



**Weatherford**

**MICRORESISTIVITY LOG**

|                                         |              |        |                |                                     |  |         |  |
|-----------------------------------------|--------------|--------|----------------|-------------------------------------|--|---------|--|
| COMPANY                                 |              |        |                | O'BRIEN ENERGY RESOURCES CORP.      |  |         |  |
| WELL                                    |              |        |                | VAIL 6-30                           |  |         |  |
| FIELD                                   |              |        |                | SINGLEY                             |  |         |  |
| PROVINCE/COUNTY                         |              |        |                | MEADE                               |  |         |  |
| COUNTRY/STATE                           |              |        |                | U.S.A. / KANSAS                     |  |         |  |
| LOCATION                                |              |        |                | 1976' FSL & 681' FEL<br>NE SW NE SE |  |         |  |
| SEC                                     | TWP          | RGE    | Other Services |                                     |  |         |  |
| 30                                      | 33S          | 29W    | MPD/MDN        |                                     |  |         |  |
| API Number                              | 15-119-21356 |        | MAI/MFE        |                                     |  |         |  |
| Permit Number                           |              |        | MML            |                                     |  |         |  |
| Permanent Datum GL, Elevation 2647 feet |              |        |                | Elevations:                         |  | feet    |  |
| Log Measured From KB                    |              |        |                | KB                                  |  | 2659.00 |  |
| Drilling Measured From KB @ 12 FEET     |              |        |                | DF                                  |  | 2657.00 |  |
|                                         |              |        |                | GL                                  |  | 2647.00 |  |
| Date                                    | 22-DEC-2013  |        |                |                                     |  |         |  |
| Run Number                              | ONE          |        |                |                                     |  |         |  |
| Service Order                           | 3547637      |        |                |                                     |  |         |  |
| Depth Driller                           | 6360.00      |        |                | feet                                |  |         |  |
| Depth Logger                            | 6356.00      |        |                | feet                                |  |         |  |
| First Reading                           | 6323.00      |        |                | feet                                |  |         |  |
| Last Reading                            | 4000.00      |        |                | feet                                |  |         |  |
| Casing Driller                          | 1485.00      |        |                | feet                                |  |         |  |
| Casing Logger                           | 1486.00      |        |                | feet                                |  |         |  |
| Bit Size                                | 7.875        |        |                | inches                              |  |         |  |
| Hole Fluid Type                         | CHEM         |        |                |                                     |  |         |  |
| Density / Viscosity                     | 9.20         | lb/USg | 61.00          | CP                                  |  |         |  |
| PH / Fluid Loss                         | 10.00        |        | 7.20           | ml/30Min                            |  |         |  |
| Sample Source                           | PIT          |        |                |                                     |  |         |  |
| Rm @ Measured Temp                      | 0.50 @ 90.0  |        |                | ohm-m                               |  |         |  |
| Rmf @ Measured Temp                     | 0.40 @ 90.0  |        |                | ohm-m                               |  |         |  |
| Rmc @ Measured Temp                     | 0.60 @ 90.0  |        |                | ohm-m                               |  |         |  |
| Source Rmf / Rmc                        | CALC         |        | CALC           |                                     |  |         |  |
| Rm @ BHT                                | 0.37 @121.0  |        |                | ohm-m                               |  |         |  |
| Time Since Circulation                  | 5 HRS        |        |                |                                     |  |         |  |
| Max Recorded Temp                       | 121.00       |        |                | deg F                               |  |         |  |
| Equipment / Base                        | 13057        |        | LIB            |                                     |  |         |  |
| Recorded By                             | D. COLE      |        |                |                                     |  |         |  |
| Witnessed By                            | R. PEARSON   |        |                | P. DEBENHAM                         |  |         |  |
| IOB#                                    |              |        |                |                                     |  |         |  |

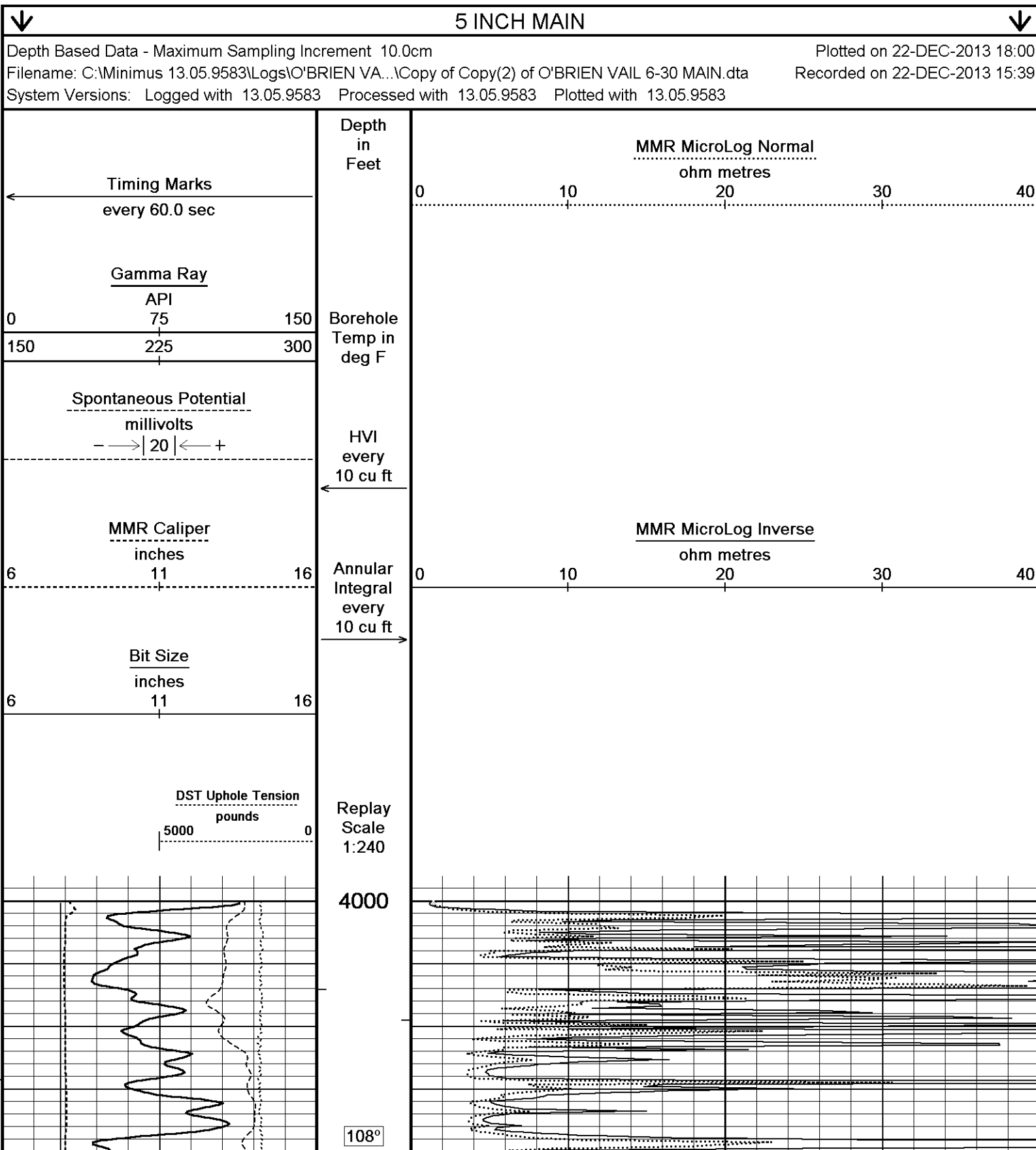
| BOREHOLE RECORD    |                |                    |                    | Last Edited: 22-DEC-2013 13:26 |                     |
|--------------------|----------------|--------------------|--------------------|--------------------------------|---------------------|
| Bit Size<br>inches |                | Depth From<br>feet |                    | Depth To<br>feet               |                     |
| 7.875              |                | 1485.00            |                    | 6360.00                        |                     |
| CASING RECORD      |                |                    |                    |                                |                     |
| Type               | Size<br>inches | Depth From<br>feet | Shoe Depth<br>feet |                                | Weight<br>pounds/ft |
| CASING             | 8.625          | 0.00               | 1485.00            |                                | 24.00               |

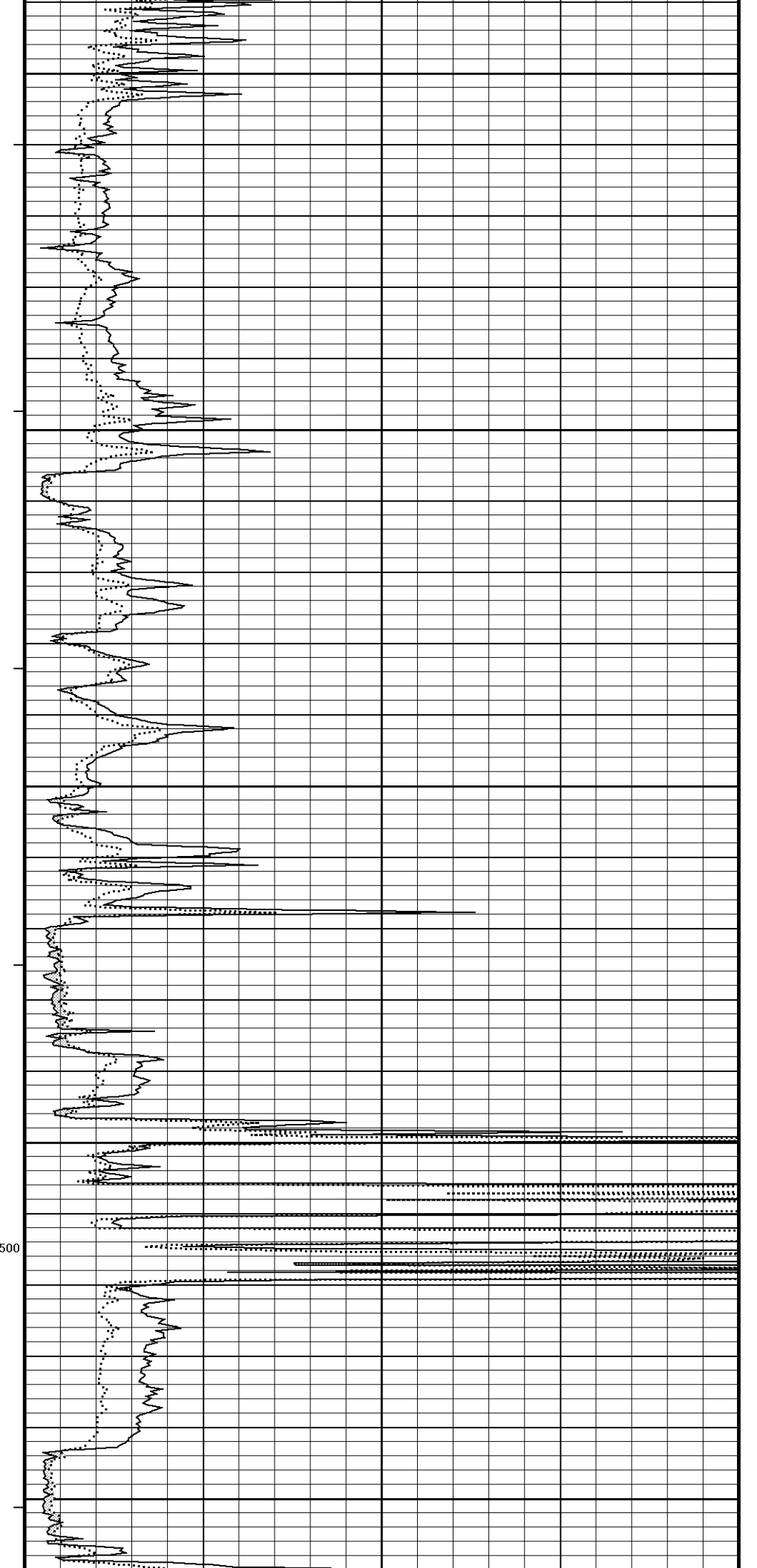
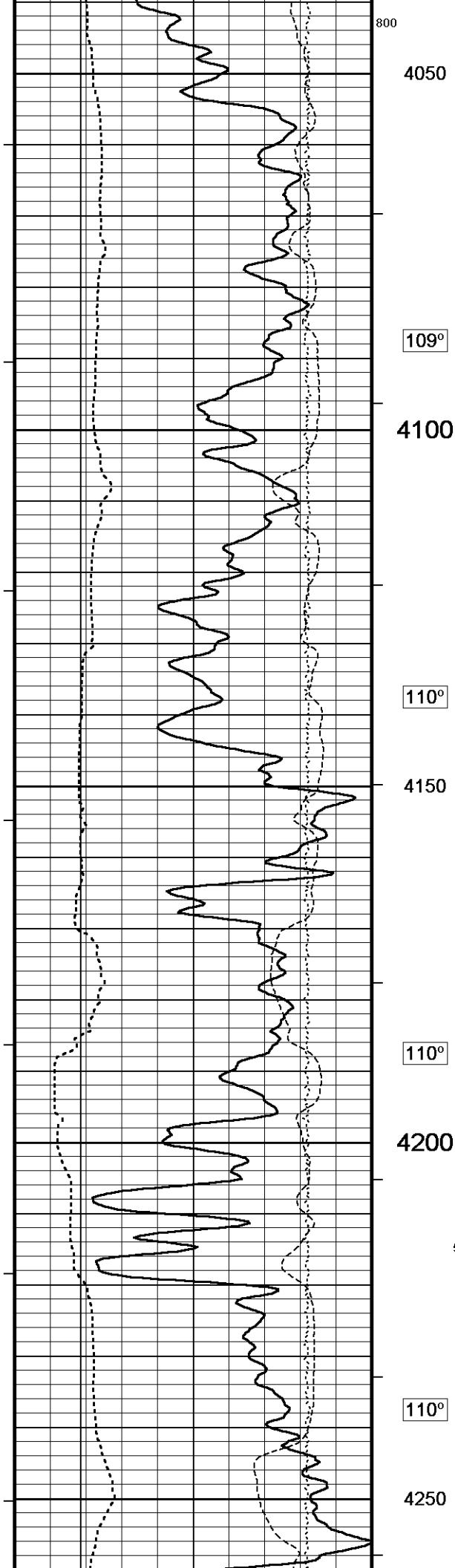
| REMARKS                                                                                      |
|----------------------------------------------------------------------------------------------|
| - SOFTWARE ISSUE: 13.05.9583                                                                 |
| - MCG, MML, MDN, MPD, MFE, MAI RAN IN COMBINATION                                            |
| - HARDWARE: DUAL BOWSPRING USED ON MDN<br>0.5 INCH STANDOFF USED ON MFE ,MAI                 |
| - 2.71 AND 2.65 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY                     |
| - BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL EFFECT DATA QUALITY                      |
| - ALL INTERVALS LOGGED AND SCALED PER CUSTOMRES REQUEST                                      |
| - TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1870 CU.FT.                                   |
| - ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1330 CU.FT. |
| -RIG: DUKE DRILLING RIG #6                                                                   |

