



Weatherford

MICRORESISTIVITY LOG

COMPANY			O'BRIEN ENERGY RESOURCES CORP.		
WELL			KEYSTONE #2-4		
FIELD			ANGELL SE		
PROVINCE/COUNTY			MEADE		
COUNTRY/STATE			U.S.A. / KANSAS		
LOCATION			500' FSL & 716' FWL		
SEC 4	TWP 33S	RGE 29W	Other Services		MAI/MFE
Latitude			MDN/MPD		
Longitude					
API Number	15-119-21397				
Permanent Datum GL, Elevation 2585 feet					
Log Measured From KB					
Drilling Measured From KB @ 12 FEET					
Date	10-NOV-2016				
Run Number	ONE				
Service Order	4558-166021107				
Depth Driller	6350.00		feet		
Depth Logger	6352.00		feet		
First Reading	6319.00		feet		
Last Reading	4000.00		feet		
Casing Driller	1495.00		feet		
Casing Logger	1494.00		feet		
Bit Size	7.875		inches		
Hole Fluid Type	WBM				
Density / Viscosity	9.40 lb/USg		48.00 CP		
PH / Fluid Loss	9.50		4.80 ml/30Min		
Sample Source	FLOWLINE				
Rm @ Measured Temp	1.18 @ 75.0		ohm-m		
Rmf @ Measured Temp	0.94 @ 75.0		ohm-m		
Rmc @ Measured Temp	1.42 @ 75.0		ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.71 @124.0		ohm-m		
Time Since Circulation	5 HOURS				
Max Recorded Temp	124.00		deg F		
Equipment / Base	13096		OKC		
Recorded By	ADAM SILL				
Witnessed By	ROGER PEARSON		PETE DEBENHAM		

BOREHOLE RECORD

Last Edited: 10-NOV-2016 22:35

Bit Size inches	Depth From feet	Depth To feet
7.875	1495.00	6350.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	1495.00	24.00

REMARKS

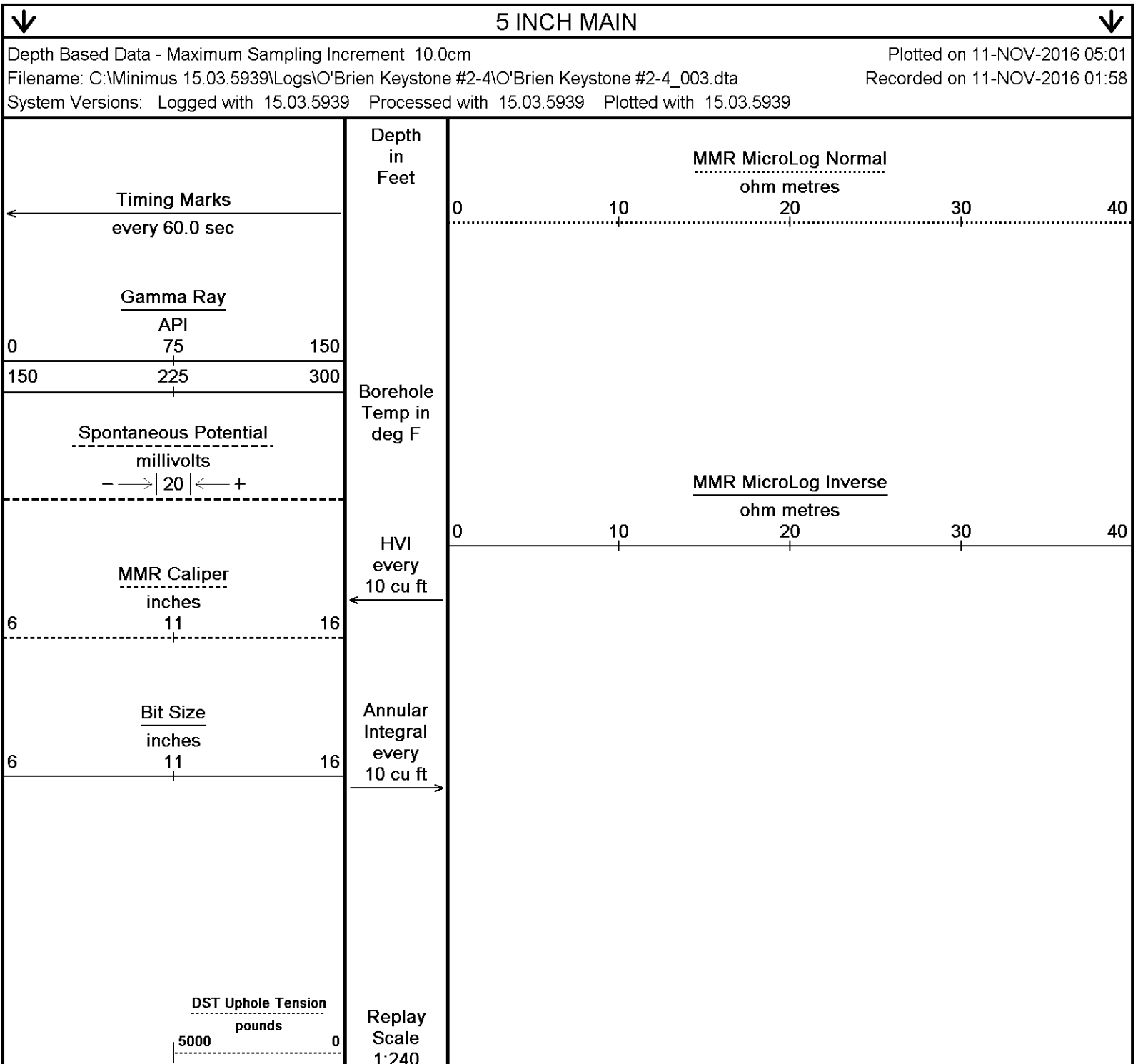
- SOFTWARE ISSUE: WLS 15.03.5939.
- RUN ONE: MCG, MML, MDN, MPD, MFE, MAI RUN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 - 0.5 INCH STANDOFF USED ON MFE.
 - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1848 CU.FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO 4000 FEET: 547 CU.FT.
- RIG: DUKE #1

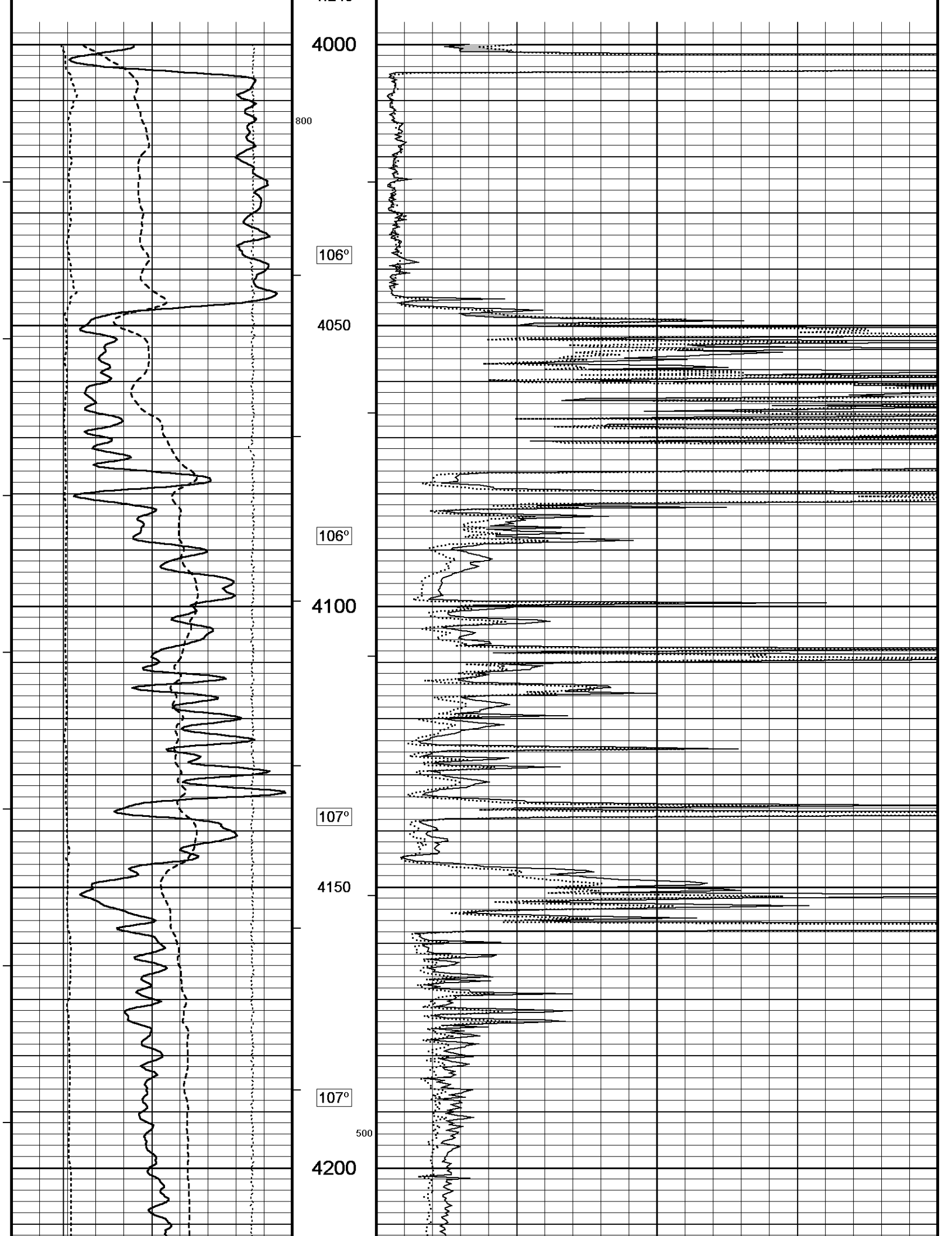
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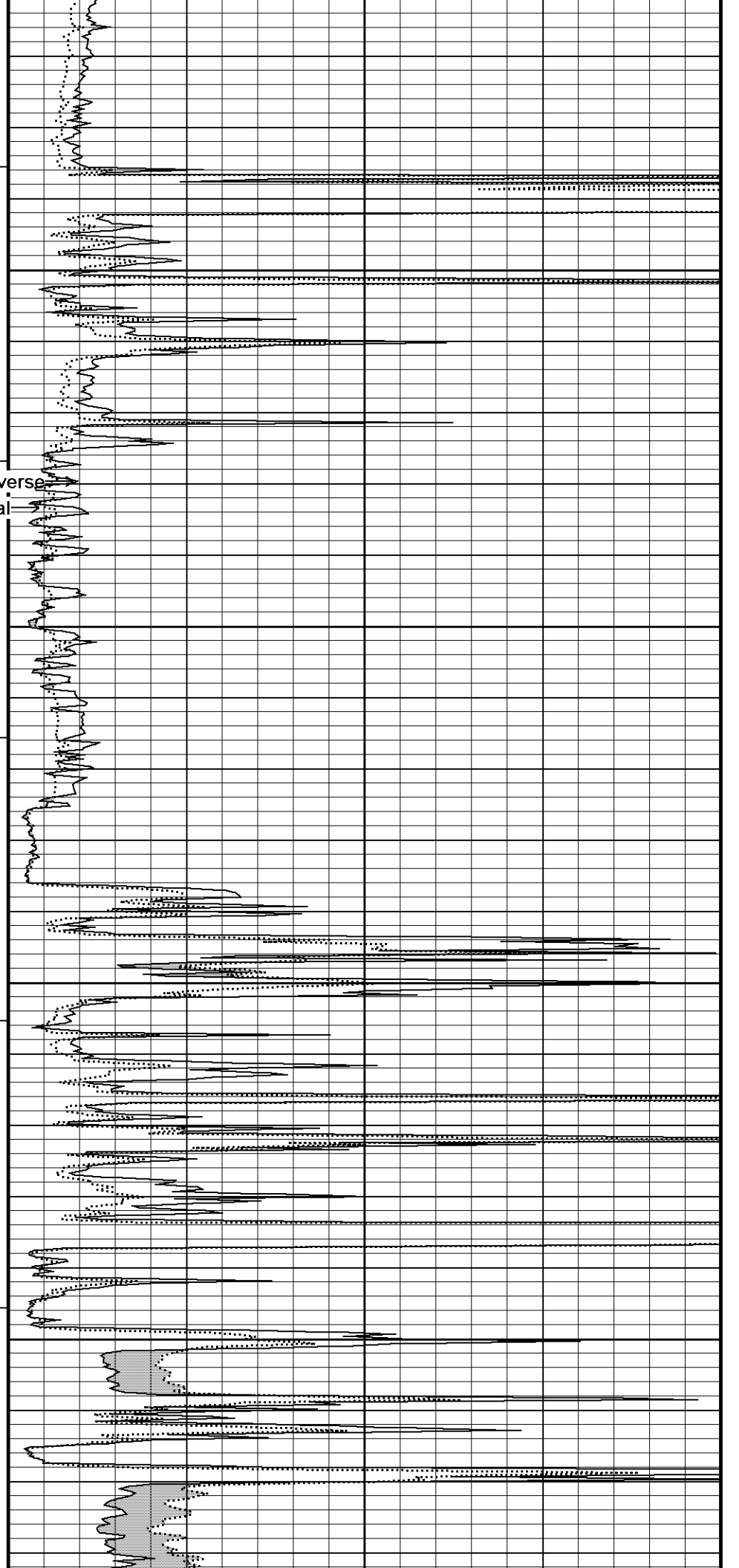
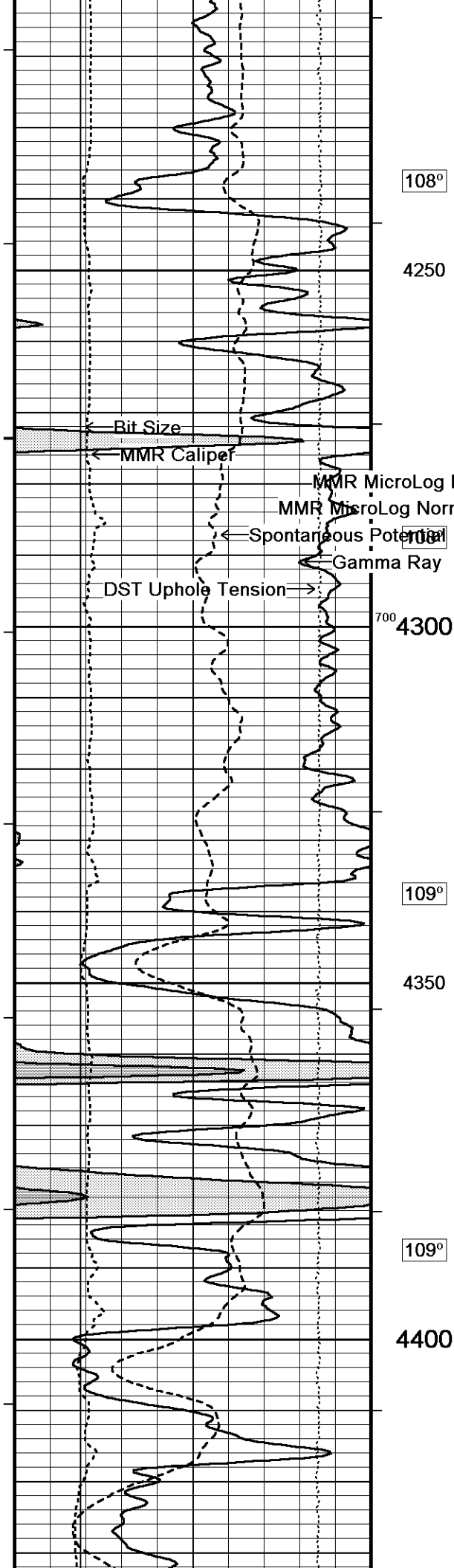
- ENGINEER: A. SILL.

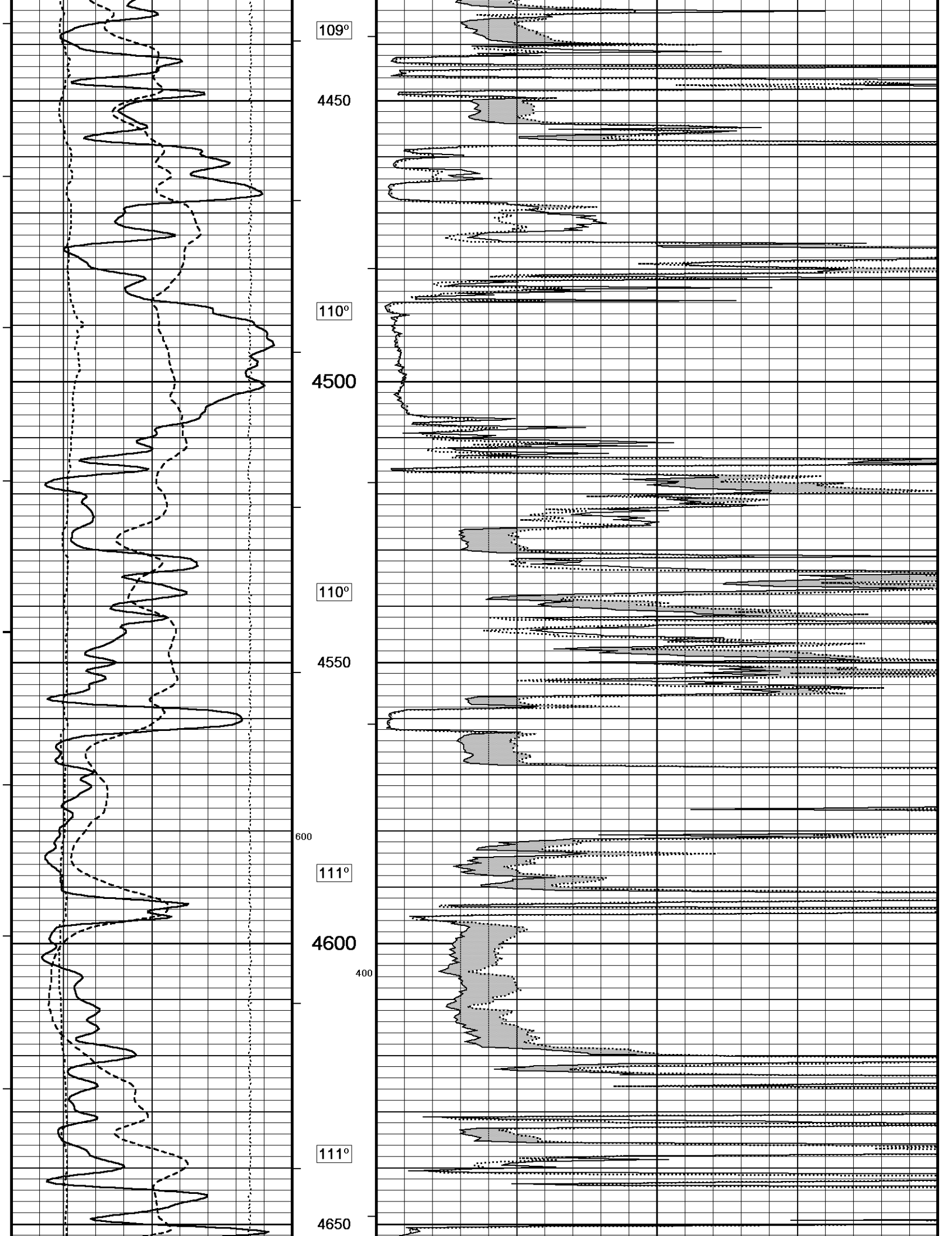
- OPERATOR: B. TOVAR.

