



**Weatherford**

**MICRORESISTIVITY LOG**

COMPANY WESTERN OPERATING COMPANY

WELL FOX #1-8

FIELD HELFRICH

PROVINCE/COUNTY HAMILTON

COUNTRY/STATE U.S.A. / KANSAS

LOCATION 335' FNL & 495' FWL

SEC TWP RGE Other Services  
8 25S 42W MAI/MFE MPD/MDN

API Number 15-075-20866

Permit Number

Permanent Datum GL, Elevation 3596 feet

Log Measured From KB

Drilling Measured From KB

Elevations: feet  
KB 3609.00  
DF 3608.00  
GL 3596.00

Date 16-JAN-2013

Run Number ONE

Service Order 3537806

Depth Driller 5400.00 feet

Depth Logger 5400.00 feet

First Reading 5367.00 feet

Last Reading 2300.00 feet

Casing Driller 850.00 feet

Casing Logger 842.00 inches

Bit Size 7.875

Hole Fluid Type CHEMICAL lb/USg

Density / Viscosity 9.40 lb/USg 50.00 CP

PH / Fluid Loss 9.50 9.50

Sample Source FLOWLINE

Rm @ Measured Temp 0.58 @ 73.0 ohm-m

Rmf @ Measured Temp 0.46 @ 73.0 ohm-m

Rmc @ Measured Temp 0.70 @ 73.0 ohm-m

Source Rmf / Rmc CALC CALC

Rm @ BHT 0.37 @ 119.0 ohm-m

Time Since Circulation 4 HOURS

Max Recorded Temp 119.00 deg F

Equipment / Base 13096 LIB

Recorded By ADAM SILL

Witnessed By PETER DEBENHAM

JOB # LB13-012

**BOREHOLE RECORD**

Last Edited: 16-JAN-2013 12:26

Bit Size inches	Depth From feet	Depth To feet
7.875	850.00	5400.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	850.00	24.00

**REMARKS**

- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MAI RAN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  - 0.5 INCH STANDOFF USED ON MFE.
  - 0.5 INCH STANDOFF USED ON MAI.
- 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 SURFACE CASING: 2134 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO 2300 FT: 578 CU. FT.
- SERVICE ORDER # 3537806

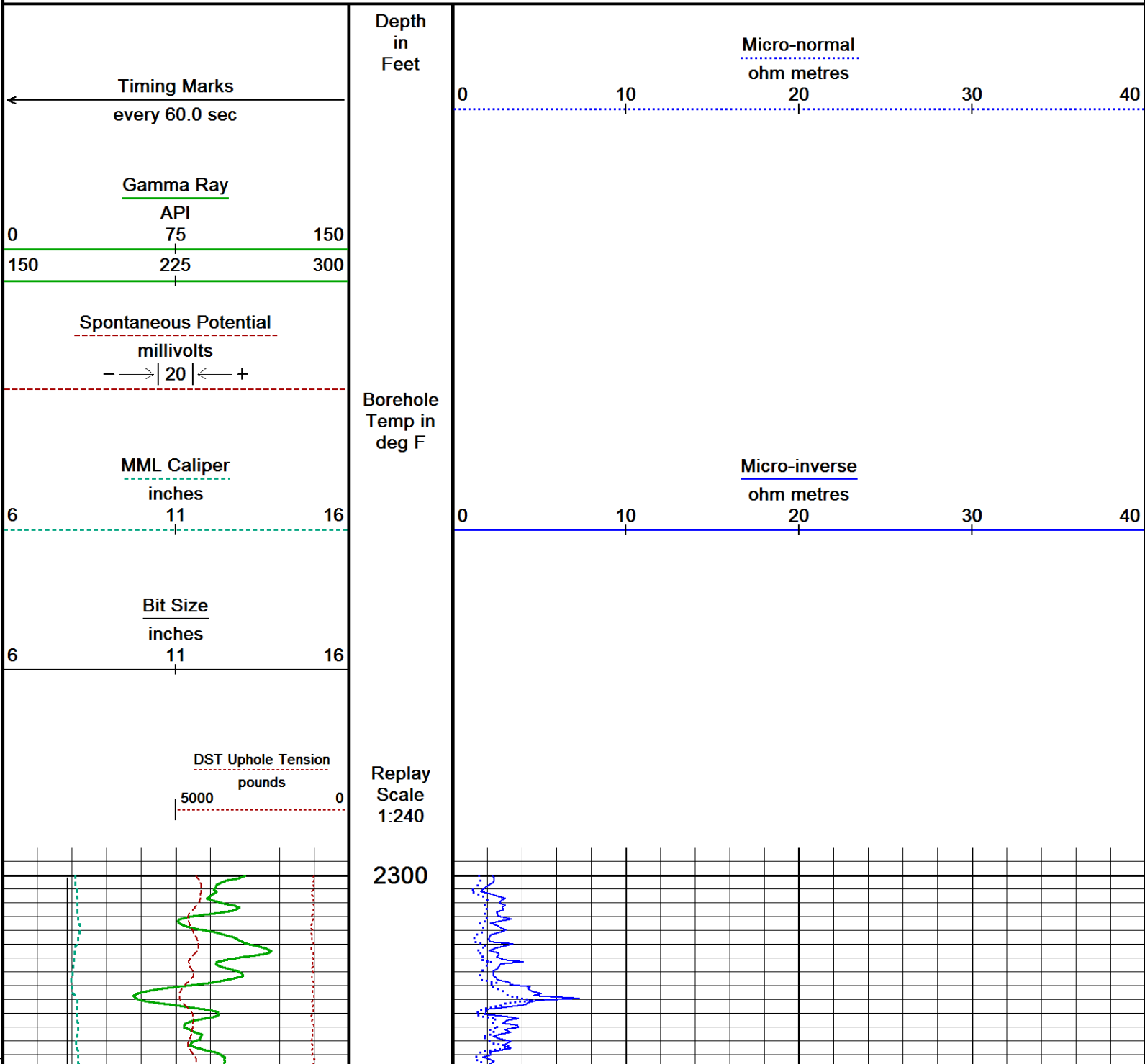
- RIG: MURFIN #25.
- ENGINEER: A. SILL.
- OPERATOR(S): B. JOHNSON.

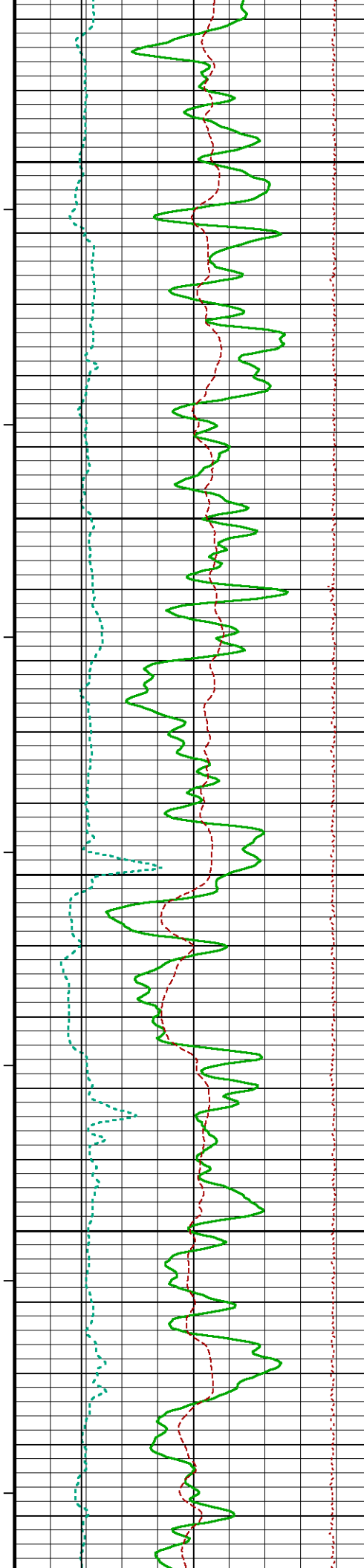
\*\*\*\* SOFTWARE ISSUE CHANGED FLUID LOSS TO MATCH THE PH, FLUID LOSS SHOULD BE 9.6 ML/30MIN. \*\*\*\*

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.

**5 INCH MAIN**

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 18-JAN-2013 08:57  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weatherford...Western Operating Fox #1-8\_002.dta Recorded on 16-JAN-2013 14:37  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506





