MICRORESISTIVITY LOG

Weatherford®

COMPANY	GRAND MESA OPERATING COMPANY
WELL	BROOKS #1-18
FIELD	WILDCAT
PROVINCE/COUNTY	GOVE
COUNTRY/STATE	UNITED STATES / KANSAS
LOCATION	2219' FNL & 1761' FWL
	NE SW SE NW

SEC	TWP	RGE	Other Services
18	11S	16W	MPD/MDN
			MAI/MFE

API Number 15-063-22099
Permit Number

Permanent Datum G.L., Elevation 2664 feet
Log Measured From KB
Drilling Measured From K.B. @ 5 FEET

Elevations:	feet
KB	2669.00
DF	2664.00
GL	2664.00

Date	27-MAR-2013			
Run Number	ONE			
Service Order	3538999			
Depth Driller	4568.00	feet		
Depth Logger	4572.00	feet		
First Reading	4538.00	feet		
Last Reading	3500.00	feet		
Casing Driller	269.00	feet		
Casing Logger	270.00	inches		
Bit Size	7.880			
Hole Fluid Type	CHEMICAL	lb/USg		
Density / Viscosity	9.30 lb/USg	63.00 CP		
PH / Fluid Loss	10.50	10.50		
Sample Source	MUDPIT			
Rm @ Measured Temp	1.30 @ 54.0	ohm-m		
Rmf @ Measured Temp	1.04 @ 54.0	ohm-m		
Rmc @ Measured Temp	1.56 @ 54.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.65 @108.0	ohm-m		
Time Since Circulation	4 HOURS			
Max Recorded Temp	108.00	deg F		
Equipment / Base	13096	LIB		
Recorded By	W. STAMBAUGH		ADAM SILL	
Witnessed By	BOB SCHREIBER			
JOB #	LB13-081			

BOREHOLE RECORD

Last Edited: 27-MAR-2013 14:15

Bit Size inches	Depth From feet	Depth To feet
7.880	270.00	4568.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	270.00	24.00

REMARKS

Tools Ran: MCG,MML,MDN,MPD,MFE,MAI Ran in Combination
Hardware Used: MDN Dual Eccentralizer used. MPD 8 inch profile plate used.
MFE: 0.5 inch Standoff = 1
MAI: 0.5 inch Standoff = 1
2.71 g/cc Limestone Density Matrix used to calculate porosity.
Tight pulls, washouts, and borehole rugosity will affect data quality.
All intervals logged and scaled per customer's request.
Annular volume with 5.5 inch production casing from TD to 3600= 210 cu. ft.
Total hole volume from TD to surface casing= 1430 cu. ft.
Service order: #3538999
Rig: Murfin Drilling #24
Engineers: William Stambaugh, Adam Sill
Operator(s): Nicolas Adame

Software duplicates the pH value onto the fluid loss value. The fluid loss is 7.6 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 27-MAR-2013 15:15
Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_002.dta
Recorded on 27-MAR-2013 11:53
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 | ← +

