



Weatherford[®]

**ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG**

COMPANY	MID-CON ENERGY OPERATING, INC.		
WELL	HRMU 14-1		
FIELD	HARKER RANCH MORROW UNIT		
PROVINCE/COUNTY	CHEYENNE		
COUNTRY/STATE	U.S.A. / COLORADO		
LOCATION	469' FSL & 1320' FWL OF SW/4		
SEC 1	TWP 13S	RGE 43W	Other Services
Latitude	MPD/MDN		
Longitude			
API Number	05-017-0714800		
Permanent Datum GL, Elevation	4028.59 feet		
Log Measured From	KB		
Drilling Measured From	KB @ 16.6 feet		
Date	06-SEP-2014		Elevations: KB 4045.19 DF 4043.19 GL 4028.59
Run Number	TWO		
Service Order	7577-97212326		
Depth Driller	5350.00	feet	
Depth Logger	5349.00	feet	
First Reading	5345.85	feet	
Last Reading	632.00	feet	
Casing Driller	626.00	feet	
Casing Logger	632.00	feet	
Bit Size	7.875	inches	
Hole Fluid Type	CHEMICAL		
Density / Viscosity	8.50 lb/USg	20.00 CP	
PH / Fluid Loss	11.00	8.80 ml/30Min	
Sample Source	MUD PIT		
Rm @ Measured Temp	1.51 @ 96.0	ohm-m	
Rmf @ Measured Temp	1.21 @ 96.0	ohm-m	
Rmc @ Measured Temp	1.81 @ 96.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	1.12 @ 131.0	ohm-m	
Time Since Circulation	3.5 HOURS		
Max Recorded Temp	131.00	deg F	
Equipment / Base	13244	LIB	
Recorded By	JEFFREY RANDLE		
Witnessed By	CLINT ARNOLD		
JOB #	LB14-264		

BOREHOLE RECORD

Last Edited: 06-SEP-2014 20:43

Bit Size inches	Depth From feet	Depth To feet
7.875	626.00	5350.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	626.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.08.2113.
- RUN ONE: MCG, MDN, MPD, MFE, MAI RUN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 - 0.5 INCH STANDOFF USED ON MFE.
 - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 2327 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 4349 FEET: 253 CU.FT.
- RIG: WILD CAT DRILLING #1

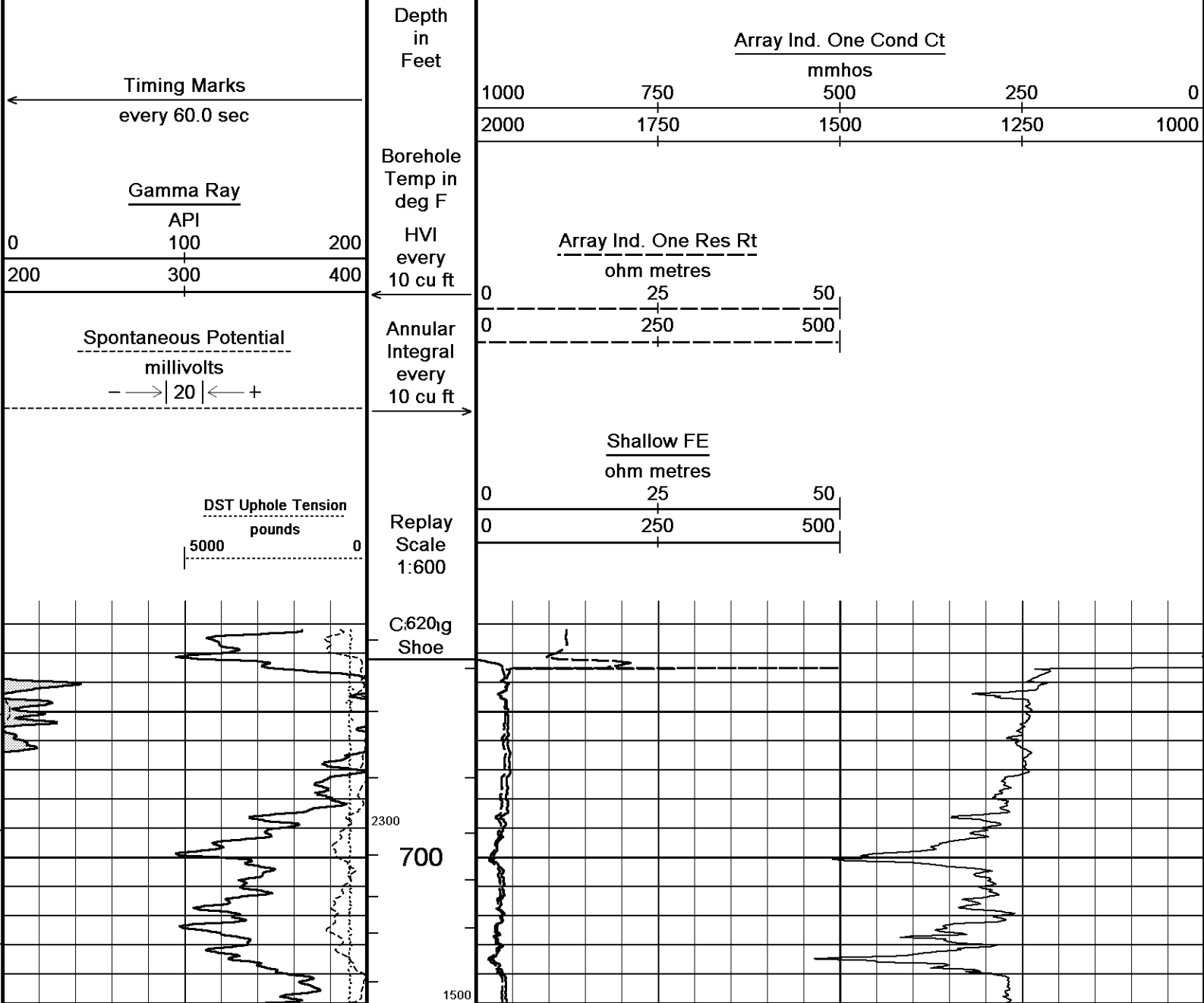
- ENGINEER: J. RANDLE.

