Meridian Environmental Consulting, LLC

February 11, 2013

Carrie Stoltz
Wisconsin Department of Natural Resources
107 Sutliff Avenue
Rhinelander, Wisconsin 54501

David Swimm
Department of Safety and Professional Services – PECFA
P.O. Box 7838
Madison, Wisconsin 53707-7838

Subject: **LNAPL Assessment Report: Addendum**
Doug's Tire Center
811 Lake Ave W
Ladysmith, Wisconsin
PECFA # 54848-1215-11-A
DNR BRRTS # 03-55-000408
Meridian No. 05F786

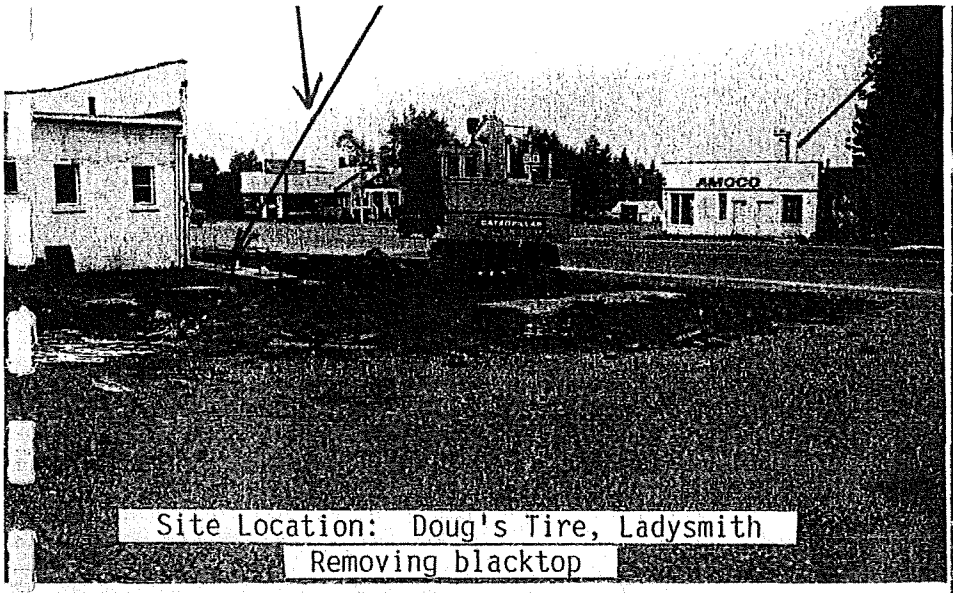
Dear Carrie and Dave:

This report is an addendum to our earlier correspondence titled (*LNAPL Assessment Report: Preliminary Results* dated November 15, 2012). The earlier correspondence presented the results of LNAPL Assessment work completed at the above referenced site in the fall of 2012. This addendum presents the interpretation of that data and our recommendations for further work to Close this site with GIS Registry for Soil and Ground Water.

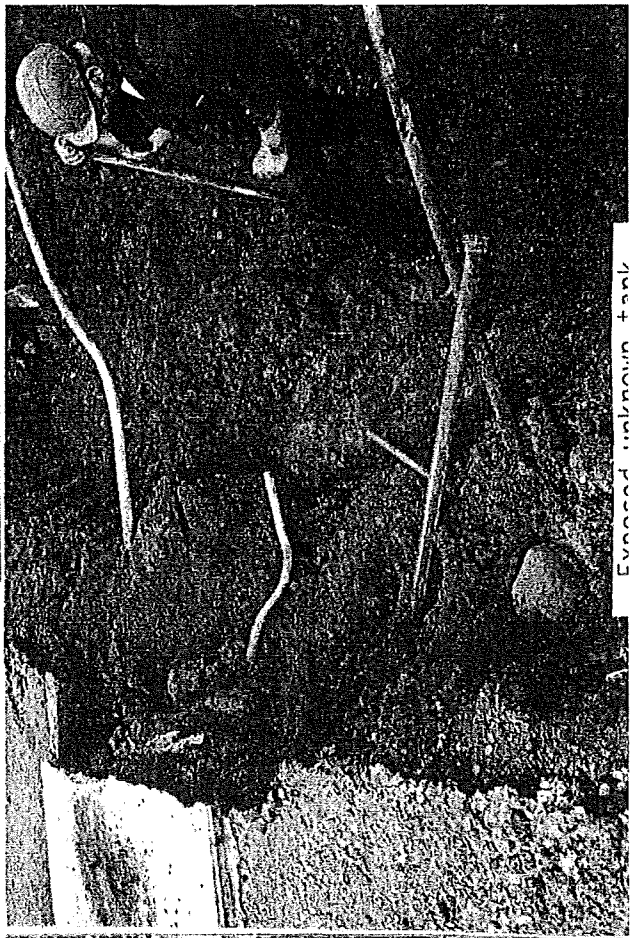
The supporting documents (i.e., lab reports, LIF reports, boring logs, etc.) were provided as appendices in the initial report. These documents comprise a significant number of pages and are not reproduced in this addendum. Instead, this addendum refers directly to the appendices in the earlier report. And, Tables, Figures, and Appendices in this addendum adhere to the numbering order of the initial report.

We recommend impacted source soils be excavated. We also recommend the existing remediation system be upgraded to more effectively remove accessible LNAPL. This upgrade should be combined with remediation at the adjacent Autostop site to save money and accelerate the remediation.

A Cost Estimate for the excavation is included with this Addendum. A Cost Estimate for designing the remedial upgrades at Doug's and Autostop will be prepared separately.

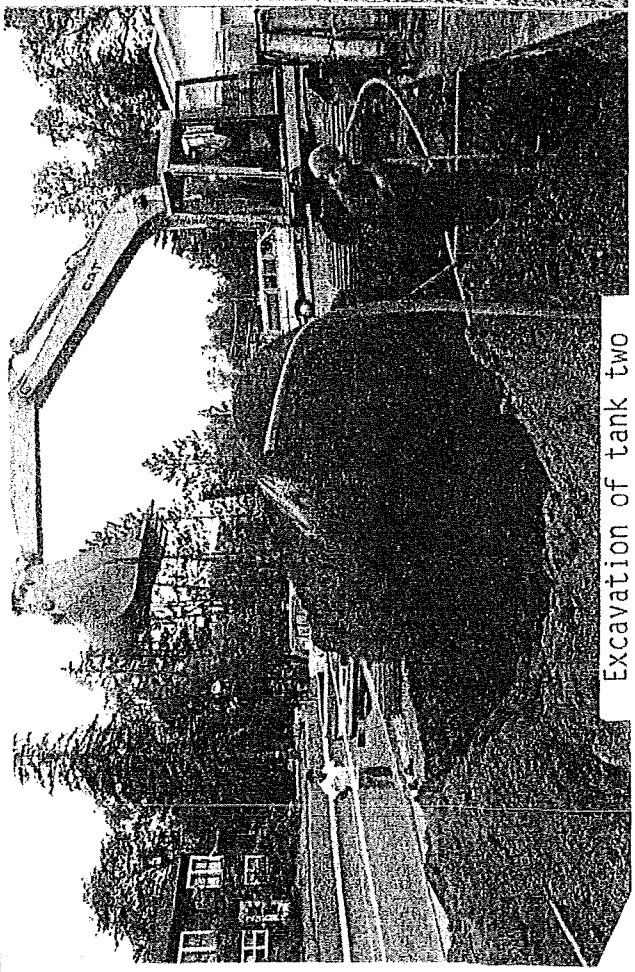


Site Location: Doug's Tire, Ladysmith
Removing blacktop

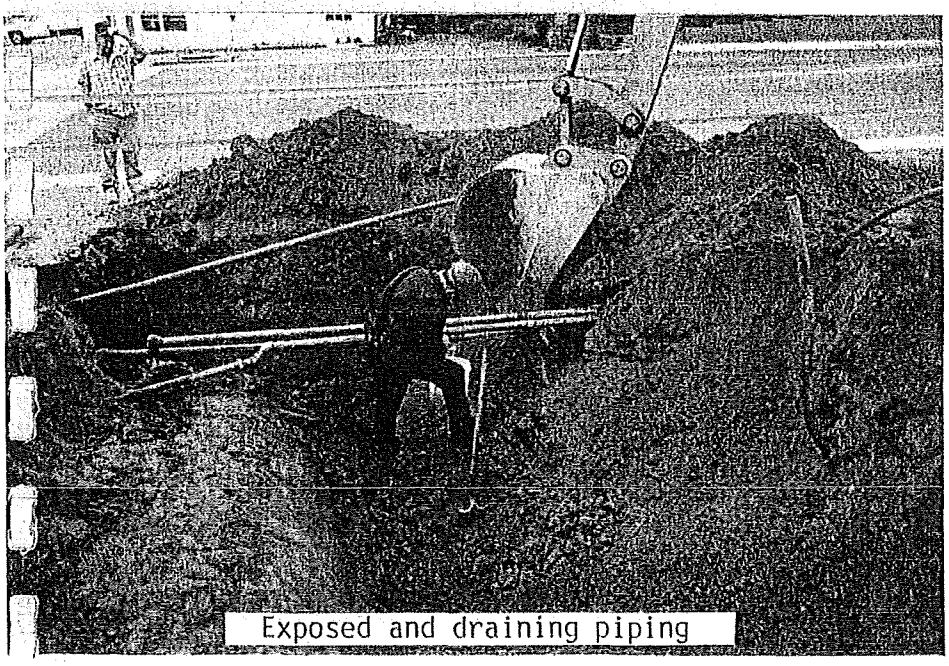


Exposed unknown tank

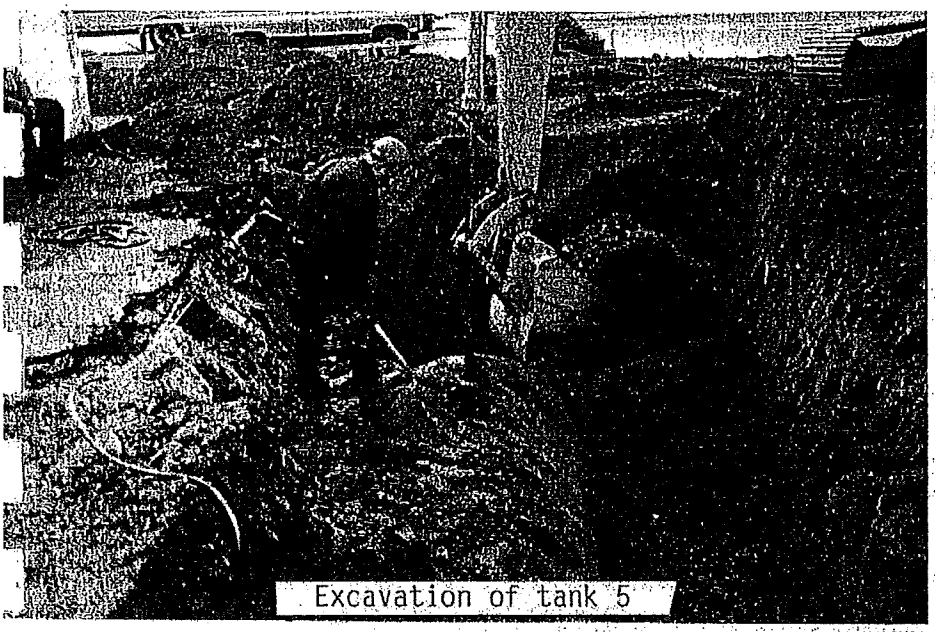
Excavation tank one 5,000 gal.



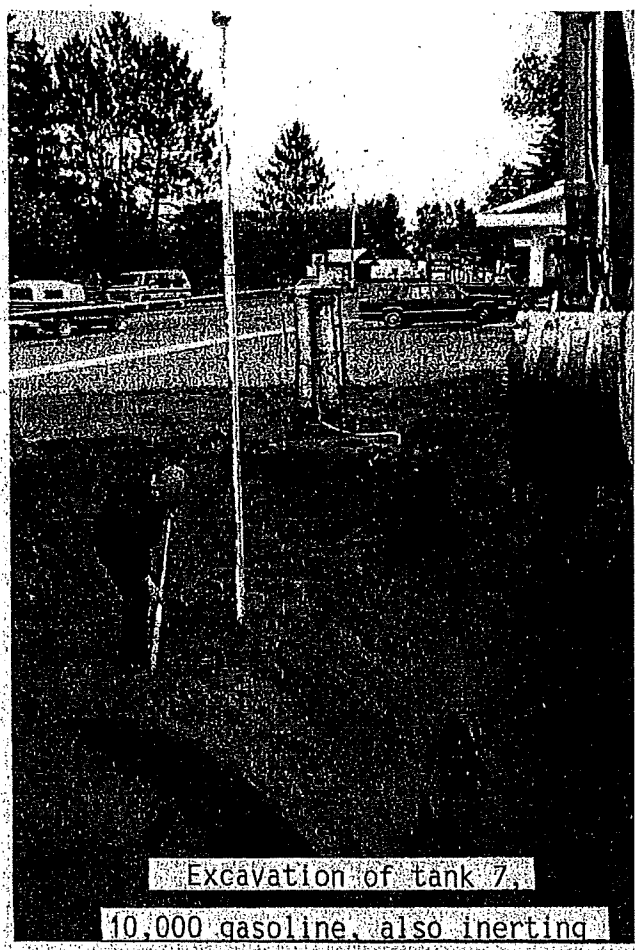
Excavation of tank two



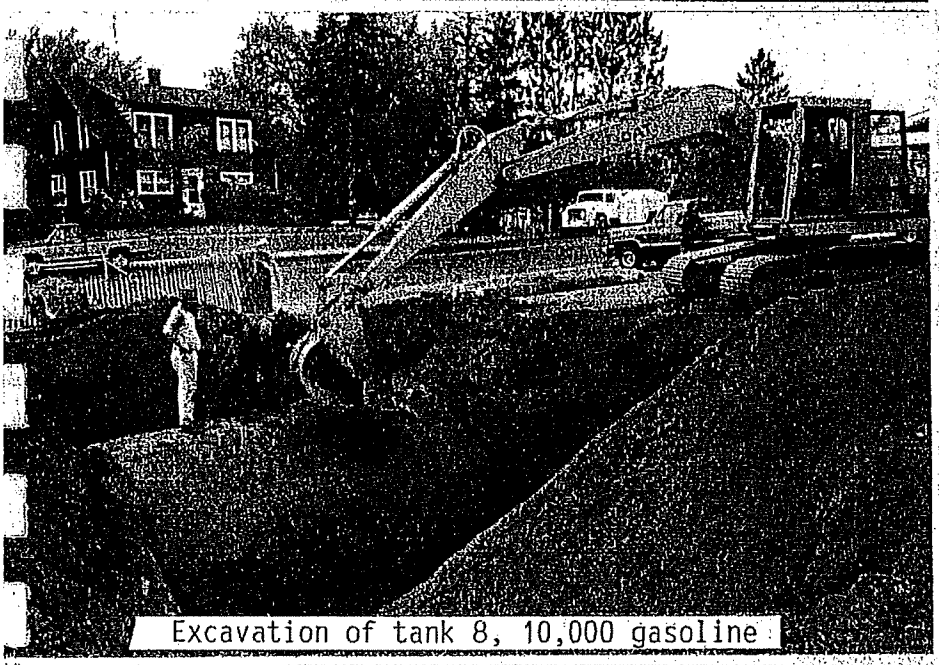
Exposed and draining piping



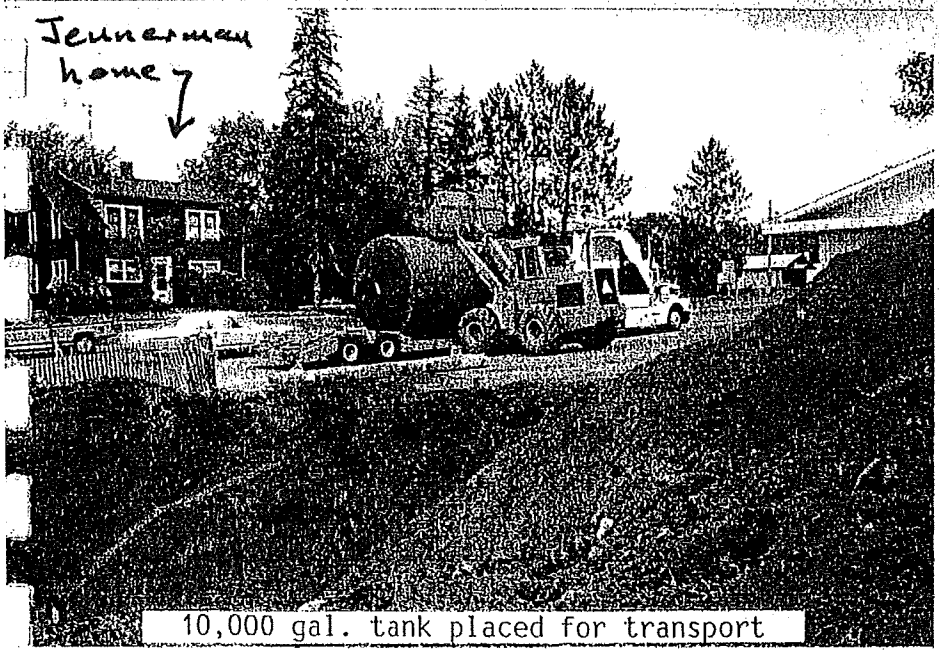
Excavation of tank 5



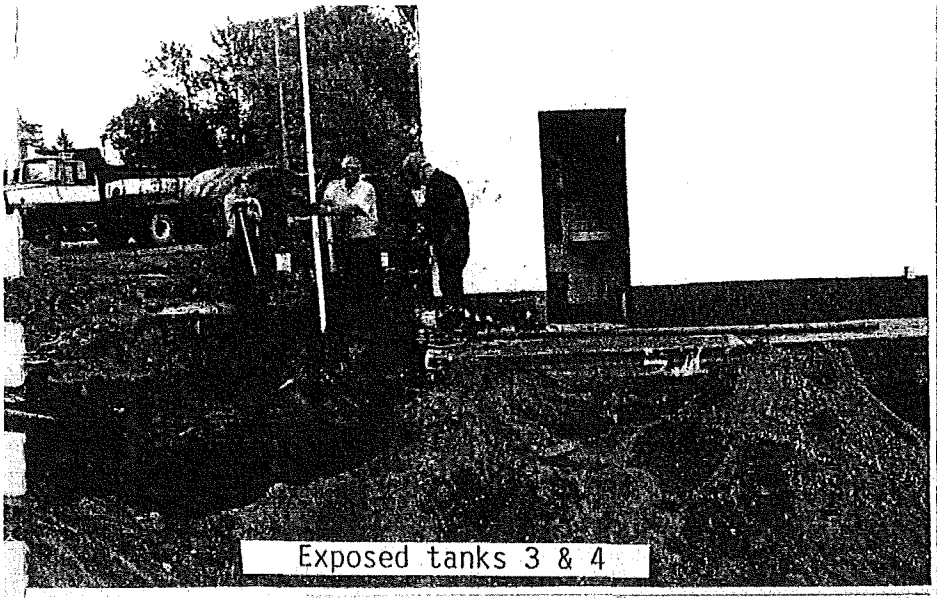
Excavation of tank 7, 10,000 gasoline, also inerting



Excavation of tank 8, 10,000 gasoline



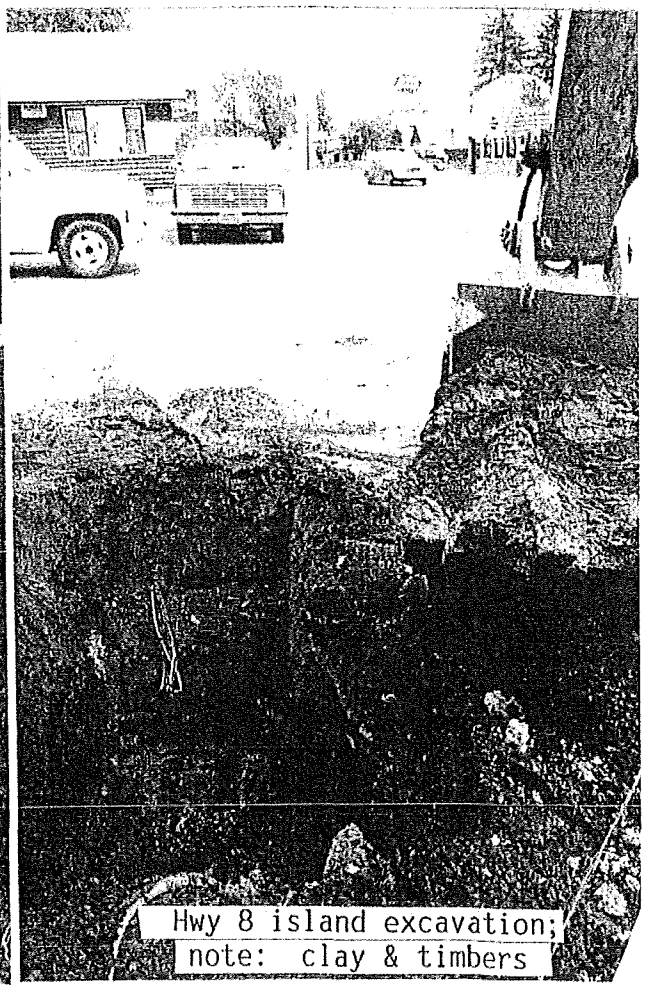
10,000 gal. tank placed for transport



Exposed tanks 3 & 4

Exposed waste oil tank

Drilling of hole due to cleaning



Hwy 8 island excavation;
note: clay & timbers

Washing tank

DATA EVALUATION

Site Hydrogeology

The site hydrogeology has been described in previous reports. The recent work (LIF conductivity logs, grain-size analysis, hydraulic conductivity measurements) support this earlier work.

The site is underlain by sandy soils. The soils are coarser sands along the southern edge of the property but contain finer-grained sediments (e.g., silt, clay) to the north across the property. This is illustrated in Figures 8 and 9 and Table 4.

Determining ground water flow is complicated by the widespread presence of LNAPL in the monitoring wells. The water levels from MW-2, MW-4, MW-5, and MW-103 (corrected for LNAPL) indicate northerly flow as shown in Figure 10. This is consistent with the ground water contaminant plume.

There is a downward vertical gradient based on the measurements in the MW-1, MW-103, PZ-100 nest.

Extent of Soil Contamination

Figures 8, 9, and 11 illustrates the extent of LNAPL in the vadose zone based on the LIF borings. There are two areas of contamination: the former diesel pump area near EX-1 and beneath the former gas pumps. As can be seen on the LIF logs for L1 and L5 (Appendix B), the soil around the former diesel pump area has heavy LNAPL concentrations from about 5 feet depth to the water table (about 20 feet below grade). The LNAPL concentrations appear to be primarily from diesel.

The soils in the former gasoline pump islands (e.g., L7, L13, L16) also have soil contamination. The concentrations appear to be primarily gasoline.

Boring L15 indicates soil contamination. The source of these impacts is unknown but may be from the nearby pump island or a former pump island located at that location.

The current concentrations in the soil are a result of several factors including contaminant type (diesel vs. gasoline) and soil type (coarse versus fines). The finer-grained soils located in the L1 area tend to adsorb and retain petroleum impacts more readily than the coarser soils located along the south of the property. In addition, gasoline tends to migrate through soil more easily than diesel. Although the impacts measured in the gasoline pump islands are not as great as those measured in the diesel pump area, this does not necessarily indicate a smaller release of petroleum. Rather, the finer-grained soils simply retained the heavier diesel whereas the gasoline migrated readily through the coarser soils along the southern portion of the property. This relationship is important when considering remediation of these soils and the ground water.

LNAPL in the Ground Water

LNAPL is found at the water table depth as well as beneath the water table. The distribution of LNAPL at the water table ("smear zone") is shown in Figure 12. Figure 13 illustrates the distribution of LNAPL trapped beneath the water table when the water table was lower.

There are two main areas of LNAPL at the water table. A diesel plume is located at the northwest corner of the onsite building where the former diesel pump island was located. A gasoline plume is located along the southern portion of the property.

- Diesel Plume

The diesel plume extends from the source soils associated with the former diesel pump island. These source soils are still releasing diesel to the subsurface which results in the accumulation of diesel in EX-1. The diesel plume extends northerly along the smear zone. The migration of the diesel is slowed by the finer-grained soils.

- Gasoline Plume

The gasoline plume forms a pool of product along the southern edge of the property. The gasoline has accumulated in the coarse sand soils.

LNAPL Volume Estimates

The volume of LNAPL at the water table was estimated using the API (American Petroleum Institute) computer program LDRM (LNAPL Distribution and Recovery Model). Appendix H contains the input parameters and results for two locations: EX-1 (diesel location) and EX-5 (gasoline location).

	Estimated Volume of LNAPL (gallons)	Estimated Recoverable Volume (gallons)
EX-1	8722.5	5233.125
EX-5	15776.25	12937.5

These results indicate there is substantial gasoline LNAPL along the southern portion of the property.

RECOMMENDATIONS

Source Soils

We recommend the source soils in the vadose zone be excavated in the locations shown in Figure 14. This includes the former diesel pump and tank area at the back (northwest corner) of the Doug's Tire site. We also recommend the gasoline pump island areas be excavated. Although the current impacts are not as dramatic as the diesel pump area, the excavations will allow for the removal of source soils.

For budgeting purposes, we estimate up to 1600 tons of impacted soil will need to be removed. This estimate assumes soil can be removed to a depth of 25 feet below grade. The actual tonnage will likely be less. Clean overburden soil will be set aside for use as backfill. The extraction well EX-1 will be abandoned and removed with the excavation.

The gasoline pump island in front (south side) will be excavated to the water table depth (20 feet if possible). The clean overburden soil will be set aside and used for backfill.

Confirmation samples will be collected from the perimeter of the excavation. For budgeting purposes, we estimate up to 12 soil samples will be collected. The samples will be analyzed for PVOC+Naphthalene.

LNAPL at and Beneath Water Table

We recommend the diesel LNAPL at the northwest portion of the property be allowed to naturally attenuate. The excavation should remove the source of diesel impacts and halt the continued loading to the ground water. This should allow natural attenuation to address the remaining diesel impacts.

We recommend remediation of the gasoline LNAPL along the southern portion of the property. We recommend vacuum extraction be applied to the existing extraction wells to remove LNAPL in the ground water. This technology has been shown to be effective at the adjacent Autostop site. The technology removes LNAPL by physical extraction as well as by vapor removal. Vapors will also be removed as part of this process. The treatment system will separate the LNAPL and treat the removed ground water using an air stripper system and carbon treatment.

Figure 15 is a conceptual layout of the remediation system. The system will use the existing extraction wells. We will also install several extraction wells near L9, L19, and MW-3.

The extraction wells will be connected to a central remediation system using the existing piping where possible. Piping will also be installed to connect to the new extraction points as well as under Highway 8 to connect to the extraction wells at Autostop.

CHANGE ORDER

Enclosed is a Change Order for the Soil Excavation. For budgeting purposes, we estimate up to 1600 tons of impacted soil will be removed. The actual tonnage may be less.

The subcontractor costs for the soil excavation will be determined using Commodity Bidding. We will prepare the Bid Documents and conduct the commodity bidding after DNR and PECFA staff approve the amount of soil to excavate.

A Cost Estimate to design and budget the installation and first year operation of the remediation system will be submitted in separate correspondence.

We plan to complete the soil excavation and system installation in summer 2013. The ground water remediation system will likely require several years of operation.

We will proceed upon authorization from DNR and PECFA.

Sincerely,
MERIDIAN ENVIRONMENTAL CONSULTING, LLC

Kenneth Shimko, PG
Project Manager

C: Vicki Richardson

CHANGE ORDER

Usual & Customary Standardized Invoice

PECFA #: 54848-1215-11 **Vendor Name:** Change Order

BRRT's #: 03-55-000408 **Invoice #:** Change Order

Site Name: Doug's Tire **Invoice Date:** February 2013

Site Address: Ladysmith **Check #:** Change Order

Personal information you provide may be used for a secondary purposes [Privacy Law, s. 15.04 (1) (m), Stats.].

TASK CODE/ACTIVITY REFERENCE CODE	TASK DESCRIPTIONS/ACTIVITY REFERENCE CODE DESCRIPTION	UNIT	MAXIMUM REIMBURSEABLE UNIT COST	UNITS INVOICED	UNIT COST CLAIMED	AMOUNT CLAIMED
4	**WASTE DISPOSAL**					
	CONSULTANT SERVICES					
WD05	Consultant Coordination	SITE	$130.60	1.00	$ 130.60	$ 130.60
	COMMODITY SERVICES					
WD10	Groundwater Sample and/or Purge	DRUM	$40.10		$ -	$ -
WD15	Drill Cuttings	DRUM	$103.00		$ -	$ -
WD17	Landfill Environmental Fee (support documentation must be provided)	ACTUAL COST	ACTUAL COST			
WD20	Free Product	DRUM	$113.10	2.00	$ 113.10	$ 226.20
WD25	Primary Mob/Demob	SITE	$274.00	1.00	$ 274.00	$ 274.00
6	**LETTER REPORT/ADDENDUM**					
LRA05	Letter Report/Addendum	LETTER	$989.80		$ -	$ -
8	**WELL ABANDONMENT**					
	CONSULTANT SERVICES					
WAB05	Coordination	SITE	$155.10	1.00	$ 155.10	$ 155.10
WAB10	Water column < 30 ft	FT	$2.40	30.00	$ 2.40	$ 72.00
WAB15	Water column > 30 ft	FT	$8.40		$ -	$ -
WAB20	Bentonite Pellets (50lb bag - 1/4" pellet)	BAG	$10.30	30.00	$ 10.30	$ 309.00
WAB25	Portland Cement (94lb bag)	BAG	$7.80		$ -	$ -
WAB30	Primary Mob/Demob	SITE	$345.00	1.00	$ 345.00	$ 345.00
20	**SOIL BORING/MONITORING WELL PERMITS**					
SBMWP05	Soil Boring/Monitoring Well Permit	PERMIT	$234.40	1.00	$ 234.40	$ 234.40
SBMWP10	Permit Fee (copy of permit & fee receipt required)	PERMIT FEE	PERMIT FEE		$ -	$ -
24	**LIMITED SOIL EXCAVATION**					
	CONSULTANT SERVICES					
LSE05	Consultant Oversight for Limited Soil Excavation	TON	$4.70	1600.00	$ 4.70	$ 7,520.00
LSE10	Mob/Demob	SITE	$792.30	1.00	$ 792.30	$ 792.30
	COMMODITY SERVICES					
LSE13	Laboratory	LAB SCHEDULE	See Lab Schedule Task 24 total		$ -	$ 411.60
LSE15	Limited Soil Excavation	TON	$47.00	1600.00	$ * 38.00	$ 60,800.00
LSE16	Landfill Environmental Fee (support documentation must be provided)	ACTUAL COST	ACTUAL COST	1.00	$ 75.00	$ 75.00
36	CHANGE ORDER REQUEST (includes cost cap exceedence requests)					
COR05	Change Order Request	CHANGE ORDER	$363.60	1.00	$ 363.60	$ 363.60
					TOTAL AMOUNT CLAIMED	$ 71,708.80

* Excavation cost will be determined by bidding
Estimate $38/ton based on nearby sites

Effective Schedule Date: January 2013 to June 2013--Schedule #13

MATRIX	ANALYTE REFERENCE CODE	REIMBURSABLE ANALYTE	UNITS	MAXIMUM REIMBURSABLE UNIT COST	UNITS INVOICED	UNIT COST CLAIMED	AMOUNT CLAIMED TASK 33	AMOUNT CLAIMED TASK 24			
AIR	A1	Benzene	SAMPLE	$42.80		$ -	$ -				
	A2	BETX	SAMPLE	$47.10		$ -	$ -				
	A3	GRO	SAMPLE	$43.90		$ -	$ -				
	A4	VOC's	SAMPLE	$68.50		$ -	$ -				
WATER	W1	GRO/PVOC	SAMPLE	$27.80		$ -	$ -				
	W2	PVOC	SAMPLE	$25.70		$ -	$ -				
	W3	PVOC + 1,2 DCA	SAMPLE	$41.70		$ -	$ -				
	W4	PVOC + Naphthalene	SAMPLE	$28.90		$ -	$ -				
	W5	VOC	SAMPLE	$68.50		$ -	$ -				
	W6	PAH	SAMPLE	$69.50		$ -	$ -				
	W7	Lead	SAMPLE	$11.80		$ -	$ -				
	W8	Cadmium	SAMPLE	$12.90		$ -	$ -				
	W9	Hardness	SAMPLE	$11.80		$ -	$ -				
	W10	BOD, Total	SAMPLE	$22.50		$ -	$ -				
	W11	Nitrate	SAMPLE	$10.70		$ -	$ -				
	W12	Total Kjeldahl	SAMPLE	$19.30		$ -	$ -				
	W13	Ammonia	SAMPLE	$16.10		$ -	$ -				
	W14	Sulfate	SAMPLE	$9.70		$ -	$ -				
	W15	Iron	SAMPLE	$9.70		$ -	$ -				
	W16	Manganese	SAMPLE	$9.70		$ -	$ -				
	W17	Alkalinity	SAMPLE	$9.70		$ -	$ -				
	W18	Methane	SAMPLE	$43.90		$ -	$ -				
	W19	Phosphorous	SAMPLE	$17.20		$ -	$ -				
	W20	VOC Method 524.2	SAMPLE	$167.90		$ -	$ -				
	W21	EDB Method 504	SAMPLE	$90.90		$ -	$ -	UNITS	UNIT COST CLAIMED	UNIT MAX	
SOILS	S1	GRO	SAMPLE	$23.60		$ -	$ -		$0.00	$23.60	
	S2	DRO	SAMPLE	$28.90		$ -	$ -		$0.00	$28.90	
	S3	GRO/PVOC	SAMPLE	$26.80		$ -	$ -		$0.00	$26.80	
	S4	PVOC	SAMPLE	$24.60		$ -	$ -		$0.00	$24.60	
	S5	PVOC + 1,2 DCA + Naphthalene	SAMPLE	$47.10		$ -	$ -		$0.00	$47.10	
	S6	PVOC + Naphthalene	SAMPLE	$34.30			$ -	12	$411.60	$34.30	
	S7	VOC	SAMPLE	$68.50		$ -	$ -		$0.00	$68.50	
	S8	SPLP Extraction VOC only	SAMPLE	$48.20		$ -	$ -		$0.00	$48.20	
	S9	PAH	SAMPLE	$69.50		$ -	$ -		$0.00	$69.50	
	S10	Lead	SAMPLE	$11.80		$ -	$ -		$0.00	$11.80	
	S11	Cadmium	SAMPLE	$13.90		$ -	$ -				
	S12	Free Liquid	SAMPLE	$10.70		$ -	$ -				
	S13	Flash Point	SAMPLE	$24.60		$ -	$ -				
	S14	Grain Size - dry	SAMPLE	$40.70		$ -	$ -				
	S15	Grain Size - wet	SAMPLE	$54.60		$ -	$ -				
	S16	Bulk Density	SAMPLE	$12.90		$ -	$ -				
	S17	Permeability	SAMPLE	$39.60		$ -	$ -				
	S18	Nitrogen as Total Kjeldahl	SAMPLE	$19.30		$ -	$ -				
	S19	Nitrogen as Ammonia	SAMPLE	$16.10		$ -	$ -				
	S20	% Organic Matter	SAMPLE	$27.80		$ -	$ -				
	S21	TOC as NPOC	SAMPLE	$54.60		$ -	$ -				
	S22	Soil Moisture Content	SAMPLE	$6.50		$ -	$ -				
	S23	Air Filled Porosity	SAMPLE	$24.60		$ -	$ -				
	S24	% Total Solids	SAMPLE	$6.50		$ -	$ -				
	S25	Field Capacity	SAMPLE	$26.80		$ -	$ -				
	S26	TCLP Lead	SAMPLE	$79.20		$ -	$ -				
	S27	Cation Exchange (Ca, MG, & K)	SAMPLE	$25.70		$ -	$ -				
	S28	TCLP Cadmium	SAMPLE	$79.20		$ -	$ -				
	S29	TCLP Benzene	SAMPLE	$79.20		$ -	$ -				
LNAPL Fluid Property Suite	LFPS01	Viscosity	SAMPLE	$534.60		$ -	$ -				
		Density	SAMPLE								
		Interfacial tension I (LNAPL/water (dyne/cm))	SAMPLE								
		Interfacial tension II (LNAPL/air (dyne/cm))	SAMPLE								
		Interfacial tension III (water/air) (dyne/cm))	SAMPLE								

TASK 33 TOTAL	$ -
TASK 24 TOTAL	$ 411.60
TOTAL LAB CHARGES	$ 411.60

TABLES

Table 4: Results of Grain Size Analysis

Doug's Tire (former)
Ladysmith, Wisconsin
Meridan No. 05F786

		%Gravel		%Sand			%Fines	
Soil Sample	**Soil Description**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**
GP-1: 20-24	Sand, with Silt, trace Clay	6.9	8.7	5.6	15.3	34.3	25.9	3.3
GP-2: 24-28	Sand, with Gravel, trace Fines	17.1	11.7	2.2	21.6	44	3.4	
GP-3: 24-28	Sand, with Gravel, trace Fines	0	31	7.4	24.9	31.5	5.2	
GP-4: 24-28	Sand and Gravel, trace Fines	21.8	37.9	11.7	16	7.2	5.4	
GP-5: 24-28	Sand and Gravel, trace Fines	4.2	31.9	9	29.7	19.6	5.6	
GP-6: 20-24	Sand, with Gravel, little Silt, trace Clay	3.8	17.8	6.5	19.3	31.8	12.6	8.2
GP-7: 24-28	Sand, little Silt and Gravel, trace Clay	0	12.8	7.1	20.6	35.6	15.8	8.1
GP-8: 20-24	Sand, with Silt, trace Gravel and Clay	0	10	4.8	17.5	37	22.8	7.9
GP-9: 24-28	Sand, with Silt, little Gravel, trace Clay	0	12.2	5	15.6	.5.5	22.3	9.4

See Appendix D for grain size analysis reports
Samples collected September 2012

FIGURES

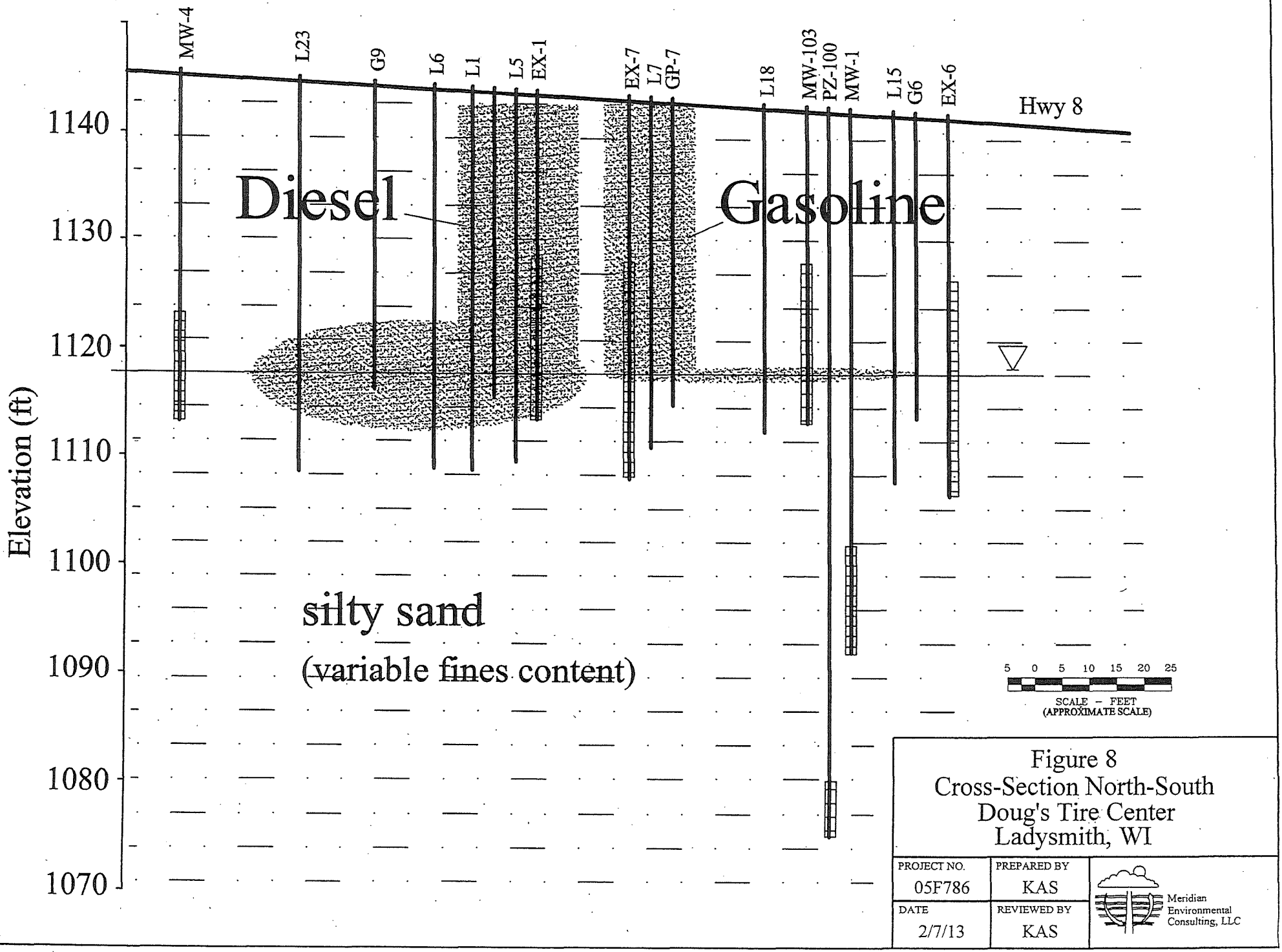


Figure 8
Cross-Section North-South
Doug's Tire Center
Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
2/7/13	KAS

Meridian Environmental Consulting, LLC

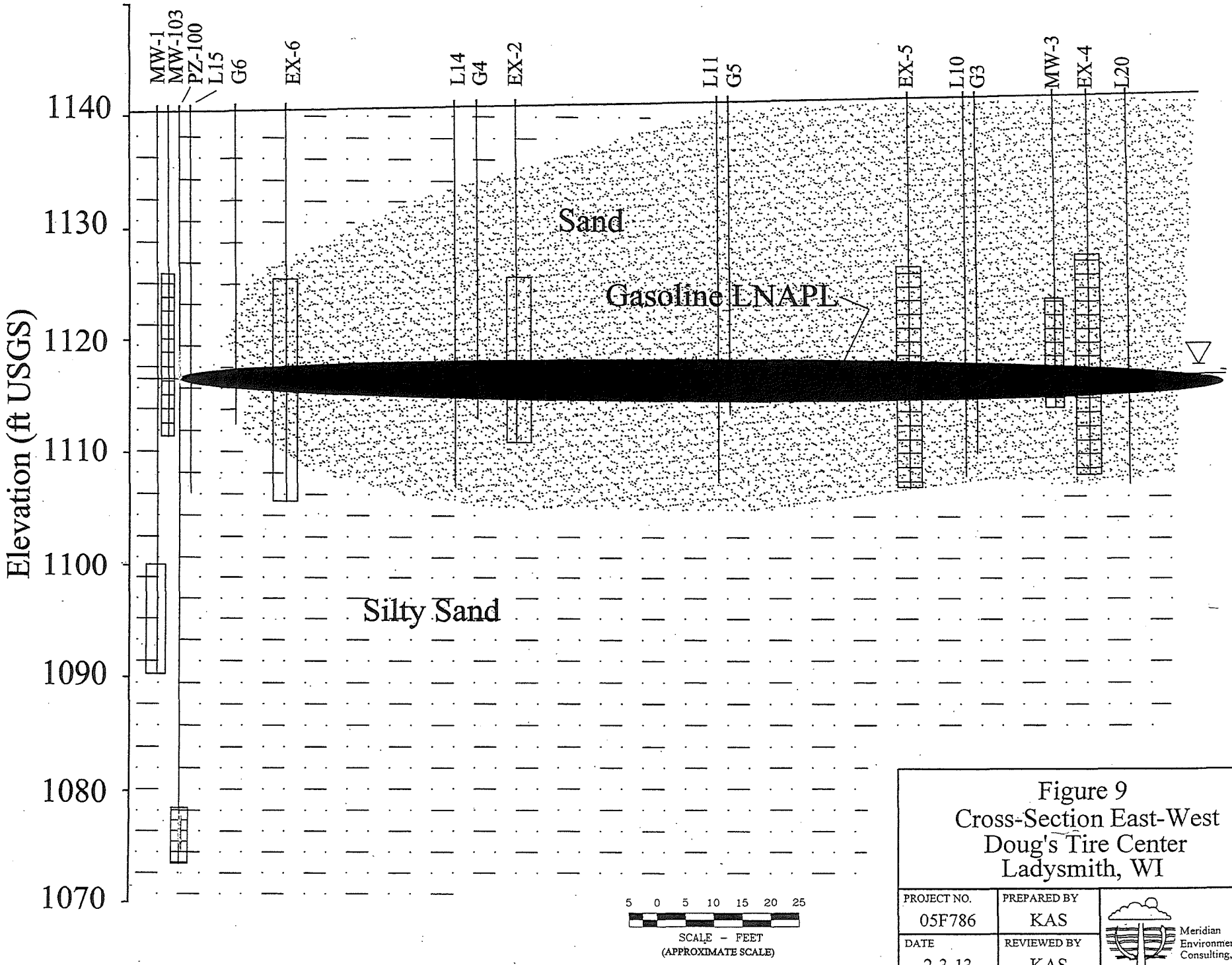


Figure 9
Cross-Section East-West
Doug's Tire Center
Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
2-3-13	KAS

