



Weatherford

MICRORESISTIVITY LOG

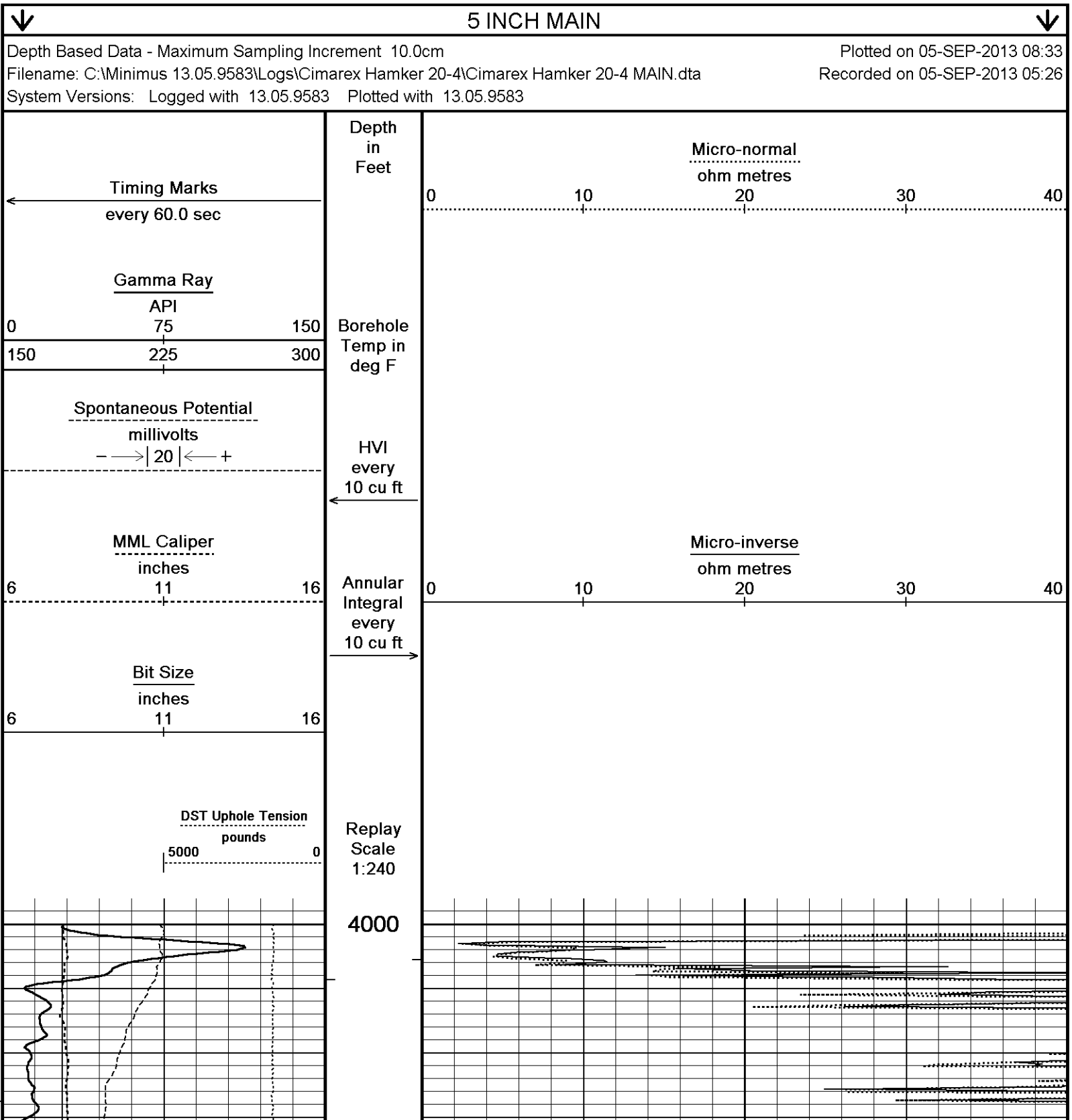
COMPANY			CIMAREX ENERGY CO.		
WELL			HAMKER 20-4		
FIELD			WILDCAT		
PROVINCE/COUNTY			HASKELL		
COUNTRY/STATE			U.S.A. / KANSAS		
LOCATION			330' FSL & 1650' FWL SW SE SW		
SEC	TWP	RGE	Other Services		
30	30S	31W	MPD/MDN		
API Number			CMI		
Permit Number			MAI/MFE		
Permanent Datum GL, Elevation 2849 feet			Elevations:		
Log Measured From KB			KB		
Drilling Measured From KB @ 8 FEET			DF		
Date			GL		
Run Number			ONE		
Service Order			3541035		
Depth Driller			5559.00		
Depth Logger			5558.00		
First Reading			5501.00		
Last Reading			4000.00		
Casing Driller			1860.00		
Casing Logger			857.00		
Bit Size			7.875		
Hole Fluid Type			GEL		
Density / Viscosity			9.00 lb/USg		
PH / Fluid Loss			11.80		
Sample Source			FLOW LINE		
Rm @ Measured Temp			1.50 @ 60.0		
Rmf @ Measured Temp			1.20 @ 60.0		
Rmc @ Measured Temp			1.80 @ 60.0		
Source Rmf / Rmc			CALC		
Rm @ BHT			0.70 @ 126.0		
Time Since Circulation			5 HRS		
Max Recorded Temp			126.00		
Equipment / Base			13244		
Recorded By			D. COLE		
Witnessed By			T. KOLODZIEJ		
JOB #			LB 13-250		

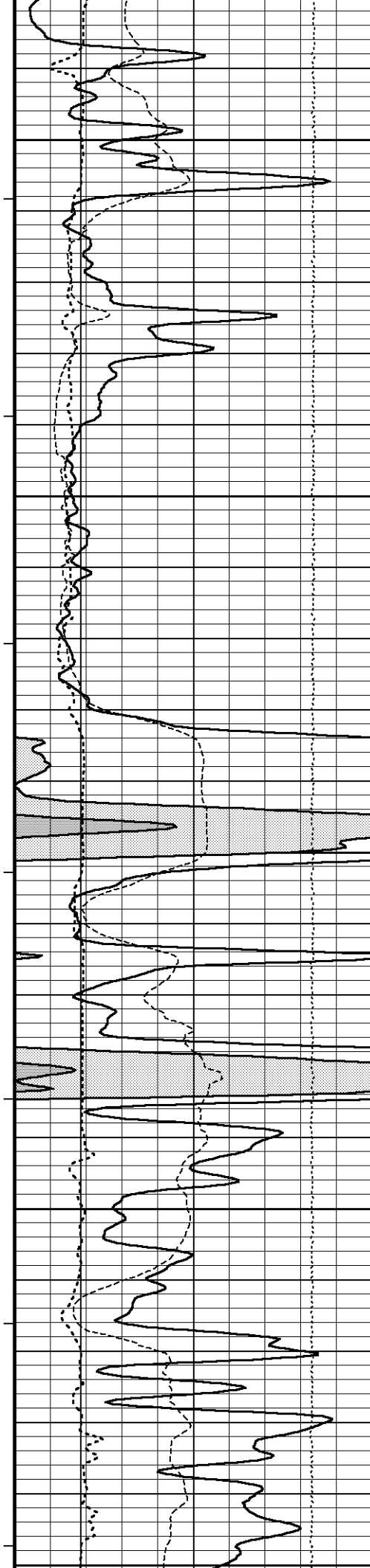
BOREHOLE RECORD					Last Edited: 05-SEP-2013 00:33
Bit Size inches		Depth From feet		Depth To feet	
7.875		1860.00		5559.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	1860.00	24.00	

REMARKS
- SOFTWARE ISSUE: WLS 13.05.9583.
- RUN ONE: MCG, MML, MDN, MPD, MIE, MAI RAN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. TWO 0.5 INCH STANDOFFS USED ON MAI AND MFE.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO 4000 FEET: 540 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD 4000 FEET: 290 CU.FT.
- RIG: TOM CAT #4

