



Weatherford

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

COMPANY	MURFIN DRILLING COMPANY, INC.			
WELL	COLUMBINE #8-24			
FIELD	WILDCAT			
PROVINCE/COUNTY	LINCOLN			
COUNTRY/STATE	U.S.A. / COLORADO			
LOCATION	2040' FNL & 600' FEL			
SEC 24	TWP 9S	RGE 56W	Other Services	
Latitude			MPD/MDN	MML
Longitude			MSS	
API Number	05-073-06753			
Permanent Datum GL, Elevation	5380 feet			Elevations: feet
Log Measured From KB, 13.00 feet above Permanent Datum				KB 5393.00
Drilling Measured From KB				DF 5391.00
				GL 5380.00
Date	15-NOV-2018			
Run Number	ONE			
Service Order	4558-229462509			
Depth Driller	8574.00			feet
Depth Logger	8566.00			feet
First Reading	8563.00			feet
Last Reading	456.00			feet
Casing Driller	455.00			feet
Casing Logger	456.00			feet
Bit Size	7.875			inches
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.40 lb/USg		70.00 CP	
PH / Fluid Loss	10.50		6.40 ml/30Min	
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.85 @ 75.0			ohm-m
Rmf @ Measured Temp	0.68 @ 75.0			ohm-m
Rmc @ Measured Temp	1.02 @ 75.0			ohm-m
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.35 @180.0			ohm-m
Time Since Circulation	5 HOURS			
Max Recorded Temp	180.00		deg F	
Equipment / Base	13096	LIB		
Recorded By	ADAM SILL			
Witnessed By	GREGG SMITH			

BOREHOLE RECORD			Last Edited: 15-NOV-2018 20:38	
Bit Size inches	Depth From feet		Depth To feet	
7.875	455.00		8574.00	
CASING RECORD				
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	455.00	24.00

REMARKS
- SOFTWARE ISSUE: WLS 18.03.9344.
- RUN ONE: MCG, MML, MDN, MPD, MFE, MSS, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 0.5 INCH STANDOFF USED ON MFE. TWO 0.5 INCH STANDOFFS USED ON MSS. 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: 4041 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 4200 FEET: 913 CU.FT.

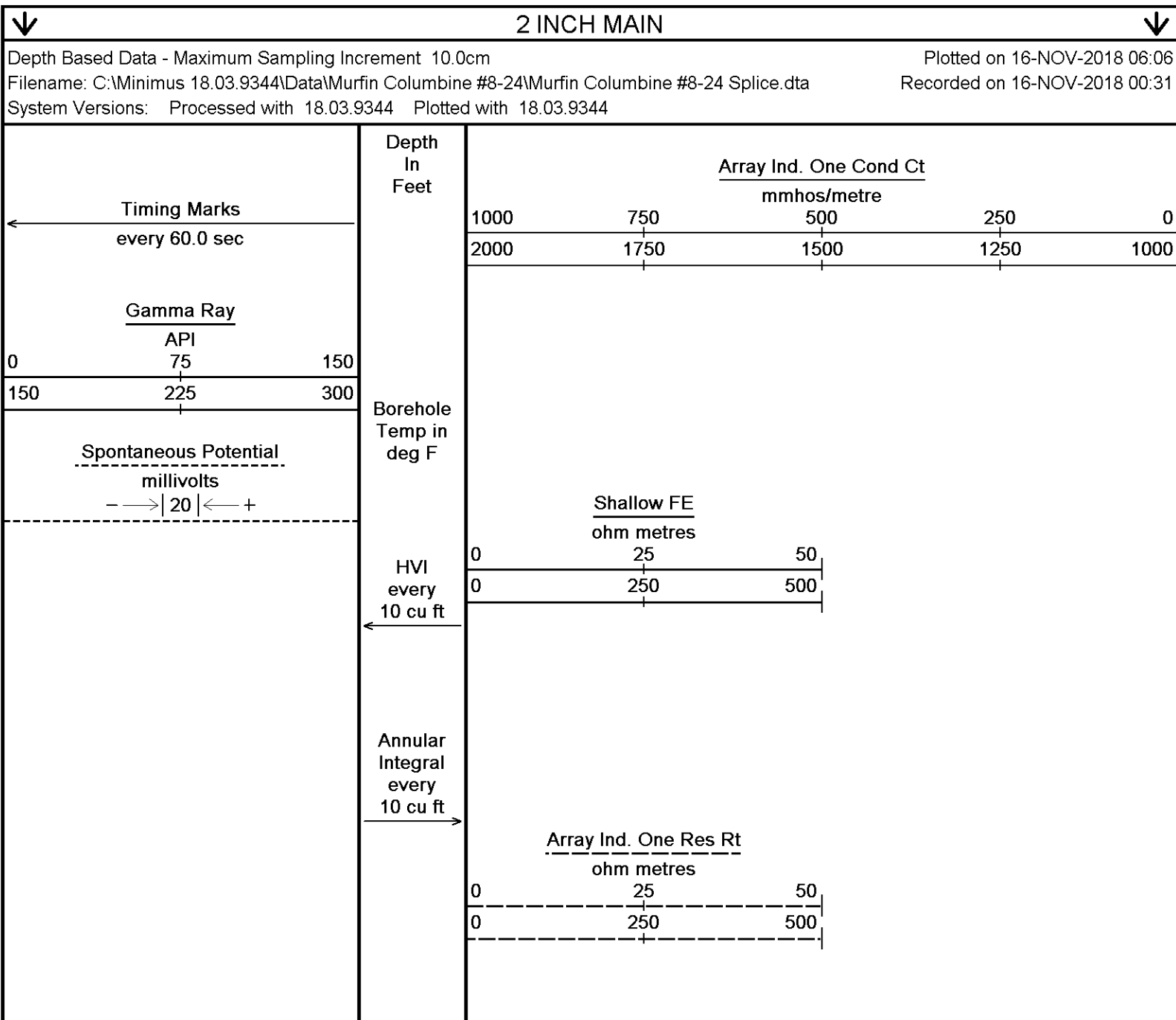
- RIG: MURFIN #25.

- ENGINEER: A. SILL.

- OPERATOR: B. TOVAR, B. COPELAND.

**** CALIPERS WERE CLOSED BETWEEN 5725 FEET AND 5900 FEET AS PER CUSTOMER'S REQUEST, DUE TO HOLE CONDITIONS THROUGH THAT INTERVAL. TOOL READINGS MAY NOT BE ACCURATE THROUGH THIS INTERVAL. ****

In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.



DST Uphole Tension
pounds
5000 0

Replay
Scale
1:600

Casing
450
C.C.

DST Uphole Tension

500

4000

2700

90°

600

3900

93°

700

2600

3800

96°

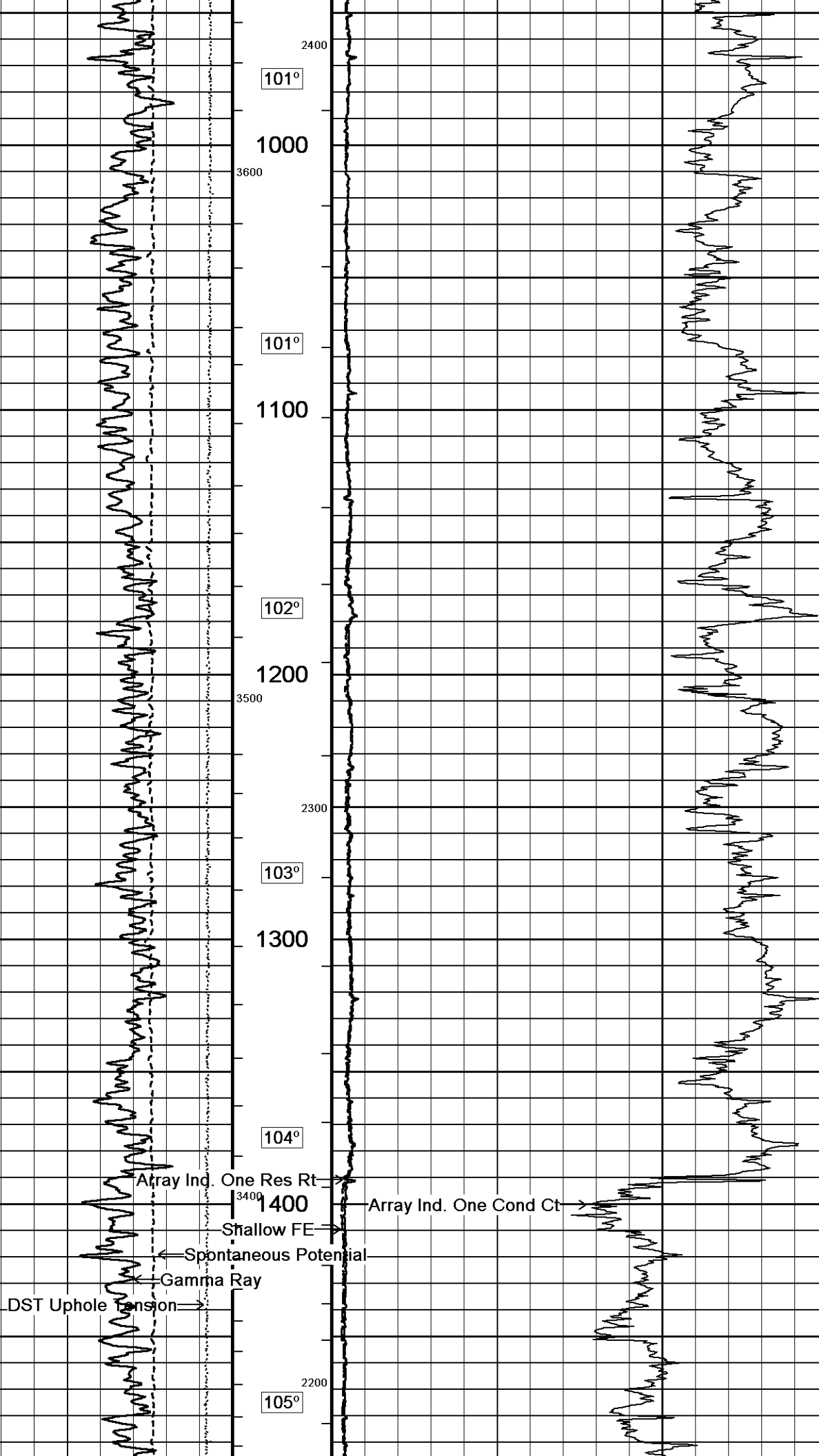
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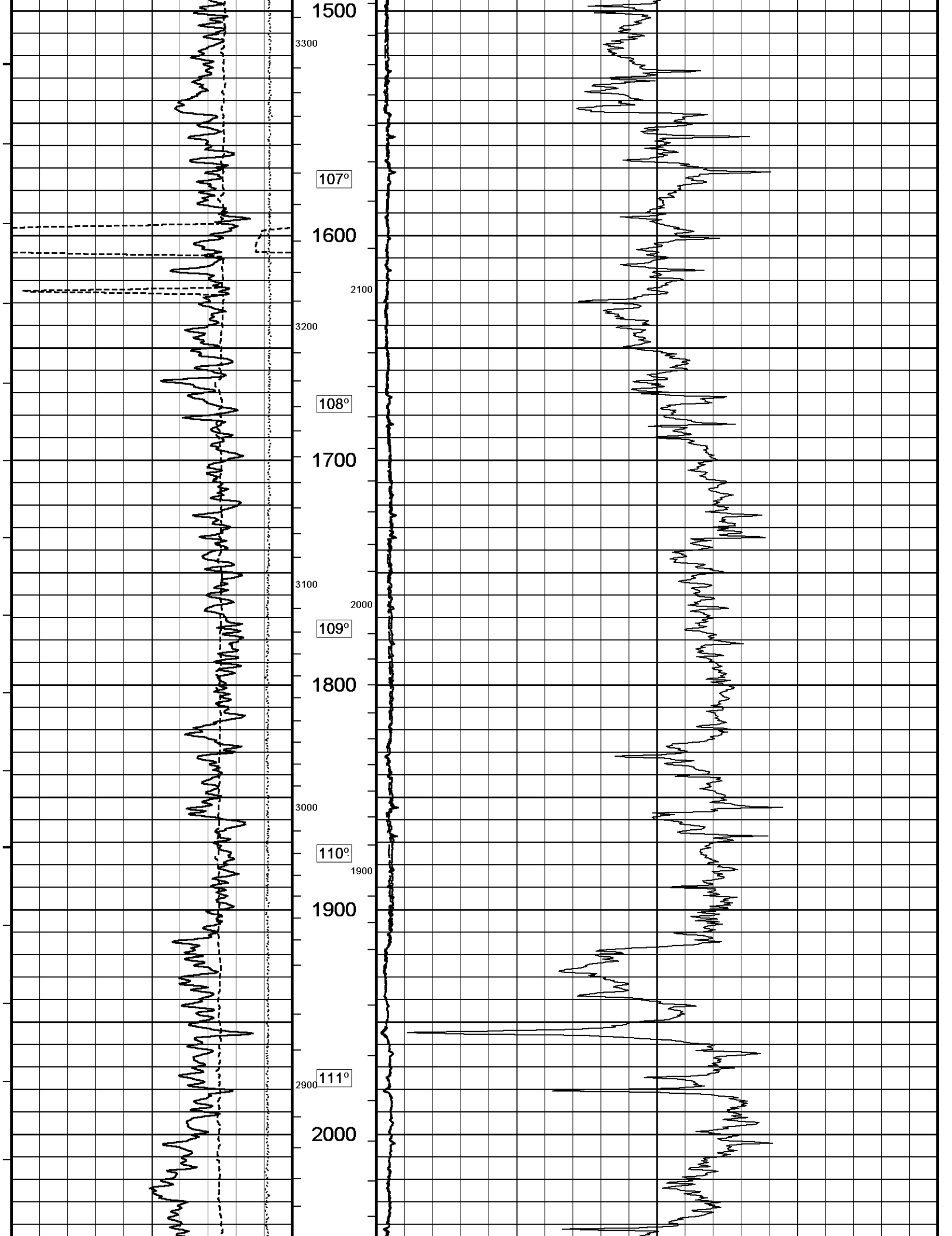
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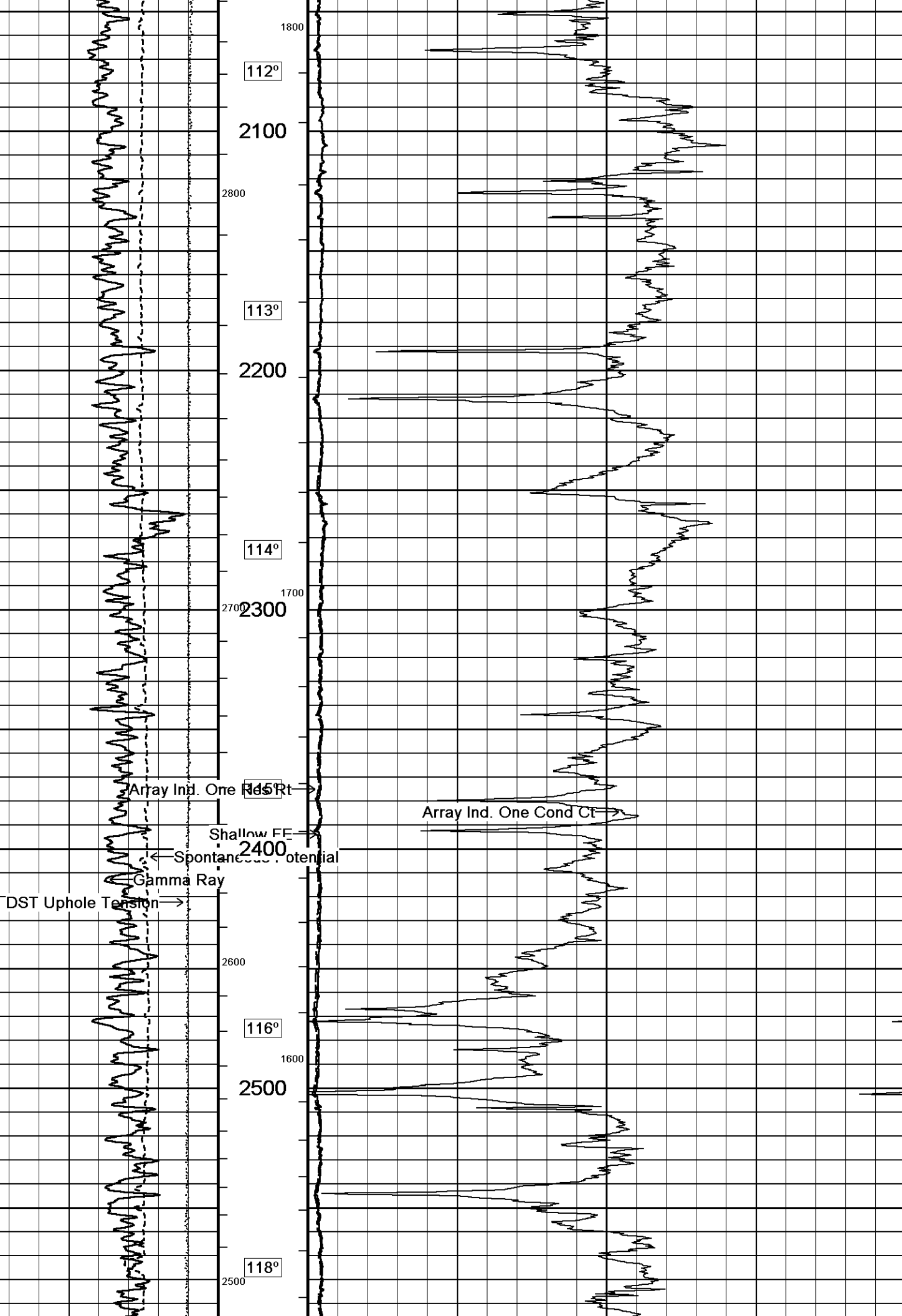
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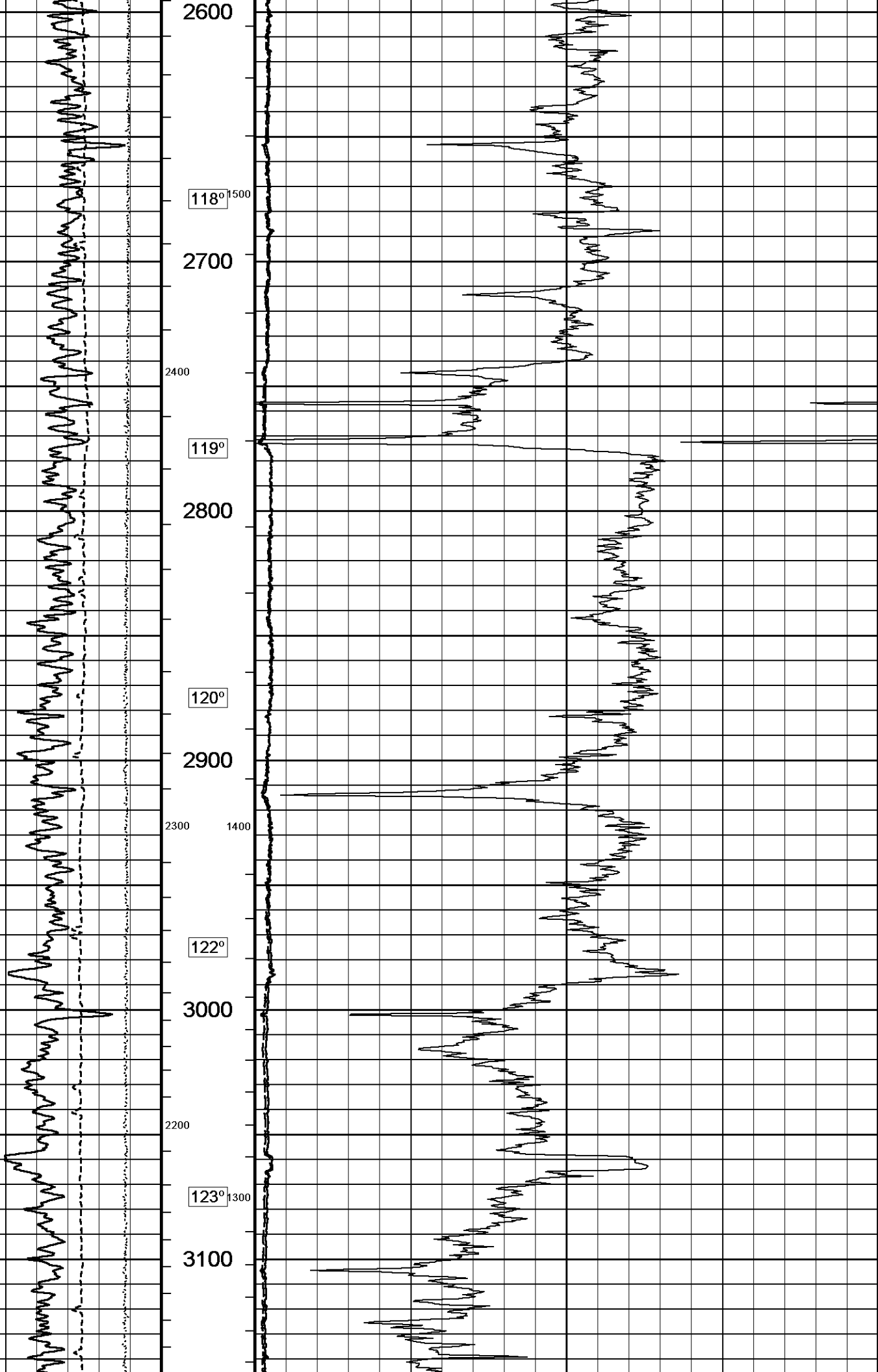
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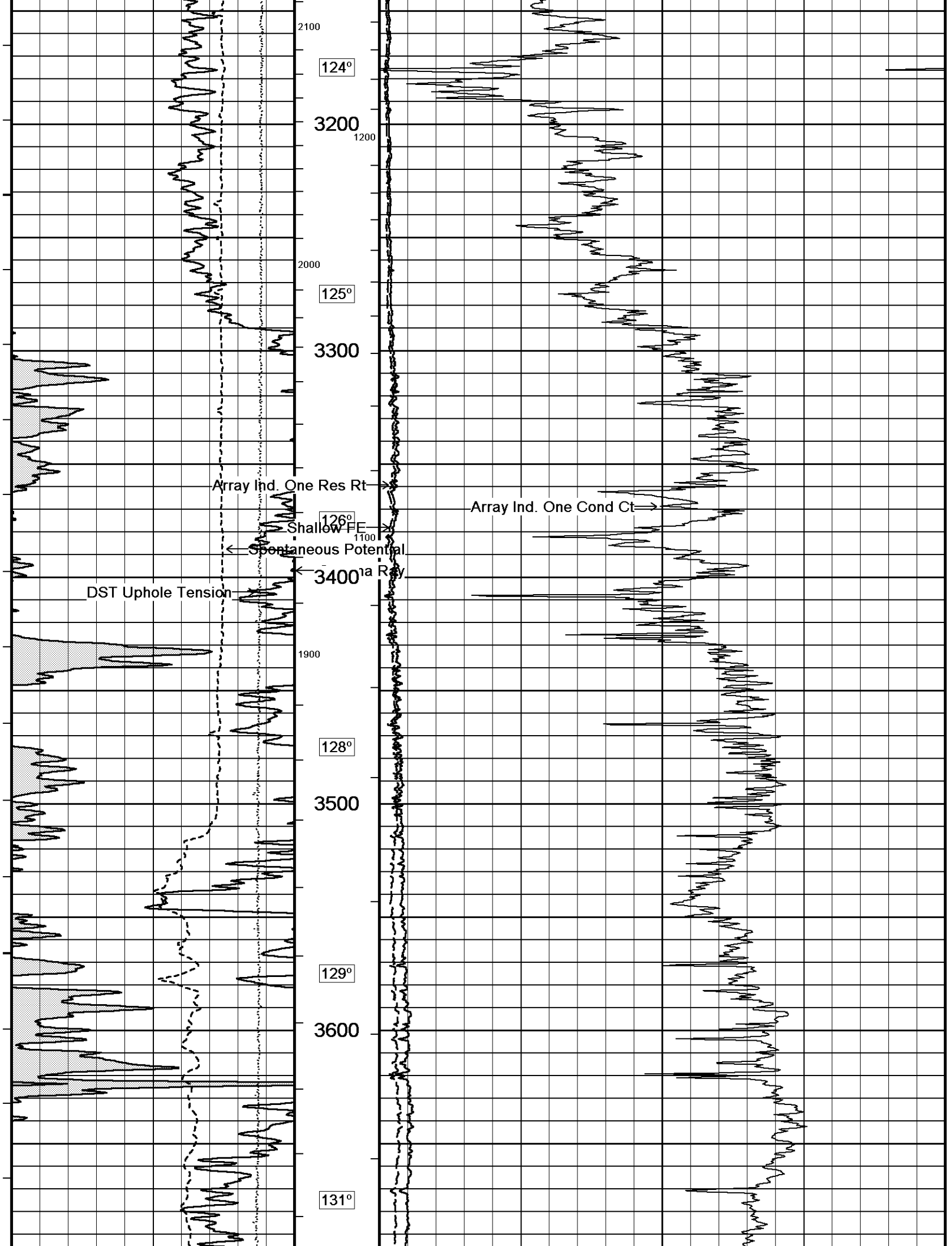
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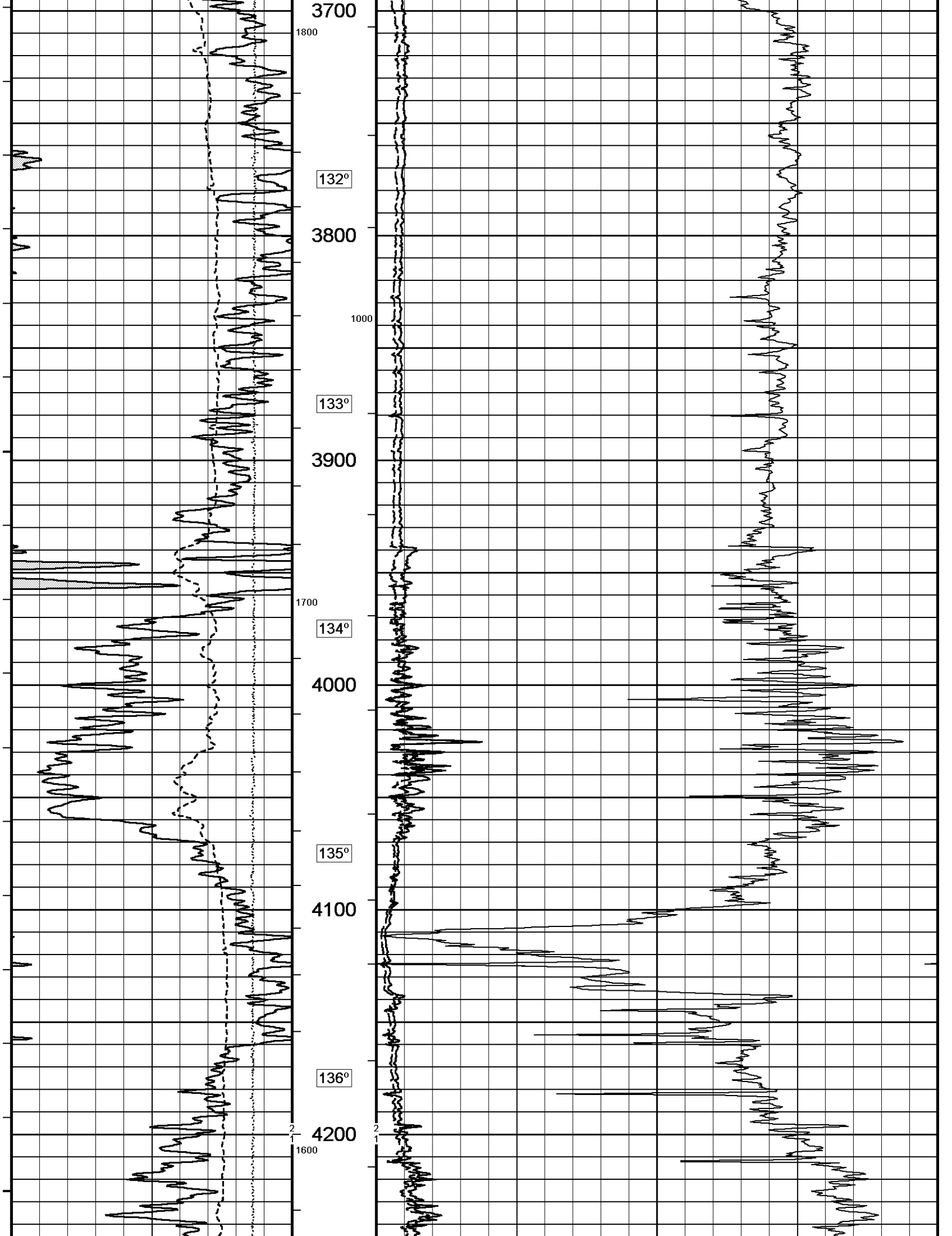


