Weatherford®

MICRORESISTIVITY LOG

COMPANY	SHAKESPEARE OIL COMPANY
WELL	RUDOLPH #1-22
FIELD	WILDCAT
PROVINCE/COUNTY	SCOTT
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	1450' FSL & 1350' FEL

SEC	TWP	RGE
22	17S	33W

API Number 15-171-20938
Permit Number

Other Services
MPD/MDN
MAI/MFE
MSS

Permanent Datum G.L., Elevation 3025 feet
Log Measured From KB
Drilling Measured From K.B. @ 10 FEET

Elevations:	feet
KB	3035.00
DF	3033.00
GL	3025.00

Date	16-APR-2013			
Run Number	ONE			
Service Order	3539888			
Depth Driller	4940.00	feet		
Depth Logger	4939.00	feet		
First Reading	4893.00	feet		
Last Reading	3700.00	feet		
Casing Driller	267.00	feet		
Casing Logger	264.00	inches		
Bit Size	7.875			
Hole Fluid Type	CHEMICAL	lb/USg		
Density / Viscosity	9.30 lb/USg	55.00 CP		
PH / Fluid Loss	10.50	10.50		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.62 @ 74.0	ohm-m		
Rmf @ Measured Temp	0.50 @ 74.0	ohm-m		
Rmc @ Measured Temp	0.74 @ 74.0	ohm-m		
Source Rmf / Rmc	CALC	CLAC		
Rm @ BHT	0.39 @119.0	ohm-m		
Time Since Circulation	3 HOURS			
Max Recorded Temp	119.00	deg F		
Equipment / Base	13057	LIB		
Recorded By	J. LAPOINT		W. STAMBAUGH	
Witnessed By	TIM PRIEST			
JOB#	LB13-104			

BOREHOLE RECORD

Last Edited: 16-APR-2013 15:06

Bit Size inches	Depth From feet	Depth To feet
7.875	264.00	4939.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	264.00	24.00

REMARKS

Tools Used: MCG, MML, MDN, MPD, MFE, MSS, MAI ran in combination.
Hardware: MPD: 8 inch profile plate used. MAI, MSS, MFE: 0.5 Inch standoffs used. MDN: Dual Bowspring used.
2.71 G/CC Limestone density matrix used to calculate porosity.
Sonic porosity calculated using a Limestone scale (47.5 usec/ft).
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= 2325 cubic feet
Annular volume with 4.5 inch production casing TD to 3700ft = 375 cubic feet
Service order #3539888
Rig: H-D Drilling #2
Engineer: W. Stambaugh, J. LaPoint
Operator(s): B. Reeves

**** Software issue changed fluid loss to match Ph. Fluid Loss should be 8.8 ml/30min.****

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 28-APR-2013 15:43
Filename: C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8...\Shakespeare Rudolph #1-22_002.dta
Recorded on 16-APR-2013 12:30
System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

