

**Weatherford****PHOTO DENSITY
COMPENSATED NEUTRON
LOGS**

COMPANY				EAST CHEYENNE GAS STORAGE LLC			
WELL				ECGS NO 6-16 WPD009-2			
FIELD				PEETZ WEST			
PROVINCE/COUNTY				LOGAN			
COUNTRY/STATE				USA/COLORADO			
LOCATION				SHL: 1646' FNL & 2199' FWL			
SEC	TWP	RGE	Other Services				
6	11N	52W	MAI				
API Number		WPD009-2		CMI			
Permit Number		05-075-09402					
Permanent Datum G.L., Elevation 4555 feet							
Log Measured From KB							
Drilling Measured From KB@ 12							
Date	23-SEP-2012						
Run Number	1						
Depth Driller	5260.00			feet			
Depth Logger	5260.00			feet			
First Reading	5208.00			feet			
Last Reading	1223.00			feet			
Casing Driller	1234.00			feet			
Casing Logger	1223.00			feet			
Bit Size	8.750			inches			
Hole Fluid Type	WBM						
Density / Viscosity	9.70 g/cc		51.00 CP				
PH / Fluid Loss	9.00		17.00 ml/10min				
Sample Source	FLOWLINE						
Rm @ Measured Temp	3.46 @ 87.3			ohm-m			
Rmf @ Measured Temp	2.77 @ 87.3			ohm-m			
Rmc @ Measured Temp	4.15 @ 87.3			ohm-m			
Source Rmf / Rmc	CALC	CALC					
Rm @ BHT	2.12 @144.0		ohm-m				
Time Since Circulation	4 HOURS						
Max Recorded Temp	144.00			deg F			
Equipment Name	COMPACT						
Equipment / Base	13144	RK SPR					
Recorded By	J.LIU			T.BENICH			
Witnessed By	J.ASHBY						

BOREHOLE RECORD

Last Edited: 23-SEP-2012 09:50

Bit Size inches	Depth From feet	Depth To feet
8.750	1234.00	5260.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1234.00	36.00

REMARKS

SOFTWARE VERSION 13.03.7779

TOOLS RUN: SHA, MCG, MDN, MPD, MIS-D, SKJ, MIS-E, SKJ, MIM, MIE, SKJ, MFE, MAI RUN IN COMBINATION.

HARDWARE: MPD: 8" PROFILE PLATE USED.
MAI: TWO 1 INCH STANDOFFS USED.
MFE: ONE 1 INCH STANDOFF USED.
MDN: DUAL BOWSPRING USED.
MIM: ONE NONMETALIC CENTRALIZING BASKET USED.
MIE: ONE 1 INCH STANDOFF USED

2.65 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY.

TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

DENSITY CALIPER UNDERGAUGED. REPROCESSED WITH BIT SIZE

TIGHT PULL AT 3995 FT. CLOSED CALIPERS TO PULL THROUGH. MAX TENSION AT 2000 LBS

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING =1700 CUBIC FEET

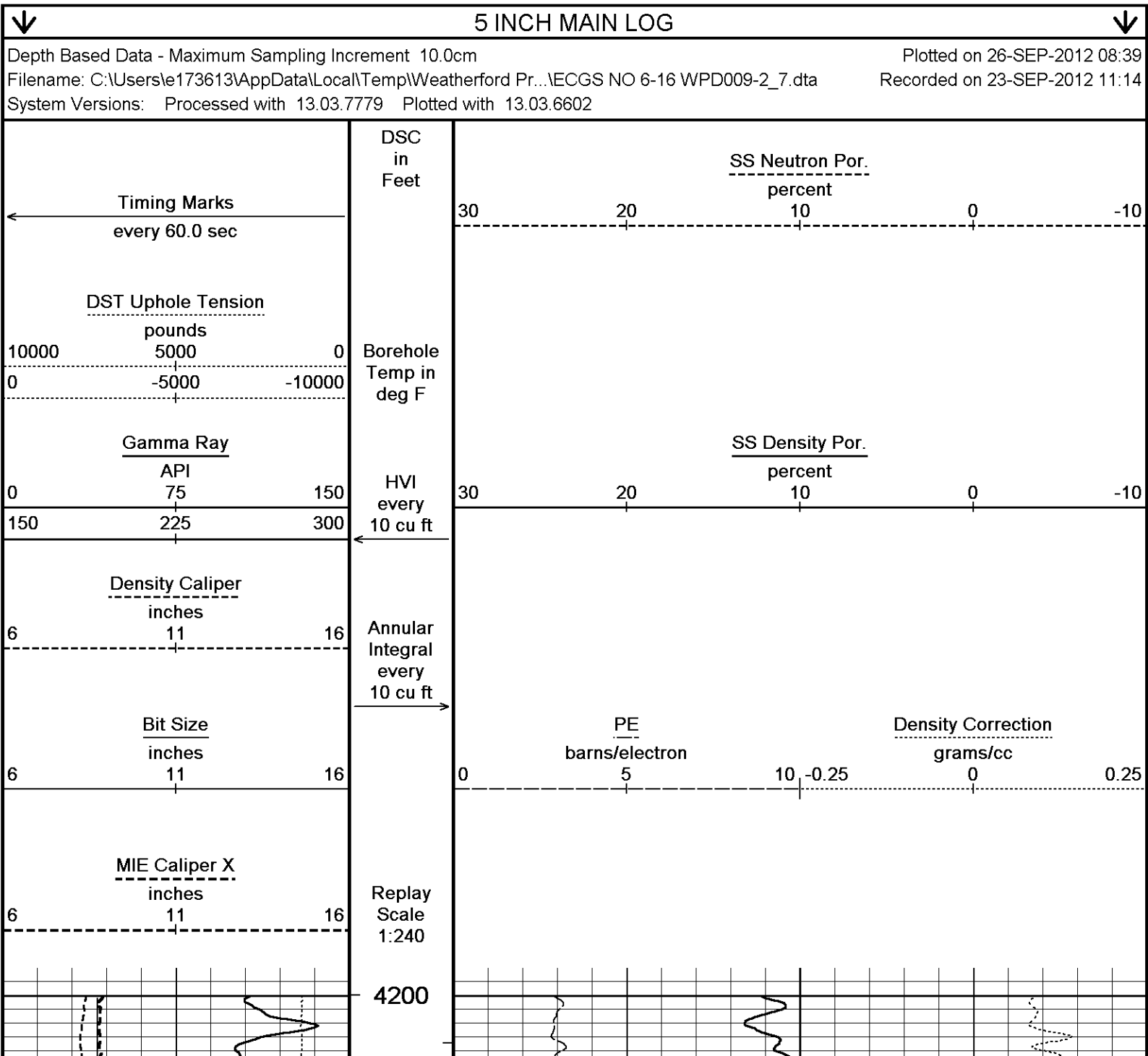
ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 620 CUBIC FEET

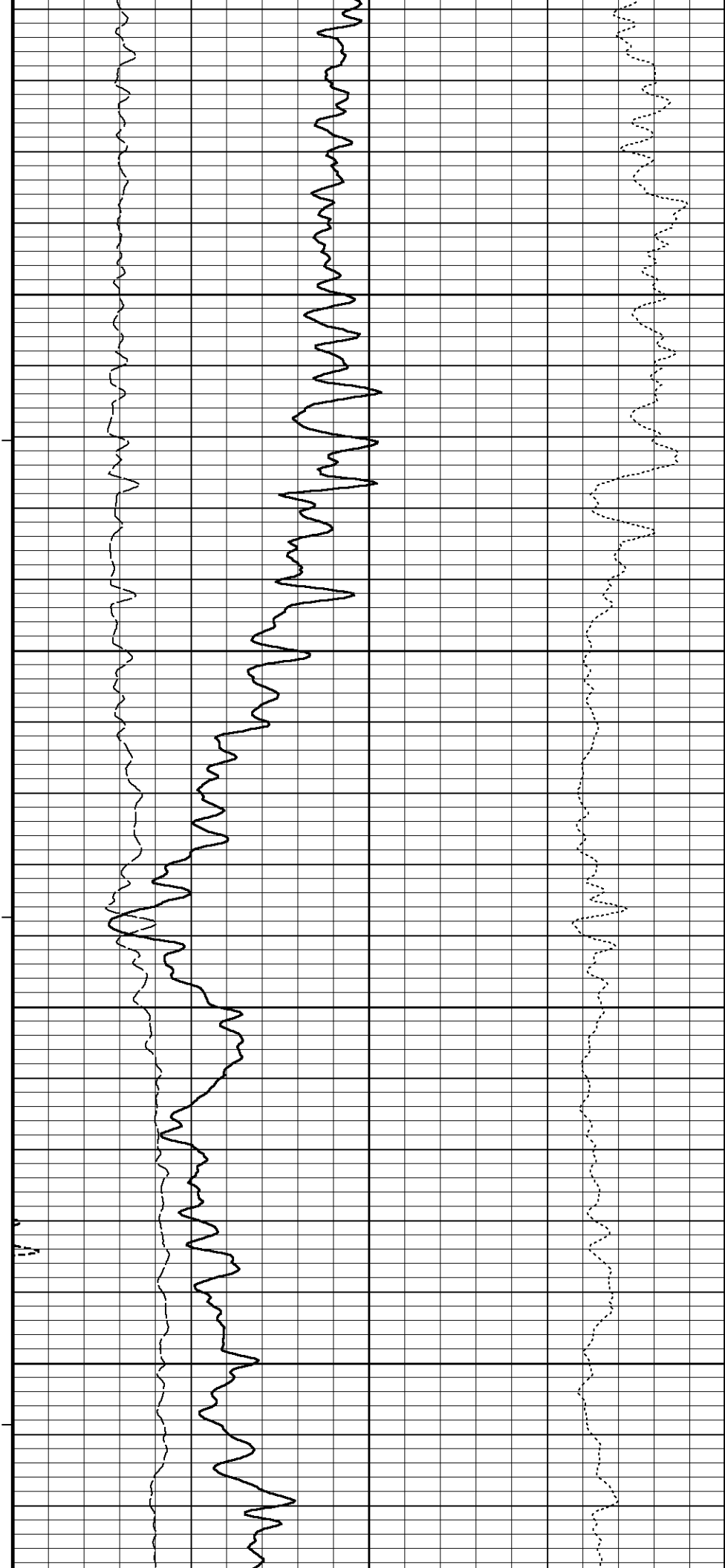
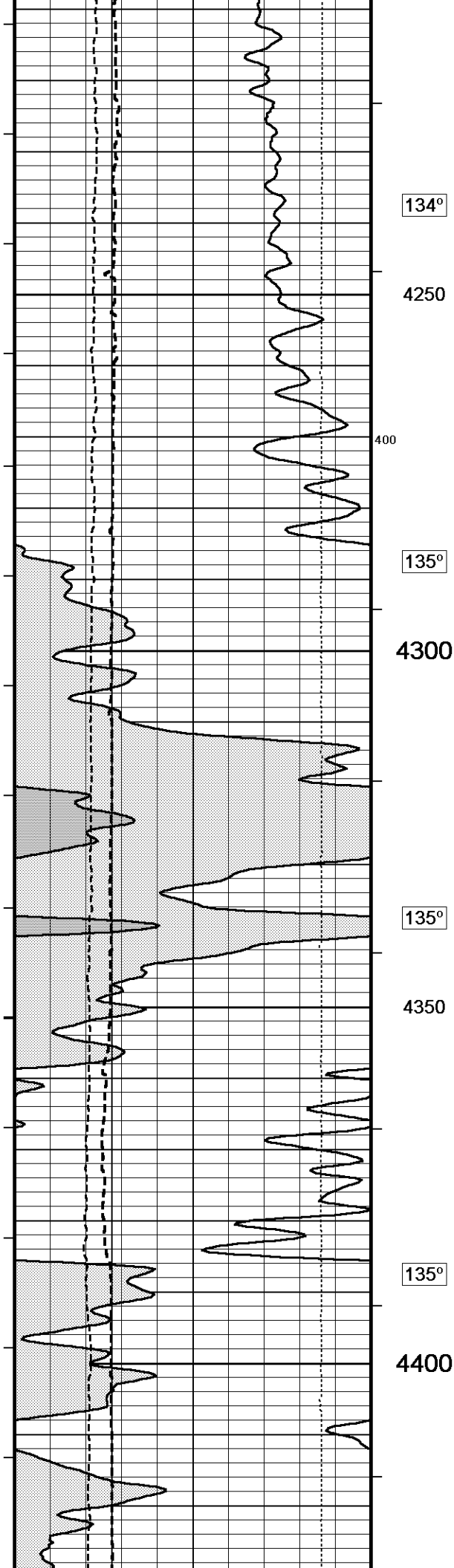
SERVICE ORDER: #3535291