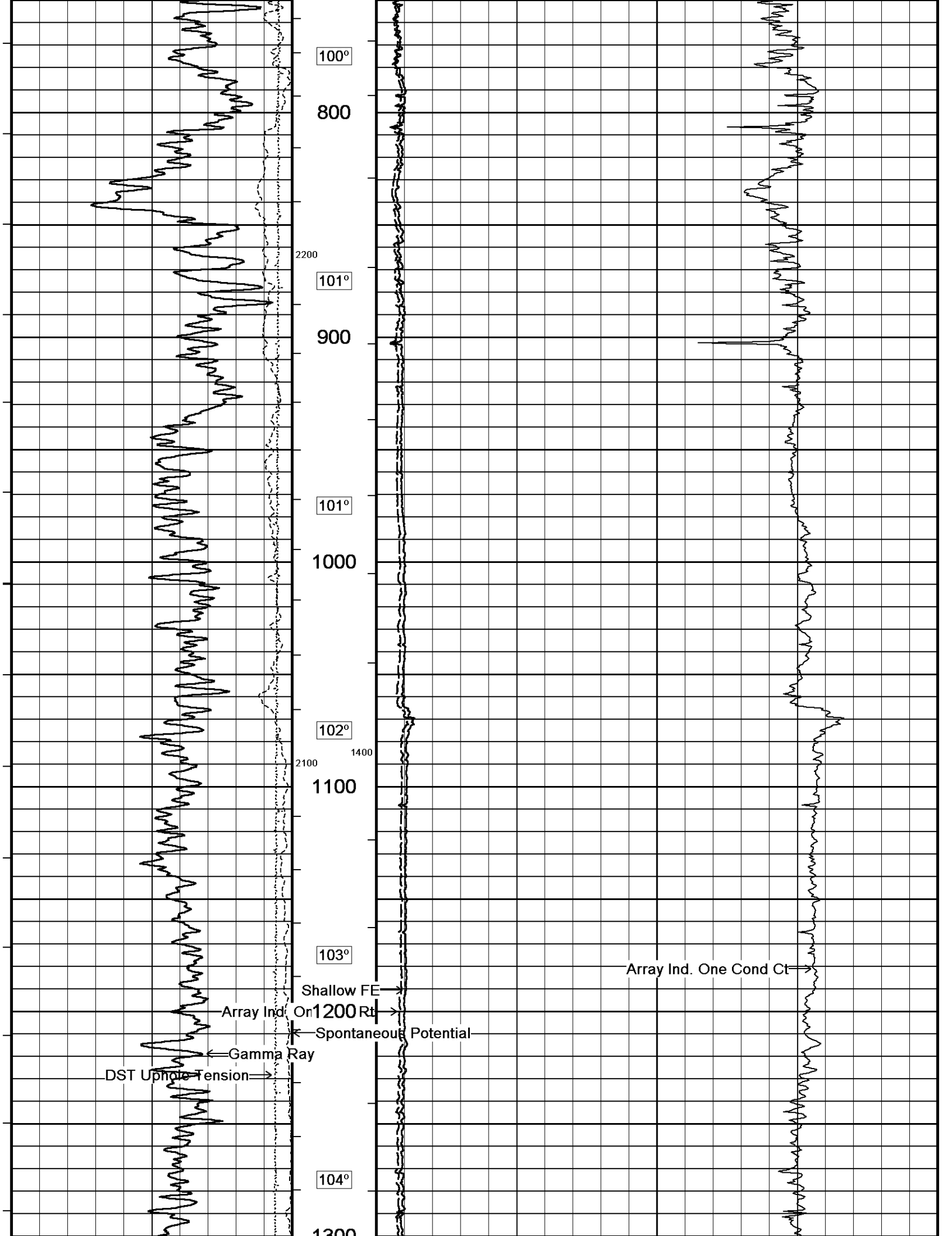
- OPERATOR: J. LaPOINT, S. LARES.

