Weatherford®

COMPACT PHOTO DENSITY COMPENSATED NEUTRON 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	RGE	Other Services
31	19S	33W	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

Elevations:	feet
KB	2996.00
DF	2994.00
GL	2991.00

Date	15-MAR-2013			
Run Number	ONE			
Service Order	3838997			
Depth Driller	4790.00	feet		
Depth Logger	4790.00	feet		
First Reading	4771.00	feet		
Last Reading	3600.00	feet		
Casing Driller	223.00	feet		
Casing Logger	222.00	inches		
Bit Size	7.875			
Hole Fluid Type	CHEMICAL	lb/USg		
Density / Viscosity	9.35 lb/USg	48.00 CP		
PH / Fluid Loss	9.50	9.50		
Sample Source	MUDPIT			
Rm @ Measured Temp	1.07 @ 66.0	ohm-m		
Rmf @ Measured Temp	0.86 @ 66.0	ohm-m		
Rmc @ Measured Temp	1.28 @ 66.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.65 @109.0	ohm-m		
Time Since Circulation	3 HOURS			
Max Recorded Temp	109.00	deg F		
Equipment / Base	13025	LIB		
Recorded By	R.HOFFMAN		D.CARTER	
Witnessed By	JOHN GOLDSMITH			
JOB #	LB13-070			

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.

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-MAR-2013 13:50
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

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Density 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

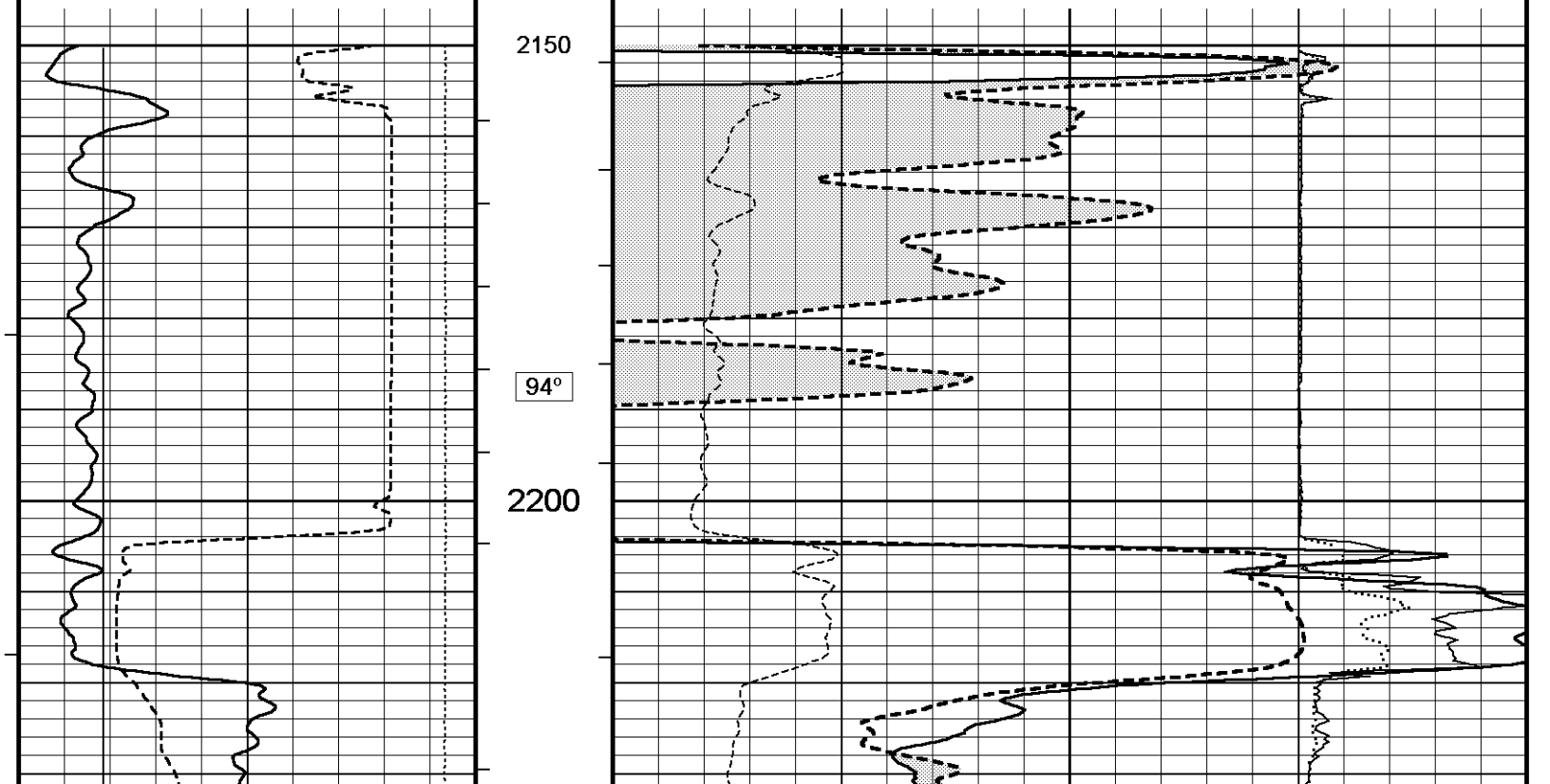
Limestone Neutron Por.
percent
30 20 10 0 -10

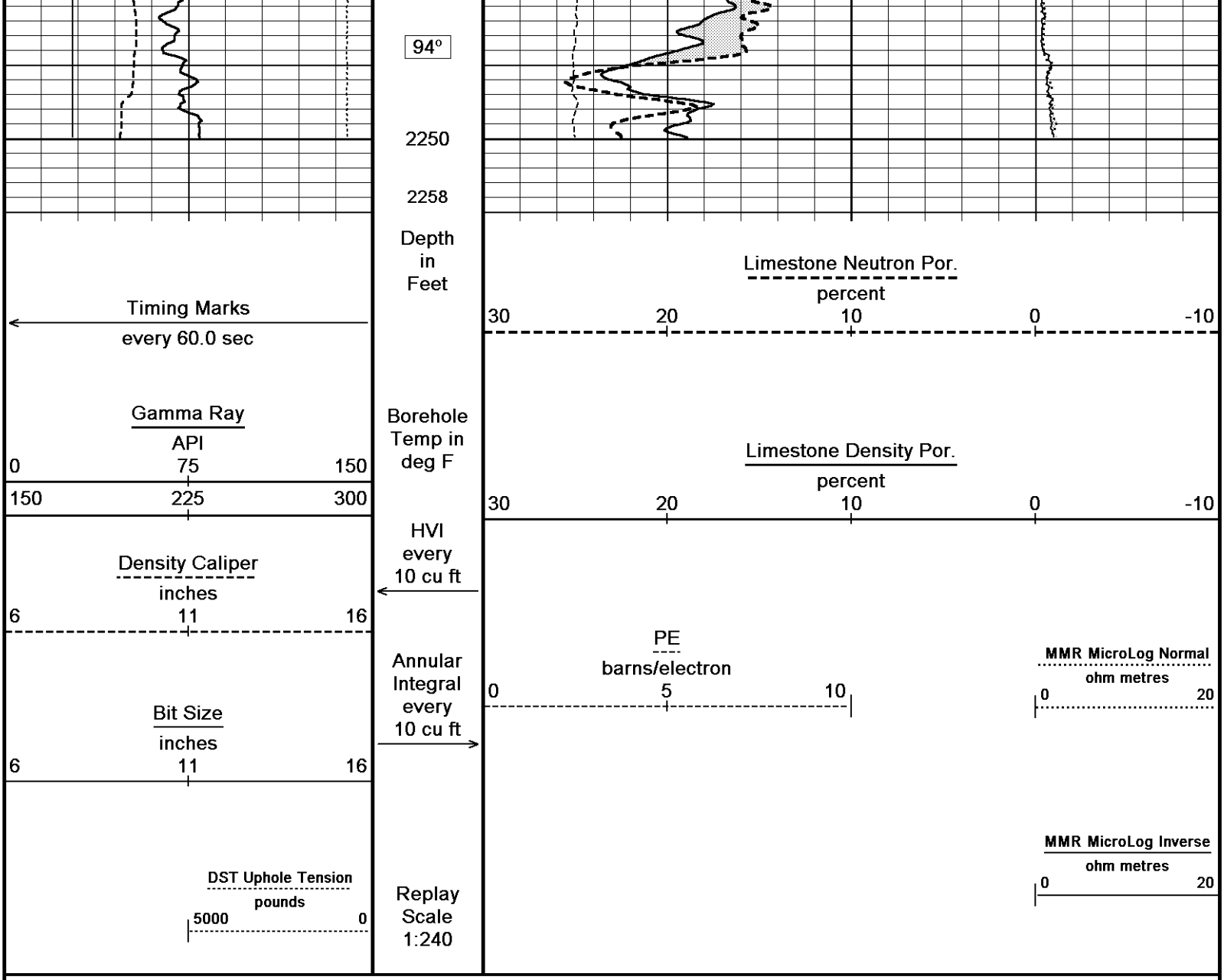
Limestone Density Por.
percent
30 20 10 0 -10

