



Weatherford

MICRORESISTIVITY LOG

COMPANY WESTERN OPERATING COMPANY

WELL HELFRICH #1-6

FIELD HELFRICH

PROVINCE/COUNTY HAMILTON

COUNTRY/STATE U.S.A. / KANSAS

LOCATION 1320' FSL & 1980' FEL

SEC TWP RGE Other Services
6 25S 42W MAI/MFE MPD/MDN

API Number 15-075-20865

Permit Number

Permanent Datum GL, Elevation 3574 feet

Log Measured From KB

Drilling Measured From KB

Elevations: feet
KB 3586.00
DF 3585.00
GL 3574.00

Date 04-JAN-2013

Run Number ONE

Service Order 3537801

Depth Driller 5400.00 feet

Depth Logger 5394.00 feet

First Reading 5361.00 feet

Last Reading 2300.00 feet

Casing Driller 843.00 feet

Casing Logger 840.00 inches

Bit Size 7.875

Hole Fluid Type CHEMICAL lb/USg

Density / Viscosity 9.50 lb/USg 53.00 CP

PH / Fluid Loss 10.00 10.00

Sample Source FLOWLINE

Rm @ Measured Temp 1.26 @ 79.0 ohm-m

Rmf @ Measured Temp 1.01 @ 79.0 ohm-m

Rmc @ Measured Temp 1.51 @ 79.0 ohm-m

Source Rmf / Rmc CALC CALC

Rm @ BHT 0.85 @121.0 ohm-m

Time Since Circulation 4 HOURS

Max Recorded Temp 121.00 deg F

Equipment / Base 13096 LIB

Recorded By ADAM SILL

Witnessed By PETER DEBENHAM

IOB # LB13-004

BOREHOLE RECORD

Last Edited: 04-JAN-2013 01:25

Bit Size inches	Depth From feet	Depth To feet
7.875	843.00	5400.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	843.00	24.00

REMARKS

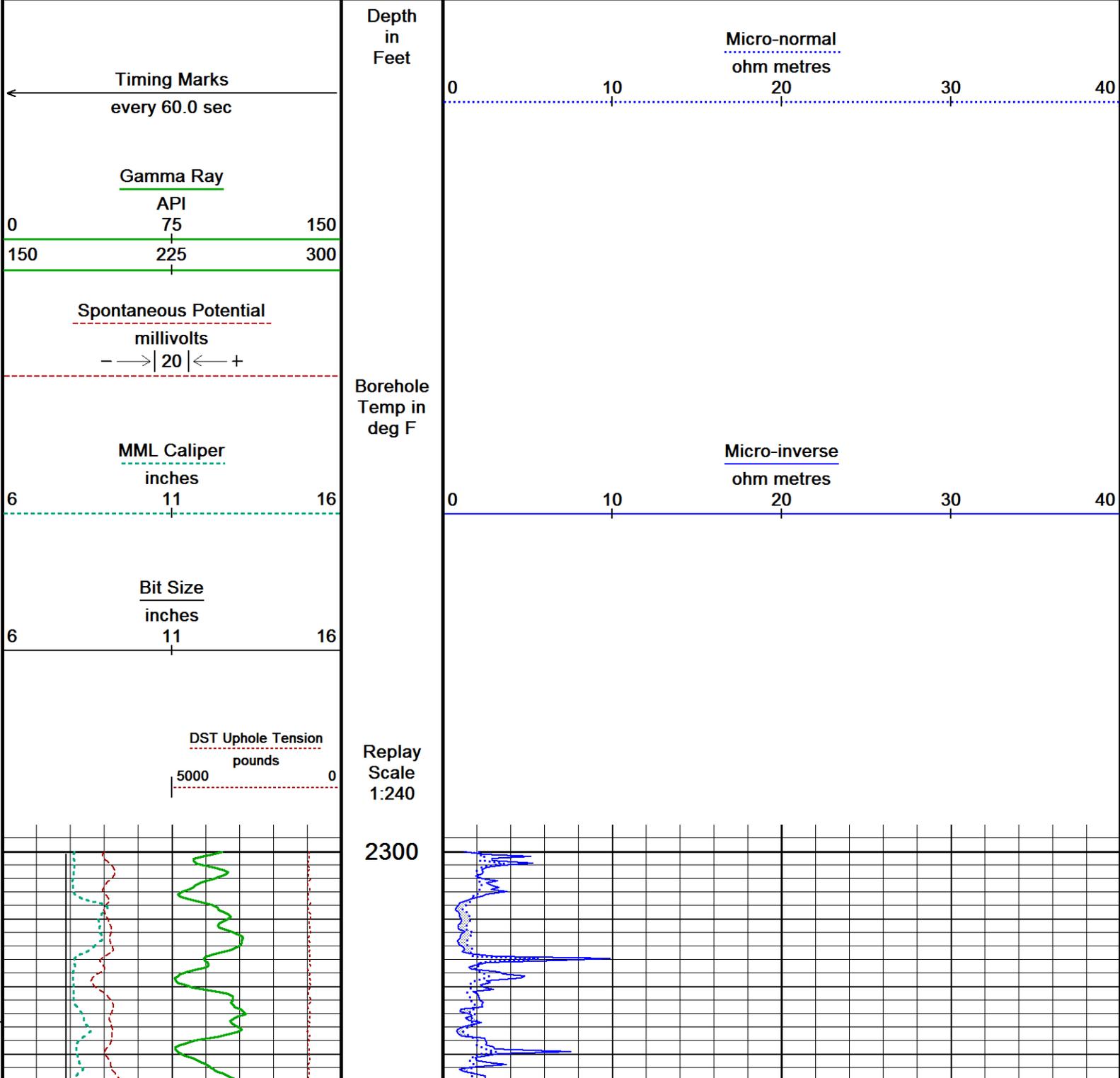
- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MAI RAN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 - 0.5 INCH STANDOFF USED ON MFE.
 - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1950 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO 2300 FT: 575 CU. FT.
- SERVICE ORDER # 3537801

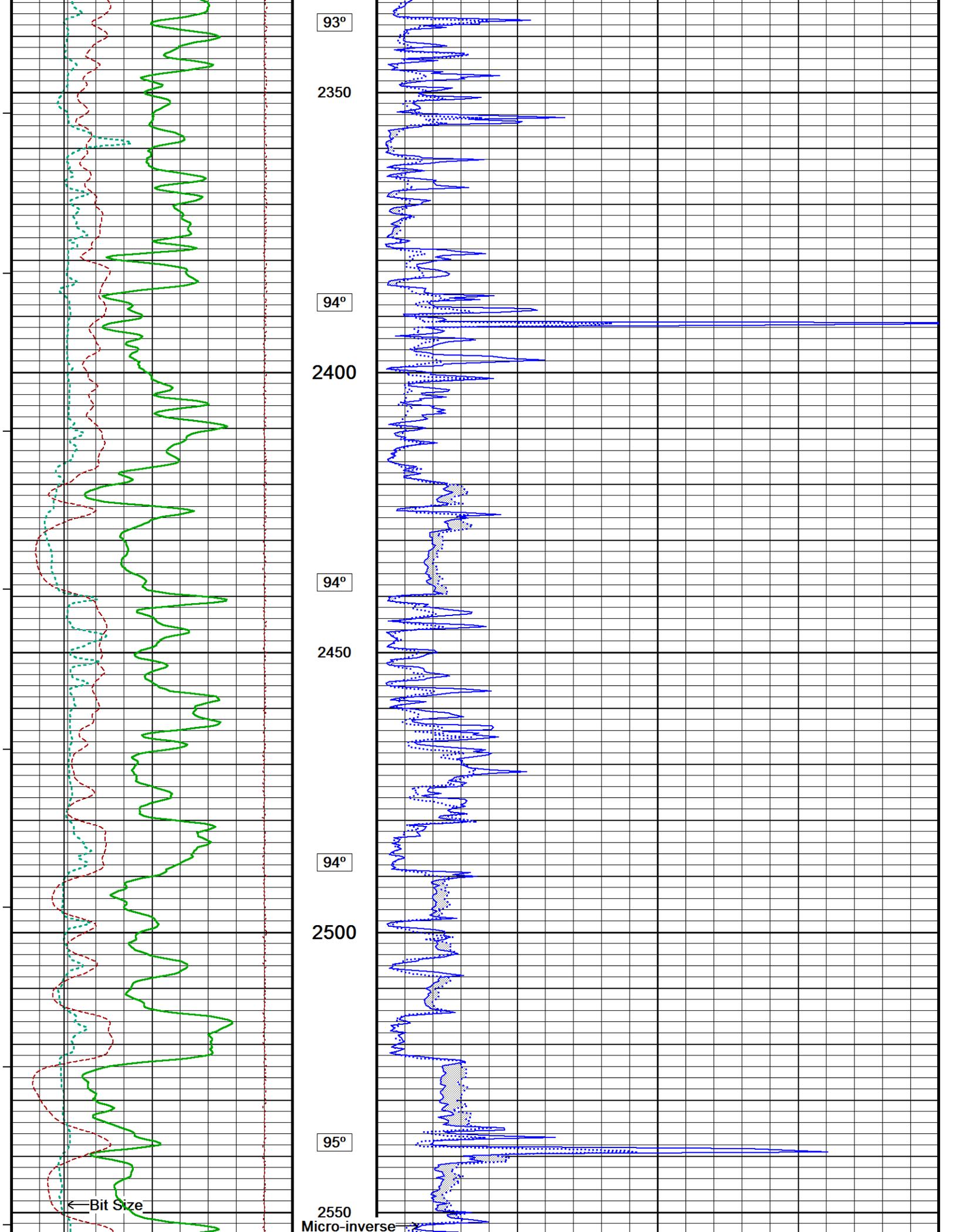
- RIG: MURFIN #25.
 - ENGINEER: A. SILL.
 - OPERATOR(S): M. STEGMAN.

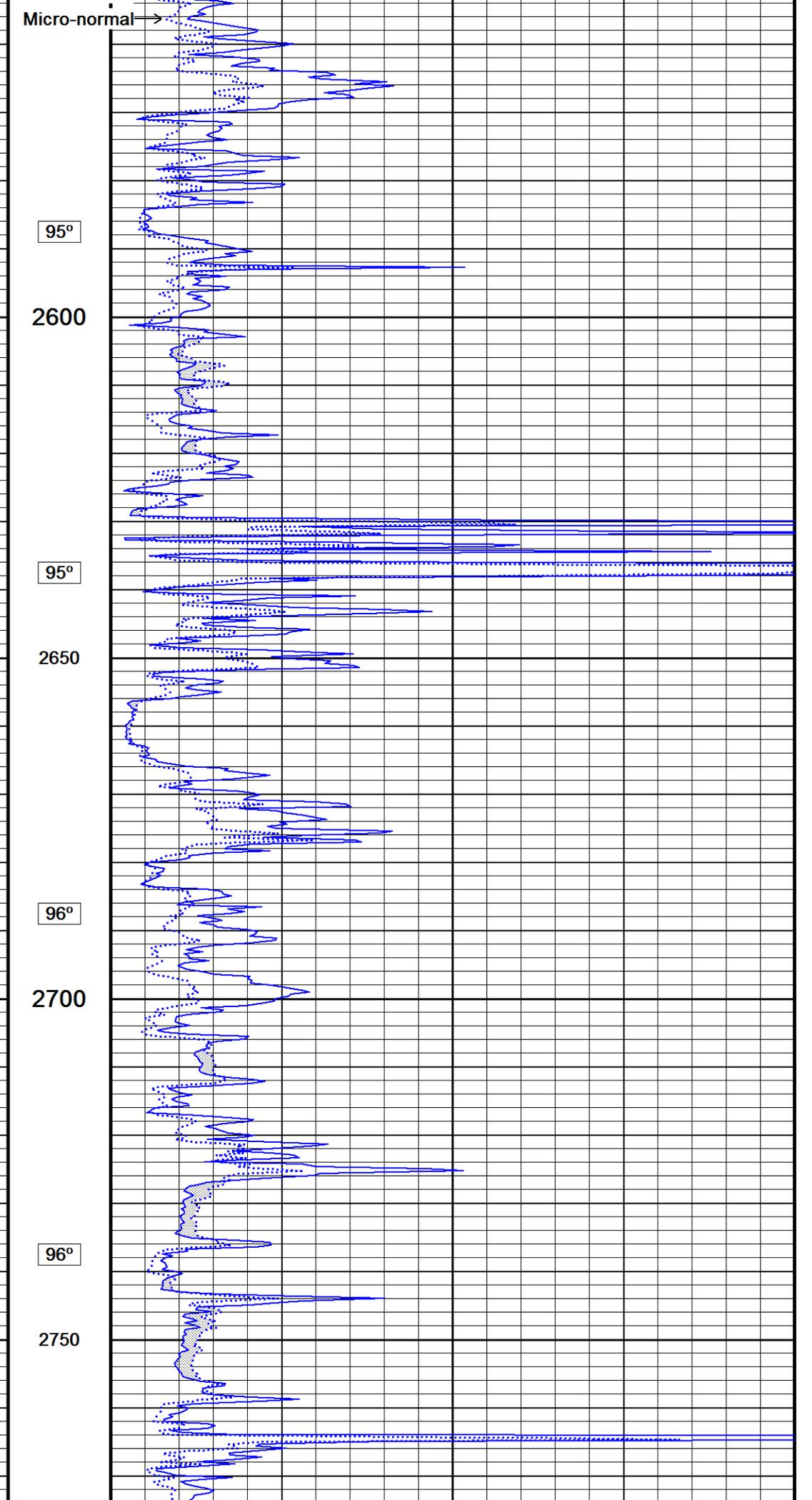
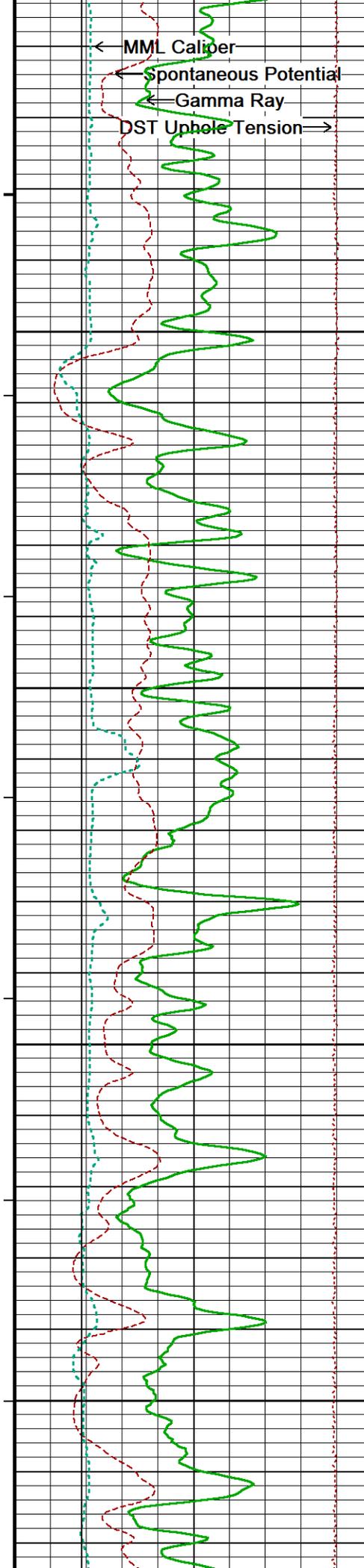
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, 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.

