COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG

Weatherford®

COMPANY	M&M EXPLORATION, INC.
WELL	Z-BAR 35-6
FIELD	AETNA GAS AREA
PROVINCE/COUNTY	BARBER
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	1740' FNL & 2090' FWL NW/4

SEC	TWP	RGE	Other Services
35	33S	15W	MAI/MFE

API Number 15-007-24034
Permit Number

Permanent Datum G.L., Elevation 1771 feet
Log Measured From KB
Drilling Measured From K.B. @ 10 FEET

Elevations:	feet
KB	1781.00
DF	1779.00
GL	1771.00

Date	28-JUN-2013				
Run Number	ONE				
Service Order	3537769				
Depth Driller	5150.00	feet			
Depth Logger	5154.00	feet			
First Reading	5135.00	feet			
Last Reading	3880.00	feet			
Casing Driller	896.00	feet			
Casing Logger	896.00	feet			
Bit Size	7.880	inches			
Hole Fluid Type	CHEMICAL				
Density / Viscosity	9.00 lb/USg		54.00 CP		
PH / Fluid Loss	10.20		8.10 ml/30Min		
Sample Source	MUDPIT				
Rm @ Measured Temp	0.87 @ 99.0	ohm-m			
Rmf @ Measured Temp	0.70 @ 99.0	ohm-m			
Rmc @ Measured Temp	1.04 @ 99.0	ohm-m			
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.70 @123.0	ohm-m			
Time Since Circulation	5 HOURS				
Max Recorded Temp	123.00	deg F			
Equipment / Base	13096		LIB		
Recorded By	ROB HOFFMAN				
Witnessed By	BILL BUSCH			BETH BROCK	
JOB#	LB13-187				

BOREHOLE RECORD

Last Edited: 29-JUN-2013 01:14

Bit Size inches	Depth From feet	Depth To feet
7.875	896.00	5150.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	896.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.05.9583.
- 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: 1680 CU. FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH CASING FROM TD TO 3880: 298 CU. FT.
- SERVICE ORDER # 3537769

- SERVICE ORDER # 6001139.

