



**Weatherford**<sup>®</sup>

**ARRAY INDUCTION  
SHALLOW FOCUSED  
ELECTRIC LOG**

COMPANY	CMX, INC.			Elevations: KB 1377.00 DF 1375.00 GL 1369.00
WELL	BARTENDER #1			
FIELD	STRANATHAN			
PROVINCE/COUNTY	BARBER			
COUNTRY/STATE	U.S.A. / KANSAS			
LOCATION	330' FNL & 330' FWL			
SEC	TWP	RGE	Other Services	
18	35S	11W	MPD/MDN	
API Number	15-007-24088		MML	
Permit Number	MSS			
Permanent Datum GL, Elevation	1369 feet			
Log Measured From	KB			
Drilling Measured From	KB			
Date	17-OCT-2013			
Run Number	ONE			
Service Order	3539937			
Depth Driller	5250.00			feet
Depth Logger	5250.00			feet
First Reading	5246.66			feet
Last Reading	1015.00			feet
Casing Driller	1012.00			feet
Casing Logger	1015.00			feet
Bit Size	7.875			inches
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.30 lb/USg	48.00 CP		
PH / Fluid Loss	9.80	16.00 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.72 @ 88.0	ohm-m		
Rmf @ Measured Temp	0.58 @ 88.0	ohm-m		
Rmc @ Measured Temp	0.86 @ 88.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.56 @ 115.0	ohm-m		
Time Since Circulation	4.5 HOURS			
Max Recorded Temp	115.00	deg F		
Equipment / Base	13244	LIB		
Recorded By	ADAM SILL			
Witnessed By	LEAH KASTEN			DEREK CARTER
JOB #	LB13-293			

**BOREHOLE RECORD**

Last Edited: 17-OCT-2013 20:53

Bit Size inches	Depth From feet	Depth To feet
7.875	1012.00	5250.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	1012.00	24.00

**REMARKS**

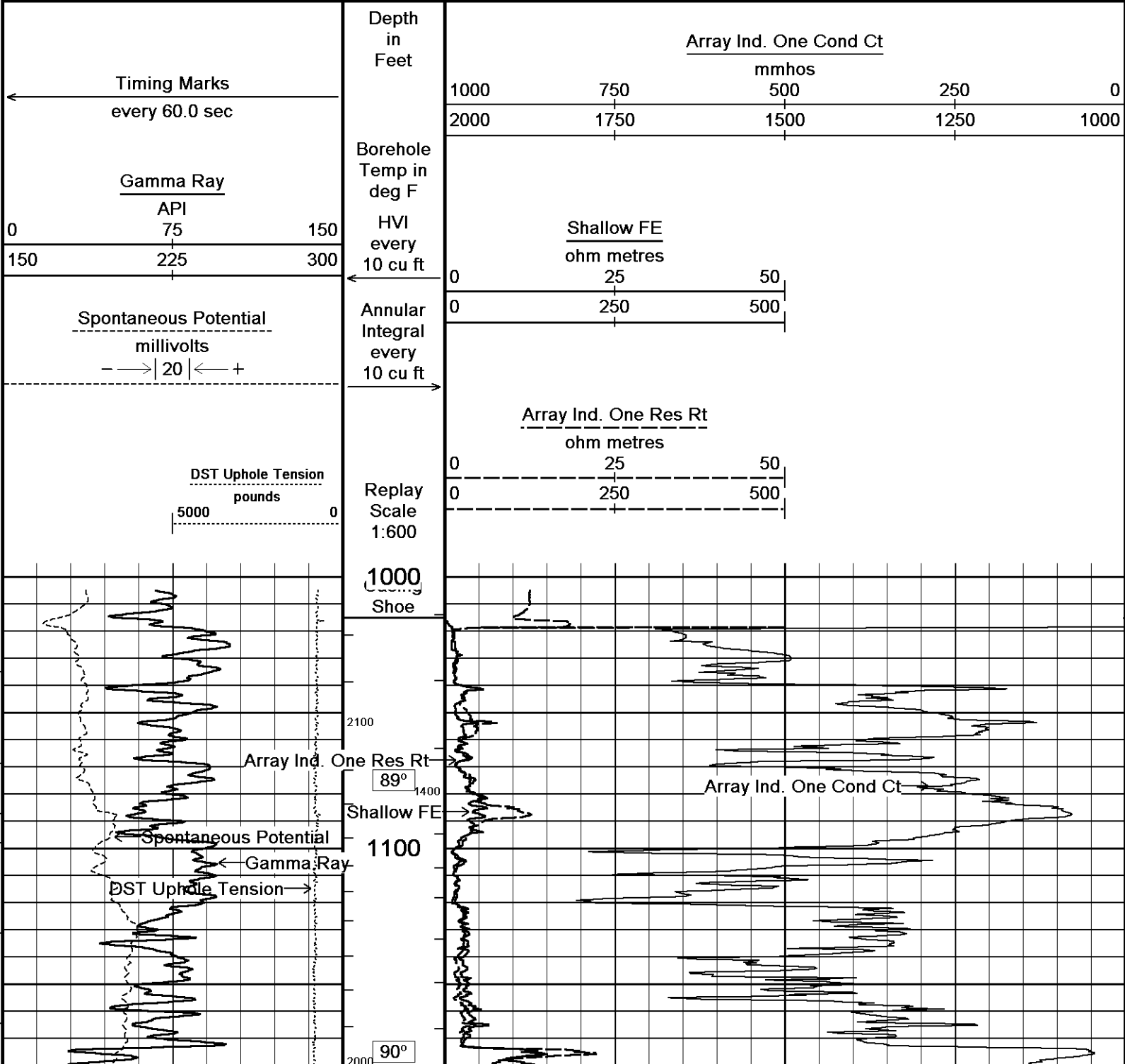
- SOFTWARE ISSUE: WLS 13.05.9583
- TOOLS: MCG, MML, MDN, MPD, MFE, MSS, MAI
- HARDWARE:  
MDN: DUAL BOWSPRING ECCENTRALIZER  
MFE: 1 X 0.5 INCH STANDOFF  
MSS: 2 X 0.5 INCH STANDOFF  
MAI: 2 X 0.5 INCH STANDOFF
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 2120 CU.FT.

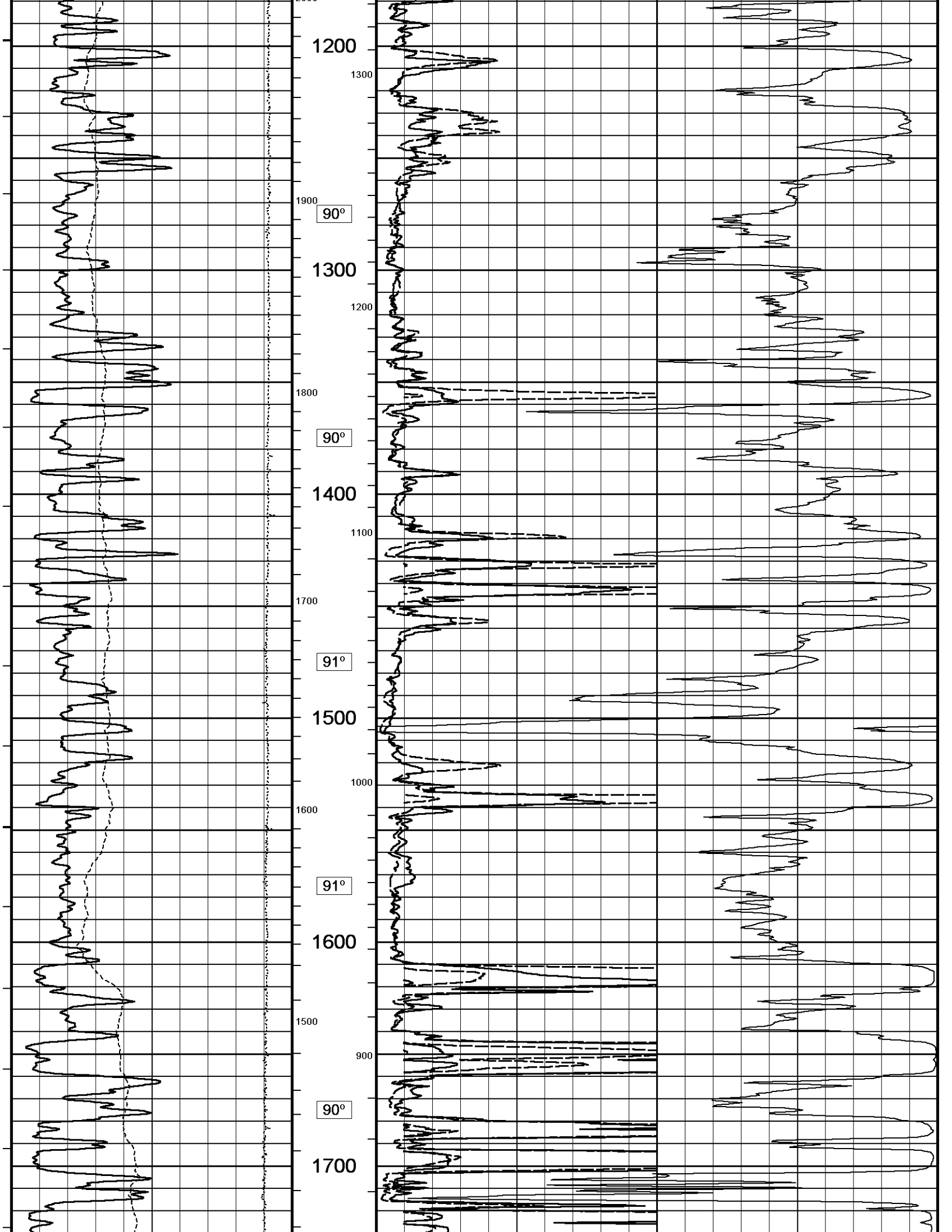
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 3800: 310CU.FT.  
 - RIG: DUKE DRILLING #2  
 - ENGINEER: ADAM SILL, DEREK CARTER  
 - OPERATOR: NICOLAS ADAME, OSCAR CRUZ

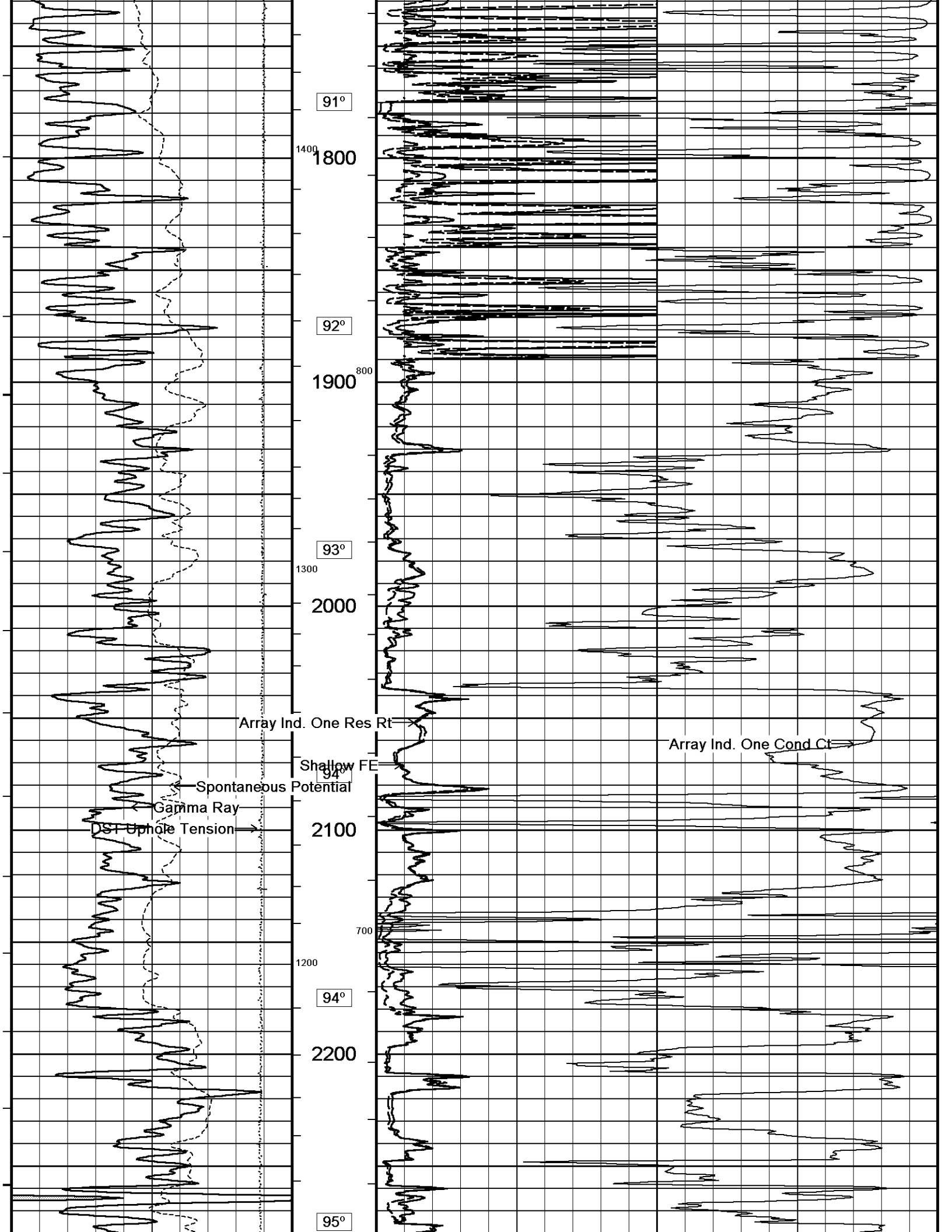
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, 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.

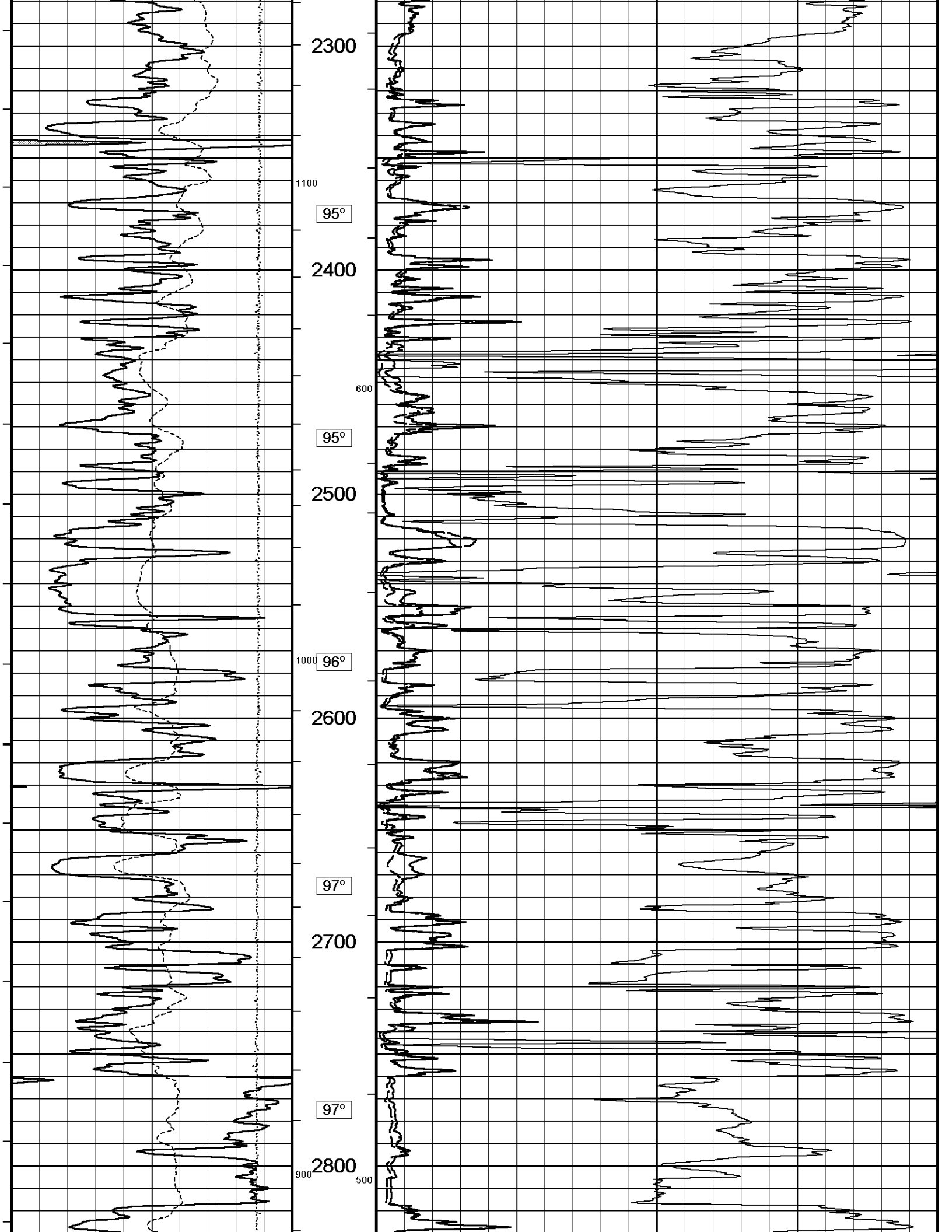
**2 INCH MAIN**

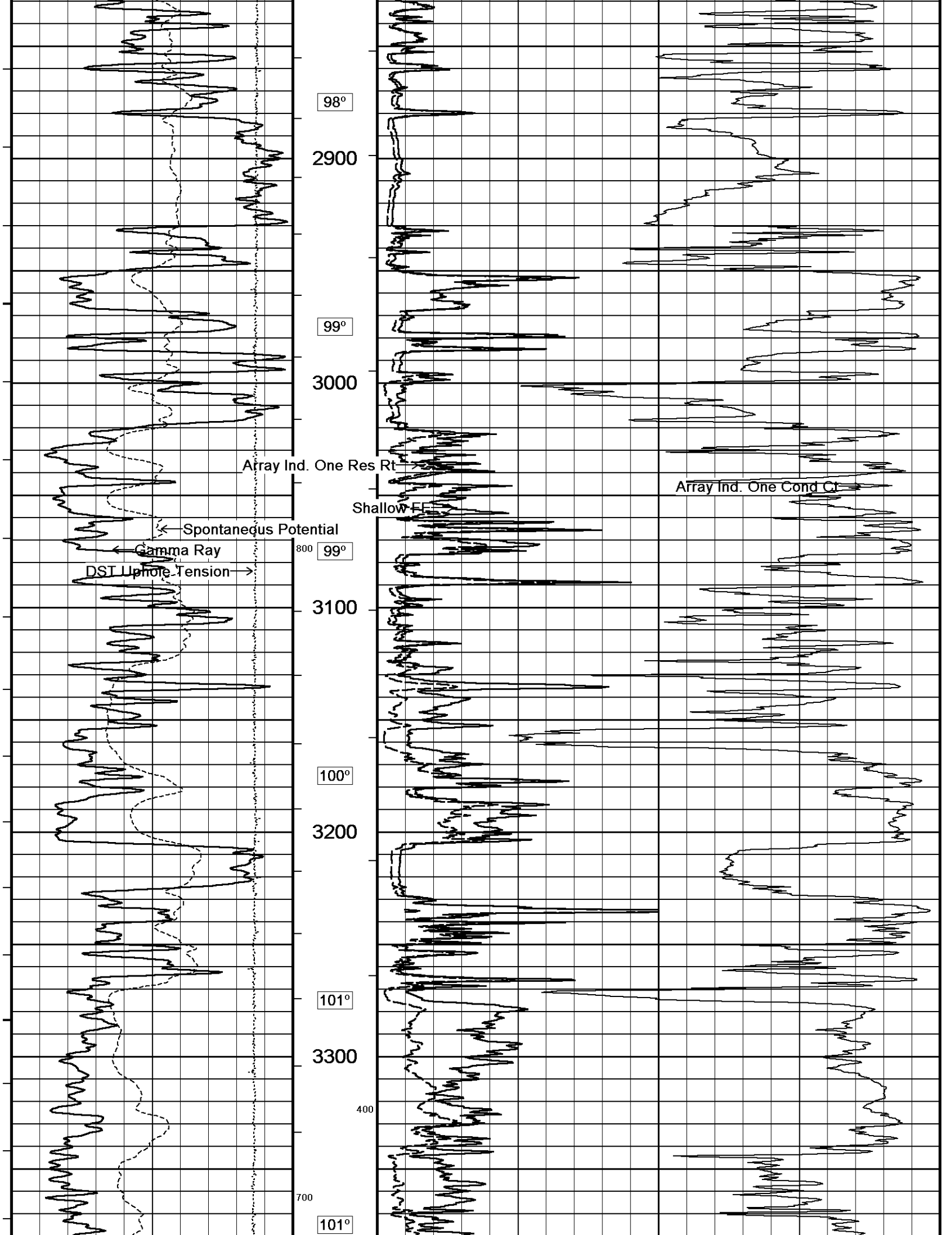
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 18-OCT-2013 06:43  
 Filename: C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Main Pass.dta Recorded on 18-OCT-2013 02:50  
 System Versions: Plotted with 13.05.9583