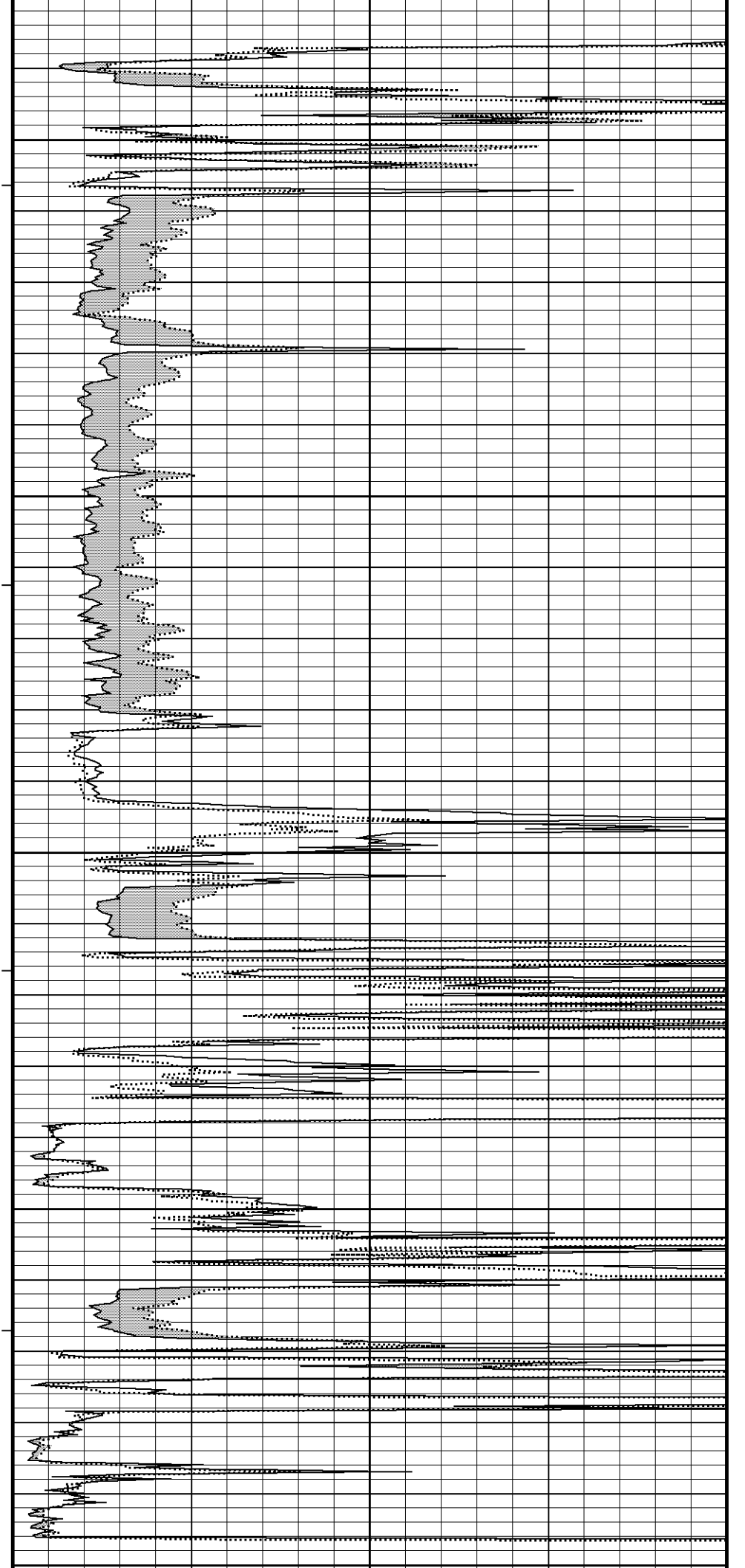
- ENGINEER: D.COLE
- OPERATOR: C. RAMIREZ
- DECLINATION: 6.22
- LAT / LON: 37.41960N -100.75081W

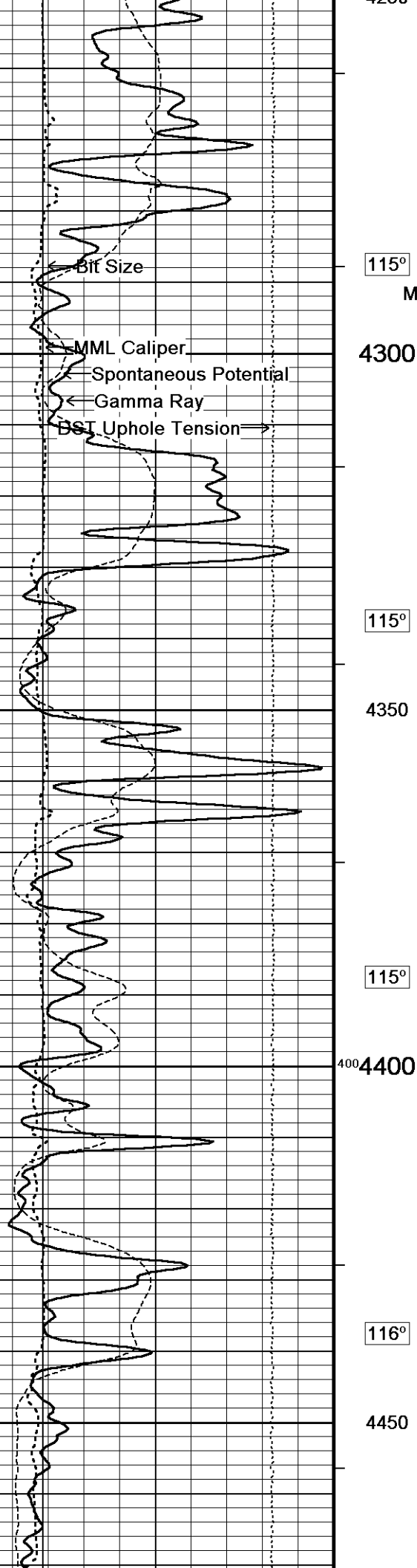
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.