- RIG: HARDT RIG #1

- ENGINEER: ROB HOFFMAN

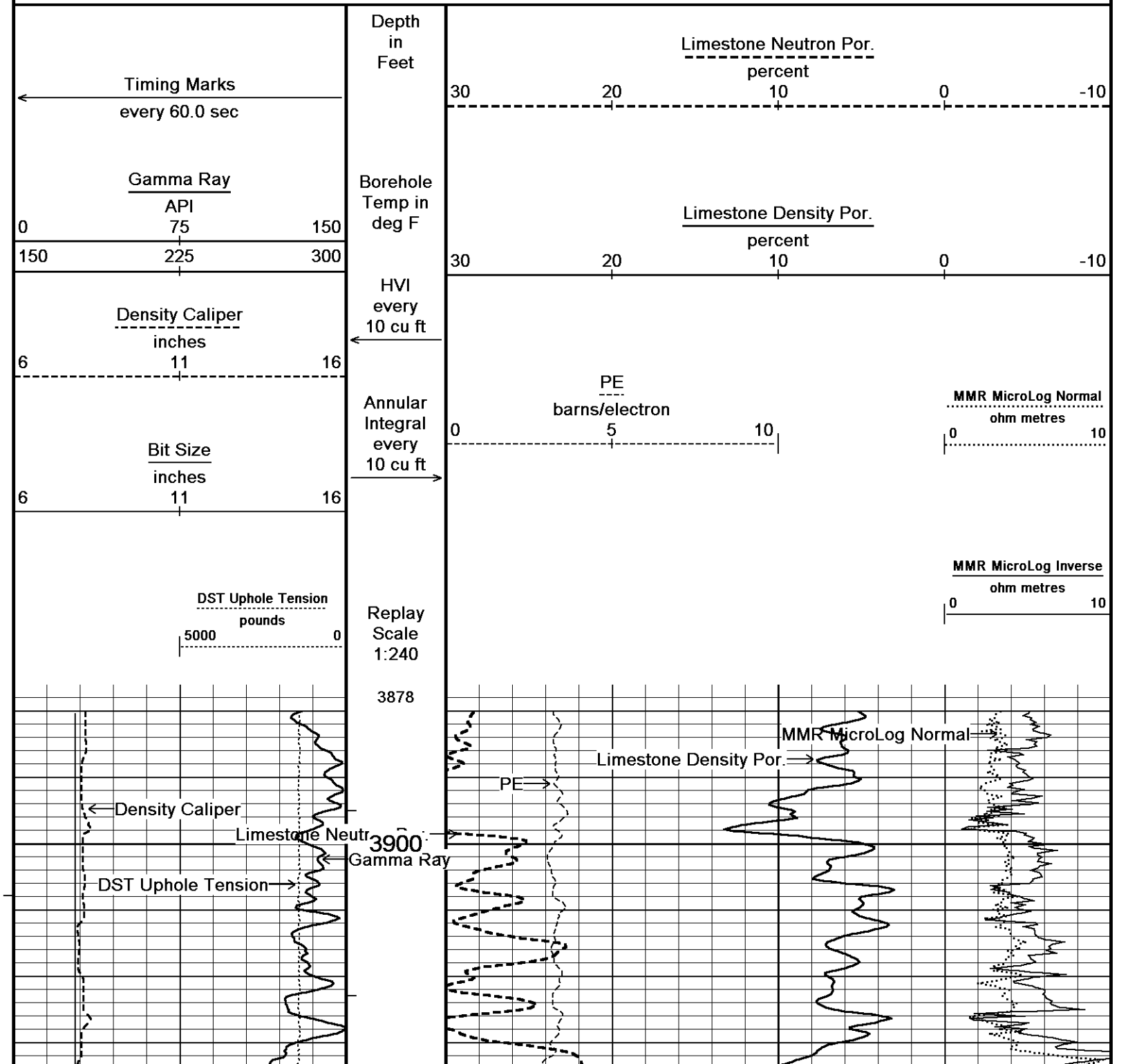
- OPERATOR(S): K. RINEHART, D. CANADAY

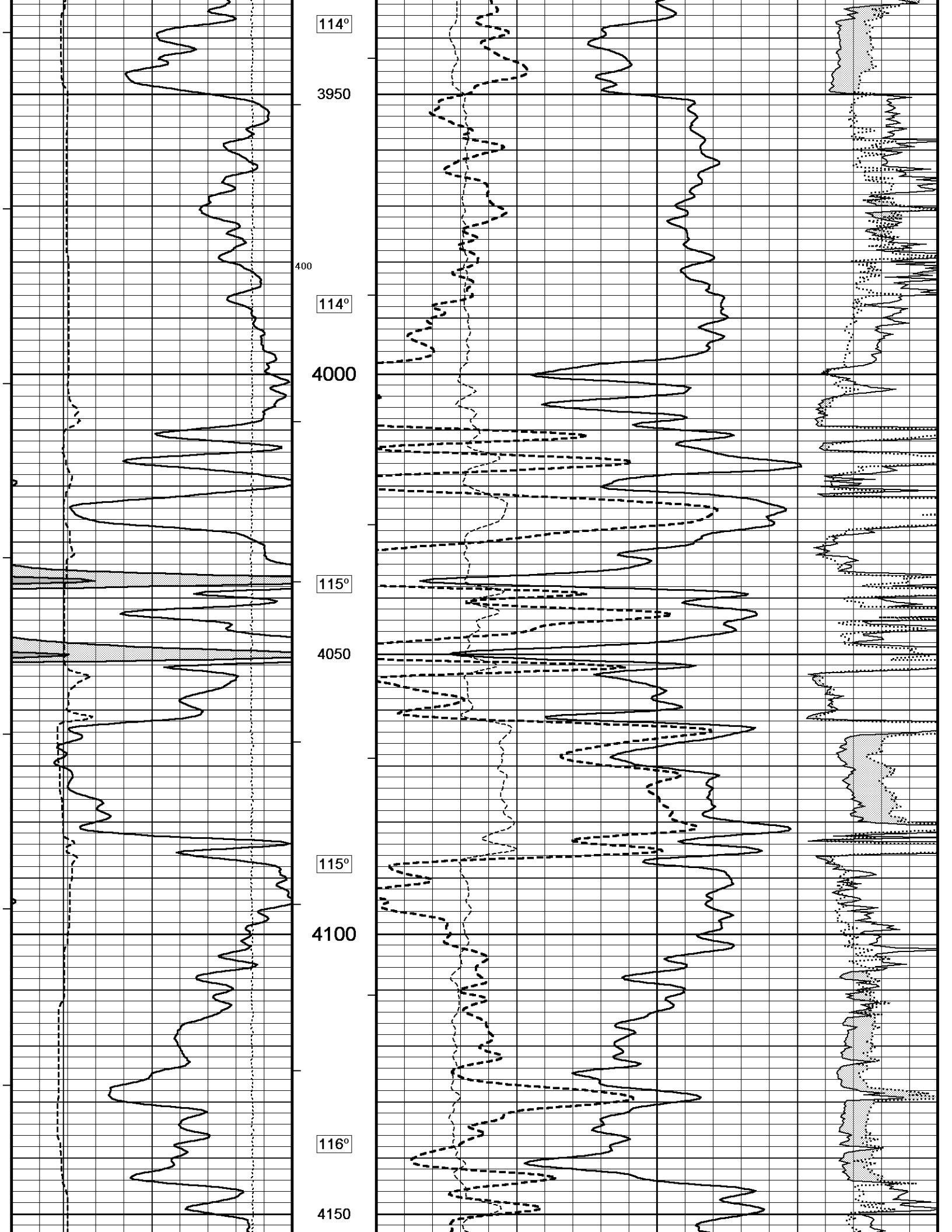
5 INCH MAIN

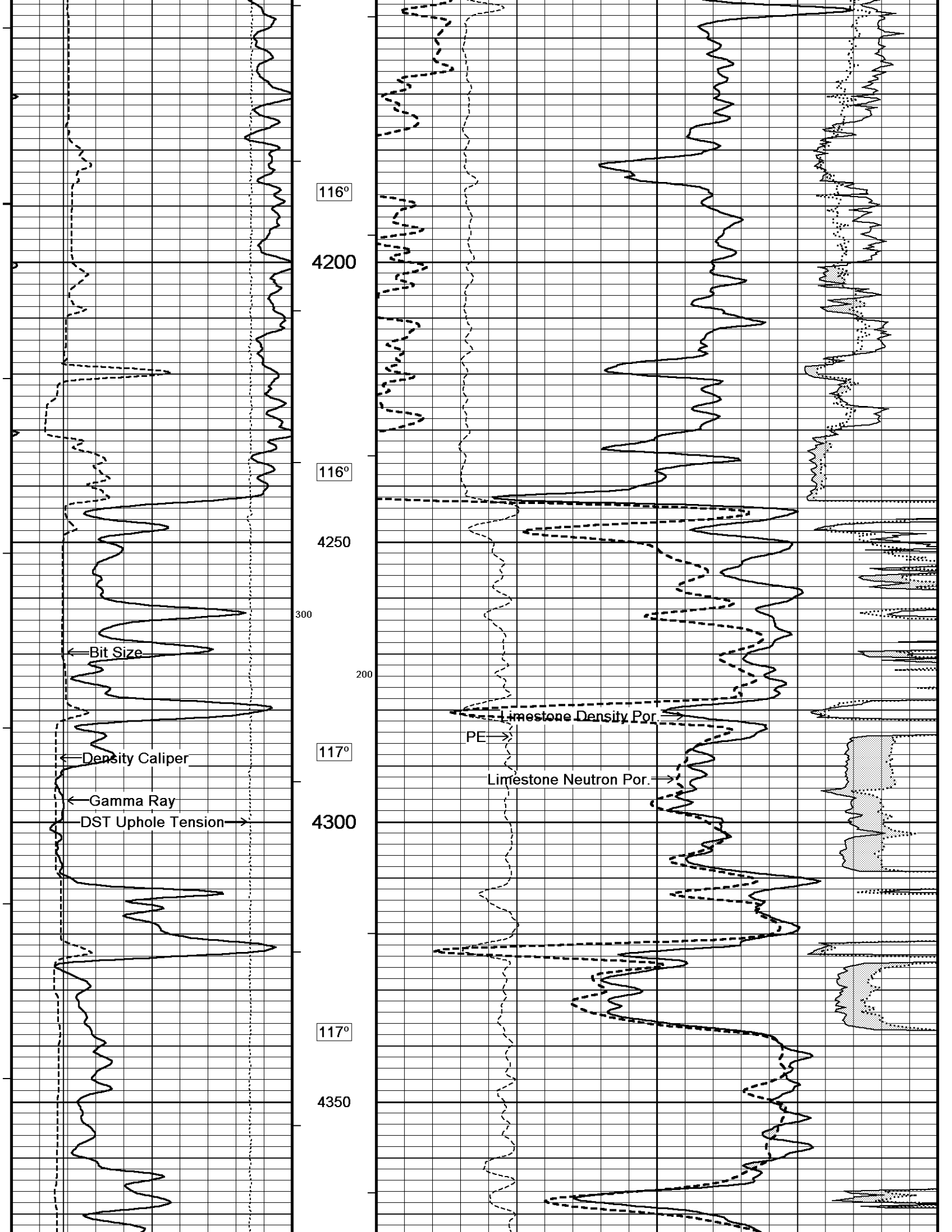
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-JUN-2013 06:10

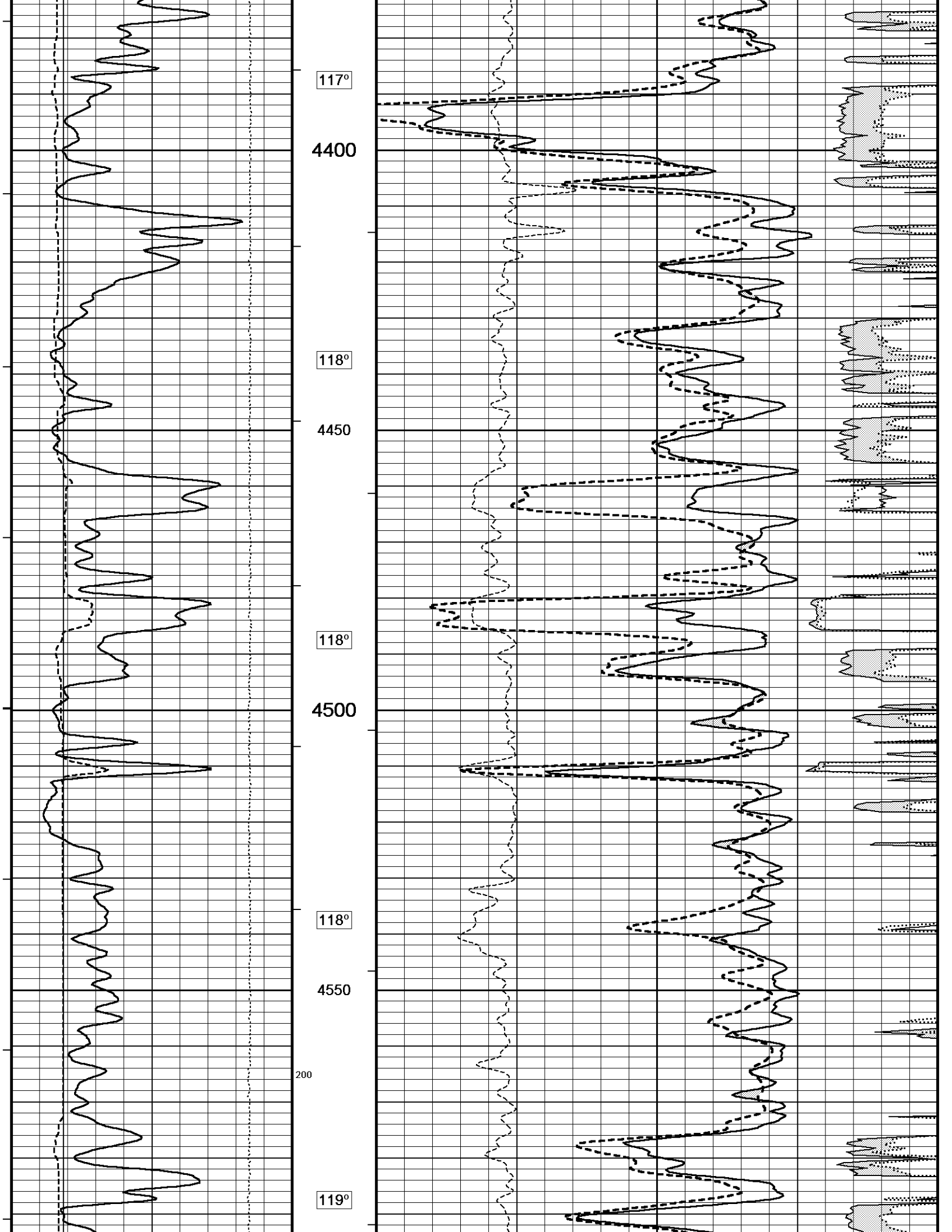
Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-...\M&M Z-Bar #35-6_002 spooled section.dta — Recorded on 29-JUN-2013 04:40

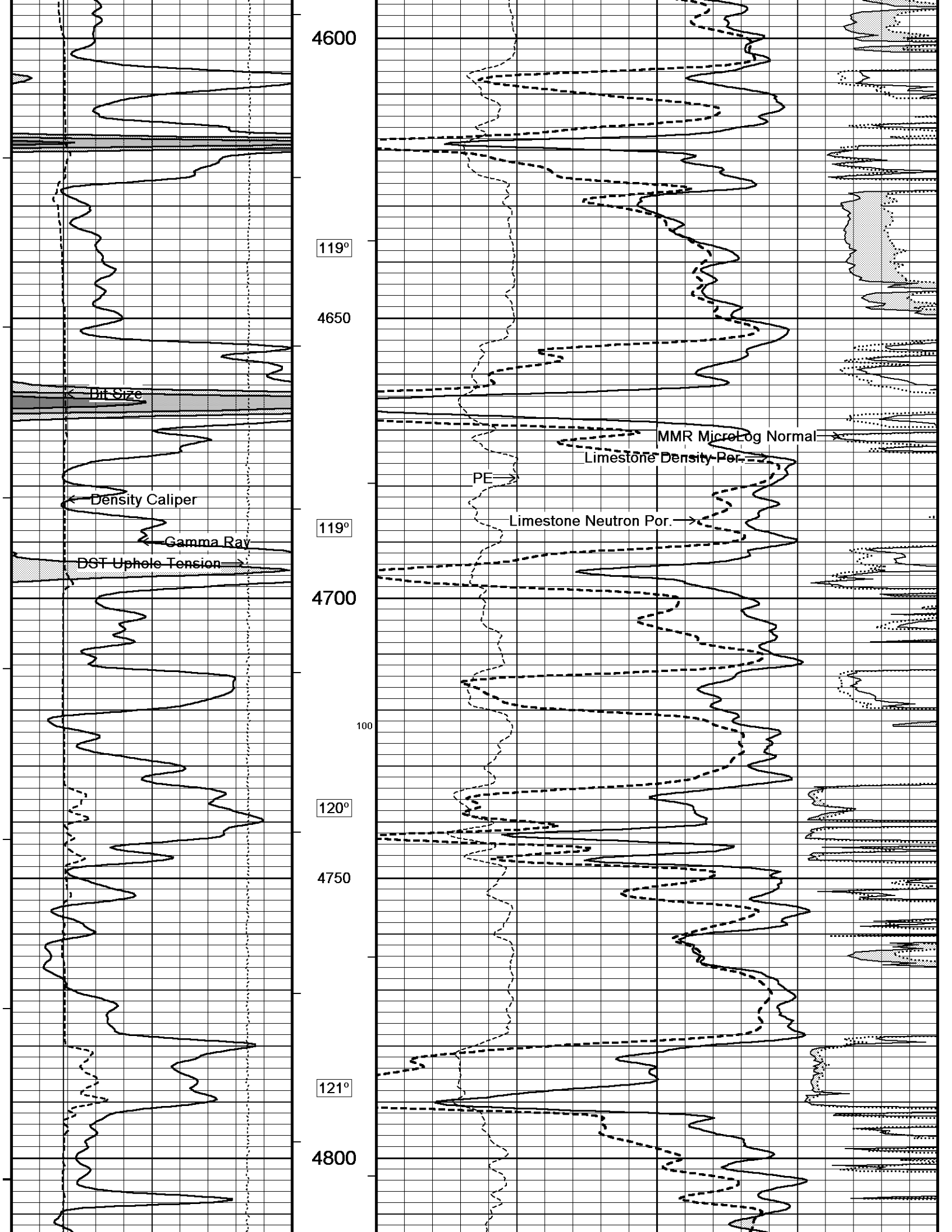
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