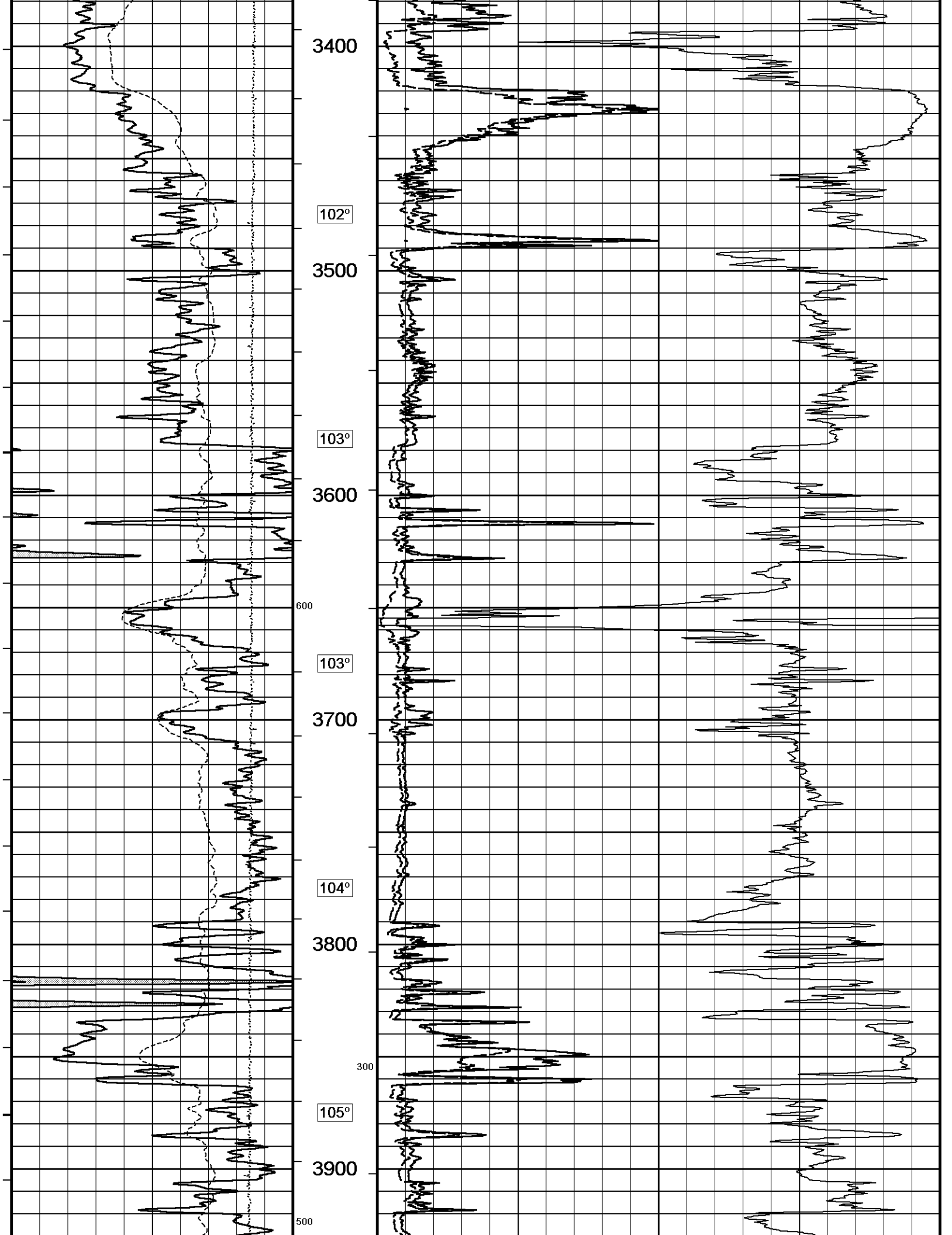


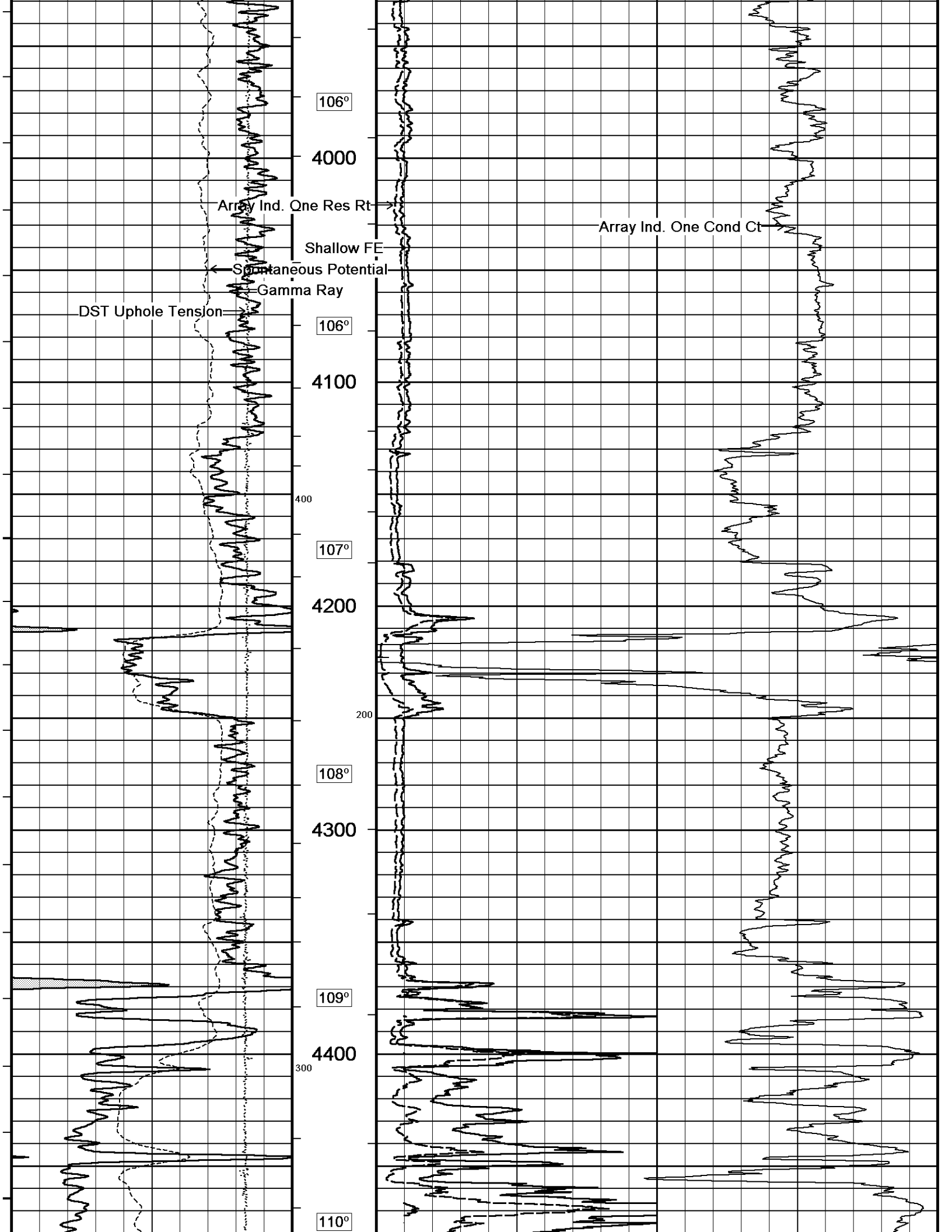


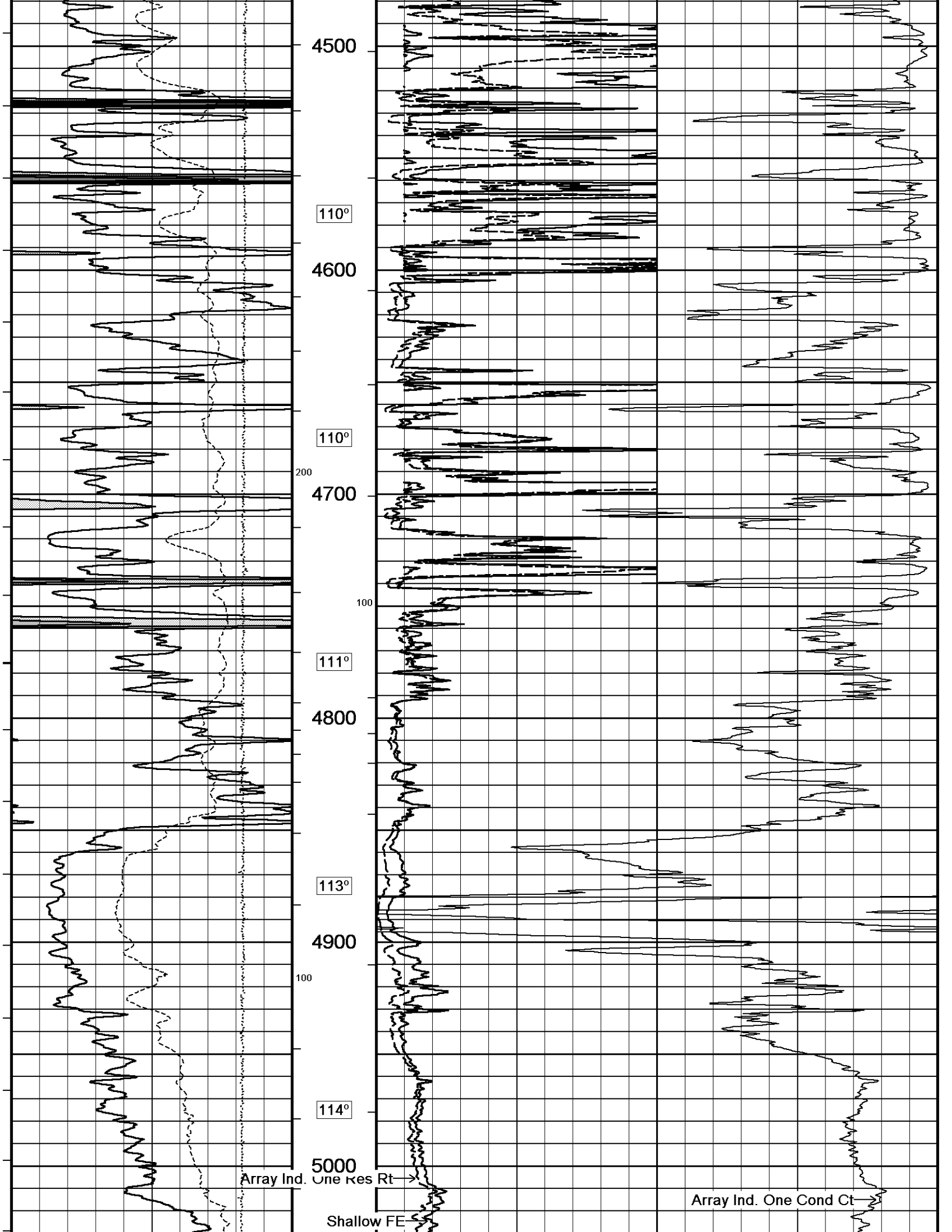


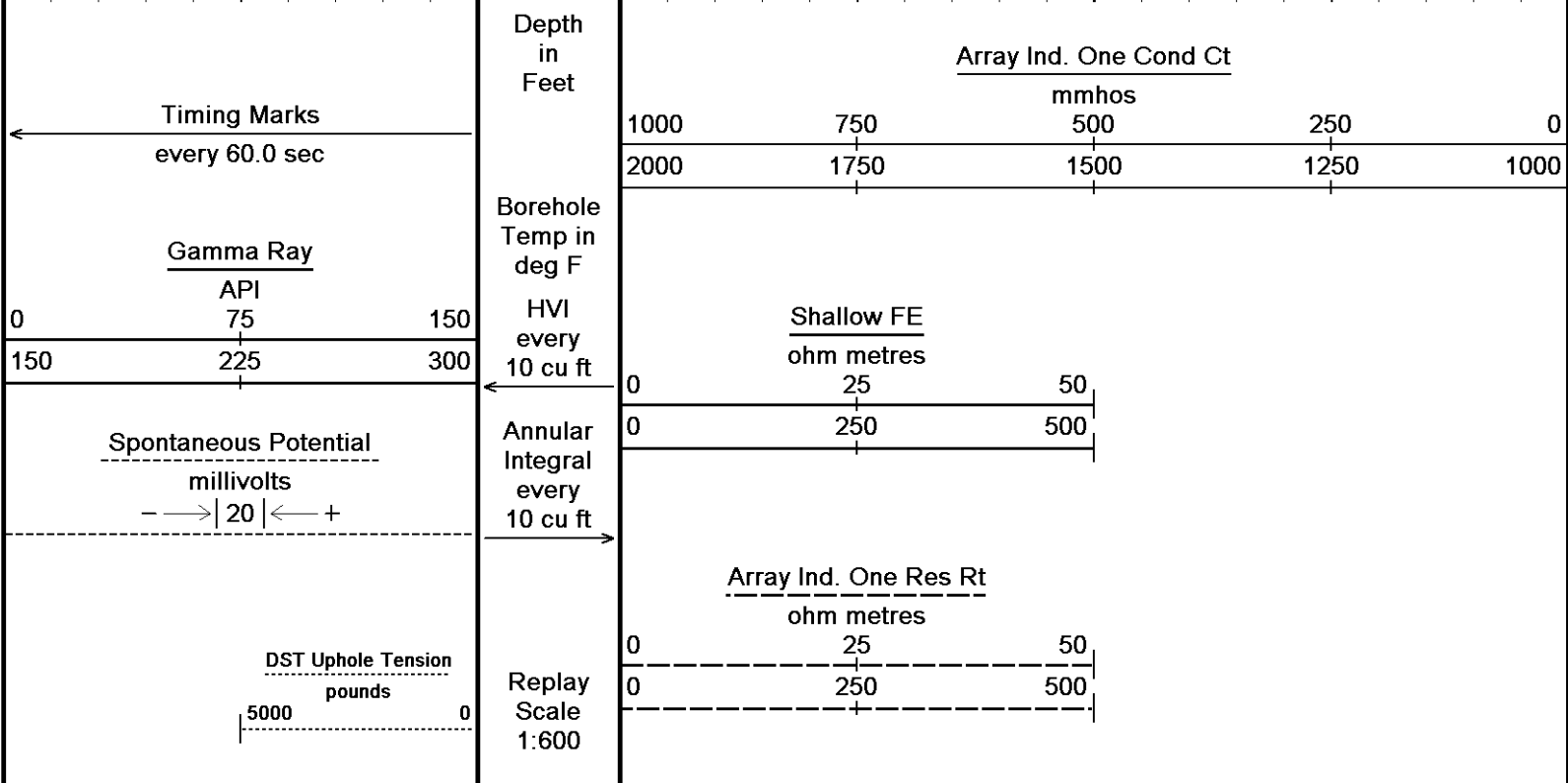
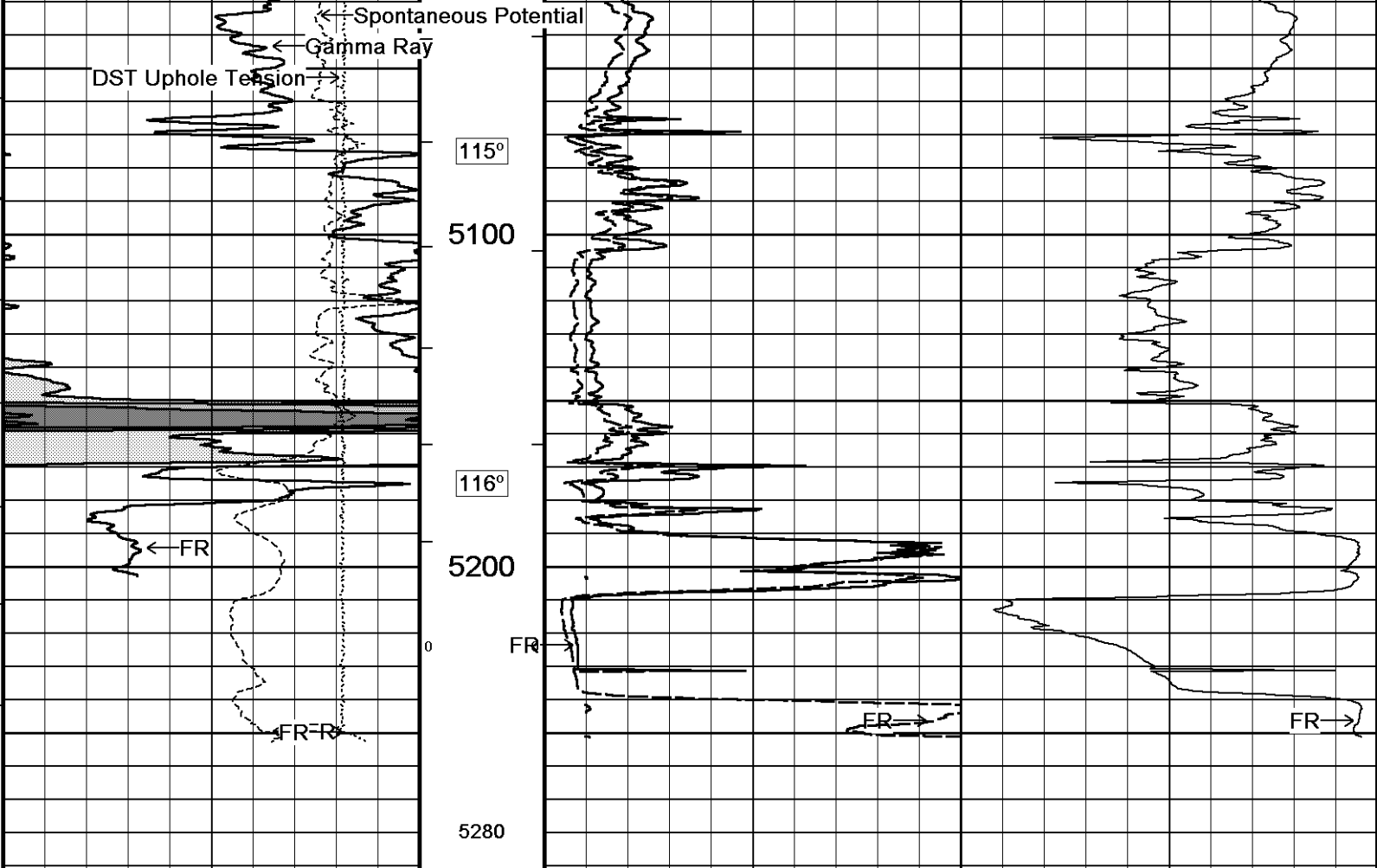












Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 18-OCT-2013 06:43

Filename: C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Main Pass.dta

Recorded on 18-OCT-2013 02:50

System Versions: Plotted with 13.05.9583

↑ 2 INCH MAIN ↑

↓ 5 INCH MAIN ↓

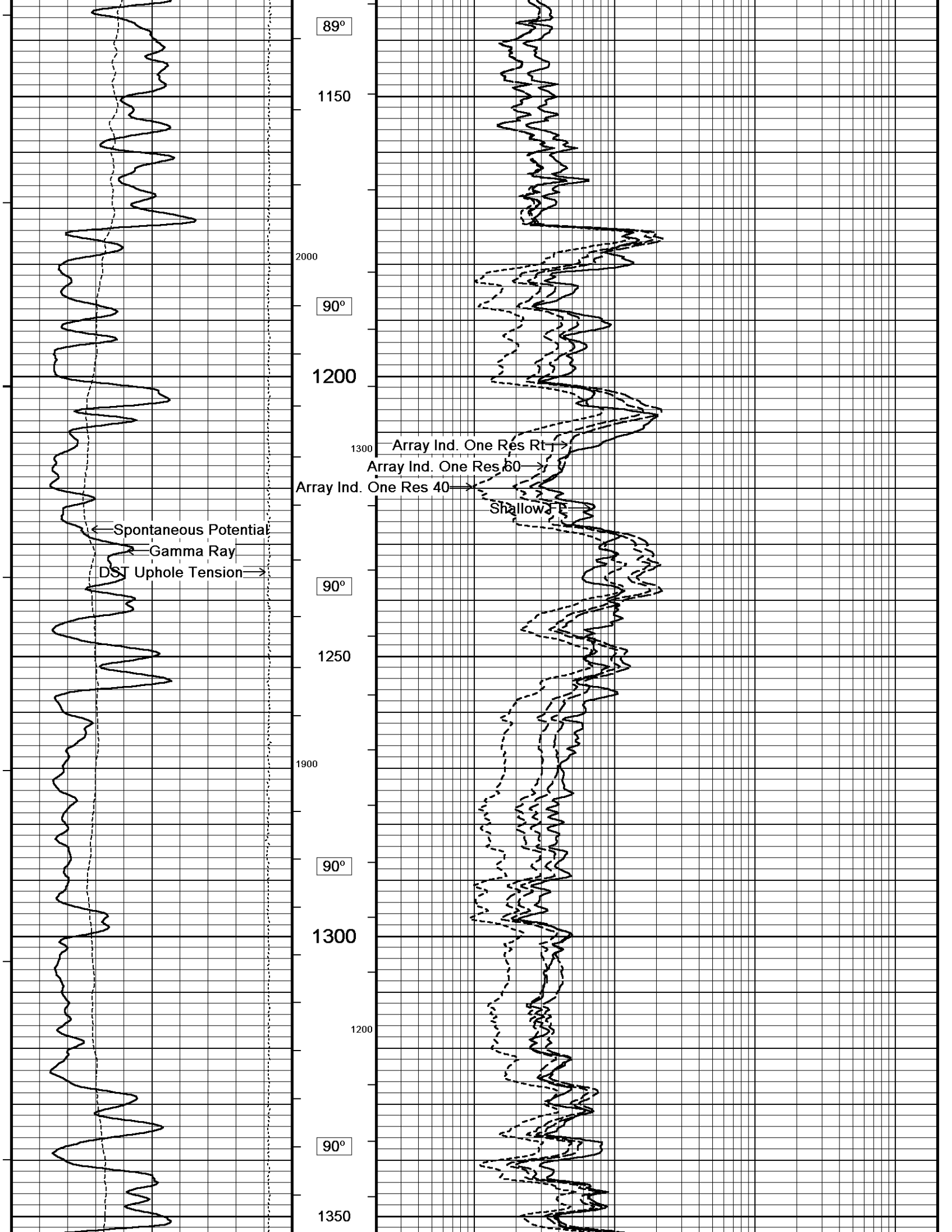
Depth Based Data - Maximum Sampling Increment 10.0cm