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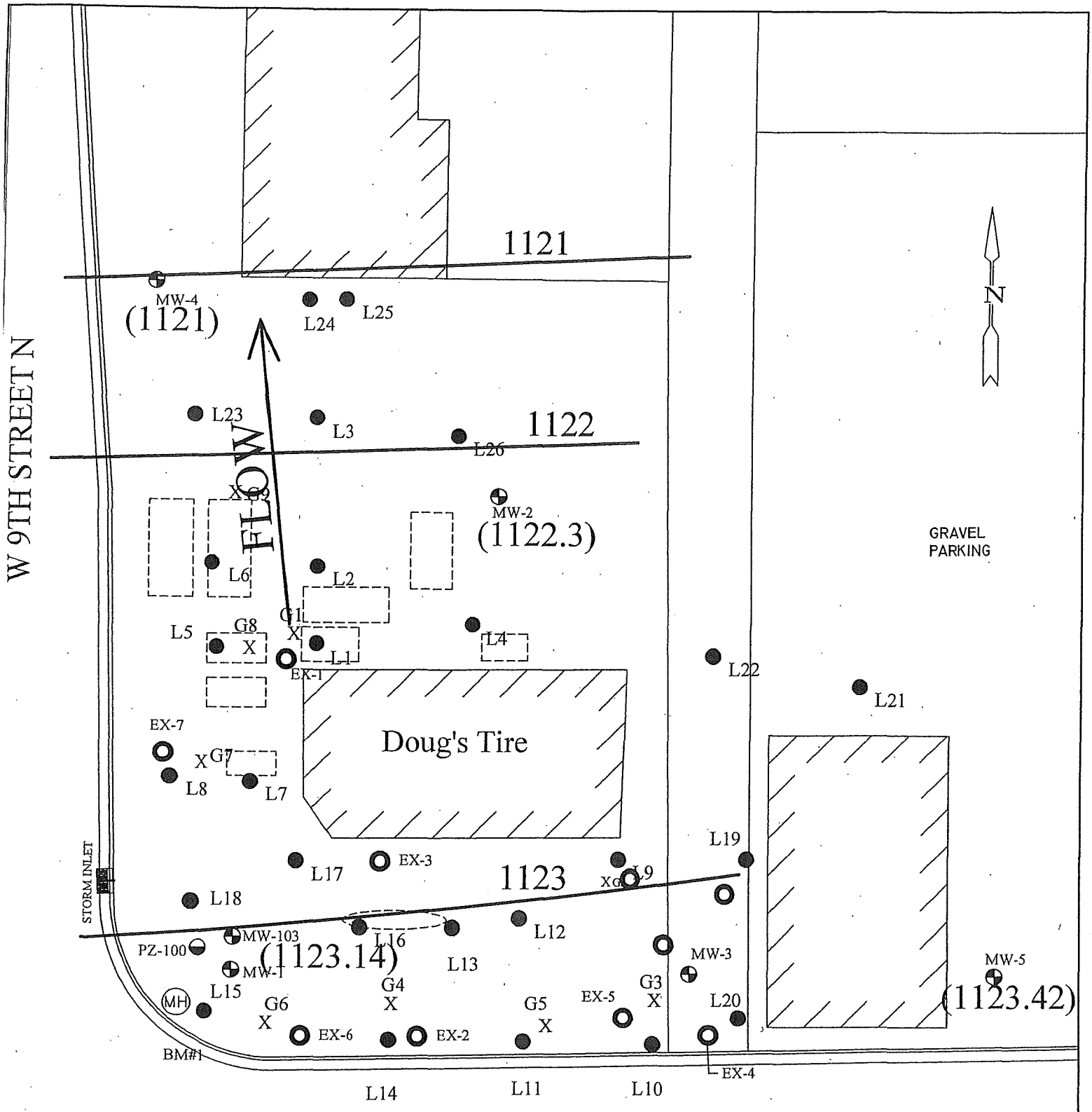

0 25 ft

approximate scale

Figure 10

Ground Water Table Contour Map (9/10/12)

Doug's Tire

Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
2/7/13	KAS

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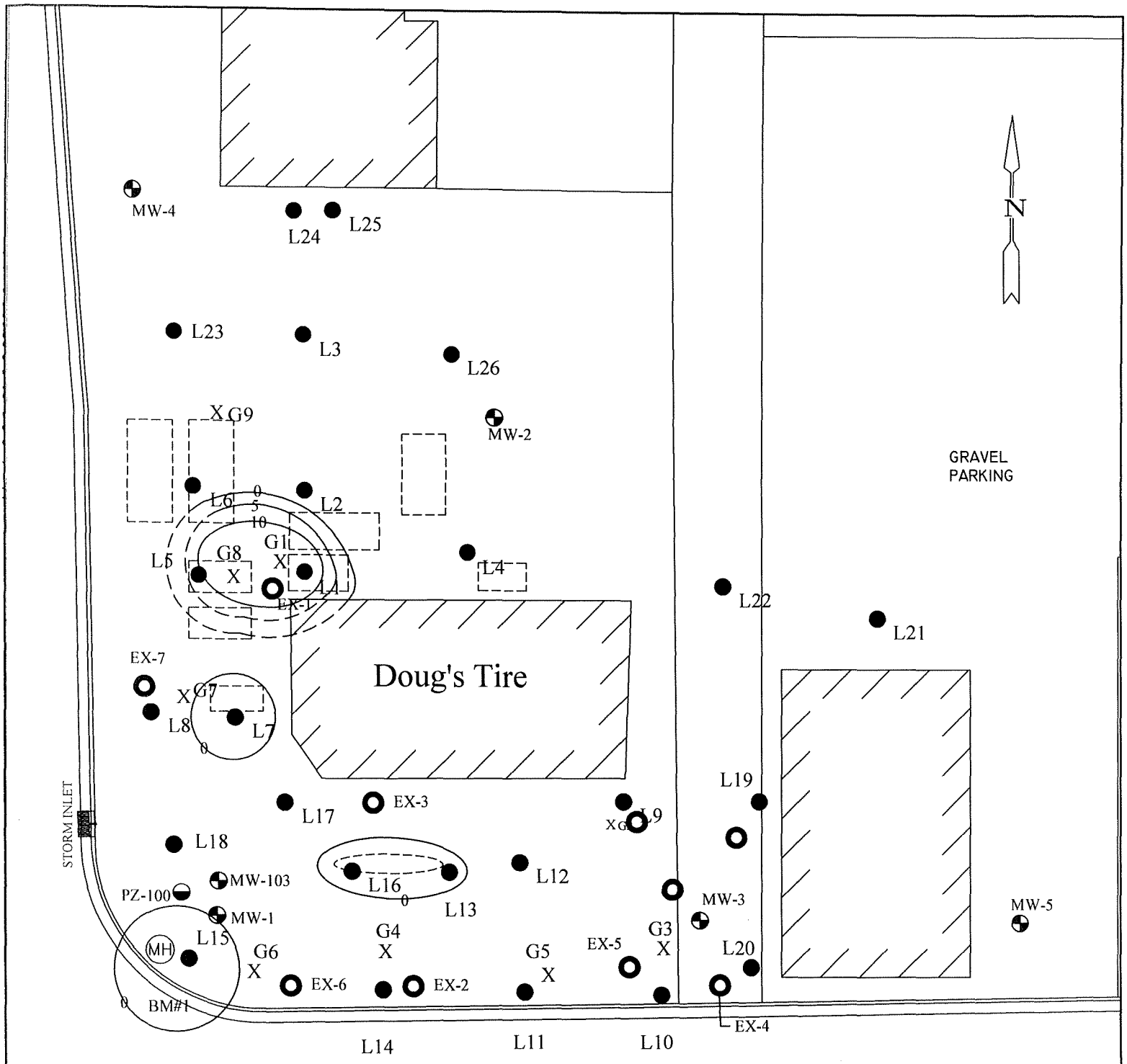

Contours of LNAPL Thickness in Vadose Zone (ft)

0 25 ft

approximate scale

Figure 11
Soil Contamination
Doug's Tire
Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
2/7/13	KAS

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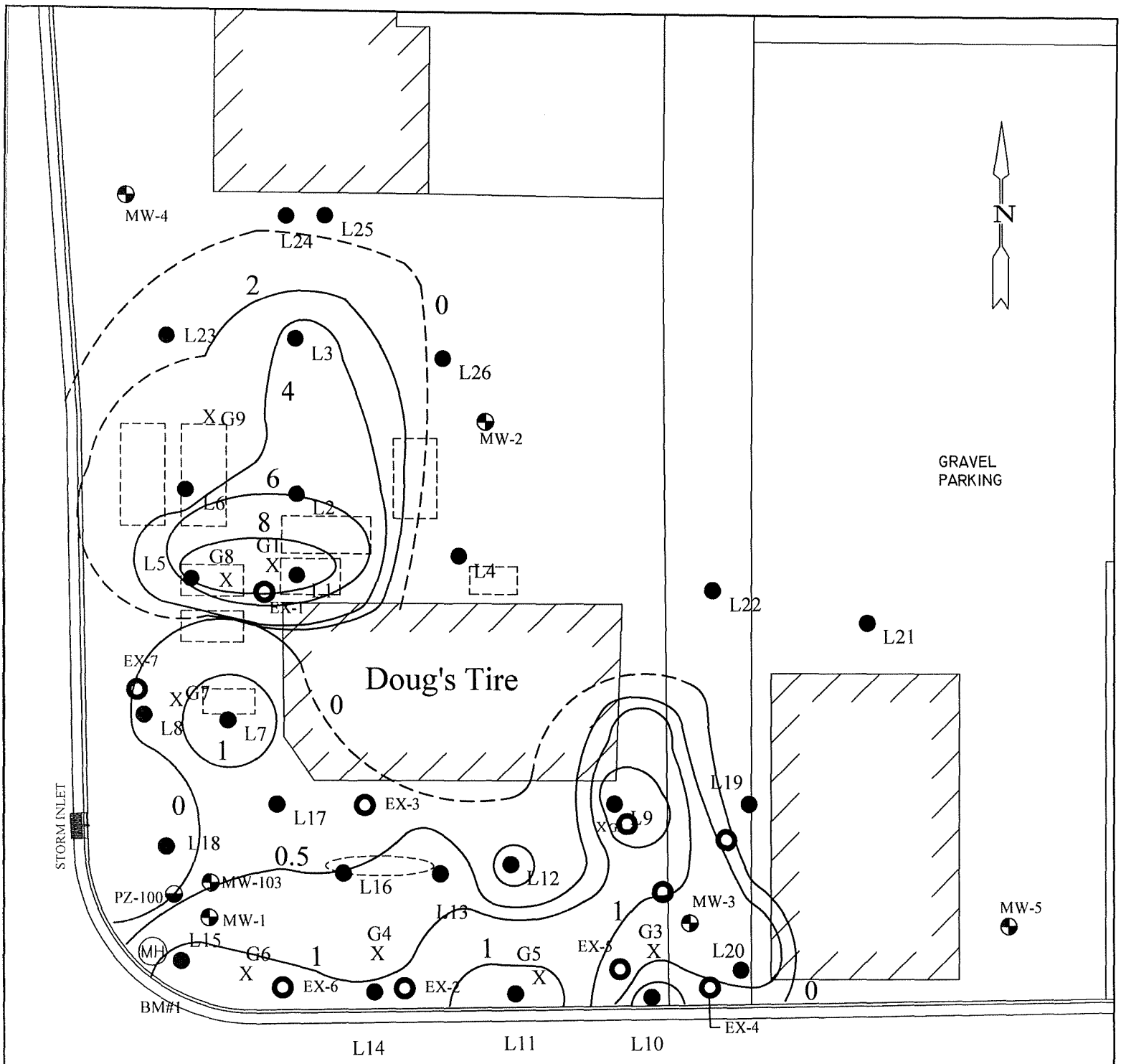

Contours of LNAPL Thickness (ft) at Water Table

0 25 ft

approximate scale

Figure 12
LNAPL at Water Table
Doug's Tire
Ladysmith, WI

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DATE	REVIEWED BY
2/7/13	KAS

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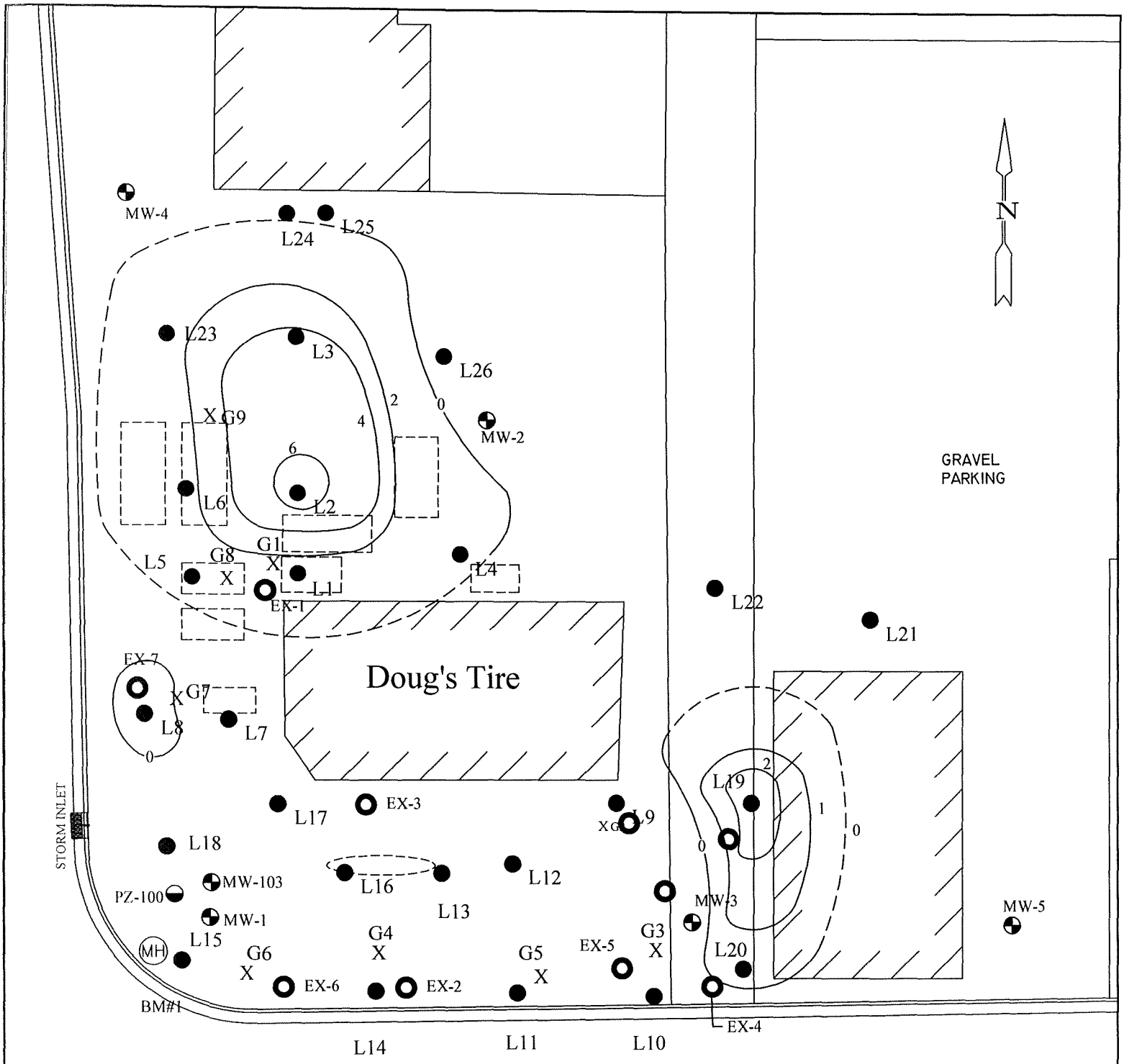

Contour of LNAPL thickness below water table (ft)

0 25 ft

approximate scale

Figure 13
LNAPL Below Water Table
Doug's Tire
Ladysmith, WI

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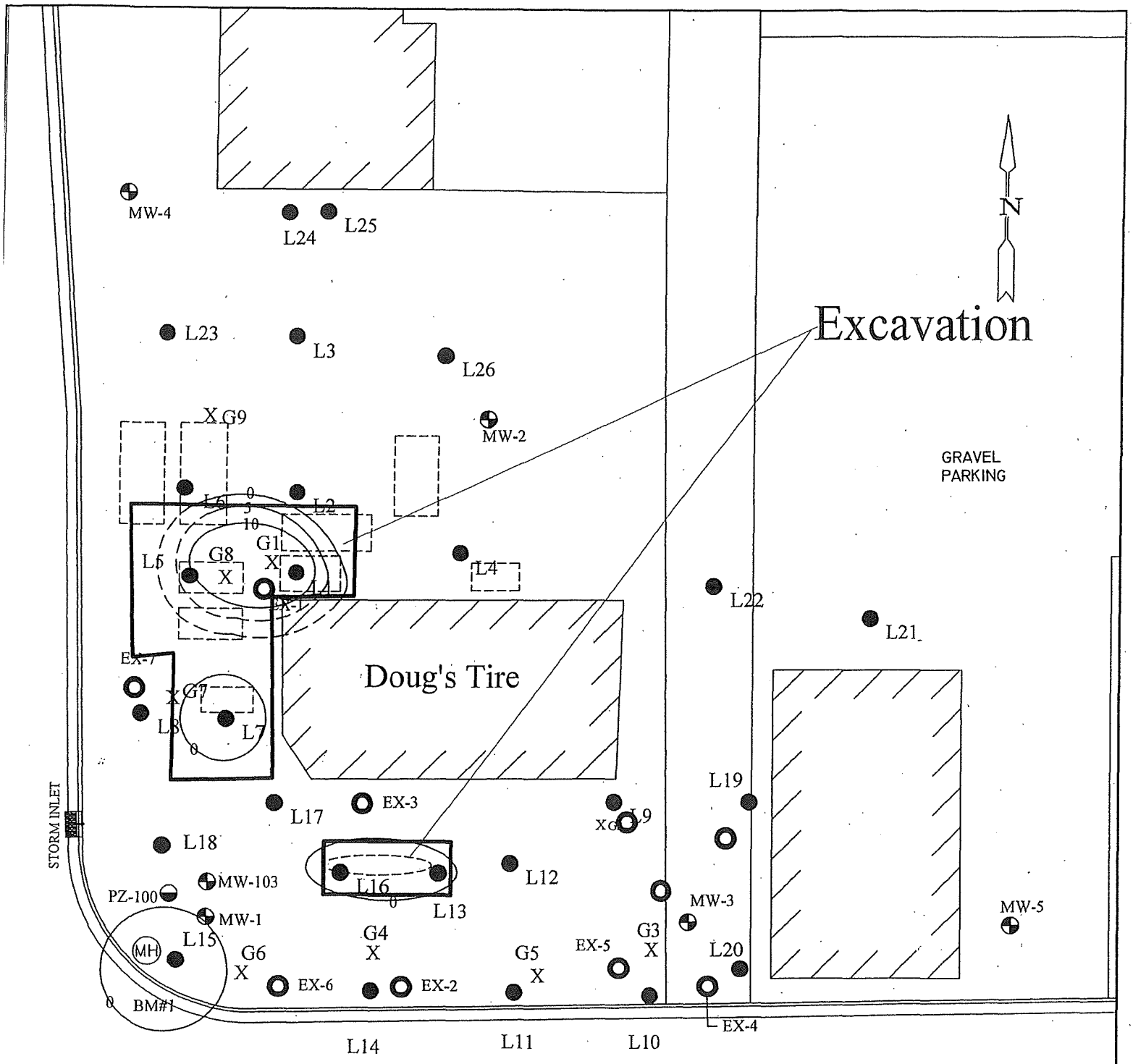
05F786	KAS
DATE	REVIEWED BY
2/7/13	KAS

Meridian Environmental Consulting, LLC



Contours of LNAPL Thickness in Vadose Zone (ft)

0 25 ft

approximate scale

Figure 14
Proposed Excavation
Doug's Tire
Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
2/7/13	KAS

Meridian Environmental Consulting, LLC

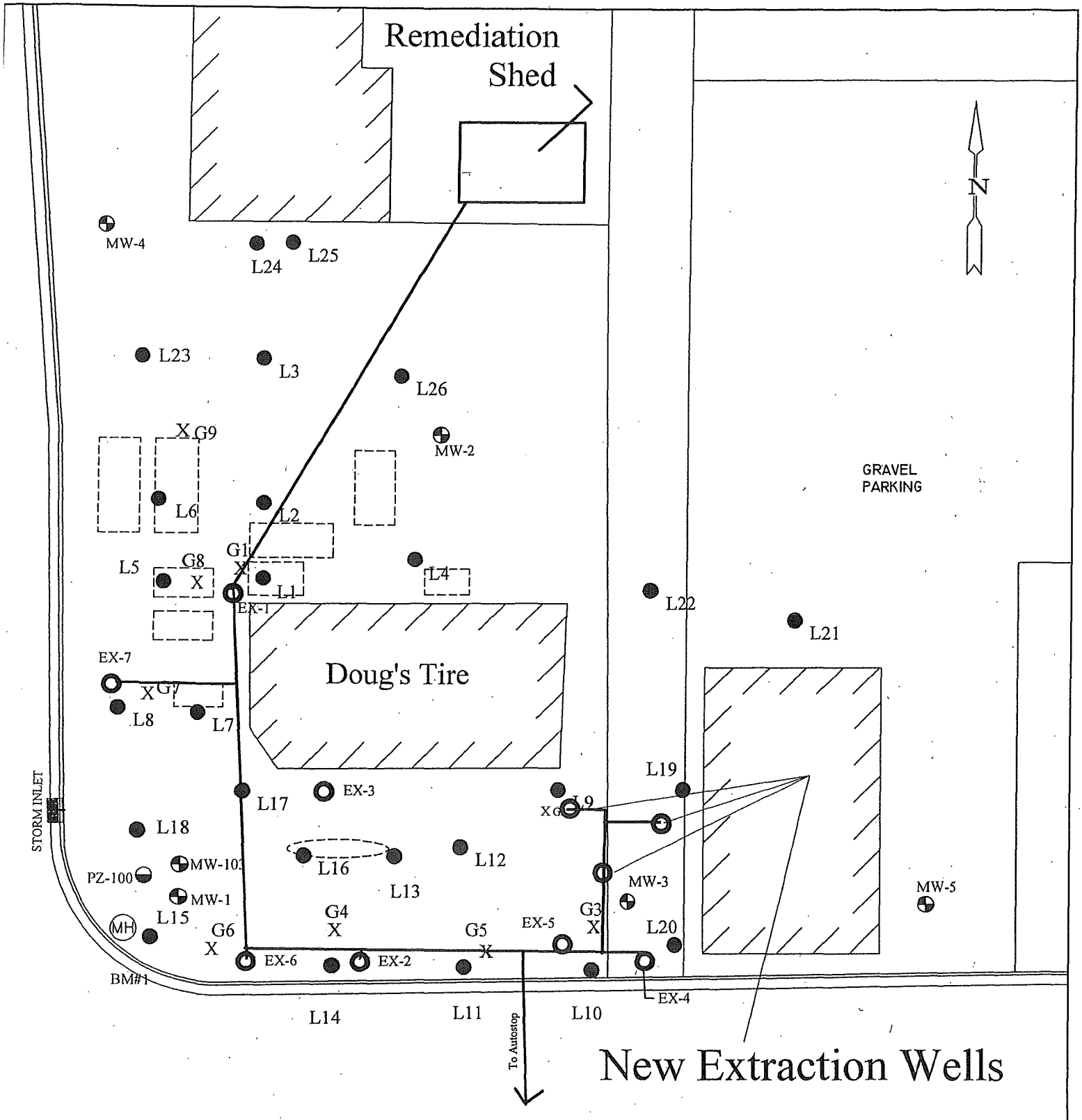


Figure 15
Remediation Upgrade
Doug's Tire/Autostop
Ladysmith, WI

PROJECT NO.	PREPARED BY
05F786	KAS
DATE	REVIEWED BY
10/25/12	KAS

Meridian Environmental Consulting, LLC

APPENDIX H

LDRM RESULTS

LDRM Results

Doug's Tire
Ladysmith, Wisconsin
Meridian No. 05F786

		EX-1		EX-5	
LDRM Output Parameter		**LDRM**	**Total (gallons)**	**LDRM**	**Total (gallons)**
LNAPL Specific Volume (ft)		0.4652	8722.5	0.4207	15776.25
LNAPL Recoverable Volume (ft)		0.2791	5233.125	0.345	12937.5
Diesel Plume Area (EX-1)(ft^2)	2500				
Gasoline Plume Area (EX-5)(ft^2)	5000				

API Model Final 0208

File Edit View Favorites Tools Help

Back

LNAPL Distribution and Recovery Model (LDRM)

Address

Go

1laye
Text
22 KE

Case
Text
36 KE

LDRM
Adob
187 K

MW-
Text
12 KE

Data Input

Thickness, Elevations, Vertical gradient

Maximum Monitoring Well LNAPL Thickness [ft] =	2.85
Depth of Ground Surface (Datum) =	0.0
Water Table Depth [ft] =	23.8
Water Vertical gradient (+ for upward) =	0.000

Fluid Characteristics

LNAPL density [gm/cc] =	.7976
LNAPL viscosity [cp] =	1.1
Air/Water surface tension [dyne/cm] =	59.3
Air/LNAPL surface tension [dyne/cm] =	24.3
LNAPL/Water surface tension [dyne/cm] =	15

Relative Permeability Model (Burdine is default)

Use Mualem Model for Layer ☑ Layer 1

Soil Characteristics

Porosity =	.3
Hydraulic Conductivity [ft/d] =	1.5
Van Genuchten "N" =	1.66
Van Genuchten "a" [ft-1] =	2.1
Irreducible water saturation =	.21
Residual LNAPL saturation =	Defaults
Residual LNAPL f-factor =	.4

OK Cancel

start 2 Windows Expl... LNAPL Distribution... Data Input 5:42 PM

EX-1

LNAPL Distribution and Recovery Model (LDRM)

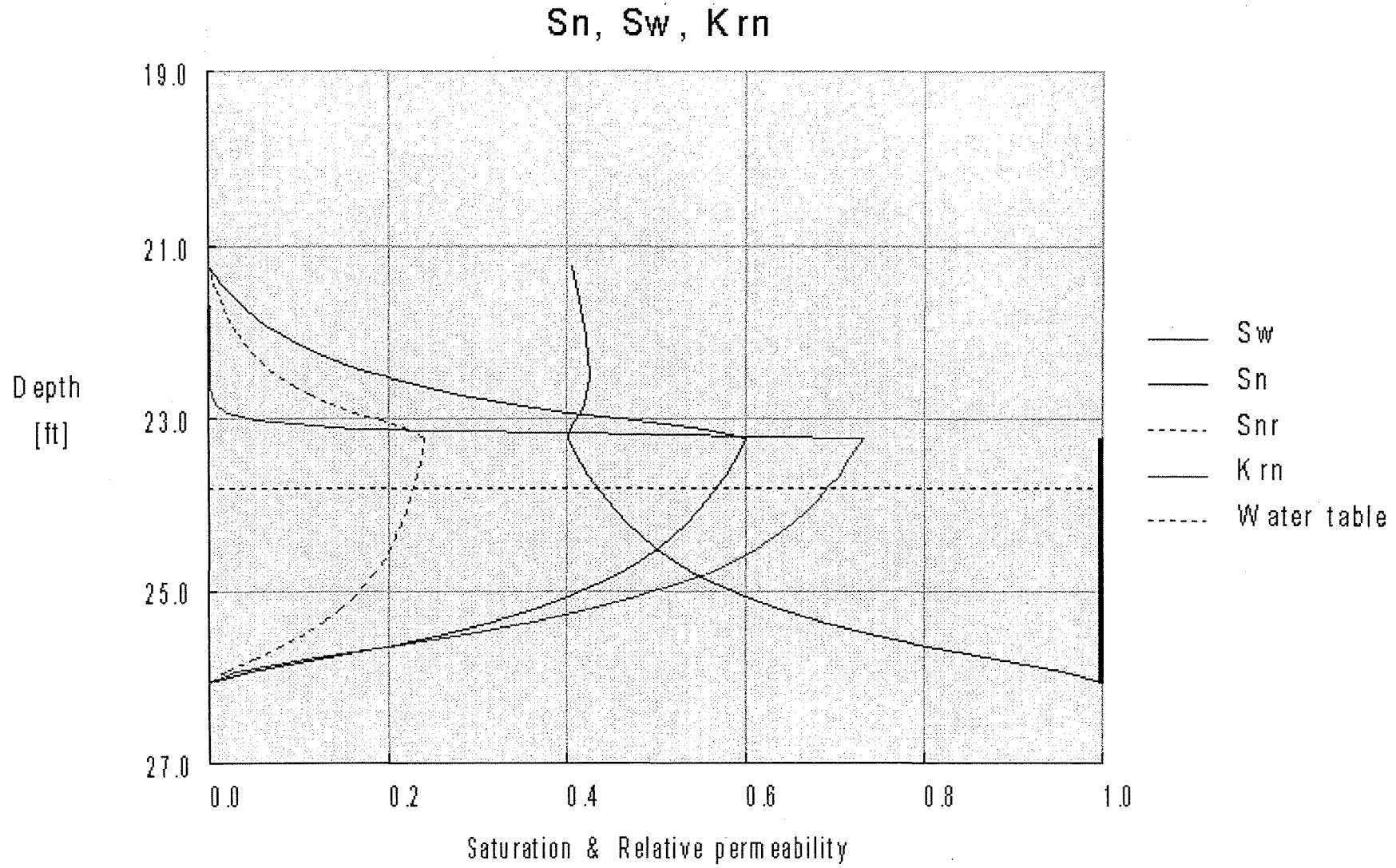
File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.4652
LNAPL Recoverable Volume, Rn (ft) =	0.2791

start | 2 Windows Expl... | LNAPL Distribution... | untitled - Paint | 5:43 PM

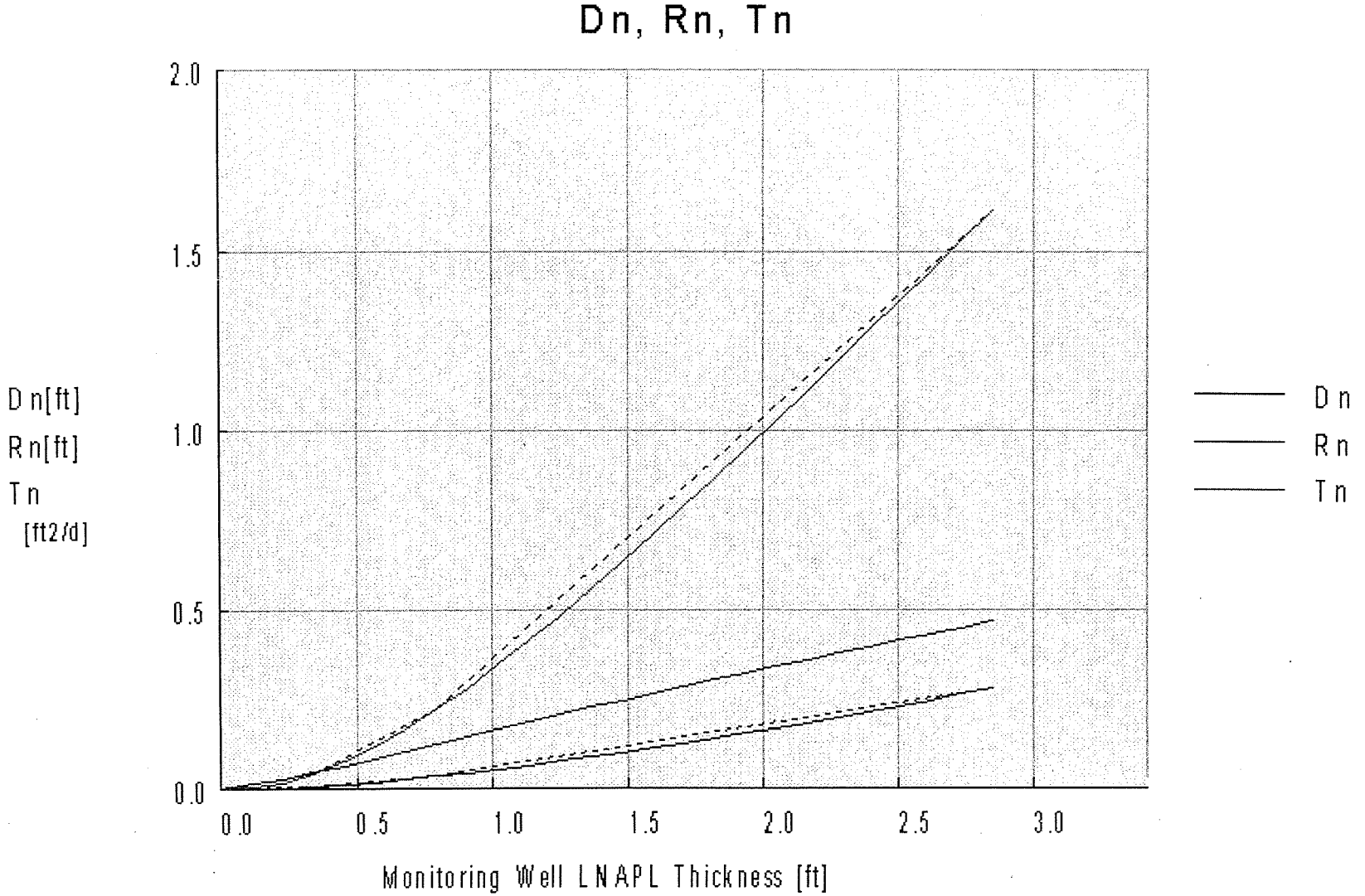
Ex-1

Saturation Profiles



EX-1

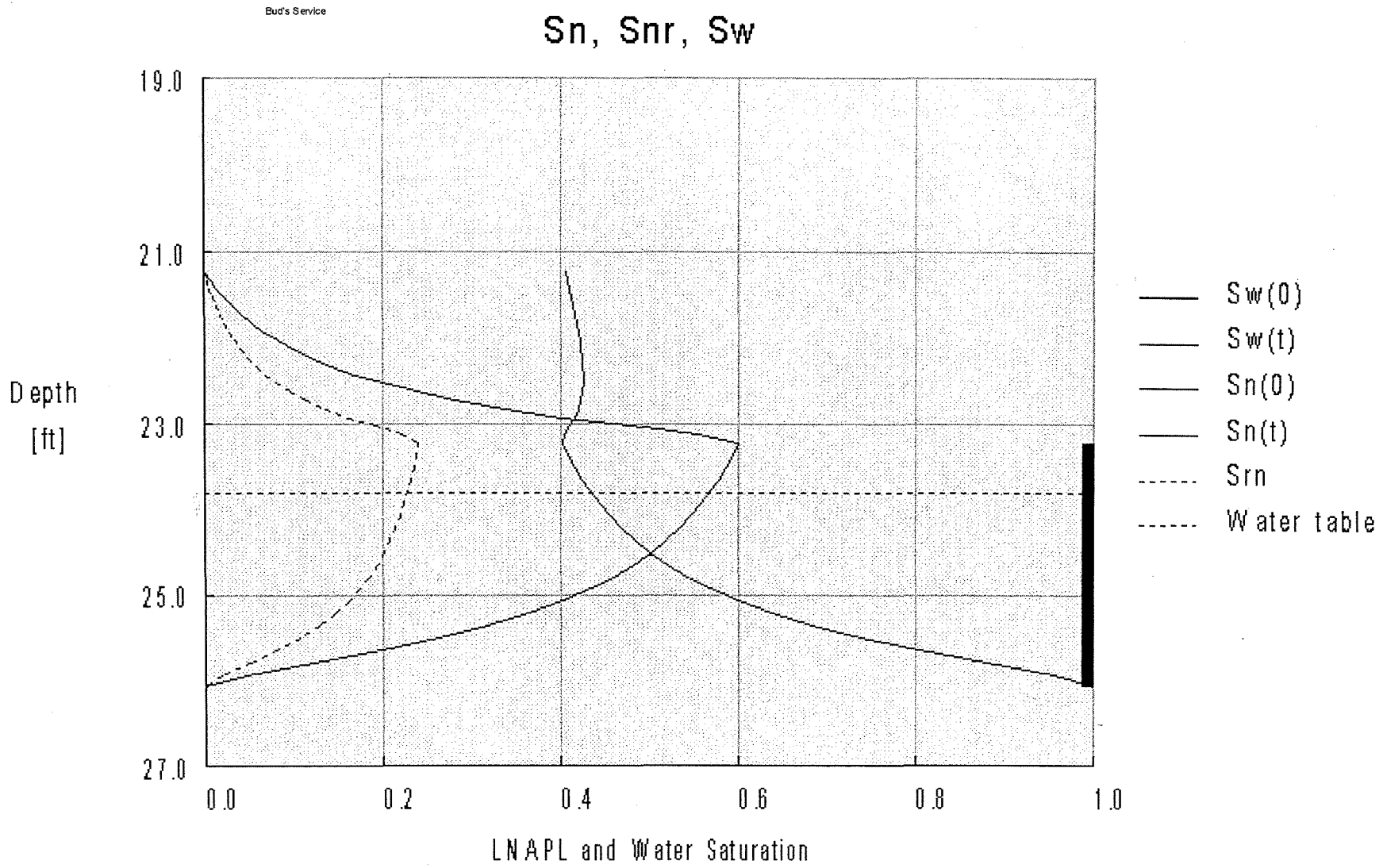
LNAPL Specific Volume / Transmissibility



start | 2 Windows Expl... | 3 LDRM | 3 Paint | 5:44 PM

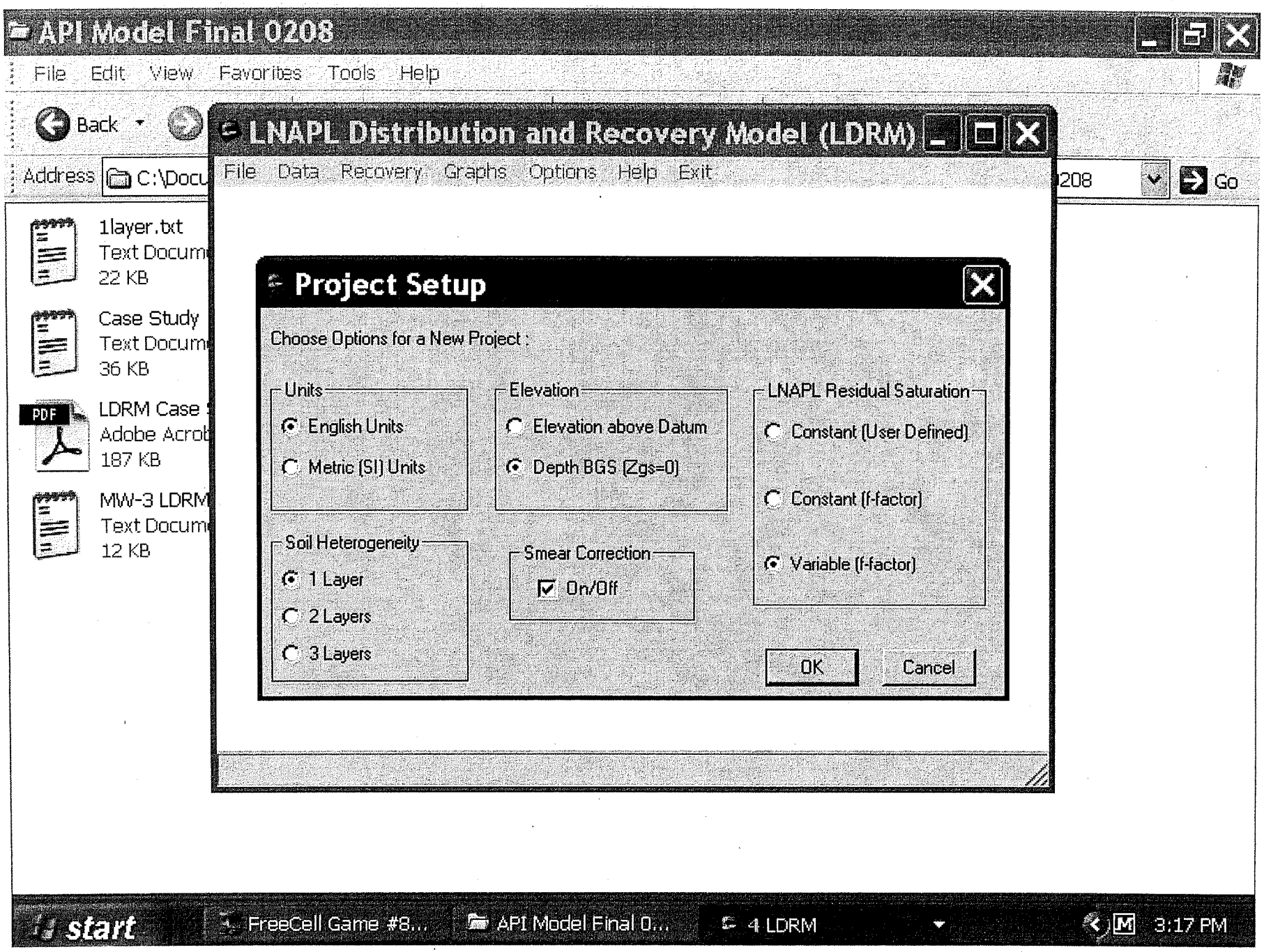
EX-1

LNAPL Distribution

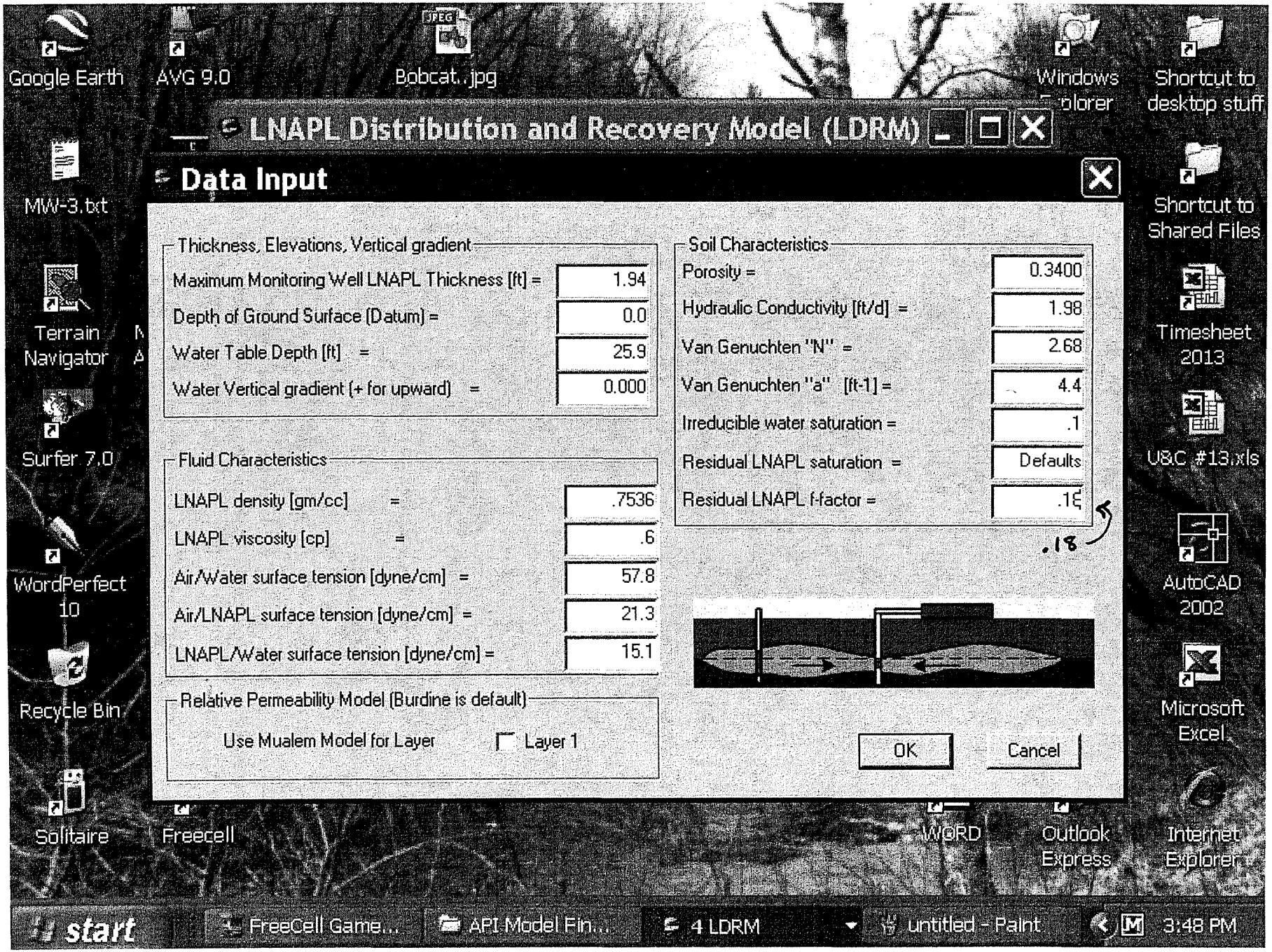


start | 2 Windows E... | 4 LDRM | 4 Paint | Dell Laser Prin... | 5:45 PM

EX-#5


API Model Final 0208
File Edit View Favorites Tools Help
Back
Address C:\Docu
208
Go
1layer.txt
Text Docum
22 KB
Case Study
Text Docum
36 KB
PDF
LDRM Case
Adobe Acrob
187 KB
MW-3 LDRM
Text Docum
12 KB
LNAPL Distribution and Recovery Model (LDRM)
File Data Recovery Graphs Options Help Exit
Project Setup
Choose Options for a New Project :
Units
English Units
Metric (SI) Units
Elevation
Elevation above Datum
Depth BGS (Zgs=0)
LNAPL Residual Saturation
Constant (User Defined)
Constant (f-factor)
Variable (f-factor)
Soil Heterogeneity
1 Layer
2 Layers
3 Layers
Smear Correction
On/Off
OK
Cancel
start
FreeCell Game #8...
API Model Final 0...
4 LDRM
3:17 PM