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

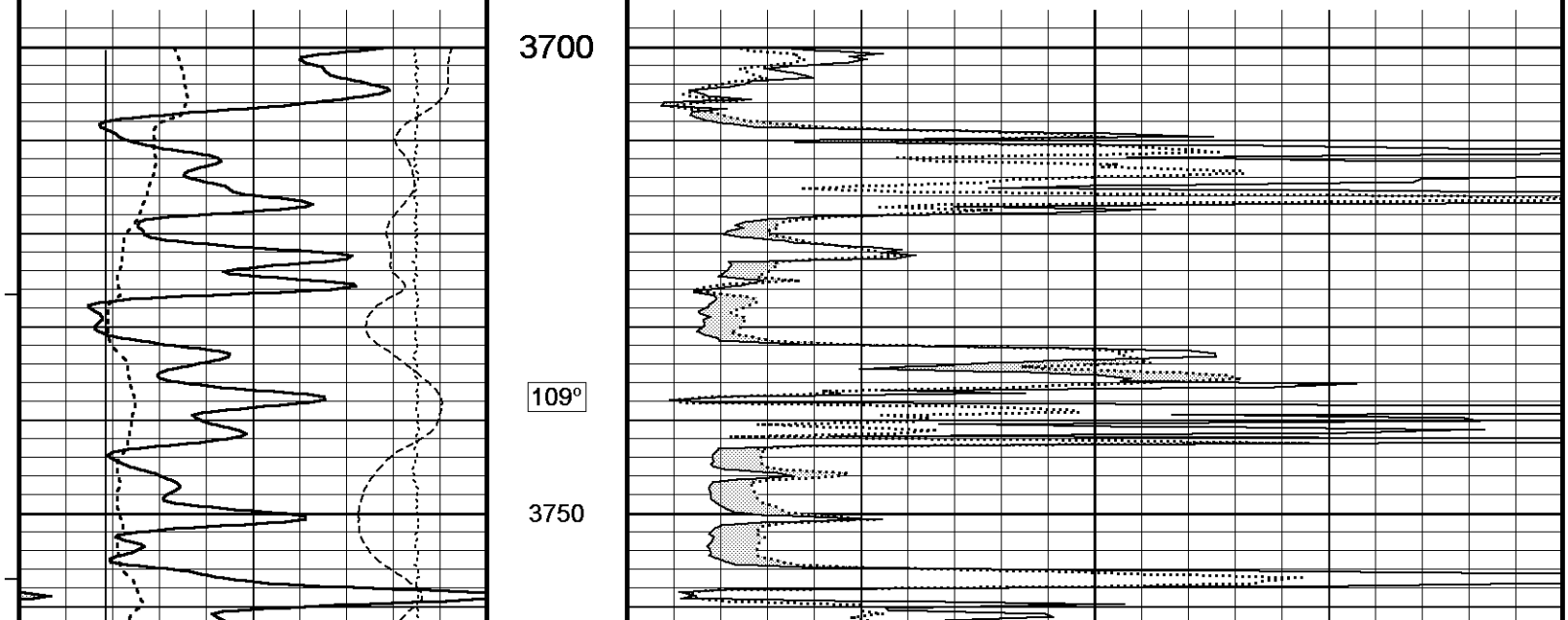
Depth in Feet

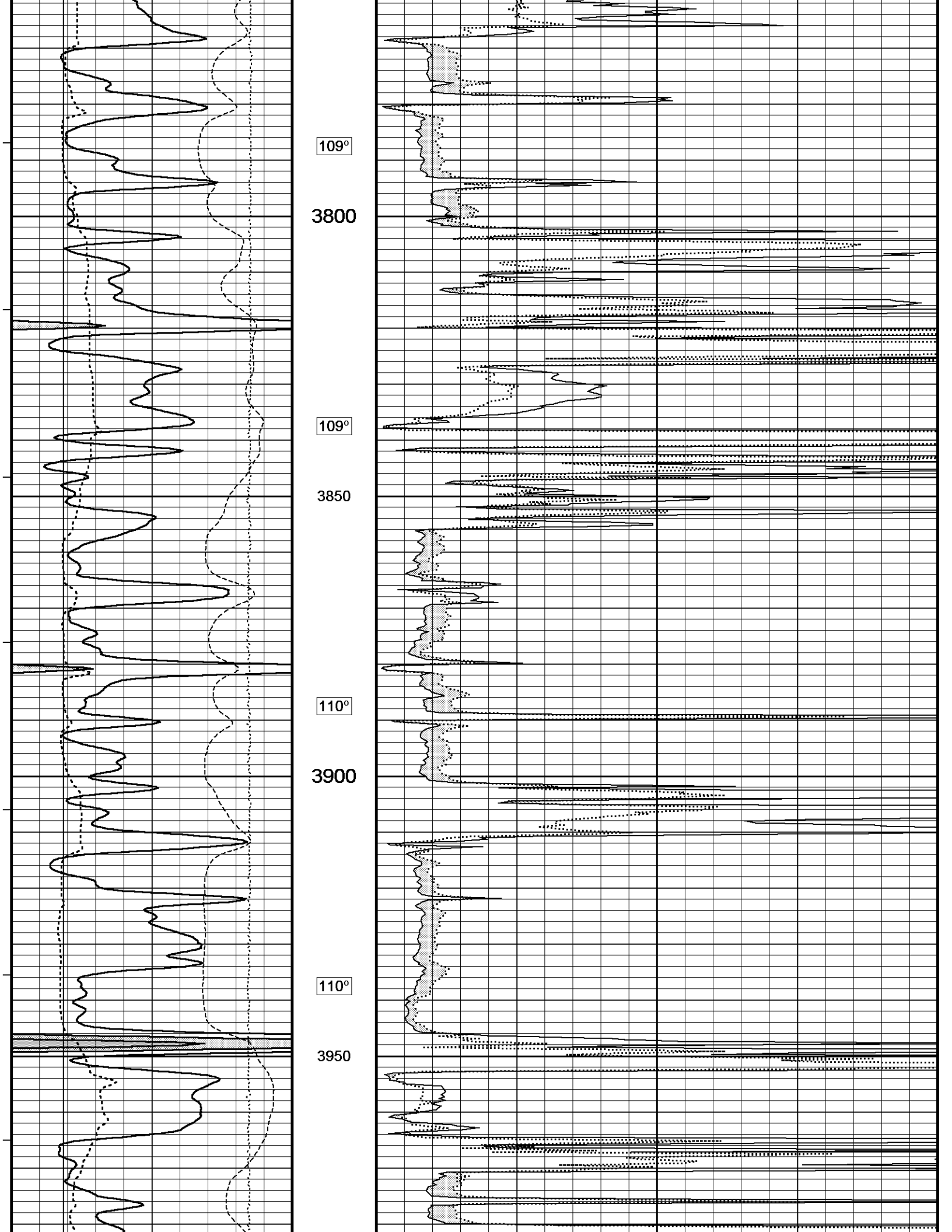