MML 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

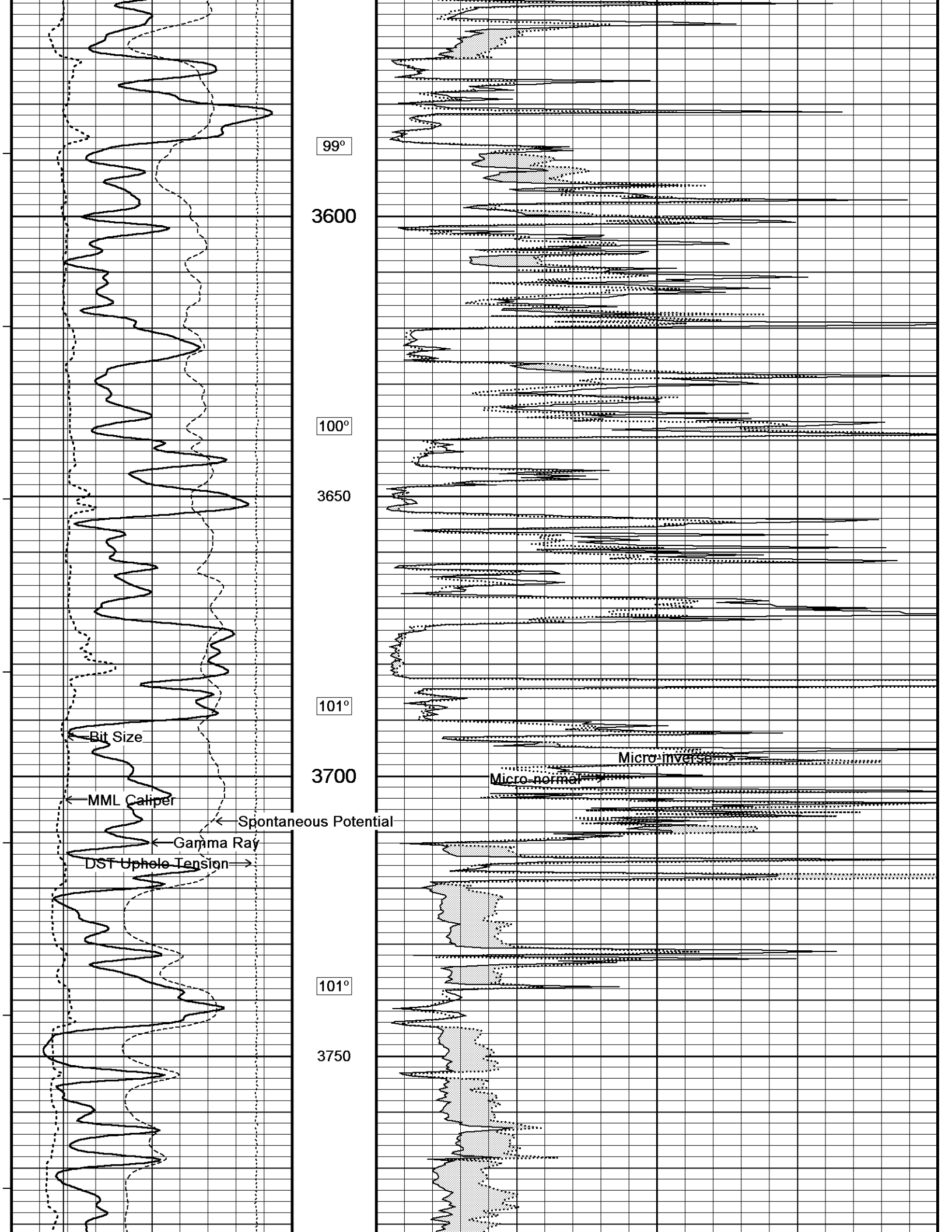
Micro-normal
ohm metres
0 10 20 30 40

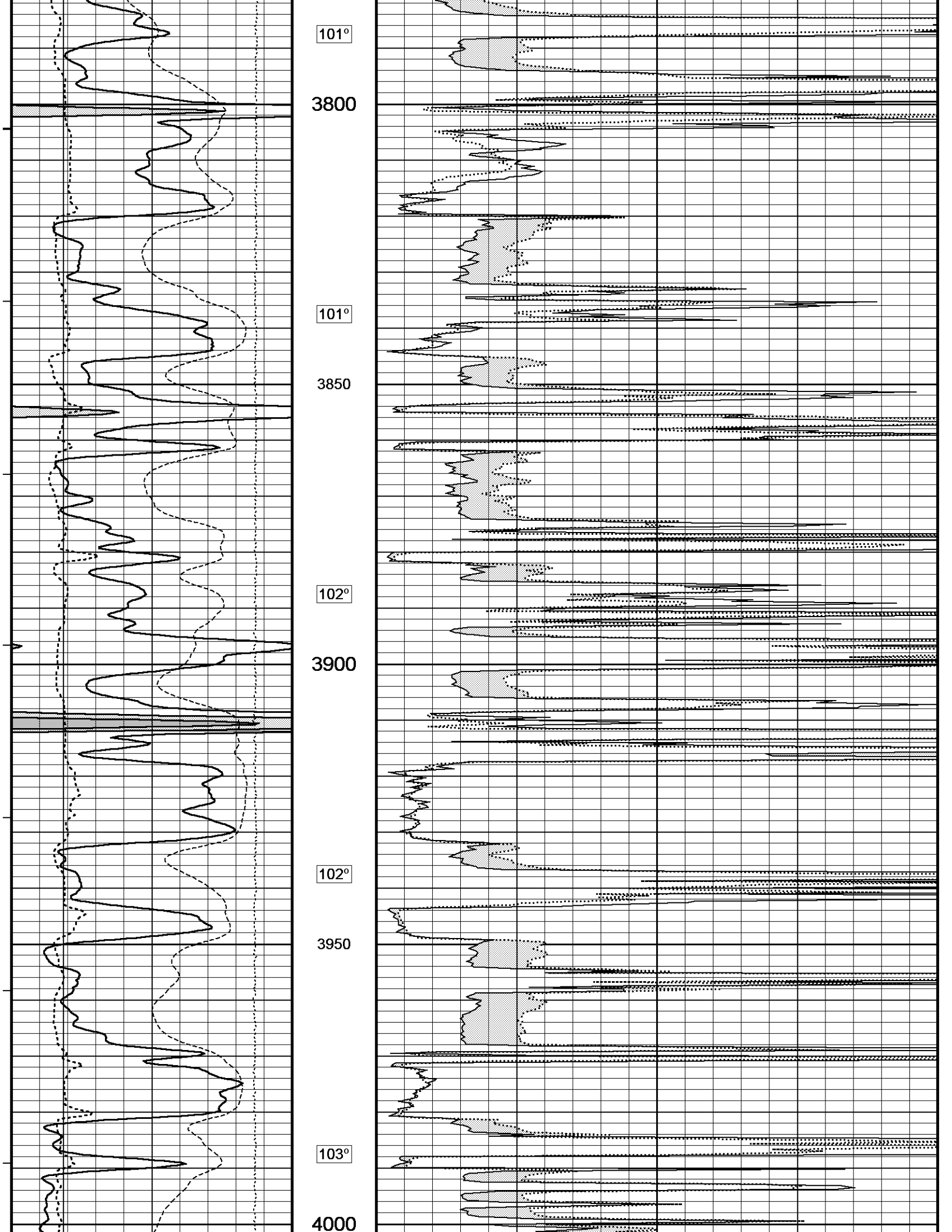
Micro-inverse
ohm metres
0 10 20 30 40

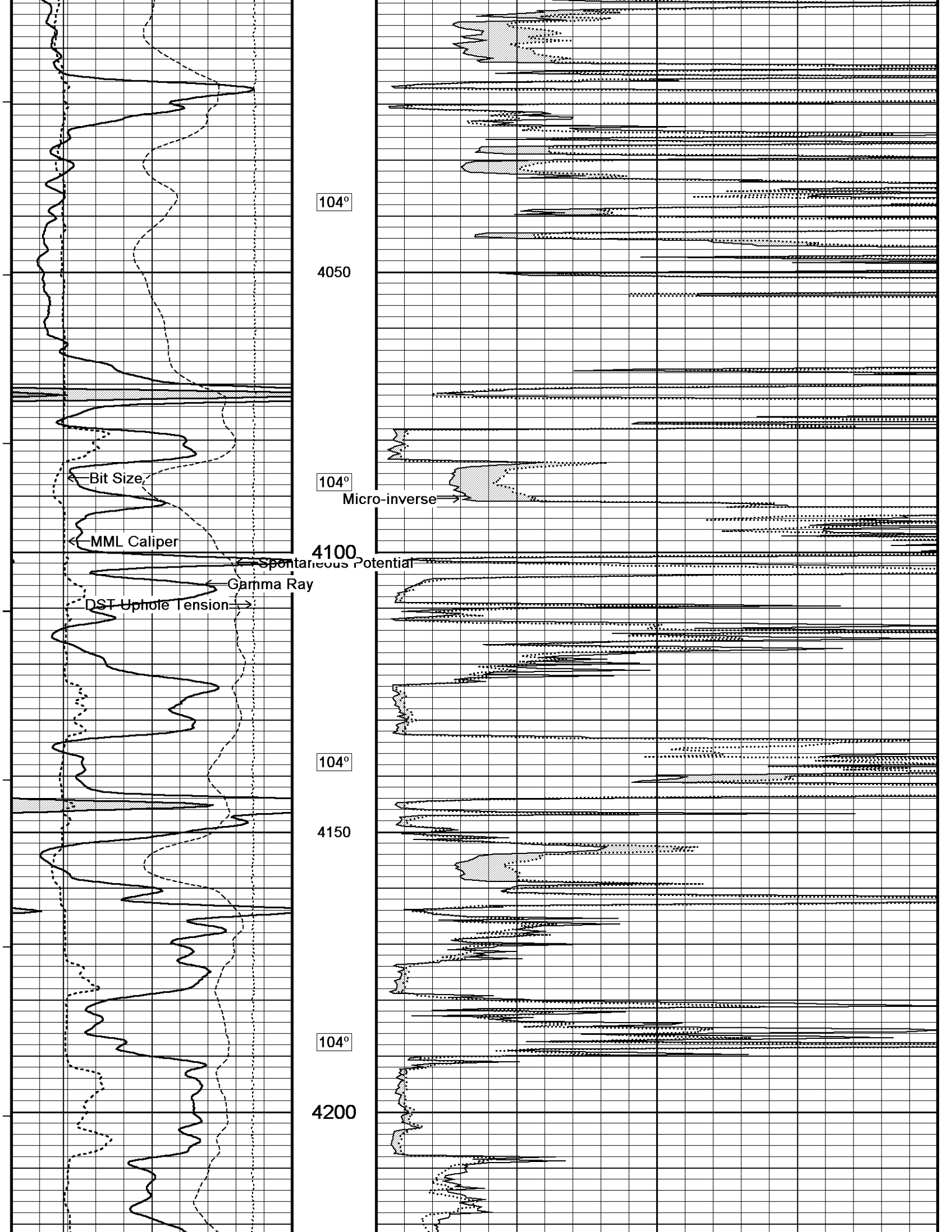
3500

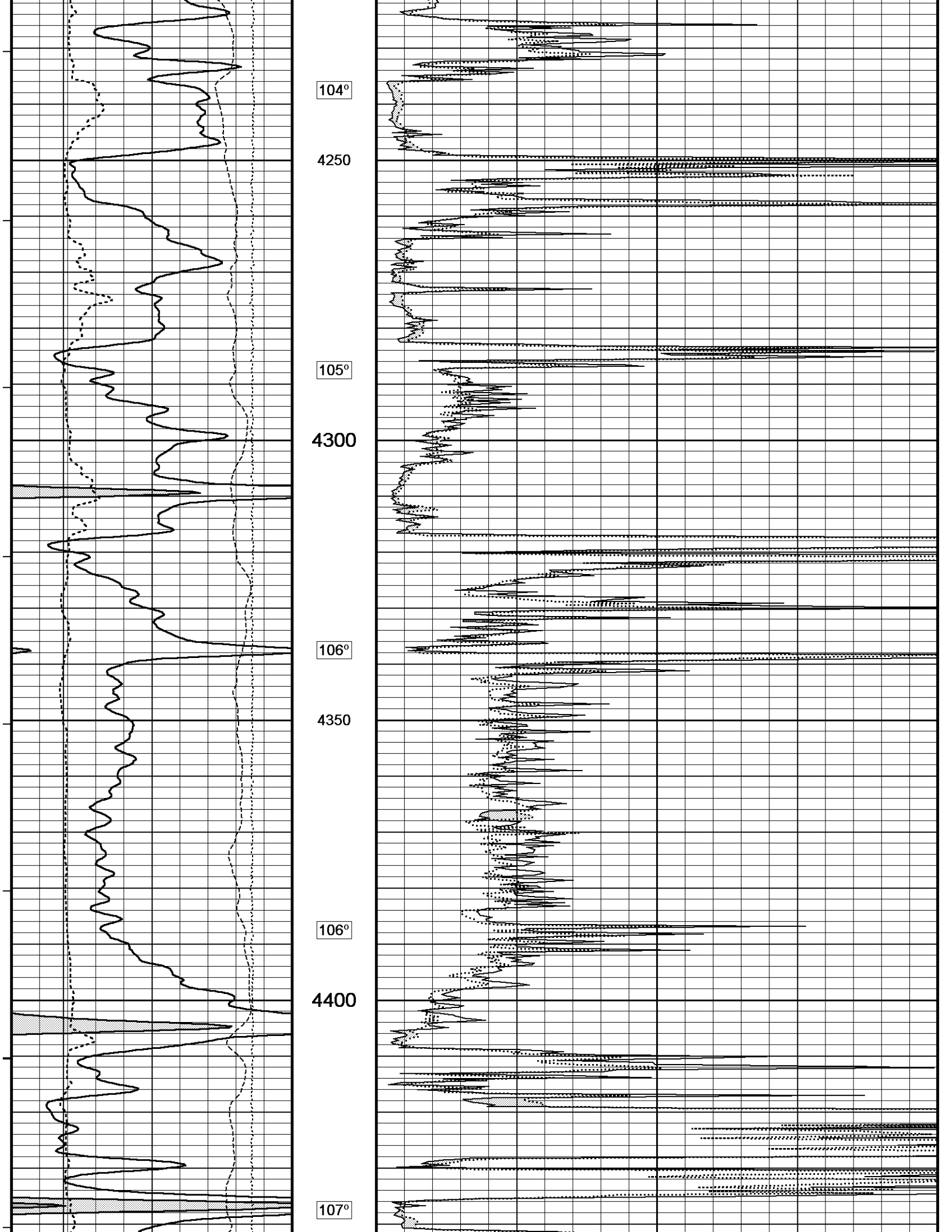
99°

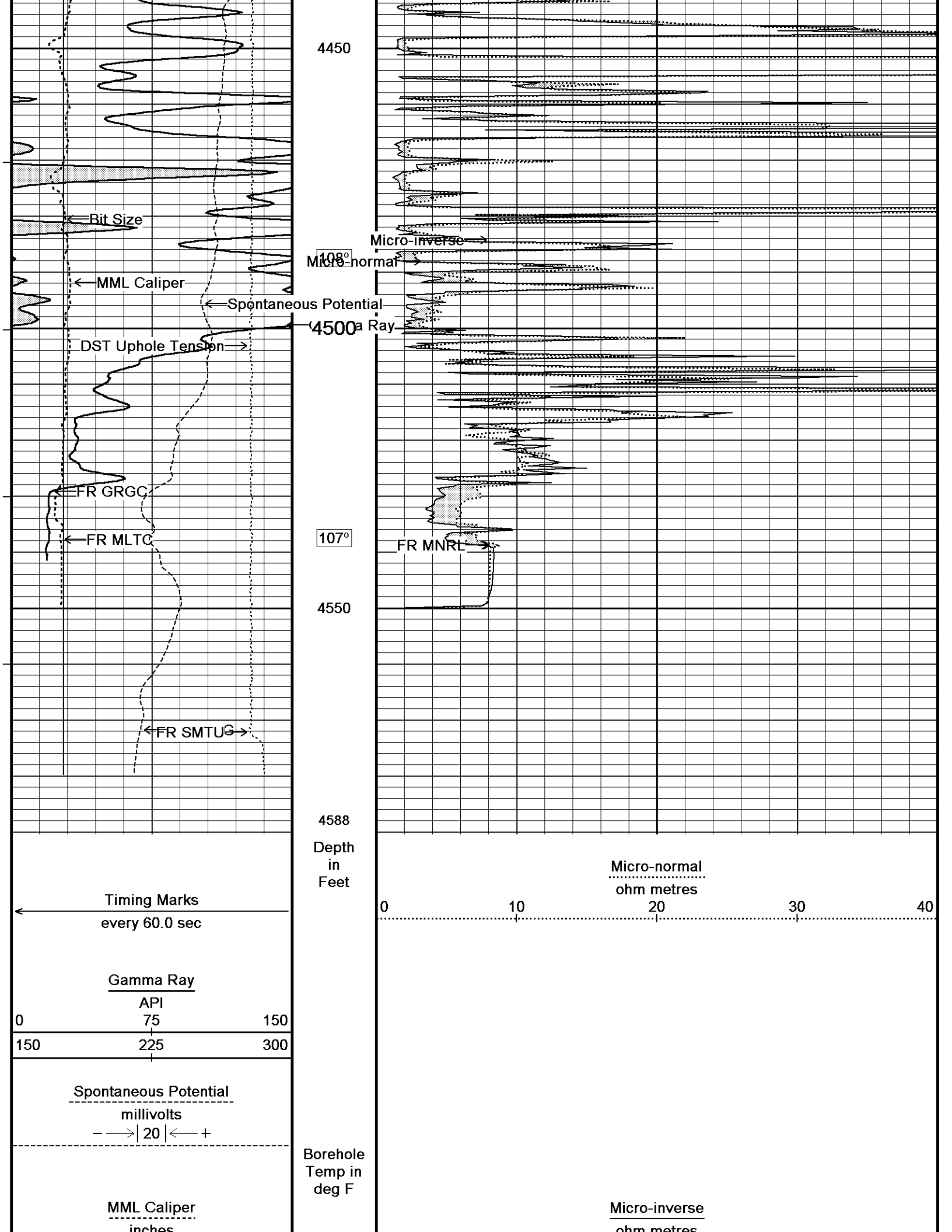
3550


99°
3600
100°
3650
101°
Bit Size
3700
MML Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Micro-inverse
Micro-normal
101°
3750


101°
3800
101°
3850
102°
3900
102°
3950
103°
4000


104°
4050
104°
Bit Size
Micro-inverse
MML Caliper
4100
Spontaneous Potential
Gamma Ray
DST Uphole Tension
104°
4150
104°
4200


104°
4250
105°
4300
106°
4350
106°
4400
107°


4450
Bit Size
Micro-inverse
108°
Micro-normal
MML Caliper
Spontaneous Potential
4500
a Ray
DST Uphole Tension
FR GRGC
FR MLTC
107°
FR MNRL
4550
FR SMTUG
4588
Depth
in
Feet
Micro-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 +
Borehole
Temp in
deg F
MML Caliper
Micro-inverse
ohm metres

6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Replay Scale 1:240

0 10 20 30 40

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 27-MAR-2013 15:15
Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_002.dta — Recorded on 27-MAR-2013 11:53
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 27-MAR-2013 15:15
Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_001.dta — Recorded on 27-MAR-2013 11:13
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 | ← +