EX-5


Google Earth
AVG 9.0
Bobcat..jpg
Windows Explorer
Shortcut to desktop stuff
LNAPL Distribution and Recovery Model (LDRM)
MW-3.txt
Data Input
Shortcut to Shared Files
Terrain Navigator
Thickness, Elevations, Vertical gradient
Maximum Monitoring Well LNAPL Thickness [ft] = 1.94
Depth of Ground Surface (Datum) = 0.0
Water Table Depth [ft] = 25.9
Water Vertical gradient (+ for upward) = 0.000
Soil Characteristics
Porosity = 0.3400
Hydraulic Conductivity [ft/d] = 1.98
Van Genuchten "N" = 2.68
Van Genuchten "a" [ft-1] = 4.4
Irreducible water saturation = .1
Residual LNAPL saturation = Defaults
Residual LNAPL f-factor = .1
.18
Timesheet 2013
Surfer 7.0
Fluid Characteristics
LNAPL density [gm/cc] = .7536
LNAPL viscosity [cp] = .6
Air/Water surface tension [dyne/cm] = 57.8
Air/LNAPL surface tension [dyne/cm] = 21.3
LNAPL/Water surface tension [dyne/cm] = 15.1
U&C #13.xls
WordPerfect 10
AutoCAD 2002
Relative Permeability Model (Burdine is default)
Use Mualem Model for Layer
Layer 1
OK
Cancel
Recycle Bin
Microsoft Excel
Solitaire
Freecell
WORD
Outlook Express
Internet Explorer
start
FreeCell Game...
API Model Fin...
4 LDRM
untitled - Paint
3:48 PM

Ex-5

LNAPL Distribution and Recovery Model (LDRM)

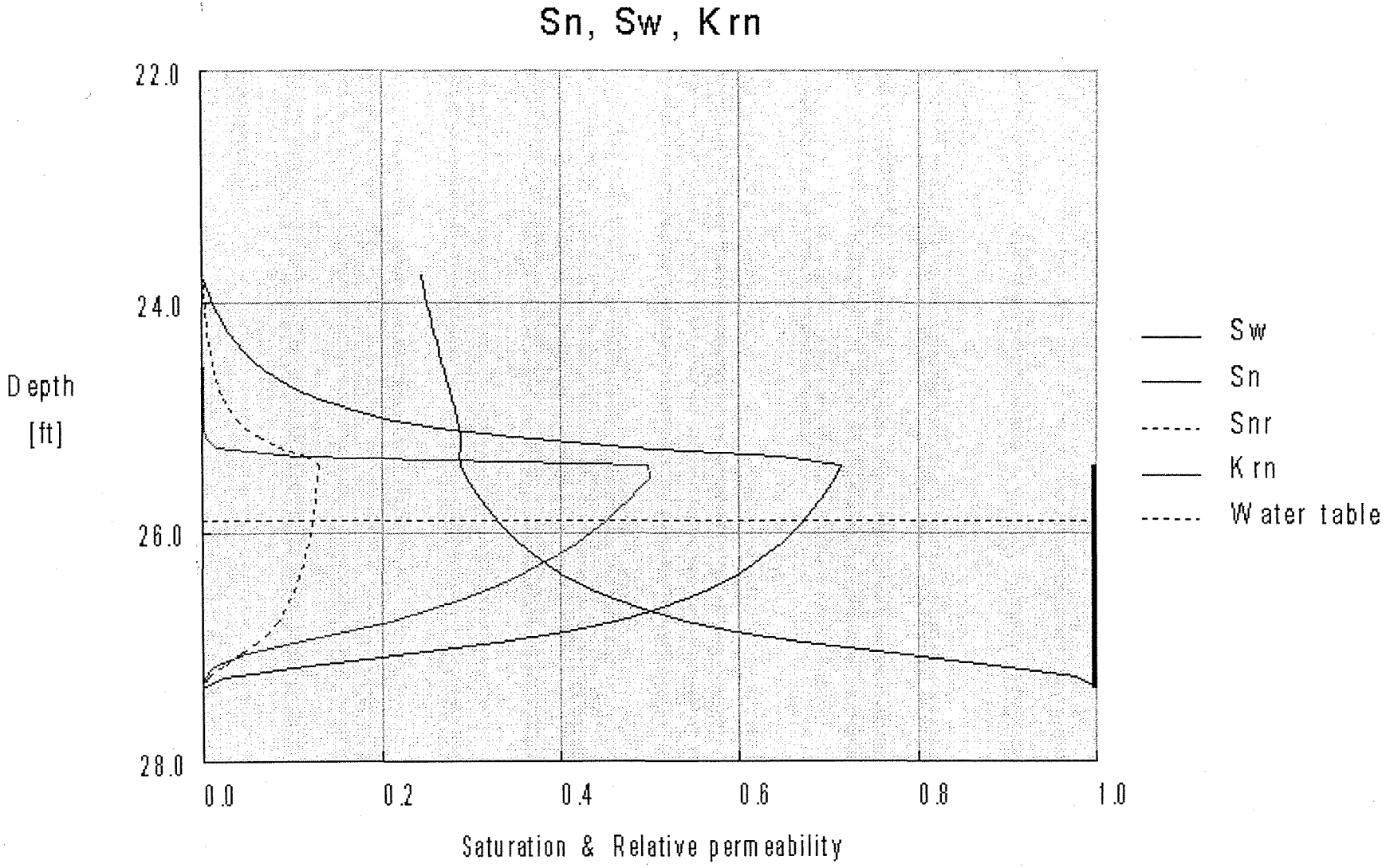
File Data Recovery Graphs Options Help Exit

LNAPL Specific Volume, Dn (ft) =	0.4207
LNAPL Recoverable Volume, Rn (ft) =	0.3450

start | API Model Final 0... | 3 LDRM | untitled - Paint | 3:57 PM

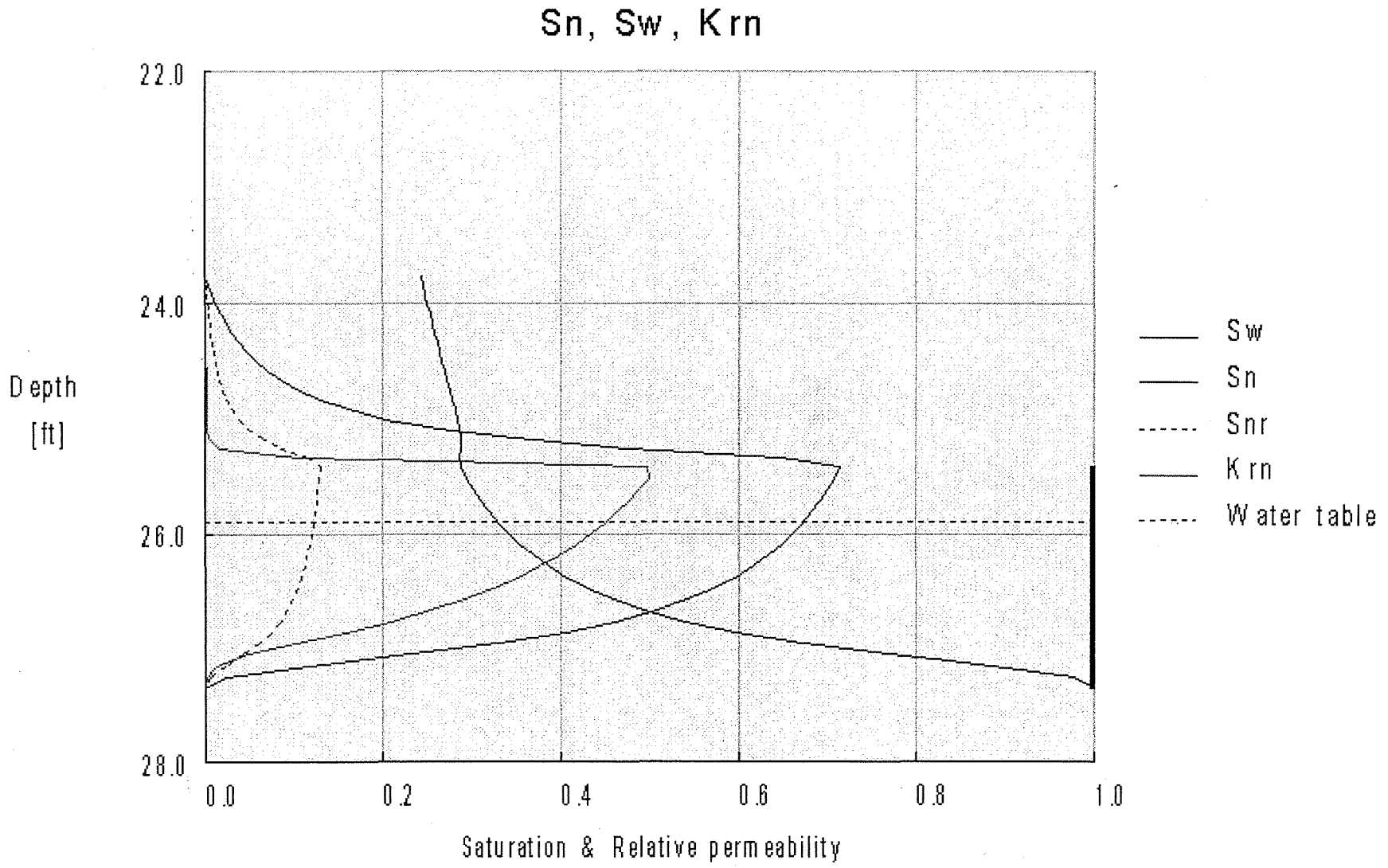
Ex-5

Saturation Profiles



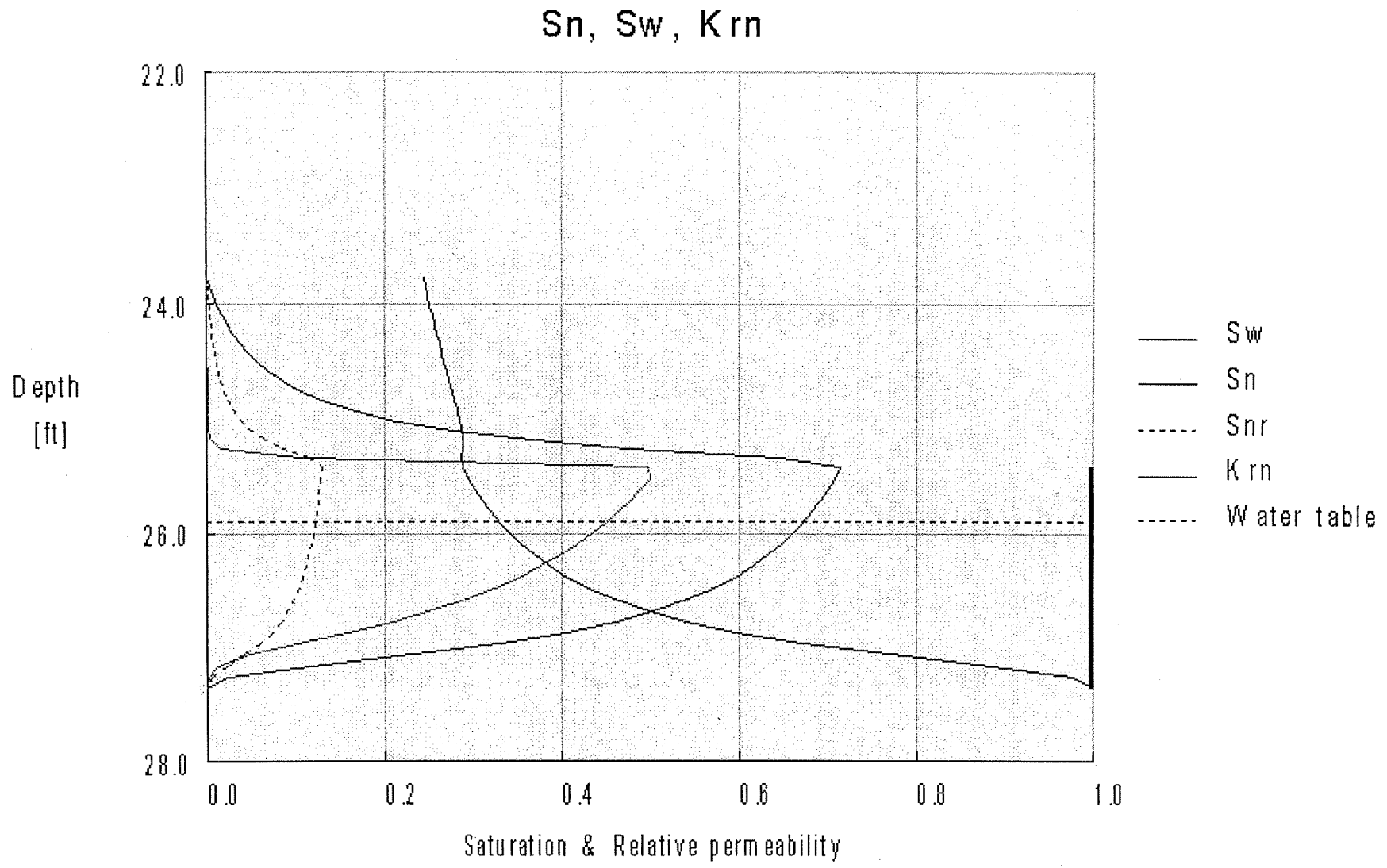
EX-5

LNAPL Specific Volume / Transmissibility



EX-5

LNAPL Distribution



MATRIX ENVIRONMENTAL LLC

11253 91st Ave N
Maple Grove, MN 55369
763-424-4803
FAX: 763-424-9452

-Direct Sensing Report-

Client:	**Meridian Environmental Consulting, LLC.**
Project Name:	**Doug's Tire**
Location:	**Ladysmith, WI**
Project Number:	**101-MNDS-12UV**

The analysis and opinions expressed in this report are based upon data obtained from UVOST logs generated (and samples collected for emulations if applicable) at the location specified, and from other information discussed in this report. Exceptions, if any, are discussed in the accompanying discussion if applicable. This report is prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted practices. Reported results shall not be reproduced, except in full, without written approval of the lab. The sample results relate only to the analytes of interest tested. No warranties, expressed or implied are intended or made.

I certify that the data contained in this final report has been generated and reviewed in accordance with approved methods and our Standard Operating Procedure. Release of this final report is authorized by Laboratory management, which is verified by the following signature.

_____ _____

Approval Signature Date

LIF SYSTEM DESCRIPTION & ANALYSIS

UVOST

Fluorescence is a property of some compounds where absorbed UV light stimulates the emission of photons (light) of a longer wavelength relative to the source emission. The release of the photons can be used to detect small amounts of substance (i.e. polycyclic aromatic hydrocarbons or PAHs) in a larger matrix (soil). This method of detection has been used in laboratories for decades. Now, with the availability of lasers and optical fibers, this technology can be applied down hole in the field.

The UVOST system sends light (via 308 nm laser) through a fiber optic cable strung within probe rods. The light, reflected by a parabolic mirror, then exits through a sapphire window in the side of the probe. As the probe is advanced, the soil is exposed to the UV laser light. If PAHs are present (compounds in POLs that fluoresce, i.e. LNAPL) longer wavelength light is emitted by the contaminants. This "signal" light is transmitted through a fiber, back up hole to be analyzed. Responses are indicated in real-time on a graph of signal vs. depth. The UVOST log displays "color mixed" signal logs (contributions from 4 channels) and waveforms ("fingerprint" of multi-wavelength) to aid in identification of the contaminant present.

Prior to every log the UVOST system is checked for optical quality by observing the background signal for sources of signal in the fiber, filter, mirror and sapphire window. Also, the reference emitter (a standard proprietary NAPL mixture called the "RE") is placed on the window to determine the qualitative and semi-quantitative properties of the laser system. This is to assure that the RE response has the correct shape and intensity and that the UVOST system is ready to log. Typically the RE will fall between 10,000 and 12,000 pVs (picovolt-seconds, a measure of waveform area) and the background can vary from 0.1% to 1% (area of about 0-100 pVs). It is important to remember that the relationship between the NAPL in the ground and the RE depends on that particular NAPL. The calibration of the system is not to a concentration, but to a known fluorescence signature.

EC (Electrical Conductivity)

Electrical Conductivity (EC) is a measure of the soils ability to conduct an electrical current between two dipoles on the LIF/EC probe. Conductivity is the reciprocal of electrical resistivity and has the units (in our application) of millisiemens per meter (mS/m). Since soil is in the pathway of the charge flow, the grain size can be determined by comparing the EC log to a soil boring. Conductivity readings in the 100s indicate smaller grain (size such as clay). Larger grain size (sand and gravels) are typically in the 10s of mS/m range. Prior to every log the EC point of the UVOST probe is checked for proper operation by performing a voltage test with a voltage meter and a conductivity test with a test block.

UVOST Log Reference Guide

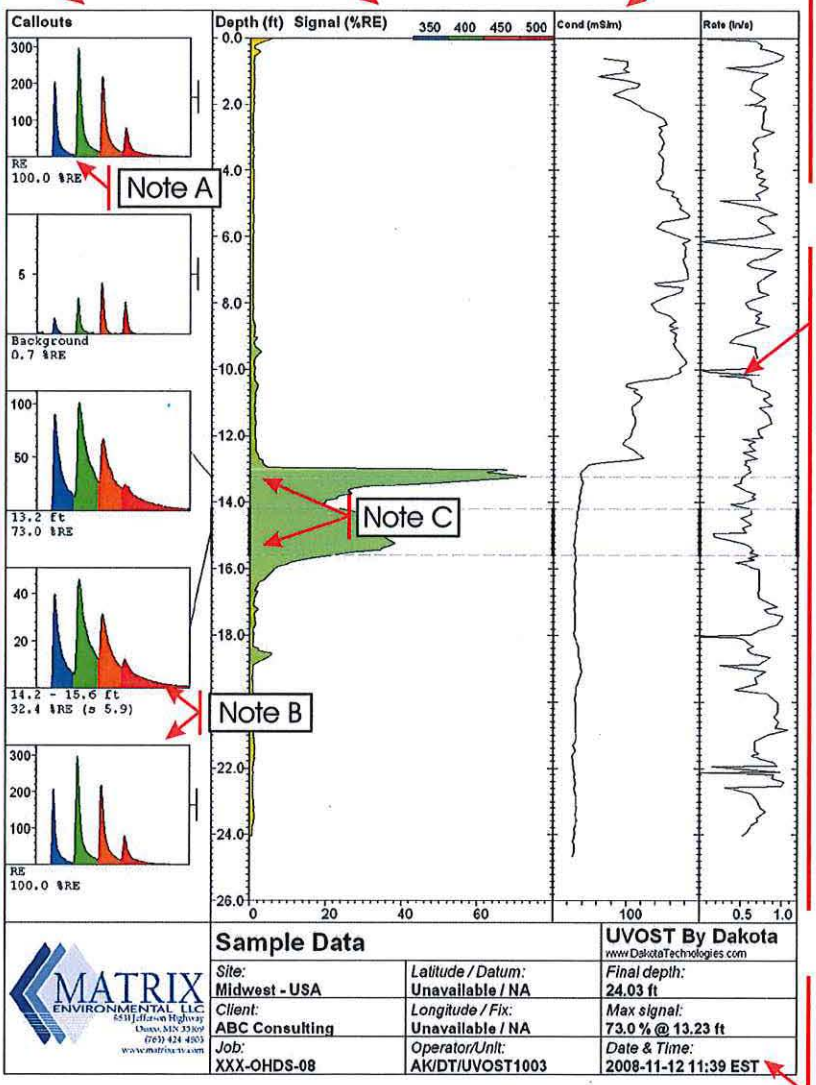
Main Plot :
Signal (total fluorescence) versus depth where signal is relative to the Reference Emitter (RE).The total area of the waveform is divided by the total area of the Reference Emitter yielding the %RE.This %RE scales with the NAPL fluorescence. The fill color is based on relative contribution of each channel's area to the total waveform area (see callout waveform).The channel-to-color relationship and corresponding wavelengths are given in the upper right corner of the main plot.

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

The four peaks are due to fluorescence at four wavelengths and referred to as "channels". Each channel is assigned a color.

Various NAPLs will have a unique waveform "fingerprint" due to the relative amplitude of the four channels and/or broadening of one or more channels.

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



Conductivity Plot :
The Electrical Conductivity (EC) of the soil can be logged simultaneously with the UVOSTdata. EC often provides insight into the stratigraphy.
Note the drop in EC from 10 - 13 ft, indicating a shift from consolidated to unconsolidated stratigraphy.This correlates with the observed NAPL distribution.

Rate Plot :
The rate of probe advancement. ~ 0.8 in (2cm) per second is preferred.

A noticeable decrease in the rate of advancement may be indicative of difficult probing conditions (gravel, angular sands, etc.).

Notice that this log was terminated arbitrarily, not due to "refusal", which would have been indicated by a sudden rate drop at final depth.

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

NoteA:
Time is along the x axis. No scale is given, but it is a consistent 320ns wide.
The y axis is in mV and directly corresponds to the amount of light striking the photodetector.

Note B :
These two waveforms are clearly different.The first is weathered diesel from the log itself while the second is the Reference Emitter (a blend of NAPLs) always taken before each log for calibration.

Note C :
Callouts can be a single depth (see 3rd callout) or a range (see 4th callout).The range is noted on the depth axis by a bold line. When the callout is a range, the average and standard deviation in %RE is given below the callout.

Discussion

All LIF locations were preprobed to a depth of 5 feet in an attempt to prolong the life of the SPOC/dipole probe, therefore signal from less than 5 feet have not been commented on as the subsurface had been disturbed. There were two different waveforms encountered on the Doug's Tire site. The waveform yielding the green color on the false-color plot is consistent with diesel type compounds, and this was found mainly in the rear of the building. The second waveform, which yielded a bluish color on the false-color plot is consistent with a gas-type waveform, and was found mainly to the South and west of the building.

MATRIX ENVIRONMENTAL LLC

11253 91st Avenue North
Maple Grove, Minnesota
(763) 424-4803
fax (763) 424-9452

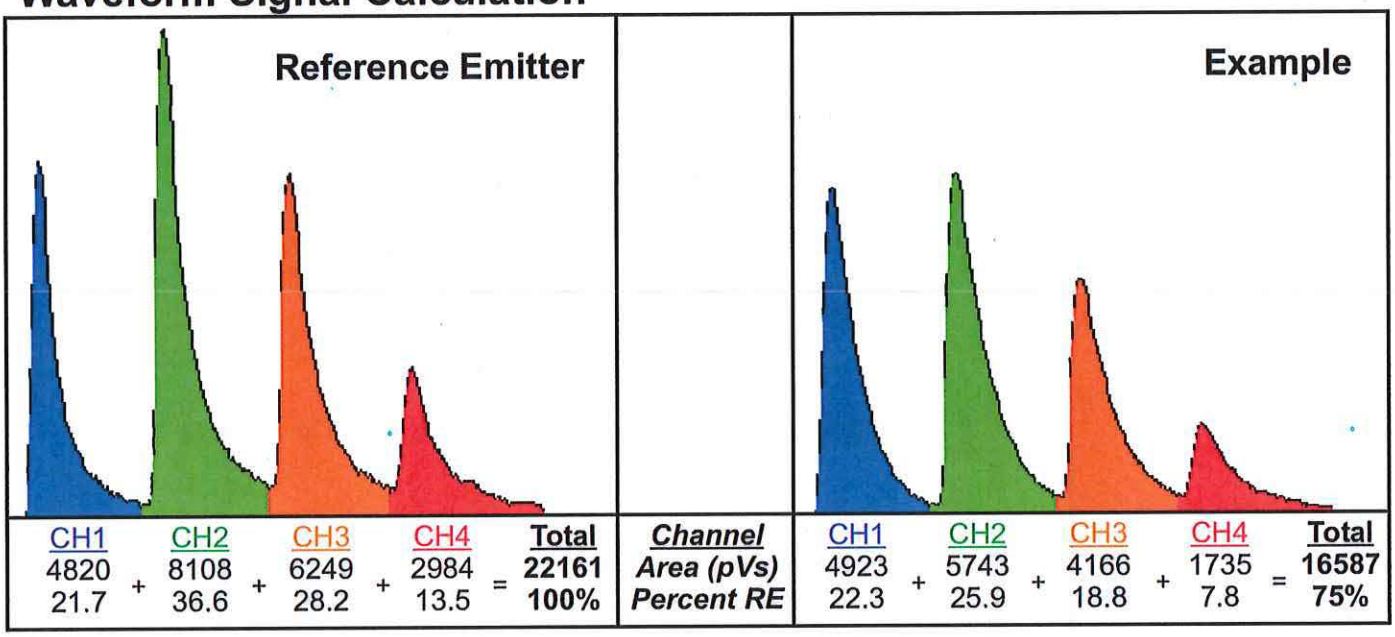
Client: Meridian Environmental Consulting, LLC.
Contact: Ken Shimko
Services: UVOST Logging

Date: 9/11 - 12/2012
Project: Doug's Tire
Project #: 101-MNDS-12UV
Address: Ladysmith, WI

UVOST Log Summary

File	Date/Time	Latitude	Longitude	Final Depth *(ft)*	Max Signal *(%RE)*	Max. Signal Depth *(ft)*	Initial RE Area *(pVs)*	Background Area *(pVs)*	Fluorescence Top - Bottom *(ft)*
LIF-01	9/11/2012 10:01	NA	NA	35.0	263	18.5	10185	22	2.1 - 27.8, 30.2 - 30.9
LIF-02	9/11/2012 10:48	NA	NA	38.0	428	26.1	10734	25	19.1 - 31.1, 32.3 - 33.7
LIF-03	9/11/2012 11:32	NA	NA	36.2	125	24.8	10785	27	20.7 - 31.6, 33.6 - 34.0
LIF-04	9/11/2012 12:55	NA	NA	34.0	62	26.3	10318	26	14.6 - 15.7, 25.6 - 27.6
LIF-05	9/11/2012 13:28	NA	NA	34.0	360	20.1	10738	16	2.5 - 27.0
LIF-06	9/11/2012 14:10	NA	NA	34.7	314	25.8	10532	25	20.8 - 32.6
LIF-07	9/11/2012 14:49	NA	NA	32.0	69	15.2	10679	21	5.0 - 24.9
LIF-08	9/11/2012 15:26	NA	NA	34.1	18	26.4	10686	19	14.9 - 19.5, 21.3 - 30.4
LIF-09	9/11/2012 16:35	NA	NA	34.0	150	25.5	10197	26	21.8 - 28.3
LIF-10	9/11/2012 17:08	NA	NA	34.1	4	0.3	10659	26	22.3 - 24.2, 26.7 - 27.6
LIF-11	9/11/2012 17:37	NA	NA	34.1	147	25.0	10120	23	22.9 - 28.4
LIF-12	9/11/2012 18:07	NA	NA	34.0	6	26.8	10979	24	25.9 - 28.1
LIF-13	9/11/2012 18:56	NA	NA	34.3	72	24.7	10562	27	7.6 - 12.1, 21.4 - 27.9
LIF-14	9/12/2012 9:01	NA	NA	34.0	129	23.9	10675	16	21.3 - 28.4
LIF-15	9/12/2012 9:42	NA	NA	34.1	89	10.8	10687	26	5.0 - 26.4
LIF-16	9/12/2012 10:16	NA	NA	24.9	70	8.2	10726	14	5.0 - 13.2, 20.6 - 24.9
LIF-17	9/12/2012 11:12	NA	NA	30.0	25	23.4	10559	28	20.9 - 26.3
LIF-18	9/12/2012 11:42	NA	NA	30.2	6	20.2	10694	32	18.1 - 21.1
LIF-19	9/12/2012 12:57	NA	NA	42.0	70	29.1	10844	44	26.4 - 37.2
LIF-20	9/12/2012 14:14	NA	NA	35.0	17	25.9	10660	0	23.2 - 29.4
LIF-21	9/12/2012 14:43	NA	NA	34.1	4	10.9	11101	4	5.0 - 16.9 *see log
LIF-22	9/12/2012 15:13	NA	NA	34.0	5	3.9	10628	6	5.0 - 10.8 *see log
LIF-23	9/12/2012 15:43	NA	NA	36.6	265	27.1	10487	8	22.8 - 32.1
LIF-24	9/12/2012 16:21	NA	NA	18.5	2	0.0	10562	6	NA
LIF-25	9/12/2012 16:45	NA	NA	13.4	0	0.1	10399	8	NA
LIF-26	9/12/2012 17:12	NA	NA	34.2	2	0.3	11137	22	NA

Waveform Signal Calculation

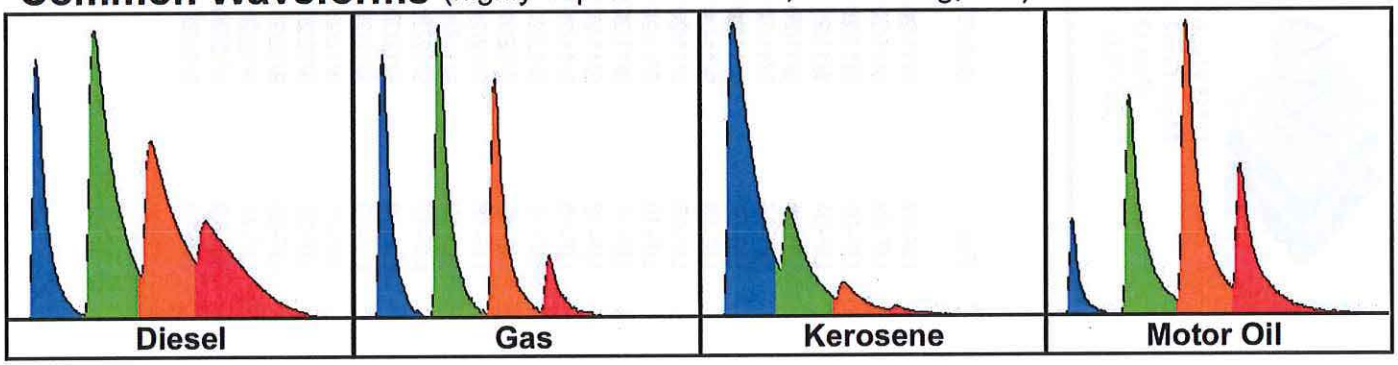


CH1		CH2		CH3		CH4		Total		CH1		CH2		CH3		CH4		Total
4820	+	8108	+	6249	+	2984	=	**22161**	***Channel***	4923	+	5743	+	4166	+	1735	=	**16587**
21.7		36.6		28.2		13.5		**100%**	***Area (pVs)***	22.3		25.9		18.8		7.8		**75%**
									Percent RE									

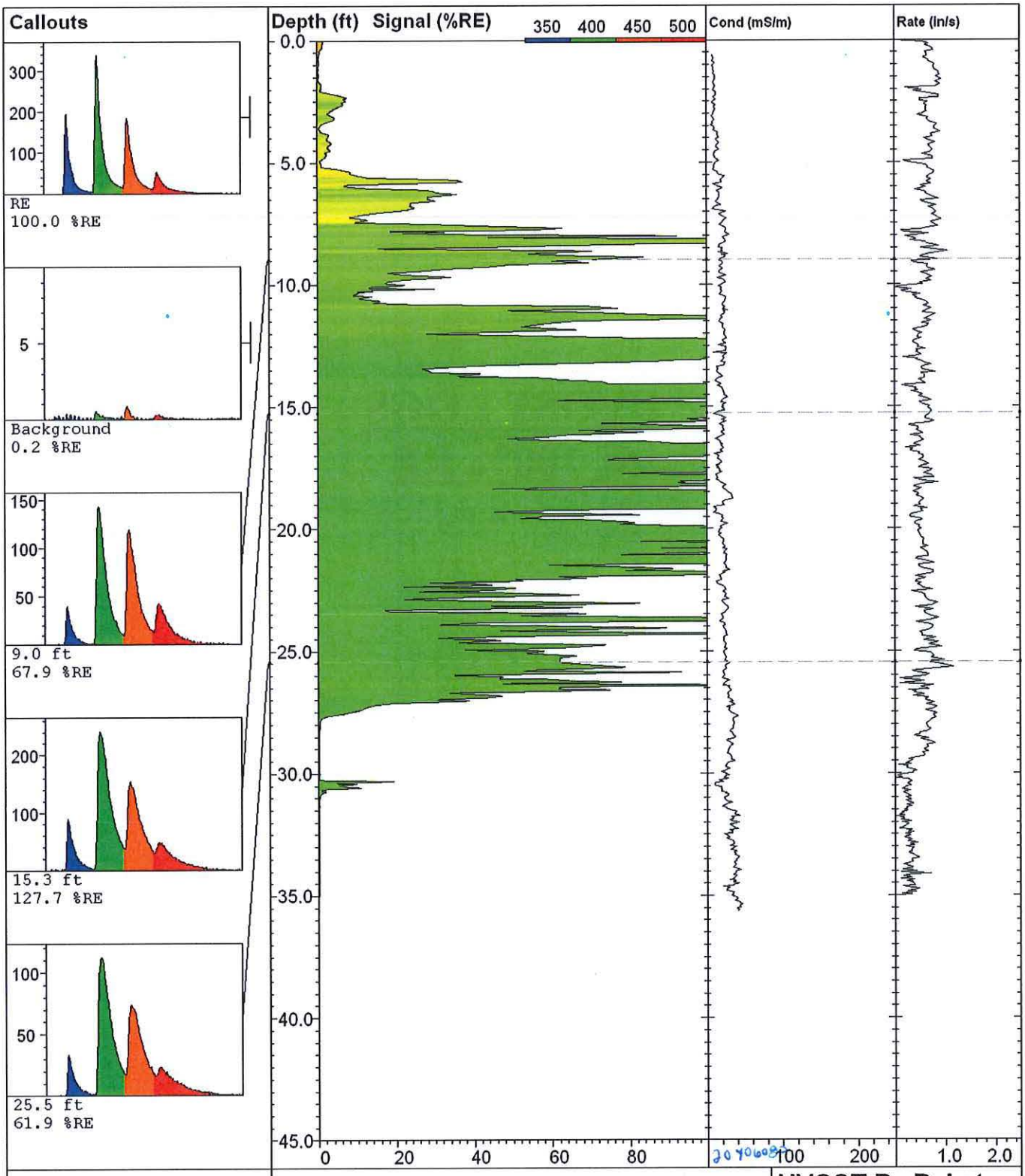
Data Files

***.lif.raw.bin**	Raw data file. Header is ASCII format and contains information stored when the file was initially written (e.g. date, total depth, max signal, gps, etc., and any information entered by the operator). All raw waveforms are appended to the bottom of the file in a binary format.
***.lif.plt**	Stores the plot scheme history (e.g. callout depths) for associated Raw file. Transfer along with the Raw file in order to recall previous plots.
***.lif.jpg**	A jpg image of the OST log including the main signal vs. depth plot, callouts, information, etc.
***.lif.dat.txt**	Data export of a single Raw file. ASCII tab delimited format. No string header is provided for the columns (to make importing into other programs easier). Each row is a unique depth reading. The columns are: Depth, Total Signal (%RE), Ch1%, Ch2%, Ch3%, Ch4%, Rate, Conductivity Depth, Conductivity Signal. Summing channels 1 to 4 yields the Total Signal.
***.lif.sum.txt**	A summary file for a number of Raw files. ASCII tab delimited format. The file contains a string header. The summary includes one row for each Raw file and contains information for each file including: the file name, gps coordinates, max depth, max signal, and depth at which the max signal occured.
***.lif.log.txt**	An activity log generated automatically located in the OST application directory in the 'log' subfolder. Each OST unit the computer operates will generate a separate log file per month. A log file contains much of the header information contained within each separate Raw file, including: date, total depth, max signal, etc.

Common Waveforms (highly dependent on soil, weathering, etc.)



UVOST LOGS
@ 100% RE

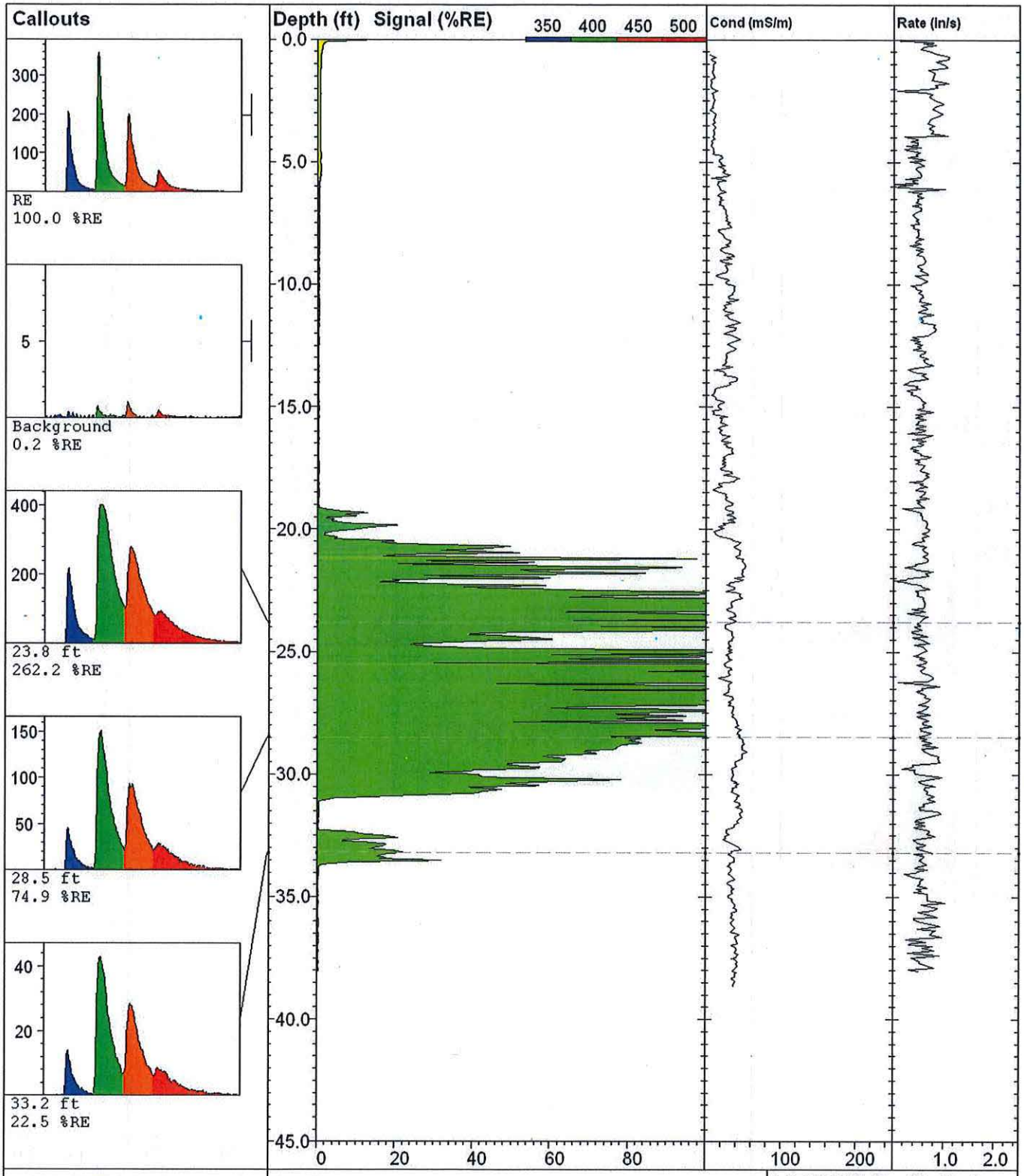


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-01

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **35.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **262.6 % @ 18.55 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:01 CDT**

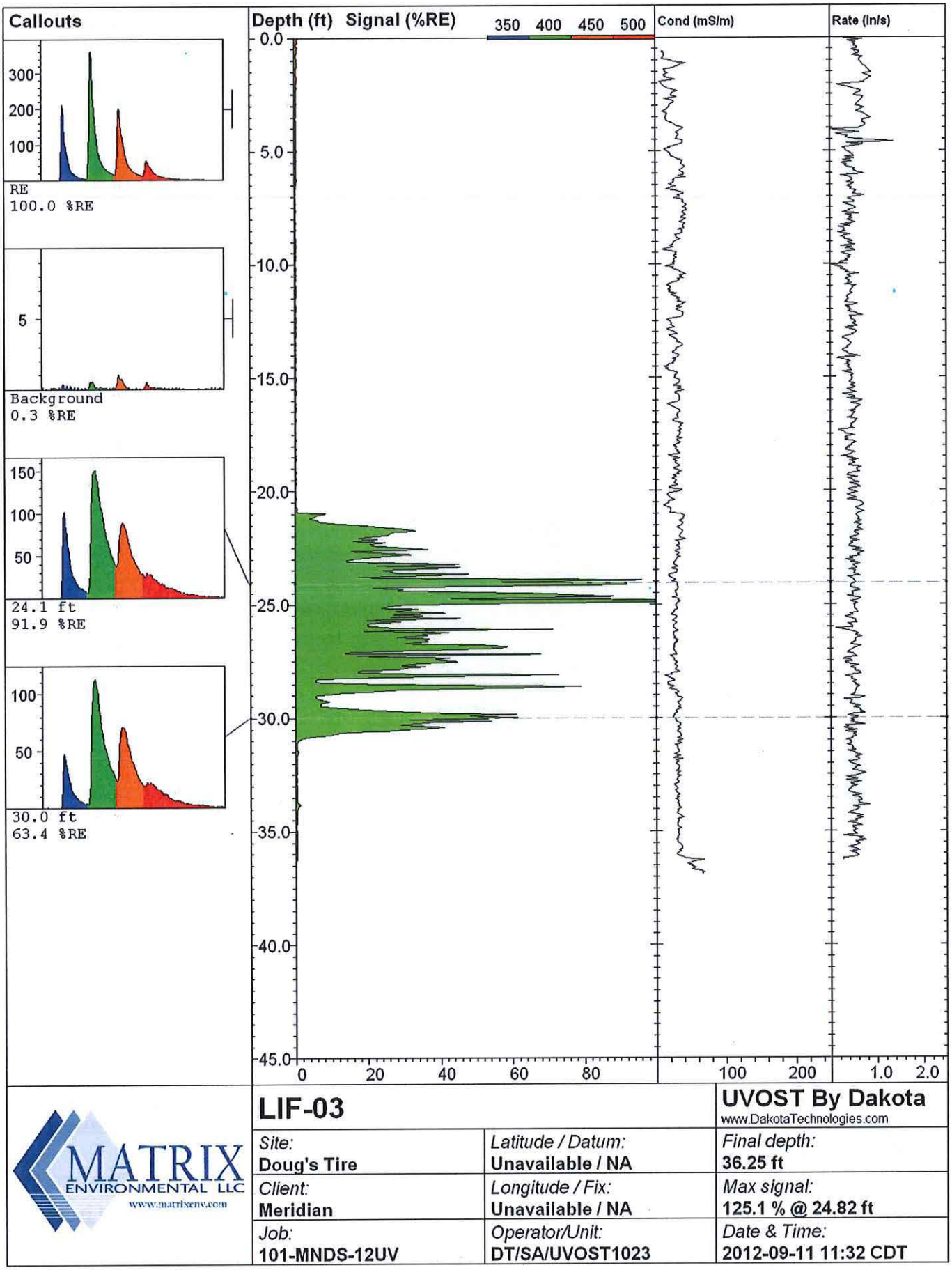


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-02

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **38.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **428.4 % @ 26.11 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:48 CDT**