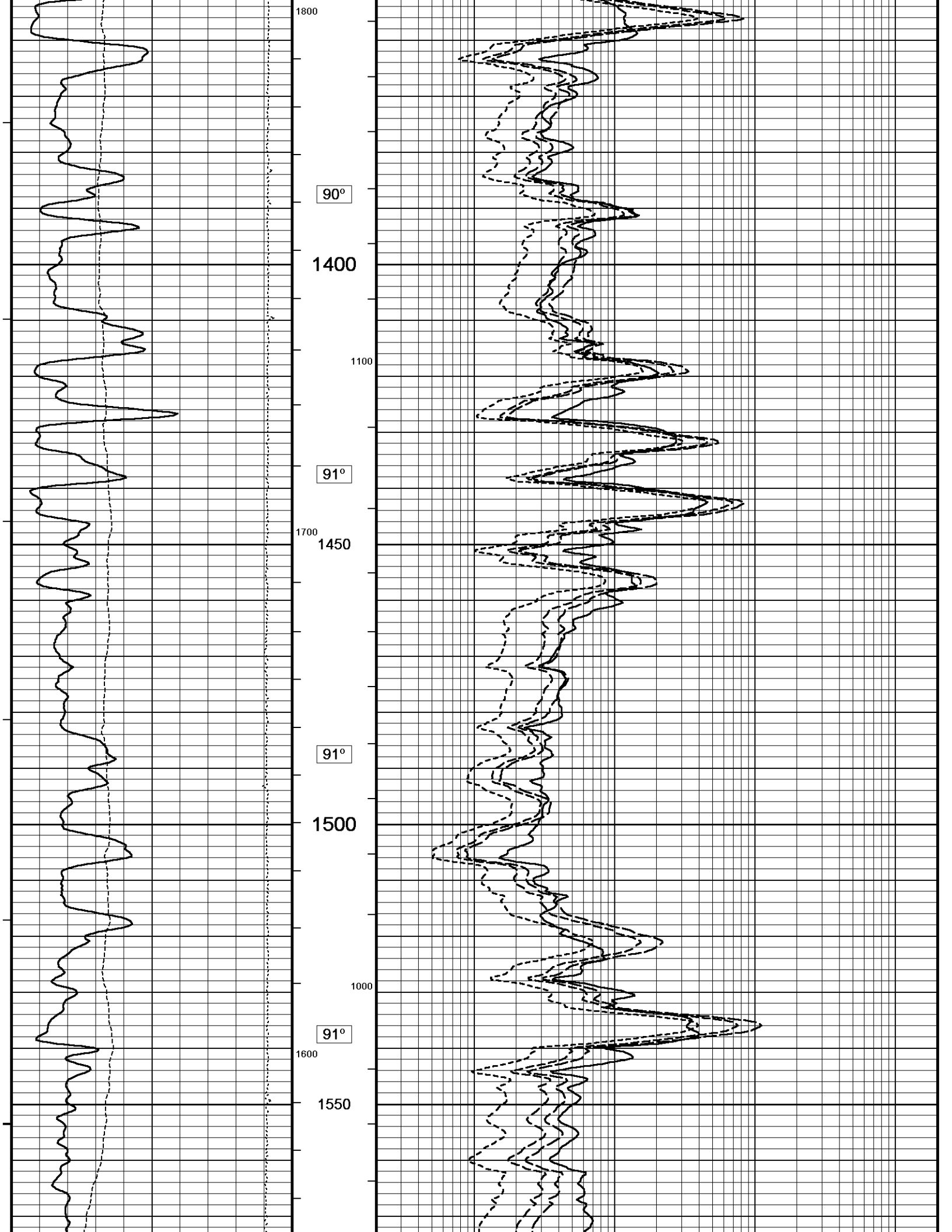
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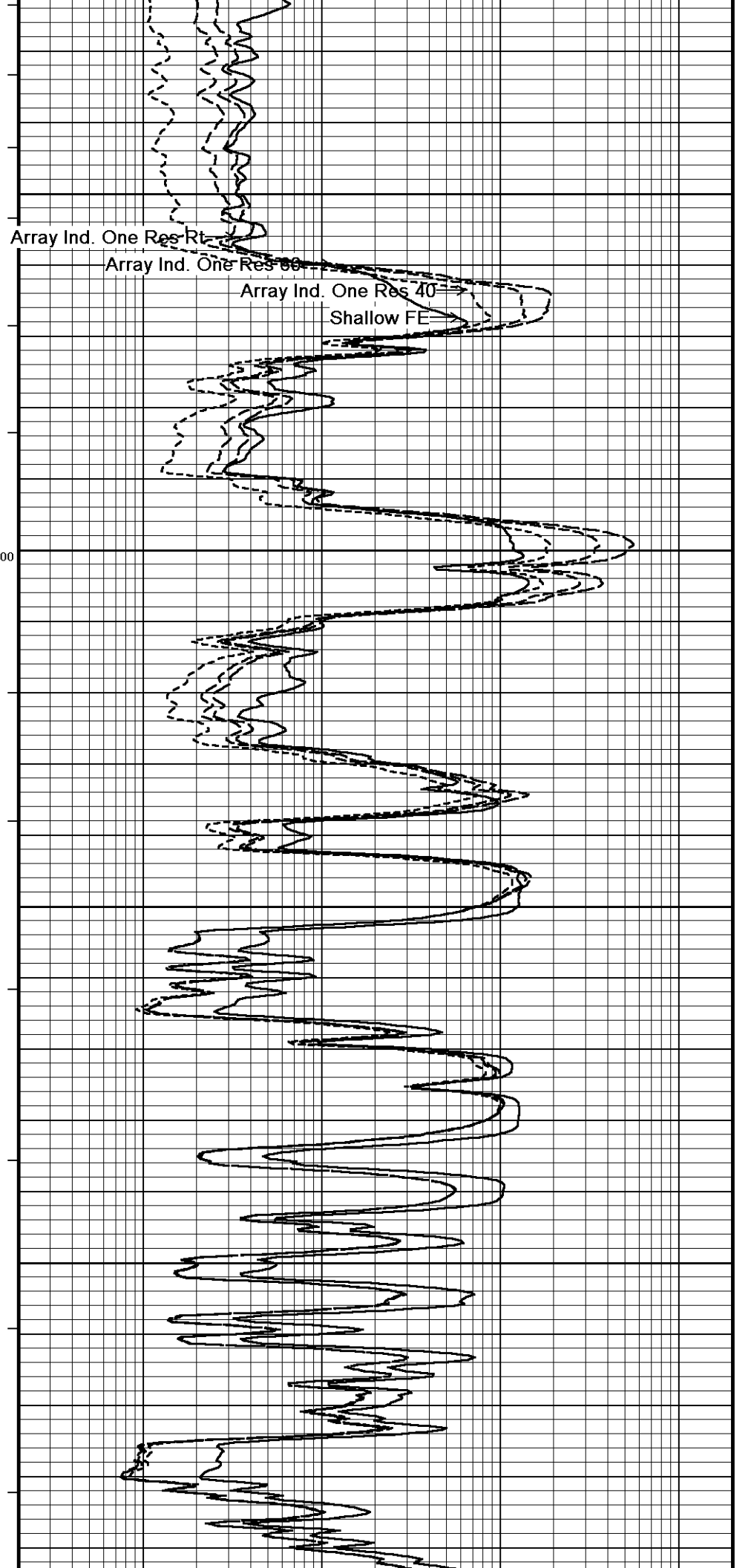
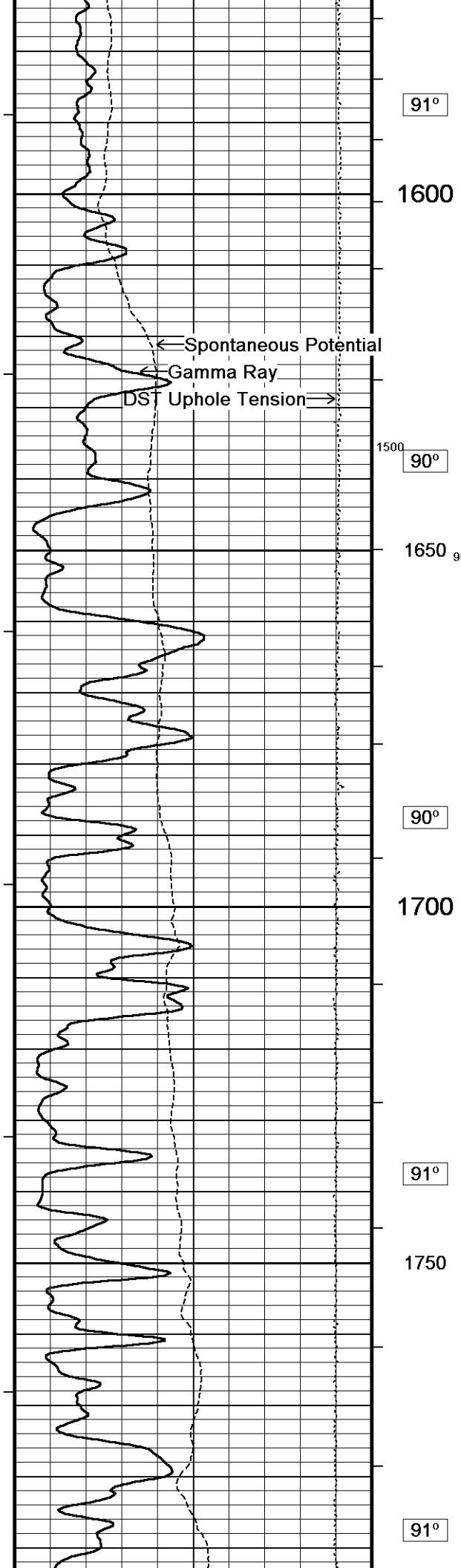
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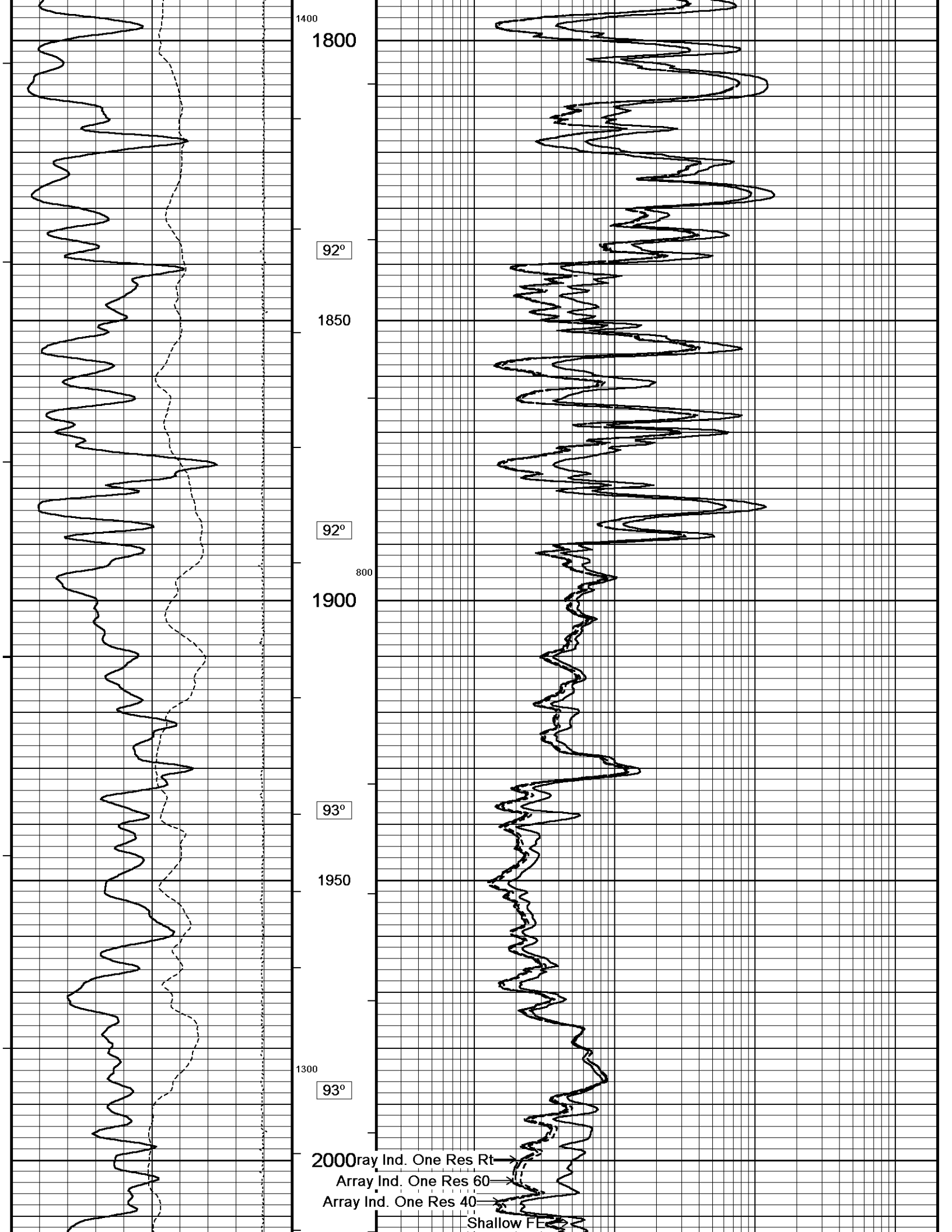
Recorded on 18-OCT-2013 02:50