$91^\circ$

2350

$92^\circ$

2400

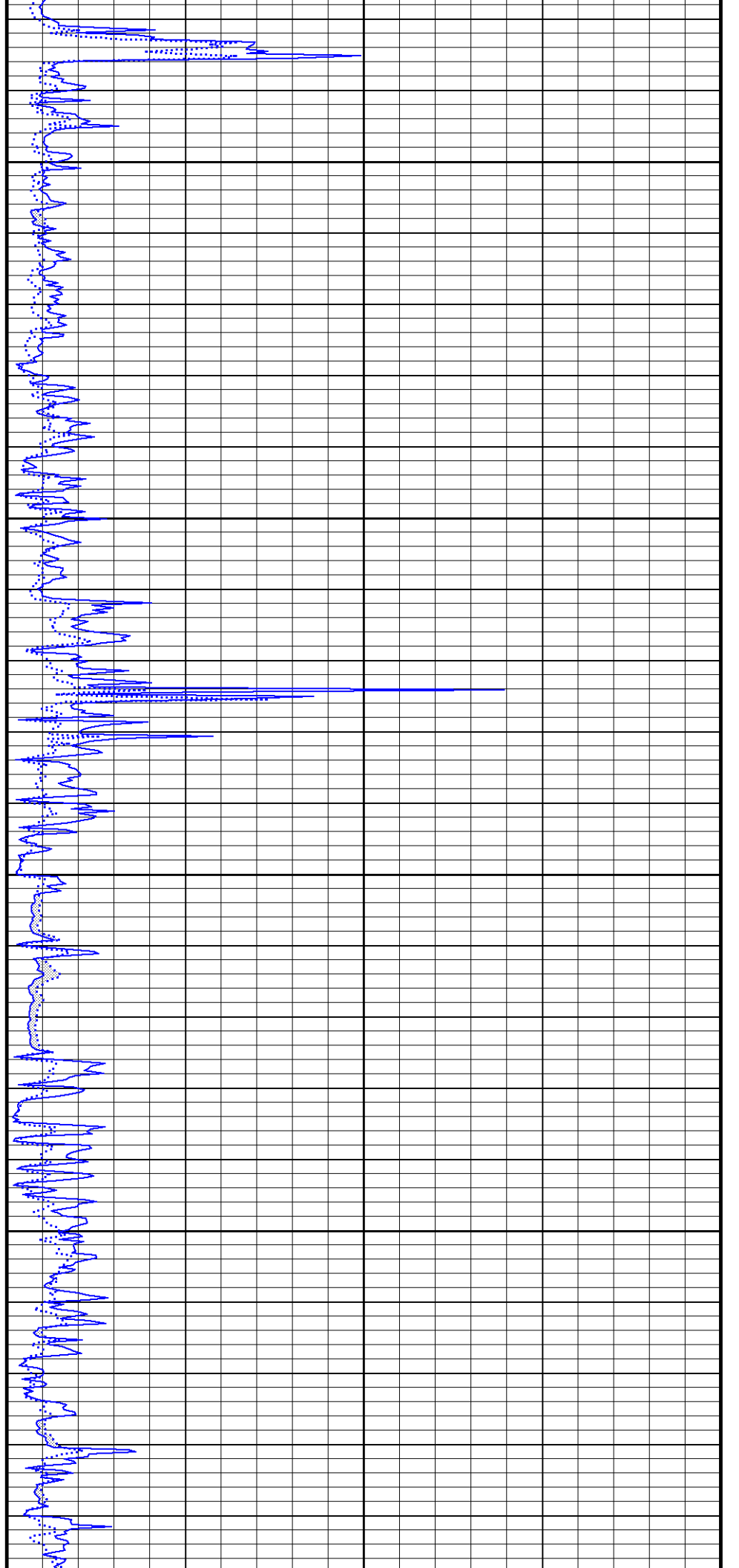
$92^\circ$

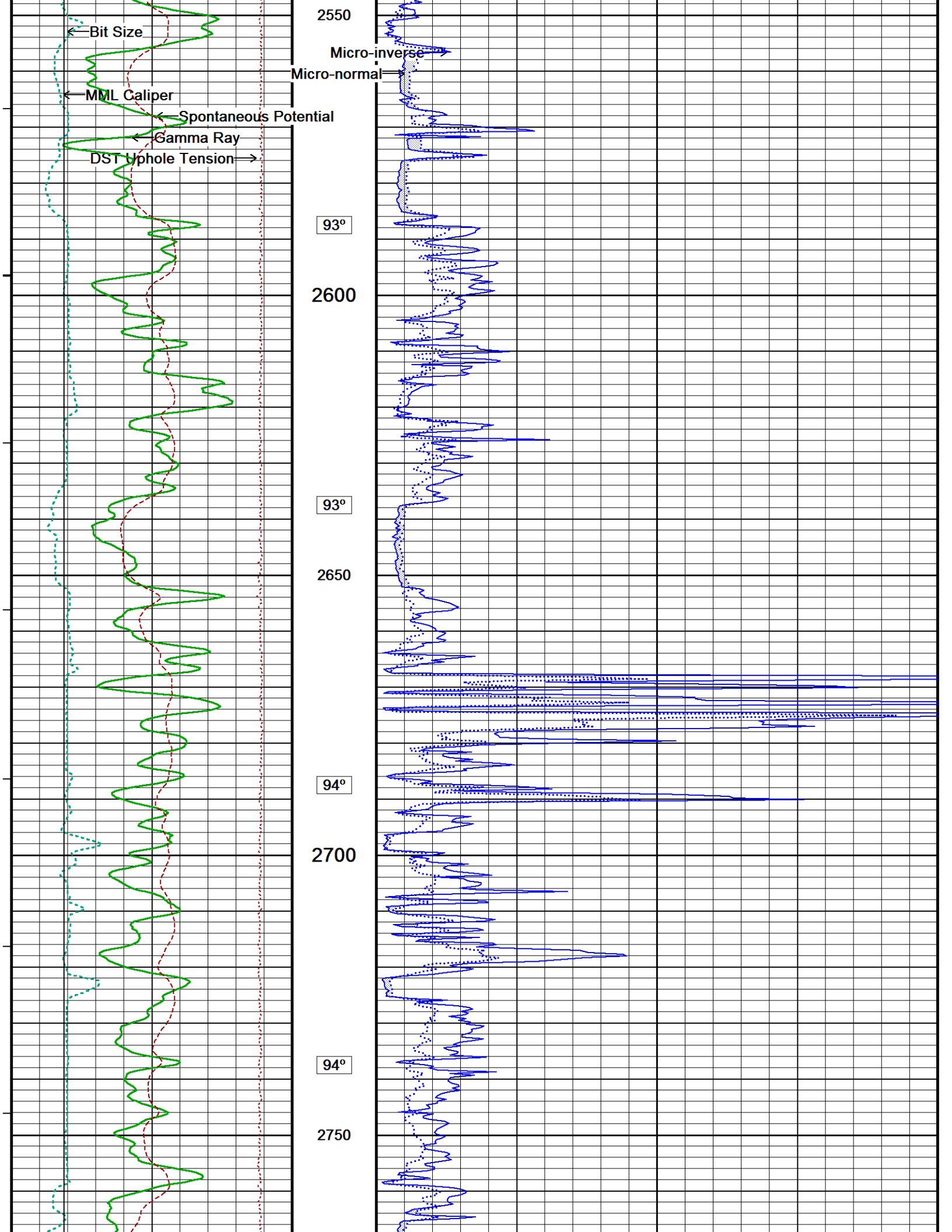
2450

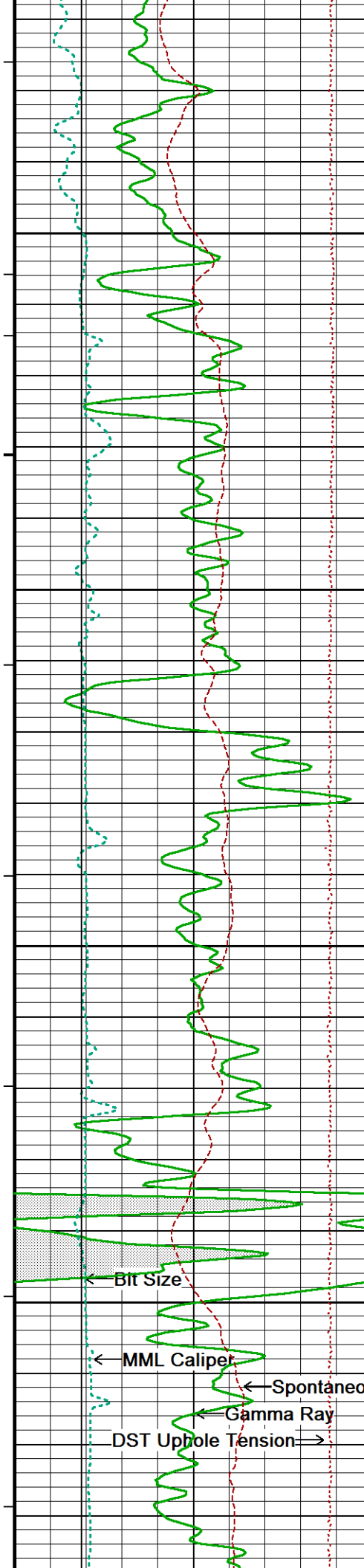
$92^\circ$

2500

$93^\circ$







95°

2800

95°

2850

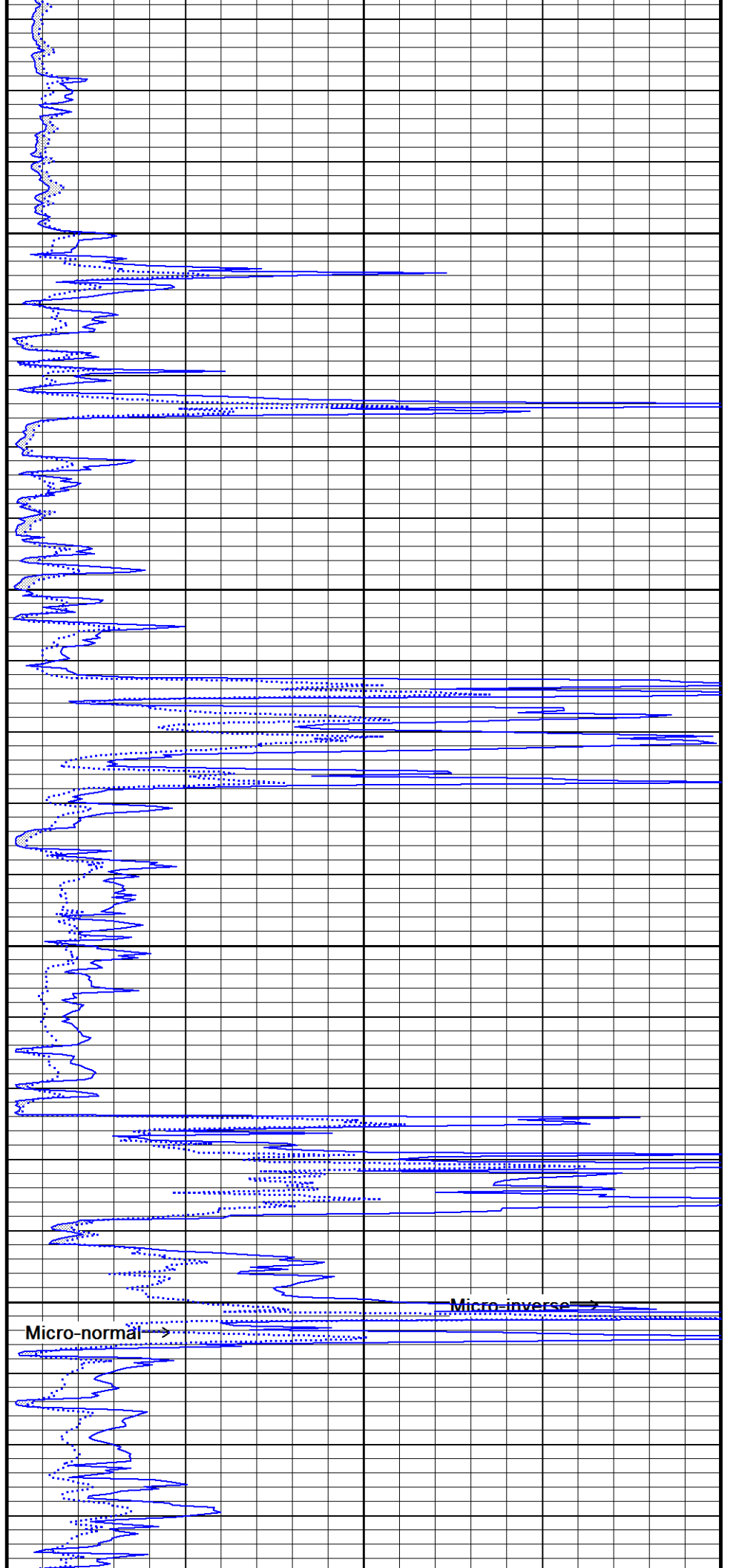
95°

2900

96°

2950

96°



Micro-normal →

Micro-inverse →

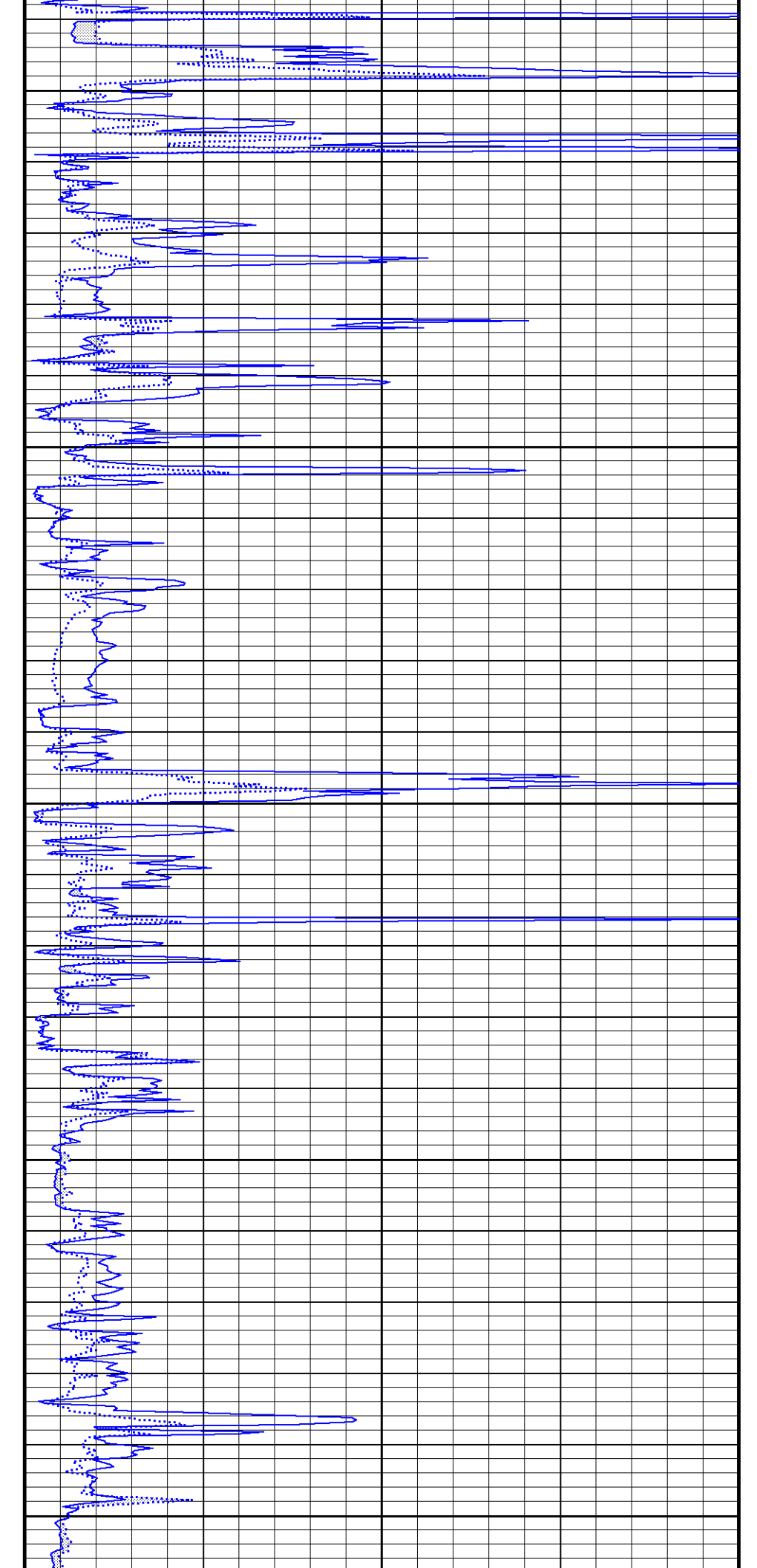
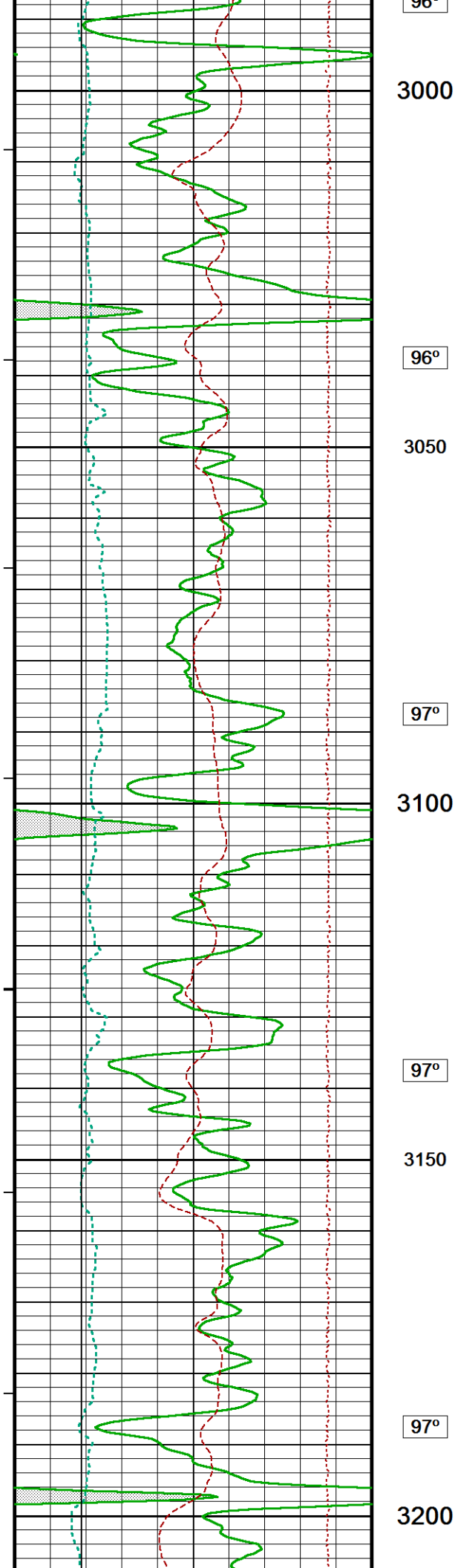
← Bit Size

