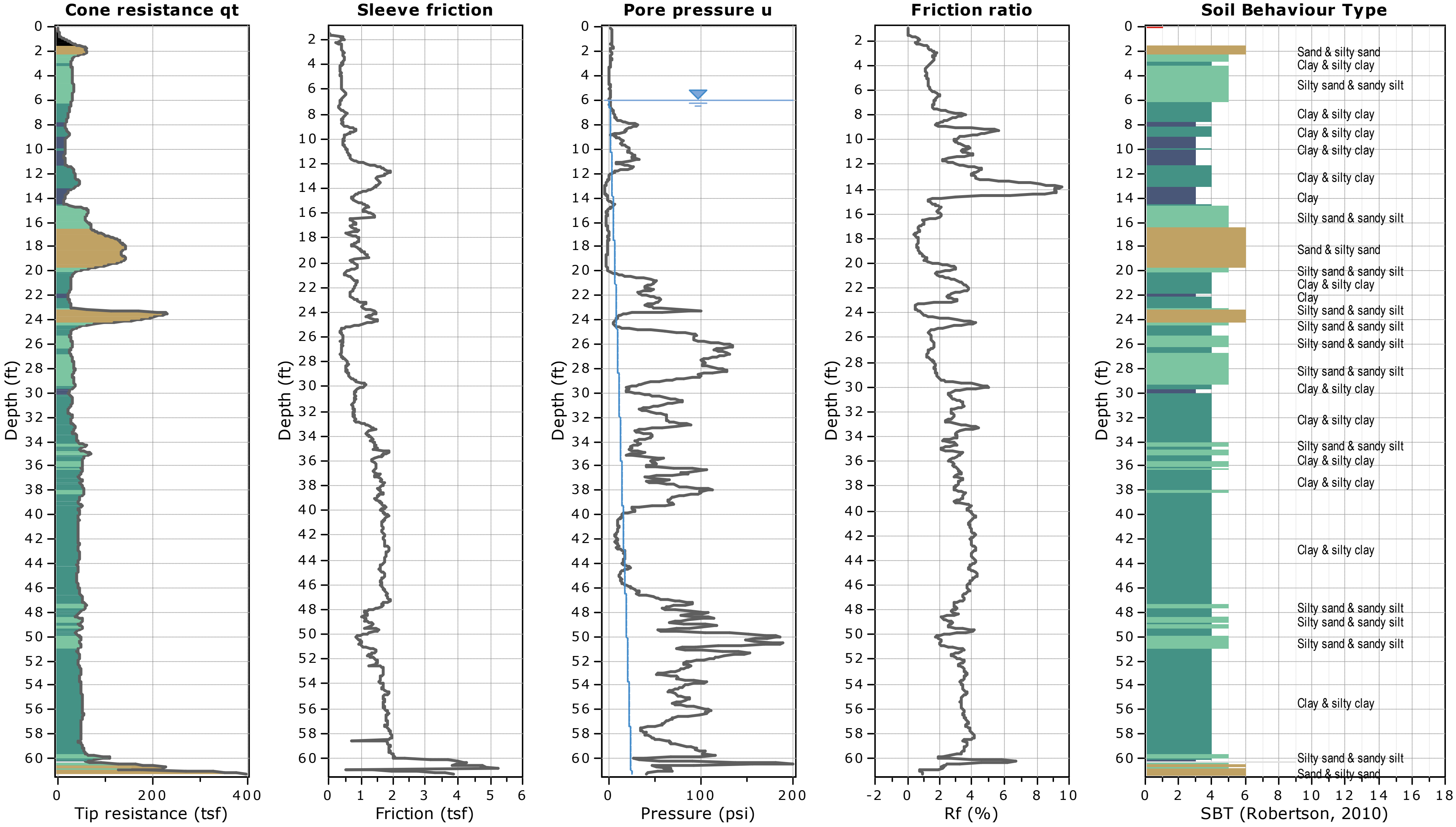
CPT: 19119232-405CPT-43-19
Total depth: 61.29 ft, Date: 12/3/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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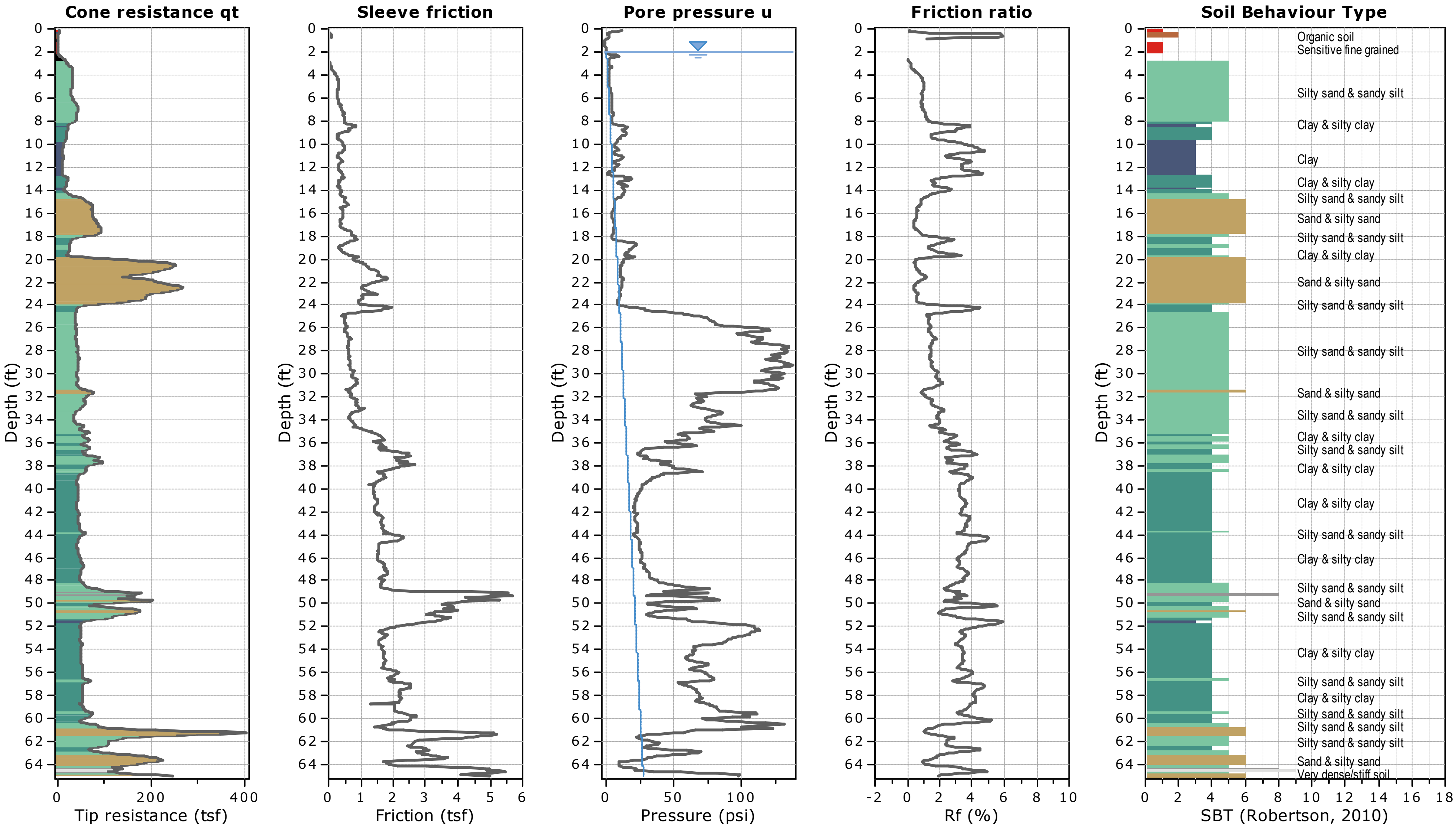
CPT: 19119232-405CPT-44-19
Total depth: 65.03 ft, Date: 12/3/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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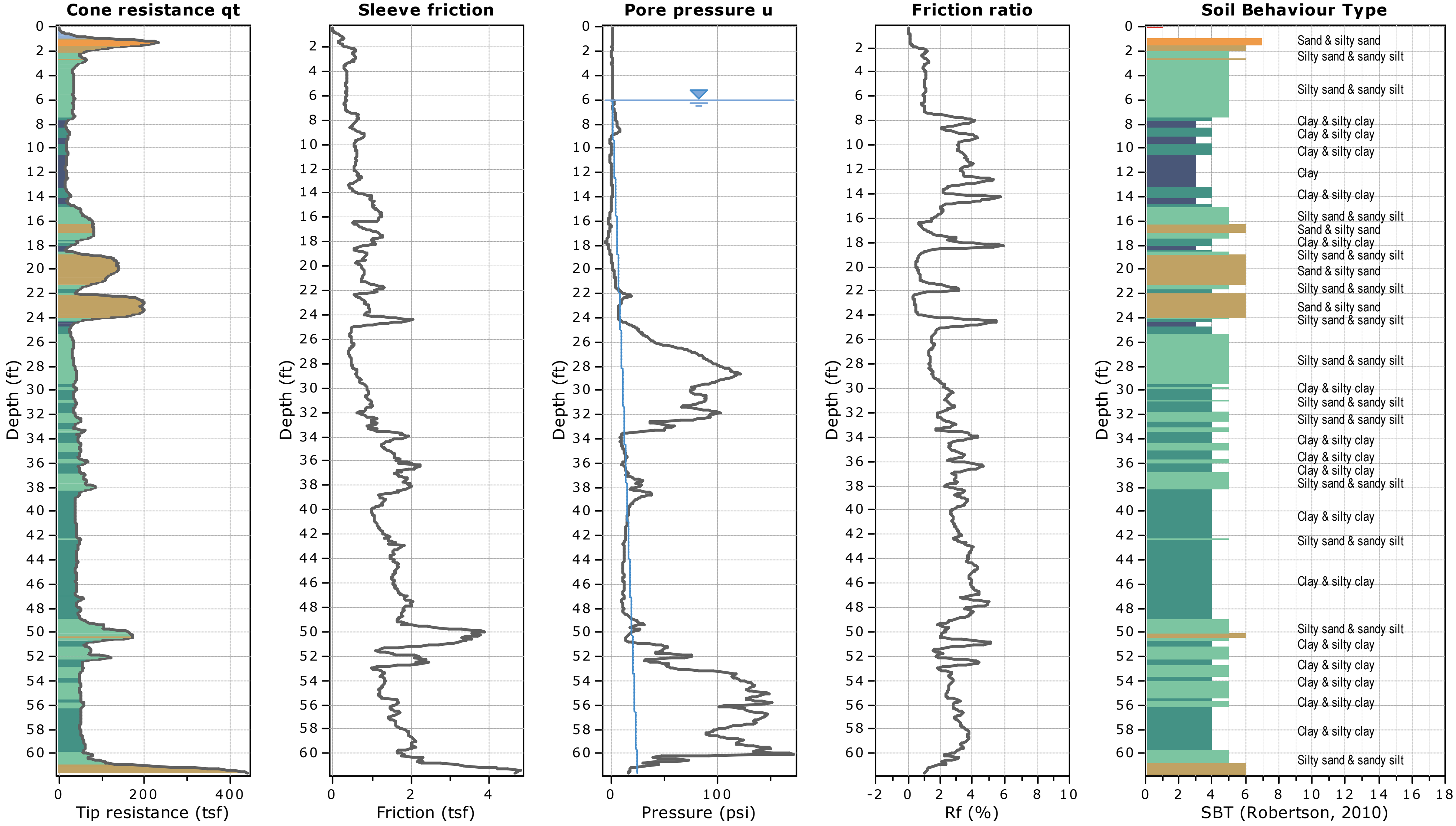
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-45-19
Total depth: 61.61 ft, Date: 12/7/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn



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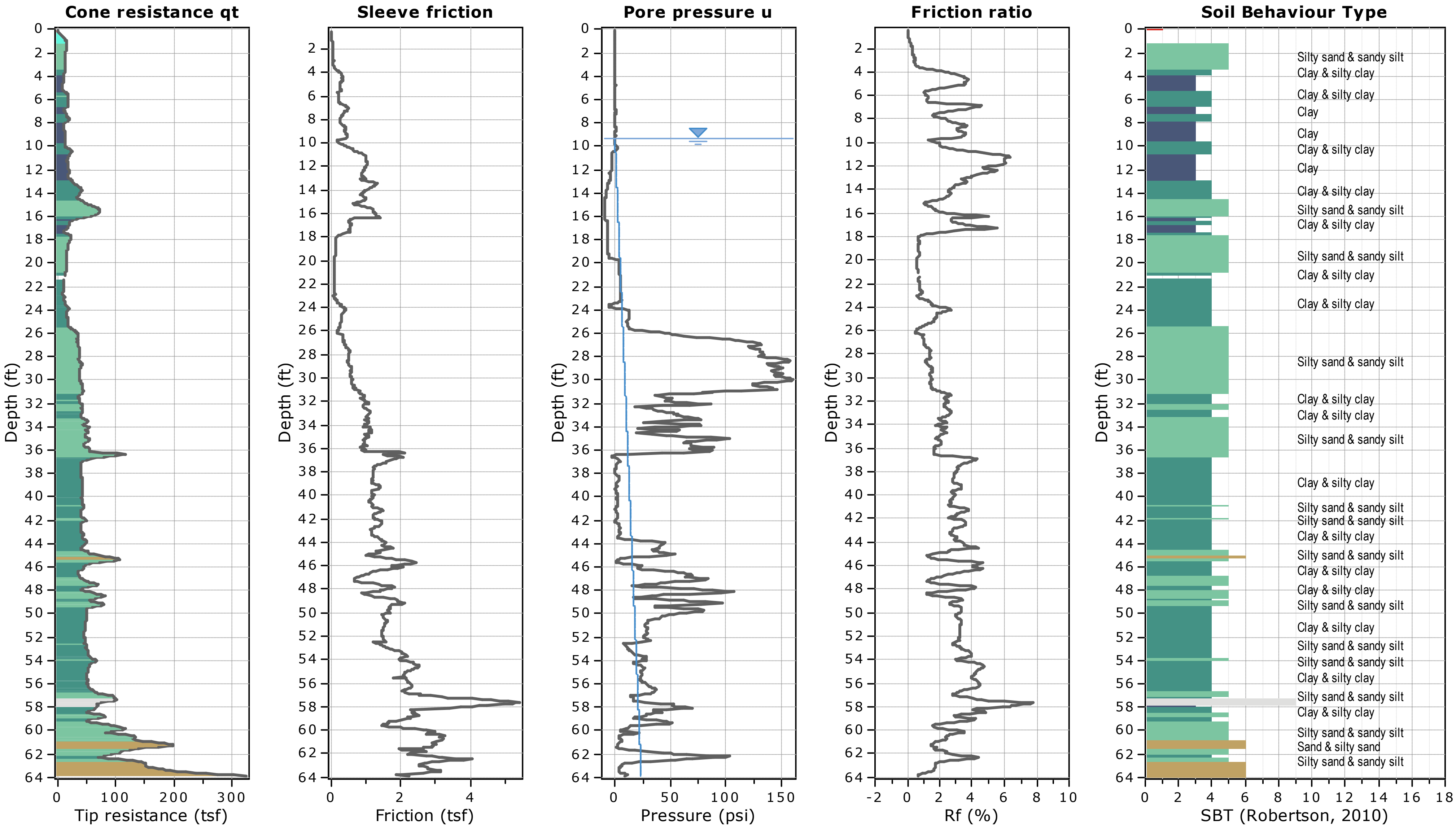
CPT: 19119232-405CPT-46-19
Total depth: 63.91 ft, Date: 12/7/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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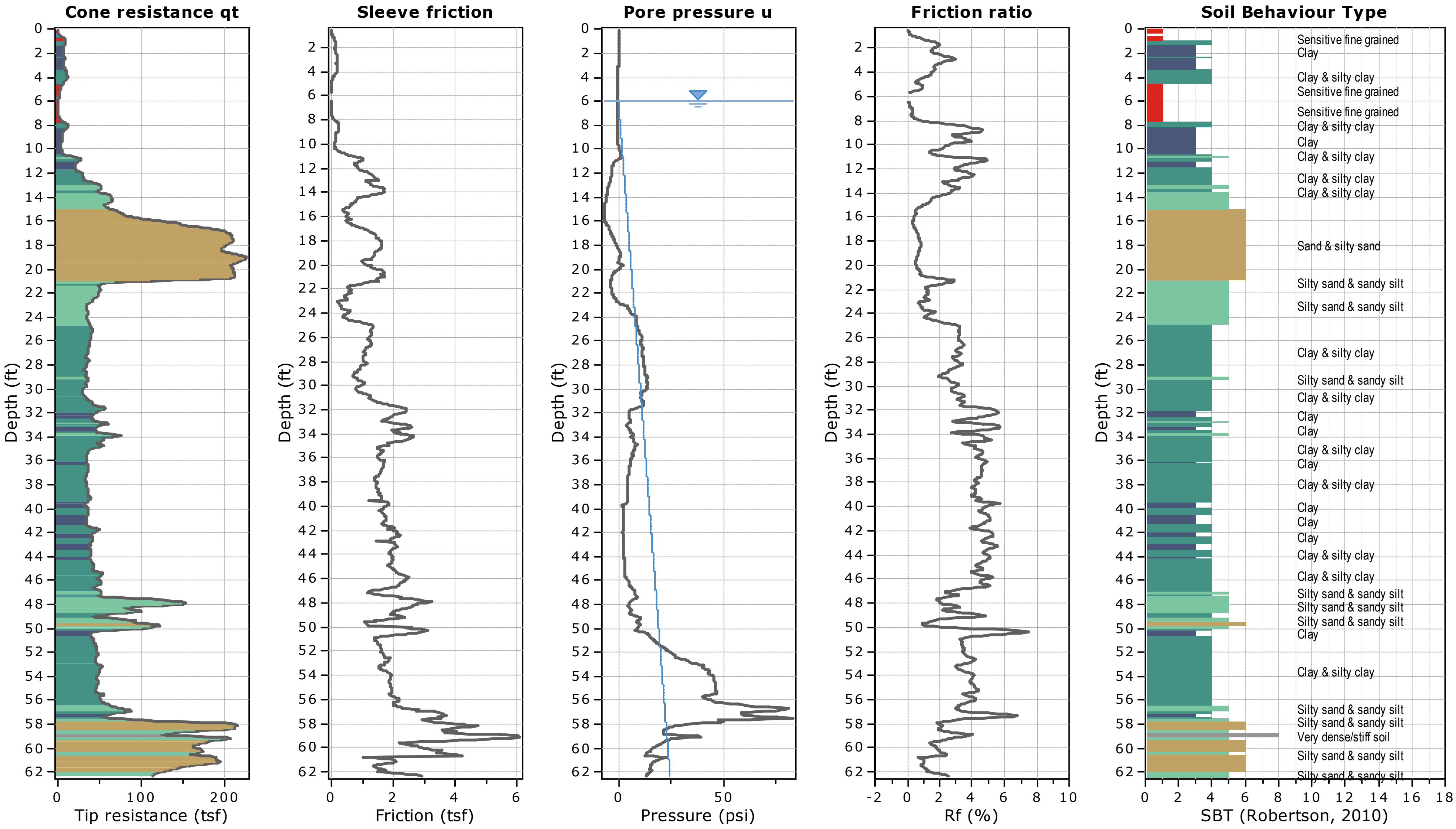
CPT: 19119232-405CPT-48-19
Total depth: 62.34 ft, Date: 12/8/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



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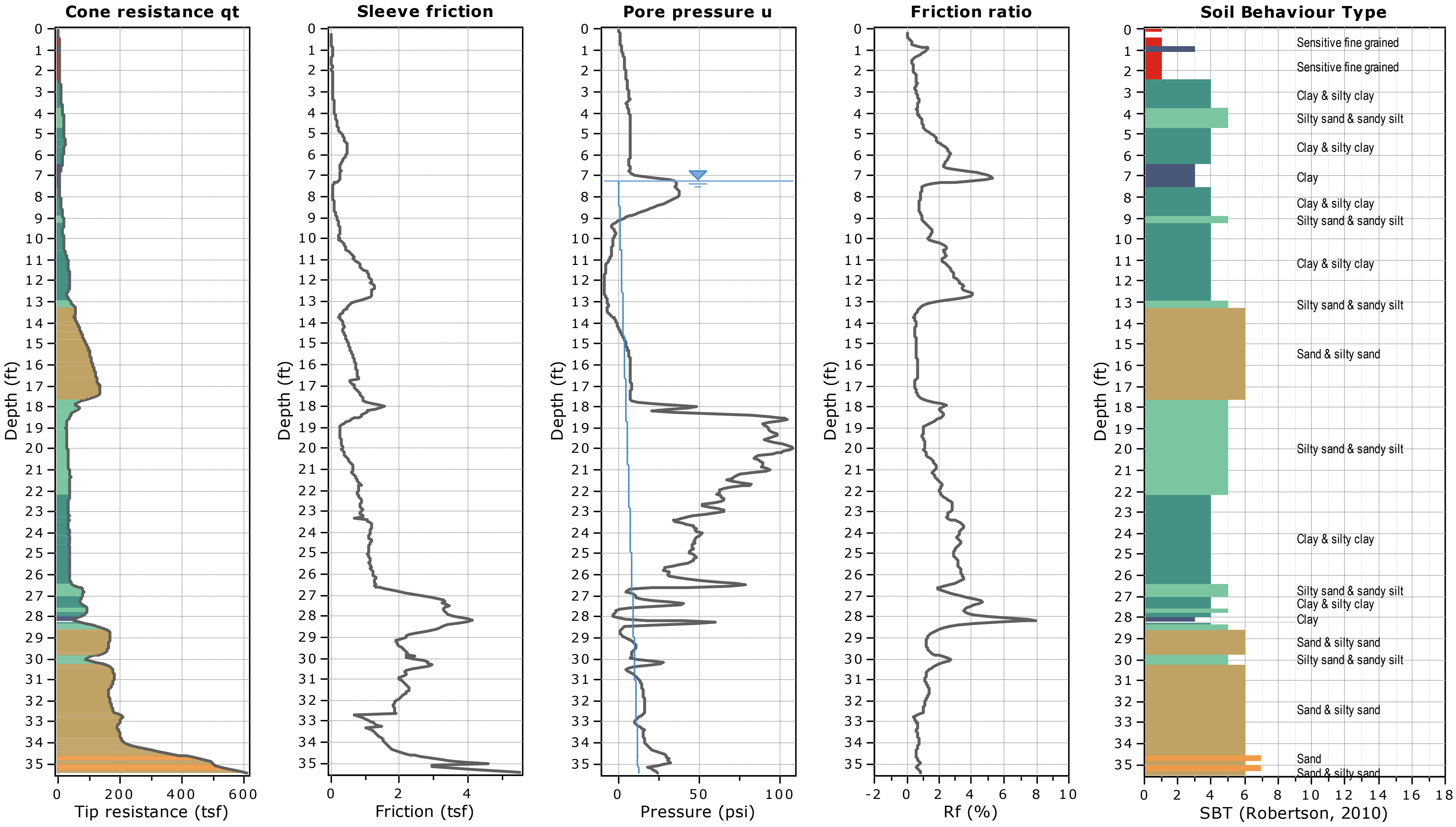
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-54-20
Total depth: 35.43 ft, Date: 1/21/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn



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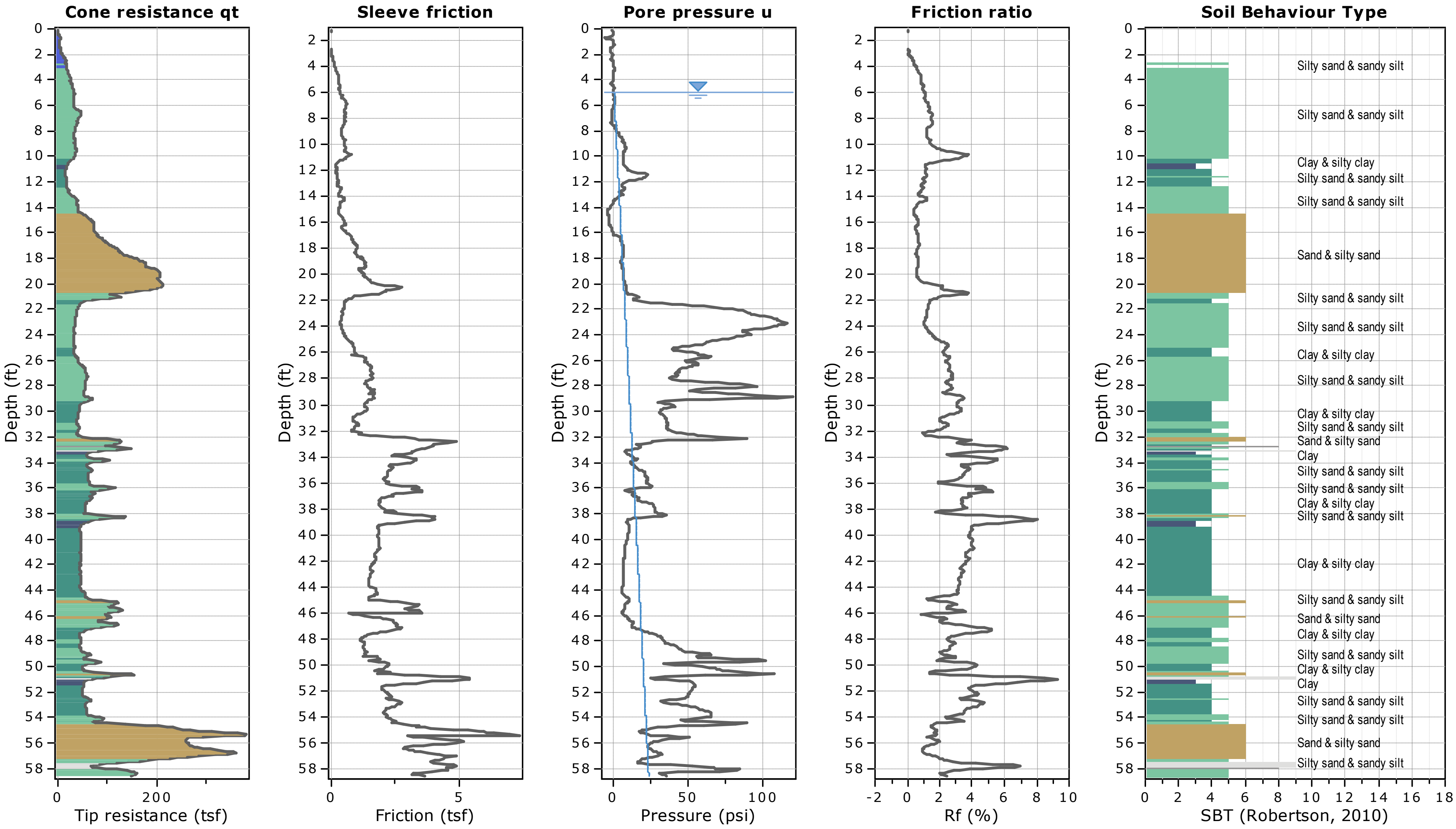
Project: **H19026-37TX**
Location: **UPPR Houston, TX**

CPT: 19119232-405CPT-55-19
Total depth: 58.60 ft, Date: 12/8/2019
Cone Type: Gregg
Cone Operator: Cody Cliburn



Walker-Hill Environmental
Chris Hayslip
chris@whenv.com
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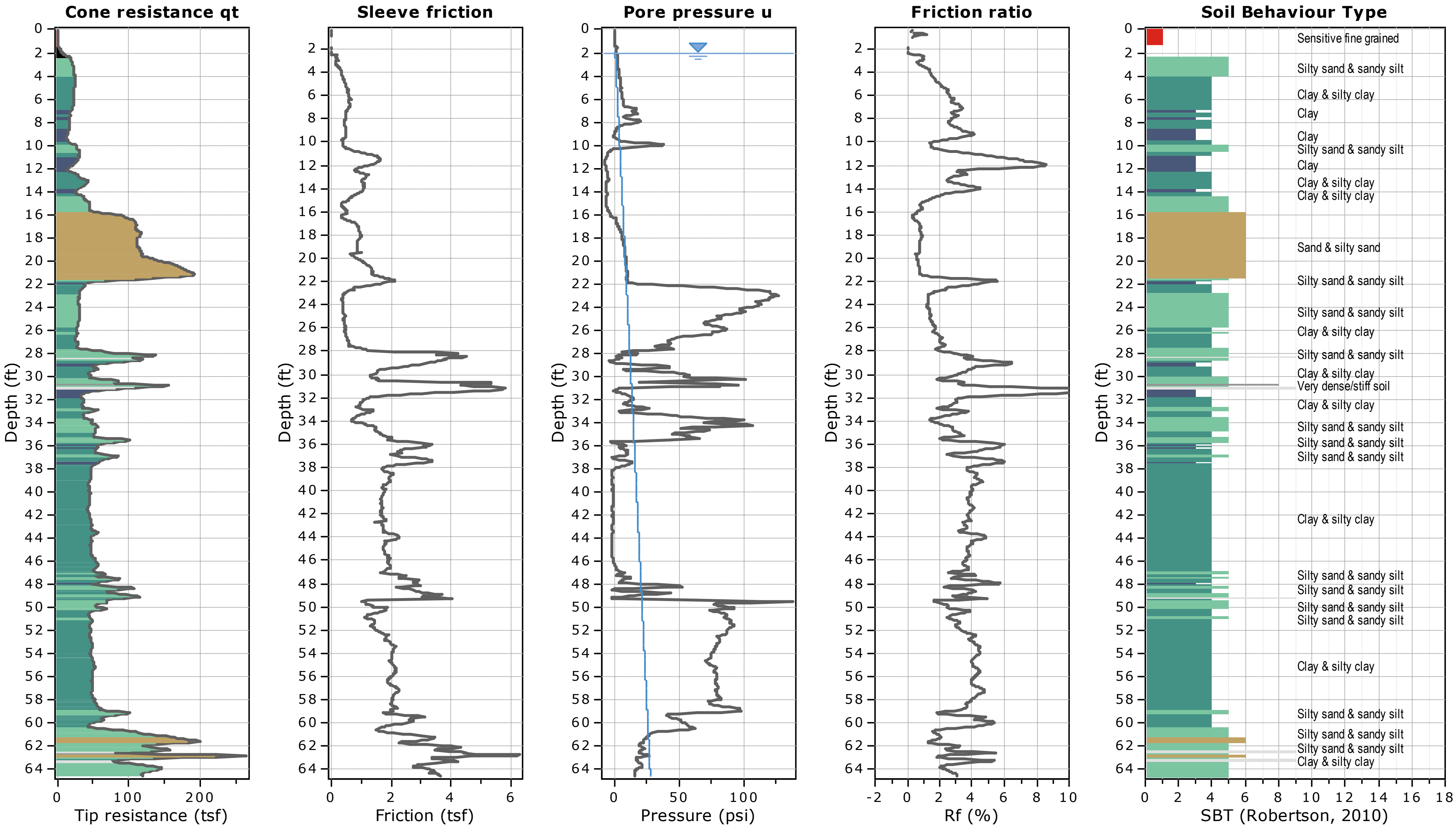
CPT: 19119232-405CPT-56A-20
Total depth: 64.57 ft, Date: 1/27/2020
Cone Type: Gregg
Cone Operator: Cody Cliburn

Project: **H19026-37TX**
Location: **UPPR Houston, TX**



ATTACHMENT C

Maximum TarGOST® Signals Summary Tables

Table C-1
Maximum TarGOST Signals - Off-Site (2019-2020)
Houston, TX - Wood Preserving Works

Top Depth (ft bgs)	Bottom Depth (ft bgs)	Off-Site											
		CPT-01	CPT02	CPT03	CPT04	CPT05	CPT06	CPT07	CPT08	CPT09	CPT10	CPT11	CPT23
0	2	11.60	19.33	13.01	24.30	17.88	18.74	17.70	26.65	14.27	4.94	32.39	7.64
2	4	2.69	3.07	5.08	3.00	4.61	5.25	7.31	3.47	3.18	2.77	2.53	2.21
4	6	2.82	2.21	4.31	2.64	2.44	2.67	3.41	1.61	3.76	3.10	2.41	2.24
6	8	2.27	2.37	2.75	2.95	2.22	2.38	2.65	1.92	6.67	2.20	2.46	1.71
8	10	2.40	1.92	3.51	2.14	2.78	2.18	2.52	1.59	1.91	1.83	2.78	1.86
10	12	2.17	1.50	1.97	1.69	2.13	1.34	2.82	1.49	1.86	1.96	2.44	2.31
12	14	1.47	1.49	1.36	1.58	1.66	1.53	2.72	2.11	2.26	1.93	2.74	2.72
14	16	1.43	1.45	1.66	2.24	1.81	1.71	2.75	1.76	4.82	1.69	2.19	2.12
16	18	1.72	1.57	2.02	2.19	1.49	1.56	2.22	1.48	3.19	1.59	1.53	2.90
18	20	1.50	1.45	1.71	1.95	1.57	1.46	1.49	1.83	1.54	1.64	2.04	3.01
20	22	1.63	1.45	1.86	1.72	1.74	1.52	1.66	1.15	1.64	1.63	1.61	3.65
22	24	1.21	2.38	1.76	11.13	1.66	1.83	1.73	1.93	2.13	1.97	1.77	2.10
24	26	1.76	1.80	1.71	51.60	1.78	10.89	1.94	2.63	1.69	3.16	1.72	3.39
26	28	1.95	2.13	1.98	27.38	1.72	121.35	4.68	5.56	2.83	3.66	2.51	1.79
28	30	2.45	2.10	8.90	38.33	3.79	14.43	12.59	12.93	3.24	4.94	3.41	2.85
30	32	2.67	12.00	6.44	33.76	3.43	4.14	8.92	6.24	2.31	2.49	3.39	6.91
32	34	2.07	27.99	7.22	3.02	4.31	5.23	5.20	8.86	2.22	2.46	2.31	5.52
34	36	3.48	22.50	3.31	3.50	2.87	2.12	12.94	29.86	2.87	2.86	2.08	2.16
36	38	2.57	52.13	3.15	3.55	2.56	2.44	16.30	3.82	2.83	2.97	1.68	1.88
38	40	4.91	56.70	2.71	3.89	3.14	2.40	8.85	3.83	3.36	3.50	5.39	2.22
40	42	2.41	13.19	3.41	3.40	3.68	3.17	2.96	3.46	3.09	3.25	2.92	3.00
42	44	1.90	2.99	3.24	4.26	3.36	2.89	3.08	3.40	3.37	2.96	3.23	3.08
44	46	2.54	5.81	3.17	3.25	4.34	3.05	3.06	3.87	3.86	3.23	2.59	3.06
46	48	2.37	5.66	3.16	5.67	4.18	3.35	3.34	4.13	3.69	3.00	2.95	3.66
48	50	3.02	2.91	3.79	4.86	3.09	2.91	2.95	3.26	3.78	3.03	2.85	2.81
50	52	2.35	2.91	3.04	3.73	3.45	3.03	2.88	3.54	3.36	2.69	3.02	3.72
52	54	2.49	2.98	3.16	3.50	3.23	2.62	2.96	3.87	3.53	3.07	3.13	2.15
54	56	2.41	3.09	3.52	3.25	2.56	3.01	2.90	3.12	3.15	--	3.06	--
56	58	1.55	5.49	3.39	3.56	--	2.60	3.01	--	3.21	--	2.82	--
58	60	--	5.08	2.23	3.23	--	2.48	3.00	--	3.95	--	2.38	--
60	62	--	--	--	--	--	--	--	--	3.52	--	--	--
62	64	--	--	--	--	--	--	--	--	--	--	--	--

Notes: Maximum TarGOST responses (RE%) for every two-foot interval are listed in the table above.

TarGOST responses are highlighted on a graded scale: Values over 5% are highlighted lighter yellow to darker yellow as the values increase. At 20%RE and greater, the color scales to orange.

Data from 0 to 10 ft bgs is not evaluated because all locations were hydro-excavated and backfilled with sand and an asphalt patch before data collection.

-- - Total depth reached

Table C-2
Maximum TarGOST Signals - Perimeter of Site (2019-2020)
Houston, TX - Wood Preserving Works

Top Depth (ft bgs)	Bottom Depth (ft bgs)	Perimeter of HWPW Site (Northern)													Perimeter of HWPW Site (Western)						
		CPT56	CPT12	CPT13	CPT14	CPT15	CPT16	CPT17	CPT18	CPT19	CPT19A	CPT20	CPT20A	CPT21	CPT24	CPT24A	CPT25	CPT26	CPT27	CPT27A	CPT54
0	2	16.14	12.96	5.13	2.85	6.19	10.87	5.93	36.07	4.43	6.15	7.20	7.40	12.98	24.12	9.71	5.37	9.13	8.54	5.76	3.31
2	4	13.51	49.20	1.93	2.05	2.69	24.94	3.48	4.77	2.69	3.75	5.28	1.85	6.64	4.06	3.97	4.80	3.10	3.78	3.52	2.25
4	6	13.26	28.67	2.40	1.47	41.97	10.82	3.49	4.66	1.76	11.21	10.51	5.55	3.66	7.36	3.54	5.75	2.41	3.53	4.16	2.35
6	8	2.88	63.20	14.11	1.68	6.34	27.26	2.07	2.02	2.30	7.11	3.11	12.25	7.47	10.58	3.92	3.02	1.66	4.31	3.91	2.05
8	10	1.83	23.16	41.87	1.62	3.32	116.13	9.29	5.53	2.04	8.88	3.18	7.36	8.95	2.17	2.29	2.39	2.03	4.39	2.49	1.68
10	12	2.27	38.52	16.11	1.63	4.29	140.09	86.44	2.84	2.81	2.62	3.43	3.30	4.39	2.26	2.46	2.10	5.93	2.69	2.39	2.00
12	14	1.79	74.88	10.98	1.73	6.37	48.79	67.17	2.17	1.83	4.21	3.94	5.38	24.26	1.95	2.51	3.48	3.23	3.27	2.02	1.73
14	16	15.72	63.72	17.57	1.52	2.00	18.86	26.73	1.70	2.67	2.56	3.41	4.31	18.41	1.58	22.72	2.70	2.09	5.38	2.16	1.25
16	18	30.15	76.10	108.81	1.63	1.64	9.49	8.24	2.57	1.82	3.58	1.81	2.80	14.70	1.60	17.52	1.87	1.60	1.58	1.46	1.28
18	20	1.44	72.20	113.27	2.43	2.01	19.61	1.50	1.17	3.55	3.95	1.36	1.48	48.86	1.27	1.41	2.71	1.83	1.78	1.37	1.76
20	22	1.41	90.59	20.82	1.62	2.05	97.78	1.35	1.21	1.46	1.71	2.08	1.69	28.01	1.67	1.72	2.11	2.17	2.47	1.50	2.16
22	24	1.49	33.23	163.04	2.16	1.94	13.15	1.32	9.71	1.55	1.73	1.30	2.56	1.45	2.27	2.27	2.67	2.57	1.68	2.04	1.94
24	26	1.98	4.45	128.20	3.94	31.05	46.77	1.70	6.95	1.50	1.43	1.50	1.82	1.28	2.02	2.12	2.96	2.03	34.32	1.87	2.09
26	28	1.83	38.95	45.91	23.97	19.95	102.90	5.12	10.80	2.01	1.72	--	1.56	1.60	1.77	1.85	2.82	1.86	29.66	1.90	2.04
28	30	2.04	5.35	75.31	30.36	29.52	65.19	19.05	24.65	1.86	1.75	--	2.20	1.44	1.77	1.31	1.77	1.50	7.48	1.78	1.47
30	32	2.16	7.93	68.57	96.26	33.09	52.61	32.41	50.98	--	1.75	--	2.03	2.49	1.70	1.30	1.65	2.24	7.06	7.36	1.52
32	34	3.17	13.91	4.13	14.53	18.25	13.60	19.93	29.15	--	3.05	--	2.15	3.49	1.53	1.45	1.91	1.84	--	--	1.25
34	36	4.58	4.53	4.25	11.47	14.30	3.26	4.16	26.75	--	24.48	--	1.88	3.24	1.41	1.61	1.97	2.12	--	--	--
36	38	2.20	3.66	2.53	25.16	3.10	2.92	2.71	16.24	--	22.57	--	16.19	2.47	1.40	1.68	1.92	1.80	--	--	--
38	40	2.47	3.63	2.68	6.76	10.88	2.72	2.70	9.05	--	26.08	--	14.74	31.76	--	2.64	2.90	2.40	--	--	--
40	42	2.57	3.81	3.23	2.72	3.17	2.98	2.50	5.49	--	55.05	--	4.17	23.25	--	2.54	3.45	3.25	--	--	--
42	44	2.46	3.34	3.39	2.84	3.18	2.96	2.29	4.75	--	2.41	--	3.37	2.69	--	3.43	2.56	3.36	--	--	--
44	46	2.50	3.14	3.14	2.93	3.06	3.41	1.94	2.59	--	2.98	--	3.36	3.60	--	2.94	3.20	2.79	--	--	--
46	48	2.37	4.51	6.89	4.48	3.75	3.66	3.49	2.83	--	2.57	--	3.04	3.19	--	2.86	2.47	2.43	--	--	--
48	50	2.71	4.65	12.08	4.85	4.86	3.54	2.75	9.67	--	3.37	--	11.88	3.23	--	--	3.12	3.87	--	--	--
50	52	3.00	4.97	3.01	5.02	4.13	3.42	3.36	12.94	--	8.39	--	39.56	24.14	--	--	3.42	2.93	--	--	--
52	54	2.58	3.18	3.22	2.83	3.82	3.30	3.42	3.63	--	3.34	--	16.78	30.58	--	--	1.82	2.51	--	--	--
54	56	2.79	3.23	3.44	3.88	2.97	3.11	2.65	3.26	--	3.60	--	11.92	26.20	--	--	2.33	--	--	--	--
56	58	2.95	3.94	3.06	2.96	3.14	3.39	2.67	2.79	--	3.38	--	5.86	3.05	--	--	--	--	--	--	--
58	60	2.81	3.71	3.05	3.12	3.95	3.05	3.48	2.78	--	1.74	--	4.38	2.46	--	--	--	--	--	--	--
60	62	2.52	5.21	3.34	6.40	3.41	3.11	3.00	2.62	--	--	--	3.70	--	--	--	--	--	--	--	--
62	64	--	--	--	--	--	--	3.41	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes: Maximum TarGOST responses (RE%) for every two-foot interval are listed in the table above.

TarGOST responses are highlighted on a graded scale: Values over 5% are highlighted lighter yellow to darker yellow as the values increase. At 20%RE and greater, the color scales to orange.

Data from 0 to 10 ft bgs is not evaluated because all locations were hydro-excavated and backfilled with sand and an asphalt patch before data collection.

-- - Total depth reached

Table C-3
Maximum TarGOST Signals (2019-2020) - Englewood Intermodal Yard
Houston, TX - Wood Preserving Works

Top Depth (ft bgs)	Bottom Depth (ft bgs)	Englewood Intermodal Yard															
		CPT22	CPT28	CPT29	CPT30	CPT31	CPT32	CPT34	CPT35	CPT36	CPT37	CPT38A	CPT39	CPT40	CPT40A	CPT41	CPT42
0	2	3.91	6.74	3.94	3.32	32.19	2.27	75.62	19.68	22.04	2.91	8.90	1.92	6.39	1.75	1.66	39.40
2	4	1.47	1.77	10.73	4.29	19.64	1.50	20.70	36.93	7.68	2.11	1.33	9.82	1.41	2.10	2.02	8.24
4	6	1.24	2.71	91.32	58.85	72.91	1.30	18.17	30.79	13.21	1.70	0.99	5.85	1.88	1.31	2.35	28.12
6	8	1.60	3.05	84.38	45.40	22.66	1.27	14.62	16.58	3.65	4.02	2.91	3.14	2.08	2.50	3.51	18.57
8	10	1.85	1.60	35.44	48.19	1.80	76.71	13.59	27.75	3.00	--	3.34	1.35	3.16	2.71	1.73	78.07
10	12	1.92	2.46	43.50	58.05	11.26	62.17	4.60	31.58	2.19	--	1.61	2.54	3.46	1.75	1.76	35.01
12	14	2.18	2.19	35.03	47.66	5.64	33.47	8.26	34.86	1.92	--	1.99	1.92	1.95	1.56	1.53	18.05
14	16	1.42	1.72	39.24	25.56	4.80	41.96	2.54	16.86	1.24	--	1.78	1.49	1.82	1.65	1.32	34.50
16	18	1.50	1.75	26.27	48.19	23.63	26.72	1.62	19.65	1.59	--	1.91	1.53	1.30	1.70	1.35	2.49
18	20	1.33	1.28	37.20	114.70	92.81	20.20	2.39	17.50	1.74	--	1.63	1.61	2.03	1.96	1.57	1.54
20	22	1.11	1.65	16.05	76.34	1.94	16.78	1.57	1.36	1.18	--	1.54	1.65	1.76	1.99	1.05	1.44
22	24	1.95	1.76	1.16	15.84	23.02	39.31	1.86	1.63	115.42	--	1.87	11.03	2.14	1.64	1.69	1.65
24	26	1.78	2.13	1.66	5.56	839.68	1297.91	1.76	15.62	872.79	--	1.91	21.99	--	188.74	3.76	2.04
26	28	1.51	2.18	2.19	22.72	811.06	607.07	2.12	39.47	190.53	--	1.69	35.45	--	895.37	32.13	1.95
28	30	1.88	1.97	2.37	54.32	913.73	173.14	3.08	20.75	147.90	--	1.56	29.57	--	340.10	46.52	1.94
30	32	1.56	2.09	1.68	52.15	987.41	85.23	3.12	18.49	139.13	--	5.23	46.25	--	474.97	22.06	1.68
32	34	2.06	2.04	10.65	21.79	690.73	52.46	2.52	26.66	95.60	--	10.80	71.82	--	472.43	8.49	1.72
34	36	2.03	1.75	7.02	48.00	56.54	22.47	6.97	27.82	51.01	--	2.86	9.90	--	657.20	2.36	2.81
36	38	2.60	2.58	9.38	9.24	10.13	67.22	2.65	2.07	11.48	--	3.02	2.63	--	564.63	60.71	2.50
38	40	3.36	3.89	7.91	6.28	14.97	25.12	6.52	2.45	7.72	--	16.30	4.28	--	485.69	2.70	2.58
40	42	3.40	2.13	146.31	34.11	807.10	4.09	4.81	89.74	12.99	--	3.69	405.78	--	89.25	5.35	2.71
42	44	3.45	2.88	325.31	120.46	307.65	3.01	3.22	541.22	3.40	--	2.76	30.88	--	18.34	3.29	3.18
44	46	2.91	2.63	94.35	12.13	48.39	2.35	3.05	926.85	2.93	--	3.20	3.84	--	3.59	3.00	3.15
46	48	4.50	3.58	158.70	3.59	4.71	3.31	2.44	513.16	4.14	--	2.46	3.20	--	4.91	2.65	3.37
48	50	3.96	4.09	12.62	5.61	4.46	2.59	--	395.81	2.66	--	3.07	18.37	--	5.25	2.38	2.52
50	52	3.03	2.92	20.58	71.73	5.46	2.82	--	9.07	3.73	--	3.28	24.65	--	4.51	3.11	2.52
52	54	3.01	2.82	12.70	813.34	3.86	3.12	--	4.72	2.98	--	3.09	3.89	--	3.48	3.06	3.73
54	56	2.87	2.88	2.97	59.59	3.15	2.47	--	2.72	3.00	--	2.69	4.38	--	3.19	2.62	3.46
56	58	3.59	2.28	2.90	6.74	3.11	2.62	--	3.19	6.12	--	2.21	26.04	--	3.42	3.00	2.82
58	60	3.09	2.14	2.78	3.30	2.84	3.03	--	2.82	2.92	--	2.41	3.87	--	4.24	3.00	--
60	62	1.84	3.51	3.15	3.55	2.74	--	--	3.16	3.41	--	2.22	3.04	--	3.28	--	--
62	64	--	2.79	2.50	3.86	3.33	--	--	2.83	3.47	--	--	--	--	--	--	--

Notes: Maximum TarGOST responses (RE%) for every two-foot interval are listed in the table above.

TarGOST responses are highlighted on a graded scale: Values over 5% are highlighted lighter yellow to darker yellow as the values increase. At 20%RE and greater, the color scales to orange.

Data from 0 to 10 ft bgs is not evaluated because all locations were hydro-excavated and backfilled with sand and an asphalt patch before data collection.

-- - Total depth reached

Table C-3
Maximum TarGOST Signals (2019-2020) - Englewood Intermodal Yard
Houston, TX - Wood Preserving Works

Top Depth (ft bgs)	Bottom Depth (ft bgs)	Englewood Intermodal Yard					
		CPT43	CPT44	CPT45	CPT46	CPT48	CPT55
0	2	33.09	20.51	4.80	3.68	2.04	1.75
2	4	1.60	4.34	1.84	2.01	2.80	1.85
4	6	4.72	2.70	2.11	2.27	1.38	1.41
6	8	3.19	2.93	2.61	1.73	1.71	2.68
8	10	2.98	1.50	1.54	1.96	1.49	2.10
10	12	2.71	1.88	1.24	1.93	2.66	2.12
12	14	1.75	1.84	1.54	1.41	1.73	2.12
14	16	2.44	1.58	1.47	1.34	1.32	1.58
16	18	1.43	1.59	1.37	1.55	1.50	1.32
18	20	1.85	1.95	1.67	1.49	1.36	1.66
20	22	2.51	1.53	1.32	4.07	1.56	1.79
22	24	1.90	1.58	1.41	569.09	1.56	1.92
24	26	1.57	2.03	1.56	431.37	2.26	2.27
26	28	1.90	1.43	1.86	435.29	1.70	1.80
28	30	2.29	1.59	7.72	248.25	2.15	2.08
30	32	2.22	8.30	26.03	281.79	2.20	3.14
32	34	2.38	22.20	20.48	101.87	2.90	2.78
34	36	2.92	3.98	4.03	143.33	2.34	3.05
36	38	3.01	3.12	10.38	35.17	3.03	3.59
38	40	3.48	3.53	72.94	15.00	3.06	3.36
40	42	3.07	3.20	9.07	5.56	2.49	3.36
42	44	5.67	3.67	8.25	3.25	2.99	3.59
44	46	4.28	3.51	2.79	12.27	2.69	3.08
46	48	3.17	3.97	3.45	8.49	3.04	2.65
48	50	3.19	7.44	4.30	16.07	2.29	3.30
50	52	3.36	3.78	3.25	3.26	2.79	4.00
52	54	3.24	3.62	2.97	3.03	3.23	4.14
54	56	3.81	3.44	3.03	3.17	3.89	3.92
56	58	3.31	3.40	2.73	3.16	2.81	--
58	60	2.94	3.48	2.66	3.38	2.65	--
60	62	--	3.36	--	2.64	--	--
62	64	--	2.70	--	--	--	--

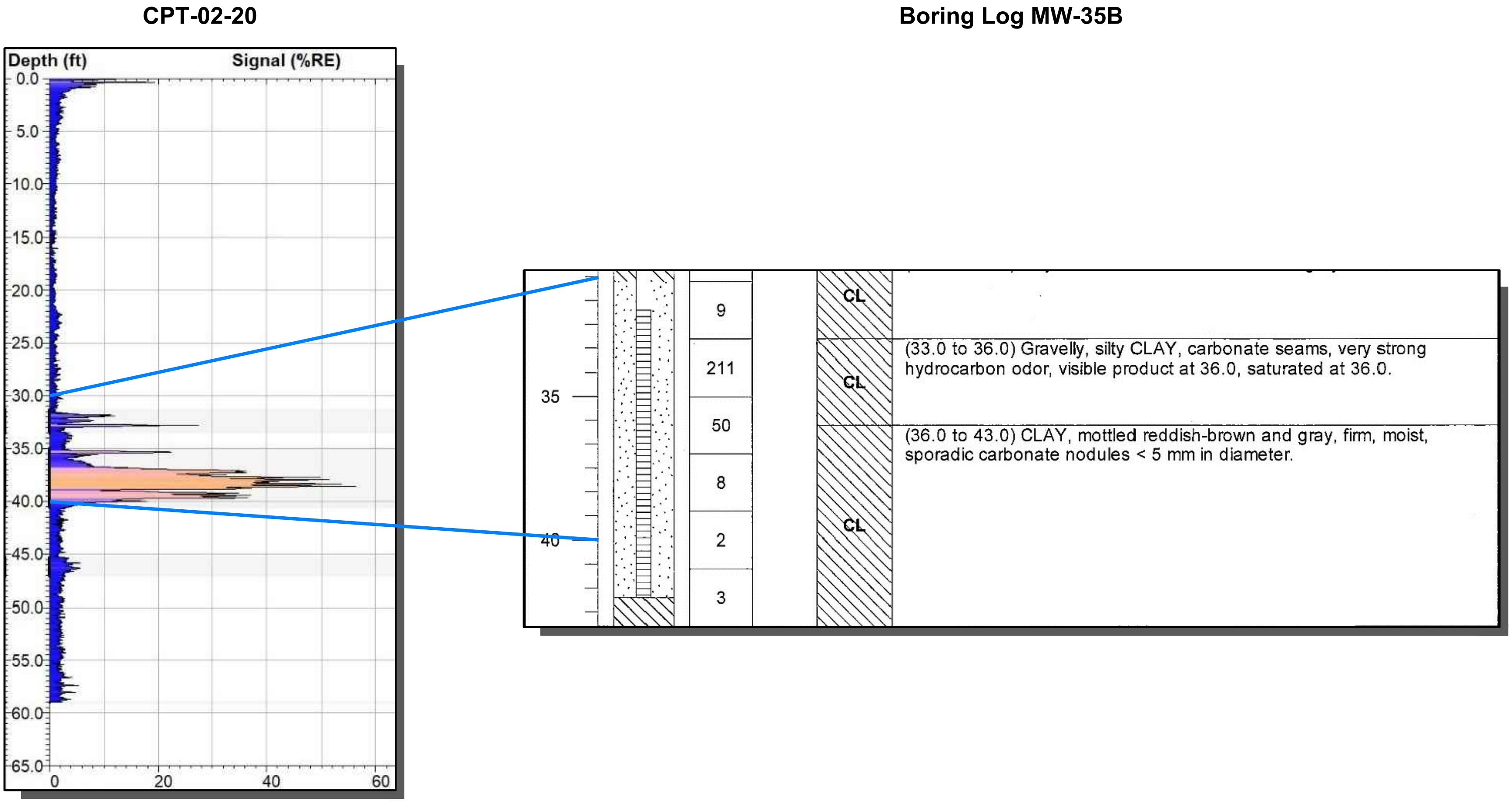
Notes: Maximum TarGOST responses (RE%) for every two-foot interval are listed in the table above.

TarGOST responses are highlighted on a graded scale: Values over 5% are highlighted lighter yellow to darker yellow as the values increase. At 20%RE and greater, the color scales to orange.

Data from 0 to 10 ft bgs is not evaluated because all locations were hydro-excavated and backfilled with sand and an asphalt patch before data collection.

ATTACHMENT D

TarGOST-Monitoring Well Figures and Geologic Cross-Section



(33.0 to 36.0) Gravelly, silty CLAY, carbonate seams, very strong hydrocarbon odor, visible product at 36.0, saturated at 36.0.