PE
barns/electron
0 5 10

MMR MicroLog Normal
ohm metres
0 20

MMR MicroLog Inverse
ohm metres
0 20





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5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm
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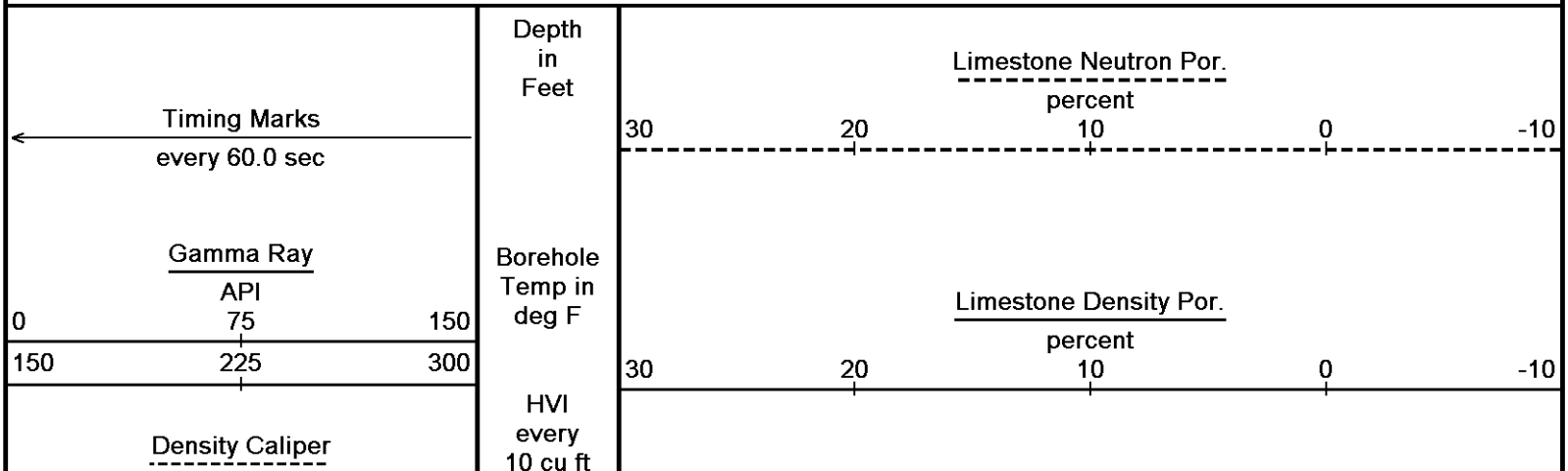
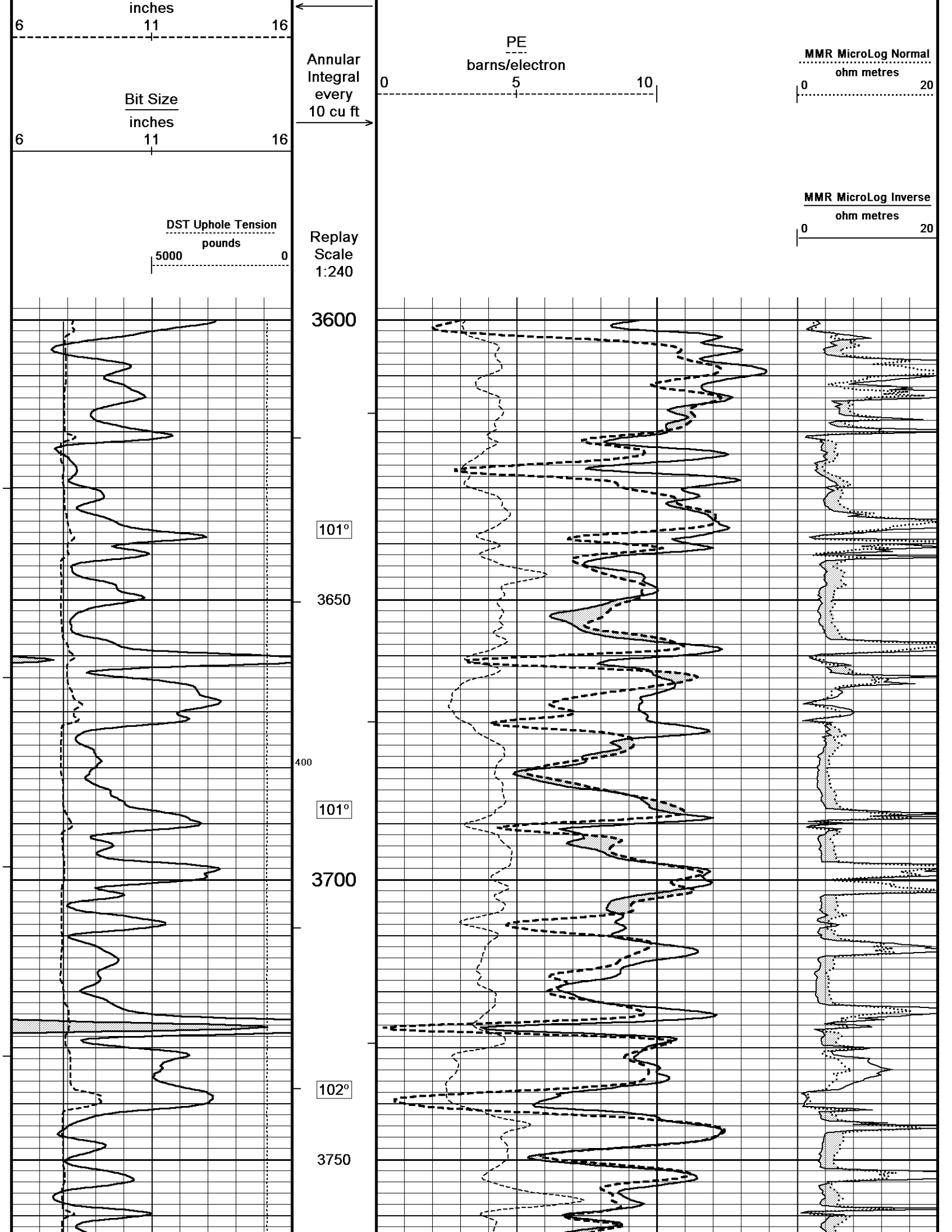
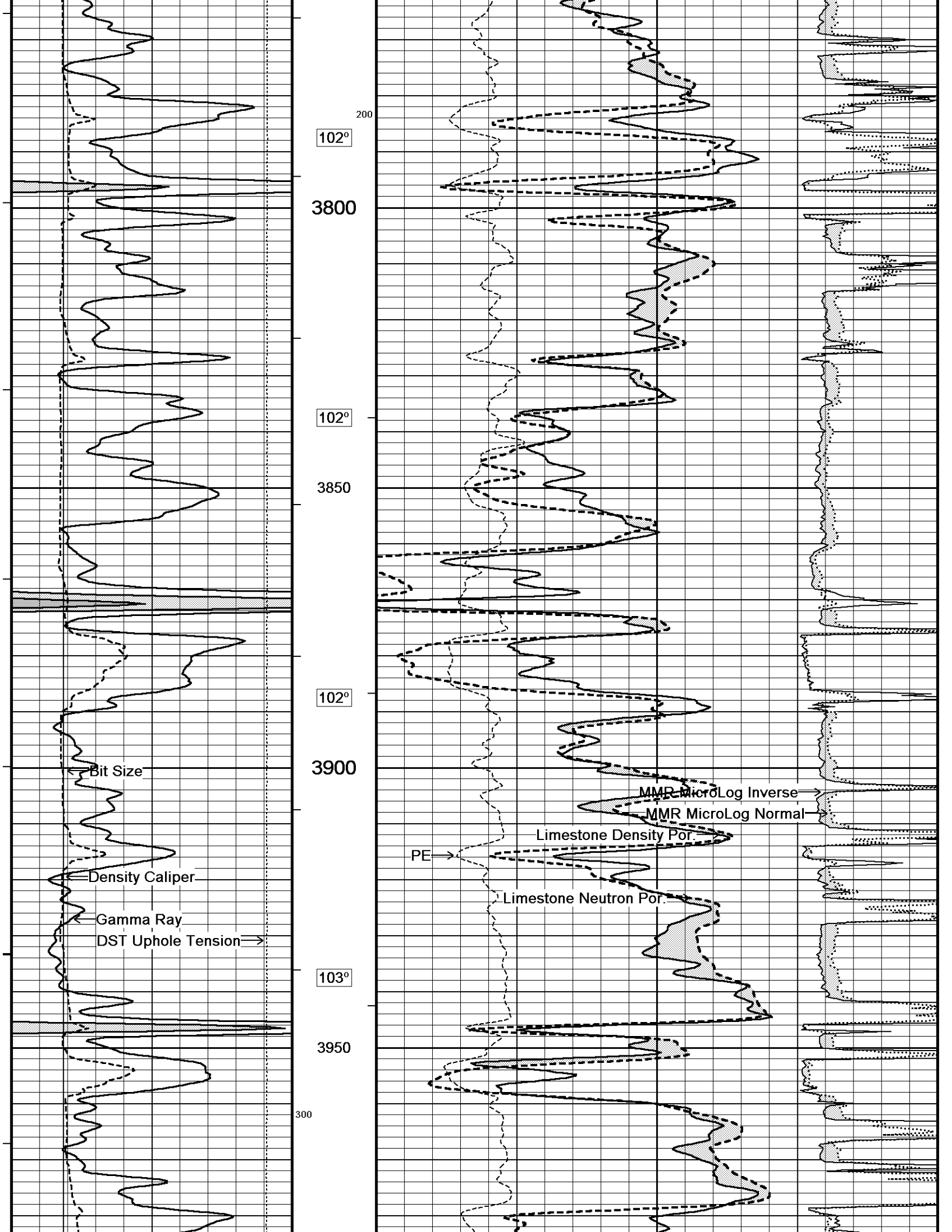
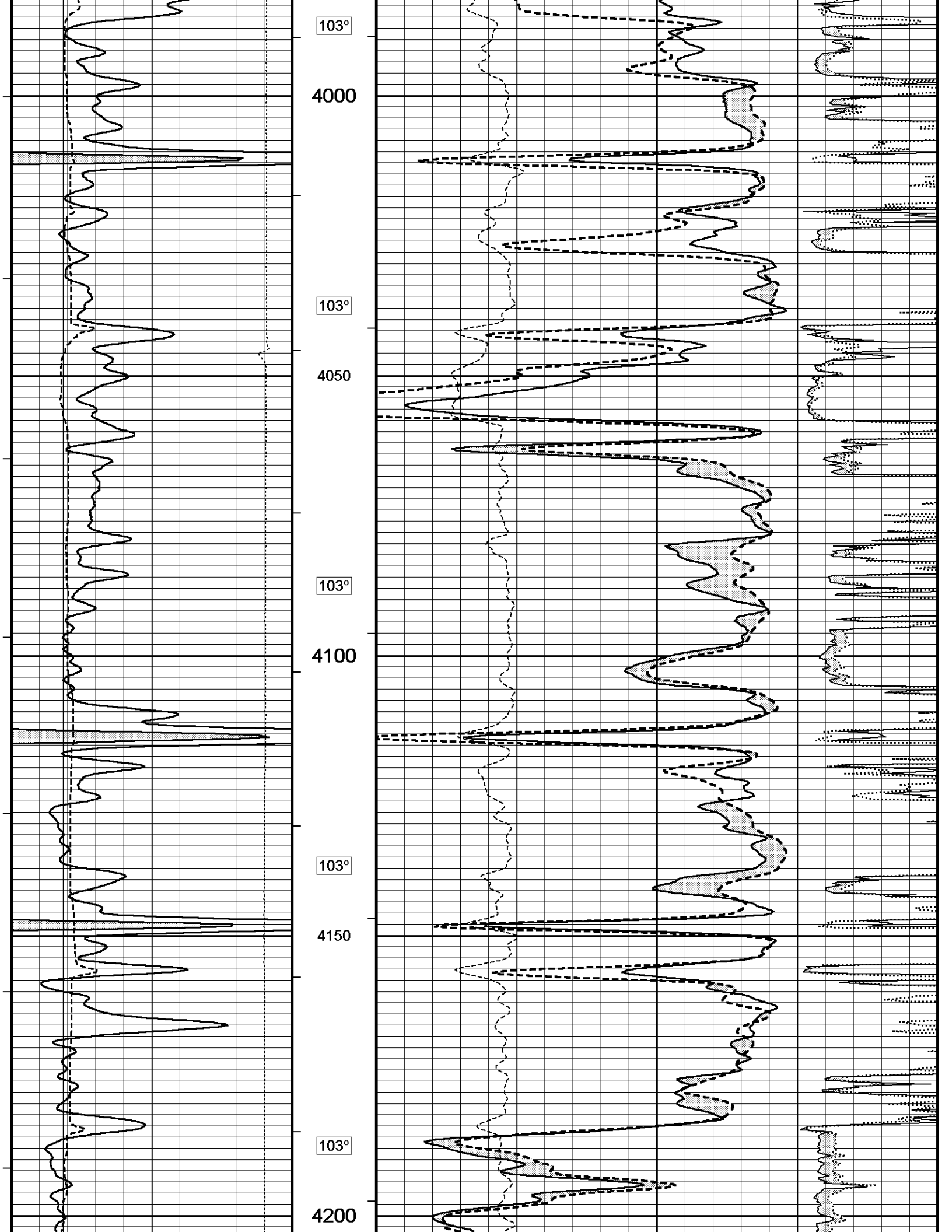
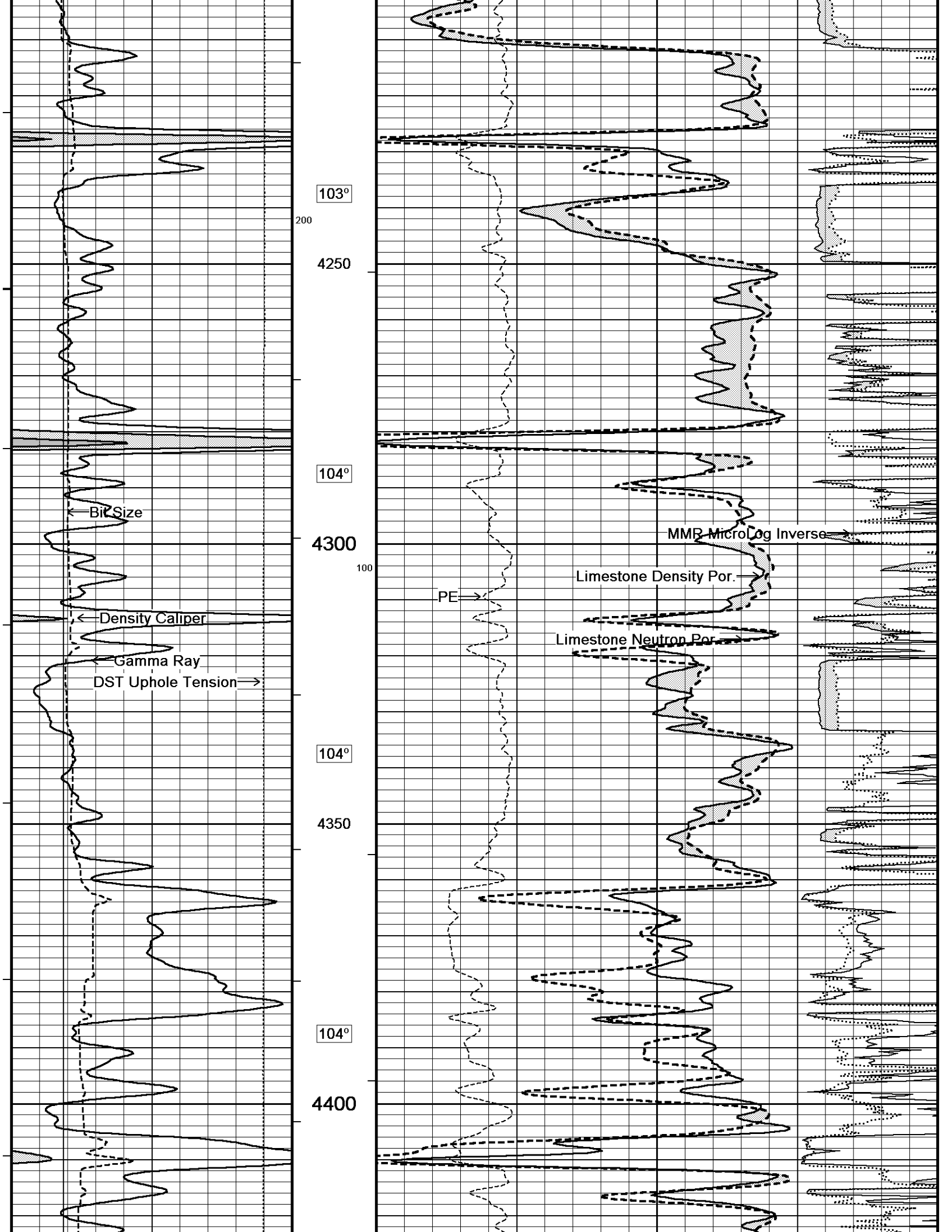
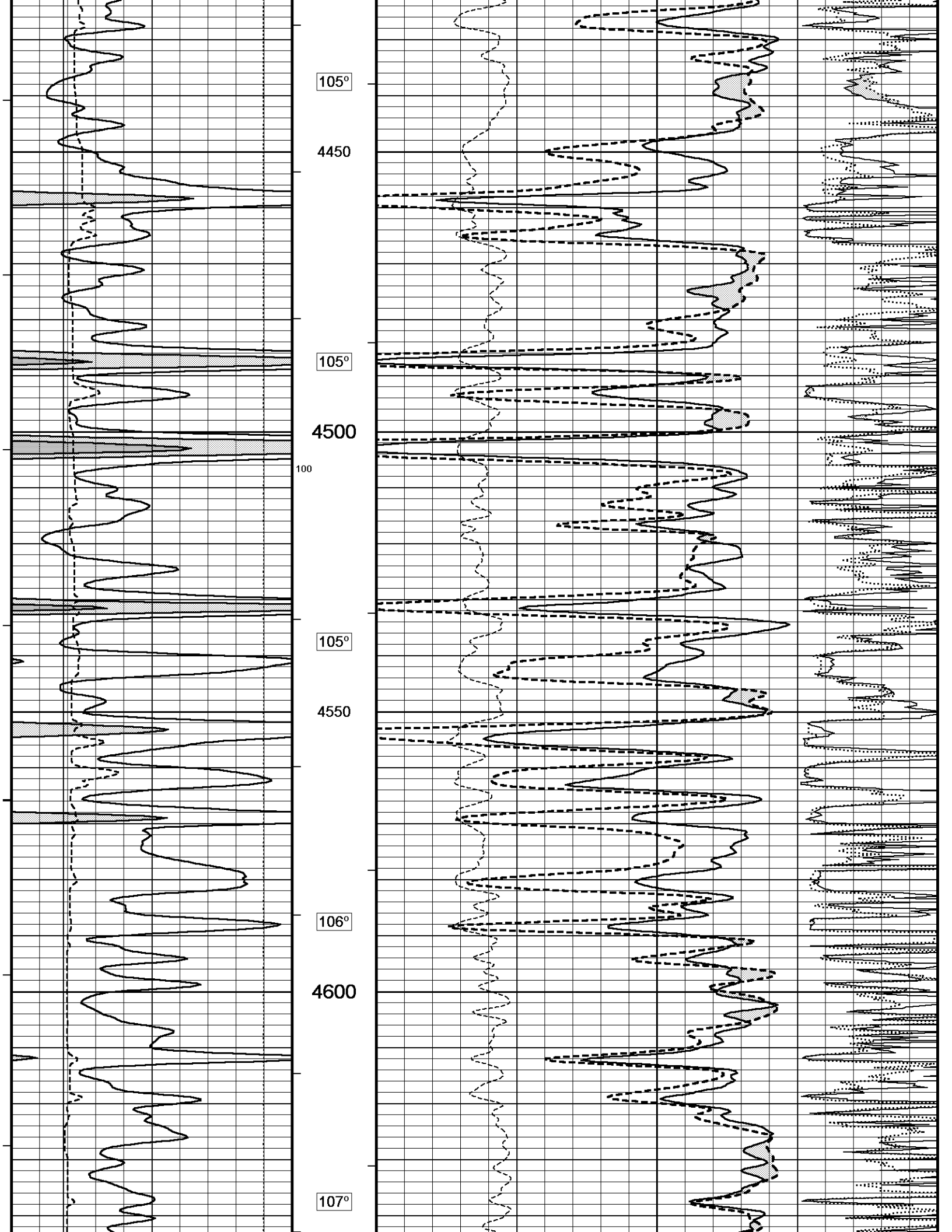


