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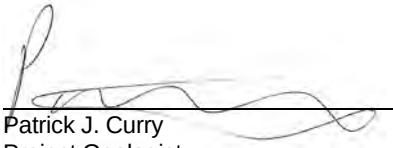
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Motors Liquidation Corporation

Summary of Field Activities, General Motors Willow Run Plant, January-February 2010

December 27, 2010

ARCADIS



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Summary of Field Activities, General Motors Willow Run Plant, January-February 2010

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Acronyms and Abbreviations

API	American Petroleum Institute
ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
cm/sec	centimeters per second
CRA	Conestoga Rovers Associates, Inc.
DRO	diesel range organics
EC	electrical conductivity
ERO	extended range organics
FPP	Fluid Properties Package
FID	flame-ionization detector
ft	feet/foot
GC	gas chromatography
GM	General Motors, Inc.
GRO	gasoline range organics
GPR	ground-penetrating radar
ITRC	Interstate Technology and Regulatory Council
LIF	laser induced fluorescence
LNAPL	light non-aqueous-phase liquid
mg/kg	milligrams per kilogram
MLC	Motors Liquidation Corporation
mS/m	millisiemens per meter
PAH	polycyclic aromatic hydrocarbon
PAOCs	potential areas of concern
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protection equipment
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency

UVOST	ultraviolet optical sensing tool
%RE	percentage of reference emitter

1. Introduction

On behalf of Motors Liquidation Corporation (MLC), ARCADIS U.S., Inc. (ARCADIS), in cooperation with Conestoga Rovers Associates, Inc. (CRA), has completed an assessment of the nature and extent of Light Non-Aqueous-Phase Liquid (LNAPL) beneath the former General Motors, Inc. (GM) Willow Run Transmission Plant located in Ypsilanti, Michigan (Site) (Figure 1). The primary objective of the work described below was to refine the LNAPL volume estimate and the understanding of the LNAPL chemical composition, physical nature, and recoverability in support of a revised cost-to-closure estimate for the Site. This *Summary of Field Activities* (Summary Report) provides Site background and history, describes the investigation methodology, and summarizes the results

1.1 Site Background

The former Willow Run Plant, located between Ypsilanti and Belleville, Michigan, was constructed in 1941 by Ford Motor Company for the mass production of the B-24 Liberator military aircraft used during World War II. The layout of the Plant and surrounding area is depicted on Figure 2. The former Willow Run Plant property includes approximately 321 acres of land on the northeast side of Tyler Pond including approximately 4.5 million square feet of manufacturing area. After the war, ownership of the former plant passed to Kaiser-Frasier Motors for the production of automobiles as well as C-119 and C-123 aircraft during the Korean War. GM purchased the plant in 1953 and the facility was used to manufacture automobiles and automobile transmissions up to the present day. The plant is currently scheduled to be closed by GM in December 2010 and will pass to MLC for decommission in January 2011.

The land use surrounding the Site includes the former GM Midsize & Luxury Willow Run Assembly plant to the south and west (across Tyler Pond) and the Willow Run Airport to the east. The area north of the Site is generally vacant and consists of several highways, railroad tracks, and various commercial and residential properties.

1.1.1 Geologic Setting

The Quaternary Geologic Map of Michigan (Farrand and Bell, 1982a) indicates the Site is located in an area of “lacustrine sand and gravel”. Soil boring logs completed for the Site indicate shallow sediments beneath the facility consist of approximately 5 feet of sand and/or clay fill beneath the plant floor followed by 10 to 15 feet of fine sand. The sand is underlain by lacustrine clay. Cross-sections prepared by CRA depicting the

shallow stratigraphy beneath the Site are included as Appendix A. Regional water well logs indicate that the clay unit beneath the Site is laterally extensive and typically greater than 50 feet thick in the area surrounding the Site. The lacustrine clay overlies interbedded sand, gravel, and clay outwash deposits of varying thickness. Bedrock beneath the area consists of the Antrim Shale typically encountered between 100 and 200 feet below ground surface (bgs). Groundwater beneath the Site is present within the shallow sand unit and encountered at a depth typically between 5 and 10 feet bgs.

The prominent hydrologic features in the immediate vicinity of the Site are Willow Run Creek, Tyler Pond, and several small ponds approximately 500 feet west of the Plant. Willow Run Creek discharges into Belleville Lake, an impoundment of the Huron River, approximately 2 miles southeast of the Plant. The Huron River is the dominant hydrologic feature in the area. The Huron River and its local impoundments, Ford Lake and Belleville Lake ultimately discharge to Lake Erie, located approximately 50 miles southeast of the Site.

1.1.2 History of Environmental Investigation

In the early 1980s, GM became aware of LNAPL impacts under portions of the Site. The LNAPL impacts were generally found beneath areas of intensive metal processing and near the many sumps, pits, tanks, and flumes that comprise a significant portion of the property's subsurface infrastructure. During the 1980s and 1990s, GM initiated limited investigative and remedial efforts including the completion of soil borings and installation of monitoring wells as well as several LNAPL recovery systems.

In November 2001, a property reconnaissance was conducted by CRA to identify and confirm all existing recovery and monitoring well locations at the Site. Former LNAPL recovery systems exist in six areas of the Site, namely, the Dynamometer, Bay E-28, Bay K-35, ATF, Subtest, and Chip House areas. At the time the survey was conducted, the level of LNAPL present in each well was also measured. Of the more than 220 wells located, 27 wells contained sufficient LNAPL to conduct recovery testing. The thickness of LNAPL in the 27 wells ranged from 0.30 feet (3.6 inches) to 3.22 feet. The consistency of the LNAPL was described as very thick, often making the oil/water interface difficult to sense and measure accurately.

In 2003, CRA performed a limited remedial investigation (RI) to gather representative soil, groundwater, and LNAPL data to evaluate the entire west end of the Site. The RI was completed prior to the Site-wide RI because of the decommissioning and major re-build of the western end of the Site, which included the installation of the YTO Six

Speed Transmission Line. The RI was conducted to evaluate whether contamination was present and to evaluate potential risks to human health or the environment within the western end of the Site.

1.2 LNAPL Assessment Scope of Work

In January 2010, ARCADIS and CRA conducted a limited subsurface investigation of the areas known to be impacted with LNAPL, areas of suspected LNAPL impacts, and other historical potential areas of concern to gather additional Site-specific information to supporting cost refinement efforts. The development of the scope of work outlined below utilized several lines of evidence to help focus the investigation to specific areas of the Site.

CRA completed a review of current and historical documents for the Site in March 2003. This review resulted in the identification of 42 potential areas of concern (PAOCs). A table describing the PAOCs and figures depicting the locations of the PAOCs are included as Appendix B. The locations of the PAOCs were, in part, used as a guide for selecting areas of the Site for the investigation described below. PAOCs concerning former LNAPL release(s), polychlorinated biphenyl (PCB)-oil release(s) and areas where chlorinated solvents (trichloroethylene, perchloroethylene) were used in the past were of particular interest during the investigation. The former location of Substation D, identified as one of the 42 PAOCs, was also of interest as it was the focus of a combined LNAPL/PCB remediation effort in 1999. Additional lines of evidence were also used to help focus the investigation:

- Utility Leaks – Information provided by CRA suggests several utility leaks in various areas of the Site. These include a subgrade transformer in the YTO building (Substation D), tanks on eastern portion of the former plant, a sewer line repair, and underground hydraulic lifts in the northern portion of the YTO building.

- Subgrade Transformers – The locations of subgrade transformers were of importance as one of the primary goals of this investigation was to determine the PCB component of the LNAPL, if any. Locations of subgrade transformers are identified on Figure 2

- Subsurface Utility Corridors – Steam tunnels and large-diameter sewers were target as potential preferential pathways for LNAPL transport.

The objectives of the investigation were to refine the LNAPL volume estimates, determine the physical characteristics of the LNAPL for estimating remedial options and costs, and determine the concentrations of PCBs in the LNAPL in relation to Toxic Substances Control Act (TSCA) disposal criteria. The sample locations and sample types are shown on Figure 3. Specific tasks included the following:

- Collection of 70 LNAPL fluid samples for chemical analysis and 12 samples for fluid properties testing.
- Completion of 10 LNAPL bail down tests to assist in determining LNAPL transmissivity and recoverability.
- Completion of 17 groundwater slug tests to determine in-situ hydraulic parameters of the affected sand unit beneath the Site.
- Completion of fluid level gauging in 148 and 75 monitoring wells in December 2009 and January 2010, respectively.
- Completion of 125 laser induced fluorescence (LIF) soil borings, and installation of 9 temporary wells.

2. Health and Safety

All onsite ARCADIS and CRA personnel completed the GM safety training prior to entering the Site and personnel adhered to all GM safety and security guidelines while onsite. In addition, a safety meeting was held prior to commencing work each day to discuss pertinent safety issues and incidents that may have occurred the previous day.

In general, ARCADIS and CRA personnel wore Level D personnel protection equipment (PPE) while onsite. However, the scope of work outlined above included the opening of wells impacted with potential PCB-containing LNAPL and the sampling and handling of LNAPL samples. Personnel involved with these tasks wore modified Level D PPE that included a Tyvek suite, rubber booties/gloves and additional splash protection. Wells known to contain LNAPL were screened with a flame-ionization detector (FID) upon opening to screen for potentially harmful or explosive vapors.

At wells where LNAPL was extracted from the well, sheeting was used around the well to minimize spillage. All excess water and LNAPL generated during sampling was placed in lidded containers and transported to a collection area. Excess water and

LNAPL were placed in drums for characterization and later transport to a licensed disposal facility.

2.1 Utility Locate

Prior to completing an LIF soil boring or temporary monitoring well installation, a Site-specific utility clearance protocol was used to verify the soil boring location was free of subgrade utilities. Detailed Site schematics were obtained for the former plant and used as a preliminary guide to select boring locations. During field activities, the proposed boring location area was examined for indications of existing or abandoned utilities. The area surrounding the proposed location was then surveyed using ground-penetrating radar (GPR) to screen for utilities and structures. The GPR services were provided by Fibertec, Inc. of Holt, Michigan and Underground Detective, Inc. of Toledo, Ohio. If the location appeared clear of utilities based on the GPR survey, GM employees with specific knowledge of the former plant infrastructure evaluated the location to determine if utilities or subsurface structures may be present. The boring was moved to another location in the vicinity of the original boring location, or was not completed if utilities were thought to be present at the location. Once the Site schematics, GPR results, and GM personnel agreed that the location was clear of utilities, the location was approved. The concrete floor was cored with a concrete coring device and the outer extent of the boring was probed with a tile probe to 5 feet. Then, the borehole was advanced to 5 feet below the concrete with a hand auger of matching diameter as the drill tooling. If the hand auger did not encounter an obstruction, the borehole was then advanced to final depth with the Geoprobe based system.

3. Methodology and Results

Field activities were completed beginning on January 19, 2010 and extending through February 8, 2010. Both CRA and ARCADIS contributed personnel to the field effort. The field effort was generally coordinated by ARCADIS, as was the data compilation presented within this Summary Report.

3.1 Fluid Level Gauging

Site-wide fluid level gauging was completed at the Site in December 2009 and January 2010, generally at wells that historically contained LNAPL. CRA collected fluid levels from 148 monitoring wells in December 2009 and ARCADIS and CRA collected fluids levels from 75 wells January 2010 (see Figure 3). Upon opening each well, the

headspace within the well was screened with an FID for organic vapors. Depth to groundwater and depth to LNAPL measurements were collected using an oil/water interface probe. The probe was thoroughly decontaminated before lowering into a well and between each monitoring well location with a mixture of distilled water and Alconox.

Depth to groundwater, depth to LNAPL, total well depth, and LNAPL thickness for each monitoring well are summarized in Table 1. As shown on Table 1, the LNAPL thickness ranged from 0.01 to 3.72 feet across the Site. The approximate distribution of LNAPL across the Site is presented on Figure 4. Figure 4 includes the LNAPL thickness measured within the monitoring wells and temporary wells, as well as the results of the LIF survey (Section 3.3).

3.2 LNAPL Fluid Sampling for Physical and Chemical Properties Testing

Existing Site monitoring wells were selected for sampling in January 2010 based on the following criteria: 1) the well exhibited measurable LNAPL in December 2009 and/or January 2010 and 2) the well had sufficient LNAPL present for the sample volume required for each method identified below. If a well indicated insufficient LNAPL present for sampling of all parameters, then in general samples were collected and submitted for analysis based on parameter order of importance (i.e. PCBs, metals, TPH, FPP). Wells selected for LNAPL sampling and the analytical parameters for each well are summarized on Table 2 and shown on Figure 3. Each LNAPL sample was submitted for one or more of the following parameters (listed in order of importance):

- PCBs by United States Environmental Protection Agency (USEPA) Method 8082: The purpose of this analysis is to determine the relative content of various Aroclor mixtures in specific LNAPL samples and identify areas of the Site that exceed TSCA requirements for disposal.

- Metals by USEPA Methods 6010B and 7471A: These analyses will aid in determining LNAPL type distinctions and identifying areas of the Site that exceed Resource Conservation and Recovery Act (RCRA) criteria for waste classification. The metals included for this analysis are the RCRA metals (silver, arsenic, barium, cadmium, chromium, mercury, lead, and selenium), as well as the following metals (iron, zinc, copper, manganese, lithium, and molybdenum) for LNAPL type distinction.

- Total petroleum hydrocarbons (TPH) by USEPA Method 8015M for gasoline range organics (GRO, C6-C10), diesel range organics (DRO, C10-C20), and extended range organics (ERO, C10-C34) with chromatograms. The purpose of these analyses is to identify representative carbon fractions for LNAPL samples. The analyses were performed by gas chromatography (GC) with a FID. The chromatograms provide a means of fingerprinting the samples to determine the source material and potential degree of degradation.

- Fluid Properties Package (FPP) by ASTM D1481 for density, ASTM D445 for viscosity, and ASTM D971 for interfacial tensions: These tests provide basic information on the LNAPL and groundwater physical properties. The laboratory analyses will be conducted at average groundwater temperature to be representative of in-situ fluid properties. Groundwater from LNAPL impacted monitoring wells will be submitted with the LNAPL sample to facilitate water-LNAPL interfacial tension testing.

The laboratory reports for the various analytical and physical properties analysis are provided on the attached compact disc. The results of the LNAPL testing are summarized on Tables 3 through 5. The LNAPL analytical parameters (PCBs, metals, TPH, and volatile organic compounds [VOCs]) results are summarized on Table 3. The physical properties of viscosity, density, and specific gravity measurements are presented on Table 4 for the LNAPL and representative groundwater samples collected from various Site wells. The interfacial tension of LNAPL and representative groundwater samples are presented on Table 5.

As shown on Table 3, only one LNAPL sample (CRA-086M-B) exceeded the TSCA-Regulated Waste Disposal Limit of 50 milligrams per kilogram (mg/kg) total PCBs. LNAPL samples collected from 46 wells exceeded RCRA Hazardous Waste Criteria for total arsenic, chromium, and/or lead.

3.3 Laser-Induced Fluorescence Borings

One hundred twenty-four LIF soil borings were completed during the January-February 2010 investigation. LIF investigations are conducted by advancing an ultraviolet optical sensing tool (UVOST®) probe in areas of known or suspected LNAPL impact. The UVOST® probe emits an ultraviolet excitation light and captures returning fluorescence. Polycyclic aromatic hydrocarbon (PAH) compounds, which are a component of common petroleum fuels, readily fluoresce when exposed to ultraviolet light. The magnitude of fluorescence is proportional to the LNAPL saturation within the soil. The

fluorescence observed is quantified by comparison to the response of a standard reference solution, known as the reference emitter; the results are expressed as a percentage of reference emitter (%RE) response. Instrument response is expected in areas with no LNAPL impacts due to the fluorescent properties of native soil materials. However, background fluorescence is typically weak as compared to LNAPL fluorescence and does not greatly diminish instrument sensitivity.

The UVOST® probe detects four distinct fluorescent light wavelengths; the relative returns of each wavelength at a given depth are collectively referred to as a waveform. Differences in waveform patterns may indicate differences in the subsurface environment or in LNAPL composition. Waveform changes are indicated by color shifts in the LIF boring log; snapshots of waveforms at selected depths are presented as callouts on each log.

The return (fluorescent) light signal is analyzed in real time by onsite equipment. As the probe is advanced downward, the fluorescence data form a vertical profile of LNAPL impact present at the soil boring location. Results were reviewed during and after completing each LIF boring and considered when selecting subsequent locations. The LIF logs indicating fluorescence as a function of %RE and electrical conductivity (EC) with depth are included in the Matrix Final Report included as Appendix C.

The UVOST® tool probe was outfitted with an EC sensor that facilitated parallel EC data collection at each boring location. EC is the measure of the electrical conductance/resistance properties of the soil. The EC sensor emits electrical pulses and measures the amount of current transmitted through the soil. Each boring log includes the vertical profile of the EC data recorded in millisiemens per meter (mS/m) in addition to the fluorescence data. The soil type can be inferred through correlation of the EC data to geologic logging data. Typically, conductivity measurements in the 100s mS/m indicate smaller grain material such as clay, and measurements in the 10s of mS/m indicate larger grain material such as sand and gravel.

LIF borings were advanced at the Site to a depth of 15 to 20 feet bgs using Geoprobe® direct-push technology. A summary of the LIF response for each boring is presented on Table 6. Note that each boring was hand cleared from ground surface to 5 feet bgs. The LIF response from 0 to 5 feet at several of the borings is due to interference from the concrete dust (from coring), and/or LNAPL impacts located within the near surface vadose zone. This shallow response is not considered as part of the summary presented on Table 6. The maximum fluorescence at each boring location is also presented on Figure 4.

Based on the waveform and relative %RE of the various logs indicating LNAPL impacts, there appear to be several different types of LNAPL present beneath the Site. This is consistent with the Site history and the various processes and systems present throughout the Site that likely contributed to the LNAPL plume. This, however, complicates the interpretation of the LIF data as different types LNAPL will present different waveforms and maximum response relative to the reference emitter.

3.4 Temporary Well Installation and Soil Sampling

Temporary monitoring wells were installed at several locations to assess whether LNAPL would pool in wells at those locations. The LIF borings selected for temporary well installation were LIF-010, LIF-027, LIF-033, LIF-034, LIF-128, LIF-258, LIF-267, LIF-271, and LIF-272, (TW-010, TW-027, TW-033, TW-034, TW-128, TW-258, TW-267, TW-271, and TW-272, respectively). In general, soil borings were completed to a depth of 15 feet bgs using direct push drilling techniques. Soils were sampled continuously and described in the field by an ARCADIS geologist. A photoionization detector (PID) was used to screen the soils for VOCs every 2 feet and soil samples were collected from the portion of the boring that indicated the highest PID reading or visual impacts. Soil samples were submitted for analysis of TPH and PCBs. Additional samples were collected from the saturated zone and submitted for particle-size analysis. Soil sample analytical results are summarized on Table 7 and the particle-size analysis results are summarized on Table 8. Boring logs for the temporary wells are included as Appendix D. The locations of the temporary wells are shown on Figures 2 and 3.

Following soil sampling activities, the temporary well assembly was placed into the open borehole to a total depth of 16 feet bgs (with the exception of TW-010 installed at 12 feet bgs). The temporary wells were constructed on 1-inch polyvinyl chloride (PVC) casing with a 1-inch, 10-foot, 0.010-inch slot PVC screen. Well construction diagrams are included on the boring logs attached as Appendix D. Following installation, the temporary wells were monitored for LNAPL accumulation on January 27 and 28 and February 1 and 8, 2010. The LNAPL monitoring data are included on Table 1. LNAPL was detected in four out of the nine temporary wells with the thickest accumulation at TW-271 (5.45 feet, February 28, 2010). At the conclusion of the February 8, 2010 event, the temporary wells were abandoned by removing the well materials, backfilling the borehole with bentonite chips, and replacing the concrete flooring material.

3.5 Baildown Testing

LNAPL Baildown testing was completed at 10 monitoring wells at the Site. The criteria for selecting a well for baildown testing included 1) LNAPL was present within the well screen, 2) the LNAPL thickness was greater than 0.5 feet, and 3) the selected well was installed in lithology representative the Site geologic conditions and spaced so as to provide good coverage of the Site as a whole. The results of the baildown testing are summarized on Table 9.

An LNAPL baildown test consists of the "instantaneous" removal of LNAPL from a well with a bailer or pump, and then monitoring of the LNAPL recovery over time. The rate LNAPL flows into the well during the recovery period is a function of LNAPL saturation, permeability of the surrounding formation relative to LNAPL, the LNAPL physical properties, and the magnitude of the initial hydraulic gradient toward the well following LNAPL removal. The general procedure for an LNAPL baildown test used at the Site included the removal of LNAPL with a disposable bailer within the shortest time period possible (generally less than 5 minutes). The LNAPL recovery was then monitored with an oil-water interface meter, initially at one minute intervals and then less frequent with time based on the recovery rate. Baildown tests were repeated up to six times to better resolve the true aquifer response versus drainage of LNAPL from the sand pack. Consecutive baildown tests for a given well were not conducted on the same day unless 90% recovery was achieved.

The data collected during the baildown testing was analyzed using both the Huntley (2000) and Lundy Zimmerman (1996) methods of bail down testing analysis. Both analysis methods were used to bracket the upper and lower limits of the results.

As shown on Table 9, the LNAPL conductivity results varied approximately two orders of magnitude across the Site with average LNAPL conductivity values ranging from 9.3E-5 centimeters per second (cm/sec) to 3.0E-3 cm/sec. Analysis of the LNAPL baildown tests was completed with Aqtesolv Pro™ (v 4.5.2) using either the Bouwer and Rice (1976) method for an unconfined aquifer or the Cooper-Bredehoeft-Papdopulos Method (1967) for a confined aquifer. Output from Aqtesolv for each test is included as Appendix E.

3.6 Hydraulic Conductivity Testing

Hydraulic conductivity (i.e., slug) testing was completed in 17 monitoring wells located generally around the perimeter of the LNAPL plumes. Criteria for selecting a well for

slug testing consisted of the following: 1) the well was historically free of LNAPL and located outside of the known LNAPL smear zone, 2) a boring log was available for the well and the geology is representative of the general Site conditions, 3) the monitoring well screen bisected the water table and the well was at least 2 inches in diameter, 4) the well was spatially distributed (relative to the other slug test wells) to best represent the Site, and 5) a minimum of 2.5 feet of water was available in the well for slug testing (based on the December 2009 gauging data).

Slug testing at the Site consisted of three slug-out tests. A slug-out test consists of removing (or displacing) water within the well and then monitoring the recovery of the water level back to static conditions. At the majority of the monitoring wells a solid cylinder was used to displace water. The solid slug was lowered into the water column and the water level was allowed to equilibrate. The solid slug was then rapidly removed, causing a lowering of the water level. The water level recovery and elapsed time was recorded on a log-scale using a pressure transducer. When a limited amount of water was available in the well for slug testing (e.g., <3 feet) a disposable bailer was used to remove the water.

A summary of the slug test results is provided on Table 10. Wells selected for testing were typically installed within the upper sand/fill unit. The hydraulic conductivity of the sand unit determined from the tests ranged from 3.5E-4 cm/sec to 6.9E-2 cm/sec. Analysis of the slug test data was completed with Aqtesolv Pro using the Bouwer and Rice (1976) method for an unconfined aquifer. Output from Aqtesolv for each test is included as Appendix F.

4. LNAPL Volume Estimate

Previous LNAPL volume calculations estimated that up to 15 million gallons of LNAPL reside beneath the Site by assuming that 1) the plume footprint was 45 acres, 2) the average LNAPL thickness was 5 feet across the Site, 3) the soil porosity was 20 percent, and 4) the pore spaces within the LNAPL-impacted zone were 100 percent filled with LNAPL. This calculation approach served as a conservative estimate of LNAPL volume, however, the simplifying assumptions in the calculation methodology resulted in an overestimate of LNAPL volume.

A more robust LNAPL volume estimate was completed following the additional LNAPL characterization work completed in January 2010. The revised LNAPL volume estimates used the LNAPL volume calculation method published by the American Petroleum Institute (API). LNAPL samples collected in January 2010 were submitted

for physical properties analyses (density, viscosity, and interfacial tension, Tables 4 and 5). The LNAPL physical characteristics data, late 2009/early 2010 in-well LNAPL thicknesses measurements (Table 1) and representative soil properties based on available site grain-size data (Table 8) provided the input for the LNAPL volume calculations.

An estimated 4.1 million gallons of LNAPL resides beneath the 34-acre LNAPL footprint. Of the total volume, approximately 460,000 gallons of LNAPL are potentially recoverable. The sections that follow provide additional detail on the LNAPL volume calculation methodology.

4.1 LNAPL Volume Calculation Methodology

Site-specific LNAPL volume can be estimated through the use of Site data and advanced LNAPL volume calculations developed through the joint work of a number of research universities and private organizations. One of the more comprehensive bodies of work in this area has been completed by API and published in numerous technical bulletins (e.g., API Publications 4682, 4711, 4729, and 4760). This science-based assessment approach was formulated to support analysis of total and recoverable LNAPL volumes in the subsurface and is referenced as a component of site management/characterization in a 2005 USEPA document titled *A Decision-Making Framework for Cleanup of Sites Impacted with Light Non-Aqueous Phase Liquids*.

ARCADIS created an LNAPL volume calculation spreadsheet (Appendix G) based on equations provided in API technical documents, predominantly API 4760 LNAPL Distribution and Recovery Model - Volume 1: Distribution and Recovery of Petroleum Hydrocarbon Liquids in Porous Media (January 2007). The spreadsheet model uses step integration functions to calculate the expected LNAPL saturation and corresponding specific LNAPL volumes (expressed in terms of gallons per square foot of LNAPL-impacted aquifer) based on input of the physical properties of the product and aquifer matrix and field observations of the degree of LNAPL impact.

The volume calculations require the following inputs:

- Fluid Characteristics: LNAPL and water density and air-water-LNAPL interfacial tensions.

- Aquifer Characteristics: porosity, soil capillarity curve fitting parameters (van Genuchten N and alpha), irreducible water saturation, and residual LNAPL saturation.
- Representative in-well LNAPL thicknesses observed at the Site and the areal extent of the LNAPL plume footprint.

LNAPL saturation and volume in the subsurface is calculated by translating in-well LNAPL thicknesses into various in-situ saturation values using capillarity and fluid property corrections. The vertical interval of soil impacted by LNAPL to varying degrees is calculated by setting the bottom of the interval to the amount the potentiometric surface would be depressed as a result of the presence of a given thickness of LNAPL in the well. The top of the LNAPL-impacted interval is calculated by adding the distance that the LNAPL would rise due to capillary forces to the top of the column of LNAPL in a monitoring well. These capillary forces are a combination of fluid properties and soil properties known for the air-water relationship and corrected for the air-LNAPL-water three-phase condition. Capillary curve fitting follows the van Genuchten soil retention model in the API volume calculations. One particular capillary correction factor, the van Genuchten M parameter, requires defining the relative permeability model (Mualem or Burdine) representative for the soil type. Relative permeability is the ratio of effective LNAPL permeability (that is the permeability of a soil to LNAPL at a particular LNAPL saturation) to absolute permeability of LNAPL at 100 percent saturation. The Mualem relative permeability relationship provides an outcome of slightly more recoverable volume than the Burdine relationship.

A series of capillarity and saturation relationships are necessary to arrive at a LNAPL saturation profile that corresponds to a given thickness of LNAPL measured in site monitoring wells. The basic premise of LNAPL saturation at any given point vertically (i.e., “z”) in the LNAPL-impacted zone is shown in Equation 1.

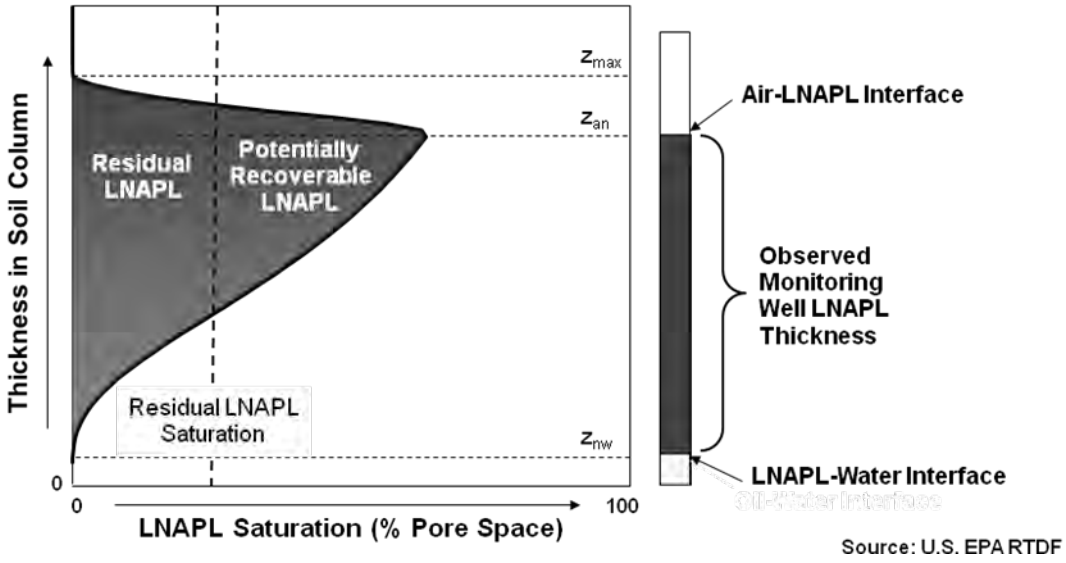
$$S_n(z) = 1 - S_w(z) - S_a(z) \qquad \text{Equation 1}$$

Where,

S_n = LNAPL saturation, dimensionless
S_w = water saturation, dimensionless
S_a = air saturation, dimensionless

The schematic below illustrates the relationship discussed above between in-well LNAPL thickness and in-situ LNAPL-impacted interval. The LNAPL saturation at which

LNAPL is discontinuous to the extent that it cannot flow is termed residual saturation. As defined by the Interstate Technology and Regulatory Council (ITRC), LNAPL saturations at or below residual saturation are not mobile (ITRC, 2009).



Source: U.S. EPA RTDF

The presence of LNAPL at saturations exceeding residual saturation indicates the potential for LNAPL movement at the pore-scale, and hence the potential for LNAPL to be recovered using LNAPL recovery technologies. Measured in-well LNAPL thickness, modeled LNAPL saturation, LNAPL residual saturation, and porosity are used to calculate specific LNAPL volumes, as shown in Equations 2 and 3 below. The result is expressed as LNAPL volume per unit area of the LNAPL-impacted aquifer. Converting LNAPL thickness into LNAPL-impacted vertical interval and LNAPL saturations at any given vertical point is discussed above and achieved through a series of calculations relying on capillary force and fluid properties. In lieu of integrating saturations over the LNAPL-impacted interval, as shown by Equations 2 and 3, specific volumes are calculated in the spreadsheet tool by dividing the interval into 25 slices, performing the calculation below for each slice, and summing the results.

$$D_n(b_n) = \int_{z_{nw}}^{z_{max}} \eta \cdot S_n(z)\, dz$$ Equation 2

$$R_n(b_n) = \int_{z_{nw}}^{z_{max}} \eta \cdot \left(S_n(z) - S_{nr}(z)\right) dz$$ Equation 3

Where,

D_n = Specific LNAPL Total Volume, ft^3/ft^2

b_n = Thickness of LNAPL in well, ft

z_{nw} = bottom of LNAPL-impacted interval (the LNAPL-water interface), ft

z_{max} = top of LNAPL-impacted interval, ft

η = Porosity, dimensionless

Rn = Specific LNAPL Potentially Recoverable Volume, ft^3/ft^2

S_{nr} = Residual LNAPL Saturation, dimensionless

Volume calculations using Equations 2 and 3 assume vertical equilibrium, meaning that groundwater elevations are reasonably static for the calculation time point and continuously changing (e.g., a tidal condition). An additional volume calculation is required to account for water table fluctuations commonly observed at sites. LNAPL in the lower portion of the "shark fin" is trapped in pore spaces at or below residual saturation when the water table rises. LNAPL in the upper portion of the "shark fin" freely drains from pore spaces as the water table lowers, but capillary forces hold some LNAPL in the pore spaces at or below residual saturation. The entire extent of residual LNAPL at higher and lower elevations than the current water table is called the "smear zone", which can be very extensive as compared to LNAPL thickness observed in wells at sites with dynamic or seasonal groundwater table fluctuations. Equation 4 below calculates the additional LNAPL volume potentially present in the smear zone that is not accounted for in the specific volume calculation above.

$$D_n(smearzone) = (smearzone\ multiplier - 1) \cdot b_n \cdot S_{nr} \cdot \eta$$ Equation 4

Where, the smear zone multiplier is a site-specific value based on an understanding of historical site conditions, e.g., known smear zone thickness based on vertical impact delineation or presumed smear zone thickness based on historical groundwater table fluctuations. There is no recoverable LNAPL in the smear zone intervals above and below the shark fin, because it is assumed that all LNAPL is at or below residual

saturation. Total specific volume is calculated by summing the specific volumes calculated using Equations 2 and 4, as shown in Equation 5.

$$D_n = D_n(smearzone) + D_n(b_n) \qquad \text{Equation 5}$$

The specific volumes calculated in Equations 2 through 5 are converted to gallons per square foot with the conversion factor of 7.48 gallons in one cubic foot. Site-wide total and recoverable LNAPL volumes can be calculated in gallons based on the series calculations shown in Equations 6 and 7 below by dividing the Site into subareas based upon LNAPL thicknesses measured in Site monitoring wells.

$$V_{D_n} = \sum_{i=1}^{m} D_{n_i} A_i + D_{n_{i+1}} A_{i+1} \ldots\ldots D_{n_n} A_n \qquad \text{Equation 6}$$

$$V_{R_n} = \sum_{i=1}^{m} R_{n_i} A_i + R_{n_{i+1}} A_{i+1} \ldots\ldots R_{n_n} A_n \qquad \text{Equation 7}$$

Where,

V_{D_n} = Site-wide Total LNAPL Volume (gallons)

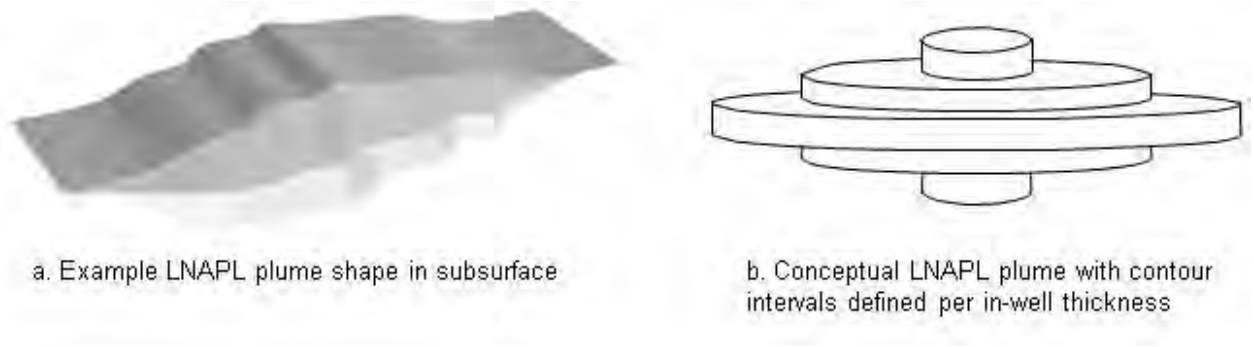
V_{R_n} = Site-wide Recoverable LNAPL Volume (gallons)

i = Number of contour intervals in series

m = Last contour interval in series

A = Area per plume contour interval (ft^2)

Representative LNAPL thicknesses are selected from LNAPL in-well thickness contour maps generated for the site as presented in the schematic below where part ‘a’ is an example LNAPL plume. Specifically, average LNAPL contour thicknesses are entered into the spreadsheet model to generate specific volumes for each interval area associated with the average contour thickness which is represented as the contour discs presented in part ‘b’ of the schematic below. The resulting specific total and recoverable LNAPL volumes are multiplied by the contour interval area to calculate the total and recoverable volumes per contour interval area. The volumes per contour interval area are summed to provide Site-wide total and potentially recoverable LNAPL volumes.



a. Example LNAPL plume shape in subsurface

b. Conceptual LNAPL plume with contour intervals defined per in-well thickness

4.2 Data Requirements for LNAPL Volume Calculations

The sections that follow include a description of data collected from Site activities or referenced from literature to support the analyses conducted as part of this volume estimation.

4.2.1 LNAPL Physical Properties

Twelve LNAPL and thirteen groundwater samples were collected from the Site in January 2010 and submitted to PTS Laboratories for measurement of density, viscosity, and air-water-LNAPL interfacial tensions at a temperature representative of groundwater temperatures at the Site. Laboratory reports from PTS are included on the attached compact disc. The results of the fluid physical properties testing, as applied to the API model and different areas of the Site, are summarized on Table 11. Testing of density, viscosity, and interfacial tensions was performed at groundwater temperature for the Site of 55ºF.

The Site was subdivided by separate plume areas and LNAPL types to facilitate calculations more specific to the varying conditions present across the large Site. The LNAPL onsite was characterized to be one of two predominant LNAPL types for purposes of the LNAPL volume calculation, diesel fuel and transmission oil. These two LNAPL types exhibited different physical properties in different subareas of the Site due to varying degrees of weathering and potentially the original product containing different additives that altered certain physical properties (e.g., detergent additives will result in a lower oil-water interfacial tension than that of the original product).

4.2.2 Soil Petrophysical Properties

Aquifer characteristics from the API Parameters Database (API, 2004) were selected based on Site-specific hydraulic conductivity determined through slug testing performed in January 2010. The API aquifer characteristics are summarized on Table 12. The API Parameter Database (updated in 2006) contains soil data that can be used as inputs to LNAPL volume calculations in the absence of site-specific data derived from undisturbed soil core collection and analysis. The data in the API database were derived from soil property analyses conducted on various geology types from a myriad of actual sites with LNAPL impact. The soil properties selected from the API database include van Genuchten soil capillarity fitting parameters N and alpha, porosity, irreducible water saturation, and residual LNAPL saturation.

The geology of the Site, as described on soil boring logs in the screened intervals of wells slug tested, is fine to coarse sand with some areas having some amounts of silt and clay with the sand. Geology in each subarea created for purposes of this volume calculation are noted in Table 12. The range of results of slug testing performed in each subarea were used as the search query in the API Parameter Database, and the geometric means of these ranges are included on Table 12. As noted in Section 3.6, slug tests were repeated three times to obtain a result representative of the subsurface conditions. The hydraulic conductivities shown in Table 12 from wells slug tested are congruent with hydraulic conductivities anticipated for the lithology noted on the soil boring logs.

The geometric means of the values collected from the API database were used in the volume calculations for each aquifer matrix property and are shown in Table 12. Mualem was selected as the appropriate relative permeability model for this volume calculation to provide a conservative estimate of recoverable volume. Representative values of residual LNAPL saturation for each subarea are included in Table 12. These values were determined from values reported by Mercer and Cohen (1990) for diesel and light fuel oil in soil for the diesel fuel LNAPL type and for lube and heavy fuel oils in soil for the transmission oil fuel type.

4.3 Total and Recoverable LNAPL Volume Calculation Results

For the API volume calculation, LNAPL distribution and thickness was assumed based on both the LNAPL gauging data (Table 1) and the LIF data (Table 6). The assumed thickness and assumed LNAPL speciation is summarized on a figure included as part of Appendix G. LNAPL contour thicknesses were entered into a calculation

spreadsheet designated per subarea to generate specific total and recoverable volumes for each contour thickness. The total and recoverable volumes for the Site were calculated based on a multiplication of the LNAPL thickness contour interval area and the specific total or recoverable volume for that contour thickness. Appendix G also contains the detailed calculation spreadsheets for each subarea, as well as the detailed summary spreadsheet aggregating all subarea volumes into Site-wide volumes.

The total and recoverable LNAPL volumes calculated per subarea and for the Site are summarized on Table 13, as well as the recoverable volume as a percent of the total volume. Total LNAPL volume was estimated to be approximately 4 million gallons at the Site, with approximately 463,000 gallons of the total volume being potentially recoverable. The recoverable volume as a percent of total volume varies among the subareas at the Site from 0.4 to 20 percent. The wide variability in potential recoverability is driven by LNAPL-water interfacial tension, total LNAPL volume present, the van Genuchten capillary fitting parameters, and the differences in these Site conditions from subarea to subarea. The central plume, for both areas of transmission oil and diesel fuel, resulted in the greatest percent of potentially recoverable LNAPL. The high recoverability in the central plume is due to the presence of coarser-grained sand and the oil-water interfacial tension being relatively low.

5. Summary

- 125 LIF borings were completed and 56 indicated an %RE above background.
- One LNAPL sample exceeded the TSCA Regulated Disposal Waste Limit for total PCBs.
- 46 LNAPL samples exceeded the RCRA Hazardous Waste Criteria for metals.
- Hydraulic conductivity determined from LNAPL baildown tests ranged from 9.3 x 10^{-5} to 3 x 10^{-3} cm/sec.
- Hydraulic conductivity determined from slug tests ranged from 3.5 x 10^{-4} to 6.8 x 10^{-2} cm/sec
- The total LNAPL volume present at the site was estimated as 4 million gallons; 463,000 gallons of which is potentially recoverable.

References:

API, 2004. American Petroleum Institute (API) Interactive LNAPL Guide, Version 2.0.4.

API, 2007. LNAPL Distribution and Recovery Model (LDRM) Volume 1: Distribution and Recovery of Petroleum Hydrocarbon Liquids in Porous Media, Regulatory and Scientific Affairs Department, American Petroleum Institute (API), Technical Publication 4760, January, 2007.

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Cooper, H.H., J.D. Bredehoeft and S.S. Papadopulos, 1967. Response of a finite-diameter well to an instantaneous charge of water, Water Resources Research, vol. 3, no. 1, pp. 263-269.

Farrand, W.R. and D.L. Bell. 1982a. Quaternary Geology of Southern Michigan, The University of Michigan, Ann Arbor, MI. Information Source: Michigan Department of Natural Resources, pre-1980, Michigan Resource Information System database, Michigan Department of Natural Resources.

Huntley, D. (2000) “Analytic Determination of Hydrocarbon Transmissivity from Baildown Tests", *Ground Water*, Vol. 38, No. 1, pp. 46-52.

Lundy, D. A., and Laura M. Zimmerman (1996) “Assessing the Recoverability of LNAPL Plumes for Recovery System Conceptual Design.” Proceedings of the 10th annual National Outdoor Action Conference and Exposition, National Ground Water Association, Las Vegas, NV. May 13-15, 1996.

Mercer, J.W. and Cohen, R.M., 1990. A Review of Immiscible Fluids in the Subsurface: Properties, Models, Characterization and Remediation, Journal of Contaminant Hydrology, Volume 6, pgs. 107-163.

ITRC (Interstate Technology & Regulatory Council), 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org.

USEPA, 2005. The Basics: Understanding the Behavior of Light Non-Aqueous Phase Liquids (LNAPLs) in the subsurface. Remediation Technologies Development Forum (RTDF). Powerpoint training materials. February 2005.

Table 1. Groundwater and LNAPL Guaging Summary, December 2009 and January 2010
MLC Willow Run Facility

Well Name	Date	Depth to LNAPL (feet)	Depth to Groundwater (feet)	Total Depth of Well (feet)	LNAPL Thickness (feet)
CRA-001M	12/23/2009	5.74	7.85	10.99	2.11
	1/20/2010	5.82	7.87	11.99	2.05
CRA-002RA	1/20/2010	NP	6.15	8.10	-
CRA-004M	12/23/2009	5.88	8.68	NM	2.80
	1/20/2010	5.94	8.91	12.51	2.97
CRA-006R	1/20/2010	5.97	7.94	10.49	1.97
CRA-006RA	12/23/2009	NP	6.21	NM	-
CRA-006RB	12/23/2009	5.92	7.67	NM	1.75
CRA-007T	12/22/2009	7.13	8.52	NM	1.39
CRA-008T	12/22/2009	7.57	7.63	NM	0.06
CRA-009R	12/22/2009	7.36	7.37	NM	0.01
CRA-011RA	12/22/2009	NP	7.14	NM	-
CRA-011RB	12/22/2009	NP	7.32	NM	-
CRA-012RA	12/22/2009	7.28	7.72	NM	0.44
CRA-012RB	12/22/2009	7.47	8.18	NM	0.71
	1/19/2010	7.48	8.20	13.20	0.72
CRA-013RA	12/22/2009	7.03	8.23	NM	1.20
CRA-015R	12/22/2009	6.81	8.12	NM	1.31
	1/19/2010	6.81	8.15	9.48	1.34
CRA-016R	12/22/2009	6.76	8.35	NM	1.59
	1/19/2010	6.75	8.41	11.70	1.66
CRA-017R	12/22/2009	6.66	8.80	NM	2.14
	1/19/2010	6.65	8.77	11.64	2.12
CRA-018T	12/22/2009	NP	7.82	NM	-
CRA-025R	12/23/2009	6.32	7.13	NM	0.81
	1/20/2010	6.41	7.02	12.40	0.61
CRA-027R	12/23/2009	5.76	6.17	NM	0.41
	1/20/2010	6.14	6.15	13.70	0.01
CRA-041R	12/23/2009	6.62	8.05	NM	1.43
	1/20/2010	6.66	8.15	8.92	1.49
CRA-043R	1/19/2010	7.28	9.10	8.70	1.82
CRA-051M	12/21/2009	NP	8.75	NM	-
CRA-052M	12/21/2009	NP	9.13	NM	-
CRA-071M	12/22/2009	NP	6.40	NM	-
CRA-072M	12/22/2009	NP	6.48	NM	-
CRA-075M	12/22/2009	6.57	7.07	NM	0.50
	1/19/2010	6.63	7.17	10.13	0.54
CRA-078M	12/22/2009	6.74	6.90	NM	0.16
CRA-079M	12/22/2009	6.61	8.04	NM	1.43
CRA-080M	12/22/2009	6.38	8.16	NM	1.78
CRA-081M	12/22/2009	6.42	8.40	NM	1.98
	1/19/2010	6.46	8.12	10.65	1.66
CRA-083M	12/22/2009	7.69	8.88	NM	1.19

See notes on page 6.

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Well Name	Date	Depth to LNAPL (feet)	Depth to Groundwater (feet)	Total Depth of Well (feet)	LNAPL Thickness (feet)
CRA-086M-A	12/22/2009	7.29	7.38	NM	0.09
CRA-086M-B	12/22/2009	7.39	9.02	NM	1.63
CRA-087M	12/22/2009	NP	8.92	NM	-
	1/19/2010	7.67	8.76	12.54	1.09
CRA-088RA	12/22/2009	NP	7.17	NM	-
CRA-088RB	12/22/2009	7.51	9.27	NM	1.76
CRA-089M	12/22/2009	8.03	8.05	NM	0.02
CRA-089R	1/19/2010	7.53	9.45	11.50	1.92
CRA-090M	12/22/2009	NP	7.95	NM	-
CRA-091M	12/22/2009	NP	8.18	NM	-
CRA-092M	12/22/2009	8.27	8.93	NM	0.66
CRA-094M	12/22/2009	NP	7.45	NM	-
CRA-096M	12/22/2009	8.00	8.75	NM	0.75
CRA-098M	12/22/2009	7.97	8.35	NM	0.38
	1/19/2010	8.04	8.44	NM	0.40
CRA-100M	12/22/2009	NP	8.25	NM	-
CRA-101M	12/22/2009	8.32	9.72	NM	1.40
CRA-102M	12/22/2009	8.03	9.56	NM	1.53
CRA-103M	12/22/2009	NP	8.24	NM	-
CRA-104M	12/22/2009	NP	8.40	NM	-
CRA105M	12/22/2009	NP	8.28	NM	-
CRA-106M	12/22/2009	NP	8.26	NM	-
CRA-107M	12/22/2009	8.74	8.98	NM	0.24
CRA-108M	12/22/2009	NP	8.08	NM	-
CRA-109M	12/22/2009	NP	8.25	NM	-
CRA-111R	12/23/2009	6.77	7.65	NM	0.88
	1/20/2010	6.85	7.75	9.03	0.90
	1/20/2010	6.85	7.75	8.60	0.90
CRA-113M	12/23/2009	7.00	8.00	NM	1.00
	1/20/2010	7.05	7.10	11.49	0.05
CRA-116R	12/23/2009	6.22	6.52	NM	0.30
	1/20/2010	6.31	6.68	10.50	0.37
CRA-118M-A	12/23/2009	NP	6.30	NM	-
CRA-118M-B	12/23/2009	NP	2.83	NM	-
CRA-119R	12/23/2009	NP	7.10	NM	-
CRA-120M-A	12/23/2009	6.02	6.13	NM	0.11
CRA-120M-B	12/23/2009	5.98	6.36	NM	0.38
CRA-121M-A	12/23/2009	NP	6.13	NM	-
CRA-121M-B	12/23/2009	6.11	6.51	NM	0.40
CRA-122M	1/20/2010	Inaccessible		NM	-
CRA-123R	12/23/2009	NP	6.34	NM	-
CRA-124M	12/23/2009	NP	6.67	NM	-
CRA-125M	12/23/2009	6.22	6.37	NM	0.15
CRA-130M-A	12/23/2009	NP	5.76	NM	-

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CRA-130M-B	12/23/2009	5.91	6.82	NM	0.91
CRA-131M-A	12/23/2009	NP	5.85	NM	-
CRA-131M-B	12/23/2009	5.64	8.27	NM	2.63
CRA-132M-A	12/23/2009	NP	5.99	NM	-
CRA-132M-B	12/23/2009	5.79	7.68	NM	1.89
CRA-134M	12/21/2009	NP	6.56	NM	-
CRA-200M	12/23/2009	NP	5.81	NM	-
CRA-201M	1/20/2010	5.33	7.45	10.22	2.12
CRA-201M-A	12/23/2009	NP	4.92	NM	-
CRA-202M	1/20/2010	5.81	6.48	7.74	0.67
CRA-203M	1/20/2010	NP	6.07	12.39	-
CRA-204A-B	1/20/2010	5.61	7.70	10.85	2.09
CRA-207M	12/23/2009	5.43	7.81	NM	2.38
CRA-207R	1/20/2010	5.53	7.80	12.42	2.27
CRA-210M-B	12/23/2009	5.10	5.55	NM	0.45
CRA-211M-A	12/23/2009	NP	4.96	NM	-
CRA-211M-B	12/23/2009	NP	5.09	NM	-
CRA-212M	1/20/2010	6.60	8.63	8.70	2.03
CRA-212M-A	12/23/2009	4.42	-	NM	-
CRA-212M-B	12/23/2009	NP	6.40	NM	-
CRA-215M	1/20/2010	6.35	7.40	10.80	1.05
CRA-218M	1/20/2010	8.15	9.23	11.95	1.08
CRA-218M-A	12/21/2009	NP	8.04	NM	-
CRA-019M	12/21/2009	7.20	8.25	NM	1.05
CRA-220M-A	12/21/2009	NP	7.97	NM	-
CRA-221M	12/21/2009	NP	8.36	NM	-
CRA-222M	12/21/2009	5.14	6.95	NM	1.81
	1/20/2010	5.33	7.25	11.90	1.92
CRA-223M	12/21/2009	5.21	6.51	NM	1.30
	1/20/2010	5.51	8.51	11.60	3.00
CRA-224M	1/20/2010	5.35	5.55	11.65	0.20
CRA-234RB	1/20/2010	5.65	7.16	9.81	1.51
CRA-235R	1/20/2010	5.33	9.05	9.71	3.72
CRA-235RA	12/23/2009	5.23	8.20	NM	2.97
CRA-235RB	12/23/2009	6.65	8.17	NM	1.52
CRA-236M	12/22/2009	8.26	8.54	NM	0.28
CRA-238M	12/23/2009	NP	6.81	NM	-
CRA-239M	12/23/2009	NP	6.71	NM	-
CRA-242M	12/23/2009	7.31	7.78	NM	0.47
	1/19/2010	7.29	7.87	14.12	0.58
CRA-245R	12/22/2009	8.40	9.55	NM	1.15
	1/19/2010	8.20	9.42	15.00	1.22
CRA-252R	12/22/2009	7.73	11.10	NM	3.37
	1/19/2010	7.44	10.71	11.47	3.27

See notes on page 6.

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CRA-256M	12/22/2009	NP	8.04	NM	-
CRA-301M	12/22/2009	6.44	6.62	NM	0.18
CRA-302M	12/22/2009	6.32	6.33	NM	0.01
CRA-303M	12/22/2009	NP	6.71	NM	-
CRA-305M	12/22/2009	NP	8.11	NM	-
CRA-306M	12/22/2009	NP	9.13	NM	-
CRA-307M	12/22/2009	NP	9.26	NM	-
CRA-310M	12/22/2009	NP	8.15	NM	-
CRA-311M	12/22/2009	NP	8.11	NM	-
CRA-315M	12/23/2009	NP	7.15	NM	-
CRA-316M	12/23/2009	NP	5.88	NM	-
CRA-321M	12/21/2009	NP	3.61	NM	-
CRA-322M	12/21/2009	NP	3.59	NM	-
CRA-325M	12/21/2009	NP	7.14	NM	-
CRA-326M	12/21/2009	NP	6.77	NM	-
CRA-342M	12/21/2009	NP	DRY @ 6.75	NM	-
CRA-343M	12/21/2009	NP	3.75	NM	-
CRA-401M-D	12/21/2009	NP	7.97	NM	-
CRA-401R	12/23/2009	NP	6.04	NM	-
CRA-402M-S	12/21/2009	NP	7.61	NM	-
CRA-402R	12/23/2009	5.90	6.14	NM	0.24
CRA-403R	12/23/2009	6.12	6.87	NM	0.75
	1/20/2010	6.14	6.90	15.00	0.76
CRA-501R	12/23/2009	5.39	7.95	NM	2.56
	1/20/2010	5.45	8.15	8.65	2.70
CRA-502R	12/23/2009	5.78	8.05	NM	2.27
	1/20/2010	5.88	8.19	8.62	2.31
CRA-503R	12/23/2009	5.83	7.75	NM	1.92
	1/20/2010	5.92	7.93	8.75	2.01
CRA-504R	1/20/2010	5.40	8.24	8.97	2.84
CRA-505R	1/20/2010	5.63	8.20	8.85	2.57
CRA-507R	12/23/2009	5.69	8.20	NM	2.51
	1/20/2010	5.81	8.35	9.01	2.54
CRA-508B	1/20/2010	5.46	7.57	8.47	2.11
CRA-509R	1/20/2010	5.55	7.47	8.14	1.92
CRA-510R	12/23/2009	5.83	7.22	NM	1.39
	1/20/2010	5.91	8.55	8.43	2.64
CRA-511R	12/23/2009	5.50	7.18	NM	1.68
	1/20/2010	5.60	7.31	8.70	1.71
CRA-512R	12/23/2009	5.65	5.79	NM	0.14
CRA-513R	12/23/2009	6.46	6.80	NM	0.34
	1/20/2010	6.57	6.81	9.00	0.24
CRA-514R	12/23/2009	6.36	6.81	NM	0.45
	1/20/2010	6.47	6.86	8.70	0.39

See notes on page 6.

Table 1. Groundwater and LNAPL Guaging Summary, December 2009 and January 2010
MLC Willow Run Facility

Well Name	Date	Depth to LNAPL (feet)	Depth to Groundwater (feet)	Total Depth of Well (feet)	LNAPL Thickness (feet)
CRA-515R	12/23/2009	6.08	6.55	NM	0.47
	1/20/2010	6.15	6.62	8.71	0.47
CRA-516R	12/23/2009	6.70	7.12	NM	0.42
	1/20/2010	6.79	7.22	8.53	0.43
CRA-517R	12/23/2009	6.42	6.53	NM	0.11
CRA-518R	12/23/2009	6.35	6.83	NM	0.48
	1/20/2010	6.43	6.90	8.70	0.47
CRA-519R	12/23/2009	6.47	6.97	NM	0.50
	1/20/2010	6.55	7.03	8.72	0.48
CRA-520R	12/23/2009	6.49	7.12	NM	0.63
	1/20/2010	6.58	7.20	8.60	0.62
CRA-521R	12/23/2009	6.37	6.62	NM	0.25
	1/20/2010	6.47	6.57	8.60	0.10
CRA-522R	12/23/2009	6.00	6.55	NM	0.55
	1/20/2010	6.04	6.47	8.50	0.43
CRA-523R	12/23/2009	6.07	6.62	NM	0.55
	1/20/2010	6.13	6.70	8.71	0.57
CRA-527M	12/23/2009	7.52	8.51	NM	0.99
CRA-528M	12/23/2009	7.57	7.59	NM	0.02
CRA-529M	12/23/2009	NP	7.67	NM	-
CRA-531R	12/23/2009	7.88	9.14	NM	1.26
CRA-533M	12/23/2009	NP	7.68	NM	-
CRA-534M	12/23/2009	NP	7.85	NM	-
CRA-609	12/21/2009	NP	7.03	NM	-
CRA-610	12/21/2009	NP	4.77	NM	-
CRA-611	12/21/2009	NP	4.68	NM	-
CRA-612	12/21/2009	NP	4.85	NM	-
CRA-613	12/21/2009	NP	4.64	NM	-
CRA-614	12/21/2009	NP	4.68	NM	-
CRA-615	12/21/2009	NP	4.62	NM	-
CRA-616	12/21/2009	NP	4.59	NM	-
Temporary Wells					
TW-010	1/28/2010	NP	8.44	11.58	-
	2/1/2010	NP	8.00	11.58	-
	2/8/2010	NP	8.04	11.58	-
TW-027	1/28/2010	NP	9.79	15.73	-
	2/1/2010	NP	9.69	15.73	-
	2/8/2010	NP	9.76	15.73	-
TW-033	1/27/2010	NP	11.51	15.81	-
	1/28/2010	8.76	8.86	15.81	0.10
	2/1/2010	11.89	12.01	15.81	0.12
	2/8/2010	10.81	12.51	15.81	1.70
TW-034	1/28/2010	NP	9.72	15.95	-
	2/1/2010	NP	10.65	15.95	-
	2/8/2010	NP	10.71	15.95	-

See notes on page 6.

Table 1. Groundwater and LNAPL Guaging Summary, December 2009 and January 2010
MLC Willow Run Facility

Well Name	Date	Depth to LNAPL (feet)	Depth to Groundwater (feet)	Total Depth of Well (feet)	LNAPL Thickness (feet)
TW-128	2/1/2010	8.25	8.61	15.55	0.36
	2/8/2010	7.5	8.87	15.55	1.37
TW-258	2/1/2010	NP	9.29	14.12	-
	2/8/2010	NP	9.50	15.17	-
TW-267	2/1/2010	NP	8.81	15.51	-
	2/8/2010	NP	8.94	15.51	-
TW-271	1/27/2010	9.32	14.23	15.68	4.91
	1/28/2010	8.39	13.18	15.68	4.79
	2/1/2010	8.21	13.03	15.68	4.82
	2/8/2010	8.18	13.63	15.68	5.45
TW-272	1/27/2010	NP	14.41	14.67	-
	1/28/2010	12.67	12.86	14.67	0.19
	2/1/2010	11.54	11.62	14.67	0.08
	2/8/2010	11.58	12.48	14.67	0.90

Notes:
1. Depth of LNAPL and depth to groundwater are expressed in feet below the top of the well casing.
2. NP - LNAPL not encountered.
3. NM - Not Measured

Table 2. Summary of Soil, Groundwater, and LNAPL Samples Collected, January-February 2010 Site Investigation Activities
MLC Willow Run Facilty

				ANALYSIS												
Well Identification	Sample Identification	Date Sampled	Matrix	Metals SW6010	Mercury SW7471	TPH SW8015	PCBs SW8082	Density, Specific Gravity ASTM D1481	Viscosity ASTM D445	Interfacial Tension ASTM D971	VOCs 8260B	VOCs SW8260	Microseeps AM20GAX	Grain Size D422	Percent Solids E160_3	Specific Gravity SM2710
CRA-001M	CRA-001M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-002RB	CRA-002RB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-004M	CRA004M-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-006R	CRA006R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-006R	DUP-005-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-011RB	CRA-011RB-012010-GW	1/20/2010	GW					X	X							
CRA-012RB	CRA12RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-013RB	CRA013RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-015R	CRA-015R-011910-GW	1/19/2010	GW					X	X	X						
CRA-015RB	CRA015RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-016RB	CRA016RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-017RB	CRA017RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-025R	CRA-025R-012010-GW	1/20/2010	GW					X	X	X						
CRA-025R-B	CRA025RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-041R	CRA041R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-041R	CRA-041R-012610-OIL	1/26/2010	OIL					X	X	X						
CRA-075M	CRA075M-011910-OIL	1/19/2010	OIL			X	X									
CRA-075M	CRA-075M-011910-GW	1/19/2010	GW					X	X	X						
CRA-079M	CRA079M-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-079M	DUP-006-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-080M	CRA-080M-12110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-080M	DUP008-12110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-080M	CRA-080M-B-012110-OIL	1/21/2010	OIL					X	X	X						
CRA-081M	CRA081M-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-083M	CRA083M-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-086M-B	CRA086M-B-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-086M-B	CRA-086M-B-011910-OIL	1/19/2010	OIL					X	X	X						
CRA-087M-A	CRA087MA-012210-GW	1/22/2010	GW													X
CRA-087M-B	CRA-087M-B-011910-OIL	1/19/2010	OIL					X	X	X						
CRA-088RB	CRA088RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-092M	CRA092M-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-092M	DUP-003-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-092M	CRA-092M-012210-OIL	1/22/2010	OIL					X	X	X						
CRA-096M	CRA096M-012210-OIL	1/22/2010	OIL	X	X	X	X									
CRA-098M	CRA-098M-011910-GW	1/19/2010	GW					X	X	X						
CRA-101M	101M-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-101M	DUP-001_011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-101M	CRA-101M-012610-OIL	1/26/2010	OIL					X	X	X						
CRA-102M	102M-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-102M	DUP-002_011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-102M	CRA-102M-011910-OIL	1/19/2010	OIL					X	X	X						
CRA-110M	CRA-110M-012510-W	1/25/2010	GW													X
CRA-111R-B	CRA111RB-012010-OIL	1/20/2010	OIL	X	X	X	X									

See notes on page 3.

Table 2. Summary of Soil, Groundwater, and LNAPL Samples Collected, January-February 2010 Site Investigation Activities
MLC Willow Run Facilty

				ANALYSIS													
Well Identification	Sample Identification	Date Sampled	Matrix	Metals SW6010	Mercury SW7471	TPH SW8015	PCBs SW8082	Density, Specific Gravity ASTM D1481	Viscosity ASTM D445	Interfacial Tension ASTM D971	VOCs 8260B	VOCs SW8260	Microseeps AM20GAX	Grain Size D422	Percent Solids E160_3	Specific Gravity SM2710
CRA-116R	CRA-116R-012010-GW	1/20/2010	GW					X	X	X						
CRA-116R-B	CRA116RB-012010-OIL	1/20/2010	OIL			X	X									
CRA-123R	CRA-123R-012510-W	1/25/2010	GW									X				
CRA-130M	CRA-130M-012210-OIL	1/22/2010	OIL					X	X	X						
CRA-130M-B	CRA130MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-131M-B	CRA-131MB-12110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-131M-B	DUP007-12110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-131M-B	CRA-131M-B-012110-OIL	1/21/2010	OIL					X	X	X						
CRA-132M-B	CRA-132MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-201M-B	CRA-201MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-202M	CRA-202M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-204M-B	CRA-204MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-207M	CRA-207M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-210M-B	CRA210MB-012210-OIL	1/22/2010	OIL	X	X	X	X									
CRA-210M-B	CRA-210M-B-012610-OIL	1/26/2010	OIL					X	X	X						
CRA-212M-A	CRA-212MA-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-215M-B	CRA-215MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-218M-B	CRA218MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-219M	CRA219M-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-219M	DUP-004-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-219M	CRA-219M-012010-OIL	1/20/2010	OIL					X	X	X						
CRA-222M	CRA222M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-223M	CRA223M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-234M-B	CRA-234MB-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-235A	CRA-235A-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-235B	CRA-235B-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-238M	CRA-238M-012510-W	1/25/2010	GW								X	X	X			
CRA-242M	CRA242M-011910-OIL	1/19/2010	OIL			X	X									
CRA-242M	CRA-242M-011910-GW	1/19/2010	GW					X	X	X						
CRA-245R	CRA-245R-011910-GW	1/19/2010	GW					X	X	X						
CRA-245RB	CRA245RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-252RB	CRA252RB-011910-OIL	1/19/2010	OIL	X	X	X	X									
CRA-302M	CRA302M-012210-GW	1/22/2010	GW									X				
CRA-303M	CRA303M-012210-GW	1/22/2010	GW									X				
CRA-315M	CRA-315M-012510-W	1/25/2010	GW									X				
CRA-317M	CRA-317M-012510-W	1/25/2010	GW									X				
CRA-403R	CRA-403R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-501R	CRA-501R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-502R	CRA-502R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-503R	CRA-503R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-504R	CRA-504R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-505R	CRA-505R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-507R	CRA507R-012010-OIL	1/20/2010	OIL	X	X	X	X									

See notes on page 3.

Table 2. Summary of Soil, Groundwater, and LNAPL Samples Collected, January-February 2010 Site Investigation Activities
MLC Willow Run Facilty

				ANALYSIS												
Well Identification	Sample Identification	Date Sampled	Matrix	Metals SW6010	Mercury SW7471	TPH SW8015	PCBs SW8082	Density, Specific Gravity ASTM D1481	Viscosity ASTM D445	Interfacial Tension ASTM D971	VOCs 8260B	VOCs SW8260	Microseeps AM20GAX	Grain Size D422	Percent Solids E160_3	Specific Gravity SM2710
CRA-508R	CRA-508R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-509R	CRA-509R-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-510R	CRA510R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-511R	CRA511R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-513R	CRA-513R-012010-GW	1/20/2010	GW					X	X	X						
CRA-513RB	CRA513RB-012010-OIL	1/20/2010	OIL			X	X									
CRA-514R	CRA-514R-012010-GW	1/20/2010	GW					X	X	X						
CRA-514RB	CRA514RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-515RB	CRA515RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-516R	CRA-516R-012010-GW	1/20/2010	GW					X	X	X						
CRA-516RB	CRA516RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-518RB	CRA518RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-519RB	CRA519RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-520RB	CRA520RB-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-520RB	CRA-520RB-012010-GW	1/20/2010	GW					X	X	X						
CRA-522R	CRA522R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-523R	CRA523R-012010-OIL	1/20/2010	OIL	X	X	X	X									
CRA-525M	CRA525M-012210-OIL	1/22/2010	OIL	X	X	X	X					X				X
CRA-526M	CRA526M-012210-OIL	1/22/2010	OIL	X	X	X	X					X				X
CRA-526M	CRA-526M-012610-GW	1/26/2010	GW					X	X	X						
CRA-527M	CRA527M-012110-OIL	1/21/2010	OIL	X	X	X	X									
CRA-527M	CRA-527M-012210-OIL	1/22/2010	OIL					X	X	X						
CRA-529M	CRA529M-012210-GW	1/22/2010	GW									X				
CRA-530R	CRA530R-012210-OIL	1/22/2010	OIL	X	X	X	X									
CRA-531R	CRA531R-012210-OIL	1/22/2010	OIL	X	X	X	X									
TW-010	TW-010-8.0-9.5	1/27/2010	SOIL											X		
TW-010	TW-010-4.5-5.5	1/27/2010	SOIL			X	X								X	
TW-027	TW-027-12.0-14.0	1/27/2010	SOIL											X		
TW-027	TW-027-8.5-9.5	1/27/2010	SOIL			X	X								X	
TW-033	TW-033 13-16	1/26/2010	SOIL											X		
TW-033	TW-033 9.5-10.5	1/26/2010	SOIL			X	X								X	
TW-034	TW-034-6.0-8.0	1/27/2010	SOIL											X		
TW-034	TW-034-8.5-9.5	1/27/2010	SOIL			X	X								X	
TW-128	TW-128-7.5-8.5	1/29/2010	SOIL			X	X								X	
TW-258	TW-258-8-9	1/28/2010	SOIL			X	X								X	
TW-267	TW-267-8-9	1/28/2010	SOIL			X	X								X	
TW-271	TW-271 14-16	1/26/2010	SOIL											X		
TW-271	TW 271-012810-OIL	1/28/2010	OIL	X	X	X	X									
TW-271	TW-271 8-9	1/26/2010	SOIL			X	X								X	
TW-272	TW-272 13-16	1/26/2010	SOIL											X		
TW-272	TW-272 10-12	1/26/2010	SOIL			X	X								X	

Notes:
GW - Groundwater
OIL - Light non-aqueos phase liquid
SOIL - Soil samples collected from either the LNAPL impacted zone or from the aquifer matrix.
PCBs - polychlorinated biphenyls
TPH - total petroleum hydrocarbons
VOCs - volatile organic carbons

Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-001M	CRA-002RB	CRA-004M	CRA-006R	CRA-006R	CRA-012RB
Sample ID	Disposal Waste	Hazardous	CRA-001M-012110-OIL	CRA-002RB-012110-OIL	CRA004M-012010-OIL	CRA006R-012010-OIL	DUP-005-012010-OIL	CRA12RB-011910-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/20/2010	1/19/2010
PCBs								
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 1	0.14 J	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	0	0	0.14 J	0	0
Metals								
Arsenic	NS	5	< 1	2.2	0.35 B	1.4	1.5	0.72 B
Barium	NS	100	323	7.9 B	84.8	29.2	30.3	0.66 B
Cadmium	NS	1	0.24 B	0.059 B	0.16 B	0.14 B	0.14 B	< 0.5
Chromium	NS	5	0.82 J	0.42 BJ	0.66 J	1.3 J	0.79 J	0.6 J
Copper	NS	NS	0.46 B	6.2	< 2.5	< 2.5	0.5 B	< 2.5
Iron	NS	NS	45.8	203	125	97	97.1	29.5
Lead	NS	5	2.7	4.3	6.3	9.1	9.6	1.9
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.97 B	1.8	1.9	0.83 B	0.87 B	0.22 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	< 4	0.54 B	< 4	0.34 B	0.39 B	< 4
Selenium	NS	1	< 0.5	0.26 B	< 0.5	< 0.5	< 0.5	0.32 B
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	308 J	7.1 J	22.4	6.5	6.9	2
TPH								
C6 - C12	NS	NS	390 B	73 B	360 B	1300 B	1300 B	820 B
C10-C20	NS	NS	69000 J	67000 J	68000 JB	110000 JB	120000 JB	640000 B
C20-C34	NS	NS	690000 B	910000 B	850000	720000	750000	300000 JB
Other								
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA
VOC								
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-001M	CRA-002RB	CRA-004M	CRA-006R	CRA-006R	CRA-012RB
Sample ID	Disposal Waste	Hazardous	CRA-001M-012110-OIL	CRA-002RB-012110-OIL	CRA004M-012010-OIL	CRA006R-012010-OIL	DUP-005-012010-OIL	CRA12RB-011910-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/20/2010	1/19/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-013RB	CRA-015RB	CRA-016RB	CRA-017RB	CRA-025R-B	CRA-041R	CRA-075M
Sample ID	Disposal Waste	Hazardous	CRA013RB-011910-OIL	CRA015RB-011910-OIL	CRA016RB-011910-OIL	CRA017RB-011910-OIL	CRA025RB-012010-OIL	CRA041R-012010-OIL	CRA075M-011910-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/19/2010	1/19/2010	1/19/2010	1/20/2010	1/20/2010	1/19/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	3.1 J	4.2 J	< 5	< 10	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	21	18	< 5	< 10	< 1	0.4 J
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 5	< 5	< 5	< 10	< 1	2.5
Total Detected PCBs	50	NS	0	24.1 J	22.2 J	0	0	0	2.9 J
Metals									
Arsenic	NS	5	0.92 B	11.8	9.3	5.6	0.59 B	4.8	NA
Barium	NS	100	2.7 BE	3.8 B	4 B	2.3 B	4.3 B	7.2 B	NA
Cadmium	NS	1	0.048 B	< 0.5	< 0.5	< 0.5	0.19 B	< 0.5	NA
Chromium	NS	5	0.89 J	2.9 J	2.9 J	2.8 J	1.1 J	2.9 J	NA
Copper	NS	NS	2.1 B	0.98 B	1.4 B	3.5	104	4.9	NA
Iron	NS	NS	25	34.1	47.4	41.9	389	186	NA
Lead	NS	5	2.5	0.32	0.49	0.35	24.8	1.1	NA
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5	NA
Manganese	NS	NS	0.29 B	0.74 B	1.3 B	1.3 B	8.8	1.1 B	NA
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	NA
Molybdenum	NS	NS	< 4	< 4	< 4	< 4	0.21 B	0.85 B	NA
Selenium	NS	1	0.22 B	0.49 B	0.47 B	0.32 B	< 0.5	0.25 B	NA
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA
Zinc	NS	NS	2.6	1.7 B	2.4	2.2	249	9	NA
TPH									
C6 - C12	NS	NS	230 B	400 B	480 B	93 B	54 B	3500 B	520 B
C10-C20	NS	NS	190000 JB	180000 JB	200000 JB	160000 JB	61000 JB	800000 B	470000 B
C20-C34	NS	NS	720000 B	620000 B	630000 B	550000 B	640000 B	210000 J	240000 JB
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-013RB	CRA-015RB	CRA-016RB	CRA-017RB	CRA-025R-B	CRA-041R	CRA-075M
Sample ID	Disposal Waste	Hazardous	CRA013RB-011910-OIL	CRA015RB-011910-OIL	CRA016RB-011910-OIL	CRA017RB-011910-OIL	CRA025RB-012010-OIL	CRA041R-012010-OIL	CRA075M-011910-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/19/2010	1/19/2010	1/19/2010	1/20/2010	1/20/2010	1/19/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-079M	CRA-079M	CRA-080M	CRA-080M	CRA-081M	CRA-083M	CRA-086M-B
Sample ID	Disposal Waste	Hazardous	CRA079M-012010-OIL	DUP-006-012010-OIL	CRA-080M-12110-OIL	DUP008-12110-OIL	CRA081M-011910-OIL	CRA083M-011910-OIL	CRA086M-B-011910-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/19/2010	1/19/2010	1/19/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 5	< 5	< 1	< 5	< 5	< 5	< 5
Aroclor-1221 (PCB-1221)	NS	NS	< 5	< 5	< 1	< 5	< 5	< 5	< 5
Aroclor-1232 (PCB-1232)	NS	NS	< 5	< 5	< 1	< 5	< 5	< 5	< 5
Aroclor-1242 (PCB-1242)	NS	NS	< 5	< 5	< 1	< 5	2.9 J	2.8 J	34
Aroclor-1248 (PCB-1248)	NS	NS	5.7	< 5	2.9	13	< 5	< 5	< 5
Aroclor-1254 (PCB-1254)	NS	NS	< 5	24	< 1	< 5	24	24	< 5
Aroclor-1260 (PCB-1260)	NS	NS	17	< 5	12	8.9	< 5	< 5	29
Aroclor-1262 (PCB-1262)	NS	NS	< 5	< 5	< 1	< 5	< 5	< 5	< 5
Aroclor-1268 (PCB-1268)	NS	NS	< 5	< 5	< 1	< 5	< 5	< 5	< 5
Total Detected PCBs	50	NS	22.7	24	14.9	21.9	26.9 J	26.8 J	**63**
Metals									
Arsenic	NS	5	7	7	11.3	9.8	5.7	10.5	9.5
Barium	NS	100	4 BE	4 B	2.6 B	2.2 B	3.3 B	2.5 B	1.1 B
Cadmium	NS	1	< 0.5	< 0.5	0.04 B	0.03 B	< 0.5	< 0.5	< 0.5
Chromium	NS	5	2.5 J	2.5 J	3.3 J	2.8 J	2 J	1.2 J	1.8 J
Copper	NS	NS	0.93 B	0.84 B	2.6	2.4 B	< 2.5	0.52 B	4.1
Iron	NS	NS	10.7	10.3	25.5	20.1	7.4 B	14	22.5
Lead	NS	5	1.3	1.3	2.2	1.9	< 0.3	0.2 B	0.9
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.074 B	< 1.5	0.43 B	0.45 B	0.087 B	0.29 B	0.28 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	< 4	< 4	0.16 B	< 4	< 4	< 4	< 4
Selenium	NS	1	0.26 B	0.25 B	0.42 B	0.27 B	0.63	0.39 B	0.25 B
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	0.61 B	0.58 B	3.4	3.1 J	1.1 B	1.1 B	1.1 B
TPH									
C6 - C12	NS	NS	370 B	360 B	260 B	350 B	270 B	230 B	410 B
C10-C20	NS	NS	210000 JB	220000 JB	200000 JB	200000 JB	200000 JB	200000 JB	250000 B
C20-C34	NS	NS	640000	670000	740000	670000	710000 B	730000 B	630000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-079M	CRA-079M	CRA-080M	CRA-080M	CRA-081M	CRA-083M	CRA-086M-B
Sample ID	Disposal Waste	Hazardous	CRA079M-012010-OIL	DUP-006-012010-OIL	CRA-080M-12110-OIL	DUP008-12110-OIL	CRA081M-011910-OIL	CRA083M-011910-OIL	CRA086M-B-011910-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/19/2010	1/19/2010	1/19/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-088RB	CRA-092M	CRA-092M	CRA-096M	CRA-101M	CRA-101M	CRA-102M
Sample ID	Disposal Waste	Hazardous	CRA088RB-011910-OIL	CRA092M-012010-OIL	DUP-003-012010-OIL	CRA096M-012210-OIL	101M-011910-OIL	DUP-001_011910-OIL	102M-011910-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/20/2010	1/20/2010	1/22/2010	1/19/2010	1/19/2010	1/19/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	1.5	2.6	0.45 J	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 2	1.2	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	0.29 J	5.7	11	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 2	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0.29 J	7.2	13.6	1.65 J	0	0	0
Metals									
Arsenic	NS	5	0.72 B	34.2	35	< 1	8.5	9.7	2.2
Barium	NS	100	0.34 B	3 B	3 B	0.18 B	0.65 B	0.72 B	0.099 B
Cadmium	NS	1	< 0.5	0.078 B	0.077 B	< 0.5	< 0.5	< 0.5	0.12 B
Chromium	NS	5	0.37 BJ	3 J	2.3 J	0.24 BJ	0.4 BJ	0.52 J	0.93 J
Copper	NS	NS	< 2.5	1.1 B	1.1 B	< 2.5	0.85 B	0.69 B	0.55 B
Iron	NS	NS	24.5	52	55	12.9	5.7 B	8.7 B	13.5
Lead	NS	5	0.17 B	1.6	1.6	2.2	0.29 B	0.3	20.1
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.34 B	1.3 B	1.3 B	0.2 B	0.097 B	0.12 B	0.12 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	< 4	0.66 B	0.65 B	< 4	< 4	< 4	< 4
Selenium	NS	1	0.55	0.36 B	0.39 B	< 0.5	0.31 B	0.45 B	< 0.5
Silver	NS	5	< 0.5	< 0.5	< 0.5	0.065 B	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	3.9	8.8	11	0.9 BJ	2	1.4 B	2.7
TPH									
C6 - C12	NS	NS	360 B	180 B	270 B	76 B	170 B	160 B	27 JB
C10-C20	NS	NS	620000 B	130000 JB	140000 JB	100000 JB	370000 B	340000 B	12000 JB
C20-C34	NS	NS	98000 JB	650000 B	720000 B	740000	560000 B	560000 B	280000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-088RB	CRA-092M	CRA-092M	CRA-096M	CRA-101M	CRA-101M	CRA-102M
Sample ID	Disposal Waste	Hazardous	CRA088RB-011910-OIL	CRA092M-012010-OIL	DUP-003-012010-OIL	CRA096M-012210-OIL	101M-011910-OIL	DUP-001_011910-OIL	102M-011910-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/20/2010	1/20/2010	1/22/2010	1/19/2010	1/19/2010	1/19/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-102M	CRA-111R-B	CRA-116R-B	CRA-130M-B	CRA-131M-B	CRA-131M-B	CRA-132M-B
Sample ID	Disposal Waste	Hazardous	DUP-002_011910-OIL	CRA111RB-012010-OIL	CRA116RB-012010-OIL	CRA130MB-012110-OIL	CRA-131MB-12110-OIL	DUP007-12110-OIL	CRA-132MB-012110-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/21/2010	1/21/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	8.9	< 1	< 1	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	8.9	0	0	0	0	0
Metals									
Arsenic	NS	5	2.4	0.41 B	NA	0.36 B	1.2	1.1	1.1
Barium	NS	100	0.062 B	0.56 B	NA	13.2 B	20.8	22.1	122
Cadmium	NS	1	0.11 B	< 0.5	NA	0.088 B	0.089 B	0.089 B	0.46 B
Chromium	NS	5	0.3 BJ	0.4 BJ	NA	0.43 BJ	0.56 J	0.75 J	0.53 J
Copper	NS	NS	0.51 B	< 2.5	NA	0.56 B	< 2.5	0.39 B	0.52 B
Iron	NS	NS	7.5 B	21.5	NA	116	130	137	224
Lead	NS	5	21.1	0.24 B	NA	3.7	3.4	3.6	12.6
Lithium	NS	NS	< 5	< 5	NA	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.082 B	0.16 B	NA	1.5	1.2 B	1.2 B	1.2 B
Mercury	NS	0.2	< 0.033	< 0.033	NA	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	< 4	< 4	NA	0.19 B	0.25 B	0.26 B	0.16 B
Selenium	NS	1	< 0.5	0.26 B	NA	0.22 B	< 0.5	< 0.5	< 0.5
Silver	NS	5	< 0.5	< 0.5	NA	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	1.1 B	0.85 B	NA	7.8	11	11.7	27.9 J
TPH									
C6 - C12	NS	NS	28 JB	70 B	NA	46 JB	410 B	370 B	540 B
C10-C20	NS	NS	17000 JB	160000 JB	770000 B	62000 JB	81000 JB	94000 JB	120000 J
C20-C34	NS	NS	350000 B	790000 B	160000 JB	820000	800000	920000	720000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-102M	CRA-111R-B	CRA-116R-B	CRA-130M-B	CRA-131M-B	CRA-131M-B	CRA-132M-B
Sample ID	Disposal Waste	Hazardous	DUP-002_011910-OIL	CRA111RB-012010-OIL	CRA116RB-012010-OIL	CRA130MB-012110-OIL	CRA-131MB-12110-OIL	DUP007-12110-OIL	CRA-132MB-012110-OIL
Sample Date	Limit	Waste Criteria	1/19/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/21/2010	1/21/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-201M-B	CRA-202M	CRA-204M-B	CRA-207M	CRA-210M-B	CRA-212M-A
Sample ID	Disposal Waste	Hazardous	CRA-201MB-012110-OIL	CRA-202M-012110-OIL	CRA-204MB-012110-OIL	CRA-207M-012110-OIL	CRA210MB-012210-OIL	CRA-212MA-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/21/2010	1/21/2010	1/22/2010	1/21/2010
PCBs								
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	0	0	0	0	0
Metals								
Arsenic	NS	5	1.2	1.6	1.1	0.68 B	0.94 B	< 1
Barium	NS	100	30.9	160	70.3	40.8	3 B	0.57 B
Cadmium	NS	1	0.12 B	0.063 B	0.063 B	0.24 B	0.078 B	0.51
Chromium	NS	5	0.7 J	2.2 J	0.84 J	5.7 J	0.61 J	1 J
Copper	NS	NS	1.8 B	0.73 B	3.1	11.9	3.8	6.1
Iron	NS	NS	137	210	139	538	151	180
Lead	NS	5	10	26.7	9.8	8.6	1.5	16.8
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	2.2	3.2	1.6	4.7	3.3	1.1 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.5 B	0.49 B	0.62 B	0.34 B	0.47 B	< 4
Selenium	NS	1	< 0.5	< 0.5	< 0.5	< 0.5	0.34 B	< 0.5
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	8.7 J	16.3 J	14.2 J	49.7 J	16.4 J	149 J
TPH								
C6 - C12	NS	NS	250 B	600 B	440 B	300 B	23 JB	76 B
C10-C20	NS	NS	78000 J	110000 J	93000 J	91000 J	58000 JB	63000 J
C20-C34	NS	NS	810000 B	680000 B	1000000 B	740000 B	870000	540000 B
Other								
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA
VOC								
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-201M-B	CRA-202M	CRA-204M-B	CRA-207M	CRA-210M-B	CRA-212M-A
Sample ID	Disposal Waste	Hazardous	CRA-201MB-012110-OIL	CRA-202M-012110-OIL	CRA-204MB-012110-OIL	CRA-207M-012110-OIL	CRA210MB-012210-OIL	CRA-212MA-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/21/2010	1/21/2010	1/22/2010	1/21/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-215M-B	CRA-218M-B	CRA-219M	CRA-219M	CRA-222M	CRA-223M	CRA-234M-B
Sample ID	Disposal Waste	Hazardous	CRA-215MB-012110-OIL	CRA218MB-012110-OIL	CRA219M-012010-OIL	DUP-004-012010-OIL	CRA222M-012110-OIL	CRA223M-012110-OIL	CRA-234MB-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/21/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 1	< 5	< 1	2.6 J	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 5	< 1	< 10	< 1
Total Detected PCBs	50	NS	0	0	0	0	0	2.6 J	0
Metals									
Arsenic	NS	5	1	0.67 B	2.4	2.3	0.63 B	23.6	2.2
Barium	NS	100	4.2 B	60.1	12 B	11.7 B	104	3.6 B	6.6 B
Cadmium	NS	1	< 0.5	0.48 B	0.041 B	0.041 B	< 0.5	0.053 B	0.043 B
Chromium	NS	5	0.35 BJ	0.51 J	0.9 J	2.7 J	2.6 J	6.2 J	0.37 BJ
Copper	NS	NS	3.2	0.62 B	3.8	3.5	2.5	7.7	3.6
Iron	NS	NS	132	230	52.2	86.8	126	309	125
Lead	NS	5	1.3	12.3	3.9	3.9	4.3	6.3	3.2
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	2.9	0.68 B	1.6	1.7	0.71 B	1.6	1.4 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.28 B	0.18 B	0.21 B	0.18 B	0.19 B	0.98 B	0.43 B
Selenium	NS	1	< 0.5	< 0.5	0.51	0.43 B	0.22 B	< 0.5	< 0.5
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	10.8 J	7.8 J	2.7	2.4	6.8 J	5 J	9.3 J
TPH									
C6 - C12	NS	NS	140 B	250 B	2100 B	1600 B	800 B	1200 B	130 B
C10-C20	NS	NS	74000 J	110000 JB	280000 B	250000 B	140000 JB	190000 JB	78000 J
C20-C34	NS	NS	900000 B	880000	530000 B	460000 B	710000	580000	1000000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-215M-B	CRA-218M-B	CRA-219M	CRA-219M	CRA-222M	CRA-223M	CRA-234M-B
Sample ID	Disposal Waste	Hazardous	CRA-215MB-012110-OIL	CRA218MB-012110-OIL	CRA219M-012010-OIL	DUP-004-012010-OIL	CRA222M-012110-OIL	CRA223M-012110-OIL	CRA-234MB-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010	1/21/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-235A	CRA-235B	CRA-242M	CRA-245RB	CRA-252RB	CRA-403R	CRA-501R
Sample ID	Disposal Waste	Hazardous	CRA-235A-012110-OIL	CRA-235B-012110-OIL	CRA242M-011910-OIL	CRA245RB-011910-OIL	CRA252RB-011910-OIL	CRA-403R-012110-OIL	CRA-501R-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/19/2010	1/19/2010	1/19/2010	1/21/2010	1/21/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	1.5	< 1	< 5	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	5.3	< 1	< 5	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 5	< 1	< 1
Total Detected PCBs	50	NS	0	0	6.8	0	0	0	0
Metals									
Arsenic	NS	5	< 1	< 1	NA	2.9	2.9	1.5	< 1
Barium	NS	100	0.43 B	0.44 B	NA	1.1 B	0.41 B	3.9 B	8 B
Cadmium	NS	1	0.039 B	0.043 B	NA	< 0.5	< 0.5	0.23 B	0.025 B
Chromium	NS	5	0.36 BJ	0.39 BJ	NA	0.33 BJ	0.8 J	3.2 J	0.84 J
Copper	NS	NS	4.7	5.8	NA	0.8 B	< 2.5	3.6	1.3 B
Iron	NS	NS	68.7	83.5	NA	15.7	14.2	98.2	231
Lead	NS	5	1.1	1.1	NA	0.81	0.45	18.8	0.57
Lithium	NS	NS	< 5	< 5	NA	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.64 B	0.72 B	NA	0.17 B	0.13 B	0.5 B	1.4 B
Mercury	NS	0.2	< 0.033	< 0.033	NA	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.19 B	0.32 B	NA	< 4	< 4	0.58 B	0.17 B
Selenium	NS	1	< 0.5	< 0.5	NA	0.21 B	0.28 B	< 0.5	< 0.5
Silver	NS	5	< 0.5	< 0.5	NA	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	14.1 J	11.7 J	NA	0.57 B	0.63 B	3.2 J	23.1 J
TPH									
C6 - C12	NS	NS	91 B	73 B	100 B	250 B	560 B	110 B	240 B
C10-C20	NS	NS	85000 J	100000 J	170000 JB	400000 B	530000 B	220000 J	120000 J
C20-C34	NS	NS	720000 B	840000 B	600000 B	390000 JB	280000 JB	640000 B	590000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-235A	CRA-235B	CRA-242M	CRA-245RB	CRA-252RB	CRA-403R	CRA-501R
Sample ID	Disposal Waste	Hazardous	CRA-235A-012110-OIL	CRA-235B-012110-OIL	CRA242M-011910-OIL	CRA245RB-011910-OIL	CRA252RB-011910-OIL	CRA-403R-012110-OIL	CRA-501R-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/19/2010	1/19/2010	1/19/2010	1/21/2010	1/21/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-502R	CRA-503R	CRA-504R	CRA-505R	CRA-507R	CRA-508R	CRA-509R
Sample ID	Disposal Waste	Hazardous	CRA-502R-012110-OIL	CRA-503R-012110-OIL	CRA-504R-012110-OIL	CRA-505R-012110-OIL	CRA507R-012010-OIL	CRA-508R-012110-OIL	CRA-509R-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/21/2010	1/21/2010	1/20/2010	1/21/2010	1/21/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	0	0	0	0	0	0
Metals									
Arsenic	NS	5	0.52 B	< 1	0.63 B	< 1	0.75 B	0.66 B	0.42 B
Barium	NS	100	64.7	186	25.3	406	23	12.8 B	65.2
Cadmium	NS	1	0.033 B	0.12 B	0.074 B	0.45 B	0.18 B	0.09 B	0.18 B
Chromium	NS	5	1 J	0.45 BJ	1.2 J	0.8 J	1.3 J	0.72 J	0.43 BJ
Copper	NS	NS	1.5 B	0.95 B	2.2 B	0.34 B	0.82 B	1.3 B	< 2.5
Iron	NS	NS	136	84.4	156	151	146	124	139
Lead	NS	5	1.2	3.5	5.5	7.1	9.4	5.1	7.3
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	1.7	1.2 B	1.1 B	2.1	1.5	1.6	0.77 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.28 B	< 4	0.21 B	0.15 B	< 4	< 4	< 4
Selenium	NS	1	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.3 B	< 0.5
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	31.1 J	102 J	23.6 J	192 J	8.2	6.4 J	15.8 J
TPH									
C6 - C12	NS	NS	260 B	280 B	240 B	490 B	240 B	280 B	180 B
C10-C20	NS	NS	76000 J	72000 J	100000 J	100000 J	93000 JB	110000 J	89000 J
C20-C34	NS	NS	560000 B	770000 B	670000 B	860000 B	870000	890000 B	690000 B
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-502R	CRA-503R	CRA-504R	CRA-505R	CRA-507R	CRA-508R	CRA-509R
Sample ID	Disposal Waste	Hazardous	CRA-502R-012110-OIL	CRA-503R-012110-OIL	CRA-504R-012110-OIL	CRA-505R-012110-OIL	CRA507R-012010-OIL	CRA-508R-012110-OIL	CRA-509R-012110-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/21/2010	1/21/2010	1/21/2010	1/20/2010	1/21/2010	1/21/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-510R	CRA-511R	CRA-513RB	CRA-514RB	CRA-515RB	CRA-516RB	CRA-518RB
Sample ID	Disposal Waste	Hazardous	CRA510R-012010-OIL	CRA511R-012010-OIL	CRA513RB-012010-OIL	CRA514RB-012010-OIL	CRA515RB-012010-OIL	CRA516RB-012010-OIL	CRA518RB-012010-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010
PCBs									
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	0.46 J	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0.46 J	0	0	0	0	0	0
Metals									
Arsenic	NS	5	1.4	1.1	NA	1.1	0.84 B	< 1	0.43 B
Barium	NS	100	15.7 B	282	NA	10.4 B	30.5	2 B	11.5 B
Cadmium	NS	1	0.048 B	0.58	NA	0.093 B	0.14 B	< 0.5	0.21 B
Chromium	NS	5	0.52 J	1 J	NA	0.34 BJ	0.63 J	0.63 J	0.36 BJ
Copper	NS	NS	1.2 B	1.3 B	NA	0.51 B	12.1	1.2 B	< 2.5
Iron	NS	NS	99.4	180	NA	110	132	62.9	64.6
Lead	NS	5	10.1	20.4	NA	4.3	11.9	0.25 B	5.8
Lithium	NS	NS	< 5	< 5	NA	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.92 B	4.2	NA	0.68 B	0.95 B	0.52 B	0.53 B
Mercury	NS	0.2	< 0.033	< 0.033	NA	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.36 B	< 4	NA	0.19 B	0.2 B	0.29 B	< 4
Selenium	NS	1	< 0.5	< 0.5	NA	< 0.5	< 0.5	< 0.5	< 0.5
Silver	NS	5	< 0.5	< 0.5	NA	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	8.7	5.3	NA	4.7	16.7	1.3 B	2.9
TPH									
C6 - C12	NS	NS	150 B	870 B	NA	4800 B	2800 B	3600 B	2000 B
C10-C20	NS	NS	81000 JB	170000 JB	590000 B	740000 B	780000 B	730000 B	770000 B
C20-C34	NS	NS	850000	740000	180000 JB	120000 JB	140000 JB	140000 JB	99000 JB
Other									
Specific Gravity	NS	NS	NA	NA	NA	NA	NA	NA	NA
VOC									
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-510R	CRA-511R	CRA-513RB	CRA-514RB	CRA-515RB	CRA-516RB	CRA-518RB
Sample ID	Disposal Waste	Hazardous	CRA510R-012010-OIL	CRA511R-012010-OIL	CRA513RB-012010-OIL	CRA514RB-012010-OIL	CRA515RB-012010-OIL	CRA516RB-012010-OIL	CRA518RB-012010-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/20/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-519RB	CRA-520RB	CRA-522R	CRA-523R	CRA-525M	CRA-526M
Sample ID	Disposal Waste	Hazardous	CRA519RB-012010-OIL	CRA520RB-012010-OIL	CRA522R-012010-OIL	CRA523R-012010-OIL	CRA525M-012210-OIL	CRA526M-012210-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/22/2010	1/22/2010
PCBs								
Aroclor-1016 (PCB-1016)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 1	0.18 J	< 1	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 1	< 1	2	< 1	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 1	< 1	< 1	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	0.18 J	2	0	0	0
Metals								
Arsenic	NS	5	1.1	2.9	0.86 B	3.3	< 1	0.56 B
Barium	NS	100	8 B	3.5 B	1.5 B	6.4 B	0.81 B	1.4 B
Cadmium	NS	1	0.26 B	< 0.5	0.066 B	0.13 B	< 0.5	< 0.5
Chromium	NS	5	0.4 BJ	0.66 J	1.1 J	0.64 J	0.33 BJ	0.73 J
Copper	NS	NS	< 2.5	2.7	20.9	2 B	< 2.5	0.63 B
Iron	NS	NS	82.5	137	292	76.5	77.8	344
Lead	NS	5	7.7	0.58	11.5	7	< 0.3	0.5 J
Lithium	NS	NS	< 5	< 5	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.62 B	0.7 B	1.8	0.48 B	0.98 B	4.6
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	0.27 B	1 B	0.37 B	0.25 B	< 4	< 4
Selenium	NS	1	< 0.5	0.26 B	< 0.5	< 0.5	0.22 BJ	0.29 BJ
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	3.7	2	21.5	4.5	2.1 J	2.3 J
TPH								
C6 - C12	NS	NS	9000 B	7500 B	1100 B	4700 B	7.1 JB	21 JB
C10-C20	NS	NS	830000 B	700000 B	300000 B	680000 B	2.5 JB	11 JB
C20-C34	NS	NS	110000 JB	160000 JB	360000 JB	190000 JB	19 JB	16 JB
Other								
Specific Gravity	NS	NS	NA	NA	NA	NA	0.99 J	1 J
VOC								
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-519RB	CRA-520RB	CRA-522R	CRA-523R	CRA-525M	CRA-526M
Sample ID	Disposal Waste	Hazardous	CRA519RB-012010-OIL	CRA520RB-012010-OIL	CRA522R-012010-OIL	CRA523R-012010-OIL	CRA525M-012210-OIL	CRA526M-012210-OIL
Sample Date	Limit	Waste Criteria	1/20/2010	1/20/2010	1/20/2010	1/20/2010	1/22/2010	1/22/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA	0.65 JB	0.69 JB
2-Hexanone	NS	NS	NA	NA	NA	NA	< 5	< 5
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA	< 5	< 5
Acetone	NS	NS	NA	NA	NA	NA	< 5	< 5
Benzene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Bromodichloromethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Bromoform	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Carbon disulfide	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Carbon tetrachloride	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Chlorobenzene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Chloroethane	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	< 0.61	< 0.61
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Cyclohexane	NS	NS	NA	NA	NA	NA	< 5	< 5
Dibromochloromethane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Ethylbenzene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Isopropylbenzene	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Methyl acetate	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Methyl cyclohexane	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA	0.055 J	< 5
Methylene chloride	NS	NS	NA	NA	NA	NA	0.2 J	0.2 J
Styrene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Tetrachloroethene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Toluene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA	< 0.61	< 0.61
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Trichloroethene	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA	< 5	< 5
Vinyl chloride	NS	NS	NA	NA	NA	NA	< 2.4	< 2.4
Xylene (total)	NS	NS	NA	NA	NA	NA	< 1.2	< 1.2

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID	TSCA-Regulated	RCRA	CRA-527M	CRA-530R	CRA-531R	TW-271
Sample ID	Disposal Waste	Hazardous	CRA527M-012110-OIL	CRA530R-012210-OIL	CRA531R-012210-OIL	TW 271-012810-OIL
Sample Date	Limit	Waste Criteria	1/21/2010	1/22/2010	1/22/2010	1/28/2010
PCBs						
Aroclor-1016 (PCB-1016)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1221 (PCB-1221)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1232 (PCB-1232)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1242 (PCB-1242)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1248 (PCB-1248)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1254 (PCB-1254)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1260 (PCB-1260)	NS	NS	< 10	0.31 J	< 1	< 1
Aroclor-1262 (PCB-1262)	NS	NS	< 10	< 1	< 1	< 1
Aroclor-1268 (PCB-1268)	NS	NS	< 10	< 1	< 1	< 1
Total Detected PCBs	50	NS	0	0.31 J	0	0
Metals						
Arsenic	NS	5	3.6	0.28 B	< 1	0.39 B
Barium	NS	100	0.46 B	5.1 BE	1.5 B	4.5 B
Cadmium	NS	1	< 0.5	0.027 B	< 0.5	0.054 B
Chromium	NS	5	0.56 J	0.41 BJ	0.38 BJ	0.19 B
Copper	NS	NS	< 2.5	3.1	0.83 B	1.2 BJ
Iron	NS	NS	5.1 B	11	4.5 B	20.8
Lead	NS	5	< 0.3	19.6	0.53	24.8
Lithium	NS	NS	< 5	< 5	< 5	< 5
Manganese	NS	NS	0.06 B	0.12 B	< 1.5	0.33 B
Mercury	NS	0.2	< 0.033	< 0.033	< 0.033	< 0.033
Molybdenum	NS	NS	< 4	< 4	< 4	< 4
Selenium	NS	1	0.28 B	0.87	0.94	0.22 B
Silver	NS	5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	NS	NS	1.2 BJ	4.2 J	1.2 BJ	1.7 BJ
TPH						
C6 - C12	NS	NS	650 B	28 JB	15 JB	19 JB
C10-C20	NS	NS	48000 JB	39000 JB	59000 JB	41000 JB
C20-C34	NS	NS	690000	640000	730000	520000 B
Other						
Specific Gravity	NS	NS	NA	NA	NA	NA
VOC						
1,1,1-Trichloroethane	NS	NS	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NS	NS	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	NA	NA	NA	NA
1,1-Dichloroethane	NS	NS	NA	NA	NA	NA
1,1-Dichloroethene	NS	NS	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NS	NS	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	NA	NA	NA
1,2-Dibromoethane (Ethylene Dibromide)	NS	NS	NA	NA	NA	NA
1,2-Dichlorobenzene	NS	NS	NA	NA	NA	NA
1,2-Dichloroethane	NS	NS	NA	NA	NA	NA
1,2-Dichloropropane	NS	NS	NA	NA	NA	NA
1,3-Dichlorobenzene	NS	NS	NA	NA	NA	NA
1,4-Dichlorobenzene	NS	NS	NA	NA	NA	NA

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Table 3. Light Non-aqueous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation
MLC Willow Run Facility

Location ID Sample ID Sample Date	TSCA-Regulated Disposal Waste Limit	RCRA Hazardous Waste Criteria	CRA-527M CRA527M-012110-OIL 1/21/2010	CRA-530R CRA530R-012210-OIL 1/22/2010	CRA-531R CRA531R-012210-OIL 1/22/2010	TW-271 TW 271-012810-OIL 1/28/2010
2-Butanone (Methyl Ethyl Ketone)	NS	NS	NA	NA	NA	NA
2-Hexanone	NS	NS	NA	NA	NA	NA
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	NS	NS	NA	NA	NA	NA
Acetone	NS	NS	NA	NA	NA	NA
Benzene	NS	NS	NA	NA	NA	NA
Bromodichloromethane	NS	NS	NA	NA	NA	NA
Bromoform	NS	NS	NA	NA	NA	NA
Bromomethane (Methyl Bromide)	NS	NS	NA	NA	NA	NA
Carbon disulfide	NS	NS	NA	NA	NA	NA
Carbon tetrachloride	NS	NS	NA	NA	NA	NA
Chlorobenzene	NS	NS	NA	NA	NA	NA
Chloroethane	NS	NS	NA	NA	NA	NA
Chloroform (Trichloromethane)	NS	NS	NA	NA	NA	NA
Chloromethane (Methyl Chloride)	NS	NS	NA	NA	NA	NA
cis-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA
Cyclohexane	NS	NS	NA	NA	NA	NA
Dibromochloromethane	NS	NS	NA	NA	NA	NA
Dichlorodifluoromethane (CFC-12)	NS	NS	NA	NA	NA	NA
Ethylbenzene	NS	NS	NA	NA	NA	NA
Isopropylbenzene	NS	NS	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA
Methyl cyclohexane	NS	NS	NA	NA	NA	NA
Methyl Tert Butyl Ether	NS	NS	NA	NA	NA	NA
Methylene chloride	NS	NS	NA	NA	NA	NA
Styrene	NS	NS	NA	NA	NA	NA
Tetrachloroethene	NS	NS	NA	NA	NA	NA
Toluene	NS	NS	NA	NA	NA	NA
trans-1,2-Dichloroethene	NS	NS	NA	NA	NA	NA
trans-1,3-Dichloropropene	NS	NS	NA	NA	NA	NA
Trichloroethene	NS	NS	NA	NA	NA	NA
Trichlorofluoromethane (CFC-11)	NS	NS	NA	NA	NA	NA
Trifluorotrichloroethane (Freon 113)	NS	NS	NA	NA	NA	NA
Vinyl chloride	NS	NS	NA	NA	NA	NA
Xylene (total)	NS	NS	NA	NA	NA	NA

See Notes on Page 25

Table 3. Light Non-aqeous Phase Liquid Sample Analytical Summary, January 2010 Site Investigation MLC Willow Run Facility.

NOTES

Results reported in milligrams per kilogram (mg/kg), unless otherwise noted.

J	Estimated result, result is less than reporting limit. Metals J: Method blank contamination.
B	Method blank contamination. Metals B: Estimated result, result is less than reporting limit.
E	Matrix interference.
Bold	Result exceeds TSCA-Regulated Disposal Waste Limit.
Shade	Result exceeds RCRA Limits.
NS	No standard.
NA	Not analyzed.

PCB - polychlorinated biphenyl
TPH - total petroleym hydrocarbons
VOCs - volatile organic compounds

Table 4. Summary of LNAPL Physical Properties, January-February 2010 Site Investigation Activities
MLC Willow Run Facility

Sample ID	Matrix	Temperature °F	Specific Gravity	Density g/cc	Viscosity	
					Centistokes	Centipoise
CRA-520RB-012010-GW	Water	55	0.9988	0.9983	1.28	1.28
CRA-131M-B-012110-OIL	NAPL	55	0.8764	0.8759	148	130
CRA-242M-011910-GW	Water	55	1.002	1.002	1.33	1.33
CRA-086M-B-011910-OIL	NAPL	55	0.8928	0.8923	103	91.7
CRA-245R-011910-GW	Water	55	0.9997	0.9991	1.30	1.30
CRA-102M-011910-OIL	NAPL	55	0.8940	0.8935	1314	1174
CRA-011RB-012010-GW	Water	55	1.001	1.000	1.31	1.31
CRA-015R-011910-GW	Water	55	1.001	1.001	1.29	1.29
CRA-087M-B-011910-OIL	NAPL	55	0.8820	0.8815	68.8	60.7
CRA-075M-011910-GW	Water	55	1.003	1.002	1.28	1.29
CRA-080M-B-012110-OIL	NAPL	55	0.8931	0.8926	134	120
CRA-514R-012010-GW	Water	55	0.9994	0.9989	1.29	1.28
CRA-219M-012010-OIL	NAPL	55	0.8782	0.8777	62.9	55.2
CRA-116R-012010-GW	Water	55	1.002	1.001	1.31	1.31
CRA-130M-012210-OIL	NAPL	55	0.8769	0.8764	172	150
CRA-098M-011910-GW	Water	55	0.9994	0.9988	1.29	1.29
CRA-092M-012210-OIL	NAPL	55	0.9005	0.9000	191	172
CRA-526M-012610-GW	Water	55	1.000	0.9995	1.29	1.29
CRA-527M-012210-OIL	NAPL	55	0.8956	0.8950	344	308
CRA-516R-012010-GW	Water	55	0.9992	0.9987	1.28	1.28
CRA-041R-012610-OIL	NAPL	55	0.8583	0.8578	16.4	14.1
CRA-025R-012010-GW	Water	55	1.002	1.001	1.34	1.34
CRA-210M-B-012610-OIL	NAPL	55	0.8858	0.8853	241	214
CRA-513R-012010-GW	Water	55	1.001	1.000	1.30	1.30
CRA-101M-012610-OIL	NAPL	55	0.8870	0.8865	54.7	48.5

Notes:

g/cc Grams per cubic centimeter

Table 5. Summary of LNAPL Physical Properties, January-February 2010 Site Investigation Activitie MLC Willow Run Facility

Phase Pair		Temperature	Interfacial Tension,
Sample ID/Phase	Sample ID/Phase	°F	Dynes/Centimeter
CRA-520RB-012010-GW	Air	55	67.7
CRA-131M-B-012110-OIL	Air	55	31.3
CRA-520RB-012010-GW	CRA-131M-B-012110-OIL	55	5.0
CRA-242M-011910-GW	Air	55	31.8
CRA-086M-B-011910-OIL	Air	55	31.9
CRA-242M-011910-GW	CRA-086M-B-011910-OIL	55	1.7
CRA-245R-011910-GW	Air	55	64.4
CRA-102M-011910-OIL	Air	55	33.7
CRA-245R-011910-GW	CRA-102M-011910-OIL	55	32.5
CRA-015R-011910-GW	Air	55	58.7
CRA-087M-B-011910-OIL	Air	55	31.2
CRA-015R-011910-GW	CRA-087M-B-011910-OIL	55	3.9
CRA-075M-011910-GW	Air	55	55.0
CRA-080M-B-012110-OIL	Air	55	32.5
CRA-075M-011910-GW	CRA-080M-B-012110-OIL	55	4.2
CRA-514R-012010-GW	Air	55	62.6
CRA-219M-012010-OIL	Air	55	31.4
CRA-514R-012010-GW	CRA-219M-012010-OIL	55	4.5
CRA-116R-012010-GW	Air	55	48.7
CRA-130M-012210-OIL	Air	55	32.2
CRA-116R-012010-GW	CRA-130M-012210-OIL	55	9.5
CRA-098M-011910-GW	Air	55	50.9
CRA-092M-012210-OIL	Air	55	32.4
CRA-098M-011910-GW	CRA-092M-012210-OIL	55	6.9
CRA-526M-012610-GW	Air	55	64.3
CRA-527M-012210-OIL	Air	55	31.5
CRA-526M-012610-GW	CRA-527M-012210-OIL	55	14.6
CRA-516R-012010-GW	Air	55	55.8
CRA-041R-012610-OIL	Air	55	29.7
CRA-516R-012010-GW	CRA-041R-012610-OIL	55	7.2
CRA-025R-012010-GW	Air	55	45.1
CRA-210M-B-012610-OIL	Air	55	31.9
CRA-025R-012010-GW	CRA-210M-B-012610-OIL	55	8.9
CRA-513R-012010-GW	Air	55	60.8
CRA-101M-012610-OIL	Air	55	30.7
CRA-513R-012010-GW	CRA-101M-012610-OIL	55	12.1

Table 6. Summary of LIF Boring Logs, January 2010 Site Investigation
MLC Willow Run Facility

Boring ID	Date/Time	Final Depth (feet bgs)	Initial RE Area (pVs)	Background Area (pVs)	Maximum Signal (%RE)	Max. Signal Depth (feet bgs)	Top of Flourescence (feet bgs)	Bottom of Flourescence (feet bgs)
LIF-001	1/20/2010 12:17	14.4	10944	31	3	0.0	BG	
LIF-002	1/20/2010 12:49	15.0	11507	75	1	0.0	BG	
LIF-003	1/20/2010 12:10	14.1	11568	90	11	2.2	BG	
LIF-004	1/20/2010 12:48	30.0	10870	86	5	0.2	BG	
LIF-006	1/20/2010 15:14	15.0	11033	27	1	10.7	BG	
LIF-007	1/20/2010 15:15	26.0	10186	58	3	0.2	BG	
LIF- 009	1/23/2010 13: 42	15.0	11115	17	1	3.1	BG	
LIF-010	1/23/2010 15:11	15.0	11252	18	231	4.9	5	9
LIF-011	1/21/2010 9:00	13.5	11080	90	398	4.1	5	9
LIF-012	1/21/2010 10:48	15.0	11075	26	91	8.9	7.5	9.5
LIF-014	1/23/2010 16:39	15.0	10184	122	4	13.6	13.5	14
LIF-015	1/25/2010 8:13	16.0	11172	120	480	4.9	5	9.5
LIF-016	1/23/2010 8:49	15.0	11200	29	1	12.9	BG	
LIF-017	1/23/2010 8:16	15.1	11586	30	1	6.0	BG	
LIF-018	1/23/2010 13:23	16.1	11059	128	2	5.0	BG	
LIF-019	1/23/2010 14:40	18.0	10863	145	319	8.6	5	14
LIF-020	1/23/2010 15:29	15.0	10584	154	5	0.8	BG	
LIF-021	1/25/2010 8:52	15.0	11350	17	1	0.3	BG	
LIF-022	1/25/2010 9:05	15.1	10282	132	3	0.7	BG	
LIF-023	1/23/2010 12:22	15.0	11399	22	7	6.4	6.3	6.6
LIF-024	1/23/2010 16:00	18.0	11033	15	70	8.7	8	9.5
LIF-025	1/23/2010 16:09	15.0	10600	149	141	7.9	7.5	9.5
LIF-026	1/25/2010 8:16	15.0	11462	27	1	5.3	BG	
LIF-027	1/22/2010 14:08	18.2	11033	132	44	9.2	9	10
LIF-028	1/23/2010 16:33	15.0	11225	30	3	6.1	BG	
LIF-029	1/22/2010 10:06	20.0	11250	112	32	13.0	8	13.5
LIF-030	1/22/2010 11:24	15.1	11253	23	1	3.4	BG	
LIF-031	1/22/2010 10:39	15.0	11463	26	8	1.2	BG	
LIF-032	1/22/2010 10:37	18.1	11109	139	3	5.0	5	5.5
LIF-033	1/21/2010 13:18	22.0	11210	117	368	10.1	5	14.5
LIF-034	1/21/2010 16:29	20.0	11641	125	135	9.4	8.5	14
LIF-035	1/22/2010 8:48	16.0	11138	105	2	11.8	BG	
LIF-036	1/22/2010 14:43	18.0	10775	125	2	6.3	BG	
LIF-037	1/22/2010 14:21	7.4	11261	23	1	4.3	BG	
LIF-039	1/21/2010 17:04	16.0	11381	122	2	6.9	BG	
LIF-040	1/22/2010 9:25	18.1	11620	173	4	3.1	BG	
LIF-041	1/22/2010 13:06	18.0	11278	114	11	0.4	BG	
LIF-042	1/22/2010 12:38	3.8	10415	120	5	3.6	BG	
LIF-043	1/23/2010 9:56	15.0	10371	128	2	6.1	BG	
LIF-044	1/23/2010 9:29	15.0	10858	111	5	2.8	BG	
LIF-045	1/23/2010 8:40	16.0	10853	140	12	2.2	9.5	11
LIF-046	1/25/2010 16:01	15.0	11276	26	5	3.7	BG	
LIF-047	1/25/2010 14:12	15.1	11019	21	1	2.6	BG	
LIF-048	1/25/2010 15:16	10.1	11817	41	2	6.4	BG	
LIF-048A	1/25/2010 15:31	15.0	11817	41	2	6.4	BG	
LIF-049	1/25/2010 14:44	15.1	11604	56	2	1.0	BG	
LIF-050	1/21/2010 9:47	4.1	11434	28	1	1.7	BG	
LIF-051	1/20/2010 16:31	15.1	11881	29	1	9.9	BG	
LIF-053	1/23/2010 12:21	13.7	10884	117	3	1.0	BG	
LIF-054	1/23/2010 11:50	15.0	11165	25	2	5.0	BG	
LIF-056	1/23/2010 10:35	18.1	10885	118	123	4.6	5	13.5
LIF-058	1/25/2010 9:59	5.1	11098	15	53	3.4	BG	
LIF-059	1/25/2010 11:38	15.3	11763	17	2	1.2	BG	
LIF-060	1/25/2010 13:28	15.0	10821	172	6	7.5	7.3	7.8
LIF-062	1/28/2010 10:26	15.0	11201	22	101	7.8	7.5	10.5
LIF-063	1/28/2010 9:57	15.0	11340	18	9	0.5	BG	
LIF- 064	1/26/2010 16: 39	15.0	10368	32	15	0.4	BG	
LIF-065	1/27/2010 14:20	17.0	11709	65	225	7.6	7	9.5
LIF-067	1/27/2010 16:43	15.1	11390	82	1	5.3	BG	
LIF-069	1/26/2010 10:38	15.1	11022	39	1	2.4	BG	
LIF-070	1/29/2010 8:19	15.0	11973	64	3	6.6	6	7
LIF-071	1/29/2010 8:43	15.0	10439	72	10	2.5	BG	
LIF-072	1/29/2010 9:23	15.0	10258	68	5	0.7	BG	
LIF-073	1/27/2010 11:06	15.0	11282	57	281	6.7	6	9
LIF-074	1/27/2010 10:36	15.0	11371	45	37	8.5	6.5	9.5
LIF-075	1/27/2010 10:05	15.0	10955	23	3	0.0	BG	
LIF-077	1/29/2010 9:20	15.0	11398	42	5	4.0	BG	

Table 6. Summary of LIF Boring Logs, January 2010 Site Investigation
MLC Willow Run Facility

Boring ID	Date/Time	Final Depth (feet bgs)	Initial RE Area (pVs)	Background Area (pVs)	Maximum Signal (%RE)	Max. Signal Depth (feet bgs)	Top of Flourescence (feet bgs)	Bottom of Flourescence (feet bgs)
LIF-092	1/28/2010 9:29	15.1	11160	14	175	0.0	BG	
LIF-093	1/28/2010 8:58	15.2	11111	29	77	6.4	5	9.5
LIF-126	1/27/2010 13:17	16.0	11340	33	101	7.9	6.5	10
LIF-127	1/28/2010 8:33	15.0	11869	-5	42	6.1	5	8
LIF-128	1/28/2010 9:01	17.0	10916	23	585	7.6	7	17
LIF-129	1/27/2010 14:50	15.0	11666	60	50	5.0	5	6.5
LIF-130	1/27/2010 13:33	15.1	11350	19	7	3.2	BG	
LIF-131	1/28/2010 10:59	15.1	11394	-9	195	8.0	5	10
LIF-132	1/27/2010 9:28	15.0	11674	19	4	0.1	BG	
LIF-133	1/27/2010 14:13	16.0	11029	27	34	1.3	BG	
LIF-134	1/27/2010 8:29	15.0	11080	-42	21	0.0	BG	
LIF-146	1/29/2010 8:35	16.1	11493	40	6	1.2	BG	
LIF-147	1/25/2010 12:51	15.0	10263	130	24	1.7	BG	
LIF-148	1/25/2010 12:28	15.1	11301	136	7	1.4	BG	
LIF-149	1/25/2010 11:52	15.0	11045	156	7	1.2	BG	
LIF-156	1/26/2010 8:27	15.0	11877	129	39	7.3	7	8.5
LIF-166	1/25/2010 14:25	15.0	10471	129	9	0.6	BG	
LIF-186	1/26/2010 15:30	15.0	10932	-32	5	0.1	BG	
LIF-187	1/27/2010 14:58	20.0	11259	18	109	8.1	7	14.5
LIF-188	1/27/2010 15:41	15.1	11665	25	172	7.9	7	9.5
LIF-189	1/27/2010 16:30	16.0	11327	32	176	7.4	5	11
LIF-190	1/27/2010 17:37	15.7	11396	30	143	7.6	7..5	10
LIF-191	1/25/2010 16:45	15.1	11830	146	5	0.2	BG	
LIF-192	1/25/2010 16:44	15.0	11432	22	1	0.0	BG	
LIF-193	1/26/2010 10:27	16.0	10764	88	420	8.9	7.5	11
LIF-209	1/28/2010 13:46	16.1	11296	27	164	7.2	5	10.5
LIF-227	1/28/2010 13:05	16.0	11627	13	182	7.6	6.5	10.5
LIF-228	1/28/2010 12:22	19.6	11170	27	199	9.0	5.5	14
LIF-239	1/27/2010 17:17	15.1	10542	60	29	0.0	BG	
LIF-243	1/27/2010 17:50	15.0	11877	56	3	0.1	BG	
LIF-244	1/26/2010 15:38	15.2	11551	22	107	8.4	7.5	11.5
LIF-247	1/27/2010 8:59	15.0	11527	21	28	8.4	8	10
LIF-249	1/27/2010 8:26	15.1	11480	28	5	7.0	7	7.5
LIF-249MN	1/28/2010 14:18	15.0	10771	44	9	0.2	BG	
LIF-250	1/28/2010 12:36	15.3	10657	-54	40	0.7	BG	
LIF-251	1/28/2010 13:39	15.0	11194	-11	10	5.2	5	7.5
LIF-252	1/27/2010 15:56	15.1	10931	66	4	7.4	7.3	7.5
LIF-255	1/26/2010 8:20	15.0	11748	56	1	11.9	BG	
LIF-256	1/26/2010 10:05	15.1	11667	128	4	1.9	BG	
LIF-257	1/26/2010 9:58	13.9	11076	38	6	5.1	5	5.5
LIF-258	1/26/2010 9:14	15.1	11187	21	87	8.7	7	10
LIF-259	1/26/2010 10:54	15.1	10456	82	29	15.1	14.5	15.1
LIF-260	1/26/2010 13:47	15.0	12048	-23	4	0.4	BG	
LIF-261	1/27/2010 9:50	15.2	11217	17	5	0.7	BG	
LIF-263	1/26/2010 13:33	15.0	11700	50	2	5.4	BG	
LIF-264	1/26/2010 14:09	15.0	11575	77	1	0.8	BG	
LIF-265	1/26/2010 14:38	15.1	11103	28	53	10.3	9	11
LIF-266	1/28/2010 15:09	15.0	10041	11	2	0.0	BG	
LIF-267	1/26/2010 14:32	18.0	11835	-36	242	10.9	8	12.5
LIF-268	1/28/2010 16:49	15.0	10369	-2	10	3.6	BG	
LIF-269	1/28/2010 15:40	17.0	10746	38	141	8.9	8	15
LIF-270	1/28/2010 16:09	15.1	11889	-36	4	5.7	5.5	6.5
LIF-271	1/23/2010 14:02	19.1	10565	135	256	8.6	8	14
LIF-272	1/22/2010 15:37	22.0	10870	125	447	11.4	7.5	17
LIF-277	1/28/2010 10:23	15.0	11517	21	4	2.7	BG	
LIF-278	1/28/2010 15:04	15.5	11620	24	349	7.1	5	10
LIF-280	1/27/2010 10:19	16.0	11451	21	141	6.0	5	11
LIF-282	1/21/2010 10:27	15.4	11810	114	4	3.5	BG	

Notes:
bgs - below ground surface
%RE - percent flourescence relative to a reference emmitter
pVs - picovolt seconds - a measure of waveform area
Borings hand cleared from floor to to 5 feet below grade and cuttings placed back in hole prior to completeing the LIF boring. The %RE recorded from the ground surface to 5 feet below grade is due to due to concrete coring dust and/or not representative of in-situ soil conditions.
BG - LIF response indicative of background soil conditions

Table 7. Summary of Temporary Well Soil Sample Analytical Results, January 2010 Site Investigation
MLC Willow Run Facility

Location ID:	TSCA-Regulated	TW-010	TW-027	TW-033	TW-034	TW-128	TW-258	TW-267	TW-271	TW-272
Sample ID:	Disposal Waste	TW-010-4.5-5.5	TW-027-8.5-9.5	TW-033 9.5-10.5	TW-034-8.5-9.5	TW-128-7.5-8.5	TW-258-8-9	TW-267-8-9	TW-271 8-9	TW-272 10-12
Sample Date:	Limit	1/27/2010	1/27/2010	1/26/2010	1/27/2010	1/29/2010	1/28/2010	1/28/2010	1/26/2010	1/26/2010
Depth Interval:		4.5 - 5.5	8.5 - 9.5	9.5 - 10.5	8.5 - 9.5	7.5 - 8.5	8 - 9	8 - 9	8 - 9	10 - 12
TPH										
C6-C12	NS	0.045 J	0.11	0.042 J	0.77	7.3	6.7	< 0.11	0.76	1.1
C10-C20	NS	< 1,000	< 45	4.8	1,400	4,700	890 J	19	1,000 J	2,000
C20-C34	NS	2,200	160	7.7	5,100	57,000 B	5,500	24 B	14,000	6,700
PCBs										
Aroclor-1016 (PCB-1016)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1221 (PCB-1221)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1232 (PCB-1232)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1242 (PCB-1242)	NS	< 0.034	< 0.037	< 0.041	< 0.036	0.031 J	0.19	< 0.037	< 0.038	< 0.037
Aroclor-1248 (PCB-1248)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1254 (PCB-1254)	NS	< 0.034	< 0.037	< 0.041	< 0.036	0.13	0.16	< 0.037	< 0.038	< 0.037
Aroclor-1260 (PCB-1260)	NS	< 0.034	< 0.037	< 0.041	0.054	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1262 (PCB-1262)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Aroclor-1268 (PCB-1268)	NS	< 0.034	< 0.037	< 0.041	< 0.036	< 0.039	< 0.038	< 0.037	< 0.038	< 0.037
Total Detected PCBs	50	0	0	0	0.054	0.161 J	0.35	0	0	0
Other										
Percent Solids	NS	97.3	88.1	81.1	92.6	85.7	86.5	88.8	85.7	89.8

Notes:

Results reported in milligrams per kilogram (mg/kg), unless otherwise noted.
<- Not detected
B - Method blank contamination
J - Estimated result, result is less than reporting limit
NS - No standard

ARCADIS

Table 8. Summary of Temporary Well Soil Sample Sieve Analysis Results, January 2010 Site Investigation
MLC Willow Run Facility

Location ID:		TW-010	TW-027	TW-033	TW-034	TW-271	TW-272
Sample ID:		TW-010-8.0-9.5	TW-027-12.0-14.0	TW-033 13-16	TW-034-6.0-8.0	TW-271 14-16	TW-272 13-16
Sample Date:		1/27/2010	1/27/2010	1/26/2010	1/27/2010	1/26/2010	1/26/2010
Depth Interval:	Units	8 - 9.5	12 - 14	13 - 16	6 - 8	14 - 16	13 - 16
Coarse Sand	%	1.5	5.6	0	9	0	5.1
Medium Sand	%	16.8	13.1	0	20.4	0	10.8
Fine Sand	%	56.7	59.2	83.2	39.8	64.8	54.8
Clay	%	2.1	3	1.4	6.2	2.6	4.6
Gravel	%	10.6	15.8	0	15.8	0	4.2
Silt	%	12.3	3.3	15.3	8.8	32.6	20.7
Particle Size							
Sieve, 75000 Microns, Percent Passing	% passing	100	100	100	100	100	100
Sieve, 50000 Microns, Percent Passing	% passing	100	100	100	100	100	100
Sieve, 37500 Microns, Percent Passing	% passing	100	100	100	100	100	100
Sieve, 25000 Microns, Percent Passing	% passing	100	100	100	100	100	100
Sieve, 19000 Microns, Percent Passing	% passing	100	100	100	100	100	100
Sieve, 9500 Microns, Percent Passing	% passing	92.3	88.4	100	91.8	100	100
Sieve No. 4, Percent Passing	% passing	89.4	84.2	100	84.2	100	95.8
Sieve No. 10, Percent Passing	% passing	87.9	78.6	100	75.2	100	90.8
Sieve, No. 20, Percent Passing	% passing	82.7	74.5	100	66.9	100	85.7
Sieve No. 40, Percent Passing	% passing	71.1	65.5	100	54.8	100	80
Sieve, No. 60, Percent Passing	% passing	37.1	33.7	97.3	33.9	99.4	71.4
Sieve No. 80, Percent Passing	% passing	22.9	16.6	78.5	24.2	96.6	64.5
Sieve, No. 100, Percent Passing	% passing	19.4	11.9	61.5	20.9	91.2	59
Sieve No. 200, Percent Passing	% passing	14.4	6.3	16.7	15	35.1	25.2
Hydrometer, Reading 1, Percent Passing	% passing	5.3	6	4.3	11	9	8.6
Hydrometer, Reading 2, Percent Passing	% passing	4.8	5.6	2.3	10	5.8	7.1
Hydrometer, Reading 3, Percent Passing	% passing	3.2	4.7	1.8	8.6	3.7	6.1
Hydrometer, Reading 4, Percent Passing	% passing	2.7	3.8	1.4	7.1	3.1	5.6
Hydrometer, Reading 5, Percent Passing	% passing	2.1	3	1.4	6.2	2.6	4.6
Hydrometer, Reading 6, Percent Passing	% passing	1.6	2.1	1.4	4.7	2	3.5
Hydrometer, Reading 7, Percent Passing	% passing	1	1.2	1.4	3.3	1.4	2.5

Table 9. Summary of LNAPL Baildown Test Results, January 2010 Site Investigation
MLC Willow Run Facility

Test Well ID / Analysis Method	Initial LNAPL Thickness (feet)	LNAPL Density (g/cm^3)	Test Duration (min)	Final LNAPL Thickness (feet)	Percent Recovery	Transmissivity (ft^2/day)	Transmissivity (cm^2/sec)	Conductivity (ft/day)	Conductivity (cm/sec)
Central									
CRA-079M (T1-B&R)	1.54	0.8800	93.00	1.23	79.9%	1.945	2.09E-02	1.263	4.46E-04
CRA-079M (T1-Cooper)	1.54	0.8800	93.00	1.23	79.9%	0.553	5.94E-03	0.359	1.27E-04
CRA-079M (T2-B&R)	1.51	0.8800	70.00	1.21	80.1%	2.783	2.99E-02	1.843	6.50E-04
CRA-079M (T2-Cooper)	1.51	0.8800	70.00	1.21	80.1%	0.581	6.24E-03	0.384	1.36E-04
CRA-079M (T3-B&R)	1.47	0.8800	335.00	1.46	99.3%	1.643	1.77E-02	1.118	3.94E-04
CRA-079M (T3-Cooper)	1.47	0.8800	335.00	1.46	99.3%	0.871	9.37E-03	0.593	2.09E-04
								Average	**3.27E-04**
CRA-080M (T1 - B&R)	1.77	0.8926	169.00	1.47	83.1%	2.099	2.26E-02	1.186	4.18E-04
CRA-080M (T1-Cooper)	1.77	0.8926	169.00	1.47	83.1%	0.693	7.45E-03	0.392	1.38E-04
CRA-080M (T2 - B&R)	1.77	0.8926	92.00	1.25	70.6%	2.410	2.59E-02	1.361	4.80E-04
CRA-080M (T2-Cooper)	1.77	0.8926	92.00	1.25	70.6%	0.510	5.49E-03	0.288	1.02E-04
CRA-080M (T3 - B&R)	1.91	0.8926	317.00	1.49	78.0%	2.328	2.50E-02	1.219	4.30E-04
CRA-080M (T3-Cooper)	1.91	0.8926	317.00	1.49	78.0%	0.819	8.81E-03	0.429	1.51E-04
CRA-080M (T4 - B&R)	1.84	0.8926	394.00	1.45	78.8%	1.479	1.59E-02	0.804	2.84E-04
CRA-080M (T4-Cooper)	1.84	0.8926	394.00	1.45	78.8%	1.385	1.49E-02	0.753	2.65E-04
								Average	**2.84E-04**
CRA-087M-B (T2 - B&R)	1.11	0.8815	463.00	0.62	55.9%	0.525	5.65E-03	0.473	1.67E-04
CRA-087M-B (T2-Cooper)	1.11	0.8815	463.00	0.62	55.9%	0.523	5.63E-03	0.471	1.66E-04
CRA-087M-B (T3 - B&R)	1.12	0.8815	1980.00	1.02	91.1%	0.516	5.55E-03	0.461	1.63E-04
CRA-087M-B (T3-Cooper)	1.12	0.8815	1980.00	1.02	91.1%	1.751	1.88E-02	1.563	5.52E-04
								Average	**2.62E-04**
CRA-092M (T1-B&R)	0.74	0.9000	45.00	0.60	81.1%	2.158	2.32E-02	2.917	1.03E-03
CRA-092M (T1-Cooper)	0.74	0.9000	45.00	0.60	81.1%	1.096	1.18E-02	1.480	5.22E-04
CRA-092M (T2-B&R)	0.74	0.9000	165.00	0.60	81.1%	0.601	6.46E-03	0.812	2.87E-04
CRA-092M (T2-Cooper)	0.74	0.9000	165.00	0.60	81.1%	0.366	3.94E-03	0.495	1.74E-04
CRA-092M (T3-B&R)	0.66	0.9000	80.00	0.60	90.9%	2.572	2.77E-02	3.898	1.38E-03
CRA-092M (T3-Cooper)	0.66	0.9000	80.00	0.60	90.9%	6.353	6.83E-02	9.626	3.40E-03
								Average	**1.13E-03**
CRA-101M (T2-B&R)	1.67	0.9000	175.00	1.29	77.2%	0.786	8.45E-03	0.471	1.66E-04
CRA-101M (T2-Cooper)	1.67	0.9000	175.00	1.29	77.2%	0.119	1.28E-03	0.071	2.52E-05
CRA-101M (T3-B&R)	1.74	0.9000	390.00	1.41	81.0%	0.551	5.93E-03	0.317	1.12E-04
CRA-101M (T3-Cooper)	1.74	0.9000	390.00	1.41	81.0%	0.875	9.40E-03	0.503	1.77E-04
								Average	**1.20E-04**

Table 9. Summary of LNAPL Baildown Test Results, January 2010 Site Investigation
MLC Willow Run Facility

Test Well ID / Analysis Method	Initial LNAPL Thickness (feet)	LNAPL Density (g/cm^3)	Test Duration (min)	Final LNAPL Thickness (feet)	Percent Recovery	Transmissivity (ft^2/day)	Transmissivity (cm^2/sec)	Conductivity (ft/day)	Conductivity (cm/sec)
CRA-102M (T2-B&R)	0.93	0.8935	32.00	0.84	90.3%	11.174	1.20E-01	12.015	4.24E-03
CRA-102M (T2-Cooper)	0.93	0.8935	32.00	0.84	90.3%	20.600	2.22E-01	22.150	7.81E-03
								Average	**6.03E-03**
East									
CRA-041R (T1 - B&R)	1.49	0.8759	487.00	0.87	58.4%	0.108	1.16E-03	0.073	2.56E-05
CRA-041R (T1 - Cooper)	1.49	0.8759	487.00	0.87	58.4%	0.110	1.18E-03	0.074	2.60E-05
								Average	**2.58E-05**
CRA-131M-B (T1 - B&R)	2.32	0.8759	70.00	1.93	83.2%	3.296	3.54E-02	1.421	5.01E-04
CRA-131M-B (T1-Cooper)	2.32	0.8759	70.00	1.93	83.2%	1.238	1.33E-02	0.534	1.88E-04
CRA-131M-B (T2 - B&R)	2.32	0.8759	345.00	1.89	81.5%	1.497	1.61E-02	0.645	2.28E-04
CRA-131M-B (T2-Cooper)	2.32	0.8759	345.00	1.89	81.5%	1.822	1.96E-02	0.785	2.77E-04
CRA-131M-B (T3 - B&R)	2.32	0.8759	260.00	1.88	81.0%	1.810	1.95E-02	0.780	2.75E-04
CRA-131M-B (T3-Cooper)	2.32	0.8759	260.00	1.88	81.0%	2.062	2.22E-02	0.889	3.14E-04
								Average	**2.97E-04**
CRA-219M (T1-B&R)	1.11	0.8777	188.00	0.77	69.4%	0.375	4.03E-03	0.338	1.19E-04
CRA-219M (T1-Cooper)	1.11	0.8777	188.00	0.77	69.4%	0.520	5.59E-03	0.469	1.65E-04
CRA-219M (T2-B&R)	0.77	0.8777	108.00	0.56	72.7%	1.129	1.21E-02	1.466	5.17E-04
CRA-219M (T2-Cooper)	0.77	0.8777	108.00	0.56	72.7%	0.665	7.15E-03	0.863	3.05E-04
CRA-219M (T3-B&R)	0.73	0.8777	315.00	0.60	82.2%	0.353	3.79E-03	0.483	1.70E-04
CRA-219M (T3-Cooper)	0.73	0.8777	315.00	0.60	82.2%	0.288	3.09E-03	0.394	1.39E-04
								Average	**2.36E-04**
Northwest									
CRA-527M (T1 - B&R)	0.89	0.8950	90.00	0.63	70.8%	0.772	8.30E-03	0.867	3.06E-04
CRA-527M (T1-Cooper)	0.89	0.8950	90.00	0.63	70.8%	0.706	7.59E-03	0.793	2.80E-04
CRA-527M (T2 - B&R)	0.66	0.8950	75.00	0.52	78.8%	0.675	7.26E-03	1.023	3.61E-04
CRA-527M (T2-Cooper)	0.66	0.8950	75.00	0.52	78.8%	1.452	1.56E-02	2.200	7.76E-04
CRA-527M (T3 - B&R)	0.60	0.8950	70.00	0.46	76.7%	1.006	1.08E-02	1.676	5.91E-04
CRA-527M (T3-Cooper)	0.60	0.8950	70.00	0.46	76.7%	1.171	1.26E-02	1.952	6.88E-04
								Average	**5.00E-04**

Notes:
g/cm^3 - grams per cubic centimeter
ft^2/day -square feet per day
ft/day - feet per day
cm^2/sec - centimeters squared per second
cm/sec - centimeters per second
B&R - Bouwer and Rice Method (1976)
Cooper-Bredehoeft-Papdopulos Method (1967)

Table 10. Summary of Slug Test Results, January 2010 Site Investigation, MLC Willow Run Facility.

Well ID	Test	Well Diameter (inches)	Screen Interval (feet bgs)	Geology - Screened Interval	Depth to Water 1/21/2010 (feet bgs)	Max Displacement (feet)	Aquifer Thickness (feet)	Saturated Screen Thickness (feet)	Solution	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)
CRA-071M	1	2.00	6-11	Upper sand/fill	6.5	3.31	3.7	3.5	B&R	1.4E-02	40.6
CRA-071M	2	2.00	6-11	Upper sand/fill	6.5	2.31	3.7	3.5	B&R	1.7E-02	48.4
CRA-071M	3	2.00	6-11	Upper sand/fill	6.5	1.26	3.7	3.5	B&R	1.8E-02	51.8
									Average	**1.7E-02**	**46.9**
CRA-073M	1	2.00	7-12	Upper sand/fill	6.49	1.08	3.61	2.7	B&R	5.8E-02	164.8
CRA-073M	2	2.00	7-12	Upper sand/fill	6.49	0.42	3.61	2.7	B&R	7.2E-02	204.6
CRA-073M	3	2.00	7-12	Upper sand/fill	6.49	0.65	3.61	2.7	B&R	7.5E-02	213.8
									Average	**6.9E-02**	**194.4**
CRA-074M	1	2.00	5-10	Upper sand/fill	6.44	1.29	3.56	2.96	B&R	6.9E-03	19.5
CRA-074M	2	2.00	5-10	Upper sand/fill	6.44	1.45	3.56	2.96	B&R	6.2E-03	17.4
CRA-074M	3	2.00	5-10	Upper sand/fill	6.44	1.17	3.56	2.96	B&R	6.1E-03	17.4
									Average	**6.4E-03**	**18.1**
CRA-082M	1	2.00	5.5-10.5	Upper sand/fill	6.57	2.74	4.23	3.93	B&R	2.7E-02	75.7
CRA-082M	2	2.00	5.5-10.5	Upper sand/fill	6.57	1.21	4.23	3.93	B&R	2.6E-02	74.9
CRA-082M	3	2.00	5.5-10.5	Upper sand/fill	6.57	0.958	4.23	3.93	B&R	2.6E-02	73.1
									Average	**2.6E-02**	**74.6**
CRA-90M	1	2.00	7-12	Upper sand/fill	8.05	1.03	4.45	3.95	B&R	3.4E-02	97.7
CRA-90M	2	2.00	7-12	Upper sand/fill	8.05	1.36	4.45	3.95	B&R	2.7E-02	77.0
CRA-90M	3	2.00	7-12	Upper sand/fill	8.05	2.18	4.45	3.95	B&R	3.7E-02	104.5
									Average	**3.3E-02**	**93.0**
CRA-94M	1	2.00	7-12	Upper sand/fill	7.54	1.08	4.96	3.91	B&R	2.4E-02	69.3
CRA-94M	2	2.00	7-12	Upper sand/fill	7.54	1.36	4.96	3.91	B&R	2.6E-02	73.7
CRA-94M	3	2.00	7-12	Upper sand/fill	7.54	1.7	4.96	3.91	B&R	2.9E-02	82.3
									Average	**2.7E-02**	**75.1**
CRA-104M	1	2.00	7-12	Upper sand/fill	8.46	0.82	3.54	2.99	B&R	4.6E-02	129.5
CRA-104M	2	2.00	7-12	Upper sand/fill	8.46	1.63	3.54	2.99	B&R	7.8E-02	222.2
CRA-104M	3	2.00	7-12	Upper sand/fill	8.46	0.72	3.54	2.99	B&R	7.1E-02	201.9
									Average	**6.5E-02**	**184.6**

Table 10. Summary of Slug Test Results, January 2010 Site Investigation, MLC Willow Run Facility.

Well ID	Test	Well Diameter (inches)	Screen Interval (feet bgs)	Geology - Screened Interval	Depth to Water 1/21/2010 (feet bgs)	Max Displacement (feet)	Aquifer Thickness (feet)	Saturated Screen Thickness (feet)	Solution	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)
CRA-105M	1	2.00	7-12	Upper sand/fill	8.36	0.93	3.44	3.09	B&R	2.9E-02	81.0
CRA-105M	2	2.00	7-12	Upper sand/fill	8.36	0.88	3.44	3.09	B&R	2.4E-02	67.8
CRA-105M	3	2.00	7-12	Upper sand/fill	8.36	0.97	3.44	3.09	B&R	2.7E-02	77.6
									Average	**2.7E-02**	**75.4**
CRA-110M	1	2.00	4-14	Upper sand/fill	6.79	2.57	5.96	5.96	B&R	3.0E-02	85.1
CRA-110M	2	2.00	4-14	Upper sand/fill	6.79	1.74	5.96	5.96	B&R	2.2E-02	61.8
CRA-110M	3	2.00	4-14	Upper sand/fill	6.79	3.26	5.96	5.96	B&R	2.6E-02	73.1
									Average	**2.6E-02**	**73.4**
CRA-124M	1	2.00	4-14	Upper sand/fill	6.54	3.58	6.46	6.72	B&R	1.6E-02	44.7
CRA-124M	2	2.00	4-14	Upper sand/fill	6.54	1.15	6.46	6.72	B&R	1.2E-02	33.2
CRA-124M	3	2.00	4-14	Upper sand/fill	6.54	1.42	6.46	6.72	B&R	1.4E-02	41.0
									Average	**1.4E-02**	**39.6**
CRA-133M	1	2.00	4-14	Upper sand/fill	6.02	2.02	7.98	6.13	B&R	7.8E-03	22.0
CRA-133M	2	2.00	4-14	Upper sand/fill	6.02	2.74	7.98	6.13	B&R	7.7E-03	21.7
CRA-133M	3	2.00	4-14	Upper sand/fill	6.02	1.88	7.98	6.13	B&R	8.0E-03	22.6
									Average	**7.8E-03**	**22.1**
CRA-141M	1	2.00	8-12.8	Upper sand/fill	10.65	2.00	2.85	2.85	B&R	8.3E-03	23.5
CRA-141M	2	2.00	8-12.8	Upper sand/fill	10.65	2.72	2.85	2.85	B&R	8.2E-03	23.3
CRA-141M	3	2.00	8-12.8	Upper sand/fill	10.65	2.85	2.85	2.85	B&R	8.0E-03	22.8
									Average	**8.2E-03**	**23.2**
CRA-533M	1	2.00	7-12	Upper sand/fill	7.74	0.88	3.26	3.26	B&R	8.3E-04	2.4
CRA-533M	2	2.00	7-12	Upper sand/fill	7.74	1.28	3.26	3.26	B&R	8.4E-04	2.4
CRA-533M	3	2.00	7-12	Upper sand/fill	7.74	1.39	3.26	3.26	B&R	8.2E-04	2.3
									Average	**8.3E-04**	**2.4**
CRA-534M	1	2.00	6-11	Upper sand/fill	7.92	0.85	4.83	2.23	B&R	1.2E-03	3.3
CRA-534M	2	2.00	6-11	Upper sand/fill	7.92	0.75	4.83	2.23	B&R	9.2E-04	2.6
CRA-534M	3	2.00	6-11	Upper sand/fill	7.92	0.71	4.83	2.23	B&R	1.0E-03	3.0
									Average	**1.0E-03**	**3.0**

Table 10. Summary of Slug Test Results, January 2010 Site Investigation, MLC Willow Run Facility.

Well ID	Test	Well Diameter (inches)	Screen Interval (feet bgs)	Geology - Screened Interval	Depth to Water 1/21/2010 (feet bgs)	Max Displacement (feet)	Aquifer Thickness (feet)	Saturated Screen Thickness (feet)	Solution	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)
CRA-611M	1	2.00	3-8	Upper sand/fill	4.91	0.79	2.69	2.69	B&R	1.2E-03	3.3
CRA-611M	2	2.00	3-8	Upper sand/fill	4.91	1.01	2.69	2.69	B&R	1.2E-03	3.4
CRA-611M	3	2.00	3-8	Upper sand/fill	4.91	1.08	2.69	2.69	B&R	1.1E-03	3.1
									Average	**1.2E-03**	**3.3**
CRA-614M	1	2.00	3-8	Upper sand/fill	4.42	0.86	2.78	2.78	B&R	3.8E-04	1.1
CRA-614M	2	2.00	3-8	Upper sand/fill	4.42	0.76	2.78	2.78	B&R	3.5E-04	1.0
CRA-614M	3	2.00	3-8	Upper sand/fill	4.42	0.83	2.78	2.78	B&R	3.2E-04	0.9
									Average	**3.5E-04**	**1.0**
CRA-325M	1	2.00	4.75-9.75	Upper sand/fill	7.35	0.89	2.05	2.05	B&R	1.6E-03	4.6
CRA-325M	2	2.00	4.75-9.75	Upper sand/fill	7.35	0.93	2.05	2.05	B&R	1.5E-03	4.3
CRA-325M	3	2.00	4.75-9.75	Upper sand/fill	7.35	1.04	2.05	2.05	B&R	1.4E-03	3.9
									Average	**1.5E-03**	**4.3**

Notes:
1. bgs - below ground surface
2. cm/sec - centimeters per second
3. ft/day - feet per day
4. B & R - Bouwer and Rice Method (1976)

Table 11. Summary of Site-Specific LNAPL and Groundwater Physical Properties, January 2010 Site Investigation MLC Willow Run Facilty

Parameter	Units	Central and Eastern	Central	Eastern and South/ Southwest	Northwest
LNAPL Type		Diesel Fuel	Transmission Oil	Transmission Oil	Transmission Oil
LNAPL Density[1]	g/cm^3	0.8578	0.895	0.8798	0.895
LNAPL Viscosity[1]	g/cm-s	0.141	0.889	1.21	3.075
Groundwater Density[2]	g/cm^3	0.9982	0.9982	0.9982	0.9982
Groundwater Viscosity[2]	g/cm-s	0.01003	0.01003	0.01003	0.01003
Air-Groundwater Interfacial (Surface) Tension[1]	Dyne/cm	55.77	50.14	55.23	64.23
Air-LNAPL Interfacial Tension[1]	Dyne/cm	29.73	31.74	31.67	31.36
LNAPL-Water Interfacial Tension[1]	Dyne/cm	7.15	4.73	6.59	14.55

Notes:

Site area averages of laboratory analytical results of LNAPL samples collected in January 2010.
Standard viscosity and density of water at 20°C.

Table 12. Summary of Input Aquifer Data for the Van Genuchten LNAPL Mobility Calculation Tool, January 2010 Site Investigation MLC Willow Run Facility

Parameter[1]	Central	Eastern	South/Southwest	Northwest	Source
Geology	Fine to Coarse Sand	Fine to Medium Sand	Fine to Medium Sand	Fine to Coarse Sand with Some Silt and Clay	Soil Boring Logs of Monitoring Wells Slug Tested[2]
Hydraulic Conductivity (geometric mean)	81 ft/d 3.58 x10^{-2} cm/s	54 ft/d 1.99 x10^{-2} cm/s	23 ft/d 8.19 x10^{-3} cm/s	2.6 ft/d 9.40 x10^{-4} cm/s	Onsite Slug Test Results[2]
Porosity	0.3808	0.3763	0.4353	0.3829	API[3]
Relative Permeability Model	Mualem	Mualem	Mualem	Mualem	Engineering Judgment
van Genuchten "N"	1.83	1.68	2.15	2.06	API
van Genuchten "α" (ft^{-1})	0.0298	0.0151	0.0175	0.0144	API
Irreducible water saturation	0.29	0.34	0.236	0.3038	API
Residual LNAPL saturation	0.2 for TO 0.15 for DF[4]	0.2 for TO 0.15 for DF	0.2	0.2	Mercer and Cohen[5]

Notes:

At site monitoring wells slug tested in January 2010.
Values referenced from Parameter Database published in API Interactive LNAPL Guide and selected based on site-specific hydraulic conductivity. Sample IDs of results averaged for each site area follow - Central: 10, 11, 29, 98, 99; Northwest: 10, 11, 98; Eastern: 14, 98, 99; and South/Southwest: 7, 12, 15, 120, 123, 129, 149, 159, 195.
Values referenced from Table 3 of Mercer and Cohen, 1990 and selected based on soil type from site-specific grain size analyses and site-specific fluid type.

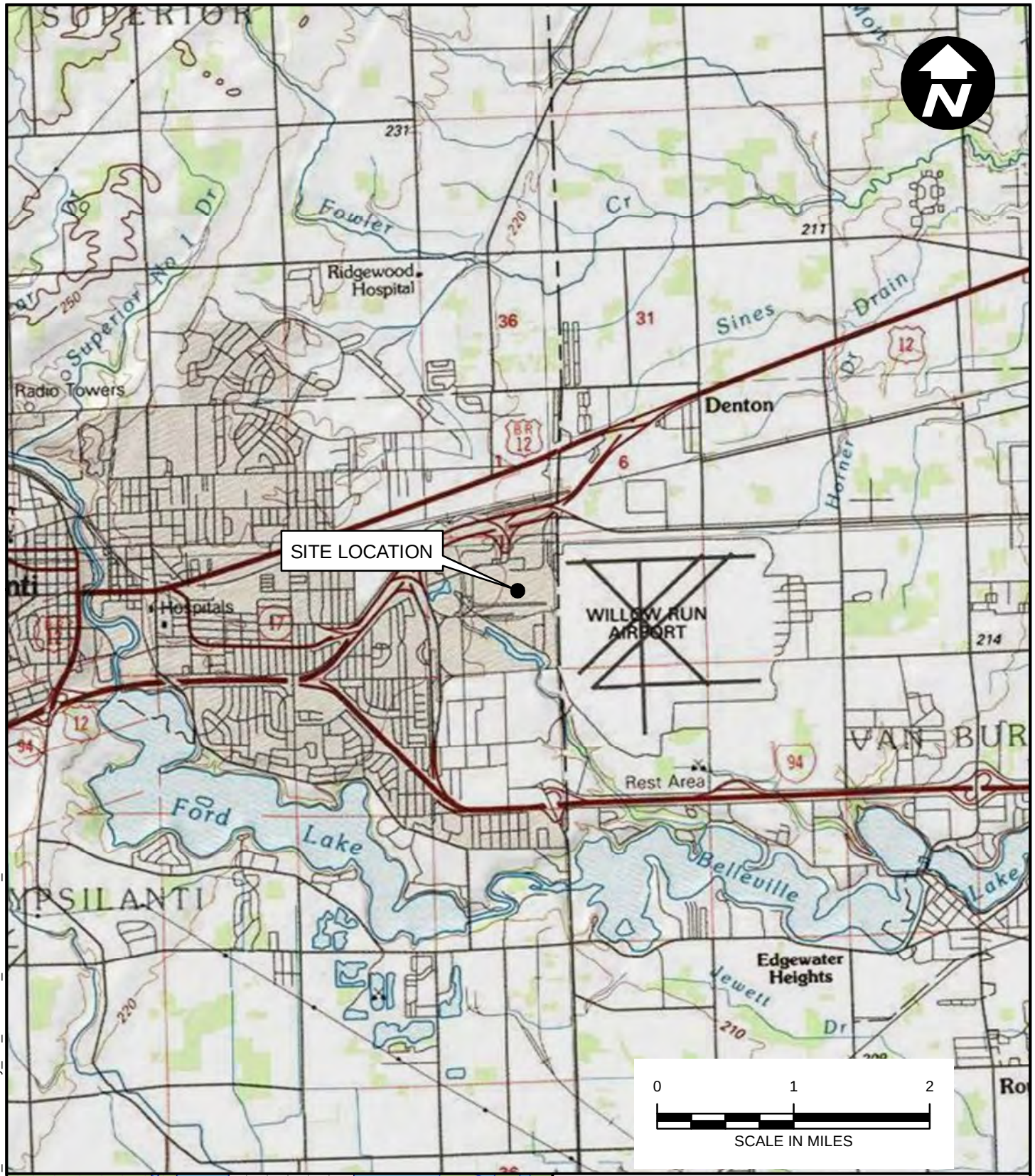
[1] Parameters are unitless or ratios, unless otherwise noted.
DF Diesel fuel
TO Transmission Oil

Table 13. Total and Recoverage Volumes for 2006 and 2010 Plumes, January 2010 Site Investigation MLC Willow Run Facility

Site Area and Fuel Type	Area (square feet)	Total Volume (gallons)	Recoverable Volume (gallons)
Northwest - TO	117,200	136,671	517
Central - DF	192,000	615,181	124,585
Central - TO	471,100	1,917,211	253,749
Eastern - DF	145,900	141,672	7,129
Eastern - TO	428,000	1,169,687	76,344
Southwest	54,090	51,831	485
South	58,200	55,770	522
Site-wide Total[1]	**1,466,490**	**4,088,022**	**463,331**

Notes:

DF Diesel fuel
TO Transmission oil
[1] See Appendix X for detailed summary.