Borehole Temp in deg F

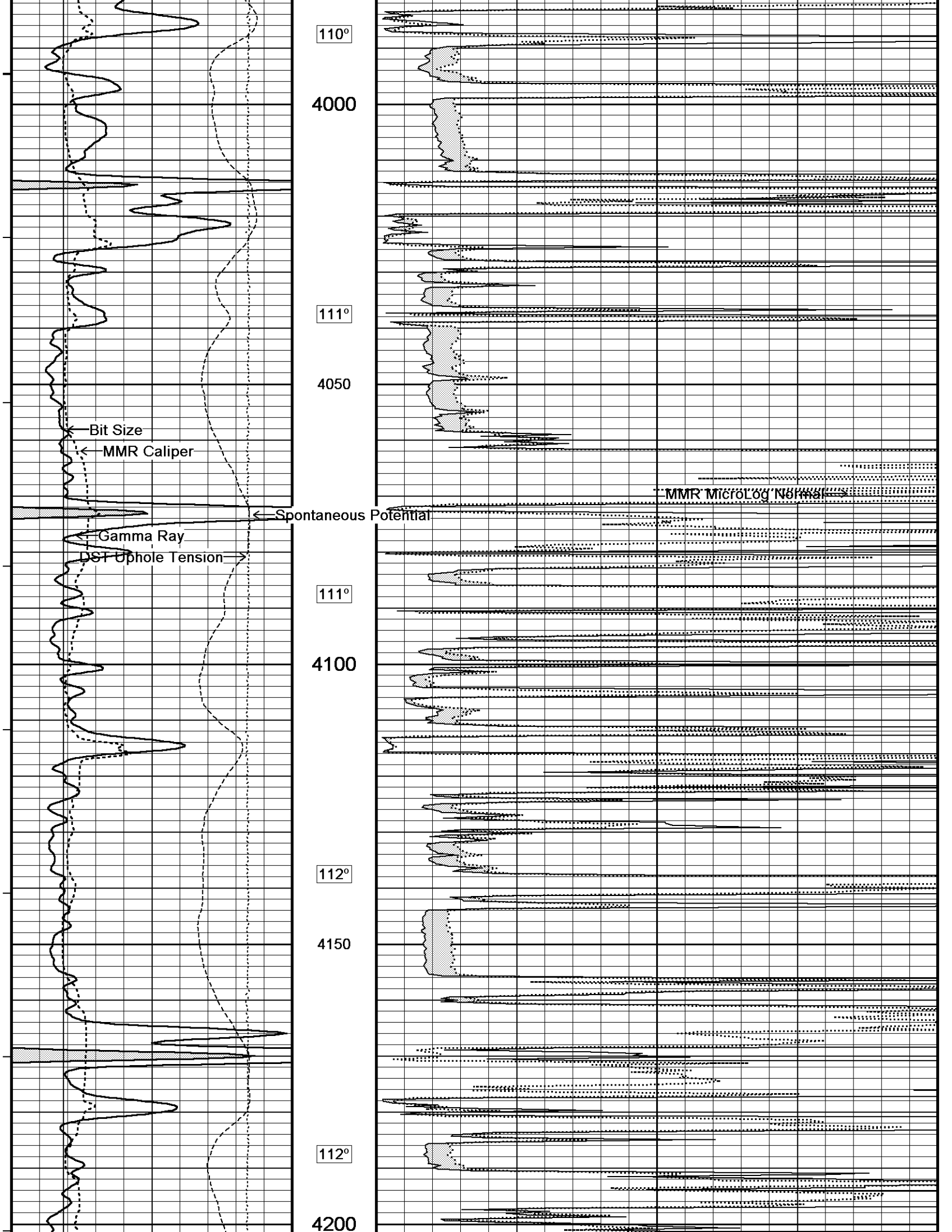
Replay Scale 1:240

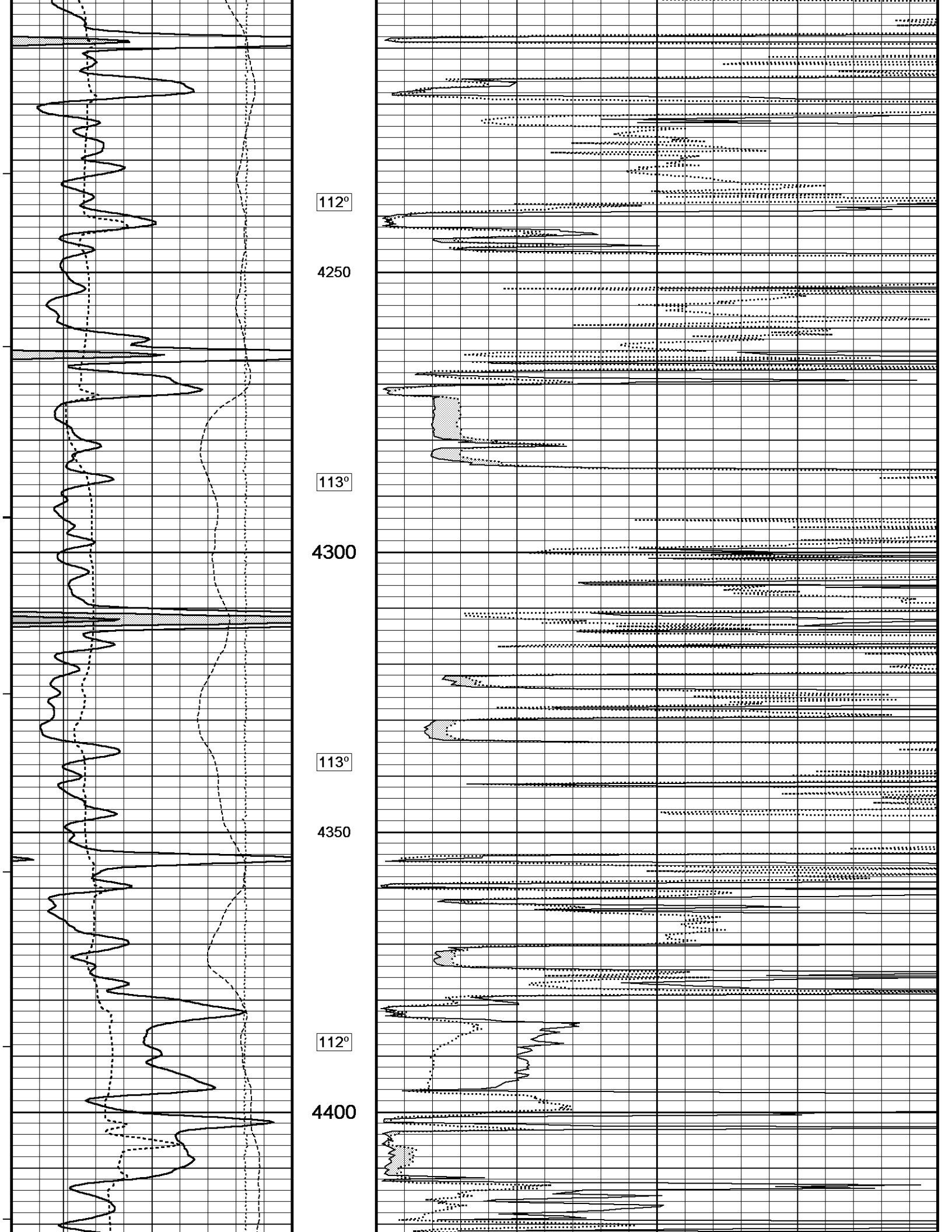
MMR MicroLog Normal
ohm metres
0 10 20 30 40