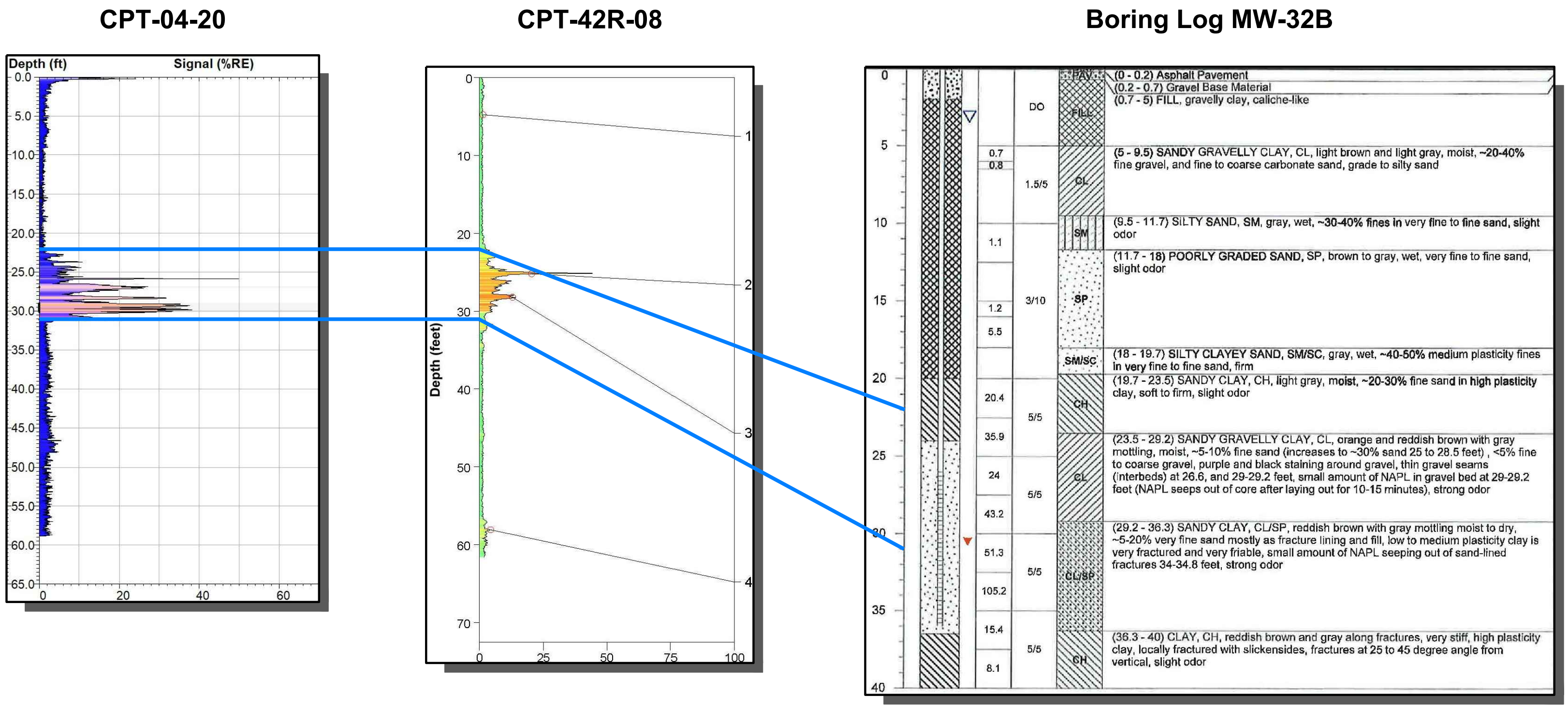
(36.0 to 43.0) CLAY, mottled reddish-brown and gray, firm, moist, sporadic carbonate nodules < 5 mm in diameter.

NOTE(S)

STAMPED BORING LOGS WERE PREVIOUSLY PROVIDED IN APPENDIX VI.B OF SECTION VI (GEOLOGY REPORT) OF THE RCRA PERMIT RENEWAL APPLICATION DATED DECEMBER 10, 2014.

GOLDER

FIGURE D-1



(0 - 0.2) Asphalt Pavement

(0.2 - 0.7) Gravel Base Material

(0.7 - 5) FILL, gravelly clay, caliche-like

(5 - 9.5) SANDY GRAVELLY CLAY, CL, light brown and light gray, moist, ~20-40% fine gravel, and fine to coarse carbonate sand, grade to silty sand

(9.5 - 11.7) SILTY SAND, SM, gray, wet, ~30-40% fines in very fine to fine sand, slight odor

(11.7 - 18) POORLY GRADED SAND, SP, brown to gray, wet, very fine to fine sand, slight odor

(18 - 19.7) SILTY CLAYEY SAND, SM/SC, gray, wet, ~40-50% medium plasticity fines in very fine to fine sand, firm

(19.7 - 23.5) SANDY CLAY, CH, light gray, moist, ~20-30% fine sand in high plasticity clay, soft to firm, slight odor

(23.5 - 29.2) SANDY GRAVELLY CLAY, CL, orange and reddish brown with gray mottling, moist, ~5-10% fine sand (increases to ~30% sand 25 to 28.5 feet) , <5% fine to coarse gravel, purple and black staining around gravel, thin gravel seams (interbeds) at 26.6, and 29-29.2 feet, small amount of NAPL in gravel bed at 29-29.2 feet (NAPL seeps out of core after laying out for 10-15 minutes), strong odor

(29.2 - 36.3) SANDY CLAY, CL/SP, reddish brown with gray mottling moist to dry, ~5-20% very fine sand mostly as fracture lining and fill, low to medium plasticity clay is very fractured and very friable, small amount of NAPL seeping out of sand-lined fractures 34-34.8 feet, strong odor

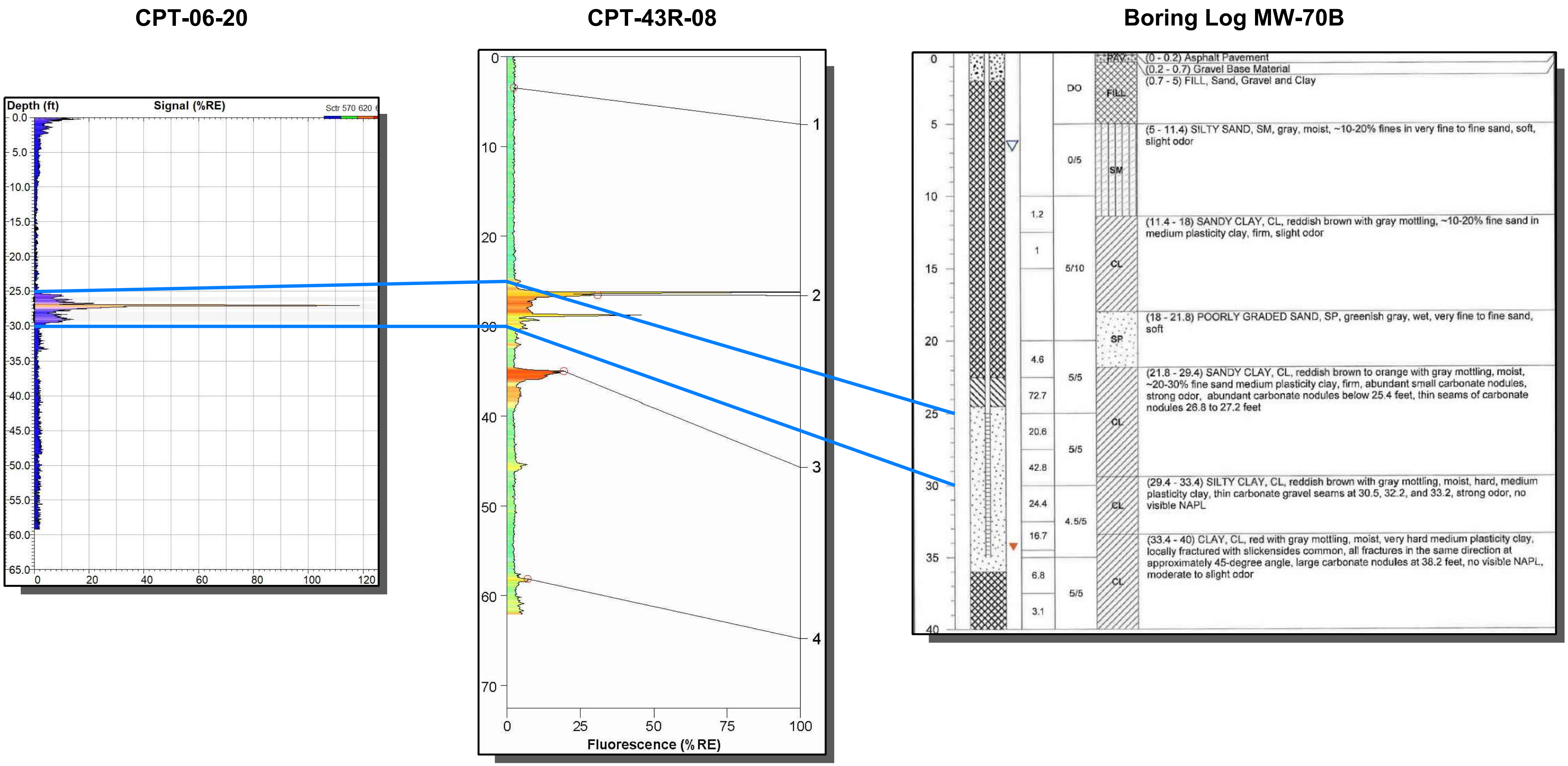
(36.3 - 40) CLAY, CH, reddish brown and gray along fractures, very stiff, high plasticity clay, locally fractured with slickensides, fractures at 25 to 45 degree angle from vertical, slight odor

NOTE(S)

STAMPED BORING LOGS WERE PREVIOUSLY PROVIDED IN APPENDIX VI.B OF SECTION VI (GEOLOGY REPORT) OF THE RCRA PERMIT RENEWAL APPLICATION DATED DECEMBER 10, 2014.

GOLDER

FIGURE D-2



CPT-06-20

CPT-43R-08

Boring Log MW-70B

(0 - 0.2) Asphalt Pavement

(0.2 - 0.7) Gravel Base Material

(0.7 - 5) FILL, Sand, Gravel and Clay

(5 - 11.4) SILTY SAND, SM, gray, moist, ~10-20% fines in very fine to fine sand, soft, slight odor

(11.4 - 18) SANDY CLAY, CL, reddish brown with gray mottling, ~10-20% fine sand in medium plasticity clay, firm, slight odor

(18 - 21.8) POORLY GRADED SAND, SP, greenish gray, wet, very fine to fine sand, soft

(21.8 - 29.4) SANDY CLAY, CL, reddish brown to orange with gray mottling, moist, ~20-30% fine sand medium plasticity clay, firm, abundant small carbonate nodules, strong odor, abundant carbonate nodules below 25.4 feet, thin seams of carbonate nodules 26.8 to 27.2 feet

(29.4 - 33.4) SILTY CLAY, CL, reddish brown with gray mottling, moist, hard, medium plasticity clay, thin carbonate gravel seams at 30.5, 32.2, and 33.2, strong odor, no visible NAPL

(33.4 - 40) CLAY, CL, red with gray mottling, moist, very hard medium plasticity clay, locally fractured with slickensides common, all fractures in the same direction at approximately 45-degree angle, large carbonate nodules at 38.2 feet, no visible NAPL, moderate to slight odor

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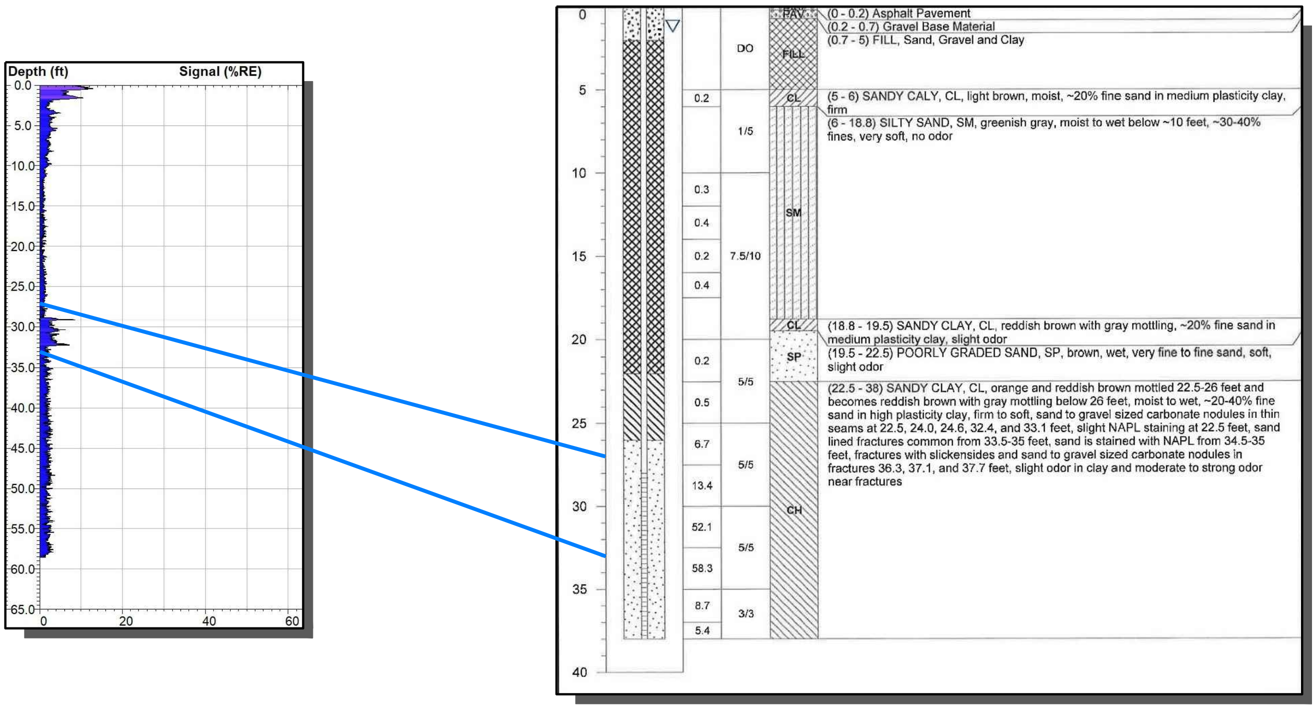
NOTE(S)

STAMPED BORING LOGS WERE PREVIOUSLY PROVIDED IN APPENDIX VI.B OF SECTION VI (GEOLOGY REPORT) OF THE RCRA PERMIT RENEWAL APPLICATION DATED DECEMBER 10, 2014.

GOLDER

FIGURE D-3



CPT-03-20

Boring Log MW-68B

(0 - 0.2) Asphalt Pavement

(0.2 - 0.7) Gravel Base Material

(0.7 - 5) FILL, Sand, Gravel and Clay

(5 - 6) SANDY CALY, CL, light brown, moist, ~20% fine sand in medium plasticity clay, firm

(6 - 18.8) SILTY SAND, SM, greenish gray, moist to wet below ~10 feet, ~30-40% fines, very soft, no odor

(18.8 - 19.5) SANDY CLAY, CL, reddish brown with gray mottling, ~20% fine sand in medium plasticity clay, slight odor

(19.5 - 22.5) POORLY GRADED SAND, SP, brown, wet, very fine to fine sand, soft, slight odor

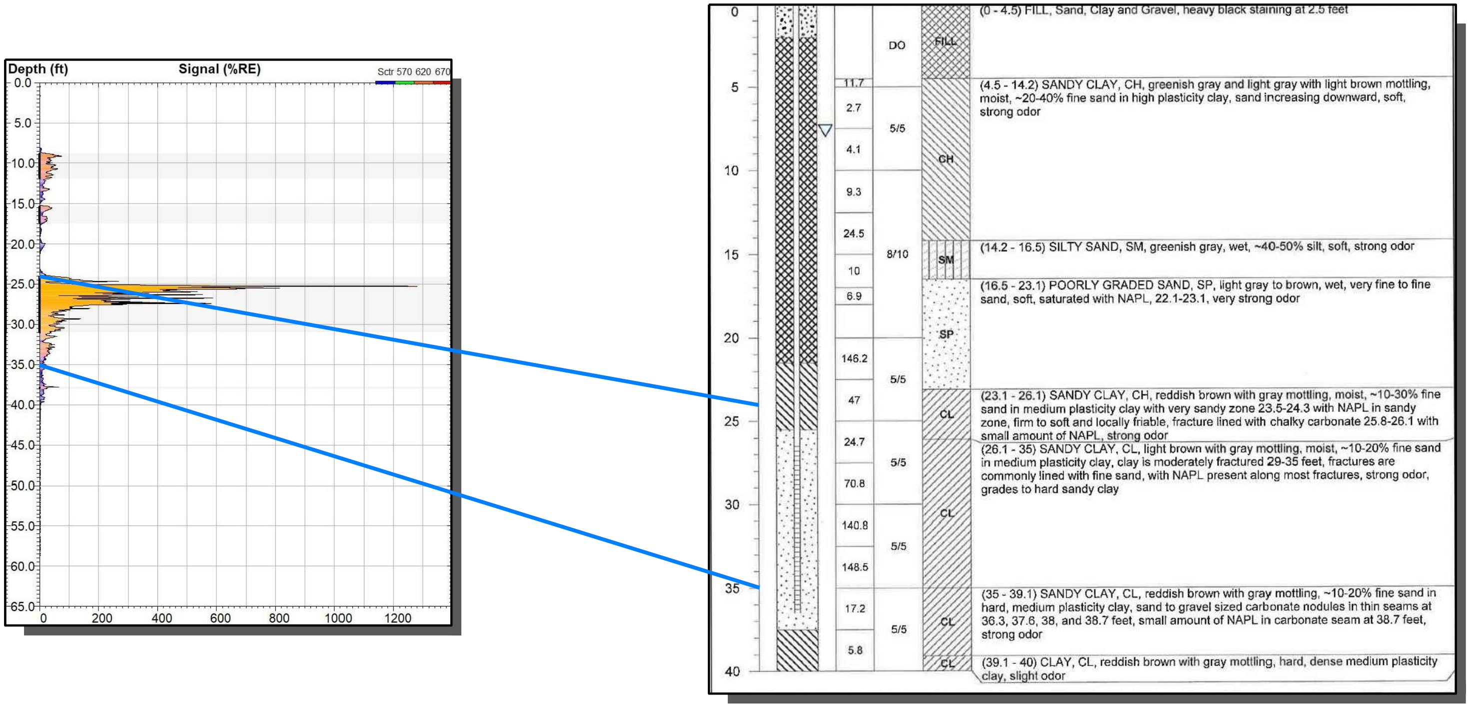
(22.5 - 38) SANDY CLAY, CL, orange and reddish brown mottled 22.5-26 feet and becomes reddish brown with gray mottling below 26 feet, moist to wet, ~20-40% fine sand in high plasticity clay, firm to soft, sand to gravel sized carbonate nodules in thin seams at 22.5, 24.0, 24.6, 32.4, and 33.1 feet, slight NAPL staining at 22.5 feet, sand lined fractures common from 33.5-35 feet, sand is stained with NAPL from 34.5-35 feet, fractures with slickensides and sand to gravel sized carbonate nodules in fractures 36.3, 37.1, and 37.7 feet, slight odor in clay and moderate to strong odor near fractures

NOTE(S)

STAMPED BORING LOGS WERE PREVIOUSLY PROVIDED IN APPENDIX VI.B OF SECTION VI (GEOLOGY REPORT) OF THE RCRA PERMIT RENEWAL APPLICATION DATED DECEMBER 10, 2014.

GOLDER

FIGURE D-4



CPT-32-20

Boring Log MW-74B

(0 - 4.5) FILL, Sand, Clay and Gravel, heavy black staining at 2.5 feet

(4.5 - 14.2) SANDY CLAY, CH, greenish gray and light gray with light brown mottling, moist, ~20-40% fine sand in high plasticity clay, sand increasing downward, soft, strong odor

(14.2 - 16.5) SILTY SAND, SM, greenish gray, wet, ~40-50% silt, soft, strong odor

(16.5 - 23.1) POORLY GRADED SAND, SP, light gray to brown, wet, very fine to fine sand, soft, saturated with NAPL, 22.1-23.1, very strong odor

(23.1 - 26.1) SANDY CLAY, CH, reddish brown with gray mottling, moist, ~10-30% fine sand in medium plasticity clay with very sandy zone 23.5-24.3 with NAPL in sandy zone, firm to soft and locally friable, fracture lined with chalky carbonate 25.8-26.1 with small amount of NAPL, strong odor

(26.1 - 35) SANDY CLAY, CL, light brown with gray mottling, moist, ~10-20% fine sand in medium plasticity clay, clay is moderately fractured 29-35 feet, fractures are commonly lined with fine sand, with NAPL present along most fractures, strong odor, grades to hard sandy clay

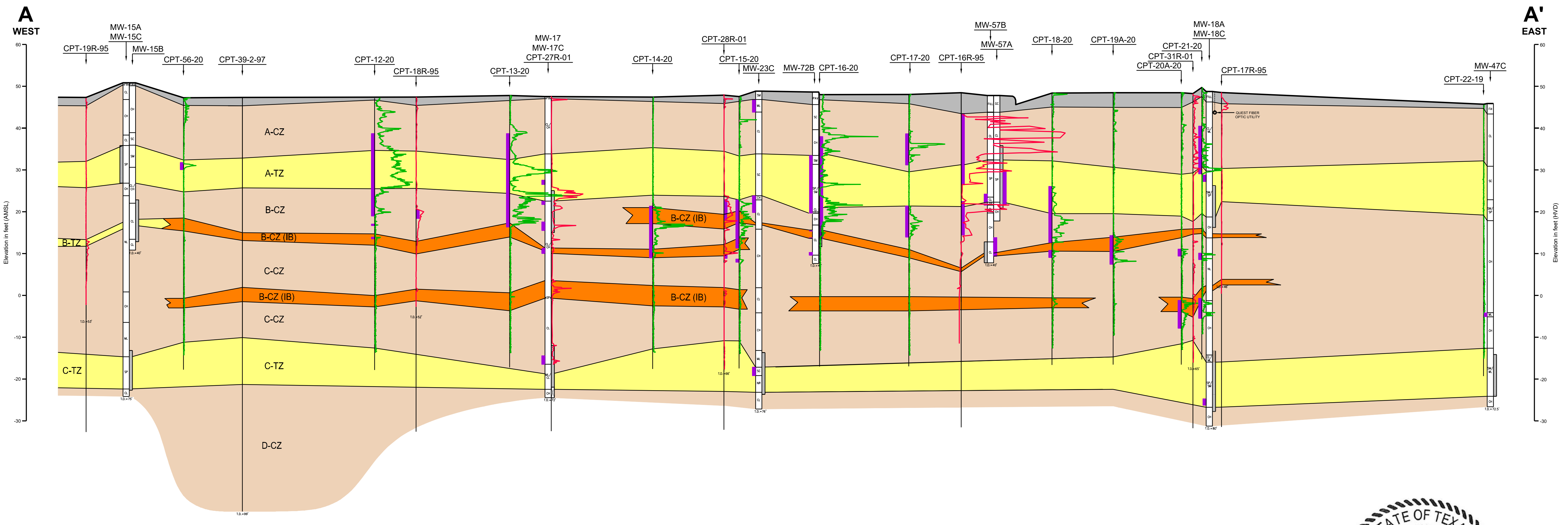
(35 - 39.1) SANDY CLAY, CL, reddish brown with gray mottling, ~10-20% fine sand in hard, medium plasticity clay, sand to gravel sized carbonate nodules in thin seams at 36.3, 37.6, 38, and 38.7 feet, small amount of NAPL in carbonate seam at 38.7 feet, strong odor

(39.1 - 40) CLAY, CL, reddish brown with gray mottling, hard, dense medium plasticity clay, slight odor

NOTE(S)

STAMPED BORING LOGS WERE PREVIOUSLY PROVIDED IN APPENDIX VI.B OF SECTION VI (GEOLOGY REPORT) OF THE RCRA PERMIT RENEWAL APPLICATION DATED DECEMBER 10, 2014.

FIGURE D-5

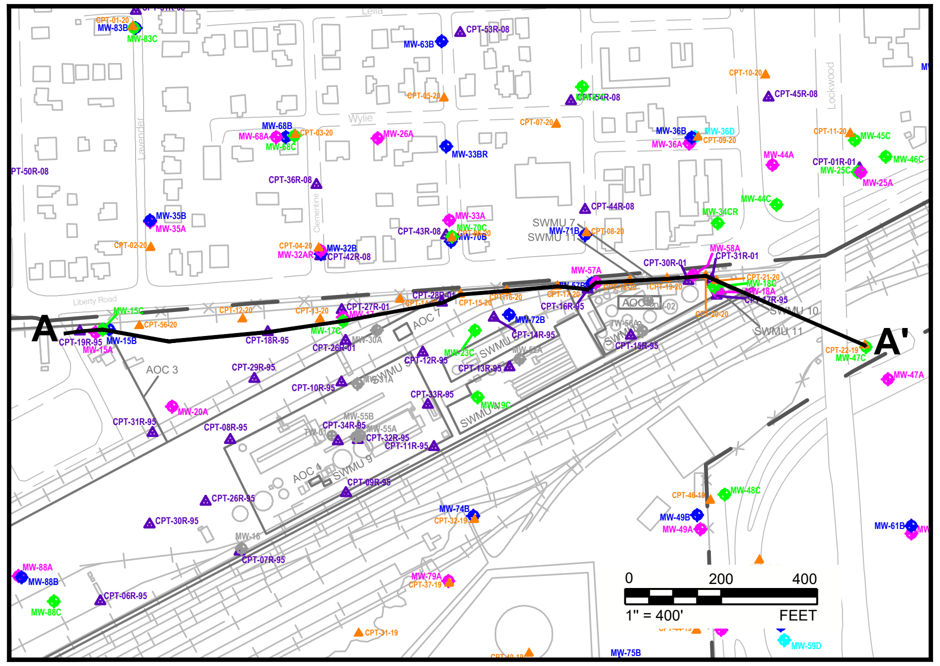


Vertical Exaggeration 5X

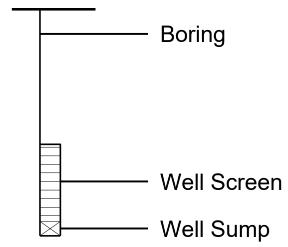
125 0 125 250

scale in feet

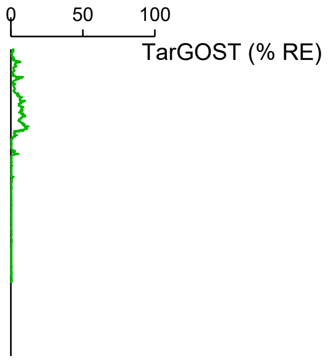
CROSS SECTION LOCATION MAP



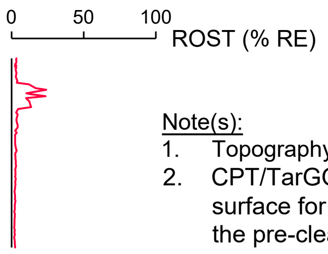
MONITORING WELL CONSTRUCTION



TarGOST LOGS



ROST LOGS



EXPLANATION

▨	Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
🟨	Transmissive Zone (TZ): Sand & Silty Sand
🟫	Cohesive Zone (CZ): Clay, Silty Clay & Silt
🟧	B-CZ Interbedded Zone B-CZ (IB): Interbedded Carbonate Seams and Calcareous Nodules with Clay & Silty Clay, within the B-CZ
🟪	NAPL or Sheen/Staining Noted in Soils for Boring Log, for CPT/ROST Location ROST Result >25% RE, and for CPT/TarGOST Locations TarGOST result >5%RE.^{2}

Note(s):
1. Topography is estimated.
2. CPT/TarGOST® locations were pre-cleared to 10 feet below ground surface for utilities and backfilled with sand, TarGOST® data collected in the pre-cleared interval are considered unreliable and are not evaluated.

ERIC C. MATZNER
GEOLOGY
LIC. # 795
5/29/20

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
CROSS SECTION A-A'

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-05-28
DESIGNED	RS
PREPARED	RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO.	REV.	FIGURE
19119232	0	D-6

Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-5 May\ | File Name: FIG D-6 - Cross Section A-A'.dwg | Last Edited By: adiamond Date: 2020-05-29 Time:12:03:52 PM | Printed By: adiamond Date: 2020-05-29 Time:12:09:53 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1 in

ATTACHMENT E

TPH Soil Boring Logs

BORING NUMBER DPT-12-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/29/20 **COMPLETED** 1/30/20
GROUND ELEVATION 47.5 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728782.497 ft
DRILLING METHOD DPT
EASTING 3167242.974 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		1.5		1.0	TOPSOIL
		29.8	CH		(CH) CLAY, dark gray, strong hydrocarbon (HC) odor, firm, moist
		62.5			
		48.5		4.0	
5	4-5	69.8	CH		(CH) Same as Above (SAA) at 4' but brown
		143.8		6.0	
		60.7	CH		(CH) SAA at 6' but gray with black and brown stains
		77.1			
	8-9	148.6		8.5	
10		130.7	SP		(SP) SAND, brown, creosote mixed in, unconsolidated, wet
		74.3		11.5	
		137.3	CL		(CL) SANDY CLAY, gray with black and orange stains, firm, moist
		117.1			
		142.2		13.5	
15		146.0	SP		(SP) SAND, gray with HC odor, compact, wet
				16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GEOLOGY
LIC. # 795

5/29/20

GOLDER

BORING NUMBER DPT-16-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/30/20 **COMPLETED** 1/30/20
GROUND ELEVATION 48.4 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728841.681 ft
DRILLING METHOD DPT
EASTING 3167792.336 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		0.1 3.2 1.0		3.0	TOPSOIL
5	4-5	5.6 132.7	CH	5.0	(CH) CLAY, brown-gray, cobbles, moist, soft-firm
		329.3 249.1	CH	7.0	(CH) Same as Above (SAA) at 5' with some hydrocarbon (HC) odor
10		283.3 230.0 223.2 295.9	CH	11.0	(CH) SAA at 7' but gray-tan, firm
		382.7 294.0	SP	13.0	(SP) SAND, brown-gray with strong HC odor, soft, wet
		329.9	CL	14.0	(CL) SANDY CLAY, gray-brown to gray-tan with orange stains, strong HC odor, and some unconsolidated sand pockets, firm, moist
15	14-15	509.5	CL	16.0	(CL) SAA at 14' but gray-tan, firm-soft, moist-wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

STATE OF TEXAS
ERIC C. MATZNER
GEOLOGY
LIC. # 795
LICENSED
PROFESSIONAL GEOSCIENTIST

5/29/20

BORING NUMBER DPT-21-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/30/20 **COMPLETED** 1/30/20
GROUND ELEVATION 50.1 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728862.474 ft
DRILLING METHOD DPT
EASTING 3168229.187 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		0.0		1.0	TOPSOIL
		0.1			FILL and cobbles
		0.0		3.0	
	3-4	314.2	CH	4.0	(CH) CLAY, dark brown with a lot of cobbles, red stains, and some hydrocarbon (HC) odor, soft, moist
5		201.2	CH	5.0	(CH) Same as Above (SAA) at 4' but with black and orange stains only
	5-6	92.6	CH	6.0	(CH) SAA at 5' but dark gray with no staining
		23.6	CH		(CH) SAA at 6' but gray, firm-soft
		9.1			
		42.5		9.5	
10		8.8	SP		(SP) SAND, dark gray with HC odor, loose, wet
		5.5		11.0	
		4.5	CH		(CH) CLAY, gray with yellow, white, and dark gray mottling, some HC odor, firm-soft, moist
		6.4		13.0	
		4.4	CH		(CH) SAA at 13' but with loose, wet, dark gray SAND pockets
15		4.4		15.0	
		3.1	CH		(CH) SAA at 15' but without SAND
		2.5		17.0	
		2.8	CH		(CH) SAA at 17' but light gray with orange stains only
		3.3		19.5	
20		4.4	SP	20.0	(SP) SAND, gray with HC odor, compact, wet

Bottom of borehole at 20.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

ERIC C. MATZNER
GEOLOGY
LIC. # 795

5/29/20

BORING NUMBER DPT-24-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/29/20 **COMPLETED** 1/29/20
GROUND ELEVATION 46.7 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728453.79 ft
DRILLING METHOD DPT
EASTING 3165983.937 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A	GP	1.0	(GP) GRAVEL mixture
		N/A		2.0	CONCRETE
		1.8	CH		(CH) CLAY, gray with some tan mottling, firm, moist
		2.1			
5	4-5	2.2			
		1.9		6.0	
		0.5	CH		(CH) Same as Above (SAA) at 6' but with cobbles
		1.3			
	8-9	2.5			
10		2.3		10.0	
			CL		(CL) SANDY CLAY, gray, soft, wet
				12.0	
			CH		(CH) CLAY with sand, gray with tan mottling, soft, wet
				14.0	
			SP		(SP) SAND with clay, gray, soft, wet
15				16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

ERIC C. MATZNER
LIC. # 795

5/29/20

GOLDER

BORING NUMBER DPT-26-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/28/20 **COMPLETED** 1/29/20
GROUND ELEVATION 46.7 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728262.641 ft
DRILLING METHOD DPT
EASTING 3165990.215 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		3.2	CL	1.5	(CL) CLAY with gravel, gray, strong hydrocarbon (HC) odor, firm, wet
		5.0	CL		(CL) Same as Above (SAA) at 1.5' but no gravel
	2-3	9.0			
		7.1			
5		3.6			
		2.9		6.0	
		2.1	CL		(CL) SAA at 6' but tan-gray
		2.0			
		4.1			
10		3.1			
		2.2			
		3.3			
		5.4			
	13-14	5.4		14.0	
15		3.7	CL		(CL) SANDY CLAY, gray, HC odor, compact, wet
		3.6		16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates. Concrete at the surface of this location.

ERIC C. MATZNER
GEOLOGY
LIC. # 795

5/29/20

BORING NUMBER DPT-28-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 2/5/20 **COMPLETED** 2/6/20

GROUND ELEVATION 49.1 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727665.619 ft

DRILLING METHOD DPT

EASTING 3166602.207 ft

LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A		1.0	CONCRETE
		N/A N/A N/A		4.0	FILL
5	4-5	4.6	CH	5.0	(CH) CLAY, gray, some hydrocarbon (HC) odor, firm-soft, moist
		1.5 1.6	CH	7.0	(CH) Same as Above (SAA) at 5' but brown-gray
	7-8	2.5	CH	8.0	(CH) SAA at 7' but wet
		1.8	CH	9.5	(CH) SAA at 8' but light brown-gray with gray mottling, no HC odor
10		1.9	CL	11.0	(CL) SANDY CLAY, light gray, firm-soft, wet
			CH	12.0	(CH) CLAY, light gray with yellow and black stains, firm, moist

Bottom of borehole at 12.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

ERIC C. MATZNER
GEOLOGY
LIC. # 795

5/29/20

GOLDER

BORING NUMBER DPT-29-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/5/20 **COMPLETED** 2/5/20
GROUND ELEVATION 50.5 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727872.88 ft
DRILLING METHOD DPT
EASTING 3167007.498 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		N/A			
		N/A			2.5 FILL
		N/A			
5	4-5	20.7	CH		4.3 (CH) CLAY, dark gray, hydrocarbon (HC) odor, visible creosote, black stains, wood pieces, and assorted debris, soft, wet (with product)
		116.1	CH		5.5 (CH) Same as Above (SAA) at 5.5' but brown-gray
		119.8			
		117.5	CH		7.0 (CH) SAA at 7' but no visible creosote
		78.5	CH		8.0 (CH) SAA at 8' but with yellow and black stains, firm
10	9-10	184.0	CH		9.0 (CH) SAA at 9' but with cobbles
		148.7	CH		10.0 (CH) Same as Above (SAA) at 10' but firm-hard
		127.1	CH		11.0 (CH) SAA at 11' but with light gray, orange, and black stains and without cobbles
		78.0			
		62.9			
15		55.3			
		24.4	CL		15.5 (CL) SANDY CLAY, light gray with HC odor and orange and black stains, firm, moist
					16.0

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

ERIC C. MATZNER
GEOLOGY
LIC. # 795

5/29/20

GOLDER

BORING NUMBER DPT-30-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/3/20 **COMPLETED** 2/5/20
GROUND ELEVATION 50.0 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728000.981 ft
DRILLING METHOD DPT
EASTING 3167239.561 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A		▨	FILL-Black
		N/A		▨	
		N/A		▨ 3.0	
		6.5		▨ 3.5	Same as Above (SAA) at 3' but with hydrocarbon (HC) odor and visible creosote
5	4-5	33.5	CH	▧ 5.0	(CH) CLAY, brown-black with HC odor and visible creosote, with fill mixed in, firm-soft. moist
		52.9	CH	▧ 6.0	(CH) SAA at 5' but brown-gray, firm, no visible creosote or fill
		96.8	CH	▧ 7.0	(CH) SAA at 6' but with visible creosote
		159.6	CH	▧	(CH) SAA at 7' but with no visible creosote
		116.4		▧ 9.0	
10		67.8	CH	▧ 10.0	(CH) SAA at 9' but with red stains
		88.5	CH	▧ 11.0	(CH) SAA at 10' but with visible creosote
		185.2	CH	▧ 12.0	(CH) SAA at 11' but with no visible creosote
		113.7	CH	▧ 13.0	(CH) SAA at 12' but light gray with yellow and black stains
	13-14	282.7	CH	▧ 14.0	(CH) SAA at 13' but with cobbles
15		197.5	CH	▧ 15.0	(CH) SAA at 14' but without cobbles
			CL	░ 16.0	(CL) SANDY CLAY, light gray with yellow and brown stains, firm, moist

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates Concrete at the surface of this location.

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LIC. # 795

5/29/20

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BORING NUMBER DPT-32-19

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CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/4/20 **COMPLETED** 2/4/20
GROUND ELEVATION 47.8 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728364.623 ft
DRILLING METHOD DPT
EASTING 3167725.451 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		8.9 37		▦ 2.5	FILL
	2-3	172.7	CH	▨ 3.5	(CH) CLAY, brown with strong hydrocarbon (HC) odor and visible creosote, firm-soft, moist
		166.4	CH	▨ 4.0	(CH) Same as Above (SAA) at 3.5' but brown-gray
5		111.4	CH	▨ 5.0	(CH) SAA at 4' without visible creosote
		107.2	CH	▨ 6.0	(CH) SAA at 5' with visible creosote
		154.9 116.6 154.6	CH	▨ 9.0	(CH) SAA at 6' without visible creosote, with yellow, black, and brown stains
10	11-12	166.6 136.1 166.9	CH	▨ 12.0	(CH) SAA at 9' but with some visible creosote
		130.0	CH	▨ 13.5	(CH) SAA at 12' but with black stains only
		128.3	CL	▨ 14.5	(CL) SANDY CLAY, gray with brown stains and HC odor, firm-soft, moist
15		153.9	SP	░ 16.0	(SP) SAND, gray with brown stains and HC odor, compact, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER DPT-34-19

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GOLDER

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/18/19 **COMPLETED** 12/18/19

GROUND ELEVATION 49.6 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727665.981 ft

DRILLING METHOD DPT

EASTING 3166962.592 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		N/A		2.0	
		30.1			FILL black with gravel, assorted debris, glass pieces, pockets of NAPL starting at 3', and coarse sand, strong odor
		22.3			
5	4-5	41.5			
	5-6	13.3		5.5	
			SM	6.0	(SM) CLAYEY SILT dark gray with black staining and some sand, very soft, moist
		6.2	CL		(CL) SILTY CLAY dark gray with fine grain sand and black staining, lighter with depth, soft, moist
		4.7			
		6.7		9.0	
10		5.4	CL		(CL) Same as Above (SAA) at 9' but with CaCO3 nodules, more fine grain sand and lighter with depth, firm
		5.2		11.5	
		5.5	CL		(CL) SAA at 11.5' with iron concentrations and depletions
		5.3		13.0	
		5.2	CL		(CL) SANDY CLAY tan with silt, iron staining, more fine grain sand with depth, soft
15		5.3		15.0	
		N/A	SM	16.0	(SM) SILTY SAND green-tan fine grain sand with silt, very soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GOLDER

BORING NUMBER DPT-35-19

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CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 12/19/19 **COMPLETED** 12/19/19
GROUND ELEVATION 49.8 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727851.803 ft
DRILLING METHOD DPT
EASTING 3167301.512 ft
LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		N/A		2.0	
		29.2		3.1	FILL black , gravel, sand, glass pieces, assorted debris, strong hydrocarbon (HC) odor, very wet
		41.1	CL	3.4	FILL white silty white material, ash, very ~~strong~~ odor - HC and NH4 (CL) FILL black, gravel, sand, glass pieces, assorted debris strong hydrocarbon (HC) odor, very wet, pockets of silty white material (ash, very strong odor - HC and NH4)
5	4-5	150.6	CL	4.5	(CL) CLAY dark gray , soft, wet
		67.0			
	6-7	55.0	CL	6.5	(CL) Same as Above (SAA) at 6.5' but with very strong odor, HC staining
		N/A		8.0	
		N/A	CL		(CL) SAA at 8' but lighter with depth, HC staining, very strong odor, CaCO3 nodules
10		N/A		10.0	
		N/A	CL	11.0	(CL) SAA at 10' but tan
		N/A	CL		(CL) SAA at 11' but with iron staining
		N/A			
		N/A			
15		N/A		15.5	
		N/A	SP	16.0	(SP) SAND green-tan , soft, wet

Bottom of borehole at 16.0 feet.

REMARKS Extra sample collected of white material from 3.1', 0-5' was advanced using a hand auger; stopped work due to high PID readings near samples cores, logged generally based on sight w/o breaking up most of the sample core; No PID readings past 7'.

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GOLDER

BORING NUMBER DPT-36-19

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CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/5/20 **COMPLETED** 2/5/20
GROUND ELEVATION 49.2 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727948.123 ft
DRILLING METHOD DPT
EASTING 3167494.441 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A		▩	FILL, sand
		N/A		▩	
		N/A		▩ 3.0	
	3-4	16.7	CH	▨ 4.0	(CH) CLAY, dark gray-brown with strong hydrocarbon (HC) odor, firm-soft, moist
5		15.1	SP	░	(SP) SAND, light gray with strong HC odor and black stains, compact, moist
	5-6	9.5		░ 6.0	
		2.8	CH	▨ 7.0	(CH) CLAY, dark gray with black stains and HC odor, firm-soft, moist
		0.0	SP	░ 8.0	(SP) SAND, gray-brown, compact, moist

Bottom of borehole at 8.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates. Concrete at the surface of this location.

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BORING NUMBER DPT-37-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 2/4/20 **COMPLETED** 2/6/20

GROUND ELEVATION 49.6 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728232.383 ft

DRILLING METHOD DPT

EASTING 3167673.18 ft

LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		N/A		2.0	
		N/A		3.0	FILL SAND
		72.9	CH	4.0	(CH) CLAY, gray with strong hydrocarbon (HC) odor and visible creosote, soft, wet (from product)
5	4-5	137.9	CH		(CH) Same as Above (SAA) at 4' but gray-light tan
		N/A			
		53.0		6.5	
	7-8	140.8	CH	8.0	(CH) SAA at 6.5' but gray with brown stains without visible creosote, firm, moist
		106.7	CH	9.0	(CH) SAA at 8' but moist-wet
10		100.9	CH	10.0	(CH) SAA at 9' but with light gray, brown, and yellow stains, moist

Bottom of borehole at 10.0 feet.

REMARKS 0-5' was advanced using a hand auger, Refusal at 10'. Coordinates and elevation are estimates.

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BORING NUMBER DPT-38-19

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GOLDER

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/16/19 **COMPLETED** 12/17/19

GROUND ELEVATION 49.3 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727658.424 ft

DRILLING METHOD DPT

EASTING 3167352.576 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		N/A		2.0	
		256.8			FILL GRAVEL, black, glass pieces, with pockets of NAPL
	3-4	359			
5		332.3	CL	4.5	(CL) CLAY dark gray to black with pockets of NAPL and fill, soft, moist
	5-6	170.8		6.0	
		62.4	CL		(CL) Same as Above (SAA) at 6' but dark gray only, lighter with depth, pockets of black staining, no NAPL or fill pockets, iron concentrations and depletions, firm
		94.1		8.0	
		27.9	CL		(CL) SAA at 8' but light gray, with fine grain sand, more sand with depth, very little black staining, dry
10		21.8			
		12.8		11.1	
		6.0	CL		(CL) SAA at 11.1' but with many iron concentrations, CACO3 pockets, color change to tan with depth, moist
		2.8			
		1.9		14.0	
15		1.6	CL	15.5	(CL) SANDY CLAY tan with fine grain sand, iron staining, soft, wet
		N/A	SP	16.0	(SP) SAND tan, fine grained, soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER DPT-39-19

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GOLDER

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/17/19 **COMPLETED** 12/17/19

GROUND ELEVATION 48.7 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727822.125 ft

DRILLING METHOD DPT

EASTING 3167602.163 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A			CONCRETE
		N/A		2.0	
	2-3	9.8			FILL black with gravel, coarse sand, glass pieces, HC odor
		6.9		4.0	
5		4.1	SC	5.0	(SC) CLAYEY SAND black to dark gray coarse sand with clay, gravel, black staining, soft, wet
		3.7	CL	6.0	(CL) CLAY dark gray with slight odor and very little medium grain sand, firm, moist
		3.4	CL		(CL) Same as Above (SAA) at 6' but drier, lighter, and more medium grain sand with depth, iron concentrations and depletions
	7-8	5.8			
		4.9			
10		4.1		10.5	
		3.4	CL		(CL) SANDY CLAY light gray medium grain sand, CaCO3 nodules and pockets, soft, moist, fades to tan color with depth
		2.8			
		3.4			
		3.6		14.0	
15		N/A	CL	14.5	(CL) SAA at 14' but with iron staining
			SC	15.7	(SC) CLAYEY SAND green-tan fine-medium grain sand with clay, soft, wet
		N/A	SM	16.0	(SM) SILTY SAND gray fine-medium grain sand with silt, very soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER DPT-40-19

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CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/18/19 **COMPLETED** 12/18/19

GROUND ELEVATION 48.2 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728086.085 ft

DRILLING METHOD DPT

EASTING 3167839.252 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A		1.3	CONCRETE
	1-2	110.2		2.0	FILL black with gravel, few cobbles, coarse sand, and assorted debris
		20.4		3.0	SAND tan with pockets of gray clay and black-stained sand/silty clay, very soft, moist
		13.3	SM	4.0	(SM) SILTY SAND dark gray fine sand with silt, very soft, moist
5		14.3	CL		(CL) SILTY CLAY, with iron concentrations and depletions, black staining, some fine sand, more sand and lighter with depth, soft, moist
		9.1			
		9.0			
	7-8	9.5		8.0	
		5.5	CL		(CL) CLAY gray with gravel and CaCO3 nodules, firm, dry
10		6.3	CL	9.5	(CL) SANDY CLAY light gray with iron concentrations and depletions, soft, moist, green color with depth
		5.8			
		6.2		12.0	
		6.5	CL	12.5	(CL) Same as Above (SAA) at 12' but with CaCO3 nodules and pockets (SC) CLAYEY SAND tan fine grain sand with clay, iron staining, soft, wet
		5.9	SC		
15		6.2		14.8	
		N/A	SP	16.0	(SP) SAND tan-green fine grain sand with CaCO3 pockets, very soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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5/29/20

GOLDER

BORING NUMBER DPT-41-19

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CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/6/20 **COMPLETED** 2/6/20
GROUND ELEVATION 47.2 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728183.236 ft
DRILLING METHOD DPT
EASTING 3168011.343 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG		MATERIAL DESCRIPTION
0		1.4			0.5	FILL SAND
			CL		1.0	(CL) SANDY CLAY, gray, soft, wet
	1-2	2.2 1.1	CL		3.0	(CL) Same as Above (SAA) at 1' but dark gray-brown, moist
		0.7	CL		4.0	(CL) SAA at 3' but gray
5		0.6	CL		5.0	(CL) SAA at 4' but light gray with gray mottling
	5-6	0.8	CH		6.0	(CH) CLAY, gray with cobbles, firm-hard, moist
		0.0 0.0	CH		8.0	(CH) SAA at 6' but with yellow stains
10		0.0 0.0	CH		10.0	(CH) SAA at 8' but without cobbles, with yellow and black stains, firm
		0.0	CH		11.0	(CH) SAA at 10' but without black stains
		0.0	CH		12.0	(CH) SAA at 11' but with black stains
		0.0	CH		12.5	(CH) SAA at 12' but with gray stains only
15		0.0 0.0	CL		14.5	(CL) SANDY CLAY, light gray, firm, moist
		0.0	SP		15.0	(SP) SAND, light-gray, compact, moist
			SP		16.0	(SP) SAA at 15' but wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates. Concrete at the surface of this location.

STATE OF TEXAS
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5/29/20

GOLDER

BORING NUMBER DPT-42-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 12/17/19 **COMPLETED** 12/17/19
GROUND ELEVATION 48.7 ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727876.787 ft
DRILLING METHOD DPT
EASTING 3167935.238 ft
LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			CONCRETE
		11.0		1.5	FILL with gravel, black, few cobbles, coarse sand, trash and rubber pieces
		5.0	CL	2.5	(CL) CLAY with some coarse sand and pockets of varied NAPL starting at 3.8', dark gray, black staining, debris, strong fuel-like odor, firm, dry
		23.5			
	4-5	84.1			
5		171.4			
		251.7			
	7-8	254.0	CL	7.0	(CL) Same as Above (SAA) at 7' but with iron concentrations and depletions, no visible product, lighter gray and more medium grain sand with depth
		134.9	CL	8.9	(CL) SAA at 8.9' but with CaCO3 nodules, medium grain sand, few iron concentrations, iron staining, firm, moist, green with depth
		111.2			
10		128.0			
		54.0	SC	11.5	(SC) CLAYEY SAND, light gray, medium grain sand with clay, strong odor, soft, wet, clay lense at 12', very strong odor starting at 13'
		N/A			
		N/A			
		N/A	SC	14.0	(SC) SAA at 14' but some dark gray staining, more sand with depth, very few iron concentrations
15		N/A	SP	15.6 16.0	(SP) SAND, tan, fine-medium grain sand with silt, very soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

ERIC C. MATZNER
GEOLOGY
LIC. # 795

5/29/20

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BORING NUMBER DPT-43-19

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CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 2/4/20

COMPLETED 2/4/20

GROUND ELEVATION 47.7 ft

BOREHOLE SIZE 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728017.778 ft

DRILLING METHOD DPT

EASTING 3168197.947 ft

LOGGED BY B Sokora

CHECKED BY M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A			FILL
		N/A			
	2-3	3.4	CH	2.5	(CH) CLAY, gray-dark brown, firm-hard, moist
		2.7			
5		2.6			
		3.4			
		5.4			
		5.3			
		6.3			
10		3.4		10.0	
		2.0	CH		(CH) Same as Above (SAA) at 10' but light gray
		6.7	CL	11.5	(CL) SANDY CLAY, light-gray with red stains, firm, moist
	12-13	6.7			
		6.1	SC	13.5	(SC) CLAYEY SAND, tan with red and black stains, compact, moist
15		6.5			
			SC	15.0	(SC) SAA at 15' but gray
				16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates. Concrete at the surface of this location.

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GOLDER

BORING NUMBER DPT-45-19

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CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 2/5/20 **COMPLETED** 2/5/20

GROUND ELEVATION 47.8 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728235.607 ft

DRILLING METHOD DPT

EASTING 3168166.934 ft

LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A		1.0	FILL SAND
	1-2	1.8	CL	2.0	(CL) SANDY CLAY, dark gray-brown with some hydrocarbon (HC) odor, compact, moist
		0.6	SP	3.0	(SP) SAND, light brown, compact, moist
		0.9	CH	4.0	(CH) CLAY, gray, firm-hard, moist
5		0.7	CH	5.0	(CH) Same as Above (SAA) at 4' but light gray
		1.1	CH	6.5	(CH) SAA at 5' but gray with orange stains, firm, moist
		0.6 1.1	CL	8.0	(CL) SANDY CLAY, gray with orange stains, firm, moist
	8-9	2.0	CH	9.0	(CH) CLAY, gray with cobbles and orange stains, hard, dry
10		1.3	CH	9.8	(CH) SAA at 9' but without cobbles, firm-soft, moist
			CL	11.5	(CL) SANDY CLAY, light gray-gray, soft, wet
			CH	12.0	(CH) CLAY, gray with orange stains, firm, moist

Bottom of borehole at 12.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates. Concrete at the surface of this location.

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GOLDER

BORING NUMBER DPT-46-20

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 1/30/20 **COMPLETED** 1/31/20

GROUND ELEVATION 45.8 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728404.796 ft

DRILLING METHOD DPT

EASTING 3168216.654 ft

LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		0.0			TOPSOIL
		0.0	CH	1.5	(CH) CLAY, dark brown with organics and cobbles, soft, moist
	2-3	0.9			
		0.0		4.0	
5		0.0	CH	5.0	(CH) Same as Above (SAA) at 4' but with black stains
		0.0	CH		(CH) SAA at 5' but with orange and black stains
		0.0			
		0.0		8.0	
		1.3	CL		(CL) SANDY CLAY, tan-gray with yellow, black, and red stains, firm-soft, moist
10	9-10	2.1		10.0	
			SP		(SP) SAND with clay, gray-brown, compact, wet
				12.0	

Bottom of borehole at 12.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER DPT-55-19

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/16/19 **COMPLETED** 12/16/19

GROUND ELEVATION 47.6 ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727247.655 ft

DRILLING METHOD DPT

EASTING 3167274.924 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A			FILL black cobble roadbase
		0.2		1.5	FILL black with gravel and cobbles
		0.2			
	3-4	0.1	CL	3.0	(CL) CLAY dark gray with medium grain sand, with light gray mottling, some gravel, some iron concentrations and deposits, soft, dry
5		0.1			
		0.1	CL	5.0	(CL) Same as Above (SAA) at 5' but lighter and more iron with depth
		0.1	CL	6.5	(CL) SAA at 6.5' but more medium grain sand with depth
		0.1			
		0.1			
10		0.1			
		0.1	CL	10.0	(CL) SANDY CLAY light brown with fine-medium grain sand with CaCO3 pockets, very soft, wet
		0.1			
	12-13	0.1	CL	12.0	(CL) SAA at 13.3' but with iron streaking and concentrations, more fine-medium grain sand and lighter with depth
		N/A	SM	13.3	(SM) SILTY SAND light brown fine-medium grain sand with silt, few iron concentrations, very soft, wet, red color at 16'
15		N/A			
		N/A		16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GOLDER

BORING NUMBER SB-216

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 1/29/20 **COMPLETED** 1/29/20

GROUND ELEVATION ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 728208.689 ft

DRILLING METHOD DPT

EASTING 3166795.975 ft

LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A	GP	○	(GP) GRAVEL mixture with cobbles
		N/A		○	
		3.2		○ 2.5	
	3-4	4.1	CH	▨	(CH) CLAY, gray with hydrocarbon (HC) odor, firm-soft, wet
5		3.2		▨	
		3.8		▨	
		4.1		▨ 7.0	
	7-8	17.8	CL	⁘ 8.0	(CL) SANDY CLAY, gray with cobbles and HC odor, firm, moist
		16.6	CH	▨	(CH) CLAY, gray with orange stains and HC odor, firm, moist
10		14.9		▨	
		7.2		▨	
		6.6		▨	
		3.3		▨	
		3.7		▨	
15		4.4		▨ 15.0	
		9.8	SP	⁘ 16.0	(SP) SAND, gray with HC odor, compact, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GOLDER

BORING NUMBER SB-217

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 1/29/20 **COMPLETED** 1/29/20
GROUND ELEVATION ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 728619.641 ft
DRILLING METHOD DPT
EASTING 3167196.466 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOI TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		2.9	GP		(GP) GRAVEL mixture
		2.1			
		3.2	CH	2.0	(CH) CLAY, gray with hydrocarbon (HC) odor, firm, wet
	3-4	3.4			
		1.8			
5		2.3			
		2.4			
		1.3			
	8-9	3.2	CH	8.0	(CH) Same as Above (SAA) at 8' but with orange stains and without HC odor, moist
		2.7			
10		2.4			
		2.5	CL	11.0	(CL) SANDY CLAY, gray, firm, moist
		2.3			
		2.2	CL	13.5	(CL) SAA at 13.5' but wet
15				16.0	

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GOLDER

BORING NUMBER SB-218

PAGE 1 OF 1

CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 12/19/19 **COMPLETED** 12/19/19

GROUND ELEVATION ft **BOREHOLE SIZE** 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727414.786 ft

DRILLING METHOD DPT

EASTING 3166647.798 ft

LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOILTYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A N/A		2.3	CONCRETE
	2-3	10.8		3.4	FILL CLAY with fine grain sand, gravel, black, iron staining, slight hydrocarbon (HC) odor- different from other boring locations
5		3.5 3.7	CL	5.5	(CL) CLAY with fine grain sand, dark gray, few iron concentrations and depletions, firm, dry
		3.6	CL	6.1	(CL) Same as Above (SAA) at 5.5' but more fine grain sand and lighter gray with depth, few CaCO3 nodules
		2.8 3.1	CL	8.5	(CL) SANDY CLAY with fine grain sand, light gray, more moisture with depth, CaCO3 nodules, soft, moist
10		4.4 3.5 4.1 2.5 1.4	CL	13.3	(CL) CLAY with fine grain sand, tan, iron-manganese nodules, orange mottling, hard, dry, thin layer of CaCO3 gravels at 11.3'
		4.0	CL	14.5	(CL) SANDY CLAY with fine grain sand, tan with iron staining, firm, moist
15	15-16	4.2 4.6	SC	15.9	(SC) CLAYEY SAND fine grain sand with clay, tan, silt, pockets of red clay and sand, iron staining, soft, moist
			SM	16.0	(SM) SILTY SAND, green-gray fine grain sand with silt, very soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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GOLDER

BORING NUMBER SB-219

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CLIENT Union Pacific Railroad

PROJECT NAME Houston, TX - Wood Preserving Works

PROJECT NUMBER 19119232

PROJECT LOCATION Houston, TX

DATE STARTED 2/3/20

COMPLETED 2/4/20

GROUND ELEVATION ft

BOREHOLE SIZE 2 inches

DRILLING CONTRACTOR Walker Hill Environmental

NORTHING 727520.281 ft

DRILLING METHOD DPT

EASTING 3167398.955 ft

LOGGED BY B Sokora

CHECKED BY M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG		MATERIAL DESCRIPTION
0		3.9		▩	0.8	FILL SAND
		12.3	CH	▨	2.0	(CH) CLAY, dark gray with cobbles, firm-soft, moist
	2-3	16.9	CH	▨	3.0	(CH) Same as Above (SAA) at 2' but dark gray-brown with hydrocarbon (HC) odor
		8.5 8.0	CH	▨	5.0	(CH) SAA at 3' but dark brown without HC odor
5		3.6 4.1	CH	▨	7.0	(CH) SAA at 5' but gray, firm
10	7-8	5.4 4.4 4.9 4.9 4.3 4.1 3.7	CH	▨	14.0	(CH) SAA at 7' but with red and black stains
15		3.7	CL	░	15.0	(CL) SANDY CLAY, gray with red and black stains, firm, wet
		N/A	SP	⁘	16.0	(SP) SAND, gray with red stains, compact, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER SB-220

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CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 2/3/20 **COMPLETED** 2/4/20
GROUND ELEVATION ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727527.364 ft
DRILLING METHOD DPT
EASTING 3167928.277 ft
LOGGED BY B Sokora **CHECKED BY** M Hermiston

DEPTH (ft) 0	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
		N/A		1.0	FILL SAND
		2.6	CH		(CH) CLAY, gray, firm-soft, moist
		3.0			
		3.0		3.5	(CL) SANDY CLAY, gray with brown mottling, firm-soft, moist
5	4-5	3.6	CL		
		3.4			
		5.2		7.0	
		3.1	CL		(CL) Same as Above (SAA) at 7' but firm-hard
	8-9	6.5		9.0	
10			SP	10.0	(SP) SAND, gray, unconsolidated, wet
			CL		(CL) SANDY CLAY, gray with tan mottling, firm-soft, moist
				12.0	

Bottom of borehole at 12.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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BORING NUMBER SB-221

PAGE 1 OF 1

CLIENT Union Pacific Railroad
PROJECT NAME Houston, TX - Wood Preserving Works
PROJECT NUMBER 19119232
PROJECT LOCATION Houston, TX
DATE STARTED 12/16/19 **COMPLETED** 12/16/19
GROUND ELEVATION ft **BOREHOLE SIZE** 2 inches
DRILLING CONTRACTOR Walker Hill Environmental
NORTHING 727717.173 ft
DRILLING METHOD DPT
EASTING 3168199.247 ft
LOGGED BY S Balke **CHECKED BY** M Hermiston

DEPTH (ft)	SAMPLE INTERVAL	PID (ppm)	SOIL TYPE	GRAPHIC LOG	MATERIAL DESCRIPTION
0		N/A N/A		▩ 2.0	CONCRETE
		0.3 0.3	CL	▨ 4.0	(CL) CLAY with fine-medium grain sand, dark gray, iron staining, concentrations, and depletions, lighter grey with depth, soft, moist
5	4-5	0.6 0.3 0.7	CL	▨ 7.0	(CL) Same as Above (SAA) at 4' but light gray, very little fine-medium grain sand, with CaCO3 nodules, Mn and iron staining and nodules, some dark grey mottling, firm, dry
		0.3	CL	▨ 8.5	(CL) SAA at 7' but with tan mottling
10	9-10	0.6 0.7	CL	▨ 10.2	(CL) SAA at 8.5' but more fine-medium grain sand with depth, red-brown mottling
		0.6 0.5	CL	▨ 12.5	(CL) SANDY CLAY with fine-medium grain sand, gray with dark gray mottling, iron concentrations, more sand with depth, very soft, wet
		N/A	SC	▨ 13.5	(SC) CLAYEY SAND, tan fine-medium grain sand with clay, with iron concentrations, soft, wet
15		N/A N/A N/A	SP	░ 16.0	(SP) SAND tan fine-medium grain sand with iron concentrations, soft, wet

Bottom of borehole at 16.0 feet.