MOTORS LIQUIDATION CORPORATION
WILLOW RUN, MICHIGAN

SITE LOCATION

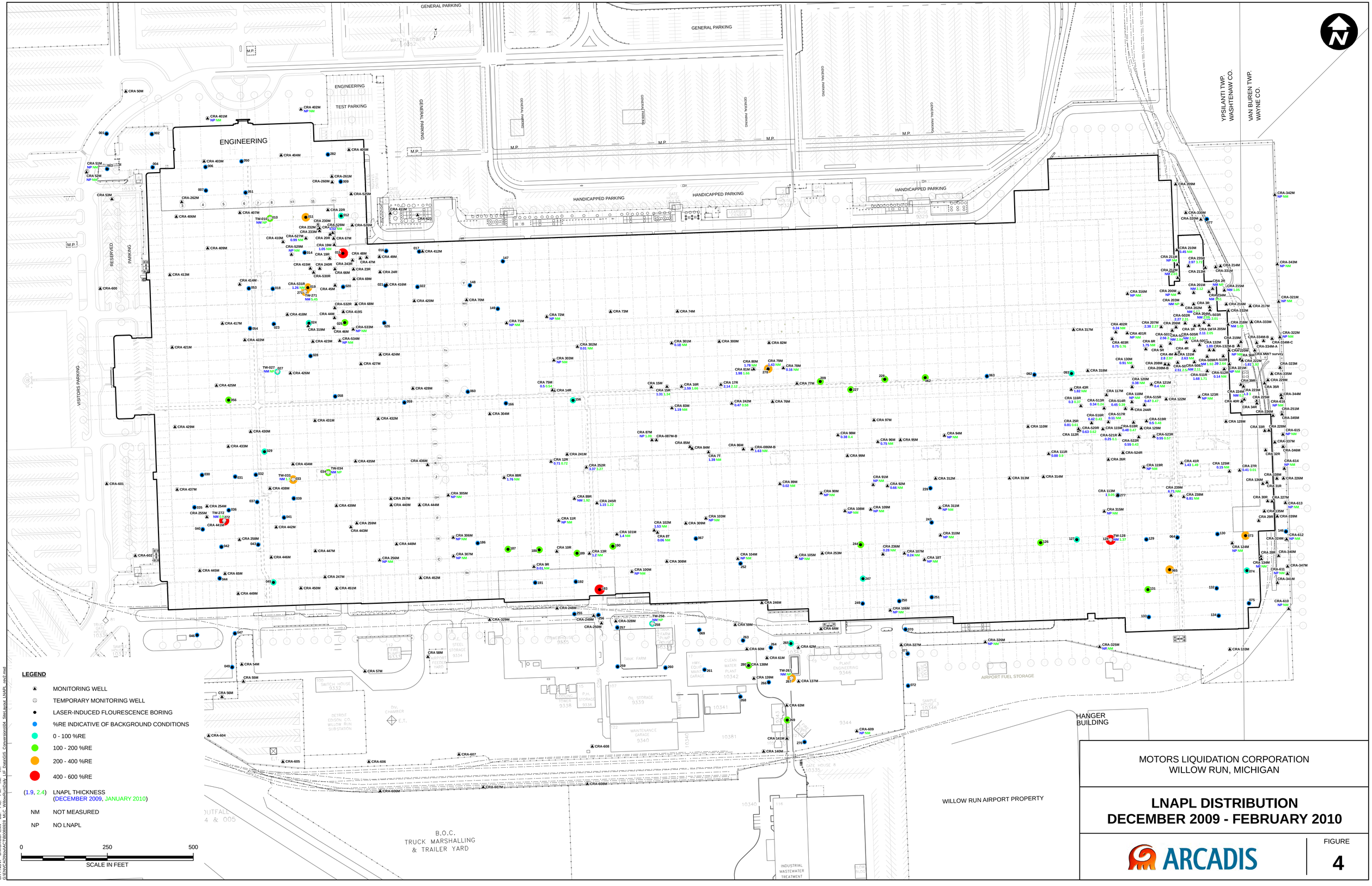
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GENERAL PARKING
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RESERVED PARKING
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TRUCK GATE 10334
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DETROIT EDISON CO. WILLOW RUN SUBSTATION
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VAN BUREN TWP.
WAYNE CO.
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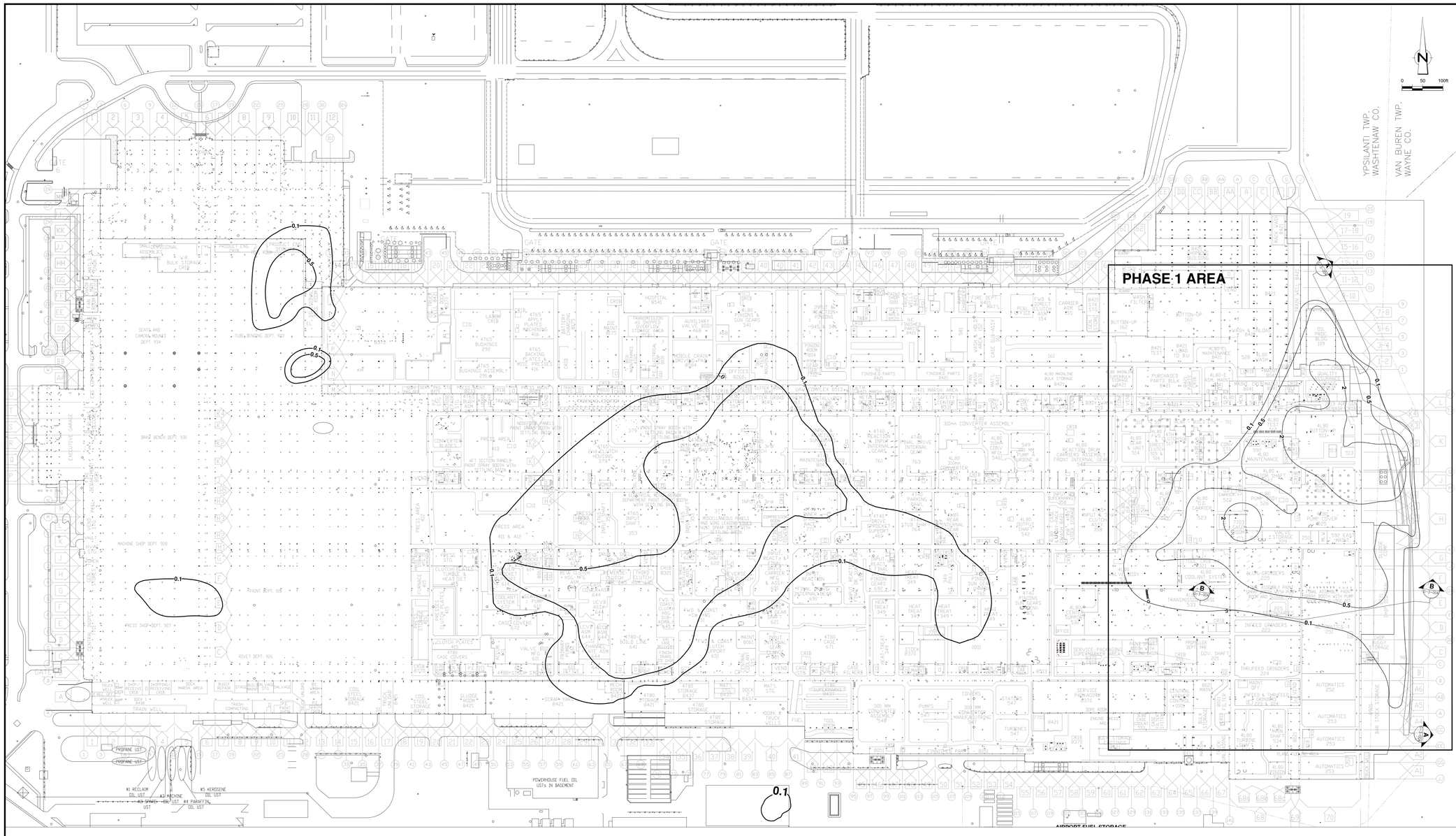
ARCADIS

Appendix A

CRA Cross Sections

WFG JOB NO.

SHEET NO. **G-1 - 003**



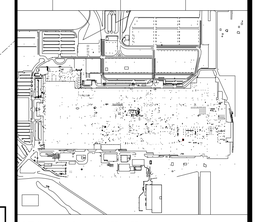
NOTES:

1. SITE BASEMAP AND INTERNAL PLANT LAYOUT PROVIDED BY GM -- JANUARY 2005.

2. LNAPL CONTOURS AND EXTENTS BASED ON EVALUATION OF SITE DATA COLLECTED FROM AN EXISTING NETWORK OF MONITORING WELLS.

3. LNAPL AREAS SHOWN OUTSIDE OF THE DESIGNATED PHASE 1 AREA SHALL BE ADDRESSED AT A LATER DATE.

DATE	ISSUED FOR	PROJECT ARCH/ ENGR APPROVAL	DEPT. MGR/SUPR APPROVAL
8/25/05	REVIEW		
8/31/05	BARRIER WALL BID		



SITE/BUILDING PLAN & NORTH ARROW

GM DISCLAIMER & TYPICAL NOTES

NO.	DATE	PROJECT ARCH/ ENGR APPROVAL	DEPT. MGR/SUPR APPROVAL

REVISIONS

SUPPLIER PROJECT NO.
017358

CERTIFIED BY

SUPPLIER DRAWN BY
LMR

SUPPLIER CHECKED BY
MPL

SUPPLIER PE/PM
SCOTT ADAMOWSKI

CONSULTANT A/E FIRM INFO & LOGO

CRA, Inc.
14496 Sheldon Road
Plymouth, MI 48170
Phone: (734) 453-5123

Worldwide Facilities Group

General Motors Corporation
2930 Ecorse Rd, Ypsilanti, MI 48197-0935

GMPT – WILLOW RUN
Site ID: 2635
WILLOW RUN TRANSMISSION
Structure ID:
Level:

LNAPL RECOVERY PROGRAM
GMPT - WILLOW RUN

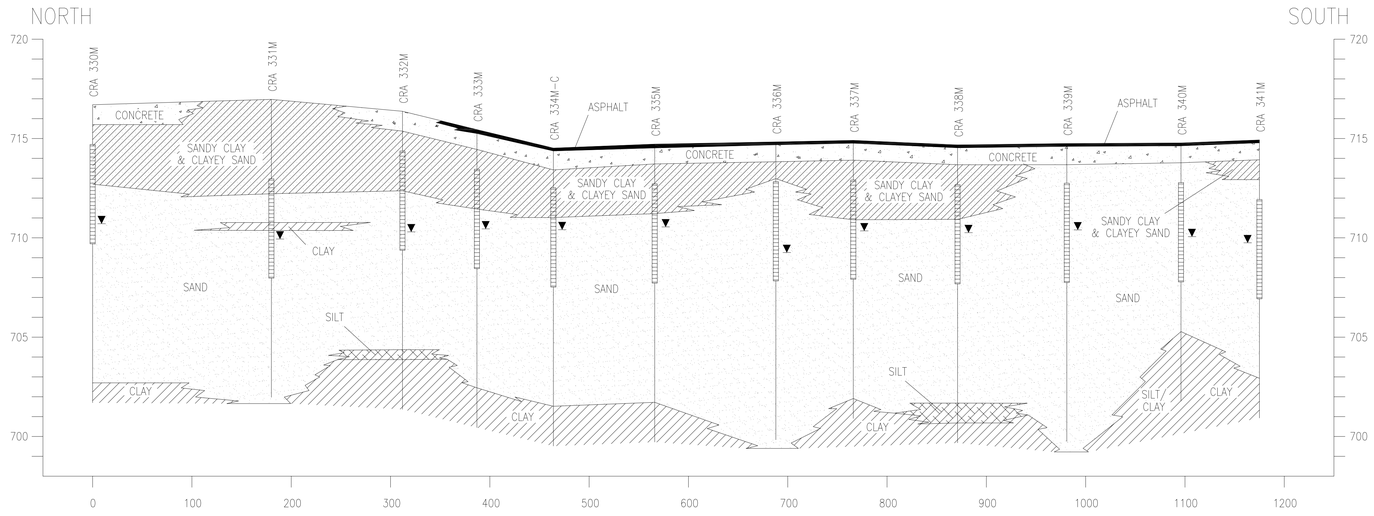
SITE PLAN & LNAPL PLUMES
GENERAL

WFG PE/PM	WFG JOB NO
DRAWN BY: LMR	SHEET NUMBER: **G-1-003**
SCALE: 1":100'	
DATE: 8/25/05	

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FILE PLOT DATE STAMP Jan 07, 2010 – 3:55pm

WFG JOB NO. SHEET NO. **G-3-004**

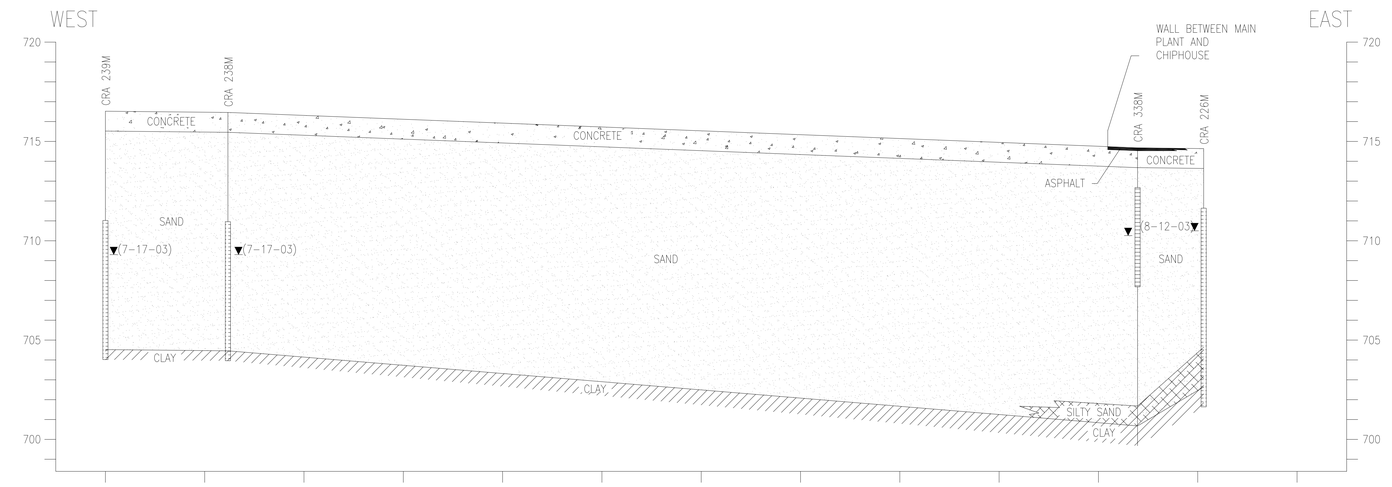


HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=5' (FT. AMSL)

A G-3-004 NORTH-SOUTH GEOLOGIC CROSS-SECTION

LEGEND

- CRA 331M — WELL DESIGNATION
- GROUND SURFACE
- STRATIGRAPHIC CONTACT
- STATIC WATER LEVEL (8-29-03 OR AS NOTED)
- SCREEN
- END OF BOREHOLE
- CONCRETE
- SAND
- CLAY + SILT/CLAY
- SILT
- SANDY CLAY & CLAYEY SAND
- ASPHALT
- SILTY SAND



HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=5' (FT. AMSL)

B G-3-004 WEST-EAST GEOLOGIC CROSS-SECTION

DATE	ISSUED FOR	PROJECT ARCH/ ENGR APPROVAL	DEPT. MGR/SUPR APPROVAL
8/25/05	REVIEW		
8/31/05	BARRIER WALL BID		

SITE/BUILDING PLAN & NORTH ARROW

GM DISCLAIMER & TYPICAL NOTES

NO.	DATE	PROJECT ARCH/ ENGR APPROVAL	DEPT. MGR/SUPR APPROVAL

REVISIONS

SUPPLIER PROJECT NO.: 017358
SUPPLIER DRAWN BY: LMR
SUPPLIER CHECKED BY: MPL
SUPPLIER PE/PM: SCOTT ADAMOWSKI
CERTIFIED BY

CONSULTANT A/E FIRM INFO & LOGO

CRA, Inc.
14496 Sheldon Road
Plymouth, MI 48170
Phone: (734) 453-5123

Worldwide Facilities Group

General Motors Corporation
2930 Ecorse Rd, Ypsilanti, MI 49197-0935

GMPT – WILLOW RUN
Site ID: 2635
WILLOW RUN TRANSMISSION
Structure ID:
Level:

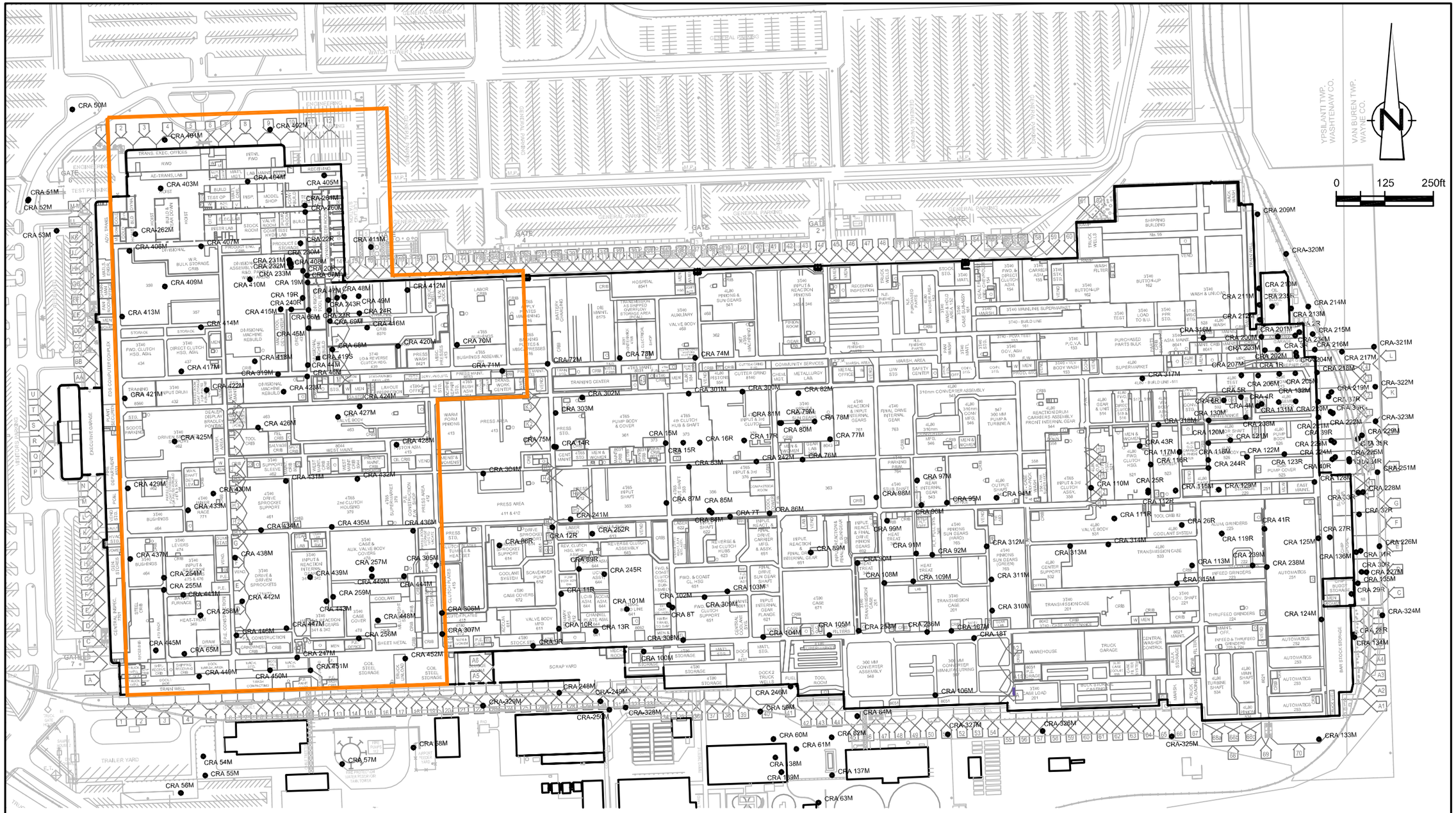
LNAPL RECOVERY PROGRAM
GMPT - WILLOW RUN

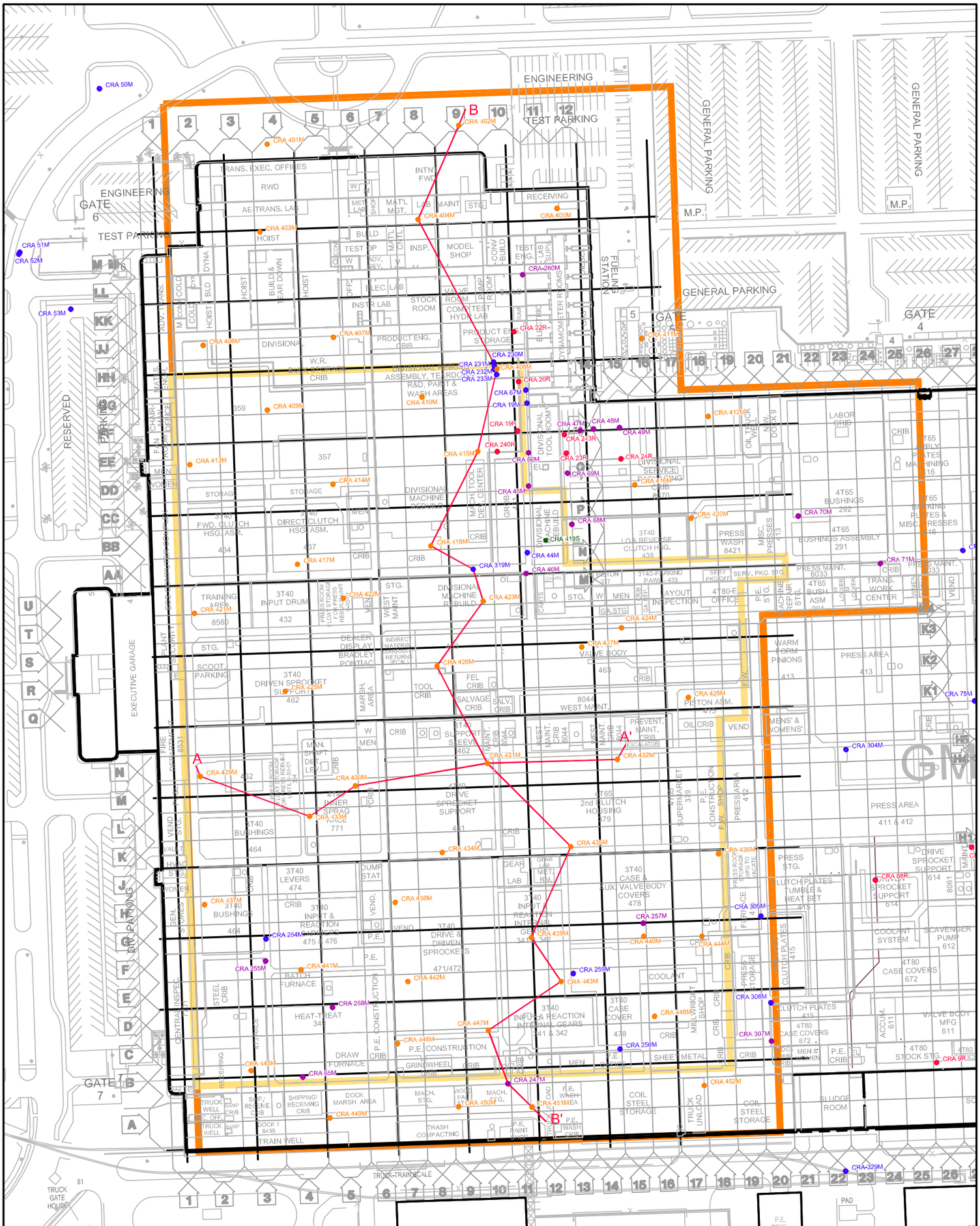
GEOLOGIC CROSS-SECTIONS
GENERAL

WFG PE/PM	WFG JOB NO
DRAWN BY: LMR	SHEET NUMBER: **G-3-004**
SCALE: AS NOTED	
DATE: 8/25/05	

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FILE PLOT DATE STAMP Jan 07, 2010 - 3:56pm


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VAN BUREN TWP.
WAYNE CO.
GENERAL PARKING
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GATE 2
GATE 6
GATE 7
CRA 50M
CRA 51M
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LEGEND

- CRA 423M — MONITORING WELL LOCATION (INSTALLED FEBRUARY/MARCH 2003)
- CRA 419S — BOREHOLE LOCATION (DRILLED FEBRUARY/MARCH 2003)
- CRA-251M — MONITORING WELL LOCATIONS (INSTALLED PRIOR TO FEBRUARY/MARCH 2003)
- CRA 29R — RECOVERY WELL LOCATIONS
- CRA-230M — MONITORING WELL SAMPLED (INSTALLED PRIOR TO FEBRUARY/MARCH 2003)
- RI SAMPLING AREA
- DECOMMISSIONING AREA (6-SPEED AREA)
- A — A' GEOLOGICAL CROSS-SECTIONS

BASE MAP WAS OBTAINED FROM GMPT YPSILANTI DRAWINGS.

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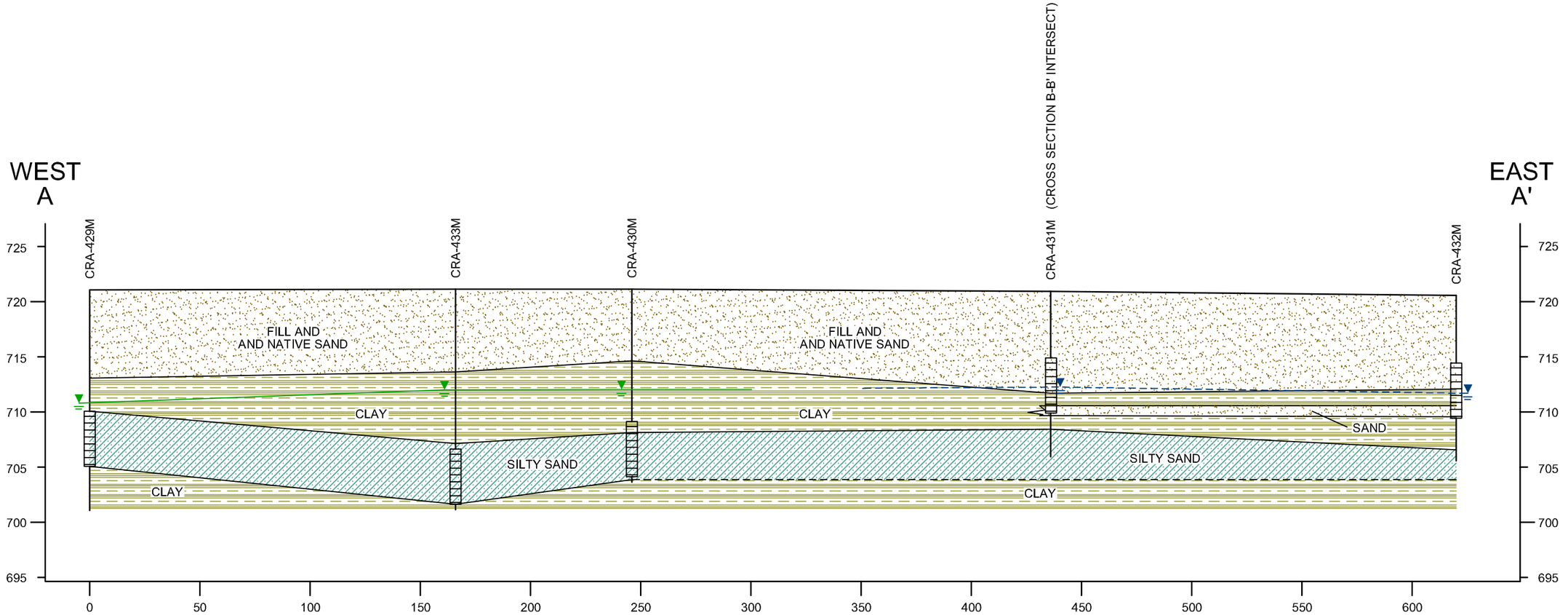
figure 1.3

RI SAMPLING LOCATIONS
AND CROSS SECTION LOCATIONS
GMPT WILLOW RUN
Ypsilanti, Michigan

17358-23(006)GN-DE011 SEP 14/2004

WEST
A

EAST
A'



HORIZONTAL SCALE: 1"=50'
ELEVATION: 1"=10' (ft. AMSL)

LEGEND

- SAND
- CLAY
- SILTY SAND

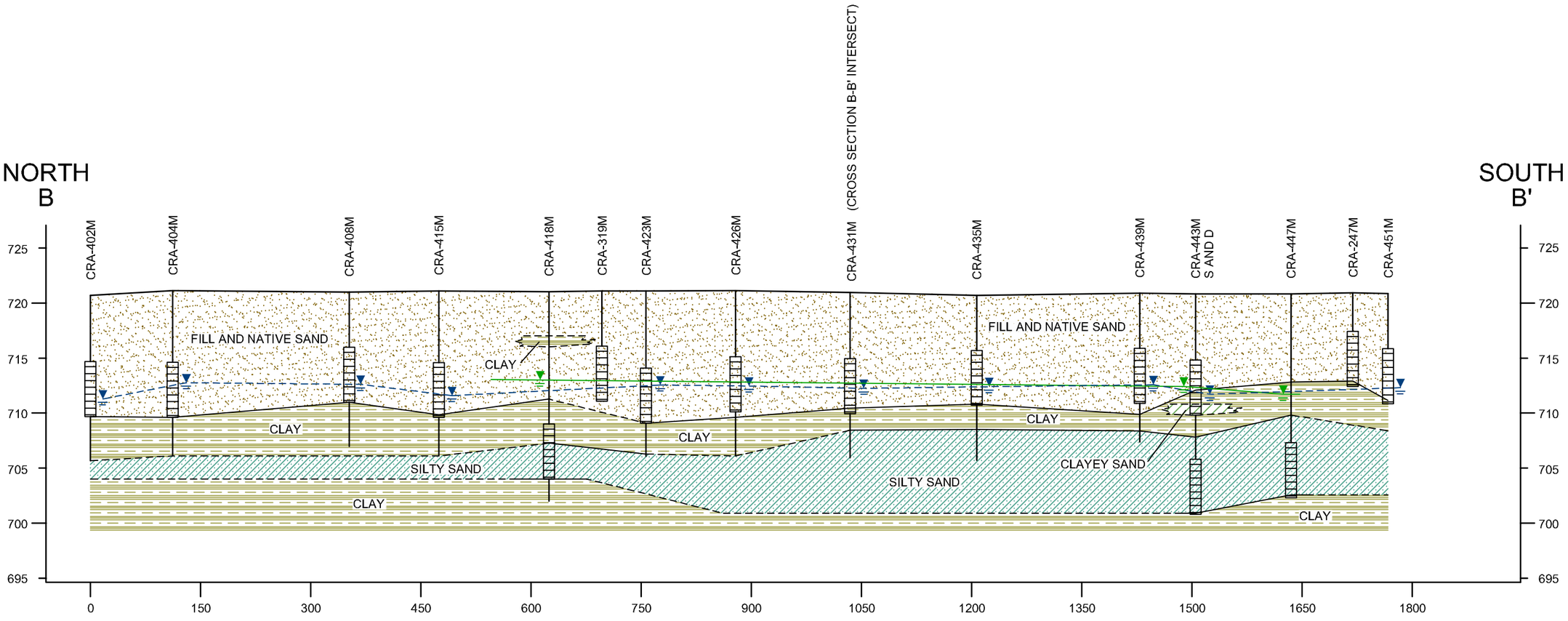
- WELL
- SHALLOW GROUNDWATER ELEVATION (MEASURED MARCH 2003)
- DEEP GROUNDWATER ELEVATION (MEASURED MARCH 2003)
- MONITORING WELL SCREENED INTERVAL

figure 5.1

CROSS-SECTION A-A'
GMPT WILLOW RUN
Ypsilanti, Michigan

NORTH
B

SOUTH
B'



HORIZONTAL SCALE: 1"=150'
ELEVATION: 1"=10' (ft. AMSL)

LEGEND

- SAND
- CLAY
- SILTY SAND
- CLAYEY SAND

- WELL
- SHALLOW GROUNDWATER ELEVATION (MEASURED MARCH 2003)
- DEEP GROUNDWATER ELEVATION (MEASURED MARCH 2003)
- MONITORING WELL SCREENED INTERVAL

figure 5.2

CROSS-SECTION B-B'
GMPT WILLOW RUN
Ypsilanti, Michigan

17358-23(006)GN-DE005 SEP 14/2004

ARCADIS

Appendix B

Potential Areas of Concern

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
1	Chiphouse Tank Farm	Leaks from USTs. 13 tanks were removed in 1990 (eleven 15,000-gallon oil and two 5,000-gallon gasoline). Free product present - recovery wells were installed.
2	Bay K-35	Release discovered during construction in the early 1990's. Leaks thought to be from a underground quench oil tank and process coolant trenches in the area. A mixed oil free-product plume is located beneath the plant floor in this area. Two steam tunnels (PAOC 26) and a storm sewer run through the plum area. A May 2001 Harding Lawson Associates report recommended chlorinated VOC subsurface investigation due to elevated VOC's in groundwater in the southern portion of the area. No current analytical data.
3	Bay K-42	Leaks from two 4,000-gallon quick dump quench oil USTs. According to the MDEQ UST database from February 2002, Tanks 46 and 47 were closed in place. The free-product mixed-oil plume is located beneath the plant floor in this area (PAOC 2, 3, 5, and 6 are located in same plume).
4	Former Drum Handling Area	In the past, spills and leaks of chemicals occurred from drums that were stored in this area. Phase I and II investigations were conducted. As part of the Phase II investigation, monitoring wells were installed. According to a January 1995 report by ABB, groundwater flow is to the south and no detections were not in the southern down-gradient wells. In a April 21, 1995 letter to facility personnel, the MDNR concluded that the "incident" area did not involve a hazardous substance that was present in a quantity that was injurious to the environment or natural resources or to public health, safety or welfare. The MDNR also stated that it would not include it on the Act 307 list. They considered the incident closed, but indicated that if additional data indicated that concentrations of hazardous substances in the groundwater increased, the MDNR would re-evaluate the incident.
5	Department 263	A leaking coolant flume at Bay H-49 was discovered in 1989. As part of the hydrogeologic investigation, two monitoring wells (at Bay H-50) were installed by ABB. It was determined that the free product was discovered in one of the wells was not from the leaking coolant flume, but from another source (part of the K-35 and E-49 plume). The impacted groundwater at the second well was thought be from the leaking coolant flume.
6	Bay E-49	Leaks from five 4,000-gallon quick dump quench oil USTs. According to the MDEQ UST database from February 2002, Tanks 50 - 53 were closed in place, while Tank 54 was removed. Area is located in the free product plume.
7	Hydraulic Lift Area	Information provided by previous consultants indicated that there may have been a leak from a hydraulic lift in this area. The lift and hydraulic cylinder were removed. Several days after excavating, oil was observed entering the excavation. Fingerprint analysis indicated that a the source of the oil was from the hydraulic lift. According to an ABB report (May 1995), sampling results did not indicate constituents above cleanup. However, the presence of oil on the perched groundwater needed to be investigated further. It was recommended that a additional investigation be conducted to define the extent and further characterize hydrocarbon contamination in the vicinity of the failed hydraulic lift.
8	Bay EE-10	Petroleum free-product observed in a recovery well associated with the Dynamometer area (PAOC 11). This product was the result of leaking machinery trenches adjacent to the recovery well.
9	Scrap Yard	During construction in October 1992, stained soils discovered near a trench used to collect surface runoff in the Metals Scrap Yard. According to the February 1993 ABB report, contamination resulting from leaks in the trench were located in three areas; northeast portion of the trench, north-central portion of the trench and the southwest portion of the trench, with staining decreasing in depth not extending below 3.5 feet. It was recommended that the trench be fixed and the remove the contaminated soil. No analytical was available with this report.
10	ATF Area	An automatic transmission fluid plume was discovered in 1987 resulting from UST's and associated piping. Product recovery system installed. Free product present.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
11	Dynamometer Area	During the 1984 expansion of the Transmission Engineering Building, gasoline was detected in subsurface soil and the perched aquifer adjacent to the plant. A hydrogeologic investigation was conducted and at that time a free product gasoline plume was discovered below the floor of the plant. The source was the UST's tank system associated with the dynamometer test cells. The UST's were removed and replaced in 1985. Reports indicated that the groundwater flow in the area is to the south and southwest. A recovery system is in place. Free product is still present. Dissolved phase gasoline is minimal.
12	North Yard	Surface soils were contaminated with residual oils containing PCBs and metal working fluids from machinery stored outside in this area. In 1988, the area was investigated, with detectable concentrations of TPH, metals, and low levels of PCBs observed in the surficial soils (≤ 24 inches). Although the concentrations did not exceed any existing criteria (at that time), GM removed soil in two areas with the highest concentrations. GM removed 2,200 cubic yards of soil down to 2 feet from two areas. Soils that had lower concentrations of TPH, metals, and PCBs were left in place. In 1989, ABB conducted a hydrogeologic investigation was conducted with a two-year quarterly groundwater monitoring program was instituted. In general, low levels of metals were detected over the course of the sampling program. Iron was the only dissolved metal detected during the final sampling event. 1,1,1-TCA was detected in groundwater on one occasion at 1 ppb. PCBs were detected on two occasions. It was concluded that the PCB detections were carry down from overlying soils during drilling. During successive sampling events, sediment was removed by purging extra groundwater. No evidence of PCBs were detected during these successive samplings. In 1996, ABB recommended no further action based on contaminated soil with the highest concentrations were removed, analytical data indicated that residual constituents in the soil were below generic industrial direct contact values (at that time), and there was no evidence of shallow groundwater contamination based on analytical data. At the time of the site visit for the PAOC review, several areas of oil staining were observed. The storm water from the area is treated at GMPT on-site wastewater pre-treatment facility.
13	Building #17	In 1992, a RCRA Facility Assessment (RFA) was performed by PRC Environmental Management, Inc. (contactor for USEPA). PRC recommended soil sampling be conducted based on oil observed on the floor of Building 17. Also, in 1992, a break was discovered in a trench used to convey waste oils to a collection sump in Building 17. According to a ABB Technical Memorandum (October 23, 1997) on the site status for this area, no further action was recommended based on the following information from a 1993 Phase I Hydrogeologic Study by NTH Consultants: - Low Levels of organic and inorganic compounds detected in the soil are in concentrations below Industrial Direct Contact Values (IDCV); - PCB Aroclor 1260 was detected in only one soil sample below IDCV. No other PCBs were detected in adjacent borings; - VOCs detected in shallow groundwater did not exceed Groundwater/Surface Water Interface (GSI) criteria; - Lead was only inorganic compound detected in shallow groundwater above GSI. The lead was in a well 240 feet way from Building 17. It was not believed to be associated with this area since no lead was observed in groundwater samples taken near the building and only background concentrations were observed in soil. - ABB believed that PCBs were unlikely to be present in groundwater, due to its physiochemical properties, it was unlikely that PCB will leach to groundwater. During the PAOC site visit, cracks were observed in the concrete near the building. Oil sheen was observed on pools of water. According to plant personnel, monies are being set aside to replace the concrete.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
14	Product Engineering Tank Farm	Leak from 12,000-gallon gasoline UST. Tank removed in 1988. Phase I and II hydrogeologic investigations conducted. Remedial activities performed. MDEQ in a January 12,1994 letter to the plant indicated that the contamination was reduced to below Type B levels and that based on the data submitted to the MDEQ, the soils impacted by the release have been removed and groundwater had not been impacted. A diesel UST was also located near the gasoline tank. No other information regarding the removal of the diesel tank.
15	Bays L-5 and E-5	Leaks from four 4,000-gallon quick dump quench oil USTs located at Bays L-5 and E-5. According to the MDEQ UST database from February 2002, Tanks 42 and 43 (Bay E-5) were closed in place, while Tanks 44 and 45 (Bay L-5) were removed from the ground. According to a ABB Technical Memorandum (October 23, 1997) on the site status for this area, no further action was recommended for the E-5 area based on the following information: - Low levels of PAHs and VOCs were detected in soil below IDCV's - Vinyl chloride was detected during one sampling at 24 ug/l exceeding Groundwater/Surface Water Interface (GSI) criteria. It was not detected during a subsequent sampling event. ABB developed site-specific, risk-based target levels (SSTLs) for subsurface soil and groundwater at the site. ABB indicated that based on SSTL calculations vinyl chloride at the fenceline was below GSI criteria. An ABB report (August 1992) indicated that all detected levels of VOCs and PAHs are below MDNR Act 307 Type B cleanup criteria. ABB recommended that based on analytical data and observed conditions, further action should not be necessary at Bay L-5. On December 1, 1993 a letter was sent by ABB on behalf of the facility requesting a Type C closure. The MDNR responded on December 16, 1993 to the plant that due to insufficient information, a Type C closure could not be issued at that time. No other information related to closure was identified during a file review of MDEQ files.
16	Tank #84	Release discovered during a site assessment for permanent closure of this 10,000-gallon storm water skimmer UST (Note: in some reports this tank is listed as Tank #100) in August 1991. According to the August 13, 1992 Hydrogeological Site Investigation and Removal of Storm Retention Skimmer Tank #84 Report by Chester Engineers, the following conditions existed: - The site investigation conducted prior to the removal of tank indicated that impacted soil and groundwater appeared to be limited to the immediate area of the tank location. - Tank removal activities (Removed May, 4, 1992) indicated that free product was present in the excavation by had not migrated to monitoring wells in the surrounding area. - PNAs exceeded MDNR Type B Criteria in soil at several sample locations (utilities critical to plant operations impeded additional removal of impacted soil. - Concentrations of lead in several soil samples from the excavation exceeded levels observed in other soil samples in the vicinity of the UST. - Several soil samples from the excavation had a high oil content which resulted in elevated method of detections limits. - A slotted drainage system was installed in the bottom of the excavation to remove impacted groundwater or product. In October 2001, ABB prepared a summary table of PAOC's, which indicated that in 1995 a request for MDNR closure was prepared. No information related to the request for closure was identified during a file review of MDEQ files. The release from the tank is still listed as "Open Status" on the MDEQ LUST directory dated 2/02.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
17	Building #19 Tank Farm	Leaks and spills from USTs. Three tanks removed in 1989 (two 15,000-gallon cutting oil and one 15,000-gallon gasoline). Contamination was observed in the soil and groundwater. A new vaulted tank farm was installed. A soil removal corrective action was implemented following the vault construction. A drainage system was installed in the excavation that ties into the vault underdrain system. The underdrain system discharges to the WWTP. According to an ABB Groundwater Sampling Report (June 26, 1995), only benzene was detected in the shallow groundwater samples. The report indicated that the benzene concentrations were decreasing over time. The groundwater in the sump of the tank vault contained benzene. The report summary indicated that the sump is capturing impacted groundwater and that shallow groundwater is being diverted to the sump.
18	Salvage Building Tank Farm	Leaks from USTs. Seven tanks were removed in 1990 (five 15,000-gallon oil and two 30,000-gallon diesel fuel). The tanks were installed in 1941-42. A 54" storm sewer line runs west to east through the former tank excavation area. As part of the excavation drain tile was placed in the bottom of the excavation to drain any residual contamination to three purge wells. On December 1, 1993 a letter was sent by ABB on behalf of the facility requesting a Type C closure. The MDNR responded on December 16, 1993 to the plant that due to insufficient information, a Type C closure could not be issued at that time. No other information related to closure was identified during a file review of MDEQ files. In an April 28, 1995 letter sent by ABB to the MDEQ-UST Division, closure for the Salvage Building Tank Farm was requested. It was noted that none of the compounds detected in soil exceeded the criteria at that time. Phenanthrene was detected at 760 ug/kg. It was thought that the phenanthrene was not from the tank farm release, but from another source. The concentration was below Type C criteria, but surface water impacts could not be made because GSI value is not available for phenanthrene. ABB performed a statistical evaluation (using MDNR's "Guidance Document: Verification of Soil Remediation - April 1994) of the phenanthrene values in 26 soil samples and concluded that the 95% Upper Confidence Level (UCL) would be below the detection limit of 330 ug/kg. The MDNR in a May 18, 1995 letter to the facility acknowledged the receipt of the closure report.
19	Bay C-40	Removal of two 4,000-gallon quick dump quench oil USTs (Tanks 48 and 49). An ABB report (July 21, 1992) to the plant indicated that low levels of ethylbenzene, toluene, and xylene were found in the samples collected in Bay C-40. None of the concentrations exceeded Act 307 criteria. Several PAHs exceeded Type B cleanup criteria in a soil sample collected on the east side of the tank excavation. During the removal of the tanks, hydrocarbon impacted groundwater was observed seeping into the excavation from the east wall of the excavation. The free-product mixed-oil plume (K-35 area) is located beneath the plant floor in this northeast of this area. In an ABB Hydrogeologic Investigation Report (December 1993) it was thought that this plume did not extend to the excavation area based on soil samples collected between the two areas. A sanitary sewer and main support wall that are orientated north-south run through the plume and are adjacent to the tank excavation. It was thought that the backfill for the sewer and the main support wall foundations maybe providing a pathway between the plume and the excavation area.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
20	Bay Q-24	A leaking sump was discovered in 1988. The sump was used to collect soluble oil coolant from a production machine pad. The soluble oil was leaking into a void between between the top of the sump and the concrete floor. In a July 1989 Hydrogeologic Report, C-E Environmental (currently ABB) indicated that metals in soil samples were below 1993 MDEQ Type A soil cleanup criteria, however, Total Hydrocarbons (THCs) were detected in three soil samples (720 to 10,000 mg/kg). In groundwater ,no metals were detected and THCs were detected in low levels (0.63 mg/L to 3.2 mg/L) in two of three monitoring wells. In a February 1990 Phase II Report, C-E Environmental indicated that THCs were detected (0.29 mg/L to 1 mg/L) in samples from the three monitoring wells in the area of Bay Q-24. No VOCs or SVOCs were not detected in the samples. It was recommended that the no further action was recommended for the area since the THCs were observed, no hazardous constituents were detected, residual oil in unsaturated soils would be immobile, and the potential human exposure would be low. An unsigned letter from the facility to the MDEQ was observed in a file at the facility requesting closure. No information related to the closure request was identified during a file review of MDEQ files. VOCs and SVOCs were not analyzed in soil samples. VOCs and SVOCs were not analyzed in groundwater wells ~ 100 feet away. Oil may still be present in vadose zone soils.
21	Bay E-28	A leaking trench was discovered in 1988. The trench was used to convey soluble coolant oil form a production machine to a collection sump. Free product and dissolved phase product present. Cadmium, lead, ethylbenzene, toluene, and xylene have been previously detected. A steam tunnel orientated north-south is located in the eastern edge of the free product plume. Another steam tunnel orientated east-west is located along the northern edge of the free product plume.
22	Subtest Area	Leak from process trenches in the area. Free product plume present below the floor of the plant. A steam tunnel orientated north-south is located in the free product plume. Another steam tunnel and storm drain which are orientated east-west are also located in the free product plume. Recovery wells are currently collecting LNAPL.
23	Barrel Yard	Spills/leaks in the Barrel Yard. PCE, MEK, MIBK, vinyl chloride, 1,1-DCA, 1,1,1-TCA, cis 1,2-TCE, trans 1,2-DCE, and acetone in groundwater. PCE, vinyl chloride, and napthalene in soil. According to a Harding Lawson Associates (HLA) Site Investigation report (October 1997), no further action was recommended for this area based on the following information: - Subsurface materials consist of fill and sand undelain by clay. - Groundwater flow is toward the east-northeast in the direction of Building #19 tank farm. It is thought that localized flow is influenced by the drainage system of the tank farm, which collects groundwater and sends it to the facility's on-site WWTP. - Soil and groundwater samples were observed in concentrations exceeding Groundwater/Surface Water Interface (GSI) criteria in a small area of the Barrel Yard. The nearest surface water body is 1,200 feet to the south. Groundwater appears to be flowing to the northeast toward the drainage system of the Building #19 tank farm. - Soil samples were observed in concentrations exceeding indoor air criteria for vinyl chloride. It was thought that since generic indoor air criteria is very conservative and not representative of conditions in the Barrel Yard, HLA calculated site-specific target levels (SSTLs). HLA indicated that the highest observed concentration of vinyl chloride was below the calculated level and concluded that the concentrations of VOCs were not of concern.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
24	Transformer Substations	Per facility personnel, the underground transformer substations previously had transformers that contained PCBs. The transformers were all removed and the substations were closed by backfilling with concrete. Prior to closure, the substations were cleaned. A 2000 Conestoga-Rovers & Associates (CRA) report indicated that PCB remediation of Substation D was completed on January 31, 1999. All areas of Substation D were remediated below 10 ppm with the exception several areas of PCB impact. The impacted areas and the substation was entombed by concrete (In accordance to 40 CFR 761.30 (p) and 761.61(a) (7)). The plant surface area of the plant floor above Substation D was labeled with a large PCB Mark. According to facility personnel, the disposition of the records for the substation closures is unknown.
25	Powerhouse Tank Farm	Automatic transmission fluid was detected in groundwater during the construction of a new vaulted tank farm near the Powerhouse. In a July 1989 Hydrogeologic Report, C-E Environmental (currently ABB) indicated that it appeared that the USTs did not impact soils or groundwater in the area. According to the report, the source of the transmission fluid was unknown. During a review of MDEQ files, a spill report indicated that approximately 400 to 500 gallons of transmission fluid was spilled on a gravel topped soil area during unloading at the tank farm. The facility vacuumed the free liquid from the surface area and the impacted soil was removed and disposed of. A drainage system was installed in the excavation that ties into the vault underdrain system. The underdrain system discharges to the WWTP. It was believed that the system would capture the groundwater and any residual contamination. On August 7, 1989, the facility met with the MDNR and recommended no further action be undertaken for this area. The MDNR agreed and on August 15, 1989 a letter from the facility was sent to the MDNR to document the agreement made at the meeting.
26	Steam Tunnels	Several of the steam tunnels run through areas of free product. Due to the age of the steam tunnels (~62 years old), their integrity is in question. In 1987 MDNR inspection correspondence, several GM employees indicated that they observed oil leaking into several of the tunnels.
27	Machinery Staging Area	This area is located outside the southwest corner of the building and is used for decommissioned machinery. Machinery is sitting on concrete and soil. Staining was observed on the concrete and soil. The concrete in this area is cracked.
28	Coolant Trenches	Based on the number of releases from coolant trenches (PAOC 2, 5, 6, 20, 21, and 22), they should be considered a PAOC.
29	Paint Booths	The facility currently has two paint booths (Dyno Lab and Dock 1). The paint booth in the Dyno Lab (Bay KK-10) is inactive. No cracks were observed in the concrete of the booths. The booth for the Dyno Lab is equipped with a trench drain. The Dock 1 paint booth is located at Bay A-10. Due to the historical use of solvents and solvent-based paints (with possible metals as a component) in the past and the unknown integrity of the trench drain at the Dyno Lab, these areas should be considered PAOCs.
30	Battery Charging Area	The Battery Charging Area is located at Bay Q-28. Three battery washers are located in this area. The washers discharge to a trench drain located under a battery mover. No cracks were observed in the concrete in this area. Due to potential spills/leaks from lead-acid batteries and the unknown integrity of the trench drain the area should be considered a PAOC.
31	Transmission Lab	A Quality Assurance Inspection Lab is located at Bay L-69. Mineral spirits are used in the lab. In past RCRA inspections and in the RCRA closure report for the Drum Storage Area, it was noted that acetone was also used in the Transmission Lab.
32	Chemistry Lab	The Chemistry Lab is located at Bay ?. Various lab chemicals are used. In past RCRA inspections and in the RCRA closure report for the Drum Storage Area, it was noted that D001, F001, F002, F003, and F005 wastes were generated here.

POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
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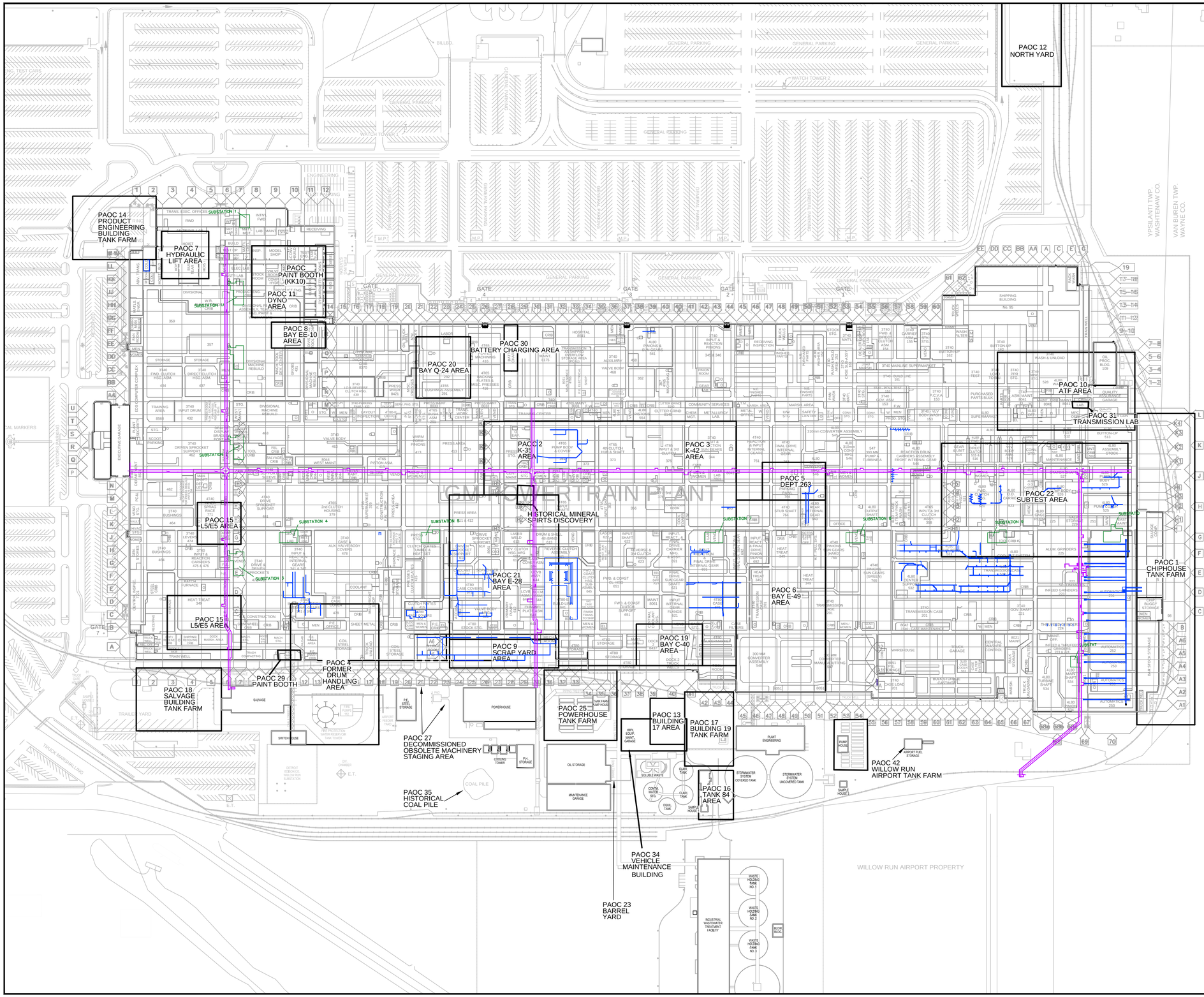
PAOC Number	*PAOC Description*	*Notes*
33	Maintenance Degreasing	In past RCRA inspections and in the RCRA closure report for the Drum Storage Area, it was noted that maintenance parts and tools were cleaned using 1,1,1-TCA and freon.
34	Vehicle Maintenance Building	Gasoline and diesel fuel wastes are generated.
35	Historical Coal Pile	Coal was originally used a backup fuel source for the powerhouse. It is believed that the coal pile was located near the powerhouse from the 1950's to early 1990's.
36	Historical Painting Areas	Paint booths were used to paint sections of bombers and entire bombers from 1941 to 1945. - Paint booths were located in a paint department at what is now Bays F-6/H-6 to F-10/H-10. - Paint booths with settling basins were located at what is now Bays U-24, P-24, P-35, P-32, K-34 to K36, and B64/D64 to B68/D68. - A paint booth with a settling basin was located in a Dope Room located at what is now Bays A-5/58 to A-5/60. A Dope Building which piped material to the Dope Room was located at what is now Bays A-2/56 to A-5/62. - Two Final Assembly paint booths with pump rooms and sludge pits were located at what is now Bays E-68 to F-68 and E-70 to F-70. Paint was reclaimed from the sludge pits.

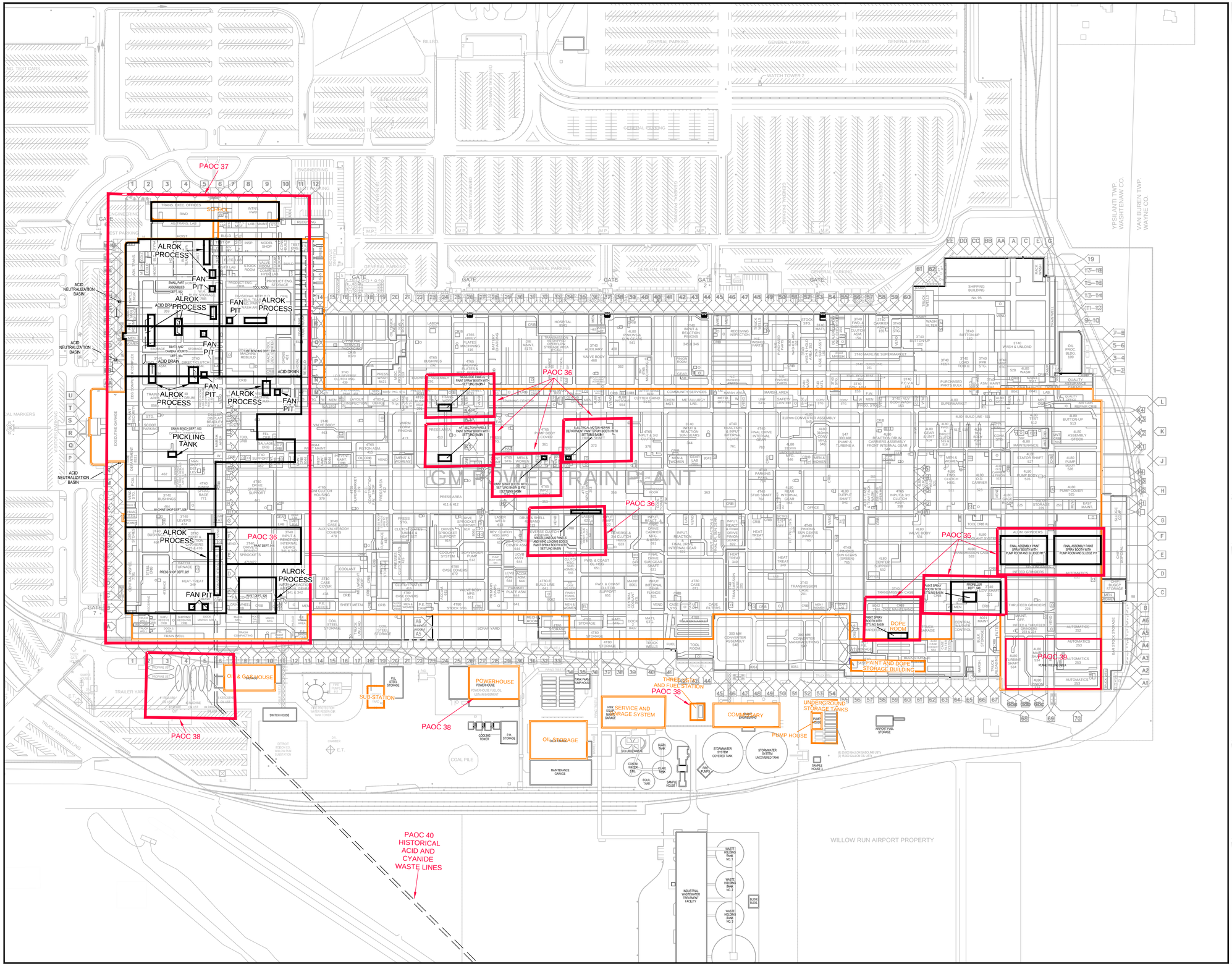
POTENTIAL AREAS OF CONCERN (PAOC)
GMPT WILLOW RUN
YPSILANTI, MICHIGAN

PAOC Number	*PAOC Description*	*Notes*
37	Historical Machining/ Plating Areas	From 1941 to 1945, a manufacturing area which included machining and plating processes, was located at what is now Bays A-1/MM-1 to A-12/MM-12. Located in these area were vapor degreasers, acid/cyanide/metal coating (Alrok Coating) processes, heat treating, and cleaning tanks. **Vapor Degreasers** - The vapor degreasers used trichlorethylene. There were 13 spray units (located throughout the manufacturing area), 1 vapor slush unit (located in a rivet shop located at Bay B-7/D-7 to B-9/D-9), and 1conveyor unit (located in a press shop located at Bay B-2/H-2 to B-6/H-6). There was also three solvent stills located in the machining and plating areas. **Plating/Alroking Areas** - An anti-corrosion coating process (Alroking) was used on bomber parts. The process utilized hydrochloric acid, chromic acid, cyanide, caustics, chromium, and cadmium. The Alroking processes were located within Bay B-7/D-7 to B-9/D-9, Bay B-2/H-2 to B-6/H-6, Bays U-9 to AA-9, Bays AA-2 to BB-2, Bays AA-4 to BB-4, Bays DD-2 to FF-2, Bays EE-4 to FF-4, Bays FF-5 to GG-5, and Bays FF-8 to FF-9. - The Alroking processes were equipped with fan pits to draw fumes way from the plant workers. The fumes were drawn down into underground vent ducts which carried air to large rubber-lined fans, which were located in underground rooms. The fans discharged the fumes through ducts lined with heat and acid resistant paint to points higher than the roof of the building. The ducts were made of ceramic material with sealed joints between the the Alroking tanks and the fans. - Plating was done in press shop located at Bays B-2/H-2 to B-6/H-6 until 1942. - A pickling dip tank was located in Bay P-3. **Heat Treating** - Heat treating took place in a press shop located at Bays B-2/H-2 to B-6/H-6, the Draw Bench Department located approximately from Bays M-/M-6 to AA-1/AA-11, a tool room located at Bays FF-6/MM-6 to FF-11/MM-11, and in a training school in what is now the Product Engineering offices. - The heat treating in the tool room located at Bays FF-6/MM-6 to FF-11/MM-11 utilized lead salts, nitrate and cyanide pots, quench tanks, and oil baths. **Cleaning Tanks** - 38 cleaning tanks were located in four cleaning departments that were located in the various shops in the manufacturing area. The cleaning tanks consisted of a soap solution, a cold water rinse, a chromic trioxide/sulfuric acid/water dip, and water rinse. **Metal Reclaim** - A process to reclaim cadmium from material used to bend metal was located in the Tube Bending Department located in Bays BB-6/EE-6 to BB-11/EE-11. **Training School Labs** - The training school was located n what is now the Product Engineering offices. Various labs (e.g., x-ray, heat treat, metallography, etc., were located in the Training School.
38	Historical Tank Farms	Several of the historical tank farms are covered under the following PAOC's: 17, 18, and 25. From 1941 to 1945, the USTs contained various types of materials such as gasoline, kerosene, cutting oils, machine oil, paraffin oil, reclaimed oil, hydraulic oil, and fuel oil. A design drawing from 1941 indicated that the powerhouse basement contained fuel oil USTs. However, it is thought that fuel oil USTs may have been placed in the adjacent tank farm (PAOC 25). Actual location is unknown. A current facility personnel have indicated that there is currently no USTs in the basement of the powerhouse. An AST containing de-icing solution (IPA and glycerin) for the bombers was located near what is now PAOC 18.

POTENTIAL AREAS OF CONCERN (PAOC)
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PAOC Number	*PAOC Description*	*Notes*
39	Historical Plane Fueling Area	From 1941 to 1945, bombers were fueled with gasoline, oils, de-icing fluid, etc. at what is now Bays A1-68/A1-70 to A4-68/70.
40	Historical Acid and Cyanide Waste Lines	Waste acid and cyanide was conveyed from the Alroking processes in the Machining and Plating Areas via two 10-inch sewer lines to a acid and cyanide treatment plant across what is now Airport Road. The sewers exited the plant at what is now Bay A-6 and ran to the to southeast and then to the south to the treatment plant. Several acid drains were located in the Machining and Plating Areas. The drains discharged to acid neutralization basins outside near the west wall of the plant.
41	Historical Mineral Spirits Discovery	During the Comprehensive Source Investigation portion of this project, several production supervisors indicated that during the construction of a loop pit near Bay H4-29 (Department 412) in the late 1970's to early 1980's, an excavation reportedly filled up with mineral spirits.
42	Willow Run Airport Tank Farm	A former tank farm is located to the southeast of the plant beyond the fenceline on the property of the Willow Run Airport. The tank farm was installed in 1941-1942 as a tank farm for the bomber plant. The date of the transfer to Willow Run Airport is unknown. According to the MDEQ UST/LUST database, the tanks that were installed during 1941-1942 have been removed. The LUST database indicated that 11 releases incidents have been been reported. It is unknown if the release reports are associated with the tank farm. Two of incidents are closed.


PAOC 12
NORTH YARD
PAOC 14
PRODUCT
ENGINEERING
BUILDING
TANK FARM
PAOC 7
HYDRAULIC
LIFT AREA
PAOC
PAINT BOOTH
(KK10)
PAOC 11
DYNO
AREA
PAOC 8
BAY EE-10
AREA
PAOC 30
BATTERY CHARGING AREA
PAOC 20
BAY Q-24 AREA
PAOC 10
ATF AREA
PAOC 31
TRANSMISSION LAB
PAOC 2
K-35
AREA
PAOC 3
K-42
AREA
PAOC 5
DEPT.263
PAOC 22
SUBTEST AREA
PAOC 1
CHIPHOUSE
TANK FARM
PAOC 15
L5/E5 AREA
HISTORICAL MINERAL
SPIRITS DISCOVERY
PAOC 21
BAY E-28
AREA
PAOC 6
BAY E-49
AREA
PAOC 9
SCRAP YARD
AREA
PAOC 19
BAY C-40
AREA
PAOC 4
FORMER
DRUM
HANDLING
AREA
PAOC 29
PAINT BOOTH
PAOC 18
SALVAGE
BUILDING
TANK FARM
PAOC 27
DECOMMISSIONED
OBSOLETE MACHINERY
STAGING AREA
PAOC 25
POWERHOUSE
TANK FARM
PAOC 13
BUILDING
17 AREA
PAOC 17
BUILDING 19
TANK FARM
PAOC 42
WILLOW RUN
AIRPORT TANK FARM
PAOC 35
HISTORICAL
COAL PILE
PAOC 16
TANK 84
AREA
PAOC 34
VEHICLE
MAINTENANCE
BUILDING
PAOC 23
BARREL
YARD
GM POWERTRAIN PLANT
WILLOW RUN AIRPORT PROPERTY
YPSILANTI TWP.
WASHTENAW CO.
VAN BUREN TWP.
WAYNE CO.
GATE 1
GATE 2
GATE 3
GATE 4
GATE 5
GATE 6
GATE 7
SUBSTATION 1
SUBSTATION 2
SUBSTATION 3
SUBSTATION 4
SUBSTATION 5
SUBSTATION 6
SUBSTATION 7
SUBSTATION 8
SUBSTATION 9
SUBSTATION 10
SUBSTATION 11
SUBSTATION 12
SUBSTATION 13
SUBSTATION 14
SUBSTATION 15
GENERAL PARKING
TRUCK MARSHALLING
TRAILER YARD
EXECUTIVE GARAGE
VISITORS PARKING
SALVAGE
POWERHOUSE
SWITCH HOUSE
COAL PILE
OIL STORAGE
MAINTENANCE GARAGE
PLANT ENGINEERING
PUMP HOUSE
SAMPLE HOUSE 1
SAMPLE HOUSE 2
SOLUBLE WASTE
CONTAM. WATER STG.
EQUAL. TANK
CLARI. TANK
STORMWATER SYSTEM COVERED TANK
STORMWATER SYSTEM UNCOVERED TANK
INDUSTRIAL WASTEWATER TREATMENT FACILITY
WASTE HOLDING BASIN NO. 1
WASTE HOLDING BASIN NO. 2
WASTE HOLDING TANK NO. 3
BLOW BLDG.
HSKV. EQUIP. MAINT. GARAGE
P.E. STEEL STORAGE
P.H. STORAGE
COOLING TOWER
DETROIT EDISON CO. WILLOW RUN SUBSTATION
DRY CHAMBER
E.T.
TRANS. EXEC. OFFICES
RWD
INTNL FWD
MAIN MNTC.
LAB
MAINT.
STR.
RECEIVING
BUILD
MISC. SHOP
MODEL SHOP
TEST LAB
STOCK ROOM
VALVE BODY HYSD
PAINT BOOTH
PAINT MIX
PAINT STR.
DIVISIONAL MACHINE REBUILD
MAIN TOOL CRIB & CLOSET
MAGNA FLUX REBUILD
MACHINE REBUILD
GRIND
ASSEMBLY
TRAINING AREA
INPUT DRUM
DRIVEN SPROCKET SUPPORT
DRIVE SPROCKET SUPPORT
SCOOT PARKING
LED COMPUTER COMPLEX
CHAIR ASSEMBLY
MAIN GATE
SECURITY
VISITORS
MAIN OFFICE
LEG STG.
MAIN STG.
MAIN TOOL CRIB
SALVAGE ORD.
TOOL CRIB
FEL. CRIB
MAIN SUBSTATION
MAIN TRANS.
ADM. TRANS.
ENGINEERING STORES
DRAWING STORES
MAIN TRANS. SUBSTATION
HVAC EQUIP. STORES
POOL
MAIN STG.
MAIN TOOL CRIB
MAIN MAINT.
MAIN OFFICE
MAIN GATE
MAIN SECURITY
MAIN ENTRANCE
MAIN PARKING
MAIN ENTRANCE
MAIN GATE
MAIN SECURITY



№	Revision	Date	Initial

N

0 50 150ft

LEGEND

FOOTPRINT OF BOMBER PLANT (1941-1945)

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

1941 - 1945 POTENTIAL AREAS OF CONCERN (PAOC)

YPSILANTI, MICHIGAN
GMPT YPSILANTI FACILITY

CONESTOGA–ROVERS & ASSOCIATES

Source Reference:

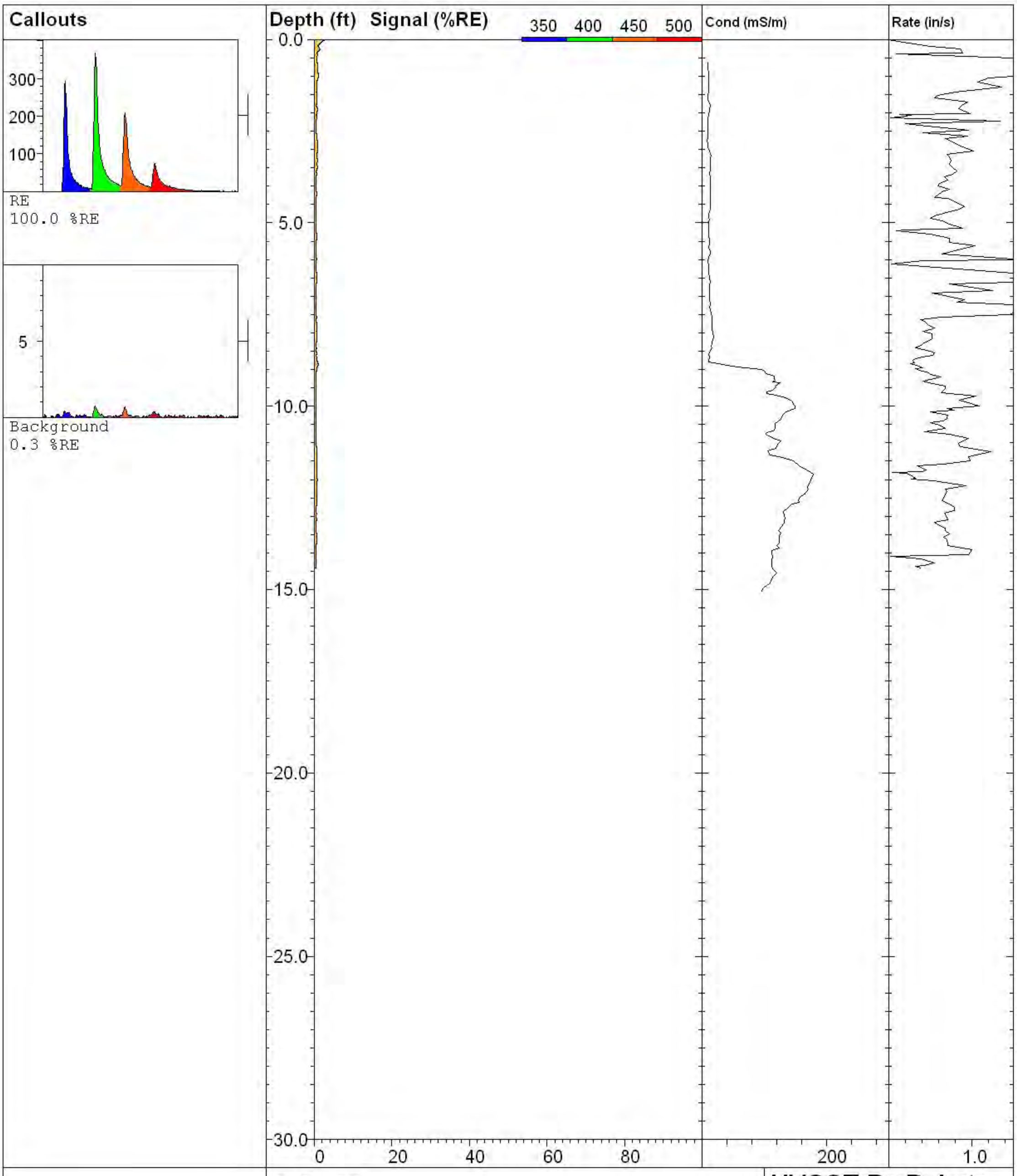
Project Manager:	Reviewed By:	Date:	
S.A.	M.L.R.	MARCH 2003	
Scale: 1"=150'	Project N º: 17358-22	Report N º: MEMO020	Drawing N º: 2

17358-22(MEMO020)GN-DE001 MAR 26/2003

ARCADIS

Appendix C

Matrix Final Report LIF Logs

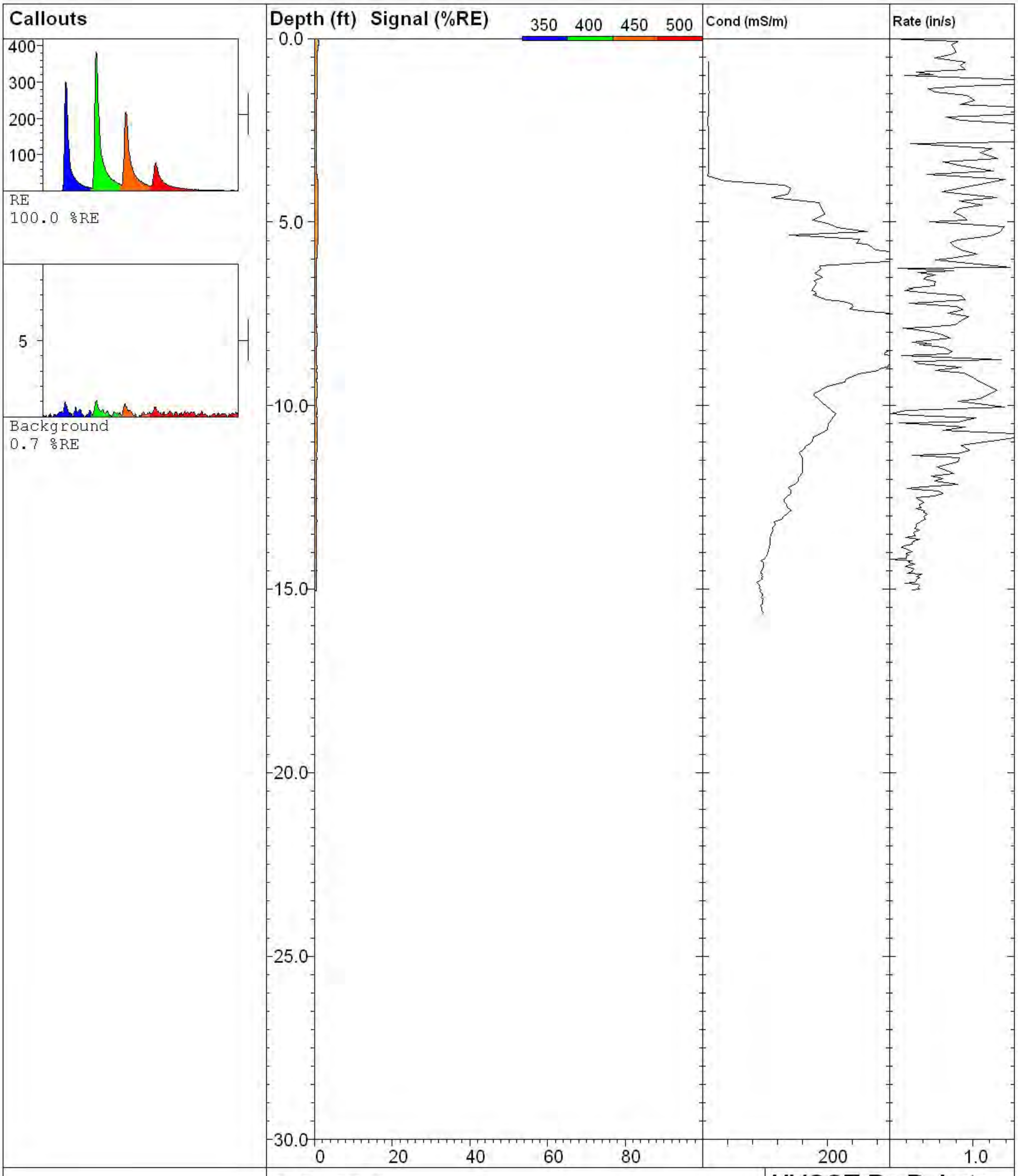


MATRIX ENVIRONMENTAL LLC
8531 Jefferson Highway
Osseo, MN 55369
(763) 424-4803
www.matrixenv.com

LIF-001

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.42 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.8 % @ 0.00 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-20 12:17 CST**

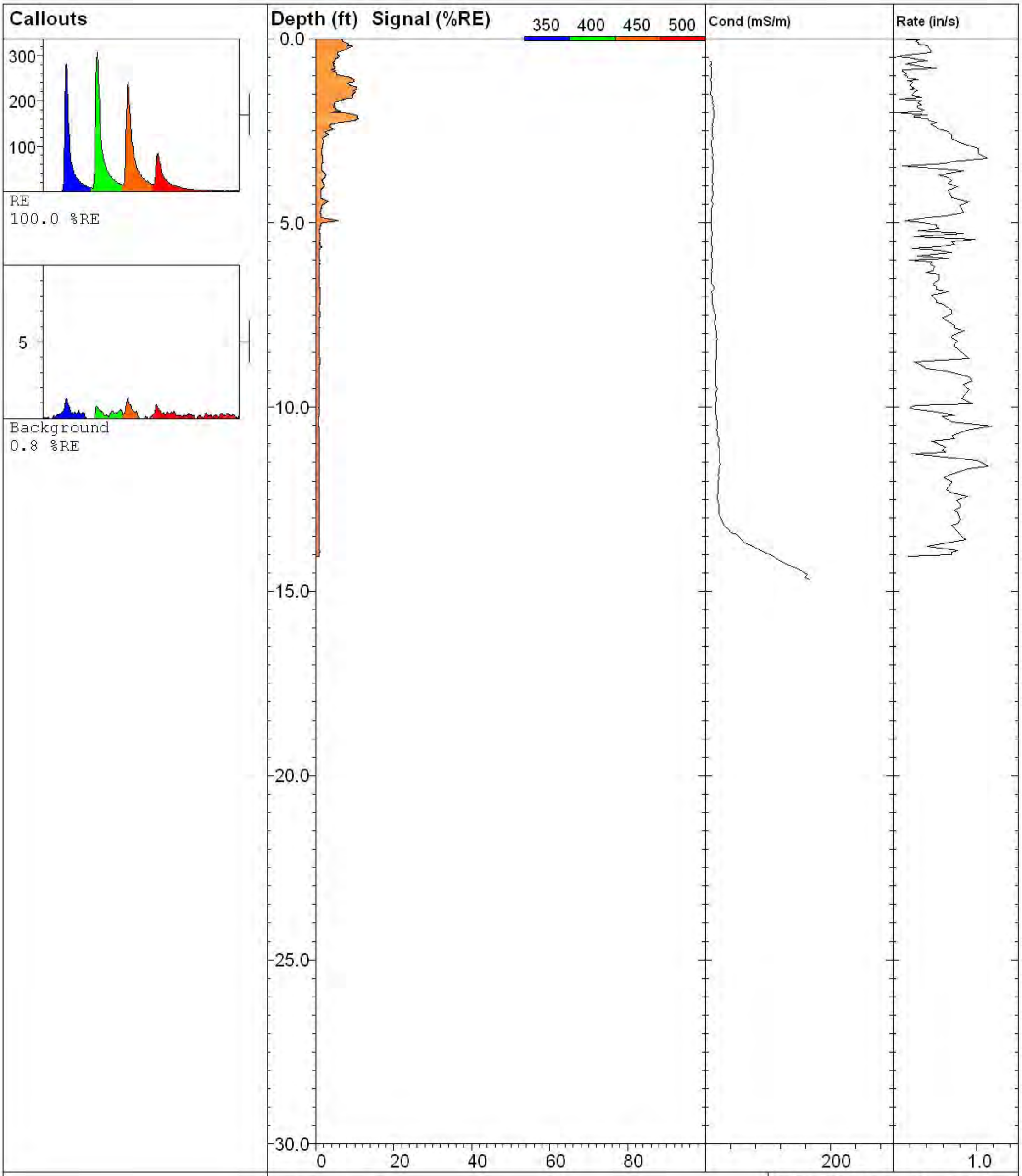


MATRIX ENVIRONMENTAL LLC
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www.matrixenv.com

LIF-002

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.0 % @ 0.00 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-20 12:49 CST**

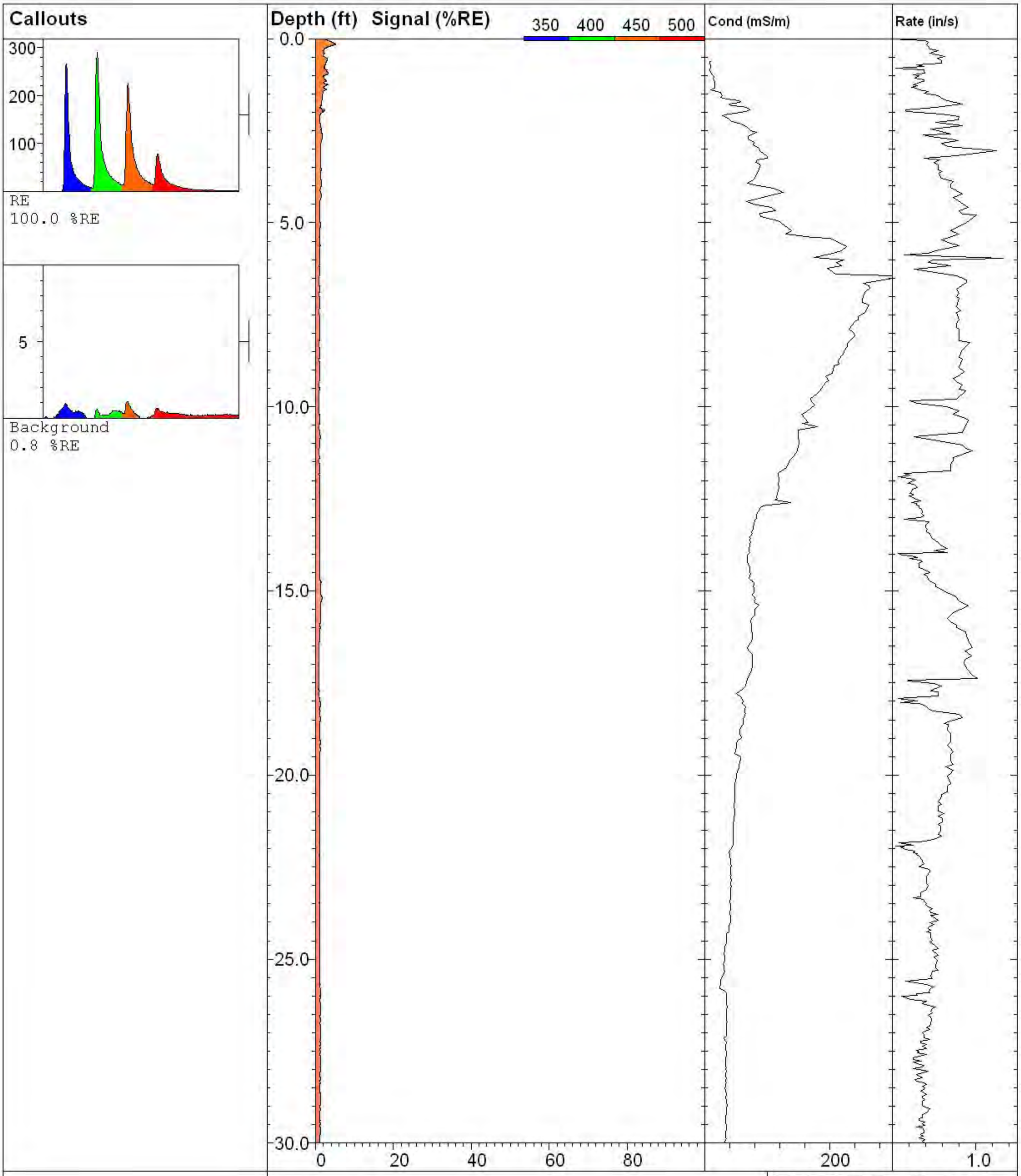


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LIF-003

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **11.0 % @ 2.17 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-20 12:10 CST**

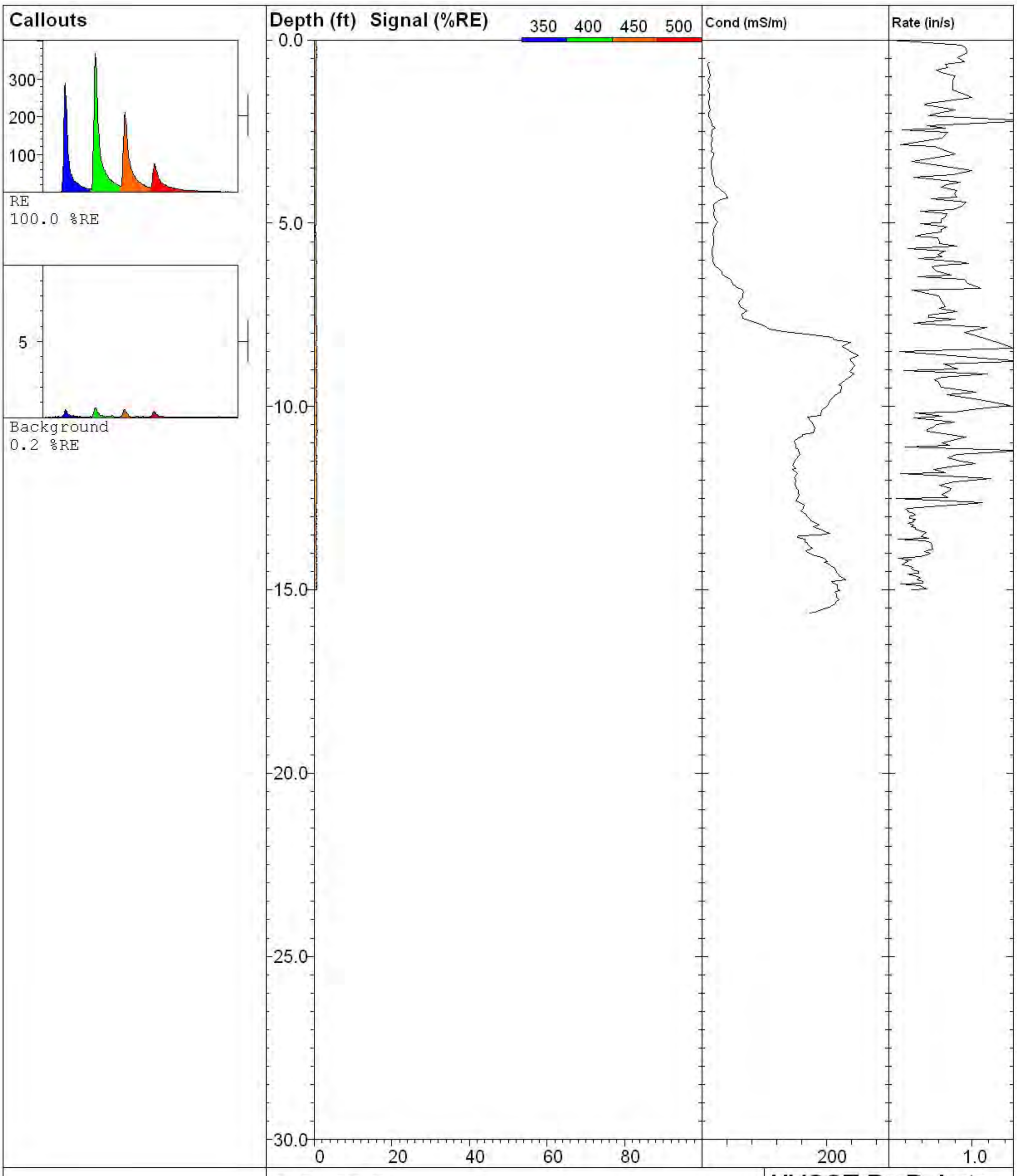


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LIF-004

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **30.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.2 % @ 0.16 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-20 12:48 CST**

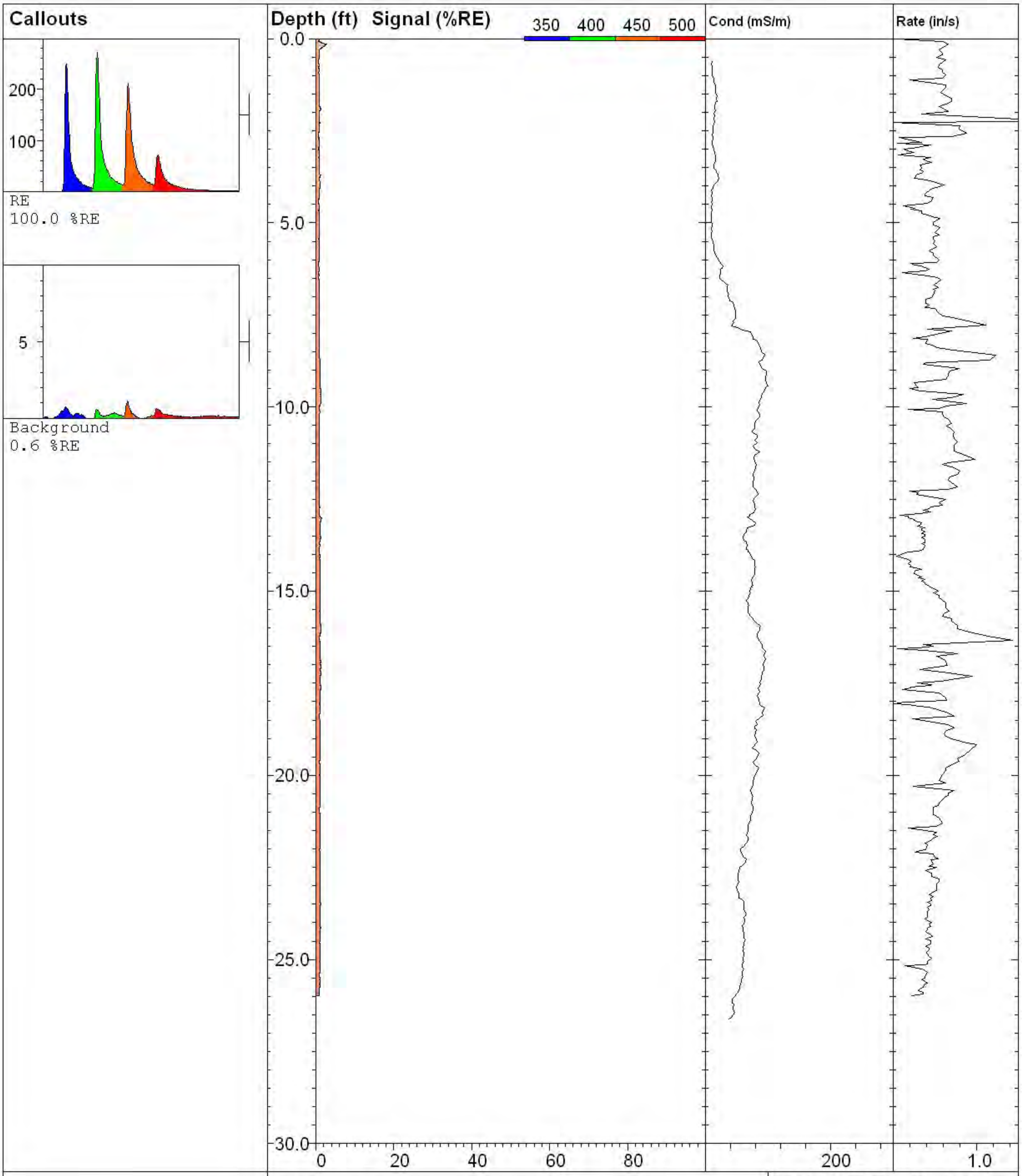


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LIF-006

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **0.8 % @ 10.68 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-20 15:14 CST**

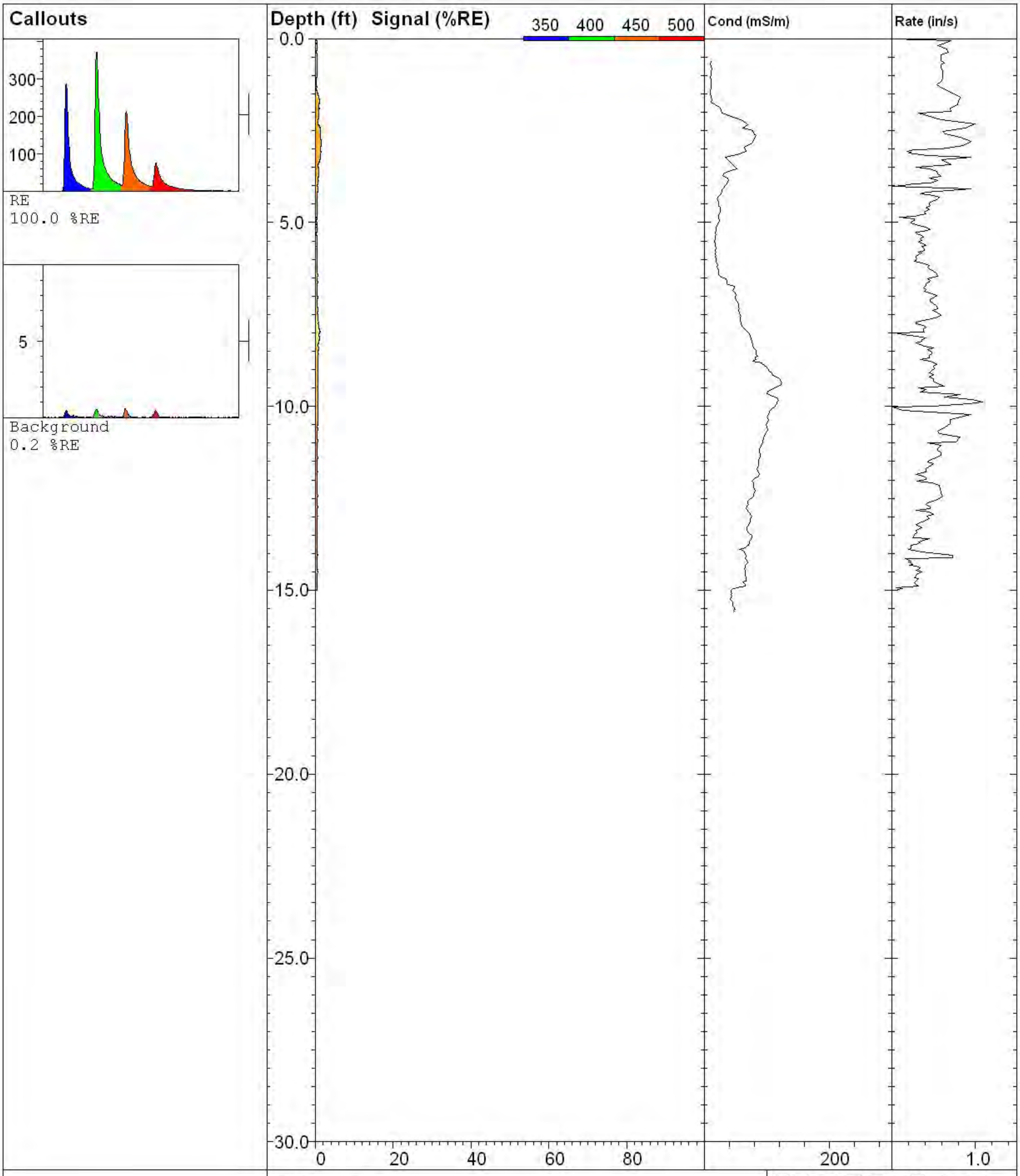


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LIF-007

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **25.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.7 % @ 0.15 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-20 15:15 CST**

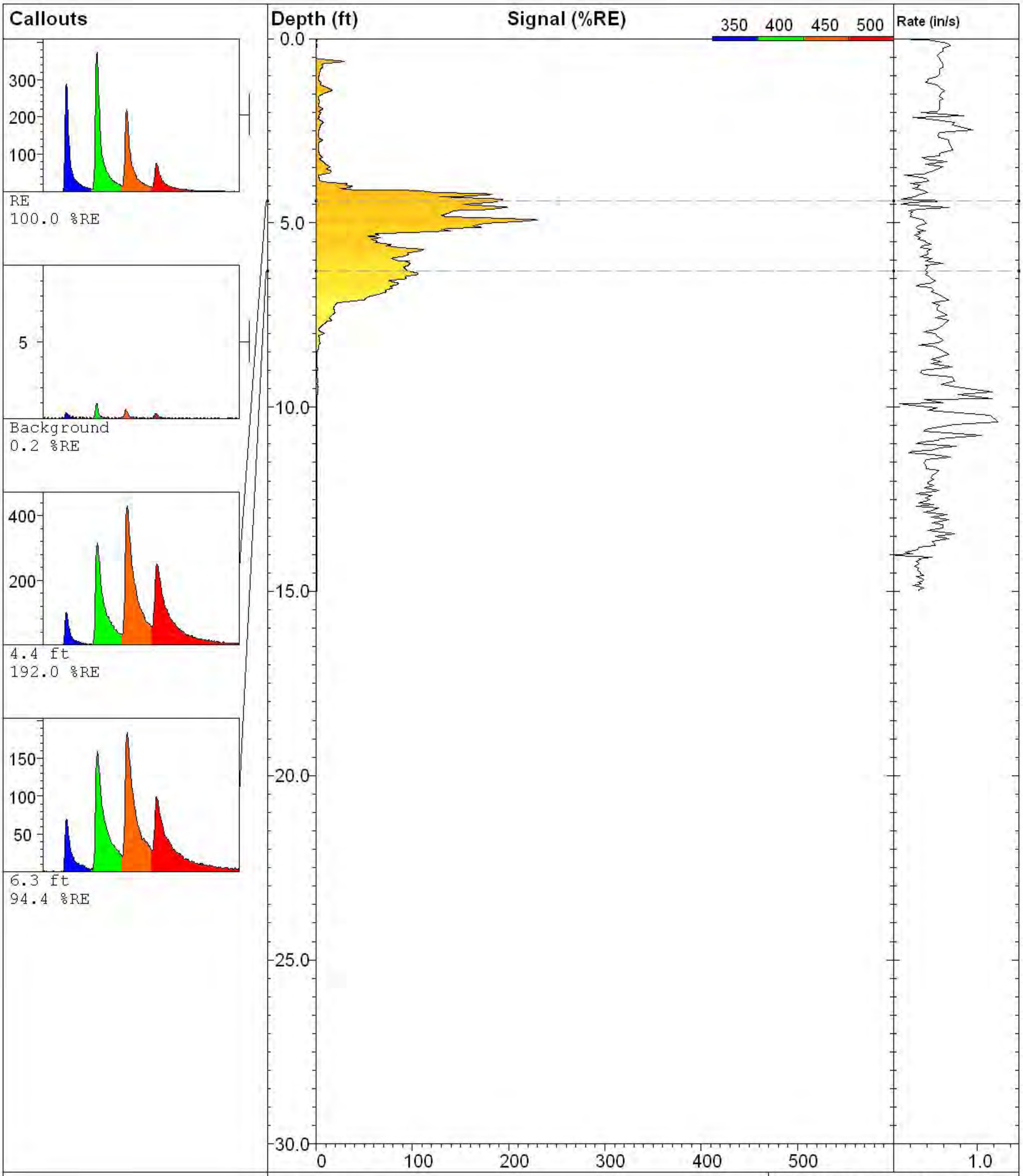


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LIF-009

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.4 % @ 3.09 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 13:42 CST**



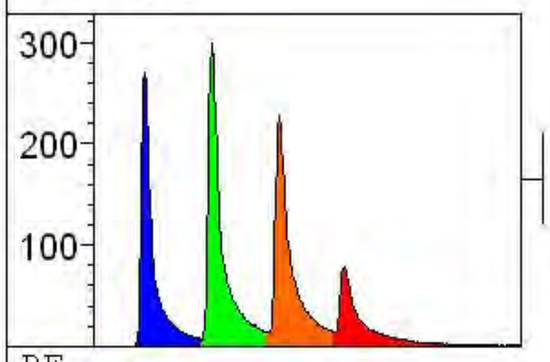
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LIF-010

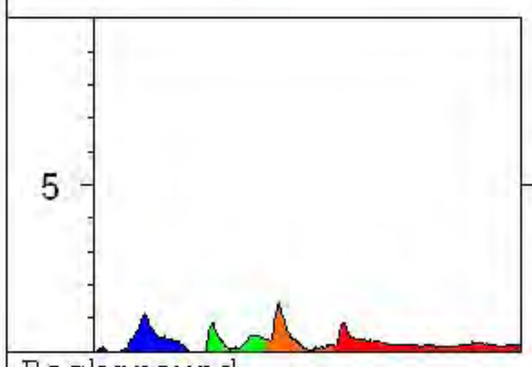
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **230.6 % @ 4.92 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 15:11 CST**

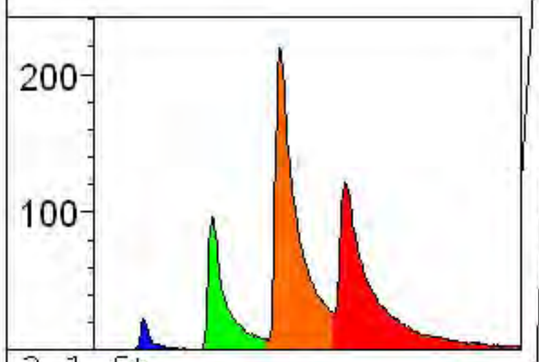
Callouts



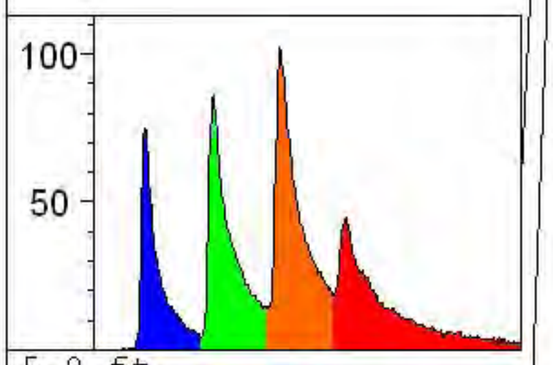
RE
100.0 %RE



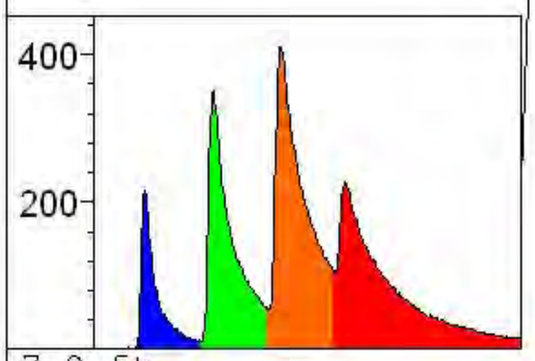
Background
0.8 %RE



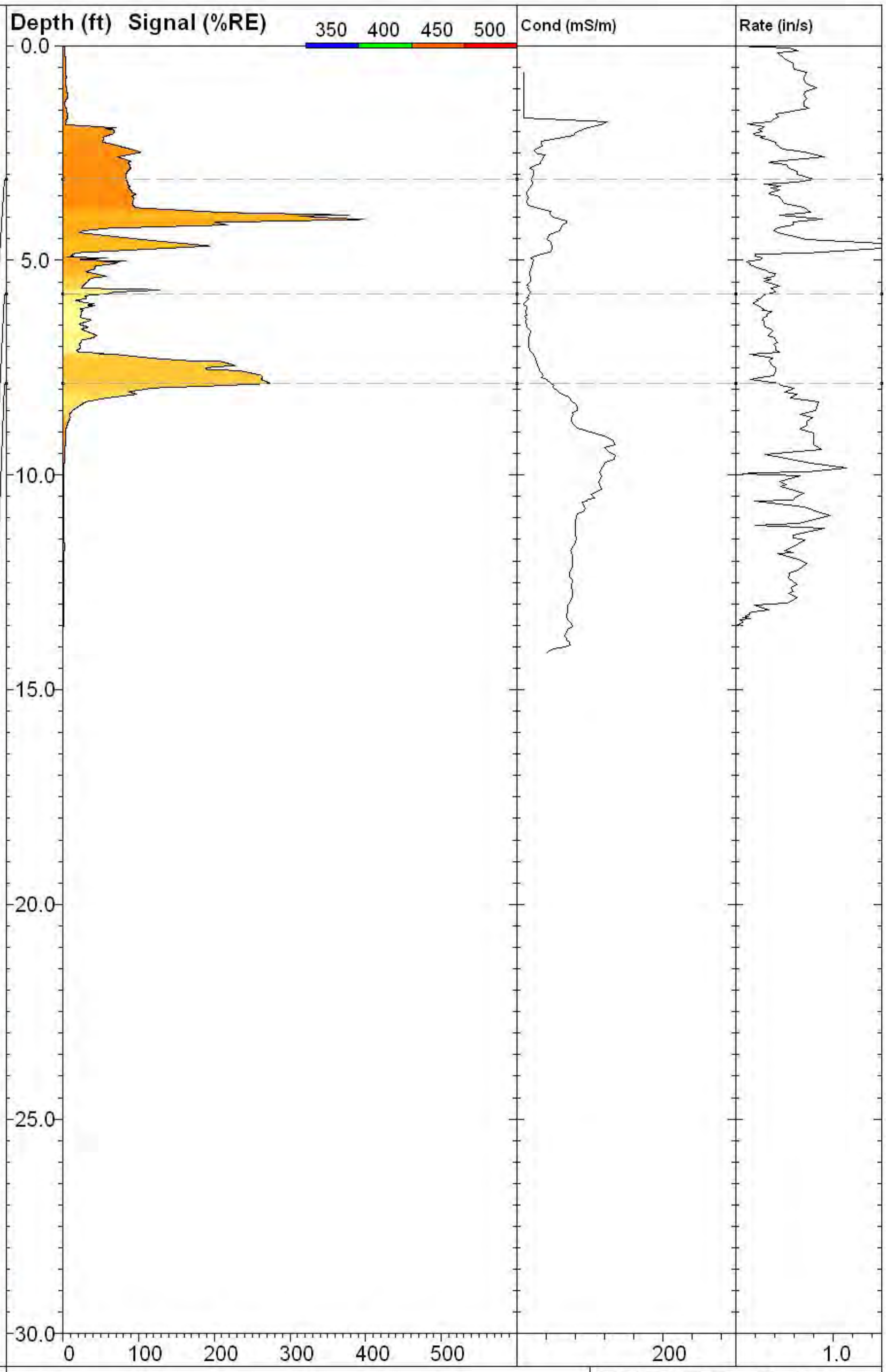
3.1 ft
83.5 %RE



5.8 ft
60.5 %RE



7.9 ft
274.7 %RE

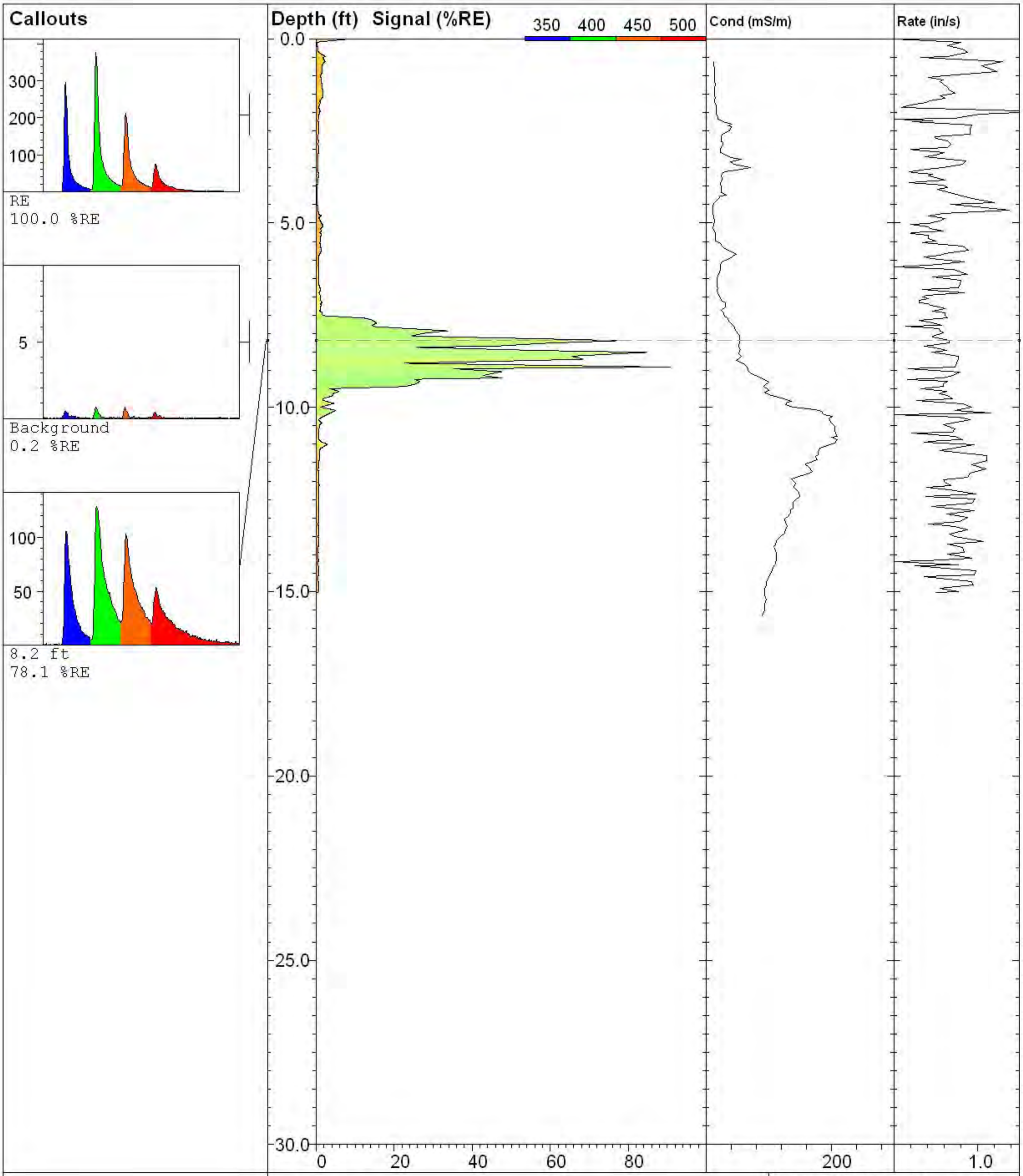


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LIF-011

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **13.52 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **397.8 % @ 4.05 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-21 09:00 CST**

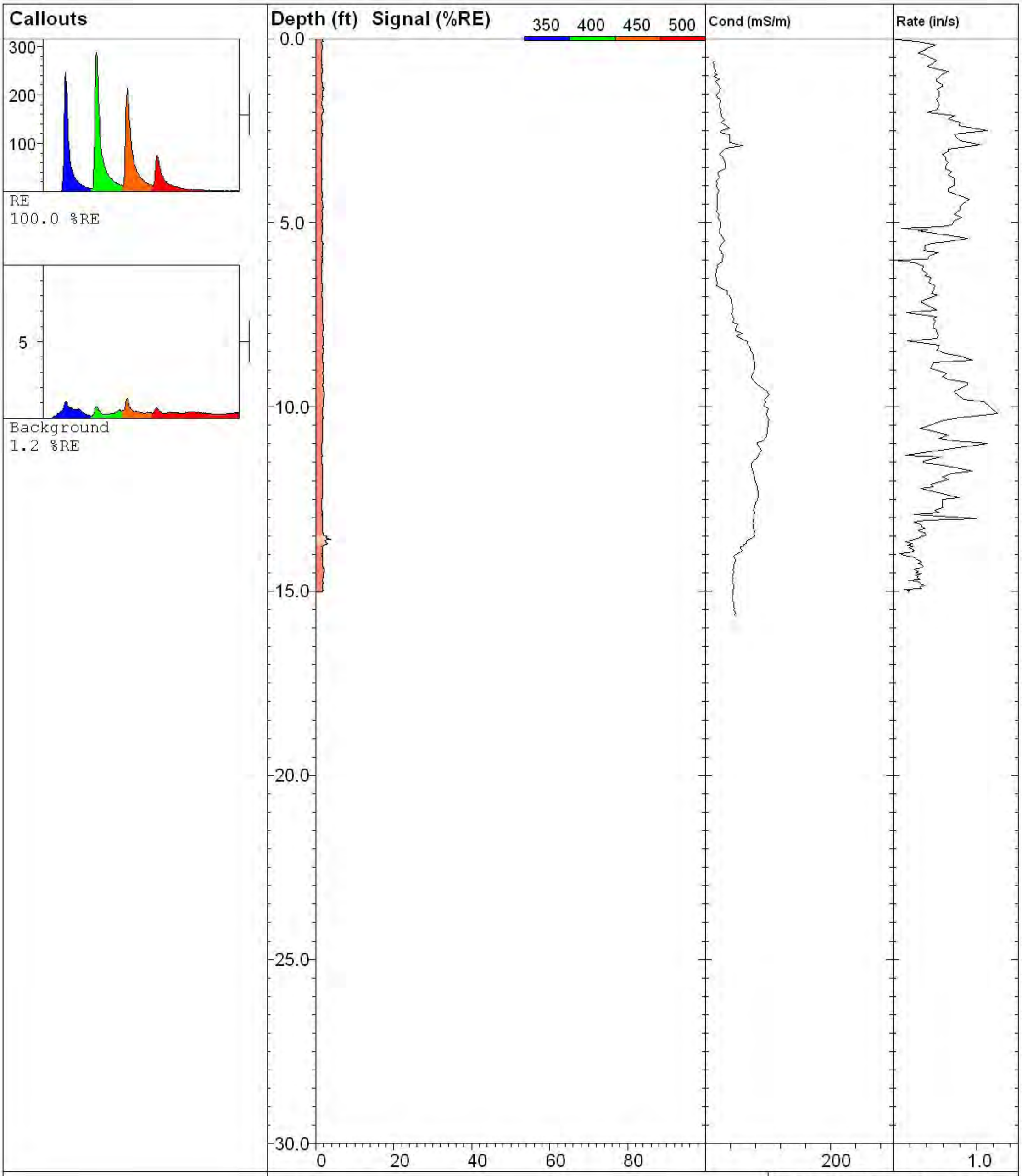


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LIF-012

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **91.3 % @ 8.91 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-21 10:48 CST**

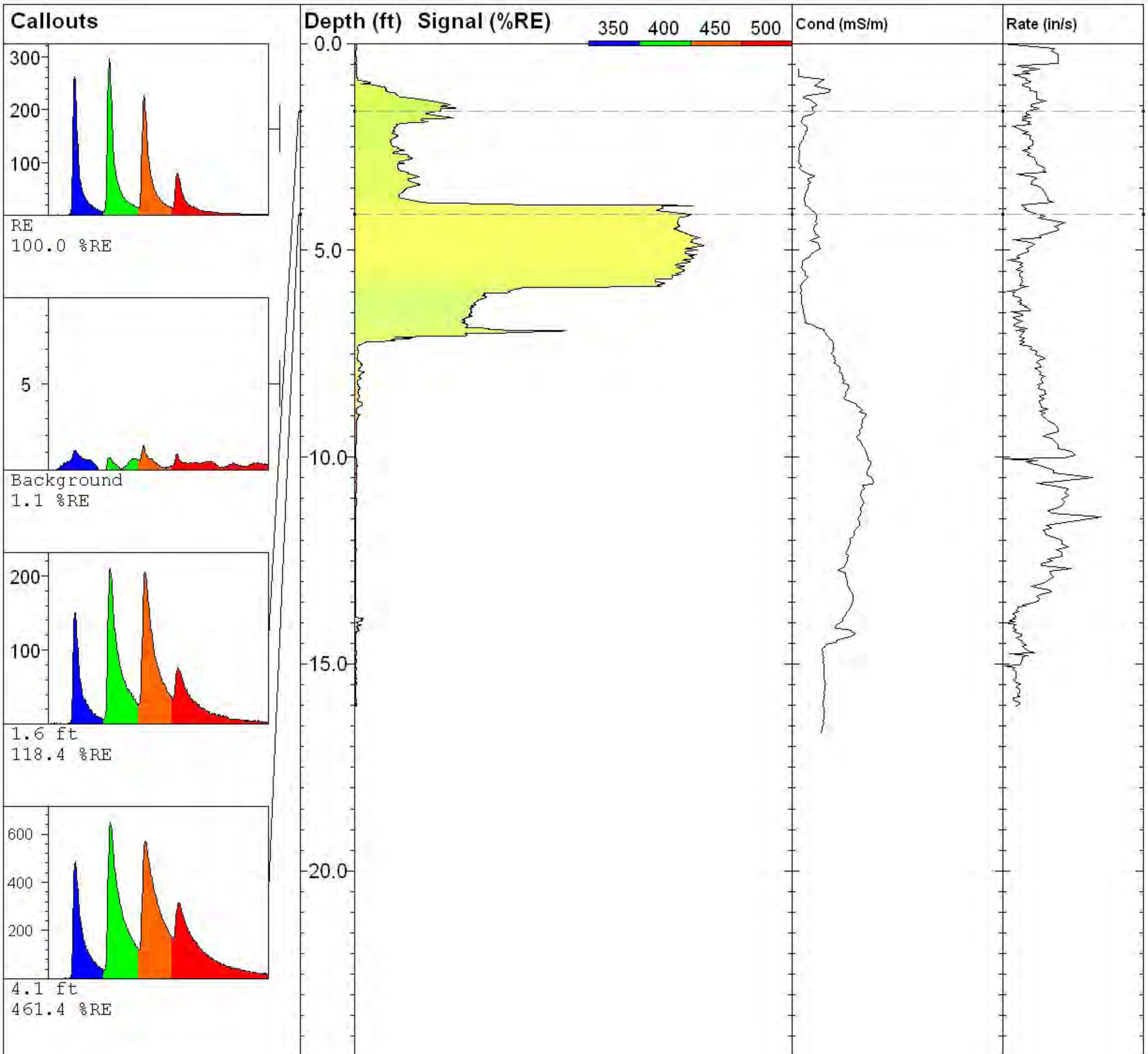


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LIF-014

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.8 % @ 13.59 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 16:39 CST**

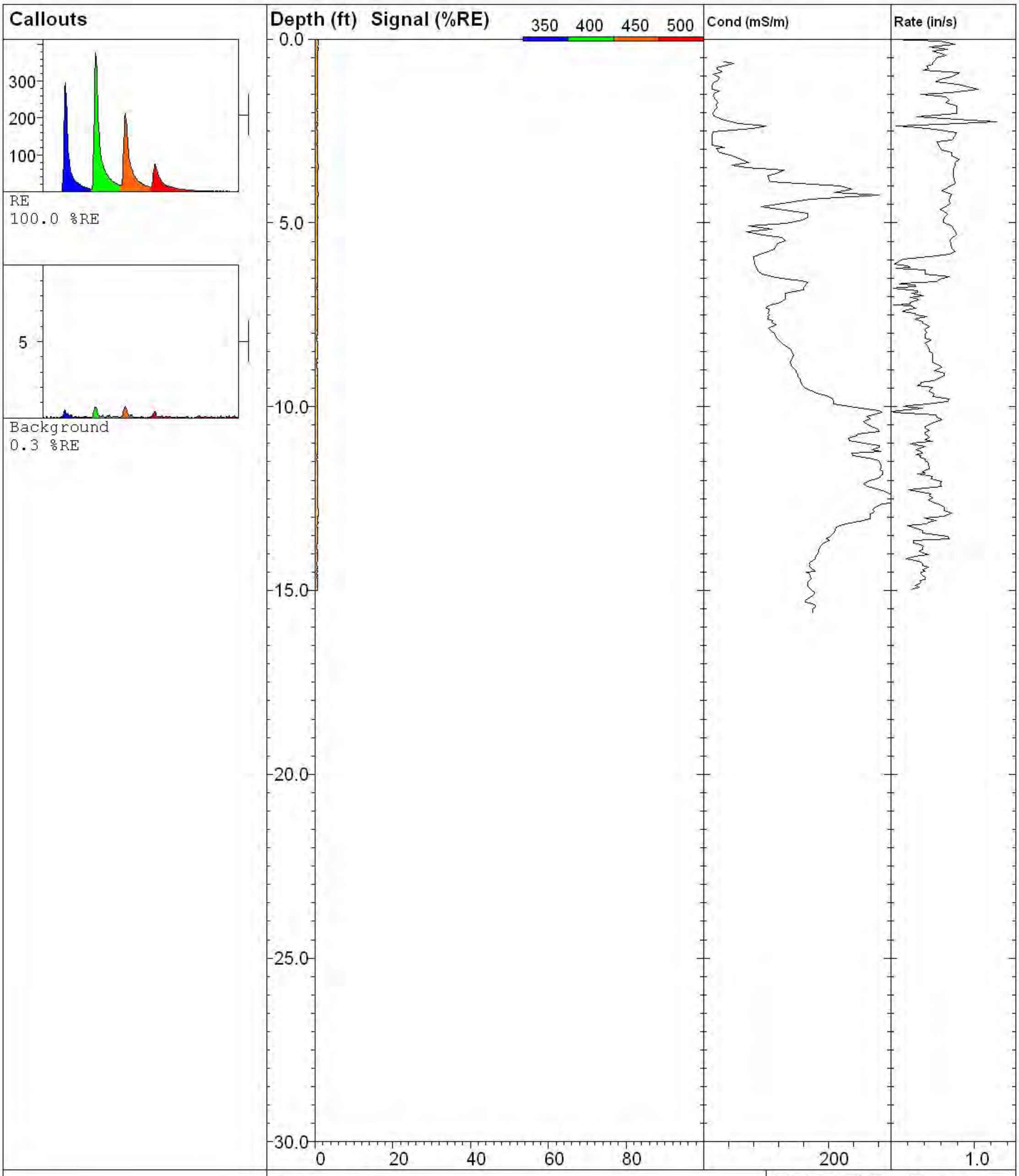


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LIF-015

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **479.8 % @ 4.88 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 08:13 CST**

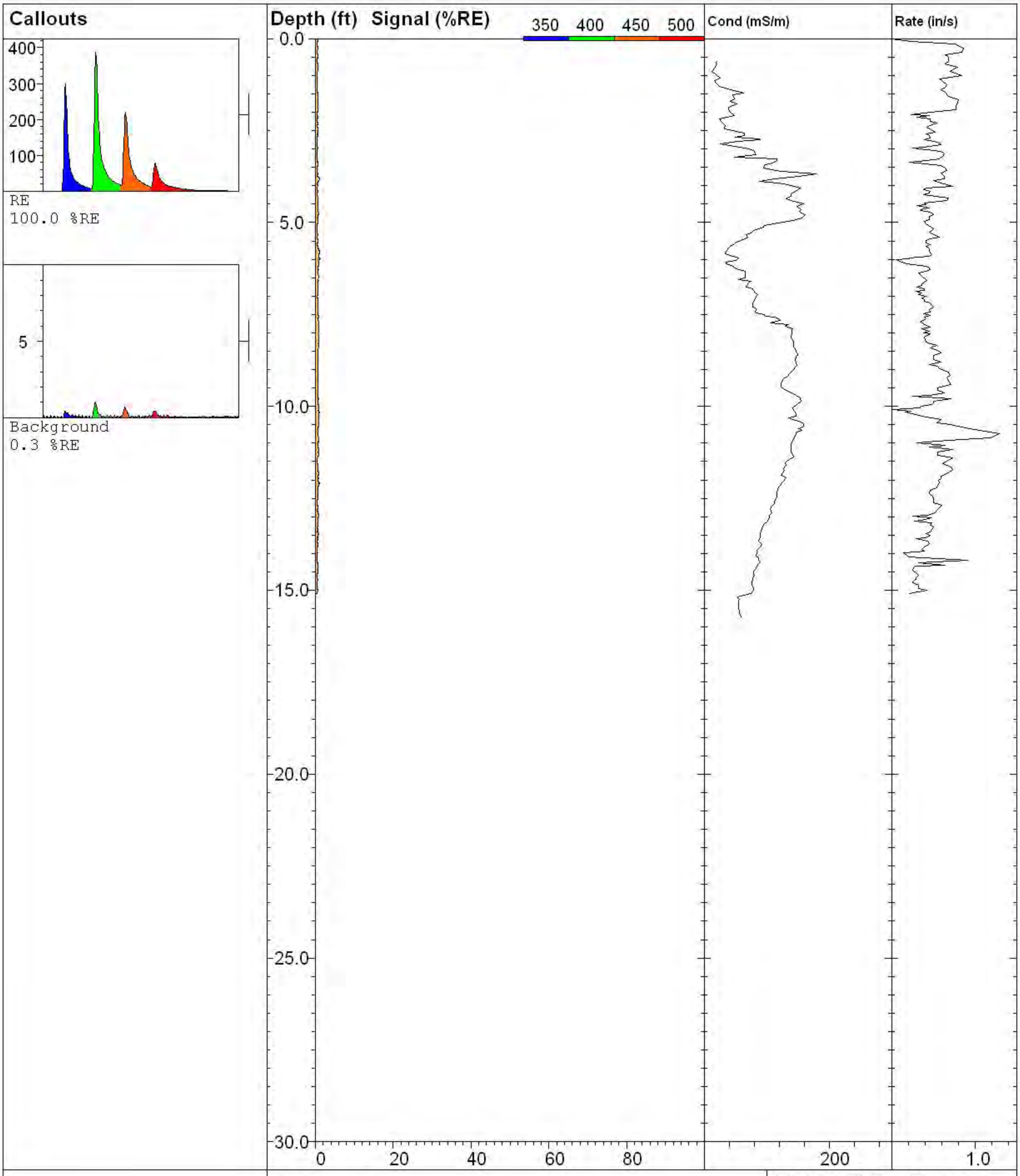


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LIF-016

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **0.9 % @ 12.90 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 08:49 CST**

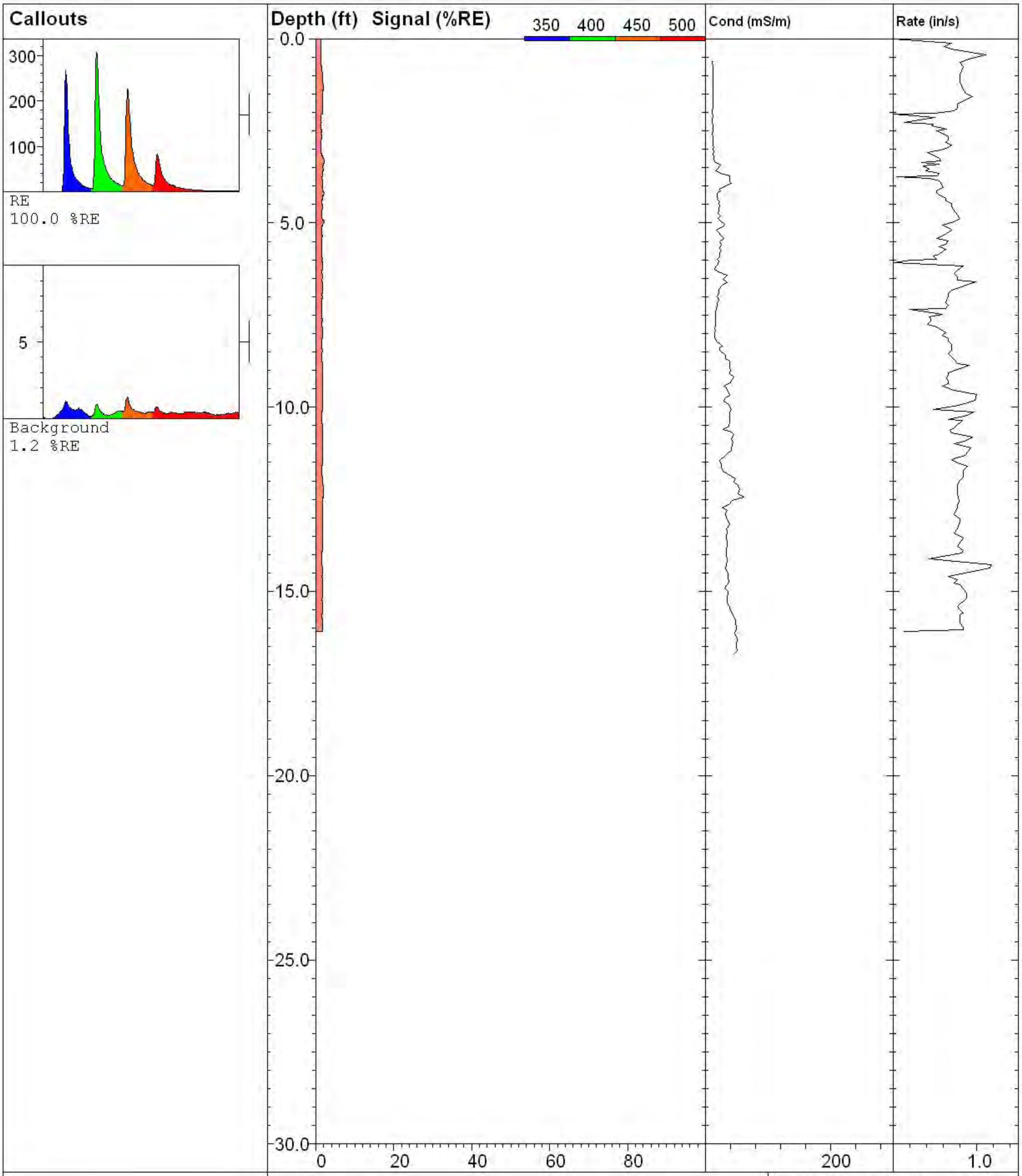


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LIF-017

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.09 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.2 % @ 5.99 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 08:16 CST**



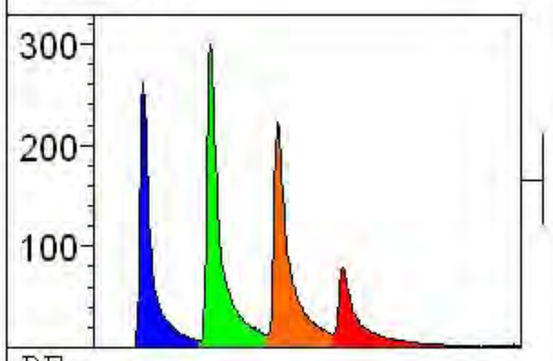
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LIF-018

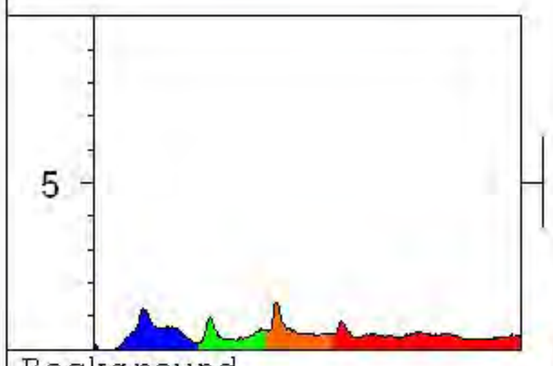
UVOST By Dakota
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.2 % @ 4.96 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 13:23 CST**

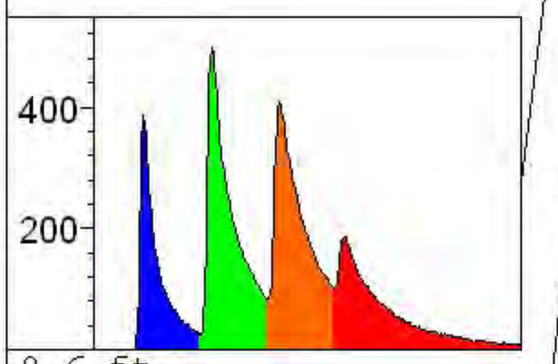
Callouts



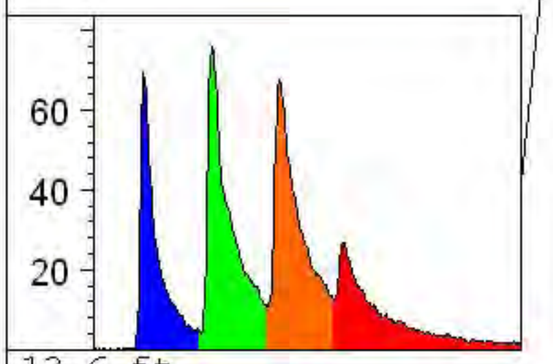
RE
100.0 %RE



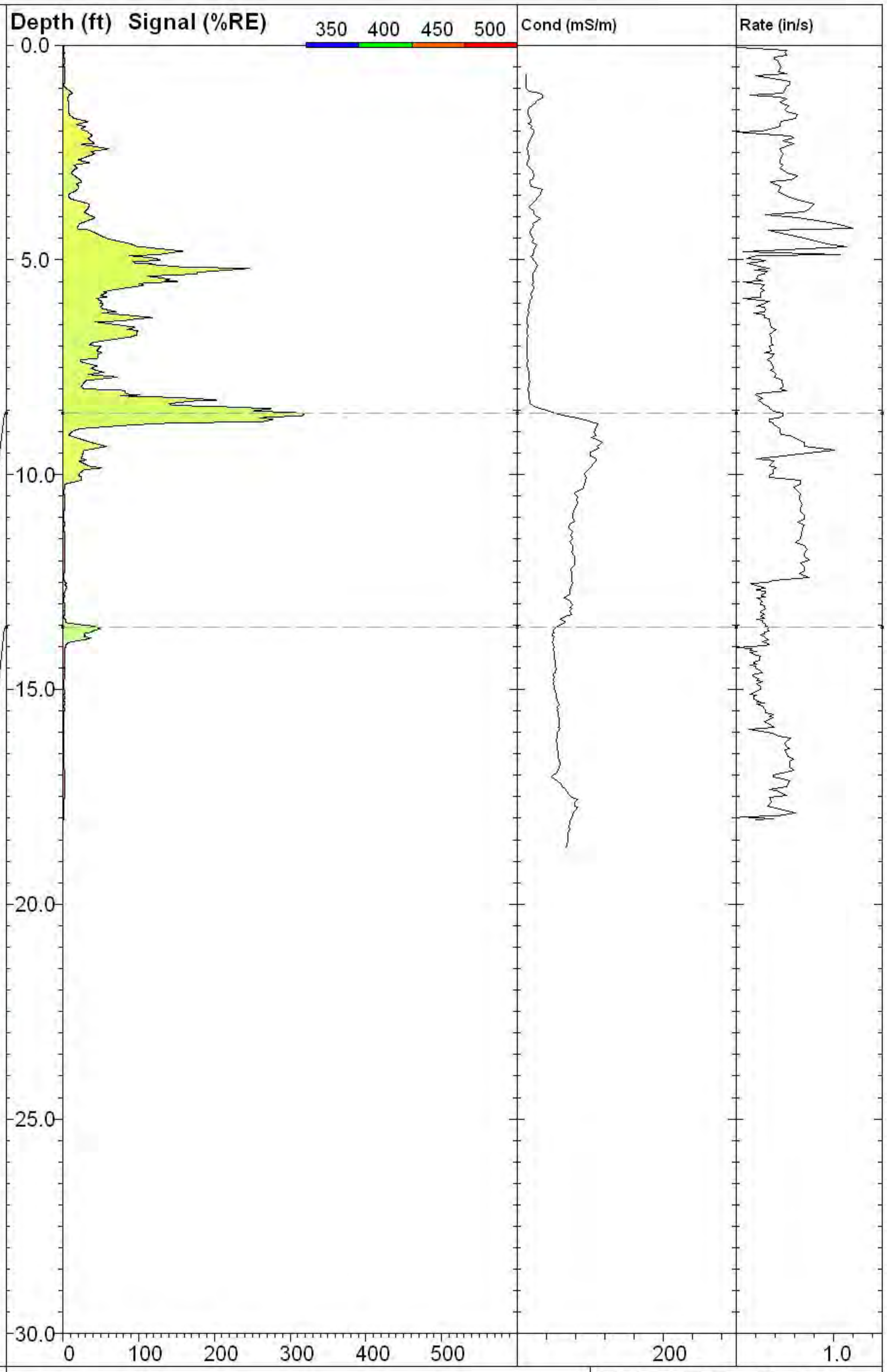
Background
1.3 %RE



8.6 ft
319.4 %RE



13.6 ft
46.2 %RE

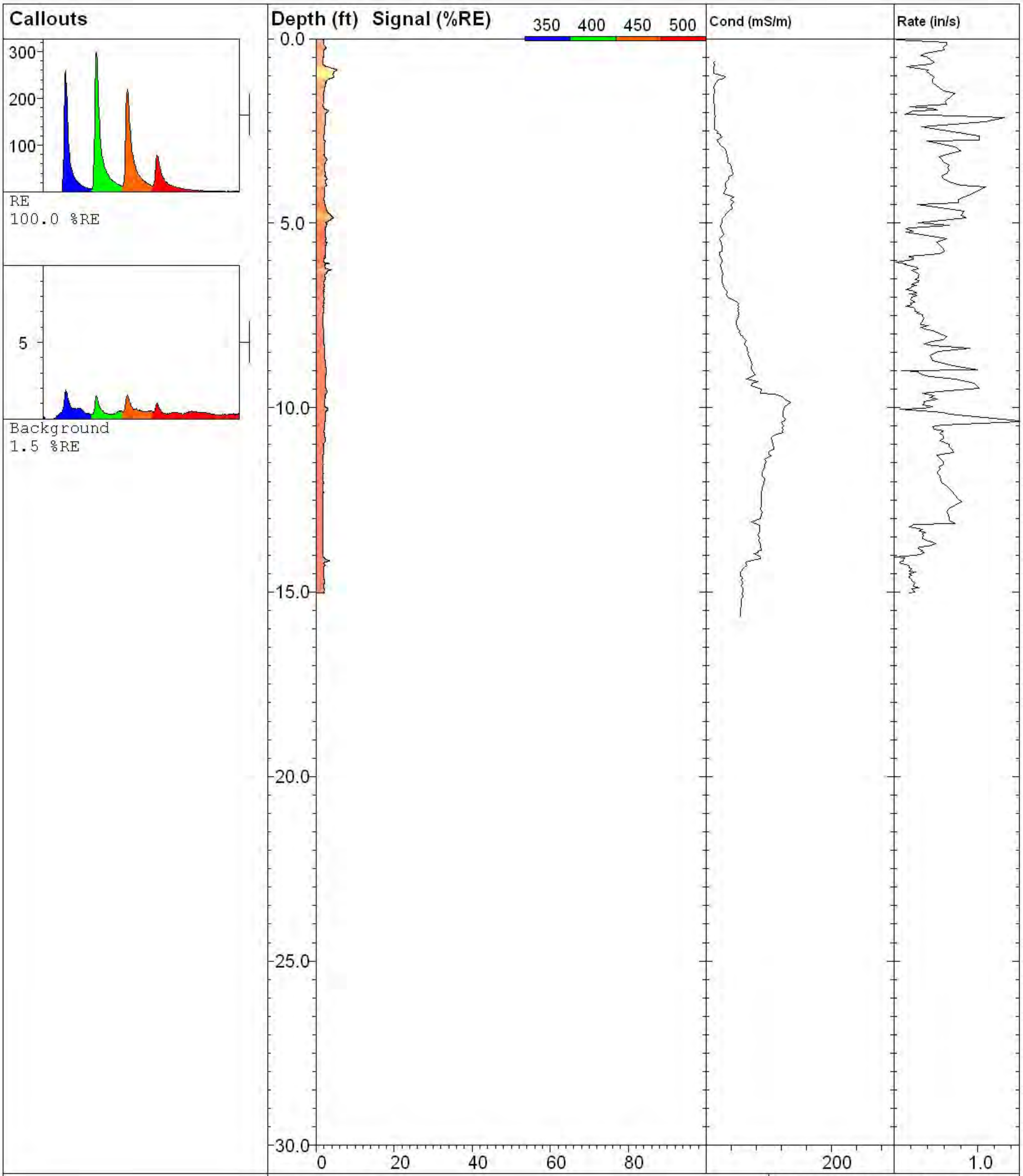


LIF-019

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **319.4 % @ 8.57 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 14:40 CST**

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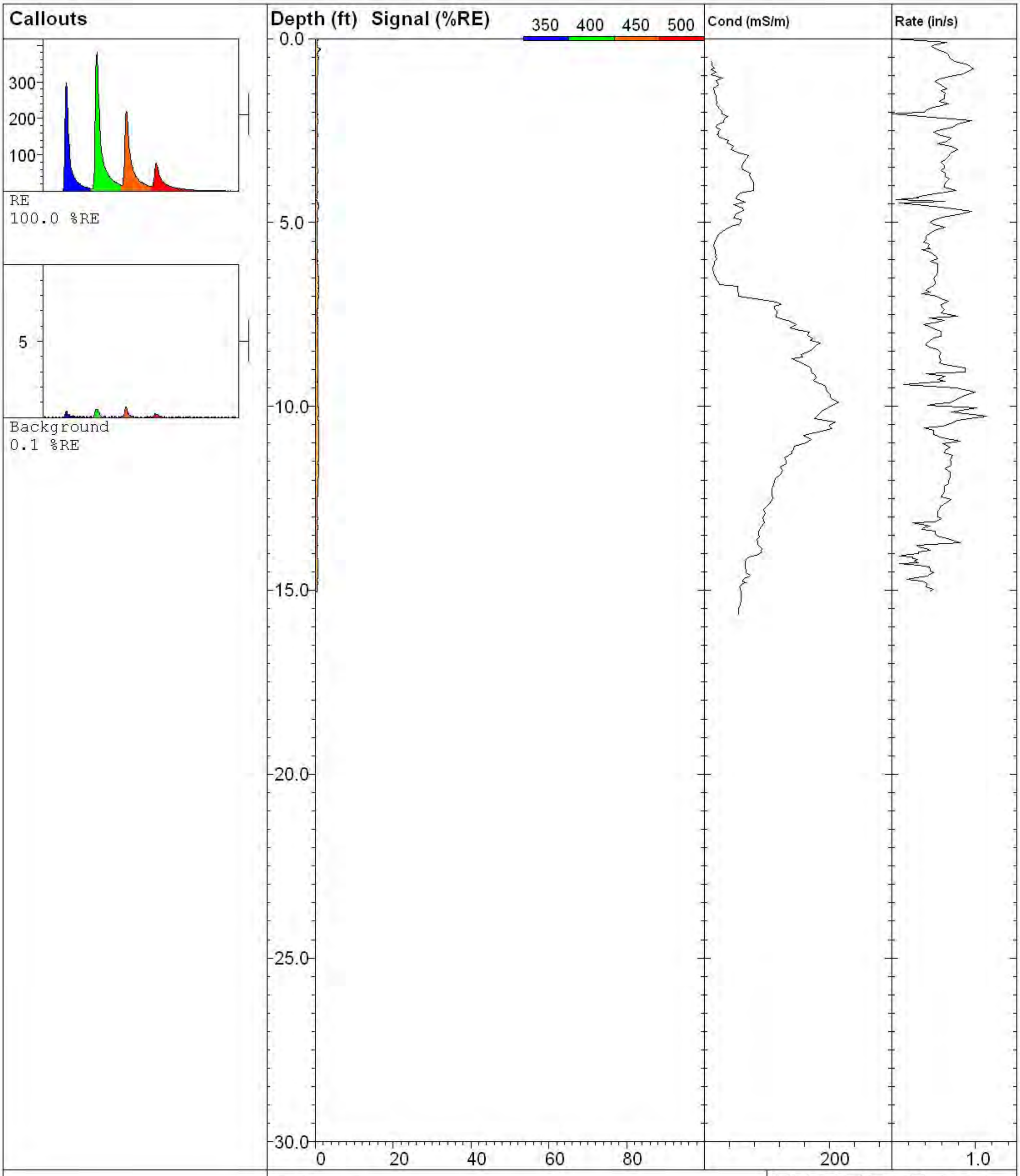


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LIF-020

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.4 % @ 0.84 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 15:29 CST**

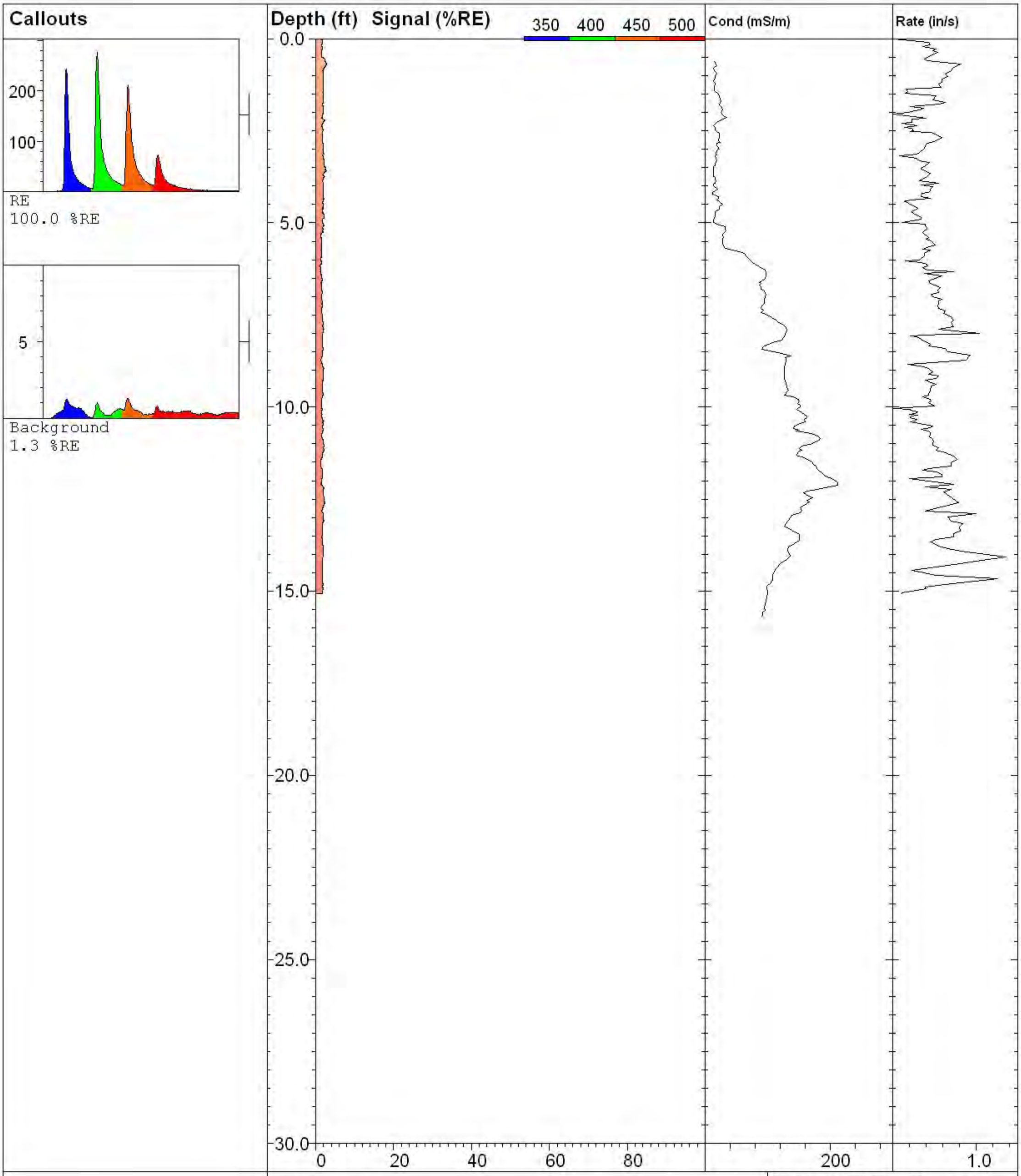


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LIF-021

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.3 % @ 0.30 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 08:52 CST**

