MICRORESISTIVITY LOG

COMPANY	O'BRIEN RESOURCES, LLC.
WELL	MSJ-PENNER 28 #3
FIELD	WILDCAT
PROVINCE/COUNTY	GOVE
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	1382' FNL & 2362' FWL

SEC 28	TWP 14S	RGE 30W	Other Services
Latitude			MAI/MFE MPD/MDN
Longitude			
API Number	15-063-22212		

Permanent Datum GL, Elevation 2798 feet
Log Measured From KB
Drilling Measured From KB @ 13 feet

Elevations:	feet
KB	2811.00
DF	2809.00
GL	2798.00

Date	19-NOV-2014						
Run Number	ONE						
Service Order	7577-103540900						
Depth Driller	4650.00	feet					
Depth Logger	4650.00	feet					
First Reading	4617.00	feet					
Last Reading	3700.00	feet					
Casing Driller	286.00	feet					
Casing Logger	288.00	feet					
Bit Size	7.875	inches					
Hole Fluid Type	CHEMICAL						
Density / Viscosity	9.20	lb/USg	47.00	CP			
PH / Fluid Loss	9.50		9.20	ml/30Min			
Sample Source	MUD PIT						
Rm @ Measured Temp	1.73 @ 75.0	ohm-m					
Rmf @ Measured Temp	1.38 @ 75.0	ohm-m					
Rmc @ Measured Temp	2.08 @ 75.0	ohm-m					
Source Rmf / Rmc	CALC		CALC				
Rm @ BHT	1.17 @113.0	ohm-m					
Time Since Circulation	4 HOURS						
Max Recorded Temp	113.00	deg F					
Equipment / Base	13244		LIB				
Recorded By	JEFFREY RANDLE						
Witnessed By	KURT TALBOTT						
JOB #	LB14-360						

BOREHOLE RECORD

Last Edited: 19-NOV-2014 01:28

Bit Size inches	Depth From feet	Depth To feet
7.875	286.00	4650.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	286.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 14.03.5114.
- 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: 1663 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 3700 FEET: 167 CU.FT.
- RIG: MAVERICK DRILLING #108

- RIG: MAVERICK DRILLING #100.

- ENGINEER: J. RANDLE.

- OPERATOR: J. LaPOINT, S. LARES.

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 19-NOV-2014 06:33

Filename: C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-P...\O'Brien (LA) MSJ-Penner 28 #3 Main.dta — Recorded on 19-NOV-2014 03:27