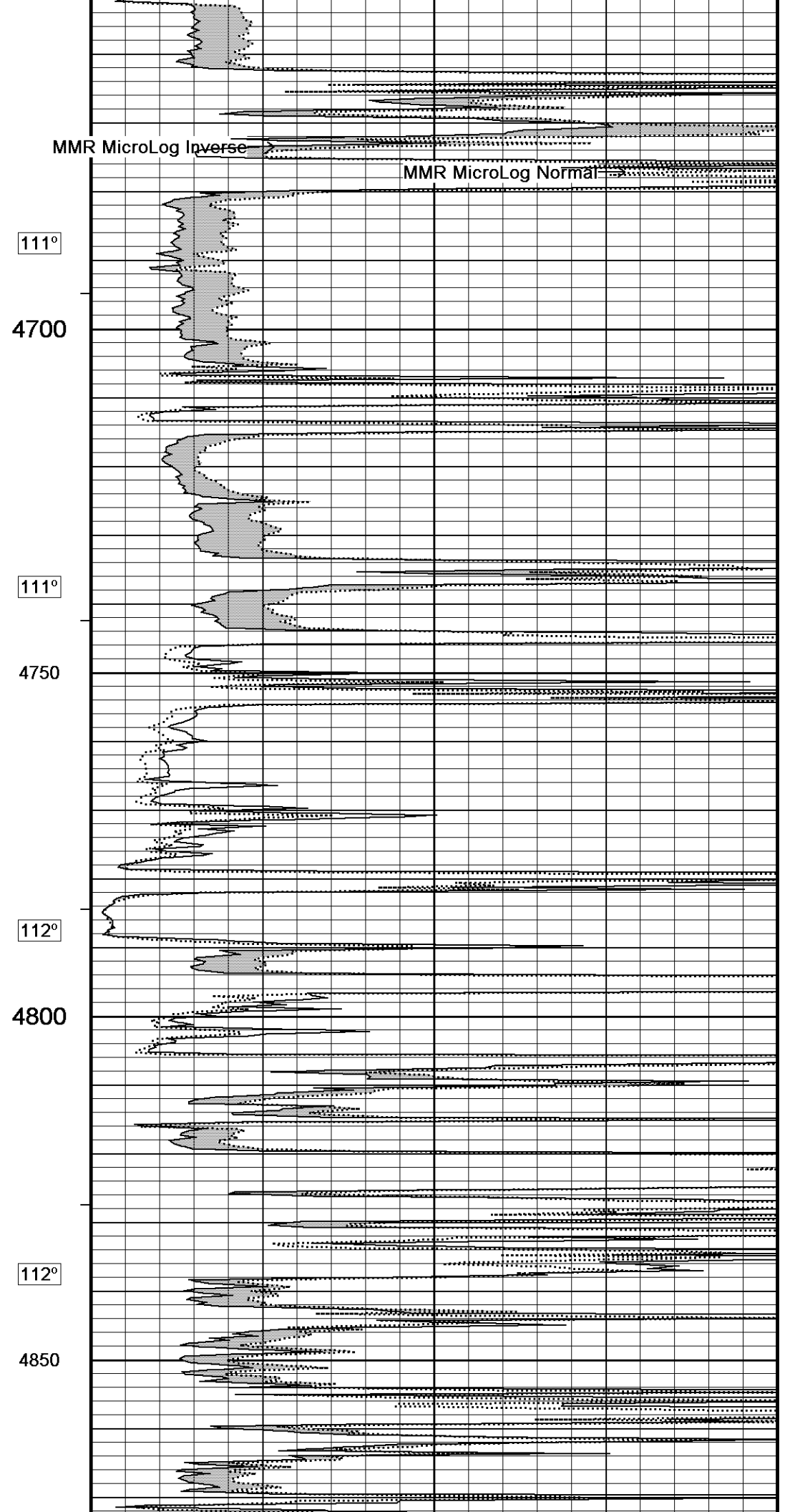
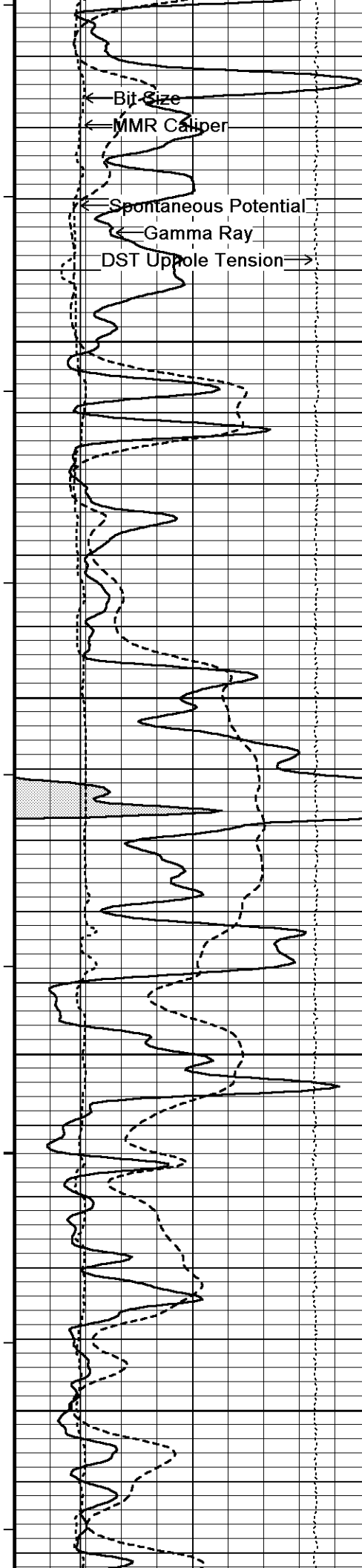
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.

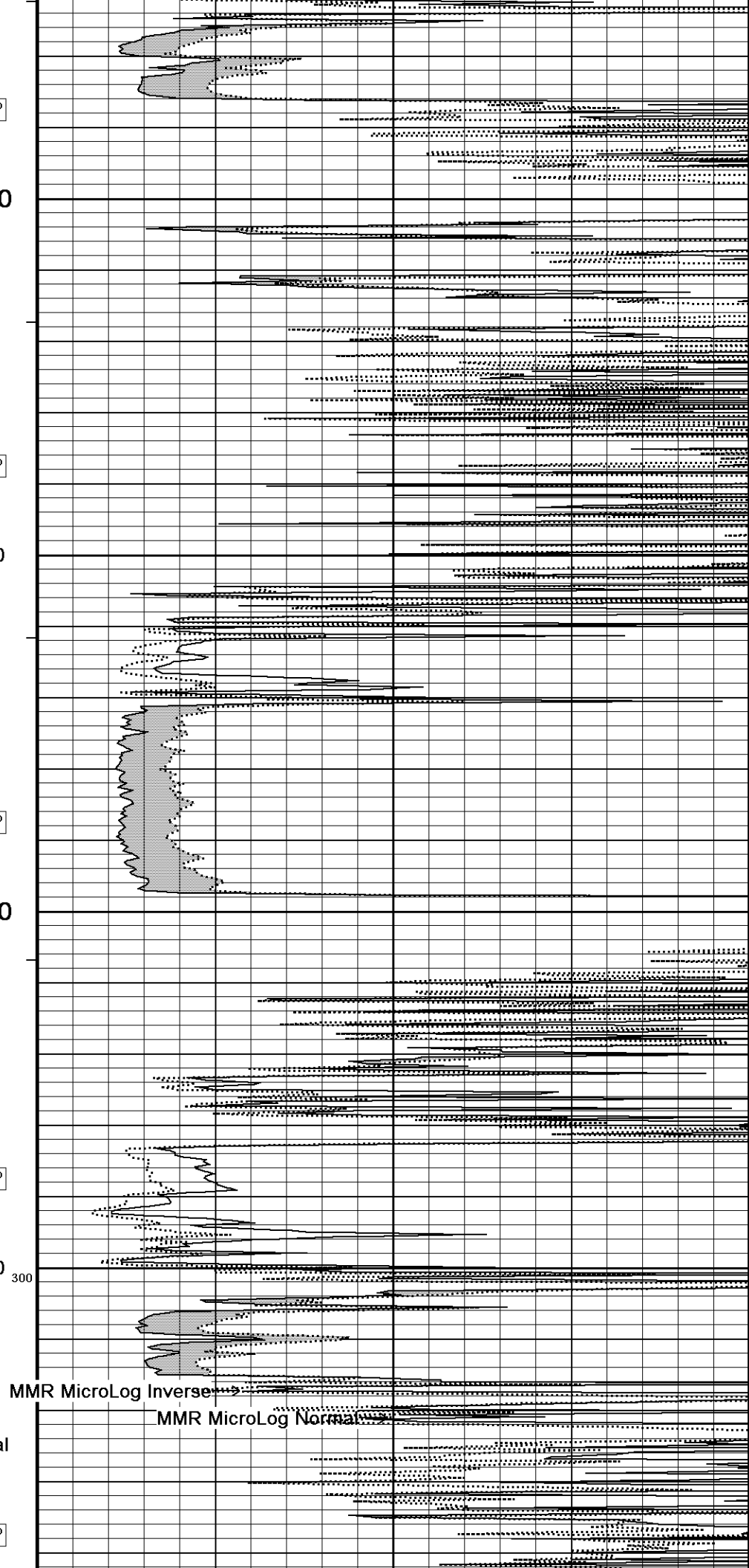
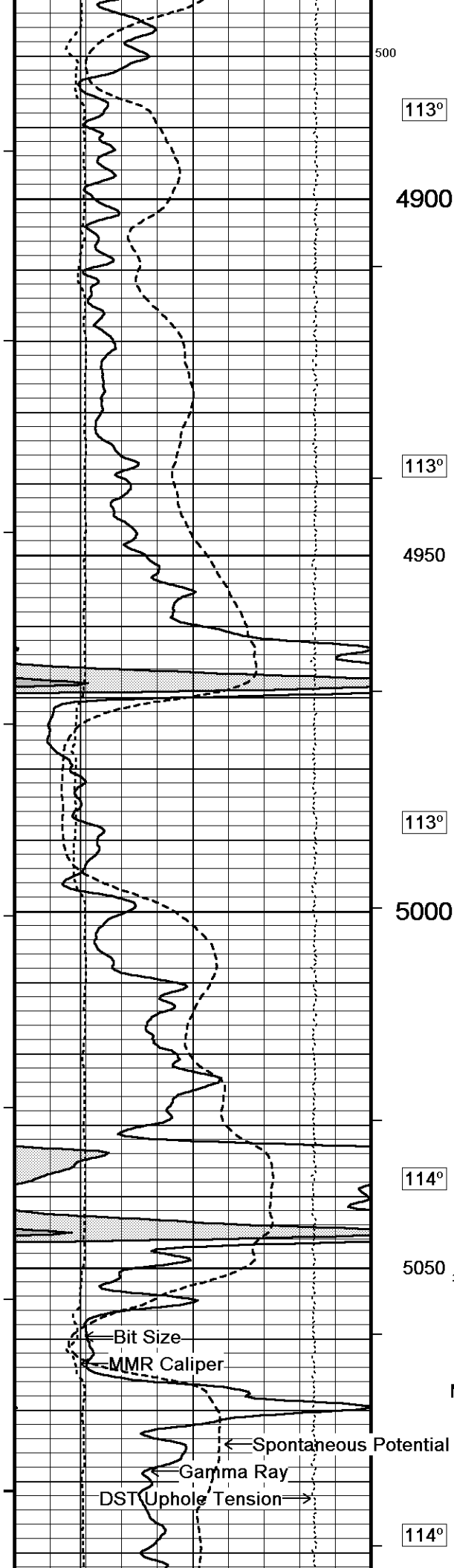


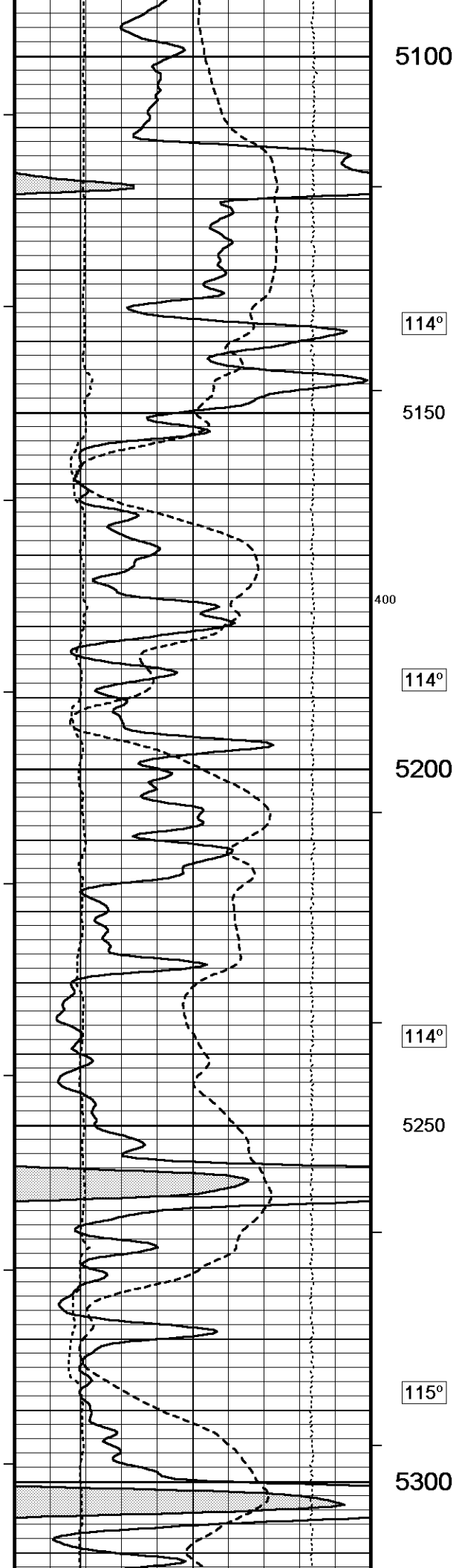












5100

114°

5150

400

114°

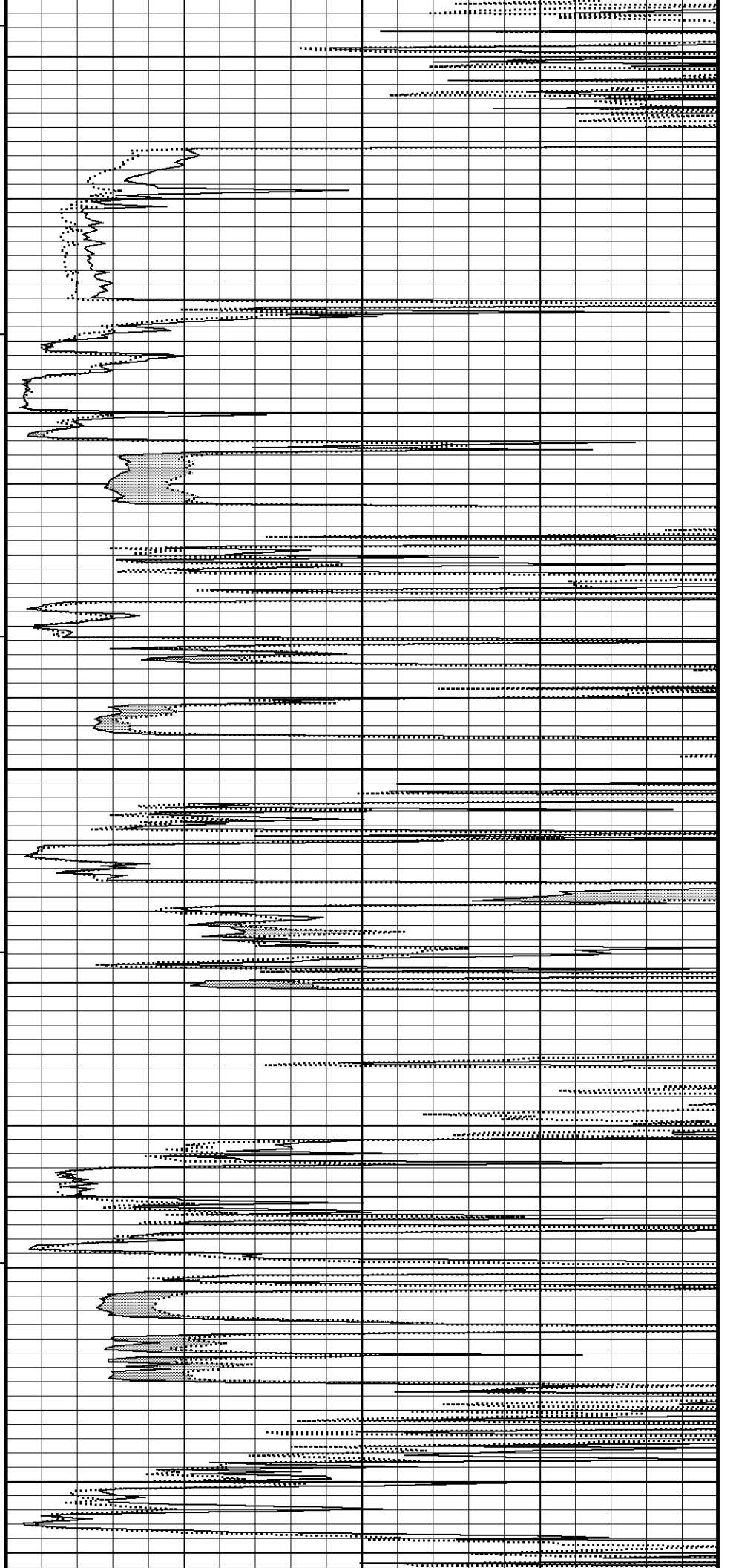
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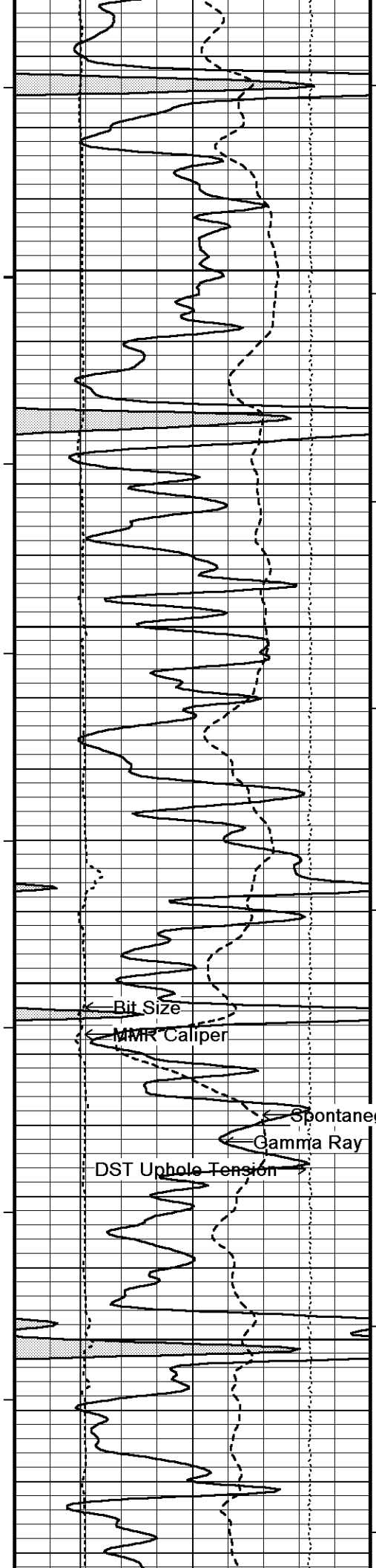
114°