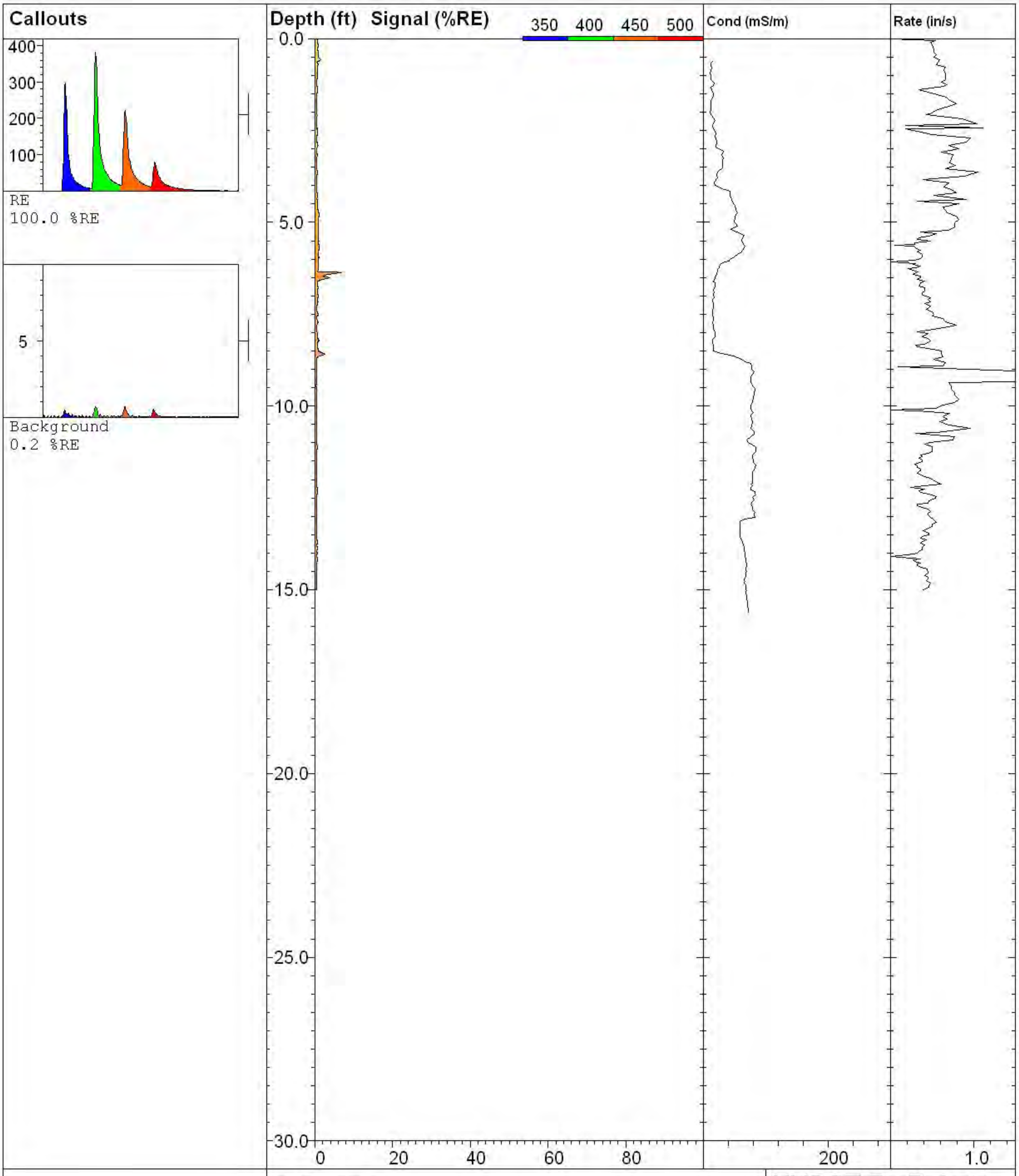


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LIF-022

UVOST By Dakota
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.06 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.8 % @ 0.70 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 09:05 CST**

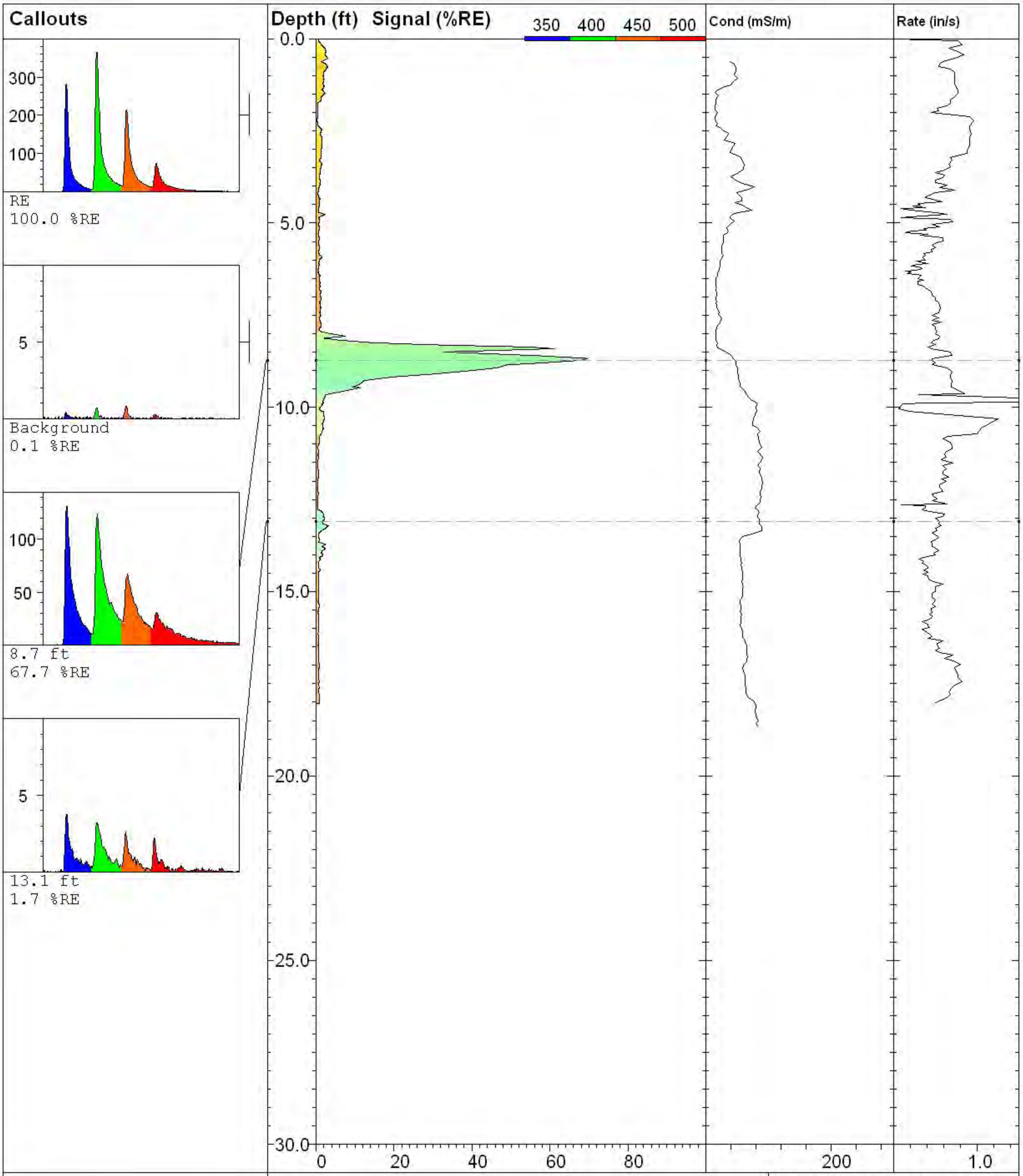


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LIF-023

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.9 % @ 6.36 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 12:22 CST**

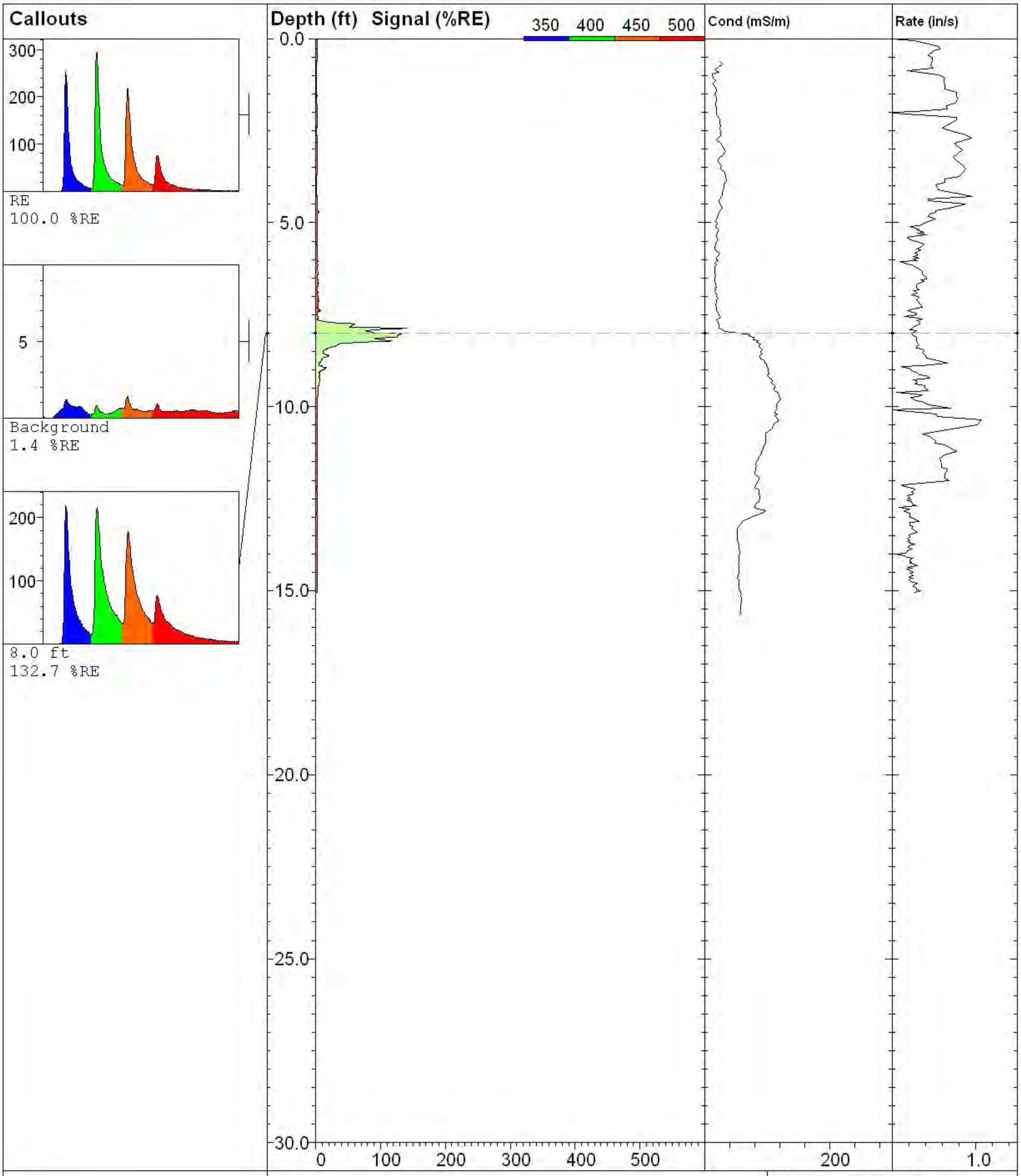


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LIF-024

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **69.7 % @ 8.67 ft**
Job:	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 16:00 CST**

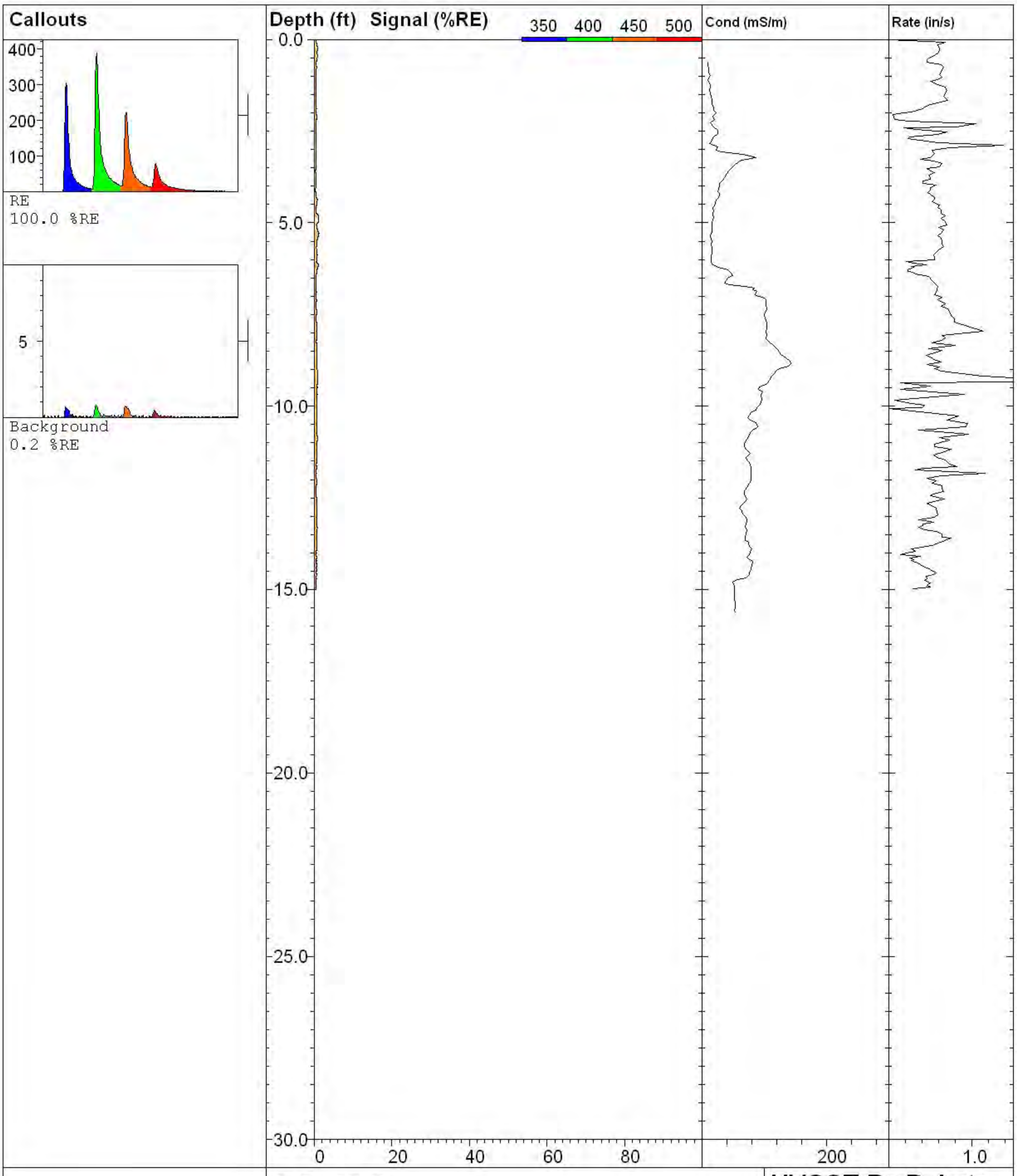


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LIF-025

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **141.2 % @ 7.87 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 16:09 CST**

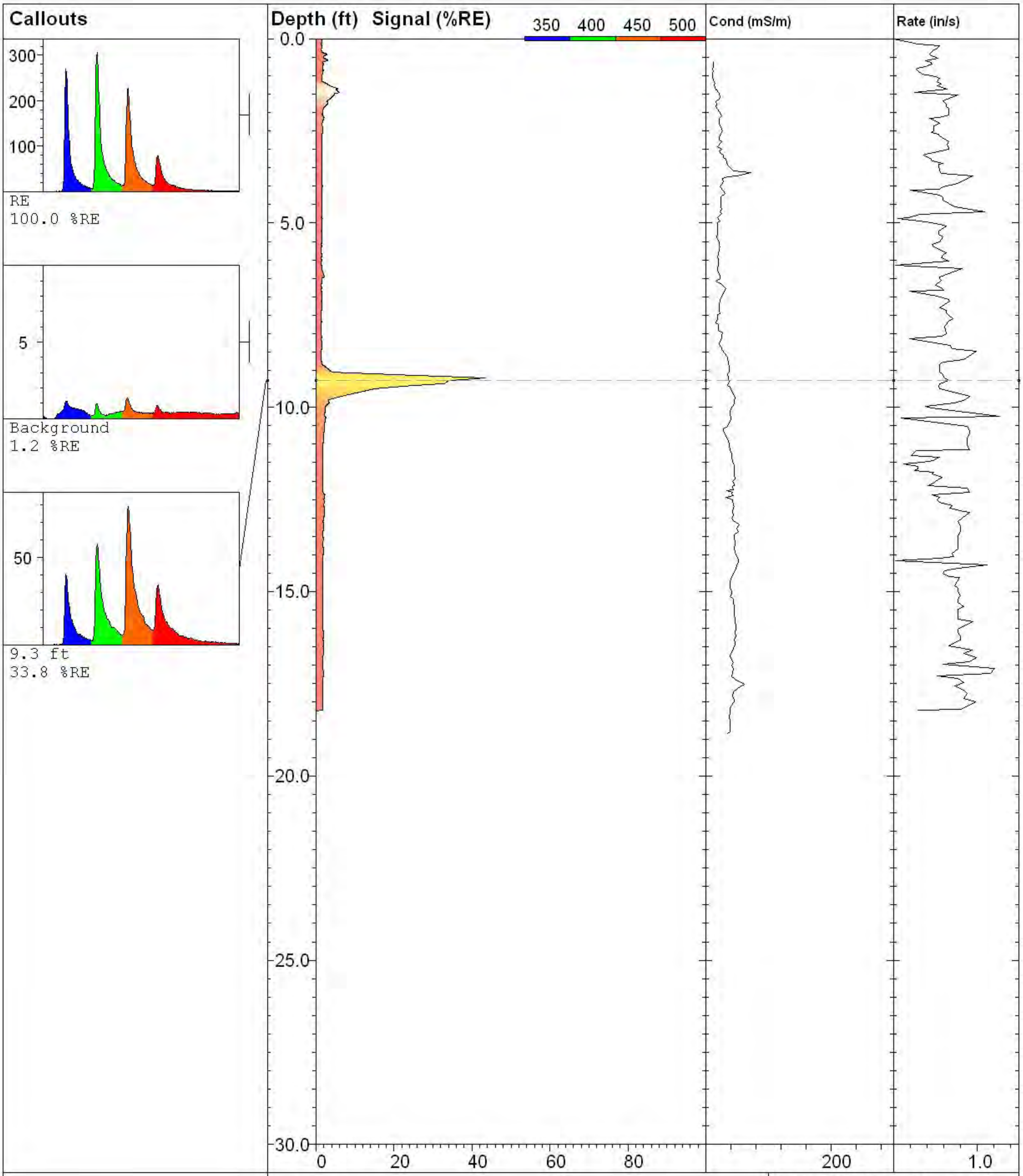


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LIF-026

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.2 % @ 5.28 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 08:16 CST**

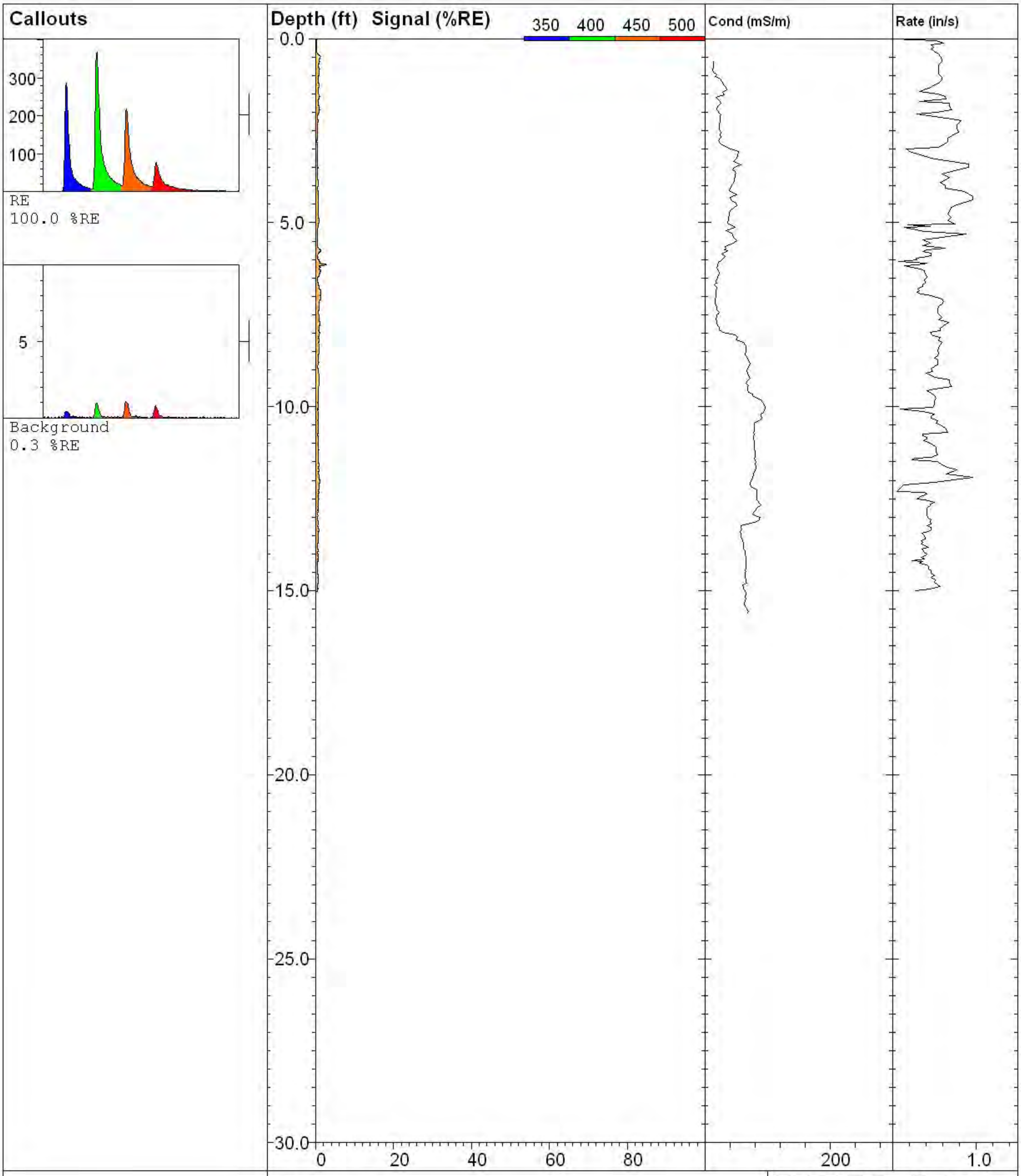


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LIF-027

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.23 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **43.6 % @ 9.20 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 14:08 CST**



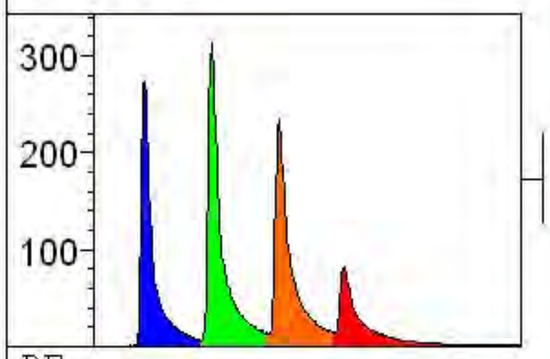
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LIF-028

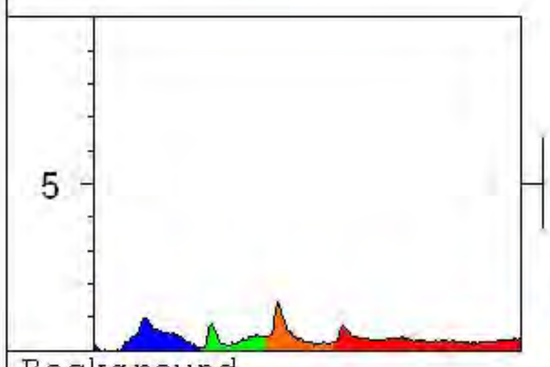
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.9 % @ 6.14 ft**
Job:	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 16:33 CST**

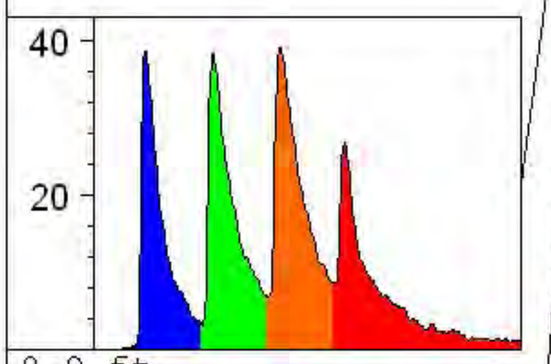
Callouts



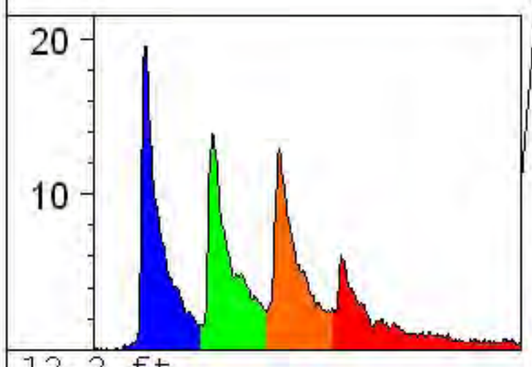
RE
100.0 %RE



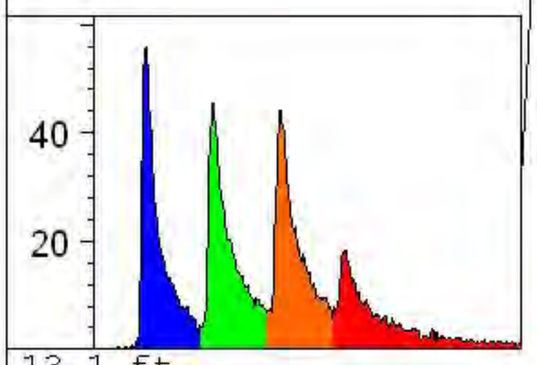
Background
1.0 %RE



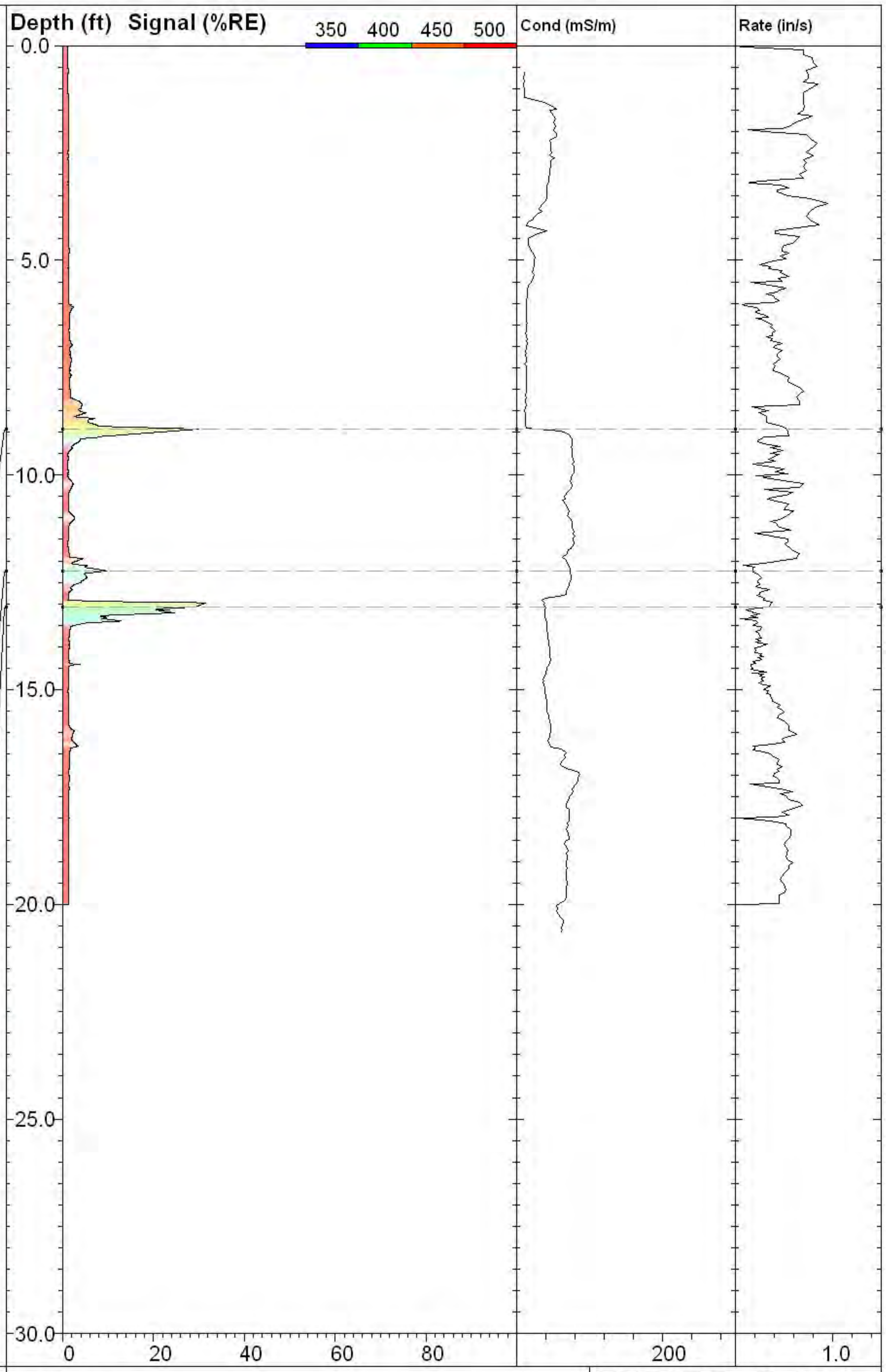
8.9 ft
30.2 %RE



12.2 ft
9.5 %RE



13.1 ft
29.1 %RE

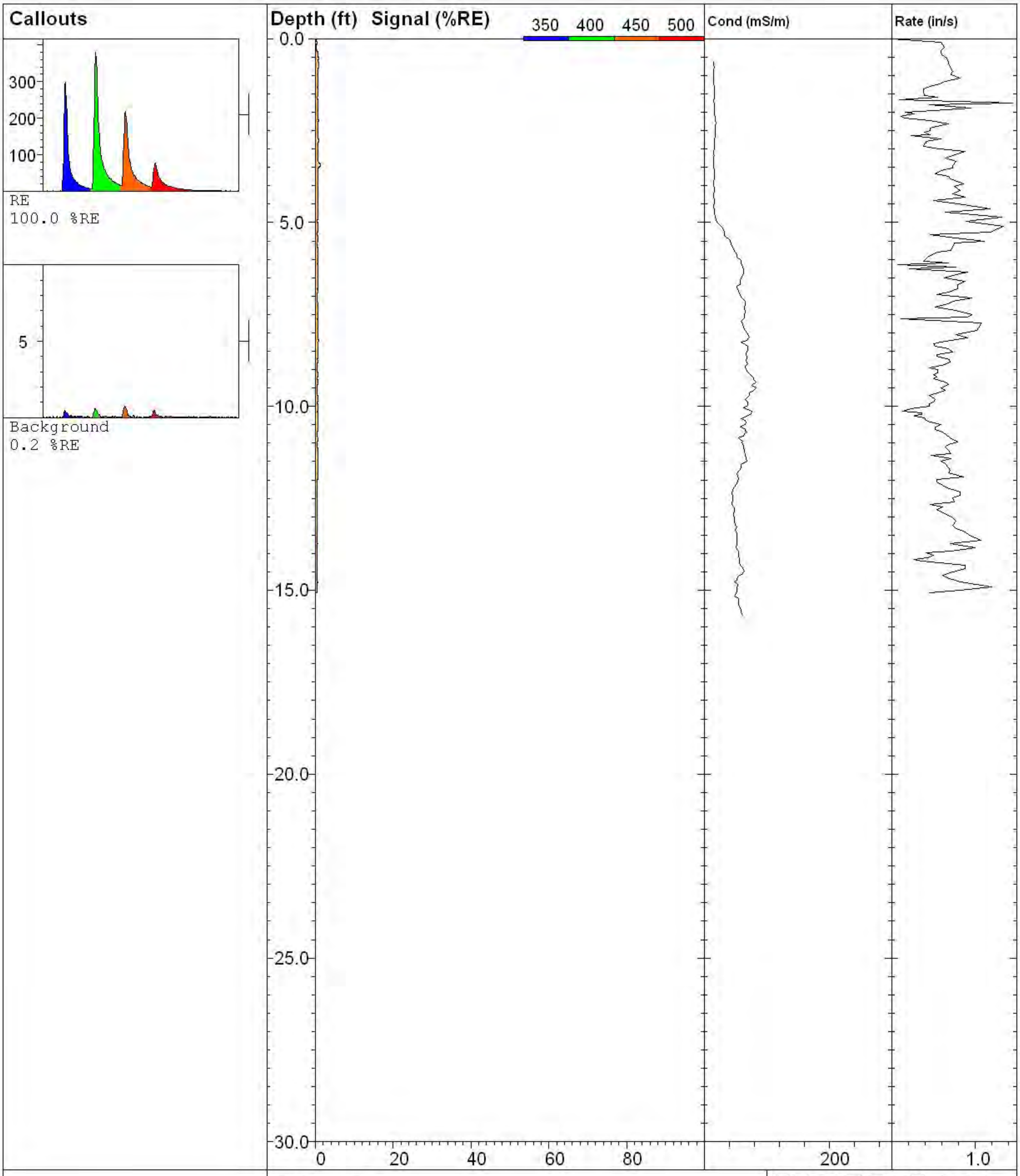


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LIF-029

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **20.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **31.5 % @ 12.97 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 10:06 CST**

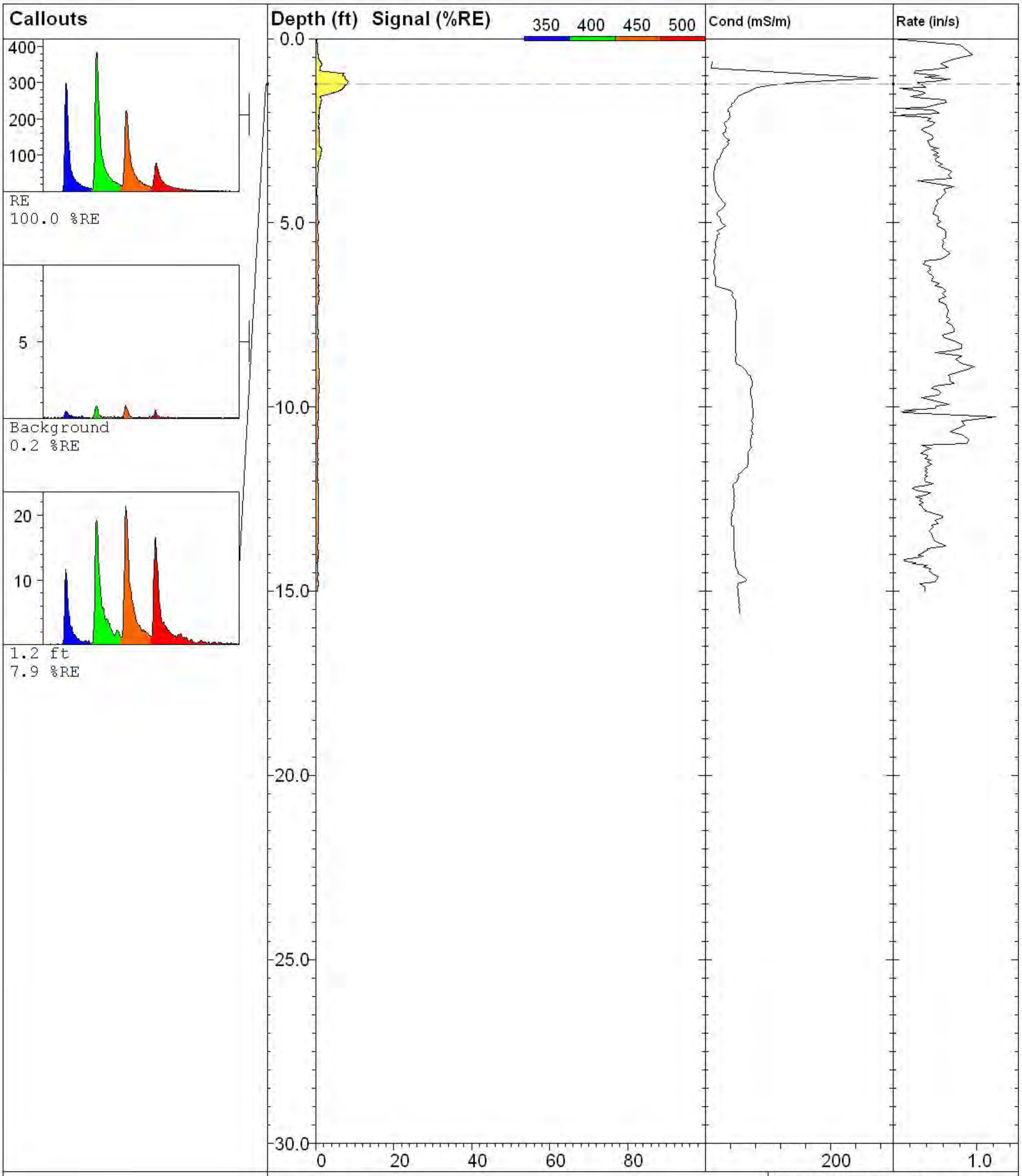


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LIF-030

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.06 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.4 % @ 3.44 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-22 11:24 CST**

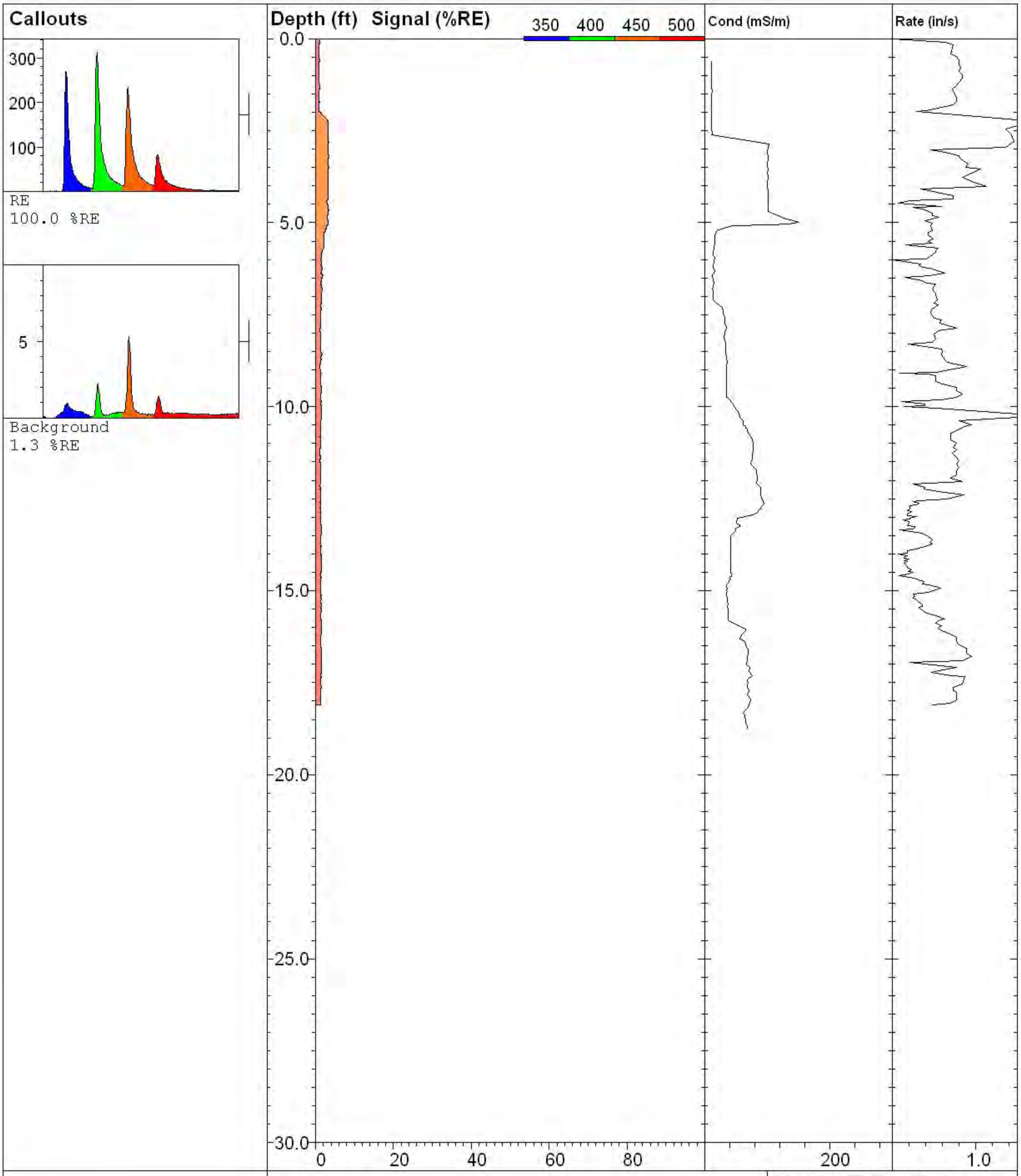


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LIF-031

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **8.3 % @ 1.16 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-22 10:39 CST**



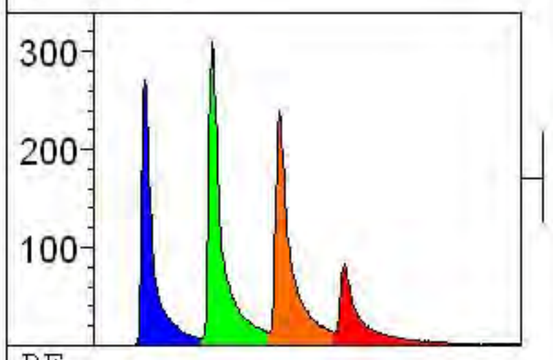
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LIF-032

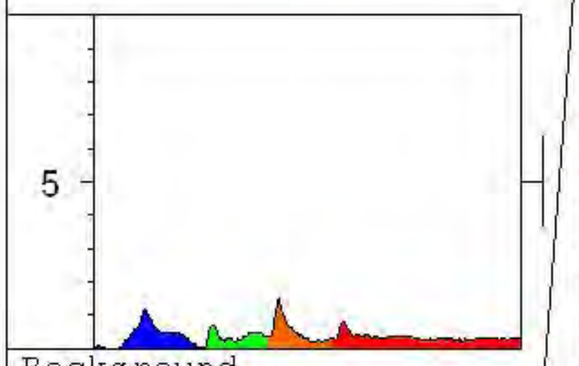
UVOST By Dakota
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.11 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.3 % @ 3.18 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 10:37 CST**

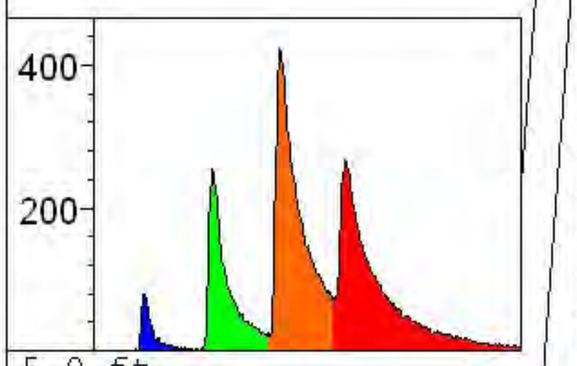
Callouts



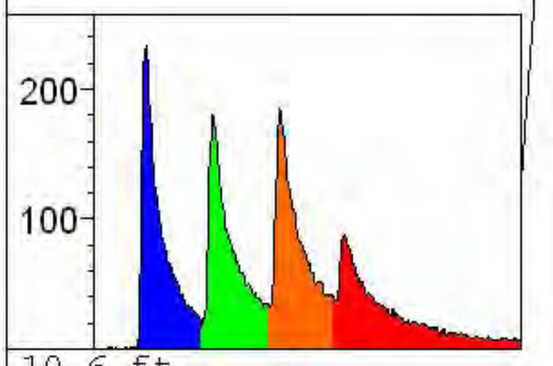
RE
100.0 %RE



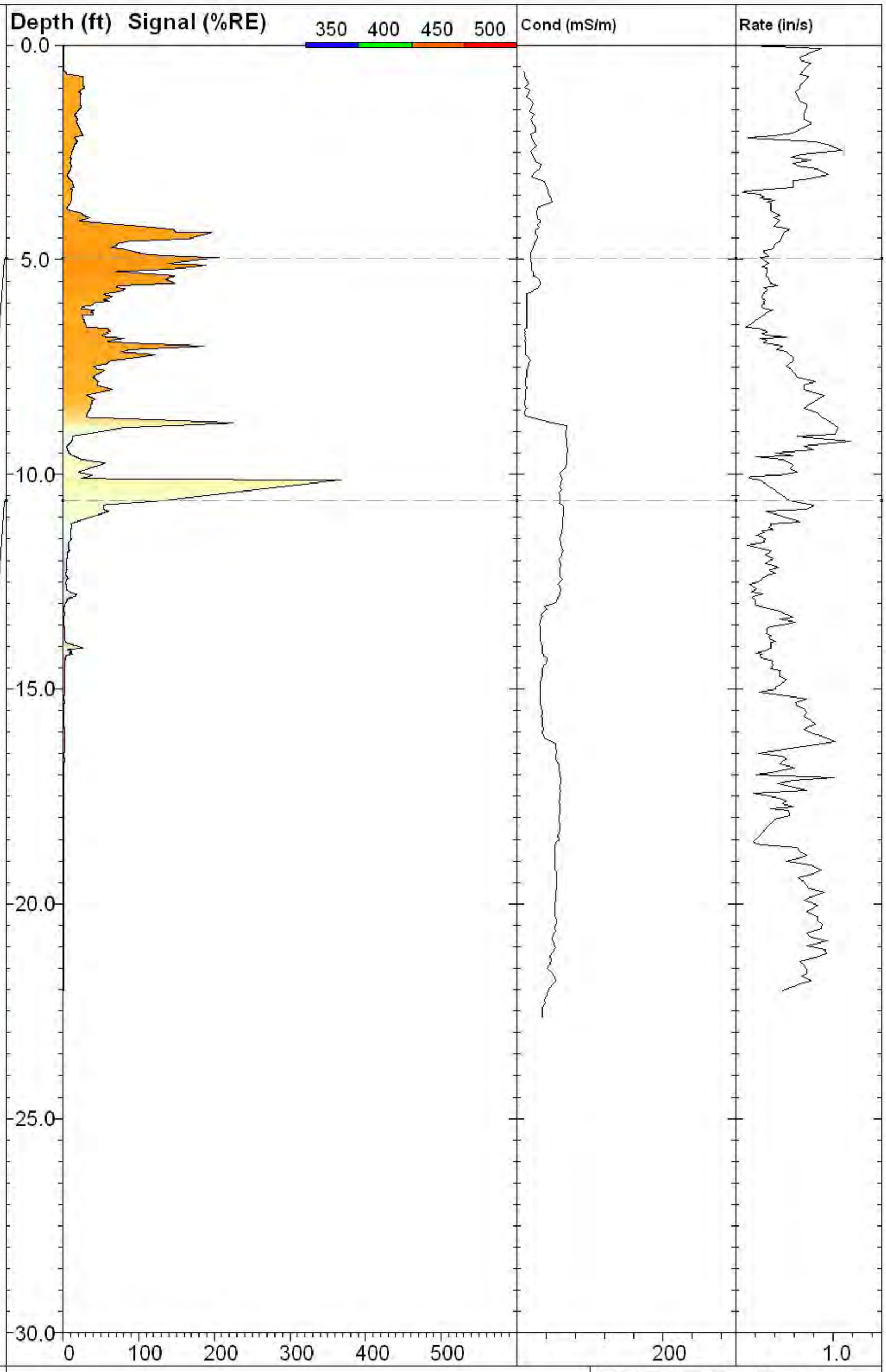
Background
1.0 %RE



5.0 ft
198.9 %RE



10.6 ft
135.9 %RE



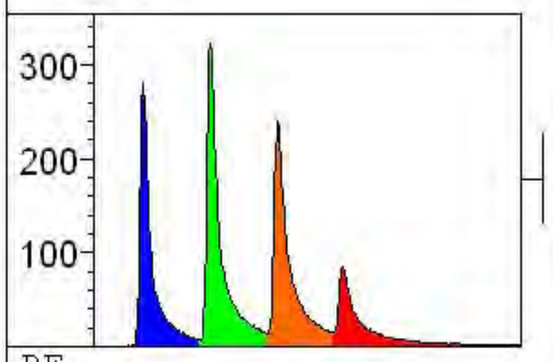
LIF-033

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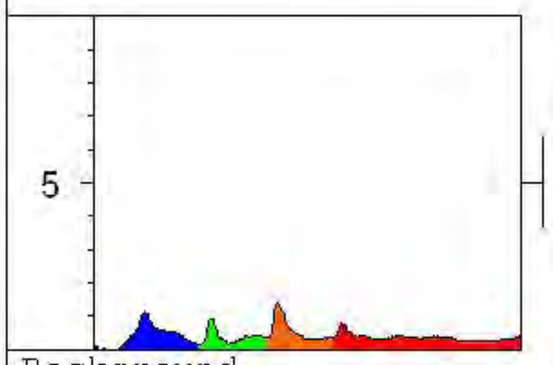
Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **22.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **367.8 % @ 10.12 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-21 13:18 CST**

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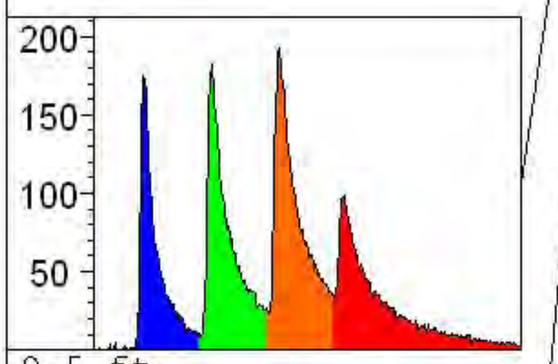
Callouts



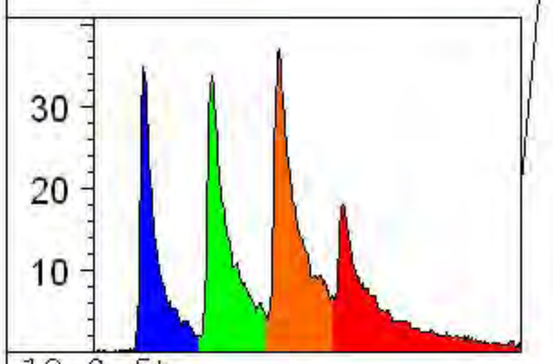
RE
100.0 %RE



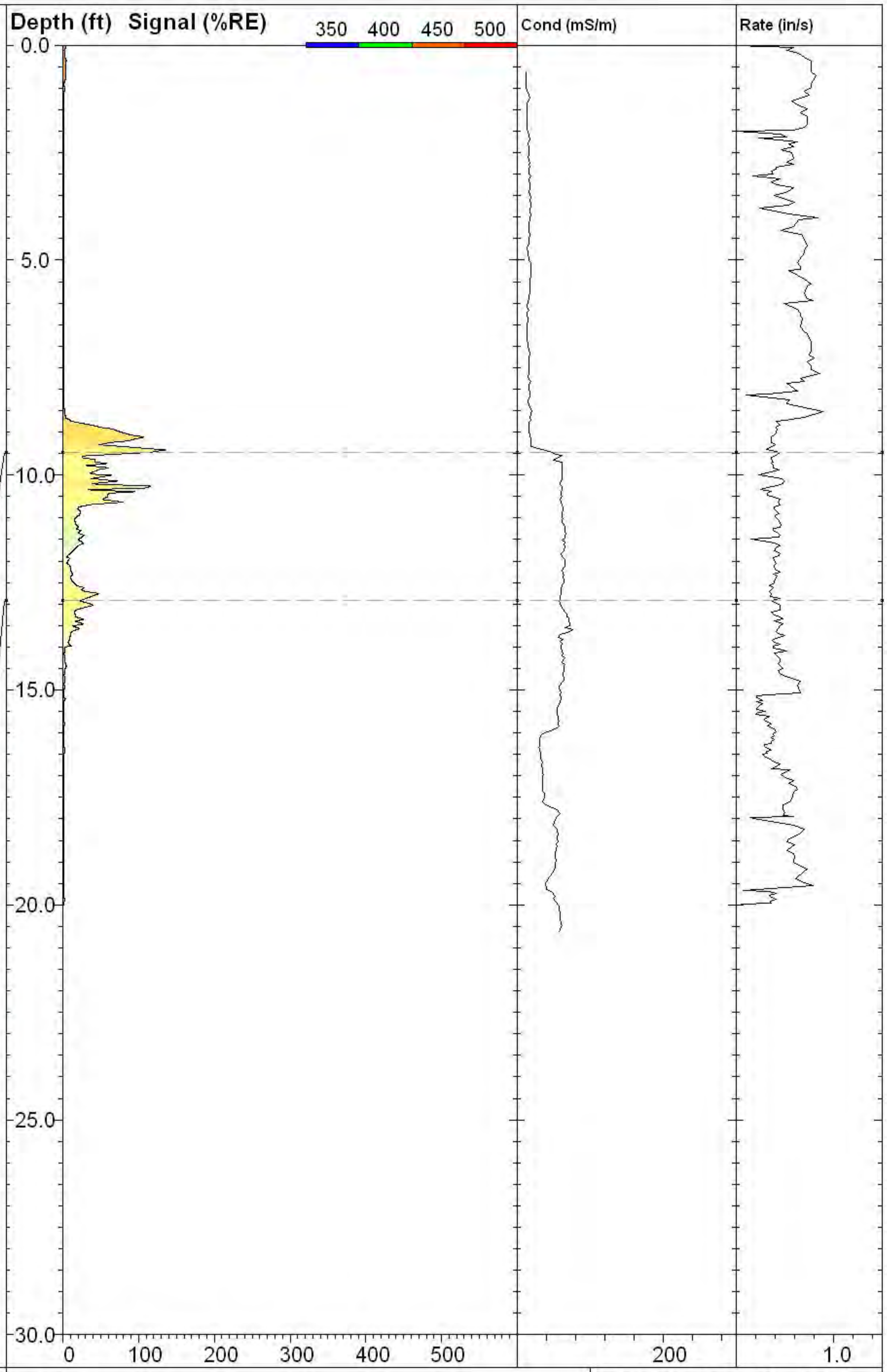
Background
1.1 %RE



9.5 ft
114.3 %RE



12.9 ft
21.3 %RE

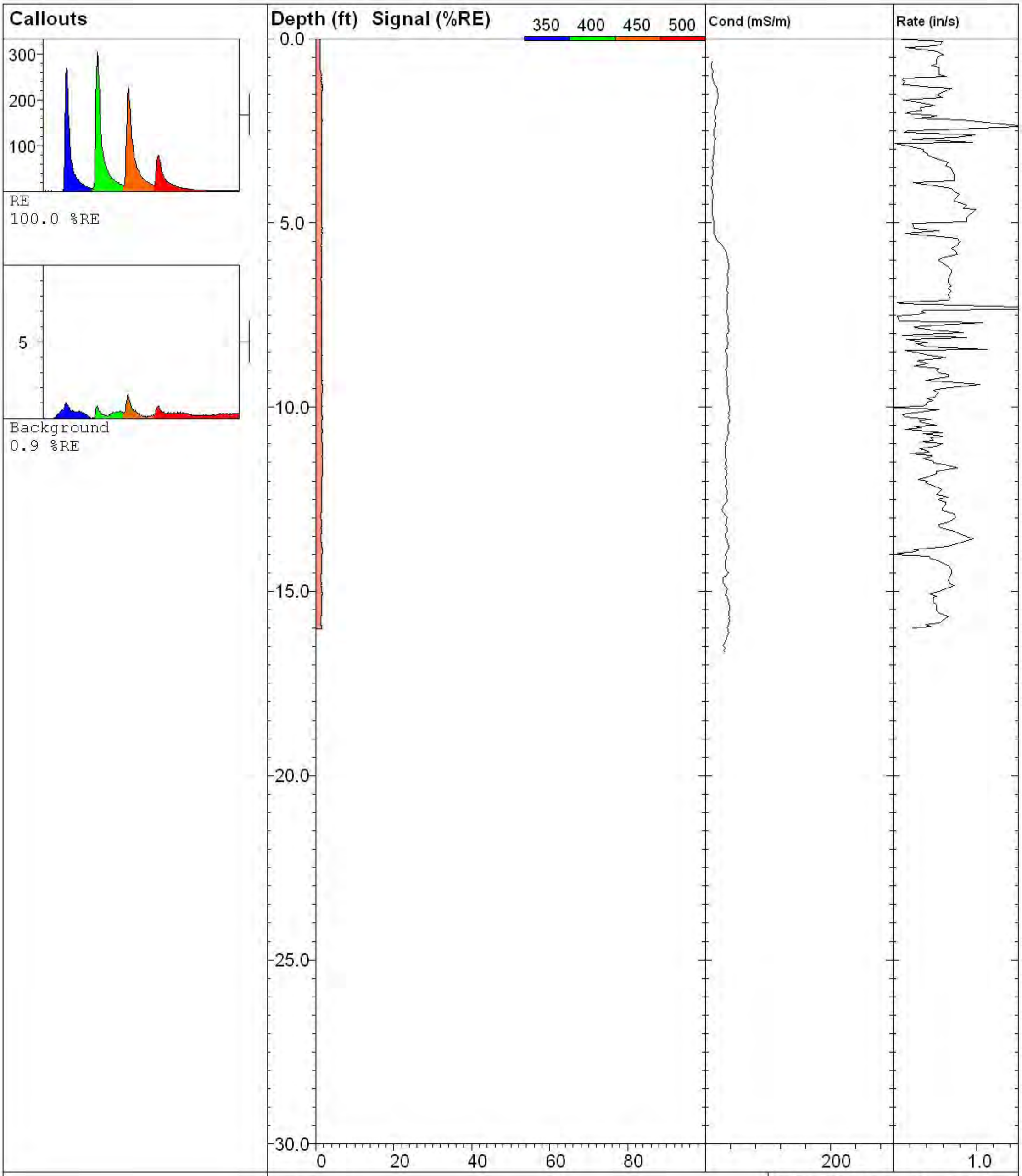


LIF-034

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **20.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **135.3 % @ 9.42 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-21 16:29 CST**

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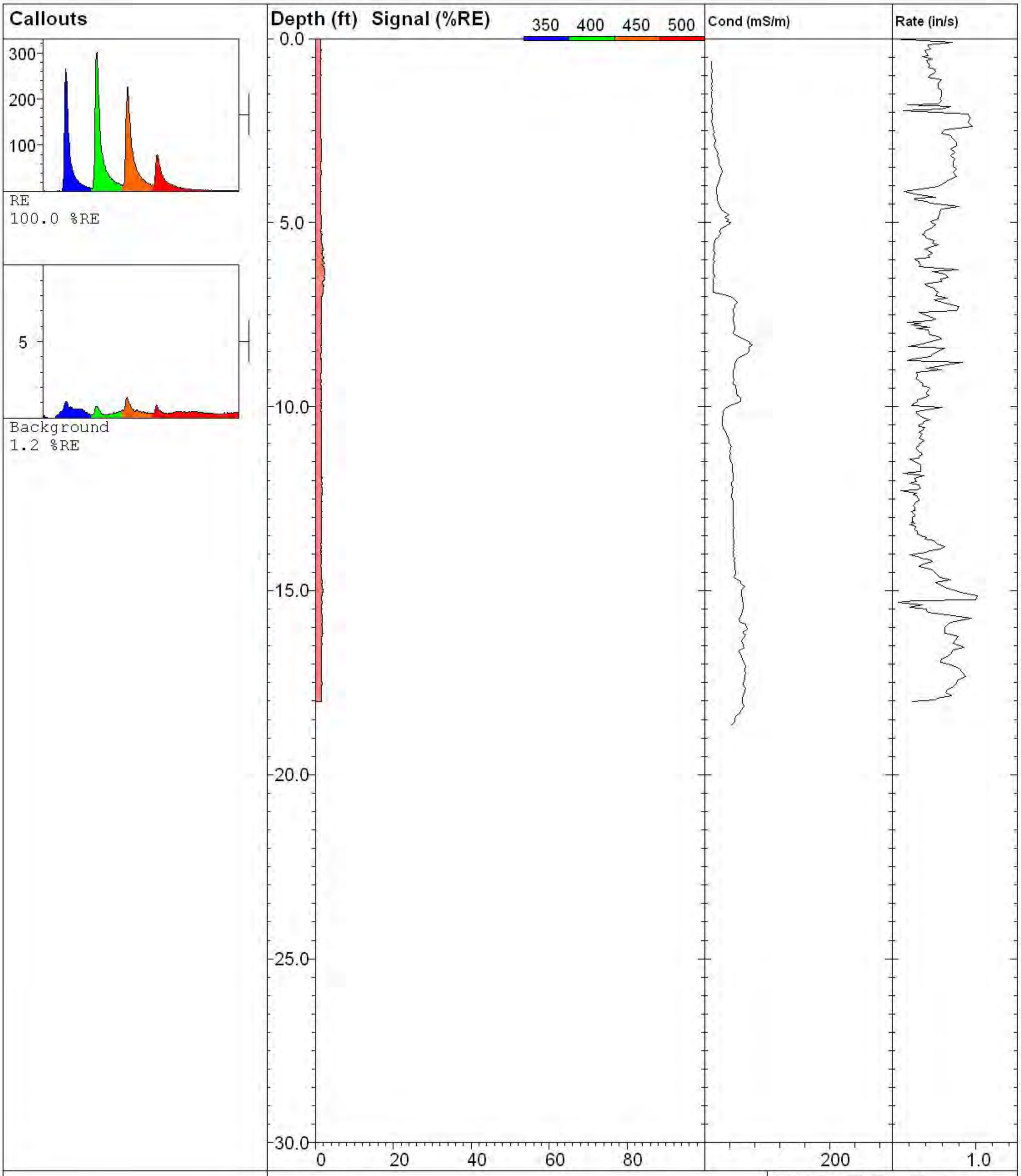


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LIF-035

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.7 % @ 11.80 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 08:48 CST**

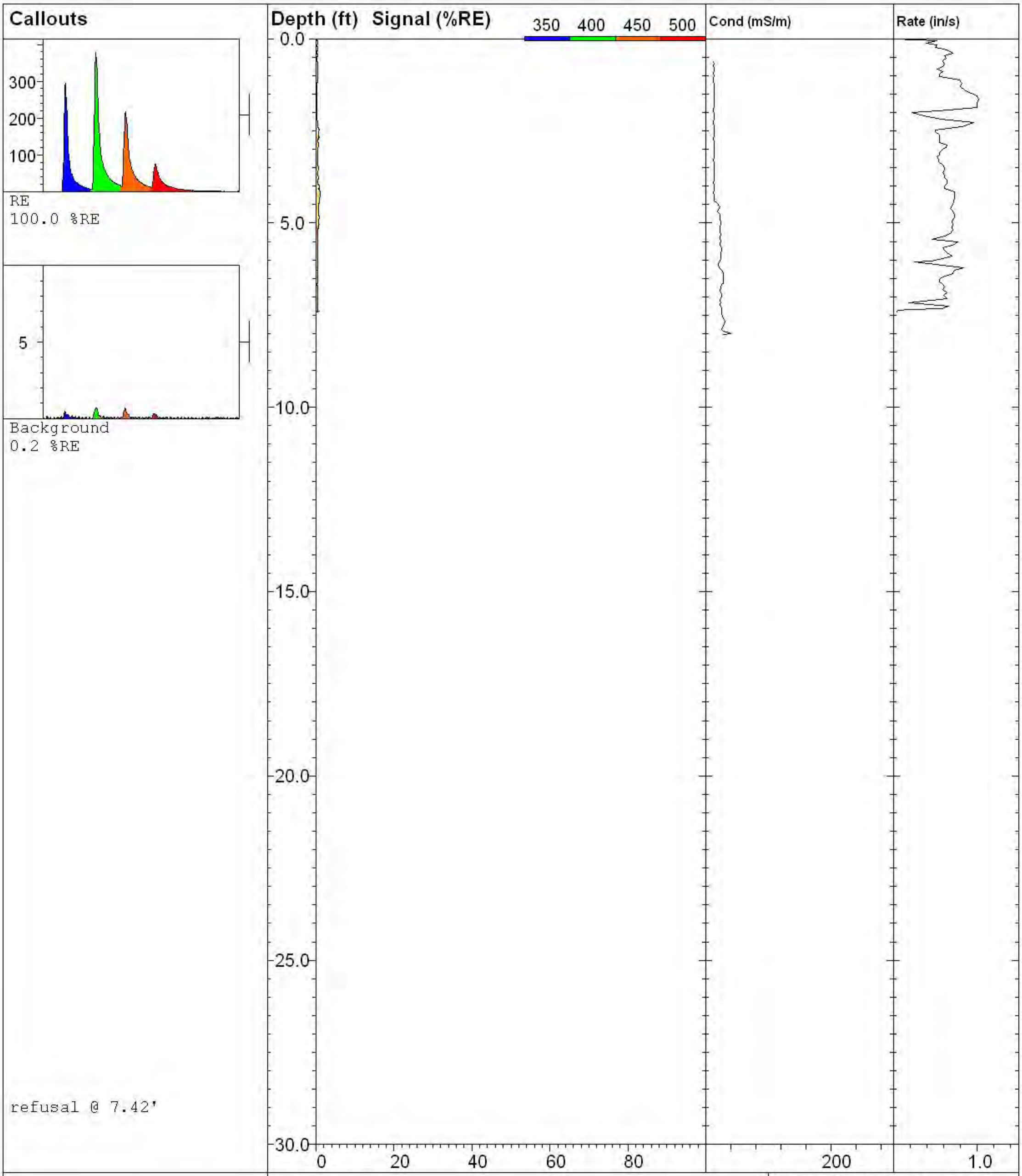


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LIF-036

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.4 % @ 6.33 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 14:43 CST**

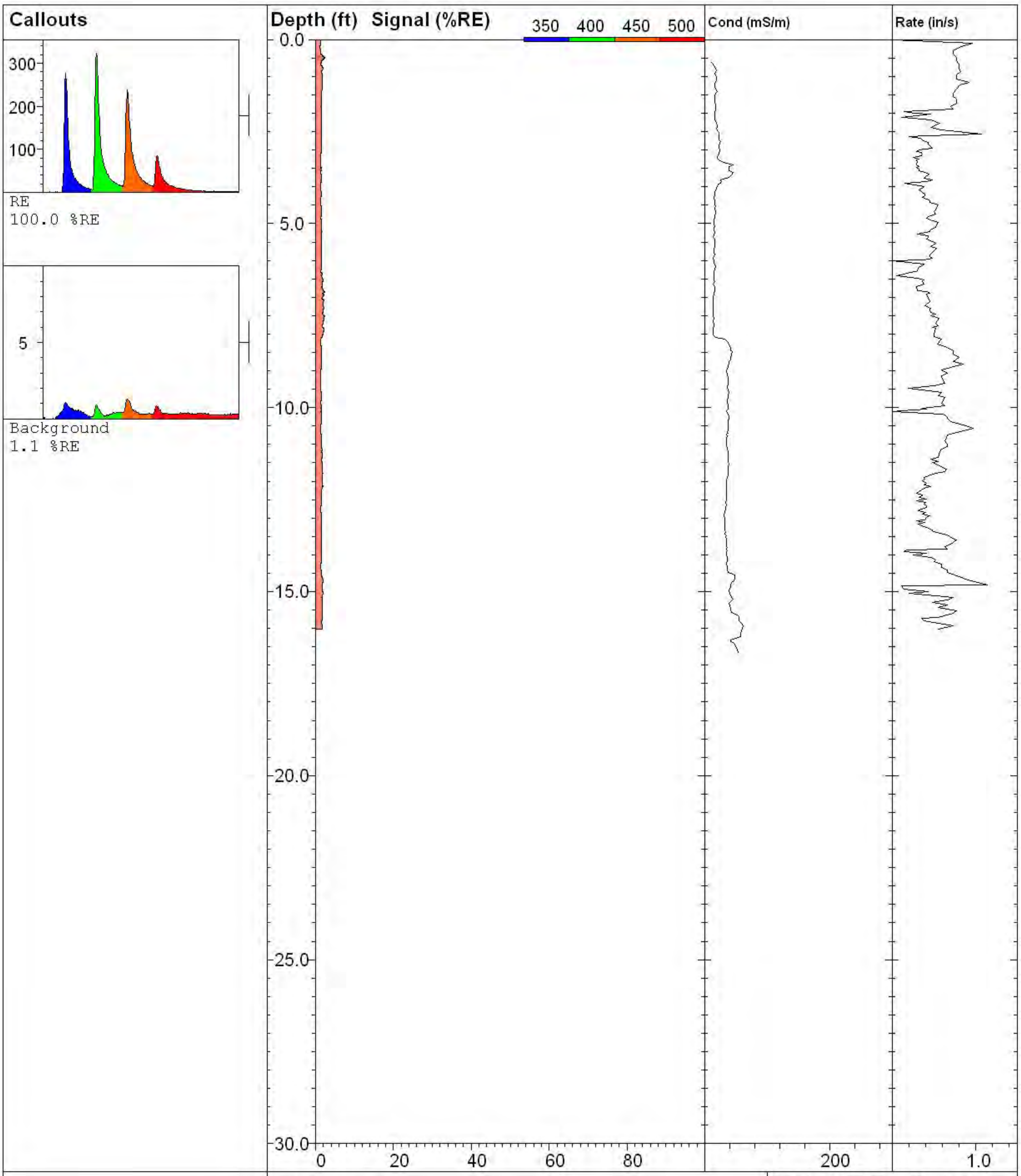


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LIF-037

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **7.42 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.1 % @ 4.25 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-22 14:21 CST**

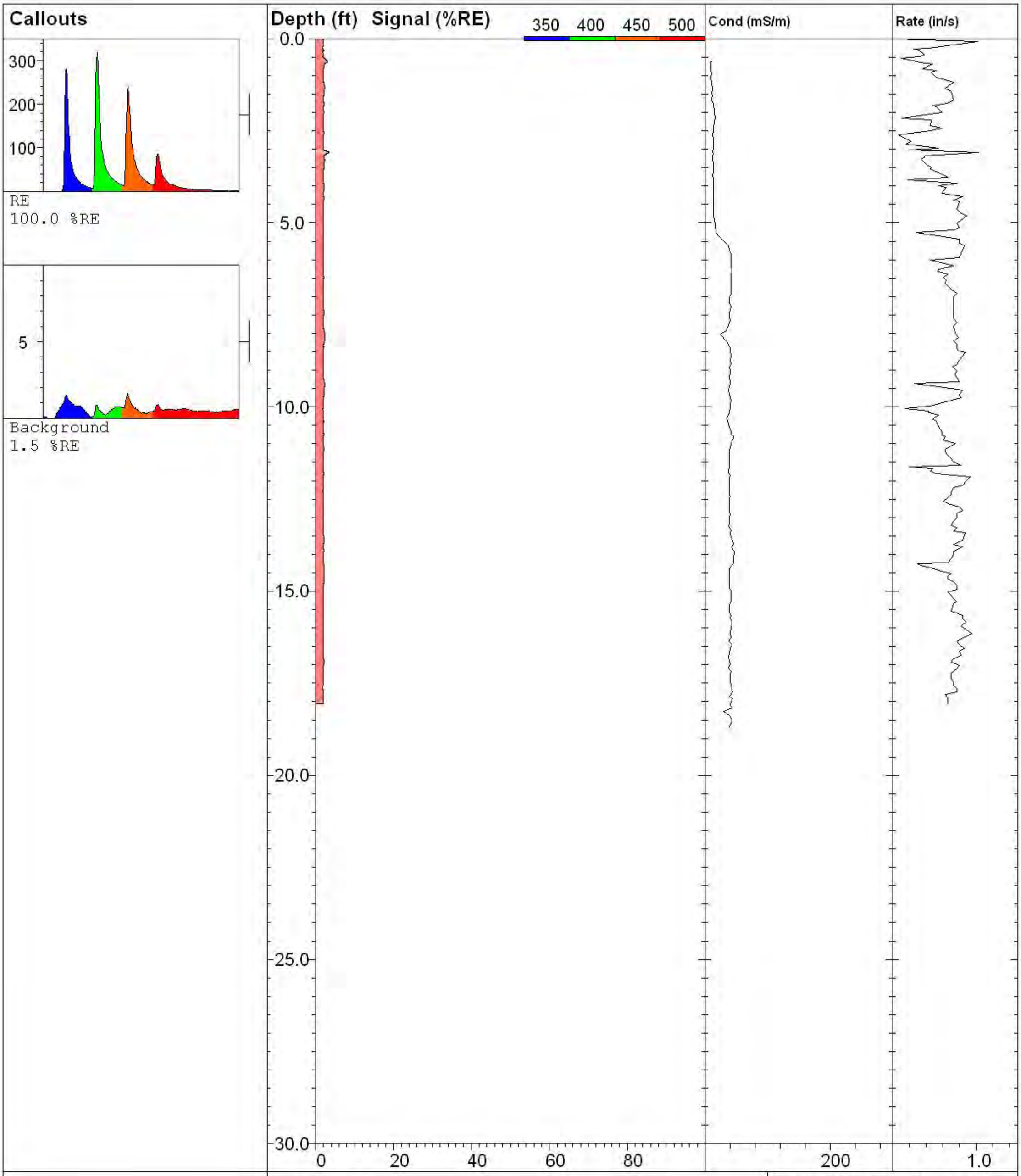


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LIF-039

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.4 % @ 6.85 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-21 17:04 CST**

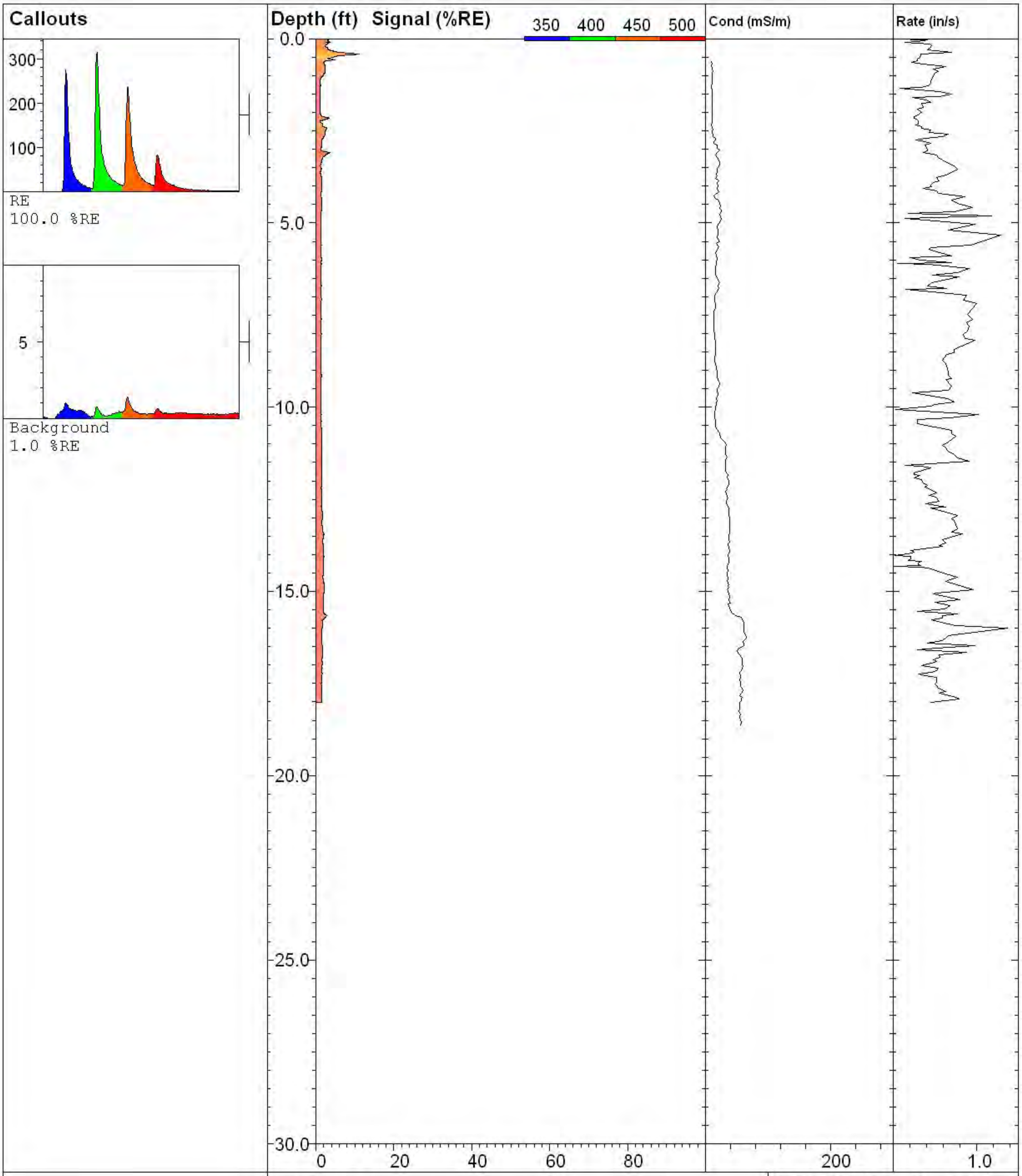


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LIF-040

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.07 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.5 % @ 3.08 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 09:25 CST**

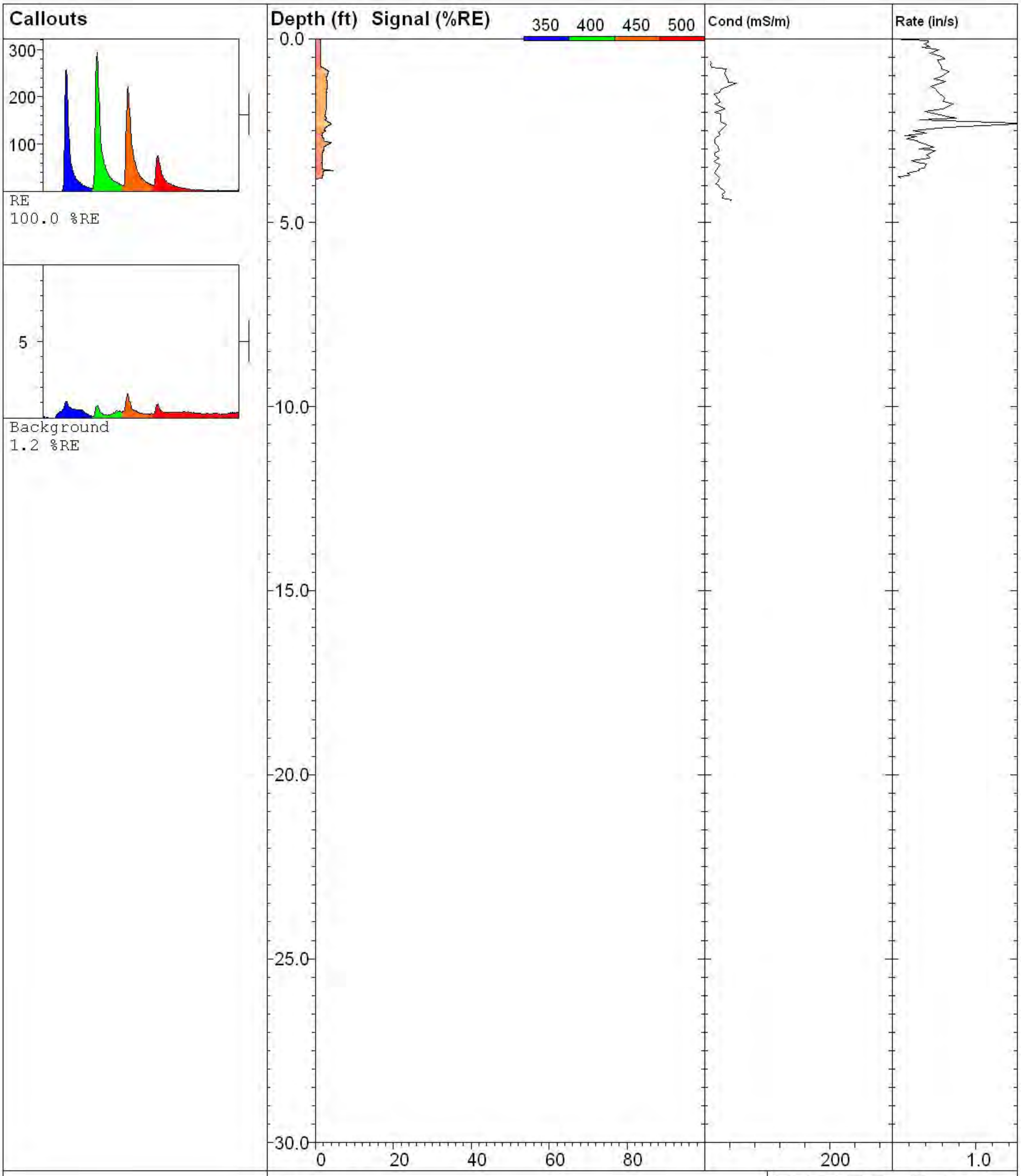


LIF-041

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **11.2 % @ 0.42 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 13:06 CST**

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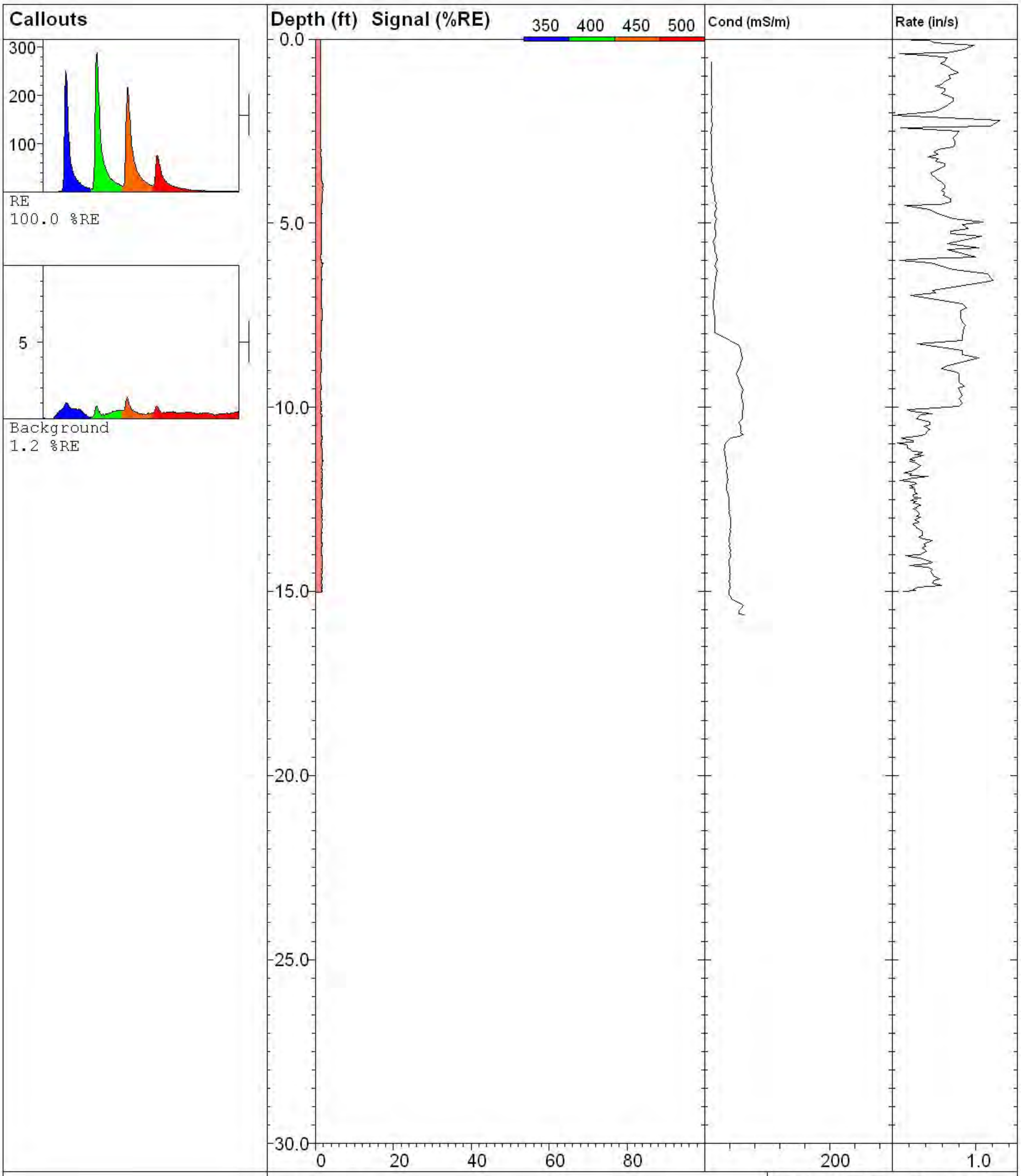


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LIF-042

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **3.80 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.5 % @ 3.59 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 12:38 CST**

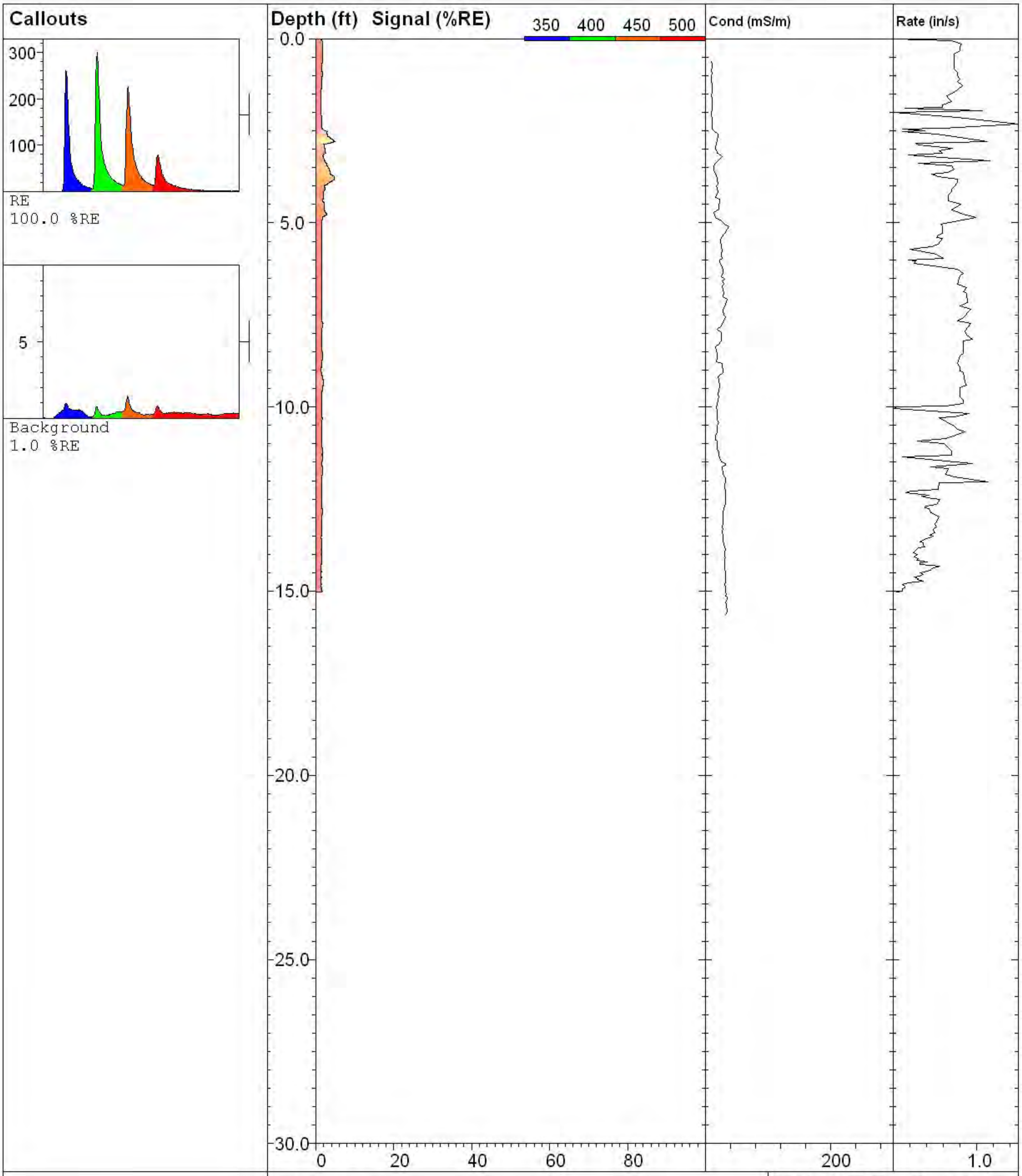


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LIF-043

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.0 % @ 6.08 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 09:56 CST**

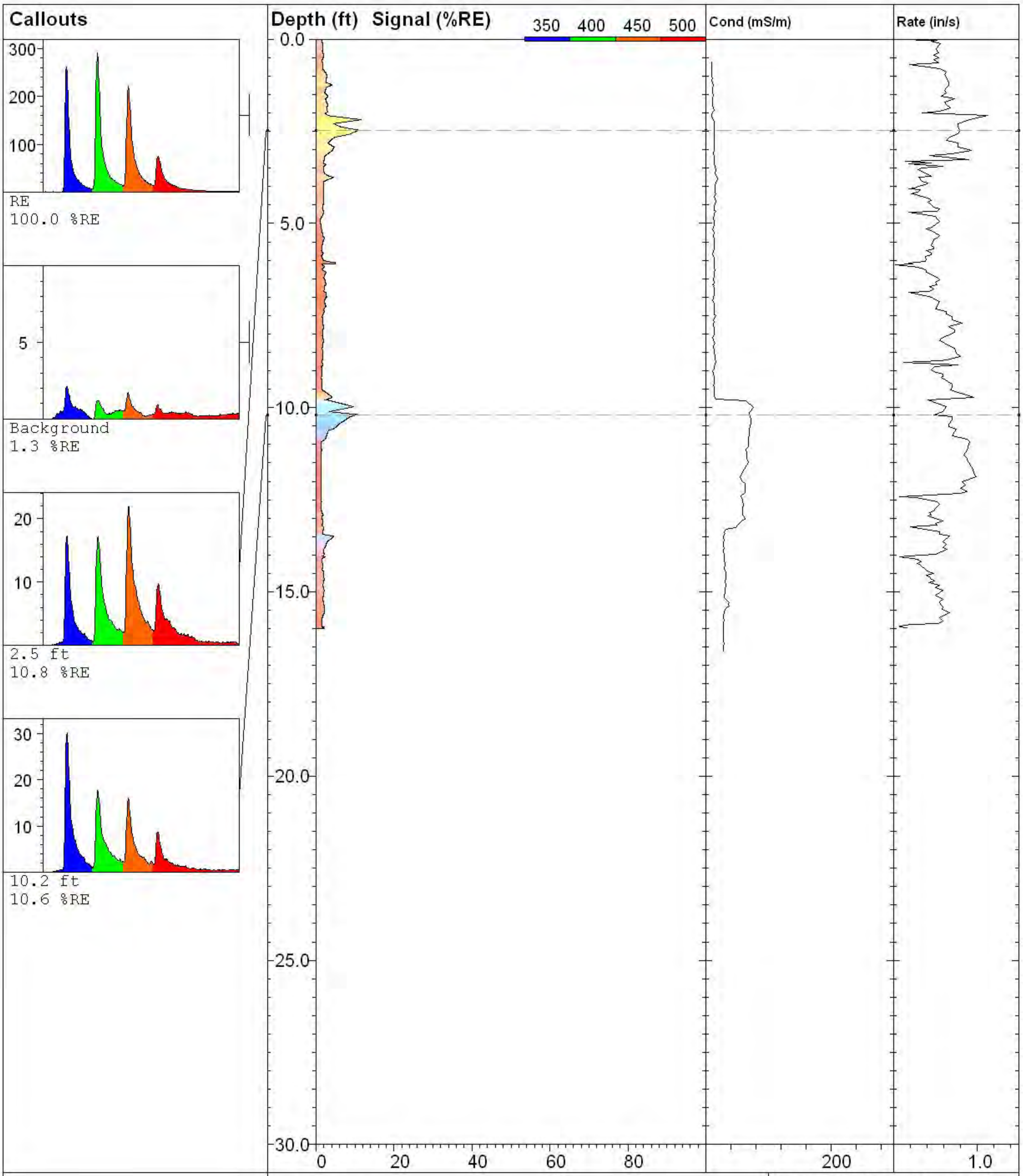


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LIF-044

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.8 % @ 2.79 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 09:29 CST**

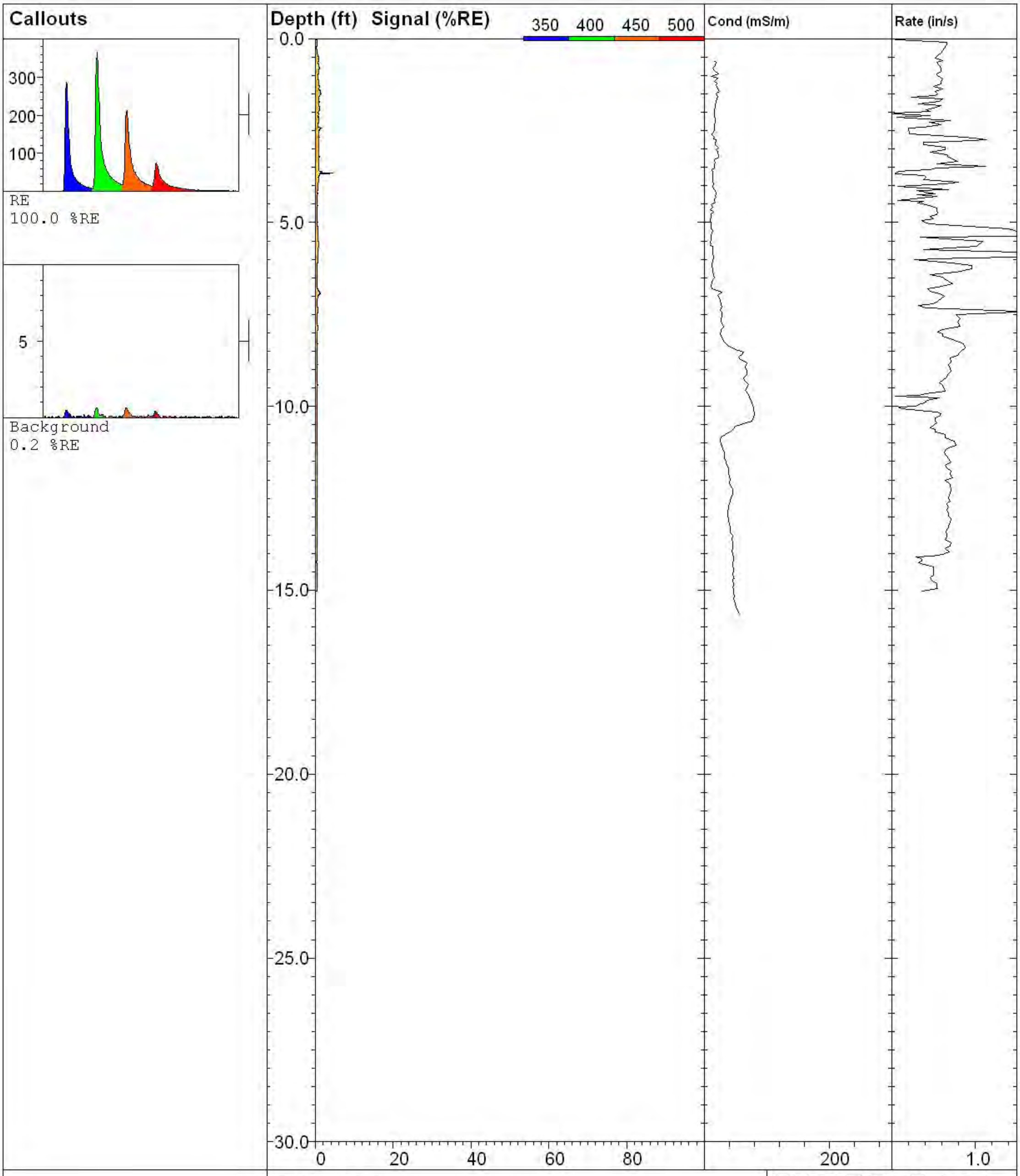


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LIF-045

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **11.6 % @ 2.19 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 08:40 CST**

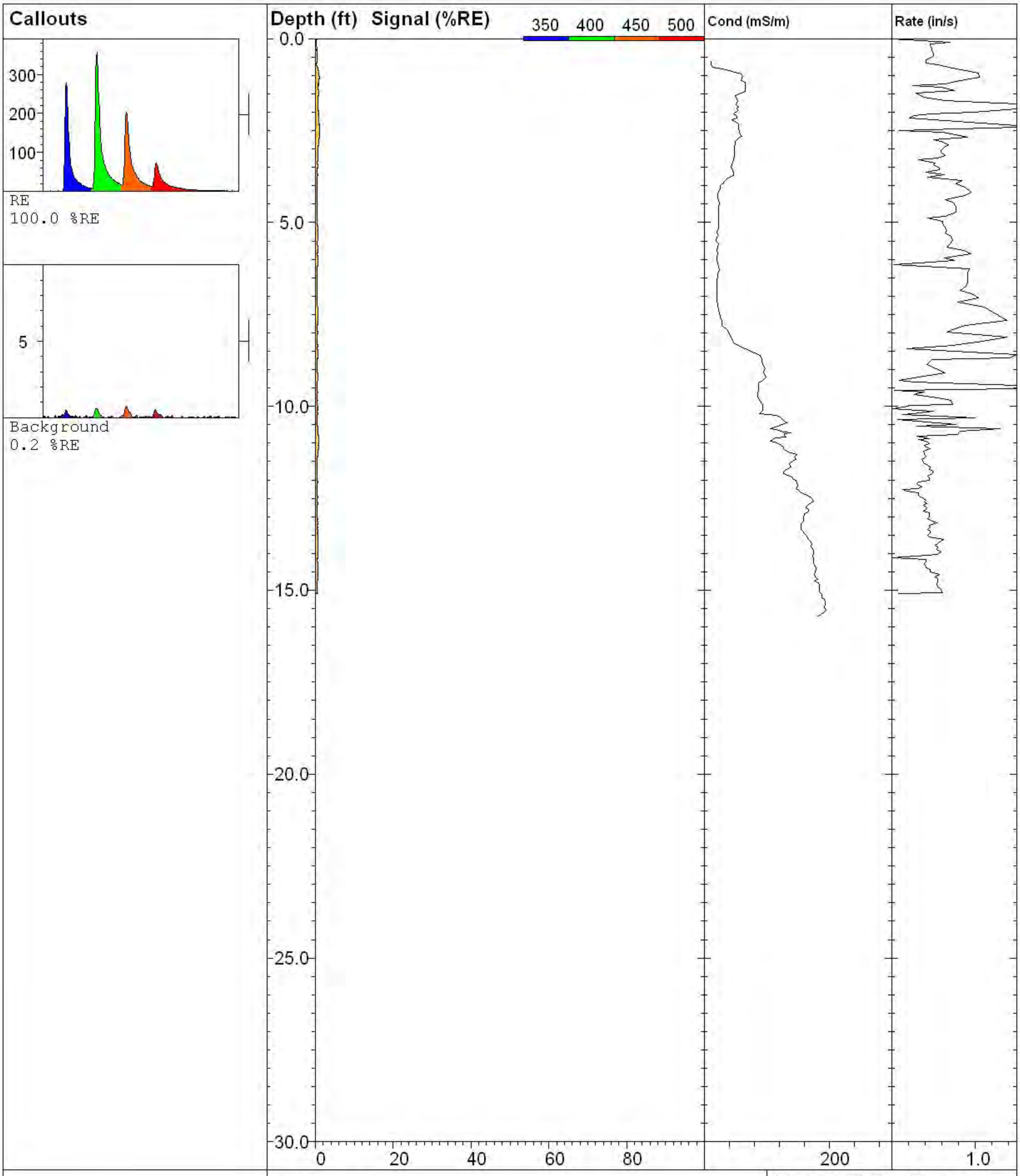


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LIF-046

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.8 % @ 3.66 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 16:01 CST**

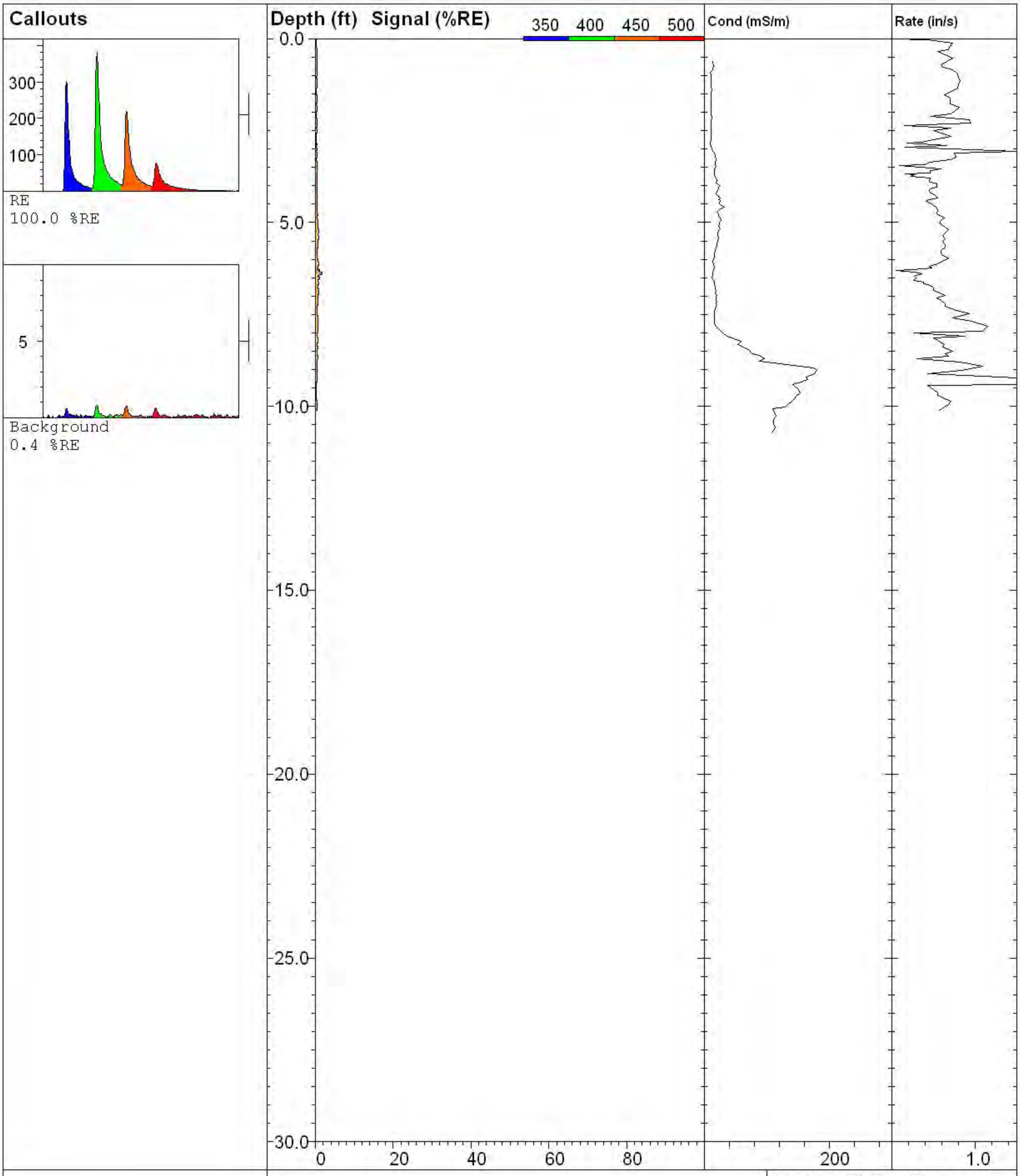


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.09 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.1 % @ 2.55 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 14:12 CST**

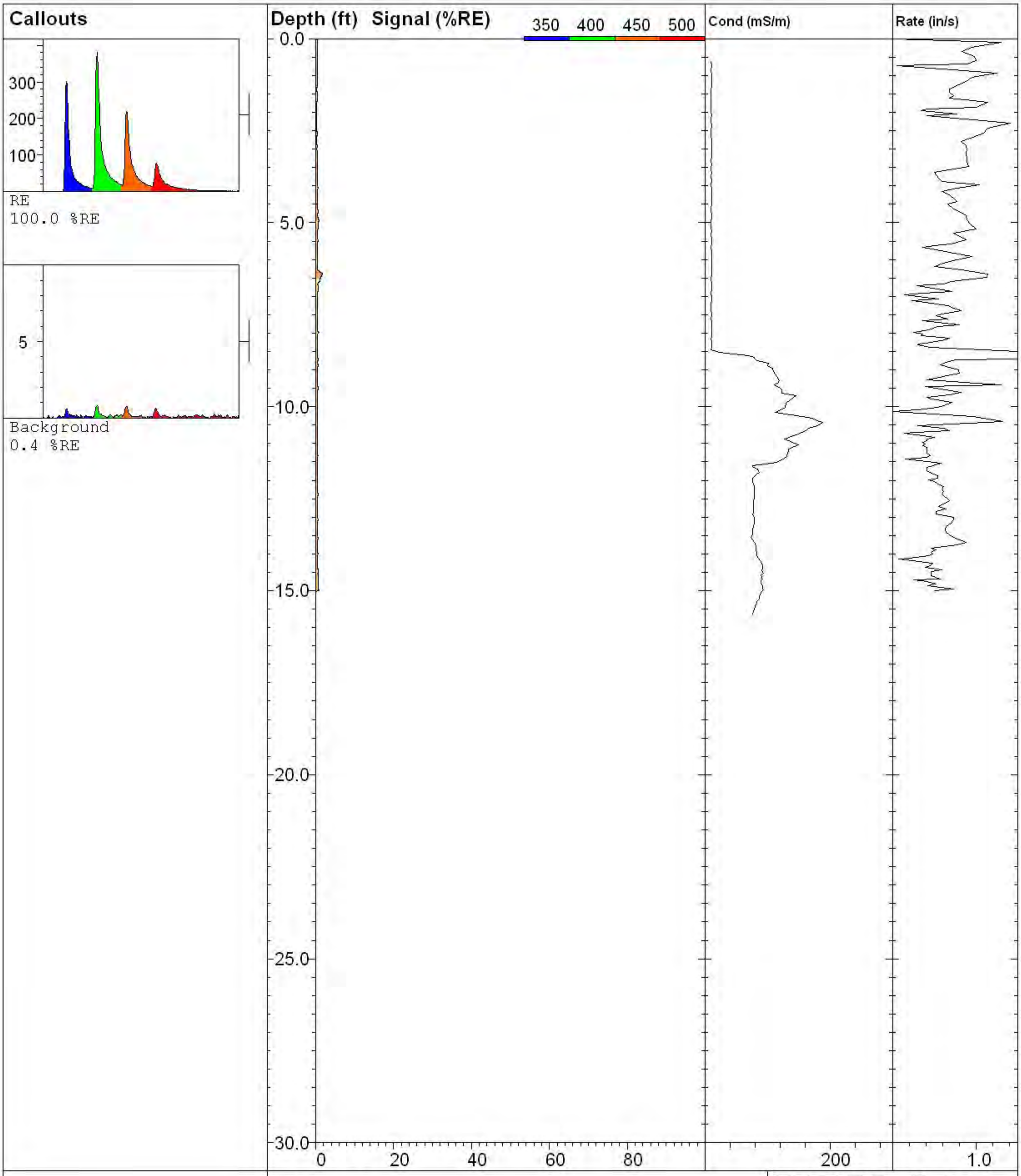


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **10.12 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.8 % @ 6.36 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 15:16 CST**

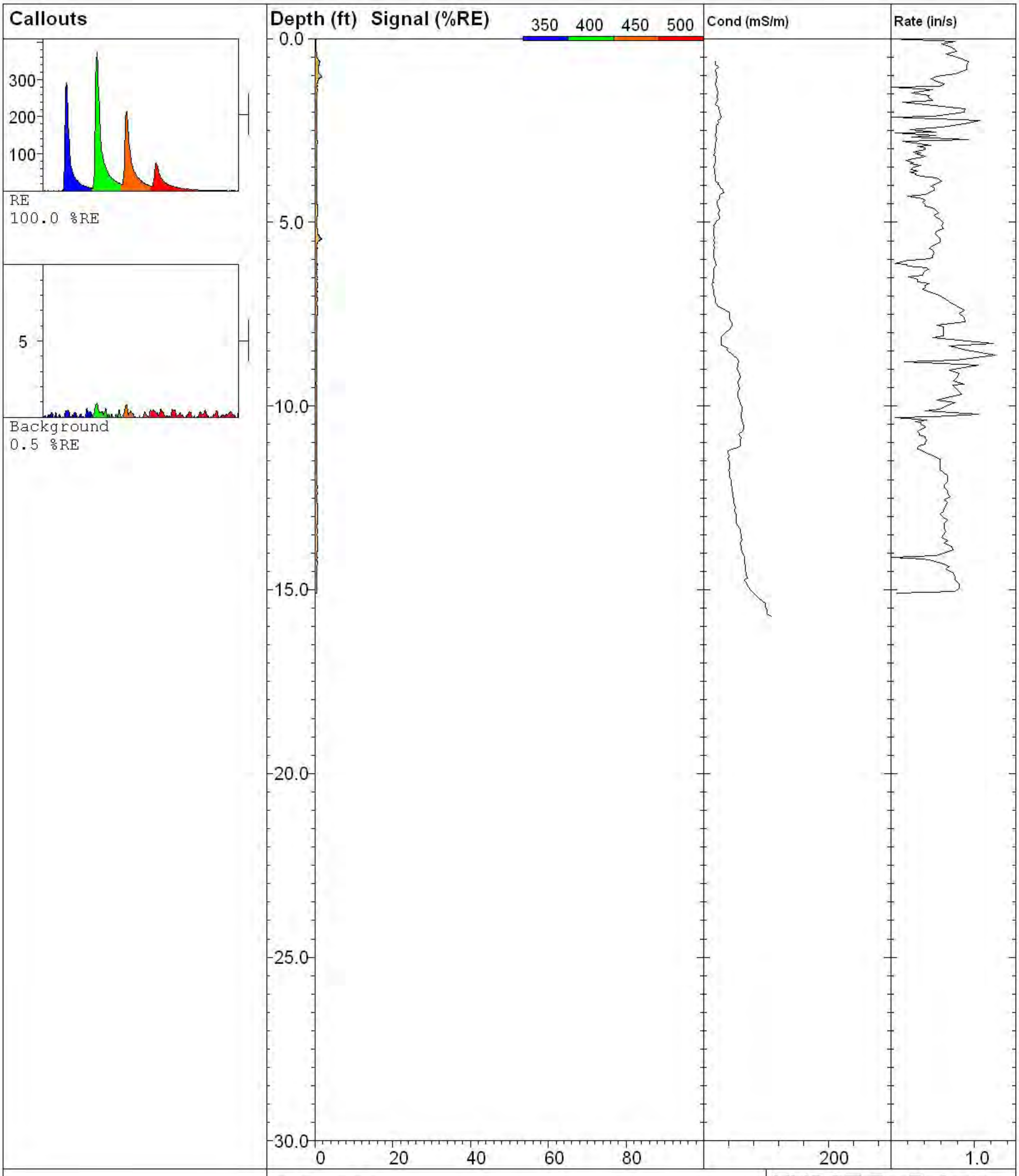


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LIF-048A

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.8 % @ 6.39 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 15:31 CST**

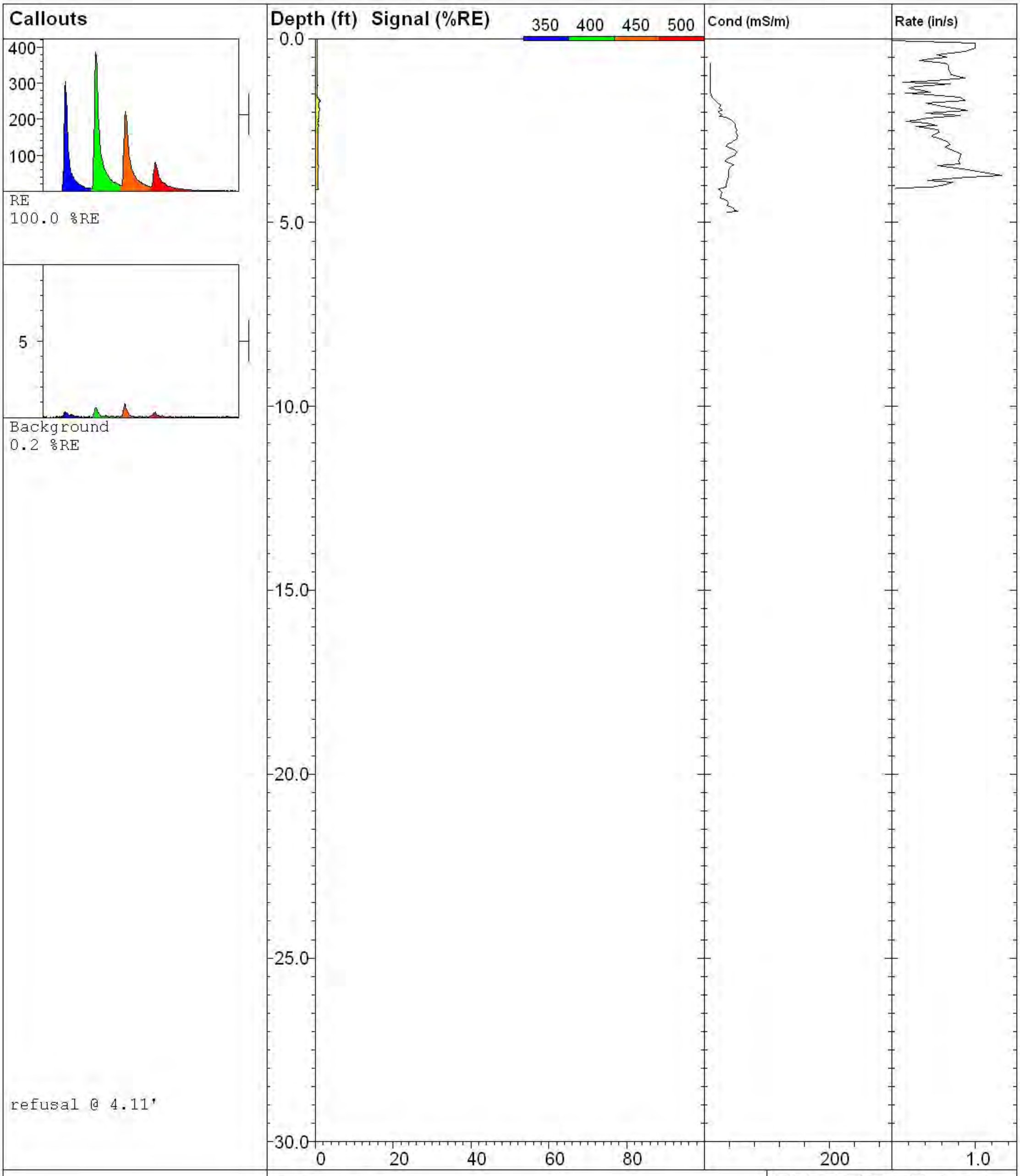


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.09 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.7 % @ 1.03 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 14:44 CST**

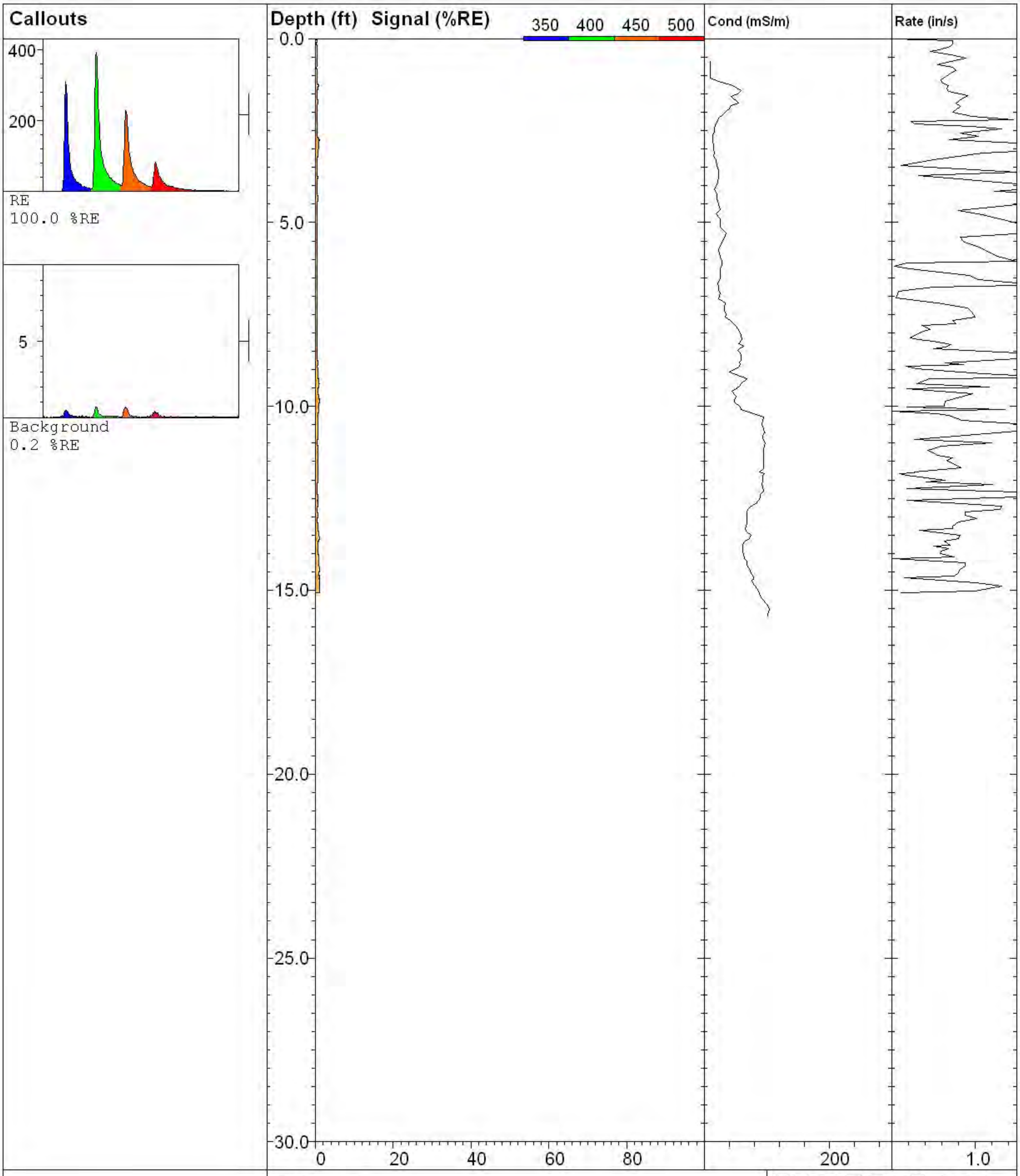


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **4.11 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.2 % @ 1.69 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-21 09:47 CST**

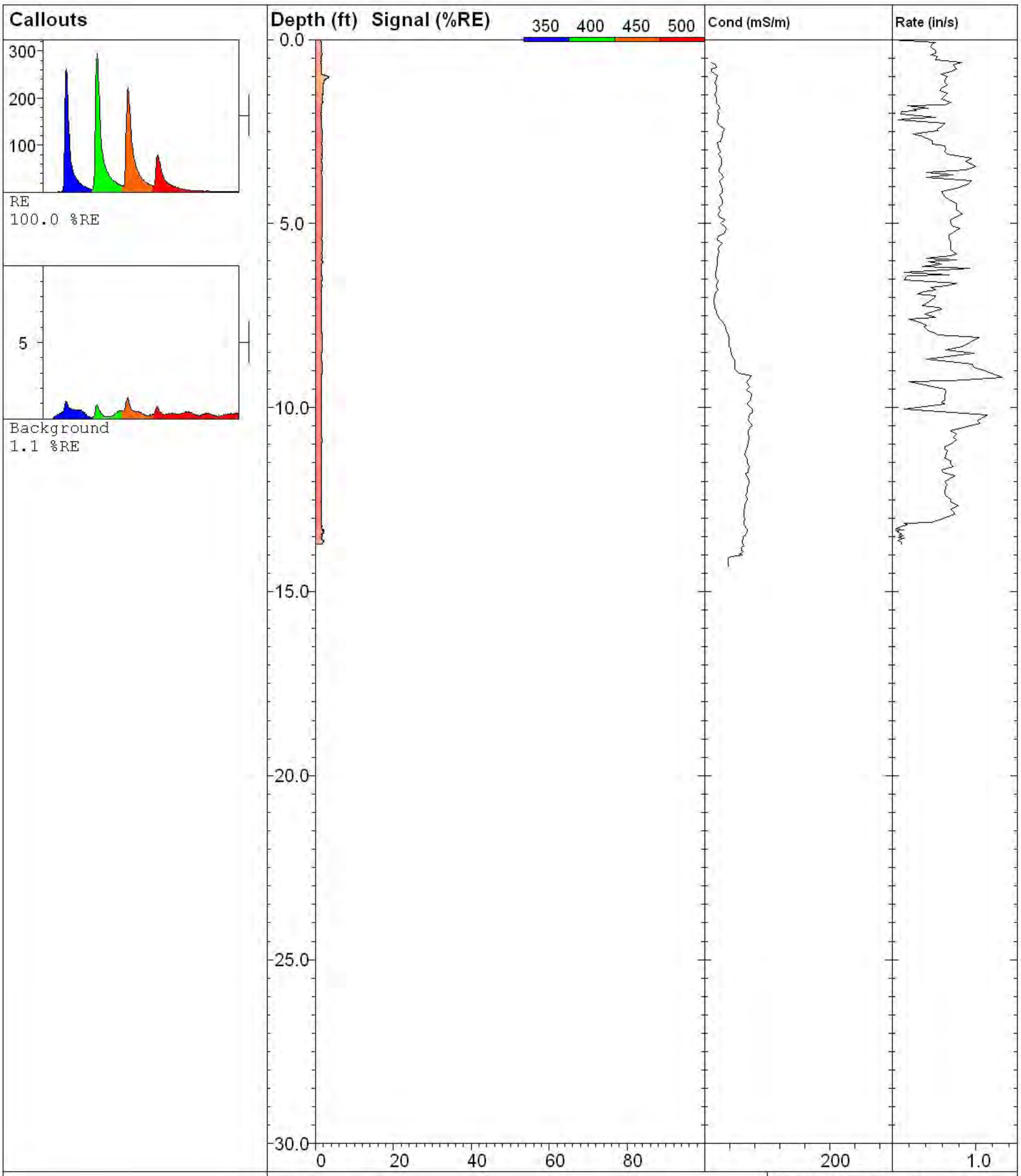


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.07 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.0 % @ 9.87 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-20 16:31 CST**

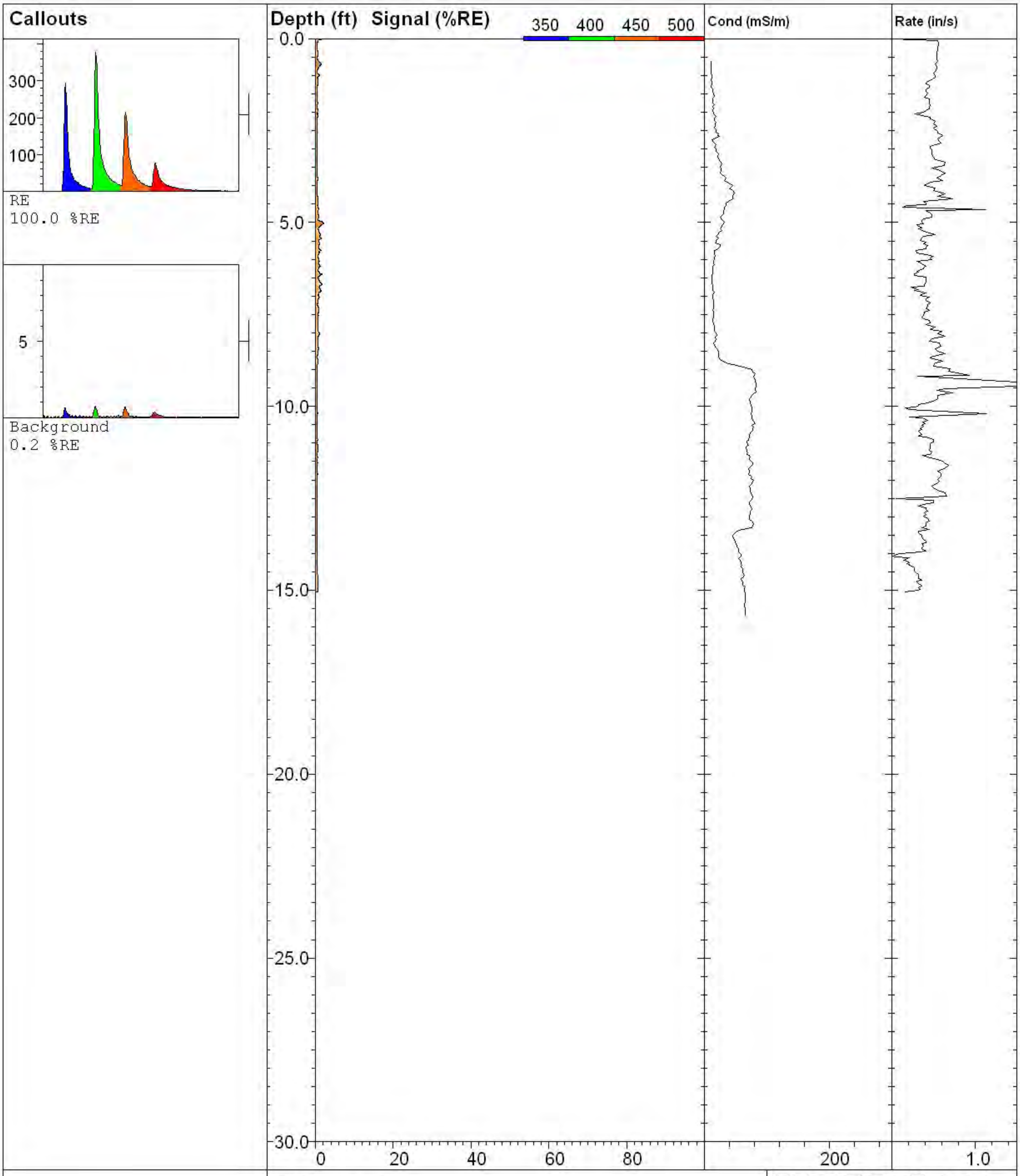


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **13.71 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.5 % @ 1.01 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 12:21 CST**

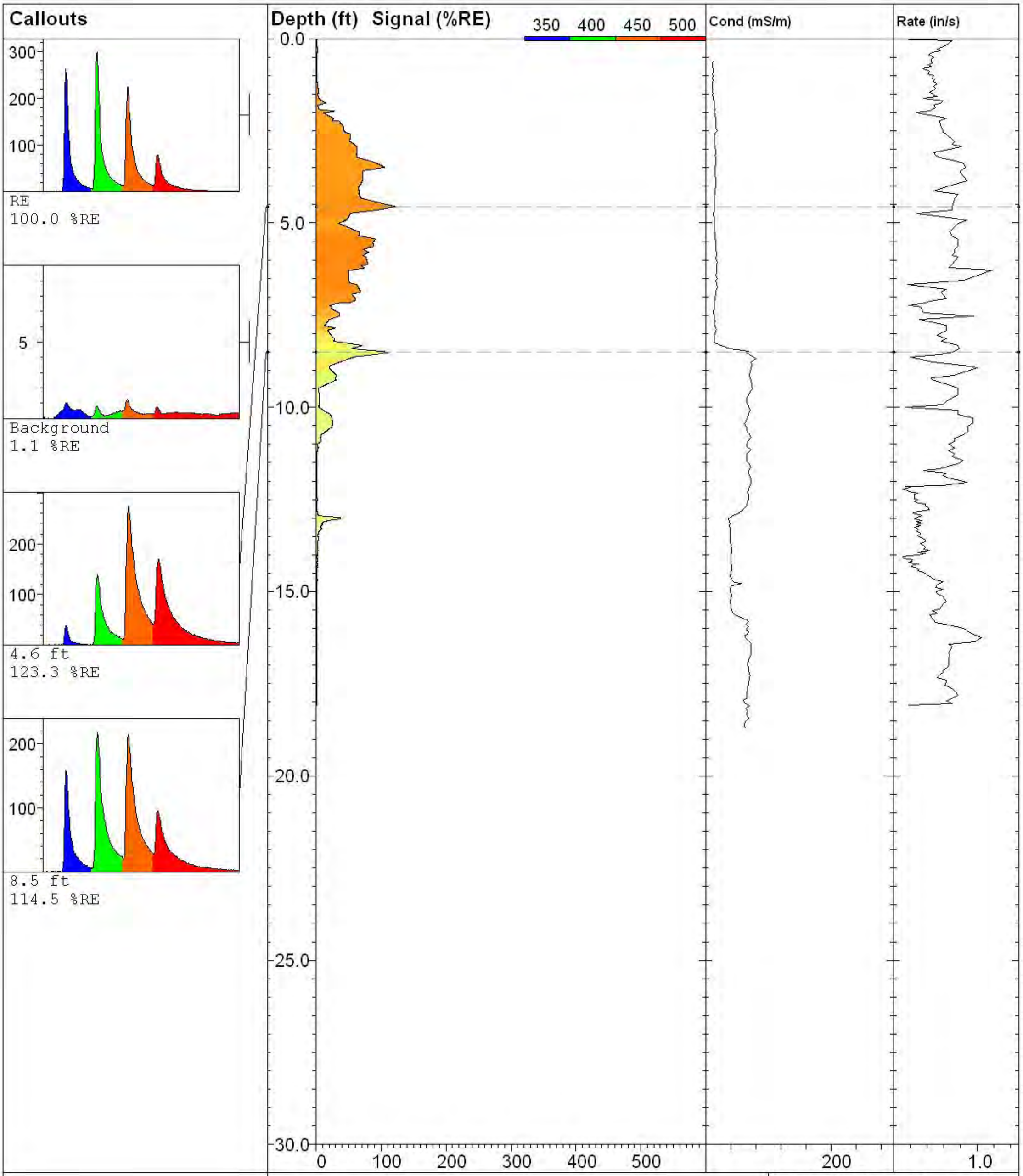


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.2 % @ 5.03 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-23 11:50 CST**

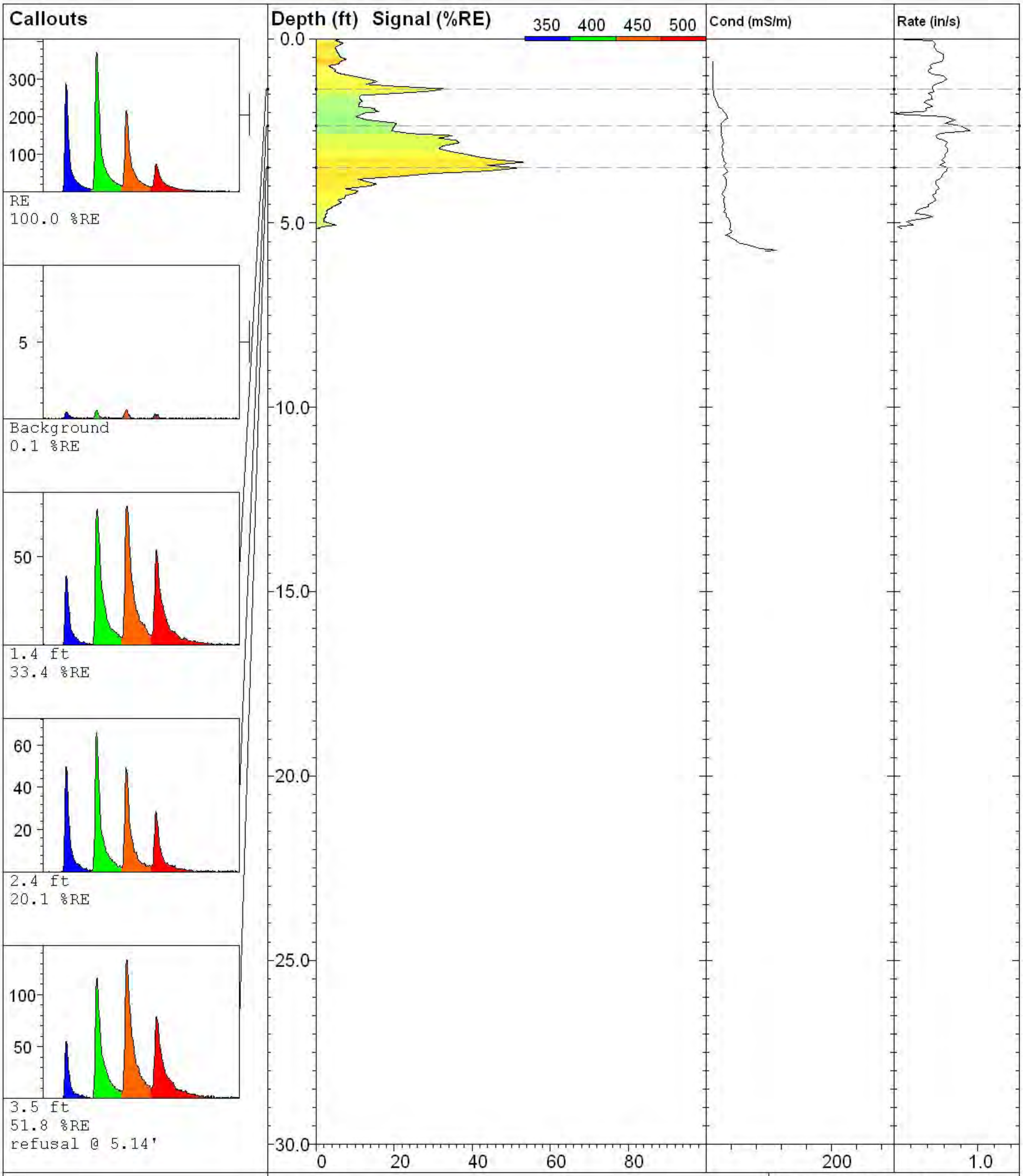


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LIF-056

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **123.3 % @ 4.56 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 10:35 CST**

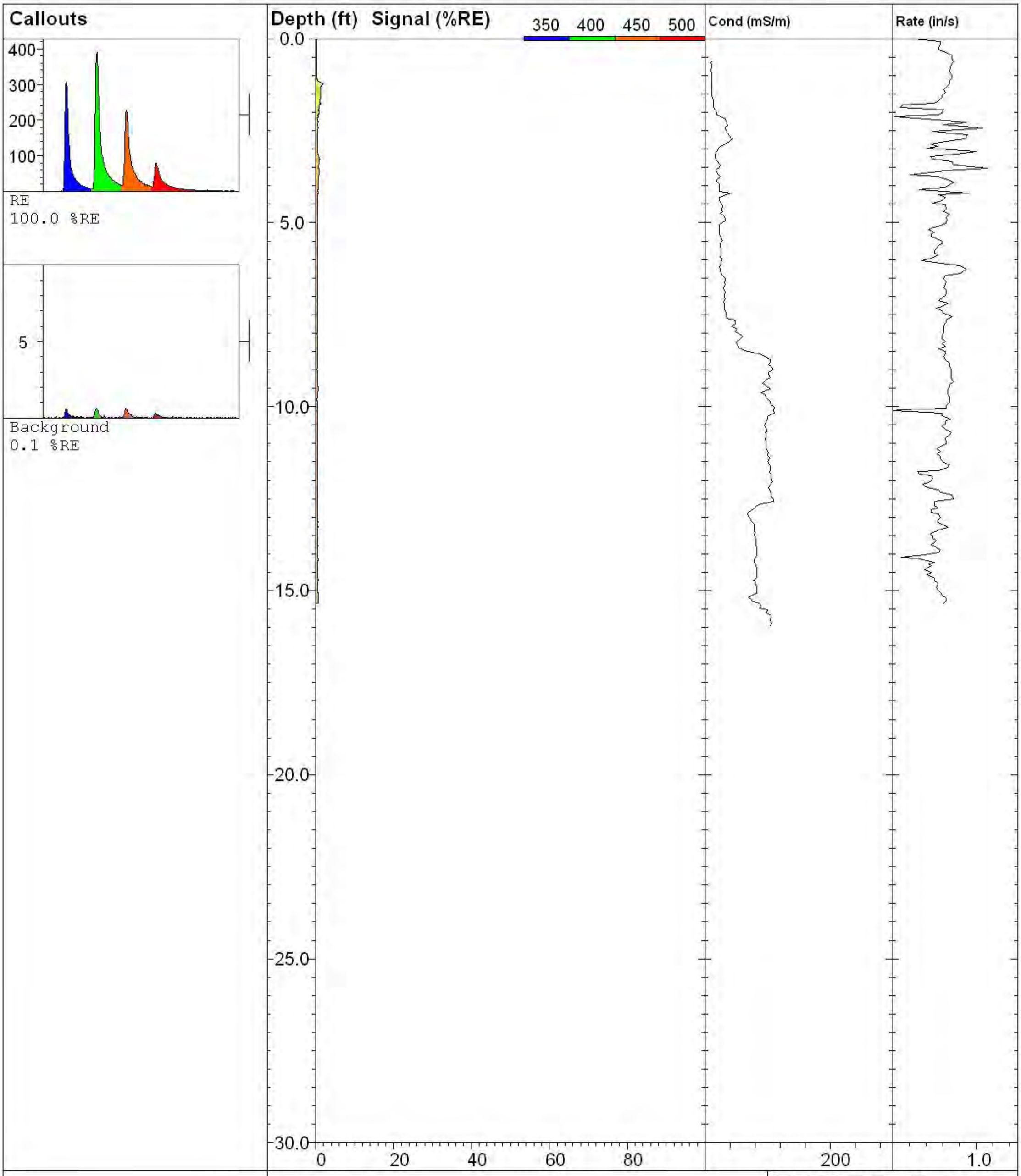


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LIF-058

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **5.14 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **53.3 % @ 3.35 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 09:59 CST**

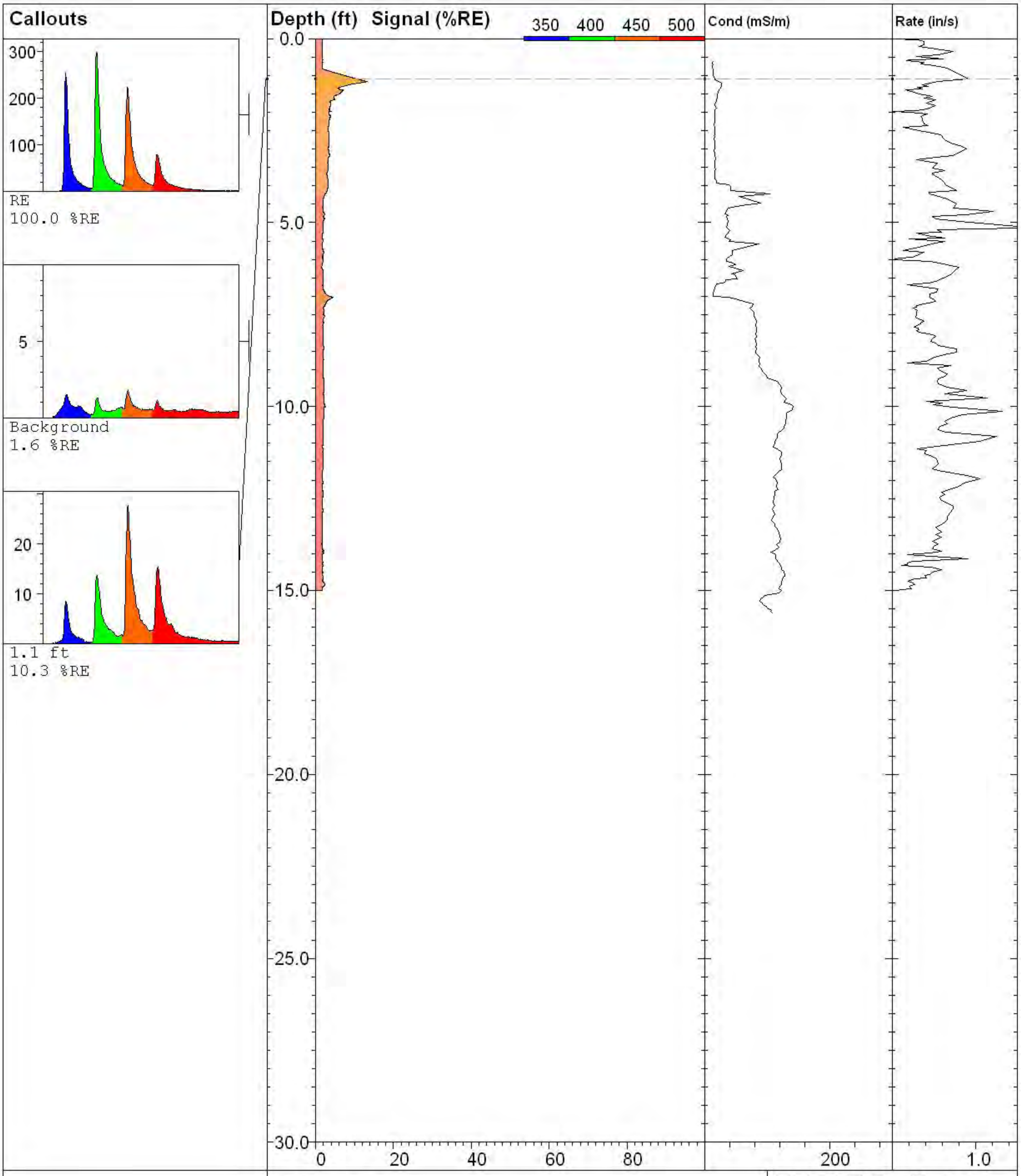


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LIF-059

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.34 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.8 % @ 1.22 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 11:38 CST**

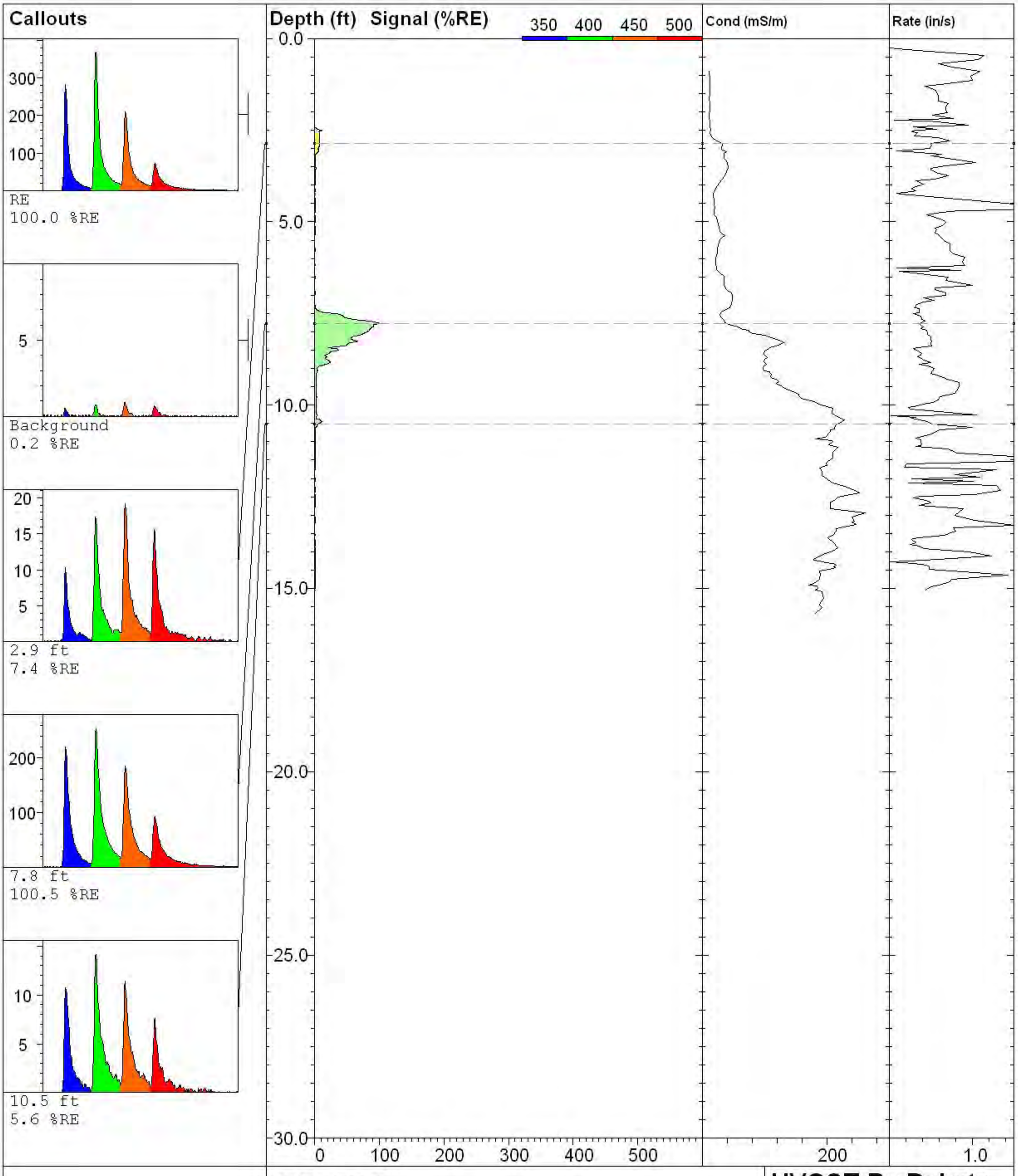


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LIF-060

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **13.2 % @ 1.17 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 13:28 CST**

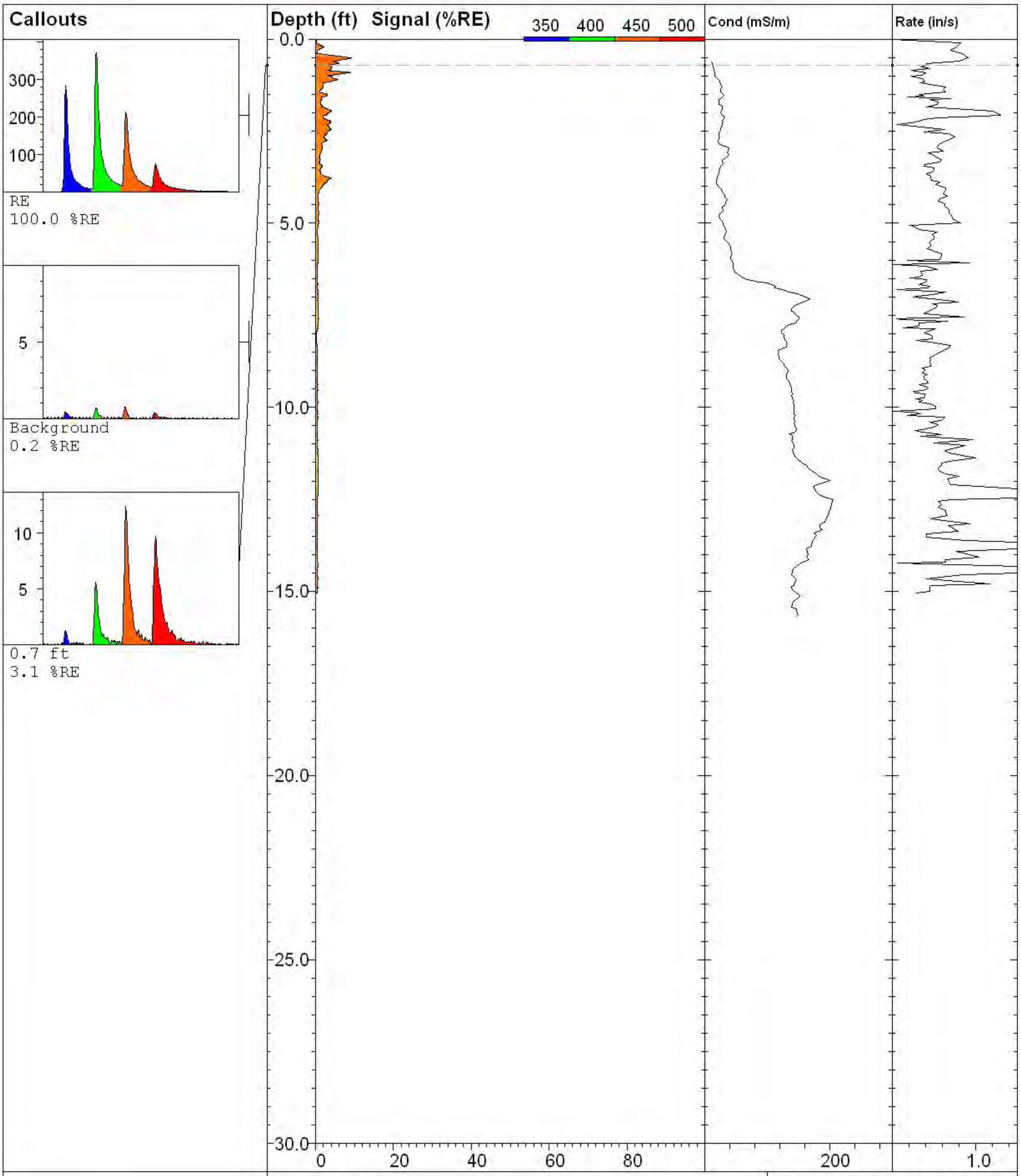


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LIF-062

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **100.5 % @ 7.77 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 10:26 CST**