REMARKS 0-5' was advanced using a hand auger. Coordinates and elevation are estimates.

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ATTACHMENT F

Data Usability Summary and Analytical Report – TPH Data

GHD

Memorandum

March 9, 2020
Revision: April 23, 2020

To: Eric Matzner   Ref. No.: 11183954-1620

CK

From: Chris G. Knight/eew/556-NF   Tel: 512-506-8803

CC: Jesse Orth, Jon Lang; Julie Lidstone

Subject: **Data Usability Summary**
TPH Assessment
Union Pacific Railroad (UPRR) / Houston TX-Wood Preserving Works
Houston, Texas
December 2019 – February 2020

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1. Scope of Data Usability Study

This document details a Data Usability Summary (DUS) of analytical results for soil samples collected in support of the TPH Assessment at the Union Pacific Railroad (UPRR) / Houston TX-Wood Preserving Works site during December 2019 – February 2020. Samples were submitted to ALS Environmental (ALS), located in Houston, Texas and are reported in data packages HS19120951, HS19121010, HS19121108, HS20011392, HS20011494, HS20020158, and HS20020239. The intended use of the data is to support the TPH Assessment at the site by providing current concentration of chemicals of concern.

Data were reviewed and validated by Chris G. Knight of GHD, in accordance with Title 30 of the Texas Administrative Code Section 350.54 (30 TAC 350.54) as described in the Texas Commission on Environmental Quality (TCEQ) Regulatory Guidance document entitled "Review and Reporting of COC Concentration Data under TRRP", (RG-366/TRRP-13), revised May 2010, herein referred to as "TRRP-13 Guidance". Evaluation of the data was based on information obtained from the chain of custody forms, the finished report forms, method blank data, recovery data from surrogate spikes/laboratory control samples (LCS)/matrix spikes (MS), the laboratory review checklists (LRC), and the laboratory exception reports (ER).

A sample collection and analysis summary is presented in Table 1. This summary provides a cross-reference of field sample identification numbers and location identification. Each sample is assigned a unique field identification number.

The validated sample results are presented in Table 2. A summary of the analytical methodology is presented in Table 3.

2. Laboratory Qualifications

The Laboratory's quality assurance program is consistent with the quality standards outlined in the National Environmental Laboratory Accreditation Program (NELAP). This laboratory was accredited under Texas Certification number # TX104704231 at the time the analysis was performed and the certificate is included in Attachment A.

i) With the exception of total petroleum hydrocarbons (TPH) by method TX1006, ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices, and methods associated with these laboratory data packages. Because TCEQ does not offer accreditation for these analytes, the results are flagged with "n" in the analytical reports. No further action was required.

3. Project Objectives

3.1 Sampling/Analytical QA/QC Objectives

The QA/QC program was designed to identify contamination resulting from the sampling, sample transport and analytical process through the analysis of method blanks. The QA/QC program was designed to evaluate the quality of the resulting data with respect to bias and precision through analysis of LCS and MS analyses.

4. Data Review/Validation Results

4.1 Sample Holding Time and Preservation

Samples were shipped with a chain of custody and the paper work was filled out properly with the following exceptions:

i) HS19120951– Select sample names were changed from the original chain of custody per client direction. No further action was required.

All samples were delivered on ice and stored by the laboratory at the required temperature (0-6°C).

The sample chain of custody documents and the analytical reports were used to determine sample holding times. All samples were prepared and analyzed within the required holding times.

4.2 Sample Containers

Sample containers used were certified pre-cleaned glass containers provided by the laboratory. These containers meet or exceed analyte specifications established in the United States Environmental Protection Agency (USEPA) *Specifications and Guidance for Contaminant-free Sample Containers*.

4.3 Calibrations

According to the LRC, initial calibration and continuing calibration data met the criteria for the selected method.

4.4 Laboratory Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures. As these were not discrete samples handled in the field, these blanks are not listed on the sample identification cross-reference list found in the data packages.

For this study, laboratory method blanks were analyzed at a minimum frequency of one per twenty investigative samples and/or one per analytical batch and results are reported in the laboratory data packages.

The method blank results were non-detect or below the method quantitation limit (MQL), indicating that laboratory contamination was not a factor for this investigation.

4.5 Internal Standard and Surrogate Spike Recoveries

Recoveries of internal standards are addressed in the LRC of the data packages. All internal standard recoveries associated with the compounds of interest were acceptable per the LRC.

In accordance with the methods employed, all samples, blanks, and QC samples analyzed for TPH determinations are spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of laboratory performance on individual sample matrices. The recovery ranges established by the laboratory are adopted as the acceptance criteria for the project. Each individual surrogate compound is expected to meet the laboratory control limits. According to the TRRP-13 Guidelines, one outlying surrogate is acceptable for methods with multiple surrogate spike compounds as long as the recovery is at least ten percent. Sample analyzed at elevated sample dilutions (five times or greater) were not assessed.

Surrogate recoveries were assessed against laboratory control limits and/or the guidance in TRRP-13. All surrogate recoveries met the above criteria.

4.6 Laboratory Control Sample Analysis

LCS/laboratory control sample duplicate (LCSD) are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects. The relative percent difference (RPD) of the LCS/LCSD recoveries is used to evaluate analytical precision. The recovery ranges established by the laboratory are adopted as the acceptance criteria for the project.

For this study, LCS/LCSD were analyzed at a minimum frequency of one per twenty investigative samples and/or one per analytical batch.

The LCS/LCSD contained all analytes specified in the methods. All LCS recoveries and/or RPDs were within the laboratory control limits, demonstrating acceptable analytical accuracy and precision.

4.7 Matrix Spike Analysis

To evaluate the effects of sample matrices on the preparation process, measurement procedures, and accuracy of a particular analysis, samples are spiked with known concentrations of the analytes of interest and analyzed as MS/matrix spike duplicate (MSD) samples. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as specified in Table 1. The recovery ranges established by the laboratory is adopted as the acceptance criteria for the project.

The MS/MSD samples were spiked with all analytes specified in the methods. All percent recoveries and the RPD value were within the laboratory control limits, demonstrating acceptable analytical accuracy and precision with the following exception:

i) One MS/MSD was reported with elevated recoveries and/or elevated RPDs for TPH determinations due to possible matrix interferences and were not assessed. No further action was required.

The laboratory also performed additional MS/MSD on non-site samples. These cannot be used to assess accuracy and precision for the site samples.

4.8 Field Procedures

Golder Associates, Inc. collected soil samples in accordance with their Standard Operating Procedures (SOP) for sample collection.

4.9 Analyte Reporting

The laboratory reported detected results for each analyte down to the sample detection limit (SDL), which is defined as the method detection limit (MDL) with sample-specific adjustments for dilutions, aliquot size, volumes, etc. Positive analyte detections less than the MQL but greater than the SDL were qualified as estimated (J) in Table 2.

The detectability check standard (DCS) results supported the laboratory MDLs.

All soil results were reported on a dry weight basis.

5. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are usable for the purpose of supporting the TPH Assessment at the site by providing current concentration of chemicals of concern in soil samples without qualification.

Table 1

Sample Collection and Analysis Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

Work Order	Sample Identification	Location	Matrix	Initial Sample Depth (ft bgs)	Final Sample Depth (ft bgs)	Collection Date (mm/dd/yyyy)	Collection Time (hr:min)	Analysis/Parameters		Comments
								TPH (TX1005)	TPH (TX1006)	
HS19120951	SO-1620-SB221(4-5)-20191216	SB-221	Soil	4	5	12/16/2019	10:55	X		
	SO-1620-SB221(9-10)-20191216	SB-221	Soil	9	10	12/16/2019	11:40	X		
	SO-1620-DPT5519(3-4)-20191216	DPT-55-19	Soil	3	4	12/16/2019	14:25	X		
	SO-1620-DPT5519(12.3-13.3)-20191216	DPT-55-19	Soil	12.3	13.3	12/16/2019	14:58	X		
	SO-1620-DPT3819(3-4)-20191216	DPT-38-19	Soil	3	4	12/16/2019	16:50	X	X	
	SO-1620-DPT3819(5-6)-20191216	DPT-38-19	Soil	5	6	12/16/2019	16:55	X	X	MS/MSD-P
HS19121010	SO-1620-DPT3919(2-3)-20191217	DPT-39-19	Soil	2	3	12/17/2019	12:10	X	X	
	SO-1620-DPT3919(7-8)-20191217	DPT-39-19	Soil	7	8	12/17/2019	12:15	X		
	SO-1620-DPT4219(4-5)-20191217	DPT-42-19	Soil	4	5	12/17/2019	15:05	X	X	
	SO-1620-DPT4219(7-8)-20191217	DPT-42-19	Soil	7	8	12/17/2019	15:10	X	X	
HS19121108	SO-1620-DPT4019(1.25-2)-20191	DPT-40-19	Soil	1.25	2	12/18/2019	10:05	X		
	SO-1620-DPT4019(7-8)-20191218	DPT-40-19	Soil	7	8	12/18/2019	11:45	X		
	SO-1620-DPT3419(4-5)-20191218	DPT-34-19	Soil	4	5	12/18/2019	13:45	X	X	
	SO-1620-DPT3419(5-6)-20191218	DPT-34-19	Soil	5	6	12/18/2019	15:10	X		
	SO-1620-SB218(2.25-3)-20191219	SB-218	Soil	2.25	3	12/19/2019	10:15	X		
	SO-1620-SB218((15-16)-20191219	SB-218	Soil	15	16	12/19/2019	11:25	X		
	SO-1620-DPT3519(4-5)-20191219	DPT-35-19	Soil	4	5	12/19/2019	13:45	X	X	MS/MSD-P
	SO-1620-DPT3519(6-7)-20191219	DPT-35-19	Soil	6	7	12/19/2019	15:50	X		

Table 1

Sample Collection and Analysis Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

Work Order	Sample Identification	Location	Matrix	Initial Sample Depth (ft bgs)	Final Sample Depth (ft bgs)	Collection Date (mm/dd/yyyy)	Collection Time (hr:min)	Analysis/Parameters		Comments
								TPH (TX1005)	TPH (TX1006)	
HS20011392	SO-1620-CPT2620(2-3)-20200128	DPT-26-20	Soil	2	3	01/28/2020	16:35	X	X	
	SO-1620-CPT2620(13-14)-202001	DPT-26-20	Soil	13	14	01/29/2020	11:35	X		
	SO-1620-CPT2420(4-5)-20200129	DPT-24-20	Soil	4	5	01/29/2020	11:40	X		
	SO-1620-CPT2420(8-9)-20200129	DPT-24-20	Soil	8	9	01/29/2020	11:45	X		
	SO-1620-SB216(3-4)-20200129	SB-216	Soil	3	4	01/29/2020	14:40	X		
	SO-1620-SB216(7-8)-20200129	SB-216	Soil	7	8	01/29/2020	14:45	X		
	SO-1620-SB217(3-4)-20200129	SB-217	Soil	3	4	01/29/2020	16:30	X		
	SO-1620-SB217(8-9)-20200129	SB-217	Soil	8	9	01/29/2020	16:35	X		
HS20011494	SO-1620-CPT1220(4-5)-20200130	DPT-12-20	Soil	4	5	01/30/2020	10:35	X		
	SO-1620-CPT1220(8-9)-20200130	DPT-12-20	Soil	8	9	01/30/2020	10:40	X	X	
	SO-1620-CPT1620(4-5)-20200130	DPT-16-20	Soil	4	5	01/30/2020	13:05	X		
	SO-1620-CPT1620(14-15)-202001	DPT-16-20	Soil	14	15	01/30/2020	13:10	X		
	SO-1620-CPT2120(3-4)-20200130	DPT-21-20	Soil	3	4	01/30/2020	13:20	X	X	
	SO-1620-CPT2120(5-6)-20200130	DPT-21-20	Soil	5	6	01/30/2020	15:25	X		
	SO-1620-CPT4619(2-3)-20200130	DPT-46-19	Soil	2	3	01/30/2020	16:40	X		
	SO-1620-CPT4619(9-10)-20200131	DPT-46-19	Soil	9	10	01/31/2020	09:10	X		
HS20020158	SO-1620-SB22019(4-5)-20200203	SB-220	Soil	4	5	02/03/2020	16:55	X		
	SO-1620-SB21919(2-3)-20200203	SB-219	Soil	2	3	02/03/2020	17:15	X		
	SO-1620-CPT3019(4-5)-20200203	DPT-30-19	Soil	4	5	02/03/2020	17:20	X	X	
	SO-1620-CPT37(7-8)-20200204	DPT-37-19	Soil	7	8	02/04/2020	10:45	X		
	SO-1620-CPT3219(2-3)-20200204	DPT-32-19	Soil	2	3	02/04/2020	13:50	X	X	
	SO-1620-CPT3219(11-12)-202002	DPT-32-19	Soil	11	12	02/04/2020	13:55	X		

Table 1

Sample Collection and Analysis Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

								Analysis/Parameters		
Work Order	**Sample Identification**	**Location**	**Matrix**	**Initial Sample Depth (ft bgs)**	**Final Sample Depth (ft bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**TPH (TX1005)**	**TPH (TX1006)**	**Comments**
HS20020158	SO-1620-SB220(8-9)-20200204	SB-220	Soil	8	9	02/04/2020	14:10	X		
	SO-1620-SB219(7-8)-20200204	SB-219	Soil	7	8	02/04/2020	15:10	X		
HS20020239	SO-1620-CPT4319(2-3)-20200204	DPT-43-19	Soil	2	3	02/04/2020	17:00	X		
	SO-1620-CPT4319(12-13)-202002	DPT-43-19	Soil	12	13	02/04/2020	17:05	X		
	SO-1620-CPT3019(13-14)-202002	DPT-30-19	Soil	13	14	02/05/2020	10:00	X		
	SO-1620-CPT3619(3-4)-20200205	DPT-36-19	Soil	3	4	02/05/2020	11:35	X		
	SO-1620-CPT3619(5-6)-20200205	DPT-36-19	Soil	5	6	02/05/2020	11:45	X	X	
	SO-1620-CPT2819(7-8)-20200205	DPT-28-19	Soil	7	8	02/05/2020	13:50	X		
	SO-1620-CPT2919(4-5)-20200205	DPT-29-19	Soil	4	5	02/05/2020	16:25	X	X	
	SO-1620-CPT2919(9-10)-20200205	DPT-29-19	Soil	9	10	02/05/2020	16:35	X		
	SO-1620-CPT4519(1-2)-20200205	DPT-45-19	Soil	1	2	02/05/2020	16:45	X		
	SO-1620-CPT4519(8-9)-20200205	DPT-45-19	Soil	8	9	02/05/2020	16:50	X		
	SO-1620-CPT4119(1-2)-20200206	DPT-41-19	Soil	1	2	02/06/2020	10:15	X		
	SO-1620-CPT4119(5-6)-20200206	DPT-41-19	Soil	5	6	02/06/2020	10:20	X		
	SO-1620-CPT2819(4-5)-20200206	DPT-28-19	Soil	4	5	02/06/2020	10:40	X		
	SO-1620-CPT3719(4-5)-20200206	DPT-37-19	Soil	4	5	02/06/2020	11:55	X		

Notes:

ft bgs	- Feet Below Ground Surface
TPH	- Total Petroleum Hydrocarbons
MS/MSD-P	- Matrix Spike/ Matrix Spike Duplicate (partial parameters)

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

Location ID:		DPT-12-20	DPT-12-20	DPT-16-20	DPT-16-20
Sample Name:		SO-1620-CPT1220(4-5)-20200130	SO-1620-CPT1220(8-9)-20200130	SO-1620-CPT1620(4-5)-20200130	SO-1620-CPT1620(14-15)-202001
Sample Date:		01/30/2020	01/30/2020	01/30/2020	01/30/2020
Depth:		4-5 ft bgs	8-9 ft bgs	4-5 ft bgs	14-15 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	3.2	--	--
Aromatics relative % distribution	%	--	97	--	--
Total Petroleum Hydrocarbons	mg/kg	2710	8070	1160	4520
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	1100	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	110	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	2000	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	2300	6500	860	3100
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	58 J	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	2600	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	52 J	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	990	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	120 J	270 J	28 J	120 J
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	6900	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	<52	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	290	1300	270	1300
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	220	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	6690	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-21-20	DPT-21-20	DPT-24-20	DPT-24-20
	Sample Name:	SO-1620-CPT2120(3-4)-20200130	SO-1620-CPT2120(5-6)-20200130	SO-1620-CPT2420(4-5)-20200129	SO-1620-CPT2420(8-9)-20200129
	Sample Date:	01/30/2020	01/30/2020	01/29/2020	01/29/2020
	Depth:	3-4 ft bgs	5-6 ft bgs	4-5 ft bgs	8-9 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	4.7	--	--	--
Aromatics relative % distribution	%	95	--	--	--
Total Petroleum Hydrocarbons	mg/kg	4200	180	<7.6	<7.0
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	38 J	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	440	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	36 J	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	710	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	2800	110	<10	<9.2
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	27 J	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	1100	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	<26	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	390	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	97 J	22 J	<10	<9.2
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	3300	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<26	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<26	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	53	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	470	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<26	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	1300	48	<7.6	<7.0
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	154	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	3110	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

Location ID:		DPT-26-20	DPT-26-20	DPT-28-19	DPT-28-19
Sample Name:		**SO-1620-CPT2620(2-3)-20200128**	**SO-1620-CPT2620(13-14)-202001**	**SO-1620-CPT2819(7-8)-20200205**	**SO-1620-CPT2819(4-5)-20200206**
Sample Date:		**01/28/2020**	**01/29/2020**	**02/05/2020**	**02/06/2020**
Depth:		**2-3 ft bgs**	**13-14 ft bgs**	**7-8 ft bgs**	**4-5 ft bgs**
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	0	--	--	--
Aromatics relative % distribution	%	100	--	--	--
Total Petroleum Hydrocarbons	mg/kg	3910	14.0 J	72.0	<7.5
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	76	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	1400	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	3300	14 J	31 J	<9.8
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	1700	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	550	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	440	<11	41 J	<9.8
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	3700	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	170 J	<8.2	<7.6	<7.5
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	<33	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	3730	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-29-19	DPT-29-19	DPT-30-19	DPT-30-19
	Sample Name:	SO-1620-CPT2919(4-5)-20200205	SO-1620-CPT2919(9-10)-20200205	SO-1620-CPT3019(4-5)-20200203	SO-1620-CPT3019(13-14)-202002
	Sample Date:	02/05/2020	02/05/2020	02/03/2020	02/05/2020
	Depth:	4-5 ft bgs	9-10 ft bgs	4-5 ft bgs	13-14 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	7.8	--	28	--
Aromatics relative % distribution	%	92	--	72	--
Total Petroleum Hydrocarbons	mg/kg	4220	1530	12500	4720
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	<26	--	<80	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	420	--	150 J	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	<26	--	200	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	1100	--	590	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	2600	1100	9300	3400
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	<26	--	520	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	330	--	1800	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	220	--	1100	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	760	--	2000	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	970	200 J	3000	510
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	2800	--	6300	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<26	--	<80	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<26	--	<80	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	<26	--	<80	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	30 J	--	<80	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<26	--	<80	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	650	230 J	220 J	810
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	220	--	1820	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	2640	--	4540	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-32-19	DPT-32-19	DPT-34-19	DPT-34-19
	Sample Name:	SO-1620-CPT3219(2-3)-20200204	SO-1620-CPT3219(11-12)-202002	SO-1620-DPT3419(4-5)-20191218	SO-1620-DPT3419(5-6)-20191218
	Sample Date:	02/04/2020	02/04/2020	12/18/2019	12/18/2019
	Depth:	2-3 ft bgs	11-12 ft bgs	4-5 ft bgs	5-6 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	7.4	--	42	--
Aromatics relative % distribution	%	93	--	58	--
Total Petroleum Hydrocarbons	mg/kg	11800	7440	19500	5000
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	1200	--	<300	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	280	--	<300	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	2700	--	<300	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	8700	5600	15000	3800
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	260	--	640	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	4100	--	1600	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	340	--	1900	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	3100	--	1800	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	1800	950	4500	1200
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	12000	--	5900	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<110	--	<300	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	1300	890	<450	<82
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	880	--	2540	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	11100	--	3400	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	**DPT-35-19**	**DPT-35-19**	**DPT-36-19**	**DPT-36-19**
	Sample Name:	**SO-1620-DPT3519(4-5)-20191219**	**SO-1620-DPT3519(6-7)-20191219**	**SO-1620-CPT3619(3-4)-20200205**	**SO-1620-CPT3619(5-6)-20200205**
	Sample Date:	**12/19/2019**	**12/19/2019**	**02/05/2020**	**02/05/2020**
	Depth:	**4-5 ft bgs**	**6-7 ft bgs**	**3-4 ft bgs**	**5-6 ft bgs**
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	27	--	--	33
Aromatics relative % distribution	%	73	--	--	67
Total Petroleum Hydrocarbons	mg/kg	16800	1570	8840	11900
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	470	--	--	<48
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	300	--	--	480
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	810	--	--	460
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	13000	1200	7100	9100
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	600	--	--	830
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	2200	--	--	1300
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	1200	--	--	770
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	2200	--	--	2400
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	2900	170 J	1600	2700
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	7800	--	--	6300
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<79	--	--	<48
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	900	200 J	140 J	130 J
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	2100	--	--	2080
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	5680	--	--	4160

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-37-19	DPT-37-19	DPT-38-19	DPT-38-19
	Sample Name:	SO-1620-CPT37(7-8)-20200204	SO-1620-CPT3719(4-5)-20200206	SO-1620-DPT3819(3-4)-20191216	SO-1620-DPT3819(5-6)-20191216
	Sample Date:	02/04/2020	02/06/2020	12/16/2019	12/16/2019
	Depth:	7-8 ft bgs	4-5 ft bgs	3-4 ft bgs	5-6 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	35	34
Aromatics relative % distribution	%	--	--	65	66
Total Petroleum Hydrocarbons	mg/kg	2340	12000	14500	7800
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	210	<60
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	1400	390
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	<62	<60
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	320	370
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	1800	9600	6400	4700
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	220	250
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	770	700
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	880	540
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	700	440
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	270	1500	3100	1700
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	5600	3100
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	<62	<60
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	<62	<60
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	630	260
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	490	120
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	<62	<60
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	270	880 J	5000	1400
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	1940	1050
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	3680	2020

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

Location ID:		**DPT-39-19**	**DPT-39-19**	**DPT-40-19**	**DPT-40-19**
Sample Name:		**SO-1620-DPT3919(2-3)-20191217**	**SO-1620-DPT3919(7-8)-20191217**	**SO-1620-DPT4019(1.25-2)-20191**	**SO-1620-DPT4019(7-8)-20191218**
Sample Date:		**12/17/2019**	**12/17/2019**	**12/18/2019**	**12/18/2019**
Depth:		**2-3 ft bgs**	**7-8 ft bgs**	**1.25-2 ft bgs**	**7-8 ft bgs**
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	50	--	--	--
Aromatics relative % distribution	%	50	--	--	--
Total Petroleum Hydrocarbons	mg/kg	960	<7.6	7970	58.0
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	13	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	22	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	600	<10	6500	35 J
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	140	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	140	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	680	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	680	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	360	<10	1300	23 J
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	1700	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	<5.0	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	<7.4	<7.6	170 J	<7.0
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	833	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	842	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	**DPT-41-19**	**DPT-41-19**	**DPT-42-19**	**DPT-42-19**
	Sample Name:	**SO-1620-CPT4119(1-2)-20200206**	**SO-1620-CPT4119(5-6)-20200206**	**SO-1620-DPT4219(4-5)-20191217**	**SO-1620-DPT4219(7-8)-20191217**
	Sample Date:	**02/06/2020**	**02/06/2020**	**12/17/2019**	**12/17/2019**
	Depth:	**1-2 ft bgs**	**5-6 ft bgs**	**4-5 ft bgs**	**7-8 ft bgs**
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	38	70
Aromatics relative % distribution	%	--	--	62	30
Total Petroleum Hydrocarbons	mg/kg	308	<6.4	18200	1310
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	2600	580
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	1900	<51
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	130	<8.4	15000	960
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	2400	190
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	4500	<51
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	4000	320
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	8400	460
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	170	<8.4	3200	210 J
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	24000	1500
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	<78	<51
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	8.1 J	<6.4	<120	140 J
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	9000	1090
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	14800	460

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-43-19	DPT-43-19	DPT-45-19	DPT-45-19
	Sample Name:	SO-1620-CPT4319(2-3)-20200204	SO-1620-CPT4319(12-13)-202002	SO-1620-CPT4519(1-2)-20200205	SO-1620-CPT4519(8-9)-20200205
	Sample Date:	02/04/2020	02/04/2020	02/05/2020	02/05/2020
	Depth:	2-3 ft bgs	12-13 ft bgs	1-2 ft bgs	8-9 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	--	--
Aromatics relative % distribution	%	--	--	--	--
Total Petroleum Hydrocarbons	mg/kg	987	<7.6	428	<6.4
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	430	<10	170	<8.4
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	550	<10	250	<8.4
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	7.0 J	<7.6	8.5 J	<6.4
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	DPT-46-19	DPT-46-19	DPT-55-19	DPT-55-19
	Sample Name:	SO-1620-CPT4619(2-3)-20200130	SO-1620-CPT4619(9-10)-20200131	SO-1620-DPT5519(3-4)-20191216	SO-1620-DPT5519(12.3-13.3)-20191216
	Sample Date:	01/30/2020	01/31/2020	12/16/2019	12/16/2019
	Depth:	2-3 ft bgs	9-10 ft bgs	3-4 ft bgs	12.3-13.3 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	--	--
Aromatics relative % distribution	%	--	--	--	--
Total Petroleum Hydrocarbons	mg/kg	<6.5	<6.4	<8.6	<9.4
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	<8.5	<8.4	<11	<12
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	<8.5	<8.4	<11	<12
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	<6.5	<6.4	<8.6	<9.4
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	SB-216	SB-216	SB-217	SB-217
	Sample Name:	SO-1620-SB216(3-4)-20200129	SO-1620-SB216(7-8)-20200129	SO-1620-SB217(3-4)-20200129	SO-1620-SB217(8-9)-20200129
	Sample Date:	01/29/2020	01/29/2020	01/29/2020	01/29/2020
	Depth:	3-4 ft bgs	7-8 ft bgs	3-4 ft bgs	8-9 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	--	--
Aromatics relative % distribution	%	--	--	--	--
Total Petroleum Hydrocarbons	mg/kg	<8.5	387	<8.7	<7.7
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	<11	360	<12	<10
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	<11	<9.7	<12	<10
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	<8.5	27 J	<8.7	<7.7
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	**SB-218**	**SB-218**	**SB-219**	**SB-219**
	Sample Name:	**SO-1620-SB218(2.25-3)-20191219**	**SO-1620-SB218((15-16)-20191219**	**SO-1620-SB21919(2-3)-20200203**	**SO-1620-SB219(7-8)-20200204**
	Sample Date:	**12/19/2019**	**12/19/2019**	**02/03/2020**	**02/04/2020**
	Depth:	**2.25-3 ft bgs**	**15-16 ft bgs**	**2-3 ft bgs**	**7-8 ft bgs**
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	--	--
Aromatics relative % distribution	%	--	--	--	--
Total Petroleum Hydrocarbons	mg/kg	280	<6.7	2380	<6.6
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	150	<8.8	1400	<8.7
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	130	<8.8	980	<8.7
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	<6.9	<6.7	<79	<6.6
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	--	--

Table 2

Analytical Results Summary
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

	Location ID:	SB-220	SB-220	SB-221	SB-221
	Sample Name:	SO-1620-SB22019(4-5)-20200203	SO-1620-SB220(8-9)-20200204	SO-1620-SB221(4-5)-20191216	SO-1620-SB221(9-10)-20191216
	Sample Date:	02/03/2020	02/04/2020	12/16/2019	12/16/2019
	Depth:	4-5 ft bgs	8-9 ft bgs	4-5 ft bgs	9-10 ft bgs
Parameters	**Unit**				
Total Petroleum Hydrocarbons					
Aliphatics relative % distribution	%	--	--	--	--
Aromatics relative % distribution	%	--	--	--	--
Total Petroleum Hydrocarbons	mg/kg	<7.0	19.0 J	<8.5	<8.2
Total Petroleum Hydrocarbons (>C10-C12) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C10-C12) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C16) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C12-C28)	mg/kg	<9.2	19 J	<11	<11
Total Petroleum Hydrocarbons (>C16-C21) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C16-C21) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C21-C35) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C28-C35)	mg/kg	<9.2	<10	<11	<11
Total Petroleum Hydrocarbons (>C6-C35) Aliphatics & Aromatics	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C6-C8) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C7-C8) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (>C8-C10) Aromatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6) Aliphatic	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons (C6-C12)	mg/kg	<7.0	<7.8	<8.5	<8.2
Total Petroleum Hydrocarbons Aliphatic Fraction	mg/kg	--	--	--	--
Total Petroleum Hydrocarbons Aromatic Fraction	mg/kg	--	--	--	--

Notes:

ft bgs - Feet below ground surface
< - Not detected at the associated reporting limit
J - Estimated concentration
"--" - Not applicable

Table 3

Analytical Methods
TPH Assessment
Union Pacific Railroad (UPRR)/Houston, TX-Wood Preserving Works
Houston, Texas
December 2019 - February 2020

			Holding Time	
Parameter	**Method**	**Matrix**	**Collection to Extraction (Days)**	**Extraction to Analysis (Days)**
TPH (TX1005)	TX1005	Soil	14	40
TPH (TX1006)	TX1006	Soil	14	40

Notes:

TPH - Total Petroleum Hydrocarbons

Attachment A
Laboratory NELAP Certificate

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: **T104704231-19-23**

Expiration Date: **4/30/2020**

Issue Date: **5/1/2019**

ALS Laboratory Group, Environmental Services Division (Houston, Texas)

10450 Stancliff Road, Suite 210
Houston, TX 77099-4338

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Drinking Water***

Method EPA 1613

Analyte	AB	Analyte ID	Method ID
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	TX	9618	10120408

Method EPA 200.8

Analyte	AB	Analyte ID	Method ID
Copper	TX	1055	10014605
Lead	TX	1075	10014605

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

		Certificate:	**T104704231-19-23**
ALS Laboratory Group, Environmental Services Division (Houston, Texas)		**Expiration Date:**	**4/30/2020**
10450 Stancliff Road, Suite 210 **Houston, TX 77099-4338**		**Issue Date:**	**5/1/2019**

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Non-Potable Water***

Method EPA 1010

Analyte	**AB**	**Analyte ID**	**Method ID**
Ignitability	TX	1780	10116606

Method EPA 120.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Conductivity	TX	1610	10006403

Method EPA 1311

Analyte	**AB**	**Analyte ID**	**Method ID**
TCLP	TX	849	10118806

Method EPA 1312

Analyte	**AB**	**Analyte ID**	**Method ID**
SPLP	TX	850	10119003

Method EPA 160.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Residue-volatile	TX	1970	10010409

Method EPA 1613

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	TX	9516	10120408
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	TX	9519	10120408
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	TX	9420	10120408
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	TX	9426	10120408
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	TX	9423	10120408
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	TX	9471	10120408
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	TX	9453	10120408
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-HxCDF)	TX	9474	10120408
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-HxCDD)	TX	9456	10120408
1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-HxCDF)	TX	9477	10120408
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	TX	9459	10120408
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	TX	9543	10120408
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	TX	9540	10120408
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	TX	9480	10120408

Certificate: T104704231-19-23

Expiration Date: 4/30/2020

Issue Date: 5/1/2019

ALS Laboratory Group, Environmental Services Division (Houston, Texas)

10450 Stancliff Road, Suite 210
Houston, TX 77099-4338

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Non-Potable Water***

2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF	TX	9549	10120408
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	TX	9612	10120408
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	TX	9618	10120408
Total Heptachlorodibenzofuran (Total HpCDF)	TX	9444	10120408
Total Heptachlorodibenzo-p-dioxin (Total HpCDD)	TX	9438	10120408
Total Hexachlorodibenzofuran (Total HxCDF)	TX	9483	10120408
Total Hexachlorodibenzo-p-dioxin (Total HxCDD)	TX	9468	10120408
Total Pentachlorodibenzofuran (Total PeCDF)	TX	9552	10120408
Total Pentachlorodibenzo-p-dioxin (Total PeCDD)	TX	9555	10120408
Total Tetrachlorodibenzofuran (Total TCDF)	TX	9615	10120408
Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	TX	9609	10120408

Method EPA 1664

Analyte	**AB**	**Analyte ID**	**Method ID**
n-Hexane Extractable Material (HEM) (O&G)	TX	1803	10127807

Method EPA 180.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Turbidity	TX	2055	10011606

Method EPA 200.8

Analyte	**AB**	**Analyte ID**	**Method ID**
Aluminum	TX	1000	10014605
Antimony	TX	1005	10014605
Arsenic	TX	1010	10014605
Barium	TX	1015	10014605
Beryllium	TX	1020	10014605
Boron	TX	1025	10014605
Cadmium	TX	1030	10014605
Calcium	TX	1035	10014605
Chromium	TX	1040	10014605
Cobalt	TX	1050	10014605
Copper	TX	1055	10014605
Iron	TX	1070	10014605

Matrix: ***Non-Potable Water***

Lead	TX	1075	10014605
Magnesium	TX	1085	10014605
Manganese	TX	1090	10014605
Molybdenum	TX	1100	10014605
Nickel	TX	1105	10014605
Potassium	TX	1125	10014605
Selenium	TX	1140	10014605
Silver	TX	1150	10014605
Sodium	TX	1155	10014605
Strontium	TX	1160	10014605
Thallium	TX	1165	10014605
Tin	TX	1175	10014605
Titanium	TX	1180	10014605
Uranium	TX	3035	10014605
Vanadium	TX	1185	10014605
Zinc	TX	1190	10014605

Method EPA 245.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Mercury	TX	1095	10036609

Method EPA 300.0

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10053200
Chloride	TX	1575	10053200
Fluoride	TX	1730	10053200
Nitrate as N	TX	1810	10053200
Nitrate-nitrite	TX	1820	10053200
Nitrite as N	TX	1840	10053200
Orthophosphate as P	TX	1870	10053200
Sulfate	TX	2000	10053200

Method EPA 325.1

Analyte	**AB**	**Analyte ID**	**Method ID**

Matrix: ***Non-Potable Water***

Chloride	TX	1575	10056801

Method EPA 335.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10060001

Method EPA 335.2

Analyte	**AB**	**Analyte ID**	**Method ID**
Total cyanide	TX	1645	10278203

Method EPA 335.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Total cyanide	TX	1645	10061402

Method EPA 350.3

Analyte	**AB**	**Analyte ID**	**Method ID**
Ammonia as N	TX	1515	10064401

Method EPA 365.3

Analyte	**AB**	**Analyte ID**	**Method ID**
Orthophosphate as P	TX	1870	10070801
Phosphorus	TX	1910	10070801

Method EPA 375.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfate	TX	2000	10073800

Method EPA 376.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfide	TX	2005	10074201

Method EPA 410.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Chemical oxygen demand (COD)	TX	1565	10077404

Method EPA 415.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Total Organic Carbon (TOC)	TX	2040	10078407

Method EPA 420.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10079400

Certificate: **T104704231-19-23**

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Issue Date: **5/1/2019**

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Matrix: ***Non-Potable Water***

Method EPA 420.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10080203

Method EPA 6020

Analyte	**AB**	**Analyte ID**	**Method ID**
Aluminum	TX	1000	10156419
Antimony	TX	1005	10156419
Arsenic	TX	1010	10156419
Barium	TX	1015	10156419
Beryllium	TX	1020	10156419
Boron	TX	1025	10156419
Cadmium	TX	1030	10156419
Calcium	TX	1035	10156419
Chromium	TX	1040	10156419
Cobalt	TX	1050	10156419
Copper	TX	1055	10156419
Iron	TX	1070	10156419
Lead	TX	1075	10156419
Lithium	TX	1080	10156419
Magnesium	TX	1085	10156419
Manganese	TX	1090	10156419
Molybdenum	TX	1100	10156419
Nickel	TX	1105	10156419
Potassium	TX	1125	10156419
Selenium	TX	1140	10156419
Silver	TX	1150	10156419
Sodium	TX	1155	10156419
Strontium	TX	1160	10156419
Thallium	TX	1165	10156419
Tin	TX	1175	10156419
Titanium	TX	1180	10156419

Vanadium	TX	1185	10156419
Zinc	TX	1190	10156419

Method EPA 608

Analyte	**AB**	**Analyte ID**	**Method ID**
4,4'-DDD	TX	7355	10103603
4,4'-DDE	TX	7360	10103603
4,4'-DDT	TX	7365	10103603
Aldrin	TX	7025	10103603
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10103603
alpha-Chlordane	TX	7240	10103603
Aroclor-1016 (PCB-1016)	TX	8880	10103603
Aroclor-1221 (PCB-1221)	TX	8885	10103603
Aroclor-1232 (PCB-1232)	TX	8890	10103603
Aroclor-1242 (PCB-1242)	TX	8895	10103603
Aroclor-1248 (PCB-1248)	TX	8900	10103603
Aroclor-1254 (PCB-1254)	TX	8905	10103603
Aroclor-1260 (PCB-1260)	TX	8910	10103603
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10103603
Chlordane (tech.)	TX	7250	10103603
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10103603
Dieldrin	TX	7470	10103603
Endosulfan I	TX	7510	10103603
Endosulfan II	TX	7515	10103603
Endosulfan sulfate	TX	7520	10103603
Endrin	TX	7540	10103603
Endrin aldehyde	TX	7530	10103603
Endrin ketone	TX	7535	10103603
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10103603
gamma-Chlordane	TX	7245	10103603
Heptachlor	TX	7685	10103603

Matrix: ***Non-Potable Water***

Heptachlor epoxide	TX	7690	10103603
Methoxychlor	TX	7810	10103603
Toxaphene (Chlorinated camphene)	TX	8250	10103603

Method EPA 624

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1-Trichloroethane	TX	5160	10107207
1,1,2,2-Tetrachloroethane	TX	5110	10107207
1,1,2-Trichloroethane	TX	5165	10107207
1,1-Dichloroethane	TX	4630	10107207
1,1-Dichloroethylene	TX	4640	10107207
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10107207
1,2-Dichlorobenzene	TX	4610	10107207
1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10107207
1,2-Dichloropropane	TX	4655	10107207
1,3-Dichlorobenzene	TX	4615	10107207
1,4-Dichlorobenzene	TX	4620	10107207
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10107207
2-Chloroethyl vinyl ether	TX	4500	10107207
Acetone (2-Propanone)	TX	4315	10107207
Acrolein (Propenal)	TX	4325	10107207
Acrylonitrile	TX	4340	10107207
Benzene	TX	4375	10107207
Bromodichloromethane	TX	4395	10107207
Bromoform	TX	4400	10107207
Carbon tetrachloride	TX	4455	10107207
Chlorobenzene	TX	4475	10107207
Chlorodibromomethane	TX	4575	10107207
Chloroethane (Ethyl chloride)	TX	4485	10107207
Chloroform	TX	4505	10107207
cis-1,2-Dichloroethylene	TX	4645	10107207

Matrix: ***Non-Potable Water***

cis-1,3-Dichloropropene	TX	4680	10107207
Ethylbenzene	TX	4765	10107207
m+p-xylene	TX	5240	10107207
Methyl bromide (Bromomethane)	TX	4950	10107207
Methyl chloride (Chloromethane)	TX	4960	10107207
Methyl tert-butyl ether (MTBE)	TX	5000	10107207
Methylene chloride (Dichloromethane)	TX	4975	10107207
Naphthalene	TX	5005	10107207
o-Xylene	TX	5250	10107207
Tetrachloroethylene (Perchloroethylene)	TX	5115	10107207
Toluene	TX	5140	10107207
trans-1,2-Dichloroethylene	TX	4700	10107207
trans-1,3-Dichloropropylene	TX	4685	10107207
Trichloroethene (Trichloroethylene)	TX	5170	10107207
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10107207
Vinyl chloride	TX	5235	10107207
Xylene (total)	TX	5260	10107207

Method EPA 625

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,4,5-Tetrachlorobenzene	TX	6715	10107401
1,2,4-Trichlorobenzene	TX	5155	10107401
1,2-Dichlorobenzene	TX	4610	10107401
1,2-Diphenylhydrazine	TX	6220	10107401
1,3-Dichlorobenzene	TX	4615	10107401
1,4-Dichlorobenzene	TX	4620	10107401
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10107401
2,4,5-Trichlorophenol	TX	6835	10107401
2,4,6-Trichlorophenol	TX	6840	10107401
2,4-Dichlorophenol	TX	6000	10107401
2,4-Dimethylphenol	TX	6130	10107401

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ALS Laboratory Group, Environmental Services Division (Houston, Texas)

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Matrix: ***Non-Potable Water***

2,4-Dinitrophenol	TX	6175	10107401
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10107401
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10107401
2-Chloronaphthalene	TX	5795	10107401
2-Chlorophenol	TX	5800	10107401
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10107401
2-Methylphenol (o-Cresol)	TX	6400	10107401
2-Nitrophenol	TX	6490	10107401
3,3'-Dichlorobenzidine	TX	5945	10107401
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10107401
4-Chloro-3-methylphenol	TX	5700	10107401
4-Chlorophenyl phenylether	TX	5825	10107401
4-Methylphenol (p-Cresol)	TX	6410	10107401
4-Nitrophenol	TX	6500	10107401
Acenaphthene	TX	5500	10107401
Acenaphthylene	TX	5505	10107401
Anthracene	TX	5555	10107401
Benzidine	TX	5595	10107401
Benzo(a)anthracene	TX	5575	10107401
Benzo(a)pyrene	TX	5580	10107401
Benzo(b)fluoranthene	TX	5585	10107401
Benzo(g,h,i)perylene	TX	5590	10107401
Benzo(k)fluoranthene	TX	5600	10107401
bis(2-Chloroethoxy)methane	TX	5760	10107401
bis(2-Chloroethyl) ether	TX	5765	10107401
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10107401
Butyl benzyl phthalate	TX	5670	10107401
Chrysene	TX	5855	10107401
Dibenz(a,h) anthracene	TX	5895	10107401
Diethyl phthalate	TX	6070	10107401

Matrix: ***Non-Potable Water***

Dimethyl phthalate	TX	6135	10107401
Di-n-butyl phthalate	TX	5925	10107401
Di-n-octyl phthalate	TX	6200	10107401
Fluoranthene	TX	6265	10107401
Fluorene	TX	6270	10107401
Hexachlorobenzene	TX	6275	10107401
Hexachlorobutadiene	TX	4835	10107401
Hexachlorocyclopentadiene	TX	6285	10107401
Hexachloroethane	TX	4840	10107401
Indeno(1,2,3-cd) pyrene	TX	6315	10107401
Isophorone	TX	6320	10107401
Naphthalene	TX	5005	10107401
Nitrobenzene	TX	5015	10107401
n-Nitrosodiethylamine	TX	6525	10107401
n-Nitrosodimethylamine	TX	6530	10107401
n-Nitrosodi-n-butylamine	TX	5025	10107401
n-Nitrosodi-n-propylamine	TX	6545	10107401
n-Nitrosodiphenylamine	TX	6535	10107401
Pentachlorobenzene	TX	6590	10107401
Pentachlorophenol	TX	6605	10107401
Phenanthrene	TX	6615	10107401
Phenol	TX	6625	10107401
Pyrene	TX	6665	10107401
Pyridine	TX	5095	10107401

Method EPA 7196

Analyte	**AB**	**Analyte ID**	**Method ID**
Chromium (VI)	TX	1045	10162206

Method EPA 7470

Analyte	**AB**	**Analyte ID**	**Method ID**
Mercury	TX	1095	10165603

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

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Matrix: ***Non-Potable Water***

Method EPA 8011

Analyte	AB	Analyte ID	Method ID
1,2,3-Trichloropropane	TX	5180	10173009
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10173009
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10173009

Method EPA 8015

Analyte	AB	Analyte ID	Method ID
Diesel range organics (DRO)	TX	9369	10173203
Ethanol	TX	4750	10173203
Ethylene glycol	TX	4785	10173203
Gasoline range organics (GRO)	TX	9408	10173203
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10173203
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10173203
Methanol	TX	4930	10173203
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10173203
n-Propanol (1-Propanol)	TX	5055	10173203
Propylene Glycol	TX	6657	10173203
tert-Butyl alcohol	TX	4420	10173203

Method EPA 8021

Analyte	AB	Analyte ID	Method ID
Benzene	TX	4375	10174400
Ethylbenzene	TX	4765	10174400
m+p-xylene	TX	5240	10174400
Methyl tert-butyl ether (MTBE)	TX	5000	10174400
o-Xylene	TX	5250	10174400
Toluene	TX	5140	10174400
Xylene (total)	TX	5260	10174400

Method EPA 8081

Analyte	AB	Analyte ID	Method ID
4,4'-DDD	TX	7355	10178402
4,4'-DDE	TX	7360	10178402

Matrix: ***Non-Potable Water***

4,4'-DDT	TX	7365	10178402
Aldrin	TX	7025	10178402
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10178402
alpha-Chlordane	TX	7240	10178402
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10178402
Chlordane (tech.)	TX	7250	10178402
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10178402
Dieldrin	TX	7470	10178402
Endosulfan I	TX	7510	10178402
Endosulfan II	TX	7515	10178402
Endosulfan sulfate	TX	7520	10178402
Endrin	TX	7540	10178402
Endrin aldehyde	TX	7530	10178402
Endrin ketone	TX	7535	10178402
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10178402
gamma-Chlordane	TX	7245	10178402
Heptachlor	TX	7685	10178402
Heptachlor epoxide	TX	7690	10178402
Hexachlorobenzene	TX	6275	10178402
Methoxychlor	TX	7810	10178402
Mirex	TX	7870	10178402
Toxaphene (Chlorinated camphene)	TX	8250	10178402

Method EPA 8082

Analyte	**AB**	**Analyte ID**	**Method ID**
Aroclor-1016 (PCB-1016)	TX	8880	10179201
Aroclor-1221 (PCB-1221)	TX	8885	10179201
Aroclor-1232 (PCB-1232)	TX	8890	10179201
Aroclor-1242 (PCB-1242)	TX	8895	10179201
Aroclor-1248 (PCB-1248)	TX	8900	10179201
Aroclor-1254 (PCB-1254)	TX	8905	10179201

Aroclor-1260 (PCB-1260)	TX	8910	10179201
PCBs (total)	TX	8870	10179201

Method EPA 8151

Analyte	**AB**	**Analyte ID**	**Method ID**
2,4,5-T	TX	8655	10183003
2,4-D	TX	8545	10183003
2,4-DB	TX	8560	10183003
Dalapon	TX	8555	10183003
Dicamba	TX	8595	10183003
Dichloroprop (Dichlorprop, Weedone)	TX	8605	10183003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10183003
MCPA	TX	7775	10183003
MCPP	TX	7780	10183003
Silvex (2,4,5-TP)	TX	8650	10183003

Method EPA 8260

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1,2-Tetrachloroethane	TX	5105	10184404
1,1,1-Trichloroethane	TX	5160	10184404
1,1,2,2-Tetrachloroethane	TX	5110	10184404
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	TX	5195	10184404
1,1,2-Trichloroethane	TX	5165	10184404
1,1-Dichloroethane	TX	4630	10184404
1,1-Dichloroethylene	TX	4640	10184404
1,1-Dichloropropene	TX	4670	10184404
1,2,3-Trichlorobenzene	TX	5150	10184404
1,2,3-Trichloropropane	TX	5180	10184404
1,2,4-Trichlorobenzene	TX	5155	10184404
1,2,4-Trimethylbenzene	TX	5210	10184404
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10184404
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10184404
1,2-Dichlorobenzene	TX	4610	10184404

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Matrix: ***Non-Potable Water***

1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10184404
1,2-Dichloropropane	TX	4655	10184404
1,3,5-Trimethylbenzene	TX	5215	10184404
1,3-Dichlorobenzene	TX	4615	10184404
1,3-Dichloropropane	TX	4660	10184404
1,4-Dichlorobenzene	TX	4620	10184404
1,4-Dioxane (1,4-Diethyleneoxide)	TX	4735	10184404
1-Chlorohexane	TX	4510	10184404
1-Propanol	TX	5060	10184404
2,2-Dichloropropane	TX	4665	10184404
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10184404
2-Chloroethyl vinyl ether	TX	4500	10184404
2-Chlorotoluene	TX	4535	10184404
2-Hexanone (MBK)	TX	4860	10184404
2-Pentanone	TX	5045	10184404
4-Chlorotoluene	TX	4540	10184404
4-Isopropyltoluene (p-Cymene)	TX	4915	10184404
4-Methyl-2-pentanone (MIBK)	TX	4995	10184404
Acetone (2-Propanone)	TX	4315	10184404
Acetonitrile	TX	4320	10184404
Acrolein (Propenal)	TX	4325	10184404
Acrylonitrile	TX	4340	10184404
Allyl alcohol	TX	4350	10184404
Allyl chloride (3-Chloropropene)	TX	4355	10184404
Benzene	TX	4375	10184404
Benzyl chloride	TX	5635	10184404
Bromobenzene	TX	4385	10184404
Bromochloromethane	TX	4390	10184404
Bromodichloromethane	TX	4395	10184404
Bromoform	TX	4400	10184404

Matrix: ***Non-Potable Water***

Carbon disulfide	TX	4450	10184404
Carbon tetrachloride	TX	4455	10184404
Chlorobenzene	TX	4475	10184404
Chlorodibromomethane	TX	4575	10184404
Chloroethane (Ethyl chloride)	TX	4485	10184404
Chloroform	TX	4505	10184404
Chloroprene (2-Chloro-1,3-butadiene)	TX	4525	10184404
cis-1,2-Dichloroethylene	TX	4645	10184404
cis-1,3-Dichloropropene	TX	4680	10184404
Dibromofluoromethane	TX	4590	10184404
Dibromomethane (Methylene bromide)	TX	4595	10184404
Dichlorodifluoromethane (Freon-12)	TX	4625	10184404
Diethyl ether	TX	4725	10184404
Di-isopropylether (DIPE)	TX	9375	10184404
Epichlorohydrin (1-Chloro-2,3-epoxypropane)	TX	4745	10184404
Ethanol	TX	4750	10184404
Ethyl acetate	TX	4755	10184404
Ethyl methacrylate	TX	4810	10184404
Ethylbenzene	TX	4765	10184404
Ethylene oxide	TX	4795	10184404
Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)	TX	4770	10184404
Hexachlorobutadiene	TX	4835	10184404
Iodomethane (Methyl iodide)	TX	4870	10184404
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10184404
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10184404
Isopropylbenzene (Cumene)	TX	4900	10184404
m+p-xylene	TX	5240	10184404
Methacrylonitrile	TX	4925	10184404
Methyl acetate	TX	4940	10184404
Methyl acrylate	TX	4945	10184404

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Issue Date: **5/1/2019**

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Matrix: ***Non-Potable Water***

Methyl bromide (Bromomethane)	TX	4950	10184404
Methyl chloride (Chloromethane)	TX	4960	10184404
Methyl methacrylate	TX	4990	10184404
Methyl tert-butyl ether (MTBE)	TX	5000	10184404
Methylcyclohexane	TX	4965	10184404
Methylene chloride (Dichloromethane)	TX	4975	10184404
Naphthalene	TX	5005	10184404
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10184404
n-Butylbenzene	TX	4435	10184404
n-Propylbenzene	TX	5090	10184404
o-Xylene	TX	5250	10184404
Pentachloroethane	TX	5035	10184404
Propionitrile (Ethyl cyanide)	TX	5080	10184404
Pyridine	TX	5095	10184404
sec-Butylbenzene	TX	4440	10184404
Styrene	TX	5100	10184404
T-amylmethylether (TAME)	TX	4370	10184404
tert-Butyl alcohol	TX	4420	10184404
tert-Butylbenzene	TX	4445	10184404
Tetrachloroethylene (Perchloroethylene)	TX	5115	10184404
Toluene	TX	5140	10184404
trans-1,2-Dichloroethylene	TX	4700	10184404
trans-1,3-Dichloropropylene	TX	4685	10184404
trans-1,4-Dichloro-2-butene	TX	4605	10184404
Trichloroethene (Trichloroethylene)	TX	5170	10184404
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10184404
Vinyl acetate	TX	5225	10184404
Vinyl chloride	TX	5235	10184404
Xylene (total)	TX	5260	10184404

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ALS Laboratory Group, Environmental Services Division (Houston, Texas)

Expiration Date: 4/30/2020

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Houston, TX 77099-4338

Issue Date: 5/1/2019

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Matrix: ***Non-Potable Water***