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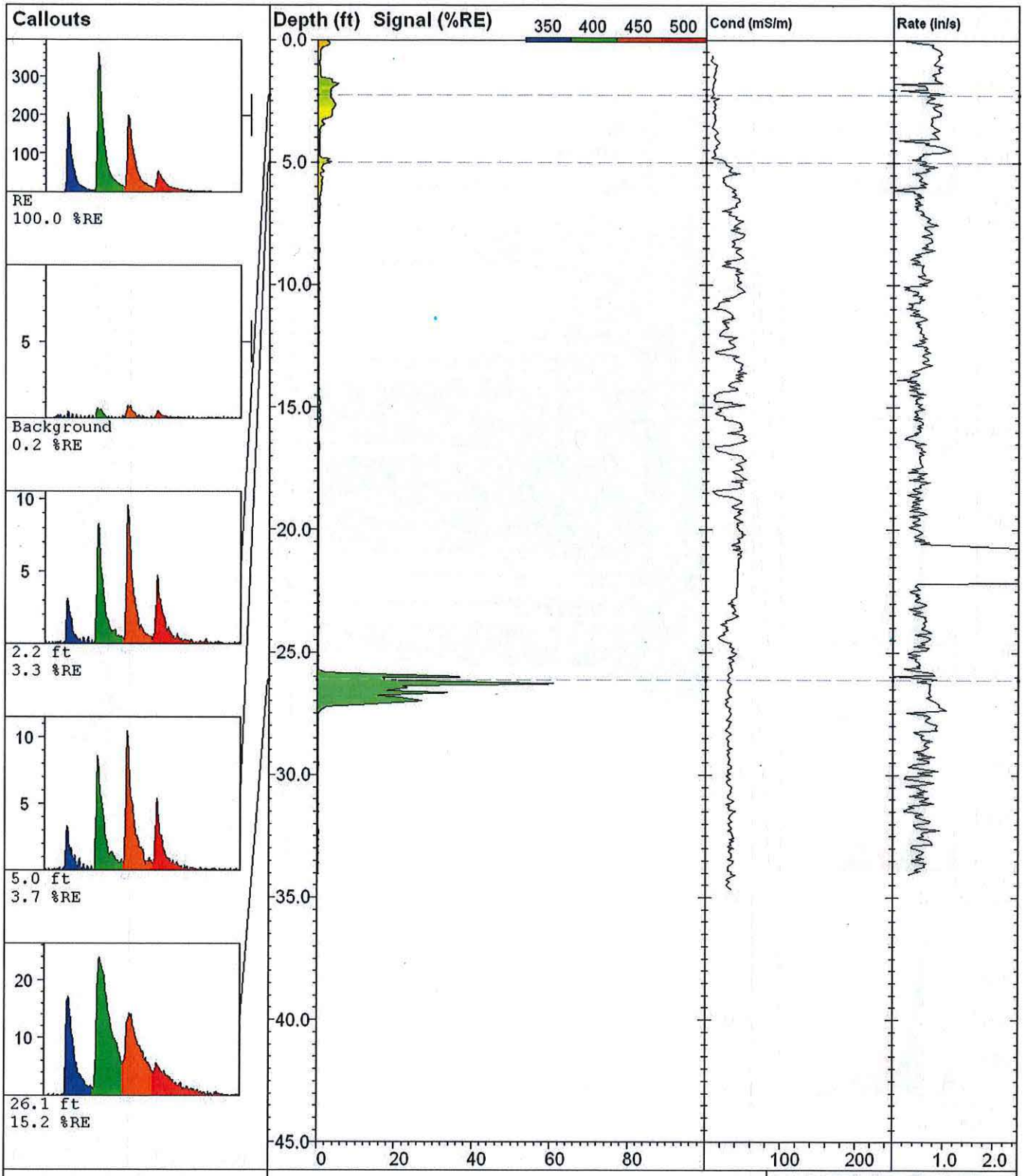
www.matrixenv.com

LIF-03

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.25 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **125.1 % @ 24.82 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 11:32 CDT**

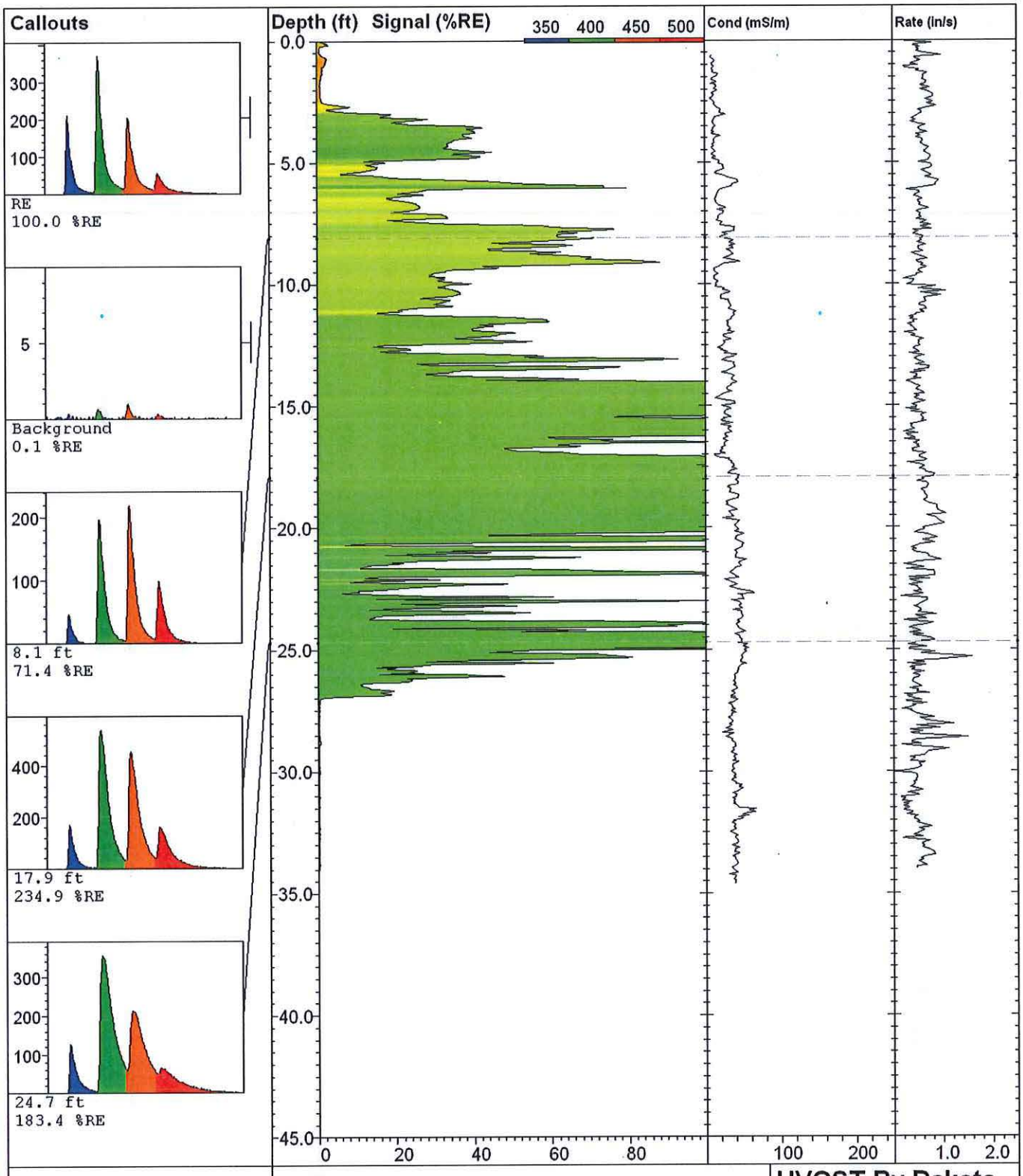


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-04

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.04 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **61.6 % @ 26.28 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 12:55 CDT**

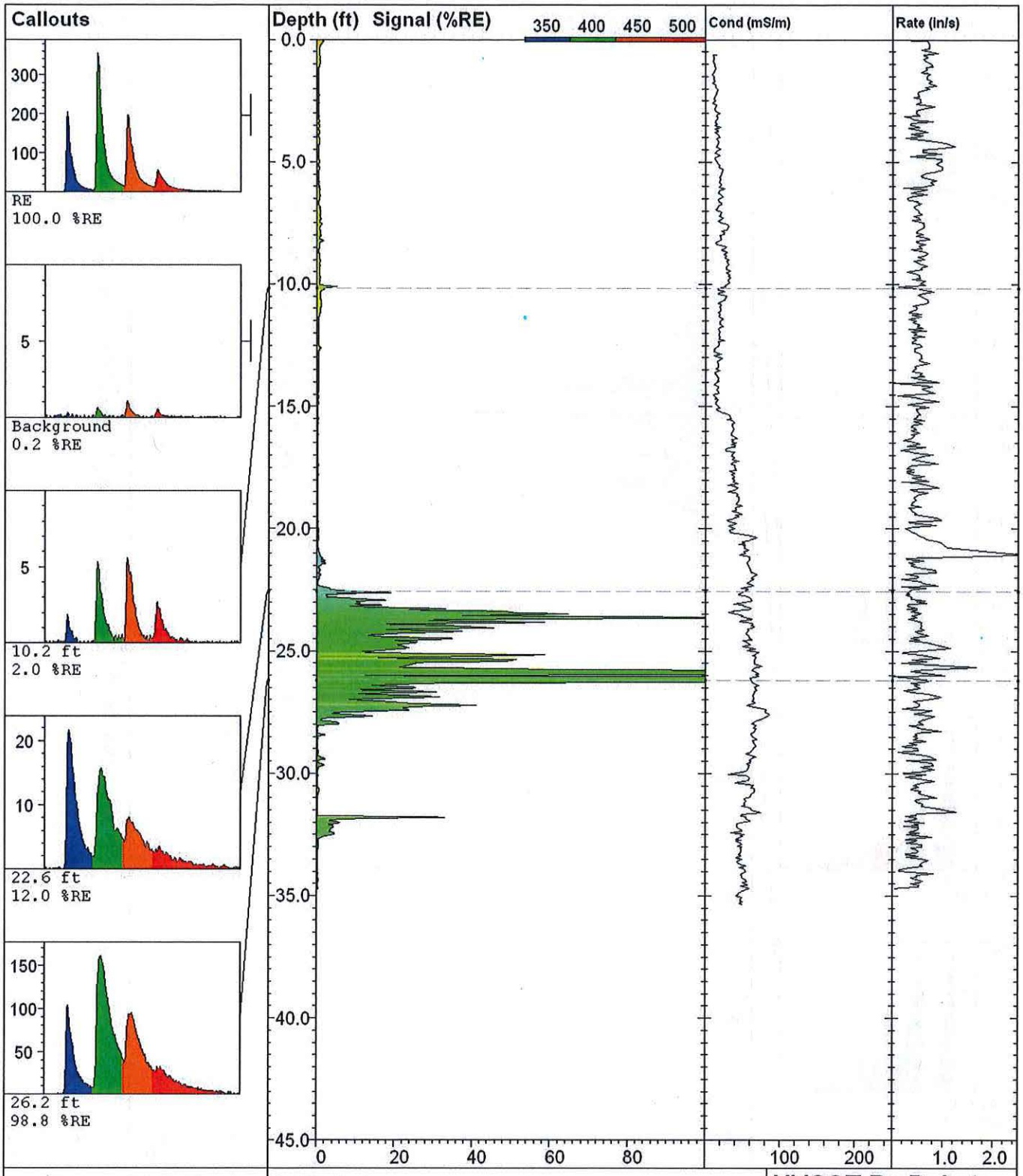


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-05

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **360.4 % @ 20.09 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 13:28 CDT**

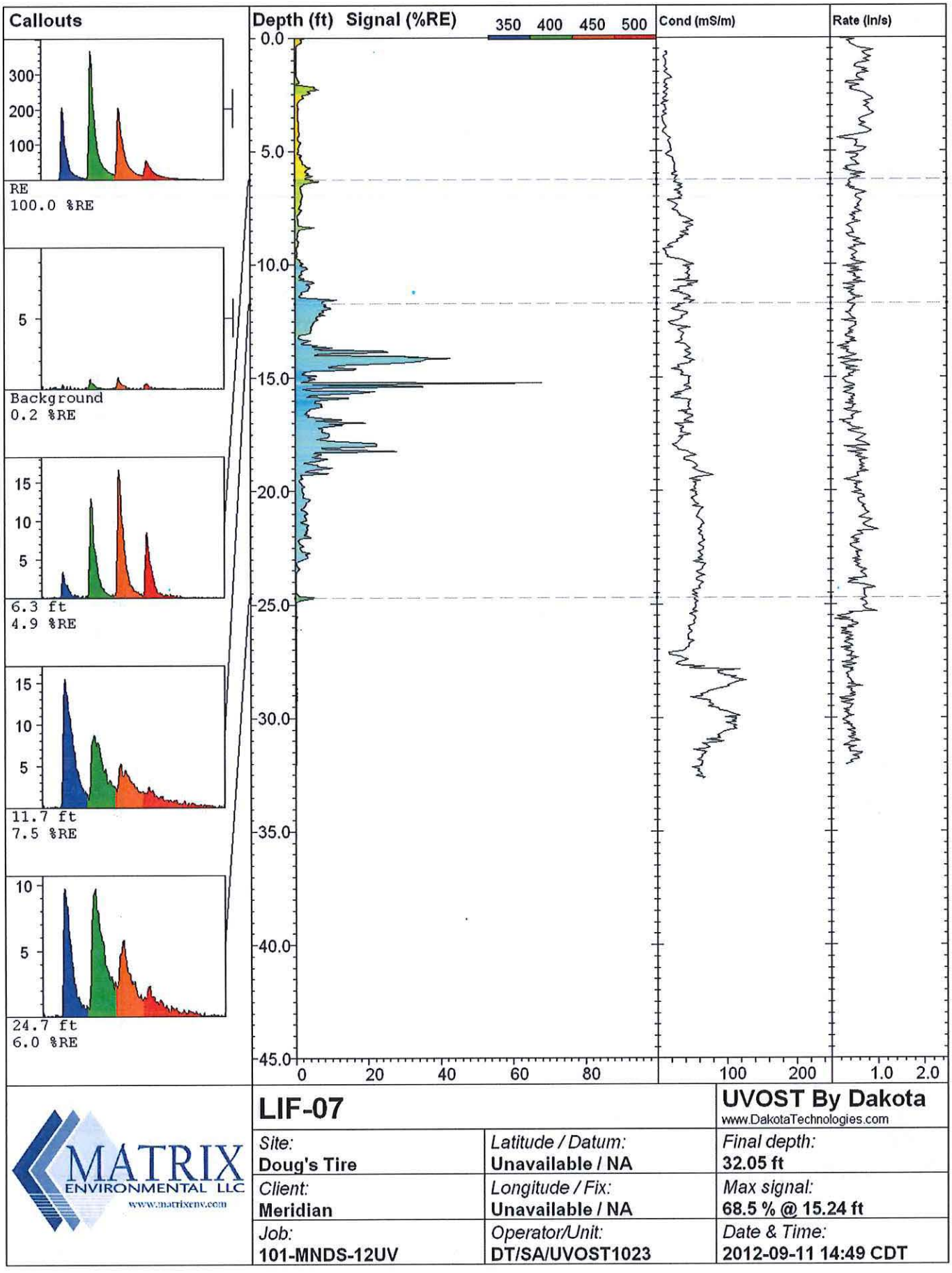


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-06

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.72 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **313.8 % @ 25.84 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 14:10 CDT**

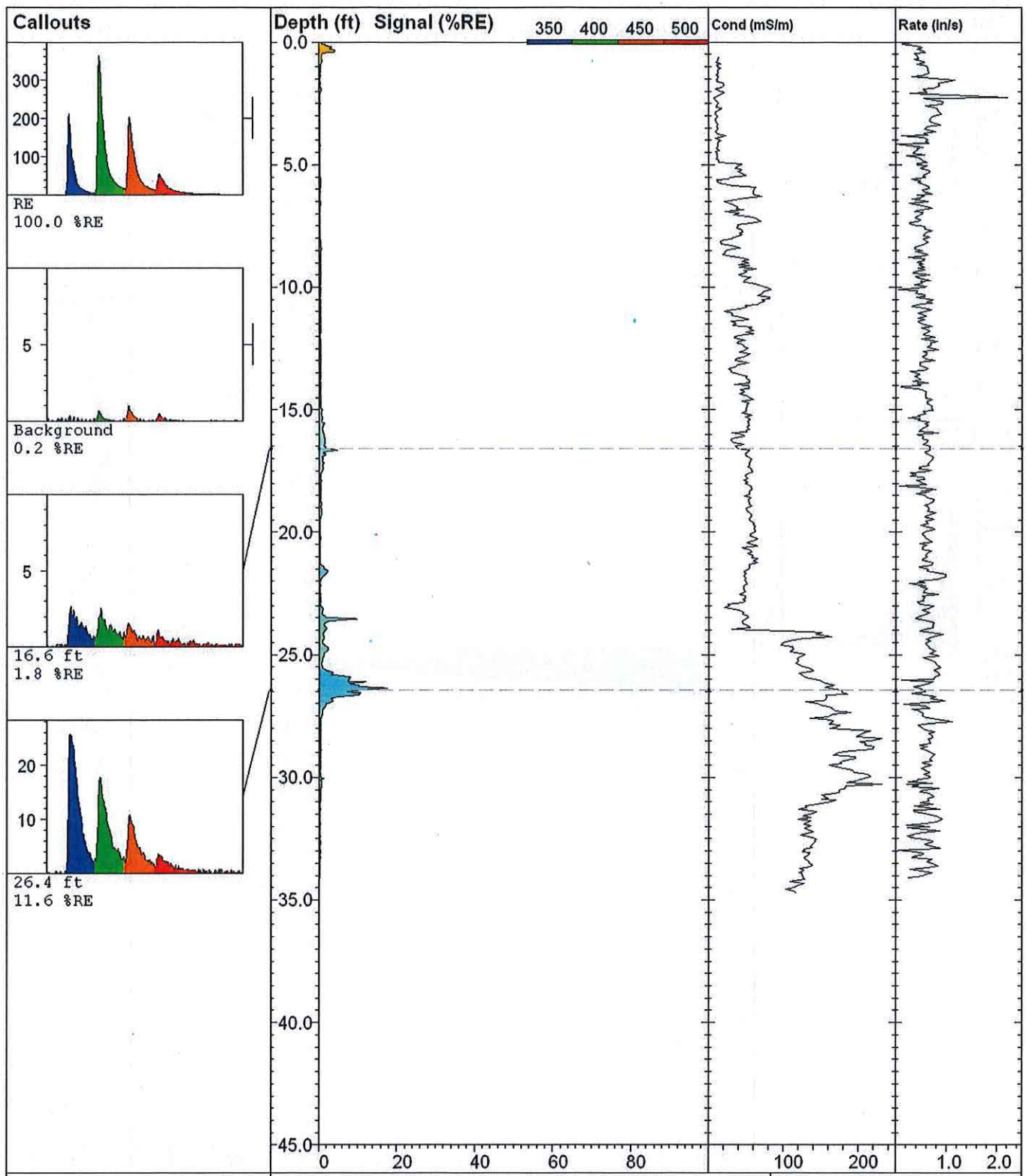


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-07

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **32.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **68.5 % @ 15.24 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 14:49 CDT**

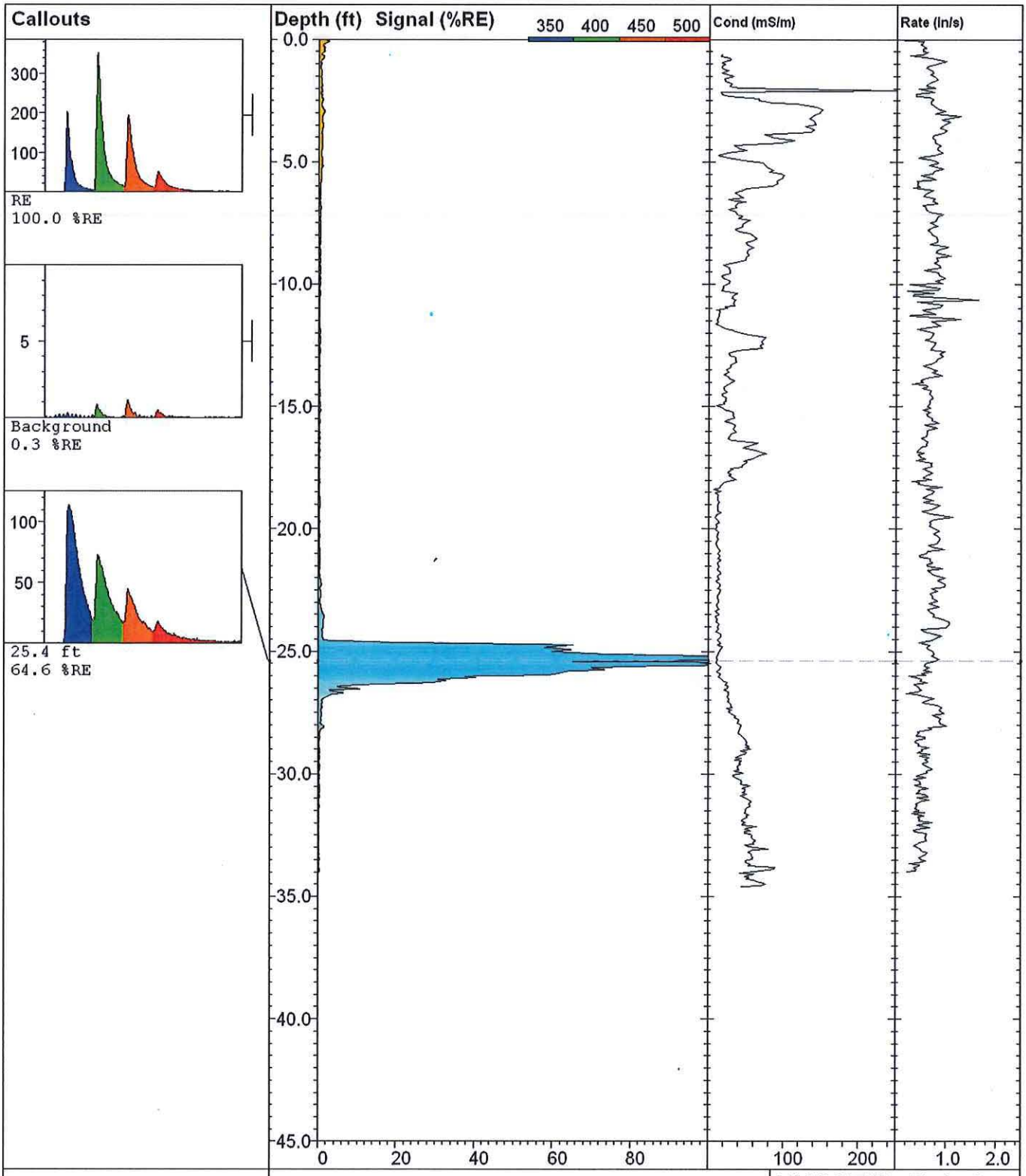


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-08

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.09 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **17.7 % @ 26.37 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 15:26 CDT**

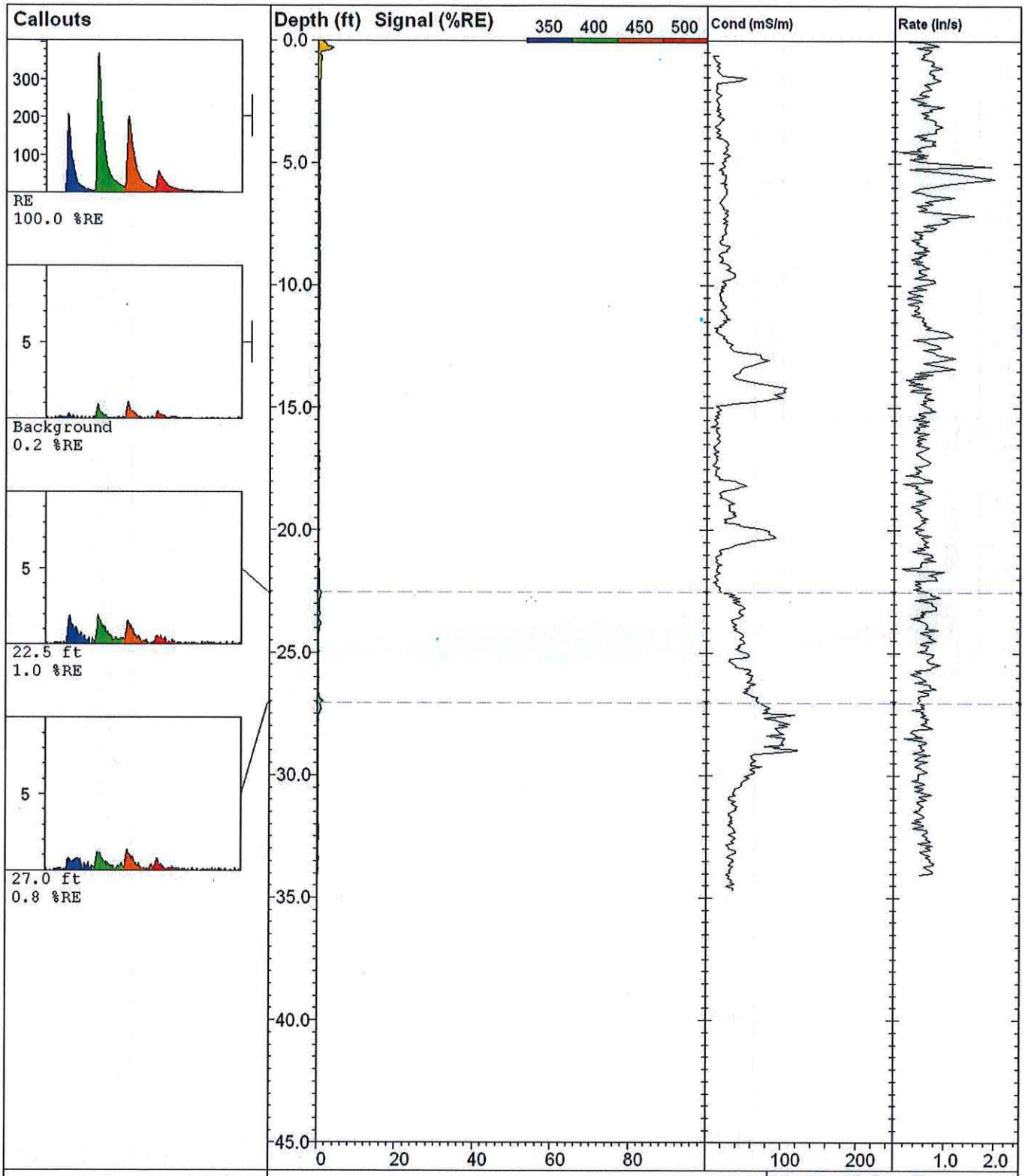


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-09

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **150.2 % @ 25.48 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 16:35 CDT**



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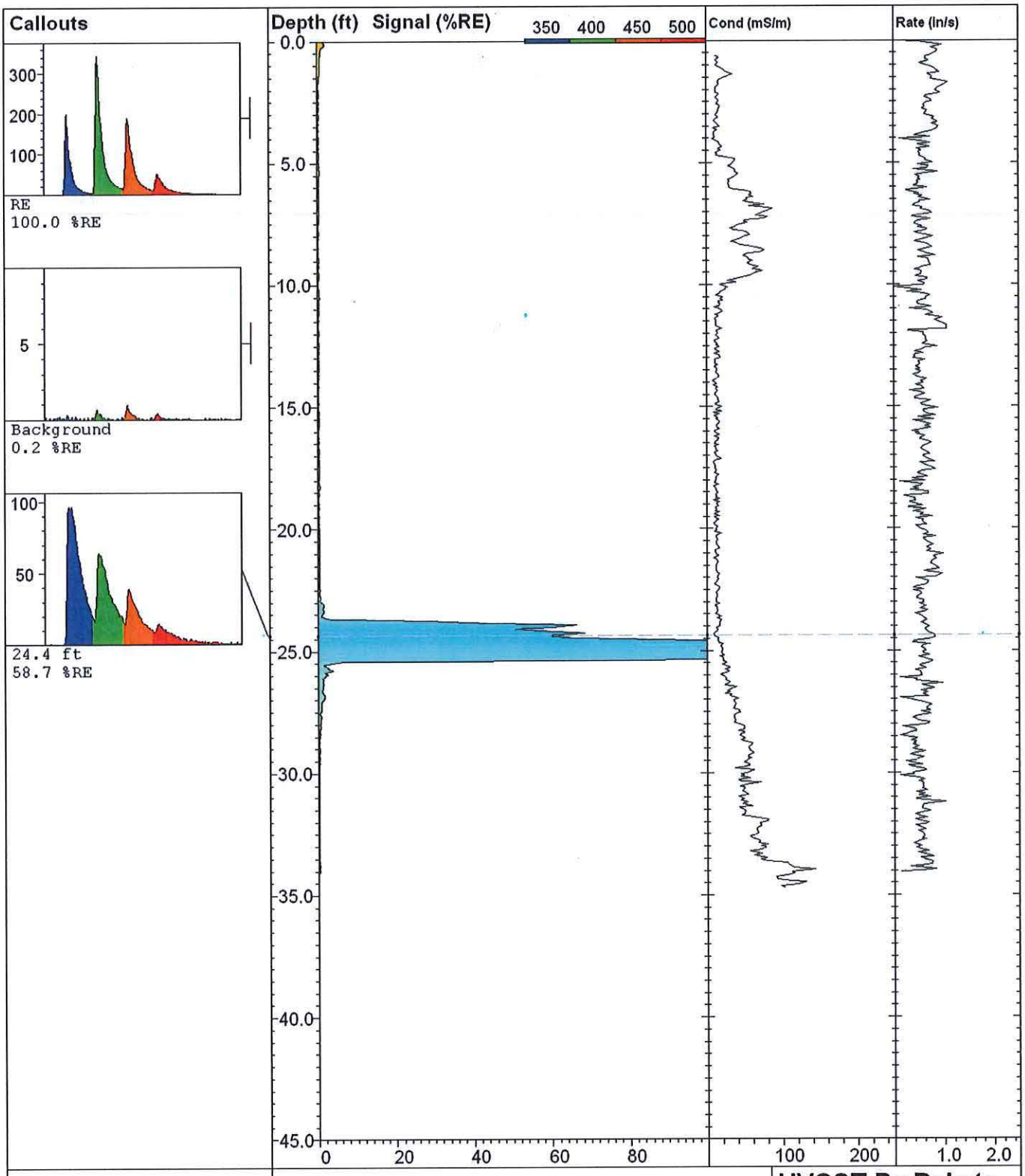
LIF-10

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.9 % @ 0.29 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 17:08 CDT**



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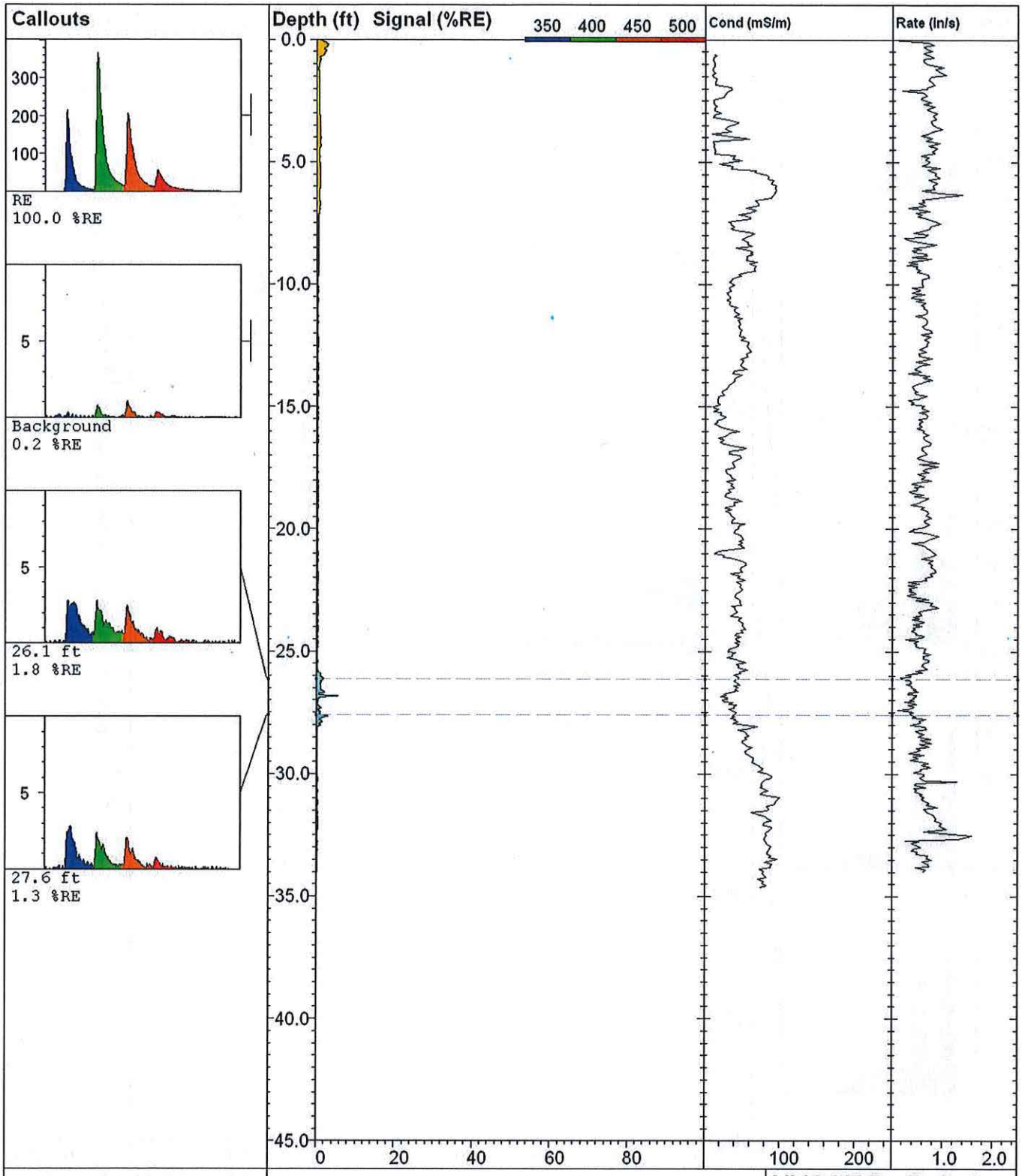
LIF-11

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.06 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **147.0 % @ 25.00 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 17:37 CDT**



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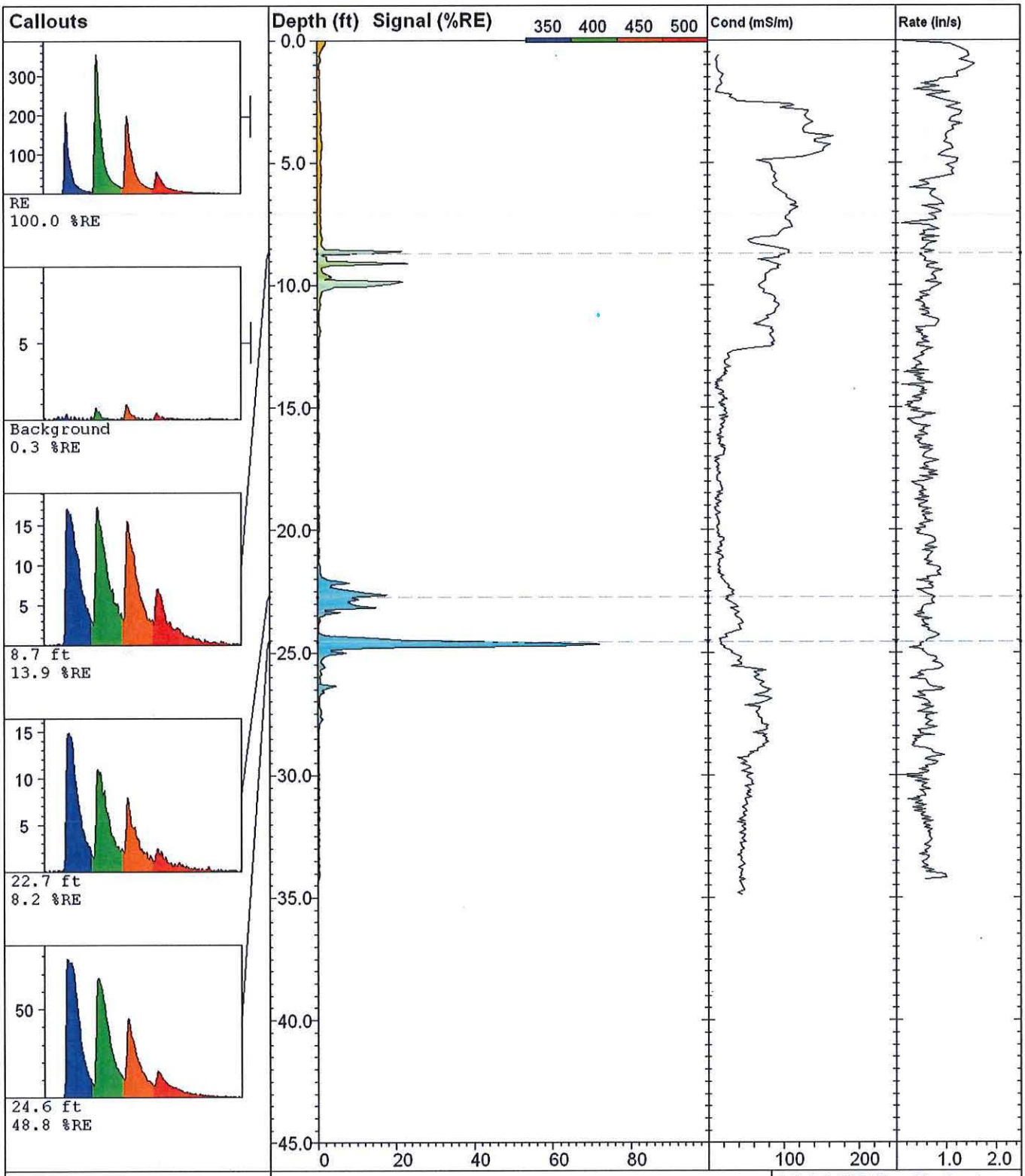
LIF-12

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.02 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.8 % @ 26.83 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 18:07 CDT**



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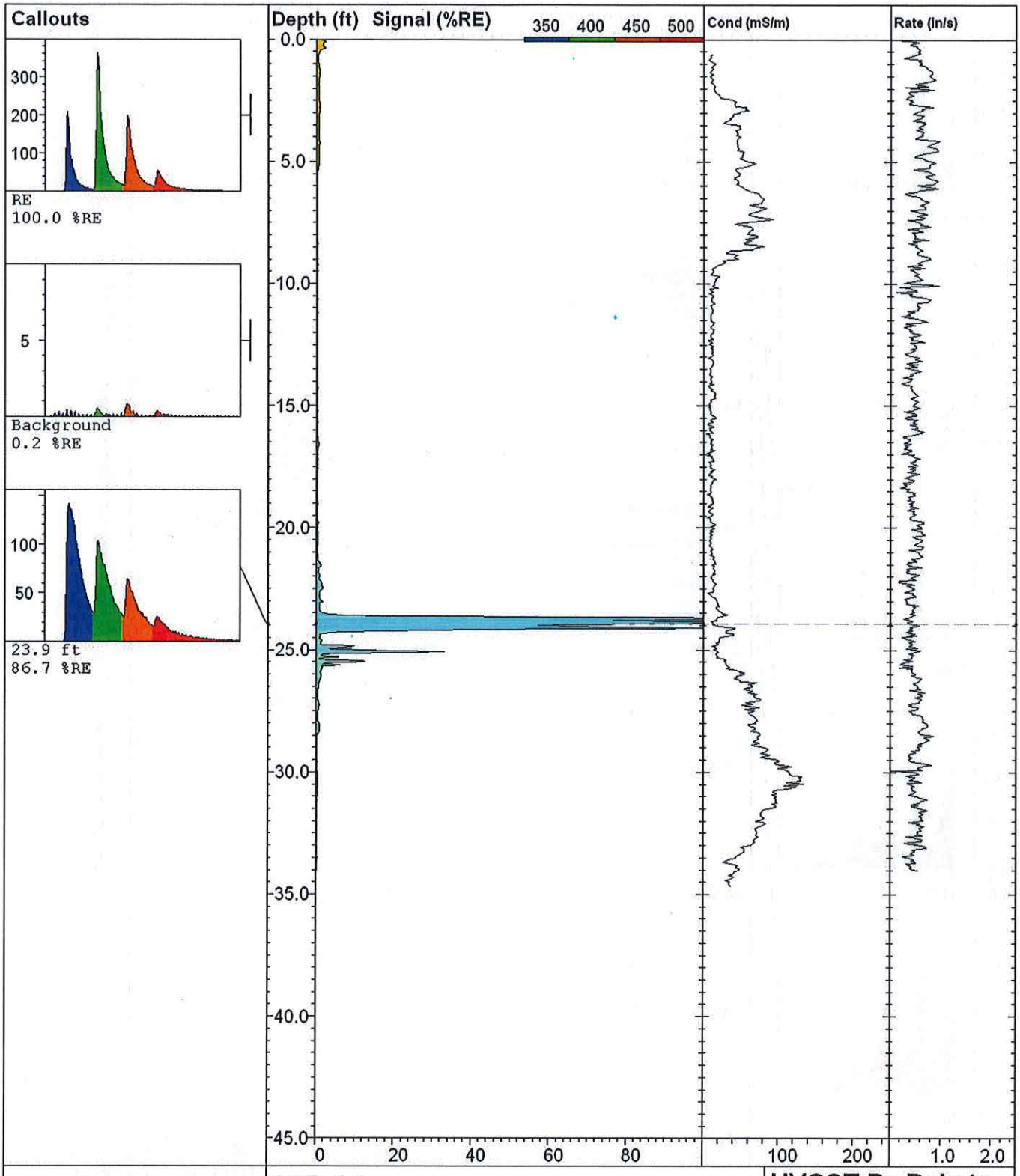
LIF-13

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.26 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **72.3 % @ 24.66 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 18:56 CDT**



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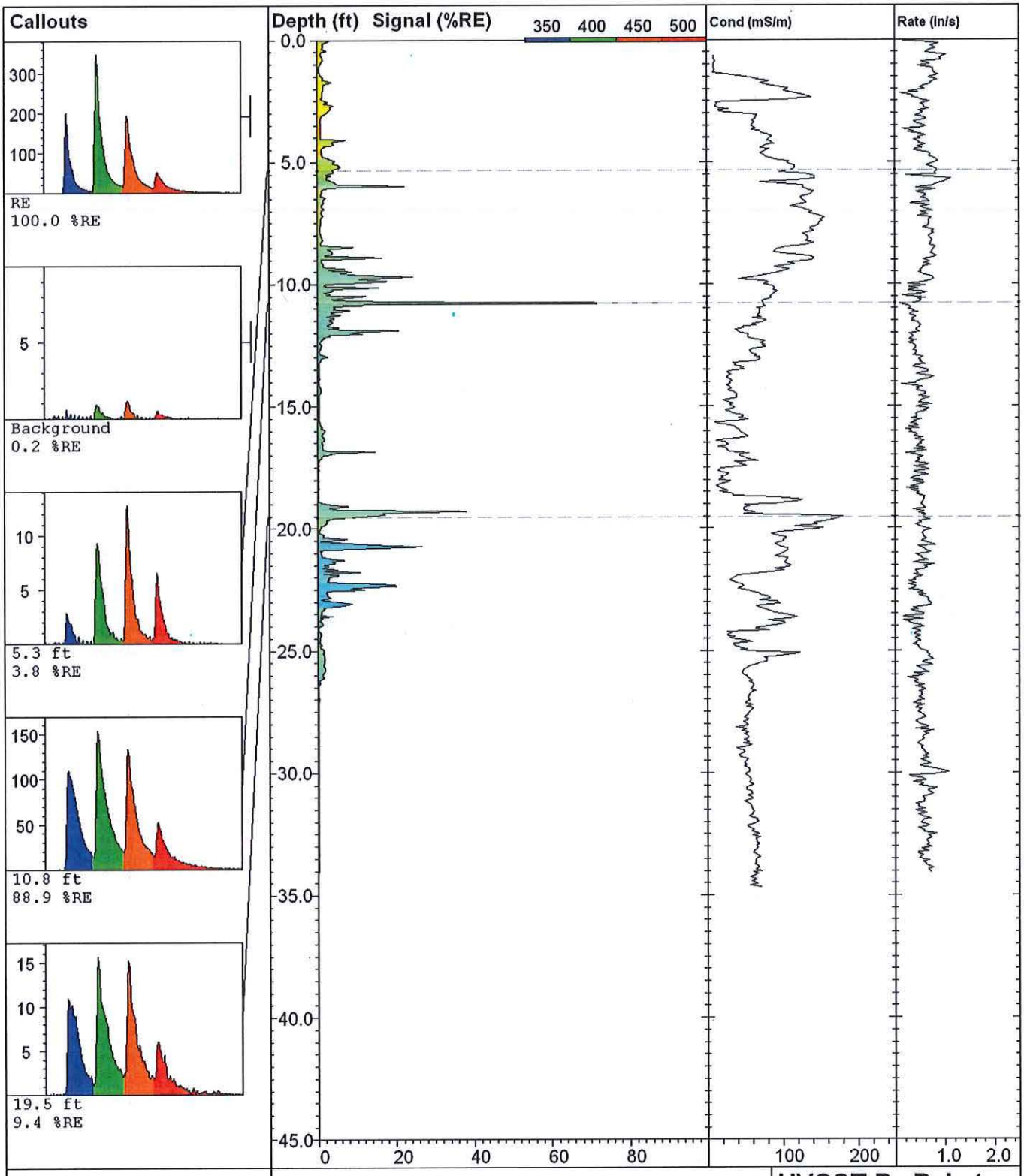
LIF-14