5250

115°

5300





116°

5350

116°

5400

117°

5450

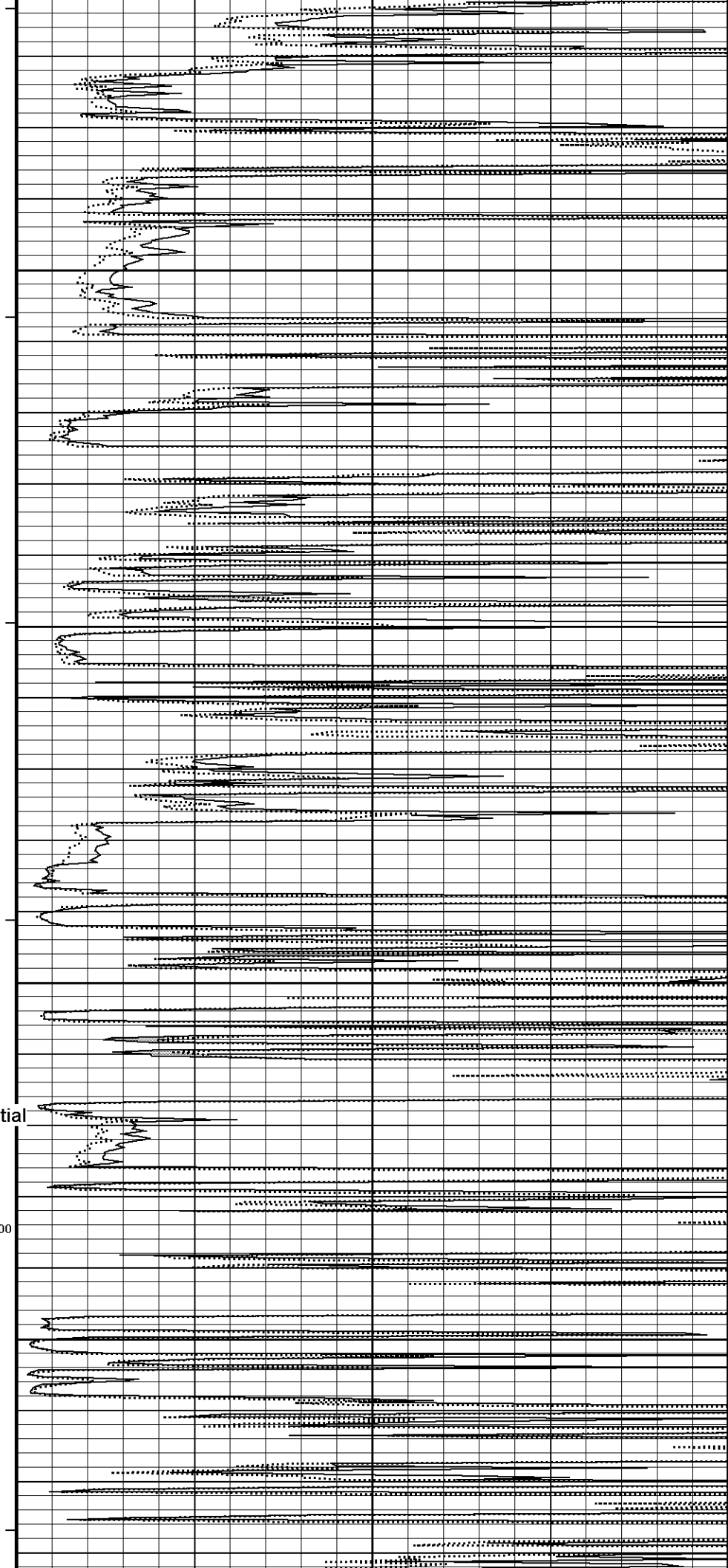
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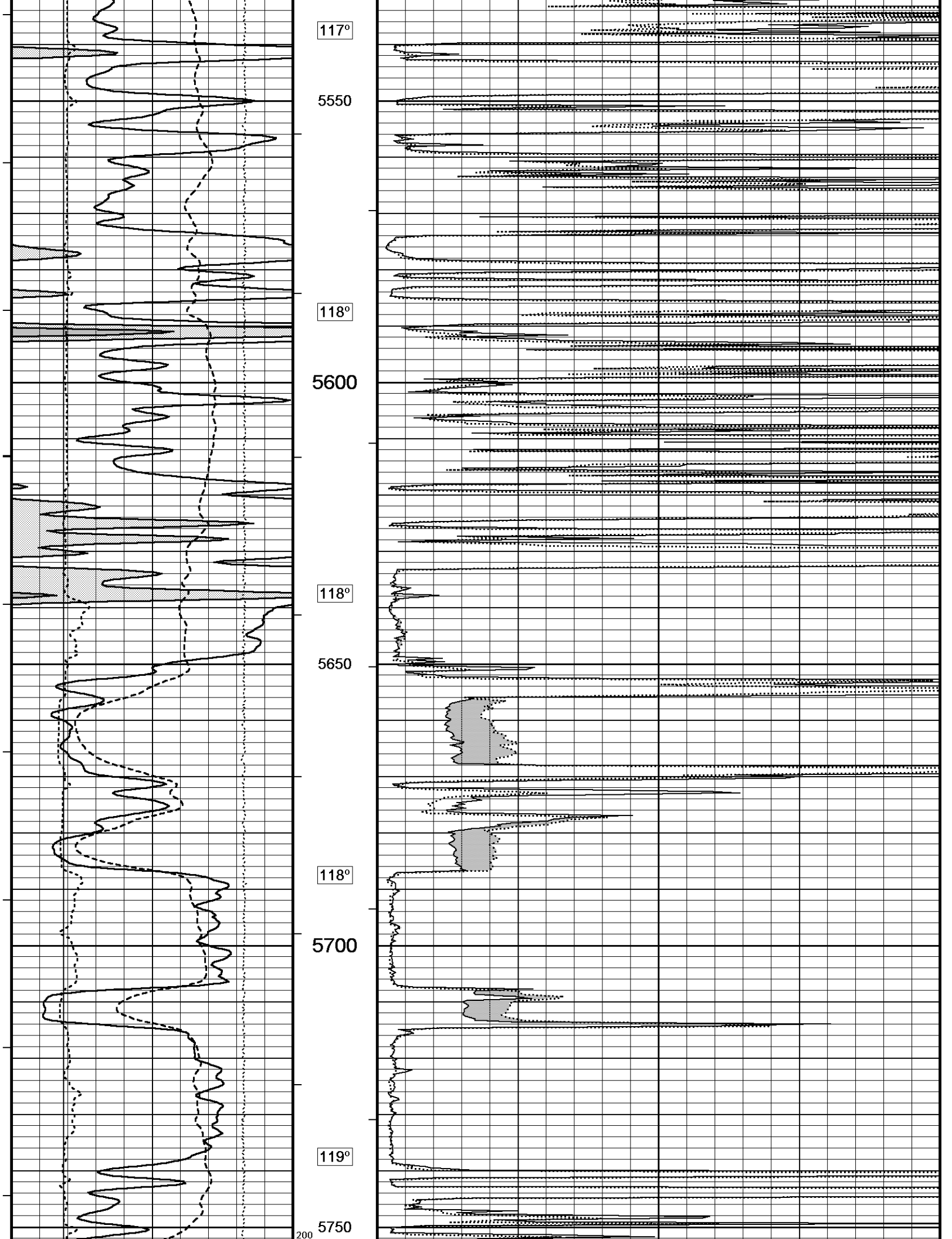
Gamma Ray