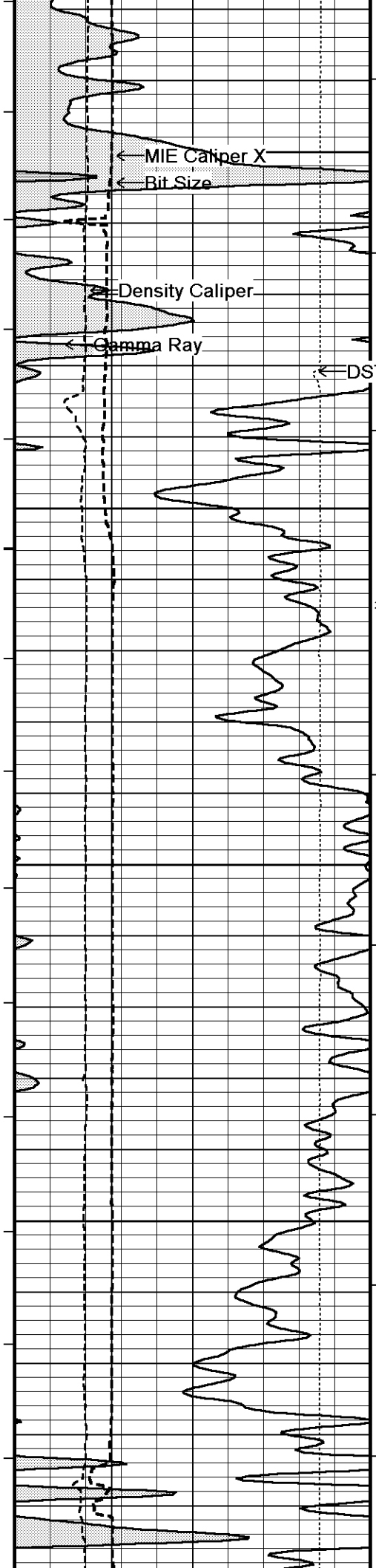
OPERATOR: B.PECK
S.ELMORE
J.BARTZ

RIG: CADE 22

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.







135°

4450

SS Density Por.