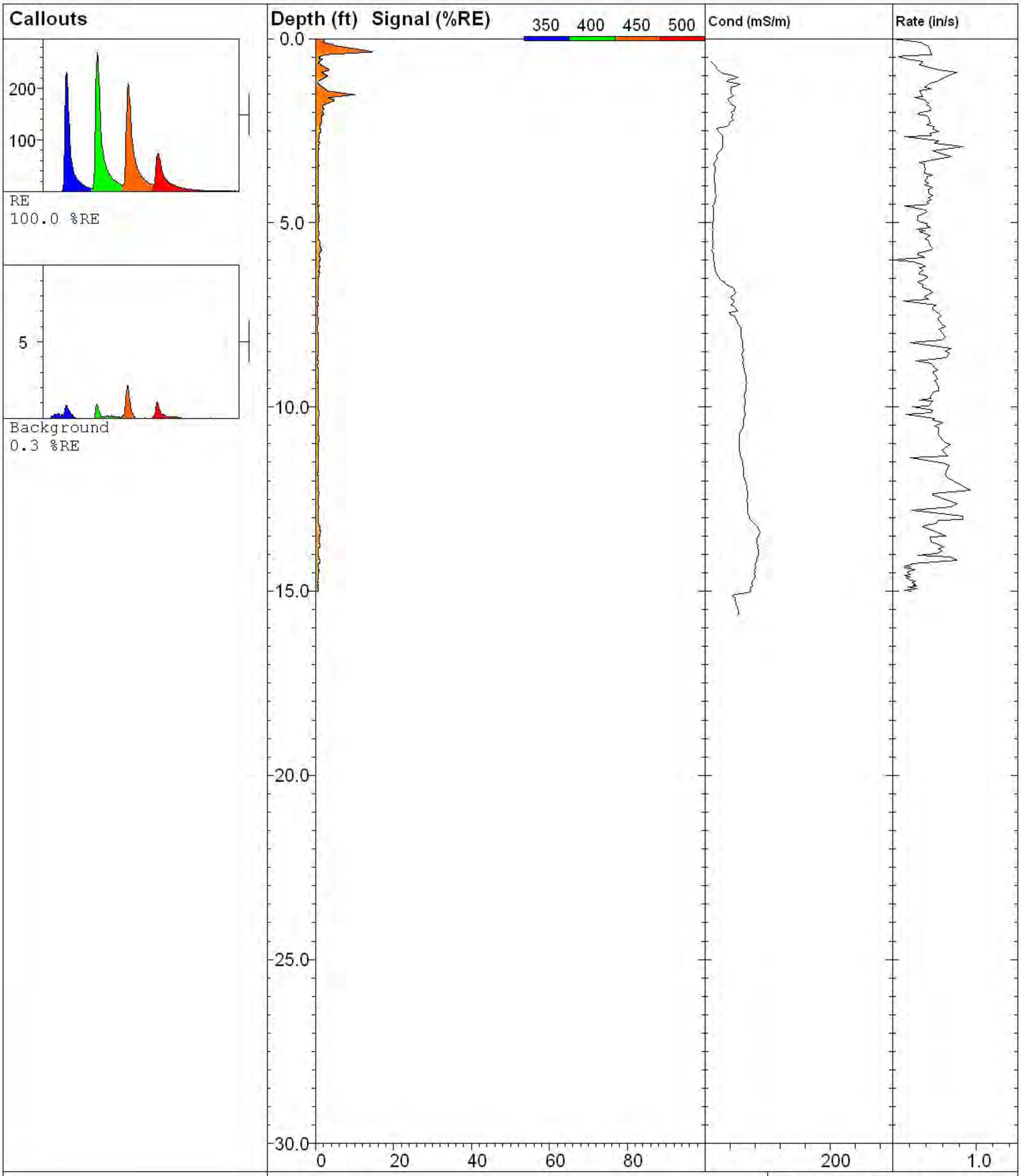


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LIF-063

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **9.3 % @ 0.51 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 09:57 CST**

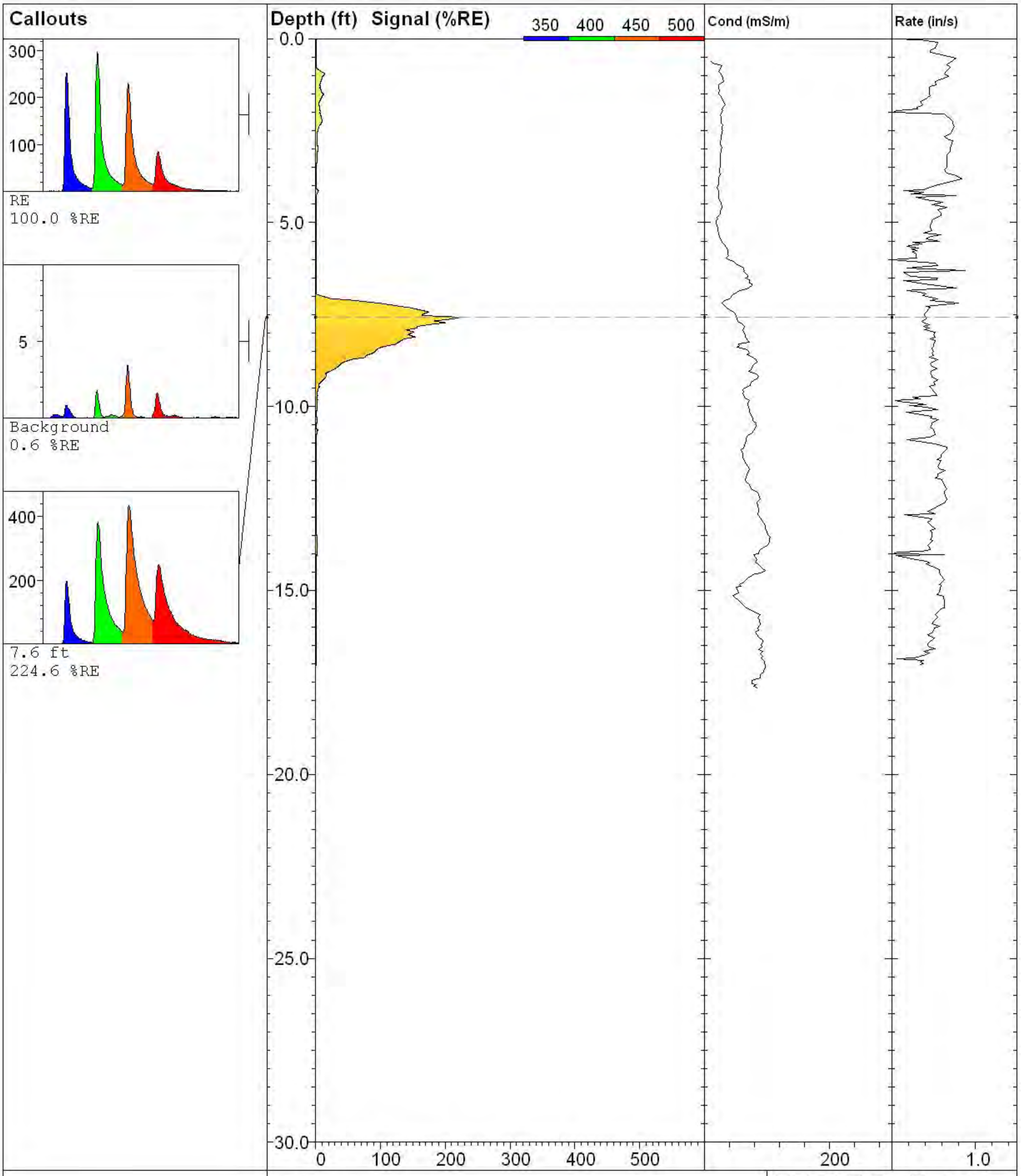


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LIF-064

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **14.6 % @ 0.36 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 16:39 CST**

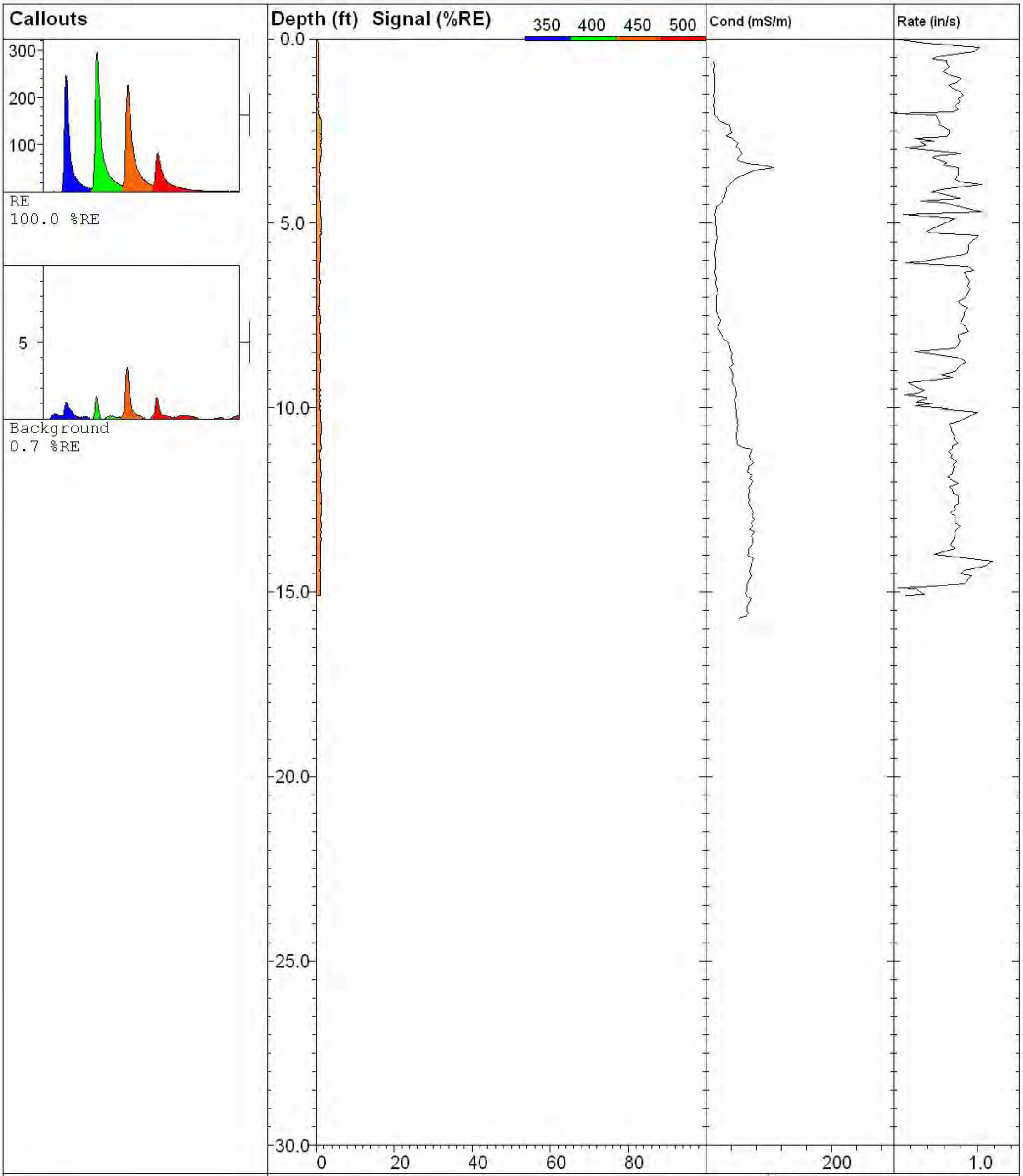


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **17.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **224.6 % @ 7.57 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 14:20 CST**

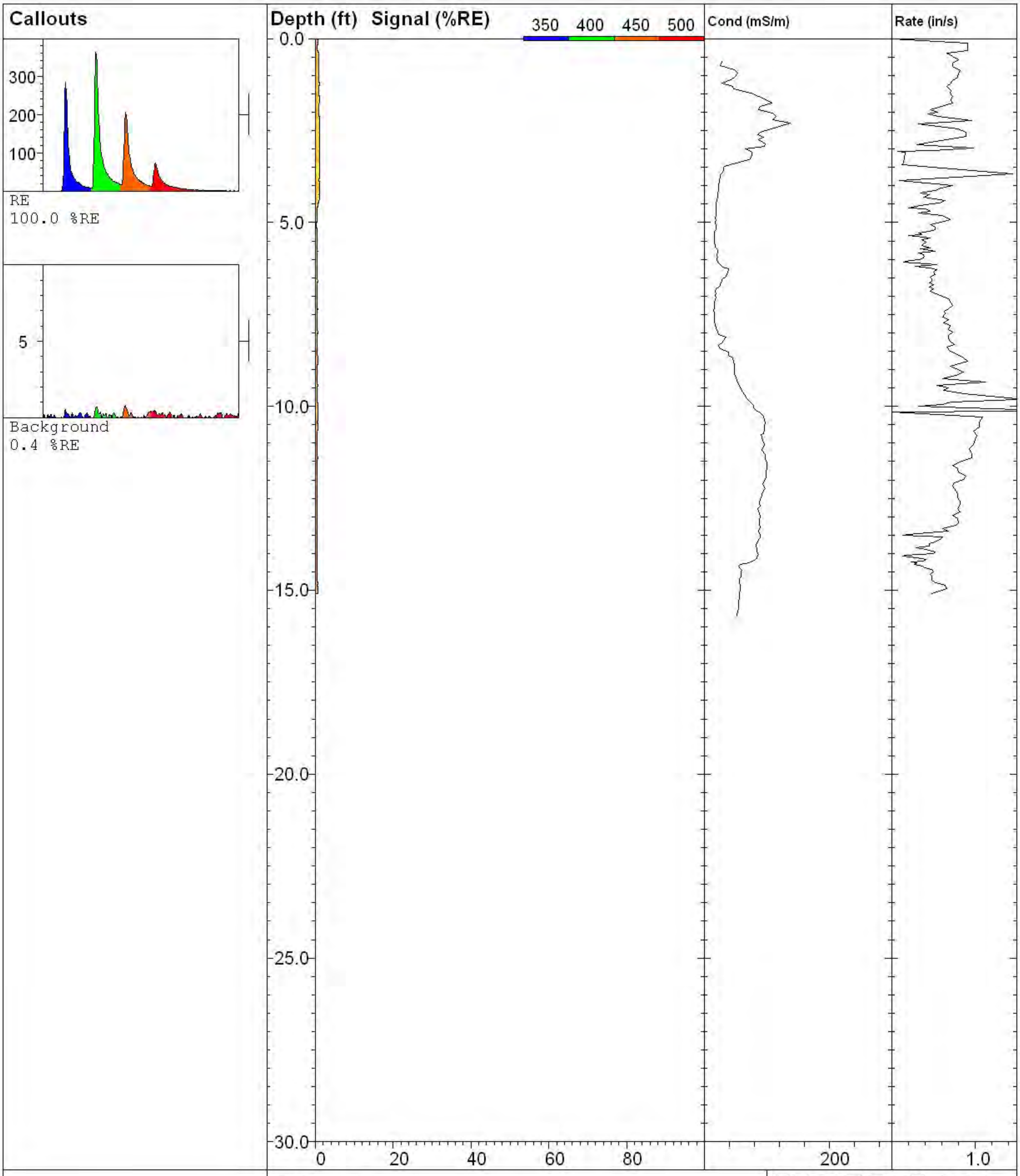


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LIF-067

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.10 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.5 % @ 5.27 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 16:43 CST**

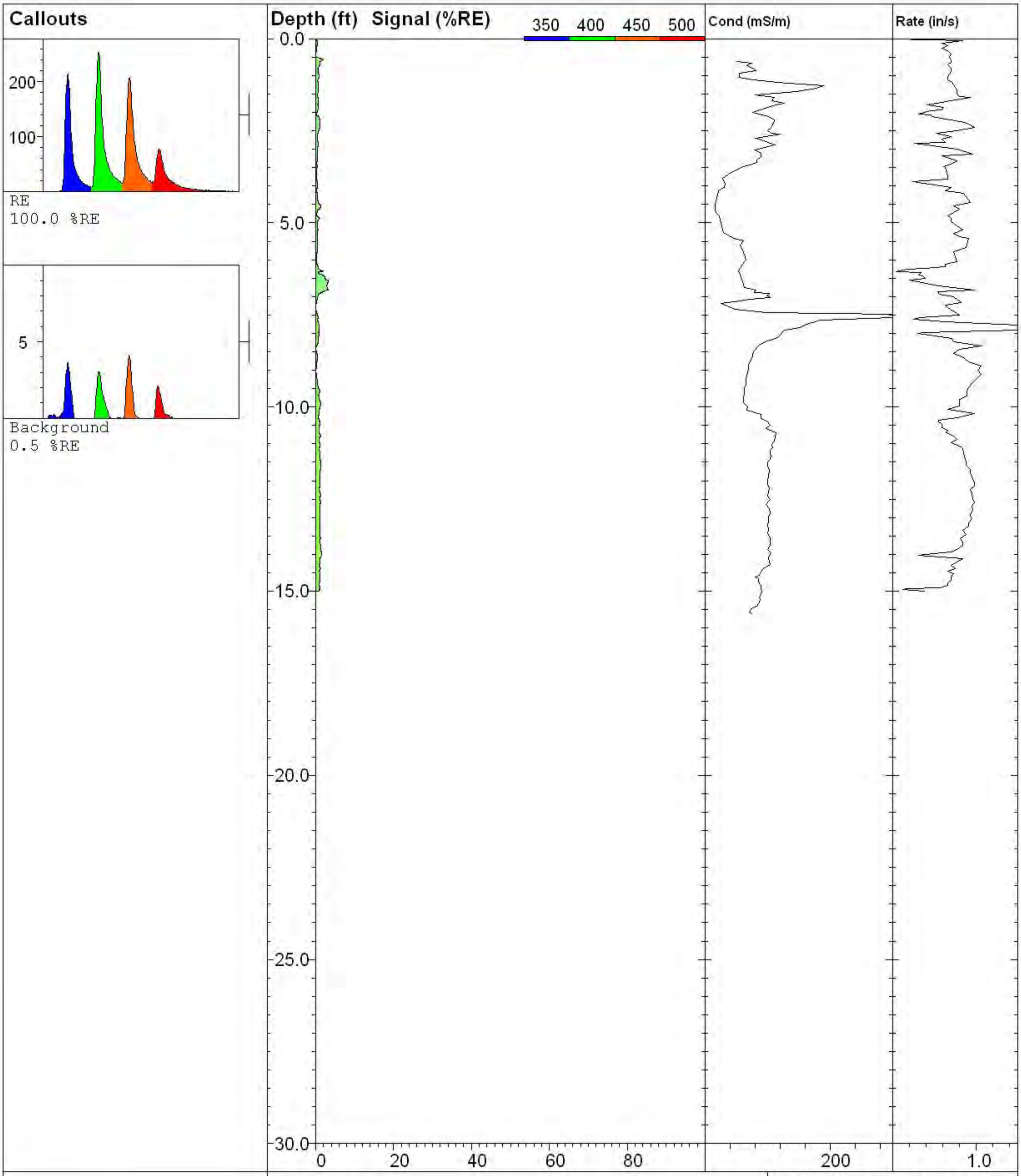


LIF-069

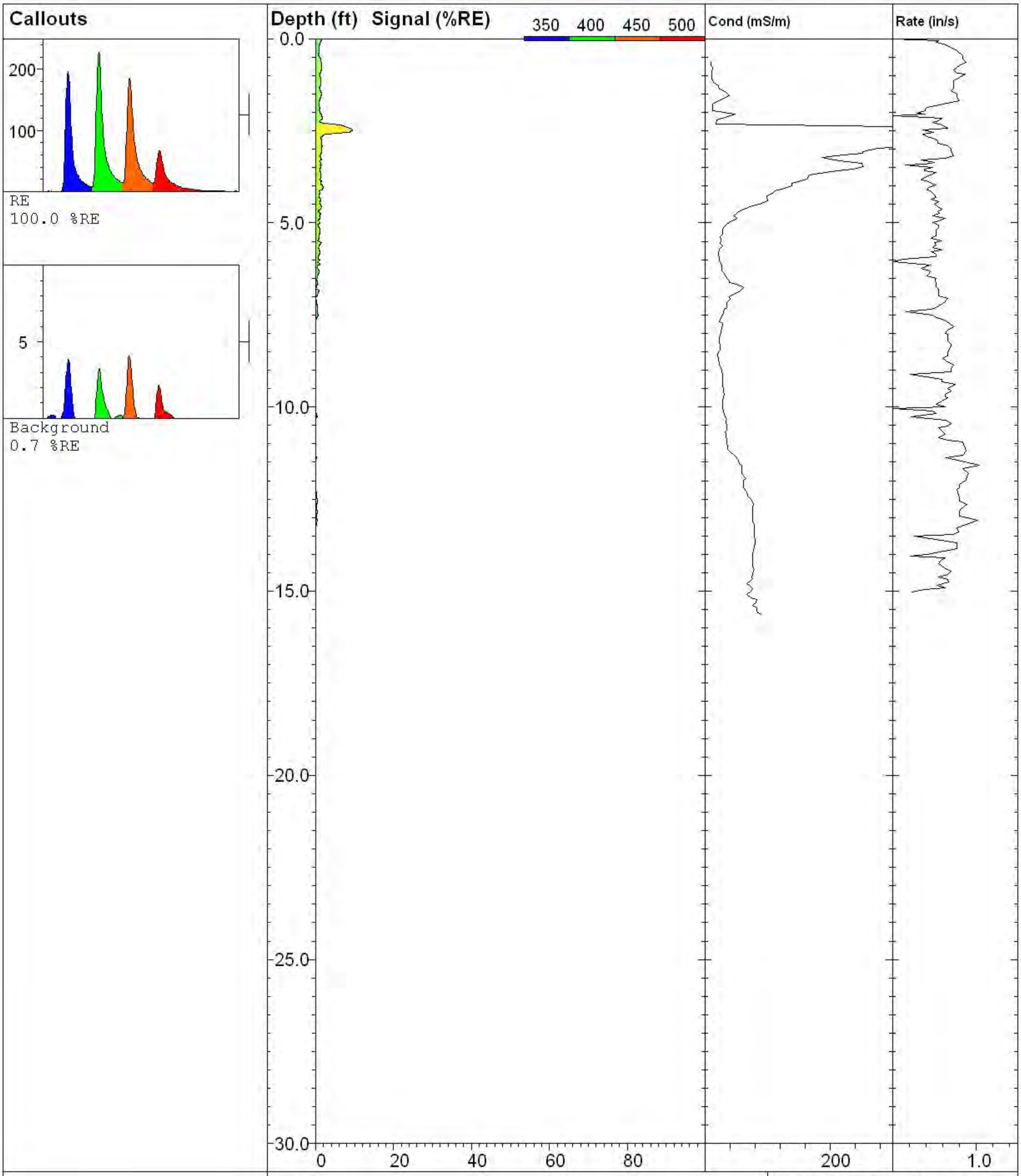
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.2 % @ 2.38 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 10:38 CST**

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	Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
	Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.3 % @ 6.56 ft**
	Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-29 08:19 CST**

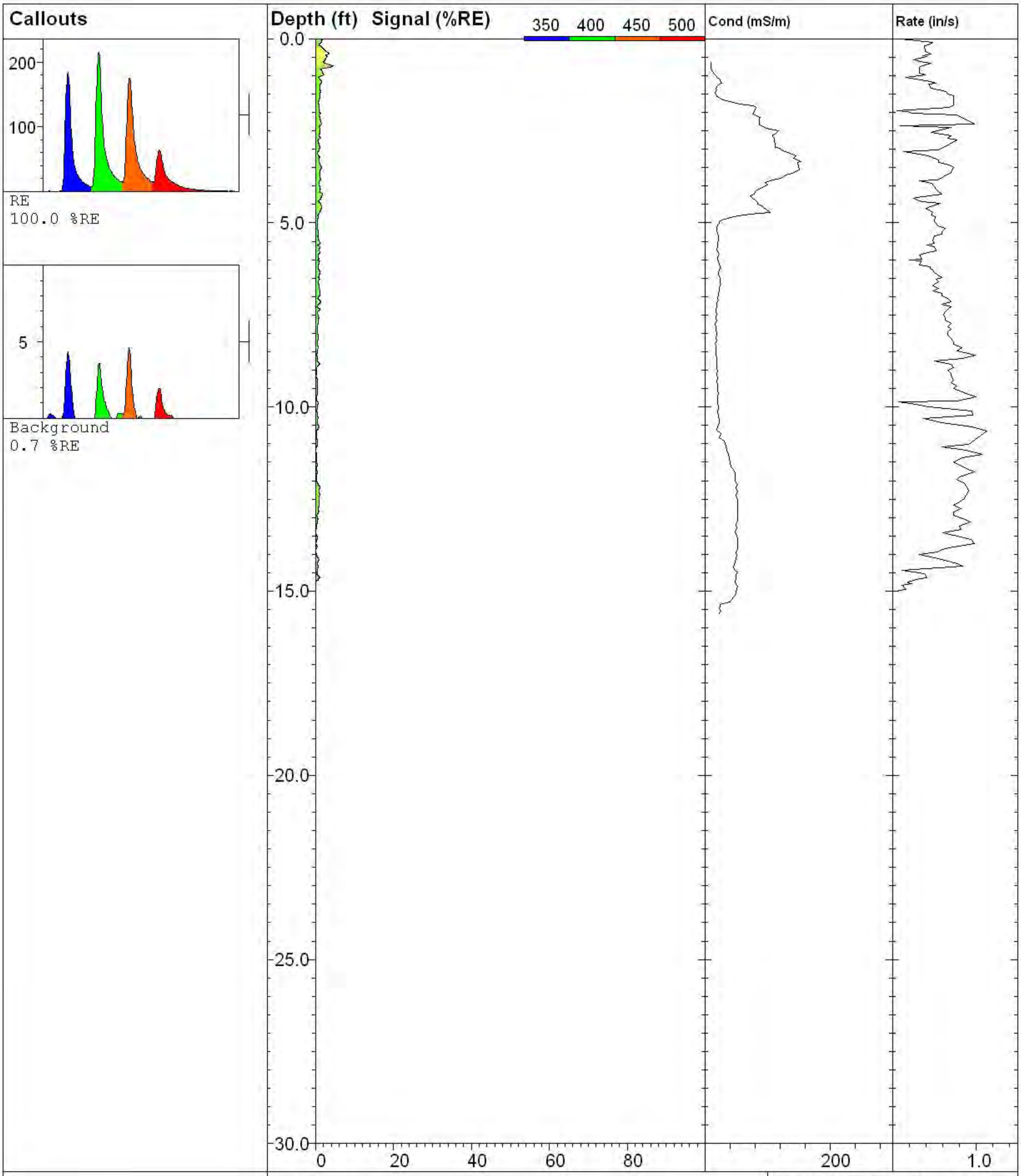


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LIF-071

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **9.5 % @ 2.48 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-29 08:43 CST**

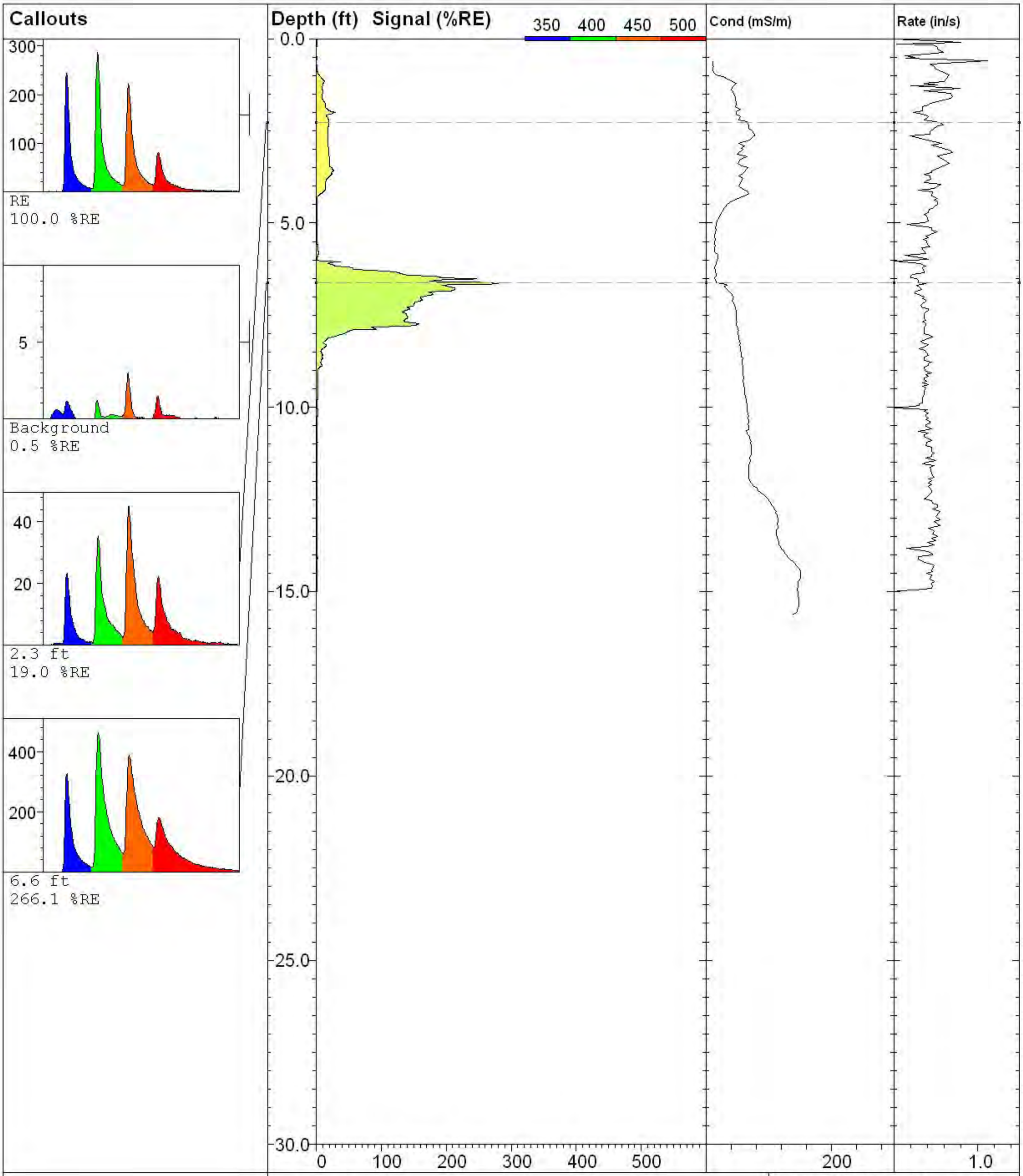


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.5 % @ 0.74 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-29 09:23 CST**

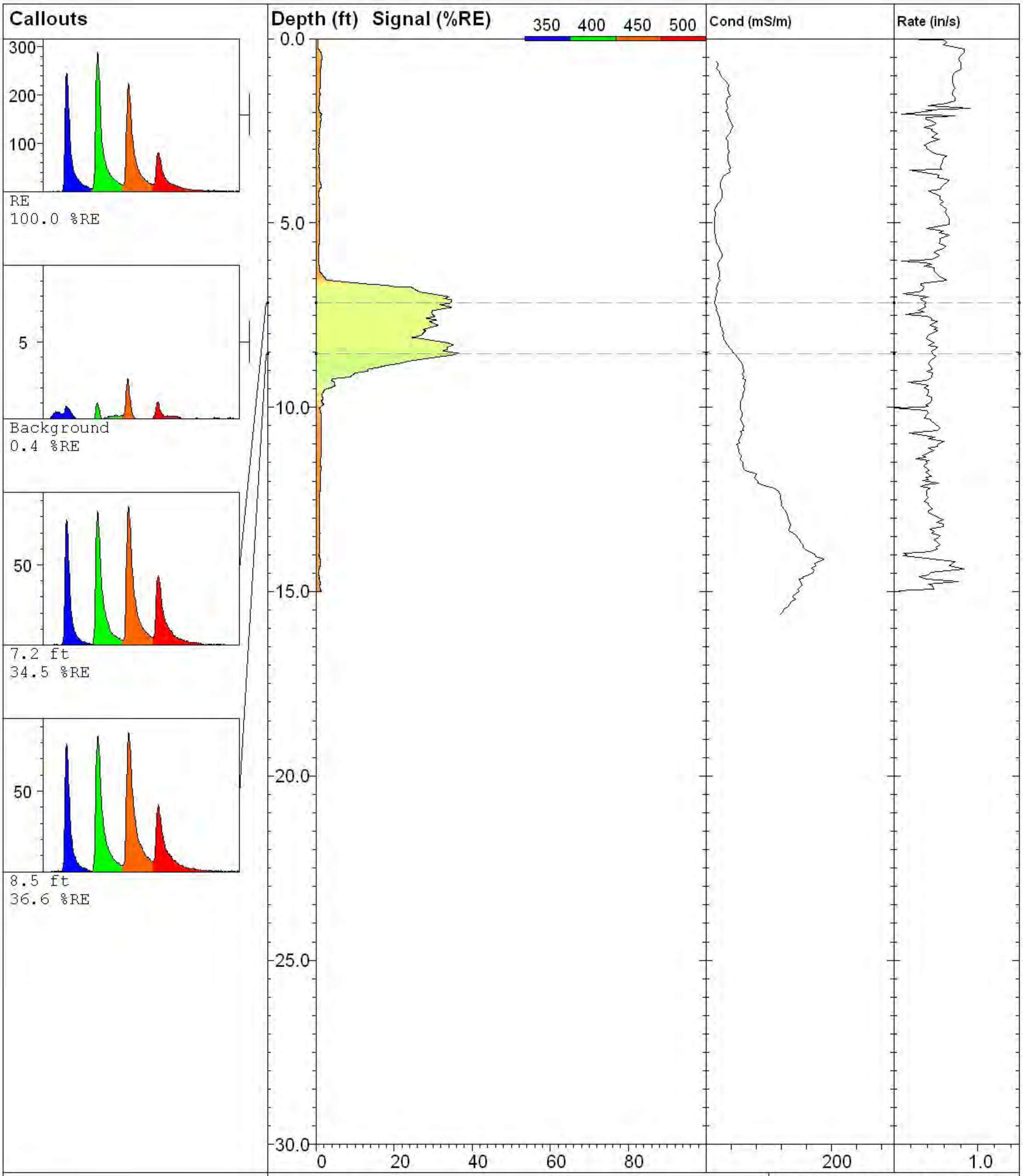


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **281.3 % @ 6.65 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-27 11:06 CST**

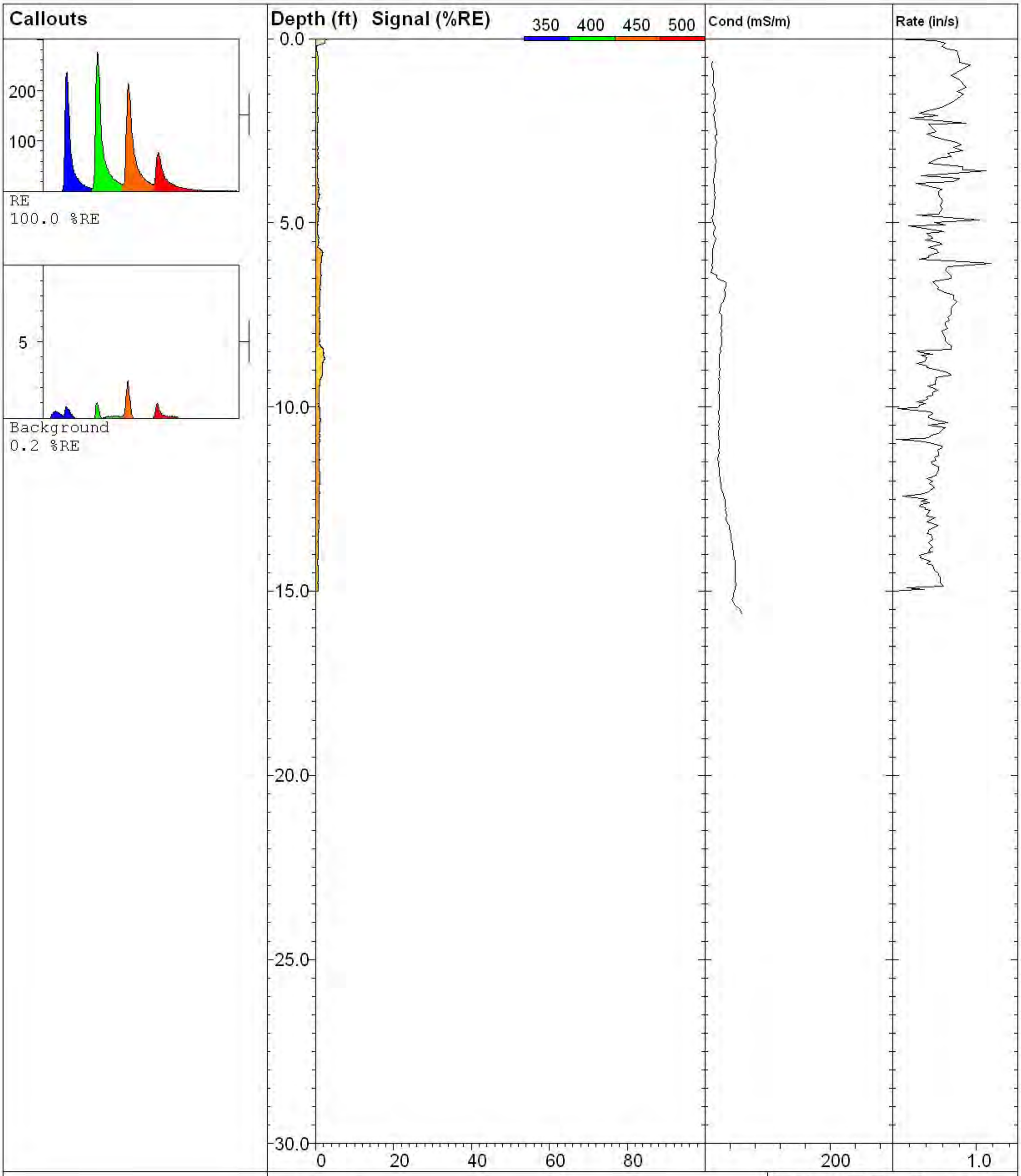


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **36.6 % @ 8.54 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-27 10:36 CST**

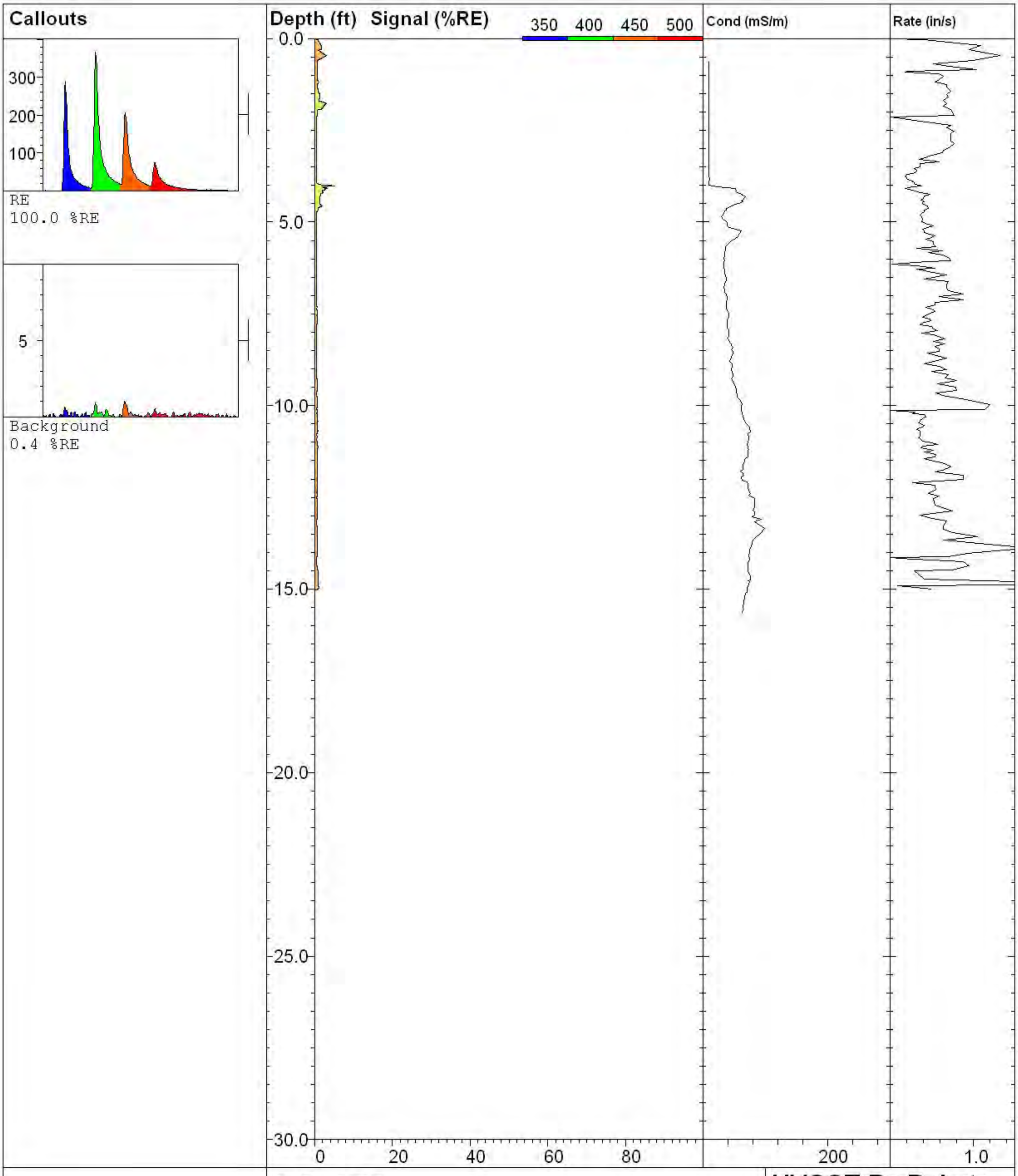


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.9 % @ 0.01 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-27 10:05 CST**

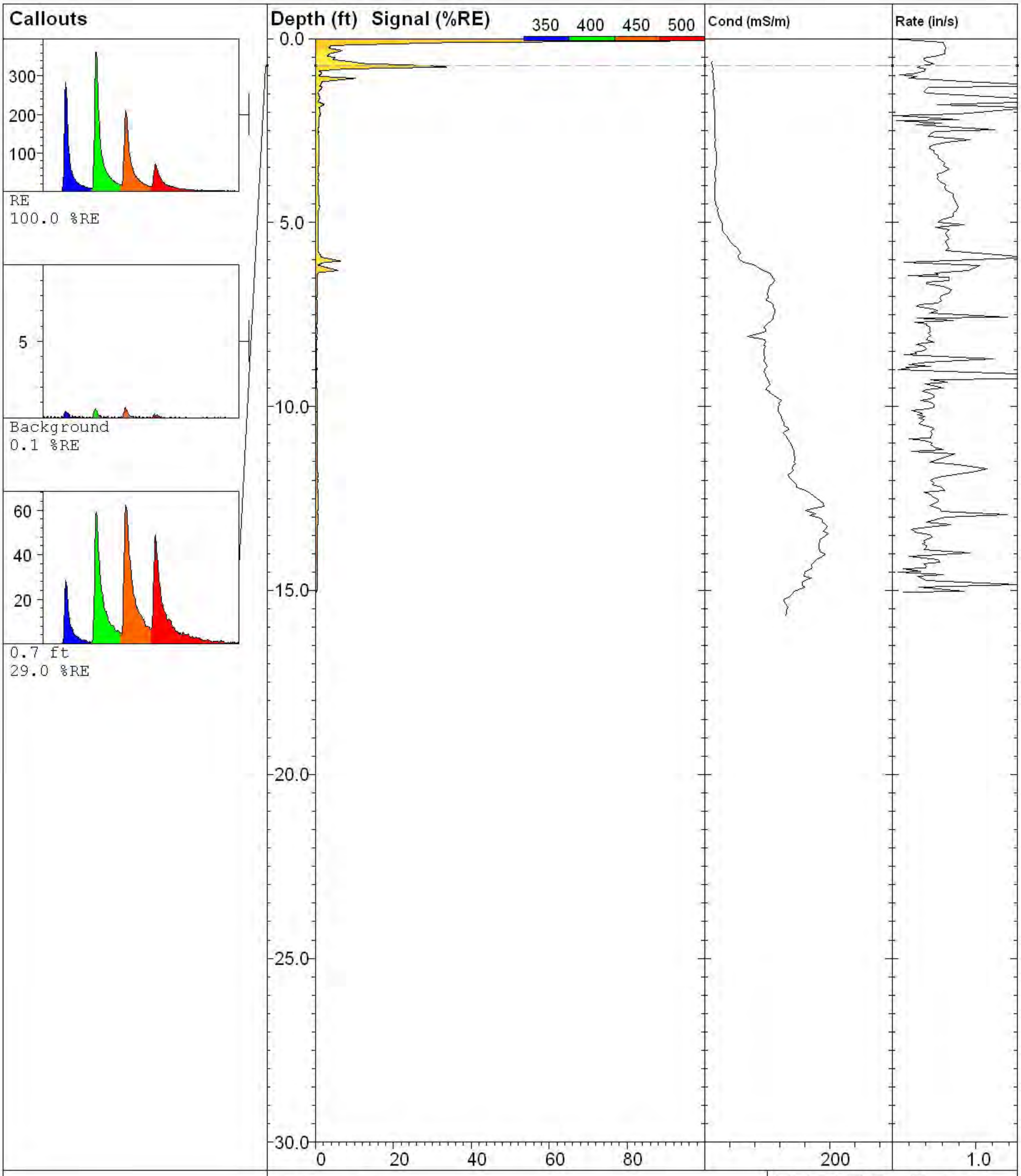


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LIF-077

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.1 % @ 4.01 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-29 09:20 CST**

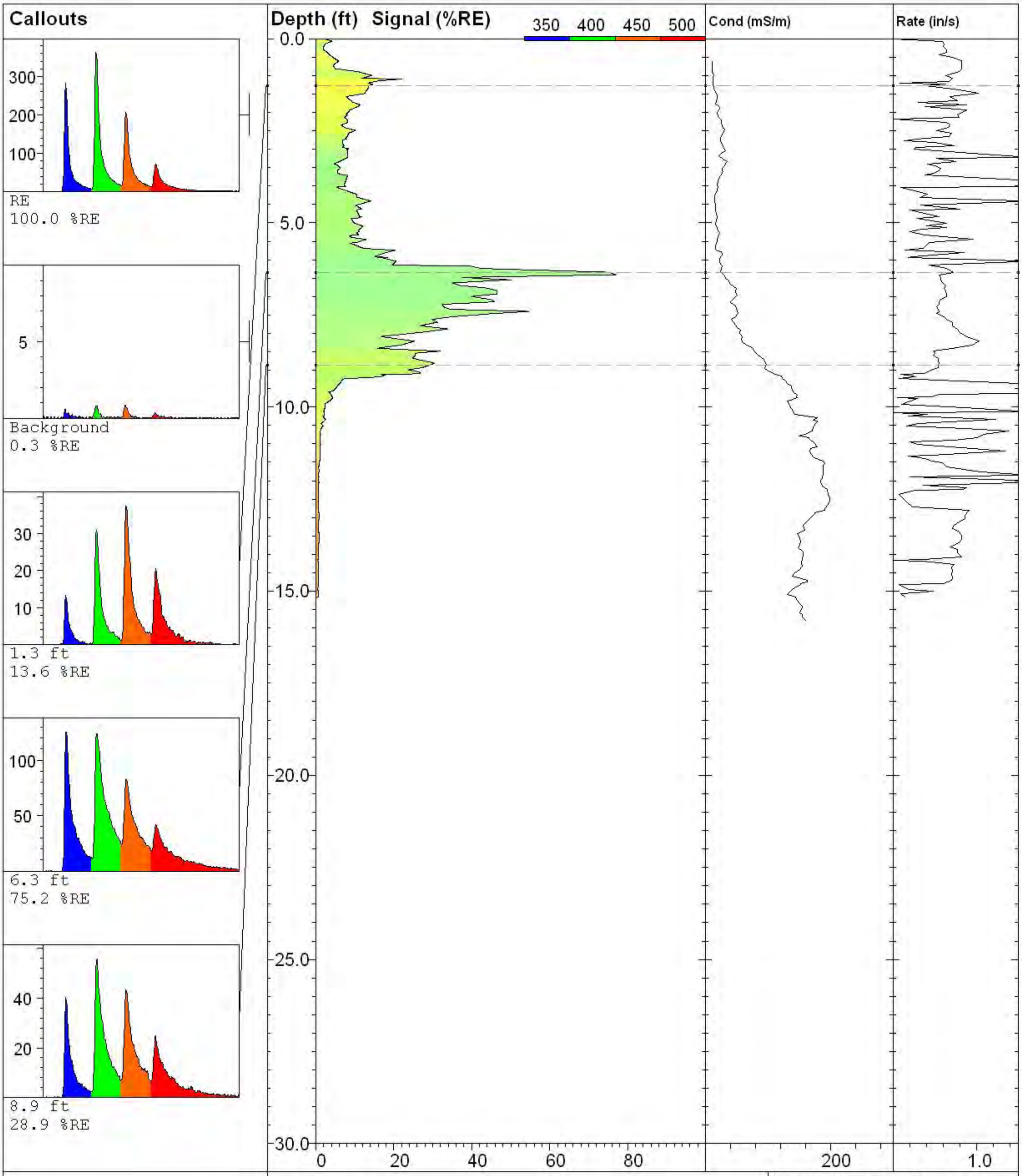


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **174.8 % @ 0.01 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 09:29 CST**



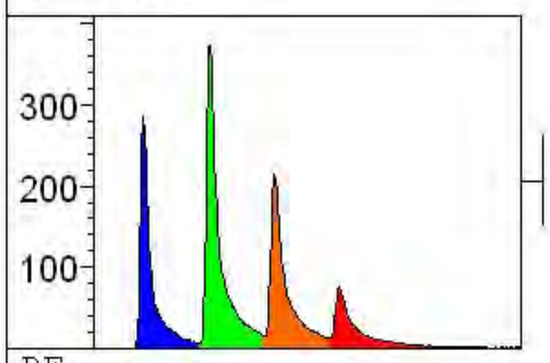
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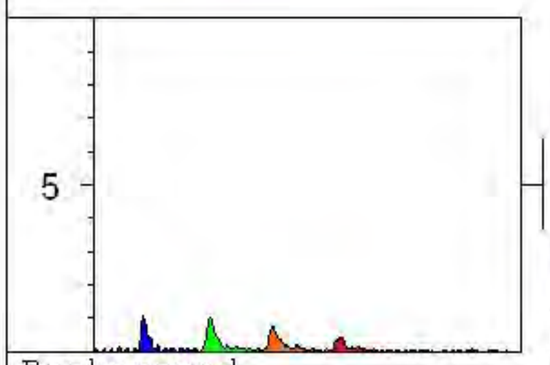
UVOST By Dakota
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.17 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **77.1 % @ 6.41 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 08:58 CST**

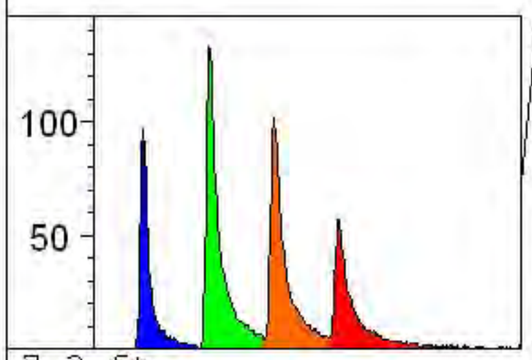
Callouts



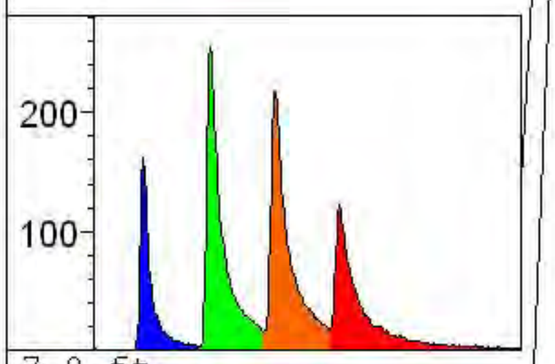
RE
100.0 %RE



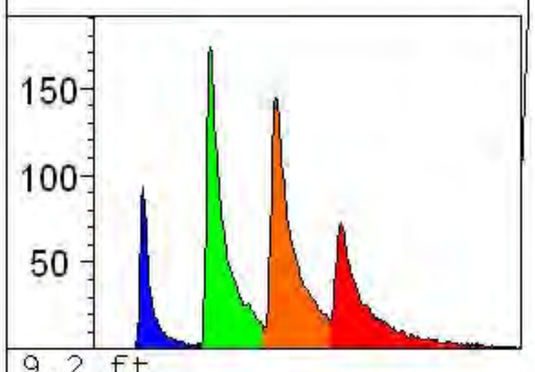
Background
0.3 %RE



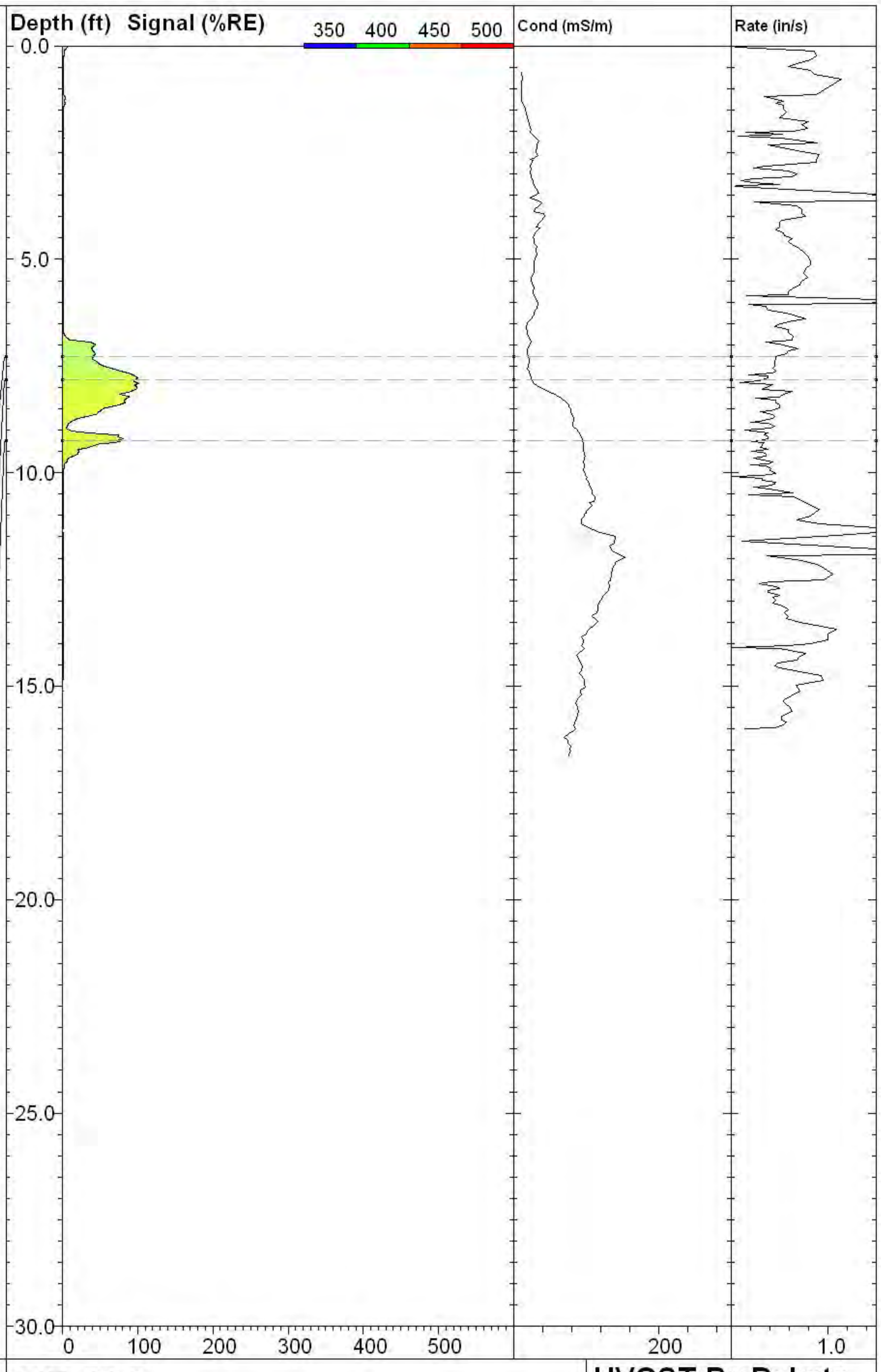
7.3 ft
40.4 %RE



7.8 ft
96.9 %RE



9.2 ft
72.3 %RE

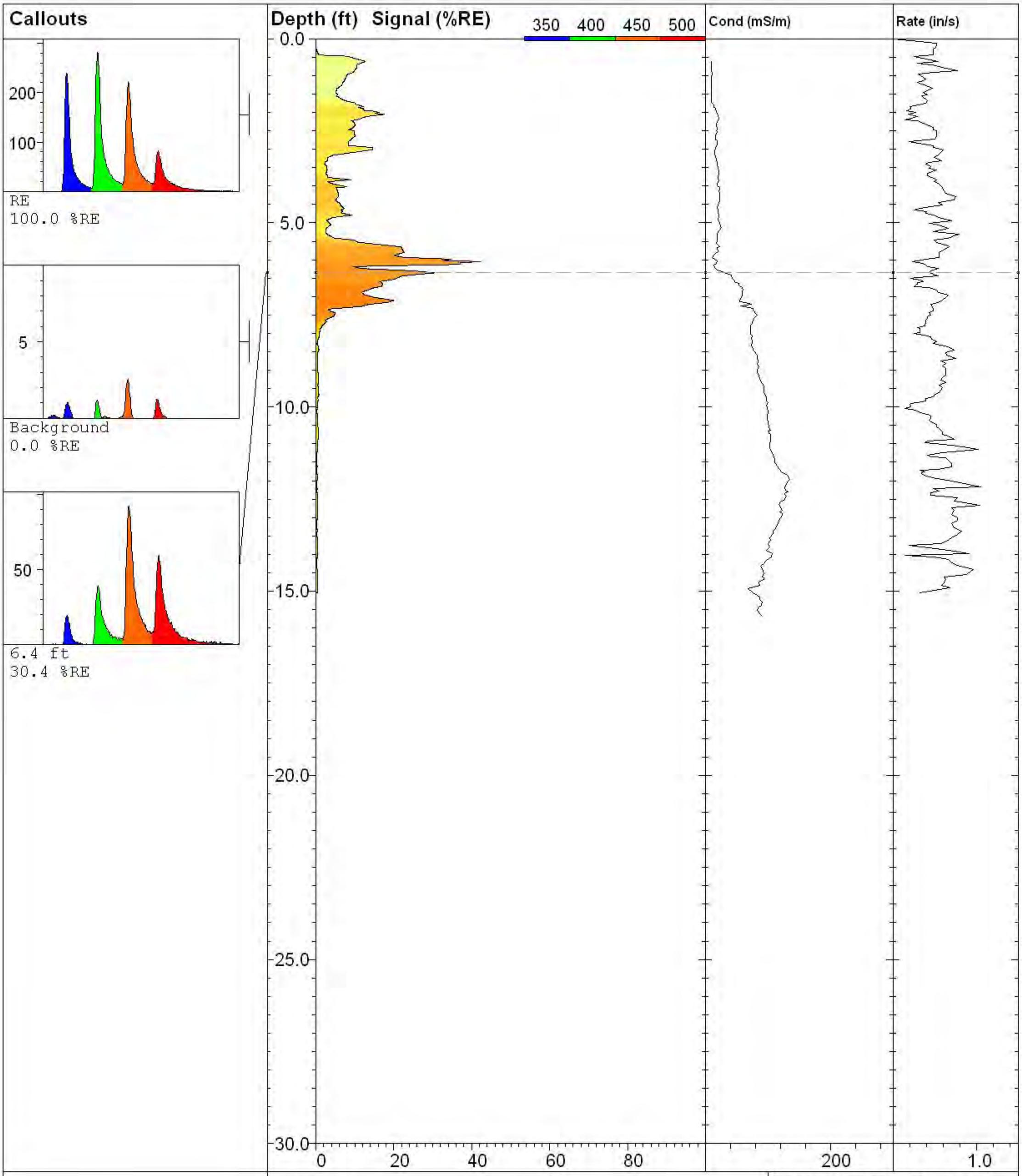


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **101.0 % @ 7.90 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 13:17 CST**

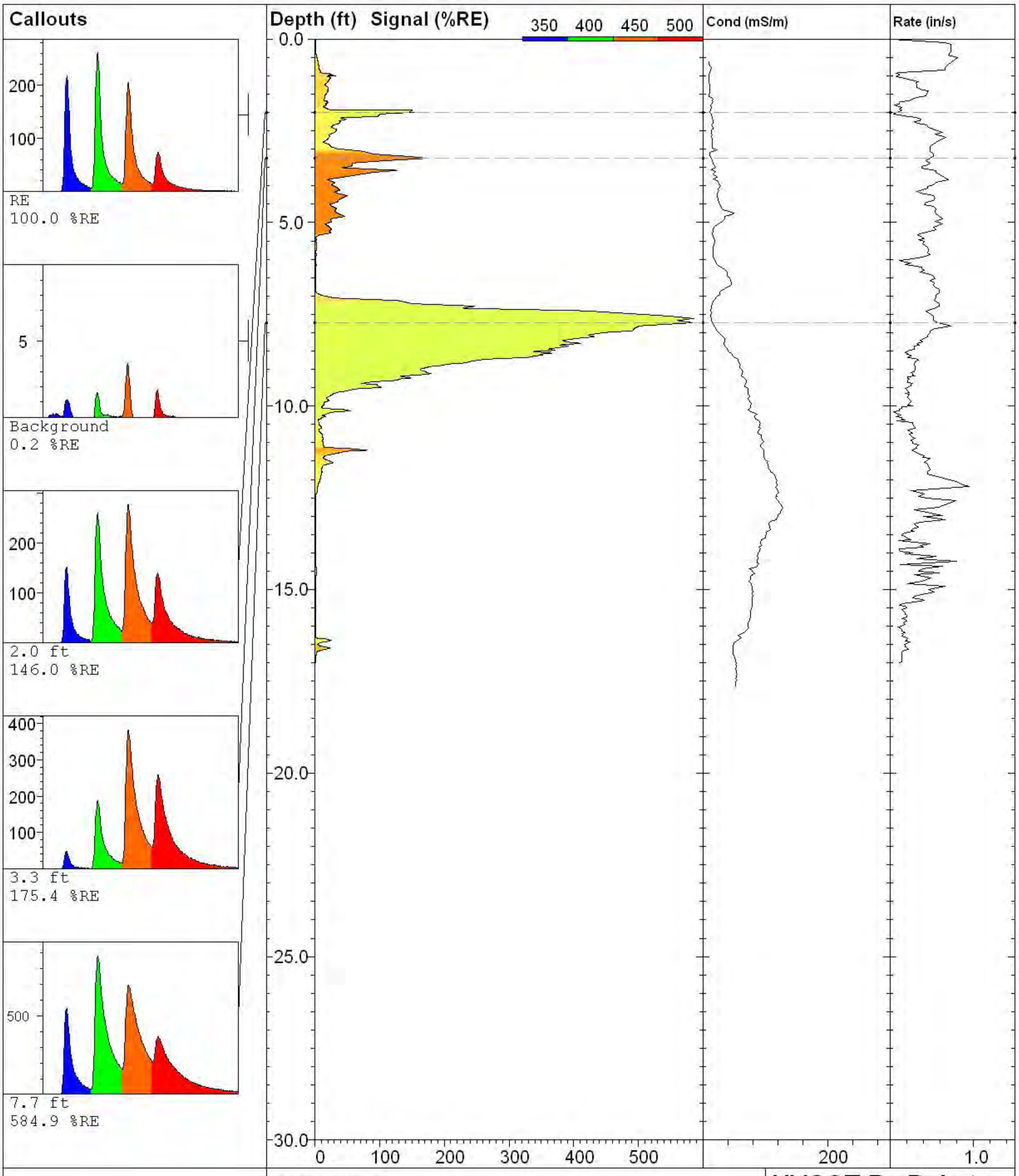


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **42.3 % @ 6.05 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 08:33 CST**

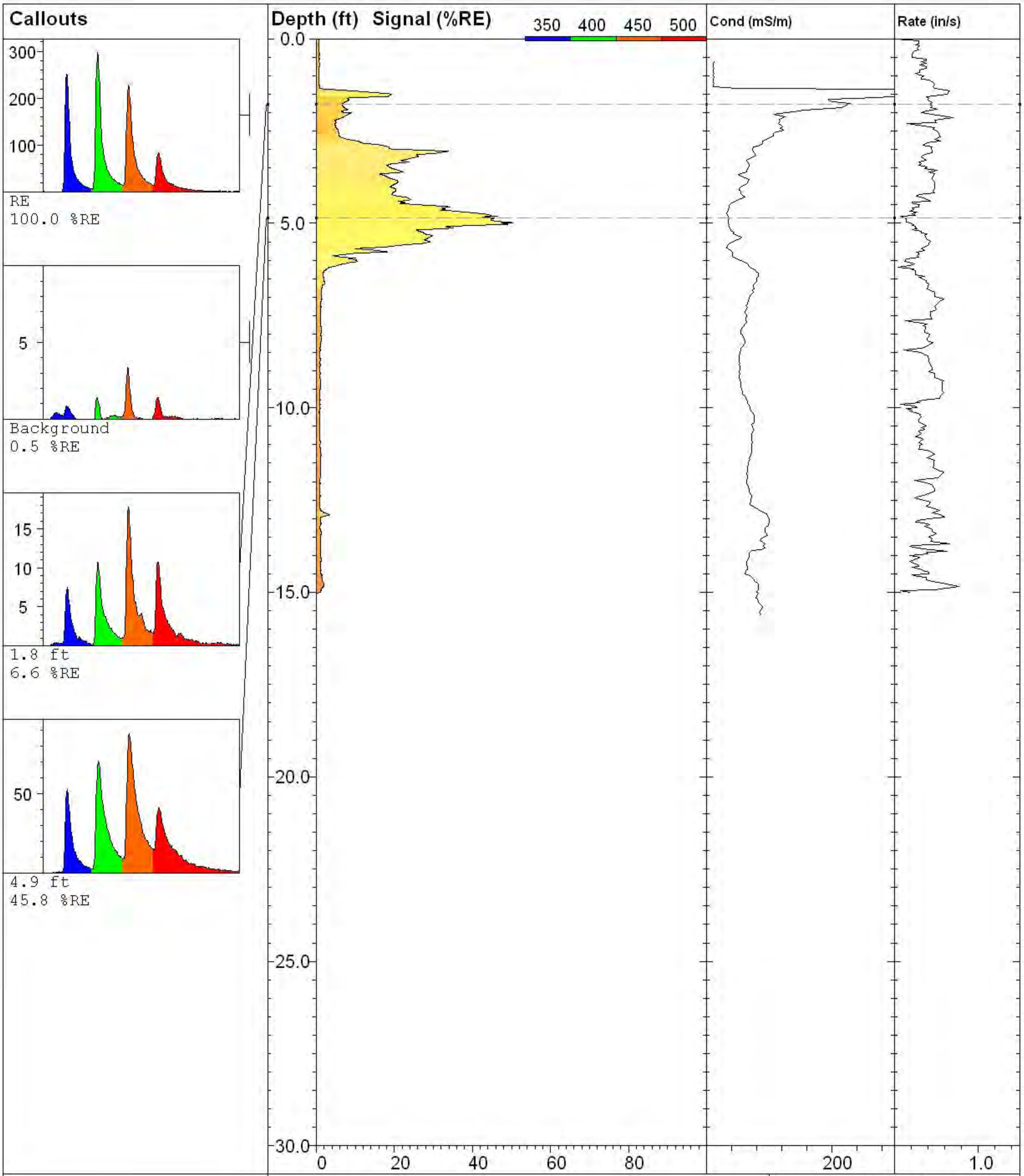


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **17.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **585.5 % @ 7.62 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 09:01 CST**

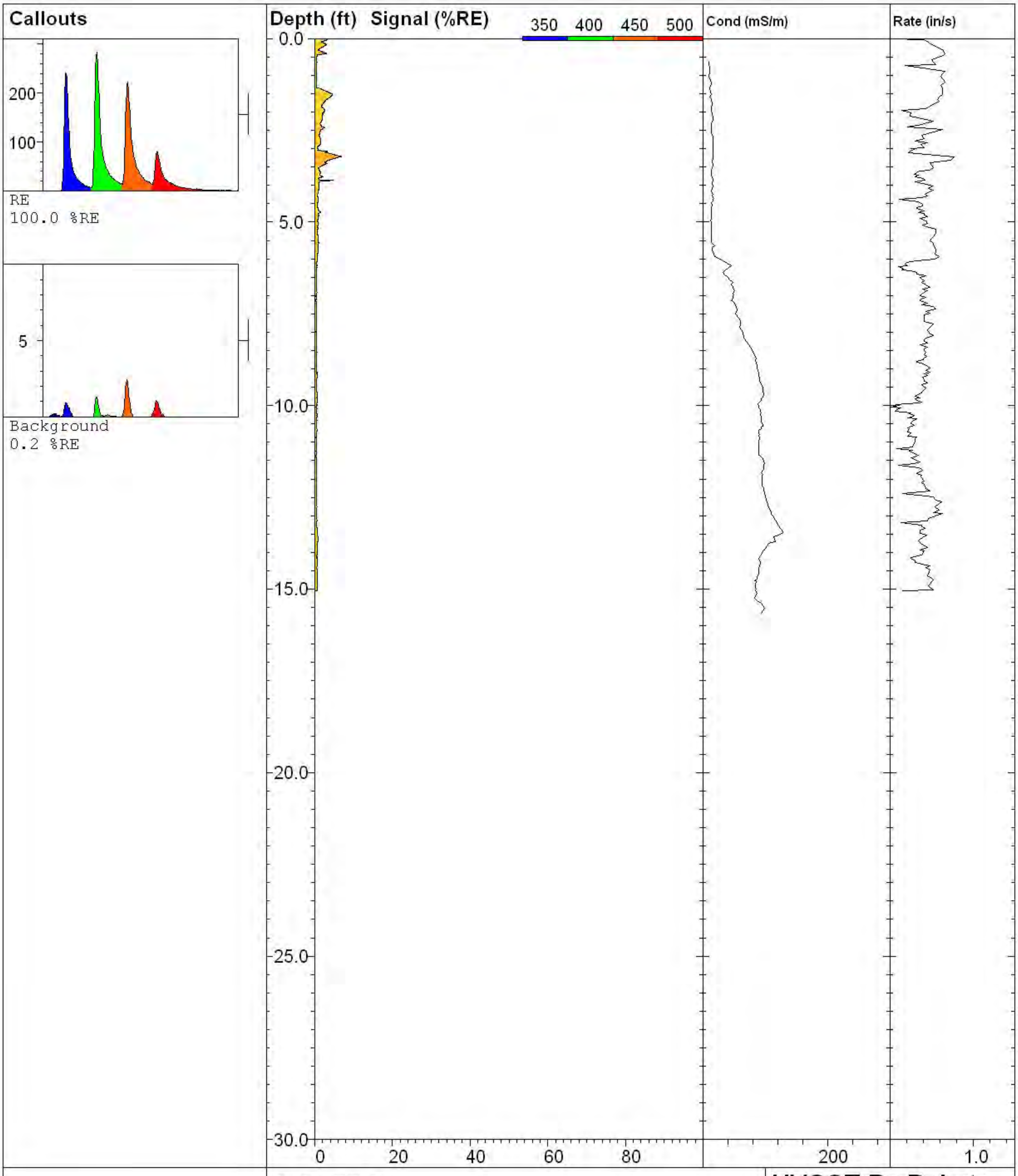


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **50.2 % @ 4.98 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 14:50 CST**

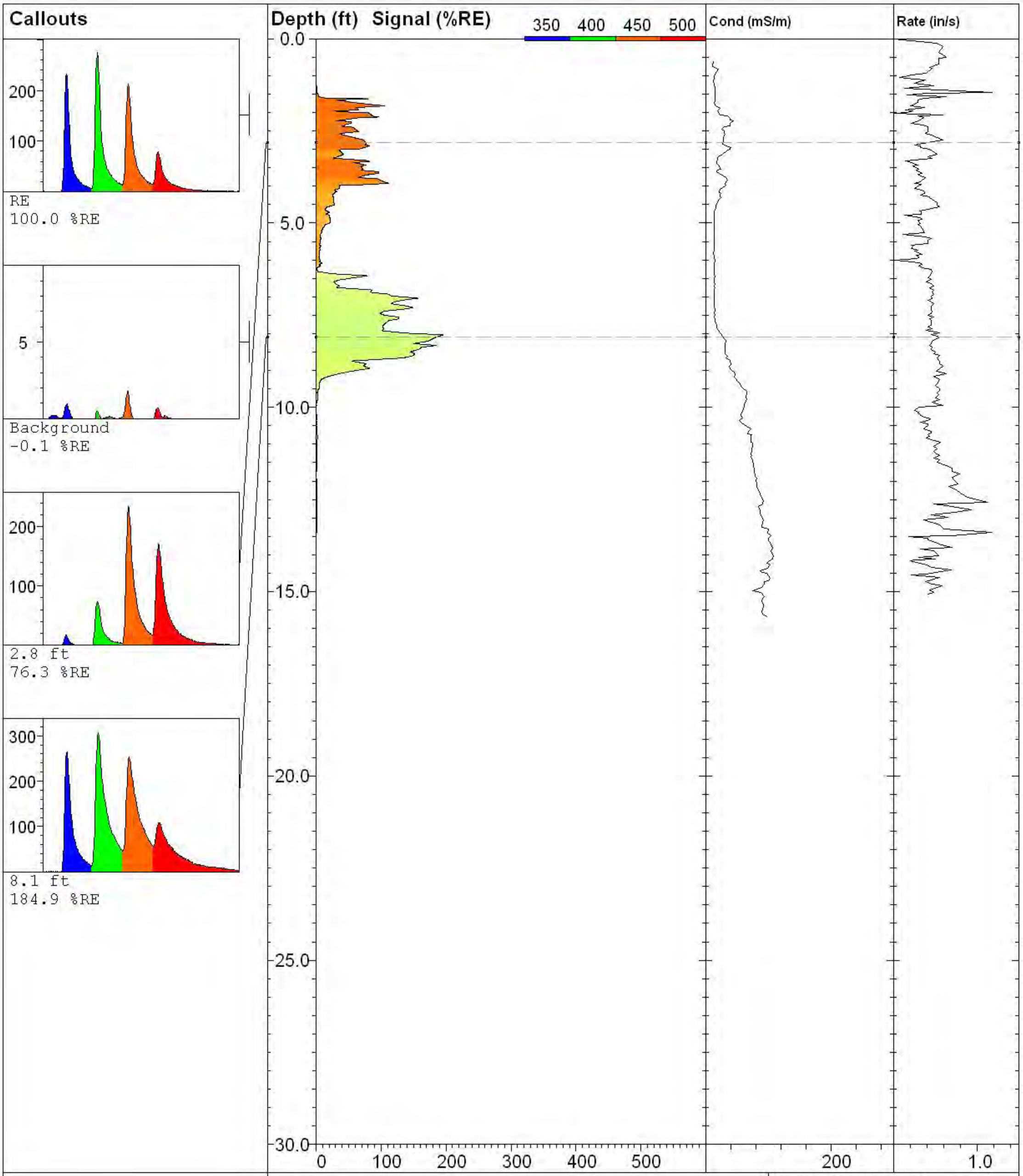


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.8 % @ 3.22 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 13:33 CST**

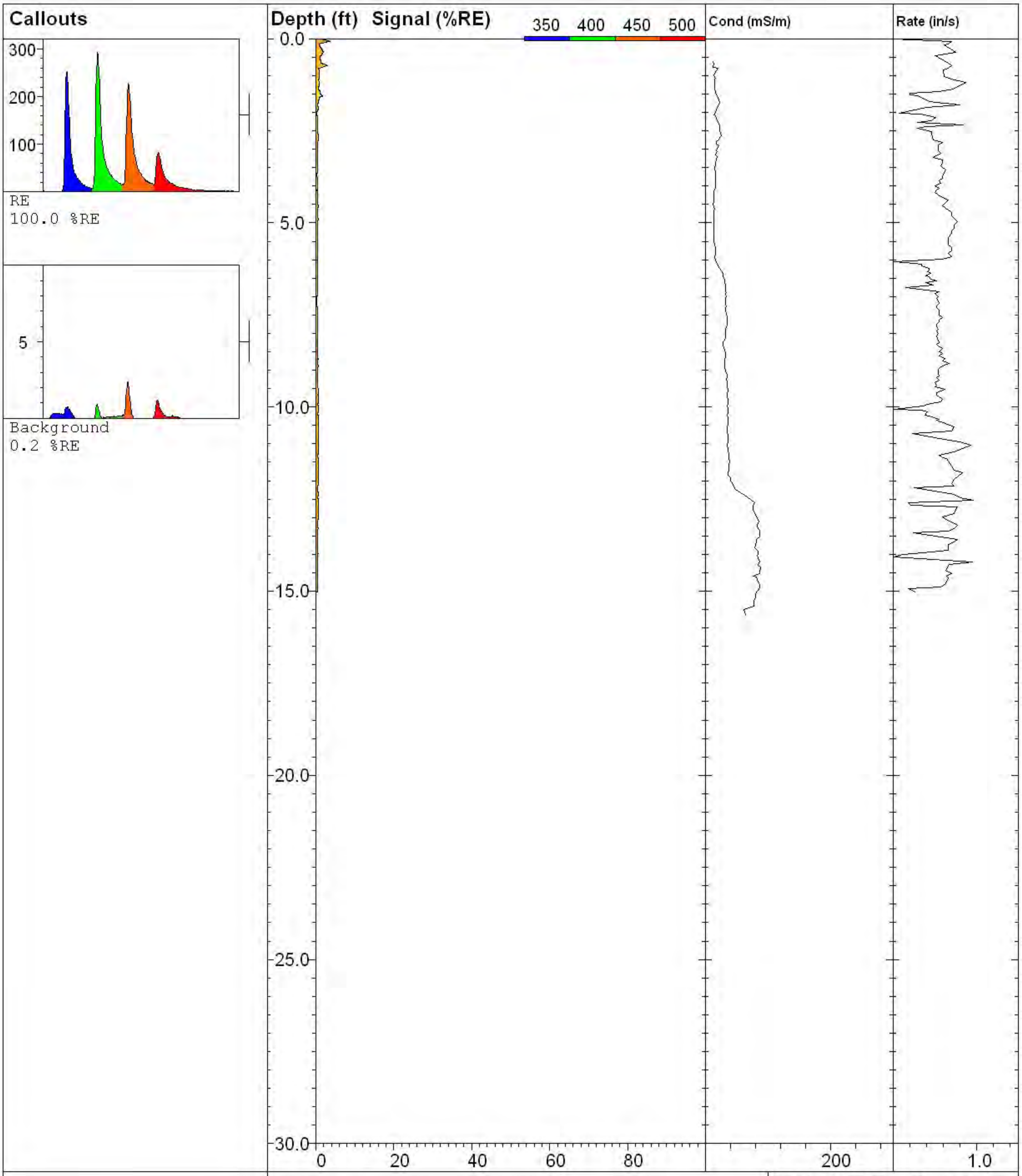


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.07 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **195.4 % @ 8.03 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 10:59 CST**

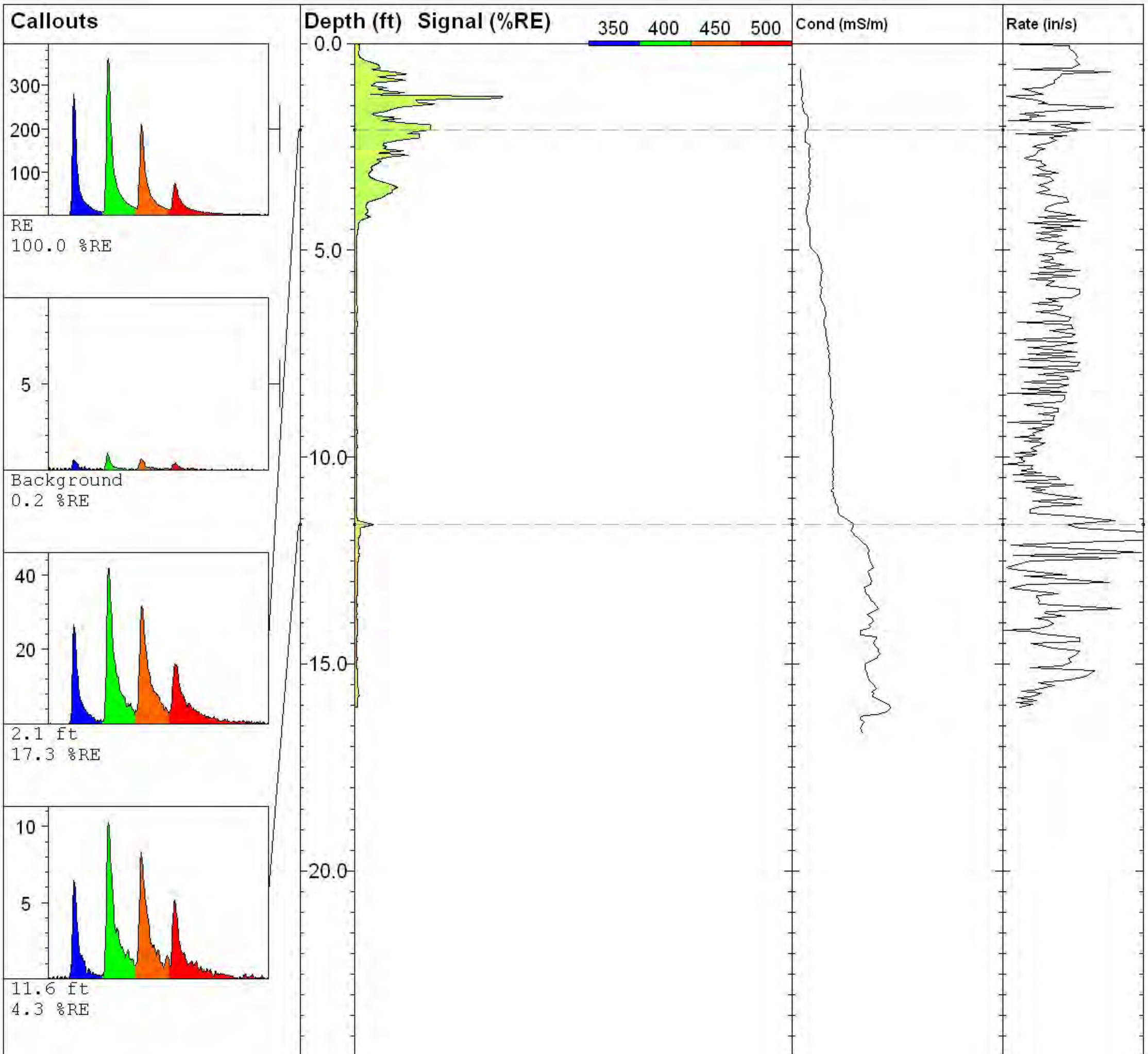


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.5 % @ 0.07 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-27 09:28 CST**

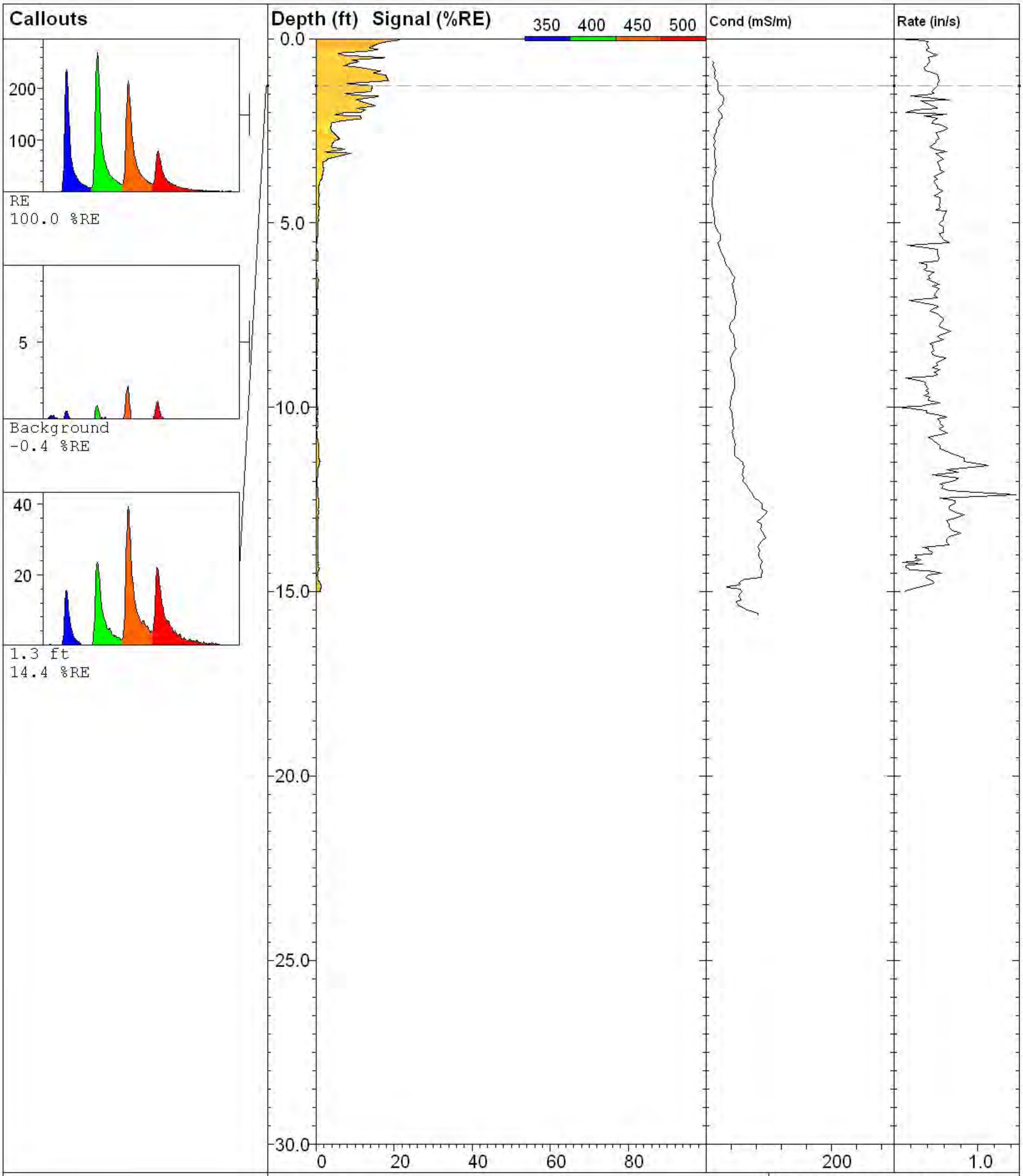


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **33.8 % @ 1.28 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 14:13 CST**

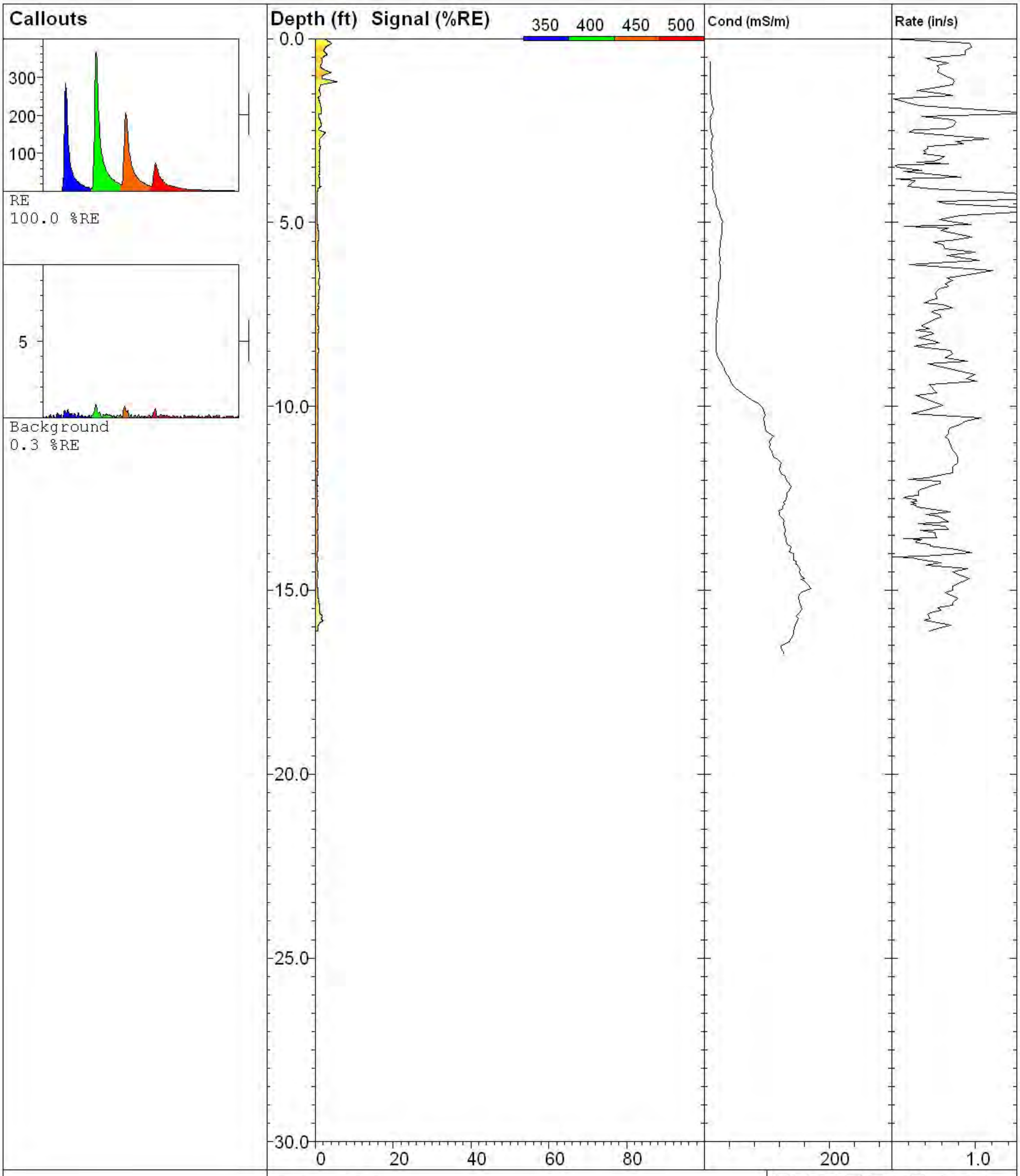


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LIF-134

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **21.4 % @ 0.04 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-27 08:29 CST**

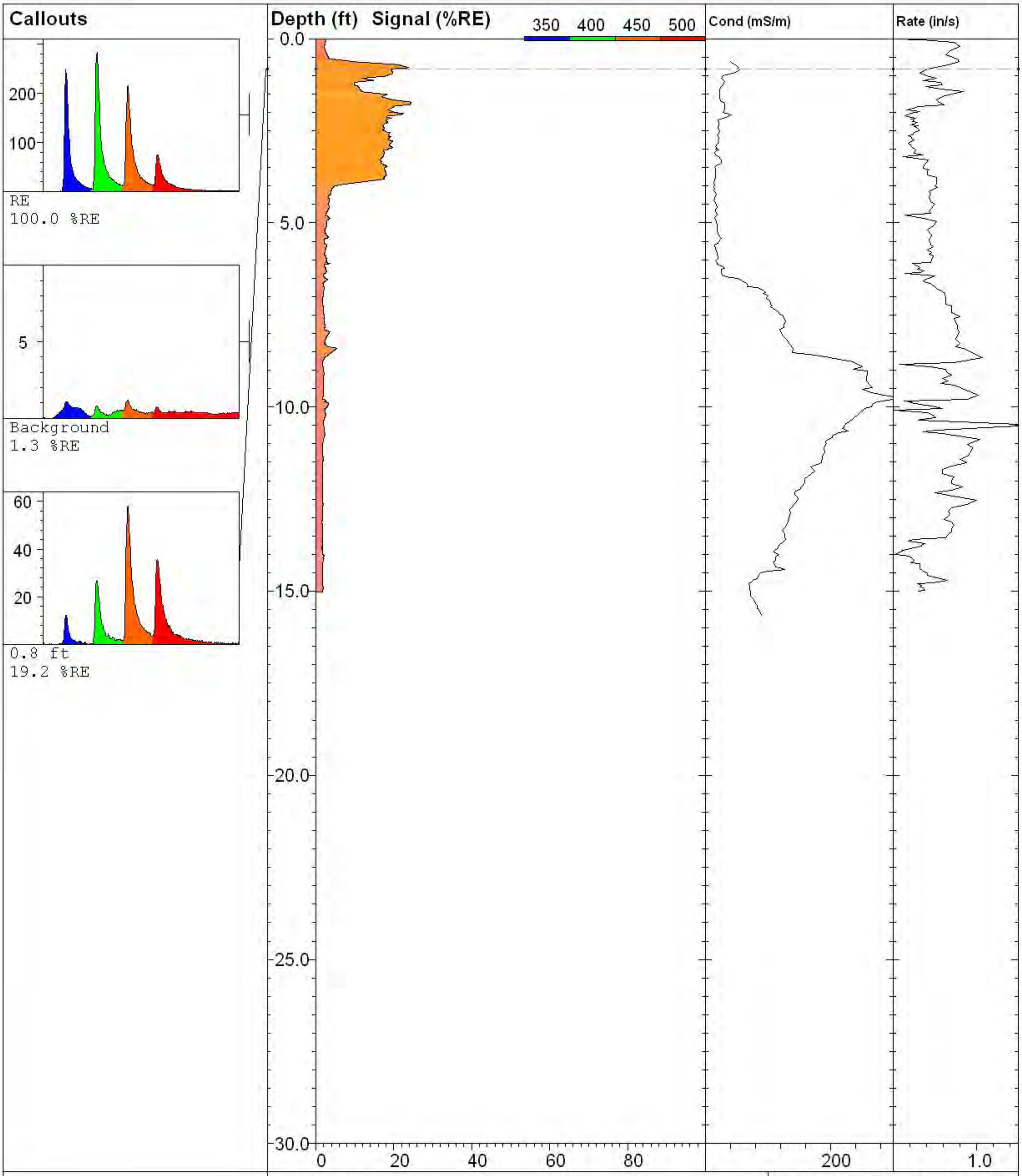


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LIF-146

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.11 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.6 % @ 1.17 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-29 08:35 CST**

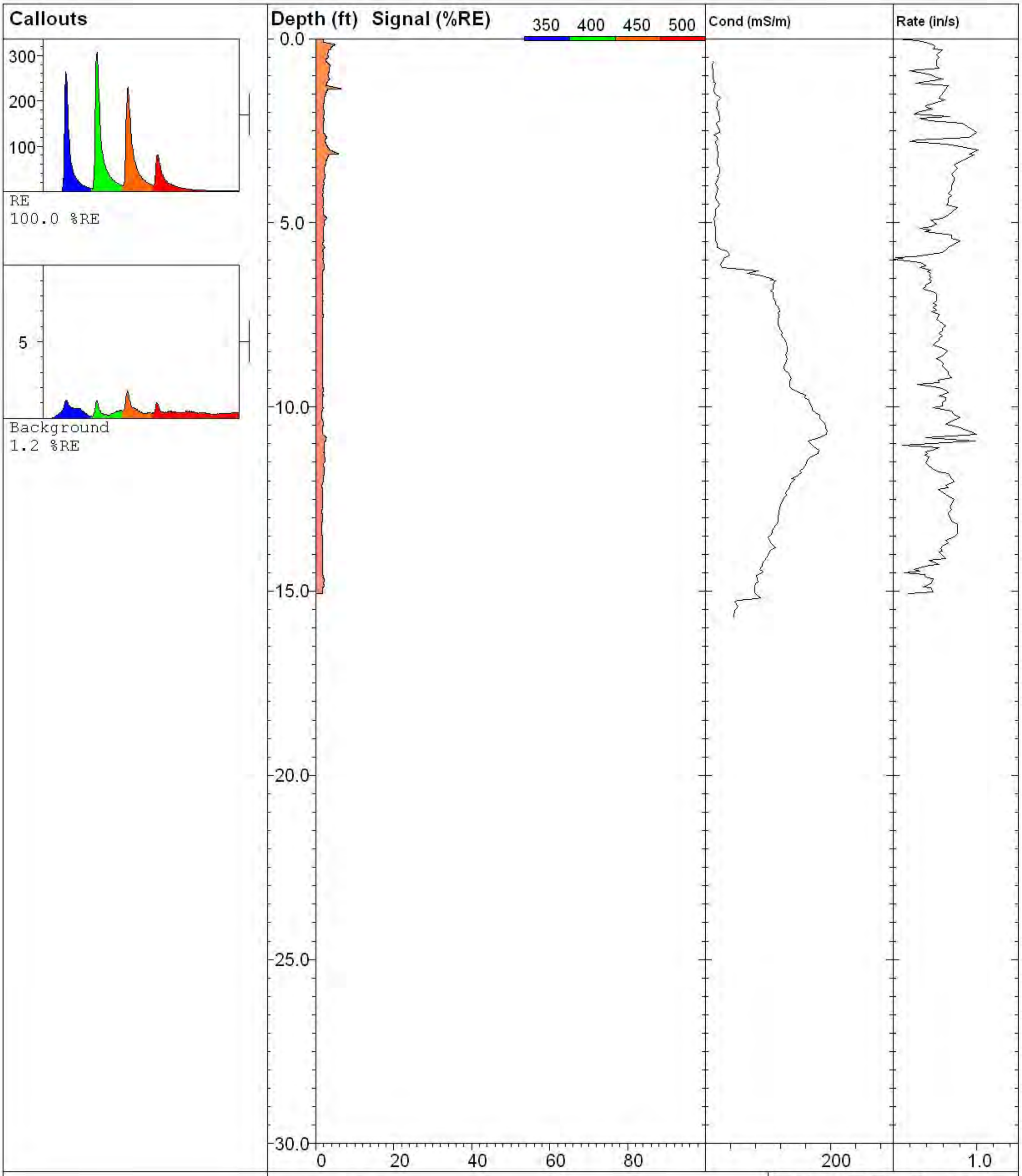


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LIF-147

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **24.5 % @ 1.73 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 12:51 CST**

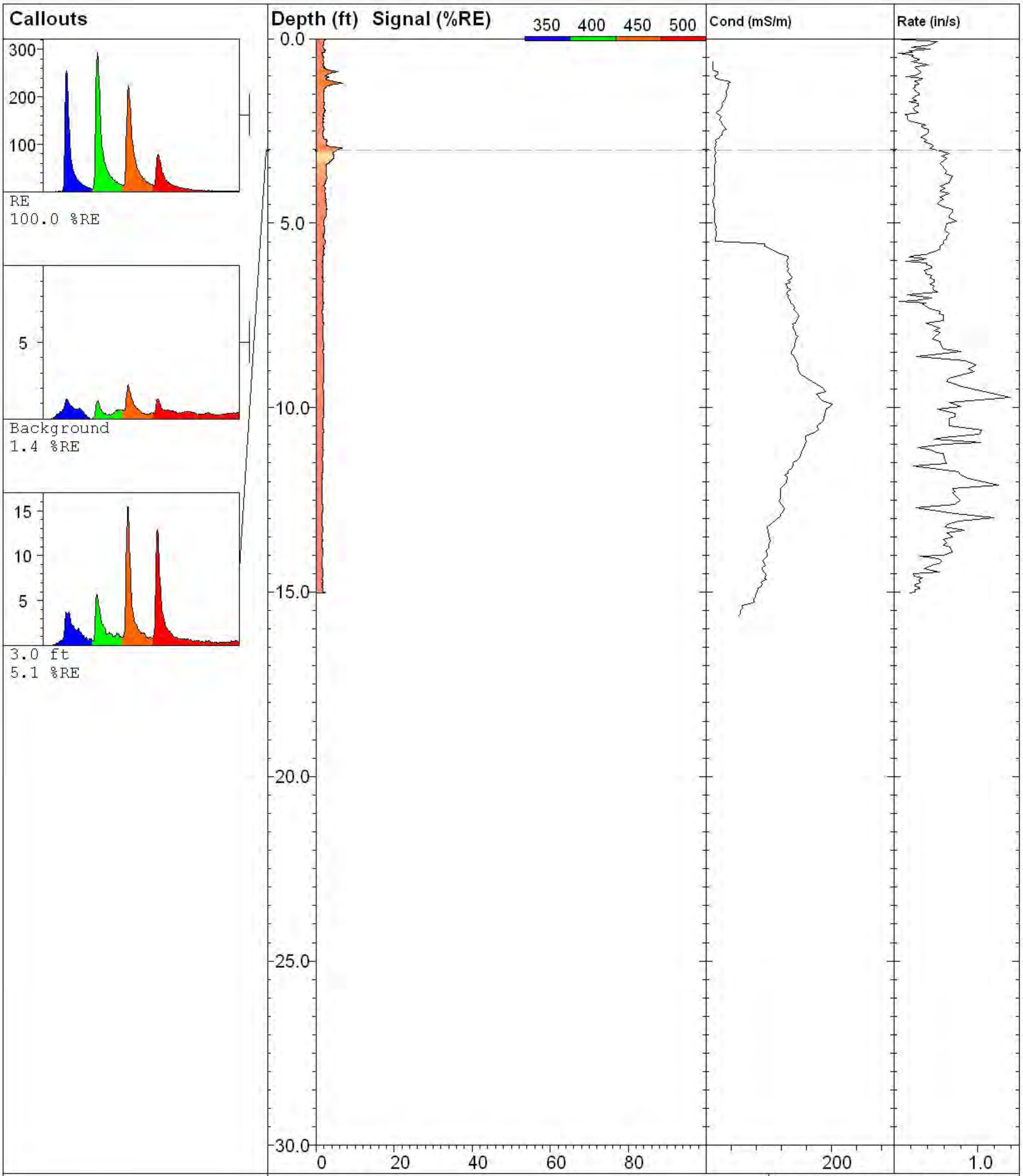


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LIF-148

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.6 % @ 1.36 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 12:28 CST**

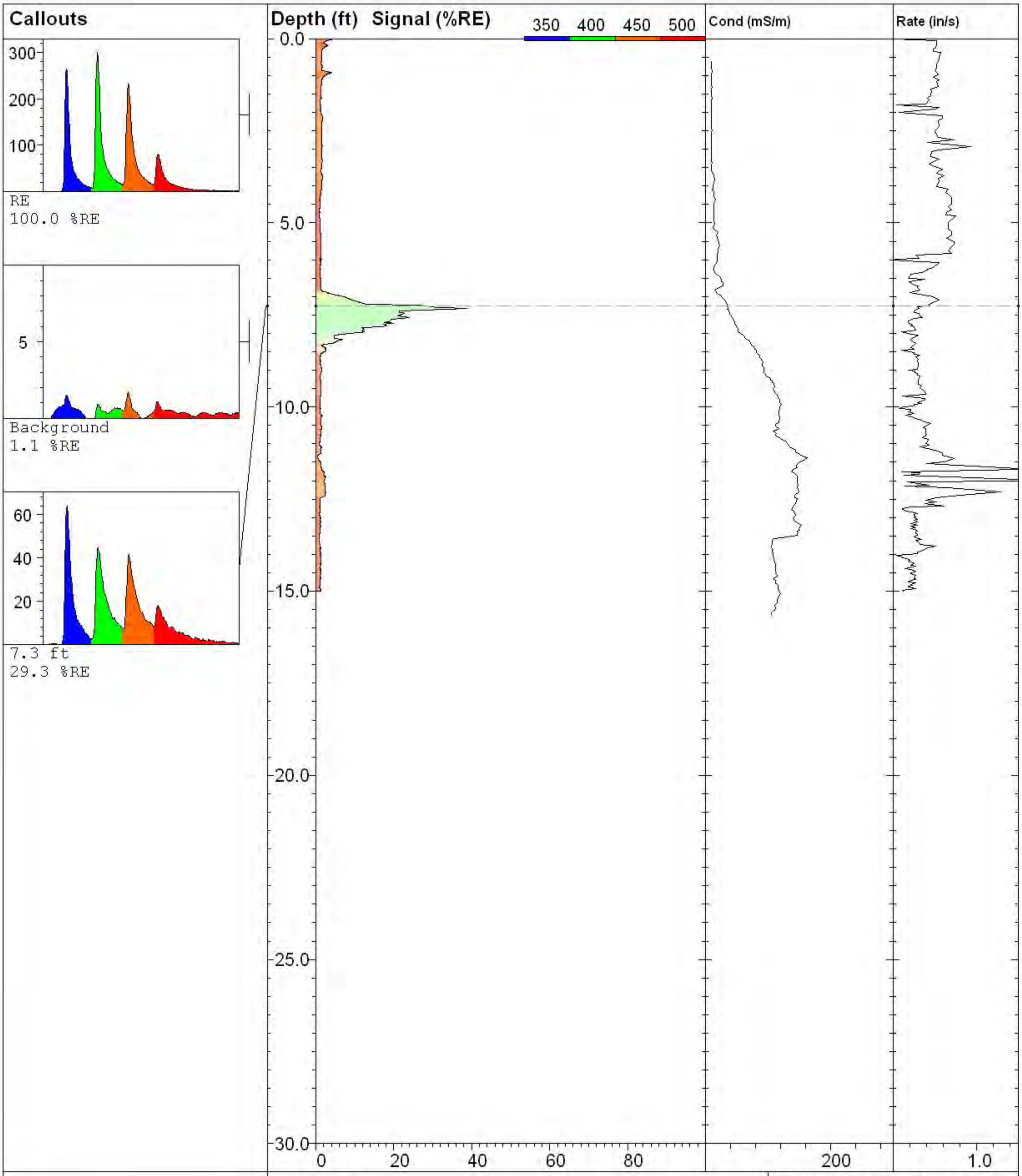


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LIF-149

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.8 % @ 1.21 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 11:52 CST**

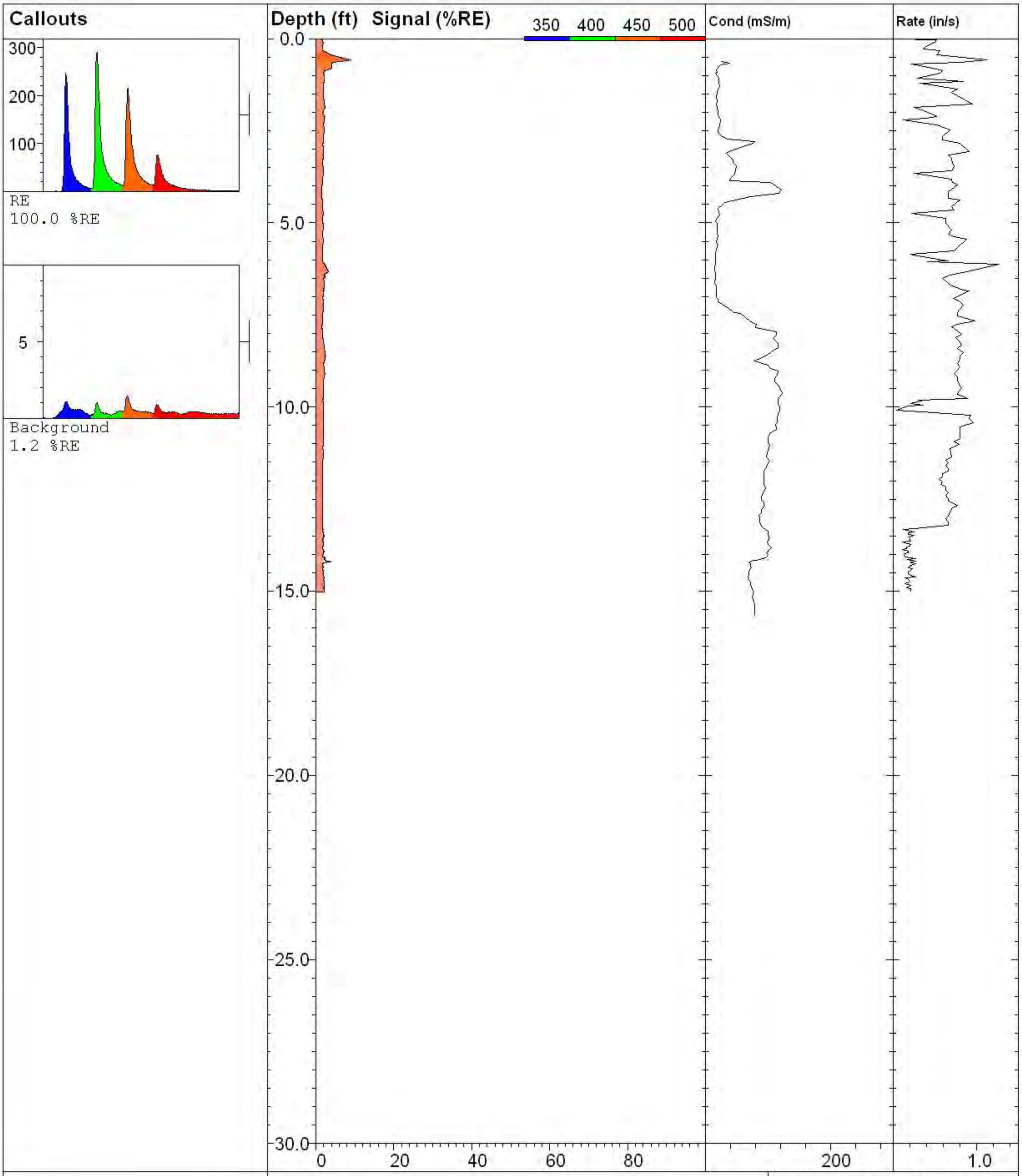


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LIF-156

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **39.0 % @ 7.33 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 08:27 CST**

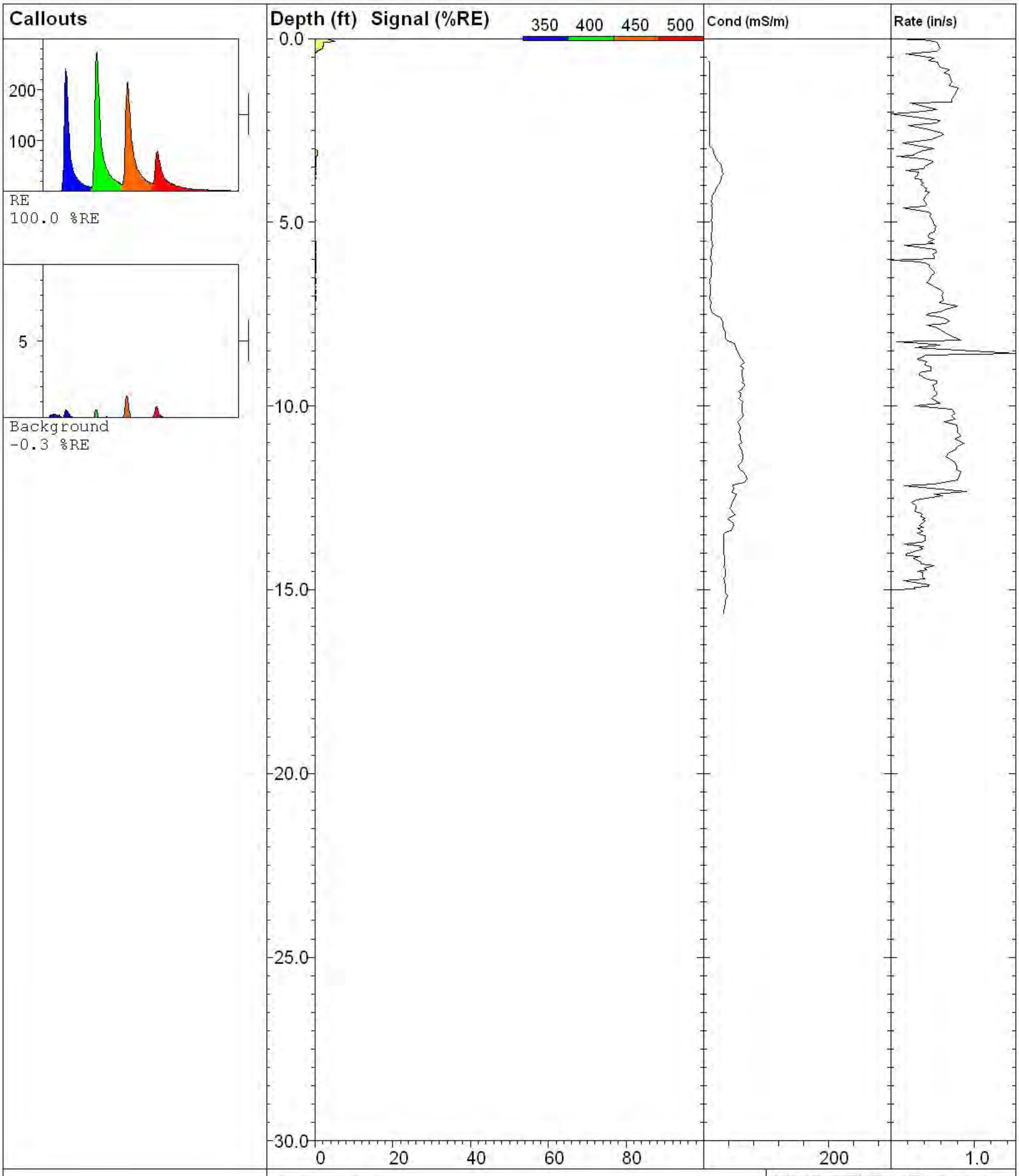


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LIF-166

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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **8.9 % @ 0.58 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 14:25 CST**



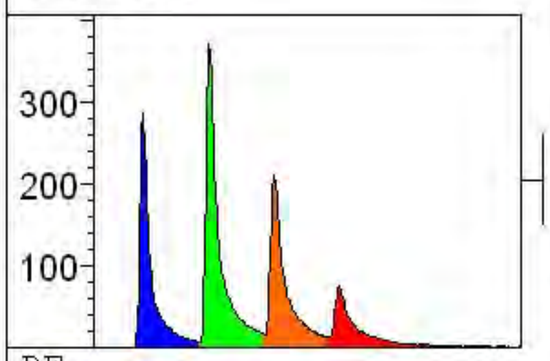
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LIF-186

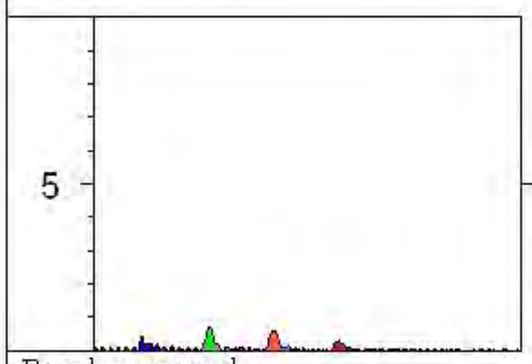
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.1 % @ 0.08 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 15:30 CST**

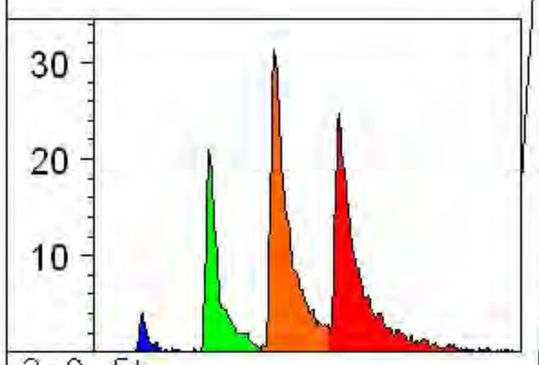
Callouts



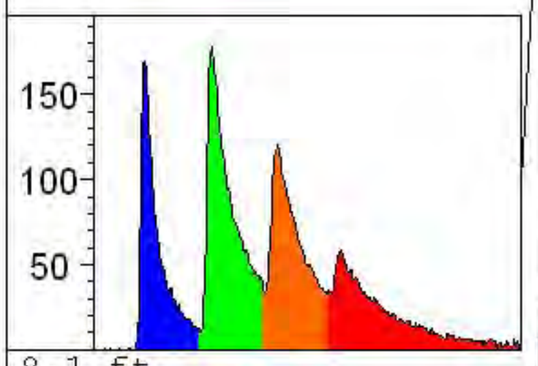
RE
100.0 %RE



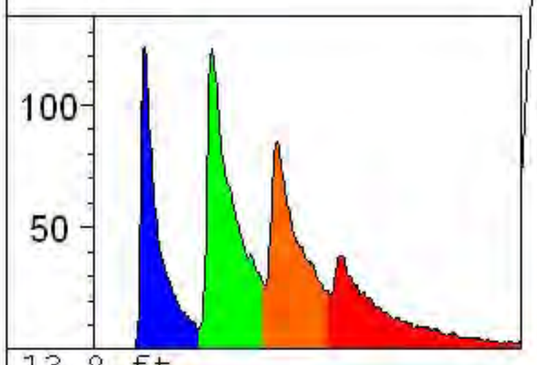
Background
0.2 %RE



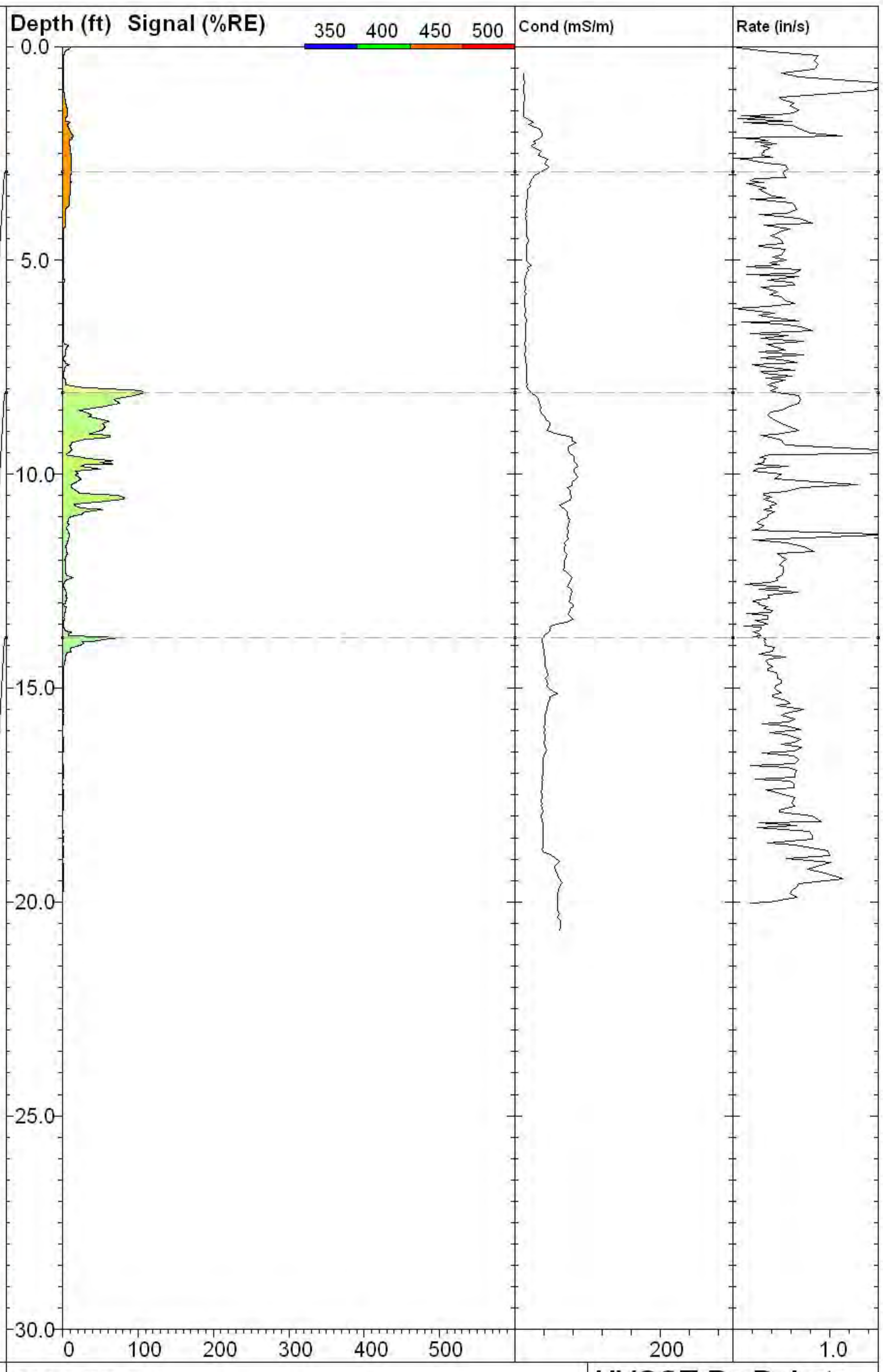
2.9 ft
10.9 %RE



8.1 ft
108.6 %RE



13.8 ft
77.0 %RE

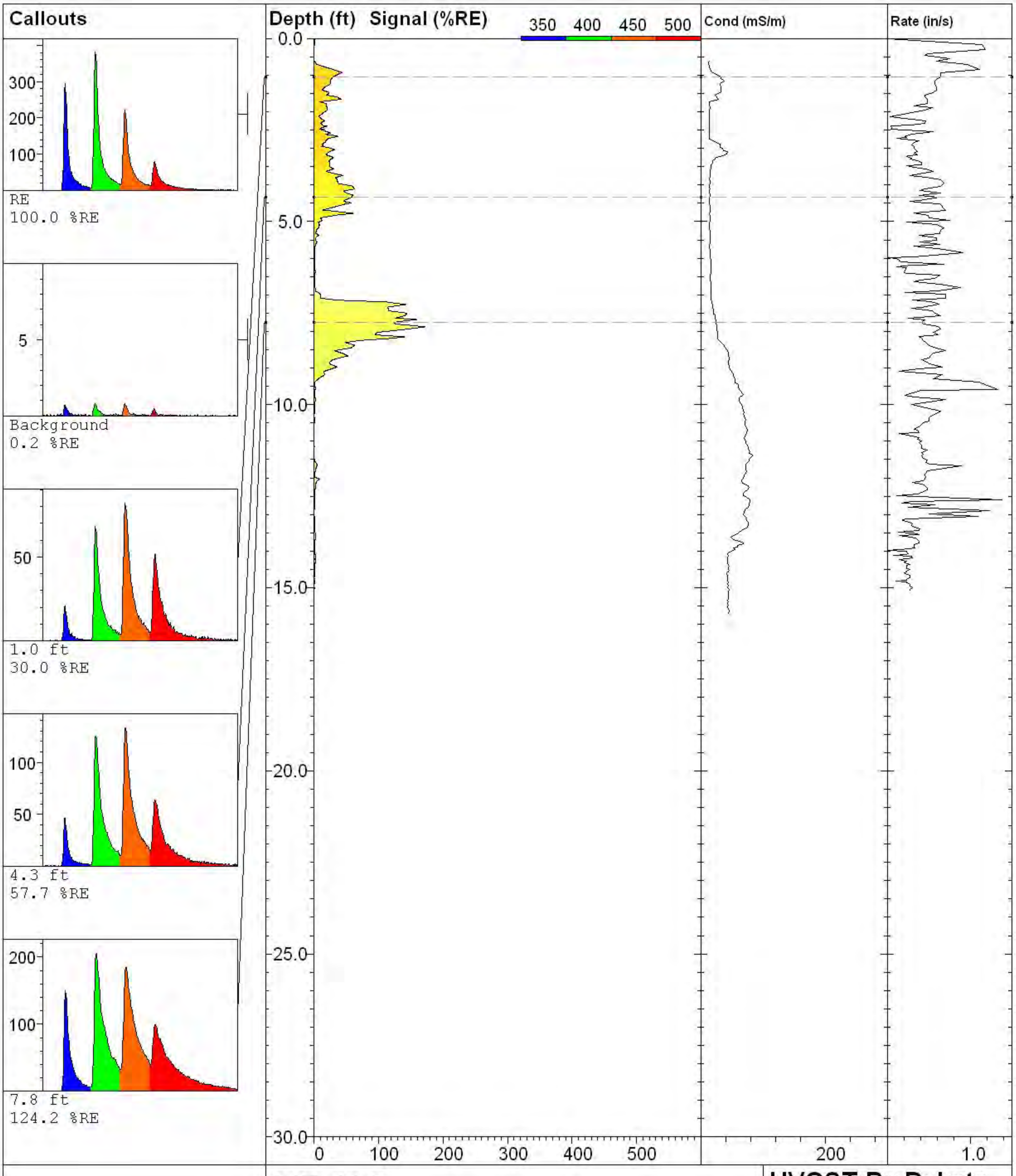


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LIF-187

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **20.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **108.6 % @ 8.10 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 14:58 CST**



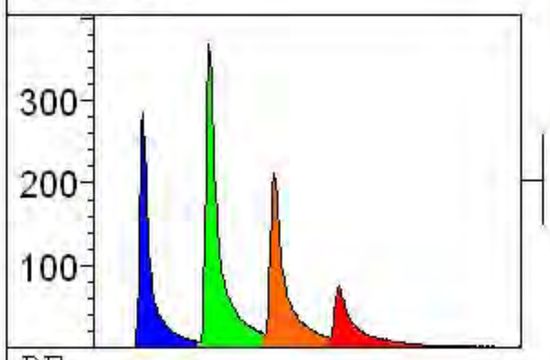
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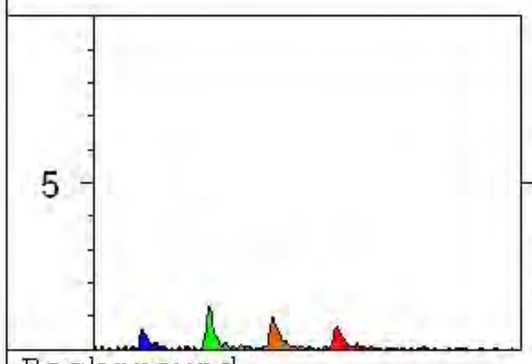
UVOST By Dakota
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **172.2 % @ 7.88 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 15:41 CST**

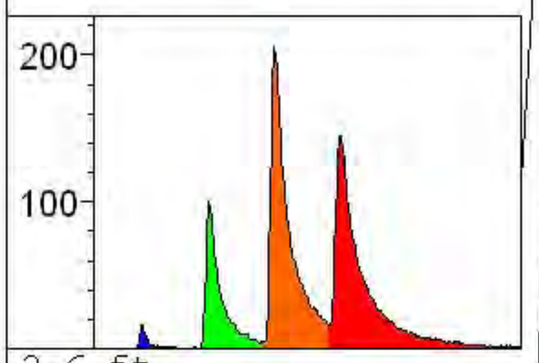
Callouts



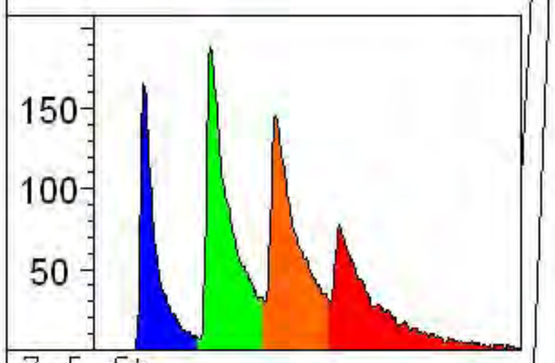
RE
100.0 %RE



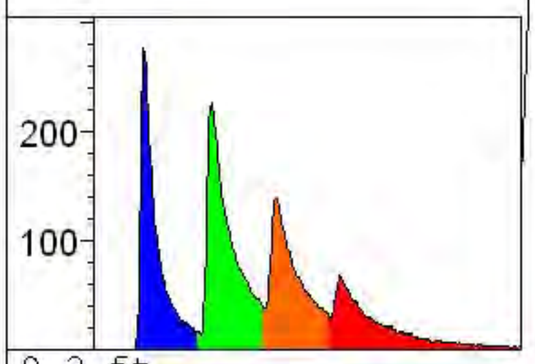
Background
0.3 %RE



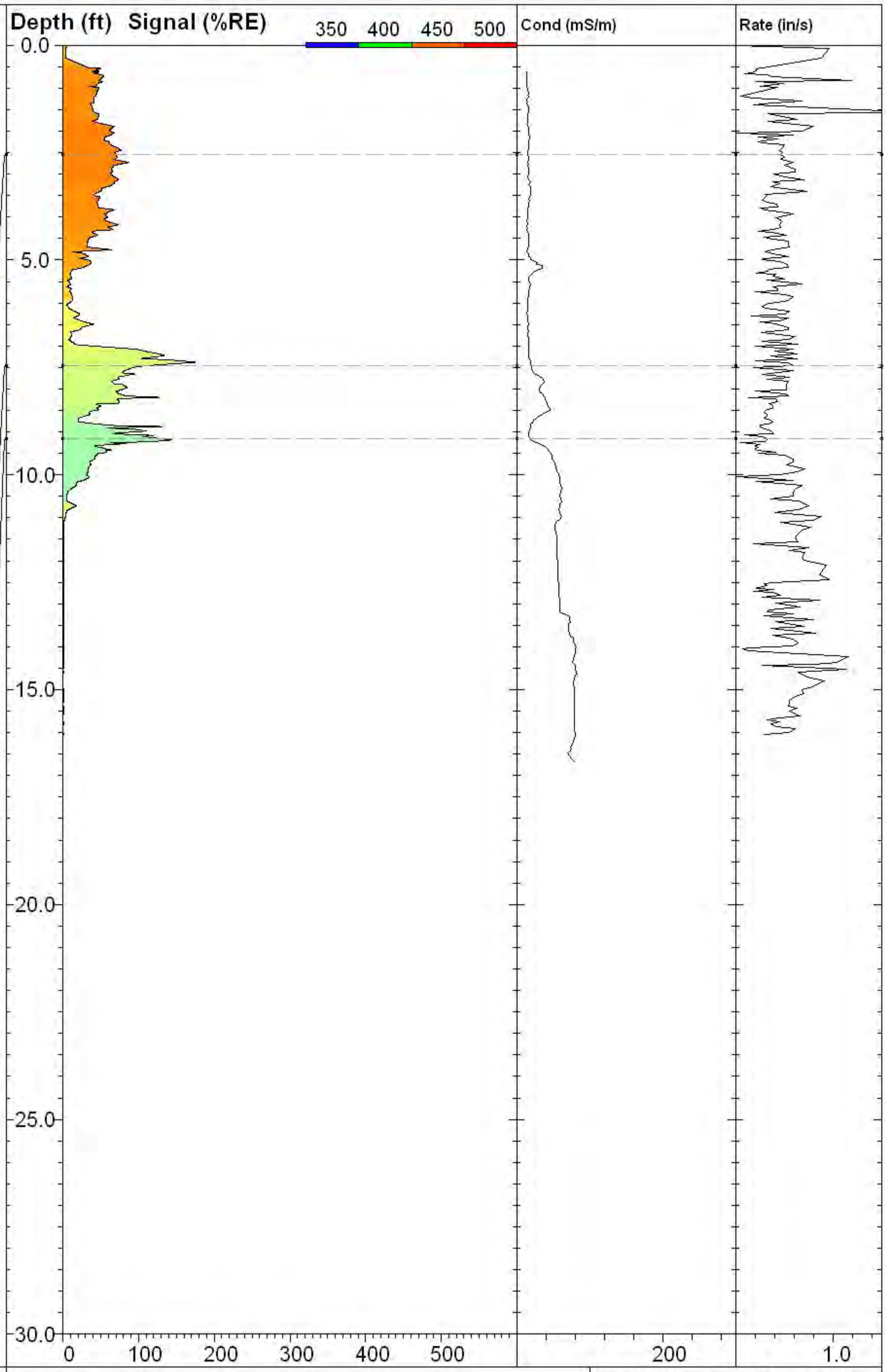
2.6 ft
70.6 %RE



7.5 ft
106.8 %RE



9.2 ft
128.9 %RE

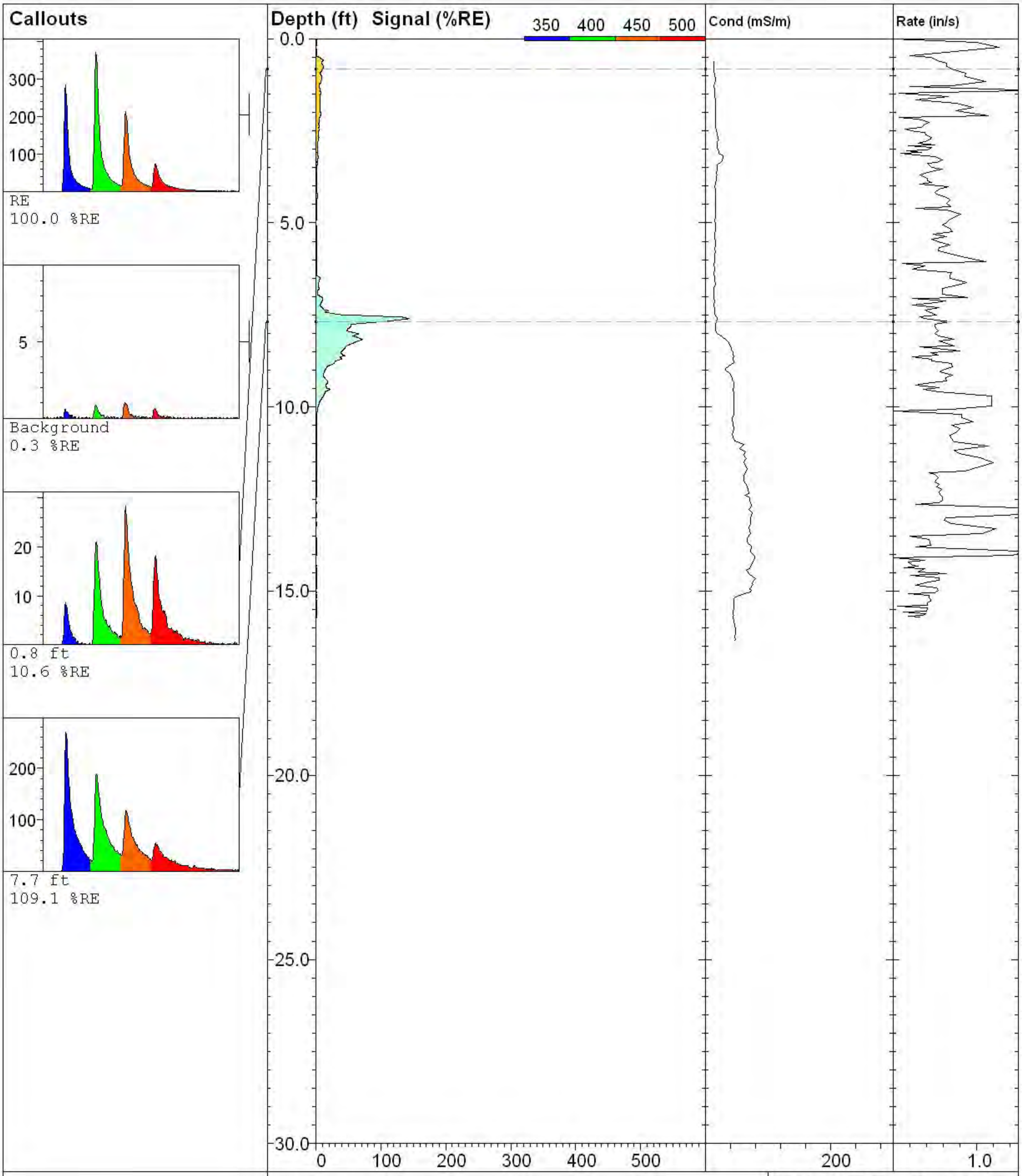


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **175.7 % @ 7.38 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 16:30 CST**

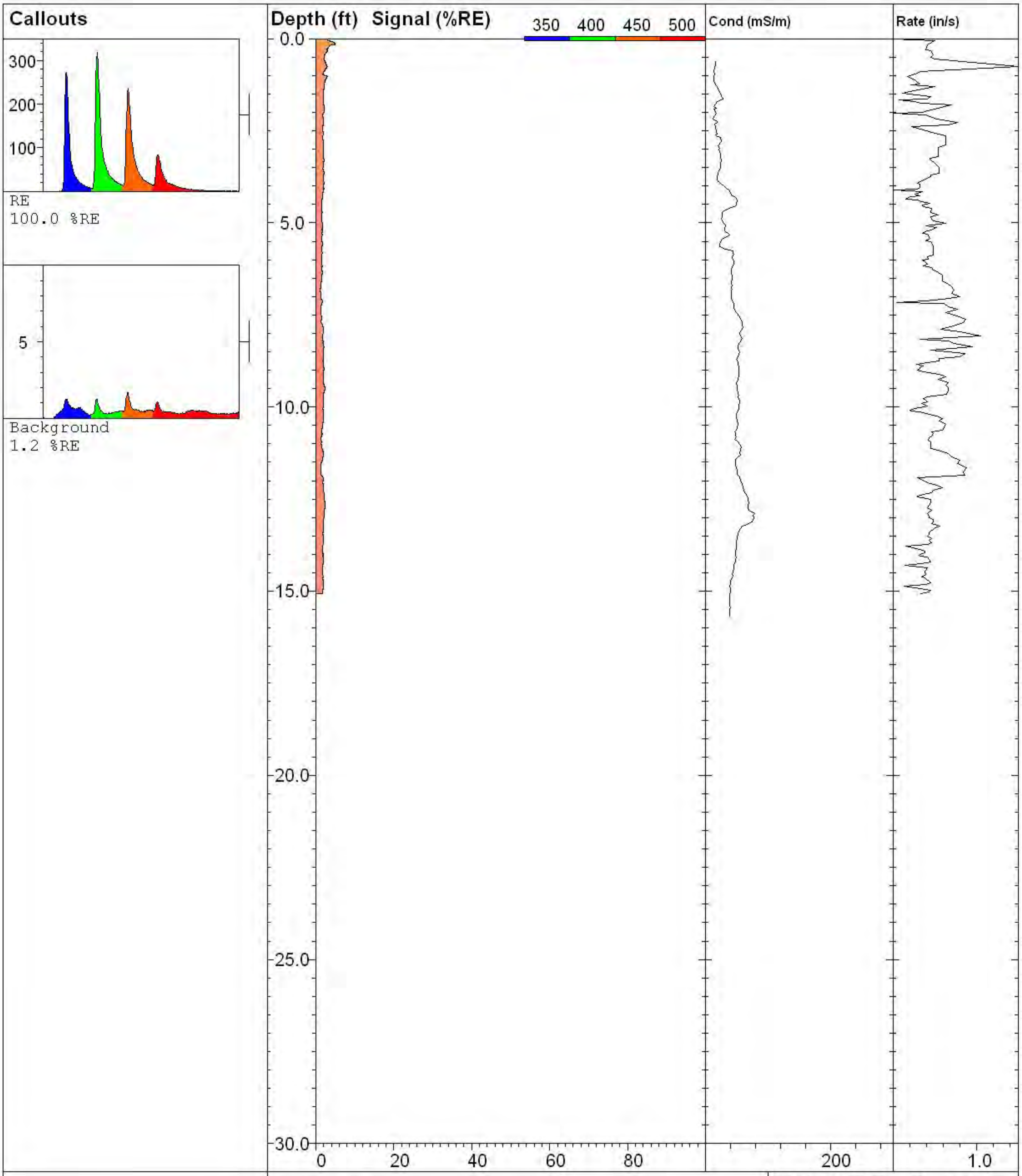


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.72 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **143.5 % @ 7.60 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 17:37 CST**

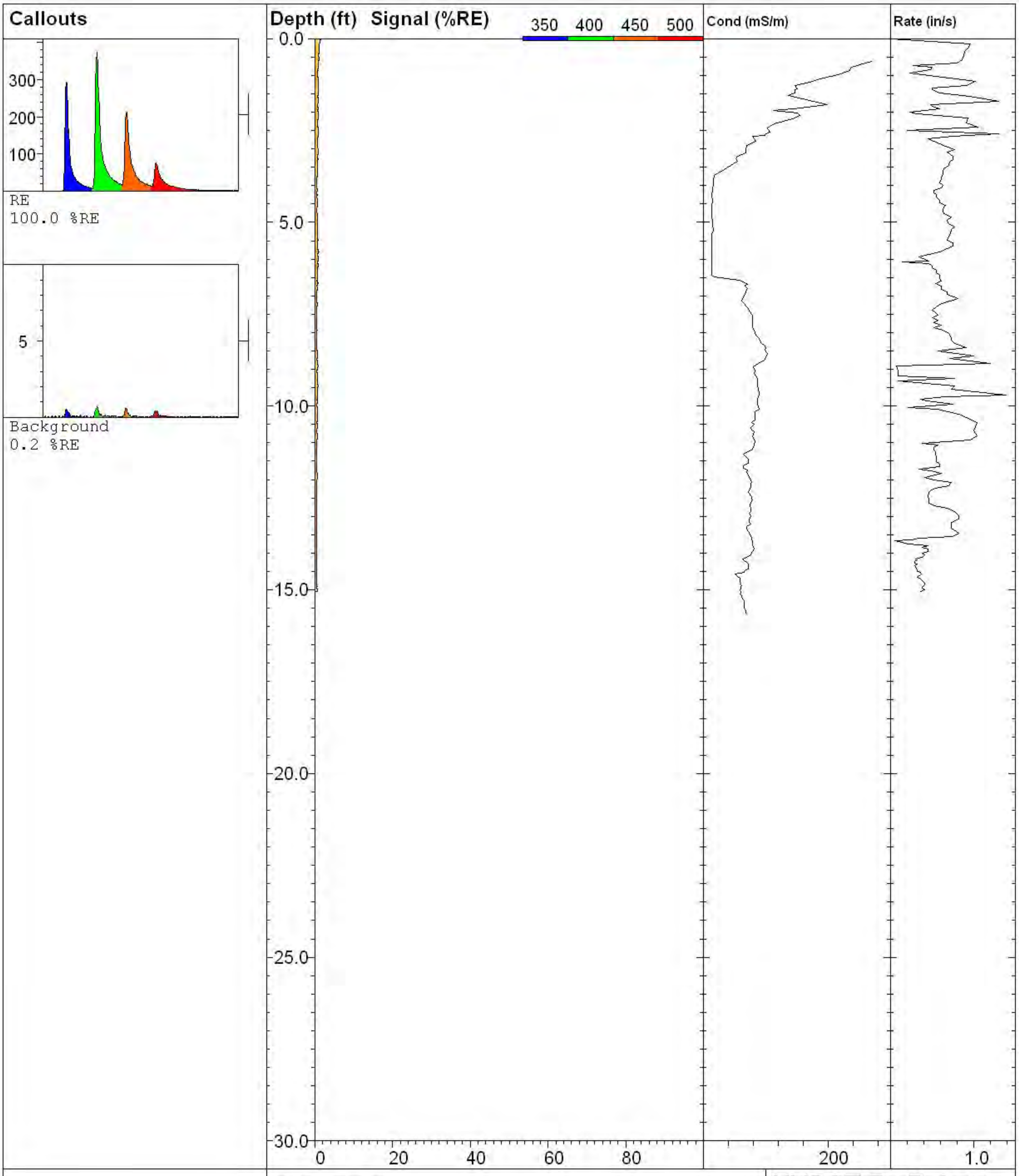


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.06 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.9 % @ 0.16 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-25 16:45 CST**

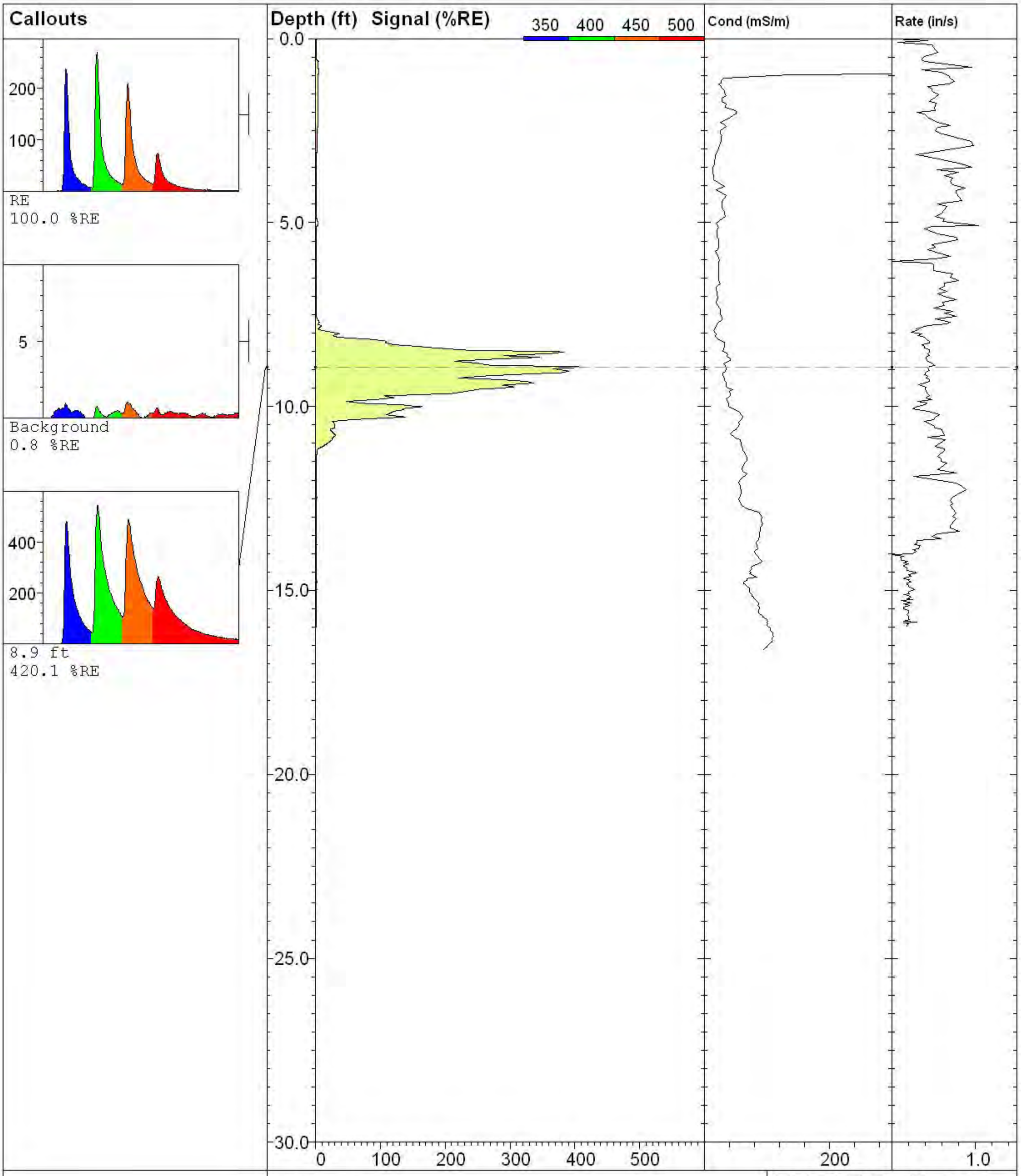


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.5 % @ 0.00 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-25 16:44 CST**

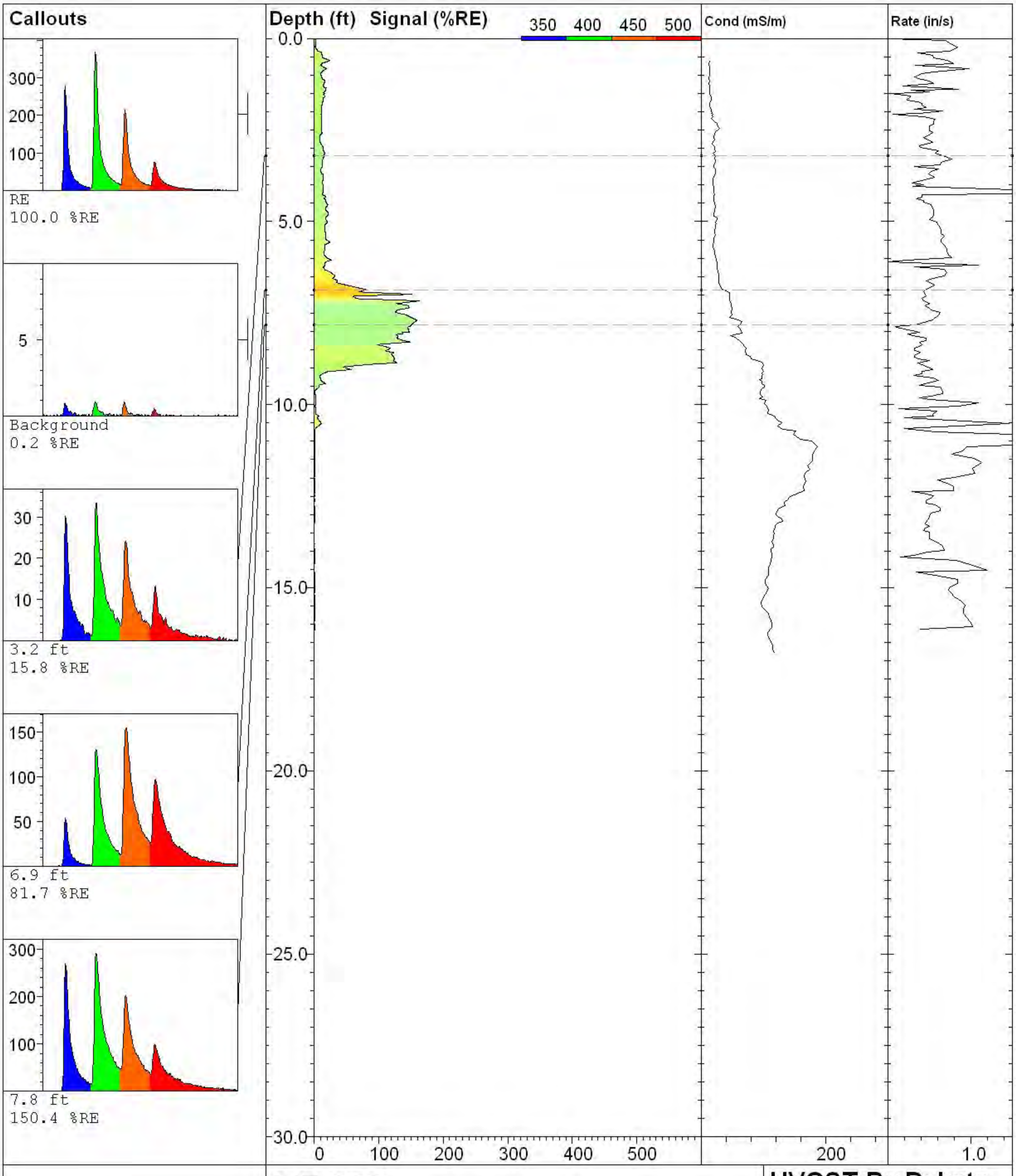


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **420.1 % @ 8.92 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 10:27 CST**