MML Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Depth in Feet

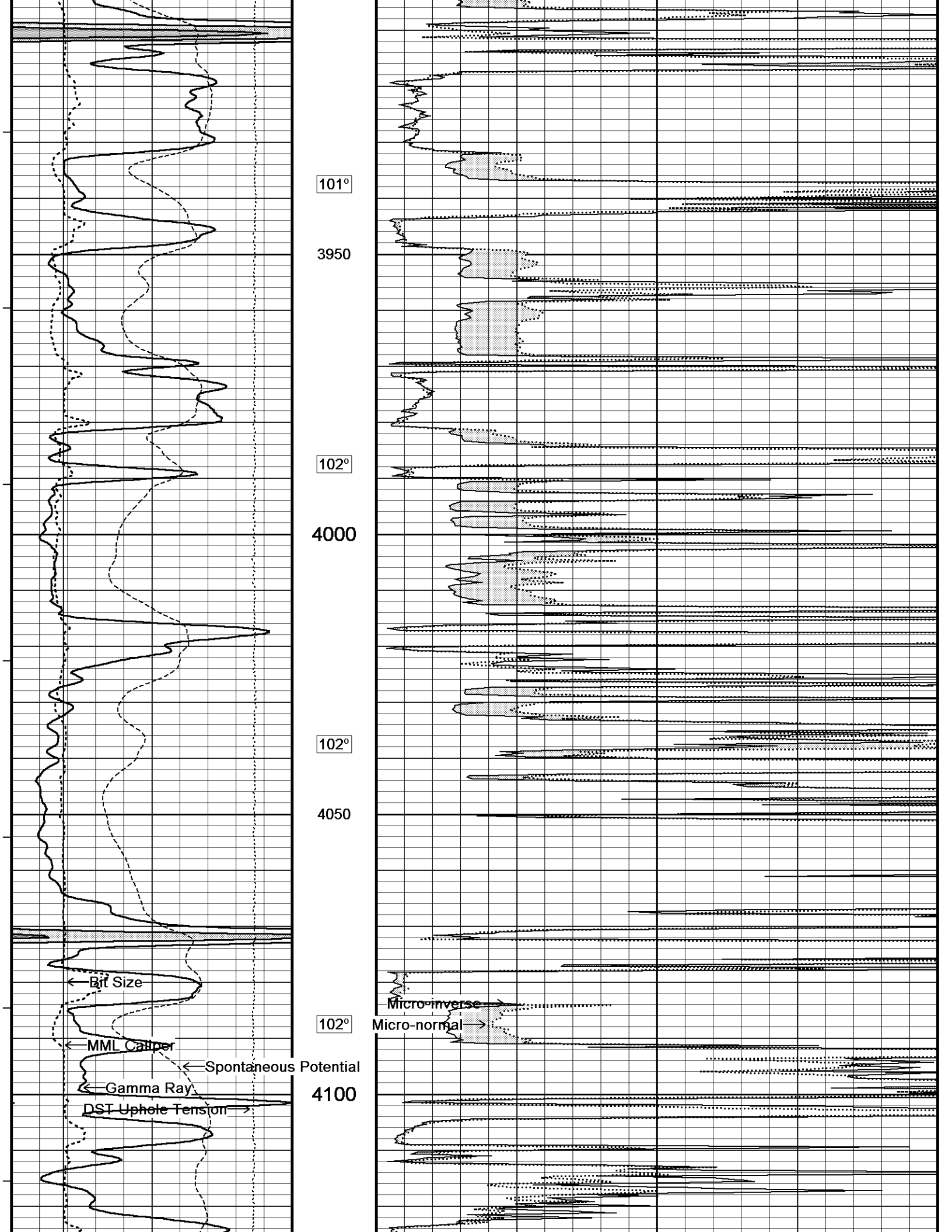
Borehole Temp in deg F

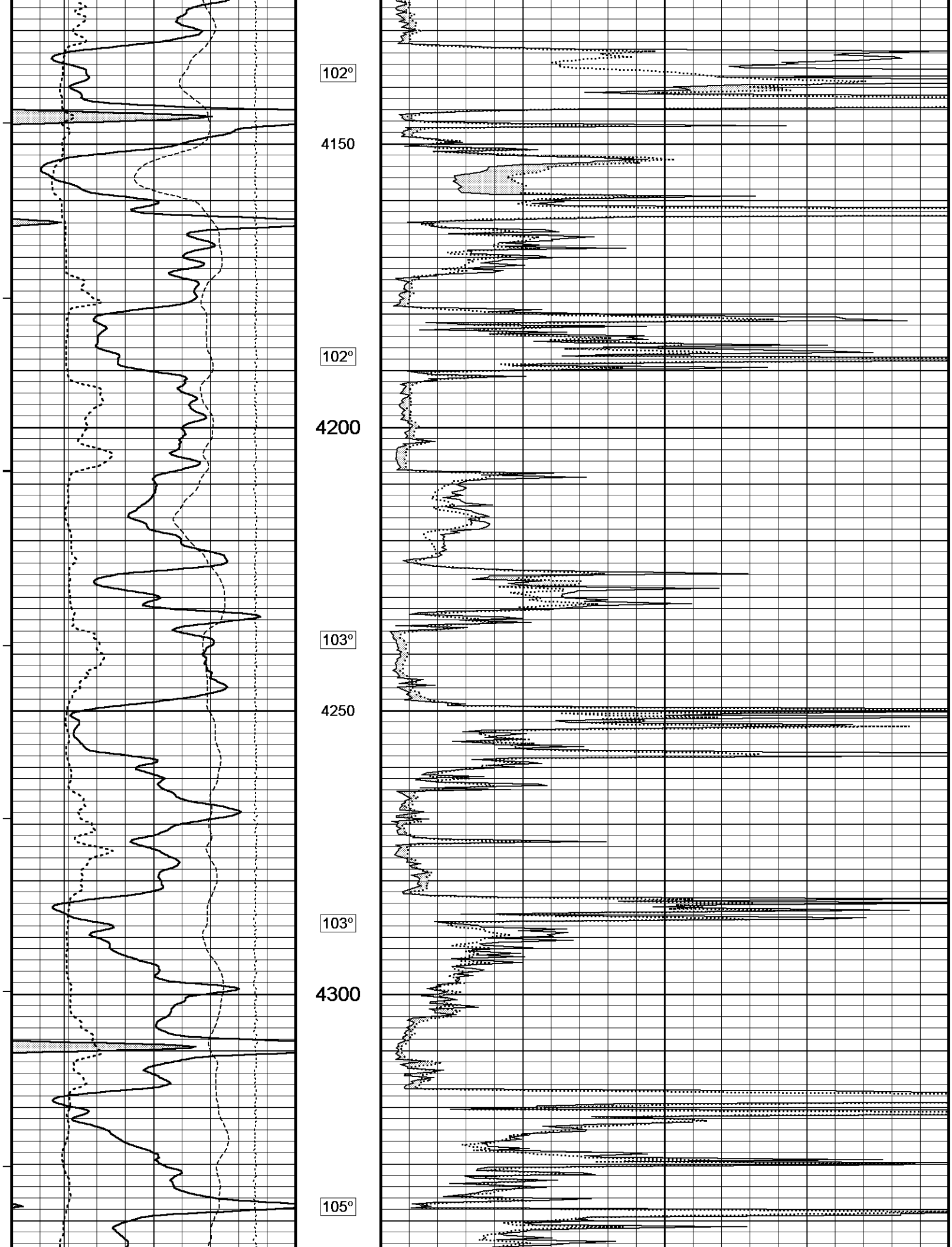
Replay Scale 1:240

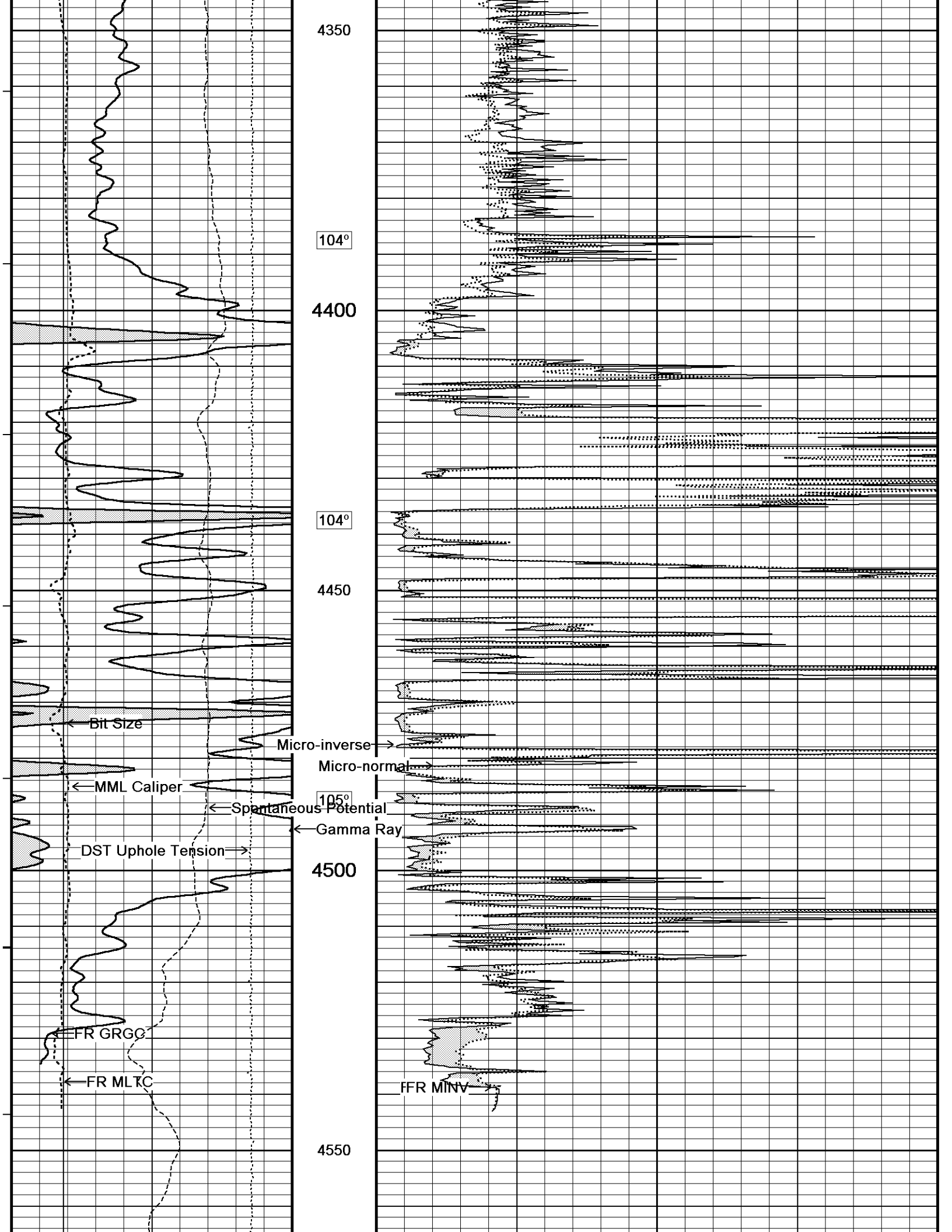
3900

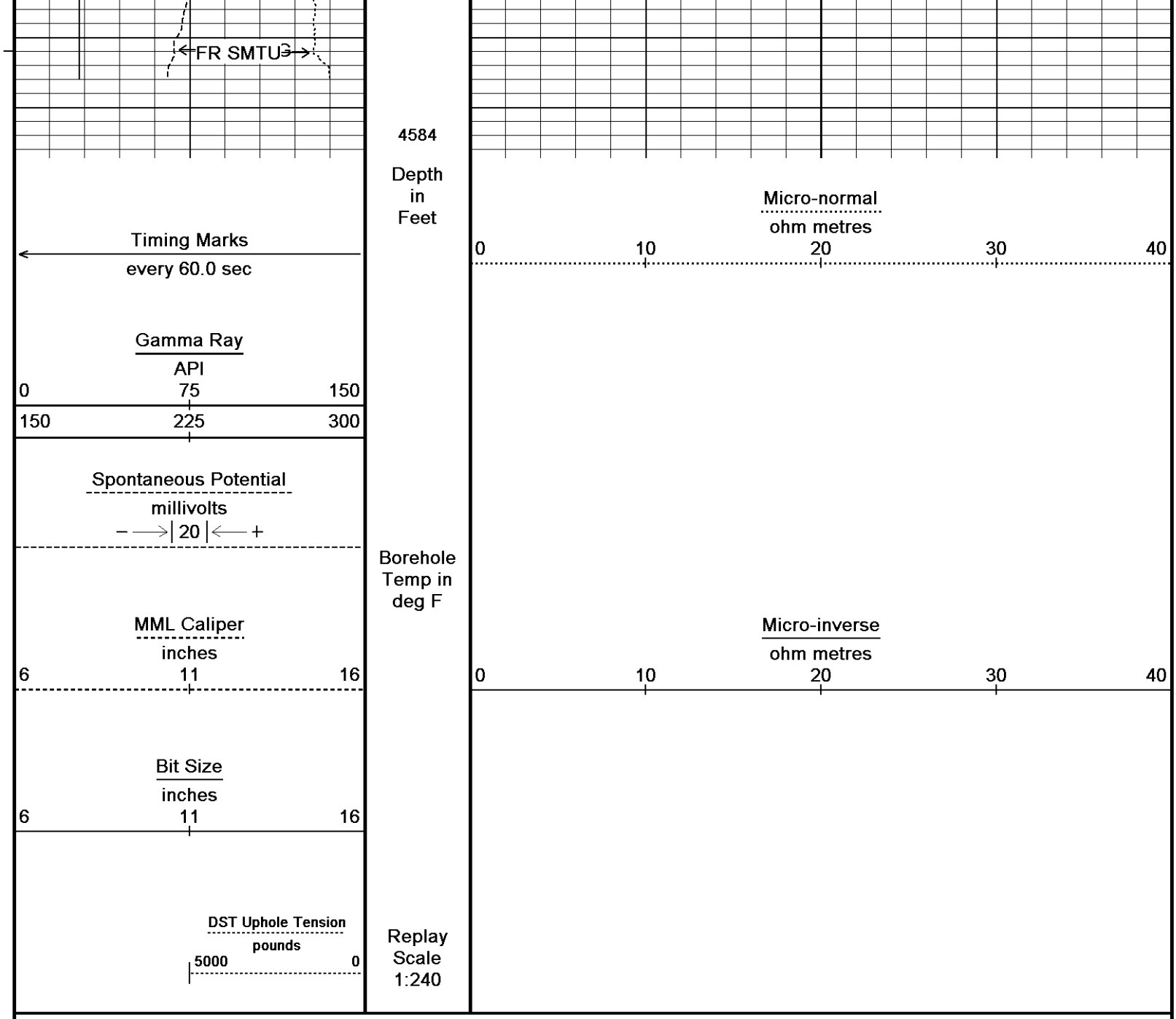
Micro-normal
ohm metres
0 10 20 30 40

Micro-inverse
ohm metres
0 10 20 30 40


101°
3950
102°
4000
102°
4050
Bit Size
102°
MML Caliper
Spontaneous Potential
Gamma Ray
4100
DST Uphole Tension
Micro-inverse
Micro-normal


102°
4150
102°
4200
103°
4250
103°
4300
105°


4350
104°
4400
104°
4450
Bit Size
Micro-inverse
Micro-normal
MML Caliper
105°
Spontaneous Potential
Gamma Ray
DST Uphole Tension
4500
FR GRGC
FR MLTC
FFR MINV
4550



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 27-MAR-2013 15:15

Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_001.dta — Recorded on 27-MAR-2013 11:13

System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_001.dta

General Constants All 000 — Last Edited on 27-MAR-2013,10:41

General Parameters		
Mud Resistivity	1.300	ohm-metres
Mud Resistivity Temperature	54.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	

Caliper for Differential Caliper | Density Caliper

Rwa Parameters

Porosity used	Crossplot Porosity
Resistivity used	Array Ind. One Res Rt