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **129.0 % @ 23.87 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 09:01 CDT**

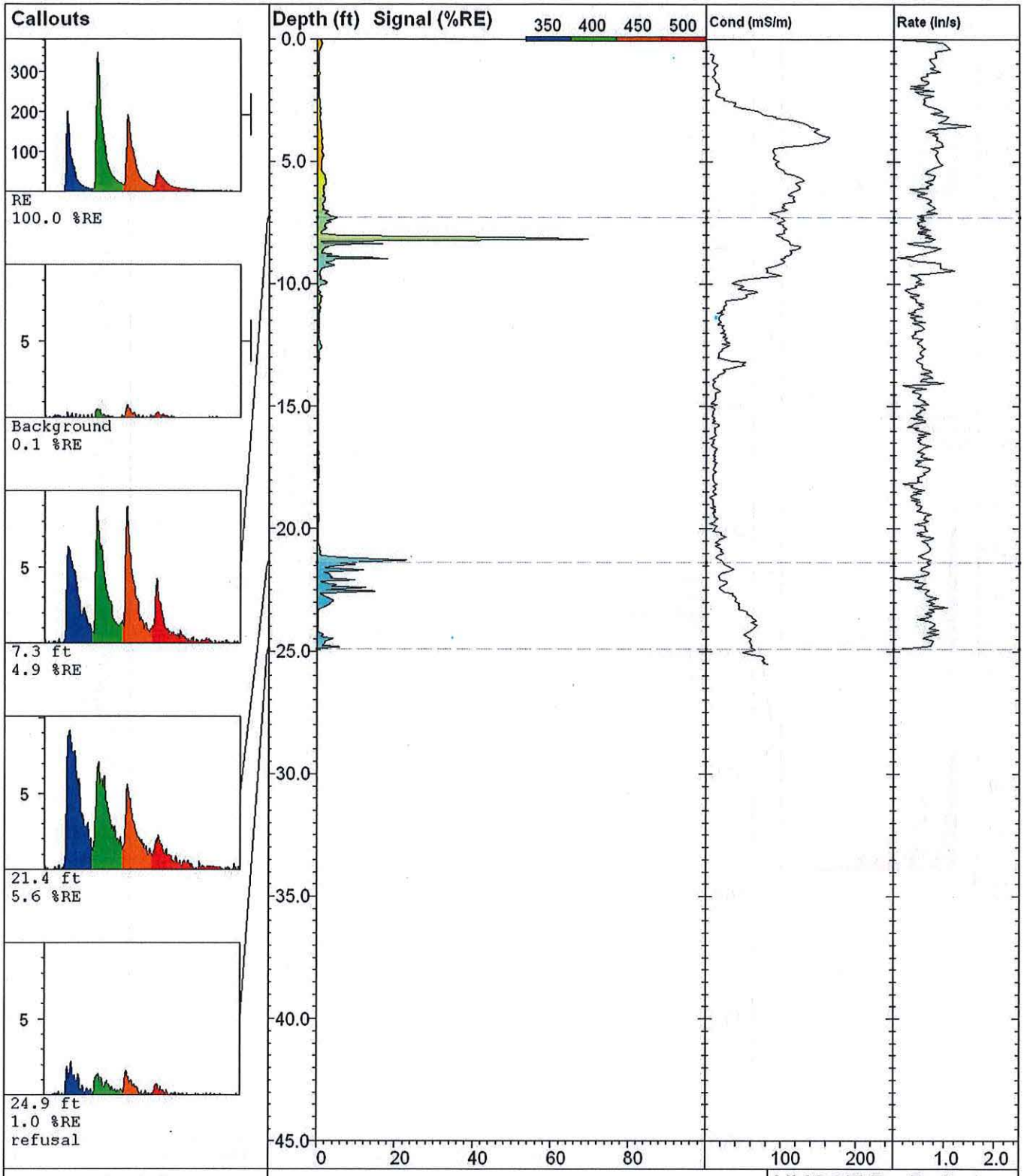


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-15

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **88.9 % @ 10.79 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 09:42 CDT**



MATRIX ENVIRONMENTAL LLC
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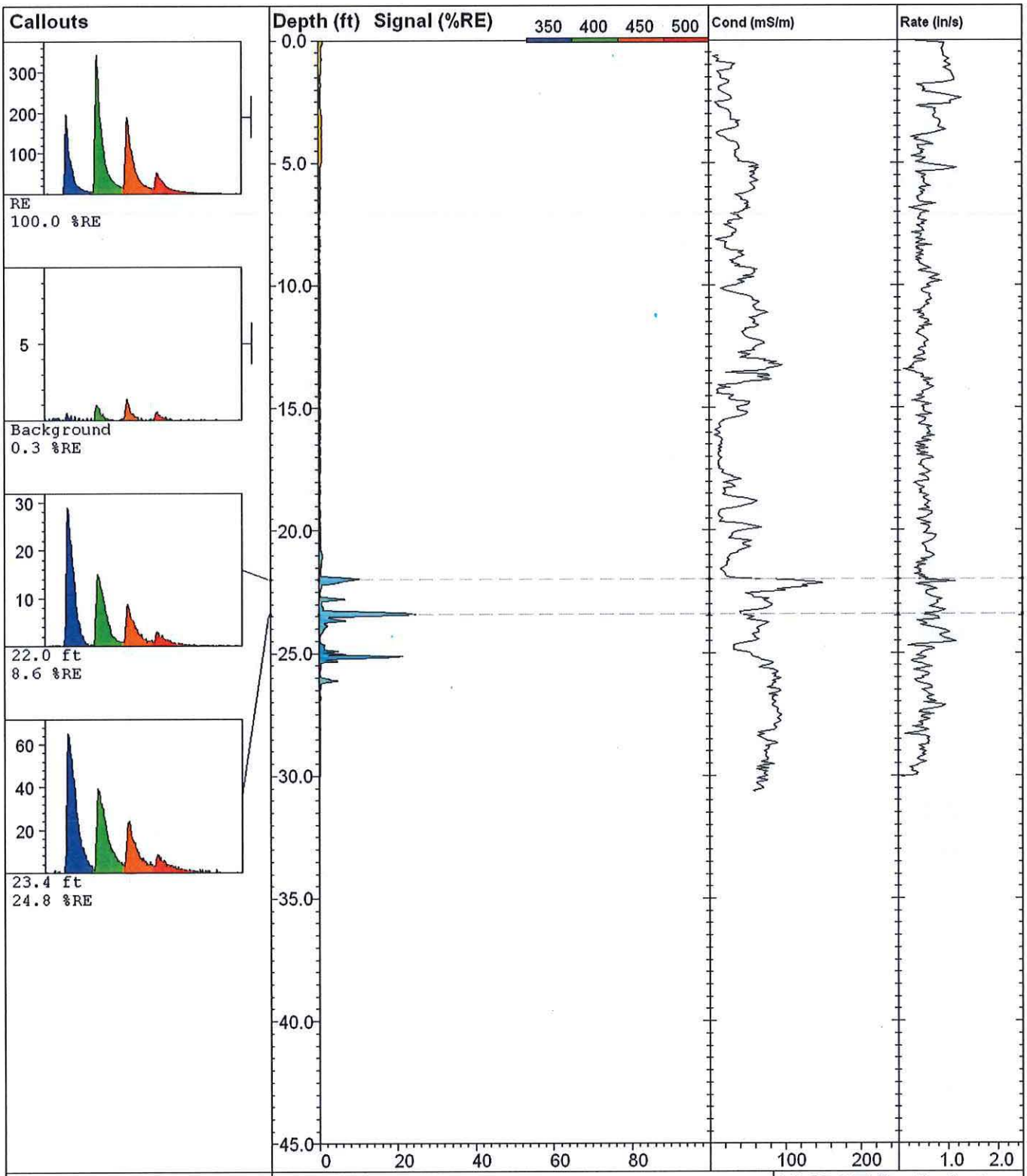
LIF-16

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **24.93 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **70.1 % @ 8.18 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 10:16 CDT**



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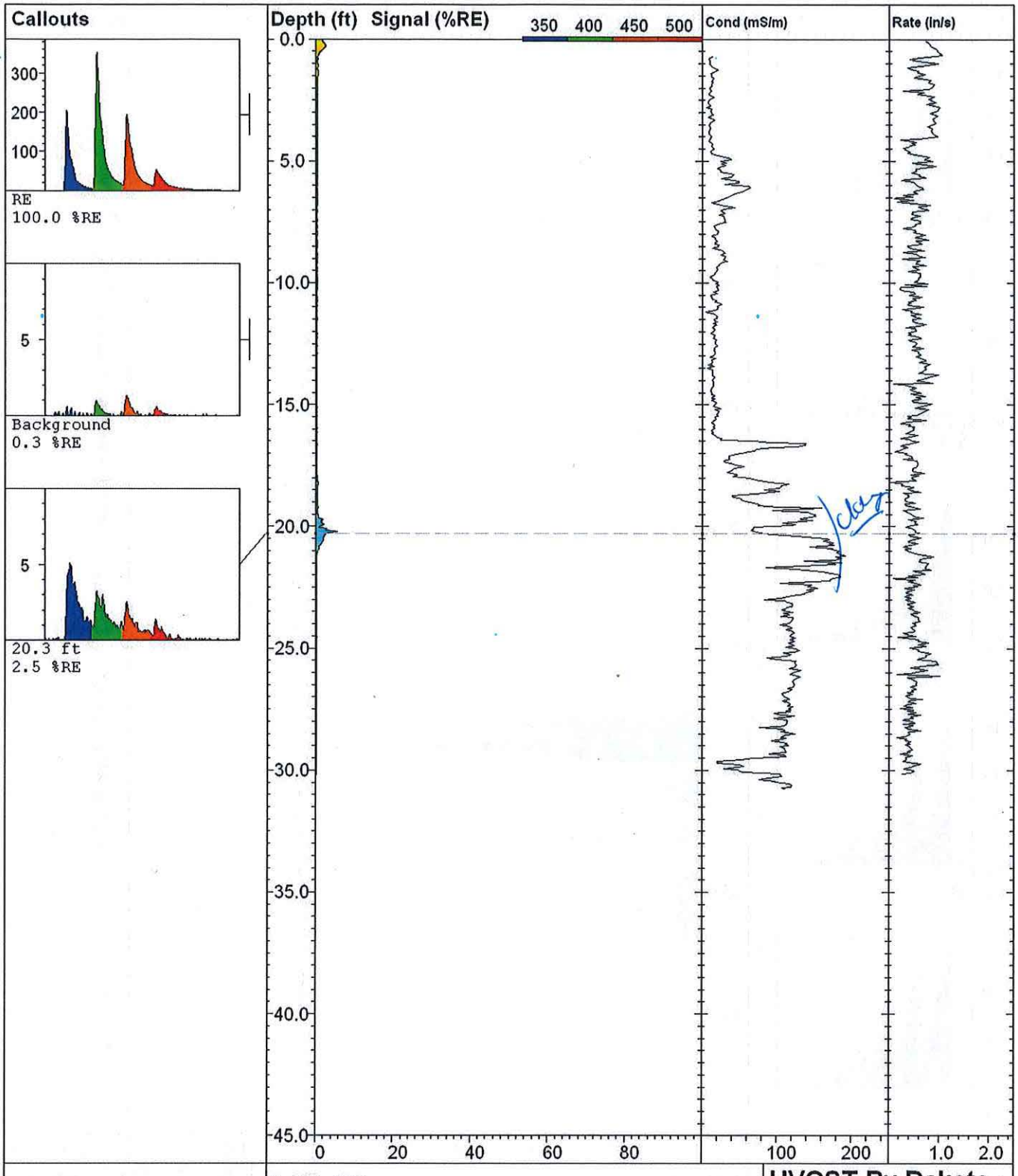
LIF-17

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **30.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **24.8 % @ 23.42 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 11:12 CDT**



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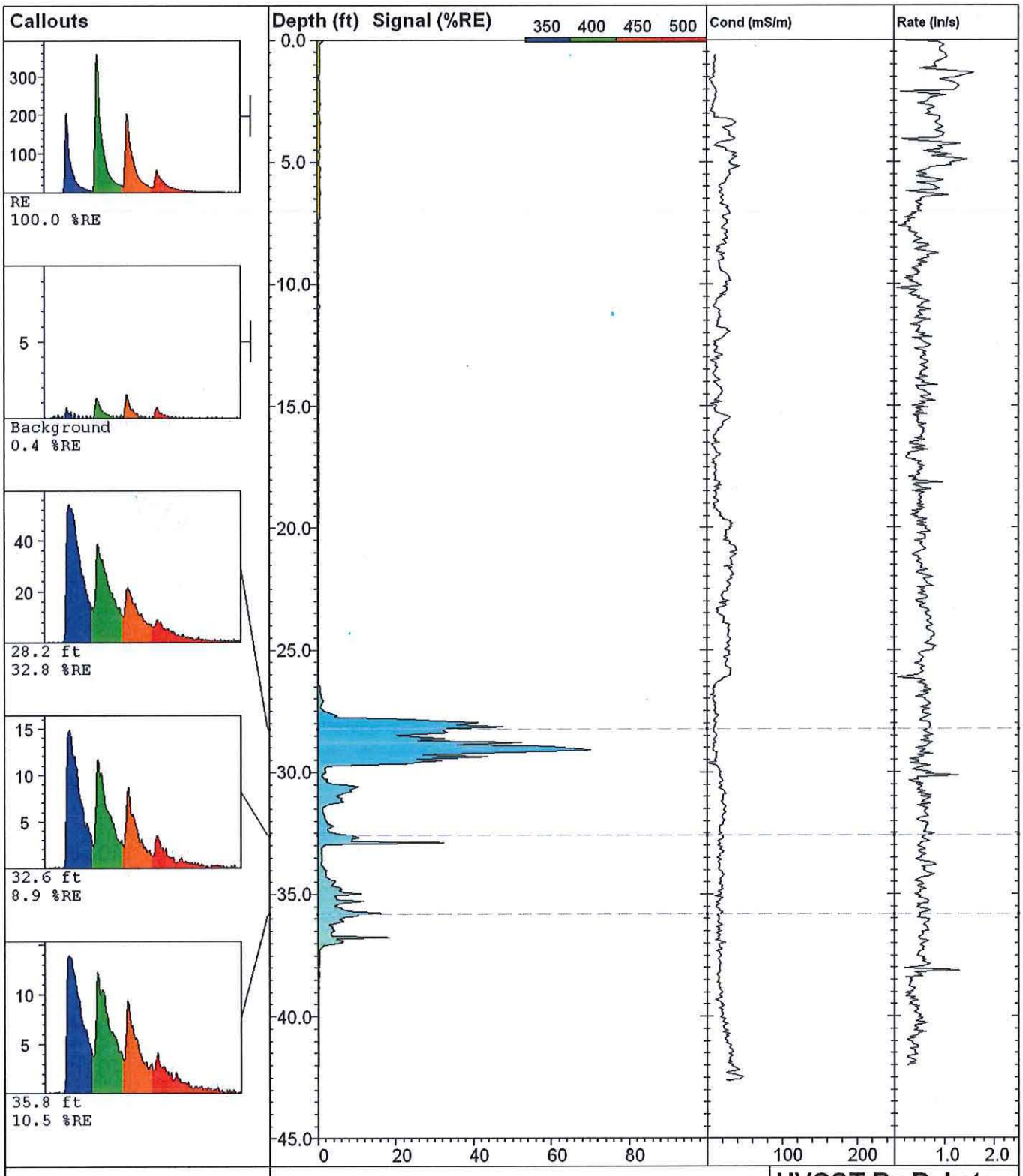
LIF-18

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **30.17 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.6 % @ 20.22 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 11:42 CDT**



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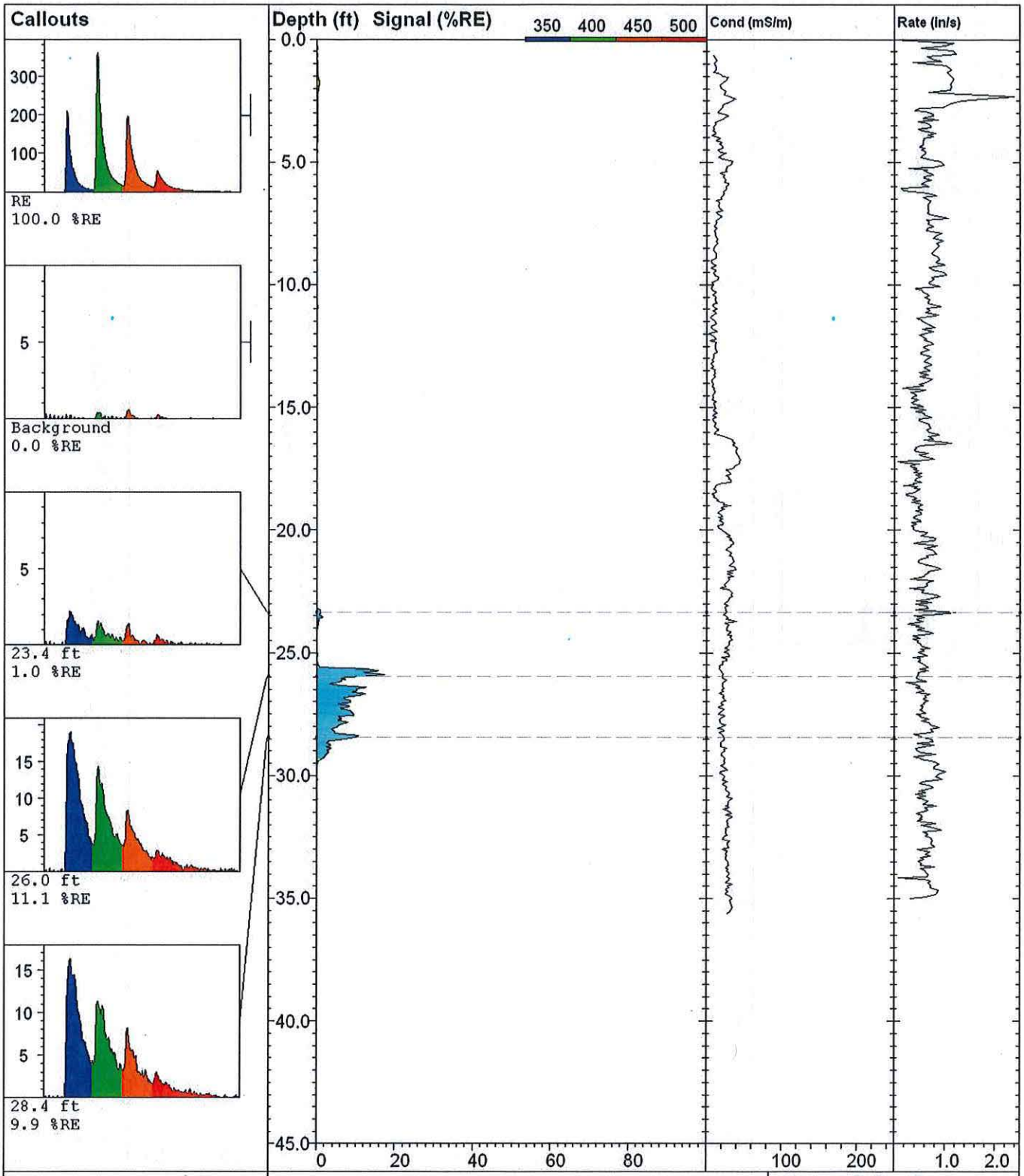
www.matrixenv.com

LIF-19

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **42.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **70.3 % @ 29.10 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 12:57 CDT**

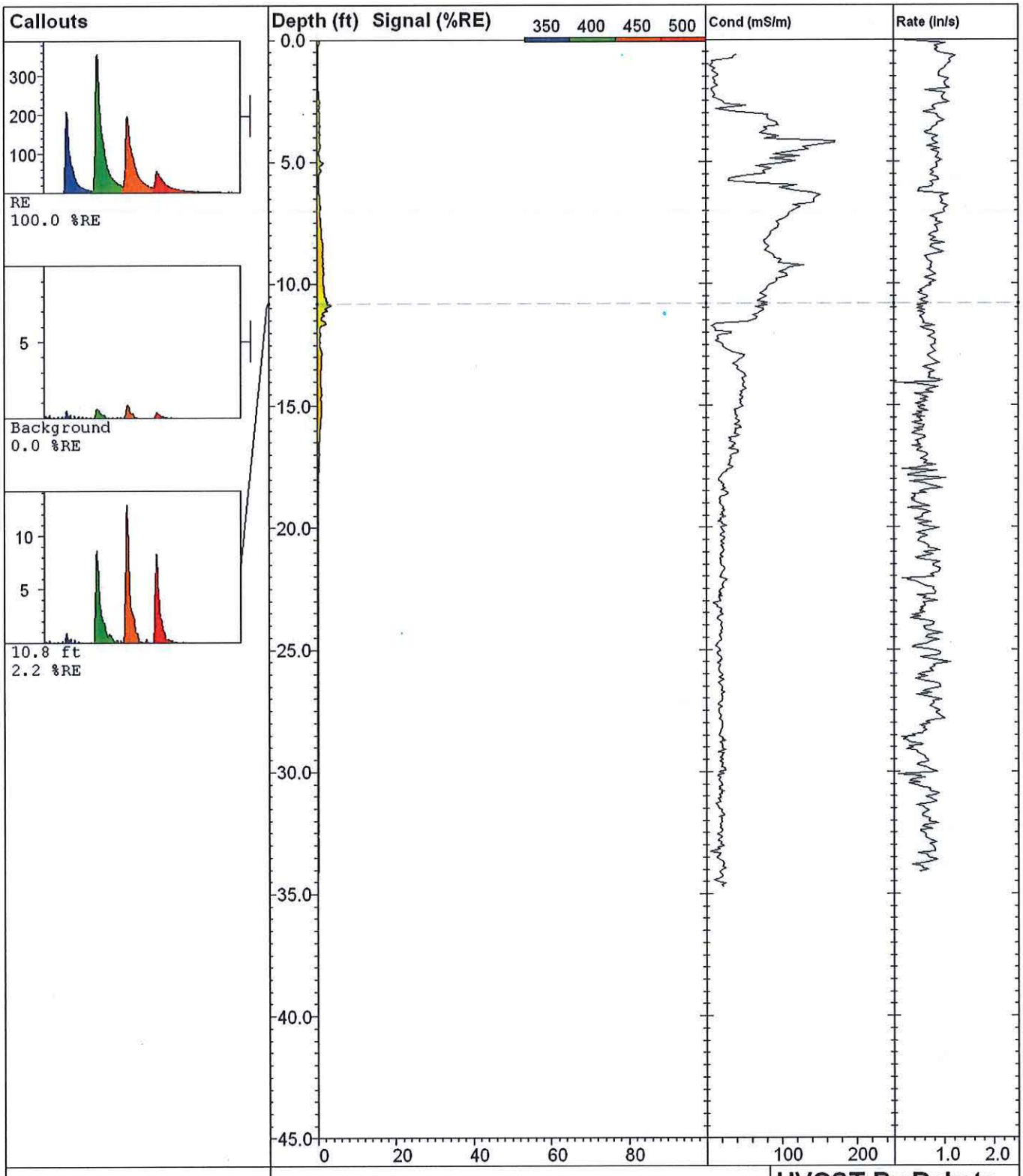


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-20

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **35.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **17.3 % @ 25.89 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 14:14 CDT**

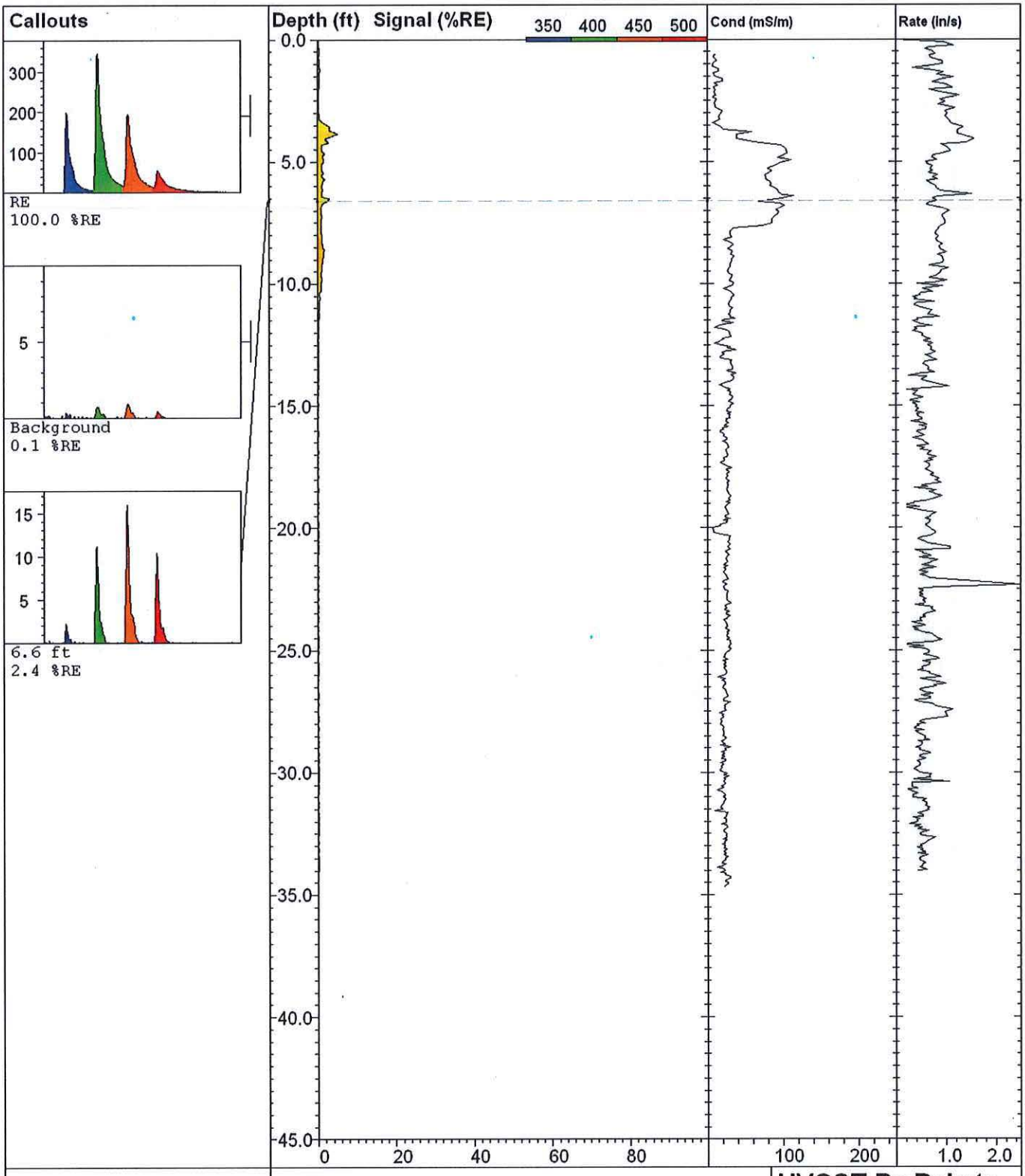


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-21

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.07 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.7 % @ 10.88 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 14:43 CDT**



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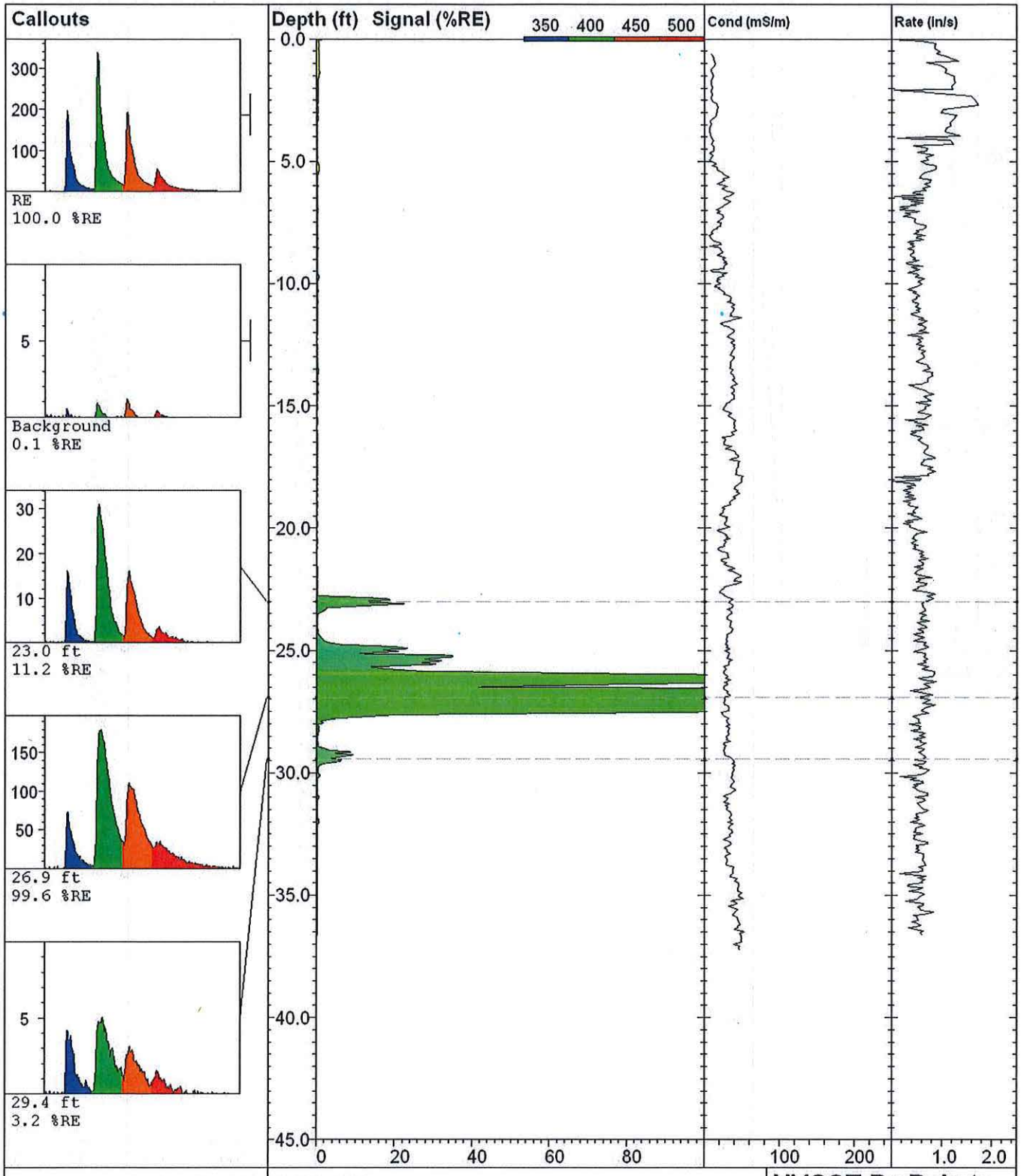
www.matrixenv.com

LIF-22

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.1 % @ 3.86 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 15:13 CDT**



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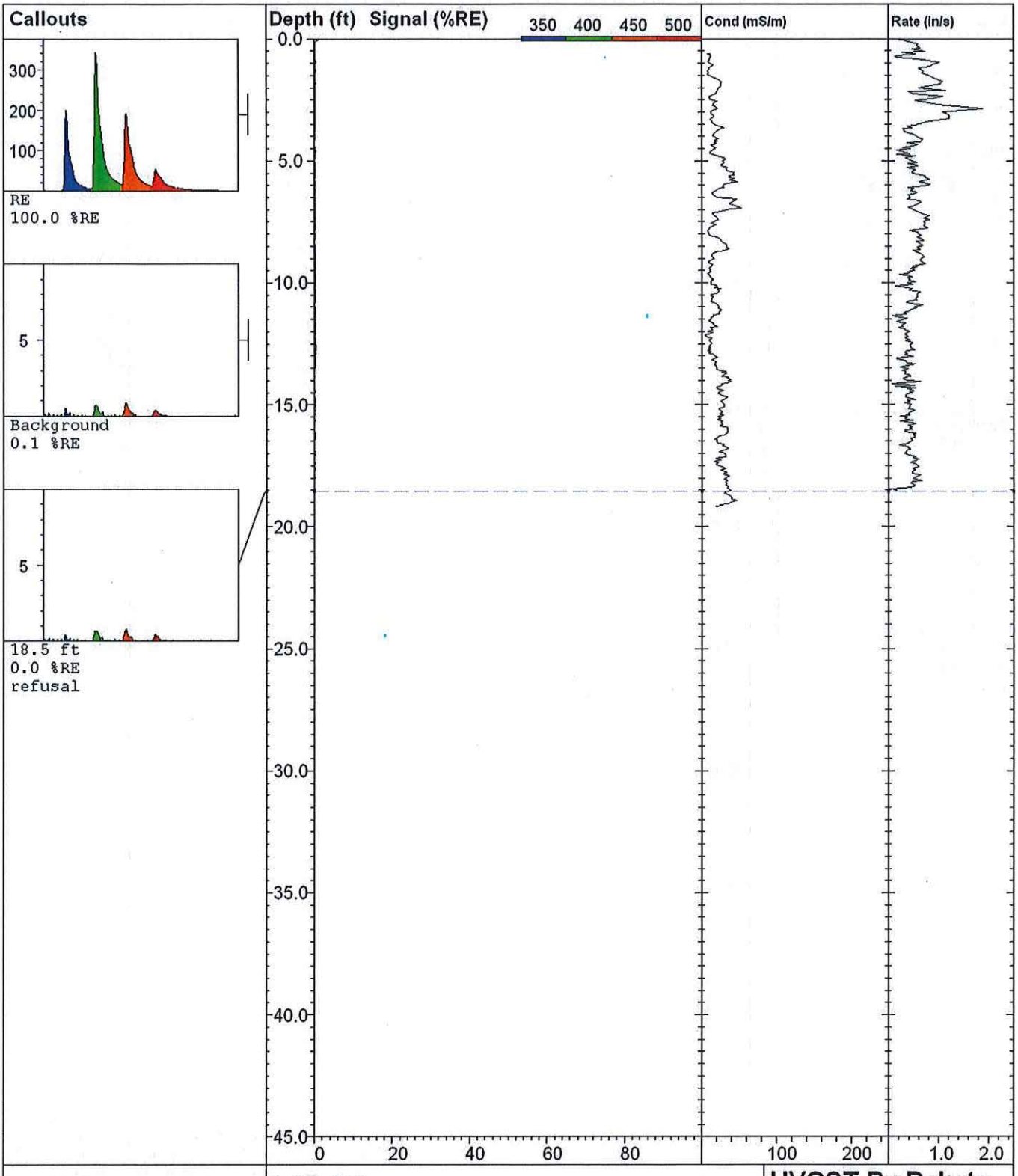
LIF-23

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.62 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **265.5 % @ 27.15 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 15:43 CDT**



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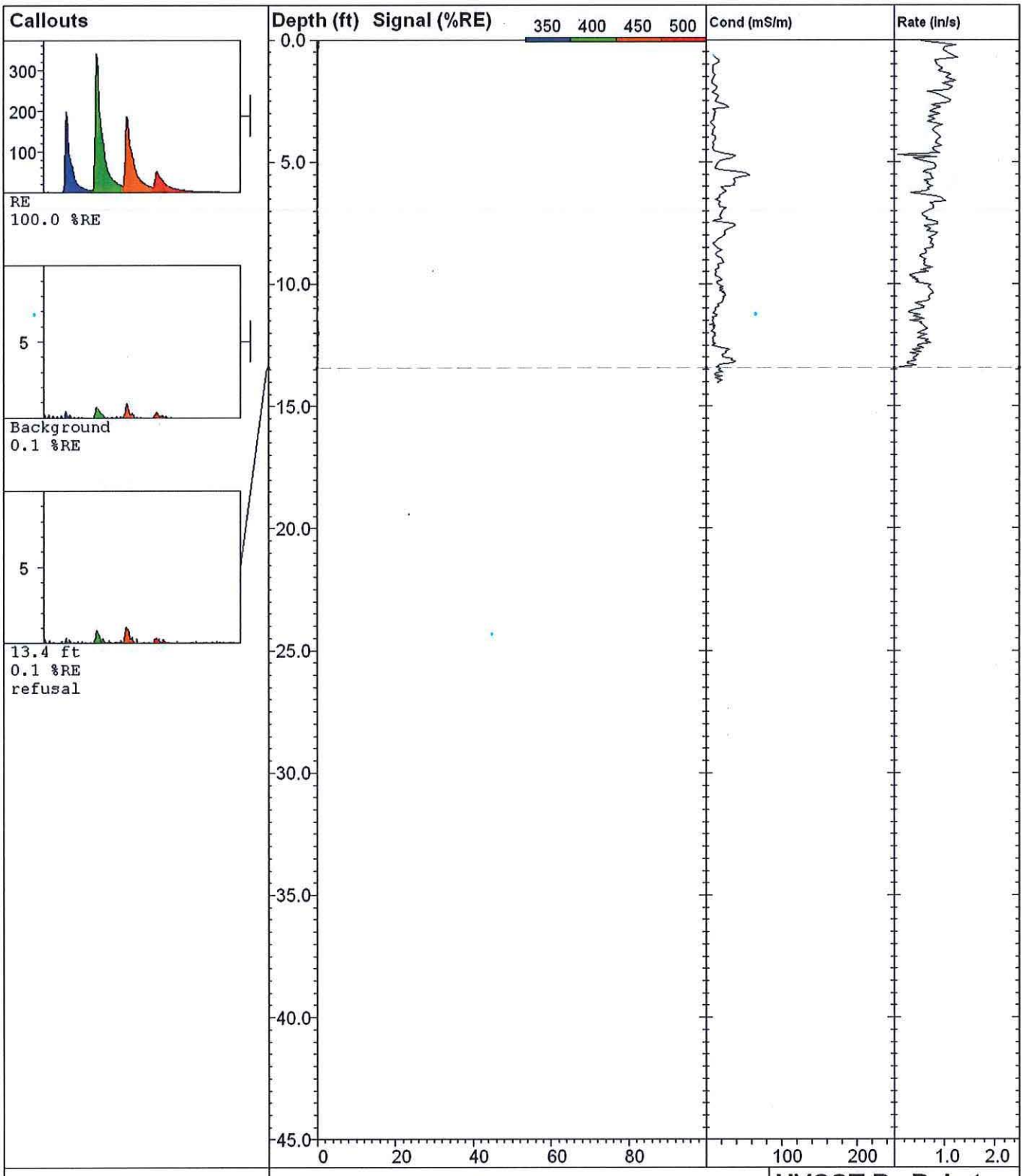
LIF-24

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.54 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.0 % @ 0.00 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 16:21 CDT**



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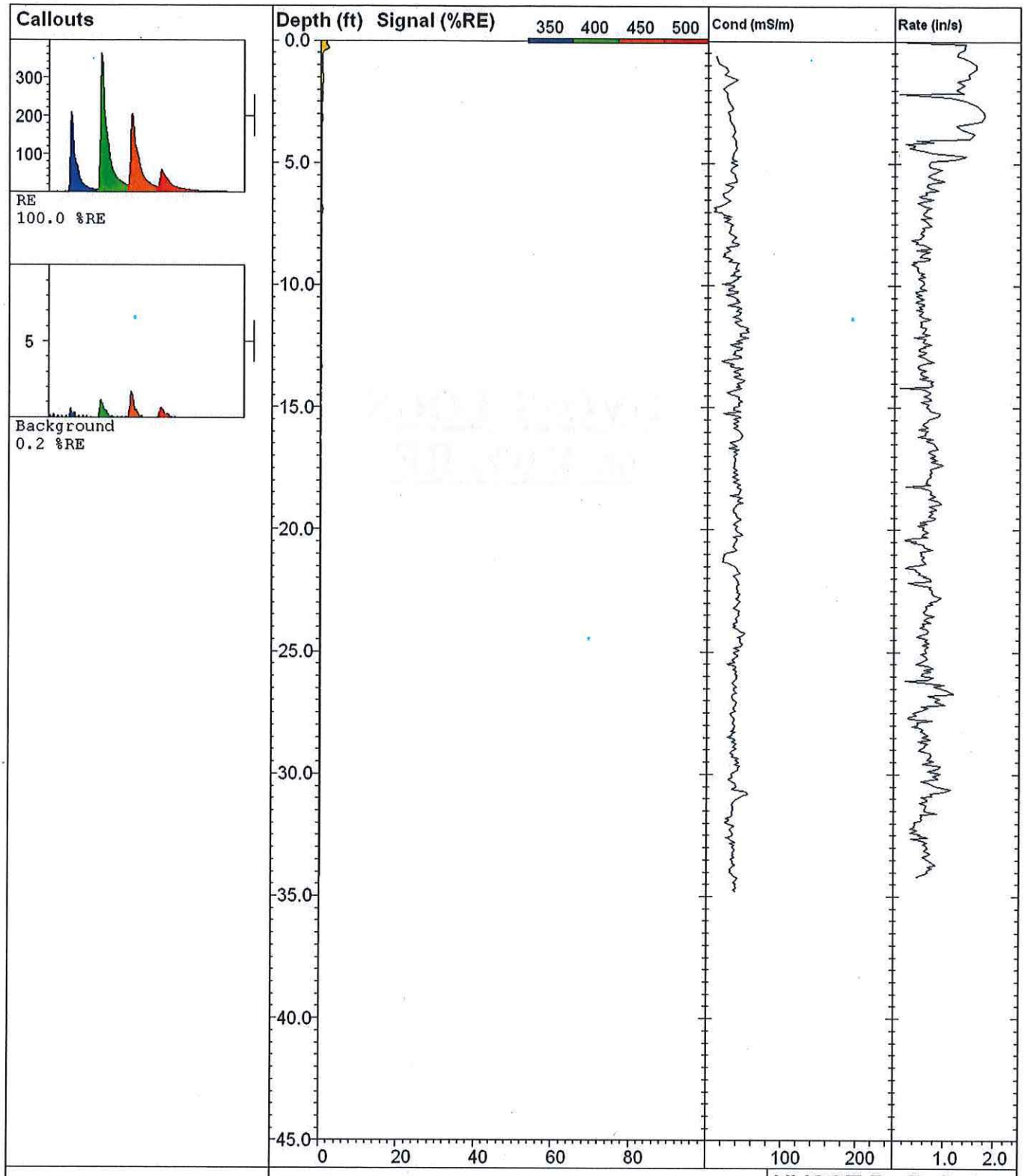
LIF-25

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **13.43 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **0.5 % @ 0.06 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 16:45 CDT**