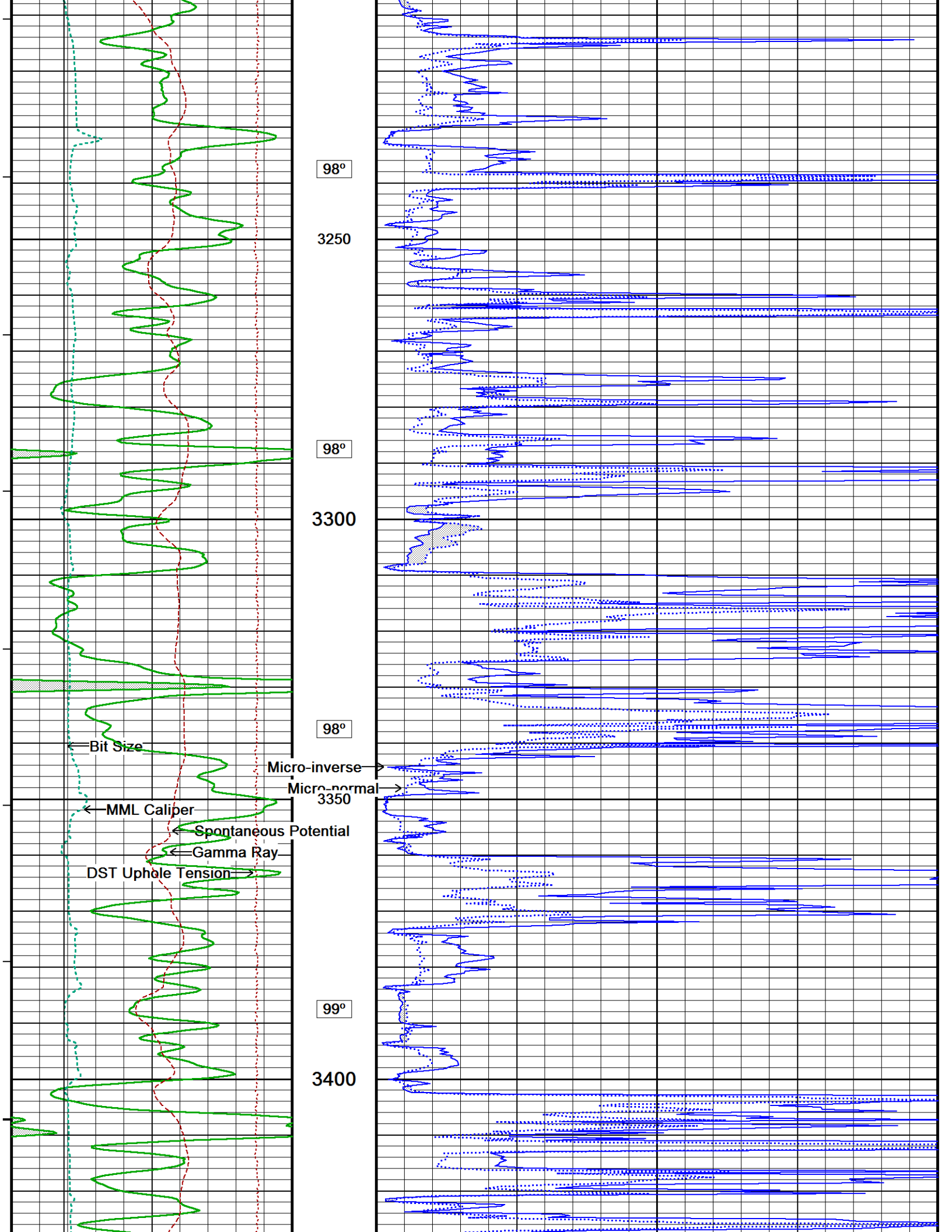
← MML Caliper

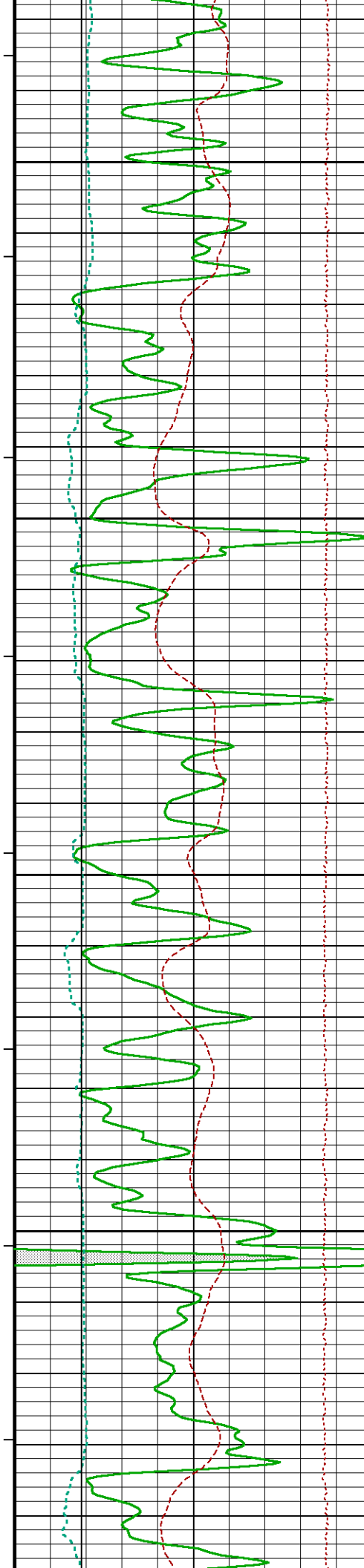
← Spontaneous Potential

← Gamma Ray

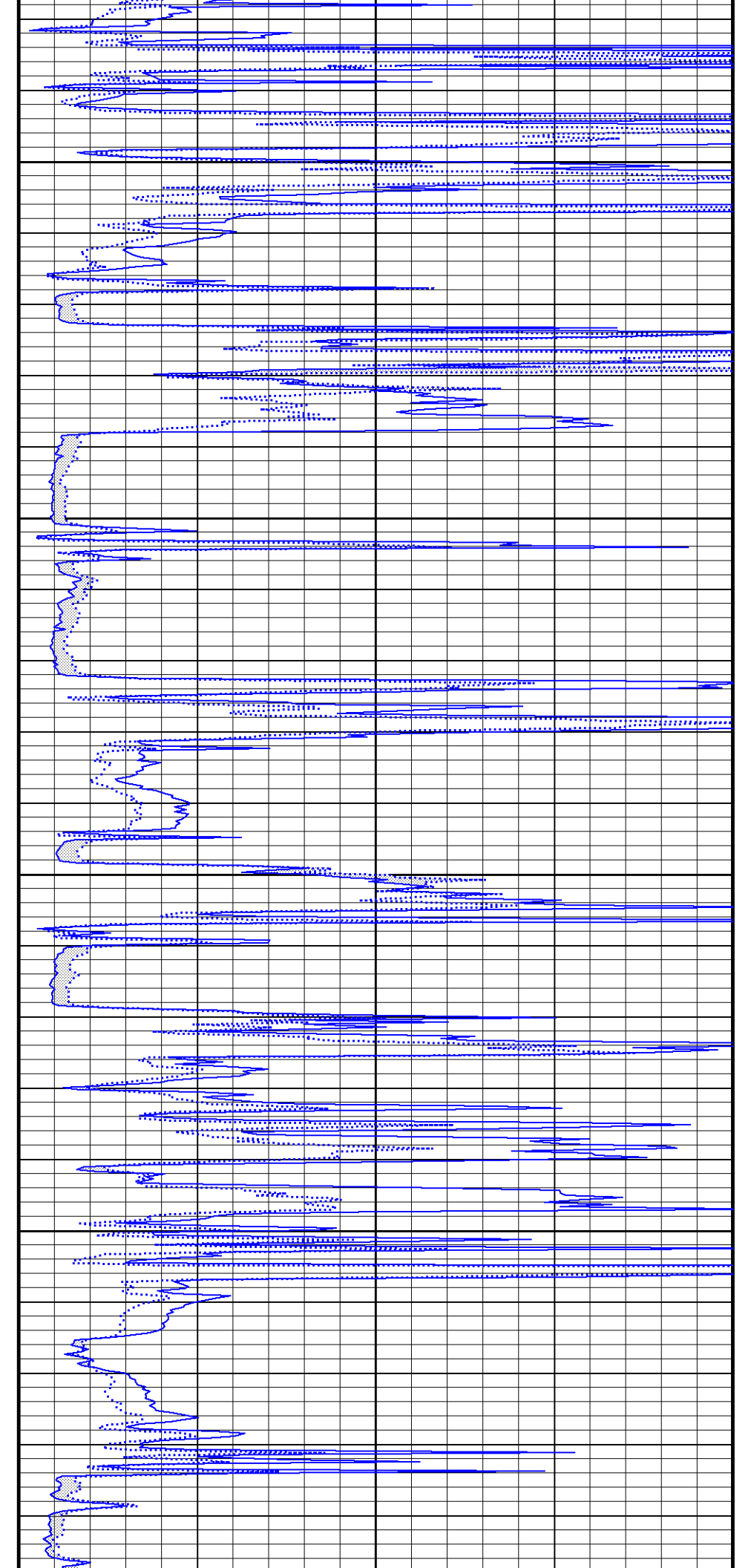
DST Uphole Tension →

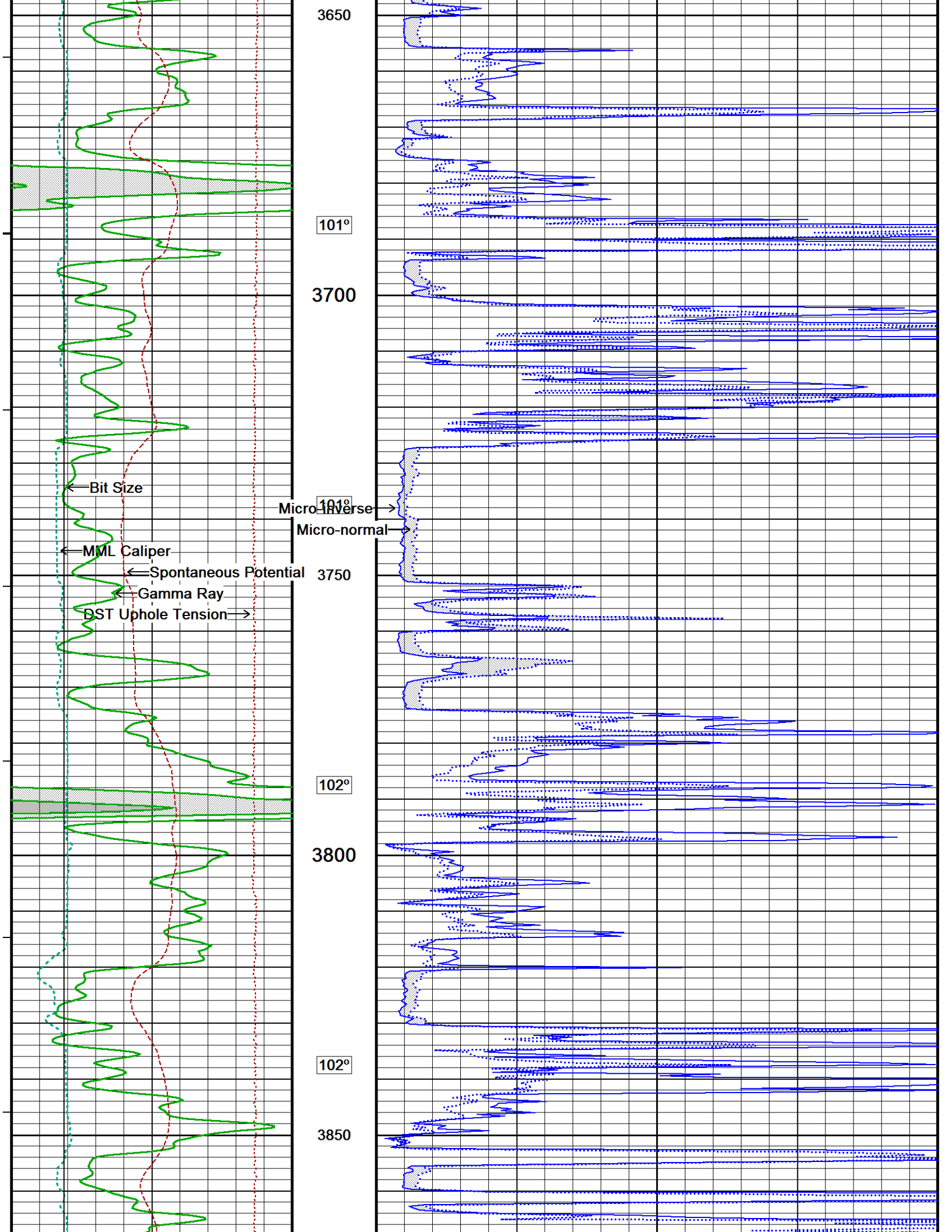