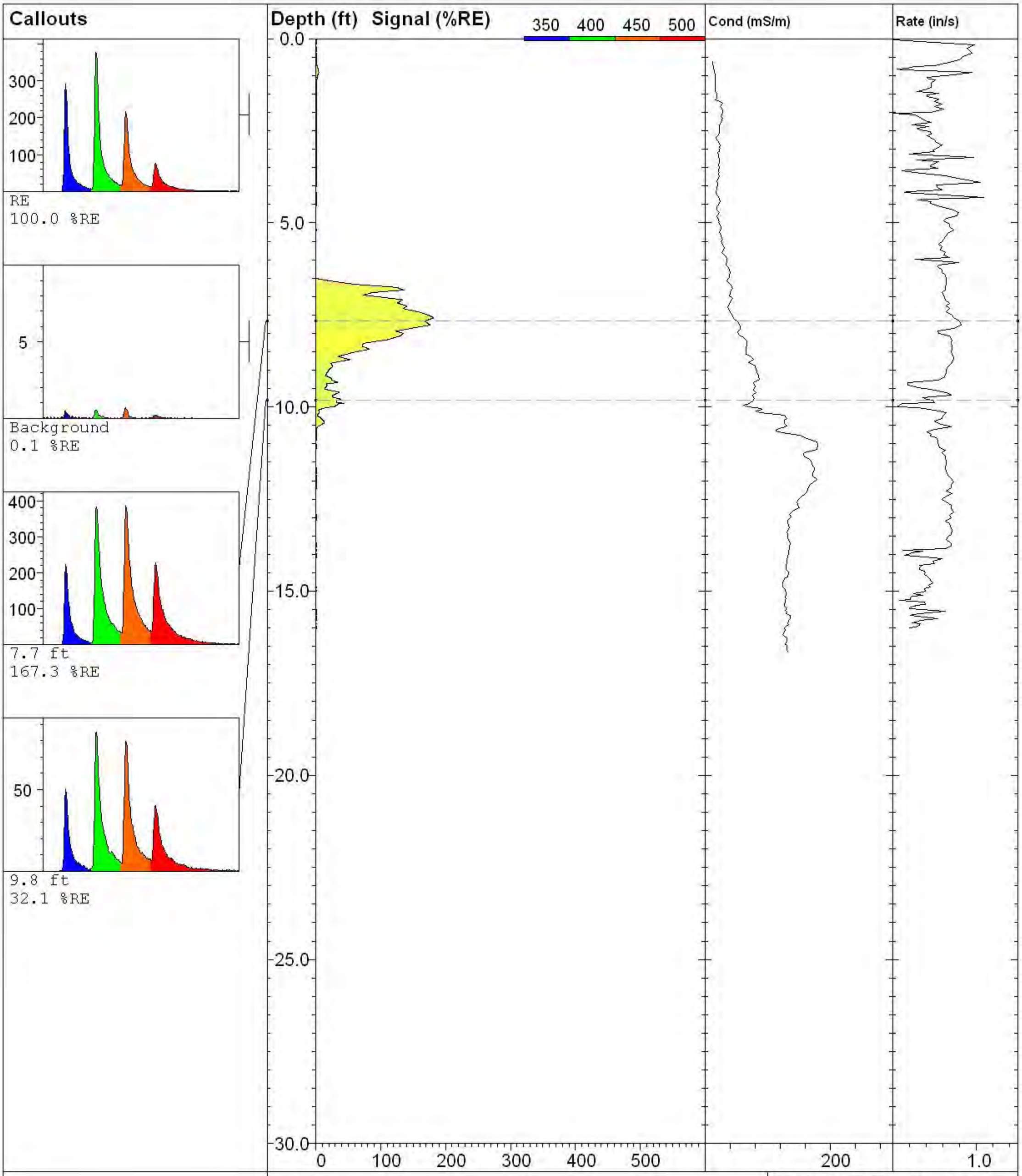


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.15 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **163.9 % @ 7.17 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 13:46 CST**



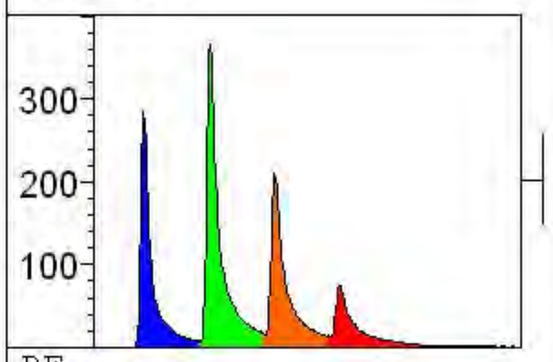
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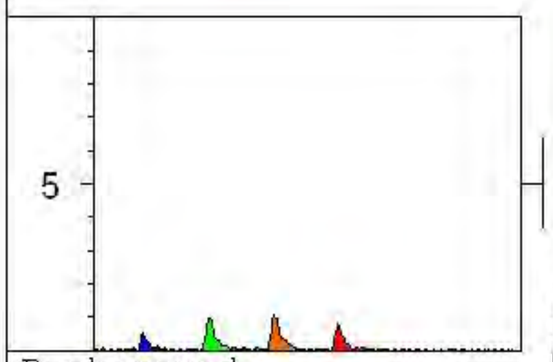
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.02 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **181.6 % @ 7.58 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 13:05 CST**

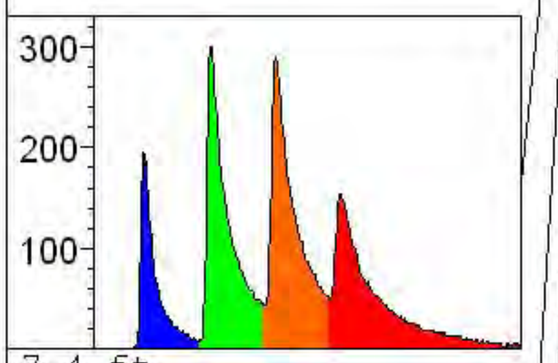
Callouts



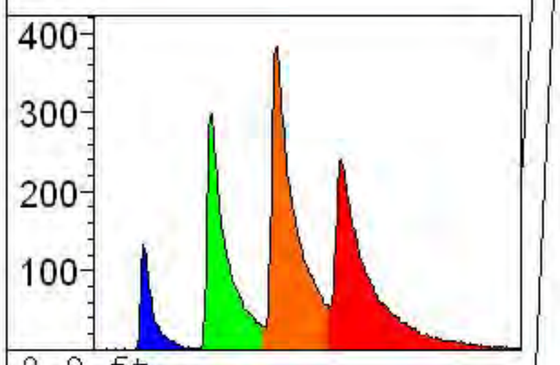
RE
100.0 %RE



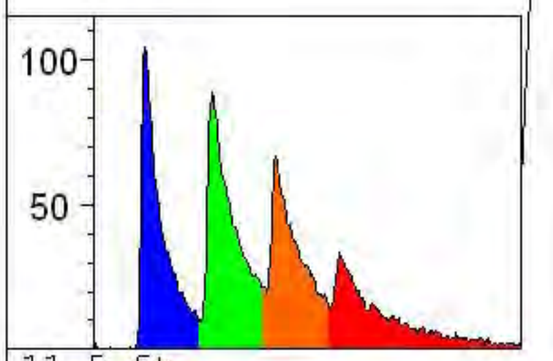
Background
0.2 %RE



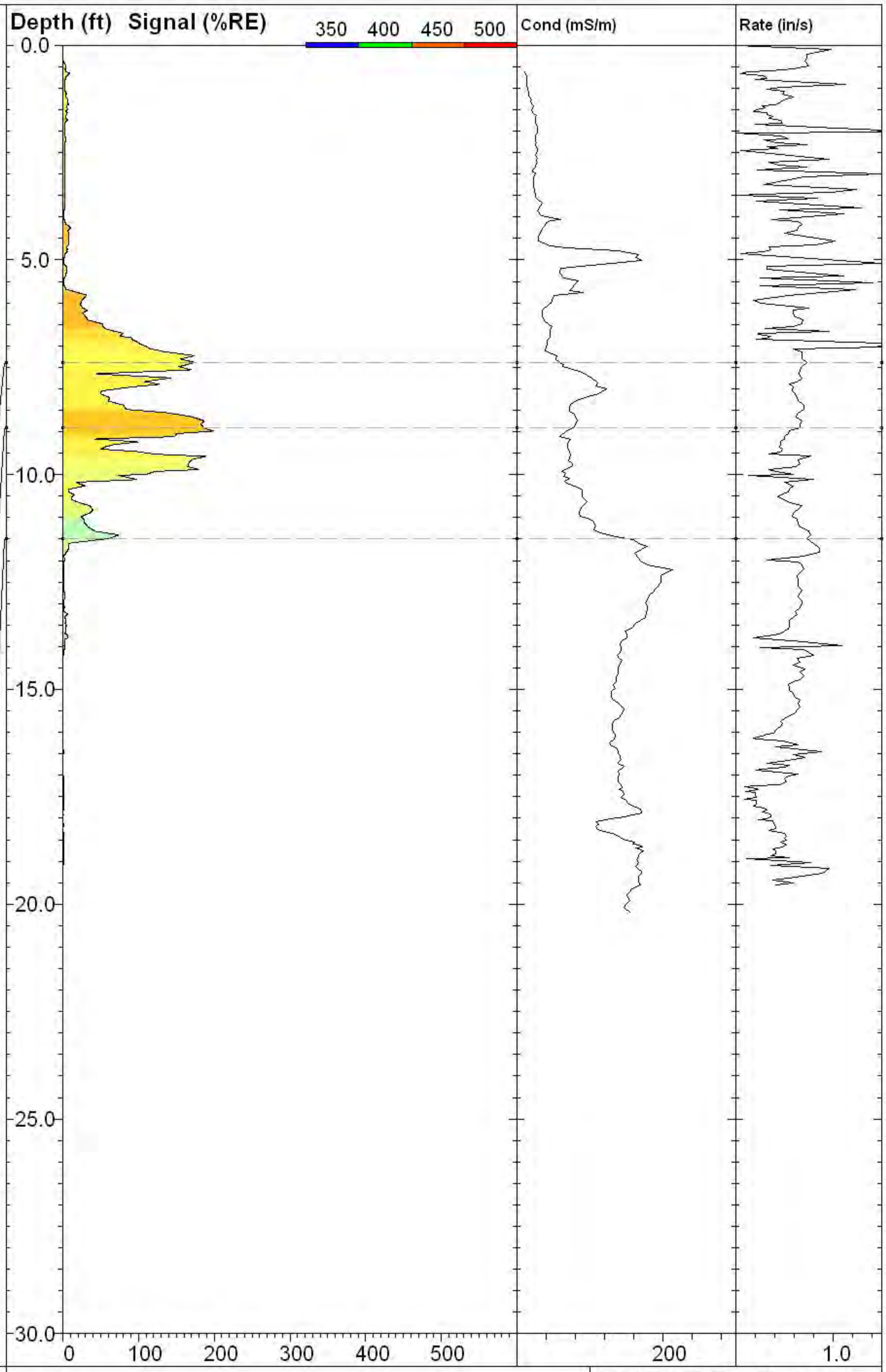
7.4 ft
174.3 %RE



8.9 ft
186.5 %RE



11.5 ft
62.0 %RE

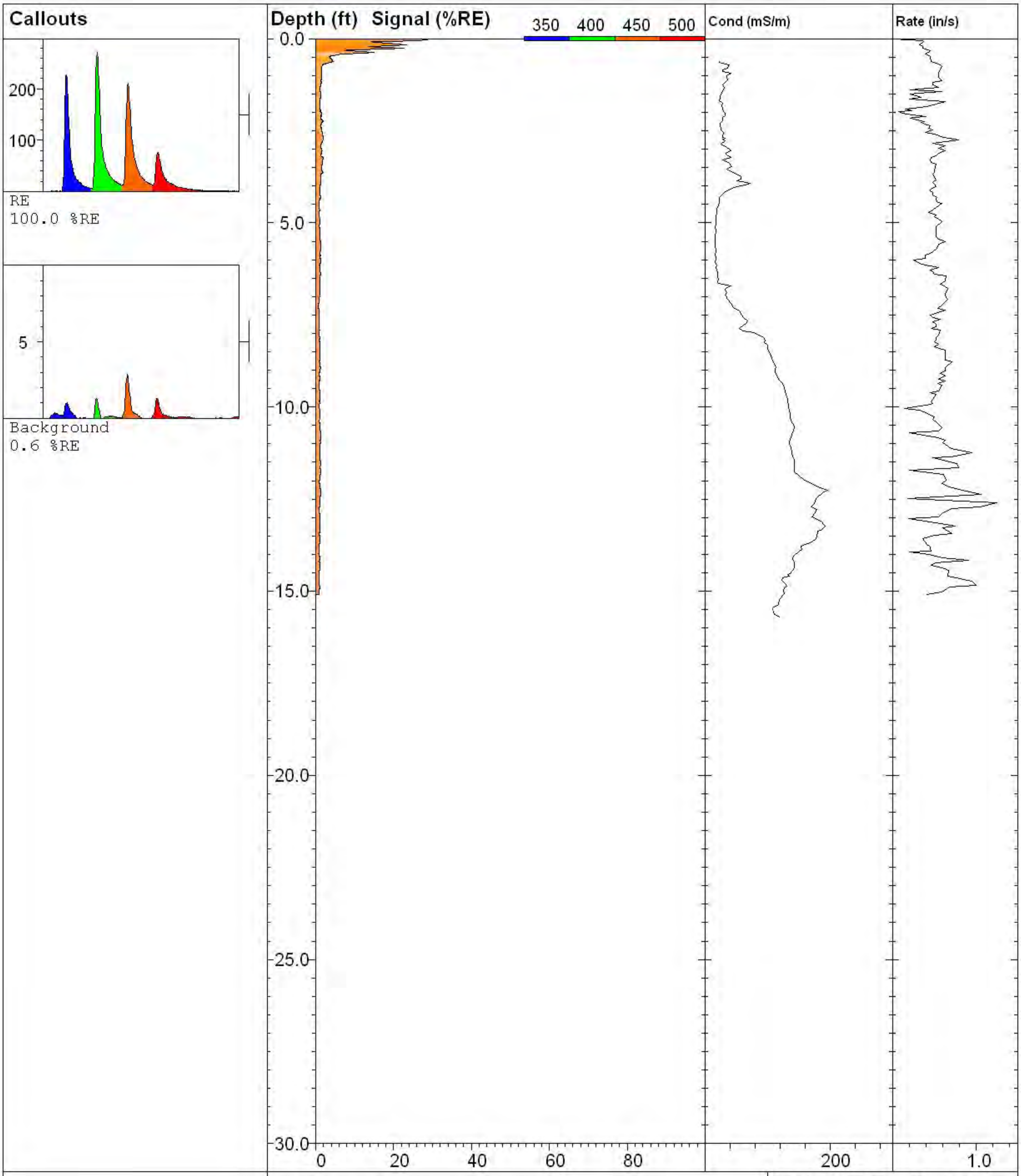


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **19.55 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **199.0 % @ 8.99 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 12:22 CST**

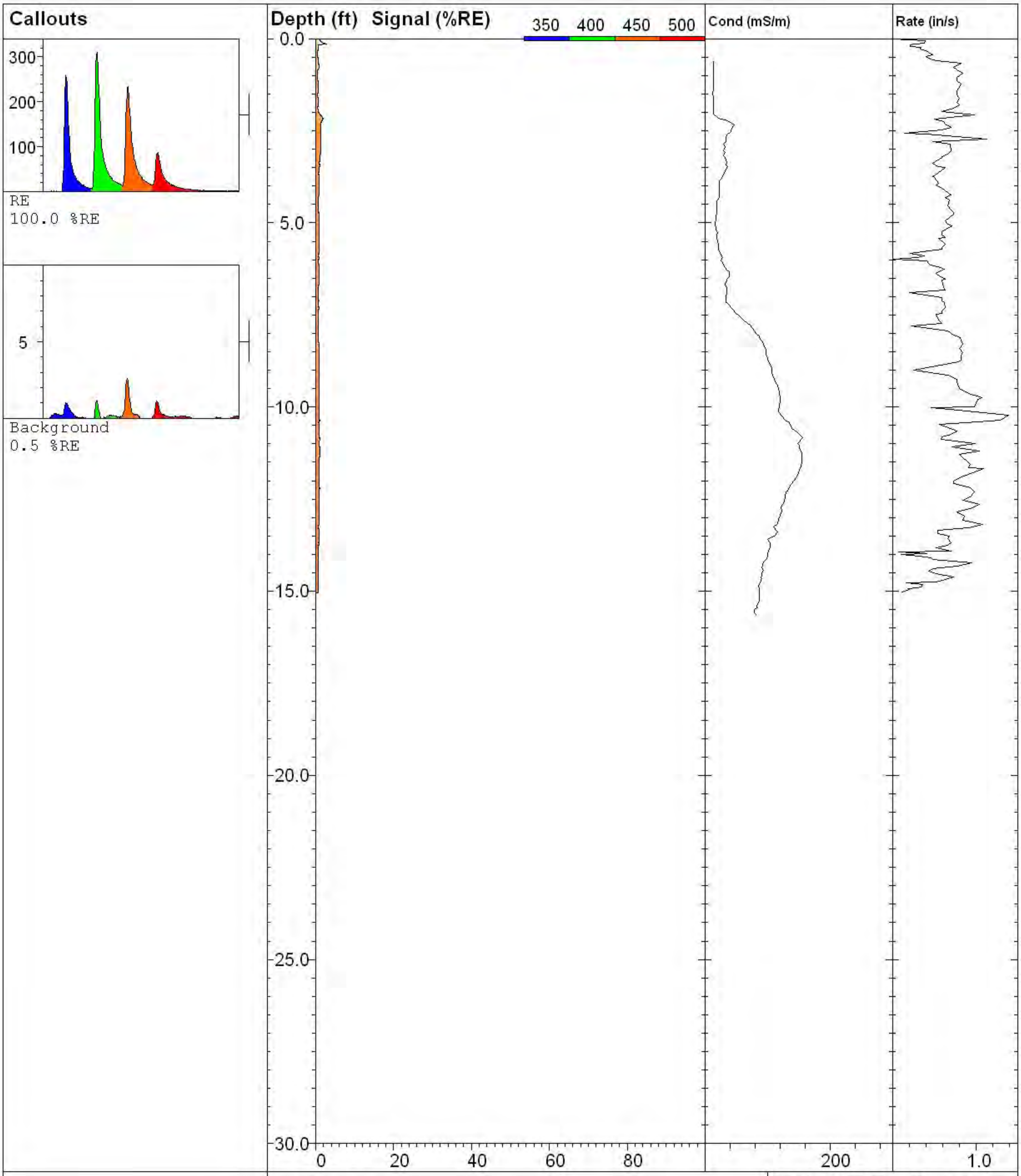


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.09 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **29.5 % @ 0.01 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 17:17 CST**



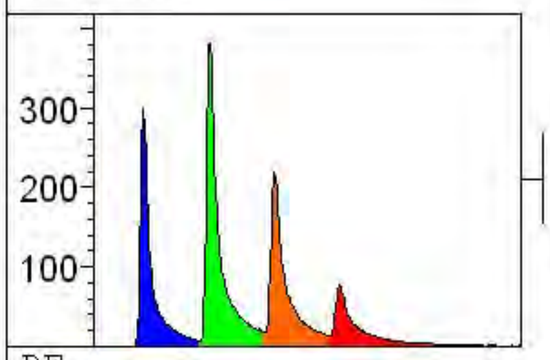
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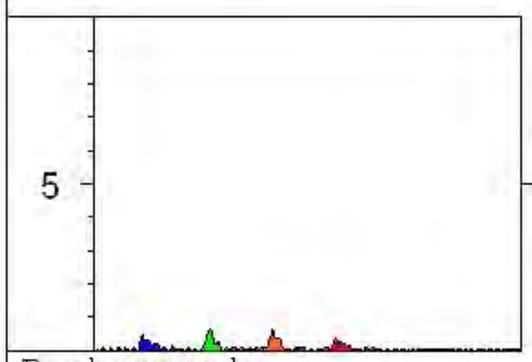
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.7 % @ 0.14 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 17:50 CST**

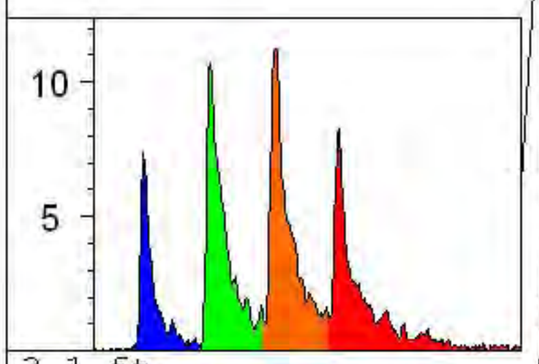
Callouts



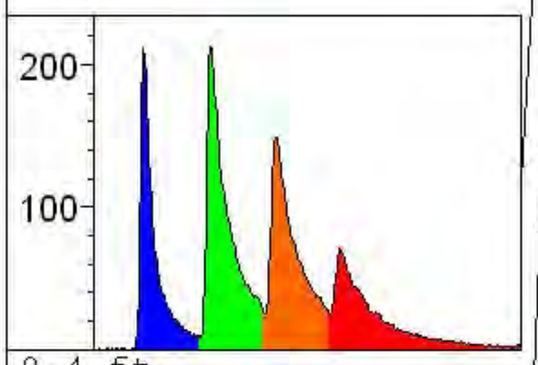
RE
100.0 %RE



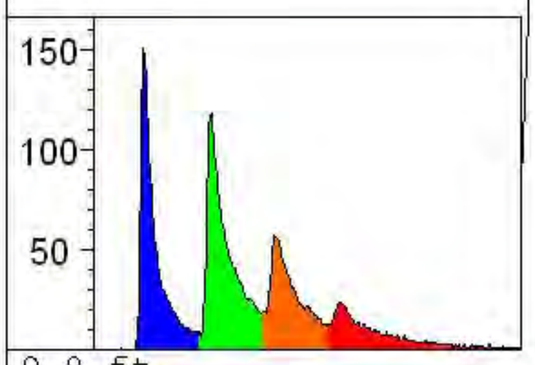
Background
0.2 %RE



3.1 ft
5.2 %RE

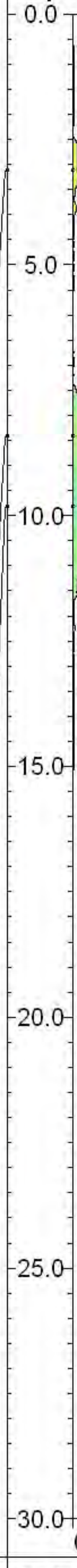


8.4 ft
106.7 %RE

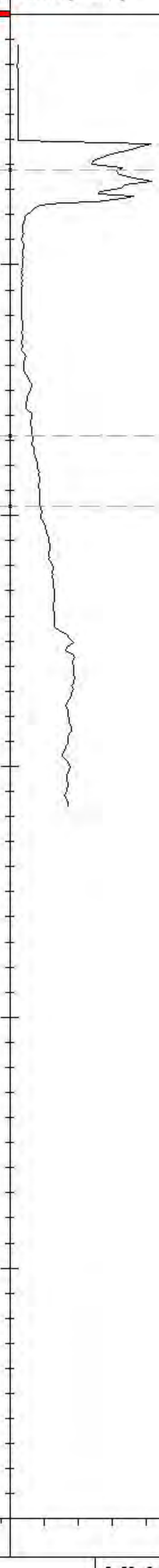


9.8 ft
56.2 %RE

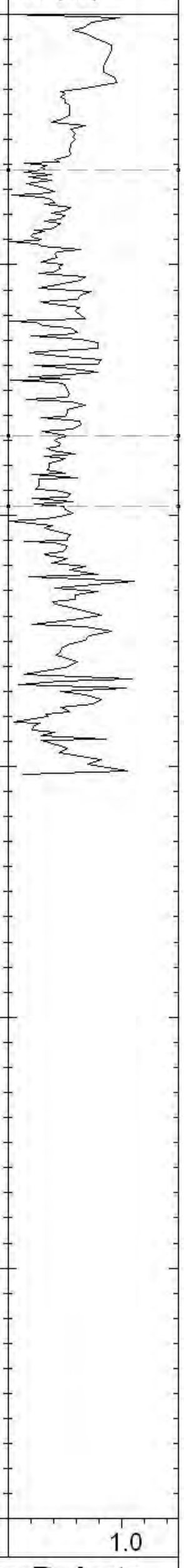
Depth (ft) Signal (%RE)



Cond (mS/m)



Rate (in/s)

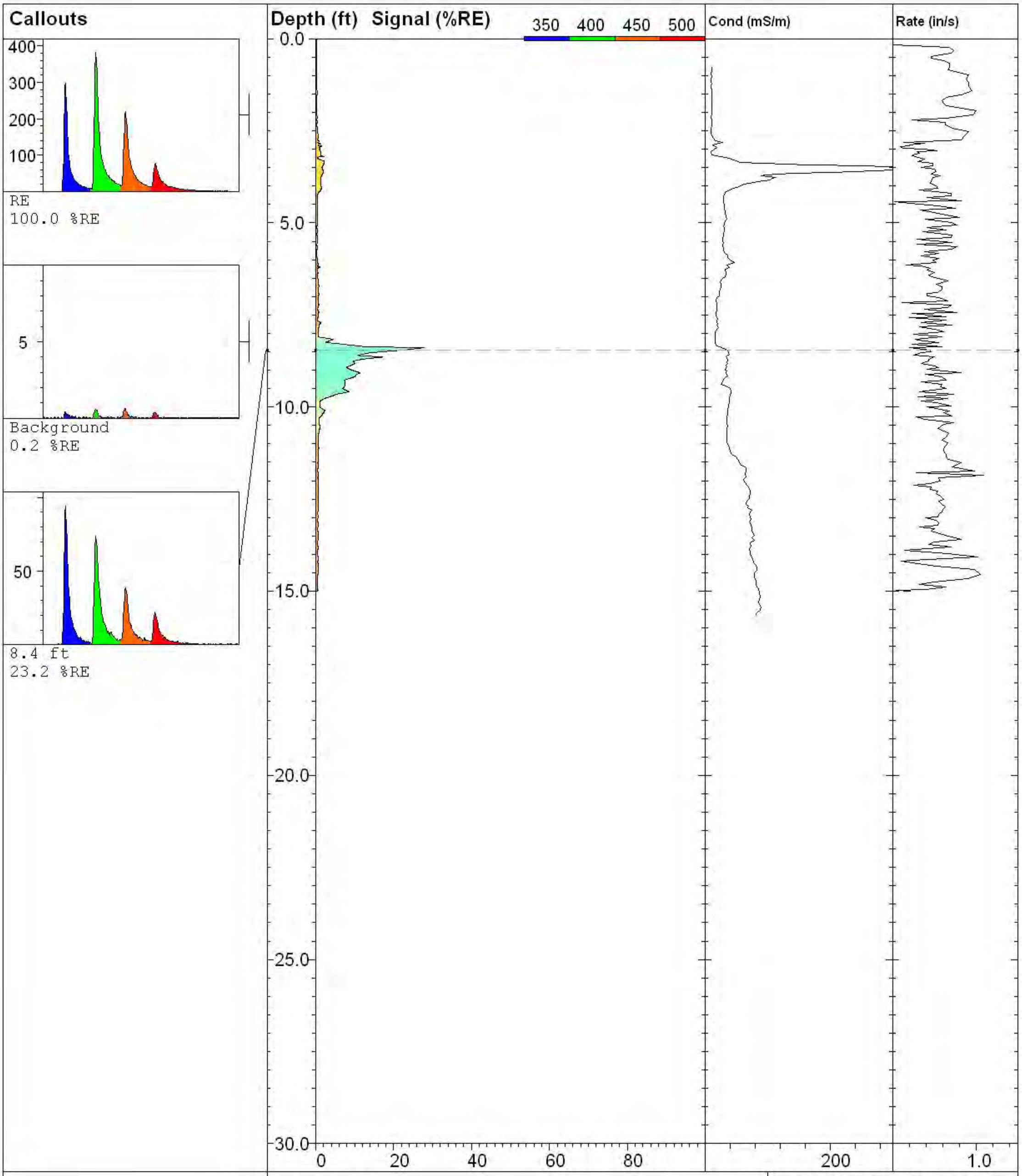


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.16 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **106.7 % @ 8.41 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 15:38 CST**

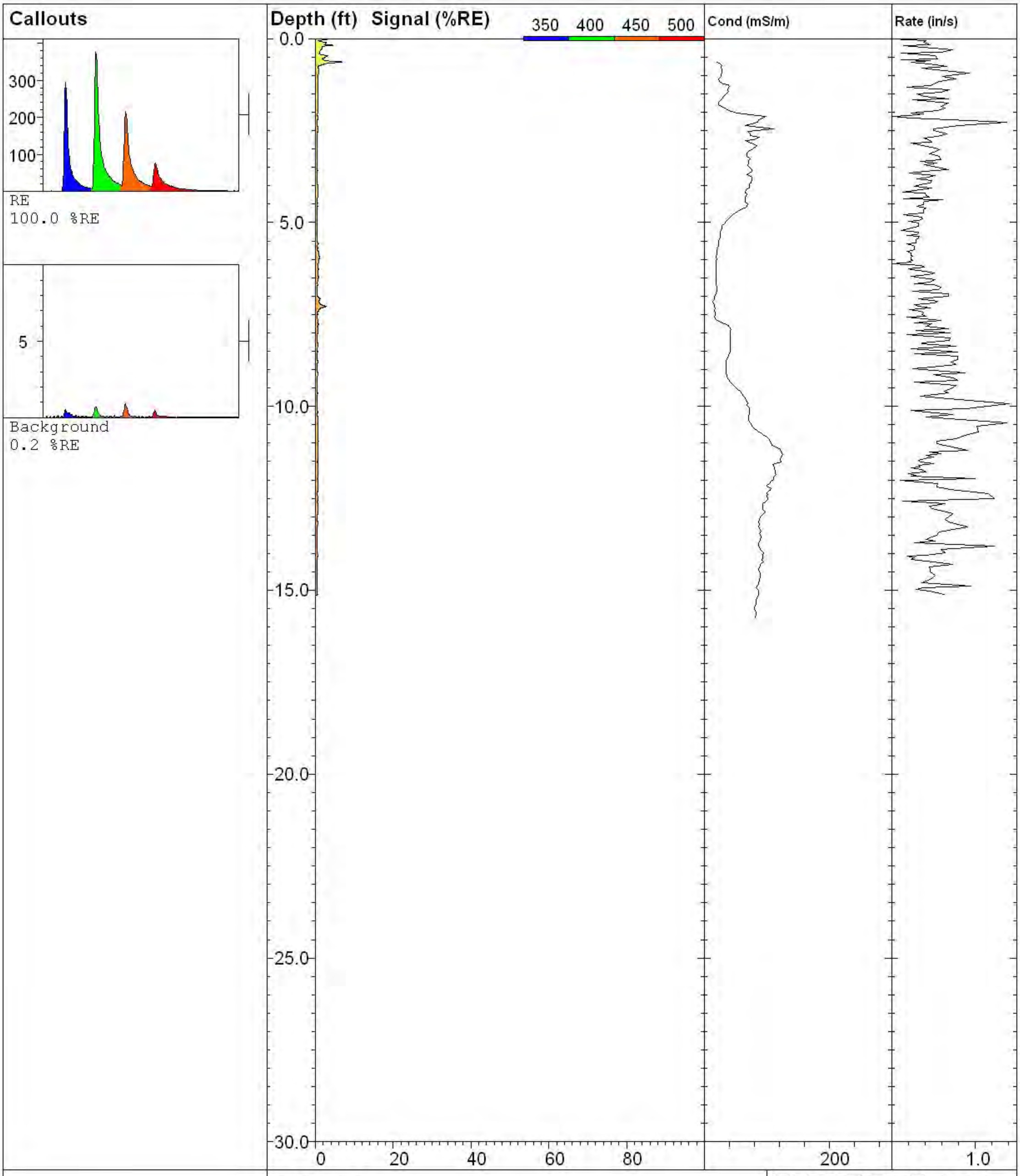


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **28.0 % @ 8.39 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 08:59 CST**

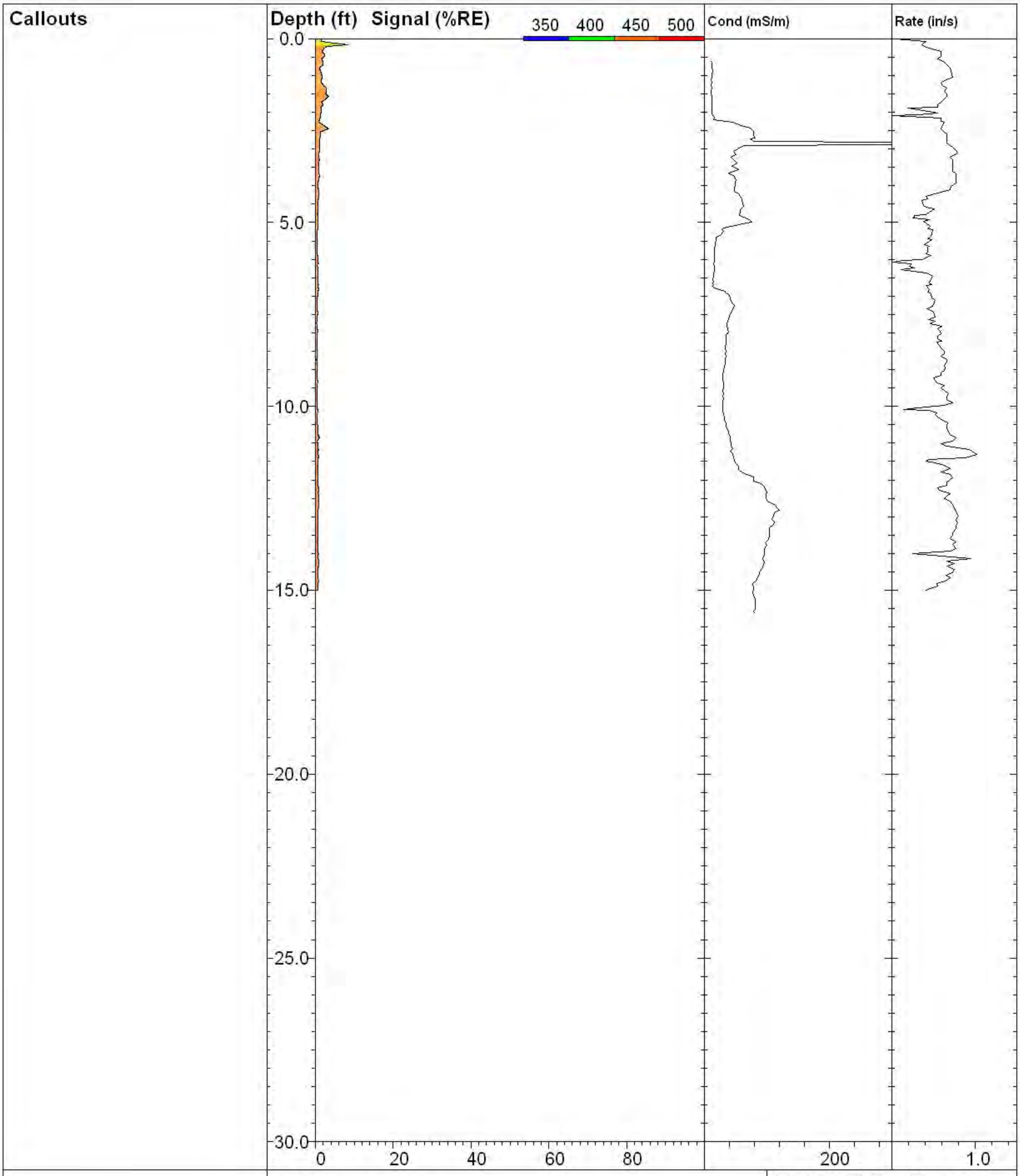


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.13 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **7.0 % @ 0.64 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 08:26 CST**

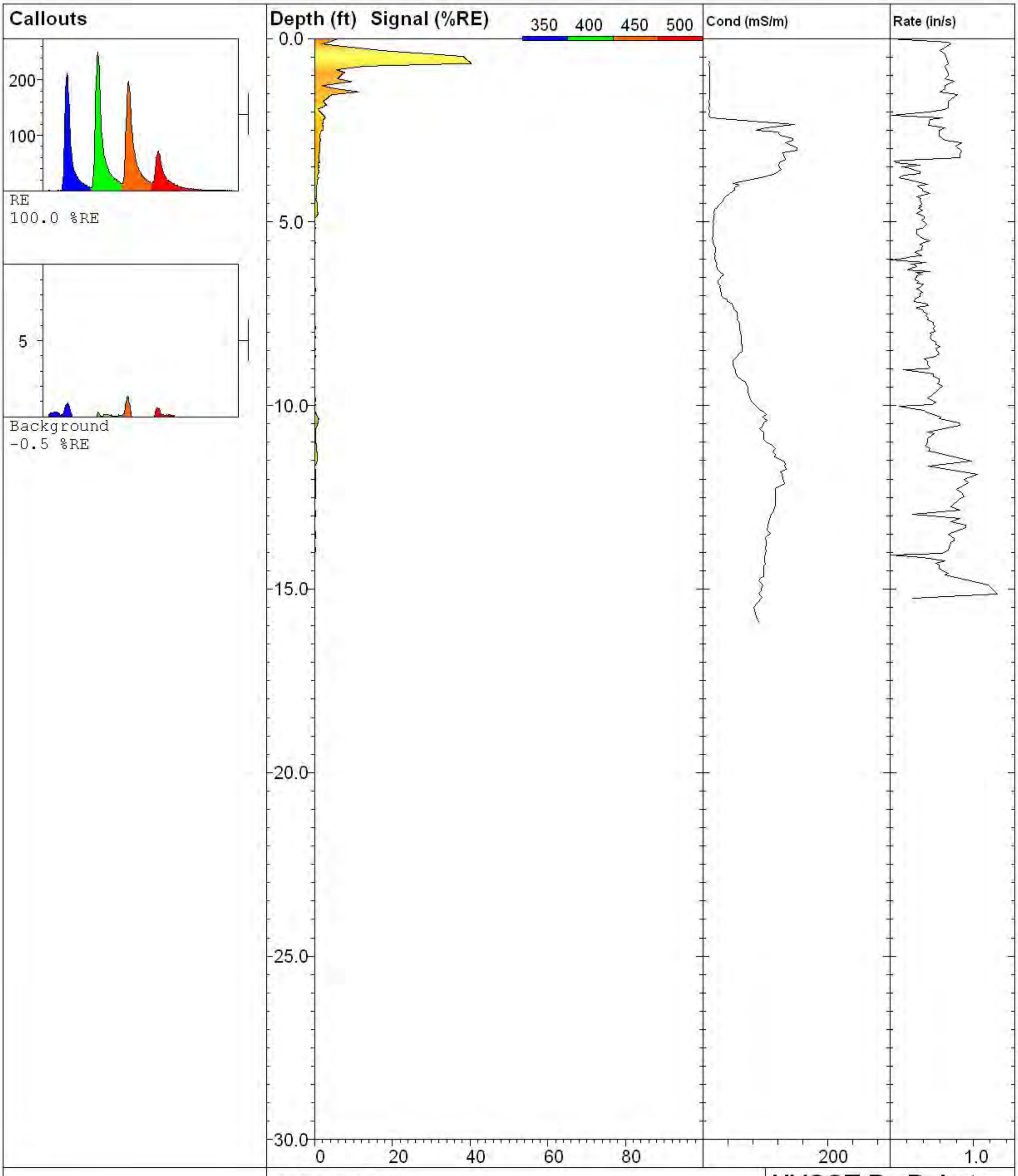


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **8.5 % @ 0.17 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-28 14:18 CST**



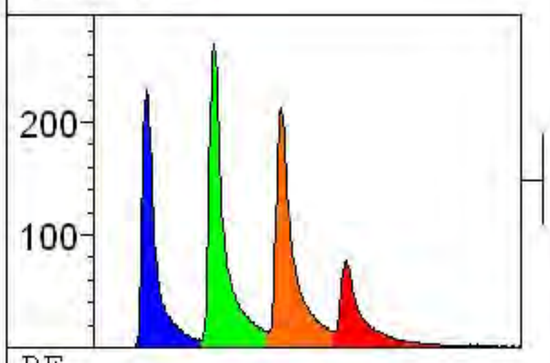
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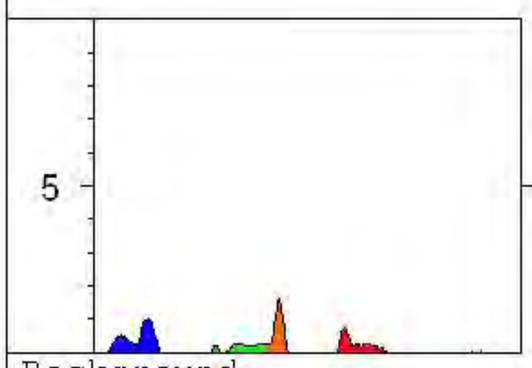
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.27 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **40.3 % @ 0.68 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 12:36 CST**

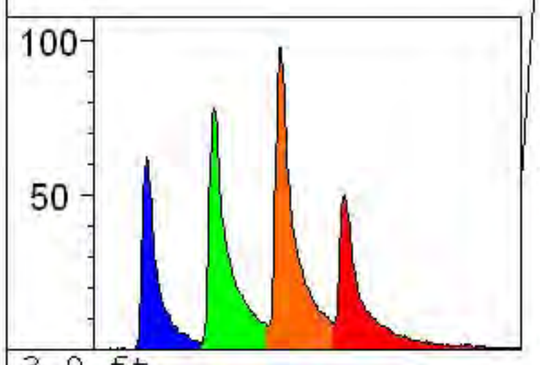
Callouts



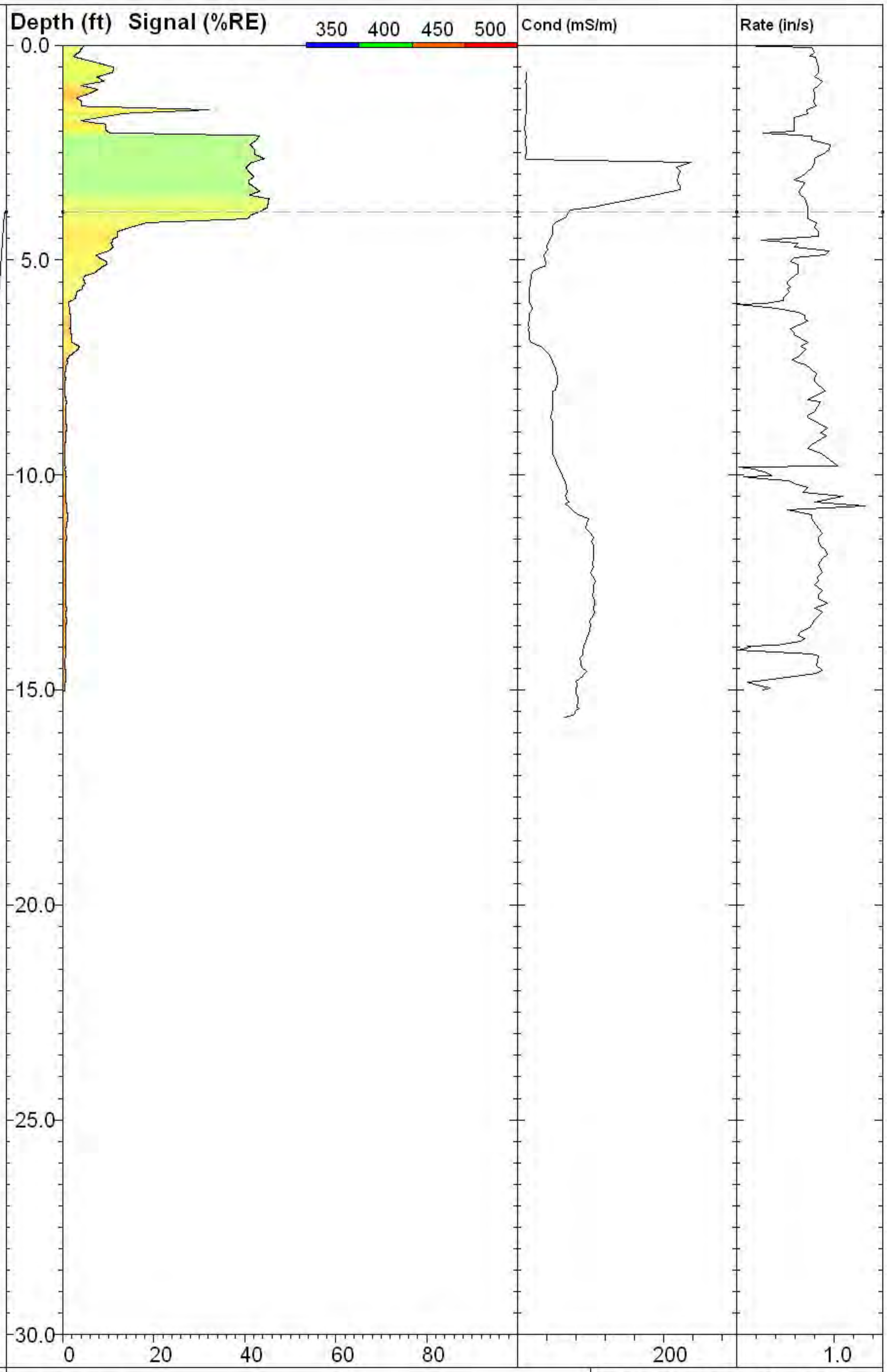
RE
100.0 %RE



Background
-0.1 %RE



3.9 ft
43.3 %RE

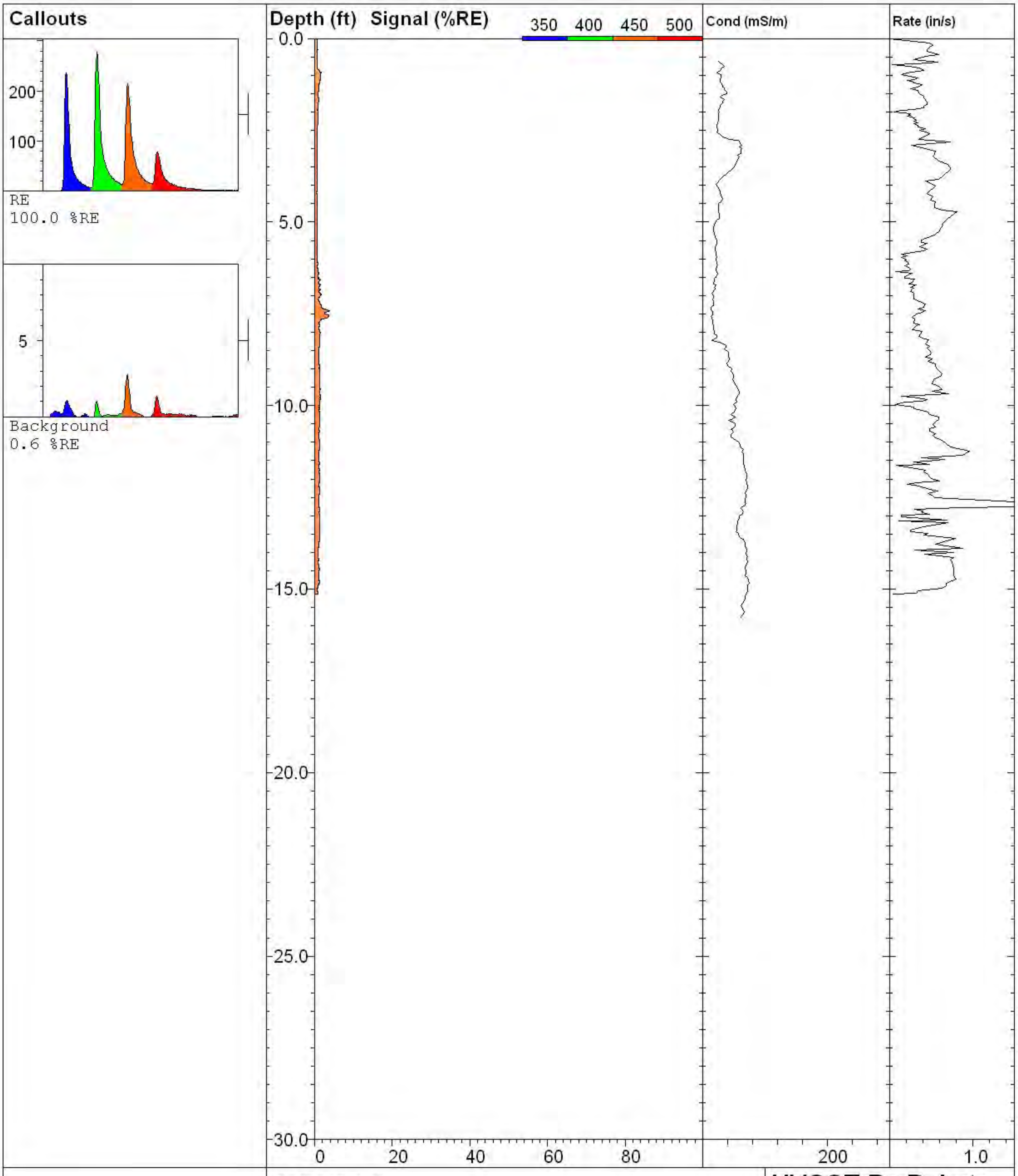


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.01 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **45.3 % @ 3.57 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 13:39 CST**

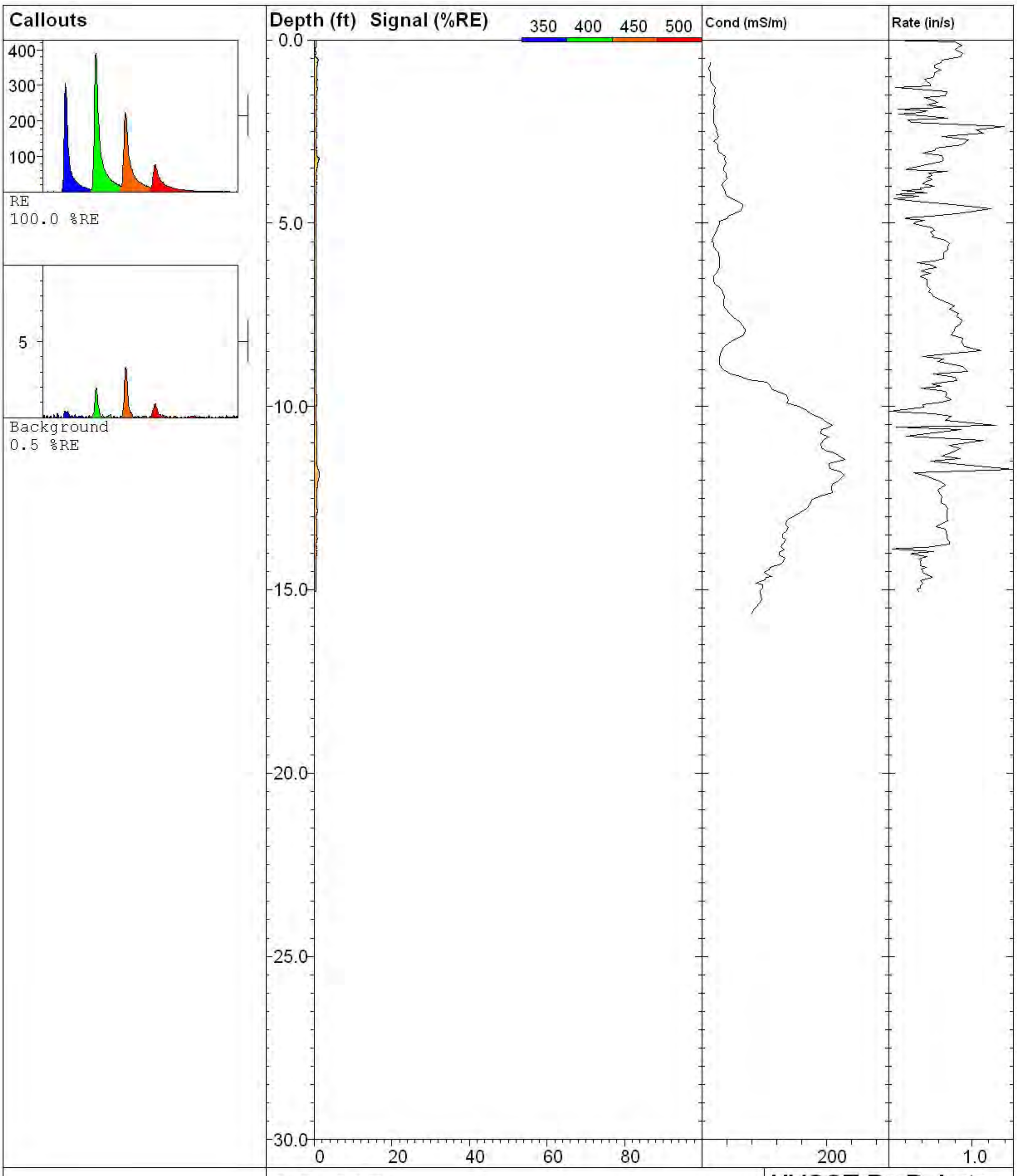


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.14 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.8 % @ 7.42 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-27 15:56 CST**

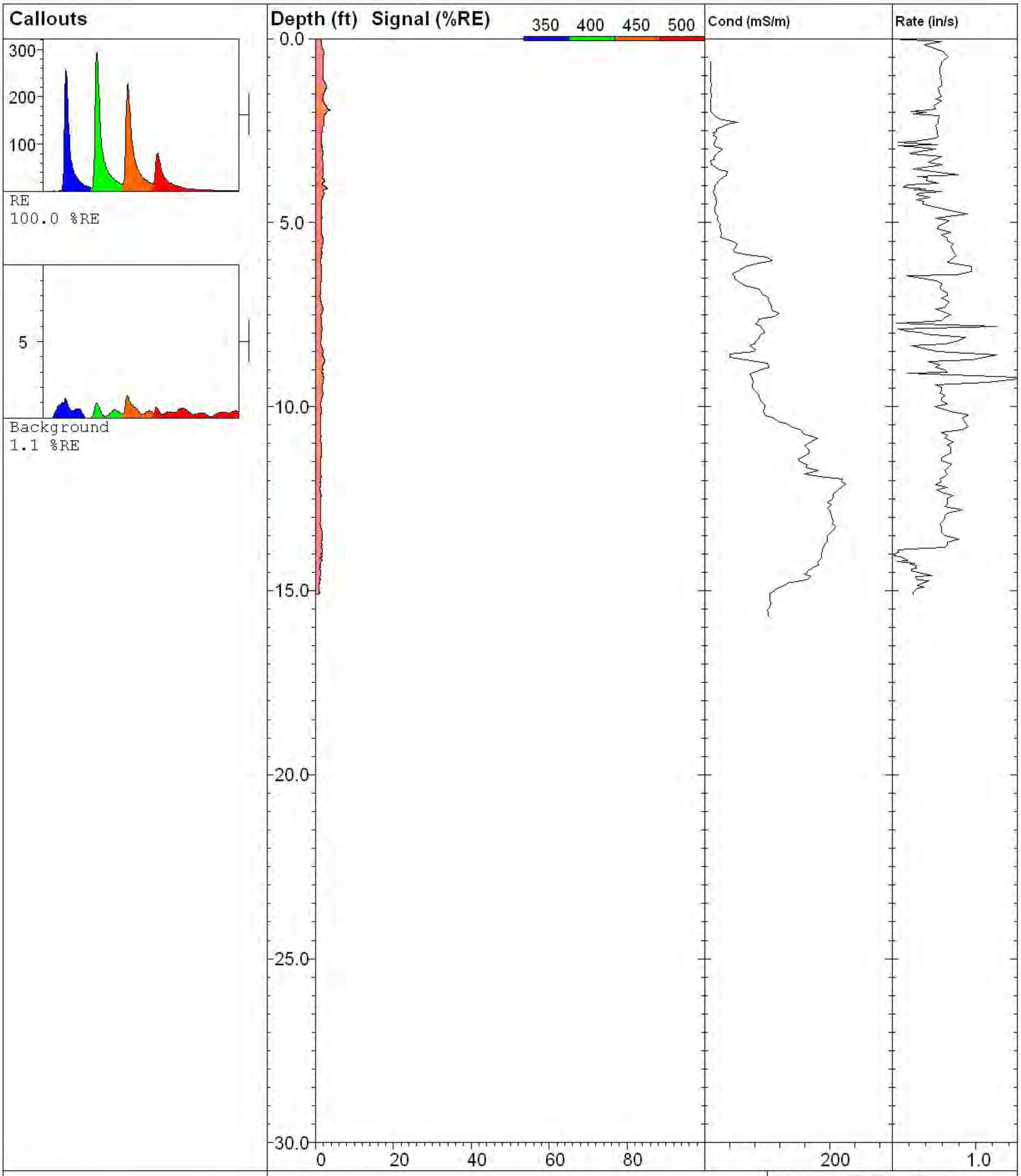


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LIF-255

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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.4 % @ 11.91 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 08:20 CST**

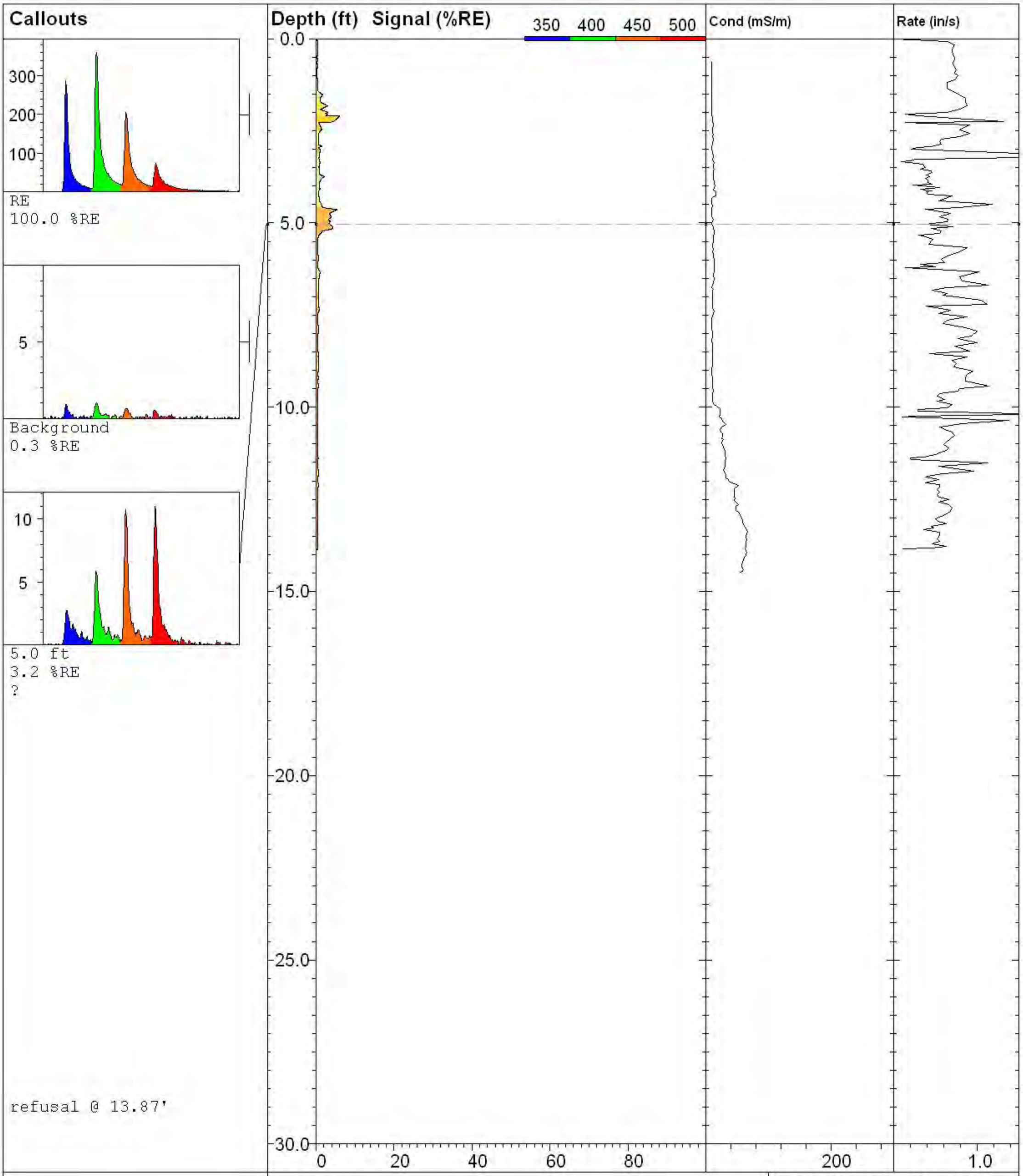


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.08 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.8 % @ 1.94 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 10:05 CST**

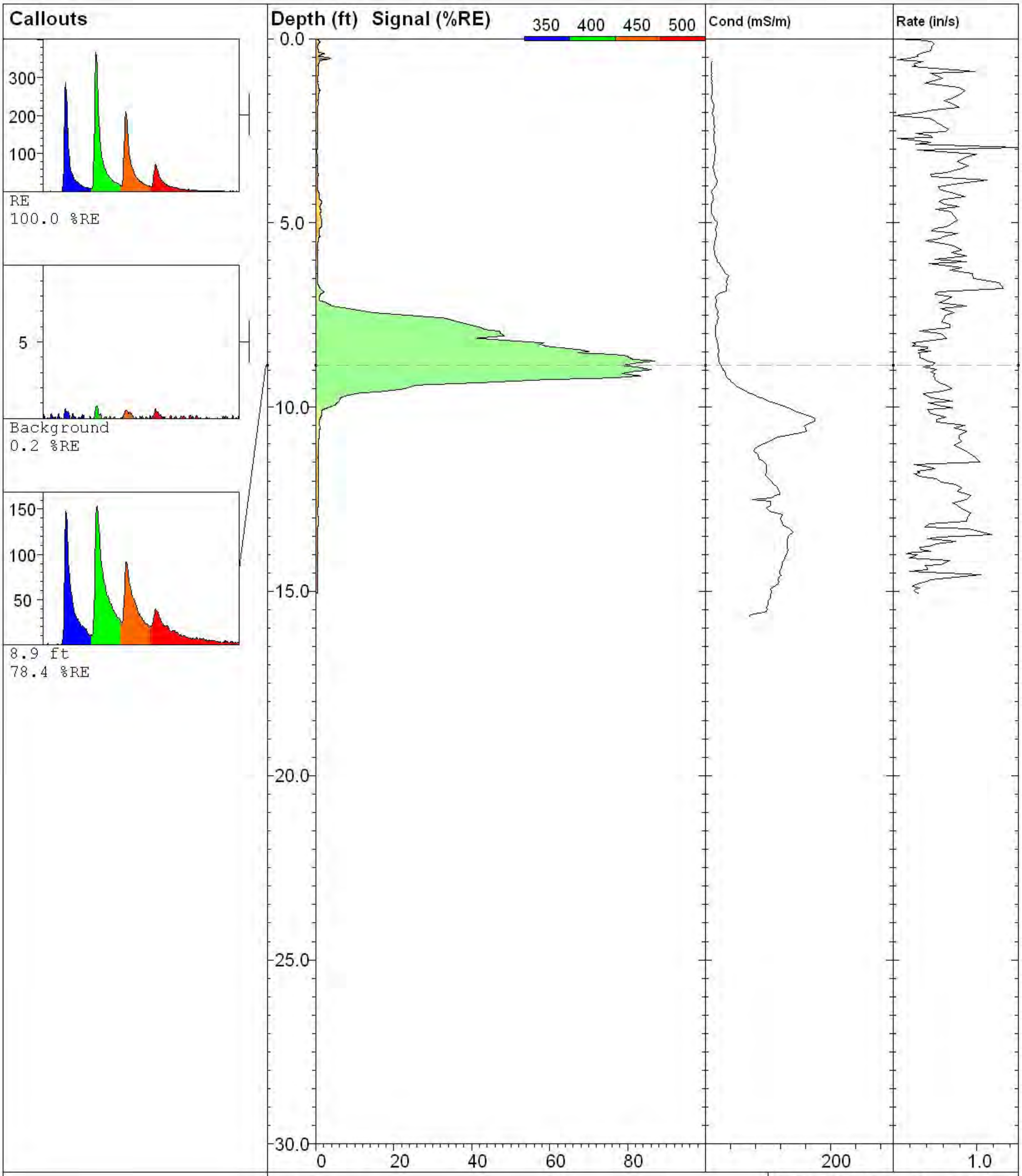


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **13.87 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.1 % @ 2.09 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 09:58 CST**

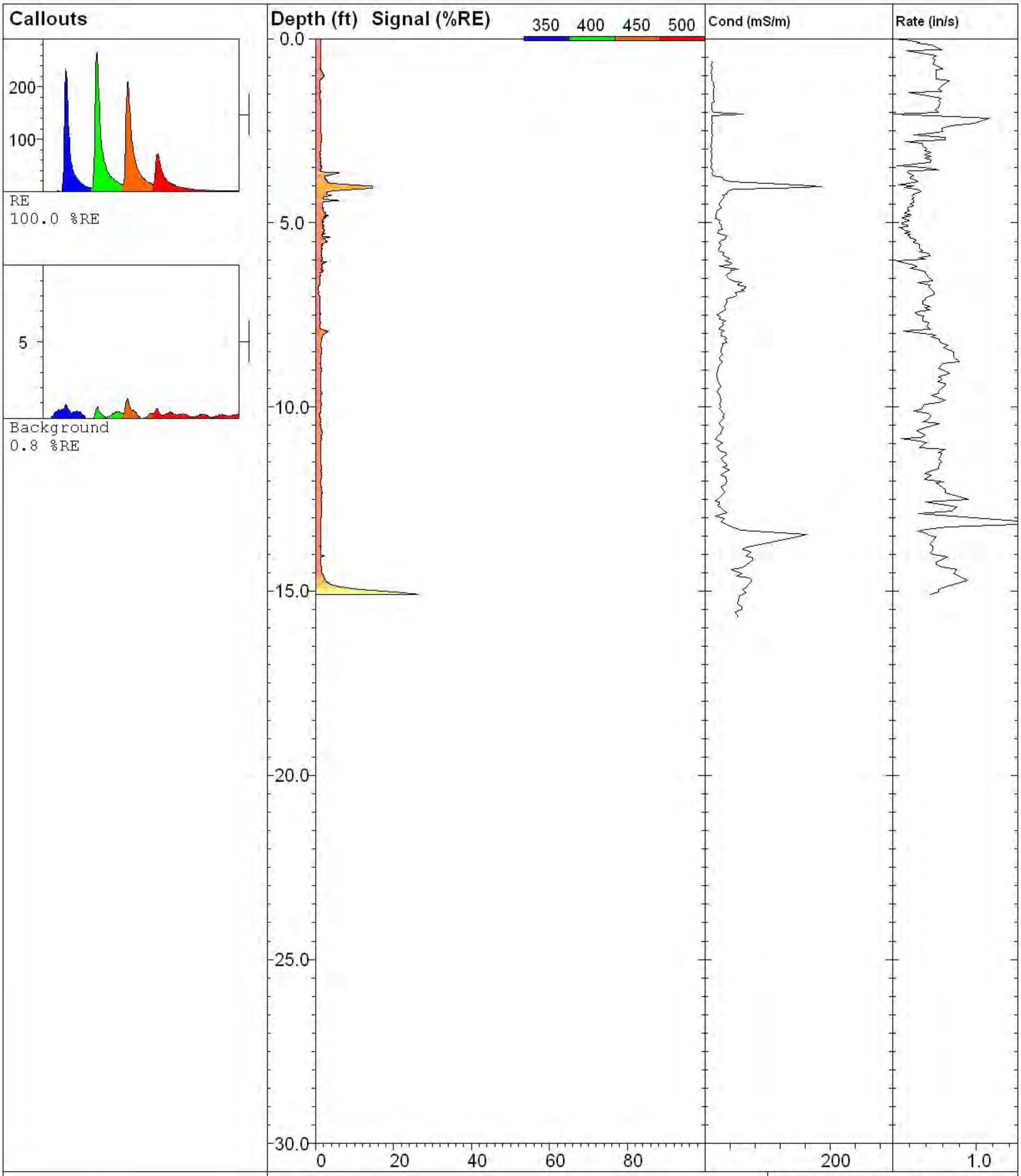


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **87.0 % @ 8.75 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 09:14 CST**

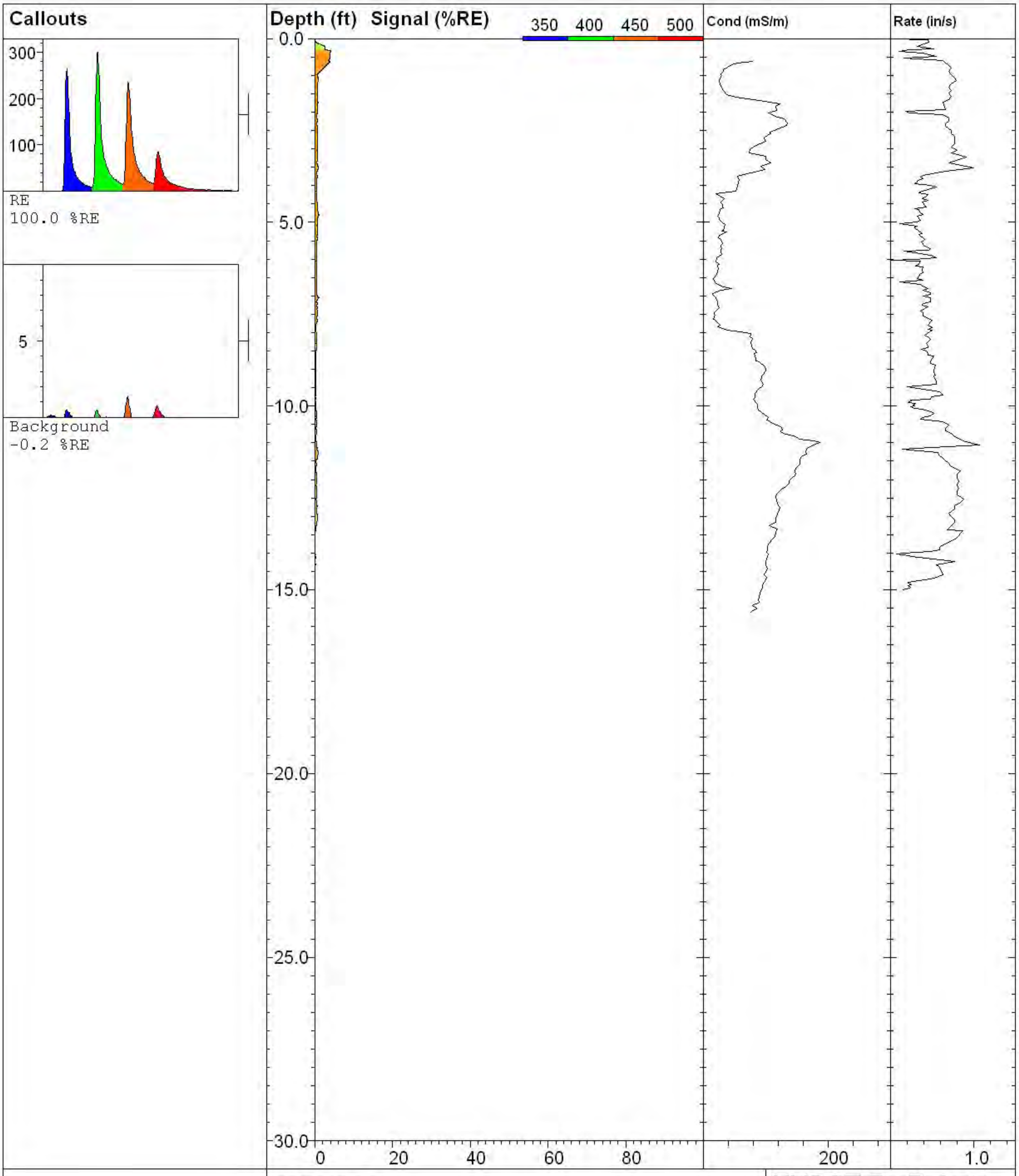


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.09 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **29.3 % @ 15.09 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 10:54 CST**

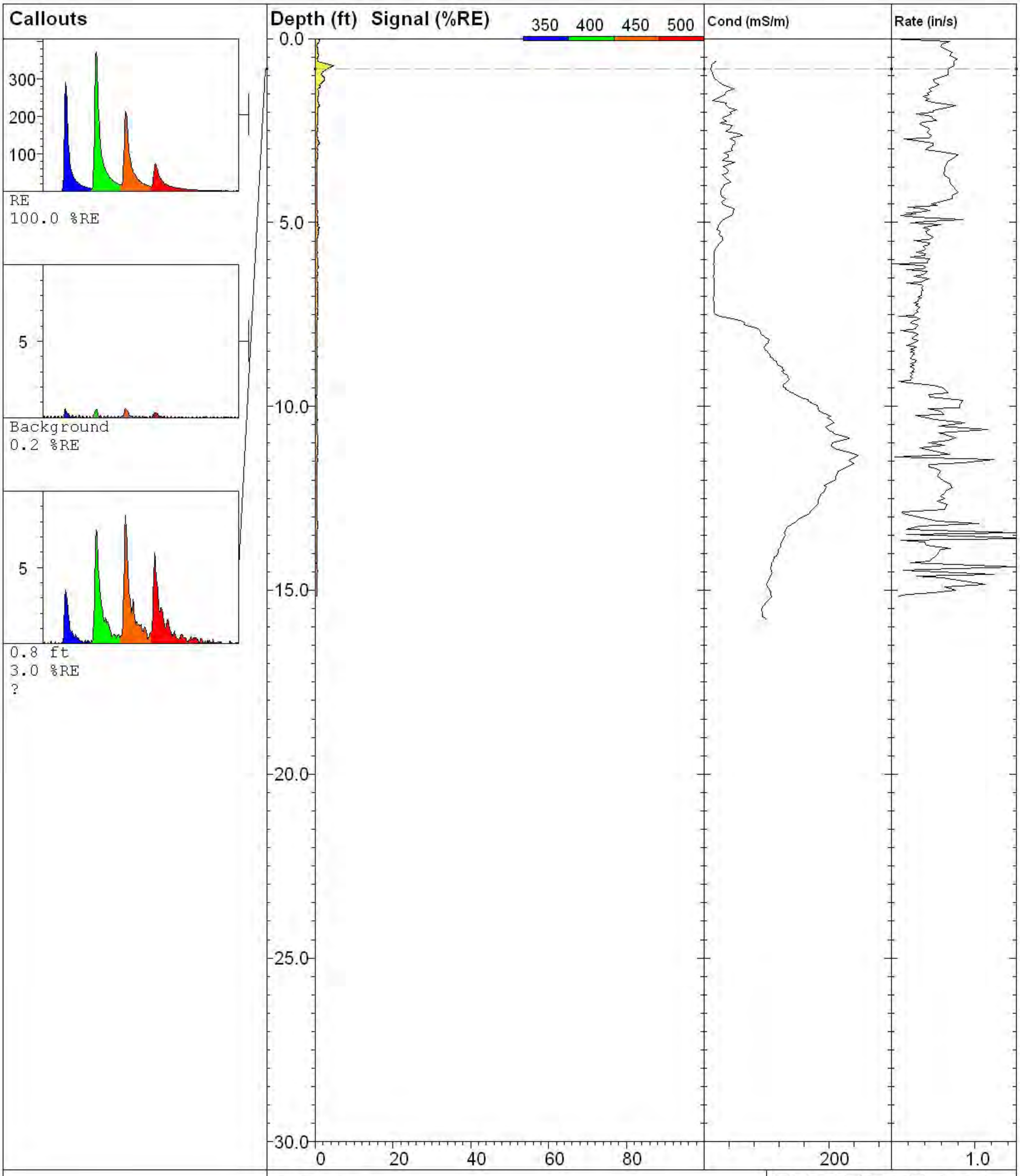


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.1 % @ 0.35 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 13:47 CST**

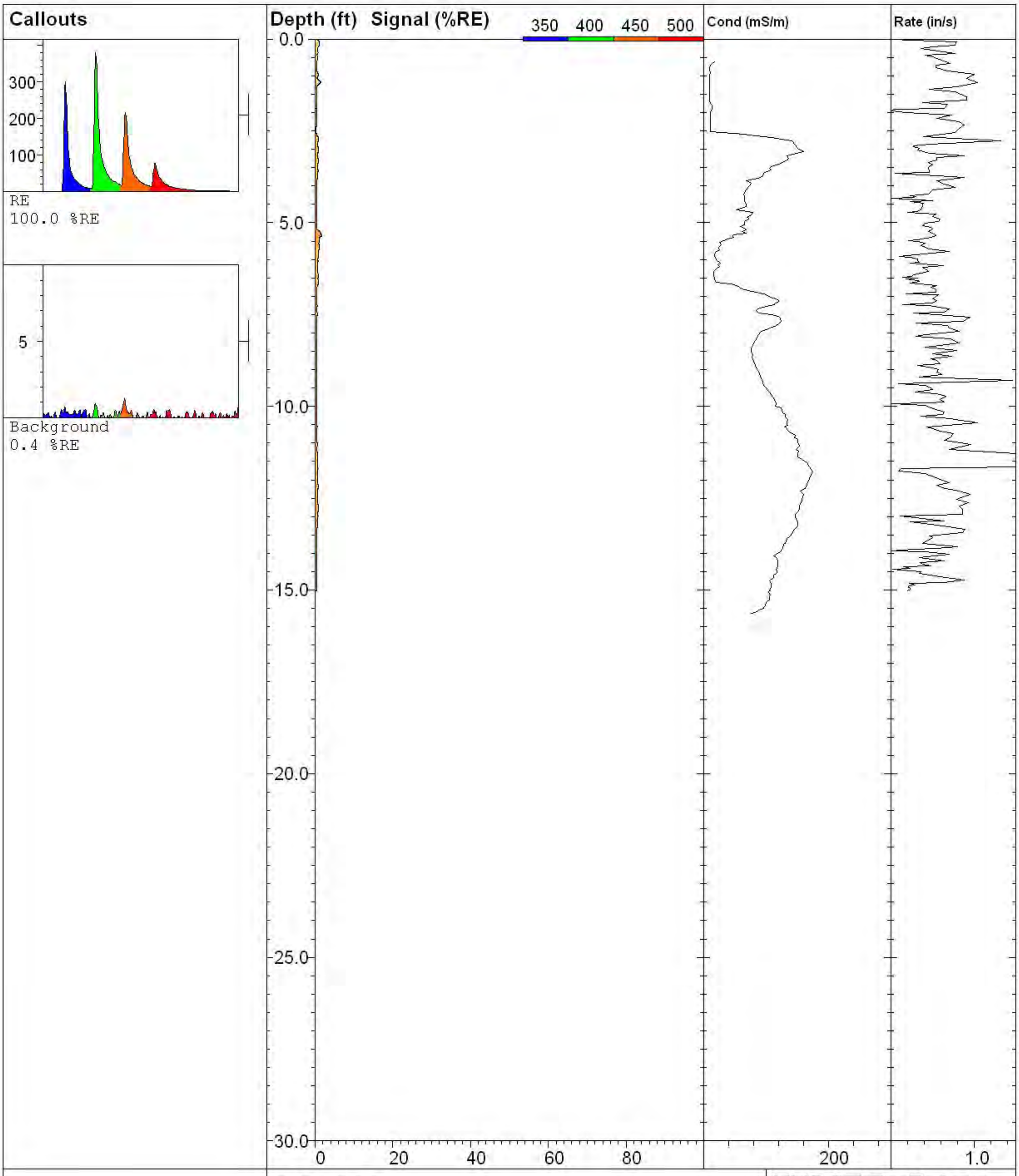


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.17 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.7 % @ 0.74 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 09:50 CST**

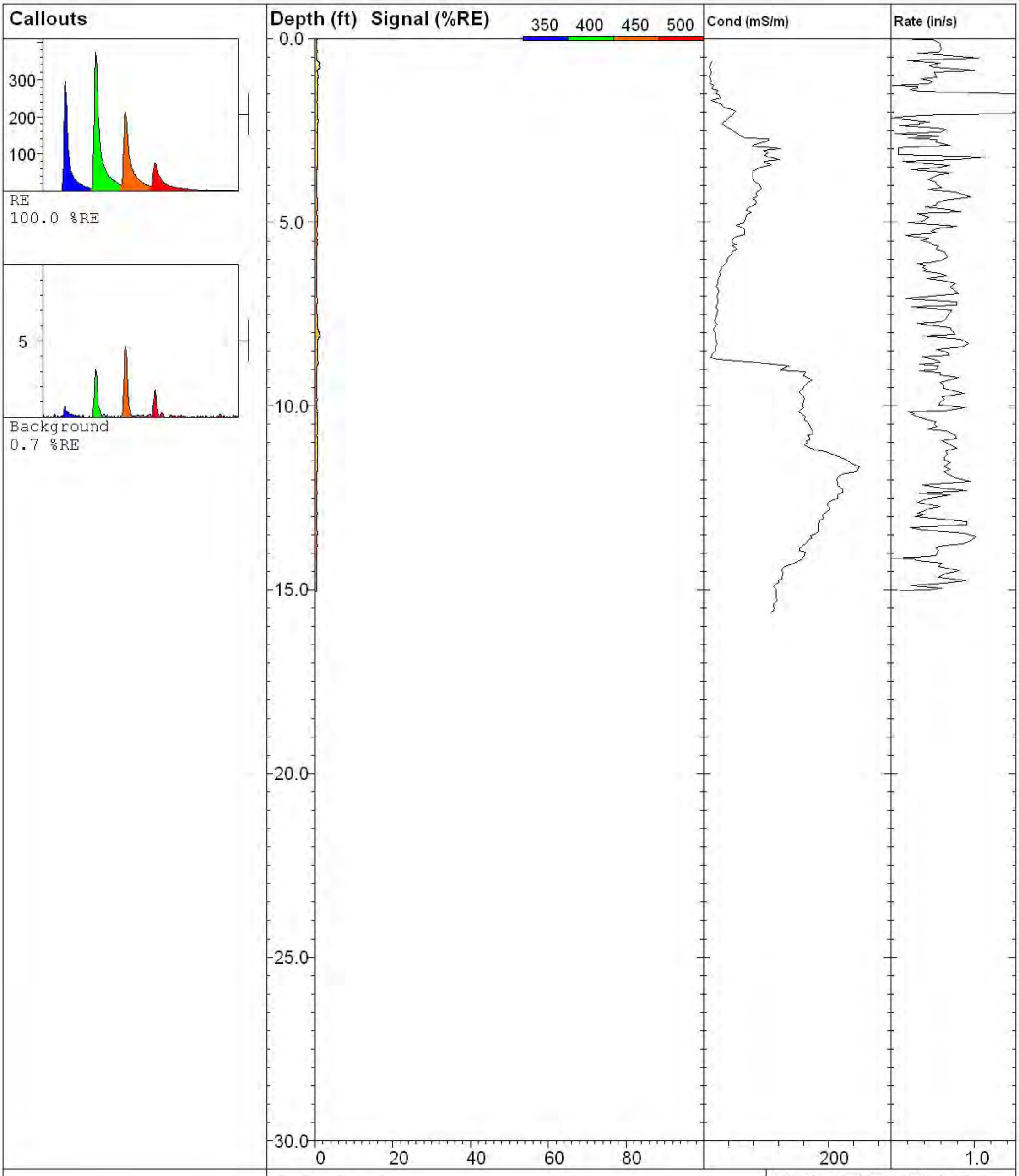


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.8 % @ 5.35 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 13:33 CST**

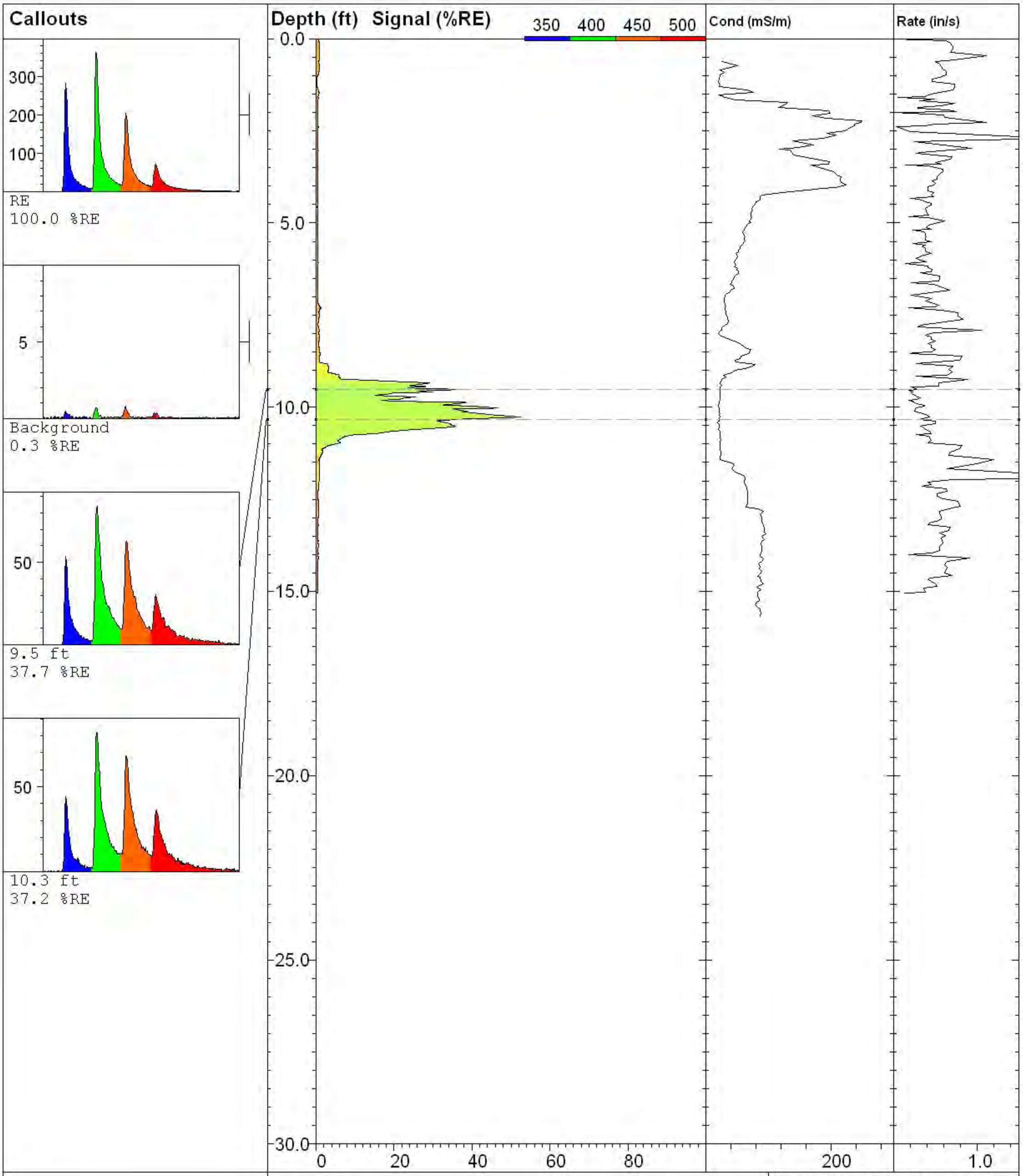


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.04 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **1.3 % @ 0.79 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 14:09 CST**

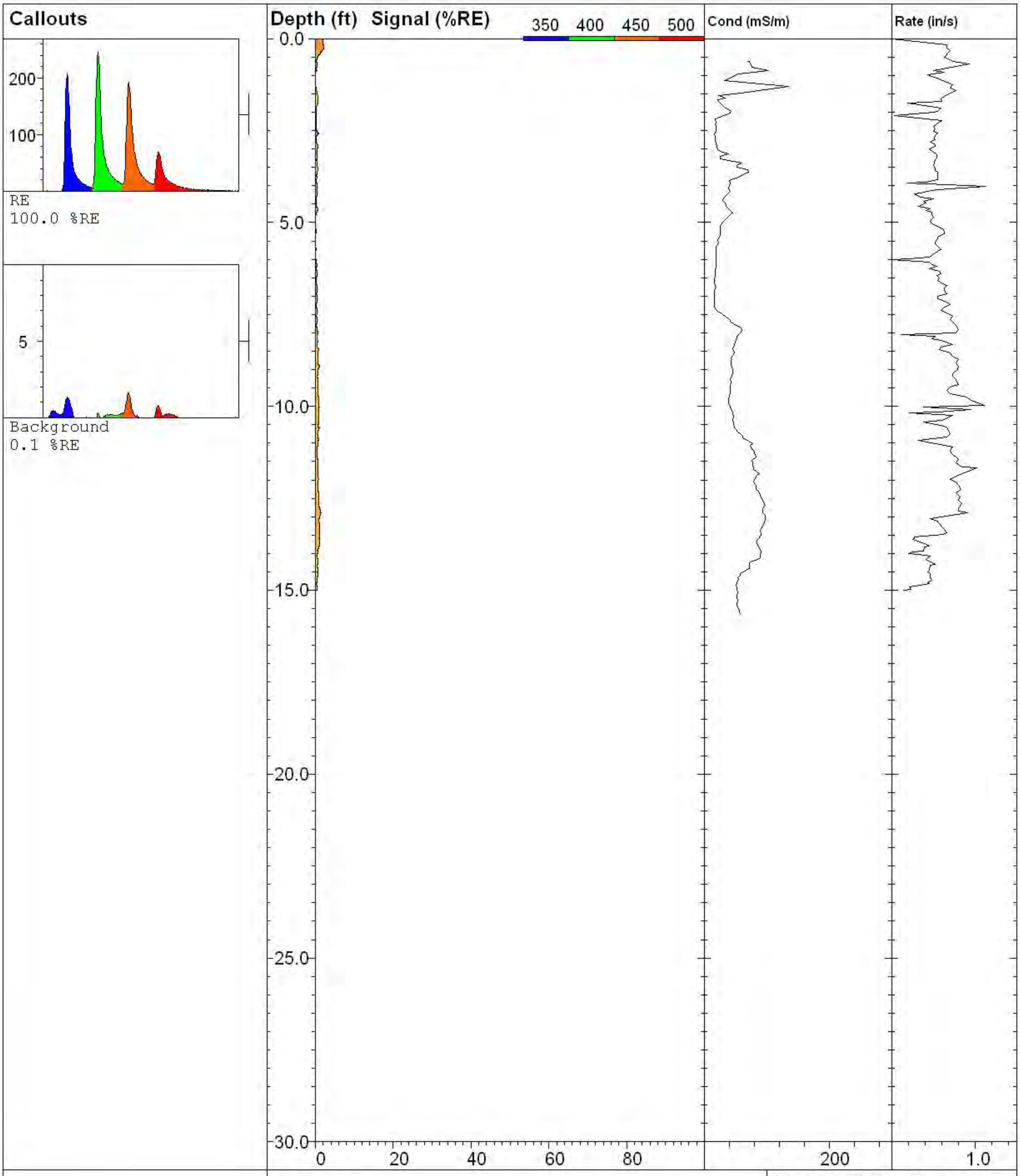


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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.06 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **52.7 % @ 10.27 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-26 14:38 CST**



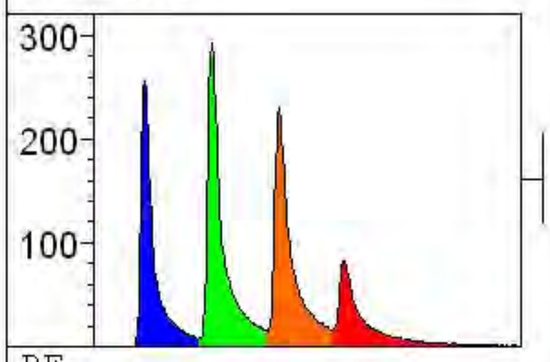
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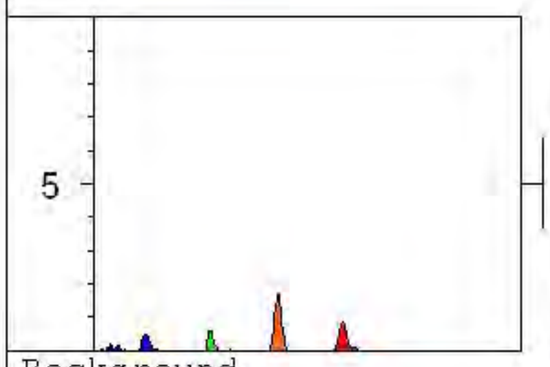
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.2 % @ 0.00 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-28 15:09 CST**

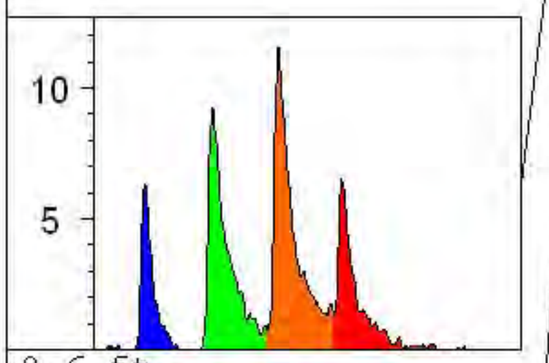
Callouts



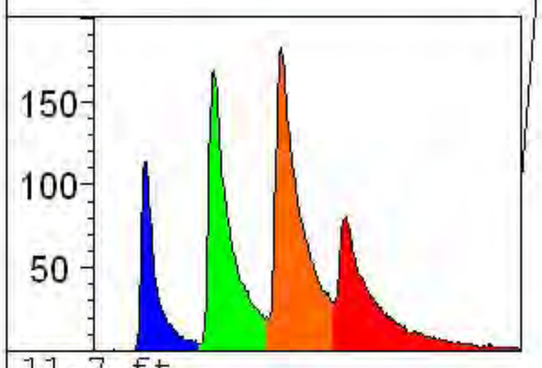
RE
100.0 %RE



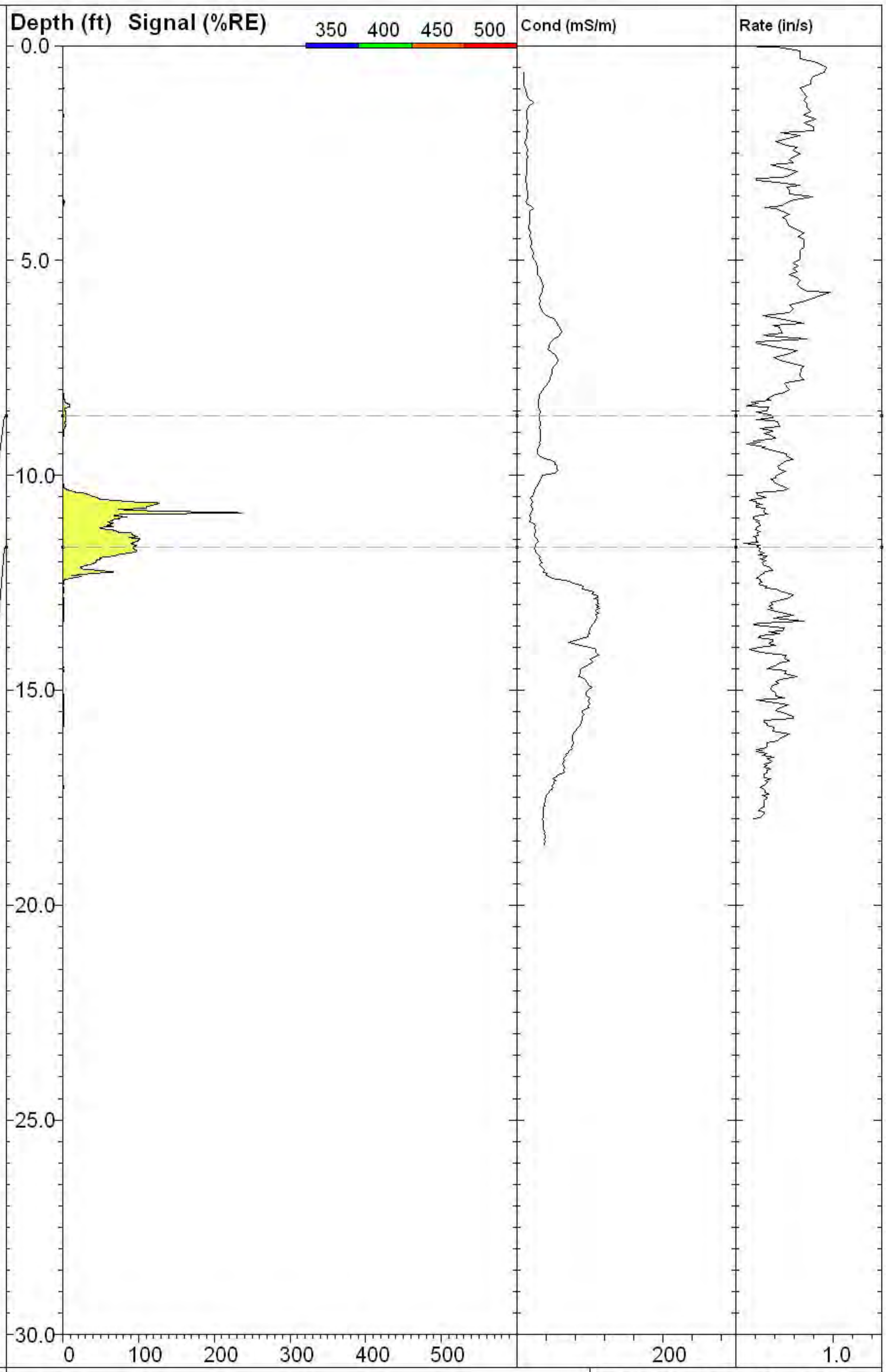
Background
-0.3 %RE



8.6 ft
4.3 %RE



11.7 ft
93.0 %RE

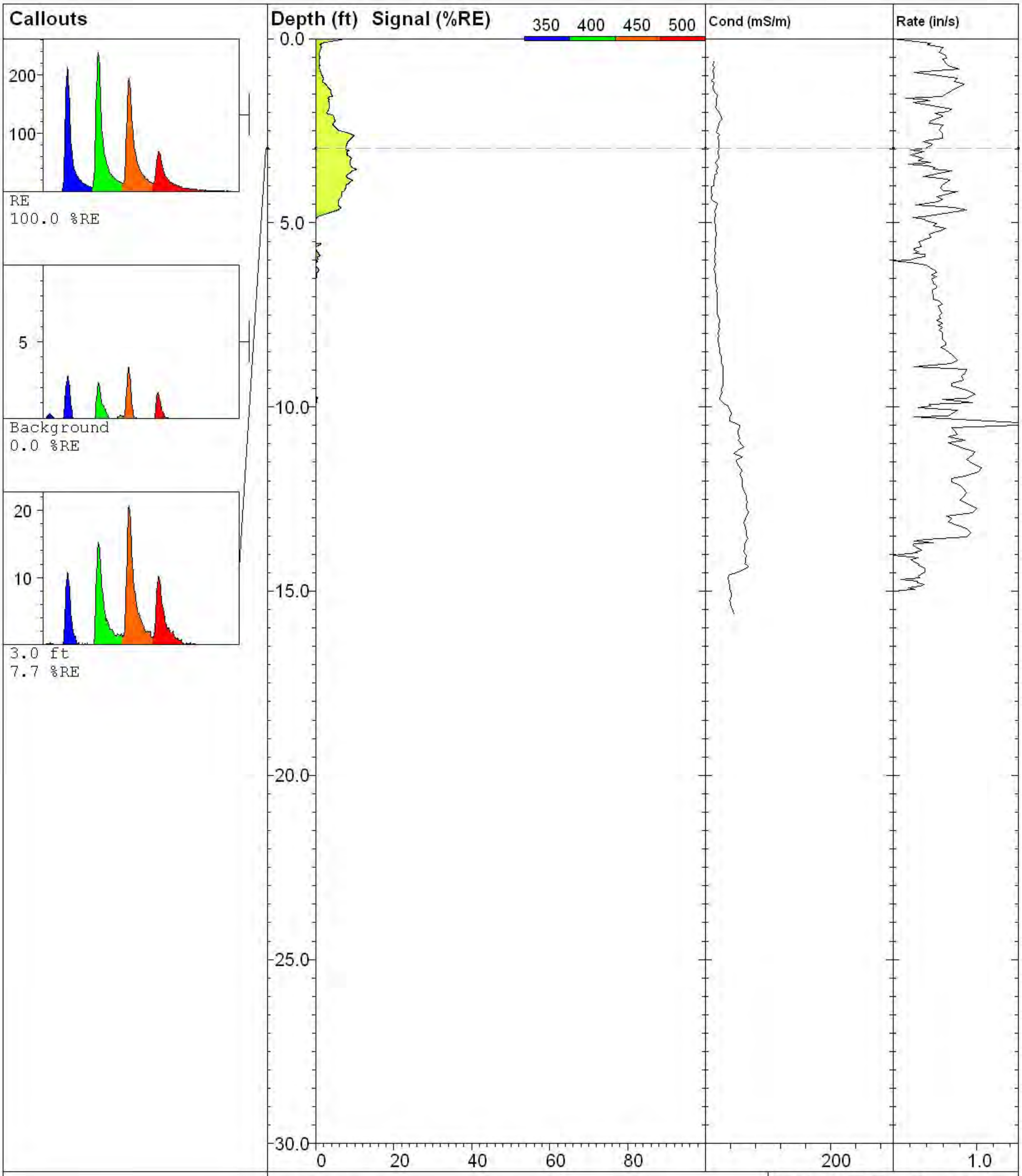


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **242.5 % @ 10.87 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-26 14:32 CST**

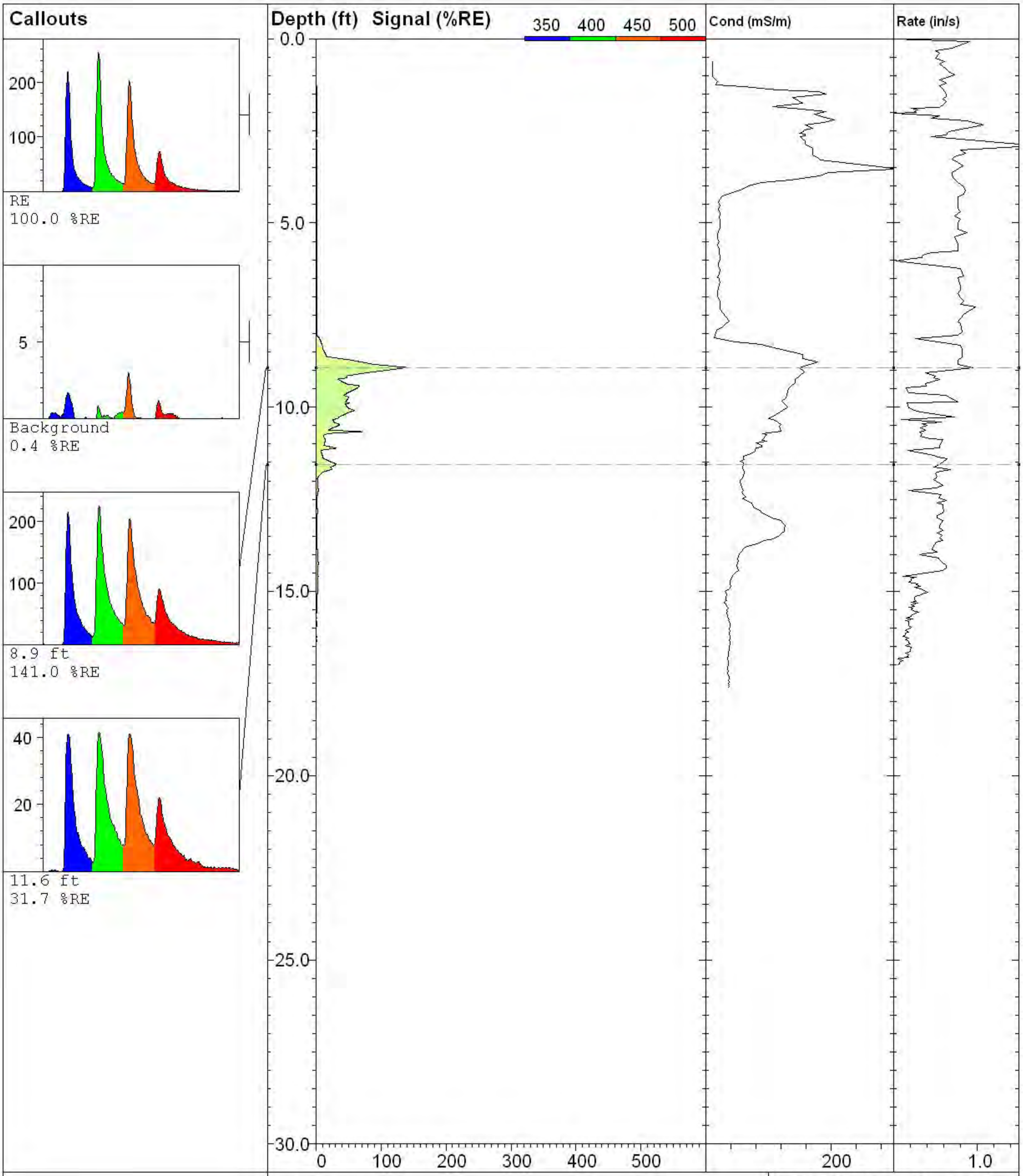


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **10.5 % @ 3.55 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-28 16:49 CST**

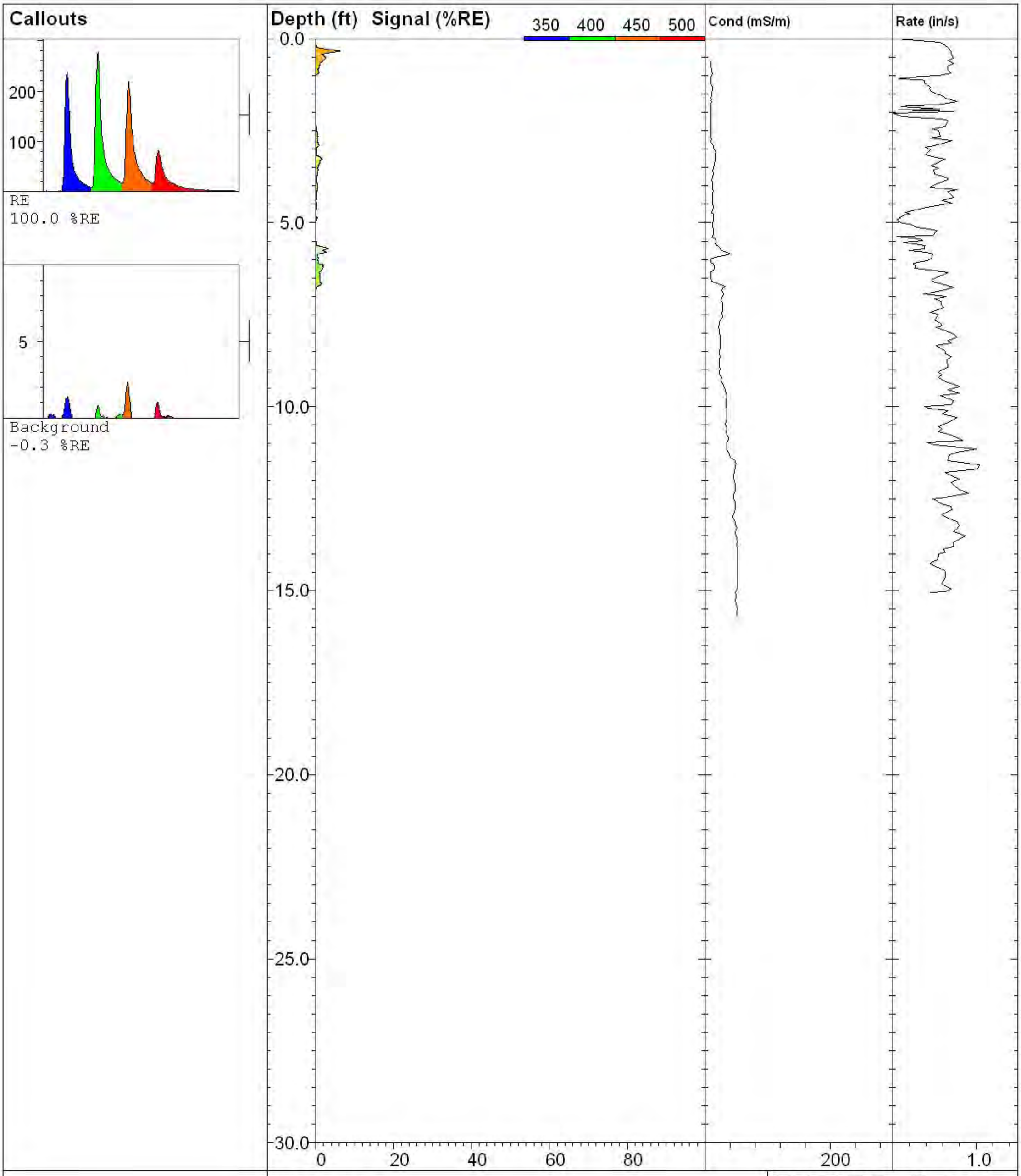


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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **17.00 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **141.0 % @ 8.93 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 15:40 CST**



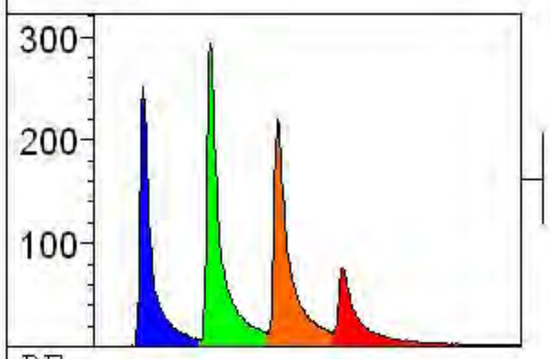
LIF-270

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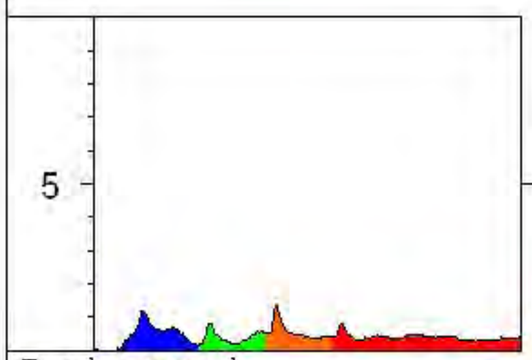
Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **6.2 % @ 0.34 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/UVOST1003**	*Date & Time:* **2010-01-28 16:09 CST**

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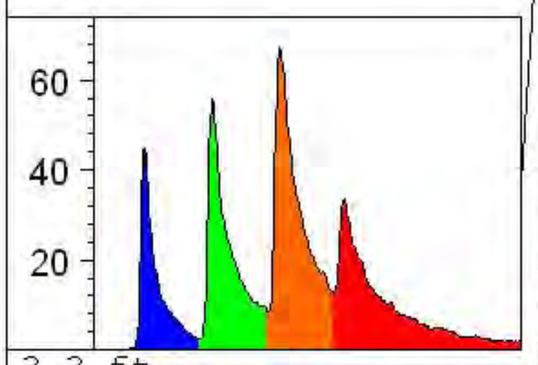
Callouts



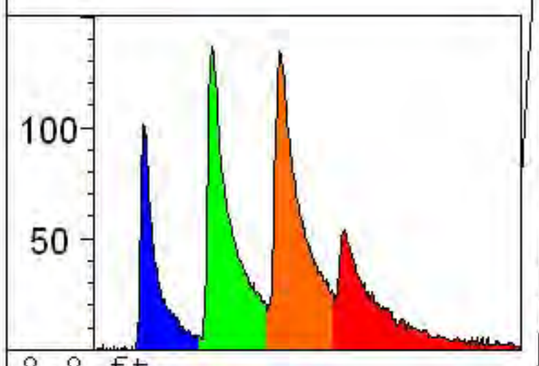
RE
100.0 %RE



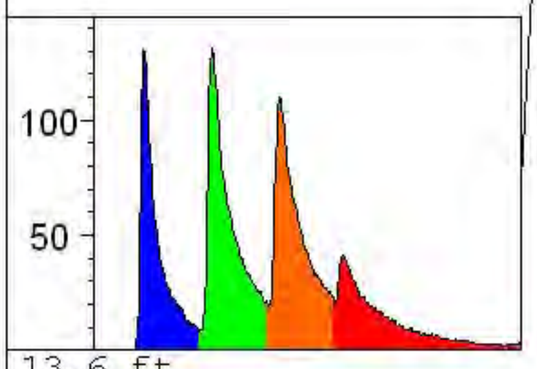
Background
1.3 %RE



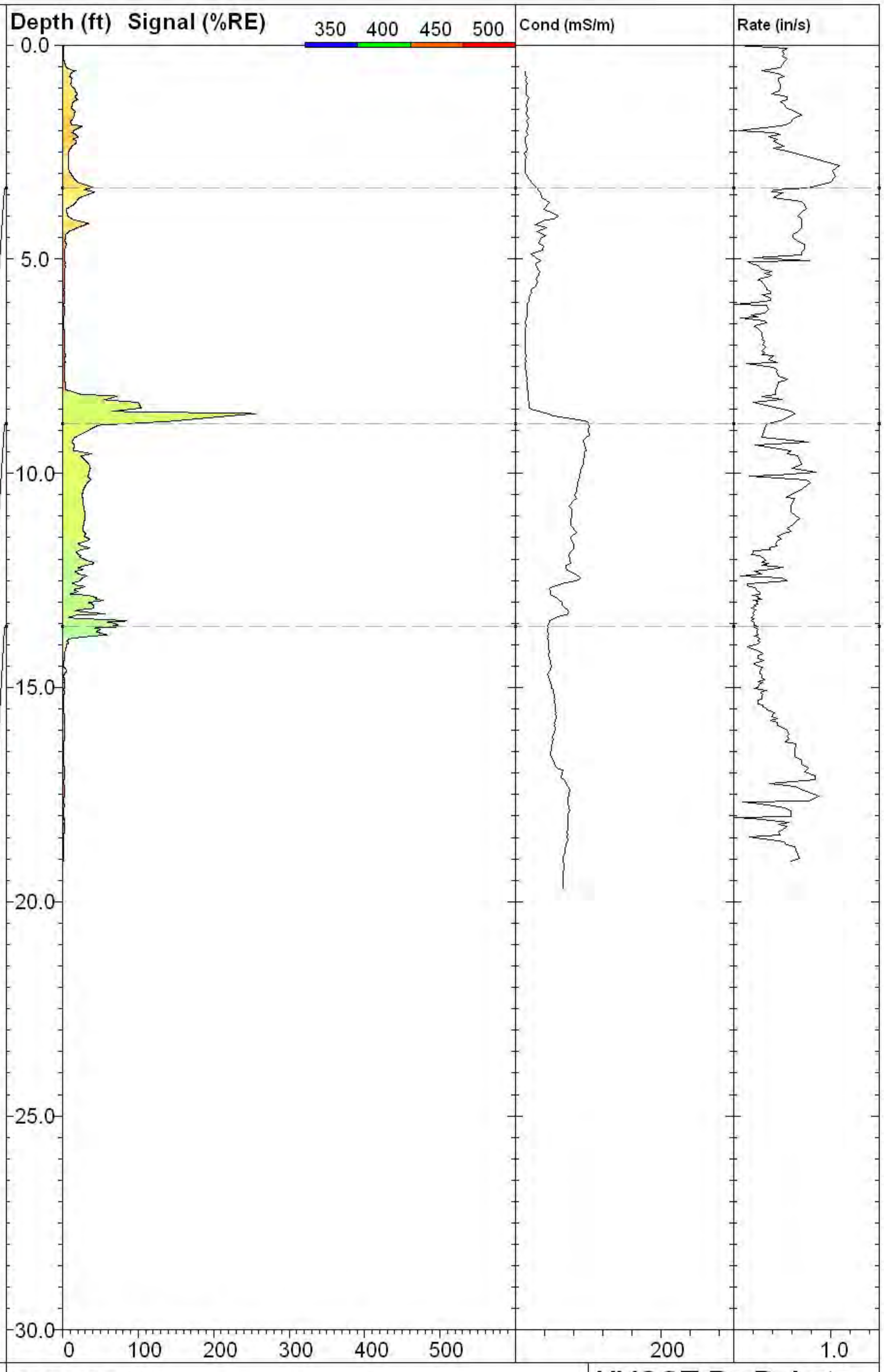
3.3 ft
41.9 %RE



8.8 ft
84.6 %RE



13.6 ft
82.8 %RE



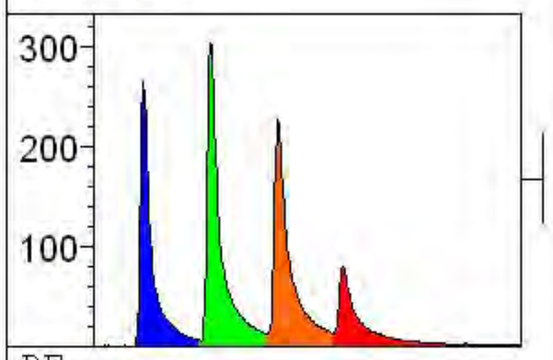
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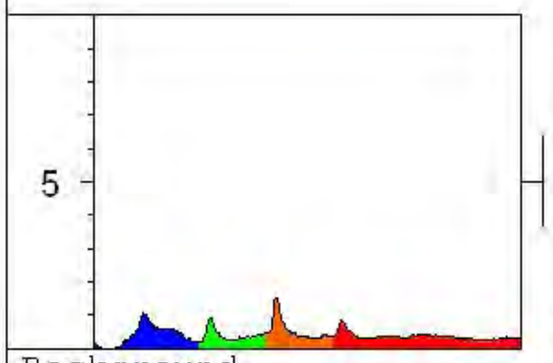
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **19.05 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **256.0 % @ 8.60 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-23 14:02 CST**

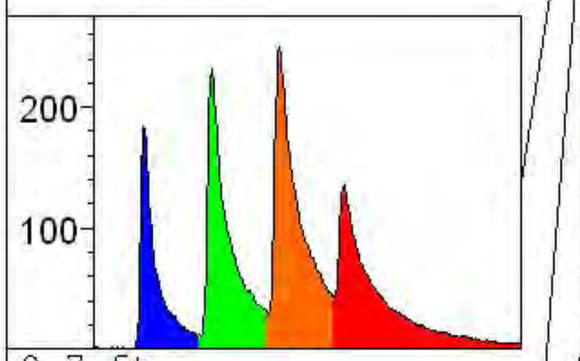
Callouts



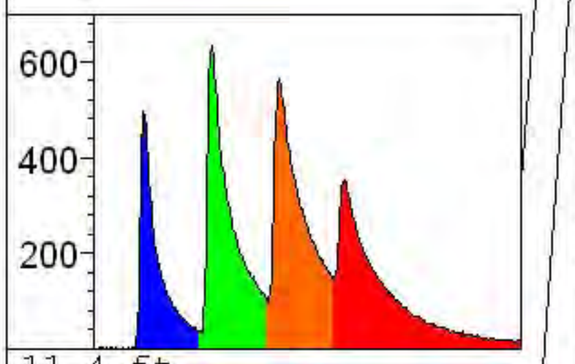
RE
100.0 %RE



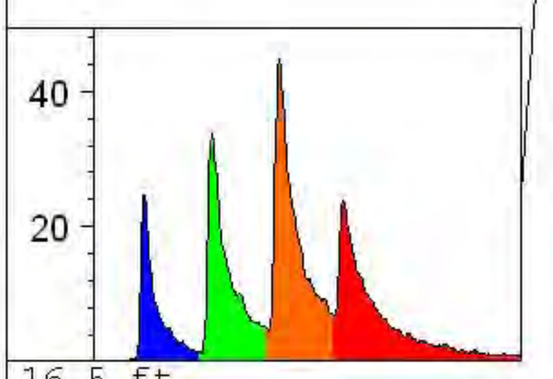
Background
1.1 %RE



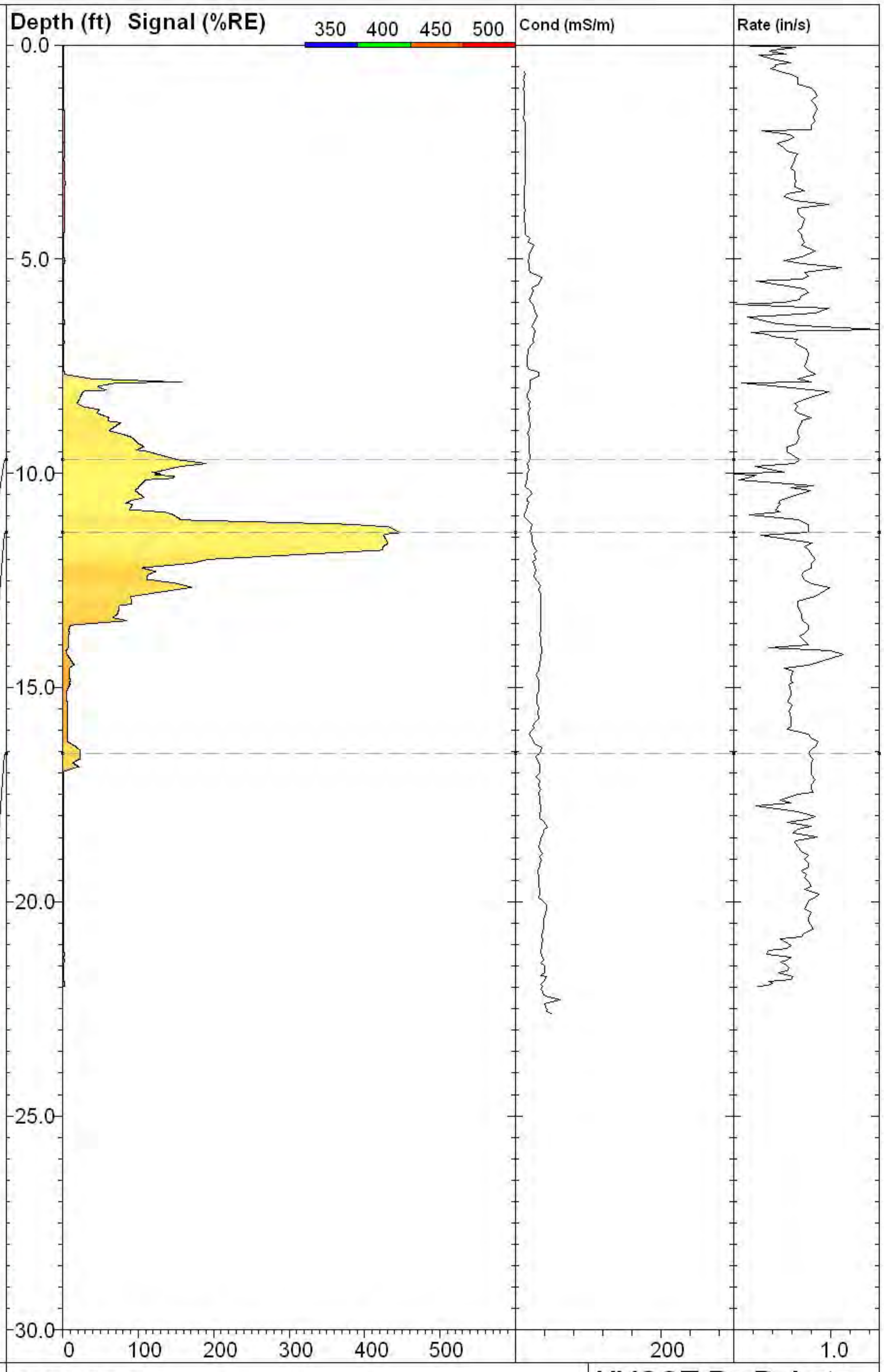
9.7 ft
152.5 %RE



11.4 ft
447.4 %RE



16.5 ft
23.6 %RE

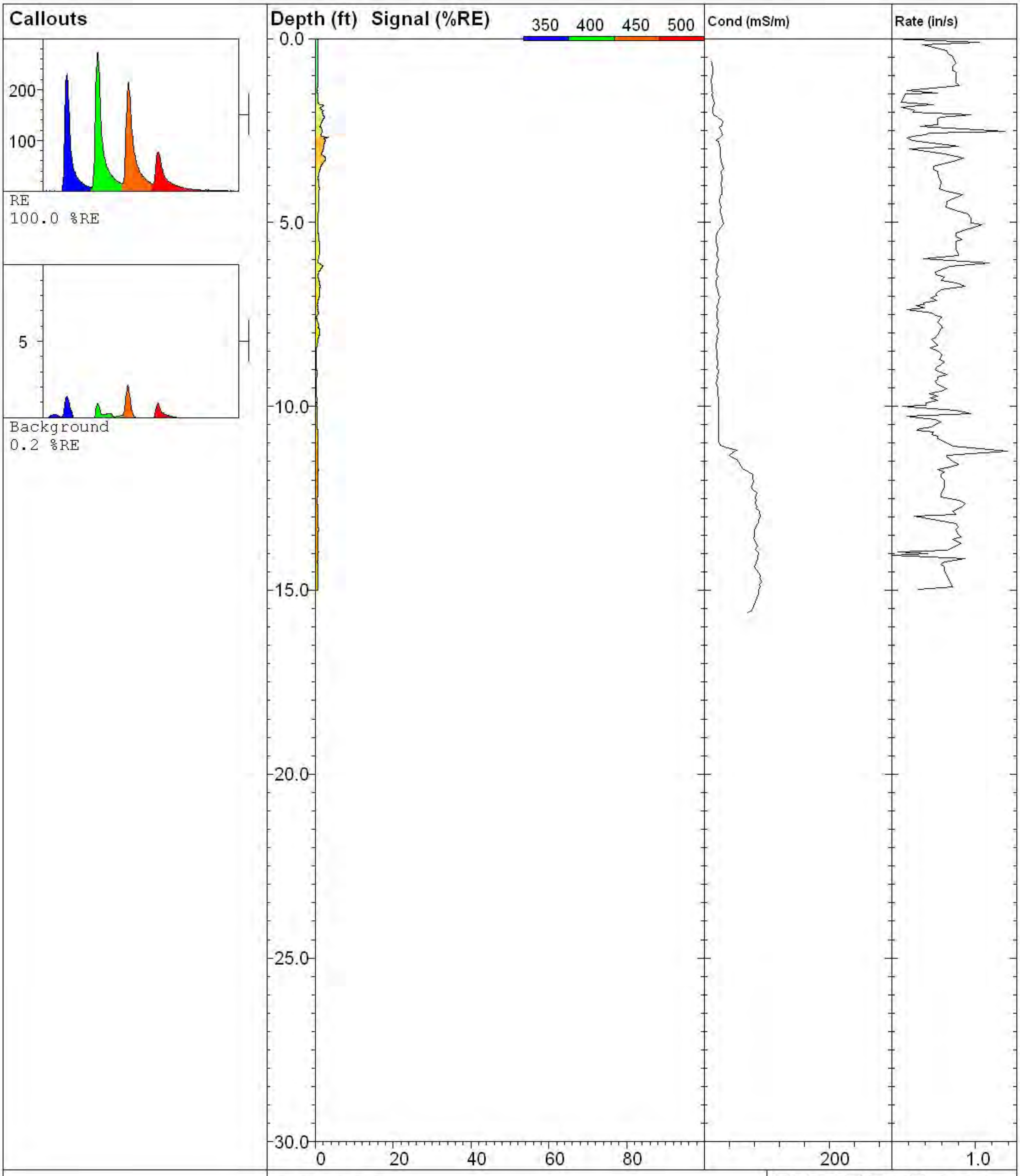


LIF-272

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **21.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **447.4 % @ 11.39 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-22 15:37 CST**

MATRIX ENVIRONMENTAL LLC
8531 Jefferson Highway
Osseo, MN 55369
(763) 424-4803
www.matrixenv.com

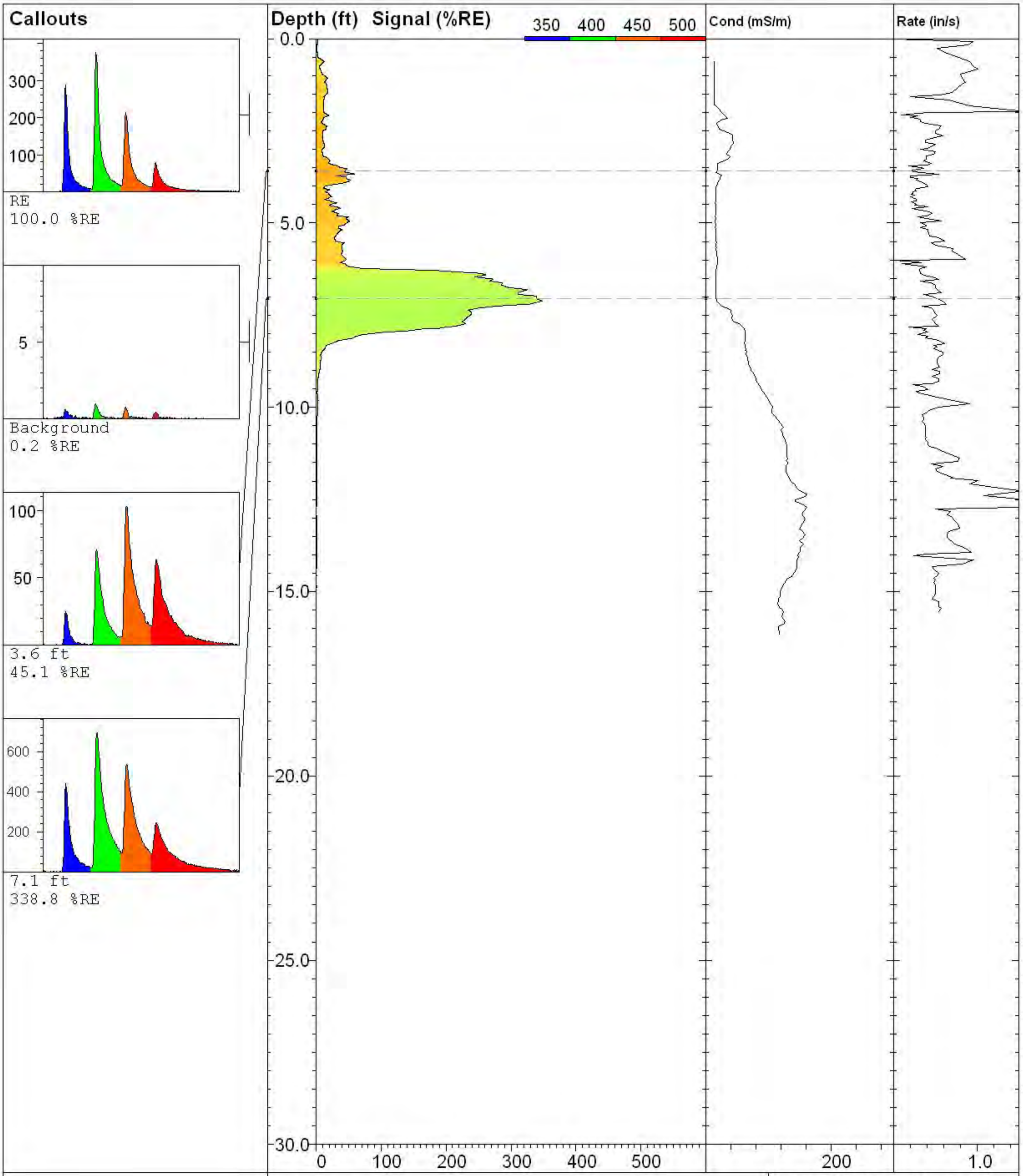


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LIF-277

UVOST By Dakota
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Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **14.99 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.6 % @ 2.68 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-28 10:23 CST**

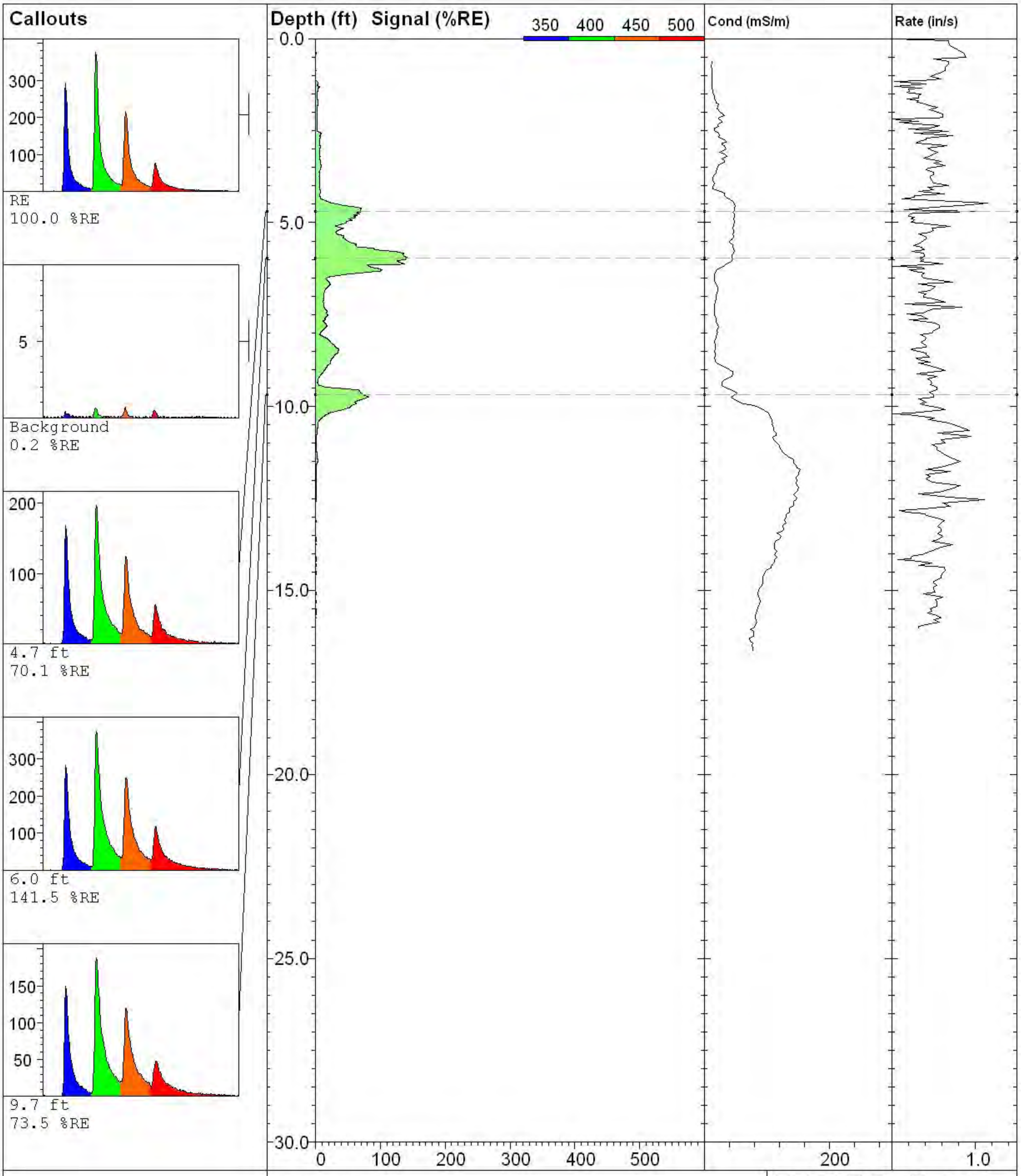


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LIF-278

UVOST By Dakota
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Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.53 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **348.8 % @ 7.12 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-28 15:04 CST**

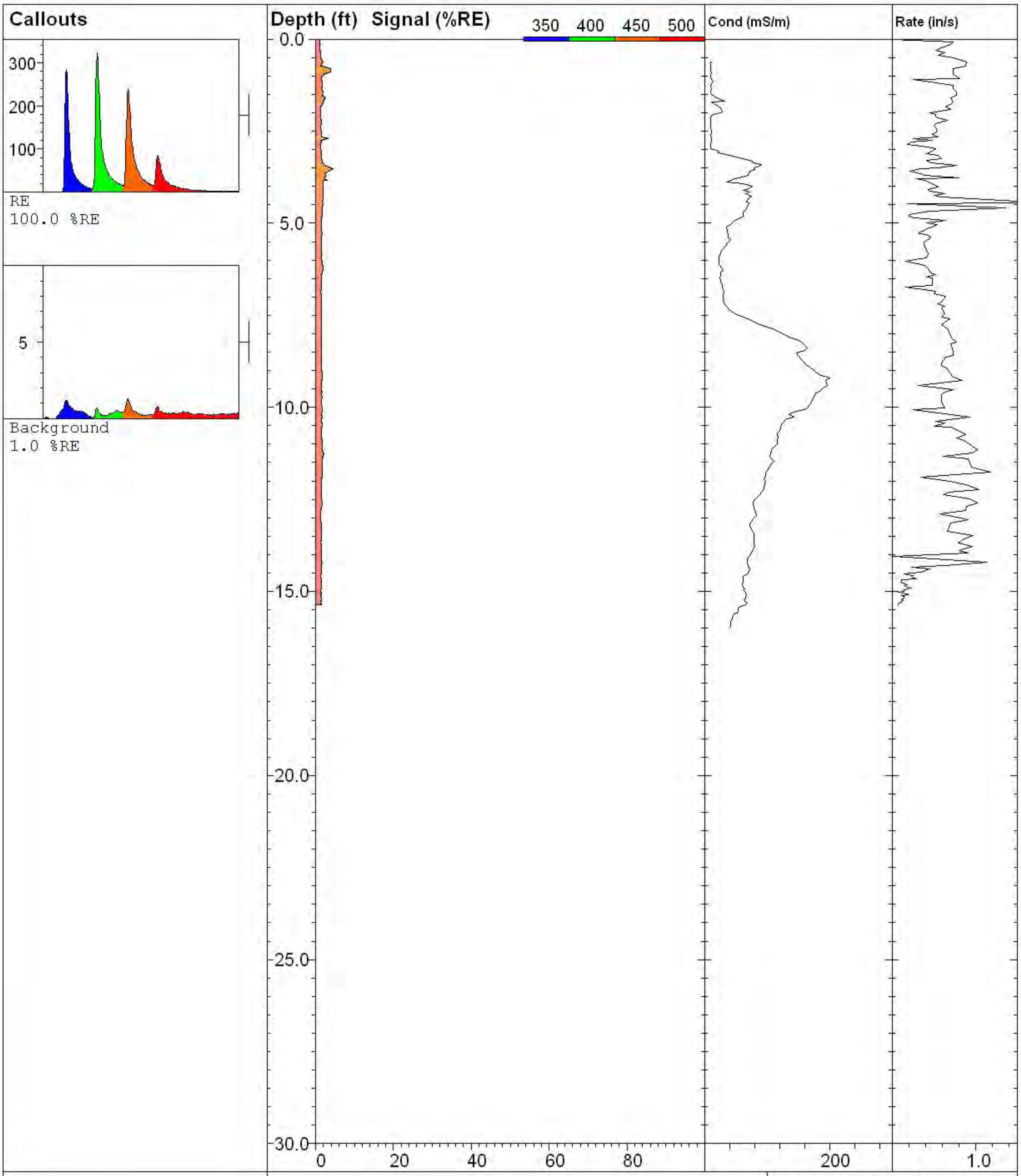


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LIF-280

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC- Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **16.03 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **141.5 % @ 5.95 ft**
Job: **008-MNDS-10UVa**	*Operator/Unit:* **MJ/AK/UVOST1013**	*Date & Time:* **2010-01-27 10:19 CST**



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LIF-282

UVOST By Dakota
www.DakotaTechnologies.com

Site: **MLC-Willow Run Property**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **15.37 ft**
Client: **ARCADIS**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.5 % @ 3.53 ft**
Job: **008-MNDS-10UV**	*Operator/Unit:* **DT/SA/UVOST1003**	*Date & Time:* **2010-01-21 10:27 CST**

ARCADIS

Appendix D

Temporary Well Soil Boring Logs

ARCADIS

Soil Boring Log

Boring No.: TW-010

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/27/2010
Date Completed: 01/29/2010

Logger: Adam Peckens
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1 feet - CONCRETE.	
2							1 to 2.5 feet - SAND, fine, trace silt; dry, well sorted, light yellowish brown.	
3							2.5 to 4 feet - SAND, very fine to very coarse, little granule to small pebble; dry, poorly sorted, light yellowish brown.	
4								
5				TW-010, 4.5 to 5.5 feet, 1150			4 to 5 feet - SAND, very fine to very coarse, little granule to small pebble; dry, poorly sorted, light yellowish brown.	
6			30				5 to 8 feet - SAND, very fine to medium, trace granules; moist, well sorted, light brown. Note: Slight sheen on gloves.	
7								
8								
9				TW-010, 8 to 9.5 feet, 1155			8 to 9.5 feet - SAND, very fine to very coarse, some granule, trace small pebble; wet, poorly sorted, grayish brown.	
10			40				9.5 to 10 feet - SILT; wet, grayish brown.	
11							10 to 12 feet - CLAY, moist; high plasticity, medium stiff, grayish brown.	
12								
13								
14								
15								
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start: 9
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-027

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/27/2010
Date Completed: 01/29/2010

Logger: Adam Peckens
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1					1.8		0 to 1.5 feet - CONCRETE.	
2					2.1		1.5 to 4 feet - SAND, very fine to very coarse, trace silt, trace granule to small pebbles, subround; dry, poorly sorted, brown.	
3								
4								
5					3.1		4 to 8 feet - SAND, very fine to very coarse, little silt, little granule to medium pebbles, subround; moist, poorly sorted, brown.	
6			14	GP	2.5			
7								
8								
9				TW-027, 8.5 to 9.5 feet, 1110	3.8		8 to 8.5 feet - SAND, very fine to very coarse, little silt, little granule to medium pebbles, subround; moist, poorly sorted, brown.	
10			21		4.1		8.5 to 12 feet - SAND, very fine to very coarse, trace granule, trace small pebble; wet, poorly sorted, gray. Note: Slight odor, no noticeable sheen. 9 feet - Note, Clay seam at 9 feet, 3 inches thick collected in PCB/TPH sample.	
11								
12								
13				TW-027, 12 to 14 feet, GSA, 1115	4.3		12 to 16 feet - SAND, very fine to very coarse, trace granule, trace medium pebbles; wet, poorly sorted, grayish brown.	
14					2.9			
15								
16					3.1			

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start: 8.5 feet
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-033

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/26/2010
Date Completed: 01/29/2010

Logger: Patrick Curry
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1 feet - CONCRETE.	
2							1 to 4 feet - Hand cleared (not logged).	
3								
4								
5					0.6		4 to 6 feet - SAND, fine to coarse, trace silt, trace granules, angular; dry, poorly sorted, dark brown; NOTE: FILL.	
6			36	GP	0.1			
7					0.5		6 to 7 feet - SAND, fine to very coarse, trace granules, angular; dry, poorly sorted, medium brown.	
8					0.1		7 to 10 feet - SAND, medium to very coarse, trace granules, subangular; dry, poorly sorted, medium brown.	
9					0.0			
10			36	TW-033, 9.5 to 10.5 feet, PCB/TPH	0.0		10 to 13 feet - CLAY, trace silt, moist, high plasticity, medium gray. Note: Lacustrine.	
11								
12								
13							13 to 16 feet - SAND, very fine to fine, trace silt; wet, well sorted, medium brown.	
14			44	TW-033, 13 to 16 feet, Sieve	0.0			
15								
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start: 17 feet
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-034

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/27/2010
Date Completed: 01/29/2010

Logger: Adam Peckens
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1.3 feet - CONCRETE.	
2					2.1		1.3 to 4 feet - SAND, very fine to medium, trace silt, trace pebble (5 to 10 mm); well sorted, dry, yellowish brown.	
3								
4					1.9			
5							4 to 8 feet - SAND, fine to very coarse, little granules, trace small to medium pebbles, trace silt; dry, poorly sorted, brown.	
6			26		2.1			
7				TW-034, 6 to 8 feet, Sieve, 1025				
8								
9				TW-034, 8.5 to 9.5 feet, PCB/TPH, 1020	5.1		8 to 9.5 feet - SAND, fine to very coarse, little granule to small pebble, trace silt; moist, poorly sorted, grayish brown. Note: Sheen on gloves.	
10			41				9.5 to 12 feet - CLAY, high plasticity; moist, medium stiff, grayish brown.	
11					7.1			
12								
13							12 to 16 feet - CLAY, high plasticity; moist, medium stiff, grayish brown.	
14				GP				
15								
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start: 9 feet
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-128

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/29/2010
Date Completed: 01/29/2010

Logger: Alec MacAdam
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 0.8 feet - CONCRETE.	
2			33.6	GP			0.8 to 4 feet - SAND, fine, little very fine/silt, trace medium to coarse, dry, loose, brown.	
3								
4								
5							4 to 7 feet - SAND, very fine to fine, some silt, little coarse, loose, light brown. Note: Reddish brown silt inclusions, very dark brown/black staining at 6.6 feet for 1 inch; very fine sand and silt lamina 6.7 to 7 feet.	
6			31.2					
7								
8							7 to 8 feet - SAND, very fine, some silt, little fine sand, gray, loose, black staining laminates, loose, moist, sheen present when wetted.	
9				TW-128, 7.5 to 8.5 feet, PCB/TPH, 0924			8 to 12 feet - SAND, very fine to fine, some silt, little medium, very dark gray, black staining at 9.4 feet for 1 inch, loose. Wet at 8.5 feet.	
10			37.2					
11				TW-128, 10 to 12 feet, G.S., 0937				
12							12 to 13.8 feet - SAND, very fine to fine, some silt, little medium, very dark gray.	
13								
14			48	GP			13.8 to 16 feet - CLAY, little silt, soft, gray; high plasticity, trace light gray silt inclusions at 14.8 to 15 feet.	
15								
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-258

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/28/2010
Date Completed: 01/29/2010

Logger: Alec MacAdam
Editor:
Weather Conditions: 20's Windy, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to .6 feet - Crushed LIMESTONE.	
2			28.8	GP	0.0		.6 to 2 feet - SAND, very fine, little silt, loose, dry, well sorted, light brown.	
3							2 to 2.4 feet - SAND, very fine, some silt, little fine sand, dry, loose, reddish brown.	
4								
5					0.0		4 to 7 feet - SAND, very fine, some silt, little fine sand, trace granule to small pebble; loose; light redish brown to redish brown; NOTE: black staining at 6.5 feet.	
6			33.6	GP				
7								
8							7 to 8 feet - SILTY very fine sand/sandy silt, dark gray brown. Note: Little clay from 7.1 to 7.3 feet dark gray black staining, loose, moist at 7 feet.	
9				TW-258, 8 to 9 feet, 1552	0.0		8 to 9 feet - SAND, some silt, little fine, gray. Note: Wet at 9 feet, very dark gray to black at 9 feet for 1 inch.	
10			34.8				9 to 12 feet - SILT, some very fine to fine sand, little clay, wet, loose, gray to reddish brown.	
11								
12								
13				TW-258, 12 to 14 feet	0.0		12 to 14.9 feet - SILT, some very fine sand, little clay, wet, loose to soft, gray.	
14			33.6					
15							14.9 to 16 feet - SILT, some clay, little very fine sand, soft, gray.	
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Set temp well at 5 to 15 feet (screen pulled up 1 foot with tooling.). Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-267

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/28/2010
Date Completed: 01/29/2010

Logger: Alec MacAdam
Editor:
Weather Conditions: 16, Partly Cloudy, Windy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1 feet - CONCRETE.	
2			14.4	GP			1 to 4 feet - SAND, medium, some fine, little silt, loose, poorly sorted, dry, reddish brown.	
3								
4								
5							4 to 5 feet - SAND, medium, some fine, little very fine to silt, trace granules, dry, loose, light brown to reddish brown.	
6			28.8	GP			5 to 8 feet - SAND, very fine to fine, some silt, trace clay, loose, poorly sorted, moist, gray to reddish brown.	
7								
8							7.7 to 8 feet - Becomes gray very fine sandy silt.	
9				TW-267, 8 to 9 feet, 1728			8 to 9 feet - SAND, fine, some silt, little coarse sand, poorly sorted, loose, moist, gray.	
10			27.6				9 to 11.5 feet - SAND, very fine, some silt, little coarse sand, poorly sorted, sheen, wet at 9 feet, gray.	
11								
12							11.5 to 12 feet - SAND, medium to coarse, some fine and silt, poorly sorted, loose, wet with sheen, gray.	
13				TW-267, 10 to 14 feet, 1739			12 to 14.6 feet - SAND, medium to coarse, little silt, poorly sorted, loose, wet, trace of sheen, gray.	
14			28.8	GP				
15							14.6 to 16 feet - SILT, some clay, little very fine sand, moist, soft to medium stiff, gray.	
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-271

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/26/2010
Date Completed: 01/29/2010

Logger: Patrick Curry
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1.5 feet - CONCRETE.	
2					0.0		1.5 to 2.5 feet - Hand cleared, no logged.	
3			21		0.0		2.5 to 3.75 feet - SAND, very fine to very coarse, little, granule, small pebble, little silt with clay, NOTE: FILL.	
4					0.0		3.25 to 4.25 feet - CLAY, little silt and very fine sand, moist, low plasticity, soft, dark brown.	
5							4.25 to 6.5 feet - SAND and CLAY, very fine to very coarse sand, little silt, little granular; moist, low plasticity, soft, mottled brown to gray; NOTE: FILL.	
6			36	GP	0.0			
7							6.5 to 9 feet - SAND, fine to very coarse, little granules, trace small pebble; dry, poorly sorted, light brown.	
8					0.1			
9				TW-271, 8 to 9 feet, PCB/TPH	0.1		8 to 9 feet - Wet (possible oil).	
10			44		0.0		9 to 14 feet - CLAY, trace silt; moist, high plasticity, soft, gray. Note: Lacustrine.	
11								
12					0.0			
13					0.0			
14								
15				TW-271, 14 to 16 feet, Sieve	0.0		14 to 16 feet - SAND, very fine to fine, little silt; wet, well sorted, gray.	
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

Sampling Method: Macrocore
Sampling Interval: 4 feet
Water Level Start:
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Soil Boring Log

Boring No.: TW-272

Sheet: 1 of 1

Project Name: MLC - Willow Run
Project Number: BN015218.0000.00003
Project Location: Ypsilanti, Michigan

Date Started: 01/26/2010
Date Completed: 01/29/2010

Logger: Patrick Curry
Editor:
Weather Conditions: 60's Indoors

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details
1							0 to 1.5 feet - CONCRETE.	
2							1.5 to 4 feet - Hand cleared, no logged.	
3								
4								
5							4 to 10.5 feet - SAND, very fine to medium, trace coarse to very coarse, trace granules, little silt and clay; dry, poorly sorted, medium brown, NOTE: FILL, poor recovery.	
6			18	GP	0.0			
7								
8					0.0			
9					0.0			
10			28		0.0		9.5 to 10.5 feet - Wet (possible oil).	
11				TW-272, 10 to 12 feet, PCB/TPH			10.5 to 11.5 feet - SAND and SILT, very fine sand, little clay; moist, well sorted, medium gray.	
12					0.0		11.5 to 13 feet - CLAY, trace silt; moist, high plasticity, soft, gray.	
13							13 to 14 feet - SAND, very fine to medium; wet, well sorted, gray.	
14			24					
15				TW-272, 13 to 16 feet, Seive	0.0 1.8		14 to 16 feet - SAND, very fine to fine, little silt; wet, well sorted, gray.	
16								

Drilling Co.: Matrix Environmental
Driller: Sam
Drilling Method: Direct Push
Drilling Fluid: No
Remarks: Converted to temporary 1-inch well. Well abandoned with bentonite on 2/8/2010. Hand auger first four feet.