RWA Constant A	0.610
RWA Constant M	2.150

Down-hole Tension Calibration SMS 0

Field Calibration on 26-MAR-2013 22:09

Reading No	Measured	Calibrated (lbs)
1	15789.74	0.00
2	16297.35	399.00

High Resolution Temperature Calibration MCG-B 34

Field Calibration on 14-MAR-2013,12:12

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-B 34

Last Edited on 14-MAR-2013,12:12

Pre-filter Length	11

SP Calibration MCG-B 34

Field Calibration on 14-MAR-2013,12:12

	Measured	Calibrated (mV)
Reference 1	105.8	100.0
Reference 2	-94.3	-100.0

Gamma Calibration MCG-B 34

Field Calibration on 25-MAR-2013 17:22

	Measured	Calibrated (API)
Background	70	48
Calibrator (Gross)	1125	773
Calibrator (Net)	1055	725

Gamma Constants MCG-B 34

Last Edited on 27-MAR-2013,10:27

Gamma Calibrator Number	GRC38	
Mud Density	1.11	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

Caliper Calibration MML-A 3

Base Calibration on 14-MAR-2013 12:18
Field Calibration on 25-MAR-2013 17:12

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14700	5.98
2	17863	7.97
3	21143	9.86
4	24990	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.02	5.98

Micro Normal and Micro Inverse Calibration MML-A 3

Base Calibration on 14-MAR-2013 12:10
Field Check on 25-MAR-2013 17:16

Base Calibration