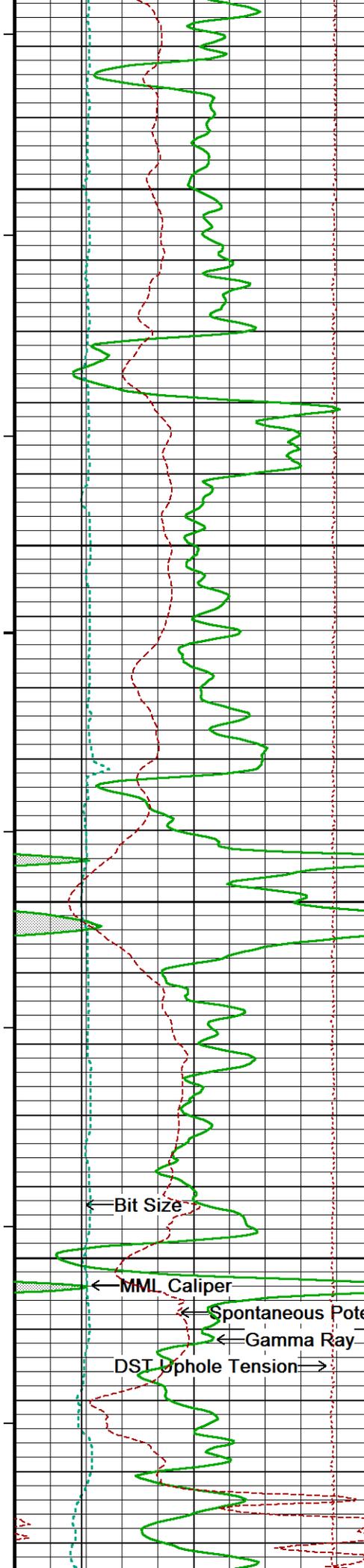
5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 10-JAN-2013 15:34
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6_005.dta Recorded on 04-JAN-2013 07:46
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506