Method EPA 8270

Analyte	AB	Analyte ID	Method ID
1,2,4,5-Tetrachlorobenzene	TX	6715	10185203
1,2,4-Trichlorobenzene	TX	5155	10185203
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10185203
1,2-Dichlorobenzene	TX	4610	10185203
1,2-Dinitrobenzene	TX	6155	10185203
1,2-Diphenylhydrazine	TX	6220	10185203
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10185203
1,3-Dichlorobenzene	TX	4615	10185203
1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10185203
1,4-Dichlorobenzene	TX	4620	10185203
1,4-Dinitrobenzene	TX	6165	10185203
1,4-Naphthoquinone	TX	6420	10185203
1,4-Phenylenediamine	TX	6630	10185203
1-Chloronaphthalene	TX	5790	10185203
1-Naphthylamine	TX	6425	10185203
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10185203
2,3,4,6-Tetrachlorophenol	TX	6735	10185203
2,4,5-Trichlorophenol	TX	6835	10185203
2,4,5-Trimethylaniline	TX	6880	10185203
2,4,6-Trichlorophenol	TX	6840	10185203
2,4-Diaminotoluene	TX	5880	10185203
2,4-Dichlorophenol	TX	6000	10185203
2,4-Dimethylphenol	TX	6130	10185203
2,4-Dinitrophenol	TX	6175	10185203
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10185203
2,6-Dichlorophenol	TX	6005	10185203
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10185203
2-Acetylaminofluorene	TX	5515	10185203

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

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ALS Laboratory Group, Environmental Services Division (Houston, Texas)

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Matrix: ***Non-Potable Water***

2-Chloronaphthalene	TX	5795	10185203
2-Chlorophenol	TX	5800	10185203
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10185203
2-Methylaniline (o-Toluidine)	TX	5145	10185203
2-Methylnaphthalene	TX	6385	10185203
2-Methylphenol (o-Cresol)	TX	6400	10185203
2-Naphthylamine	TX	6430	10185203
2-Nitroaniline	TX	6460	10185203
2-Nitrophenol	TX	6490	10185203
2-Picoline (2-Methylpyridine)	TX	5050	10185203
3,3'-Dichlorobenzidine	TX	5945	10185203
3,3'-Dimethylbenzidine	TX	6120	10185203
3-Methylcholanthrene	TX	6355	10185203
3-Methylphenol (m-Cresol)	TX	6405	10185203
3-Nitroaniline	TX	6465	10185203
4-Aminobiphenyl	TX	5540	10185203
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10185203
4-Chloro-3-methylphenol	TX	5700	10185203
4-Chloroaniline	TX	5745	10185203
4-Chlorophenyl phenylether	TX	5825	10185203
4-Dimethyl aminoazobenzene	TX	6105	10185203
4-Methylphenol (p-Cresol)	TX	6410	10185203
4-Nitroaniline	TX	6470	10185203
4-Nitrobiphenyl	TX	6480	10185203
4-Nitrophenol	TX	6500	10185203
4-Nitroquinoline-1-oxide	TX	6510	10185203
5-Chloro-2-methylaniline	TX	5695	10185203
5-Nitro-o-toluidine	TX	6570	10185203
7,12-Dimethylbenz(a) anthracene	TX	6115	10185203
a-a-Dimethylphenethylamine	TX	6125	10185203

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Matrix: ***Non-Potable Water***

Acenaphthene	TX	5500	10185203
Acenaphthylene	TX	5505	10185203
Acetophenone	TX	5510	10185203
Aniline	TX	5545	10185203
Anthracene	TX	5555	10185203
Aramite	TX	5560	10185203
Atrazine	TX	7065	10185203
Azinphos-methyl (Guthion)	TX	7075	10185203
Azobenzene	TX	5562	10185203
Benzenethiol (Thiophenol)	TX	6750	10185203
Benzidine	TX	5595	10185203
Benzo(a)anthracene	TX	5575	10185203
Benzo(a)pyrene	TX	5580	10185203
Benzo(b)fluoranthene	TX	5585	10185203
Benzo(e)pyrene	TX	5605	10185203
Benzo(g,h,i)perylene	TX	5590	10185203
Benzo(k)fluoranthene	TX	5600	10185203
Benzoic acid	TX	5610	10185203
Benzyl alcohol	TX	5630	10185203
Biphenyl	TX	5640	10185203
bis(2-Chloroethoxy)methane	TX	5760	10185203
bis(2-Chloroethyl) ether	TX	5765	10185203
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10185203
Butyl benzyl phthalate	TX	5670	10185203
Caprolactam	TX	7180	10185203
Captan	TX	7190	10185203
Carbaryl (Sevin)	TX	7195	10185203
Carbazole	TX	5680	10185203
Carbophenothion	TX	7220	10185203
Chlorobenzilate	TX	7260	10185203

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Matrix: ***Non-Potable Water***

Chrysene	TX	5855	10185203
Coumaphos	TX	7315	10185203
Demeton	TX	7390	10185203
Demeton	TX	7390	10185203
Demeton-o	TX	7395	10185203
Demeton-s	TX	7385	10185203
Diallate	TX	7405	10185203
Dibenz(a,h) anthracene	TX	5895	10185203
Dibenz(a,j) acridine	TX	5900	10185203
Dibenzofuran	TX	5905	10185203
Dichlorovos (DDVP, Dichlorvos)	TX	8610	10185203
Diethyl phthalate	TX	6070	10185203
Dimethoate	TX	7475	10185203
Dimethoate	TX	7475	10185203
Dimethyl phthalate	TX	6135	10185203
Di-n-butyl phthalate	TX	5925	10185203
Di-n-octyl phthalate	TX	6200	10185203
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10185203
Dioxathion	TX	7495	10185203
Diphenylamine	TX	6205	10185203
Disulfoton	TX	8625	10185203
Ethion	TX	7565	10185203
Ethyl methanesulfonate	TX	6260	10185203
Famphur	TX	7580	10185203
Fluoranthene	TX	6265	10185203
Fluorene	TX	6270	10185203
Hexachlorobenzene	TX	6275	10185203
Hexachlorobutadiene	TX	4835	10185203
Hexachlorocyclopentadiene	TX	6285	10185203
Hexachloroethane	TX	4840	10185203

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Matrix: ***Non-Potable Water***

Hexachlorophene	TX	6290	10185203
Hexachloropropene	TX	6295	10185203
Indeno(1,2,3-cd) pyrene	TX	6315	10185203
Isodrin	TX	7725	10185203
Isophorone	TX	6320	10185203
Isosafrole	TX	6325	10185203
Kepone	TX	7740	10185203
Maleic anhydride	TX	6335	10185203
Methapyrilene	TX	6345	10185203
Methyl methanesulfonate	TX	6375	10185203
Methyl parathion (Parathion, methyl)	TX	7825	10185203
Mevinphos	TX	7850	10185203
Naled	TX	7905	10185203
Naphthalene	TX	5005	10185203
Nitrobenzene	TX	5015	10185203
n-Nitrosodiethylamine	TX	6525	10185203
n-Nitrosodimethylamine	TX	6530	10185203
n-Nitrosodi-n-butylamine	TX	5025	10185203
n-Nitrosodi-n-propylamine	TX	6545	10185203
n-Nitrosodiphenylamine	TX	6535	10185203
n-Nitrosomethylethylamine	TX	6550	10185203
n-Nitrosomorpholine	TX	6555	10185203
n-Nitrosopiperidine	TX	6560	10185203
n-Nitrosopyrrolidine	TX	6565	10185203
o,o,o-Triethyl phosphorothioate	TX	8290	10185203
o-Anisidine	TX	5550	10185203
Parathion, ethyl	TX	7955	10185203
p-Cresidine	TX	5860	10185203
Pentachlorobenzene	TX	6590	10185203
Pentachloronitrobenzene (PCNB)	TX	6600	10185203

Matrix: ***Non-Potable Water***

Pentachlorophenol	TX	6605	10185203
Phenacetin	TX	6610	10185203
Phenanthrene	TX	6615	10185203
Phenol	TX	6625	10185203
Phorate	TX	7985	10185203
Phosmet (Imidan)	TX	8000	10185203
Phthalic anhydride	TX	6640	10185203
Pronamide (Kerb)	TX	6650	10185203
Pyrene	TX	6665	10185203
Pyridine	TX	5095	10185203
Quinoline	TX	6670	10185203
Resorcinol	TX	6680	10185203
Safrole	TX	6685	10185203
Sulfotepp	TX	8155	10185203
Terbufos	TX	8185	10185203
Tetrachlorvinphos (Stirophos, Gardona)	TX	8197	10185203
Thionazin (Zinophos)	TX	8235	10185203
Toluene diisocyanate	TX	6775	10185203
Trifluralin (Treflan)	TX	8295	10185203

Method EPA 8290

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	TX	9516	10187209
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	TX	9519	10187209
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	TX	9420	10187209
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	TX	9426	10187209
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	TX	9423	10187209
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	TX	9471	10187209
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	TX	9453	10187209
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-HxCDF)	TX	9474	10187209
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-HxCDD)	TX	9456	10187209

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Matrix: ***Non-Potable Water***

1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-HxCDF)	TX	9477	10187209
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	TX	9459	10187209
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	TX	9543	10187209
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	TX	9540	10187209
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	TX	9480	10187209
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF	TX	9549	10187209
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	TX	9612	10187209
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	TX	9618	10187209
Total Heptachlorodibenzofuran (Total HpCDF)	TX	9444	10187209
Total Heptachlorodibenzo-p-dioxin (Total HpCDD)	TX	9438	10187209
Total Hexachlorodibenzofuran (Total HxCDF)	TX	9483	10187209
Total Hexachlorodibenzo-p-dioxin (Total HxCDD)	TX	9468	10187209
Total Pentachlorodibenzofuran (Total PeCDF)	TX	9552	10187209
Total Pentachlorodibenzo-p-dioxin (Total PeCDD)	TX	9555	10187209
Total Tetrachlorodibenzofuran (Total TCDF)	TX	9615	10187209
Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	TX	9609	10187209

Method EPA 8316

Analyte	**AB**	**Analyte ID**	**Method ID**
Acrylamide	TX	4330	10188202

Method EPA 8330

Analyte	**AB**	**Analyte ID**	**Method ID**
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10189807
1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10189807
2,4,6-Trinitrotoluene (2,4,6-TNT)	TX	9651	10189807
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10189807
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10189807
2-Amino-4,6-dinitrotoluene (2-am-dnt)	TX	9303	10189807
2-Nitrotoluene	TX	9507	10189807
3-Nitrotoluene	TX	9510	10189807
4-Amino-2,6-dinitrotoluene (4-am-dnt)	TX	9306	10189807
4-Nitrotoluene	TX	9513	10189807

Matrix: ***Non-Potable Water***

Methyl-2,4,6-trinitrophenylnitramine (tetryl)	TX	6415	10189807
Nitrobenzene	TX	5015	10189807
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	TX	9522	10189807
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	TX	9432	10189807

Method EPA 9014

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10193803
Total cyanide	TX	1645	10193803

Method EPA 9038

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfate	TX	2000	10196608

Method EPA 9040

Analyte	**AB**	**Analyte ID**	**Method ID**
pH	TX	1900	10196802

Method EPA 9050

Analyte	**AB**	**Analyte ID**	**Method ID**
Conductivity	TX	1610	10198604

Method EPA 9056

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10199209
Chloride	TX	1575	10199209
Fluoride	TX	1730	10199209
Nitrate as N	TX	1810	10199209
Nitrate-nitrite	TX	1820	10199209
Nitrite as N	TX	1840	10199209
Orthophosphate as P	TX	1870	10199209
Sulfate	TX	2000	10199209

Method EPA 9060

Analyte	**AB**	**Analyte ID**	**Method ID**
Total Organic Carbon (TOC)	TX	2040	10200201

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Matrix: ***Non-Potable Water***

Method EPA 9065

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10200405

Method EPA 9066

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10200609

Method EPA 9250

Analyte	**AB**	**Analyte ID**	**Method ID**
Chloride	TX	1575	10207202

Method EPA RSK 175

Analyte	**AB**	**Analyte ID**	**Method ID**
2-methylpropane (Isobutane)	TX	4942	10212905
Ethane	TX	4747	10212905
Ethene	TX	4752	10212905
Methane	TX	4926	10212905
n-Butane	TX	5007	10212905
n-Propane	TX	5029	10212905

Method HACH 8000

Analyte	**AB**	**Analyte ID**	**Method ID**
Chemical oxygen demand (COD)	TX	1565	60003001

Method SM 2120 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Color	TX	1605	20223807

Method SM 2310 B (4a)

Analyte	**AB**	**Analyte ID**	**Method ID**
Acidity, as CaCO3	TX	1500	20002806

Method SM 2320 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Alkalinity as CaCO3	TX	1505	20045005

Method SM 2340 B

Analyte	**AB**	**Analyte ID**	**Method ID**

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Matrix: ***Non-Potable Water***

Total hardness as $CaCO_3$	TX	1755	20046008

Method SM 2510 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Conductivity	TX	1610	20048004

Method SM 2540 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Residue-total (total solids)	TX	1950	20004608

Method SM 2540 C

Analyte	**AB**	**Analyte ID**	**Method ID**
Residue-filterable (TDS)	TX	1955	20049803

Method SM 2540 D

Analyte	**AB**	**Analyte ID**	**Method ID**
Residue-nonfilterable (TSS)	TX	1960	20004802

Method SM 3500-Cr B

Analyte	**AB**	**Analyte ID**	**Method ID**
Chromium (VI)	TX	1045	20065809

Method SM 4500-Cl F

Analyte	**AB**	**Analyte ID**	**Method ID**
Total residual chlorine	TX	1940	20080482

Method SM 4500-Cl^- E

Analyte	**AB**	**Analyte ID**	**Method ID**
Chloride	TX	1575	20019209

Method SM 4500-CN^- C

Analyte	**AB**	**Analyte ID**	**Method ID**
Total cyanide	TX	1645	20020808

Method SM 4500-CN^- E

Analyte	**AB**	**Analyte ID**	**Method ID**
Total cyanide	TX	1645	20021209

Method SM 4500-CN^- G

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	20021607

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Matrix: ***Non-Potable Water***

Method SM 4500-H+ B

Analyte	**AB**	**Analyte ID**	**Method ID**
pH	TX	1900	20104603

Method SM 4500-NH3 D

Analyte	**AB**	**Analyte ID**	**Method ID**
Ammonia as N	TX	1515	20108809
Kjeldahl Nitrogen (Total Kjeldahl Nitrogen-TKN)	TX	1790	20108809

Method SM 4500-NH3 F

Analyte	**AB**	**Analyte ID**	**Method ID**
Ammonia as N	TX	1515	20023001

Method SM 4500-O G

Analyte	**AB**	**Analyte ID**	**Method ID**
Oxygen, dissolved	TX	1880	20025405

Method SM 4500-P E

Analyte	**AB**	**Analyte ID**	**Method ID**
Orthophosphate as P	TX	1870	20025803
Phosphorus	TX	1910	20025803

Method SM 4500-S2¯ F

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfide	TX	2005	20126209

Method SM 4500-SiO2 D

Analyte	**AB**	**Analyte ID**	**Method ID**
Silica as SiO2	TX	1990	20127202

Method SM 4500-SO3¯ B

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfite	TX	2015	20026806

Method SM 5210 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Biochemical oxygen demand (BOD)	TX	1530	20027401
Carbonaceous BOD, CBOD	TX	1555	20027401

Method SM 5310 B

Analyte	**AB**	**Analyte ID**	**Method ID**

Matrix: ***Non-Potable Water***

Total Organic Carbon (TOC)	TX	2040	20137206

Method SM 5310 C

Analyte	AB	Analyte ID	Method ID
Total Organic Carbon (TOC)	TX	2040	20138209

Method SM 5540 C

Analyte	AB	Analyte ID	Method ID
Surfactants - MBAS	TX	2025	20144405

Method TCEQ 1005

Analyte	AB	Analyte ID	Method ID
Total Petroleum Hydrocarbons (TPH)	TX	2050	90019208

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Issue Date: 5/1/2019

ALS Laboratory Group, Environmental Services Division (Houston, Texas)

10450 Stancliff Road, Suite 210
Houston, TX 77099-4338

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Matrix: ***Solid & Chemical Materials***

Method ASTM D2216

Analyte	**AB**	**Analyte ID**	**Method ID**
Moisture	TX	10337	ASTM D2216-05

Method EPA 1010

Analyte	**AB**	**Analyte ID**	**Method ID**
Ignitability	TX	1780	10116606

Method EPA 1030

Analyte	**AB**	**Analyte ID**	**Method ID**
Ignitability	TX	1780	10117201

Method EPA 1311

Analyte	**AB**	**Analyte ID**	**Method ID**
TCLP	TX	849	10118806

Method EPA 1312

Analyte	**AB**	**Analyte ID**	**Method ID**
SPLP	TX	850	10119003

Method EPA 1668

Analyte	**AB**	**Analyte ID**	**Method ID**
Decachlorobiphenyls	TX	10332	10262007
Dichlorobiphenyls	TX	464	10262007
Heptachlorobiphenyls	TX	486	10262007
Hexachlorobiphenyls	TX	487	10262007
Monochlorobiphenyls	TX	501	10262007
Nonachlorobiphenyls	TX	507	10262007
Octachlorobiphenyls	TX	508	10262007
Pentachlorobiphenyls	TX	515	10262007
Tetrachlorobiphenyls	TX	528	10262007
Trichlorobiphenyls	TX	541	10262007

Method EPA 200.8

Analyte	**AB**	**Analyte ID**	**Method ID**
Uranium	TX	3035	10014605

Certificate: T104704231-19-23

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Matrix: ***Solid & Chemical Materials***

Method EPA 300.0

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10053200
Chloride	TX	1575	10053200
Fluoride	TX	1730	10053200
Nitrate as N	TX	1810	10053200
Nitrate-nitrite	TX	1820	10053200
Nitrite as N	TX	1840	10053200
Orthophosphate as P	TX	1870	10053200
Sulfate	TX	2000	10053200

Method EPA 310.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Alkalinity as CaCO3	TX	1505	10054805

Method EPA 350.3

Analyte	**AB**	**Analyte ID**	**Method ID**
Ammonia as N	TX	1515	10064401

Method EPA 365.3

Analyte	**AB**	**Analyte ID**	**Method ID**
Orthophosphate as P	TX	1870	10070801
Phosphorus	TX	1910	10070801

Method EPA 6020

Analyte	**AB**	**Analyte ID**	**Method ID**
Aluminum	TX	1000	10156204
Antimony	TX	1005	10156204
Arsenic	TX	1010	10156204
Barium	TX	1015	10156204
Beryllium	TX	1020	10156204
Boron	TX	1025	10156204
Cadmium	TX	1030	10156204
Calcium	TX	1035	10156204
Chromium	TX	1040	10156204

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Matrix: ***Solid & Chemical Materials***

Cobalt	TX	1050	10156204
Copper	TX	1055	10156204
Iron	TX	1070	10156204
Lead	TX	1075	10156204
Lithium	TX	1080	10156204
Magnesium	TX	1085	10156204
Manganese	TX	1090	10156204
Molybdenum	TX	1100	10156204
Nickel	TX	1105	10156204
Potassium	TX	1125	10156204
Selenium	TX	1140	10156204
Silver	TX	1150	10156204
Sodium	TX	1155	10156204
Strontium	TX	1160	10156204
Thallium	TX	1165	10156204
Tin	TX	1175	10156204
Titanium	TX	1180	10156204
Vanadium	TX	1185	10156204
Zinc	TX	1190	10156204

Method EPA 7196

Analyte	AB	Analyte ID	Method ID
Chromium (VI)	TX	1045	10162206

Method EPA 7470

Analyte	AB	Analyte ID	Method ID
Mercury	TX	1095	10165603

Method EPA 7471

Analyte	AB	Analyte ID	Method ID
Mercury	TX	1095	10166004

Method EPA 8015

Analyte	AB	Analyte ID	Method ID
Diesel range organics (DRO)	TX	9369	10173203

Matrix: ***Solid & Chemical Materials***

Ethanol	TX	4750	10173203
Ethylene glycol	TX	4785	10173203
Gasoline range organics (GRO)	TX	9408	10173203
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10173203
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10173203
Methanol	TX	4930	10173203
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10173203
n-Propanol (1-Propanol)	TX	5055	10173203
Propylene Glycol	TX	6657	10173203
tert-Butyl alcohol	TX	4420	10173203

Method EPA 8021

Analyte	**AB**	**Analyte ID**	**Method ID**
Benzene	TX	4375	10174400
Ethylbenzene	TX	4765	10174400
m+p-xylene	TX	5240	10174400
Methyl tert-butyl ether (MTBE)	TX	5000	10174400
o-Xylene	TX	5250	10174400
Toluene	TX	5140	10174400
Xylene (total)	TX	5260	10174400

Method EPA 8081

Analyte	**AB**	**Analyte ID**	**Method ID**
4,4'-DDD	TX	7355	10178402
4,4'-DDE	TX	7360	10178402
4,4'-DDT	TX	7365	10178402
Aldrin	TX	7025	10178402
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10178402
alpha-Chlordane	TX	7240	10178402
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10178402
Chlordane (tech.)	TX	7250	10178402
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10178402
Dieldrin	TX	7470	10178402

Matrix: ***Solid & Chemical Materials***

Endosulfan I	TX	7510	10178402
Endosulfan II	TX	7515	10178402
Endosulfan sulfate	TX	7520	10178402
Endrin	TX	7540	10178402
Endrin aldehyde	TX	7530	10178402
Endrin ketone	TX	7535	10178402
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10178402
gamma-Chlordane	TX	7245	10178402
Heptachlor	TX	7685	10178402
Heptachlor epoxide	TX	7690	10178402
Methoxychlor	TX	7810	10178402
Mirex	TX	7870	10178402
Toxaphene (Chlorinated camphene)	TX	8250	10178402

Method EPA 8082

Analyte	**AB**	**Analyte ID**	**Method ID**
Aroclor-1016 (PCB-1016)	TX	8880	10179201
Aroclor-1221 (PCB-1221)	TX	8885	10179201
Aroclor-1232 (PCB-1232)	TX	8890	10179201
Aroclor-1242 (PCB-1242)	TX	8895	10179201
Aroclor-1248 (PCB-1248)	TX	8900	10179201
Aroclor-1254 (PCB-1254)	TX	8905	10179201
Aroclor-1260 (PCB-1260)	TX	8910	10179201
PCBs (total)	TX	8870	10179201

Method EPA 8260

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1,2-Tetrachloroethane	TX	5105	10184404
1,1,1-Trichloroethane	TX	5160	10184404
1,1,2,2-Tetrachloroethane	TX	5110	10184404
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	TX	5195	10184404
1,1,2-Trichloroethane	TX	5165	10184404
1,1-Dichloroethane	TX	4630	10184404

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Matrix: ***Solid & Chemical Materials***

1,1-Dichloroethylene	TX	4640	10184404
1,1-Dichloropropene	TX	4670	10184404
1,2,3-Trichlorobenzene	TX	5150	10184404
1,2,3-Trichloropropane	TX	5180	10184404
1,2,4-Trichlorobenzene	TX	5155	10184404
1,2,4-Trimethylbenzene	TX	5210	10184404
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10184404
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10184404
1,2-Dichlorobenzene	TX	4610	10184404
1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10184404
1,2-Dichloropropane	TX	4655	10184404
1,3,5-Trimethylbenzene	TX	5215	10184404
1,3-Dichlorobenzene	TX	4615	10184404
1,3-Dichloropropane	TX	4660	10184404
1,4-Dichlorobenzene	TX	4620	10184404
1,4-Dioxane (1,4-Diethyleneoxide)	TX	4735	10184404
1-Chlorohexane	TX	4510	10184404
1-Propanol	TX	5060	10184404
2,2-Dichloropropane	TX	4665	10184404
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10184404
2-Chloroethyl vinyl ether	TX	4500	10184404
2-Chlorotoluene	TX	4535	10184404
2-Hexanone (MBK)	TX	4860	10184404
4-Chlorotoluene	TX	4540	10184404
4-Isopropyltoluene (p-Cymene)	TX	4915	10184404
4-Methyl-2-pentanone (MIBK)	TX	4995	10184404
Acetone (2-Propanone)	TX	4315	10184404
Acetonitrile	TX	4320	10184404
Acrolein (Propenal)	TX	4325	10184404
Acrylonitrile	TX	4340	10184404

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

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Matrix: ***Solid & Chemical Materials***

Allyl chloride (3-Chloropropene)	TX	4355	10184404
Benzene	TX	4375	10184404
Benzyl chloride	TX	5635	10184404
Bromobenzene	TX	4385	10184404
Bromochloromethane	TX	4390	10184404
Bromodichloromethane	TX	4395	10184404
Bromoform	TX	4400	10184404
Carbon disulfide	TX	4450	10184404
Carbon tetrachloride	TX	4455	10184404
Chlorobenzene	TX	4475	10184404
Chlorodibromomethane	TX	4575	10184404
Chloroethane (Ethyl chloride)	TX	4485	10184404
Chloroform	TX	4505	10184404
Chloroprene (2-Chloro-1,3-butadiene)	TX	4525	10184404
cis-1,2-Dichloroethylene	TX	4645	10184404
cis-1,3-Dichloropropene	TX	4680	10184404
Dibromofluoromethane	TX	4590	10184404
Dibromomethane (Methylene bromide)	TX	4595	10184404
Dichlorodifluoromethane (Freon-12)	TX	4625	10184404
Diethyl ether	TX	4725	10184404
Epichlorohydrin (1-Chloro-2,3-epoxypropane)	TX	4745	10184404
Ethanol	TX	4750	10184404
Ethyl acetate	TX	4755	10184404
Ethyl methacrylate	TX	4810	10184404
Ethylbenzene	TX	4765	10184404
Ethylene oxide	TX	4795	10184404
Hexachlorobutadiene	TX	4835	10184404
Iodomethane (Methyl iodide)	TX	4870	10184404
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10184404
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10184404

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Matrix: ***Solid & Chemical Materials***

Isopropylbenzene (Cumene)	TX	4900	10184404
m+p-xylene	TX	5240	10184404
Methacrylonitrile	TX	4925	10184404
Methyl acetate	TX	4940	10184404
Methyl acrylate	TX	4945	10184404
Methyl bromide (Bromomethane)	TX	4950	10184404
Methyl chloride (Chloromethane)	TX	4960	10184404
Methyl methacrylate	TX	4990	10184404
Methyl tert-butyl ether (MTBE)	TX	5000	10184404
Methylcyclohexane	TX	4965	10184404
Methylene chloride (Dichloromethane)	TX	4975	10184404
Naphthalene	TX	5005	10184404
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10184404
n-Butylbenzene	TX	4435	10184404
n-Propylbenzene	TX	5090	10184404
o-Xylene	TX	5250	10184404
Pentachloroethane	TX	5035	10184404
Propionitrile (Ethyl cyanide)	TX	5080	10184404
Pyridine	TX	5095	10184404
sec-Butylbenzene	TX	4440	10184404
Styrene	TX	5100	10184404
tert-Butyl alcohol	TX	4420	10184404
tert-Butylbenzene	TX	4445	10184404
Tetrachloroethylene (Perchloroethylene)	TX	5115	10184404
Toluene	TX	5140	10184404
trans-1,2-Dichloroethylene	TX	4700	10184404
trans-1,3-Dichloropropylene	TX	4685	10184404
trans-1,4-Dichloro-2-butene	TX	4605	10184404
Trichloroethene (Trichloroethylene)	TX	5170	10184404
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10184404

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Matrix: ***Solid & Chemical Materials***

Vinyl acetate	TX	5225	10184404
Vinyl chloride	TX	5235	10184404
Xylene (total)	TX	5260	10184404

Method EPA 8270

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,4,5-Tetrachlorobenzene	TX	6715	10185203
1,2,4-Trichlorobenzene	TX	5155	10185203
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10185203
1,2-Dichlorobenzene	TX	4610	10185203
1,2-Dinitrobenzene	TX	6155	10185203
1,2-Diphenylhydrazine	TX	6220	10185203
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10185203
1,3-Dichlorobenzene	TX	4615	10185203
1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10185203
1,4-Dichlorobenzene	TX	4620	10185203
1,4-Dinitrobenzene	TX	6165	10185203
1,4-Naphthoquinone	TX	6420	10185203
1,4-Phenylenediamine	TX	6630	10185203
1-Chloronaphthalene	TX	5790	10185203
1-Naphthylamine	TX	6425	10185203
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10185203
2,3,4,6-Tetrachlorophenol	TX	6735	10185203
2,4,5-Trichlorophenol	TX	6835	10185203
2,4,5-Trimethylaniline	TX	6880	10185203
2,4,6-Trichlorophenol	TX	6840	10185203
2,4-Diaminotoluene	TX	5880	10185203
2,4-Dichlorophenol	TX	6000	10185203
2,4-Dimethylphenol	TX	6130	10185203
2,4-Dinitrophenol	TX	6175	10185203
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10185203

Matrix: ***Solid & Chemical Materials***

2,6-Dichlorophenol	TX	6005	10185203
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10185203
2-Acetylaminofluorene	TX	5515	10185203
2-Chloronaphthalene	TX	5795	10185203
2-Chlorophenol	TX	5800	10185203
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10185203
2-Methylaniline (o-Toluidine)	TX	5145	10185203
2-Methylnaphthalene	TX	6385	10185203
2-Methylphenol (o-Cresol)	TX	6400	10185203
2-Naphthylamine	TX	6430	10185203
2-Nitroaniline	TX	6460	10185203
2-Nitrophenol	TX	6490	10185203
2-Picoline (2-Methylpyridine)	TX	5050	10185203
3,3'-Dichlorobenzidine	TX	5945	10185203
3,3'-Dimethylbenzidine	TX	6120	10185203
3-Methylcholanthrene	TX	6355	10185203
3-Methylphenol (m-Cresol)	TX	6405	10185203
3-Nitroaniline	TX	6465	10185203
4-Aminobiphenyl	TX	5540	10185203
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10185203
4-Chloro-3-methylphenol	TX	5700	10185203
4-Chloroaniline	TX	5745	10185203
4-Chlorophenyl phenylether	TX	5825	10185203
4-Methylphenol (p-Cresol)	TX	6410	10185203
4-Nitroaniline	TX	6470	10185203
4-Nitrophenol	TX	6500	10185203
4-Nitroquinoline-1-oxide	TX	6510	10185203
5-Nitro-o-toluidine	TX	6570	10185203
7,12-Dimethylbenz(a) anthracene	TX	6115	10185203
a-a-Dimethylphenethylamine	TX	6125	10185203

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Matrix: ***Solid & Chemical Materials***

Acenaphthene	TX	5500	10185203
Acenaphthylene	TX	5505	10185203
Acetophenone	TX	5510	10185203
Aniline	TX	5545	10185203
Anthracene	TX	5555	10185203
Aramite	TX	5560	10185203
Atrazine	TX	7065	10185203
Azinphos-methyl (Guthion)	TX	7075	10185203
Azobenzene	TX	5562	10185203
Benzenethiol (Thiophenol)	TX	6750	10185203
Benzidine	TX	5595	10185203
Benzo(a)anthracene	TX	5575	10185203
Benzo(a)pyrene	TX	5580	10185203
Benzo(b)fluoranthene	TX	5585	10185203
Benzo(e)pyrene	TX	5605	10185203
Benzo(g,h,i)perylene	TX	5590	10185203
Benzo(k)fluoranthene	TX	5600	10185203
Benzoic acid	TX	5610	10185203
Benzyl alcohol	TX	5630	10185203
Biphenyl	TX	5640	10185203
bis(2-Chloroethoxy)methane	TX	5760	10185203
bis(2-Chloroethyl) ether	TX	5765	10185203
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10185203
Butyl benzyl phthalate	TX	5670	10185203
Caprolactam	TX	7180	10185203
Carbaryl (Sevin)	TX	7195	10185203
Carbazole	TX	5680	10185203
Carbophenothion	TX	7220	10185203
Chlorobenzilate	TX	7260	10185203
Chrysene	TX	5855	10185203

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Matrix: ***Solid & Chemical Materials***

Demeton	TX	7390	10185203
Demeton-o	TX	7395	10185203
Demeton-s	TX	7385	10185203
Diallate	TX	7405	10185203
Dibenz(a,h) anthracene	TX	5895	10185203
Dibenz(a,j) acridine	TX	5900	10185203
Dibenzo(a,e) pyrene	TX	5890	10185203
Dibenzofuran	TX	5905	10185203
Dichlorovos (DDVP, Dichlorvos)	TX	8610	10185203
Diethyl phthalate	TX	6070	10185203
Dimethoate	TX	7475	10185203
Dimethyl phthalate	TX	6135	10185203
Di-n-butyl phthalate	TX	5925	10185203
Di-n-octyl phthalate	TX	6200	10185203
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10185203
Diphenylamine	TX	6205	10185203
Disulfoton	TX	8625	10185203
Ethyl methanesulfonate	TX	6260	10185203
Fluoranthene	TX	6265	10185203
Fluorene	TX	6270	10185203
Hexachlorobenzene	TX	6275	10185203
Hexachlorobutadiene	TX	4835	10185203
Hexachlorocyclopentadiene	TX	6285	10185203
Hexachloroethane	TX	4840	10185203
Hexachlorophene	TX	6290	10185203
Hexachloropropene	TX	6295	10185203
Indeno(1,2,3-cd) pyrene	TX	6315	10185203
Isodrin	TX	7725	10185203
Isophorone	TX	6320	10185203
Isosafrole	TX	6325	10185203

Matrix: ***Solid & Chemical Materials***

Kepone	TX	7740	10185203
Malathion	TX	7770	10185203
Methapyrilene	TX	6345	10185203
Methyl methanesulfonate	TX	6375	10185203
Methyl parathion (Parathion, methyl)	TX	7825	10185203
Mevinphos	TX	7850	10185203
Naphthalene	TX	5005	10185203
Nitrobenzene	TX	5015	10185203
n-Nitrosodiethylamine	TX	6525	10185203
n-Nitrosodimethylamine	TX	6530	10185203
n-Nitrosodi-n-butylamine	TX	5025	10185203
n-Nitrosodi-n-propylamine	TX	6545	10185203
n-Nitrosodiphenylamine	TX	6535	10185203
n-Nitrosomethylethylamine	TX	6550	10185203
n-Nitrosomorpholine	TX	6555	10185203
n-Nitrosopiperidine	TX	6560	10185203
n-Nitrosopyrrolidine	TX	6565	10185203
o,o,o-Triethyl phosphorothioate	TX	8290	10185203
o-Anisidine	TX	5550	10185203
Parathion, ethyl	TX	7955	10185203
p-Cresidine	TX	5860	10185203
Pentachlorobenzene	TX	6590	10185203
Pentachloronitrobenzene (PCNB)	TX	6600	10185203
Pentachlorophenol	TX	6605	10185203
Phenacetin	TX	6610	10185203
Phenanthrene	TX	6615	10185203
Phenol	TX	6625	10185203
Phorate	TX	7985	10185203
Pronamide (Kerb)	TX	6650	10185203
Pyrene	TX	6665	10185203

Matrix: ***Solid & Chemical Materials***

Pyridine	TX	5095	10185203
Quinoline	TX	6670	10185203
Safrole	TX	6685	10185203
Sulfotepp	TX	8155	10185203
Terbufos	TX	8185	10185203
Tetrachlorvinphos (Stirophos, Gardona)	TX	8197	10185203
Thionazin (Zinophos)	TX	8235	10185203
Toluene diisocyanate	TX	6775	10185203

Method EPA 8290

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	TX	9516	10187209
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	TX	9519	10187209
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	TX	9420	10187209
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	TX	9426	10187209
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	TX	9423	10187209
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	TX	9471	10187209
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	TX	9453	10187209
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-HxCDF)	TX	9474	10187209
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-HxCDD)	TX	9456	10187209
1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-HxCDF)	TX	9477	10187209
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	TX	9459	10187209
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	TX	9543	10187209
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	TX	9540	10187209
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	TX	9480	10187209
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF	TX	9549	10187209
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	TX	9612	10187209
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	TX	9618	10187209
Total Heptachlorodibenzofuran (Total HpCDF)	TX	9444	10187209
Total Heptachlorodibenzo-p-dioxin (Total HpCDD)	TX	9438	10187209
Total Hexachlorodibenzofuran (Total HxCDF)	TX	9483	10187209

Matrix: ***Solid & Chemical Materials***

Total Hexachlorodibenzo-p-dioxin (Total HxCDD)	TX	9468	10187209
Total Pentachlorodibenzofuran (Total PeCDF)	TX	9552	10187209
Total Pentachlorodibenzo-p-dioxin (Total PeCDD)	TX	9555	10187209
Total Tetrachlorodibenzofuran (Total TCDF)	TX	9615	10187209
Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	TX	9609	10187209

Method EPA 8316

Analyte	**AB**	**Analyte ID**	**Method ID**
Acrylamide	TX	4330	10188202

Method EPA 8330

Analyte	**AB**	**Analyte ID**	**Method ID**
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10189807
1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10189807
2,4,6-Trinitrotoluene (2,4,6-TNT)	TX	9651	10189807
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10189807
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10189807
2-Amino-4,6-dinitrotoluene (2-am-dnt)	TX	9303	10189807
2-Nitrotoluene	TX	9507	10189807
3-Nitrotoluene	TX	9510	10189807
4-Amino-2,6-dinitrotoluene (4-am-dnt)	TX	9306	10189807
4-Nitrotoluene	TX	9513	10189807
Methyl-2,4,6-trinitrophenylnitramine (tetryl)	TX	6415	10189807
Nitrobenzene	TX	5015	10189807
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	TX	9522	10189807
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	TX	9432	10189807

Method EPA 9014

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10193803
Total cyanide	TX	1645	10193803

Method EPA 9038

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfate	TX	2000	10196608

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704231-19-23

ALS Laboratory Group, Environmental Services Division (Houston, Texas)

Expiration Date: 4/30/2020

10450 Stancliff Road, Suite 210
Houston, TX 77099-4338

Issue Date: 5/1/2019

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Solid & Chemical Materials***

Method EPA 9040

Analyte	AB	Analyte ID	Method ID
Corrosivity	TX	1615	10197203
pH	TX	1900	10196802

Method EPA 9045

Analyte	AB	Analyte ID	Method ID
Corrosivity	TX	1615	10197805
pH	TX	1900	10197805

Method EPA 9050

Analyte	AB	Analyte ID	Method ID
Conductivity	TX	1610	10198604

Method EPA 9056

Analyte	AB	Analyte ID	Method ID
Bromide	TX	1540	10199209
Chloride	TX	1575	10199209
Fluoride	TX	1730	10199209
Nitrate as N	TX	1810	10199209
Nitrate-nitrite	TX	1820	10199209
Nitrite as N	TX	1840	10199209
Orthophosphate as P	TX	1870	10199209
Sulfate	TX	2000	10199209

Method EPA 9060

Analyte	AB	Analyte ID	Method ID
Total Organic Carbon (TOC)	TX	2040	10200201

Method EPA 9065

Analyte	AB	Analyte ID	Method ID
Total phenolics	TX	1905	10200405

Method EPA 9071

Analyte	AB	Analyte ID	Method ID
n-Hexane Extractable Material (HEM) (O&G)	TX	1803	10201204

Texas Commission on Environmental Quality

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Matrix: ***Solid & Chemical Materials***

Method EPA 9095

Analyte	AB	Analyte ID	Method ID
Paint Filter Liquids Test	TX	10312	10204009

Method EPA 9250

Analyte	AB	Analyte ID	Method ID
Chloride	TX	1575	10207202

Method SM 2320 B

Analyte	AB	Analyte ID	Method ID
Alkalinity as CaCO3	TX	1505	20045005

Method SM 2510 B

Analyte	AB	Analyte ID	Method ID
Conductivity	TX	1610	20048004

Method SM 2540 G

Analyte	AB	Analyte ID	Method ID
Residue-total (total solids)	TX	1950	20005203

Method SSA/ASA Part 3:34

Analyte	AB	Analyte ID	Method ID
Carbon, organic (Walkley-Black)	TX	10340	SSA/ASA Pt 3:34

Method TCEQ 1005

Analyte	AB	Analyte ID	Method ID
Total Petroleum Hydrocarbons (TPH)	TX	2050	90019208

10450 Stancliff Rd. Suite 210
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January 28, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS19120951**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 6 sample(s) on Dec 17, 2019 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Dane W

Generated By: DANE.WACASEY

Dane J. Wacasey

Client:	Golder Associates Inc.	**CASE NARRATIVE**
Project:	Houston TX-Wood Preserving Works	
Work Order:	HS19120951	

Work Order Comments

- This report was revised January 28, 2020 in order to adjust select sample IDs per client direction received via email.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19120951**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
- a) Items consistent with NELAC Chapter 5,
- b) dilution factors,
- c) preparation methods,
- d) cleanup methods, and
- e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
- a) Calculated recovery (%R), and
- b) The laboratory’s surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
- a) LCS spiking amounts,
- b) Calculated %R for each analyte, and
- c)The laboratory’s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %Rs and relative percent differences (RPDs), and
- e) The laboratory’s MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory’s QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each “No” or “Not Reviewed (NR)” item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
WorkOrder:	**HS19120951**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group
LRC Date: 01/10/2020
Project Name: Houston TX-Wood Preserving Works
Laboratory Job Number: HS19120951
Reviewer Name: Dane Wacasey
Prep Batch Number(s): 148904, 148916, 149362, R353203

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			1
		Were MS/MSD RPDs within laboratory QC limits?		X			2
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				3

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group	LRC Date: 01/10/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS19120951
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 148904, 148916, 149362, R353203

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports	
Laboratory Name: ALS Laboratory Group	LRC Date: 01/10/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS19120951
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 148904, 148916, 149362, R353203

ER#^{5}	**Description**
1	Batch 148916, Texas TPH by Method TX1005, Sample SO-1620-DPT3819(5-6)-20191216, MS/MSD recovered above upper control limits due to sample matrix interference.
2	Batch 148916, Texas TPH by Method TX1005, Sample SO-1620-DPT3819(5-6)-20191216, MS/MSD RPD recovered above upper control limits for >nC12 to nC28 due to possible heterogeneity of the soil matrix.
3	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS19120951

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19120951-01	SO-1620-SB221(4-5)-20191216	Soil		16-Dec-2019 10:55	17-Dec-2019 16:25	☐
HS19120951-02	SO-1620-SB221(9-10)-20191216	Soil		16-Dec-2019 11:40	17-Dec-2019 16:25	☐
HS19120951-03	SO-1620-DPT5519(3-4)-20191216	Soil		16-Dec-2019 14:25	17-Dec-2019 16:25	☐
HS19120951-04	SO-1620-DPT5519(12.3-13.3)-20191216	Soil		16-Dec-2019 14:58	17-Dec-2019 16:25	☐
HS19120951-05	SO-1620-DPT3819(3-4)-20191216	Soil		16-Dec-2019 16:50	17-Dec-2019 16:25	☐
HS19120951-06	SO-1620-DPT3819(5-6)-20191216	Soil		16-Dec-2019 16:55	17-Dec-2019 16:25	☐

Client: Golder Associates Inc.

Project: Houston TX-Wood Preserving Works

Sample ID: SO-1620-SB221(4-5)-20191216

Collection Date: 16-Dec-2019 10:55

ANALYTICAL REPORT

WorkOrder:HS19120951

Lab ID:HS19120951-01

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	< 8.5		8.5	57	mg/Kg-dry	1	25-Dec-2019 03:08
>nC12 to nC28	< 11		11	57	mg/Kg-dry	1	25-Dec-2019 03:08
>nC28 to nC35	< 11		11	57	mg/Kg-dry	1	25-Dec-2019 03:08
Total Petroleum Hydrocarbon	< 8.5		8.5	57	mg/Kg-dry	1	25-Dec-2019 03:08
Surr: 2-Fluorobiphenyl	*82.8*			*70-130*	*%REC*	*1*	*25-Dec-2019 03:08*
Surr: Trifluoromethyl benzene	*94.7*			*70-130*	*%REC*	*1*	*25-Dec-2019 03:08*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**14.2**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-SB221(9-10)-20191216
Collection Date: 16-Dec-2019 11:40

ANALYTICAL REPORT

WorkOrder:HS19120951
Lab ID:HS19120951-02
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	< 8.2		8.2	55	mg/Kg-dry	1	25-Dec-2019 03:37
>nC12 to nC28	< 11		11	55	mg/Kg-dry	1	25-Dec-2019 03:37
>nC28 to nC35	< 11		11	55	mg/Kg-dry	1	25-Dec-2019 03:37
Total Petroleum Hydrocarbon	< 8.2		8.2	55	mg/Kg-dry	1	25-Dec-2019 03:37
Surr: 2-Fluorobiphenyl	*87.0*			*70-130*	*%REC*	*1*	*25-Dec-2019 03:37*
Surr: Trifluoromethyl benzene	*98.9*			*70-130*	*%REC*	*1*	*25-Dec-2019 03:37*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**16.4**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19120951
Sample ID:	SO-1620-DPT5519(3-4)-20191216	Lab ID:	HS19120951-03
Collection Date:	16-Dec-2019 14:25	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	< 8.6		8.6	58	mg/Kg-dry	1	25-Dec-2019 04:06
>nC12 to nC28	< 11		11	58	mg/Kg-dry	1	25-Dec-2019 04:06
>nC28 to nC35	< 11		11	58	mg/Kg-dry	1	25-Dec-2019 04:06
Total Petroleum Hydrocarbon	< 8.6		8.6	58	mg/Kg-dry	1	25-Dec-2019 04:06
Surr: 2-Fluorobiphenyl	*81.6*			*70-130*	*%REC*	*1*	*25-Dec-2019 04:06*
Surr: Trifluoromethyl benzene	*92.7*			*70-130*	*%REC*	*1*	*25-Dec-2019 04:06*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**13.5**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19120951
Sample ID:	SO-1620-DPT5519(12.3-13.3)-20191216	Lab ID:	HS19120951-04
Collection Date:	16-Dec-2019 14:58	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	< 9.4		9.4	63	mg/Kg-dry	1	25-Dec-2019 04:34
>nC12 to nC28	< 12		12	63	mg/Kg-dry	1	25-Dec-2019 04:34
>nC28 to nC35	< 12		12	63	mg/Kg-dry	1	25-Dec-2019 04:34
Total Petroleum Hydrocarbon	< 9.4		9.4	63	mg/Kg-dry	1	25-Dec-2019 04:34
Surr: 2-Fluorobiphenyl	*86.2*			*70-130*	*%REC*	*1*	*25-Dec-2019 04:34*
Surr: Trifluoromethyl benzene	*96.9*			*70-130*	*%REC*	*1*	*25-Dec-2019 04:34*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**22.4**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS19120951
Sample ID:	SO-1620-DPT3819(3-4)-20191216		Lab ID:HS19120951-05
Collection Date:	16-Dec-2019 16:50		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	**5,000**		**92**	**620**	**mg/Kg-dry**	10	24-Dec-2019 12:01
>nC12 to nC28	**6,400**		**120**	**620**	**mg/Kg-dry**	10	24-Dec-2019 12:01
>nC28 to nC35	**3,100**		**120**	**620**	**mg/Kg-dry**	10	24-Dec-2019 12:01
Total Petroleum Hydrocarbon	**14,500**		**92**	**620**	**mg/Kg-dry**	10	24-Dec-2019 12:01
Surr: 2-Fluorobiphenyl	*76.7*			*70-130*	*%REC*	*10*	*24-Dec-2019 12:01*
Surr: Trifluoromethyl benzene	*81.0*			*70-130*	*%REC*	*10*	*24-Dec-2019 12:01*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 02-Jan-2020		Analyst: MBG
Aliphatics nC6	< 62	n	62	120	mg/Kg-dry	10	02-Jan-2020 15:44
Aliphatics >nC6 to nC8	< 62	n	62	120	mg/Kg-dry	10	02-Jan-2020 15:44
Aliphatics >nC8 to nC10	**630**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
Aliphatics >nC10 to nC12	**210**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
Aliphatics >nC12 to nC16	< 62	n	62	120	mg/Kg-dry	10	02-Jan-2020 15:44
Aliphatics >nC16 to nC21	**220**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
Aliphatics >nC21 to nC35	**880**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
Total Aliphatic Fraction	**1,940**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
Aliphatics Relative % Distribution	**35**	n	**0**	**0**	**%-dry**	10	02-Jan-2020 15:44
Aromatics >nC7 to nC8	< 62	n	62	120	mg/Kg-dry	10	02-Jan-2020 16:13
Aromatics >nC8 to nC10	**490**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Aromatics >nC10 to nC12	**1,400**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Aromatics >nC12 to nC16	**320**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Aromatics >nC16 to nC21	**770**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Aromatics >nC21 to nC35	**700**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Total Aromatic Fraction	**3,680**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:13
Aromatics Relative % Distribution	**65**	n	**0**	**0**	**%-dry**	10	02-Jan-2020 16:13
Total Petroleum Hydrocarbons	**5,600**	n	**62**	**120**	**mg/Kg-dry**	10	02-Jan-2020 15:44
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**22.7**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS19120951
Sample ID:	SO-1620-DPT3819(5-6)-20191216		Lab ID:HS19120951-06
Collection Date:	16-Dec-2019 16:55		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 19-Dec-2019		Analyst: MBG
nC6 to nC12	**1,400**		**89**	**600**	**mg/Kg-dry**	10	24-Dec-2019 08:37
>nC12 to nC28	**4,700**		**120**	**600**	**mg/Kg-dry**	10	24-Dec-2019 08:37
>nC28 to nC35	**1,700**		**120**	**600**	**mg/Kg-dry**	10	24-Dec-2019 08:37
Total Petroleum Hydrocarbon	**7,800**		**89**	**600**	**mg/Kg-dry**	10	24-Dec-2019 08:37
Surr: 2-Fluorobiphenyl	*70.5*			*70-130*	*%REC*	*10*	*24-Dec-2019 08:37*
Surr: Trifluoromethyl benzene	*74.5*			*70-130*	*%REC*	*10*	*24-Dec-2019 08:37*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 02-Jan-2020		Analyst: MBG
Aliphatics nC6	< 60	n	60	120	mg/Kg-dry	10	02-Jan-2020 16:43
Aliphatics >nC6 to nC8	< 60	n	60	120	mg/Kg-dry	10	02-Jan-2020 16:43
Aliphatics >nC8 to nC10	**260**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:43
Aliphatics >nC10 to nC12	< 60	n	60	120	mg/Kg-dry	10	02-Jan-2020 16:43
Aliphatics >nC12 to nC16	< 60	n	60	120	mg/Kg-dry	10	02-Jan-2020 16:43
Aliphatics >nC16 to nC21	**250**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:43
Aliphatics >nC21 to nC35	**540**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:43
Total Aliphatic Fraction	**1,050**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:43
Aliphatics Relative % Distribution	**34**	n	**0**	**0**	**%-dry**	10	02-Jan-2020 16:43
Aromatics >nC7 to nC8	< 60	n	60	120	mg/Kg-dry	10	02-Jan-2020 17:12
Aromatics >nC8 to nC10	**120**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Aromatics >nC10 to nC12	**390**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Aromatics >nC12 to nC16	**370**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Aromatics >nC16 to nC21	**700**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Aromatics >nC21 to nC35	**440**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Total Aromatic Fraction	**2,020**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 17:12
Aromatics Relative % Distribution	**66**	n	**0**	**0**	**%-dry**	10	02-Jan-2020 17:12
Total Petroleum Hydrocarbons	**3,100**	n	**60**	**120**	**mg/Kg-dry**	10	02-Jan-2020 16:43
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: TH
Percent Moisture	**18.8**		**0.0100**	**0.0100**	**wt%**	1	23-Dec-2019 11:59

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

Batch ID: 148904 **Start Date:** 19 Dec 2019 12:30 **End Date:** 19 Dec 2019 19:00
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19120951-01	1	10.16 (g)	10 (mL)	0.9843
HS19120951-02	1	10.86 (g)	10 (mL)	0.9208
HS19120951-03	1	10.01 (g)	10 (mL)	0.999
HS19120951-04	1	10.17 (g)	10 (mL)	0.9833

Batch ID: 148916 **Start Date:** 19 Dec 2019 14:00 **End Date:** 19 Dec 2019 19:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19120951-05	1	10.39 (g)	10 (mL)	0.9625
HS19120951-06	1	10.21 (g)	10 (mL)	0.9794

Batch ID: 149362 **Start Date:** 02 Jan 2020 12:30 **End Date:** 03 Jan 2020 15:30
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19120951-05		10.39 (g)	10 (mL)	0.9625
HS19120951-06		10.21 (g)	10 (mL)	0.9794

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 148904 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS19120951-01	SO-1620-SB221(4-5)-20191216	16 Dec 2019 10:55		19 Dec 2019 12:30	25 Dec 2019 03:08	1
HS19120951-02	SO-1620-SB221(9-10)-20191216	16 Dec 2019 11:40		19 Dec 2019 12:30	25 Dec 2019 03:37	1
HS19120951-03	SO-1620-DPT5519(3-4)-20191216	16 Dec 2019 14:25		19 Dec 2019 12:30	25 Dec 2019 04:06	1
HS19120951-04	SO-1620-DPT5519(12.3-13.3)-20191216	16 Dec 2019 14:58		19 Dec 2019 12:30	25 Dec 2019 04:34	1
Batch ID: 148916 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS19120951-05	SO-1620-DPT3819(3-4)-20191216	16 Dec 2019 16:50		19 Dec 2019 14:00	24 Dec 2019 12:01	10
HS19120951-06	SO-1620-DPT3819(5-6)-20191216	16 Dec 2019 16:55		19 Dec 2019 14:00	24 Dec 2019 08:37	10
Batch ID: 149362 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS19120951-05	SO-1620-DPT3819(3-4)-20191216	16 Dec 2019 16:50		02 Jan 2020 12:30	02 Jan 2020 16:13	10
HS19120951-05	SO-1620-DPT3819(3-4)-20191216	16 Dec 2019 16:50		02 Jan 2020 12:30	02 Jan 2020 15:44	10
HS19120951-06	SO-1620-DPT3819(5-6)-20191216	16 Dec 2019 16:55		02 Jan 2020 12:30	02 Jan 2020 17:12	10
HS19120951-06	SO-1620-DPT3819(5-6)-20191216	16 Dec 2019 16:55		02 Jan 2020 12:30	02 Jan 2020 16:43	10
Batch ID: R353203 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS19120951-01	SO-1620-SB221(4-5)-20191216	16 Dec 2019 10:55			23 Dec 2019 11:59	1
HS19120951-02	SO-1620-SB221(9-10)-20191216	16 Dec 2019 11:40			23 Dec 2019 11:59	1
HS19120951-03	SO-1620-DPT5519(3-4)-20191216	16 Dec 2019 14:25			23 Dec 2019 11:59	1
HS19120951-04	SO-1620-DPT5519(12.3-13.3)-20191216	16 Dec 2019 14:58			23 Dec 2019 11:59	1
HS19120951-05	SO-1620-DPT3819(3-4)-20191216	16 Dec 2019 16:50			23 Dec 2019 11:59	1
HS19120951-06	SO-1620-DPT3819(5-6)-20191216	16 Dec 2019 16:55			23 Dec 2019 11:59	1

WorkOrder: HS19120951
InstrumentID: FID-13
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	25	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	22	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	22	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	22	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS19120951
InstrumentID: FID-12
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	28	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	26	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	26	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	26	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

Revision:1

WorkOrder:	HS19120951
InstrumentID:	FID-11
Test Code:	TX1006_S
Test Number:	TX1006
Test Name:	Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

Revision:1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **148904 (0)** **Instrument:** **FID-13** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-148904** Units: **mg/Kg** Analysis Date: **26-Dec-2019 13:15**
Client ID: Run ID: **FID-13_353321** SeqNo: **5410234** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*23.11*	*0*	*25*	*0*	*92.4*	*70 - 130*				
Surr: Trifluoromethyl benzene	*26.24*	*0*	*25*	*0*	*105*	*70 - 130*				

LCS Sample ID: **LCS-148904** Units: **mg/Kg** Analysis Date: **24-Dec-2019 16:26**
Client ID: Run ID: **FID-13_353321** SeqNo: **5410237** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	235.8	50	250	0	94.3	75 - 125				
>nC12 to nC28	253.6	50	250	0	101	75 - 125				
Surr: 2-Fluorobiphenyl	*18.93*	*0*	*25*	*0*	*75.7*	*70 - 130*				
Surr: Trifluoromethyl benzene	*19.9*	*0*	*25*	*0*	*79.6*	*70 - 130*				

LCSD Sample ID: **LCSD-148904** Units: **mg/Kg** Analysis Date: **24-Dec-2019 16:55**
Client ID: Run ID: **FID-13_353321** SeqNo: **5410238** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	252.2	50	250	0	101	75 - 125	235.8	6.73	20	
>nC12 to nC28	269.5	50	250	0	108	75 - 125	253.6	6.09	20	
Surr: 2-Fluorobiphenyl	*21.86*	*0*	*25*	*0*	*87.5*	*70 - 130*	*18.93*	*14.4*	*20*	
Surr: Trifluoromethyl benzene	*22.17*	*0*	*25*	*0*	*88.7*	*70 - 130*	*19.9*	*10.8*	*20*	