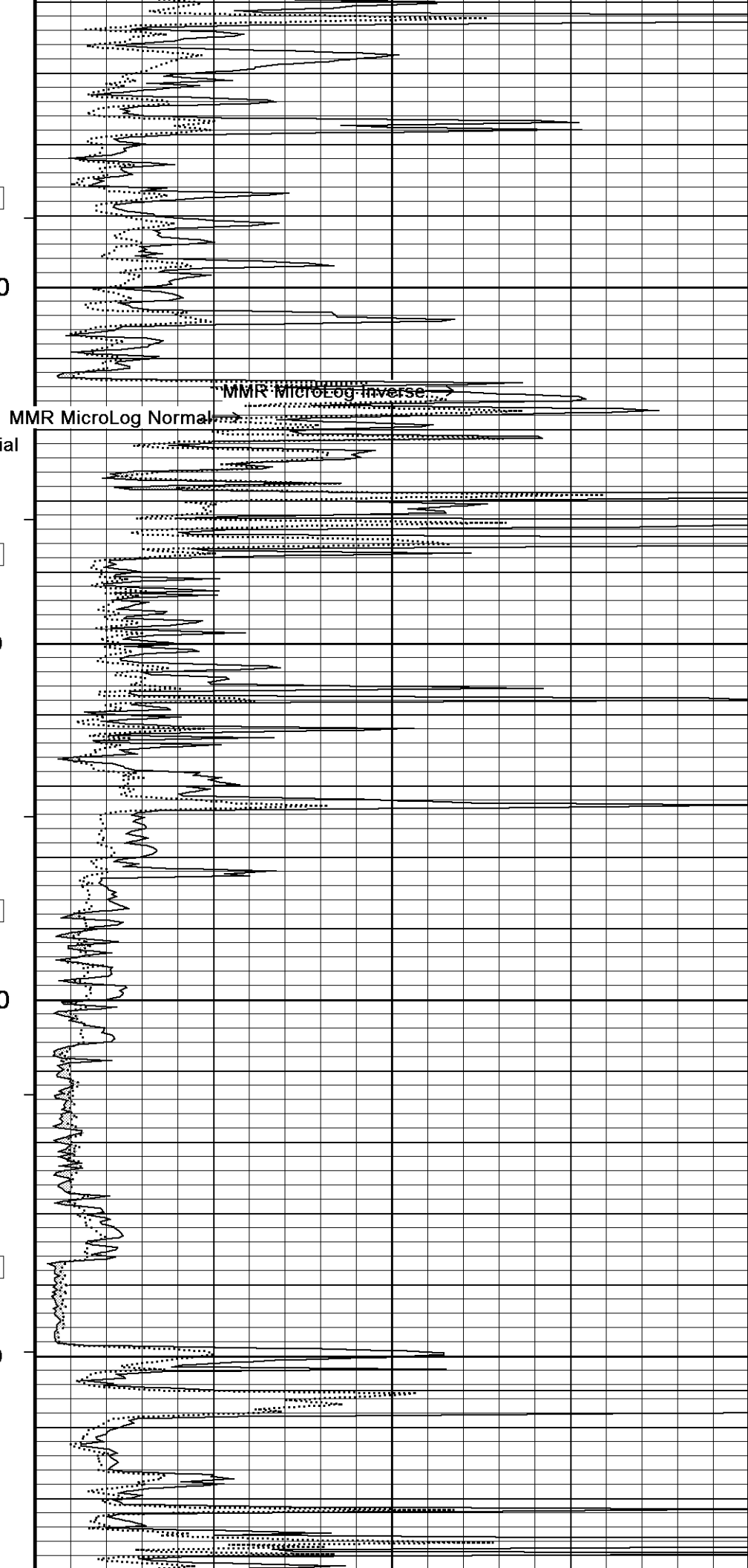
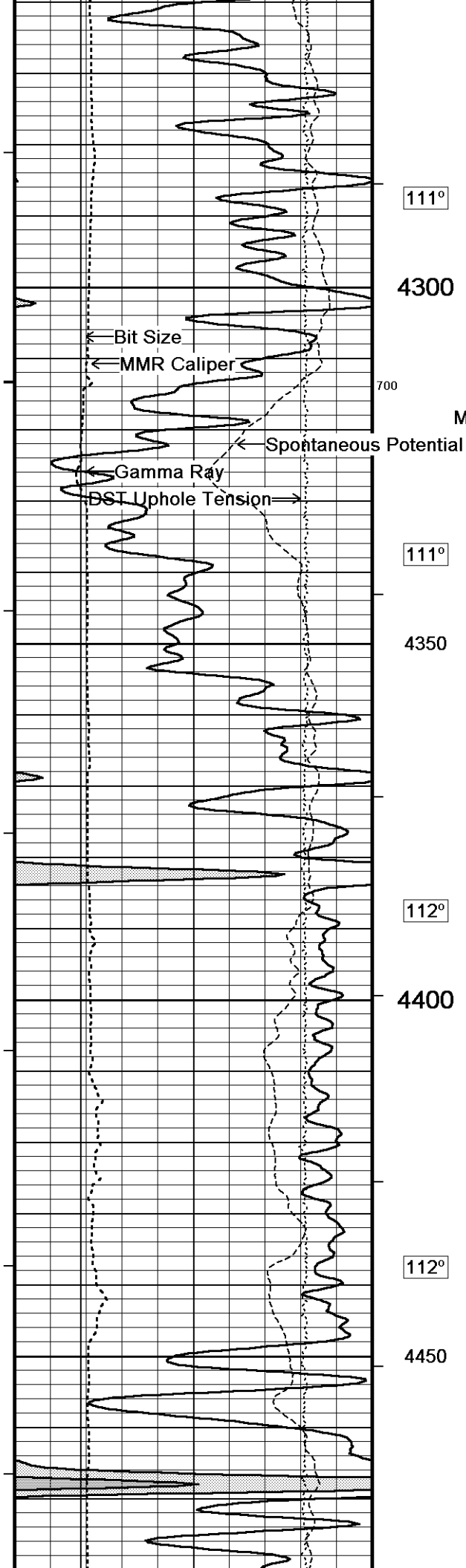
- ENGINEER: D. COLE

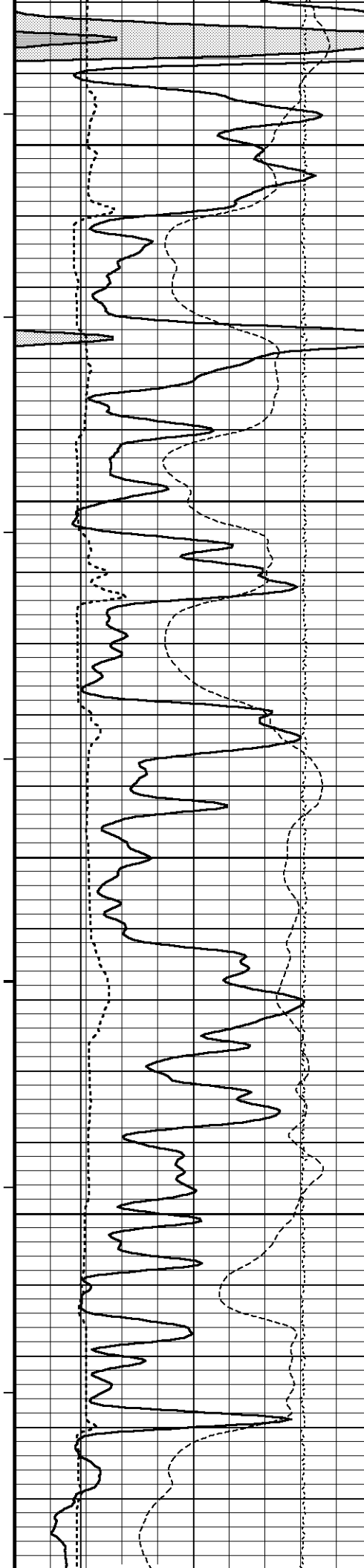
- OPERATOR: K. PHILLIPS AND J. DUNLAP

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.









112°

4500

113°

4550

113°

600

4600

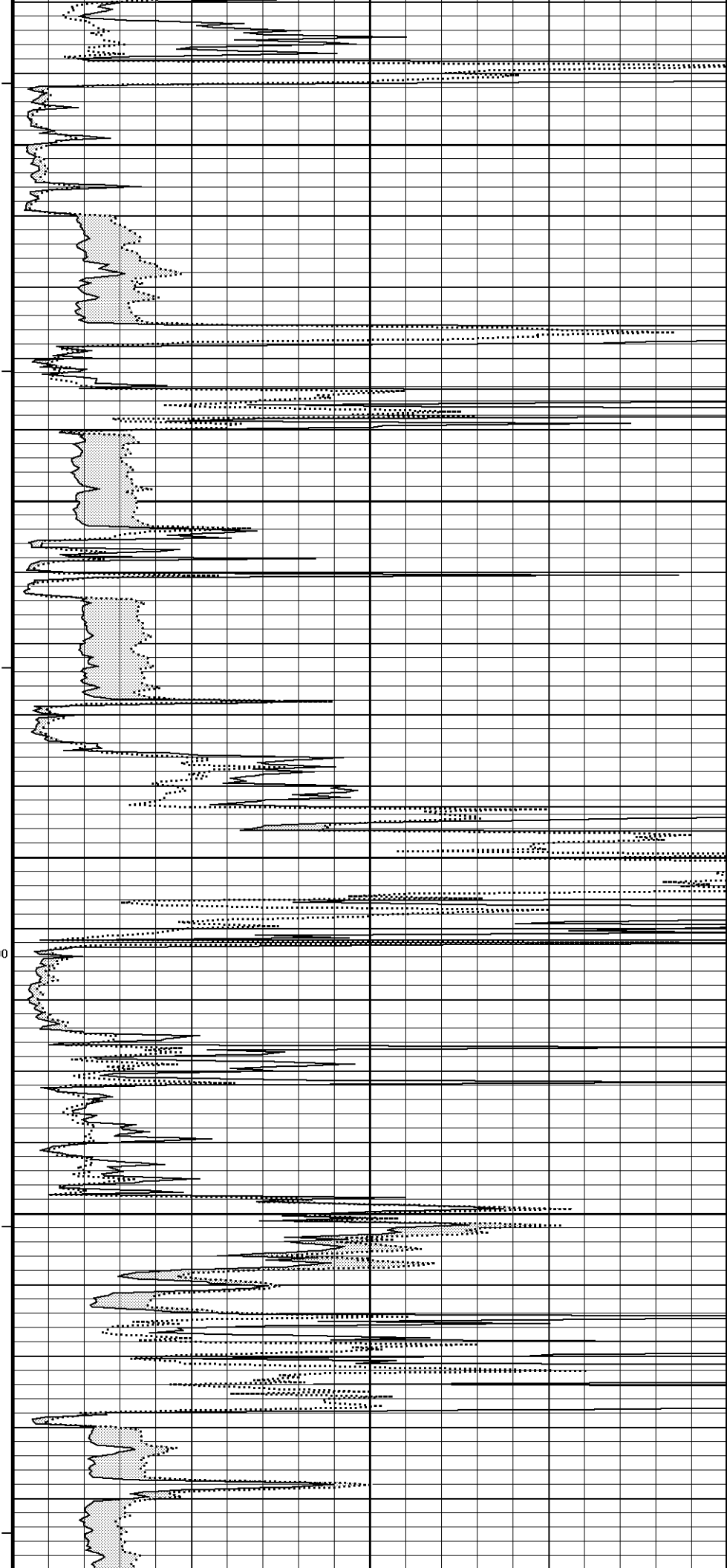
400

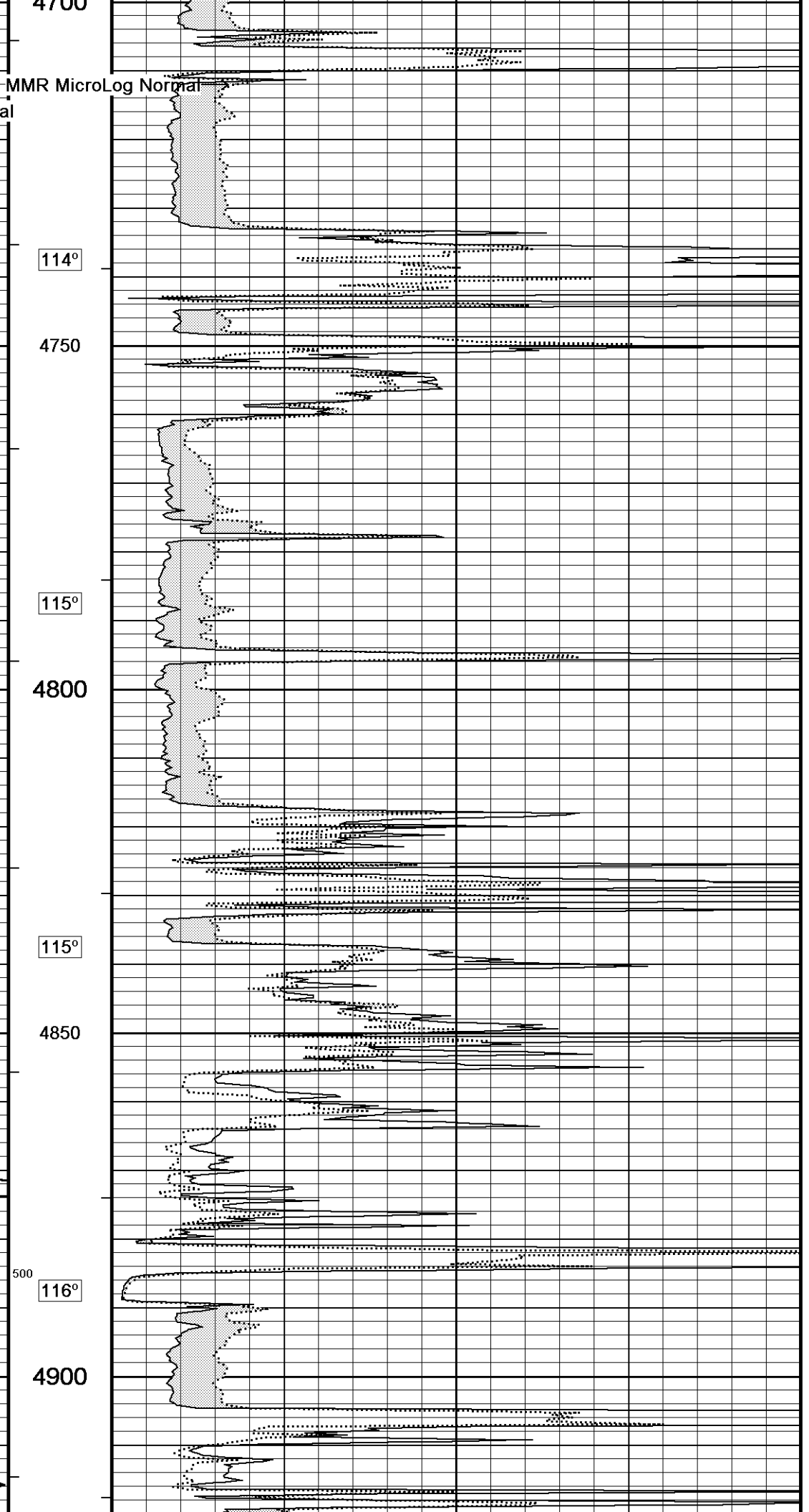
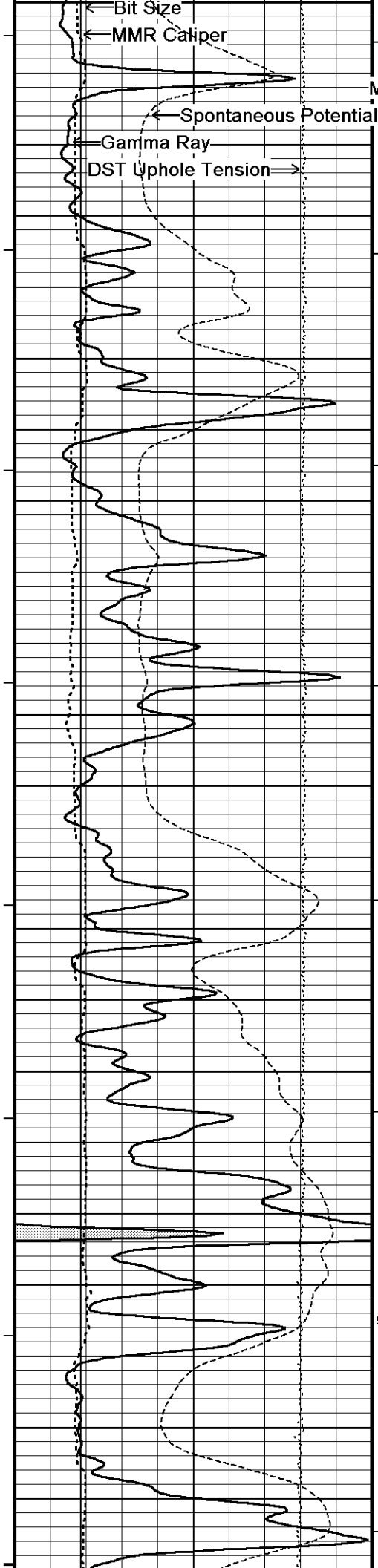
114°