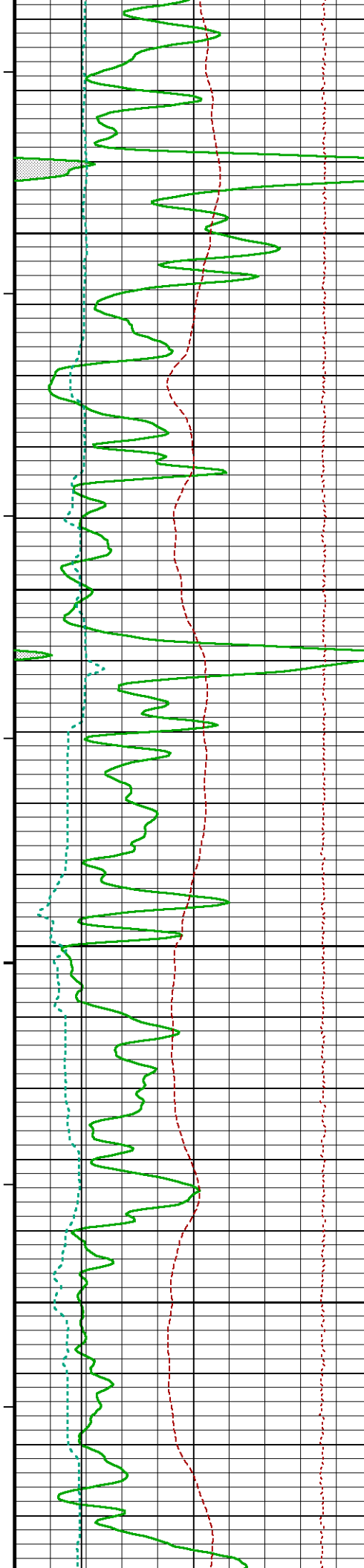




99°  
3450  
99°  
3500  
100°  
3550  
100°  
3600  
101°







103°

3900

103°

3950

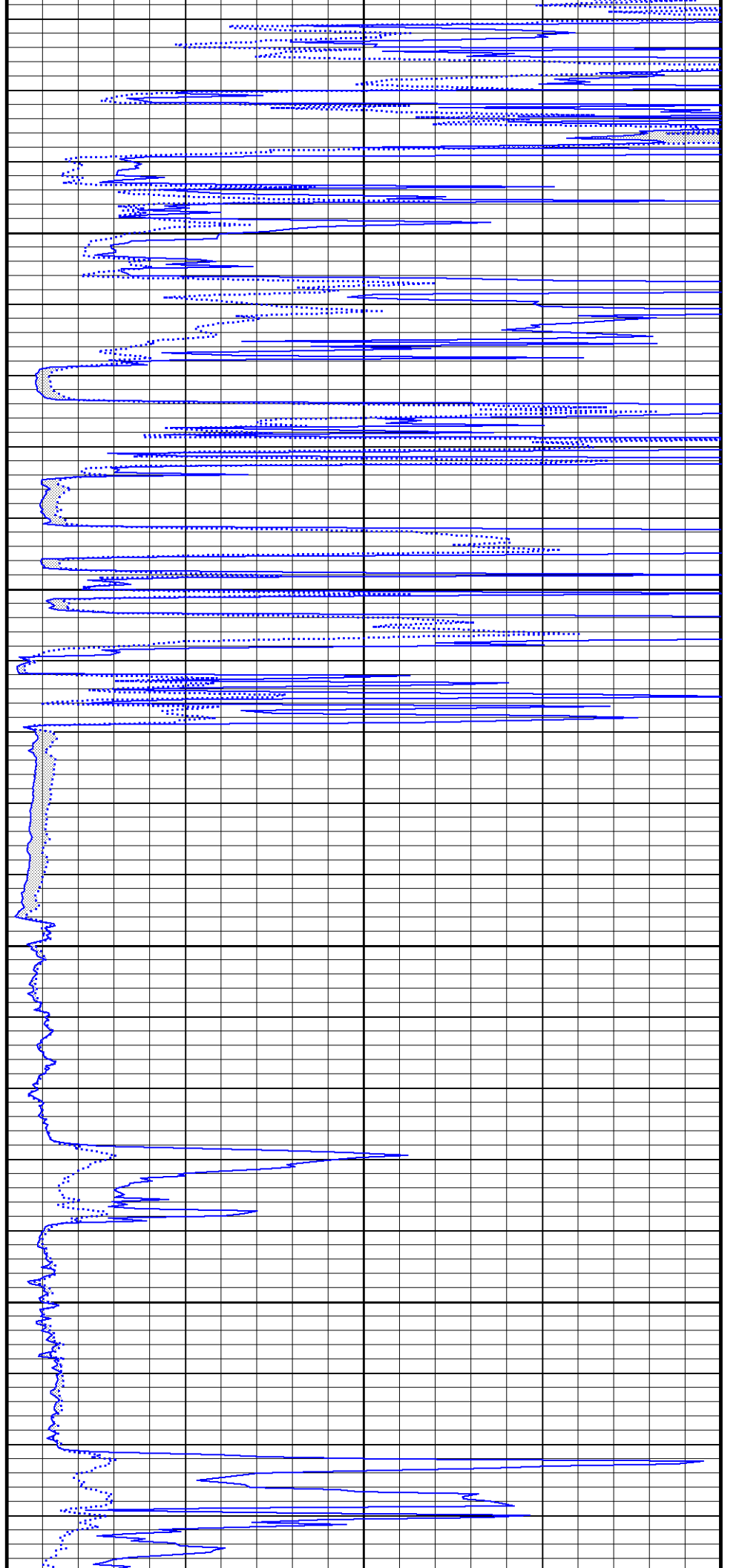
103°

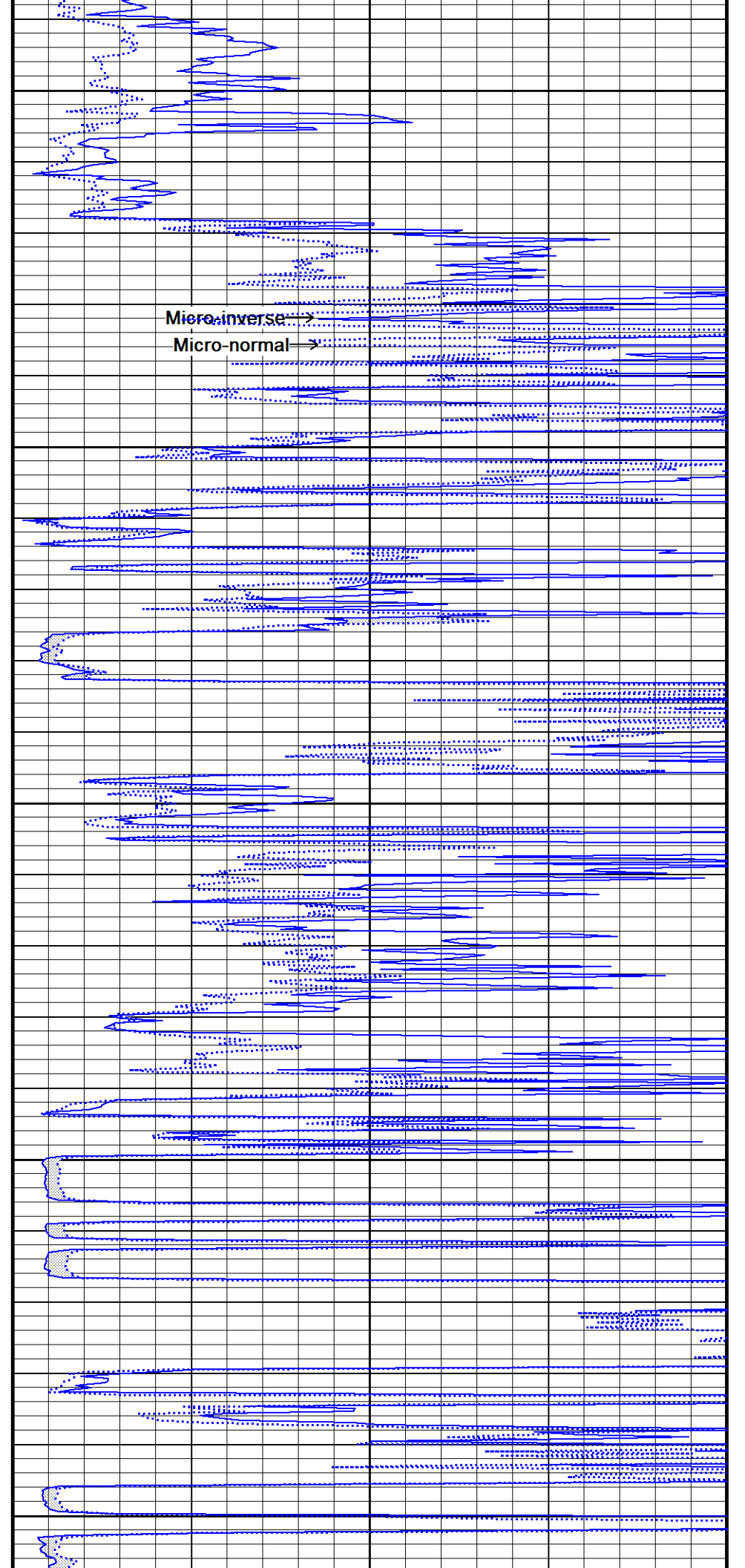
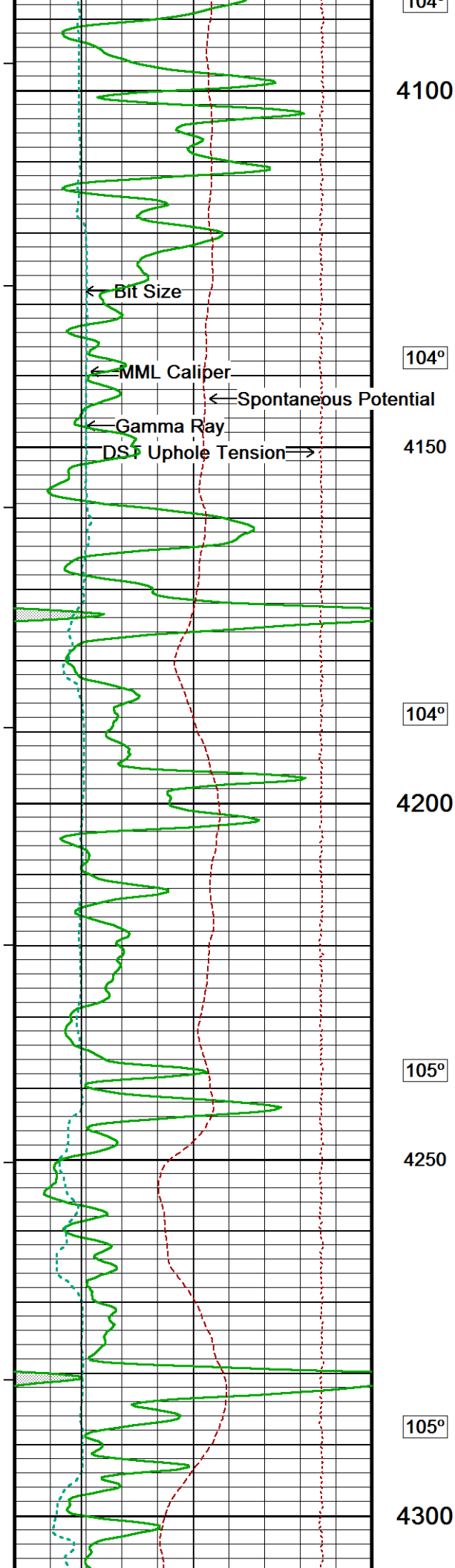
4000