PE

Density Correction

135°

4500

300

136°

4550

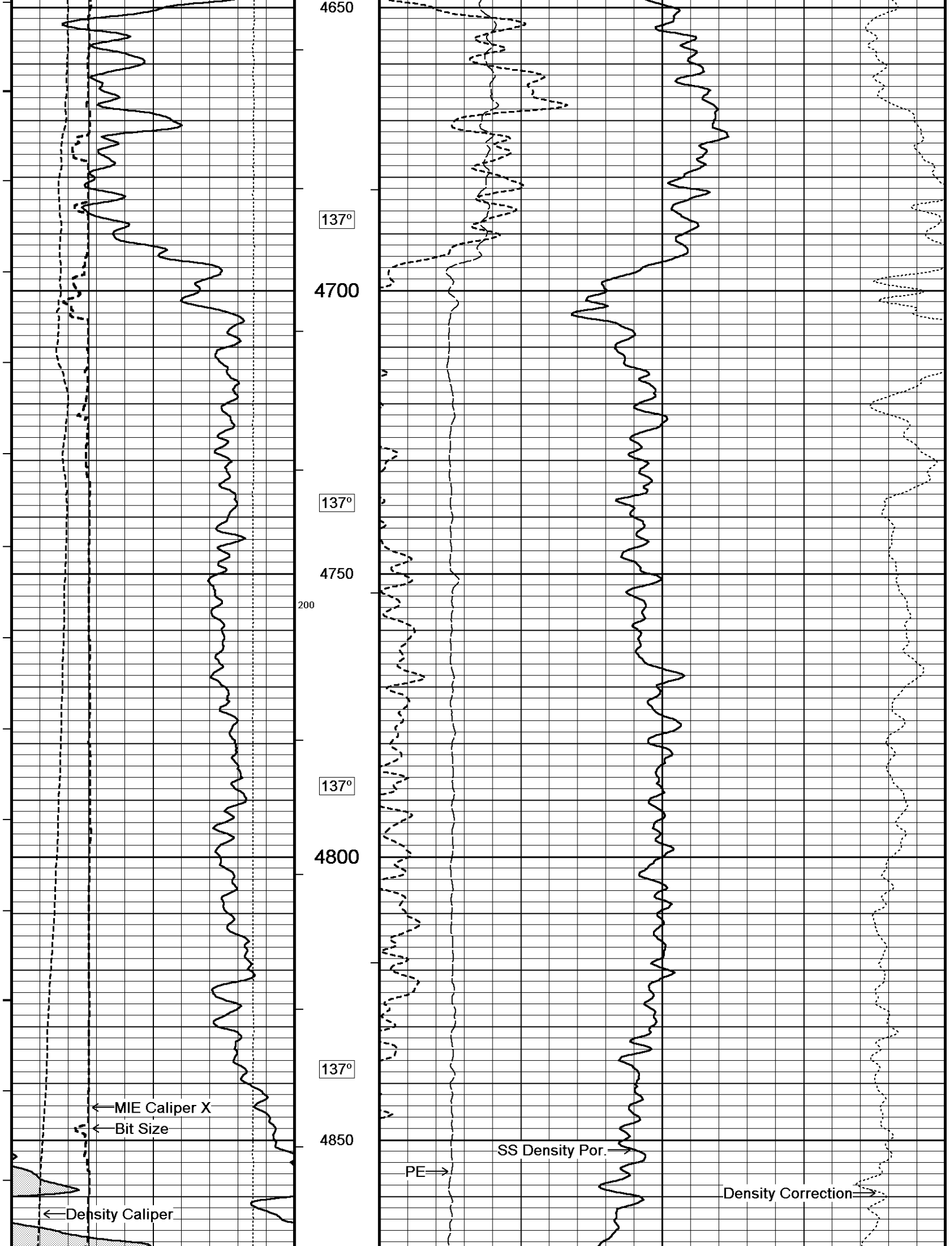
100

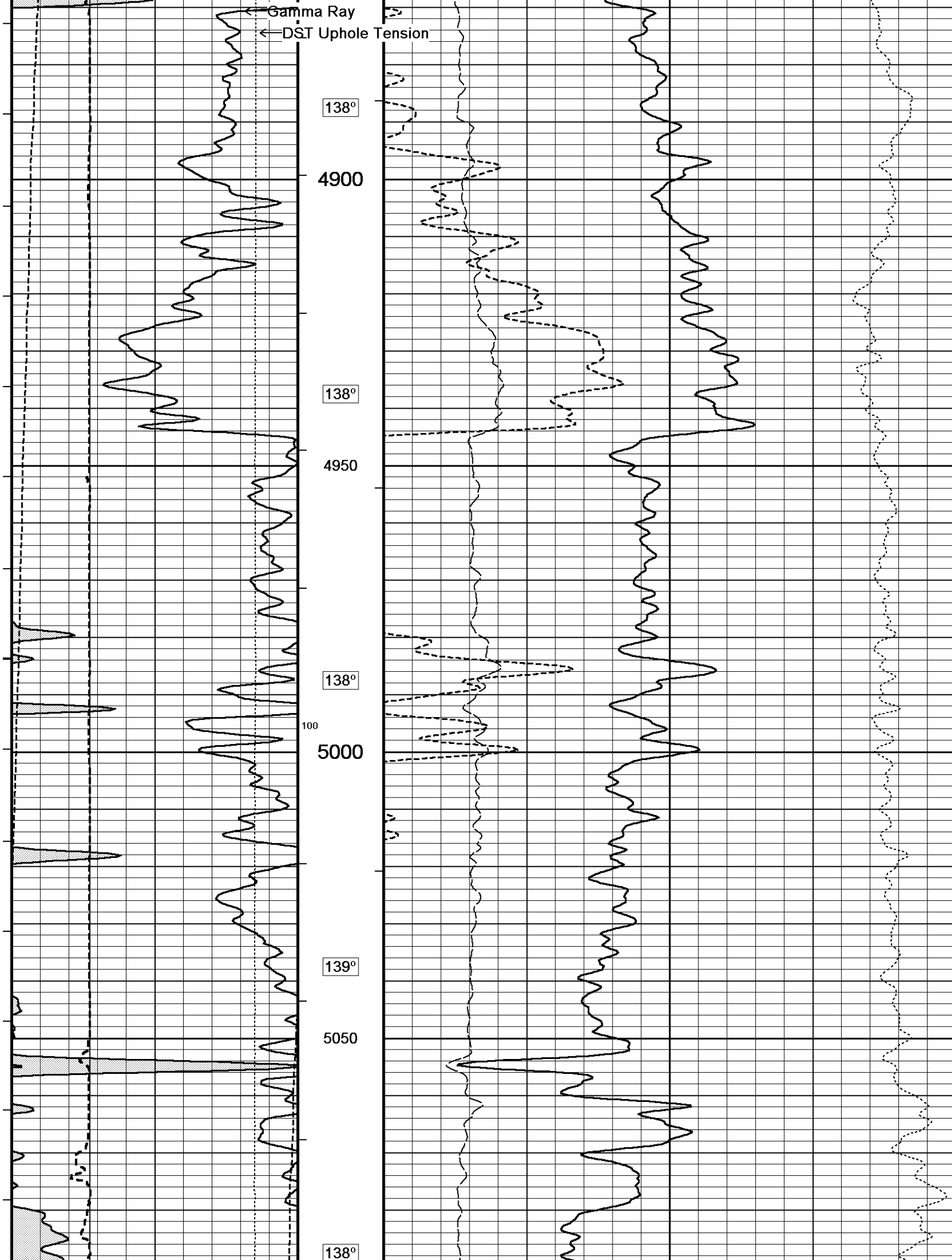
136°

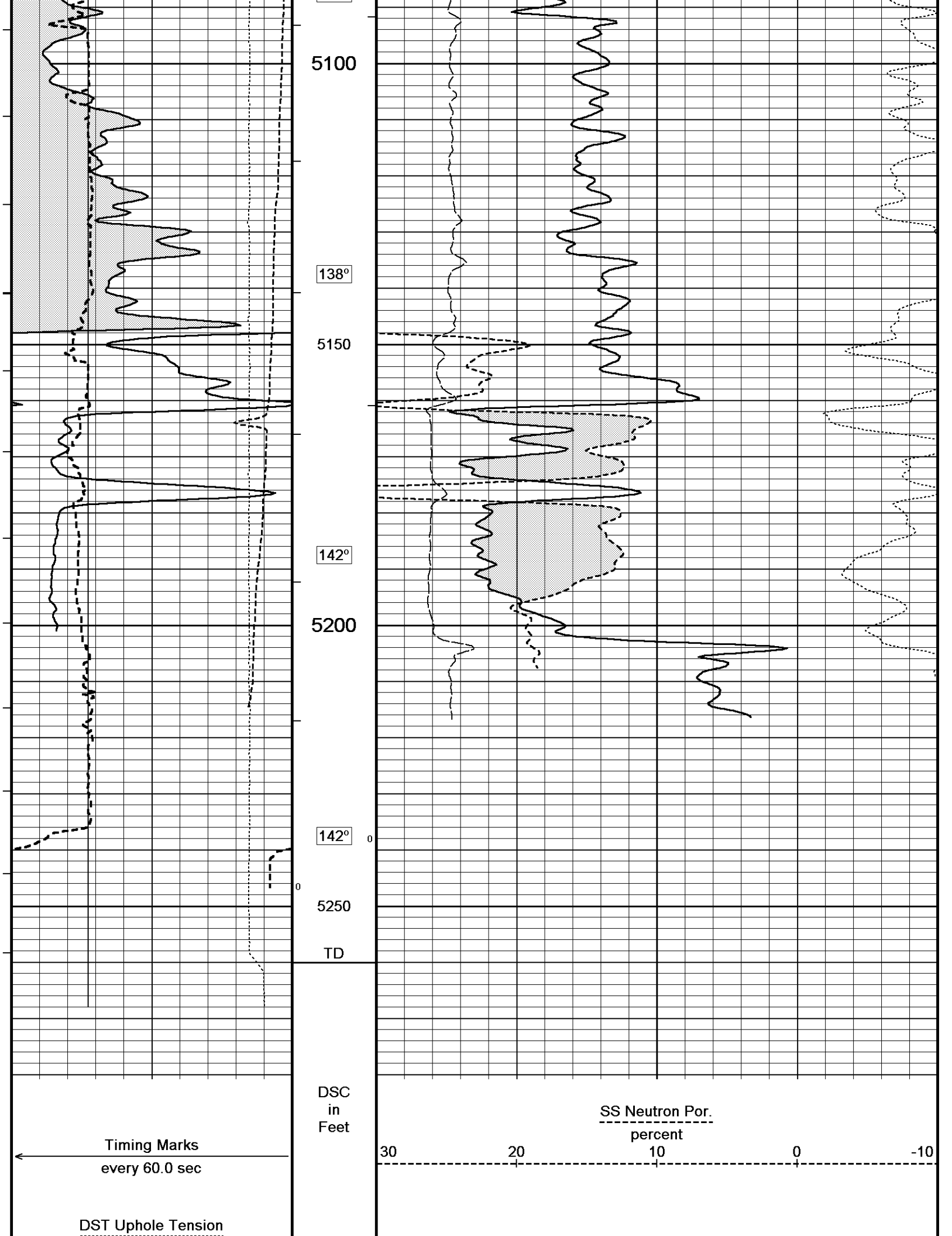
4600

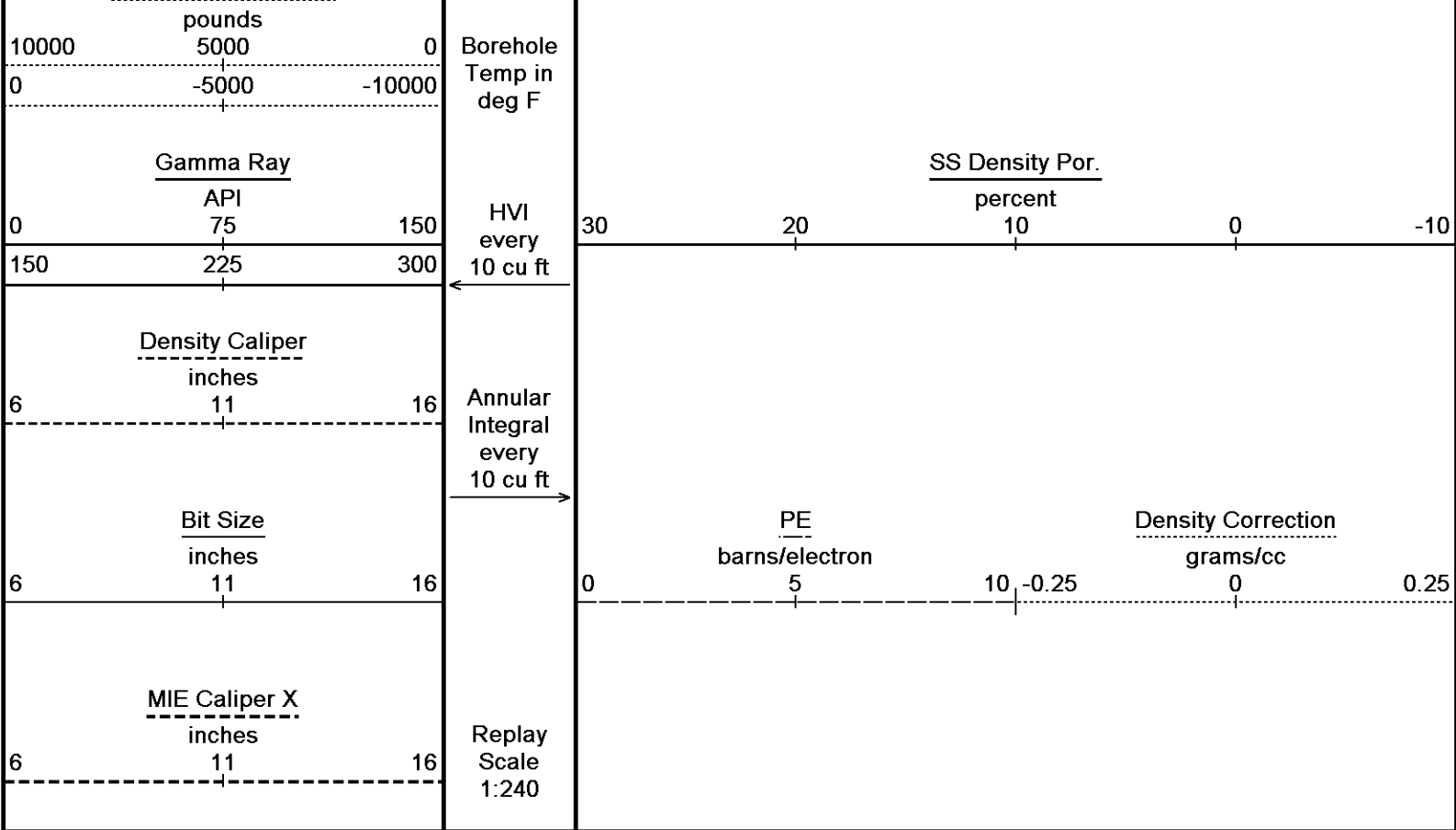
137°

DST Uphole Tension









Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 26-SEP-2012 08:39

Filename: C:\Users\le173613\AppData\Local\Temp\Weatherford Pr...\IECGS NO 6-16 WPD009-2_7.dta

Recorded on 23-SEP-2012 11:14

System Versions: Processed with 13.03.7779 Plotted with 13.03.6602

↑

5 INCH MAIN LOG

↑

↓

OVERLAY SECTION

↓

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 26-SEP-2012 08:39

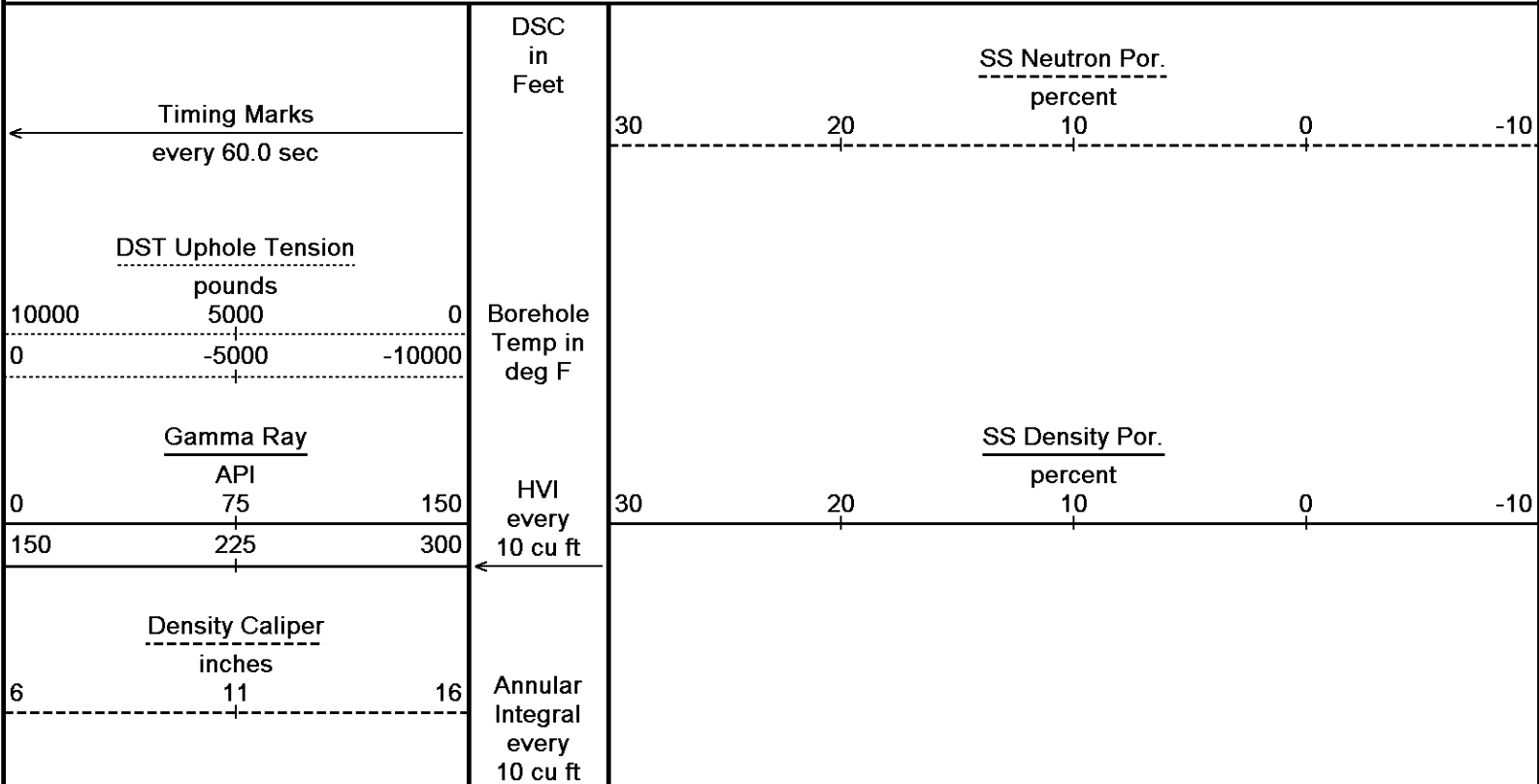
Filename: C:\Users\le173613\AppData\Local\Temp\Weatherford Pr...\IECGS NO 6-16 WPD009-2_7.dta

Recorded on 23-SEP-2012 11:14

Filename: C:\Users\le173613\AppData\Local\Temp\Weatherford Pr...\IECGS NO 6-16 WPD009-2_8.dta