	Measured		Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.1	60.1	5.0	25.0
Micro Inverse	15.6	78.4	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	62.9	62.9
Micro Inverse	48.2	48.2

Micro Normal and Micro Inverse Constants MML-A 3

Last Edited on 25-MAR-2013,17:12

Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159

Micro Normal K Factor	1.0000	
Micro Inverse K Factor	1.0000	
Standoff Offset	N/A	inches

Neutron Calibration MDN-A.B 66

Base Calibration on 14-MAR-2013,12:32
Field Check on 25-MAR-2013 17:27

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	2998	94	3714	110
Ratio	31.811		33.764	

Field Calibrator at Base

	Calibrated (cps)	
	1692	2389
Ratio	0.708	

Field Check

	Calibrated (cps)	
	1718	2418
Ratio	0.697	

Neutron Constants MDN-A.B 66

Last Edited on 25-MAR-2013,17:23

Neutron Source Id	P0204NN	
Neutron Jig Number	5824NE	
Epithermal Neutron	No	
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	0.00	kpsi
Temperature Source	None	
Temperature	20.00	degrees F
Mud Salinity	0.00	kppm
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	0.00	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-B.J 353

Base Calibration on 14-MAR-2013 11:59
Field Check on 25-MAR-2013 17:03

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	966.2	126.8
Base Check		280.5
Field Check		280.6