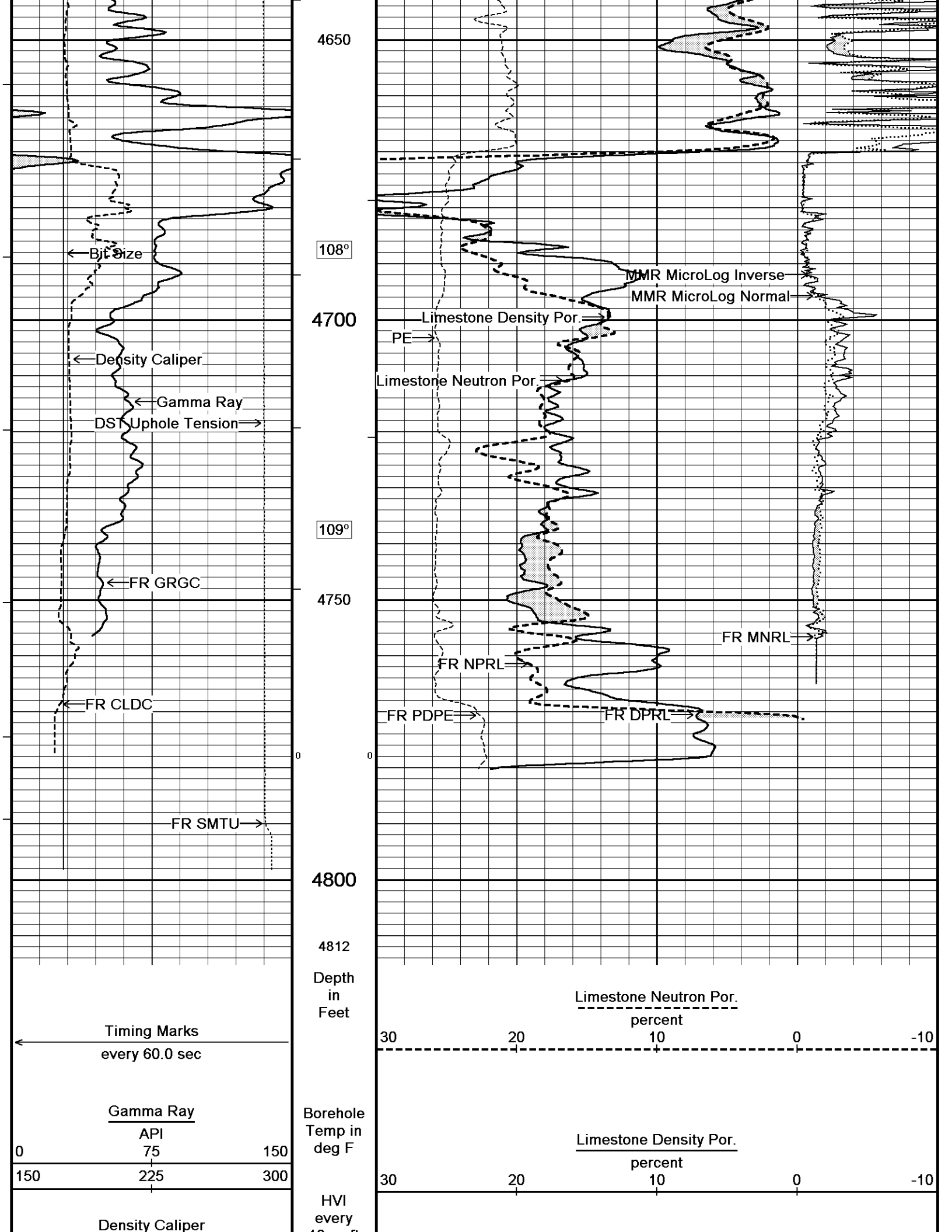

inches
6
11
16
Bit Size
inches
6
11
16
Annular Integral every 10 cu ft
PE
barns/electron
0
5
10
MMR MicroLog Normal
ohm metres
0
20
MMR MicroLog Inverse
ohm metres
0
20
DST Uphole Tension
pounds
5000
0
Replay Scale 1:240
3600
101°
3650
400
101°
3700
102°
3750