MS Sample ID: **HS19120555-24MS** Units: **mg/Kg** Analysis Date: **26-Dec-2019 13:45**
Client ID: Run ID: **FID-13_353321** SeqNo: **5410235** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	259.3	45	227.3	1.63	113	75 - 125				
>nC12 to nC28	266.4	45	227.3	0	117	75 - 125				
Surr: 2-Fluorobiphenyl	*22.23*	*0*	*22.73*	*0*	*97.8*	*70 - 130*				
Surr: Trifluoromethyl benzene	*21.97*	*0*	*22.73*	*0*	*96.6*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **148904 (0)** **Instrument:** **FID-13** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS19120555-24MSD** Units: **mg/Kg** Analysis Date: **26-Dec-2019 14:14**
Client ID: Run ID: **FID-13_353321** SeqNo: **5410236** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	285.8	46	230.6	1.63	123	75 - 125	259.3	9.72	20	
>nC12 to nC28	257.5	46	230.6	0	112	75 - 125	266.4	3.41	20	
Surr: 2-Fluorobiphenyl	*25.46*	*0*	*23.06*	*0*	*110*	*70 - 130*	*22.23*	*13.6*	*20*	
Surr: Trifluoromethyl benzene	*25.48*	*0*	*23.06*	*0*	*110*	*70 - 130*	*21.97*	*14.8*	*20*	

The following samples were analyzed in this batch: HS19120951-01 HS19120951-02 HS19120951-03 HS19120951-04

Revision: 1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **148916 (0)** **Instrument:** **FID-12** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-148916** Units: **mg/Kg** Analysis Date: **24-Dec-2019 07:11**
Client ID: Run ID: **FID-12_353318** SeqNo: **5410173** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*22.03*	*0*	*25*	*0*	*88.1*	*70 - 130*				
Surr: Trifluoromethyl benzene	*27.32*	*0*	*25*	*0*	*109*	*70 - 130*				

LCS Sample ID: **LCS-148916** Units: **mg/Kg** Analysis Date: **24-Dec-2019 07:40**
Client ID: Run ID: **FID-12_353318** SeqNo: **5410174** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	295.7	50	250	0	118	75 - 125				
>nC12 to nC28	282.9	50	250	0	113	75 - 125				
Surr: 2-Fluorobiphenyl	*23.63*	*0*	*25*	*0*	*94.5*	*70 - 130*				
Surr: Trifluoromethyl benzene	*27.18*	*0*	*25*	*0*	*109*	*70 - 130*				

LCSD Sample ID: **LCSD-148916** Units: **mg/Kg** Analysis Date: **24-Dec-2019 08:08**
Client ID: Run ID: **FID-12_353318** SeqNo: **5410175** PrepDate: **19-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	287.7	50	250	0	115	75 - 125	295.7	2.72	20	
>nC12 to nC28	290.2	50	250	0	116	75 - 125	282.9	2.55	20	
Surr: 2-Fluorobiphenyl	*24.17*	*0*	*25*	*0*	*96.7*	*70 - 130*	*23.63*	*2.27*	*20*	
Surr: Trifluoromethyl benzene	*26.92*	*0*	*25*	*0*	*108*	*70 - 130*	*27.18*	*0.955*	*20*	

MS Sample ID: **HS19120951-06MS** Units: **mg/Kg** Analysis Date: **24-Dec-2019 09:06**
Client ID: **SO-1620-DPT3819(5-6)-20191216** Run ID: **FID-12_353318** SeqNo: **5410177** PrepDate: **19-Dec-2019** DF: **10**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	1770	490	245.6	1134	259	75 - 125				SO
>nC12 to nC28	4735	490	245.6	3844	363	75 - 125				SO
Surr: 2-Fluorobiphenyl	*22.98*	*0*	*24.56*	*0*	*93.6*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.63*	*0*	*24.56*	*0*	*100*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **148916 (0)** **Instrument:** **FID-12** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS19120951-06MSD** Units: **mg/Kg** Analysis Date: **24-Dec-2019 09:35**

Client ID: **SO-1620-DPT3819(5-6)-20191216** Run ID: **FID-12_353318** SeqNo: **5410178** PrepDate: **19-Dec-2019** DF: **10**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	1945	490	242.7	1134	334	75 - 125	1770	9.41	20	SO
>nC12 to nC28	6080	490	242.7	3844	921	75 - 125	4735	24.9	20	SRO
Surr: 2-Fluorobiphenyl	*21.92*	*0*	*24.27*	*0*	*90.3*	*70 - 130*	*22.98*	*4.72*	*20*	
Surr: Trifluoromethyl benzene	*24.59*	*0*	*24.27*	*0*	*101*	*70 - 130*	*24.63*	*0.158*	*20*	

The following samples were analyzed in this batch: HS19120951-05 HS19120951-06

Revision: 1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **149362 (0)** **Instrument:** **FID-11** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 21:09**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430308** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution	0	0								
Total Petroleum Hydrocarbons	< 5.0	10								

MBLK Sample ID: **MBLK-149362** Units: **mg/Kg** Analysis Date: **04-Jan-2020 02:00**
Client ID: Run ID: **FID-11_354136** SeqNo: **5430350** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution	0	0								

LCS Sample ID: **LCS-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 21:38**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430309** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	456.4	10	500	0	91.3	60 - 140				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **149362 (0)** **Instrument:** **FID-11** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

LCSD Sample ID: **LCSD-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 22:07**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430310** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	505.1	10	500	0	101	60 - 140	456.4	10.1	30	

The following samples were analyzed in this batch: HS19120951-05 HS19120951-06

Revision: 1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19120951

QC BATCH REPORT

Batch ID: **R353203 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS19120555-24DUP** Units: **wt%** Analysis Date: **23-Dec-2019 11:59**

Client ID: Run ID: **Balance1_353203** SeqNo: **5407471** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	23.3	0.0100					23.3	0	20	

The following samples were analyzed in this batch:

HS19120951-01	HS19120951-02	HS19120951-03	HS19120951-04
HS19120951-05	HS19120951-06		

Revision: 1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19120951**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

ALS Houston, US Date: 28-Jan-20

Sample Receipt Checklist

Client Name: PBW
Work Order: HS19120951
Date/Time Received: **17-Dec-2019 16:25**
Received by: **DDG**

Checklist completed by: *Nilesh D. Ranchod* eSignature 17-Dec-2019 Date

Reviewed by: *Dane J. Wacasey* eSignature 19-Dec-2019 Date

Matrices: **Soil**
Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☐	No ☑	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212489
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s): 1.1c UC/C IR # 25
Cooler(s)/Kit(s): RED
Date/Time sample(s) sent to storage: 12/17/2019 5:50PM

Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

Cincinnati, OH
+1 513 733 5336

Everett, WA
+1 425 356 2600

Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of ____

COC ID: 212489

HS19120951

Golder Associates Inc.
Houston TX-Wood Preserving Works

WV

ALS Project Manager:

Customer Information		Project Information	
Purchase Order	UPRR/Kevin Peterburs	Project Name	Houston TX-Wood Preserving Works
Work Order		Project Number	1620-10-Rev0 SR 92688
Company Name	Golder Associates Inc.	Bill To Company	Union Pacific Railroad- A/P
Send Report To	Eric Matzner	Invoice Attn	Accounts Payable
Address	2201 Double Creek Drive Suite 4004	Address	1400 Douglas Street Stop 0750
City/State/Zip	Round Rock, TX 78664	City/State/Zip	Omaha NE 681790750
Phone	(512) 671-3434	Phone	
Fax	(512) 671-3446	Fax	
e-Mail Address	Eric_Matzner@golder.com	e-Mail Address	

A TX1005_S_REV3 (5643233 TX1005 TPH)
B MOIST_ASTM (5651931 Moisture Content)
C TX1006_S (5645481 TPH TX1006) (HOLD)
D
E
F
G
H
I
J

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-DPTA19(4-5)-20191216	12·16·19	10:55	Soil	8	1	X	X	X								
2	" -DPTA19(9-10)- "	12·16·19	11:40														
3	" -DPT5519(3-4)- "	12·16·19	14:25														
4	" -DPT5519(12.3-13.3)- "	12·16·19	14:58														
5	" -DPT3819(3-4)- "	12·16·19	16:50														
6	" -DPT3819(5-6)- "	12·16·19	16:55														
7	~~SO-1620-DPT3919(2-3)-20191217~~	~~12·17·19~~	~~12:10~~ SB														
8	~~" -DPT3919(7-8) "~~	~~12·17·19~~	~~12:15~~ SB														
9	~~" -DPT4219(4-5) "~~	~~12·17·19~~	~~15:05~~ SB														
10	~~" -DPT4219(7-8) "~~	~~12·17·19~~	~~15:10~~ SB														

Sampler(s) Please Print & Sign: Sarah Baker Sarah Baker

Shipment Method: Courier

Required Turnaround Time: (Check Box) ☐ Other ________ ☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Sarah Baker Date: 12·17·19 Time: 15:30 Received by: D

Relinquished by: D Date: 12·17·19 Time: 16 25 Received by (Laboratory): D

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
~~454~~ DG	
~~45642~~	1.1
RE	

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

12 # 25
c/d-o

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

January 28, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS19121010**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 4 sample(s) on Dec 18, 2019 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DANE.WACASEY

Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19121010**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group	LRC Date: 01/14/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS19121010
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 148954, 149362, R353367

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?		X			1
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				2
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				2

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group | LRC Date: 01/14/2020
Project Name: Houston TX-Wood Preserving Works | Laboratory Job Number: HS19121010
Reviewer Name: Dane Wacasey | Prep Batch Number(s): 148954, 149362, R353367

#[1]	**A[2]**	**Description**	**Yes**	**No**	**NA[3]**	**NR[4]**	**ER#[5]**
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 01/14/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS19121010
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 148954, 149362, R353367

ER#[5]	Description
1	Batch 148954, TPH by method TX1005, sample SQ-1620-DPT4219(4-5)-20191217, surrogate 2-Fluorobiphenyl was recovered outside of control limits due to matrix effect.
2	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS19121010

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19121010-01	SQ-1620-DPT3919(2-3)-20191217	Soil		17-Dec-2019 12:10	18-Dec-2019 11:29	☐
HS19121010-02	SQ-1620-DPT3919(7-8)-20191217	Soil		17-Dec-2019 12:15	18-Dec-2019 11:29	☐
HS19121010-03	SQ-1620-DPT4219(4-5)-20191217	Soil		17-Dec-2019 15:05	18-Dec-2019 11:29	☐
HS19121010-04	SQ-1620-DPT4219(7-8)-20191217	Soil		17-Dec-2019 15:10	18-Dec-2019 11:29	☐

ANALYTICAL REPORT

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SQ-1620-DPT3919(2-3)-20191217
Collection Date: 17-Dec-2019 12:10

WorkOrder:HS19121010
Lab ID:HS19121010-01
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 20-Dec-2019		Analyst: GR
nC6 to nC12	< 7.4		7.4	50	mg/Kg-dry	1	27-Dec-2019 11:39
>nC12 to nC28	**600**		**9.8**	**50**	**mg/Kg-dry**	1	27-Dec-2019 11:39
>nC28 to nC35	**360**		**9.8**	**50**	**mg/Kg-dry**	1	27-Dec-2019 11:39
Total Petroleum Hydrocarbon	**960**		**7.4**	**50**	**mg/Kg-dry**	1	27-Dec-2019 11:39
Surr: 2-Fluorobiphenyl	*102*			*70-130*	*%REC*	*1*	*27-Dec-2019 11:39*
Surr: Trifluoromethyl benzene	*98.4*			*70-130*	*%REC*	*1*	*27-Dec-2019 11:39*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 02-Jan-2020		Analyst: MBG
Aliphatics nC6	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 18:14
Aliphatics >nC6 to nC8	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 18:14
Aliphatics >nC8 to nC10	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 18:14
Aliphatics >nC10 to nC12	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 18:14
Aliphatics >nC12 to nC16	**13**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 18:14
Aliphatics >nC16 to nC21	**140**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 18:14
Aliphatics >nC21 to nC35	**680**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 18:14
Total Aliphatic Fraction	**833**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 18:14
Aliphatics Relative % Distribution	**50**	n	**0**	**0**	**%-dry**	1	03-Jan-2020 18:14
Aromatics >nC7 to nC8	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 19:42
Aromatics >nC8 to nC10	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 19:42
Aromatics >nC10 to nC12	< 5.0	n	5.0	10	mg/Kg-dry	1	03-Jan-2020 19:42
Aromatics >nC12 to nC16	**22**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 19:42
Aromatics >nC16 to nC21	**140**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 19:42
Aromatics >nC21 to nC35	**680**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 19:42
Total Aromatic Fraction	**842**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 19:42
Aromatics Relative % Distribution	**50**	n	**0**	**0**	**%-dry**	1	03-Jan-2020 19:42
Total Petroleum Hydrocarbons	**1,700**	n	**5.0**	**10**	**mg/Kg-dry**	1	03-Jan-2020 18:14
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.1**		**0.0100**	**0.0100**	**wt%**	1	26-Dec-2019 10:25

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SQ-1620-DPT3919(7-8)-20191217
Collection Date: 17-Dec-2019 12:15

ANALYTICAL REPORT

WorkOrder:HS19121010
Lab ID:HS19121010-02
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 20-Dec-2019		Analyst: GR
nC6 to nC12	< 7.6		7.6	52	mg/Kg-dry	1	27-Dec-2019 12:09
>nC12 to nC28	< 10		10	52	mg/Kg-dry	1	27-Dec-2019 12:09
>nC28 to nC35	< 10		10	52	mg/Kg-dry	1	27-Dec-2019 12:09
Total Petroleum Hydrocarbon	< 7.6		7.6	52	mg/Kg-dry	1	27-Dec-2019 12:09
Surr: 2-Fluorobiphenyl	*93.0*			*70-130*	*%REC*	*1*	*27-Dec-2019 12:09*
Surr: Trifluoromethyl benzene	*96.4*			*70-130*	*%REC*	*1*	*27-Dec-2019 12:09*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**15.1**		**0.0100**	**0.0100**	**wt%**	1	26-Dec-2019 10:25

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS19121010
Sample ID:	SQ-1620-DPT4219(4-5)-20191217		Lab ID:HS19121010-03
Collection Date:	17-Dec-2019 15:05		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 20-Dec-2019		Analyst: GR
nC6 to nC12	< 120		120	780	mg/Kg-dry	10	27-Dec-2019 12:38
>nC12 to nC28	**15,000**		**150**	**780**	**mg/Kg-dry**	10	27-Dec-2019 12:38
>nC28 to nC35	**3,200**		**150**	**780**	**mg/Kg-dry**	10	27-Dec-2019 12:38
Total Petroleum Hydrocarbon	**18,200**		**120**	**780**	**mg/Kg-dry**	10	27-Dec-2019 12:38
Surr: 2-Fluorobiphenyl	*177*	*S*		*70-130*	*%REC*	*10*	*27-Dec-2019 12:38*
Surr: Trifluoromethyl benzene	*96.6*			*70-130*	*%REC*	*10*	*27-Dec-2019 12:38*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 02-Jan-2020		Analyst: MBG
Aliphatics nC6	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 18:43
Aliphatics >nC6 to nC8	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 18:43
Aliphatics >nC8 to nC10	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 18:43
Aliphatics >nC10 to nC12	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 18:43
Aliphatics >nC12 to nC16	**2,600**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 18:43
Aliphatics >nC16 to nC21	**2,400**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 18:43
Aliphatics >nC21 to nC35	**4,000**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 18:43
Total Aliphatic Fraction	**9,000**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 18:43
Aliphatics Relative % Distribution	**38**	n	**0**	**0**	**%-dry**	10	03-Jan-2020 18:43
Aromatics >nC7 to nC8	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 20:11
Aromatics >nC8 to nC10	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 20:11
Aromatics >nC10 to nC12	< 78	n	78	160	mg/Kg-dry	10	03-Jan-2020 20:11
Aromatics >nC12 to nC16	**1,900**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 20:11
Aromatics >nC16 to nC21	**4,500**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 20:11
Aromatics >nC21 to nC35	**8,400**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 20:11
Total Aromatic Fraction	**14,800**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 20:11
Aromatics Relative % Distribution	**62**	n	**0**	**0**	**%-dry**	10	03-Jan-2020 20:11
Total Petroleum Hydrocarbons	**24,000**	n	**78**	**160**	**mg/Kg-dry**	10	03-Jan-2020 18:43
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**19.5**		**0.0100**	**0.0100**	**wt%**	1	26-Dec-2019 10:25

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SQ-1620-DPT4219(7-8)-20191217
Collection Date: 17-Dec-2019 15:10

ANALYTICAL REPORT
WorkOrder:HS19121010
Lab ID:HS19121010-04
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 20-Dec-2019		Analyst: GR
nC6 to nC12	**140**	J	**75**	**510**	**mg/Kg-dry**	10	31-Dec-2019 09:52
>nC12 to nC28	**960**		**99**	**510**	**mg/Kg-dry**	10	31-Dec-2019 09:52
>nC28 to nC35	**210**	J	**99**	**510**	**mg/Kg-dry**	10	31-Dec-2019 09:52
Total Petroleum Hydrocarbon	**1,310**		**75**	**510**	**mg/Kg-dry**	10	31-Dec-2019 09:52
Surr: 2-Fluorobiphenyl	*109*			*70-130*	*%REC*	*10*	*31-Dec-2019 09:52*
Surr: Trifluoromethyl benzene	*121*			*70-130*	*%REC*	*10*	*31-Dec-2019 09:52*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 02-Jan-2020		Analyst: MBG
Aliphatics nC6	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 19:12
Aliphatics >nC6 to nC8	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 19:12
Aliphatics >nC8 to nC10	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 19:12
Aliphatics >nC10 to nC12	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 19:12
Aliphatics >nC12 to nC16	**580**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 19:12
Aliphatics >nC16 to nC21	**190**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 19:12
Aliphatics >nC21 to nC35	**320**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 19:12
Total Aliphatic Fraction	**1,090**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 19:12
Aliphatics Relative % Distribution	**70**	n	**0**	**0**	**%-dry**	10	03-Jan-2020 19:12
Aromatics >nC7 to nC8	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 20:40
Aromatics >nC8 to nC10	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 20:40
Aromatics >nC10 to nC12	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 20:40
Aromatics >nC12 to nC16	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 20:40
Aromatics >nC16 to nC21	< 51	n	51	100	mg/Kg-dry	10	03-Jan-2020 20:40
Aromatics >nC21 to nC35	**460**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 20:40
Total Aromatic Fraction	**460**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 20:40
Aromatics Relative % Distribution	**30**	n	**0**	**0**	**%-dry**	10	03-Jan-2020 20:40
Total Petroleum Hydrocarbons	**1,500**	n	**51**	**100**	**mg/Kg-dry**	10	03-Jan-2020 19:12
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.0**		**0.0100**	**0.0100**	**wt%**	1	26-Dec-2019 10:25

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

Batch ID: 148954 **Start Date:** 20 Dec 2019 11:30 **End Date:** 20 Dec 2019 19:00
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19121010-01	1	11.76 (g)	10 (mL)	0.8503
HS19121010-02	1	11.43 (g)	10 (mL)	0.8749
HS19121010-03	1	7.97 (g)	10 (mL)	1.255
HS19121010-04	1	11.62 (g)	10 (mL)	0.8606

Batch ID: 149362 **Start Date:** 02 Jan 2020 12:30 **End Date:** 03 Jan 2020 15:30
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19121010-01		11.76 (g)	10 (mL)	0.8503
HS19121010-03		7.97 (g)	10 (mL)	1.255
HS19121010-04		11.62 (g)	10 (mL)	0.8606

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 148954 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS19121010-01	SQ-1620-DPT3919(2-3)-20191217	17 Dec 2019 12:10		20 Dec 2019 11:30	27 Dec 2019 11:39	1
HS19121010-02	SQ-1620-DPT3919(7-8)-20191217	17 Dec 2019 12:15		20 Dec 2019 11:30	27 Dec 2019 12:09	1
HS19121010-03	SQ-1620-DPT4219(4-5)-20191217	17 Dec 2019 15:05		20 Dec 2019 11:30	27 Dec 2019 12:38	10
HS19121010-04	SQ-1620-DPT4219(7-8)-20191217	17 Dec 2019 15:10		20 Dec 2019 11:30	31 Dec 2019 09:52	10
Batch ID: 149362 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS19121010-01	SQ-1620-DPT3919(2-3)-20191217	17 Dec 2019 12:10		02 Jan 2020 12:30	03 Jan 2020 19:42	1
HS19121010-01	SQ-1620-DPT3919(2-3)-20191217	17 Dec 2019 12:10		02 Jan 2020 12:30	03 Jan 2020 18:14	1
HS19121010-03	SQ-1620-DPT4219(4-5)-20191217	17 Dec 2019 15:05		02 Jan 2020 12:30	03 Jan 2020 20:11	10
HS19121010-03	SQ-1620-DPT4219(4-5)-20191217	17 Dec 2019 15:05		02 Jan 2020 12:30	03 Jan 2020 18:43	10
HS19121010-04	SQ-1620-DPT4219(7-8)-20191217	17 Dec 2019 15:10		02 Jan 2020 12:30	03 Jan 2020 20:40	10
HS19121010-04	SQ-1620-DPT4219(7-8)-20191217	17 Dec 2019 15:10		02 Jan 2020 12:30	03 Jan 2020 19:12	10
Batch ID: R353367 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS19121010-01	SQ-1620-DPT3919(2-3)-20191217	17 Dec 2019 12:10			26 Dec 2019 10:25	1
HS19121010-02	SQ-1620-DPT3919(7-8)-20191217	17 Dec 2019 12:15			26 Dec 2019 10:25	1
HS19121010-03	SQ-1620-DPT4219(4-5)-20191217	17 Dec 2019 15:05			26 Dec 2019 10:25	1
HS19121010-04	SQ-1620-DPT4219(7-8)-20191217	17 Dec 2019 15:10			26 Dec 2019 10:25	1

WorkOrder: HS19121010
InstrumentID: FID-10
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	25	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	25	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	25	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	25	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS19121010
InstrumentID: FID-11
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

QC BATCH REPORT

Batch ID: **148954 (0)** **Instrument:** **FID-10** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-148954** Units: **mg/Kg** Analysis Date: **25-Dec-2019 09:16**
Client ID: Run ID: **FID-10_353528** SeqNo: **5415744** PrepDate: **20-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*23.29*	*0*	*25*	*0*	*93.2*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.33*	*0*	*25*	*0*	*97.3*	*70 - 130*				

LCS Sample ID: **LCS-148954** Units: **mg/Kg** Analysis Date: **25-Dec-2019 09:45**
Client ID: Run ID: **FID-10_353528** SeqNo: **5415745** PrepDate: **20-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	249.9	50	250	0	100.0	75 - 125				
>nC12 to nC28	201.4	50	250	0	80.6	75 - 125				
Surr: 2-Fluorobiphenyl	*29.43*	*0*	*25*	*0*	*118*	*70 - 130*				
Surr: Trifluoromethyl benzene	*26.12*	*0*	*25*	*0*	*104*	*70 - 130*				

LCSD Sample ID: **LCSD-148954** Units: **mg/Kg** Analysis Date: **25-Dec-2019 10:14**
Client ID: Run ID: **FID-10_353528** SeqNo: **5415746** PrepDate: **20-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	234.7	50	250	0	93.9	75 - 125	249.9	6.27	20	
>nC12 to nC28	195.6	50	250	0	78.2	75 - 125	201.4	2.95	20	
Surr: 2-Fluorobiphenyl	*28.03*	*0*	*25*	*0*	*112*	*70 - 130*	*29.43*	*4.86*	*20*	
Surr: Trifluoromethyl benzene	*25.24*	*0*	*25*	*0*	*101*	*70 - 130*	*26.12*	*3.42*	*20*	

MS Sample ID: **HS19120875-04MS** Units: **mg/Kg** Analysis Date: **25-Dec-2019 11:13**
Client ID: Run ID: **FID-10_353528** SeqNo: **5415748** PrepDate: **20-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	238.6	48	241.3	0	98.9	75 - 125				
>nC12 to nC28	202.4	48	241.3	0	83.9	75 - 125				
Surr: 2-Fluorobiphenyl	*27.89*	*0*	*24.13*	*0*	*116*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.75*	*0*	*24.13*	*0*	*103*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

QC BATCH REPORT

Batch ID: **148954 (0)** **Instrument:** **FID-10** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS19120875-04MSD** Units: **mg/Kg** Analysis Date: **25-Dec-2019 11:42**

Client ID: Run ID: **FID-10_353528** SeqNo: **5415749** PrepDate: **20-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	239.7	48	241.8	0	99.1	75 - 125	238.6	0.464	20	
>nC12 to nC28	191.1	48	241.8	0	79.0	75 - 125	202.4	5.73	20	
Surr: 2-Fluorobiphenyl	*25.38*	*0*	*24.18*	*0*	*105*	*70 - 130*	*27.89*	*9.43*	*20*	
Surr: Trifluoromethyl benzene	*22.84*	*0*	*24.18*	*0*	*94.5*	*70 - 130*	*24.75*	*8.03*	*20*	

The following samples were analyzed in this batch: HS19121010-01 HS19121010-02 HS19121010-03 HS19121010-04

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

QC BATCH REPORT

Batch ID: **149362 (0)** **Instrument:** **FID-11** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 21:09**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430308** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution	0	0								
Total Petroleum Hydrocarbons	< 5.0	10								

MBLK Sample ID: **MBLK-149362** Units: **mg/Kg** Analysis Date: **04-Jan-2020 02:00**
Client ID: Run ID: **FID-11_354136** SeqNo: **5430350** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution	0	0								

LCS Sample ID: **LCS-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 21:38**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430309** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	456.4	10	500	0	91.3	60 - 140				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

QC BATCH REPORT

Batch ID: **149362 (0)** **Instrument:** **FIID-11** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

LCSD Sample ID: **LCSD-149362** Units: **mg/Kg** Analysis Date: **03-Jan-2020 22:07**
Client ID: Run ID: **FID-11_354135** SeqNo: **5430310** PrepDate: **02-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	505.1	10	500	0	101	60 - 140	456.4	10.1	30	

The following samples were analyzed in this batch: HS19121010-01 HS19121010-03 HS19121010-04

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121010

QC BATCH REPORT

Batch ID: **R353367 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS19121291-03DUP** Units: **wt%** Analysis Date: **26-Dec-2019 10:25**
Client ID: Run ID: **Balance1_353367** SeqNo: **5411589** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	16.2	0.0100					15.8	2.5	20	

The following samples were analyzed in this batch: HS19121010-01 HS19121010-02 HS19121010-03 HS19121010-04

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19121010**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Sample Receipt Checklist

Client Name: PBW

Work Order: HS19121010

Date/Time Received: **18-Dec-2019 11:29**

Received by: **NDR**

Checklist completed by: *Nilesh D. Ranchod* eSignature 18-Dec-2019 Date

Reviewed by: *Dane J. Wacasey* eSignature 22-Dec-2019 Date

Matrices: **Soil**

Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212488
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s): 2.1c UC/C IR # 11

Cooler(s)/Kit(s): 24728

Date/Time sample(s) sent to storage: 12/18/2019 7:12pm

Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

ALS

Cincinnati, OH
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Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

, WV

Chain of Custody Forn

Page 2 of ____

COC ID: 212488

HS19121010

Golder Associates Inc.
Houston TX-Wood Preserving Works

Customer Information

Purchase Order	UPRR/Kevin Peterburs
Work Order	
Company Name	Golder Associates Inc.
Send Report To	Eric Matzner
Address	2201 Double Creek Drive Suite 4004
City/State/Zip	Round Rock, TX 78664
Phone	(512) 671-3434
Fax	(512) 671-3446
e-Mail Address	Eric_Matzner@golder.com

ALS Project Manager:

Project Information

Project Name	Houston TX-Wood Preserving Works
Project Number	1620-10-Rev0 SR 92688
Bill To Company	Union Pacific Railroad- A/P
Invoice Attn	Accounts Payable
Address	1400 Douglas Street Stop 0750
City/State/Zip	Omaha NE 681790750
Phone	
Fax	
e-Mail Address	

A	TX1005_S_REV3 (5643233 TX1005 TPH)
B	MOIST_ASTM (5631931 Moisture Content)
C	TX1006_S (5645481 TPH TX1006) [HOLD]
D	
E	
F	
G	
H	
I	
J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-DPT319 (2-3) - 20191217	12-17-19	12:10	Soil	8	+3	X	X	X								
2	" DPT 3919 (7-8) "	12-17-19	12:15	↓	↓	↓	↓	↓	↓								
3	" DPT4219 (4-5) "	12-17-19	15:05	↓	↓	↓	↓	↓	↓								
4	" DPT4219 (7-8) "	12-17-19	15:10	↓	↓	↓	↓	↓	↓								
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: Sam Baker Sam Baker

Shipment Method: Courier

Required Turnaround Time: (Check Box) ☐ Other ____
☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Sam Baker Date: 12.18.19 Time: 11:00 Received by: NR 12/18/19 11.00

Relinquished by: Date: Time: Received by (Laboratory): NR 12/18/19 11.29

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
	U/C
24728	2.1

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ____
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

1K#11

ote: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

January 28, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS19121108**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 8 sample(s) on Dec 19, 2019 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DANE.WACASEY
Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19121108**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
a) Items consistent with NELAC Chapter 5,
b) dilution factors,
c) preparation methods,
d) cleanup methods, and
e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
a) Calculated recovery (%R), and
b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
a) LCS spiking amounts,
b) Calculated %R for each analyte, and
c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %Rs and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19121108**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group
LRC Date: 01/13/2020
Project Name: Houston TX-Wood Preserving Works
Laboratory Job Number: HS19121108
Reviewer Name: Dane Wacasey
Prep Batch Number(s): 149026, 149028, 149540, R353569

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?		X			1
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		X			2
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				3

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group
LRC Date: 01/13/2020
Project Name: Houston TX-Wood Preserving Works
Laboratory Job Number: HS19121108
Reviewer Name: Dane Wacasey
Prep Batch Number(s): 149026, 149028, 149540, R353569

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 01/13/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS19121108
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 149026, 149028, 149540, R353569

ER#[5]	**Description**
1	Batch 149026, TPH by method TX1005, SQ-1620-DPT3419(4-5)-20191218 (HS19121108-03), the surrogate recoveries could not be determined due to dilution below the calibration range.
2	Batch 149026, TPH by method TX1005, sample HS19120963-03, the MS/MSD were performed on an unrelated sample.
3	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS19121108

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19121108-01	SQ-1620-DPT4019(1.25-2)-20191218	Soil		18-Dec-2019 10:05	19-Dec-2019 18:25	☐
HS19121108-02	SQ-1620-DPT4019(7-8)-20191218	Soil		18-Dec-2019 11:45	19-Dec-2019 18:25	☐
HS19121108-03	SQ-1620-DPT3419(4-5)-20191218	Soil		18-Dec-2019 13:45	19-Dec-2019 18:25	☐
HS19121108-04	SQ-1620-DPT3419(5-6)-20191218	Soil		18-Dec-2019 15:10	19-Dec-2019 18:25	☐
HS19121108-05	SQ-1620-SB218(2.25-3)-20191219	Soil		19-Dec-2019 10:15	19-Dec-2019 18:25	☐
HS19121108-06	SQ-1620-SB218((15-16)-20191219	Soil		19-Dec-2019 11:25	19-Dec-2019 18:25	☐
HS19121108-07	SQ-1620-DPT3519(4-5)-20191219	Soil		19-Dec-2019 13:45	19-Dec-2019 18:25	☐
HS19121108-08	SQ-1620-DPT3519(6-7)-20191219	Soil		19-Dec-2019 15:50	19-Dec-2019 18:25	☐

ANALYTICAL REPORT

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SQ-1620-DPT4019(1.25-2)-20191218
Collection Date: 18-Dec-2019 10:05

WorkOrder:HS19121108
Lab ID:HS19121108-01
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: MBG
nC6 to nC12	**170**	J	**81**	**550**	**mg/Kg-dry**	10	30-Dec-2019 20:57
>nC12 to nC28	**6,500**		**110**	**550**	**mg/Kg-dry**	10	30-Dec-2019 20:57
>nC28 to nC35	**1,300**		**110**	**550**	**mg/Kg-dry**	10	30-Dec-2019 20:57
Total Petroleum Hydrocarbon	**7,970**		**81**	**550**	**mg/Kg-dry**	10	30-Dec-2019 20:57
Surr: 2-Fluorobiphenyl	*115*			*70-130*	*%REC*	*10*	*30-Dec-2019 20:57*
Surr: Trifluoromethyl benzene	*82.3*			*70-130*	*%REC*	*10*	*30-Dec-2019 20:57*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.9**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19121108
Sample ID:	SQ-1620-DPT4019(7-8)-20191218	Lab ID:	HS19121108-02
Collection Date:	18-Dec-2019 11:45	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: MBG
nC6 to nC12	< 7.0		7.0	47	mg/Kg-dry	1	30-Dec-2019 21:26
>nC12 to nC28	**35**	J	**9.3**	**47**	**mg/Kg-dry**	1	30-Dec-2019 21:26
>nC28 to nC35	**23**	J	**9.3**	**47**	**mg/Kg-dry**	1	30-Dec-2019 21:26
Total Petroleum Hydrocarbon	**58.0**		**7.0**	**47**	**mg/Kg-dry**	1	30-Dec-2019 21:26
Surr: 2-Fluorobiphenyl	*100*			*70-130*	*%REC*	*1*	*30-Dec-2019 21:26*
Surr: Trifluoromethyl benzene	*102*			*70-130*	*%REC*	*1*	*30-Dec-2019 21:26*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**13.9**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19121108
Sample ID:	SQ-1620-DPT3419(4-5)-20191218	Lab ID:	HS19121108-03
Collection Date:	18-Dec-2019 13:45	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: MBG
nC6 to nC12	< 450		450	3000	mg/Kg-dry	50	03-Jan-2020 20:11
>nC12 to nC28	**15,000**		**590**	**3000**	**mg/Kg-dry**	50	03-Jan-2020 20:11
>nC28 to nC35	**4,500**		**590**	**3000**	**mg/Kg-dry**	50	03-Jan-2020 20:11
Total Petroleum Hydrocarbon	**19,500**		**450**	**3000**	**mg/Kg-dry**	50	03-Jan-2020 20:11
Surr: 2-Fluorobiphenyl	*0*	*S*		*70-130*	*%REC*	*50*	*03-Jan-2020 20:11*
Surr: Trifluoromethyl benzene	*0*	*S*		*70-130*	*%REC*	*50*	*03-Jan-2020 20:11*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 06-Jan-2020		Analyst: MBG
Aliphatics nC6	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aliphatics >nC6 to nC8	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aliphatics >nC8 to nC10	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aliphatics >nC10 to nC12	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aliphatics >nC12 to nC16	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aliphatics >nC16 to nC21	**640**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Aliphatics >nC21 to nC35	**1,900**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Total Aliphatic Fraction	**2,540**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Aliphatics Relative % Distribution	**42**	n	**0**	**0**	**%-dry**	50	06-Jan-2020 17:40
Aromatics >nC7 to nC8	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aromatics >nC8 to nC10	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aromatics >nC10 to nC12	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aromatics >nC12 to nC16	< 300	n	300	610	mg/Kg-dry	50	06-Jan-2020 17:40
Aromatics >nC16 to nC21	**1,600**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Aromatics >nC21 to nC35	**1,800**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Total Aromatic Fraction	**3,400**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
Aromatics Relative % Distribution	**58**	n	**0**	**0**	**%-dry**	50	06-Jan-2020 17:40
Total Petroleum Hydrocarbons	**5,900**	n	**300**	**610**	**mg/Kg-dry**	50	06-Jan-2020 17:40
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**27.9**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS19121108
Sample ID:	SQ-1620-DPT3419(5-6)-20191218		Lab ID:HS19121108-04
Collection Date:	18-Dec-2019 15:10		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: MBG
nC6 to nC12	< 82		82	550	mg/Kg-dry	10	30-Dec-2019 22:24
>nC12 to nC28	**3,800**		**110**	**550**	**mg/Kg-dry**	10	30-Dec-2019 22:24
>nC28 to nC35	**1,200**		**110**	**550**	**mg/Kg-dry**	10	30-Dec-2019 22:24
Total Petroleum Hydrocarbon	**5,000**		**82**	**550**	**mg/Kg-dry**	10	30-Dec-2019 22:24
Surr: 2-Fluorobiphenyl	*109*			*70-130*	*%REC*	*10*	*30-Dec-2019 22:24*
Surr: Trifluoromethyl benzene	*124*			*70-130*	*%REC*	*10*	*30-Dec-2019 22:24*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**25.2**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:HS19121108
Sample ID:	SQ-1620-SB218(2.25-3)-20191219	Lab ID:HS19121108-05
Collection Date:	19-Dec-2019 10:15	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: GR
nC6 to nC12	< 6.9		6.9	46	mg/Kg-dry	1	27-Dec-2019 21:41
>nC12 to nC28	**150**		**9.1**	**46**	**mg/Kg-dry**	1	27-Dec-2019 21:41
>nC28 to nC35	**130**		**9.1**	**46**	**mg/Kg-dry**	1	27-Dec-2019 21:41
Total Petroleum Hydrocarbon	**280**		**6.9**	**46**	**mg/Kg-dry**	1	27-Dec-2019 21:41
Surr: 2-Fluorobiphenyl	*81.8*			*70-130*	*%REC*	*1*	*27-Dec-2019 21:41*
Surr: Trifluoromethyl benzene	*94.4*			*70-130*	*%REC*	*1*	*27-Dec-2019 21:41*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.7**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19121108
Sample ID:	SQ-1620-SB218((15-16)-20191219	Lab ID:	HS19121108-06
Collection Date:	19-Dec-2019 11:25	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: GR
nC6 to nC12	< 6.7		6.7	45	mg/Kg-dry	1	27-Dec-2019 22:10
>nC12 to nC28	< 8.8		8.8	45	mg/Kg-dry	1	27-Dec-2019 22:10
>nC28 to nC35	< 8.8		8.8	45	mg/Kg-dry	1	27-Dec-2019 22:10
Total Petroleum Hydrocarbon	< 6.7		6.7	45	mg/Kg-dry	1	27-Dec-2019 22:10
Surr: 2-Fluorobiphenyl	*89.9*			*70-130*	*%REC*	*1*	*27-Dec-2019 22:10*
Surr: Trifluoromethyl benzene	*98.4*			*70-130*	*%REC*	*1*	*27-Dec-2019 22:10*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**12.3**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SQ-1620-DPT3519(4-5)-20191219
Collection Date: 19-Dec-2019 13:45

ANALYTICAL REPORT
WorkOrder:HS19121108
Lab ID:HS19121108-07
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: GR
nC6 to nC12	**900**		**120**	**790**	**mg/Kg-dry**	10	27-Dec-2019 22:39
>nC12 to nC28	**13,000**		**150**	**790**	**mg/Kg-dry**	10	27-Dec-2019 22:39
>nC28 to nC35	**2,900**		**150**	**790**	**mg/Kg-dry**	10	27-Dec-2019 22:39
Total Petroleum Hydrocarbon	**16,800**		**120**	**790**	**mg/Kg-dry**	10	27-Dec-2019 22:39
Surr: 2-Fluorobiphenyl	*113*			*70-130*	*%REC*	*10*	*27-Dec-2019 22:39*
Surr: Trifluoromethyl benzene	*98.3*			*70-130*	*%REC*	*10*	*27-Dec-2019 22:39*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 06-Jan-2020		Analyst: MBG
Aliphatics nC6	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aliphatics >nC6 to nC8	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aliphatics >nC8 to nC10	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aliphatics >nC10 to nC12	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aliphatics >nC12 to nC16	**300**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aliphatics >nC16 to nC21	**600**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aliphatics >nC21 to nC35	**1,200**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Total Aliphatic Fraction	**2,100**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aliphatics Relative % Distribution	**27**	n	**0**	**0**	**%-dry**	10	06-Jan-2020 18:10
Aromatics >nC7 to nC8	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aromatics >nC8 to nC10	< 79	n	79	160	mg/Kg-dry	10	06-Jan-2020 18:10
Aromatics >nC10 to nC12	**470**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aromatics >nC12 to nC16	**810**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aromatics >nC16 to nC21	**2,200**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aromatics >nC21 to nC35	**2,200**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Total Aromatic Fraction	**5,680**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
Aromatics Relative % Distribution	**73**	n	**0**	**0**	**%-dry**	10	06-Jan-2020 18:10
Total Petroleum Hydrocarbons	**7,800**	n	**79**	**160**	**mg/Kg-dry**	10	06-Jan-2020 18:10
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**35.8**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS19121108
Sample ID:	SQ-1620-DPT3519(6-7)-20191219	Lab ID:	HS19121108-08
Collection Date:	19-Dec-2019 15:50	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 23-Dec-2019		Analyst: GR
nC6 to nC12	**200**	J	**82**	**550**	**mg/Kg-dry**	10	03-Jan-2020 21:38
>nC12 to nC28	**1,200**		**110**	**550**	**mg/Kg-dry**	10	03-Jan-2020 21:38
>nC28 to nC35	**170**	J	**110**	**550**	**mg/Kg-dry**	10	03-Jan-2020 21:38
Total Petroleum Hydrocarbon	**1,570**		**82**	**550**	**mg/Kg-dry**	10	03-Jan-2020 21:38
Surr: 2-Fluorobiphenyl	*102*			*70-130*	*%REC*	*10*	*03-Jan-2020 21:38*
Surr: Trifluoromethyl benzene	*104*			*70-130*	*%REC*	*10*	*03-Jan-2020 21:38*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.6**		**0.0100**	**0.0100**	**wt%**	1	30-Dec-2019 10:09

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

Batch ID: 149026 **Start Date:** 23 Dec 2019 09:30 **End Date:** 23 Dec 2019 11:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19121108-01	1	10.84 (g)	10 (mL)	0.9225
HS19121108-02	1	12.23 (g)	10 (mL)	0.8177
HS19121108-03	1	11.4 (g)	10 (mL)	0.8772
HS19121108-04	1	12.16 (g)	10 (mL)	0.8224

Batch ID: 149028 **Start Date:** 23 Dec 2019 10:30 **End Date:** 23 Dec 2019 12:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19121108-05	1	13.13 (g)	10 (mL)	0.7616
HS19121108-06	1	12.71 (g)	10 (mL)	0.7868
HS19121108-07	1	9.88 (g)	10 (mL)	1.012
HS19121108-08	1	11.02 (g)	10 (mL)	0.9074

Batch ID: 149540 **Start Date:** 06 Jan 2020 12:00 **End Date:** 06 Jan 2020 15:00
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS19121108-03		11.4 (g)	10 (mL)	0.8772
HS19121108-07		9.88 (g)	10 (mL)	1.012

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 149026 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS19121108-01	SQ-1620-DPT4019(1.25-2)-20191218	18 Dec 2019 10:05		23 Dec 2019 09:30	30 Dec 2019 20:57	10
HS19121108-02	SQ-1620-DPT4019(7-8)-20191218	18 Dec 2019 11:45		23 Dec 2019 09:30	30 Dec 2019 21:26	1
HS19121108-03	SQ-1620-DPT3419(4-5)-20191218	18 Dec 2019 13:45		23 Dec 2019 09:30	03 Jan 2020 20:11	50
HS19121108-04	SQ-1620-DPT3419(5-6)-20191218	18 Dec 2019 15:10		23 Dec 2019 09:30	30 Dec 2019 22:24	10
Batch ID: 149028 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS19121108-05	SQ-1620-SB218(2.25-3)-20191219	19 Dec 2019 10:15		23 Dec 2019 10:30	27 Dec 2019 21:41	1
HS19121108-06	SQ-1620-SB218((15-16)-20191219	19 Dec 2019 11:25		23 Dec 2019 10:30	27 Dec 2019 22:10	1
HS19121108-07	SQ-1620-DPT3519(4-5)-20191219	19 Dec 2019 13:45		23 Dec 2019 10:30	27 Dec 2019 22:39	10
HS19121108-08	SQ-1620-DPT3519(6-7)-20191219	19 Dec 2019 15:50		23 Dec 2019 10:30	03 Jan 2020 21:38	10
Batch ID: 149540 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS19121108-03	SQ-1620-DPT3419(4-5)-20191218	18 Dec 2019 13:45		06 Jan 2020 12:00	06 Jan 2020 17:40	50
HS19121108-03	SQ-1620-DPT3419(4-5)-20191218	18 Dec 2019 13:45		06 Jan 2020 12:00	06 Jan 2020 17:40	50
HS19121108-07	SQ-1620-DPT3519(4-5)-20191219	19 Dec 2019 13:45		06 Jan 2020 12:00	06 Jan 2020 18:10	10
HS19121108-07	SQ-1620-DPT3519(4-5)-20191219	19 Dec 2019 13:45		06 Jan 2020 12:00	06 Jan 2020 18:10	10
Batch ID: R353569 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS19121108-01	SQ-1620-DPT4019(1.25-2)-20191218	18 Dec 2019 10:05			30 Dec 2019 10:09	1
HS19121108-02	SQ-1620-DPT4019(7-8)-20191218	18 Dec 2019 11:45			30 Dec 2019 10:09	1
HS19121108-03	SQ-1620-DPT3419(4-5)-20191218	18 Dec 2019 13:45			30 Dec 2019 10:09	1
HS19121108-04	SQ-1620-DPT3419(5-6)-20191218	18 Dec 2019 15:10			30 Dec 2019 10:09	1
HS19121108-05	SQ-1620-SB218(2.25-3)-20191219	19 Dec 2019 10:15			30 Dec 2019 10:09	1
HS19121108-06	SQ-1620-SB218((15-16)-20191219	19 Dec 2019 11:25			30 Dec 2019 10:09	1
HS19121108-07	SQ-1620-DPT3519(4-5)-20191219	19 Dec 2019 13:45			30 Dec 2019 10:09	1
HS19121108-08	SQ-1620-DPT3519(6-7)-20191219	19 Dec 2019 15:50			30 Dec 2019 10:09	1

WorkOrder: HS19121108
InstrumentID: FID-11
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	30	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	22	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	22	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	22	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS19121108
InstrumentID: FID-11
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

WorkOrder: HS19121108
InstrumentID: FID-10
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: 149026 (0) **Instrument: FID-11** **Method: TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-149026** Units: **mg/Kg** Analysis Date: **30-Dec-2019 10:50**
Client ID: Run ID: **FID-11_353740** SeqNo: **5421274** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*30.66*	*0*	*25*	*0*	*123*	*70 - 130*				
Surr: Trifluoromethyl benzene	*32.32*	*0*	*25*	*0*	*129*	*70 - 130*				

LCS Sample ID: **LCS-149026** Units: **mg/Kg** Analysis Date: **30-Dec-2019 11:19**
Client ID: Run ID: **FID-11_353740** SeqNo: **5421275** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	286.3	50	250	0	115	75 - 125				
>nC12 to nC28	246.7	50	250	0	98.7	75 - 125				
Surr: 2-Fluorobiphenyl	*32.26*	*0*	*25*	*0*	*129*	*70 - 130*				
Surr: Trifluoromethyl benzene	*32.35*	*0*	*25*	*0*	*129*	*70 - 130*				

LCSD Sample ID: **LCSD-149026** Units: **mg/Kg** Analysis Date: **30-Dec-2019 12:13**
Client ID: Run ID: **FID-11_353740** SeqNo: **5421276** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	300.9	50	250	0	120	75 - 125	286.3	4.97	20	
>nC12 to nC28	276.1	50	250	0	110	75 - 125	246.7	11.3	20	
Surr: 2-Fluorobiphenyl	*31.7*	*0*	*25*	*0*	*127*	*70 - 130*	*32.26*	*1.73*	*20*	
Surr: Trifluoromethyl benzene	*30.8*	*0*	*25*	*0*	*123*	*70 - 130*	*32.35*	*4.9*	*20*	

MS Sample ID: **HS19120963-03MS** Units: **mg/Kg** Analysis Date: **30-Dec-2019 13:11**
Client ID: Run ID: **FID-11_353740** SeqNo: **5421278** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	1128	47	236.1	855.5	115	75 - 125				E
>nC12 to nC28	3167	47	236.1	2679	207	75 - 125				SEO
Surr: 2-Fluorobiphenyl	*52.13*	*0*	*23.61*	*0*	*221*	*70 - 130*				S
Surr: Trifluoromethyl benzene	*22.51*	*0*	*23.61*	*0*	*95.3*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: 149026 (0) **Instrument: FID-11** **Method: TEXAS TPH BY TX1005**

MSD Sample ID: **HS19120963-03MSD** Units: **mg/Kg** Analysis Date: **30-Dec-2019 13:40**
Client ID: Run ID: **FID-11_353740** SeqNo: **5421279** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	1107	47	237.4	855.5	106	75 - 125	1128	1.82	20	E
>nC12 to nC28	3095	47	237.4	2679	175	75 - 125	3167	2.3	20	SEO
Surr: 2-Fluorobiphenyl	*51.86*	*0*	*23.74*	*0*	*218*	*70 - 130*	*52.13*	*0.509*	*20*	S
Surr: Trifluoromethyl benzene	*22.59*	*0*	*23.74*	*0*	*95.1*	*70 - 130*	*22.51*	*0.368*	*20*	

The following samples were analyzed in this batch: HS19121108-01 HS19121108-02 HS19121108-03 HS19121108-04

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: **149028 (0)** **Instrument:** **FID-11** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-149028** Units: **mg/Kg** Analysis Date: **27-Dec-2019 17:45**
Client ID: Run ID: **FID-11_353511** SeqNo: **5415294** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*26.84*	*0*	*25*	*0*	*107*	*70 - 130*				
Surr: Trifluoromethyl benzene	*28.05*	*0*	*25*	*0*	*112*	*70 - 130*				

LCS Sample ID: **LCS-149028** Units: **mg/Kg** Analysis Date: **27-Dec-2019 18:14**
Client ID: Run ID: **FID-11_353511** SeqNo: **5415295** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	261.2	50	250	0	104	75 - 125				
>nC12 to nC28	258.7	50	250	0	103	75 - 125				
Surr: 2-Fluorobiphenyl	*30.91*	*0*	*25*	*0*	*124*	*70 - 130*				
Surr: Trifluoromethyl benzene	*30.3*	*0*	*25*	*0*	*121*	*70 - 130*				

LCSD Sample ID: **LCSD-149028** Units: **mg/Kg** Analysis Date: **27-Dec-2019 18:44**
Client ID: Run ID: **FID-11_353511** SeqNo: **5415296** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	260.7	50	250	0	104	75 - 125	261.2	0.196	20	
>nC12 to nC28	261.6	50	250	0	105	75 - 125	258.7	1.15	20	
Surr: 2-Fluorobiphenyl	*30.25*	*0*	*25*	*0*	*121*	*70 - 130*	*30.91*	*2.18*	*20*	
Surr: Trifluoromethyl benzene	*29.53*	*0*	*25*	*0*	*118*	*70 - 130*	*30.3*	*2.56*	*20*	

MS Sample ID: **HS19121244-01MS** Units: **mg/Kg** Analysis Date: **27-Dec-2019 19:43**
Client ID: Run ID: **FID-11_353511** SeqNo: **5415298** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	228.4	47	235.4	0.5579	96.8	75 - 125				
>nC12 to nC28	212	47	235.4	0	90.1	75 - 125				
Surr: 2-Fluorobiphenyl	*24.1*	*0*	*23.54*	*0*	*102*	*70 - 130*				
Surr: Trifluoromethyl benzene	*23.38*	*0*	*23.54*	*0*	*99.3*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: 149028 (0) **Instrument: FID-11** **Method: TEXAS TPH BY TX1005**

MSD Sample ID: **HS19121244-01MSD** Units: **mg/Kg** Analysis Date: **27-Dec-2019 20:12**

Client ID: Run ID: **FID-11_353511** SeqNo: **5415299** PrepDate: **23-Dec-2019** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	227.9	48	240.4	0.5579	94.6	75 - 125	228.4	0.193	20	
>nC12 to nC28	214.8	48	240.4	0	89.4	75 - 125	212	1.32	20	
Surr: 2-Fluorobiphenyl	*24.56*	*0*	*24.04*	*0*	*102*	*70 - 130*	*24.1*	*1.85*	*20*	
Surr: Trifluoromethyl benzene	*23.71*	*0*	*24.04*	*0*	*98.7*	*70 - 130*	*23.38*	*1.42*	*20*	

The following samples were analyzed in this batch: HS19121108-05 HS19121108-06 HS19121108-07 HS19121108-08

QC BATCH REPORT

Batch ID: 149540 (0) **Instrument:** FID-11 **Method:** PETROLEUM HYDROCARBONS BY TX1006

MBLK Sample ID: **MBLK-149540** Units: **mg/Kg** Analysis Date: **06-Jan-2020 19:08**
Client ID: Run ID: **FID-11_354177** SeqNo: **5431052** PrepDate: **06-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution	0	0								
Total Petroleum Hydrocarbons	< 5.0	10								

MBLK Sample ID: **MBLK-149540** Units: **mg/Kg** Analysis Date: **06-Jan-2020 19:08**
Client ID: Run ID: **FID-10_354183** SeqNo: **5431114** PrepDate: **06-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution	0	0								

LCS Sample ID: **LCS-149540** Units: **mg/Kg** Analysis Date: **06-Jan-2020 19:38**
Client ID: Run ID: **FID-11_354177** SeqNo: **5431053** PrepDate: **06-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	463.2	10	500	0	92.6	60 - 140				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: **149540 (0)** **Instrument:** **FID-11** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

LCSD Sample ID: **LCSD-149540** Units: **mg/Kg** Analysis Date: **06-Jan-2020 20:07**
Client ID: Run ID: **FID-11_354177** SeqNo: **5431054** PrepDate: **06-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	464.4	10	500	0	92.9	60 - 140	463.2	0.25	30	

The following samples were analyzed in this batch: HS19121108-03 HS19121108-07

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS19121108

QC BATCH REPORT

Batch ID: **R353569 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS19121255-02DUP** Units: **wt%** Analysis Date: **30-Dec-2019 10:09**
Client ID: Run ID: **Balance1_353569** SeqNo: **5417236** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	23.2	0.0100					23.3	0.43	20	

The following samples were analyzed in this batch:

HS19121108-01	HS19121108-02	HS19121108-03	HS19121108-04
HS19121108-05	HS19121108-06	HS19121108-07	HS19121108-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS19121108**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS19121108

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS19121108-01	SQ-1620-DPT4019(1.25-2)-20191218	Login	12/19/2019 7:57:07 PM	NDR	SPA082
HS19121108-01	SQ-1620-DPT4019(1.25-2)-20191218	Login	12/19/2019 7:57:07 PM	NDR	LF019

Sample Receipt Checklist

Client Name:	PBW	Date/Time Received:	**19-Dec-2019 18:25**
Work Order:	HS19121108	Received by:	**NDR**

Checklist completed by: *Nilesh D. Ranchod* eSignature 19-Dec-2019 Date

Reviewed by: *Dane J. Wacasey* eSignature 24-Dec-2019 Date

Matrices: **Soil**

Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212487
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	1.2°C uc/c		IR # 11
Cooler(s)/Kit(s):	45513		
Date/Time sample(s) sent to storage:	12/19/2019 8:15pm		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

ALS

Cincinnati, OH
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Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 3 of ____

COC ID: 212487

ALS Project Manager:

HS19121108

.WV

Golder Associates Inc.
Houston TX-Wood Preserving Works

Customer Information

Purchase Order: UPRR/Kevin Peterburs
Work Order:
Company Name: Golder Associates Inc.
Send Report To: Eric Matzner
Address: 2201 Double Creek Drive
Suite 4004
City/State/Zip: Round Rock, TX 78664
Phone: (512) 671-3434
Fax: (512) 671-3446
e-Mail Address: Eric_Matzner@golder.com

Project Information

Project Name: Houston TX-Wood Preserving Works
Project Number: 1620-10-Rev0 SR 92688
Bill To Company: Union Pacific Railroad- A/P
Invoice Attn: Accounts Payable
Address: 1400 Douglas Street
Stop 0750
City/State/Zip: Omaha NE 681790750
Phone:
Fax:
e-Mail Address:

A TX1005_S_REV3 (5643233 TX1005 TPH)
B MOIST_ASTM (5631931 Moisture Content)
C TX1006_S (5645481 TPH TX1006) [HOLD]
D
E
F
G
H
I
J

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-DPT4019(1.25-2)-20191218	12.18.19	10:05	Soil	8	~~1~~ 3	X	X	X								
2	" -DPT4019(7-8)- "	12.18.19	11:45	↓	↓	↓	↓	↓	↓								
3	" -DPT3419(4-5)- "	12.18.19	13:45														
4	" -DPT3419(5-6)- "	12.18.19	15:10														
5	SO-1620-DPTD19(2.25-3)-20191219	12.19.19	10:15														
6	" -DPTD19(15-16)-20191219	12.19.19	11:25														
7	" -DPT3519(4-5)- "	12.19.19	13:45														
8	" -DPT3519(6-7)- "	12.19.19	15:50														
9																	
10																	

Sampler(s) Please Print & Sign: Sarah Balke Sarah Balke

Shipment Method: Courier

Required Turnaround Time: (Check Box) ☐ Other ______
☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Sarah Balke Date: 12.19.19 Time: 1745 Received by:
Relinquished by: Date: 12.19.19 Time: 1825 Received by (Laboratory): D_Q
Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
	u/c
45513	1.0/.7

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ______
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

IR 11 C/F 10

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

February 17, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS20011392**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 8 sample(s) on Jan 30, 2020 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER

Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20011392**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
a) Items consistent with NELAC Chapter 5,
b) dilution factors,
c) preparation methods,
d) cleanup methods, and
e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
a) Calculated recovery (%R), and
b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
a) LCS spiking amounts,
b) Calculated %R for each analyte, and
c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %Rs and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client: Golder Associates Inc.