System Versions: Logged with 14.03.5114 Plotted with 14.03.5114

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
– → | 20 | ← +

MMR Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

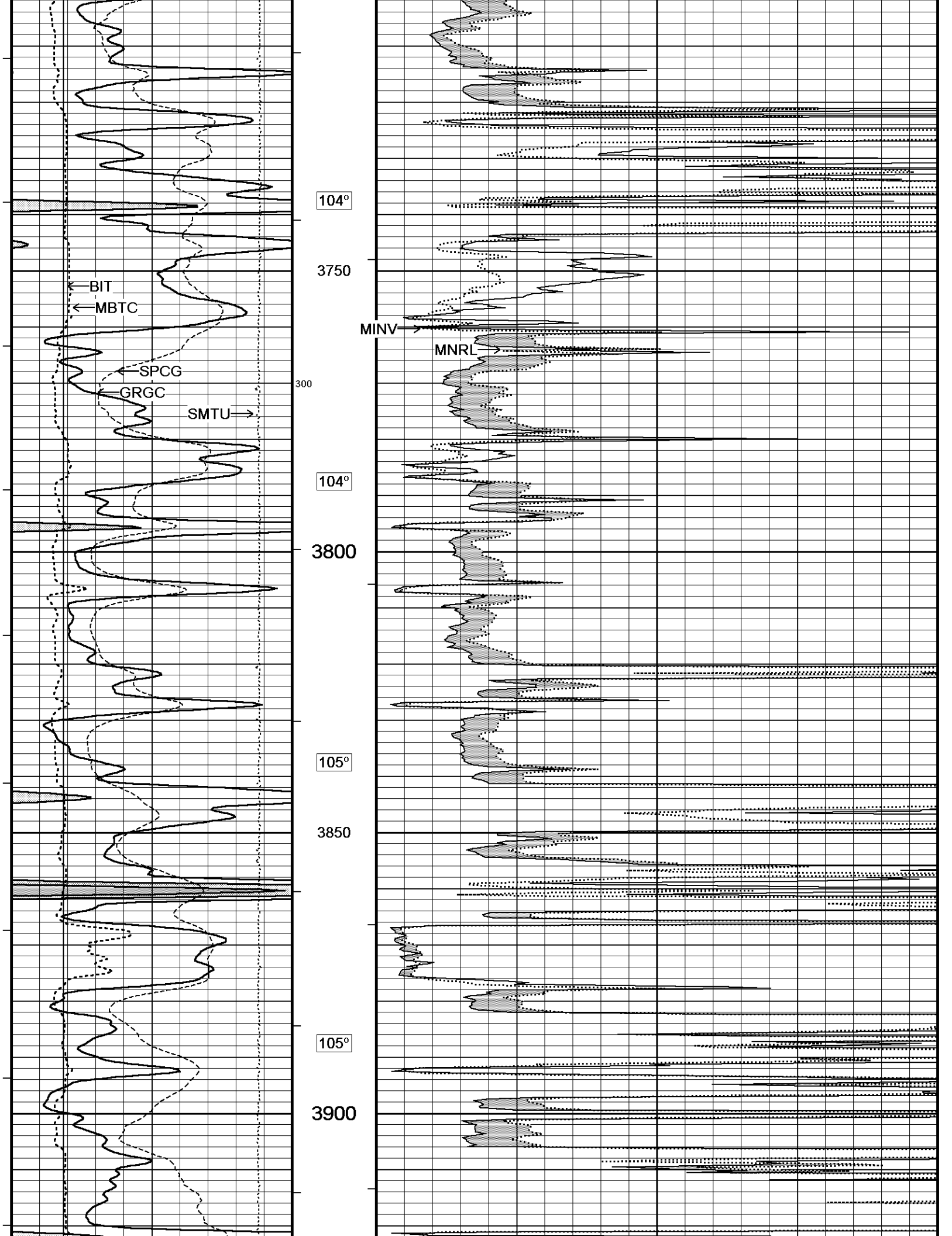