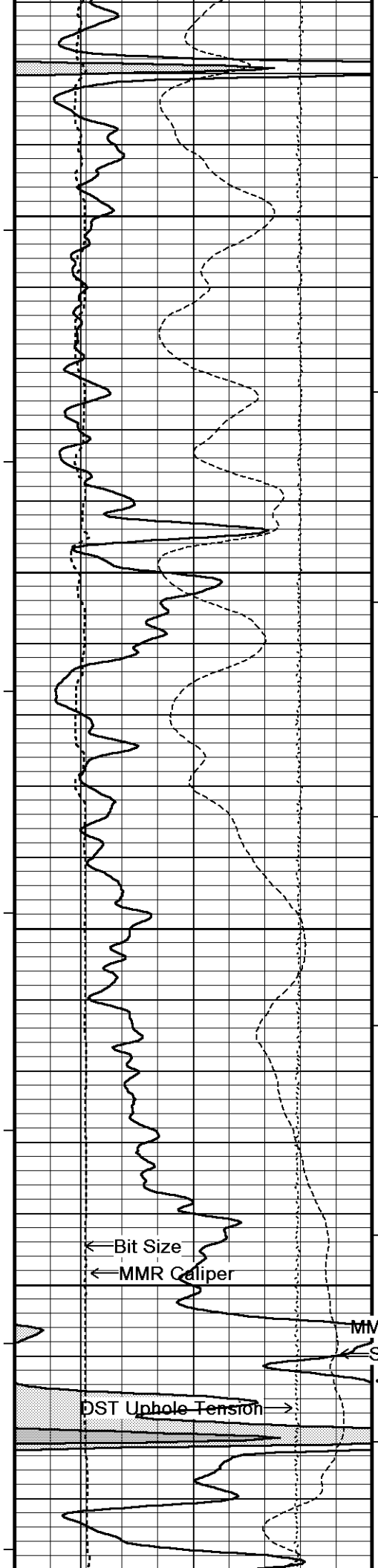
4650

114°

4700







116°

4950

116°

5000

116°

5050

117°

5100

117°

← Bit Size

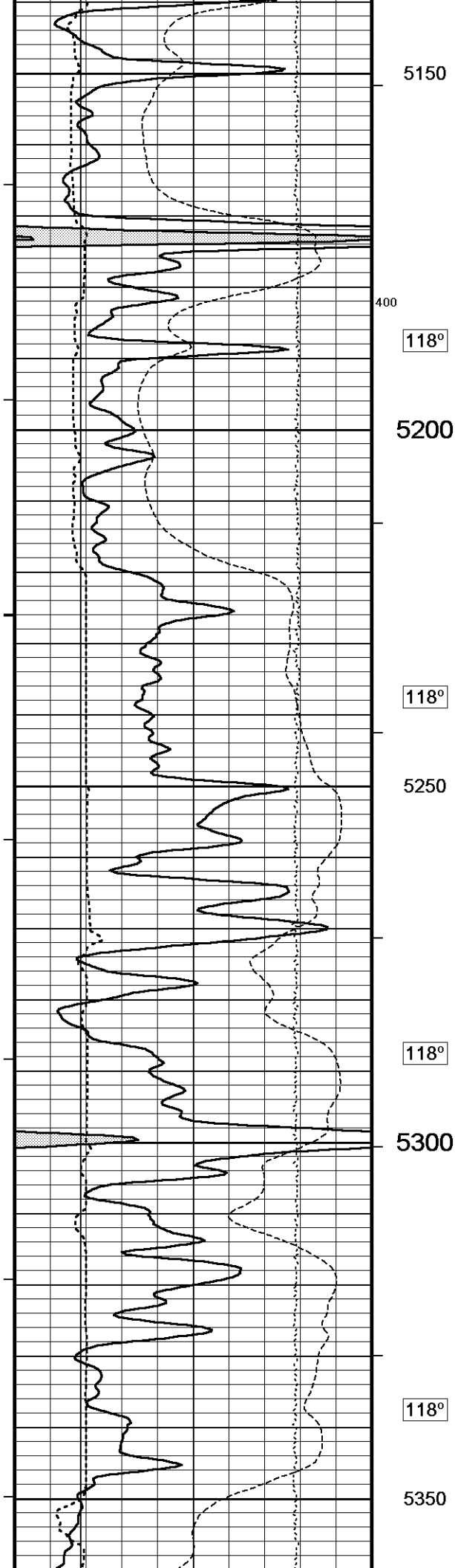
← MMR Caliper

DST Uphole Tension →

MMR MicroLog Normal →

← Spontaneous Potential

← Gamma Ray



5150

400

118°

5200

118°

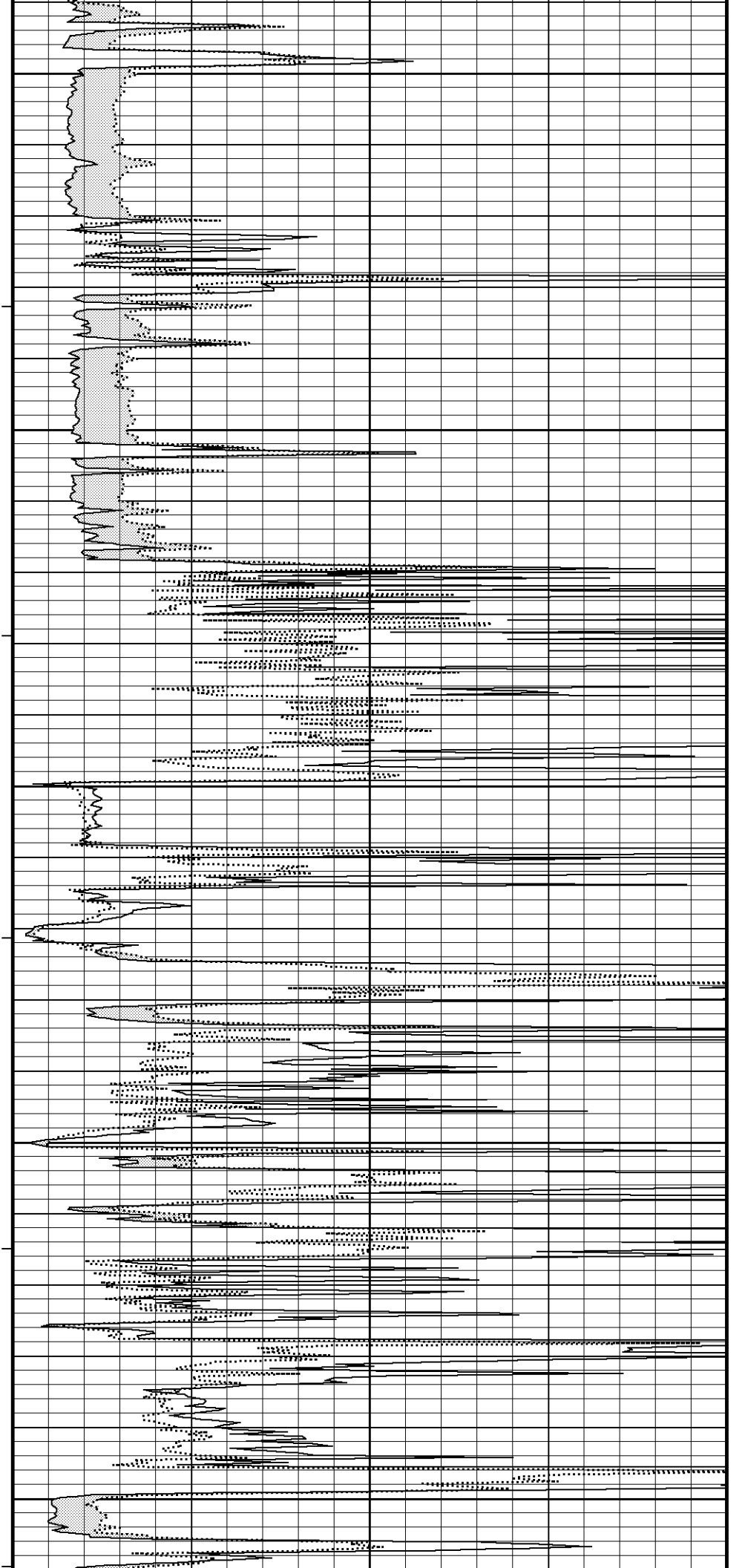
5250

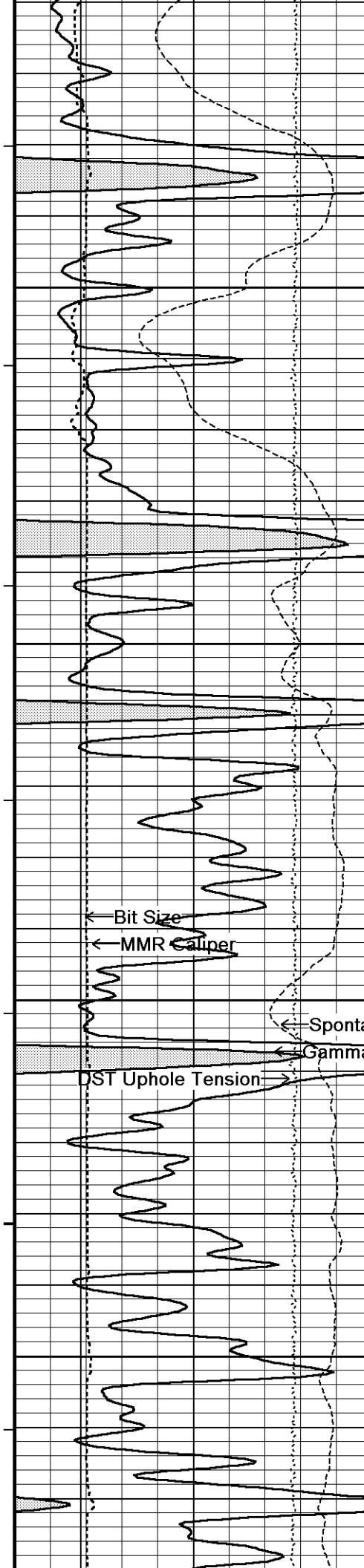
118°

5300

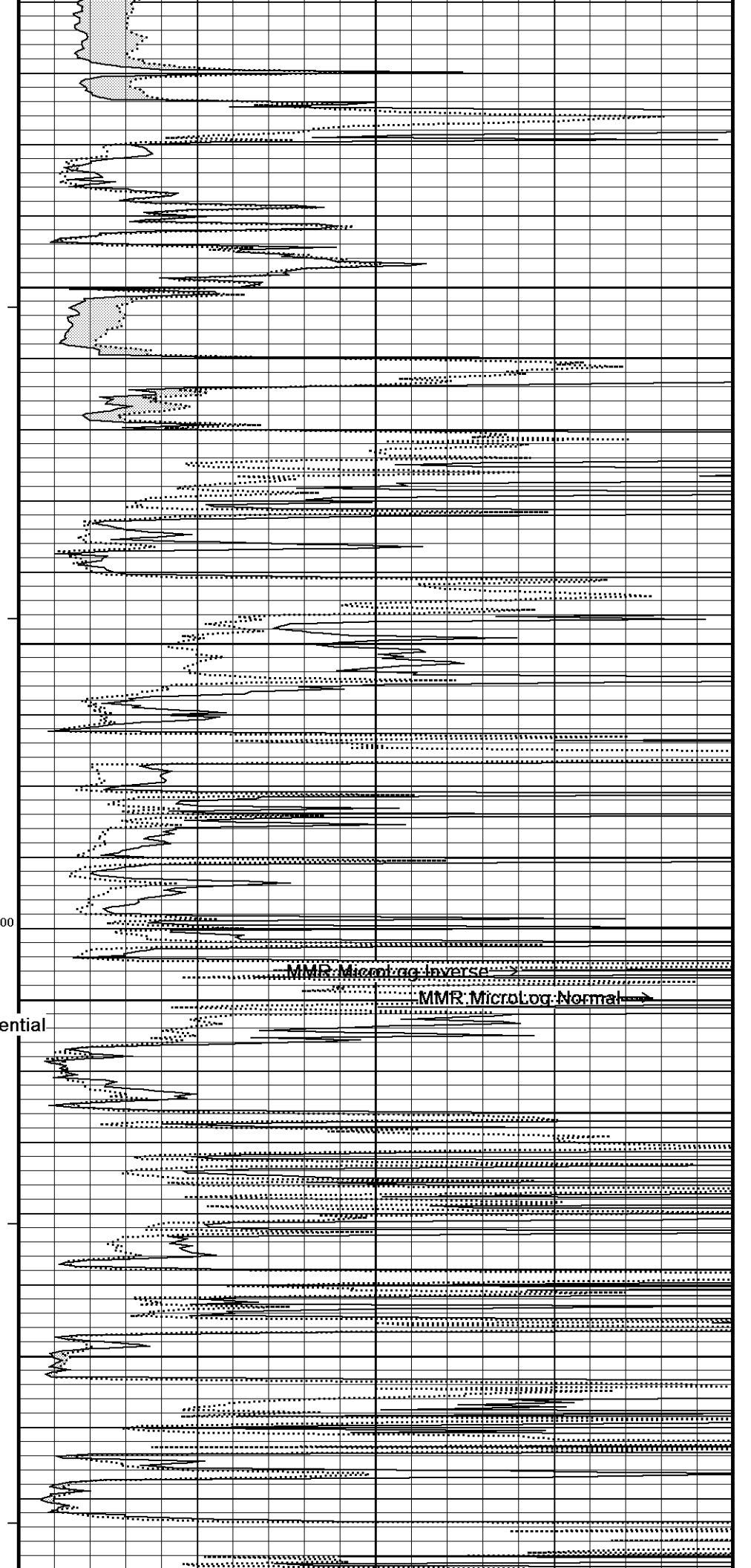
118°

5350





119°  
5400  
119°  
5450  
300  
119°  
200  
5500  
120°  
5550



← Bit Size

← MMR Caliper

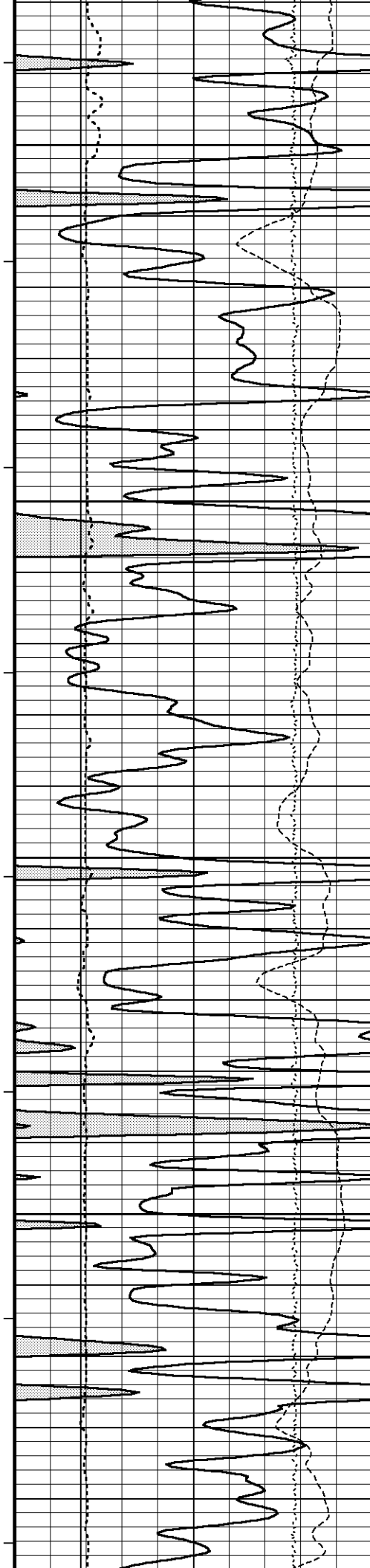
← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →

MMR Microlog Inverse →

MMR Microlog Normal →



120°

5600

121°

5650

121°

5700

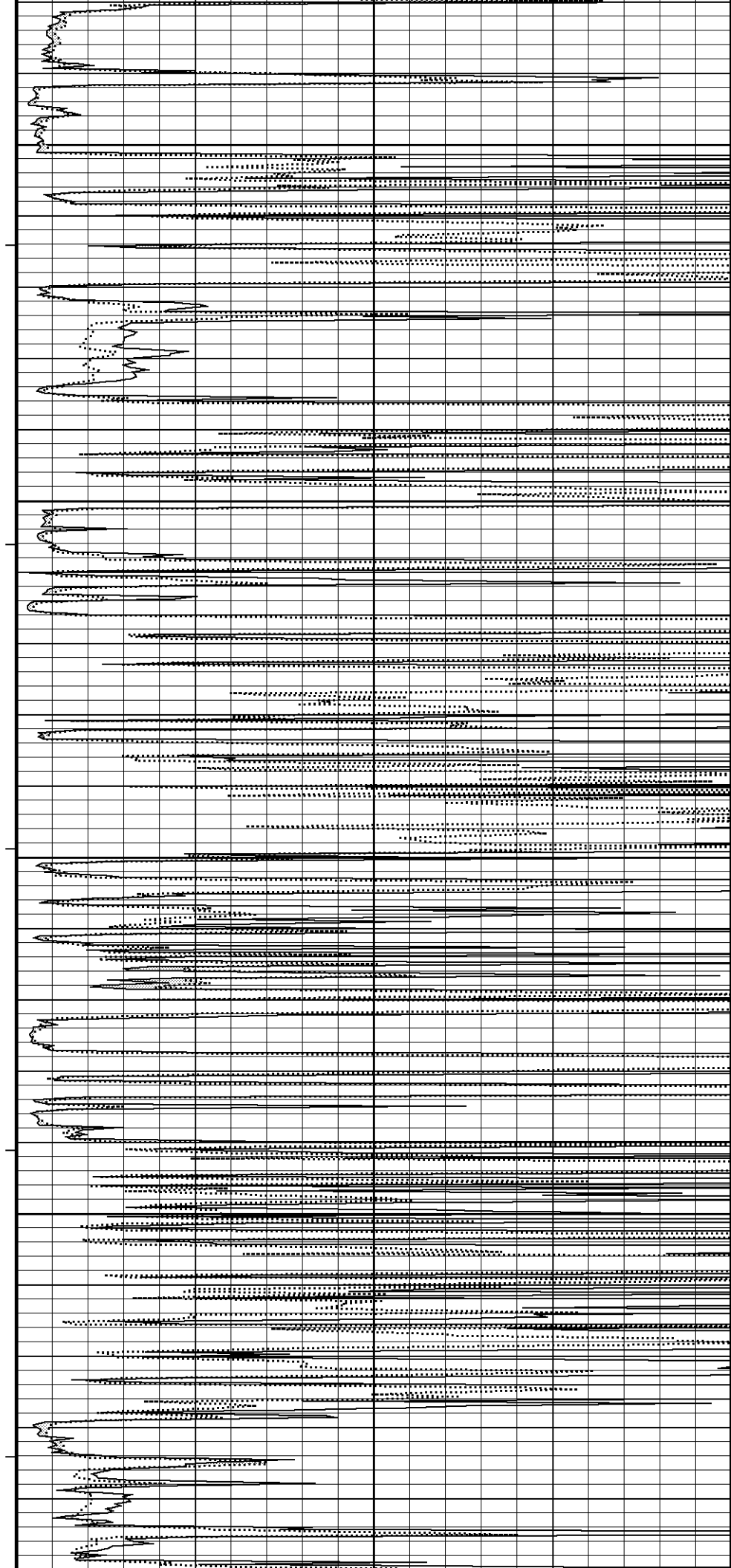
122°

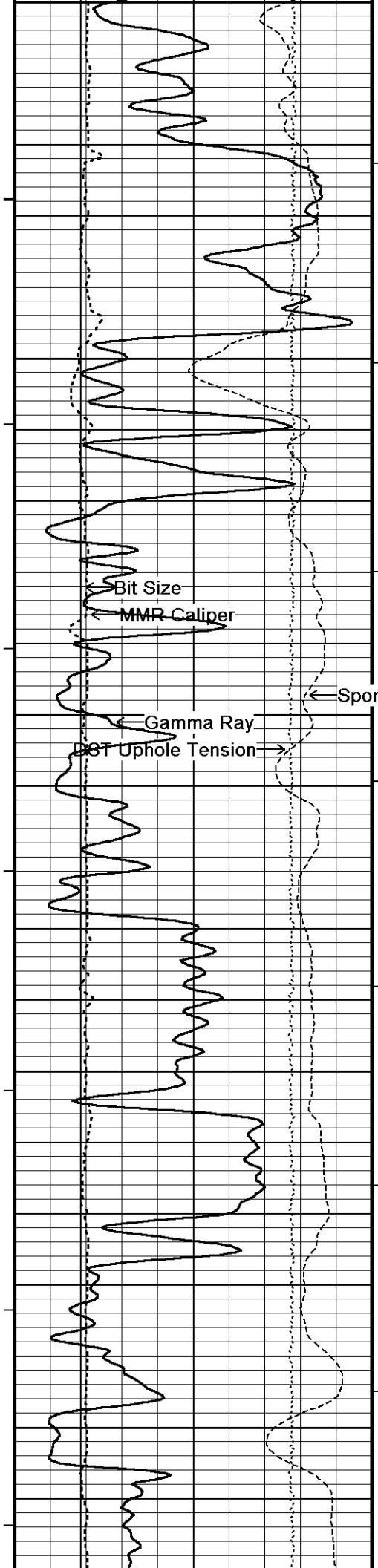
5750

200

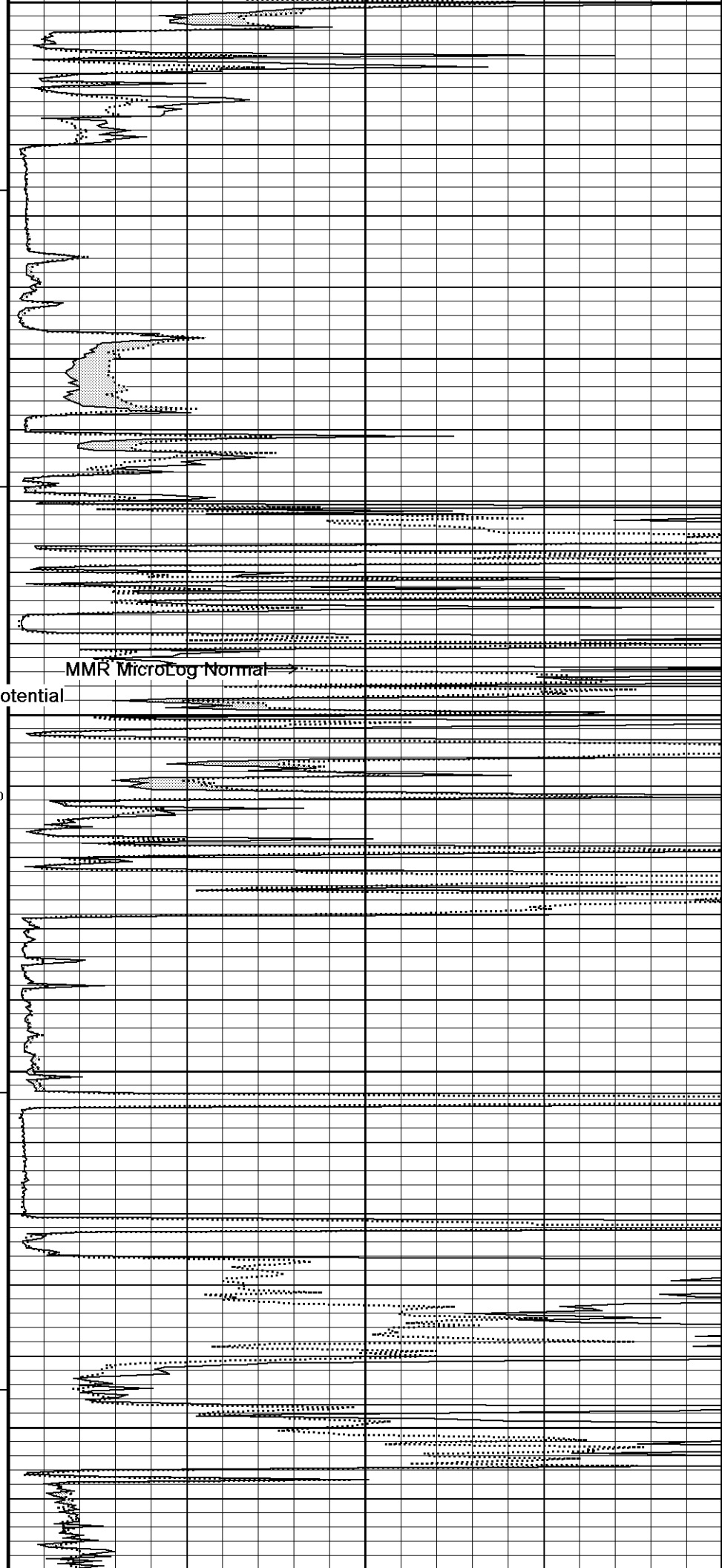
122°

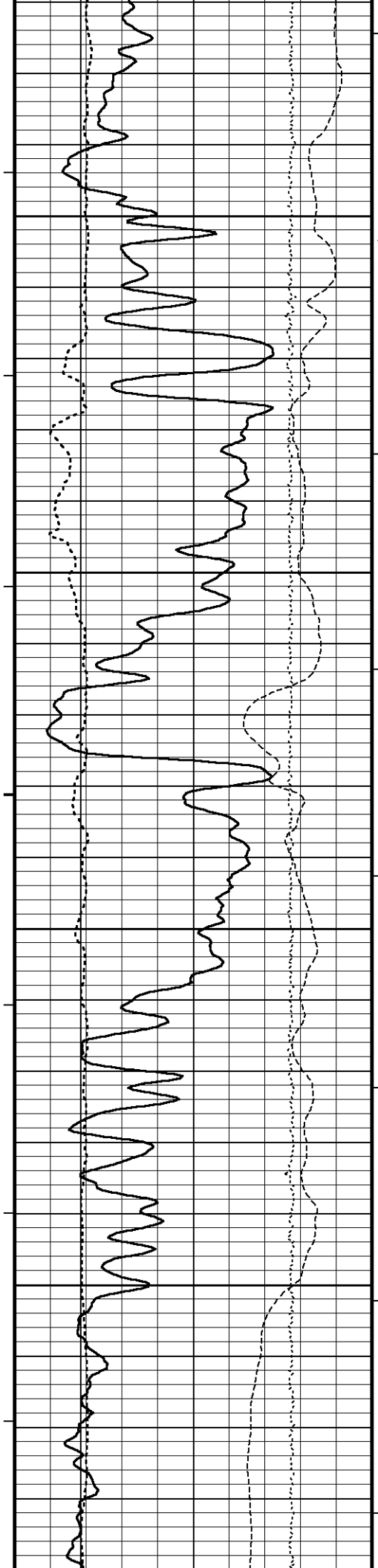
5800





5800  
122°  
5850  
123°  
5900  
100  
123°  
5950  
123°  
6000





123°

6050

100

124°

6100

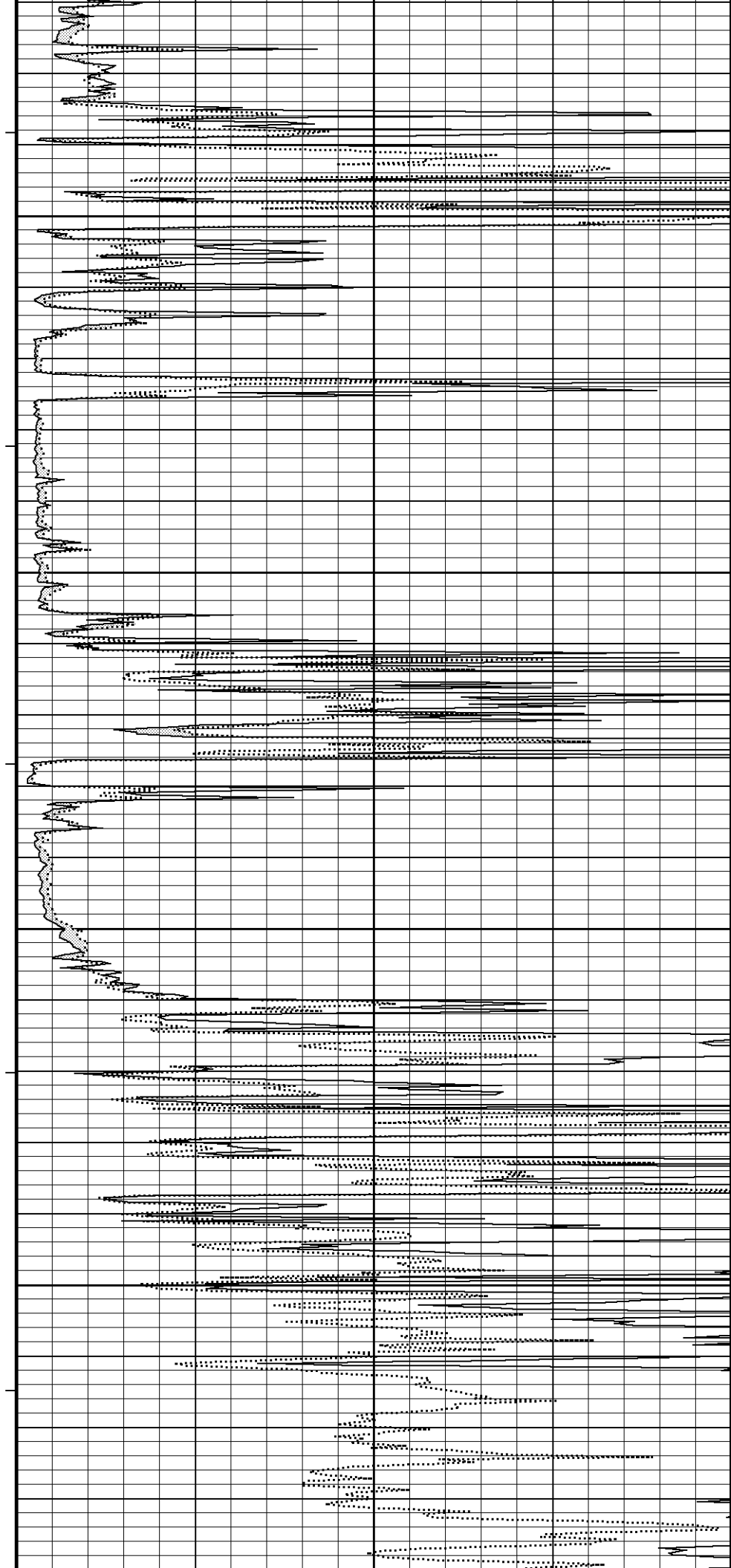
124°

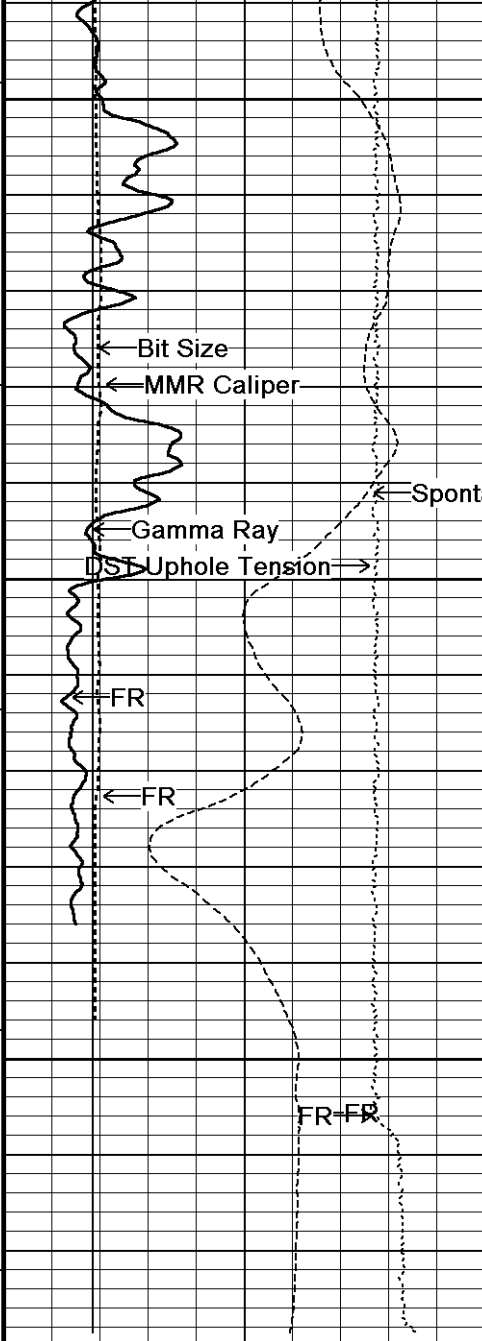
6150

124°

6200

124°





6250

123°

6300

121°

6350

0

6394

Depth  
in  
Feet

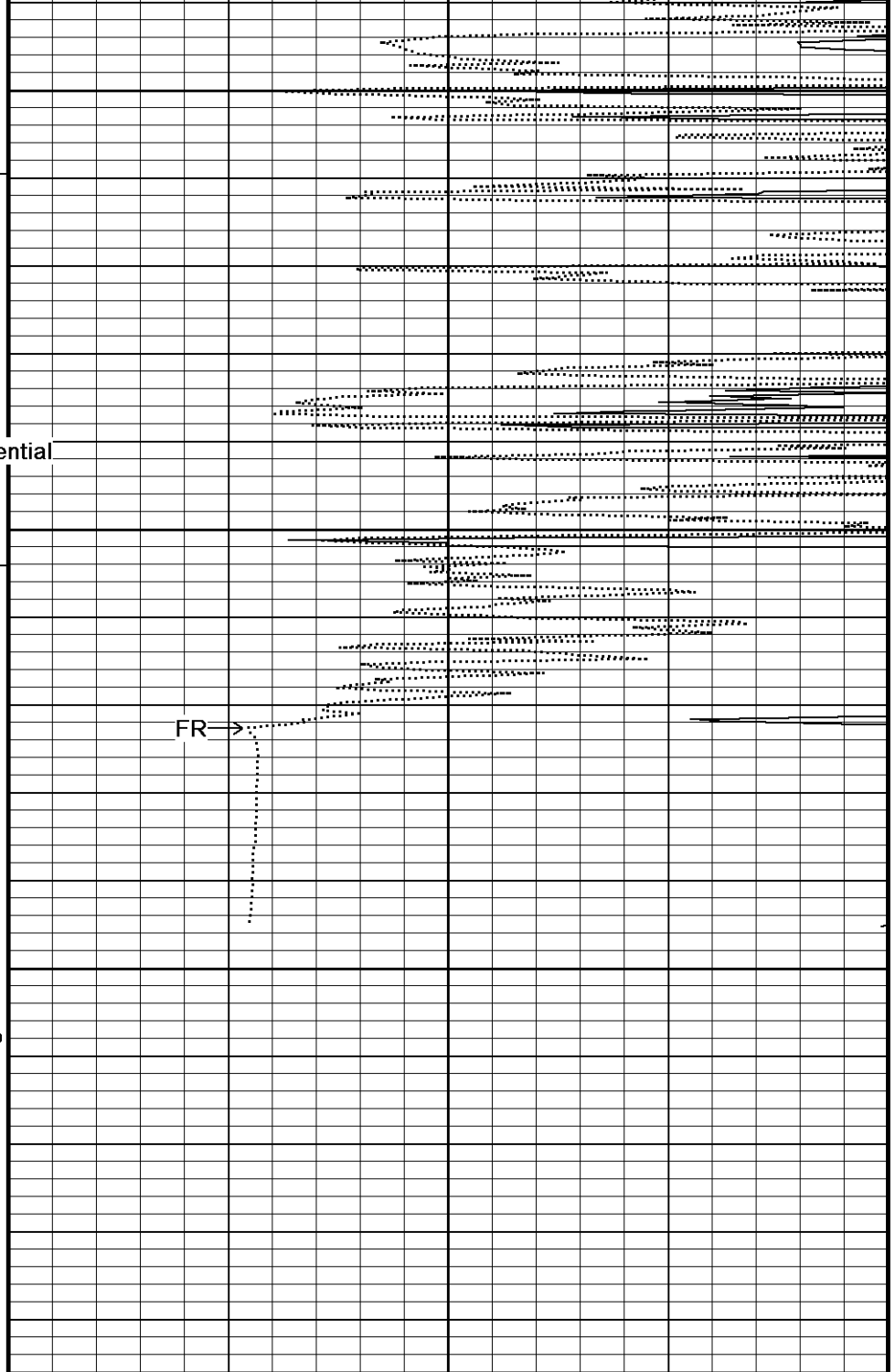
Timing Marks  
every 60.0 sec

Gamma Ray  
API  
0 75 150  
150 225 300

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