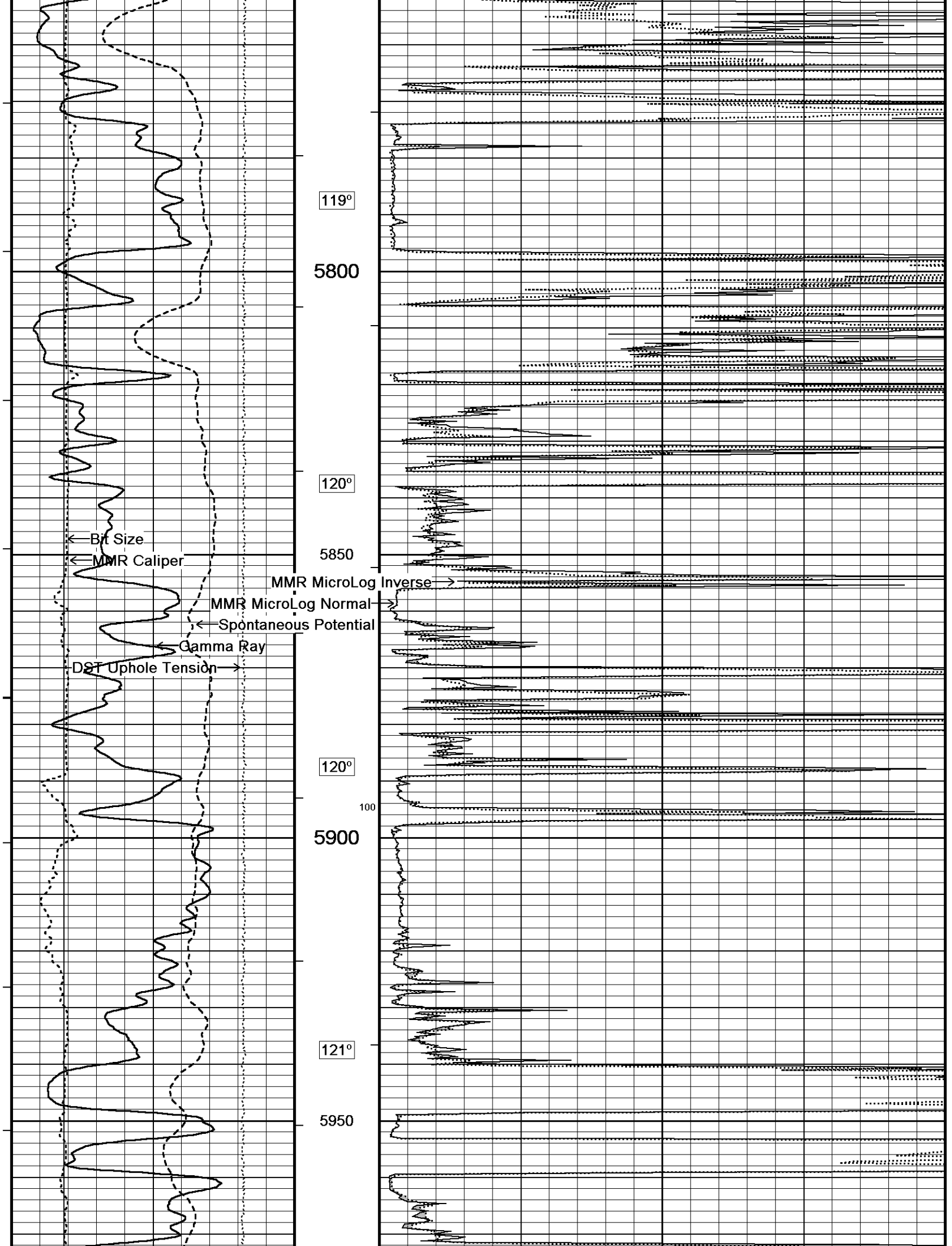
DST Uphole Tension

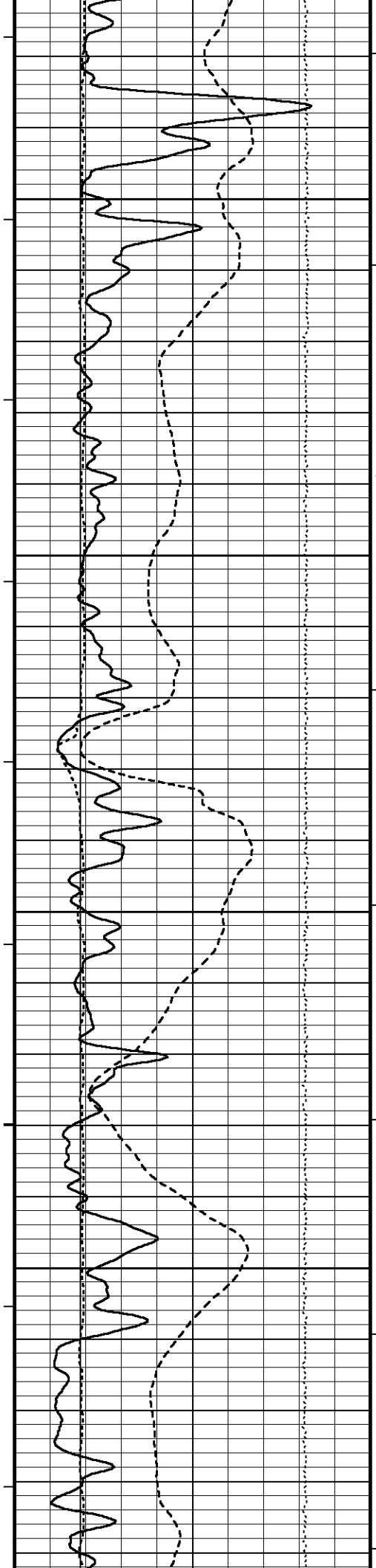
117°
200

5500

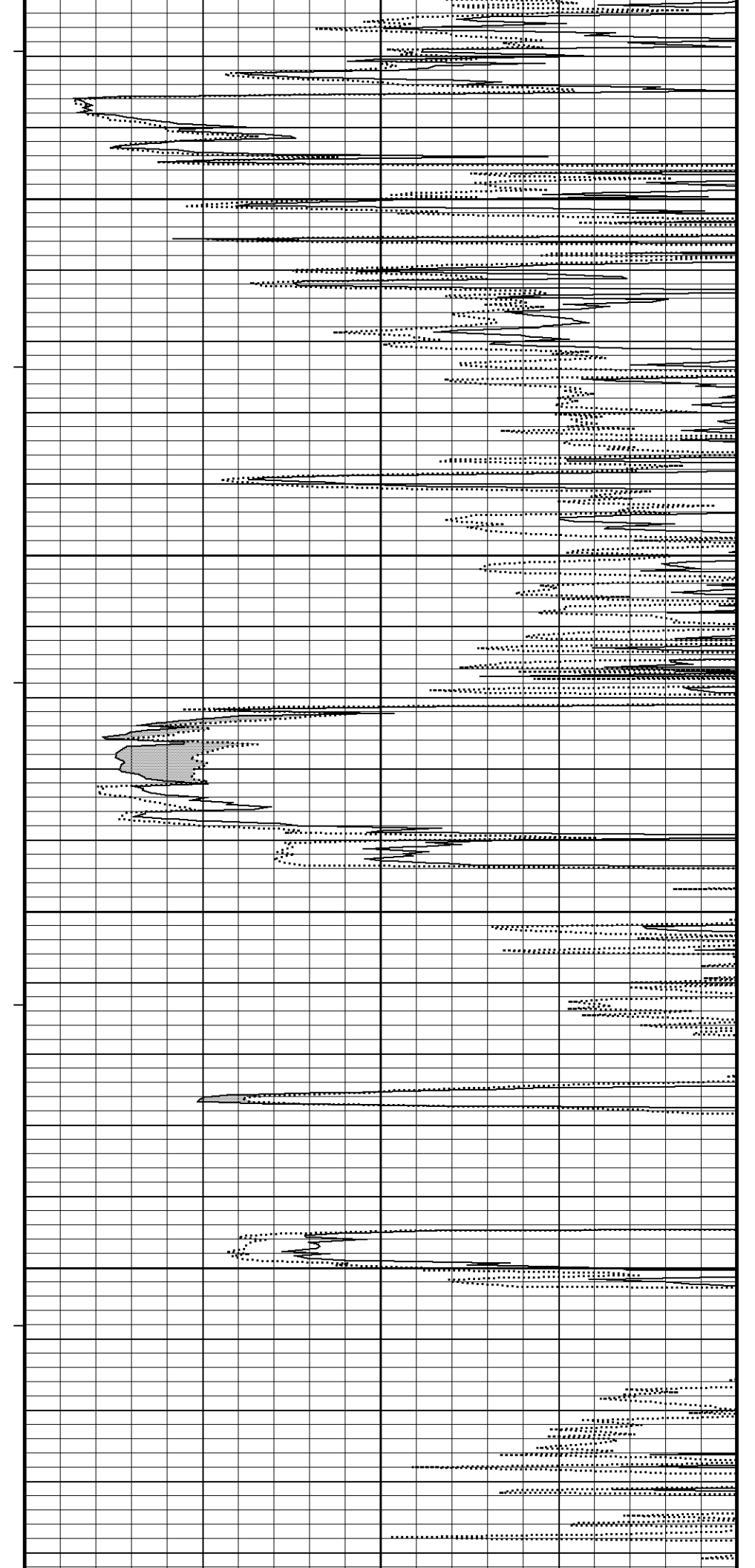


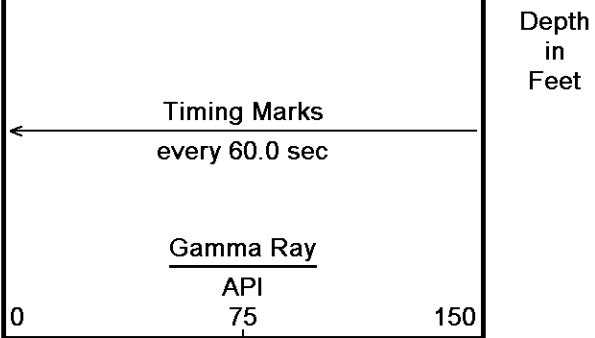
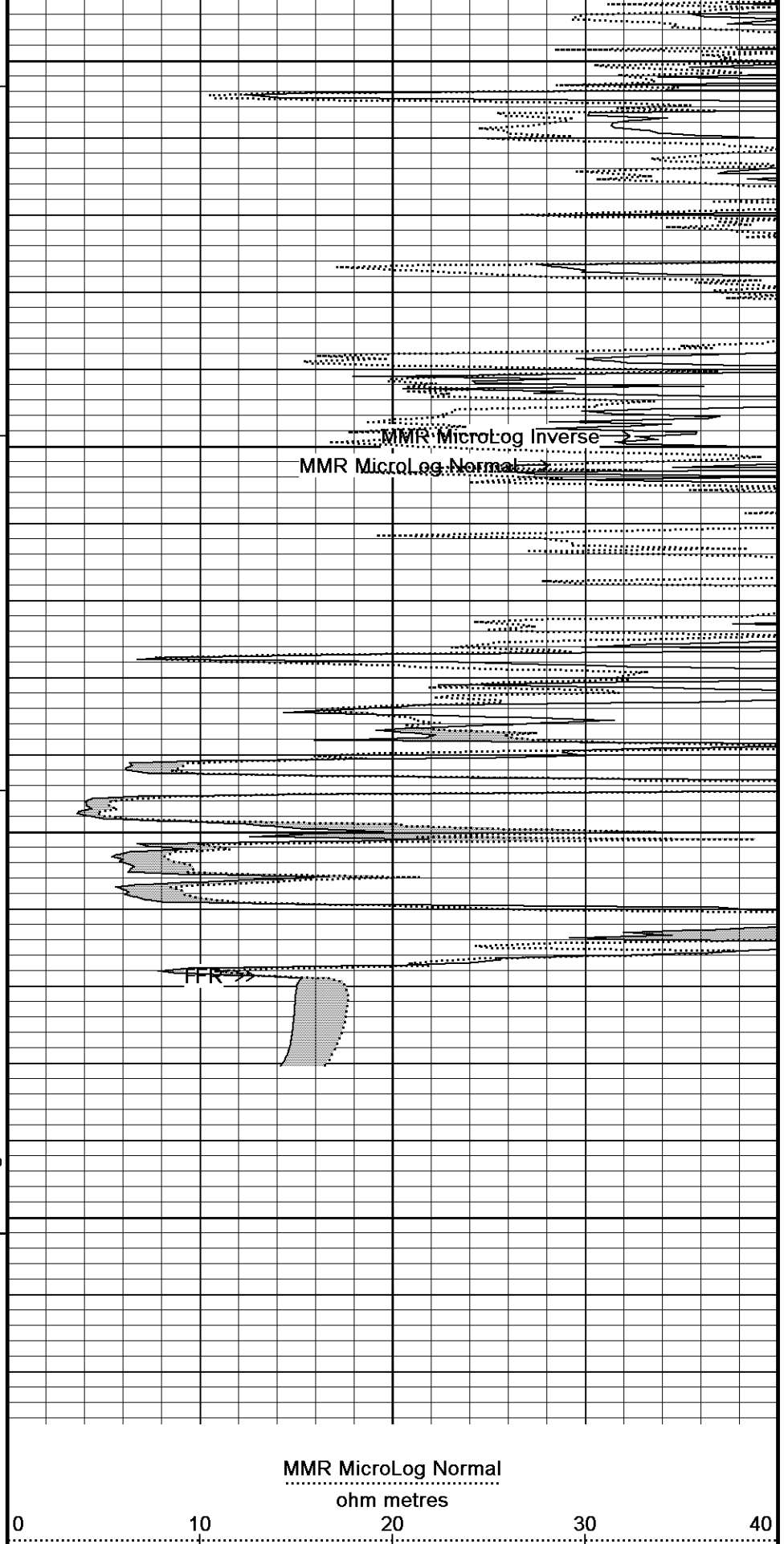
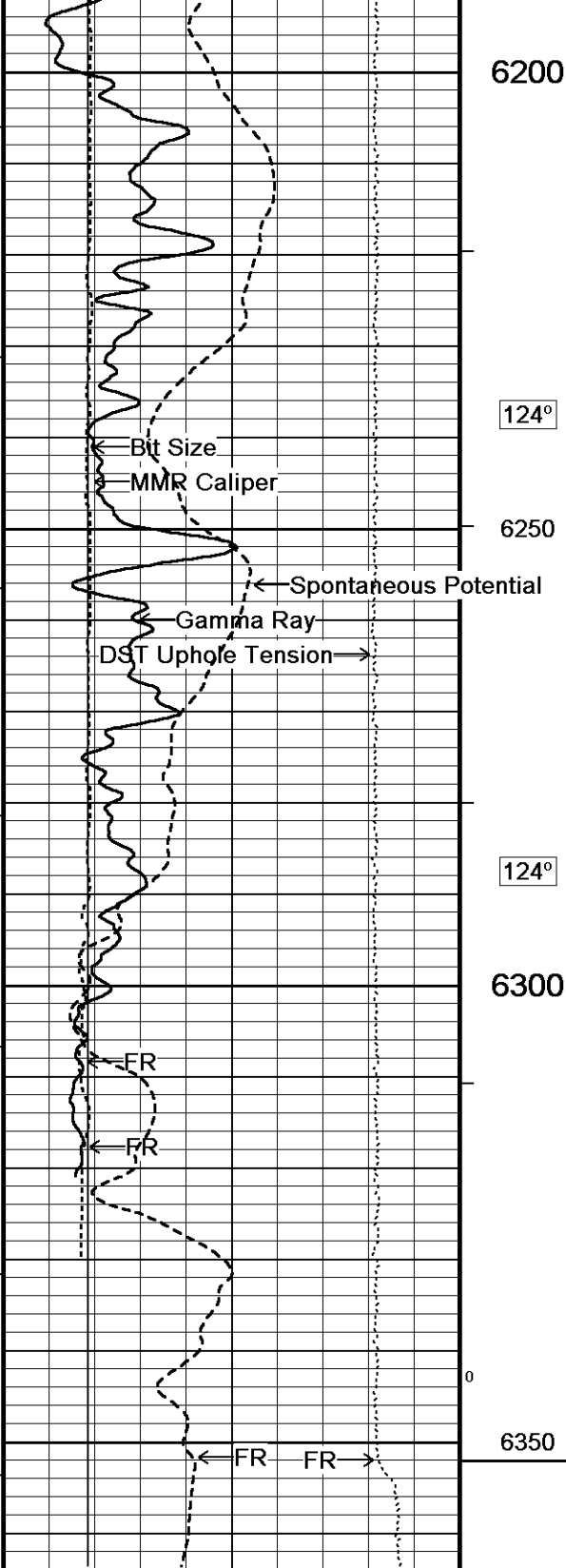






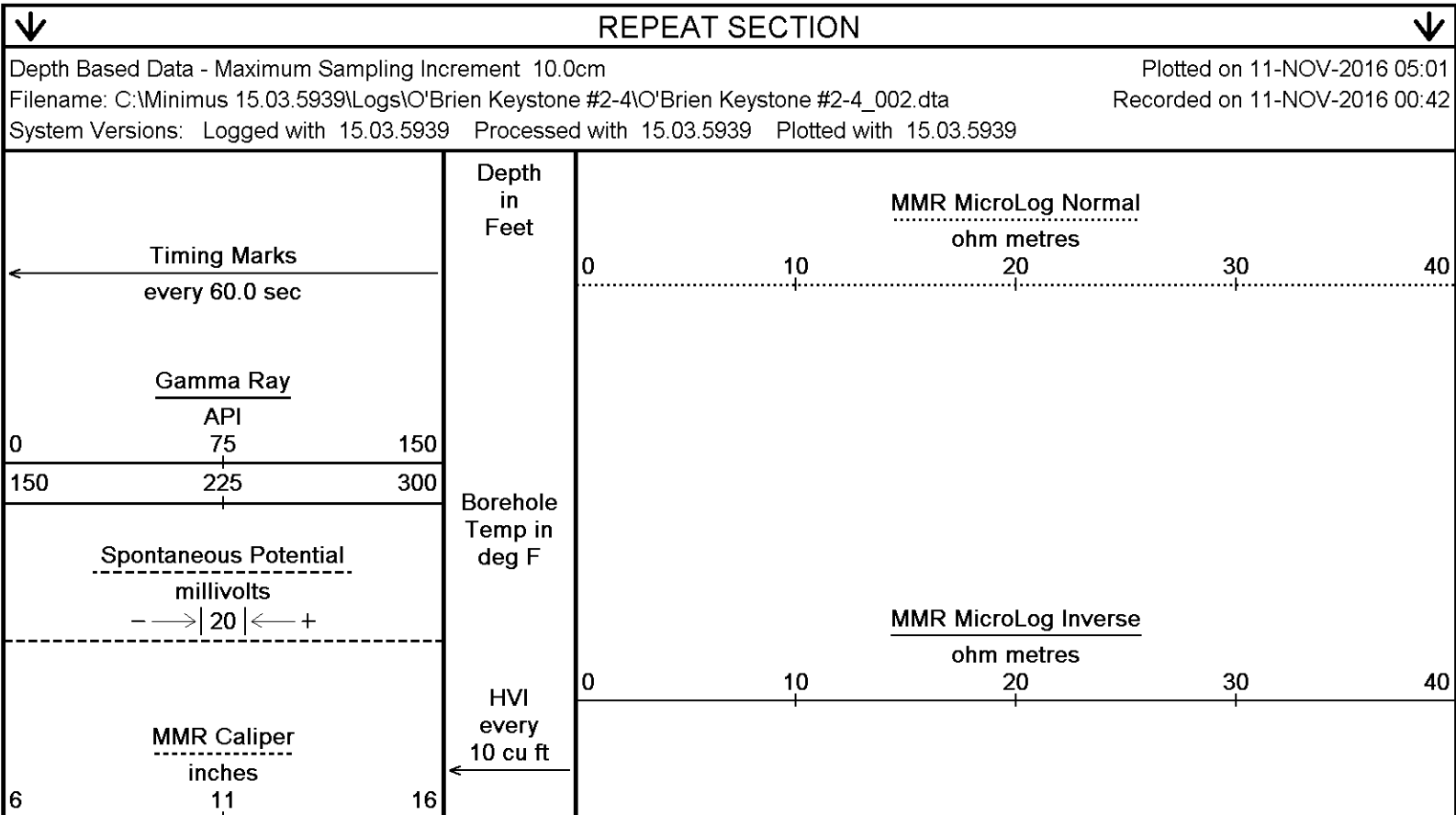
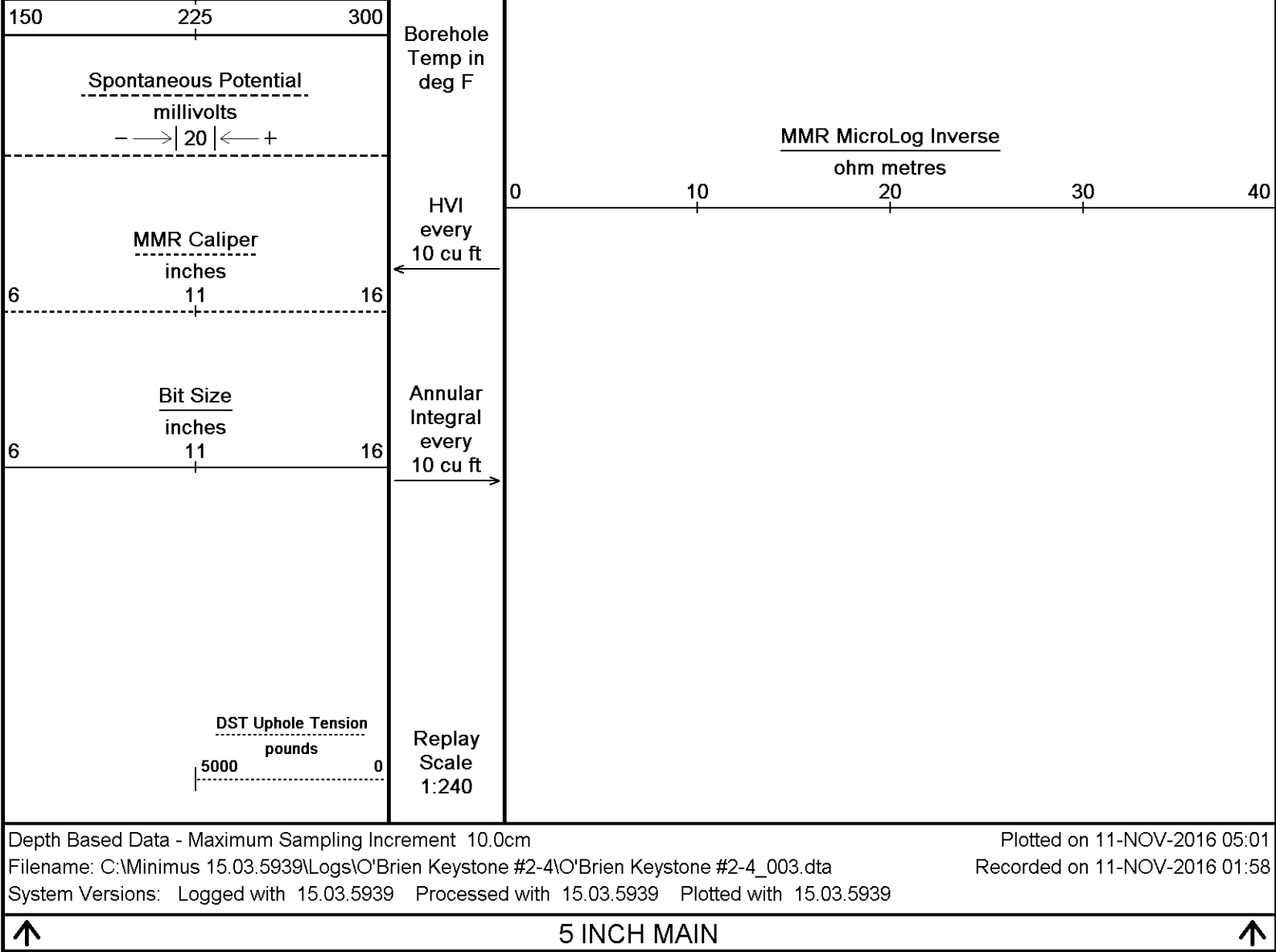
122°
6000
100 122°
6050
123°
6100
123°
6150
124°