Recorded on 23-SEP-2012 10:50

System Versions: Processed with 13.03.7779 Plotted with 13.03.6602



Bit Size
inches

6 11 16

MIE Caliper X
inches

6 11 16

Replay
Scale
1:240

5000

139°

5050

138°

5100

138°

5150

PE

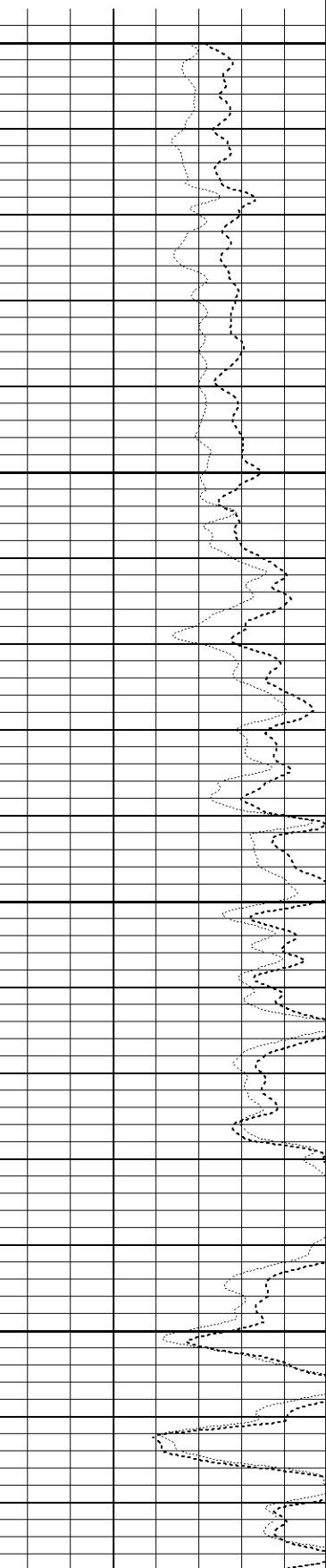
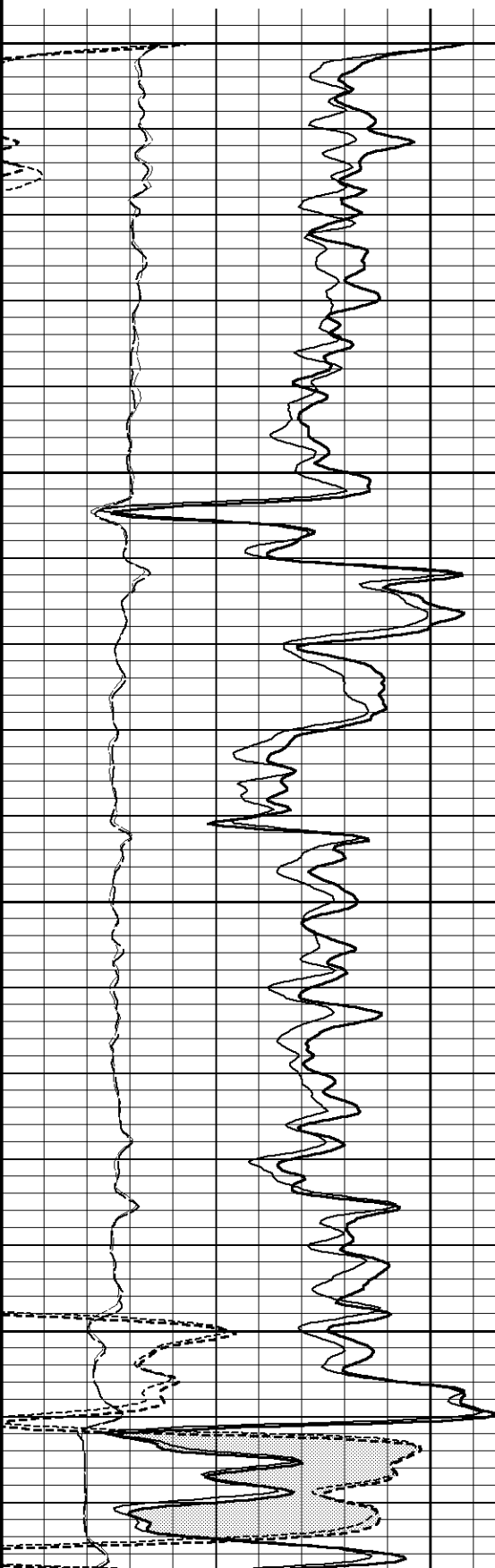
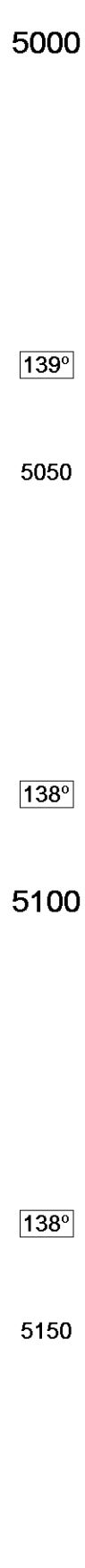
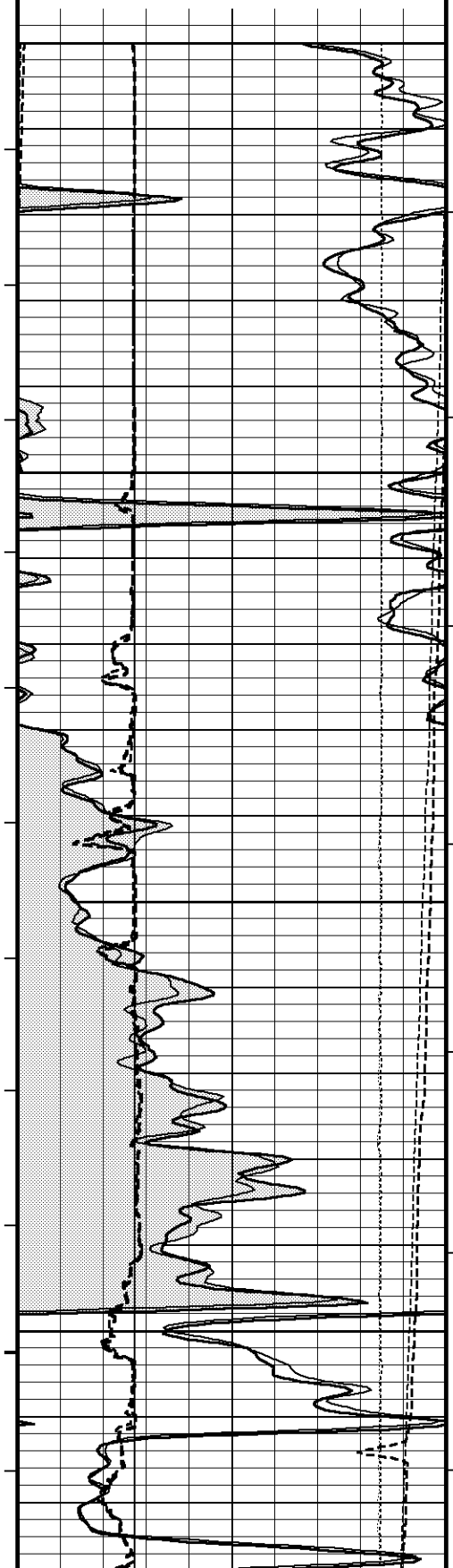
barns/electron