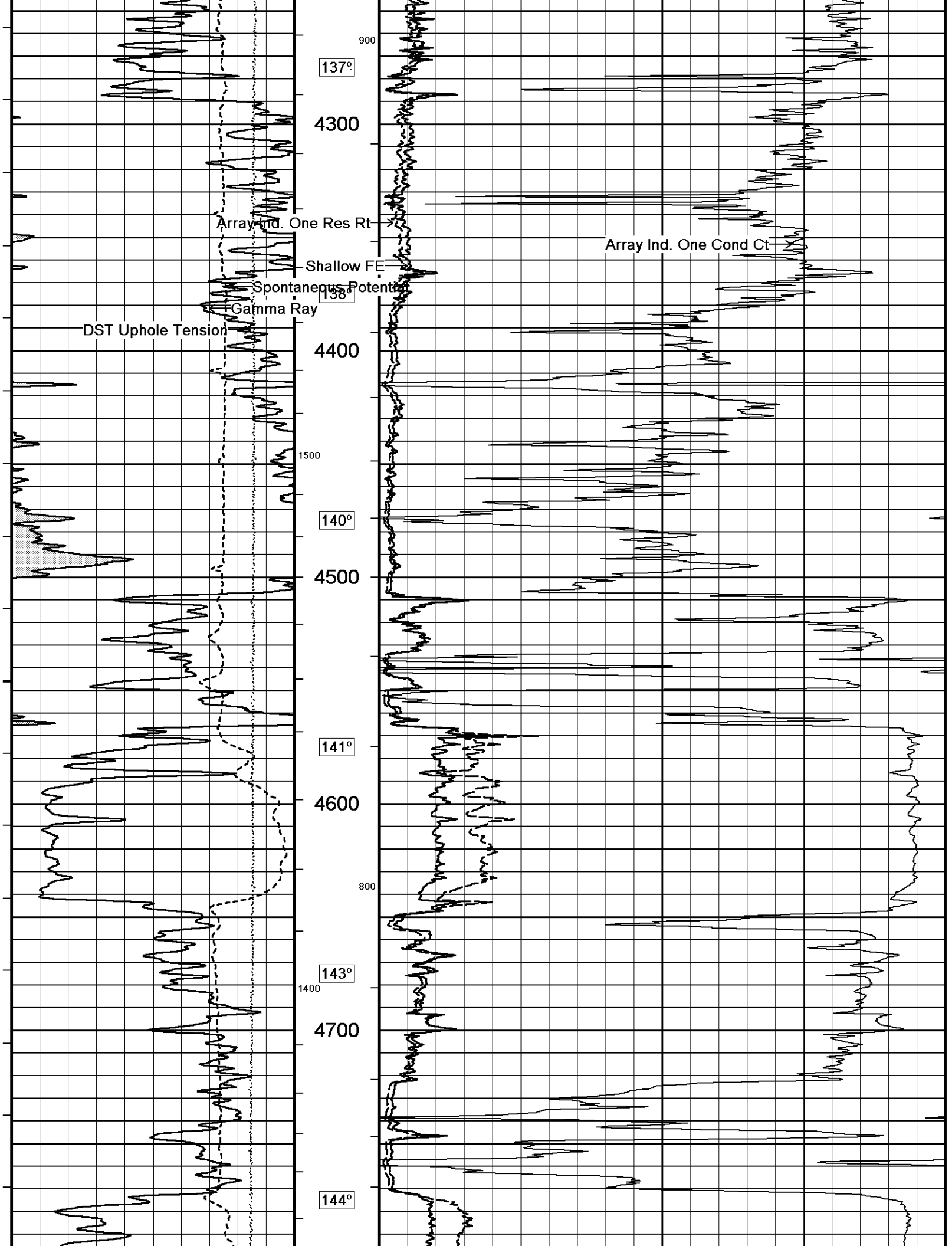


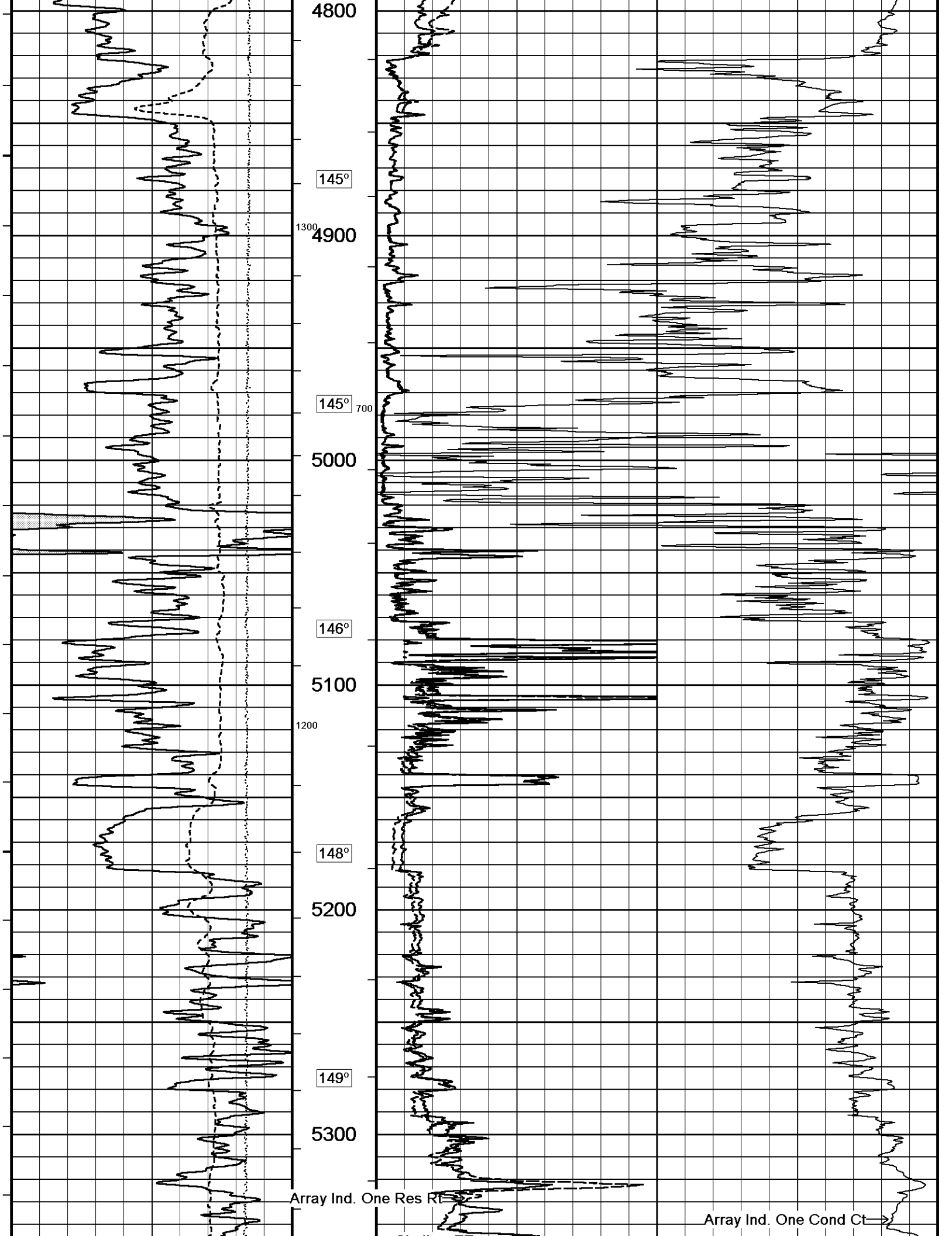


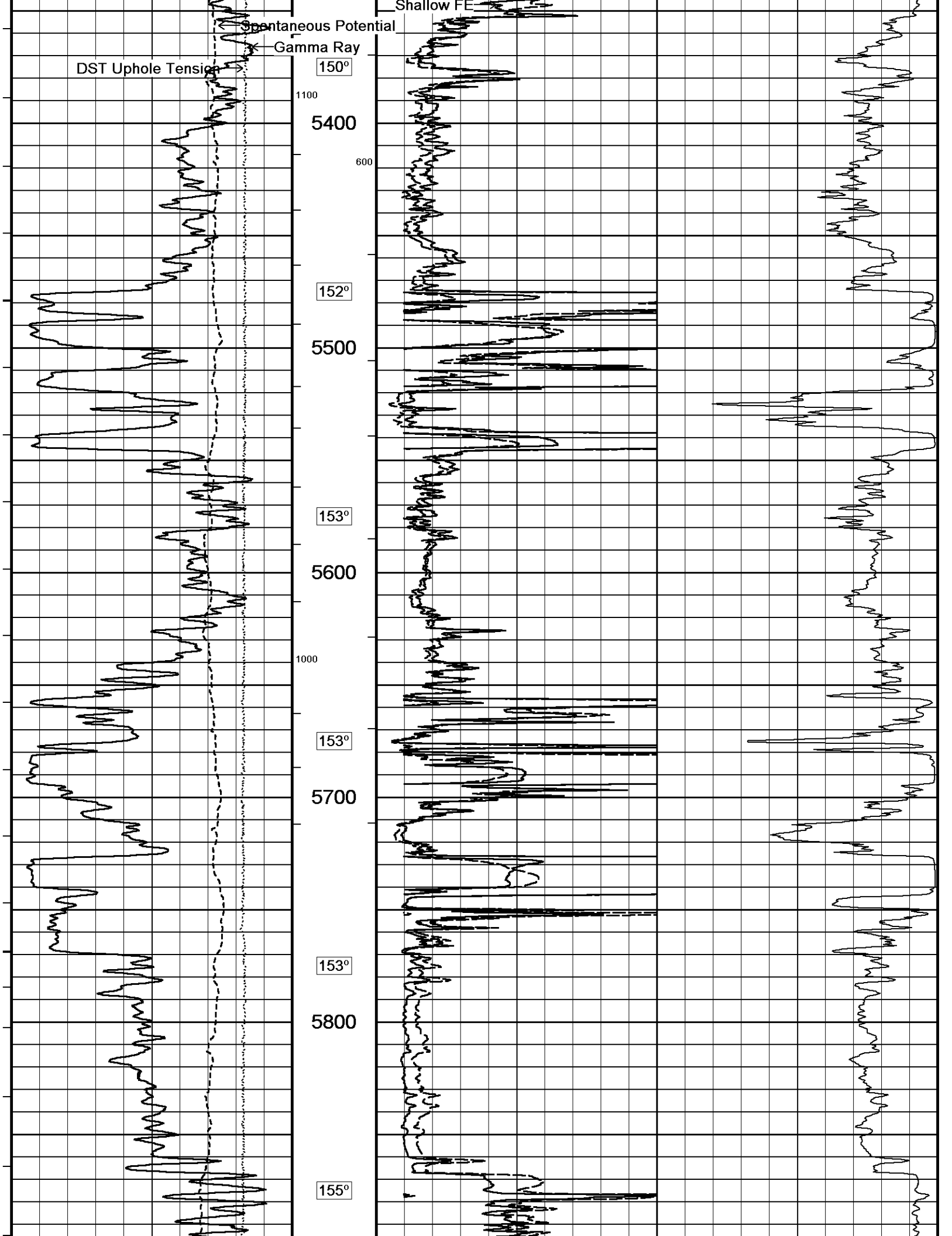


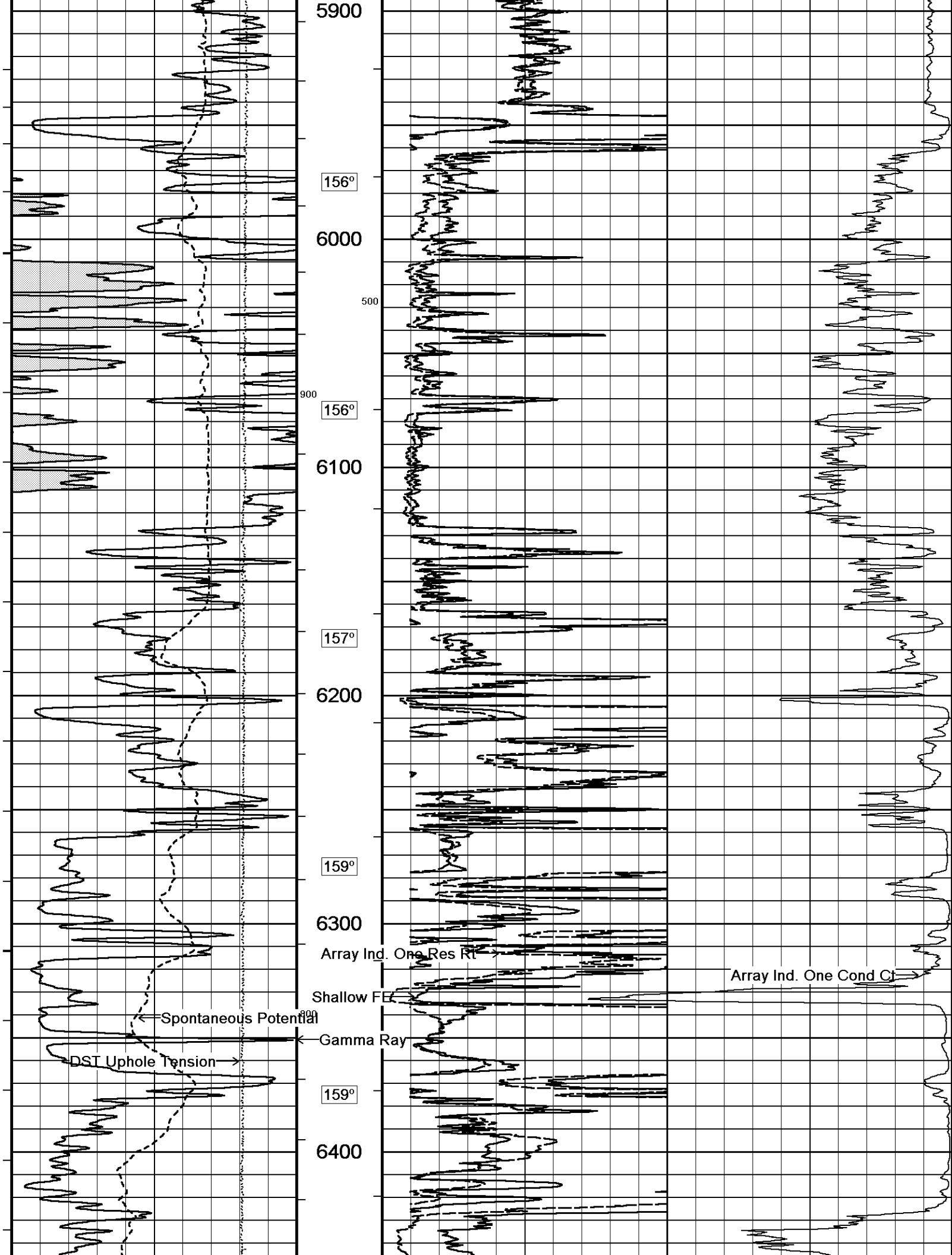


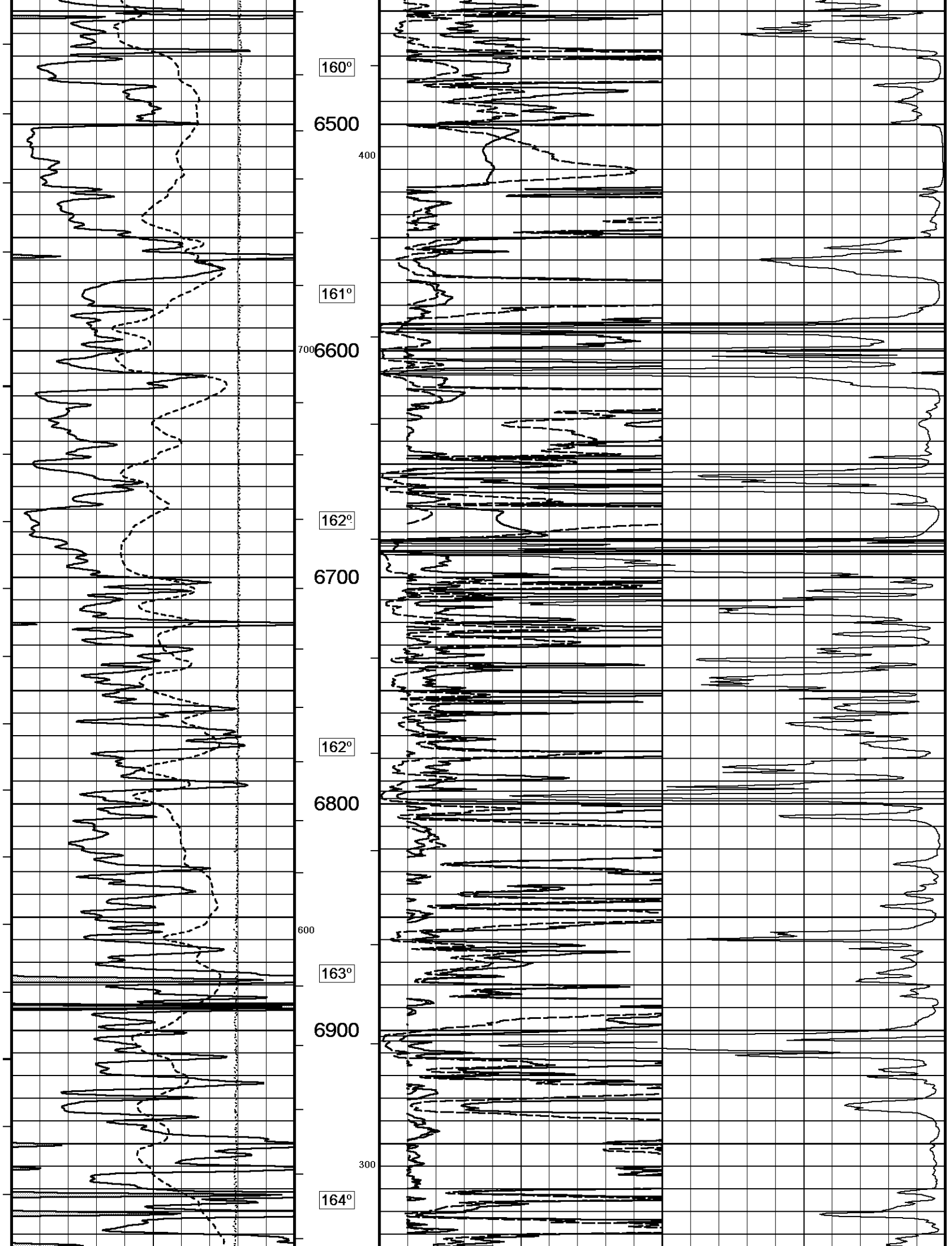


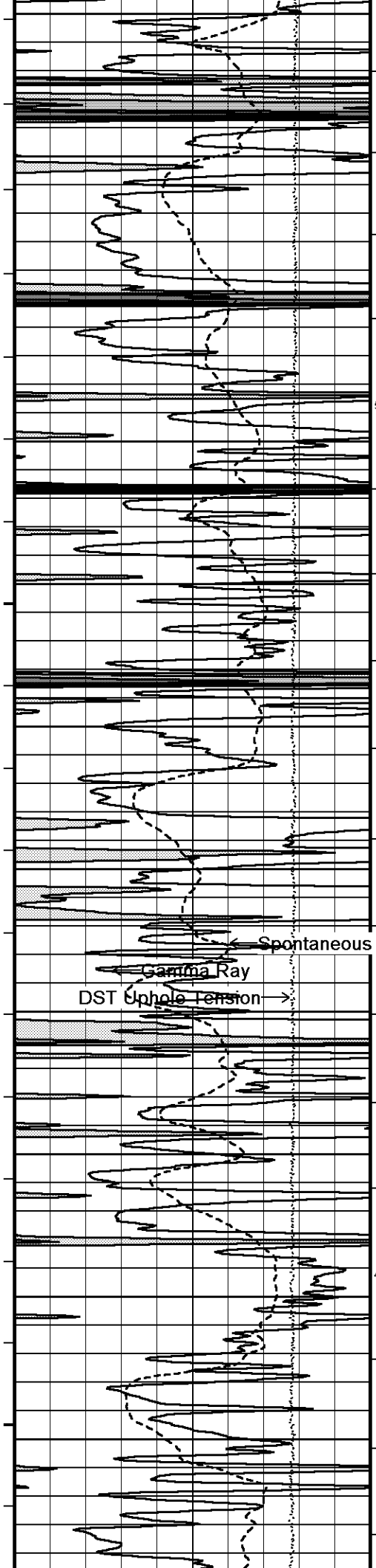




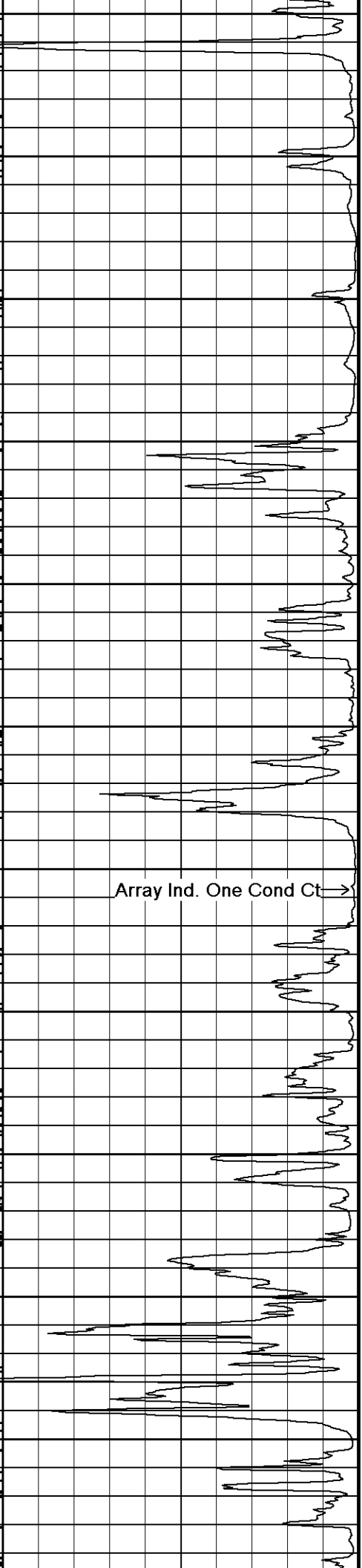
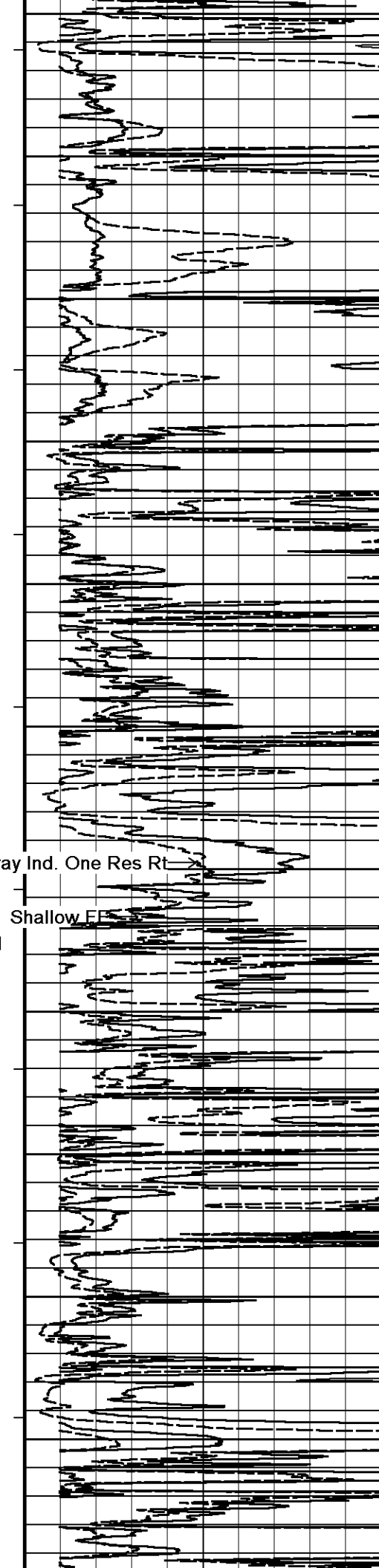








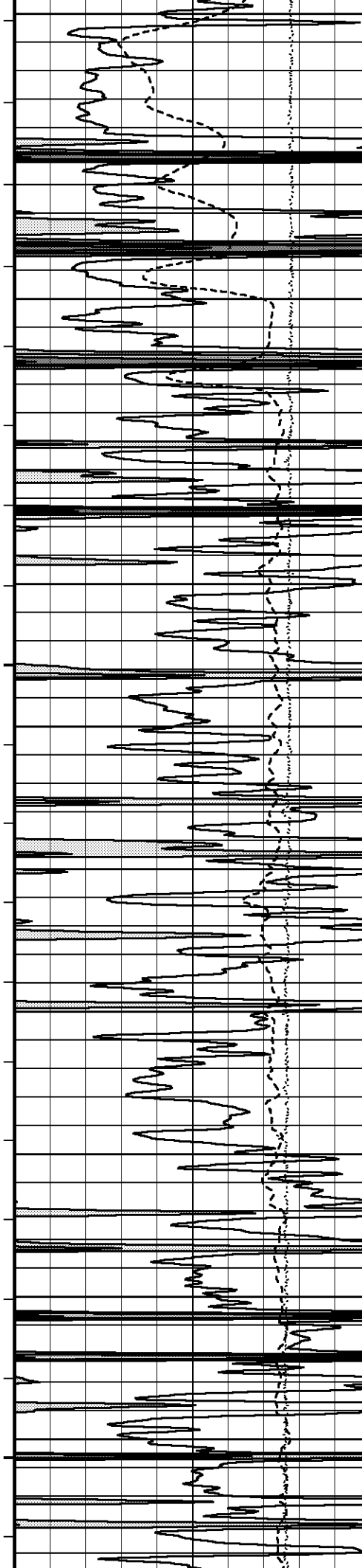
7000
165°
7100
500
166°
7200
168°
7300
168°
7400
400
170°
7500



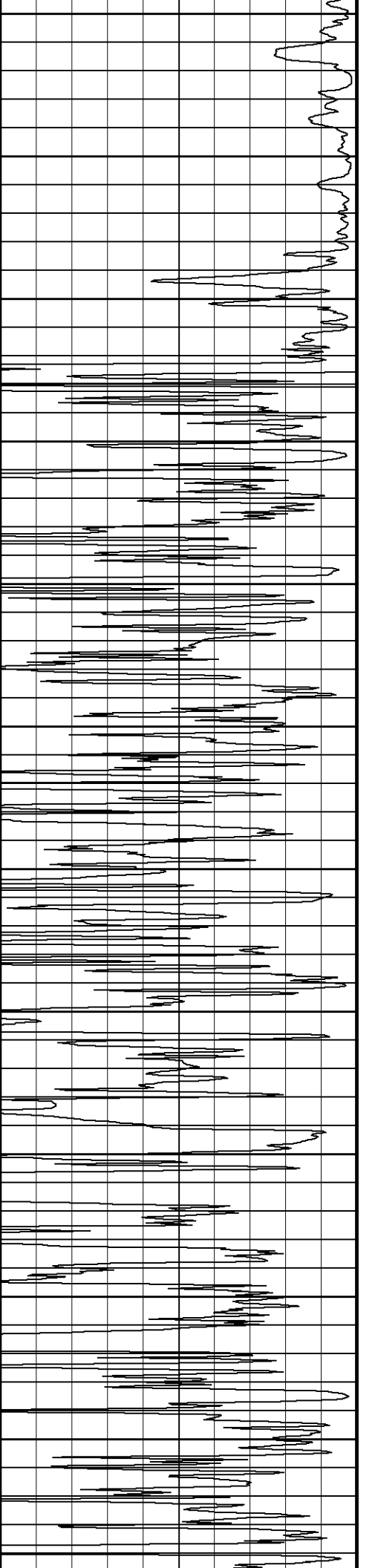
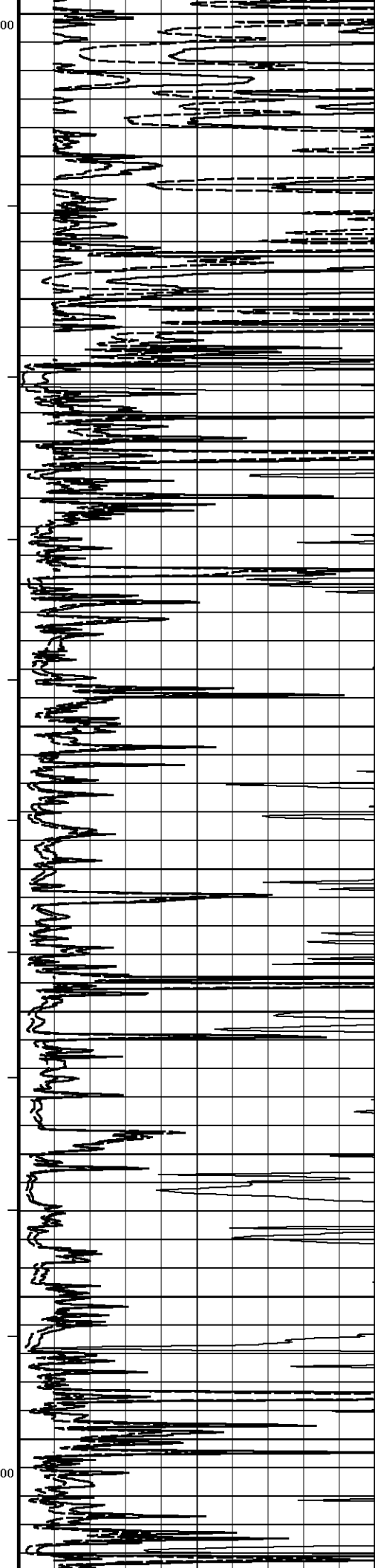
Spontaneous Potential
Gamma Ray
DST Up-hole Tension

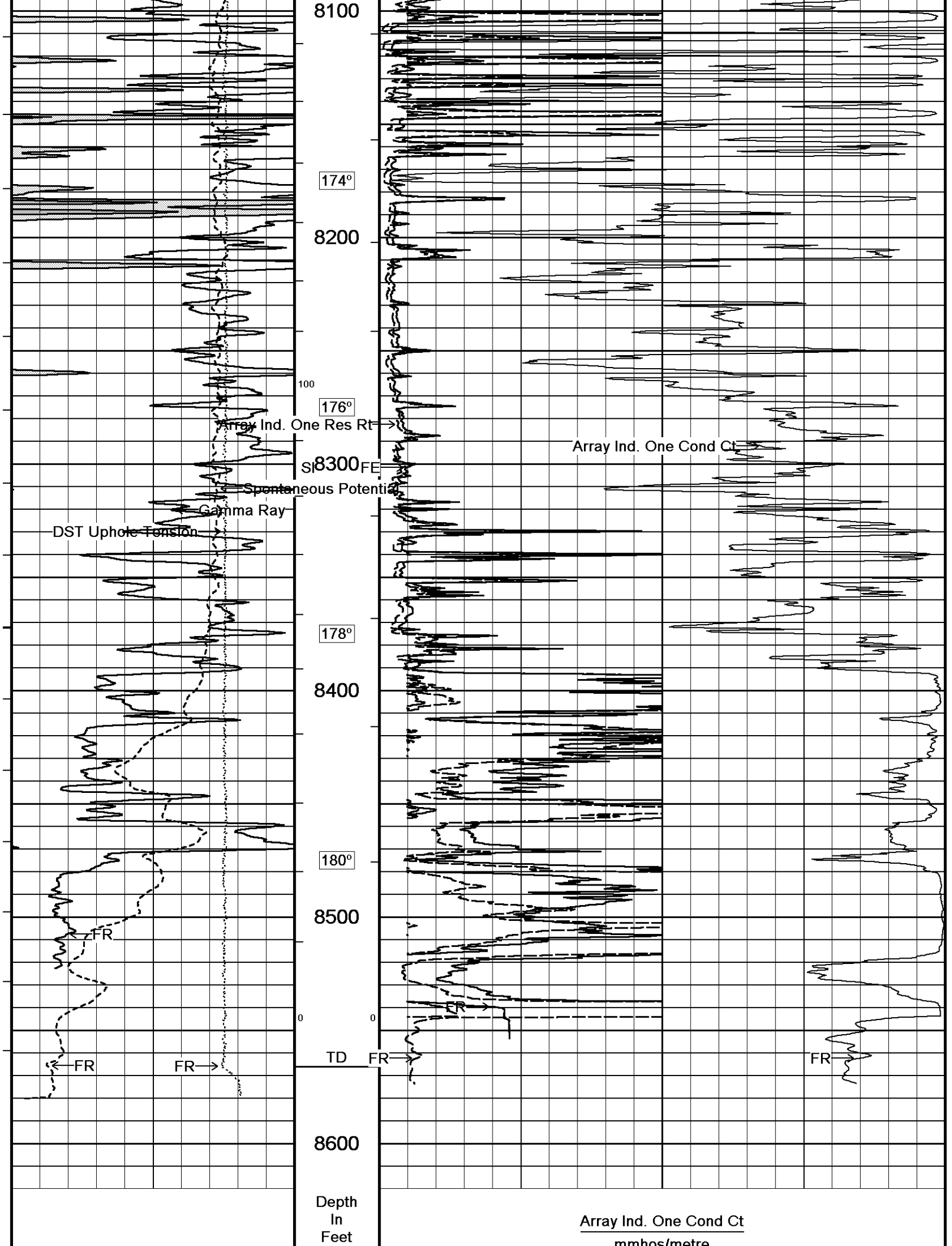
Array Ind. One Res Rt
Shallow FF

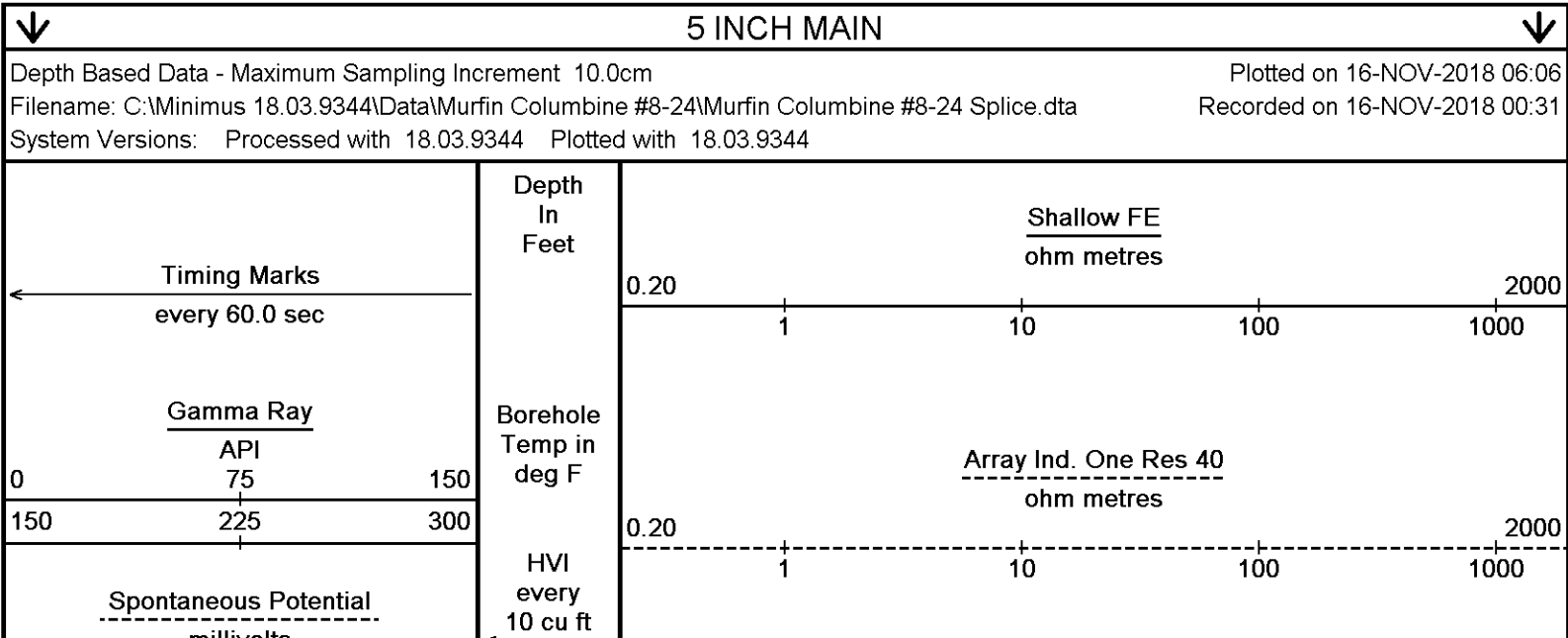
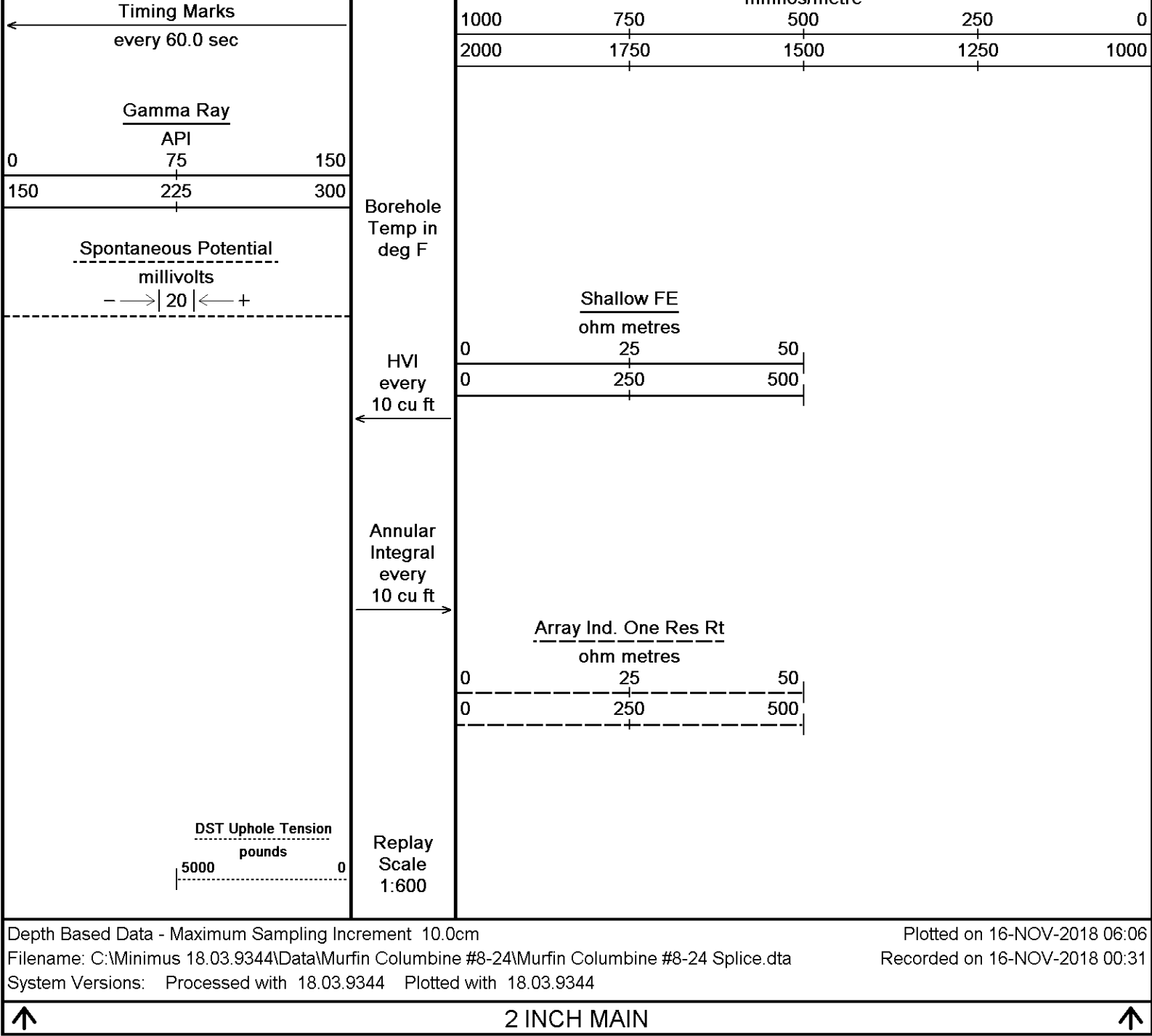
Array Ind. One Cond Ct



171°
7600
172°
7700
172°
7800
173°
7900
173°
8000
173°







millivolts

—→| 20 |←+

Annular
Integral
every
10 cu ft

Array Ind. One Res 60
ohm metres

0.20 1 10 100 1000 2000

Array Ind. One Res Rt
ohm metres

0.20 1 10 100 1000 2000

DST Uphole Tension
pounds

5000 0

Replay
Scale
1:240

450
Casing
Shoe

88°

500

89°

550 2700

90°

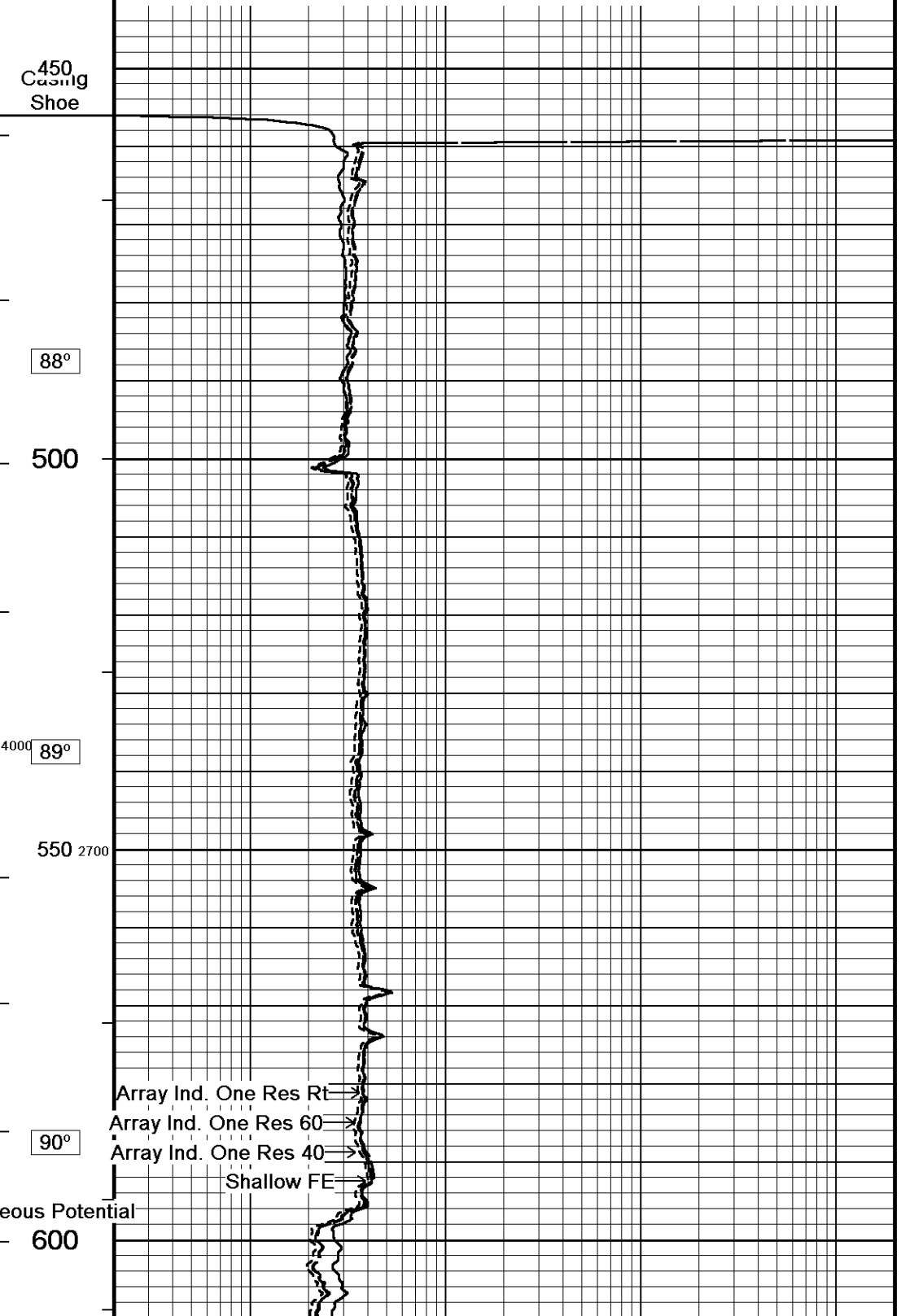
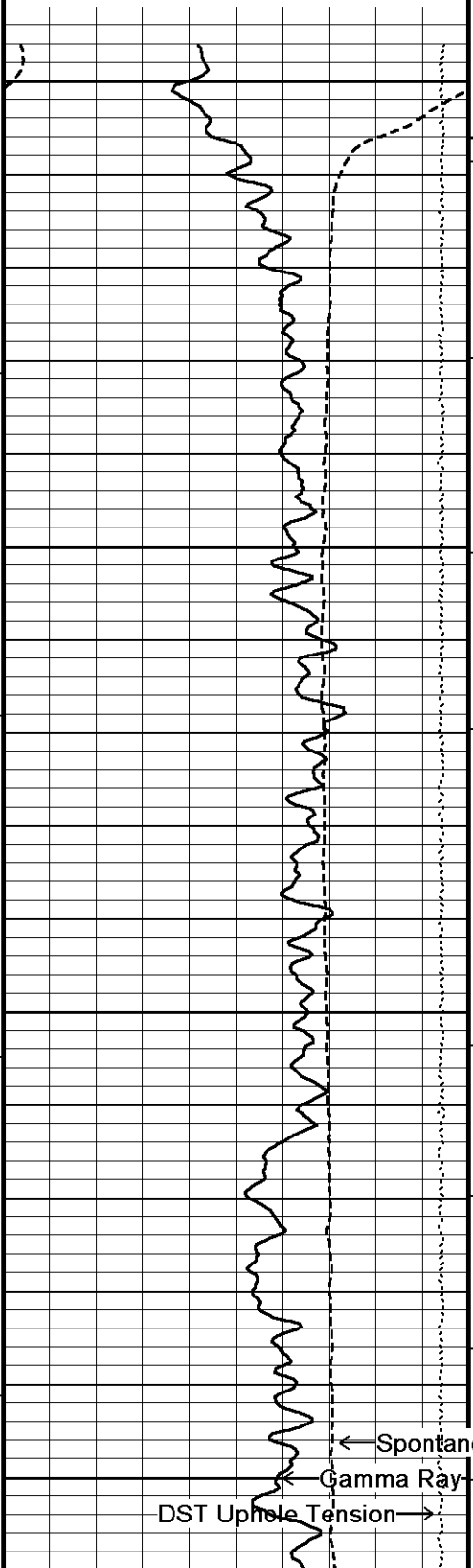
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