Depth
in
Feet

MMR MicroLog Normal
ohm metres



Bit Size
inches
11

Annular
Integral
every
10 cu ft

DST Uphole Tension
pounds

Replay
Scale
1:240

5000

16

6

5600

117°

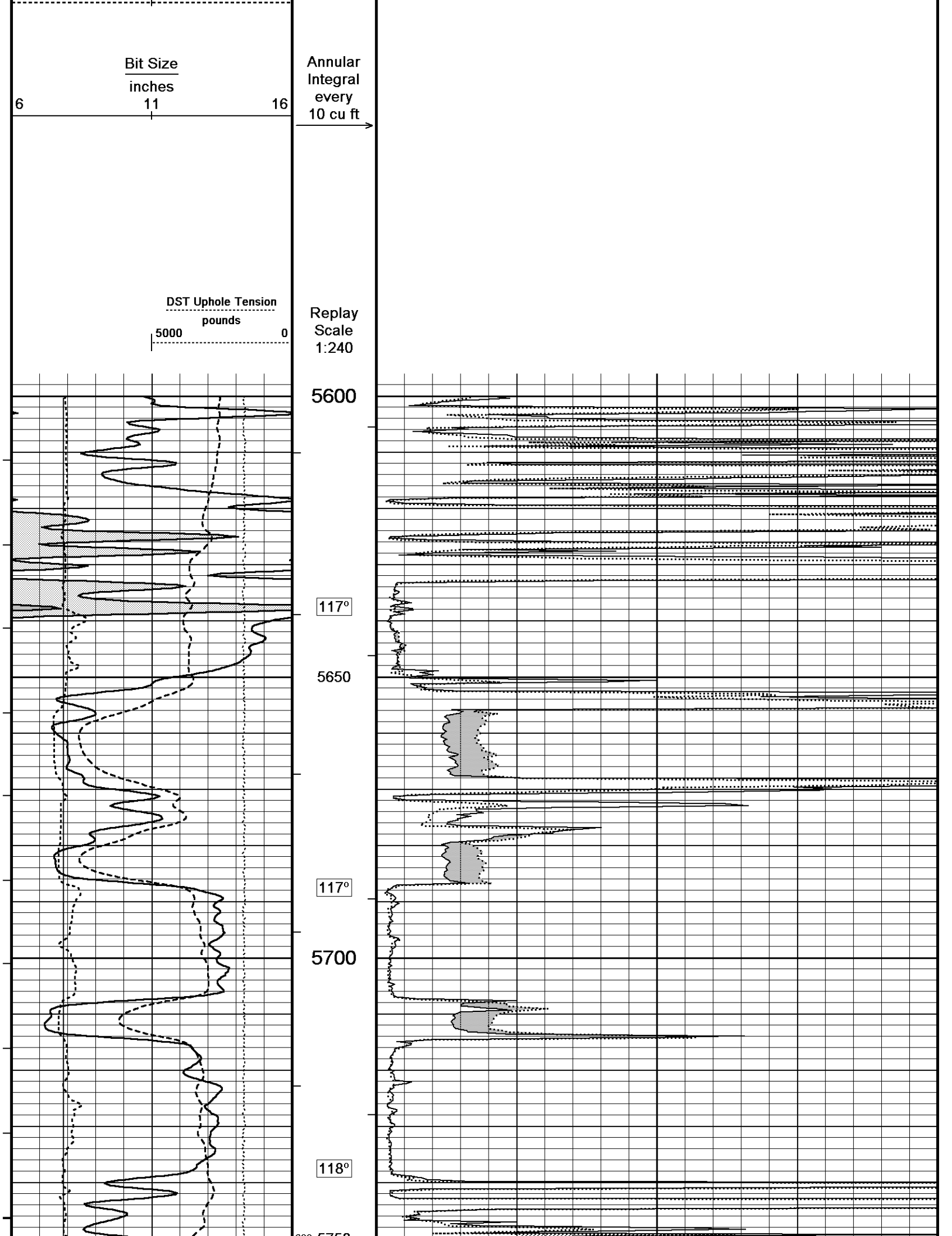
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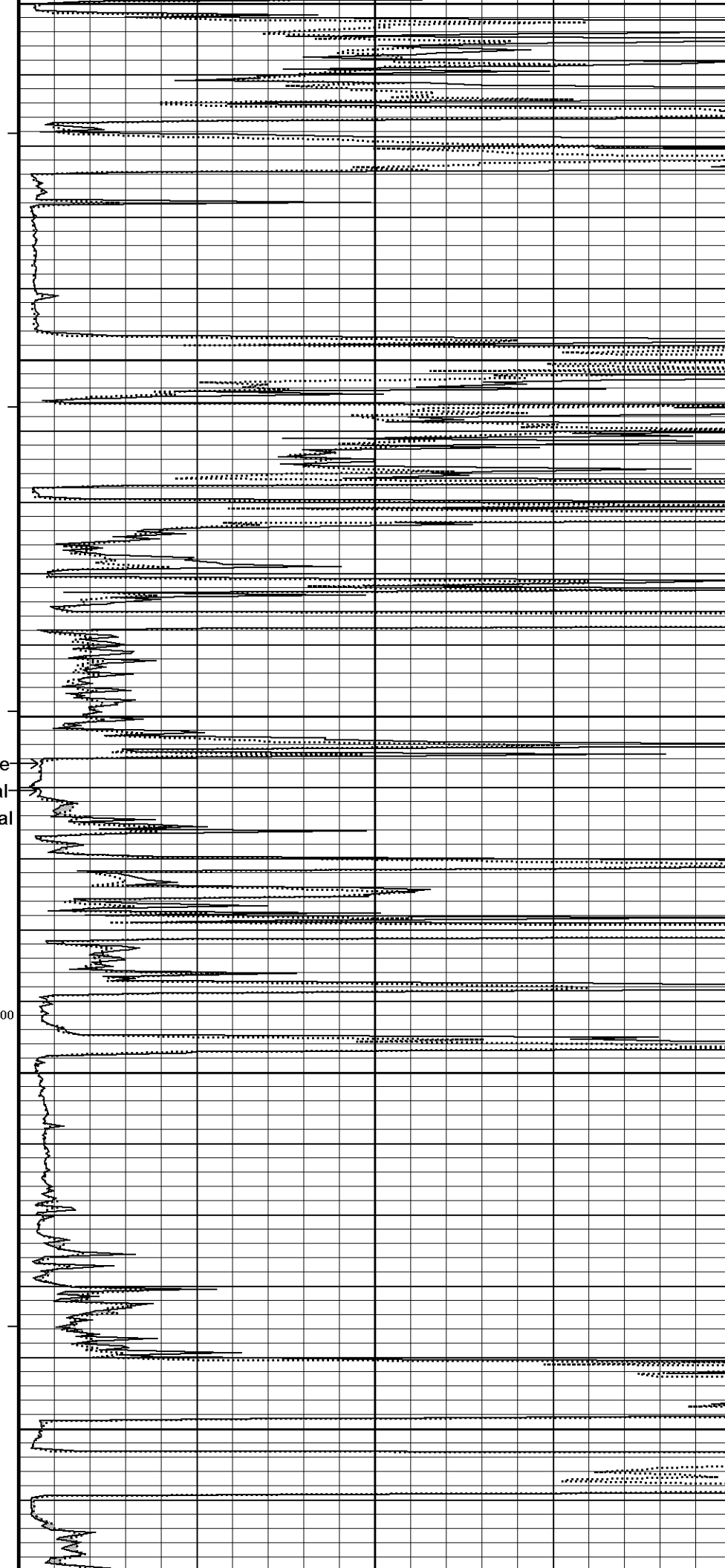
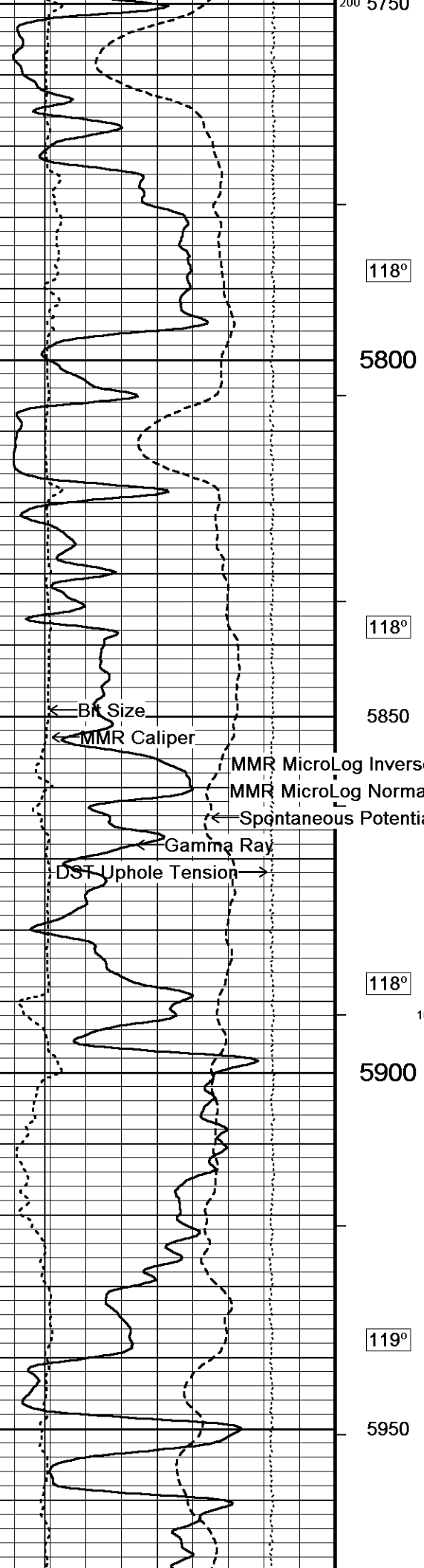
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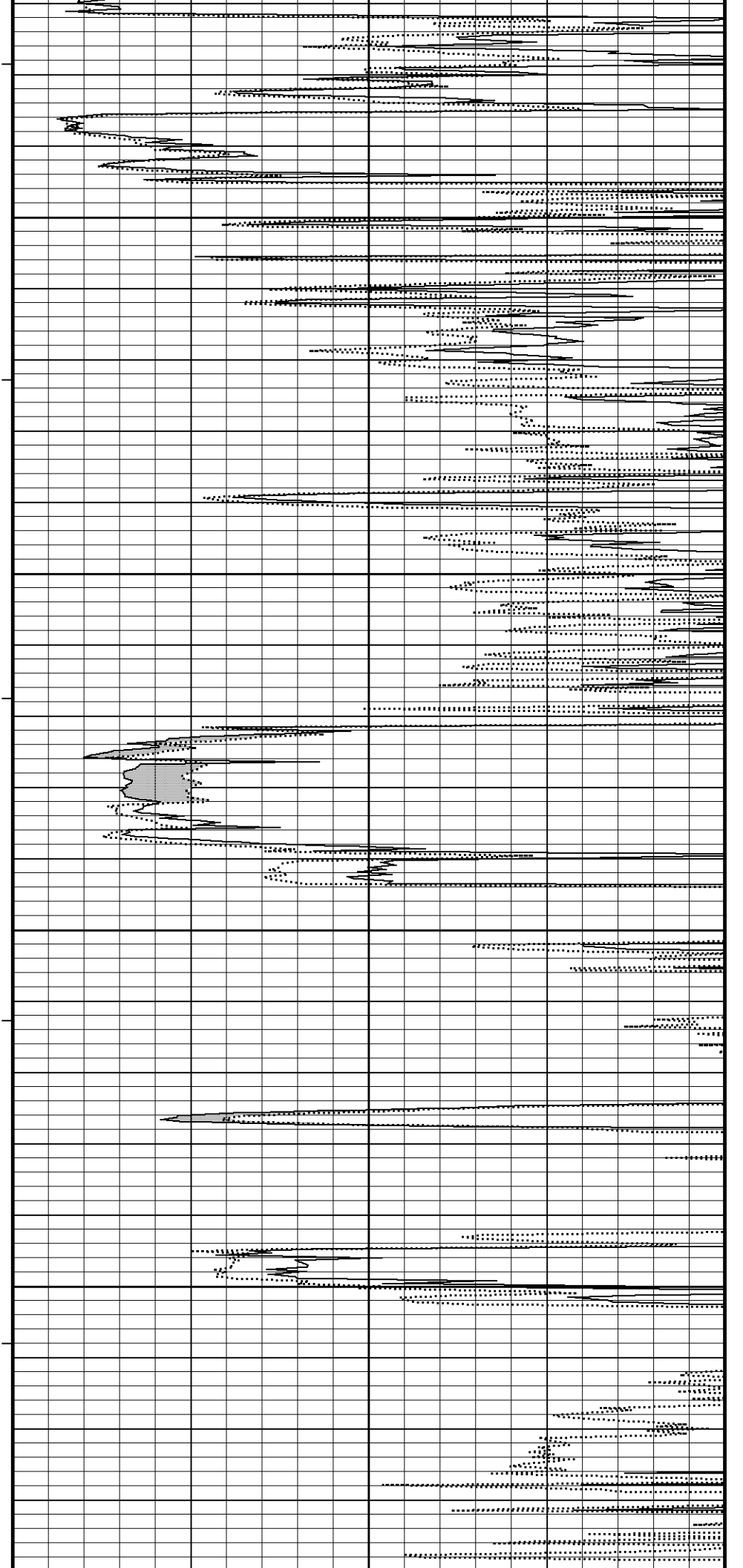
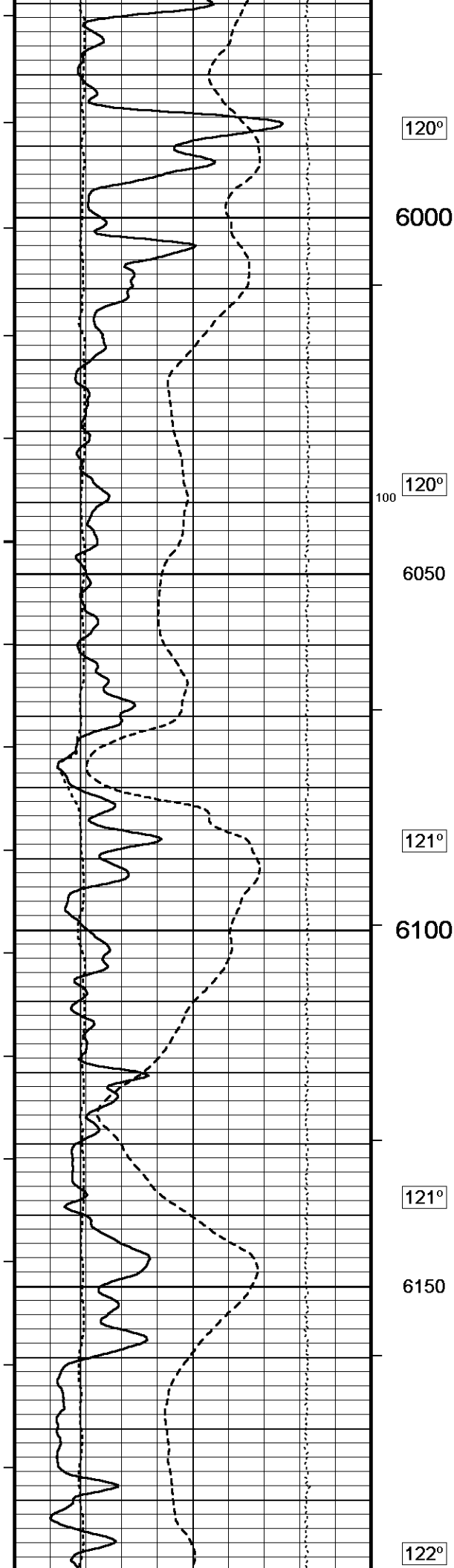
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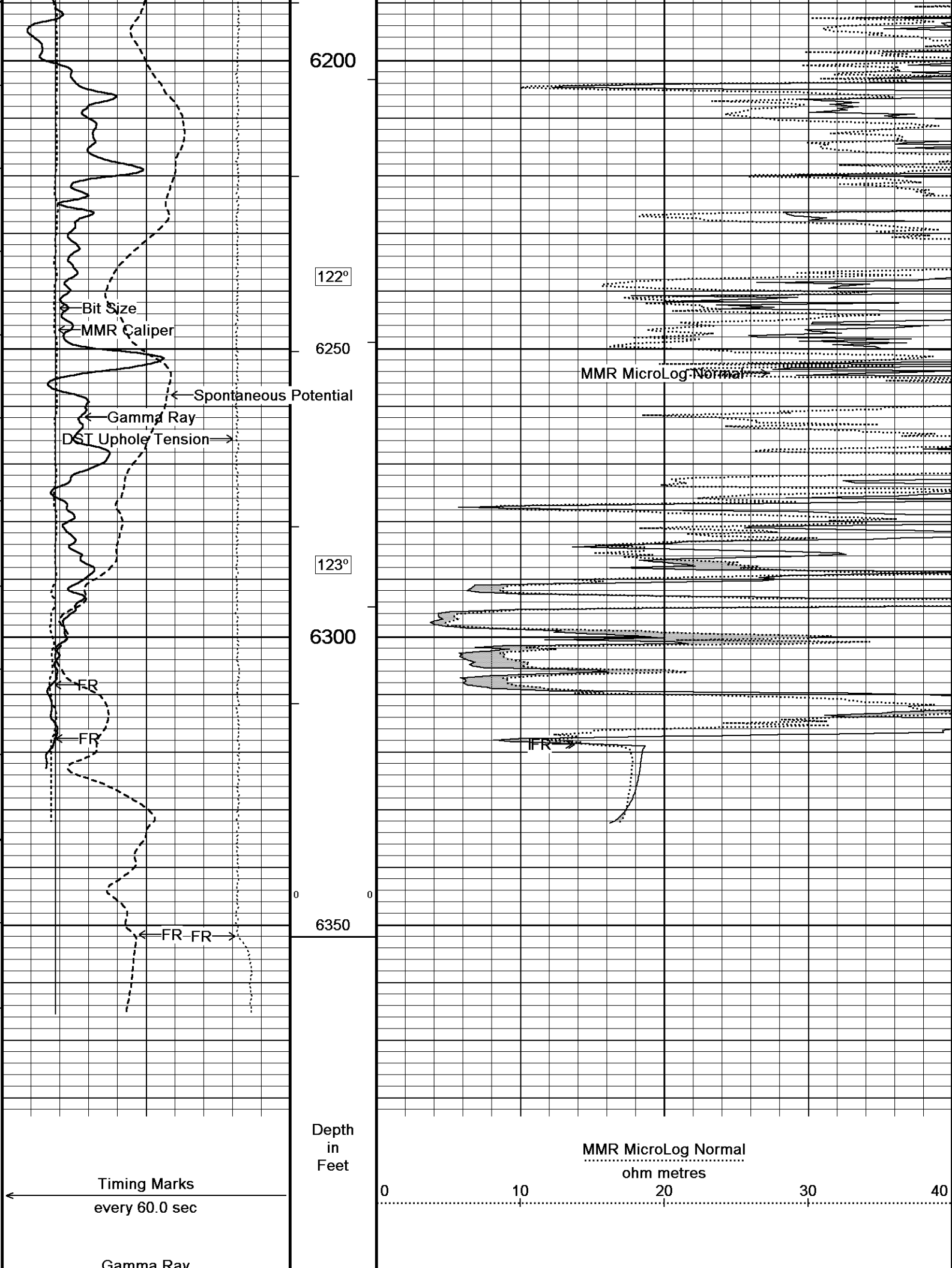
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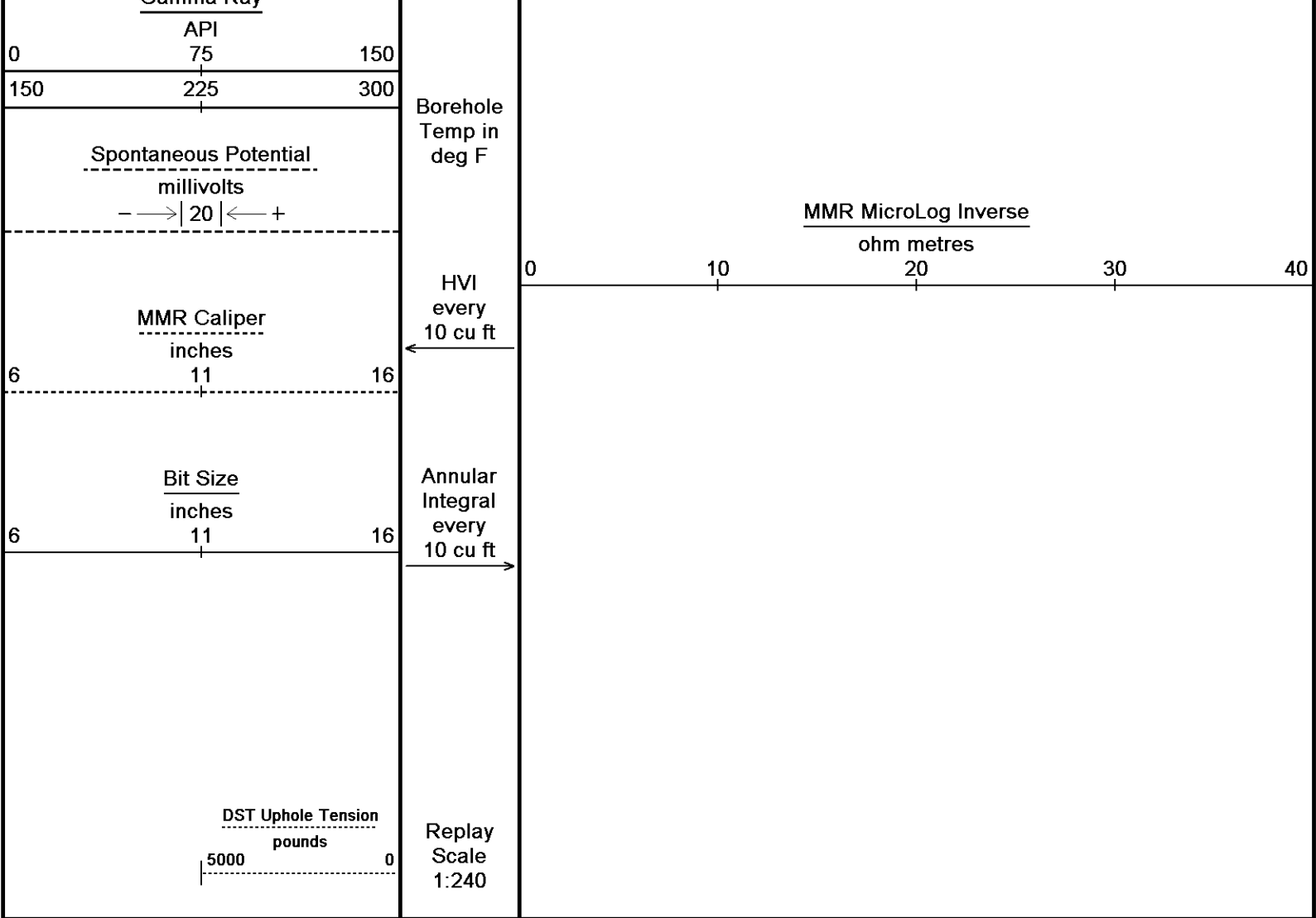
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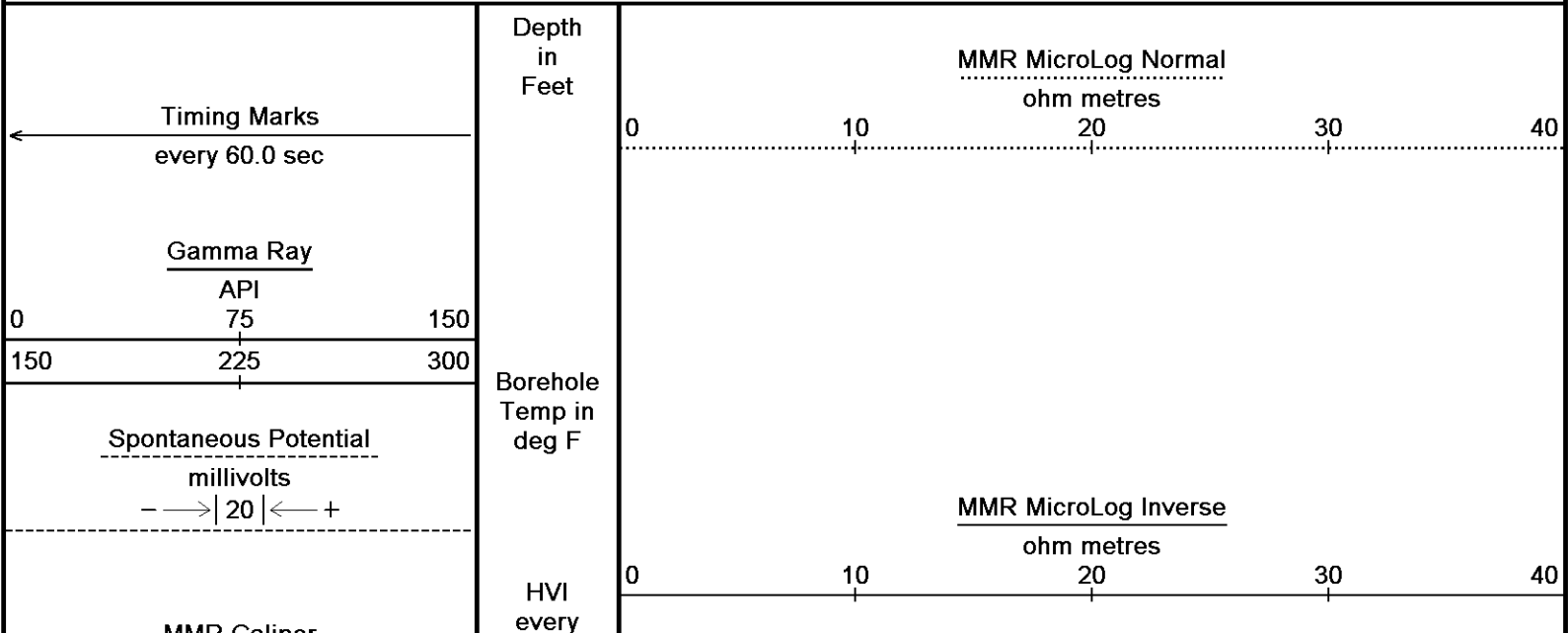