113°
4050
113°
4100
500
113°
4150
114°
4200
114°
4250





115°

4300

115°

4350

115°

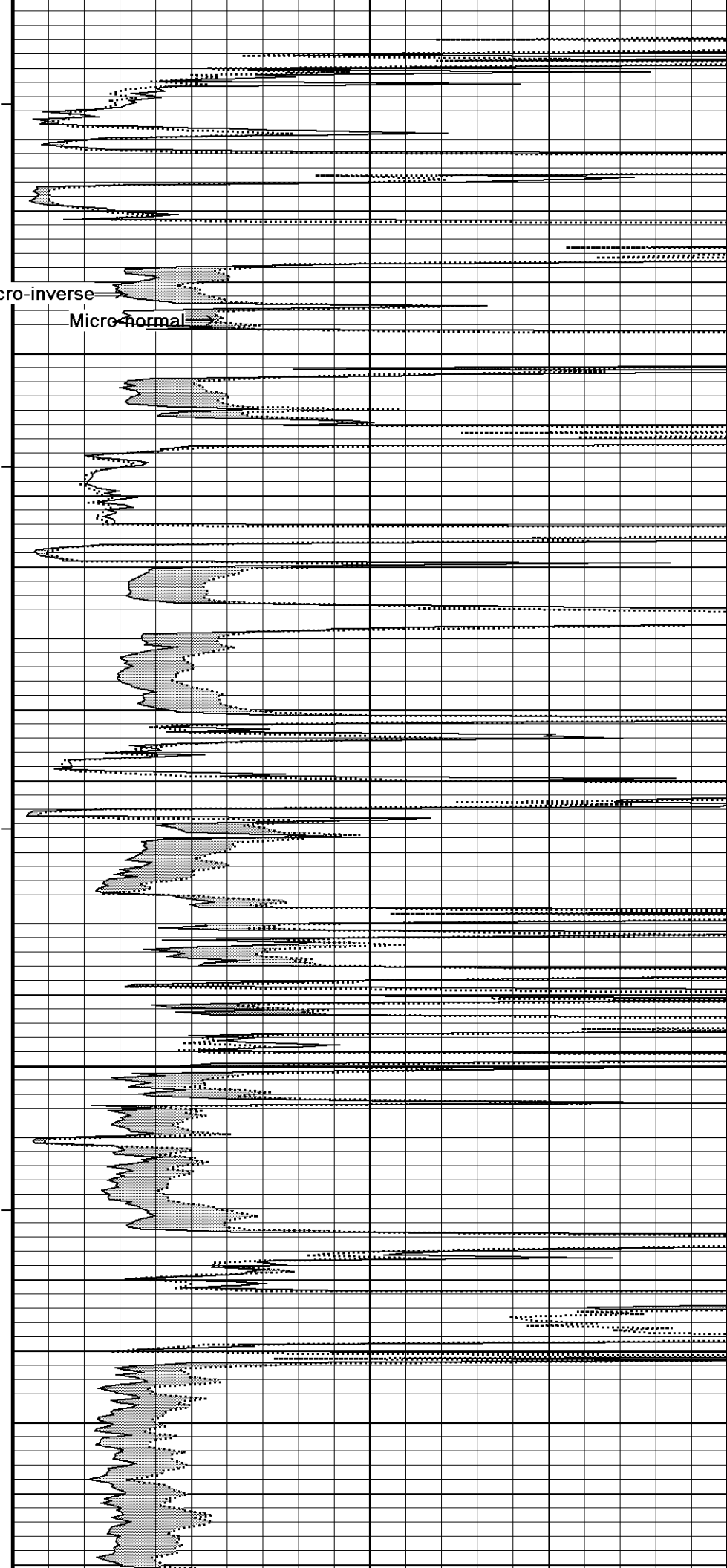
4400

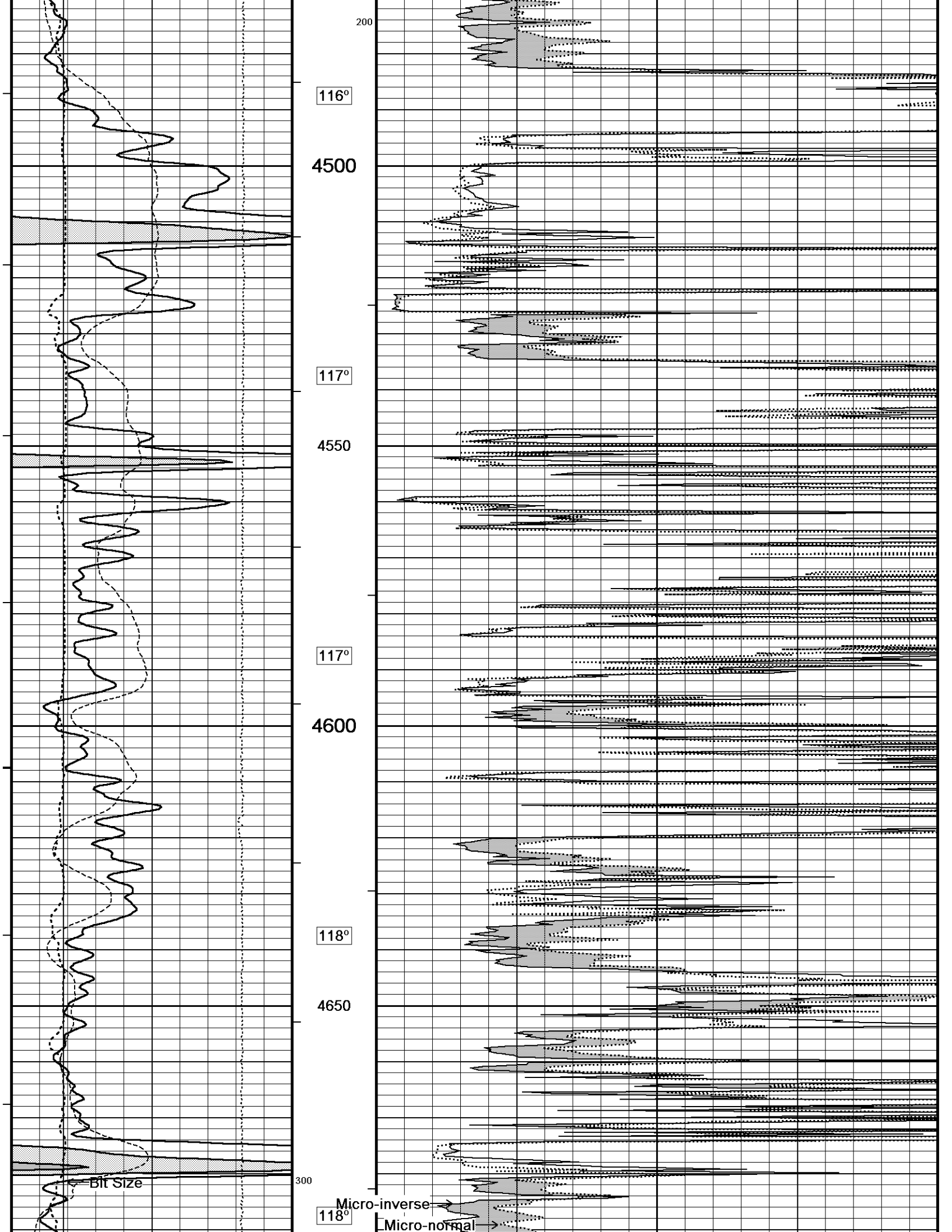
116°