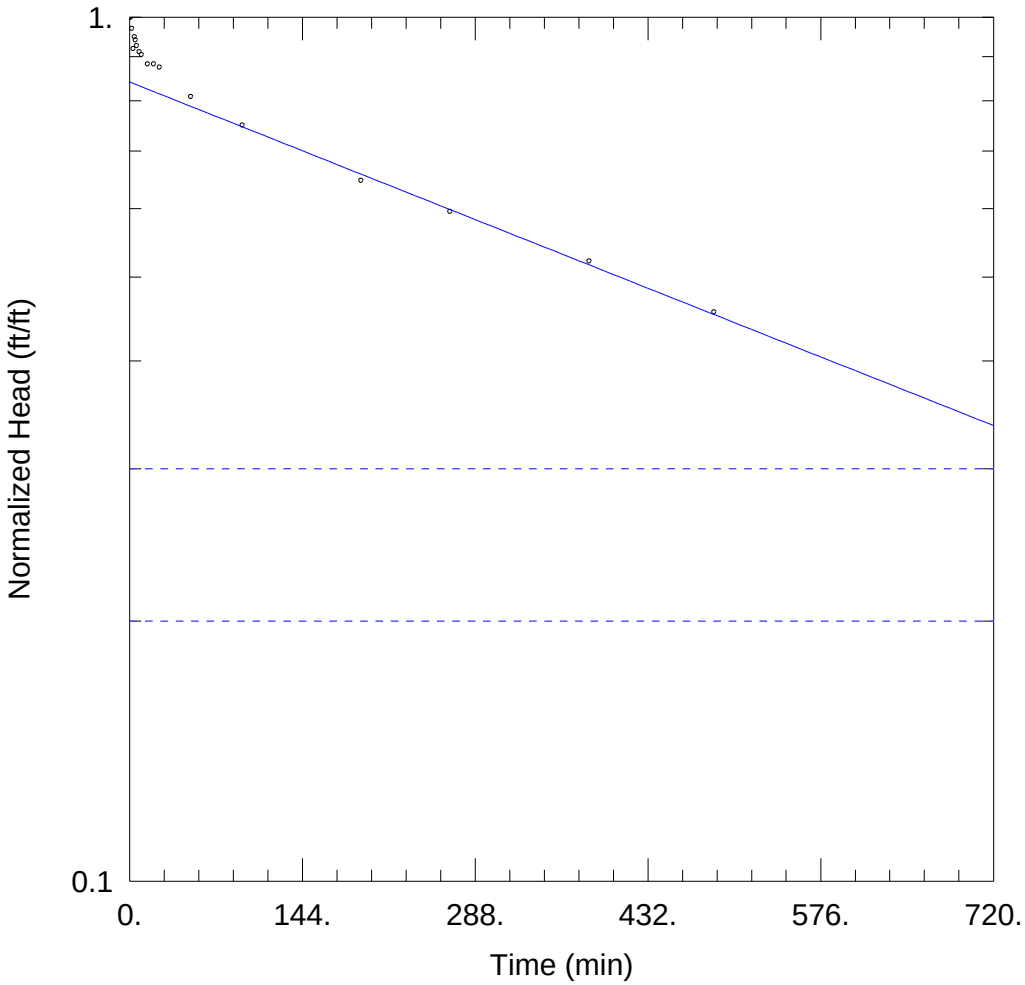
Sampling Method: Macrocore
Sampling Interval: 4 foot
Water Level Start: 9.5
Water Level Finish:
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG GINT LOGS.GPJ ARCADIS.GDT 2/15/10

ARCADIS

Appendix E

Baildown Tests



CRA-041R BAILDOWN TEST

Data Set: G:\...\CRA-041R_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:27:14

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-041R
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.49 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-041R)

Initial Displacement: 1.36 ft
Total Well Penetration Depth: 1.49 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.49 ft
Screen Length: 1.49 ft
Well Radius: 0.083 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-041R Baildown Test
Date: 12/22/10
Time: 16:27:17

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-041R

AQUIFER DATA

Saturated Thickness: 1.49 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-041R

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.36 ft
Static Water Column Height: 1.49 ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft
Well Skin Radius: 1. ft
Screen Length: 1.49 ft
Total Well Penetration Depth: 1.49 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 17

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.36	20.	1.2
2.	1.32	25.	1.19
3.	1.25	51.	1.1
4.	1.29	94.	1.02
5.	1.28	193.	0.88
6.	1.26	267.	0.81
8.	1.24	383.	0.71
10.	1.23	487.	0.62
15.	1.2		

SOLUTION

Slug Test
Aquifer Model: Unconfined

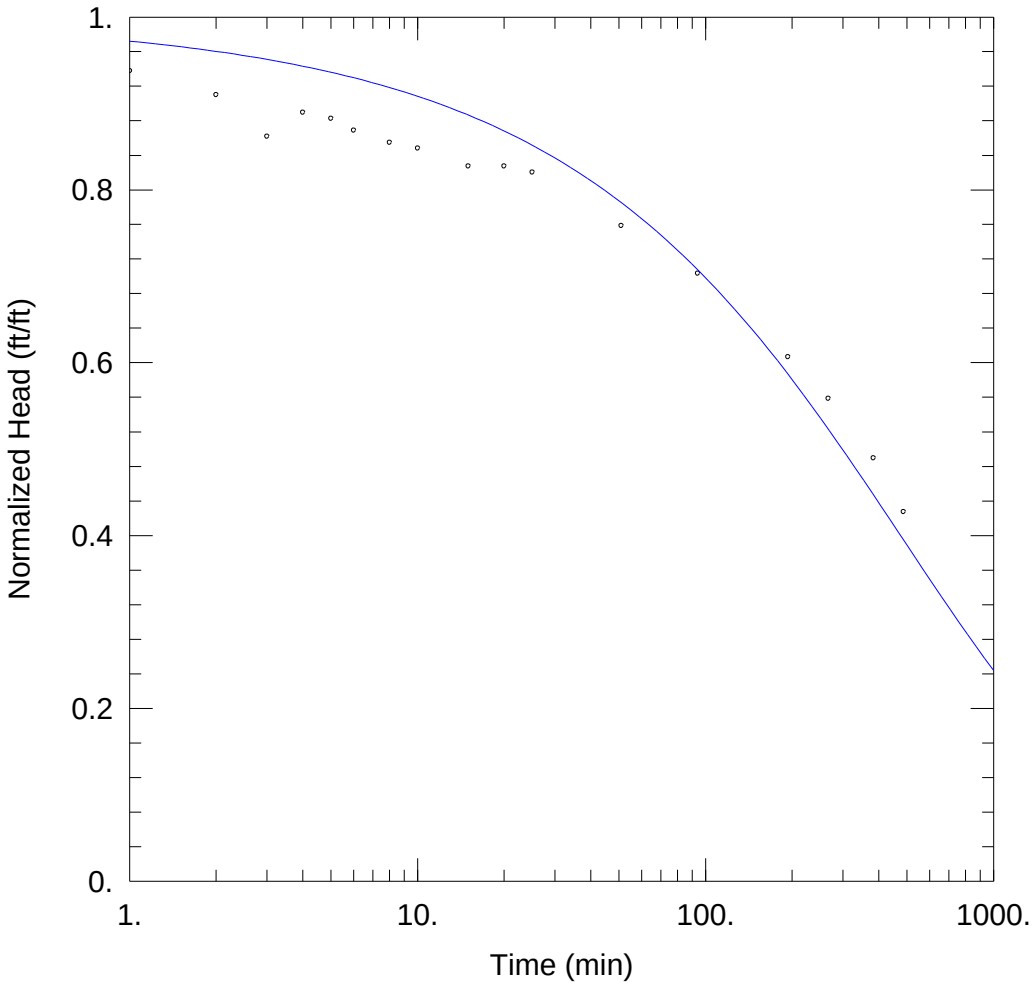
Solution Method: Bouwer-Rice
ln(Re/rw): 2.128

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.178E-6	cm/sec
y0	1.144	ft

T = K*b = 0.0001443 cm^2/sec



CRA-041R BAILDOWN TEST

Data Set: G:\...\CRA-041R_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:27:19

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-041R
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.49 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-041R)

Initial Displacement: 1.45 ft
Total Well Penetration Depth: 1.49 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.49 ft
Screen Length: 1.49 ft
Well Radius: 0.085 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-041R Baildown Test
Date: 12/22/10
Time: 16:27:24

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-041R

AQUIFER DATA

Saturated Thickness: 1.49 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-041R

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.45 ft
Static Water Column Height: 1.49 ft
Casing Radius: 0.083 ft
Well Radius: 0.085 ft
Well Skin Radius: 1. ft
Screen Length: 1.49 ft
Total Well Penetration Depth: 1.49 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 17

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.36	20.	1.2
2.	1.32	25.	1.19
3.	1.25	51.	1.1
4.	1.29	94.	1.02
5.	1.28	193.	0.88
6.	1.26	267.	0.81
8.	1.24	383.	0.71
10.	1.23	487.	0.62
15.	1.2		

SOLUTION

Slug Test
Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0001464	cm^2/sec
S	0.1	

K = T/b = 3.225E-6 cm/sec
Ss = S/b = 0.06711 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0001464	6.671E-5	+/- 0.0001422	2.195	cm^2/sec
S	0.1	0.09359	+/- 0.1994	1.068	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 3.225E-6 cm/sec
Ss = S/b = 0.06711 1/ft

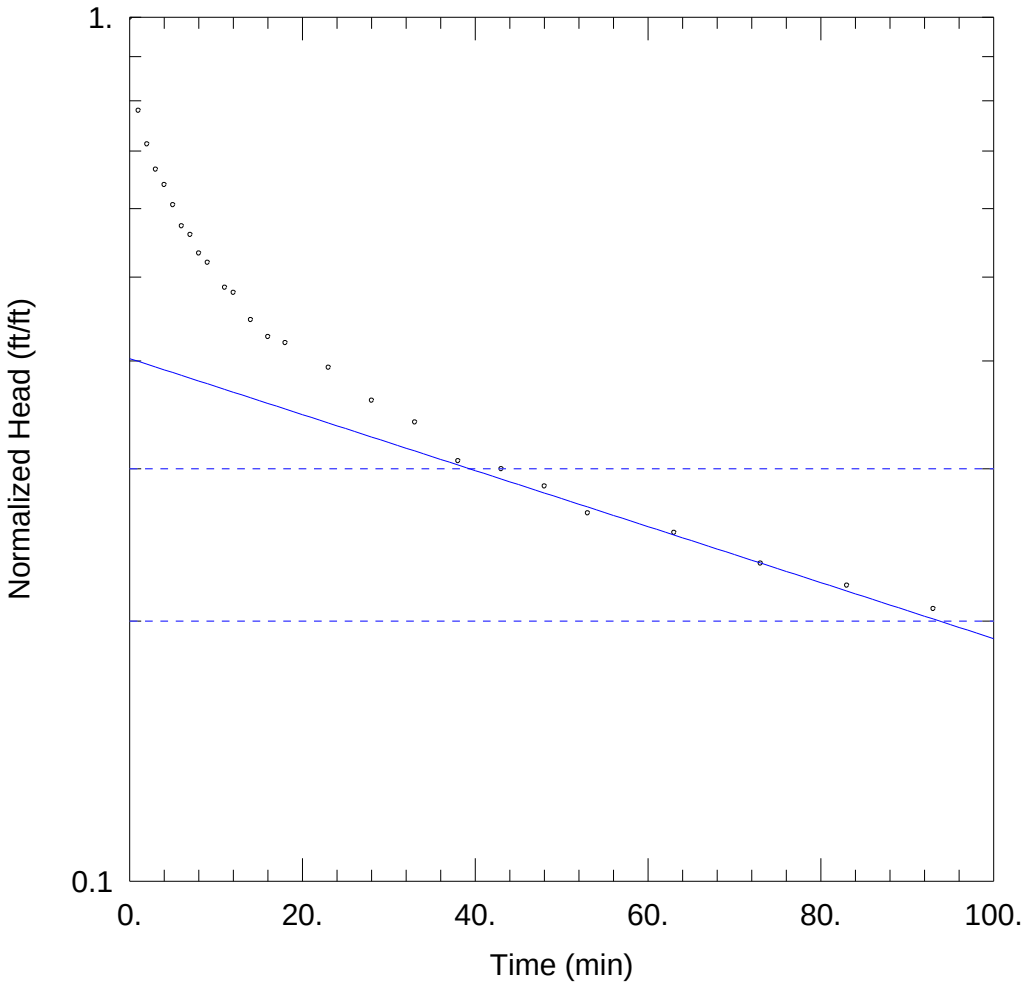
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.08388 ft^2
Variance . . . . . 0.005592 ft^2
Std. Deviation . . . . . 0.07478 ft
Mean . . . . . -0.04224 ft
No. of Residuals . . . 17
No. of Estimates . . . 2



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:27:26

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 1.54 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.5 ft
Total Well Penetration Depth: 1.54 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.54 ft
Screen Length: 1.54 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:27:28

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.54 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.5 ft
Static Water Column Height: 1.54 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.54 ft
Total Well Penetration Depth: 1.54 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 25

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.17	18.	0.63
2.	1.07	23.	0.59
3.	1.	28.	0.54
4.	0.96	33.	0.51
5.	0.91	38.	0.46
6.	0.86	43.	0.45
7.	0.84	48.	0.43
8.	0.8	53.	0.4
9.	0.78	63.	0.38
11.	0.73	73.	0.35
12.	0.72	83.	0.33
14.	0.67	93.	0.31
16.	0.64		

SOLUTION

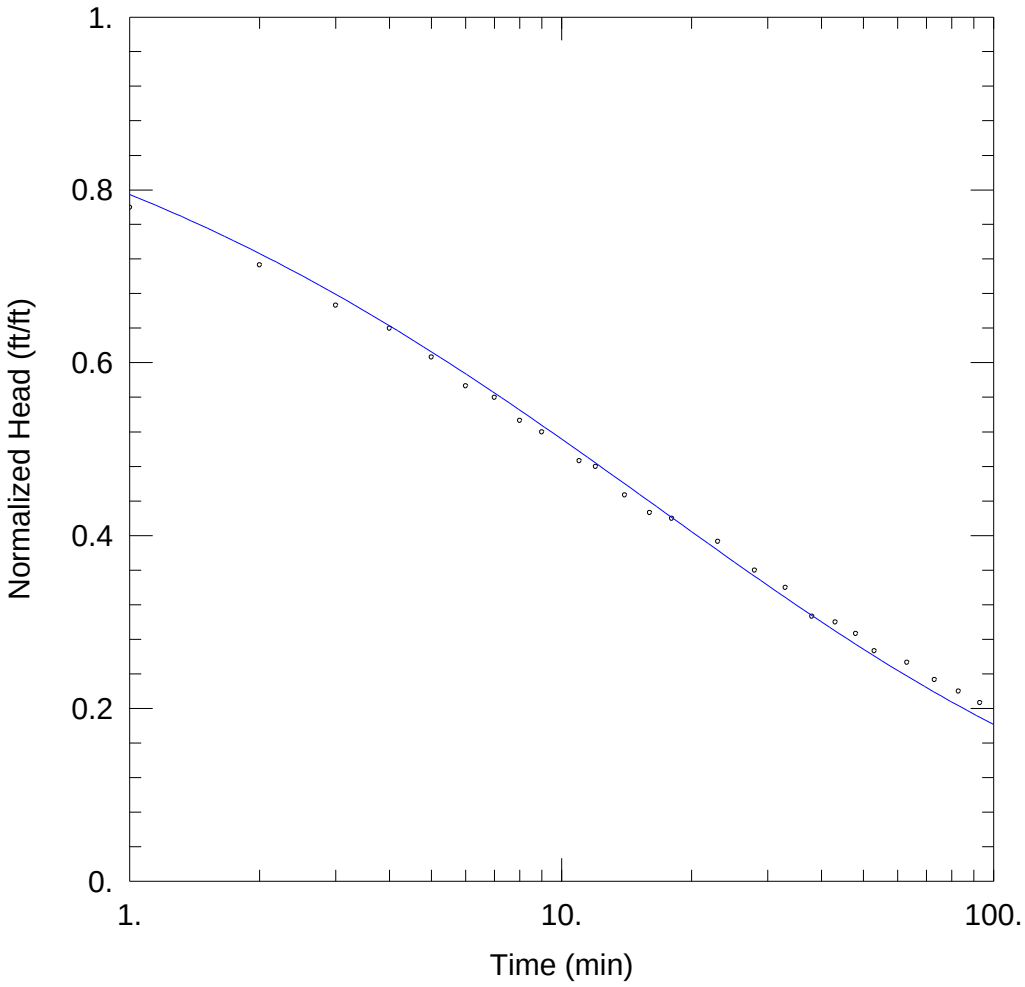
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.1

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.348E-5	cm/sec
y0	0.6038	ft

T = K*b = 0.00251 cm²/sec



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:27:30

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 1.54 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.5 ft
Total Well Penetration Depth: 1.54 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.54 ft
Screen Length: 1.54 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:27:36

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.54 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.5 ft
Static Water Column Height: 1.54 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.54 ft
Total Well Penetration Depth: 1.54 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 25

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.17	18.	0.63
2.	1.07	23.	0.59
3.	1.	28.	0.54
4.	0.96	33.	0.51
5.	0.91	38.	0.46
6.	0.86	43.	0.45
7.	0.84	48.	0.43
8.	0.8	53.	0.4
9.	0.78	63.	0.38
11.	0.73	73.	0.35
12.	0.72	83.	0.33
14.	0.67	93.	0.31
16.	0.64		

SOLUTION

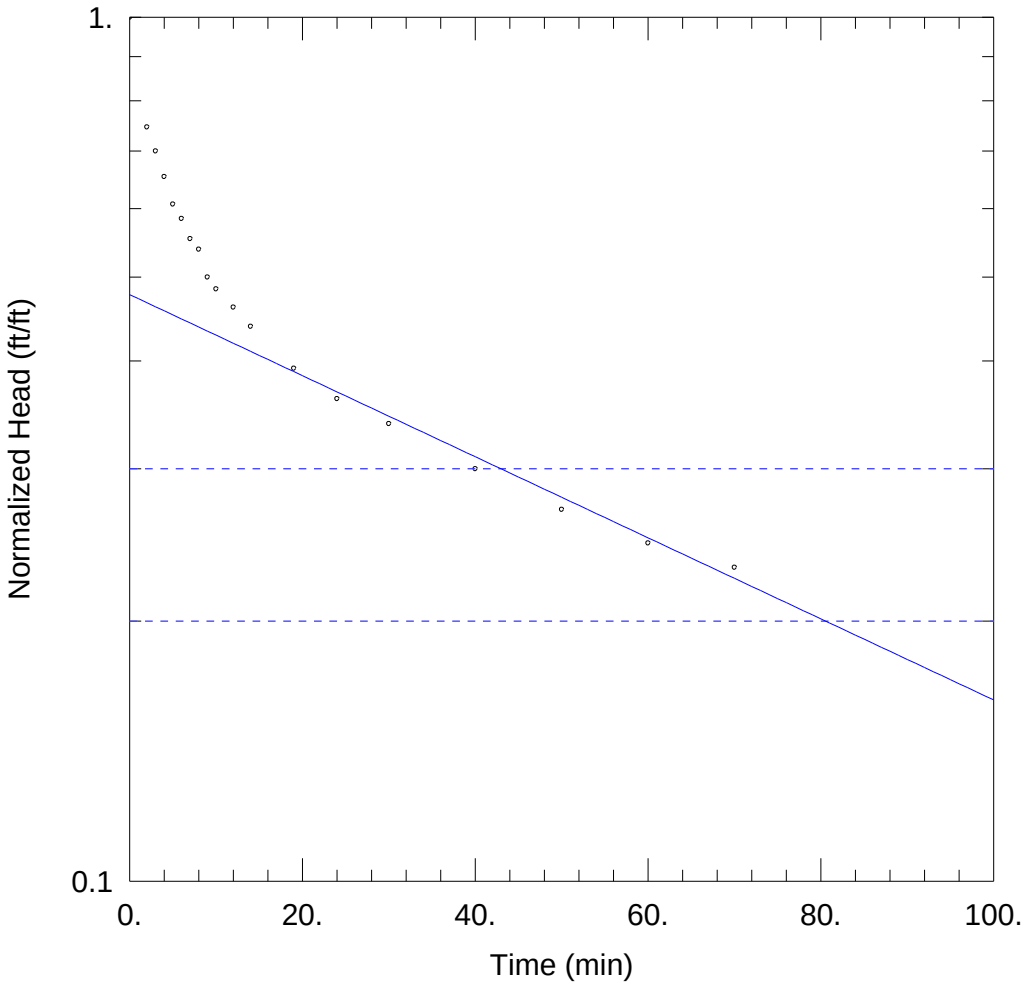
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0007131	cm^2/sec
S	0.1	

K = T/b = 1.519E-5 cm/sec
Ss = S/b = 0.06494 1/ft



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:27:37

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.51 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.3 ft
Total Well Penetration Depth: 1.51 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.51 ft
Screen Length: 1.51 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:27:40

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.51 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.3 ft
Static Water Column Height: 1.51 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.51 ft
Total Well Penetration Depth: 1.51 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 18

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	0.97	12.	0.6
3.	0.91	14.	0.57
4.	0.85	19.	0.51
5.	0.79	24.	0.47
6.	0.76	30.	0.44
7.	0.72	40.	0.39
8.	0.7	50.	0.35
9.	0.65	60.	0.32
10.	0.63	70.	0.3

SOLUTION

Slug Test
Aquifer Model: Unconfined

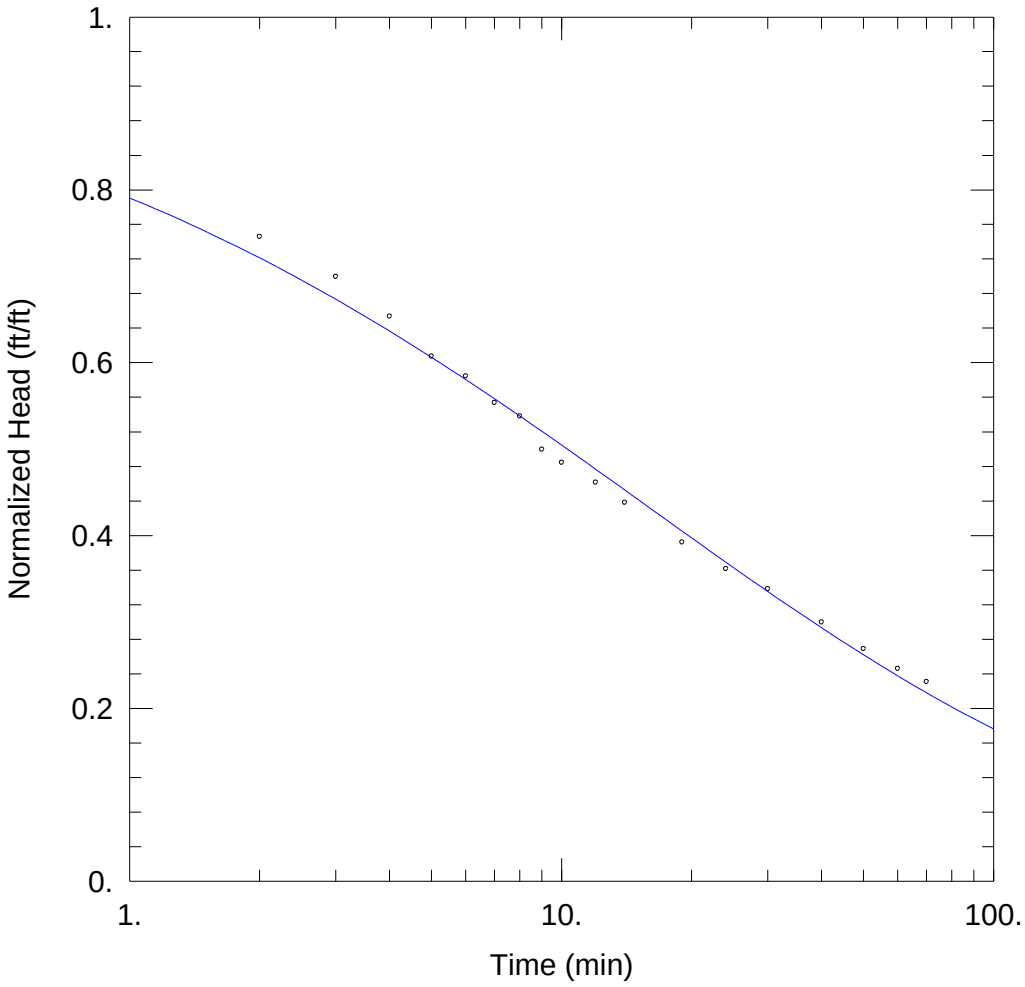
Solution Method: Bouwer-Rice
ln(Re/rw): 1.087

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	7.803E-5	cm/sec
y0	0.6205	ft

T = K*b = 0.003591 cm²/sec



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:28:34

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.51 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.3 ft
Total Well Penetration Depth: 1.51 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.51 ft
Screen Length: 1.51 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:28:39

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.51 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.3 ft
Static Water Column Height: 1.51 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.51 ft
Total Well Penetration Depth: 1.51 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 18

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	0.97	12.	0.6
3.	0.91	14.	0.57
4.	0.85	19.	0.51
5.	0.79	24.	0.47
6.	0.76	30.	0.44
7.	0.72	40.	0.39
8.	0.7	50.	0.35
9.	0.65	60.	0.32
10.	0.63	70.	0.3

SOLUTION

Slug Test
Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0007491	cm^2/sec
S	0.09963	

K = T/b = 1.628E-5 cm/sec
Ss = S/b = 0.06598 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0007491	0.000176	+/- 0.0003732	4.255	cm^2/sec
S	0.09963	0.02921	+/- 0.06193	3.41	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.628E-5 cm/sec
Ss = S/b = 0.06598 1/ft

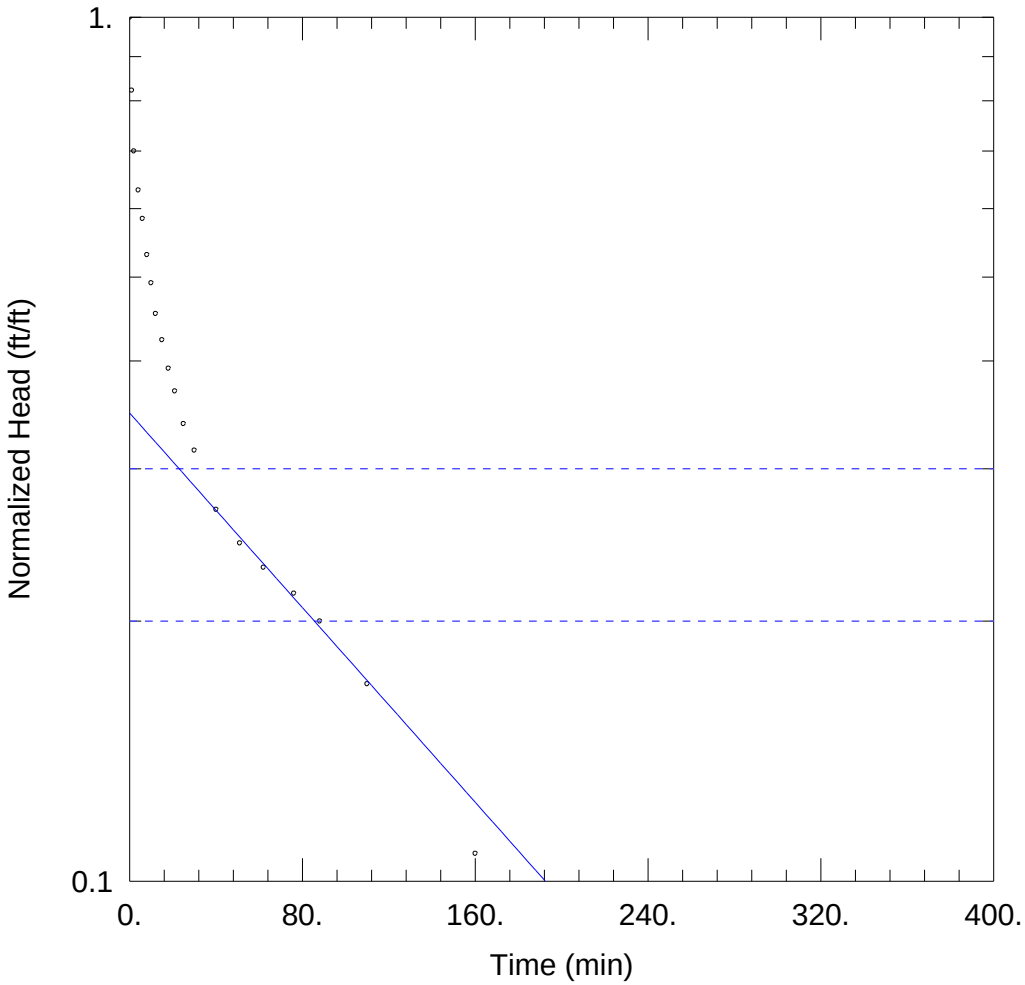
Parameter Correlations

	T	S
T	1.00	-0.99
S	-0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.005889 ft^2
Variance . . . . . 0.0003681 ft^2
Std. Deviation . . . . . 0.01919 ft
Mean . . . . . 0.001415 ft
No. of Residuals . . . 18
No. of Estimates . . . 2



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:28:41

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.47 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.3 ft
Total Well Penetration Depth: 1.47 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.47 ft
Screen Length: 1.47 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:28:44

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.47 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.3 ft
Static Water Column Height: 1.47 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.47 ft
Total Well Penetration Depth: 1.47 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.07	30.	0.41
2.	0.91	40.	0.35
4.	0.82	51.	0.32
6.	0.76	62.	0.3
8.	0.69	76.	0.28
10.	0.64	88.	0.26
12.	0.59	110.	0.22
15.	0.55	160.	0.14
18.	0.51	218.	0.07
21.	0.48	335.	0.01
25.	0.44		

SOLUTION

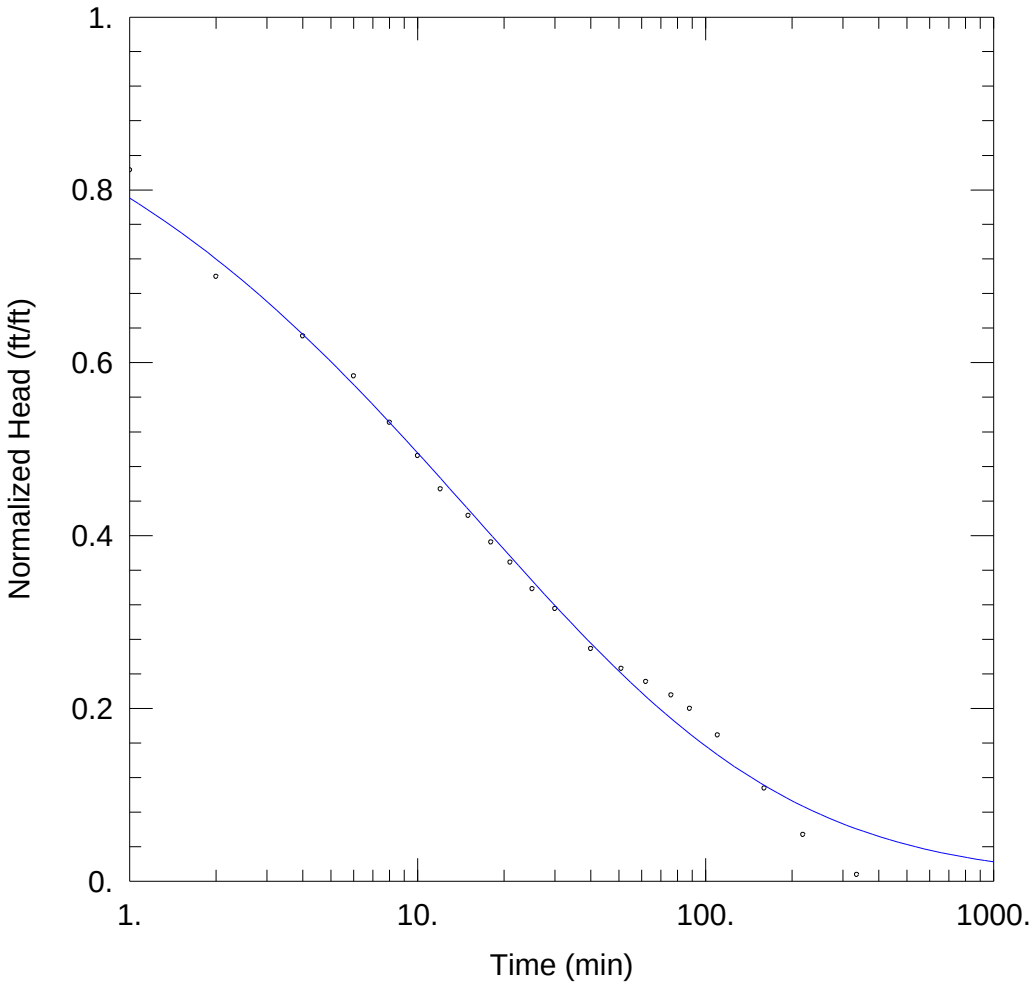
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.069

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.732E-5	cm/sec
y0	0.4525	ft

$T = K*b = 0.00212$ cm²/sec



CRA-079M BAILDOWN TEST

Data Set: G:\...\CRA-079M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:29:15

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-079M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.47 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-079M)

Initial Displacement: 1.3 ft
Total Well Penetration Depth: 1.47 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.47 ft
Screen Length: 1.47 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-079M Baildown Test
Date: 12/22/10
Time: 16:28:52

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-079M

AQUIFER DATA

Saturated Thickness: 1.47 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-079M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.3 ft
Static Water Column Height: 1.47 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.47 ft
Total Well Penetration Depth: 1.47 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.07	30.	0.41
2.	0.91	40.	0.35
4.	0.82	51.	0.32
6.	0.76	62.	0.3
8.	0.69	76.	0.28
10.	0.64	88.	0.26
12.	0.59	110.	0.22
15.	0.55	160.	0.14
18.	0.51	218.	0.07
21.	0.48	335.	0.01
25.	0.44		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001124	cm^2/sec
S	0.06458	

K = T/b = 2.509E-5 cm/sec
Ss = S/b = 0.04393 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.001124	0.0002062	+/- 0.0004316	5.451	cm^2/sec
S	0.06458	0.01707	+/- 0.03573	3.783	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 2.509E-5 cm/sec
Ss = S/b = 0.04393 1/ft

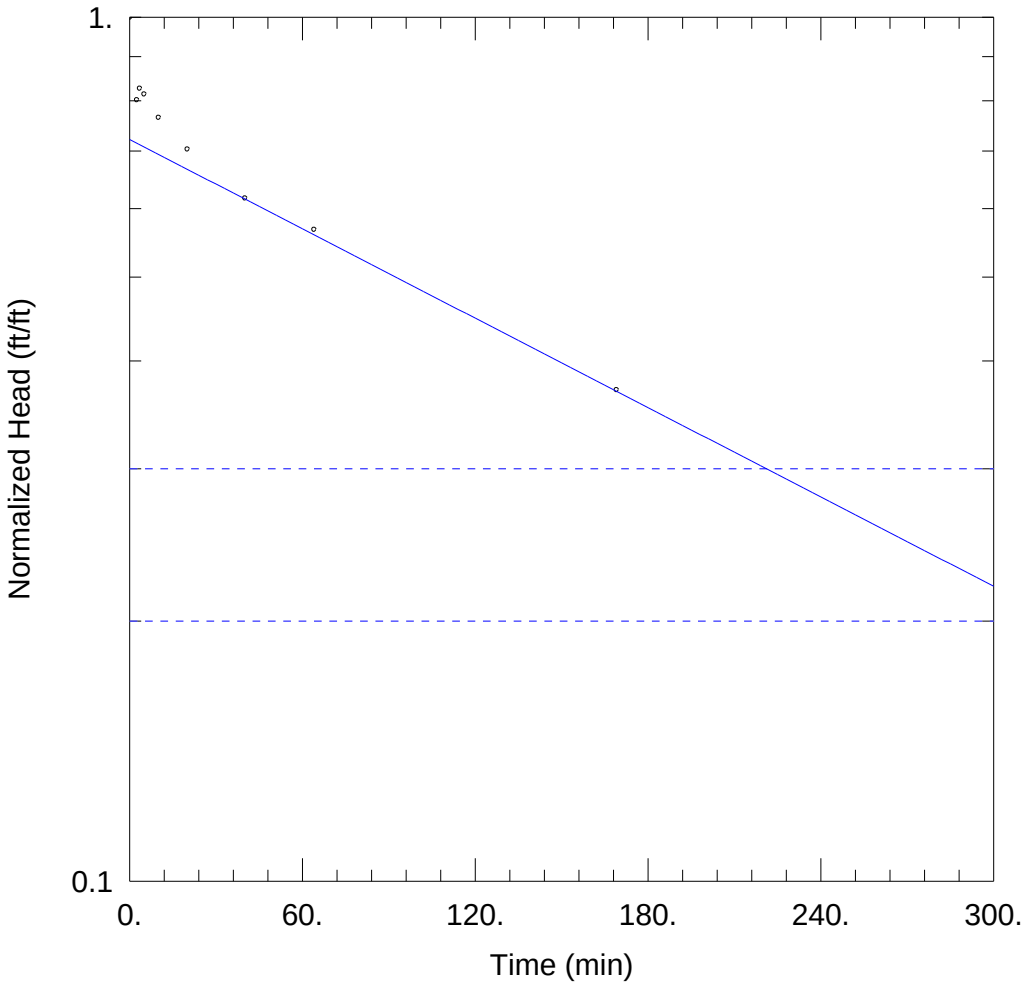
Parameter Correlations

	T	S
T	1.00	-0.98
S	-0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.01411 ft^2
Variance . . . . . 0.0007424 ft^2
Std. Deviation . . . . . 0.02725 ft
Mean . . . . . -0.001233 ft
No. of Residuals . . . 21
No. of Estimates . . . 2



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:29:25

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 1.77 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 0.81 ft
Total Well Penetration Depth: 1.77 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.77 ft
Screen Length: 1.77 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:28:56

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.81 ft
Static Water Column Height: 1.77 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.77 ft
Total Well Penetration Depth: 1.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2774 ft
Gravel Pack Porosity: 0.3

No. of Observations: 8

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.5	0.65	20.	0.57
3.5	0.67	40.	0.5
5.	0.66	64.	0.46
10.	0.62	169.	0.3

SOLUTION

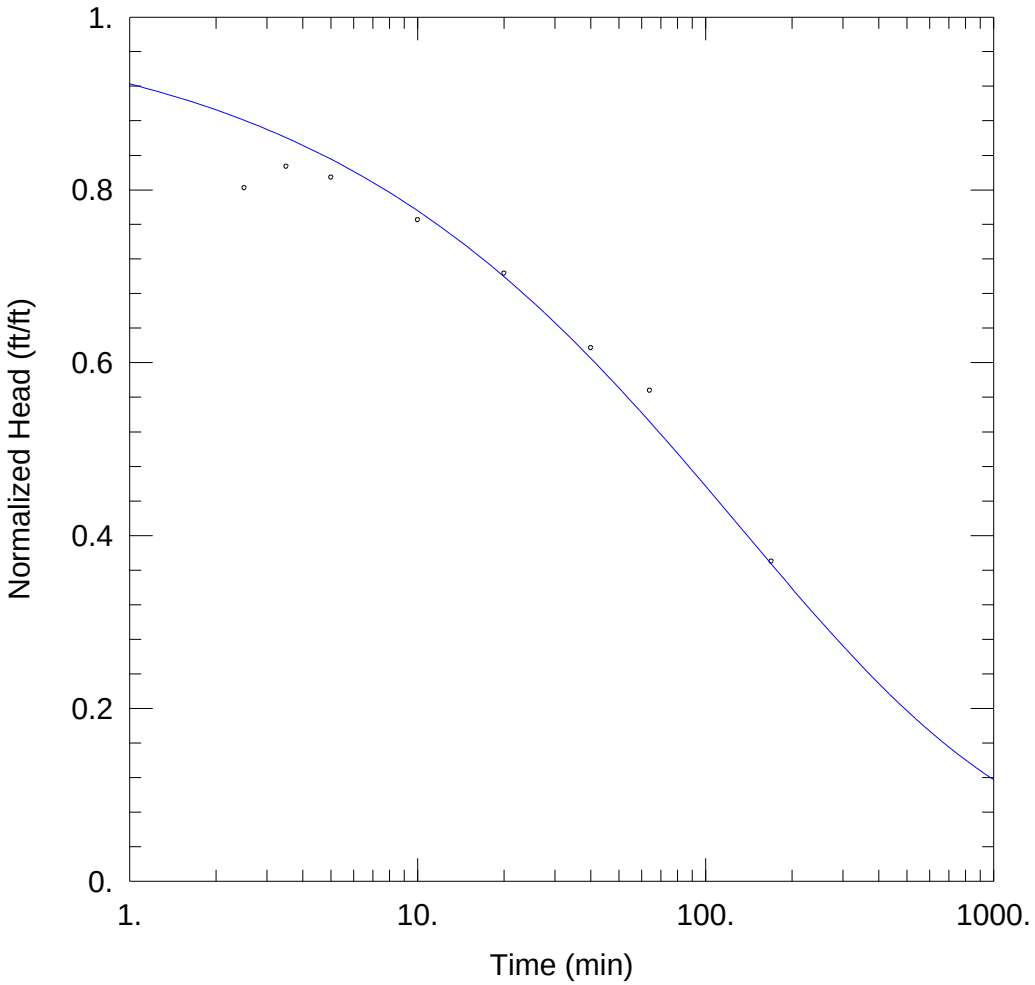
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.025

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.494E-5	cm/sec
y0	0.5846	ft

T = K*b = 0.002425 cm²/sec



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:29:35

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 1.77 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 0.81 ft
Total Well Penetration Depth: 1.77 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.77 ft
Screen Length: 1.77 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:29:02

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.81 ft
Static Water Column Height: 1.77 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.77 ft
Total Well Penetration Depth: 1.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.167 ft
Gravel Pack Porosity: 0.3

No. of Observations: 8

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.5	0.65	20.	0.57
3.5	0.67	40.	0.5
5.	0.66	64.	0.46
10.	0.62	169.	0.3

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0008004	cm^2/sec
S	0.1	

K = T/b = 1.484E-5 cm/sec
Ss = S/b = 0.0565 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0008004	0.0006915	+/- 0.001692	1.158	cm^2/sec
S	0.1	0.1138	+/- 0.2785	0.8788	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.484E-5 cm/sec
Ss = S/b = 0.0565 1/ft

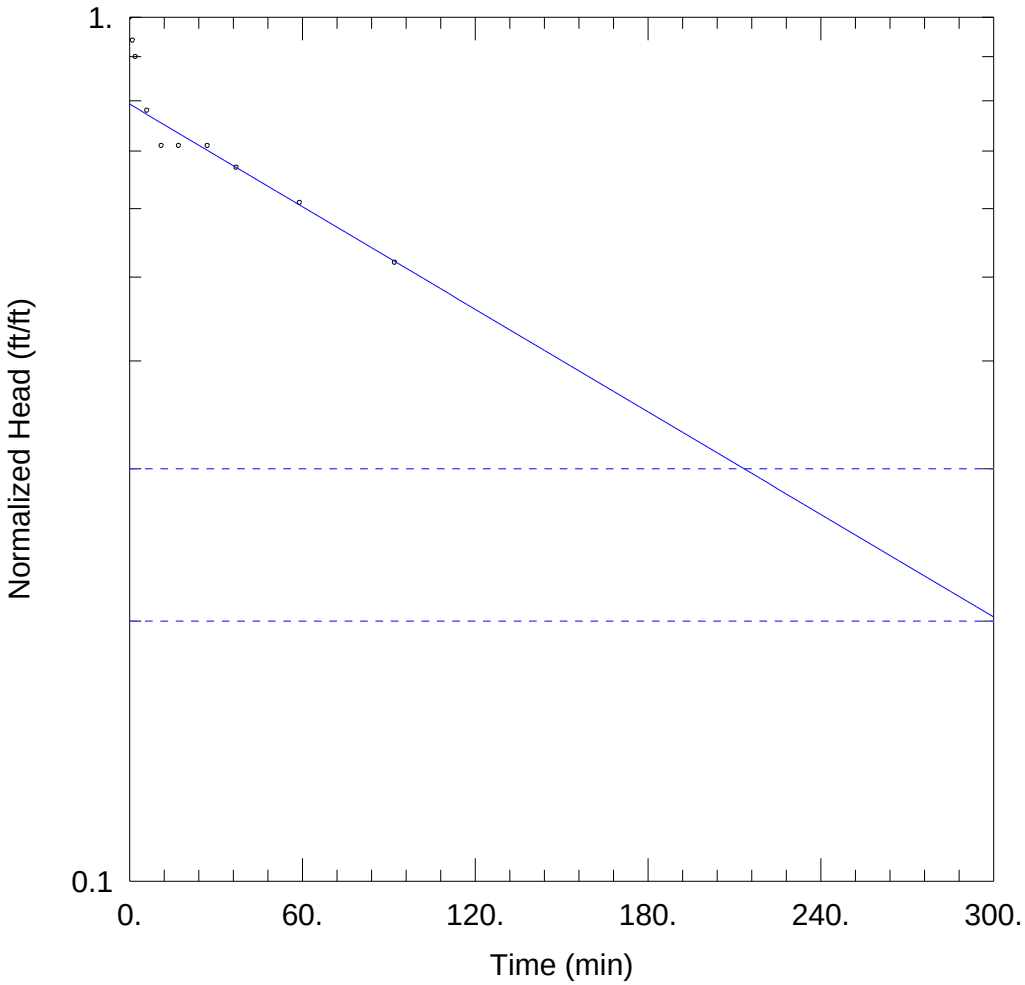
Parameter Correlations

	T	S
T	1.00	-0.99
S	-0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.006074 ft^2
Variance . . . . . 0.001012 ft^2
Std. Deviation . . . . . 0.03182 ft
Mean . . . . . -0.008697 ft
No. of Residuals . . . 8
No. of Estimates . . . 2



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:31:21

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 1.77 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1. ft
Total Well Penetration Depth: 1.77 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.77 ft
Screen Length: 1.77 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:31:24

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1. ft
Static Water Column Height: 1.77 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.77 ft
Total Well Penetration Depth: 1.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2774 ft
Gravel Pack Porosity: 0.3

No. of Observations: 9

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.94	27.	0.71
2.	0.9	37.	0.67
6.	0.78	59.	0.61
11.	0.71	92.	0.52
17.	0.71		

SOLUTION

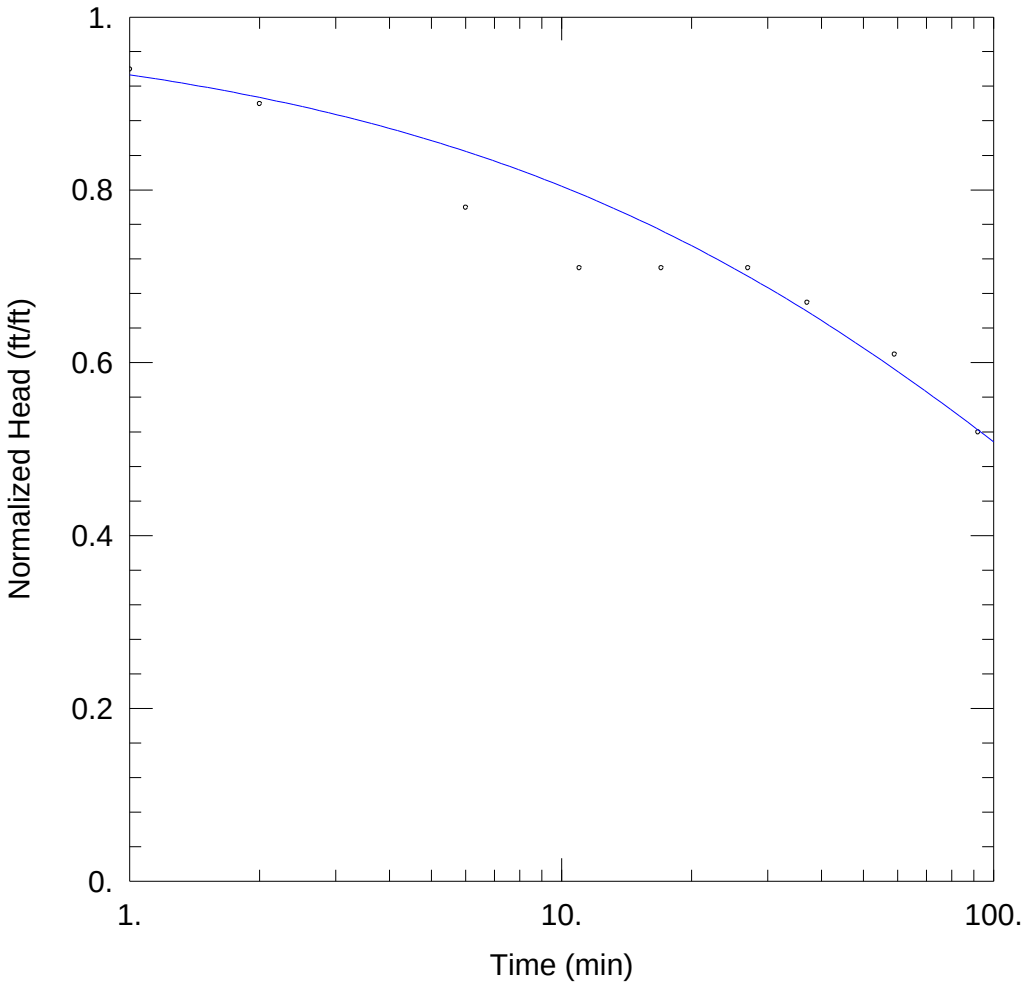
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.025

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.158E-5	cm/sec
y0	0.793	ft

T = K*b = 0.002783 cm²/sec



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:31:26

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 1.77 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1. ft
Total Well Penetration Depth: 1.77 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.77 ft
Screen Length: 1.77 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:31:31

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1. ft
Static Water Column Height: 1.77 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.77 ft
Total Well Penetration Depth: 1.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.167 ft
Gravel Pack Porosity: 0.3

No. of Observations: 9

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.94	27.	0.71
2.	0.9	37.	0.67
6.	0.78	59.	0.61
11.	0.71	92.	0.52
17.	0.71		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0005892	cm^2/sec
S	0.1	

K = T/b = 1.092E-5 cm/sec
Ss = S/b = 0.0565 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0006548	0.0009845	+/- 0.002328	0.6651	cm^2/sec
S	0.1	0.1893	+/- 0.4477	0.5282	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.214E-5 cm/sec
Ss = S/b = 0.0565 1/ft

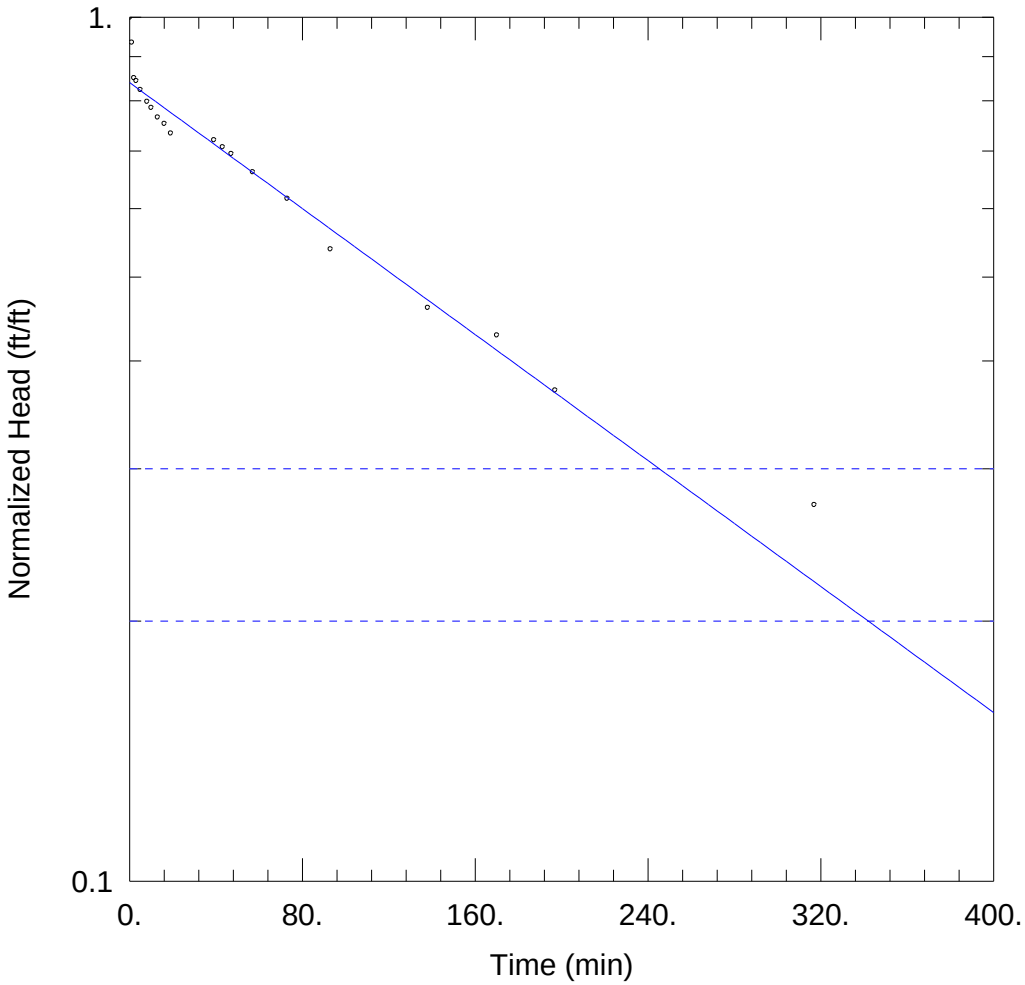
Parameter Correlations

	T	S
T	1.00	-1.00
S	-1.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.01267 ft^2
Variance . . . . . 0.00181 ft^2
Std. Deviation . . . . . 0.04255 ft
Mean . . . . . -0.006595 ft
No. of Residuals . . . 9
No. of Estimates . . . 2



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:31:33

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.91 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1.54 ft
Total Well Penetration Depth: 1.91 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.91 ft
Screen Length: 1.91 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:31:36

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.91 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.54 ft
Static Water Column Height: 1.91 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.91 ft
Total Well Penetration Depth: 1.91 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2774 ft
Gravel Pack Porosity: 0.3

No. of Observations: 19

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.44	43.	1.09
2.	1.31	47.	1.07
3.	1.3	57.	1.02
5.	1.27	73.	0.95
8.	1.23	93.	0.83
10.	1.21	138.	0.71
13.	1.18	170.	0.66
16.	1.16	197.	0.57
19.	1.13	317.	0.42
39.	1.11		

SOLUTION

Slug Test

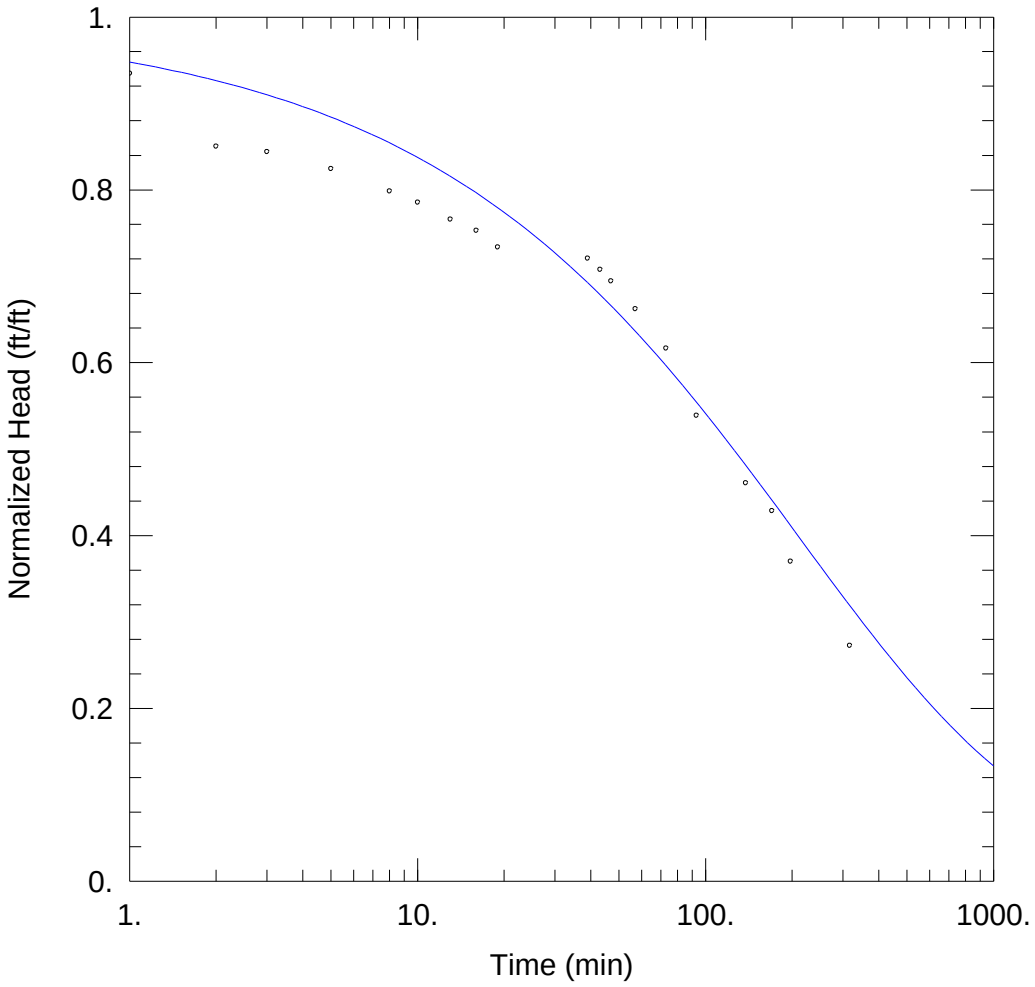
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.076

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.619E-5	cm/sec
y0	1.293	ft

$T = K*b = 0.002689$ cm²/sec



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:31:59

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.91 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1.54 ft
Total Well Penetration Depth: 1.91 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.91 ft
Screen Length: 1.91 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:31:43

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.91 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.54 ft
Static Water Column Height: 1.91 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.91 ft
Total Well Penetration Depth: 1.91 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.167 ft
Gravel Pack Porosity: 0.3

No. of Observations: 19

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.44	43.	1.09
2.	1.31	47.	1.07
3.	1.3	57.	1.02
5.	1.27	73.	0.95
8.	1.23	93.	0.83
10.	1.21	138.	0.71
13.	1.18	170.	0.66
16.	1.16	197.	0.57
19.	1.13	317.	0.42
39.	1.11		

SOLUTION

Slug Test

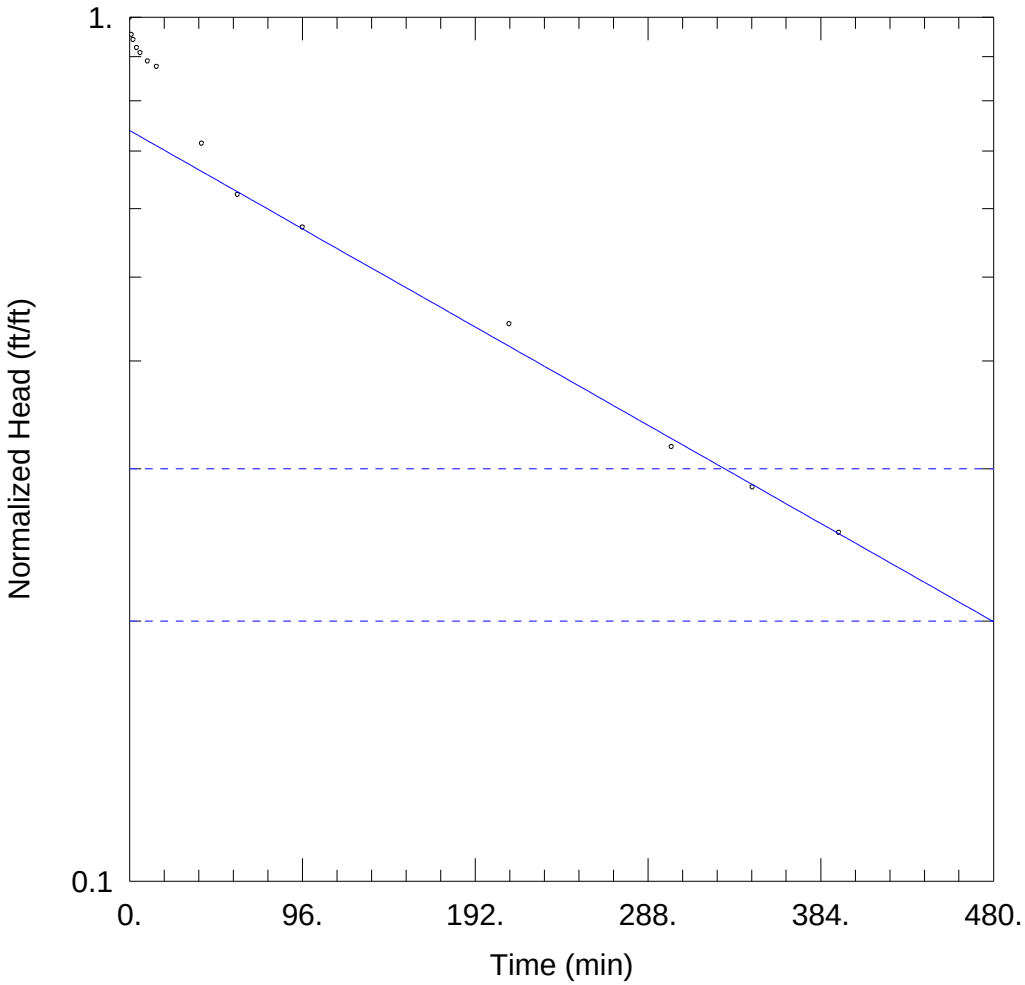
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0009463	cm^2/sec
S	0.03549	

K = T/b = 1.625E-5 cm/sec
Ss = S/b = 0.01858 1/ft



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT4_B&R.aqt
Date: 12/22/10 Time: 16:32:09

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/26/10

AQUIFER DATA

Saturated Thickness: 1.84 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1.54 ft
Total Well Penetration Depth: 1.84 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.84 ft
Screen Length: 1.84 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:31:47

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/26/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.84 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.54 ft
Static Water Column Height: 1.84 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.84 ft
Total Well Penetration Depth: 1.84 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2774 ft
Gravel Pack Porosity: 0.3

No. of Observations: 13

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.47	60.	0.96
2.	1.45	96.	0.88
4.	1.42	211.	0.68
6.	1.4	301.	0.49
10.	1.37	346.	0.44
15.	1.35	394.	0.39
40.	1.1		

SOLUTION

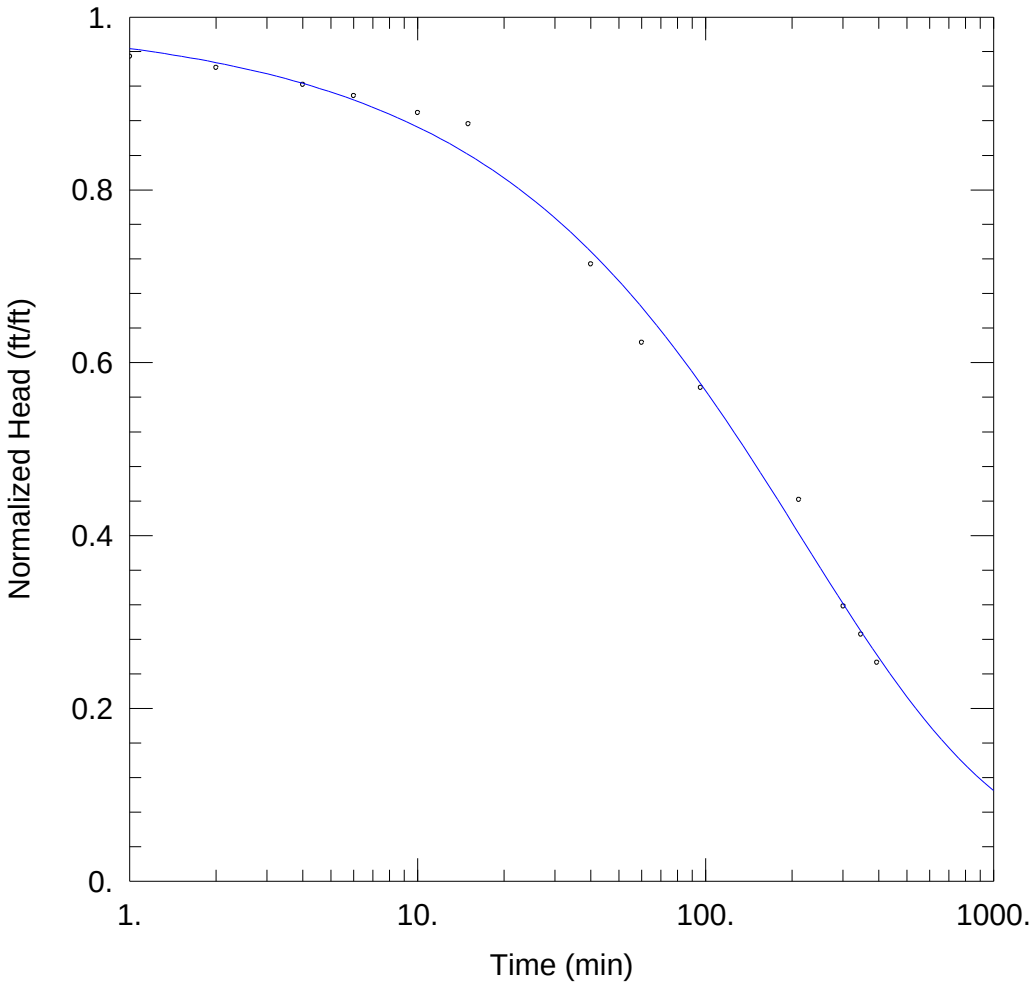
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.051

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.045E-5	cm/sec
y0	1.138	ft

T = K*b = 0.001708 cm²/sec



CRA-080M BAILDOWN TEST

Data Set: G:\...\CRA-080M_BDT4_Cooper.aqt
Date: 12/22/10 Time: 16:33:10

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-080M
Test Date: 1/26/10

AQUIFER DATA

Saturated Thickness: 1.84 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-080M)

Initial Displacement: 1.54 ft
Total Well Penetration Depth: 1.84 ft
Casing Radius: 0.167 ft
Static Water Column Height: 1.84 ft
Screen Length: 1.84 ft
Well Radius: 0.4375 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-080M Baildown Test
Date: 12/22/10
Time: 16:33:14

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/26/10
Test Well: CRA-080M

AQUIFER DATA

Saturated Thickness: 1.84 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-080M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.54 ft
Static Water Column Height: 1.84 ft
Casing Radius: 0.167 ft
Well Radius: 0.4375 ft
Well Skin Radius: 1. ft
Screen Length: 1.84 ft
Total Well Penetration Depth: 1.84 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.167 ft
Gravel Pack Porosity: 0.3

No. of Observations: 13

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.47	60.	0.96
2.	1.45	96.	0.88
4.	1.42	211.	0.68
6.	1.4	301.	0.49
10.	1.37	346.	0.44
15.	1.35	394.	0.39
40.	1.1		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001599	cm^2/sec
S	0.008871	

K = T/b = 2.851E-5 cm/sec
Ss = S/b = 0.004821 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.001599	0.0002212	+/- 0.0004868	7.23	cm^2/sec
S	0.008871	0.00334	+/- 0.007351	2.656	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 2.851E-5 cm/sec
Ss = S/b = 0.004821 1/ft

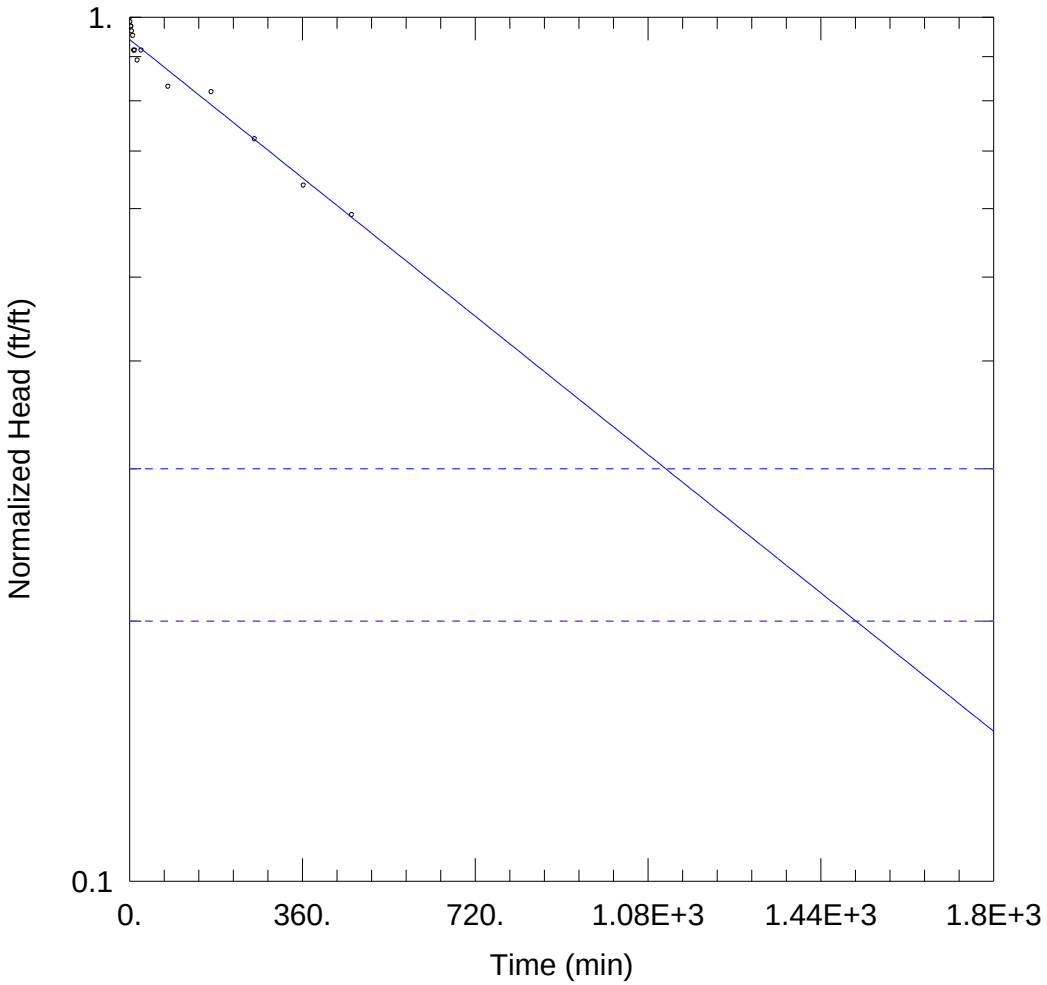
Parameter Correlations

	T	S
T	1.00	-0.96
S	-0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.01242 ft^2
Variance . . . . . 0.001129 ft^2
Std. Deviation . . . . . 0.0336 ft
Mean . . . . . 0.0007398 ft
No. of Residuals . . . 13
No. of Estimates . . . 2



CRA-087M BAILDOWN TEST

Data Set: G:\...\CRA-087M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:33:16

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-087M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.11 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-087M-B)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 1.11 ft
Casing Radius: 0.3227 ft
Static Water Column Height: 1.11 ft
Screen Length: 1.11 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-087M Baildown Test
Date: 12/22/10
Time: 16:33:19

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-087M

AQUIFER DATA

Saturated Thickness: 1.11 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-087M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.83 ft
Static Water Column Height: 1.11 ft
Casing Radius: 0.3227 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 1.11 ft
Total Well Penetration Depth: 1.11 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.4296 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.82	16.	0.74
2.	0.81	24.	0.76
3.	0.81	80.	0.69
4.	0.8	170.	0.68
7.	0.79	260.	0.6
9.	0.76	362.	0.53
11.	0.76	463.	0.49

SOLUTION

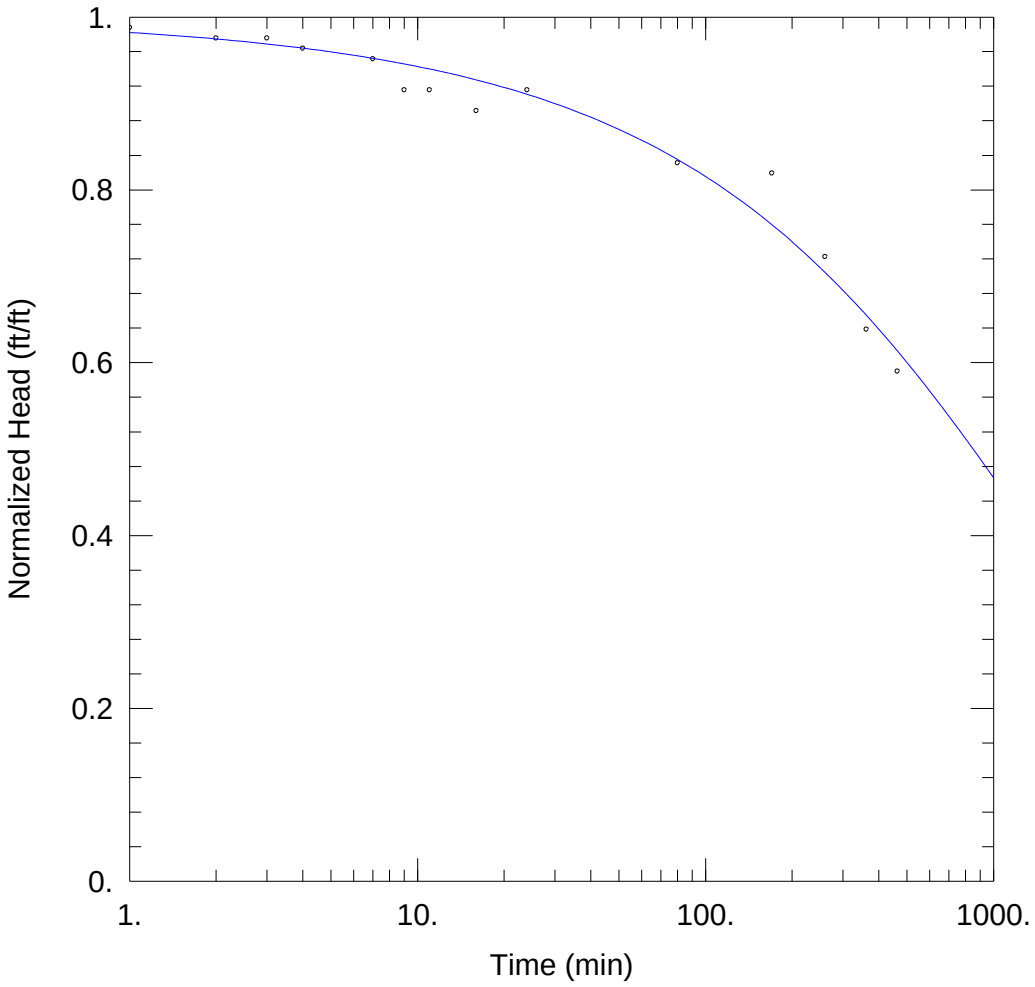
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.4575

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.979E-5	cm/sec
y0	0.7819	ft

T = K*b = 0.0006695 cm^2/sec



CRA-087M BAILDOWN TEST

Data Set: G:\...\CRA-087M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:33:20

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-087M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.11 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-087M-B)

Initial Displacement: 0.83 ft
Total Well Penetration Depth: 1.11 ft
Casing Radius: 0.3227 ft
Static Water Column Height: 1.11 ft
Screen Length: 1.11 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-087M Baildown Test
Date: 12/22/10
Time: 16:33:24

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-087M

AQUIFER DATA

Saturated Thickness: 1.11 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-087M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.83 ft
Static Water Column Height: 1.11 ft
Casing Radius: 0.3227 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 1.11 ft
Total Well Penetration Depth: 1.11 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.3227 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.82	16.	0.74
2.	0.81	24.	0.76
3.	0.81	80.	0.69
4.	0.8	170.	0.68
7.	0.79	260.	0.6
9.	0.76	362.	0.53
11.	0.76	463.	0.49

SOLUTION

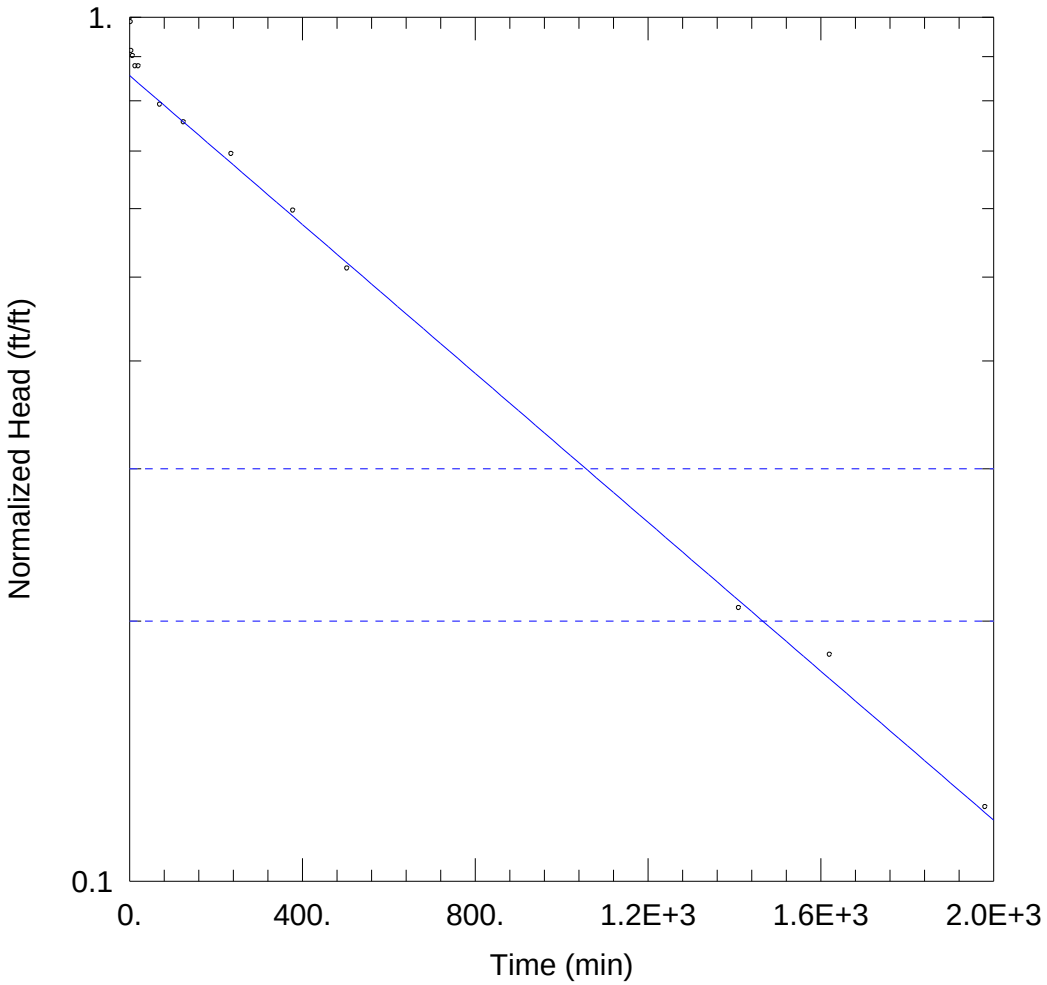
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0006668	cm^2/sec
S	0.04144	

K = T/b = 1.971E-5 cm/sec
Ss = S/b = 0.03733 1/ft



CRA-087M-B BAILDOWN TEST

Data Set: G:\...\CRA-087M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:33:25

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-087M-B
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.12 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-087M-B)

Initial Displacement: 0.82 ft
Total Well Penetration Depth: 1.12 ft
Casing Radius: 0.3227 ft
Static Water Column Height: 1.12 ft
Screen Length: 1.12 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-087M-B Baildown Test
Date: 12/22/10
Time: 16:33:28

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-087M-B

AQUIFER DATA

Saturated Thickness: 1.12 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-087M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.82 ft
Static Water Column Height: 1.12 ft
Casing Radius: 0.3227 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 1.12 ft
Total Well Penetration Depth: 1.12 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.4296 ft
Gravel Pack Porosity: 0.3

No. of Observations: 13

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	0.81	235.	0.57
3.	0.75	378.	0.49
7.	0.74	503.	0.42
13.	0.72	1410.	0.17
20.	0.72	1620.	0.15
70.	0.65	1980.	0.1
125.	0.62		

SOLUTION

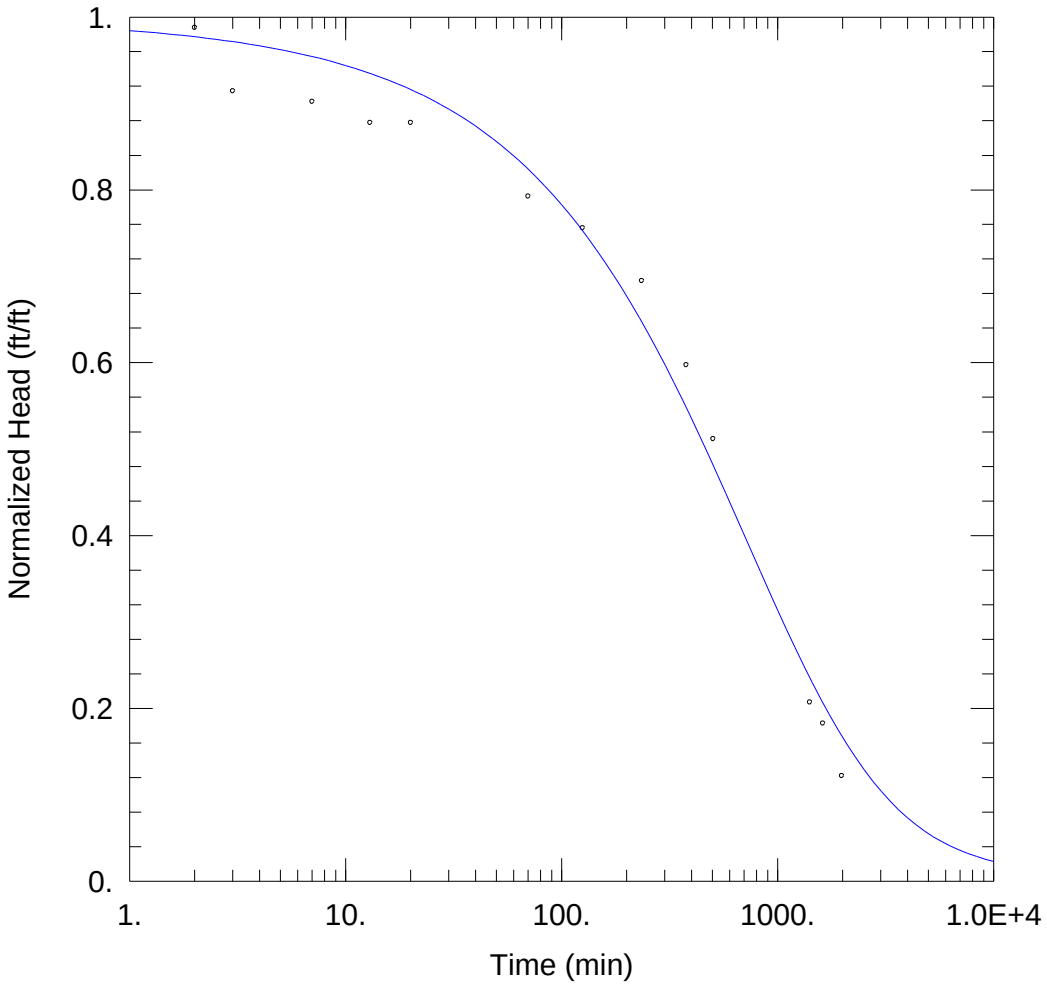
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.4641

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.927E-5	cm/sec
y0	0.7017	ft

T = K*b = 0.0006578 cm²/sec



CRA-087M-B BAILDOWN TEST

Data Set: G:\...\CRA-087M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:33:29

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-087M-B
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 1.12 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-087M-B)

Initial Displacement: 0.82 ft
Total Well Penetration Depth: 1.12 ft
Casing Radius: 0.3227 ft
Static Water Column Height: 1.12 ft
Screen Length: 1.12 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-087M-B Baildown Test
Date: 12/22/10
Time: 16:33:34

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-087M-B

AQUIFER DATA

Saturated Thickness: 1.12 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-087M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.82 ft
Static Water Column Height: 1.12 ft
Casing Radius: 0.3227 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 1.12 ft
Total Well Penetration Depth: 1.12 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.3227 ft
Gravel Pack Porosity: 0.3

No. of Observations: 13

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	0.81	235.	0.57
3.	0.75	378.	0.49
7.	0.74	503.	0.42
13.	0.72	1410.	0.17
20.	0.72	1620.	0.15
70.	0.65	1980.	0.1
125.	0.62		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.002231	cm^2/sec
S	0.008345	

K = T/b = 6.534E-5 cm/sec
Ss = S/b = 0.00745 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.002231	0.0005853	+/- 0.001288	3.811	cm^2/sec
S	0.008345	0.007254	+/- 0.01597	1.15	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 6.534E-5 cm/sec
Ss = S/b = 0.00745 1/ft

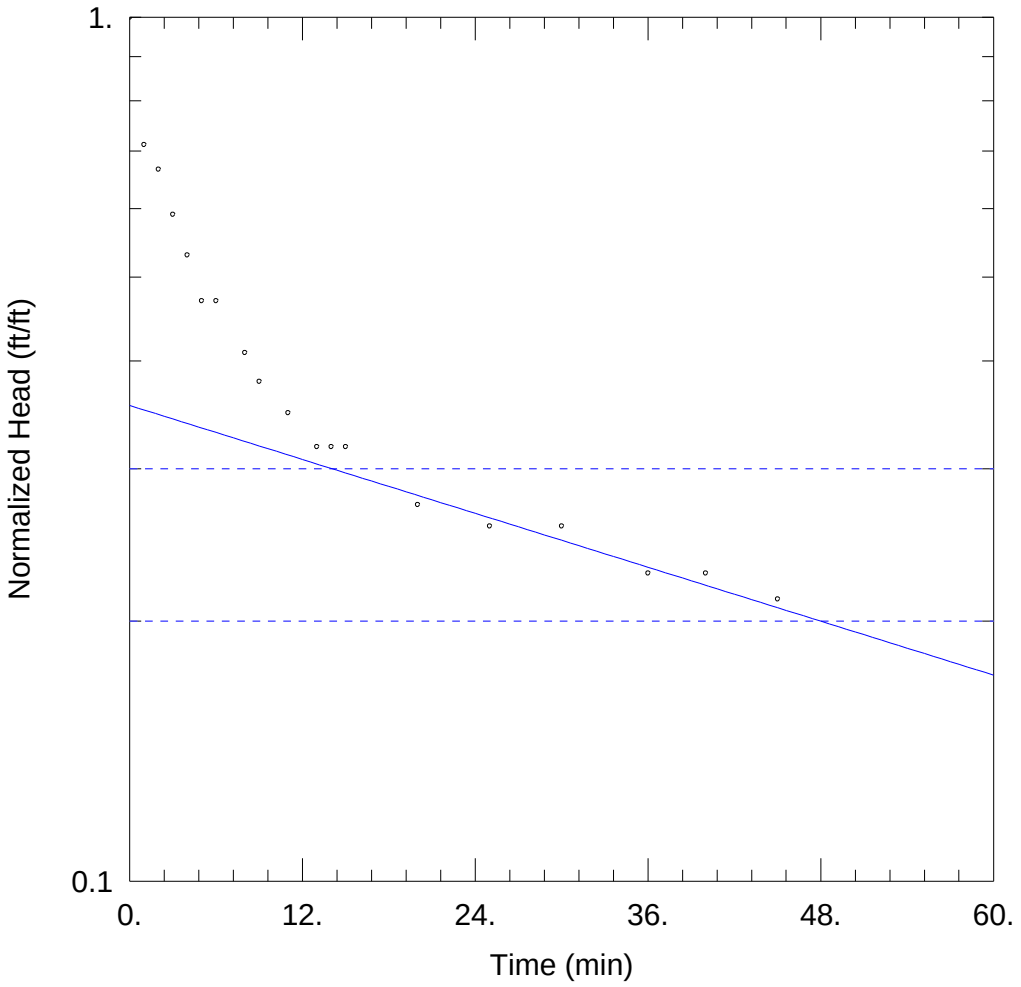
Parameter Correlations

	T	S
T	1.00	-0.95
S	-0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.01407 ft^2
Variance . . . . . 0.001279 ft^2
Std. Deviation . . . . . 0.03576 ft
Mean . . . . . -0.01198 ft
No. of Residuals . . . 13
No. of Estimates . . . 2



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:34:16

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 0.74 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.66 ft
Total Well Penetration Depth: 0.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.74 ft
Screen Length: 0.74 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:34:18

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.66 ft
Static Water Column Height: 0.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.74 ft
Total Well Penetration Depth: 0.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2386 ft
Gravel Pack Porosity: 0.3

No. of Observations: 18

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.47	13.	0.21
2.	0.44	14.	0.21
3.	0.39	15.	0.21
4.	0.35	20.	0.18
5.	0.31	25.	0.17
6.	0.31	30.	0.17
8.	0.27	36.	0.15
9.	0.25	40.	0.15
11.	0.23	45.	0.14

SOLUTION

Slug Test
Aquifer Model: Unconfined

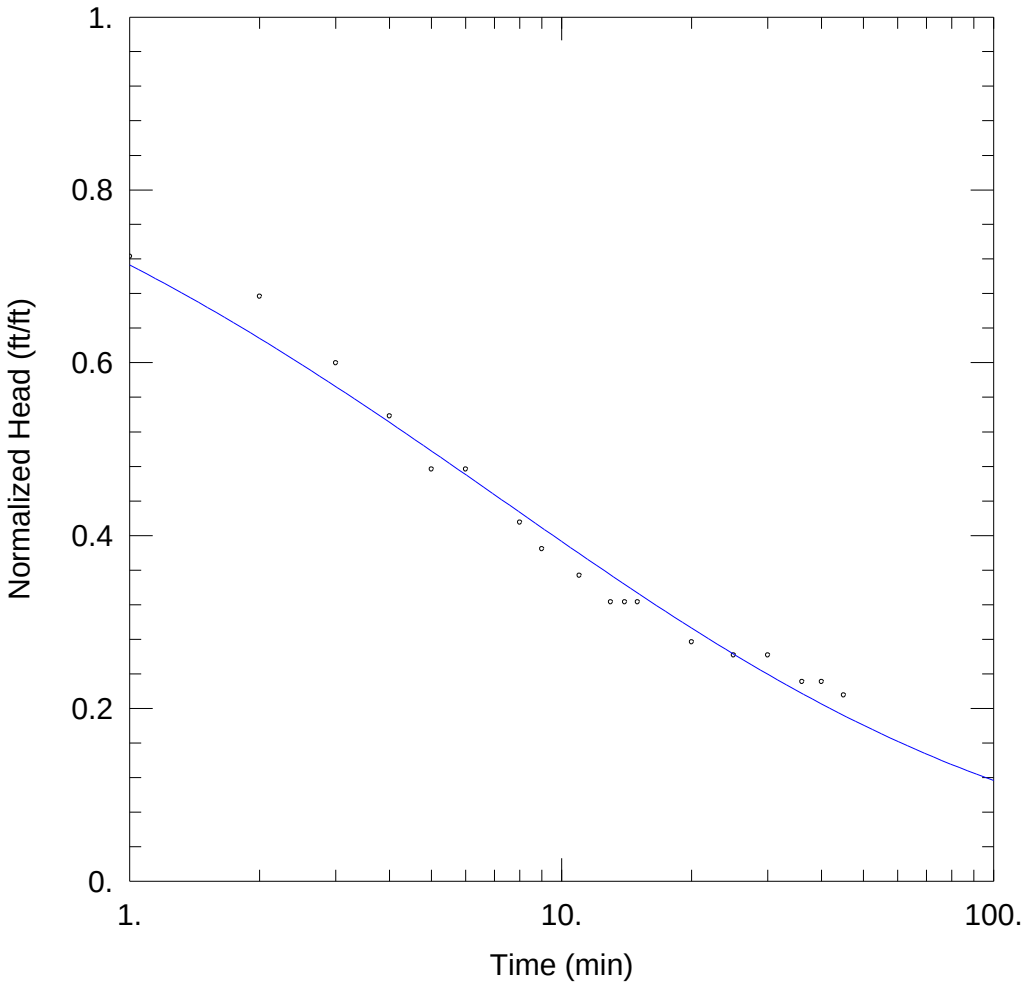
Solution Method: Bouwer-Rice
ln(Re/rw): 0.4396

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001029	cm/sec
y0	0.2345	ft

$T = K*b = 0.00232$ cm²/sec



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:34:20

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 0.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 0.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.74 ft
Screen Length: 0.74 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:34:23

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 0.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.74 ft
Total Well Penetration Depth: 0.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 18

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.47	13.	0.21
2.	0.44	14.	0.21
3.	0.39	15.	0.21
4.	0.35	20.	0.18
5.	0.31	25.	0.17
6.	0.31	30.	0.17
8.	0.27	36.	0.15
9.	0.25	40.	0.15
11.	0.23	45.	0.14

SOLUTION

Slug Test
Aquifer Model: Confined

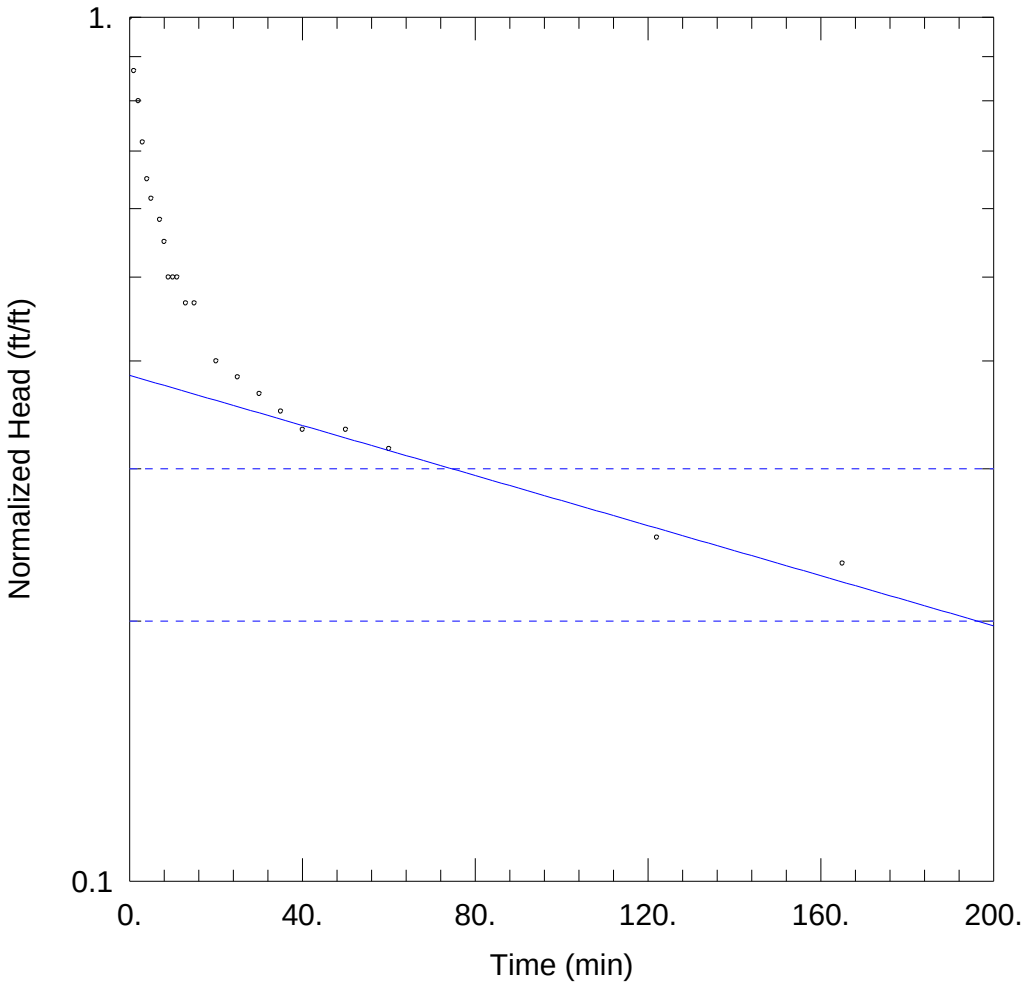
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001178	cm^2/sec
S	0.09286	

K = T/b = 5.221E-5 cm/sec
Ss = S/b = 0.1255 1/ft



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:34:50

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 0.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.6 ft
Total Well Penetration Depth: 0.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.74 ft
Screen Length: 0.74 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:34:29

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.6 ft
Static Water Column Height: 0.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.74 ft
Total Well Penetration Depth: 0.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2386 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.52	15.	0.28
2.	0.48	20.	0.24
3.	0.43	25.	0.23
4.	0.39	30.	0.22
5.	0.37	35.	0.21
7.	0.35	40.	0.2
8.	0.33	50.	0.2
9.	0.3	60.	0.19
10.	0.3	122.	0.15
11.	0.3	165.	0.14
13.	0.28		

SOLUTION

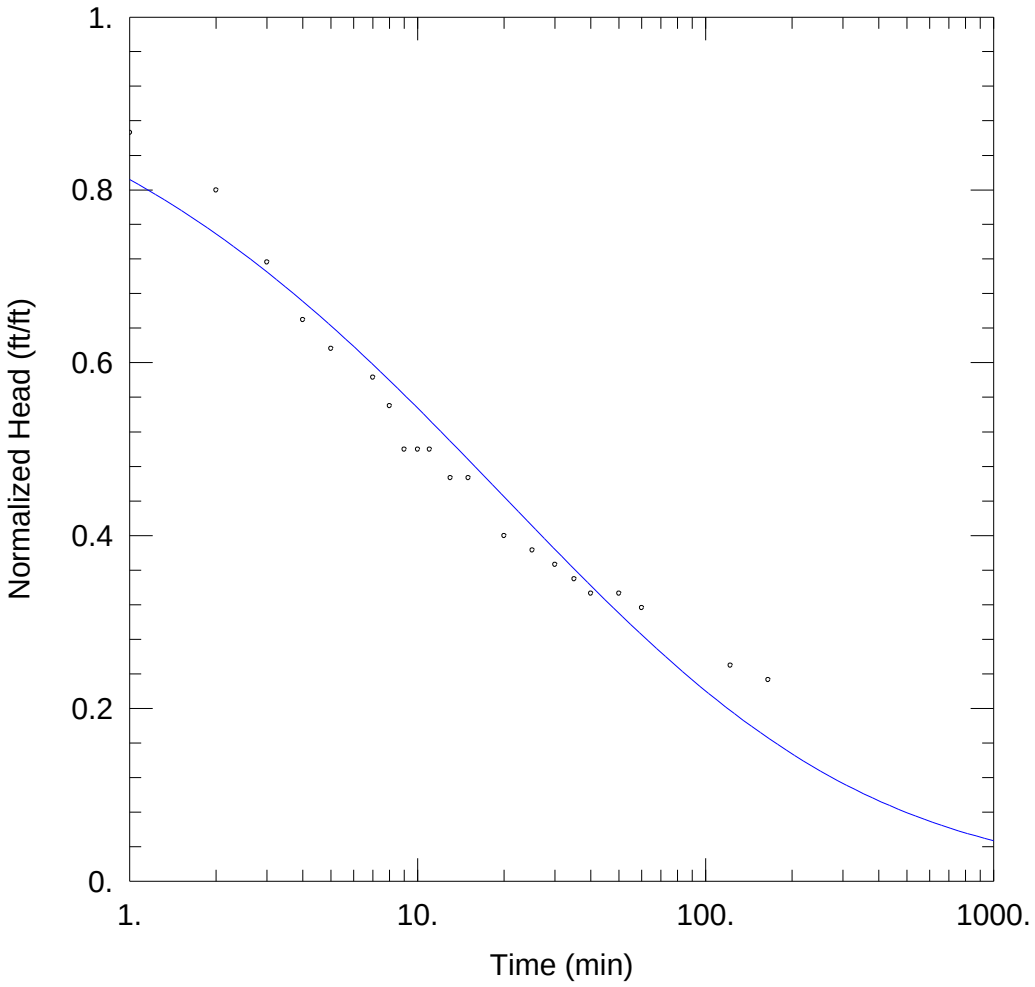
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.4396

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.865E-5	cm/sec
y0	0.2309	ft

$T = K*b = 0.0006462$ cm²/sec



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:34:31

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 0.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.6 ft
Total Well Penetration Depth: 0.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.74 ft
Screen Length: 0.74 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:34:34

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.6 ft
Static Water Column Height: 0.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.74 ft
Total Well Penetration Depth: 0.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.52	15.	0.28
2.	0.48	20.	0.24
3.	0.43	25.	0.23
4.	0.39	30.	0.22
5.	0.37	35.	0.21
7.	0.35	40.	0.2
8.	0.33	50.	0.2
9.	0.3	60.	0.19
10.	0.3	122.	0.15
11.	0.3	165.	0.14
13.	0.28		

SOLUTION

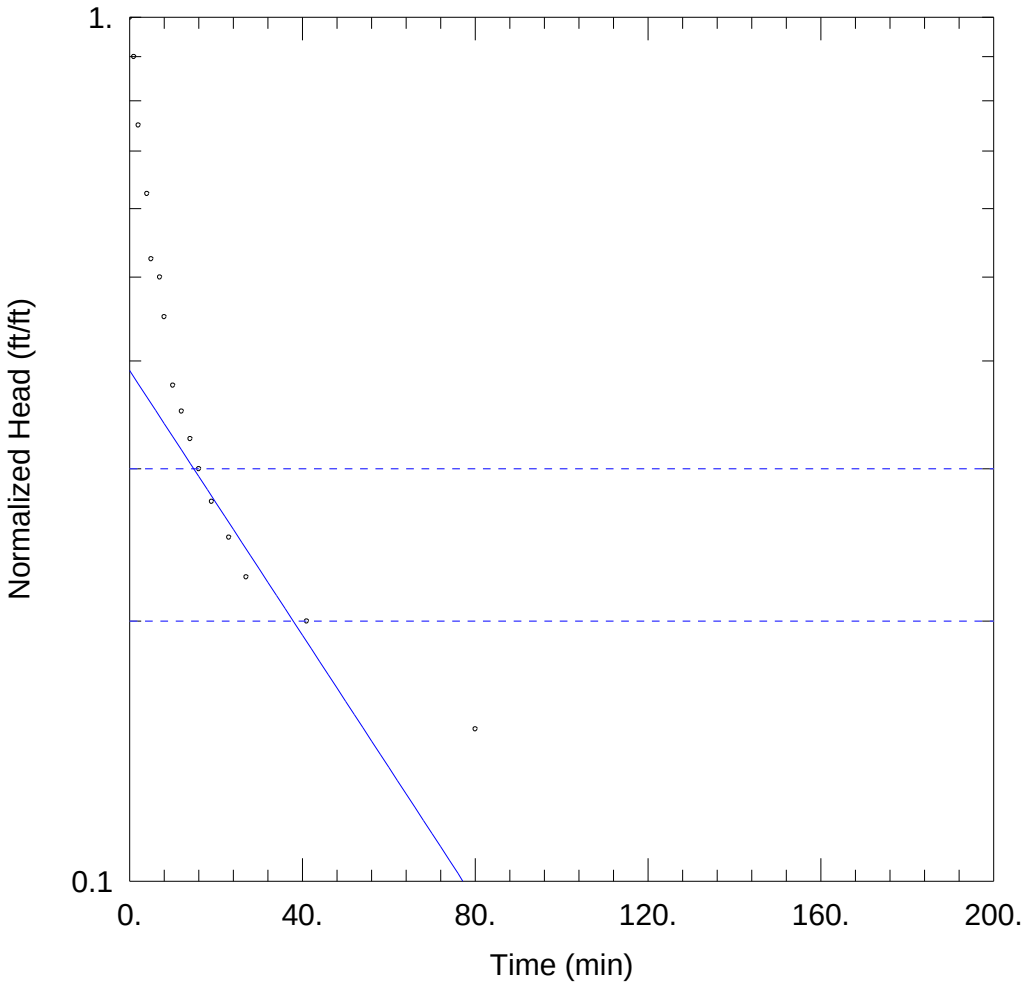
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0003935	cm^2/sec
S	0.1	

K = T/b = 1.745E-5 cm/sec
Ss = S/b = 0.1351 1/ft



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:34:35

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.66 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.4 ft
Total Well Penetration Depth: 0.66 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.66 ft
Screen Length: 0.66 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:34:38

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.66 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.4 ft
Static Water Column Height: 0.66 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.66 ft
Total Well Penetration Depth: 0.66 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2386 ft
Gravel Pack Porosity: 0.3

No. of Observations: 15

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.36	14.	0.13
2.	0.3	16.	0.12
4.	0.25	19.	0.11
5.	0.21	23.	0.1
7.	0.2	27.	0.09
8.	0.18	41.	0.08
10.	0.15	80.	0.06
12.	0.14		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

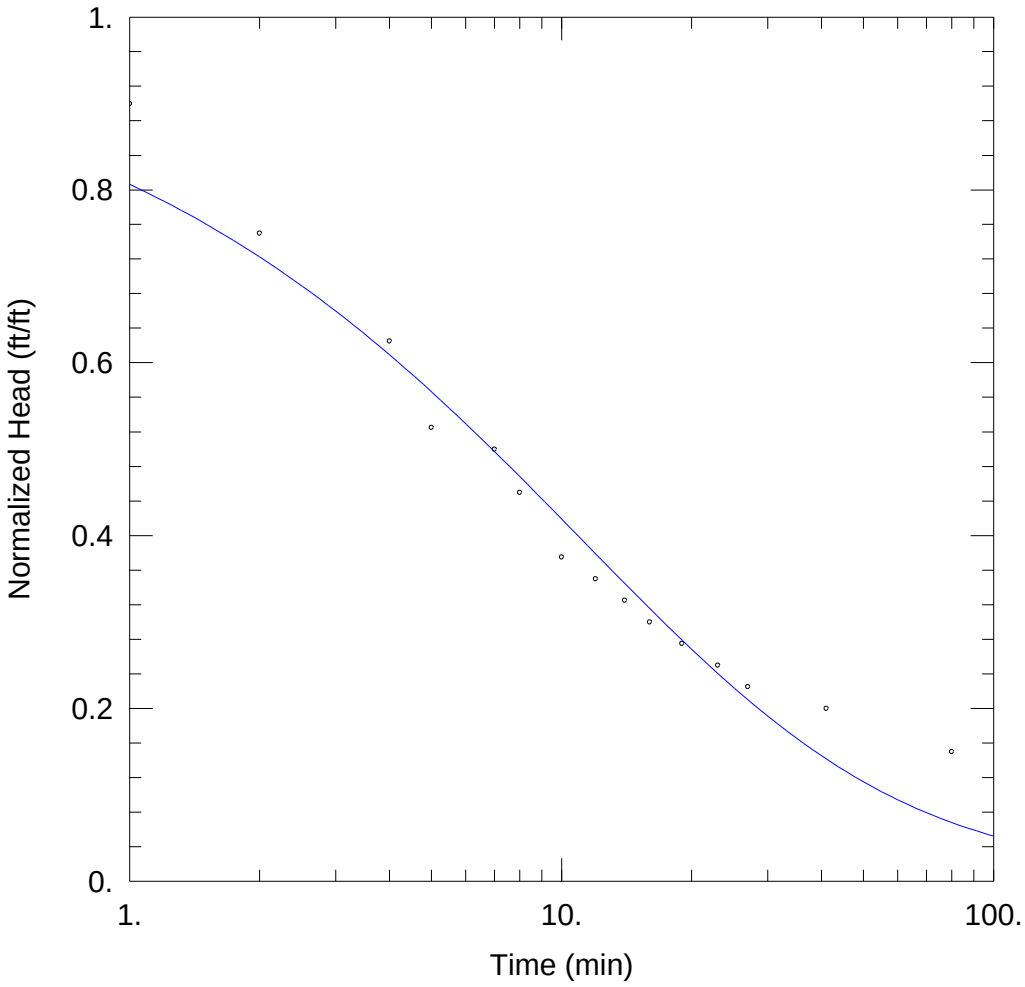
ln(Re/rw): 0.3561

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001375	cm/sec
y0	0.1559	ft

T = K*b = 0.002765 cm²/sec



CRA-092M BAILDOWN TEST

Data Set: G:\...\CRA-092M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:35:25

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-092M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.66 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-092M)

Initial Displacement: 0.4 ft
Total Well Penetration Depth: 0.66 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.66 ft
Screen Length: 0.66 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-092M Baildown Test
Date: 12/22/10
Time: 16:35:28

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-092M

AQUIFER DATA

Saturated Thickness: 0.66 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-092M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.4 ft
Static Water Column Height: 0.66 ft
Casing Radius: 0.083 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 0.66 ft
Total Well Penetration Depth: 0.66 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 15

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.36	14.	0.13
2.	0.3	16.	0.12
4.	0.25	19.	0.11
5.	0.21	23.	0.1
7.	0.2	27.	0.09
8.	0.18	41.	0.08
10.	0.15	80.	0.06
12.	0.14		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.006831	cm^2/sec
S	0.003479	

K = T/b = 0.0003396 cm/sec
Ss = S/b = 0.005271 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.006831	0.001803	+/- 0.003895	3.788	cm^2/sec
S	0.003479	0.002518	+/- 0.005439	1.382	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0003396 cm/sec
Ss = S/b = 0.005271 1/ft

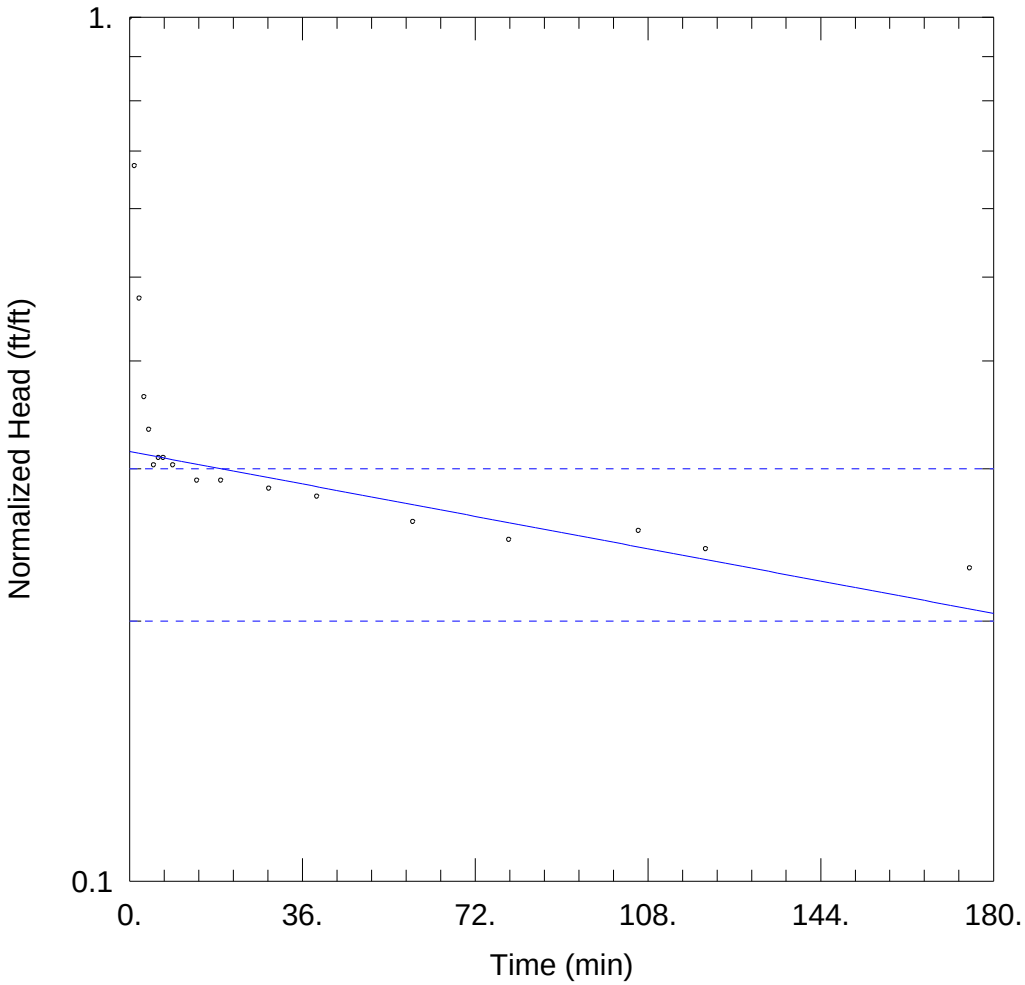
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.004115 ft^2
Variance . . . . . 0.0003166 ft^2
Std. Deviation . . . . . 0.01779 ft
Mean . . . . . 0.003603 ft
No. of Residuals . . . 15
No. of Estimates . . . 2



CRA-101M BAILDOWN TEST

Data Set: G:\...\CRA-101M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:35:29

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-101M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.67 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-101M)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 1.67 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.67 ft
Screen Length: 1.67 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-101M Baildown Test
Date: 12/22/10
Time: 16:35:33

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-101M

AQUIFER DATA

Saturated Thickness: 1.67 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-101M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.65 ft
Static Water Column Height: 1.67 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.67 ft
Total Well Penetration Depth: 1.67 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 17

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.11	19.	0.48
2.	0.78	29.	0.47
3.	0.6	39.	0.46
4.	0.55	59.	0.43
5.	0.5	79.	0.41
6.	0.51	106.	0.42
7.	0.51	120.	0.4
9.	0.5	175.	0.38
14.	0.48		

SOLUTION

Slug Test
Aquifer Model: Unconfined

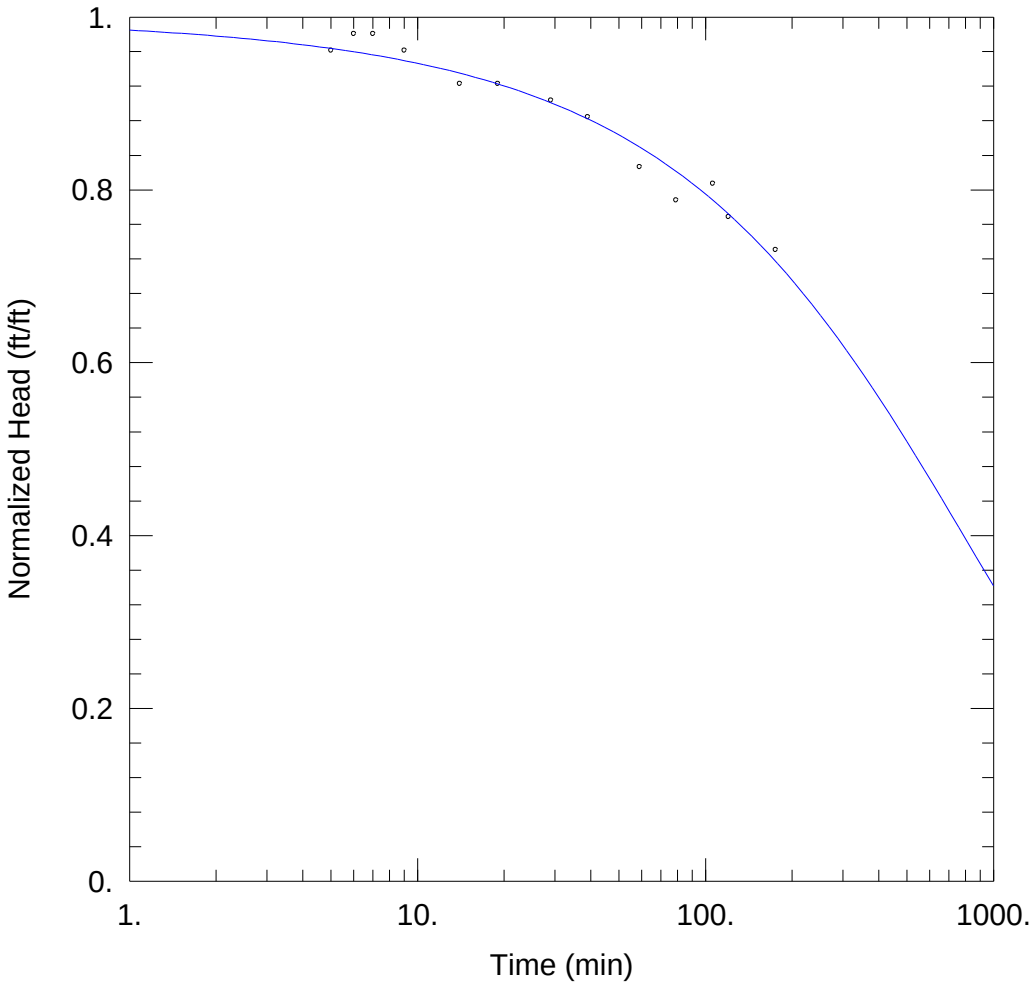
Solution Method: Bouwer-Rice
ln(Re/rw): 1.153

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.66E-5	cm/sec
y0	0.5183	ft

T = K*b = 0.000845 cm²/sec



CRA-101M BAILDOWN TEST

Data Set: G:\...\CRA-101M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:36:00

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-101M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 1.67 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-101M)

Initial Displacement: 0.52 ft
Total Well Penetration Depth: 1.67 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.67 ft
Screen Length: 1.67 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-101M Baildown Test
Date: 12/22/10
Time: 16:35:38

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-101M

AQUIFER DATA

Saturated Thickness: 1.67 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-101M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.52 ft
Static Water Column Height: 1.67 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.67 ft
Total Well Penetration Depth: 1.67 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 17

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	1.11	19.	0.48
2.	0.78	29.	0.47
3.	0.6	39.	0.46
4.	0.55	59.	0.43
5.	0.5	79.	0.41
6.	0.51	106.	0.42
7.	0.51	120.	0.4
9.	0.5	175.	0.38
14.	0.48		

SOLUTION

Slug Test
Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0001282	cm^2/sec
S	0.001948	

K = T/b = 2.518E-6 cm/sec
Ss = S/b = 0.001166 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0001282	5.088E-5	+/- 0.000112	2.519	cm^2/sec
S	0.001948	0.001631	+/- 0.003589	1.194	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 2.518E-6 cm/sec
Ss = S/b = 0.001166 1/ft

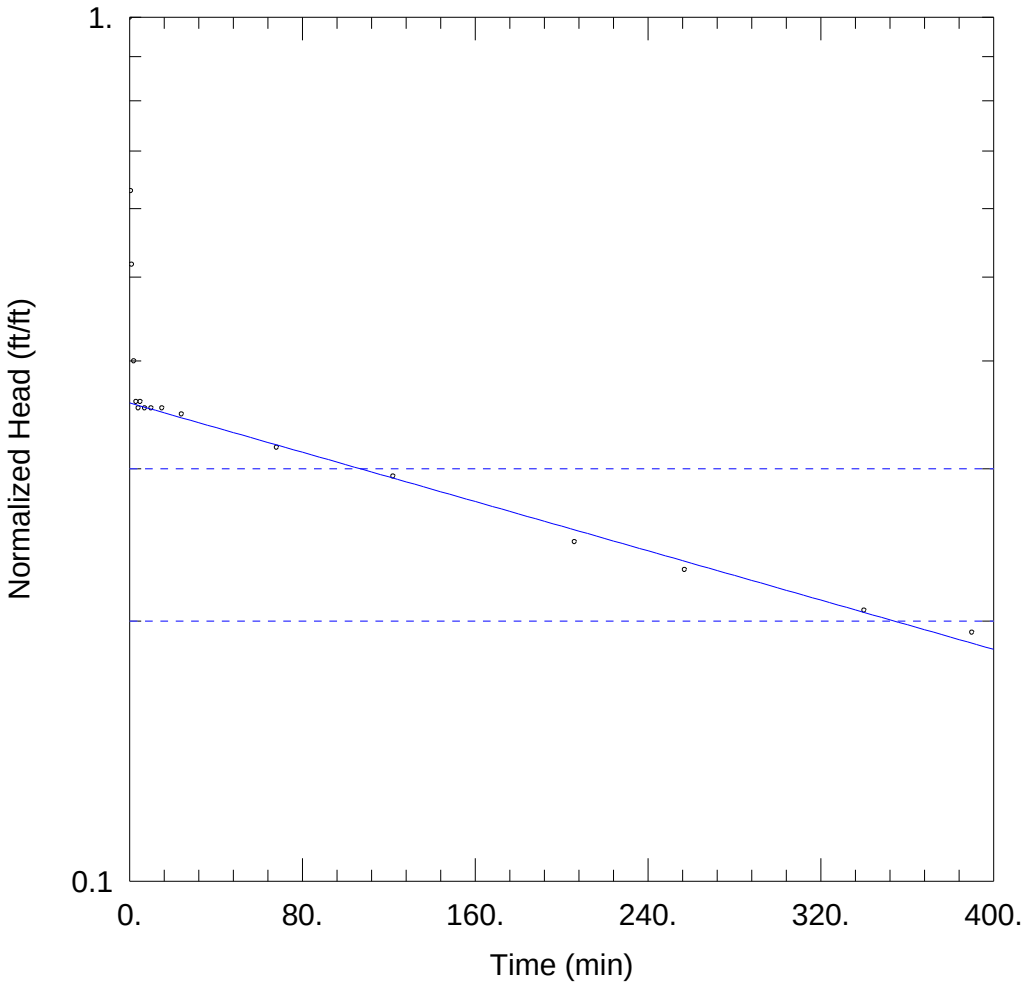
Parameter Correlations

	T	S
T	1.00	-0.99
S	-0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares ... 0.0009528 ft^2
Variance ..... 8.662E-5 ft^2
Std. Deviation ..... 0.009307 ft
Mean ..... 0.0009385 ft
No. of Residuals... 13
No. of Estimates... 2



CRA-101M BAILDOWN TEST

Data Set: G:\...\CRA-101M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:35:39

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-101M
Test Date: 1/26/10

AQUIFER DATA

Saturated Thickness: 1.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-101M)

Initial Displacement: 1.7 ft
Total Well Penetration Depth: 1.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.74 ft
Screen Length: 1.74 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-101M Baildown Test
Date: 12/22/10
Time: 16:35:42

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/26/10
Test Well: CRA-101M

AQUIFER DATA

Saturated Thickness: 1.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-101M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.7 ft
Static Water Column Height: 1.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.74 ft
Total Well Penetration Depth: 1.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 16

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.5	1.07	15.	0.6
1.	0.88	24.	0.59
2.	0.68	68.	0.54
3.	0.61	122.	0.5
4.	0.6	206.	0.42
5.	0.61	257.	0.39
7.	0.6	340.	0.35
10.	0.6	390.	0.33

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

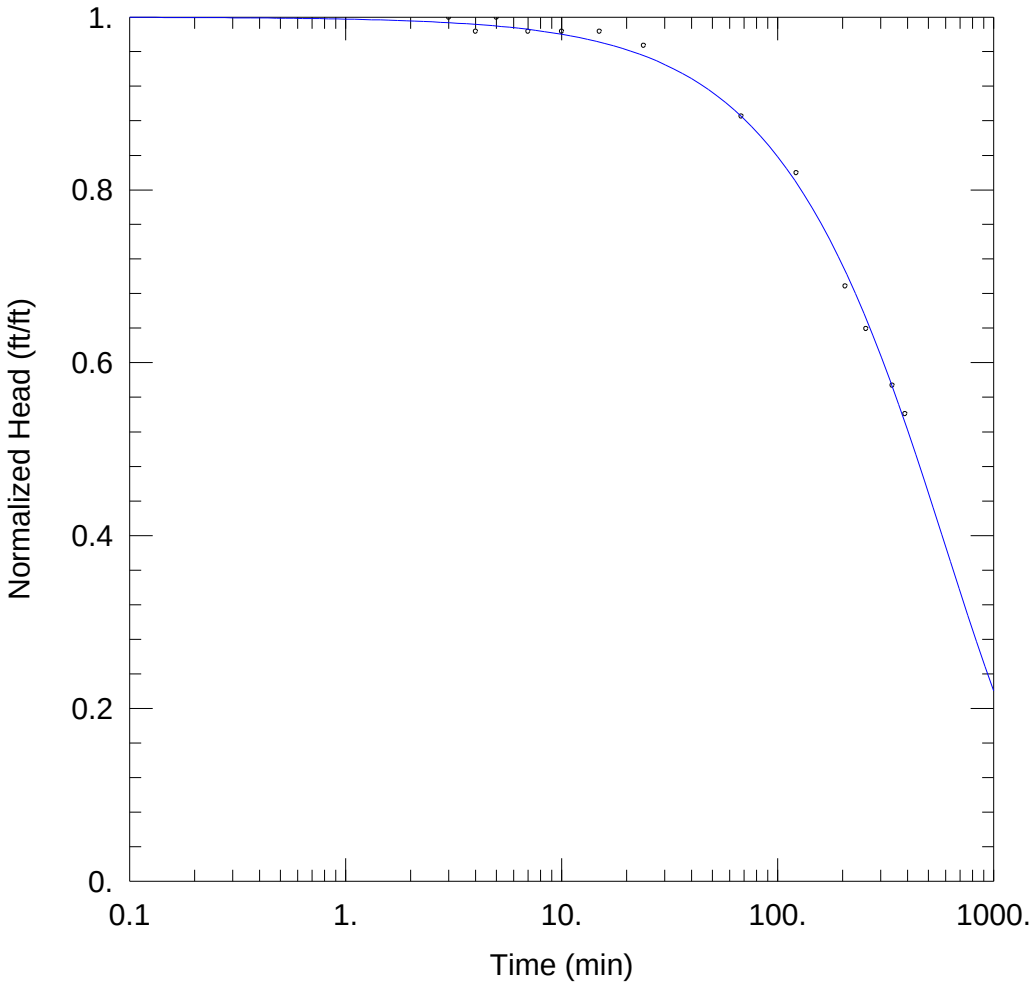
ln(Re/rw): 1.18

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.118E-5	cm/sec
y0	0.6079	ft

T = K*b = 0.0005927 cm²/sec



CRA-101M BAILDOWN TEST

Data Set: G:\...\CRA-101M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:36:14

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-101M
Test Date: 1/26/10

AQUIFER DATA

Saturated Thickness: 1.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-101M)

Initial Displacement: 0.61 ft
Total Well Penetration Depth: 1.74 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.74 ft
Screen Length: 1.74 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-101M Baildown Test
Date: 12/22/10
Time: 16:35:46

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/26/10
Test Well: CRA-101M

AQUIFER DATA

Saturated Thickness: 1.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-101M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.61 ft
Static Water Column Height: 1.74 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 1.74 ft
Total Well Penetration Depth: 1.74 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 16

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.5	1.07	15.	0.6
1.	0.88	24.	0.59
2.	0.68	68.	0.54
3.	0.61	122.	0.5
4.	0.6	206.	0.42
5.	0.61	257.	0.39
7.	0.6	340.	0.35
10.	0.6	390.	0.33

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0009404	cm^2/sec
S	1.0E-10	

K = T/b = 1.773E-5 cm/sec
Ss = S/b = 5.747E-11 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0009404	0.0005528	+/- 0.001217	1.701	cm^2/sec
S	1.0E-10	1.19E-9	+/- 2.619E-9	0.08405	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.773E-5 cm/sec
Ss = S/b = 5.747E-11 1/ft

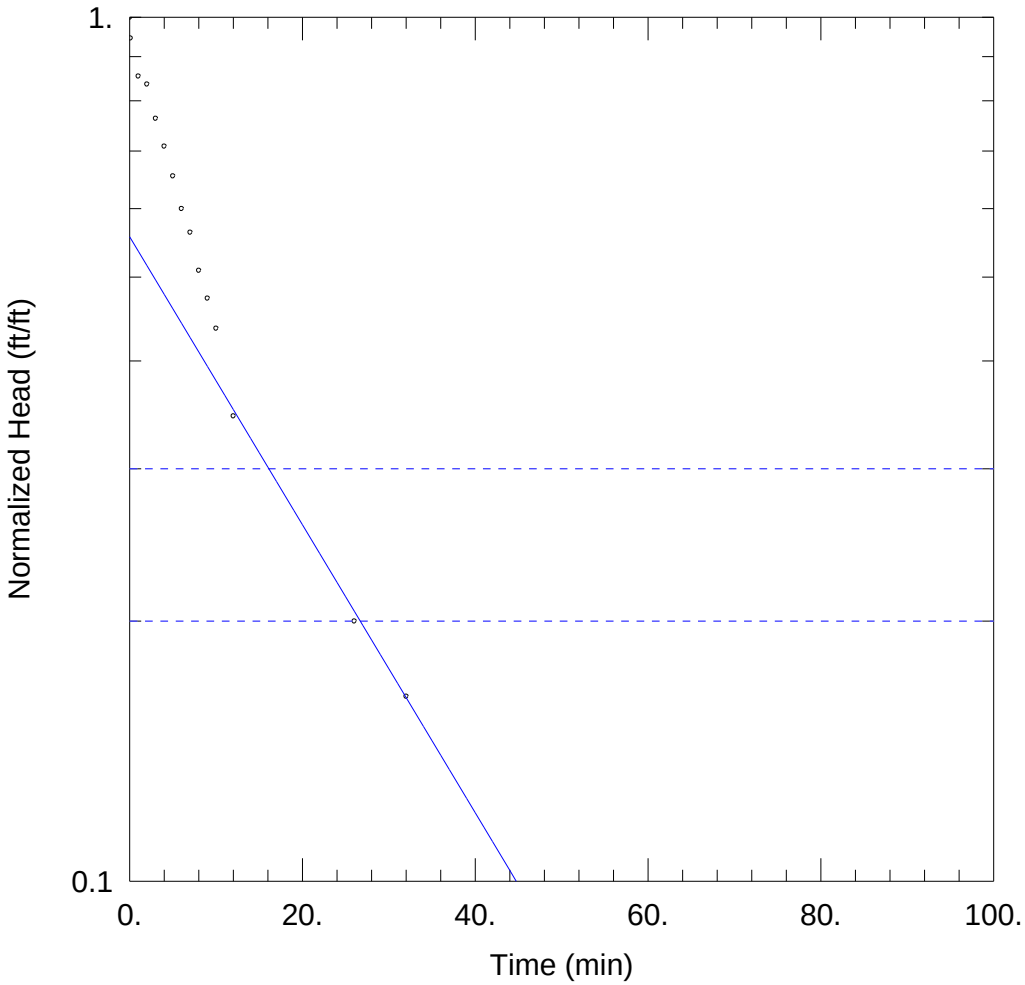
Parameter Correlations

	T	S
T	1.00	-1.00
S	-1.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.0004501 ft^2
Variance . . . . . 4.092E-5 ft^2
Std. Deviation . . . . . 0.006397 ft
Mean . . . . . 0.001452 ft
No. of Residuals . . . 13
No. of Estimates . . . 2



CRA-102M BAILDOWN TEST

Data Set: G:\...\CRA-102M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:37:20

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-102M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.93 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-102M)

Initial Displacement: 0.55 ft
Total Well Penetration Depth: 0.93 ft
Casing Radius: 0.167 ft
Static Water Column Height: 0.93 ft
Screen Length: 0.93 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-102M Baildown Test
Date: 12/22/10
Time: 16:37:23

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-102M

AQUIFER DATA

Saturated Thickness: 0.93 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-102M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.55 ft
Static Water Column Height: 0.93 ft
Casing Radius: 0.167 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 0.93 ft
Total Well Penetration Depth: 0.93 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.3621 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1	0.52	7.	0.31
1.	0.47	8.	0.28
2.	0.46	9.	0.26
3.	0.42	10.	0.24
4.	0.39	12.	0.19
5.	0.36	26.	0.11
6.	0.33	32.	0.09

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.3283

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0004514	cm/sec
y0	0.3063	ft

T = K*b = 0.0128 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0008321	4.487E-5	+/- 9.776E-5	18.55	cm/sec
y0	0.5123	0.01074	+/- 0.02341	47.69	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02359 cm²/sec

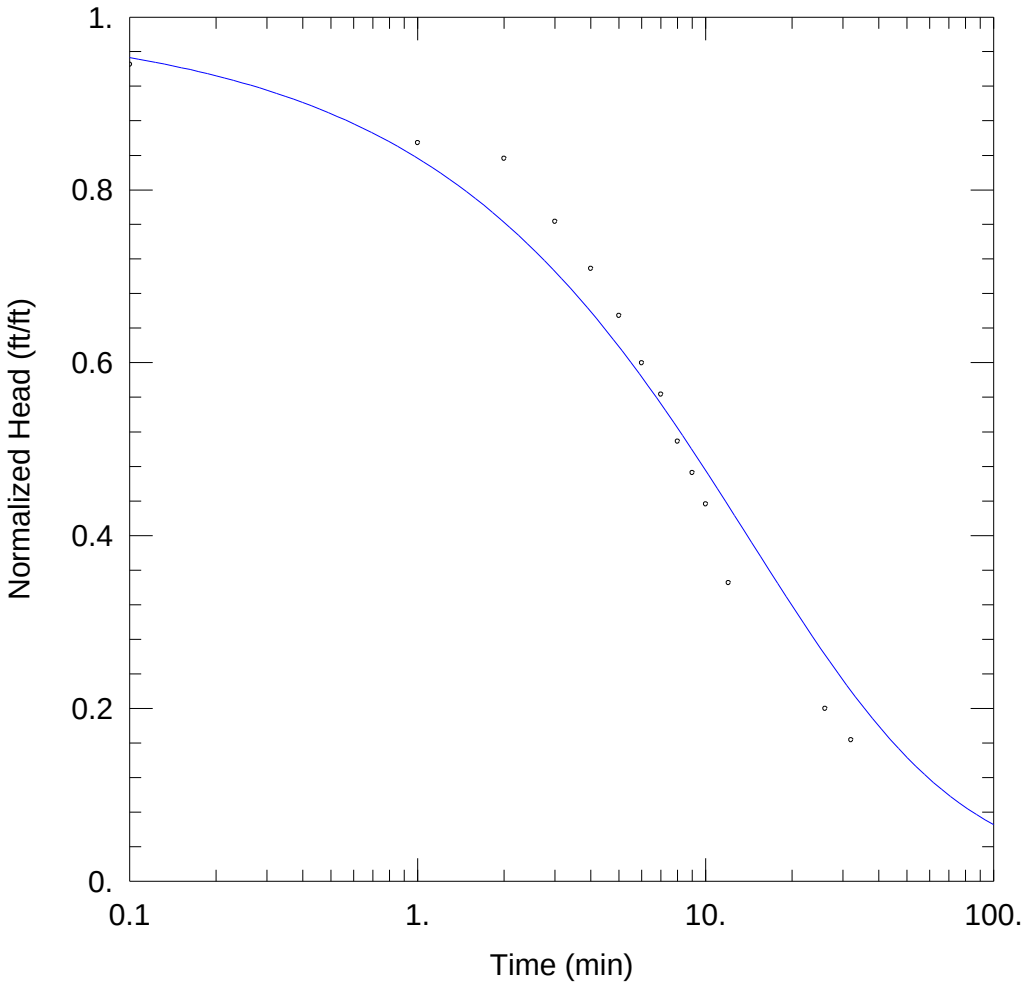
Parameter Correlations

	K	y0
K	1.00	0.74
y0	0.74	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.00391 ft^2
Variance . . . . . 0.0003259 ft^2
Std. Deviation . . . . . 0.01805 ft
Mean . . . . . 0.001688 ft
No. of Residuals . . . 14
No. of Estimates . . . 2



CRA-102M BAILDOWN TEST

Data Set: G:\...\CRA-102M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:37:25

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-102M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.93 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-102M)

Initial Displacement: 0.55 ft
Total Well Penetration Depth: 0.93 ft
Casing Radius: 0.167 ft
Static Water Column Height: 0.93 ft
Screen Length: 0.93 ft
Well Radius: 0.61 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-102M Baildown Test
Date: 12/22/10
Time: 16:37:28

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-102M

AQUIFER DATA

Saturated Thickness: 0.93 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-102M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.55 ft
Static Water Column Height: 0.93 ft
Casing Radius: 0.167 ft
Well Radius: 0.61 ft
Well Skin Radius: 1. ft
Screen Length: 0.93 ft
Total Well Penetration Depth: 0.93 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.167 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1	0.52	7.	0.31
1.	0.47	8.	0.28
2.	0.46	9.	0.26
3.	0.42	10.	0.24
4.	0.39	12.	0.19
5.	0.36	26.	0.11
6.	0.33	32.	0.09

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.02359	cm^2/sec
S	0.005082	

K = T/b = 0.0008321 cm/sec
Ss = S/b = 0.005465 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.02359	0.008725	+/- 0.01901	2.703	cm^2/sec
S	0.005082	0.004822	+/- 0.01051	1.054	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.0008321 cm/sec
Ss = S/b = 0.005465 1/ft

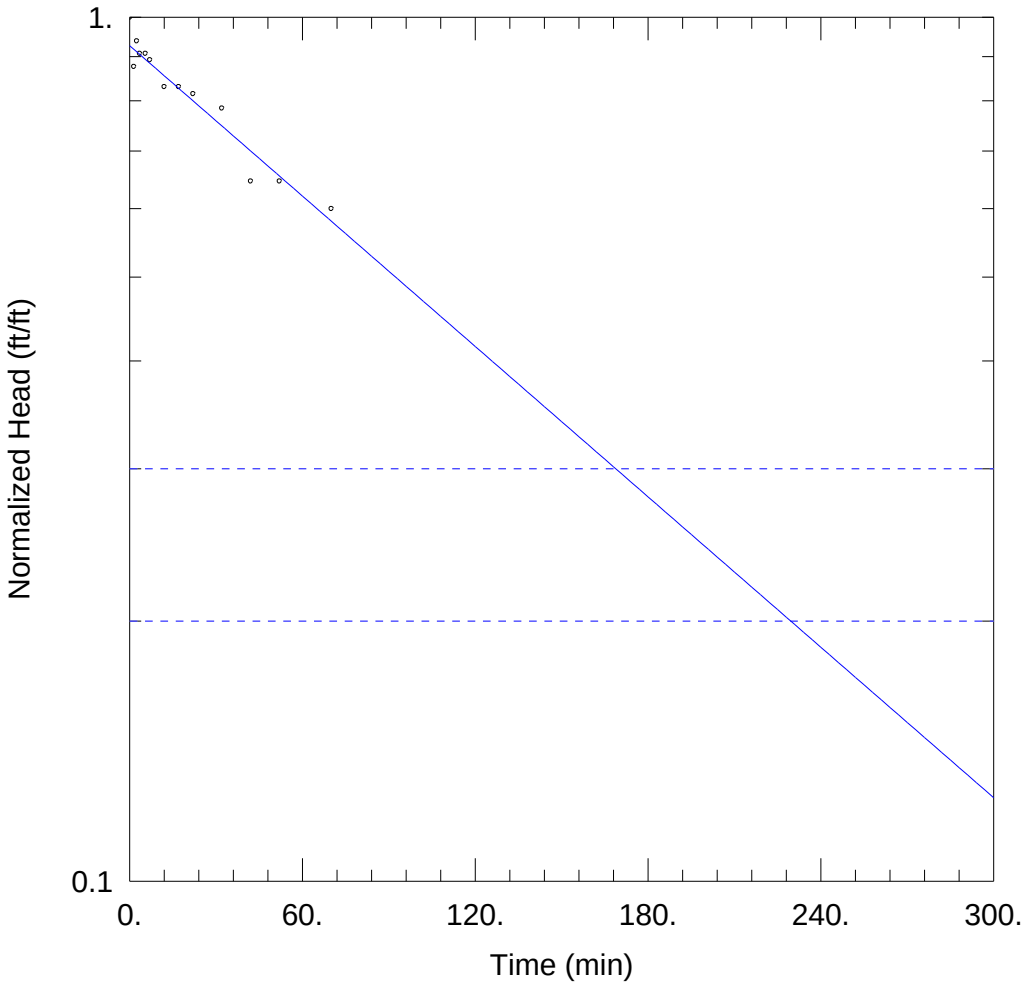
Parameter Correlations

	T	S
T	1.00	-0.98
S	-0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.009299 ft^2
Variance . . . . . 0.0007749 ft^2
Std. Deviation . . . . . 0.02784 ft
Mean . . . . . -0.001146 ft
No. of Residuals . . . 14
No. of Estimates . . . 2



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:37:59

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:37:33

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2623 ft
Gravel Pack Porosity: 0.3

No. of Observations: 12

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.5	0.57	17.	0.54
2.5	0.61	22.	0.53
3.5	0.59	32.	0.51
5.5	0.59	42.	0.42
7.	0.58	52.	0.42
12.	0.54	70.	0.39

SOLUTION

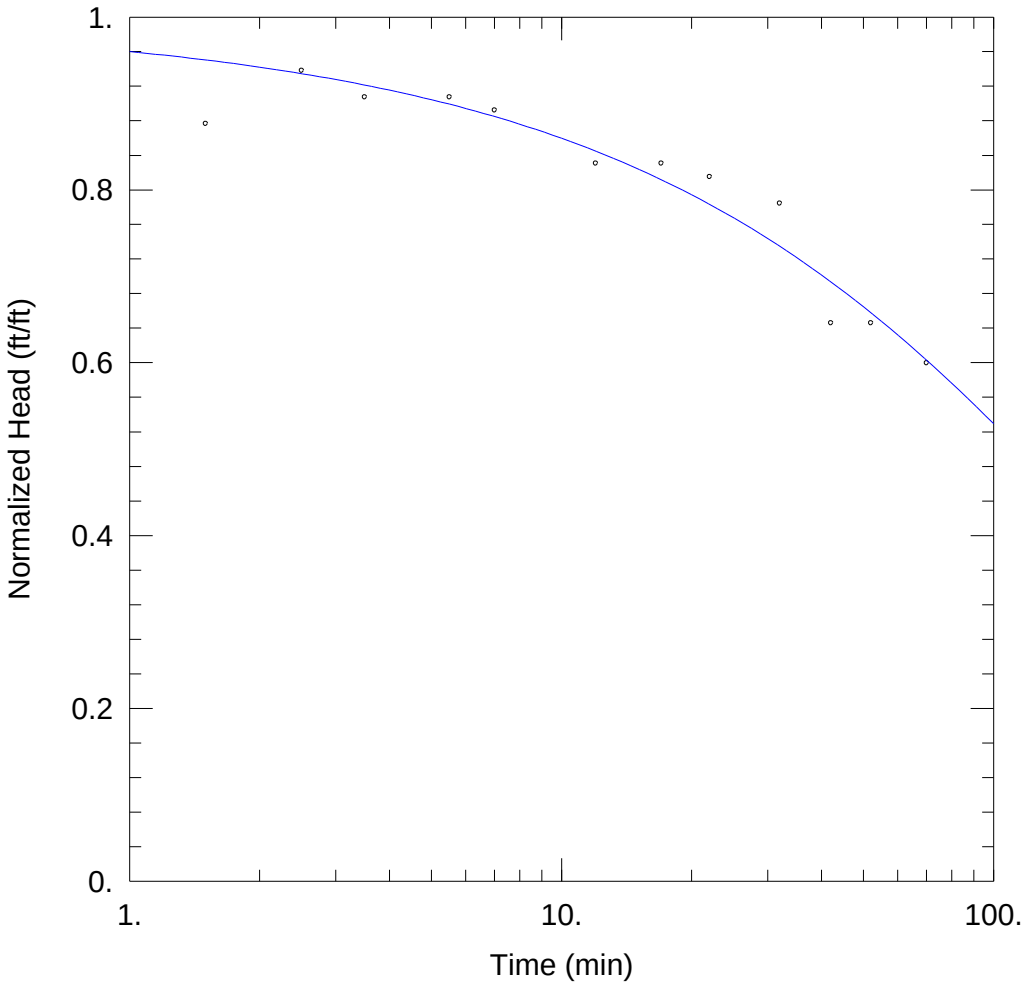
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.236

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.219E-5	cm/sec
y0	0.6023	ft

T = K*b = 0.004398 cm²/sec



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:38:10

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:37:37

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1545 ft
Gravel Pack Porosity: 0.3

No. of Observations: 12

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.5	0.57	17.	0.54
2.5	0.61	22.	0.53
3.5	0.59	32.	0.51
5.5	0.59	42.	0.42
7.	0.58	52.	0.42
12.	0.54	70.	0.39

SOLUTION

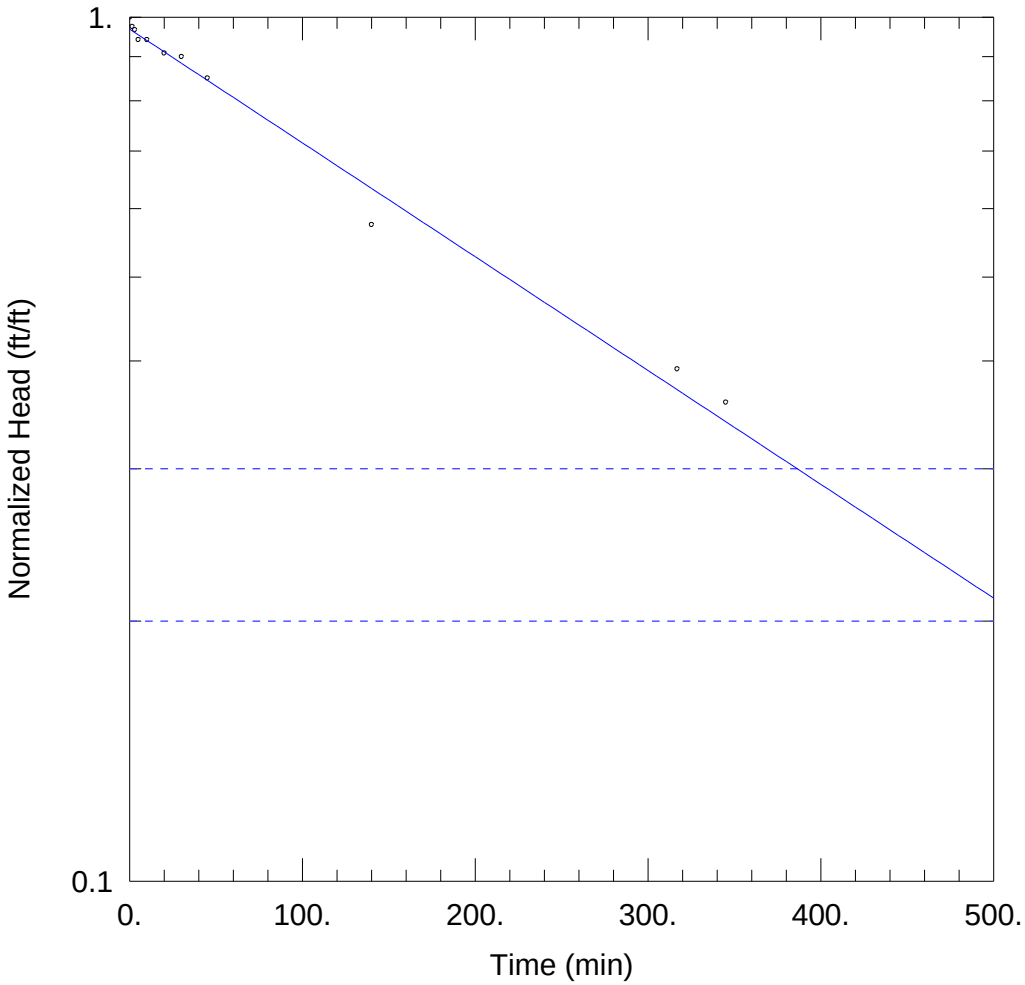
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001652	cm^2/sec
S	0.008222	

K = T/b = 2.336E-5 cm/sec
Ss = S/b = 0.003544 1/ft



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:37:39

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 1.2 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:37:41

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.2 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2623 ft
Gravel Pack Porosity: 0.3

No. of Observations: 10

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.5	1.17	30.	1.08
3.	1.16	45.	1.02
5.	1.13	140.	0.69
10.	1.13	317.	0.47
20.	1.09	345.	0.43

SOLUTION

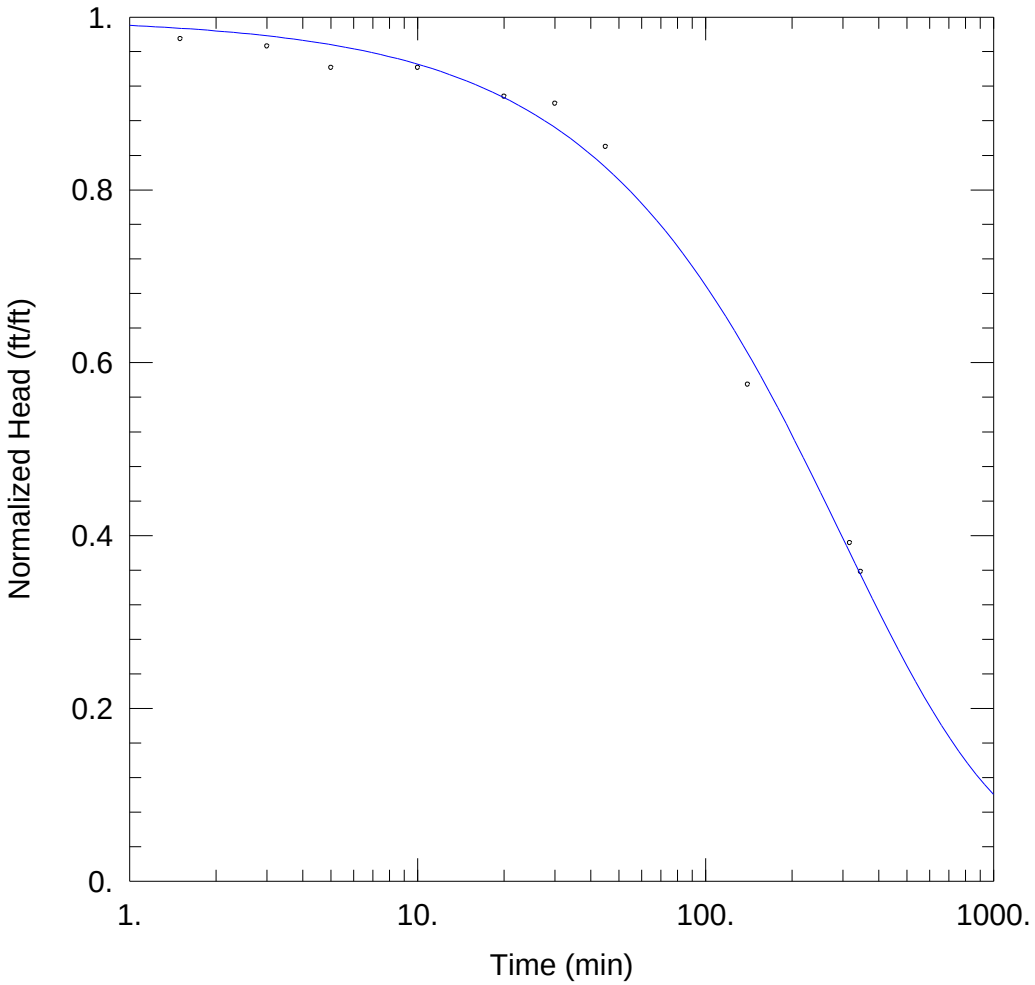
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.236

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.824E-5	cm/sec
y0	1.162	ft

T = K*b = 0.001997 cm²/sec



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:38:51

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 1.2 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:38:57

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.2 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1545 ft
Gravel Pack Porosity: 0.3

No. of Observations: 10

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.5	1.17	30.	1.08
3.	1.16	45.	1.02
5.	1.13	140.	0.69
10.	1.13	317.	0.47
20.	1.09	345.	0.43

