



Weatherford[®]

MICRORESISTIVITY LOG

COMPANY

GRAND MESA OPERATING CO.

WELL

VULGAMORE #2-31

FIELD

WILDCAT

PROVINCE/COUNTY

SCOTT

COUNTRY/STATE

U.S.A. / KANSAS

LOCATION

1910' FSL & 610' FEL

SEC

TWP

31

19S

33W

Other Services
MPD/MDN
MAI/MFE

API Number

15-171-20931

Permit Number

Permanent Datum G.L., Elevation 2991 feet
Log Measured From KB
Drilling Measured From K.B. @ 5 FEET

Date

15-MAR-2013

Run Number

ONE

Service Order

3838997

Depth Driller

4790.00

Depth Logger

4790.00

First Reading

4757.00

Last Reading

3600.00

Casing Driller

223.00

Casing Logger

222.00

Bit Size

7.875

Hole Fluid Type

CHEMICAL

Density / Viscosity

9.35 lb/USg

pH / Fluid Loss

9.50

Sample Source

MUDPIT

Rm @ Measured Temp

1.07 @ 66.0

Rmf @ Measured Temp

0.86 @ 66.0

Rmc @ Measured Temp

1.28 @ 66.0

Source Rmf / Rmc

CALC

Rm @ BHT

0.65 @109.0

Time Since Circulation

3 HOURS

Max Recorded Temp

109.00

Equipment / Base

13025

Recorded By

R.HOFFMAN

Witnessed By

JOHN GOLDSMITH

JOB #

LB13-070

Elevations:
KB 2996.00
DF 2994.00
GL 2991.00

BOREHOLE RECORD

Last Edited: 15-MAR-2013 09:26

Bit Size inches	Depth From feet	Depth To feet
7.875	222.00	4790.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	222.00	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 = 235 cu. ft.
Total hole volume from TD to surface casing = 2127 cu. ft.
Service order: #3538997
Rig: Murfin Drilling #24
Engineers: R. Hoffman, Derek Carter
Operator(s): B. Johnson

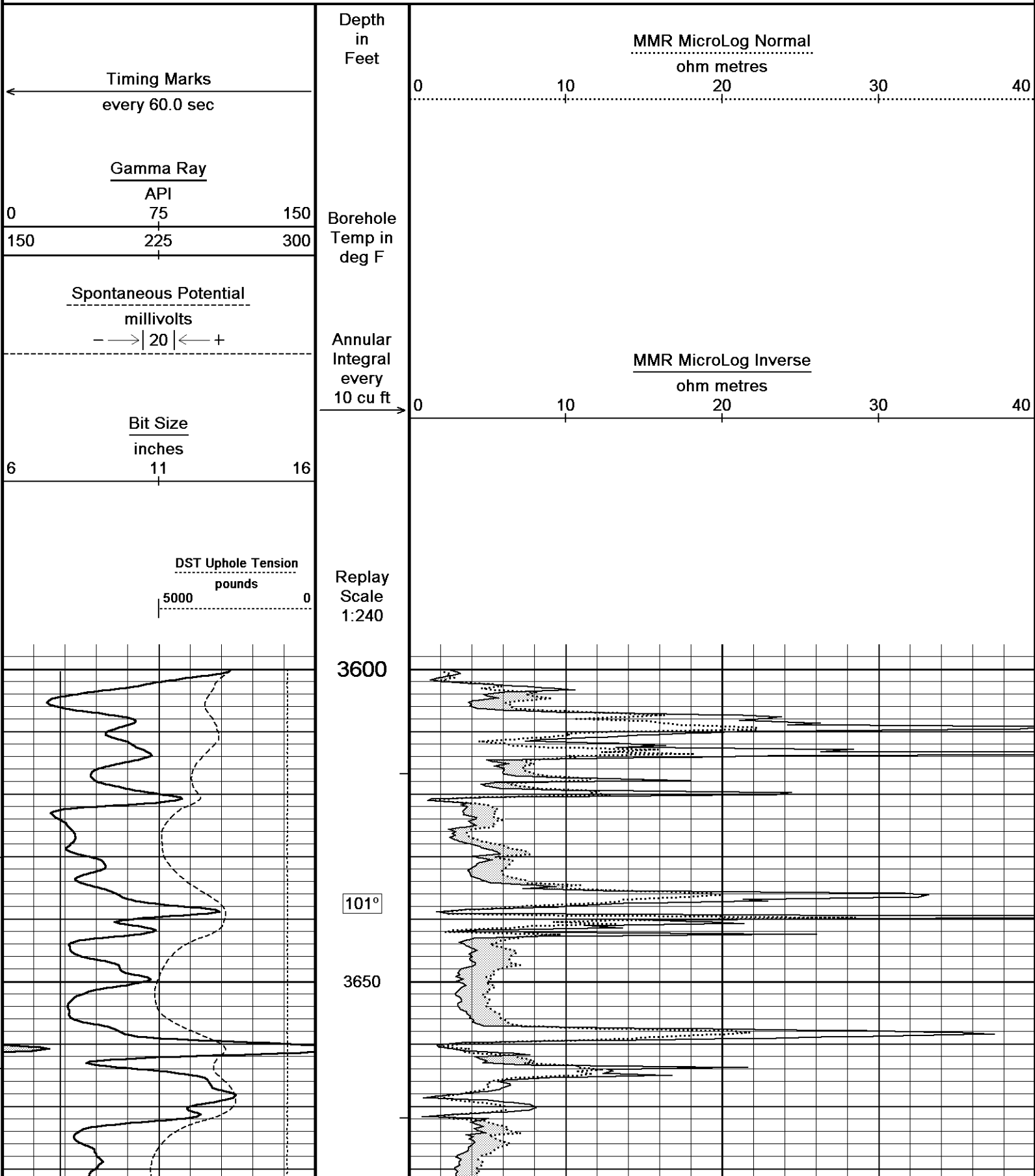
Software duplicates the pH value onto the fluid loss value. The fluid loss is 9.6 ml/30min.