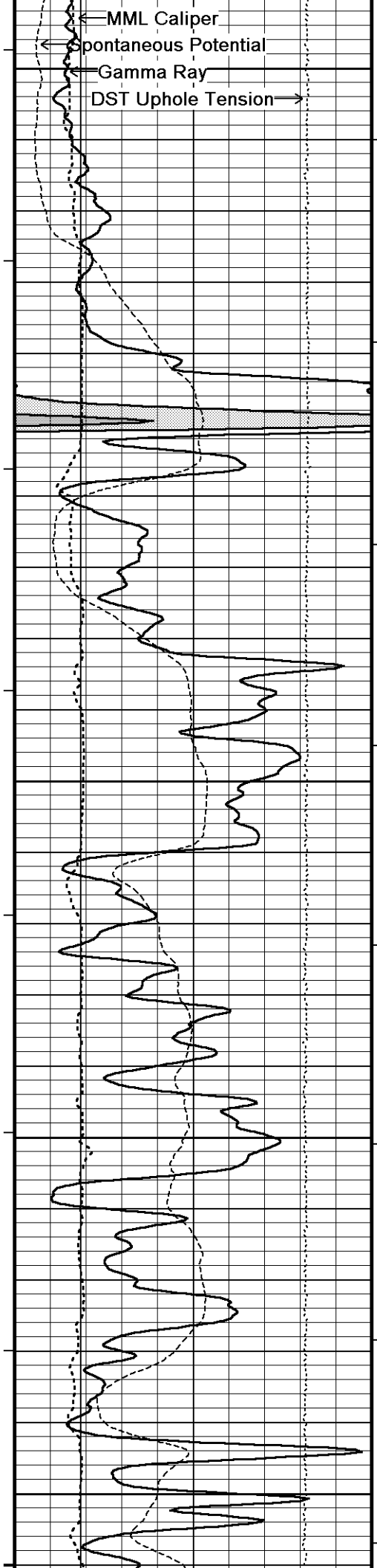
4450

Micro-inverse

Micro-normal







4700

118°

4750

119°

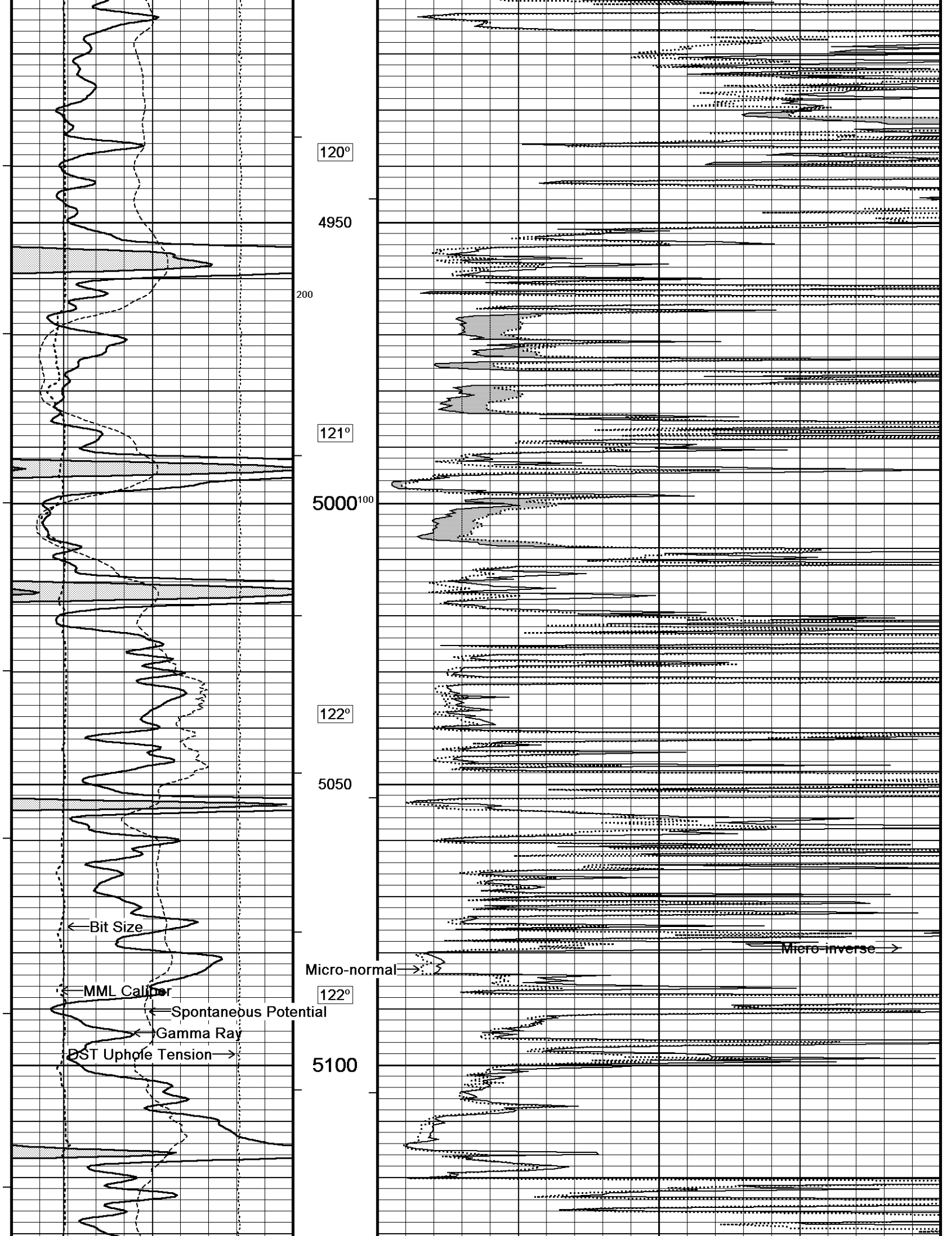
4800

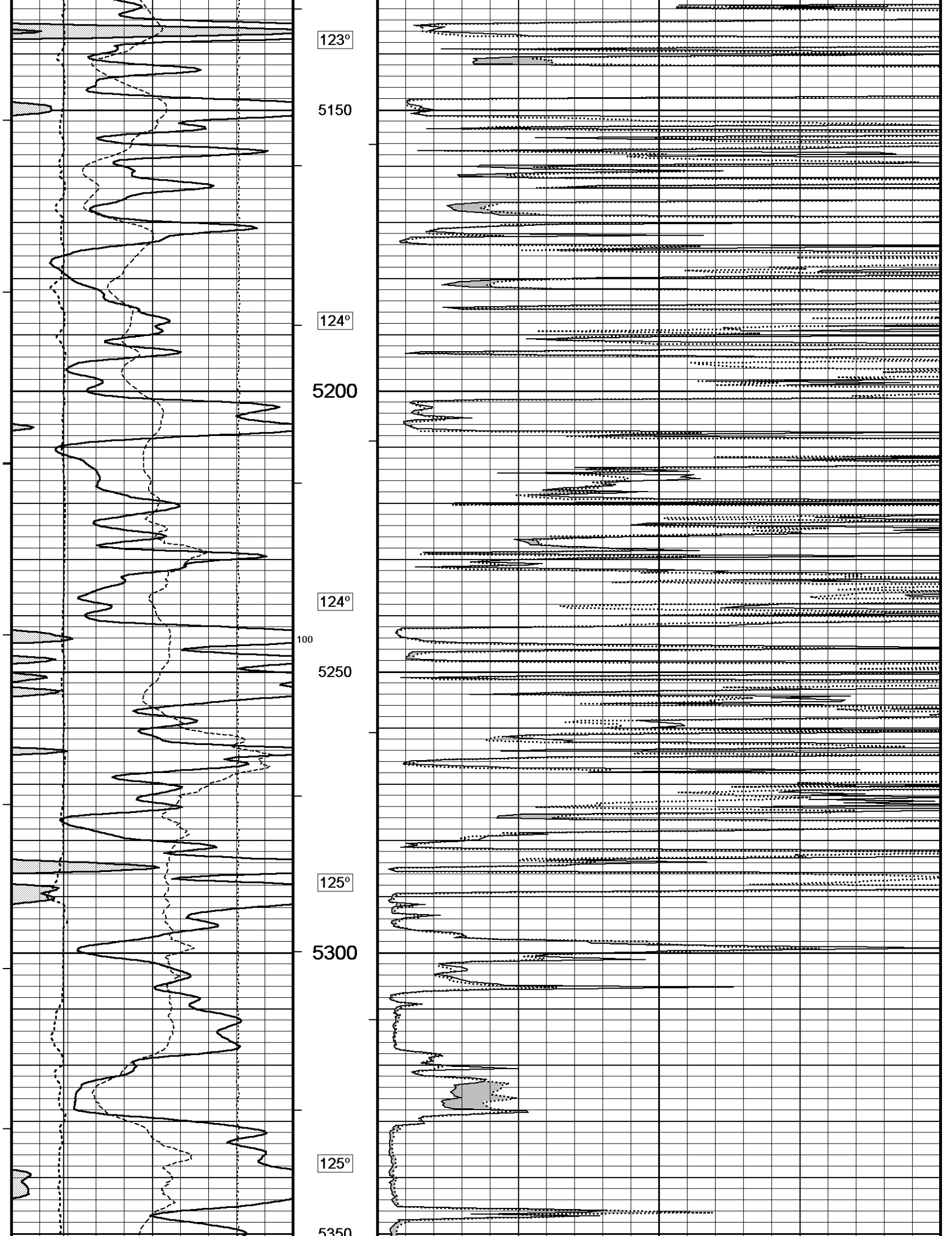