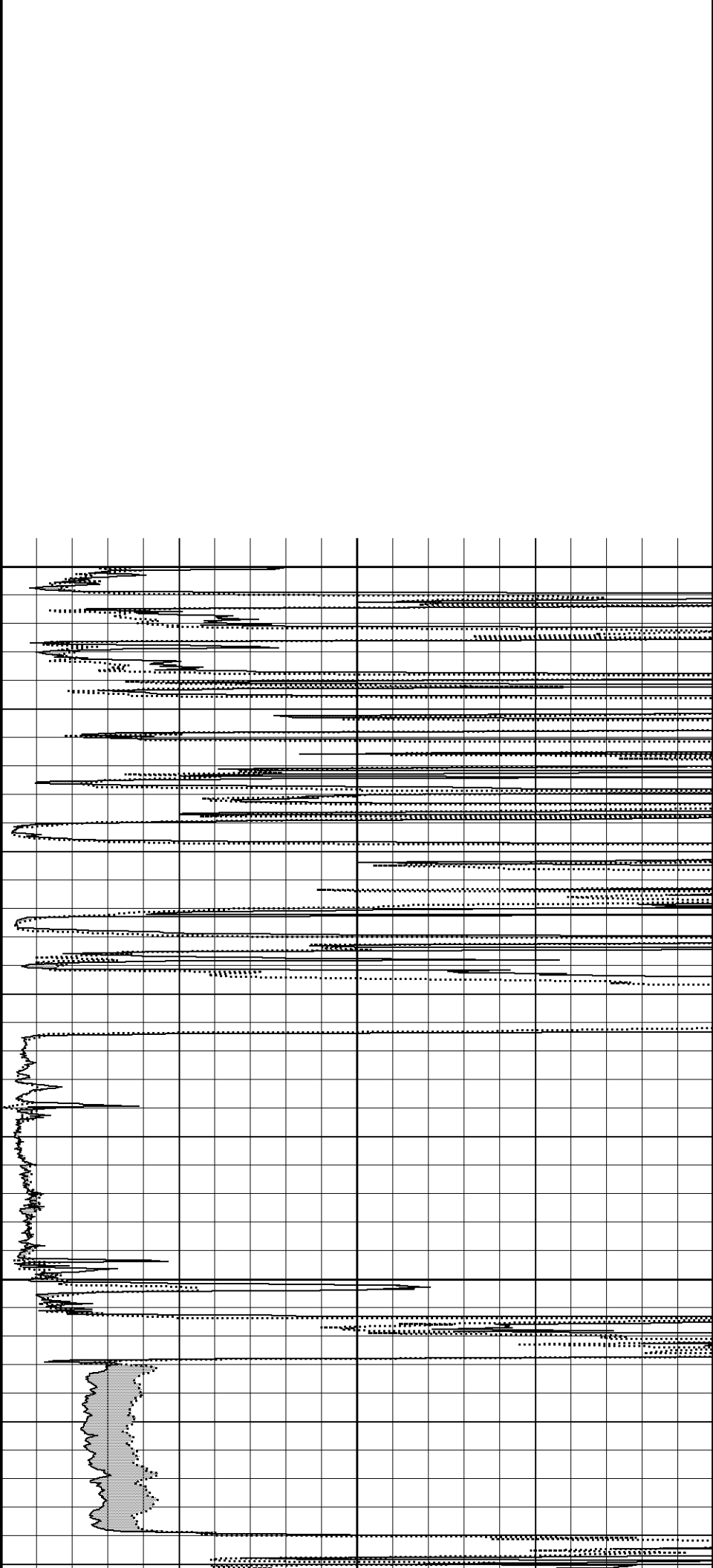
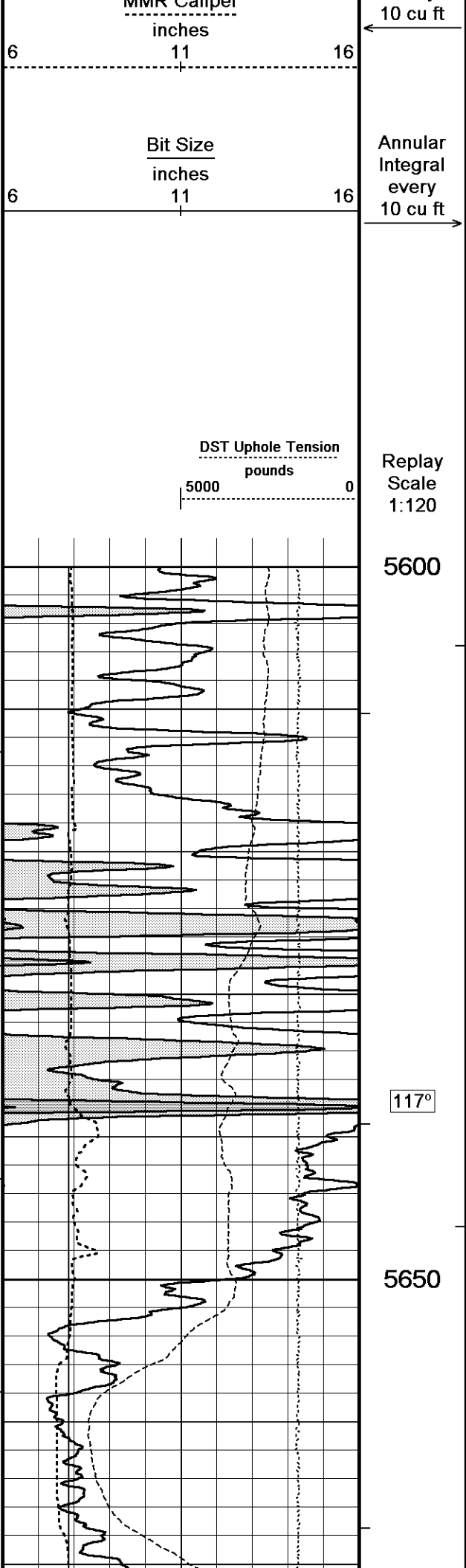
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Filename: C:\Minimus 15.03.5939\Logs\O'Brien Keystone #2-4\O'Brien Keystone #2-4_002.dta		Recorded on 11-NOV-2016 00:42
System Versions: Logged with 15.03.5939 Processed with 15.03.5939 Plotted with 15.03.5939		

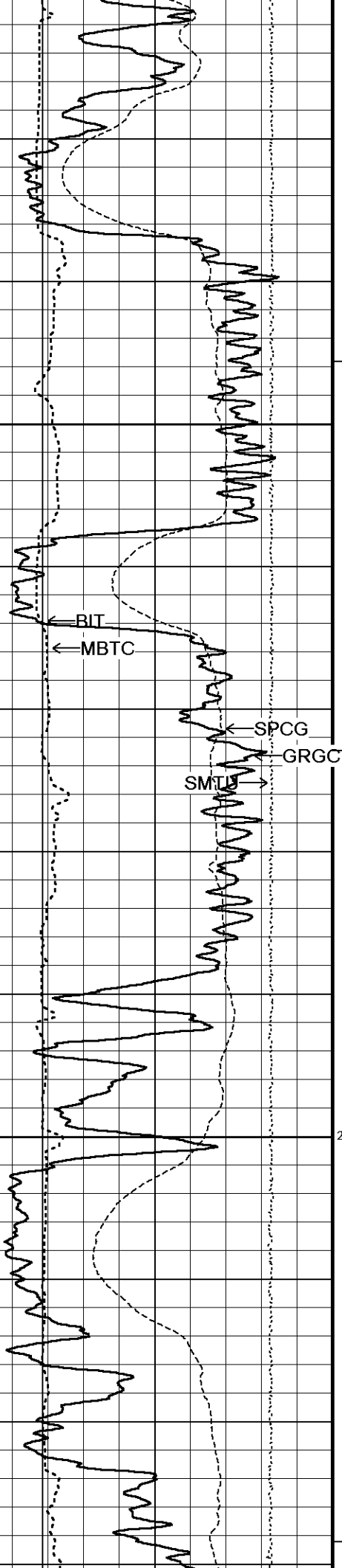
↑	REPEAT SECTION	↑
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↓	10 INCH HIGH RESOLUTION	↓
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Depth Based Data - Maximum Sampling Increment 2.5cm		Plotted on 11-NOV-2016 05:01
Filename: C:\Minimus 15.03.5939\Logs\O'Brien Keystone #2-4\O'Brien Keystone #2-4_001.dta		Recorded on 11-NOV-2016 00:42
System Versions: Logged with 15.03.5939 Plotted with 15.03.5939		







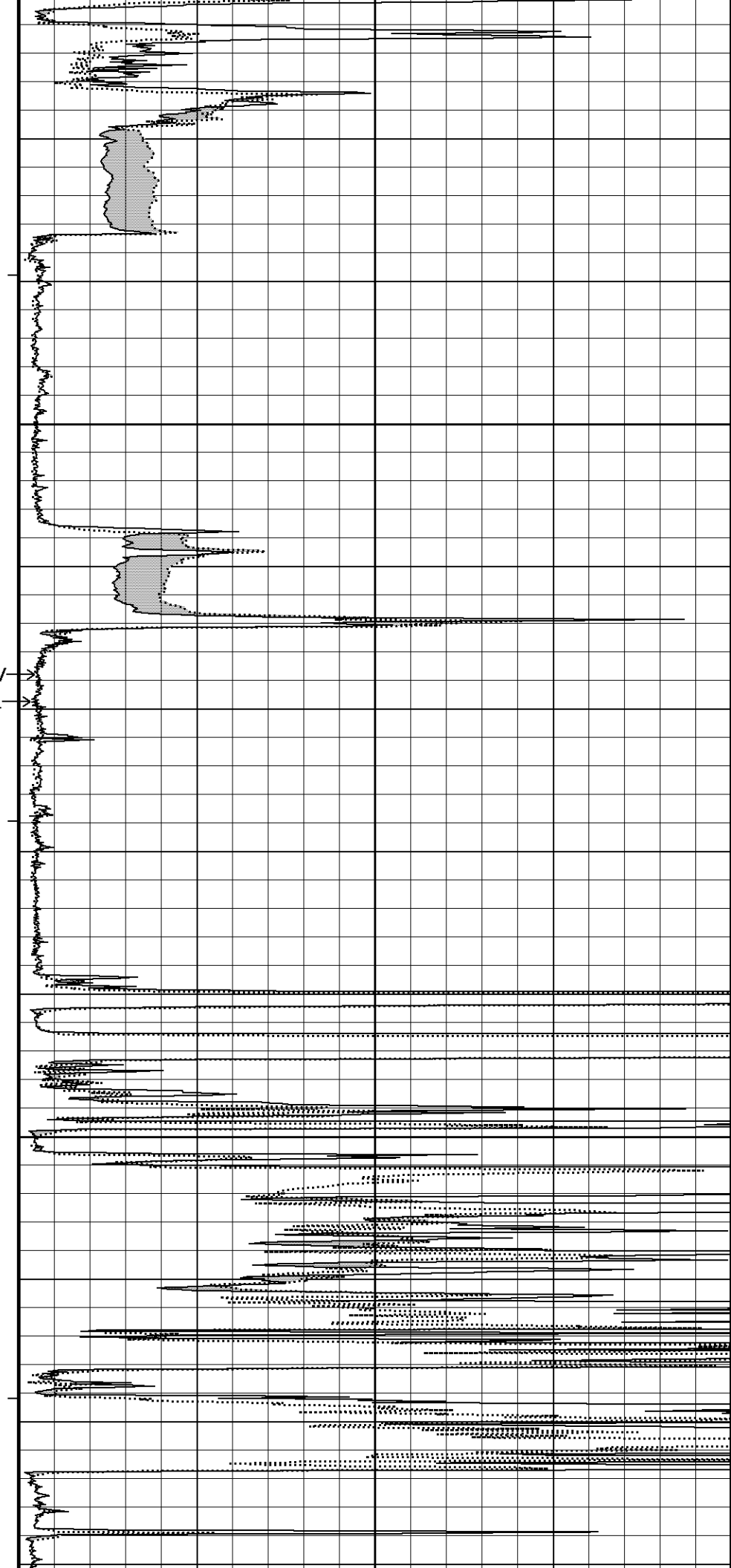
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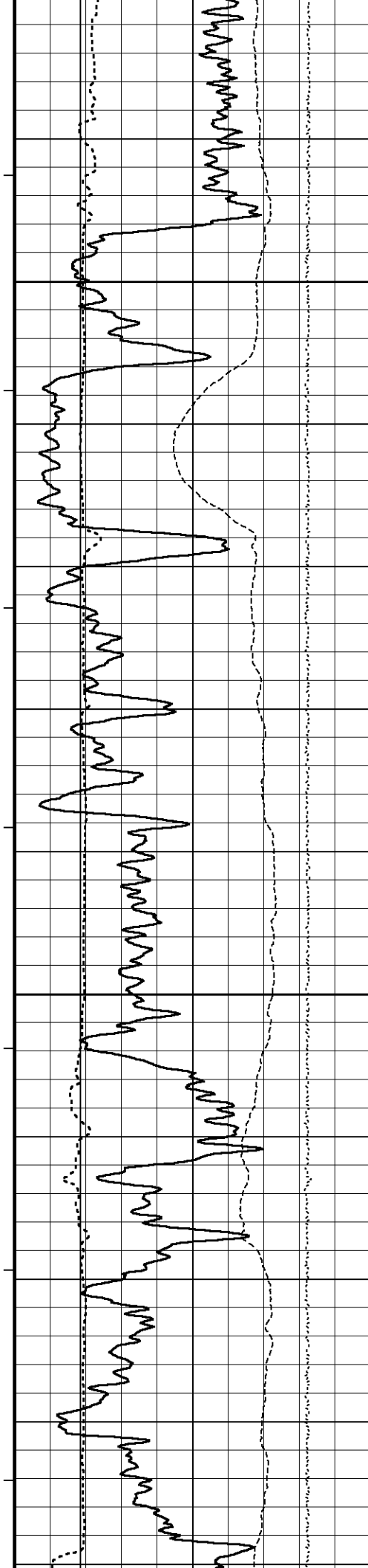
5700