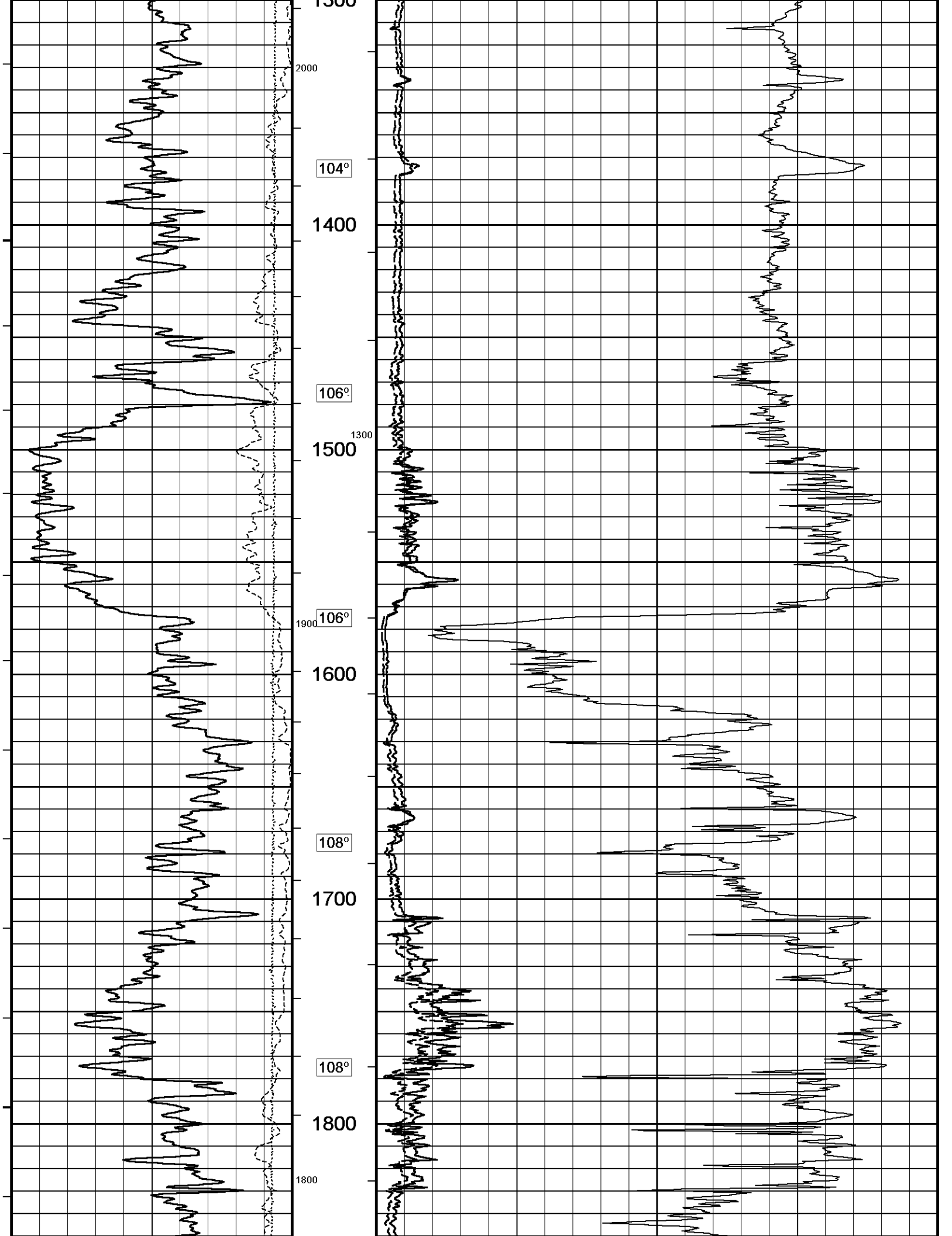
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will 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.