SOLUTION

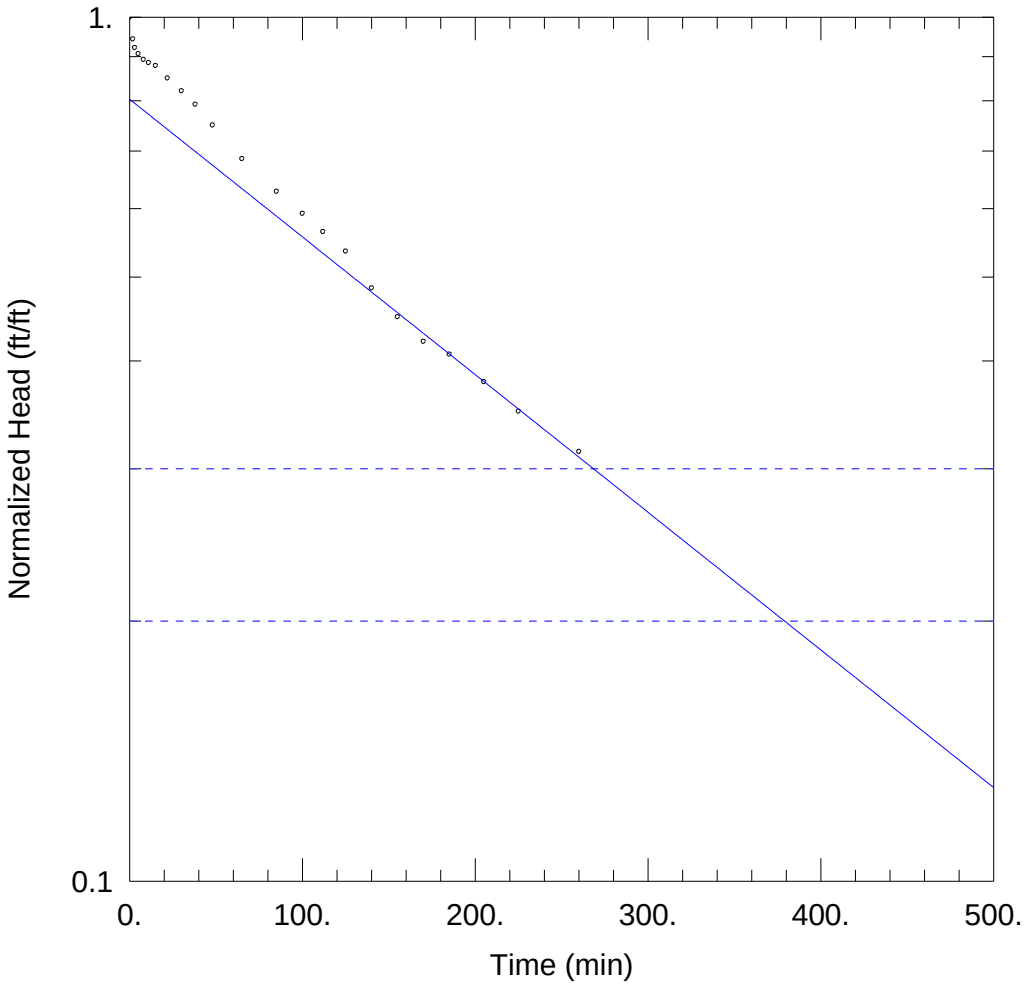
Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.002431	cm^2/sec
S	8.881E-5	

K = T/b = 3.437E-5 cm/sec
Ss = S/b = 3.828E-5 1/ft



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:39:22

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 1.4 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:39:01

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.4 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.2623 ft
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	1.32	85.	0.88
3.	1.29	100.	0.83
5.	1.27	112.	0.79
8.	1.25	125.	0.75
11.	1.24	140.	0.68
15.	1.23	155.	0.63
22.	1.19	170.	0.59
30.	1.15	185.	0.57
38.	1.11	205.	0.53
48.	1.05	225.	0.49
65.	0.96	260.	0.44

SOLUTION

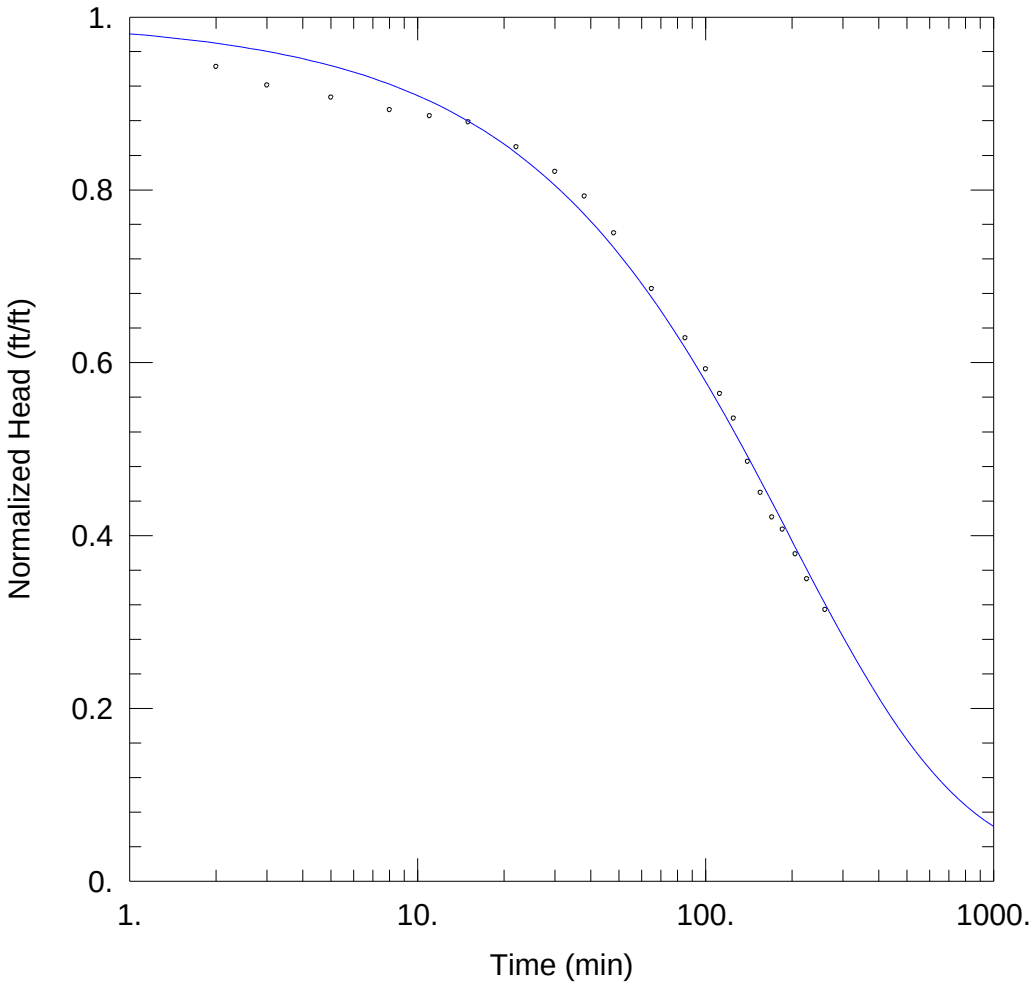
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.236

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.416E-5	cm/sec
y0	1.125	ft

$T = K*b = 0.002416$ cm²/sec



CRA-131M-B BAILDOWN TEST

Data Set: G:\...\CRA-131M-B_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:39:03

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-131M-B
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 2.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-131M-B)

Initial Displacement: 1.4 ft
Total Well Penetration Depth: 2.32 ft
Casing Radius: 0.1545 ft
Static Water Column Height: 2.32 ft
Screen Length: 2.32 ft
Well Radius: 0.4167 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-131M-B Baildown Test
Date: 12/22/10
Time: 16:39:06

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-131M-B

AQUIFER DATA

Saturated Thickness: 2.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-131M-B

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.4 ft
Static Water Column Height: 2.32 ft
Casing Radius: 0.1545 ft
Well Radius: 0.4167 ft
Well Skin Radius: 1. ft
Screen Length: 2.32 ft
Total Well Penetration Depth: 2.32 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1545 ft
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
2.	1.32	85.	0.88
3.	1.29	100.	0.83
5.	1.27	112.	0.79
8.	1.25	125.	0.75
11.	1.24	140.	0.68
15.	1.23	155.	0.63
22.	1.19	170.	0.59
30.	1.15	185.	0.57
38.	1.11	205.	0.53
48.	1.05	225.	0.49
65.	0.96	260.	0.44

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.002752	cm^2/sec
S	0.0006285	

K = T/b = 3.891E-5 cm/sec
Ss = S/b = 0.0002709 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.002752	0.000329	+/- 0.0006863	8.364	cm^2/sec
S	0.0006285	0.0003715	+/- 0.0007749	1.692	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 3.891E-5 cm/sec
Ss = S/b = 0.0002709 1/ft

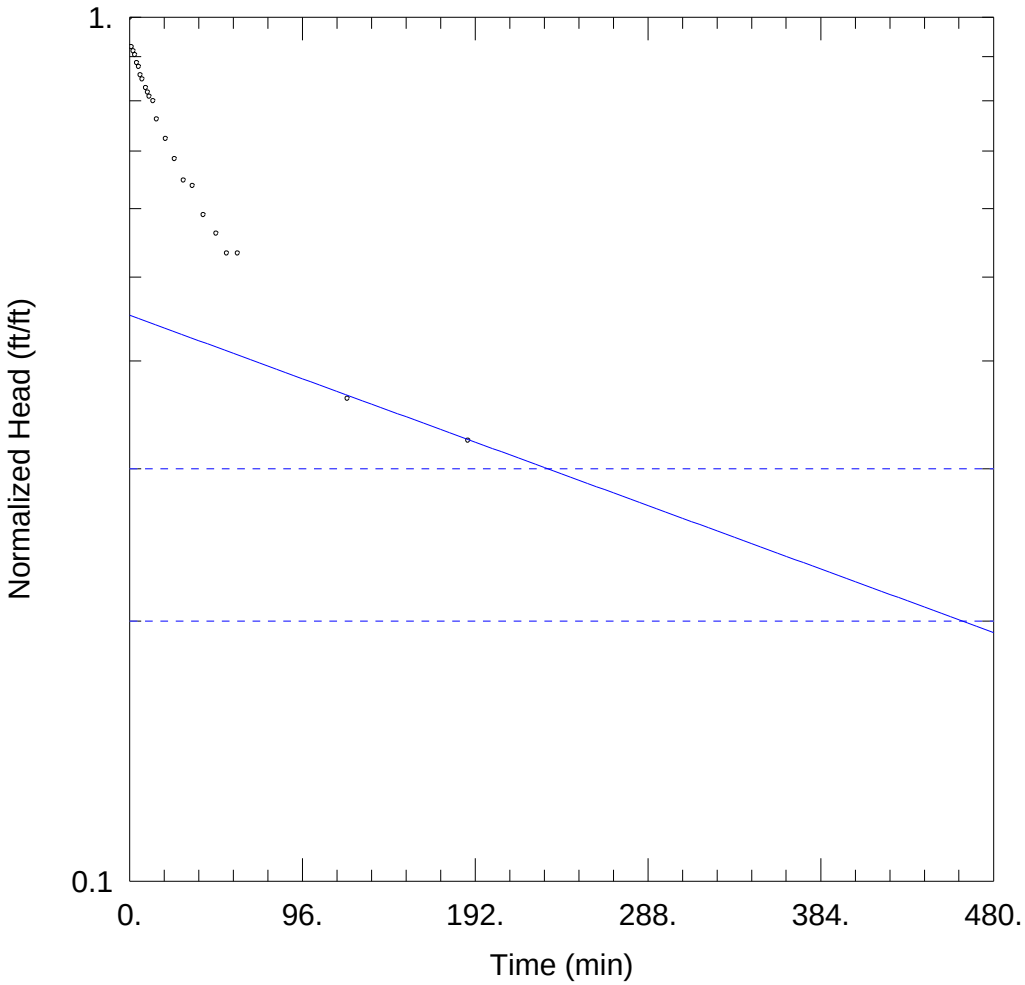
Parameter Correlations

	T	S
T	1.00	-0.99
S	-0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.01471 ft^2
Variance . . . . . 0.0007357 ft^2
Std. Deviation . . . . . 0.02712 ft
Mean . . . . . -0.005879 ft
No. of Residuals . . . 22
No. of Estimates . . . 2



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:39:08

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 1.11 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 1.05 ft
Total Well Penetration Depth: 1.11 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.11 ft
Screen Length: 1.11 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:39:10

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 1.11 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.05 ft
Static Water Column Height: 1.11 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 1.11 ft
Total Well Penetration Depth: 1.11 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.206 ft
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.97	15.	0.8
2.	0.96	20.	0.76
3.	0.95	25.	0.72
4.	0.93	30.	0.68
5.	0.92	35.	0.67
6.	0.9	41.	0.62
7.	0.89	48.	0.59
9.	0.87	54.	0.56
10.	0.86	60.	0.56
11.	0.85	121.	0.38
13.	0.84	188.	0.34

SOLUTION

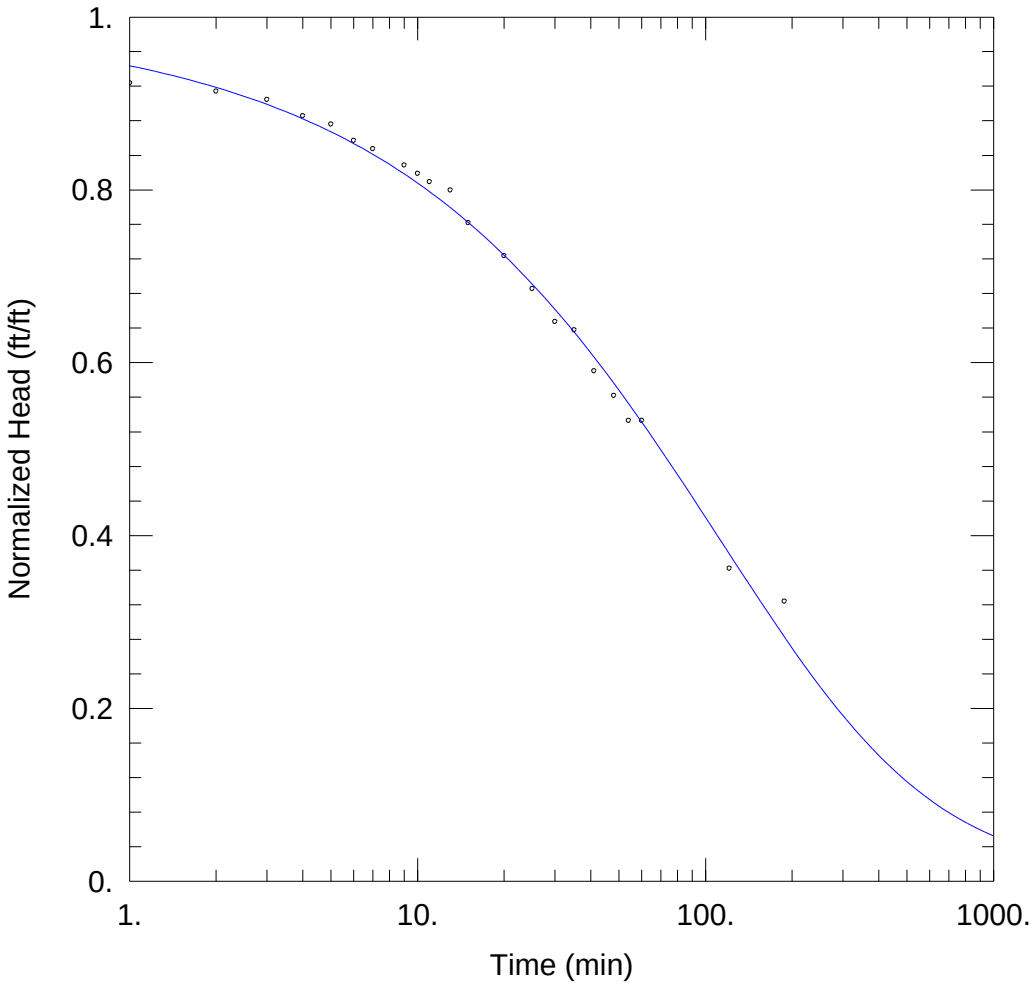
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.8524

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.457E-5	cm/sec
y0	0.4743	ft

$T = K*b = 0.0004929$ cm²/sec



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:40:06

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/20/10

AQUIFER DATA

Saturated Thickness: 1.11 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 1.05 ft
Total Well Penetration Depth: 1.11 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.11 ft
Screen Length: 1.11 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:40:12

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/20/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 1.11 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.05 ft
Static Water Column Height: 1.11 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 1.11 ft
Total Well Penetration Depth: 1.11 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.97	15.	0.8
2.	0.96	20.	0.76
3.	0.95	25.	0.72
4.	0.93	30.	0.68
5.	0.92	35.	0.67
6.	0.9	41.	0.62
7.	0.89	48.	0.59
9.	0.87	54.	0.56
10.	0.86	60.	0.56
11.	0.85	121.	0.38
13.	0.84	188.	0.34

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0006841	cm^2/sec
S	0.004698	

K = T/b = 2.022E-5 cm/sec
Ss = S/b = 0.004232 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0006841	6.934E-5	+/- 0.0001446	9.865	cm^2/sec
S	0.004698	0.001004	+/- 0.002094	4.679	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 2.022E-5 cm/sec
Ss = S/b = 0.004232 1/ft

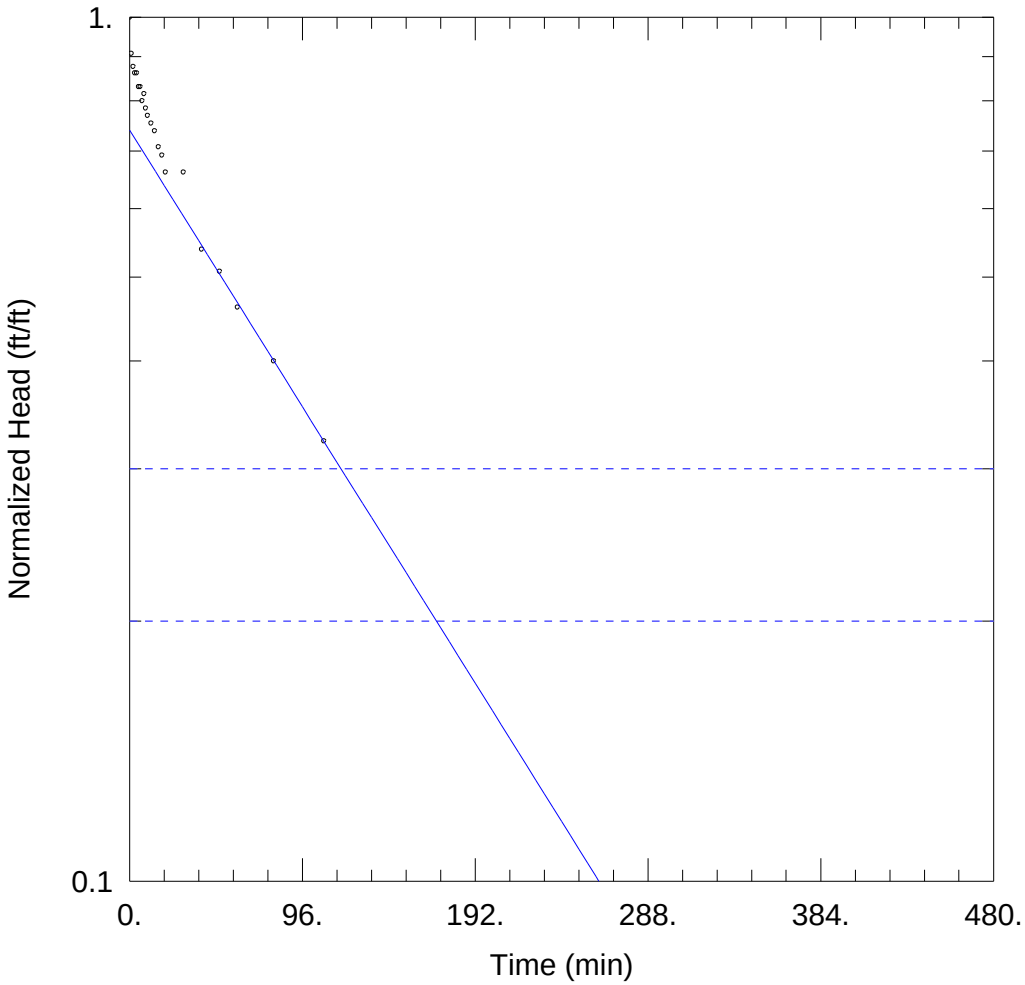
Parameter Correlations

	T	S
T	1.00	-0.98
S	-0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.004885 ft^2
Variance . . . . . 0.0002442 ft^2
Std. Deviation . . . . . 0.01563 ft
Mean . . . . . 0.0008685 ft
No. of Residuals . . . 22
No. of Estimates . . . 2



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:40:13

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.77 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 0.77 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.77 ft
Screen Length: 0.77 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:40:16

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 0.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 0.77 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 0.77 ft
Total Well Penetration Depth: 0.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.206 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.59	14.	0.48
2.	0.57	16.	0.46
3.	0.56	18.	0.45
4.	0.56	20.	0.43
5.	0.54	30.	0.43
6.	0.54	40.	0.35
7.	0.52	50.	0.33
8.	0.53	60.	0.3
9.	0.51	80.	0.26
10.	0.5	108.	0.21
12.	0.49		

SOLUTION

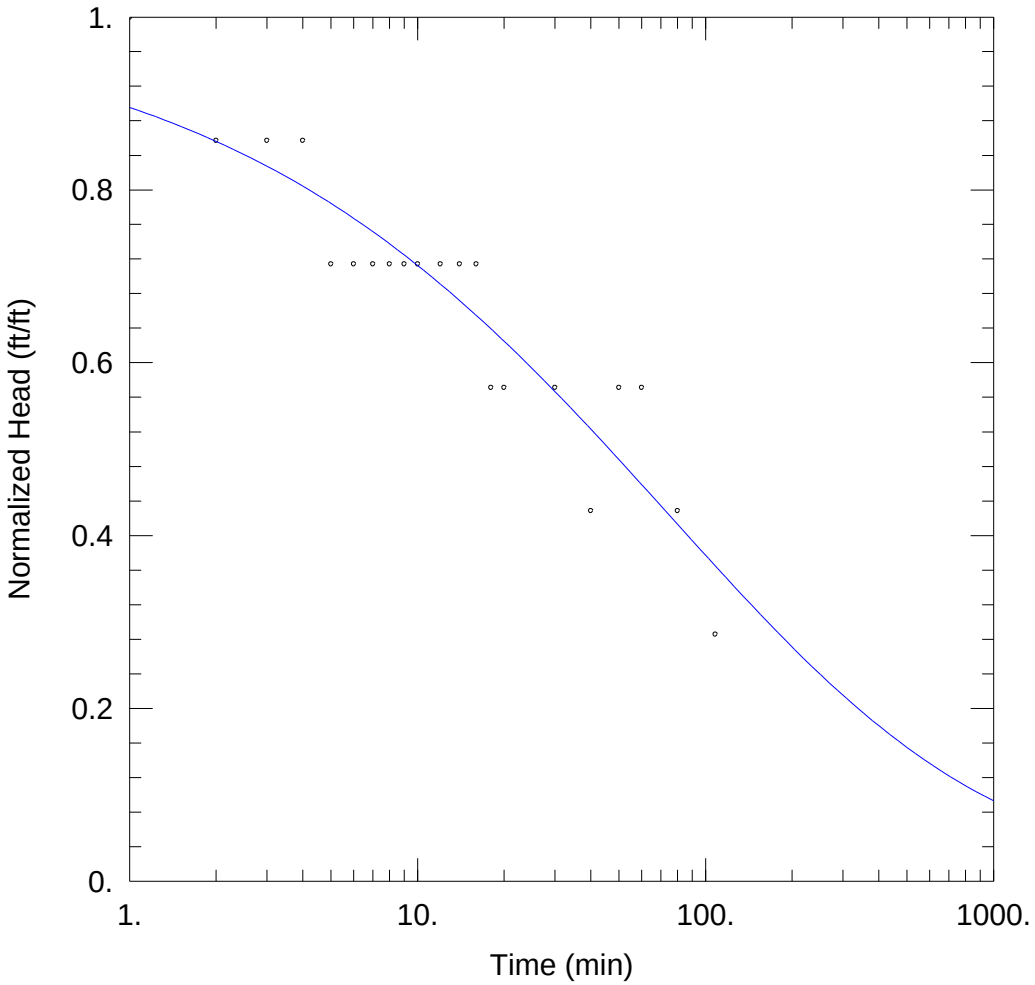
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.589

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.326E-5	cm/sec
y0	0.4809	ft

$T = K*b = 0.001485$ cm²/sec



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:40:18

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.77 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 0.07 ft
Total Well Penetration Depth: 0.77 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.77 ft
Screen Length: 0.77 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:40:21

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 0.77 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.07 ft
Static Water Column Height: 0.77 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 0.77 ft
Total Well Penetration Depth: 0.77 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.07	14.	0.05
2.	0.06	16.	0.05
3.	0.06	18.	0.04
4.	0.06	20.	0.04
5.	0.05	30.	0.04
6.	0.05	40.	0.03
7.	0.05	50.	0.04
8.	0.05	60.	0.04
9.	0.05	80.	0.03
10.	0.05	108.	0.02
12.	0.05		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0002143	cm^2/sec
S	0.06745	

K = T/b = 9.13E-6 cm/sec
Ss = S/b = 0.0876 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0002143	0.0002799	+/- 0.0005858	0.7656	cm^2/sec
S	0.06745	0.1052	+/- 0.2201	0.6414	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 9.13E-6 cm/sec
Ss = S/b = 0.0876 1/ft

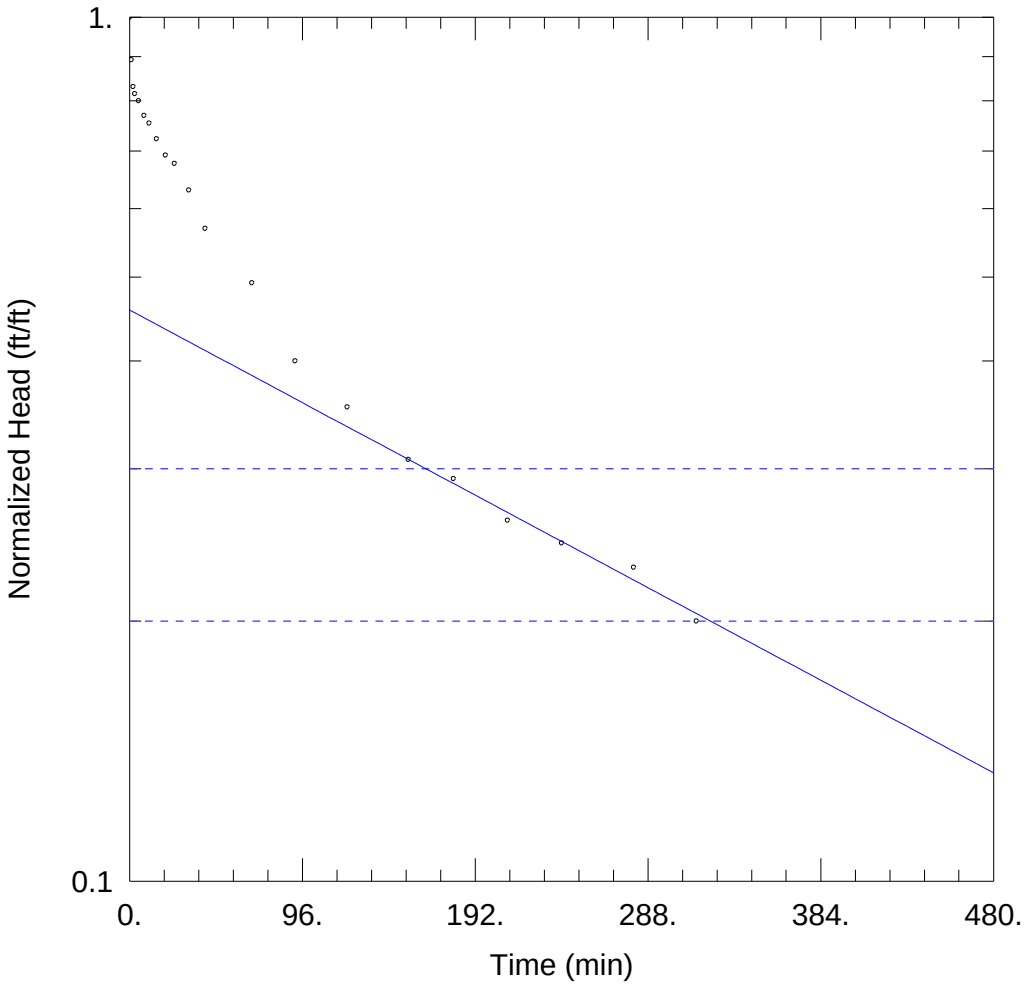
Parameter Correlations

	T	S
T	1.00	-1.00
S	-1.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.0003564 ft^2
Variance . . . . . 1.876E-5 ft^2
Std. Deviation . . . . . 0.004331 ft
Mean . . . . . 0.0001497 ft
No. of Residuals . . . 21
No. of Estimates . . . 2



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:40:22

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.73 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 0.73 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.73 ft
Screen Length: 0.73 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:40:25

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 0.73 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 0.73 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 0.73 ft
Total Well Penetration Depth: 0.73 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.206 ft
Gravel Pack Porosity: 0.3

No. of Observations: 20

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.58	42.	0.37
2.	0.54	68.	0.32
3.	0.53	92.	0.26
5.	0.52	121.	0.23
8.	0.5	155.	0.2
11.	0.49	180.	0.19
15.	0.47	210.	0.17
20.	0.45	240.	0.16
25.	0.44	280.	0.15
33.	0.41	315.	0.13

SOLUTION

Slug Test

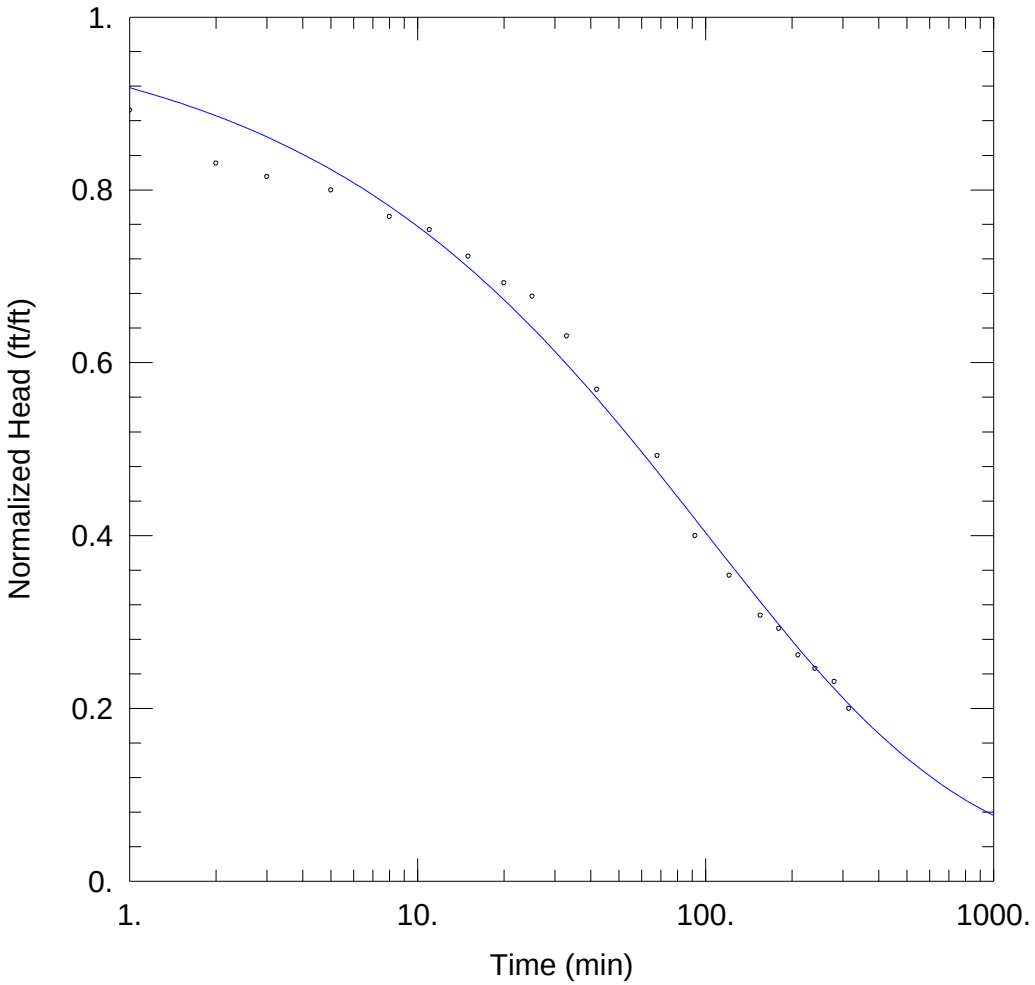
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.5496

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.084E-5	cm/sec
y0	0.2978	ft

$T = K*b = 0.0004638$ cm²/sec



CRA-219M/MW-616 BAILDOWN TEST

Data Set: G:\...\CRA-219M (MW-616)_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:41:01

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-219M/MW-616
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.73 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-219M)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 0.73 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.73 ft
Screen Length: 0.73 ft
Well Radius: 0.354 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-219M/MW-616 Baildown Test
Date: 12/22/10
Time: 16:41:04

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-219M/MW-616

AQUIFER DATA

Saturated Thickness: 0.73 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-219M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.65 ft
Static Water Column Height: 0.73 ft
Casing Radius: 0.083 ft
Well Radius: 0.354 ft
Well Skin Radius: 1. ft
Screen Length: 0.73 ft
Total Well Penetration Depth: 0.73 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 20

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.58	42.	0.37
2.	0.54	68.	0.32
3.	0.53	92.	0.26
5.	0.52	121.	0.23
8.	0.5	155.	0.2
11.	0.49	180.	0.19
15.	0.47	210.	0.17
20.	0.45	240.	0.16
25.	0.44	280.	0.15
33.	0.41	315.	0.13

SOLUTION

Slug Test

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.0003782	cm^2/sec
S	0.02142	

K = T/b = 1.7E-5 cm/sec
Ss = S/b = 0.02934 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.0003782	6.303E-5	+/- 0.0001324	5.999	cm^2/sec
S	0.02142	0.006052	+/- 0.01271	3.54	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.7E-5 cm/sec
Ss = S/b = 0.02934 1/ft

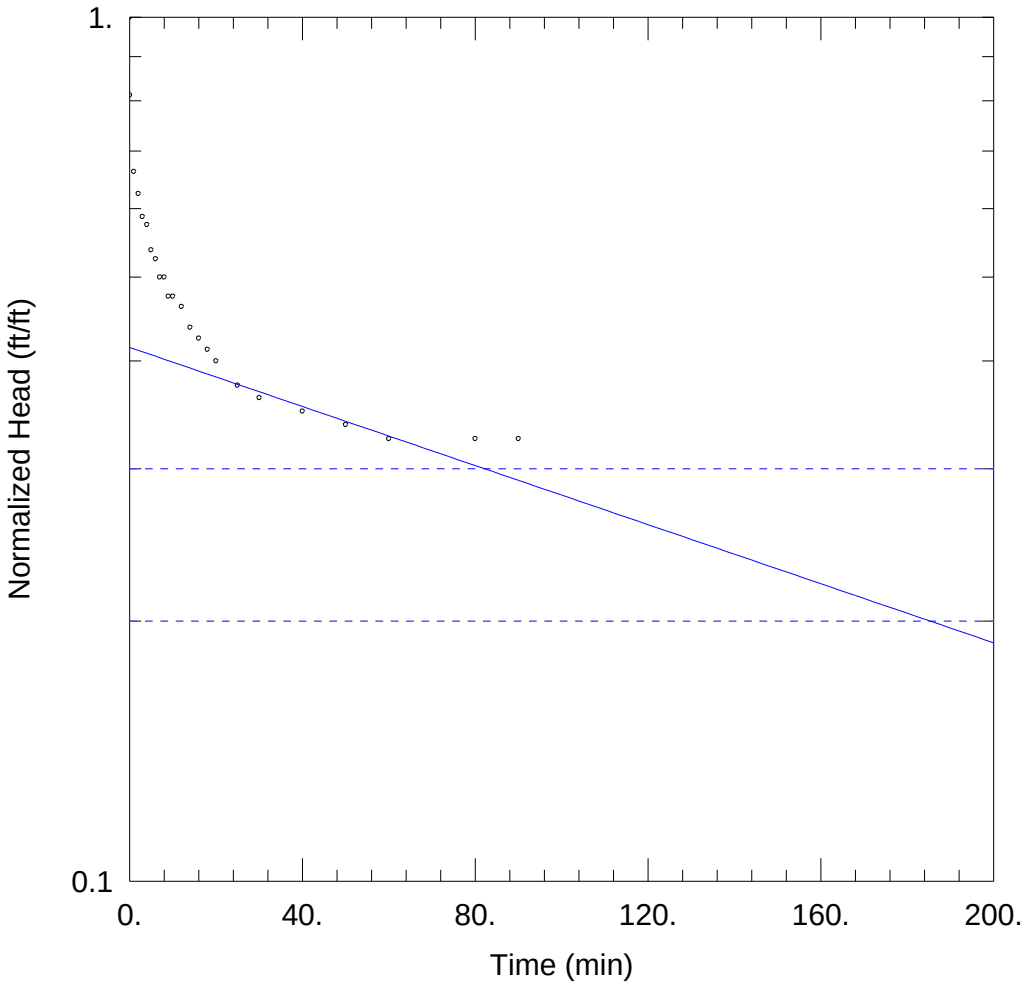
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.004612 ft^2
Variance . . . . . 0.0002562 ft^2
Std. Deviation . . . . . 0.01601 ft
Mean . . . . . -0.002713 ft
No. of Residuals . . . 20
No. of Estimates . . . 2



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT1_B&R.aqt
Date: 12/22/10 Time: 16:41:05

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 0.89 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.8 ft
Total Well Penetration Depth: 0.89 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.89 ft
Screen Length: 0.89 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:41:08

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.89 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.8 ft
Static Water Column Height: 0.89 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.89 ft
Total Well Penetration Depth: 0.89 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 23

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.65	14.	0.35
1.	0.53	16.	0.34
2.	0.5	18.	0.33
3.	0.47	20.	0.32
4.	0.46	25.	0.3
5.	0.43	30.	0.29
6.	0.42	40.	0.28
7.	0.4	50.	0.27
8.	0.4	60.	0.26
9.	0.38	80.	0.26
10.	0.38	90.	0.26
12.	0.37		

SOLUTION

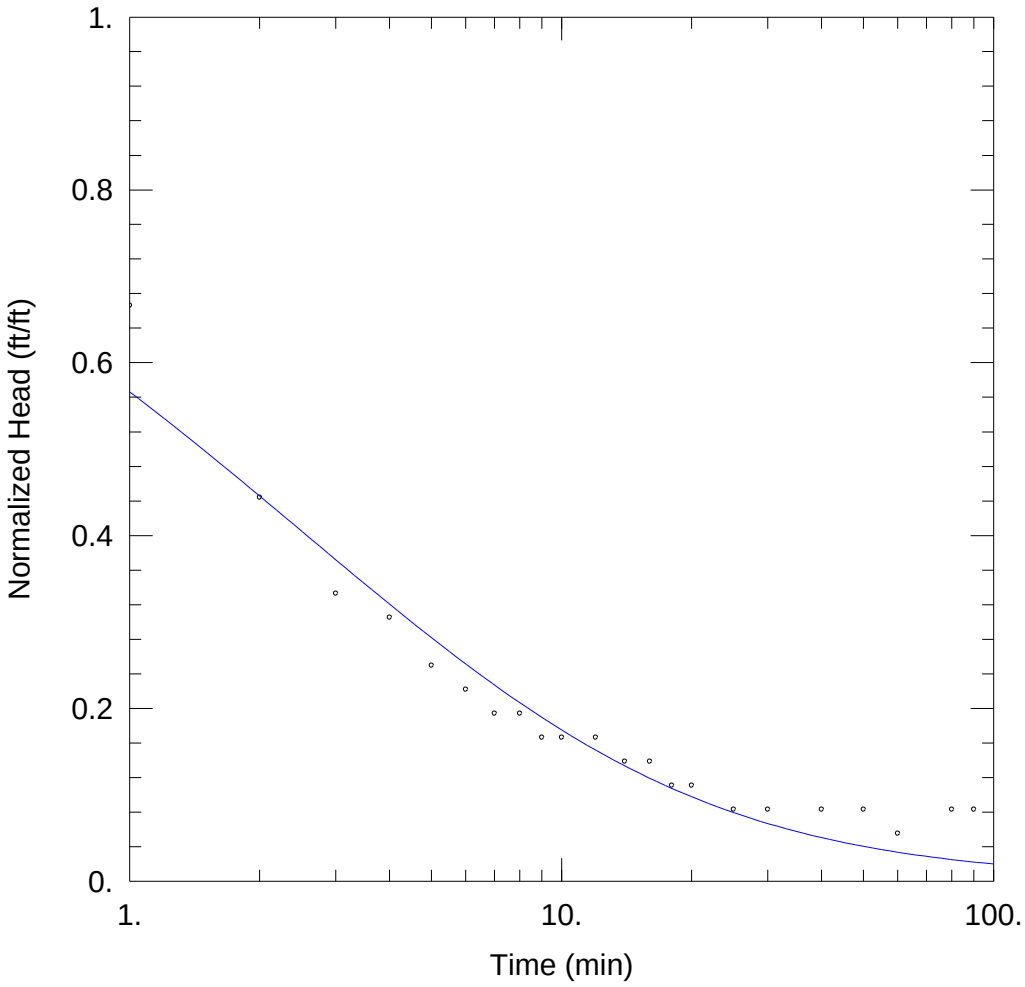
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.7243

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.213E-5	cm/sec
y0	0.3317	ft

$T = K*b = 0.0008717$ cm²/sec



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT1_Cooper.aqt
Date: 12/22/10 Time: 16:41:09

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/21/10

AQUIFER DATA

Saturated Thickness: 0.89 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.36 ft
Total Well Penetration Depth: 0.89 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.89 ft
Screen Length: 0.89 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:41:12

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/21/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.89 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.36 ft
Static Water Column Height: 0.89 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.89 ft
Total Well Penetration Depth: 0.89 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 23

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.36	14.	0.05
1.	0.24	16.	0.05
2.	0.16	18.	0.04
3.	0.12	20.	0.04
4.	0.11	25.	0.03
5.	0.09	30.	0.03
6.	0.08	40.	0.03
7.	0.07	50.	0.03
8.	0.07	60.	0.02
9.	0.06	80.	0.03
10.	0.06	90.	0.03
12.	0.06		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.01411	cm^2/sec
S	0.02587	

K = T/b = 0.00052 cm/sec
Ss = S/b = 0.02907 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.01411	0.00339	+/- 0.00705	4.161	cm^2/sec
S	0.02587	0.01337	+/- 0.02782	1.935	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 0.00052 cm/sec
Ss = S/b = 0.02907 1/ft

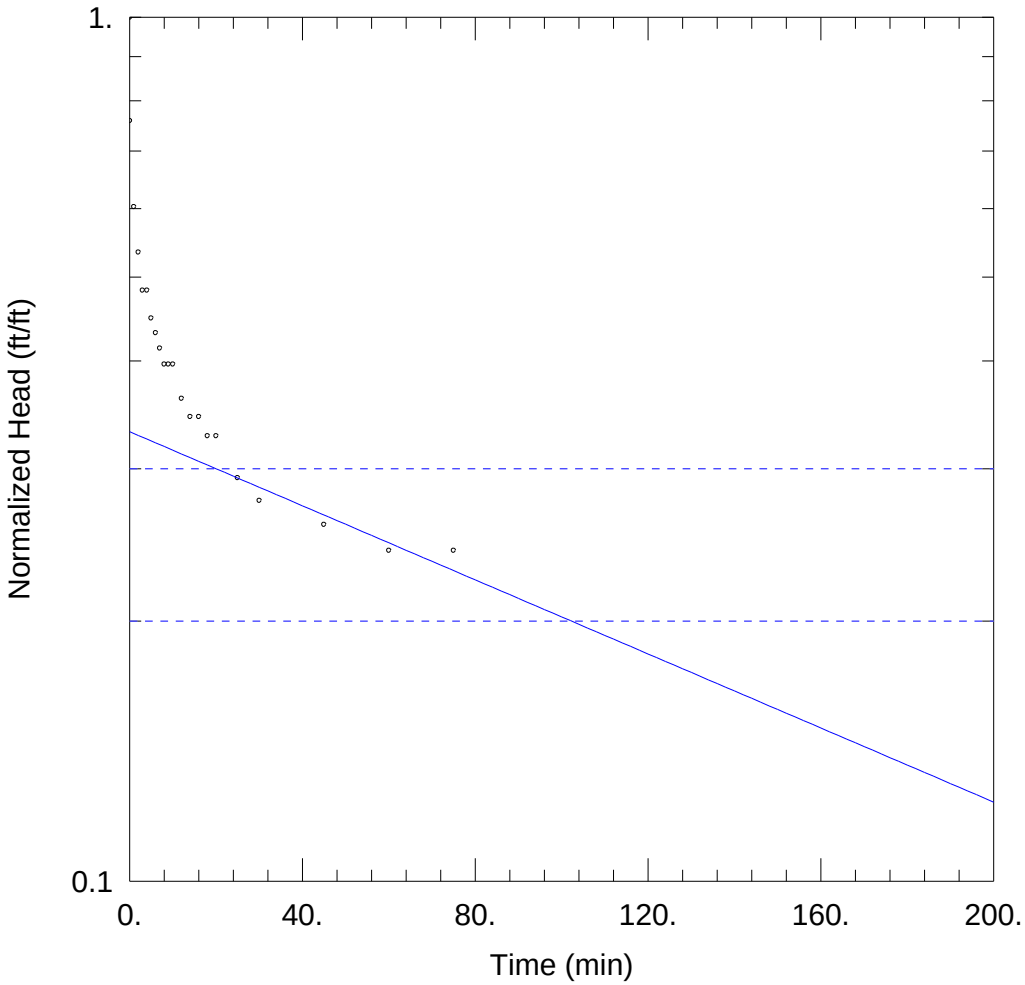
Parameter Correlations

	T	S
T	1.00	-0.97
S	-0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.00352 ft^2
Variance . . . . . 0.0001676 ft^2
Std. Deviation . . . . . 0.01295 ft
Mean . . . . . 0.003232 ft
No. of Residuals . . . 23
No. of Estimates . . . 2



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT2_B&R.aqt
Date: 12/22/10 Time: 16:41:14

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.66 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.58 ft
Total Well Penetration Depth: 0.66 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.66 ft
Screen Length: 0.66 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:41:17

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.66 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.58 ft
Static Water Column Height: 0.66 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.66 ft
Total Well Penetration Depth: 0.66 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.44	12.	0.21
1.	0.35	14.	0.2
2.	0.31	16.	0.2
3.	0.28	18.	0.19
4.	0.28	20.	0.19
5.	0.26	25.	0.17
6.	0.25	30.	0.16
7.	0.24	45.	0.15
8.	0.23	60.	0.14
9.	0.23	75.	0.14
10.	0.23		

SOLUTION

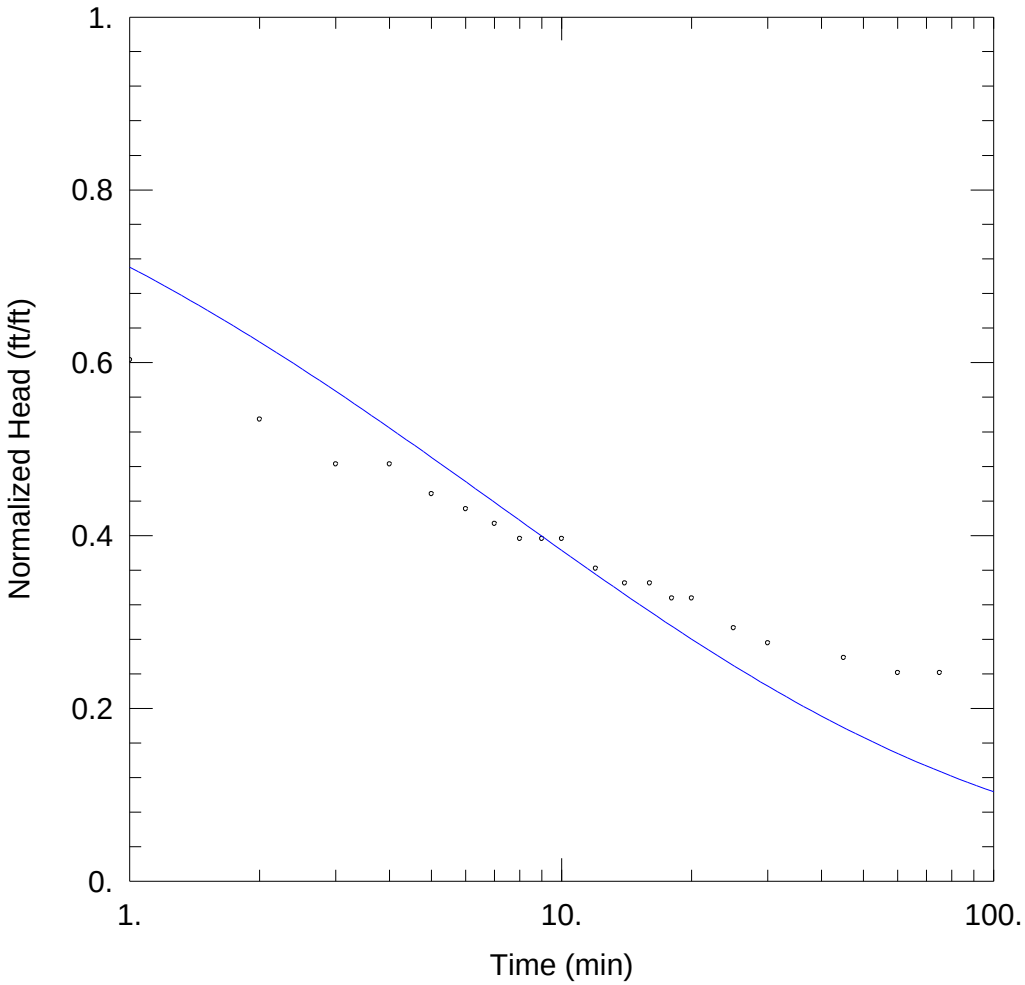
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.5051

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.789E-5	cm/sec
y0	0.1921	ft

$T = K*b = 0.0007622$ cm²/sec



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT2_Cooper.aqt
Date: 12/22/10 Time: 16:41:19

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 0.66 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.58 ft
Total Well Penetration Depth: 0.66 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.66 ft
Screen Length: 0.66 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:41:24

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/22/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.66 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.58 ft
Static Water Column Height: 0.66 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.66 ft
Total Well Penetration Depth: 0.66 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 21

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.44	12.	0.21
1.	0.35	14.	0.2
2.	0.31	16.	0.2
3.	0.28	18.	0.19
4.	0.28	20.	0.19
5.	0.26	25.	0.17
6.	0.25	30.	0.16
7.	0.24	45.	0.15
8.	0.23	60.	0.14
9.	0.23	75.	0.14
10.	0.23		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001639	cm^2/sec
S	0.1	

K = T/b = 8.146E-5 cm/sec
Ss = S/b = 0.1515 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.001639	0.00175	+/- 0.003663	0.9363	cm^2/sec
S	0.1	0.1406	+/- 0.2942	0.7115	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 8.146E-5 cm/sec
Ss = S/b = 0.1515 1/ft

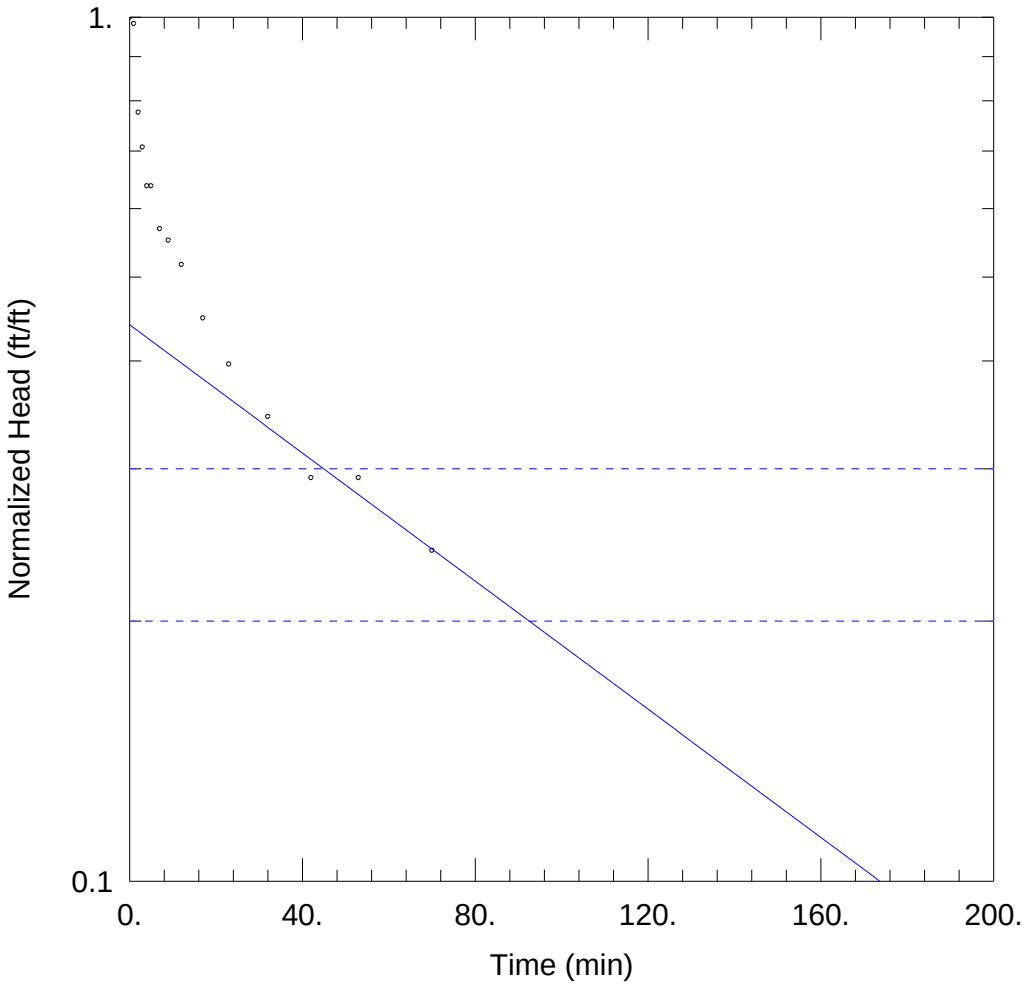
Parameter Correlations

	T	S
T	1.00	-0.99
S	-0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . 0.04308 ft^2
Variance . . . . . 0.002268 ft^2
Std. Deviation . . . . . 0.04762 ft
Mean . . . . . -0.004282 ft
No. of Residuals . . . 21
No. of Estimates . . . 2



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT3_B&R.aqt
Date: 12/22/10 Time: 16:42:08

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.6 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.58 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:42:11

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.58 ft
Static Water Column Height: 0.6 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.6 ft
Total Well Penetration Depth: 0.6 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1988 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.57	12.	0.3
2.	0.45	17.	0.26
3.	0.41	23.	0.23
4.	0.37	32.	0.2
5.	0.37	42.	0.17
7.	0.33	53.	0.17
9.	0.32	70.	0.14

SOLUTION

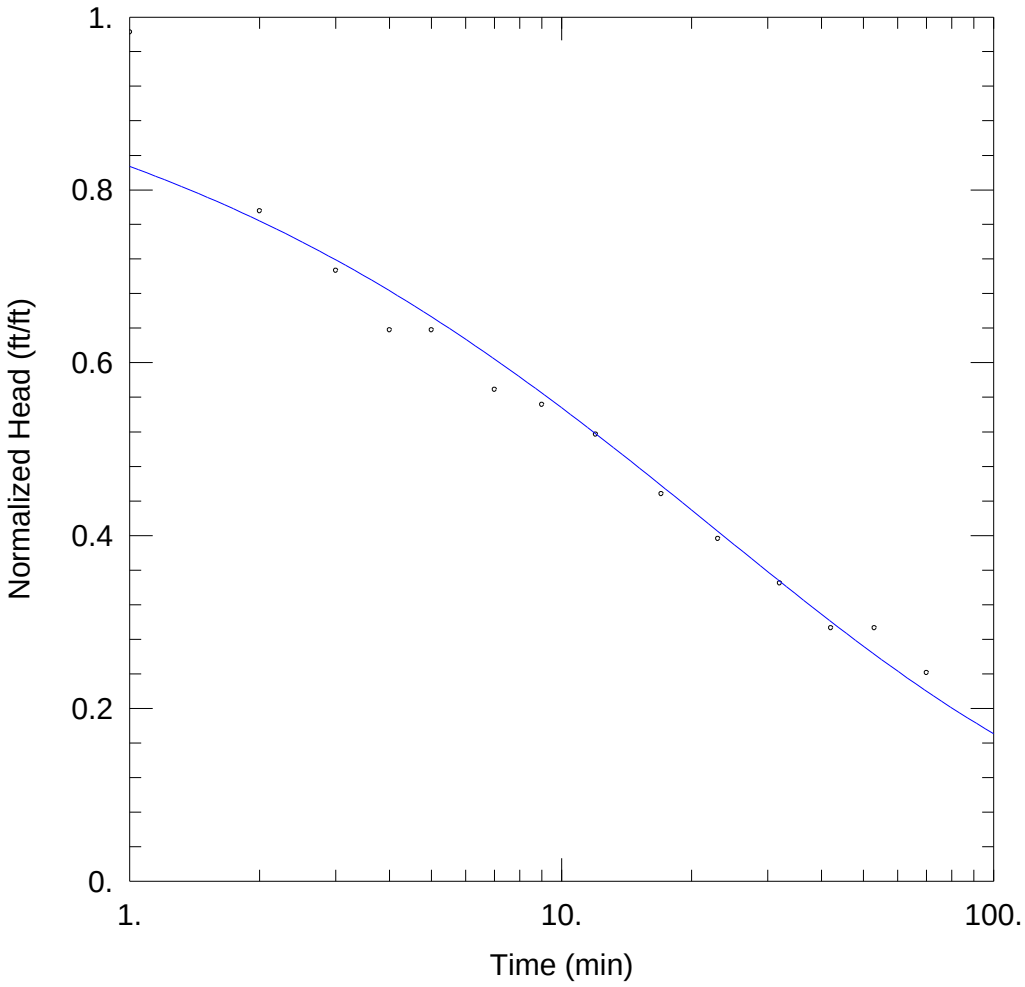
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.435

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.21E-5	cm/sec
y0	0.2554	ft

T = K*b = 0.001136 cm²/sec



CRA-527M BAILDOWN TEST

Data Set: G:\...\CRA-527M_BDT3_Cooper.aqt
Date: 12/22/10 Time: 16:42:12

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Well: CRA-527M
Test Date: 1/25/10

AQUIFER DATA

Saturated Thickness: 0.6 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-527M)

Initial Displacement: 0.58 ft
Total Well Penetration Depth: 0.6 ft
Casing Radius: 0.083 ft
Static Water Column Height: 0.6 ft
Screen Length: 0.6 ft
Well Radius: 0.34 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

Data Set: G:\COMMON\MLC\B0064609.2010 - Willow Run GMPT\old B086928-Willow Run Powertrain-12.2009
Title: CRA-527M Baildown Test
Date: 12/22/10
Time: 16:42:16

PROJECT INFORMATION

Company: ARCADIS
Client: MLC - Willow Run
Project: B0086928.0000.00001
Location: Ypsilanti, MI
Test Date: 1/25/10
Test Well: CRA-527M

AQUIFER DATA

Saturated Thickness: 0.6 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: CRA-527M

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.58 ft
Static Water Column Height: 0.6 ft
Casing Radius: 0.083 ft
Well Radius: 0.34 ft
Well Skin Radius: 1. ft
Screen Length: 0.6 ft
Total Well Penetration Depth: 0.6 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.083 ft
Gravel Pack Porosity: 0.3

No. of Observations: 14

Observation Data			
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.57	12.	0.3
2.	0.45	17.	0.26
3.	0.41	23.	0.23
4.	0.37	32.	0.2
5.	0.37	42.	0.17
7.	0.33	53.	0.17
9.	0.32	70.	0.14

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.001322	cm^2/sec
S	0.03344	

K = T/b = 7.228E-5 cm/sec
Ss = S/b = 0.05573 1/ft

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	0.001322	0.0006617	+/- 0.001442	1.998	cm^2/sec
S	0.03344	0.02541	+/- 0.05537	1.316	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 7.228E-5 cm/sec
Ss = S/b = 0.05573 1/ft

Parameter Correlations

	T	S
T	1.00	-0.98
S	-0.98	1.00

Residual Statistics

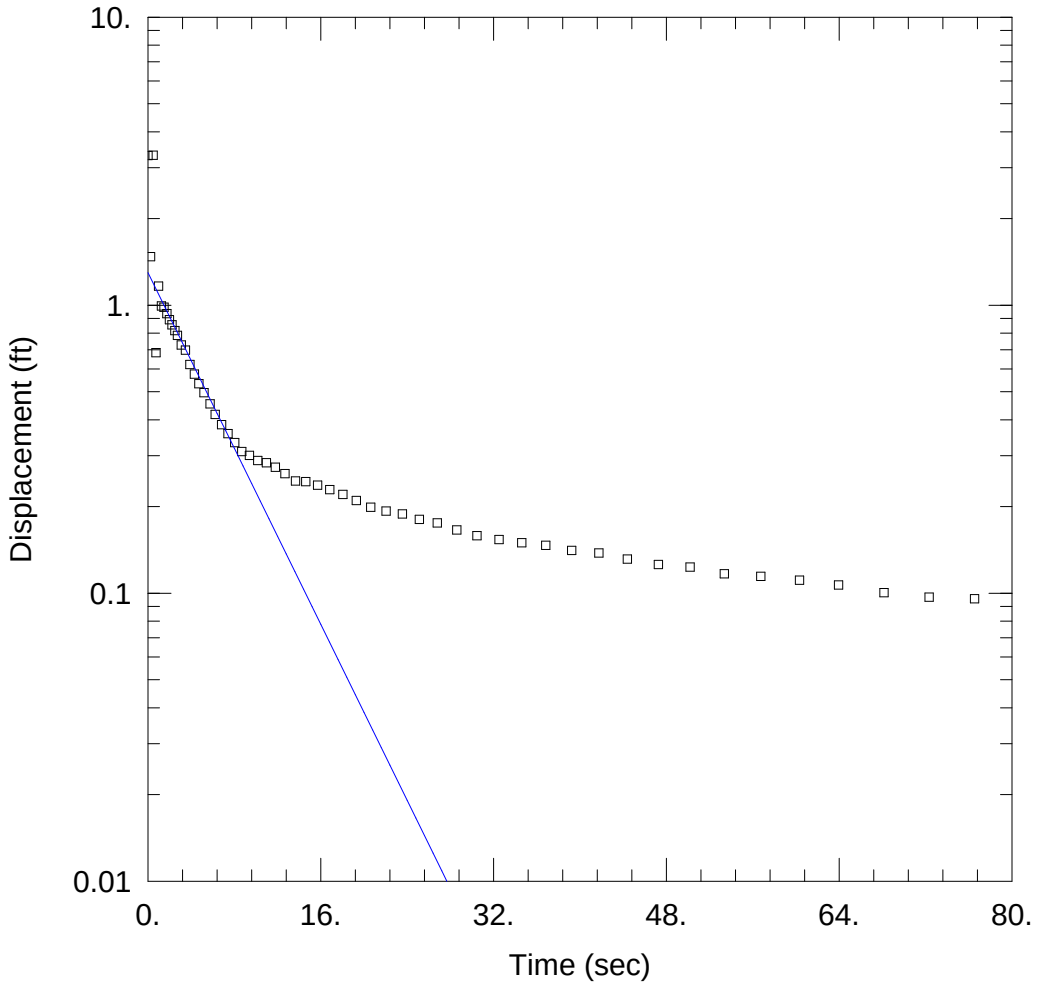
for weighted residuals

Sum of Squares . . . 0.01004 ft^2
Variance . . . . . 0.0008363 ft^2
Std. Deviation . . . . . 0.02892 ft
Mean . . . . . 0.002979 ft
No. of Residuals . . . 14
No. of Estimates . . . 2

ARCADIS

Appendix F

Slug Tests



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-71M
Test Date: 1-22-10

AQUIFER DATA

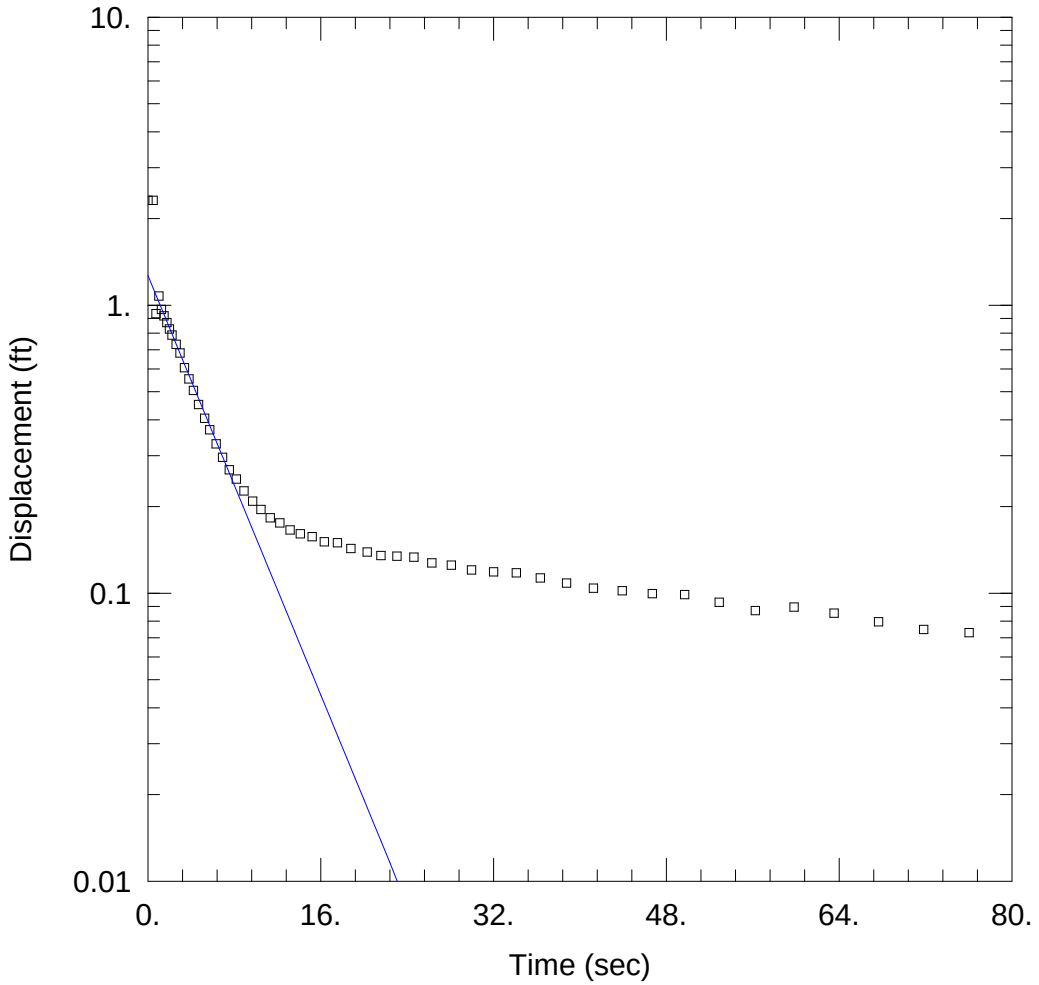
Saturated Thickness: 3.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-71M)

Initial Displacement: 3.31 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01432 cm/sec
y0 = 1.297 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-71M
Test Date: 1-22-10

AQUIFER DATA

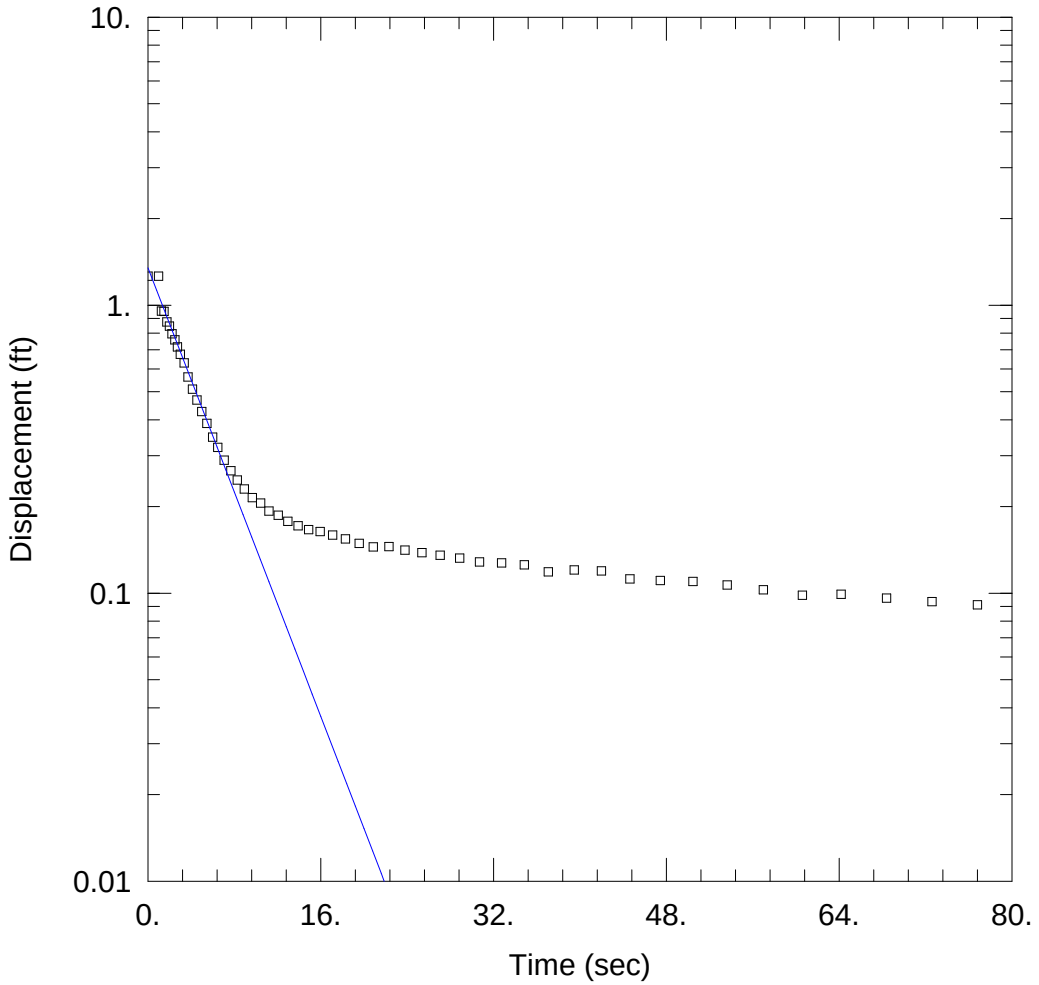
Saturated Thickness: 3.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-71M)

Initial Displacement: 2.31 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01706 cm/sec
y0 = 1.266 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-71M
Test Date: 1-22-10

AQUIFER DATA

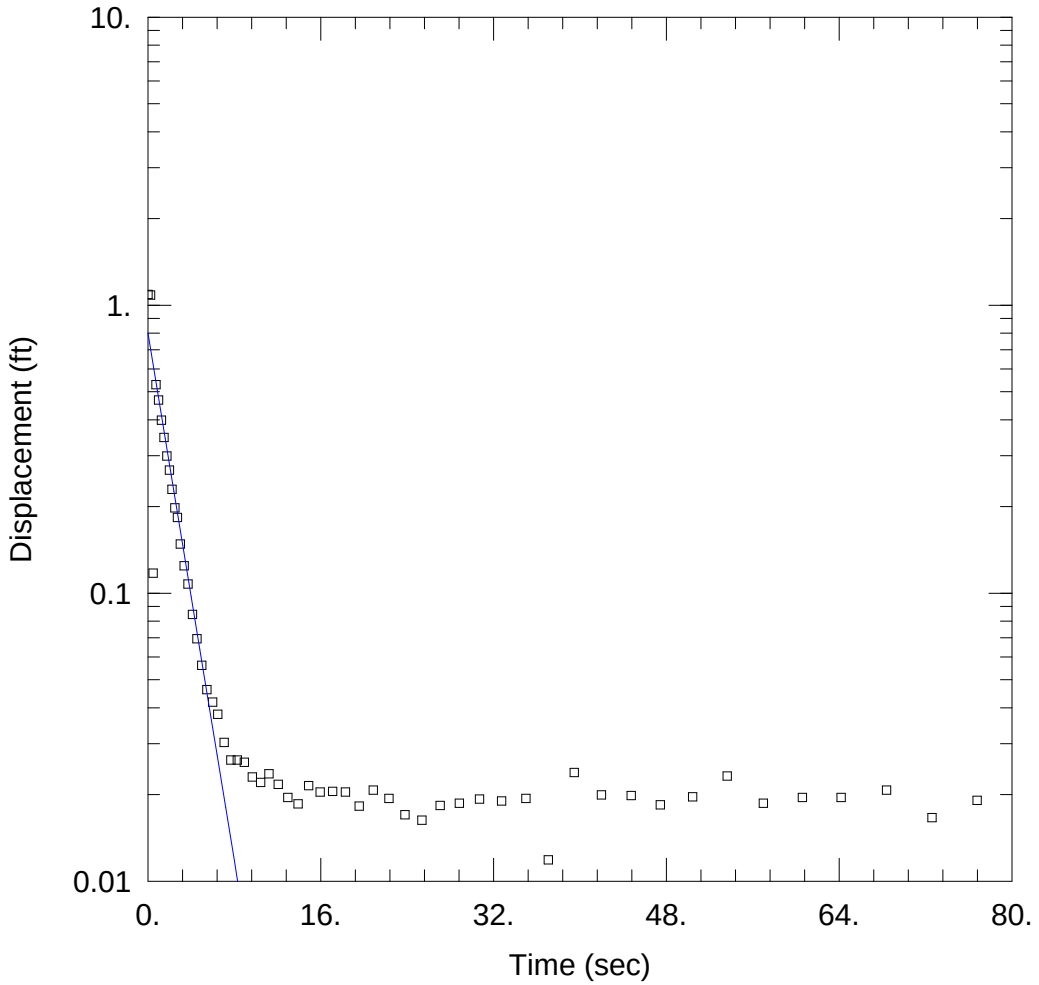
Saturated Thickness: 3.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-71M)

Initial Displacement: 1.26 ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01826 cm/sec
y0 = 1.348 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-73M
Test Date: 1-21-10

AQUIFER DATA

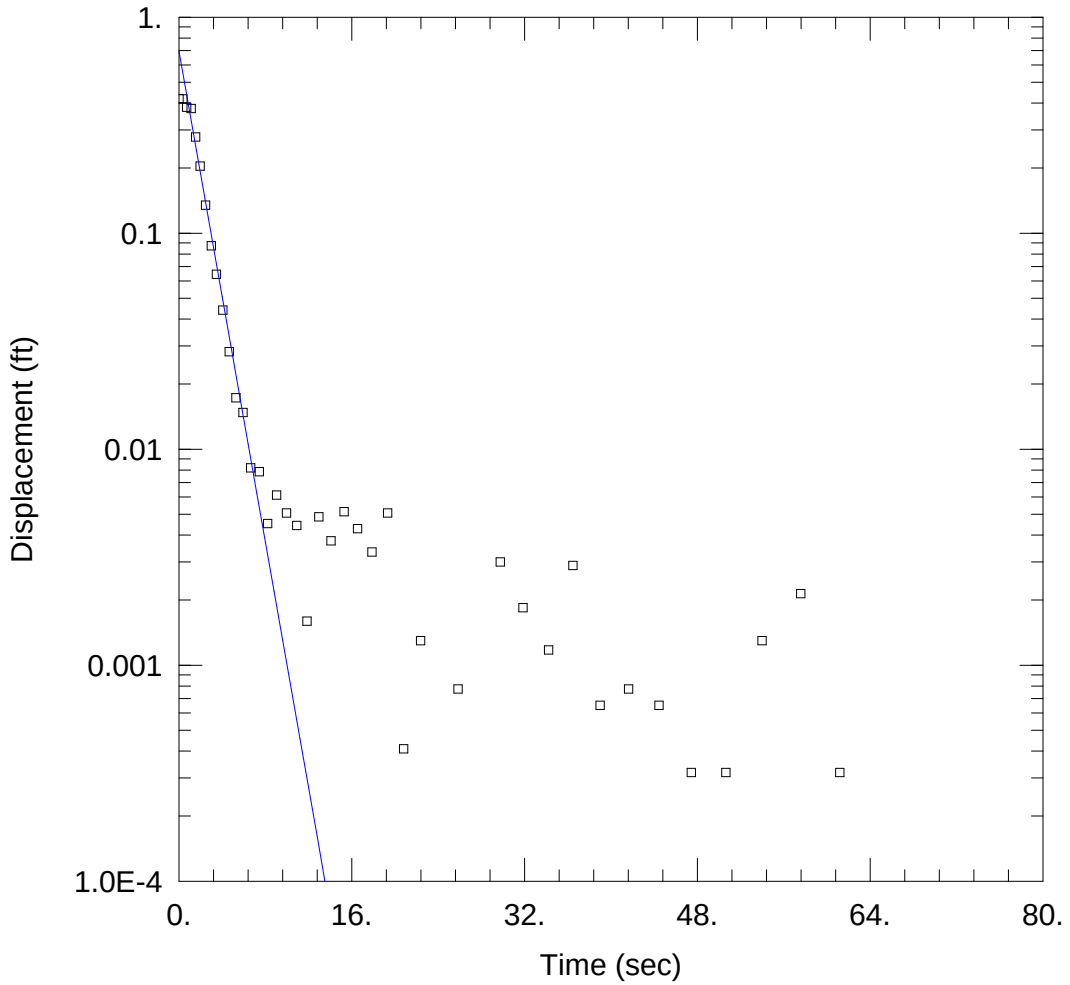
Saturated Thickness: 3.61 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-73M)

Initial Displacement: 1.09 ft
Total Well Penetration Depth: 3.61 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.61 ft
Screen Length: 2.7 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.05814 cm/sec
y0 = 0.799 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-73M
Test Date: 1-21-10

AQUIFER DATA

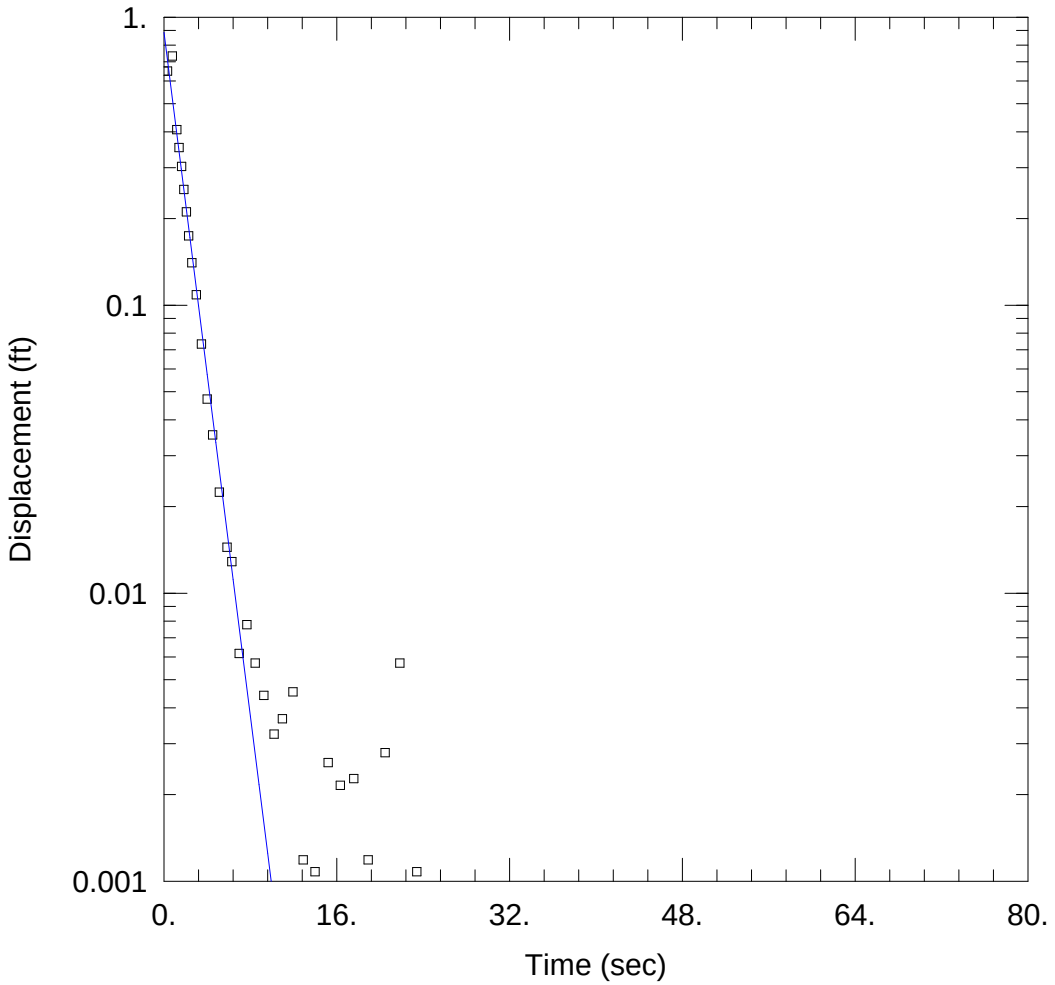
Saturated Thickness: 3.61 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-73M)

Initial Displacement: 0.42 ft
Total Well Penetration Depth: 3.61 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.61 ft
Screen Length: 2.7 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
K = 0.07217 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.6954 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-73M
Test Date: 1-21-10

AQUIFER DATA

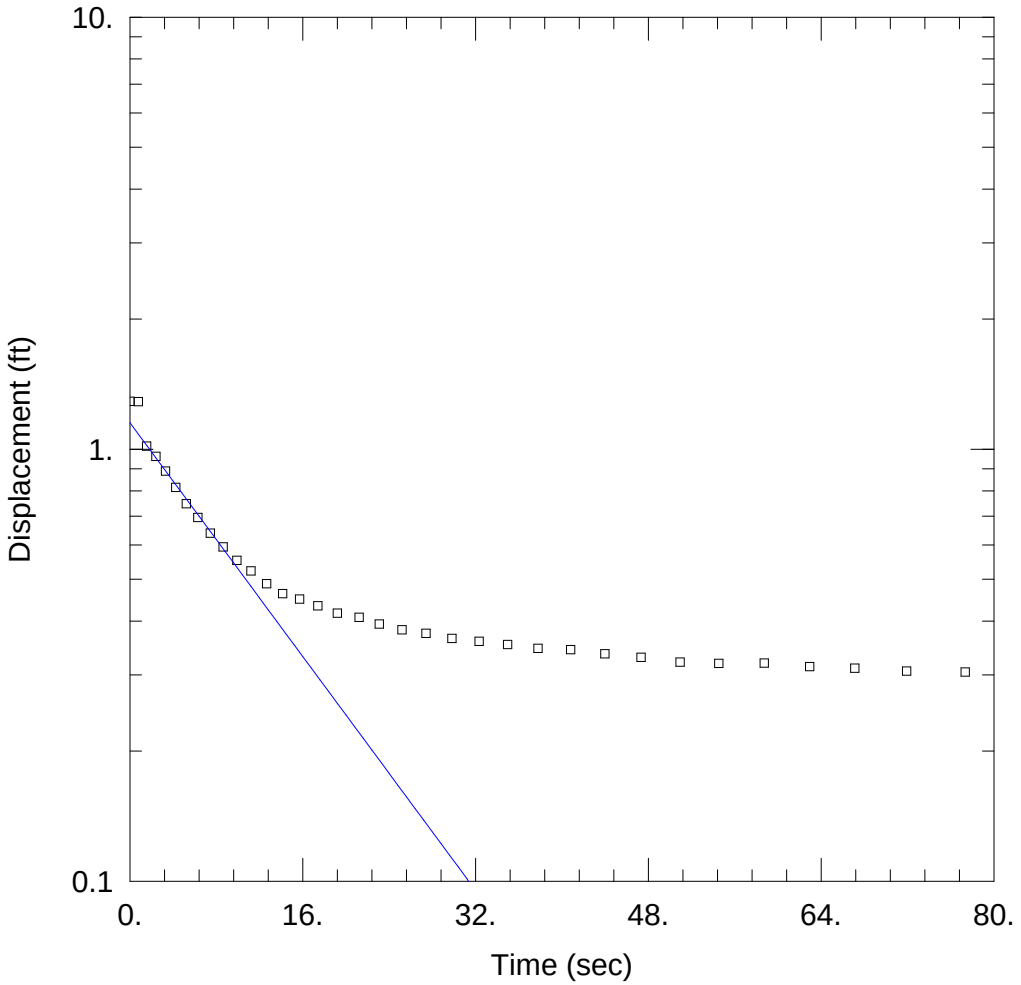
Saturated Thickness: 3.61 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-73M)

Initial Displacement: 0.65 ft
Total Well Penetration Depth: 3.61 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.61 ft
Screen Length: 2.7 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.07542 cm/sec
y0 = 0.8858 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-74M
Test Date: 1-22-10

AQUIFER DATA

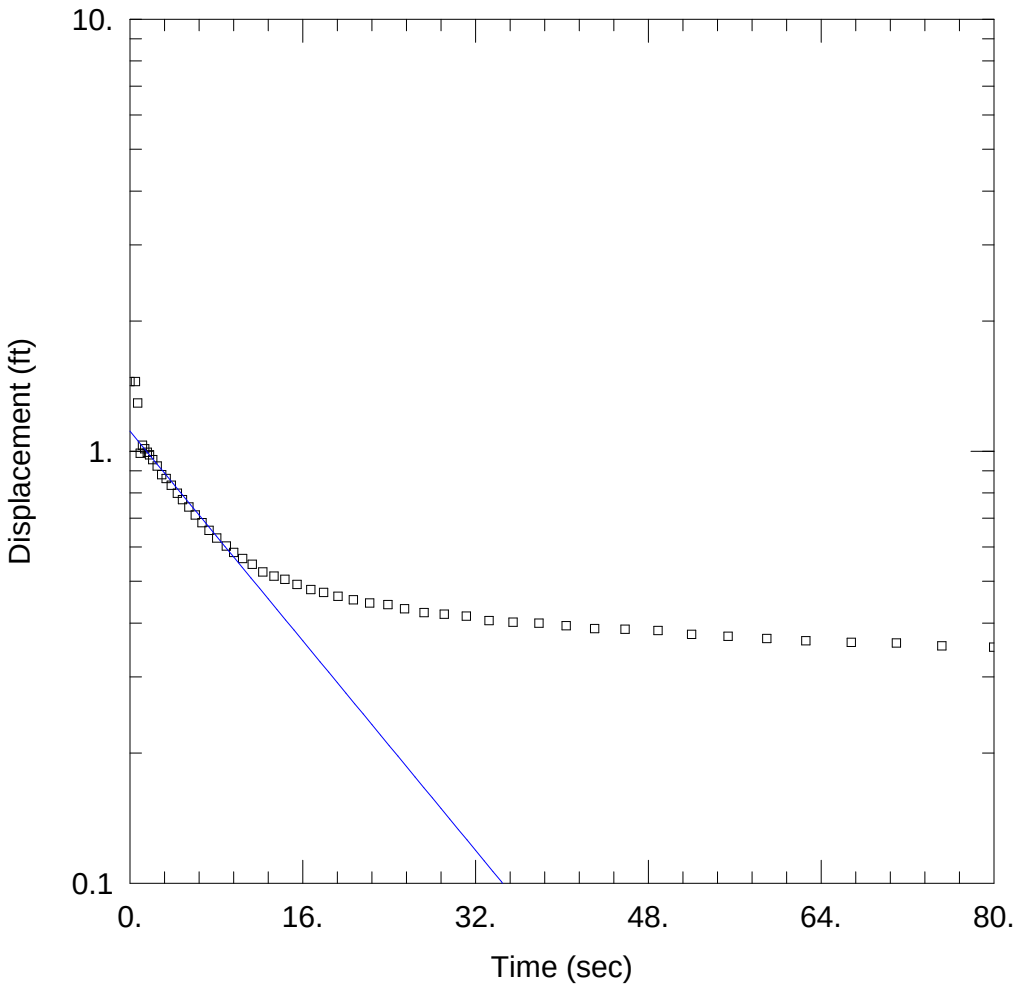
Saturated Thickness: 3.56 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-74M)

Initial Displacement: 1.29 ft
Total Well Penetration Depth: 2.96 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.96 ft
Screen Length: 2.96 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006864 cm/sec
y0 = 1.151 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-74M
Test Date: 1-22-10

AQUIFER DATA

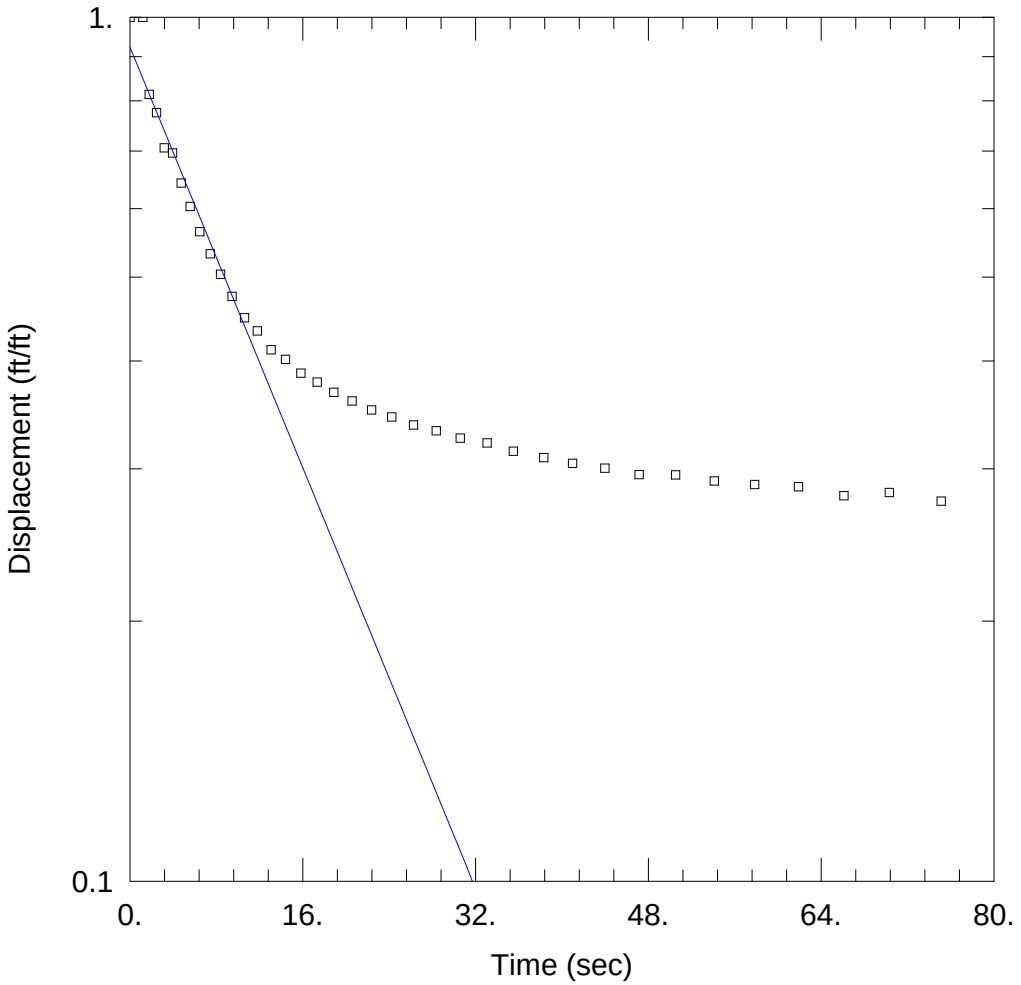
Saturated Thickness: 3.56 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-74M)

Initial Displacement: 1.45 ft
Total Well Penetration Depth: 2.96 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.96 ft
Screen Length: 2.96 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006152 cm/sec
y0 = 1.112 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: GM - Kokomo, IN
Project: IN000743.02.02
Location: Kokomo, IN
Test Well: Well No. 1 (99-2)
Test Date: 1999

AQUIFER DATA

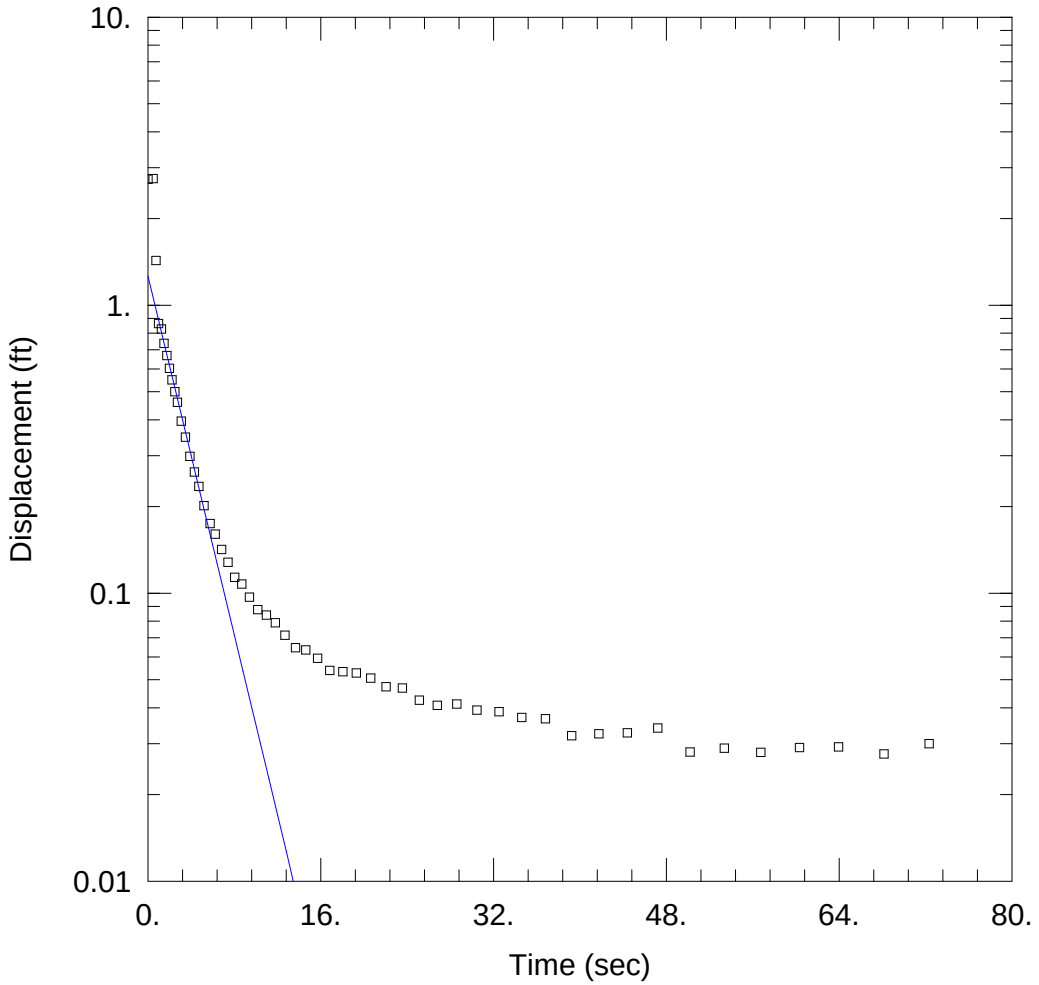
Saturated Thickness: 3.56 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-74M S3)

Initial Displacement: 1.173 ft
Total Well Penetration Depth: 2.96 ft
Casing Radius: 0.083 ft
Static Water Column Height: 2.96 ft
Screen Length: 2.96 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006128 cm/sec
y0 = 1.083 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-82M
Test Date: 1-21-10

AQUIFER DATA

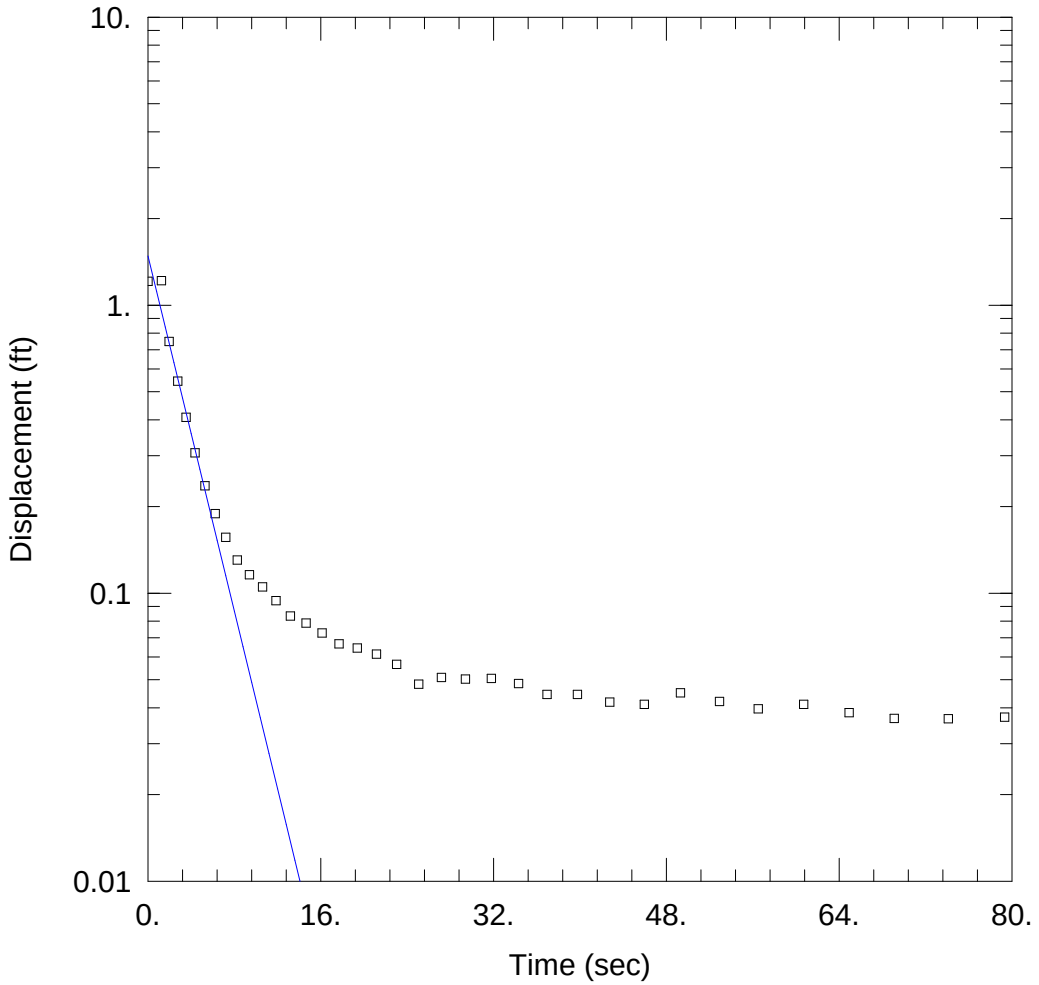
Saturated Thickness: 4.23 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-82M)

Initial Displacement: 2.74 ft
Total Well Penetration Depth: 3.93 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 4.23 ft
Screen Length: 3.93 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0267 cm/sec
y0 = 1.26 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-82M
Test Date: 1-21-10

AQUIFER DATA

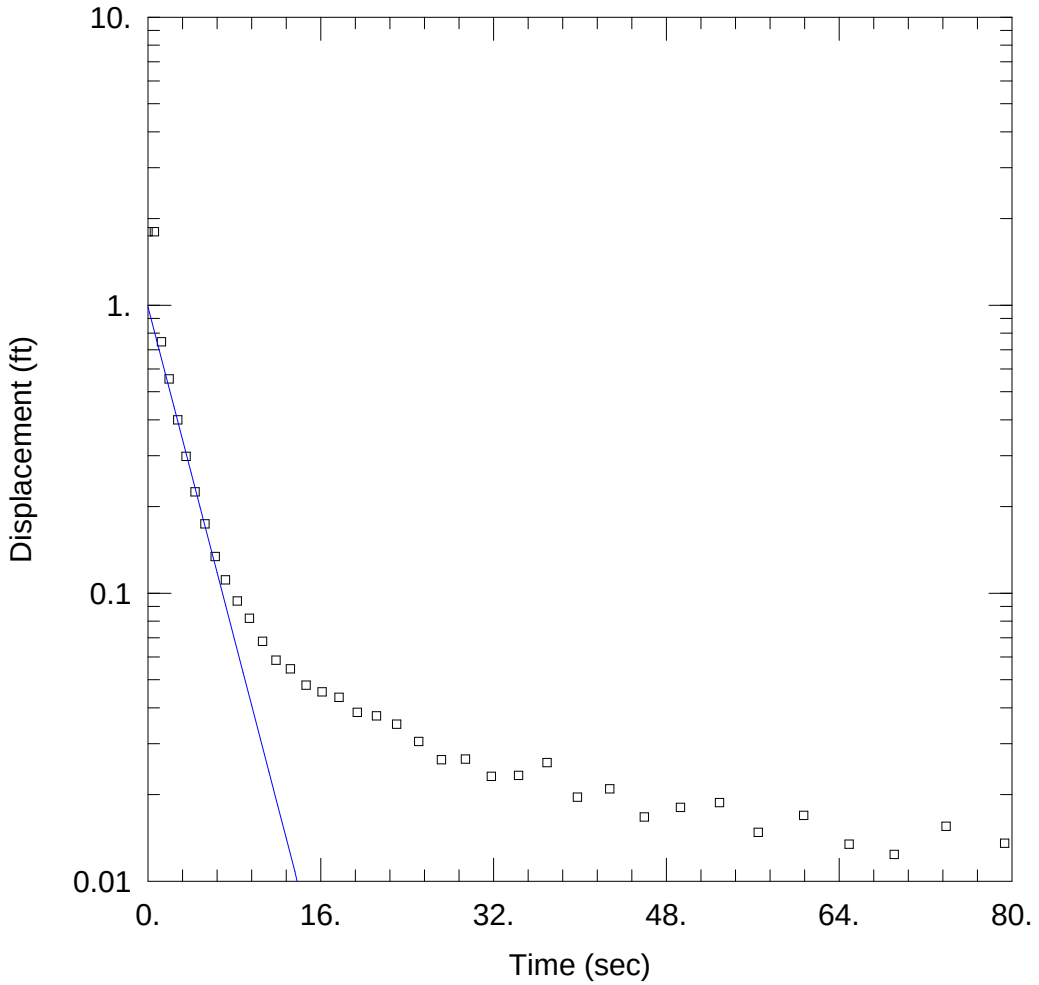
Saturated Thickness: 4.23 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-82M)

Initial Displacement: 1.21 ft
Total Well Penetration Depth: 3.93 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 4.23 ft
Screen Length: 3.93 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02641 cm/sec
y0 = 1.48 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-82M
Test Date: 1-21-10

AQUIFER DATA

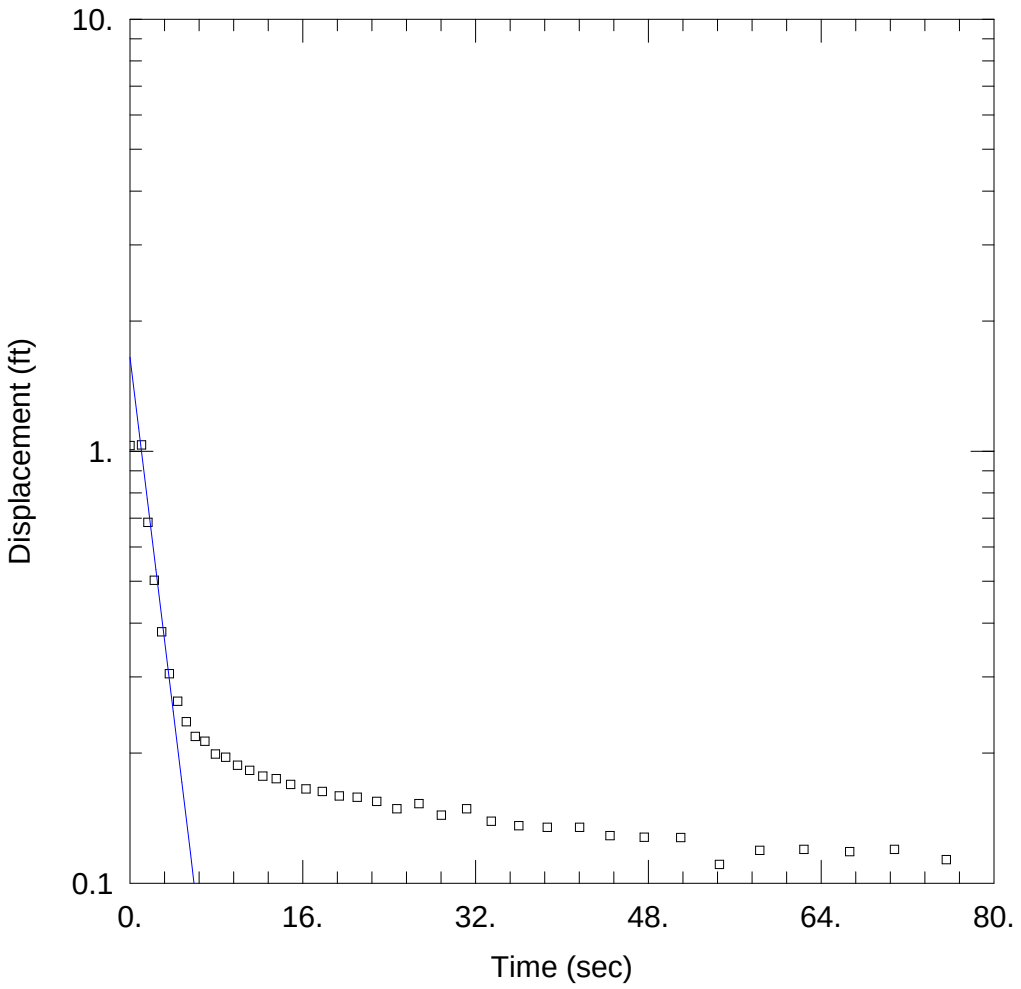
Saturated Thickness: 4.23 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-82M)

Initial Displacement: 1.8 ft
Total Well Penetration Depth: 3.56 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 4.23 ft
Screen Length: 3.56 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0258 cm/sec
y0 = 0.9855 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-90M
Test Date: 1-21-10

AQUIFER DATA

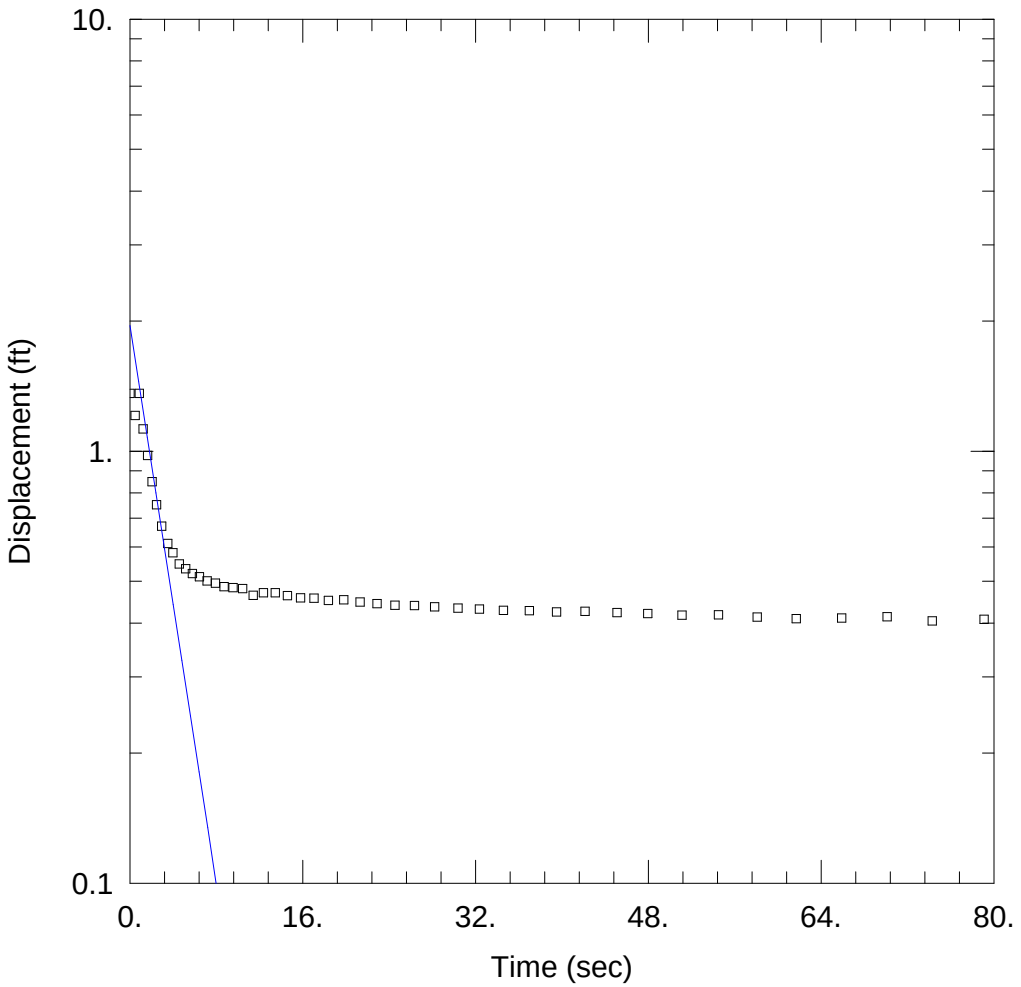
Saturated Thickness: 4.45 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-90M)

Initial Displacement: 1.03 ft
Total Well Penetration Depth: 3.95 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.95 ft
Screen Length: 3.95 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.03447 cm/sec
y0 = 1.649 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-90M
Test Date: 1-21-10

AQUIFER DATA

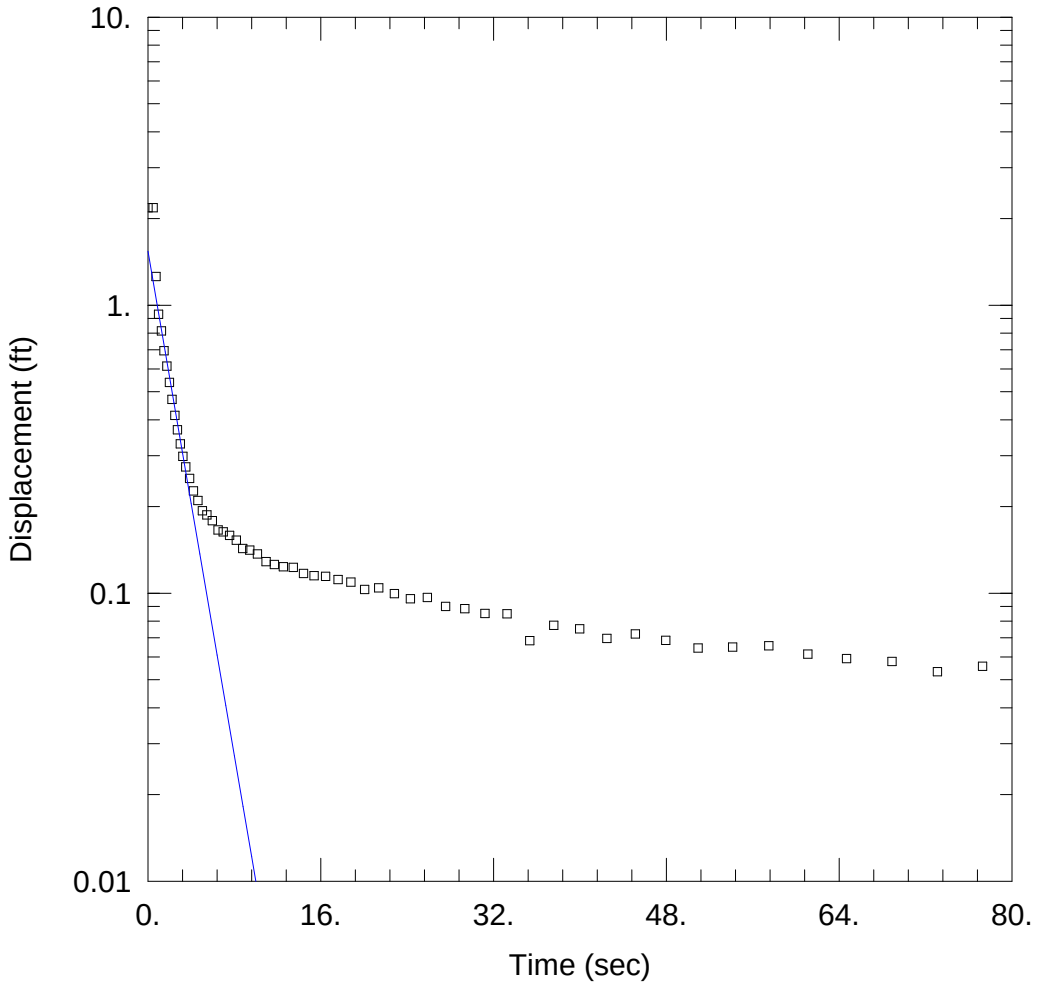
Saturated Thickness: 4.45 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-90M)

Initial Displacement: 1.36 ft
Total Well Penetration Depth: 3.95 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.95 ft
Screen Length: 3.95 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.02715 cm/sec
y0 = 1.952 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-90M
Test Date: 1-21-10

AQUIFER DATA

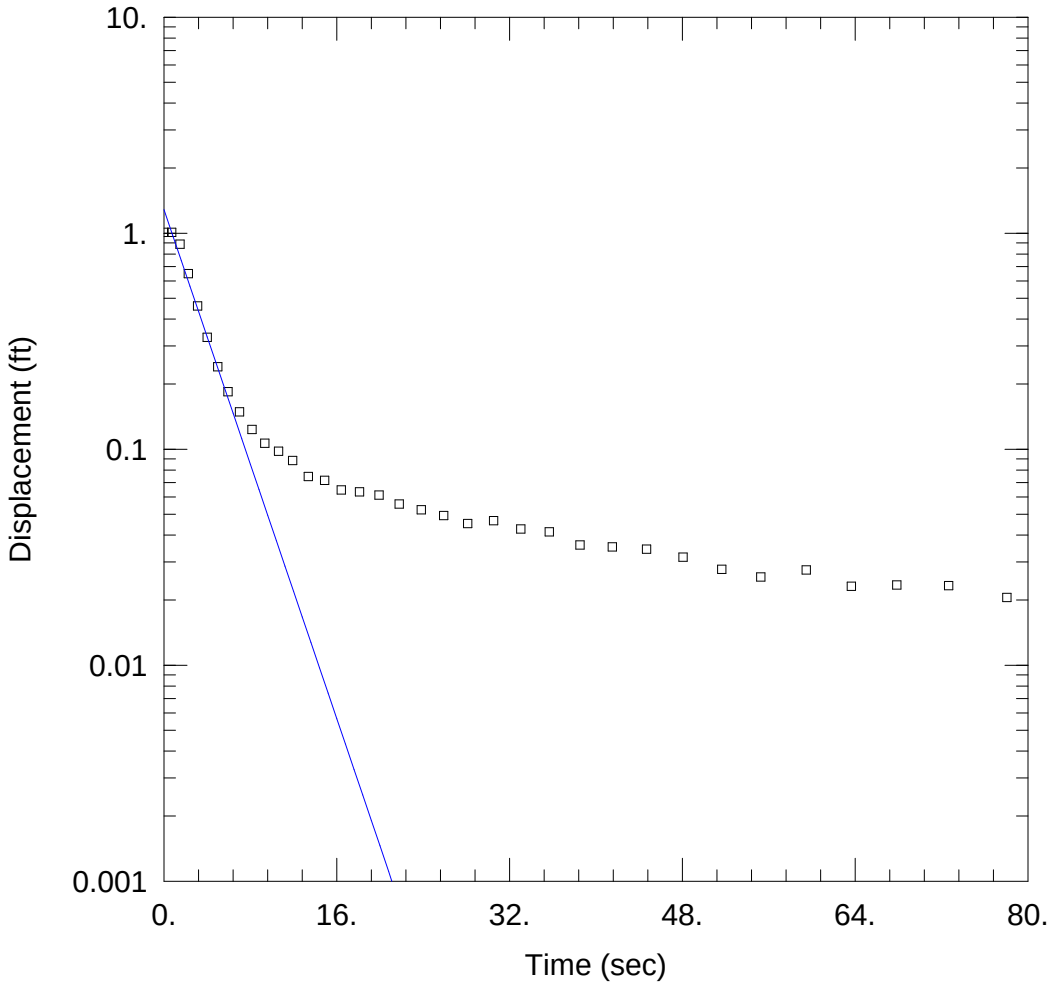
Saturated Thickness: 4.45 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-90M)

Initial Displacement: 2.18 ft
Total Well Penetration Depth: 3.95 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.95 ft
Screen Length: 3.95 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.03685 cm/sec
y0 = 1.539 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-94M
Test Date: 1-21-10

AQUIFER DATA

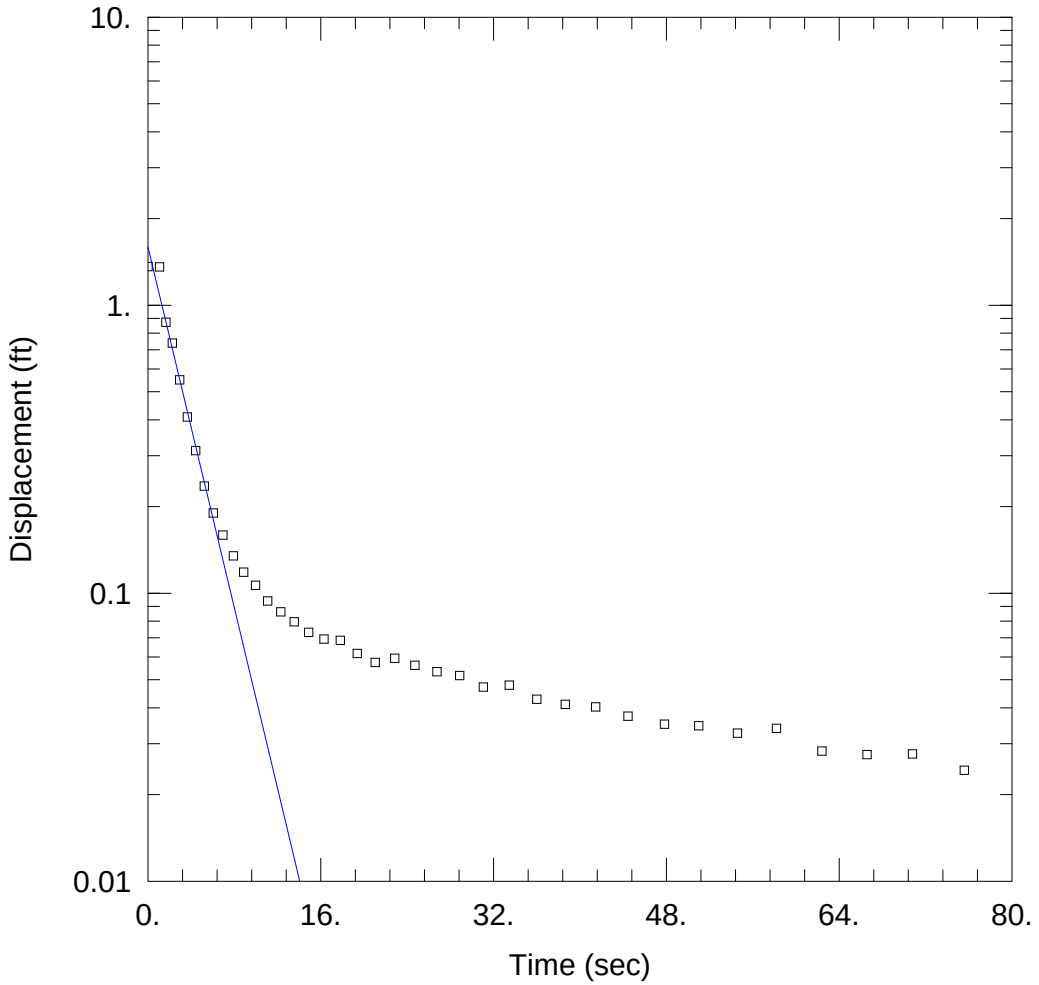
Saturated Thickness: 4.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-94M)

Initial Displacement: 1.01 ft
Total Well Penetration Depth: 3.91 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.91 ft
Screen Length: 3.91 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02444 cm/sec
y0 = 1.283 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-94M
Test Date: 1-21-10

AQUIFER DATA

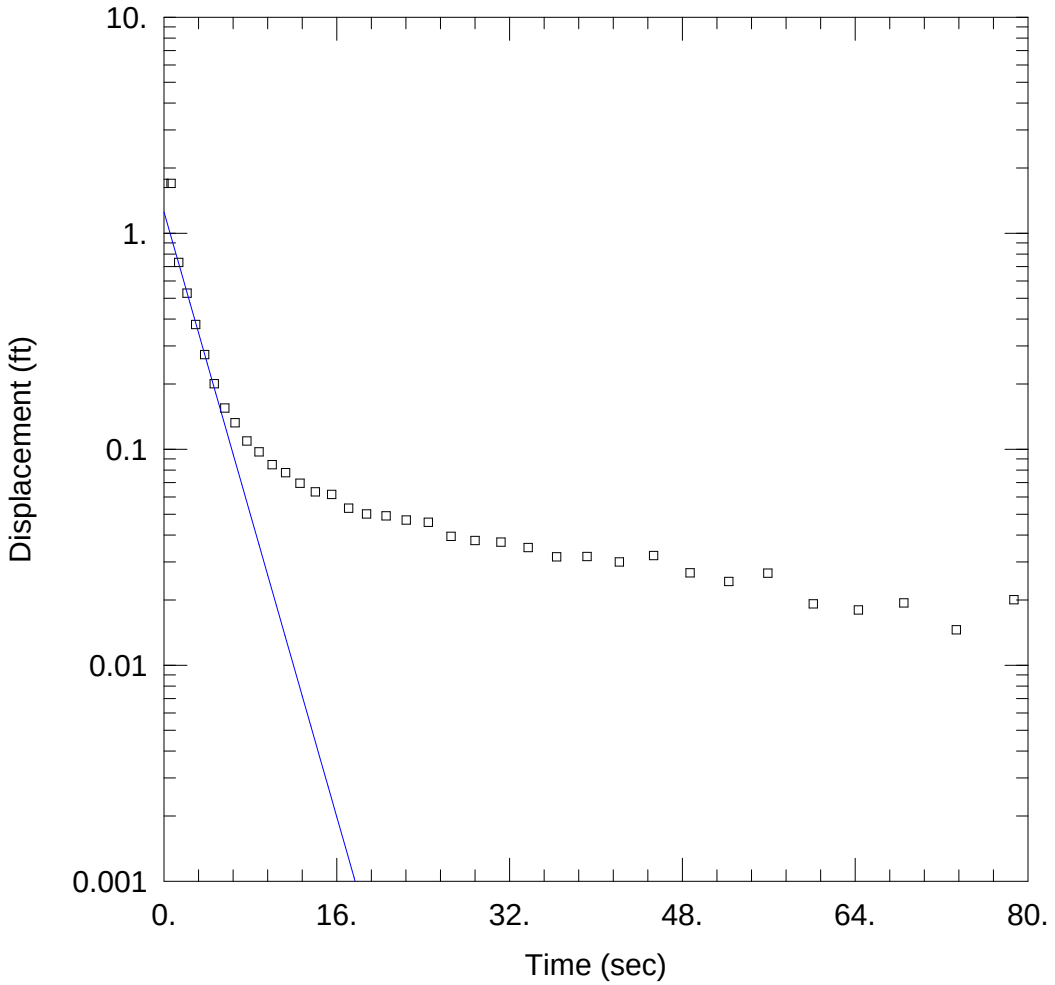
Saturated Thickness: 4.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-94M)

Initial Displacement: 1.36 ft
Total Well Penetration Depth: 3.91 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.91 ft
Screen Length: 3.91 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02601 cm/sec
y0 = 1.592 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-94M
Test Date: 1-21-10

AQUIFER DATA

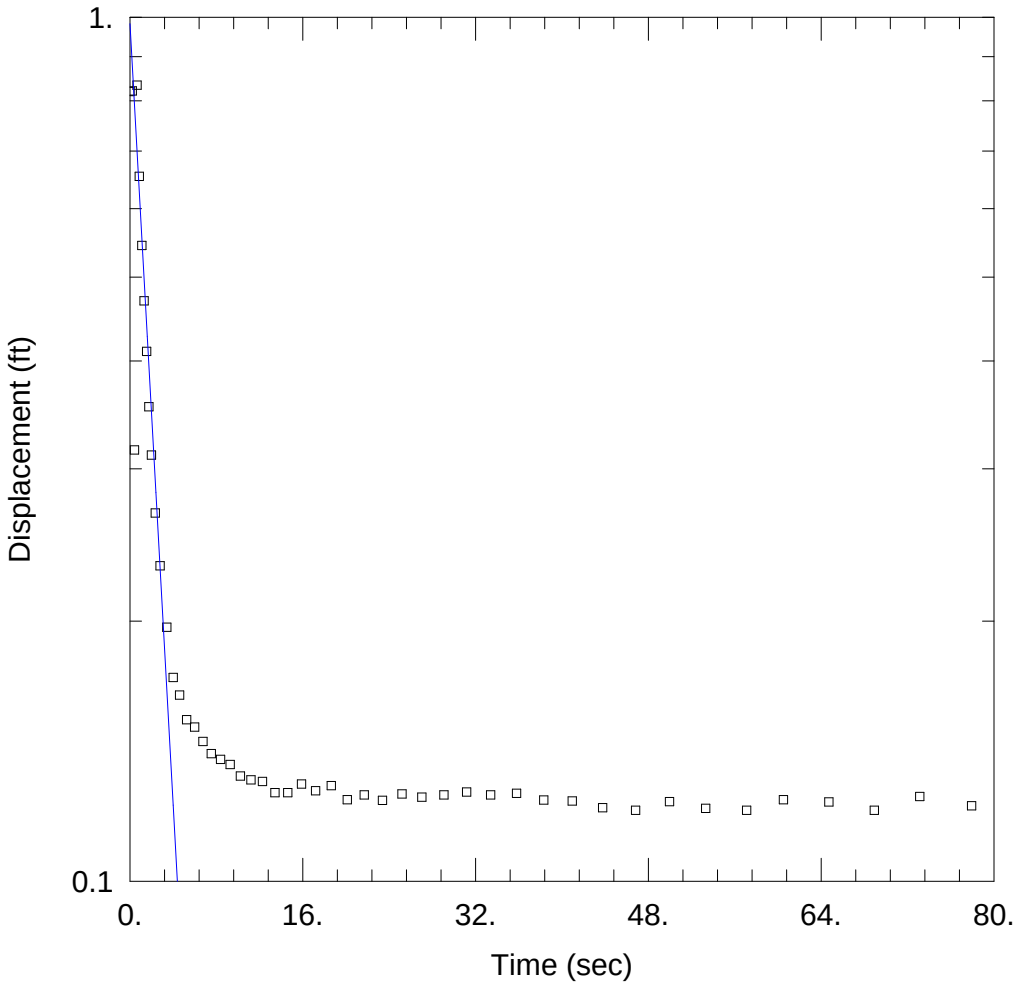
Saturated Thickness: 4.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-94M)

Initial Displacement: 1.7 ft
Total Well Penetration Depth: 3.91 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.91 ft
Screen Length: 3.91 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02905 cm/sec
y0 = 1.253 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-104M
Test Date: 1-21-10

AQUIFER DATA

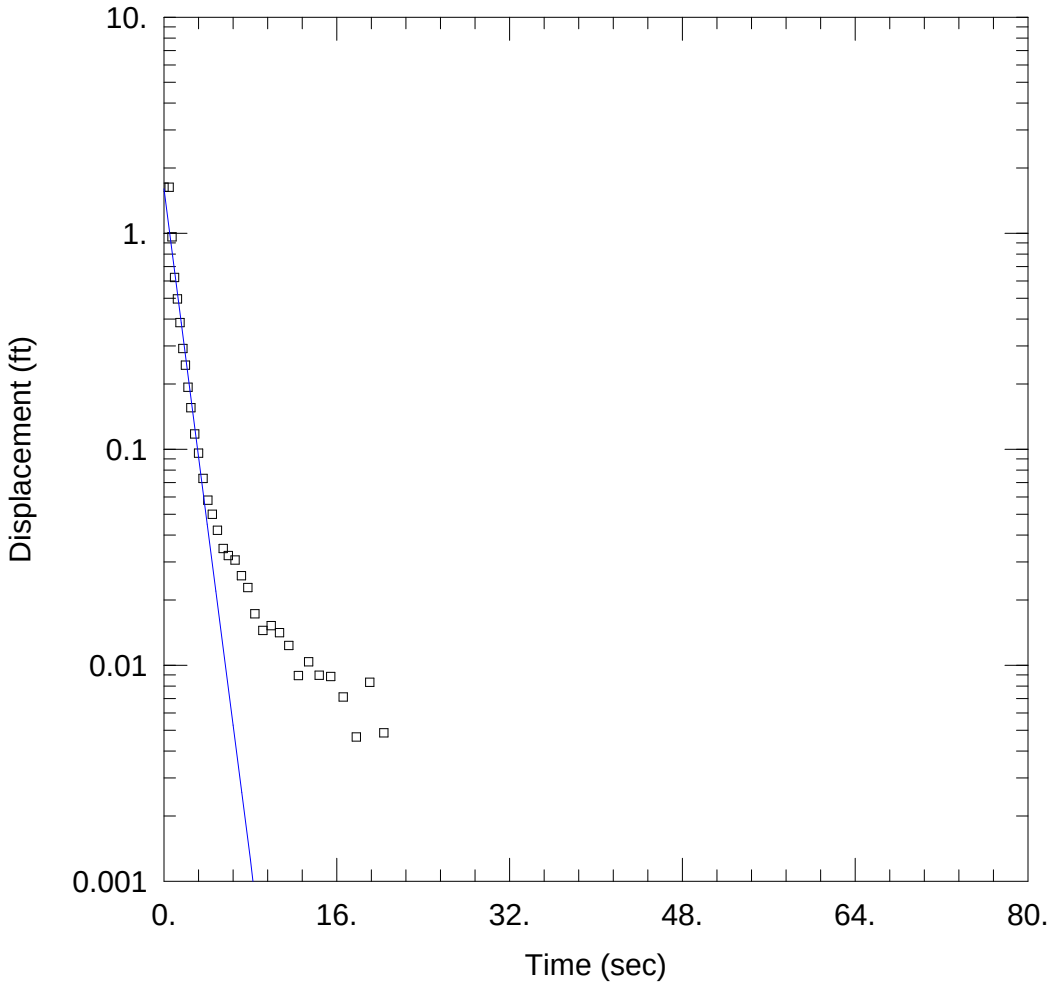
Saturated Thickness: 3.54 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-104M)

Initial Displacement: 0.82 ft
Total Well Penetration Depth: 2.99 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.99 ft
Screen Length: 2.99 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.04569 cm/sec
y0 = 0.9828 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-104M
Test Date: 1-21-10

AQUIFER DATA

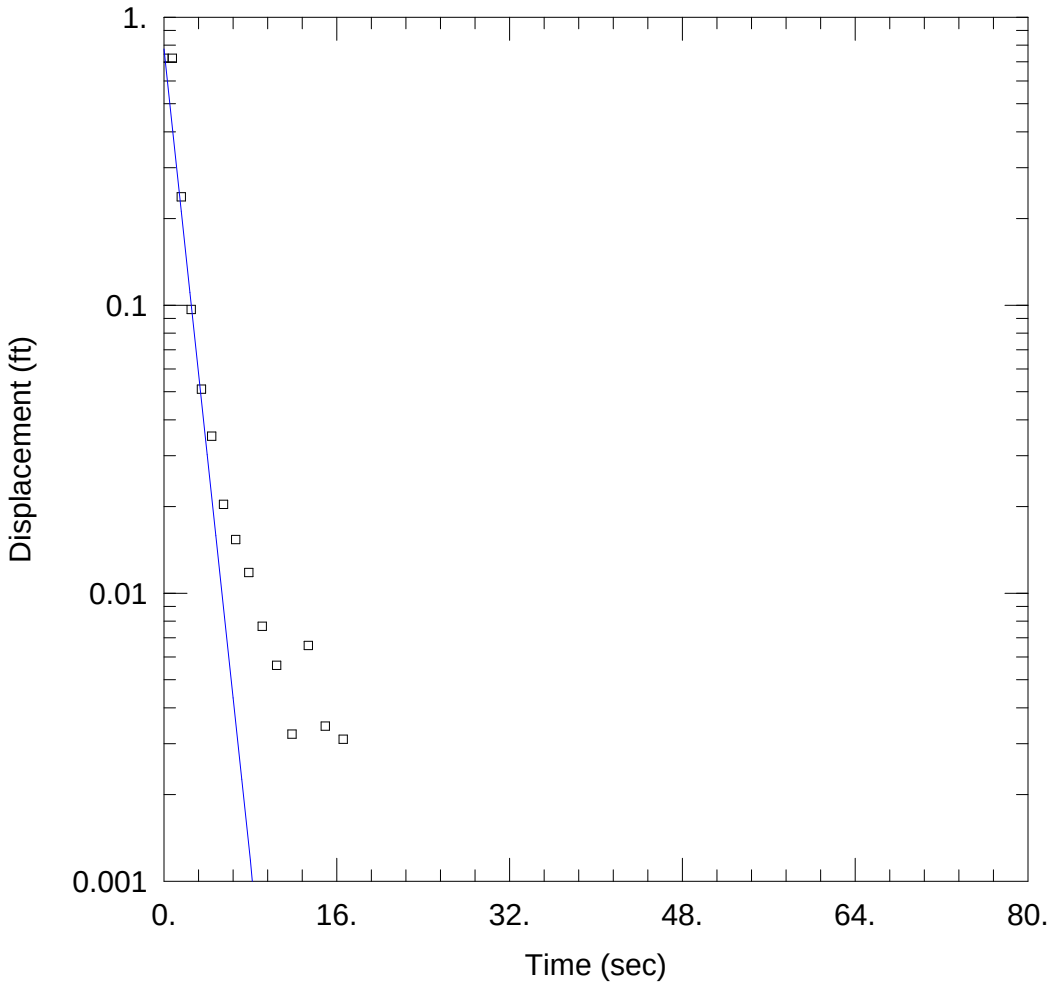
Saturated Thickness: 3.54 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-104M)

Initial Displacement: 1.63 ft
Total Well Penetration Depth: 2.99 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.99 ft
Screen Length: 2.99 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0784 cm/sec
y0 = 1.602 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-104M
Test Date: 1-21-10

AQUIFER DATA

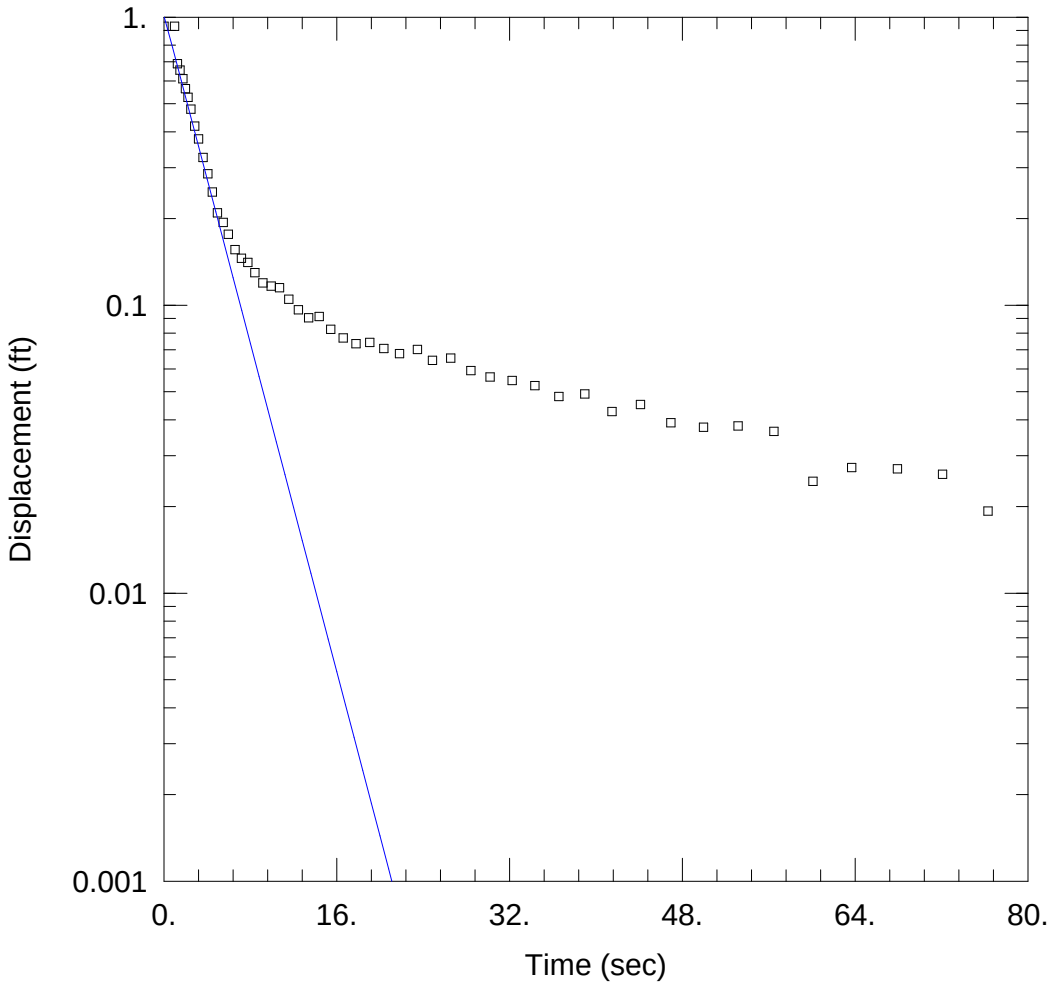
Saturated Thickness: 3.54 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-104M)

Initial Displacement: 0.72 ft
Total Well Penetration Depth: 2.99 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.99 ft
Screen Length: 2.99 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.07124 cm/sec
y0 = 0.7747 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-105M
Test Date: 1-21-10

AQUIFER DATA

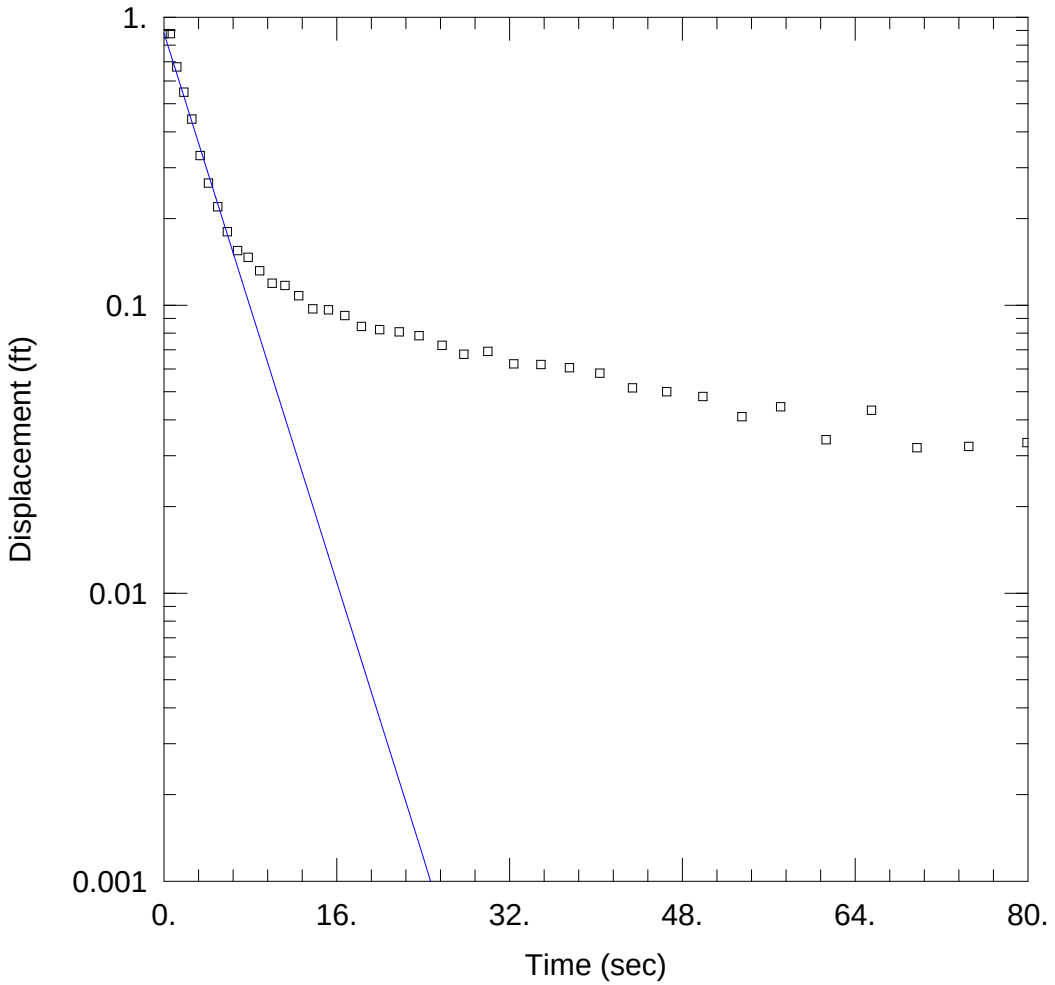
Saturated Thickness: 3.44 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-105M)

Initial Displacement: 0.93 ft
Total Well Penetration Depth: 3.09 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.09 ft
Screen Length: 3.09 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02857 cm/sec
y0 = 1.017 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-105M
Test Date: 1-21-10

AQUIFER DATA

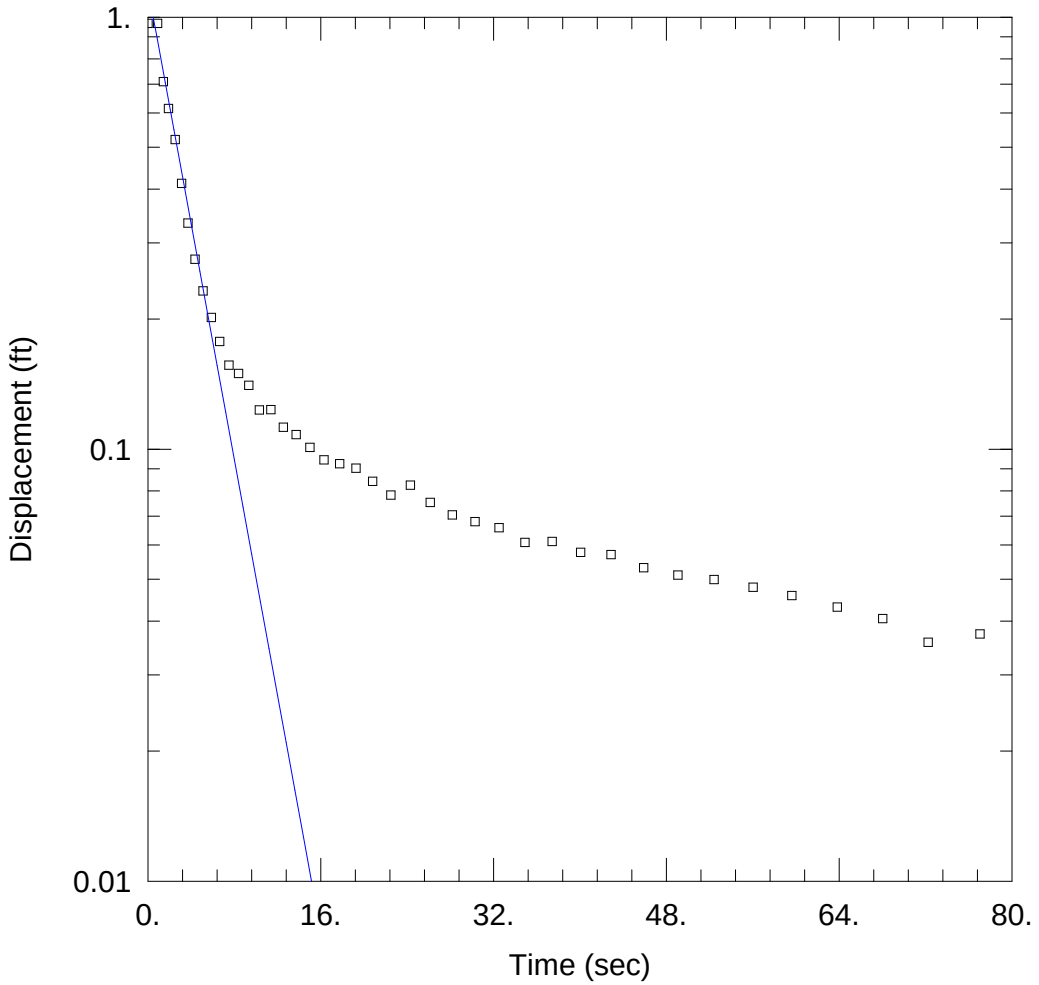
Saturated Thickness: 3.44 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-105M)

Initial Displacement: 0.876 ft
Total Well Penetration Depth: 3.09 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.09 ft
Screen Length: 3.09 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02392 cm/sec
y0 = 0.8799 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-105M
Test Date: 1-21-10

AQUIFER DATA

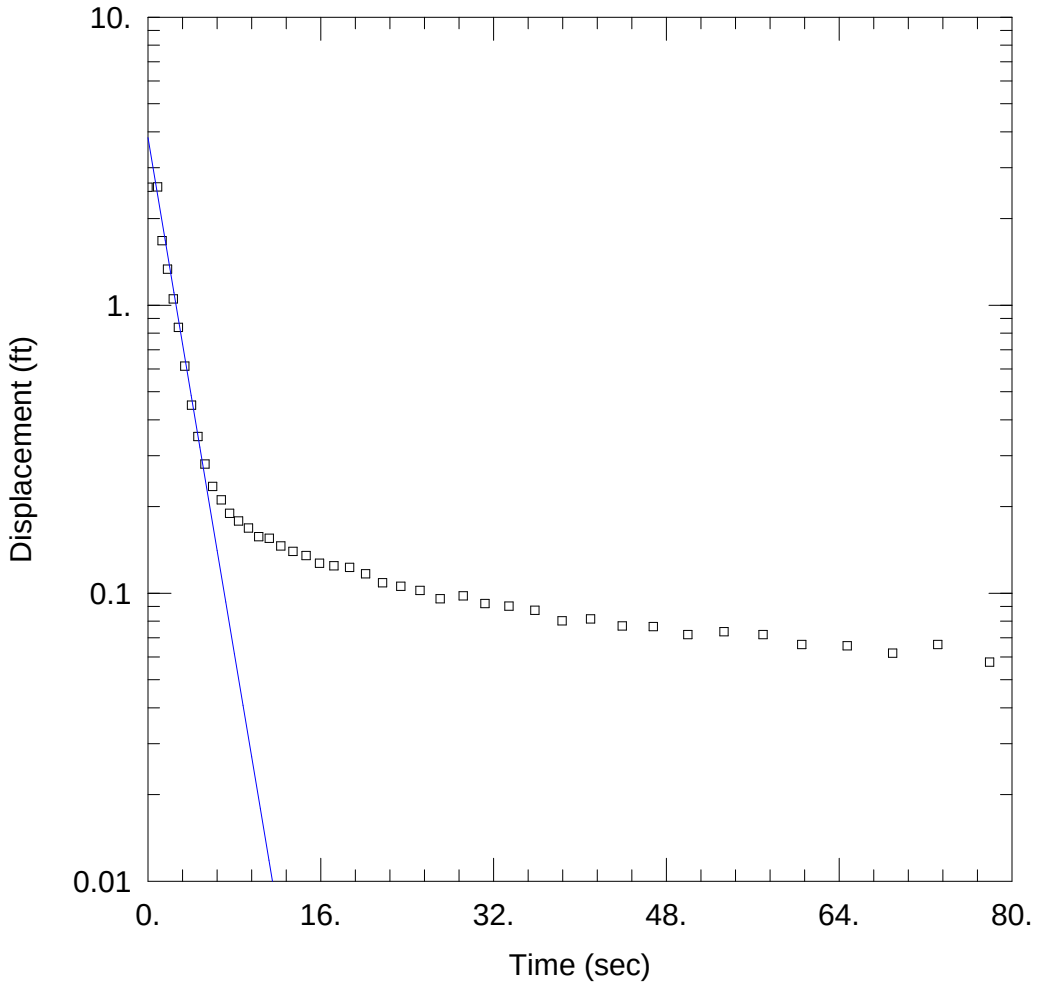
Saturated Thickness: 3.44 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-105M)

Initial Displacement: 0.967 ft
Total Well Penetration Depth: 3.09 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.09 ft
Screen Length: 3.09 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02736 cm/sec
y0 = 1.167 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-110M
Test Date: 1-21-10

AQUIFER DATA

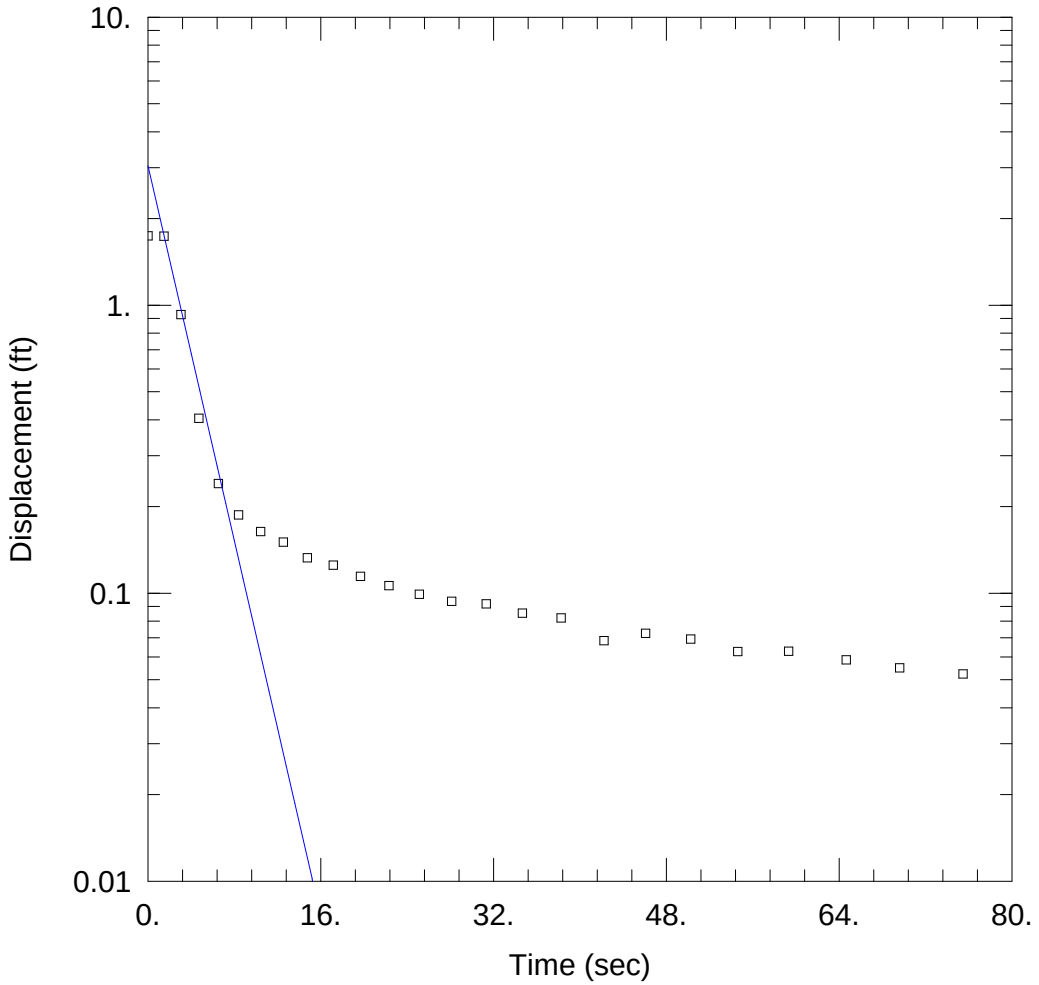
Saturated Thickness: 5.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-110M)