Borehole  
Temp in  
deg F

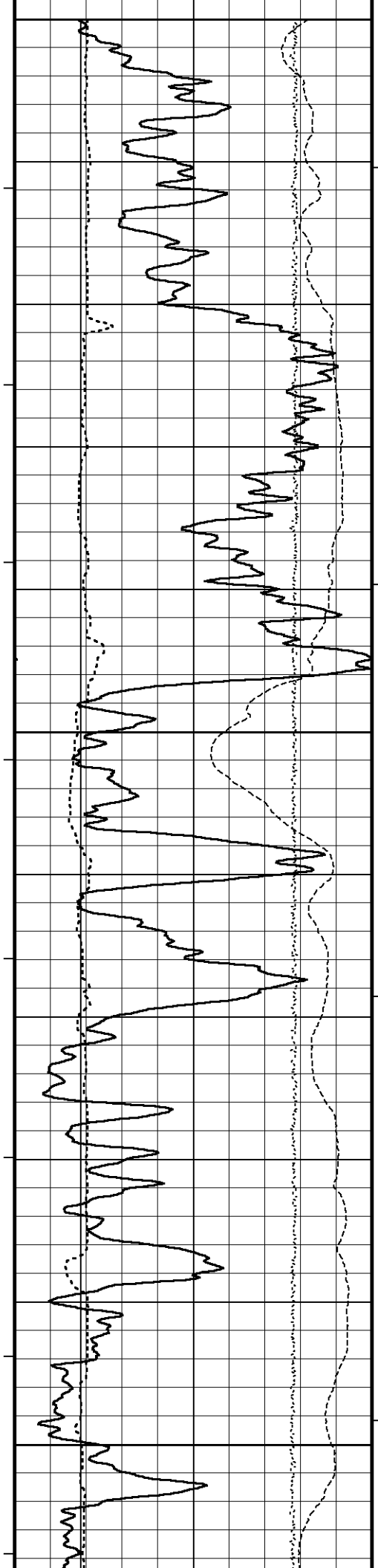
HVI  
every  
10 cu ft



MMR MicroLog Normal  
ohm metres

0 10 20 30 40





5800

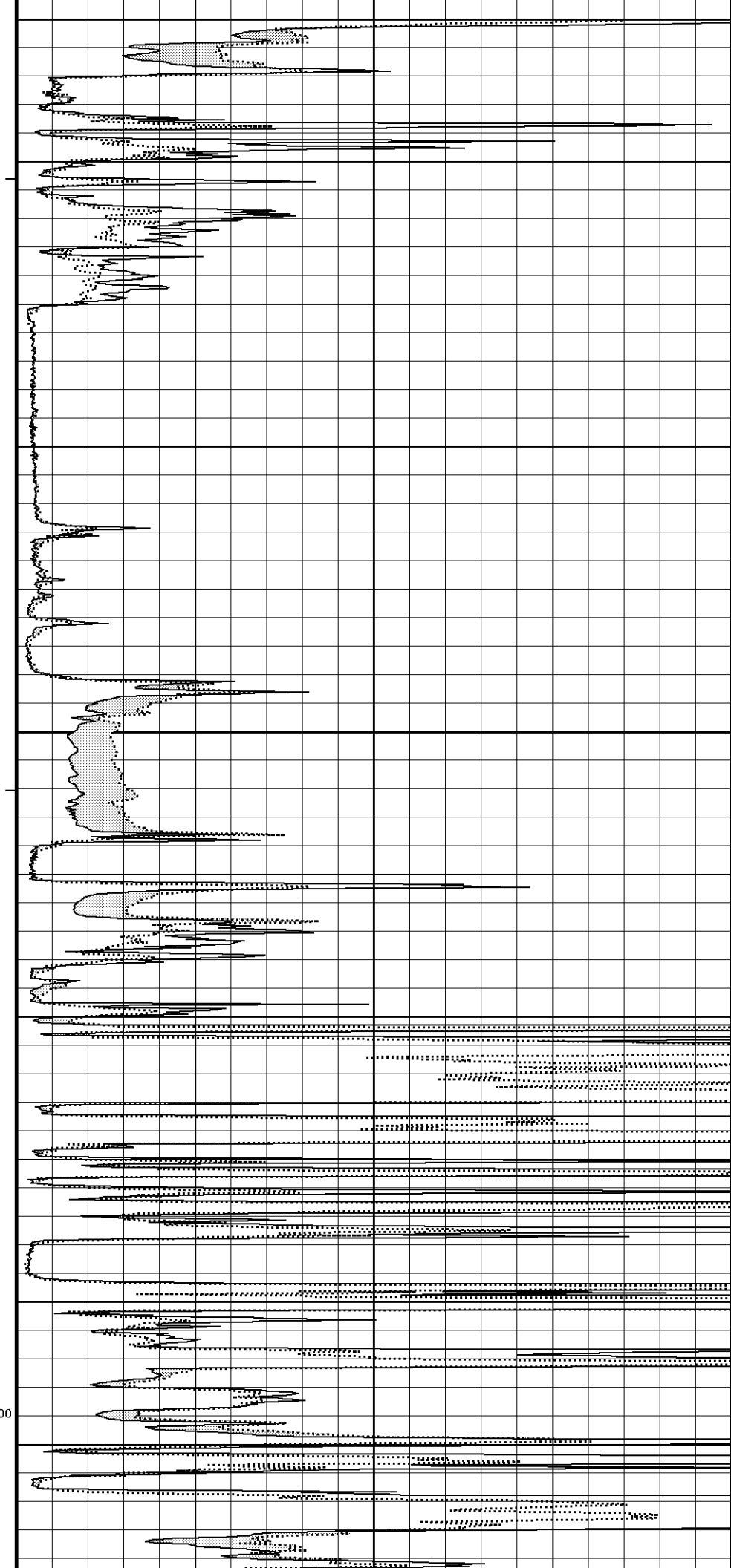
120°

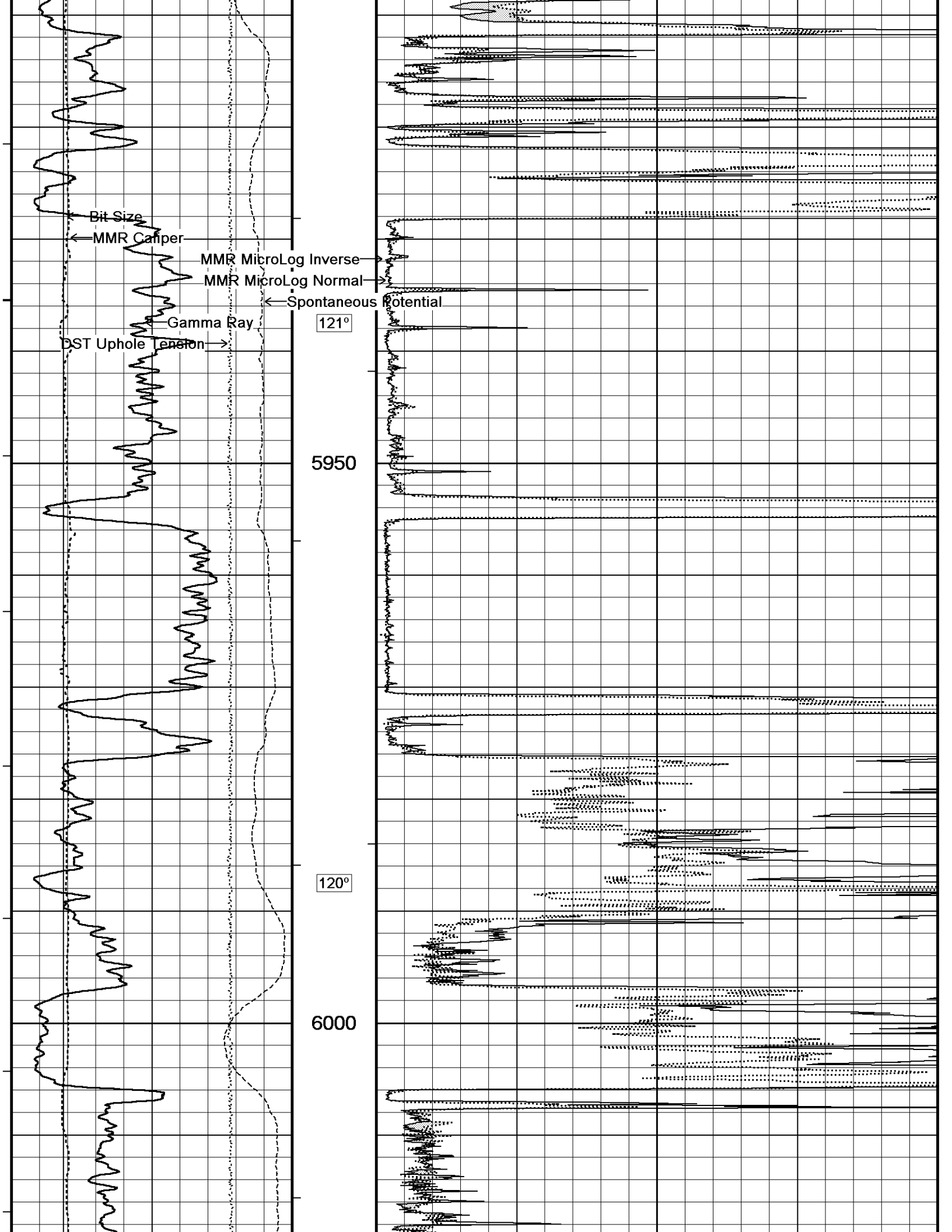
5850

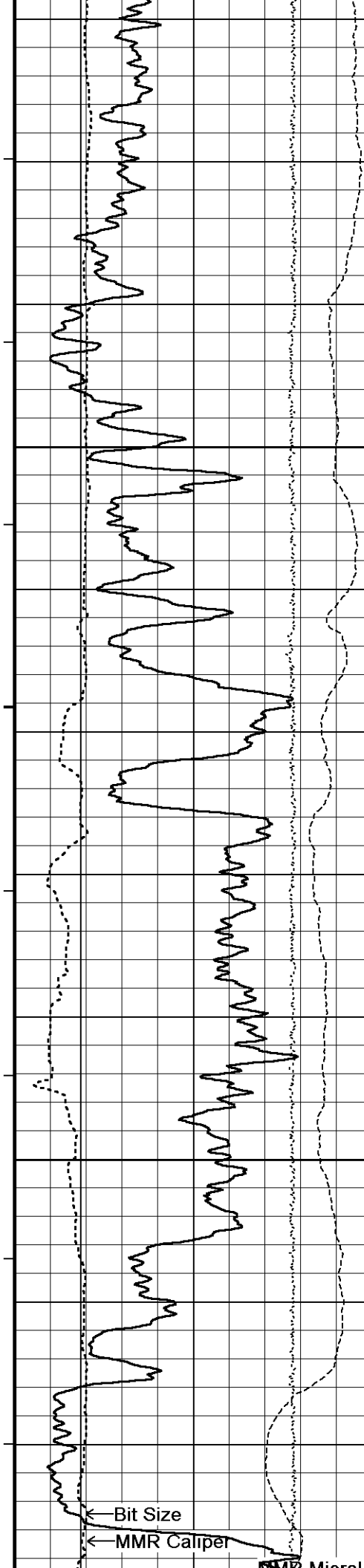
121°

100

5900







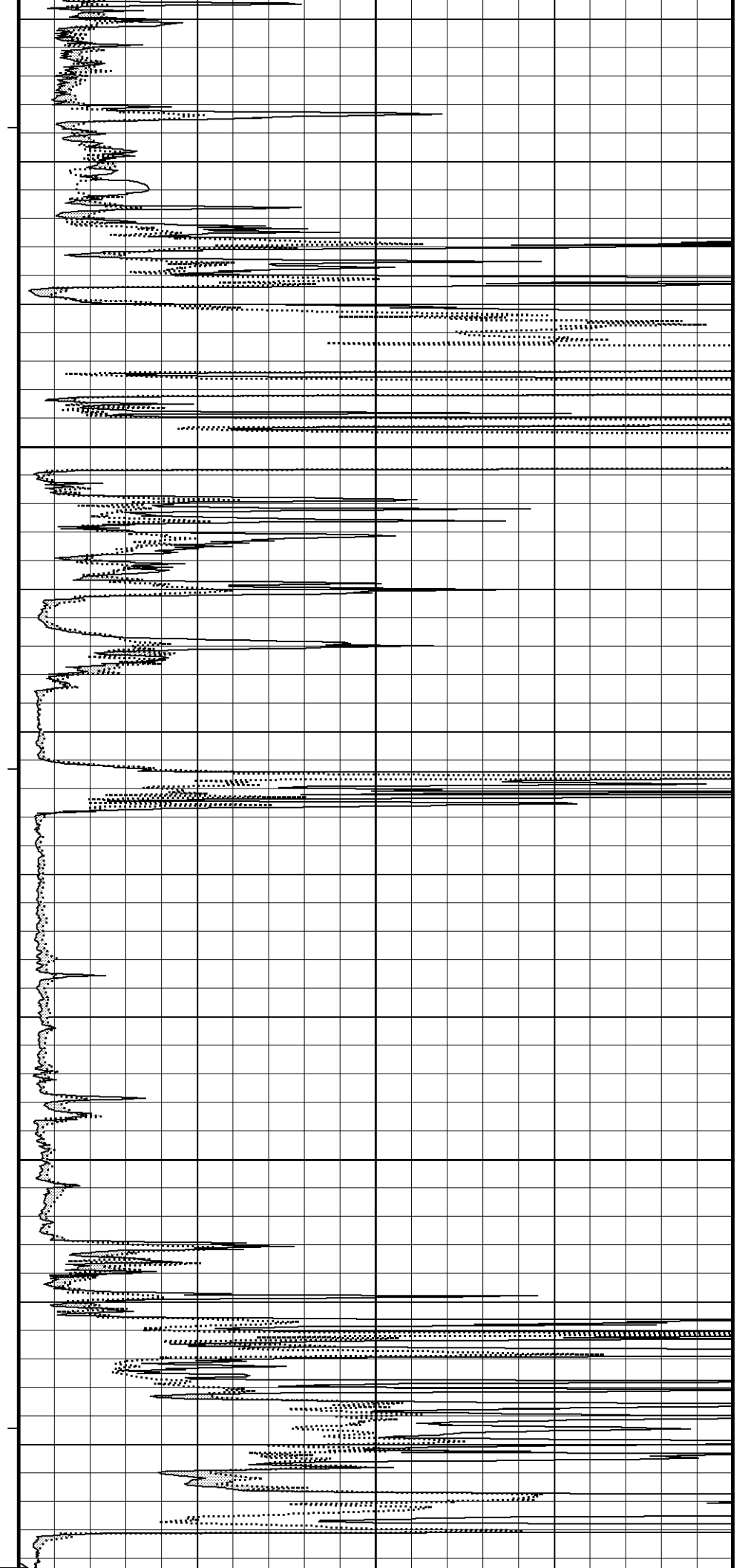
120°

100

6050

121°

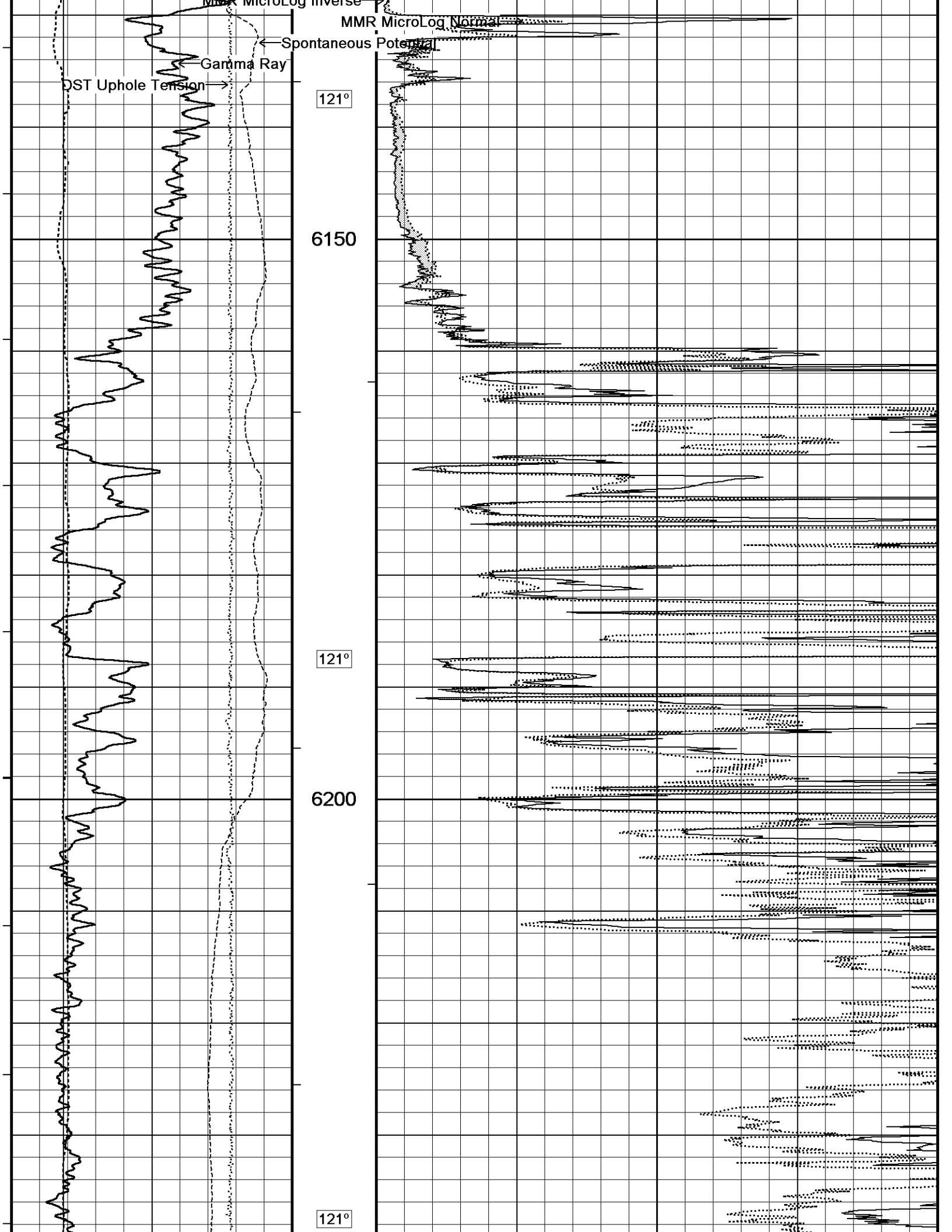
6100

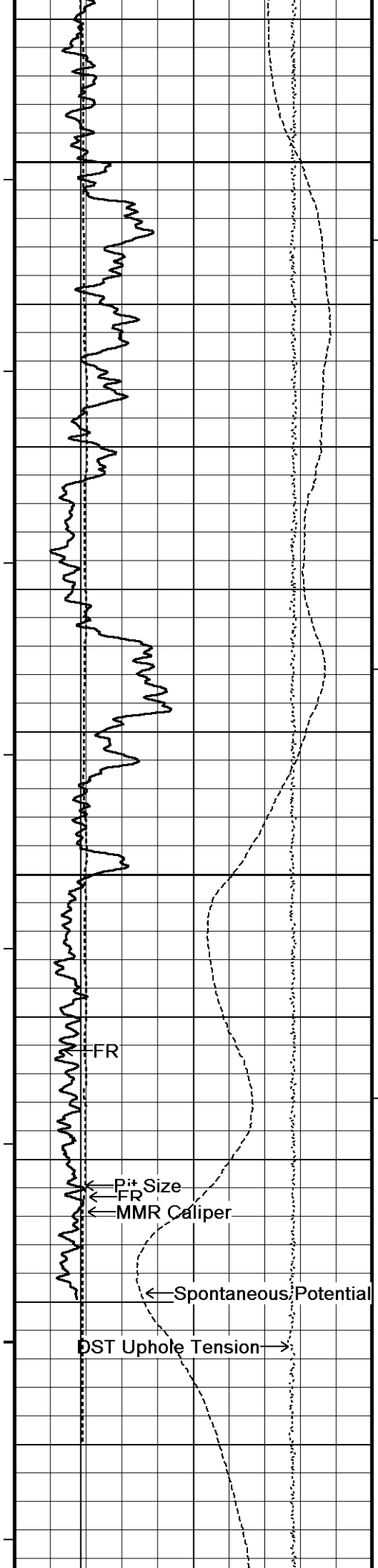


Bit Size

MMR Caliper

Microlog Inverse

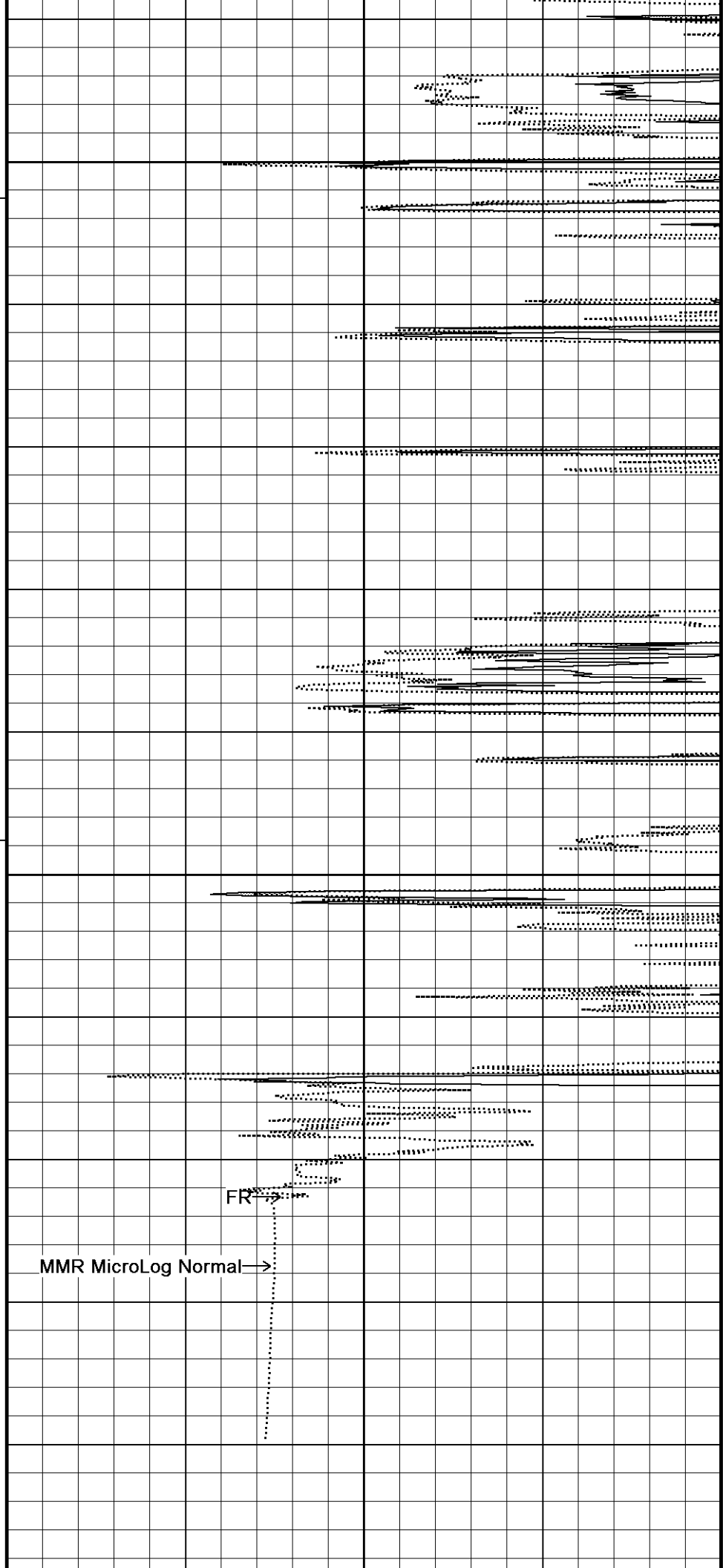




6250

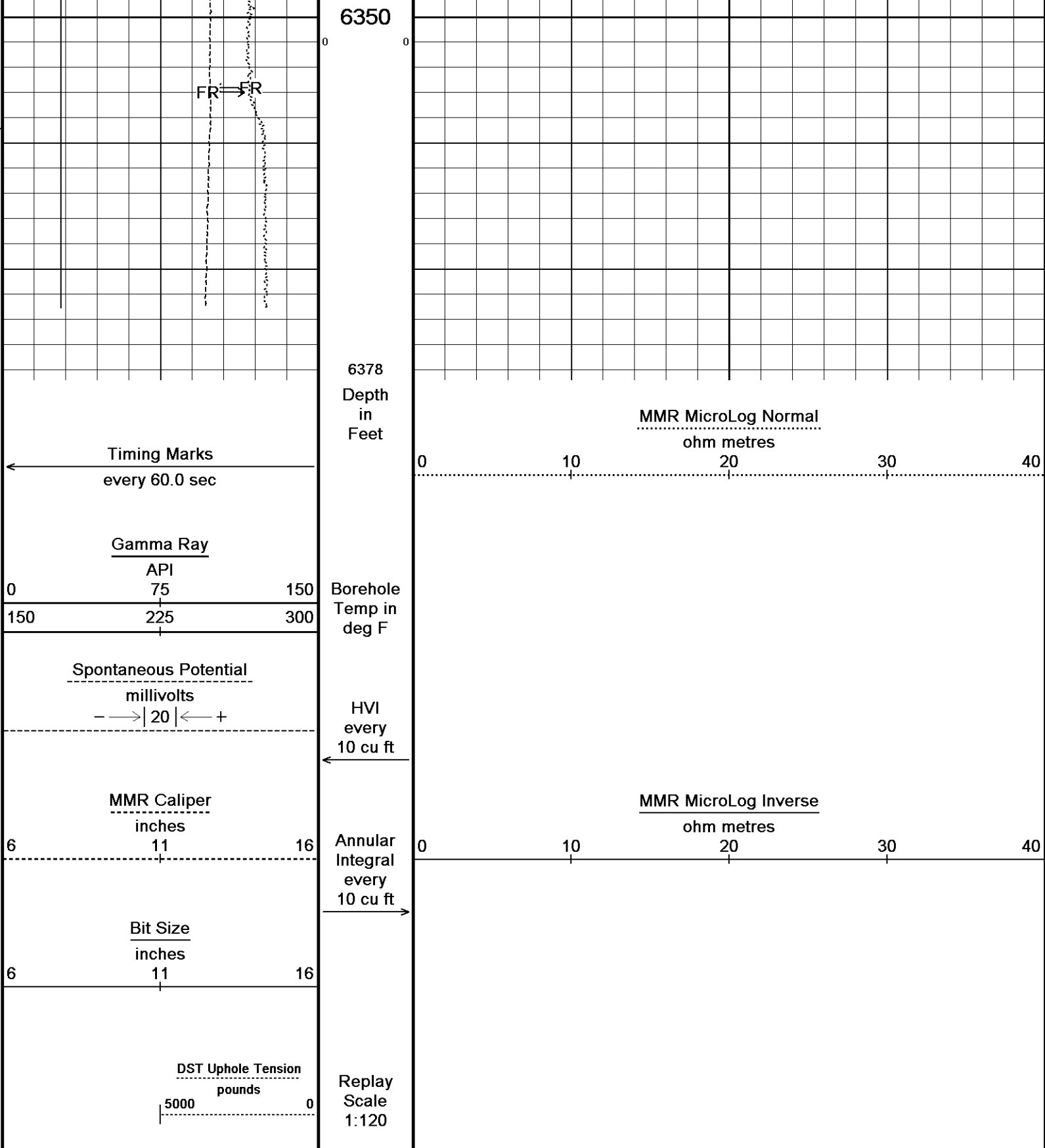
121°

6300



FR

MMR MicroLog Normal

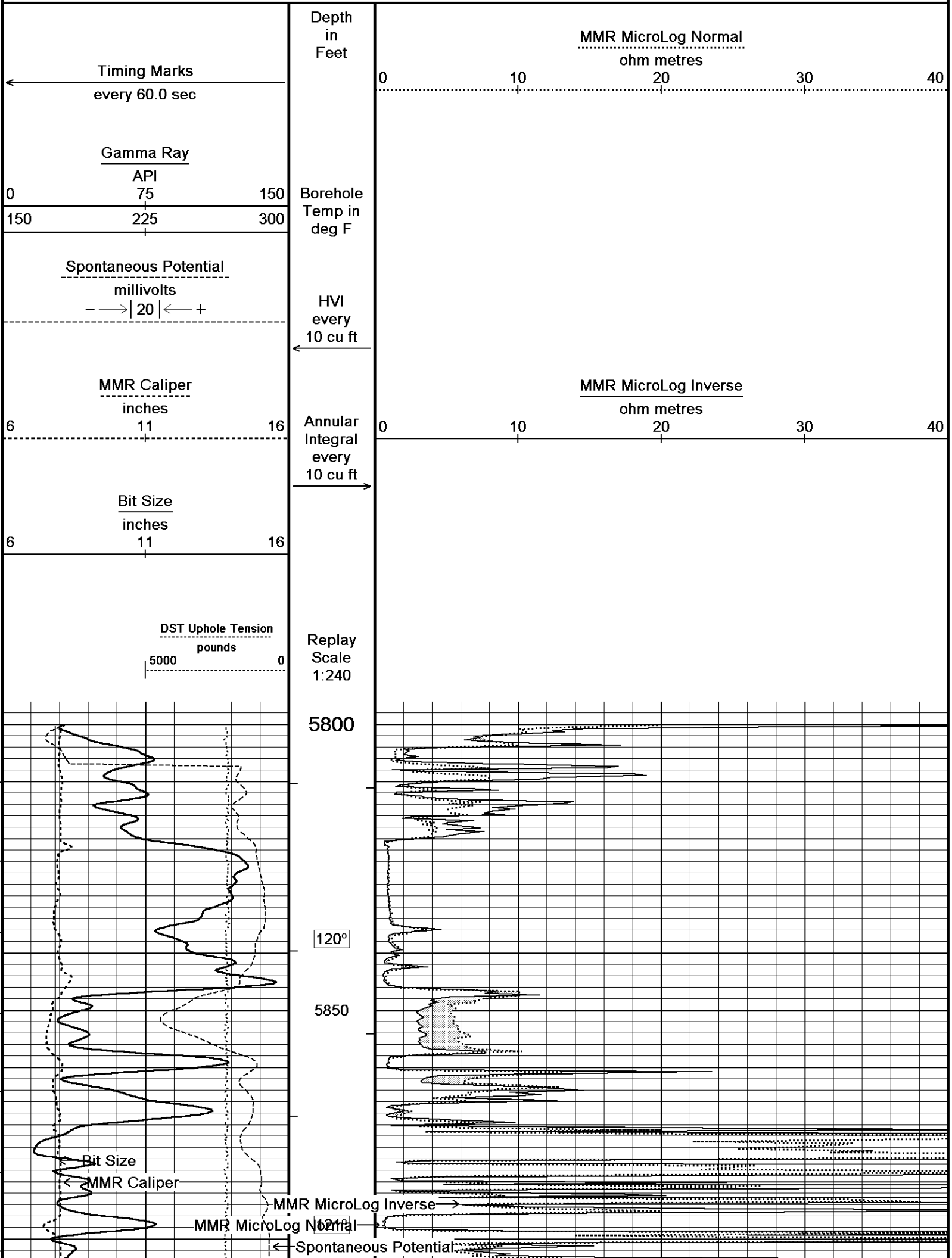


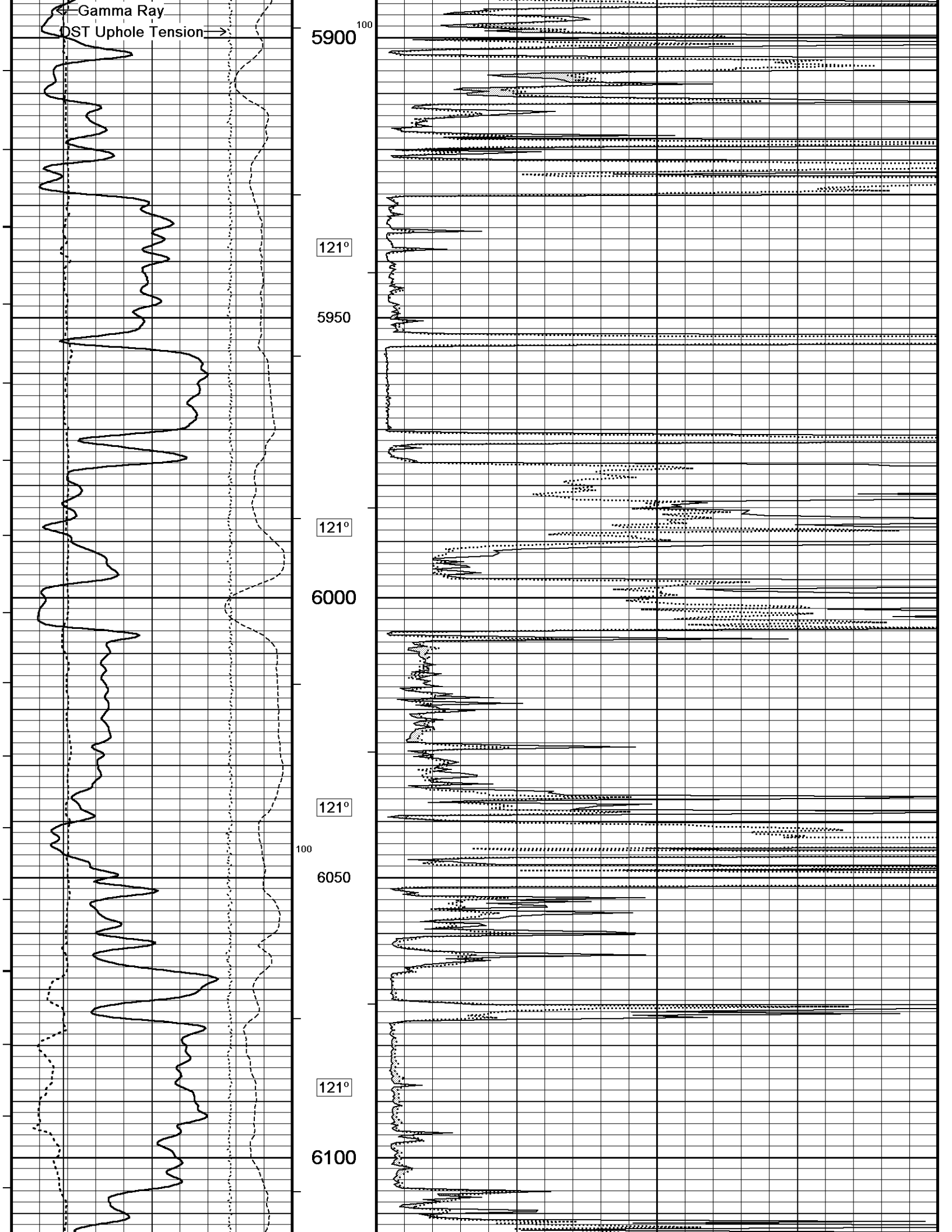