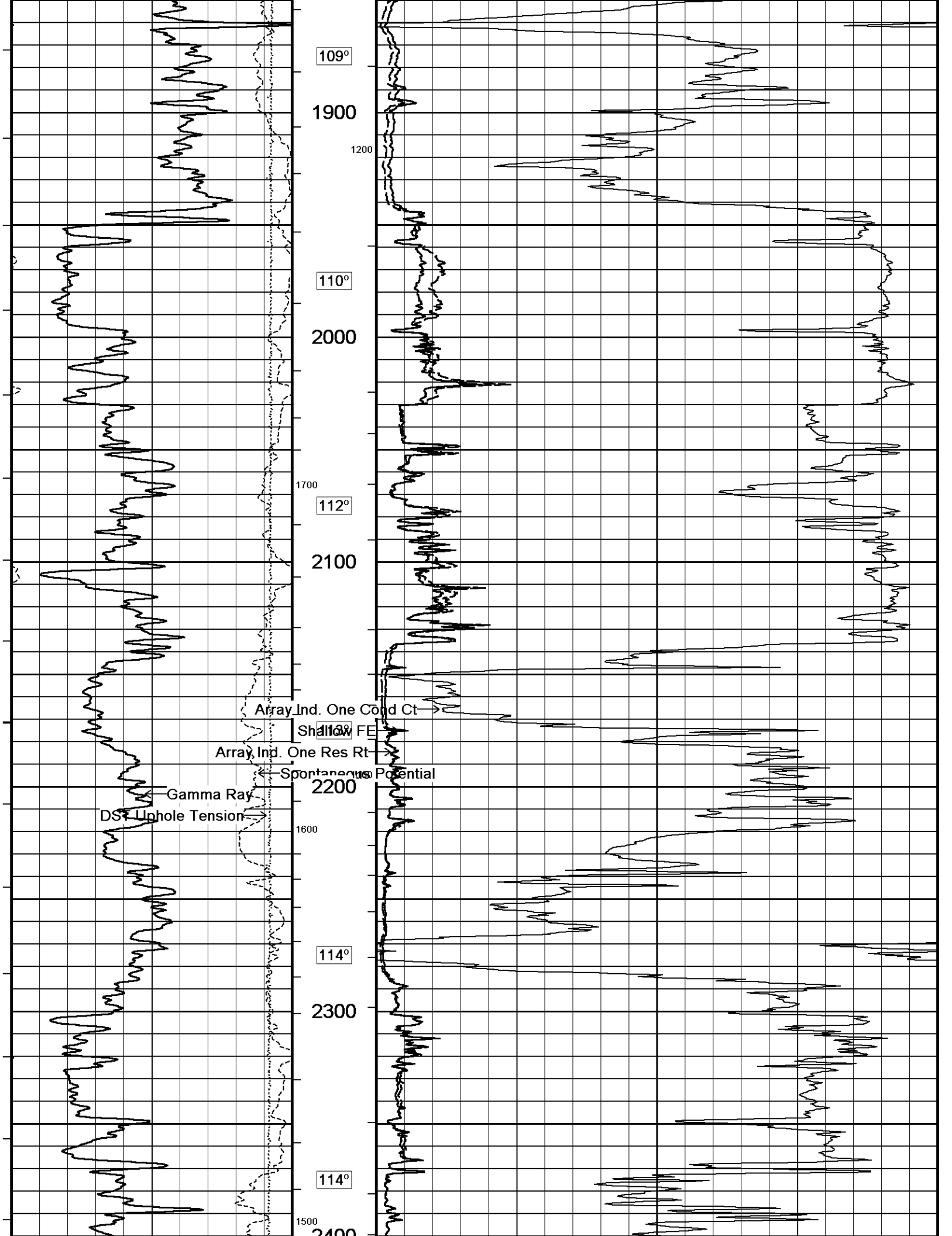
2 INCH MAIN

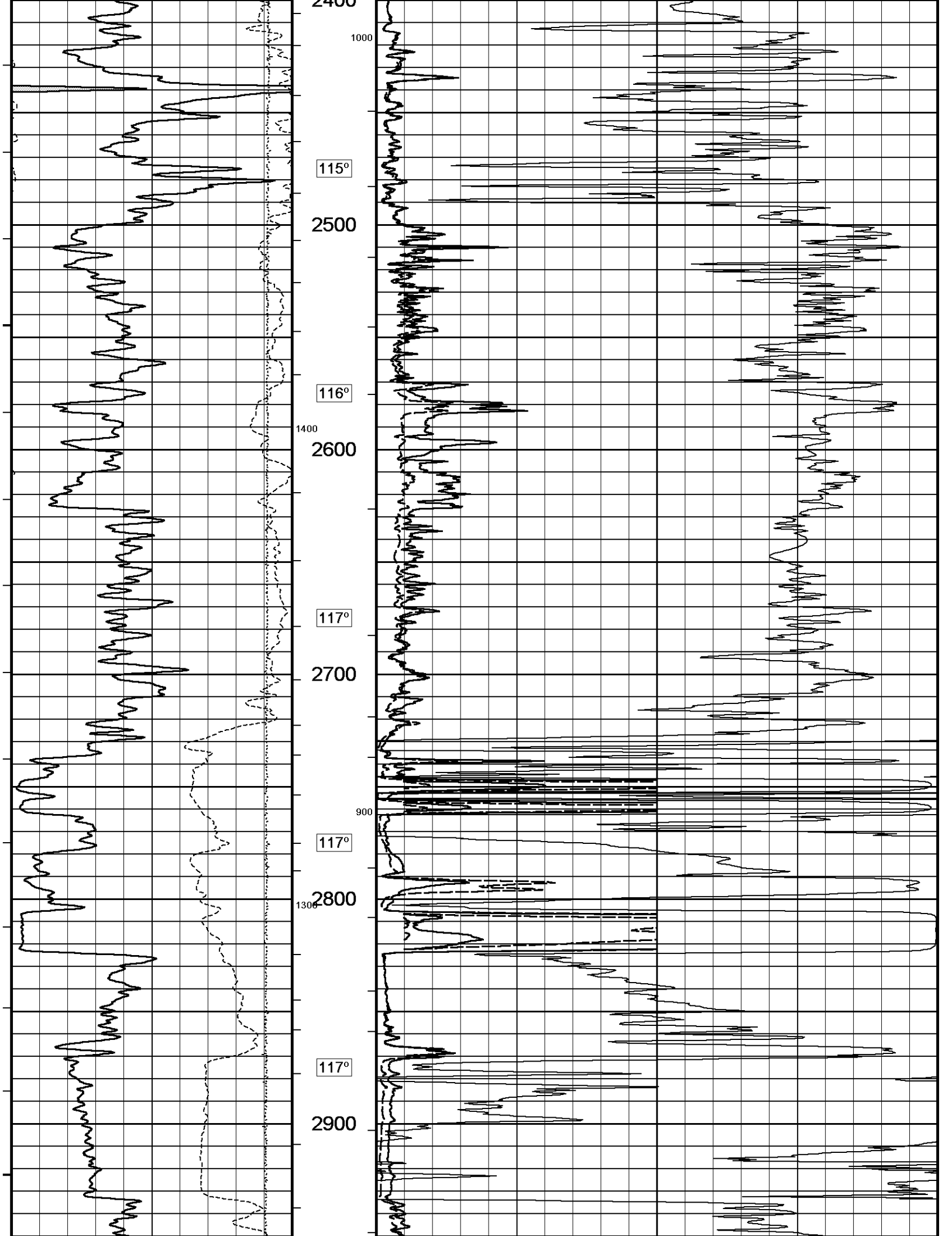
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 Filename: C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta Recorded on 06-SEP-2014 22:19
 System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