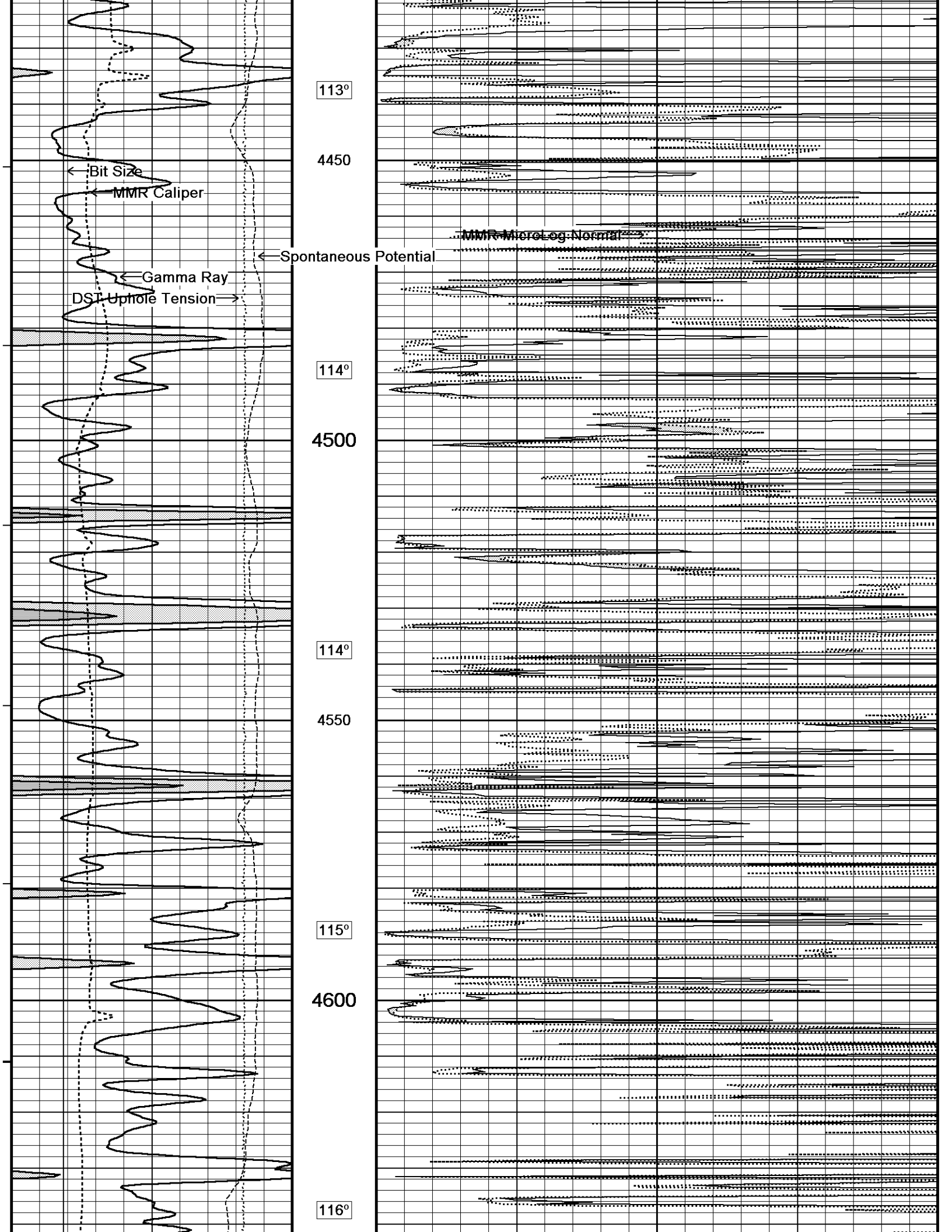
MMR MicroLog Inverse
ohm metres
0 10 20 30 40