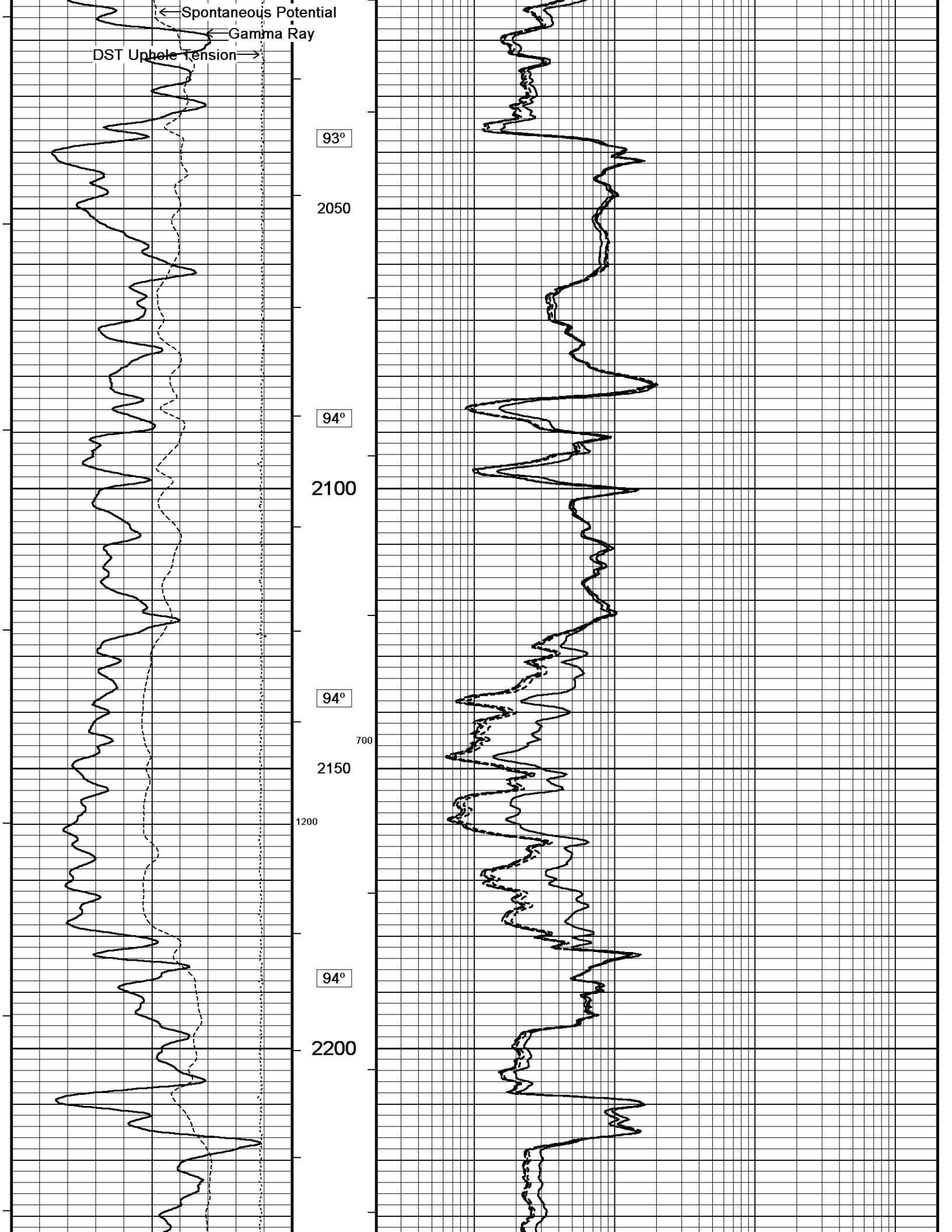


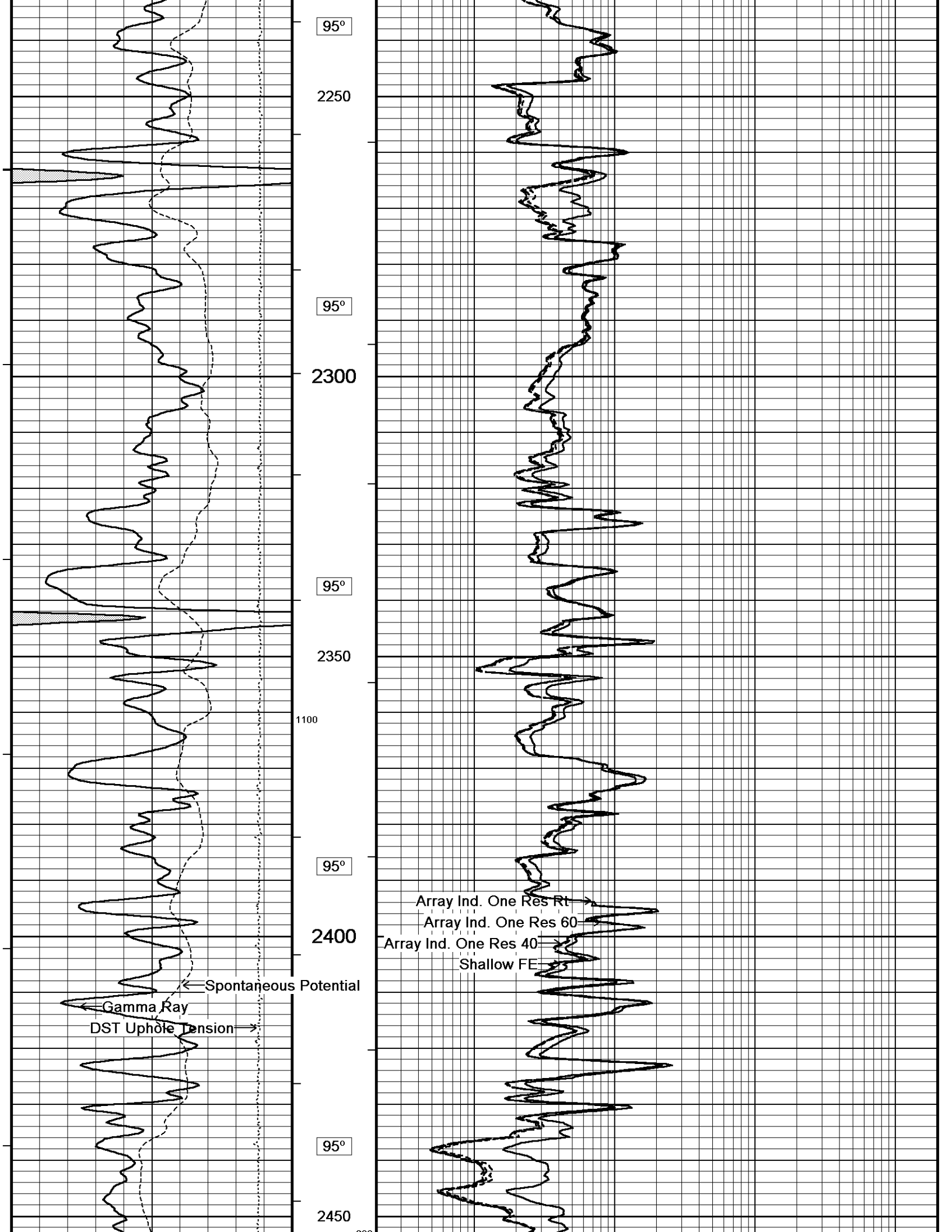
ray Ind. One Res Rt

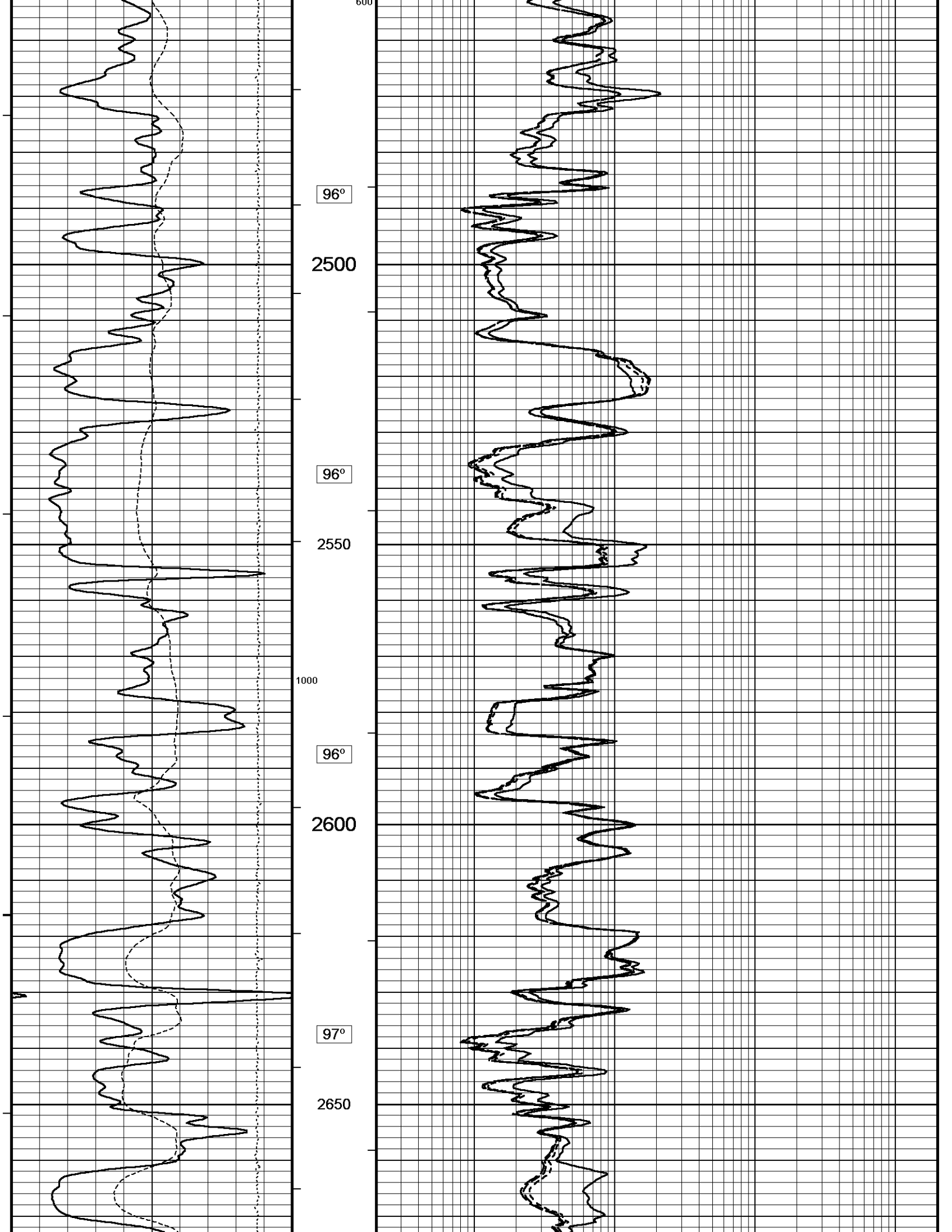
Array Ind. One Res 60

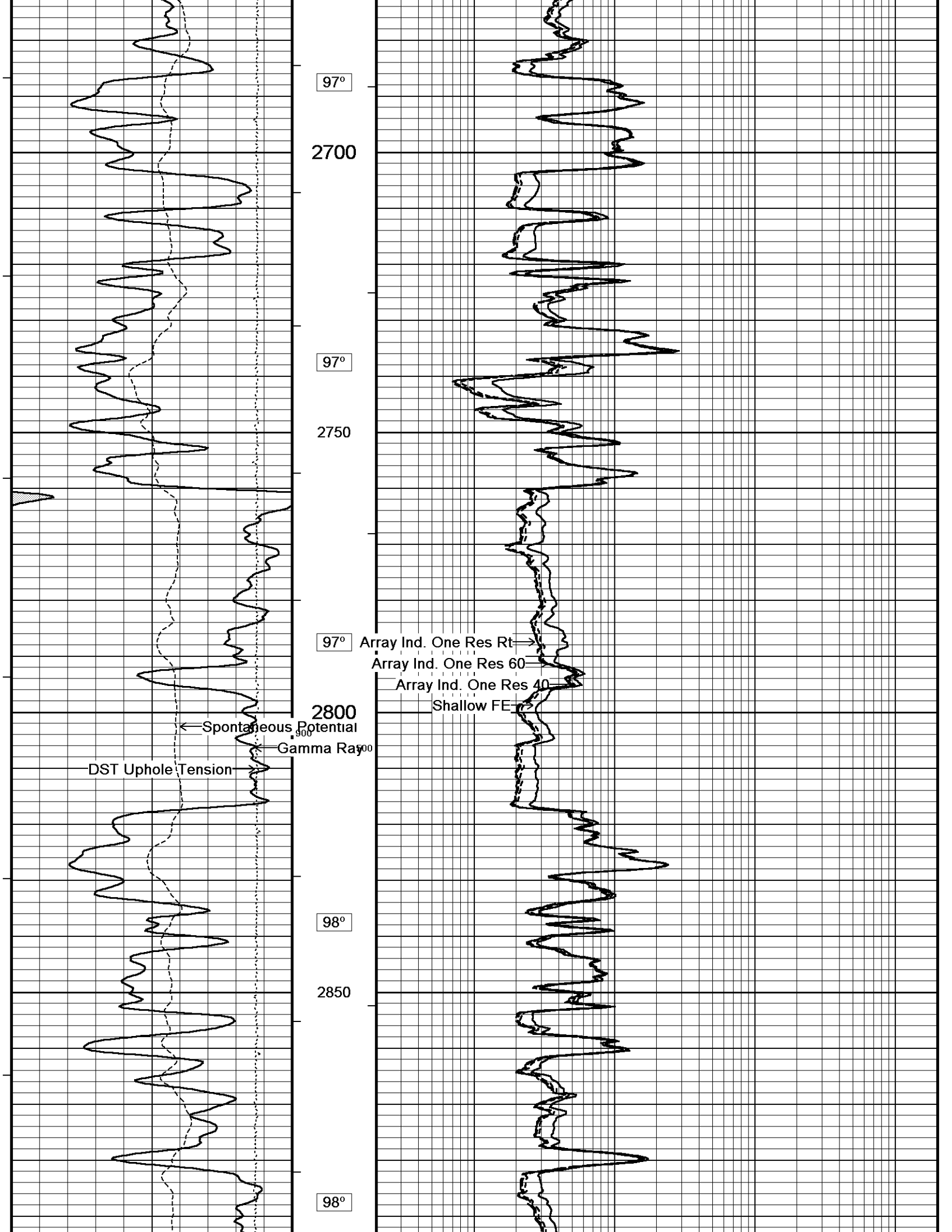
Array Ind. One Res 40

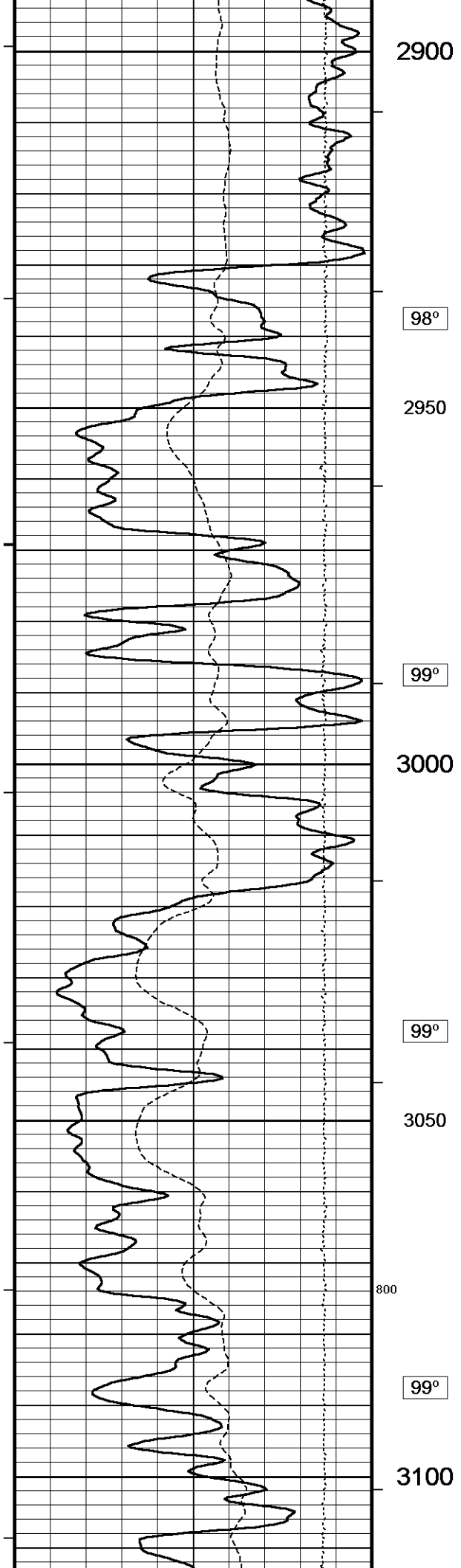
Shallow FE











2900

98°

2950

99°

3000

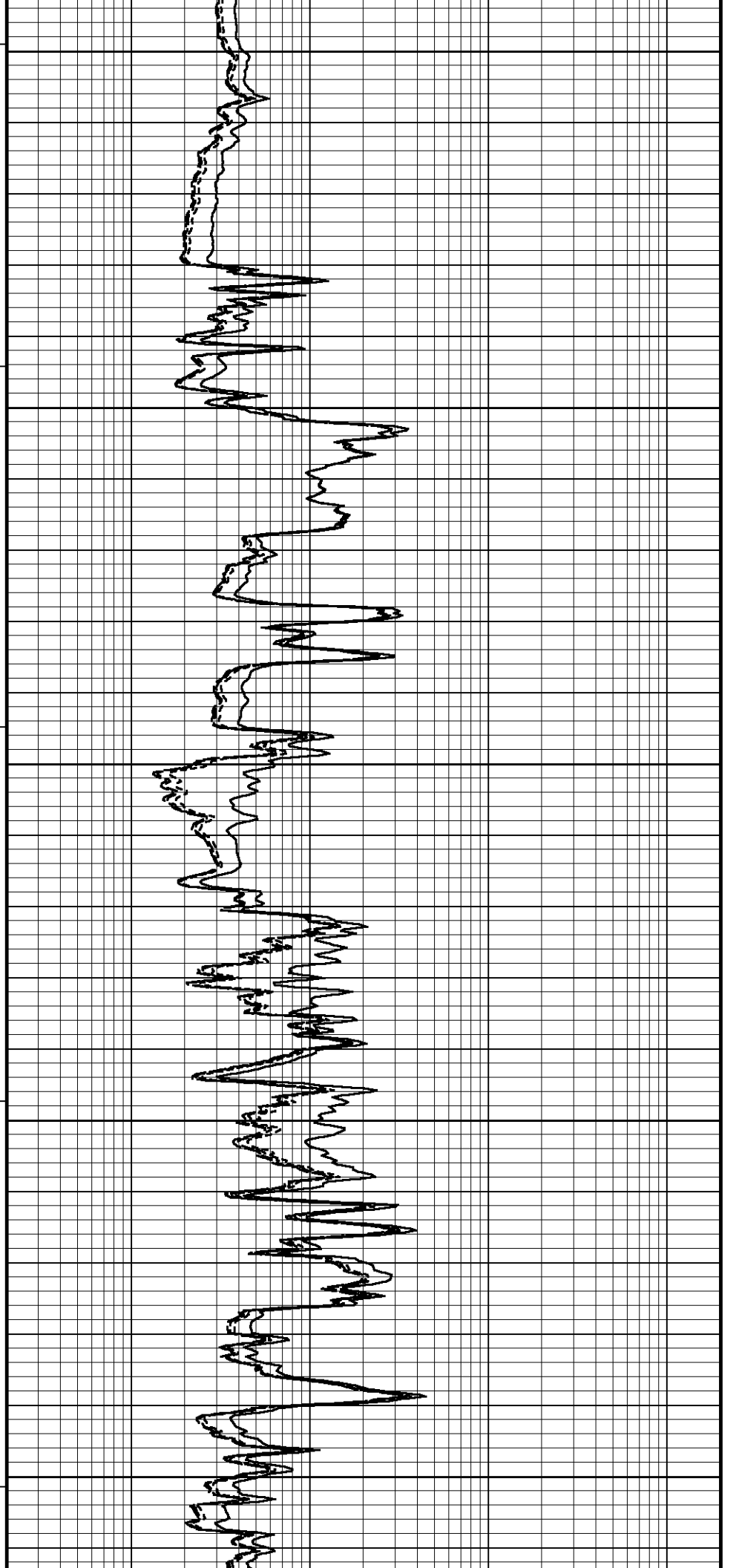
99°

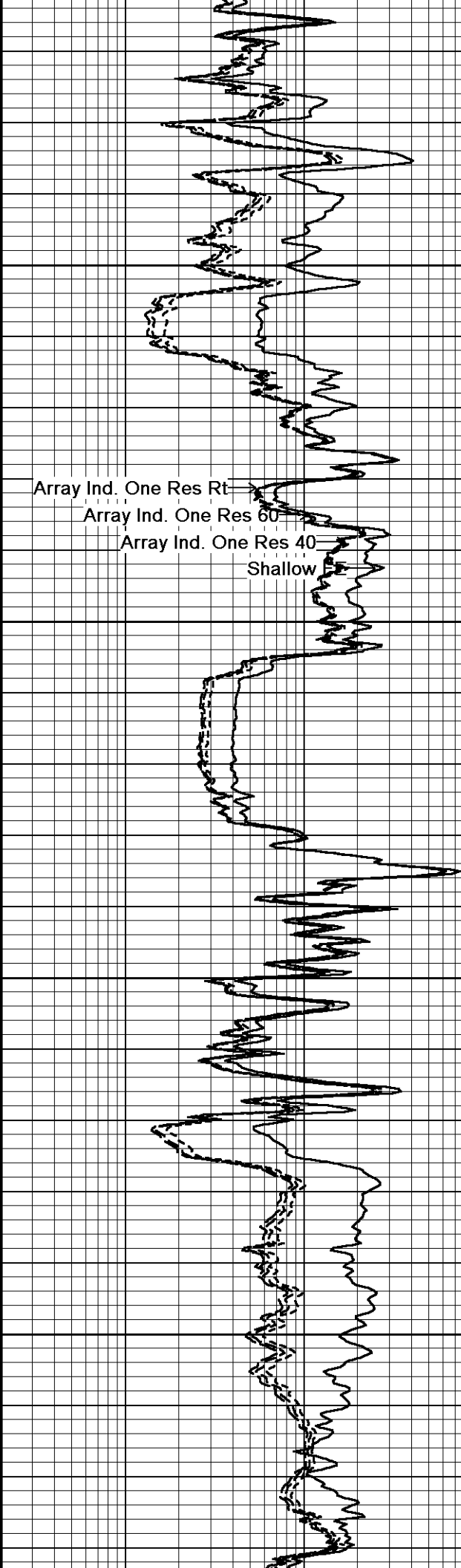
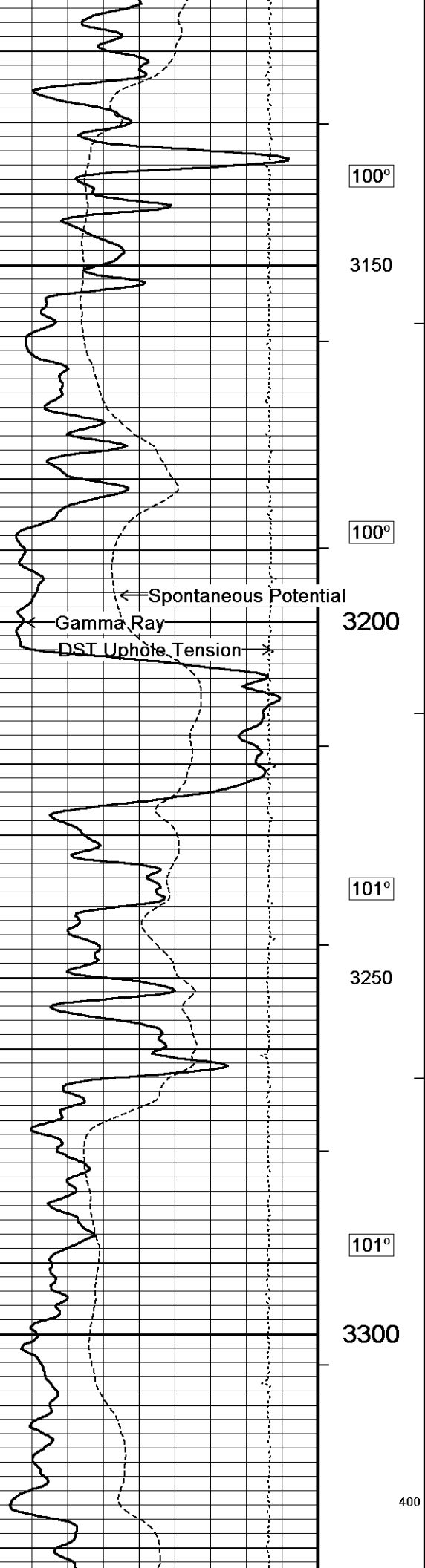
3050

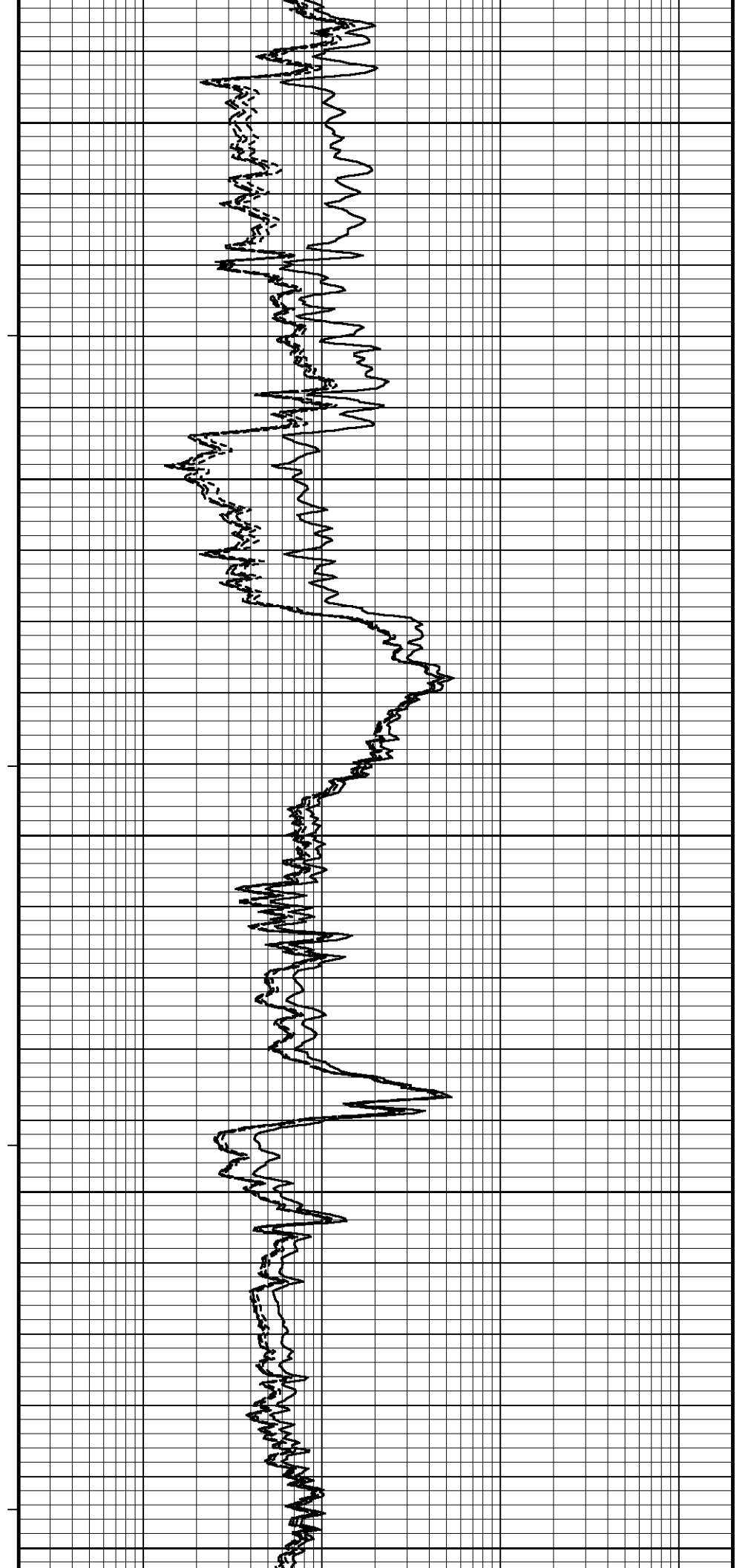
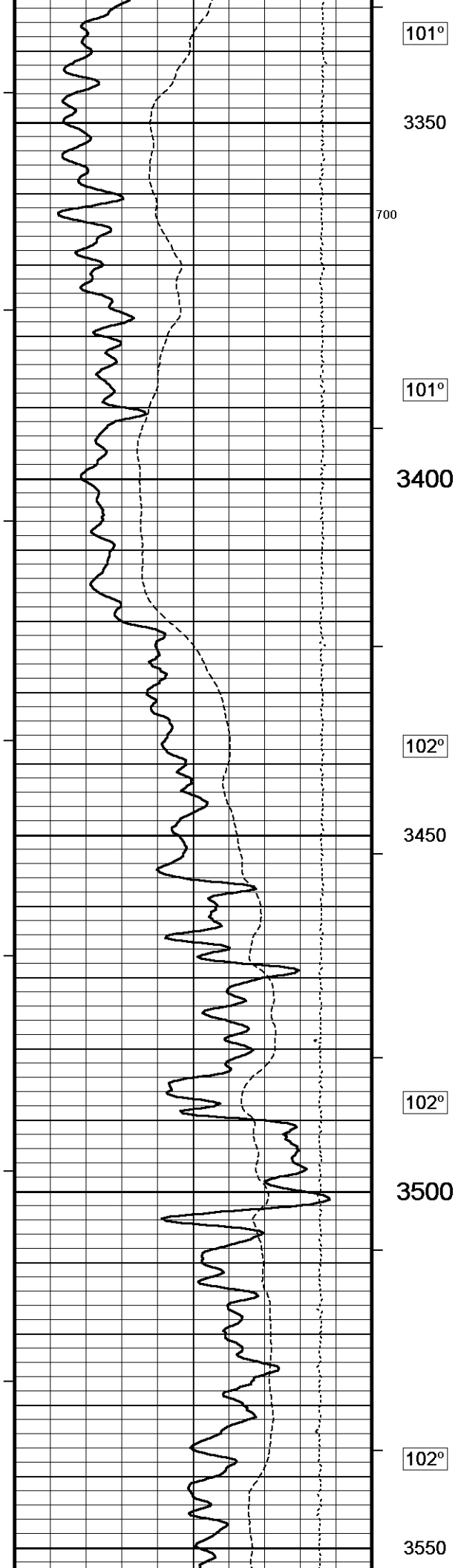
800