Replay Scale 1:240

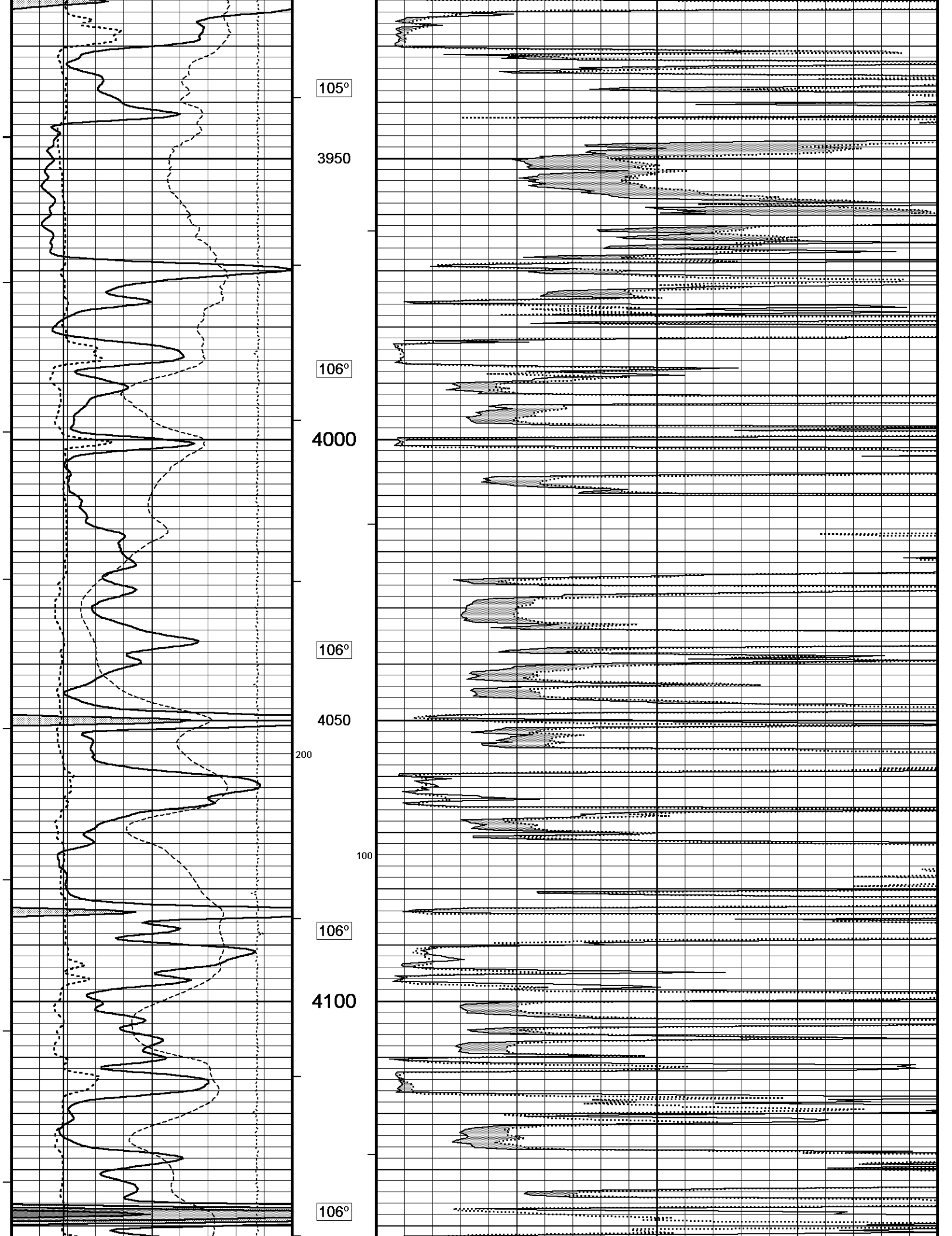
3688

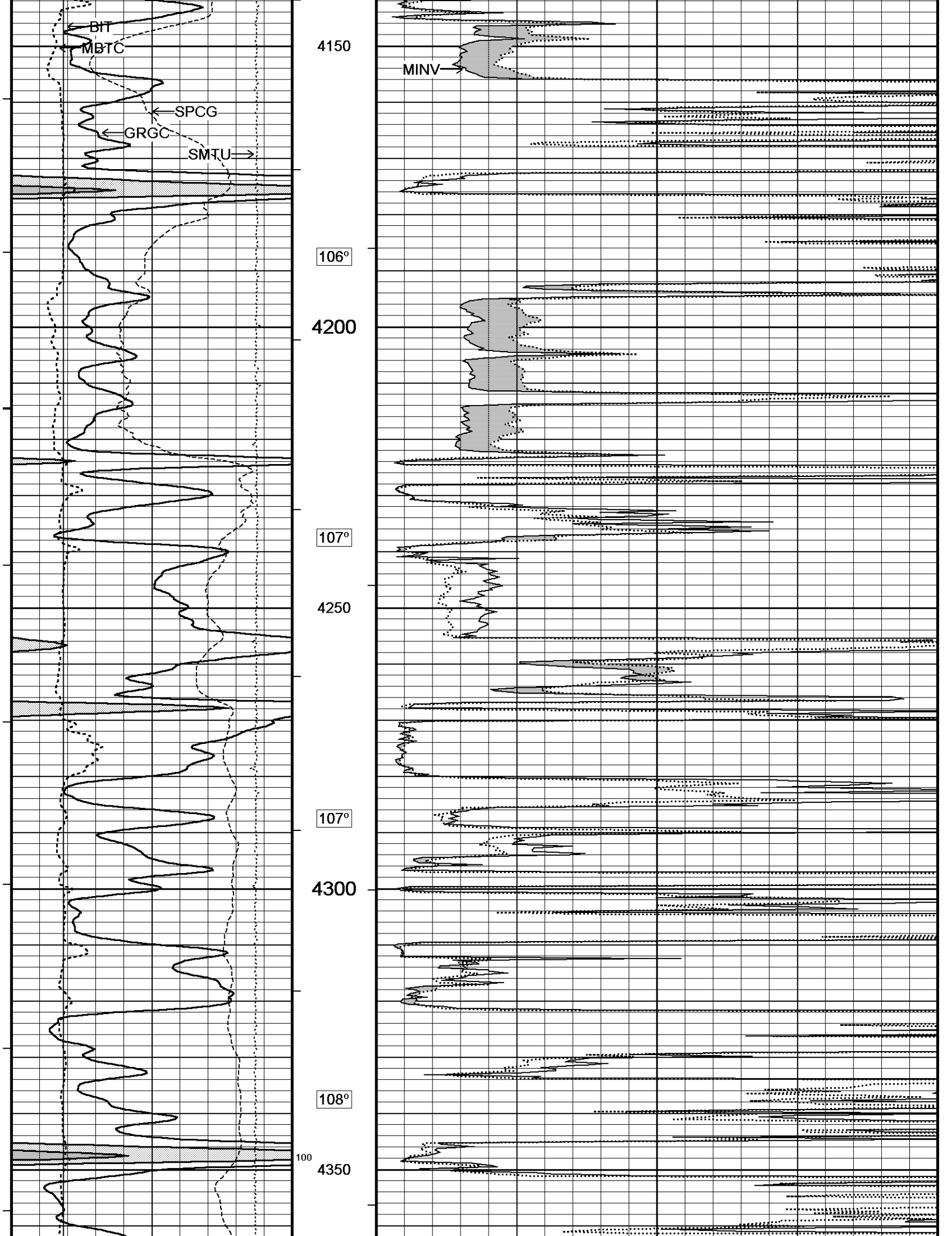
3700

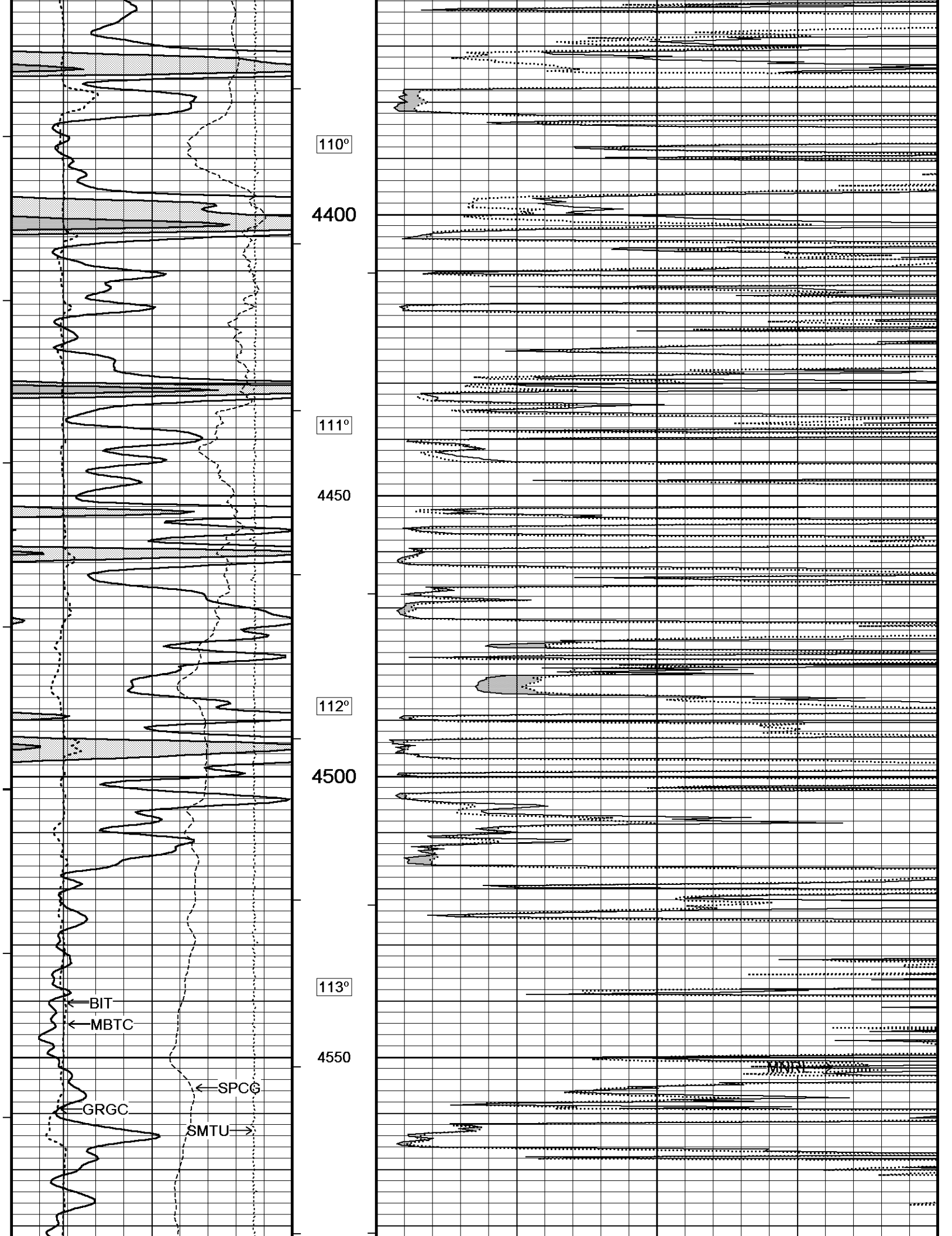
MMR MicroLog Normal
ohm metres
0 10 20 30 40