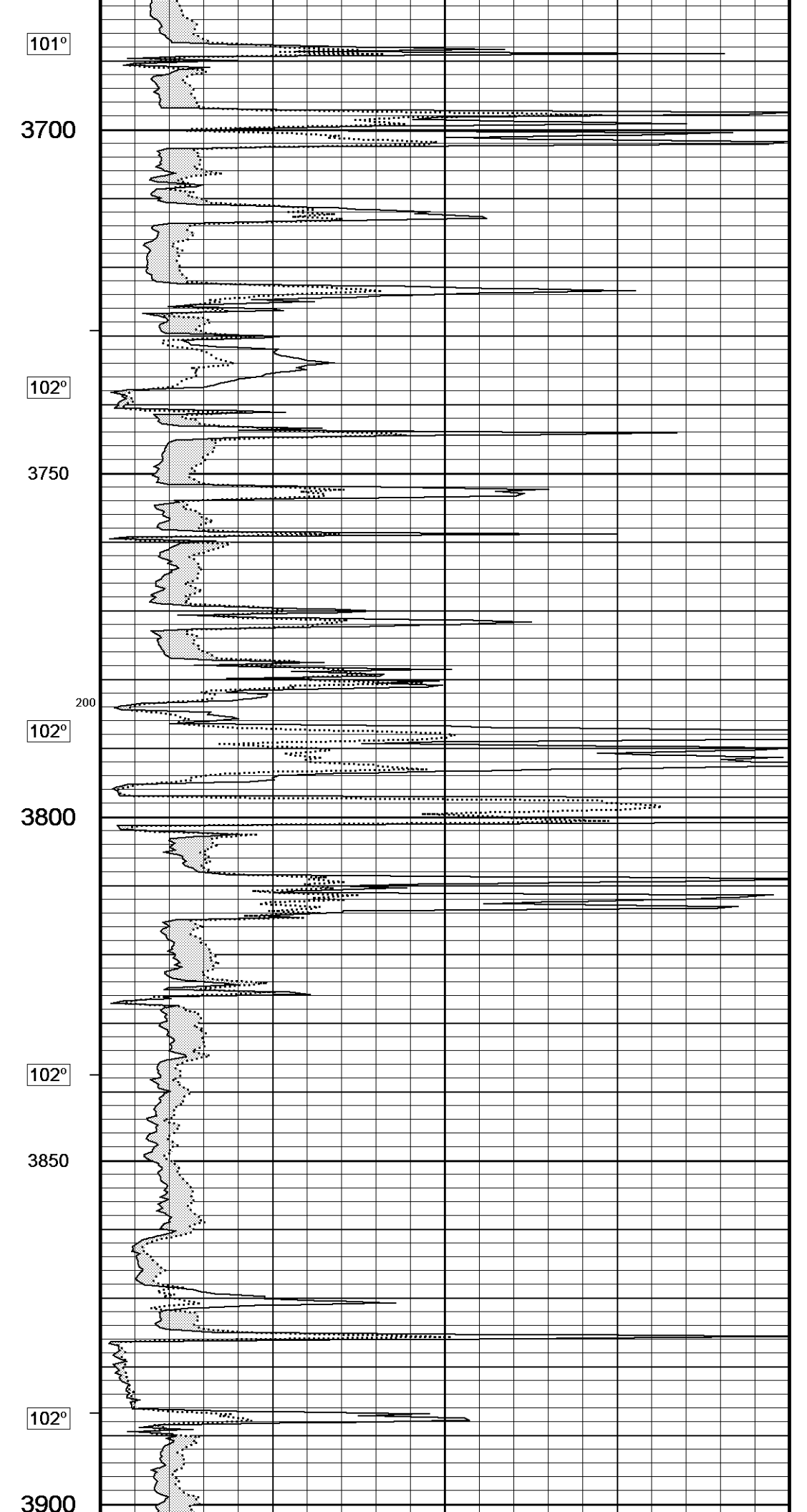
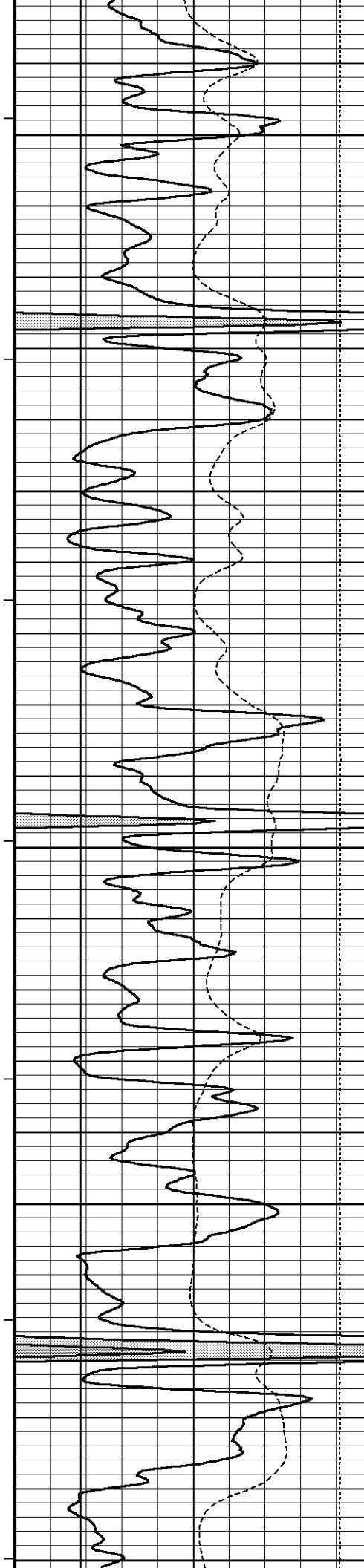
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy

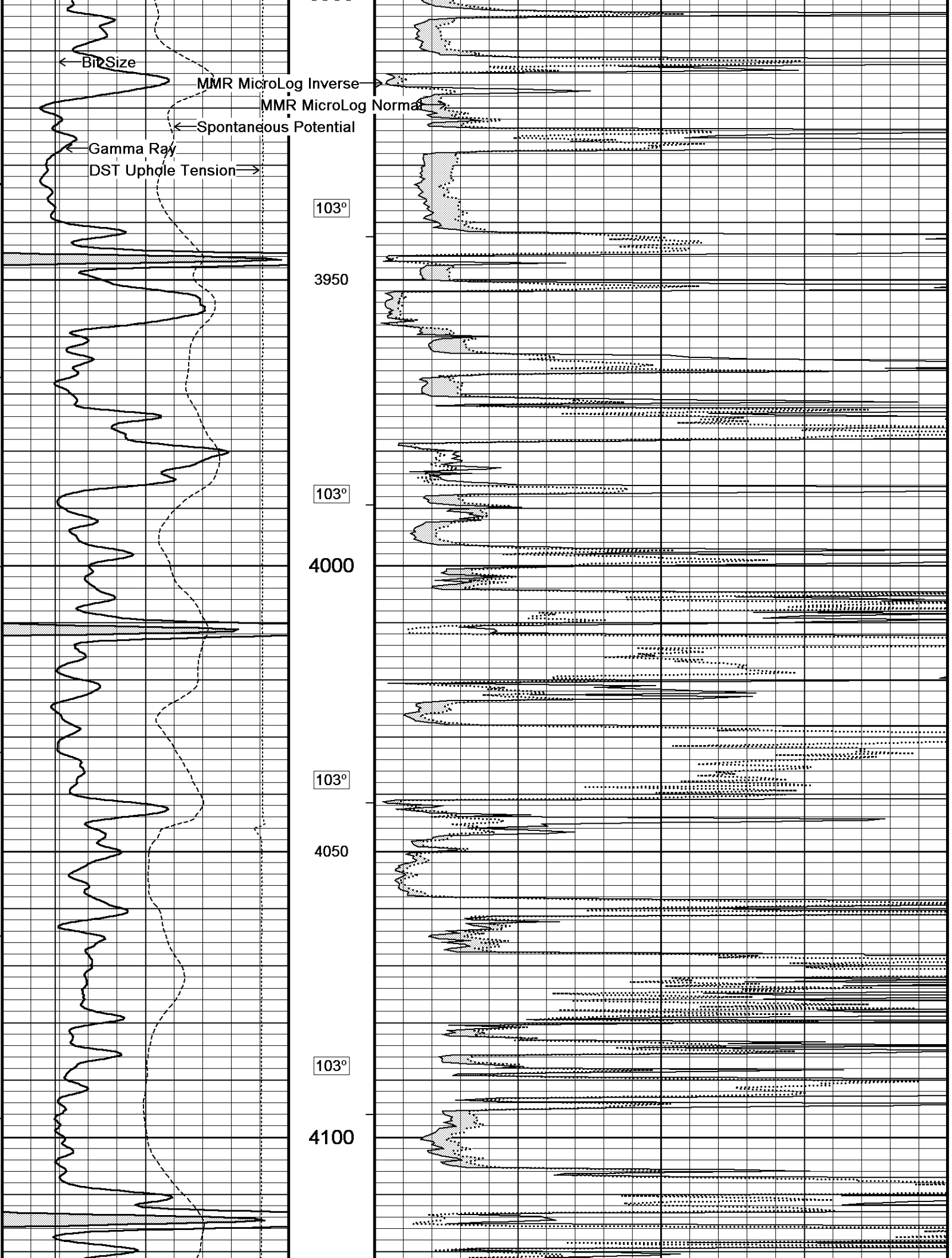
or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

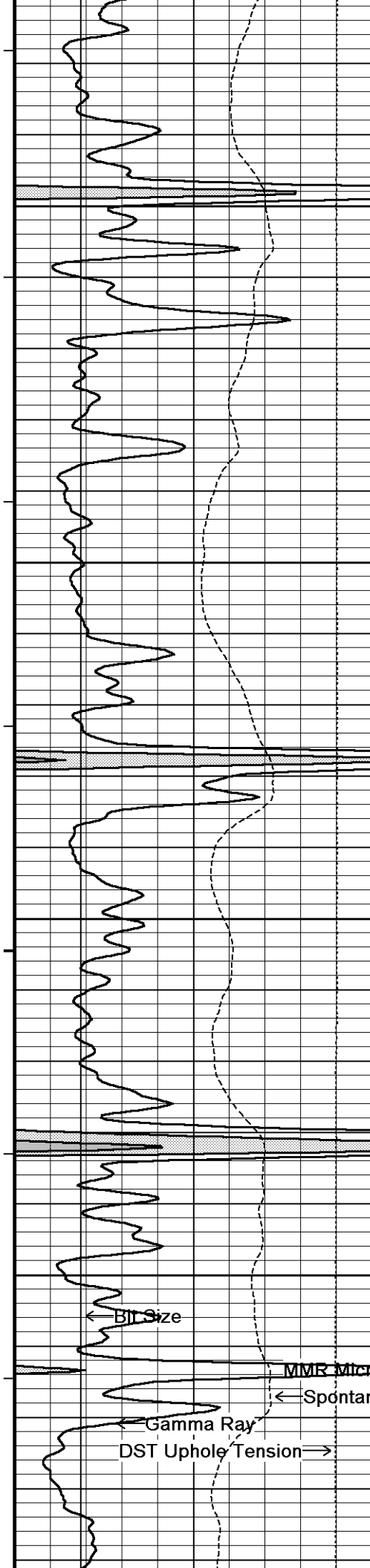
5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 15-MAR-2013 13:47
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamo...\Grand Mesa Vulgamore #2-31 Main.dta Recorded on 15-MAR-2013 10:38
 System Versions: Processed with 13.04.8492 Plotted with 13.04.8492