Project: Houston TX-Wood Preserving Works

WorkOrder: **HS20011392**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group
LRC Date: 02/17/2020
Project Name: Houston TX-Wood Preserving Works
Laboratory Job Number: HS20011392
Reviewer Name: Dane Wacasey
Prep Batch Number(s): 150196, 150682, R355773

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				1

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group	LRC Date: 02/17/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20011392
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150196, 150682, R355773

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 02/17/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20011392
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150196, 150682, R355773

ER#[5]	**Description**
1	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS20011392

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS20011392-01	SO-1620-CPT2620(2-3)-20200128	Soil		28-Jan-2020 16:35	30-Jan-2020 05:30	☐
HS20011392-02	SO-1620-CPT2620(13-14)-20200129	Soil		29-Jan-2020 11:35	30-Jan-2020 05:30	☐
HS20011392-03	SO-1620-CPT2420(4-5)-20200129	Soil		29-Jan-2020 11:40	30-Jan-2020 05:30	☐
HS20011392-04	SO-1620-CPT2420(8-9)-20200129	Soil		29-Jan-2020 11:45	30-Jan-2020 05:30	☐
HS20011392-05	SO-1620-SB216(3-4)-20200129	Soil		29-Jan-2020 14:40	30-Jan-2020 05:30	☐
HS20011392-06	SO-1620-SB216(7-8)-20200129	Soil		29-Jan-2020 14:45	30-Jan-2020 05:30	☐
HS20011392-07	SO-1620-SB217(3-4)-20200129	Soil		29-Jan-2020 16:30	30-Jan-2020 05:30	☐
HS20011392-08	SO-1620-SB217(8-9)-20200129	Soil		29-Jan-2020 16:35	30-Jan-2020 05:30	☐

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
Sample ID:	SO-1620-CPT2620(2-3)-20200128
Collection Date:	28-Jan-2020 16:35

ANALYTICAL REPORT

WorkOrder:HS20011392

Lab ID:HS20011392-01

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	**170**	J	**48**	**330**	**mg/Kg-dry**	5	04-Feb-2020 17:16
>nC12 to nC28	**3,300**		**64**	**330**	**mg/Kg-dry**	5	04-Feb-2020 17:16
>nC28 to nC35	**440**		**64**	**330**	**mg/Kg-dry**	5	04-Feb-2020 17:16
Total Petroleum Hydrocarbon	**3,910**		**48**	**330**	**mg/Kg-dry**	5	04-Feb-2020 17:16
Surr: 2-Fluorobiphenyl	*72.4*			*70-130*	*%REC*	*5*	*04-Feb-2020 17:16*
Surr: Trifluoromethyl benzene	*79.7*			*70-130*	*%REC*	*5*	*04-Feb-2020 17:16*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 13-Feb-2020		Analyst: MBG
Aliphatics nC6	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC6 to nC8	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC8 to nC10	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC10 to nC12	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC12 to nC16	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC16 to nC21	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics >nC21 to nC35	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Total Aliphatic Fraction	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aliphatics Relative % Distribution	**0**	n	**0**	**0**	**%-dry**	5	14-Feb-2020 18:13
Aromatics >nC7 to nC8	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aromatics >nC8 to nC10	< 33	n	33	65	mg/Kg-dry	5	14-Feb-2020 18:13
Aromatics >nC10 to nC12	**76**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
Aromatics >nC12 to nC16	**1,400**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
Aromatics >nC16 to nC21	**1,700**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
Aromatics >nC21 to nC35	**550**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
Total Aromatic Fraction	**3,730**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
Aromatics Relative % Distribution	**100**	n	**0**	**0**	**%-dry**	5	14-Feb-2020 18:13
Total Petroleum Hydrocarbons	**3,700**	n	**33**	**65**	**mg/Kg-dry**	5	14-Feb-2020 18:13
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**16.5**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT2620(13-14)-20200129
Collection Date: 29-Jan-2020 11:35

ANALYTICAL REPORT
WorkOrder:HS20011392
Lab ID:HS20011392-02
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 8.2		8.2	55	mg/Kg-dry	1	31-Jan-2020 20:12
>nC12 to nC28	**14**	J	**11**	**55**	**mg/Kg-dry**	1	31-Jan-2020 20:12
>nC28 to nC35	< 11		11	55	mg/Kg-dry	1	31-Jan-2020 20:12
Total Petroleum Hydrocarbon	**14.0**	J	**8.2**	**55**	**mg/Kg-dry**	1	31-Jan-2020 20:12
Surr: 2-Fluorobiphenyl	*92.6*			*70-130*	*%REC*	*1*	*31-Jan-2020 20:12*
Surr: Trifluoromethyl benzene	*96.6*			*70-130*	*%REC*	*1*	*31-Jan-2020 20:12*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**18.0**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT2420(4-5)-20200129
Collection Date: 29-Jan-2020 11:40

ANALYTICAL REPORT

WorkOrder:HS20011392
Lab ID:HS20011392-03
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 7.6		7.6	51	mg/Kg-dry	1	31-Jan-2020 20:41
>nC12 to nC28	< 10		10	51	mg/Kg-dry	1	31-Jan-2020 20:41
>nC28 to nC35	< 10		10	51	mg/Kg-dry	1	31-Jan-2020 20:41
Total Petroleum Hydrocarbon	< 7.6		7.6	51	mg/Kg-dry	1	31-Jan-2020 20:41
Surr: 2-Fluorobiphenyl	*87.2*			*70-130*	*%REC*	*1*	*31-Jan-2020 20:41*
Surr: Trifluoromethyl benzene	*87.7*			*70-130*	*%REC*	*1*	*31-Jan-2020 20:41*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**19.7**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT2420(8-9)-20200129
Collection Date: 29-Jan-2020 11:45

ANALYTICAL REPORT

WorkOrder:HS20011392
Lab ID:HS20011392-04
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 7.0		7.0	47	mg/Kg-dry	1	31-Jan-2020 21:10
>nC12 to nC28	< 9.2		9.2	47	mg/Kg-dry	1	31-Jan-2020 21:10
>nC28 to nC35	< 9.2		9.2	47	mg/Kg-dry	1	31-Jan-2020 21:10
Total Petroleum Hydrocarbon	< 7.0		7.0	47	mg/Kg-dry	1	31-Jan-2020 21:10
Surr: 2-Fluorobiphenyl	*98.9*			*70-130*	*%REC*	*1*	*31-Jan-2020 21:10*
Surr: Trifluoromethyl benzene	*109*			*70-130*	*%REC*	*1*	*31-Jan-2020 21:10*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.4**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.

ANALYTICAL REPORT

Project: Houston TX-Wood Preserving Works

WorkOrder:HS20011392

Sample ID: SO-1620-SB216(3-4)-20200129

Lab ID:HS20011392-05

Collection Date: 29-Jan-2020 14:40

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 8.5		8.5	57	mg/Kg-dry	1	31-Jan-2020 21:39
>nC12 to nC28	< 11		11	57	mg/Kg-dry	1	31-Jan-2020 21:39
>nC28 to nC35	< 11		11	57	mg/Kg-dry	1	31-Jan-2020 21:39
Total Petroleum Hydrocarbon	< 8.5		8.5	57	mg/Kg-dry	1	31-Jan-2020 21:39
Surr: 2-Fluorobiphenyl	*79.3*			*70-130*	*%REC*	*1*	*31-Jan-2020 21:39*
Surr: Trifluoromethyl benzene	*89.5*			*70-130*	*%REC*	*1*	*31-Jan-2020 21:39*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**19.7**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
Sample ID:	SO-1620-SB216(7-8)-20200129
Collection Date:	29-Jan-2020 14:45

ANALYTICAL REPORT

WorkOrder:HS20011392

Lab ID:HS20011392-06

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	**27**	J	**7.3**	**49**	**mg/Kg-dry**	1	31-Jan-2020 22:08
>nC12 to nC28	**360**		**9.7**	**49**	**mg/Kg-dry**	1	31-Jan-2020 22:08
>nC28 to nC35	< 9.7		9.7	49	mg/Kg-dry	1	31-Jan-2020 22:08
Total Petroleum Hydrocarbon	**387**		**7.3**	**49**	**mg/Kg-dry**	1	31-Jan-2020 22:08
Surr: 2-Fluorobiphenyl	*89.1*			*70-130*	*%REC*	*1*	*31-Jan-2020 22:08*
Surr: Trifluoromethyl benzene	*82.3*			*70-130*	*%REC*	*1*	*31-Jan-2020 22:08*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.2**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20011392
Sample ID:	SO-1620-SB217(3-4)-20200129		Lab ID:HS20011392-07
Collection Date:	29-Jan-2020 16:30		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 8.7		8.7	59	mg/Kg-dry	1	31-Jan-2020 22:37
>nC12 to nC28	< 12		12	59	mg/Kg-dry	1	31-Jan-2020 22:37
>nC28 to nC35	< 12		12	59	mg/Kg-dry	1	31-Jan-2020 22:37
Total Petroleum Hydrocarbon	< 8.7		8.7	59	mg/Kg-dry	1	31-Jan-2020 22:37
Surr: 2-Fluorobiphenyl	*86.1*			*70-130*	*%REC*	*1*	*31-Jan-2020 22:37*
Surr: Trifluoromethyl benzene	*90.9*			*70-130*	*%REC*	*1*	*31-Jan-2020 22:37*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.8**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:HS20011392
Sample ID:	SO-1620-SB217(8-9)-20200129	Lab ID:HS20011392-08
Collection Date:	29-Jan-2020 16:35	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 31-Jan-2020		Analyst: MBG
nC6 to nC12	< 7.7		7.7	52	mg/Kg-dry	1	31-Jan-2020 23:06
>nC12 to nC28	< 10		10	52	mg/Kg-dry	1	31-Jan-2020 23:06
>nC28 to nC35	< 10		10	52	mg/Kg-dry	1	31-Jan-2020 23:06
Total Petroleum Hydrocarbon	< 7.7		7.7	52	mg/Kg-dry	1	31-Jan-2020 23:06
Surr: 2-Fluorobiphenyl	*82.4*			*70-130*	*%REC*	*1*	*31-Jan-2020 23:06*
Surr: Trifluoromethyl benzene	*88.6*			*70-130*	*%REC*	*1*	*31-Jan-2020 23:06*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**14.8**		**0.0100**	**0.0100**	**wt%**	1	05-Feb-2020 11:30

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

Batch ID: 150196 **Start Date:** 31 Jan 2020 10:30 **End Date:** 31 Jan 2020 13:00
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20011392-01	1	9.2 (g)	10 (mL)	1.087
HS20011392-02	1	11.1 (g)	10 (mL)	0.9009
HS20011392-03	1	12.15 (g)	10 (mL)	0.823
HS20011392-04	1	12.81 (g)	10 (mL)	0.7806
HS20011392-05	1	10.92 (g)	10 (mL)	0.9158
HS20011392-06	1	11.94 (g)	10 (mL)	0.8375
HS20011392-07	1	10.34 (g)	10 (mL)	0.9671
HS20011392-08	1	11.29 (g)	10 (mL)	0.8857

Batch ID: 150682 **Start Date:** 13 Feb 2020 11:30 **End Date:** 13 Feb 2020 12:30
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20011392-01		9.2 (g)	10 (mL)	1.087

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 150196 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS20011392-01	SO-1620-CPT2620(2-3)-20200128	28 Jan 2020 16:35		31 Jan 2020 10:30	04 Feb 2020 17:16	5
HS20011392-02	SO-1620-CPT2620(13-14)-20200129	29 Jan 2020 11:35		31 Jan 2020 10:30	31 Jan 2020 20:12	1
HS20011392-03	SO-1620-CPT2420(4-5)-20200129	29 Jan 2020 11:40		31 Jan 2020 10:30	31 Jan 2020 20:41	1
HS20011392-04	SO-1620-CPT2420(8-9)-20200129	29 Jan 2020 11:45		31 Jan 2020 10:30	31 Jan 2020 21:10	1
HS20011392-05	SO-1620-SB216(3-4)-20200129	29 Jan 2020 14:40		31 Jan 2020 10:30	31 Jan 2020 21:39	1
HS20011392-06	SO-1620-SB216(7-8)-20200129	29 Jan 2020 14:45		31 Jan 2020 10:30	31 Jan 2020 22:08	1
HS20011392-07	SO-1620-SB217(3-4)-20200129	29 Jan 2020 16:30		31 Jan 2020 10:30	31 Jan 2020 22:37	1
HS20011392-08	SO-1620-SB217(8-9)-20200129	29 Jan 2020 16:35		31 Jan 2020 10:30	31 Jan 2020 23:06	1
Batch ID: 150682 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20011392-01	SO-1620-CPT2620(2-3)-20200128	28 Jan 2020 16:35		13 Feb 2020 11:30	14 Feb 2020 18:13	5
HS20011392-01	SO-1620-CPT2620(2-3)-20200128	28 Jan 2020 16:35		13 Feb 2020 11:30	14 Feb 2020 18:13	5
Batch ID: R355773 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS20011392-01	SO-1620-CPT2620(2-3)-20200128	28 Jan 2020 16:35			05 Feb 2020 11:30	1
HS20011392-02	SO-1620-CPT2620(13-14)-20200129	29 Jan 2020 11:35			05 Feb 2020 11:30	1
HS20011392-03	SO-1620-CPT2420(4-5)-20200129	29 Jan 2020 11:40			05 Feb 2020 11:30	1
HS20011392-04	SO-1620-CPT2420(8-9)-20200129	29 Jan 2020 11:45			05 Feb 2020 11:30	1
HS20011392-05	SO-1620-SB216(3-4)-20200129	29 Jan 2020 14:40			05 Feb 2020 11:30	1
HS20011392-06	SO-1620-SB216(7-8)-20200129	29 Jan 2020 14:45			05 Feb 2020 11:30	1
HS20011392-07	SO-1620-SB217(3-4)-20200129	29 Jan 2020 16:30			05 Feb 2020 11:30	1
HS20011392-08	SO-1620-SB217(8-9)-20200129	29 Jan 2020 16:35			05 Feb 2020 11:30	1

WorkOrder: HS20011392
InstrumentID: FID-10
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	24	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	25	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	24	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	24	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20011392
InstrumentID: FID-12
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

WorkOrder: HS20011392
InstrumentID: FID-13
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

QC BATCH REPORT

Batch ID: **150196 (0)** **Instrument:** **FID-10** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-150196** Units: **mg/Kg** Analysis Date: **31-Jan-2020 16:49**
Client ID: Run ID: **FID-10_355525** SeqNo: **5456869** PrepDate: **31-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*24.84*	*0*	*25*	*0*	*99.4*	*70 - 130*				
Surr: Trifluoromethyl benzene	*23.71*	*0*	*25*	*0*	*94.8*	*70 - 130*				

LCS Sample ID: **LCS-150196** Units: **mg/Kg** Analysis Date: **31-Jan-2020 17:18**
Client ID: Run ID: **FID-10_355525** SeqNo: **5456870** PrepDate: **31-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	257	50	250	0	103	75 - 125				
>nC12 to nC28	237.8	50	250	0	95.1	75 - 125				
Surr: 2-Fluorobiphenyl	*29.39*	*0*	*25*	*0*	*118*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.85*	*0*	*25*	*0*	*99.4*	*70 - 130*				

LCSD Sample ID: **LCSD-150196** Units: **mg/Kg** Analysis Date: **31-Jan-2020 17:47**
Client ID: Run ID: **FID-10_355525** SeqNo: **5456871** PrepDate: **31-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	254	50	250	0	102	75 - 125	257	1.16	20	
>nC12 to nC28	214.5	50	250	0	85.8	75 - 125	237.8	10.3	20	
Surr: 2-Fluorobiphenyl	*27.2*	*0*	*25*	*0*	*109*	*70 - 130*	*29.39*	*7.73*	*20*	
Surr: Trifluoromethyl benzene	*23.52*	*0*	*25*	*0*	*94.1*	*70 - 130*	*24.85*	*5.51*	*20*	

MS Sample ID: **HS20011400-03MS** Units: **mg/Kg** Analysis Date: **31-Jan-2020 18:45**
Client ID: Run ID: **FID-10_355525** SeqNo: **5456873** PrepDate: **31-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	231.4	48	238.3	0	97.1	75 - 125				
>nC12 to nC28	193.6	48	238.3	0	81.2	75 - 125				
Surr: 2-Fluorobiphenyl	*27.34*	*0*	*23.83*	*0*	*115*	*70 - 130*				
Surr: Trifluoromethyl benzene	*22.99*	*0*	*23.83*	*0*	*96.4*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

QC BATCH REPORT

Batch ID: **150196 (0)** **Instrument:** **FID-10** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS20011400-03MSD** Units: **mg/Kg** Analysis Date: **31-Jan-2020 19:14**
Client ID: Run ID: **FID-10_355525** SeqNo: **5456874** PrepDate: **31-Jan-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	209.7	48	241.3	0	86.9	75 - 125	231.4	9.81	20	
>nC12 to nC28	201.6	48	241.3	0	83.5	75 - 125	193.6	4.05	20	
Surr: 2-Fluorobiphenyl	*22.45*	*0*	*24.13*	*0*	*93.0*	*70 - 130*	*27.34*	*19.6*	*20*	
Surr: Trifluoromethyl benzene	*20.03*	*0*	*24.13*	*0*	*83.0*	*70 - 130*	*22.99*	*13.8*	*20*	

The following samples were analyzed in this batch:

HS20011392-01	HS20011392-02	HS20011392-03	HS20011392-04
HS20011392-05	HS20011392-06	HS20011392-07	HS20011392-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

QC BATCH REPORT

Batch ID: **150682 (0)** **Instrument:** **FID-12** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150682** Units: **mg/Kg** Analysis Date: **14-Feb-2020 16:17**
Client ID: Run ID: **FID-12_356400** SeqNo: **5475560** PrepDate: **13-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution	0	0								
Total Petroleum Hydrocarbons	< 5.0	10								

MBLK Sample ID: **MBLK-150682** Units: **mg/Kg** Analysis Date: **14-Feb-2020 16:17**
Client ID: Run ID: **FID-13_356405** SeqNo: **5475605** PrepDate: **13-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution	0	0								

LCS Sample ID: **LCS-150682** Units: **mg/Kg** Analysis Date: **14-Feb-2020 16:46**
Client ID: Run ID: **FID-12_356400** SeqNo: **5475561** PrepDate: **13-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	609.2	10	500	0	122	60 - 140				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

QC BATCH REPORT

Batch ID: **150682 (0)** **Instrument:** **FID-12** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

LCSD Sample ID: **LCSD-150682** Units: **mg/Kg** Analysis Date: **14-Feb-2020 17:15**
Client ID: Run ID: **FID-12_356400** SeqNo: **5475562** PrepDate: **13-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	596.3	10	500	0	119	60 - 140	609.2	2.13	30	

The following samples were analyzed in this batch: HS20011392-01

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011392

QC BATCH REPORT

Batch ID: **R355773 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS20011392-08DUP** Units: **wt%** Analysis Date: **05-Feb-2020 11:30**

Client ID: **SO-1620-SB217(8-9)-20200129** Run ID: **Balance1_355773** SeqNo: **5462055** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	15	0.0100					14.8	1.34	20	

The following samples were analyzed in this batch:

HS20011392-01	HS20011392-02	HS20011392-03	HS20011392-04
HS20011392-05	HS20011392-06	HS20011392-07	HS20011392-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20011392**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Sample Receipt Checklist

Client Name:	PBW	Date/Time Received:	**30-Jan-2020 05:30**
Work Order:	HS20011392	Received by:	**DDG**

Checklist completed by: *Nilesh D. Ranchod* 30-Jan-2020
eSignature Date

Reviewed by: *Dane J. Wacasey* 4-Feb-2020
eSignature Date

Matrices: **Soil**

Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212485
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	0.8C UC/C		IR # 11
Cooler(s)/Kit(s):	45627		
Date/Time sample(s) sent to storage:	01/30/2020 15:00		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

ALS

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n, WV

Chain of Custody Forı

Page 1 of 1

COC ID: 212485

HS20011392

Golder Associates Inc.
Houston TX-Wood Preserving Works

ALS Project Manager:

Customer Information

Purchase Order	UPRR/Kevin Peterburs
Work Order	
Company Name	Golder Associates Inc.
Send Report To	Eric Matzner
Address	2201 Double Creek Drive Suite 4004
City/State/Zip	Round Rock, TX 78664
Phone	(512) 671-3434
Fax	(512) 671-3446
e-Mail Address	Eric_Matzner@golder.com

Project Information

Project Name	Houston TX-Wood Preserving Works
Project Number	1620-10-Rev0 SR 92663
Bill To Company	Union Pacific Railroad- A/P
Invoice Attn	Accounts Payable
Address	1400 Douglas Street Stop 0750
City/State/Zip	Omaha NE 681790750
Phone	
Fax	
e-Mail Address	

A TX1005_S_REV3 (5643233 TX1005 TPH)
B MOIST_ASTM (5631931 Moisture Content)
C TX1006_S (5645481 TPH TX1006) [HOLD]
D
E
F
G
H
I
J

Per Golder
MSA

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-CPT2620(2-3)-20200128	1-28-20	1635	Soil	8	2	X		X								
2	— CPT2620(13-14)-20200129	1-29-20	1135	↓	↓	↓	X		X								
3	— CPT2420(4-5) —	↓	1140	↓	↓	↓	X		X								
4	— CPT2420(8-9) —	↓	1145	↓	↓	↓	X		X								
5	— SB21620(3-4) —	↓	1440	↓	↓	↓	X		X								
6	— SB21620(7-8) —	↓	1445	↓	↓	↓	X		X								
7	— SB21720(3-4) —	↓	1630	↓	↓	↓	X		X								
8	— SB21720(8-9) —	↓	1635	↓	↓	↓	X		X								
9																	
10																	

Just A+C
for all
Samples

Hold 1006
Sampling

Sampler(s) Please Print & Sign: Blake Sekora

Shipment Method

Required Turnaround Time: (Check Box) ☐ Other______
☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Blake Sekora Date: 1-29-20 Time: 1655 Received by:

Relinquished by: Date: 1-30-20 Time: 0810 Received by (Laboratory): D.

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp. u/c
~~45627~~	~~0.5~~

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other______
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

ote: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

10450 Stancliff Rd. Suite 210
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February 21, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS20011494**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 8 sample(s) on Jan 31, 2020 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL

Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20011494**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
  a) Items consistent with NELAC Chapter 5,
  b) dilution factors,
  c) preparation methods,
  d) cleanup methods, and
  e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
  a) Calculated recovery (%R), and
  b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
  a) LCS spiking amounts,
  b) Calculated %R for each analyte, and
  c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  a) Samples associated with the MS/MSD clearly identified,
  b) MS/MSD spiking amounts,
  c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  d) Calculated %Rs and relative percent differences (RPDs), and
  e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
  a) the amount of analyte measured in the duplicate,
  b) the calculated RPD, and
  c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client: Golder Associates Inc.

Project: Houston TX-Wood Preserving Works

WorkOrder: **HS20011494**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group	LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20011494
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150266,150790,R356210

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				1

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group	LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20011494
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150266,150790,R356210

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20011494
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150266,150790,R356210

ER#[5]	Description
1	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS20011494

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS20011494-01	SO-1620-CPT1220(4-5)-20200130	Soil		30-Jan-2020 10:35	31-Jan-2020 11:10	☐
HS20011494-02	SO-1620-CPT1220(8-9)-20200130	Soil		30-Jan-2020 10:40	31-Jan-2020 11:10	☐
HS20011494-03	SO-1620-CPT1620(4-5)-20200130	Soil		30-Jan-2020 13:05	31-Jan-2020 11:10	☐
HS20011494-04	SO-1620-CPT1620(14-15)-20200130	Soil		30-Jan-2020 13:10	31-Jan-2020 11:10	☐
HS20011494-05	SO-1620-CPT2120(3-4)-20200130	Soil		30-Jan-2020 13:20	31-Jan-2020 11:10	☐
HS20011494-06	SO-1620-CPT2120(5-6)-20200130	Soil		30-Jan-2020 15:25	31-Jan-2020 11:10	☐
HS20011494-07	SO-1620-CPT4619(2-3)-20200130	Soil		30-Jan-2020 16:40	31-Jan-2020 11:10	☐
HS20011494-08	SO-1620-CPT4619(9-10)-20200131	Soil		31-Jan-2020 09:10	31-Jan-2020 11:10	☐

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT1220(4-5)-20200130
Collection Date: 30-Jan-2020 10:35

ANALYTICAL REPORT
WorkOrder:HS20011494
Lab ID:HS20011494-01
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**290**		**33**	**220**	**mg/Kg-dry**	5	07-Feb-2020 07:29
>nC12 to nC28	**2,300**		**43**	**220**	**mg/Kg-dry**	5	07-Feb-2020 07:29
>nC28 to nC35	**120**	J	**43**	**220**	**mg/Kg-dry**	5	07-Feb-2020 07:29
Total Petroleum Hydrocarbon	**2,710**		**33**	**220**	**mg/Kg-dry**	5	07-Feb-2020 07:29
Surr: 2-Fluorobiphenyl	*85.0*			*70-130*	*%REC*	*5*	*07-Feb-2020 07:29*
Surr: Trifluoromethyl benzene	*78.1*			*70-130*	*%REC*	*5*	*07-Feb-2020 07:29*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**16.2**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20011494
Sample ID:	SO-1620-CPT1220(8-9)-20200130		Lab ID:HS20011494-02
Collection Date:	30-Jan-2020 10:40		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**1,300**		**77**	**520**	**mg/Kg-dry**	10	07-Feb-2020 07:58
>nC12 to nC28	**6,500**		**100**	**520**	**mg/Kg-dry**	10	07-Feb-2020 07:58
>nC28 to nC35	**270**	J	**100**	**520**	**mg/Kg-dry**	10	07-Feb-2020 07:58
Total Petroleum Hydrocarbon	**8,070**		**77**	**520**	**mg/Kg-dry**	10	07-Feb-2020 07:58
Surr: 2-Fluorobiphenyl	*81.8*			*70-130*	*%REC*	*10*	*07-Feb-2020 07:58*
Surr: Trifluoromethyl benzene	*78.9*			*70-130*	*%REC*	*10*	*07-Feb-2020 07:58*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 17-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aliphatics >nC6 to nC8	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aliphatics >nC8 to nC10	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aliphatics >nC10 to nC12	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aliphatics >nC12 to nC16	**110**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aliphatics >nC16 to nC21	**58**	Jn	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aliphatics >nC21 to nC35	**52**	Jn	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Total Aliphatic Fraction	**220**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aliphatics Relative % Distribution	**3.2**	n	**0**	**0**	**%-dry**	10	18-Feb-2020 18:47
Aromatics >nC7 to nC8	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aromatics >nC8 to nC10	< 52	n	52	100	mg/Kg-dry	10	18-Feb-2020 18:47
Aromatics >nC10 to nC12	**1,100**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aromatics >nC12 to nC16	**2,000**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aromatics >nC16 to nC21	**2,600**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aromatics >nC21 to nC35	**990**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Total Aromatic Fraction	**6,690**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
Aromatics Relative % Distribution	**97**	n	**0**	**0**	**%-dry**	10	18-Feb-2020 18:47
Total Petroleum Hydrocarbons	**6,900**	n	**52**	**100**	**mg/Kg-dry**	10	18-Feb-2020 18:47
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**13.4**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:HS20011494
Sample ID:	SO-1620-CPT1620(4-5)-20200130	Lab ID:HS20011494-03
Collection Date:	30-Jan-2020 13:05	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**270**		**6.9**	**47**	**mg/Kg-dry**	1	05-Feb-2020 22:36
>nC12 to nC28	**860**		**9.1**	**47**	**mg/Kg-dry**	1	05-Feb-2020 22:36
>nC28 to nC35	**28**	J	**9.1**	**47**	**mg/Kg-dry**	1	05-Feb-2020 22:36
Total Petroleum Hydrocarbon	**1,160**		**6.9**	**47**	**mg/Kg-dry**	1	05-Feb-2020 22:36
Surr: 2-Fluorobiphenyl	*81.8*			*70-130*	*%REC*	*1*	*05-Feb-2020 22:36*
Surr: Trifluoromethyl benzene	*78.2*			*70-130*	*%REC*	*1*	*05-Feb-2020 22:36*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**16.6**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS20011494
Sample ID:	SO-1620-CPT1620(14-15)-20200130	Lab ID:	HS20011494-04
Collection Date:	30-Jan-2020 13:10	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**1,300**		**63**	**420**	**mg/Kg-dry**	10	07-Feb-2020 08:28
>nC12 to nC28	**3,100**		**83**	**420**	**mg/Kg-dry**	10	07-Feb-2020 08:28
>nC28 to nC35	**120**	J	**83**	**420**	**mg/Kg-dry**	10	07-Feb-2020 08:28
Total Petroleum Hydrocarbon	**4,520**		**63**	**420**	**mg/Kg-dry**	10	07-Feb-2020 08:28
Surr: 2-Fluorobiphenyl	*107*			*70-130*	*%REC*	*10*	*07-Feb-2020 08:28*
Surr: Trifluoromethyl benzene	*90.1*			*70-130*	*%REC*	*10*	*07-Feb-2020 08:28*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.5**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:HS20011494
Sample ID:	SO-1620-CPT2120(3-4)-20200130	Lab ID:HS20011494-05
Collection Date:	30-Jan-2020 13:20	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**1,300**		**38**	**260**	**mg/Kg-dry**	5	07-Feb-2020 08:57
>nC12 to nC28	**2,800**		**50**	**260**	**mg/Kg-dry**	5	07-Feb-2020 08:57
>nC28 to nC35	**97**	J	**50**	**260**	**mg/Kg-dry**	5	07-Feb-2020 08:57
Total Petroleum Hydrocarbon	**4,200**		**38**	**260**	**mg/Kg-dry**	5	07-Feb-2020 08:57
Surr: 2-Fluorobiphenyl	*97.2*			*70-130*	*%REC*	*5*	*07-Feb-2020 08:57*
Surr: Trifluoromethyl benzene	*88.7*			*70-130*	*%REC*	*5*	*07-Feb-2020 08:57*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 17-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 26	n	26	51	mg/Kg-dry	5	18-Feb-2020 19:16
Aliphatics >nC6 to nC8	< 26	n	26	51	mg/Kg-dry	5	18-Feb-2020 19:16
Aliphatics >nC8 to nC10	**53**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aliphatics >nC10 to nC12	**38**	Jn	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aliphatics >nC12 to nC16	**36**	Jn	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aliphatics >nC16 to nC21	**27**	Jn	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aliphatics >nC21 to nC35	< 26	n	26	51	mg/Kg-dry	5	18-Feb-2020 19:16
Total Aliphatic Fraction	**154**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aliphatics Relative % Distribution	**4.7**	n	**0**	**0**	**%-dry**	5	18-Feb-2020 19:16
Aromatics >nC7 to nC8	< 26	n	26	51	mg/Kg-dry	5	18-Feb-2020 19:16
Aromatics >nC8 to nC10	**470**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aromatics >nC10 to nC12	**440**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aromatics >nC12 to nC16	**710**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aromatics >nC16 to nC21	**1,100**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aromatics >nC21 to nC35	**390**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Total Aromatic Fraction	**3,110**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
Aromatics Relative % Distribution	**95**	n	**0**	**0**	**%-dry**	5	18-Feb-2020 19:16
Total Petroleum Hydrocarbons	**3,300**	n	**26**	**51**	**mg/Kg-dry**	5	18-Feb-2020 19:16
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**19.6**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20011494
Sample ID:	SO-1620-CPT2120(5-6)-20200130		Lab ID:HS20011494-06
Collection Date:	30-Jan-2020 15:25		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	**48**		**6.2**	**42**	**mg/Kg-dry**	1	06-Feb-2020 00:04
>nC12 to nC28	**110**		**8.2**	**42**	**mg/Kg-dry**	1	06-Feb-2020 00:04
>nC28 to nC35	**22**	J	**8.2**	**42**	**mg/Kg-dry**	1	06-Feb-2020 00:04
Total Petroleum Hydrocarbon	**180**		**6.2**	**42**	**mg/Kg-dry**	1	06-Feb-2020 00:04
Surr: 2-Fluorobiphenyl	*87.1*			*70-130*	*%REC*	*1*	*06-Feb-2020 00:04*
Surr: Trifluoromethyl benzene	*82.1*			*70-130*	*%REC*	*1*	*06-Feb-2020 00:04*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.0**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT4619(2-3)-20200130
Collection Date: 30-Jan-2020 16:40

ANALYTICAL REPORT
WorkOrder:HS20011494
Lab ID:HS20011494-07
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	< 6.5		6.5	44	mg/Kg-dry	1	06-Feb-2020 00:33
>nC12 to nC28	< 8.5		8.5	44	mg/Kg-dry	1	06-Feb-2020 00:33
>nC28 to nC35	< 8.5		8.5	44	mg/Kg-dry	1	06-Feb-2020 00:33
Total Petroleum Hydrocarbon	< 6.5		6.5	44	mg/Kg-dry	1	06-Feb-2020 00:33
Surr: 2-Fluorobiphenyl	*93.4*			*70-130*	*%REC*	*1*	*06-Feb-2020 00:33*
Surr: Trifluoromethyl benzene	*90.2*			*70-130*	*%REC*	*1*	*06-Feb-2020 00:33*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.4**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**	
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS20011494
Sample ID:	SO-1620-CPT4619(9-10)-20200131	Lab ID:	HS20011494-08
Collection Date:	31-Jan-2020 09:10	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 04-Feb-2020		Analyst: MBG
nC6 to nC12	< 6.4		6.4	43	mg/Kg-dry	1	06-Feb-2020 01:03
>nC12 to nC28	< 8.4		8.4	43	mg/Kg-dry	1	06-Feb-2020 01:03
>nC28 to nC35	< 8.4		8.4	43	mg/Kg-dry	1	06-Feb-2020 01:03
Total Petroleum Hydrocarbon	< 6.4		6.4	43	mg/Kg-dry	1	06-Feb-2020 01:03
Surr: 2-Fluorobiphenyl	*88.2*			*70-130*	*%REC*	*1*	*06-Feb-2020 01:03*
Surr: Trifluoromethyl benzene	*83.6*			*70-130*	*%REC*	*1*	*06-Feb-2020 01:03*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**18.8**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

Batch ID: 150266 **Start Date:** 04 Feb 2020 09:00 **End Date:** 04 Feb 2020 13:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20011494-01	1	13.53 (g)	10 (mL)	0.7391
HS20011494-02	1	11.17 (g)	10 (mL)	0.8953
HS20011494-03	1	12.89 (g)	10 (mL)	0.7758
HS20011494-04	1	13.94 (g)	10 (mL)	0.7174
HS20011494-05	1	12.14 (g)	10 (mL)	0.8237
HS20011494-06	1	14 (g)	10 (mL)	0.7143
HS20011494-07	1	13.58 (g)	10 (mL)	0.7364
HS20011494-08	1	14.31 (g)	10 (mL)	0.6988

Batch ID: 150790 **Start Date:** 17 Feb 2020 14:30 **End Date:** 18 Feb 2020 12:00
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20011494-02		11.17 (g)	10 (mL)	0.8953
HS20011494-05		12.14 (g)	10 (mL)	0.8237

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 150266 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS20011494-01	SO-1620-CPT1220(4-5)-20200130	30 Jan 2020 10:35		04 Feb 2020 09:00	07 Feb 2020 07:29	5
HS20011494-02	SO-1620-CPT1220(8-9)-20200130	30 Jan 2020 10:40		04 Feb 2020 09:00	07 Feb 2020 07:58	10
HS20011494-03	SO-1620-CPT1620(4-5)-20200130	30 Jan 2020 13:05		04 Feb 2020 09:00	05 Feb 2020 22:36	1
HS20011494-04	SO-1620-CPT1620(14-15)-20200130	30 Jan 2020 13:10		04 Feb 2020 09:00	07 Feb 2020 08:28	10
HS20011494-05	SO-1620-CPT2120(3-4)-20200130	30 Jan 2020 13:20		04 Feb 2020 09:00	07 Feb 2020 08:57	5
HS20011494-06	SO-1620-CPT2120(5-6)-20200130	30 Jan 2020 15:25		04 Feb 2020 09:00	06 Feb 2020 00:04	1
HS20011494-07	SO-1620-CPT4619(2-3)-20200130	30 Jan 2020 16:40		04 Feb 2020 09:00	06 Feb 2020 00:33	1
HS20011494-08	SO-1620-CPT4619(9-10)-20200131	31 Jan 2020 09:10		04 Feb 2020 09:00	06 Feb 2020 01:03	1
Batch ID: 150790 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20011494-02	SO-1620-CPT1220(8-9)-20200130	30 Jan 2020 10:40		17 Feb 2020 14:30	18 Feb 2020 18:47	10
HS20011494-05	SO-1620-CPT2120(3-4)-20200130	30 Jan 2020 13:20		17 Feb 2020 14:30	18 Feb 2020 19:16	5
Batch ID: 150790 (1)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20011494-02	SO-1620-CPT1220(8-9)-20200130	30 Jan 2020 10:40		17 Feb 2020 14:30	18 Feb 2020 18:47	10
HS20011494-05	SO-1620-CPT2120(3-4)-20200130	30 Jan 2020 13:20		17 Feb 2020 14:30	18 Feb 2020 19:16	5
Batch ID: R356210 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS20011494-01	SO-1620-CPT1220(4-5)-20200130	30 Jan 2020 10:35			12 Feb 2020 13:42	1
HS20011494-02	SO-1620-CPT1220(8-9)-20200130	30 Jan 2020 10:40			12 Feb 2020 13:42	1
HS20011494-03	SO-1620-CPT1620(4-5)-20200130	30 Jan 2020 13:05			12 Feb 2020 13:42	1
HS20011494-04	SO-1620-CPT1620(14-15)-20200130	30 Jan 2020 13:10			12 Feb 2020 13:42	1
HS20011494-05	SO-1620-CPT2120(3-4)-20200130	30 Jan 2020 13:20			12 Feb 2020 13:42	1
HS20011494-06	SO-1620-CPT2120(5-6)-20200130	30 Jan 2020 15:25			12 Feb 2020 13:42	1
HS20011494-07	SO-1620-CPT4619(2-3)-20200130	30 Jan 2020 16:40			12 Feb 2020 13:42	1
HS20011494-08	SO-1620-CPT4619(9-10)-20200131	31 Jan 2020 09:10			12 Feb 2020 13:42	1

WorkOrder: HS20011494
InstrumentID: FID-11
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	23	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	26	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	23	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	23	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20011494
InstrumentID: FID-10
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

QC BATCH REPORT

Batch ID: **150266 (0)** **Instrument:** **FID-11** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-150266** Units: **mg/Kg** Analysis Date: **05-Feb-2020 18:40**
Client ID: Run ID: **FID-11_355778** SeqNo: **5462136** PrepDate: **04-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*24.4*	*0*	*25*	*0*	*97.6*	*70 - 130*				
Surr: Trifluoromethyl benzene	*23.86*	*0*	*25*	*0*	*95.4*	*70 - 130*				

LCS Sample ID: **LCS-150266** Units: **mg/Kg** Analysis Date: **05-Feb-2020 19:10**
Client ID: Run ID: **FID-11_355778** SeqNo: **5462137** PrepDate: **04-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	222.8	50	250	0	89.1	75 - 125				
>nC12 to nC28	221.6	50	250	0	88.6	75 - 125				
Surr: 2-Fluorobiphenyl	*26.55*	*0*	*25*	*0*	*106*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.53*	*0*	*25*	*0*	*98.1*	*70 - 130*				

LCSD Sample ID: **LCSD-150266** Units: **mg/Kg** Analysis Date: **05-Feb-2020 19:39**
Client ID: Run ID: **FID-11_355778** SeqNo: **5462138** PrepDate: **04-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	220.2	50	250	0	88.1	75 - 125	222.8	1.17	20	
>nC12 to nC28	219.5	50	250	0	87.8	75 - 125	221.6	0.942	20	
Surr: 2-Fluorobiphenyl	*26.72*	*0*	*25*	*0*	*107*	*70 - 130*	*26.55*	*0.642*	*20*	
Surr: Trifluoromethyl benzene	*24.45*	*0*	*25*	*0*	*97.8*	*70 - 130*	*24.53*	*0.344*	*20*	

MS Sample ID: **HS20011502-01MS** Units: **mg/Kg** Analysis Date: **05-Feb-2020 20:38**
Client ID: Run ID: **FID-11_355778** SeqNo: **5462140** PrepDate: **04-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	256.9	48	241.3	14.72	100	75 - 125				
>nC12 to nC28	266.4	48	241.3	8.83	107	75 - 125				
Surr: 2-Fluorobiphenyl	*24.29*	*0*	*24.13*	*0*	*101*	*70 - 130*				
Surr: Trifluoromethyl benzene	*22.9*	*0*	*24.13*	*0*	*94.9*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

QC BATCH REPORT

Batch ID: **150266 (0)** **Instrument:** **FID-11** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS20011502-01MSD** Units: **mg/Kg** Analysis Date: **05-Feb-2020 21:07**
Client ID: Run ID: **FID-11_355778** SeqNo: **5462141** PrepDate: **04-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	251	47	236.5	14.72	99.9	75 - 125	256.9	2.31	20	
>nC12 to nC28	272.2	47	236.5	8.83	111	75 - 125	266.4	2.15	20	
Surr: 2-Fluorobiphenyl	*23.63*	*0*	*23.65*	*0*	*99.9*	*70 - 130*	*24.29*	*2.77*	*20*	
Surr: Trifluoromethyl benzene	*22.22*	*0*	*23.65*	*0*	*94.0*	*70 - 130*	*22.9*	*3.02*	*20*	

The following samples were analyzed in this batch:

HS20011494-01	HS20011494-02	HS20011494-03	HS20011494-04
HS20011494-05	HS20011494-06	HS20011494-07	HS20011494-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

QC BATCH REPORT

Batch ID: **150790 (0)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:18**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482498** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution		0								
Total Petroleum Hydrocarbons	< 5.0	10								

LCS Sample ID: **LCS-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:48**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482499** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	427.2	10	500	0	85.4	60 - 140				

LCSD Sample ID: **LCSD-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 18:17**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482500** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	426.3	10	500	0	85.3	60 - 140	427.2	0.192	30	

The following samples were analyzed in this batch: HS20011494-02 HS20011494-05

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

QC BATCH REPORT

Batch ID: **150790 (1)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:18**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482535** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution		0								

The following samples were analyzed in this batch: HS20011494-02 HS20011494-05

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20011494

QC BATCH REPORT

Batch ID: **R356210 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS20020239-04DUP** Units: **wt%** Analysis Date: **12-Feb-2020 13:42**

Client ID: Run ID: **Balance1_356210** SeqNo: **5471584** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	20.2	0.0100					20.8	2.93	20	

The following samples were analyzed in this batch:

HS20011494-01	HS20011494-02	HS20011494-03	HS20011494-04
HS20011494-05	HS20011494-06	HS20011494-07	HS20011494-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20011494**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Sample Receipt Checklist

Client Name: PBW
Work Order: HS20011494

Date/Time Received: **31-Jan-2020 11:10**
Received by: **AC**

Checklist completed by: *Nilesh D. Ranchod* eSignature 31-Jan-2020 Date

Reviewed by: *Dane J. Wacasey* eSignature 5-Feb-2020 Date

Matrices: **Soil**

Carrier name: **Client**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212480
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☐	No ☑	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s): 1.3C UC/C IR # 25
Cooler(s)/Kit(s): 43199
Date/Time sample(s) sent to storage: 01/31/2020 15:00

Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑

pH adjusted by:

Login Notes: 2oz jar not received; used 1 x TX1005 vial assigned for Moisture

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

Cincinnati, OH
+1 513 733 5336

Everett, WA
+1 425 356 2600

Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 1

COC ID: 212480

HS20011494

, WV

Golder Associates Inc.
Houston TX-Wood Preserving Works

ALS Project Manager:

Customer Information		**Project Information**			
Purchase Order	UPRR/Kevin Peterburs	Project Name	Houston TX-Wood Preserving Works	A	TX1005_S_REV3 (5643233 TX1005 TPH)
Work Order		Project Number	1620-10-Rev0 SR 92686	B	MOIST_ASTM (5631931 Moisture Content)
Company Name	Golder Associates Inc.	Bill To Company	Union Pacific Railroad- A/P	C	TX1006_S (5645481 TPH TX1006) [HOLD]
Send Report To	Eric Matzner	Invoice Attn	Accounts Payable	D	
Address	2201 Double Creek Drive Suite 4004	Address	1400 Douglas Street Stop 0750	E F	Per Golder
City/State/Zip	Round Rock, TX 78664	City/State/Zip	Omaha NE 681790750	G	MSA
Phone	(512) 671-3434	Phone		H	
Fax	(512) 671-3446	Fax		I	
e-Mail Address	Eric_Matzner@golder.com	e-Mail Address		J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-CPT1220(4-5)-20200130	1-30-20	1035	Soil	8	2	X	X	X			Hold 1006 Sampling					
2	CPT1220(8-9)		1040				X	X	X								
3	CPT1620(4-5)		1305				X	X	X								
4	CPT1620(14-15)		1310				X	X	X								
5	CPT2120(3-4)		1520				X	X	X								
6	CPT2120(5-6)		1525				X	X	X								
7	CPT4620(2-3)		1640				X	X	X								
8	CPT4620(9-10)-20200131	1-31-20	910				X	X	X								
9																	
10																	

Sampler(s) Please Print & Sign: Blake Sokora, Blake Sokora

Shipment Method:

Required Turnaround Time: (Check Box) ☐ Other ______ ☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Blake Sokora Date: 1-31-2020 Time: 1110 Received by:

Relinquished by: Date: Time: Received by (Laboratory): AC Date: 1/31/2020 Time: 11:10

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
43199	u/c 1.3 IR #25 CF=0

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ______
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note:
1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

February 21, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS20020158**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 8 sample(s) on Feb 04, 2020 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL

Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20020158**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
- a) Items consistent with NELAC Chapter 5,
- b) dilution factors,
- c) preparation methods,
- d) cleanup methods, and
- e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
- a) Calculated recovery (%R), and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
- a) LCS spiking amounts,
- b) Calculated %R for each analyte, and
- c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %Rs and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
WorkOrder:	**HS20020158**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group	LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20020158
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150351,150790,R356024

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?		X			1
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				2

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group | LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works | Laboratory Job Number: HS20020158
Reviewer Name: Dane Wacasey | Prep Batch Number(s): 150351,150790,R356024

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 02/21/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20020158
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150351,150790,R356024

ER#^{5}	**Description**
1	Texas TPH by TX1005, sample SO-1620-CPT3219(2-3)-20200204, the surrogate recoveries could not be determined due to dilution below the calibration range.
2	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS20020158

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS20020158-01	SO-1620-SB22019(4-5)-20200203	Soil		03-Feb-2020 16:55	04-Feb-2020 16:50	☐
HS20020158-02	SO-1620-SB21919(2-3)-20200203	Soil		03-Feb-2020 17:15	04-Feb-2020 16:50	☐
HS20020158-03	SO-1620-CPT3019(4-5)-20200203	Soil		03-Feb-2020 17:20	04-Feb-2020 16:50	☐
HS20020158-04	SO-1620-CPT37(7-8)-20200204	Soil		04-Feb-2020 10:45	04-Feb-2020 16:50	☐
HS20020158-05	SO-1620-CPT3219(2-3)-20200204	Soil		04-Feb-2020 13:50	04-Feb-2020 16:50	☐
HS20020158-06	SO-1620-CPT3219(11-12)-20200204	Soil		04-Feb-2020 13:55	04-Feb-2020 16:50	☐
HS20020158-07	SO-1620-SB220(8-9)-20200204	Soil		04-Feb-2020 14:10	04-Feb-2020 16:50	☐
HS20020158-08	SO-1620-SB219(7-8)-20200204	Soil		04-Feb-2020 15:10	04-Feb-2020 16:50	☐

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS20020158
Sample ID:	SO-1620-SB22019(4-5)-20200203	Lab ID:	HS20020158-01
Collection Date:	03-Feb-2020 16:55	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	< 7.0		7.0	47	mg/Kg-dry	1	06-Feb-2020 02:31
>nC12 to nC28	< 9.2		9.2	47	mg/Kg-dry	1	06-Feb-2020 02:31
>nC28 to nC35	< 9.2		9.2	47	mg/Kg-dry	1	06-Feb-2020 02:31
Total Petroleum Hydrocarbon	< 7.0		7.0	47	mg/Kg-dry	1	06-Feb-2020 02:31
Surr: 2-Fluorobiphenyl	*89.0*			*70-130*	*%REC*	*1*	*06-Feb-2020 02:31*
Surr: Trifluoromethyl benzene	*82.2*			*70-130*	*%REC*	*1*	*06-Feb-2020 02:31*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.1**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20020158
Sample ID:	SO-1620-SB21919(2-3)-20200203		Lab ID:HS20020158-02
Collection Date:	03-Feb-2020 17:15		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	< 79		79	530	mg/Kg-dry	10	06-Feb-2020 03:00
>nC12 to nC28	**1,400**		**100**	**530**	**mg/Kg-dry**	10	06-Feb-2020 03:00
>nC28 to nC35	**980**		**100**	**530**	**mg/Kg-dry**	10	06-Feb-2020 03:00
Total Petroleum Hydrocarbon	**2,380**		**79**	**530**	**mg/Kg-dry**	10	06-Feb-2020 03:00
Surr: 2-Fluorobiphenyl	*121*			*70-130*	*%REC*	*10*	*06-Feb-2020 03:00*
Surr: Trifluoromethyl benzene	*92.8*			*70-130*	*%REC*	*10*	*06-Feb-2020 03:00*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**13.4**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3019(4-5)-20200203
Collection Date: 03-Feb-2020 17:20

ANALYTICAL REPORT
WorkOrder:HS20020158
Lab ID:HS20020158-03
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	**220**	J	**120**	**800**	**mg/Kg-dry**	10	06-Feb-2020 04:28
>nC12 to nC28	**9,300**		**160**	**800**	**mg/Kg-dry**	10	06-Feb-2020 04:28
>nC28 to nC35	**3,000**		**160**	**800**	**mg/Kg-dry**	10	06-Feb-2020 04:28
Total Petroleum Hydrocarbon	**12,500**		**120**	**800**	**mg/Kg-dry**	10	06-Feb-2020 04:28
Surr: 2-Fluorobiphenyl	*128*			*70-130*	*%REC*	*10*	*06-Feb-2020 04:28*
Surr: Trifluoromethyl benzene	*106*			*70-130*	*%REC*	*10*	*06-Feb-2020 04:28*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 17-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aliphatics >nC6 to nC8	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aliphatics >nC8 to nC10	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aliphatics >nC10 to nC12	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aliphatics >nC12 to nC16	**200**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aliphatics >nC16 to nC21	**520**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aliphatics >nC21 to nC35	**1,100**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Total Aliphatic Fraction	**1,820**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aliphatics Relative % Distribution	**28**	n	**0**	**0**	**%-dry**	10	18-Feb-2020 19:46
Aromatics >nC7 to nC8	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aromatics >nC8 to nC10	< 80	n	80	160	mg/Kg-dry	10	18-Feb-2020 19:46
Aromatics >nC10 to nC12	**150**	Jn	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aromatics >nC12 to nC16	**590**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aromatics >nC16 to nC21	**1,800**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aromatics >nC21 to nC35	**2,000**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Total Aromatic Fraction	**4,540**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
Aromatics Relative % Distribution	**72**	n	**0**	**0**	**%-dry**	10	18-Feb-2020 19:46
Total Petroleum Hydrocarbons	**6,300**	n	**80**	**160**	**mg/Kg-dry**	10	18-Feb-2020 19:46
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**33.8**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT37(7-8)-20200204
Collection Date: 04-Feb-2020 10:45

ANALYTICAL REPORT

WorkOrder:HS20020158
Lab ID:HS20020158-04
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	**270**		**37**	**250**	**mg/Kg-dry**	5	12-Feb-2020 09:59
>nC12 to nC28	**1,800**		**49**	**250**	**mg/Kg-dry**	5	12-Feb-2020 09:59
>nC28 to nC35	**270**		**49**	**250**	**mg/Kg-dry**	5	12-Feb-2020 09:59
Total Petroleum Hydrocarbon	**2,340**		**37**	**250**	**mg/Kg-dry**	5	12-Feb-2020 09:59
Surr: 2-Fluorobiphenyl	*86.6*			*70-130*	*%REC*	*5*	*12-Feb-2020 09:59*
Surr: Trifluoromethyl benzene	*112*			*70-130*	*%REC*	*5*	*12-Feb-2020 09:59*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**14.4**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3219(2-3)-20200204
Collection Date: 04-Feb-2020 13:50

ANALYTICAL REPORT
WorkOrder:HS20020158
Lab ID:HS20020158-05
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	**1,300**		**160**	**1100**	**mg/Kg-dry**	20	12-Feb-2020 10:28
>nC12 to nC28	**8,700**		**210**	**1100**	**mg/Kg-dry**	20	12-Feb-2020 10:28
>nC28 to nC35	**1,800**		**210**	**1100**	**mg/Kg-dry**	20	12-Feb-2020 10:28
Total Petroleum Hydrocarbon	**11,800**		**160**	**1100**	**mg/Kg-dry**	20	12-Feb-2020 10:28
Surr: 2-Fluorobiphenyl	*0*	*S*		*70-130*	*%REC*	*20*	*12-Feb-2020 10:28*
Surr: Trifluoromethyl benzene	*0*	*S*		*70-130*	*%REC*	*20*	*12-Feb-2020 10:28*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 17-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aliphatics >nC6 to nC8	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aliphatics >nC8 to nC10	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aliphatics >nC10 to nC12	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aliphatics >nC12 to nC16	**280**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aliphatics >nC16 to nC21	**260**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aliphatics >nC21 to nC35	**340**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Total Aliphatic Fraction	**880**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aliphatics Relative % Distribution	**7.4**	n	**0**	**0**	**%-dry**	20	18-Feb-2020 20:15
Aromatics >nC7 to nC8	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aromatics >nC8 to nC10	< 110	n	110	210	mg/Kg-dry	20	18-Feb-2020 20:15
Aromatics >nC10 to nC12	**1,200**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aromatics >nC12 to nC16	**2,700**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aromatics >nC16 to nC21	**4,100**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aromatics >nC21 to nC35	**3,100**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Total Aromatic Fraction	**11,100**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
Aromatics Relative % Distribution	**93**	n	**0**	**0**	**%-dry**	20	18-Feb-2020 20:15
Total Petroleum Hydrocarbons	**12,000**	n	**110**	**210**	**mg/Kg-dry**	20	18-Feb-2020 20:15
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.7**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ANALYTICAL REPORT

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3219(11-12)-20200204
Collection Date: 04-Feb-2020 13:55

WorkOrder:HS20020158
Lab ID:HS20020158-06
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	**890**		**70**	**470**	**mg/Kg-dry**	10	06-Feb-2020 05:56
>nC12 to nC28	**5,600**		**92**	**470**	**mg/Kg-dry**	10	06-Feb-2020 05:56
>nC28 to nC35	**950**		**92**	**470**	**mg/Kg-dry**	10	06-Feb-2020 05:56
Total Petroleum Hydrocarbon	**7,440**		**70**	**470**	**mg/Kg-dry**	10	06-Feb-2020 05:56
Surr: 2-Fluorobiphenyl	*127*			*70-130*	*%REC*	*10*	*06-Feb-2020 05:56*
Surr: Trifluoromethyl benzene	*99.8*			*70-130*	*%REC*	*10*	*06-Feb-2020 05:56*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.0**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-SB220(8-9)-20200204
Collection Date: 04-Feb-2020 14:10

ANALYTICAL REPORT
WorkOrder:HS20020158
Lab ID:HS20020158-07
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	< 7.8		7.8	53	mg/Kg-dry	1	06-Feb-2020 06:25
>nC12 to nC28	**19**	J	**10**	**53**	**mg/Kg-dry**	1	06-Feb-2020 06:25
>nC28 to nC35	< 10		10	53	mg/Kg-dry	1	06-Feb-2020 06:25
Total Petroleum Hydrocarbon	**19.0**	J	**7.8**	**53**	**mg/Kg-dry**	1	06-Feb-2020 06:25
Surr: 2-Fluorobiphenyl	*104*			*70-130*	*%REC*	*1*	*06-Feb-2020 06:25*
Surr: Trifluoromethyl benzene	*90.0*			*70-130*	*%REC*	*1*	*06-Feb-2020 06:25*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.4**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.	**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:HS20020158
Sample ID:	SO-1620-SB219(7-8)-20200204	Lab ID:HS20020158-08
Collection Date:	04-Feb-2020 15:10	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 05-Feb-2020		Analyst: MBG
nC6 to nC12	< 6.6		6.6	44	mg/Kg-dry	1	06-Feb-2020 06:54
>nC12 to nC28	< 8.7		8.7	44	mg/Kg-dry	1	06-Feb-2020 06:54
>nC28 to nC35	< 8.7		8.7	44	mg/Kg-dry	1	06-Feb-2020 06:54
Total Petroleum Hydrocarbon	< 6.6		6.6	44	mg/Kg-dry	1	06-Feb-2020 06:54
Surr: 2-Fluorobiphenyl	*99.5*			*70-130*	*%REC*	*1*	*06-Feb-2020 06:54*
Surr: Trifluoromethyl benzene	*87.2*			*70-130*	*%REC*	*1*	*06-Feb-2020 06:54*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**14.9**		**0.0100**	**0.0100**	**wt%**	1	10-Feb-2020 11:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