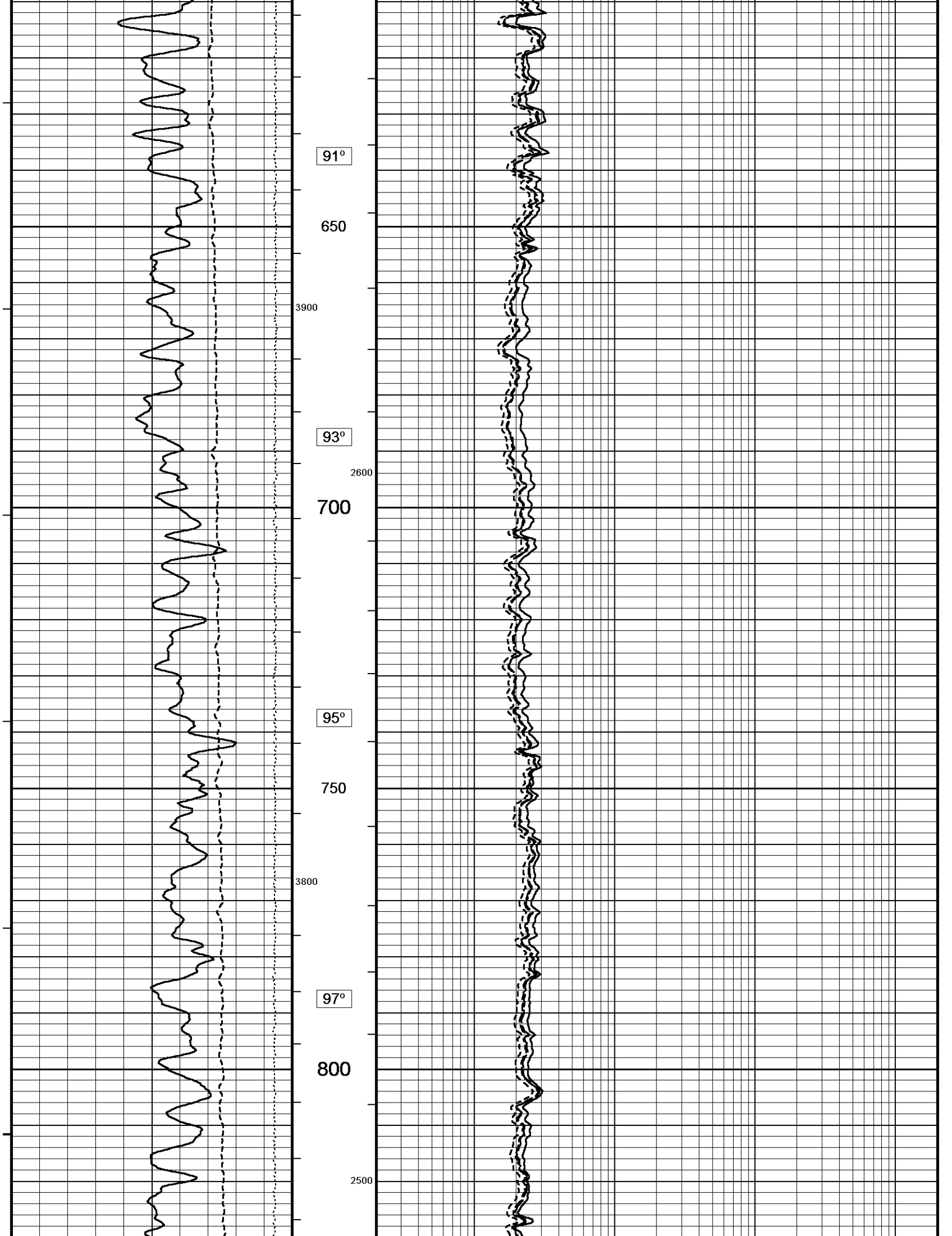
← Spontaneous Potential

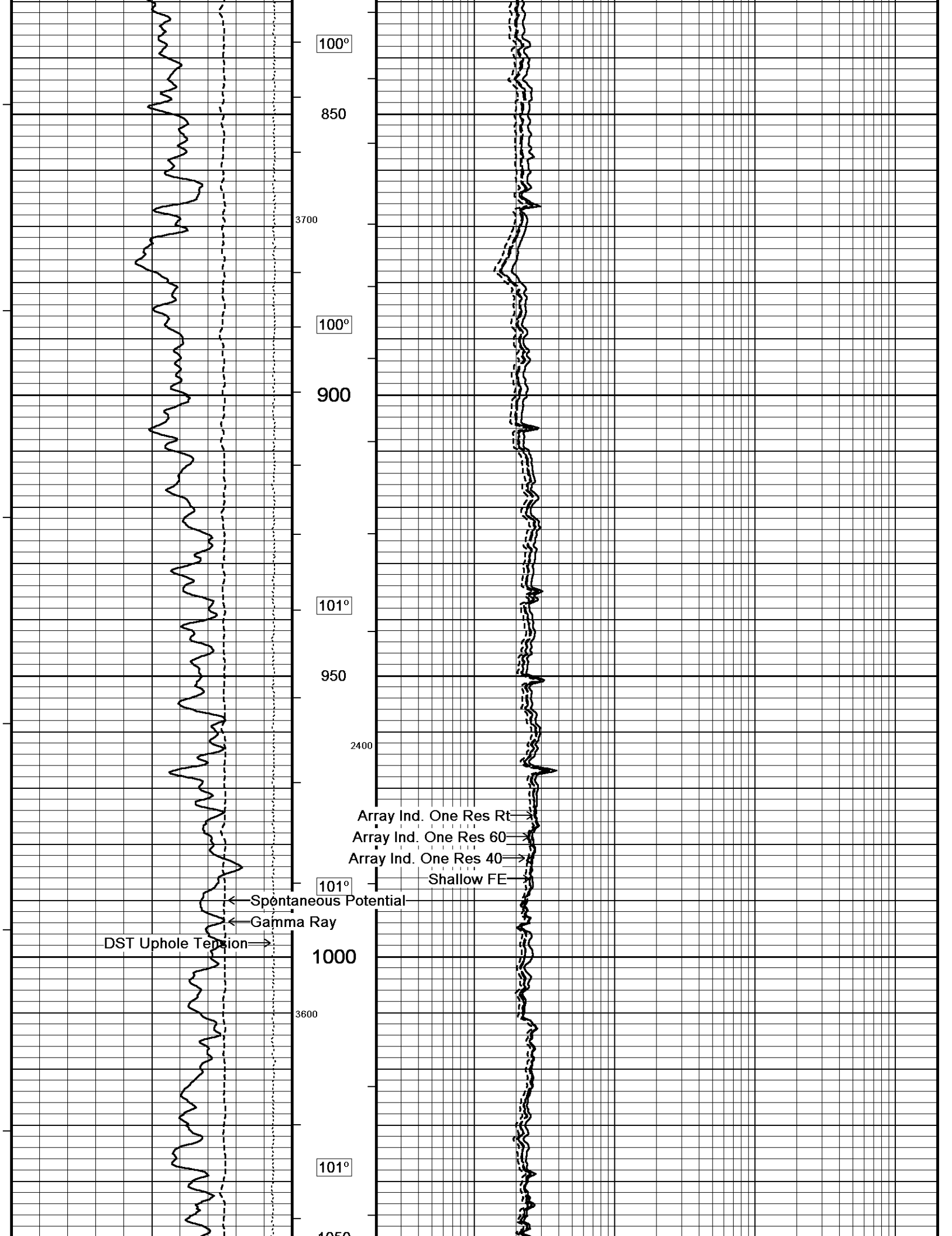
← Gamma Ray

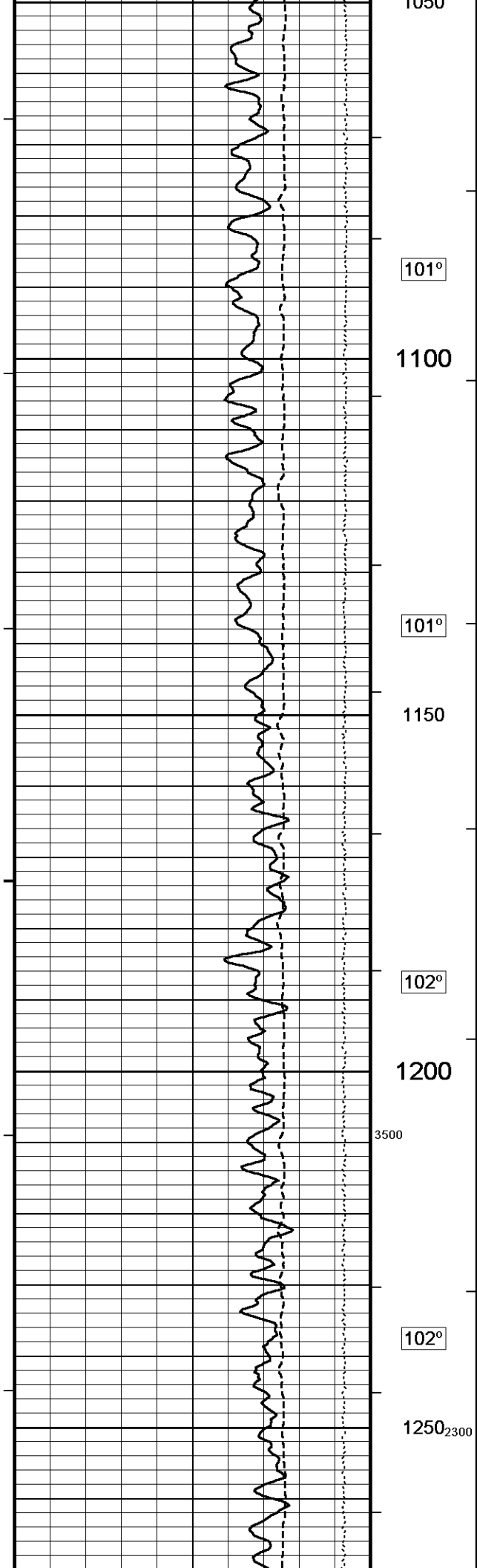
DST Uphole Tension →

600









101°

1100

101°

1150

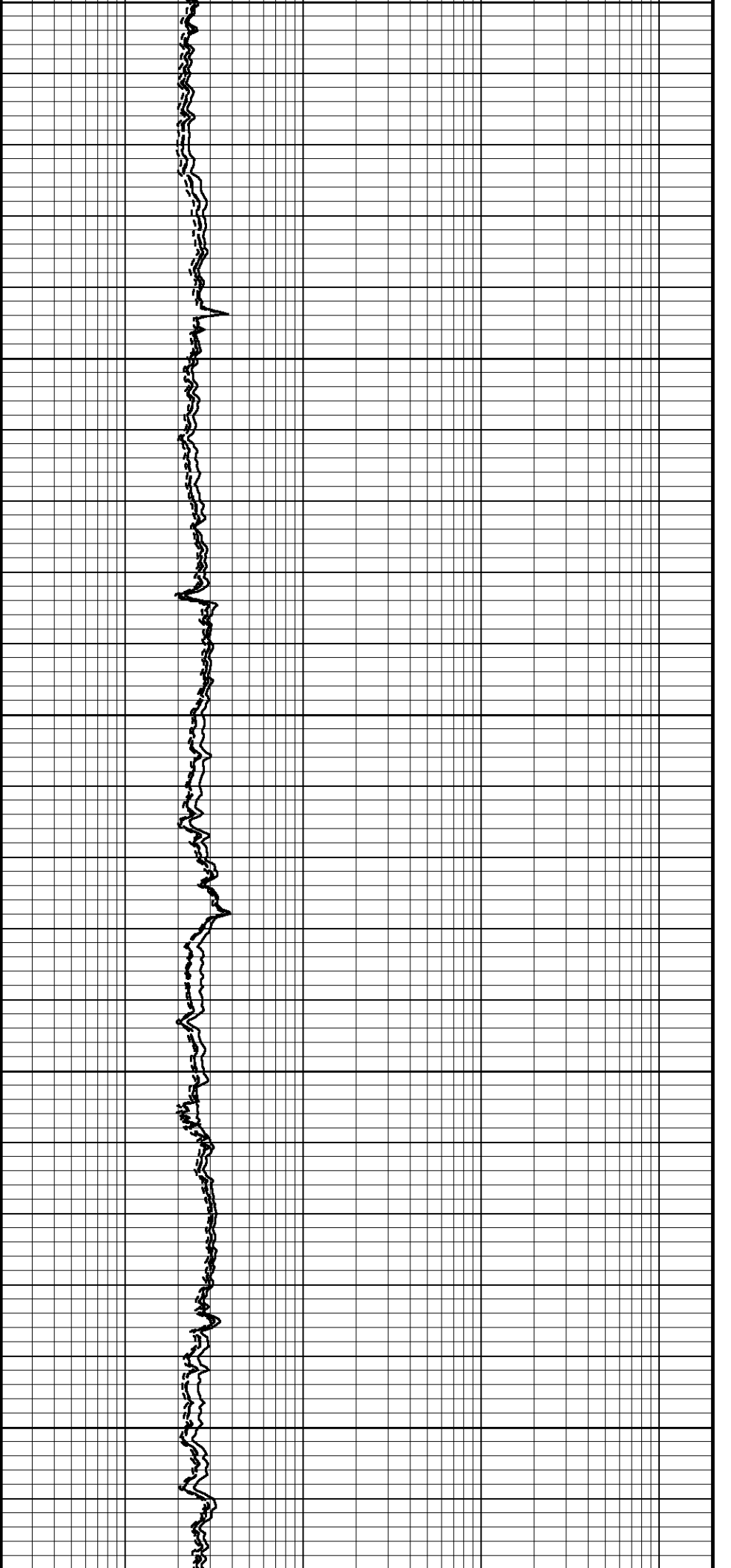
102°

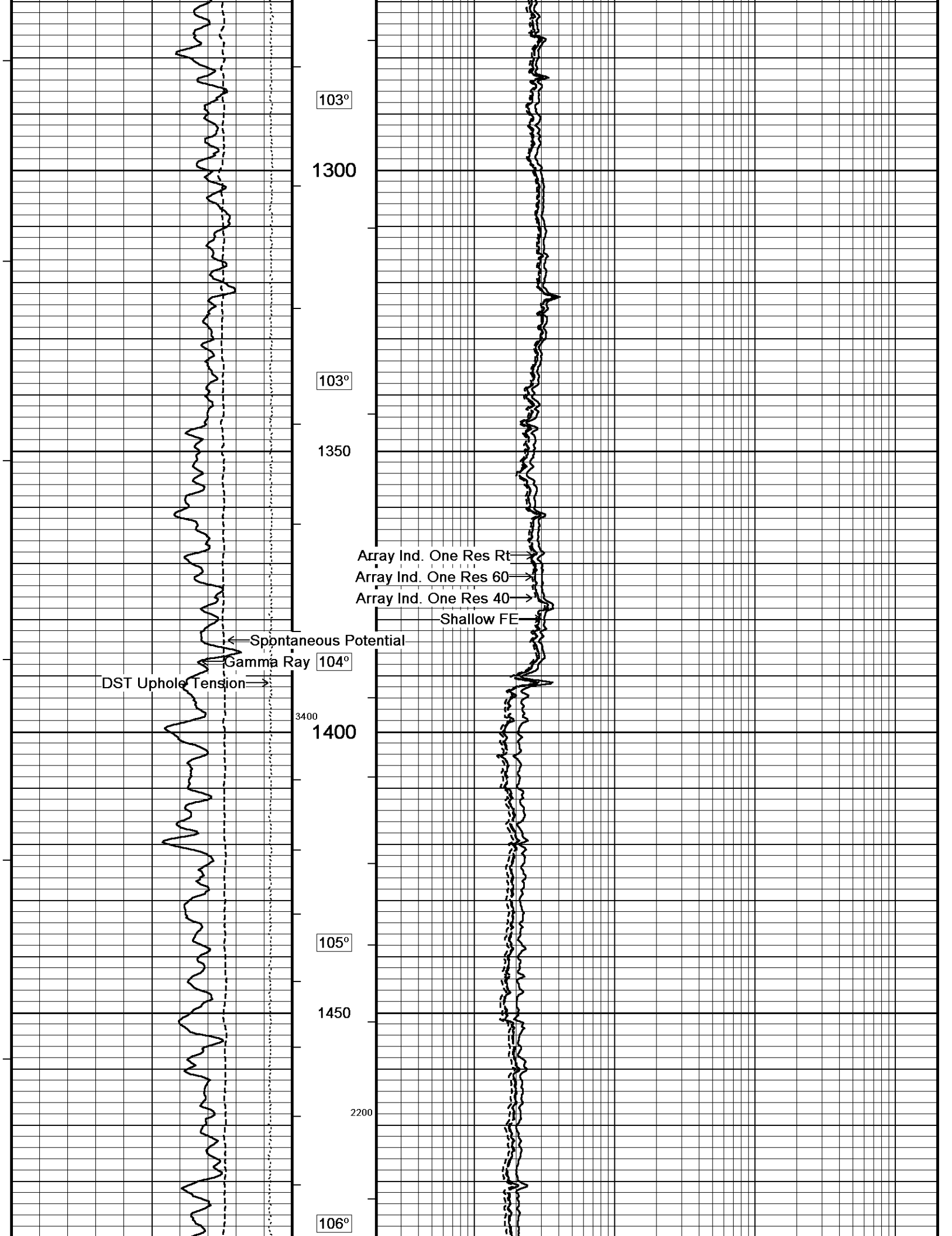
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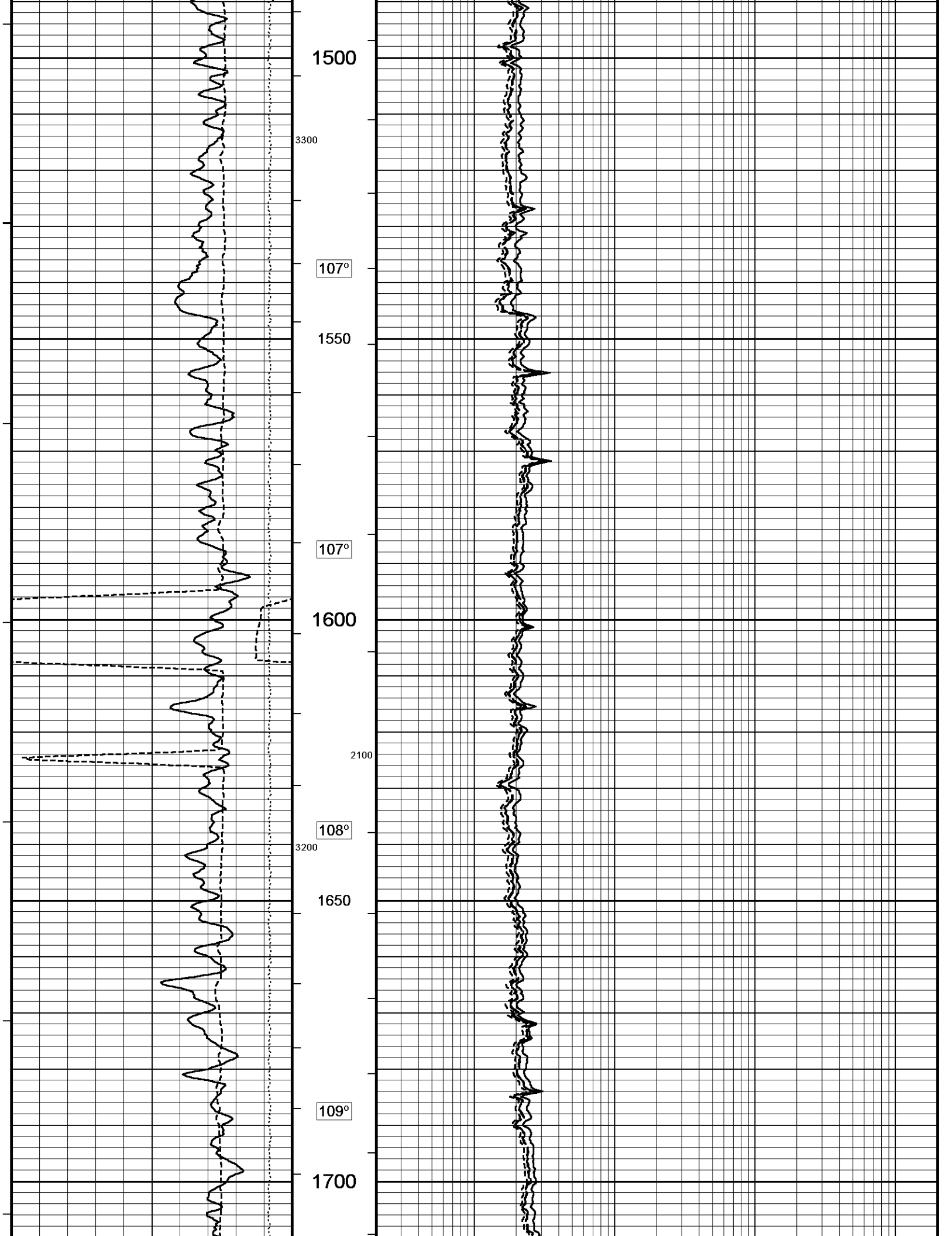
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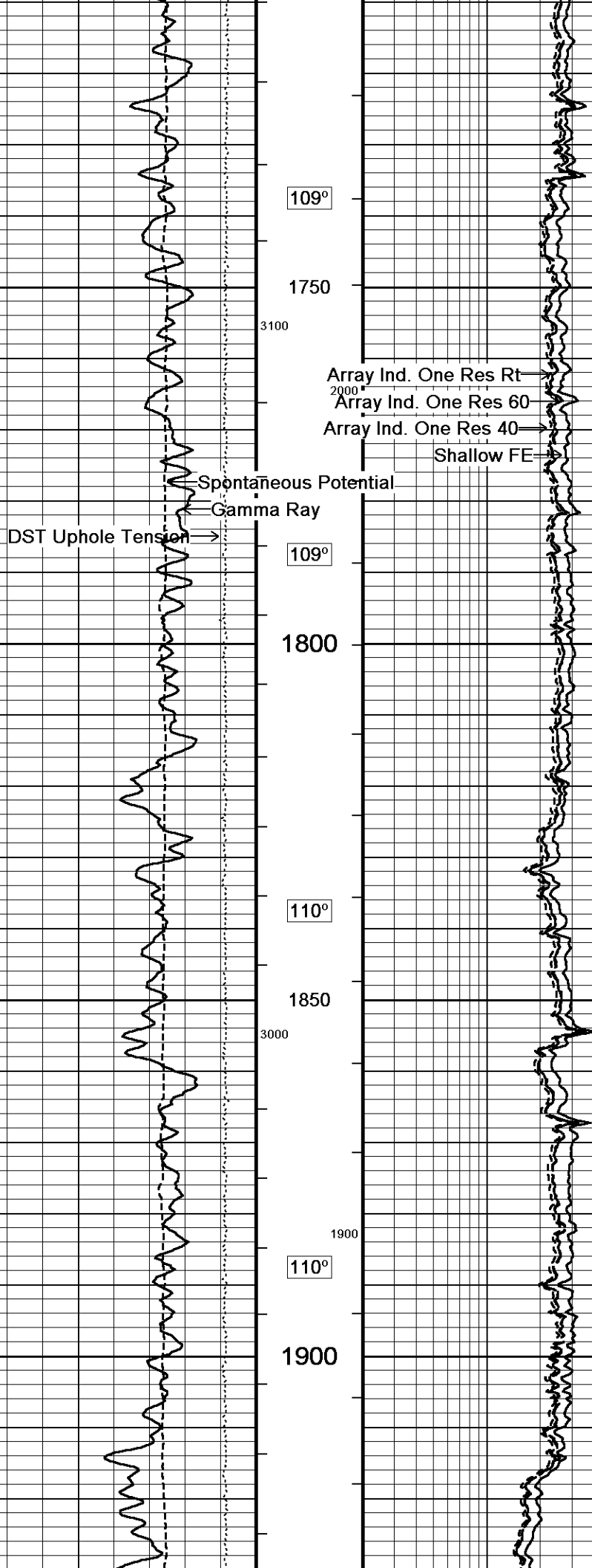
102°