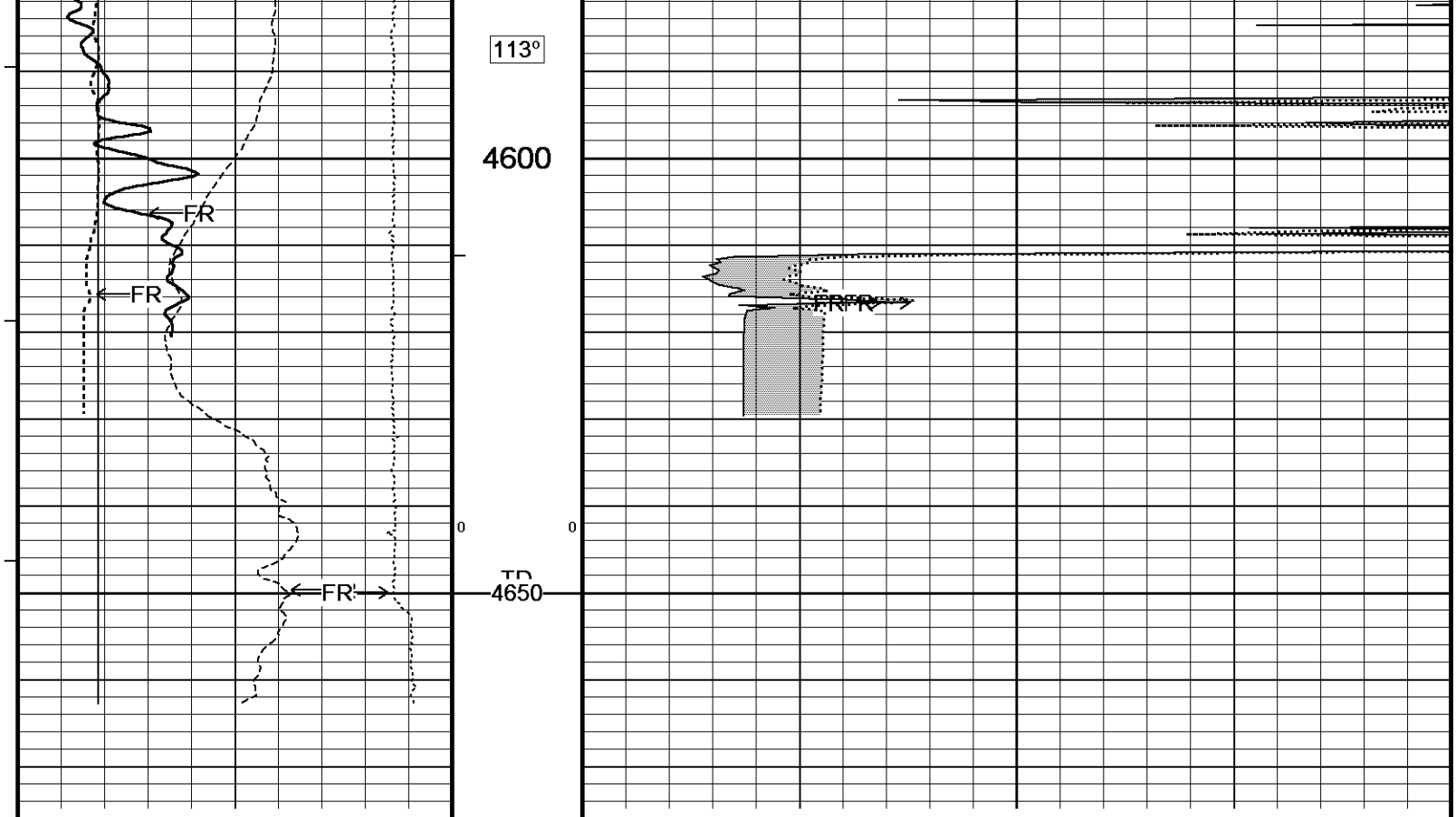
MMR MicroLog Inverse
ohm metres
0 10 20 30 40