Batch ID: 150351 **Start Date:** 05 Feb 2020 14:00 **End Date:** 05 Feb 2020 15:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20020158-01	1	12.5 (g)	10 (mL)	0.8
HS20020158-02	1	10.85 (g)	10 (mL)	0.9217
HS20020158-03	1	9.39 (g)	10 (mL)	1.065
HS20020158-04	1	11.61 (g)	10 (mL)	0.8613
HS20020158-05	1	11.55 (g)	10 (mL)	0.8658
HS20020158-06	1	12.53 (g)	10 (mL)	0.7981
HS20020158-07	1	11.19 (g)	10 (mL)	0.8937
HS20020158-08	1	13.26 (g)	10 (mL)	0.7541

Batch ID: 150790 **Start Date:** 17 Feb 2020 14:30 **End Date:** 18 Feb 2020 12:00
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20020158-03		9.39 (g)	10 (mL)	1.065
HS20020158-05		11.55 (g)	10 (mL)	0.8658

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 150351 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS20020158-01	SO-1620-SB22019(4-5)-20200203	03 Feb 2020 16:55		05 Feb 2020 15:00	06 Feb 2020 02:31	1
HS20020158-02	SO-1620-SB21919(2-3)-20200203	03 Feb 2020 17:15		05 Feb 2020 15:00	06 Feb 2020 03:00	10
HS20020158-03	SO-1620-CPT3019(4-5)-20200203	03 Feb 2020 17:20		05 Feb 2020 15:00	06 Feb 2020 04:28	10
HS20020158-04	SO-1620-CPT37(7-8)-20200204	04 Feb 2020 10:45		05 Feb 2020 15:00	12 Feb 2020 09:59	5
HS20020158-05	SO-1620-CPT3219(2-3)-20200204	04 Feb 2020 13:50		05 Feb 2020 15:00	12 Feb 2020 10:28	20
HS20020158-06	SO-1620-CPT3219(11-12)-20200204	04 Feb 2020 13:55		05 Feb 2020 15:00	06 Feb 2020 05:56	10
HS20020158-07	SO-1620-SB220(8-9)-20200204	04 Feb 2020 14:10		05 Feb 2020 15:00	06 Feb 2020 06:25	1
HS20020158-08	SO-1620-SB219(7-8)-20200204	04 Feb 2020 15:10		05 Feb 2020 15:00	06 Feb 2020 06:54	1
Batch ID: 150790 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20020158-03	SO-1620-CPT3019(4-5)-20200203	03 Feb 2020 17:20		17 Feb 2020 14:30	18 Feb 2020 19:46	10
HS20020158-05	SO-1620-CPT3219(2-3)-20200204	04 Feb 2020 13:50		17 Feb 2020 14:30	18 Feb 2020 20:15	20
Batch ID: 150790 (1)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20020158-03	SO-1620-CPT3019(4-5)-20200203	03 Feb 2020 17:20		17 Feb 2020 14:30	18 Feb 2020 19:46	10
HS20020158-05	SO-1620-CPT3219(2-3)-20200204	04 Feb 2020 13:50		17 Feb 2020 14:30	18 Feb 2020 20:15	20
Batch ID: R356024 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS20020158-01	SO-1620-SB22019(4-5)-20200203	03 Feb 2020 16:55			10 Feb 2020 11:08	1
HS20020158-02	SO-1620-SB21919(2-3)-20200203	03 Feb 2020 17:15			10 Feb 2020 11:08	1
HS20020158-03	SO-1620-CPT3019(4-5)-20200203	03 Feb 2020 17:20			10 Feb 2020 11:08	1
HS20020158-04	SO-1620-CPT37(7-8)-20200204	04 Feb 2020 10:45			10 Feb 2020 11:08	1
HS20020158-05	SO-1620-CPT3219(2-3)-20200204	04 Feb 2020 13:50			10 Feb 2020 11:08	1
HS20020158-06	SO-1620-CPT3219(11-12)-20200204	04 Feb 2020 13:55			10 Feb 2020 11:08	1
HS20020158-07	SO-1620-SB220(8-9)-20200204	04 Feb 2020 14:10			10 Feb 2020 11:08	1
HS20020158-08	SO-1620-SB219(7-8)-20200204	04 Feb 2020 15:10			10 Feb 2020 11:08	1

WorkOrder: HS20020158
InstrumentID: FID-10
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	24	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	25	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	24	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	24	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20020158
InstrumentID: FID-13
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	29	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	22	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	22	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	22	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20020158
InstrumentID: FID-10
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

QC BATCH REPORT

Batch ID: 150351 (0) **Instrument: FID-10** **Method: TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-150351** Units: **mg/Kg** Analysis Date: **05-Feb-2020 18:40**
Client ID: Run ID: **FID-10_355750** SeqNo: **5461587** PrepDate: **05-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*27.01*	*0*	*25*	*0*	*108*	*70 - 130*				
Surr: Trifluoromethyl benzene	*25.54*	*0*	*25*	*0*	*102*	*70 - 130*				

LCS Sample ID: **LCS-150351** Units: **mg/Kg** Analysis Date: **05-Feb-2020 19:10**
Client ID: Run ID: **FID-10_355750** SeqNo: **5461588** PrepDate: **05-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	213.4	50	250	0	85.4	75 - 125				
>nC12 to nC28	204	50	250	0	81.6	75 - 125				
Surr: 2-Fluorobiphenyl	*27.33*	*0*	*25*	*0*	*109*	*70 - 130*				
Surr: Trifluoromethyl benzene	*23*	*0*	*25*	*0*	*92.0*	*70 - 130*				

LCSD Sample ID: **LCSD-150351** Units: **mg/Kg** Analysis Date: **05-Feb-2020 19:39**
Client ID: Run ID: **FID-10_355750** SeqNo: **5461589** PrepDate: **05-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	212.7	50	250	0	85.1	75 - 125	213.4	0.353	20	
>nC12 to nC28	195.5	50	250	0	78.2	75 - 125	204	4.28	20	
Surr: 2-Fluorobiphenyl	*27.77*	*0*	*25*	*0*	*111*	*70 - 130*	*27.33*	*1.6*	*20*	
Surr: Trifluoromethyl benzene	*23.38*	*0*	*25*	*0*	*93.5*	*70 - 130*	*23*	*1.61*	*20*	

MS Sample ID: **HS20020126-01MS** Units: **mg/Kg** Analysis Date: **05-Feb-2020 20:38**
Client ID: Run ID: **FID-10_355750** SeqNo: **5461591** PrepDate: **05-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	190.6	46	231.1	0	82.5	75 - 125				
>nC12 to nC28	190.4	46	231.1	0	82.4	75 - 125				
Surr: 2-Fluorobiphenyl	*23.46*	*0*	*23.11*	*0*	*102*	*70 - 130*				
Surr: Trifluoromethyl benzene	*18.92*	*0*	*23.11*	*0*	*81.9*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

QC BATCH REPORT

Batch ID: **150351 (0)** **Instrument:** **FID-10** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS20020126-01MSD** Units: **mg/Kg** Analysis Date: **05-Feb-2020 21:07**

Client ID: Run ID: **FID-10_355750** SeqNo: **5461592** PrepDate: **05-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	204.7	46	230	0	89.0	75 - 125	190.6	7.1	20	
>nC12 to nC28	201.6	46	230	0	87.7	75 - 125	190.4	5.74	20	
Surr: 2-Fluorobiphenyl	*23.87*	*0*	*23*	*0*	*104*	*70 - 130*	*23.46*	*1.76*	*20*	
Surr: Trifluoromethyl benzene	*19.9*	*0*	*23*	*0*	*86.5*	*70 - 130*	*18.92*	*5.03*	*20*	

The following samples were analyzed in this batch:

HS20020158-01	HS20020158-02	HS20020158-03	HS20020158-04
HS20020158-05	HS20020158-06	HS20020158-07	HS20020158-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

QC BATCH REPORT

Batch ID: **150790 (0)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:18**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482498** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution		0								
Total Petroleum Hydrocarbons	< 5.0	10								

LCS Sample ID: **LCS-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:48**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482499** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	427.2	10	500	0	85.4	60 - 140				

LCSD Sample ID: **LCSD-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 18:17**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482500** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	426.3	10	500	0	85.3	60 - 140	427.2	0.192	30	

The following samples were analyzed in this batch: HS20020158-03 HS20020158-05

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

QC BATCH REPORT

Batch ID: **150790 (1)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150790** Units: **mg/Kg** Analysis Date: **18-Feb-2020 17:18**
Client ID: Run ID: **FID-10_356767** SeqNo: **5482535** PrepDate: **17-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution		0								

The following samples were analyzed in this batch: HS20020158-03 HS20020158-05

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020158

QC BATCH REPORT

Batch ID: **R356024 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS20020158-08DUP** Units: **wt%** Analysis Date: **10-Feb-2020 11:08**
Client ID: **SO-1620-SB219(7-8)-20200204** Run ID: **Balance1_356024** SeqNo: **5467487** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	14.9	0.0100					14.9	0	20	

The following samples were analyzed in this batch:

HS20020158-01	HS20020158-02	HS20020158-03	HS20020158-04
HS20020158-05	HS20020158-06	HS20020158-07	HS20020158-08

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20020158**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Sample Receipt Checklist

Client Name: PBW

Work Order: HS20020158

Date/Time Received: **04-Feb-2020 16:50**

Received by: **DDG**

Checklist completed by: *Paresh M. Giga* 5-Feb-2020
eSignature | Date

Reviewed by:
eSignature | Date

Matrices: **Soil**

Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212481
Samplers name present on COC?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s): 0.4c U/C | IR25

Cooler(s)/Kit(s): 45593

Date/Time sample(s) sent to storage: 2/4/2020 18:00

Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑
pH adjusted?	Yes ☐	No ☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

Cincinnati, OH
+1 513 733 5336

Everett, WA
+1 425 356 2600

Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 1

COC ID: 212481

HS20020158

Golder Associates Inc.
Houston TX-Wood Preserving Works

WV

ALS Project Manager:

Customer Information		**Project Information**	
Purchase Order	UPRR/Kevin Peterburs	Project Name	Houston TX-Wood Preserving Works
Work Order		Project Number	1620-10-Rev0 SR 92663
Company Name	Golder Associates Inc.	Bill To Company	Union Pacific Railroad- A/P
Send Report To	Eric Malzner	Invoice Attn	Accounts Payable
Address	2201 Double Creek Drive Suite 4004	Address	1400 Douglas Street Stop 0750
City/State/Zip	Round Rock, TX 78664	City/State/Zip	Omaha NE 681790750
Phone	(512) 671-3434	Phone	
Fax	(512) 671-3446	Fax	
e-Mail Address	Eric_Malzner@golder.com	e-Mail Address	

A TX1005_S_REV3 (5643233 TX1005 TPH)
B MOIST_ASTM (5631931 Moisture Content)
C TX1006_S (5645481 TPH TX1006) [HOLD]
D
E
F
G
H
I
J

Per Golder MSA

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-SB22019(4-5)-20200203	2-3-20	1655	Soil	8	3	X	X	X								
2	~SB21919(2-3)-20200203	2-3-20	1715				X	X	X								
3	~CPT3019(4-5)-20200203	2-3-20	1720				X	X	X								
4	~CPT37(7-8)-20200204	2-4-20	1045				X	X	X								
5	~CPT3219(2-3)~		1350				X	X	X								
6	~CPT3219(11-12)~		1355				X	X	X								
7	~SB220(8-9)~		1410				X	X	X								
8	~SB219(7-8)~		1510				X	X	X								
9																	
10																	

Hold 1006 Samples

Sampler(s) Please Print & Sign: Blake Sobora Blake Sobola

Shipment Method:

Required Turnaround Time: (Check Box) ☐ Other ____ ☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Blake Sobola Date: 2-4-20 Time: 1520 Received by: DS

Relinquished by: DS Date: 2-4-20 Time: 1650 Received by (Laboratory): DS

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
45593	0.4

QC Package: (Check One Box Below)
☒ Level II Std QC ☐ TRRP Checklist
☐ Level III Std QC/Raw Data ☐ TRRP Level IV
☐ Level IV SW846/CLP
☐ Other

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

February 24, 2020

Eric Matzner
Golder Associates Inc.
2201 Double Creek Drive
Suite 4004
Round Rock, TX 78664

Work Order: **HS20020239**

Laboratory Results for: **Houston TX-Wood Preserving Works**

Dear Eric,

ALS Environmental received 14 sample(s) on Feb 06, 2020 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL

Dane J. Wacasey

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20020239**

TRRP Laboratory Data Package Cover Page

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
- a) Items consistent with NELAC Chapter 5,
- b) dilution factors,
- c) preparation methods,
- d) cleanup methods, and
- e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
- a) Calculated recovery (%R), and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
- a) LCS spiking amounts,
- b) Calculated %R for each analyte, and
- c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %Rs and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20020239**

TRRP Laboratory Data Package Cover Page

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group
LRC Date: 02/24/2020
Project Name: Houston TX-Wood Preserving Works
Laboratory Job Number: HS20020239
Reviewer Name: Dane Wacasey
Prep Batch Number(s): 150420,150437,150896,R356210,R356211

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?	X				
		Were % moisture (or solids) reported for all soil and sediment samples?	X				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?	X				
		Were surrogate percent recoveries in all samples within the laboratory QC limits?		X			1
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	X				
		Were analytical duplicates analyzed at the appropriate frequency?	X				
		Were RPDs or relative standard deviations within the laboratory QC limits?	X				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				2

Laboratory Review Checklist: Supporting Data

Laboratory Name: ALS Laboratory Group | LRC Date: 02/24/2020
Project Name: Houston TX-Wood Preserving Works | Laboratory Job Number: HS20020239
Reviewer Name: Dane Wacasey | Prep Batch Number(s): 150420,150437,150896,R356210,R356211

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?			X		
		Were ion abundance data within the method-required QC limits?			X		
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?			X		
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?			X		
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Reports

Laboratory Name: ALS Laboratory Group	LRC Date: 02/24/2020
Project Name: Houston TX-Wood Preserving Works	Laboratory Job Number: HS20020239
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 150420,150437,150896,R356210,R356211

ER#[5]	**Description**
1	Texas TPH by TX1005, sample SO-1620-CPT3719(4-5)-20200206, the surrogates could not be determined due to dilution below the calibration range.
2	TPH TX 1006: ALS is NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package. Because TCEQ does not offer accreditation for TX 1006, the results are flagged with n.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Work Order: HS20020239

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS20020239-01	SO-1620-CPT4319(2-3)-20200204	Soil		04-Feb-2020 17:00	06-Feb-2020 16:05	☐
HS20020239-02	SO-1620-CPT4319(12-13)-20200204	Soil		04-Feb-2020 17:05	06-Feb-2020 16:05	☐
HS20020239-03	SO-1620-CPT3019(13-14)-20200205	Soil		05-Feb-2020 10:00	06-Feb-2020 16:05	☐
HS20020239-04	SO-1620-CPT3619(3-4)-20200205	Soil		05-Feb-2020 11:35	06-Feb-2020 16:05	☐
HS20020239-05	SO-1620-CPT3619(5-6)-20200205	Soil		05-Feb-2020 11:45	06-Feb-2020 16:05	☐
HS20020239-06	SO-1620-CPT2819(7-8)-20200205	Soil		05-Feb-2020 13:50	06-Feb-2020 16:05	☐
HS20020239-07	SO-1620-CPT2919(4-5)-20200205	Soil		05-Feb-2020 16:25	06-Feb-2020 16:05	☐
HS20020239-08	SO-1620-CPT2919(9-10)-20200205	Soil		05-Feb-2020 16:35	06-Feb-2020 16:05	☐
HS20020239-09	SO-1620-CPT4519(1-2)-20200205	Soil		05-Feb-2020 16:45	06-Feb-2020 16:05	☐
HS20020239-10	SO-1620-CPT4519(8-9)-20200205	Soil		05-Feb-2020 16:50	06-Feb-2020 16:05	☐
HS20020239-11	SO-1620-CPT4119(1-2)-20200206	Soil		06-Feb-2020 10:15	06-Feb-2020 16:05	☐
HS20020239-12	SO-1620-CPT4119(5-6)-20200206	Soil		06-Feb-2020 10:20	06-Feb-2020 16:05	☐
HS20020239-13	SO-1620-CPT2819(4-5)-20200206	Soil		06-Feb-2020 10:40	06-Feb-2020 16:05	☐
HS20020239-14	SO-1620-CPT3719(4-5)-20200206	Soil		06-Feb-2020 11:55	06-Feb-2020 16:05	☐

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT4319(2-3)-20200204
Collection Date: 04-Feb-2020 17:00

ANALYTICAL REPORT

WorkOrder:HS20020239
Lab ID:HS20020239-01
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**7.0**	J	**6.6**	**44**	**mg/Kg-dry**	1	07-Feb-2020 20:20
>nC12 to nC28	**430**		**8.6**	**44**	**mg/Kg-dry**	1	07-Feb-2020 20:20
>nC28 to nC35	**550**		**8.6**	**44**	**mg/Kg-dry**	1	07-Feb-2020 20:20
Total Petroleum Hydrocarbon	**987**		**6.6**	**44**	**mg/Kg-dry**	1	07-Feb-2020 20:20
Surr: 2-Fluorobiphenyl	*70.6*			*70-130*	*%REC*	*1*	*07-Feb-2020 20:20*
Surr: Trifluoromethyl benzene	*83.0*			*70-130*	*%REC*	*1*	*07-Feb-2020 20:20*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**18.0**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS20020239
Sample ID:	SO-1620-CPT4319(12-13)-20200204	Lab ID:	HS20020239-02
Collection Date:	04-Feb-2020 17:05	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	< 7.6		7.6	51	mg/Kg-dry	1	07-Feb-2020 20:49
>nC12 to nC28	< 10		10	51	mg/Kg-dry	1	07-Feb-2020 20:49
>nC28 to nC35	< 10		10	51	mg/Kg-dry	1	07-Feb-2020 20:49
Total Petroleum Hydrocarbon	< 7.6		7.6	51	mg/Kg-dry	1	07-Feb-2020 20:49
Surr: 2-Fluorobiphenyl	*73.2*			*70-130*	*%REC*	*1*	*07-Feb-2020 20:49*
Surr: Trifluoromethyl benzene	*85.1*			*70-130*	*%REC*	*1*	*07-Feb-2020 20:49*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**14.6**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
Sample ID:	SO-1620-CPT3019(13-14)-20200205
Collection Date:	05-Feb-2020 10:00

ANALYTICAL REPORT

WorkOrder:HS20020239

Lab ID:HS20020239-03

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**810**		**67**	**450**	**mg/Kg-dry**	10	11-Feb-2020 13:32
>nC12 to nC28	**3,400**		**88**	**450**	**mg/Kg-dry**	10	11-Feb-2020 13:32
>nC28 to nC35	**510**		**88**	**450**	**mg/Kg-dry**	10	11-Feb-2020 13:32
Total Petroleum Hydrocarbon	**4,720**		**67**	**450**	**mg/Kg-dry**	10	11-Feb-2020 13:32
Surr: 2-Fluorobiphenyl	*119*			*70-130*	*%REC*	*10*	*11-Feb-2020 13:32*
Surr: Trifluoromethyl benzene	*107*			*70-130*	*%REC*	*10*	*11-Feb-2020 13:32*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**13.3**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3619(3-4)-20200205
Collection Date: 05-Feb-2020 11:35

ANALYTICAL REPORT

WorkOrder:HS20020239
Lab ID:HS20020239-04
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**140**	J	**77**	**520**	**mg/Kg-dry**	10	10-Feb-2020 22:32
>nC12 to nC28	**7,100**		**100**	**520**	**mg/Kg-dry**	10	10-Feb-2020 22:32
>nC28 to nC35	**1,600**		**100**	**520**	**mg/Kg-dry**	10	10-Feb-2020 22:32
Total Petroleum Hydrocarbon	**8,840**		**77**	**520**	**mg/Kg-dry**	10	10-Feb-2020 22:32
Surr: 2-Fluorobiphenyl	*102*			*70-130*	*%REC*	*10*	*10-Feb-2020 22:32*
Surr: Trifluoromethyl benzene	*89.2*			*70-130*	*%REC*	*10*	*10-Feb-2020 22:32*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**20.8**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ANALYTICAL REPORT

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3619(5-6)-20200205
Collection Date: 05-Feb-2020 11:45

WorkOrder:HS20020239
Lab ID:HS20020239-05
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**130**	J	**72**	**480**	**mg/Kg-dry**	10	10-Feb-2020 23:01
>nC12 to nC28	**9,100**		**95**	**480**	**mg/Kg-dry**	10	10-Feb-2020 23:01
>nC28 to nC35	**2,700**		**95**	**480**	**mg/Kg-dry**	10	10-Feb-2020 23:01
Total Petroleum Hydrocarbon	**11,900**		**72**	**480**	**mg/Kg-dry**	10	10-Feb-2020 23:01
Surr: 2-Fluorobiphenyl	*126*			*70-130*	*%REC*	*10*	*10-Feb-2020 23:01*
Surr: Trifluoromethyl benzene	*94.7*			*70-130*	*%REC*	*10*	*10-Feb-2020 23:01*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 20-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aliphatics >nC6 to nC8	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aliphatics >nC8 to nC10	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aliphatics >nC10 to nC12	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aliphatics >nC12 to nC16	**480**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aliphatics >nC16 to nC21	**830**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aliphatics >nC21 to nC35	**770**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Total Aliphatic Fraction	**2,080**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aliphatics Relative % Distribution	**33**	n	**0**	**0**	**%-dry**	10	21-Feb-2020 20:51
Aromatics >nC7 to nC8	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aromatics >nC8 to nC10	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aromatics >nC10 to nC12	< 48	n	48	97	mg/Kg-dry	10	21-Feb-2020 20:51
Aromatics >nC12 to nC16	**460**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aromatics >nC16 to nC21	**1,300**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aromatics >nC21 to nC35	**2,400**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Total Aromatic Fraction	**4,160**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
Aromatics Relative % Distribution	**67**	n	**0**	**0**	**%-dry**	10	21-Feb-2020 20:51
Total Petroleum Hydrocarbons	**6,300**	n	**48**	**97**	**mg/Kg-dry**	10	21-Feb-2020 20:51
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**16.4**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT2819(7-8)-20200205
Collection Date: 05-Feb-2020 13:50

ANALYTICAL REPORT
WorkOrder:HS20020239
Lab ID:HS20020239-06
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	< 7.6		7.6	51	mg/Kg-dry	1	10-Feb-2020 23:30
>nC12 to nC28	**31**	J	**10**	**51**	**mg/Kg-dry**	1	10-Feb-2020 23:30
>nC28 to nC35	**41**	J	**10**	**51**	**mg/Kg-dry**	1	10-Feb-2020 23:30
Total Petroleum Hydrocarbon	**72.0**		**7.6**	**51**	**mg/Kg-dry**	1	10-Feb-2020 23:30
Surr: 2-Fluorobiphenyl	*89.4*			*70-130*	*%REC*	*1*	*10-Feb-2020 23:30*
Surr: Trifluoromethyl benzene	*104*			*70-130*	*%REC*	*1*	*10-Feb-2020 23:30*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**19.5**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20020239
Sample ID:	SO-1620-CPT2919(4-5)-20200205		Lab ID:HS20020239-07
Collection Date:	05-Feb-2020 16:25		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**650**		**38**	**260**	**mg/Kg-dry**	2	12-Feb-2020 09:59
>nC12 to nC28	**2,600**		**50**	**260**	**mg/Kg-dry**	2	12-Feb-2020 09:59
>nC28 to nC35	**970**		**50**	**260**	**mg/Kg-dry**	2	12-Feb-2020 09:59
Total Petroleum Hydrocarbon	**4,220**		**38**	**260**	**mg/Kg-dry**	2	12-Feb-2020 09:59
Surr: 2-Fluorobiphenyl	*86.0*			*70-130*	*%REC*	*2*	*12-Feb-2020 09:59*
Surr: Trifluoromethyl benzene	*99.6*			*70-130*	*%REC*	*2*	*12-Feb-2020 09:59*
PETROLEUM HYDROCARBONS BY TX1006		**Method:TX1006**			Prep:TX1006PR / 20-Feb-2020		Analyst: JLJ
Aliphatics nC6	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC6 to nC8	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC8 to nC10	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC10 to nC12	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC12 to nC16	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC16 to nC21	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aliphatics >nC21 to nC35	**220**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Total Aliphatic Fraction	**220**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aliphatics Relative % Distribution	**7.8**	n	**0**	**0**	**%-dry**	2	21-Feb-2020 21:20
Aromatics >nC7 to nC8	< 26	n	26	51	mg/Kg-dry	2	21-Feb-2020 21:20
Aromatics >nC8 to nC10	**30**	Jn	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aromatics >nC10 to nC12	**420**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aromatics >nC12 to nC16	**1,100**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aromatics >nC16 to nC21	**330**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aromatics >nC21 to nC35	**760**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Total Aromatic Fraction	**2,640**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
Aromatics Relative % Distribution	**92**	n	**0**	**0**	**%-dry**	2	21-Feb-2020 21:20
Total Petroleum Hydrocarbons	**2,800**	n	**26**	**51**	**mg/Kg-dry**	2	21-Feb-2020 21:20
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**49.5**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.		**ANALYTICAL REPORT**
Project:	Houston TX-Wood Preserving Works		WorkOrder:HS20020239
Sample ID:	SO-1620-CPT2919(9-10)-20200205		Lab ID:HS20020239-08
Collection Date:	05-Feb-2020 16:35		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**230**	J	**38**	**260**	**mg/Kg-dry**	5	12-Feb-2020 10:28
>nC12 to nC28	**1,100**		**50**	**260**	**mg/Kg-dry**	5	12-Feb-2020 10:28
>nC28 to nC35	**200**	J	**50**	**260**	**mg/Kg-dry**	5	12-Feb-2020 10:28
Total Petroleum Hydrocarbon	**1,530**		**38**	**260**	**mg/Kg-dry**	5	12-Feb-2020 10:28
Surr: 2-Fluorobiphenyl	*92.1*			*70-130*	*%REC*	*5*	*12-Feb-2020 10:28*
Surr: Trifluoromethyl benzene	*104*			*70-130*	*%REC*	*5*	*12-Feb-2020 10:28*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**16.0**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT4519(1-2)-20200205
Collection Date: 05-Feb-2020 16:45

ANALYTICAL REPORT
WorkOrder:HS20020239
Lab ID:HS20020239-09
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**8.5**	J	**7.3**	**50**	**mg/Kg-dry**	1	11-Feb-2020 00:57
>nC12 to nC28	**170**		**9.7**	**50**	**mg/Kg-dry**	1	11-Feb-2020 00:57
>nC28 to nC35	**250**		**9.7**	**50**	**mg/Kg-dry**	1	11-Feb-2020 00:57
Total Petroleum Hydrocarbon	**428**		**7.3**	**50**	**mg/Kg-dry**	1	11-Feb-2020 00:57
Surr: 2-Fluorobiphenyl	*80.2*			*70-130*	*%REC*	*1*	*11-Feb-2020 00:57*
Surr: Trifluoromethyl benzene	*93.7*			*70-130*	*%REC*	*1*	*11-Feb-2020 00:57*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**18.7**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates Inc.
Project:	Houston TX-Wood Preserving Works
Sample ID:	SO-1620-CPT4519(8-9)-20200205
Collection Date:	05-Feb-2020 16:50

ANALYTICAL REPORT

WorkOrder:HS20020239

Lab ID:HS20020239-10

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	< 6.4		6.4	43	mg/Kg-dry	1	11-Feb-2020 01:26
>nC12 to nC28	< 8.4		8.4	43	mg/Kg-dry	1	11-Feb-2020 01:26
>nC28 to nC35	< 8.4		8.4	43	mg/Kg-dry	1	11-Feb-2020 01:26
Total Petroleum Hydrocarbon	< 6.4		6.4	43	mg/Kg-dry	1	11-Feb-2020 01:26
Surr: 2-Fluorobiphenyl	*82.3*			*70-130*	*%REC*	*1*	*11-Feb-2020 01:26*
Surr: Trifluoromethyl benzene	*93.5*			*70-130*	*%REC*	*1*	*11-Feb-2020 01:26*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**10.1**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT4119(1-2)-20200206
Collection Date: 06-Feb-2020 10:15

ANALYTICAL REPORT
WorkOrder:HS20020239
Lab ID:HS20020239-11
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**8.1**	J	**7.7**	**52**	**mg/Kg-dry**	1	11-Feb-2020 01:55
>nC12 to nC28	**130**		**10**	**52**	**mg/Kg-dry**	1	11-Feb-2020 01:55
>nC28 to nC35	**170**		**10**	**52**	**mg/Kg-dry**	1	11-Feb-2020 01:55
Total Petroleum Hydrocarbon	**308**		**7.7**	**52**	**mg/Kg-dry**	1	11-Feb-2020 01:55
Surr: 2-Fluorobiphenyl	*81.3*			*70-130*	*%REC*	*1*	*11-Feb-2020 01:55*
Surr: Trifluoromethyl benzene	*96.2*			*70-130*	*%REC*	*1*	*11-Feb-2020 01:55*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**17.6**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.

ANALYTICAL REPORT

Project: Houston TX-Wood Preserving Works

WorkOrder:HS20020239

Sample ID: SO-1620-CPT4119(5-6)-20200206

Lab ID:HS20020239-12

Collection Date: 06-Feb-2020 10:20

Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	< 6.4		6.4	43	mg/Kg-dry	1	11-Feb-2020 03:22
>nC12 to nC28	< 8.4		8.4	43	mg/Kg-dry	1	11-Feb-2020 03:22
>nC28 to nC35	< 8.4		8.4	43	mg/Kg-dry	1	11-Feb-2020 03:22
Total Petroleum Hydrocarbon	< 6.4		6.4	43	mg/Kg-dry	1	11-Feb-2020 03:22
Surr: 2-Fluorobiphenyl	*93.4*			*70-130*	*%REC*	*1*	*11-Feb-2020 03:22*
Surr: Trifluoromethyl benzene	*110*			*70-130*	*%REC*	*1*	*11-Feb-2020 03:22*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**12.8**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ANALYTICAL REPORT

Client:	Golder Associates Inc.		
Project:	Houston TX-Wood Preserving Works	WorkOrder:	HS20020239
Sample ID:	SO-1620-CPT2819(4-5)-20200206	Lab ID:	HS20020239-13
Collection Date:	06-Feb-2020 10:40	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005			**Method:TX1005**		Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	< 7.5		7.5	50	mg/Kg-dry	1	11-Feb-2020 03:51
>nC12 to nC28	< 9.8		9.8	50	mg/Kg-dry	1	11-Feb-2020 03:51
>nC28 to nC35	< 9.8		9.8	50	mg/Kg-dry	1	11-Feb-2020 03:51
Total Petroleum Hydrocarbon	< 7.5		7.5	50	mg/Kg-dry	1	11-Feb-2020 03:51
Surr: 2-Fluorobiphenyl	*81.9*			*70-130*	*%REC*	*1*	*11-Feb-2020 03:51*
Surr: Trifluoromethyl benzene	*97.1*			*70-130*	*%REC*	*1*	*11-Feb-2020 03:51*
MOISTURE - ASTM D2216			**Method:ASTM D2216**				Analyst: DFF
Percent Moisture	**19.2**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
Sample ID: SO-1620-CPT3719(4-5)-20200206
Collection Date: 06-Feb-2020 11:55

ANALYTICAL REPORT

WorkOrder:HS20020239
Lab ID:HS20020239-14
Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TEXAS TPH BY TX1005		**Method:TX1005**			Prep:TX1005PR / 07-Feb-2020		Analyst: MBG
nC6 to nC12	**880**	J	**140**	**940**	**mg/Kg-dry**	20	12-Feb-2020 10:58
>nC12 to nC28	**9,600**		**180**	**940**	**mg/Kg-dry**	20	12-Feb-2020 10:58
>nC28 to nC35	**1,500**		**180**	**940**	**mg/Kg-dry**	20	12-Feb-2020 10:58
Total Petroleum Hydrocarbon	**12,000**		**140**	**940**	**mg/Kg-dry**	20	12-Feb-2020 10:58
Surr: 2-Fluorobiphenyl	*0*	*S*		*70-130*	*%REC*	*20*	*12-Feb-2020 10:58*
Surr: Trifluoromethyl benzene	*0*	*S*		*70-130*	*%REC*	*20*	*12-Feb-2020 10:58*
MOISTURE - ASTM D2216		**Method:ASTM D2216**					Analyst: DFF
Percent Moisture	**15.8**		**0.0100**	**0.0100**	**wt%**	1	12-Feb-2020 13:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Weight / Prep Log

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

Batch ID: 150420 **Start Date:** 07 Feb 2020 10:00 **End Date:** 07 Feb 2020 12:30
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20020239-01	1	13.79 (g)	10 (mL)	0.7252
HS20020239-02	1	11.45 (g)	10 (mL)	0.8734
HS20020239-03	1	12.86 (g)	10 (mL)	0.7776

Batch ID: 150437 **Start Date:** 07 Feb 2020 11:30 **End Date:** 07 Feb 2020 14:00
Method: TX 1005 PREP **Prep Code:** TX 1005_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20020239-04	1	12.13 (g)	10 (mL)	0.8244
HS20020239-05	1	12.36 (g)	10 (mL)	0.8091
HS20020239-06	1	12.19 (g)	10 (mL)	0.8203
HS20020239-07	1	7.74 (g)	10 (mL)	1.292
HS20020239-08	1	11.62 (g)	10 (mL)	0.8606
HS20020239-09	1	12.42 (g)	10 (mL)	0.8052
HS20020239-10	1	12.96 (g)	10 (mL)	0.7716
HS20020239-11	1	11.75 (g)	10 (mL)	0.8511
HS20020239-12	1	13.38 (g)	10 (mL)	0.7474
HS20020239-13	1	12.3 (g)	10 (mL)	0.813
HS20020239-14	1	12.65 (g)	10 (mL)	0.7905

Batch ID: 150896 **Start Date:** 20 Feb 2020 15:00 **End Date:** 21 Feb 2020 16:00
Method: TX 1006 PREP **Prep Code:** TX 1006_S PR

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS20020239-05		12.36 (g)	10 (mL)	0.8091
HS20020239-07		7.74 (g)	10 (mL)	1.292

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 150420 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS20020239-01	SO-1620-CPT4319(2-3)-20200204	04 Feb 2020 17:00		07 Feb 2020 10:00	07 Feb 2020 20:20	1
HS20020239-02	SO-1620-CPT4319(12-13)-20200204	04 Feb 2020 17:05		07 Feb 2020 10:00	07 Feb 2020 20:49	1
HS20020239-03	SO-1620-CPT3019(13-14)-20200205	05 Feb 2020 10:00		07 Feb 2020 10:00	11 Feb 2020 13:32	10
Batch ID: 150437 (0)	**Test Name :** TEXAS TPH BY TX1005				**Matrix:** Soil	
HS20020239-04	SO-1620-CPT3619(3-4)-20200205	05 Feb 2020 11:35		07 Feb 2020 11:30	10 Feb 2020 22:32	10
HS20020239-05	SO-1620-CPT3619(5-6)-20200205	05 Feb 2020 11:45		07 Feb 2020 11:30	10 Feb 2020 23:01	10
HS20020239-06	SO-1620-CPT2819(7-8)-20200205	05 Feb 2020 13:50		07 Feb 2020 11:30	10 Feb 2020 23:30	1
HS20020239-07	SO-1620-CPT2919(4-5)-20200205	05 Feb 2020 16:25		07 Feb 2020 11:30	12 Feb 2020 09:59	2
HS20020239-08	SO-1620-CPT2919(9-10)-20200205	05 Feb 2020 16:35		07 Feb 2020 11:30	12 Feb 2020 10:28	5
HS20020239-09	SO-1620-CPT4519(1-2)-20200205	05 Feb 2020 16:45		07 Feb 2020 11:30	11 Feb 2020 00:57	1
HS20020239-10	SO-1620-CPT4519(8-9)-20200205	05 Feb 2020 16:50		07 Feb 2020 11:30	11 Feb 2020 01:26	1
HS20020239-11	SO-1620-CPT4119(1-2)-20200206	06 Feb 2020 10:15		07 Feb 2020 11:30	11 Feb 2020 01:55	1
HS20020239-12	SO-1620-CPT4119(5-6)-20200206	06 Feb 2020 10:20		07 Feb 2020 11:30	11 Feb 2020 03:22	1
HS20020239-13	SO-1620-CPT2819(4-5)-20200206	06 Feb 2020 10:40		07 Feb 2020 11:30	11 Feb 2020 03:51	1
HS20020239-14	SO-1620-CPT3719(4-5)-20200206	06 Feb 2020 11:55		07 Feb 2020 11:30	12 Feb 2020 10:58	20
Batch ID: 150896 (0)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20020239-05	SO-1620-CPT3619(5-6)-20200205	05 Feb 2020 11:45		20 Feb 2020 15:00	21 Feb 2020 20:51	10
HS20020239-07	SO-1620-CPT2919(4-5)-20200205	05 Feb 2020 16:25		20 Feb 2020 15:00	21 Feb 2020 21:20	2
Batch ID: 150896 (1)	**Test Name :** PETROLEUM HYDROCARBONS BY TX1006				**Matrix:** Soil	
HS20020239-05	SO-1620-CPT3619(5-6)-20200205	05 Feb 2020 11:45		20 Feb 2020 15:00	21 Feb 2020 20:51	10
HS20020239-07	SO-1620-CPT2919(4-5)-20200205	05 Feb 2020 16:25		20 Feb 2020 15:00	21 Feb 2020 21:20	2
Batch ID: R356210 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS20020239-01	SO-1620-CPT4319(2-3)-20200204	04 Feb 2020 17:00			12 Feb 2020 13:42	1
HS20020239-02	SO-1620-CPT4319(12-13)-20200204	04 Feb 2020 17:05			12 Feb 2020 13:42	1
HS20020239-03	SO-1620-CPT3019(13-14)-20200205	05 Feb 2020 10:00			12 Feb 2020 13:42	1
HS20020239-04	SO-1620-CPT3619(3-4)-20200205	05 Feb 2020 11:35			12 Feb 2020 13:42	1

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R356211 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS20020239-05	SO-1620-CPT3619(5-6)-20200205	05 Feb 2020 11:45			12 Feb 2020 13:45	1
HS20020239-06	SO-1620-CPT2819(7-8)-20200205	05 Feb 2020 13:50			12 Feb 2020 13:45	1
HS20020239-07	SO-1620-CPT2919(4-5)-20200205	05 Feb 2020 16:25			12 Feb 2020 13:45	1
HS20020239-08	SO-1620-CPT2919(9-10)-20200205	05 Feb 2020 16:35			12 Feb 2020 13:45	1
HS20020239-09	SO-1620-CPT4519(1-2)-20200205	05 Feb 2020 16:45			12 Feb 2020 13:45	1
HS20020239-10	SO-1620-CPT4519(8-9)-20200205	05 Feb 2020 16:50			12 Feb 2020 13:45	1
HS20020239-11	SO-1620-CPT4119(1-2)-20200206	06 Feb 2020 10:15			12 Feb 2020 13:45	1
HS20020239-12	SO-1620-CPT4119(5-6)-20200206	06 Feb 2020 10:20			12 Feb 2020 13:45	1
HS20020239-13	SO-1620-CPT2819(4-5)-20200206	06 Feb 2020 10:40			12 Feb 2020 13:45	1
HS20020239-14	SO-1620-CPT3719(4-5)-20200206	06 Feb 2020 11:55			12 Feb 2020 13:45	1

WorkOrder: HS20020239
InstrumentID: FID-13
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	29	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	22	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	22	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	22	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20020239
InstrumentID: FID-12
Test Code: TX1005_S_REV3
Test Number: TX1005
Test Name: Texas TPH by TX1005

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	nC6 to nC12	TPH-1005-1	25	29	7.4	50
A	>nC12 to nC28	TPH-1005-2	25	29	9.8	50
A	>nC28 to nC35	TPH-1005-4	25	29	9.8	50
A	Total Petroleum Hydrocarbon	TPH	25	29	7.4	50
S	2-Fluorobiphenyl	321-60-8	0	0	0	0
S	Trifluoromethyl benzene	98-08-8	0	0	0	0

WorkOrder: HS20020239
InstrumentID: FID-10
Test Code: TX1006_S
Test Number: TX1006
Test Name: Petroleum Hydrocarbons by

METHOD DETECTION / REPORTING LIMITS

Matrix: Solid **Units:** mg/Kg

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Aliphatics nC6	PHC6ALIP	0	0	5.0	10
A	Aliphatics >nC6 to nC8	PHCG68ALIP	0	0	5.0	10
A	Aliphatics >nC8 to nC10	PHCG810ALIP	0	0	5.0	10
A	Aliphatics >nC10 to nC12	PHCG1012ALIP	0	0	5.0	10
A	Aliphatics >nC12 to nC16	PHCG1216ALIP	0	0	5.0	10
A	Aliphatics >nC16 to nC21	PHCG1621ALIP	0	0	5.0	10
A	Aliphatics >nC21 to nC35	PHCG2135ALIP	0	0	5.0	10
A	Total Aliphatic Fraction	TOTALIPFRACT	0	0	5.0	10
A	Aliphatics Relative % Distribution	ALPRELPERDIST	0	0	0	0
A	Aromatics >nC7 to nC8	PHCG78AROM	0	0	5.0	10
A	Aromatics >nC8 to nC10	PHCG810AROM	0	0	5.0	10
A	Aromatics >nC10 to nC12	PHCG1012AROM	0	0	5.0	10
A	Aromatics >nC12 to nC16	PHCG1216AROM	0	0	5.0	10
A	Aromatics >nC16 to nC21	PHCG1621AROM	0	0	5.0	10
A	Aromatics >nC21 to nC35	PHCG2135AROM	0	0	5.0	10
A	Total Aromatic Fraction	TOTAROFRACT	0	0	5.0	10
A	Aromatics Relative % Distribution	ARORELPERCDIST	0	0	0	0
A	Total Petroleum Hydrocarbons	PHCG635AROMALIP	0	0	5.0	10

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150420 (0)** **Instrument:** **FID-13** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-150420** Units: **mg/Kg** Analysis Date: **07-Feb-2020 14:55**
Client ID: Run ID: **FID-13_355959** SeqNo: **5466072** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*19.78*	*0*	*25*	*0*	*79.1*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.11*	*0*	*25*	*0*	*96.4*	*70 - 130*				

LCS Sample ID: **LCS-150420** Units: **mg/Kg** Analysis Date: **07-Feb-2020 15:24**
Client ID: Run ID: **FID-13_355959** SeqNo: **5466073** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	285.8	50	250	0	114	75 - 125				
>nC12 to nC28	287.1	50	250	0	115	75 - 125				
Surr: 2-Fluorobiphenyl	*23.59*	*0*	*25*	*0*	*94.4*	*70 - 130*				
Surr: Trifluoromethyl benzene	*25.86*	*0*	*25*	*0*	*103*	*70 - 130*				

LCSD Sample ID: **LCSD-150420** Units: **mg/Kg** Analysis Date: **07-Feb-2020 15:54**
Client ID: Run ID: **FID-13_355959** SeqNo: **5466074** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	261	50	250	0	104	75 - 125	285.8	9.08	20	
>nC12 to nC28	251.5	50	250	0	101	75 - 125	287.1	13.2	20	
Surr: 2-Fluorobiphenyl	*22.11*	*0*	*25*	*0*	*88.4*	*70 - 130*	*23.59*	*6.49*	*20*	
Surr: Trifluoromethyl benzene	*23.92*	*0*	*25*	*0*	*95.7*	*70 - 130*	*25.86*	*7.8*	*20*	

MS Sample ID: **HS20020190-02MS** Units: **mg/Kg** Analysis Date: **07-Feb-2020 16:53**
Client ID: Run ID: **FID-13_355959** SeqNo: **5466076** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	263.5	48	237.9	0	111	75 - 125				
>nC12 to nC28	296.1	48	237.9	0	124	75 - 125				
Surr: 2-Fluorobiphenyl	*19.12*	*0*	*23.79*	*0*	*80.4*	*70 - 130*				
Surr: Trifluoromethyl benzene	*20.41*	*0*	*23.79*	*0*	*85.8*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150420 (0)** **Instrument:** **FID-13** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS20020190-02MSD** Units: **mg/Kg** Analysis Date: **07-Feb-2020 17:23**
Client ID: Run ID: **FID-13_355959** SeqNo: **5466077** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	264.5	48	238.8	0	111	75 - 125	263.5	0.414	20	
>nC12 to nC28	287.3	48	238.8	0	120	75 - 125	296.1	3.03	20	
Surr: 2-Fluorobiphenyl	*19.55*	*0*	*23.88*	*0*	*81.9*	*70 - 130*	*19.12*	*2.24*	*20*	
Surr: Trifluoromethyl benzene	*20.76*	*0*	*23.88*	*0*	*87.0*	*70 - 130*	*20.41*	*1.72*	*20*	

The following samples were analyzed in this batch: HS20020239-01 HS20020239-02 HS20020239-03

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150437 (0)** **Instrument:** **FID-12** **Method:** **TEXAS TPH BY TX1005**

MBLK Sample ID: **MBLK-150437** Units: **mg/Kg** Analysis Date: **10-Feb-2020 17:37**
Client ID: Run ID: **FID-12_356034** SeqNo: **5467677** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	< 7.4	50								
>nC12 to nC28	< 9.8	50								
>nC28 to nC35	< 9.8	50								
Total Petroleum Hydrocarbon	< 7.4	50								
Surr: 2-Fluorobiphenyl	*20.87*	*0*	*25*	*0*	*83.5*	*70 - 130*				
Surr: Trifluoromethyl benzene	*24.96*	*0*	*25*	*0*	*99.8*	*70 - 130*				

LCS Sample ID: **LCS-150437** Units: **mg/Kg** Analysis Date: **10-Feb-2020 18:07**
Client ID: Run ID: **FID-12_356034** SeqNo: **5467678** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	302.8	50	250	0	121	75 - 125				
>nC12 to nC28	270.6	50	250	0	108	75 - 125				
Surr: 2-Fluorobiphenyl	*24.32*	*0*	*25*	*0*	*97.3*	*70 - 130*				
Surr: Trifluoromethyl benzene	*26.03*	*0*	*25*	*0*	*104*	*70 - 130*				

LCSD Sample ID: **LCSD-150437** Units: **mg/Kg** Analysis Date: **10-Feb-2020 18:37**
Client ID: Run ID: **FID-12_356034** SeqNo: **5467679** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	286.7	50	250	0	115	75 - 125	302.8	5.49	20	
>nC12 to nC28	248.9	50	250	0	99.6	75 - 125	270.6	8.32	20	
Surr: 2-Fluorobiphenyl	*22.84*	*0*	*25*	*0*	*91.4*	*70 - 130*	*24.32*	*6.25*	*20*	
Surr: Trifluoromethyl benzene	*25.62*	*0*	*25*	*0*	*102*	*70 - 130*	*26.03*	*1.6*	*20*	

MS Sample ID: **HS20020191-03MS** Units: **mg/Kg** Analysis Date: **10-Feb-2020 19:36**
Client ID: Run ID: **FID-12_356034** SeqNo: **5467680** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	289.2	49	244.6	0	118	75 - 125				
>nC12 to nC28	290	49	244.6	3.358	117	75 - 125				
Surr: 2-Fluorobiphenyl	*18.24*	*0*	*24.46*	*0*	*74.5*	*70 - 130*				
Surr: Trifluoromethyl benzene	*20.22*	*0*	*24.46*	*0*	*82.7*	*70 - 130*				

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150437 (0)** **Instrument:** **FID-12** **Method:** **TEXAS TPH BY TX1005**

MSD Sample ID: **HS20020191-03MSD** Units: **mg/Kg** Analysis Date: **10-Feb-2020 20:06**
Client ID: Run ID: **FID-12_356034** SeqNo: **5467681** PrepDate: **07-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
nC6 to nC12	282.5	49	242.7	0	116	75 - 125	289.2	2.35	20	
>nC12 to nC28	286.7	49	242.7	3.358	117	75 - 125	290	1.13	20	
Surr: 2-Fluorobiphenyl	*18.45*	*0*	*24.27*	*0*	*76.0*	*70 - 130*	*18.24*	*1.16*	*20*	
Surr: Trifluoromethyl benzene	*20.63*	*0*	*24.27*	*0*	*85.0*	*70 - 130*	*20.22*	*2*	*20*	

The following samples were analyzed in this batch:

HS20020239-04	HS20020239-05	HS20020239-06	HS20020239-07
HS20020239-08	HS20020239-09	HS20020239-10	HS20020239-11
HS20020239-12	HS20020239-13	HS20020239-14	

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150896 (0)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150896** Units: **mg/Kg** Analysis Date: **21-Feb-2020 18:54**
Client ID: Run ID: **FID-10_356852** SeqNo: **5484313** PrepDate: **20-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aliphatics nC6	< 5.0	10								
Aliphatics >nC6 to nC8	< 5.0	10								
Aliphatics >nC8 to nC10	< 5.0	10								
Aliphatics >nC10 to nC12	< 5.0	10								
Aliphatics >nC12 to nC16	< 5.0	10								
Aliphatics >nC16 to nC21	< 5.0	10								
Aliphatics >nC21 to nC35	< 5.0	10								
Total Aliphatic Fraction	< 5.0	10								
Aliphatics Relative % Distribution	0	0								
Total Petroleum Hydrocarbons	< 5.0	10								

LCS Sample ID: **LCS-150896** Units: **mg/Kg** Analysis Date: **21-Feb-2020 19:23**
Client ID: Run ID: **FID-10_356852** SeqNo: **5484314** PrepDate: **20-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	448.4	10	500	0	89.7	60 - 140				

LCSD Sample ID: **LCSD-150896** Units: **mg/Kg** Analysis Date: **21-Feb-2020 19:53**
Client ID: Run ID: **FID-10_356852** SeqNo: **5484315** PrepDate: **20-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Petroleum Hydrocarbons	471.7	10	500	0	94.3	60 - 140	448.4	5.07	30	

The following samples were analyzed in this batch: HS20020239-05 HS20020239-07

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **150896 (1)** **Instrument:** **FID-10** **Method:** **PETROLEUM HYDROCARBONS BY TX1006**

MBLK Sample ID: **MBLK-150896** Units: **mg/Kg** Analysis Date: **21-Feb-2020 18:54**
Client ID: Run ID: **FID-10_356852** SeqNo: **5484343** PrepDate: **20-Feb-2020** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Aromatics >nC7 to nC8	< 5.0	10								
Aromatics >nC8 to nC10	< 5.0	10								
Aromatics >nC10 to nC12	< 5.0	10								
Aromatics >nC12 to nC16	< 5.0	10								
Aromatics >nC16 to nC21	< 5.0	10								
Aromatics >nC21 to nC35	< 5.0	10								
Total Aromatic Fraction	< 5.0	10								
Aromatics Relative % Distribution		0								

The following samples were analyzed in this batch: HS20020239-05 HS20020239-07

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **R356210 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS20020239-04DUP** Units: **wt%** Analysis Date: **12-Feb-2020 13:42**

Client ID: **SO-1620-CPT3619(3-4)-20200205** Run ID: **Balance1_356210** SeqNo: **5471584** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	20.2	0.0100					20.8	2.93	20	

The following samples were analyzed in this batch:

HS20020239-01	HS20020239-02	HS20020239-03	HS20020239-04

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: HS20020239

QC BATCH REPORT

Batch ID: **R356211 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS20020269-10DUP** Units: **wt%** Analysis Date: **12-Feb-2020 13:45**

Client ID: Run ID: **Balance1_356211** SeqNo: **5471605** PrepDate: DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	10.2	0.0100					10.2	0	20	

The following samples were analyzed in this batch:

HS20020239-05	HS20020239-06	HS20020239-07	HS20020239-08
HS20020239-09	HS20020239-10	HS20020239-11	HS20020239-12
HS20020239-13	HS20020239-14		

Client: Golder Associates Inc.
Project: Houston TX-Wood Preserving Works
WorkOrder: **HS20020239**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	**Number**	**Expire Date**
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

Sample Receipt Checklist

Client Name: PBW

Work Order: HS20020239

Date/Time Received: **06-Feb-2020 16:05**

Received by: **DDG**

Checklist completed by: *Nilesh D. Ranchod* eSignature 6-Feb-2020 Date

Reviewed by: *Dane J. Wacasey* eSignature 10-Feb-2020 Date

Matrices: **Soil**

Carrier name: **ALS Courier**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑	
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑	
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☑	No ☐	Not Present ☐	
Chain of custody present?	Yes ☑	No ☐	1 Page(s)	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:212483/212482	
Samplers name present on COC?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		
Temperature(s)/Thermometer(s):	0.9C UC/C			IR # 25
Cooler(s)/Kit(s):	43812			
Date/Time sample(s) sent to storage:	02/06/2020 16:30			
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑	
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑	
pH adjusted?	Yes ☐	No ☐	N/A ☑	
pH adjusted by:				

Login Notes: samples placed in Freezer 02/06/2020 16:30

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

Cincinnati, OH
+1 513 733 5336

Everett, WA
+1 425 356 2600

Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 2

COC ID: 212482

HS20020239

Golder Associates Inc.
Houston TX-Wood Preserving Works

Customer Information		**Project Information**		**ALS Project Manager:**
Purchase Order	UPRR/Kevin Peterburs	Project Name	Houston TX-Wood Preserving Works	A TX1005_S_REV3 (5643233 TX1005 TPH)
Work Order		Project Number	1620-10-Rev0 SR 92688	B MOIST_ASTM (5631931 Moisture Content)
Company Name	Golder Associates Inc.	Bill To Company	Union Pacific Railroad- A/P	C TX1006_S (5645481 TPH TX1006) [HOLD]
Send Report To	Eric Matzner	Invoice Attn	Accounts Payable	D
Address	2201 Double Creek Drive Suite 4004	Address	1400 Douglas Street Stop 0750	E F Per
City/State/Zip	Round Rock, TX 78664	City/State/Zip	Omaha NE 681790750	G Golder
Phone	(512) 671-3434	Phone		H
Fax	(512) 671-3446	Fax		I MSA
e-Mail Address	Eric_Matzner@golder.com	e-Mail Address		J

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-CPT4319(2-3)-20200204	2-4-20	1700	Soil	8	3	X	X	X								
2	CPT4319(12-13)	2-4-20	1705				X	X	X								
3	CPT3019(13-14)-20200205	2-5-20	1000				X	X	X		Hold						
4	CPT3619(3-4)		1135				X	X	X								
5	CPT3619(5-6)		1145				X	X	X		1006						
6	CPT2819(7-8)		1350														
7	CPT2919(4-5)		1625								Sampling						
8	CPT2919(9-10)		1635														
9	CPT4519([illegible])		1645														
10	CPT4519(8-9)		1655														

Sampler(s) Please Print & Sign: Blake Sokora Blake Sokora

Shipment Method:

Required Turnaround Time: (Check Box) ☒ STD 10 Wk Days ☐ 5 Wk Days ☐ Other ______ ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Blake Sokora Date: 2-6-20 Time: 1425 Received by: DS

Relinquished by: DS Date: 2-6-20 Time: 1605 Received by (Laboratory): DS

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp.
	ulC
43810	0.9

QC Package: (Check One Box Below)
☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ______
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ALS

Cincinnati, OH
+1 513 733 5336

Everett, WA
+1 425 356 2600

Fort Collins, CO
+1 970 490 1511

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 2 of 2

COC ID: 212483

HS20020239

WV

Golder Associates Inc.
Houston TX-Wood Preserving Works

ALS Project Manager:

Customer Information	
Purchase Order	UPRR/Kevin Peterburs
Work Order	
Company Name	Golder Associates Inc.
Send Report To	Eric Matzner
Address	2201 Double Creek Drive Suite 4004
City/State/Zip	Round Rock, TX 78664
Phone	(512) 671-3434
Fax	(512) 671-3446
e-Mail Address	Eric_Matzner@golder.com

Project Information	
Project Name	Houston TX-Wood Preserving Works
Project Number	1620-10-Rev0 SR 92688
Bill To Company	Union Pacific Railroad- A/P
Invoice Attn	Accounts Payable
Address	1400 Douglas Street Stop 0750
City/State/Zip	Omaha NE 681790750
Phone	
Fax	
e-Mail Address	

A	TX1005_S_REV3 (5643233 TX1005 TPH)
B	MOIST_ASTM (5631931 Moisture Content)
C	TX1006_S (5645481 TPH TX1006) [HOLD]
D	
E	
F	
G	
H	
I	
J	

Per Golder MSA

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SO-1620-CPT4119(1-2)-20200206	2-6-20	1015	Soil	8	3	X	X	X								
2	CPT4119(5-6)-20200206	↓	1020	↓	↓	↓	X	X	X								
3	CPT2819(4-5)		1040				X	X	X								
4	CPT3719(4-5)		1155				X	X	X								
5																	
6																	
7																	
8																	
9																	
10																	

Hold 1006 Sampling

Sampler(s) Please Print & Sign: Blake Sokora Blake Sokora

Shipment Method:

Required Turnaround Time: (Check Box) ☐ Other ______ ☒ STD 10 Wk Days ☐ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished by: Blake Sokora Date: 2-6-20 Time: 1425 Received by: D

Relinquished by: D Date: 2 6 20 Time: 1605 Received by (Laboratory): D

Logged by (Laboratory): Date: Time: Checked by (Laboratory):

Notes: UPRR HWPW 1620 TPH NAPL Assessment

Cooler ID	Cooler Temp. 4°C
43810	0.9

QC Package: (Check One Box Below)

☒ Level II Std QC
☐ Level III Std QC/Raw Data
☐ Level IV SW846/CLP
☐ Other ______
☐ TRRP Checklist
☐ TRRP Level IV

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ATTACHMENT G

Technical Memorandum - TPH Interpretation

MEMORANDUM

DATE May 11, 2020 **Project No.** 19119232

TO Michelle Hermiston
Golder Associates, Inc

FROM Brenda Basile **EMAIL brenda_basile@golder.com**

INTERPRETATION OF SOIL TX1005 AND TX1006 DATA FOR SAMPLES COLLECTED FROM HOUSTON WOOD PRESERVING WORKS

Samples collected from the Houston Wood Preserving Works (HWPW) facility were analyzed for total petroleum hydrocarbons (TPH) by Texas Method 1005 (Total Petroleum Hydrocarbons, Revision 3). Selected samples were fractioned for carbon range aliphatic and aromatic hydrocarbons by Texas Method 1006 (Characterization of nC_6 to nC_{35} Petroleum Hydrocarbons in Environmental Samples). Chromatograms for 33 samples and the fractionation data for 14 of these samples were reviewed to provide an interpretation of the hydrocarbon types present in the soil samples. Based on the profile of the predominant peaks in the chromatograms and the fractionation data, it is concluded that the soil samples can be assigned four categories:

- nC_6 to nC_{12} Organics
- $>nC_{12}$ to nC_{28} Organics
- $>nC_{12}$ to nC_{28} Organics with High Aromatic Content
- Unresolved complex material (UCM)

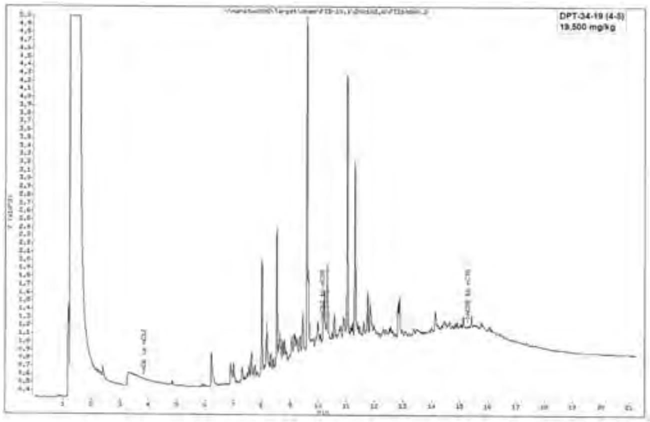
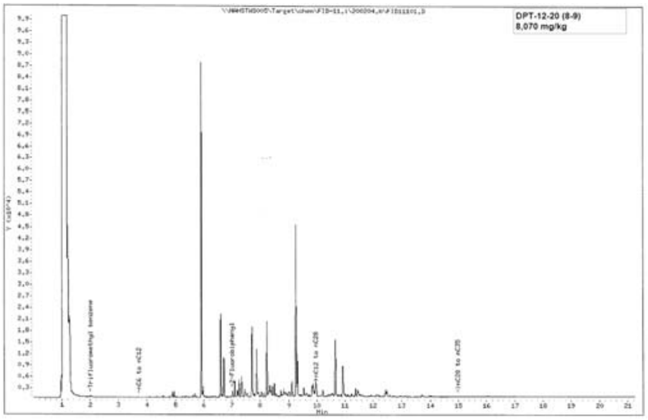
An example chromatogram for each category of hydrocarbon material is provided in this memorandum. Underneath the chromatogram is a list of samples assigned to each category (Tables 1 through 4). The TPH concentrations are provided in the tables. The TX1005 TPH concentrations are listed in Table 5. The percentage fractions in the TX1006 data are listed in Table 6.

nC_6 to nC_{12} Organics

Samples grouped in the nC_6 to nC_{12} organics category are listed in Table 1. These samples contain chromatographic peaks between the nC_6 to nC_{12} mark on the chromatogram (first red arrow on Figure 1) and the 2-fluorobiphenyl surrogate (second red arrow on Figure 1). While the peaks for the $>nC_{12}$ to nC_{28} range hydrocarbons are also present in the chromatogram, this set of samples is marked by the visual presence of peaks in nC_6 to nC_{12} range. This indicates the presence of volatile organic compounds in the soil at the locations listed in Table 1.