103°

4150

103°

4200

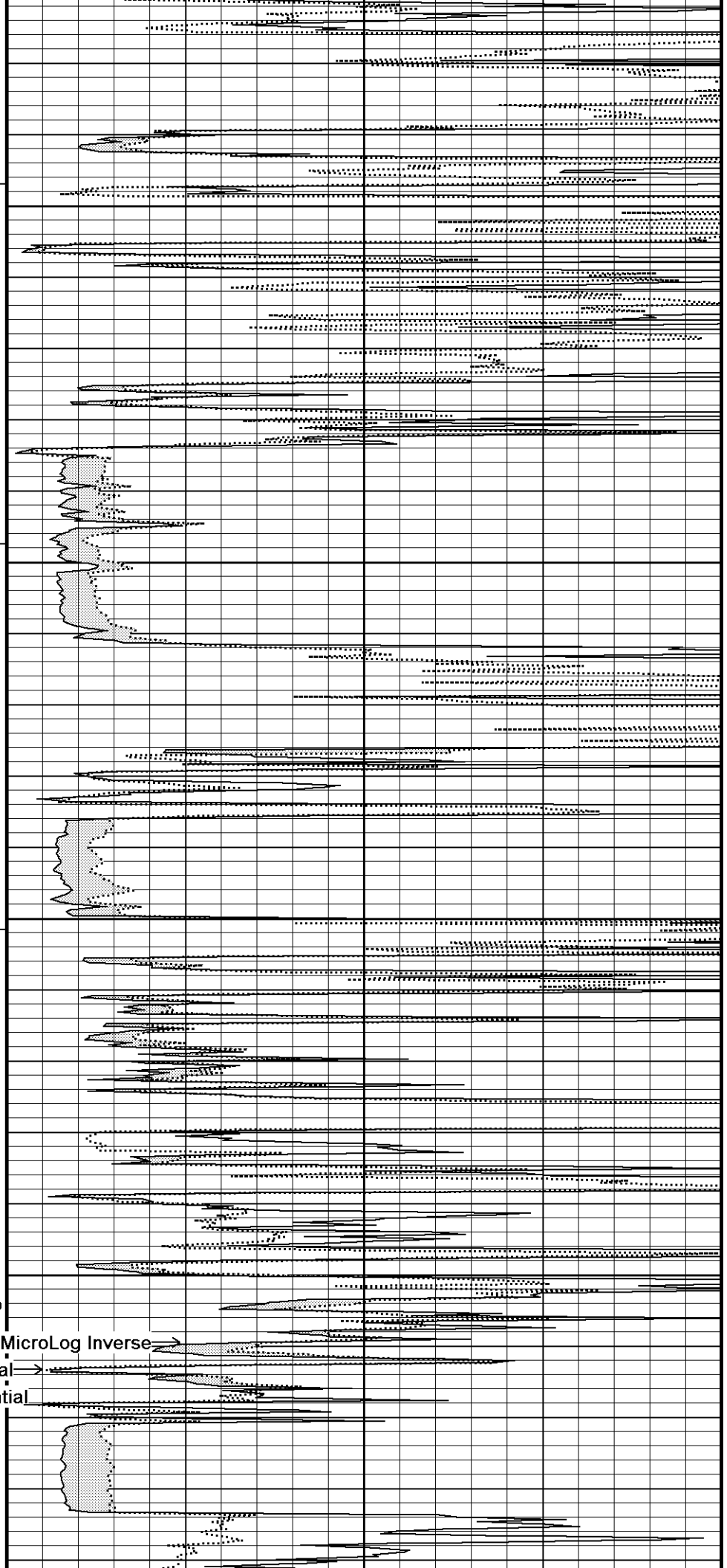
103°

4250

104°

4300

104°



100

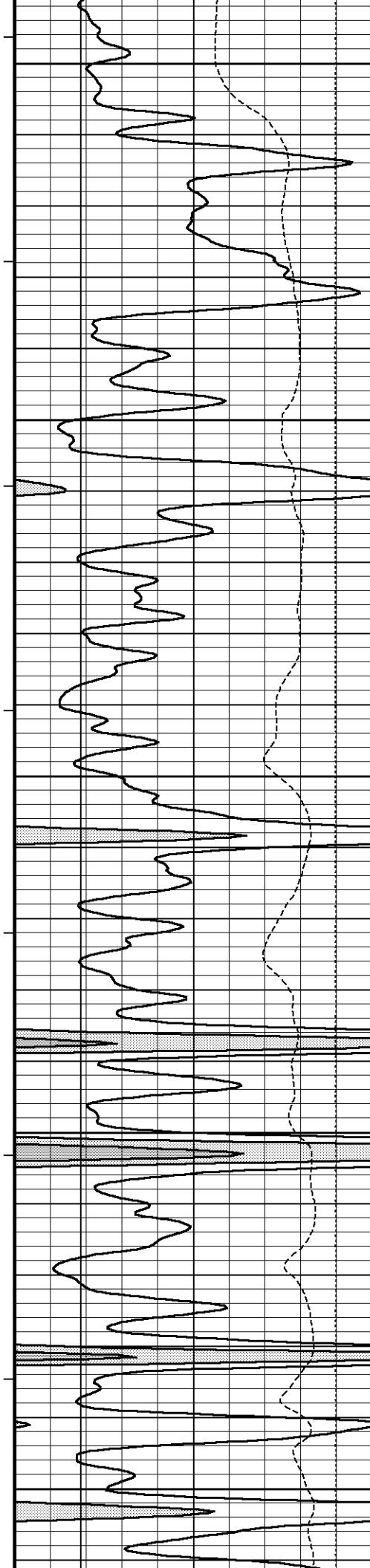
MMR MicroLog Inverse →

← MMR MicroLog Normal

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →



4350

104°

4400

105°

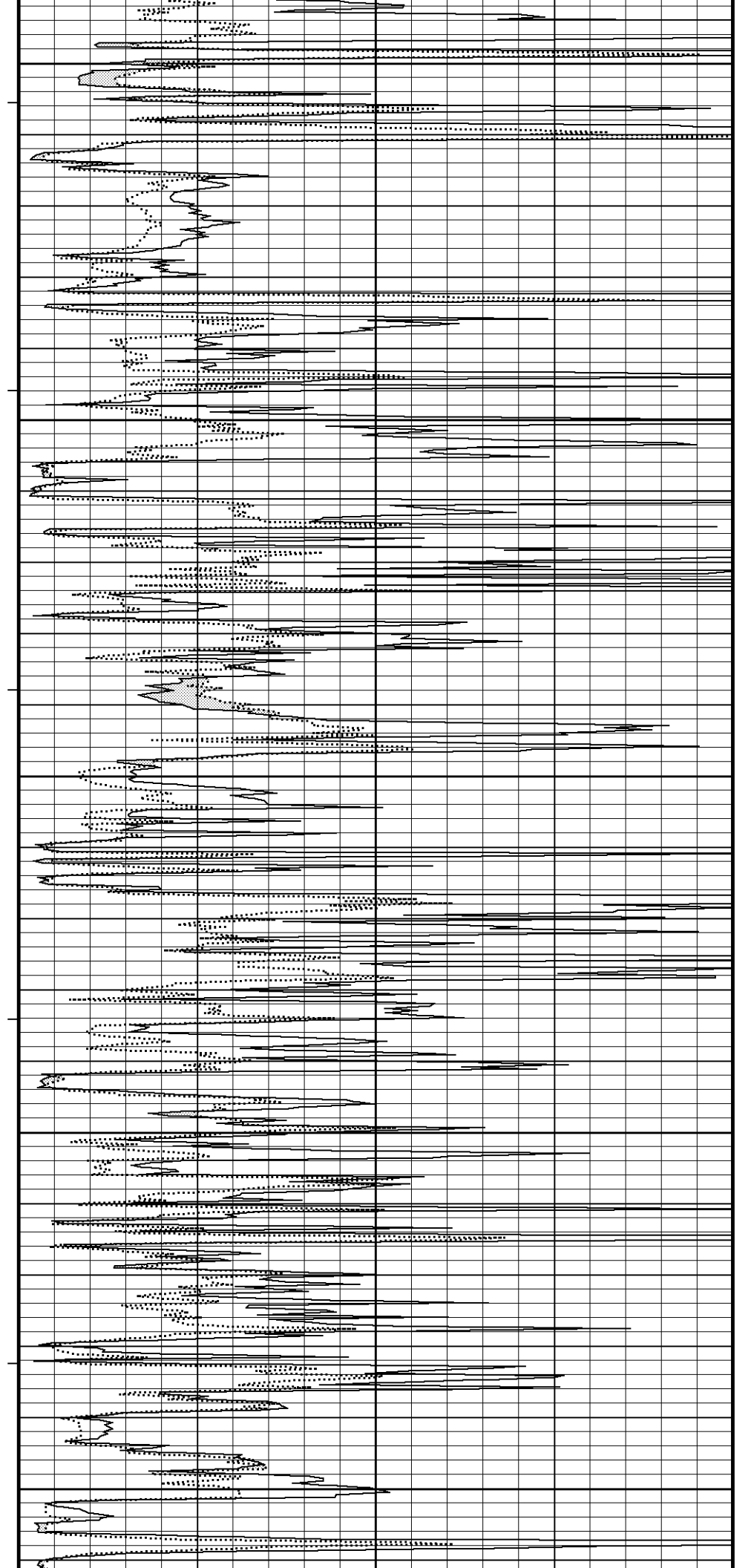
4450

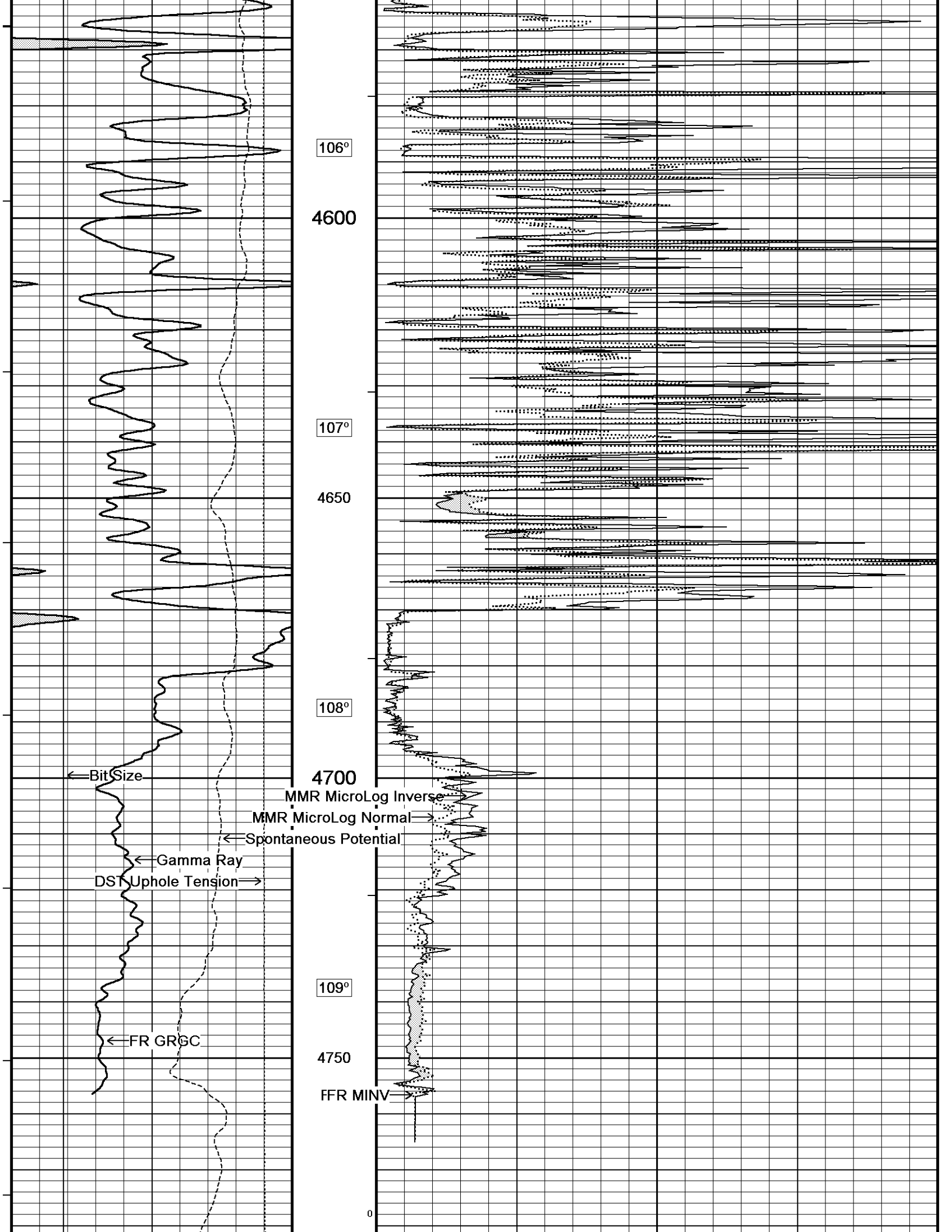
105°

4500

105°

4550





FR SMTU:PSG

4800

4812

Depth
in
Feet

Timing Marks
every 60.0 sec

Gamma Ray

API

75

225

300

0 150

150 300

Borehole
Temp in
deg F

Spontaneous Potential

millivolts

- -> | 20 | <- +

Annular
Integral
every
10 cu ft

Bit Size
inches

11

6 16

Replay
Scale
1:240

DST Uphole Tension
pounds

5000

0

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 15-MAR-2013 13:47

Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamo...\Grand Mesa Vulgamore #2-31 Main.dta

Recorded on 15-MAR-2013 10:38

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5 INCH MAIN



REPEAT SECTION



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 15-MAR-2013 13:47

Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulga...\Grand Mesa Vulgamore #2-31 Repeat.dta

Recorded on 15-MAR-2013 09:59

System Versions: Processed with 13.04.8492 Plotted with 13.04.8492

Depth
in
Feet

Timing Marks
every 60.0 sec

Gamma Ray

API

75

225

300

0 150

150 300

Borehole
Temp in
deg F

MMR MicroLog Normal

ohm metres

0 10 20 30 40

Spontaneous Potential

millivolts
- -> | 20 | <- +

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Annular
Integral
every
10 cu ft