120°

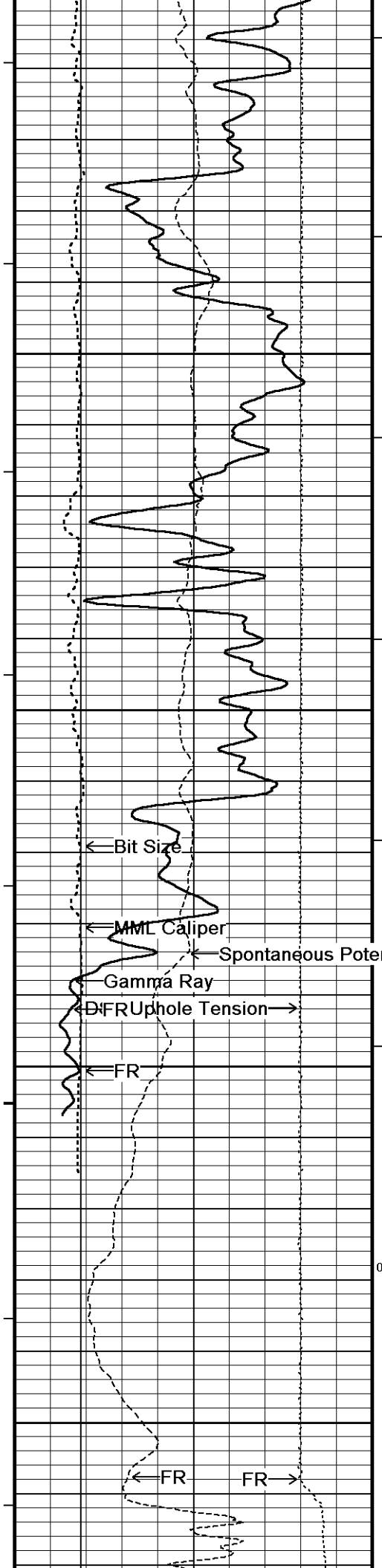
4850

120°

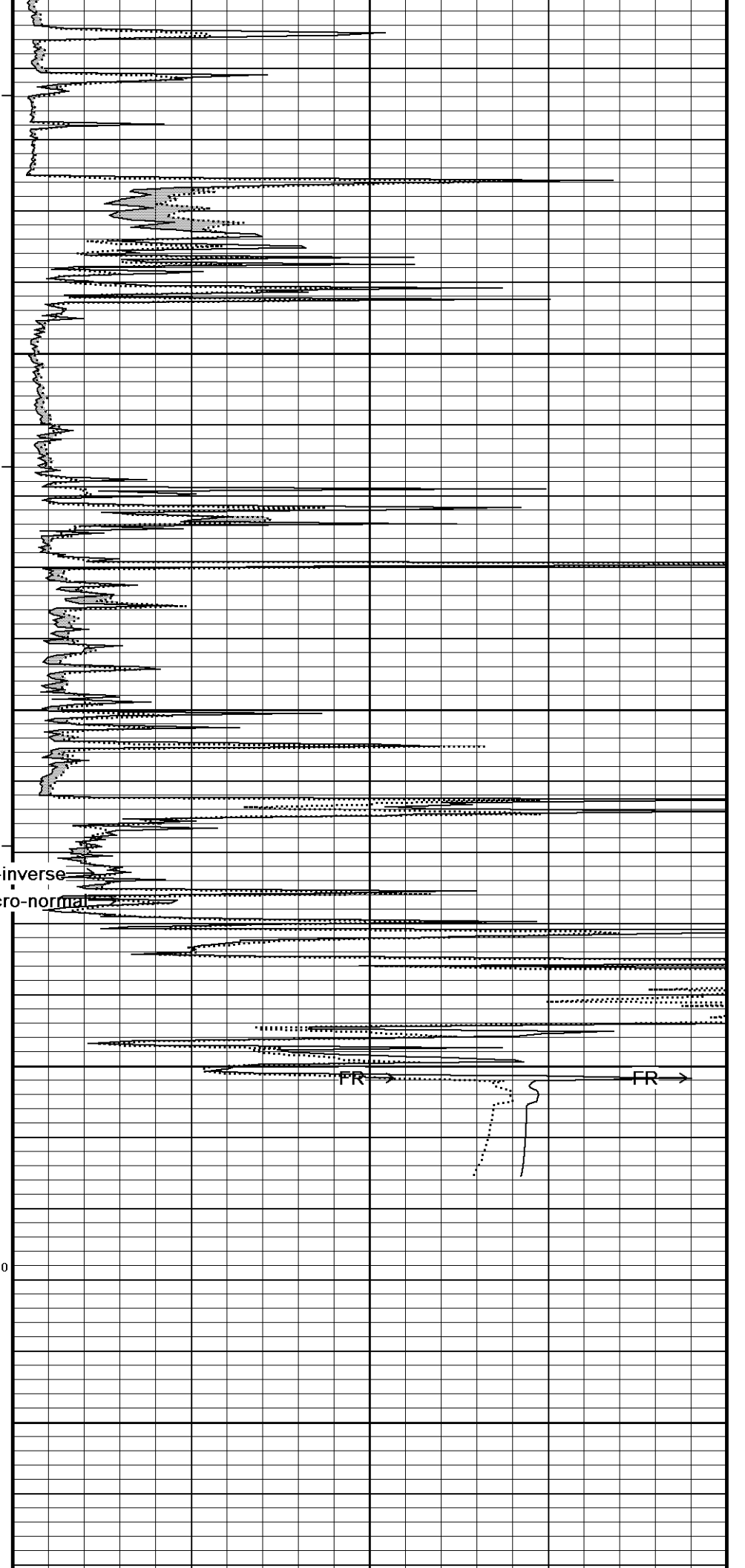
4900

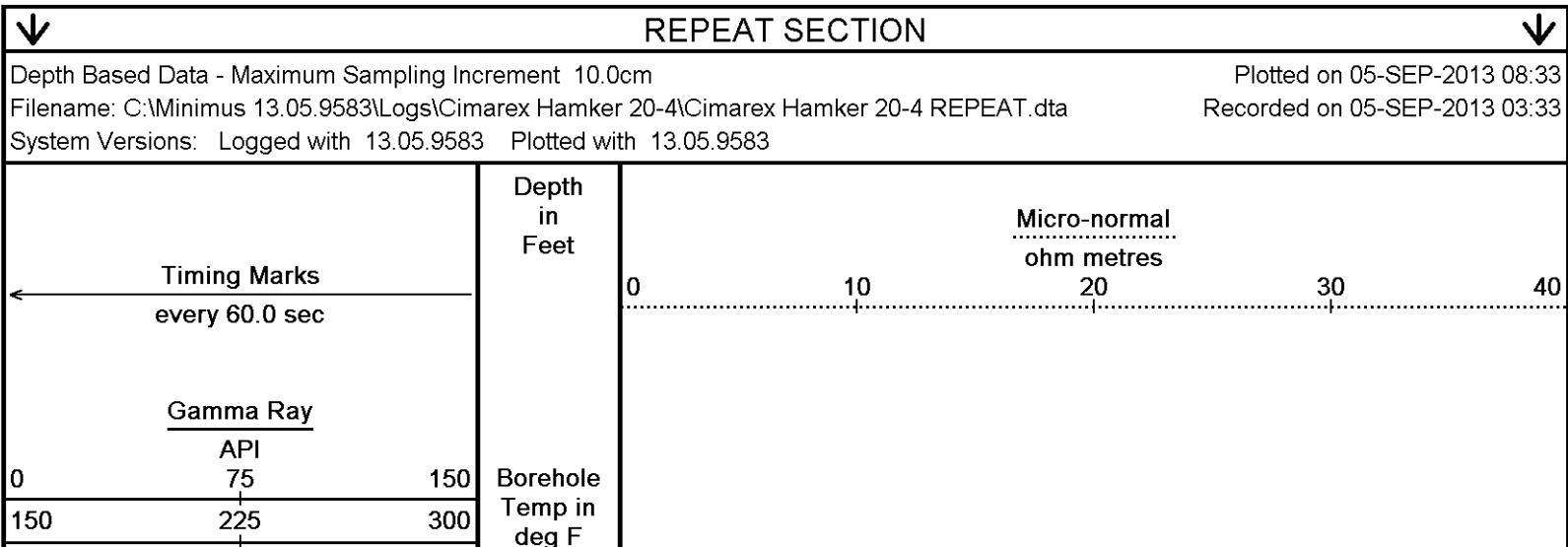
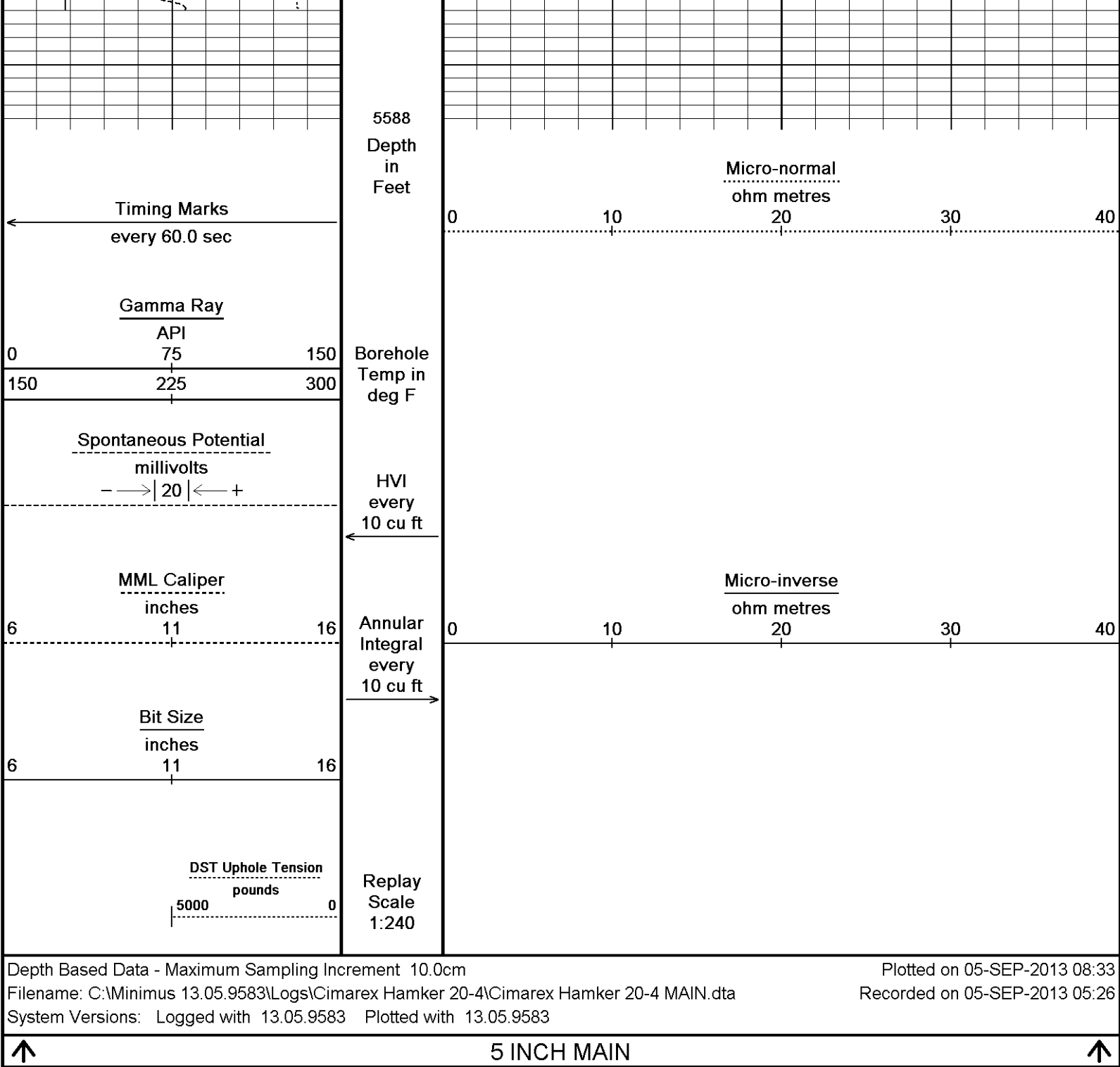