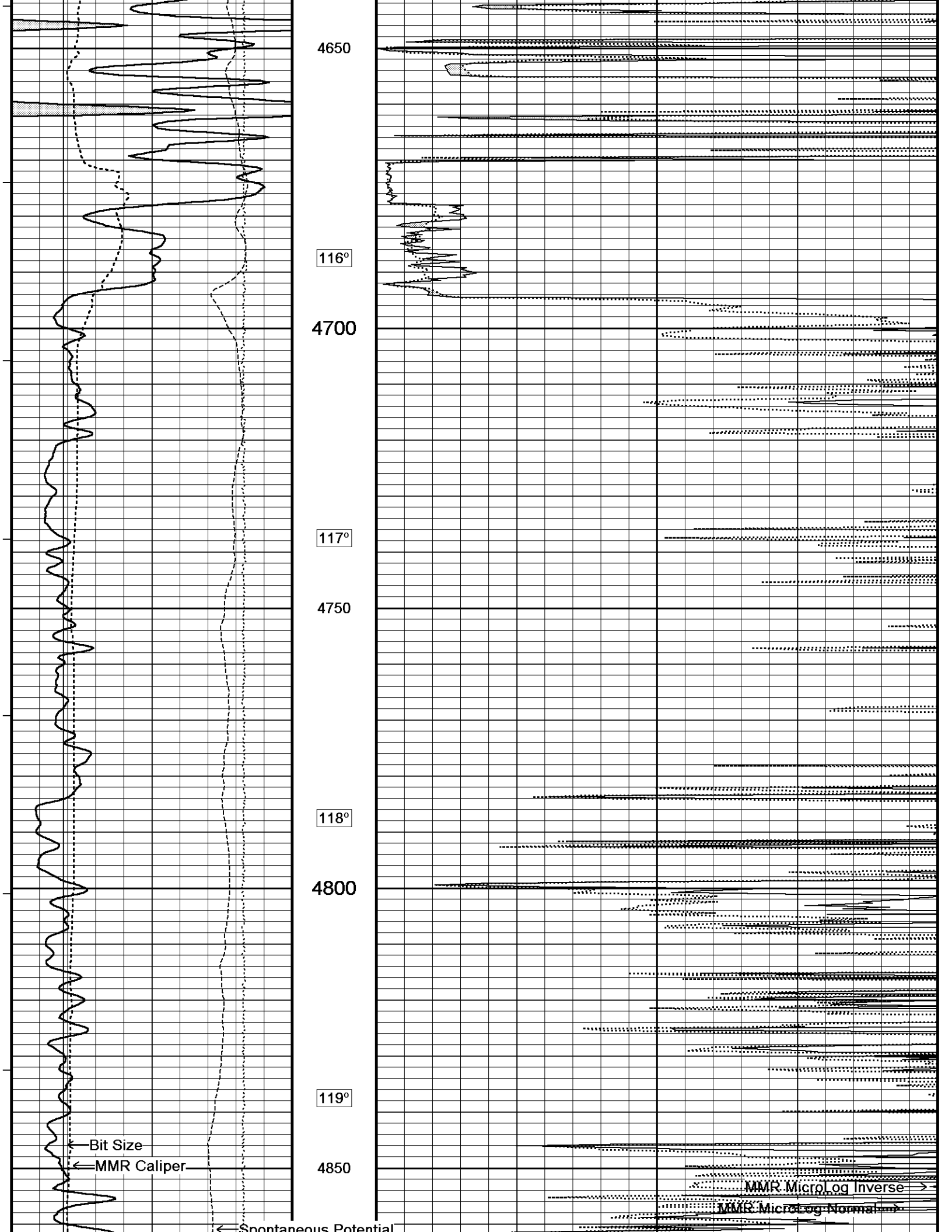


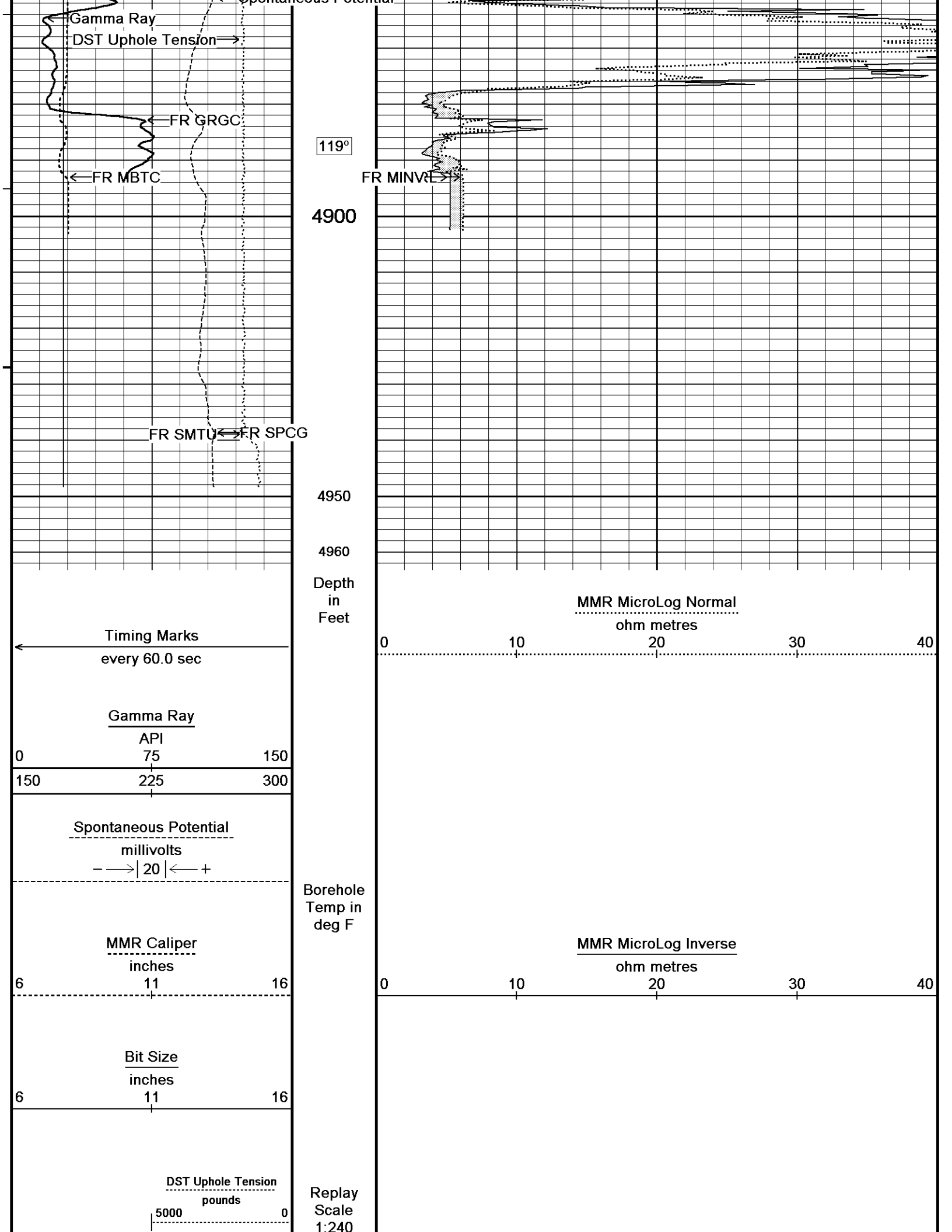

109°
3800
109°
3850
110°
3900
110°
3950


110°
4000
111°
4050
Bit Size
MMR Caliper
MMR Micrôl og Normal
Spontaneous Potential
Gamma Ray
DSI Uphole Tension
111°
4100
112°
4150
112°
4200


112°
4250
113°
4300
113°
4350
112°
4400


113°
4450
Bit Size
MMR Caliper
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
114°
4500
114°
4550
115°
4600
116°


4650
116°
4700
117°
4750
118°
4800
119°
4850
Bit Size
MMR Caliper
Spontaneous Potential
MMR Micro Log Inverse
MMR Micro Log Normal


Gamma Ray
DST Uphole Tension
FR GRGC
FR MBTC
119°
FR MINVL
4900
FR SMTU
FR SPCG
4950
4960
Depth in Feet
MMR MicroLog Normal
ohm metres
0
10
20
30
40
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
Borehole Temp in deg F
MMR MicroLog Inverse
ohm metres
0
10
20
30
40
Bit Size
inches
6
11
16
DST Uphole Tension
pounds
5000
0
Replay Scale 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 28-APR-2013 15:43
Filename: C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8...\Shakespeare Rudolph #1-22_002.dta — Recorded on 16-APR-2013 12:30
System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 28-APR-2013 15:43
Filename: C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8...\Shakespeare Rudolph #1-22_001.dta — Recorded on 16-APR-2013 12:04
System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

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

Replay Scale 1:240

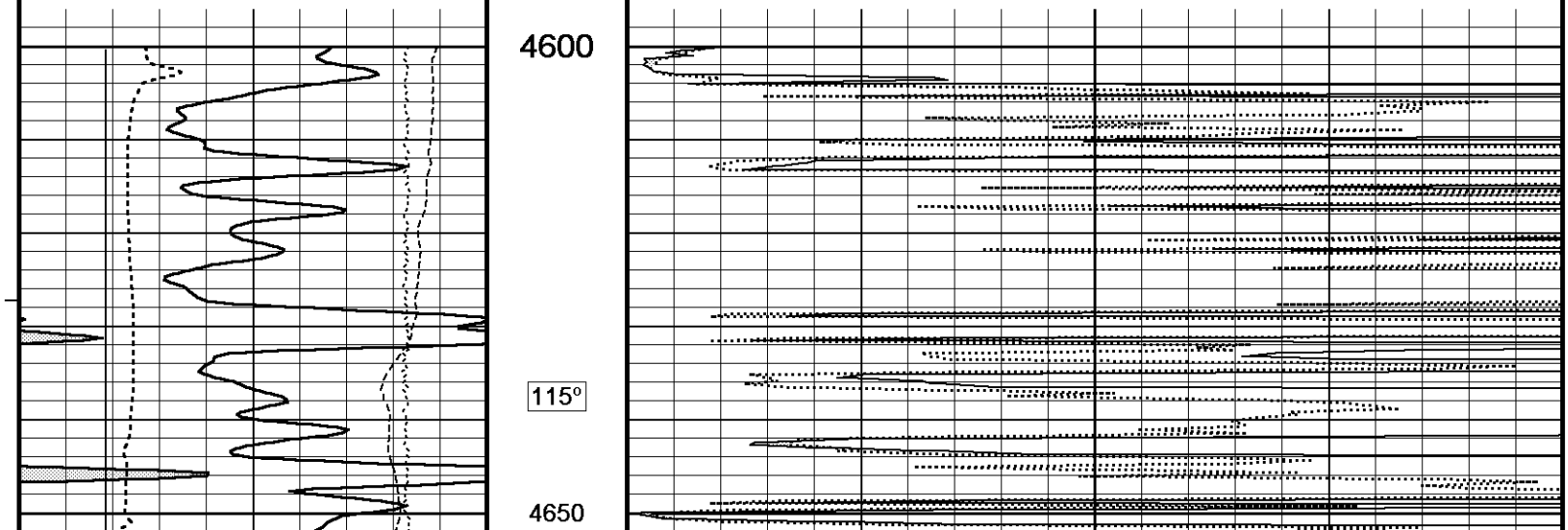
MMR MicroLog Normal
ohm metres
0 10 20 30 40