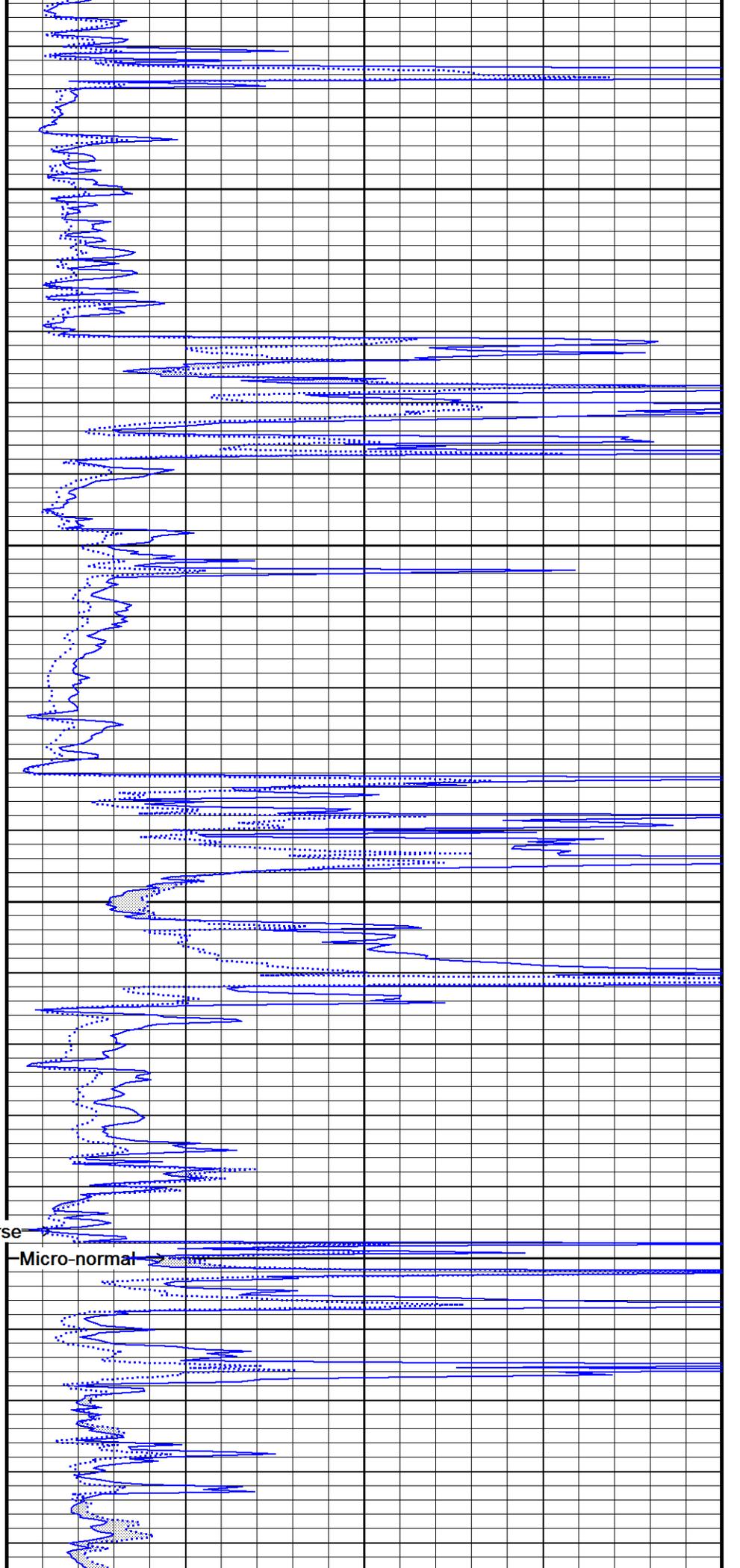




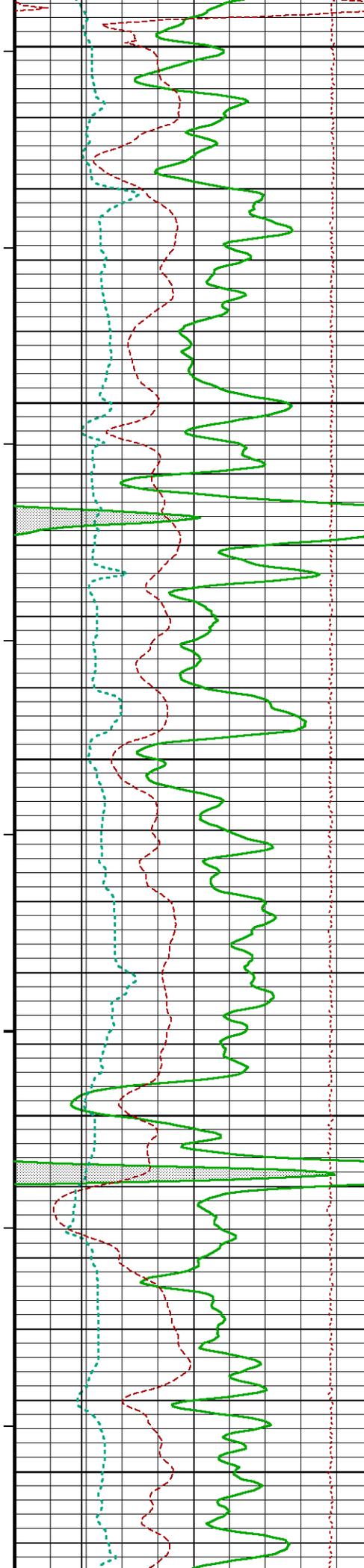




96°
2800
97°
2850
97°
2900
97°
2950
98°



Micro-inverse
Micro-normal



3000

98°

3050

99°

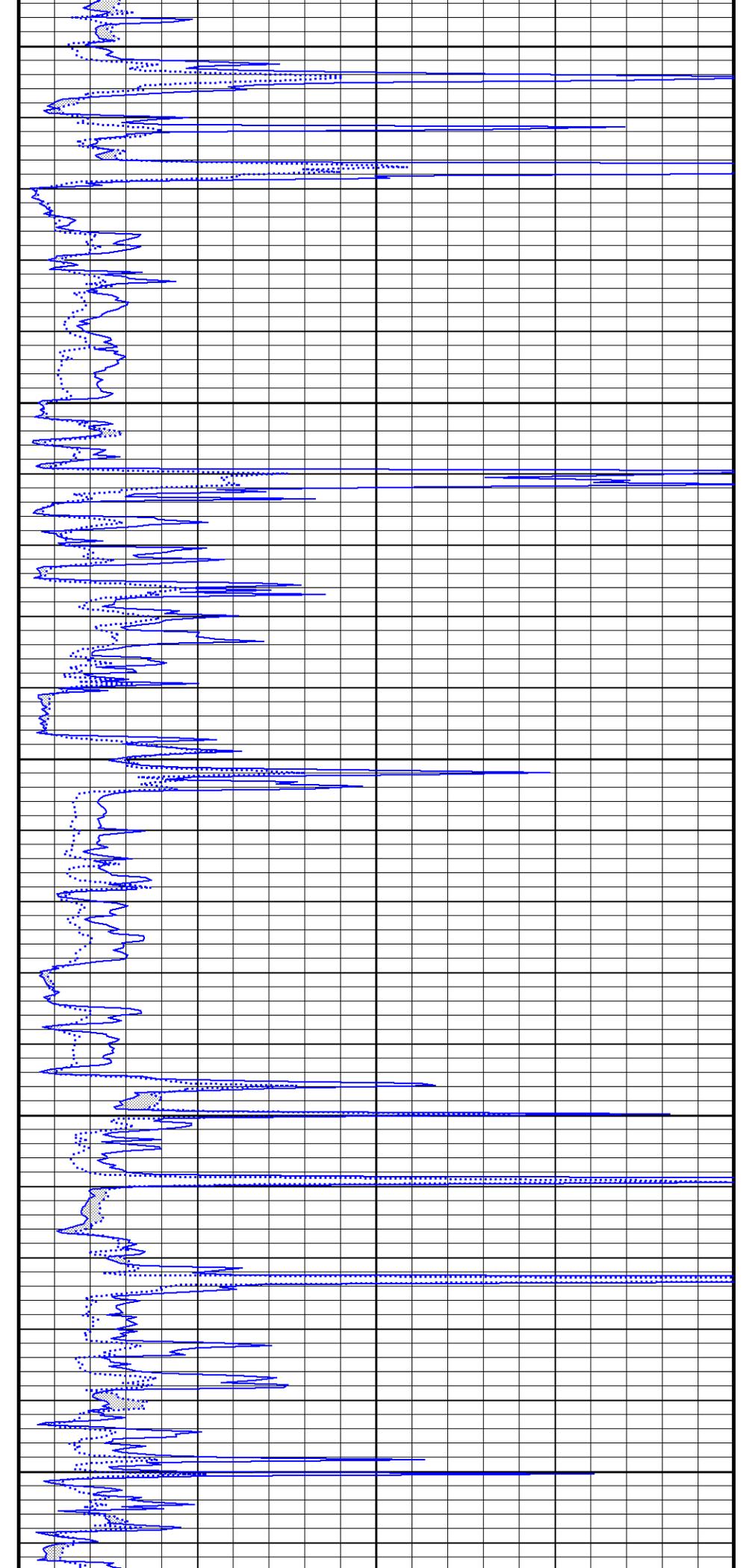
3100

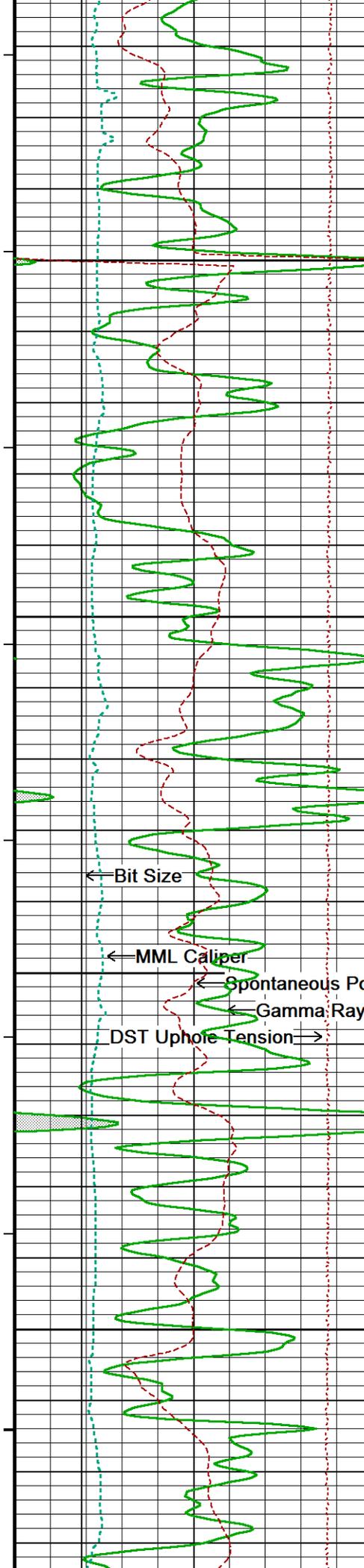
99°

3150

99°

3200





100°

3250

100°

3300

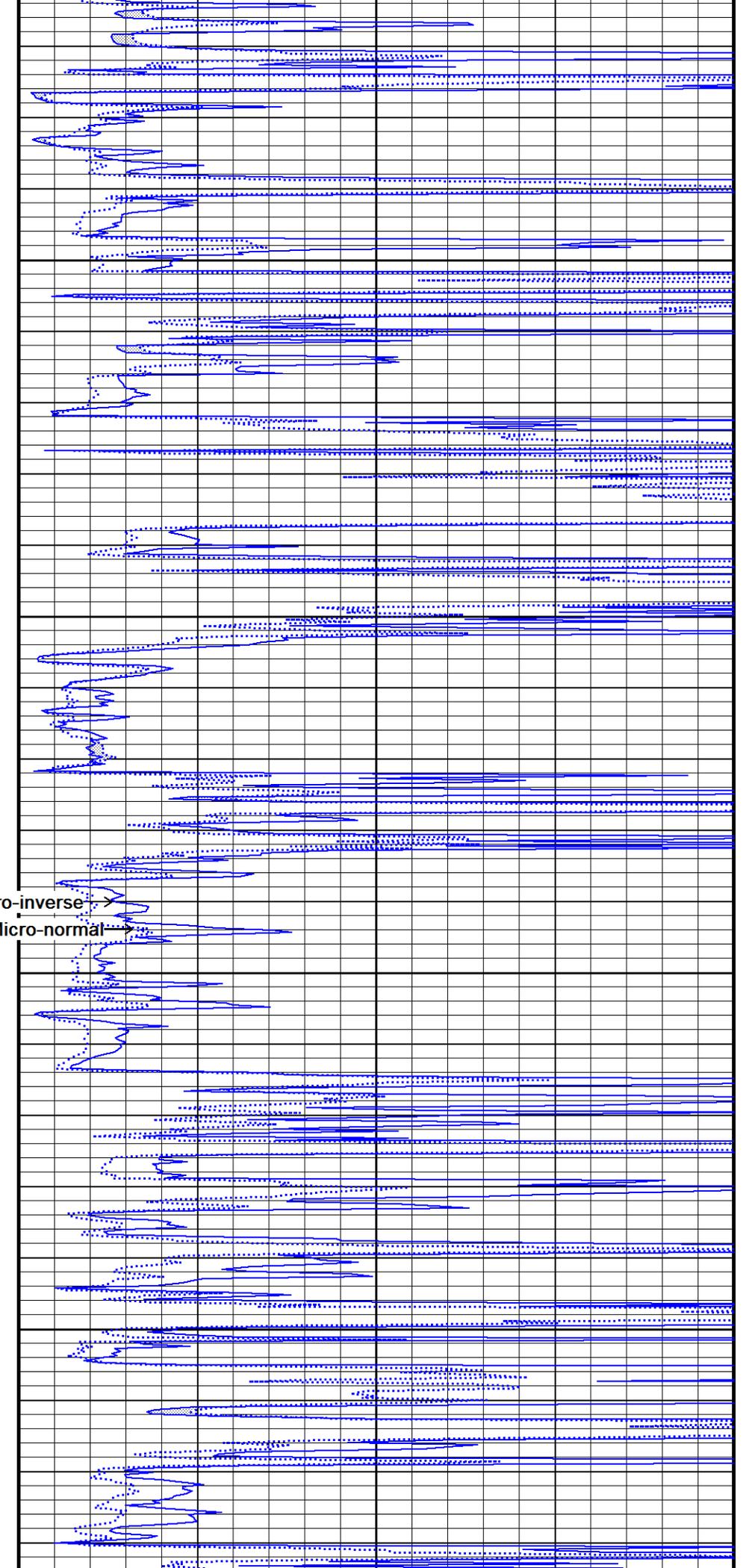
101°

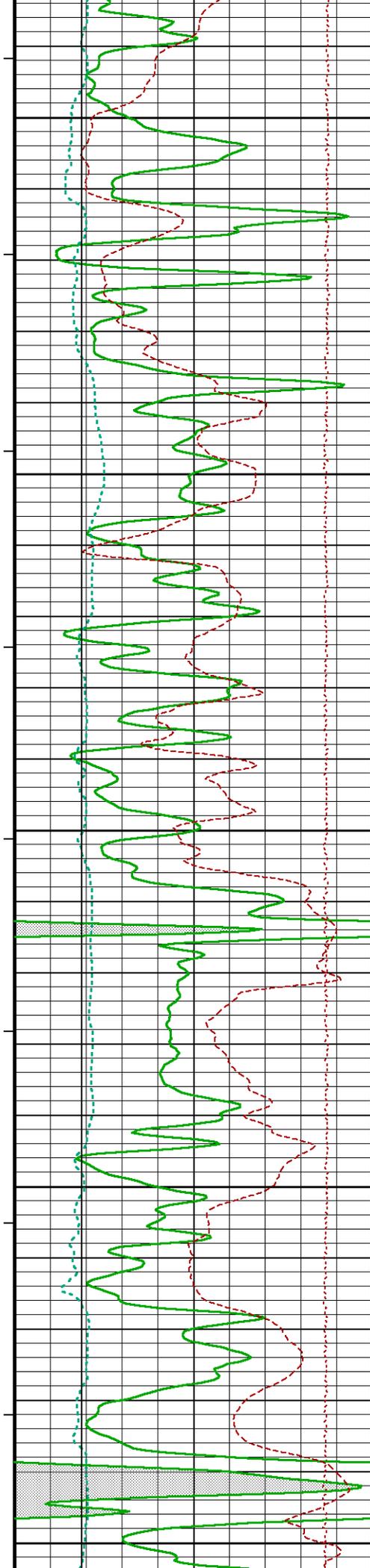
3350

101°

3400