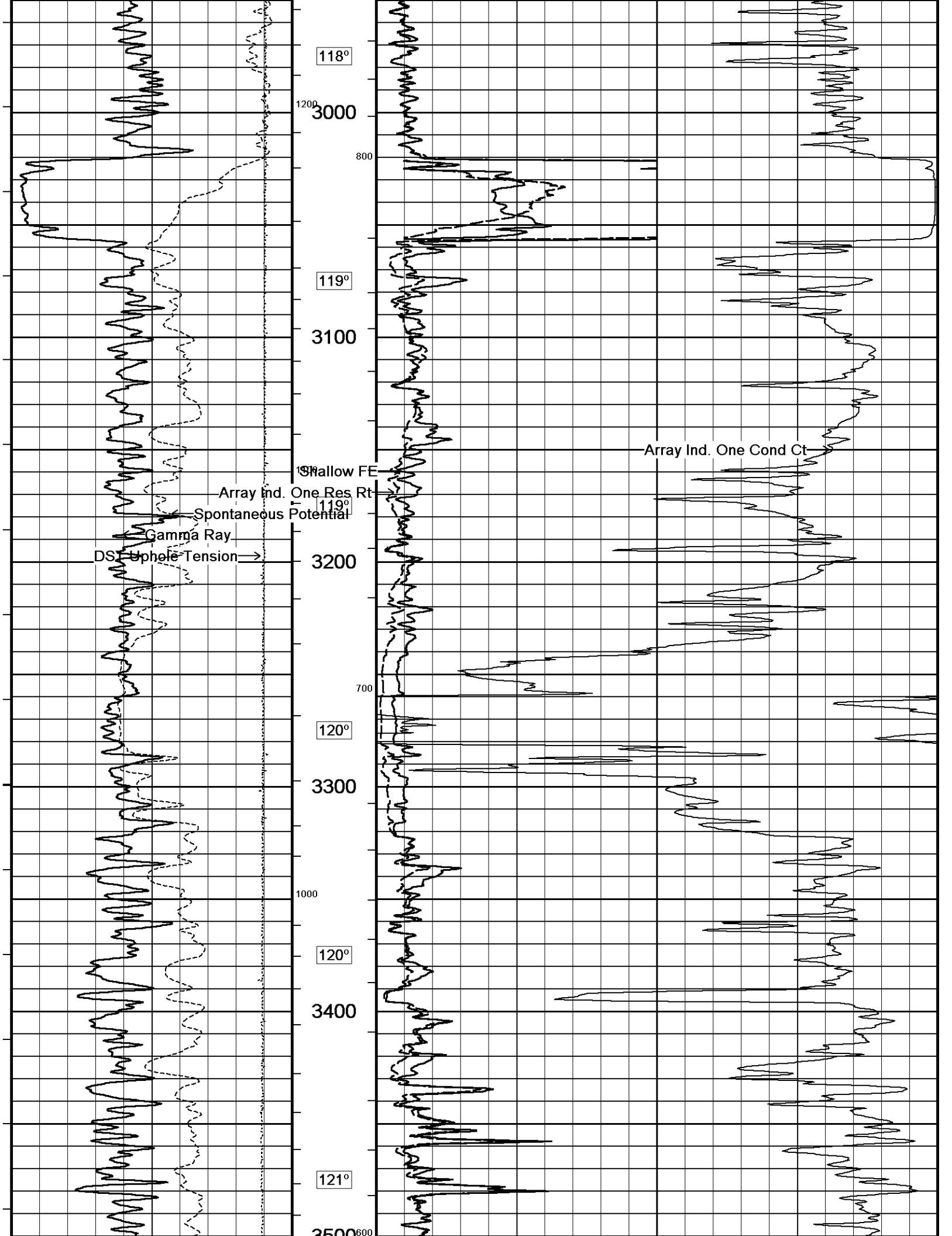


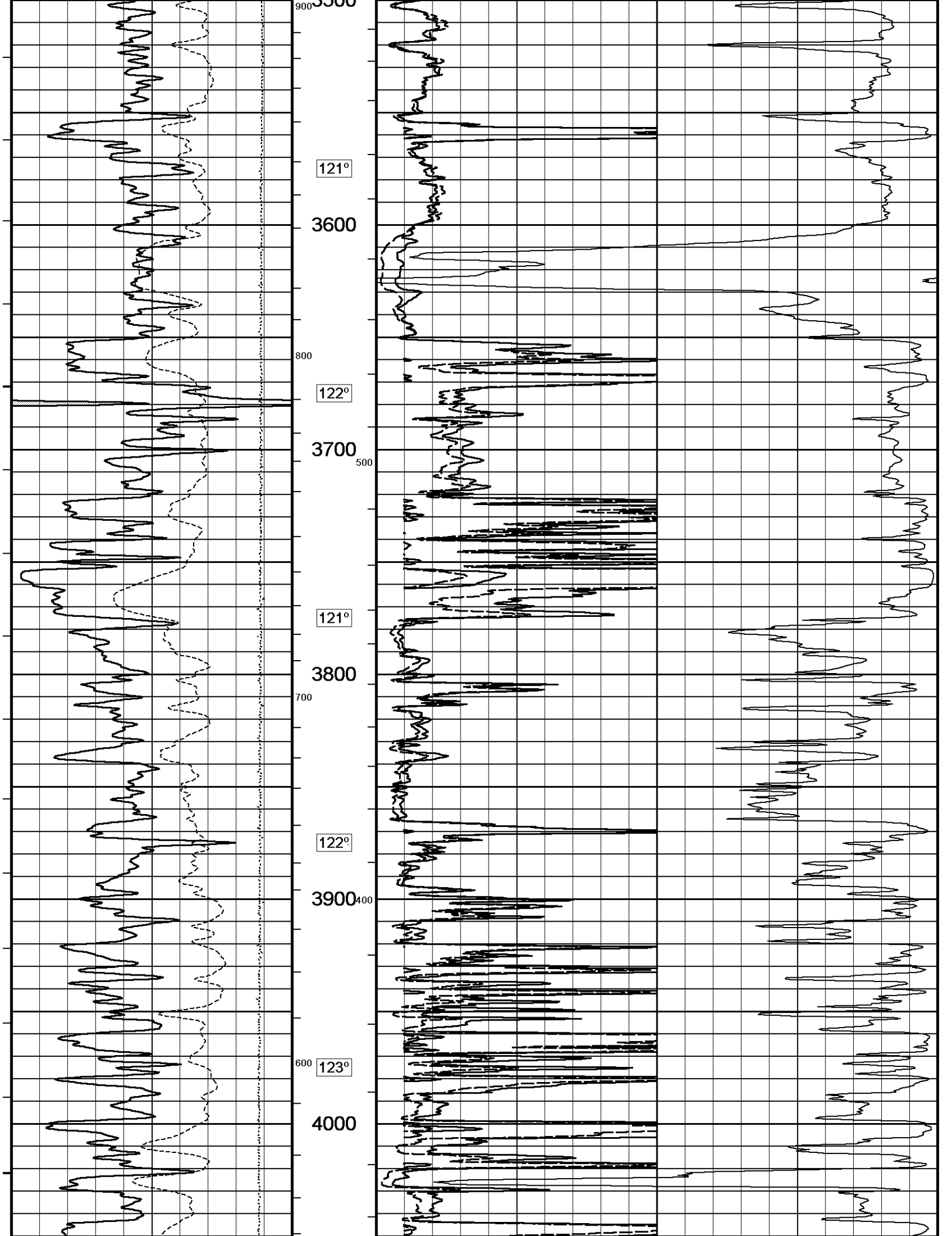