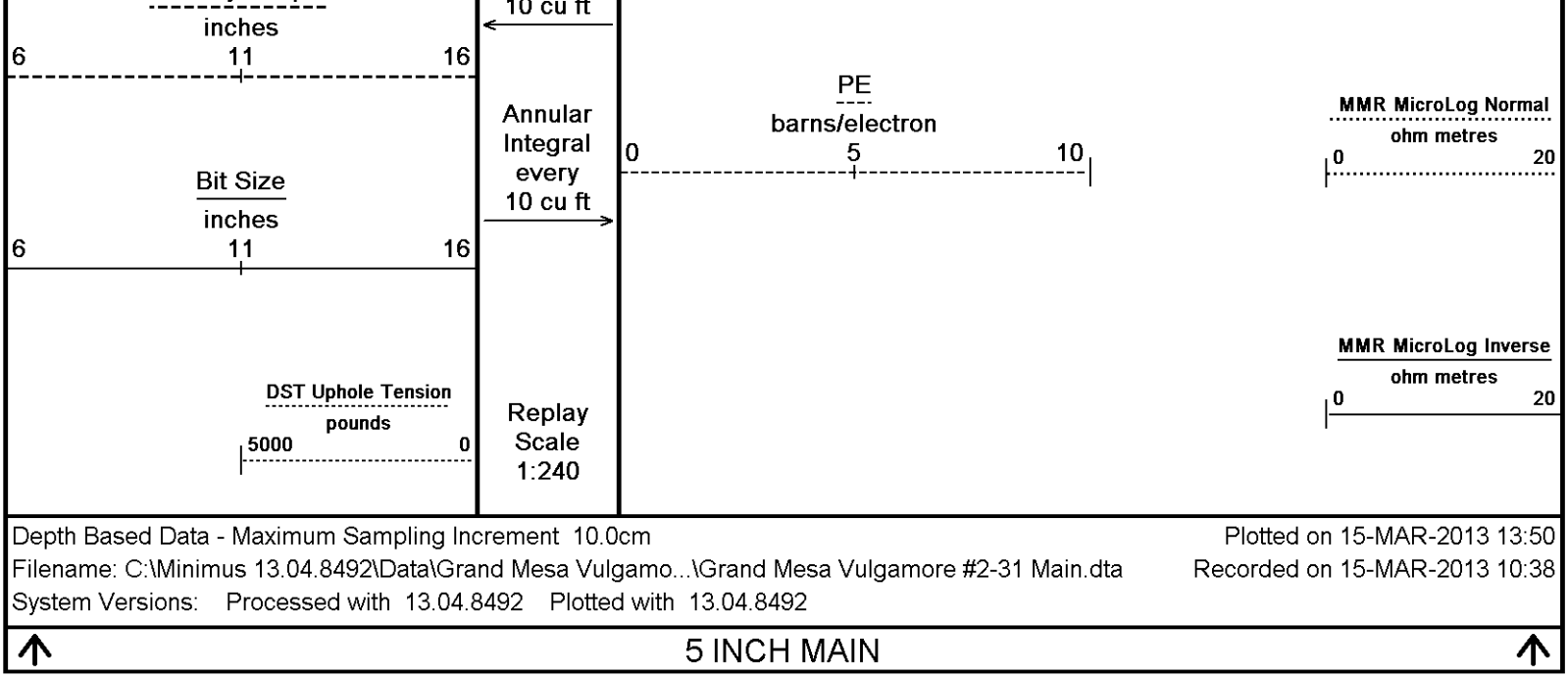

200
102°
3800
102°
3850
102°
3900
103°
3950
300
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
MMR MicroLog Inverse
MMR MicroLog Normal
Limestone Density Por.
PE
Limestone Neutron Por.


103°
4000
103°
4050
103°
4100
103°
4150
103°
4200


103°
200
4250
104°
Bit Size
4300
MMR MicroLog Inverse
100
Limestone Density Por.
PE
Density Caliper
Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
104°
4350
104°
4400


105°
4450
105°
4500
100
105°
4550
106°
4600
107°


4650
108°
4700
109°
4750
4800
4812
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
FR SMTU
MMR MicroLog Inverse
MMR MicroLog Normal
Limestone Density Por.
PE
Limestone Neutron Por.
FR MNRL
FR NPRL
FR PDPE
FR DPRL
0
0
Depth in Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Density Caliper
Borehole Temp in deg F
HVI
every
Limestone Neutron Por.
percent
30
20
10
0
-10
Limestone Density Por.
percent
30
20
10
0
-10