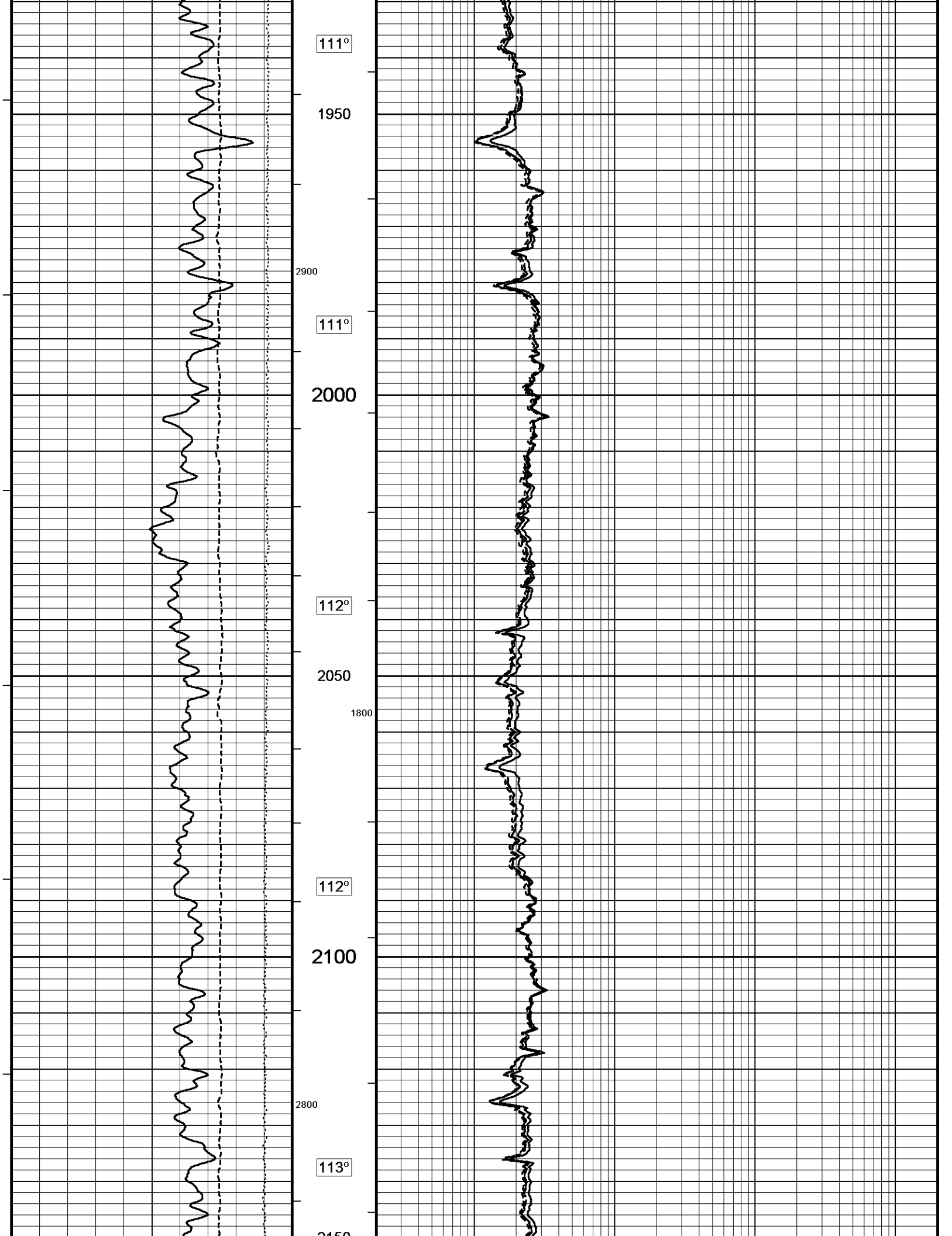
1250₂₃₀₀

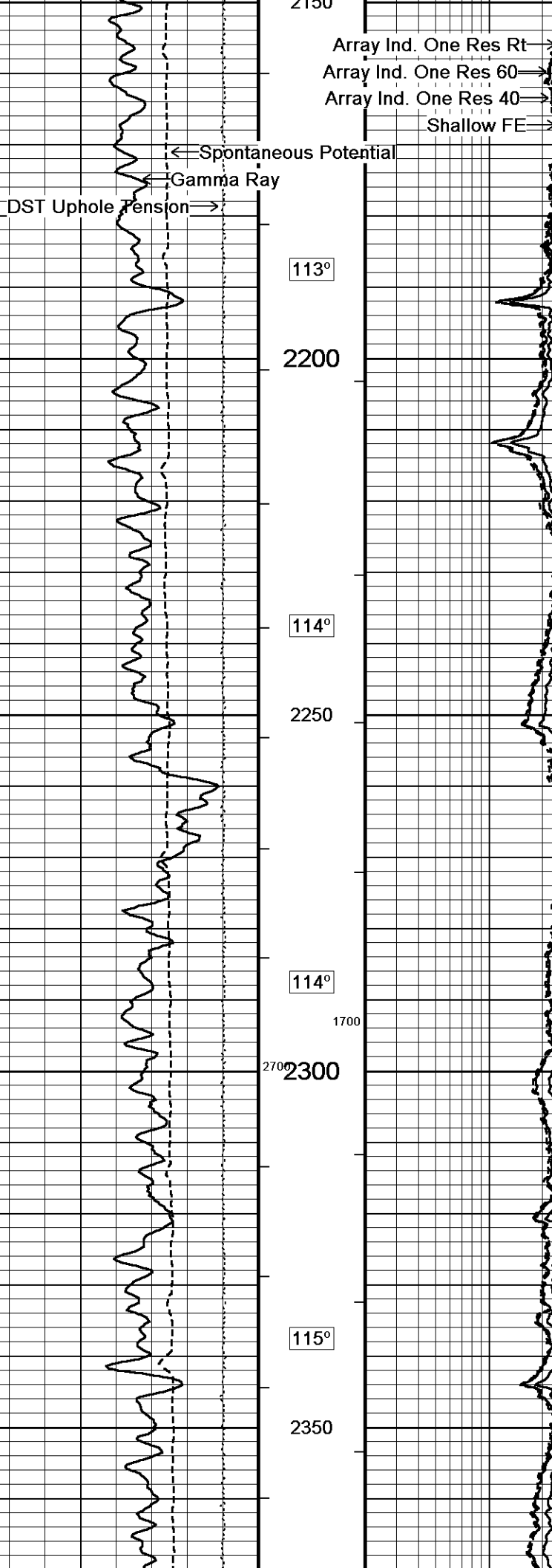


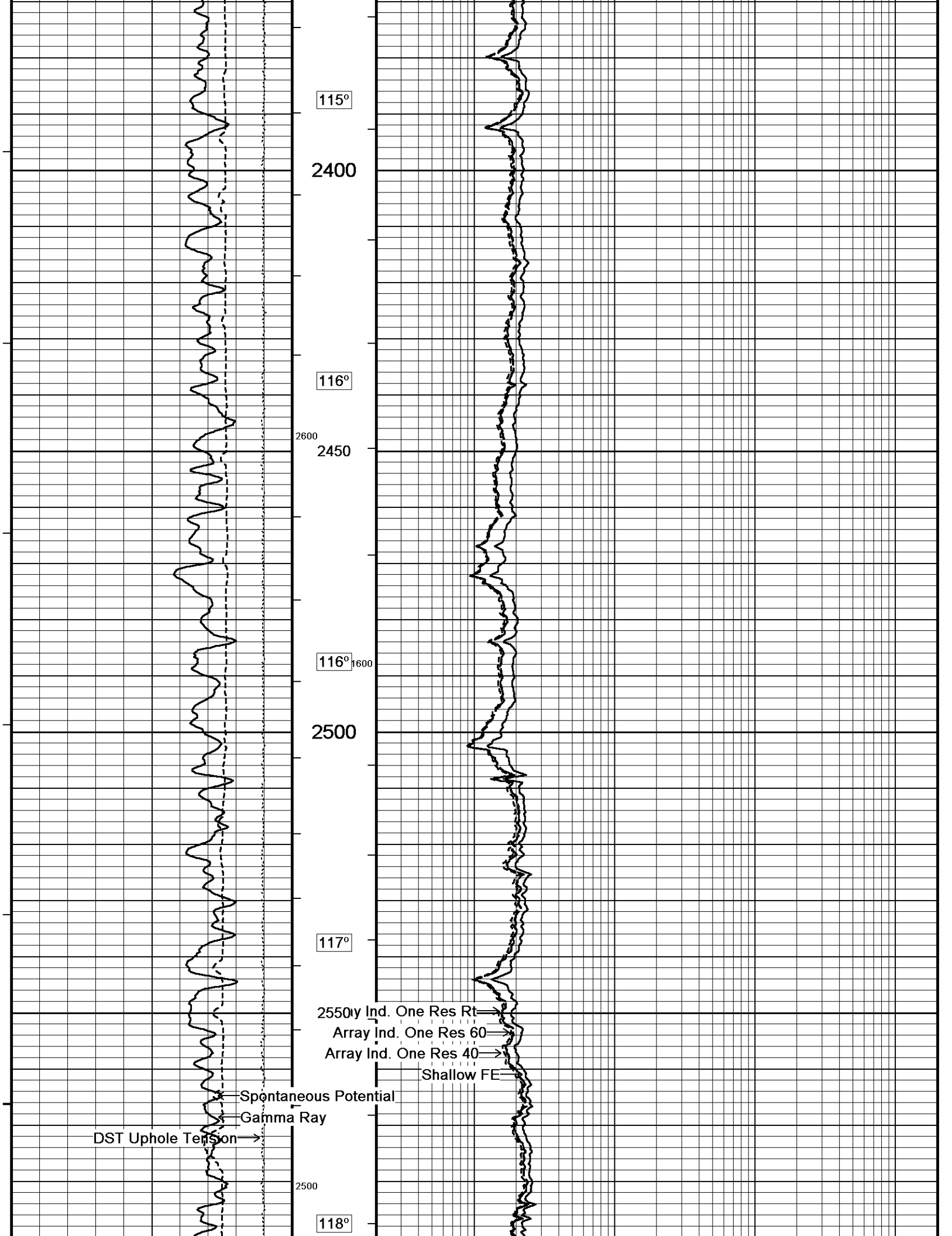


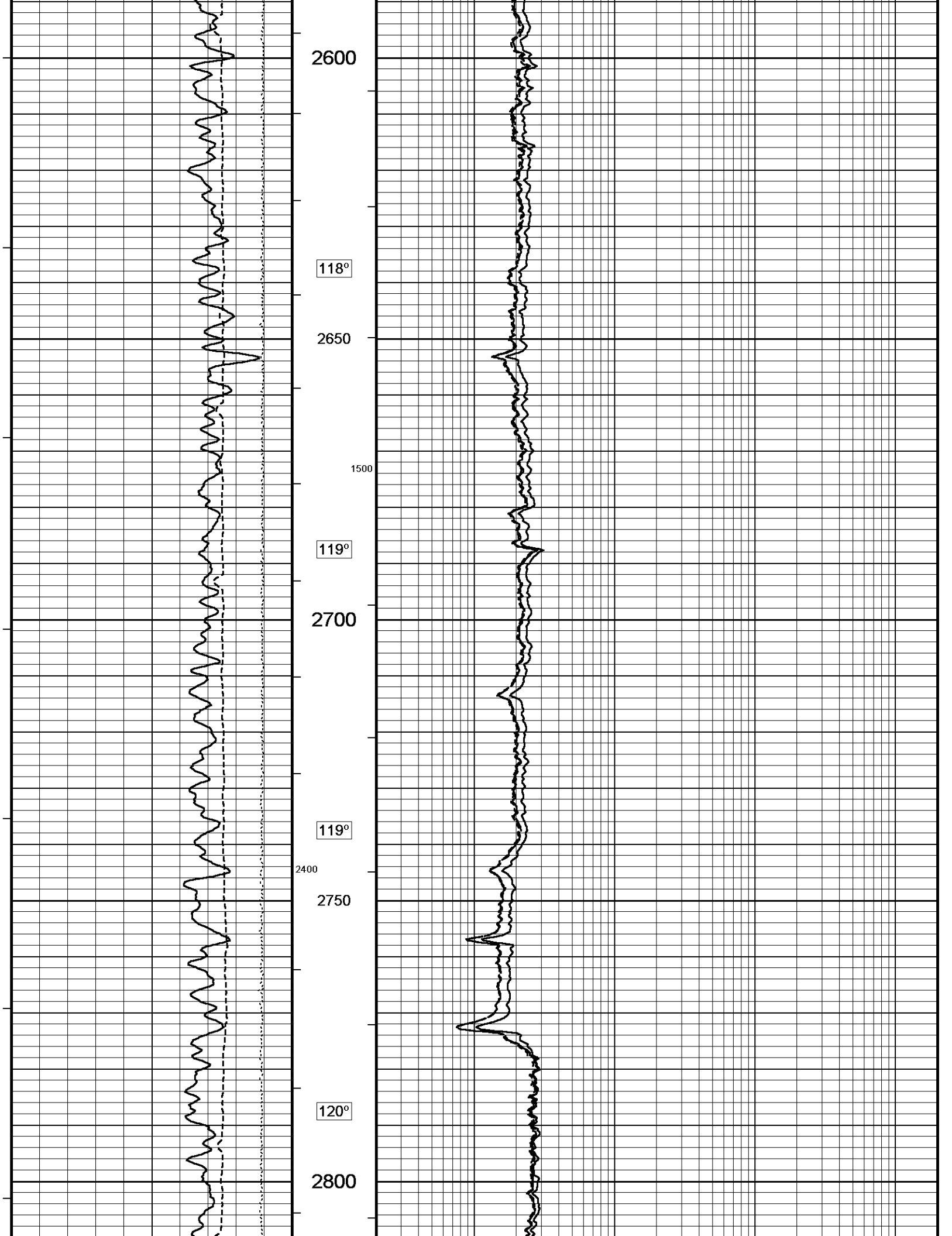


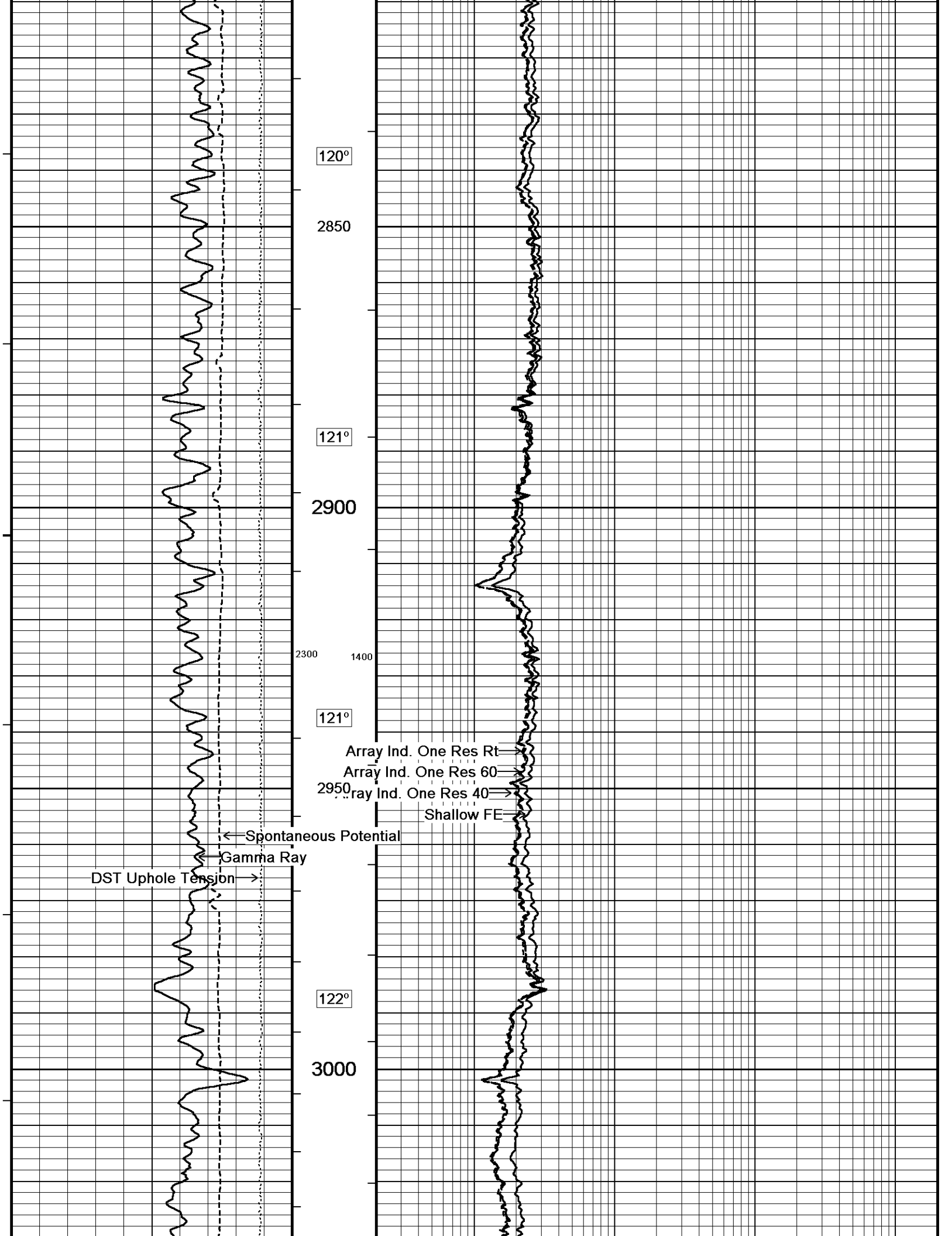


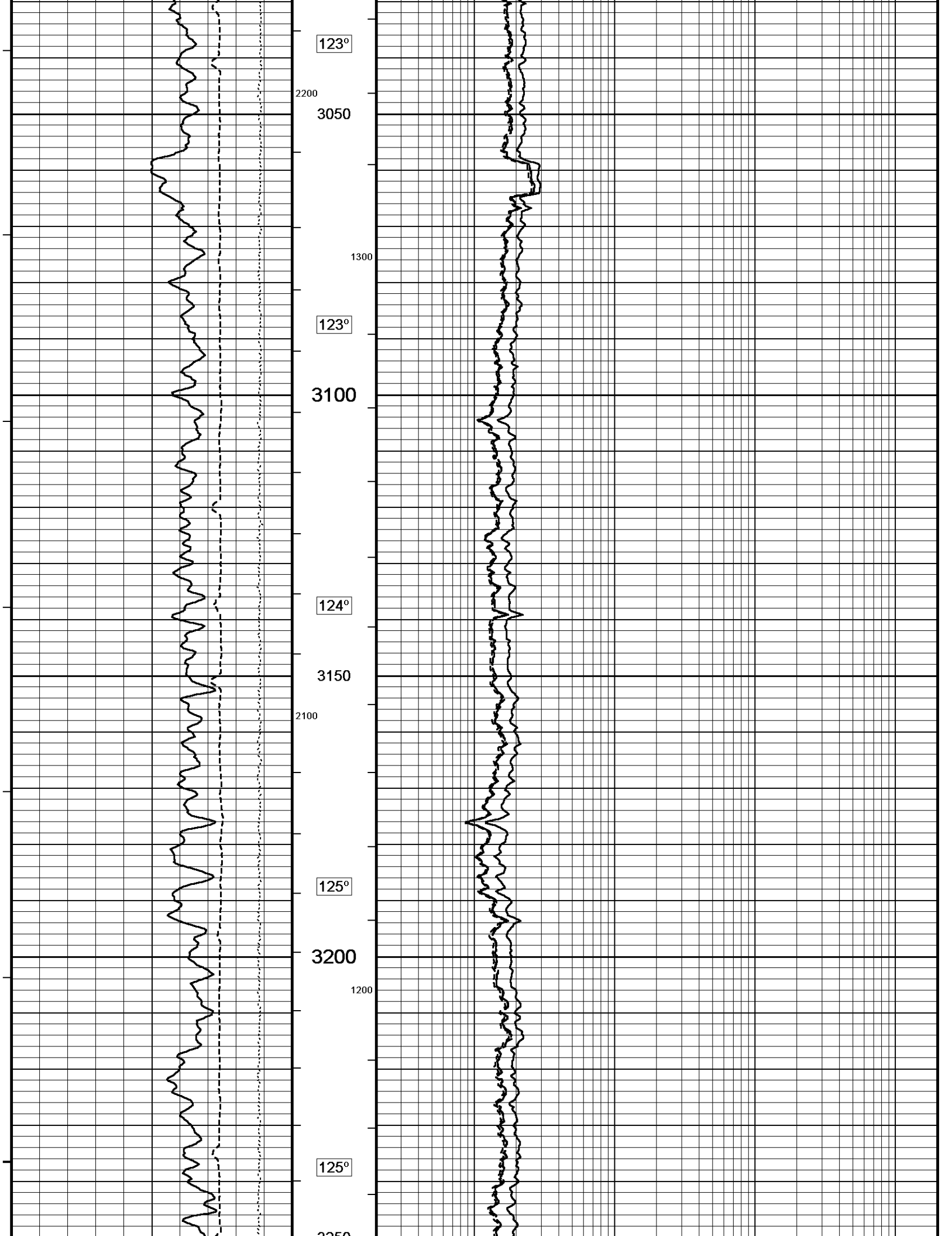


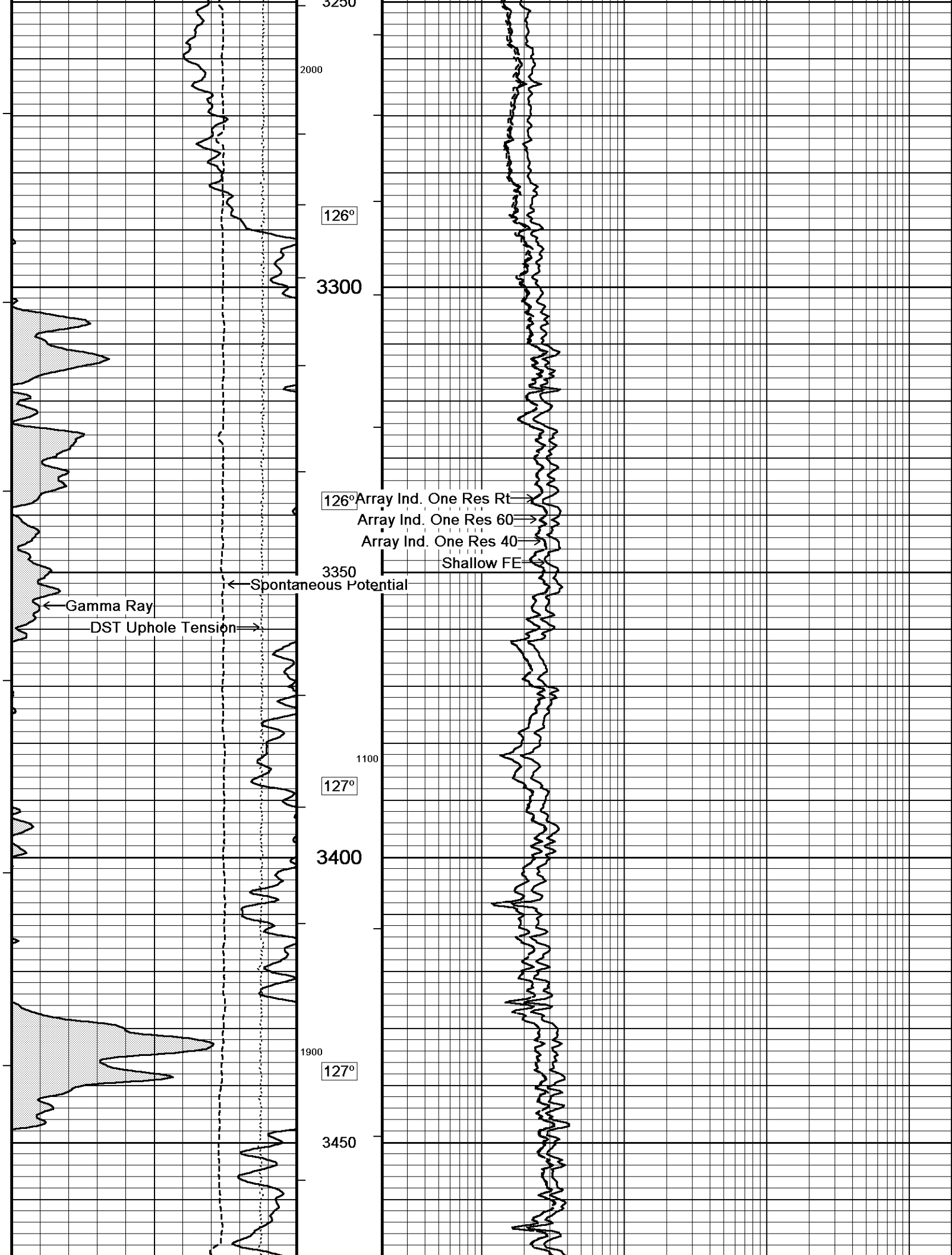


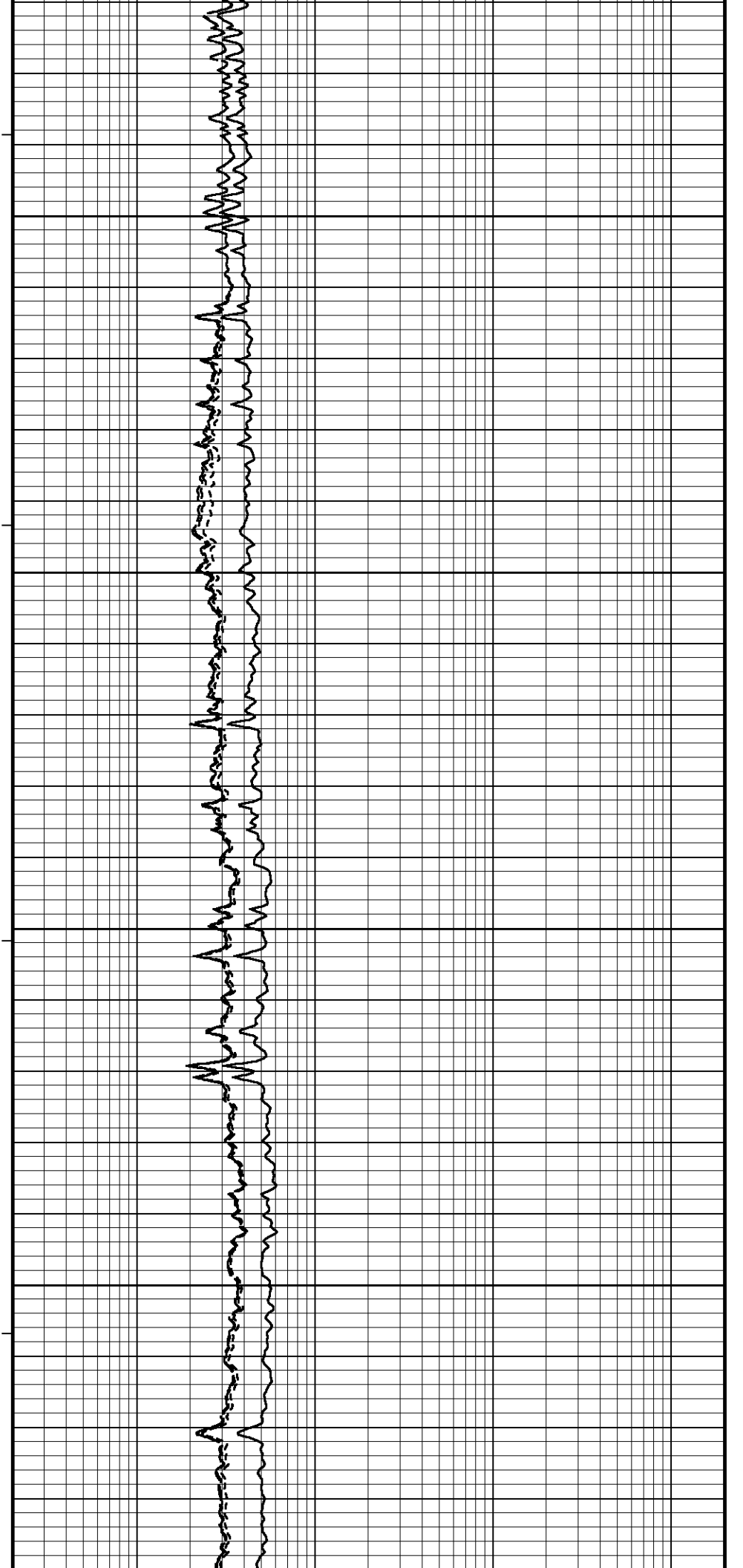
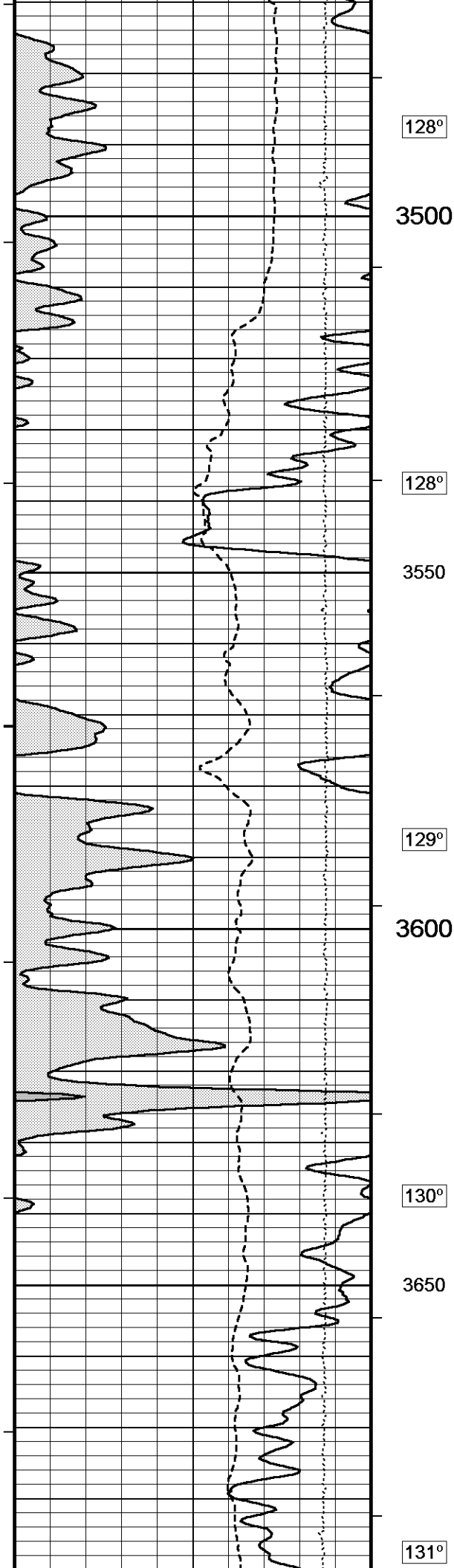


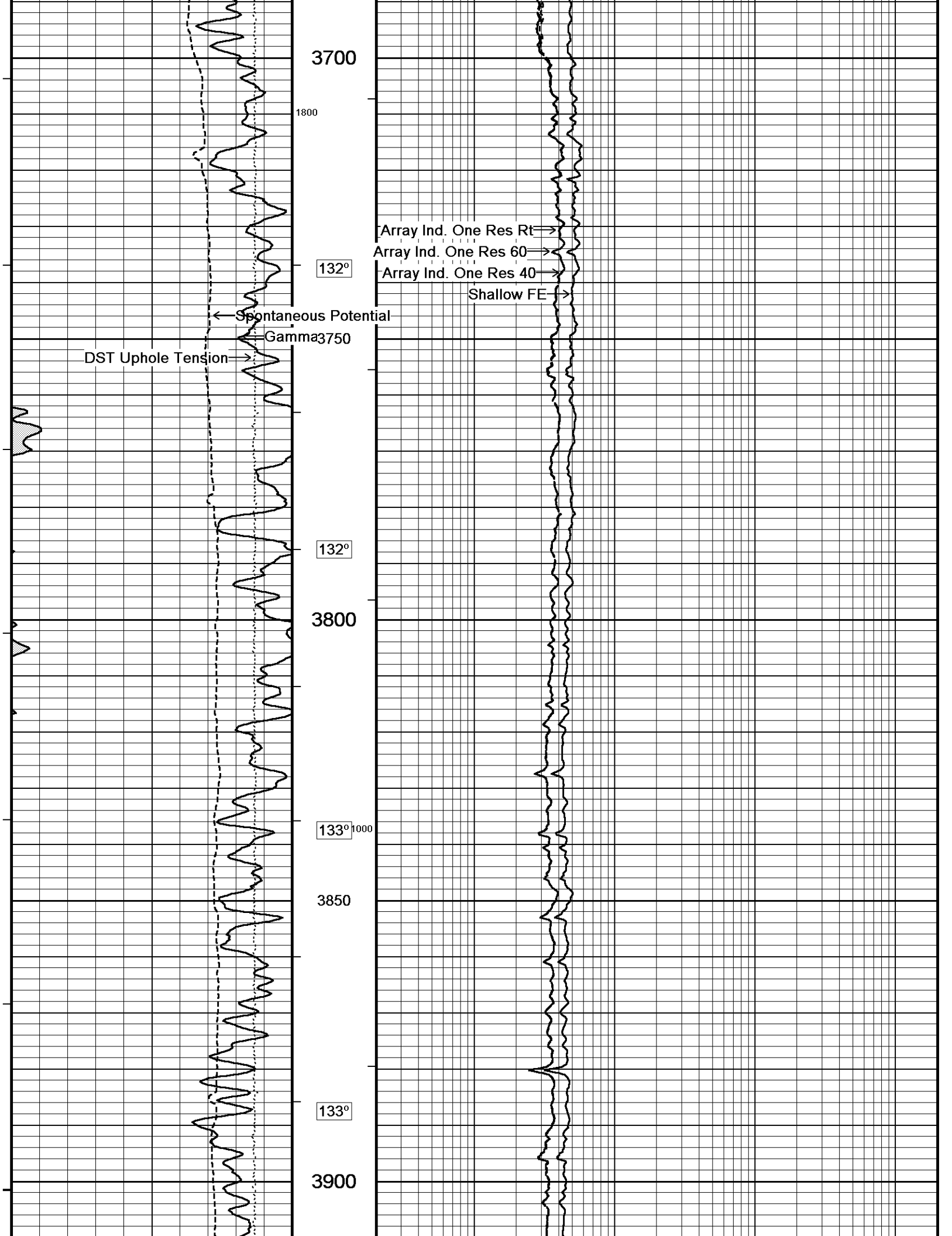


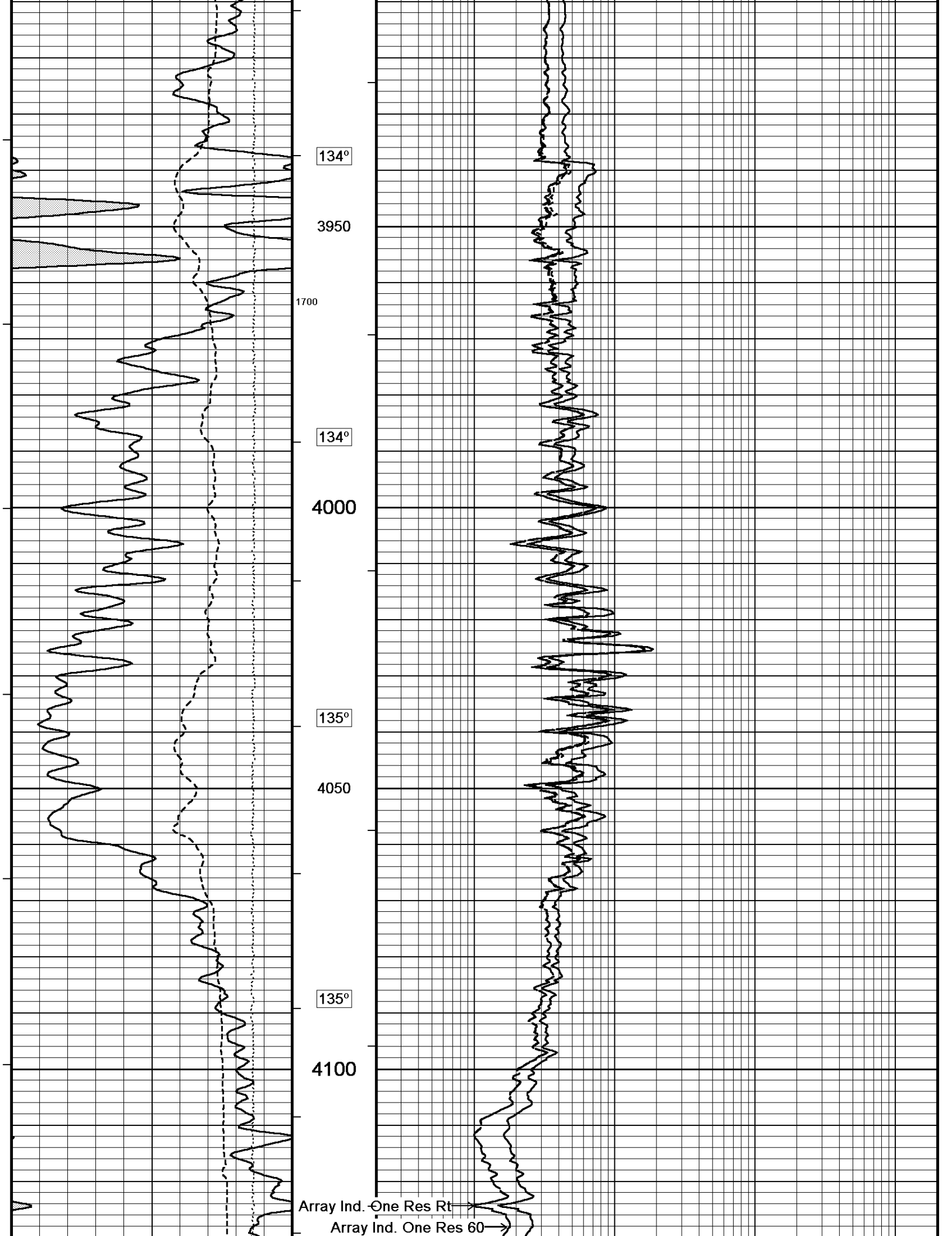


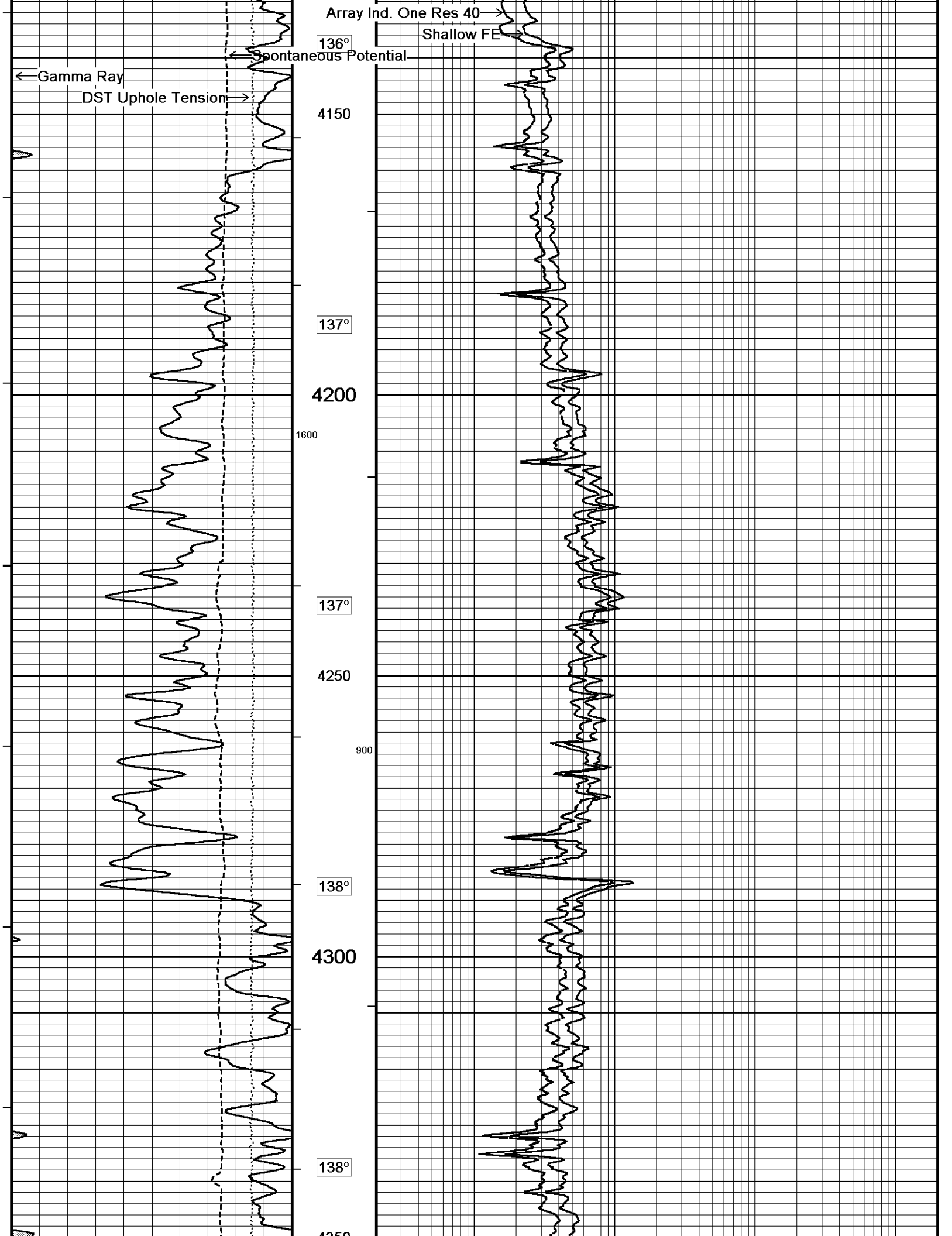


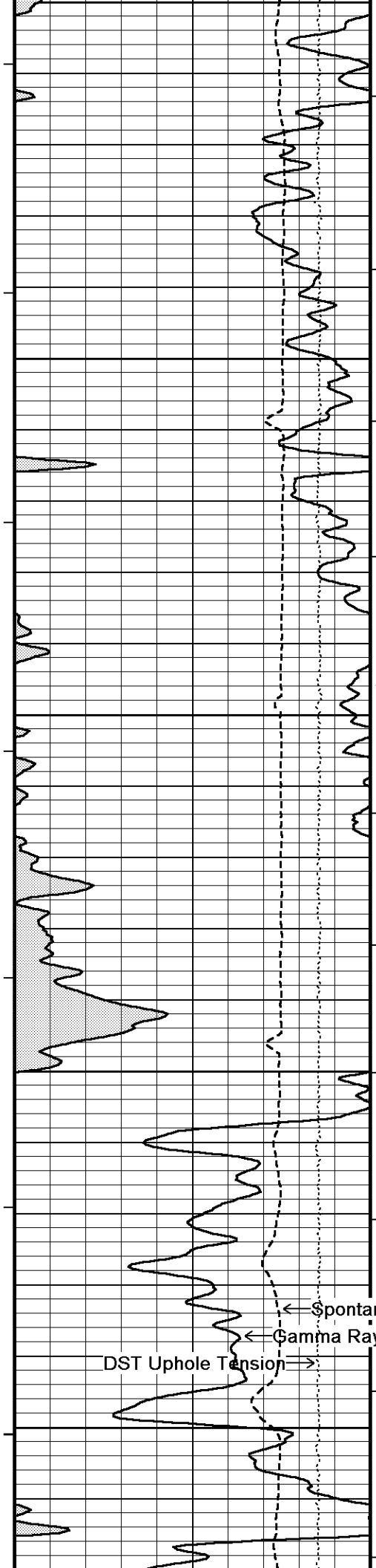




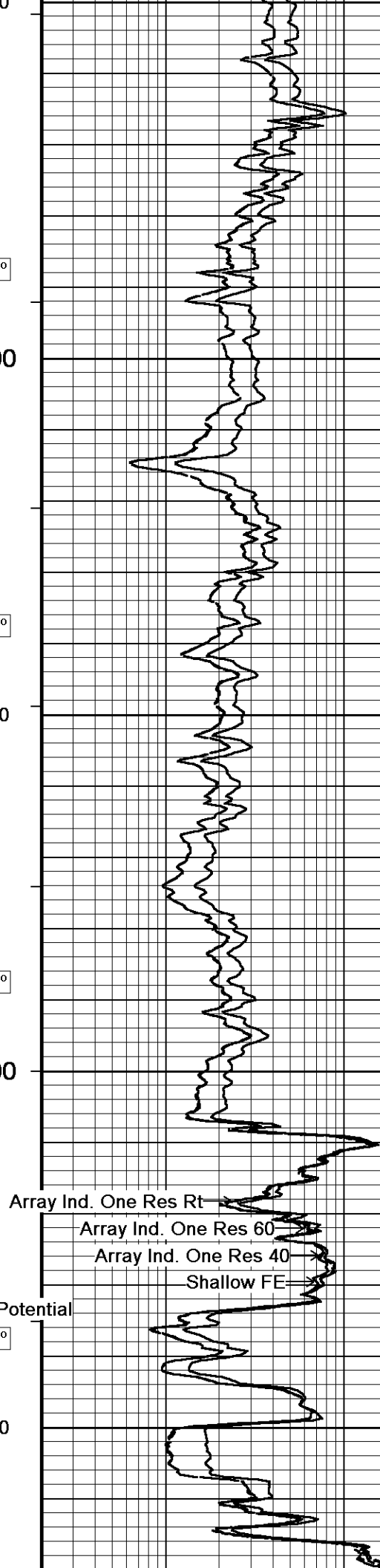




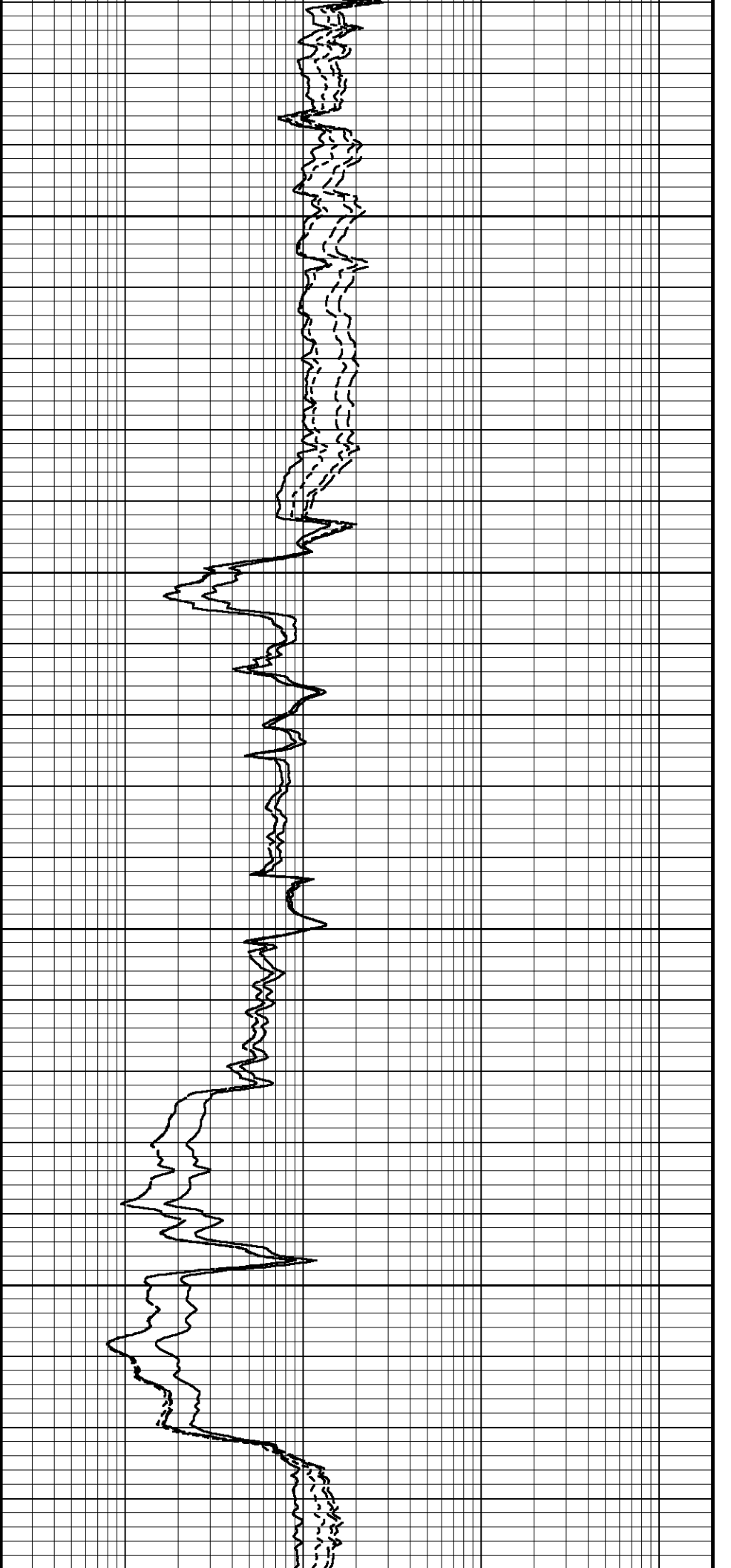
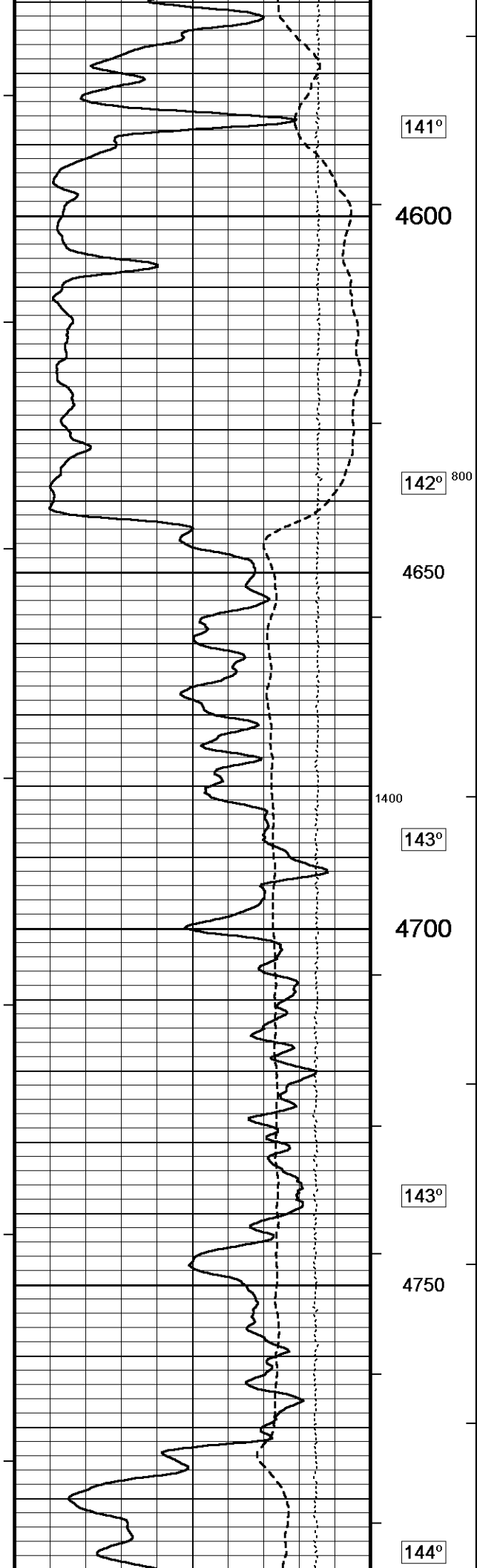