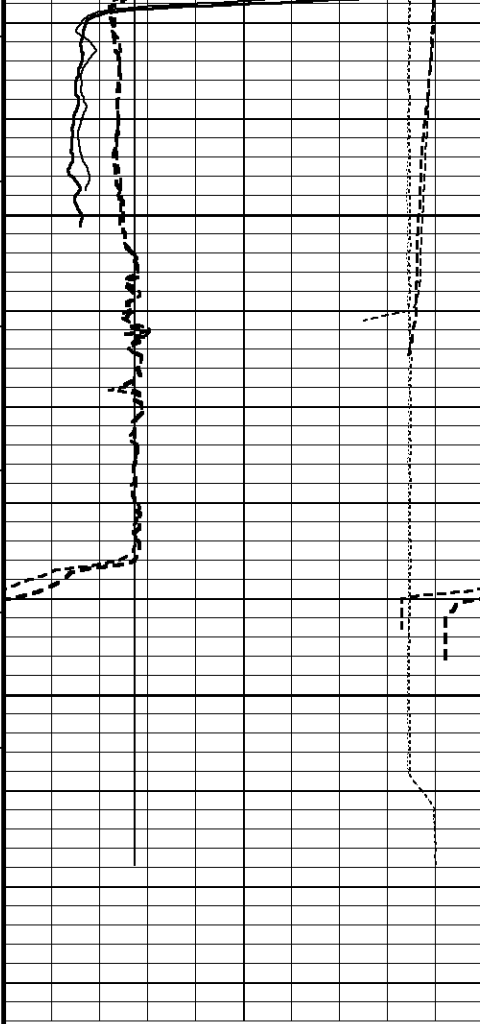
0 5 10 -0.25

Density Correction

grams/cc

0 0.25





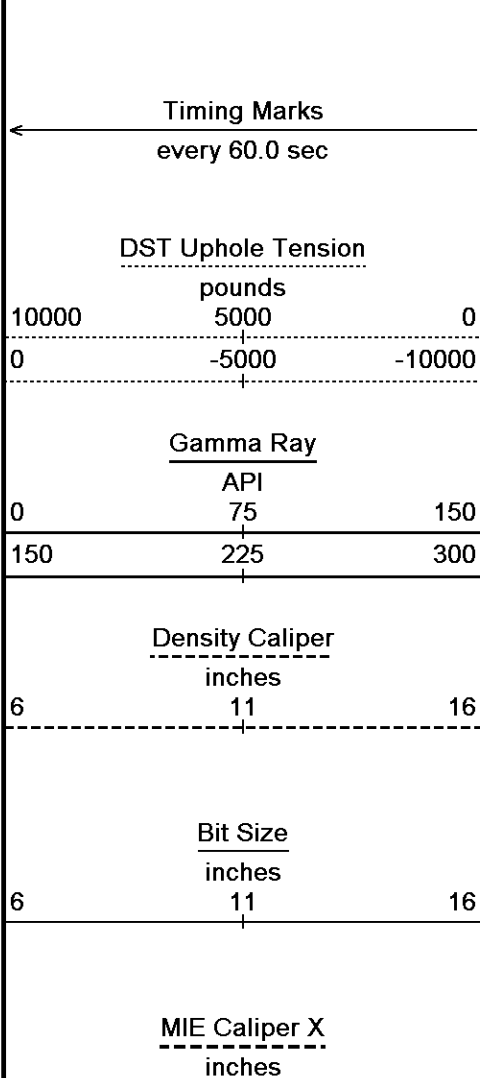
142°

5200

142°

5250

TD



Timing Marks
every 60.0 sec

DST Uphole Tension
pounds

10000 5000 0
0 -5000 -10000

Gamma Ray

API

0 75 150
150 225 300

Density Caliper
inches

6 11 16

Bit Size

inches

6 11 16

MIE Caliper X

inches

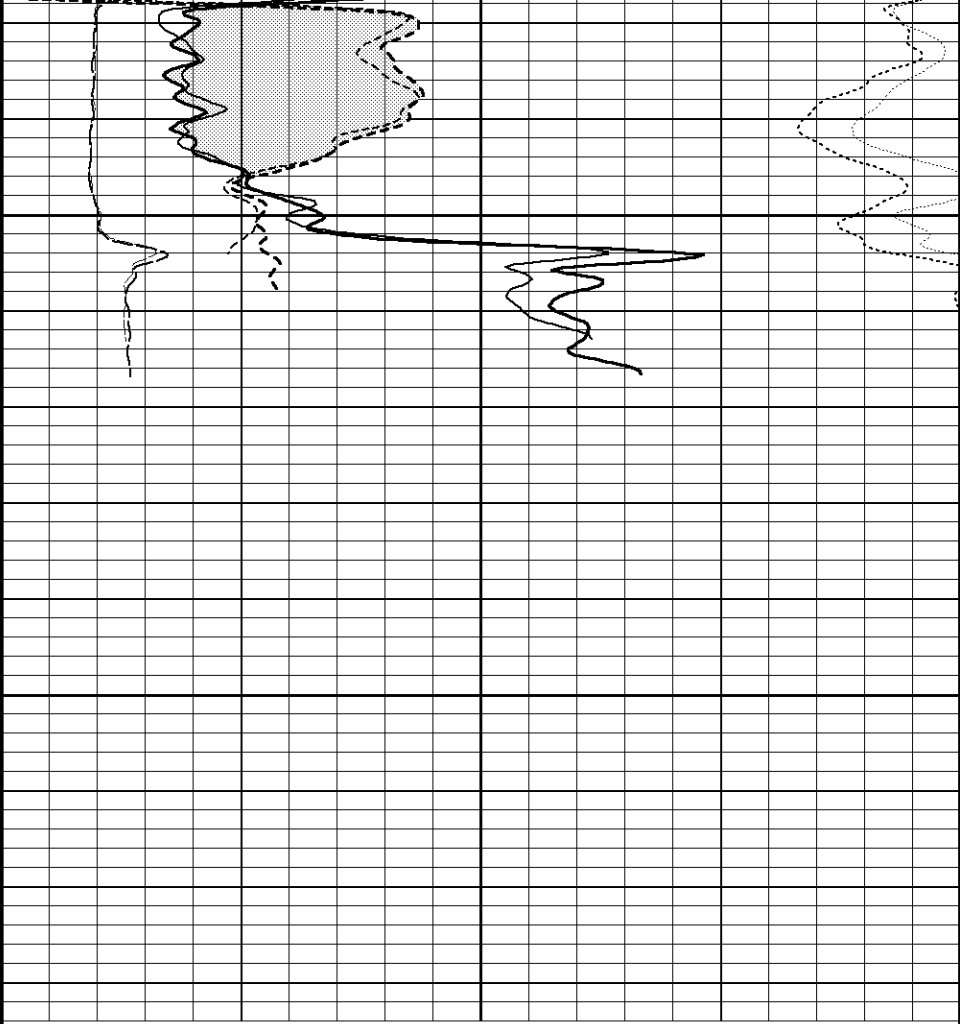
DSC
in
Feet

Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay



SS Neutron Por.
percent

30 20 10 0 -10

SS Density Por.
percent

30 20 10 0 -10

PE
barns/electron

0 5 10 -0.25

Density Correction
grams/cc

-0.25 0 0.25

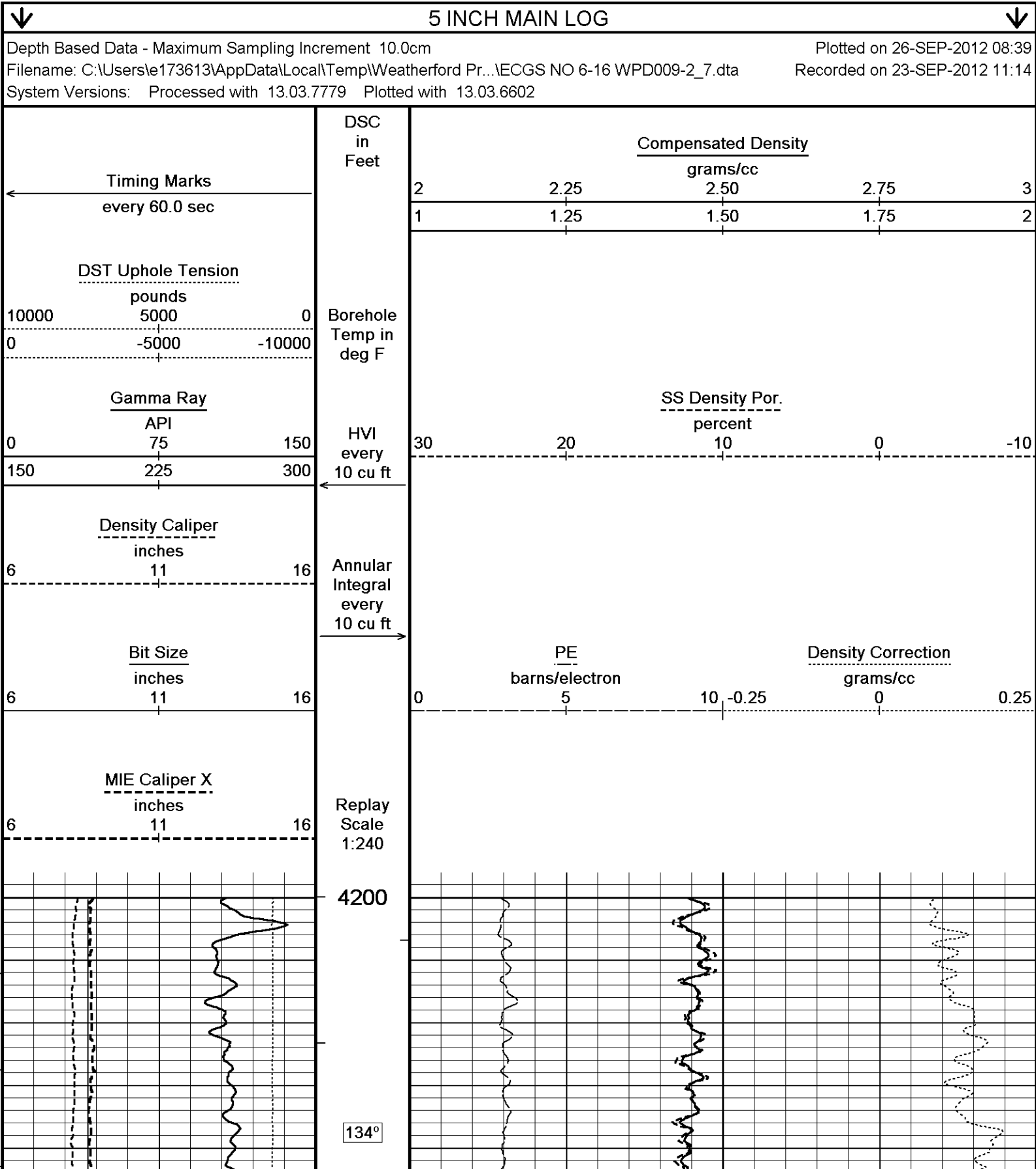
61116

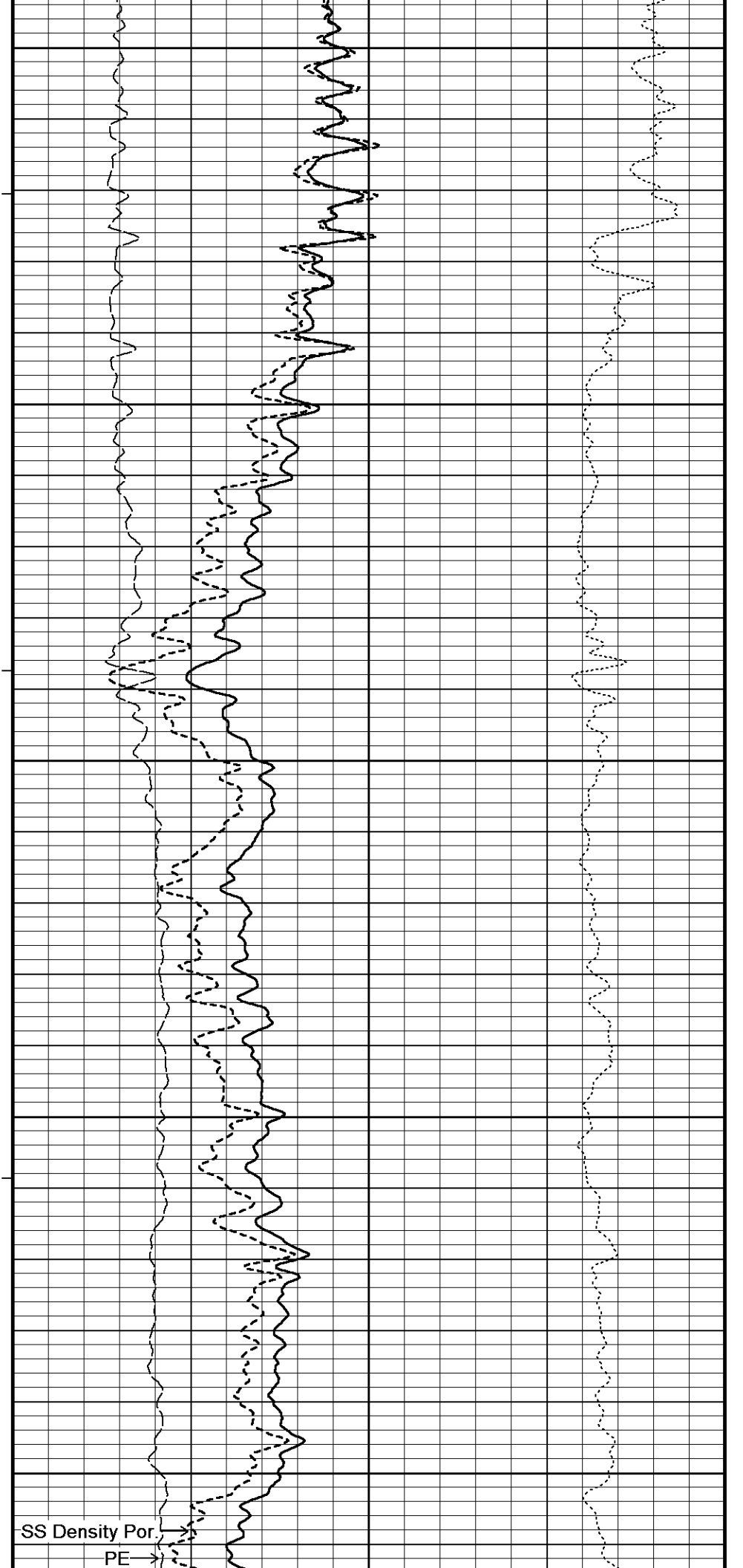
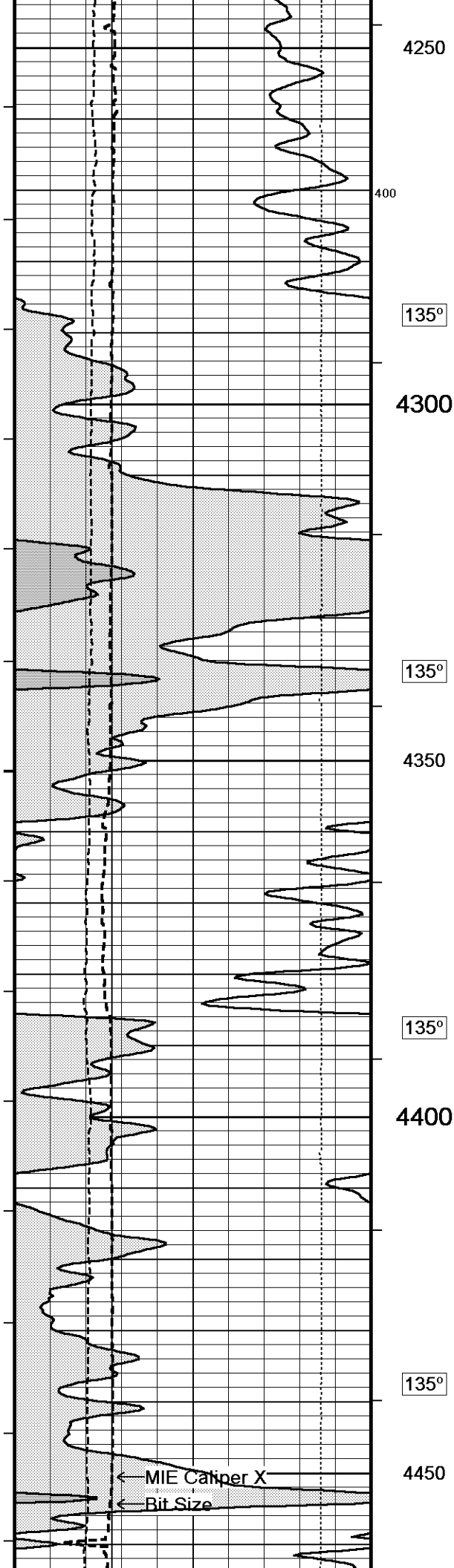
Scale
1:240