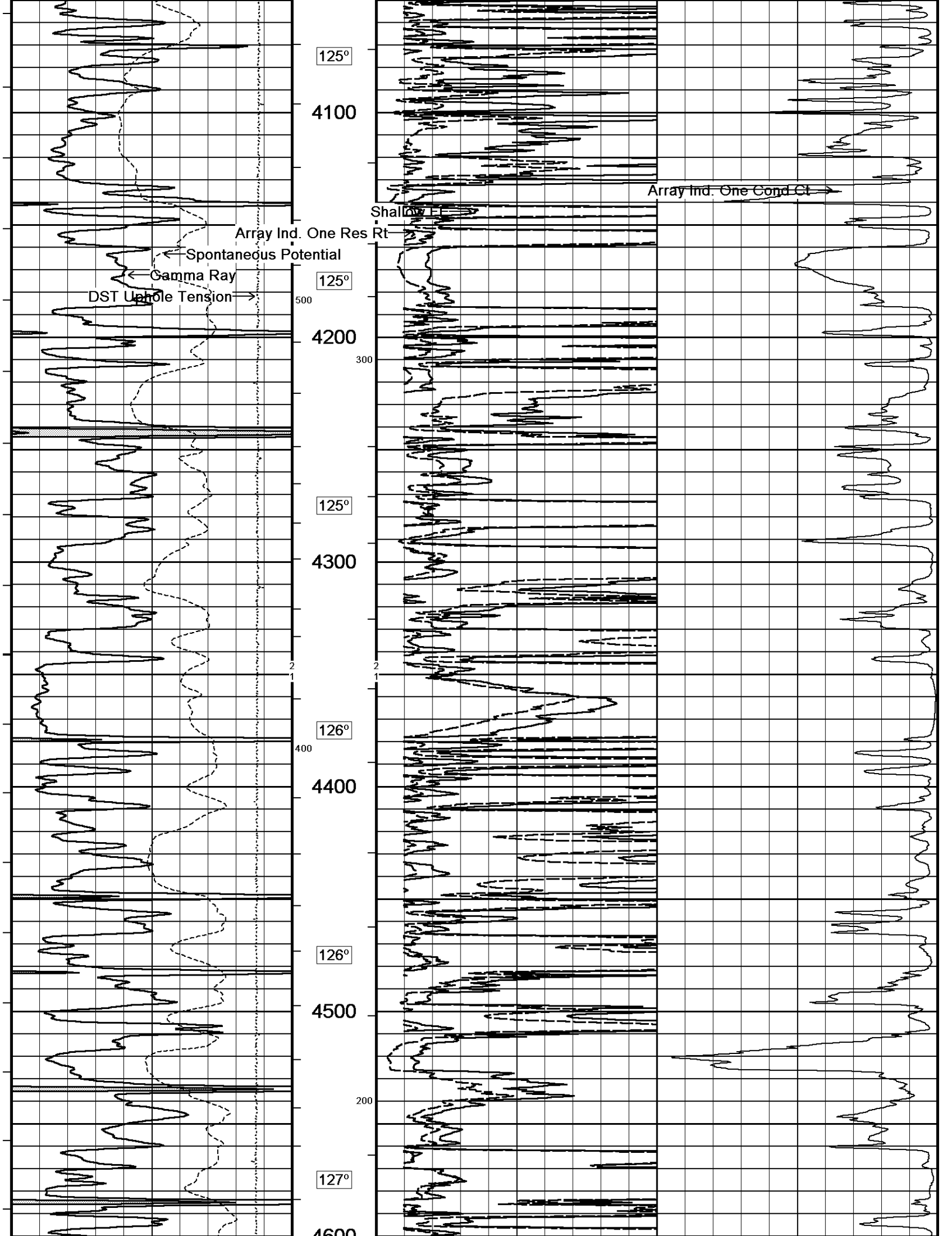