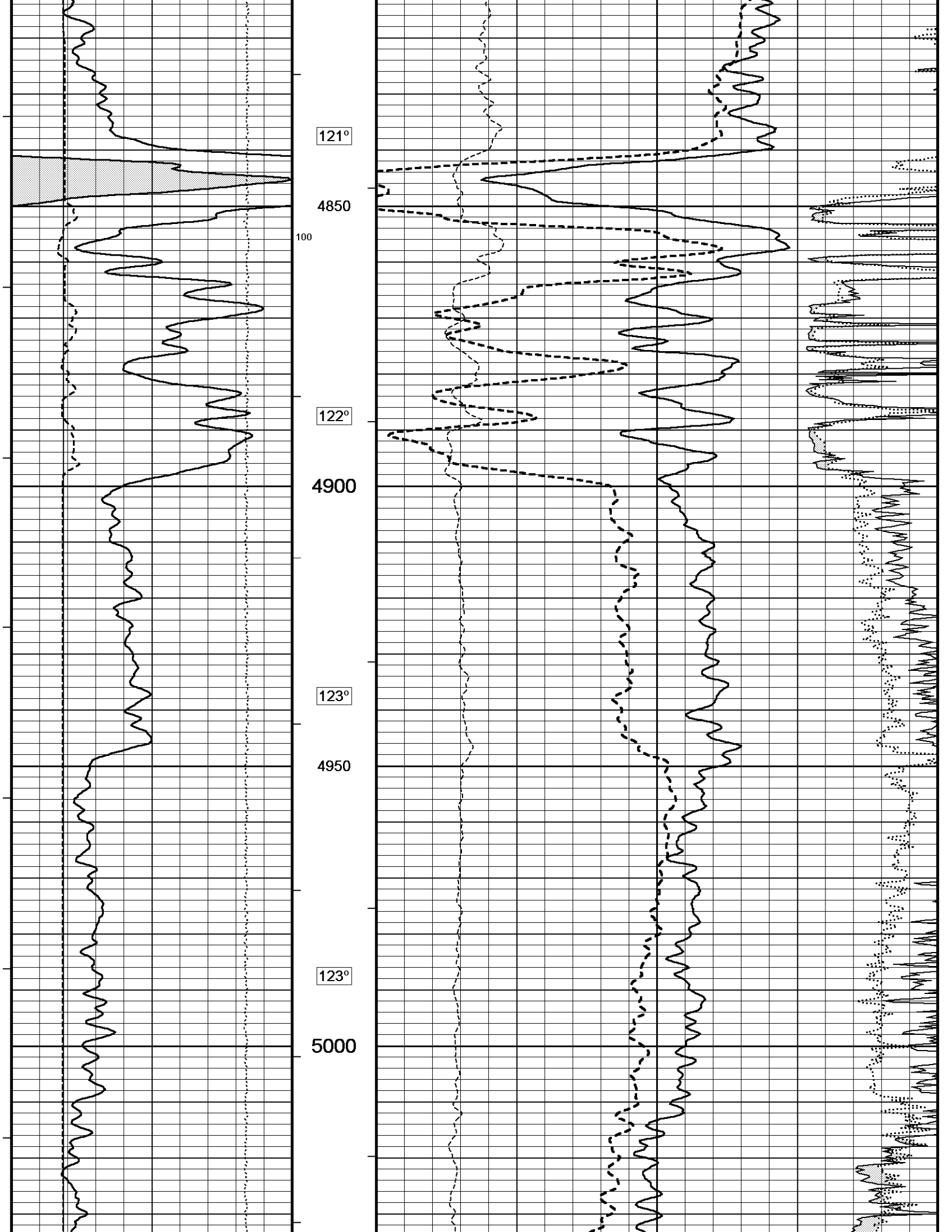


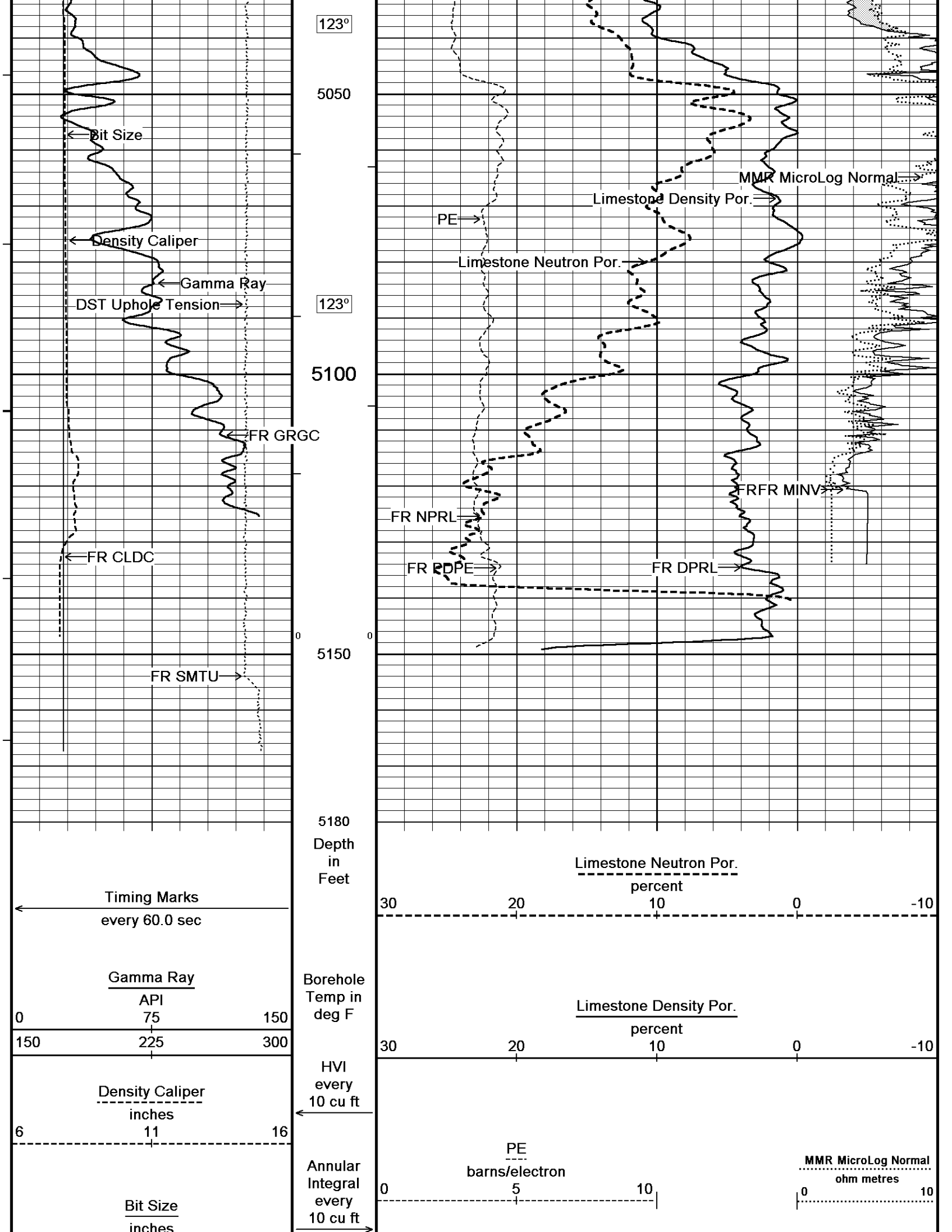

114°
3950
400
114°
4000
115°
4050
115°
4100
116°
4150


116°
4200
116°
4250
300
Bit Size
200
Limestone Density Por.
PE
117°
Density Caliper
Limestone Neutron Por.
Gamma Ray
DST Uphole Tension
4300
117°
4350


117°
4400
118°
4450
118°
4500
118°
4550
200
119°


4600
119°
4650
Bit Size
MMR Microlog Normal
Limestone Density Por.
PE
Density Caliper
Limestone Neutron Por.
119°
Gamma Ray
DST Uphole Tension
4700
100
120°
4750
121°
4800


121°
4850
100
122°
4900
123°
4950
123°
5000


123°
5050
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
123°
5100
FR GRGC
FR CLDC
FR SMTU
0
0
5150
5180
PE
Limestone Neutron Por.
MMR MicroLog Normal
Limestone Density Por.
FRFR MINV
FR NPRL
FR PDPE
FR DPRL
Depth in Feet
Timing Marks
every 60.0 sec
Limestone Neutron Por.
percent
30 20 10 0 -10
Gamma Ray
API
0 75 150
150 225 300
Borehole Temp in deg F
Limestone Density Por.
percent
30 20 10 0 -10
Density Caliper
inches
6 11 16
HVI every 10 cu ft
PE
barns/electron
0 5 10
MMR MicroLog Normal
ohm metres
0 10
Bit Size
inches
Annular Integral every 10 cu ft

6 11 16

DST Uphole Tension
pounds
5000 0

Replay
Scale
1:240

MMR MicroLog Inverse
ohm metres
0 10

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-JUN-2013 06:10
Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-...\M&M Z-Bar #35-6_002 spooled section.dta — Recorded on 29-JUN-2013 04:40
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-JUN-2013 06:10
Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_001.dta — Recorded on 29-JUN-2013 03:11
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