Micro-inverse >
Micro-normal >





101°

3450

102°

3500

102°

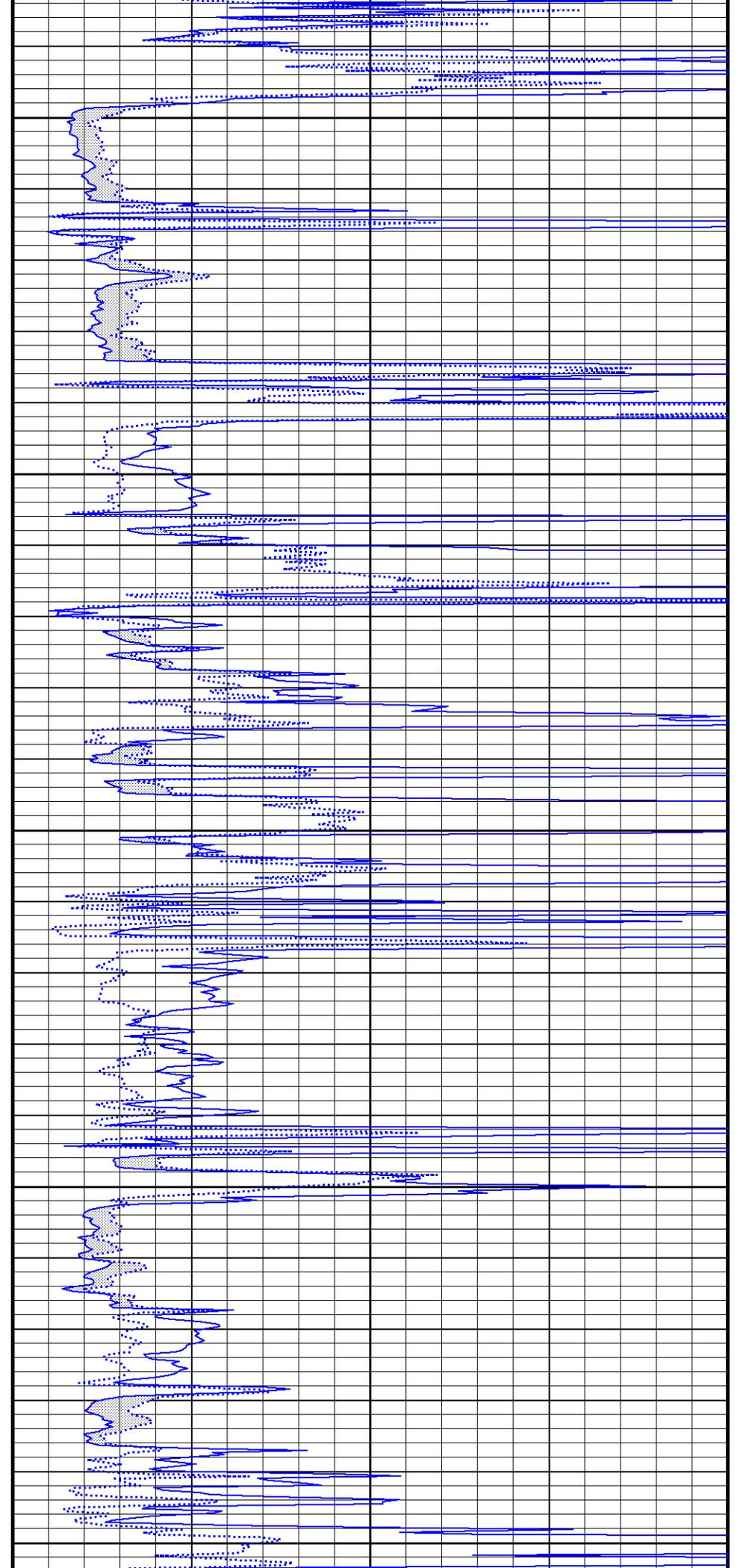
3550

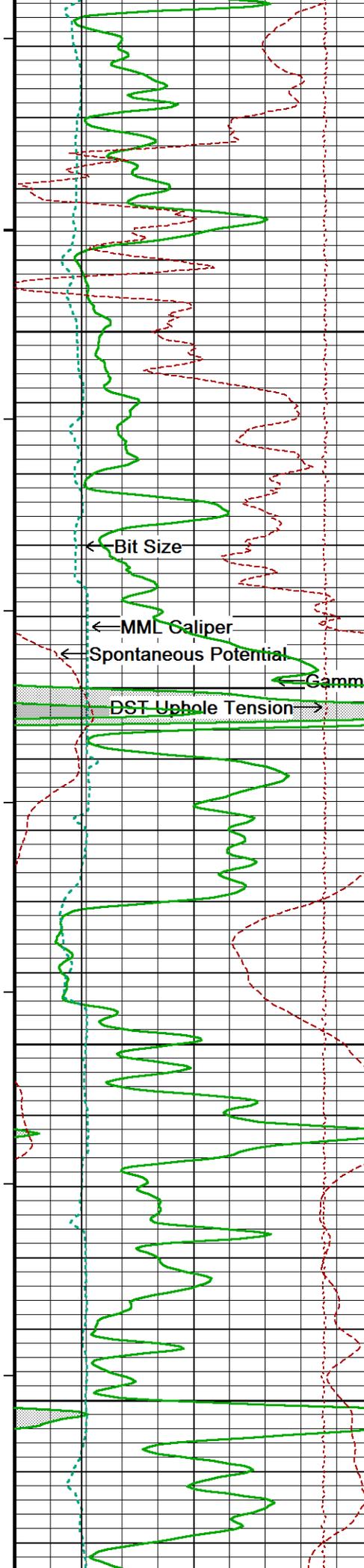
102°

3600

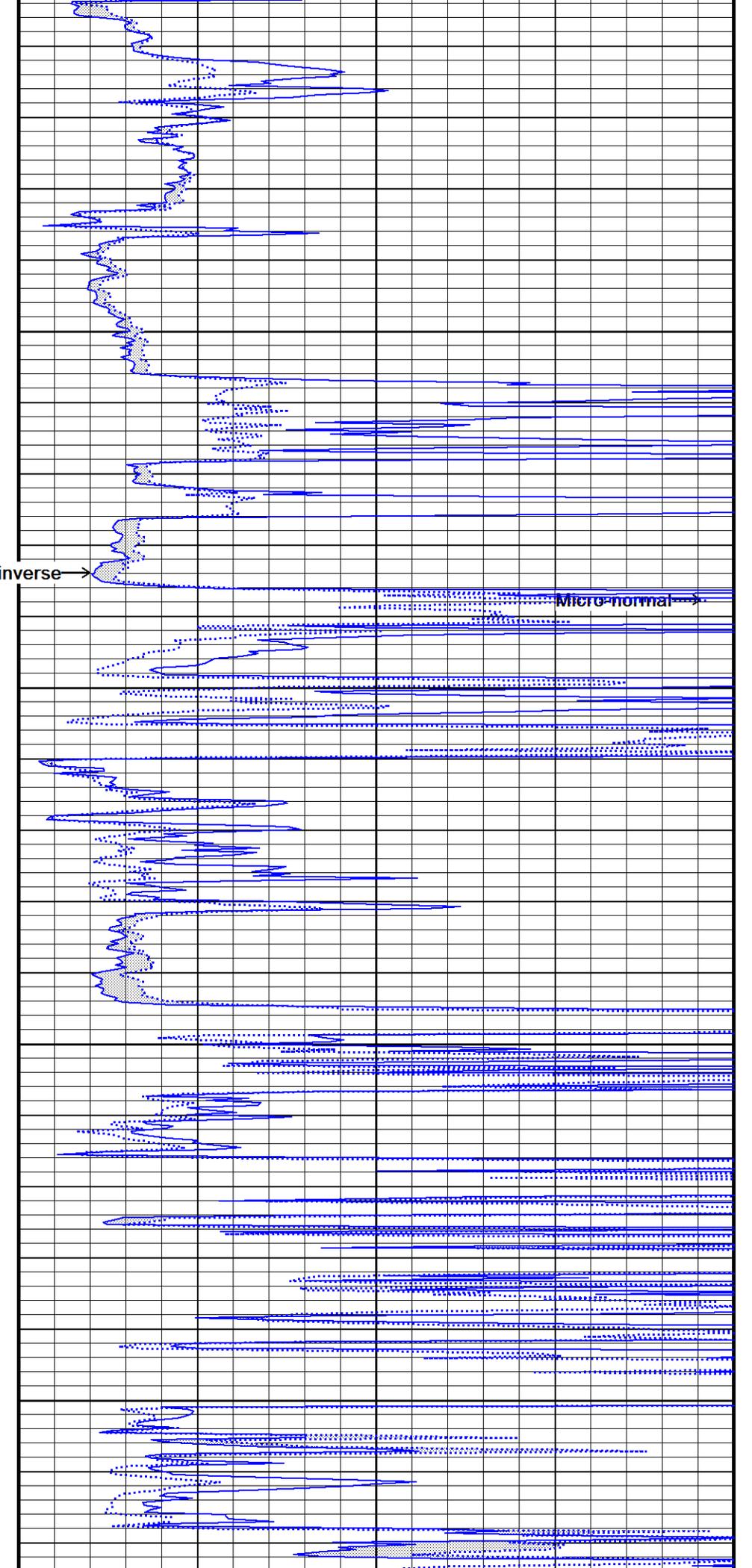
103°

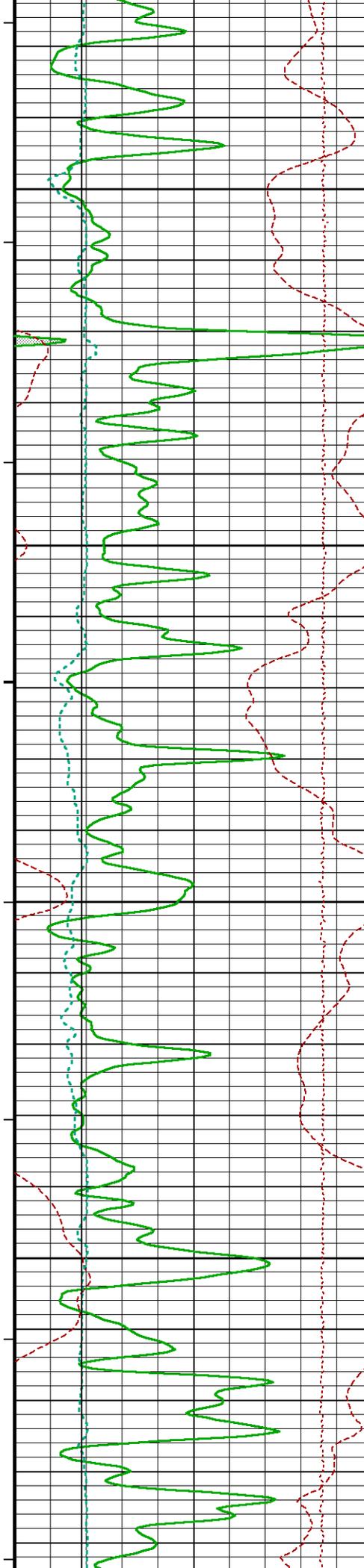
3650



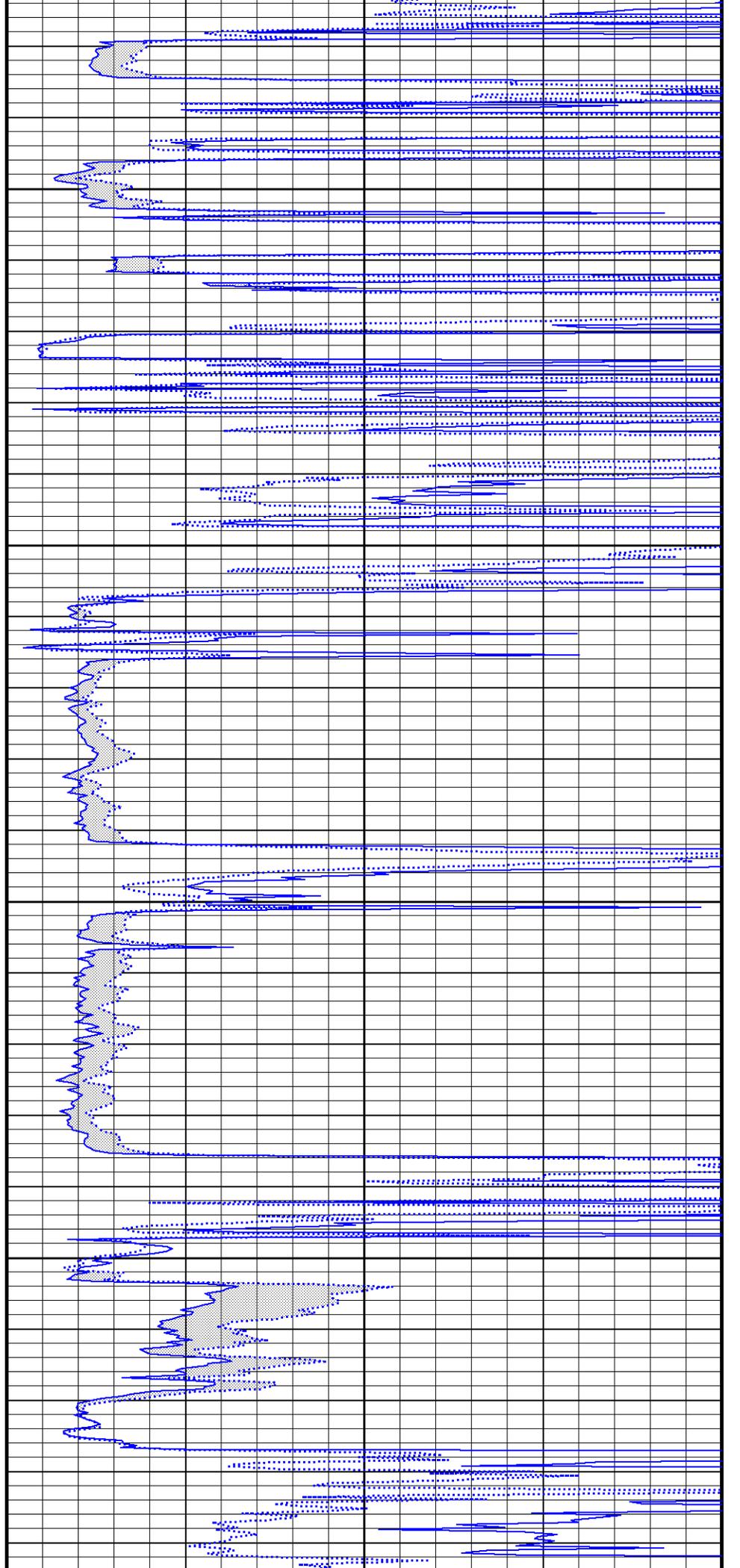


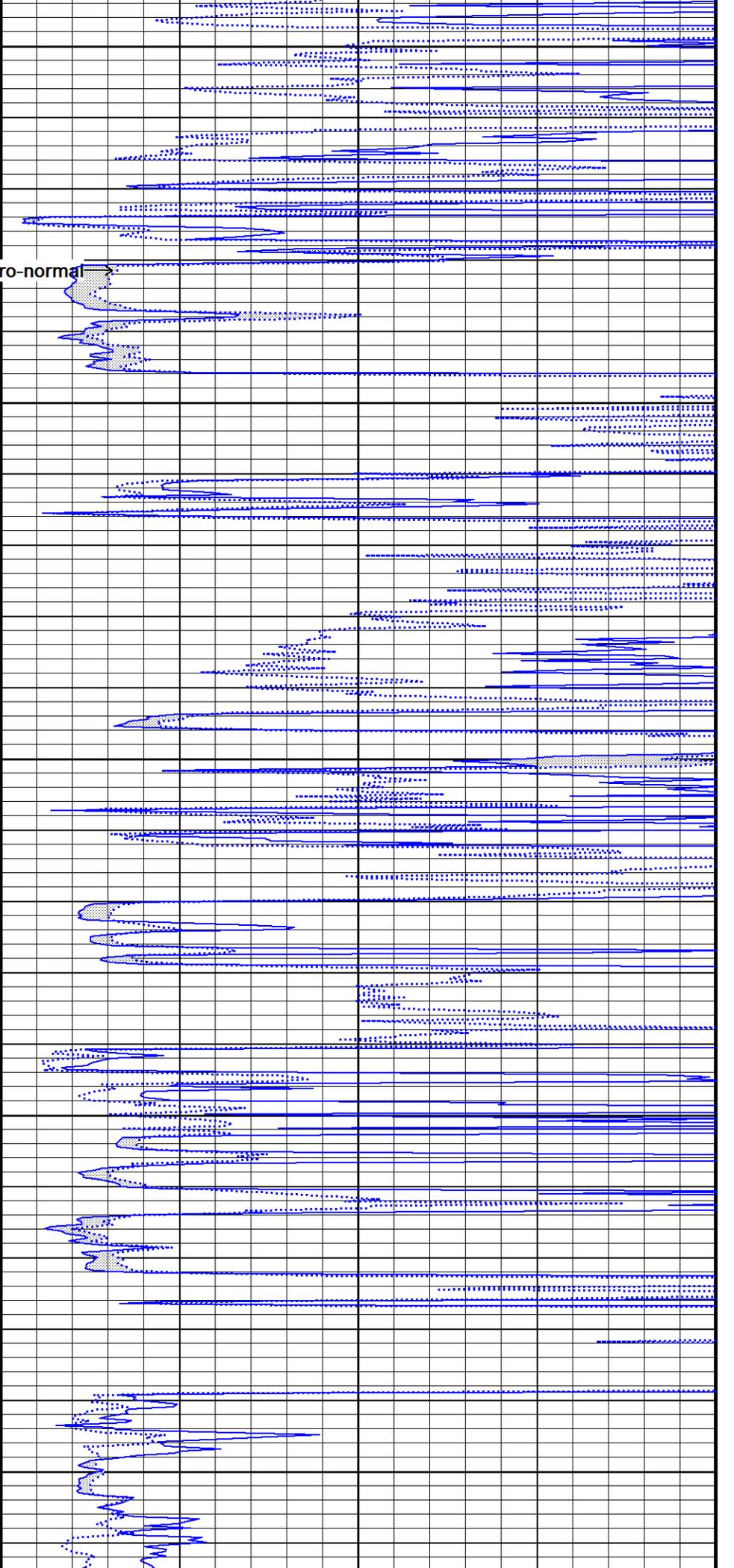
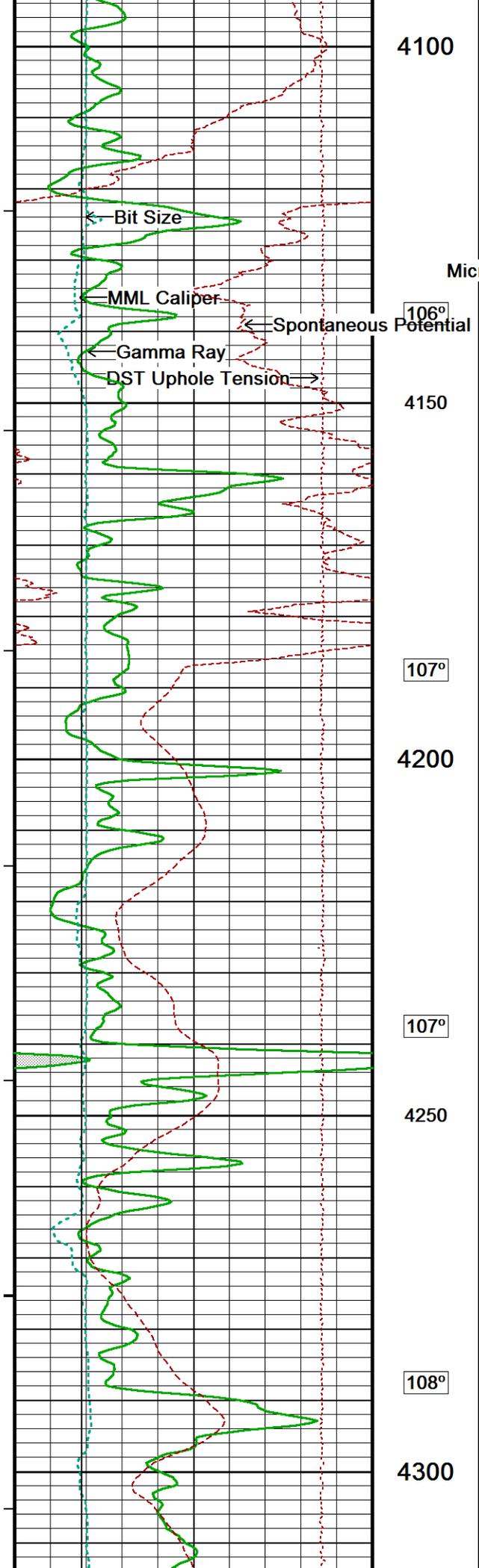
103°
3700
103°
3750
104°
3800
104°
3850