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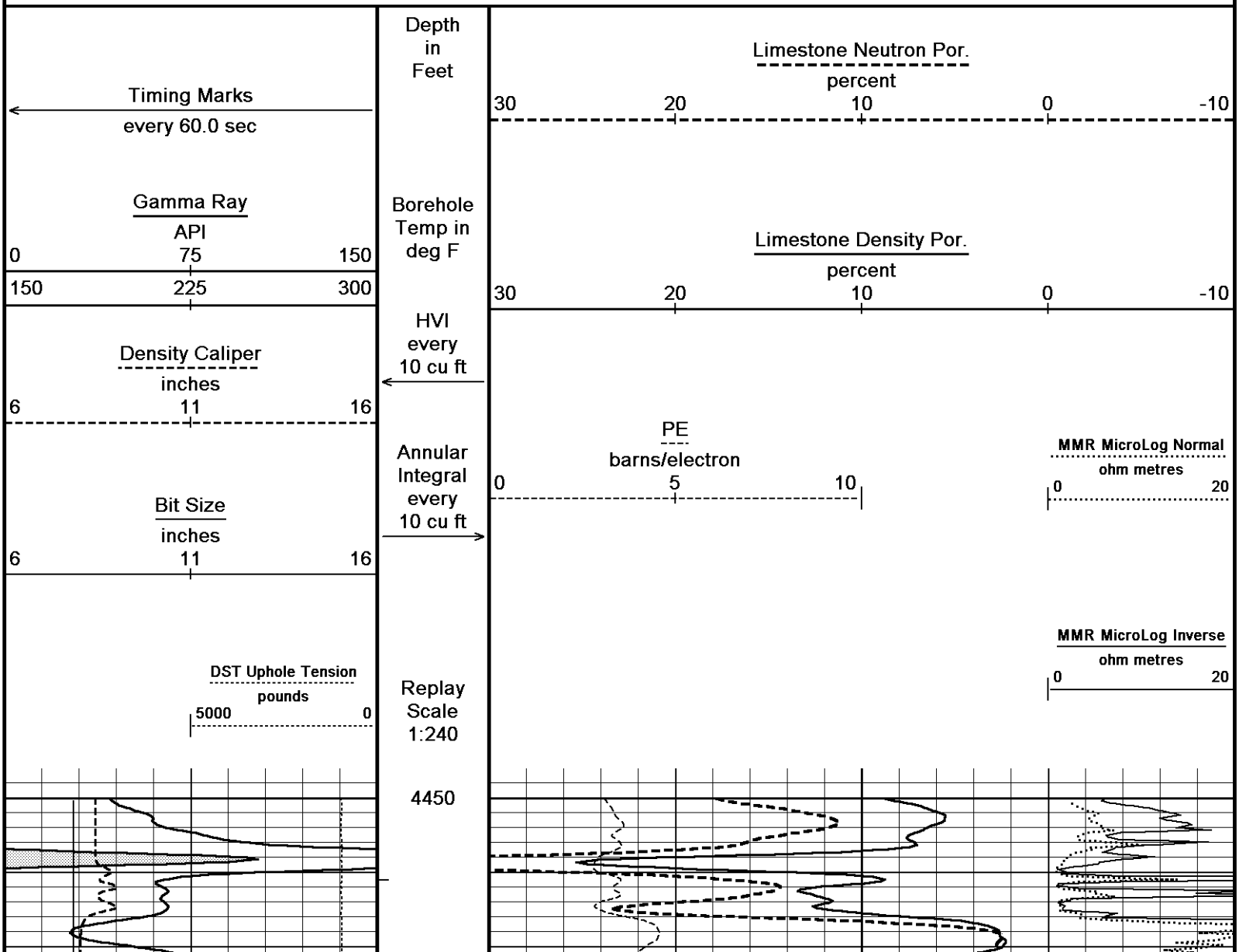
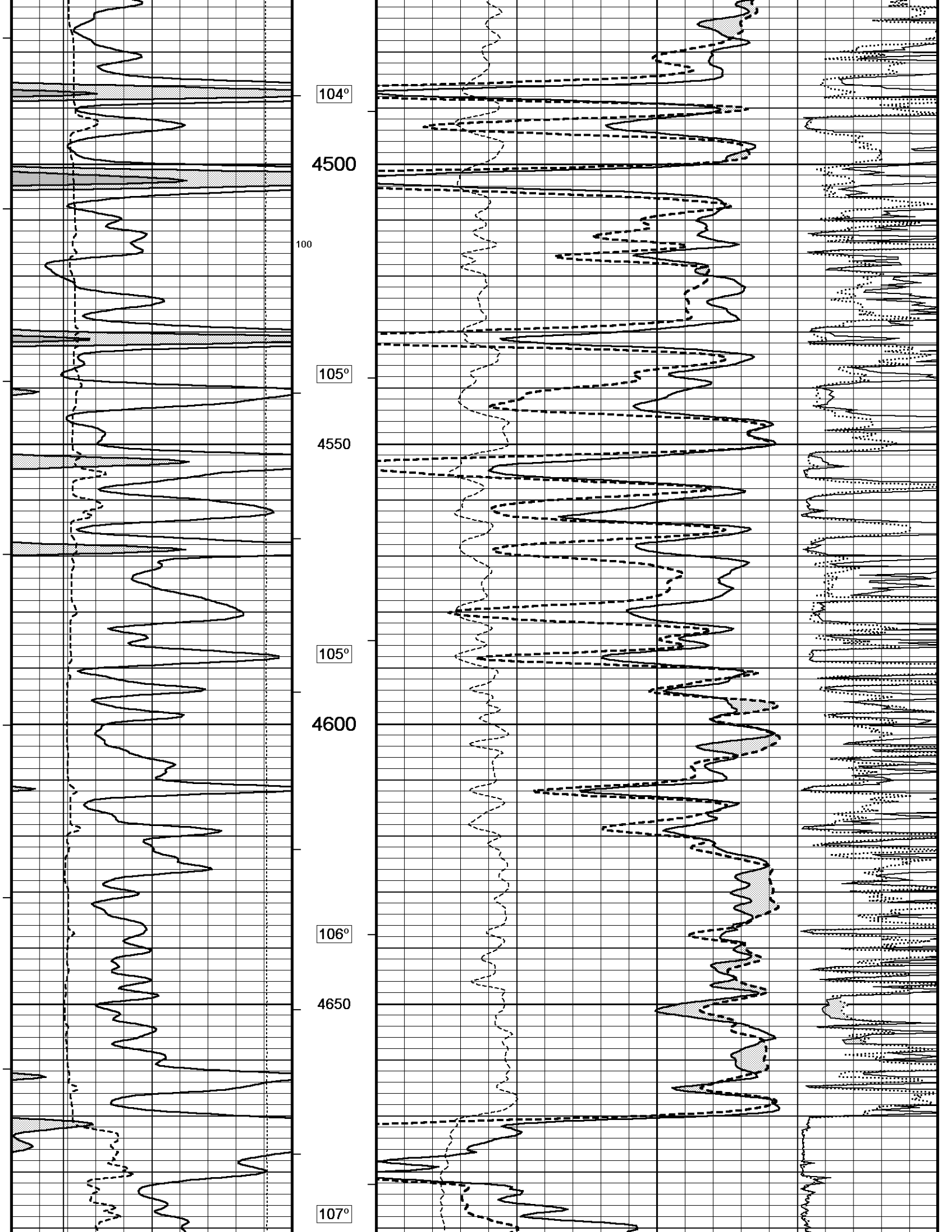
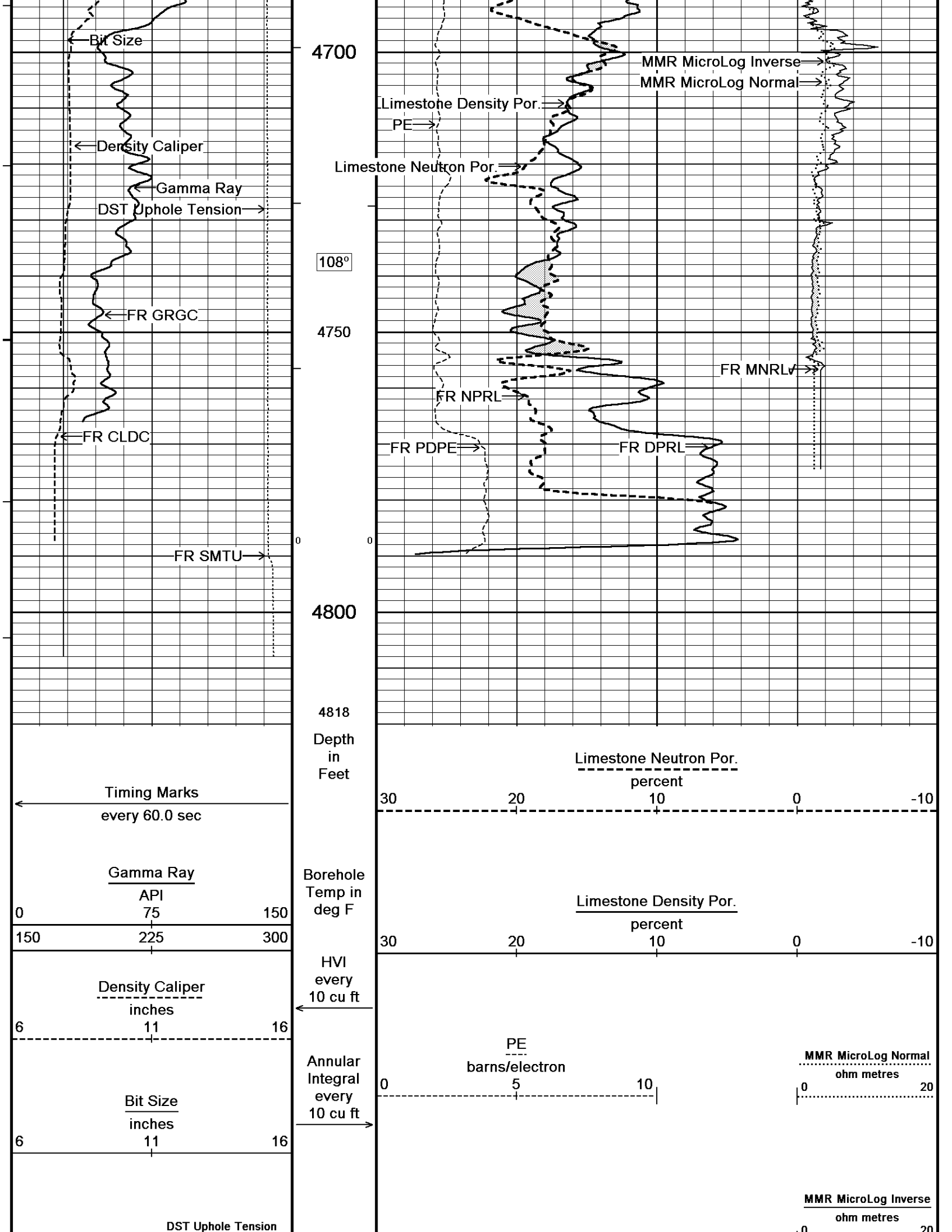
5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-MAR-2013 13:50
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




104°
4500
100
105°
4550
105°
4600
106°
4650
107°


Bit Size
4700
MMR MicroLog Inverse
MMR MicroLog Normal
Limestone Density Por.
PE
Density Caliper
Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
108°
FR GRGC
4750
FR MNRL
FR NPRL
FR CLDC
FR PDPE
FR DPRL
0
0
FR SMTU
4800
4818
Depth in Feet
Limestone Neutron Por.
percent
30 20 10 0 -10
Timing Marks
every 60.0 sec
Gamma Ray
API
0 75 150
150 225 300
Borehole Temp in deg F
Limestone Density Por.
percent
30 20 10 0 -10
HVI every 10 cu ft
Density Caliper
inches
6 11 16
PE
barns/electron
0 5 10
MMR MicroLog Normal
ohm metres
0 20
Annular Integral every 10 cu ft
Bit Size
inches
6 11 16
MMR MicroLog Inverse
ohm metres
0 20
DST Uphole Tension

pounds
5000 0

Replay Scale 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm
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REPEAT SECTION

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Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Density Caliper
inches
6 11 16

Bit Size
inches
6 11 16

Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Compensated Density
grams/cc
2 2.25 2.50 2.75 3