Timing Marks
every 60.0 sec

Depth
in
Feet

Limestone Neutron Por.
percent
30 20 10 0 -10

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

Annular
Integral
every
10 cu ft

MMR MicroLog Normal
ohm metres
0 10

Bit Size
inches
6 11 16

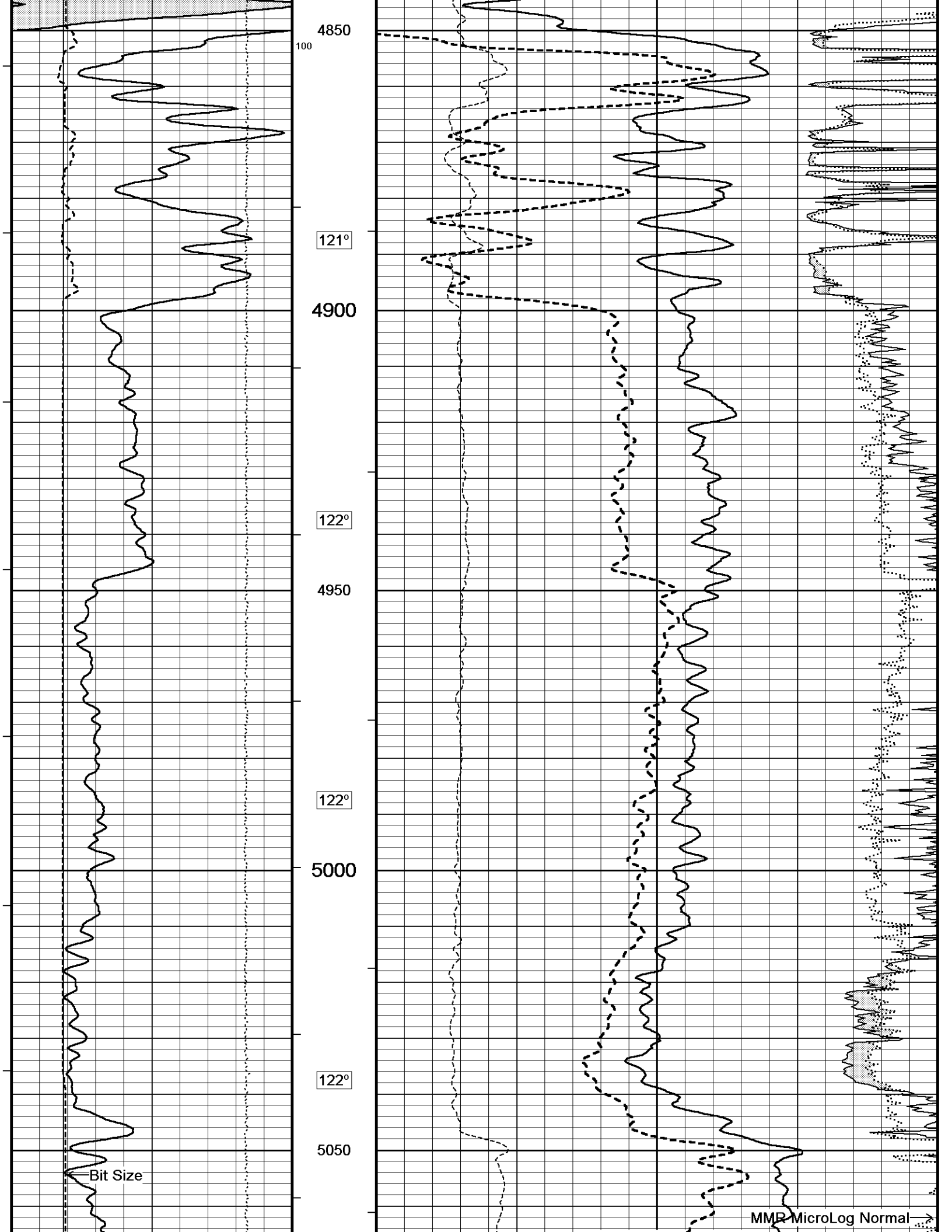
MMR MicroLog Inverse
ohm metres
0 10

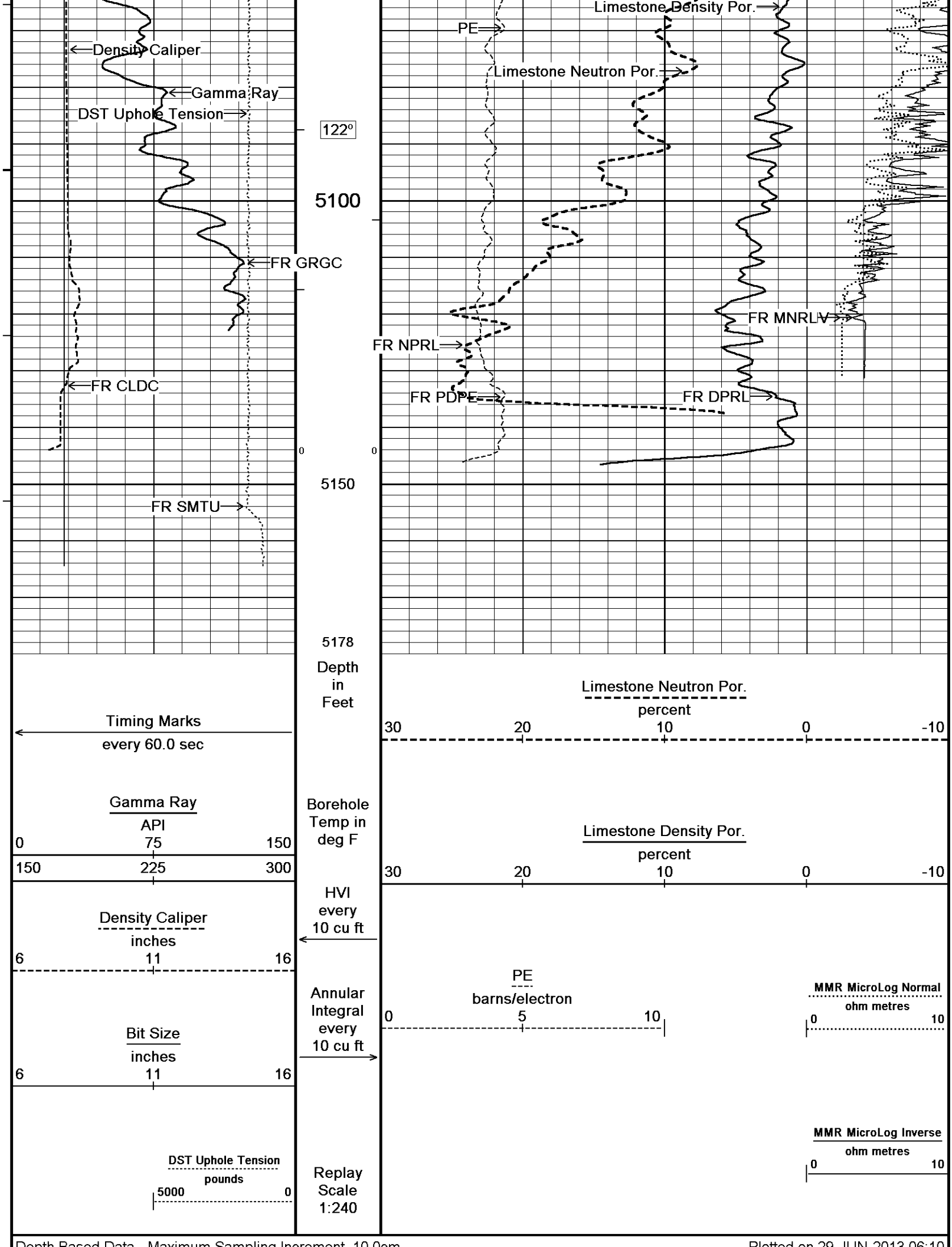
DST Uphole Tension
pounds
5000 0

Replay
Scale
1:240

4800

120°


4850
100
121°
4900
122°
4950
122°
5000
122°
5050
Bit Size
MMR MicroLog Normal



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 29 JUN 2013 06:10

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-JUN-2013 06:10
Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_001.dta — Recorded on 29-JUN-2013 03:11
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REPEAT SECTION