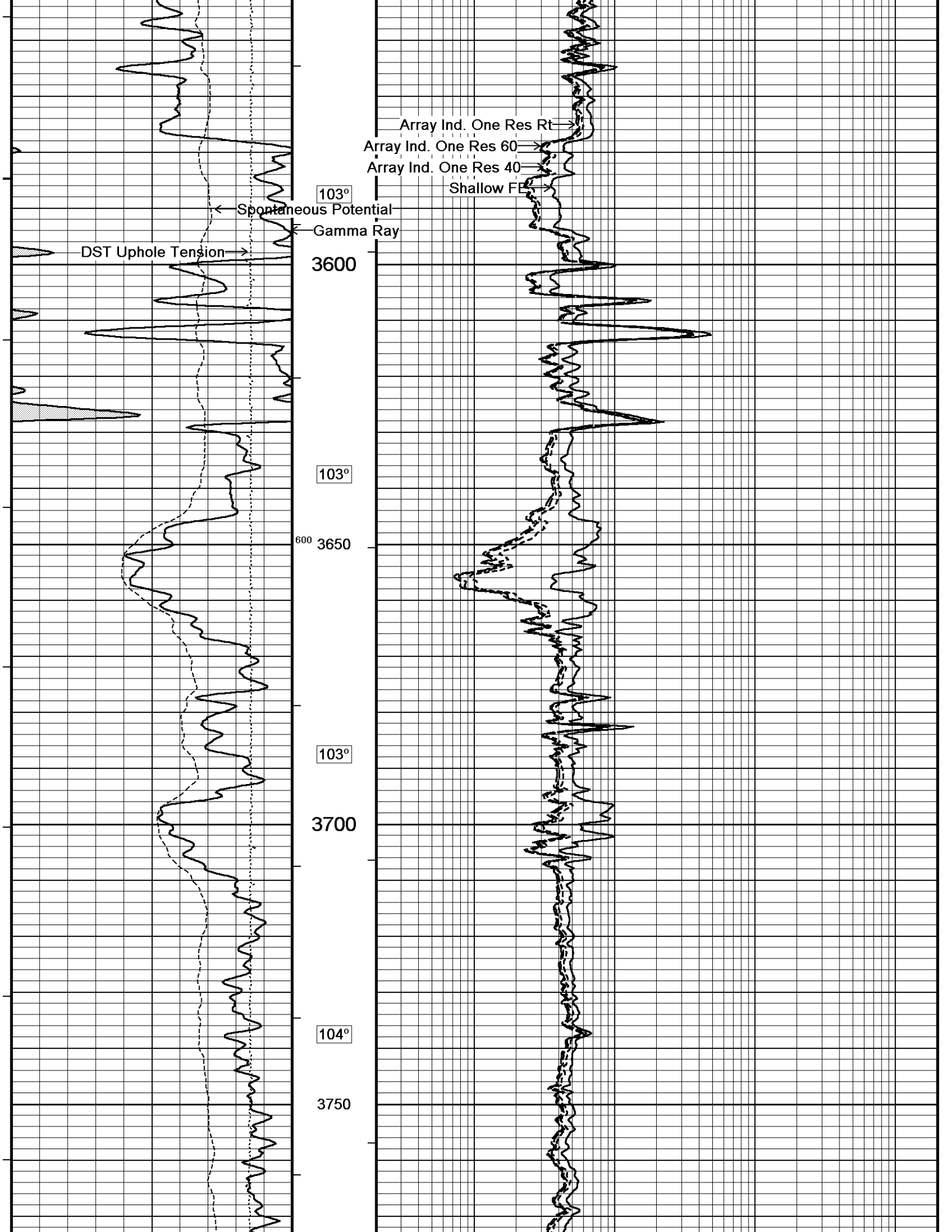
99°

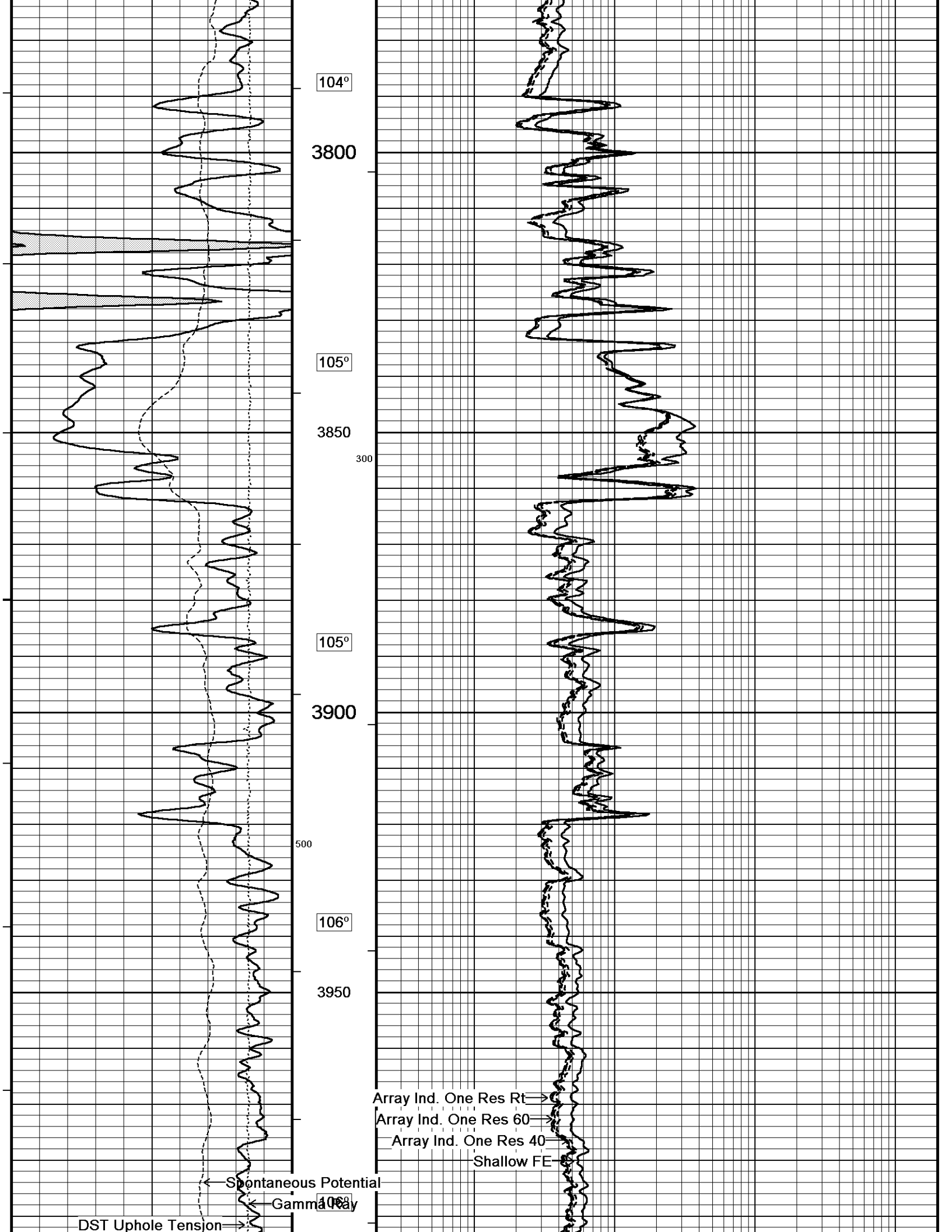
3100











104°

3800

105°

3850

105°

3900

106°

3950

300

500

Array Ind. One Res Rt

Array Ind. One Res 60

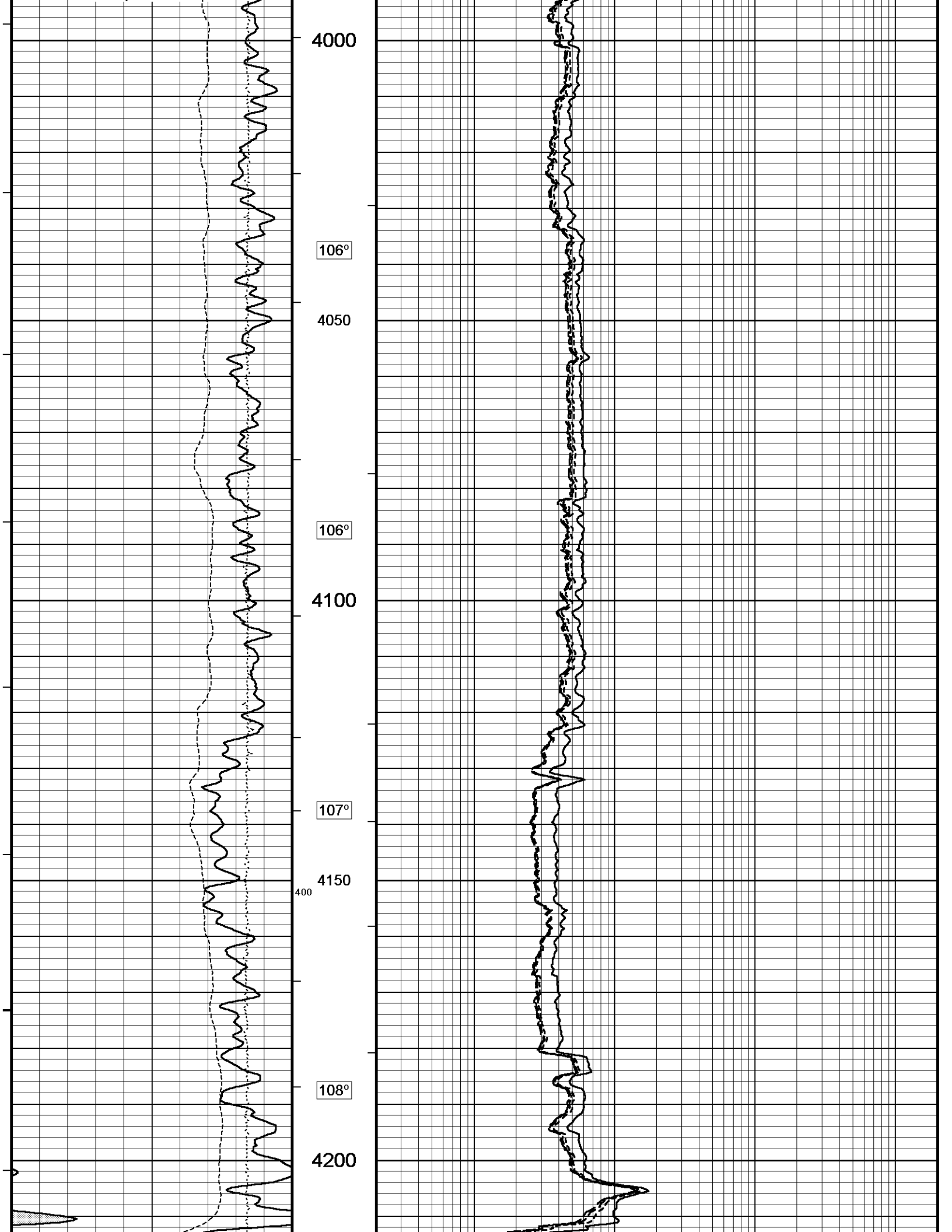
Array Ind. One Res 40

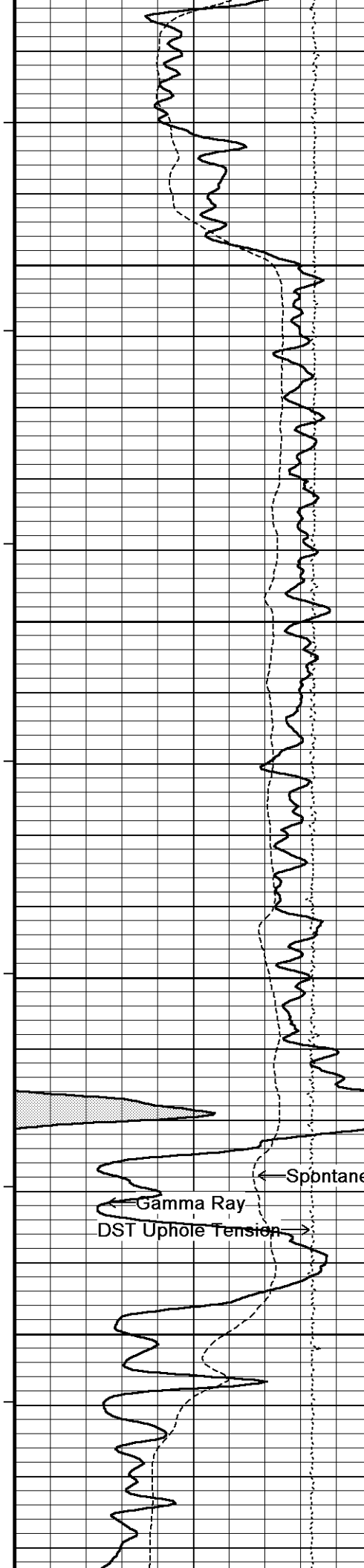
Shallow FE

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →





108°

4250<sup>200</sup>

108°

4300

108°

4350

Array Ind. One Res Rt →

Array Ind. One Res 60 →

Array Ind. One Res 40 →

Shallow FE →

← Spontaneous Potential

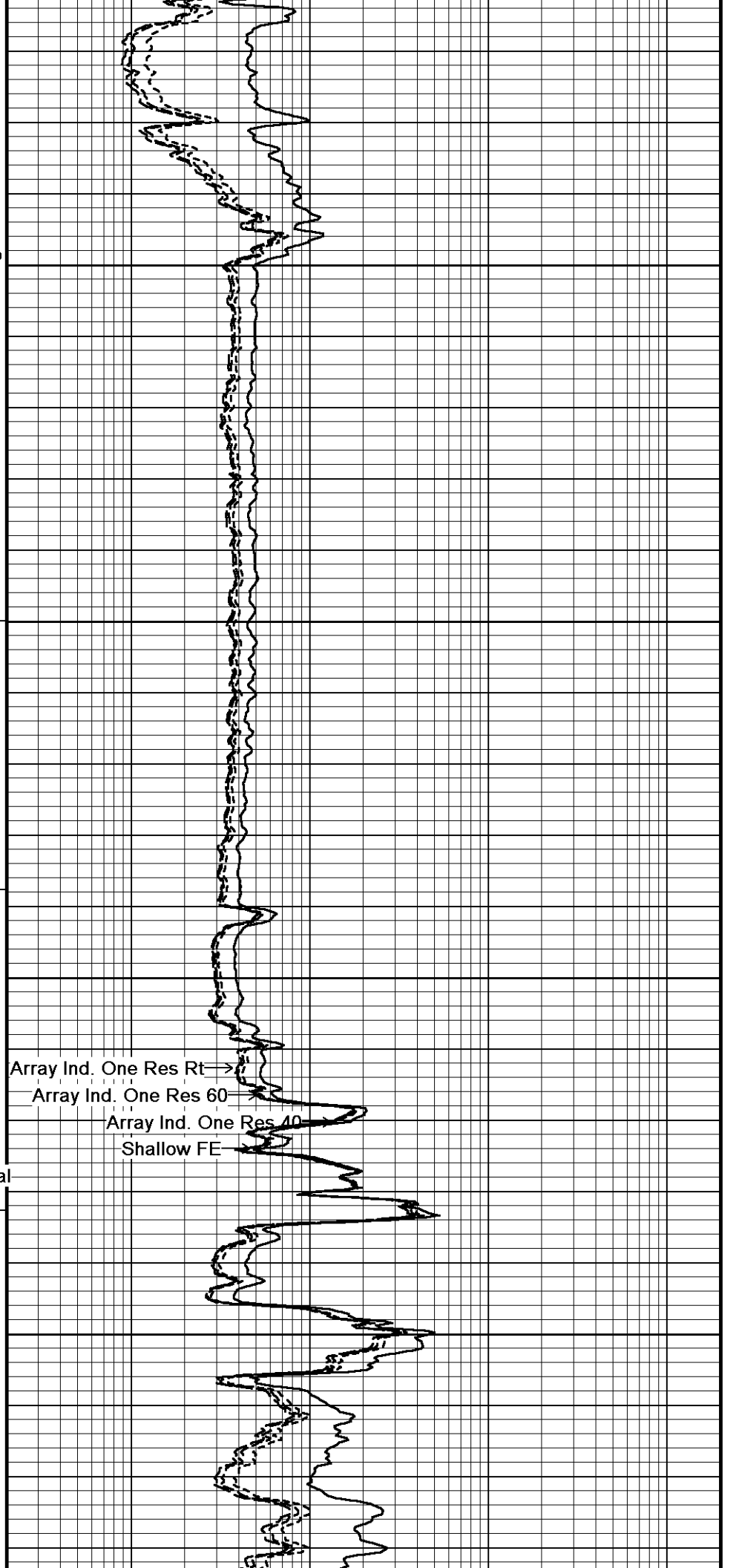
← Gamma Ray

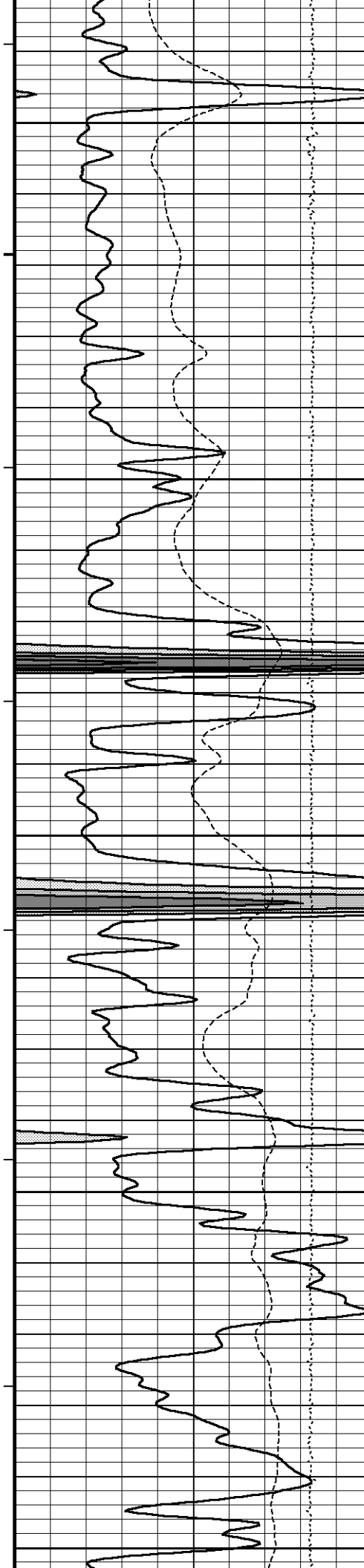
DST Uphole Tension →

109°

4400

300





110°

4450

110°

4500

110°

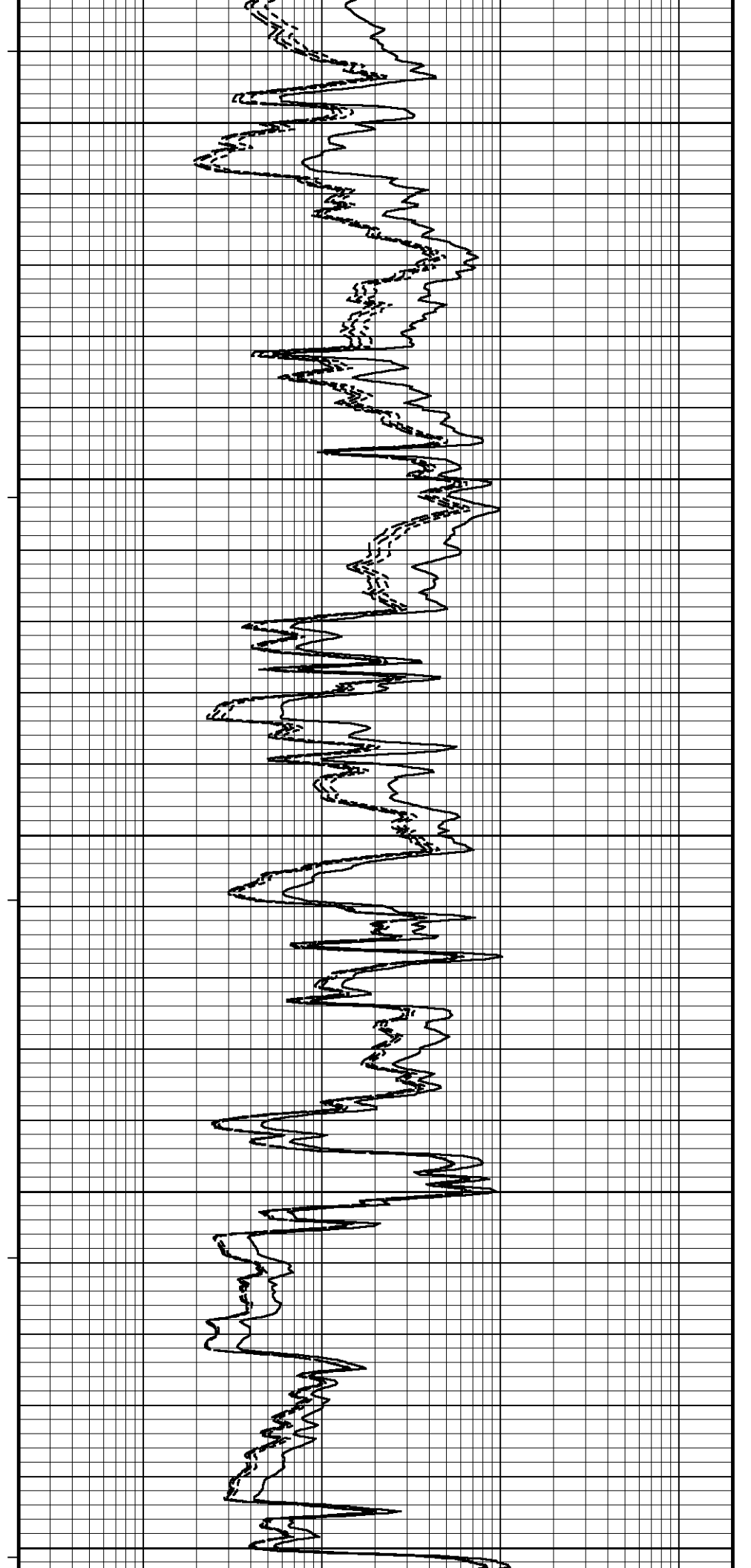