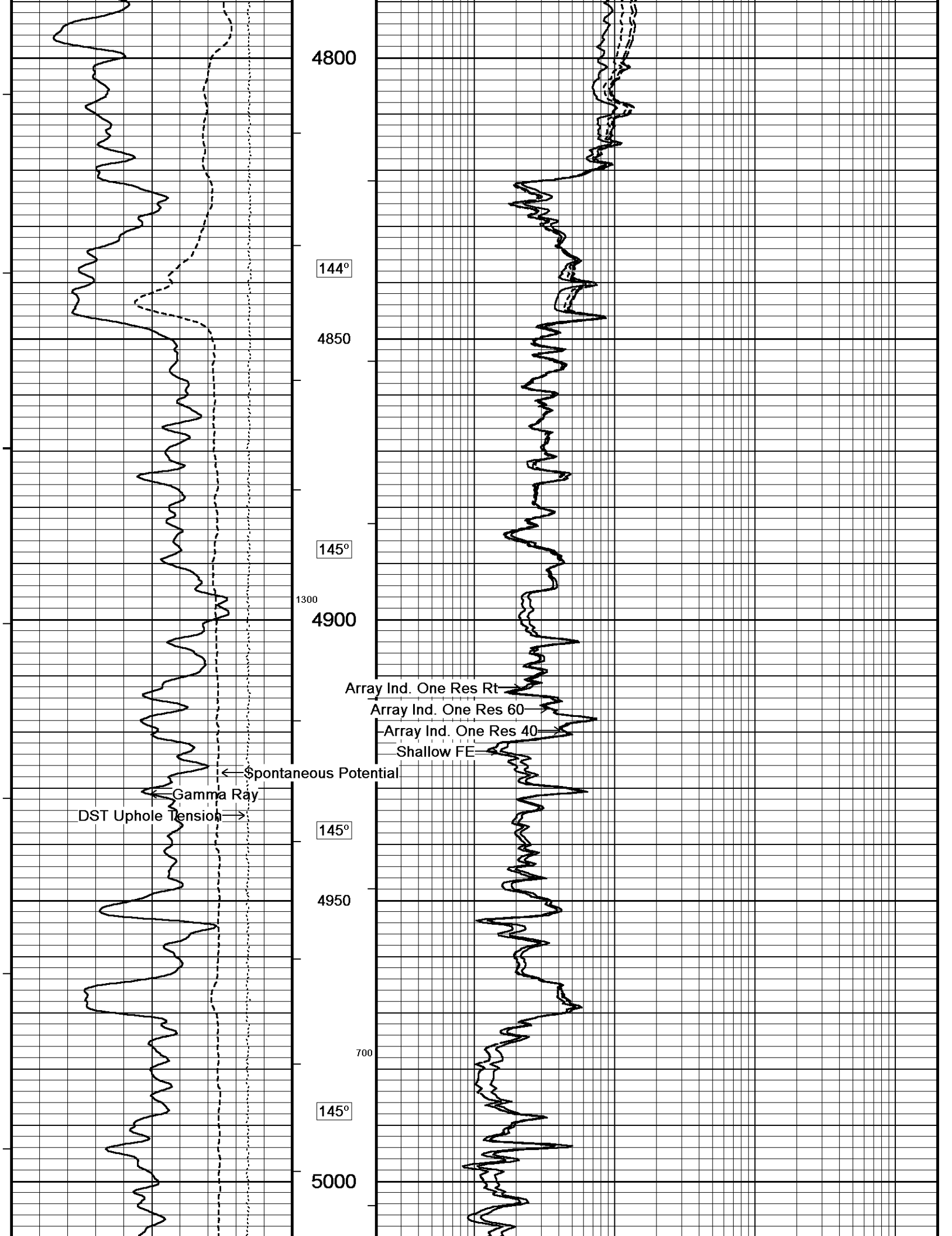


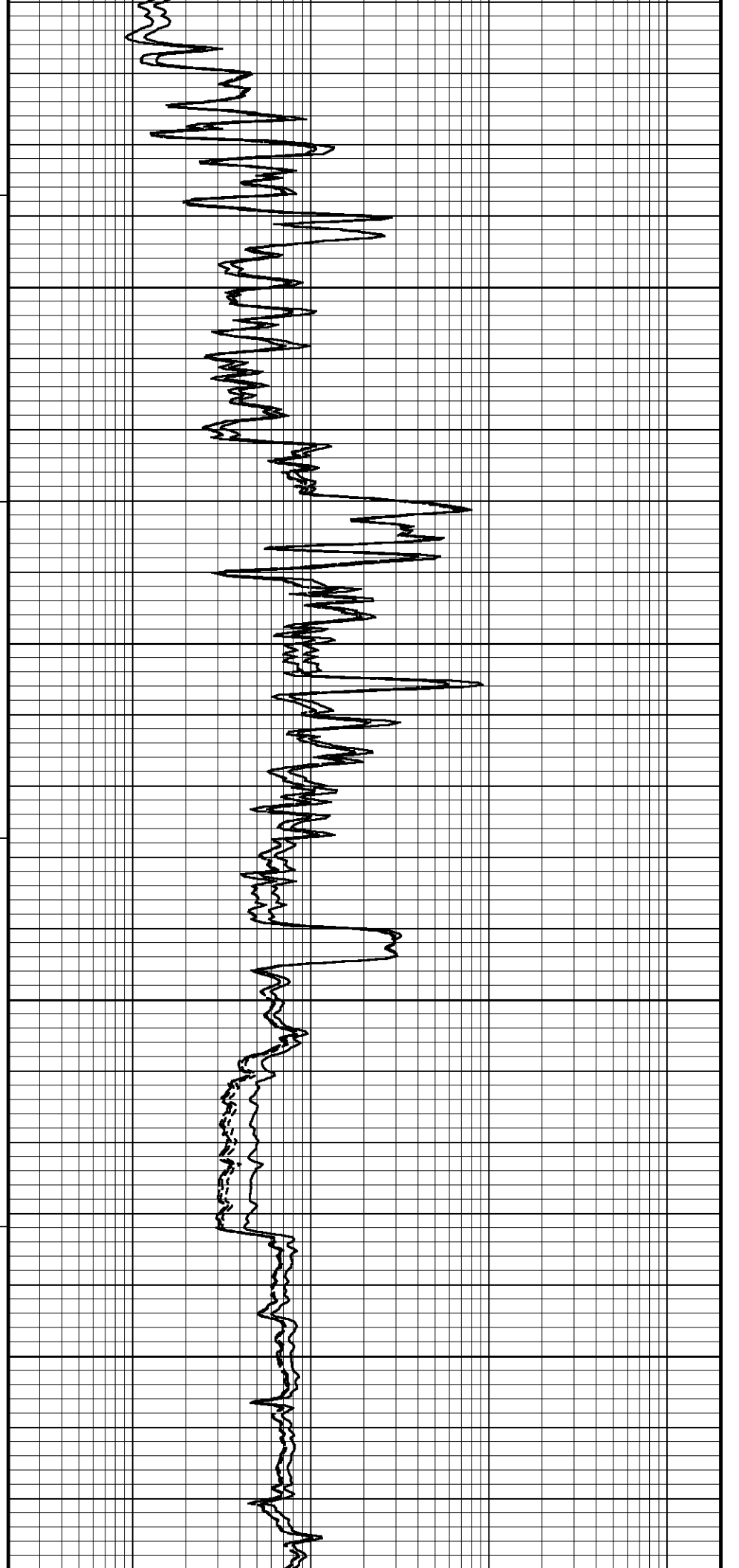
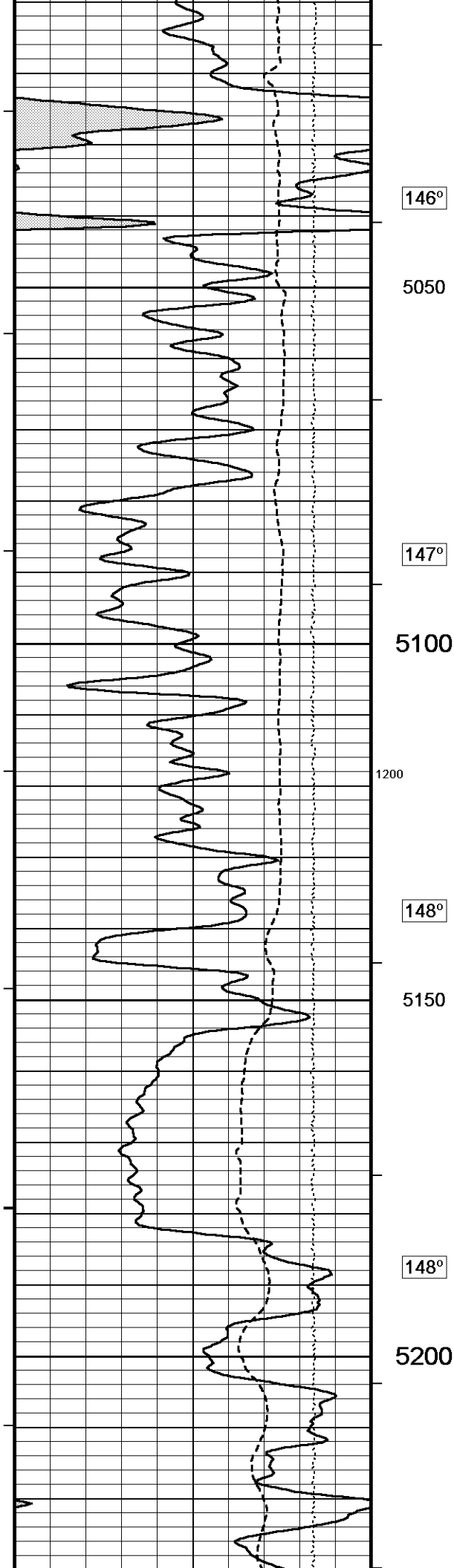
4350
139°
4400
139°
1500
4450
140°
4500
141°
4550

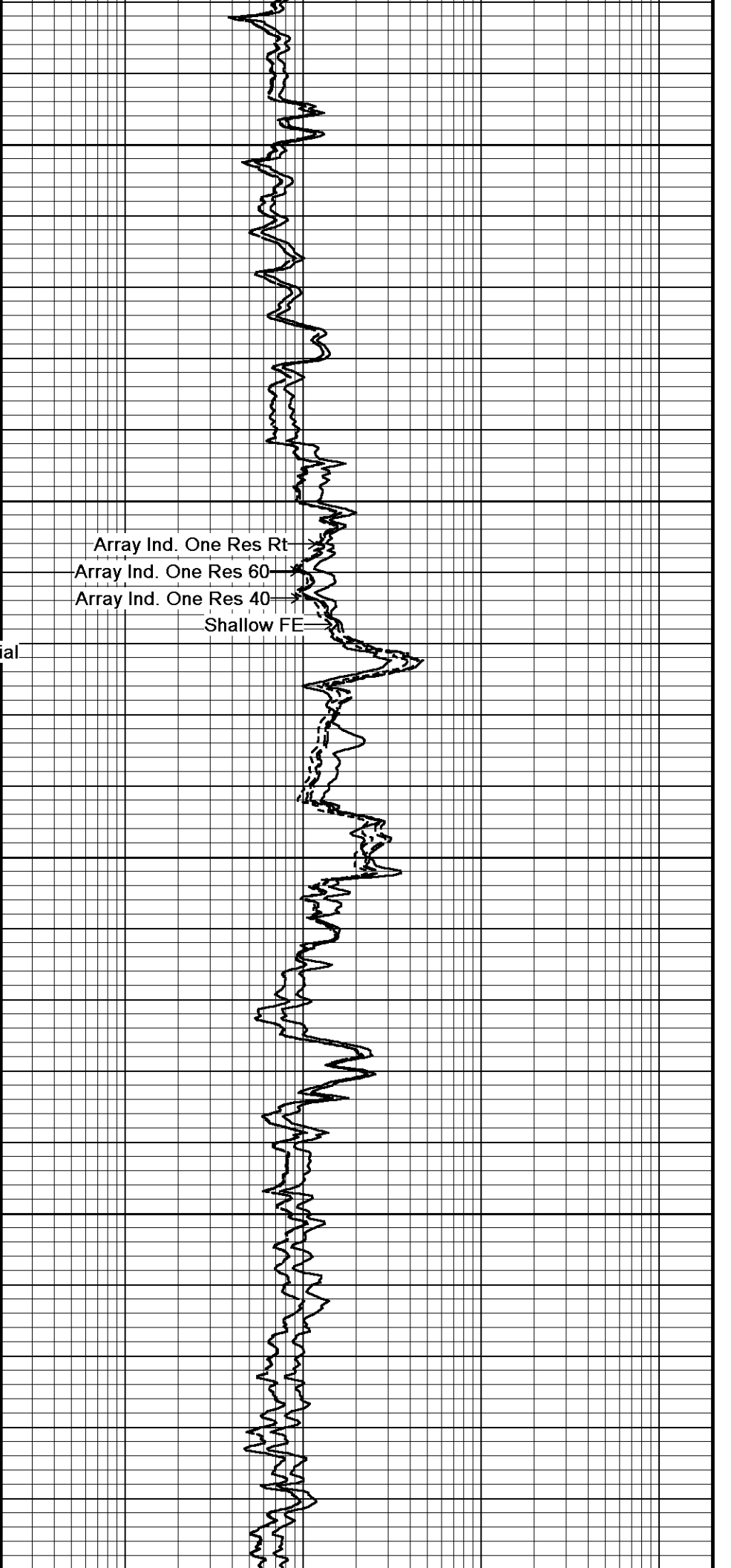
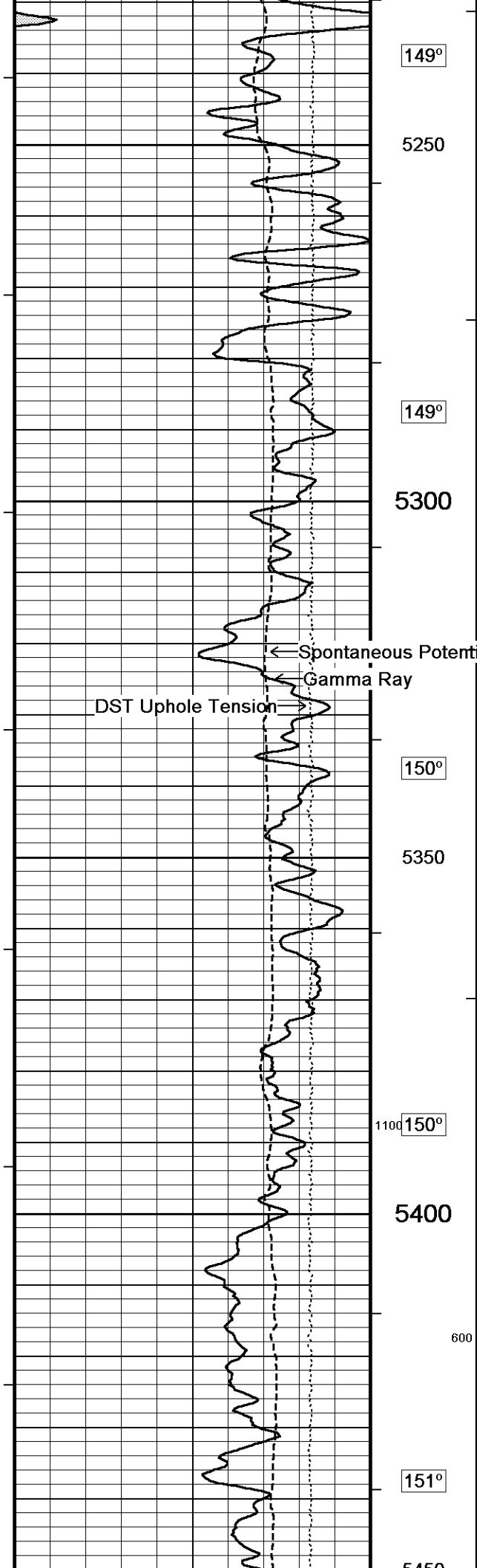


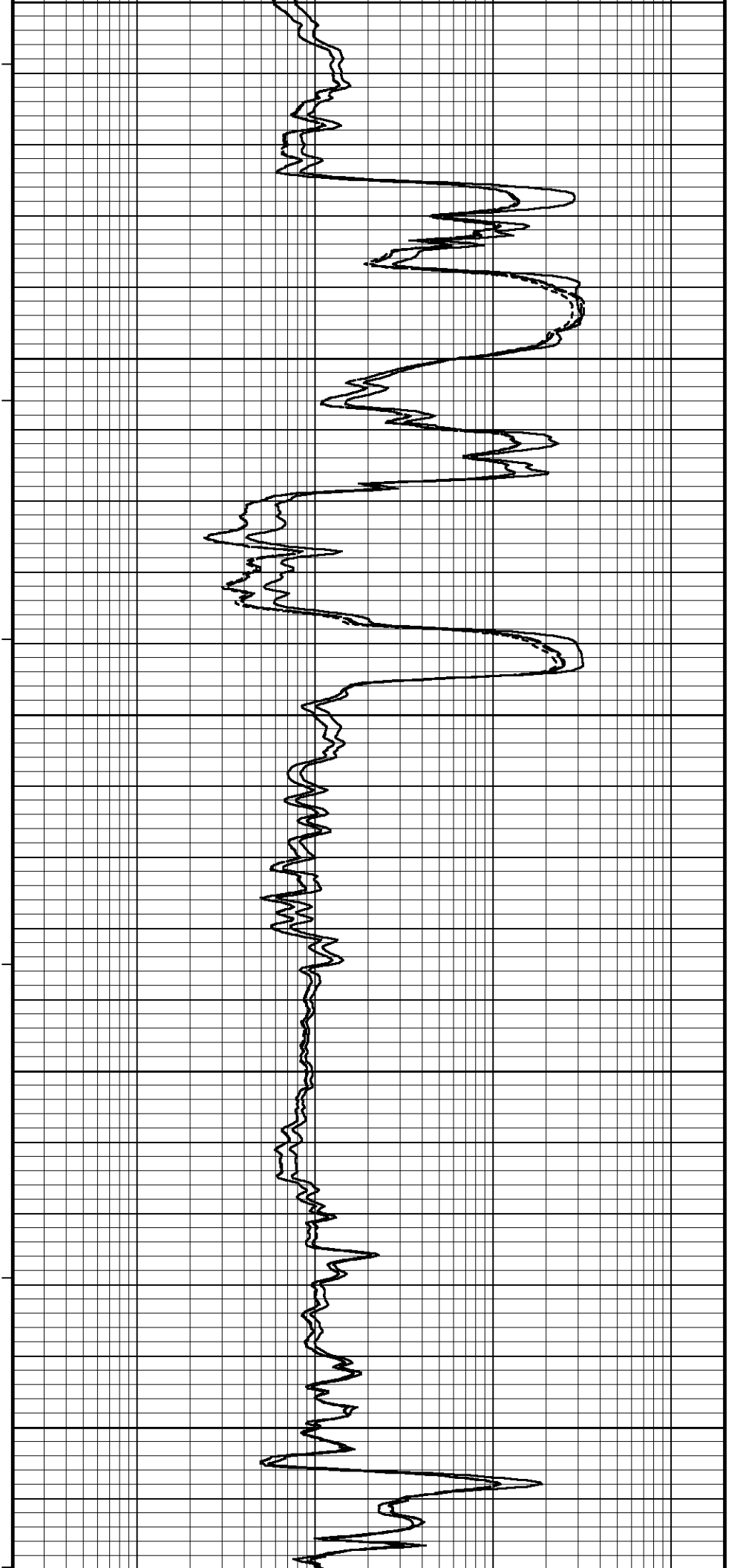
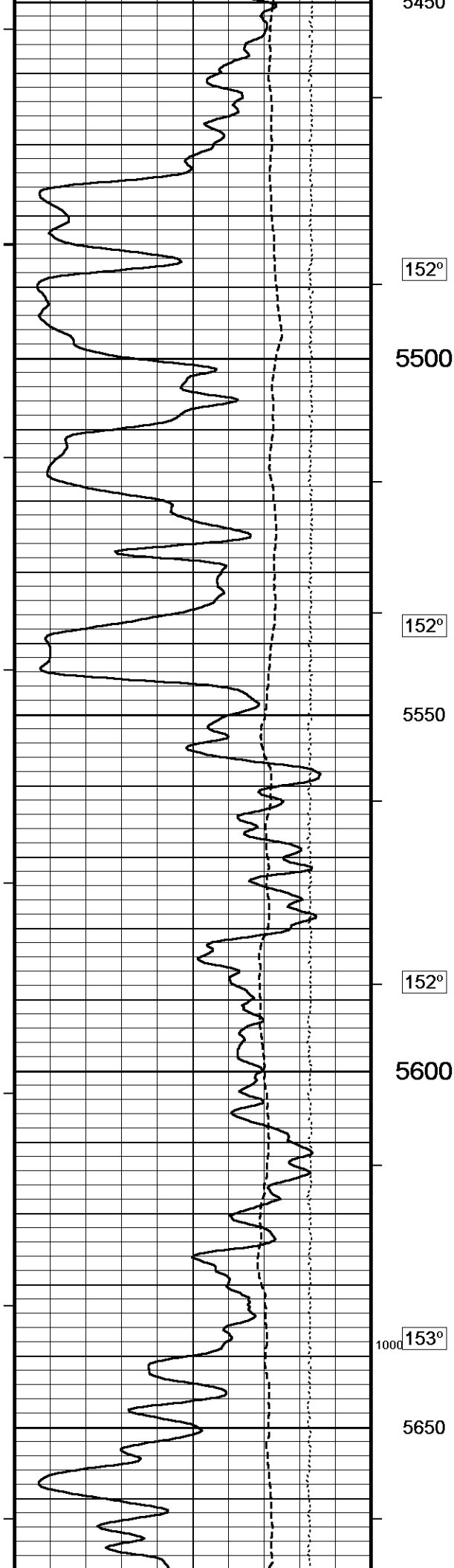
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

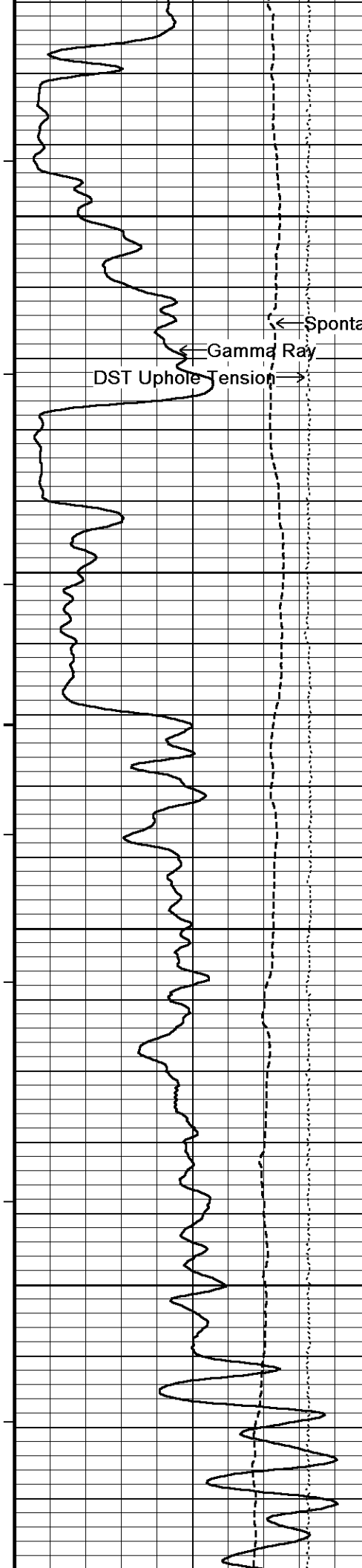












153°

5700

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →

153°

5750

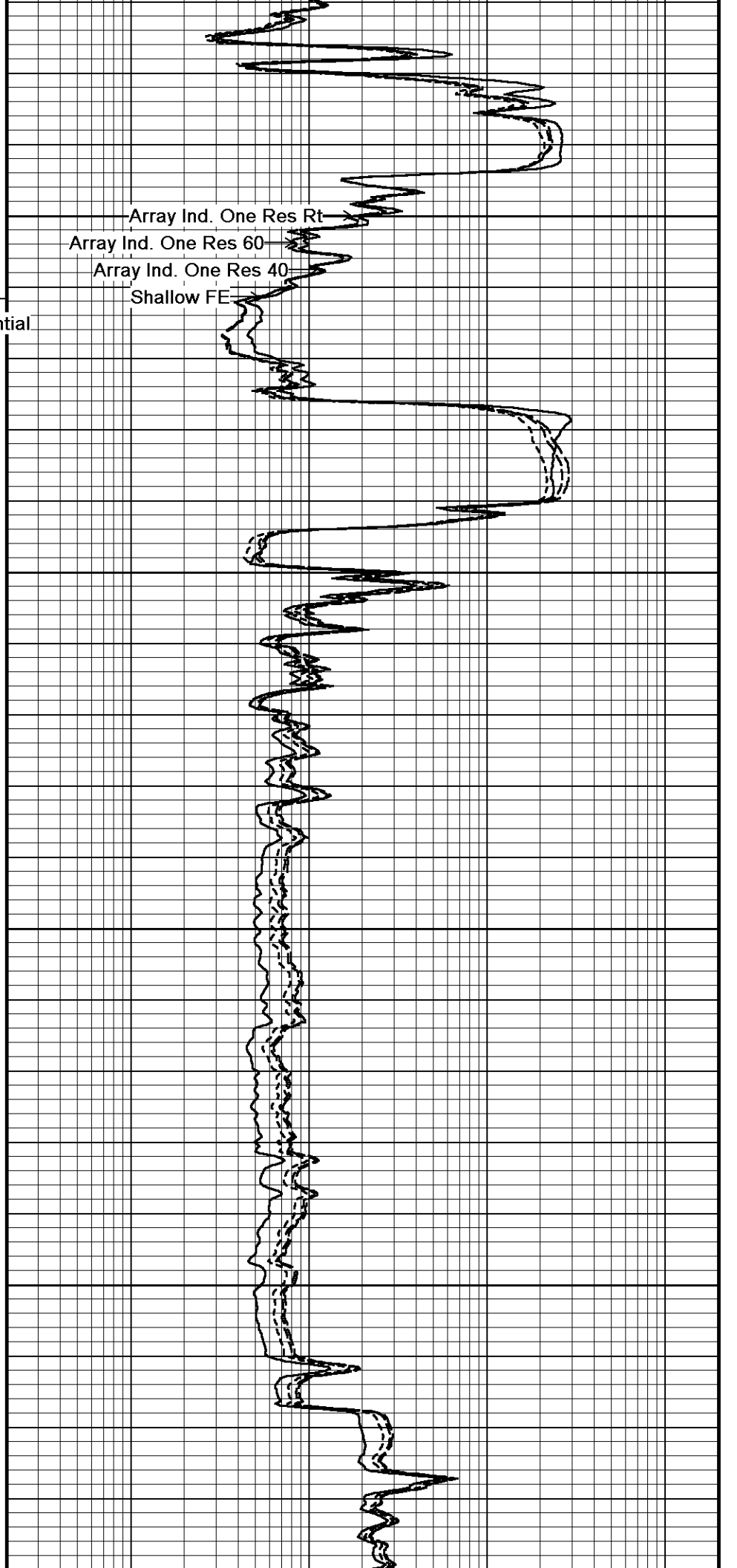
154°

5800

154°

5850

156°

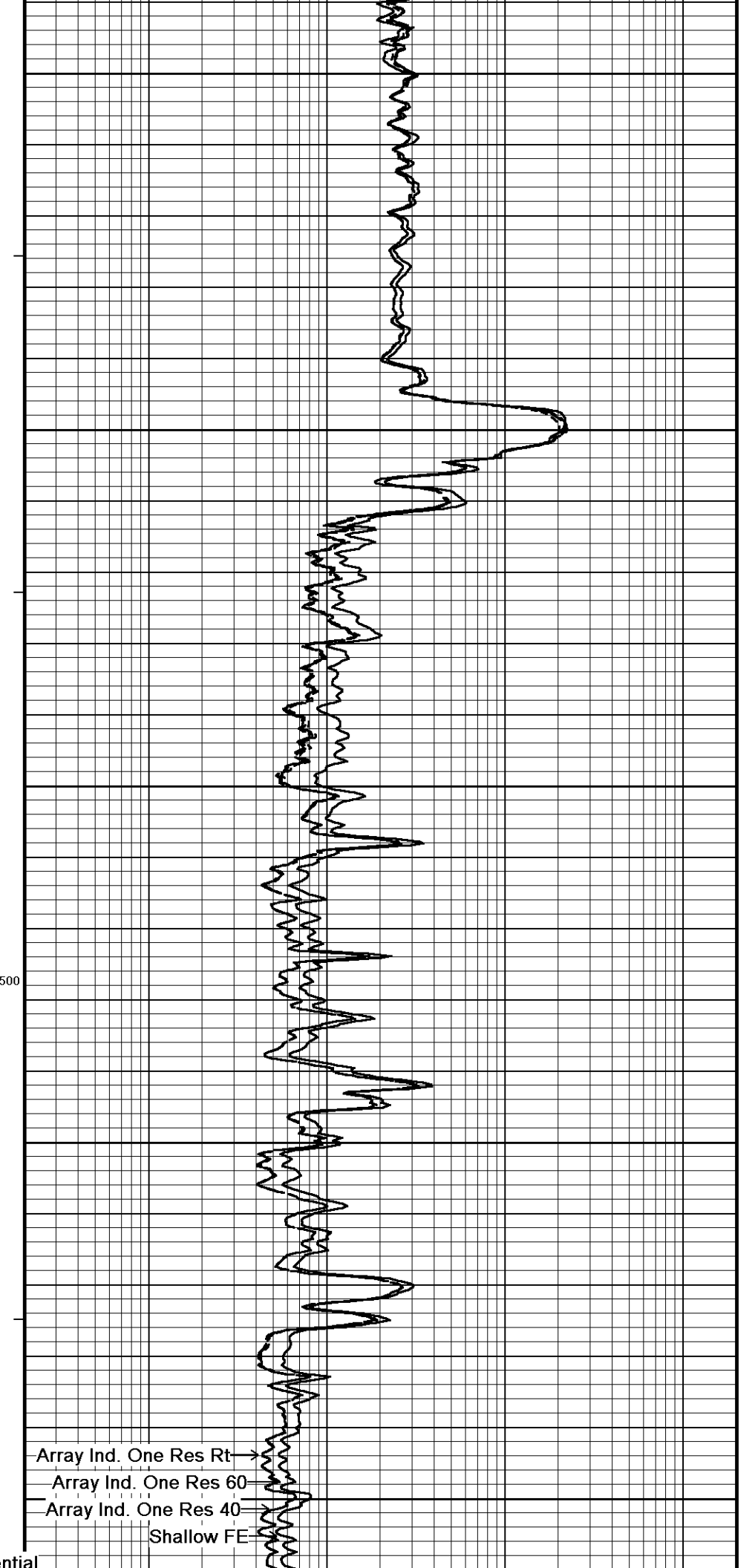
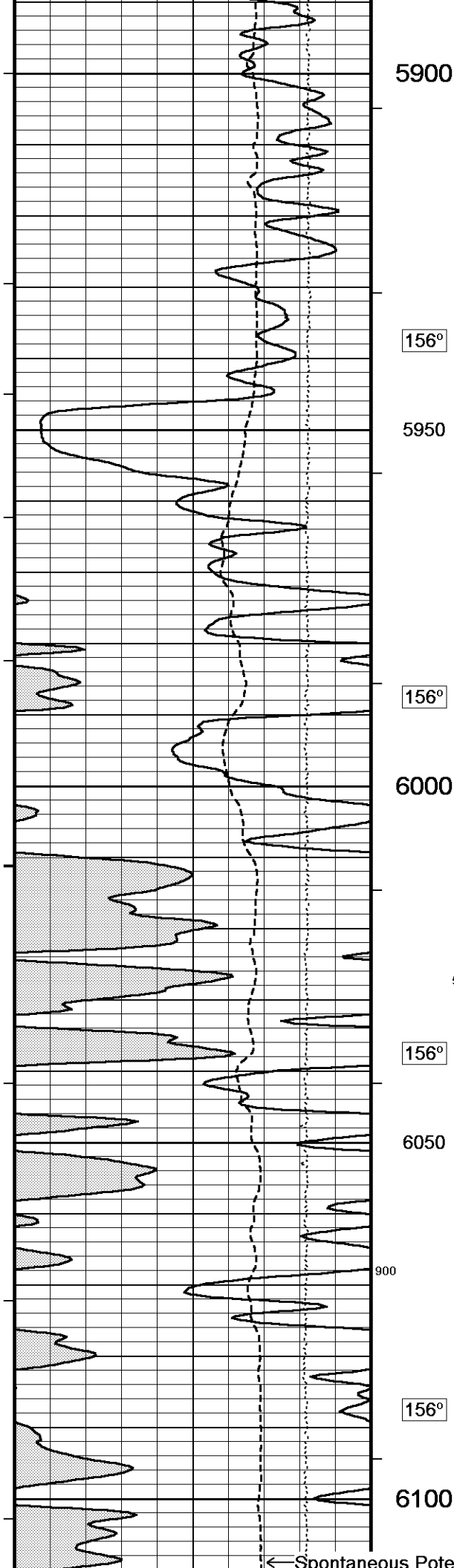