5 INCH MAIN

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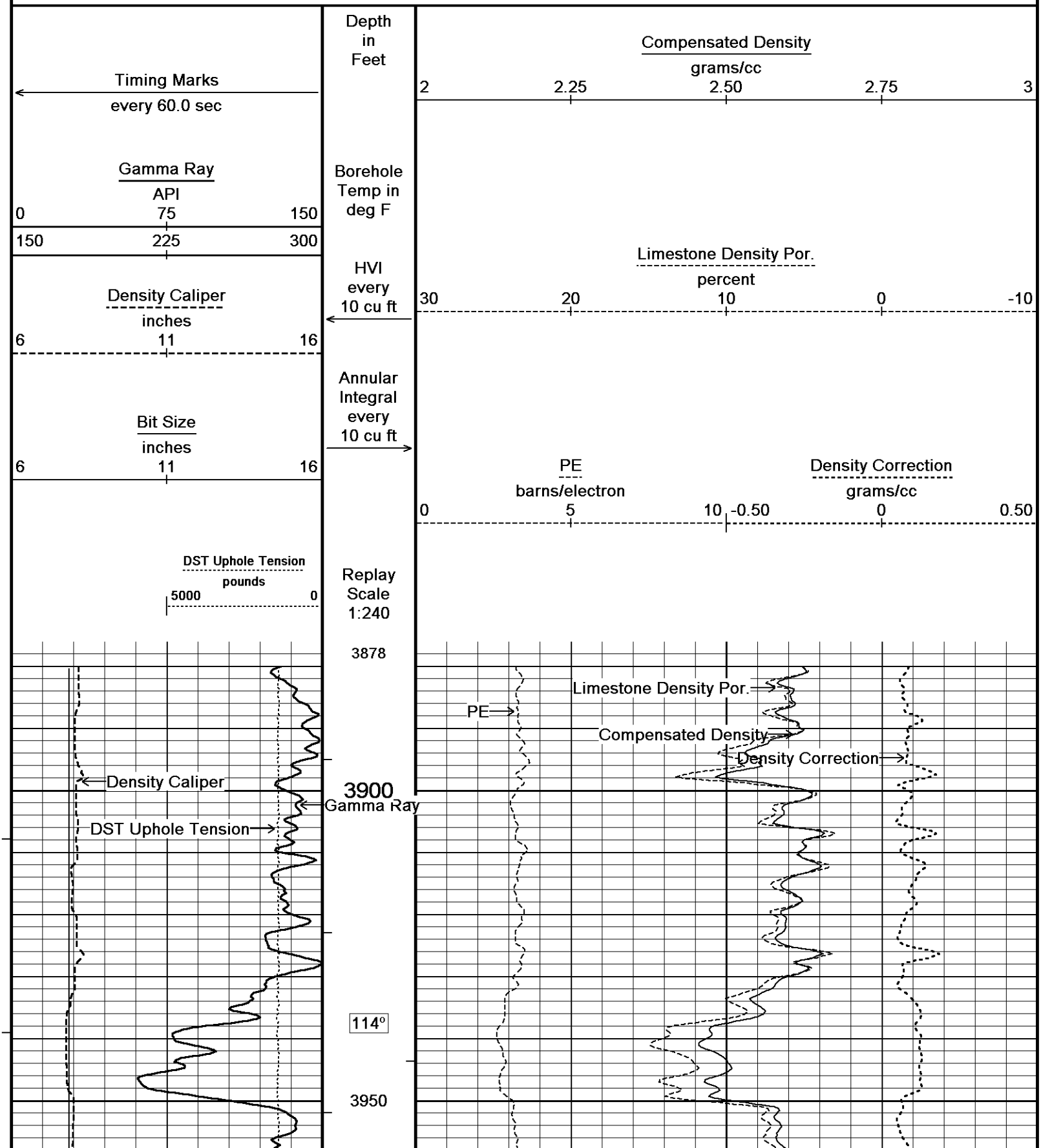
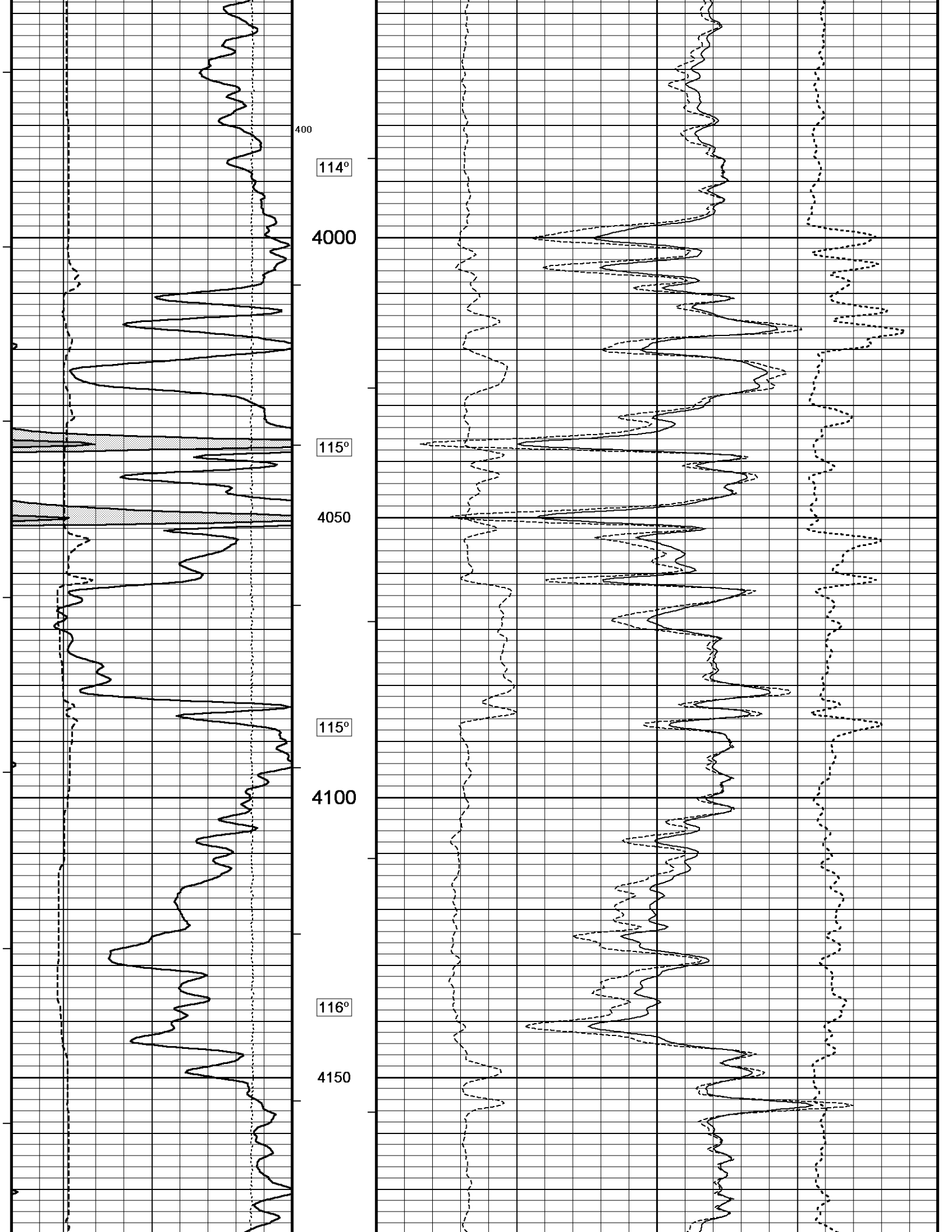