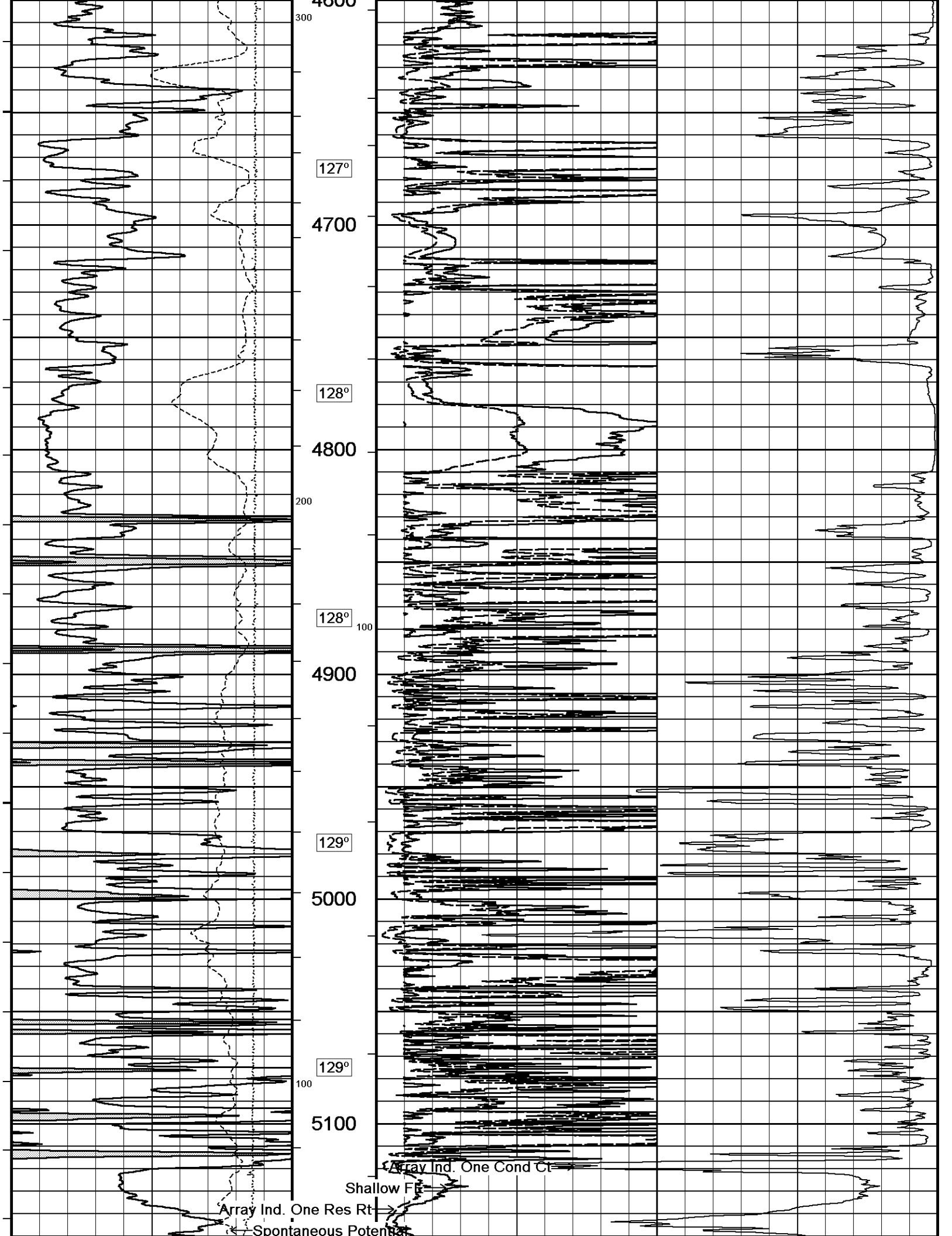