MMR MicroLog Inverse
ohm metres

0 10 20 30 40

Replay
Scale
1:240

4450

104°

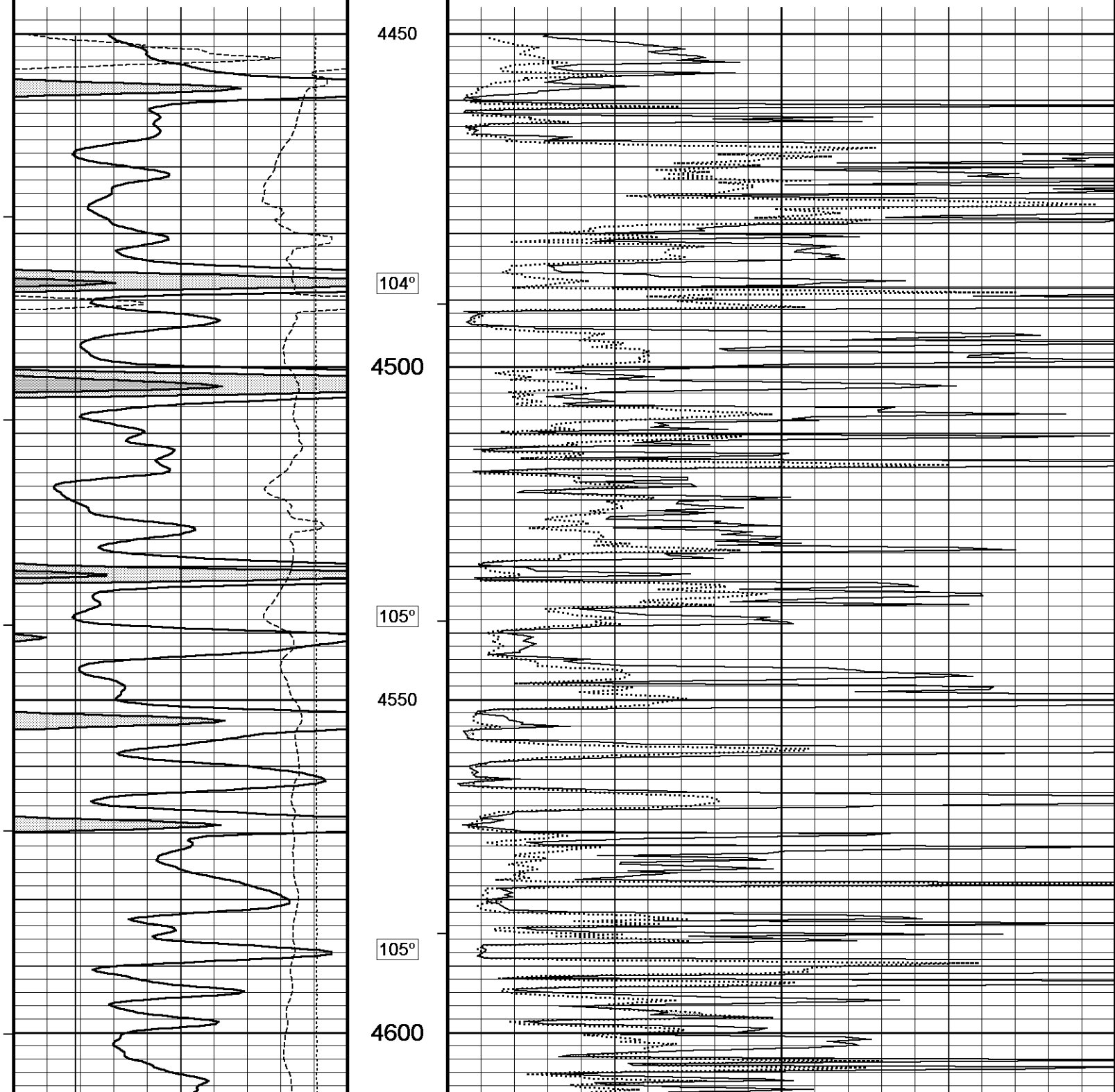
4500

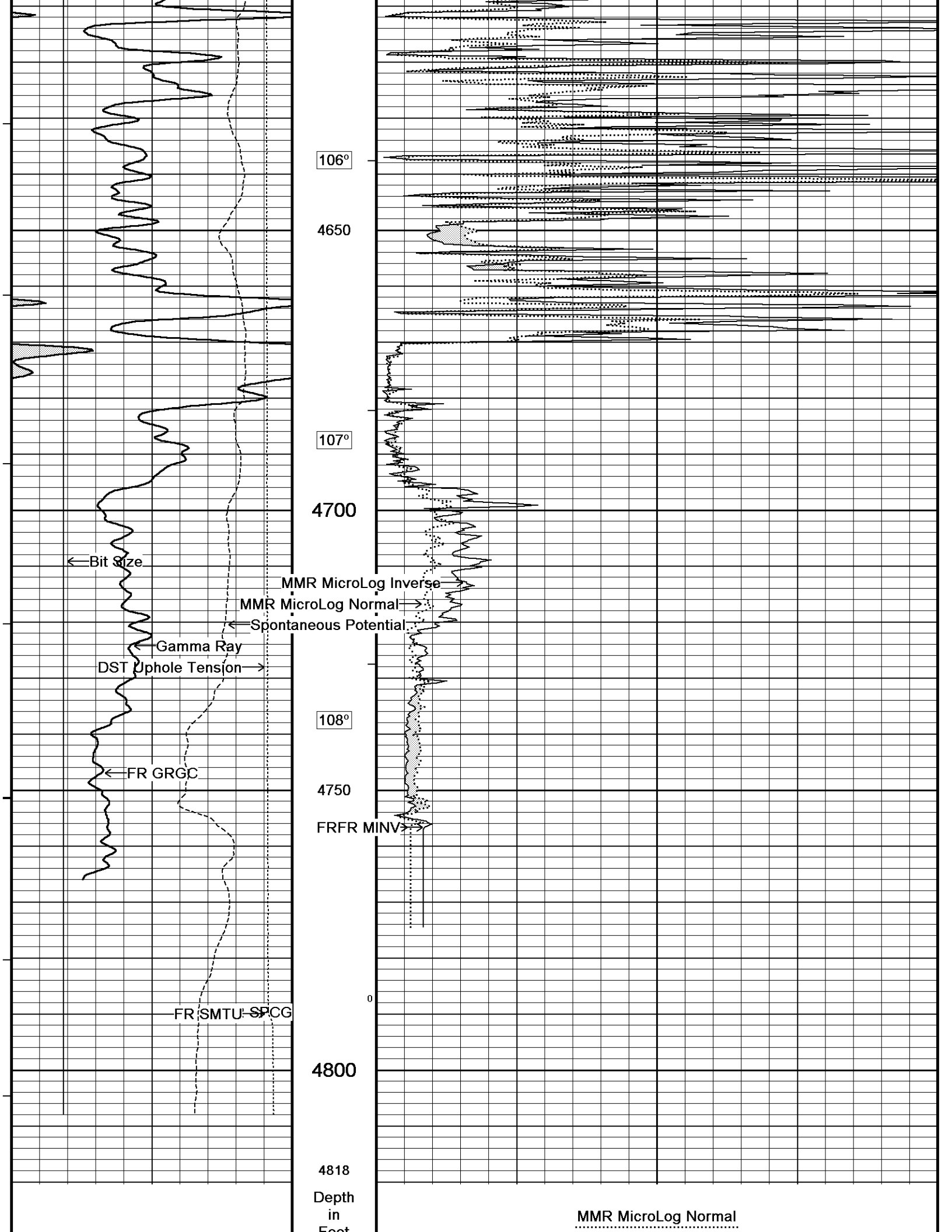
105°

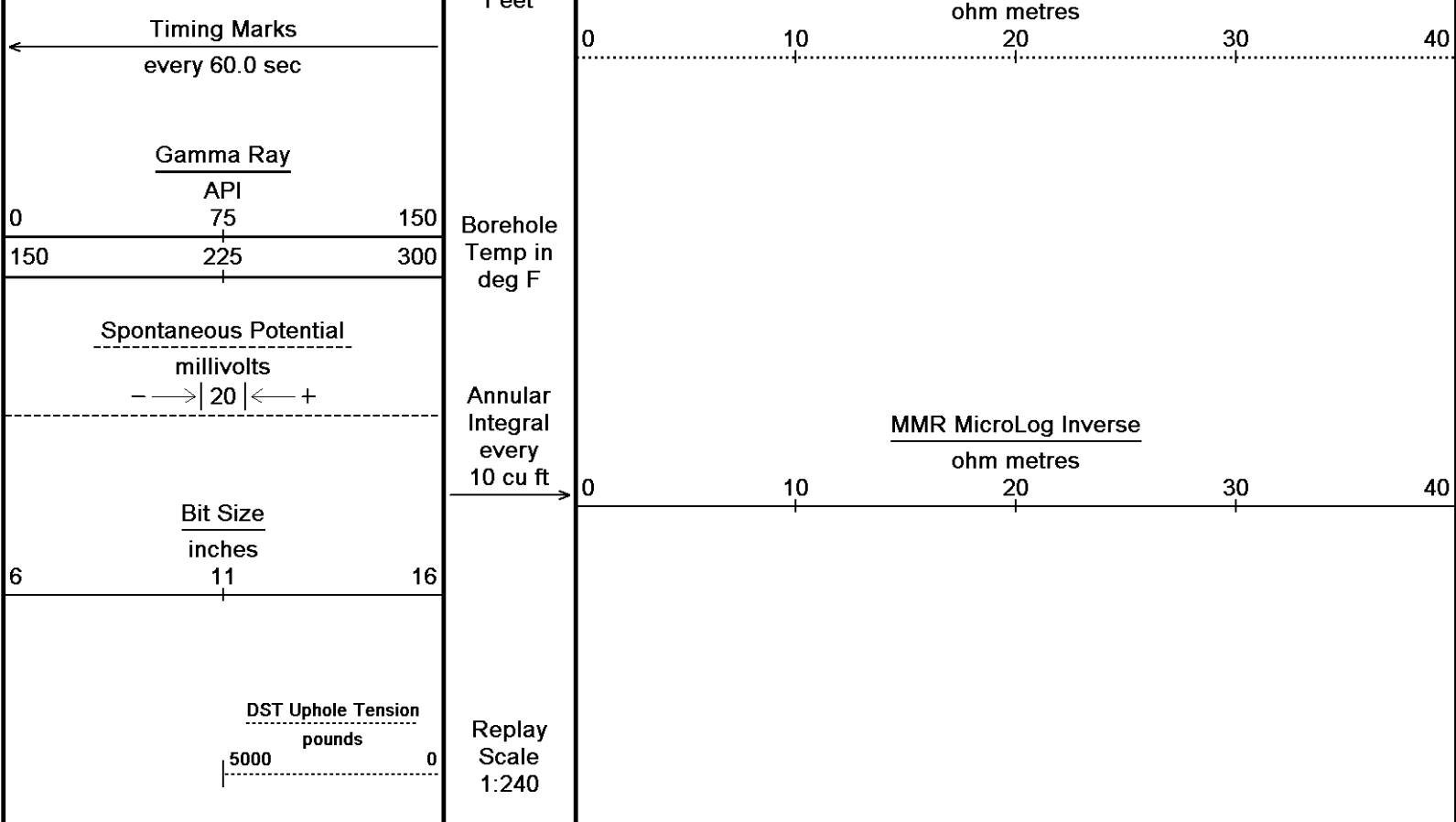
4550

105°

4600







Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 15-MAR-2013 13:47
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulga...\Grand Mesa Vulgamore #2-31 Repeat.dta
 Recorded on 15-MAR-2013 09:59
 System Versions: Processed with 13.04.8492 Plotted with 13.04.8492

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION
 C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31\Grand Mesa Vulgamore #2-31 Main.dta

General Constants All 000 Last Edited on 15-MAR-2013,13:23

General Parameters

Mud Resistivity	1.070	ohm-metres
Mud Resistivity Temperature	66.000	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	

Rwa Parameters

Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Six Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	

Down-hole Tension Calibration SMS 0 Field Calibration on 09-FEB-2013 07:52

Reading No	Measured	Calibrated (lbs)
1	15612.38	0.00
2	16153.00	384.00

Gamma Calibration MCG-C 84 Field Calibration on 14-MAR-2013 10:31

	Measured	Calibrated (API)
Background	76	52

Calibrator (Gross)	1151	777
Calibrator (Net)	1075	725

Gamma Constants MCG-C 84		Last Edited on 14-MAR-2013,19:57	
Gamma Calibrator Number	GRC38		
Mud Density	1.12	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	

SP Calibration MCG-C 84		Field Calibration on 20-FEB-2013,08:14	