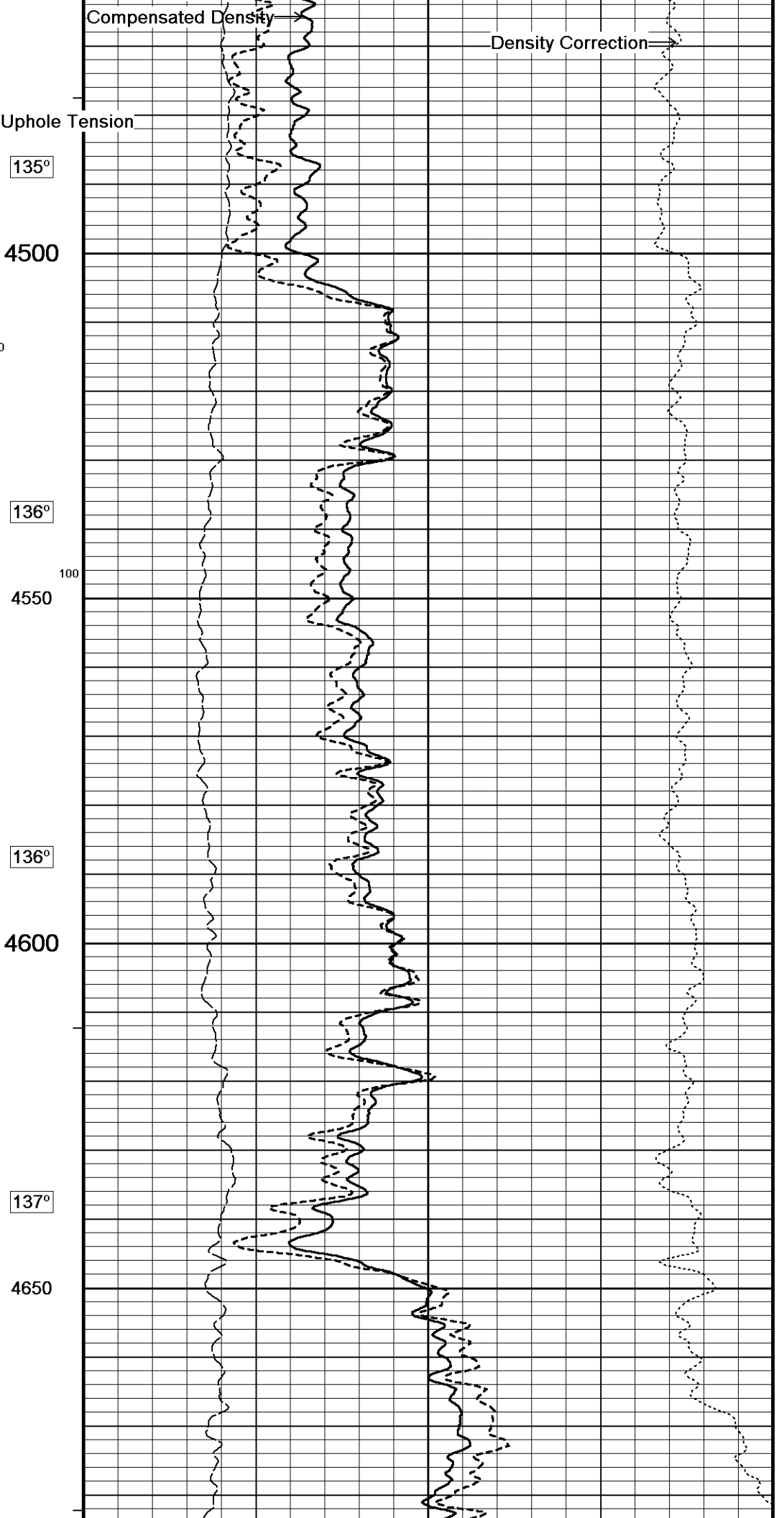
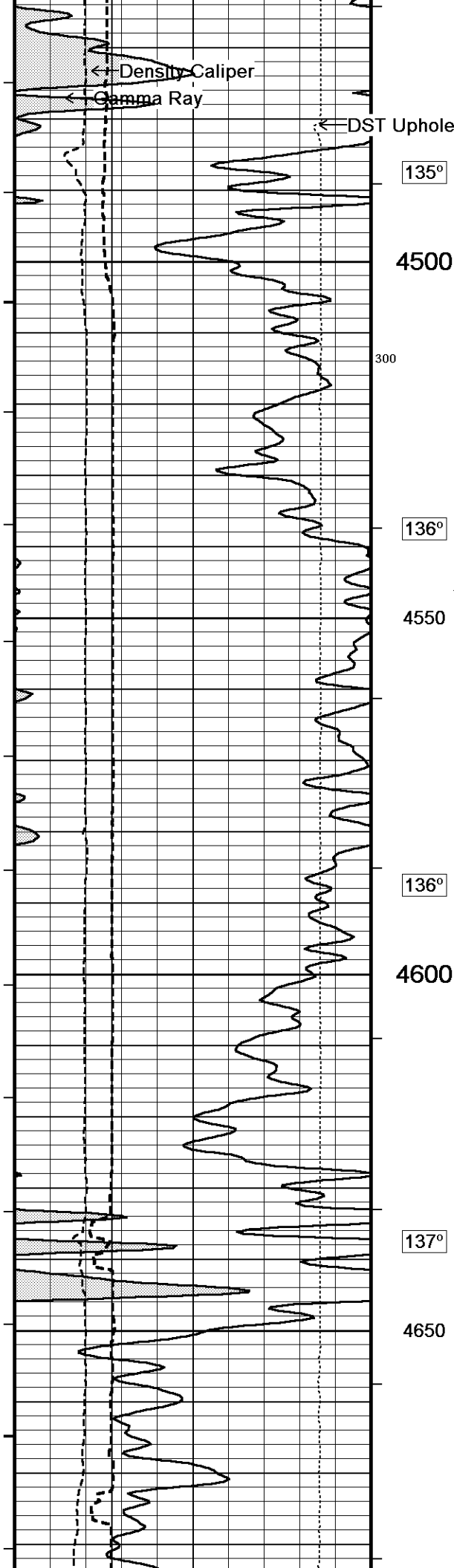
Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Users\173613\AppData\Local\Temp\Weatherford Pr...\IECGS NO 6-16 WPD009-2_7.dta
Filename: C:\Users\173613\AppData\Local\Temp\Weatherford Pr...\IECGS NO 6-16 WPD009-2_8.dta
System Versions: Processed with 13.03.7779 Plotted with 13.03.6602

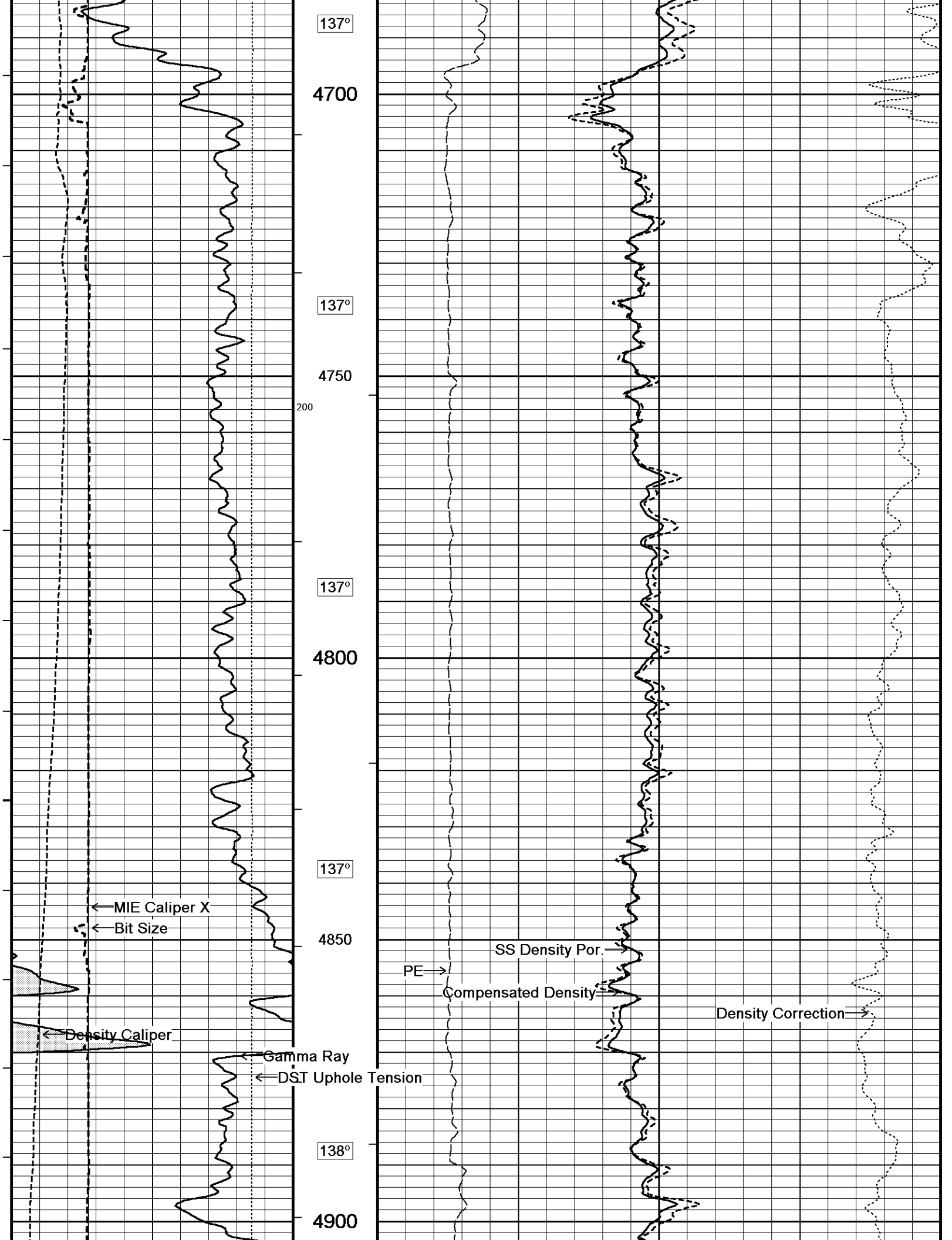
Plotted on 26-SEP-2012 08:39
Recorded on 23-SEP-2012 11:14
Recorded on 23-SEP-2012 10:50

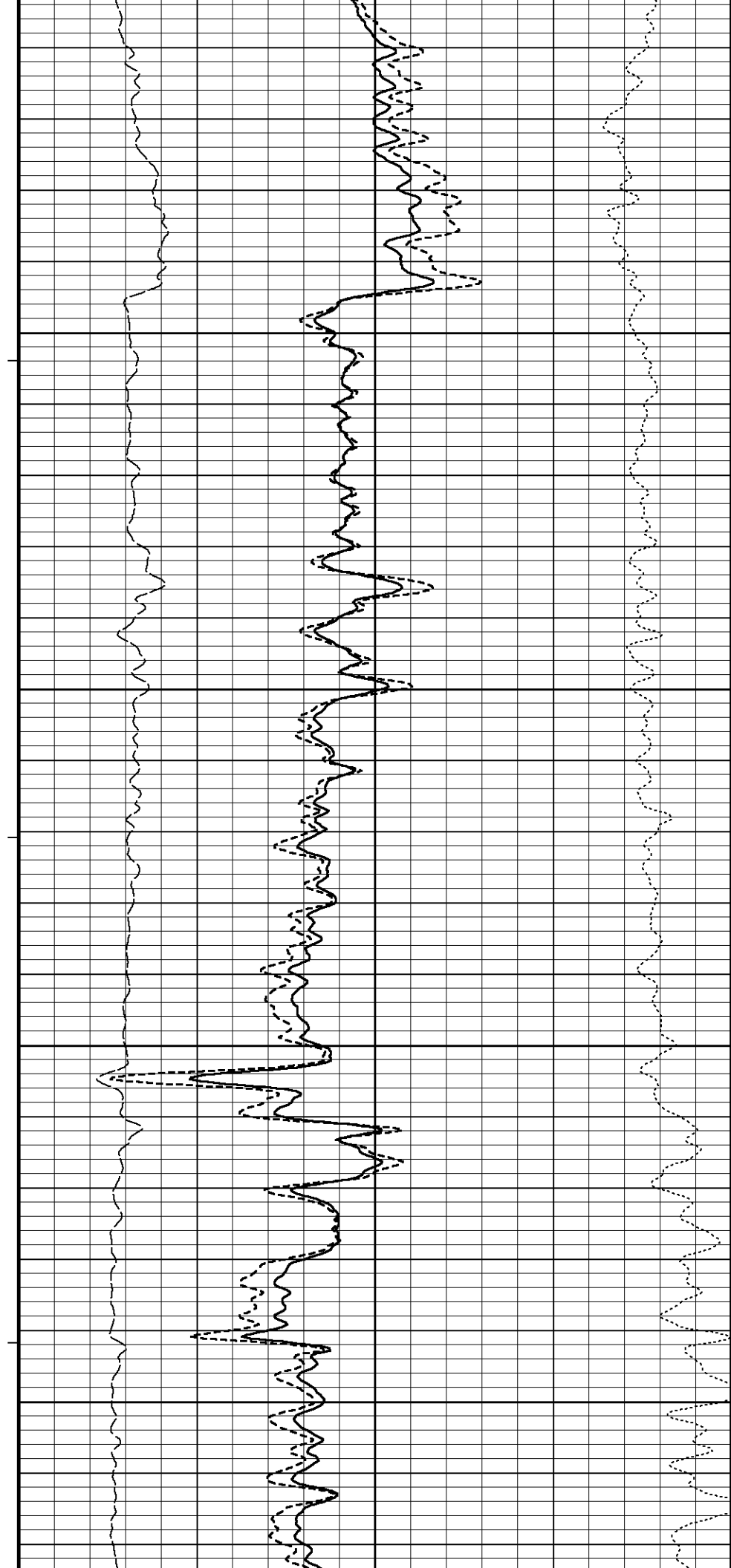
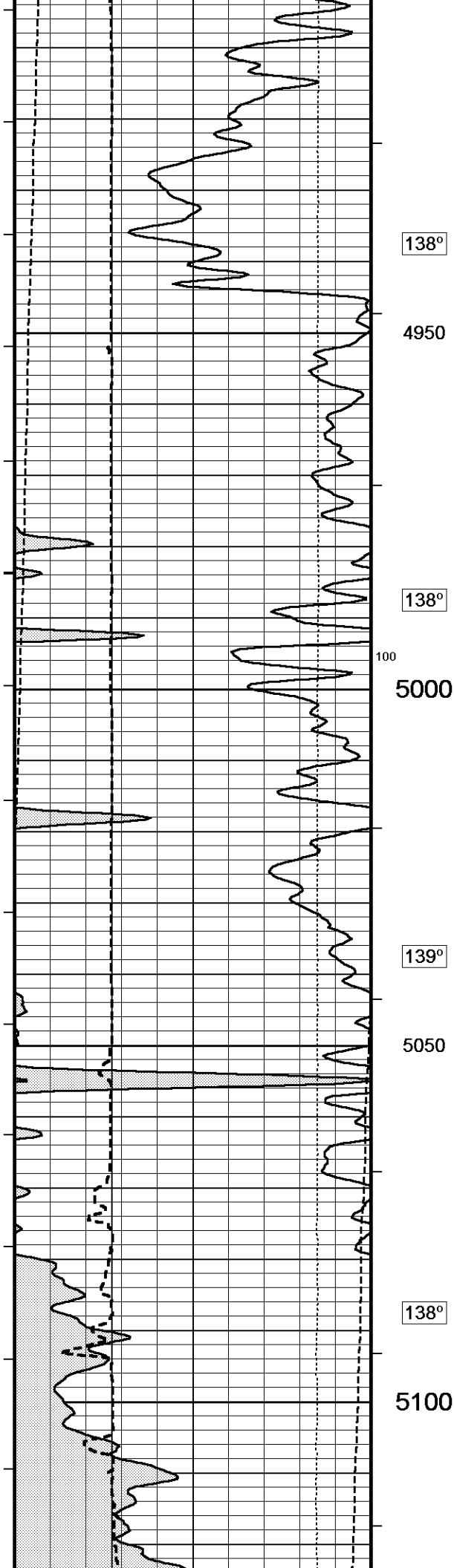
↑OVERLAY SECTION↑