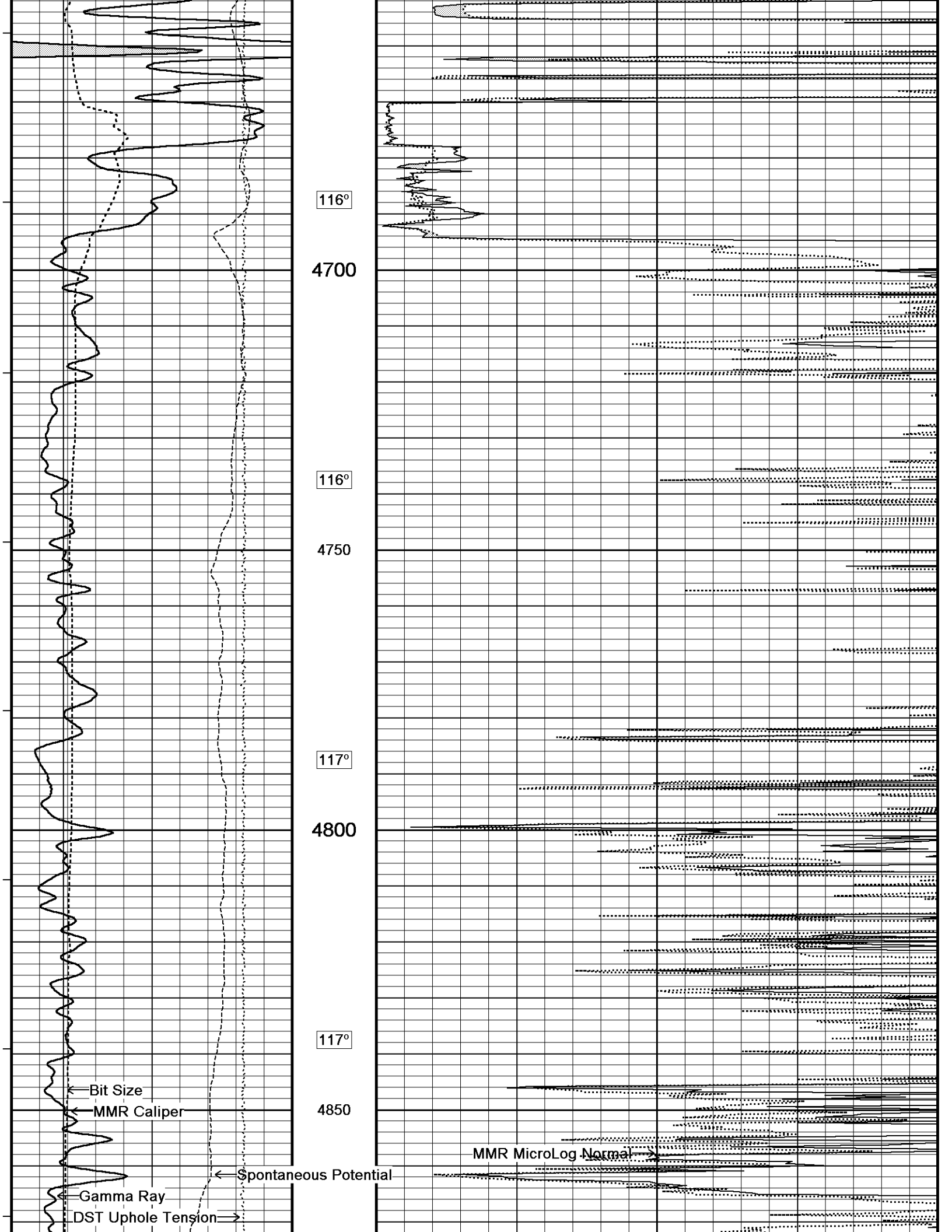
MMR MicroLog Inverse
ohm metres
0 10 20 30 40