MINV
MNRL

118°

200 5750





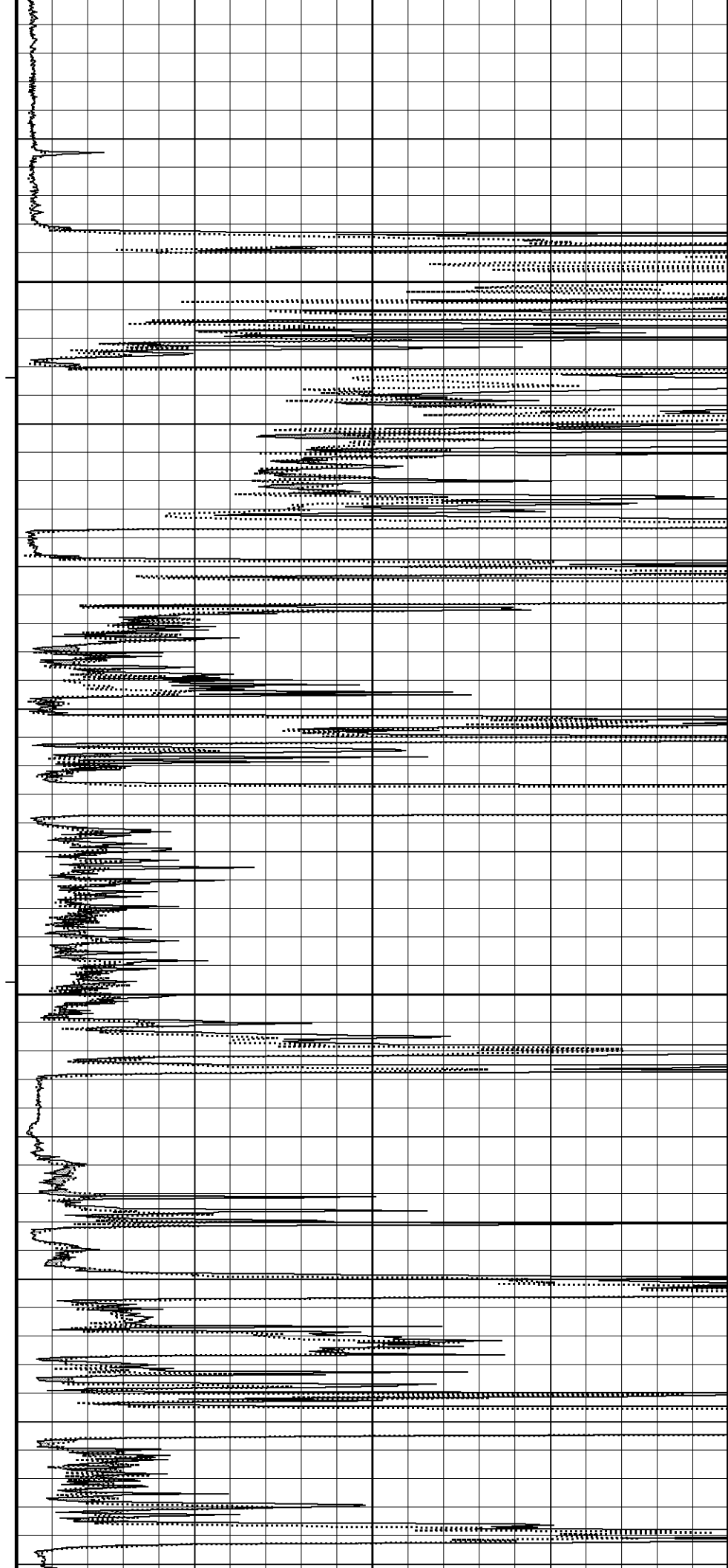
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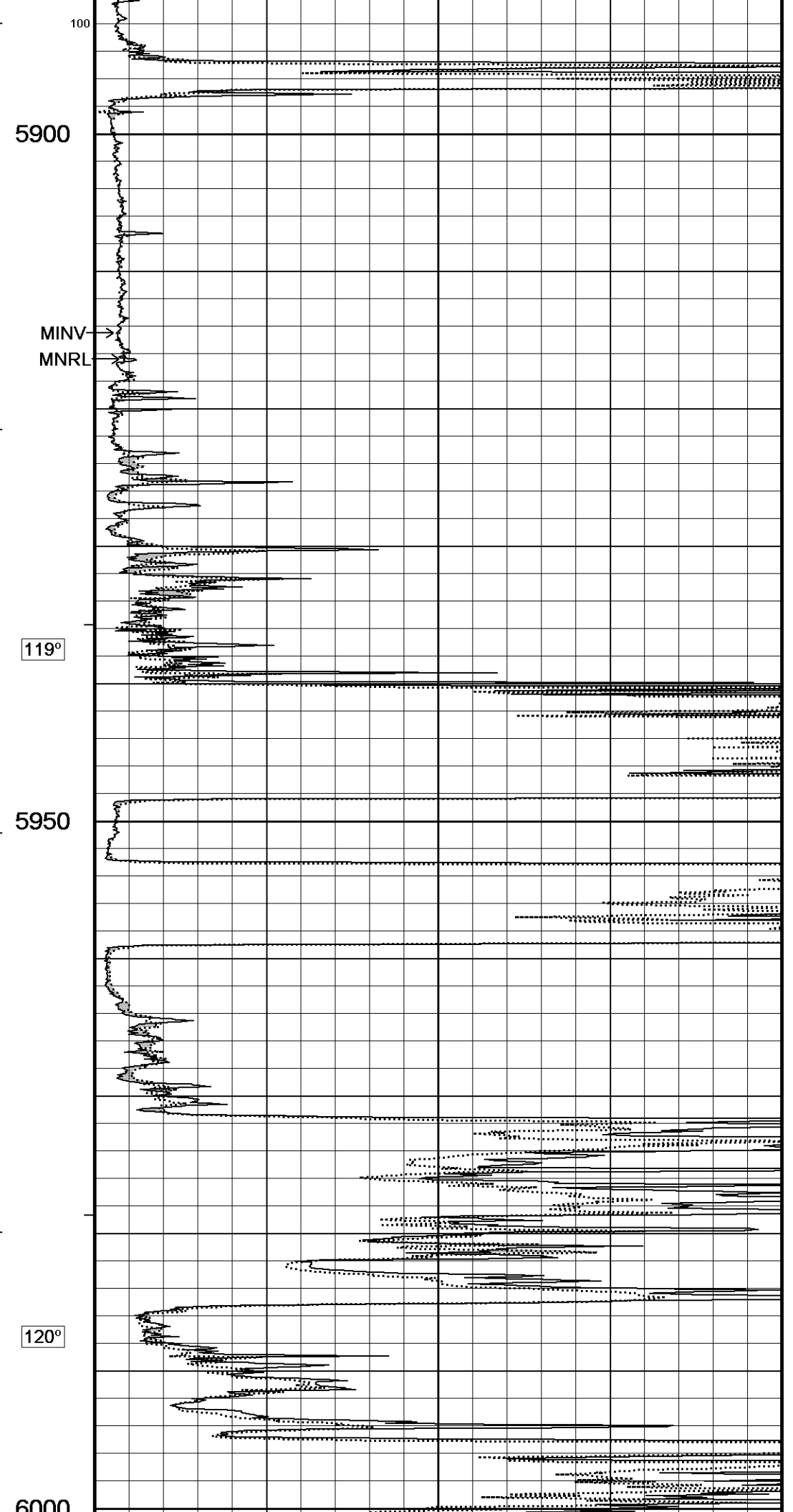
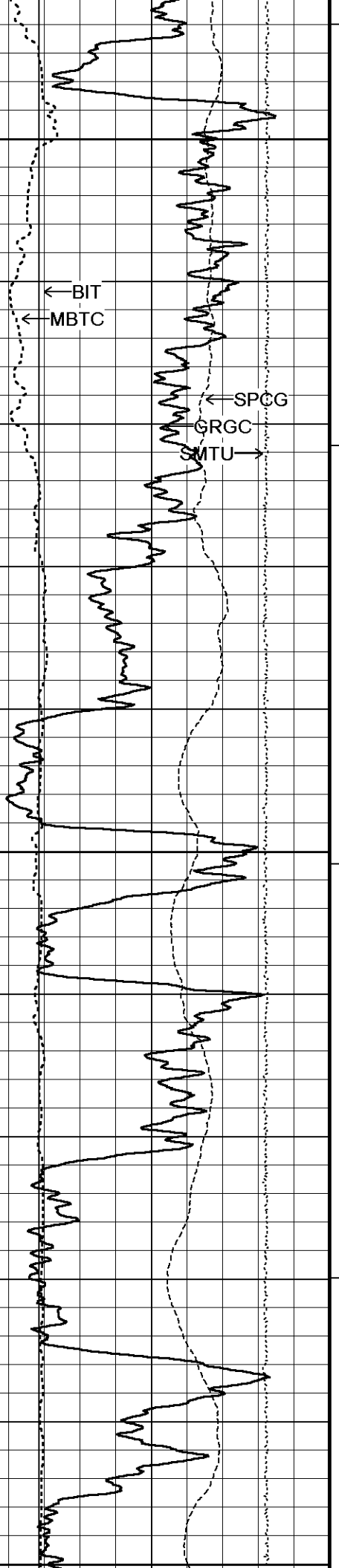
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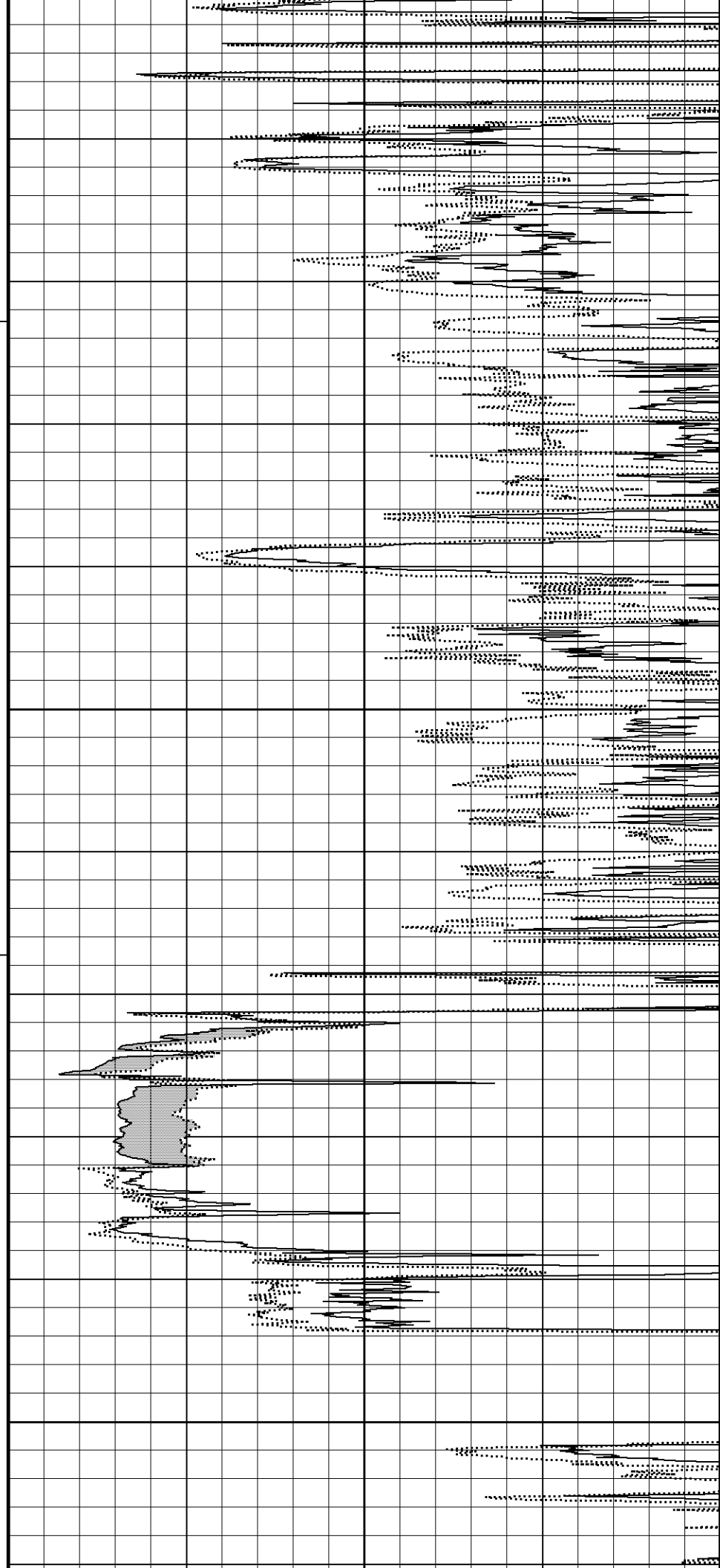
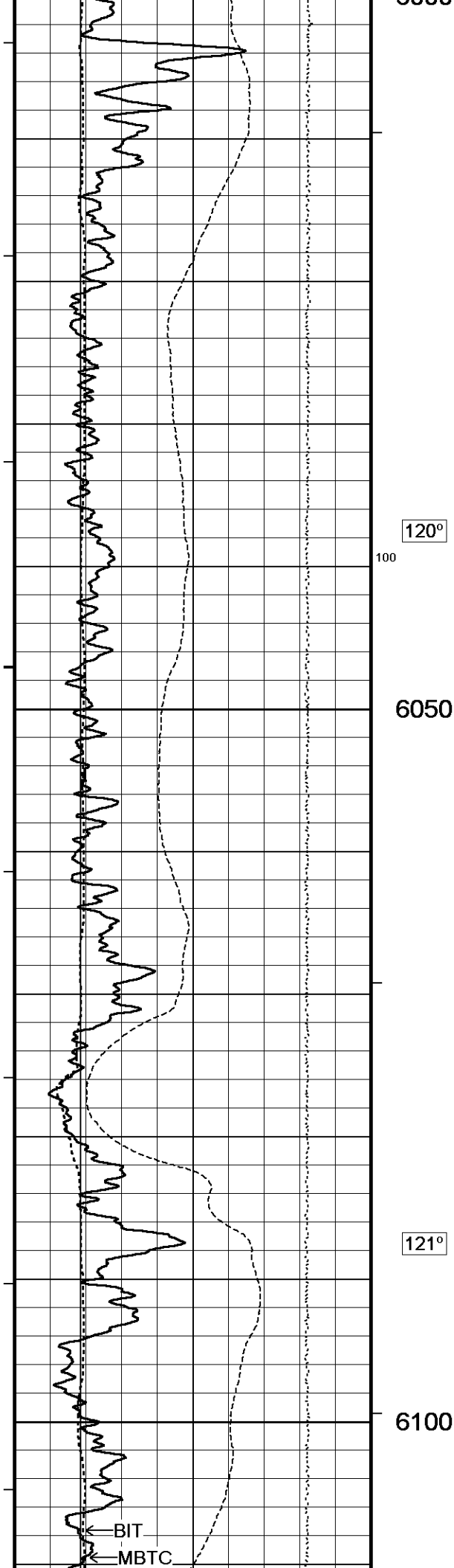
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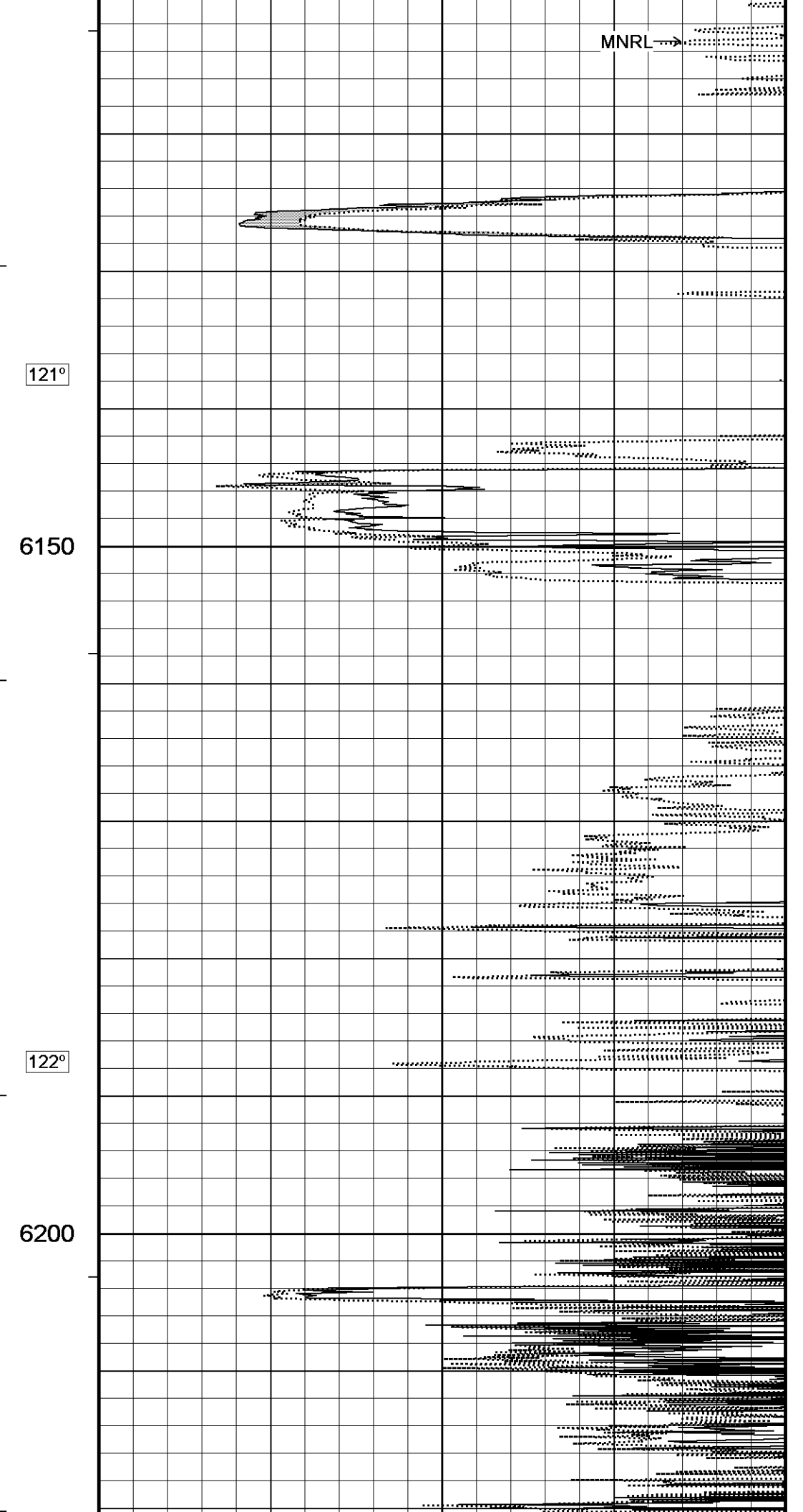
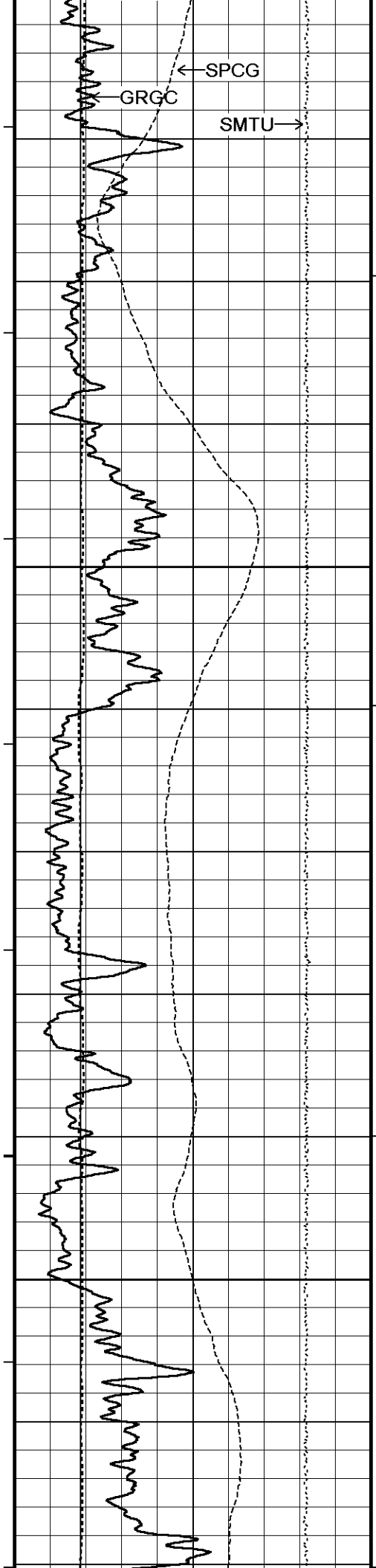
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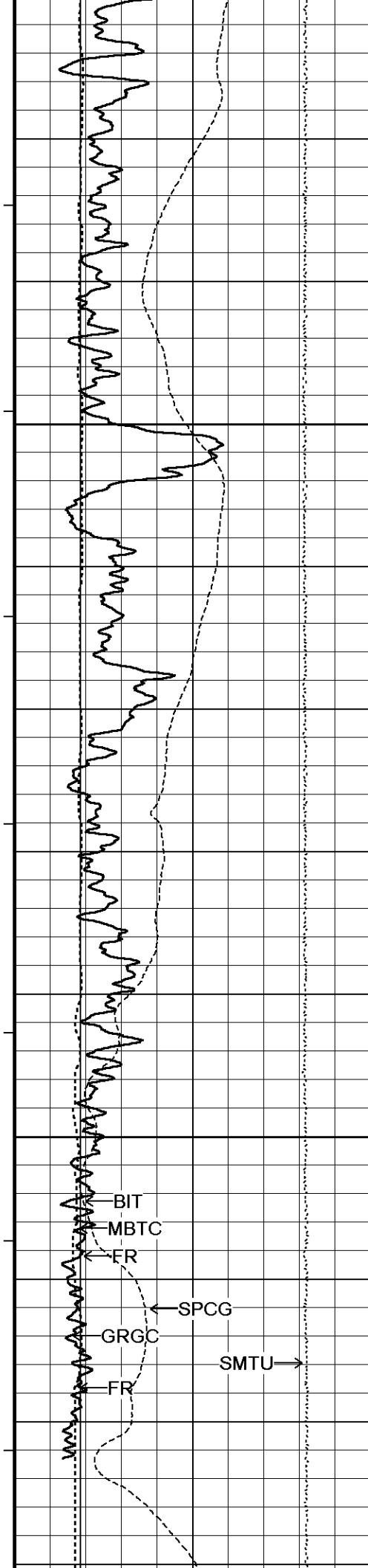
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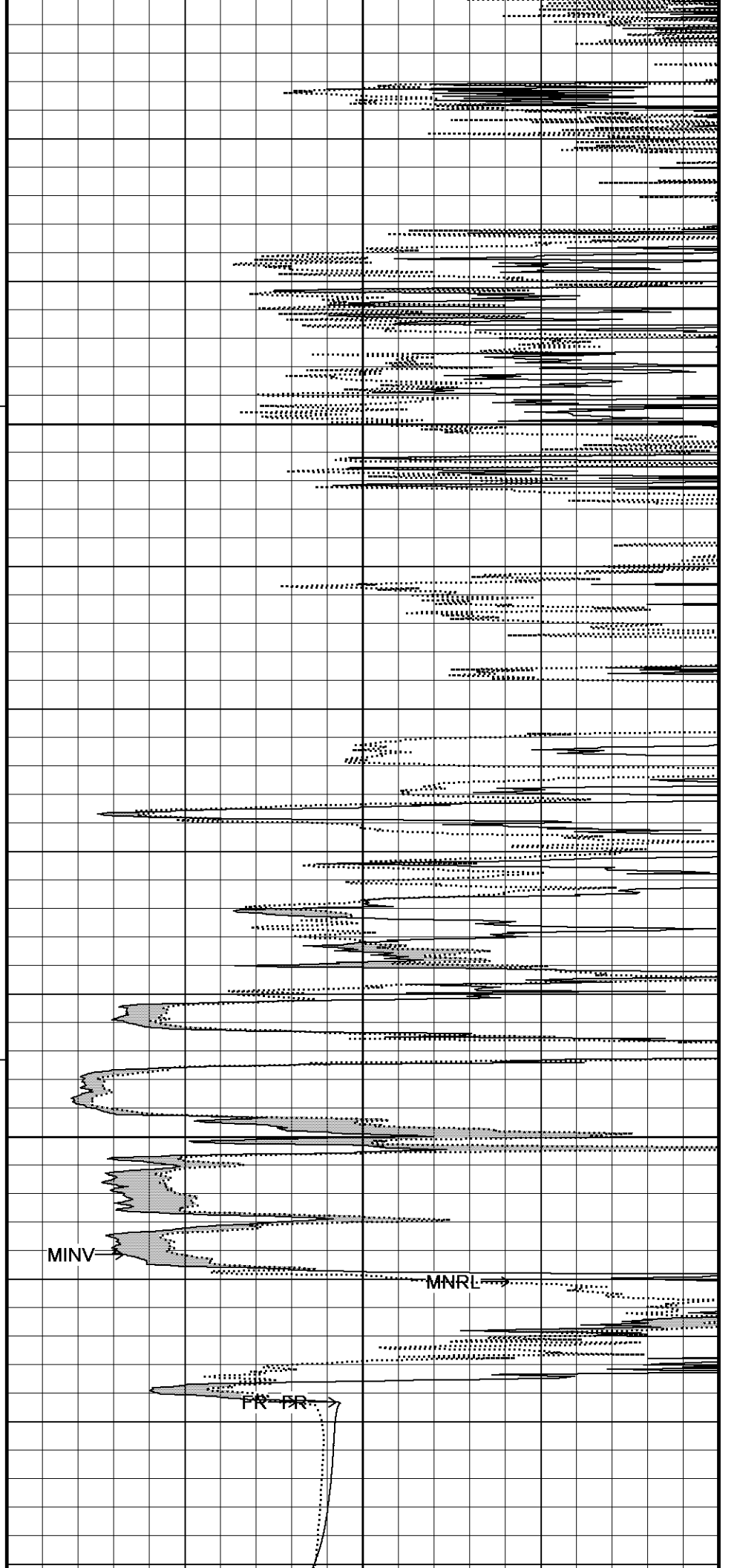