BIT
MBTC
SPCG
GRGC
SMTU
MINV
MNRL
104°
3750
300
104°
3800
105°
3850
105°
3900


105°
3950
106°
4000
106°
4050
200
100
106°
4100
106°


BIT
MBTC
SPCG
GRGC
SMTU
MINV
4150
106°
4200
107°
4250
107°
4300
108°
100
4350


110°
4400
111°
4450
112°
4500
113°
4550
BIT
MBTC
SPCG
GRGC
SMTU
MNRL



Depth in Feet

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− | 20 | +

MMR Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

MMR MicroLog Normal
ohm metres
0 10 20 30 40

MMR MicroLog Inverse
ohm metres
0 10 20 30 40

Depth Based Data - Maximum Sampling Increment 10.0cm

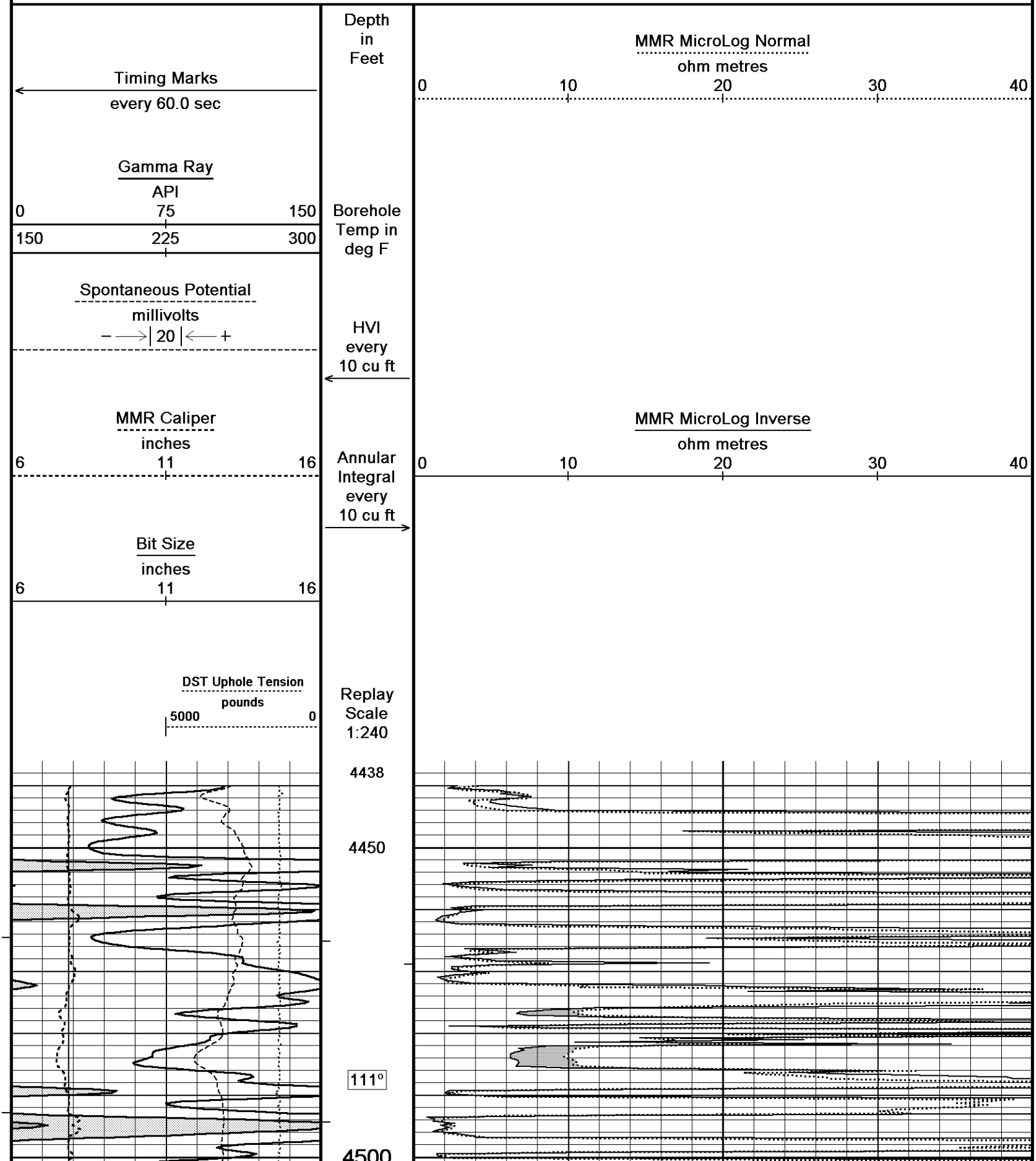
Plotted on 19-NOV-2014 06:33

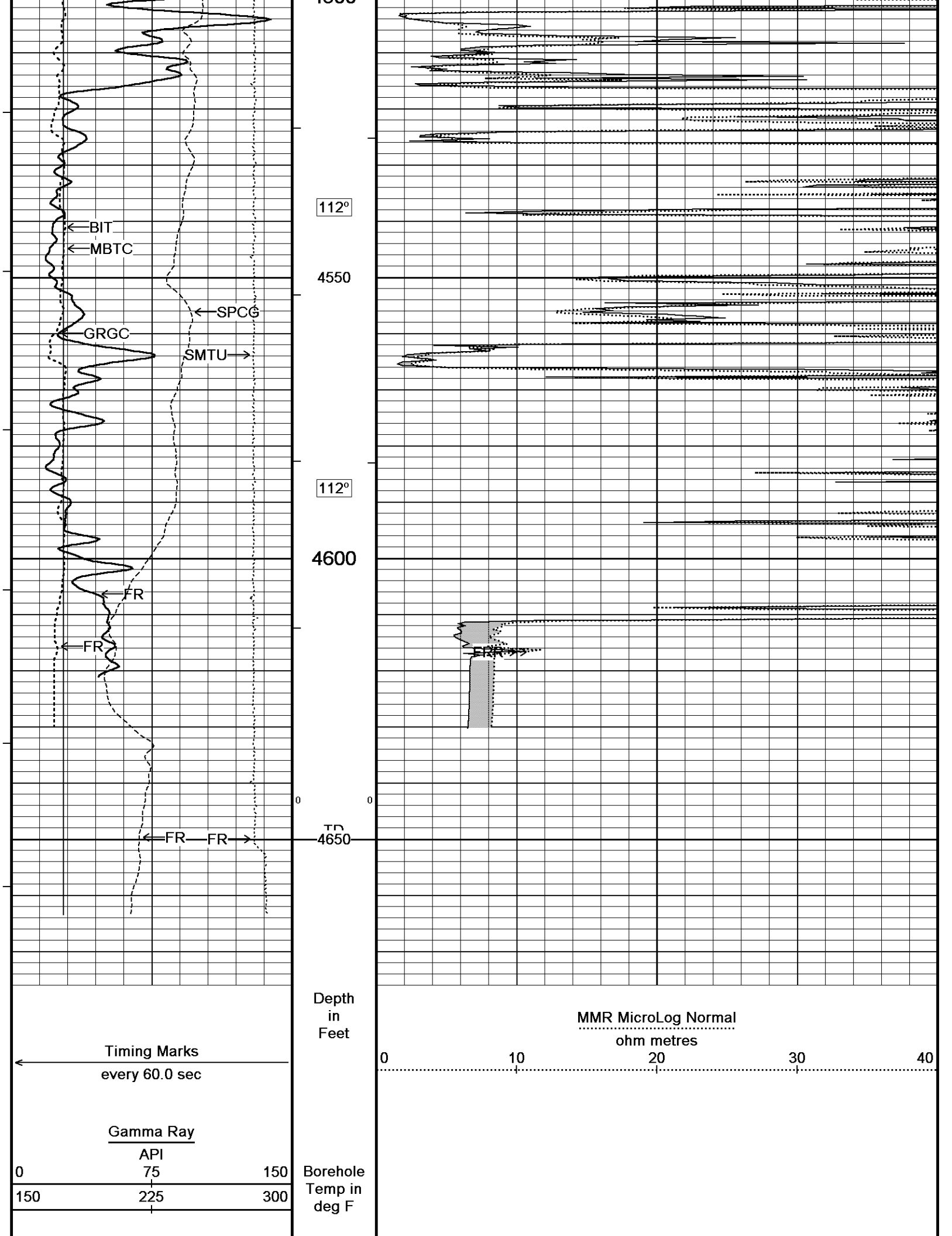
Filename: C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-P...\O'Brien (LA) MSJ-Penner 28 #3 Main.dta Recorded on 19-NOV-2014 03:27
System Versions: Logged with 14.03.5114 Plotted with 14.03.5114