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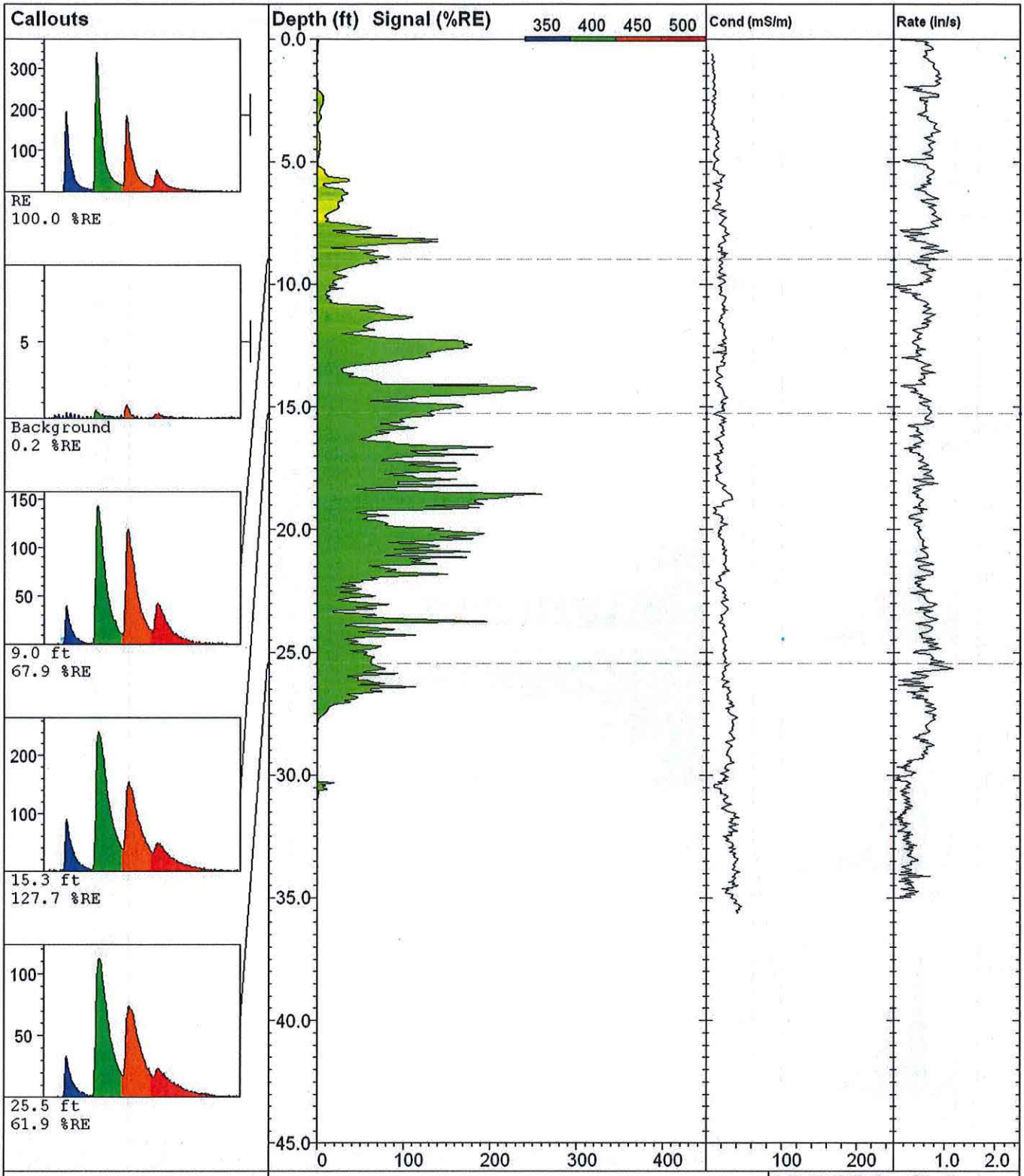
LIF-26

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.18 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.2 % @ 0.31 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 17:12 CDT**

UVOST LOGS
@ 450% RE



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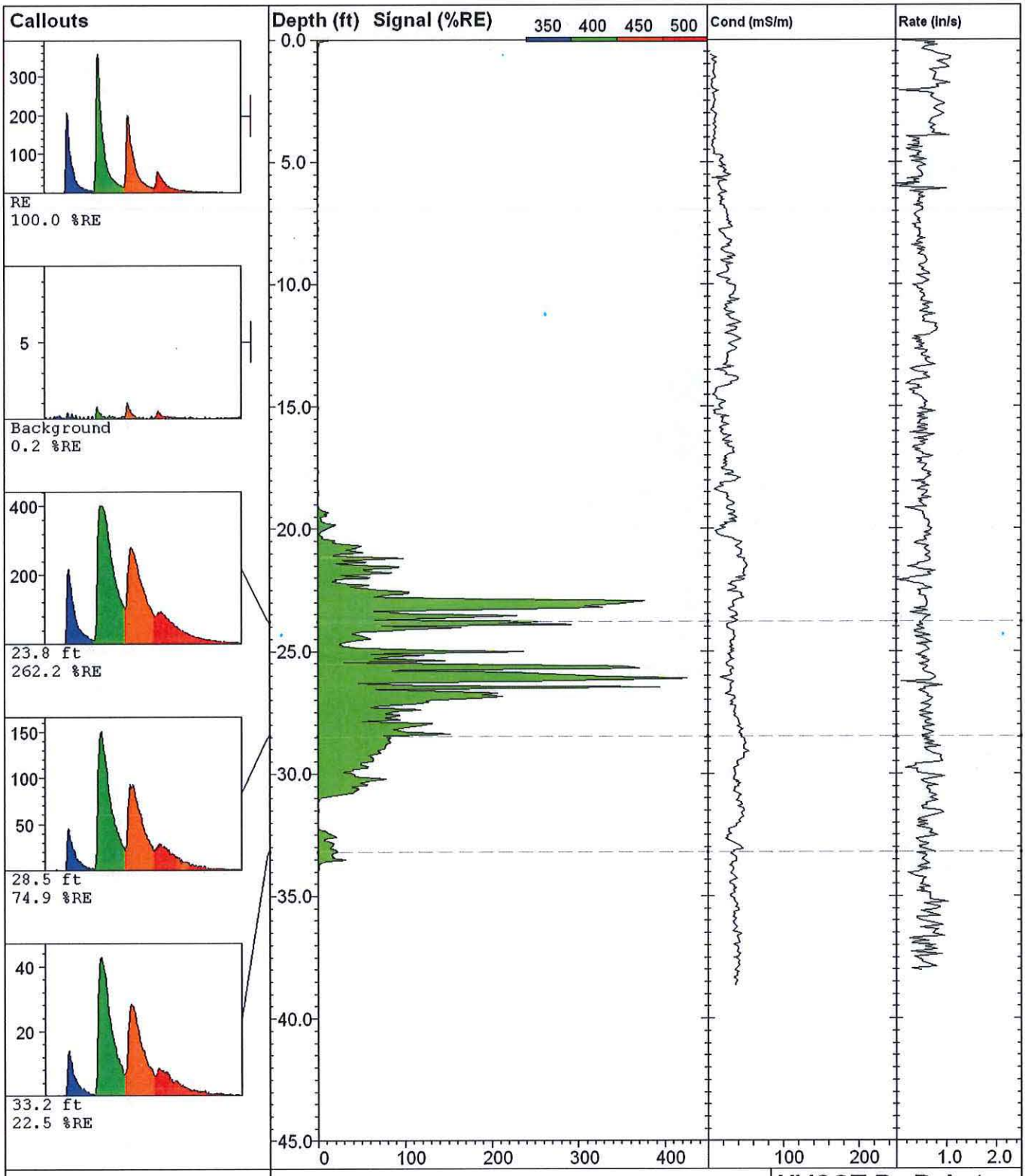
LIF-01

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **35.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **262.6 % @ 18.55 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:01 CDT**



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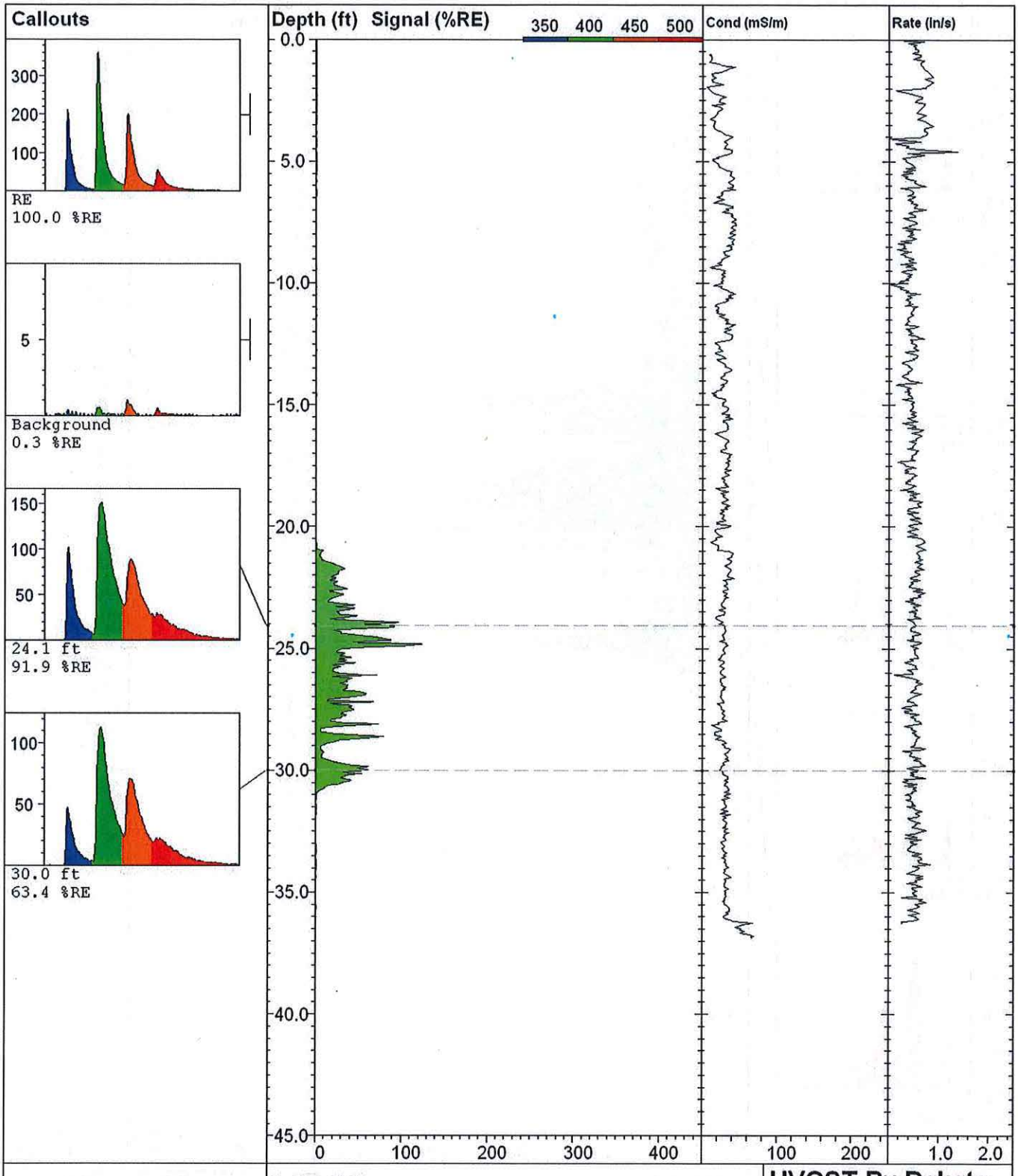
LIF-02

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **38.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **428.4 % @ 26.11 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:48 CDT**



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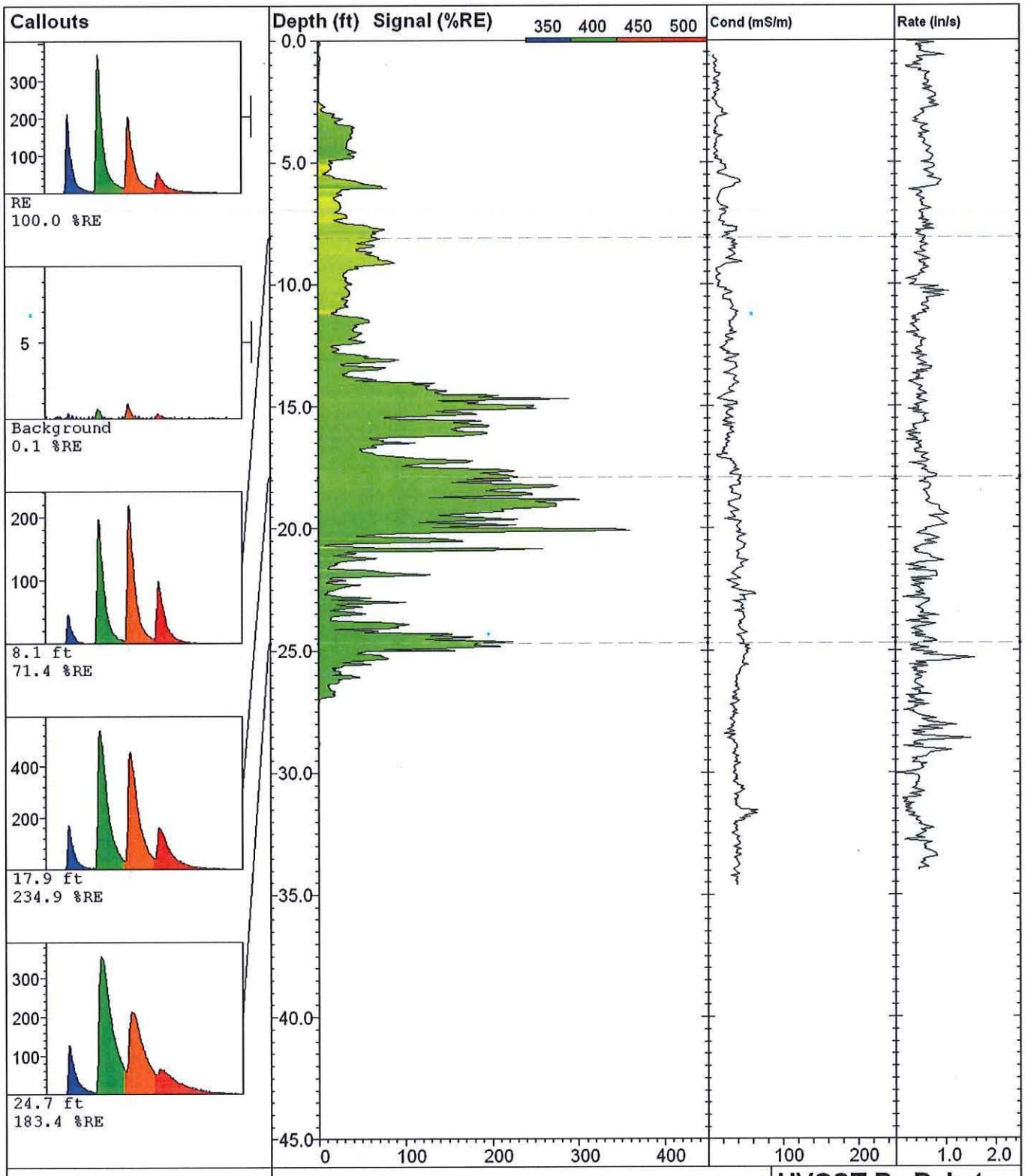
LIF-03

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.25 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **125.1 % @ 24.82 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 11:32 CDT**



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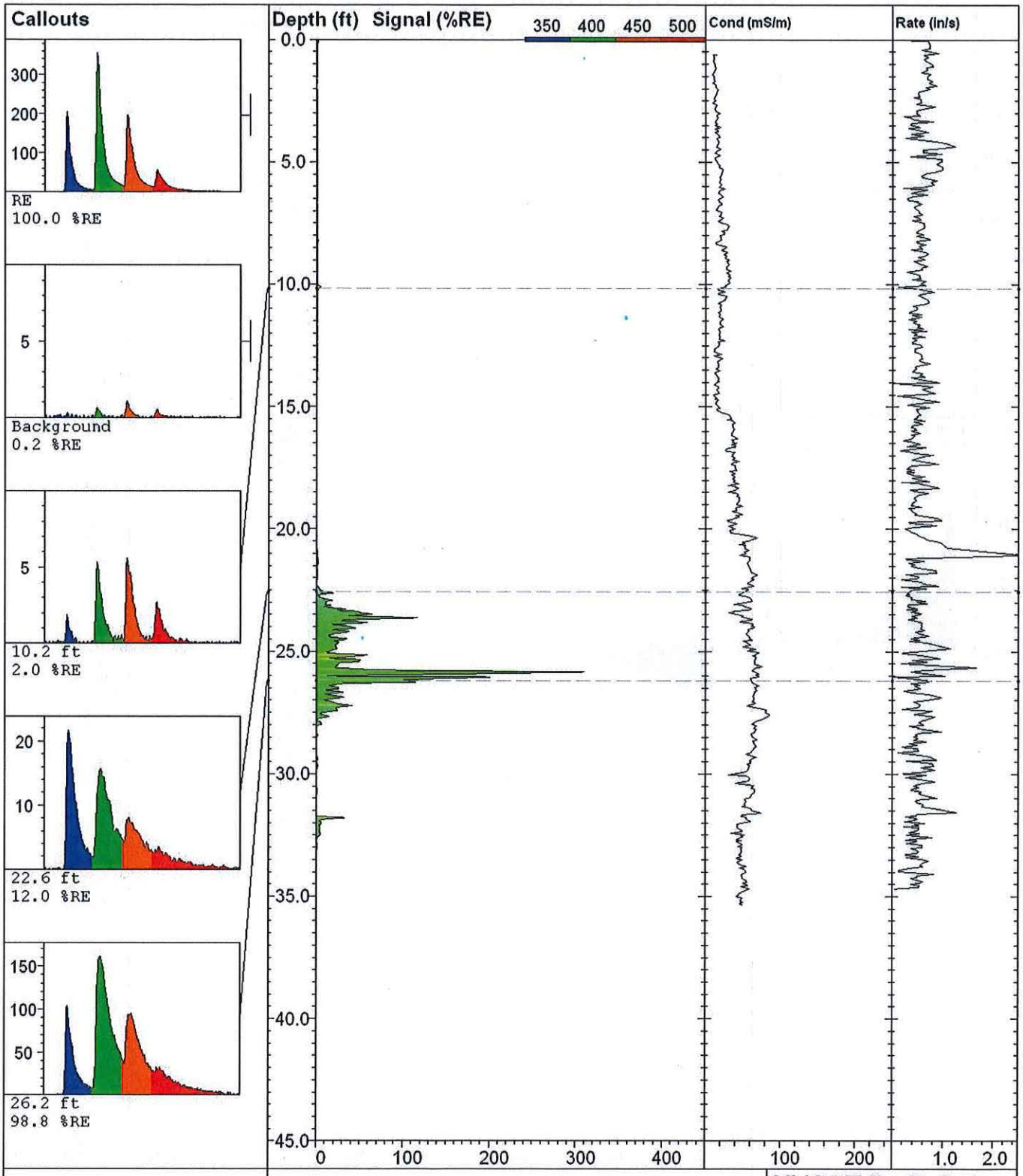
LIF-05

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **360.4 % @ 20.09 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 13:28 CDT**



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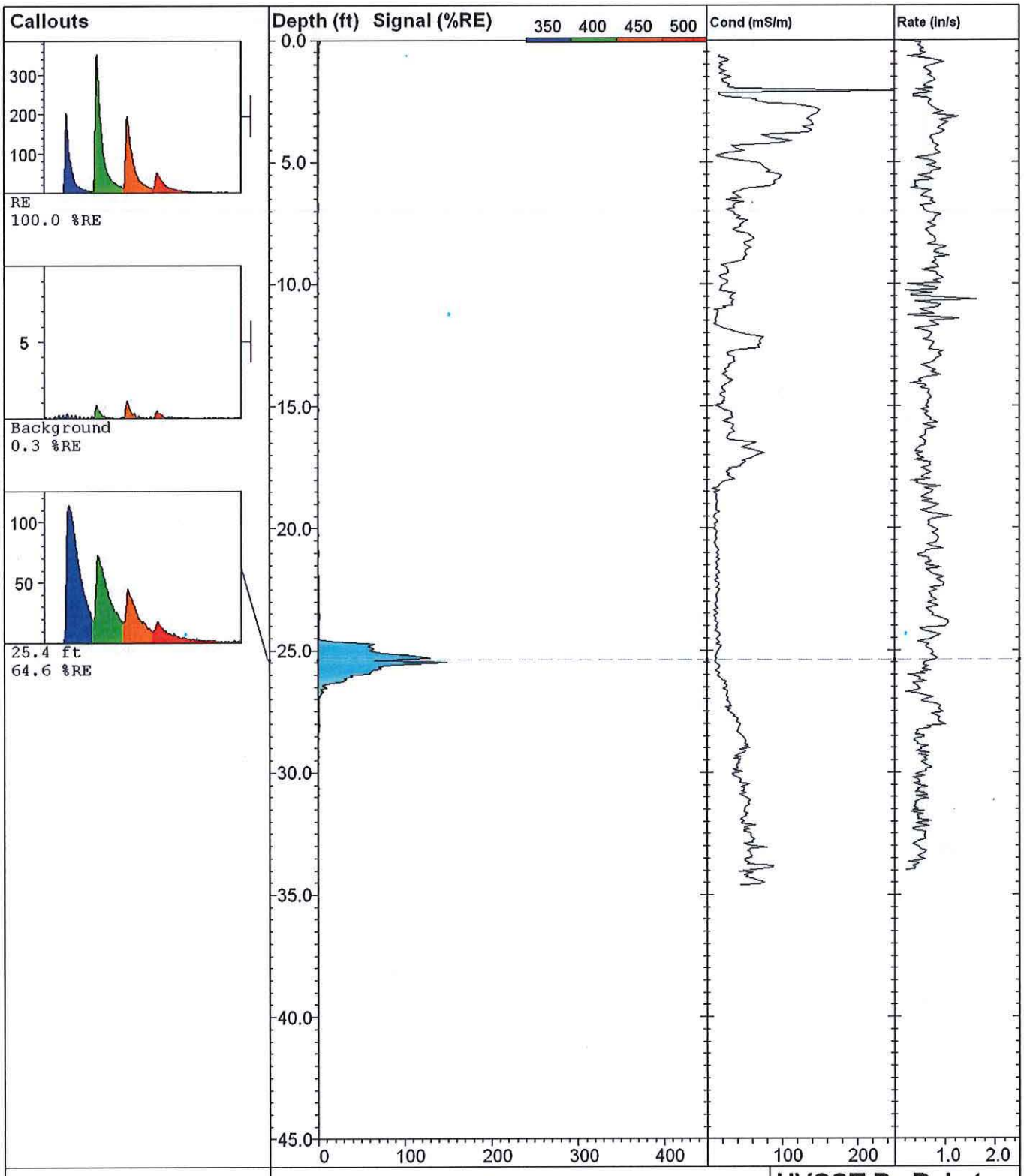
LIF-06

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.72 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **313.8 % @ 25.84 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 14:10 CDT**



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LIF-09

UVOST By Dakota
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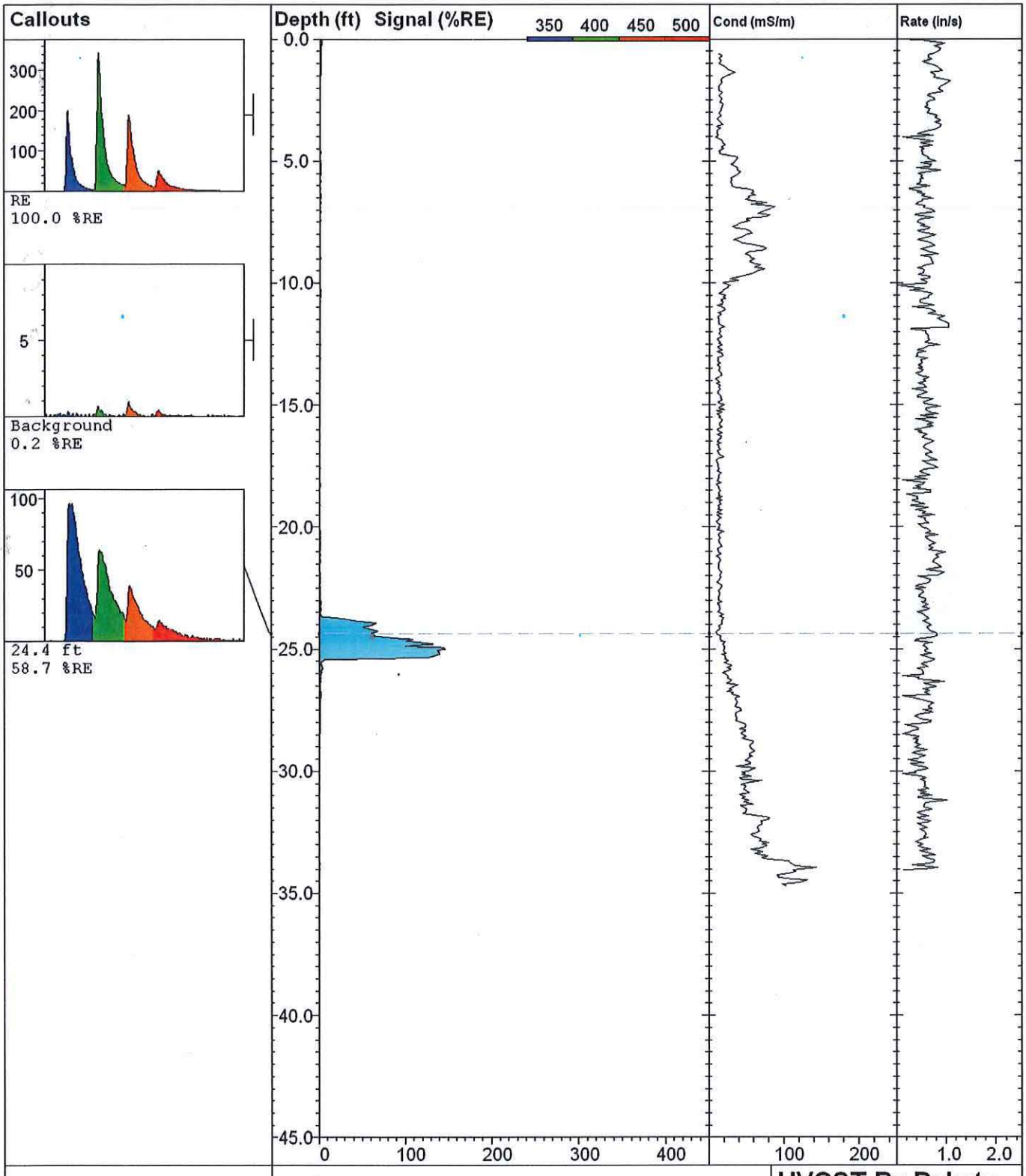
Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **150.2 % @ 25.48 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 16:35 CDT**

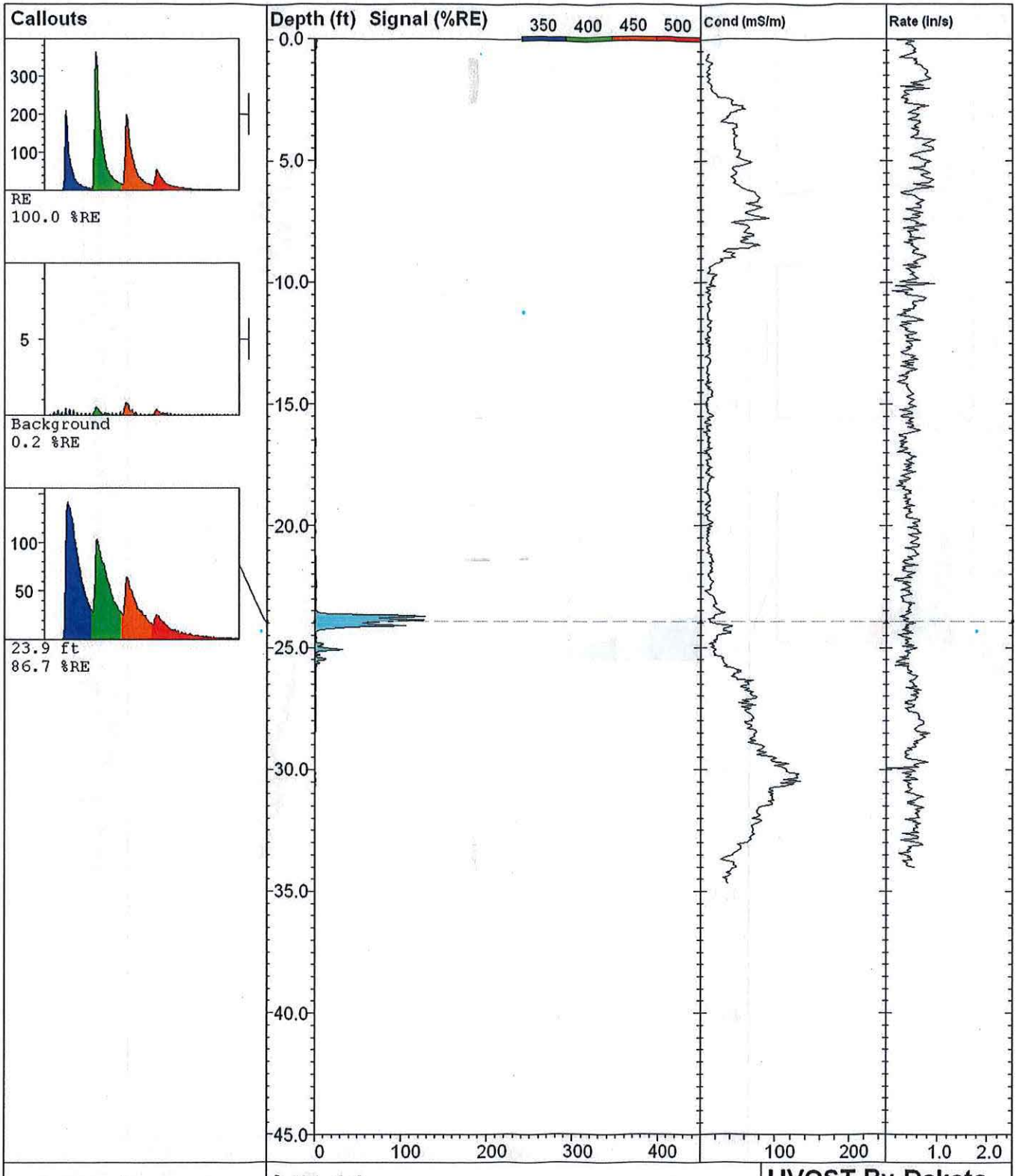


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-11

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.06 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **147.0 % @ 25.00 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 17:37 CDT**

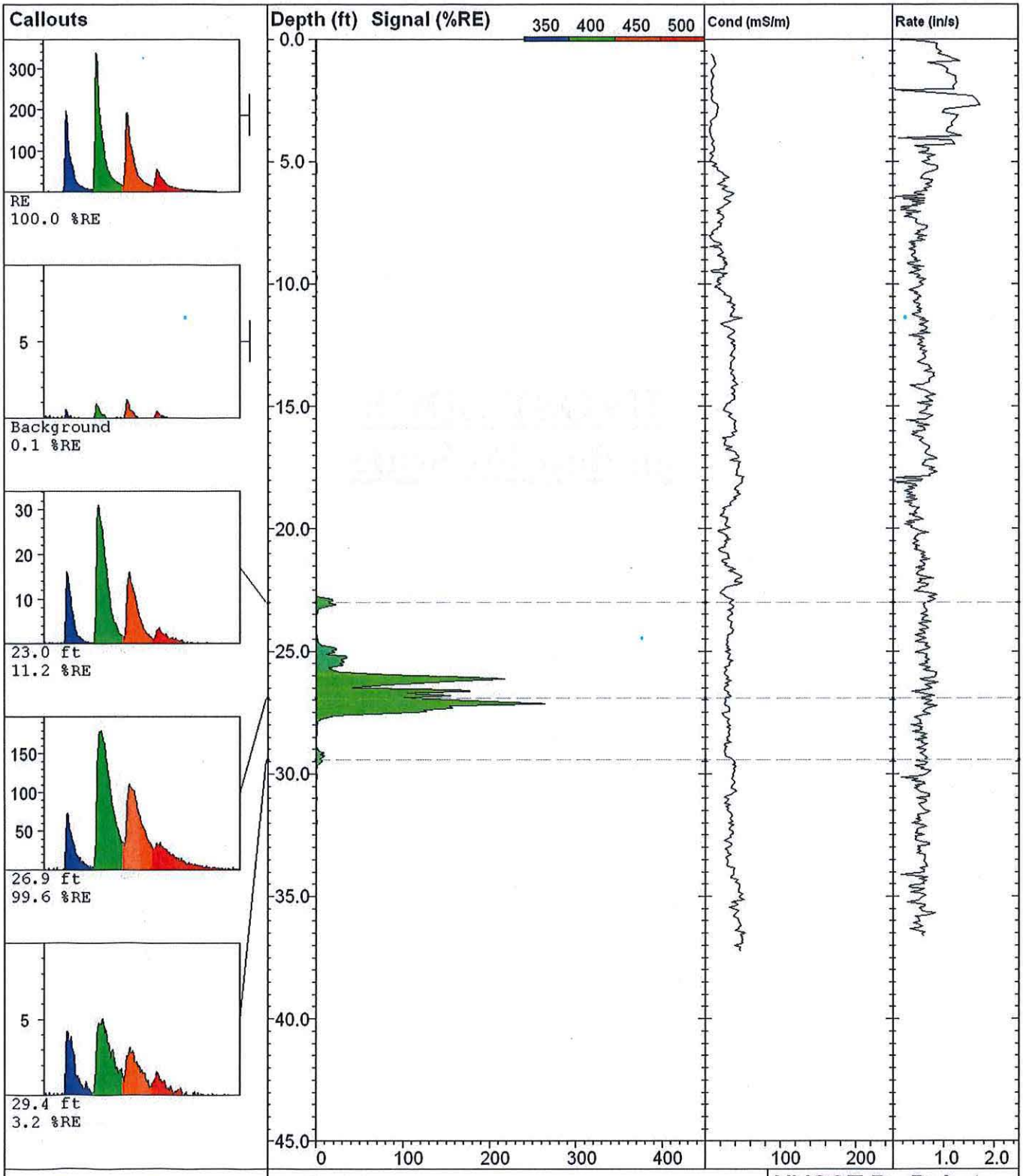


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-14

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **129.0 % @ 23.87 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 09:01 CDT**



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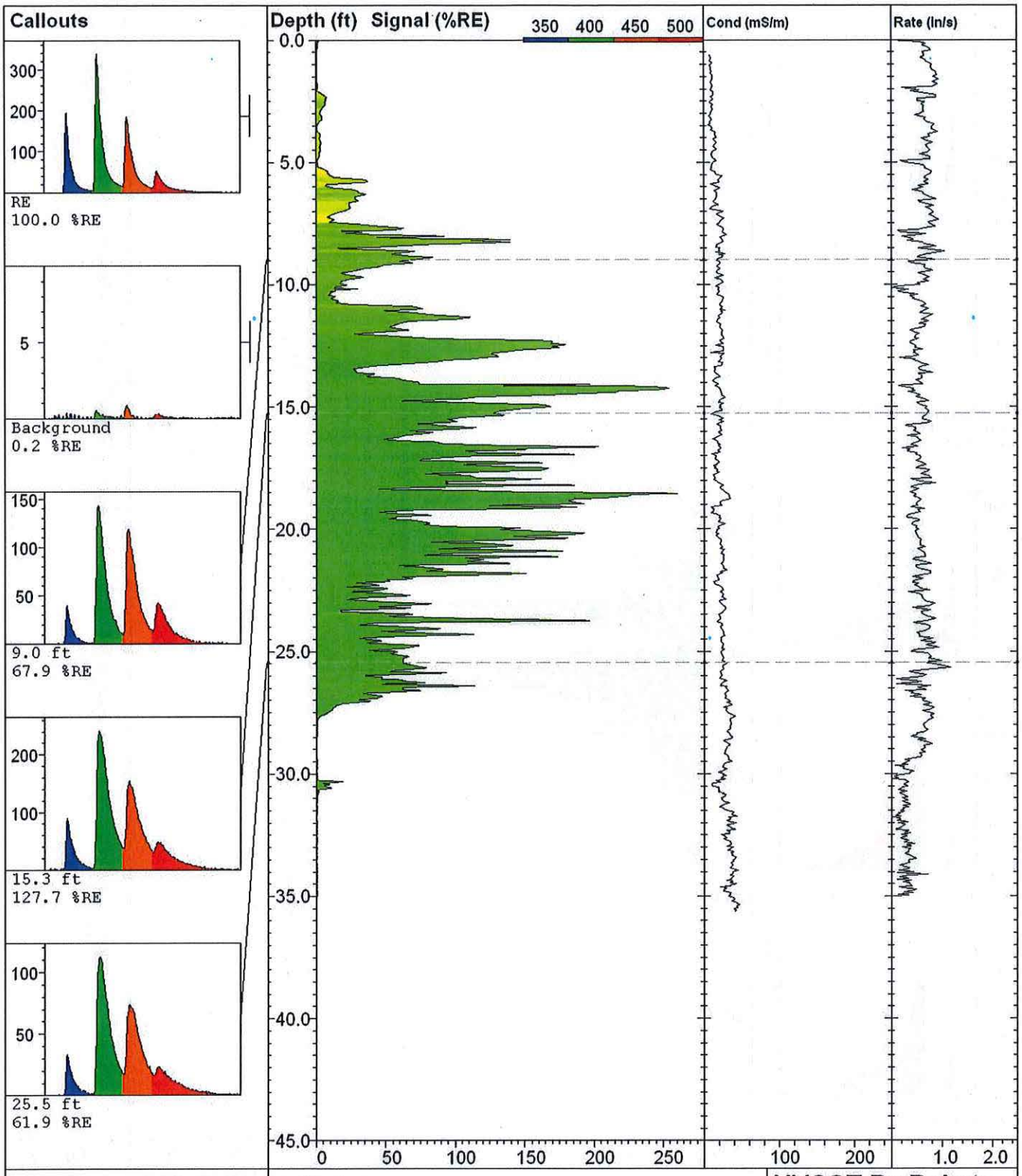
LIF-23

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.62 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **265.5 % @ 27.15 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 15:43 CDT**

UVOST LOGS
@ Best Fit Scale

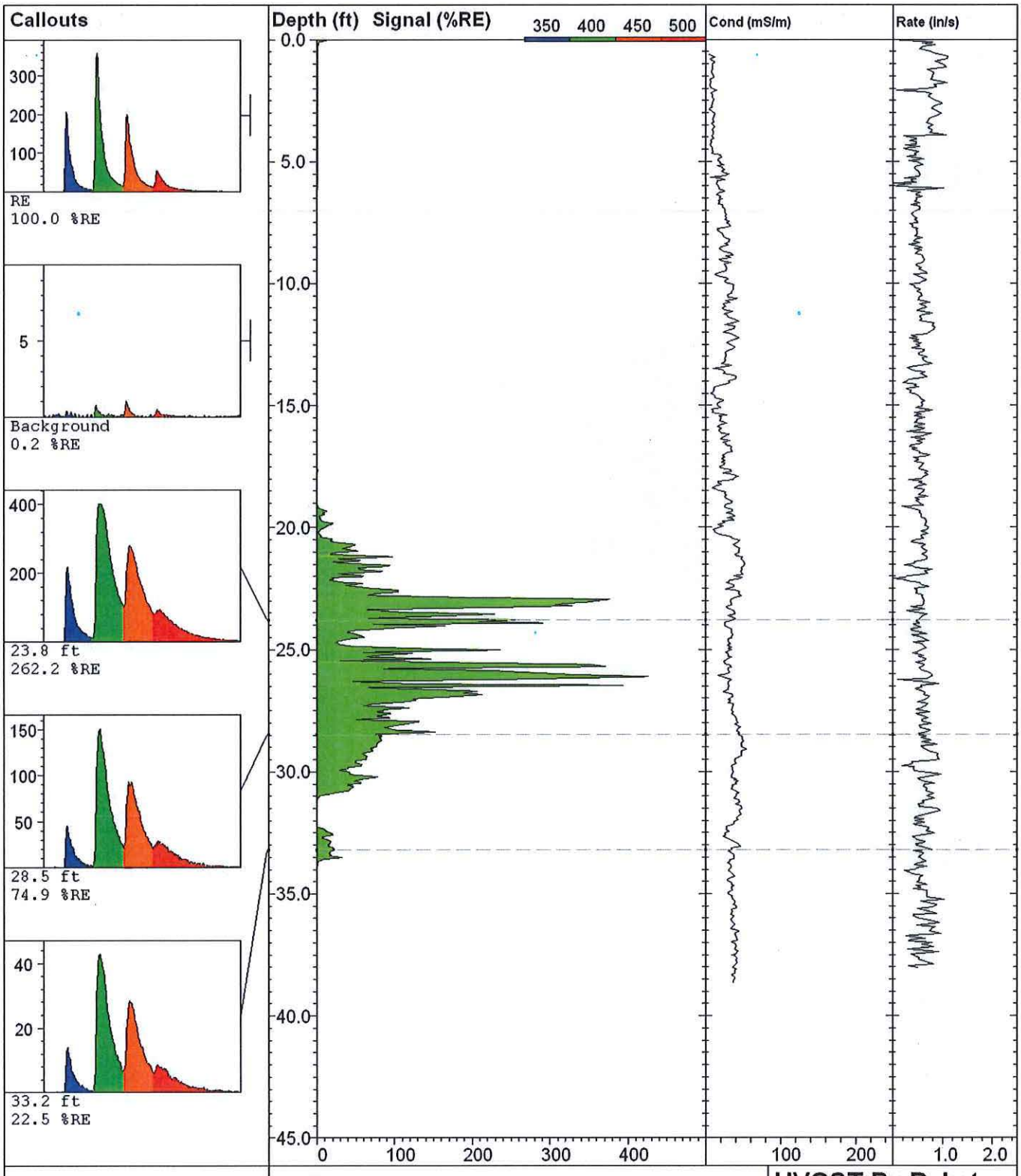


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-01

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **35.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **262.6 % @ 18.55 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:01 CDT**

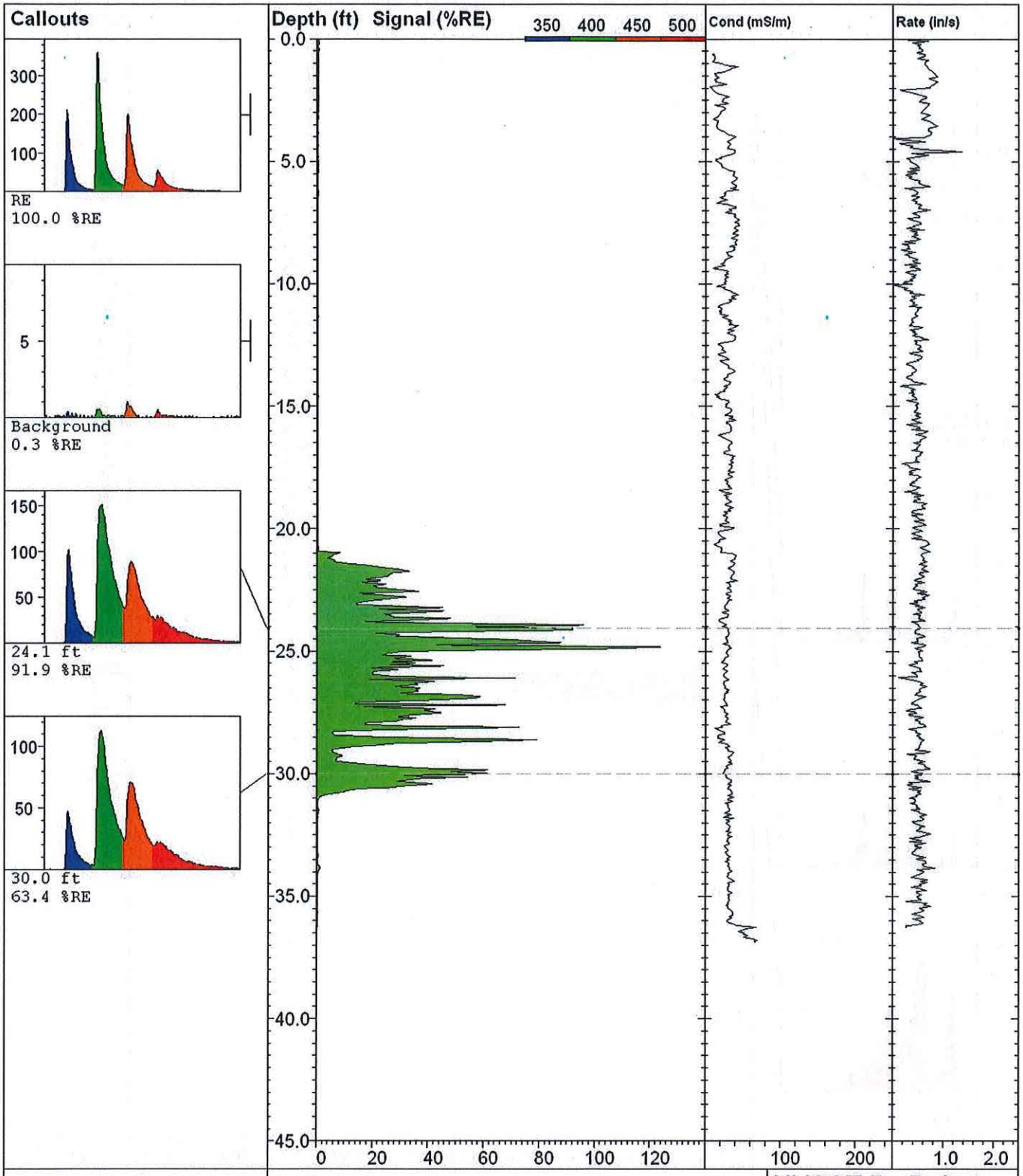


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-02

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **38.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **428.4 % @ 26.11 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 10:48 CDT**