Limestone Density Por.
percent
30 20 10 0 -10

PE
barns/electron
0 5 10

Density Correction
grams/cc
-0.50 0 0.50

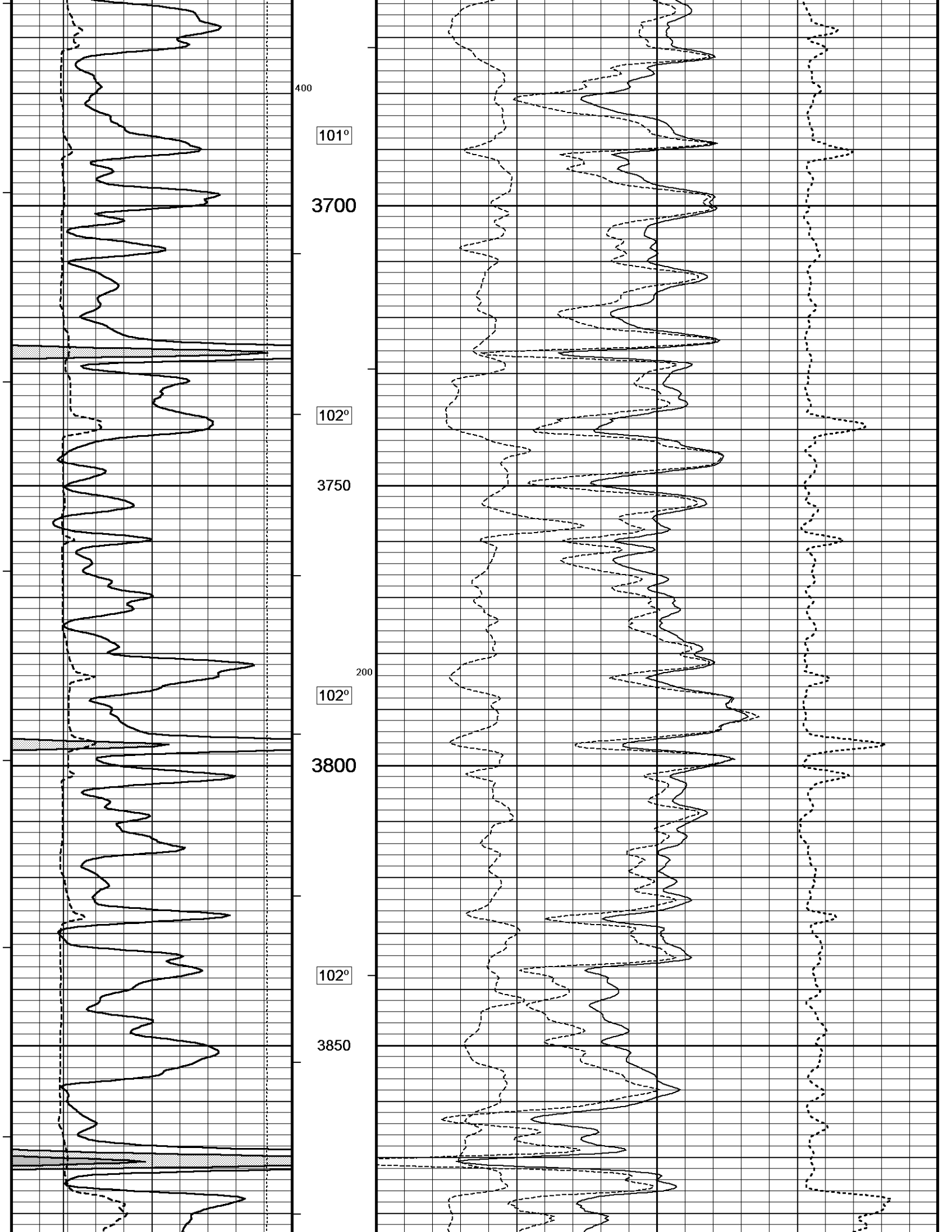
DST Uphole Tension
pounds
5000 0

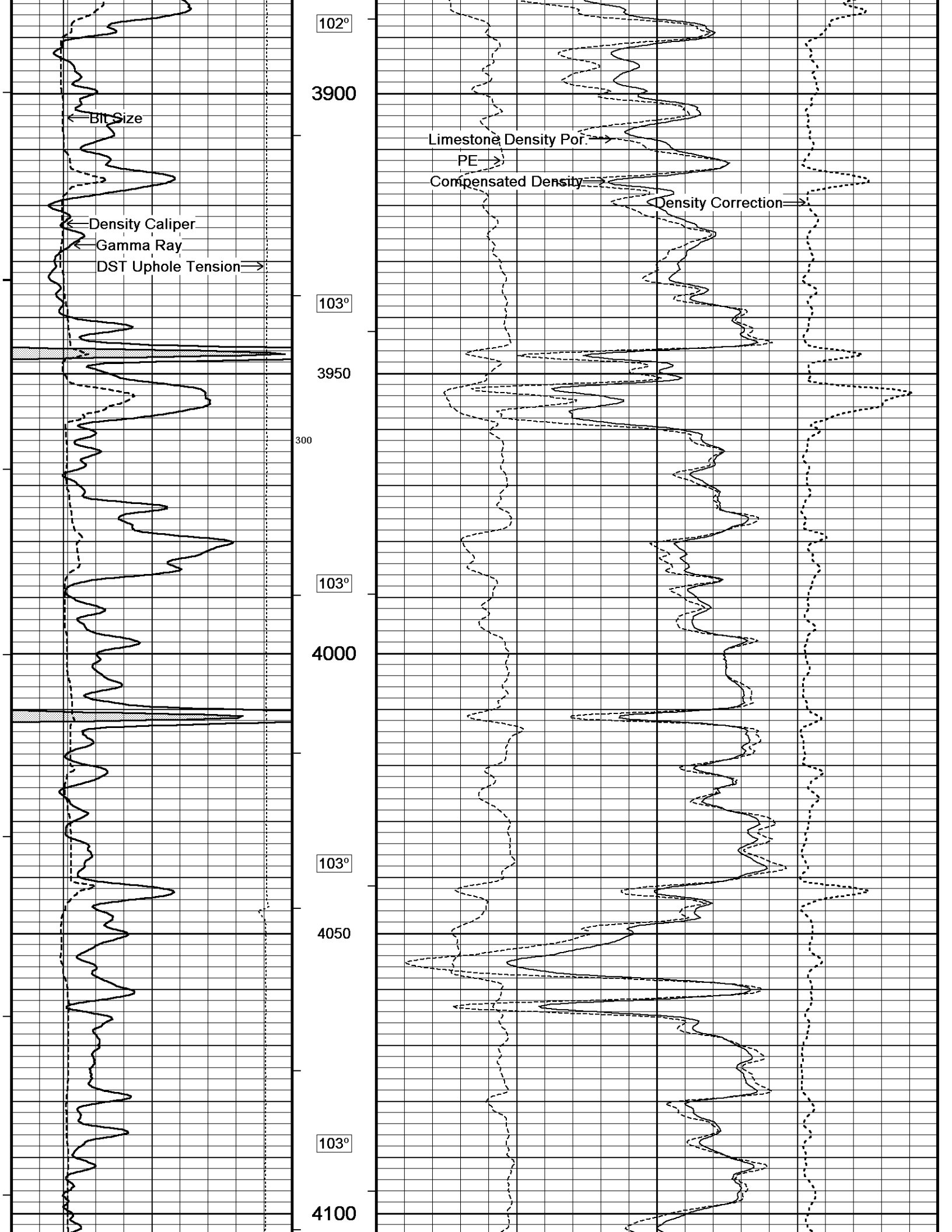
Replay Scale 1:240

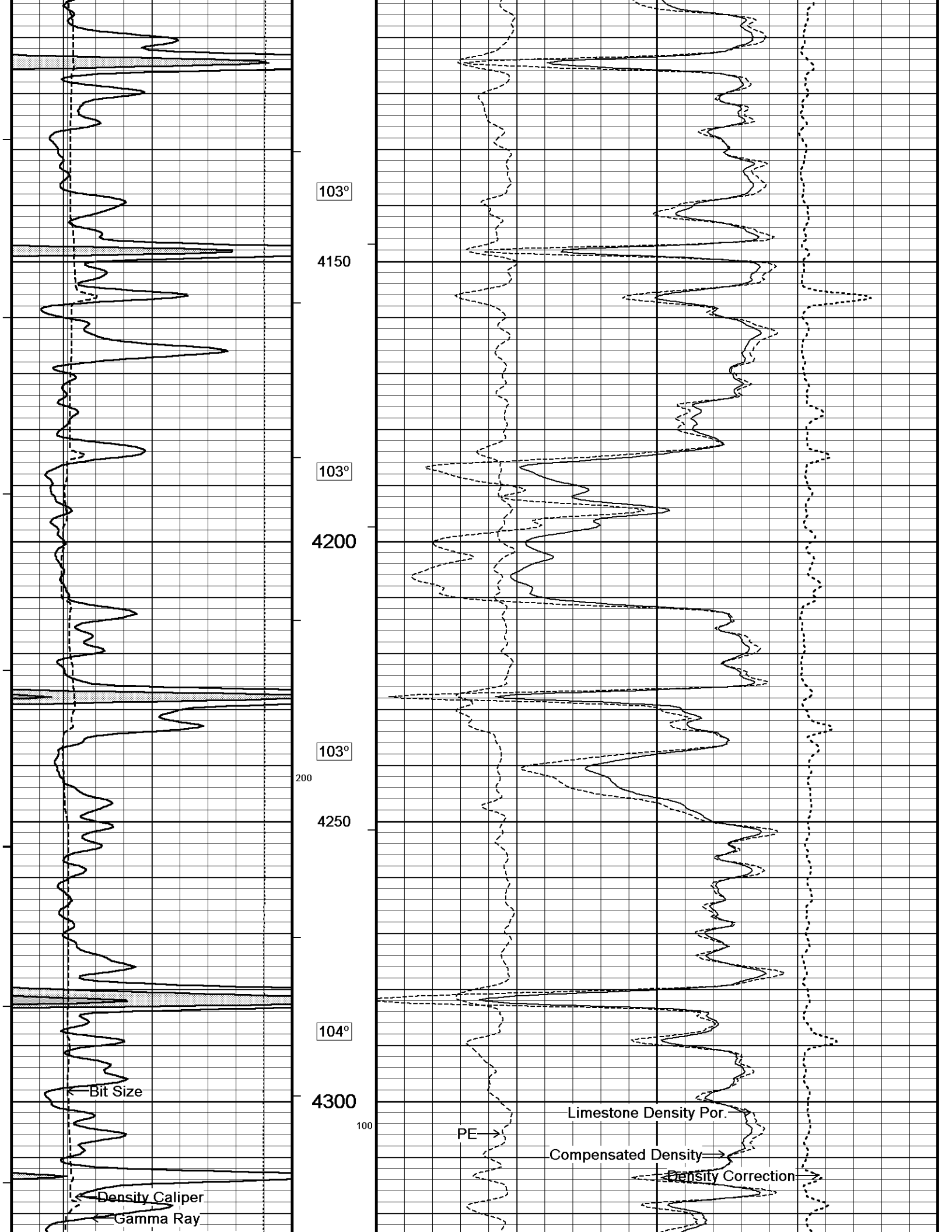
3600

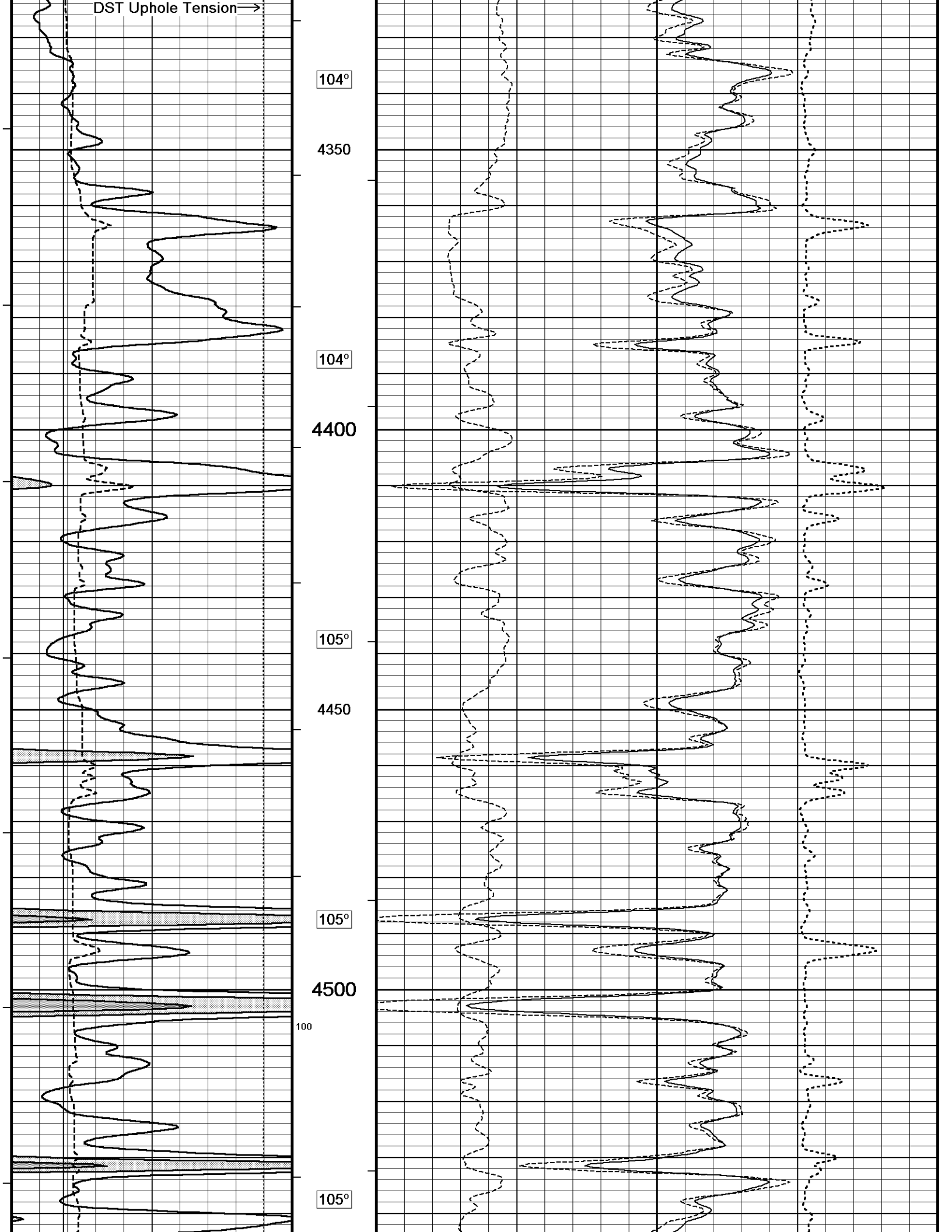
101°

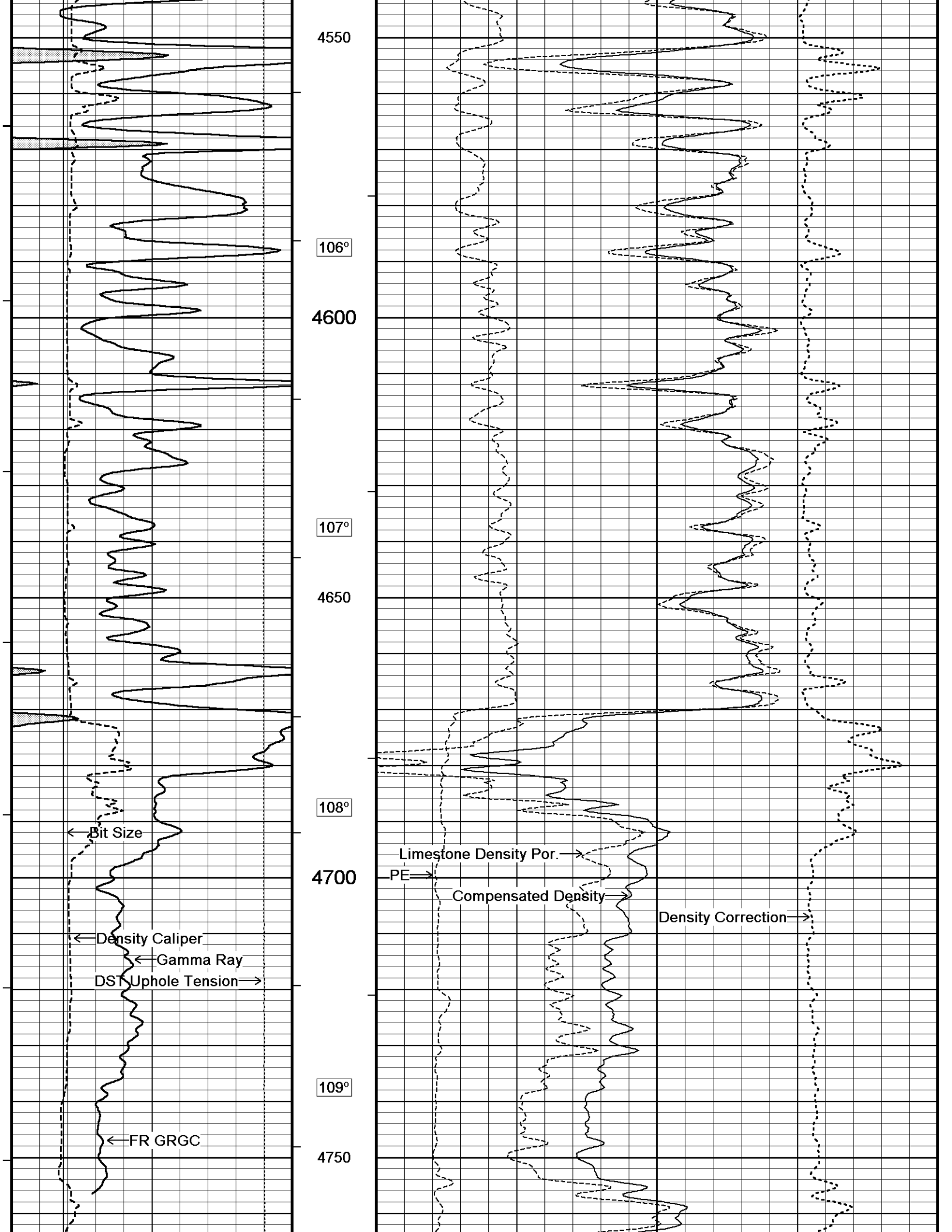
3650

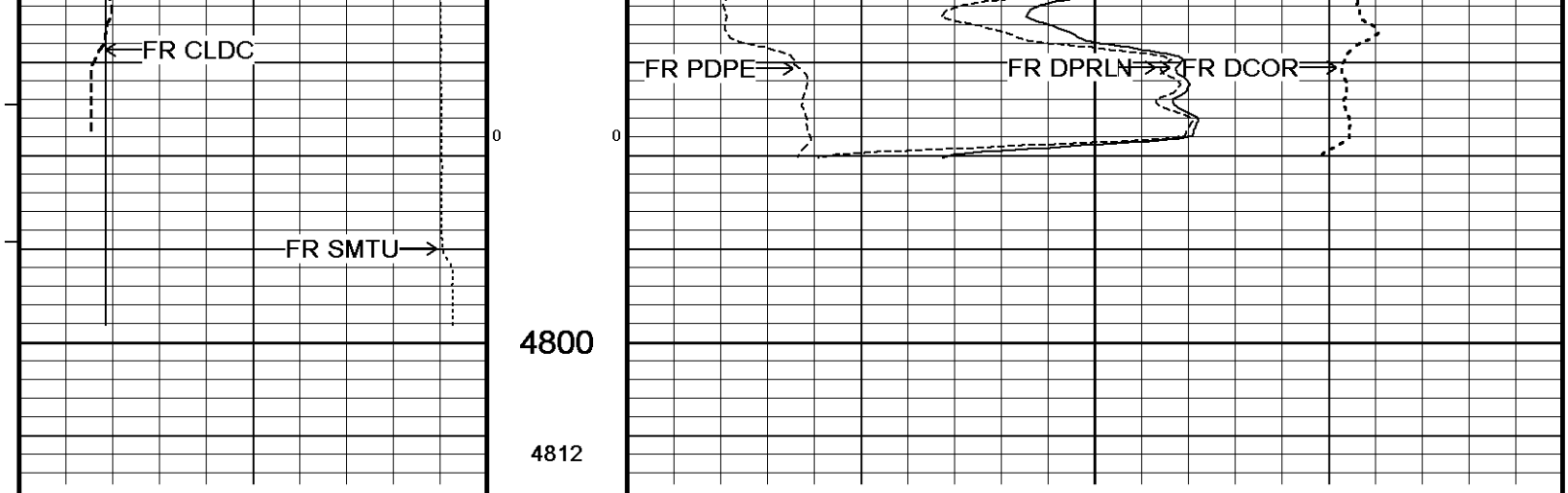

400
101°
3700
102°
3750
200
102°
3800
102°
3850


102°
3900
Bit Size
Limestone Density Por.
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
103°
3950
300
103°
4000
103°
4050
103°
4100


103°
4150
103°
4200
103°
200
4250
104°
4300
100
Bit Size
Density Caliper
Gamma Ray
PE
Limestone Density Por.
Compensated Density
Density Correction