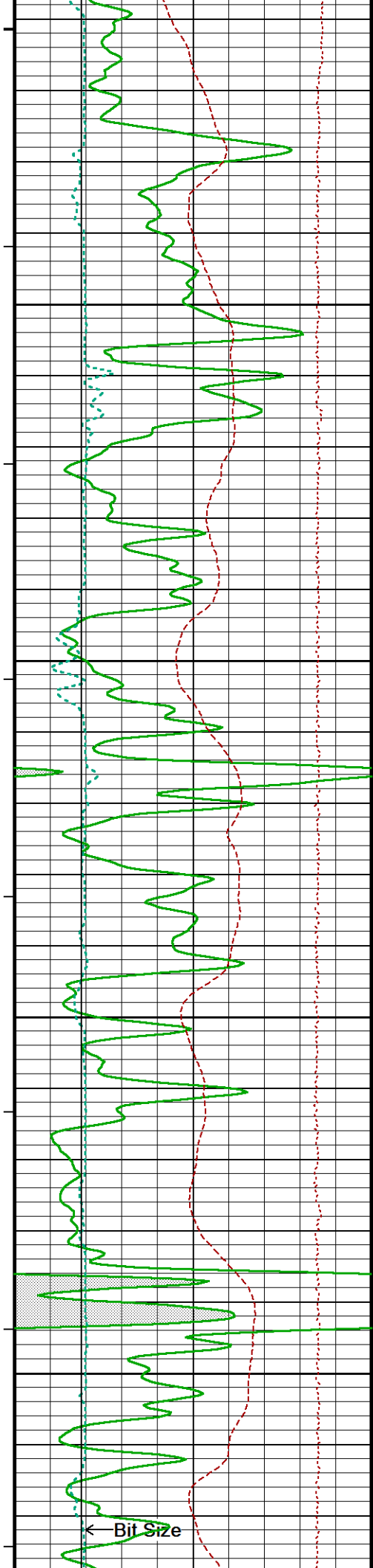
104°

4050

104°







105°

4350

106°

4400

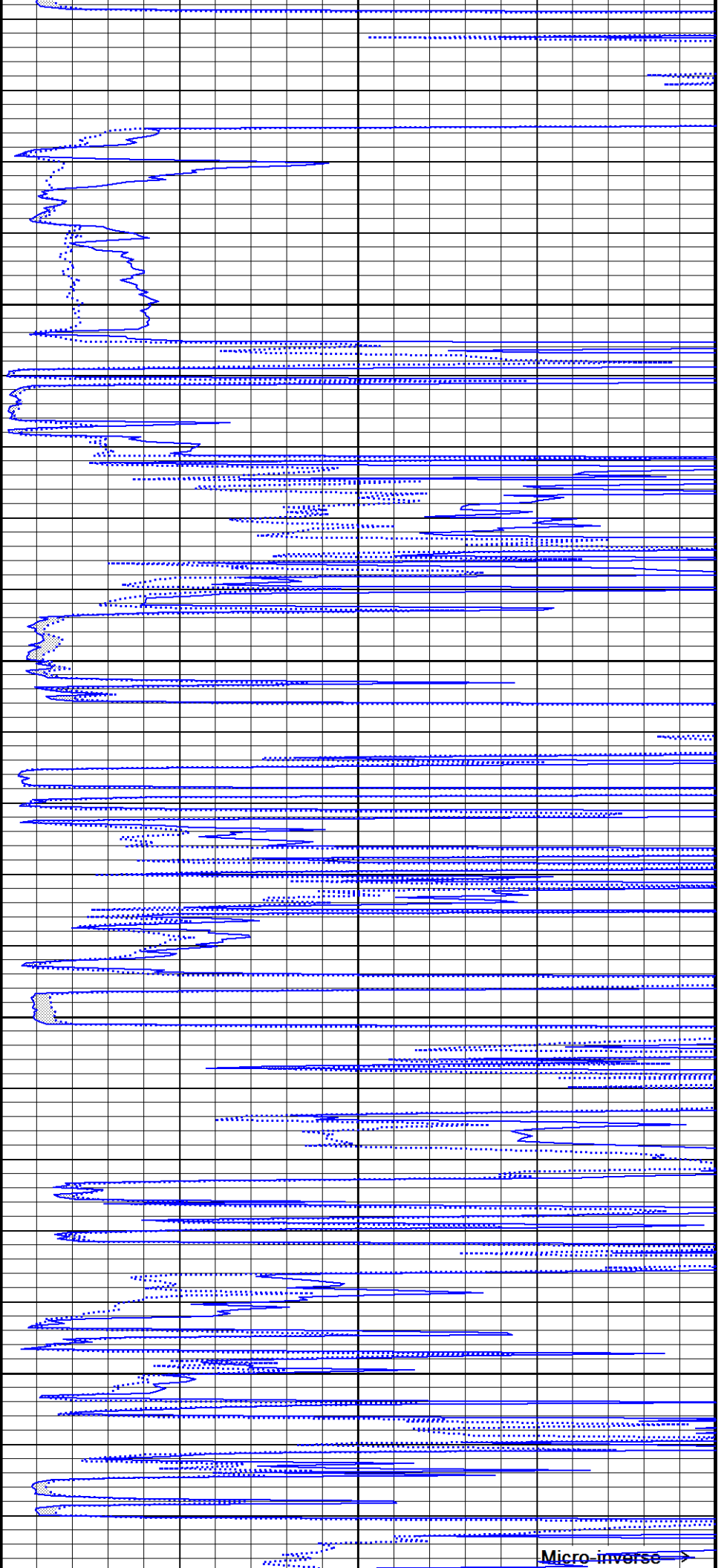
106°

4450

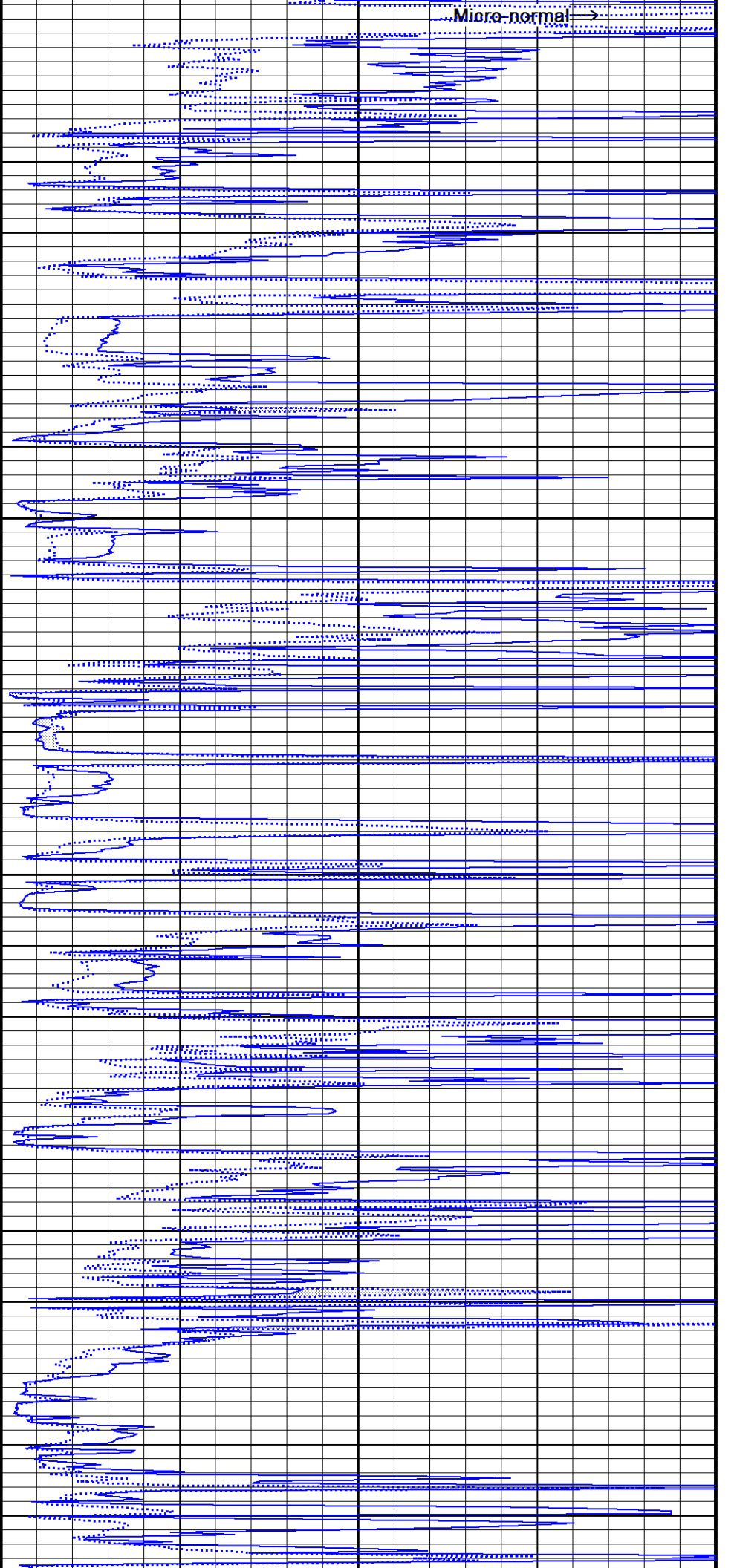
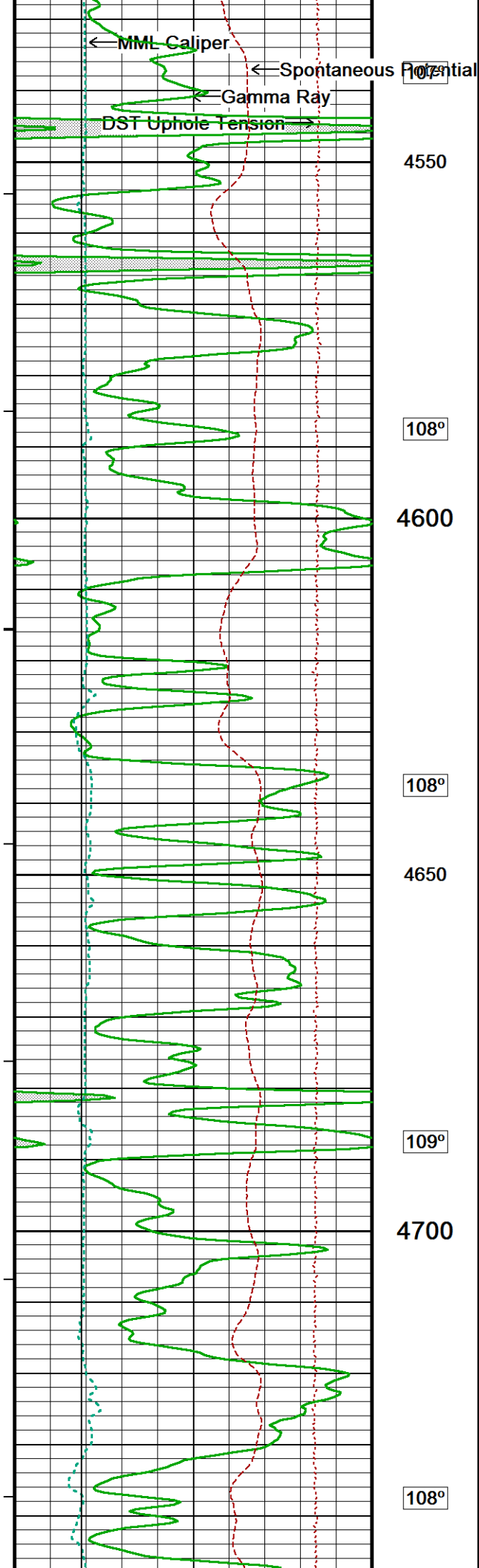
107°

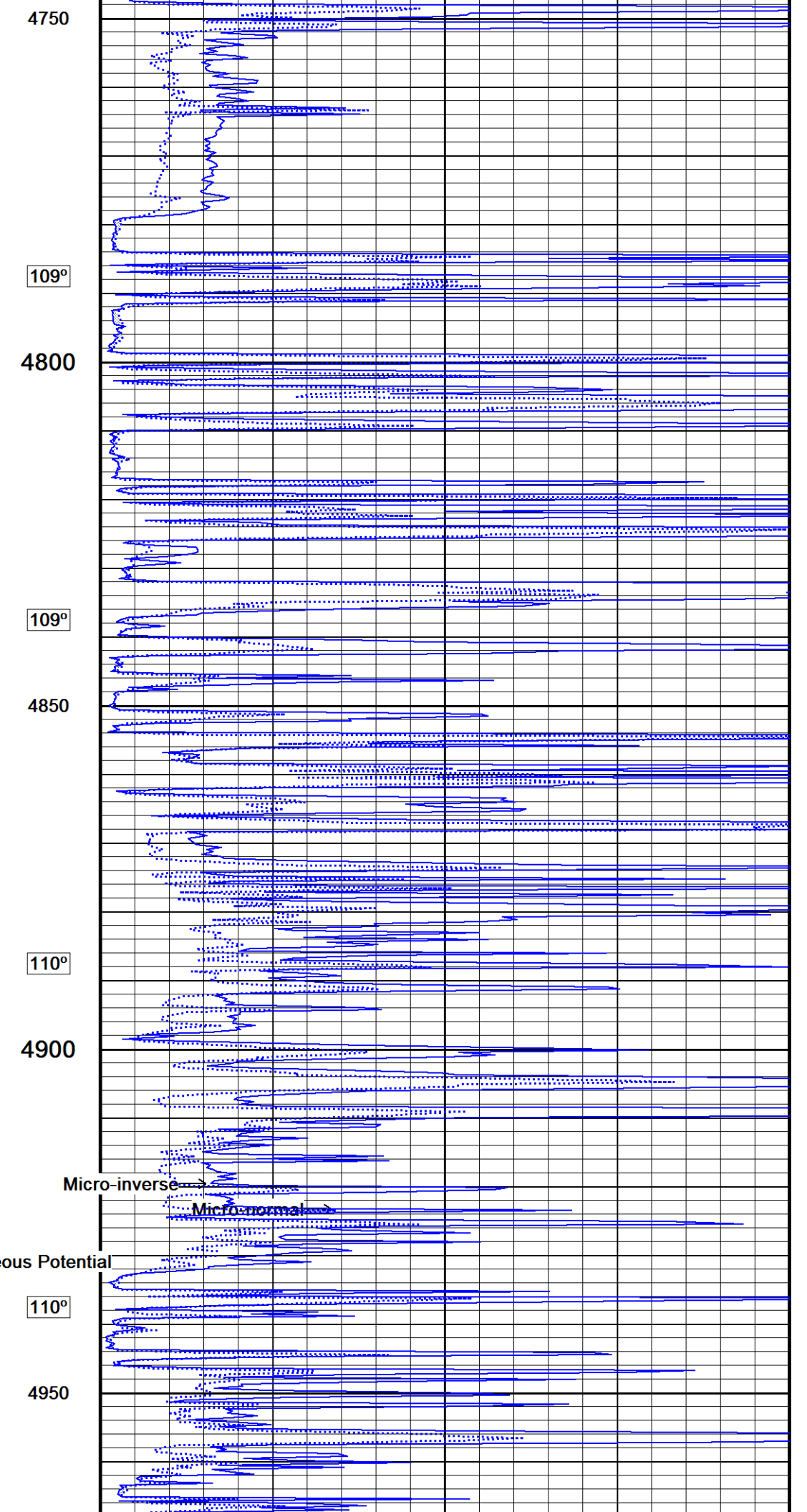
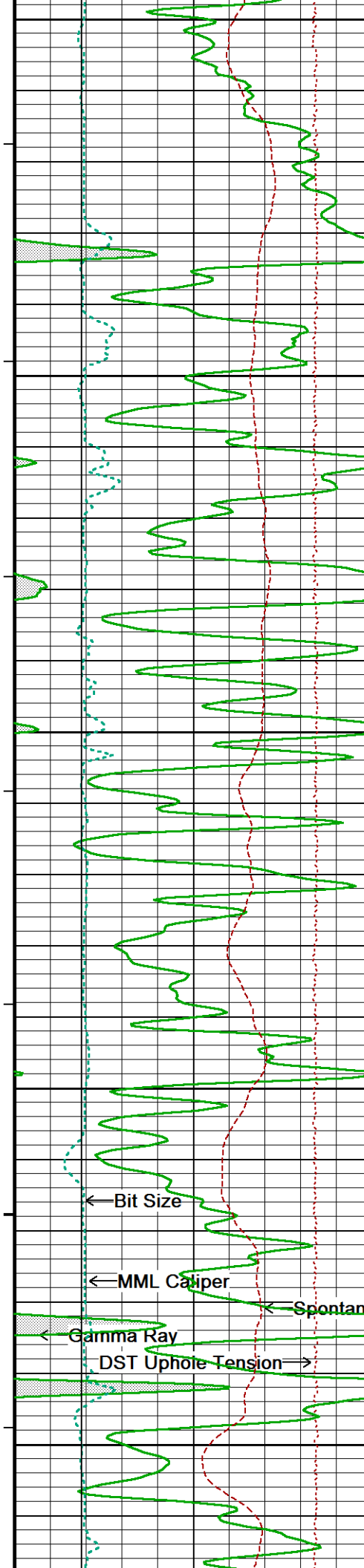
4500