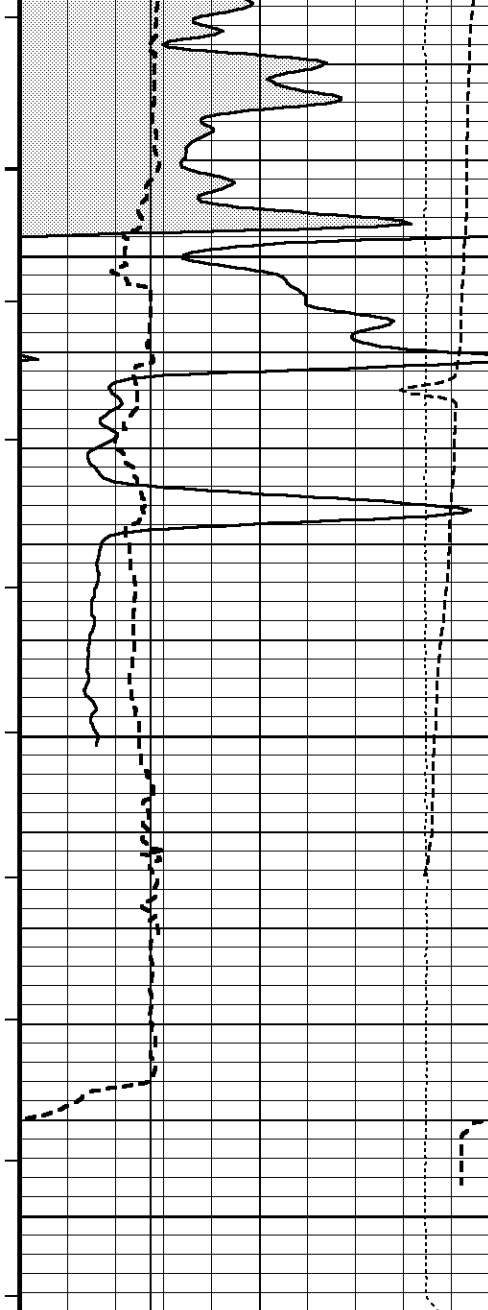












138°

5150

142°

5200

142°

5250

TD

DSC
in
Feet

Timing Marks
every 60.0 sec

DST Uphole Tension

pounds

10000 5000 0
0 -5000 -10000

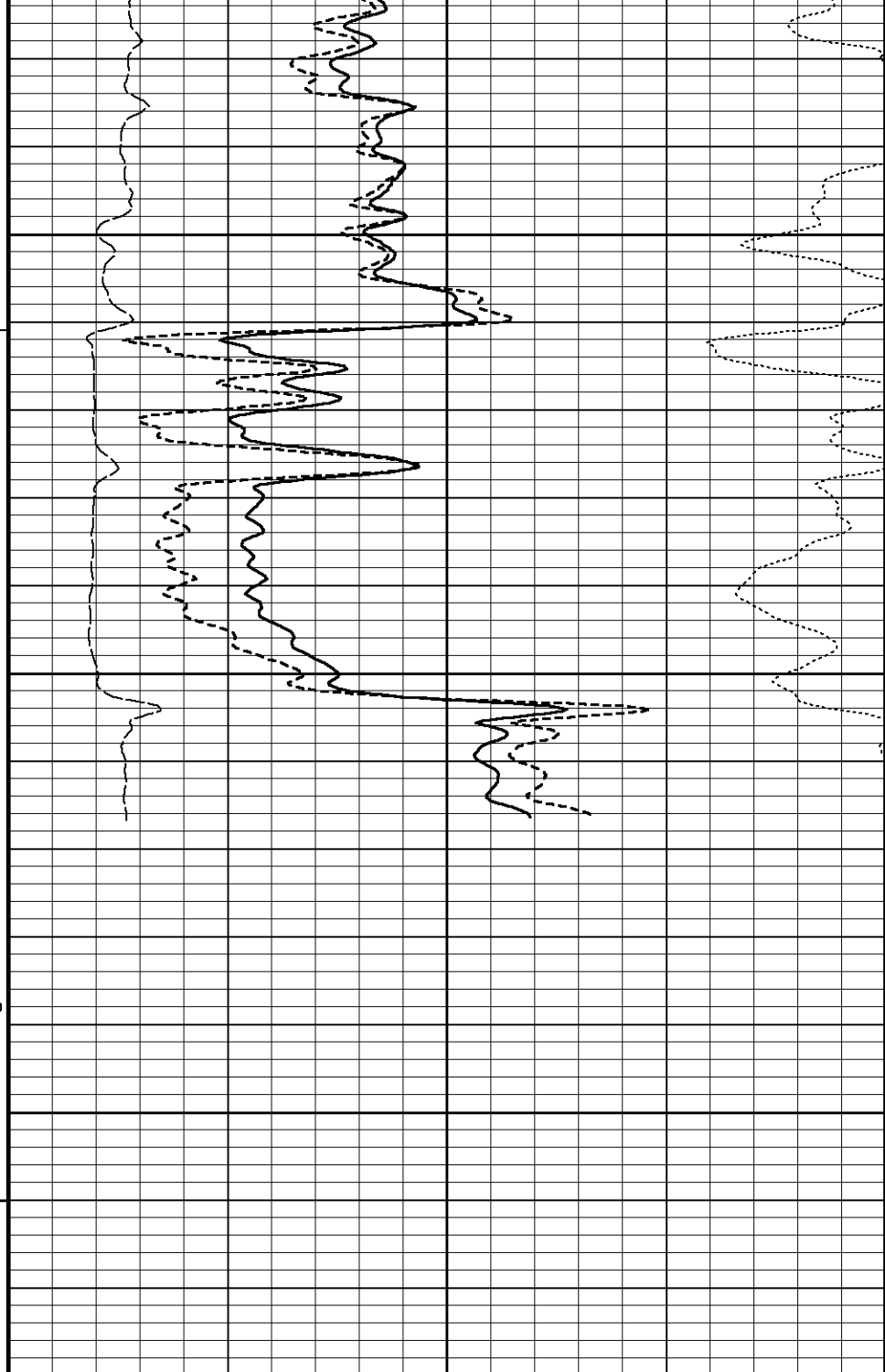
Borehole
Temp in
deg F

Gamma Ray

API

0 75 150
150 225 300

HVI
every
10 cu ft



Compensated Density

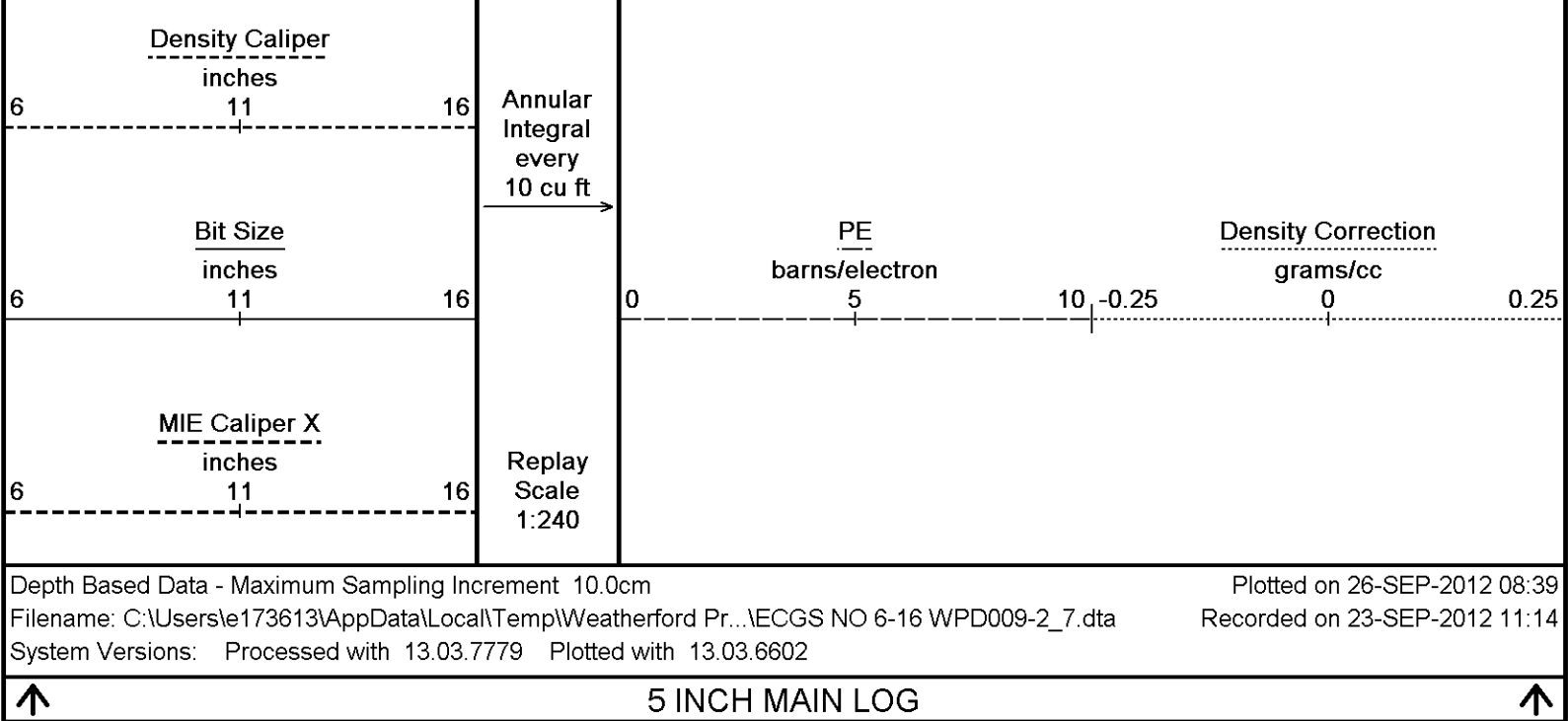
grams/cc

2 2.25 2.50 2.75 3
1 1.25 1.50 1.75 2

SS Density Por.