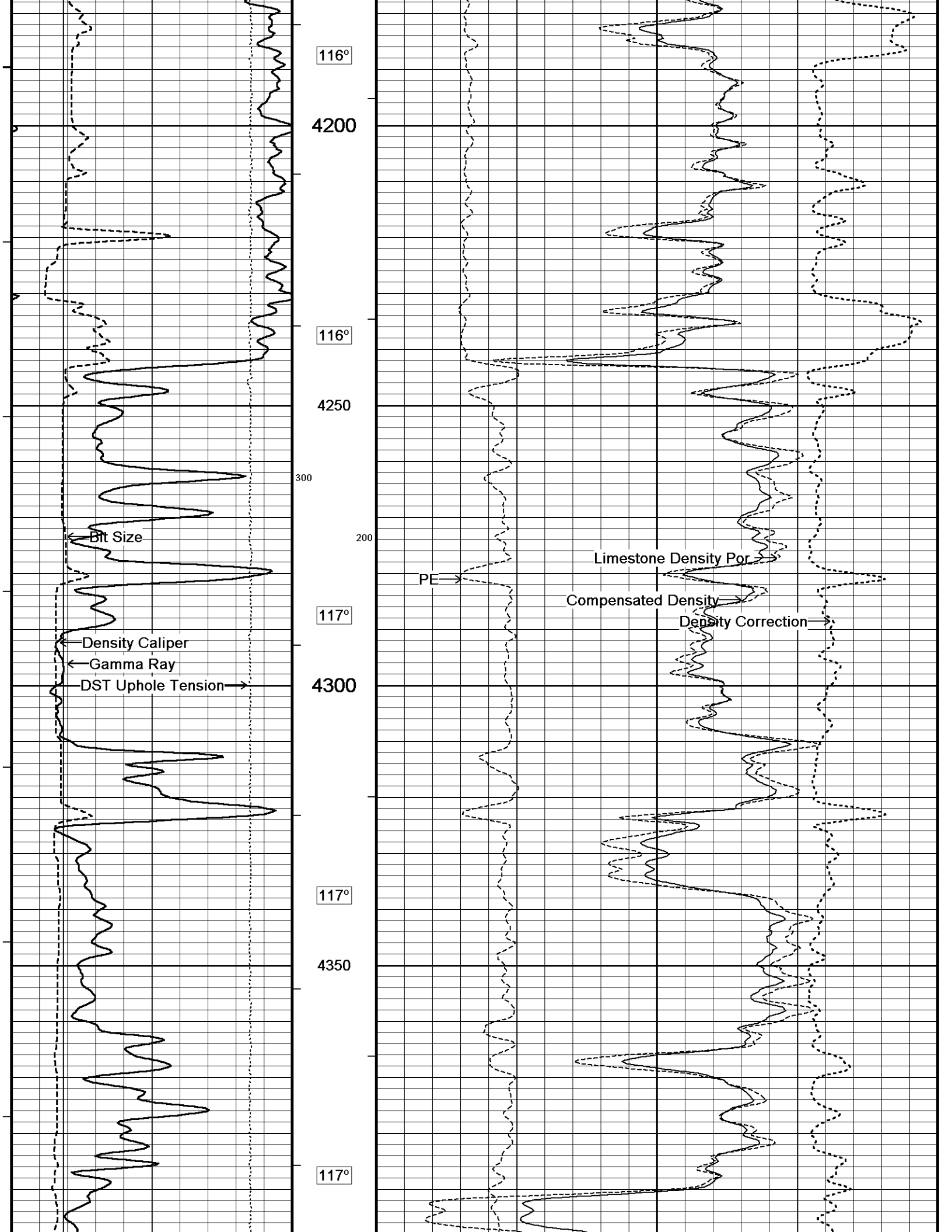
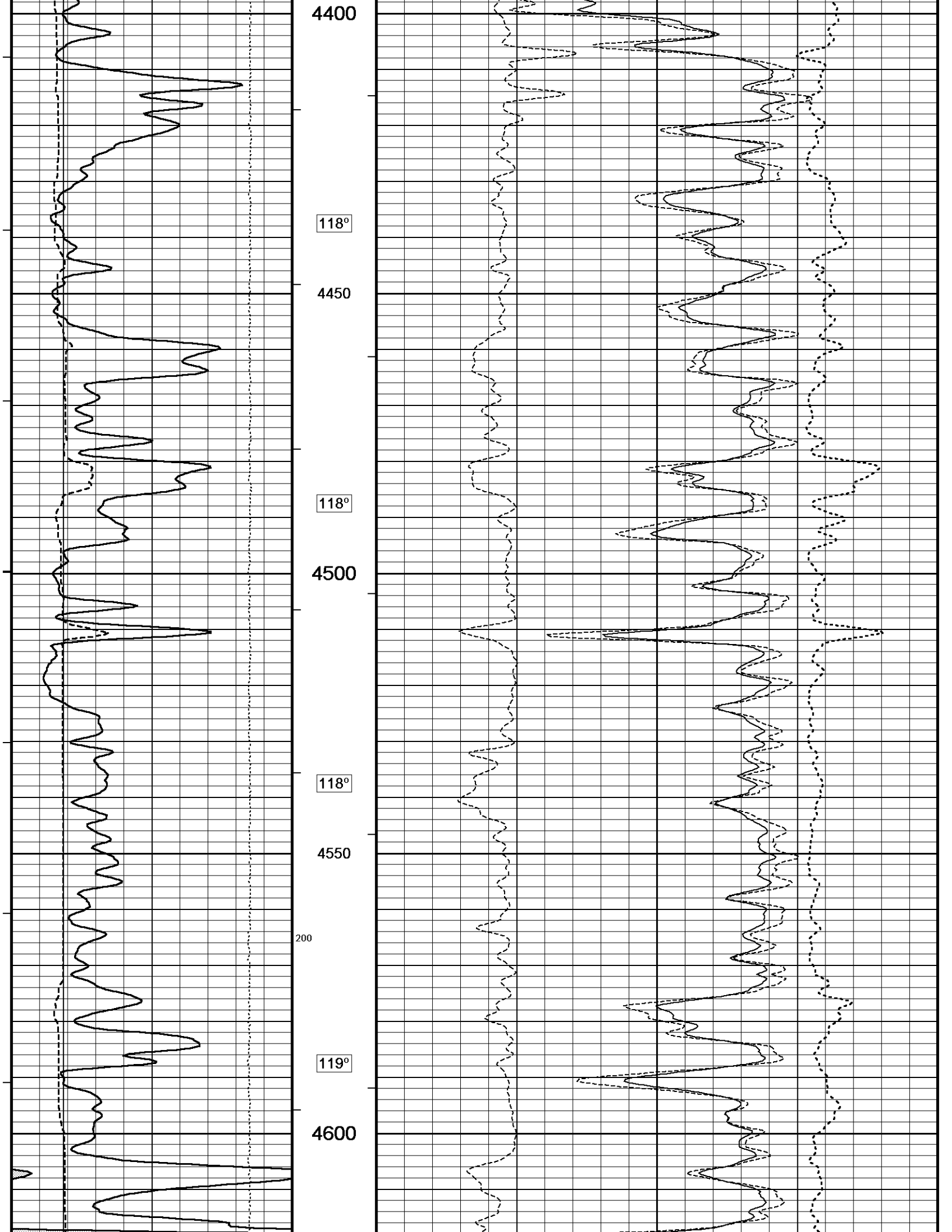
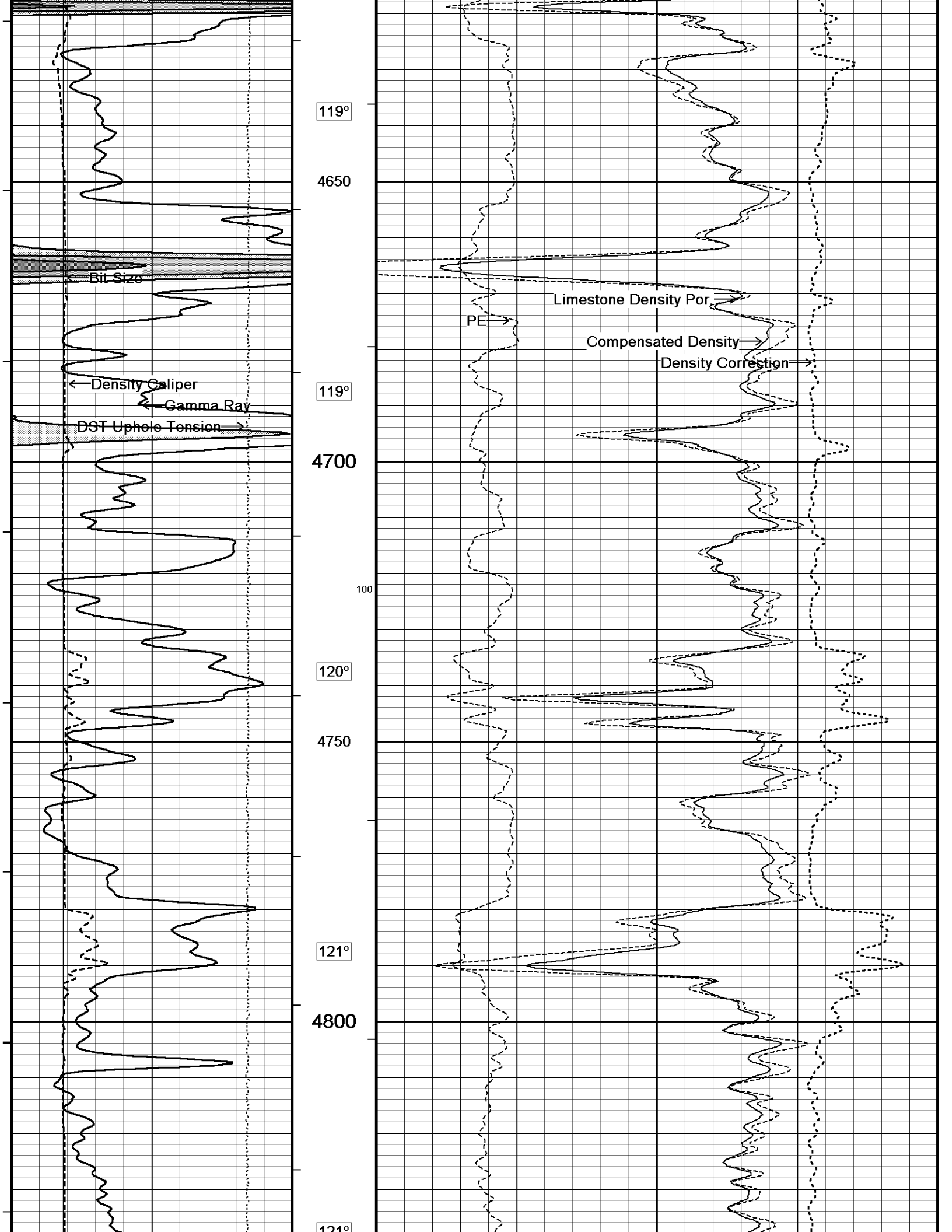
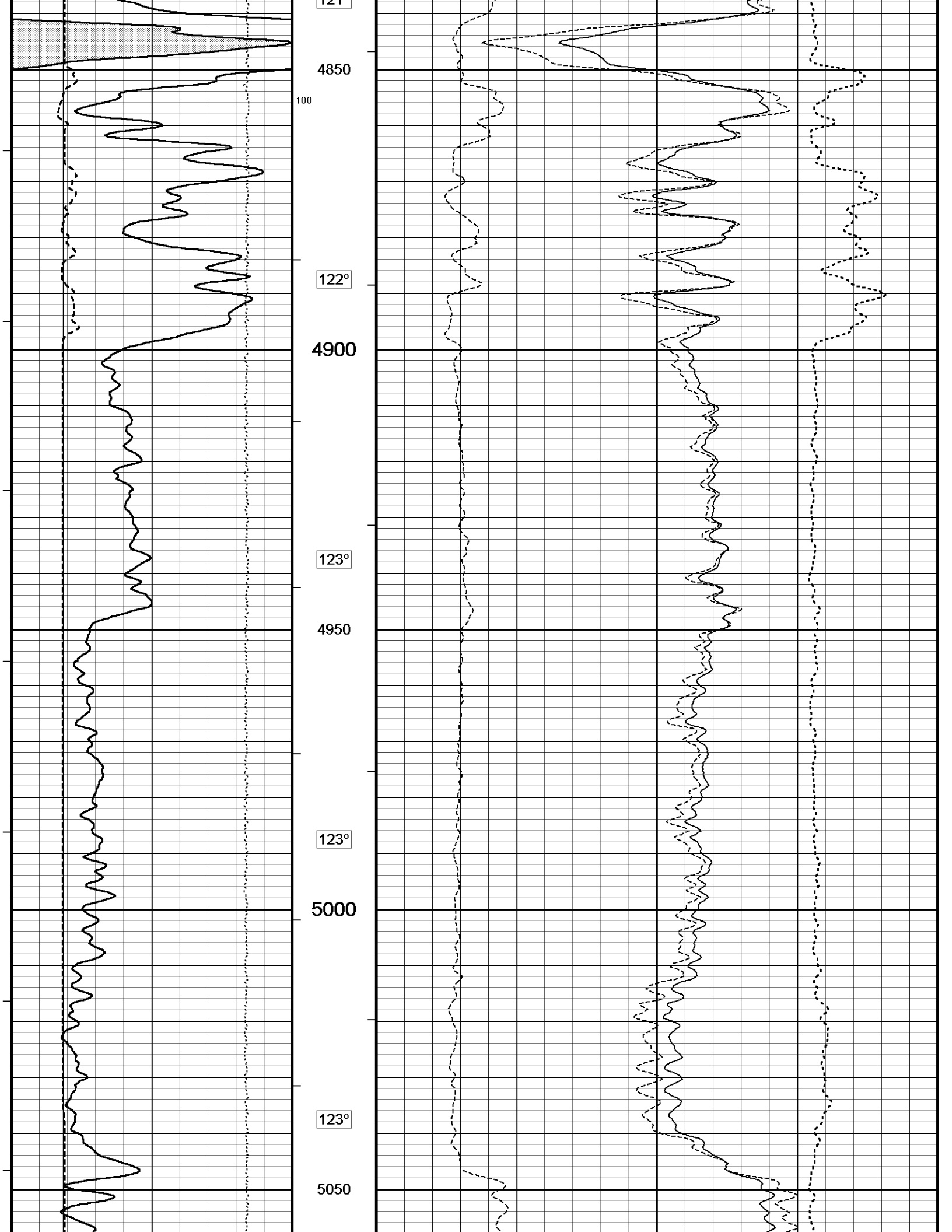