4550

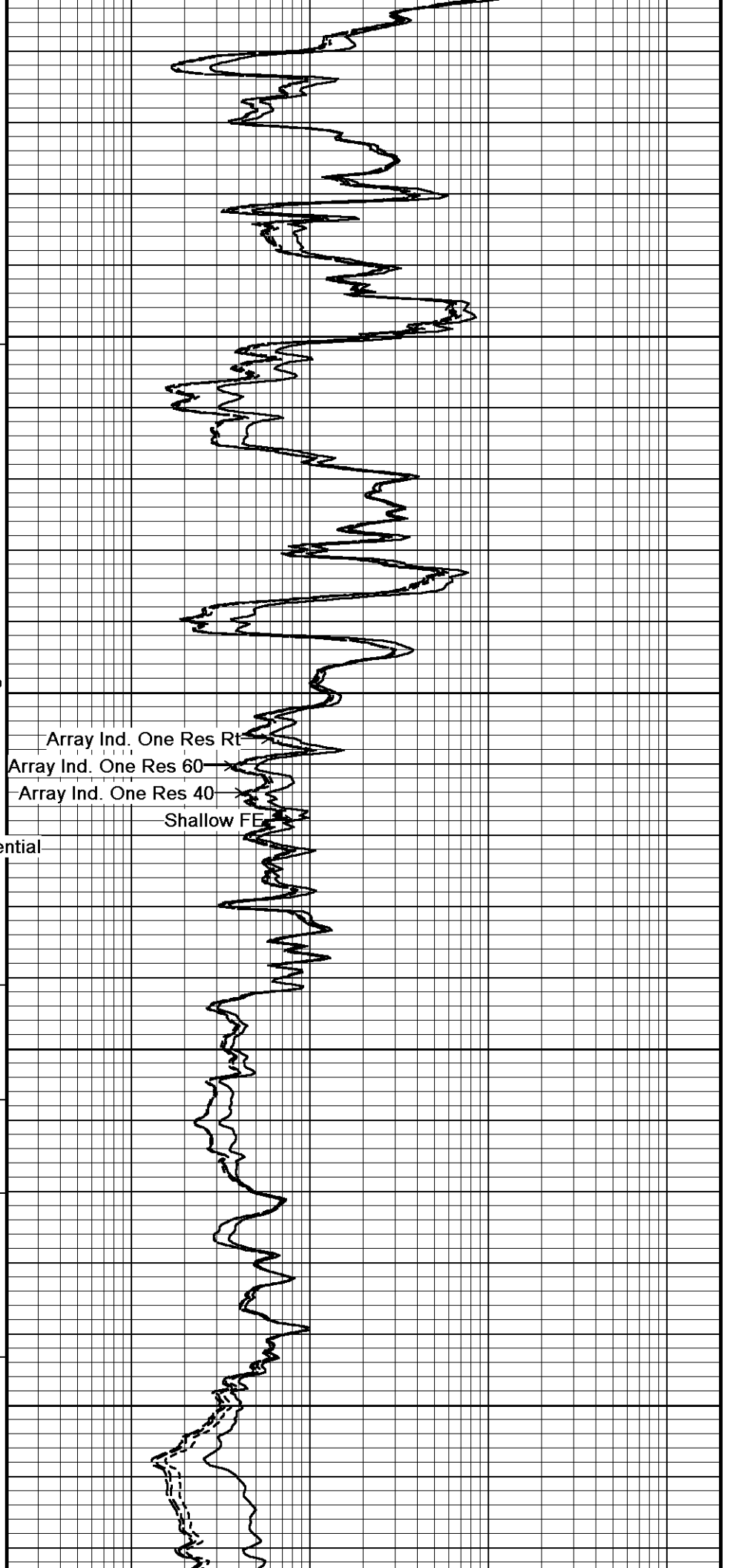
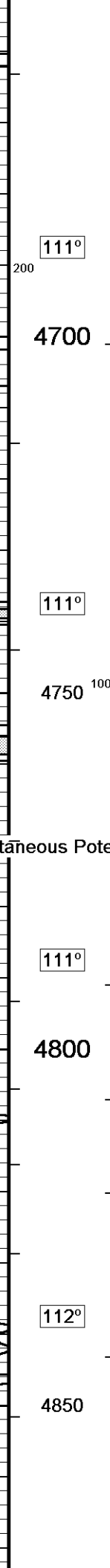
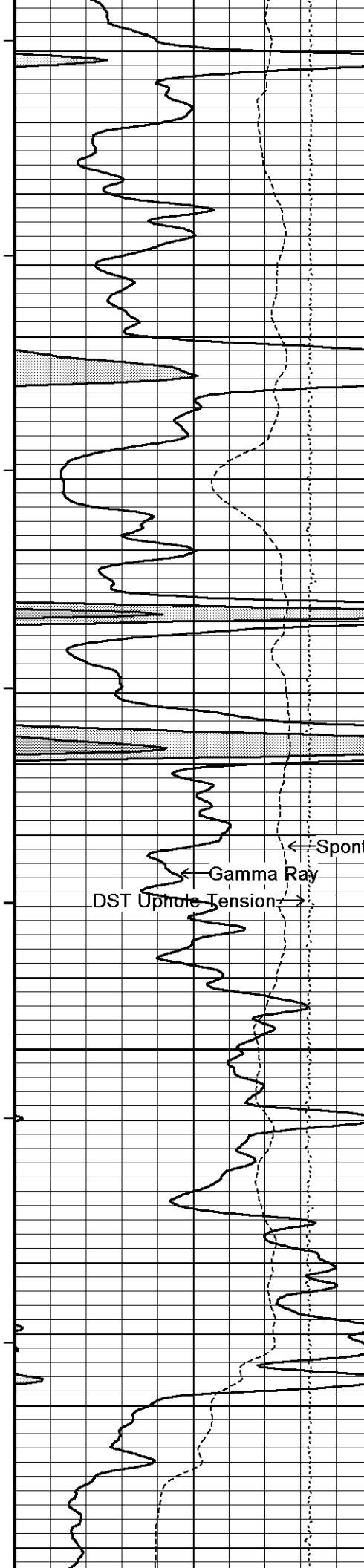
110°

4600

110°

4650



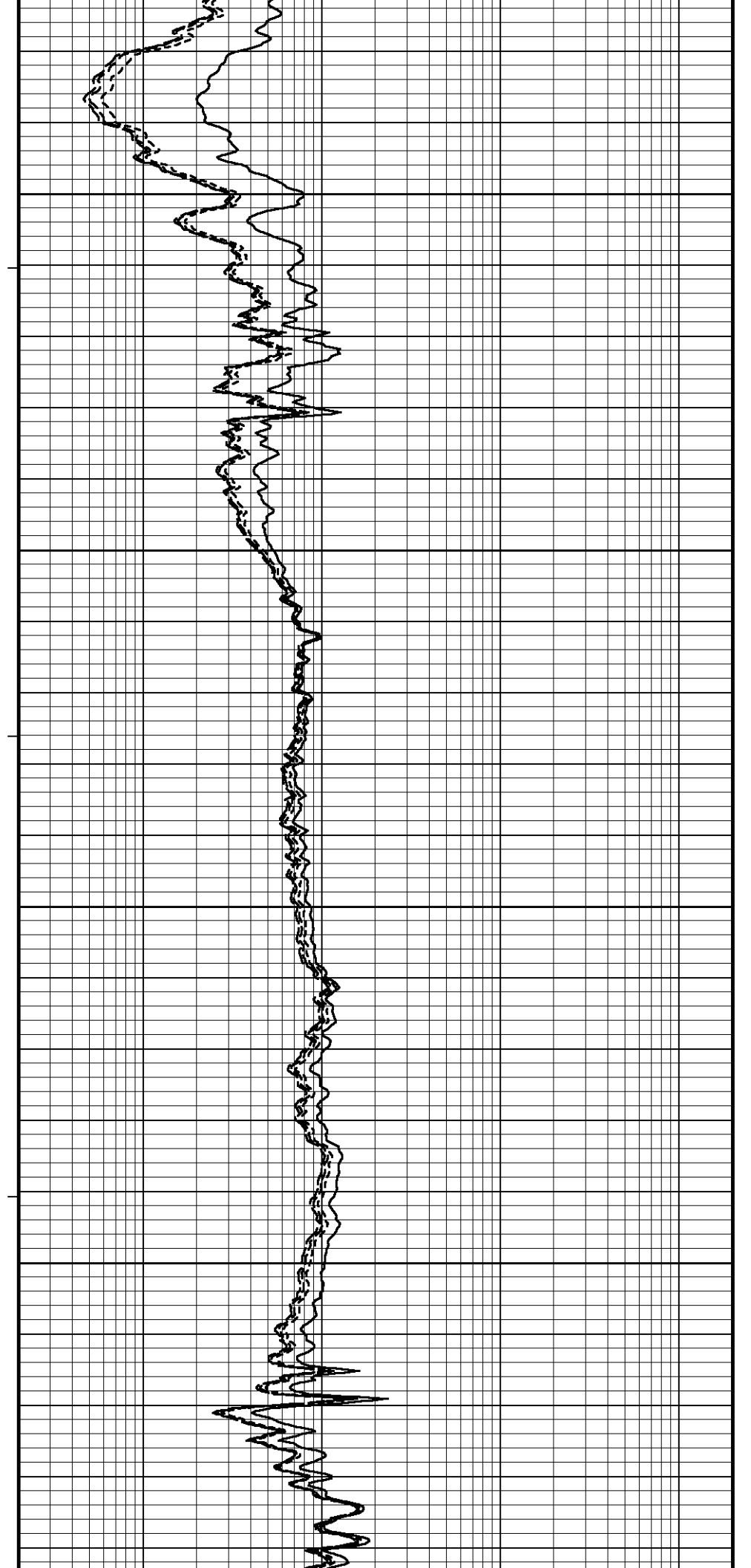
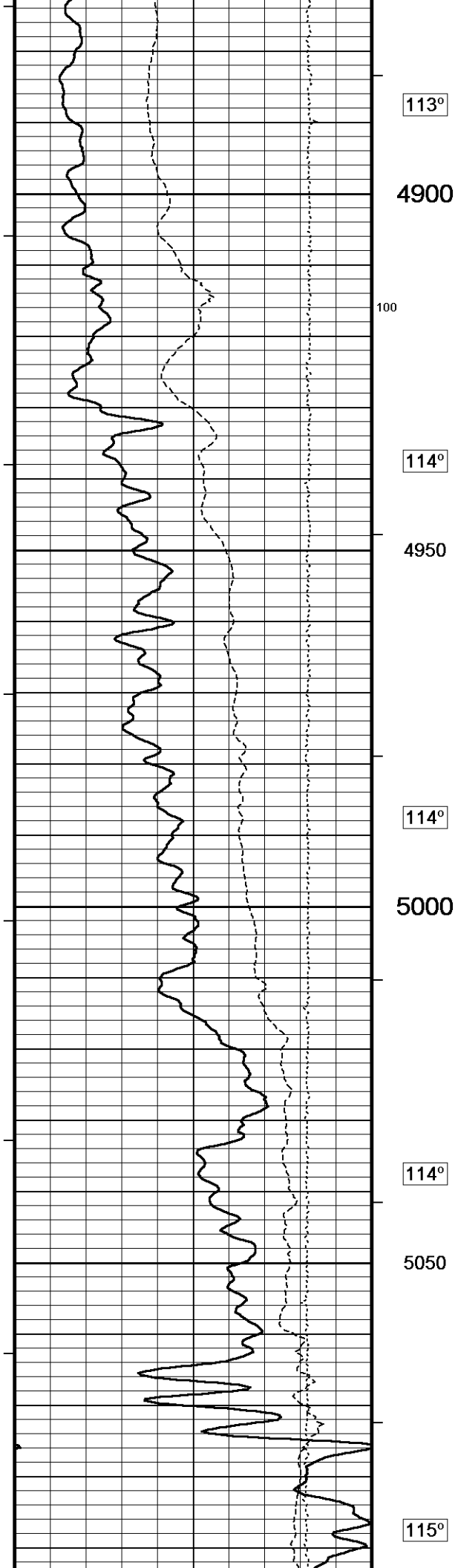


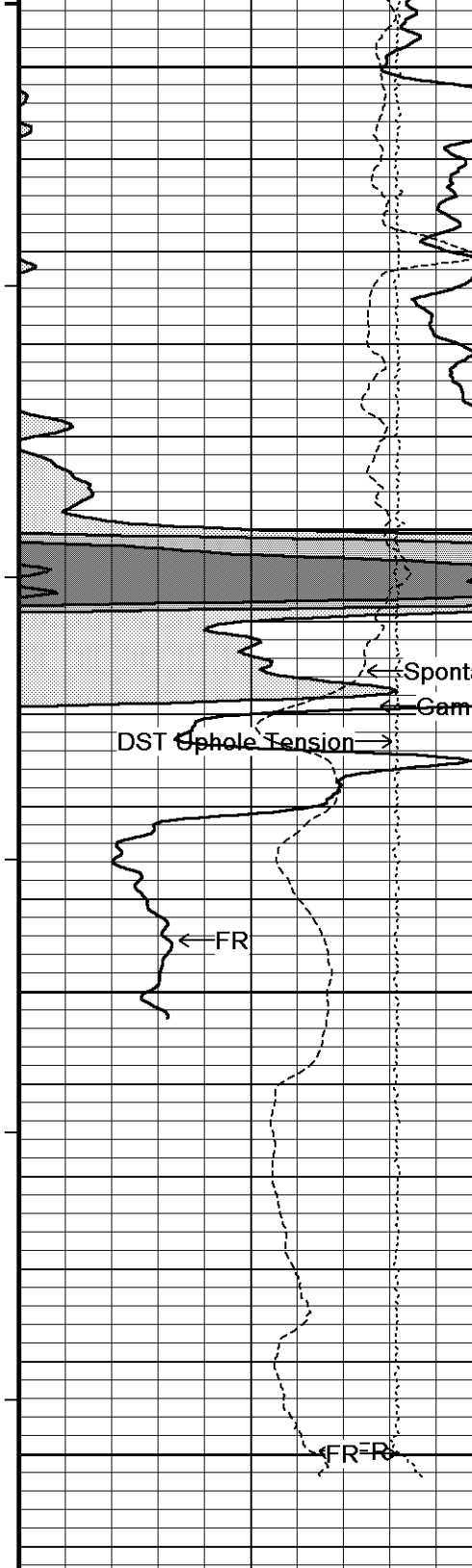
DST Uprobe Tension →

← Gamma Ray

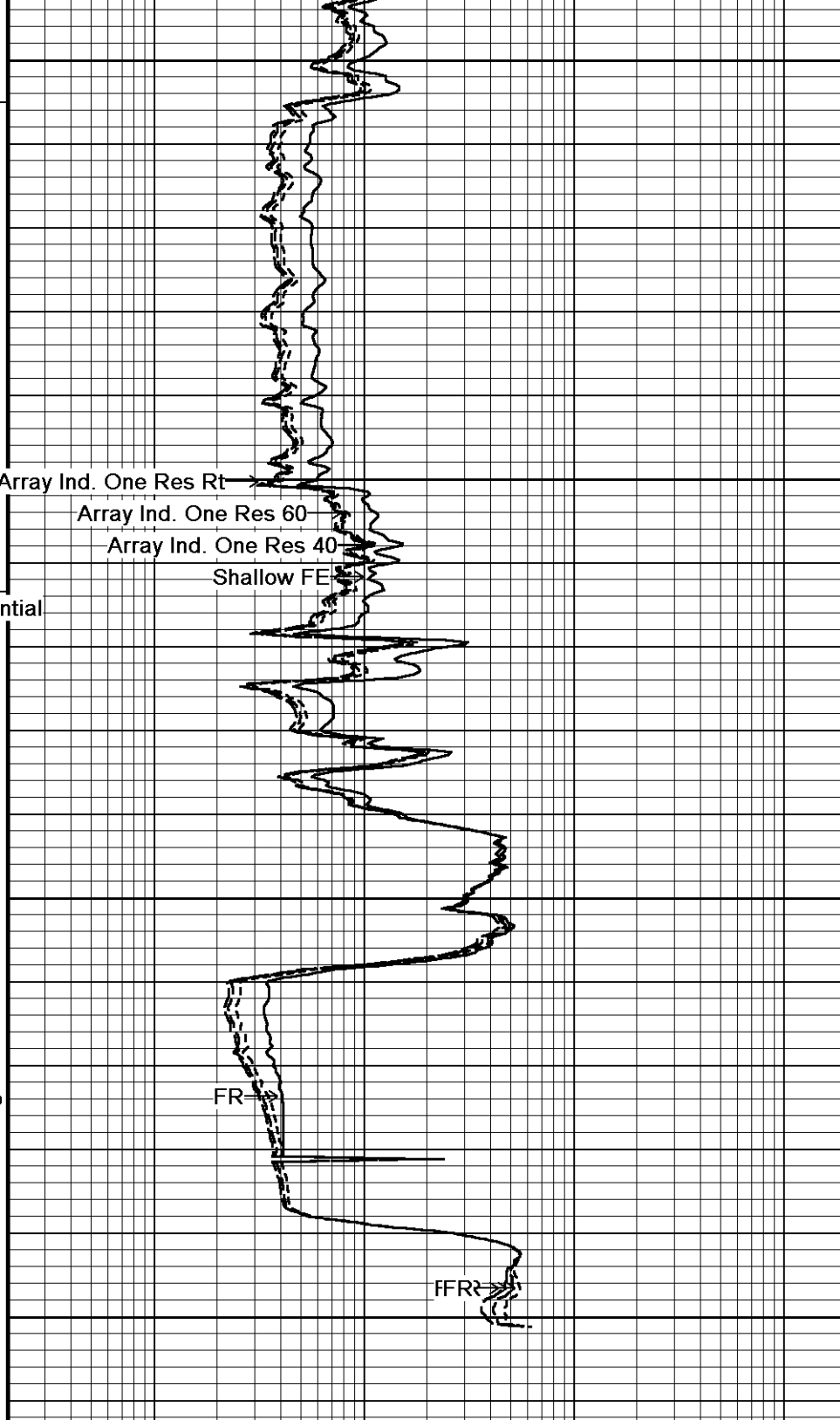
← Spontaneous Potential

Array Ind. One Res Rt  
Array Ind. One Res 60 →  
Array Ind. One Res 40 →  
Shallow FE





5100  
 115°  
 5150  
 115°  
 5200  
 0  
 5250  
 5260  
 Depth in Feet



Timing Marks  
 every 60.0 sec

Gamma Ray  
 API  
 0 75 150  
 150 225 300

Spontaneous Potential

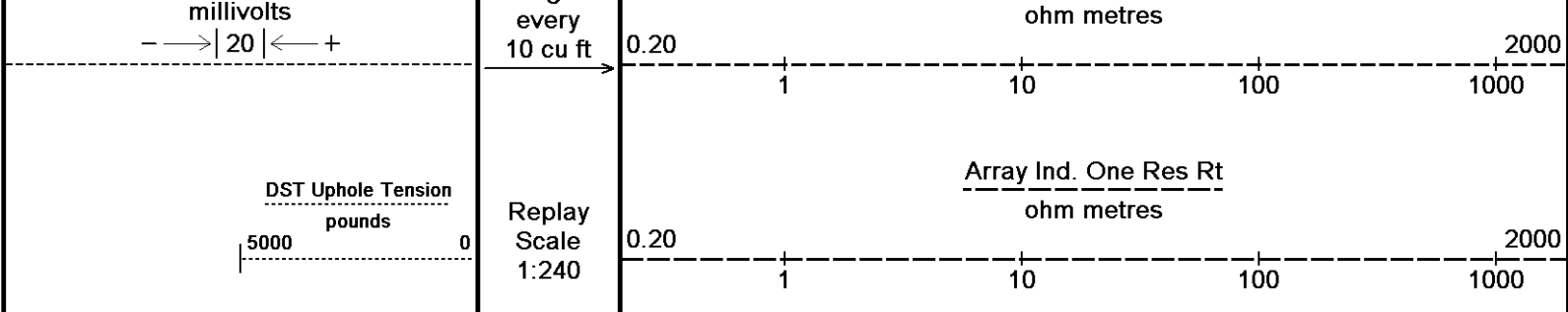
Borehole  
 Temp in  
 deg F  
 HVI  
 every  
 10 cu ft