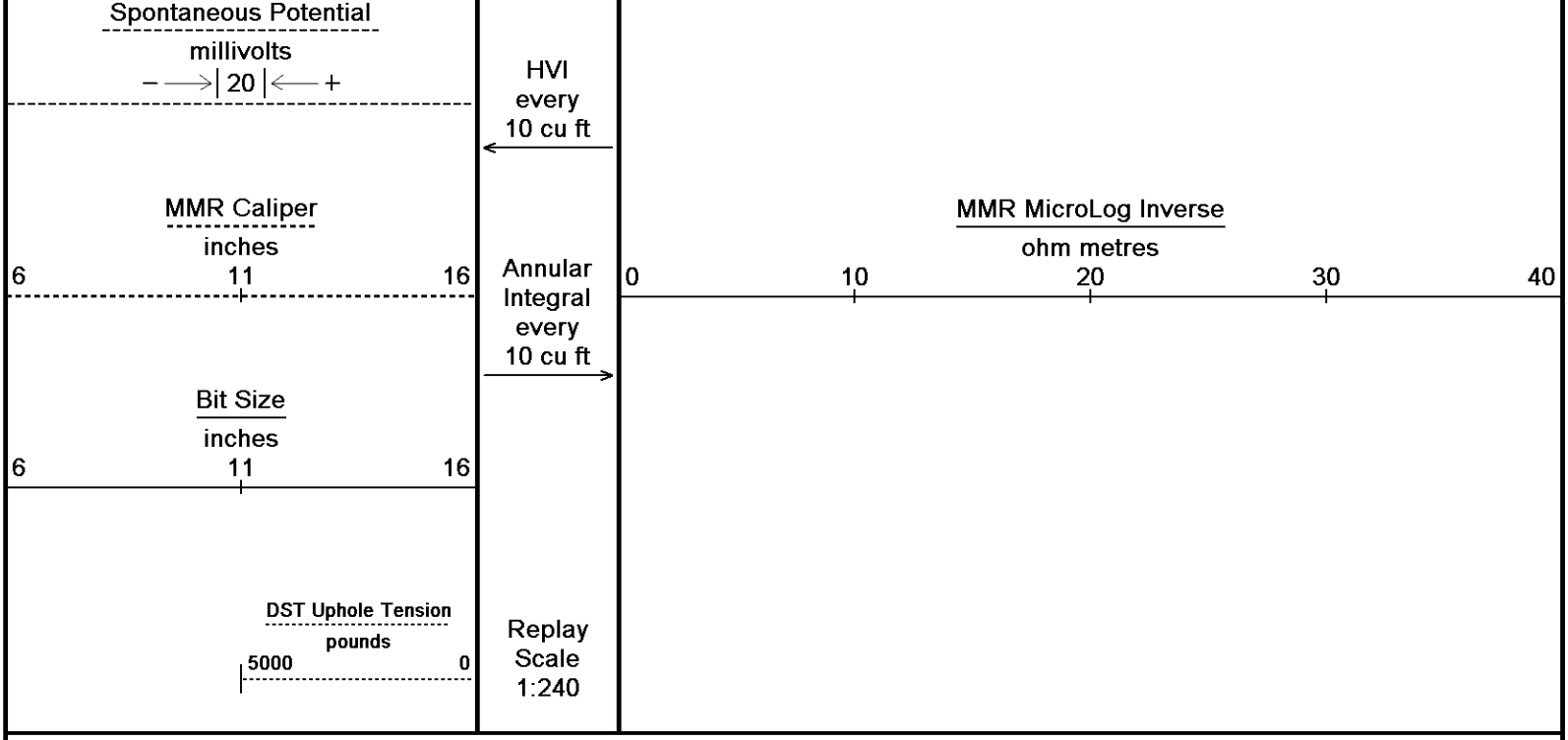
5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 19-NOV-2014 06:33
Filename: C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-...\O'Brien (LA) MSJ-Penner 28 #3 Repeat.dta Recorded on 19-NOV-2014 03:06
System Versions: Logged with 14.03.5114 Plotted with 14.03.5114




BIT
MBTC
SPCG
GRGC
SMTU
FR
FR
FR
FR
112°
4550
112°
4600
4650
TD
Depth
in
Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Borehole
Temp in
deg F
MMR MicroLog Normal
ohm metres
0
10
20
30
40



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 19-NOV-2014 06:33

Filename: C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-...\O'Brien (LA) MSJ-Penner 28 #3 Repeat.dta — Recorded on 19-NOV-2014 03:06

System Versions: Logged with 14.03.5114 Plotted with 14.03.5114

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-Penner 28 #3\O'Brien (LA) MSJ-Penner 28 #3 Repeat.dta

General Constants All 000

Last Edited on 19-NOV-2014,01:48

General Parameters		
Mud Resistivity	1.730	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	5.500	inches
Caliper for Differential Caliper	None	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Four 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 19-NOV-2014 02:09

Reading No	Measured	Calibrated (lbs)
1	15332.97	0.00
2	15825.43	407.90

Gamma Calibration MCG-C 208

Field Calibration on 18-NOV-2014 15:49

	Measured	Calibrated (API)
Background	67	48
Calibrator (Gross)	1084	773
Calibrator (Net)	1017	725

Gamma Calibration Tolerances MCG-C 208

Ratio	1.402	1.40 1.475 1.55	Counts/API

Gamma Constants MCG-C 208

Last Edited on 19-NOV-2014,01:47

Gamma Calibrator Number	GRC038	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
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	%

SP Calibration MCG-C 208

Field Calibration on 18-NOV-2014 15:38

	Measured	Calibrated (mV)
Reference 1	100.2	99.1
Reference 2	-98.0	-99.3

High Resolution Temperature Calibration MCG-C 208

Field Calibration on 23-SEP-2014,19:44

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

High Resolution Temperature Constants MCG-C 208

Last Edited on 23-SEP-2014,19:44

Pre-filter Length	11

Caliper Calibration MMR-C.A 248

Base Calibration on 23-OCT-2014 09:52
Field Calibration on 18-NOV-2014 15:35

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13737	5.96
2	17108	7.98
3	20397	9.85
4	24360	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 248