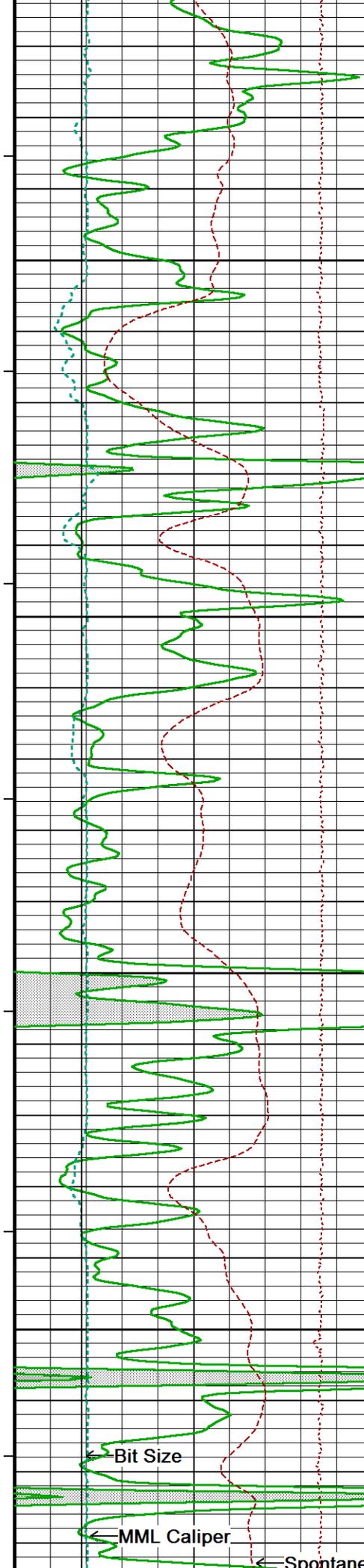




105°
3900
105°
3950
105°
4000
106°
4050
106°







108°

4350

109°

4400

109°

4450

110°

4500

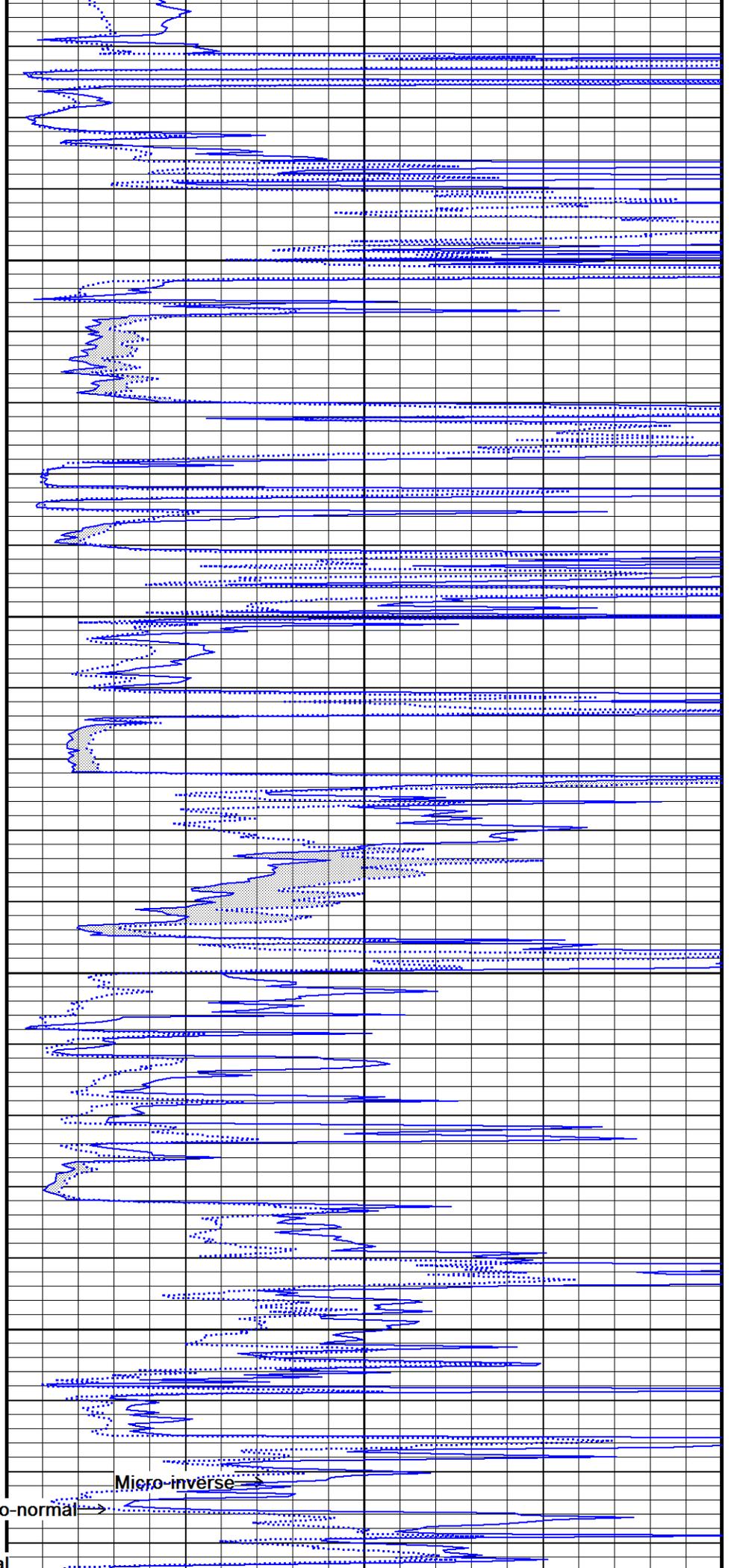
Bit Size

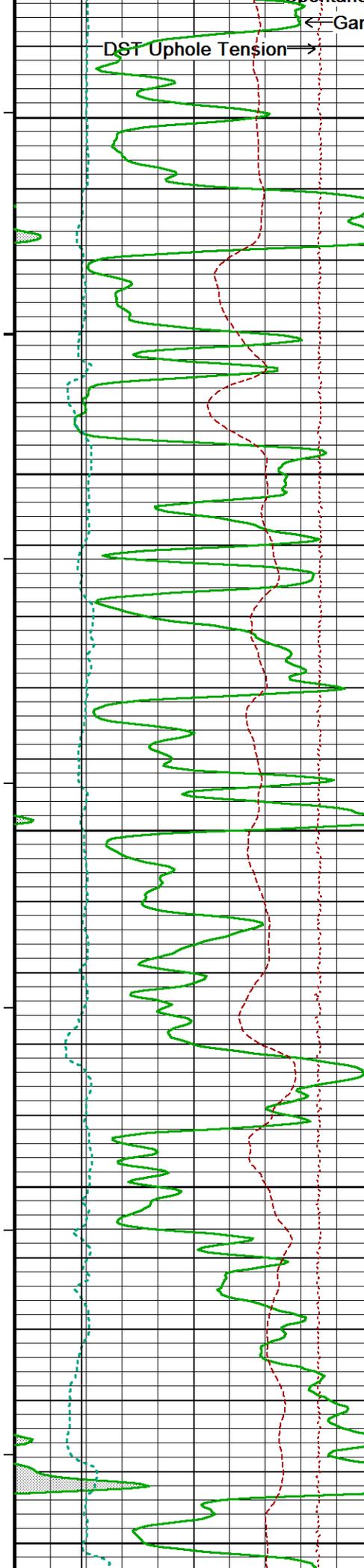
MML Caliper

Spontaneous Potential

Micro-normal

Micro-inverse

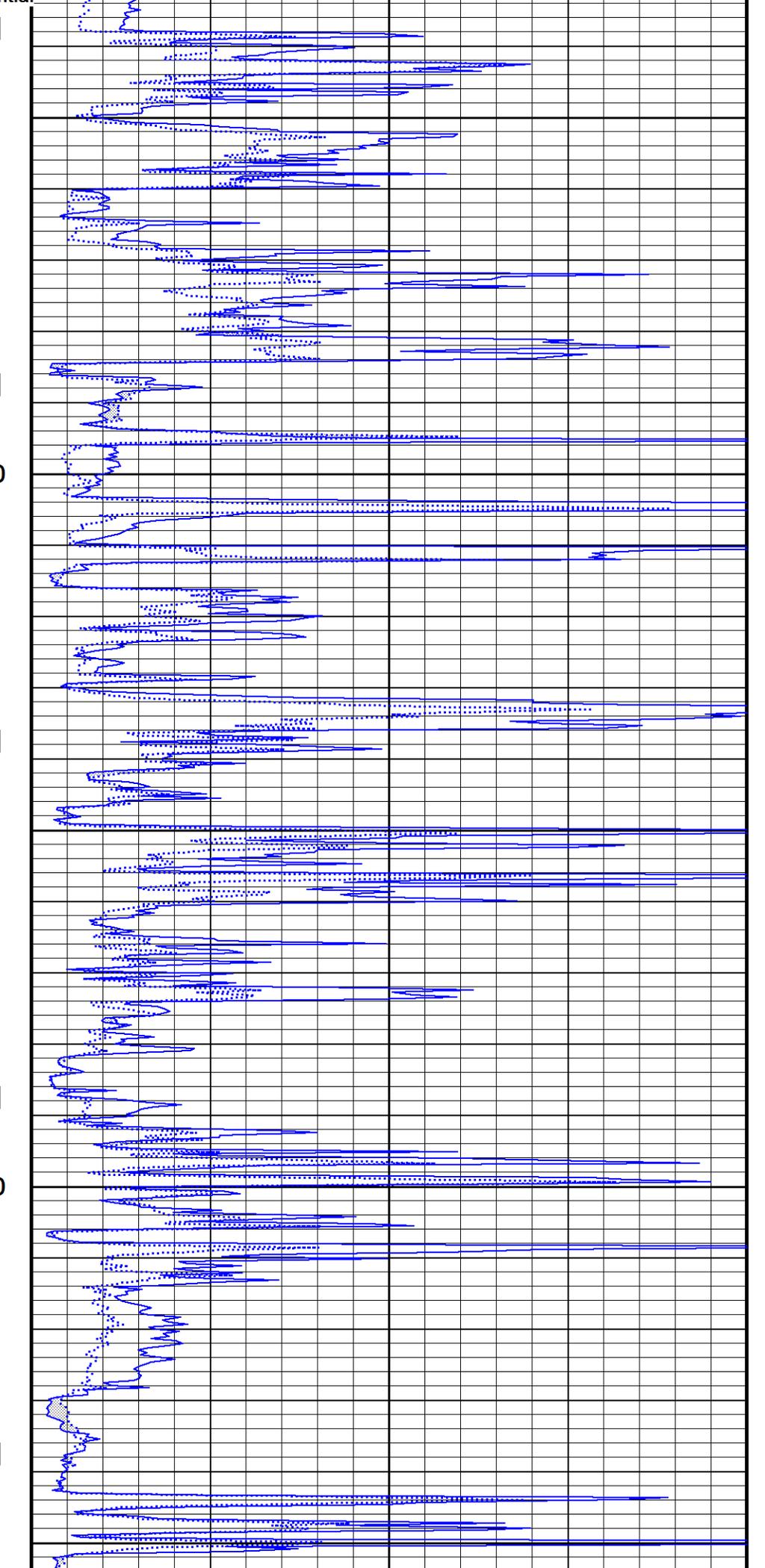


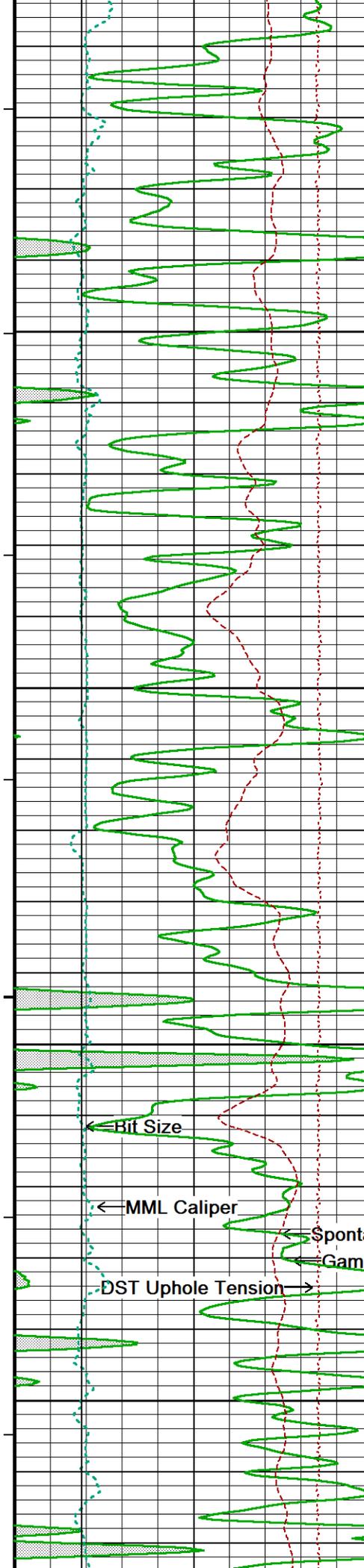


← Gamma Ray
DST Uphole Tension →

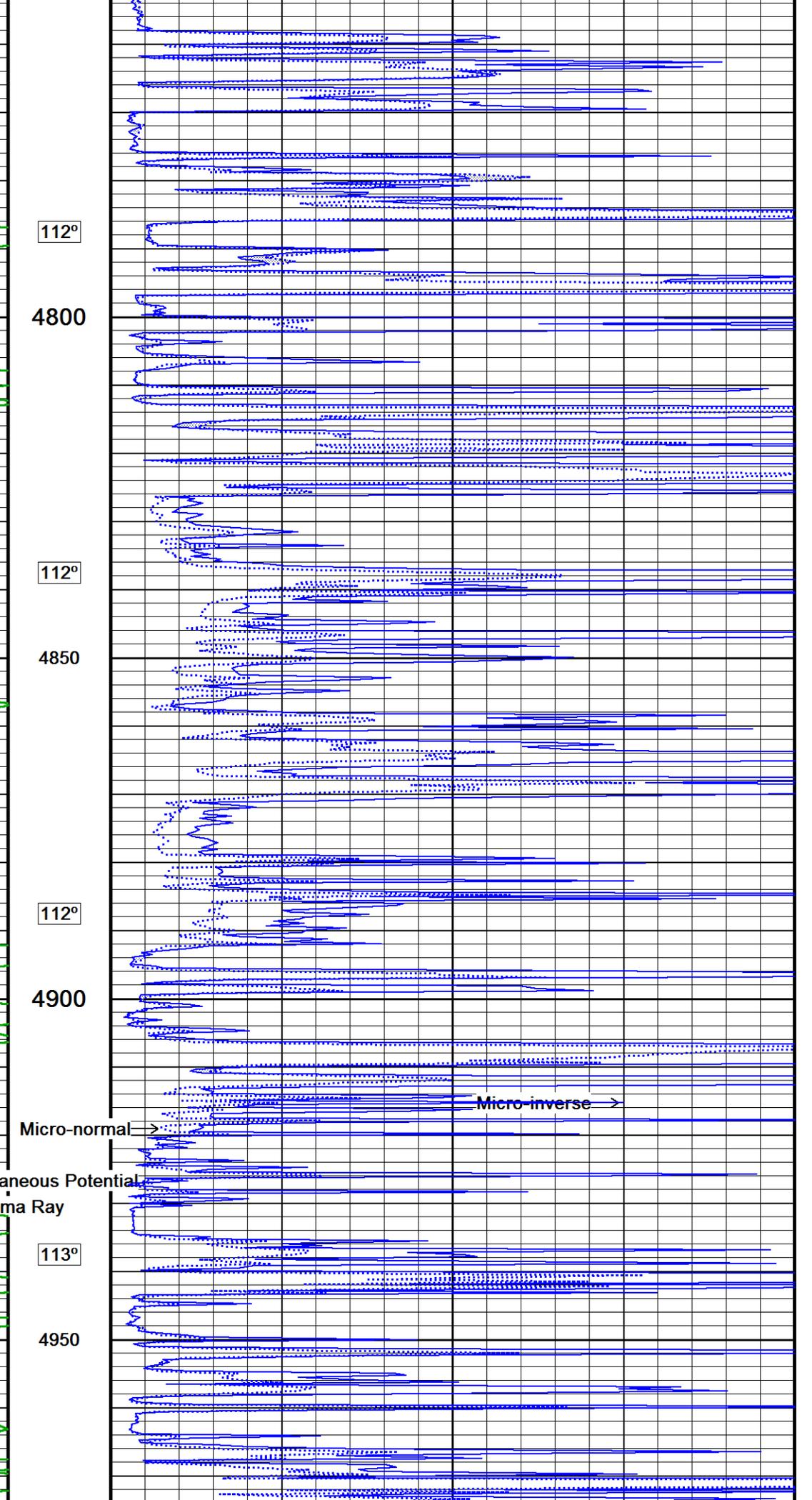
4550
4600
4650
4700
4750

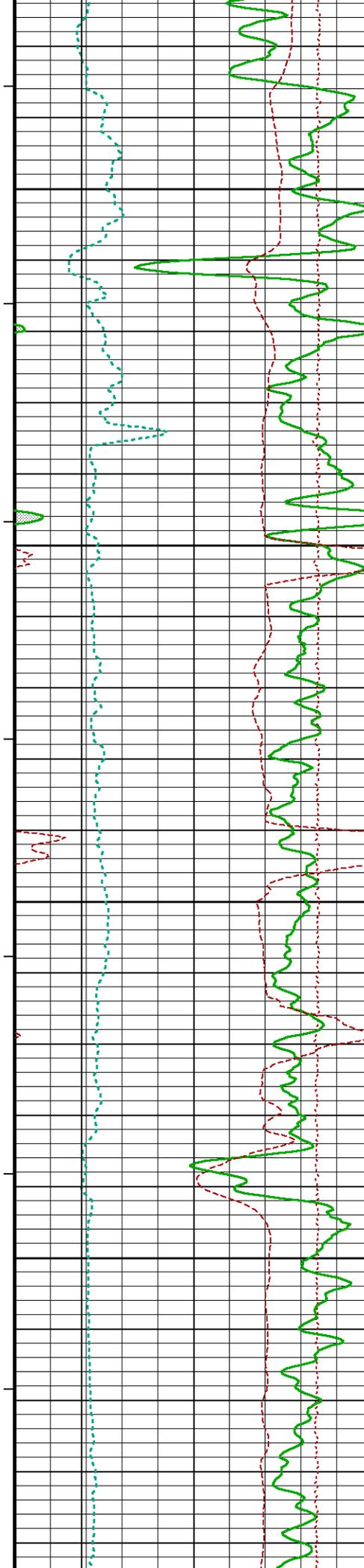
111°