MATRIX ENVIRONMENTAL LLC
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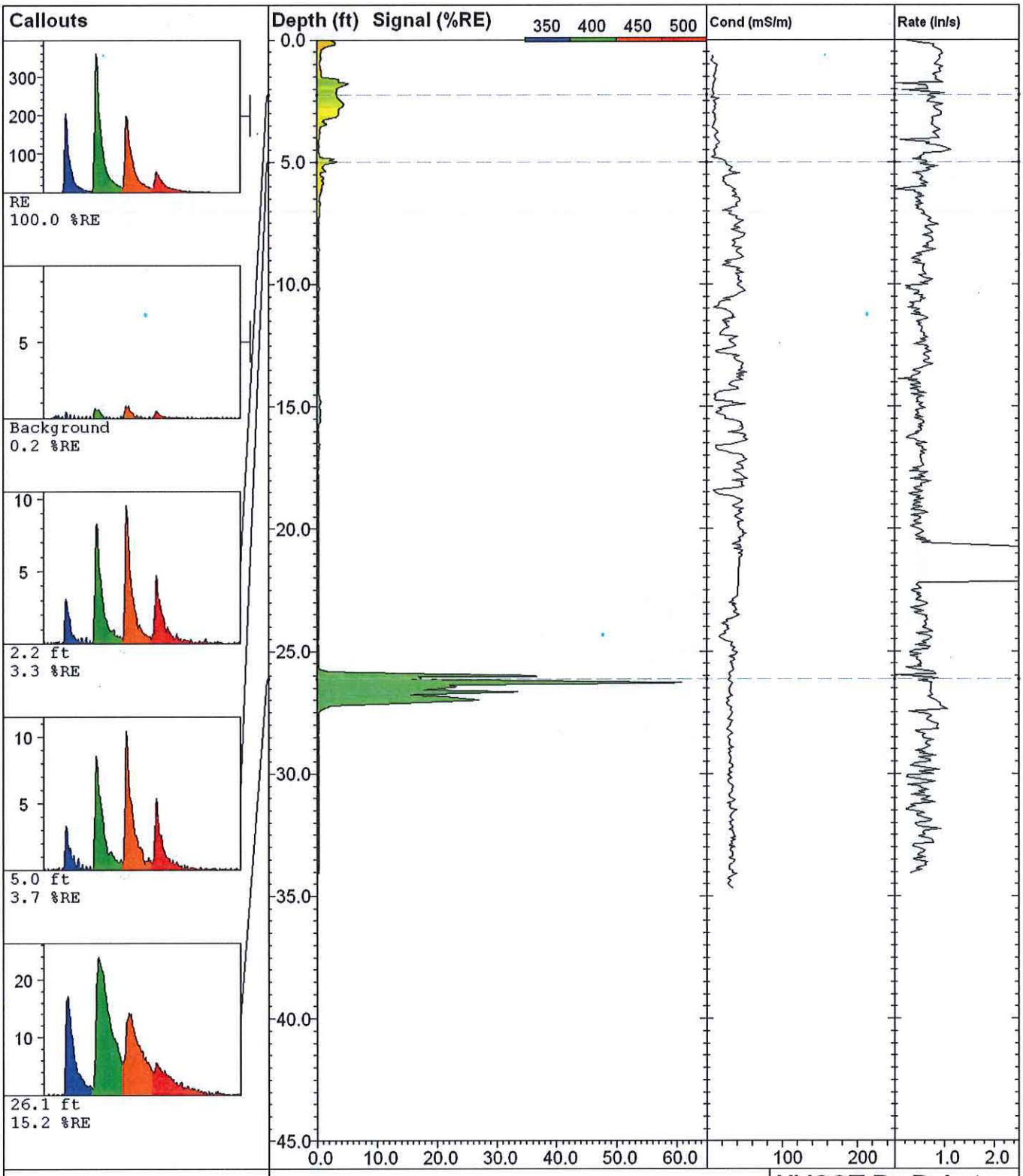
LIF-03

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.25 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **125.1 % @ 24.82 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 11:32 CDT**



MATRIX ENVIRONMENTAL LLC
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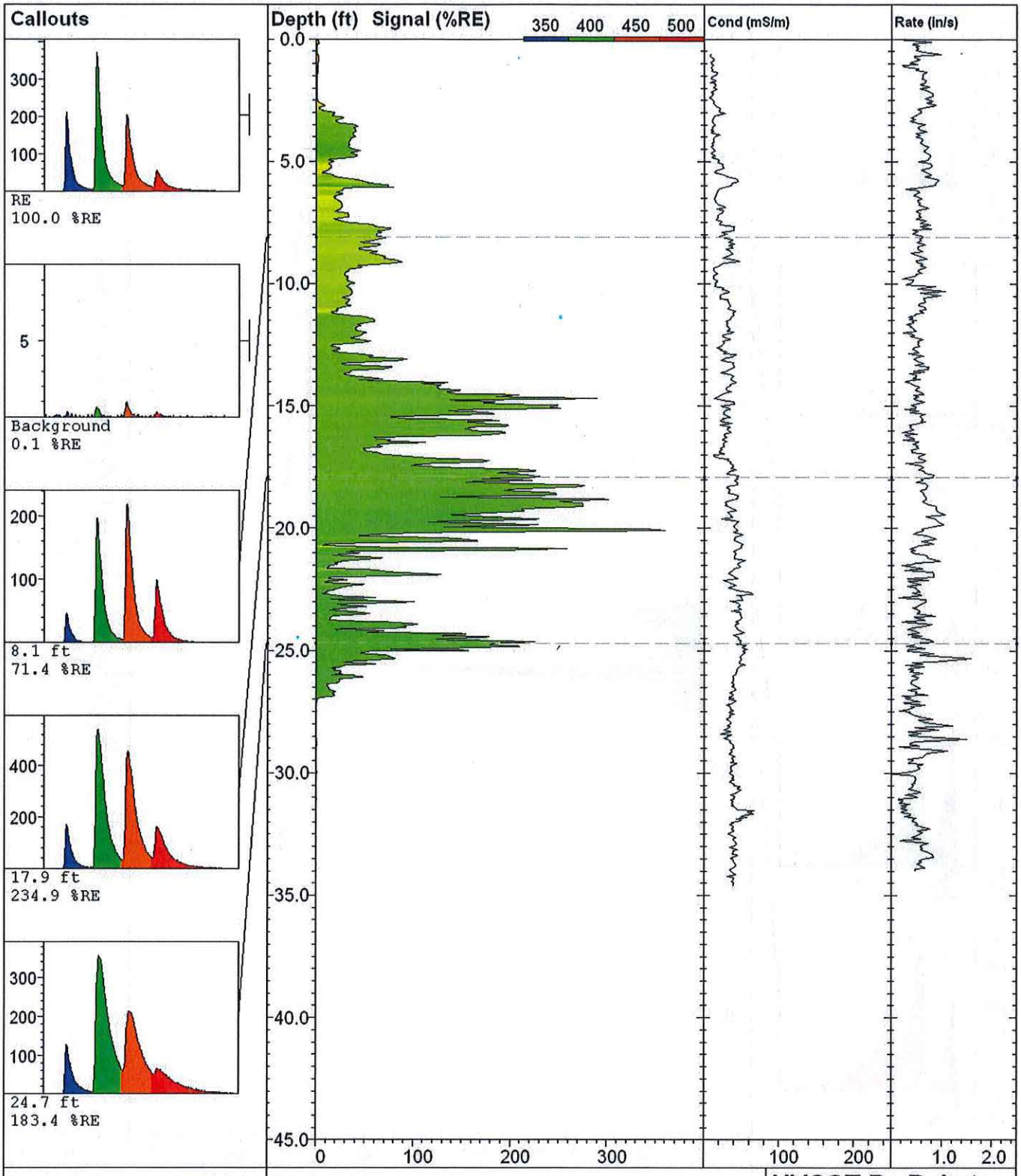
LIF-04

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.04 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **61.6 % @ 26.28 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 12:55 CDT**



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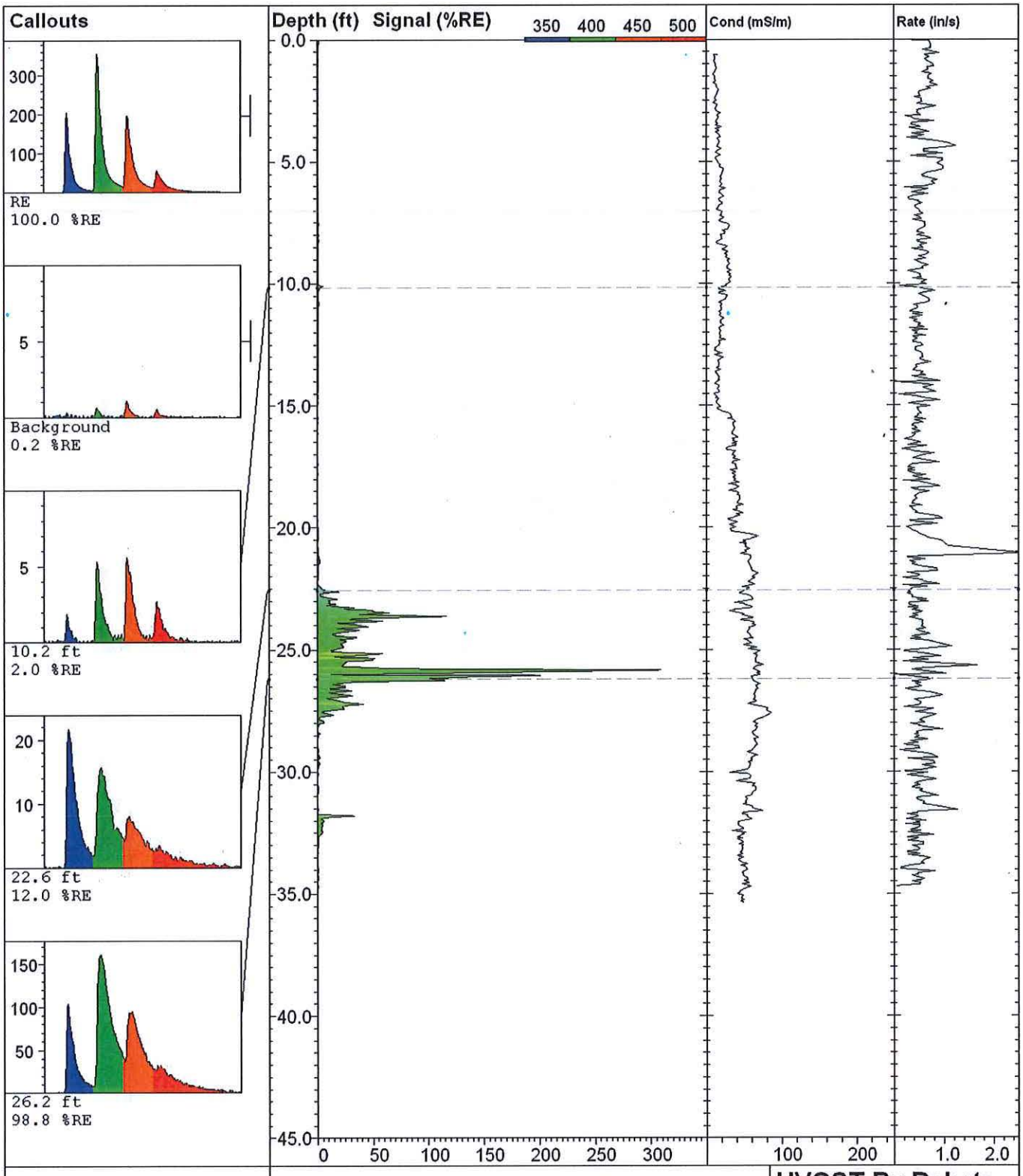
LIF-05

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **360.4 % @ 20.09 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 13:28 CDT**



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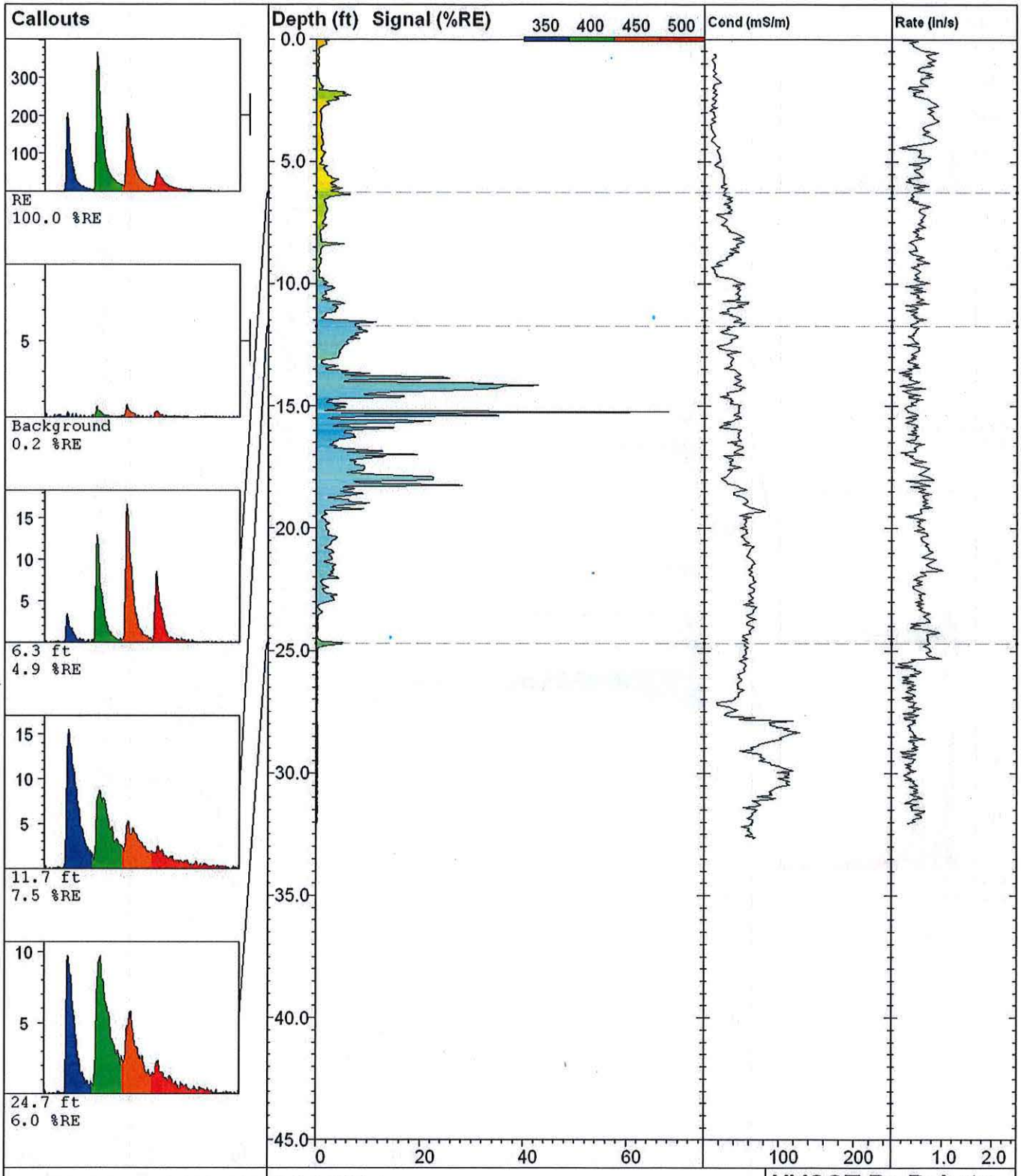
www.matrixenv.com

LIF-06

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.72 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **313.8 % @ 25.84 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 14:10 CDT**



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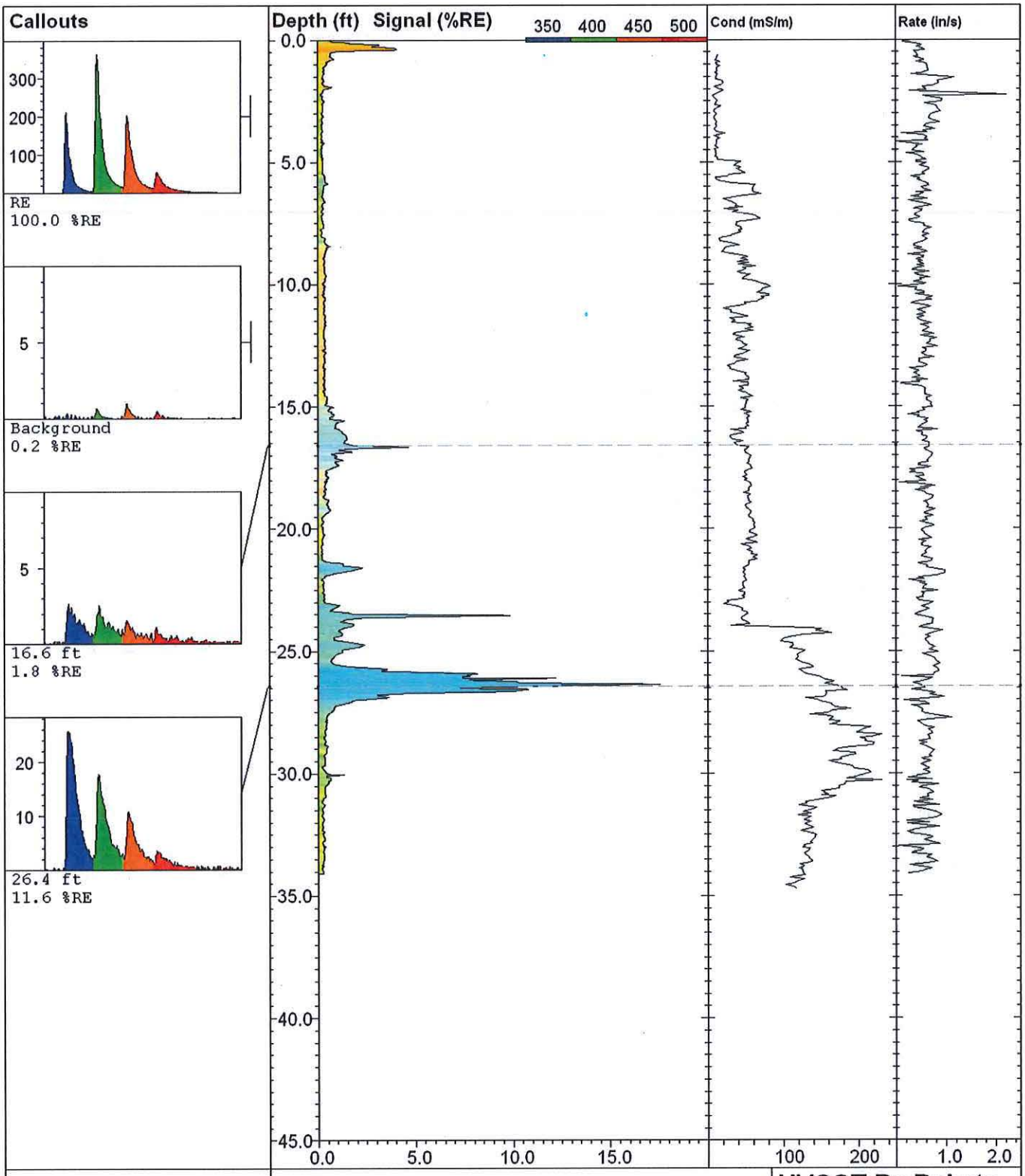
www.matrixenv.com

LIF-07

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **32.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **68.5 % @ 15.24 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 14:49 CDT**

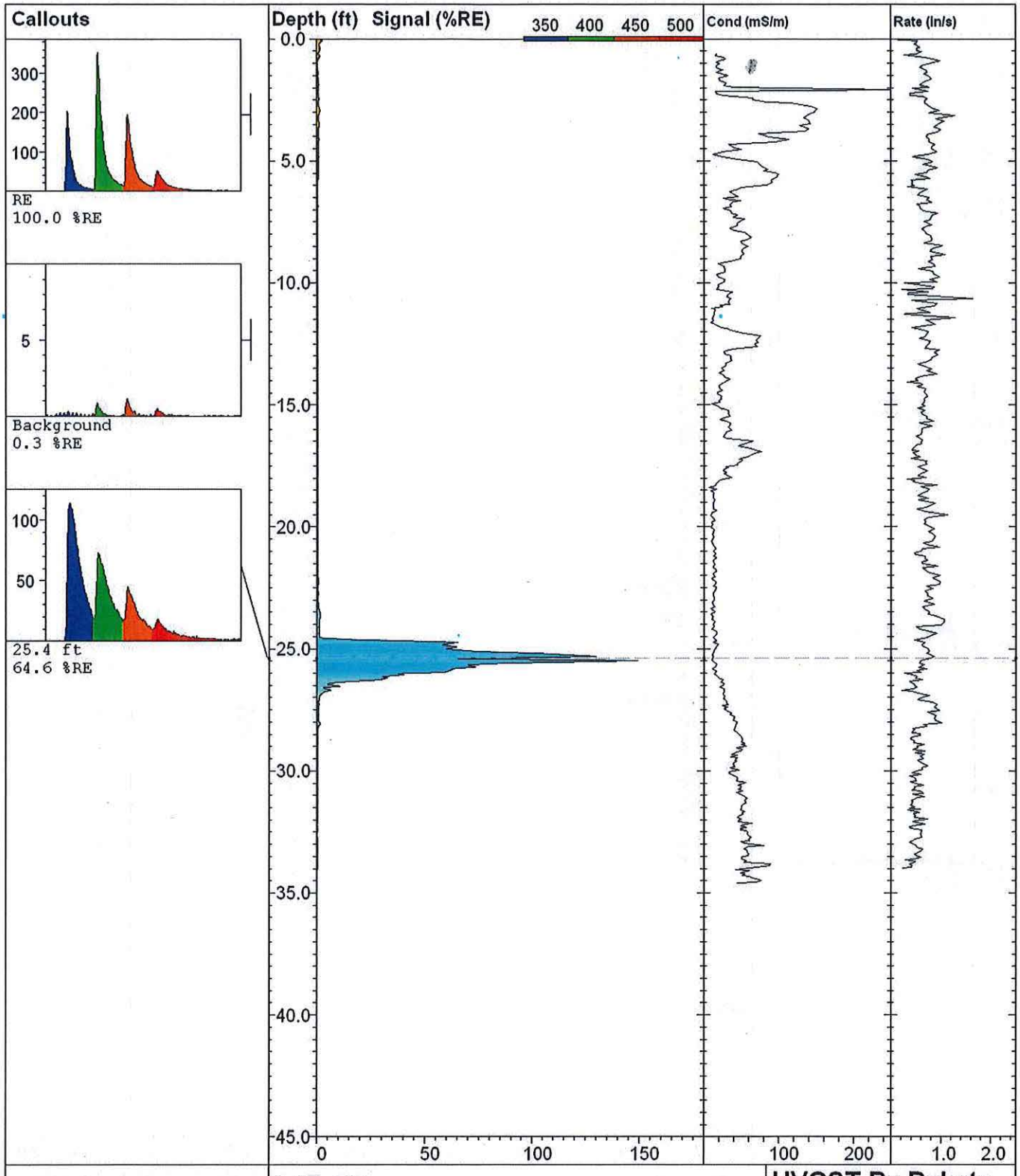


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-08

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.09 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **17.7 % @ 26.37 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 15:26 CDT**



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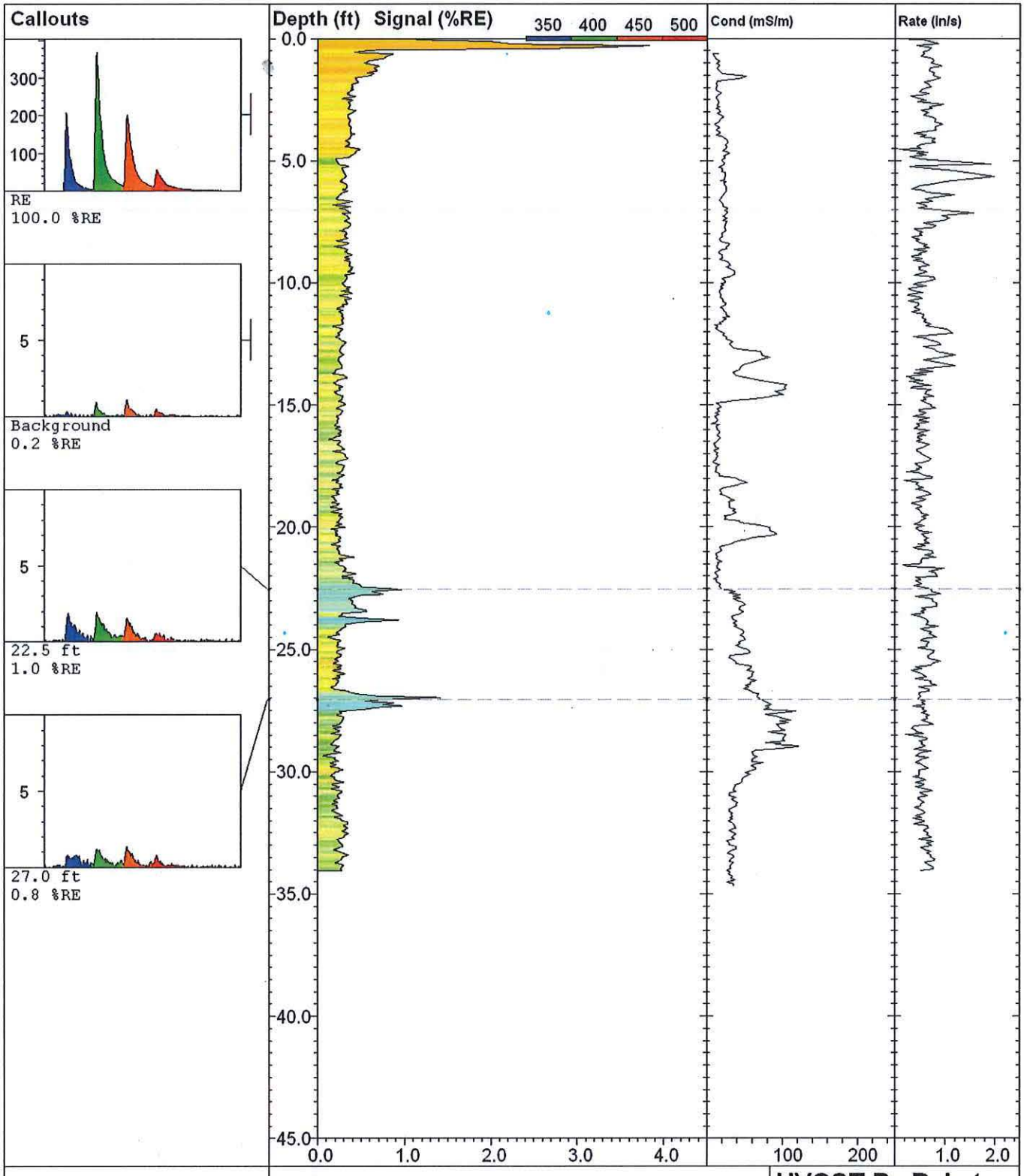
LIF-09

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.01 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **150.2 % @ 25.48 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 16:35 CDT**



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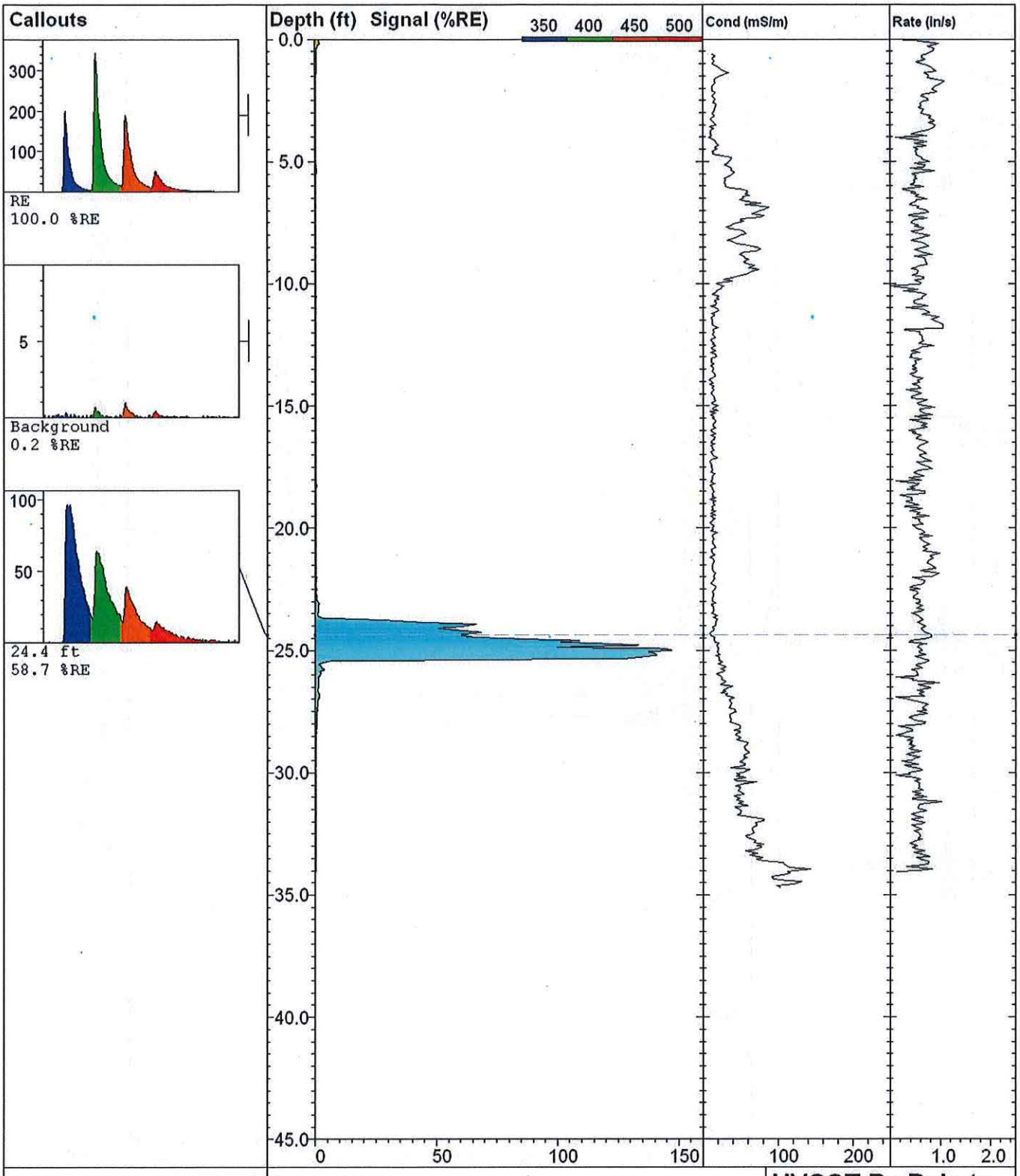
LIF-10

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.9 % @ 0.29 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 17:08 CDT**



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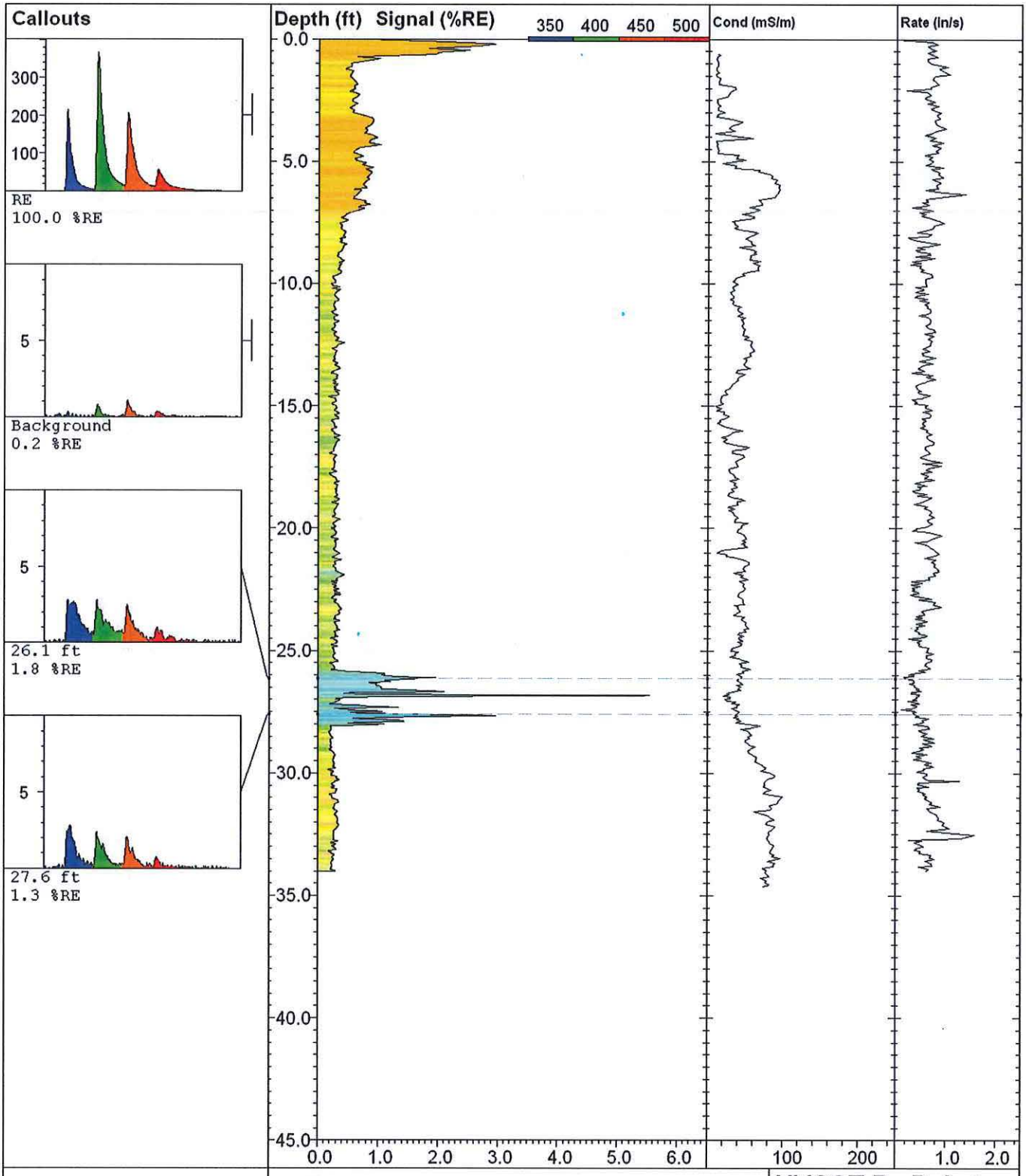
www.matrixenv.com

LIF-11

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.06 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **147.0 % @ 25.00 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 17:37 CDT**



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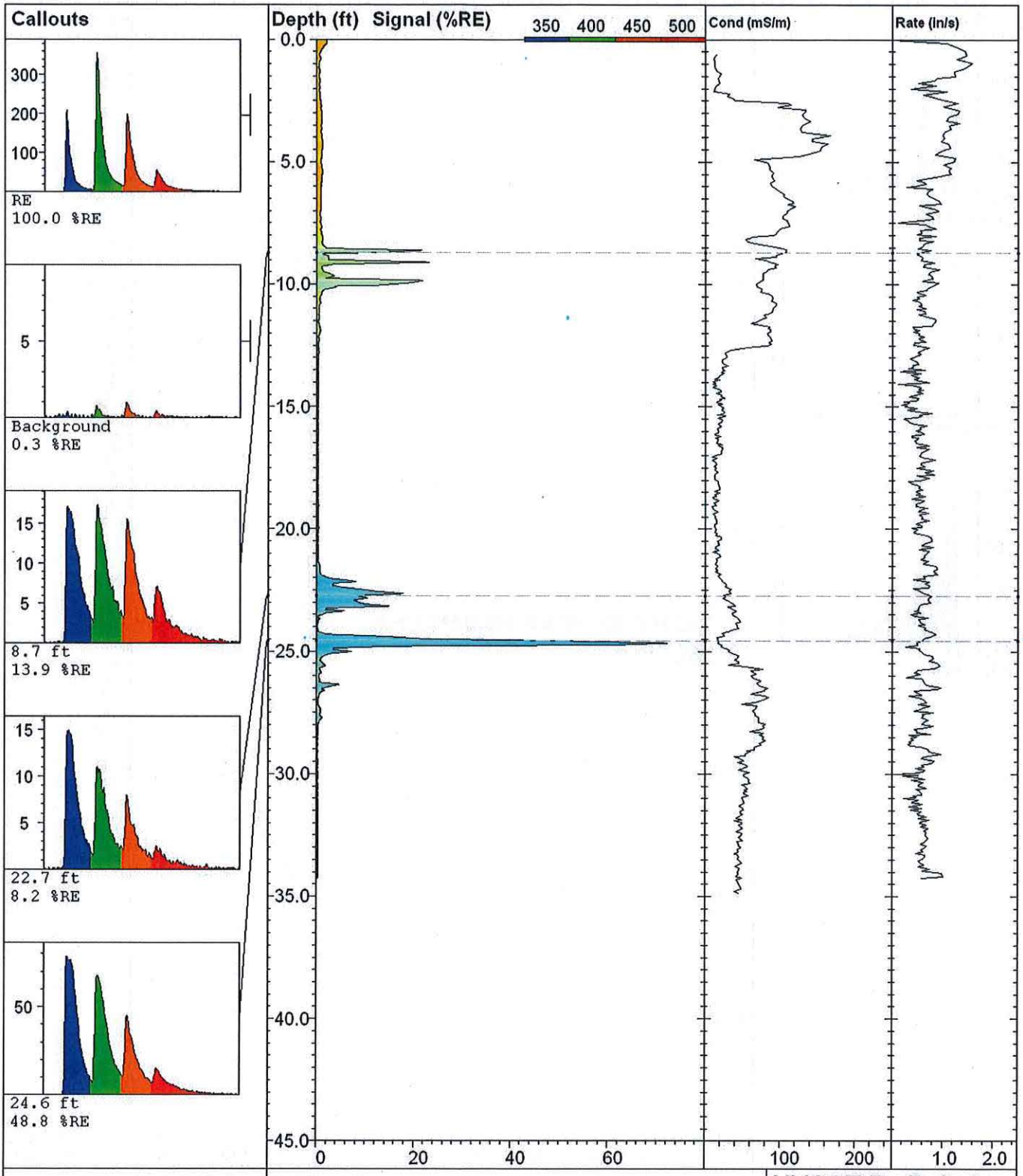
LIF-12

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.02 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.8 % @ 26.83 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 18:07 CDT**

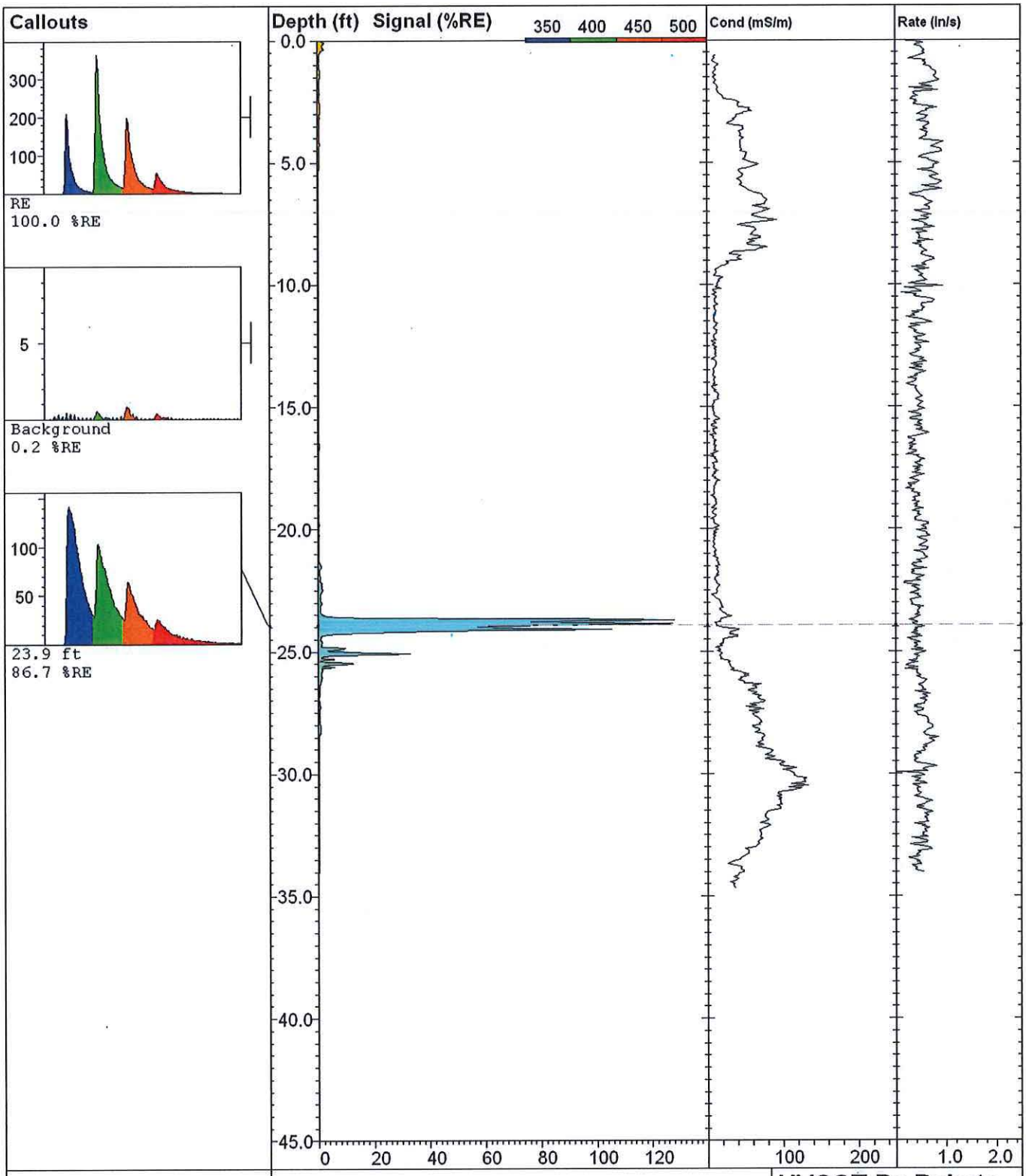


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-13

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.26 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **72.3 % @ 24.66 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-11 18:56 CDT**