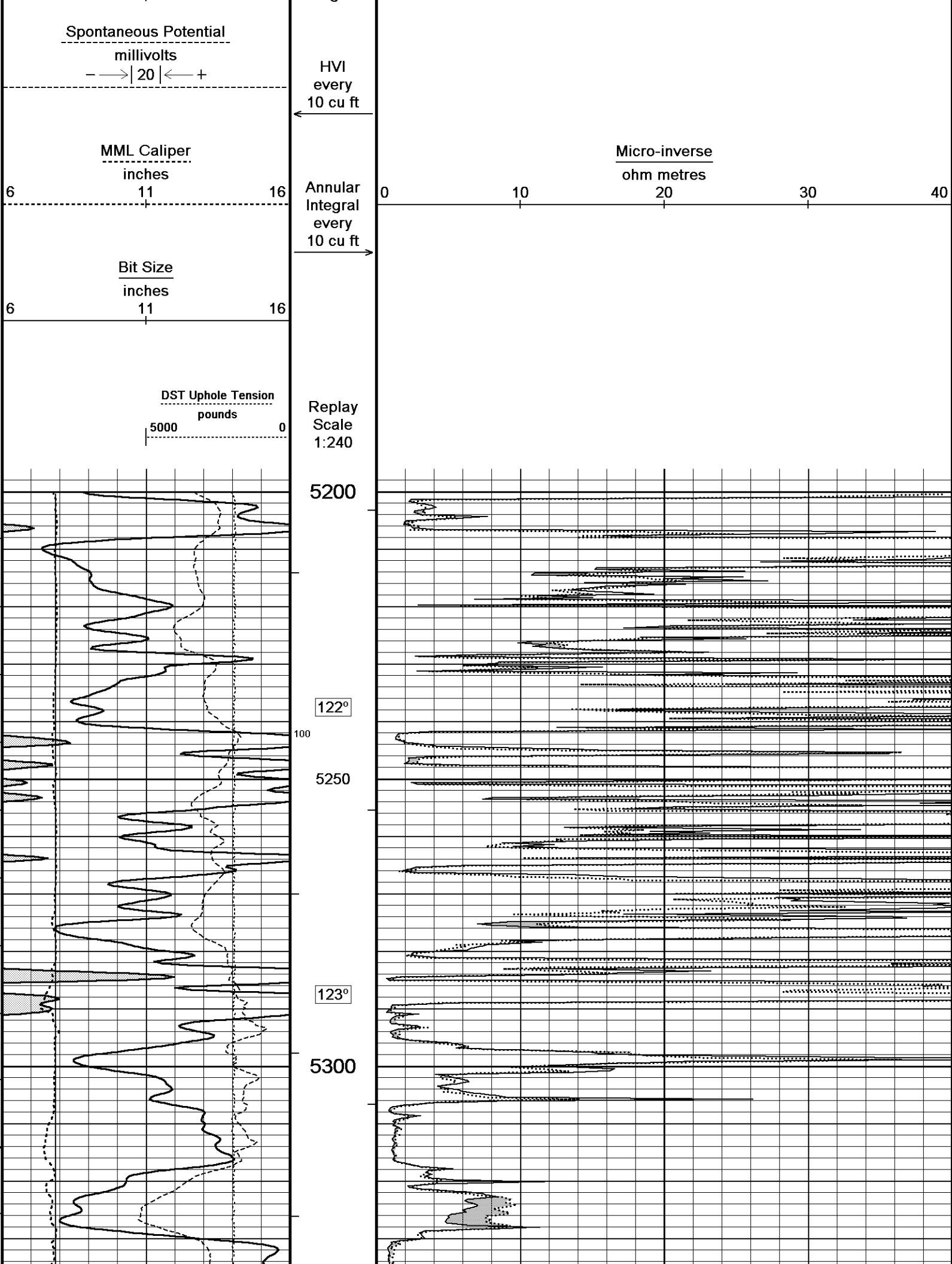


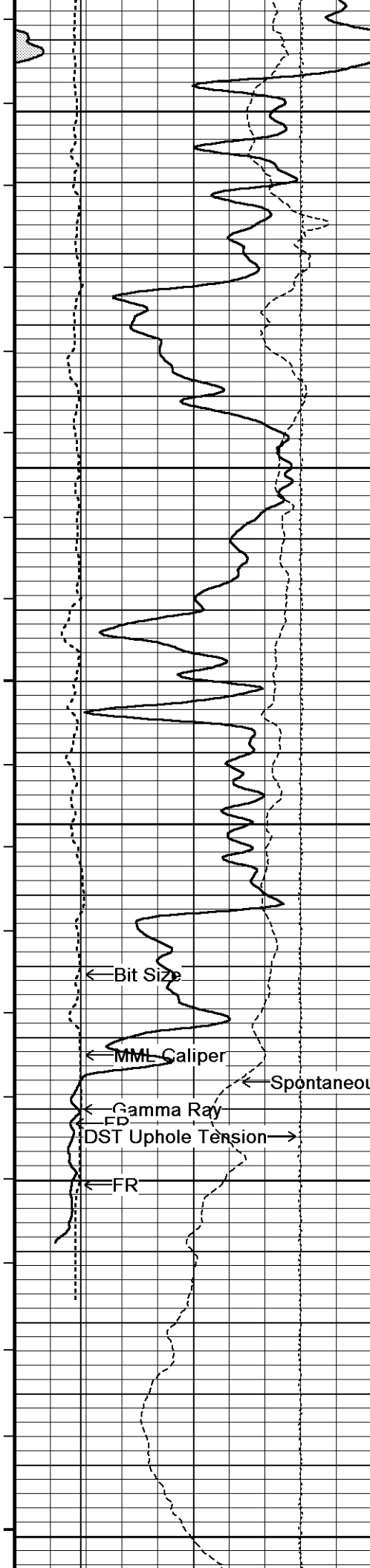


5500
126°
5400
126°
5450
126°
5500
0
5550









124°

5350

124°

5400

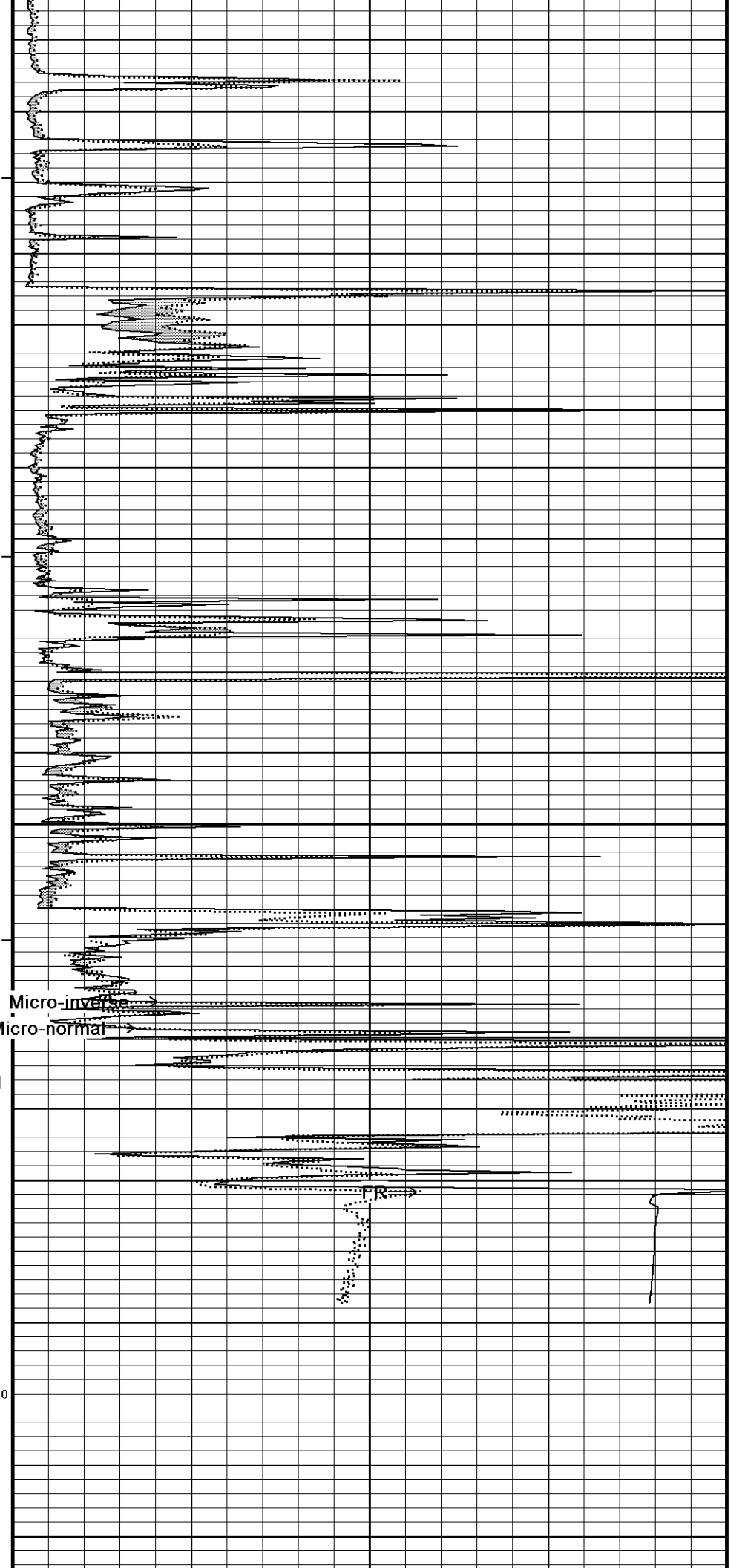
124°

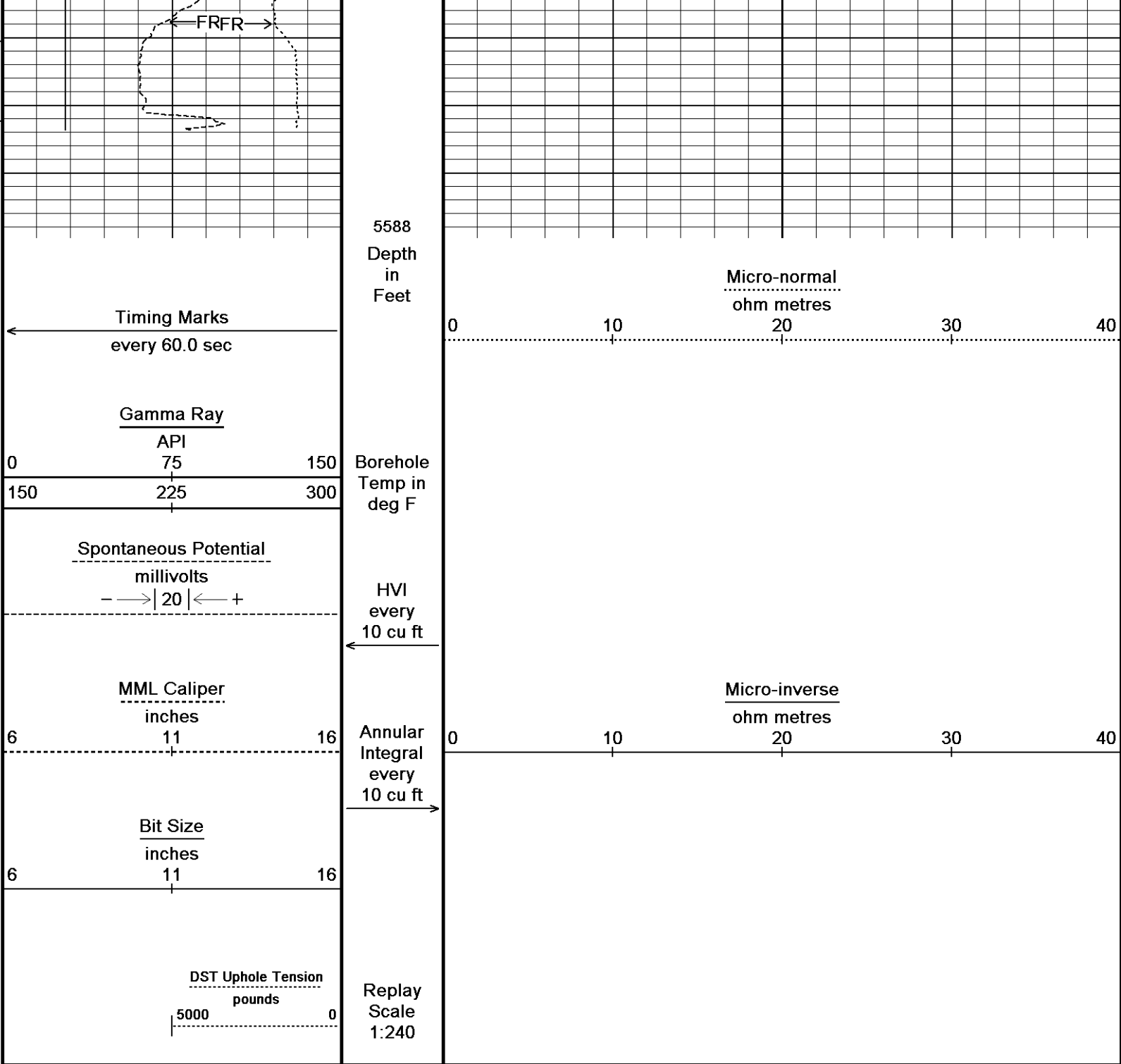
5450

Spontaneous Potential

5500

5550





Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Minimus 13.05.9583\Logs\Cimarex Hamker 20-4\Cimarex Hamker 20-4 REPEAT.dta
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION
C:\Minimus 13.05.9583\Logs\Cimarex Hamker 20-4\Cimarex Hamker 20-4 REPEAT.dta

General Constants All 000 Last Edited on 05-SEP-2013,00:24

General Parameters
Mud Resistivity 1.500 ohm-metres
Mud Resistivity Temperature 60.000 degrees F
Water Level 0.000 feet
Borehole Fluid Processing Wet Hole