Short Arm Field Cal.	8.04	7.77 7.97 8.17	in

Micro Normal and Micro Inverse Calibration MMR-C.A 248

Base Calibration on 23-OCT-2014 10:02
Field Check on 18-NOV-2014 15:36

Base Calibration

Channel	Measured Resistor 1	Measured Resistor 2	Calibrated (ohm-m) Resistor 1	Calibrated (ohm-m) Resistor 2
Micro Normal	10.2	49.9	5.1	25.6
Micro Inverse	9.9	49.5	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.5	93.5
Micro Inverse	62.2	62.2

Micro Normal & Micro Inverse Calibration Tolerance MMR-C.A 248

Micro Normal Res. 1	10.2	-5% 10.0 +5%	ohm	Micro Normal Res. 2	49.9	-5% 50.0 +5% ohm
Micro Inverse Res. 1	9.9	-5% 10.0 +5%	ohm	Micro Inverse Res. 2	49.5	-5% 50.0 +5% ohm
Micro Normal Base Check	93.5	-2% 93.16 +2%	ohm-m			
Micro Inverse Base Check	62.2	-2% 62.11 +2%	ohm-m			
Micro Normal Field Check	93.5	-2% 93.5 +2%	ohm-m			

Micro Inverse Field Check 62.2 (-2% 62.2 +2%) ohm-m

Micro Normal and Micro Inverse Constants MMR-C.A 248

Last Edited on 19-SEP-2014,16:14

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

Micro-Resistivity Caliper Constants MMR-C.A 248

Last Edited on

Sonde Configuration	Resistivity Mode

Micro Laterolog Calibration MMR-C.A 248

Base Calibration on 31-DEC-1999 00:00
Field Check on 31-DEC-1999 00:00

Base Calibration

Measured Ref 1	Measured Ref 2	Calibrated (ohm-m) Ref 1	Calibrated (ohm-m) Ref 2
0.0	0.0	0.0	0.0

Base Check (ohm-m)	Field Check (ohm-m)
0.0	0.0

Micro Laterolog Constants MMR-C.A 248

Last Edited on 23-SEP-2014,18:59

Pad Type	6 in Solid Nylon B23059	
Micro Laterolog K Factor	0.0128	
Standoff Offset	0.0000	inches

Mudcake Thickness Correction Constants

Mud Cake Source	Constant Value	
Mud Cake Thickness	0.4000	inches
Mud Cake Thickness Caliper	N/A	
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	68.00	Deg F
Mud Cake Resistivity Source	Constant Value	
Temp. Source Rmc Correc.	N/A	

Neutron Calibration MDN-A.B 163

Base Calibration on 22-OCT-2014 17:32
Field Check on 18-NOV-2014 15:53

Base Calibration

	Measured Near	Measured Far	Calibrated (cps) Near	Calibrated (cps) Far
	3042	93	3714	110
Ratio	32.627		33.764	

Field Calibrator at Base

	Calibrated (cps) Near	Calibrated (cps) Far
	1687	2482
Ratio	0.680	

Field Check

	Calibrated (cps) Near	Calibrated (cps) Far
	1672	2427
Ratio	0.689	

Neutron Calibration Tolerances MDN-A.B 163

Near Reading	3042 (-25% 3500 +25%)	cps	Far Reading	93 (-50% 106 +50%)	cps
Ratio	32.627 (-5% 33 +5%)				
Base Check	0.680 (0.65 0.7 0.75)				
Field Check	0.689 (0.660 0.680 0.700)				

Neutron Constants MDN-A.B 163

Last Edited on 19-NOV-2014,01:46

Neutron Source Id	P58125B	
Neutron Jig Number	5824NE	
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-A.A 55

Base Calibration on 23-OCT-2014 09:18
Field Check on 18-NOV-2014 15:28

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	950.6	126.8
Base Check		282.0
Field Check		281.8

FE Calibration Tolerances MFE-A.A 55

Reference 2	950.6	-3% 980.0 +3%	ohm
Base Check	282.0	-2% 277.0 +2%	ohm-m
Field Check	281.8	-2% 282.0 +2%	ohm-m

FE Constants MFE-A.A 55

Last Edited on 19-NOV-2014,01:46

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

Induction Calibration MAI-A.A 5

Base Calibration on 22-OCT-2014,13:28
Field Check on 18-NOV-2014 15:27

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) High
1	16.3	470.8	9.3	966.2
2	5.6	376.1	7.6	821.4
3	2.6	266.1	5.2	566.0
4	1.6	130.0	2.6	279.2
Array Temperature		71.1	Deg F	

Test Loop Calibration Verified

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1			14.7	3862.6
2			31.6	3591.0
3			29.7	2971.9
4			20.8	2126.6
Deep			18.4	1912.8
Medium			42.9	3861.7
Shallow			47.0	5372.5
Array Temperature			66.1	Deg F

Induction Calibration Tolerances MAI-A.A 5

Low Conductivity 1	16.3	4.5 6.0 7.5	mmho/m	High Conductivity 1	470.8	345.0 385.0 425.0	mmho/m
Low Conductivity 2	5.6	1.0 3.5 6.0	mmho/m	High Conductivity 2	376.1	240.0 260.0 280.0	mmho/m
Low Conductivity 3	2.6	0.0 2.0 4.0	mmho/m	High Conductivity 3	266.1	120.0 135.0 150.0	mmho/m
Low Conductivity 4	1.6	-110.0 -32.5 45.0	mmho/m	High Conductivity 4	130.0	-2.0 0.0 2.0	mmho/m
Background Vx 1	0.0	-35.0 20.0 75.0	mmho/m	Phase Check Loop 1	0.0	-2.0 0.0 2.0	%
Background Vx 2	0.0	-60.0 2.5 65.0	mmho/m	Phase Check Loop 2	0.0	-2.0 0.0 2.0	%
Background Vx 3	0.0	-50.0 -17.5 15.0	mmho/m	Phase Check Loop 3	0.0	-2.0 0.0 2.0	%
Background Vx 4	0.0		mmho/m	Phase Check Loop 4	0.0	-2.0 0.0 2.0	%