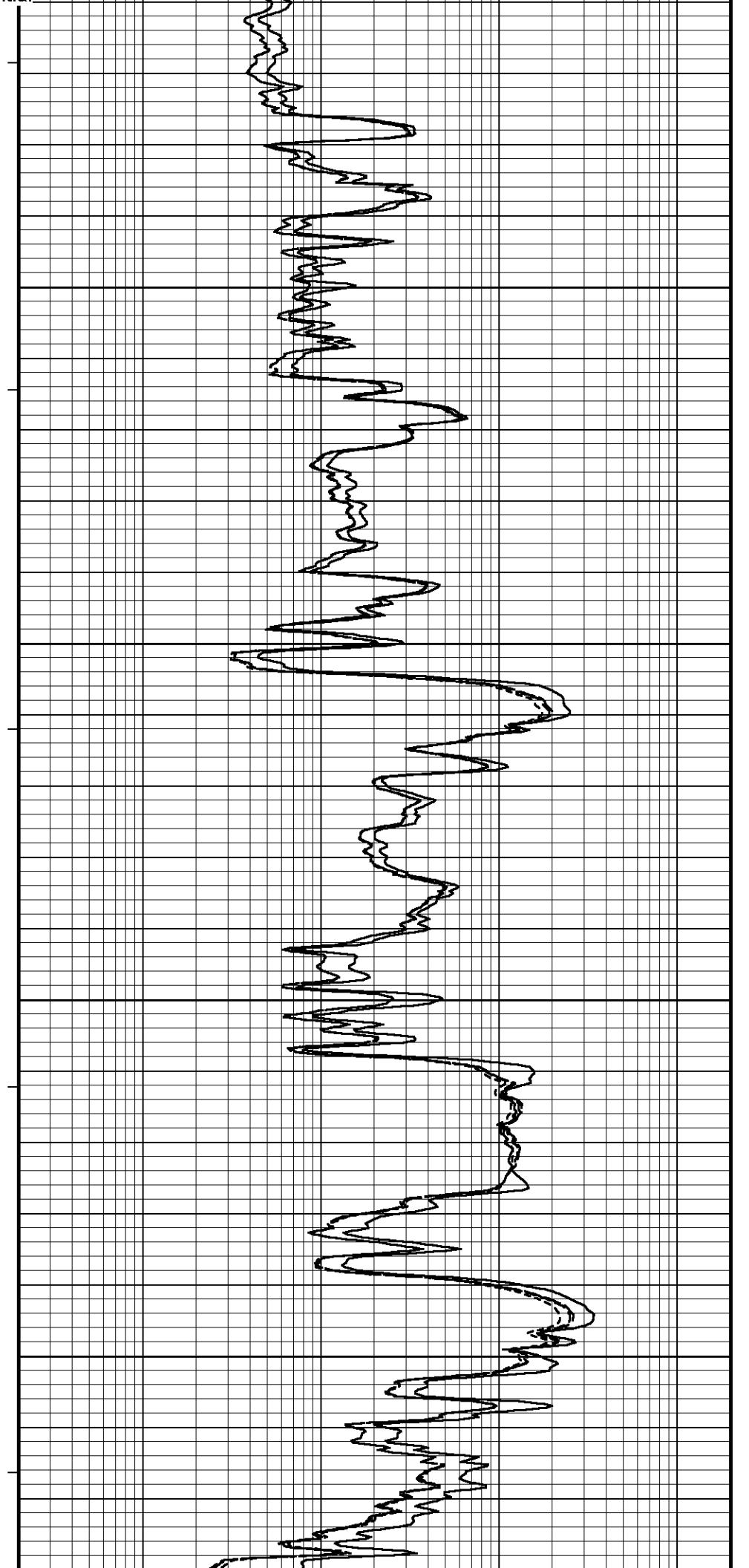
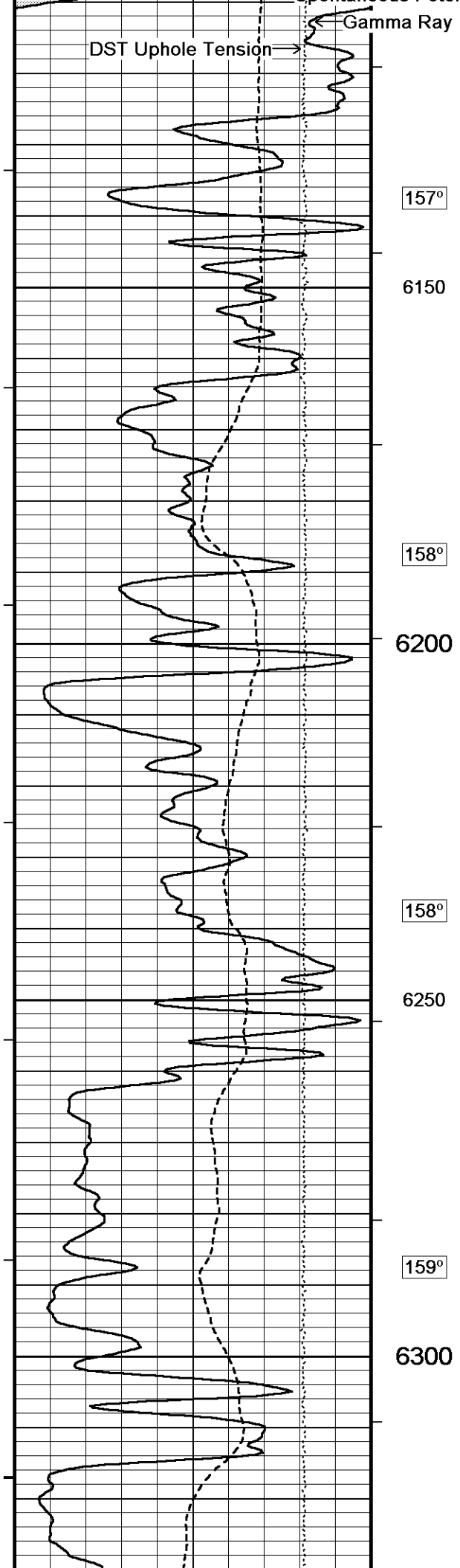
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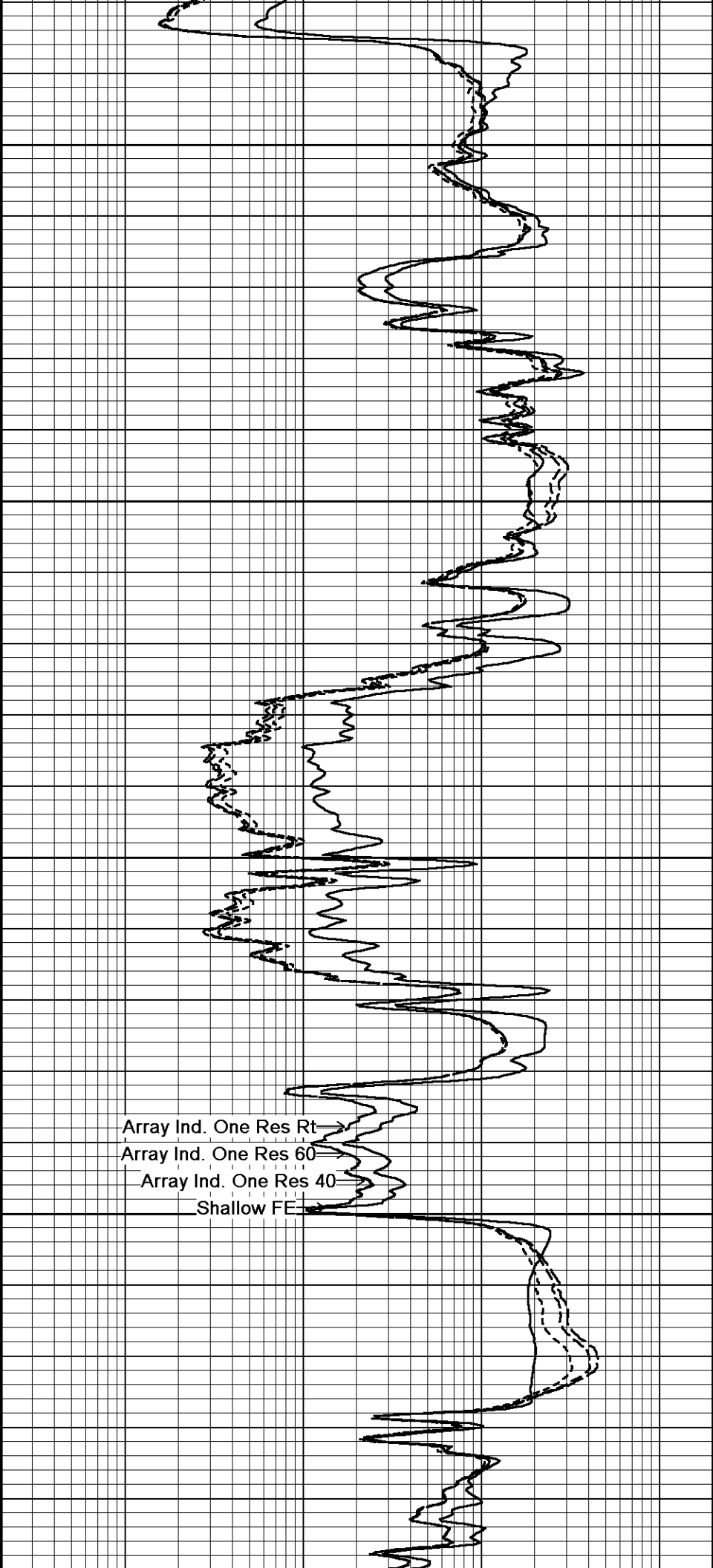
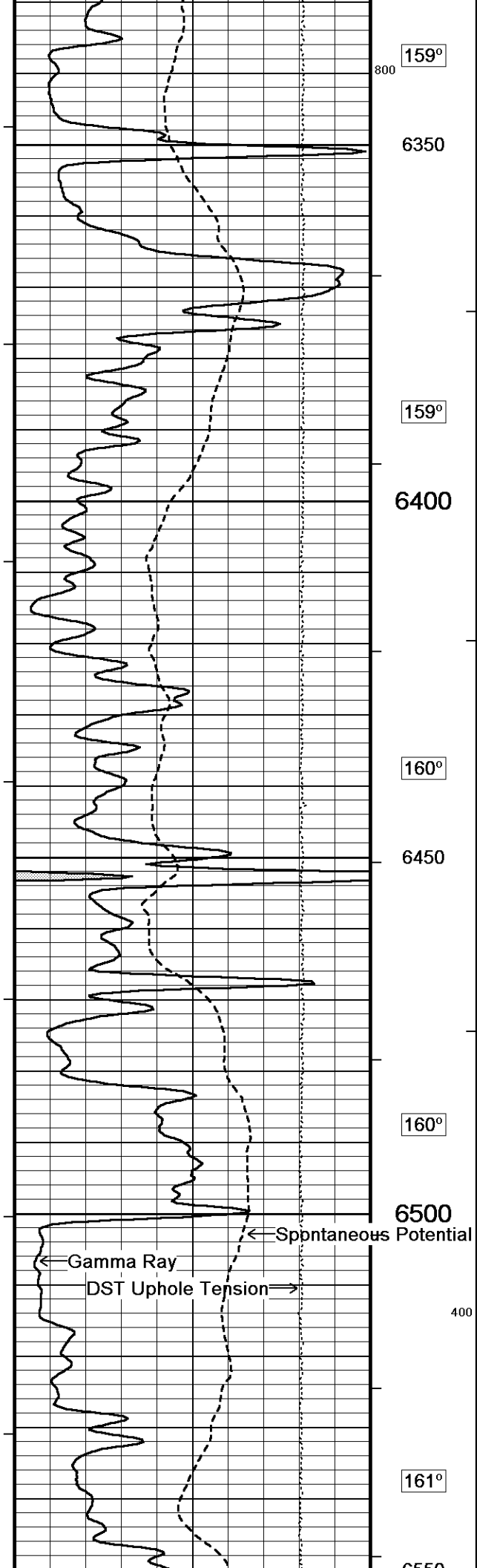
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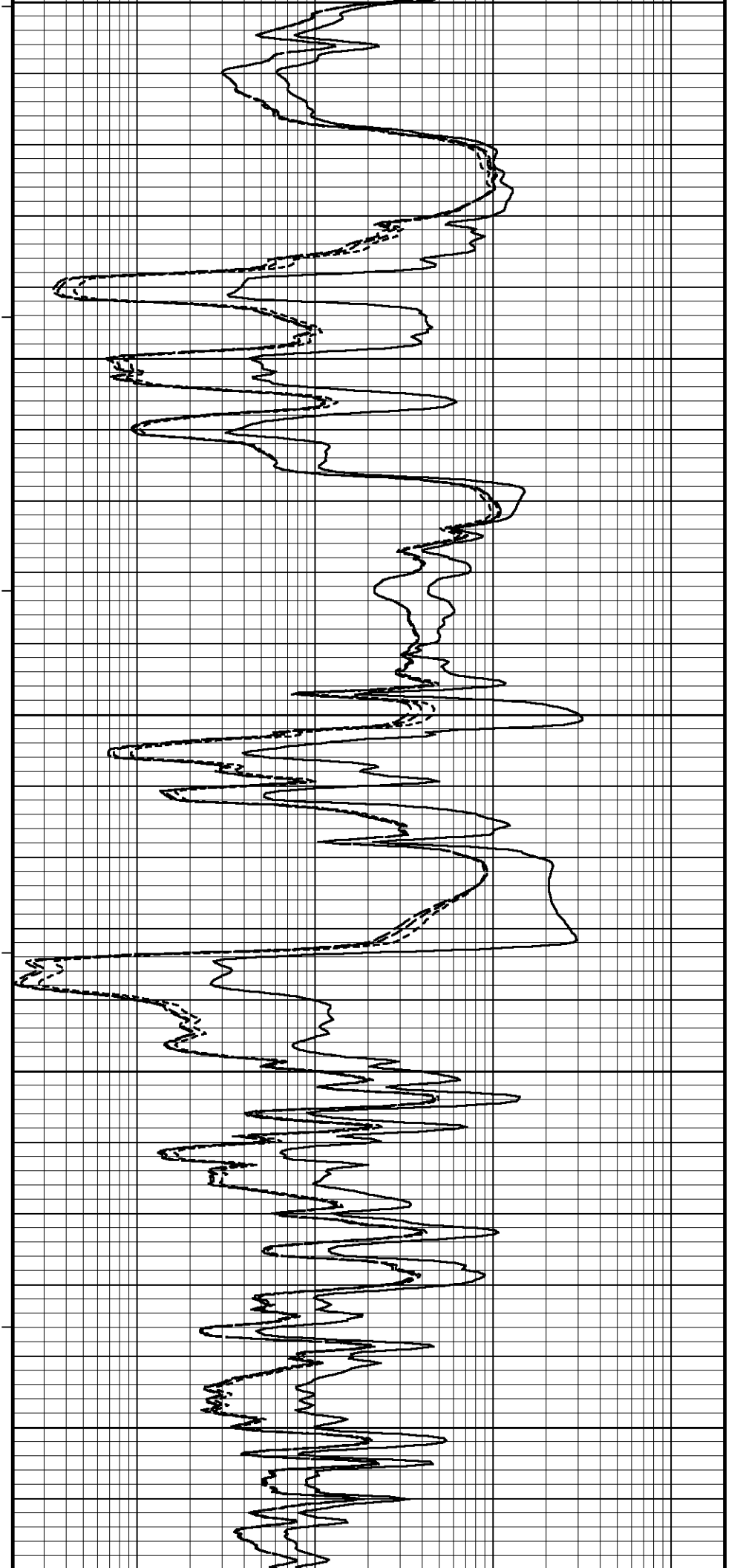
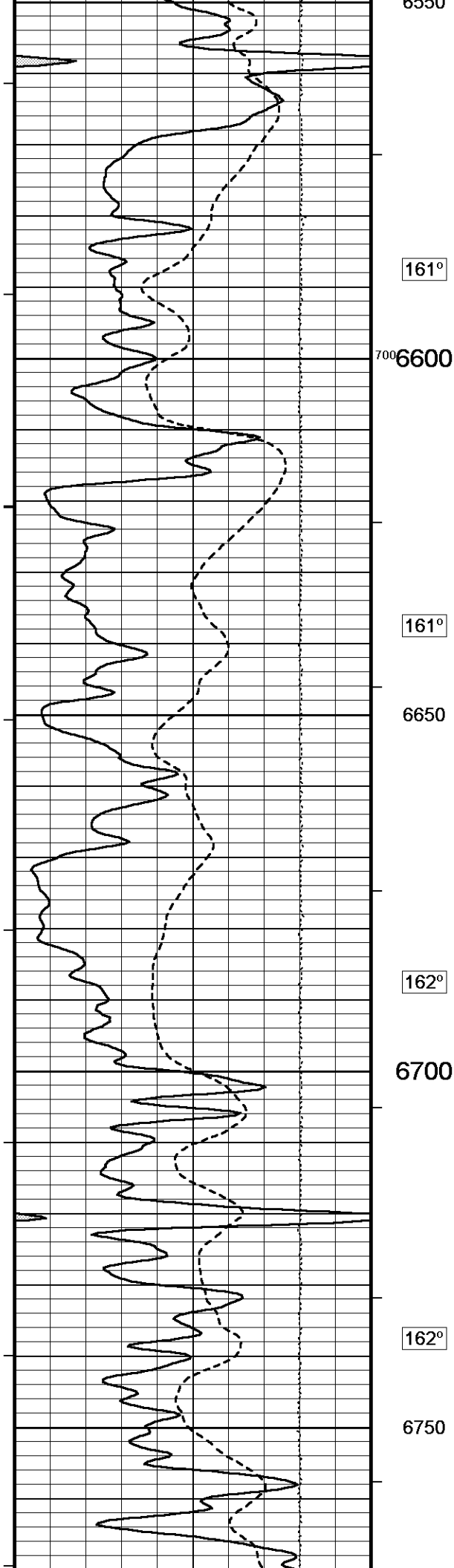
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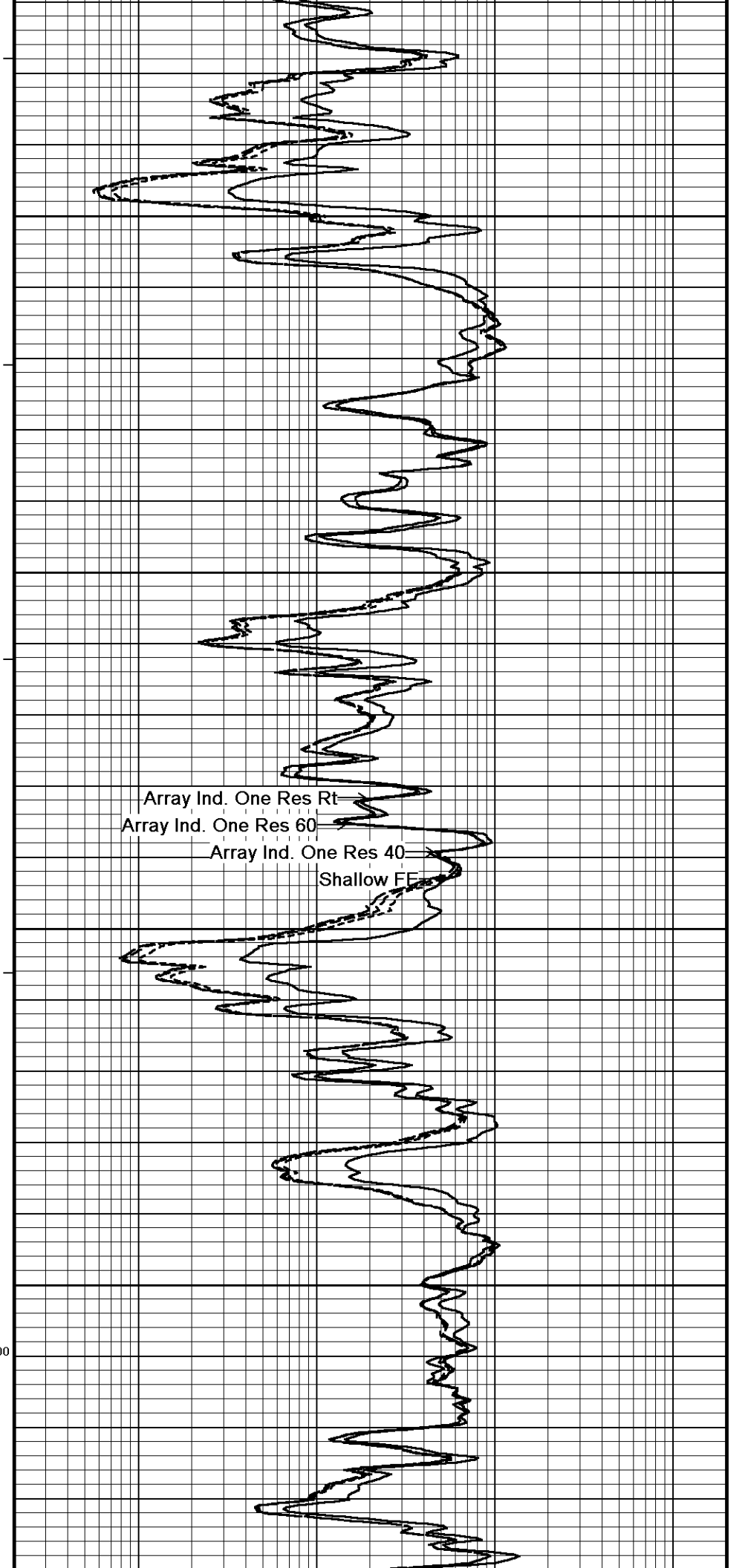
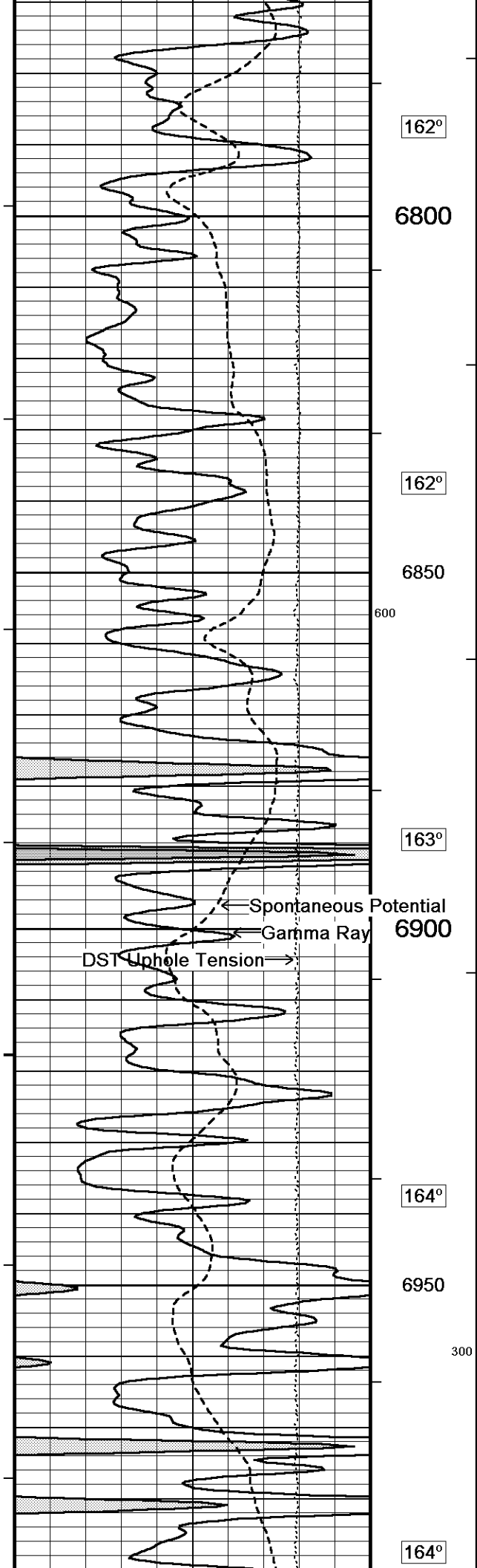
Shallow FE

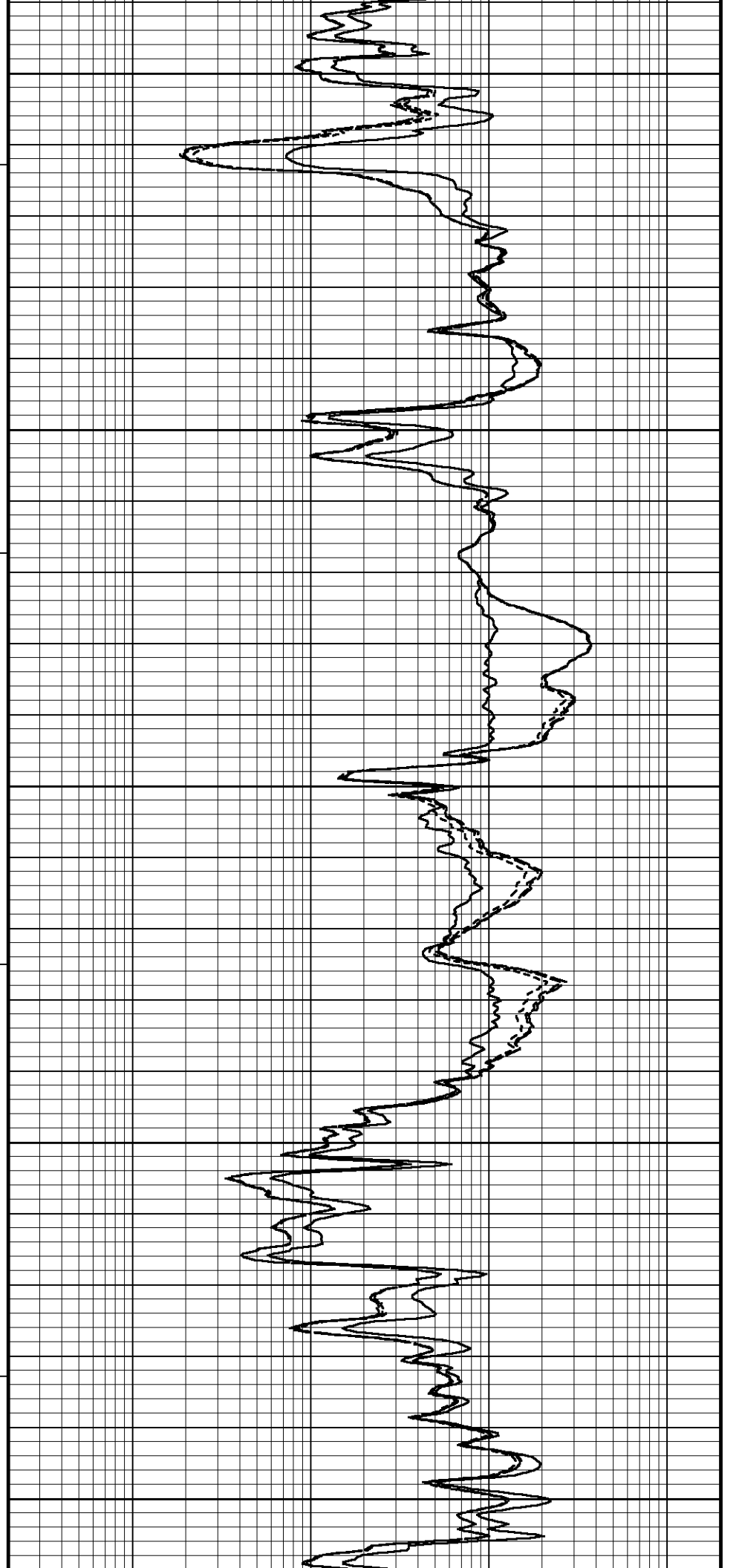
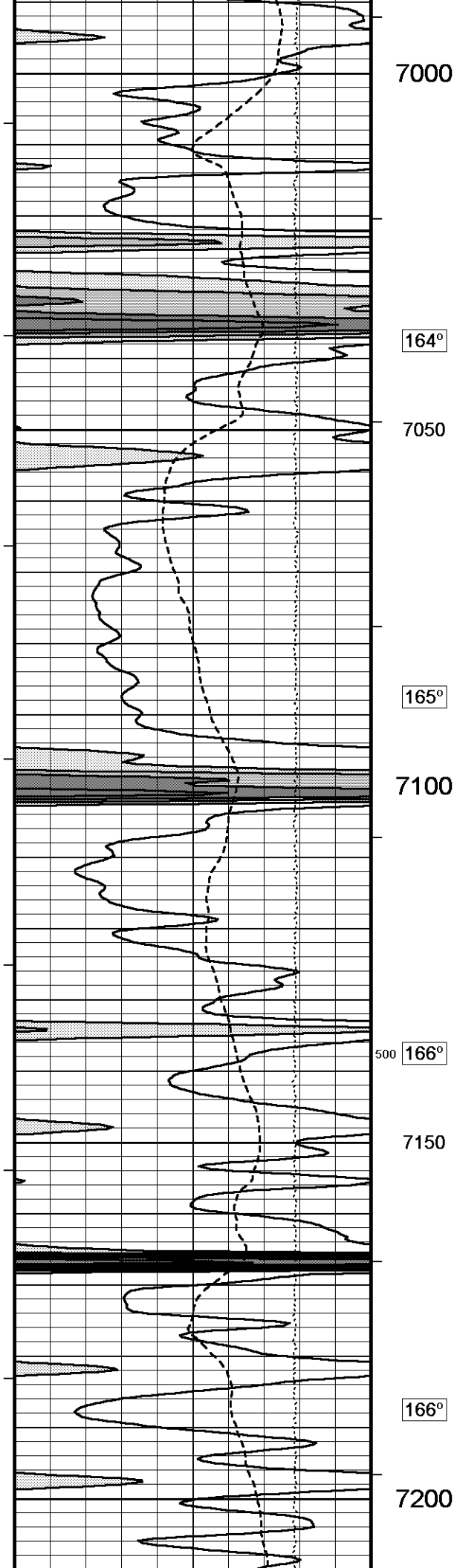


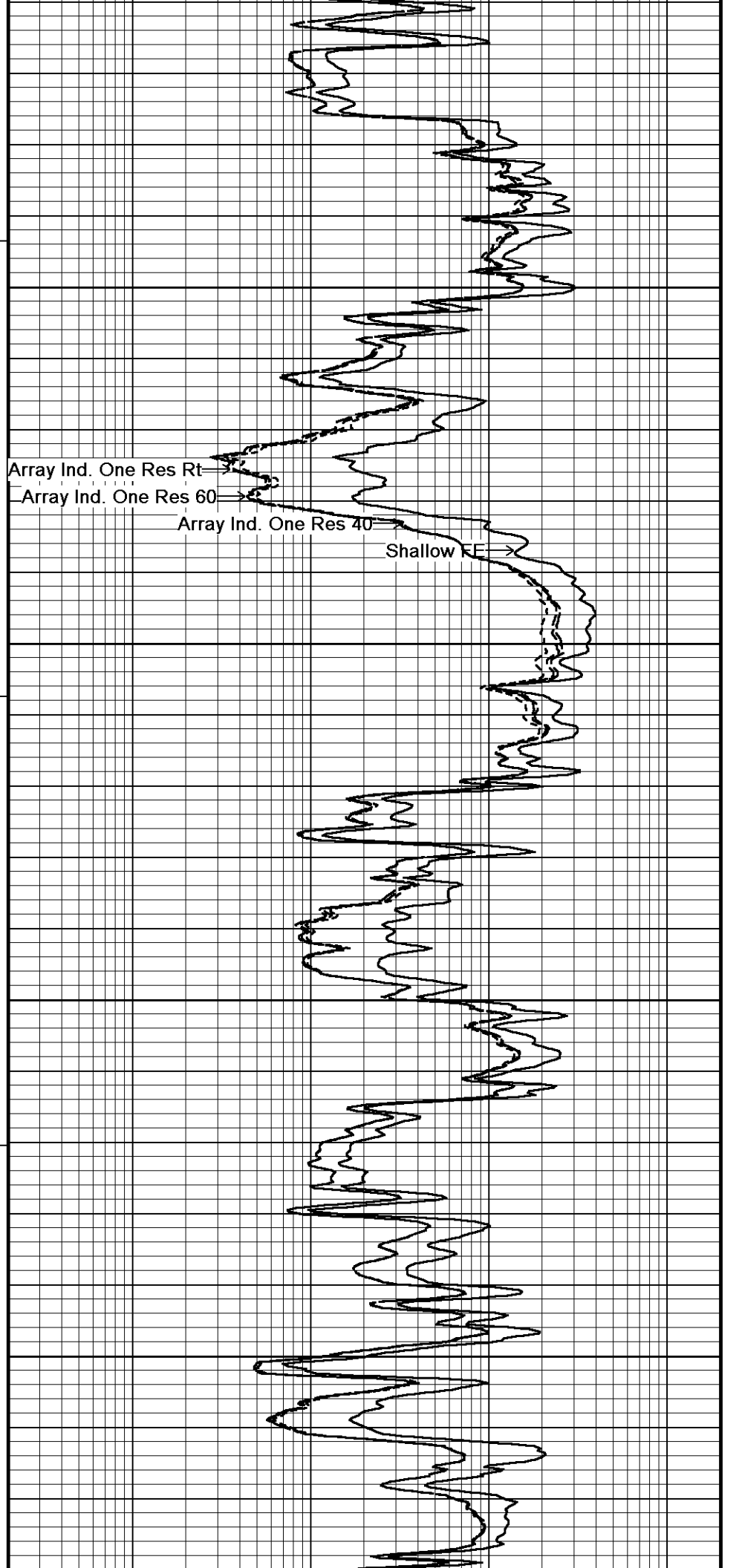
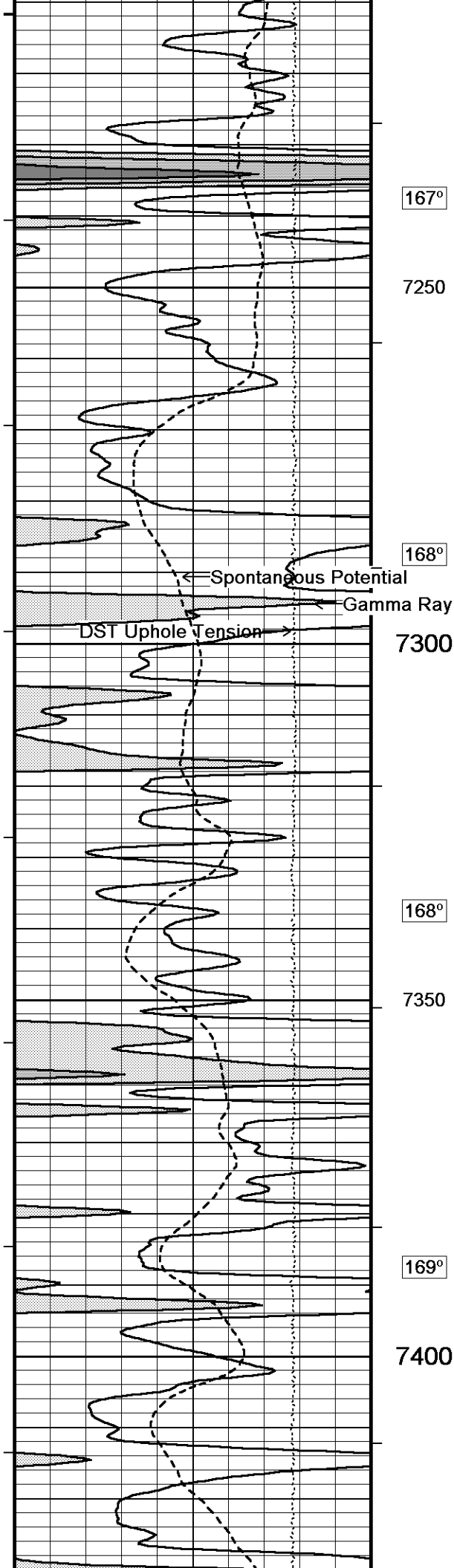


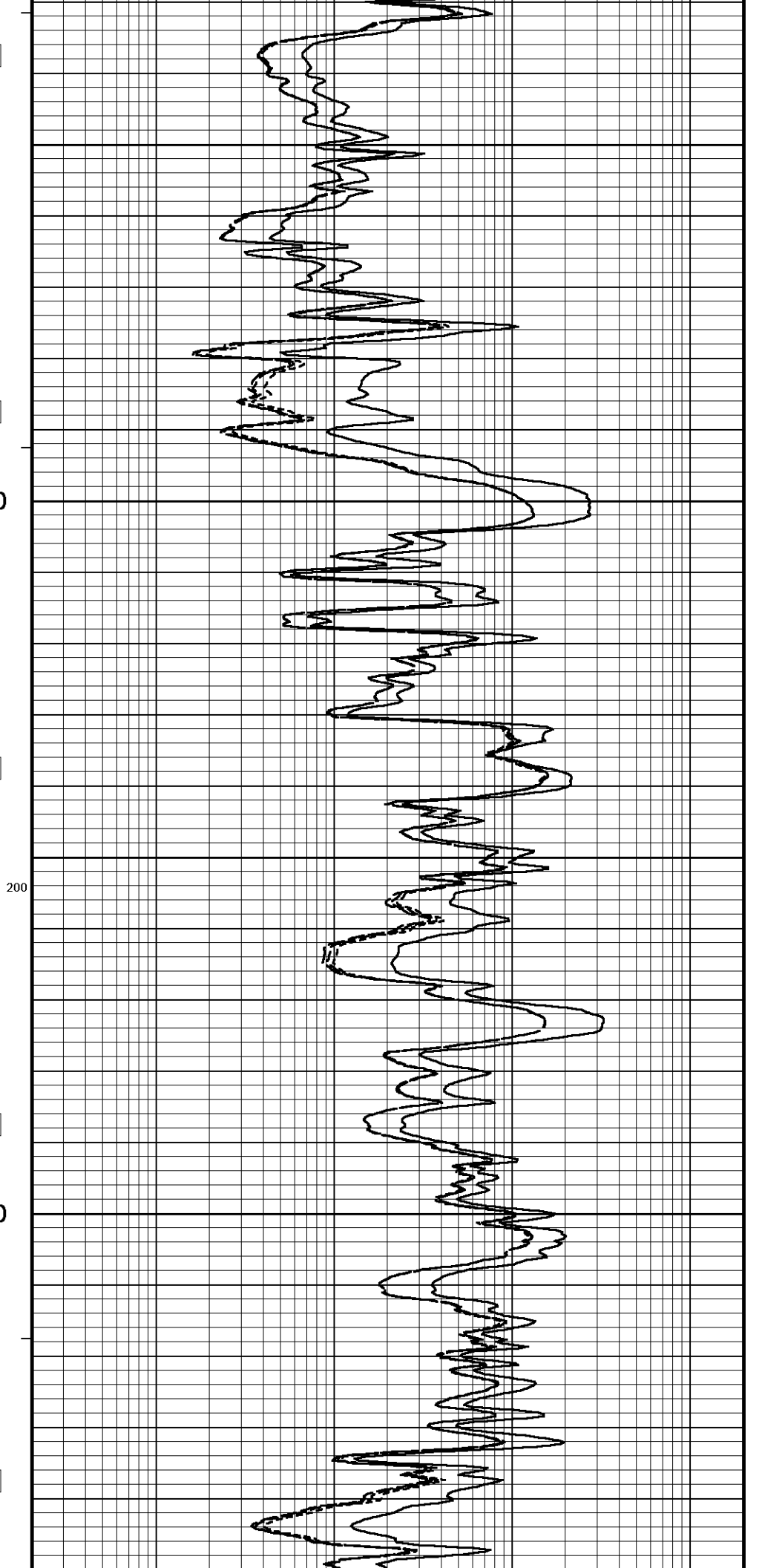
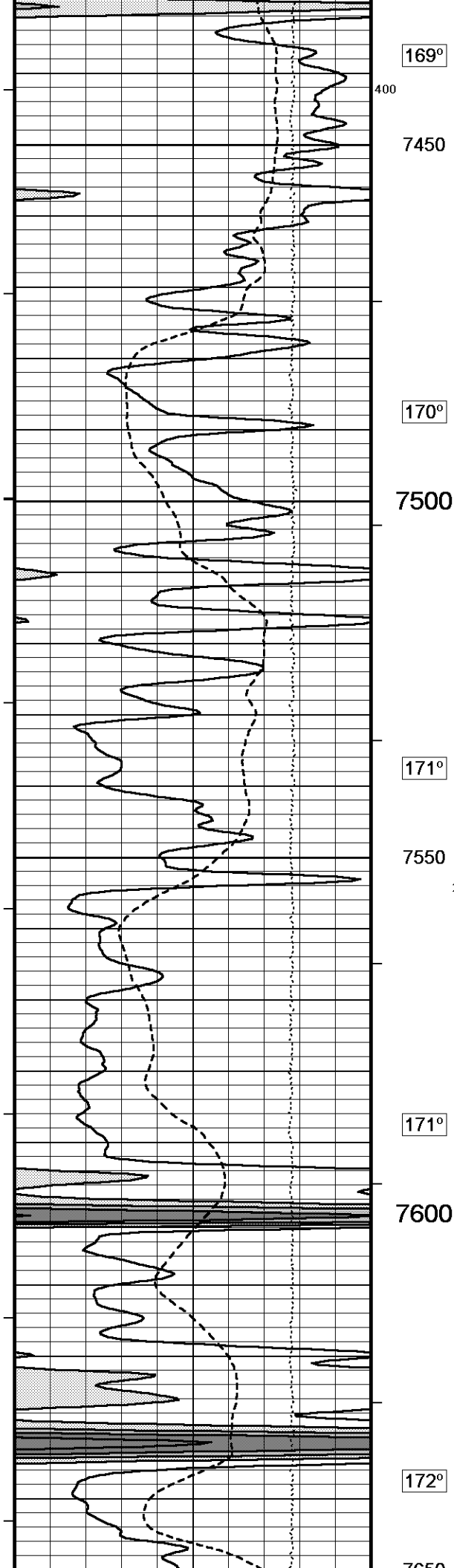