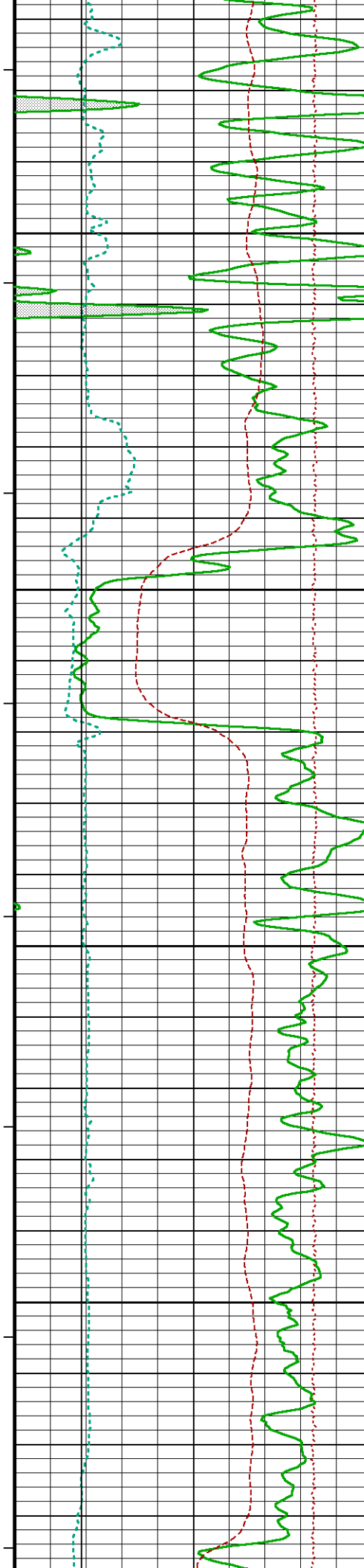
← Bit Size



Micro-inverse →







110°

5000

112°

5050

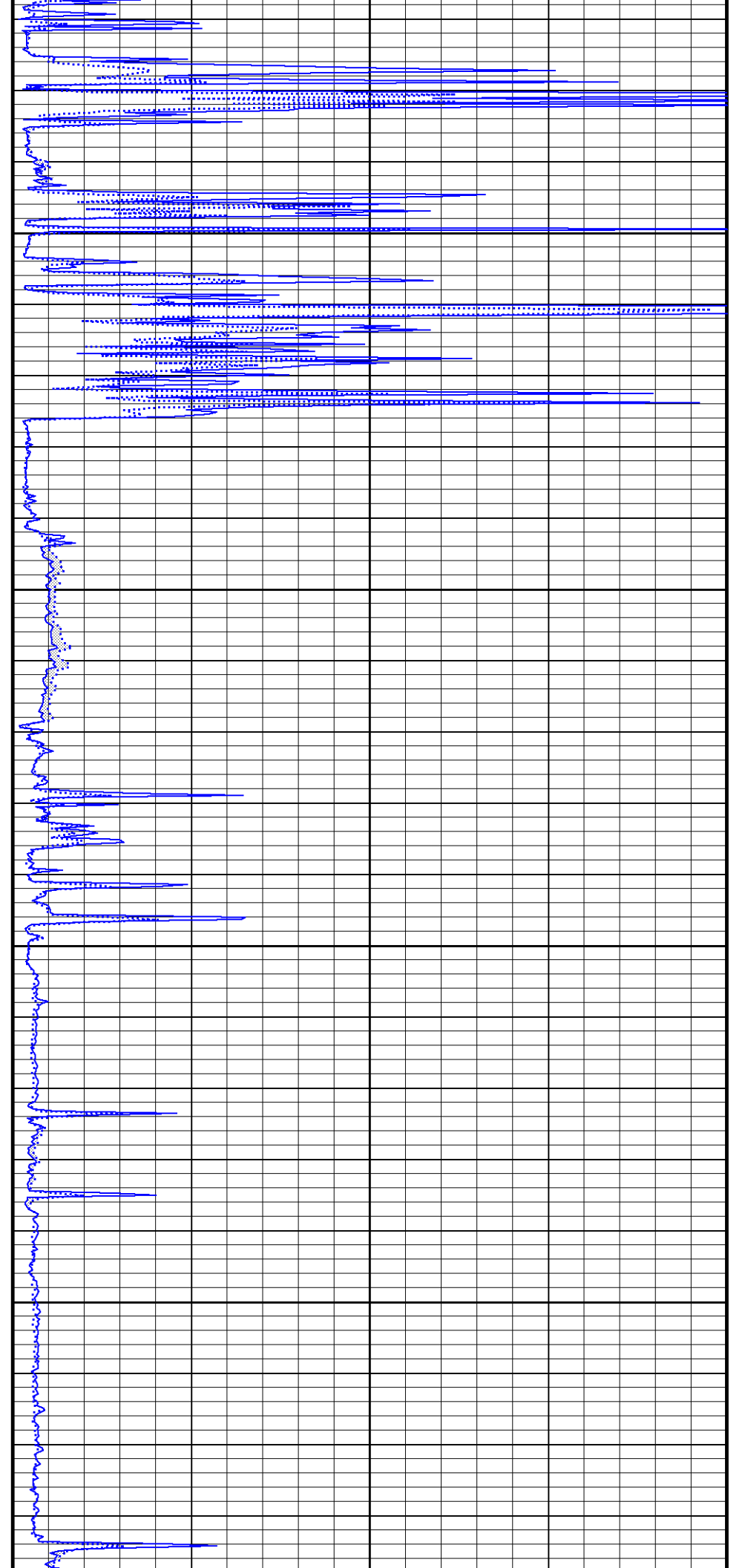
113°

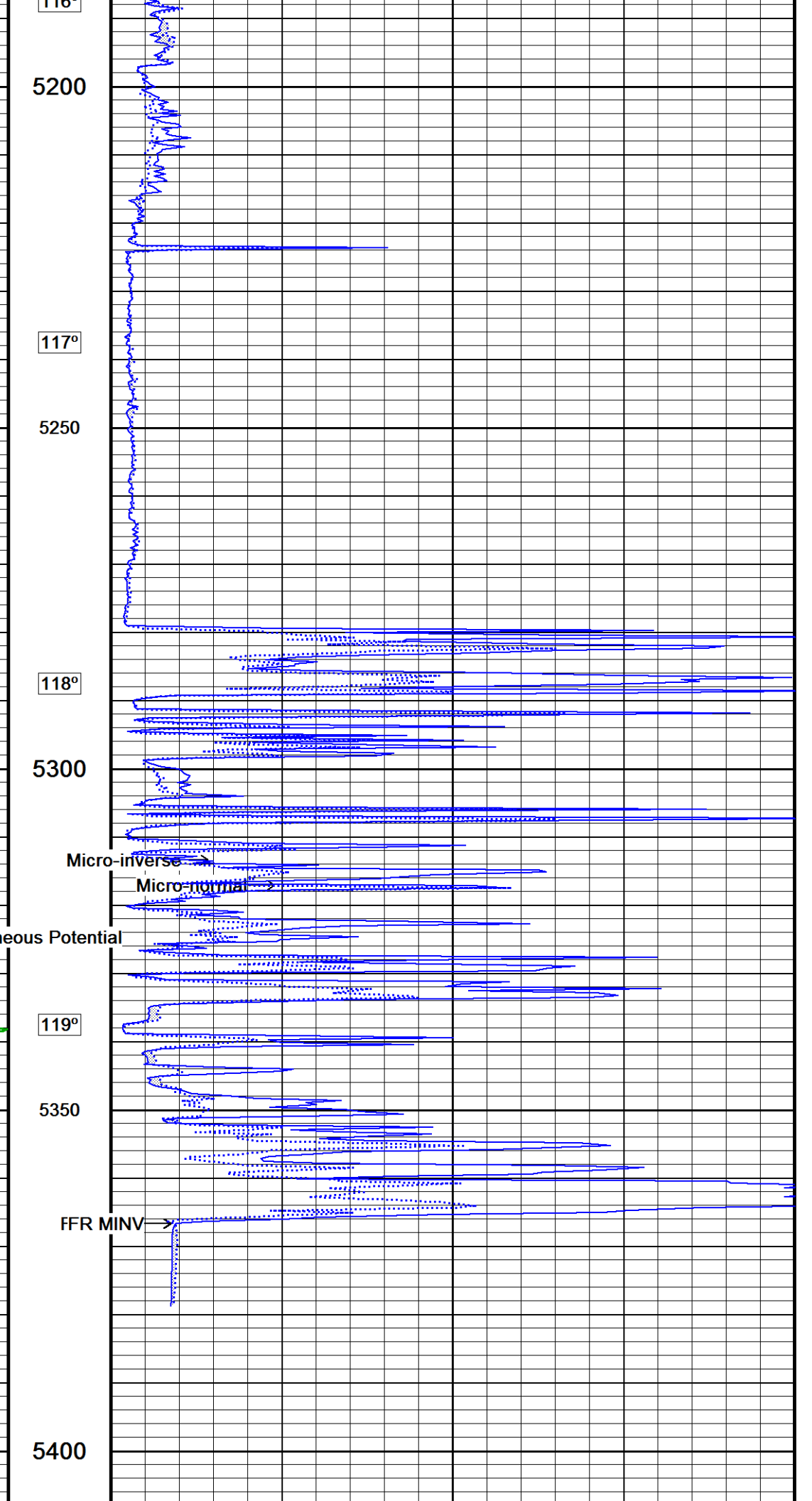
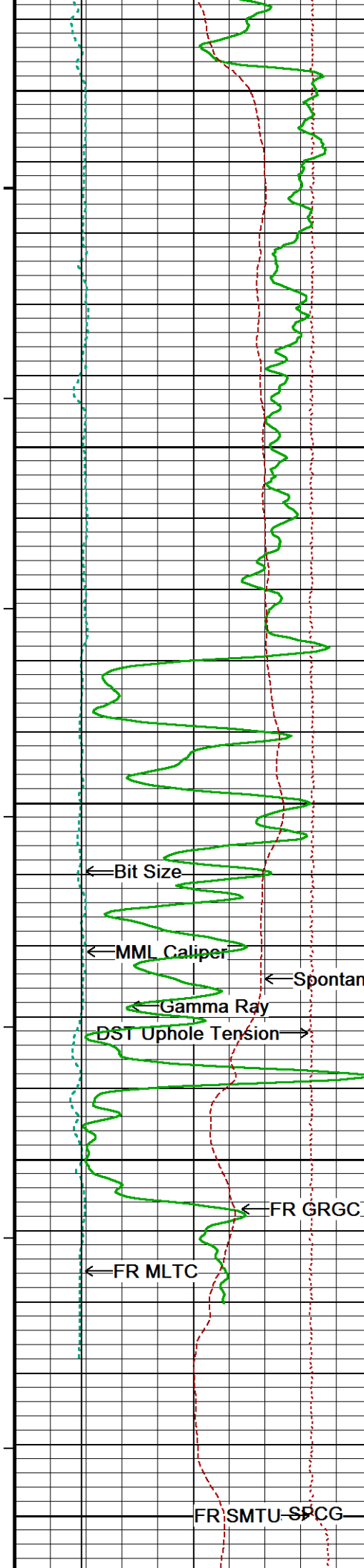
5100