Annular  
 Integral

Shallow FE  
 ohm metres  
 0.20 1 10 100 1000 2000

Array Ind. One Res 40  
 ohm metres  
 0.20 1 10 100 1000 2000

Array Ind. One Res 60

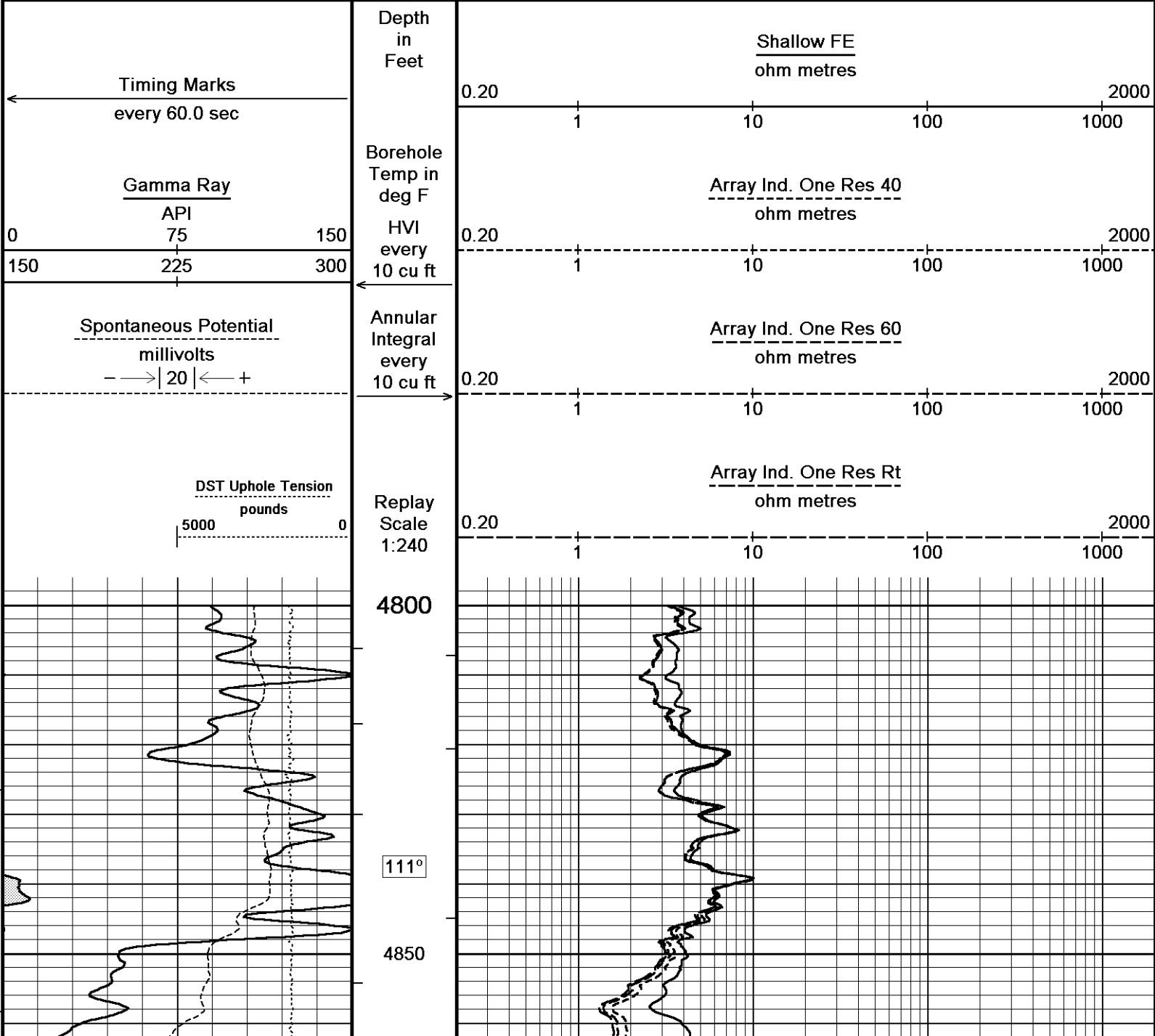


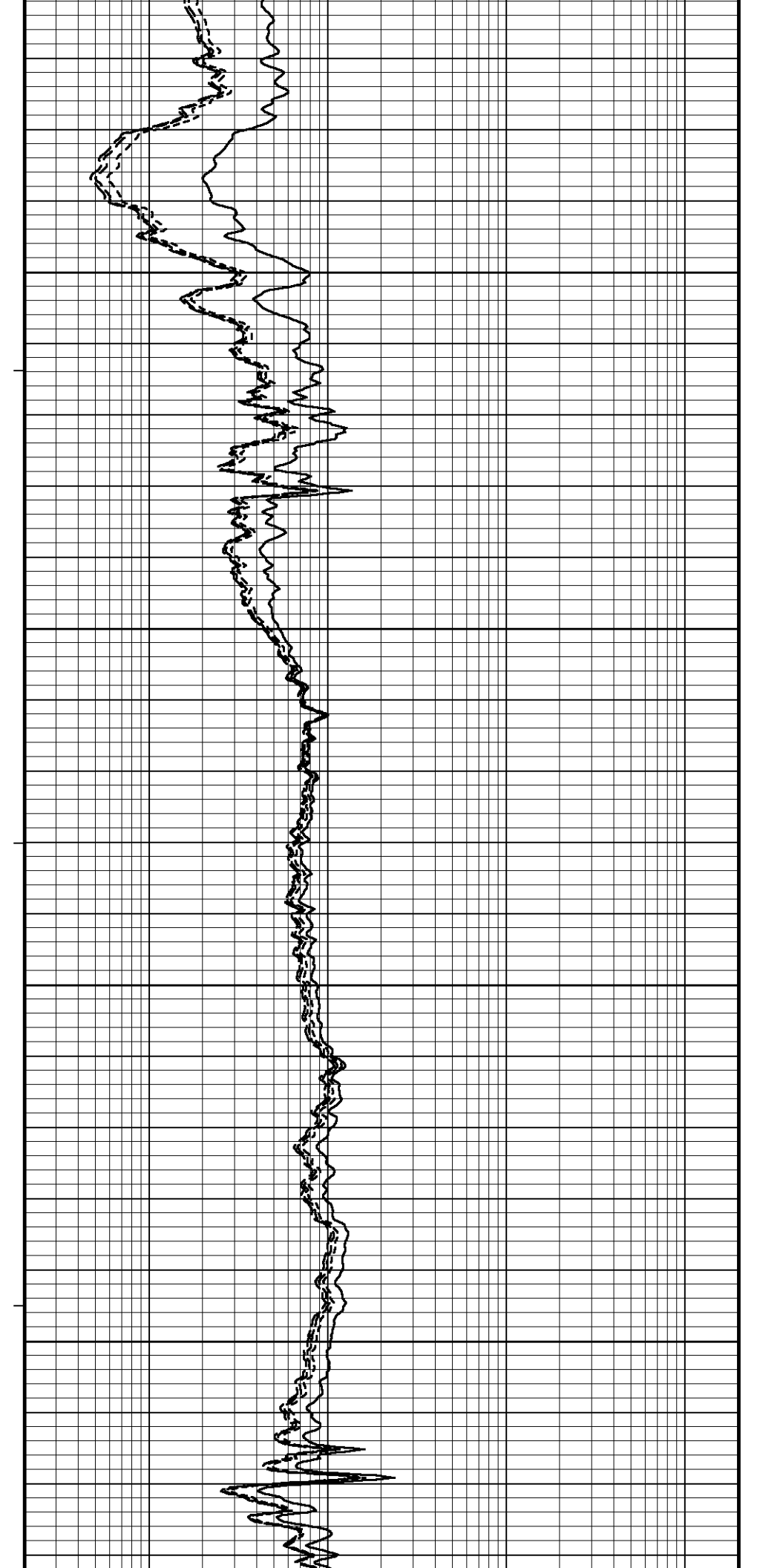
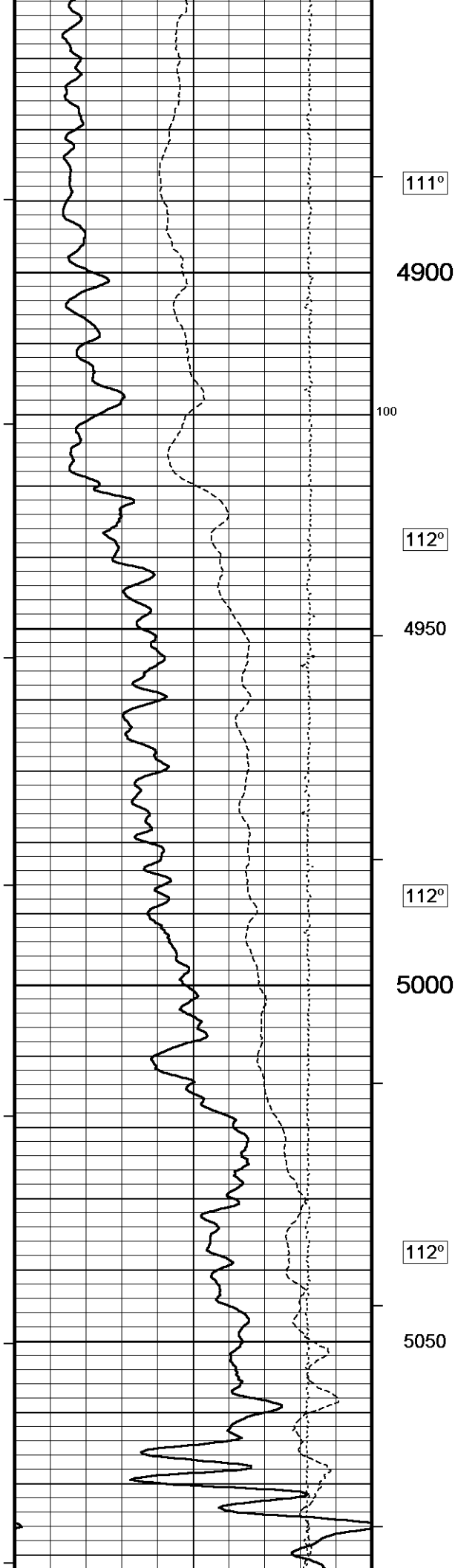
Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 18-OCT-2013 06:43  
 Filename: C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Main Pass.dta  
 Recorded on 18-OCT-2013 02:50  
 System Versions: Plotted with 13.05.9583

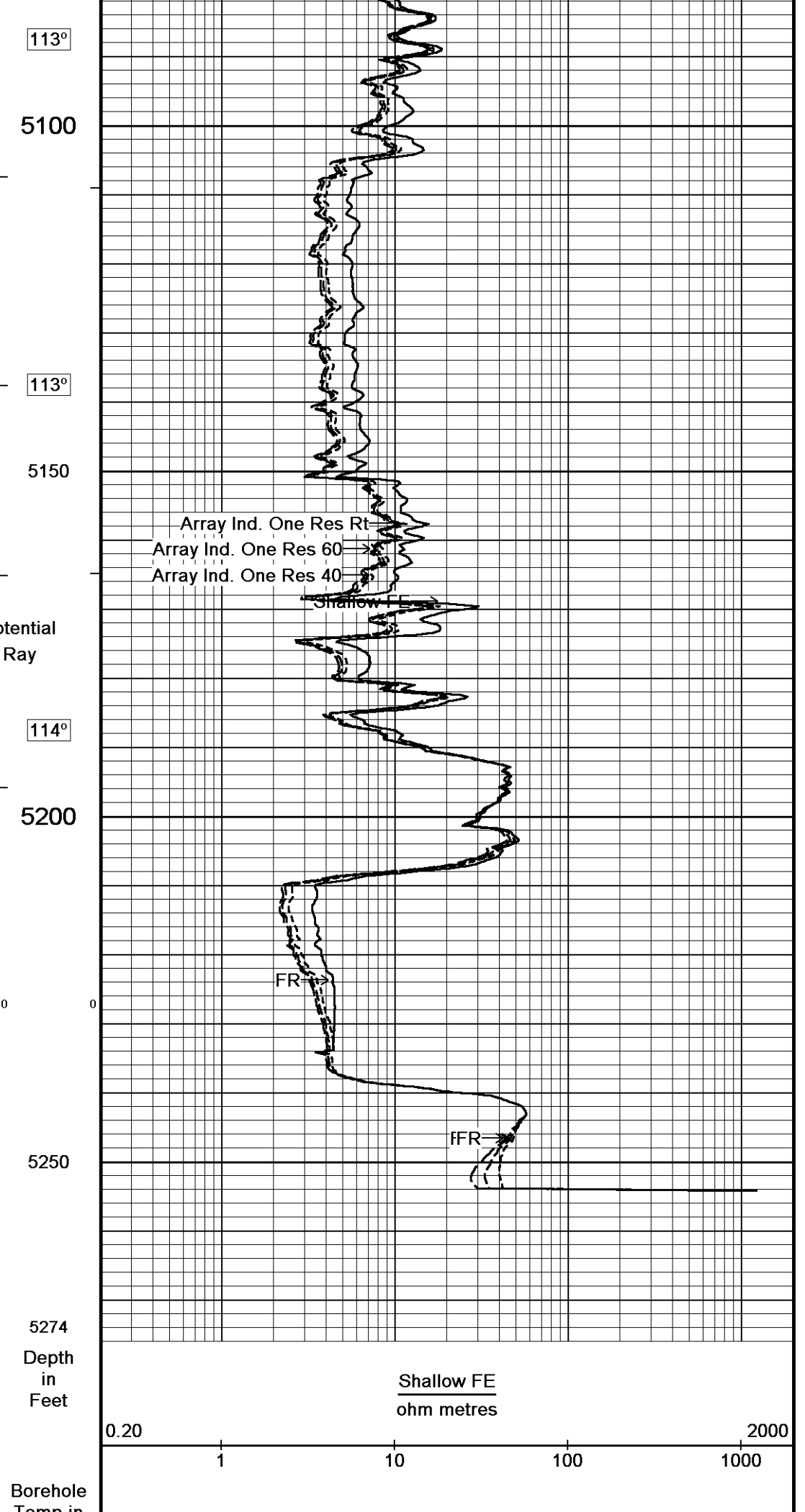
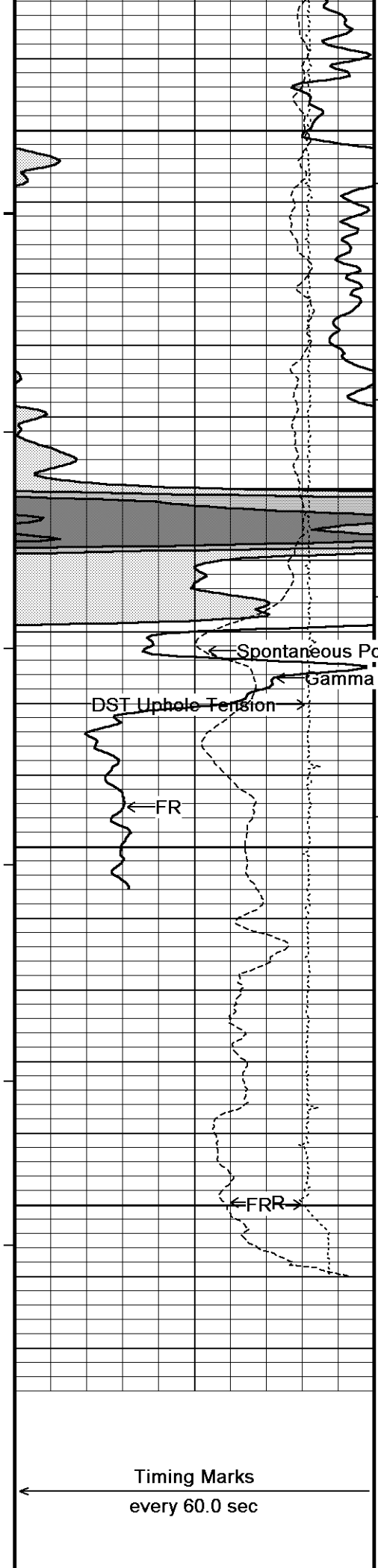
↑ 5 INCH MAIN ↑

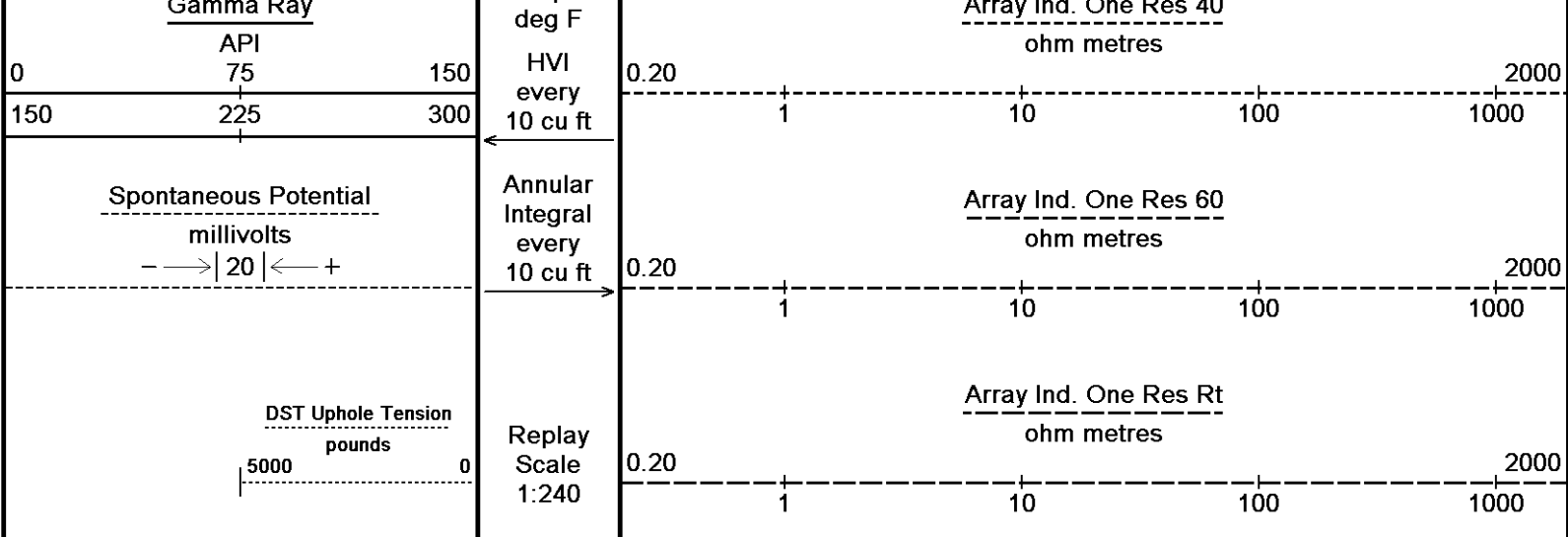
↓ REPEAT SECTION ↓

Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 18-OCT-2013 06:43  
 Filename: C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Repeat.dta  
 Recorded on 18-OCT-2013 02:10  
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583









Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 18-OCT-2013 06:44  
 Filename: C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Repeat.dta Recorded on 18-OCT-2013 02:10  
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

↑ REPEAT SECTION ↑

**BEFORE SURVEY CALIBRATION**  
 C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Main Pass.dta

General Constants All 000 Last Edited on 17-OCT-2013,21:03

General Parameters		
Mud Resistivity	0.720	ohm-metres
Mud Resistivity Temperature	88.000	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. One 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 18-OCT-2013 01:09

Reading No	Measured	Calibrated (lbs)
1	15067.27	-1.00
2	15825.18	480.00

Gamma Calibration MCG-D.K 443 Field Calibration on 11-OCT-2013 14:38

	Measured	Calibrated (API)
Background	71	48
Calibrator (Gross)	1136	773
Calibrator (Net)	1066	725

Gamma Constants MCG-D.K 443 Last Edited on 17-OCT-2013,21:03

Gamma Calibrator Number	GRC38	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	

K Mud Concentration 0.00 %

SP Calibration MCG-D.K 443

Field Calibration on 08-OCT-2013 02:27

	Measured	Calibrated (mV)
Reference 1	99.3	99.0
Reference 2	-96.6	-99.0

High Resolution Temperature Calibration MCG-D.K 443

Field Calibration on 08-OCT-2013,02:22

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

High Resolution Temperature Constants MCG-D.K 443

Last Edited on 08-OCT-2013,02:22

Pre-filter Length 11

Caliper Calibration MML-A 16

Base Calibration on 11-OCT-2013 14:20

Field Calibration on 11-OCT-2013 14:21

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13890	5.98
2	17012	7.97
3	20232	9.86
4	24164	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.99	5.98

Micro Normal and Micro Inverse Calibration MML-A 16

Base Calibration on 11-OCT-2013 14:03

Field Check on 11-OCT-2013 14:05

Base Calibration

Channel	Measured		Calibrated (ohm-m)	
	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	48.3	48.3

Micro Normal and Micro Inverse Constants MML-A 16

Last Edited on 17-OCT-2013,21:03

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-B.J 387

Base Calibration on 11-OCT-2013 11:56

Field Check on 11-OCT-2013 12:13

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
Ratio	2939	89	3714	110
	32.951		33.764	

Field Calibrator at Base

	Calibrated (cps)
Ratio	1693 2506
	0.676

Field Check

	Calibrated (cps)
Ratio	0.670

Neutron Constants MDN-B.J 387

Last Edited on 17-OCT-2013,21:03

Neutron Source Id P58125B  
 Neutron Jig Number 5824NE  
 Epithermal Neutron No  
 Caliper Source for Processing Density Caliper

Caliper Source for Processing	Density Caliper	0.00	inches
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-A.A 55

Base Calibration on 11-OCT-2013 14:27  
Field Check on 11-OCT-2013 14:32

Base Calibration			
	Measured	Calibrated (ohm-m)	
Reference 1	0.0	0.0	
Reference 2	954.0	126.8	
Base Check		280.9	
Field Check		280.8	