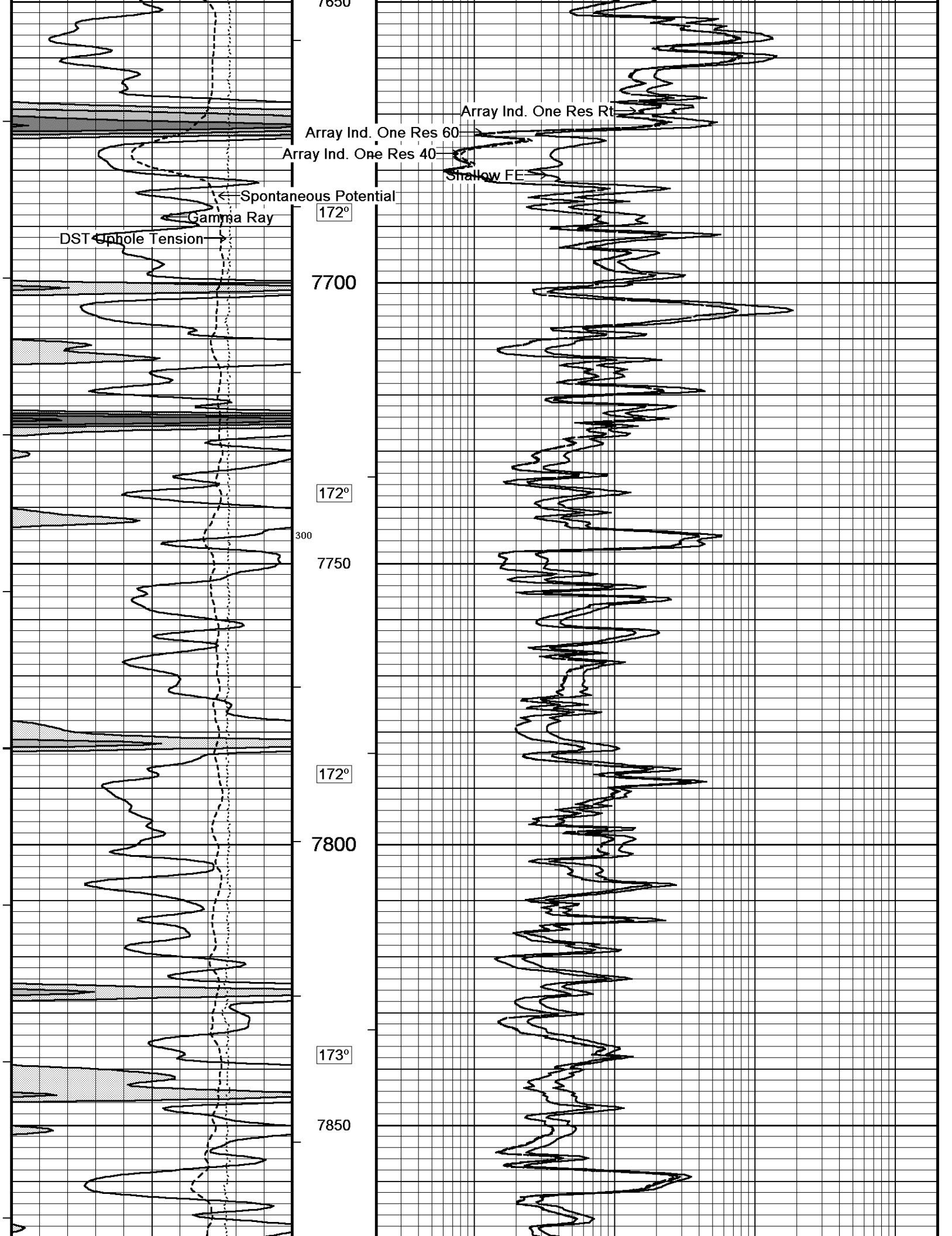


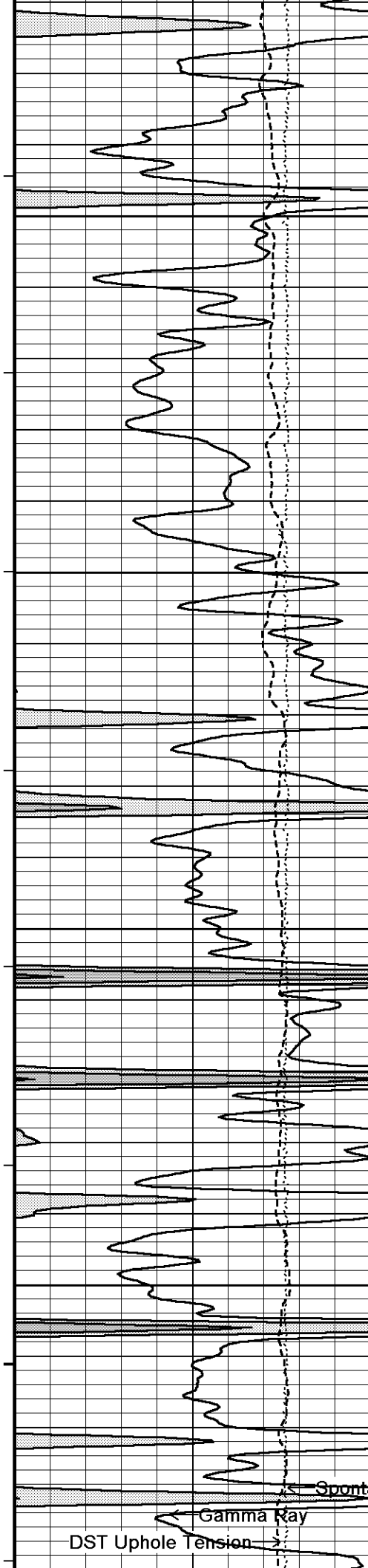




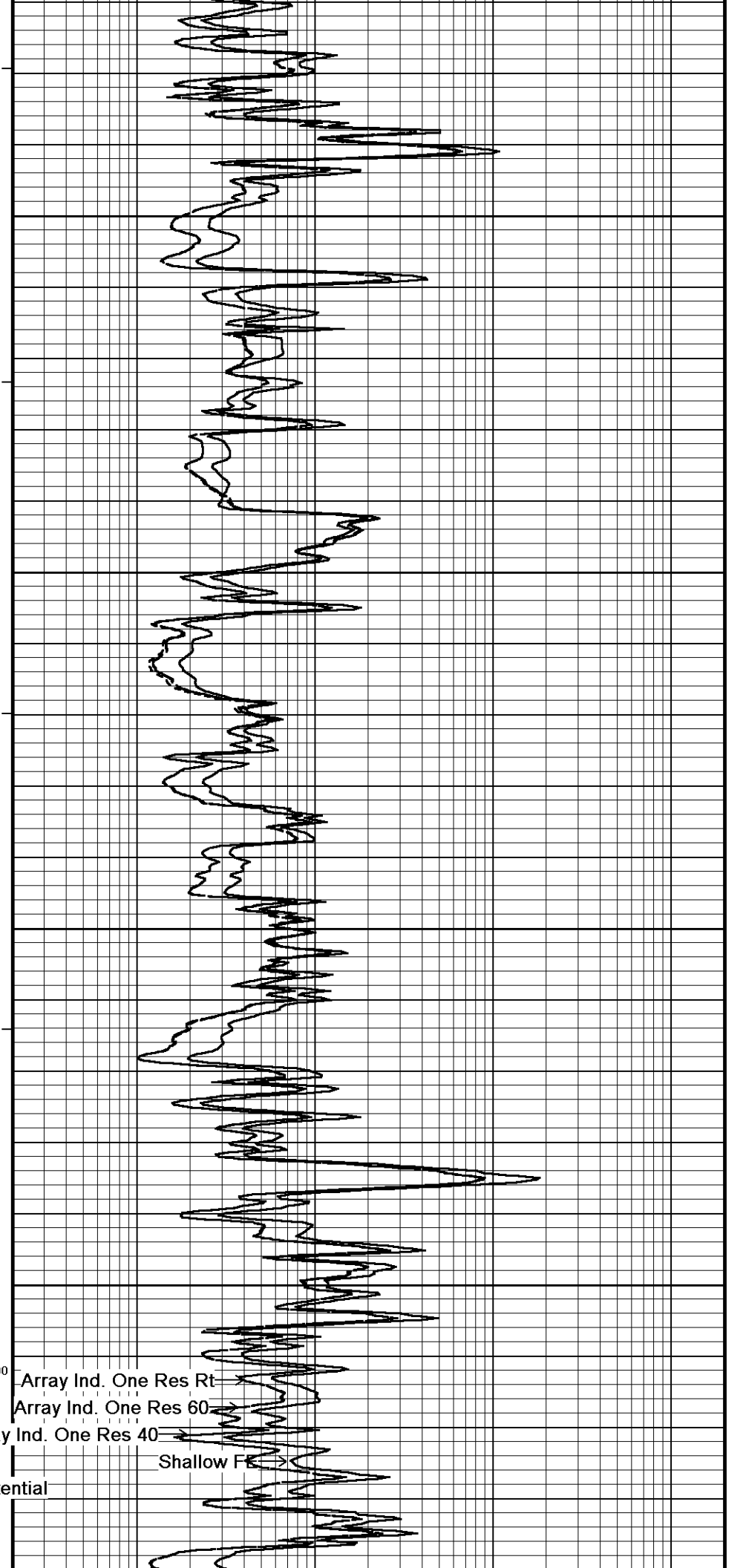




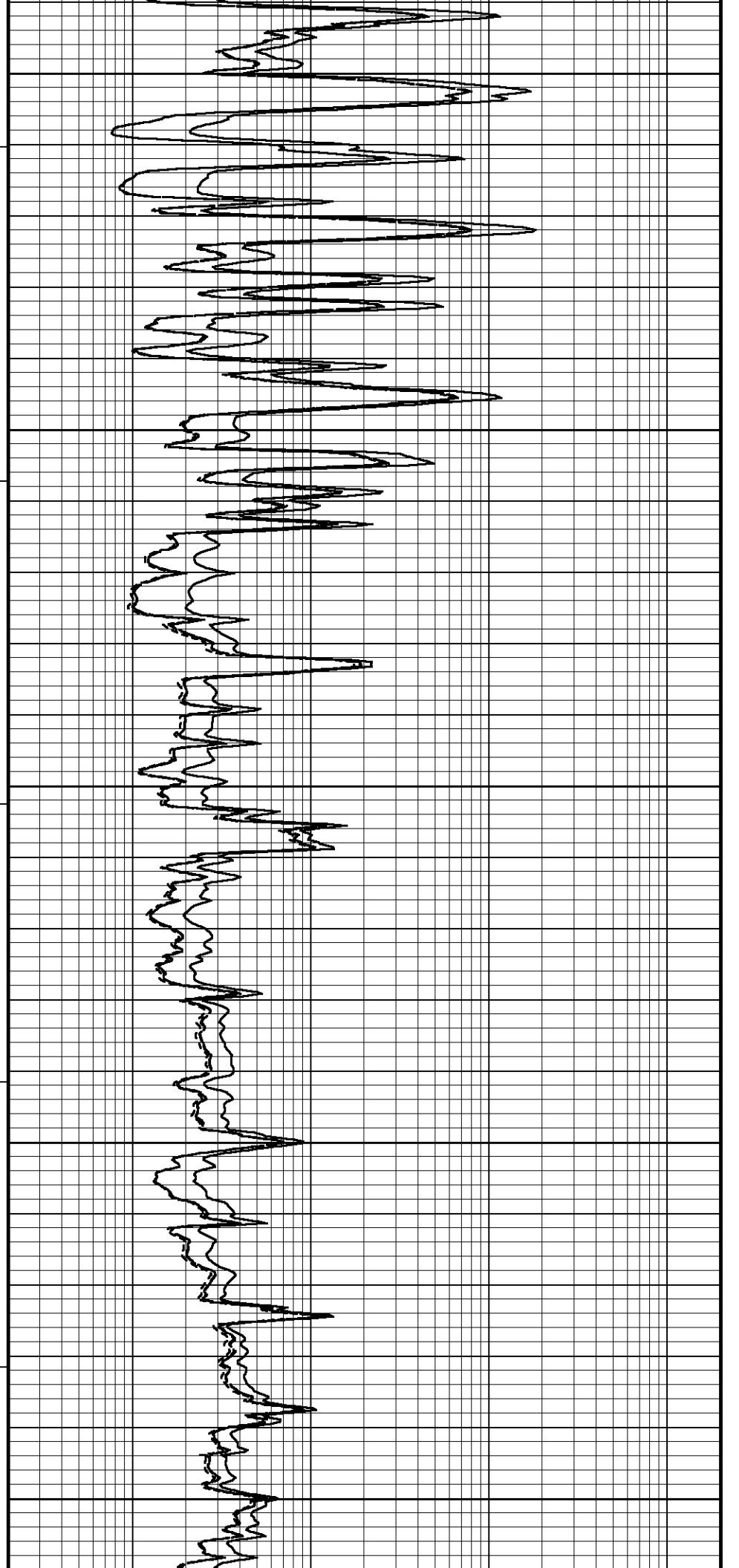
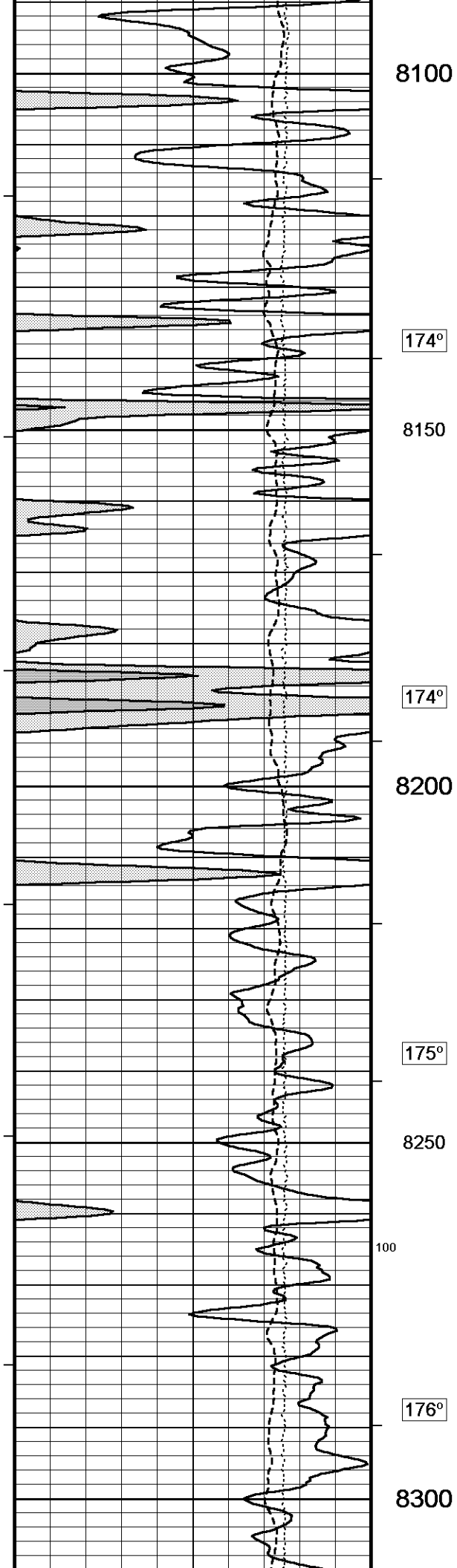


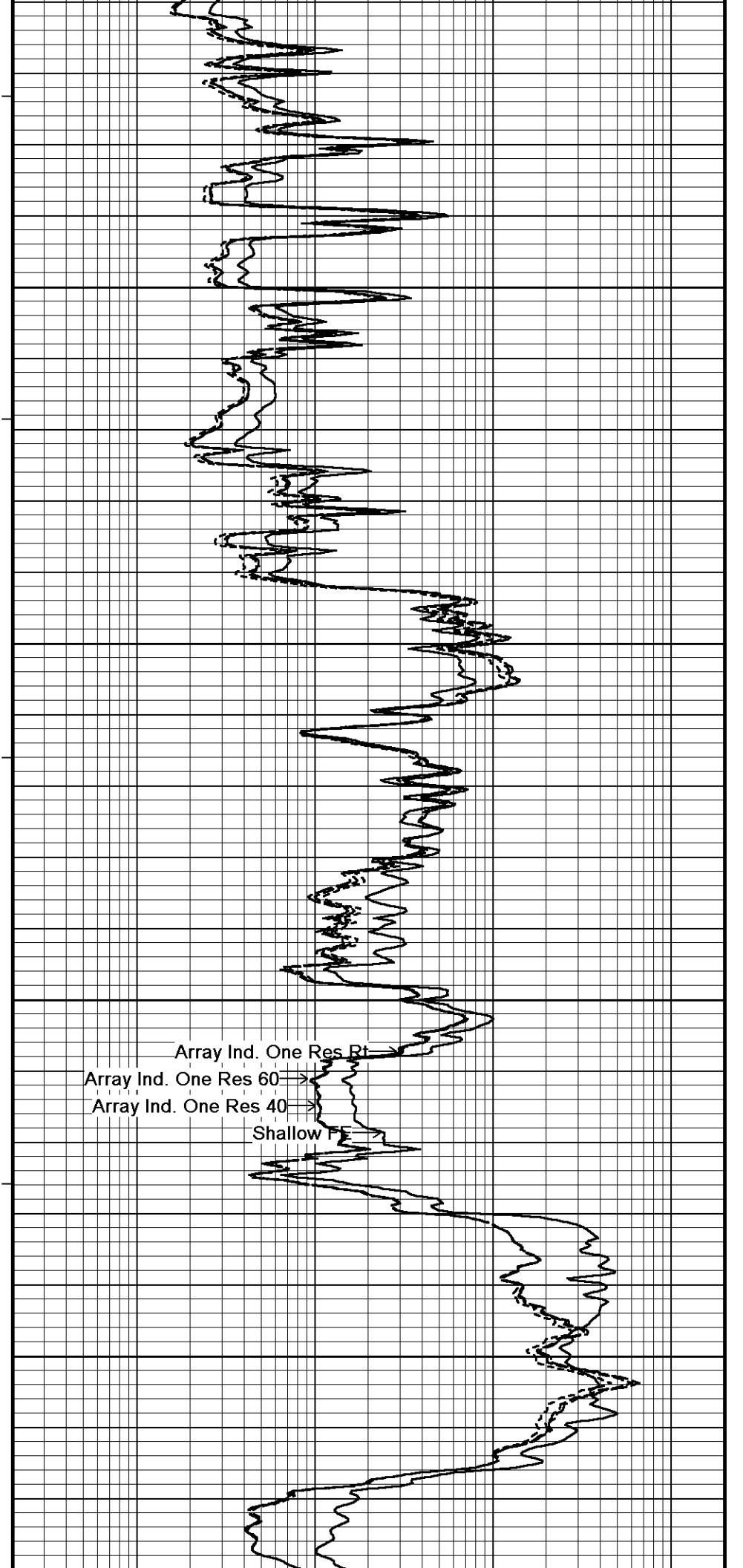
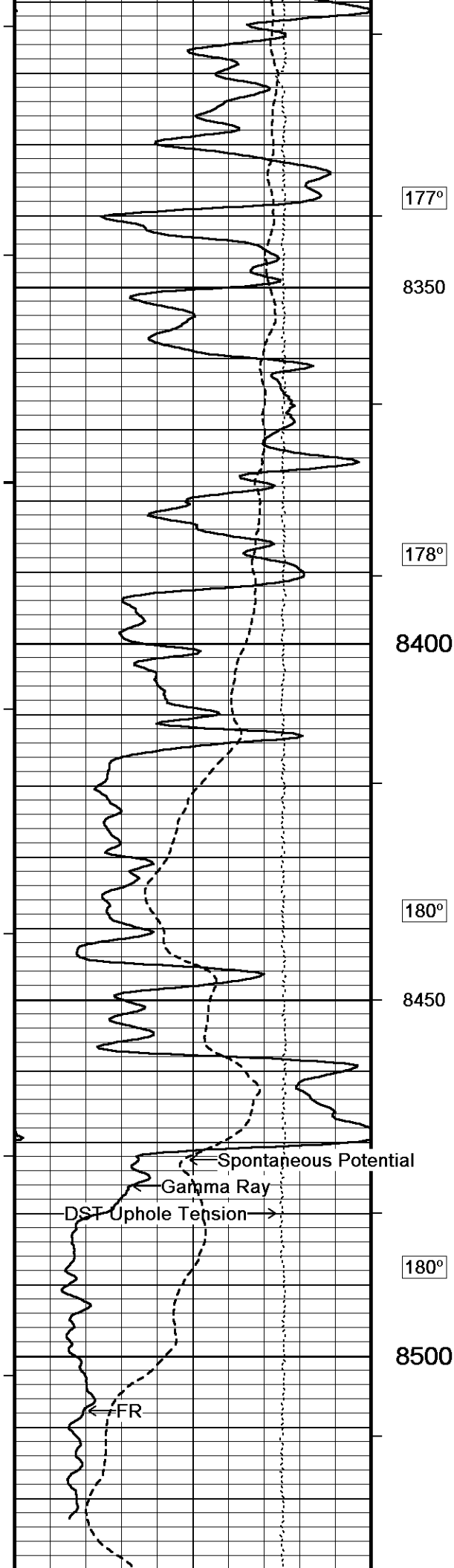


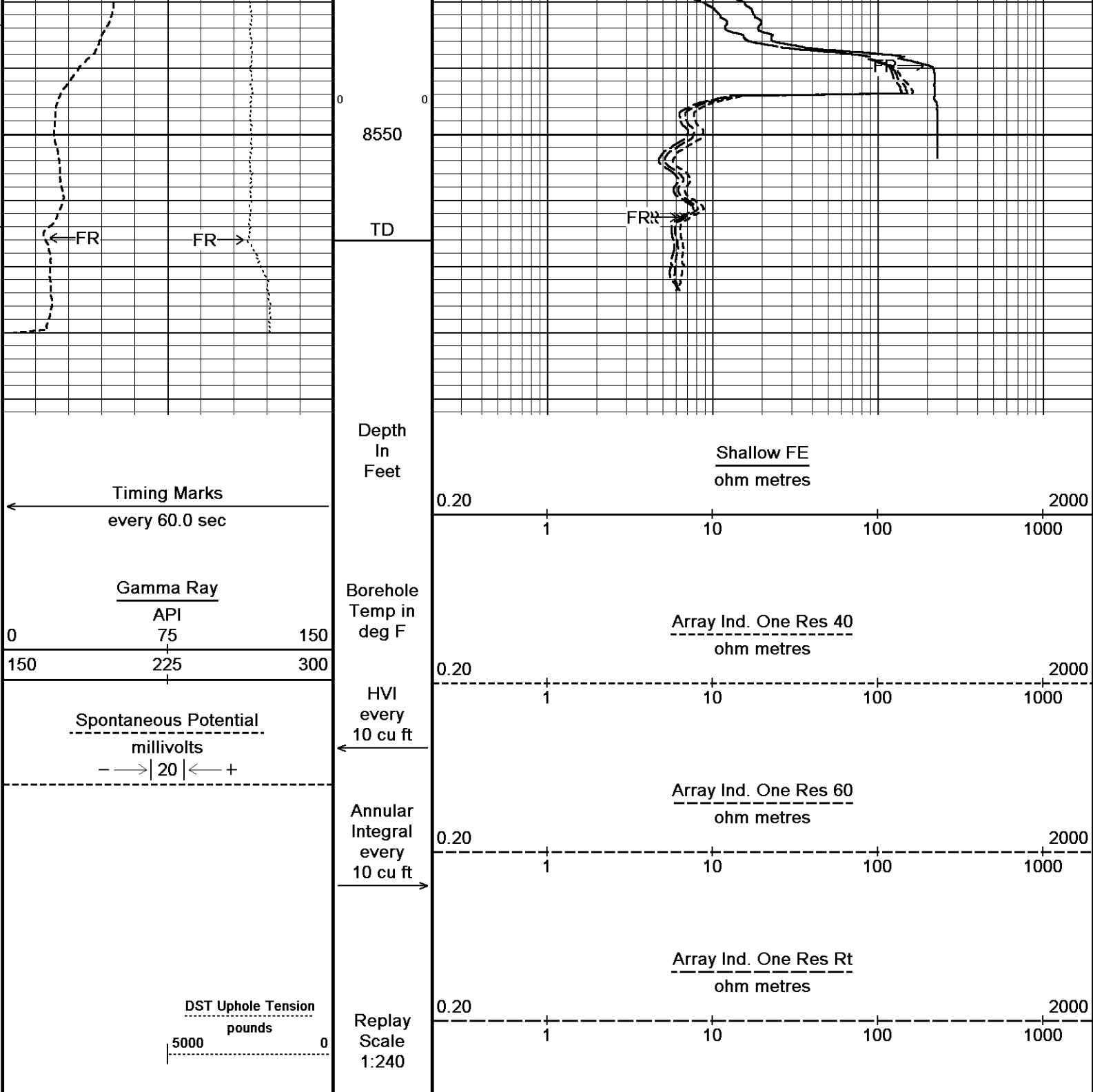
173°
7900
173°
7950
173°
8000
200
173°
8050
100
173°



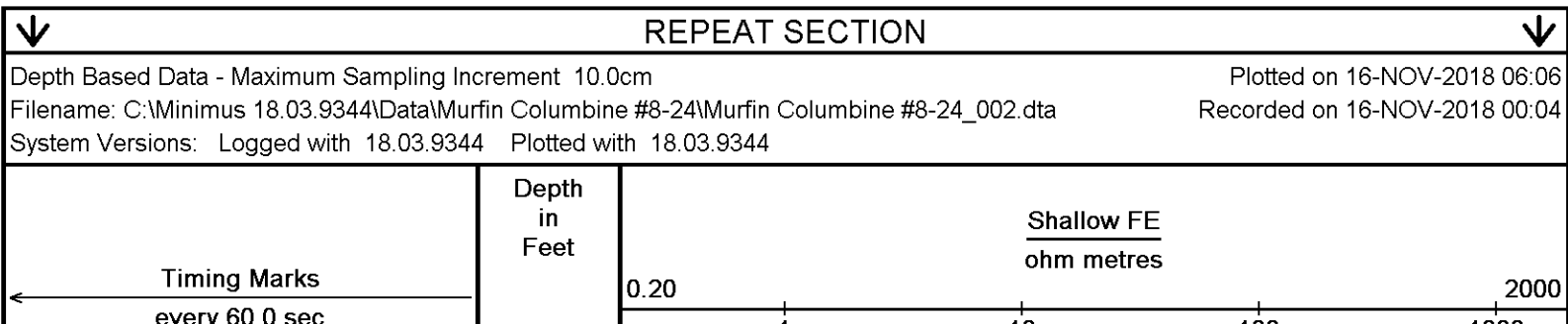
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow F

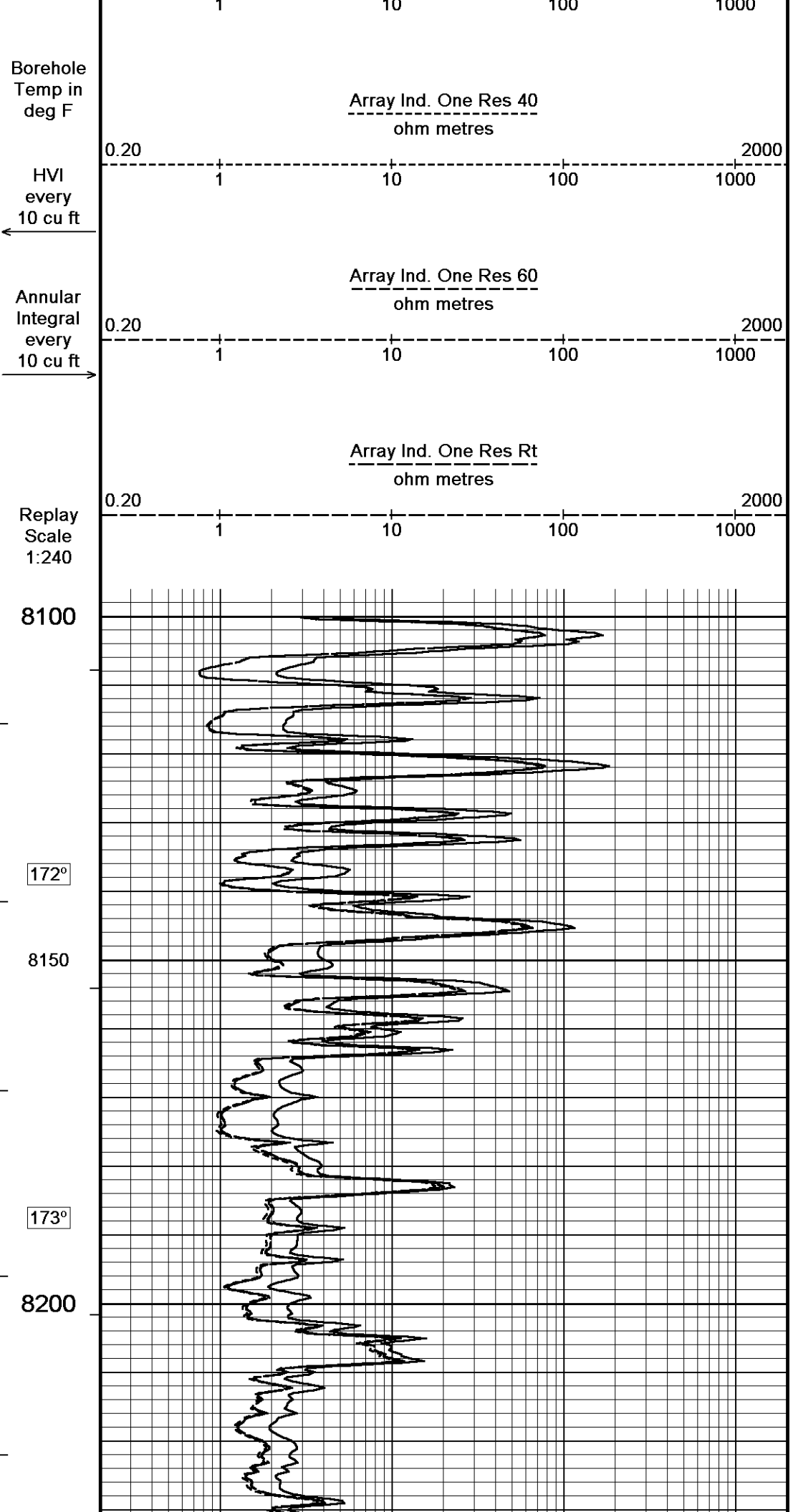
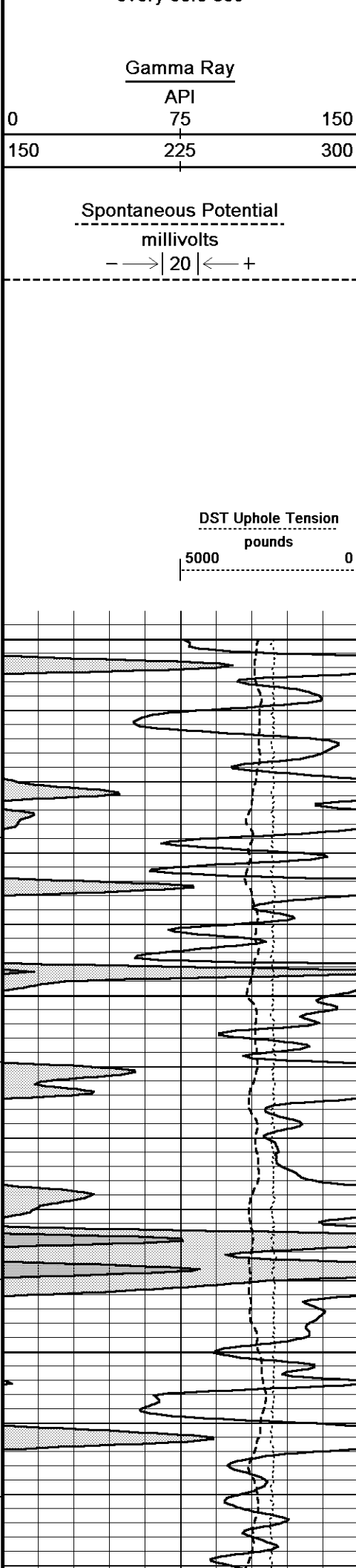


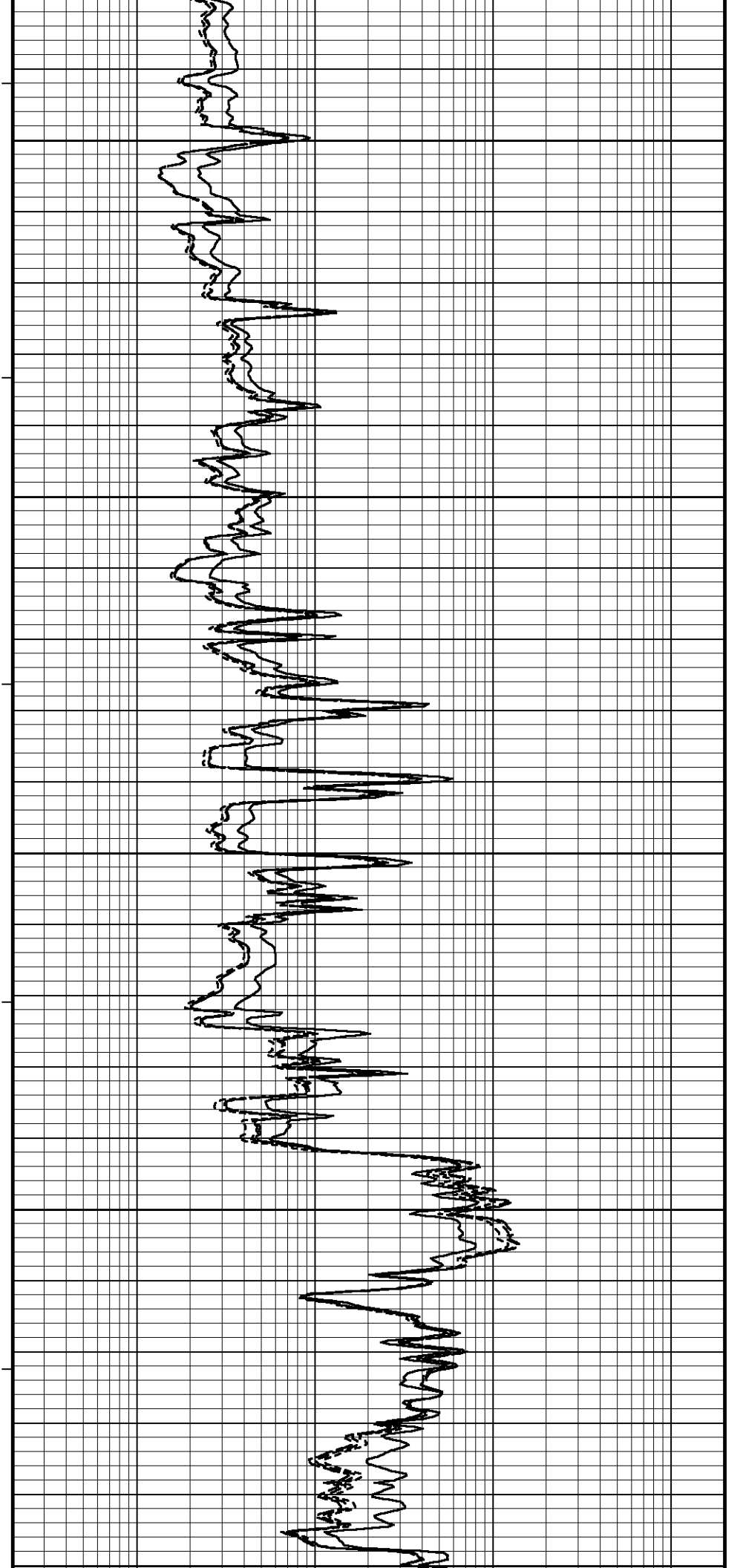
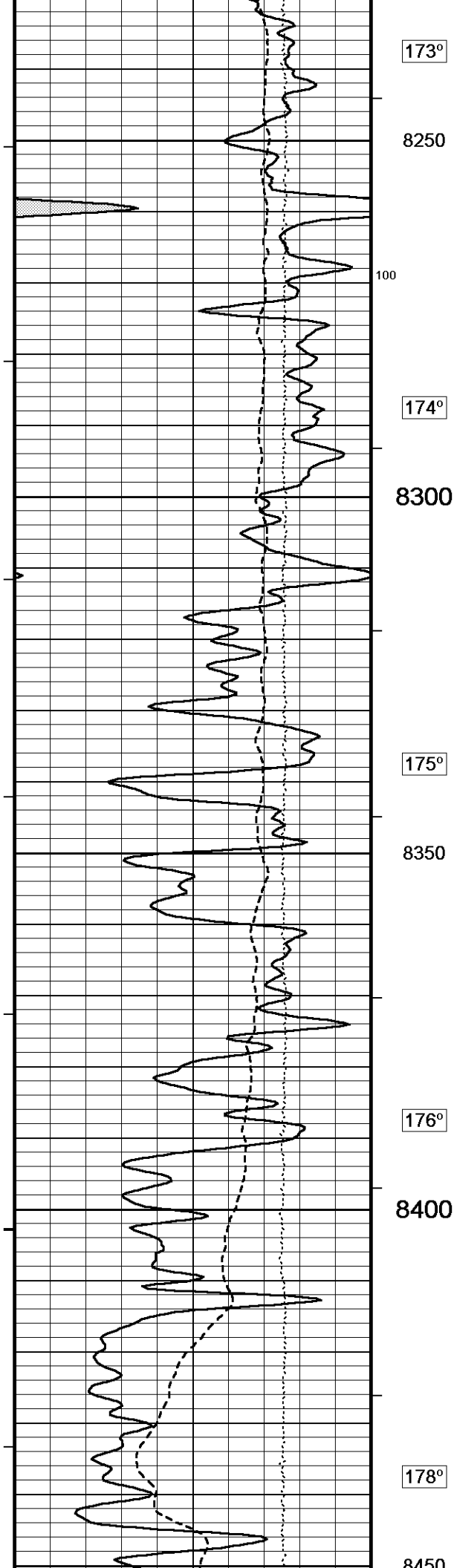


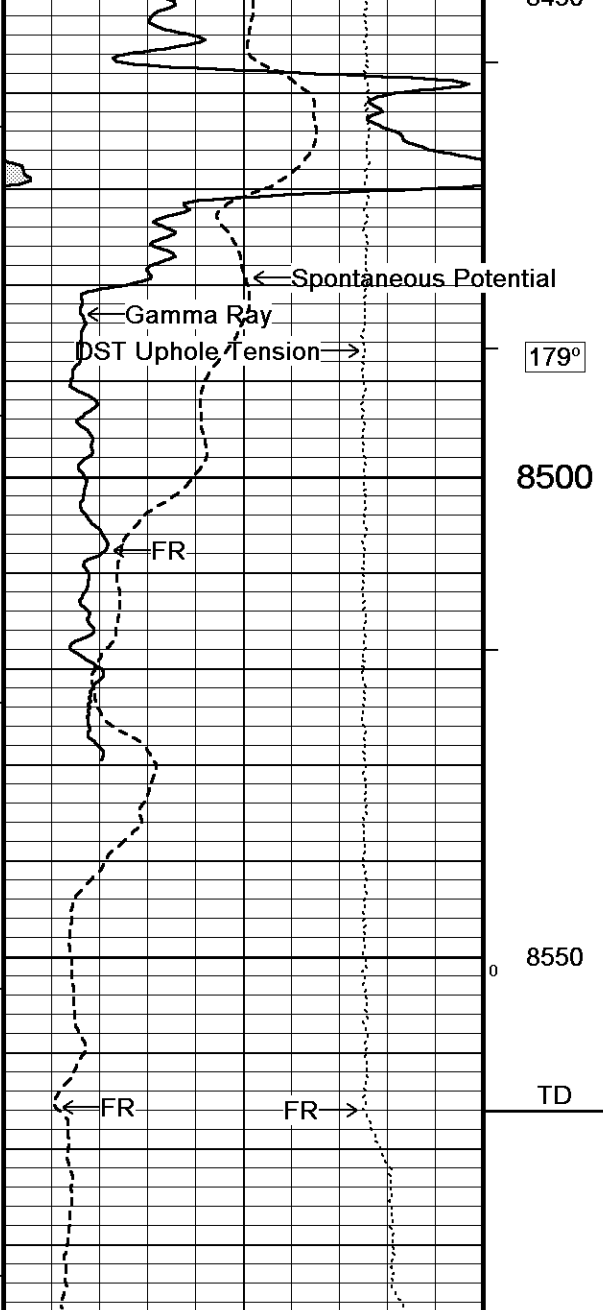


Depth Based Data - Maximum Sampling Increment 10.0cm	Plotted on 16-NOV-2018 06:06
Filename: C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24 Splice.dta	Recorded on 16-NOV-2018 00:31
System Versions: Processed with 18.03.9344 Plotted with 18.03.9344	
5 INCH MAIN	









← Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

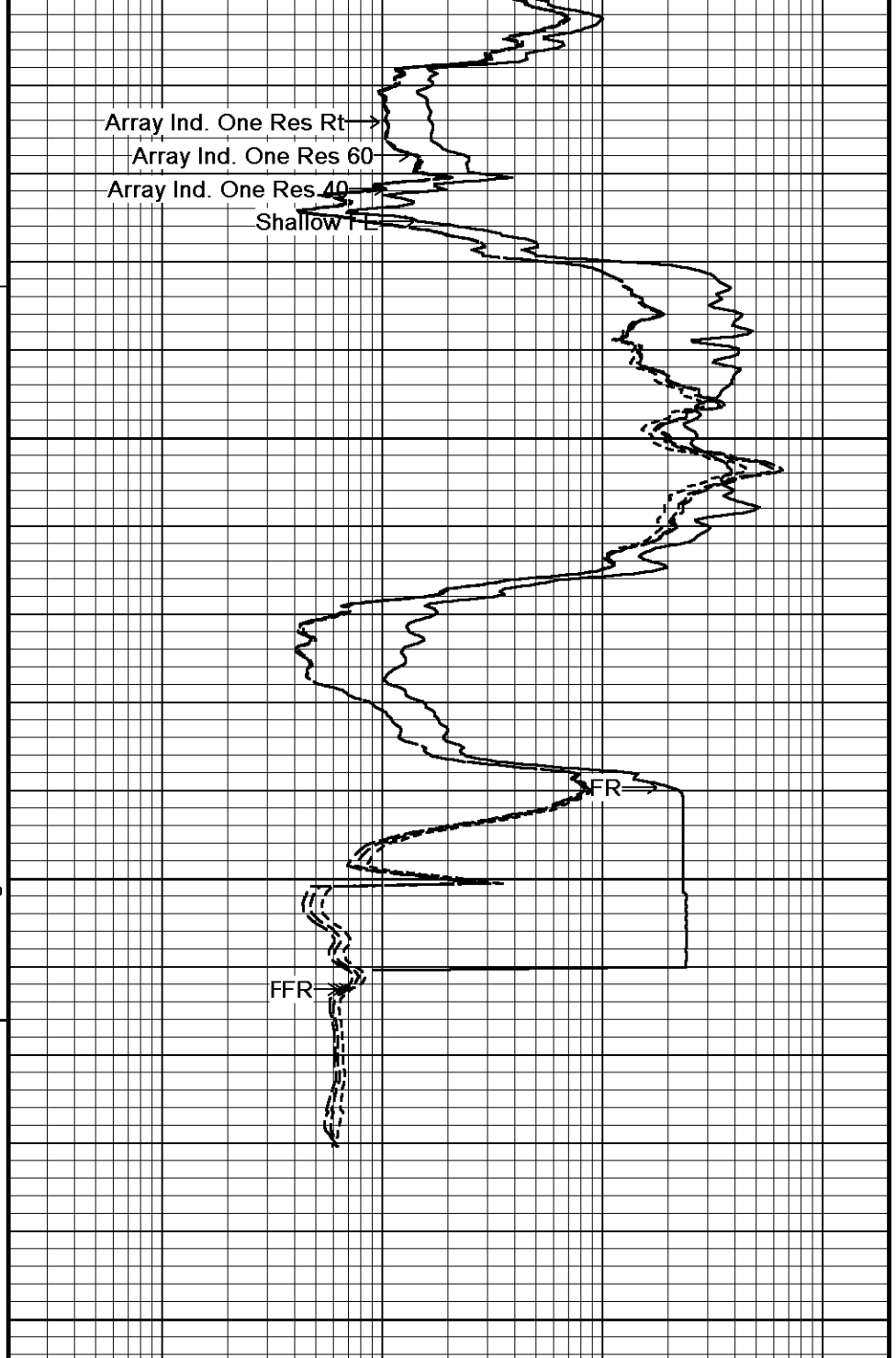
Spontaneous Potential
millivolts
- - - - - 20 - - - - - +

Depth
in
Feet

Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral



Shallow FE
ohm metres

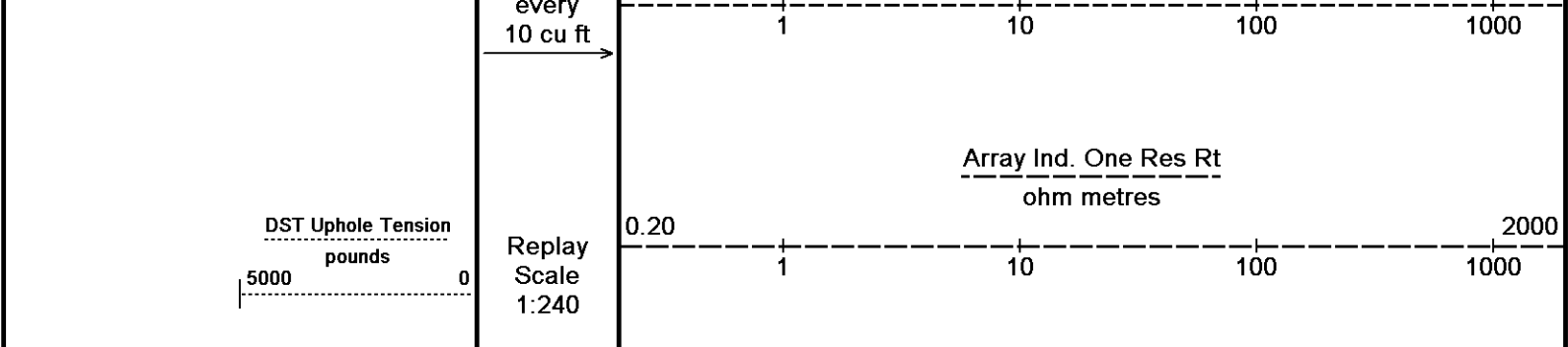
0.20 1 10 100 1000 2000

Array Ind. One Res 40
ohm metres

0.20 1 10 100 1000 2000

Array Ind. One Res 60
ohm metres

0.20 1 10 100 1000 2000



Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 16-NOV-2018 06:06
 Filename: C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta Recorded on 16-NOV-2018 00:04
 System Versions: Logged with 18.03.9344 Plotted with 18.03.9344