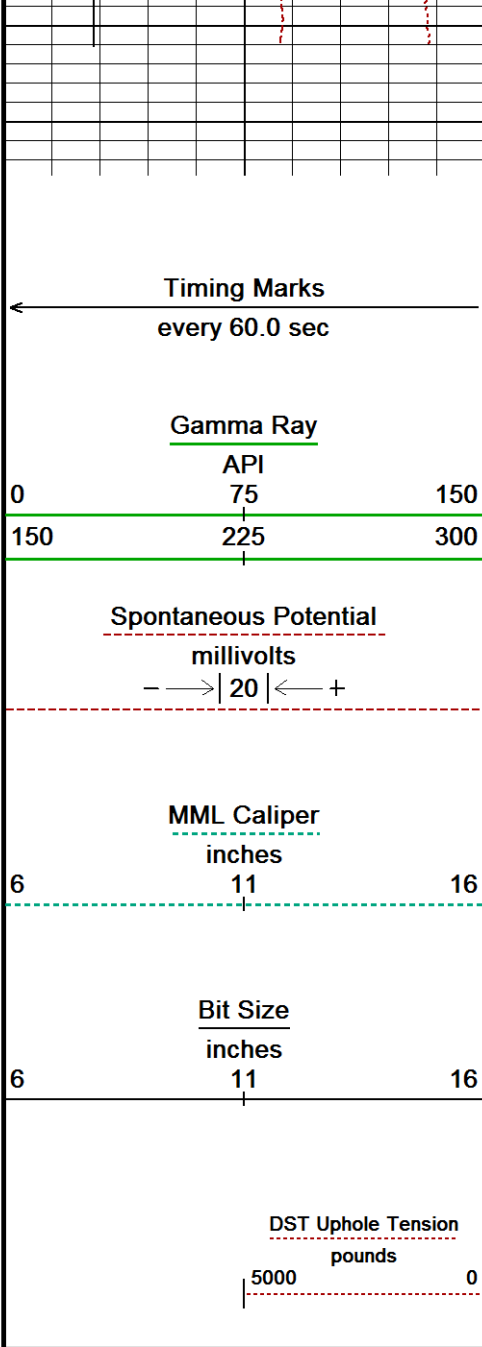
114°

5150

116°



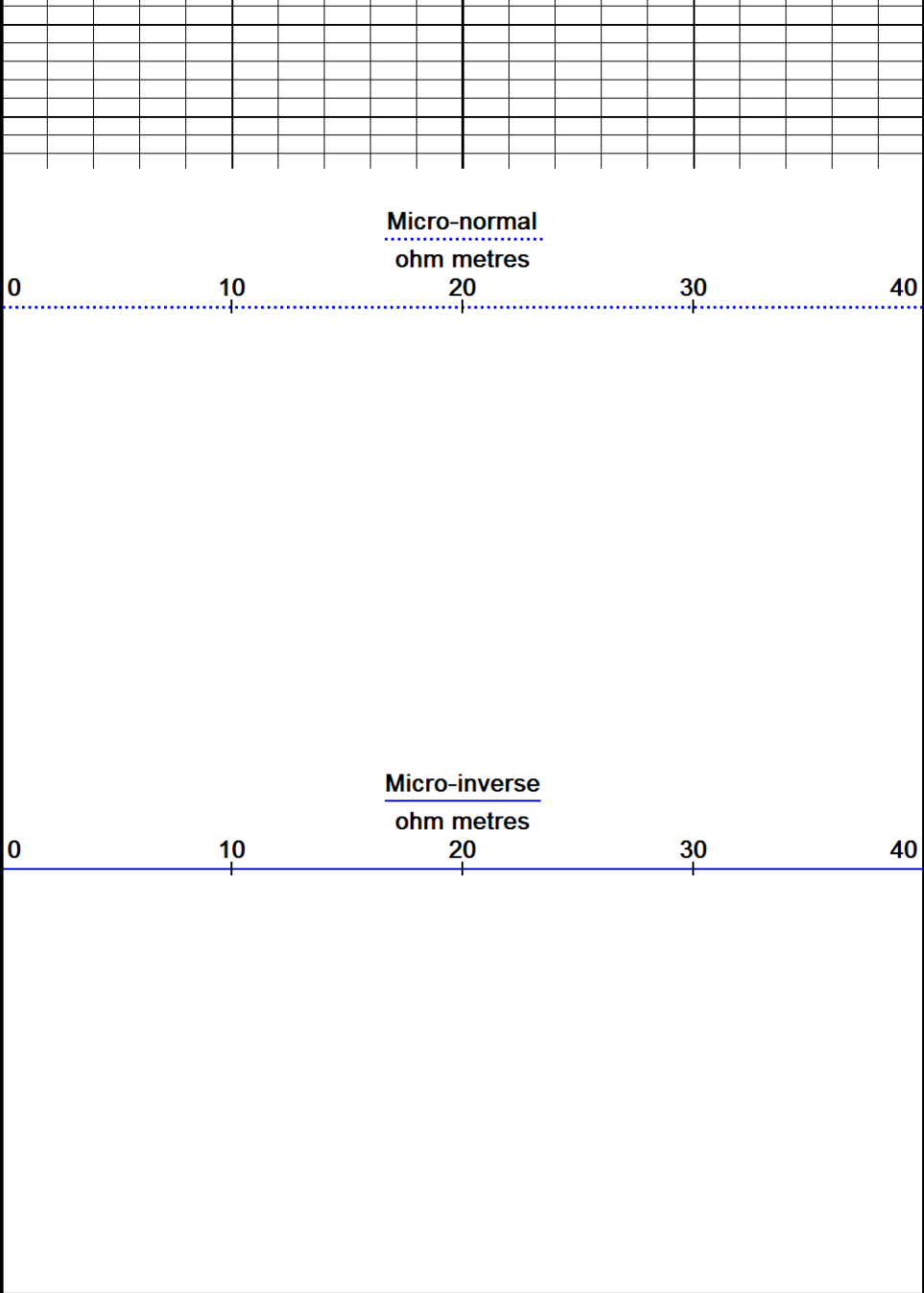




5424  
Depth  
in  
Feet

Borehole  
Temp in  
deg F

Replay  
Scale  
1:240

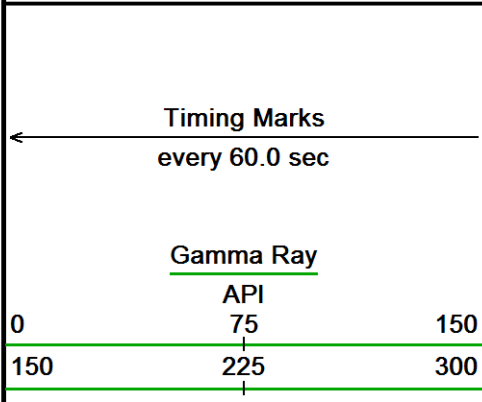


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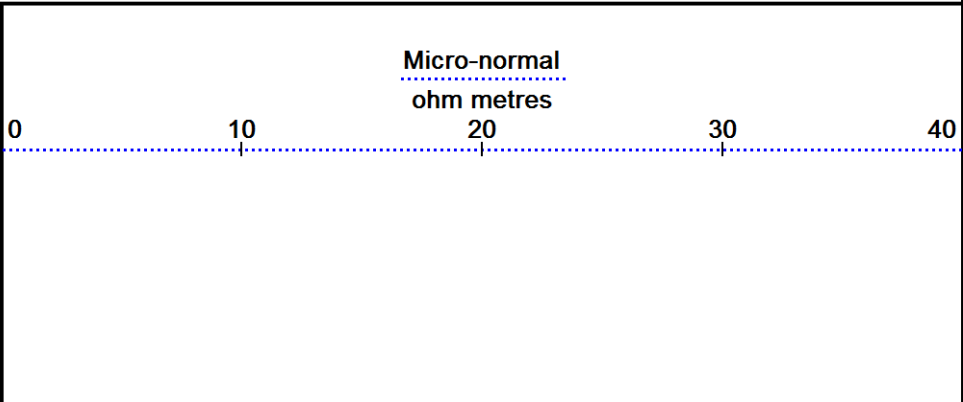
↑ 5 INCH MAIN ↑

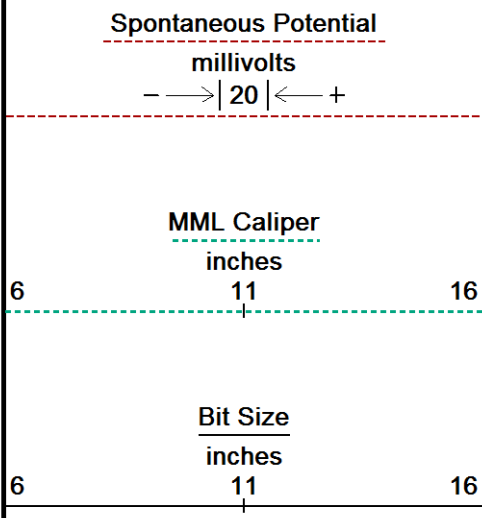
↓ REPEAT SECTION ↓

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 18-JAN-2013 08:57  
 Filename: C:\Users\E143235\AppData\Local\Temp\Weatherford...Western Operating Fox #1-8\_001.dta Recorded on 16-JAN-2013 14:09  
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

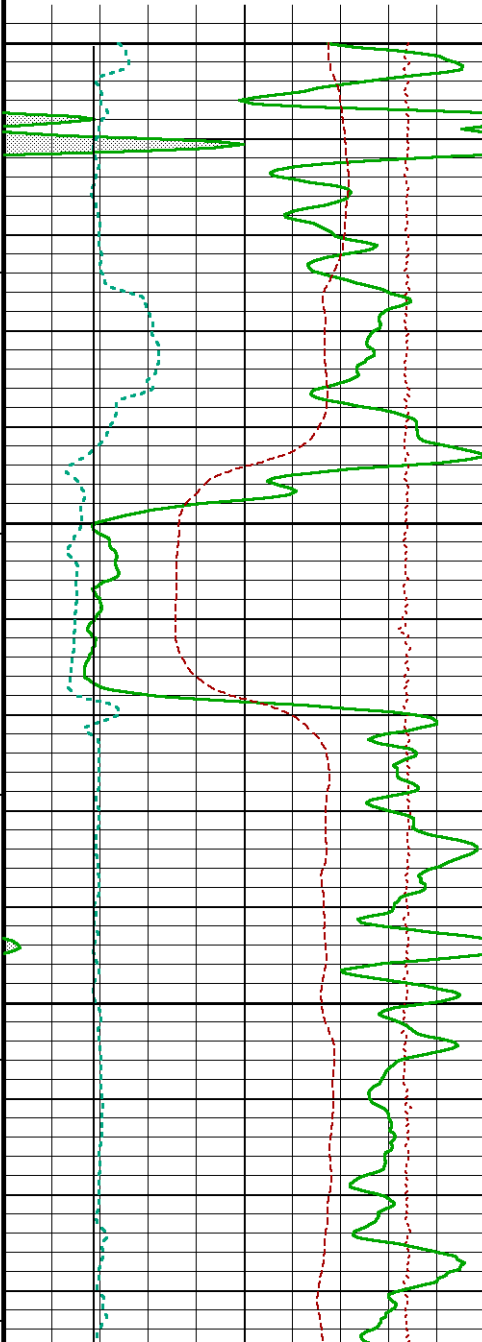
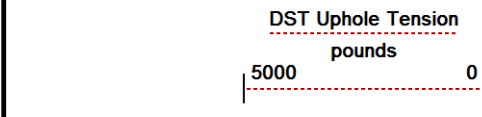
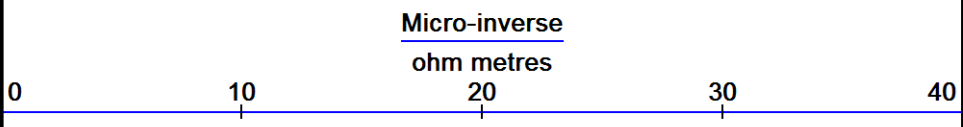