|                                                                                           |                               |
|-------------------------------------------------------------------------------------------|-------------------------------|
| Depth Based Data - Maximum Sampling Increment 2.5cm                                       | Plotted on 22-DEC-2013 18:00  |
| Filename: C:\Minimus 13.05.9583\Logs\O'BRIEN VAIL 6-30\O'BRIEN VAIL 6-30 HIGH RES.dta     | Recorded on 22-DEC-2013 14:20 |
| System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583 |                               |

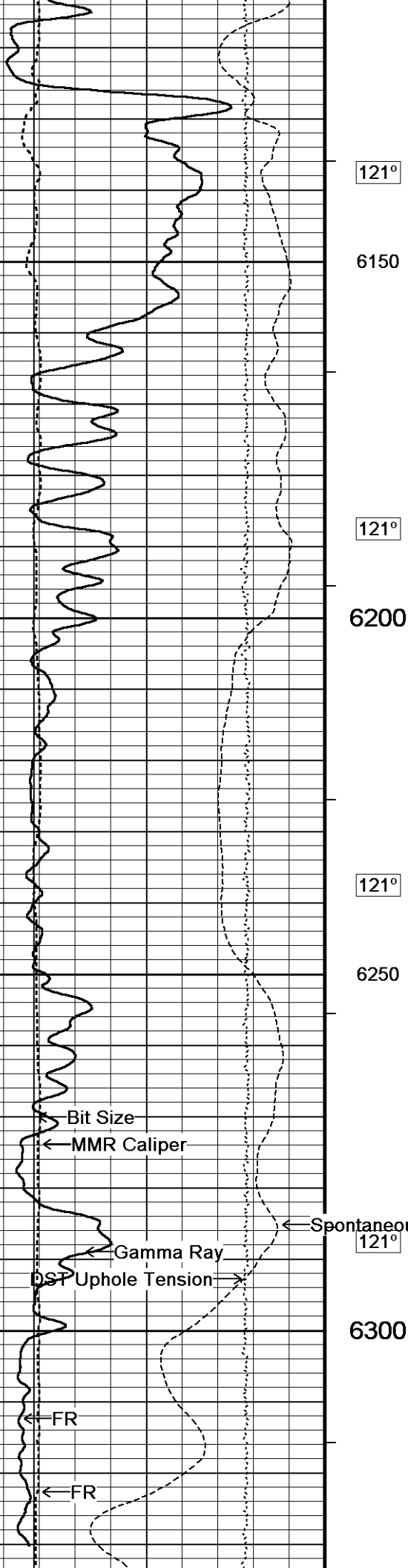
|   |                |   |
|---|----------------|---|
| ↑ | 10 INCH HI-RES | ↑ |
|---|----------------|---|

|   |                |   |
|---|----------------|---|
| ↓ | REPEAT SECTION | ↓ |
|---|----------------|---|

|                                                                                           |                               |
|-------------------------------------------------------------------------------------------|-------------------------------|
| Depth Based Data - Maximum Sampling Increment 10.0cm                                      | Plotted on 22-DEC-2013 18:00  |
| Filename: C:\Minimus 13.05.9583\Logs\O'BRIEN VAIL 6-30\O'BRIEN VAIL 6-30 HIGH REPEAT.dta  | Recorded on 22-DEC-2013 14:20 |
| System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583 |                               |