112°
113°
112°



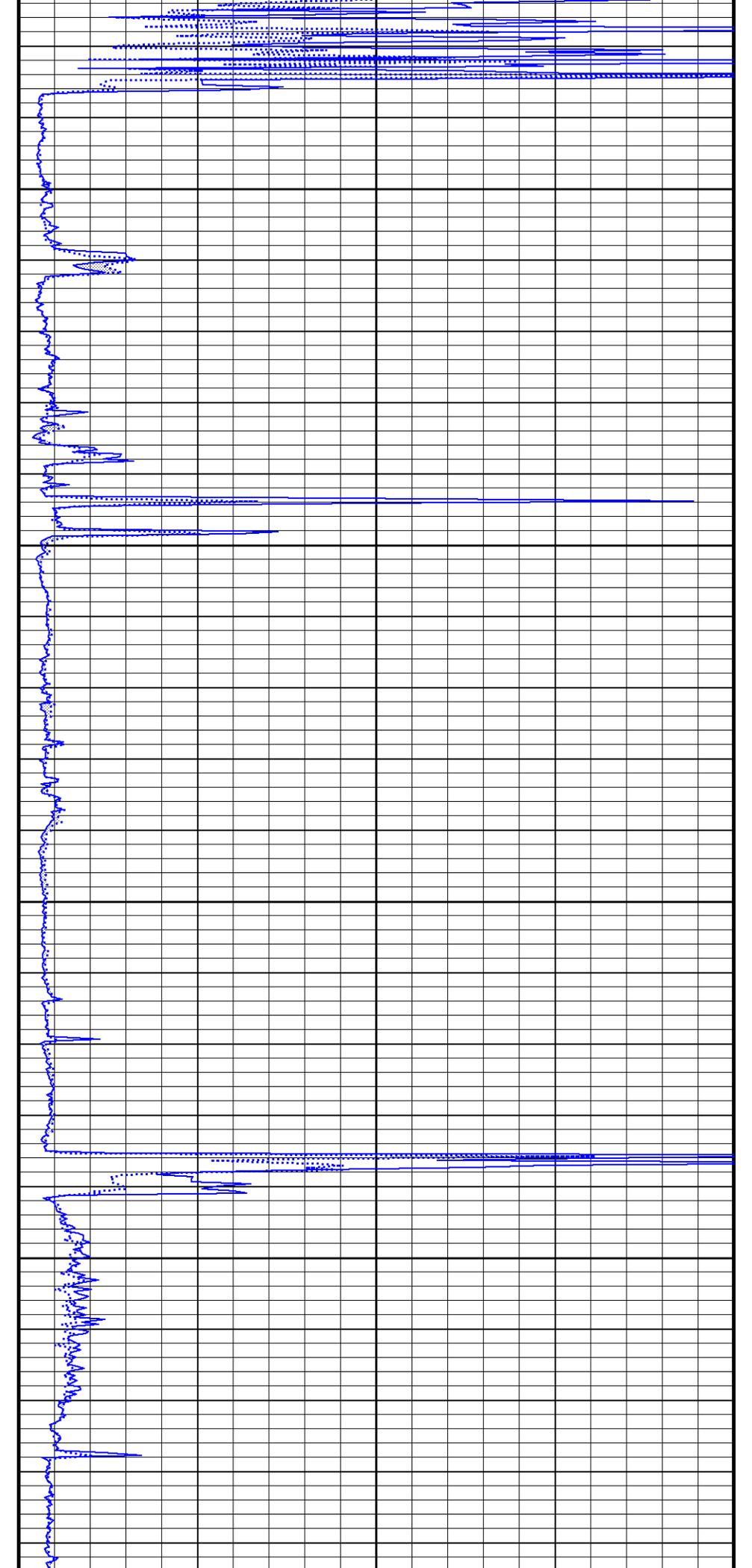


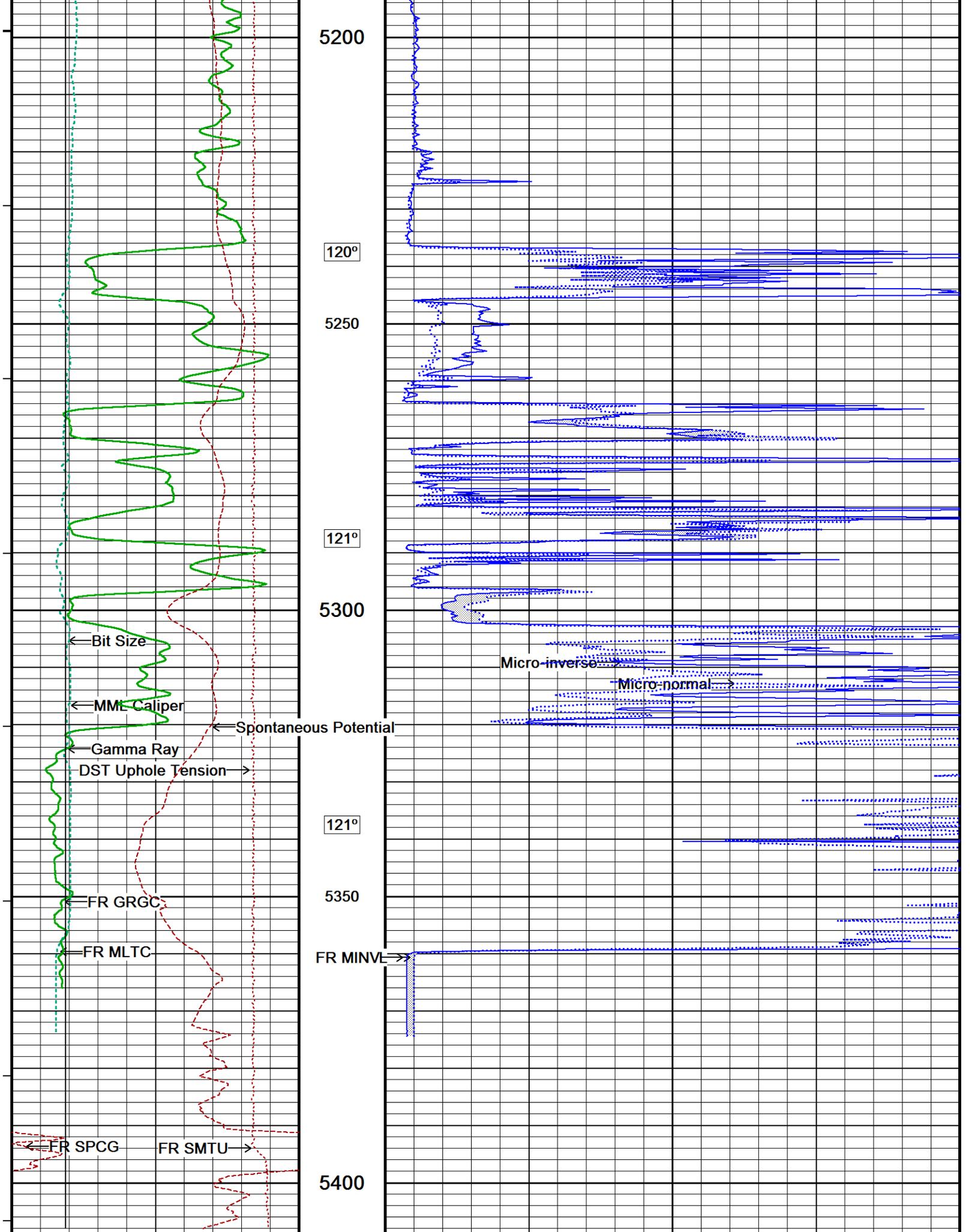
112°
4800
112°
4850
112°
4900
113°
4950

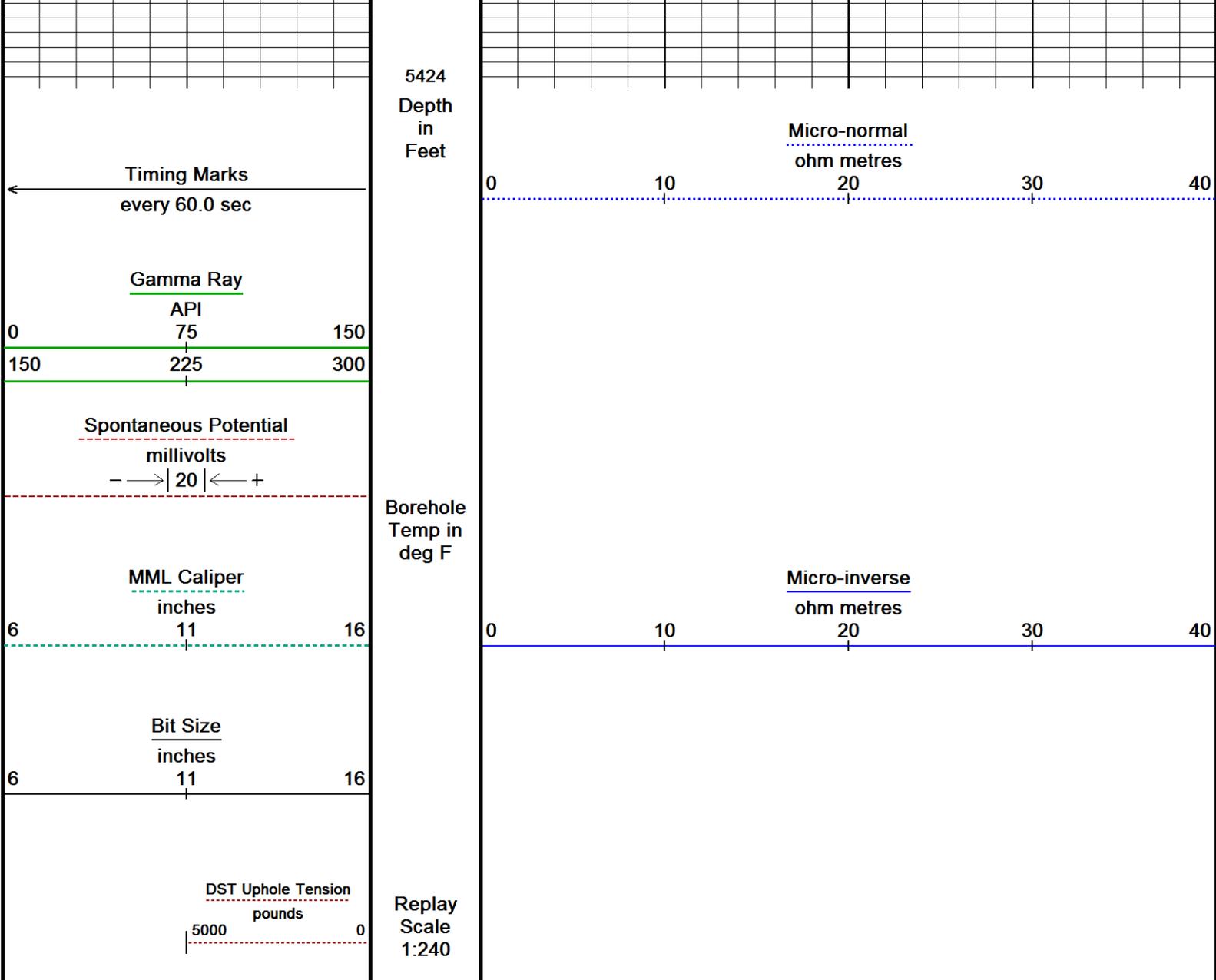




114°
5000
115°
5050
116°
5100
117°
5150
119°





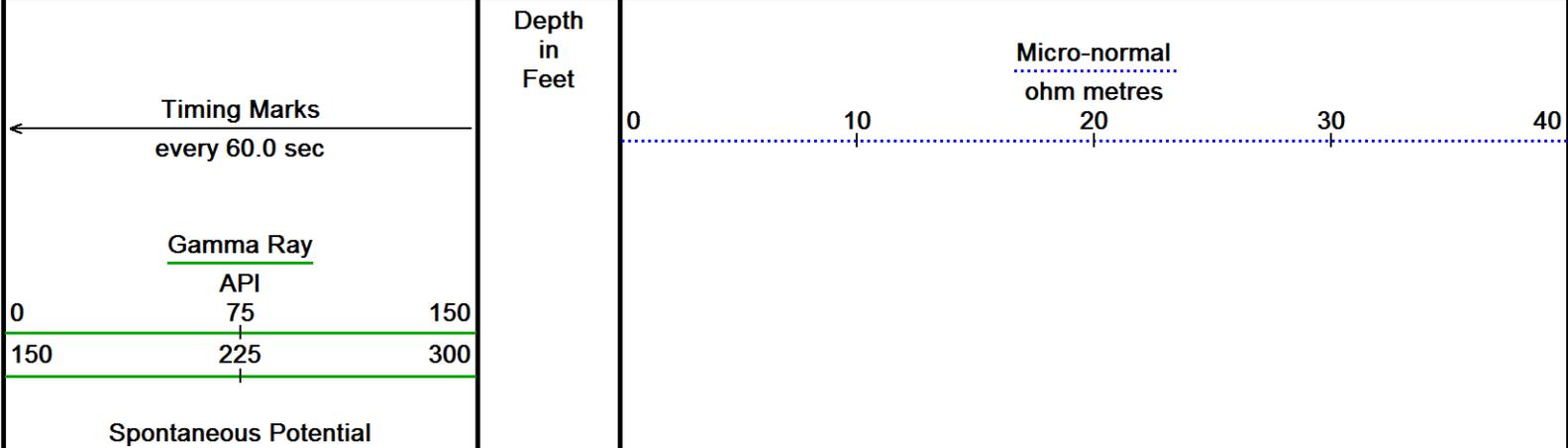


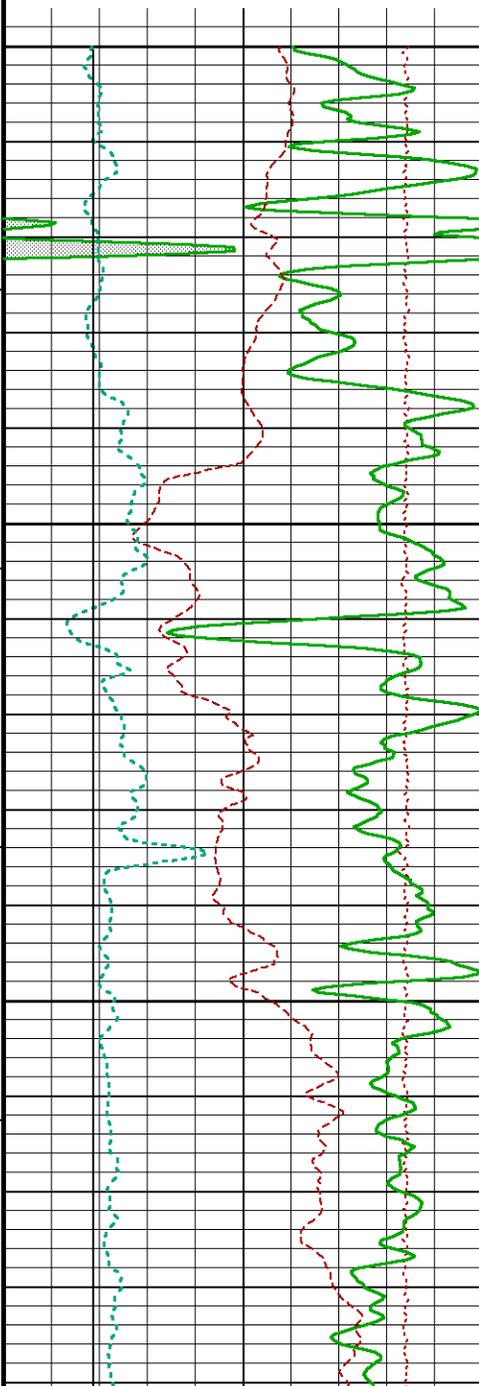
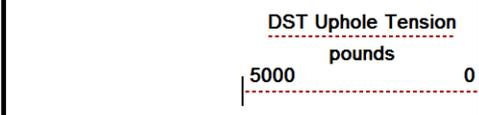
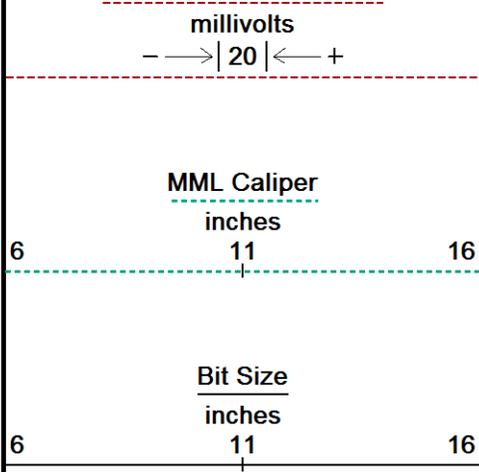
Depth Based Data - Maximum Sampling Increment 10.0cm
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6_005.dta