Hole/Annular Volume and Differential Caliper Parameters
HVOL Method Single Caliper

HWOL Caliper 1	Density Caliper	
HWOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	MIE Caliper X	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	
SW/APOR Tool Source	0.000	

Gamma Calibration MCG-D.K 443			Field Calibration on 28-AUG-2013 04:17
	Measured	Calibrated (API)	
Background	53	36	
Calibrator (Gross)	1112	761	
Calibrator (Net)	1059	725	

Gamma Constants MCG-D.K 443			Last Edited on 05-SEP-2013,00:25
Gamma Calibrator Number	GRC38		
Mud Density	1.08	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl		kppm	
K Mud Type	Chloride		
K Mud Concentration	0.00	%	

High Resolution Temperature Calibration MCG-D.K 443			Field Calibration on 28-AUG-2013,04:08
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	

High Resolution Temperature Constants MCG-D.K 443			Last Edited on 28-AUG-2013,04:08
Pre-filter Length	11		

Caliper Calibration MML-A 16			Base Calibration on 16-AUG-2013 09:13 Field Calibration on 28-AUG-2013 04:07
Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	13832	5.98	
2	16950	7.97	
3	20199	9.86	
4	24116	11.92	
5	0	0.00	
6	N/A	N/A	
Field Calibration			
	Measured Caliper (in)	Actual Caliper (in)	
	7.98	7.97	

Micro Normal and Micro Inverse Calibration MML-A 16			Base Calibration on 16-AUG-2013 09:25 Field Check on 28-AUG-2013 03:58
Base Calibration			
Channel	Measured	Calibrated (ohm-m)	
	Resistor 1	Resistor 2	
Micro Normal	12.2	60.2	5.0 25.0
Micro Inverse	15.6	78.3	5.0 25.0
Channel	Base Check (ohm-m)	Field Check (ohm-m)	
Micro Normal	62.9	62.9	
Micro Inverse	48.3	48.3	

Micro Normal and Micro Inverse Constants MML-A 16			Last Edited on 29-AUG-2013,16:43
Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159		
Micro Normal K Factor	1.0000		
Micro Inverse K Factor	1.0000		
Standoff Offset	N/A	inches	

Accelerometer Parameters MIE-A.A 209

Date Of Last Accelerometer Calibration	20-FEB-2013,10:48		
	X Accelerometer	Y Accelerometer	Z Accelerometer
Slope	-1.113935	-1.111537	-1.102344
Offset	0.004254	0.005471	0.009082

Accelerometer Constants MIE-A.A 209

Last Edited on 18-JUN-2013,10:20

Accelerometer Calibrator Number		000			
Accelerometer Temperature Characterisation					
X Accelerometer					
Serial Number	826				
Calibration Date	18-Mar-2009				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	2.32377e-005	-1.87334e-008	9.07324e-011	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.71389e-004	4.55326e-007	4.58364e-010	
Y Accelerometer					
Serial Number	617				
Calibration Date	11-May-2008				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	1.76675e-005	6.93464e-010	2.98691e-011	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.56882e-004	5.72598e-007	2.37496e-010	
Z Accelerometer					
Serial Number	844				
Calibration Date	20-Mar-2009				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	-1.21769e-005	-1.46867e-008	-6.44015e-011	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.73539e-004	4.65657e-007	2.88996e-010	

Caliper Calibration MIE-A.A 209

Base Calibration on 18-JUN-2013 10:29
Field Calibration on 25-AUG-2013 20:26

Base Calibration					
Reading No	Pads 1-5 Meas.	Pads 3-7 Meas.	Calibrator Size (in)		
1	25996	27327	5.98		
2	35112	36609	7.97		
3	43537	44699	9.86		
4	54458	53758	11.92		
5	0	0	0.00		
Reading No	Pad 2 Meas.	Pad 4 Meas.	Pad 6 Meas.	Pad 8 Meas.	Calibrator Size (in)
1	24866	26950	24809	22742	5.98
2	33198	36237	32734	30154	7.97
3	41719	46122	40442	36719	9.86
4	52107	57802	48995	43412	11.92
5	0	0	0	0	0.00
Field Calibration					
	Measured	Measured	Actual		
	Pads 1-5 Caliper(in)	Pads 3-7 Caliper(in)	Caliper(in)		
	6.26	5.88	5.98		
	Measured	Measured	Measured	Measured	Actual
	Pad 2 Caliper(in)	Pad 4 Caliper(in)	Pad 6 Caliper(in)	Pad 8 Caliper(in)	Caliper(in)
	3.08	2.85	2.94	3.22	5.98

Caliper Constants MIE-A.A 209

Last Edited on 18-JUN-2013,10:20

Caliper Difference for BRKT	0.120	inches
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Magnetometer Parameters MIE-A.A 209

Date Of Last Magnetometer Calibration	20-FEB-2013,13:52		
	X Magnetometer	Y Magnetometer	Z Magnetometer
Slope	-1.000000	-1.012493	-1.007780
Offset	0.011941	-0.015960	0.015669

Magnetometer Constants MIE-A.A 209

Last Edited on

Magnetometer Calibrator Number

000

Navigation Constants MIE-A.A 209

Last Edited on 12-AUG-2013,10:56

Magnetic Declination

6.62

degrees

East

Compact Micro Imager Constants MIE-A.A 209

Last Edited on

Sonde Configuration

Imager Mode

Arm-Pad Kit

Normal Pads (12.25 in)

Arm-Pad Kit Serial Number

Centre Pad 1 Rotational Offset

0.00

degrees

Image/Borehole Ovality Reference

Azimuth of Pad 1

Non Active Buttons

Omit

Search Angle

0.00

degrees

Correlation Interval

3.28

feet

Correlation Step

1.64

feet

Current Offset

0.0000

mAmp

Squasher Start

0.0500

mAmp

Image Processing

Enabled

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Logs\Cimarex Hamker 20-4\Cimarex Hamker 20-4 REPEAT.dta

CBH-C, Cablehead, 11 pin

CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.24 in

Compact Comms Gamma

MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log

MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

Compact Neutron

MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper

MPD-B 59 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

SKJ-D.A Compact Knuckle Joint

SKJ-D.A 36 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

SKJ-D.A Compact Knuckle Joint

SKJ-D.A 37 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact MMI Memory Section

MIM-B.A 251 LG: 4.65 ft WT: 26.5 lb OD: 2.24 in

Compact MMI Electrode Section

MIE-A.A 209 LG: 13.96 ft WT: 99.2 lb OD: 4.09 in

Compact Focussed Electric



65.80 ft

GRGC - Gamma Ray

62.90 ft

CGXT - MCG External Temperature

56.18 ft

MINV - Micro-inverse

56.18 ft

MNRL - Micro-normal

57.17 ft

MLTC - MML Caliper

51.38 ft

NPRL - Limestone Neutron Por.

44.14 ft

CLDC - Density Caliper

42.21 ft

DPRL - Limestone Density Por.

42.21 ft

DEN - Compensated Density

42.21 ft

DCOR - Density Correction

42.15 ft

PDPE - PE

19.10 ft

IECX - MIE Caliper X

19.10 ft

IECY - MIE Caliper Y

18.59 ft

DI26 - Imager Diameter 2 - 6

18.59 ft

DI48 - Imager Diameter 4 - 8

13.72 ft

FEFE - Shallow FE

MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction

MAI-A.A 178 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 73.48 ft Weight: 582.0 lb



3.34 ft R400 - Array Ind. One Res 40
3.34 ft RTAO - Array Ind. One Res Rt
3.34 ft R600 - Array Ind. One Res 60
0.23 ft SPCG - Spontaneous Potential
Tool Zero (0.13ft from bottom)
-0.13 ft SMTU - DST Uphole Tension
All measurements relative to tool zero.

COMPANY	CIMAREX ENERGY CO.
WELL	HAMKER 20-4
FIELD	WILDCAT
PROVINCE/COUNTY	HASKELL
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2857.00	feet	First Reading	5501.00	feet
Elevation Drill Floor	2855.00	feet	Depth Driller	5559.00	feet
Elevation Ground Level	2849.00	feet	Depth Logger	5558.00	feet



MICRORESISTIVITY LOG

Weatherford®