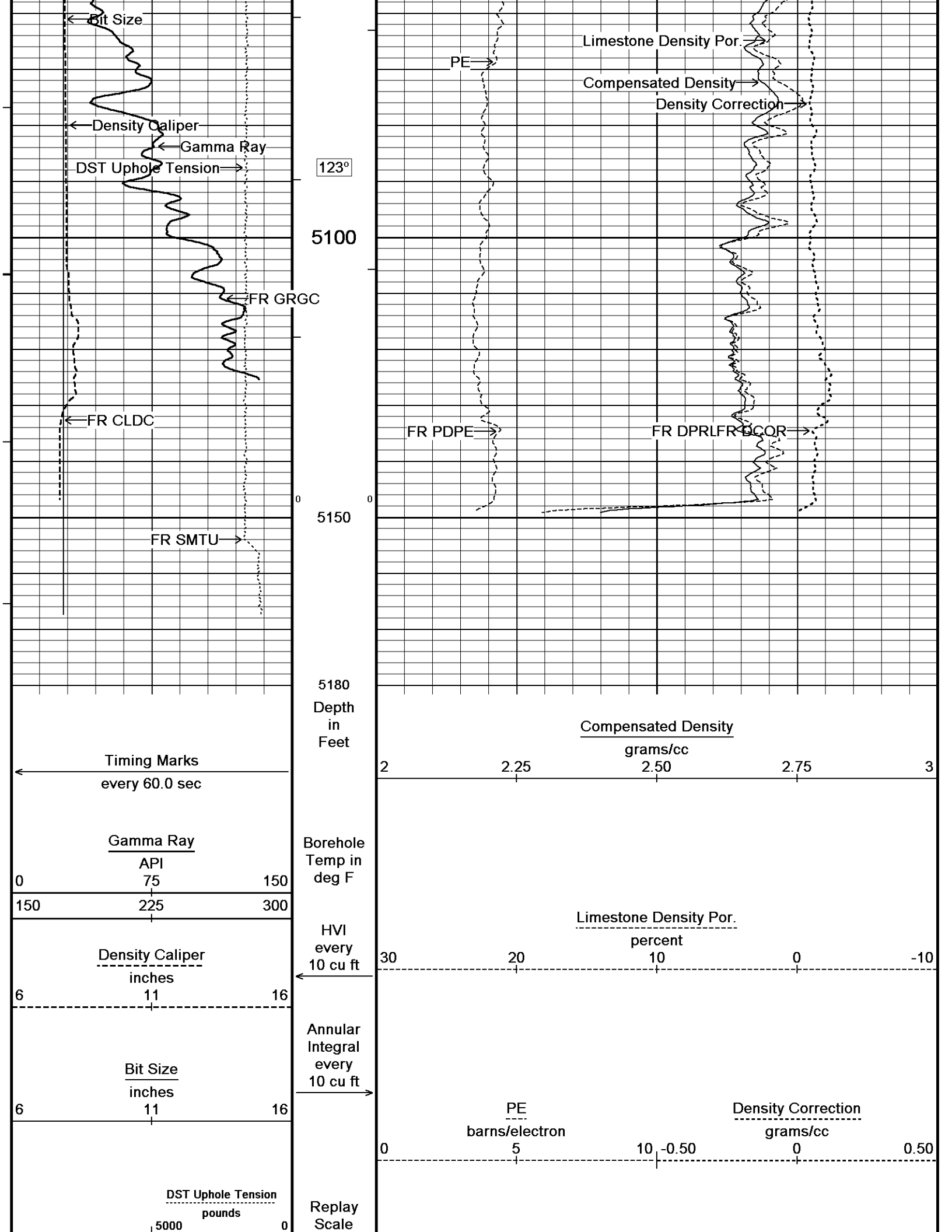

400
114°
4000
115°
4050
115°
4100
116°
4150


116°
4200
116°
4250
300
200
Bit Size
Limestone Density Por
PE
Compensated Density
Density Correction
117°
Density Caliper
Gamma Ray
DST Uphole Tension
4300
117°
4350
117°


4400
118°
4450
118°
4500
118°
4550
200
119°
4600


119°
4650
Bit Size
Limestone Density Por
PE
Compensated Density
Density Correction
Density Caliper
119°
Gamma Ray
DST Uphole Tension
4700
100
120°
4750
121°
4800
121°


121
4850
100
122°
4900
123°
4950
123°
5000
123°
5050


Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
123°
5100
FR GRGC
FR CLDC
FR SMTU
5150
5180
PE
Limestone Density Por.
Compensated Density
Density Correction
FR PDPE
FR DPRLFR DCOR
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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5 INCH MAIN

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

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

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

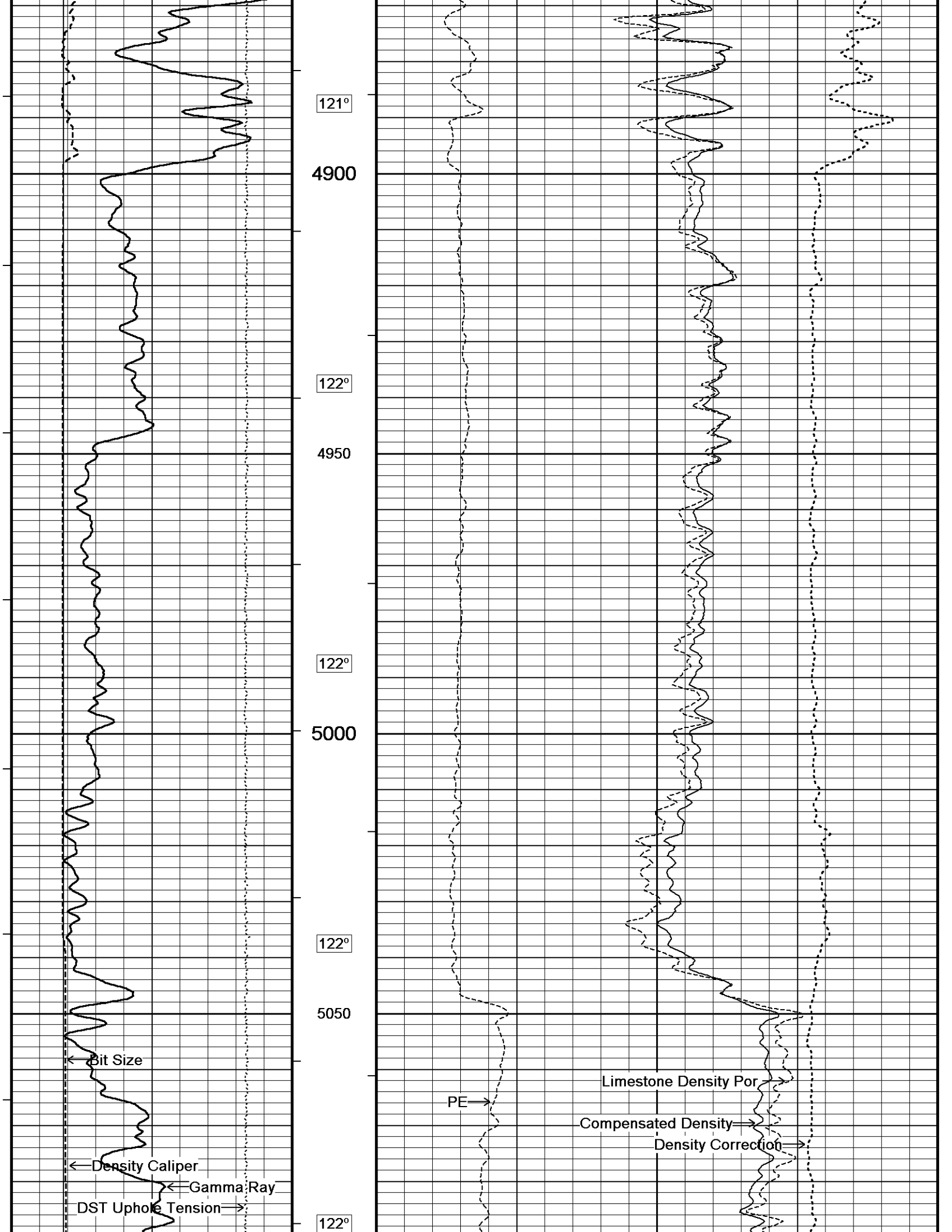
Density Correction
grams/cc
-0.50 0 0.50