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION
 C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta

General Constants All 000			Last Edited on 15-NOV-2018,23:03
General Parameters			
Mud Resistivity	0.850	ohm-metres	
Mud Resistivity Temperature	75.000	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. Two Res Rt		
RWA Constant A	0.620		
RWA Constant M	2.150		
SW/APOR Tool Source	0.000		

Down-hole Tension Calibration SMS 0			Field Calibration on 15-NOV-2018 22:34
Reading No	Measured	Calibrated (lbs)	
1	15808.85	0.00	
2	17295.28	527.00	

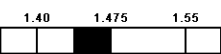
SP Calibration MCG-D.K 443			Field Calibration on 12-OCT-2018,05:20
	Measured	Calibrated (mV)	
Reference 1	103.5	100.0	
Reference 2	-96.9	-100.1	

High Resolution Temperature Calibration MCG-D.K 443			Field Calibration on 12-OCT-2018,05:20
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	212.00	212.00	

High Resolution Temperature Constants MCG-D.K 443			Last Edited on 12-OCT-2018,05:20
Pre-filter Length	11		

Gamma Calibration MCG-D.K 443			Field Calibration on 14-NOV-2018 17:02
	Measured	Calibrated (API)	
Background	73	51	
Calibrator (Gross)	728	507	
Calibrator (Net)	655	456	

Gamma Calibration Tolerances MCG-D.K 443

Ratio 1.436  Counts/API

Gamma Constants MCG-D.K 443

Last Edited on 15-NOV-2018,20:40

Gamma Calibrator Number MCGGRCC141
 GRC-M Calibrator Jig in Use? NO
 Inactive Background Jig in Use? NO
 Mud Density 1.13 gm/cc
 Caliper Source for Processing Density Caliper
 Tool Position Eccentred
 Potassium Equivalence Chloride
 K Mud Concentration 0.00 %


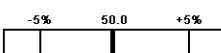
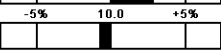
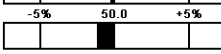
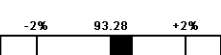
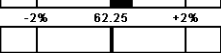
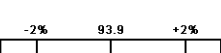
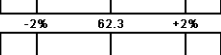
Micro Normal and Micro Inverse Calibration MMR-B.A 91

Base Calibration on 14-NOV-2018 16:15

Field Check on 14-NOV-2018 16:19

	Resistor 1 (ohm)	Resistor 2 (ohm)
Base Calibration	10.0	50.0
	Measured	Calibrated (ohm-m)
Micro Normal	10.3 49.8	5.1 25.6
Micro Inverse	9.9 49.4	3.4 16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.9	93.9
Micro Inverse	62.3	62.3

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91

Micro Normal Res. 1	10.3		ohm	Micro Normal Res. 2	49.8		ohm
Micro Inverse Res. 1	9.9		ohm	Micro Inverse Res. 2	49.4		ohm
Micro Normal Base Check	93.9		ohm-m				
Micro Inverse Base Check	62.3		ohm-m				
Micro Normal Field Check	93.9		ohm-m				
Micro Inverse Field Check	62.3		ohm-m				

Micro Normal and Micro Inverse Constants MMR-B.A 91

Last Edited on 13-APR-2018,05:04

Pad Type 8-12 in Soft Rubber Inflatable 006-9011-159
 Micro Normal K Factor 0.5110
 Micro Inverse K Factor 0.3380
 Standoff Offset 0.0000 inches

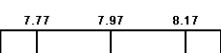
Caliper Calibration MMR-B.A 91

Base Calibration on 14-NOV-2018 16:08

Field Calibration on 14-NOV-2018 16:09

Base Calibration	Reading No	Measured	Calibrator Size (in)
	1	14000	5.98
	2	17358	7.97
	3	20707	9.86
	4	24750	11.92
	5	0	0.00
	6	N/A	N/A
Field Calibration		Measured Caliper (in)	Actual Caliper (in)
		7.97	7.97

Caliper Calibration Tolerances MMR-B.A 91

Short Arm Field Cal. 7.97  in

Micro-Resistivity Caliper Constants MMR-B.A 91

Sonde Configuration Resistivity Mode

Micro Laterolog Calibration MMR-B.A 91

Base Calibration on 31-DEC-1999 00:00

	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	0.0
Base Calibration		
	Measured	Calibrated (ohm-m)
	Ref 1 Ref 2	Ref 1 Ref 2
	0.0 0.0	0.0 0.0
	Base Check (ohm-m)	Field Check (ohm-m)
	0.0	0.0

Micro Laterolog Constants MMR-B.A 91

Pad Type	6 in Solid Nylon B23059	
Standoff Offset	0.0000	inches
Micro Laterolog K Factor	0.0128	
Micro Laterolog Rm K Factor	N/A	
Mudcake Thickness Correction Constants		
Mud Cake Source	Constant Value	
Mud Cake Thickness	0.4000	inches
Mud Cake Thickness Caliper		
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	20.00	Degrees C
Mud Cake Resistivity Source	Constant Value	
Temp. for Rmc Corr.	MCG External Temperature	

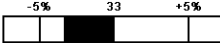
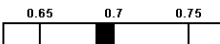
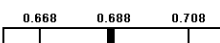
Neutron Calibration MDN-B.A 292

Base Calibration on 25-OCT-2018,14:15

Field Check on 14-NOV-2018 17:08

Base Calibration		
	Measured	Calibrated (cps)
	Near Far	Near Far
	2910 91	3714 110
Ratio	31.871	33.764
Field Calibrator at Base		Calibrated (cps)
		2207 3209
Ratio		0.688
Field Check		Calibrated (cps)
		2170 3165
Ratio		0.686

Neutron Calibration Tolerances MDN-B.A 292

Ratio	31.871	
Base Check	0.688	
Field Check	0.686	

Neutron Constants MDN-B.A 292

Last Edited on 15-NOV-2018,20:40

Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Legacy	
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

FE Calibration MFE-B.J 352

Base Calibration on 25-OCT-2018 13:00

Field Check on 14-NOV-2018 16:37

	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	1000.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	963.2	126.8
Base Check		281.4
Field Check		281.4

FE Calibration Tolerances MFE-B.J 352

Reference 2	963.2	<div><div></div><div></div><div></div><div></div><div></div></div>	ohm
Base Check	281.4	<div><div></div><div></div><div></div><div></div><div></div></div>	ohm-m
Field Check	281.4	<div><div></div><div></div><div></div><div></div><div></div></div>	ohm-m

FE Constants MFE-B.J 352

Last Edited on 15-NOV-2018,20:39

Running Mode	No Sleeve
MFE K Factor	0.1268
Borehole Correction Constants	
Sonde Position	0.5 inches
Hole Size Source	Density Caliper
Hole Size Constant Value	N/A inches
Rm Source	Global Value: Temperature Corrected
Temp. for Rm Corr.	MCG External Temperature

Sonic Constants MSS-C.K 319

Last Edited on 08-JUL-2018,09:57

Maximum Boundary Contrast	70.00	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
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 (ft)	
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
Waveform Discriminator Filter	Not Applied	
Semblance Window Width	150.00	micro-sec
Semblance Processing Enabled	Yes	
Tracking Boxes Enabled In Processing	Yes	

Induction Calibration MAI-B.J 390

Factory Loop Calibration 25-OCT-2018 13:24

Field Check on 14-NOV-2018 16:35

Factory Loop Calibration

High Conductivity Reference Resistor	3.3	ohm
Low Conductivity Reference Resistor	333.3	ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	16.8	458.6	9.3	966.2	2.166	-27.2
2	6.3	377.7	7.6	821.4	2.191	-6.2
3	3.8	258.6	5.2	566.0	2.200	-3.0
4 (far)	1.9	132.3	2.6	279.2	2.121	-1.4
Array Temperature	77.9		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		
	Low	High	Low	High	
1 (near)	11.3	3958.7	10.4	3957.3	
2	28.3	3562.5	27.6	3561.2	
3	26.5	3060.2	25.8	3059.6	
4 (far)	18.8	2087.1	18.3	2086.7	
Array Temperature	61.2		65.5		Deg F

Induction Check Tolerances MAI-B.J 390

Low Array 1	10.4	<div><div>9.8 11.3 12.8</div></div>	mmho/m	High Array 1	3957.3	<div><div>-0.5% 3958.7 +0.5%</div></div>	mmho/m
Low Array 2	27.6	<div><div>26.8 28.3 29.8</div></div>	mmho/m	High Array 2	3561.2	<div><div>-0.5% 3562.5 +0.5%</div></div>	mmho/m
Low Array 3	25.8	<div><div>25.0 26.5 28.0</div></div>	mmho/m	High Array 3	3059.6	<div><div>-0.5% 3060.2 +0.5%</div></div>	mmho/m
Low Array 4	18.3	<div><div>17.3 18.8 20.3</div></div>	mmho/m	High Array 4	2086.7	<div><div>-0.5% 2087.1 +0.5%</div></div>	mmho/m

Induction Constants MAI-B.J 390

Last Edited on 15-NOV-2018,20:39

Induction Model	RtAP-WBM	
Borehole Correction Constants		
Tool Centred	No	
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
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
Rm Source	Global Value: Constant Temperature	
Temp. for Rm Corr.	N/A	
Borehole Correction Method	Default	
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

Symmetrised Receiver Gains

Receiver 1	1.00
Receiver 2	1.00
Receiver 3	1.00
Receiver 4	1.00

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-B.J 390

Field Calibration on 15-MAY-2018,12:48

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MAI-B.J 390

Last Edited on 06-MAR-2018,13:01

Pre-filter Length	11
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Caliper Calibration MPD-C.A 216

Base Calibration on 25-OCT-2018 13:33

Field Calibration on 14-NOV-2018 16:41

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	15197	3.99
2	23984	5.98
3	32561	7.97
4	40928	9.86
5	50160	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.97	7.97

Caliper Calibration Tolerances MPD-C.A 216

Long Arm Field Cal.	7.97	<div style="display: inline-block; width: 100px; height: 15px; border: 1px solid black; position: relative;"> <div style="position: absolute; top: -5px; left: 10%; width: 10%; text-align: center;">7.57</div> <div style="position: absolute; top: -5px; left: 40%; width: 10%; text-align: center;">7.97</div> <div style="position: absolute; top: -5px; left: 70%; width: 10%; text-align: center;">8.37</div> </div>	in
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Photo Density Calibration MPD-C.A 216

Base Calibration on 25-OCT-2018 13:50

Field Check on 14-NOV-2018 16:47

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Background	1004	1211		
Reference 1	49178	24022	59556	30836
Reference 2	19804	2279	24941	2541

Field Check at Base

1003.7	1210.8
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Field Check

995.0 1181.9

PE Calibration

Base Calibration

Measured

Calibrated

	WS	WH	Ratio	Ratio
Background	184	904		
Reference 1	20688	49027	0.426	0.371
Reference 2	5715	19697	0.294	0.272

Field Check at Base

183.9 904.0

Field Check

181.4 892.8

Photo Density Calibration Tolerances MPD-C.A 216

Near Density Ratio	2.56	-5%	2.52	+5%
PE Calibration	0.123	0.089	0.110	0.131

Far Density Ratio	21.36	-5%	21.00	+5%
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Near Den. Field Check	995.0	-3%	1003.7	+3%
PE WS Field Check	181.4	-6%	183.9	+6%

Far Den. Field Check	1181.9	-3%	1210.8	+3%
PE WH Field Check	892.8	-6%	904.0	+6%

Density Constants MPD-C.A 216

Last Edited on 15-NOV-2018,20:40

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	1.13 gm/cc
Mud Density Type	
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
Precision Enhanced Density Processing	Applied
Matrix Density (gm/cc)	Depth (ft)
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	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 18.03.9344\Data\Murfin Columbine #8-24\Murfin Columbine #8-24_002.dta

Cablehead, 11 pin
CBH-CB 264 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 595 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in



58.18 ft GRGC - MCG Gamma Ray

55.28 ft CGXT - MCG External Temperature

48.92 ft MBTC - MMR Caliper

Compact Neutron
MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.913 in

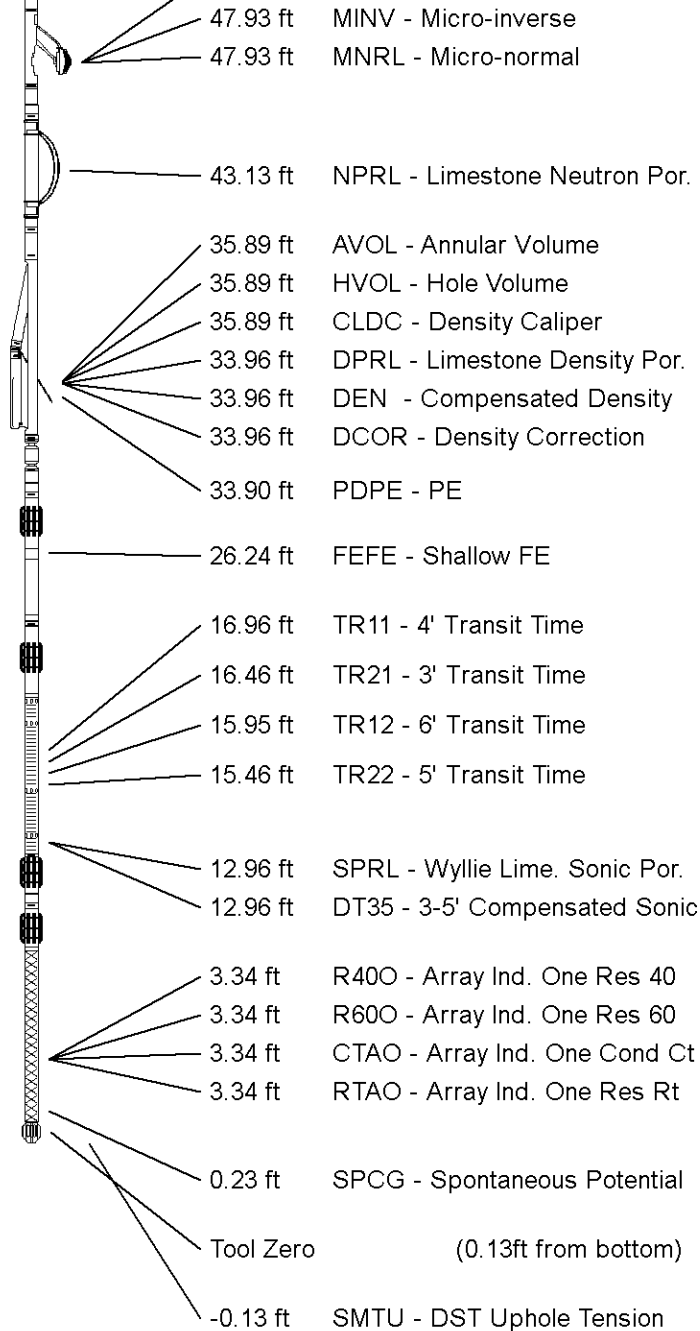
Compact Knuckle Joint
SKJ-D.A 167 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic
MSS-C.K 319 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

Compact Induction
MAI-B.J 390 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 68.16 ft Weight: 526.9 lb



All measurements relative to tool zero.

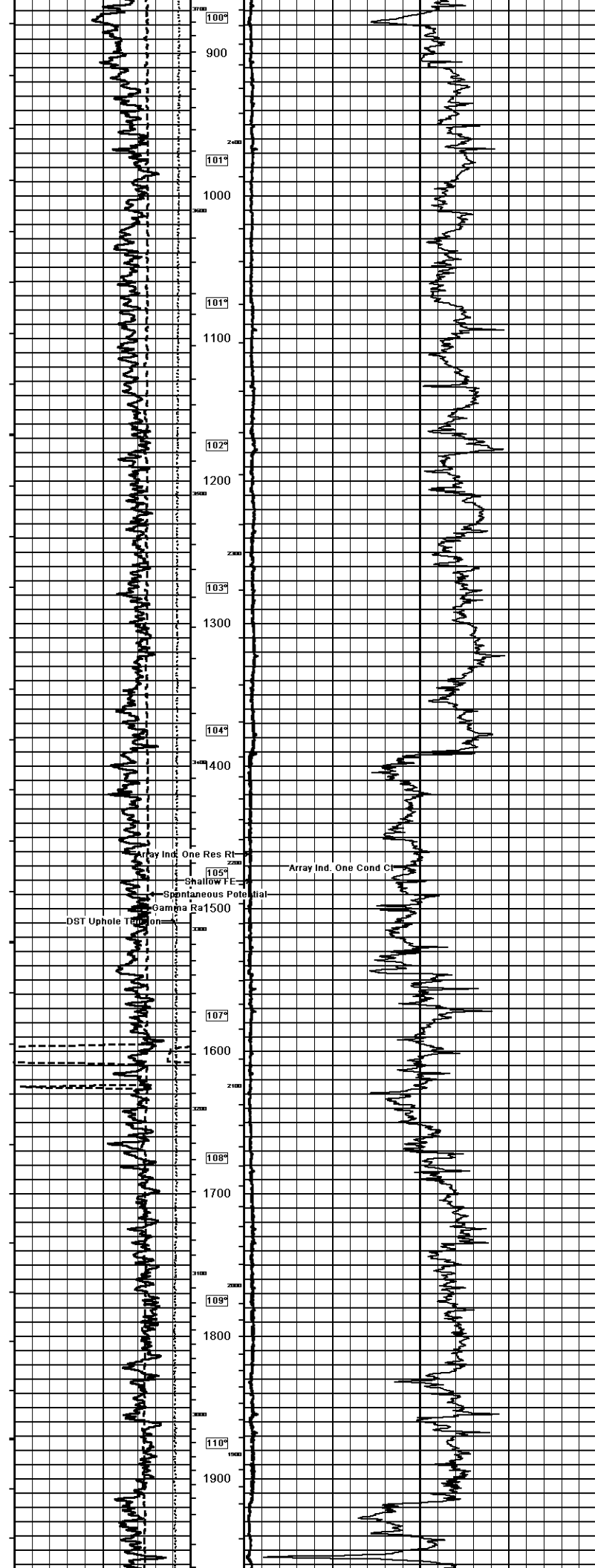
COMPANY MURFIN DRILLING COMPANY, INC.
WELL COLUMBINE #8-24
FIELD WILDCAT
PROVINCE/COUNTY LINCOLN
COUNTRY/STATE U.S.A. / COLORADO

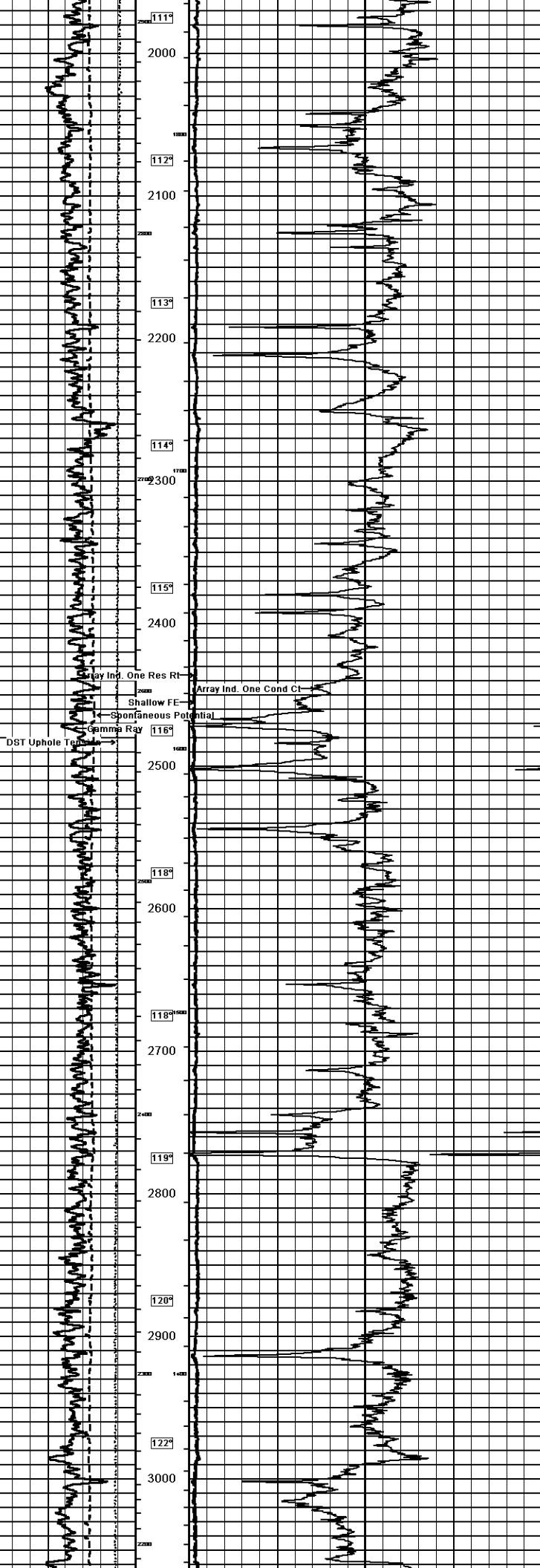
Elevation Kelly Bushing	5393	feet	First Reading	8563.00	feet
Elevation Drill Floor	5391	feet	Depth Driller	8574.00	feet
Elevation Ground Level	5380	feet	Depth Logger	8566.00	feet

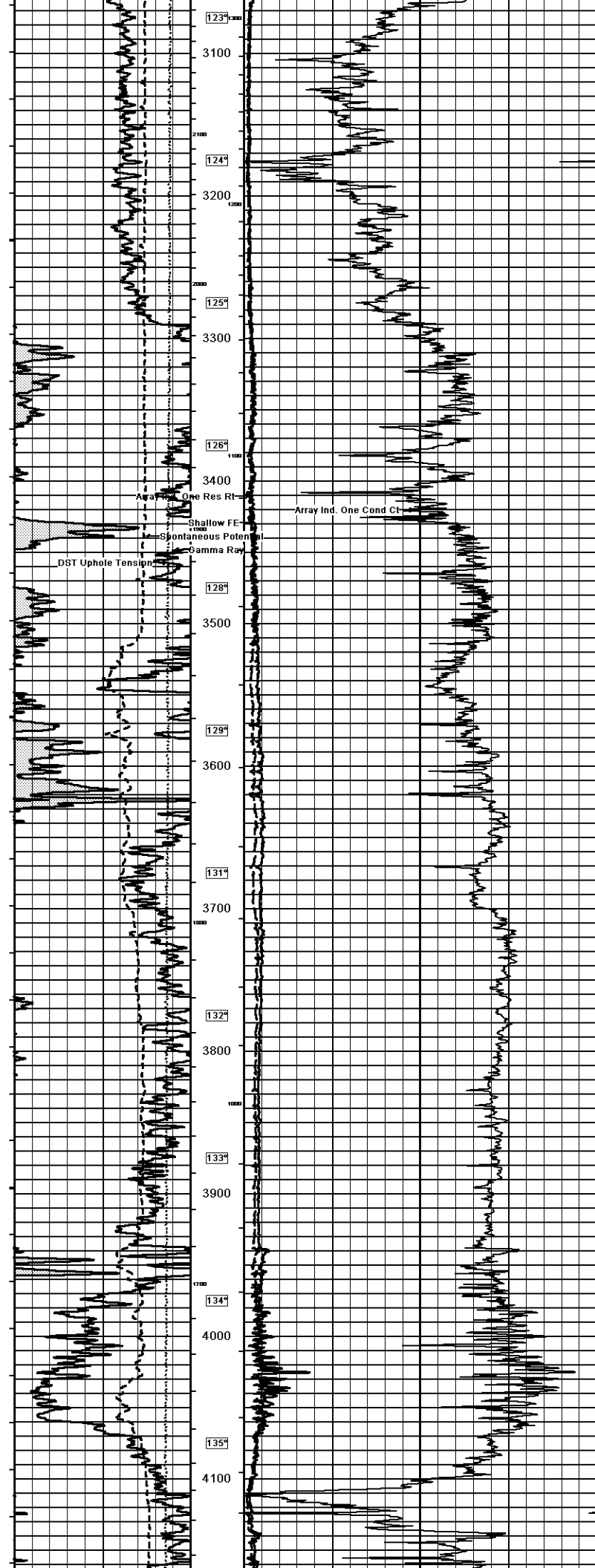


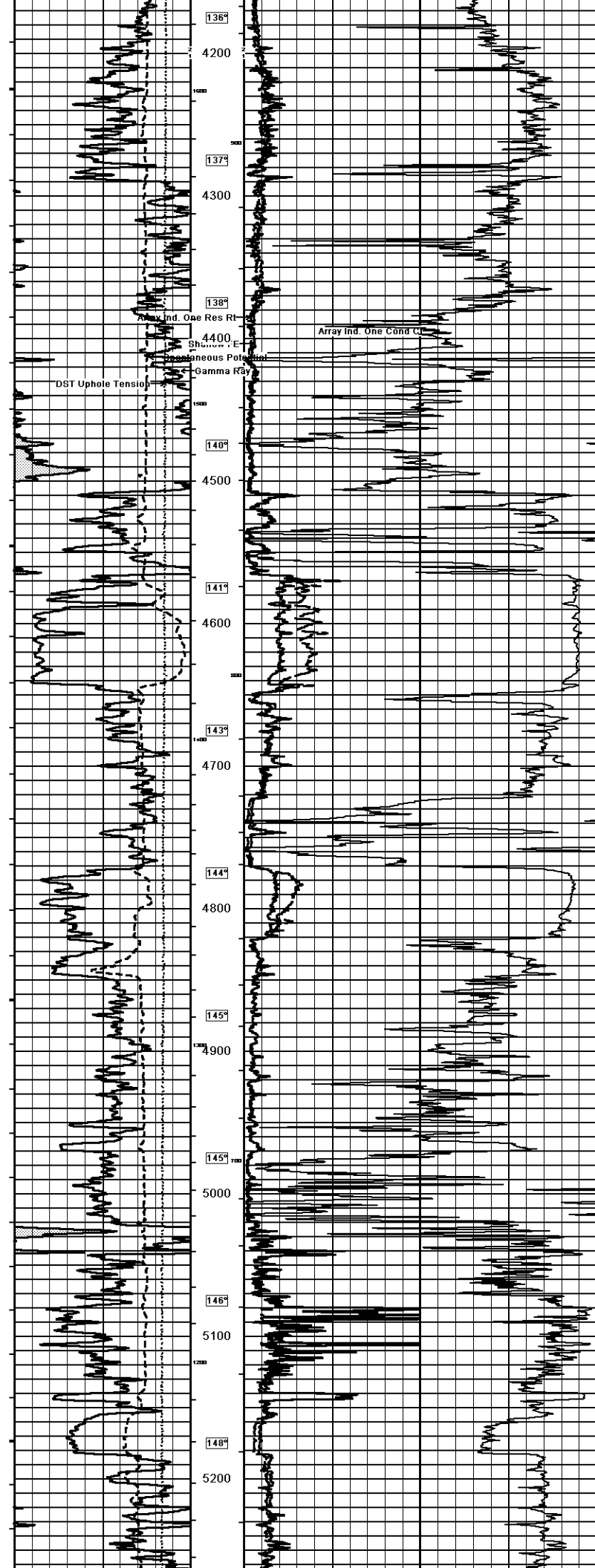
Weatherford®

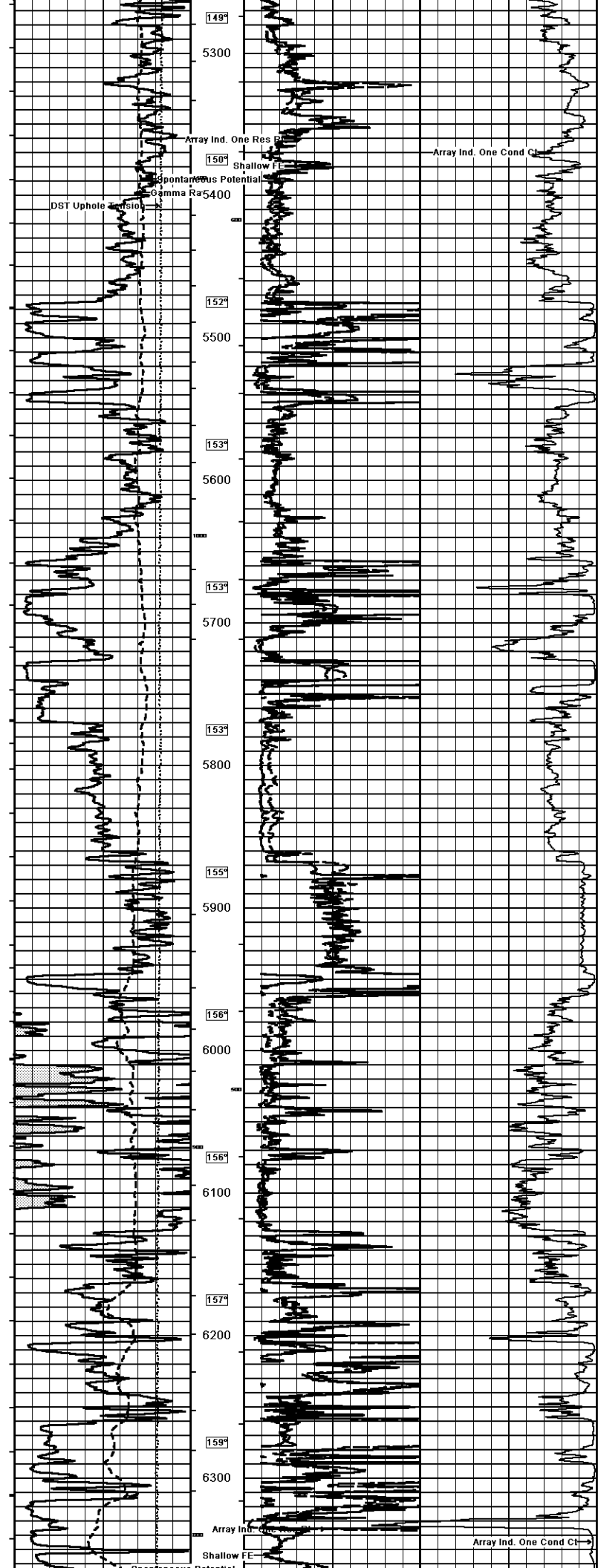
ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

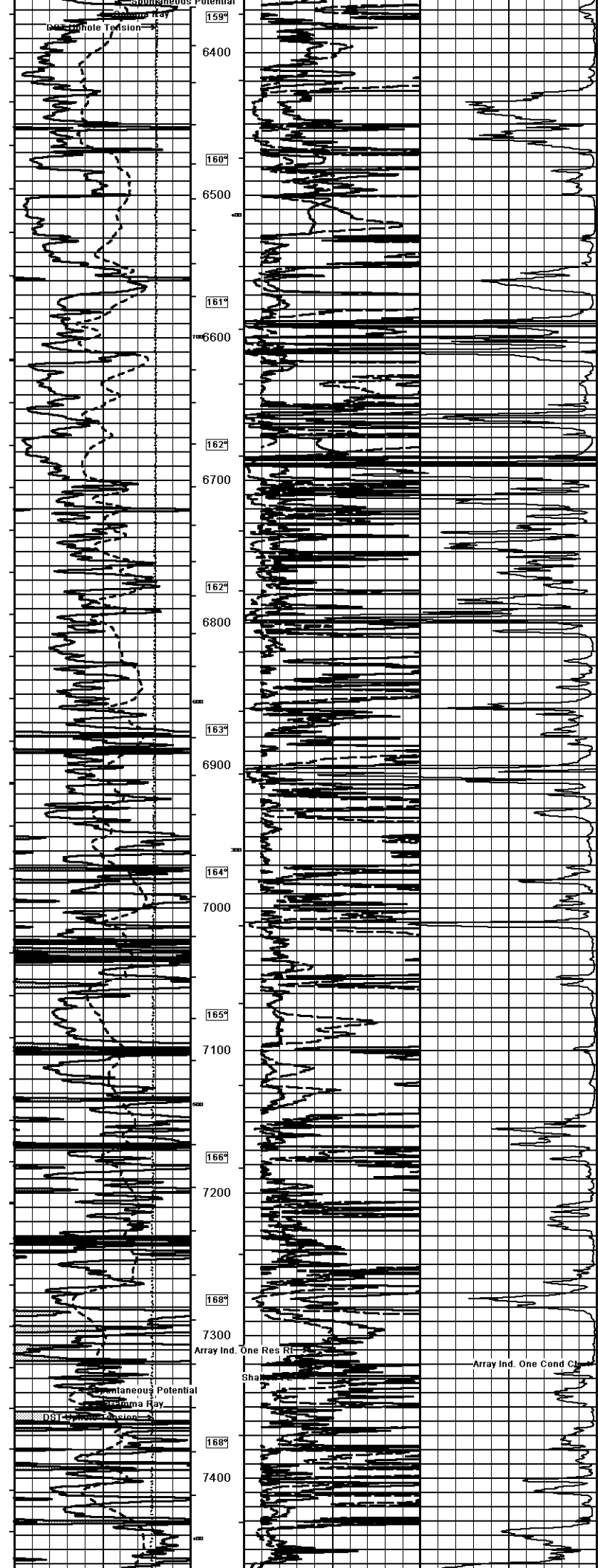


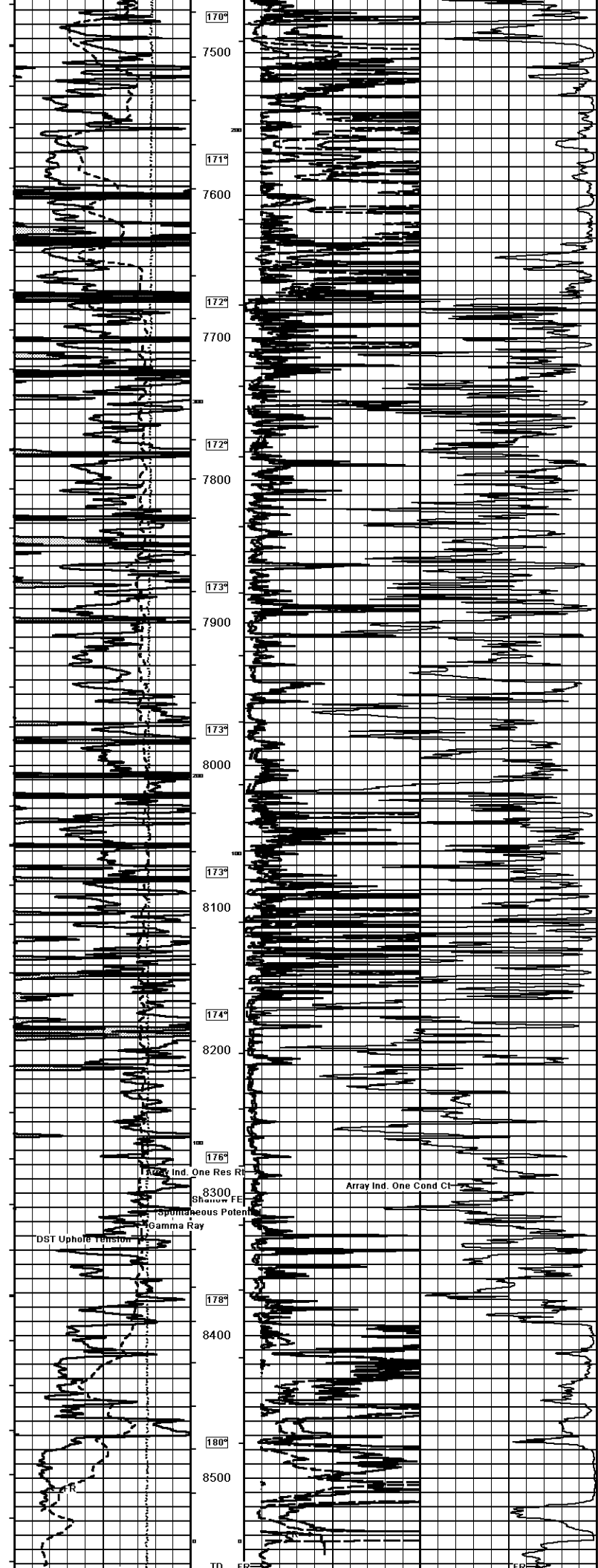


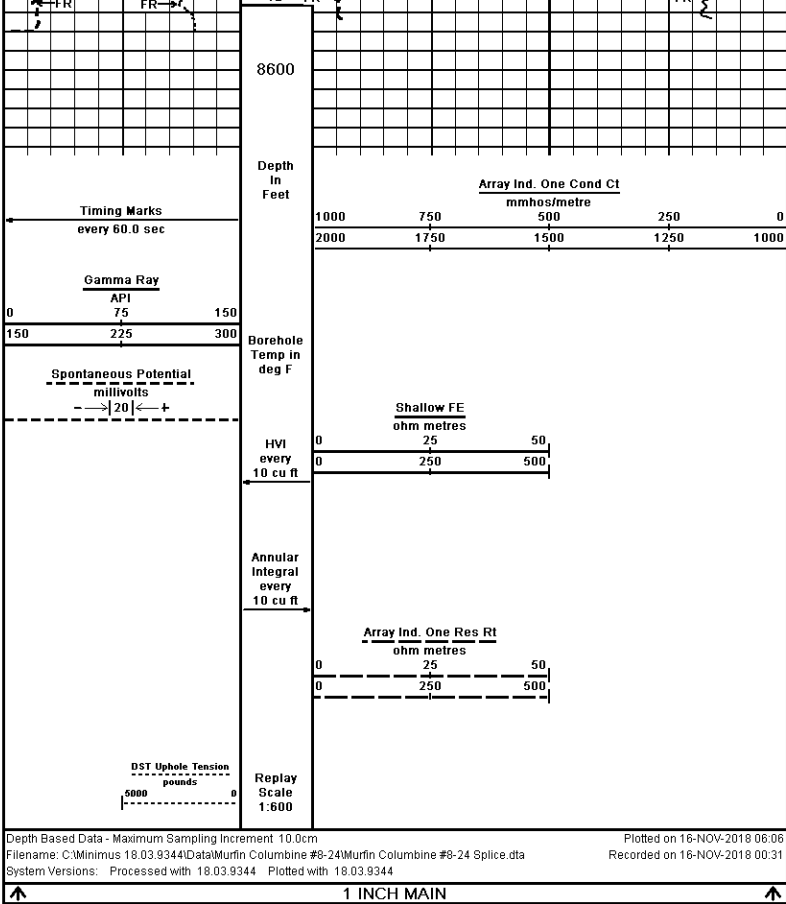













COMPANY		MURFIN DRILLING COMPANY, INC.			
WELL		COLUMBINE #8-24			
FIELD		WILDCAT			
PROVINCE/COUNTY		LINCOLN			
COUNTRY/STATE		U.S.A. / COLORADO			
Elevation Kelly Bushing	5393	feet	First Reading	8563.00	feet
Elevation Drill Floor	5391	feet	Depth Driller	8574.00	feet
Elevation Ground Level	5380	feet	Depth Logger	8566.00	feet
		ARRAY INDUCTION			
Weatherford		SHALLOW FOCUSED			
		ELECTRIC LOG			