Initial Displacement: 2.57 ft
Total Well Penetration Depth: 5.96 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 5.96 ft
Screen Length: 5.96 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.03003 cm/sec
y0 = 3.817 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-110M
Test Date: 1-21-10

AQUIFER DATA

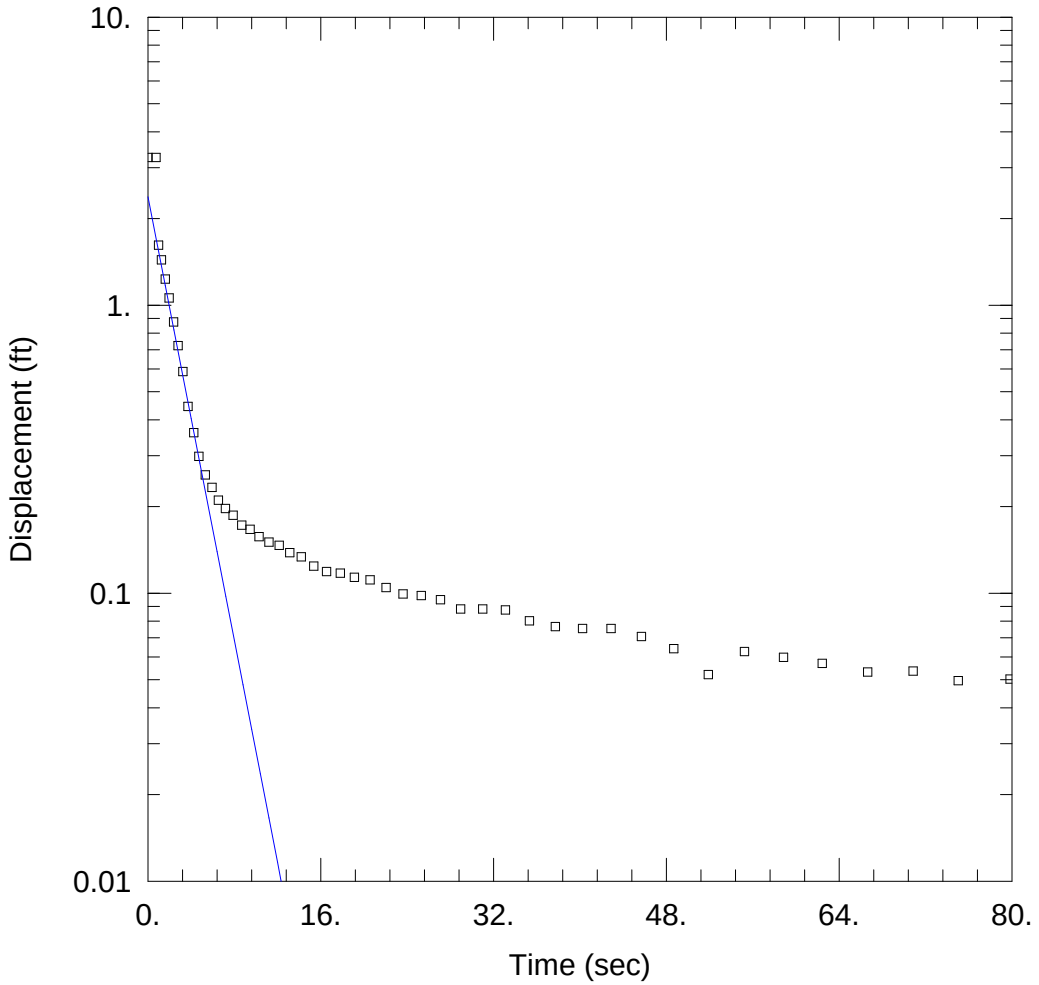
Saturated Thickness: 5.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-110M)

Initial Displacement: 1.74 ft
Total Well Penetration Depth: 5.96 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 5.96 ft
Screen Length: 5.96 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02181 cm/sec
y0 = 3.046 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-110M
Test Date: 1-21-10

AQUIFER DATA

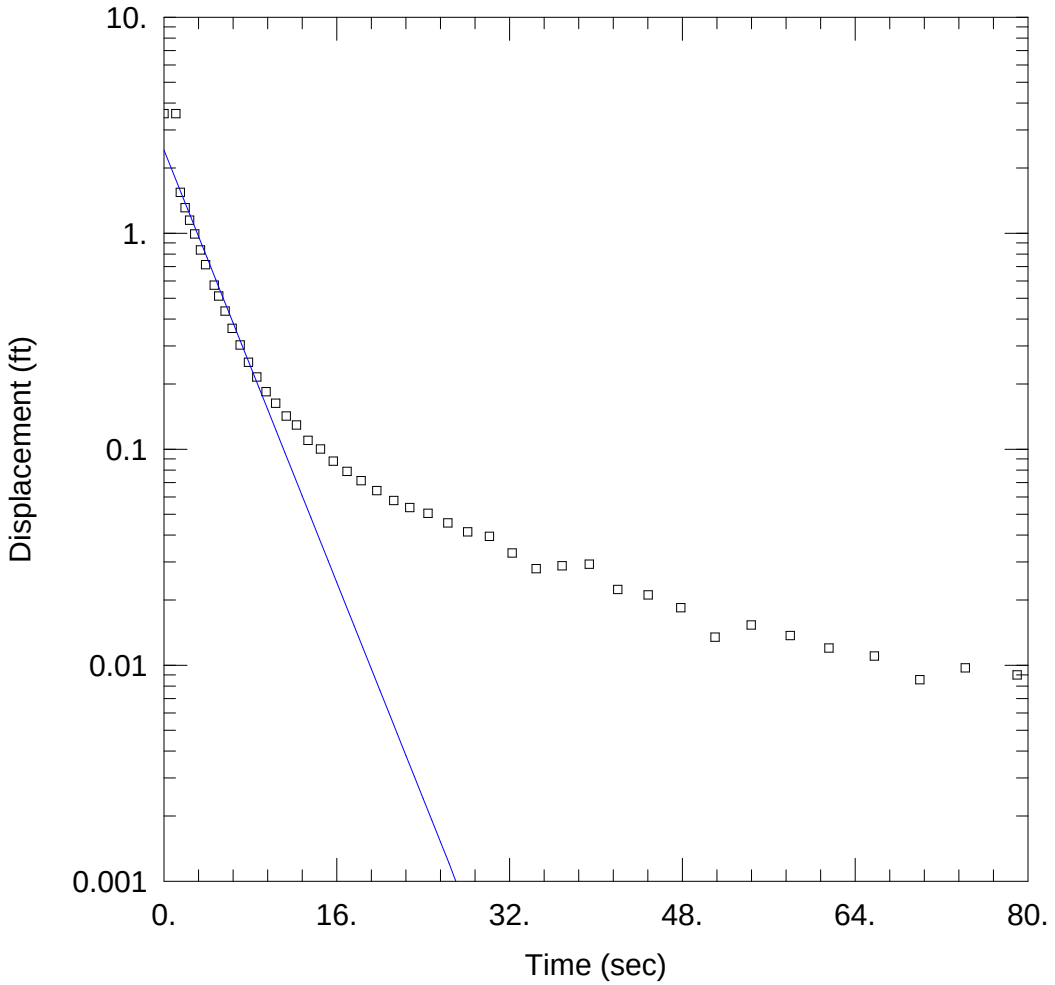
Saturated Thickness: 5.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-110M)

Initial Displacement: 3.26 ft
Total Well Penetration Depth: 5.96 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 5.96 ft
Screen Length: 5.96 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.02579 cm/sec
y0 = 2.376 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-124M
Test Date: 1-21-10

AQUIFER DATA

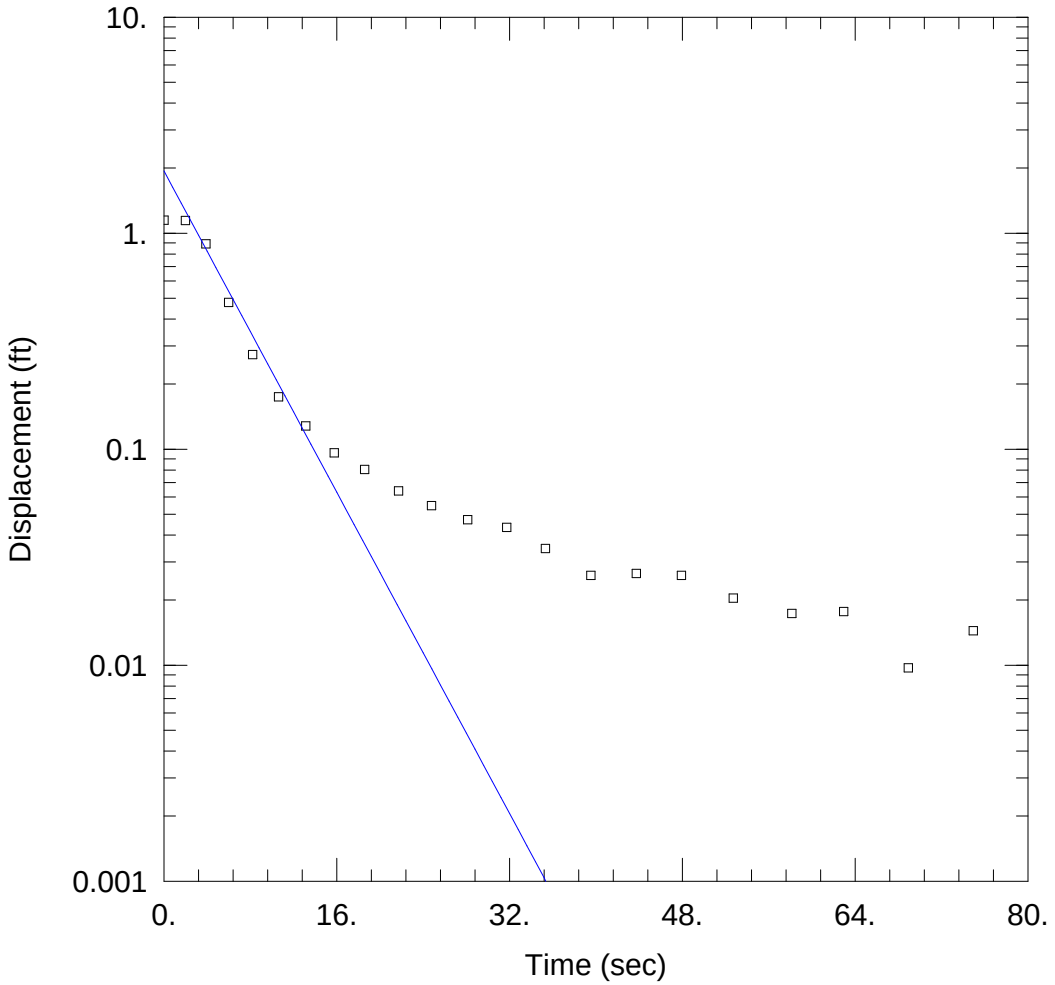
Saturated Thickness: 6.46 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-124M)

Initial Displacement: 3.58 ft
Total Well Penetration Depth: 6.46 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.46 ft
Screen Length: 6.46 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01577 cm/sec
y0 = 2.427 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-124M
Test Date: 1-21-10

AQUIFER DATA

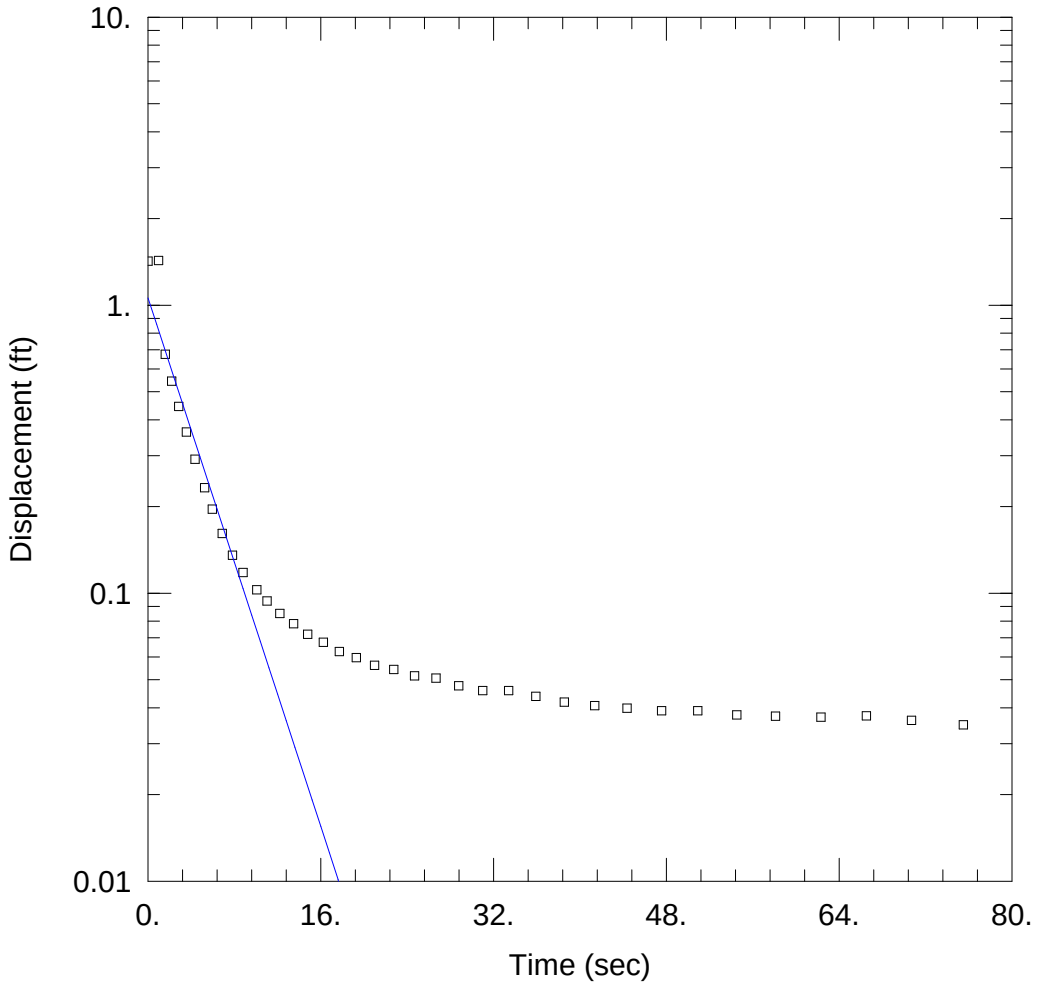
Saturated Thickness: 6.46 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-124M)

Initial Displacement: 1.15 ft
Total Well Penetration Depth: 6.46 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.46 ft
Screen Length: 6.46 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01171 cm/sec
y0 = 1.939 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-124M
Test Date: 1-21-10

AQUIFER DATA

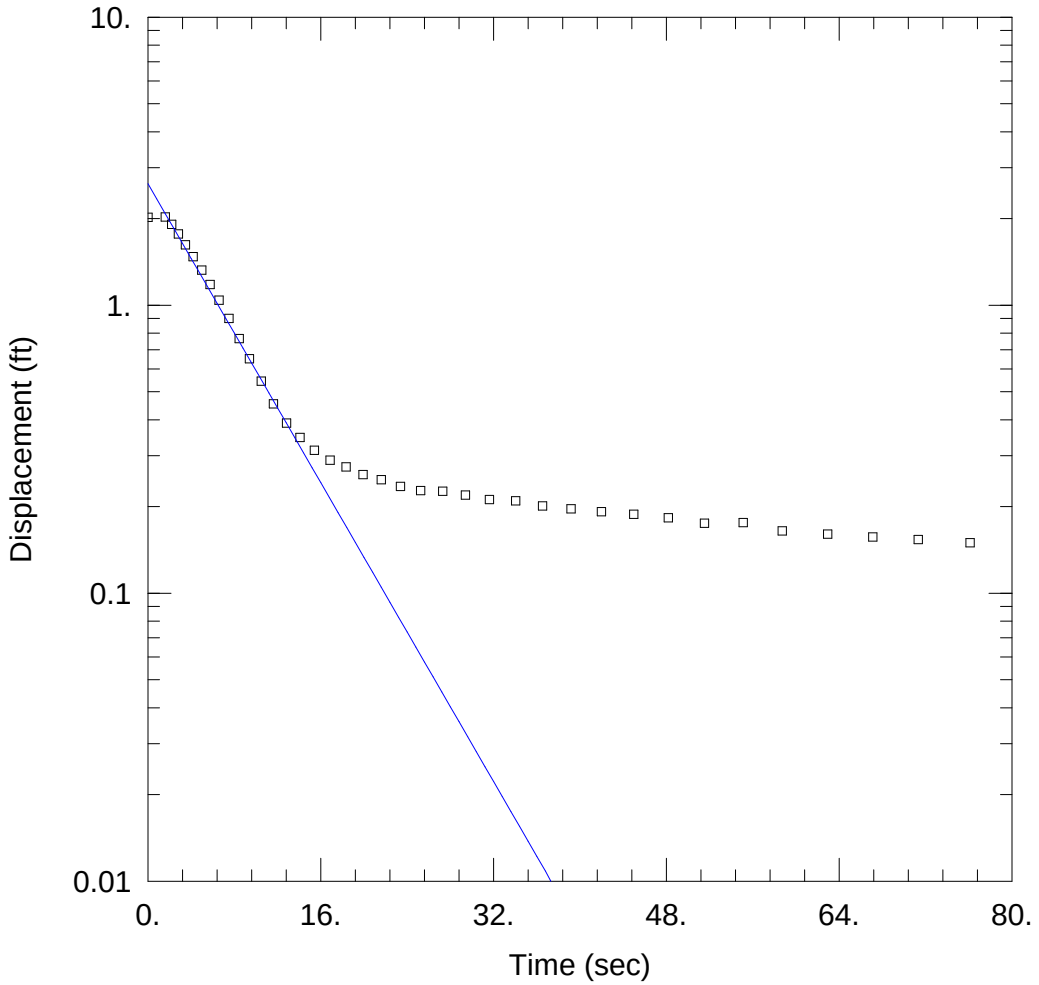
Saturated Thickness: 6.46 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-124M)

Initial Displacement: 1.42 ft
Total Well Penetration Depth: 6.46 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.46 ft
Screen Length: 6.46 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.01445 cm/sec
y0 = 1.06 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-133M
Test Date: 1-22-10

AQUIFER DATA

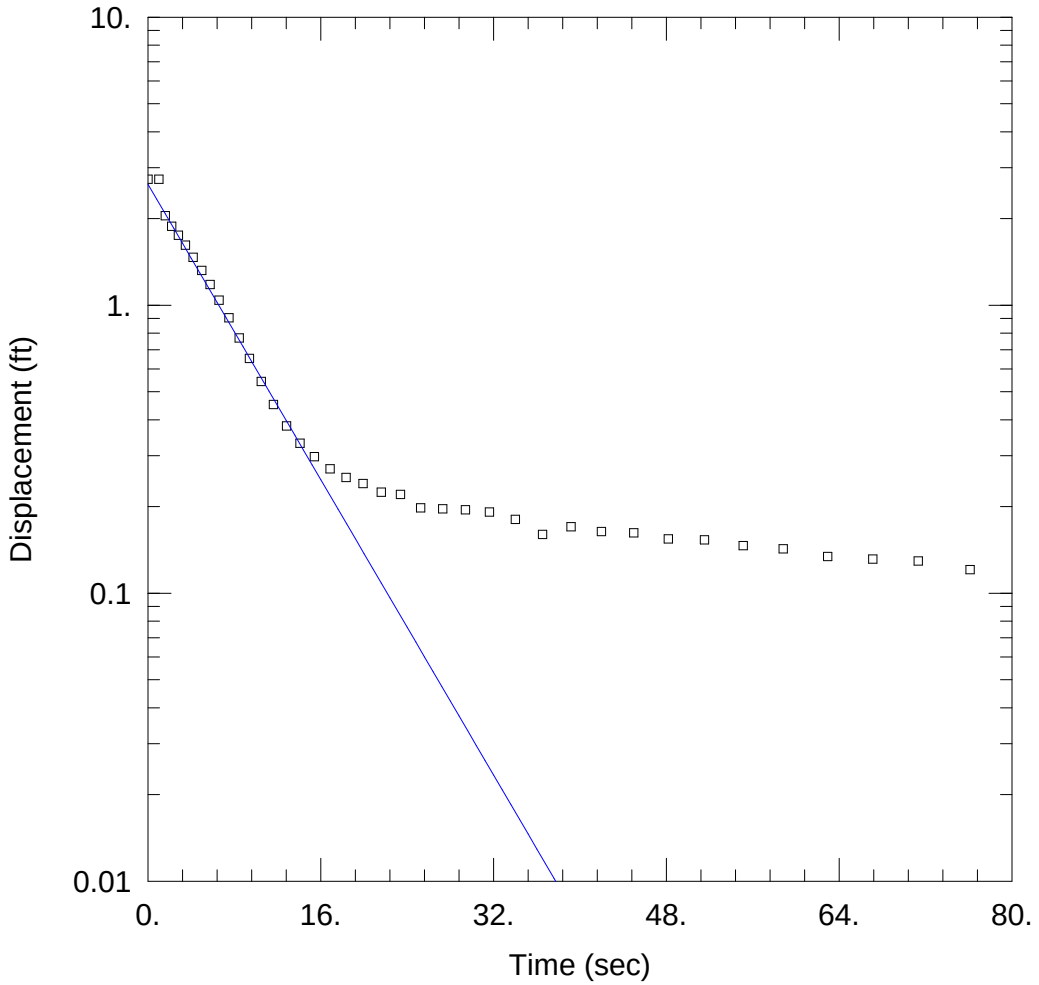
Saturated Thickness: 7.98 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-133M)

Initial Displacement: 2.02 ft
Total Well Penetration Depth: 6.13 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.13 ft
Screen Length: 6.13 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.007753 cm/sec
y0 = 2.639 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-133M
Test Date: 1-22-10

AQUIFER DATA

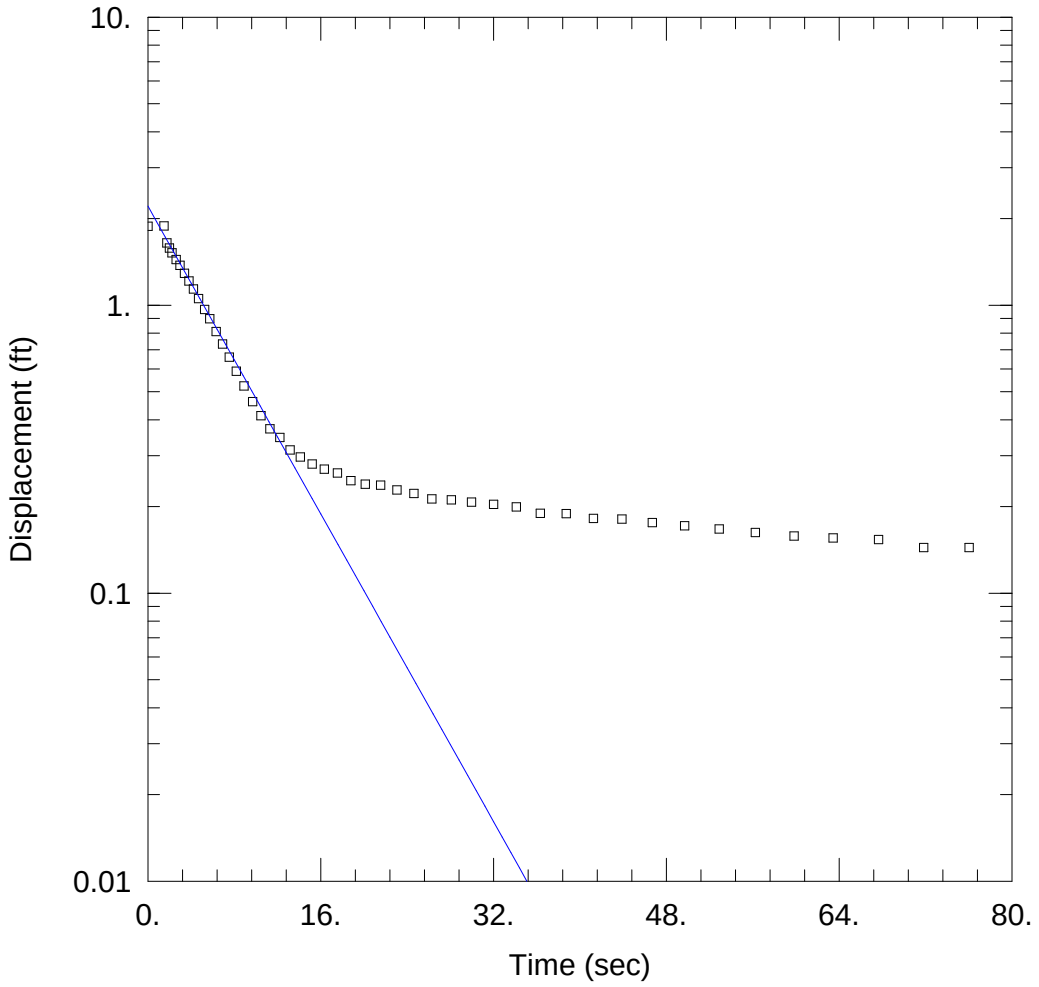
Saturated Thickness: 7.98 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-133M)

Initial Displacement: 2.74 ft
Total Well Penetration Depth: 6.13 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.13 ft
Screen Length: 6.13 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.007662 cm/sec
y0 = 2.628 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-133M
Test Date: 1-22-10

AQUIFER DATA

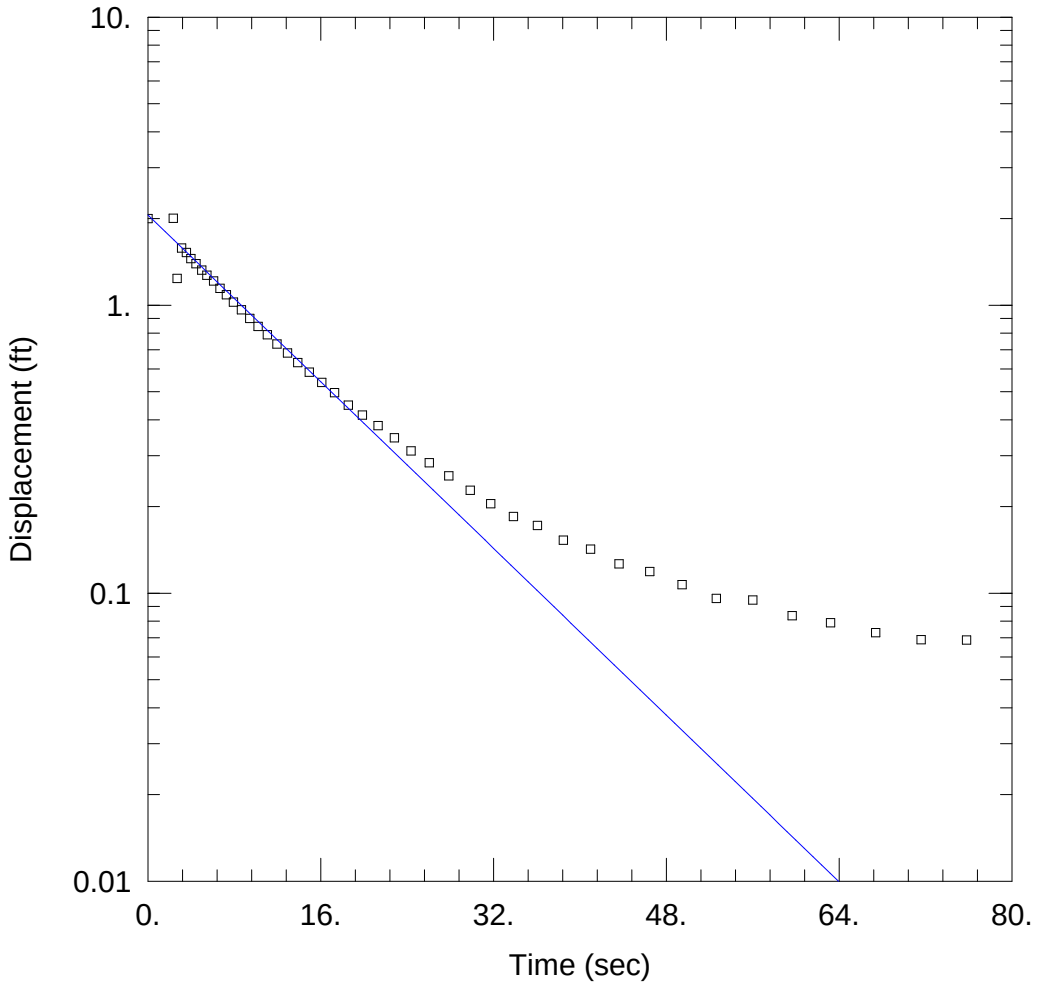
Saturated Thickness: 7.98 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-133M)

Initial Displacement: 1.88 ft
Total Well Penetration Depth: 6.13 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 6.13 ft
Screen Length: 6.13 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.007981 cm/sec
y0 = 2.205 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-141M
Test Date: 1-22-10

AQUIFER DATA

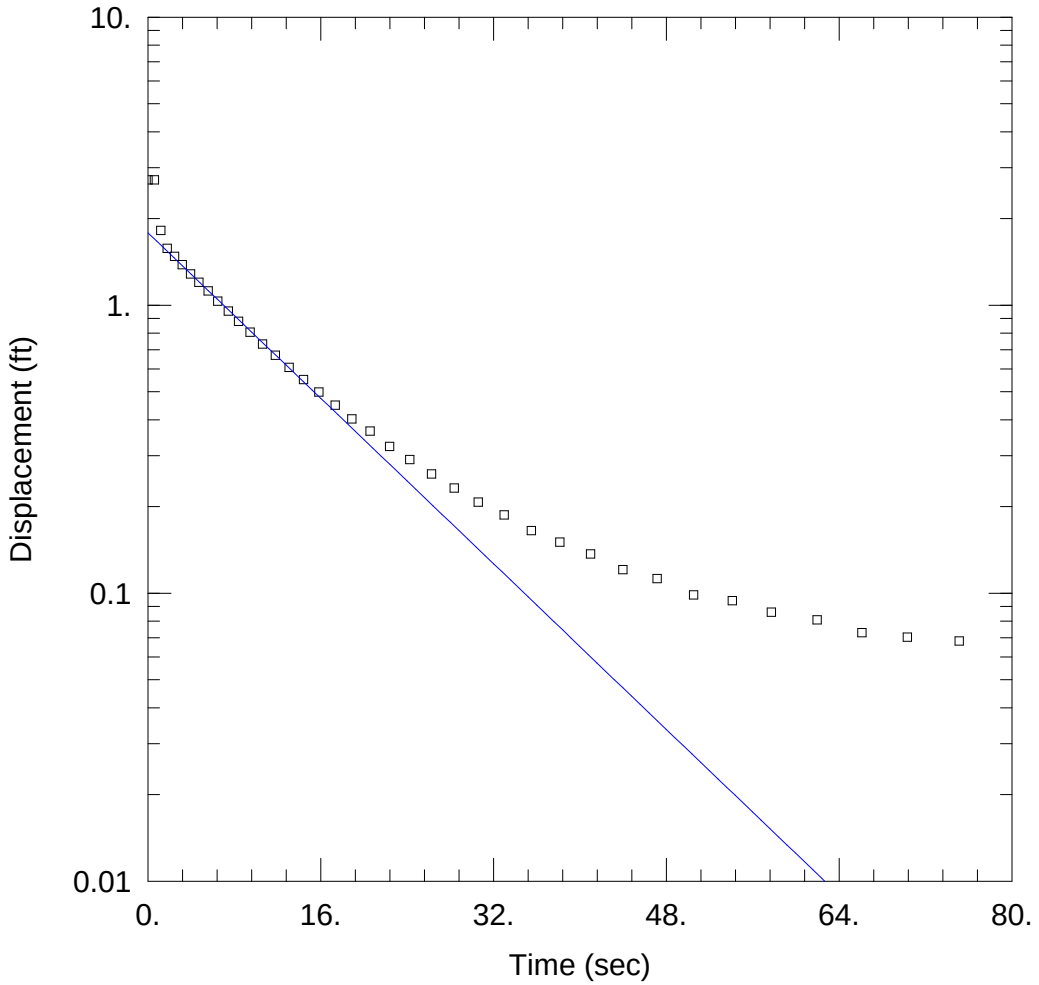
Saturated Thickness: 2.85 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-141M)

Initial Displacement: 2. ft
Total Well Penetration Depth: 2.85 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.85 ft
Screen Length: 2.85 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.008283 cm/sec
y0 = 2.053 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-141M
Test Date: 1-22-10

AQUIFER DATA

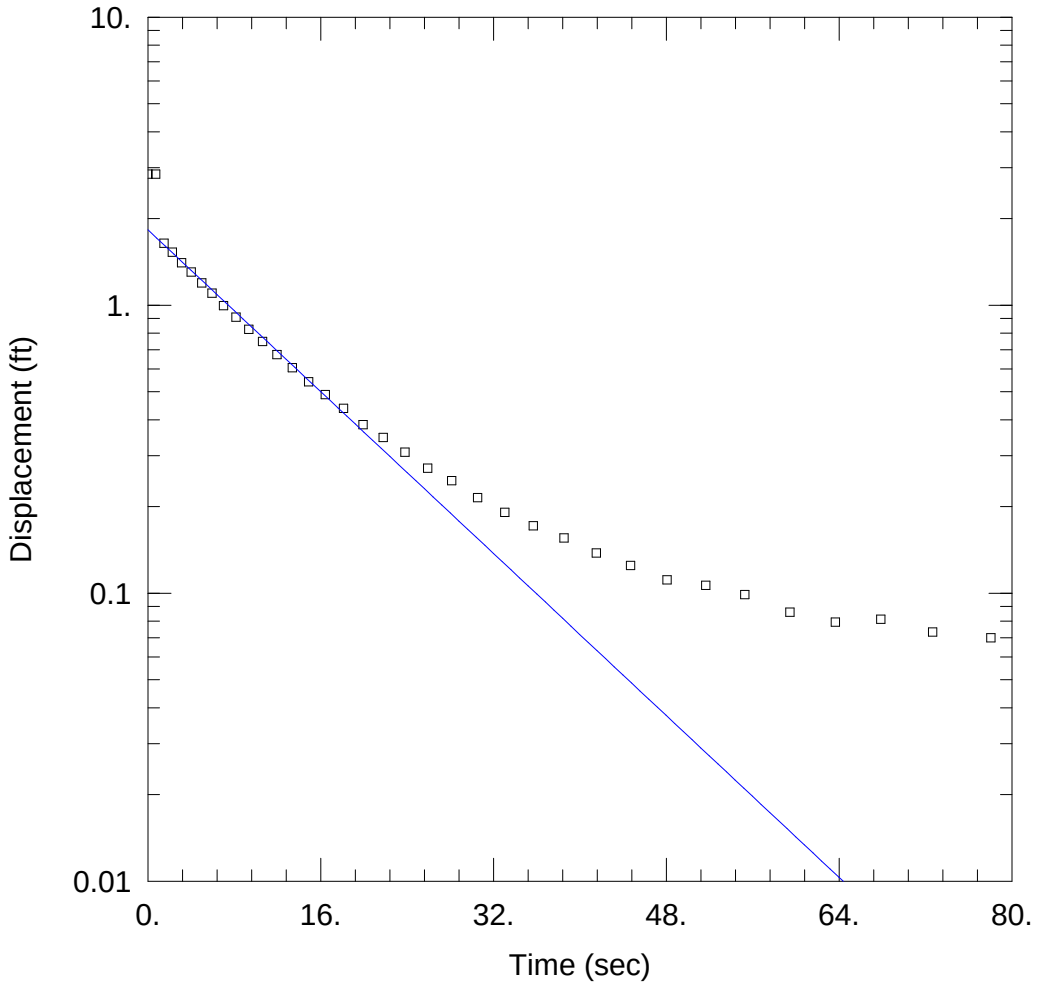
Saturated Thickness: 2.85 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-141M)

Initial Displacement: 2.72 ft
Total Well Penetration Depth: 2.85 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.85 ft
Screen Length: 2.85 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.008226 cm/sec
y0 = 1.782 ft



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: ARCADIS
Client: MLC
Project: B0086928.0000
Location: Ypsilanti
Test Well: CRA-141M
Test Date: 1-22-10

AQUIFER DATA

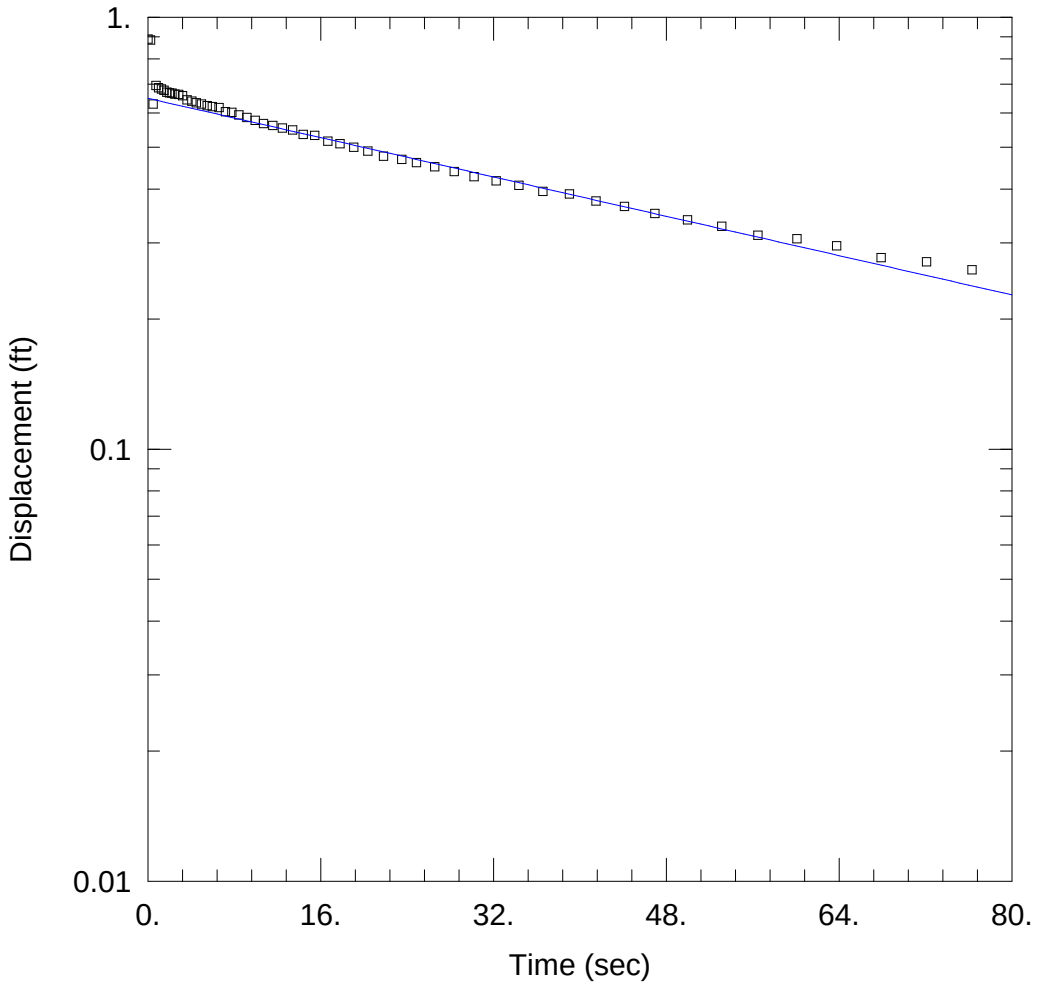
Saturated Thickness: 2.85 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-141M)

Initial Displacement: 2.85 ft
Total Well Penetration Depth: 2.85 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.85 ft
Screen Length: 2.85 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.008046 cm/sec
y0 = 1.825 ft



CRA-325M TEST 1

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-325M
Test Date: 1/22/10

AQUIFER DATA

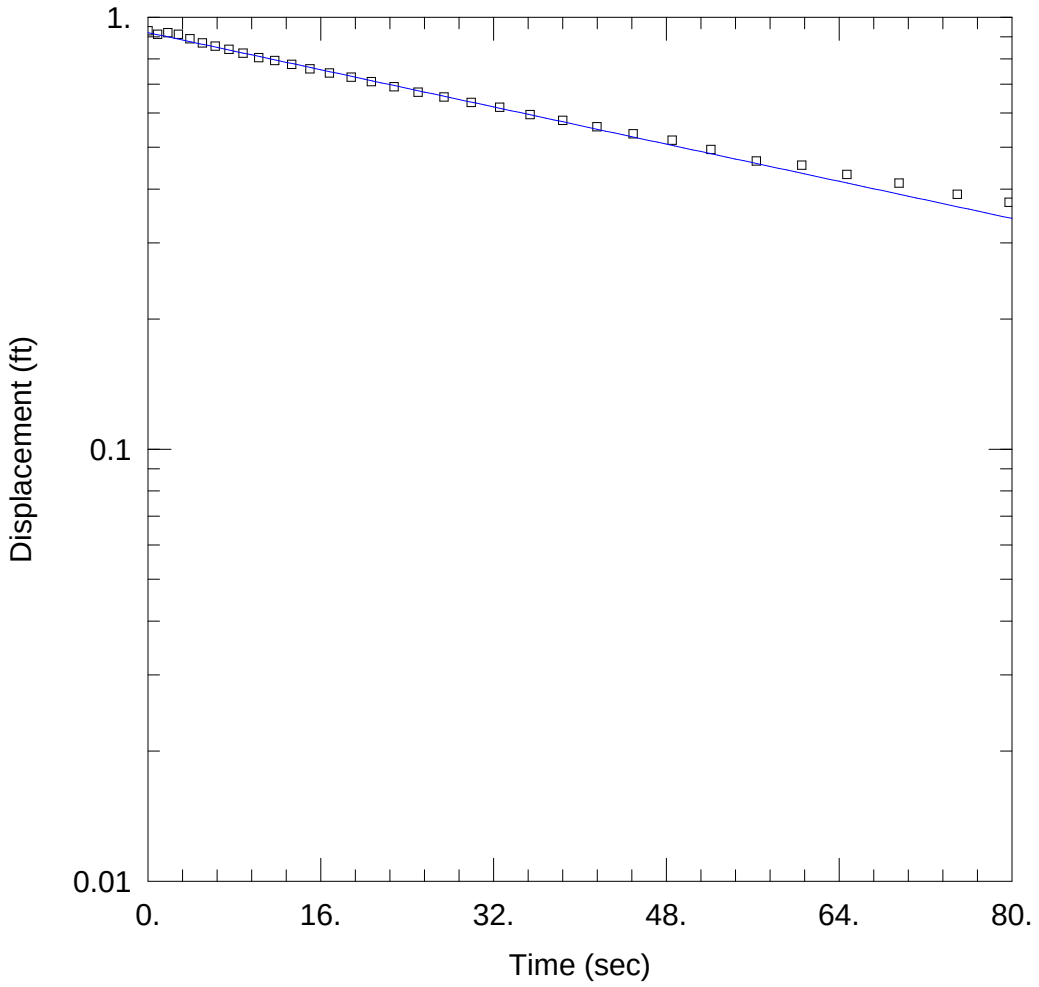
Saturated Thickness: 2.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-325M)

Initial Displacement: 0.89 ft
Total Well Penetration Depth: 2.05 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.05 ft
Screen Length: 2.05 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001621 cm/sec
y0 = 0.6487 ft



CRA-325M TEST 2

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-325M
Test Date: 1/22/10

AQUIFER DATA

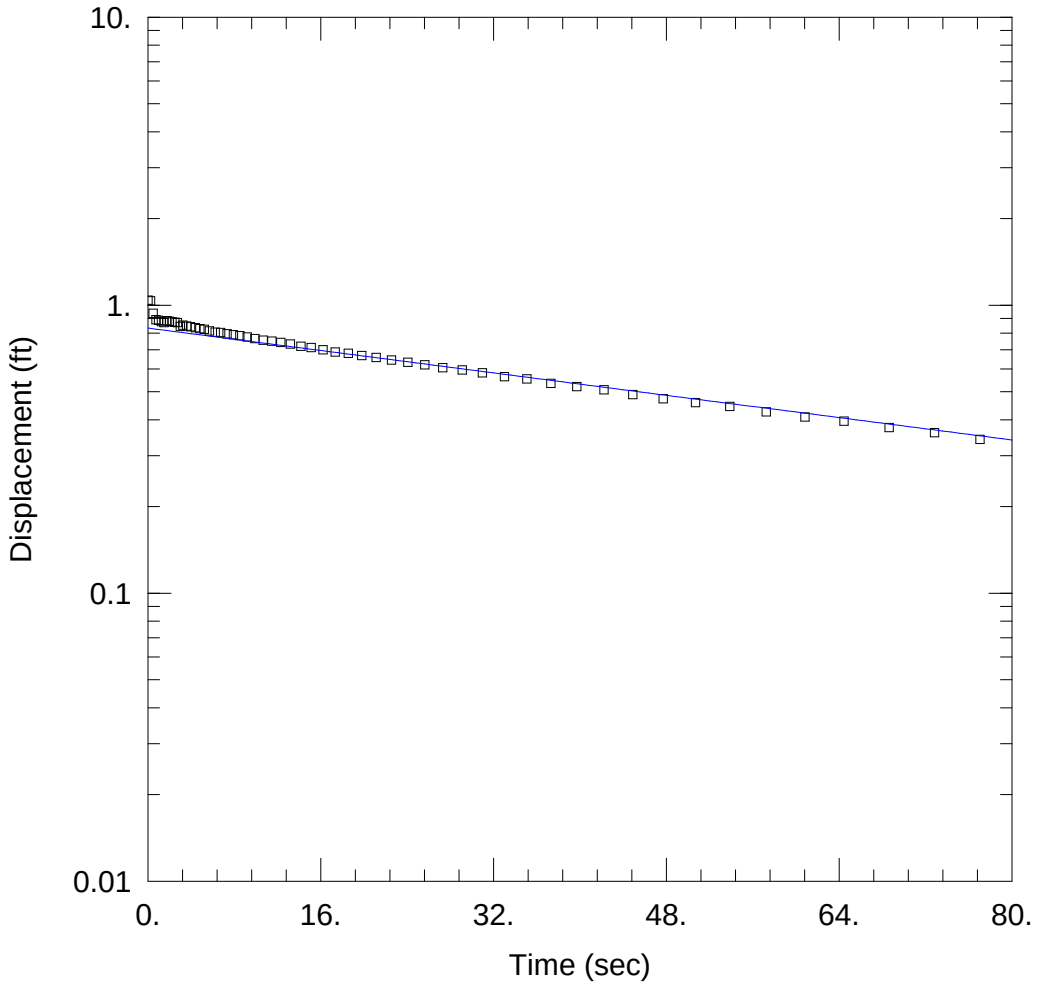
Saturated Thickness: 2.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-325M)

Initial Displacement: 0.93 ft
Total Well Penetration Depth: 2.05 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.05 ft
Screen Length: 2.05 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001533 cm/sec
y0 = 0.921 ft



CRA-325M TEST 3

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-325M
Test Date: 1/22/10

AQUIFER DATA

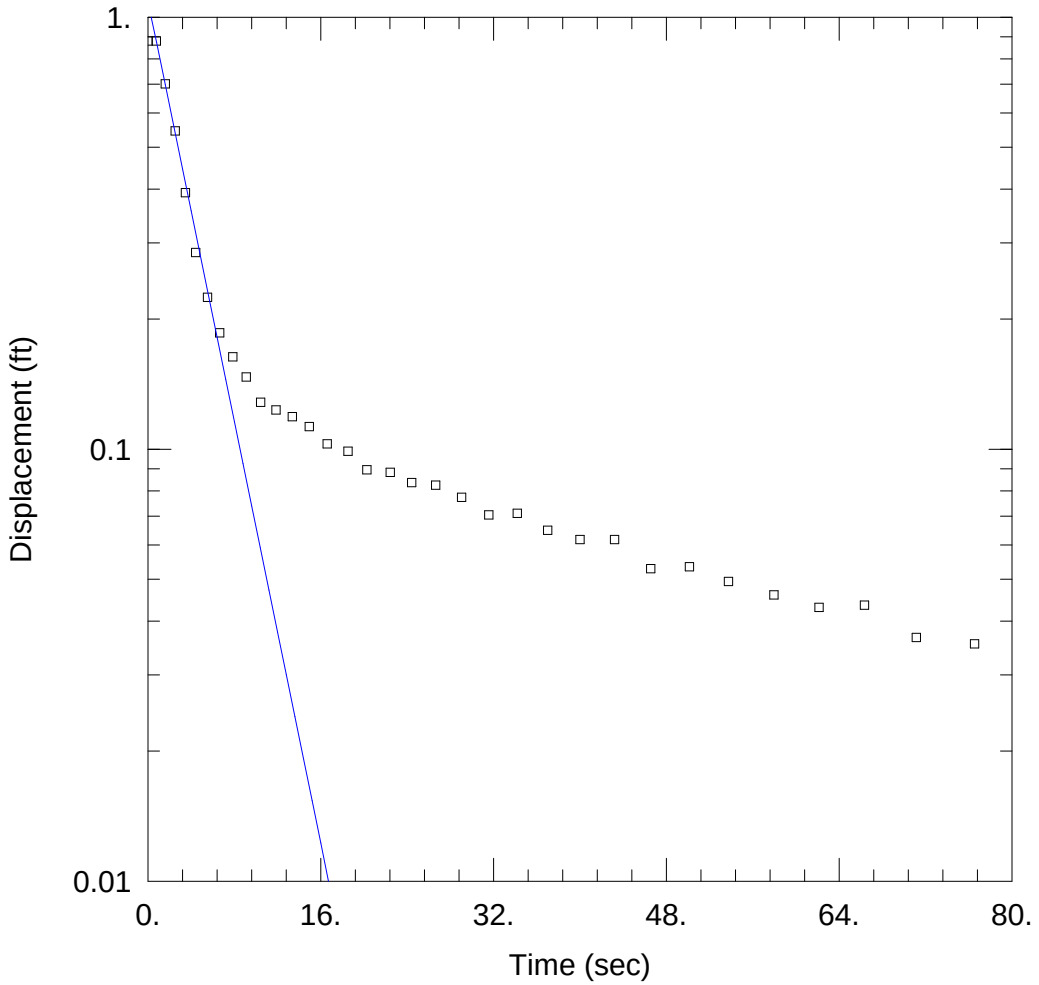
Saturated Thickness: 2.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-325M)

Initial Displacement: 1.04 ft
Total Well Penetration Depth: 2.05 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.05 ft
Screen Length: 2.05 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
K = 0.001384 cm/sec
Solution Method: Bouwer-Rice
y0 = 0.832 ft



CRA-533M TEST 1

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-533M
Test Date: 1/22/10

AQUIFER DATA

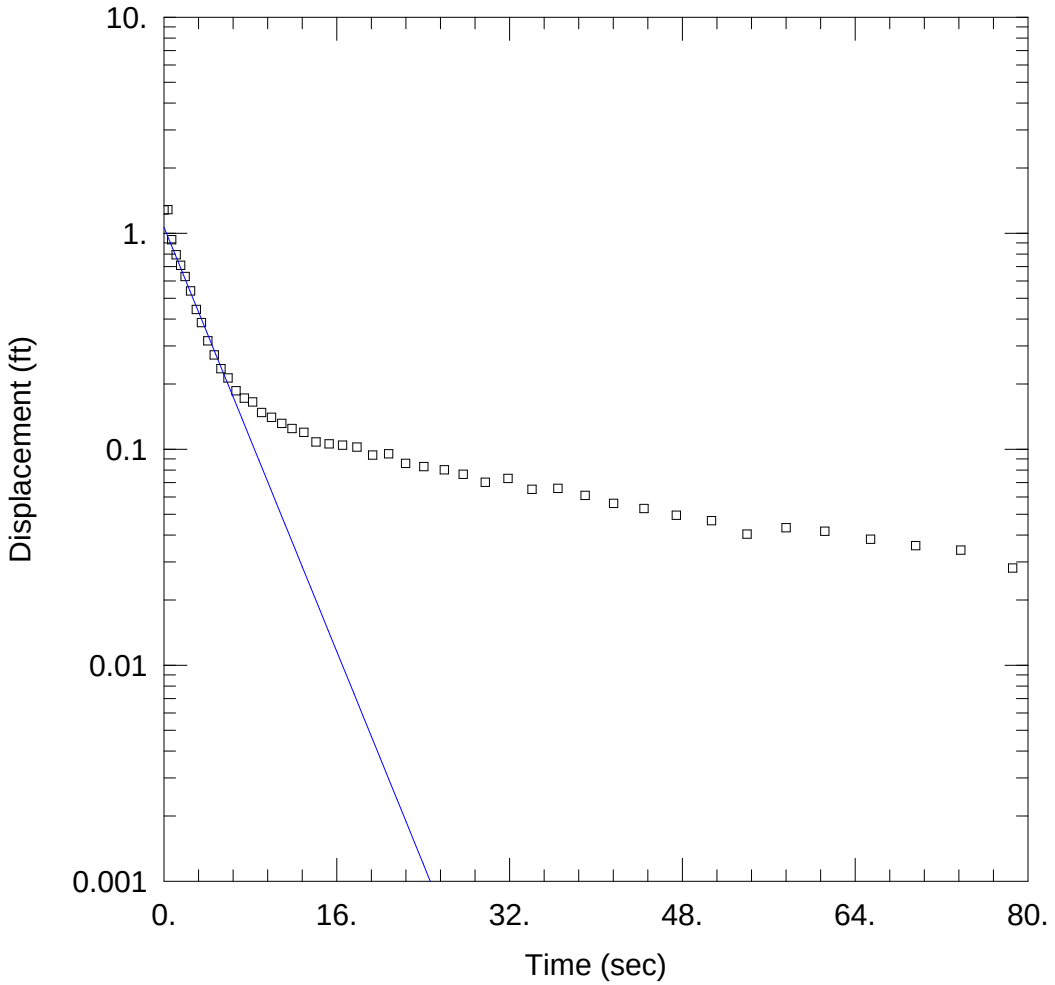
Saturated Thickness: 3.26 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-533M)

Initial Displacement: 0.88 ft
Total Well Penetration Depth: 3.26 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.26 ft
Screen Length: 3.26 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0008346 ft/sec
y0 = 1.094 ft



CRA-533M TEST 2

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-533M
Test Date: 1/22/10

AQUIFER DATA

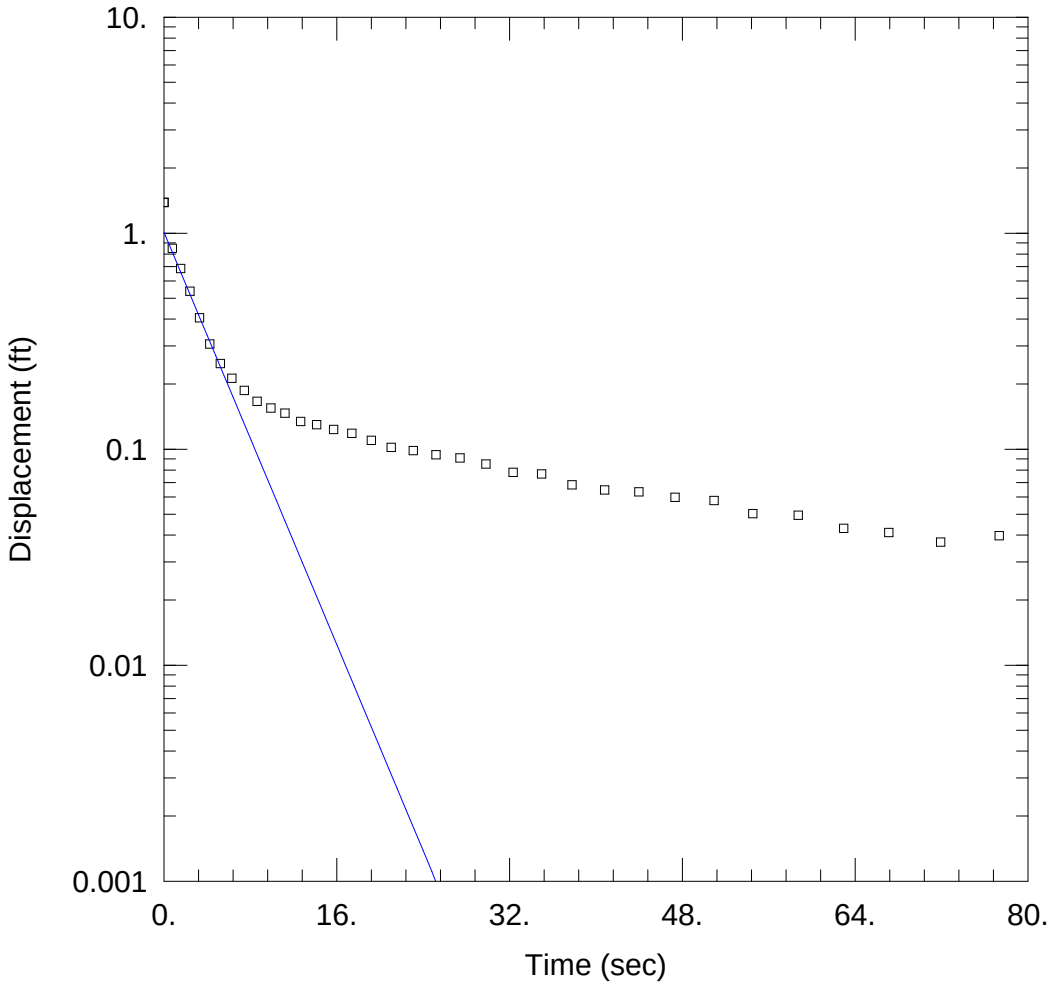
Saturated Thickness: 3.26 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-533M)

Initial Displacement: 1.28 ft
Total Well Penetration Depth: 3.26 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.26 ft
Screen Length: 3.26 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0008407 ft/sec
y0 = 1.066 ft



CRA-533M TEST 3

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-533M
Test Date: 1/22/10

AQUIFER DATA

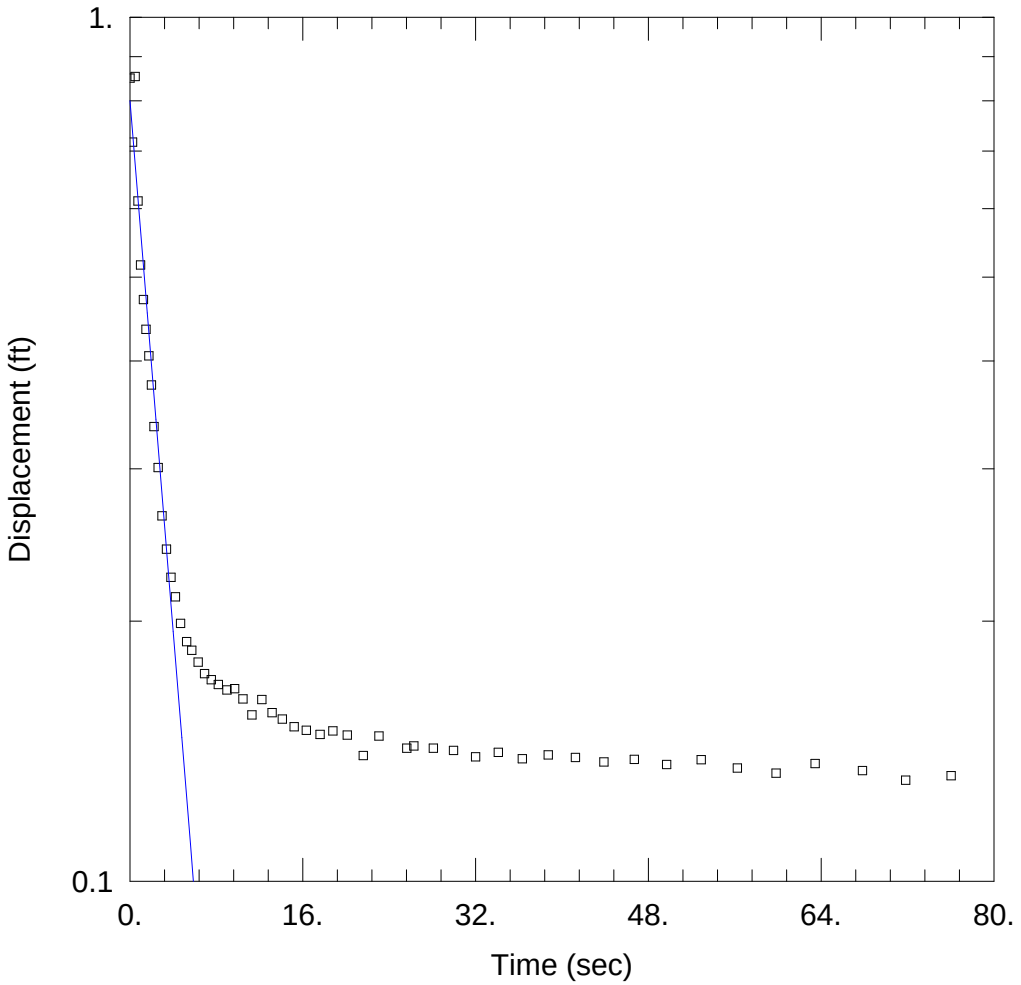
Saturated Thickness: 3.26 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-533M)

Initial Displacement: 1.39 ft
Total Well Penetration Depth: 3.26 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 3.26 ft
Screen Length: 3.26 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
K = 0.0008167 ft/sec
Solution Method: Bouwer-Rice
y0 = 1.009 ft



CRA-534M TEST 1

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-534M
Test Date: 1/22/10

AQUIFER DATA

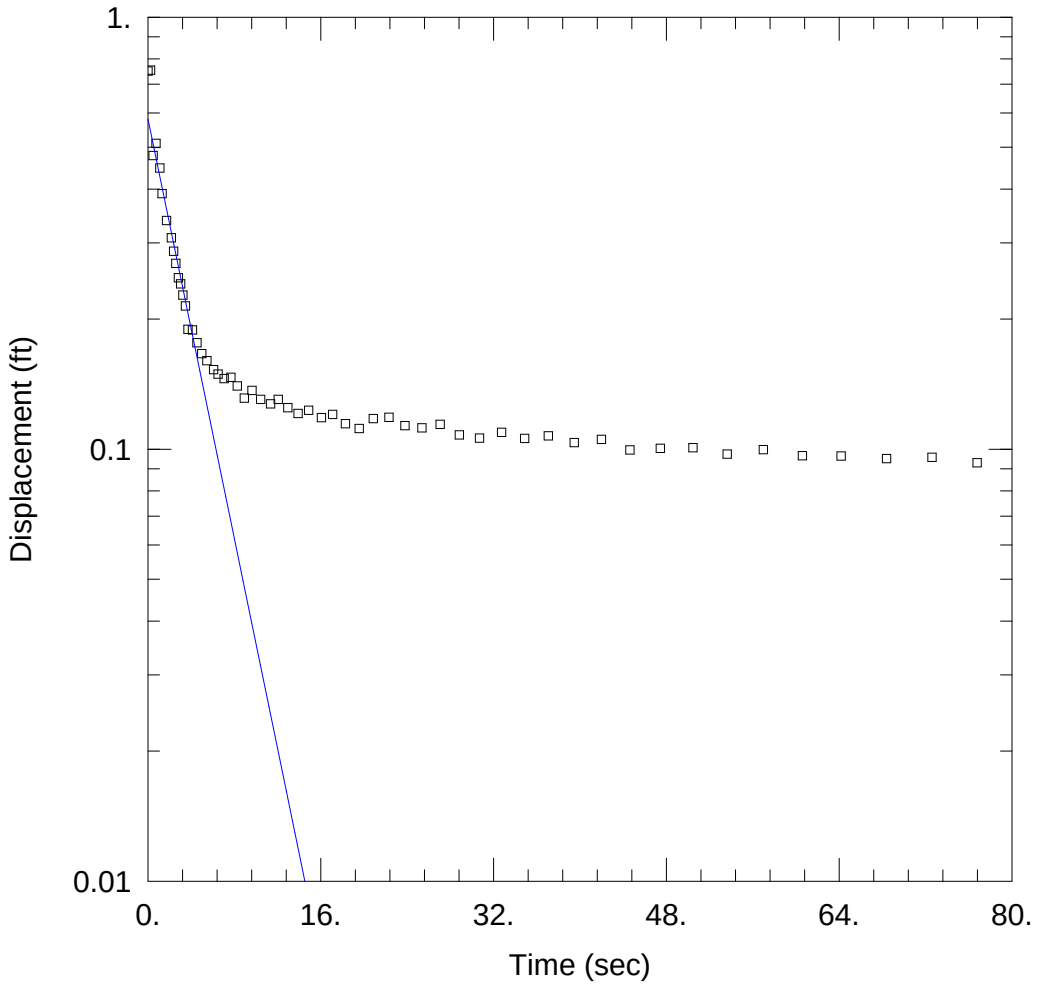
Saturated Thickness: 4.83 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-534M)

Initial Displacement: 0.85 ft
Total Well Penetration Depth: 2.23 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.23 ft
Screen Length: 2.23 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001168 ft/sec
y0 = 0.8003 ft



CRA-534M TEST 2

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-534M
Test Date: 1/22/10

AQUIFER DATA

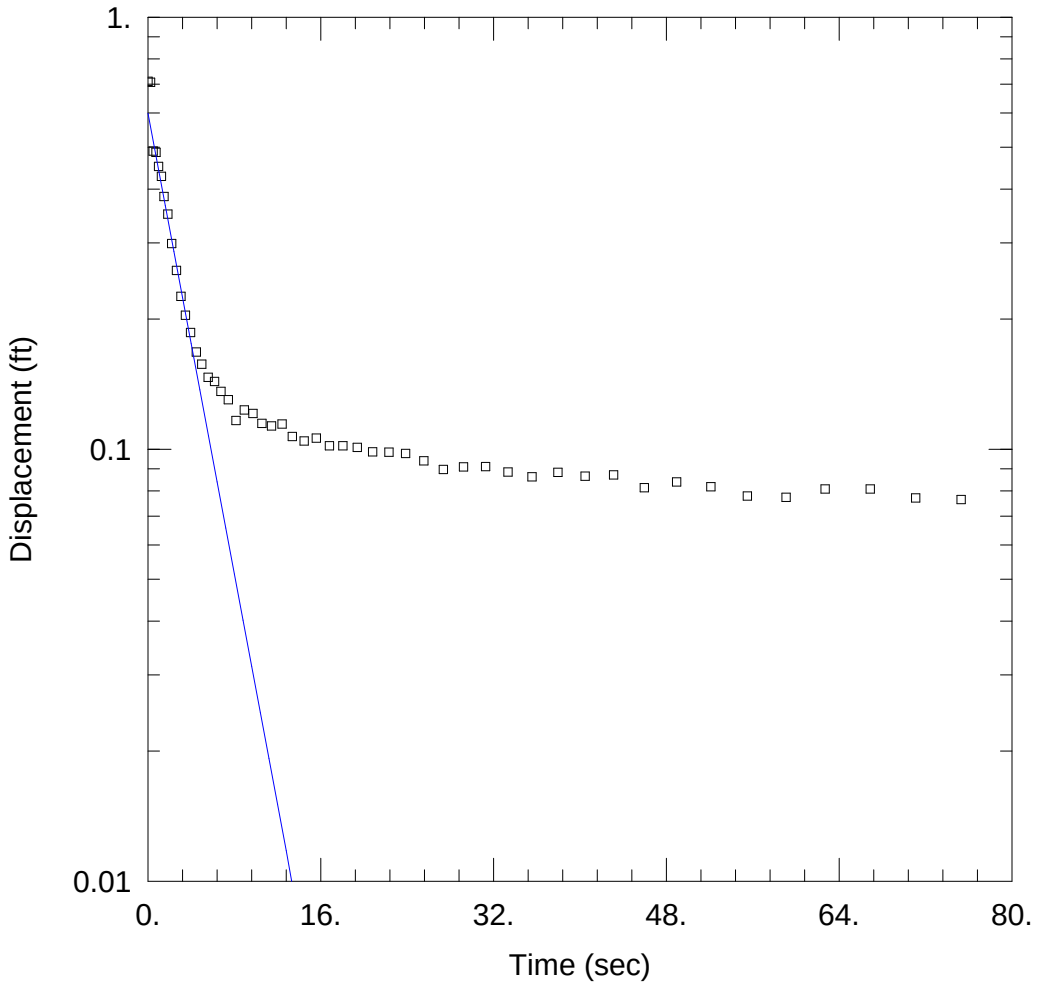
Saturated Thickness: 4.83 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-534M)

Initial Displacement: 0.75 ft
Total Well Penetration Depth: 2.23 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.23 ft
Screen Length: 2.23 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0009238 ft/sec
y0 = 0.5811 ft



CRA-534M TEST 3

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-534M
Test Date: 1/22/10

AQUIFER DATA

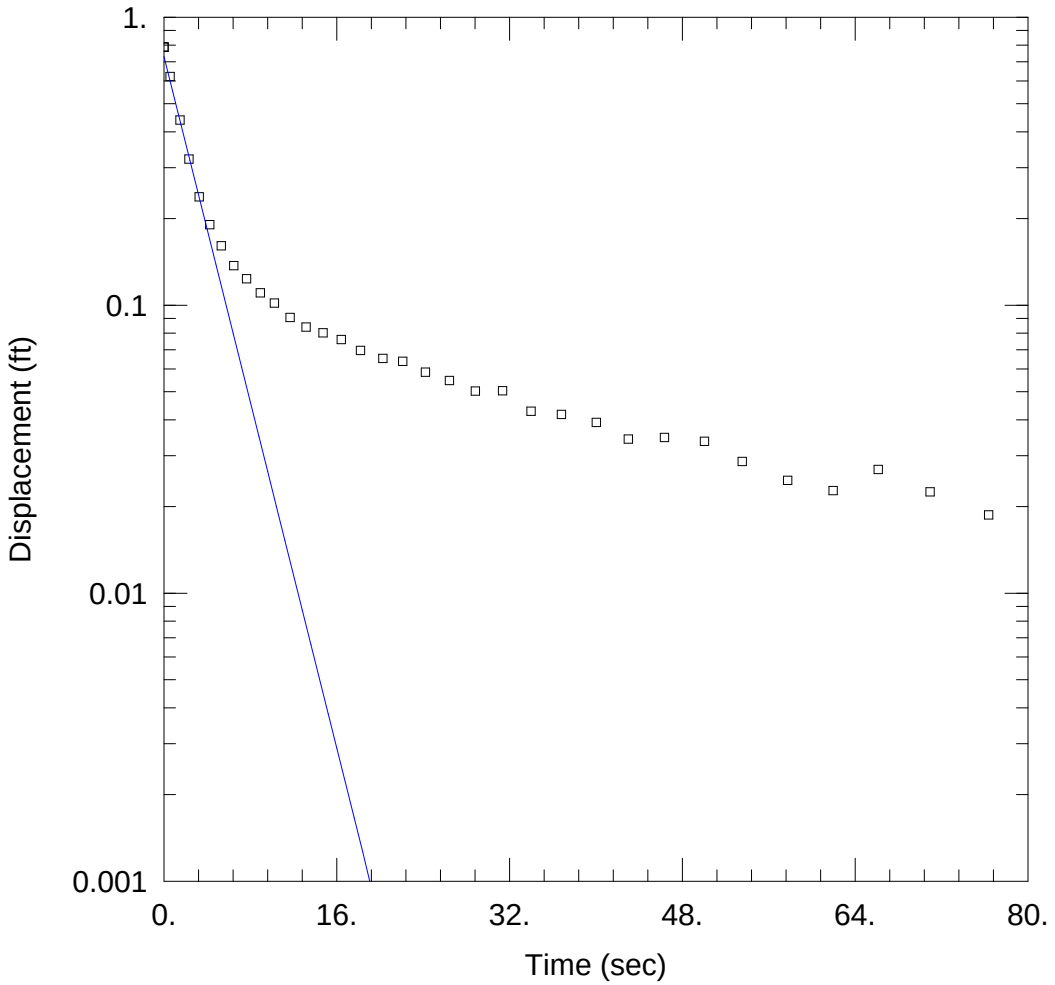
Saturated Thickness: 4.83 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-534M)

Initial Displacement: 0.71 ft
Total Well Penetration Depth: 2.23 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.23 ft
Screen Length: 2.23 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001014 ft/sec
y0 = 0.5995 ft



CRA-611M TEST1

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-611M
Test Date: 1/22/10

AQUIFER DATA

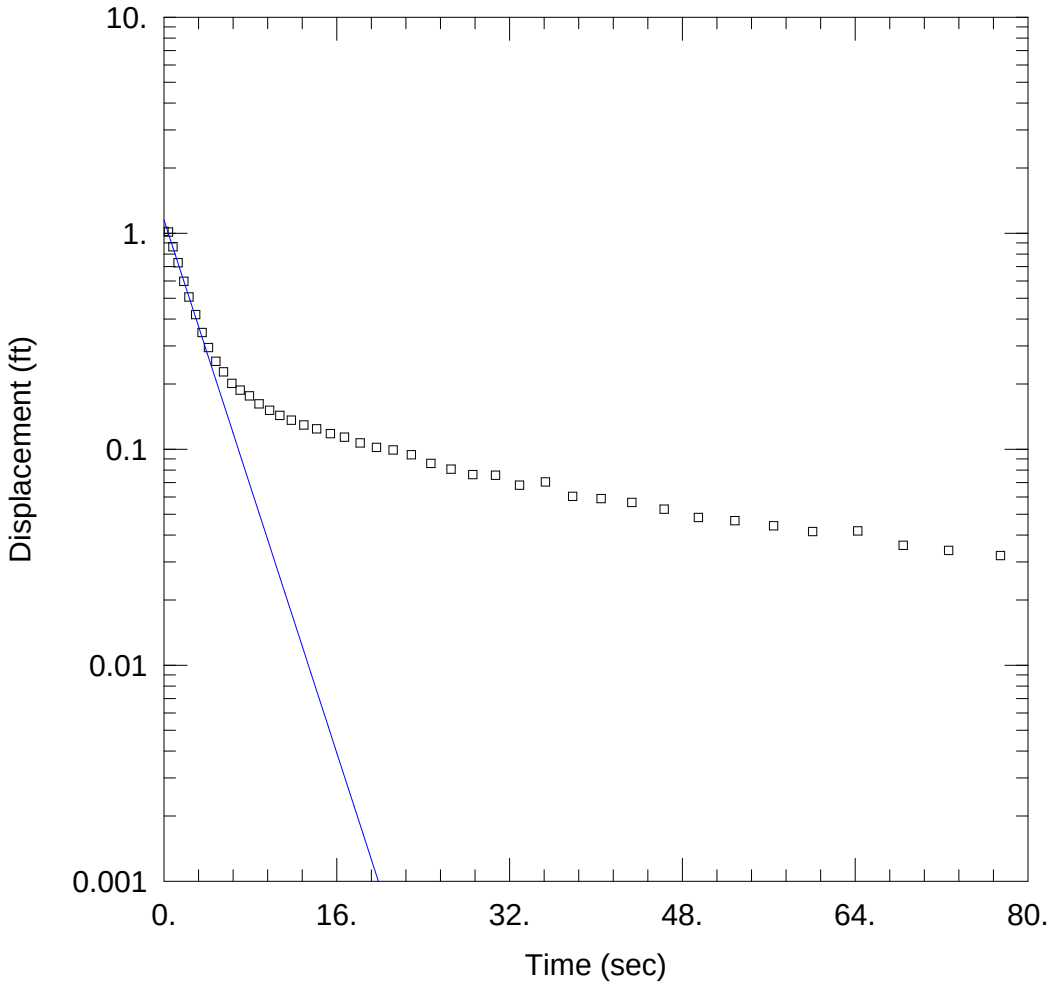
Saturated Thickness: 2.69 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-611M)

Initial Displacement: 0.79 ft
Total Well Penetration Depth: 2.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.69 ft
Screen Length: 2.69 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001173 ft/sec
y0 = 0.7286 ft



CRA-611M TEST2

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-611M
Test Date: 1/22/10

AQUIFER DATA

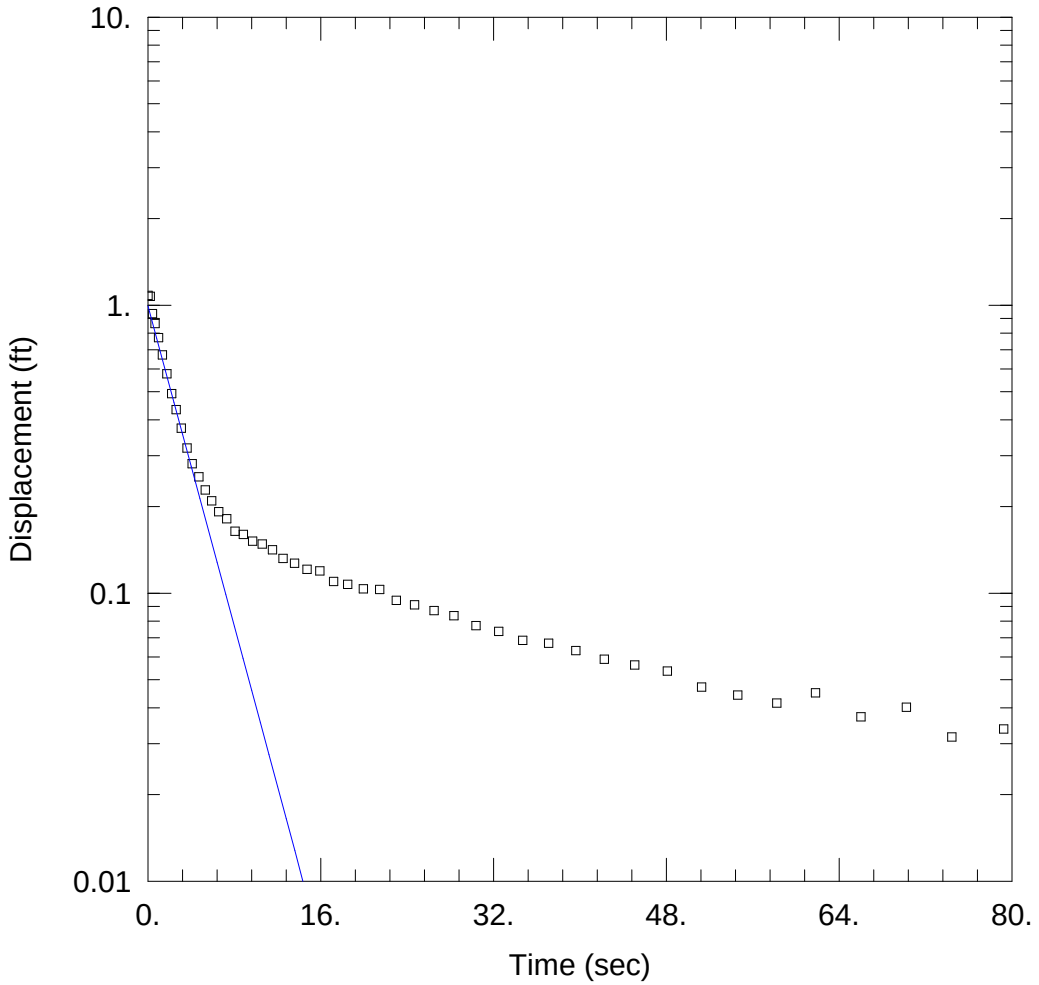
Saturated Thickness: 2.69 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-611M)

Initial Displacement: 1.02 ft
Total Well Penetration Depth: 2.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.69 ft
Screen Length: 2.69 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001206 ft/sec
y0 = 1.151 ft



CRA-611 TEST 3

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-611M
Test Date: 1/22/10

AQUIFER DATA

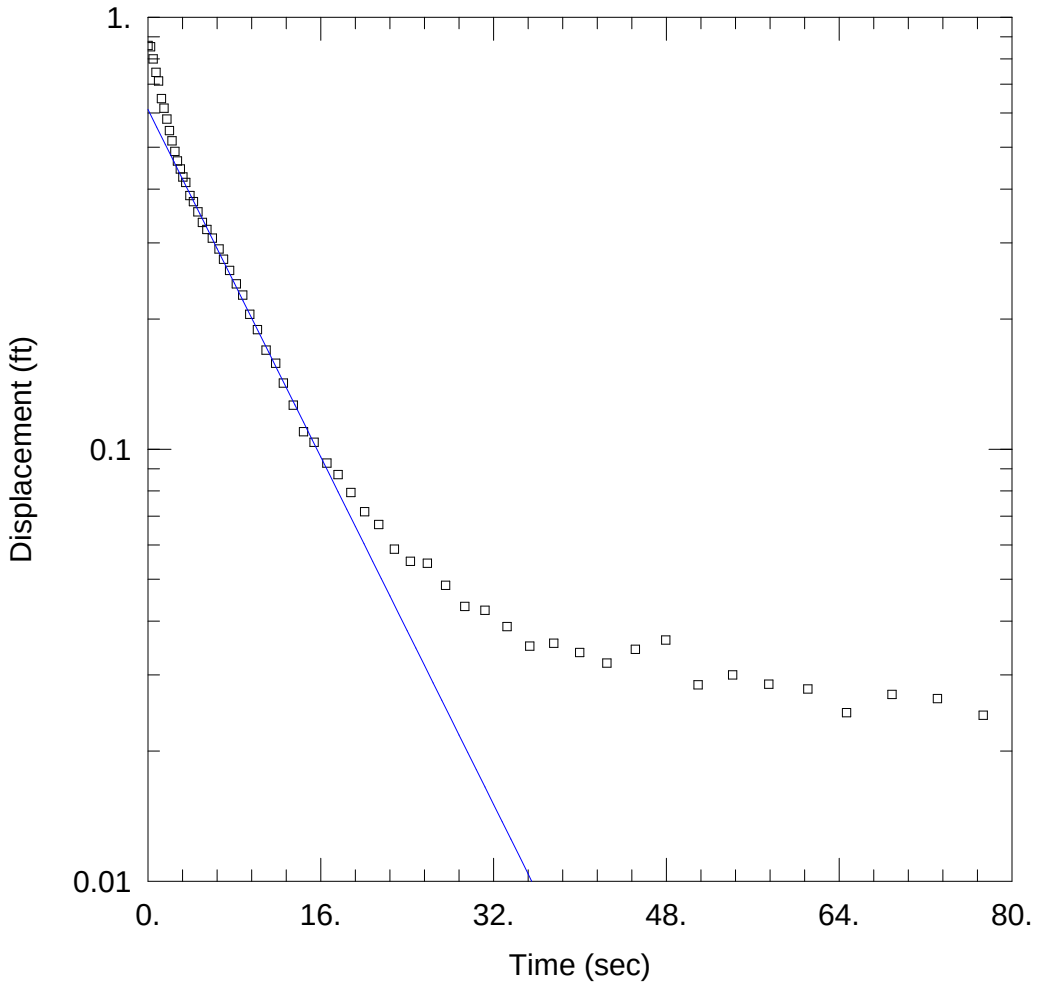
Saturated Thickness: 2.69 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-611M)

Initial Displacement: 1.08 ft
Total Well Penetration Depth: 2.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.69 ft
Screen Length: 2.69 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001087 ft/sec
y0 = 0.9925 ft



CRA-614M TEST 1

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-614M
Test Date: 1/22/10

AQUIFER DATA

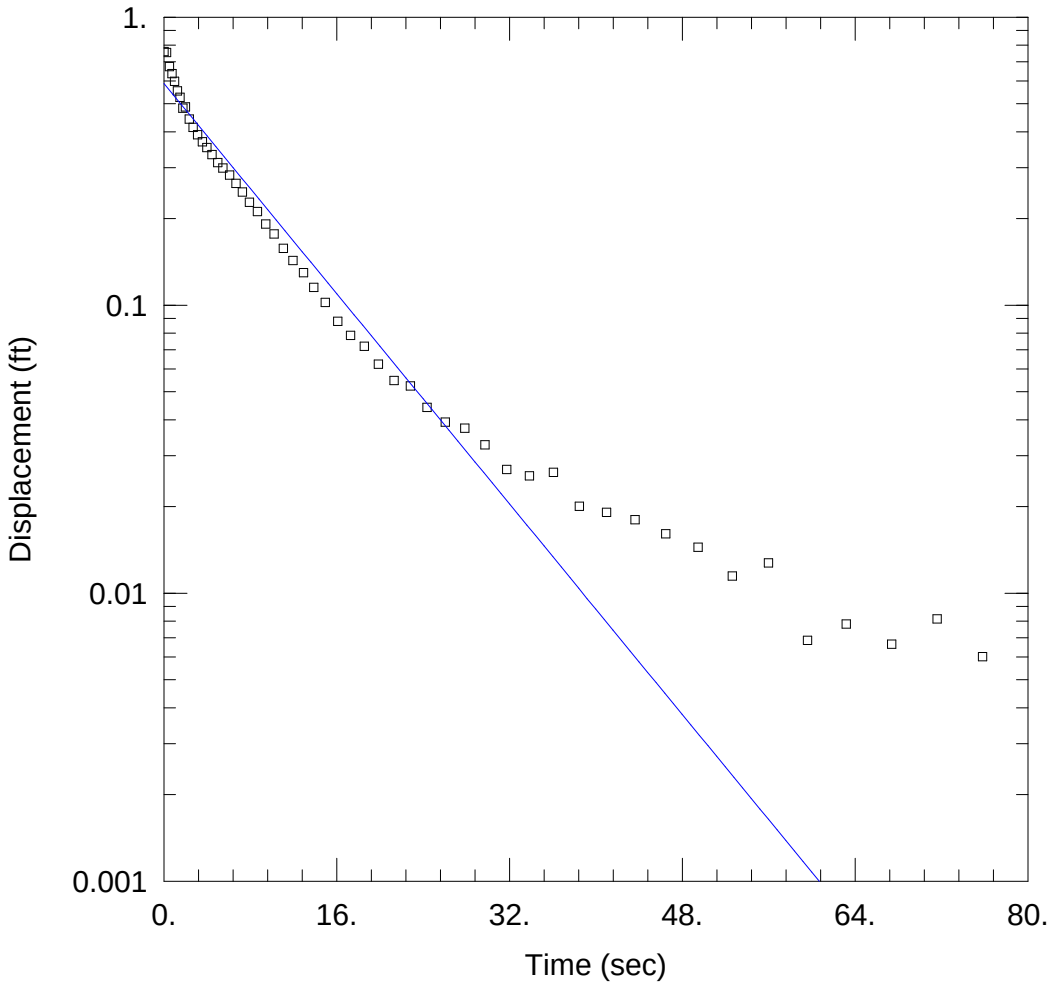
Saturated Thickness: 2.78 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-614M)

Initial Displacement: 0.86 ft
Total Well Penetration Depth: 2.78 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.78 ft
Screen Length: 2.78 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003843 ft/sec
y0 = 0.6109 ft



CRA-614M TEST 2

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-614M
Test Date: 1/22/10

AQUIFER DATA

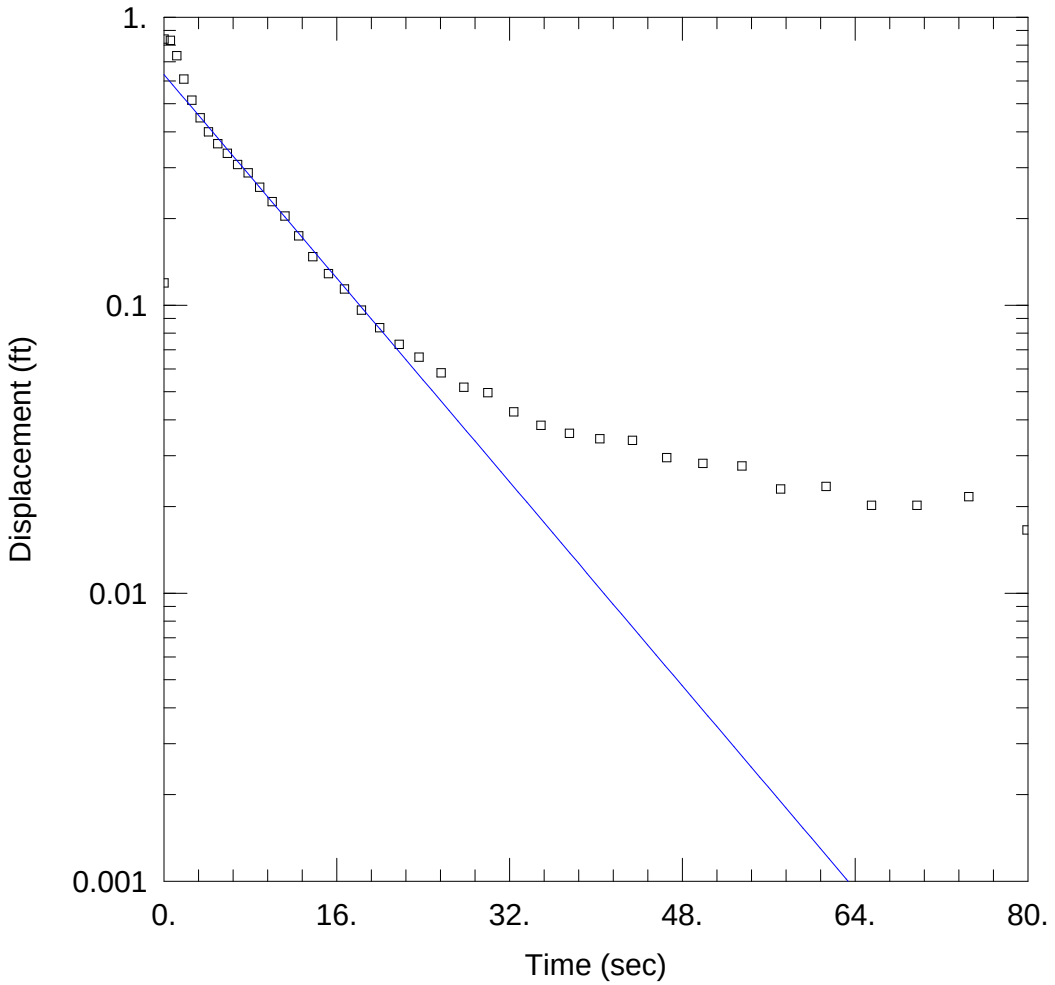
Saturated Thickness: 2.78 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-614M)

Initial Displacement: 0.76 ft
Total Well Penetration Depth: 2.78 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.78 ft
Screen Length: 2.78 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003489 ft/sec
y0 = 0.5882 ft



CRA-614M TEST 3

PROJECT INFORMATION

Company: ARCADIS
Client: GM
Project: B0086928
Location: Ypsilanti MI
Test Well: CRA-614M
Test Date: 1/22/10

AQUIFER DATA

Saturated Thickness: 2.78 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CRA-614M)

Initial Displacement: 0.84 ft
Total Well Penetration Depth: 2.78 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 2.78 ft
Screen Length: 2.78 ft
Well Radius: 0.0833 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003379 ft/sec
y0 = 0.6318 ft

ARCADIS

Appendix G

LNAPL Model

AREAS DEFINE ASSUMED 0-0.5 FEET LNAPL THICKNESS (BASED ON LIF INVESTIGATION RESULTS)

AREA DEFINES ASSUMED 0-0.5 FEET LNAPL THICKNESS (BASED ON LIF INVESTIGATION RESULTS)

SUBSTATION 1
SUBSTATION 2
SUBSTATION 3
SUBSTATION 4
SUBSTATION 5
SUBSTATION 7
SUBSTATION 8
SUBSTATION 9
SUBSTATO
SUBSTAT

LEGEND

- EXISTING MONITORING WELL
- ABANDONED MONITORING WELL
- >60% C_{20}-C_{34} PETROLEUM HYDROCARBONS
- >60% C_{10}-C_{20} PETROLEUM HYDROCARBONS
- LNAPL CONTOUR

NOTE:

1. >1% C_6-C_{10} PETROLEUM HYDROCARBONS DETECTED IN EACH SAMPLE

2. THE 0-0.1 FT CONTOUR INTERVAL AREA WAS SET TO 0.5 TIMES THE AREA OF THE 0.1-0.5 CONTOUR INTERVAL AREA

0 150' 300' 450'
SCALE IN FEET

YPSILANTI, MI
WILLOW RUN TRANMISSION PLANT

TPH SPECIATION AND CONTOUR AREAS APPLIED TO VOLUME ESTIMATE

ARCADIS

FIGURE 1

CTY:[Proj]_ DIV/GROUP:[Proj]_ DB:[Proj]_ LD:[Op]_ PIC:[Op]_ PM:[Proj]_ TM:[Op]_ LYR:[On/Off]=*REF*
DIV/GROUP: ENVIRONMENTAL
DB: ENVIRONMENTAL
LD: [Op]_ PIC: [Op]_ PM: [Proj]_ TM: [Op]_ LYR: [On/Off]=*REF*
LOCATION: [Proj]_ SAVED: 2/8/2013 2:51 PM ACADVER: 18.0 (LMS TECH) PAGESETUP: -
PLOTSTYLETABLE: COLOR.CTB PLOTTED: 2/8/2013 3:44 PM BY: HARRISON, ROB
17360-GN-UTILITIES - HARRISON 08/2013
USERS: -
IMAGES: -
PROJECTNAME:

ARCADIS
Infrastructure, environment, buildings

Motors Liquidation Company
Willow Run Site
LNAPL Volume Calculation
02.03.10

Site Subarea	LNAPL Contour Interval Line	Interval LNAPL Start Thickness	Interval LNAPL End Thickness	Average LNAPL Thickness in Contour	Area	Dn (smearzone)	Dn(bn)	Dn	Rn	LNAPL Volume	Recoverable LNAPL
	ft	ft	ft	ft	ft^2	gal/ft^2	gal/ft^2	gal/ft^2	gal/ft^2	gallons	gallons
Northwest - TO	0*	0	0.1	0.05	18,918	0.09	0.0381	0.1	0.0000	2,346	0
Northwest - TO	0.1*	0.1	0.5	0.3	37,835	0.52	0.2291	0.7	0.0004	28,172	15
Northwest - TO	0.5*	0.5	1	0.75	26,068	1.29	0.5781	1.9	0.0064	48,666	167
Northwest - TO	1*	1	1.26	1.13	10,485	1.94	0.8833	2.8	0.0219	29,621	230
Northwest - TO w/ Metals	0*	0	0.1	0.05	4,845	0.09	0.0381	0.1	0.0000	601	0
Northwest - TO w/ Metals	0.1*	0.1	0.5	0.3	9,689	0.52	0.2291	0.7	0.0004	7,215	4
Northwest - TO w/ Metals	0.5*	0.5	1	0.75	6,676	1.29	0.5781	1.9	0.0064	12,463	43
Northwest - TO w/ Metals	1*	1	1.26	1.13	2,685	1.94	0.8833	2.8	0.0219	7,586	59
Central - DF	0*	0	0.1	0.05	12,000	0.06	0.0673	0.1	0.0004	1,577	5
Central - DF	0.1	0.1	0.5	0.3	24,000	0.38	0.4514	0.8	0.0501	20,062	1,203
Central - DF	0.5	0.5	1	0.75	92,840	0.96	1.3548	2.3	0.3516	215,028	32,645
Central - DF	1	1	2	1.5	50,360	1.92	3.1409	5.1	1.1346	255,003	57,140
Central - DF	2	2	3	2.5	9,400	3.20	5.7251	8.9	2.3812	83,938	22,384
Central - DF	3	3	3.37	3.185	3,400	4.08	7.5566	11.6	3.2966	39,573	11,208
Central - TO w/ Metals	0*	0	0.1	0.05	31,363	0.09	0.1522	0.2	0.0011	7,454	33
Central - TO	0*	0	0.1	0.05	21,138	0.09	0.1522	0.2	0.0011	5,024	22
Central - TO w/ Metals	0.1	0.1	0.5	0.3	62,725	0.51	0.9988	1.5	0.0918	94,811	5,759
Central - TO	0.1	0.1	0.5	0.3	42,275	0.51	0.9988	1.5	0.0918	63,900	3,882
Central - TO w/ Metals	0.5	0.5	1	0.75	150,453	1.28	2.7495	4.0	0.4820	606,515	72,517
Central - TO w/ PCBs and Met	0.5	0.5	1	0.75	21,840	1.28	2.7495	4.0	0.4820	88,043	10,527
Central - TO	0.5	0.5	1	0.75	31,947	1.28	2.7495	4.0	0.4820	128,787	15,398
Central - TO w/ Metals	1	1	2	1.5	95,247	2.56	5.8646	8.4	1.3296	802,759	126,644
Central - TO w/ PCBs	1	1	2	1.5	5,060	2.56	5.8646	8.4	1.3296	42,647	6,728
Central - TO	1	1	2	1.5	8,767	2.56	5.8646	8.4	1.3296	73,890	11,657
Central - TO w/ Metals	2	2	2.14	2.07	286	3.54	8.2926	11.8	2.0343	3,383	582
Eastern - DF	0*	0	0.1	0.05	33,372	0.06	0.0662	0.1	0.0002	4,324	5
Eastern - DF w/ Metals	0*	0	0.1	0.05	3,529	0.06	0.0662	0.1	0.0002	457	1
Eastern - DF	0.1	0.1	0.5	0.3	66,743	0.38	0.4131	0.8	0.0166	52,934	1,107
Eastern - DF w/ Metals	0.1	0.1	0.5	0.3	7,057	0.38	0.4131	0.8	0.0166	5,597	117
Eastern - DF	0.5	0.5	1	0.75	16,880	0.95	1.1352	2.1	0.1439	35,197	2,429
Eastern - DF w/ Metals	0.5	0.5	1	0.75	14,890	0.95	1.1352	2.1	0.1439	31,048	2,142
Eastern - DF	1	1	1.43	1.215	3,430	1.54	1.9931	3.5	0.3872	12,115	1,328
Eastern - TO w/ Metals	0*	0	0.1	0.05	14,098	0.08	0.0798	0.2	0.0001	2,315	1
Eastern - TO	0*	0	0.1	0.05	23,502	0.08	0.0798	0.2	0.0001	3,859	2
Eastern - TO w/ Metals	0.1	0.1	0.5	0.3	28,196	0.51	0.4891	1.0	0.0110	28,076	311
Eastern - TO	0.1	0.1	0.5	0.3	47,004	0.51	0.4891	1.0	0.0110	46,804	518
Eastern - TO w/ Metals	0.5	0.5	1	0.75	25,686	1.27	1.2970	2.6	0.1018	65,850	2,616
Eastern - TO	0.5	0.5	1	0.75	62,064	1.27	1.2970	2.6	0.1018	159,110	6,321
Eastern - TO w/ Metals	1	1	1	1	9,250	1.69	1.7851	3.5	0.1915	32,134	1,772
Eastern - TO w/ Metals	1	1	1.81	1.405	9,400	2.37	2.6227	5.0	0.3837	46,958	3,607
Eastern - TO w/ Metals	1	1	2	1.5	31,138	2.53	2.8261	5.4	0.4358	166,880	13,569
Eastern - TO	1	1	2	1.5	15,514	2.53	2.8261	5.4	0.4358	83,145	6,760
Eastern - TO w/ Metals	2	2	2.56	2.28	11,100	3.85	4.5700	8.4	0.9366	93,468	10,397
Eastern - TO w/ Metals	2	2	2.63	2.315	48	3.91	4.6508	8.6	0.9616	411	46
Eastern - TO w/ Metals	2	2	2.97	2.485	1,275	4.20	5.0455	9.2	1.0855	11,784	1,384
Eastern - TO	2	2	2.97	2.485	725	4.20	5.0455	9.2	1.0855	6,701	787
Eastern - TO	0*	0	0.1	0.05	20,080	0.08	0.4053	0.5	0.0069	9,834	139
Eastern - TO	0.1*	0.1	0.5	0.3	40,161	0.51	0.4891	1.0	0.0110	39,990	443
Eastern - TO	0.5*	0.5	1	0.75	46,863	1.27	1.2970	2.6	0.1018	120,140	4,773
Eastern - TO	1*	1	2	1.5	34,875	2.53	2.8261	5.4	0.4358	186,906	15,197
Eastern - TO	2*	2	3	2.5	7,022	4.22	5.0806	9.3	1.0966	65,320	7,700
South	LIF	0	0.5	0.25	58,200	0.49	0.4698	1.0	0.0090	55,770	522
Southwest	LIF	0	0.5	0.25	54,090	0.49	0.4698	1.0	0.0090	51,831	485
Total					1,466,490					4,088,022	463,331

Site-wide Summary

Site Subarea	Area	Total LNAPL Volume	Total Recoverable LNAPL Volume	Recoverable LNAPL Volume
	ft^2	gallons	gallons	percent
Northwest - TO	117,200	136,671	517	0.4%
Central - DF	192,000	615,181	124,585	20%
Central - TO	471,100	1,917,211	253,749	13%
Eastern - DF	145,900	141,672	7,129	5%
Eastern - TO	428,000	1,169,687	76,344	7%
Southwest	54,090	51,831	485	0.9%
South	58,200	55,770	522	0.9%
	1,466,490	4,088,022	463,331	11.3%

Notes:

* There are no actual contours drawn for these thicknesses, these are assumed thicknesses applied to calculated areas. Included based on January 2010 LIF Investigation.

0 ot 0.1 Contour area was calculated as 0.5 x the area of the 0.1 to 0.5 contour area

Interval LNAPL End Thickness is the value of the next contour, or the max thickness observed in the monitoring well

Average LNAPL Thickness in contour is calculated as the average between the start and end thickness in the contour interval

Area take-offs were from LNAPL Contours Monitoring Event December 2009

Dn(smearzone) = (smearzone multiplier-1) x bn x Srn x porosity

Dn(bn): from API spreadsheet model per subarea/LNAPL type

Dn = Dn(smearzone) + Dn(bn)

Rn: from API Spreadsheet model

smearzone multiplier= 4

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SITE/PROJECT INFORMATION

Date:	02.02.10
Name:	MLC Willow Run
Site Location (City, ST):	Ypsilanti, MI

CASE STUDY ASSUMPTIONS

Case Name:	Central Plume - Diesel Fuel
LNAPL Type:	site-specific January laboratory data
Geology Type:	API database values based on slug test K values

CALCULATION INPUTS

Parameter	*Symbol*	*Value*	*Units*	*Source*
Site Data				
Monitoring Well LNAPL Thickness	b_n	3.185	ft	field/site data
Water Hydraulic Conductivity	K_w	3.58E-02	cm/s	slug test data Jan 2010
Water Hydraulic Gradient	J_w	0.080	dimensionless	not needed for volume calcula
Fluids Properties Data				
LNAPL density	ρ_n	0.8578	g/cm3	PTS lab data Jan 2010
LNAPL Viscosity	μ_n	0.141	g/cm-s	PTS lab data Jan 2010
Water Density	ρ_w	0.9982	g/cm3	literature (0.9982)
Water Viscosity	μ_w	0.01003	g/cm-s	literature (0.01003)
Surface Tension	σ_{aw}	55.77	dyne/cm	PTS lab data Jan 2010
Air-LNAPL Interfacial Tension	σ_{an}	29.73	dyne/cm	PTS lab data Jan 2010
LNAPL-Water Interfacial Tension	σ_{nw}	7.15	dyne/cm	PTS lab data Jan 2010
Aquifer Properties Data				
van Genuchten (vG) Alpha	α	2.98E-02	1/cm	database (API) from K
van Genuchten (vG) Beta	N	1.830	dimensionless	database (API) from K
Porosity	η	0.3808	dimensionless	database (API) from K
Irreducible Water Saturation	S_{wr}	0.29	dimensionless	database (API) from K
Residual LNAPL Saturation	S_{nr}	0.15	dimensionless	literature (M&C, 1990)

INTERIM CALCULATIONS

Parameter	*Symbol*	*Value*	*Units*	*API 4760 Equation*
Air-Water Interface in Subsurface	z_{aw}	0	ft	datum
Density Ratio	ρ_r	0.859	dimensionless	
Air-LNAPL Interface in Well	z_{an}	0.448	ft	2.19
LNAPL-Water Interface in Well	z_{nw}	-2.737	ft	2.20
Maximum Free LNAPL in Subsurface	z_{max}	7.234	ft	2.38
LNAPL vertical extent in subsurface		9.971	ft	
vG Alpha scaled to oil-water interactions	α_{nw}	0.996	1/ft	2.25
vG Alpha scaled to oil-air interactions	α_{an}	1.464	1/ft	2.31
M (Maulem)	M	0.454	dimensionless	2.6
Viscosity Ratio	μ_r	14.058	dimensionless	
Oil Hydraulic Conductivity	K_n	0.002	cm/s	3.2
Oil Hydraulic Gradient	J_n	0.093	dimensionless	site data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
29			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
30	ARCADIS Infrastructure, environment, buildings		Date:	02.02.10					Case Name:	Central Plume - Diesel Fuel					
31			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
32			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
33															
34	**PROFILE CALCULATIONS**														
35	**Scale**	**z**	**Se[w] (z)**	**Sw (z)**	**Se[t] (z)**	**Sn (z)**	**Snr**	**relative permeability, krn (Sw, Sn)**	**LNAPL velocity, Vn (cm/s)**	**delta z (cm)**	**Step Calc for Tn (bn) (cm²/s)**	**Step Calc for Dn (bn) (cm³/cm²)**	**Step Calc for Rn (cm³/cm²)**		
36	API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41		
37	0	7.234	0.147705049	0.372714827	0.147705049	0.15	0.15	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00		
38	1	6.835	0.15271618	0.375521061	0.155199189	0.151390485	0.15	2.69E-08	9.50E-11	12.16	7.15E-10	0.701	6.44E-03		
39	2	6.436	0.158115055	0.378544431	0.16357871	0.153059647	0.15	1.46E-07	5.10E-10	12.16	3.88E-09	0.709	1.42E-02		
40	3	6.037	0.163949719	0.381811843	0.173014935	0.155076521	0.15	4.53E-07	1.56E-09	12.16	1.20E-08	0.718	2.35E-02		
41	4	5.638	0.17027657	0.385354879	0.183726834	0.157532148	0.15	1.13E-06	3.85E-09	12.16	3.02E-08	0.729	3.49E-02		
42	5	5.240	0.177162255	0.389210863	0.195998824	0.160548479	0.15	2.56E-06	8.52E-09	12.16	6.80E-08	0.743	4.88E-02		
43	6	4.841	0.18468611	0.393424222	0.210207117	0.164291764	0.15	5.46E-06	1.78E-08	12.16	1.45E-07	0.761	6.62E-02		
44	7	4.442	0.192943327	0.398048263	0.226859781	0.168993214	0.15	1.14E-05	3.61E-08	12.16	3.03E-07	0.782	8.79E-02		
45	8	4.043	0.20204911	0.403147502	0.246659451	0.174981791	0.15	2.37E-05	7.25E-08	12.16	6.31E-07	0.810	1.16E-01		
46	9	3.644	0.212144205	0.408800755	0.270604717	0.182737887	0.15	5.00E-05	1.46E-07	12.16	1.33E-06	0.846	1.52E-01		
47	10	3.245	0.223402339	0.41510531	0.300160015	0.192984298	0.15	1.09E-04	3.02E-07	12.16	2.90E-06	0.893	1.99E-01		
48	11	2.847	0.236040394	0.422182621	0.337551081	0.206845985	0.15	2.50E-04	6.46E-07	12.16	6.65E-06	0.958	2.63E-01		
49	12	2.448	0.250332507	0.430186204	0.386296539	0.226139858	0.15	6.17E-04	1.46E-06	12.16	1.64E-05	1.047	3.52E-01		
50	13	2.049	0.266629956	0.439312775	0.452177544	0.253906649	0.15	1.69E-03	3.57E-06	12.16	4.51E-05	1.175	4.81E-01		
51	14	1.650	0.285389672	0.449818216	0.544877751	0.295313324	0.15	5.41E-03	9.79E-06	12.16	1.44E-04	1.367	6.73E-01		
52	15	1.251	0.307215849	0.462040875	0.679287028	0.35835986	0.15	2.13E-02	3.17E-05	12.16	5.66E-04	1.659	9.65E-01		
53	16	0.852	0.332921681	0.476436142	0.863122228	0.446912306	0.15	1.07E-01	1.28E-04	12.16	2.85E-03	2.069	1.37E+00		
54	17	0.454	0.36362227	0.493628471	0.999930134	0.506332404	0.15	6.17E-01	6.52E-04	12.16	1.64E-02	2.344	1.65E+00		
55	18	0.055	0.400875216	0.514490121	1	0.485509879	0.15	6.12E-01	6.74E-04	12.16	1.63E-02	2.247	1.55E+00		
56	19	-0.344	0.446890164	0.540258492	1	0.459741508	0.15	5.73E-01	6.67E-04	12.16	1.52E-02	2.128	1.43E+00		
57	20	-0.743	0.504818018	0.57269809	1	0.42730191	0.15	5.21E-01	6.52E-04	12.16	1.39E-02	1.978	1.28E+00		
58	21	-1.142	0.579036945	0.614260689	1	0.385739311	0.15	4.50E-01	6.23E-04	12.16	1.20E-02	1.786	1.09E+00		
59	22	-1.541	0.674882281	0.667934077	1	0.332065923	0.15	3.51E-01	5.66E-04	12.16	9.35E-03	1.537	8.43E-01		
60	23	-1.939	0.795300233	0.73536813	1	0.26463187	0.15	2.22E-01	4.49E-04	12.16	5.91E-03	1.225	5.31E-01		
61	24	-2.338	0.925980274	0.808548954	1	0.191451046	0.15	8.11E-02	2.27E-04	12.16	2.16E-03	0.886	1.92E-01		
62	25	-2.737	1	0.85	1	0.15	0.15	0.00E+00	0.00E+00	12.16	0.00E+00	0.694	4.63E-16		
63															
64	**SUMMARY CALCULATIONS (common units)**														
65								**Average S_n**	**Maximum LNAPL velocity (cm/s)**	**T_n (b_n) (ft²/yr)**	**U_{nx} (ft²/yr)**	**D_o (b_n) (gal/ft²)**	**R_n (gal/ft²)**		
66							Equation:			3.31	3.32	2.40	2.41		
67	3.185							0.261609541	6.74E-04	3.22E+03	3.00E+02	7.557	3.30E+00		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
2			Date:	02.02.10					Case Name:	Central Plume - Transmission Oil					
3			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
4			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
5															
6	**CALCULATION INPUTS**								**INTERIM CALCULATIONS**						
7	***Parameter***			***Symbol***	***Value***	***Units***	***Source***		***Parameter***			***Symbol***	***Value***	***Units***	***API 4760 Equation***
8	**Site Data**								Air-Water Interface in Subsurface			z_{aw}	0	ft	datum
9	Monitoring Well LNAPL Thickness			b_n	2.07	ft	field/site data		Density Ratio			ρ_r	0.892	dimensionless	
10	Water Hydraulic Conductivity			K_w	3.58E-02	cm/s	slug test data Jan 2010		Air-LNAPL Interface in Well			z_{an}	0.223	ft	2.19
11	Water Hydraulic Gradient			J_w	0.080	dimensionless	not needed for volume calcula		LNAPL-Water Interface in Well			z_{nw}	-1.847	ft	2.20
12									Maximum Free LNAPL in Subsurface			z_{max}	9.139	ft	2.38
13	**Fluids Properties Data**								LNAPL vertical extent in subsurface				10.986	ft	
14	LNAPL density			ρ_n	0.8905	g/cm3	PTS lab data Jan 2010		vG Alpha scaled to oil-water interactions			α_{nw}	1.039	1/ft	2.25
15	LNAPL Viscosity			μ_n	0.889	g/cm-s	PTS lab data Jan 2010		vG Alpha scaled to oil-air interactions			α_{an}	1.280	1/ft	2.31
16	Water Density			ρ_w	0.9982	g/cm3	literature (0.9982)		M (Maulem)			M	0.454	dimensionless	2.6
17	Water Viscosity			μ_w	0.01003	g/cm-s	literature (0.01003)		Viscosity Ratio			μ_r	88.634	dimensionless	
18	Surface Tension			σ_{aw}	50.14	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Conductivity			K_n	0.000	cm/s	3.2
19	Air-LNAPL Interfacial Tension			σ_{an}	31.74	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Gradient			J_n	0.090	dimensionless	site data
20	LNAPL-Water Interfacial Tension			σ_{nw}	4.73	dyne/cm	PTS lab data Jan 2010								
21															
22	**Aquifer Properties Data**														
23	van Genuchten (vG) Alpha			α	2.98E-02	1/cm	database (API) from K								
24	van Genuchten (vG) Beta			N	1.830	dimensionless	database (API) from K								
25	Porosity			η	0.3808	dimensionless	database (API) from K								
26	Irreducible Water Saturation			S_{wr}	0.29	dimensionless	database (API) from K								
27	Residual LNAPL Saturation			S_{nr}	0.2	dimensionless	literature (M&C, 1990)								
28															

29			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**							
30	ARCADIS Infrastructure, environment, buildings		Date:	02.02.10					Case Name:	Central Plume - Transmission Oil						
31			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data						
32			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values						
33																
34	**PROFILE CALCULATIONS**															
35	**Scale**	**z**	**Se[w] (z)**	**Sw (z)**	**Se[t] (z)**	**Sn (z)**	**Snr**	**relative permeability, krn (Sw, Sn)**	**LNAPL velocity, Vn (cm/s)**	**delta z (cm)**	**Step Calc for Tn (bn) (cm²/s)**	**Step Calc for Dn (bn) (cm³/cm²)**	**Step Calc for Rn (cm³/cm²)**			
36	API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41			
37	0	9.139	0.131856135	0.357246629	0.131856135	0.2	0.2	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00			
38	1	8.700	0.13634521	0.359536057	0.13743593	0.200556267	0.2	4.48E-09	1.90E-12	13.39	2.16E-11	1.023	2.84E-03			
39	2	8.260	0.14118352	0.362003595	0.143560834	0.20121243	0.2	2.35E-08	9.90E-12	13.39	1.13E-10	1.026	6.18E-03			
40	3	7.821	0.146414667	0.36467148	0.150317261	0.201990323	0.2	7.01E-08	2.94E-11	13.39	3.38E-10	1.030	1.02E-02			
41	4	7.381	0.15208991	0.367565854	0.157811116	0.202917815	0.2	1.68E-07	7.02E-11	13.39	8.10E-10	1.035	1.49E-02			
42	5	6.942	0.158269925	0.370717662	0.166173645	0.204030897	0.2	3.60E-07	1.50E-10	13.39	1.74E-09	1.041	2.06E-02			
43	6	6.502	0.165027077	0.374163809	0.175569503	0.205376637	0.2	7.23E-07	2.99E-10	13.39	3.49E-09	1.047	2.74E-02			
44	7	6.063	0.172448389	0.377948678	0.186208124	0.207017465	0.2	1.41E-06	5.76E-10	13.39	6.78E-09	1.056	3.58E-02			
45	8	5.624	0.180639447	0.382126118	0.19836003	0.209037497	0.2	2.68E-06	1.09E-09	13.39	1.30E-08	1.066	4.61E-02			
46	9	5.184	0.189729631	0.386762112	0.212380788	0.21155209	0.2	5.11E-06	2.05E-09	13.39	2.47E-08	1.079	5.89E-02			
47	10	4.745	0.199879202	0.391938393	0.228747051	0.214722603	0.2	9.80E-06	3.87E-09	13.39	4.73E-08	1.095	7.51E-02			
48	11	4.305	0.211289061	0.397757421	0.248112329	0.218779866	0.2	1.92E-05	7.43E-09	13.39	9.24E-08	1.116	9.58E-02			
49	12	3.866	0.224214425	0.404349357	0.271395945	0.224062575	0.2	3.85E-05	1.46E-08	13.39	1.86E-07	1.143	1.23E-01			
50	13	3.426	0.238984322	0.411882004	0.29992974	0.231082163	0.2	8.08E-05	2.97E-08	13.39	3.90E-07	1.179	1.59E-01			
51	14	2.987	0.256029972	0.420575286	0.335708518	0.240636059	0.2	1.79E-04	6.33E-08	13.39	8.66E-07	1.227	2.07E-01			
52	15	2.548	0.27592699	0.430722765	0.381831289	0.254011192	0.2	4.30E-04	1.44E-07	13.39	2.08E-06	1.296	2.75E-01			
53	16	2.108	0.29945957	0.442724381	0.443289533	0.273353281	0.2	1.15E-03	3.55E-07	13.39	5.53E-06	1.394	3.74E-01			
54	17	1.669	0.327720356	0.457137382	0.528295097	0.302293118	0.2	3.51E-03	9.86E-07	13.39	1.69E-05	1.542	5.22E-01			
55	18	1.229	0.362269076	0.474757229	0.64963021	0.346554179	0.2	1.30E-02	3.19E-06	13.39	6.29E-05	1.768	7.47E-01			
56	19	0.790	0.405387427	0.496747588	0.81842649	0.410649922	0.2	6.11E-02	1.26E-05	13.39	2.95E-04	2.094	1.07E+00			
57	20	0.350	0.46048245	0.52484605	0.984060857	0.467024988	0.2	3.30E-01	6.00E-05	13.39	1.59E-03	2.382	1.36E+00			
58	21	-0.089	0.532660226	0.561656715	1	0.438343285	0.2	5.10E-01	9.88E-05	13.39	2.46E-03	2.236	1.22E+00			
59	22	-0.528	0.629146446	0.610864687	1	0.389135313	0.2	4.16E-01	9.07E-05	13.39	2.01E-03	1.985	9.65E-01			
60	23	-0.968	0.757164096	0.676153689	1	0.323846311	0.2	2.80E-01	7.35E-05	13.39	1.35E-03	1.652	6.32E-01			
61	24	-1.407	0.90767243	0.75291294	1	0.24708706	0.2	1.11E-01	3.83E-05	13.39	5.38E-04	1.260	2.40E-01			
62	25	-1.847	1	0.8	1	0.2	0.2	0.00E+00	0.00E+00	13.39	0.00E+00	1.020	-5.10E-16			
63																
64	**SUMMARY CALCULATIONS (common units)**															
65								**Average S_n**	**Maximum LNAPL velocity (cm/s)**	**T_n (b_n) (ft²/yr)**	**U_{nx} (ft²/yr)**	**D_o (b_n) (gal/ft²)**	**R_n (gal/ft²)**			
66							Equation:			3.31	3.32	2.40	2.41			
67	2.07							0.262510513	9.88E-05	2.83E+02	2.54E+01	8.293	2.03E+00			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
2			Date:	02.02.10					Case Name:	Eastern Plume - Diesel Fuel					
3			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
4			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
5															
6	**CALCULATION INPUTS**								**INTERIM CALCULATIONS**						
7	***Parameter***			***Symbol***	***Value***	***Units***	***Source***		***Parameter***			***Symbol***	***Value***	***Units***	***API 4760 Equation***
8	**Site Data**								Air-Water Interface in Subsurface			z_{aw}	0	ft	datum
9	Monitoring Well LNAPL Thickness			b_n	1.215	ft	field/site data		Density Ratio			ρ_r	0.859	dimensionless	
10	Water Hydraulic Conductivity			K_w	1.99E-02	cm/s	slug test data Jan 2010		Air-LNAPL Interface in Well			z_{an}	0.171	ft	2.19
11	Water Hydraulic Gradient			J_w	0.080	dimensionless	not needed for volume calcula		LNAPL-Water Interface in Well			z_{nw}	-1.044	ft	2.20
12									Maximum Free LNAPL in Subsurface			z_{max}	2.759	ft	2.38
13	**Fluids Properties Data**								LNAPL vertical extent in subsurface				3.804	ft	
14	LNAPL density			ρ_n	0.8578	g/cm3	PTS lab data Jan 2010		vG Alpha scaled to oil-water interactions			α_{nw}	0.505	1/ft	2.25
15	LNAPL Viscosity			μ_n	0.141	g/cm-s	PTS lab data Jan 2010		vG Alpha scaled to oil-air interactions			α_{an}	0.742	1/ft	2.31
16	Water Density			ρ_w	0.9982	g/cm3	literature (0.9982)		M (Maulem)			M	0.405	dimensionless	2.6
17	Water Viscosity			μ_w	0.01003	g/cm-s	literature (0.01003)		Viscosity Ratio			μ_r	14.058	dimensionless	
18	Surface Tension			σ_{aw}	55.77	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Conductivity			K_n	0.001	cm/s	3.2
19	Air-LNAPL Interfacial Tension			σ_{an}	29.73	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Gradient			J_n	0.093	dimensionless	site data
20	LNAPL-Water Interfacial Tension			σ_{nw}	7.15	dyne/cm	PTS lab data Jan 2010								
21															
22	**Aquifer Properties Data**														
23	van Genuchten (vG) Alpha			α	1.51E-02	1/cm	database (API) from K								
24	van Genuchten (vG) Beta			N	1.680	dimensionless	database (API) from K								
25	Porosity			η	0.3763	dimensionless	database (API) from K								
26	Irreducible Water Saturation			S_{wr}	0.34	dimensionless	database (API) from K								
27	Residual LNAPL Saturation			S_{nr}	0.15	dimensionless	literature (M&C, 1990)								
28															

29			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**							
30	ARCADIS Infrastructure, environment, buildings		Date:	02.02.10					Case Name:	Eastern Plume - Diesel Fuel						
31			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data						
32			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values						
33																
34	**PROFILE CALCULATIONS**															
35	**Scale**	**z**	**Se[w] (z)**	**Sw (z)**	**Se[t] (z)**	**Sn (z)**	**Snr**	**relative permeability, krn (Sw, Sn)**	**LNAPL velocity, Vn (cm/s)**	**delta z (cm)**	**Step Calc for Tn (bn) (cm²/s)**	**Step Calc for Dn (bn) (cm³/cm²)**	**Step Calc for Rn (cm³/cm²)**			
36	API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41			
37	0	2.759	0.570952246	0.631185646	0.570952246	0.15	0.15	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00			
38	1	2.607	0.582851597	0.637254314	0.588619873	0.152941821	0.15	3.90E-06	7.68E-09	4.64	2.20E-08	0.267	5.13E-03			
39	2	2.455	0.595287272	0.643596509	0.60747604	0.156216271	0.15	1.96E-05	3.78E-08	4.64	1.11E-07	0.273	1.08E-02			
40	3	2.303	0.608289522	0.650227656	0.627618601	0.15985783	0.15	5.59E-05	1.05E-07	4.64	3.15E-07	0.279	1.72E-02			
41	4	2.151	0.621889466	0.657163628	0.649147628	0.163901662	0.15	1.27E-04	2.33E-07	4.64	7.16E-07	0.286	2.43E-02			
42	5	1.999	0.636118704	0.664420539	0.672161158	0.168381652	0.15	2.56E-04	4.58E-07	4.64	1.44E-06	0.294	3.21E-02			
43	6	1.847	0.651008747	0.672014461	0.696748185	0.173327113	0.15	4.81E-04	8.34E-07	4.64	2.71E-06	0.302	4.07E-02			
44	7	1.694	0.666590214	0.679961009	0.72297746	0.178757496	0.15	8.61E-04	1.45E-06	4.64	4.86E-06	0.312	5.02E-02			
45	8	1.542	0.682891701	0.688274768	0.750880091	0.184674079	0.15	1.50E-03	2.44E-06	4.64	8.44E-06	0.322	6.05E-02			
46	9	1.390	0.69993824	0.696968502	0.780423099	0.191047278	0.15	2.55E-03	4.01E-06	4.64	1.44E-05	0.333	7.16E-02			
47	10	1.238	0.717749193	0.706052088	0.811470218	0.197797723	0.15	4.28E-03	6.51E-06	4.64	2.41E-05	0.345	8.34E-02			
48	11	1.086	0.736335438	0.715531074	0.8437254	0.20476888	0.15	7.11E-03	1.04E-05	4.64	4.01E-05	0.357	9.56E-02			
49	12	0.934	0.755695622	0.725404767	0.876654432	0.211688993	0.15	1.17E-02	1.67E-05	4.64	6.62E-05	0.369	1.08E-01			
50	13	0.782	0.775811236	0.73566373	0.909381535	0.218120853	0.15	1.93E-02	2.66E-05	4.64	1.09E-04	0.381	1.19E-01			
51	14	0.629	0.796640224	0.746286514	0.940561429	0.223399815	0.15	3.16E-02	4.26E-05	4.64	1.78E-04	0.390	1.28E-01			
52	15	0.477	0.818108795	0.757235485	0.968228123	0.226560857	0.15	5.19E-02	6.89E-05	4.64	2.93E-04	0.395	1.34E-01			
53	16	0.325	0.840101109	0.768451566	0.989578277	0.226233355	0.15	8.67E-02	1.15E-04	4.64	4.89E-04	0.395	1.33E-01			
54	17	0.173	0.86244656	0.779847746	0.999991905	0.220148126	0.15	1.73E-01	2.36E-04	4.64	9.75E-04	0.384	1.22E-01			
55	18	0.021	0.884904486	0.791301288	1	0.208698712	0.15	1.54E-01	2.22E-04	4.64	8.68E-04	0.364	1.02E-01			
56	19	-0.131	0.907146353	0.80264464	1	0.19735536	0.15	1.28E-01	1.94E-04	4.64	7.19E-04	0.344	8.26E-02			
57	20	-0.283	0.928735692	0.813655203	1	0.186344797	0.15	1.01E-01	1.64E-04	4.64	5.72E-04	0.325	6.34E-02			
58	21	-0.436	0.949105967	0.824044043	1	0.175955957	0.15	7.59E-02	1.30E-04	4.64	4.28E-04	0.307	4.53E-02			
59	22	-0.588	0.967535079	0.83344289	1	0.16655711	0.15	5.19E-02	9.38E-05	4.64	2.93E-04	0.291	2.89E-02			
60	23	-0.740	0.983107729	0.841384942	1	0.158615058	0.15	3.01E-02	5.72E-05	4.64	1.70E-04	0.277	1.50E-02			
61	24	-0.892	0.994620328	0.847256367	1	0.152743633	0.15	1.18E-02	2.32E-05	4.64	6.65E-05	0.267	4.79E-03			
62	25	-1.044	1	0.85	1	0.15	0.15	0.00E+00	0.00E+00	4.64	0.00E+00	0.262	1.75E-16			
63																
64	**SUMMARY CALCULATIONS (common units)**															
65								**Average S_n**	**Maximum LNAPL velocity (cm/s)**	**T_n (b_n) (ft²/yr)**	**U_{nx} (ft²/yr)**	**D_o (b_n) (gal/ft²)**	**R_n (gal/ft²)**			
66							Equation:			3.31	3.32	2.40	2.41			
67	1.215							0.184772863	2.36E-04	1.81E+02	1.68E+01	1.993	3.87E-01			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
2	ARCADIS Infrastructure, environment, buildings		Date:	02.02.10					Case Name:	Eastern Plume - Transmission Oil					
3			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
4			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
5															
6	**CALCULATION INPUTS**								**INTERIM CALCULATIONS**						
7	***Parameter***			***Symbol***	***Value***	***Units***	***Source***		***Parameter***			***Symbol***	***Value***	***Units***	***API 4760 Equation***
8	**Site Data**								Air-Water Interface in Subsurface			z_{aw}	0	ft	datum
9	Monitoring Well LNAPL Thickness			b_n	2.5	ft	field/site data		Density Ratio			ρ_r	0.881	dimensionless	
10	Water Hydraulic Conductivity			K_w	1.99E-02	cm/s	slug test data Jan 2010		Air-LNAPL Interface in Well			z_{an}	0.297	ft	2.19
11	Water Hydraulic Gradient			J_w	0.080	dimensionless	not needed for volume calcula		LNAPL-Water Interface in Well			z_{nw}	-2.203	ft	2.20
12									Maximum Free LNAPL in Subsurface			z_{max}	4.873	ft	2.38
13	**Fluids Properties Data**								LNAPL vertical extent in subsurface				7.077	ft	
14	LNAPL density			ρ_n	0.8798	g/cm3	PTS lab data Jan 2010		vG Alpha scaled to oil-water interactions			α_{nw}	0.458	1/ft	2.25
15	LNAPL Viscosity			μ_n	1.21	g/cm-s	PTS lab data Jan 2010		vG Alpha scaled to oil-air interactions			α_{an}	0.707	1/ft	2.31
16	Water Density			ρ_w	0.9982	g/cm3	literature (0.9982)		M (Maulem)			M	0.405	dimensionless	2.6
17	Water Viscosity			μ_w	0.01003	g/cm-s	literature (0.01003)		Viscosity Ratio			μ_r	120.638	dimensionless	
18	Surface Tension			σ_{aw}	55.23	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Conductivity			K_n	0.000	cm/s	3.2
19	Air-LNAPL Interfacial Tension			σ_{an}	31.67	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Gradient			J_n	0.091	dimensionless	site data
20	LNAPL-Water Interfacial Tension			σ_{nw}	6.59	dyne/cm	PTS lab data Jan 2010								
21															
22	**Aquifer Properties Data**														
23	van Genuchten (vG) Alpha			α	1.51E-02	1/cm	database (API) from K								
24	van Genuchten (vG) Beta			N	1.680	dimensionless	database (API) from K								
25	Porosity			η	0.3763	dimensionless	database (API) from K								
26	Irreducible Water Saturation			S_{wr}	0.34	dimensionless	database (API) from K								
27	Residual LNAPL Saturation			S_{nr}	0.2	dimensionless	literature (M&C, 1990)								
28															

29			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**							
30	ARCADIS Infrastructure, environment, buildings		Date:	02.02.10					Case Name:	Eastern Plume - Transmission Oil						
31			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data						
32			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values						
33																
34	**PROFILE CALCULATIONS**															
35	**Scale**	**z**	**Se[w] (z)**	**Sw (z)**	**Se[t] (z)**	**Sn (z)**	**Snr**	**relative permeability, krn (Sw, Sn)**	**LNAPL velocity, Vn (cm/s)**	**delta z (cm)**	**Step Calc for Tn (bn) (cm²/s)**	**Step Calc for Dn (bn) (cm³/cm²)**	**Step Calc for Rn (cm³/cm²)**			
36	API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41			
37	0	4.873	0.426732296	0.536296856	0.426732296	0.2	0.2	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00			
38	1	4.590	0.437215518	0.541119138	0.443199143	0.202752468	0.2	1.71E-06	2.95E-10	8.63	2.14E-09	0.658	8.94E-03			
39	2	4.307	0.448316722	0.546225692	0.461216123	0.205933724	0.2	8.94E-06	1.52E-09	8.63	1.12E-08	0.669	1.93E-02			
40	3	4.024	0.460091644	0.551642156	0.481008949	0.20962196	0.2	2.67E-05	4.46E-09	8.63	3.35E-08	0.681	3.12E-02			
41	4	3.741	0.472602421	0.557397114	0.50284496	0.213911568	0.2	6.39E-05	1.05E-08	8.63	8.02E-08	0.695	4.52E-02			
42	5	3.458	0.48591838	0.563522455	0.527040746	0.218916288	0.2	1.37E-04	2.19E-08	8.63	1.72E-07	0.711	6.14E-02			
43	6	3.175	0.500116897	0.570053772	0.55396982	0.224772345	0.2	2.76E-04	4.30E-08	8.63	3.46E-07	0.730	8.04E-02			
44	7	2.892	0.515284281	0.577030769	0.584068451	0.231640718	0.2	5.35E-04	8.10E-08	8.63	6.71E-07	0.752	1.03E-01			
45	8	2.609	0.531516674	0.58449767	0.617835318	0.239706576	0.2	1.02E-03	1.49E-07	8.63	1.28E-06	0.778	1.29E-01			
46	9	2.326	0.548920839	0.592503586	0.655815492	0.249171541	0.2	1.94E-03	2.73E-07	8.63	2.43E-06	0.809	1.60E-01			
47	10	2.043	0.56761473	0.601102776	0.698548643	0.2602296	0.2	3.70E-03	4.98E-07	8.63	4.64E-06	0.845	1.96E-01			
48	11	1.760	0.587727574	0.610354684	0.746440189	0.273007803	0.2	7.12E-03	9.15E-07	8.63	8.94E-06	0.886	2.37E-01			
49	12	1.477	0.609399065	0.62032357	0.799474391	0.28743465	0.2	1.40E-02	1.70E-06	8.63	1.75E-05	0.933	2.84E-01			
50	13	1.193	0.632777001	0.63107742	0.856623916	0.302969581	0.2	2.79E-02	3.23E-06	8.63	3.51E-05	0.984	3.34E-01			
51	14	0.910	0.658012282	0.64268565	0.914741322	0.318095359	0.2	5.71E-02	6.30E-06	8.63	7.17E-05	1.033	3.83E-01			
52	15	0.627	0.685249549	0.655214793	0.966740997	0.329486066	0.2	1.20E-01	1.28E-05	8.63	1.50E-04	1.070	4.20E-01			
53	16	0.344	0.714610729	0.668720935	0.99863967	0.330653313	0.2	2.76E-01	2.93E-05	8.63	3.47E-04	1.074	4.24E-01			
54	17	0.061	0.746167288	0.683236953	1	0.316763047	0.2	3.29E-01	3.64E-05	8.63	4.13E-04	1.028	3.79E-01			
55	18	-0.222	0.779894934	0.698751669	1	0.301248331	0.2	2.92E-01	3.40E-05	8.63	3.67E-04	0.978	3.29E-01			
56	19	-0.505	0.815601895	0.715176872	1	0.284823128	0.2	2.52E-01	3.10E-05	8.63	3.16E-04	0.925	2.75E-01			
57	20	-0.788	0.852819505	0.732296972	1	0.267703028	0.2	2.08E-01	2.73E-05	8.63	2.61E-04	0.869	2.20E-01			
58	21	-1.071	0.890643238	0.749695889	1	0.250304111	0.2	1.62E-01	2.27E-05	8.63	2.04E-04	0.813	1.63E-01			
59	22	-1.354	0.927516999	0.766657819	1	0.233342181	0.2	1.15E-01	1.73E-05	8.63	1.44E-04	0.758	1.08E-01			
60	23	-1.637	0.960963013	0.782042986	1	0.217957014	0.2	6.87E-02	1.10E-05	8.63	8.61E-05	0.708	5.83E-02			
61	24	-1.920	0.987229731	0.794125676	1	0.205874324	0.2	2.74E-02	4.67E-06	8.63	3.44E-05	0.668	1.91E-02			
62	25	-2.203	1	0.8	1	0.2	0.2	0.00E+00	0.00E+00	8.63	0.00E+00	0.649	3.25E-16			
63																
64	**SUMMARY CALCULATIONS (common units)**															
65								**Average S_n**	**Maximum LNAPL velocity (cm/s)**	**T_n (b_n) (ft²/yr)**	**U_{nx} (ft²/yr)**	**D_o (b_n) (gal/ft²)**	**R_n (gal/ft²)**			
66							Equation:			3.31	3.32	2.40	2.41			
67	2.5							0.252935336	3.64E-05	8.37E+01	7.59E+00	5.081	1.10E+00			

ARCADIS
Infrastructure, environment, buildings

SITE/PROJECT INFORMATION

Date:	02.02.10
Name:	MLC Willow Run
Site Location (City, ST):	Ypsilanti, MI

CASE STUDY ASSUMPTIONS

Case Name:	Southwestern and Southern Plumes - Transmission Oil
LNAPL Type:	site-specific January laboratory data
Geology Type:	API database values based on slug test K values

CALCULATION INPUTS

Parameter	*Symbol*	*Value*	*Units*	*Source*
Site Data				
Monitoring Well LNAPL Thickness	b_n	0.3	ft	field/site data
Water Hydraulic Conductivity	K_w	8.19E-03	cm/s	slug test data Jan 2010
Water Hydraulic Gradient	J_w	0.080	dimensionless	not needed for volume calcula
Fluids Properties Data				
LNAPL density	ρ_n	0.8798	g/cm3	PTS lab data Jan 2010
LNAPL Viscosity	μ_n	1.21	g/cm-s	PTS lab data Jan 2010
Water Density	ρ_w	0.9982	g/cm3	literature (0.9982)
Water Viscosity	μ_w	0.01003	g/cm-s	literature (0.01003)
Surface Tension	σ_{aw}	55.23	dyne/cm	PTS lab data Jan 2010
Air-LNAPL Interfacial Tension	σ_{an}	31.67	dyne/cm	PTS lab data Jan 2010
LNAPL-Water Interfacial Tension	σ_{nw}	6.59	dyne/cm	PTS lab data Jan 2010
Aquifer Properties Data				
van Genuchten (vG) Alpha	α	1.75E-02	1/cm	database (API) from K
van Genuchten (vG) Beta	N	2.150	dimensionless	database (API) from K
Porosity	η	0.4353	dimensionless	database (API) from K
Irreducible Water Saturation	S_{wr}	0.236	dimensionless	database (API) from K
Residual LNAPL Saturation	S_{nr}	0.2	dimensionless	literature (M&C, 1990)

INTERIM CALCULATIONS

Parameter	*Symbol*	*Value*	*Units*	*API 4760 Equation*
Air-Water Interface in Subsurface	z_{aw}	0	ft	datum
Density Ratio	ρ_r	0.881	dimensionless	
Air-LNAPL Interface in Well	z_{an}	0.036	ft	2.19
LNAPL-Water Interface in Well	z_{nw}	-0.264	ft	2.20
Maximum Free LNAPL in Subsurface	z_{max}	0.585	ft	2.38
LNAPL vertical extent in subsurface		0.849	ft	
vG Alpha scaled to oil-water interactions	α_{nw}	0.530	1/ft	2.25
vG Alpha scaled to oil-air interactions	α_{an}	0.820	1/ft	2.31
M (Maulem)	M	0.535	dimensionless	2.6
Viscosity Ratio	μ_r	120.638	dimensionless	
Oil Hydraulic Conductivity	K_n	0.000	cm/s	3.2
Oil Hydraulic Gradient	J_n	0.091	dimensionless	site data

ARCADIS
Infrastructure, environment, buildings

SITE/PROJECT INFORMATION

Date:	02.02.10
Name:	MLC Willow Run
Site Location (City, ST):	Ypsilanti, MI

CASE STUDY ASSUMPTIONS

Case Name:	Southwestern and Southern Plumes - Transmission Oil
LNAPL Type:	site-specific January laboratory data
Geology Type:	API database values based on slug test K values

PROFILE CALCULATIONS

Scale	z	Se[w] (z)	Sw (z)	Se[t] (z)	Sn (z)	Snr	relative permeability, krn (Sw, Sn)	LNAPL velocity, Vn (cm/s)	delta z (cm)	Step Calc for Tn (bn) (cm²/s)	Step Calc for Dn (bn) (cm³/cm²)	Step Calc for Rn (cm³/cm²)
API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41
0	0.585	0.915315535	0.752237962	0.915315535	0.2	0.2	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00
1	0.551	0.921650275	0.755810755	0.925036051	0.201909578	0.2	2.82E-05	1.74E-09	1.04	1.75E-09	0.091	8.61E-04
2	0.517	0.927807186	0.759283253	0.934316231	0.203671101	0.2	1.17E-04	7.16E-09	1.04	7.24E-09	0.092	1.65E-03
3	0.483	0.93377464	0.762648897	0.943113634	0.205267192	0.2	2.72E-04	1.65E-08	1.04	1.68E-08	0.093	2.37E-03
4	0.449	0.939541181	0.765901226	0.951387245	0.20668118	0.2	4.96E-04	3.00E-08	1.04	3.08E-08	0.093	3.01E-03
5	0.415	0.945095592	0.769033914	0.959098144	0.207897439	0.2	7.94E-04	4.76E-08	1.04	4.92E-08	0.094	3.56E-03
6	0.381	0.950426976	0.772040814	0.966210201	0.208901739	0.2	1.16E-03	6.96E-08	1.04	7.22E-08	0.094	4.01E-03
7	0.347	0.955524828	0.774916003	0.972690796	0.209681606	0.2	1.61E-03	9.57E-08	1.04	9.96E-08	0.095	4.36E-03
8	0.313	0.960379116	0.777653821	0.978511552	0.210226694	0.2	2.12E-03	1.26E-07	1.04	1.31E-07	0.095	4.61E-03
9	0.279	0.964980363	0.780248925	0.983649074	0.210529153	0.2	2.69E-03	1.59E-07	1.04	1.67E-07	0.095	4.75E-03
10	0.245	0.969319728	0.782696327	0.988085712	0.210584015	0.2	3.31E-03	1.96E-07	1.04	2.05E-07	0.095	4.77E-03
11	0.211	0.973389089	0.784991446	0.991810368	0.210389601	0.2	3.96E-03	2.35E-07	1.04	2.45E-07	0.095	4.68E-03
12	0.177	0.977181125	0.787130155	0.994819427	0.209948002	0.2	4.62E-03	2.75E-07	1.04	2.86E-07	0.095	4.48E-03
13	0.143	0.980689403	0.789108823	0.997117978	0.209265716	0.2	5.27E-03	3.14E-07	1.04	3.26E-07	0.094	4.18E-03
14	0.109	0.983908461	0.790924372	0.998721768	0.208354705	0.2	5.86E-03	3.51E-07	1.04	3.63E-07	0.094	3.77E-03
15	0.075	0.986833898	0.792574318	0.999661262	0.207234633	0.2	6.34E-03	3.82E-07	1.04	3.93E-07	0.093	3.26E-03
16	0.041	0.989462465	0.79405683	0.999994728	0.205940196	0.2	6.53E-03	3.96E-07	1.04	4.05E-07	0.093	2.68E-03
17	0.007	0.991792167	0.795370782	1	0.204629218	0.2	5.17E-03	3.15E-07	1.04	3.20E-07	0.092	2.09E-03
18	-0.027	0.993822377	0.796515821	1	0.203484179	0.2	3.81E-03	2.33E-07	1.04	2.36E-07	0.092	1.57E-03
19	-0.061	0.99555398	0.797492445	1	0.202507555	0.2	2.67E-03	1.65E-07	1.04	1.66E-07	0.091	1.13E-03
20	-0.095	0.996989559	0.798302111	1	0.201697889	0.2	1.76E-03	1.09E-07	1.04	1.09E-07	0.091	7.65E-04
21	-0.129	0.99813367	0.79894739	1	0.20105261	0.2	1.05E-03	6.54E-08	1.04	6.53E-08	0.091	4.74E-04
22	-0.163	0.998993285	0.799432213	1	0.200567787	0.2	5.44E-04	3.38E-08	1.04	3.37E-08	0.090	2.56E-04
23	-0.196	0.999578618	0.799762341	1	0.200237659	0.2	2.14E-04	1.33E-08	1.04	1.33E-08	0.090	1.07E-04
24	-0.230	0.999905013	0.799946427	1	0.200053573	0.2	4.35E-05	2.71E-09	1.04	2.69E-09	0.090	2.41E-05
25	-0.264	1	0.8	1	0.2	0.2	0.00E+00	0.00E+00	1.04	0.00E+00	0.090	-4.51E-17

SUMMARY CALCULATIONS (common units)

	Average S_n	Maximum LNAPL velocity (cm/s)	T_n (b_n) (ft²/yr)	U_{nx} (ft²/yr)	D_o (b_n) (gal/ft²)	R_n (gal/ft²)
Equation:			3.31	3.32	2.40	2.41
	0.205412039	3.96E-07	1.27E-01	1.15E-02	0.569	1.56E-02

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
2			Date:	02.02.10					Case Name:	Northwestern Plume					
3			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
4			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
5															
6	**CALCULATION INPUTS**								**INTERIM CALCULATIONS**						
7	***Parameter***			***Symbol***	***Value***	***Units***	***Source***		***Parameter***			***Symbol***	***Value***	***Units***	***API 4760 Equation***
8	**Site Data**								Air-Water Interface in Subsurface			z_{aw}	0	ft	datum
9	Monitoring Well LNAPL Thickness			b_n	0.25	ft	field/site data		Density Ratio			ρ_r	0.897	dimensionless	
10	Water Hydraulic Conductivity			K_w	9.40E-04	cm/s	slug test data Jan 2010		Air-LNAPL Interface in Well			z_{an}	0.026	ft	2.19
11	Water Hydraulic Gradient			J_w	0.080	dimensionless	not needed for volume calcula		LNAPL-Water Interface in Well			z_{nw}	-0.224	ft	2.20
12									Maximum Free LNAPL in Subsurface			z_{max}	0.109	ft	2.38
13	**Fluids Properties Data**								LNAPL vertical extent in subsurface				0.333	ft	
14	LNAPL density			ρ_n	0.895	g/cm3	PTS lab data Jan 2010		vG Alpha scaled to oil-water interactions			α_{nw}	0.200	1/ft	2.25
15	LNAPL Viscosity			μ_n	3.075	g/cm-s	PTS lab data Jan 2010		vG Alpha scaled to oil-air interactions			α_{an}	0.807	1/ft	2.31
16	Water Density			ρ_w	0.9982	g/cm3	literature (0.9982)		M (Maulem)			M	0.515	dimensionless	2.6
17	Water Viscosity			μ_w	0.01003	g/cm-s	literature (0.01003)		Viscosity Ratio			μ_r	306.580	dimensionless	
18	Surface Tension			σ_{aw}	64.28	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Conductivity			K_n	0.000	cm/s	3.2
19	Air-LNAPL Interfacial Tension			σ_{an}	31.36	dyne/cm	PTS lab data Jan 2010		Oil Hydraulic Gradient			J_n	0.089	dimensionless	site data
20	LNAPL-Water Interfacial Tension			σ_{nw}	14.55	dyne/cm	PTS lab data Jan 2010								
21															
22	**Aquifer Properties Data**														
23	van Genuchten (vG) Alpha			α	1.44E-02	1/cm	database (API) from K								
24	van Genuchten (vG) Beta			N	2.060	dimensionless	database (API) from K								
25	Porosity			η	0.3829	dimensionless	database (API) from K								
26	Irreducible Water Saturation			S_{wr}	0.3038	dimensionless	database (API) from K								
27	Residual LNAPL Saturation			S_{nr}	0.2	dimensionless	literature (M&C, 1990)								
28															

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
29			**SITE/PROJECT INFORMATION**						**CASE STUDY ASSUMPTIONS**						
30			Date:	02.02.10					Case Name:	Northwestern Plume					
31			Name:	MLC Willow Run					LNAPL Type:	site-specific January laboratory data					
32			Site Location (City, ST):		Ypsilanti, MI				Geology Type:	API database values based on slug test K values					
33															
34	**PROFILE CALCULATIONS**														
35	**Scale**	**z**	**Se[w] (z)**	**Sw (z)**	**Se[t] (z)**	**Sn (z)**	**Snr**	**relative permeability, krn (Sw, Sn)**	**LNAPL velocity, Vn (cm/s)**	**delta z (cm)**	**Step Calc for Tn (bn) (cm²/s)**	**Step Calc for Dn (bn) (cm³/cm²)**	**Step Calc for Rn (cm³/cm²)**		
36	API 4760 Equation:		2.24	2.27	2.30	2.28 & 2.33		3.14			3.31	2.40	2.41		
37	0	0.109	0.998060018	0.799037381	0.998060018	0.2	0.2	0.00E+00	0.00E+00		0.00E+00	0.000	0.00E+00		
38	1	0.095	0.998216076	0.799114817	0.998647376	0.200214011	0.2	2.31E-05	7.40E-11	0.41	2.58E-11	0.031	3.32E-05		
39	2	0.082	0.998365458	0.79918894	0.999127136	0.200377945	0.2	9.14E-05	2.92E-10	0.41	1.02E-10	0.031	5.87E-05		
40	3	0.069	0.998508171	0.799259755	0.999500229	0.200492259	0.2	2.03E-04	6.47E-10	0.41	2.26E-10	0.031	7.65E-05		
41	4	0.055	0.998644227	0.799327265	0.999768056	0.200557644	0.2	3.53E-04	1.13E-09	0.41	3.94E-10	0.031	8.66E-05		
42	5	0.042	0.998773634	0.799391477	0.999932761	0.200575159	0.2	5.38E-04	1.72E-09	0.41	6.00E-10	0.031	8.93E-05		
43	6	0.029	0.998896407	0.799452397	0.99999813	0.200546675	0.2	7.44E-04	2.38E-09	0.41	8.29E-10	0.031	8.49E-05		
44	7	0.015	0.999012556	0.79951003	1	0.20048997	0.2	7.16E-04	2.29E-09	0.41	7.98E-10	0.031	7.61E-05		
45	8	0.002	0.999122098	0.799564385	1	0.200435615	0.2	6.34E-04	2.03E-09	0.41	7.07E-10	0.031	6.77E-05		
46	9	-0.011	0.999225049	0.799615469	1	0.200384531	0.2	5.58E-04	1.78E-09	0.41	6.22E-10	0.031	5.97E-05		
47	10	-0.025	0.999321427	0.799663292	1	0.200336708	0.2	4.86E-04	1.56E-09	0.41	5.42E-10	0.031	5.23E-05		
48	11	-0.038	0.999411251	0.799707863	1	0.200292137	0.2	4.20E-04	1.34E-09	0.41	4.69E-10	0.031	4.54E-05		
49	12	-0.051	0.999494545	0.799749193	1	0.200250807	0.2	3.59E-04	1.15E-09	0.41	4.01E-10	0.031	3.90E-05		
50	13	-0.064	0.999571331	0.799787295	1	0.200212705	0.2	3.03E-04	9.70E-10	0.41	3.38E-10	0.031	3.30E-05		
51	14	-0.078	0.999641638	0.799822181	1	0.200177819	0.2	2.52E-04	8.07E-10	0.41	2.81E-10	0.031	2.76E-05		
52	15	-0.091	0.999705494	0.799853866	1	0.200146134	0.2	2.06E-04	6.59E-10	0.41	2.30E-10	0.031	2.27E-05		
53	16	-0.104	0.999762933	0.799882368	1	0.200117632	0.2	1.65E-04	5.27E-10	0.41	1.84E-10	0.031	1.83E-05		
54	17	-0.118	0.999813993	0.799907703	1	0.200092297	0.2	1.28E-04	4.11E-10	0.41	1.43E-10	0.031	1.43E-05		
55	18	-0.131	0.999858716	0.799929895	1	0.200070105	0.2	9.67E-05	3.10E-10	0.41	1.08E-10	0.031	1.09E-05		
56	19	-0.144	0.999897149	0.799948965	1	0.200051035	0.2	6.98E-05	2.23E-10	0.41	7.78E-11	0.031	7.93E-06		
57	20	-0.158	0.999929349	0.799964943	1	0.200035057	0.2	4.74E-05	1.52E-10	0.41	5.28E-11	0.031	5.44E-06		
58	21	-0.171	0.999955383	0.799977861	1	0.200022139	0.2	2.95E-05	9.46E-11	0.41	3.29E-11	0.031	3.44E-06		
59	22	-0.184	0.999975332	0.79998776	1	0.20001224	0.2	1.60E-05	5.14E-11	0.41	1.79E-11	0.031	1.90E-06		
60	23	-0.198	0.9999893	0.79999469	1	0.20000531	0.2	6.79E-06	2.18E-11	0.41	7.58E-12	0.031	8.25E-07		
61	24	-0.211	0.999997434	0.799998727	1	0.200001273	0.2	1.56E-06	5.01E-12	0.41	1.74E-12	0.031	1.98E-07		
62	25	-0.224	1	0.8	1	0.2	0.2	0.00E+00	0.00E+00	0.41	0.00E+00	0.031	1.55E-17		
63															
64	**SUMMARY CALCULATIONS (common units)**														
65								**Average S_n**	**Maximum LNAPL velocity (cm/s)**	**T_n (b_n) (ft²/yr)**	**U_{nx} (ft²/yr)**	**D_o (b_n) (gal/ft²)**	**R_n (gal/ft²)**		
66							Equation:			3.31	3.32	2.40	2.41		
67	0.25							0.200226816	2.38E-09	2.44E-04	2.18E-05	0.191	2.25E-04		