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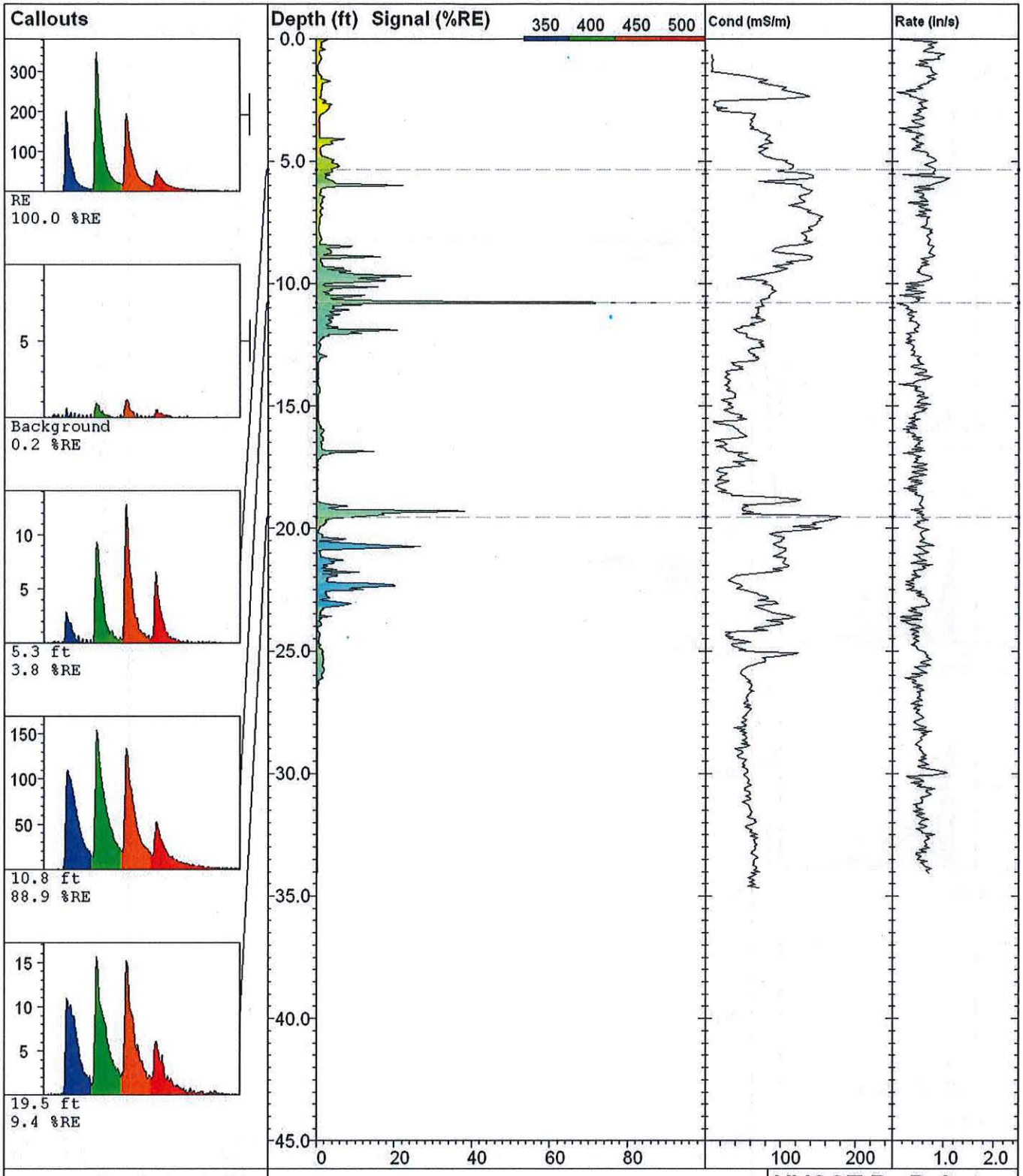
www.matrixenv.com

LIF-14

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **129.0 % @ 23.87 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 09:01 CDT**



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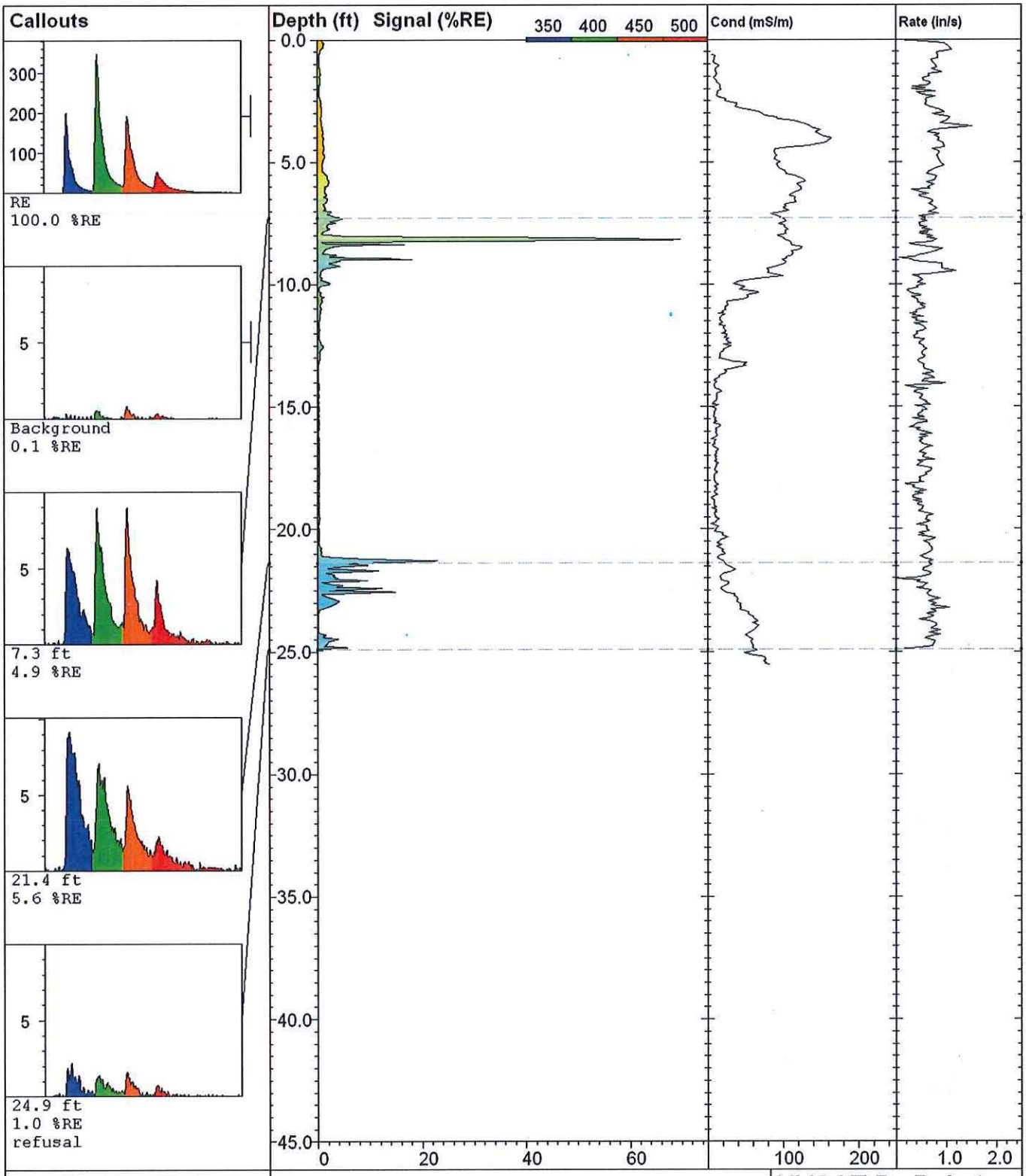
LIF-15

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.05 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **88.9 % @ 10.79 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 09:42 CDT**



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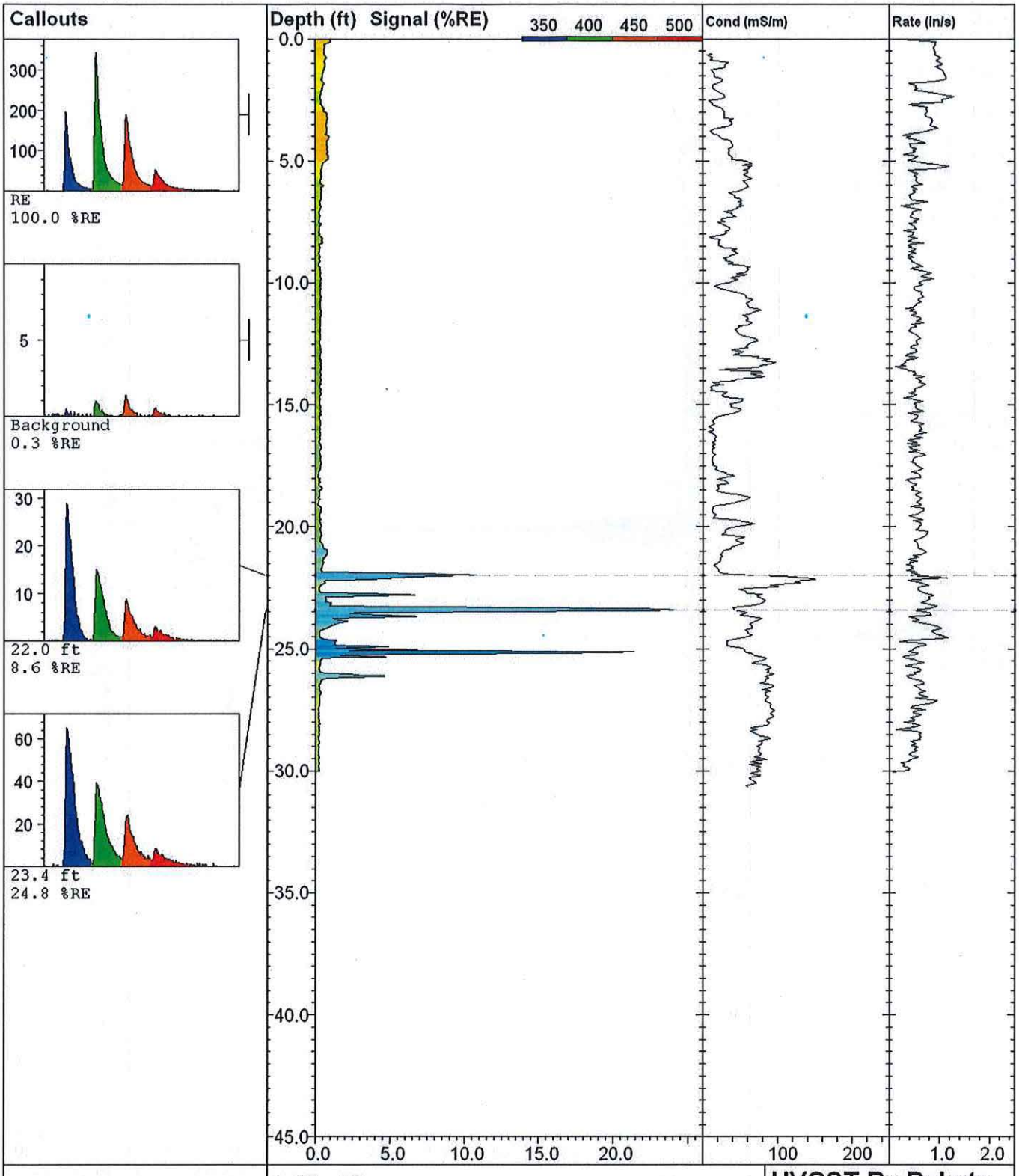
www.matrixenv.com

LIF-16

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **24.93 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **70.1 % @ 8.18 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 10:16 CDT**



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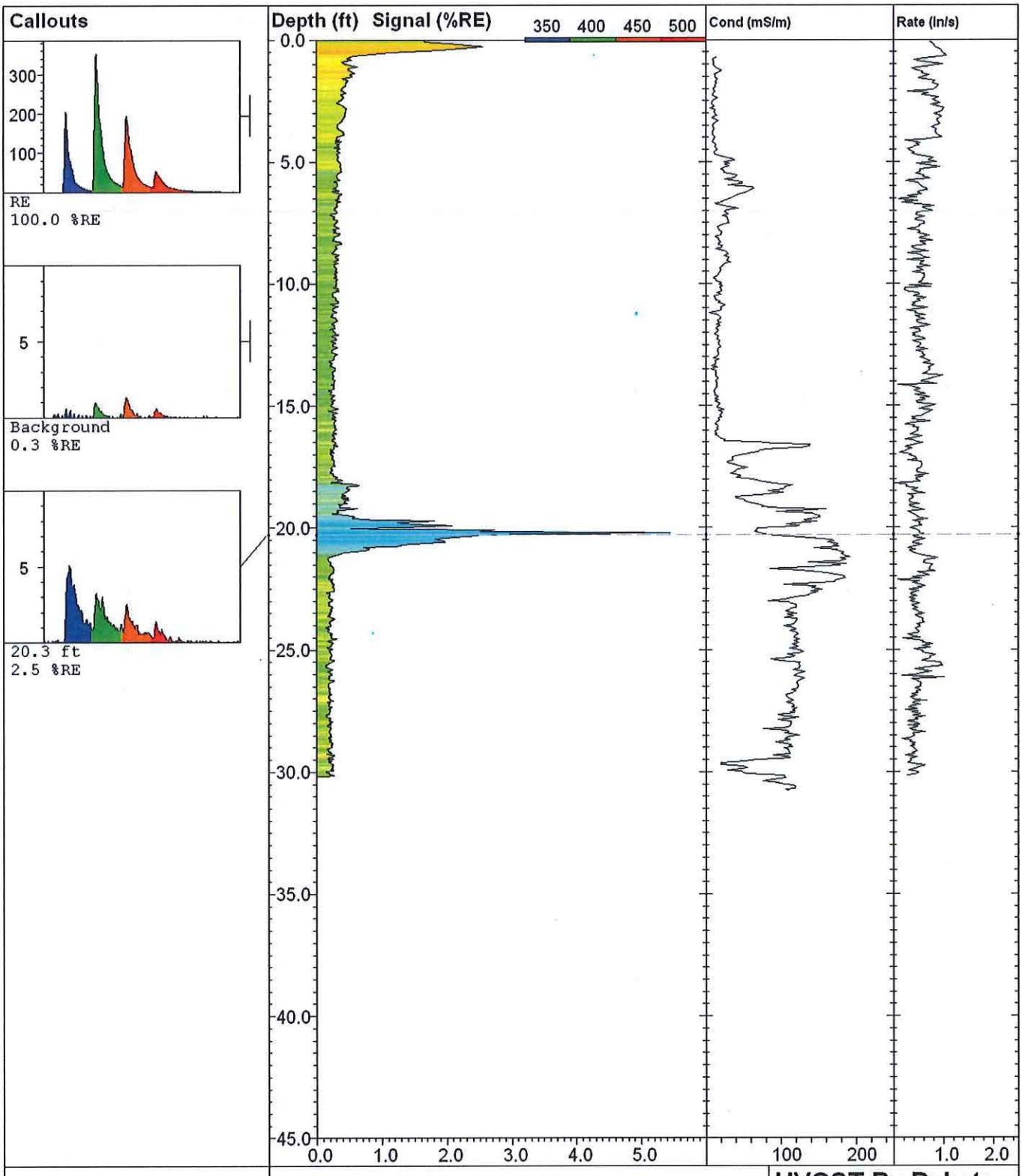
www.matrixenv.com

LIF-17

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **30.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **24.8 % @ 23.42 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 11:12 CDT**



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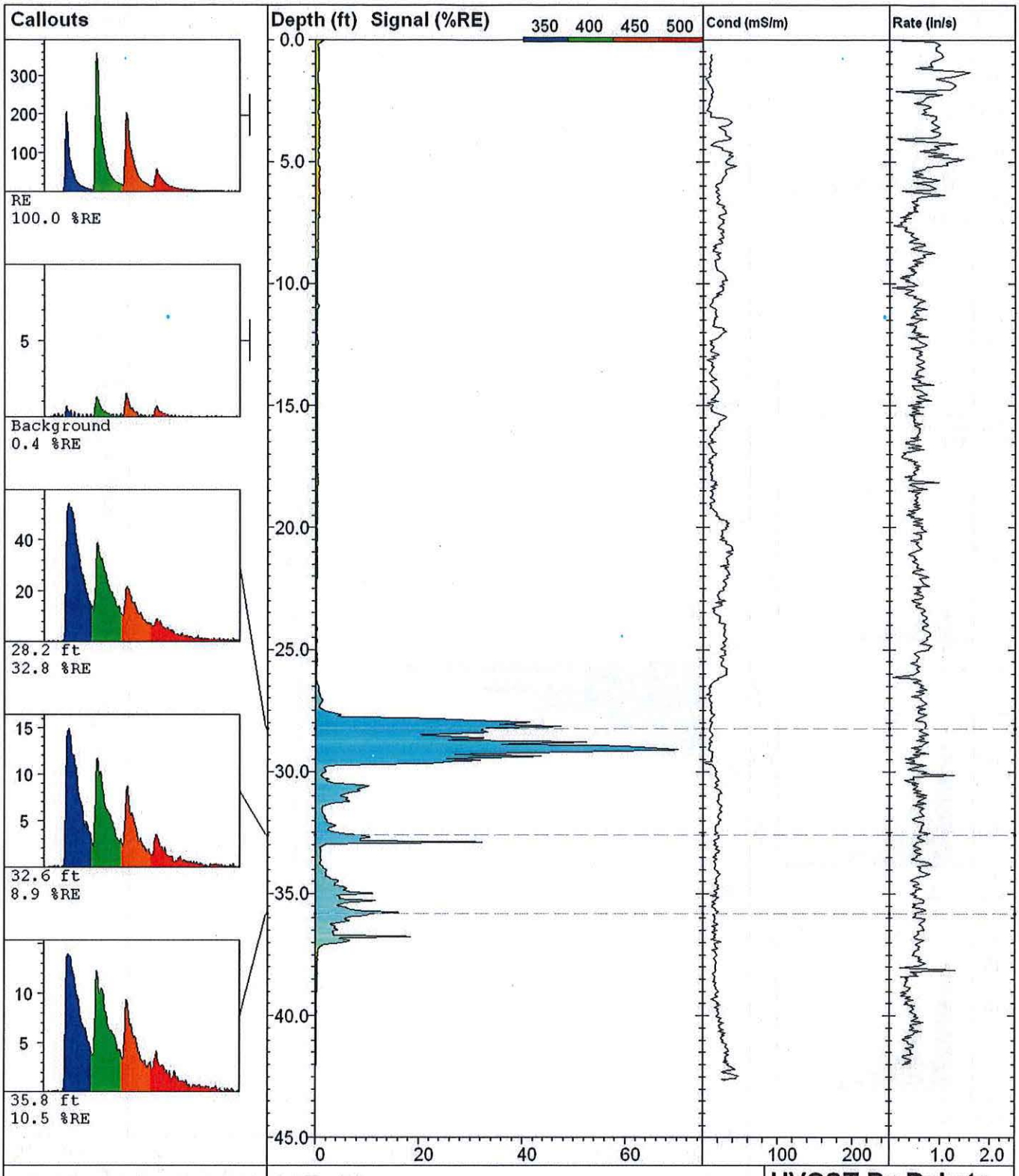
LIF-18

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **30.17 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.6 % @ 20.22 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 11:42 CDT**



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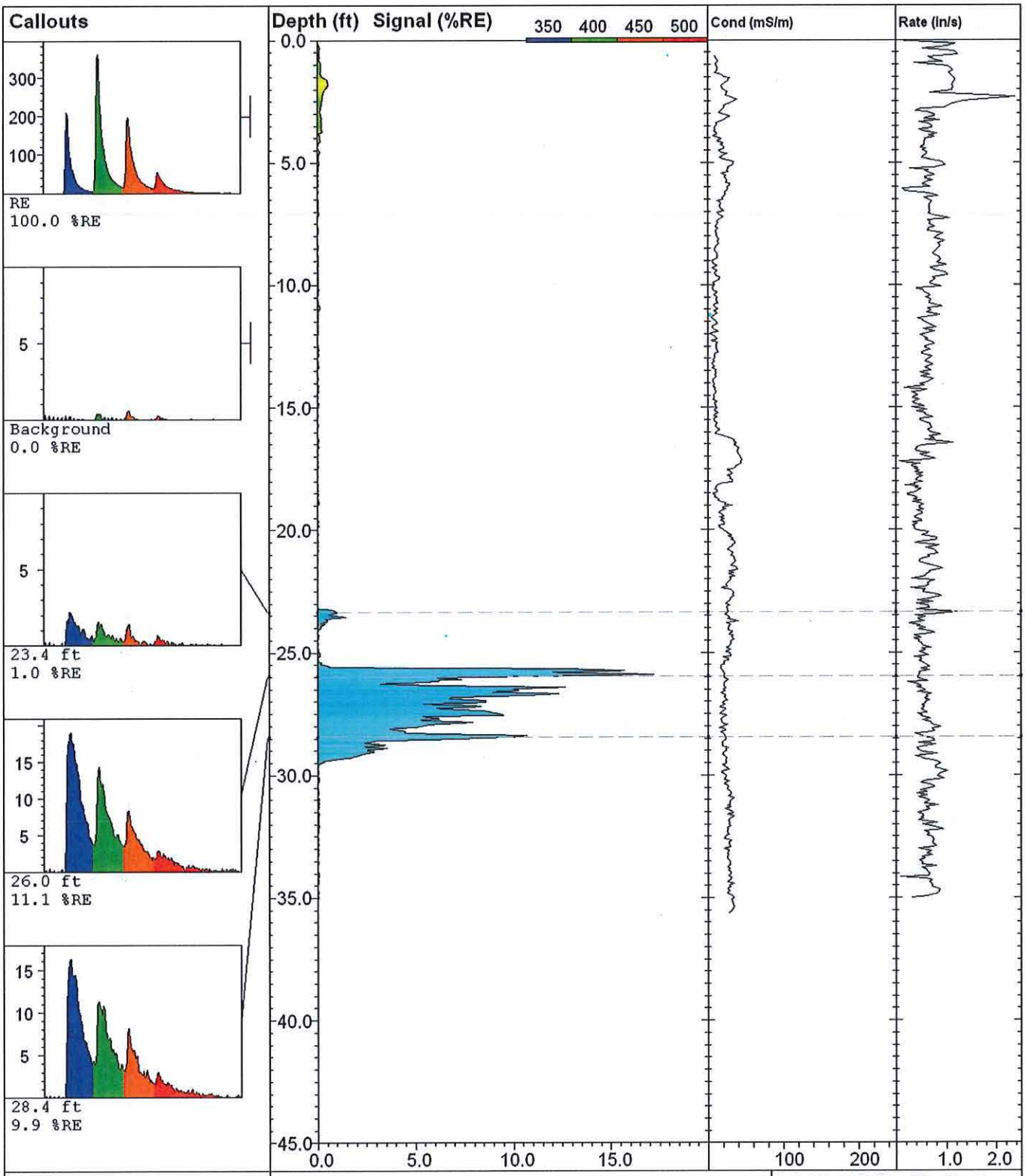
www.matrixenv.com

LIF-19

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **42.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **70.3 % @ 29.10 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 12:57 CDT**

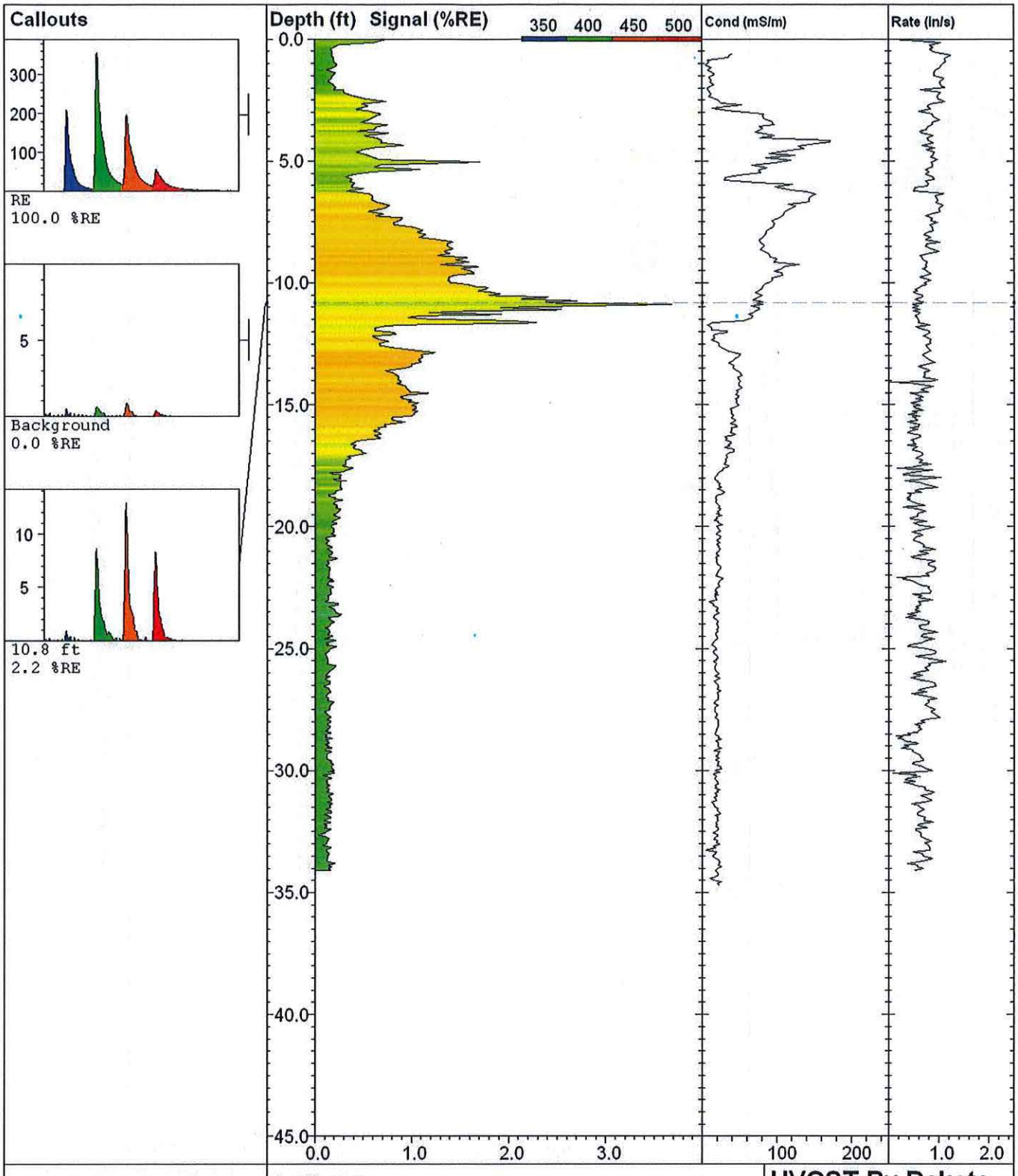


MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-20

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **35.00 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **17.3 % @ 25.89 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 14:14 CDT**



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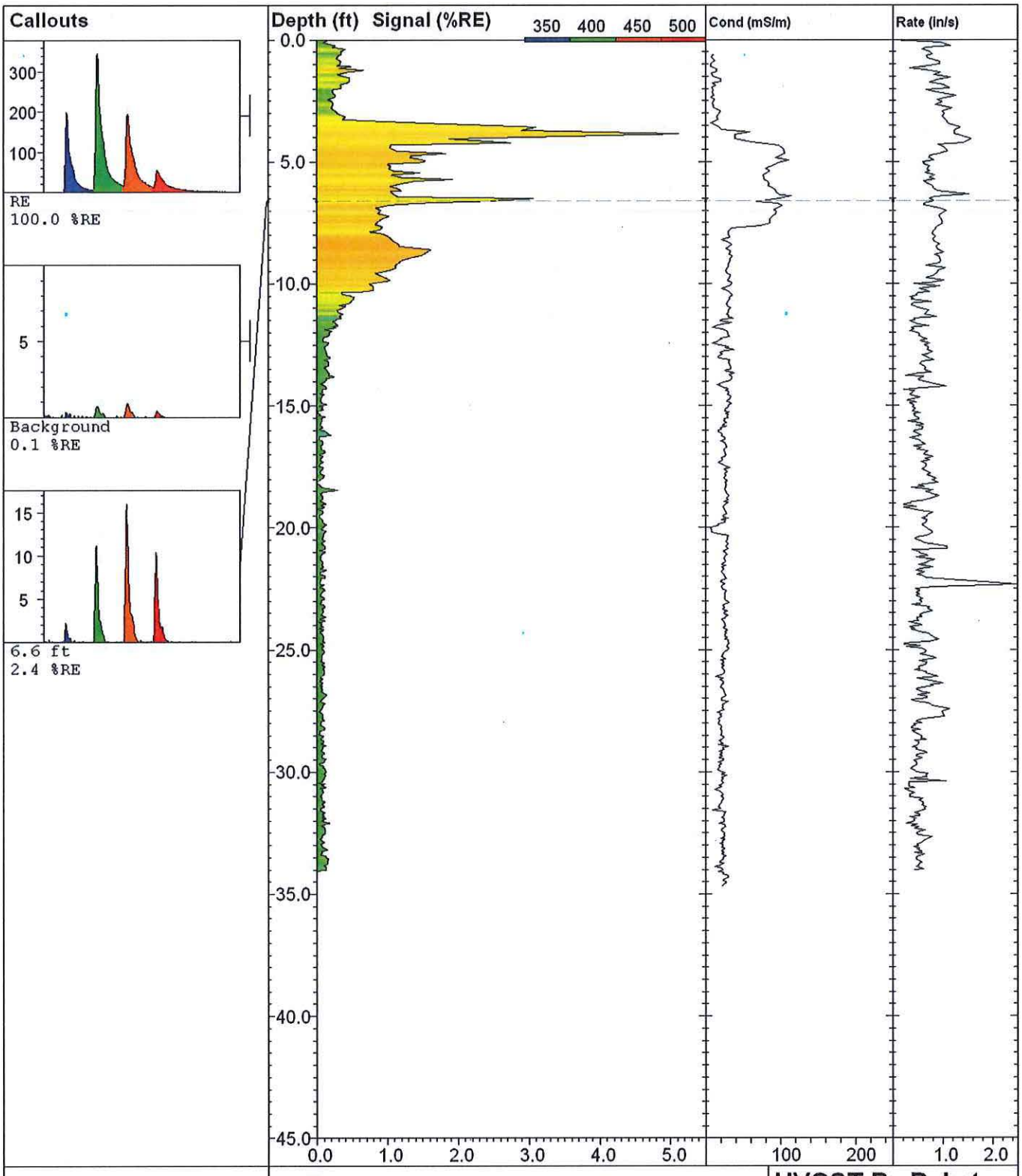
LIF-21

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.07 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **3.7 % @ 10.88 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 14:43 CDT**



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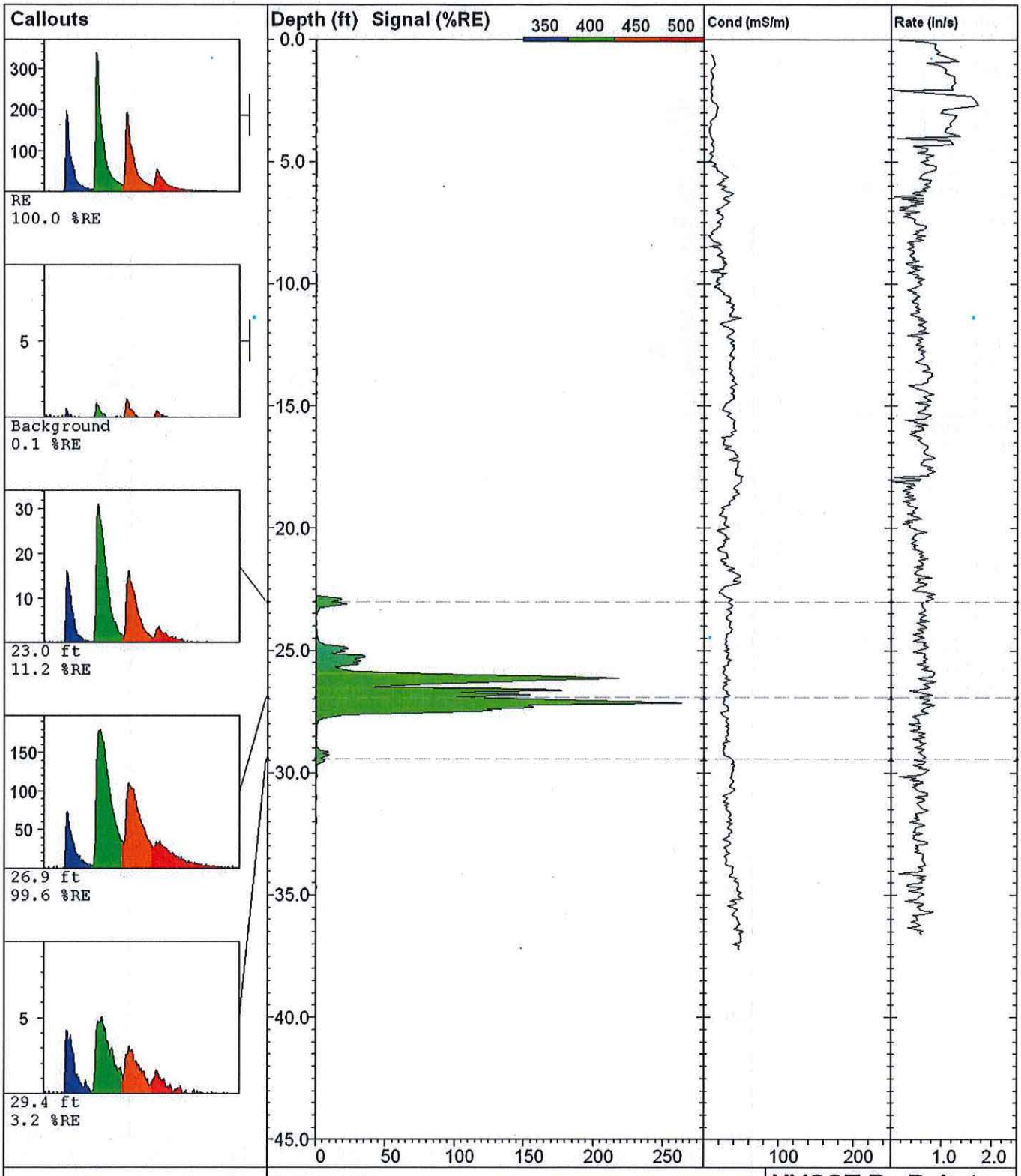
www.matrixenv.com

LIF-22

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.03 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **5.1 % @ 3.86 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 15:13 CDT**



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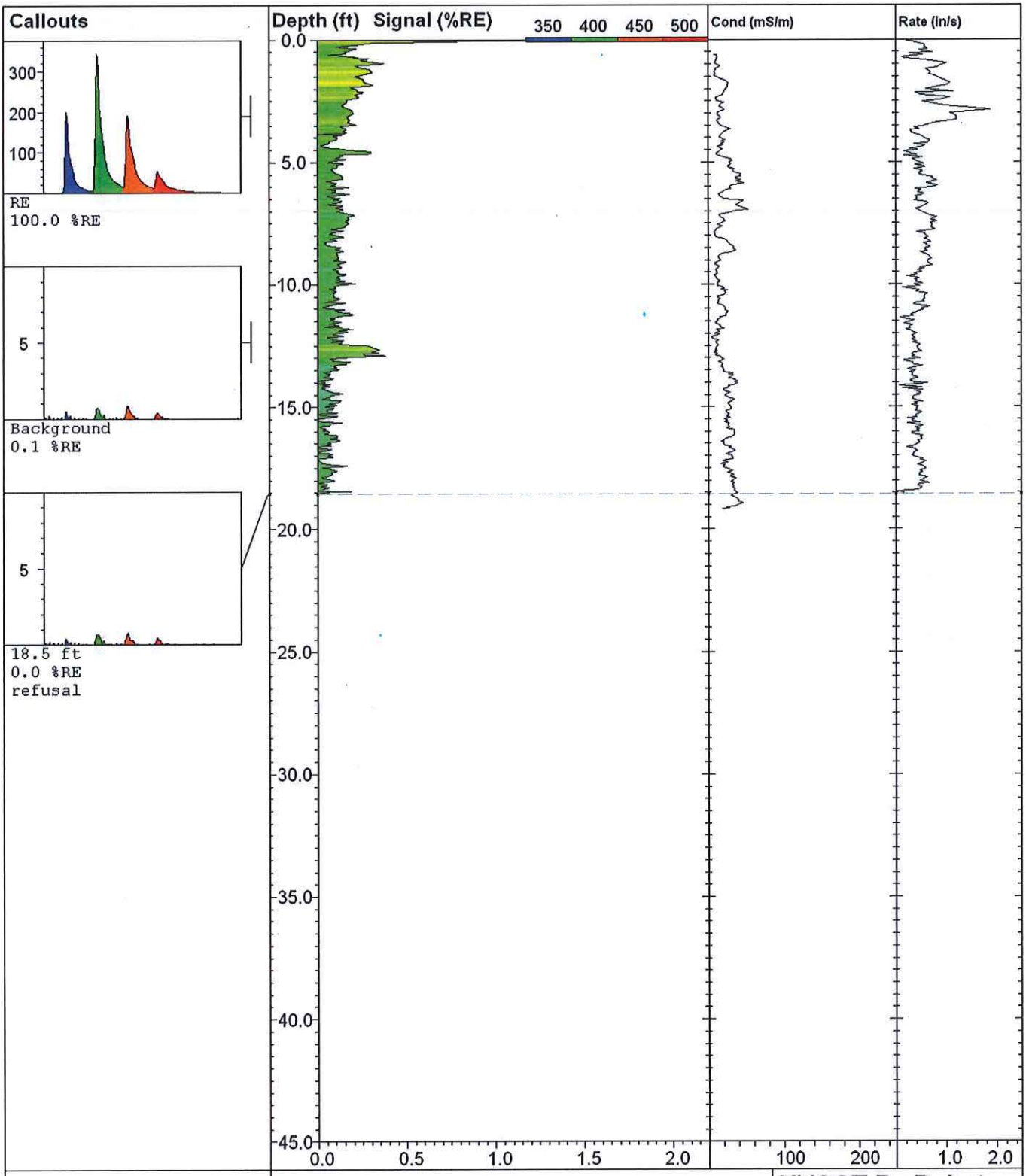
LIF-23

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **36.62 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **265.5 % @ 27.15 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 15:43 CDT**



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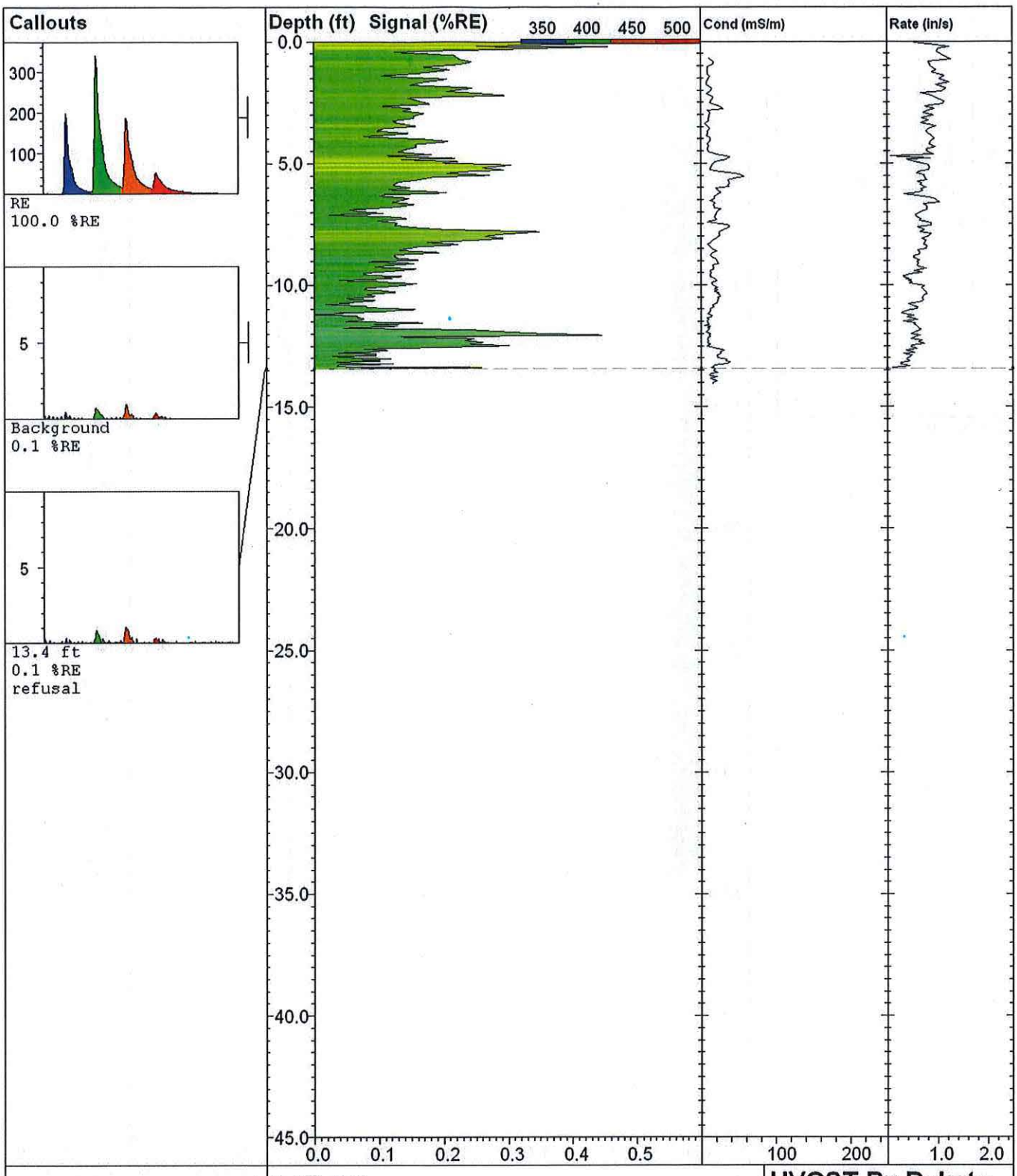
LIF-24

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **18.54 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.0 % @ 0.00 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 16:21 CDT**



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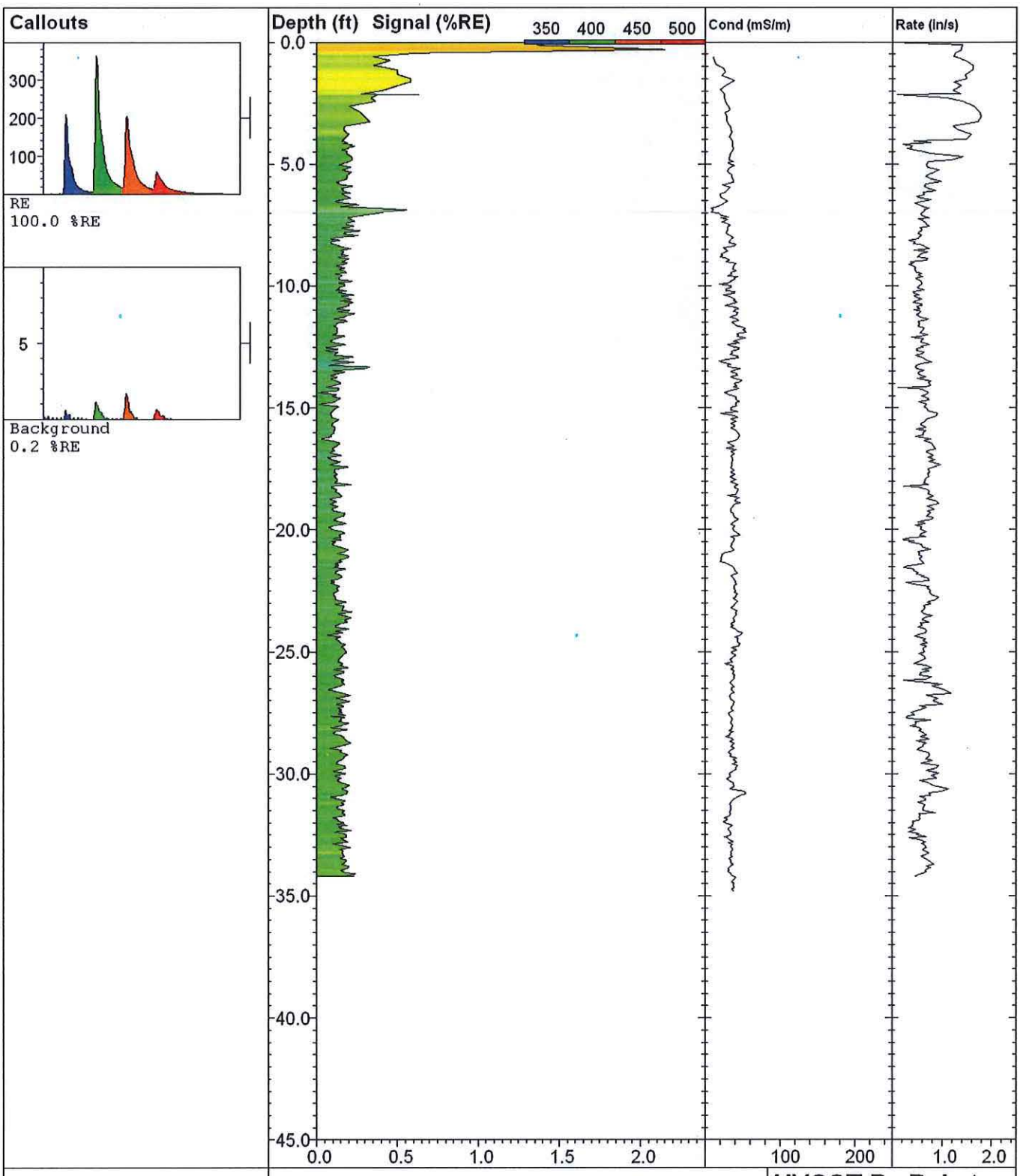
LIF-25

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **13.43 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **0.5 % @ 0.06 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 16:45 CDT**



MATRIX ENVIRONMENTAL LLC
www.matrixenv.com

LIF-26

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Doug's Tire**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **34.18 ft**
Client: **Meridian**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **2.2 % @ 0.31 ft**
Job: **101-MNDS-12UV**	*Operator/Unit:* **DT/SA/UVOST1023**	*Date & Time:* **2012-09-12 17:12 CDT**