	Measured	Calibrated (mV)	
Reference 1	101.0	100.0	
Reference 2	-99.0	-100.0	

High Resolution Temperature Calibration MCG-C 84		Field Calibration on 20-FEB-2013,08:14	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	

High Resolution Temperature Constants MCG-C 84		Last Edited on 20-FEB-2013,08:14	
Pre-filter Length	11		

Micro Normal and Micro Inverse Calibration MML-A 16		Base Calibration on 03-MAR-2013 21:50		Field Check on 14-MAR-2013 10:26	
Base Calibration					
		Measured		Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2	
Micro Normal	12.2	60.2	5.0	25.0	
Micro Inverse	15.6	78.3	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 16		Last Edited on 14-MAR-2013,10:24			
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

Caliper Calibration MML-A 16		Base Calibration on 03-MAR-2013 21:58				Field Calibration on 14-MAR-2013 10:24	
Base Calibration							
Reading No		Measured		Calibrator Size (in)			
1		14207		5.98			
2		17398		7.97			
3		20559		9.86			
4		24346		11.92			
5		0		0.00			
6		N/A		N/A			
Field Calibration							
		Measured Caliper (in)		Actual Caliper (in)			
		5.95		5.98			

Neutron Calibration MDN-B.J 387		Base Calibration on 19-FEB-2013 14:31				Field Check on 14-MAR-2013 10:36	
Base Calibration							
		Measured		Calibrated (cps)			
		Near	Far	Near	Far		
		2848	86	3714	110		
Ratio		33.156		33.764			
Field Calibrator at Base							
				Calibrated (cps)			
				1727 2589			
Ratio		0.667					
Field Check							
				Calibrated (cps)			