122°

6250

123°

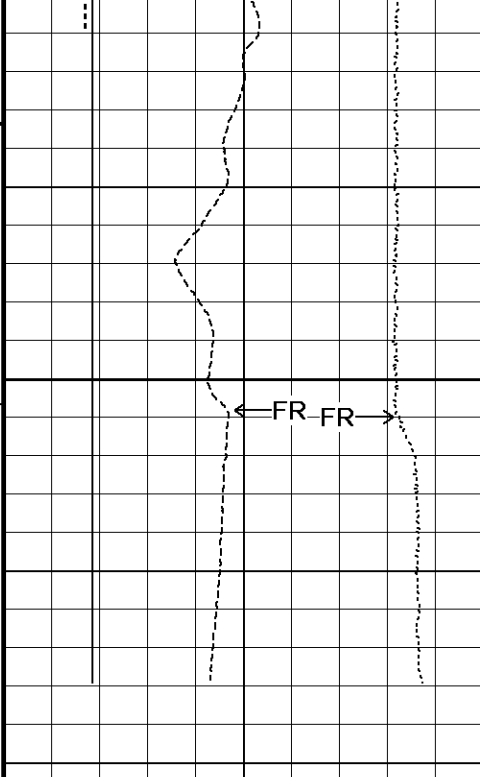
6300



MINV

MNRL

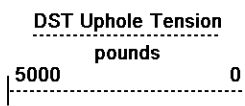
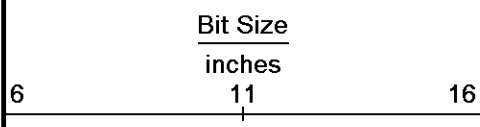
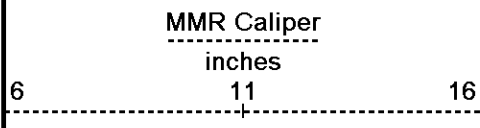
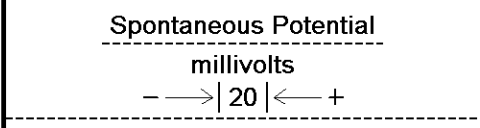
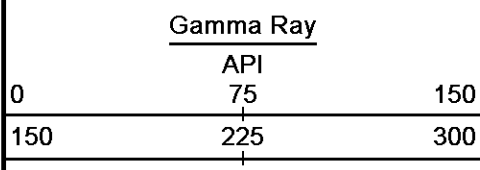
FR FR



6350
ID

Depth
in
Feet

← Timing Marks
every 60.0 sec

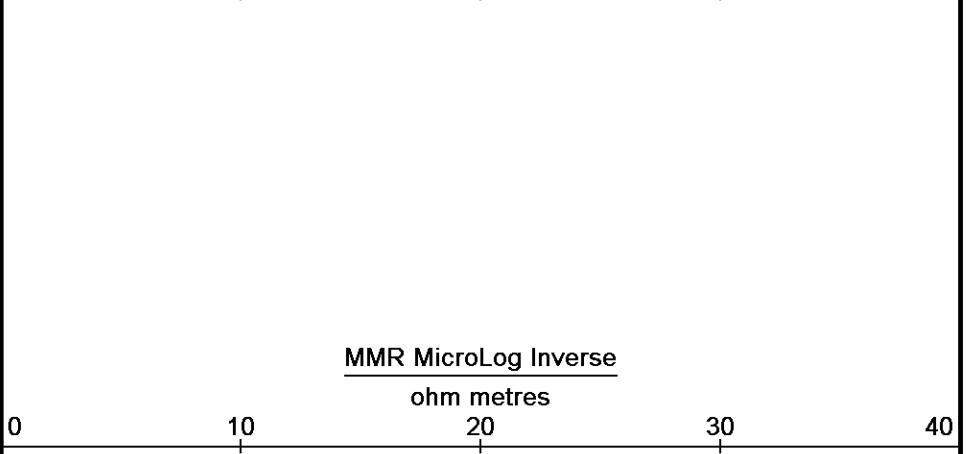
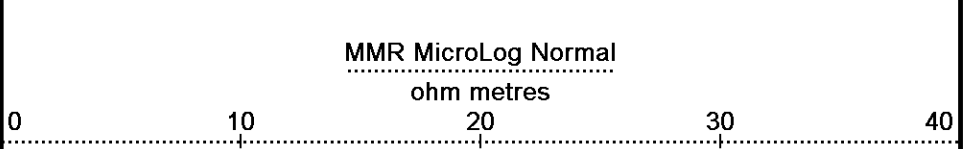
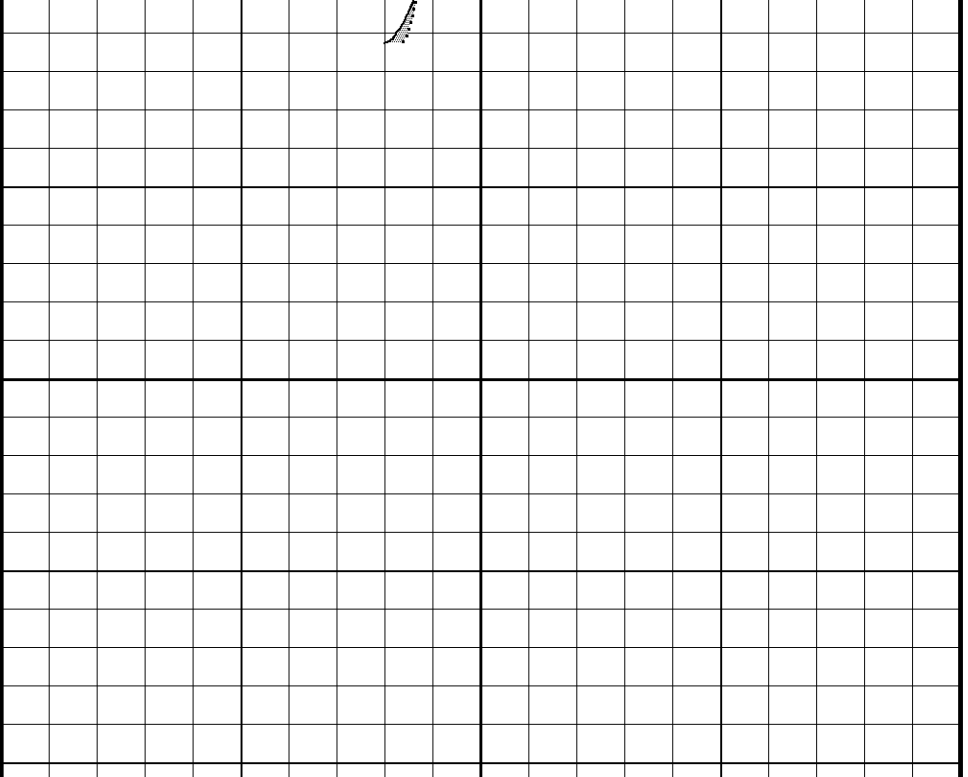


Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay
Scale
1:120



BEFORE SURVEY CALIBRATION

C:\Minimus 15.03.5939\Logs\O'Brien Keystone #2-4\O'Brien Keystone #2-4_002.dta

General Constants All 000			Last Edited on 11-NOV-2016,00:03
General Parameters			
Mud Resistivity	1.180	ohm-metres	
Mud Resistivity Temperature	75.000	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	None		
Rwa Parameters			
Porosity used	Limestone Density Por.		
Resistivity used	Array Ind. One Res Rt		
RWA Constant A	0.610		
RWA Constant M	2.150		
SW/APOR Tool Source	0.000		

Down-hole Tension Calibration SMS 0		Field Calibration on 24-JUL-2016 15:20	
Reading No	Measured	Calibrated (lbs)	
1	15235.81	0.00	
2	16026.61	481.00	

Gamma Calibration MCG-C 123		Field Calibration on 08-NOV-2016 22:41	
	Measured	Calibrated (API)	
Background	73	51	
Calibrator (Gross)	728	507	
Calibrator (Net)	656	456	

Gamma Calibration Tolerances MCG-C 123			
Ratio	1.438	1.40 1.475 1.55	Counts/API

Gamma Constants MCG-C 123		Last Edited on 10-NOV-2016,22:37	
Gamma Calibrator Number	MCGGRCC141		
GRC-M Calibrator Jig in Use?	NO		
Inactive Background Jig in Use?	NO		
Mud Density	1.13	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Potassium Equivalence	Chloride		
K Mud Concentration	0.00	%	

High Resolution Temperature Calibration MCG-C 123		Field Calibration on 31-OCT-2015,17:05	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MCG-C 123		Last Edited on 22-SEP-2015,11:43	
Pre-filter Length	11		

SP Calibration MCG-C 123		Field Calibration on 14-JUL-2016 12:06	
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Measured

Calibrated (mV)

Reference 1

101.2

100.6

Reference 2

-99.1

-99.9

Micro Normal and Micro Inverse Calibration MMR-C.A 247

Base Calibration on 28-AUG-2016 19:13

Field Check on 08-NOV-2016 22:26

Base Calibration

Channel	Measured		Calibrated (ohm-m)	
	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	10.2	49.9	5.1	25.6
Micro Inverse	10.0	49.5	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.6	93.6
Micro Inverse	62.2	62.2

Micro Normal & Micro Inverse Calibration Tolerance MMR-C.A 247

Micro Normal Res. 1	10.2		ohm	Micro Normal Res. 2	49.9		ohm
Micro Inverse Res. 1	10.0		ohm	Micro Inverse Res. 2	49.5		ohm
Micro Normal Base Check	93.6		ohm-m				
Micro Inverse Base Check	62.2		ohm-m				
Micro Normal Field Check	93.6		ohm-m				
Micro Inverse Field Check	62.2		ohm-m				

Micro Normal and Micro Inverse Constants MMR-C.A 247

Last Edited on 26-JUN-2016,15:44

Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159		
Micro Normal K Factor	0.5110		
Micro Inverse K Factor	0.3380		
Standoff Offset	0.0000	inches	

Caliper Calibration MMR-C.A 247

Base Calibration on 28-AUG-2016 19:08

Field Calibration on 08-NOV-2016 22:25

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14869	5.98
2	18207	7.97
3	21411	9.86
4	25389	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
8.04	7.97

Caliper Calibration Tolerances MMR-C.A 247

Short Arm Field Cal.	8.04		in
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Micro-Resistivity Caliper Constants MMR-C.A 247

Last Edited on

Sonde Configuration	Resistivity Mode
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Neutron Calibration MDN-A.B 66

Base Calibration on 22-MAY-2016,18:15

Field Check on 08-NOV-2016 22:46

Base Calibration

Ratio	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	3116	97	3714	110
	32.277		33.764	

Field Calibrator at Base

Ratio	Calibrated (cps)	
	2061	3028
	0.681	

Field Check		Calibrated (cps)	
		2161	3088
Ratio		0.700	

Neutron Calibration Tolerances MDN-A.B 66			
Ratio	32.277		
Base Check	0.681		
Field Check	0.700		

Neutron Constants MDN-A.B 66		Last Edited on 10-NOV-2016,22:36	
Neutron Source Id	P0204NN		
Neutron Jig Number	NJ5736		
Air Hole Processing	Legacy		
Caliper Source for Processing	Density Caliper		
Stand-off	0.00	inches	
Mud Density	1.00	gm/cc	
Limestone Sigma	7.10	cu	
Sandstone Sigma	4.26	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	Constant Value		
Temperature	68.00	degrees F	
Mud Salinity	0.00	kppm	
Salinity Correction	Not Applied		
Formation Fluid Salinity Source	None		
Formation Fluid Salinity	N/A	kppm	
Barite Mud Correction	Not Applied		

FE Calibration MFE-B.J 352		Base Calibration on 28-AUG-2016 18:58 Field Check on 08-NOV-2016 22:14	
Base Calibration			
	Measured	Calibrated (ohm-m)	
Reference 1	0.0	0.0	
Reference 2	963.3	126.8	
Base Check		281.3	
Field Check		281.6	

FE Calibration Tolerances MFE-B.J 352			
Reference 2	963.3		ohm
Base Check	281.3		ohm-m
Field Check	281.6		ohm-m

FE Constants MFE-B.J 352		Last Edited on 10-NOV-2016,22:36	
Running Mode	No Sleeve		
MFE K Factor	0.1268		
Borehole Correction Constants			
Sonde Position	0.5	inches	
Hole Size Source	Density Caliper		
Hole Size Constant Value	N/A	inches	
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		

Induction Calibration MAI-A.A 111		Base Calibration on 05-AUG-2014,09:34 Field Check on 08-NOV-2016 22:13	
Base Calibration			
Test Loop Calibration			
Channel	Measured	Calibrated (mmho/m)	
	Low	High	Low
1	17.6	473.6	9.3
			966.2

2	6.4	385.9	7.6	821.4
3	3.2	264.0	5.2	566.0
4	2.1	135.5	2.6	279.2

Array Temperature 23.0 Deg F

Test Loop Calibration Verified 22-MAY-2016,17:59

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1	12.1	3873.0	10.7	3868.1
2	29.8	3528.1	28.6	3523.9
3	29.1	3021.3	28.1	3017.8
4	19.1	2058.5	18.5	2056.2
Deep	17.7	1962.1	17.1	1959.8
Medium	43.1	3976.4	41.8	3971.7
Shallow	44.4	5232.7	42.6	5226.4
Array Temperature	65.8		62.1 Deg F	

Induction Calibration Tolerances MAI-A.A 111

Low Conductivity 1	17.6		mmho/m	High Conductivity 1	473.6		mmho/m
Low Conductivity 2	6.4		mmho/m	High Conductivity 2	385.9		mmho/m
Low Conductivity 3	3.2		mmho/m	High Conductivity 3	264.0		mmho/m
Low Conductivity 4	2.1		mmho/m	High Conductivity 4	135.5		mmho/m
Background Vx 1	0.0		mmho/m	Phase Check Loop 1	0.0		%
Background Vx 2	0.0		mmho/m	Phase Check Loop 2	0.0		%
Background Vx 3	0.0		mmho/m	Phase Check Loop 3	0.0		%
Background Vx 4	0.0		mmho/m	Phase Check Loop 4	0.0		%

Induction Constants MAI-A.A 111

Last Edited on 10-NOV-2016,22:36

Induction Model RtAP-WBM

Borehole Correction Constants

Tool Centred	No	
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Stand-off Type	Fins	
Stand-off	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	45.00	degrees
Stand-off Fin Width	0.5000	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	

Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Symmetrised Receiver Gains

Receiver 1	1.00
Receiver 2	1.00
Receiver 3	1.00
Receiver 4	1.00

Receiver 3	1.00	
Receiver 4	1.00	
Apparent Porosity and Water Saturation Constants		
Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

High Resolution Temperature Calibration MAI-A.A 111

Field Calibration on 24-NOV-2014,10:23

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MAI-A.A 111

Last Edited on 26-JUN-2014,15:06

Pre-filter Length	11
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Photo Density Calibration MPD-B 104

Base Calibration on 28-AUG-2016 20:24

Field Check on 08-NOV-2016 22:23

Density Calibration		Measured		Calibrated (sdu)	
Base Calibration		Near	Far	Near	Far
Background		1145	1339		
Reference 1		49665	24007	59556	30836
Reference 2		20032	2442	24941	2541

Field Check at Base

1144.9 1338.6

Field Check

1139.6 1323.0

PE Calibration

Base Calibration		Measured		Calibrated
	WS	WH	Ratio	Ratio
Background	211	1021		
Reference 1	20773	49486	0.424	0.371
Reference 2	5807	19899	0.296	0.272

Field Check at Base

211.3 1021.2

Field Check

207.9 1017.4

Photo Density Calibration Tolerances MPD-B 104

Near Density Ratio	2.57	
PE Calibration	0.119	

Far Density Ratio	20.54	
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Near Den. Field Check	1139.6	
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Far Den. Field Check	1323.0	
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PE WS Field Check	207.9	
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PE WH Field Check	1017.4	
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Density Constants MPD-B 104

Last Edited on 10-NOV-2016,22:36

Density Source Id	P50557B	
Nylon Calibrator Number	DNCE695	
Aluminium Calibrator Number	DACD698	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.13	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc

Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
Matrix Density (gm/cc)	Depth (ft)	
2.71	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	

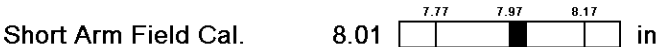
Caliper Calibration MPD-B 104

Base Calibration on 28-AUG-2016 19:51
Field Calibration on 08-NOV-2016 22:17

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	13646	3.99
2	22688	5.98
3	31297	7.97
4	39521	9.86
5	48608	11.92
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	8.01	7.97

Caliper Calibration Tolerances MPD-B 104



DOWNHOLE EQUIPMENT

C:\Minimus 15.03.5939\Logs\O'Brien Keystone #2-4\O'Brien Keystone #2-4_002.dta

Cablehead, 11 pin
CBH-CA 176 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Comms Gamma
MCG-C 123 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

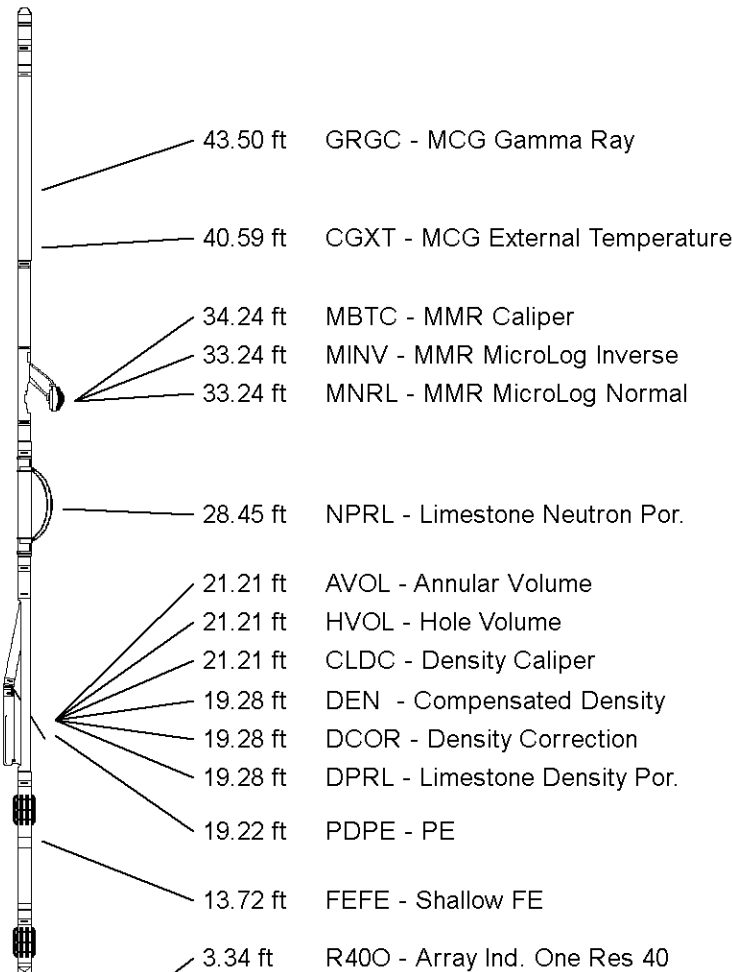
Compact Micro-Resistivity
MMR-C.A 247 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

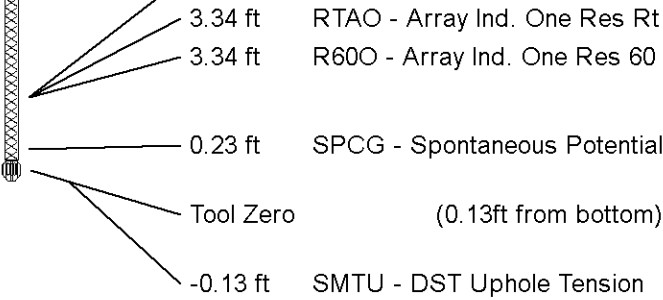
Compact Density/Caliper
MPD-B 104 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in



Total Length: 51.18 ft Weight: 407.9 lb



All measurements relative to tool zero.

COMPANY	O'BRIEN ENERGY RESOURCES CORP.
WELL	KEYSTONE #2-4
FIELD	ANGELL SE
PROVINCE/COUNTY	MEADE
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2597.00	feet	First Reading	6319.00	feet
Elevation Drill Floor	2595.00	feet	Depth Driller	6350.00	feet
Elevation Ground Level	2585.00	feet	Depth Logger	6352.00	feet



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