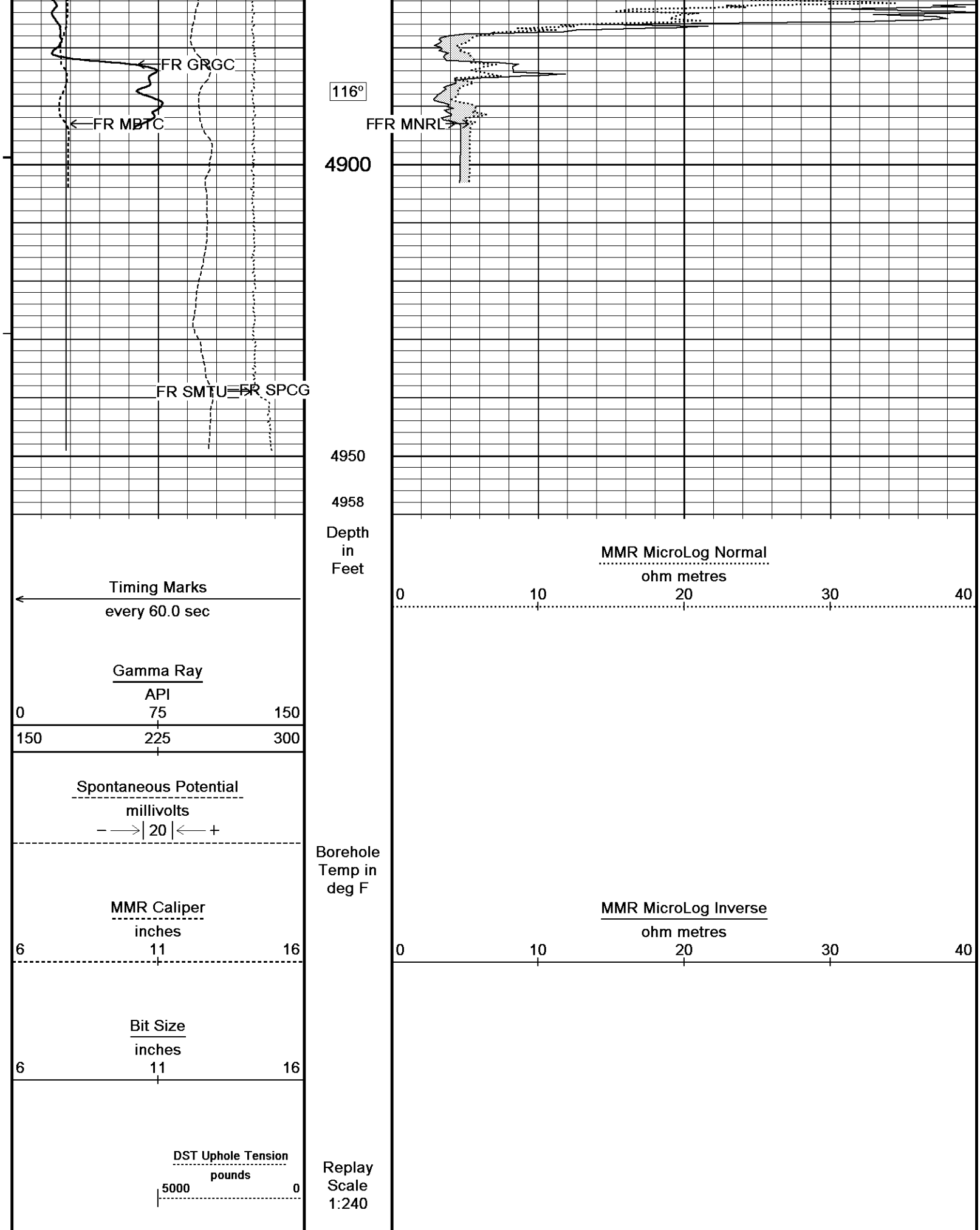
4600

115°

4650




116°
4700
116°
4750
117°
4800
117°
4850
Bit Size
MMR Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
MMR MicroLog Normal



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 28-APR-2013 15:43

Filename: C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8...\Shakespeare Rudolph #1-22_001.dta

Recorded on 16-APR-2013 12:04

System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8492_Data_Shakespeare Rudolph #1-22\Shakespeare Rudolph #1-22_001.dta

General Constants All 000

Last Edited on 16-APR-2013,10:51

General Parameters		
Mud Resistivity	0.620	ohm-metres
Mud Resistivity Temperature	74.000	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	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Six Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	

Down-hole Tension Calibration SMS 0

Field Calibration on 13-APR-2013 20:15

Reading No	Measured	Calibrated (lbs)
1	14794.45	2.00
2	15339.36	383.60

Gamma Calibration MCG-B 34

Field Calibration on 10-APR-2013 10:25

	Measured	Calibrated (API)
Background	60	40
Calibrator (Gross)	1154	765
Calibrator (Net)	1095	725

Gamma Constants MCG-B 34

Last Edited on 16-APR-2013,10:46

Gamma Calibrator Number	GR38	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

SP Calibration MCG-B 34

Field Calibration on 29-MAR-2013,12:58

	Measured	Calibrated (mV)
Reference 1	101.0	100.0
Reference 2	-99.0	-100.0

High Resolution Temperature Calibration MCG-B 34

Field Calibration on 29-MAR-2013,12:58

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	75.00	75.00

High Resolution Temperature Constants MCG-B 34

Last Edited on 29-MAR-2013,12:58

Pre-filter Length	11

Micro Laterolog Calibration MMR-A 11

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

Base Calibration

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

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

	0.0

Micro Laterolog Constants MMR-A 11

Last Edited on

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		
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	20.00	Degrees C
Mud Cake Resistivity Source	Constant Value	
Temp. Source Rmc Correc.	MCG External Temperature	

Micro Normal and Micro Inverse Calibration MMR-A 11

Base Calibration on 08-MAR-2013 17:36
Field Check on 10-APR-2013 10:27

Base Calibration

Channel	Measured Resistor 1	Measured Resistor 2	Calibrated (ohm-m) Resistor 1	Calibrated (ohm-m) Resistor 2
Micro Normal	12.4	60.0	5.0	25.0
Micro Inverse	15.5	77.5	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	76.3	76.3
Micro Inverse	58.7	58.7

Micro Normal and Micro Inverse Constants MMR-A 11

Last Edited on 05-NOV-2012,13:54

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 MMR-A 11

Base Calibration on 08-APR-2013 09:09
Field Calibration on 10-APR-2013 10:30

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13932	5.98
2	17063	7.97
3	20236	9.86
4	24170	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.93	5.98

Neutron Calibration MDN-A.B 65

Base Calibration on 13-MAR-2013 16:17
Field Check on 10-APR-2013 10:41

Base Calibration

	Measured Near	Measured Far	Calibrated (cps) Near	Calibrated (cps) Far
	2980	92	3714	110
Ratio	32.499		33.764	

Field Calibrator at Base	Calibrated (cps) Near	Calibrated (cps) Far
	1736	2464
Ratio	0.705	

Field Check	Calibrated (cps) Near	Calibrated (cps) Far
	1736	2470
Ratio	0.680	

Neutron Constants MDN-A.B 65

Last Edited on 16-APR-2013,10:46

Neutron Source Id	PN-521
Neutron Jig Number	5824NE
Epithermal Neutron	No
Caliper Source for Processing	Density Caliper

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	None	
Temperature	N/A	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 16-JAN-2013 10:20
Field Check on 10-APR-2013 10:50

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.3	126.8
Base Check		281.2
Field Check		281.3