FE Constants MFE-A.A 55

Last Edited on 17-OCT-2013,21:02

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	

Sonic Constants MSS-C.K 330

Last Edited on

Maximum Boundary Contrast	100.00	micro-sec/ft	
Fluid Transit Time	189.00	micro-sec/ft	
Limestone Transit Time	47.50	micro-sec/ft	
Sandstone Transit Time	55.50	micro-sec/ft	
Dolomite Transit Time	43.50	micro-sec/ft	
Sonic used for Porosities	3-5' Compensated		
Correction for Sonde Skew	Applied		
Cycle Stretch Algorithm	Applied		
MN3FT	0.00	micro-sec	
MX3FT	1500.00	micro-sec	
Hunt-Raymer Constant	83.13	micro-sec/ft	
Sonde Mode	Compensated		
Hole Type	Open Hole		

Sonde Parameters

	Measured	Calibrated	
Offset	0.0000	0.0000	
Free Pipe	0.0000		

Peak Amplitude Source

Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'	N/A	N/A	N/A	N/A	N/A
4'	N/A	N/A	N/A	N/A	N/A
5'	N/A	N/A	N/A	N/A	N/A
6'	N/A	N/A	N/A	N/A	N/A

Processed Fixed Gate Parameters

Waveform Used For Processing	N/A			
Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	Depth (m)	
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
0.00	0.00	0.00	0.00

Full Waveform Parameters

Use 3' Waveform to derive TR	No		
Use 4' Waveform to derive TR	No		
Use 5' Waveform to derive TR	No		
Use 6' Waveform to derive TR	No		
3' Waveform Discriminator Level	0.30	mV	
4' Waveform Discriminator Level	0.30	mV	
5' Waveform Discriminator Level	0.15	mV	
6' Waveform Discriminator Level	0.15	mV	
3' Waveform Filter			
4' Waveform Filter			
5' Waveform Filter			
6' Waveform Filter			
Semblance Level	0.50		
Semblance Window Width	120.00	micro-sec	
Sonic 1 Despiker	100.00	micro-sec/ft	
Sonic 2 Despiker	100.00	micro-sec/ft	

Induction Calibration MAI-A.A 178

Base Calibration on 28-AUG-2013,08:48  
Field Check on 11-OCT-2013 10:39

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)		Field Check (mmho/m)		
	Low	High	Low	High	
1	12.0	3763.6	12.0	3763.7	
2	29.6	3468.2	29.6	3468.1	
3	27.2	3014.9	27.2	3014.7	
4	18.8	2065.5	18.8	2065.4	
Deep	15.9	1995.7	15.9	1995.6	
Medium	40.3	3956.3	40.3	3955.9	
Shallow	45.4	5083.8	45.3	5083.6	

Array Temperature 66.9 67.3 Deg F

Induction Constants MAI-A.A 178

Last Edited on 17-OCT-2013,21:02

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	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	

### High Resolution Temperature Calibration MAI-A.A 178

Field Calibration on 08-OCT-2013,02:22

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

### High Resolution Temperature Constants MAI-A.A 178

Last Edited on 08-OCT-2013,02:22

Pre-filter Length	11
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### Photo Density Calibration MPD-B 59

Base Calibration on 11-OCT-2013 11:07  
Field Check on 11-OCT-2013 11:17

Density Calibration		Measured		Calibrated (sdu)	
Base Calibration		Near	Far	Near	Far
Reference 1	56267	27692	59556	30836	
Reference 2	22857	2469	24941	2541	
Field Check at Base		1197.2	1246.8		
Field Check		1189.0	1248.3		
PE Calibration		Measured		Calibrated	
Base Calibration		WS	WH	Ratio	Ratio
Background	216	1075			
Reference 1	20854	56084	0.375	0.371	
Reference 2	5994	22721	0.267	0.272	
Field Check at Base		216.2	1074.8		
Field Check		215.3	1063.1		

### Density Constants MPD-B 59

Last Edited on 17-OCT-2013,21:03

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

<b>Caliper Calibration MPD-B 59</b>		<b>Base Calibration on 11-OCT-2013 10:50</b>	
		<b>Field Calibration on 11-OCT-2013 10:51</b>	
<b>Base Calibration</b>			
<b>Reading No</b>	<b>Measured</b>	<b>Calibrator Size (in)</b>	
1	15529	3.99	
2	24192	5.98	
3	32738	7.97	
4	40962	9.86	
5	50171	11.92	
6	N/A	N/A	
<b>Field Calibration</b>			
	<b>Measured Caliper (in)</b>	<b>Actual Caliper (in)</b>	
	5.95	5.98	

### DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Logs\CMX Bartender #1\CMX Bartender #1 Main Pass.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 443 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

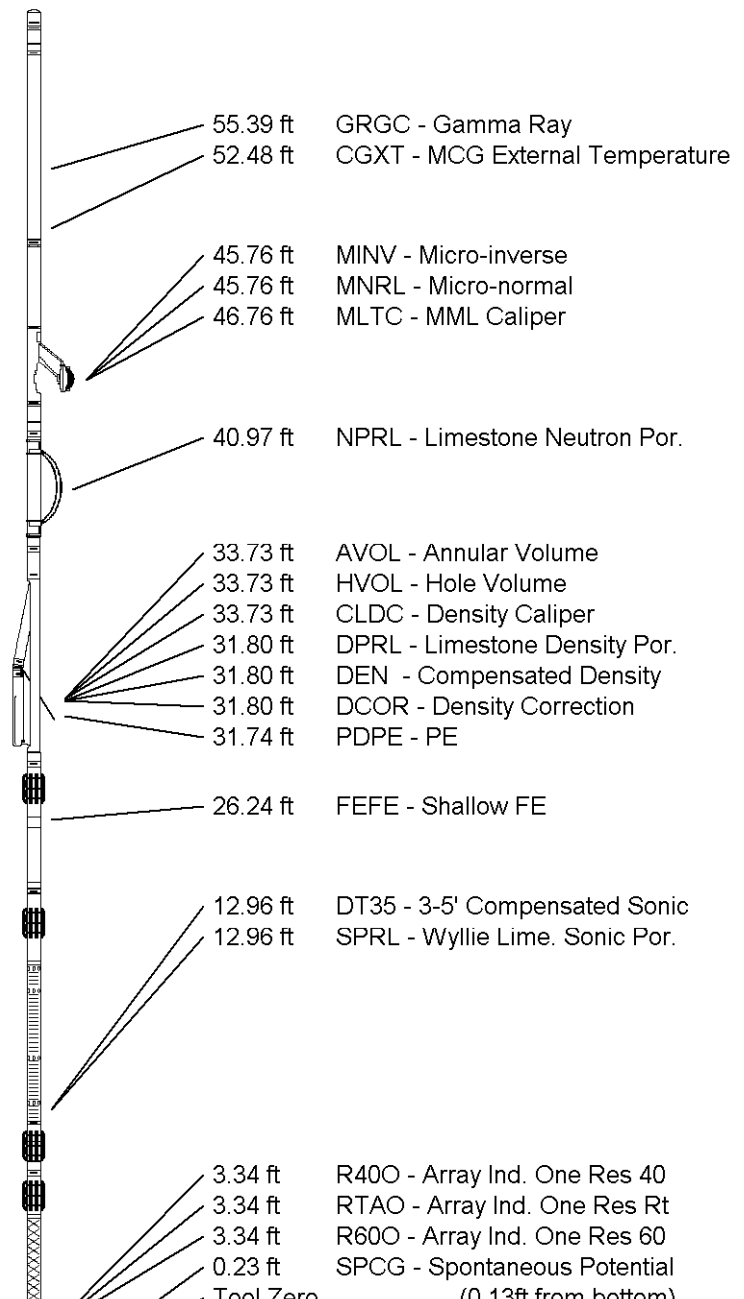
Compact Density/Caliper  
 MPD-B 59 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

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

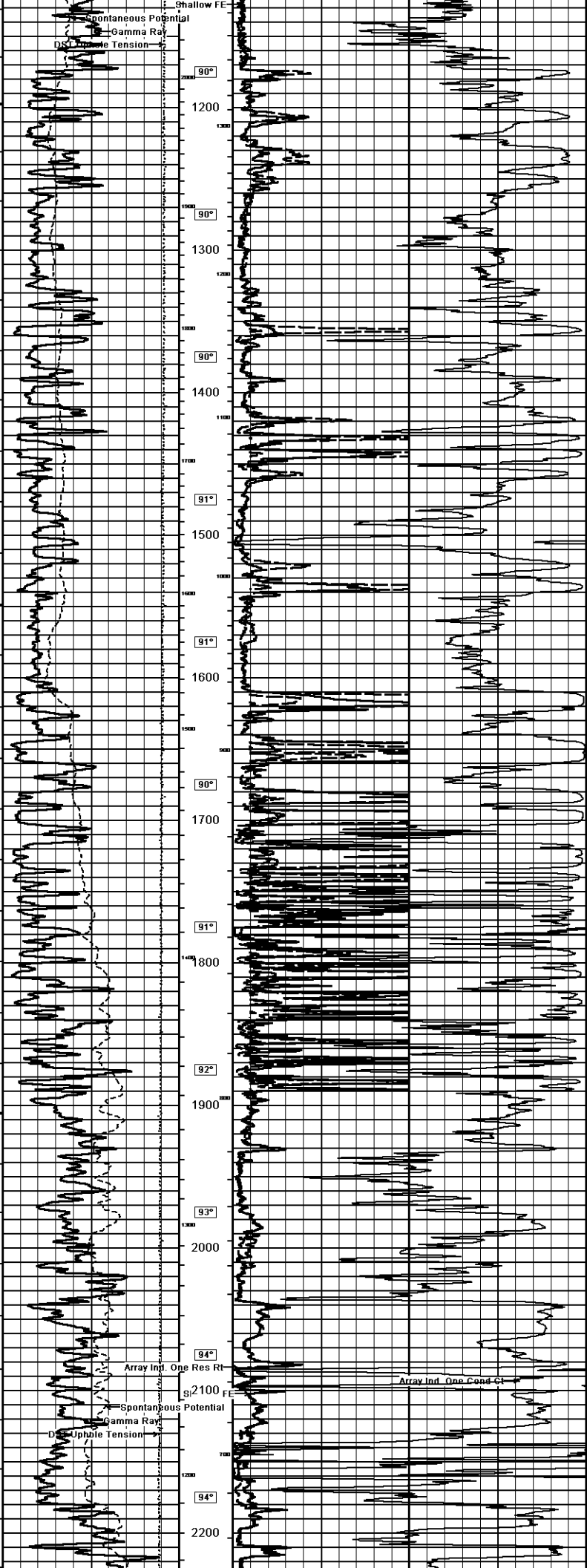
Compact Sonic  
 MSS-C.K 330 LG: 12.52 ft WT: 72.8 lb OD: 2.24 in

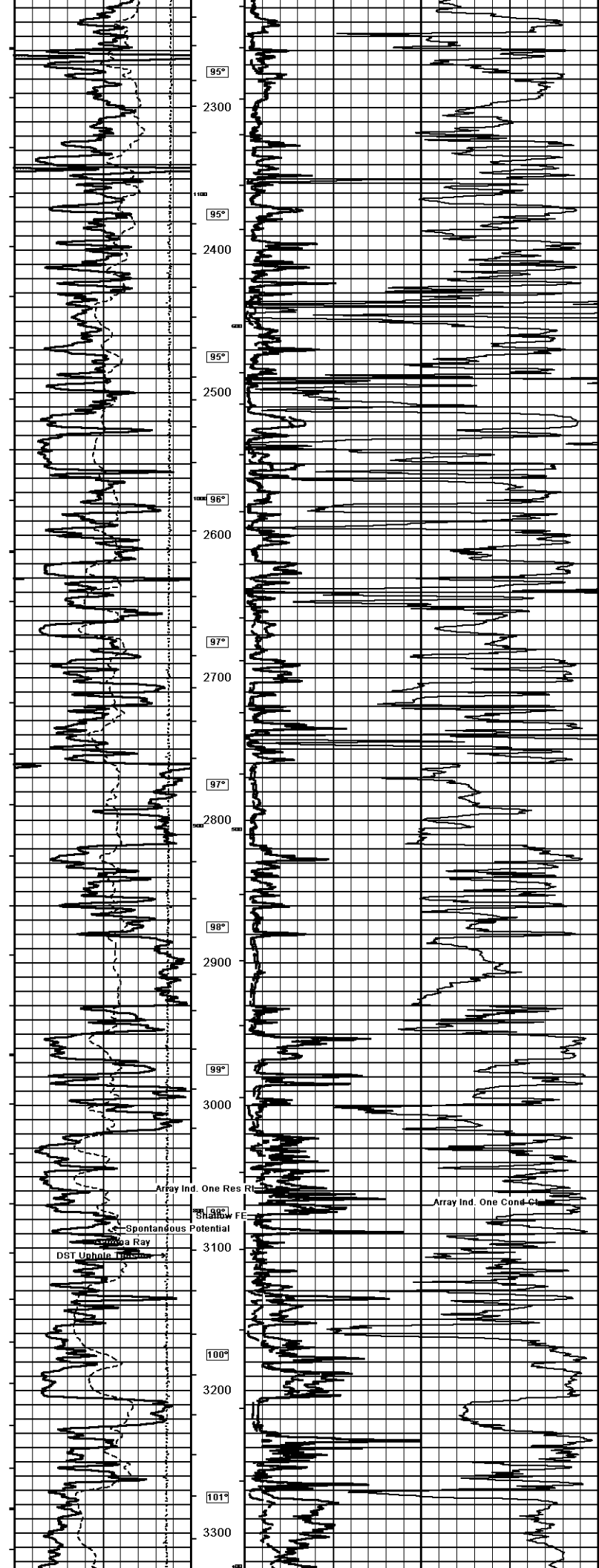
Compact Induction  
 MAI-A.A 178 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

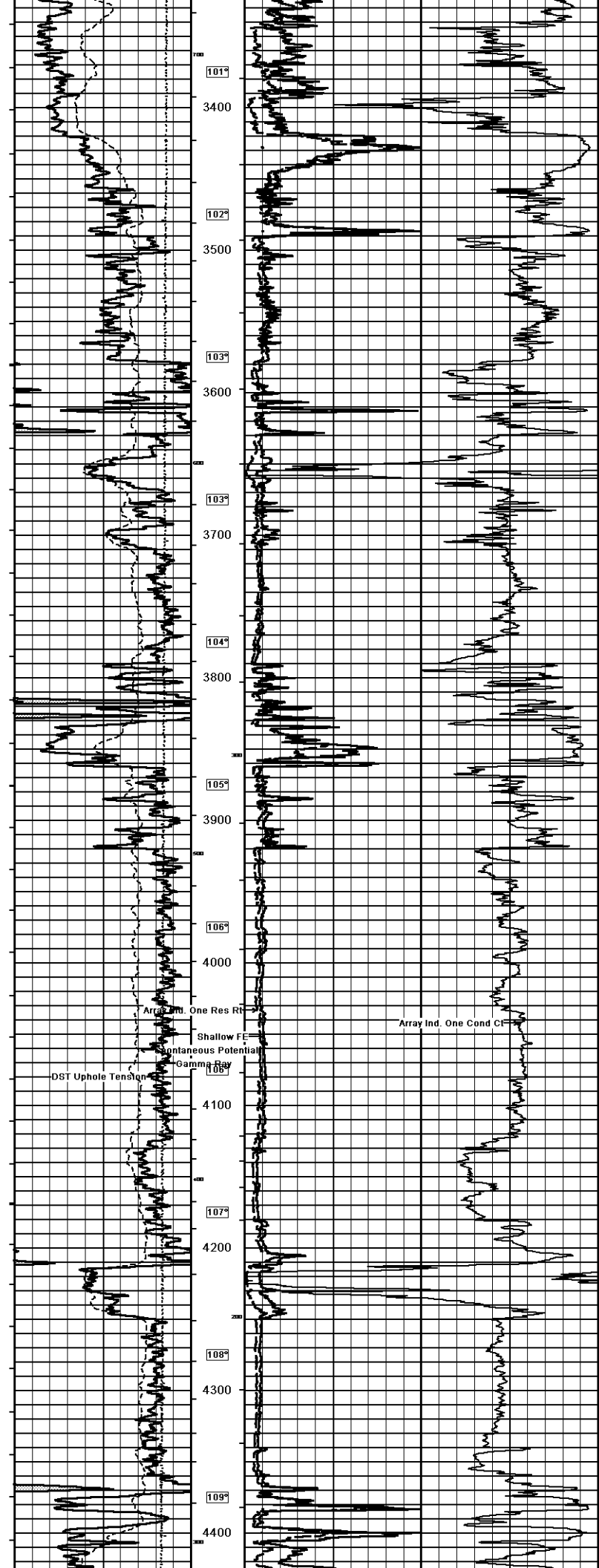
**Total Length: 62.25 ft Weight: 471.8 lb**

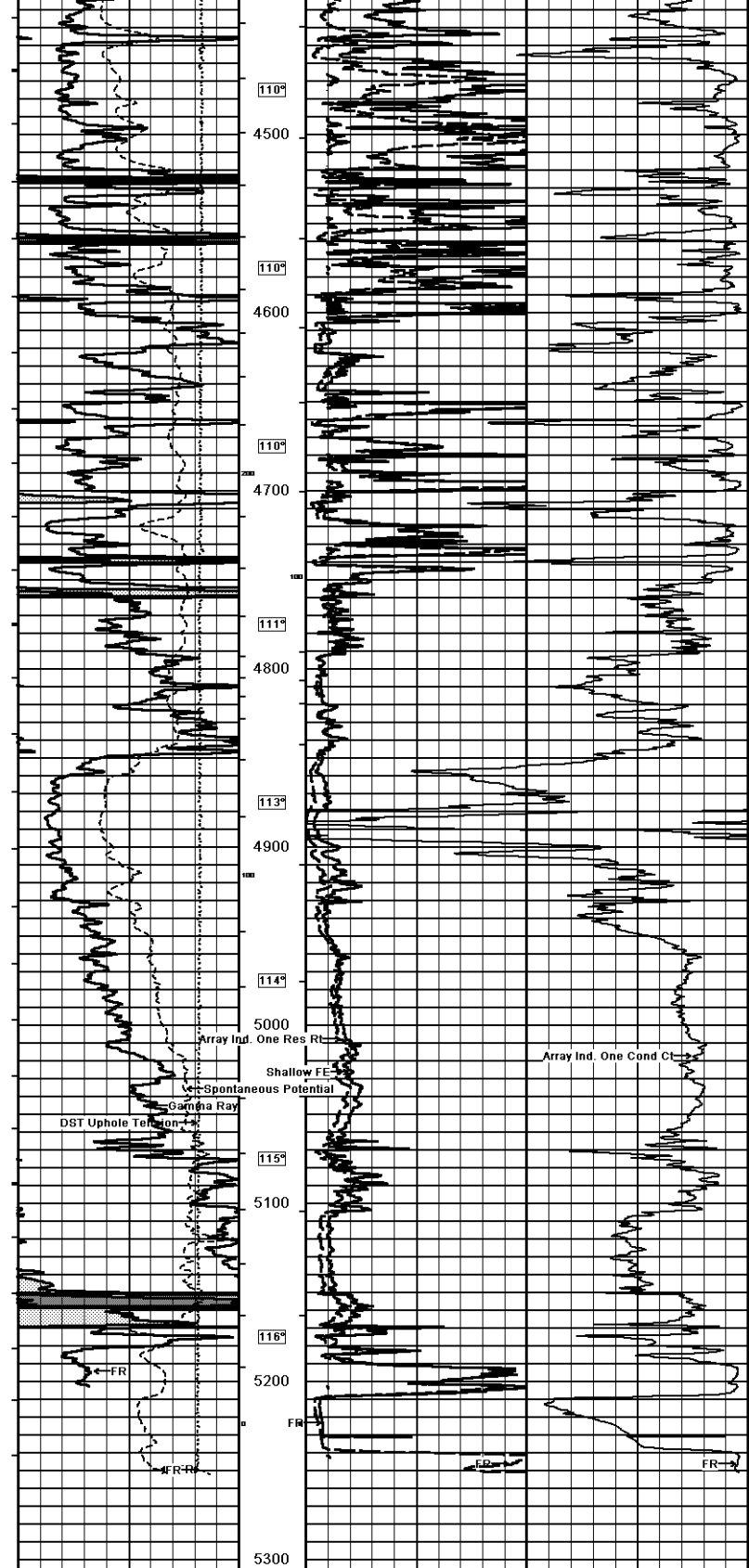













<p><b>Timing Marks</b> every 60.0 sec</p> <p><b>Gamma Ray</b> API 0 75 150 150 225 300</p> <p><b>Spontaneous Potential</b> millivolts -  20  ← +</p> <p><b>DST Uphole Tension</b> pounds 5000 0</p>	<p><b>Depth in Feet</b></p> <p><b>Borehole Temp in deg F</b></p> <p><b>Annular Integral</b> every 10 cu ft</p> <p><b>Replay Scale</b> 1:600</p>	<p><b>Array Ind. One Cond Ct</b> mmhos 1000 750 500 250 0 2000 1750 1500 1250 1000</p> <p><b>Shallow FE</b> ohm metres 0 25 50 0 250 500</p> <p><b>Array Ind. One Res Rt</b> ohm metres 0 25 50 0 250 500</p>
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COMPANY	CMX, INC.
WELL	BARTENDER #1
FIELD	STRANATHAN
PROVINCE/COUNTY	BARBER
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	1377.00	feet	First Reading	5246.66	feet
Elevation Drill Floor	1375.00	feet	Depth Driller	5250.00	feet
Elevation Ground Level	1369.00	feet	Depth Logger	5250.00	feet

 ARRAY INDUCTION  
SHALLOW FOCUSED  
ELECTRIC LOG