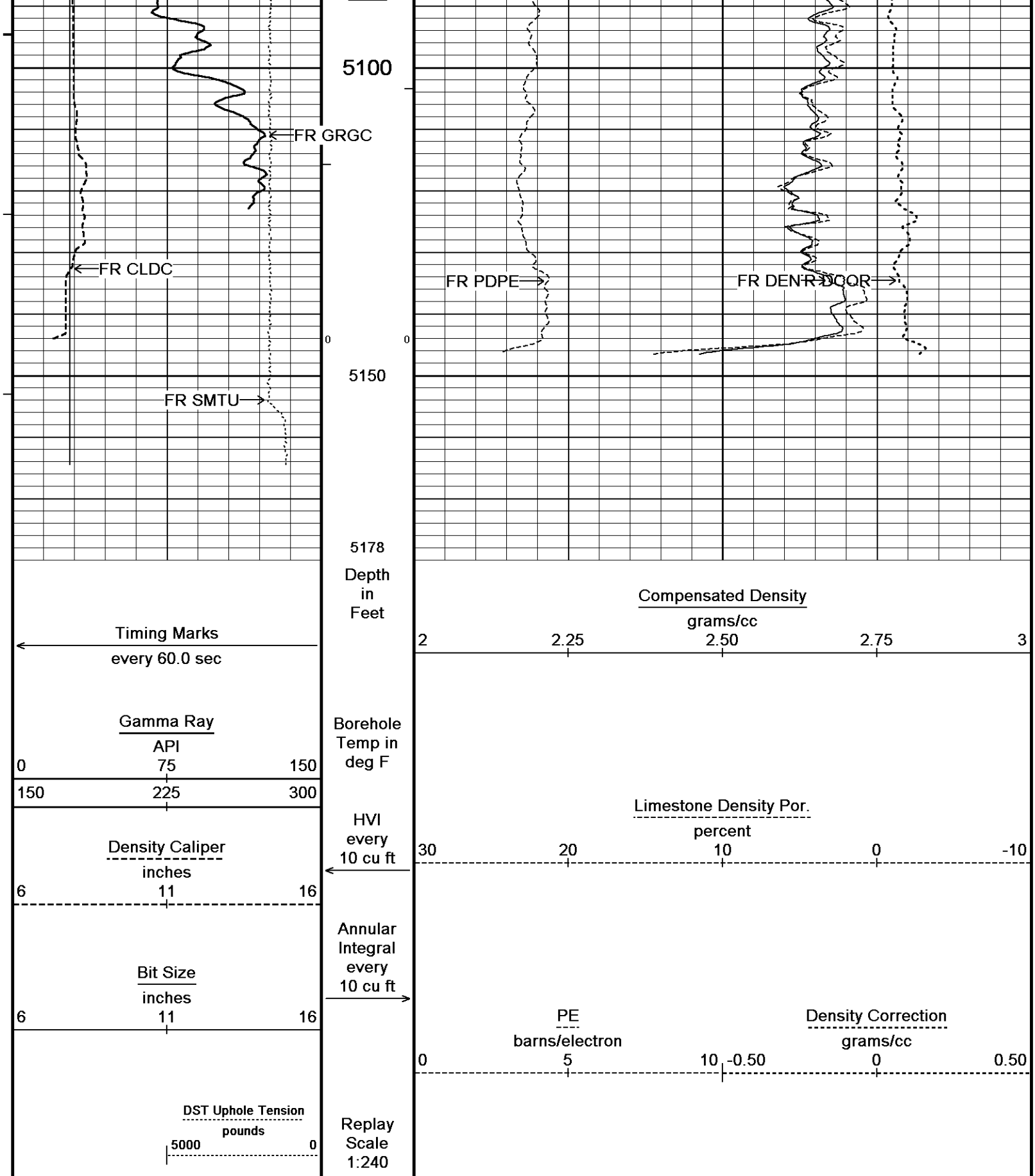
4800

120°

4850

100


121°
4900
122°
4950
122°
5000
122°
5050
122°
Bit Size
Density Caliper
Gamma Ray
DST Uphole Tension
PE
Limestone Density Por
Compensated Density
Density Correction



Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 29-JUN-2013 06:10
Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_001.dta
Recorded on 29-JUN-2013 03:11
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

REPEAT SECTION

BEFORE SURVEY CALIBRATION

General Constants All 000

Last Edited on 29-JUN-2013,01:19

General Parameters		
Mud Resistivity	0.870	ohm-metres
Mud Resistivity Temperature	99.000	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	Crossplot Porosity	
Resistivity used	Array Ind. Six Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0

Field Calibration on 29-JUN-2013 02:28

Reading No	Measured	Calibrated (lbs)
1	14017.35	0.00
2	15249.80	399.00

Gamma Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013 10:15

	Measured	Calibrated (API)
Background	78	54
Calibrator (Gross)	1127	779
Calibrator (Net)	1049	725

Gamma Constants MCG-D.K 469

Last Edited on 29-JUN-2013,01:11

Gamma Calibrator Number	GRC38	
Mud Density	1.08	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013,10:23

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

High Resolution Temperature Constants MCG-D.K 469

Last Edited on 28-JUN-2013,10:23

Pre-filter Length	11

SP Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013,10:23

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

Caliper Calibration MML-A 3

Base Calibration on 05-JUN-2013 15:43
Field Calibration on 28-JUN-2013 10:06

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14624	5.98
2	17958	7.97
3	21263	9.86
4	25213	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.06	5.98

Micro Normal and Micro Inverse Calibration MML-A 3

Base Calibration on 05-JUN-2013 15:36
Field Check on 28-JUN-2013 10:04

Base Calibration

Channel	Measured Resistor 1	Measured Resistor 2	Calibrated (ohm-m) Resistor 1	Calibrated (ohm-m) Resistor 2
Micro Normal	12.2	60.2	5.0	25.0
Micro Inverse	15.7	78.3	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	63.0	63.0
Micro Inverse	48.2	48.2

Micro Normal and Micro Inverse Constants MML-A 3

Last Edited on 28-JUN-2013,10:03

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 22-MAY-2013 15:00
Field Check on 28-JUN-2013 10:19

Base Calibration

	Measured Near	Measured Far	Calibrated (cps) Near	Calibrated (cps) Far
	3145	98	3714	110
Ratio	32.215		33.764	

Field Calibrator at Base

	Calibrated (cps)	
	1654	2365
Ratio	0.699	

Field Check

	Calibrated (cps)	
	1643	2364
Ratio	0.698	

Neutron Constants MDN-A.B 66

Last Edited on 28-JUN-2013,10:15

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	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-B.J 353

Base Calibration on 22-MAY-2013 08:22
Field Check on 28-JUN-2013 09:55

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.9	126.8
Base Check		280.9
Field Check		280.7

FE Constants MFE-B.J 353

Last Edited on 29-JUN-2013,01:11

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 167

Base Calibration on 19-APR-2013,13:41
Field Check on 28-JUN-2013 10:23

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) 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) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1			13.6	3838.5
2			29.7	3475.0
3			29.2	3051.2
4			19.8	2080.6
Deep			18.7	2048.0
Medium			42.2	3988.4
Shallow			43.1	5051.1

Array Temperature 83.0 Deg F

Induction Constants MAI-A.A 167

Last Edited on 29-JUN-2013,01:10

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	60.00	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	

Source for Rxo	0.00

High Resolution Temperature Calibration MAI-A.A 167

Field Calibration on 28-JUN-2013,10:23

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

High Resolution Temperature Constants MAI-A.A 167

Last Edited on 28-JUN-2013,10:23

Pre-filter Length	11

Caliper Calibration MPD-B 64

Base Calibration on 21-MAY-2013 17:34
Field Calibration on 28-JUN-2013 10:03

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14464	3.99
2	23406	5.98
3	32206	7.97
4	40368	9.86
5	50018	11.92
6	N/A	N/A

Field Calibration

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

Photo Density Calibration MPD-B 64

Base Calibration on 21-MAY-2013 17:55
Field Check on 28-JUN-2013 10:00

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	60105	33685	59556	30836
Reference 2	25286	2917	24941	2541

Field Check at Base

1165.8	1353.6

Field Check

1166.1	1349.7

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	210	1037		
Reference 1	22619	59903	0.381	0.371
Reference 2	6846	25146	0.275	0.272

Field Check at Base

210.2	1037.2

Field Check

209.6	1037.1

Density Constants MPD-B 64

Last Edited on 29-JUN-2013,01:11

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	1.08	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

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002 spooled section.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-D.K 469 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

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

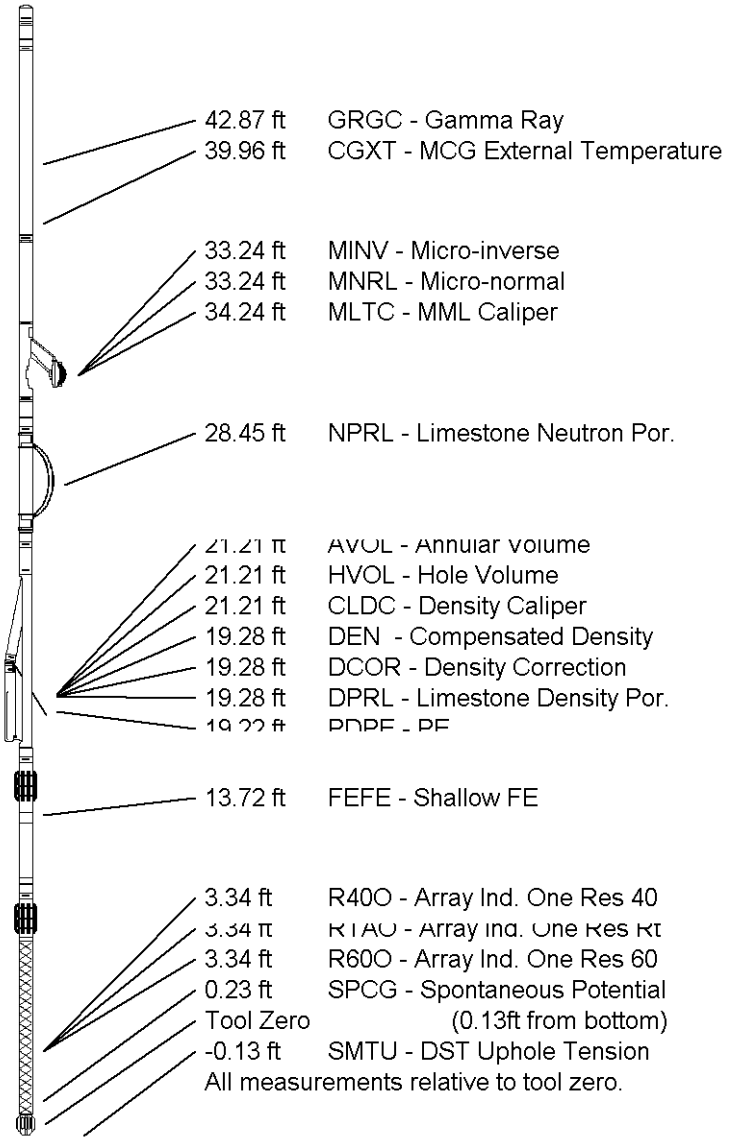
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

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: 49.73 ft Weight: 399.0 lb



COMPANY	M&M EXPLORATION, INC.
WELL	Z-BAR 35-6
FIELD	AETNA GAS AREA
PROVINCE/COUNTY	BARBER
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	1781.00	feet	First Reading	5135.00	feet
Elevation Drill Floor	1779.00	feet	Depth Driller	5150.00	feet
Elevation Ground Level	1771.00	feet	Depth Logger	5154.00	feet

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COMPACT PHOTO DENSITY
COMPENSATED NEUTRON