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506
 Plotted on 10-JAN-2013 15:34
 Recorded on 04-JAN-2013 07:46

↑ **5 INCH MAIN** ↑

↓ **REPEAT SECTION** ↓

Depth Based Data - Maximum Sampling Increment 10.0cm
 Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6_002.dta
 System Versions: Logged with 13.04.8492 Plotted with 13.05.8506
 Plotted on 10-JAN-2013 15:34
 Recorded on 04-JAN-2013 06:48





Borehole
 Temp in
 deg F

Replay
 Scale
 1:240

4950

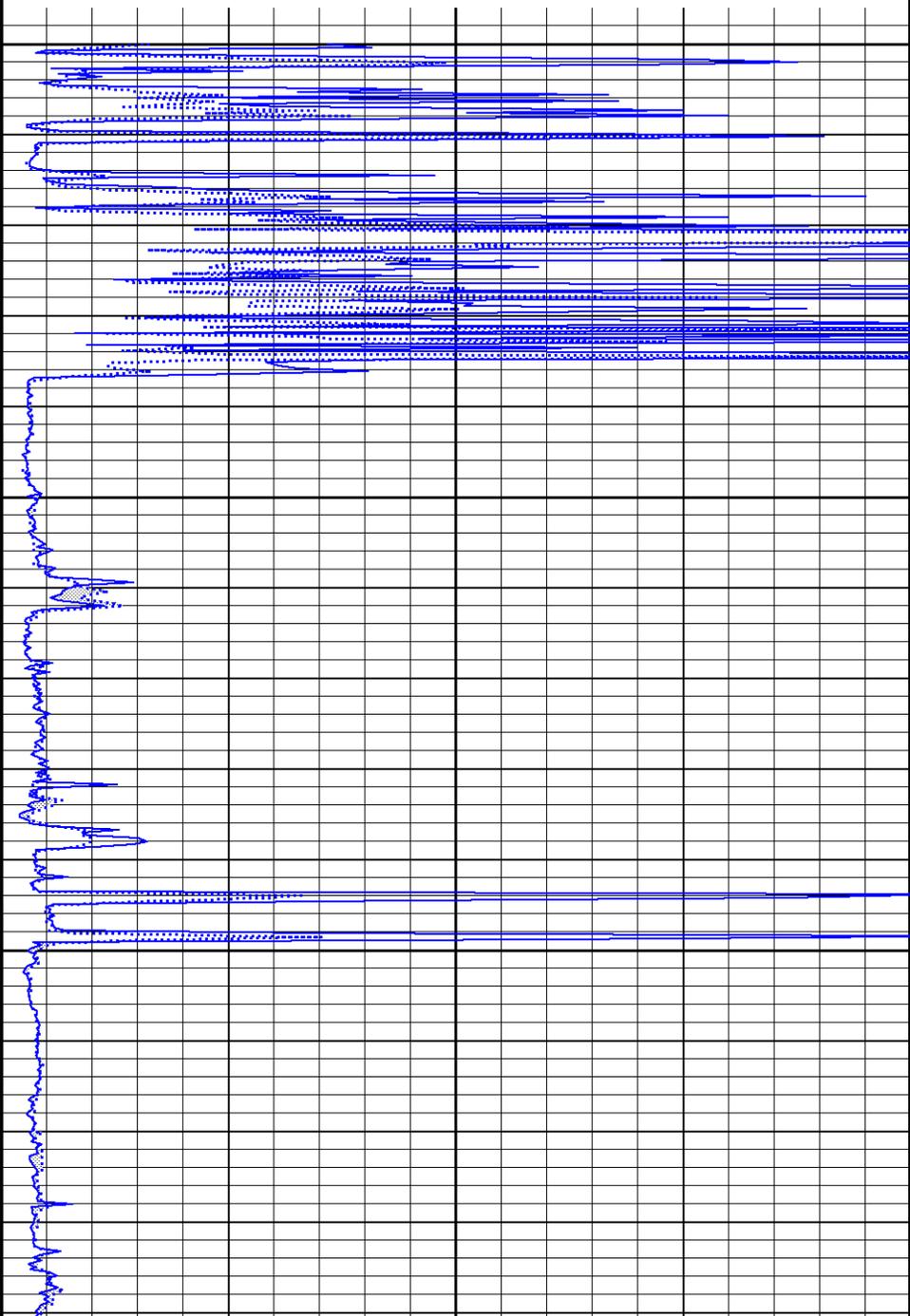
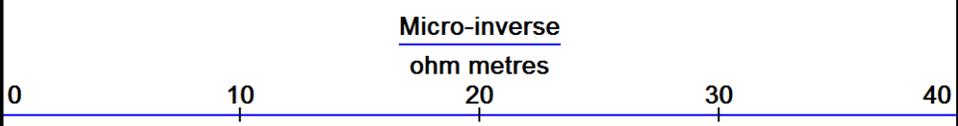
111°