Depth  
in  
Feet



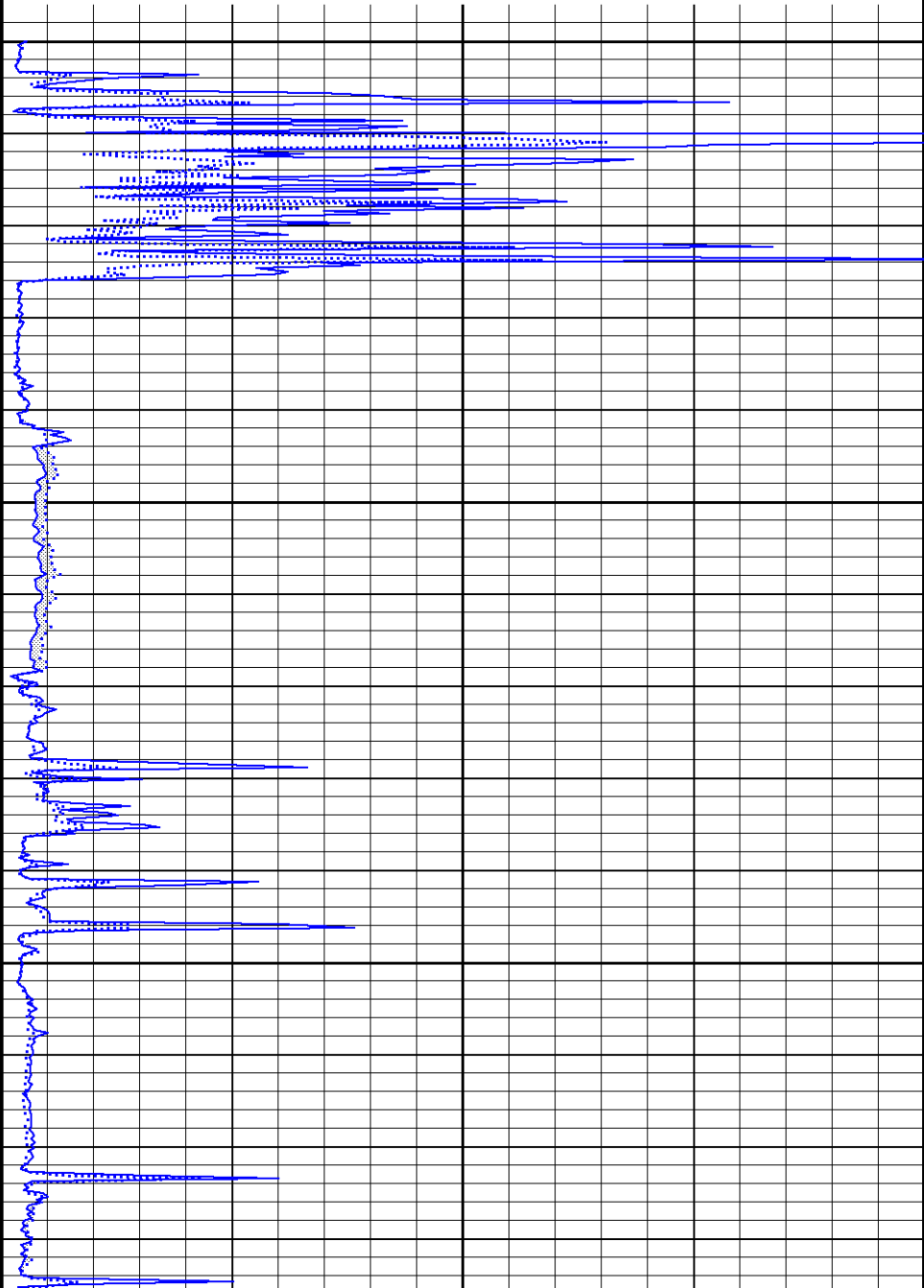


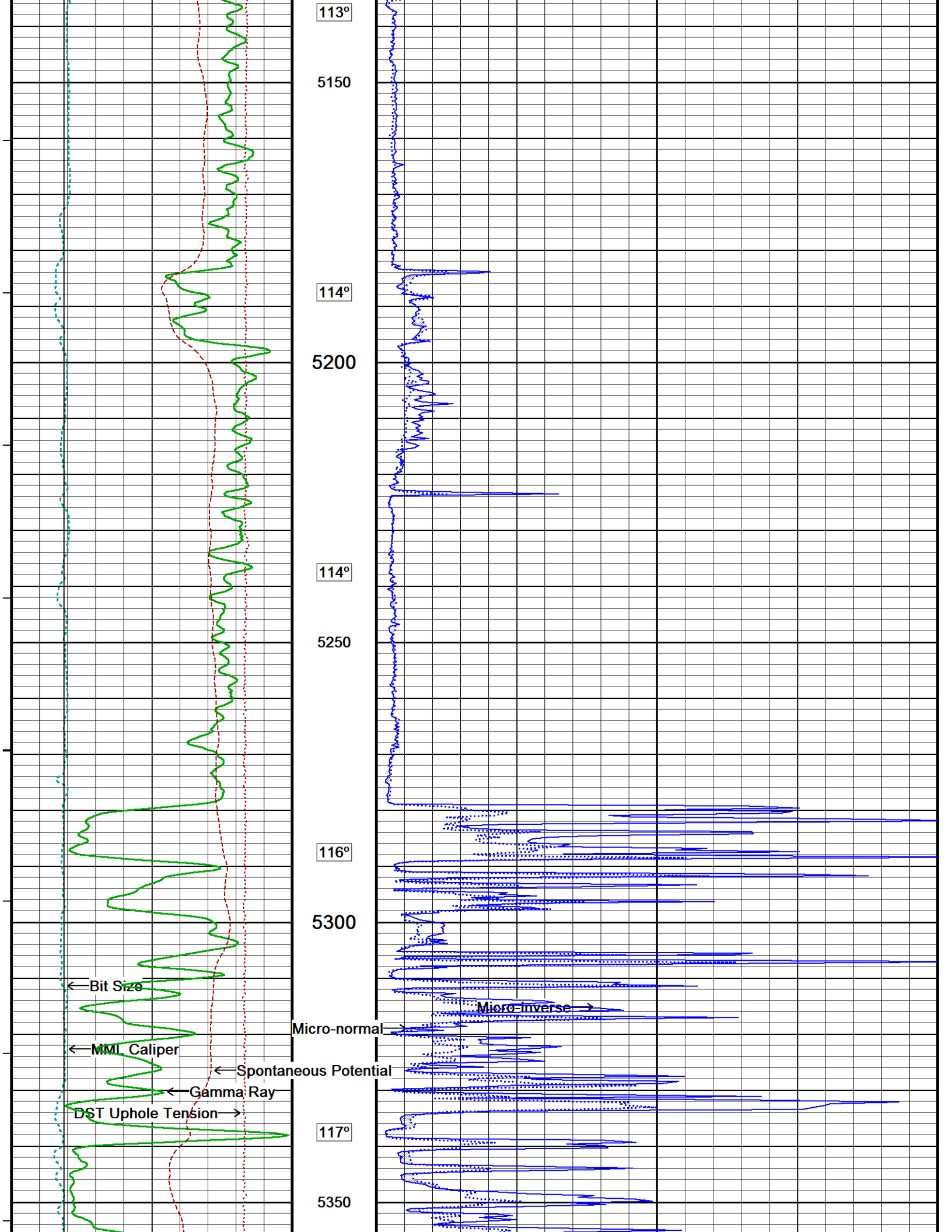
Borehole  
Temp in  
deg F

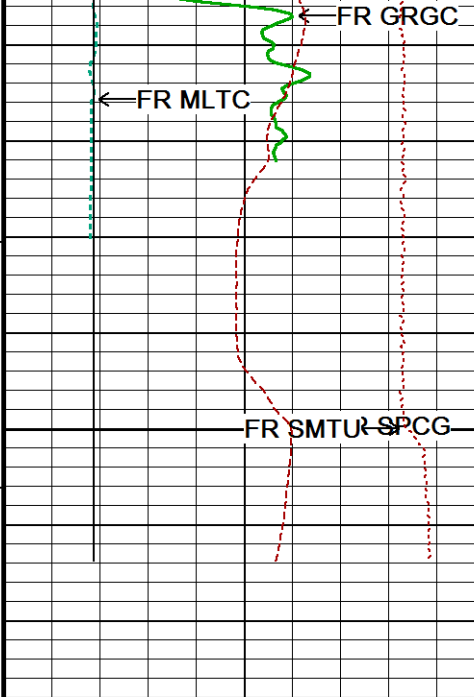


Replay  
Scale  
1:240

5000  
110°  
5050  
111°  
5100

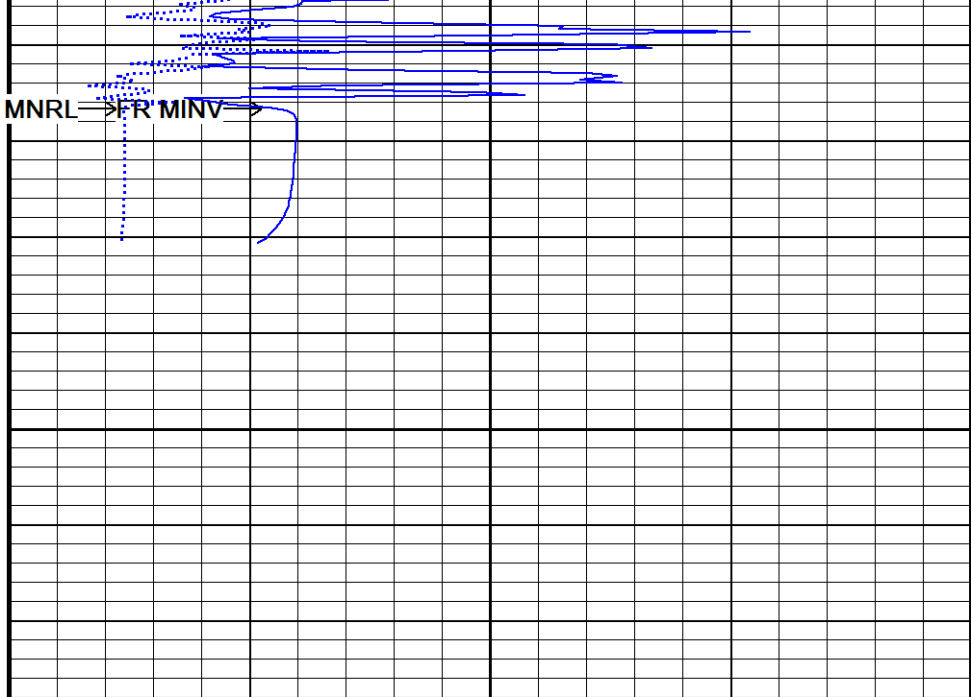






5400

5426  
Depth  
in  
Feet



Timing Marks  
every 60.0 sec

Gamma Ray  
API  
0 75 150  
150 225 300

Spontaneous Potential  
millivolts  
- -> | 20 | <- +

MML Caliper  
inches  
6 11 16

Bit Size  
inches  
6 11 16

DST Uphole Tension  
pounds  
5000 0

Borehole  
Temp in  
deg F

Replay  
Scale  
1:240

Micro-normal  
ohm metres  
0 10 20 30 40

Micro-inverse  
ohm metres  
0 10 20 30 40

General Constants All 000		Last Edited on 16-JAN-2013,12:29	
General Parameters			
Mud Resistivity	0.580	ohm-metres	
Mud Resistivity Temperature	73.000	degrees F	
Water Level	0.000	feet	
Borehole Fluid Processing	Wet Hole		
Hole/Annular Volume and Differential Caliper Parameters			
HVOL Method	Single Caliper		
HVOL Caliper 1	Density Caliper		
HVOL Caliper 2	N/A		
Annular Volume Diameter	5.500	inches	
Caliper for Differential Caliper	Density Caliper		
Rwa Parameters			
Porosity used	Base Density Porosity		
Resistivity used	Array Ind. Four Res Rt		
RWA Constant A	0.610		
RWA Constant M	2.150		
SW/APOR Tool Source			

High Resolution Temperature Calibration MCG-B 34		Field Calibration on 08-NOV-2012,10:05	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MCG-B 34		Last Edited on 08-NOV-2012,10:04	
Pre-filter Length	11		

Gamma Calibration MCG-B 34		Field Calibration on 16-JAN-2013 08:24	
	Measured	Calibrated (API)	
Background	70	47	
Calibrator (Gross)	1141	772	
Calibrator (Net)	1071	725	

Gamma Constants MCG-B 34		Last Edited on 16-JAN-2013,12:29	
Gamma Calibrator Number	GRC38		
Mud Density	1.13	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	
K Mud Type			
K Mud Concentration		%	

Micro Normal and Micro Inverse Calibration MML-A 16		Base Calibration on 13-DEC-2012 09:14		Field Check on 13-JAN-2013 17:14	
Base Calibration					
		Measured		Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2	
Micro Normal	12.1	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	48.2		48.2		

Micro Normal and Micro Inverse Constants MML-A 16		Last Edited on 16-JAN-2013,12:29	
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	

Caliper Calibration MML-A 16		Base Calibration on 13-DEC-2012 09:09		Field Calibration on 13-JAN-2013 17:13	
Base Calibration					

Reading No	Measured	Calibrator Size (in)
1	14167	5.98
2	17246	7.97
3	20473	9.86
4	24393	11.92
5	0	0.00
6	N/A	N/A

**Field Calibration**

Measured Caliper (in)	Actual Caliper (in)
6.03	5.98

**DOWNHOLE EQUIPMENT**

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView3\3\Western Operating Fox #1-8\_001.dta

Compact Comms Gamma  
MCG-B 34 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

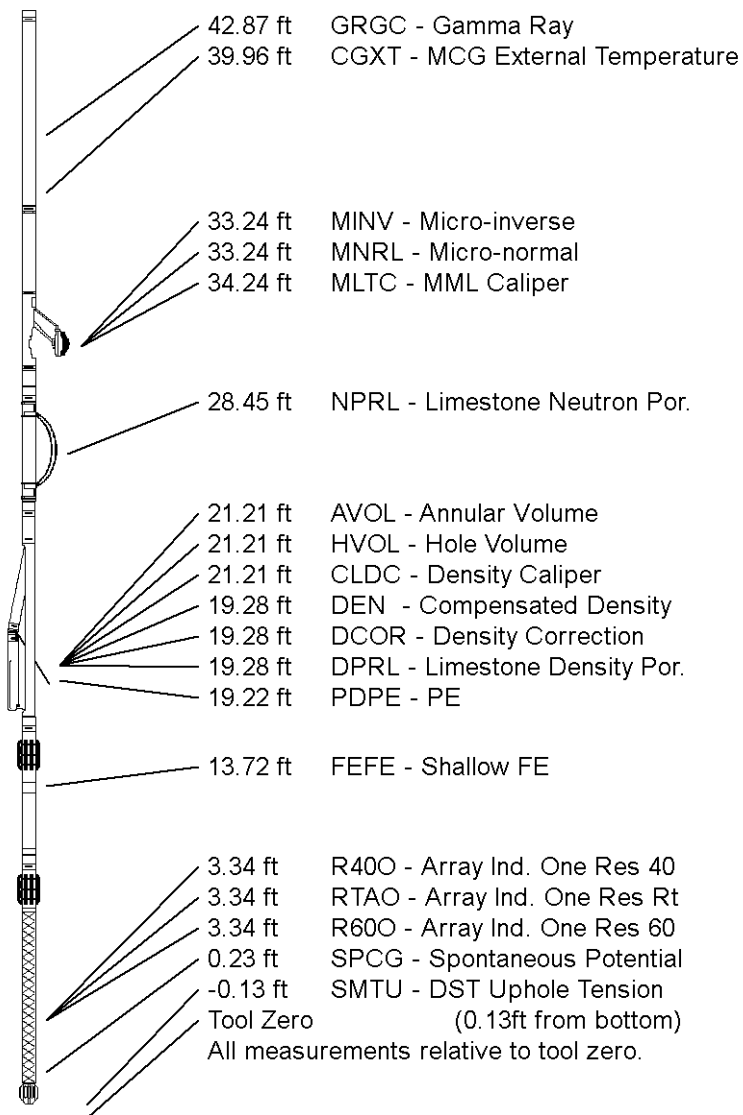
Compact Neutron  
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper  
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric  
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction  
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 48.16 ft Weight: 383.6 lb



<b>COMPANY</b>	<b>WESTERN OPERATING COMPANY</b>		
<b>WELL</b>	<b>FOX #1-8</b>		
<b>FIELD</b>	<b>HELFRICH</b>		
<b>PROVINCE/COUNTY</b>	<b>HAMILTON</b>		
<b>COUNTRY/STATE</b>	<b>U.S.A. / KANSAS</b>		

Elevation Kelly Bushing	3609.00	feet	First Reading	5367.00	feet
Elevation Drill Floor	3608.00	feet	Depth Driller	5400.00	feet
Elevation Ground Level	3596.00	feet	Depth Logger	5400.00	feet