DST Uphole Tension
104°
4350
104°
4400
105°
4450
105°
4500
100
105°


4550
106°
4600
107°
4650
108°
4700
109°
4750
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
Limestone Density Por.
PE
Compensated Density
Density Correction



4800

4812

Depth in Feet

Timing Marks
every 60.0 sec

Compensated Density
grams/cc
2 2.25 2.50 2.75 3

Gamma Ray
API
0 75 150
150 225 300

Borehole Temp in deg F

Limestone Density Por.
percent
30 20 10 0 -10

HVI every 10 cu ft

Density Caliper
inches
6 11 16

Annular Integral every 10 cu ft

Bit Size
inches
6 11 16

PE
barns/electron
0 5 10

Density Correction
grams/cc
-0.50 0 0.50

DST Uphole Tension
pounds
5000 0

Replay Scale 1:240

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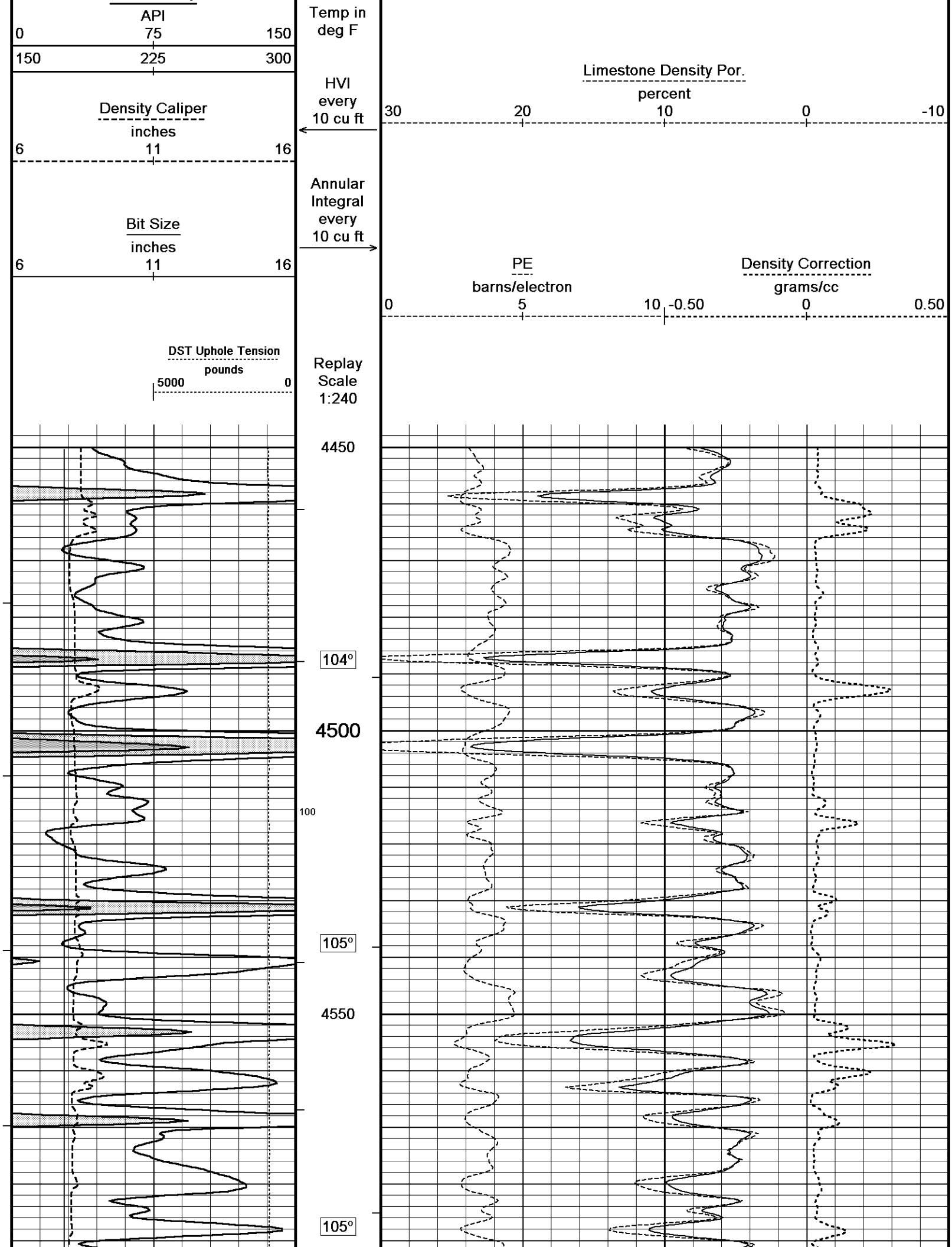
Depth in Feet