FE Constants MFE-B.J 353

Last Edited on 26-MAR-2013,20:52

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

High Resolution Temperature Calibration MAI-A.A 167

Field Calibration on 14-MAR-2013,14:23

	Measured	Calibrated(Deg F)
Lower	1.00	33.80
Upper	11.00	51.80

High Resolution Temperature Constants MAI-A.A 167

Last Edited on 15-MAR-2013,23:04

Pre-filter Length	11

Induction Calibration MAI-A.A 167

Base Calibration on 14-MAR-2013,14:52

Field Check on 25-MAR-2013 17:02

Base Calibration

Test Loop Calibration	Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High
1	17.3	474.2	9.3	966.2
2	6.3	388.4	7.6	821.4
3	3.3	259.4	5.2	566.0
4	1.9	133.0	2.6	279.2

Array Temperature 76.8 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			12.1	3840.8
2			29.3	3478.5
3			29.0	3054.5
4			19.8	2082.8
Deep			18.5	2050.1
Medium			42.2	3993.1
Shallow			42.6	5056.2

Array Temperature 58.4 Deg F

Induction Constants MAI-A.A 167

Last Edited on 26-MAR-2013,20:51

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	2.500	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

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 64

Base Calibration on 15-MAR-2013 14:36
Field Calibration on 25-MAR-2013 17:05

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14127	3.99
2	22526	5.98
3	31088	7.97
4	39424	9.86

5	48752	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.01	5.98

Photo Density Calibration MPD-B 64

Base Calibration on 14-MAR-2013 15:27
Field Check on 25-MAR-2013 17:10

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	59830	33386	59556	30836
Reference 2	25160	2926	24941	2541
Field Check at Base	1174.4	1358.8		
Field Check	1172.5	1356.0		

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	211	1047		
Reference 1	22522	59630	0.381	0.371
Reference 2	6778	25021	0.274	0.272
Field Check at Base	210.9	1046.6		
Field Check	213.0	1042.2		

Density Constants MPD-B 64

Last Edited on 27-MAR-2013,10:27

Density Source Id	18235B	
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	1.11	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 13.04.8492\Data\Grand Mesa Brooks #1-18\Brooks #1-18_001.dta

CBH-C, Cablehead, 11 pin
CBH-C 234 LG: 2.40 ft WT: 24.3 lb OD: 2.24 in

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

42.87 ft GRGC - Gamma Ray
39.96 ft CGXT - MCG External Temperature

Compact Micro-log
MML-A 3 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

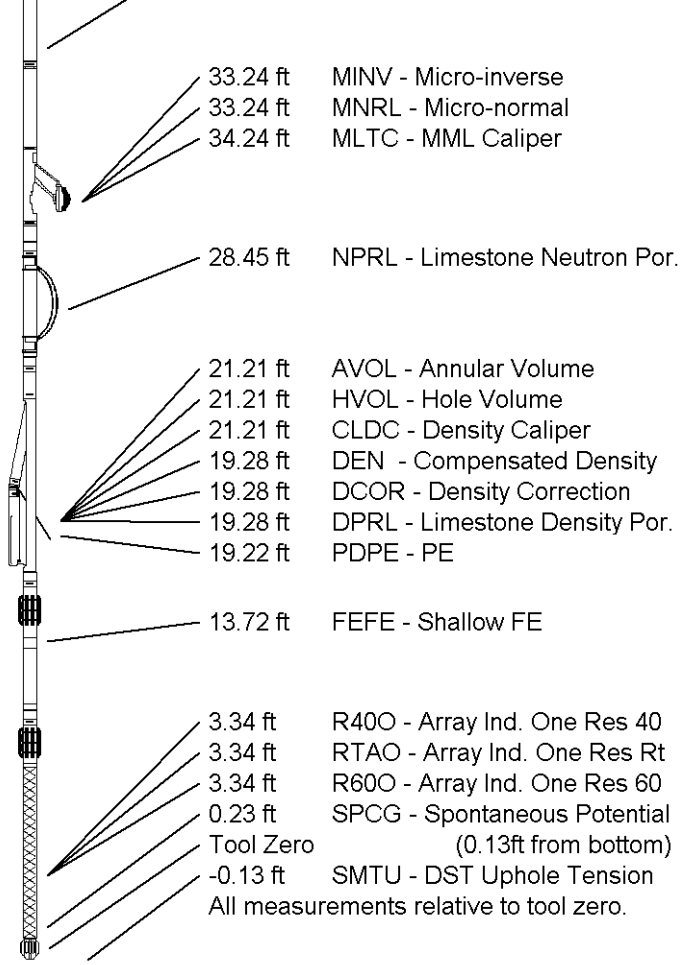
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 50.55 ft Weight: 407.9 lb



33.24 ft	MINV - Micro-inverse
33.24 ft	MNRL - Micro-normal
34.24 ft	MLTC - MML Caliper
28.45 ft	NPRL - Limestone Neutron Por.
21.21 ft	AVOL - Annular Volume
21.21 ft	HVOL - Hole Volume
21.21 ft	CLDC - Density Caliper
19.28 ft	DEN - Compensated Density
19.28 ft	DCOR - Density Correction
19.28 ft	DPRL - Limestone Density Por.
19.22 ft	PDPE - PE
13.72 ft	FEFE - Shallow FE
3.34 ft	R40O - Array Ind. One Res 40
3.34 ft	RTAO - Array Ind. One Res Rt
3.34 ft	R60O - Array Ind. One Res 60
0.23 ft	SPCG - Spontaneous Potential
Tool Zero	(0.13ft from bottom)
-0.13 ft	SMTU - DST Uphole Tension

All measurements relative to tool zero.

COMPANY	GRAND MESA OPERATING COMPANY
WELL	BROOKS #1-18
FIELD	WILDCAT
PROVINCE/COUNTY	GOVE
COUNTRY/STATE	UNITED STATES / KANSAS

Elevation Kelly Bushing	2669.00	feet	First Reading	4538.00	feet
Elevation Drill Floor	2664.00	feet	Depth Driller	4568.00	feet
Elevation Ground Level	2664.00	feet	Depth Logger	4572.00	feet

Weatherford®

MICRORESISTIVITY LOG