121°

6150

121°

6200

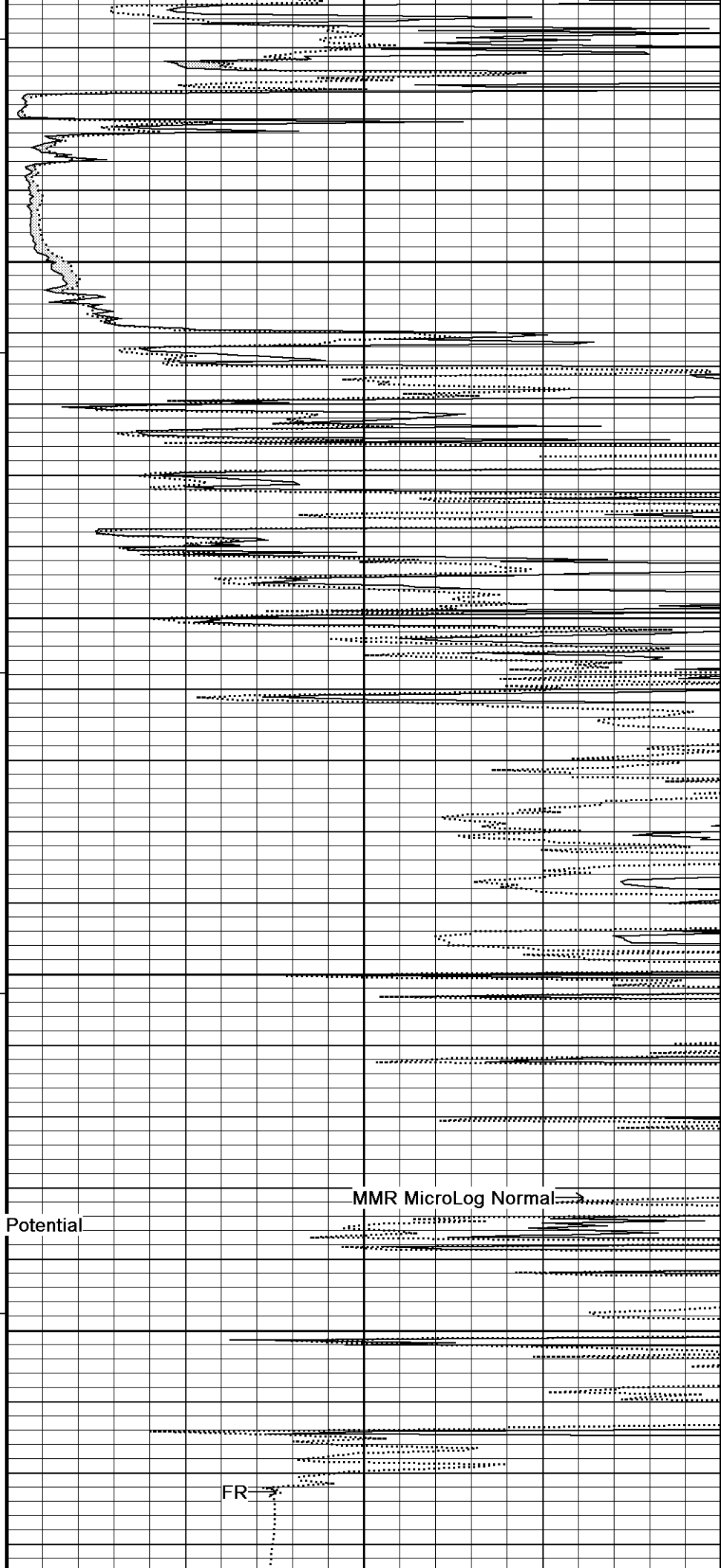
121°

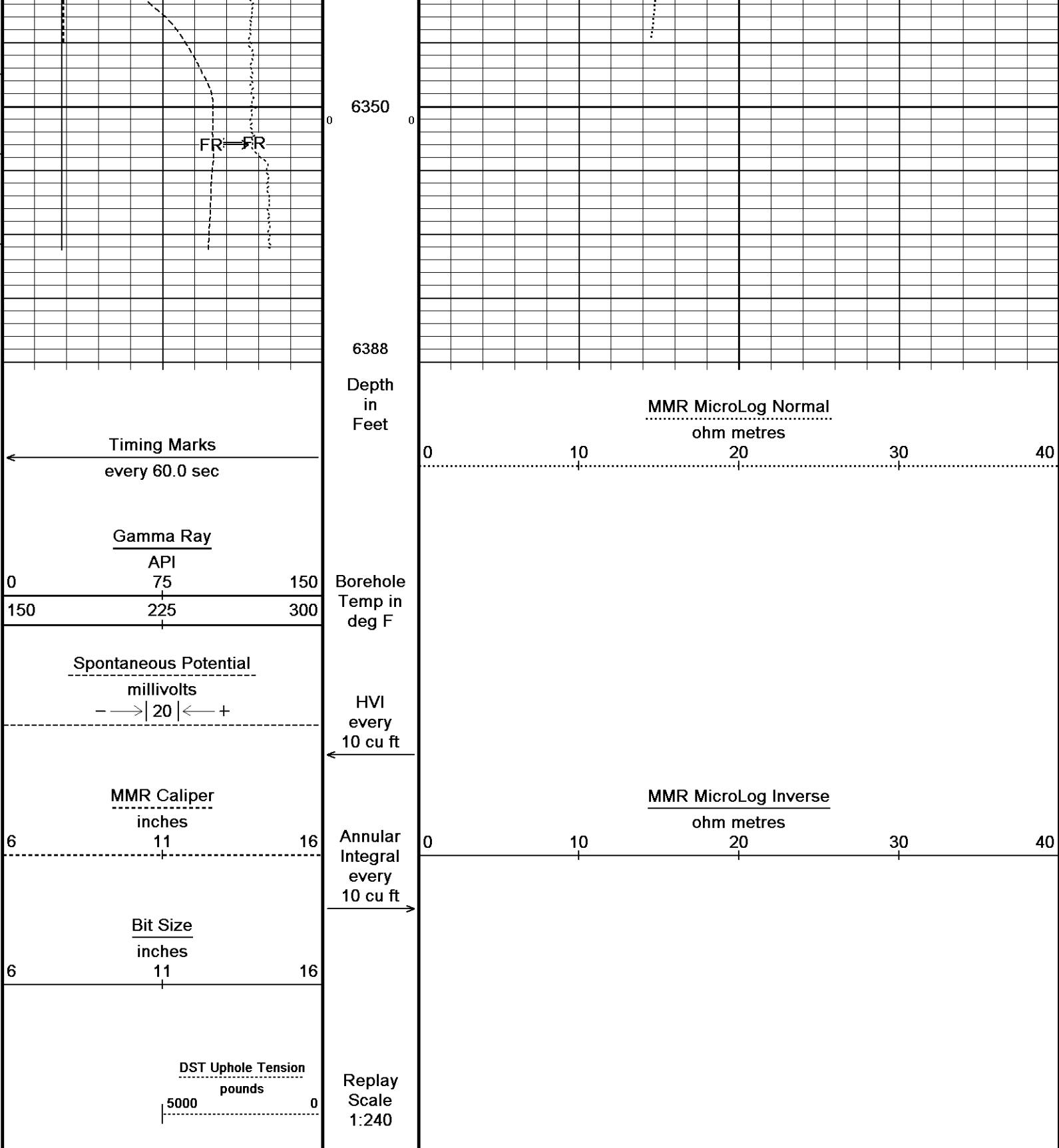
6250

Spontaneous Potential

121°

6300





Depth Based Data - Maximum Sampling Increment 10.0cm  
Filename: C:\Minimus 13.05.9583\Logs\O'BRIEN VAIL 6-30\O'BRIEN VAIL 6-30 HIGH REPEAT.dta  
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

Plotted on 22-DEC-2013 18:00  
Recorded on 22-DEC-2013 14:20

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION  
C:\Minimus 13.05.9583\Logs\O'BRIEN VAIL 6-30\O'BRIEN VAIL 6-30 HIGH REPEAT.dta

General Constants All 000  
General Parameters

Last Edited on 22-DEC-2013,13:43

|                                                         |                       |            |
|---------------------------------------------------------|-----------------------|------------|
| General Parameters                                      |                       |            |
| Mud Resistivity                                         | 0.500                 | ohm-metres |
| Mud Resistivity Temperature                             | 90.000                | 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                                 | 4.500                 | inches     |
| Caliper for Differential Caliper                        | MMR Caliper           |            |
| Rwa Parameters                                          |                       |            |
| Porosity used                                           | Base Density Porosity |            |
| Resistivity used                                        | Array Ind. One Res Rt |            |
| RWA Constant A                                          | 0.610                 |            |
| RWA Constant M                                          | 2.150                 |            |
| SW/APOR Tool Source                                     | 0.000                 |            |

|                                                     |          |                   |                                        |
|-----------------------------------------------------|----------|-------------------|----------------------------------------|
| High Resolution Temperature Calibration MCG-D.K 442 |          |                   | Field Calibration on 29-OCT-2013,14:34 |
|                                                     | Measured | Calibrated(Deg F) |                                        |
| Lower                                               | 50.00    | 50.00             |                                        |
| Upper                                               | 75.00    | 75.00             |                                        |

|                                                   |    |  |                                  |
|---------------------------------------------------|----|--|----------------------------------|
| High Resolution Temperature Constants MCG-D.K 442 |    |  | Last Edited on 29-OCT-2013,14:34 |
| Pre-filter Length                                 | 11 |  |                                  |

|                               |          |                  |                                        |
|-------------------------------|----------|------------------|----------------------------------------|
| Gamma Calibration MCG-D.K 442 |          |                  | Field Calibration on 22-DEC-2013 10:12 |
|                               | Measured | Calibrated (API) |                                        |
| Background                    | 73       | 48               |                                        |
| Calibrator (Gross)            | 1166     | 773              |                                        |
| Calibrator (Net)              | 1093     | 725              |                                        |

|                               |                 |       |                                  |
|-------------------------------|-----------------|-------|----------------------------------|
| Gamma Constants MCG-D.K 442   |                 |       | Last Edited on 17-DEC-2013,10:46 |
| Gamma Calibrator Number       | GRC38           |       |                                  |
| Mud Density                   | 1.10            | gm/cc |                                  |
| Caliper Source for Processing | Density Caliper |       |                                  |
| Tool Position                 | Eccentred       |       |                                  |
| Concentration of KCl          |                 | kppm  |                                  |
| K Mud Type                    | Chloride        |       |                                  |
| K Mud Concentration           | 0.00            | %     |                                  |

|                              |                       |                      |                                                                                 |
|------------------------------|-----------------------|----------------------|---------------------------------------------------------------------------------|
| Caliper Calibration MMR-A 11 |                       |                      | Base Calibration on 16-DEC-2013 05:55<br>Field Calibration on 22-DEC-2013 10:03 |
| Base Calibration             |                       |                      |                                                                                 |
| Reading No                   | Measured              | Calibrator Size (in) |                                                                                 |
| 1                            | 13936                 | 5.98                 |                                                                                 |
| 2                            | 17142                 | 7.97                 |                                                                                 |
| 3                            | 20397                 | 9.86                 |                                                                                 |
| 4                            | 24110                 | 11.92                |                                                                                 |
| 5                            | 0                     | 0.00                 |                                                                                 |
| 6                            | N/A                   | N/A                  |                                                                                 |
| Field Calibration            |                       |                      |                                                                                 |
|                              | Measured Caliper (in) | Actual Caliper (in)  |                                                                                 |
|                              | 7.90                  | 7.97                 |                                                                                 |

|                                                     |                       |                       |                                                                           |
|-----------------------------------------------------|-----------------------|-----------------------|---------------------------------------------------------------------------|
| Micro Normal and Micro Inverse Calibration MMR-A 11 |                       |                       | Base Calibration on 16-DEC-2013 05:47<br>Field Check on 22-DEC-2013 10:06 |
| Base Calibration                                    |                       |                       |                                                                           |
|                                                     | Measured              | Calibrated (ohm-m)    |                                                                           |
| Channel                                             | Resistor 1 Resistor 2 | Resistor 1 Resistor 2 |                                                                           |
| Micro Normal                                        | 12.2 59.5             | 5.0 25.0              |                                                                           |
| Micro Inverse                                       | 15.5 77.3             | 5.0 25.0              |                                                                           |
| Channel                                             | Base Check (ohm-m)    | Field Check (ohm-m)   |                                                                           |
| Micro Normal                                        | 76.7                  | 76.7                  |                                                                           |
| Micro Inverse                                       | 58.9                  | 58.9                  |                                                                           |

|                        |                                             |        |
|------------------------|---------------------------------------------|--------|
| 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        | 0.0000                                      | inches |

## Caliper Calibration MPD-B 31

Base Calibration on 20-NOV-2013 10:19

Field Calibration on 22-DEC-2013 10:00

| Base Calibration |          |                      |  |
|------------------|----------|----------------------|--|
| Reading No       | Measured | Calibrator Size (in) |  |
| 1                | 18720    | 3.99                 |  |
| 2                | 27472    | 5.98                 |  |
| 3                | 36127    | 7.97                 |  |
| 4                | 44368    | 9.86                 |  |
| 5                | 53568    | 11.92                |  |
| 6                | N/A      | N/A                  |  |

| Field Calibration |                       |                     |  |
|-------------------|-----------------------|---------------------|--|
|                   | Measured Caliper (in) | Actual Caliper (in) |  |
|                   | 7.98                  | 7.97                |  |

## DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Logs\O'BRIEN VAIL 6-30\O'BRIEN VAIL 6-30 HIGH REPEAT.dta

CBH-C, Cablehead, 11 pin

CBH-CA 170 LG: 2.40 ft WT: 24.3 lb OD: 2.24 in

Compact Comms Gamma

MCG-D.K 442 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-Resistivity

MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.88 in

Compact Neutron

MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper

MPD-B 31 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

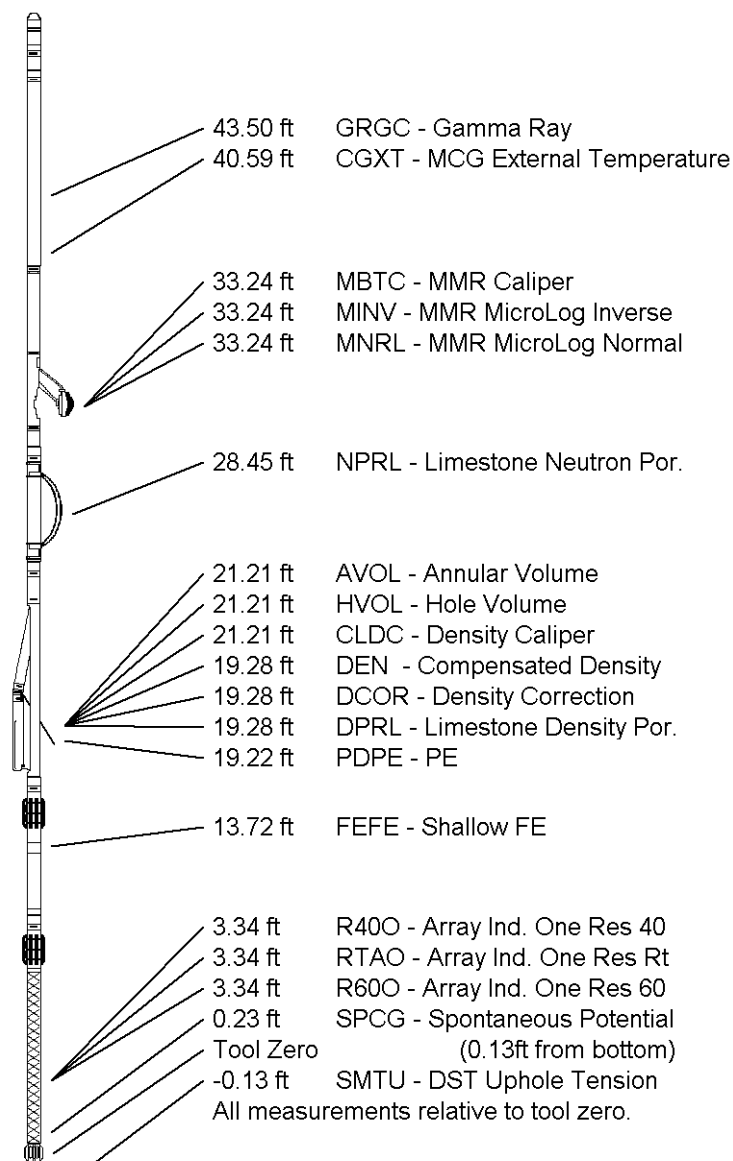
Compact Focussed Electric

MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction

MAI-A.A 45 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 51.18 ft Weight: 407.9 lb



|                 |                 |
|-----------------|-----------------|
| WELL            | VAIL 6-30       |
| FIELD           | SINGLEY         |
| PROVINCE/COUNTY | MEADE           |
| COUNTRY/STATE   | U.S.A. / KANSAS |

|                         |         |      |               |         |      |
|-------------------------|---------|------|---------------|---------|------|
| Elevation Kelly Bushing | 2659.00 | feet | First Reading | 6323.00 | feet |
| Elevation Drill Floor   | 2657.00 | feet | Depth Driller | 6360.00 | feet |
| Elevation Ground Level  | 2647.00 | feet | Depth Logger  | 6356.00 | feet |



## MICRORESISTIVITY LOG

# Weatherford®