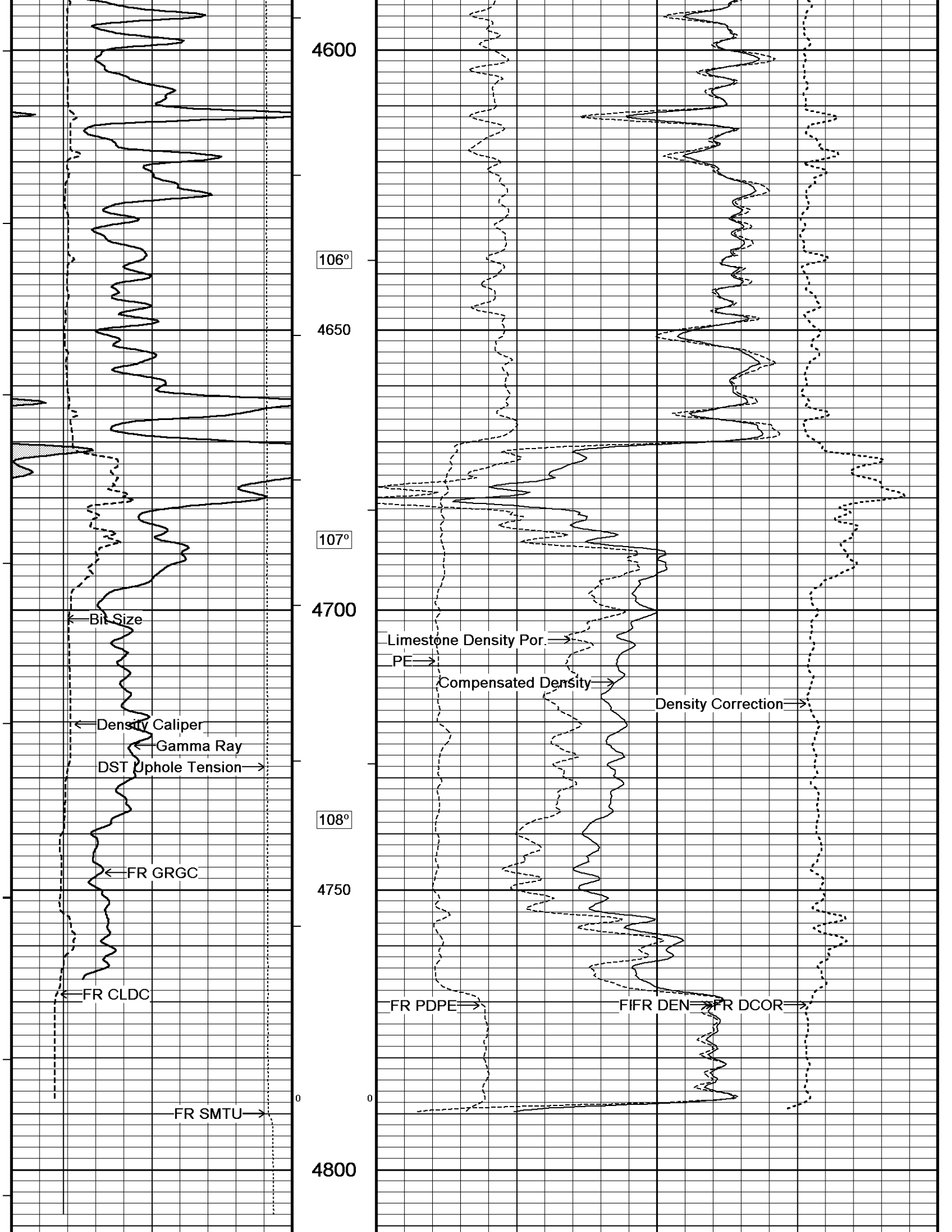
Timing Marks
every 60.0 sec

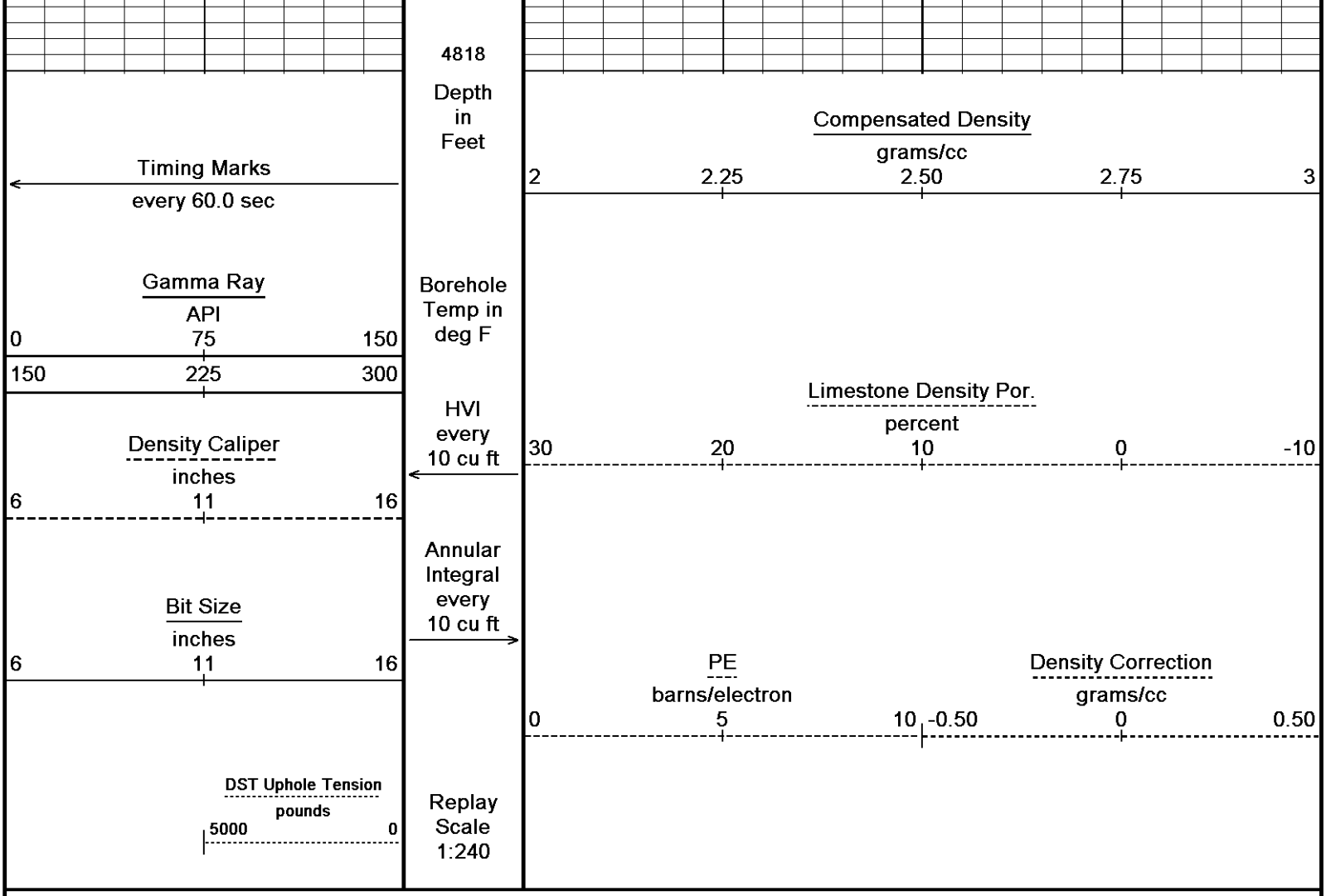
Compensated Density
grams/cc
2 2.25 2.50 2.75 3

Gamma Ray

Borehole


API
0
75
150
150
225
300
Temp in deg F
HVI every 10 cu ft
Limestone Density Por.
percent
30
20
10
0
-10
Density Caliper
inches
6
11
16
Annular Integral every 10 cu ft
Bit Size
inches
6
11
16
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.50
0
0.50
DST Uphole Tension
pounds
5000
0
Replay Scale 1:240
4450
104°
4500
100
105°
4550
105°


4600
106°
4650
107°
4700
108°
4750
4800
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
FR GRGC
FR CLDC
FR SMTU
0
Limestone Density Por
PE
Compensated Density
Density Correction
FR PDPE
FIFR DEN
FR DCOR
0



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-MAR-2013 13:50

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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)	
	1748	2586
Ratio	0.681	

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

	Measured		Calibrated (mmho/m)	
Channel	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) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) 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 Near	Measured Far	Calibrated (sdu) Near	Calibrated (sdu) 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	WS	Measured WH	Ratio	Calibrated 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	217.3	1076.2		

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

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

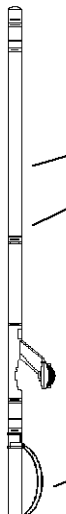
C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31\Grand Mesa Vulgamore #2-31 Main.dta

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



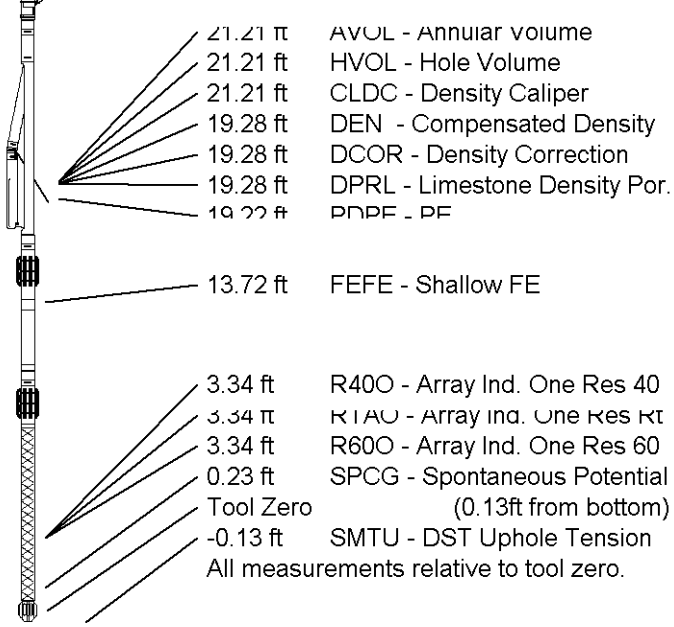
42.87 ft	GRGC - Gamma Ray
39.96 ft	CGXT - MCG External Temperature
33.24 ft	MINV - Micro-inverse
33.24 ft	MNRL - Micro-normal
34.24 ft	MLTC - MML Caliper
28.45 ft	NPRL - Limestone Neutron Por.

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

Compact Focussed 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	4771.00	feet
Elevation Drill Floor	2994.00	feet	Depth Driller	4790.00	feet
Elevation Ground Level	2991.00	feet	Depth Logger	4790.00	feet

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COMPACT PHOTO DENSITY
COMPENSATED NEUTRON
MICRORESISTIVITY LOG