Induction Constants MAI-A.A 5

Last Edited on 19-NOV-2014,01:46

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	N/A	inches
Tool Centred	No	
Stand-off Type	Fins	
Stand-off	0.00	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	45.00	degrees
Stand-off Fin Width	0.0000	inches
Borehole Corr. Rm Source	Temperature Corr	
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

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 5

Field Calibration on 01-NOV-2014,01:00

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

High Resolution Temperature Constants MAI-A.A 5

Last Edited on 01-NOV-2014,01:00

Pre-filter Length	11

Photo Density Calibration MPD-D.A 481

Base Calibration on 22-OCT-2014 15:53
Field Check on 18-NOV-2014 15:33

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Background	1210	1421		
Reference 1	55376	26233	59556	30836
Reference 2	22300	2596	24941	2541

Field Check at Base

Field Check at Base

	1210.3	1420.8

Field Check

	1209.8	1419.4

PE Calibration

Base Calibration

	WS	Measured WH	Ratio	Calibrated Ratio
Background	227	1078		
Reference 1	23980	55175	0.439	0.371
Reference 2	6780	22159	0.311	0.272

Field Check at Base

	226.9	1078.0

Field Check

	229.4	1079.9

Photo Density Calibration Tolerances MPD-D.A 481

Near Density Ratio	2.57	-5% 2.52 +5%	Far Density Ratio	21.11	-5% 21.00 +5%
PE Calibration	0.120	0.089 0.110 0.131			
Near Den. Field Check	1209.8	-3% 1210.3 +3%	Far Den. Field Check	1419.4	-3% 1420.8 +3%
PE WS Field Check	229.4	-6% 226.9 +6%	PE WH Field Check	1079.9	-6% 1078.0 +6%

Density Constants MPD-D.A 481

Last Edited on 19-NOV-2014,01:46

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	1.10	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
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	

Matrix density (gm/cc)	Depth (m)
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-D.A 481

Base Calibration on 22-OCT-2014 15:01
Field Calibration on 18-NOV-2014 15:29

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	17509	3.99
2	27597	5.98
3	37616	7.97
4	47437	9.86
5	58570	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.96	7.97

Caliper Calibration Tolerances MPD-D.A 481

7.77 7.97 8.17

Short Arm Field Cal.	7.96				in

DOWNHOLE EQUIPMENT

C:\Minimus 14.03.4558\Logs\O'Brien (LA) MSJ-Penner 28 #3\O'Brien (LA) MSJ-Penner 28 #3 Repeat.dta

CBH-C, Cablehead, 11 pin
CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Comms Gamma
MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-C.A 248 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

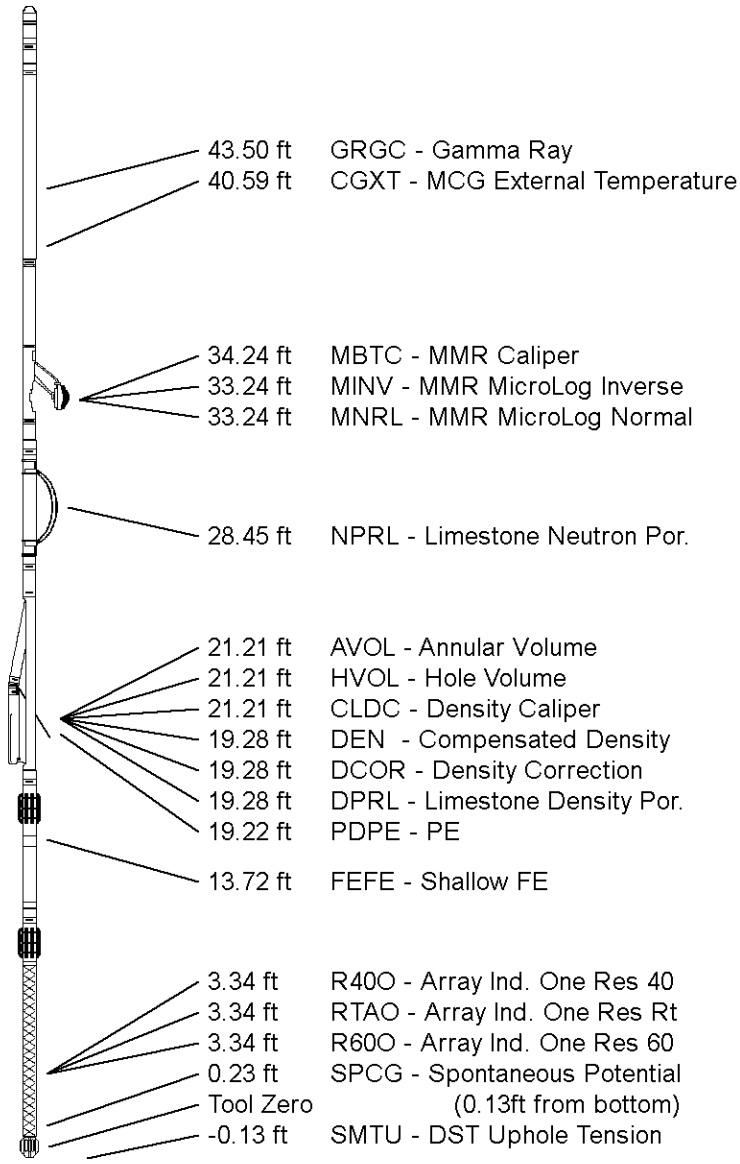
Compact Neutron
MDN-A.B 163 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-D.A 481 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-A.A 5 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 51.18 ft Weight: 407.9 lb



COMPANY	O'BRIEN RESOURCES, LLC.
WELL	MSJ-PENNER 28 #3
FIELD	WILDCAT
PROVINCE/COUNTY	GOVE
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2811.00	feet	First Reading	4617.00	feet
Elevation Drill Floor	2809.00	feet	Depth Driller	4650.00	feet
Elevation Ground Level	2798.00	feet	Depth Logger	4650.00	feet

Weatherford®

MICRORESISTIVITY LOG