Field Check

	Calibrated (cps)
1748	2586
	0.681

Ratio

Neutron Constants MDN-B.J 387

Last Edited on 14-MAR-2013,10:31

Neutron Source Id	P58125B		
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	N/A	kpsi	
Temperature Source	None		
Temperature	N/A	degrees F	
Mud Salinity	0.00	kppm	
Salinity Correction	Not Applied		
Formation Fluid Salinity Source	Constant Value		
Formation Fluid Salinity	0.00	kppm	
Barite Mud Correction	Not Applied		

FE Calibration MFE-A.A 55

 Base Calibration on 19-FEB-2013 15:08
 Field Check on 14-MAR-2013 10:14

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	962.2	126.8
Base Check		278.4
Field Check		278.6

FE Constants MFE-A.A 55

Last Edited on 14-MAR-2013,10:13

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 178

Field Calibration on 13-DEC-2012,11:50

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

High Resolution Temperature Constants MAI-A.A 178

Last Edited on 13-DEC-2012,11:50

Pre-filter Length 11

Induction Calibration MAI-A.A 178

 Base Calibration on 15-MAY-2012,14:15
 Field Check on 14-MAR-2013 10:12

Base Calibration

Test Loop Calibration Channel	Measured		Calibrated (mmho/m)	
	Low	High	Low	High
1	17.6	484.7	9.3	966.2
2	6.2	391.4	7.6	821.4
3	4.0	264.5	5.2	566.0
4	2.3	135.1	2.6	279.2

Array Temperature 77.0 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			12.1	3763.9
2			29.6	3468.2
3			27.3	3014.9
4			18.8	2065.4

Deep	15.9	1995.7
Medium	40.3	3956.4
Shallow	45.4	5083.9

Array Temperature 68.7 Deg F

Induction Constants MAI-A.A 178

Last Edited on 14-MAR-2013,10:10

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	

Photo Density Calibration MPD-B 59

Base Calibration on 19-FEB-2013 11:59

Field Check on 14-MAR-2013 10:22

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	56259	27502	59556	30836
Reference 2	22873	2493	24941	2541

Field Check at Base

1193.1 1265.6

Field Check

1198.6 1267.3

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	217	1070		
Reference 1	21109	56074	0.380	0.371
Reference 2	6069	22738	0.270	0.272

Field Check at Base

216.6 1070.1

Field Check

Density Constants MPD-B 59

Last Edited on 14-MAR-2013,19:57

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	1.12	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 (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	0.00	

Caliper Calibration MPD-B 59

Base Calibration on 19-FEB-2013 11:40

Field Calibration on 14-MAR-2013 10:17

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	17738	3.99
2	26272	5.98
3	35152	7.97
4	43249	9.86
5	52268	11.92
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	5.97	5.98

DOWNHOLE EQUIPMENT

C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31\Grand Mesa Vulgamore #2-31 Main.dta

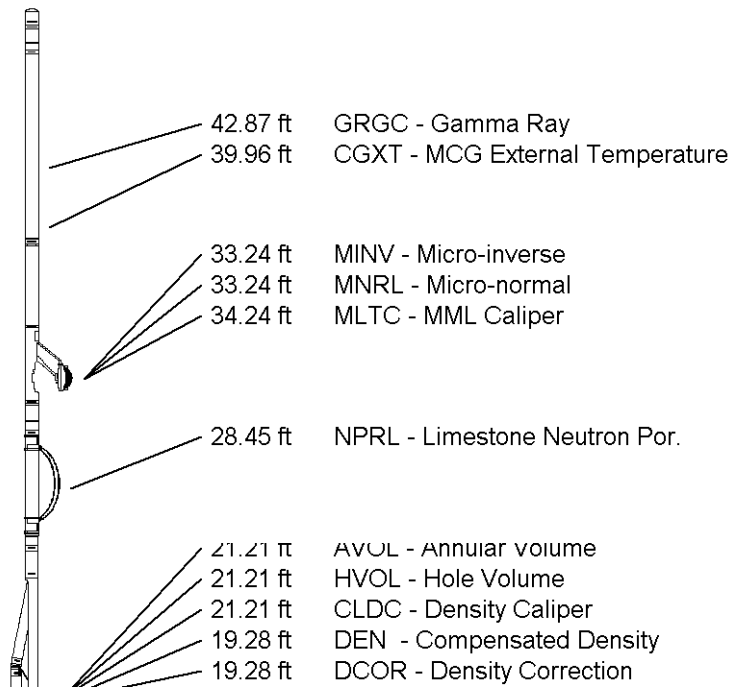
3/8" Triple Cone Cable Head (MCB C A)
MCB-C.A 5 LG: 1.58 ft WT: 15.4 lb OD: 2.24 in

Compact Comms Gamma
MCG-C 84 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

Compact Neutron
MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

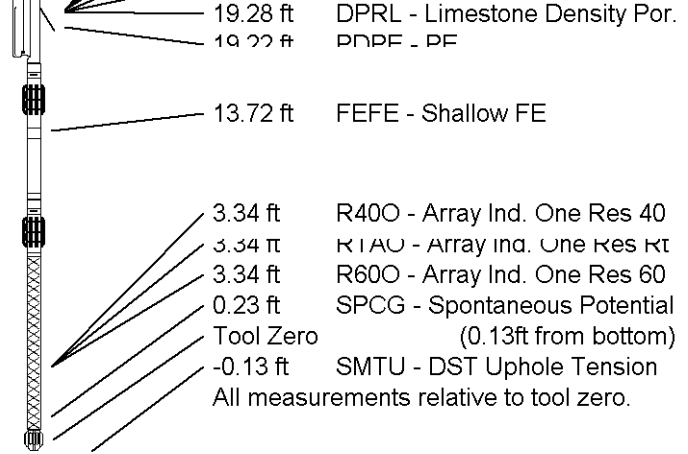
Compact Density/Caliper
MPD-B 59 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in



Compact Focused Electric
 MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
 MAI-A.A 178 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 49.73 ft Weight: 399.0 lb



COMPANY	GRAND MESA OPERATING CO.
WELL	VULGAMORE #2-31
FIELD	WILDCAT
PROVINCE/COUNTY	SCOTT
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2996.00	feet	First Reading	4757.00	feet
Elevation Drill Floor	2994.00	feet	Depth Driller	4790.00	feet
Elevation Ground Level	2991.00	feet	Depth Logger	4790.00	feet



Weatherford[®]

MICRORESISTIVITY LOG