$>nC_{12}$ to nC_{28} Organics

The samples in the $>nC_{12}$ to nC_{28} organics category contain chromatographic peaks in the higher boiling portion of the nC_6 to nC_{12} range and in the $>nC_{12}$ to nC_{28} range (as indicated by the red arrows on Figure 2). The $>nC_{12}$ to nC_{28} organics category is subdivided into two groups based on the percent aromatics in the TX1006 fractionation data (Table 6). The figures below show the visual differences used to categorize the TX1005 chromatograms. The chromatogram on the left below shows an example of a sample categorized as $>nC_{12}$ to nC_{28} while the chromatogram on the right below shows an example of a sample categorized as $>nC_{12}$ to nC_{28} range but with a high (>70%) aromatic content in the fractionation data.

>nC_{12} to nC_{28} Organics	>nC_{12} to nC_{28} Organics with High Aromatic Content
	

The example chromatographic profile in the >nC_{12} to nC_{28} category is shown in Figure 2 and samples assigned to this category are listed in Table 2. The soils at the locations listed in Table 2 may be impacted by diesel or other fuels.

>nC_{12} to nC_{28} Organics with High Aromatic Content

The samples in this category also contain chromatographic peaks in the higher boiling portion of the nC_6 to nC_{12} range and in the >nC_{12} to nC_{28} range but are characterized by a high (>70%) aromatic content in the fractionation data. Figure 3 provides the example chromatogram and Table 3 lists the field sample identifications assigned to this category. The soils at the locations listed in Table 3 may be impacted by creosote. Coal tar creosote, which is used for wood treatment, can contain about 85% polycyclic aromatic hydrocarbons (PAHs) as well as phenols and other compounds (Murphy and Brown, 2005).

Unresolved complex material (UCM)

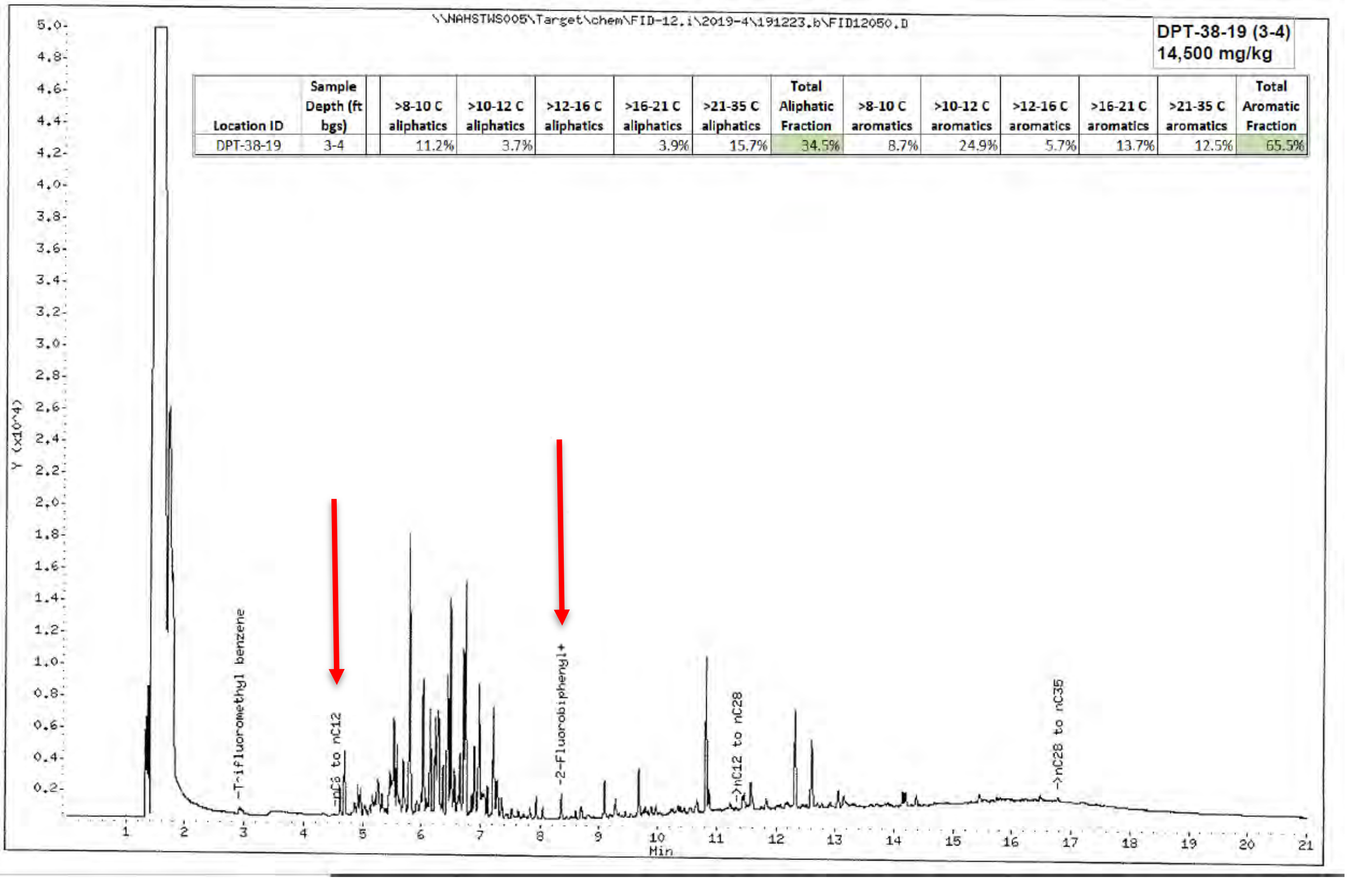
Samples grouped in the UCM category are listed in Table 4. These samples contain a “hump” of unresolved peaks in the gas chromatogram (as shown by the arc in Figure 4). The components that are separated on the gas chromatographic column appear as the peaks discussed in the first three categories, while the UCM appears as a large hump. A dominance of UCM in the chromatogram is typical of residual fuel oil which have common names such as No. 4, 5, and 6 fuel oils and bunker C. Asphalt and lubricating oils will also have an UCM profile in the gas chromatogram. The UCM composition can be quite variable containing saturated and aromatic hydrocarbons (including PAHs) as well as nonhydrocarbons (heteroatom containing molecules) (TPHWG, 1998).

References

Murphy, B. and J. Brown (Murphy and Brown). 2005. Environmental Forensics Aspects of PAHs from Wood Treatment with Creosote Compounds. *Environmental Forensics*, 6:151–159, 2005.

Total Petroleum Hydrocarbon Working Group (TPHWG). 1998. Analysis of Petroleum Hydrocarbons in Environmental Media. Volume 1. March 1998.

Figure 1: nC_6 to nC_{12} Example Chromatogram

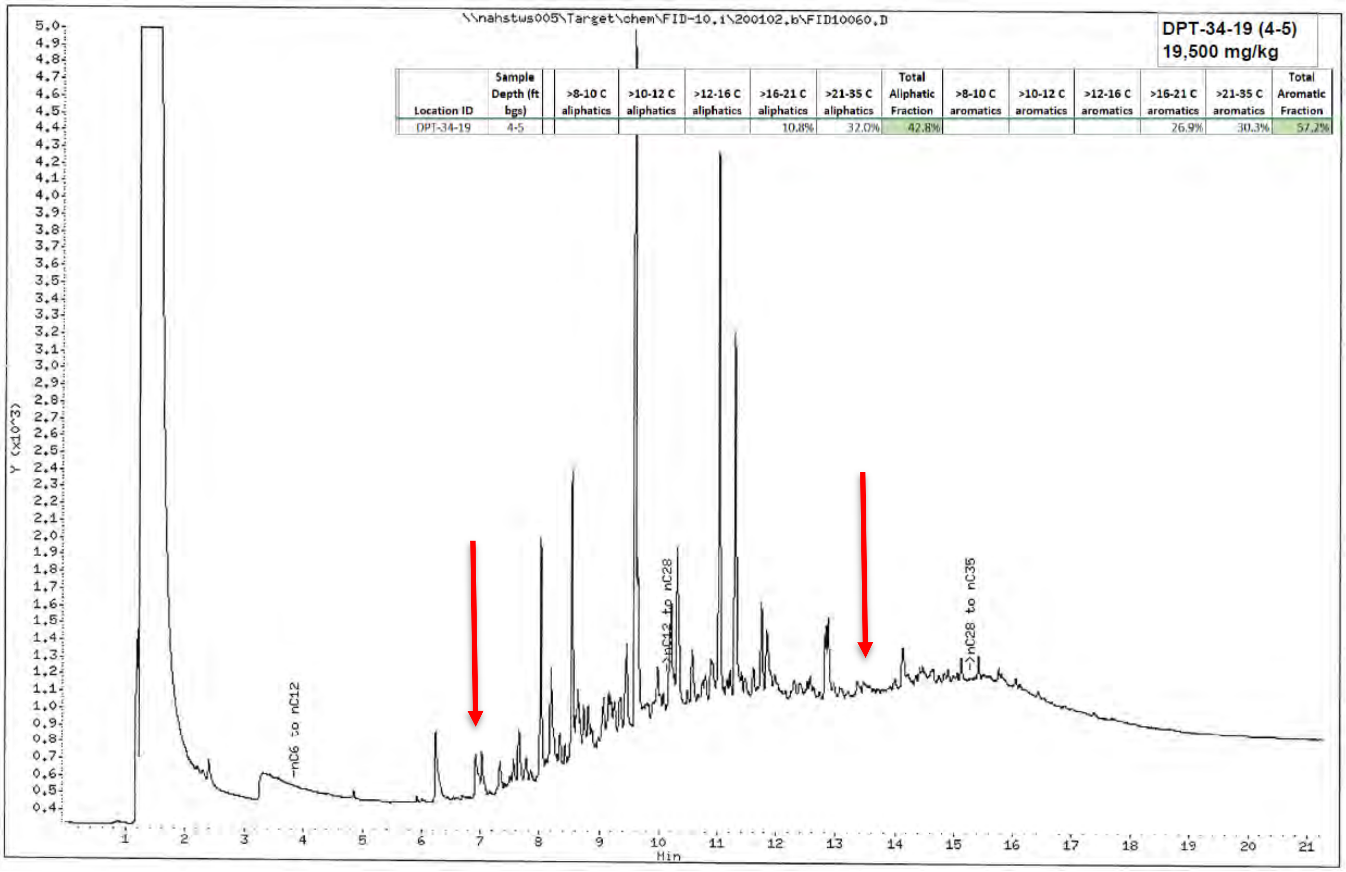


Location ID	Sample Depth (ft bgs)		>8-10 C aliphatics	>10-12 C aliphatics	>12-16 C aliphatics	>16-21 C aliphatics	>21-35 C aliphatics	Total Aliphatic Fraction	>8-10 C aromatics	>10-12 C aromatics	>12-16 C aromatics	>16-21 C aromatics	>21-35 C aromatics	Total Aromatic Fraction
DPT-38-19	3-4		11.2%	3.7%		3.9%	15.7%	34.5%	8.7%	24.9%	5.7%	13.7%	12.5%	65.5%

Table 1: nC_6 to nC_{12} Samples

Laboratory Identification	Location Identification	Depth (ft bgs)	nC6 nC12 (mg/kg)	>nC12 nC28 (mg/kg)	>nC28 nC35 (mg/kg)	Total TPH (mg/kg)
HS19120951-05	DPT-38-19	3-4	5000	6400	3100	14500
HS19120951-06	DPT-38-19	5-6	1400	4700	1700	7800
HS20011494-05	DPT-21-20	3-4	**1300**	**2800**	**97 J**	**4200**

Figure 2: >nC$_{12}$ to nC$_{28}$ Example Chromatogram



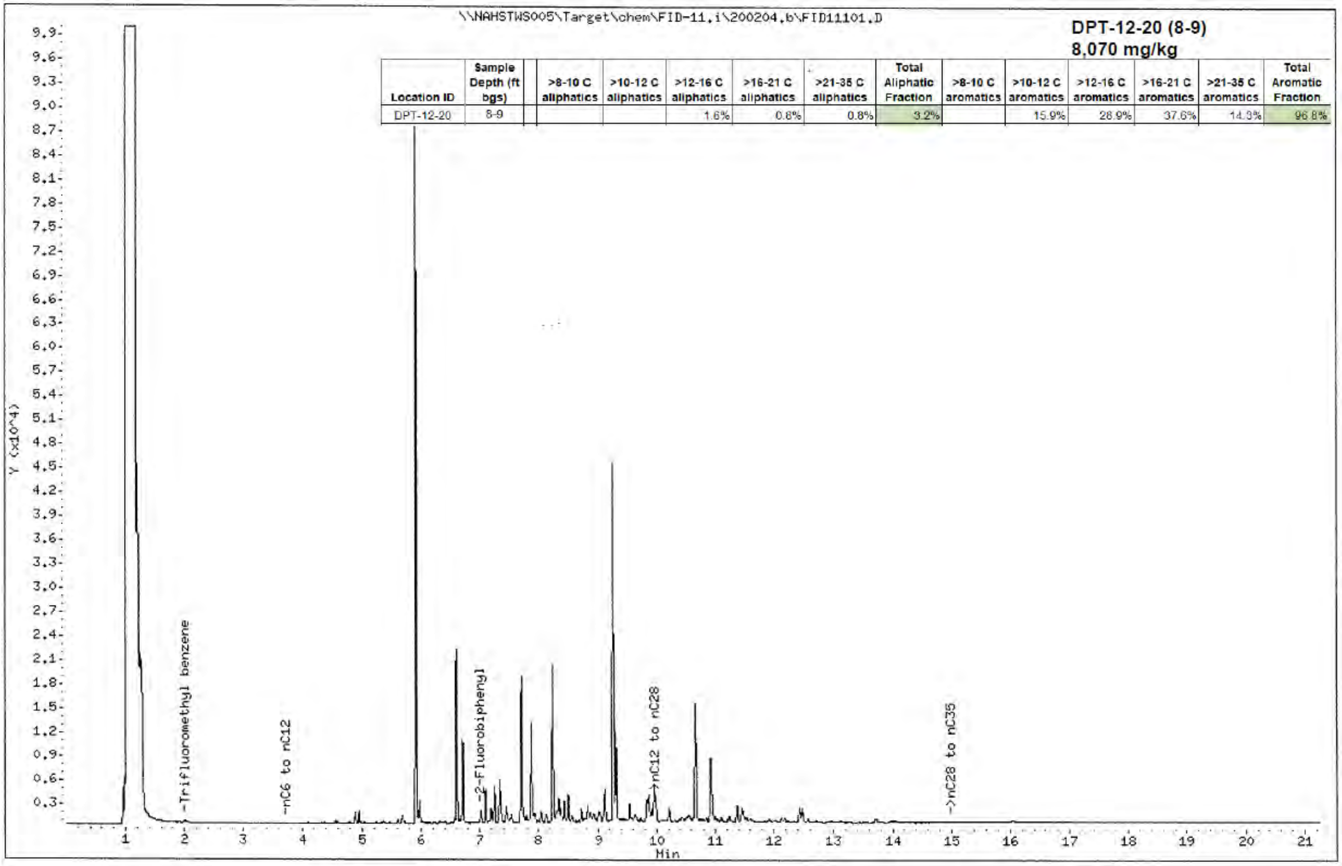
DPT-34-19 (4-5)
19,500 mg/kg

Location ID	Sample Depth (ft bgs)		>8-10 C aliphatics	>10-12 C aliphatics	>12-16 C aliphatics	>16-21 C aliphatics	>21-35 C aliphatics	Total Aliphatic Fraction	>8-10 C aromatics	>10-12 C aromatics	>12-16 C aromatics	>16-21 C aromatics	>21-35 C aromatics	Total Aromatic Fraction
DPT-34-19	4-5					10.8%	32.0%	42.8%				26.9%	30.3%	57.2%

Table 2: >nC$_{12}$ to nC$_{28}$ Samples

Laboratory Identification	Location Identification	Depth (ft bgs)	nC6 nC12 (mg/kg)	>nC12 nC28 (mg/kg)	>nC28 nC35 (mg/kg)	Total TPH (mg/kg)
HS20011494-06	DPT-21-20	5-6	**48**	**110**	**22 J**	**180**
HS20020158-03	DPT-30-19	4-5	**220 J**	**9300**	**3000**	**12500**
HS19121108-03	DPT-34-19	4-5	<450	**15000**	**4500**	**19500**
HS19121108-04	DPT-34-19	5-6	<82	**3800**	**1200**	**5000**
HS20020239-04	DPT-36-19	3-4	**140 J**	**7100**	**1600**	**8840**
HS20020158-04	DPT-37-19	7-8	**270**	**1800**	**270**	**2340**
HS20020239-14	DPT-37-19	4-5	**880 J**	**9600**	**1500**	**12000**
HS19121108-01	DPT-40-19	1.25-2	**170 J**	**6500**	**1300**	**7970**
HS20011392-06	SB-216	7-8	**27 J**	**360**	<9.7	**387**

Figure 3: >nC$_{12}$ to nC$_{28}$ with High Aromatic Content Example Chromatogram



\\NAHSTWS005\Target\chem\FID-11.i\200204.b\FID11101.D

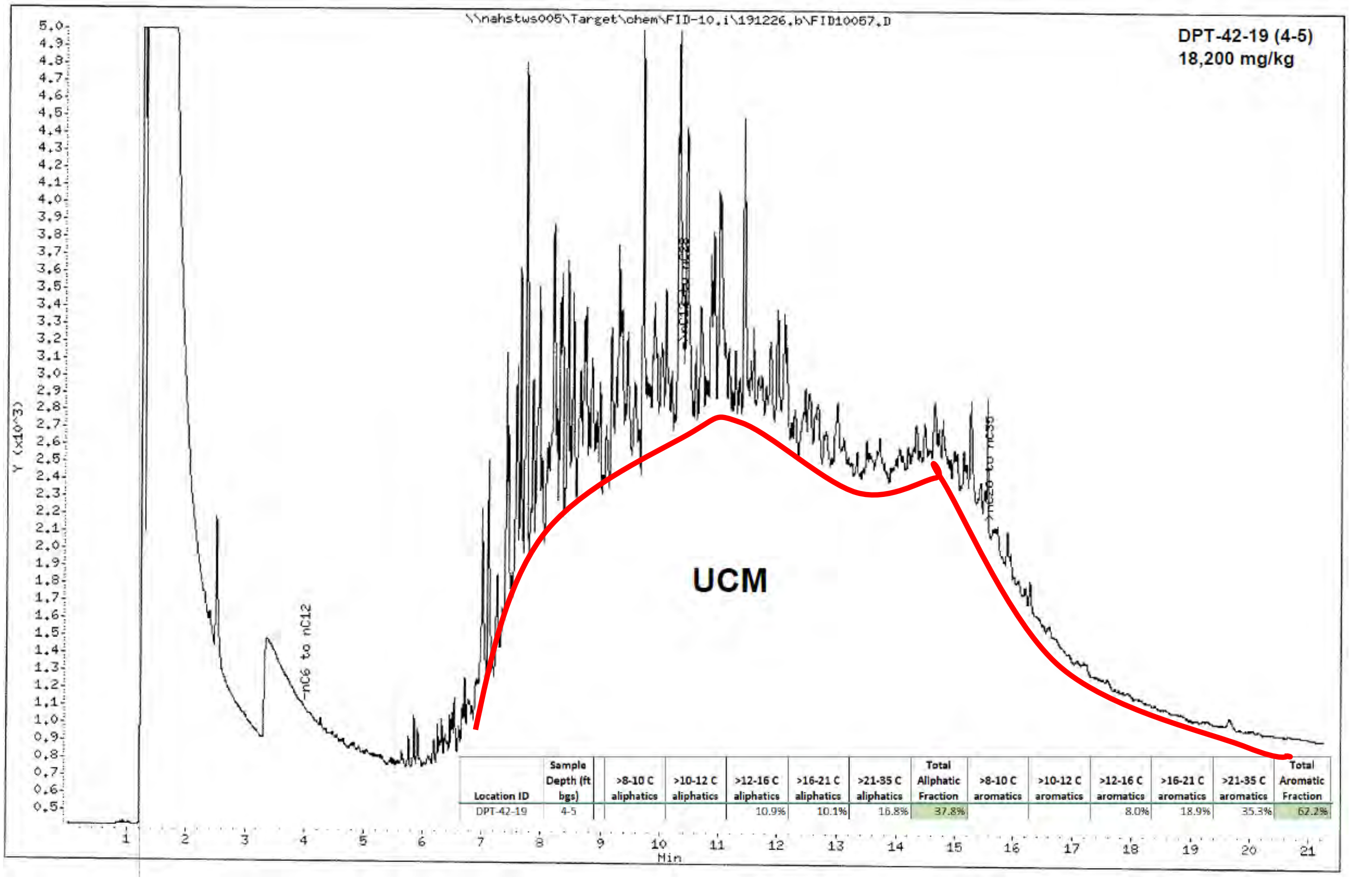
DPT-12-20 (8-9)
8,070 mg/kg

Location ID	Sample Depth (ft bgs)		>8-10 C aliphatics	>10-12 C aliphatics	>12-16 C aliphatics	>16-21 C aliphatics	>21-35 C aliphatics	Total Aliphatic Fraction	>8-10 C aromatics	>10-12 C aromatics	>12-16 C aromatics	>16-21 C aromatics	>21-35 C aromatics	Total Aromatic Fraction
DPT-12-20	8-9				1.6%	0.8%	0.8%	3.2%		15.9%	28.9%	37.6%	14.3%	96.8%

Table 3: >nC$_{12}$ to nC$_{28}$ with High Aromatic Content Samples

Laboratory Identification	Location Identification	Depth (ft bgs)	nC6 nC12 (mg/kg)	>nC12 nC28 (mg/kg)	>nC28 nC35 (mg/kg)	Total TPH (mg/kg)
HS20011494-01	DPT-12-20	4-5	**290**	**2300**	**120 J**	**2710**
HS20011494-02	DPT-12-20	8-9	**1300**	**6500**	**270 J**	**8070**
HS20011494-03	DPT-16-20	4-5	**270**	**860**	**28 J**	**1160**
HS20011494-04	DPT-16-20	14-15	**1300**	**3100**	**120 J**	**4520**
HS20011392-01	DPT-26-20	2-3	**170 J**	**3300**	**440**	**3910**
HS20020239-07	DPT-29-19	4-5	**650**	**2600**	**970**	**4220**
HS20020239-08	DPT-29-19	9-10	**230 J**	**1100**	**200 J**	**1530**
HS20020239-03	DPT-30-19	13-14	**810**	**3400**	**510**	**4720**
HS20020158-05	DPT-32-19	2-3	**1300**	**8700**	**1800**	**11800**
HS20020158-06	DPT-32-19	11-12	**890**	**5600**	**950**	**7440**
HS19121108-07	DPT-35-19	4-5	**900**	**13000**	**2900**	**16800**
HS19121108-08	DPT-35-19	6-7	**200 J**	**1200**	**170 J**	**1570**

Figure 4: Unresolved Complex Material (UCM) Example Chromatogram



Location ID	Sample Depth (ft bgs)		>8-10 C aliphatics	>10-12 C aliphatics	>12-16 C aliphatics	>16-21 C aliphatics	>21-35 C aliphatics	Total Aliphatic Fraction	>8-10 C aromatics	>10-12 C aromatics	>12-16 C aromatics	>16-21 C aromatics	>21-35 C aromatics	Total Aromatic Fraction
DPT-42-19	4-5				10.9%	10.1%	16.8%	37.8%			8.0%	18.9%	35.3%	62.2%

Table 4: Unresolved Complex Material (UCM) Samples

Laboratory Identification	Location Identification	Depth (ft bgs)	nC6 nC12 (mg/kg)	>nC12 nC28 (mg/kg)	>nC28 nC35 (mg/kg)	Total TPH (mg/kg)
HS20020239-05	DPT-36-19	5-6	**130 J**	**9100**	**2700**	**11900**
HS19121010-01	DPT-39-19	2-3	<7.4	**600**	**360**	**960**
HS20020239-11	DPT-41-19	1-2	**8.1 J**	**130**	**170**	**308**
HS19121010-03	DPT-42-19	4-5	<120	**15000**	**3200**	**18200**
HS19121010-04	DPT-42-19	7-8	**140 J**	**960**	**210 J**	**1310**
HS20020239-01	DPT-43-19	2-3	**7 J**	**430**	**550**	**987**
HS20020239-09	DPT-45-19	1-2	**8.5 J**	**170**	**250**	**428**
HS19121108-05	SB-218	2.25-3	<6.9	**150**	**130**	**280**
HS20020158-02	SB-219	2-3	<79	**1400**	**980**	**2380**

Table 5: Summary of TX1005 Total Petroleum Hydrocarbon Data

Laboratory Identification	Location Identification	Depth (ft bgs)	nC6 to nC12	>nC12 to nC28	>nC28 to nC35	Total TPH	%nC6 to nC12	%>nC12 to nC28	%>nC28 to nC35
HS20011494-01	DPT-12-20	4-5	**290**	**2300**	**120 J**	**2710**	11%	85%	4%
HS20011494-02	DPT-12-20	8-9	**1300**	**6500**	**270 J**	**8070**	16%	81%	3%
HS20011494-03	DPT-16-20	4-5	**270**	**860**	**28 J**	**1160**	23%	74%	2%
HS20011494-04	DPT-16-20	14-15	**1300**	**3100**	**120 J**	**4520**	29%	69%	3%
HS20011494-06	DPT-21-20	5-6	**48**	**110**	**22 J**	**180**	27%	61%	12%
HS20011494-05	DPT-21-20	3-4	**1300**	**2800**	**97 J**	**4200**	31%	67%	2%
HS20011392-01	DPT-26-20	2-3	**170 J**	**3300**	**440**	**3910**	4%	84%	11%
HS20020239-08	DPT-29-19	9-10	**230 J**	**1100**	**200 J**	**1530**	15%	72%	13%
HS20020239-07	DPT-29-19	4-5	**650**	**2600**	**970**	**4220**	15%	62%	23%
HS20020239-03	DPT-30-19	13-14	**810**	**3400**	**510**	**4720**	17%	72%	11%
HS20020158-03	DPT-30-19	4-5	**220 J**	**9300**	**3000**	**12500**	2%	74%	24%
HS20020158-06	DPT-32-19	11-12	**890**	**5600**	**950**	**7440**	12%	75%	13%
HS20020158-05	DPT-32-19	2-3	**1300**	**8700**	**1800**	**11800**	11%	74%	15%
HS19121108-04	DPT-34-19	5-6	<82	**3800**	**1200**	**5000**		76%	24%
HS19121108-03	DPT-34-19	4-5	<450	**15000**	**4500**	**19500**		77%	23%
HS19121108-08	DPT-35-19	6-7	**200 J**	**1200**	**170 J**	**1570**	13%	76%	11%
HS19121108-07	DPT-35-19	4-5	**900**	**13000**	**2900**	**16800**	5%	77%	17%
HS20020239-04	DPT-36-19	3-4	**140 J**	**7100**	**1600**	**8840**	2%	80%	18%
HS20020239-05	DPT-36-19	5-6	**130 J**	**9100**	**2700**	**11900**	1%	76%	23%
HS20020158-04	DPT-37-19	7-8	**270**	**1800**	**270**	**2340**	12%	77%	12%
HS20020239-14	DPT-37-19	4-5	**880 J**	**9600**	**1500**	**12000**	7%	80%	13%
HS19120951-06	DPT-38-19	5-6	**1400**	**4700**	**1700**	**7800**	18%	60%	22%
HS19120951-05	DPT-38-19	3-4	**5000**	**6400**	**3100**	**14500**	34%	44%	21%
HS19121010-01	DPT-39-19	2-3	<7.4	**600**	**360**	**960**		63%	38%
HS19121108-01	DPT-40-19	1.25-2	**170 J**	**6500**	**1300**	**7970**	2%	82%	16%
HS20020239-11	DPT-41-19	1-2	**8.1 J**	**130**	**170**	**308**	3%	42%	55%
HS19121010-04	DPT-42-19	7-8	**140 J**	**960**	**210 J**	**1310**	11%	73%	16%
HS19121010-03	DPT-42-19	4-5	<120	**15000**	**3200**	**18200**		82%	18%
HS20020239-01	DPT-43-19	2-3	**7 J**	**430**	**550**	**987**	1%	44%	56%
HS20020239-09	DPT-45-19	1-2	**8.5 J**	**170**	**250**	**428**	2%	40%	58%
HS20011392-06	SB-216	7-8	**27 J**	**360**	<9.7	**387**	7%	93%	
HS19121108-05	SB-218	2.25-3	<6.9	**150**	**130**	**280**		54%	46%
HS20020158-02	SB-219	2-3	<79	**1400**	**980**	**2380**		59%	41%

Table 6: TX1006 Fractionation Data

Location Identification	Sample Depth (ft bgs)	>8-10 C Aliphatics	>10-12 C Aliphatics	>12-16 C Aliphatics	>16-21 C Aliphatics	>21-35 C Aliphatics	Total Aliphatic Fraction	>8-10 C Aromatics	>10-12 C Aromatics	>12-16 C Aromatics	>16-21 C Aromatics	>21-35 C Aromatics	Total Aromatic Fraction
DPT-26-20	2-3						0.0%		2.0%	37.5%	45.6%	14.7%	100.0%
DPT-12-20	8-9			1.6%	0.8%	0.8%	3.2%		15.9%	28.9%	37.6%	14.3%	96.8%
DPT-21-20	3-4	1.6%	1.2%	1.1%	0.8%		4.7%	14.4%	13.5%	21.8%	33.7%	11.9%	95.3%
DPT-32-19	2-3			2.3%	2.2%	2.8%	7.3%		10.0%	22.5%	34.2%	25.9%	92.7%
DPT-29-19	4-5					7.7%	7.7%	1.0%	14.7%	38.5%	11.5%	26.6%	92.3%
DPT-35-19	4-5			3.9%	7.7%	15.4%	27.0%		6.0%	10.4%	28.3%	28.3%	73.0%
DPT-30-19	4-5			3.1%	8.2%	17.3%	28.6%		2.4%	9.3%	28.3%	31.4%	71.4%
DPT-36-19	5-6			7.7%	13.3%	12.3%	33.3%			7.4%	20.8%	38.5%	66.7%
DPT-38-19	5-6	8.5%			8.1%	17.6%	34.2%	3.9%	12.7%	12.1%	22.8%	14.3%	65.8%
DPT-38-19	3-4	11.2%	3.7%		3.9%	15.7%	34.5%	8.7%	24.9%	5.7%	13.7%	12.5%	65.5%
DPT-42-19	4-5			10.9%	10.1%	16.8%	37.8%			8.0%	18.9%	35.3%	62.2%
DPT-34-19	4-5				10.8%	32.0%	42.8%				26.9%	30.3%	57.2%
DPT-39-19	2-3			0.8%	8.4%	40.6%	49.7%			1.3%	8.4%	40.6%	50.3%
DPT-42-19	7-8			37.4%	12.3%	20.6%	70.3%					29.7%	29.7%

ATTACHMENT H

TCEQ TRRP Tier 1 TPH Mixture PCL Calculations

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Input Sheet

Site Information: HWPW

Sample ID: DPT-38-19 (3-4)

Calculation Date: April 18, 2020

		▼ INPUT ▼		$MF_i = \frac{C_i}{\sum_{i=1}^{13} C_i}$	MF_i / MW_i	$x_i = \frac{\left(MF_i / MW_i\right)}{\sum_{i=1}^{13}\left(MF_i / MW_i\right)}$	$C_{sat,i} = S_i X_i \left[\frac{\theta_{ws} + K_d \rho_b + \theta_{as} H'}{\rho_b}\right]$	$C_i \rangle C_{sat,i}$?
TCEQ Method 1006 Boiling Point Range	*i*	**TCEQ Method 1006 Boiling Point Range Concentrations in Soil Ci (mg/kg)**	**Boiling Point Range Molecular Weight[1] MWi (g/mol)**	**Boiling Point Range Mass Fraction MFi (·)**	**Mass Fraction / Molecular Wt Ratio MFi/MWi (mol/g)**	**Boiling Point Range Mole Fraction Xi (·)**	**Theoretical Soil Saturation Limit for TPH NAPL Csat, i (mg/kg)**	**Test for Theoretical Saturation Limit ($C_{sat,i}$)**
C_6 Aliphatic	1	62.00 mg/kg	81	1.06E-02	1.30E-04	2.09E-02	4.40E+00	Csat,1 EXCEEDED
$>C_6$ - C_8 Aliphatic	2	62.00 mg/kg	100	1.06E-02	1.06E-04	1.70E-02	1.31E+00	Csat,2 EXCEEDED
$>C_8$ - C_{10} Aliphatic	3	630.00 mg/kg	130	1.07E-01	8.26E-04	1.33E-01	4.18E+00	Csat,3 EXCEEDED
$>C_{10}$ - C_{12} Aliphatic	4	210.00 mg/kg	160	3.58E-02	2.24E-04	3.59E-02	6.32E-01	Csat,4 EXCEEDED
$>C_{12}$ - C_{16} Aliphatic	5	62.00 mg/kg	200	1.06E-02	5.28E-05	8.48E-03	6.50E-02	Csat,5 EXCEEDED
$>C_{16}$ - C_{21} Aliphatic	6	220.00 mg/kg	270	3.75E-02	1.39E-04	2.23E-02	7.04E-02	Csat,6 EXCEEDED
$>C_{21}$ - C_{35} Aliphatic	7	880.00 mg/kg	270	1.50E-01	5.55E-04	8.92E-02	2.81E-01	Csat,7 EXCEEDED
$>C_7$ - C_8 Aromatic	8	62.00 mg/kg	92	1.06E-02	1.15E-04	1.84E-02	4.04E+00	Csat,8 EXCEEDED
$>C_8$ - C_{10} Aromatic	9	490.00 mg/kg	120	8.35E-02	6.96E-04	1.12E-01	2.41E+01	Csat,9 EXCEEDED
$>C_{10}$ - C_{12} Aromatic	10	1,400.00 mg/kg	130	2.39E-01	1.84E-03	2.95E-01	3.78E+01	Csat,10 EXCEEDED
$>C_{12}$ - C_{16} Aromatic	11	320.00 mg/kg	150	5.45E-02	3.64E-04	5.84E-02	3.43E+00	Csat,11 EXCEEDED
$>C_{16}$ - C_{21} Aromatic	12	770.00 mg/kg	190	1.31E-01	6.91E-04	1.11E-01	2.29E+00	Csat,12 EXCEEDED
$>C_{21}$ - C_{35} Aromatic	13	700.00 mg/kg	240	1.19E-01	4.97E-04	7.98E-02	1.33E-01	Csat,13 EXCEEDED
Sum Aliphatic Fraction:		2,126.00 mg/kg	0.3623	$\sum MF_i$	$\sum\left(MF_i / MW_i\right)$	$\sum X_i$		
Sum Aromatic Fraction:		3,742.00 mg/kg	0.6377	= 1.00E+00	= 6.23E-03 mol/g	= 1.00E+00		
SumTotal TPH:		5,868.00 mg/kg	1.0000					

[1] *from* TRRP Table [§350.73(4)]

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Results

TPH NAPL Present?: Theoretical soil saturation limit IS EXCEEDED for one or more TPH fractions - Presence of NAPL is indicated - See TRRP-32 for NAPL management guidance

Mobile NAPL Present?: Presence of Mobile NAPL NOT indicated

Tier 1 $^{Tot}SOIL_{Comb}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	7.96E+03 mg/kg	6.29E+03 mg/kg	2.89E+04 mg/kg	1.68E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.97	2.85	2.59	2.50
Tier 1 $^{GW}SOIL_{Ing}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	1.00	2.00	0.34	0.67
Tier 1 $^{GW}SOIL_{Class\ 3}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.01	0.02	0.00	0.01
Tier 1 $^{Air}SOIL_{Inh-V}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	28 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	2.77E+04 mg/kg	1.43E+04 mg/kg	3.86E+04 mg/kg	2.01E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.40	2.40	2.39	2.42

This work sheet is for inputting the TQEQ Method 1006 soil concentrations and summarizing the PCL calculation results.
End of work sheet.

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Input Sheet

Site Information:	HWPW	**Sample ID:**	DPT-34-19	**Calculation Date:**	April 18, 2020

		▼ INPUT ▼		$MF_i = \frac{C_i}{\sum_{i=1}^{13} C_i}$	MF_i / MW_i	$X_i = \frac{(MF_i/MW_i)}{\sum_{i=1}^{13}(MF_i/MW_i)}$	$C_{sat,i} = S_i X_i \left[\frac{\theta_w + K_i \rho_b + \theta_a H'}{\rho_b}\right]$	$C_i \rangle C_{sat,i}$?
TCEQ Method 1006 Boiling Point Range	***i***	**TCEQ Method 1006 Boiling Point Range Concentrations in Soil Ci (mg/kg)**	**Boiling Point Range Molecular Weight[1] MWi (g/mol)**	**Boiling Point Range Mass Fraction MFi (·)**	**Mass Fraction / Molecular Wt Ratio MFi/MWi (mol/g)**	**Boiling Point Range Mole Fraction Xi (·)**	**Theoretical Soil Saturation Limit for TPH NAPL Csat, i (mg/kg)**	**Test for Theoretical Saturation Limit ($C_{sat,i}$)**
C_6 Aliphatic	1	300.00 mg/kg	81	3.47E-02	4.29E-04	7.75E-02	1.63E+01	Csat,1 EXCEEDED
$>C_6 - C_8$ Aliphatic	2	300.00 mg/kg	100	3.47E-02	3.47E-04	6.28E-02	4.86E+00	Csat,2 EXCEEDED
$>C_8 - C_{10}$ Aliphatic	3	300.00 mg/kg	130	3.47E-02	2.67E-04	4.83E-02	1.52E+00	Csat,3 EXCEEDED
$>C_{10} - C_{12}$ Aliphatic	4	300.00 mg/kg	160	3.47E-02	2.17E-04	3.92E-02	6.91E-01	Csat,4 EXCEEDED
$>C_{12} - C_{16}$ Aliphatic	5	300.00 mg/kg	200	3.47E-02	1.74E-04	3.14E-02	2.41E-01	Csat,5 EXCEEDED
$>C_{16} - C_{21}$ Aliphatic	6	640.00 mg/kg	270	7.41E-02	2.74E-04	4.96E-02	1.57E-01	Csat,6 EXCEEDED
$>C_{21} - C_{35}$ Aliphatic	7	1,900.00 mg/kg	270	2.20E-01	8.14E-04	1.47E-01	4.65E-01	Csat,7 EXCEEDED
$>C_7 - C_8$ Aromatic	8	300.00 mg/kg	92	3.47E-02	3.77E-04	6.82E-02	1.49E+01	Csat,8 EXCEEDED
$>C_8 - C_{10}$ Aromatic	9	300.00 mg/kg	120	3.47E-02	2.89E-04	5.23E-02	1.13E+01	Csat,9 EXCEEDED
$>C_{10} - C_{12}$ Aromatic	10	300.00 mg/kg	130	3.47E-02	2.67E-04	4.83E-02	6.20E+00	Csat,10 EXCEEDED
$>C_{12} - C_{16}$ Aromatic	11	300.00 mg/kg	150	3.47E-02	2.31E-04	4.19E-02	2.46E+00	Csat,11 EXCEEDED
$>C_{16} - C_{21}$ Aromatic	12	1,600.00 mg/kg	190	1.85E-01	9.75E-04	1.76E-01	3.64E+00	Csat,12 EXCEEDED
$>C_{21} - C_{35}$ Aromatic	13	1,800.00 mg/kg	240	2.08E-01	8.68E-04	1.57E-01	2.61E-01	Csat,13 EXCEEDED
Sum Aliphatic Fraction:		4,040.00 mg/kg	0.4676	$\sum MF_i$	$\sum (MF_i/MW_i)$	$\sum X_i$		
Sum Aromatic Fraction:		4,600.00 mg/kg	0.5324	= 1.00E+00	= 5.53E-03 mol/g	= 1.00E+00		
SumTotal TPH:		8,640.00 mg/kg	1.0000					

[1] *from* TRRP Table [§350.73(4)]

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Results

TPH NAPL Present?: Theoretical soil saturation limit IS EXCEEDED for one or more TPH fractions - Presence of NAPL is indicated - See TRRP-32 for NAPL management guidance

Mobile NAPL Present?: Presence of Mobile NAPL NOT indicated

Tier 1 $^{Tot}SOIL_{Comb}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	9.60E+03 mg/kg	9.60E+03 mg/kg	9.60E+04 mg/kg	6.05E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.88	3.17	4.71	4.30
Tier 1 $^{GW}SOIL_{Ing}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	1.11	2.21	0.37	0.74
Tier 1 $^{GW}SOIL_{Class\ 3}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.01	0.02	0.00	0.01
Tier 1 $^{Air}SOIL_{Inh-V}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	28 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	8.93E+04 mg/kg	4.61E+04 mg/kg	1.24E+05 mg/kg	6.34E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.87	2.88	2.83	2.84

This work sheet is for inputting the TQEQ Method 1006 soil concentrations and summarizing the PCL calculation results.
End of work sheet.

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Input Sheet

Site Information: HWPW

Sample ID: DPT-35-19

Calculation Date: April 18, 2020

▼ INPUT ▼

TCEQ Method 1006 Boiling Point Range	*i*	TCEQ Method 1006 Boiling Point Range Concentrations in Soil Ci (mg/kg)	Boiling Point Range Molecular Weight[1] MWi (g/mol)	Boiling Point Range Mass Fraction MFi (·)	Mass Fraction / Molecular Wt Ratio MFi/MWi (mol/g)	Boiling Point Range Mole Fraction Xi (·)	Theoretical Soil Saturation Limit for TPH NAPL Csat, i (mg/kg)	Test for Theoretical Saturation Limit ($C_{sat,i}$)
				$MF_i = \frac{C_i}{\sum_{i=1}^{13} C_i}$	MF_i / MW_i	$x_i = \frac{\left(MF_i / MW_i\right)}{\sum_{i=1}^{13}\left(MF_i / MW_i\right)}$	$C_{sat,i} = S_i X_i \left[\frac{\theta_{ws} + K_d \rho_b + \theta_{as} H'}{\rho_b}\right]$	$C_i \rangle C_{sat,i}$?
C_6 Aliphatic	1	79.00 mg/kg	81	9.57E-03	1.18E-04	2.31E-02	4.84E+00	Csat,1 EXCEEDED
$>C_6$ - C_8 Aliphatic	2	79.00 mg/kg	100	9.57E-03	9.57E-05	1.87E-02	1.45E+00	Csat,2 EXCEEDED
$>C_8$ - C_{10} Aliphatic	3	79.00 mg/kg	130	9.57E-03	7.36E-05	1.44E-02	4.53E-01	Csat,3 EXCEEDED
$>C_{10}$ - C_{12} Aliphatic	4	79.00 mg/kg	160	9.57E-03	5.98E-05	1.17E-02	2.05E-01	Csat,4 EXCEEDED
$>C_{12}$ - C_{16} Aliphatic	5	300.00 mg/kg	200	3.63E-02	1.82E-04	3.55E-02	2.72E-01	Csat,5 EXCEEDED
$>C_{16}$ - C_{21} Aliphatic	6	600.00 mg/kg	270	7.27E-02	2.69E-04	5.25E-02	1.66E-01	Csat,6 EXCEEDED
$>C_{21}$ - C_{35} Aliphatic	7	1,200.00 mg/kg	270	1.45E-01	5.38E-04	1.05E-01	3.32E-01	Csat,7 EXCEEDED
$>C_7$ - C_8 Aromatic	8	79.00 mg/kg	92	9.57E-03	1.04E-04	2.03E-02	4.44E+00	Csat,8 EXCEEDED
$>C_8$ - C_{10} Aromatic	9	79.00 mg/kg	120	9.57E-03	7.98E-05	1.56E-02	3.36E+00	Csat,9 EXCEEDED
$>C_{10}$ - C_{12} Aromatic	10	470.00 mg/kg	130	5.69E-02	4.38E-04	8.54E-02	1.10E+01	Csat,10 EXCEEDED
$>C_{12}$ - C_{16} Aromatic	11	810.00 mg/kg	150	9.81E-02	6.54E-04	1.28E-01	7.50E+00	Csat,11 EXCEEDED
$>C_{16}$ - C_{21} Aromatic	12	2,200.00 mg/kg	190	2.67E-01	1.40E-03	2.74E-01	5.66E+00	Csat,12 EXCEEDED
$>C_{21}$ - C_{35} Aromatic	13	2,200.00 mg/kg	240	2.67E-01	1.11E-03	2.17E-01	3.60E-01	Csat,13 EXCEEDED
Sum Aliphatic Fraction:		2,416.00 mg/kg	0.2927	$\sum MF_i$	$\sum\left(MF_i / MW_i\right)$	$\sum X_i$		
Sum Aromatic Fraction:		5,838.00 mg/kg	0.7073	= 1.00E+00	= 5.13E-03 mol/g	= 1.00E+00		
SumTotal TPH:		8,254.00 mg/kg	1.0000					

[1] *from* TRRP Table [§350.73(4)]

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Results

TPH NAPL Present?: Theoretical soil saturation limit IS EXCEEDED for one or more TPH fractions - Presence of NAPL is indicated - See TRRP-32 for NAPL management guidance

Mobile NAPL Present?: Presence of Mobile NAPL NOT indicated

Tier 1 $^{Tot}SOIL_{Comb}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	7.50E+03 mg/kg	7.50E+03 mg/kg	7.50E+04 mg/kg	7.02E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.74	2.91	3.83	4.75

Tier 1 $^{GW}SOIL_{Ing}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.47	0.93	0.16	0.31

Tier 1 $^{GW}SOIL_{Class\ 3}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.00	0.01	0.00	0.00

Tier 1 $^{Air}SOIL_{Inh-V}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	28 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	1.16E+05 mg/kg	5.97E+04 mg/kg	1.62E+05 mg/kg	8.43E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.80	2.80	2.79	2.81

This work sheet is for inputting the TQEQ Method 1006 soil concentrations and summarizing the PCL calculation results.
End of work sheet.

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Input Sheet

Site Information:	HWPW	**Sample ID:**	DPT-42-19 (4-5)	**Calculation Date:**	April 18, 2020

		▼ INPUT ▼		$MF_i = \frac{C_i}{\sum_{i=1}^{13} C_i}$	MF_i / MW_i	$x_i = \frac{(MF_i / MW_i)}{\sum_{i=1}^{13}(MF_i / MW_i)}$	$C_{sat,i} = S_i X_i \left[\frac{\theta_{ws} + K_d \rho_b + \theta_{as} H'}{\rho_b}\right]$	$C_i \rangle C_{sat,i}$?
TCEQ Method 1006 Boiling Point Range	*i*	**TCEQ Method 1006 Boiling Point Range Concentrations in Soil Ci (mg/kg)**	**Boiling Point Range Molecular Weight[1] MWi (g/mol)**	**Boiling Point Range Mass Fraction MFi (·)**	**Mass Fraction / Molecular Wt Ratio MFi/MWi (mol/g)**	**Boiling Point Range Mole Fraction Xi (·)**	**Theoretical Soil Saturation Limit for TPH NAPL Csat, i (mg/kg)**	**Test for Theoretical Saturation Limit ($C_{sat,i}$)**
C_6 Aliphatic	1	78.00 mg/kg	81	3.20E-03	3.96E-05	8.52E-03	1.79E+00	Csat,1 EXCEEDED
$>C_6 - C_8$ Aliphatic	2	78.00 mg/kg	100	3.20E-03	3.20E-05	6.90E-03	5.35E-01	Csat,2 EXCEEDED
$>C_8 - C_{10}$ Aliphatic	3	78.00 mg/kg	130	3.20E-03	2.46E-05	5.31E-03	1.68E-01	Csat,3 EXCEEDED
$>C_{10} - C_{12}$ Aliphatic	4	78.00 mg/kg	160	3.20E-03	2.00E-05	4.31E-03	7.59E-02	Csat,4 EXCEEDED
$>C_{12} - C_{16}$ Aliphatic	5	2,600.00 mg/kg	200	1.07E-01	5.34E-04	1.15E-01	8.82E-01	Csat,5 EXCEEDED
$>C_{16} - C_{21}$ Aliphatic	6	2,400.00 mg/kg	270	9.86E-02	3.65E-04	7.87E-02	2.48E-01	Csat,6 EXCEEDED
$>C_{21} - C_{35}$ Aliphatic	7	4,000.00 mg/kg	270	1.64E-01	6.09E-04	1.31E-01	4.14E-01	Csat,7 EXCEEDED
$>C_7 - C_8$ Aromatic	8	78.00 mg/kg	92	3.20E-03	3.48E-05	7.50E-03	1.64E+00	Csat,8 EXCEEDED
$>C_8 - C_{10}$ Aromatic	9	78.00 mg/kg	120	3.20E-03	2.67E-05	5.75E-03	1.24E+00	Csat,9 EXCEEDED
$>C_{10} - C_{12}$ Aromatic	10	78.00 mg/kg	130	3.20E-03	2.46E-05	5.31E-03	6.82E-01	Csat,10 EXCEEDED
$>C_{12} - C_{16}$ Aromatic	11	1,900.00 mg/kg	150	7.80E-02	5.20E-04	1.12E-01	6.58E+00	Csat,11 EXCEEDED
$>C_{16} - C_{21}$ Aromatic	12	4,500.00 mg/kg	190	1.85E-01	9.73E-04	2.10E-01	4.33E+00	Csat,12 EXCEEDED
$>C_{21} - C_{35}$ Aromatic	13	8,400.00 mg/kg	240	3.45E-01	1.44E-03	3.10E-01	5.15E-01	Csat,13 EXCEEDED
Sum Aliphatic Fraction:		9,312.00 mg/kg	0.3825	$\sum MF_i$	$\sum \left(MF_i / MW_i \right)$	$\sum X_i$		
Sum Aromatic Fraction:		15,034.00 mg/kg	0.6175	= 1.00E+00	= 4.64E-03 mol/g	= 1.00E+00		
SumTotal TPH:		24,346.00 mg/kg	1.0000					

[1] *from* TRRP Table [§350.73(4)]

TCEQ TRRP Tier 1 TPH PCL Calculator (v 3.0 - 02/2020) for TCEQ Method 1006 Data - Results

TPH NAPL Present?:	Theoretical soil saturation limit IS EXCEEDED for one or more TPH fractions - Presence of NAPL is indicated - See TRRP-32 for NAPL management guidance
Mobile NAPL Present?:	Presence of Mobile NAPL IS indicated - See TRRP-32 for guidance on the Mobile NAPL Trigger

Tier 1 $^{Tot}SOIL_{Comb}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	5.80E+03 mg/kg	5.80E+03 mg/kg	5.80E+04 mg/kg	5.80E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	1.93	2.02	2.50	3.16
Tier 1 $^{GW}SOIL_{Ing}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.16	0.32	0.05	0.11
Tier 1 $^{GW}SOIL_{Class\ 3}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *	HI<10; GW-Soil-Ing PCL not needed *
Hazard Index (HI) of TPH_{Mix} =	0.00	0.00	0.00	0.00
Tier 1 $^{Air}SOIL_{Inh-V}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	28 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	1.12E+05 mg/kg	5.81E+04 mg/kg	1.59E+05 mg/kg	8.15E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	1.86	1.86	1.87	1.86

This work sheet is for inputting the TQEQ Method 1006 soil concentrations and summarizing the PCL calculation results.
End of work sheet.