FE Constants MFE-B.J 352

Last Edited on 16-APR-2013,10:45

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

Sonic Constants MSS-C.K 330

Last Edited on 16-APR-2013,10:45

Maximum Boundary Contrast	100.00	micro-sec/ft
Fluid Transit Time	189.00	micro-sec/ft
Limestone Transit Time	47.50	micro-sec/ft
Sandstone Transit Time	55.50	micro-sec/ft
Dolomite Transit Time	43.50	micro-sec/ft
Sonic used for Porosities	3-5' Compensated Sonic	
Correction for Sonde Skew	Applied	
Cycle Stretch Algorithm	Applied	
MN3FT	N/A	micro-sec
MX3FT	N/A	micro-sec
Hunt-Raymer Constant	83.13	micro-sec/ft
Sonde Mode	Compensated	
Hole Type	Open Hole	

Sonde Parameters

	Measured	Calibrated
Offset	N/A	0.0000
Free Pipe	N/A	N/A

Peak Amplitude Source N/A

Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'	N/A	N/A	N/A	N/A	N/A
4'	N/A	N/A	N/A	N/A	N/A
5'	N/A	N/A	N/A	N/A	N/A
6'	N/A	N/A	N/A	N/A	N/A

Processed Fixed Gate Parameters

Waveform Used For Processing N/A

Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	N/A
N/A	N/A	N/A	
N/A	N/A	N/A	N/A

N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Full Waveform Parameters

Use 3' Waveform to derive TR	N/A	
Use 4' Waveform to derive TR	N/A	
Use 5' Waveform to derive TR	N/A	
Use 6' Waveform to derive TR	N/A	
3' Waveform Discriminator Level	N/A	mV
4' Waveform Discriminator Level	N/A	mV
5' Waveform Discriminator Level	N/A	mV
6' Waveform Discriminator Level	N/A	mV
3' Waveform Filter	N/A	
4' Waveform Filter	N/A	
5' Waveform Filter	N/A	
6' Waveform Filter	N/A	
Semblance Level	N/A	
Semblance Window Width	N/A	micro-sec
Sonic 1 Despiker	N/A	N/A
Sonic 2 Despiker	N/A	N/A

High Resolution Temperature Calibration MAI-A.A 45

Field Calibration on 13-DEC-2012,10:54

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	75.00	75.00

High Resolution Temperature Constants MAI-A.A 45

Last Edited on 10-APR-2013,10:31

Pre-filter Length	11

Induction Calibration MAI-A.A 45

Base Calibration on 26-JUL-2012,09:22
Field Check on 10-APR-2013 10:52

Base Calibration

Test Loop Calibration	Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High
1	14.4	472.6	9.3	966.2
2	5.7	374.0	7.6	821.4
3	3.4	261.2	5.2	566.0
4	2.5	133.9	2.6	279.2

Array Temperature	78.4	Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			18.4	3850.4
2			31.7	3628.8
3			28.7	3049.3
4			18.3	2079.1
Deep			16.1	1911.4
Medium			42.5	4060.4
Shallow			49.5	5481.9

Array Temperature	60.4	Deg F

Induction Constants MAI-A.A 45

Last Edited on 16-APR-2013,10:45

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	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	45.00	degrees
Stand-off Fin Width	0.5000	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

Squasher Offset	N/A	mmhos/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	

Caliper Calibration MPD-B 31

Base Calibration on 28-MAR-2013 13:43
Field Calibration on 08-APR-2013 08:48

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	16832	3.99
2	24690	5.98
3	33328	7.97
4	41600	9.86
5	50976	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.00	5.98

Photo Density Calibration MPD-B 31

Base Calibration on 13-MAR-2013 15:17
Field Check on 10-APR-2013 10:49

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	46119	23502	59556	30836
Reference 2	19149	1933	24941	2541

Field Check at Base

681.1	838.4

Field Check

679.5	834.9

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	125	604		
Reference 1	19219	46004	0.421	0.371
Reference 2	5674	19062	0.301	0.272

Field Check at Base

125.1	603.7

Field Check

124.6	603.1

Density Constants MPD-B 31

Last Edited on 16-APR-2013,10:46

Density Source Id	254
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	1.12	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 (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

DOWNHOLE EQUIPMENT

C:\Minimus\Archive 2013\LB13-104\Minimus 13.04.8492_Data_Shakespeare Rudolph #1-22\Shakespeare Rudolph #1-22_001.dta

Compact Comms Gamma
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

- 56.02 ft GRGC - Gamma Ray
- 53.11 ft CGXT - MCG External Temperature

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

- 45.76 ft MINV - MMR MicroLog Inverse
- 45.76 ft MNRL - MMR MicroLog Normal

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

- 40.97 ft NPRL - Limestone Neutron Por.

Compact Density/Caliper
MPD-B 31 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

- 33.73 ft AVOL - Annular Volume
- 33.73 ft HVOL - Hole Volume
- 33.73 ft CLDC - Density Caliper
- 31.80 ft DPRL - Limestone Density Por.
- 31.80 ft DEN - Compensated Density
- 31.80 ft DCOR - Density Correction
- 31.74 ft PDPE - PE

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

- 26.24 ft FEFE - Shallow FE

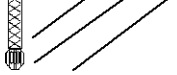
Compact Sonic
MSS-C.K 330 LG: 12.52 ft WT: 72.8 lb OD: 2.24 in

- 12.96 ft SPRL - Wyllie Lime. Sonic Por.
- 12.96 ft DT35 - 3-5' Compensated Sonic

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

- 3.34 ft R40O - Array Ind. One Res 40
- 3.34 ft R60O - Array Ind. One Res 60
- 3.34 ft RTAO - Array Ind. One Res Rt
- 0.23 ft SPCG - Spontaneous Potential
- Tool Zero (0.13ft from bottom)
- -0.13 ft SMTU - DST Uphole Tension

Total Length: 61.30 ft Weight: 456.4 lb



All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL COMPANY
WELL	RUDOLPH #1-22
FIELD	WILDCAT
PROVINCE/COUNTY	SCOTT
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3035.00	feet	First Reading	4893.00	feet
Elevation Drill Floor	3033.00	feet	Depth Driller	4940.00	feet
Elevation Ground Level	3025.00	feet	Depth Logger	4939.00	feet

Weatherford®

MICRORESISTIVITY LOG