percent

30 20 10 0 -10



BEFORE SURVEY CALIBRATION			
C:\Users\le173613\AppData\Local\Temp\Weatherford PreView\0\IECGS NO 6-16 WPD009-2_7.dta			
Down-hole Tension Calibration All 000			Field Calibration on 24-OCT-2010 03:34
Reading No	Measured	0	
1	15659.85	0.00	
2	15734.68	370.00	
General Constants All 000			Last Edited on 23-SEP-2012,13:52
General Parameters			
Mud Resistivity	3.460	ohm-metres	
Mud Resistivity Temperature	87.300	degrees F	
Water Level	0.000	feet	
Density/Neutron Processing	Wet Hole		
Hole/Annular Volume and Differential Caliper Parameters			
HVOL Method	Single Caliper		
HVOL Caliper 1	MIE Caliper X		
HVOL Caliper 2	N/A		
Annular Volume Diameter	7.000	inches	
Caliper for Differential Caliper	None		
Rwa Parameters			
Porosity used	Base Density Porosity		
Resistivity used	Deep Induction		
RWA Constant A	0.610		
RWA Constant M	2.150		
Down-hole Tension Calibration SMS 0			Field Calibration on 23-SEP-2012 09:39
Reading No	Measured	Calibrated (lbs)	
1	15638.44	0.00	
2	16772.04	490.00	
Gamma Calibration MCG-D.K 483			Field Calibration on 22-SEP-2012 22:34
	Measured	Calibrated (API)	
Background	124	85	
Calibrator (Gross)	885	604	
Calibrator (Net)	761	519	
Gamma Constants MCG-D.K 483			Last Edited on 25-SEP-2012,16:17
Gamma Calibrator Number GRCC119			

Gamma Calibrator Number	SR00115		
Mud Density	1.00	gm/cc	
Caliper Source for Processing	Bit Size		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	
SP Calibration MCG-D.K 483			
	Measured	Calibrated (mV)	Field Calibration on 23-SEP-2012,10:15
Reference 1	100.0	100.0	
Reference 2	-100.0	-100.0	
High Resolution Temperature Constants MCG-D.K 483			
			Last Edited on 23-SEP-2012,10:16
Pre-filter Length	11		
Neutron Calibration MDN-B.J 372			
			Base Calibration on 11-SEP-2012 10:37
			Field Check on 19-SEP-2012 08:56
Base Calibration			
	Measured	Calibrated (cps)	
	Near Far	Near Far	
	2935 90	3714 110	
Ratio	32.738	33.764	
Field Calibrator at Base			
		Calibrated (cps)	
		2265 3365	
Ratio		0.673	
Field Check			
		Calibrated (cps)	
		2282 3344	
Ratio		0.000	
Neutron Constants MDN-B.J 372			
			Last Edited on 25-SEP-2012,16:16
Neutron Source Id	P31115B		
Neutron Jig Number	NJ5299		
Epithermal Neutron	No		
Caliper Source for Processing	Bit Size		
Stand-off	0.00	inches	
Mud Density	1.00	gm/cc	
Limestone Sigma	7.10	cu	
Sandstone Sigma	7.00	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	MCG External Temperature		
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		
Imager Pad Check MIE-A.A 173			
			Field Check on 12-SEP-2012 09:28
Pad 1	20/20 Buttons Verified	Pad 5	20/20 Buttons Verified
Pad 2	24/24 Buttons Verified	Pad 6	24/24 Buttons Verified
Pad 3	20/20 Buttons Verified	Pad 7	20/20 Buttons Verified
Pad 4	24/24 Buttons Verified	Pad 8	24/24 Buttons Verified
Compact Micro Imager Constants MIE-A.A 173			
			Last Edited on 22-SEP-2012,23:06
Sonde Configuration	Imager Mode	degrees	
Arm-Pad Kit	Normal Pads (12.25 in)		
Centre Pad 1 Rotational Offset	0.00		
Image/Borehole Ovality Reference	Azimuth of Pad 1	degrees	
Non Active Buttons	Omit	feet	
Search Angle	0.00	feet	
Correlation Interval	3.28	mAmp	
Correlation Step	1.64	mAmp	
Current Offset	0.0000		
Squasher Start	N/A		
Image Processing	Enabled		

Magnetic Declination	7.15	degrees	East
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Magnetometer Parameters MIE-A.A 173

Date Of Last Magnetometer Calibration	23-AUG-2012,08:58		
Slope	X Magnetometer	Y Magnetometer	Z Magnetometer
Offset	-1.000000	-1.010964	-0.998834
	0.014865	-0.019075	0.015130

Magnetometer Constants MIE-A.A 173

Last Edited on

Magnetometer Calibrator Number	000
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Accelerometer Parameters MIE-A.A 173

Date Of Last Accelerometer Calibration	8-AUG-2012,14:18		
Slope	X Accelerometer	Y Accelerometer	Z Accelerometer
Offset	-1.112478	-1.107188	-1.099214
	0.008132	0.004011	0.006751

Accelerometer Constants MIE-A.A 173

Last Edited on 05-SEP-2012,16:48

Accelerometer Calibrator Number		000			
Accelerometer Temperature Characterisation					
X Accelerometer					
Serial Number	228				
Calibration Date	10-Jul-2007				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	3.38745e-005	-9.26831e-009	1.17995e-010	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.71979e-004	6.20757e-007	-4.67664e-010	
Y Accelerometer					
Serial Number	229				
Calibration Date	10-Jul-2007				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	1.46083e-005	5.28186e-009	2.04363e-010	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.68135e-004	7.37732e-007	-8.65499e-010	
Z Accelerometer					
Serial Number	212				
Calibration Date	10-Jul-2007				
	B0	B1	B2	B3	
Bias(g)	0.00000e+000	2.92968e-005	-2.00645e-008	1.96637e-010	
	SF0	SF1	SF2	SF3	
Scale Factor(mA/g)	3.00000e+000	2.56822e-004	5.65937e-007	1.73081e-011	

Caliper Calibration MIE-A.A 173

Base Calibration on 22-SEP-2012 23:13

Field Calibration on 22-SEP-2012 23:16

Base Calibration					
Reading No	Pads 1-5 Meas.	Pads 3-7 Meas.	Calibrator Size (in)		
1	24690	25434	5.97		
2	34724	35775	7.96		
3	44567	45459	9.87		
4	56108	57251	11.92		
5	0	0	0.00		
Reading No	Pad 2 Meas.	Pad 4 Meas.	Pad 6 Meas.	Pad 8 Meas.	Calibrator Size (in)
1	25363	26152	25925	25306	5.97
2	33861	34843	34504	33588	7.96
3	42302	43083	42709	41981	9.87
4	51973	52931	52879	51641	11.92
5	0	0	0	0	0.00
Field Calibration					
	Measured	Measured	Actual		
	Pads 1-5 Caliper(in)	Pads 3-7 Caliper(in)	Caliper(in)		
	7.93	7.83	7.96		

	Measured Pad 2 Caliper(in) 3.81	Measured Pad 4 Caliper(in) 3.79	Measured Pad 6 Caliper(in) 4.05	Measured Pad 8 Caliper(in) 4.06	Actual Caliper(in) 7.96
Caliper Constants MIE-A.A 173					Last Edited on 29-APR-2012 09:20
Caliper Difference for BRKT		0.120	inches		
FE Calibration MFE-A.A 76					Base Calibration on 10-SEP-2012 11:36 Field Check on 19-SEP-2012 08:38
Base Calibration		Measured	Calibrated (ohm-m)		
Reference 1		0.0	0.0		
Reference 2		964.4	126.8		
Base Check			279.9		
Field Check			280.1		
FE Constants MFE-A.A 76					Last Edited on 25-SEP-2012,16:16
Running Mode		No Sleeve			
MFE K Factor		0.1268			
Caliper Source for FE correction		Bit Size			
Caliper Value for FE correction		N/A	inches		
Rm Source for FE correction		Temperature Corr			
Temp. for Rm Corr.		MCG External Temperature			
Stand-off		1.0	inches		
High Resolution Temperature Calibration MAI-B.A 219					Field Calibration on 10-AUG-2011,00:10
		Measured	Calibrated(Deg F)		
Lower		50.00	50.00		
Upper		75.00	75.00		
High Resolution Temperature Constants MAI-B.A 219					Last Edited on 10-SEP-2012,10:18
Pre-filter Length		11			
Induction Calibration MAI-B.A 219					Base Calibration on 08-MAY-2012,15:56 Field Check on 19-SEP-2012 08:29
Base Calibration					
Test Loop Calibration		Measured	Calibrated (mmho/m)		
Channel	Low	High	Low	High	
1	17.4	478.1	9.3	966.2	
2	5.8	380.3	7.6	821.4	
3	3.5	258.5	5.2	566.0	
4	1.9	136.0	2.6	279.2	
Array Temperature		77.2	Deg F		
Channel	Base Check (mmho/m)		Field Check (mmho/m)		
	Low	High	Low	High	
1	0.0	0.0	12.2	3791.7	
2	0.0	0.0	30.9	3535.9	
3	0.0	0.0	28.6	3055.1	
4	0.0	0.0	19.3	2027.9	
Deep	0.0	0.0	16.5	1948.3	
Medium	0.0	0.0	42.7	4087.3	
Shallow	0.0	0.0	47.5	5281.3	
Array Temperature		0.0	64.9	Deg F	
Induction Constants MAI-B.A 219					Last Edited on 25-SEP-2012,16:16
Induction Model		RtAP-WBM			
Caliper for Borehole Corr.		Bit Size			
Hole Size for Borehole Correction		N/A	inches		
Tool Centred		No			
Stand-off Type		Fins			
Stand-off		1.00	inches		
Number of Fins on Stand-off		6.0000			
Stand-off Fin Angle		60.00	degrees		
Stand-off Fin Width		0.0000	inches		

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-C.A 196

Base Calibration on 11-SEP-2012 13:59
Field Calibration on 19-SEP-2012 08:45

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	15672	3.99
2	24368	5.97
3	32940	7.96
4	41136	9.87
5	50464	11.92
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.91	7.96

Photo Density Calibration MPD-C.A 196

Base Calibration on 11-SEP-2012 15:19
Field Check on 19-SEP-2012 08:44

Density Calibration				
Base Calibration				
	Measured	Calibrated (sdu)		
	Near	Far	Near	Far
Reference 1	37007	13951	52994	19128
Reference 2	17051	1942	25185	2558
Field Check at Base				
	601.7	931.8		
Field Check				
	598.3	935.0		
PE Calibration				
Base Calibration				
	Measured	Calibrated		
	WS	WH	Ratio	Ratio
Background	110	536		
Reference 1	11578	36914	0.315	0.309
Reference 2	4580	16980	0.272	0.274
Field Check at Base				
	110.3	536.4		
Field Check				
	111.2	540.3		

Density Source Id	P15771B	
Nylon Calibrator Number	DNC-D-527	
Aluminium Calibrator Number	DAC-D-527	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.16	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)
2.65	
2.68	5208.00
0.00	5060.00
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:\Users\le173613\AppData\Local\Temp\Weatherford PreView\0\ECGS 6-16 WPD009-2_INITIAL6.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

SHA-H Compact Swivel Head Adaptor
SHA-H 142 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact Comms Gamma
MCG-D.K 483 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Neutron
MDN-B.J 372 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-C.A 196 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

MIS-A.A Compact Inline Bowspring sub
MIS-A.A 70 LG: 5.70 ft WT: 33.1 lb OD: 2.24 in

SKJ-E.B Compact Knuckle Joint
SKJ-E.B 585 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

MIS-E.A Compact Inline Standoff sub
MIS-E.A 334 LG: 2.14 ft WT: 15.4 lb OD: 2.24 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 112 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact MMI Memory Section
MIM-A.A 173 LG: 4.65 ft WT: 26.5 lb OD: 2.24 in

Compact MMI Electrode Section
MIE-A.A 173 LG: 13.96 ft WT: 99.2 lb OD: 4.09 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 112 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in



SKJ-D.A 143 LG: 2.17 ft WT: 24.5 lb OD: 2.24 in

Compact Focussed Electric
MFE-A.A 76 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-B.A 219 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 77.00 ft Weight: 586.4 lb



Tool Zero (0.13ft from bottom)
All measurements relative to tool zero.

COMPANY	EAST CHEYENNE GAS STORAGE LLC
WELL	ECGS NO 6-16 WPD009-2
FIELD	PEETZ WEST
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA/COLORADO

Elevation Kelly Bushing	4567.00	feet	First Reading	5208.00	feet
Elevation Drill Floor	4566.00	feet	Depth Driller	5260.00	feet
Elevation Ground Level	4555.00	feet	Depth Logger	5260.00	feet



Weatherford®

PHOTO DENSITY
COMPENSATED NEUTRON
LOGS