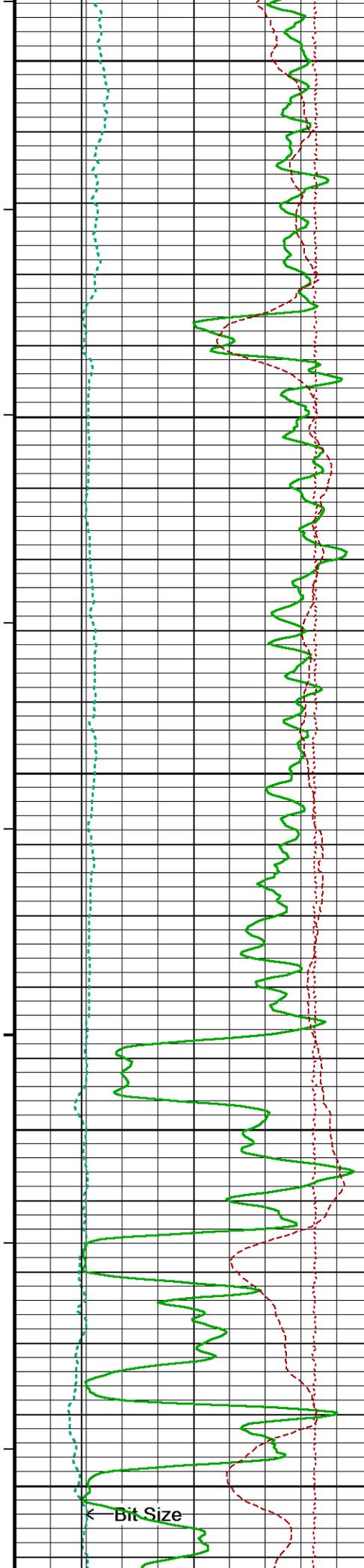
5000

113°

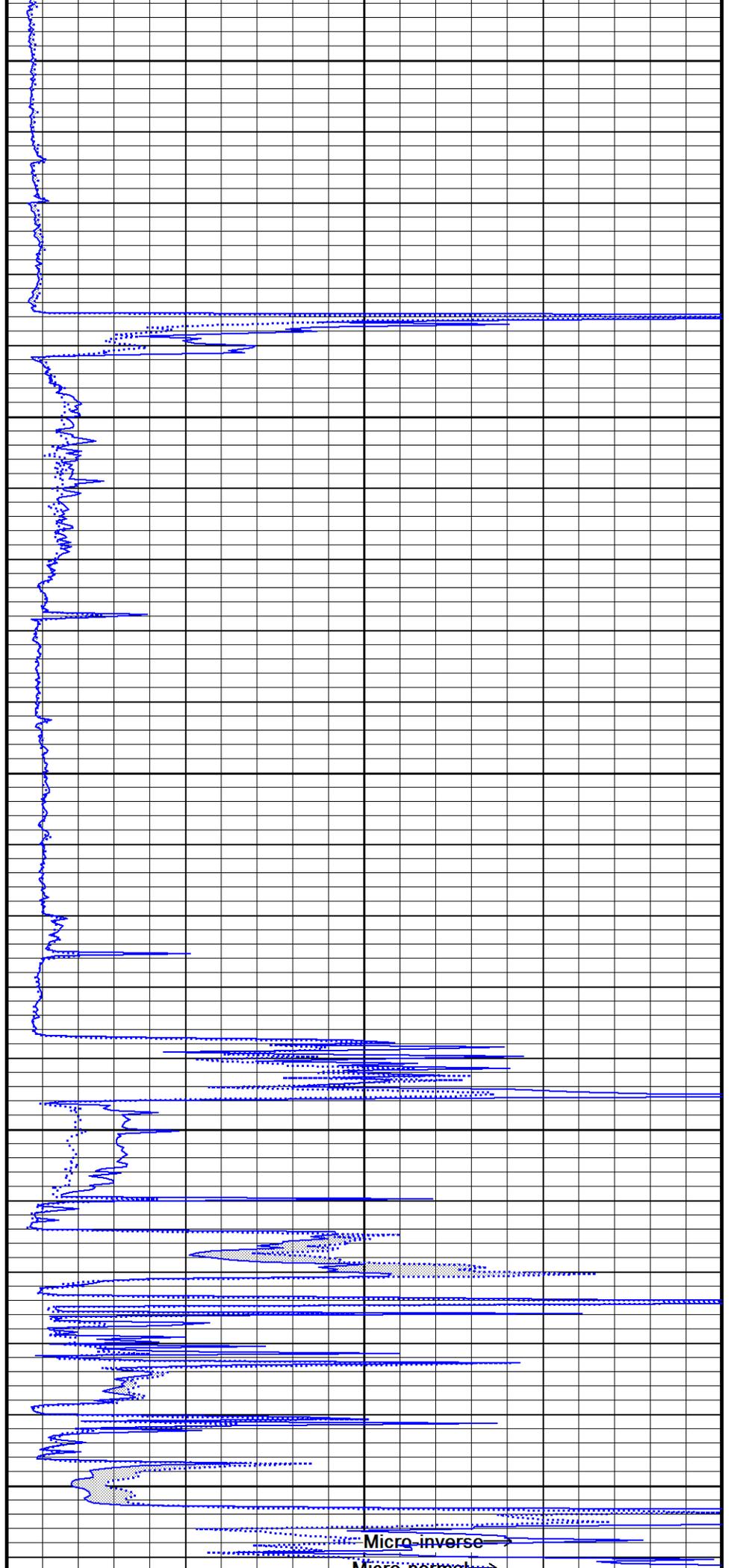
5050

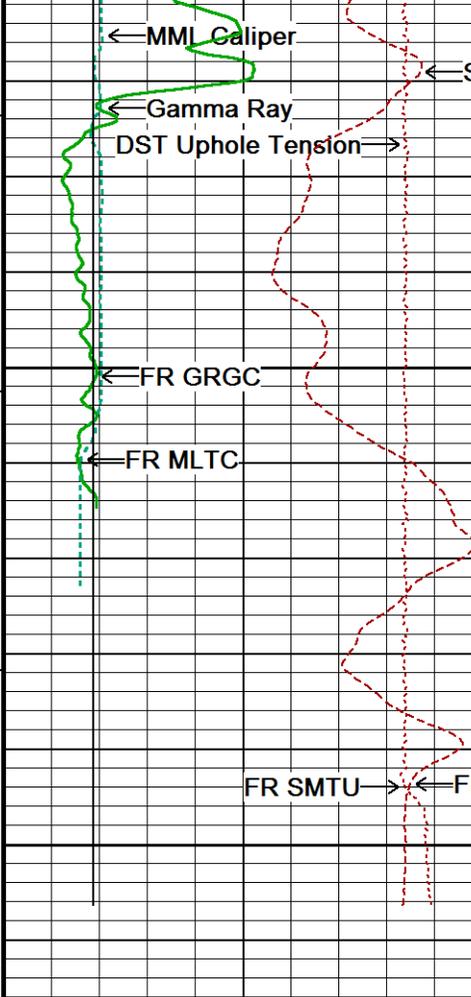
114°





5100
115°
5150
116°
5200
117°
5250
118°
5300





119°

5350

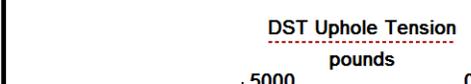
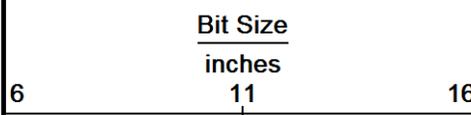
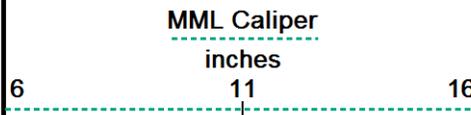
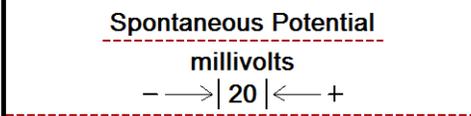
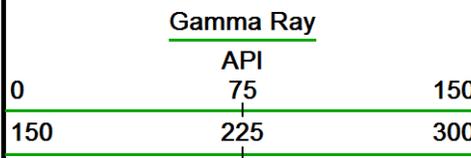
FR MNRL →

5400

5414

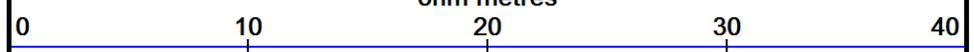
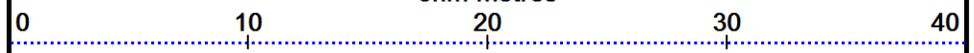
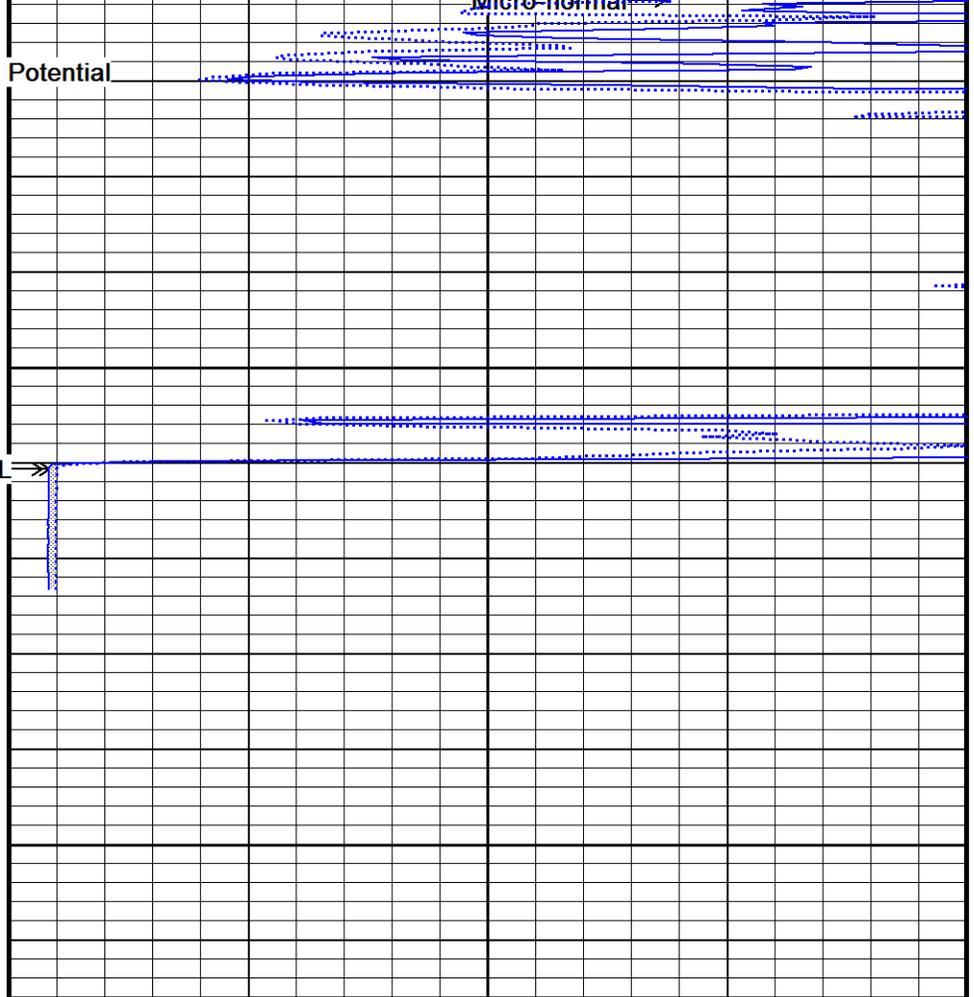
Depth in Feet

Timing Marks every 60.0 sec



Borehole Temp in deg F

Replay Scale



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 10-JAN-2013 15:34

Filename: C:\Users\E143235\AppData\Local\Temp\Weather...\Western Operating Helfrich #1-6_002.dta

Recorded on 04-JAN-2013 06:48

System Versions: Logged with 13.04.8492 Plotted with 13.05.8506



REPEAT SECTION



BEFORE SURVEY CALIBRATION

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView2\8\Western Operating Helfrich #1-6_005.dta

General Constants All 000

Last Edited on 04-JAN-2013,01:35

General Parameters

Mud Resistivity	1.260	ohm-metres
Mud Resistivity Temperature	79.000	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	1.000
RWA Constant M	2.000
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 03-JAN-2013 21:58

	Measured	Calibrated (API)
Background	66	45
Calibrator (Gross)	1127	770
Calibrator (Net)	1062	725

Gamma Constants MCG-B 34

Last Edited on 04-JAN-2013,01:35

Gamma Calibrator Number	GRC38	
Mud Density	1.14	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 03-JAN-2013 21:52

Base Calibration

Channel	Measured		Calibrated (ohm-m)	
	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

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 03-JAN-2013 21:50

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)
5.92	5.98

DOWNHOLE EQUIPMENT

C:\Users\E143235\AppData\Local\Temp\Weatherford PreView2\8\Western Operating Helfrich #1-6_005.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

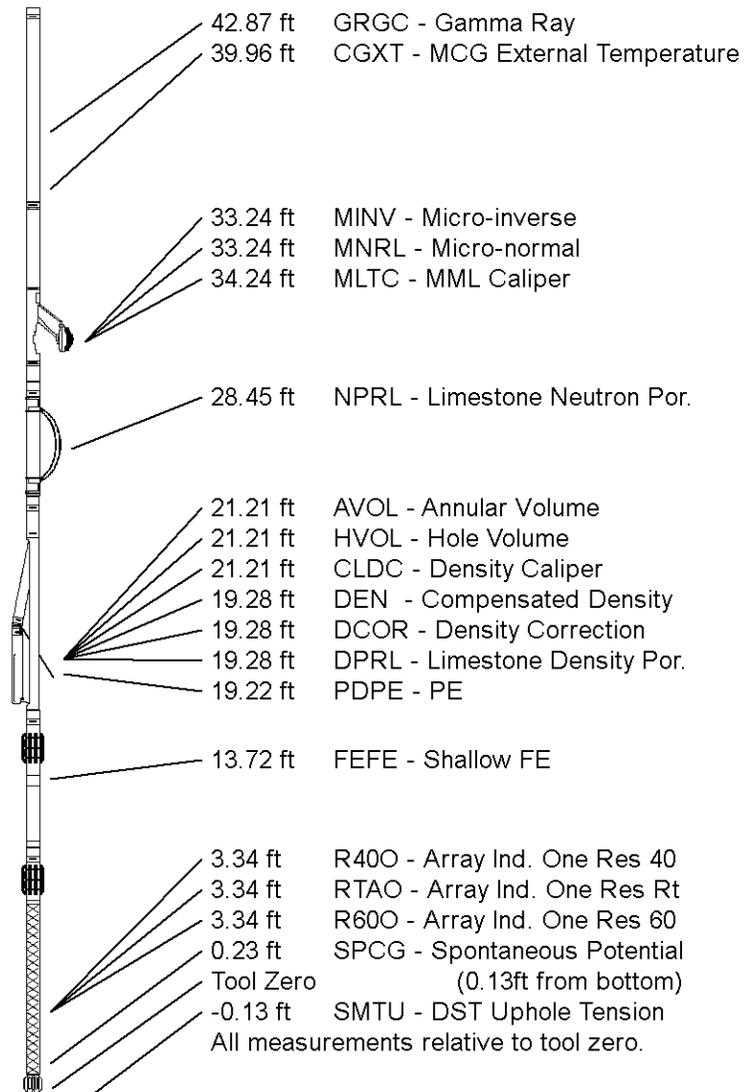
Compact Neutron
 MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

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



FIELD HELFRICH
PROVINCE/COUNTY HAMILTON
COUNTRY/STATE U.S.A. / KANSAS

Elevation Kelly Bushing	3586.00	feet	First Reading	5361.00	feet
Elevation Drill Floor	3585.00	feet	Depth Driller	5400.00	feet
Elevation Ground Level	3574.00	feet	Depth Logger	5394.00	feet



Weatherford[®]

MICRORESISTIVITY LOG