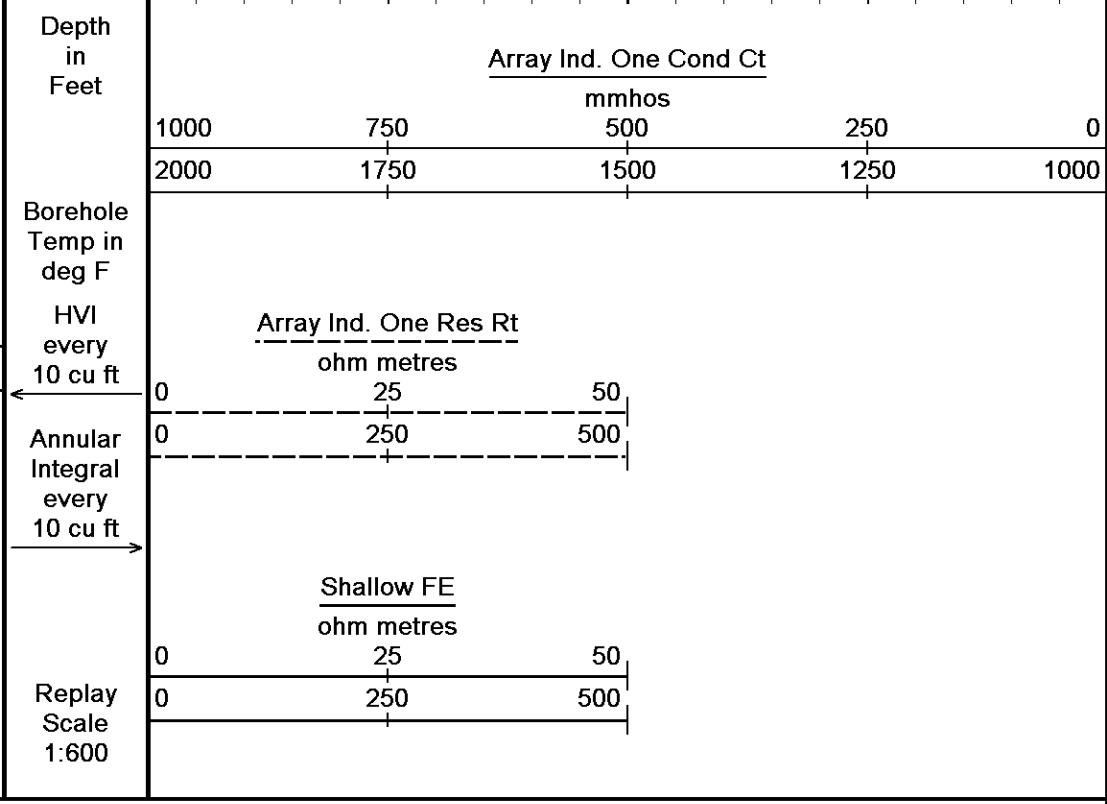
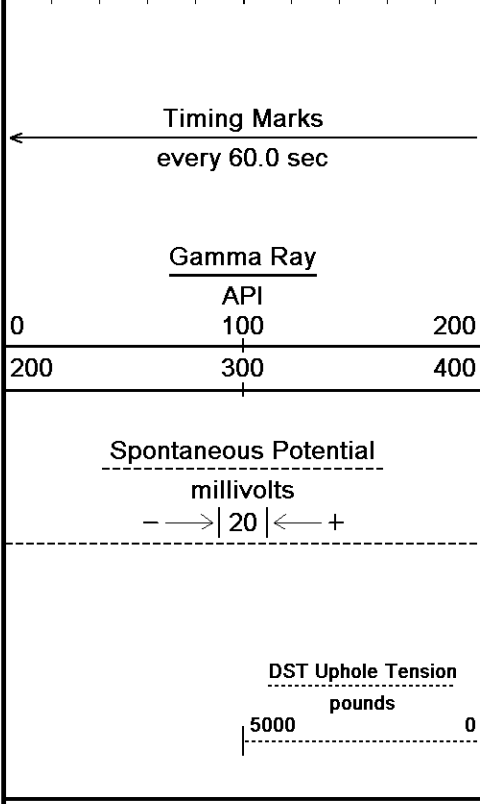
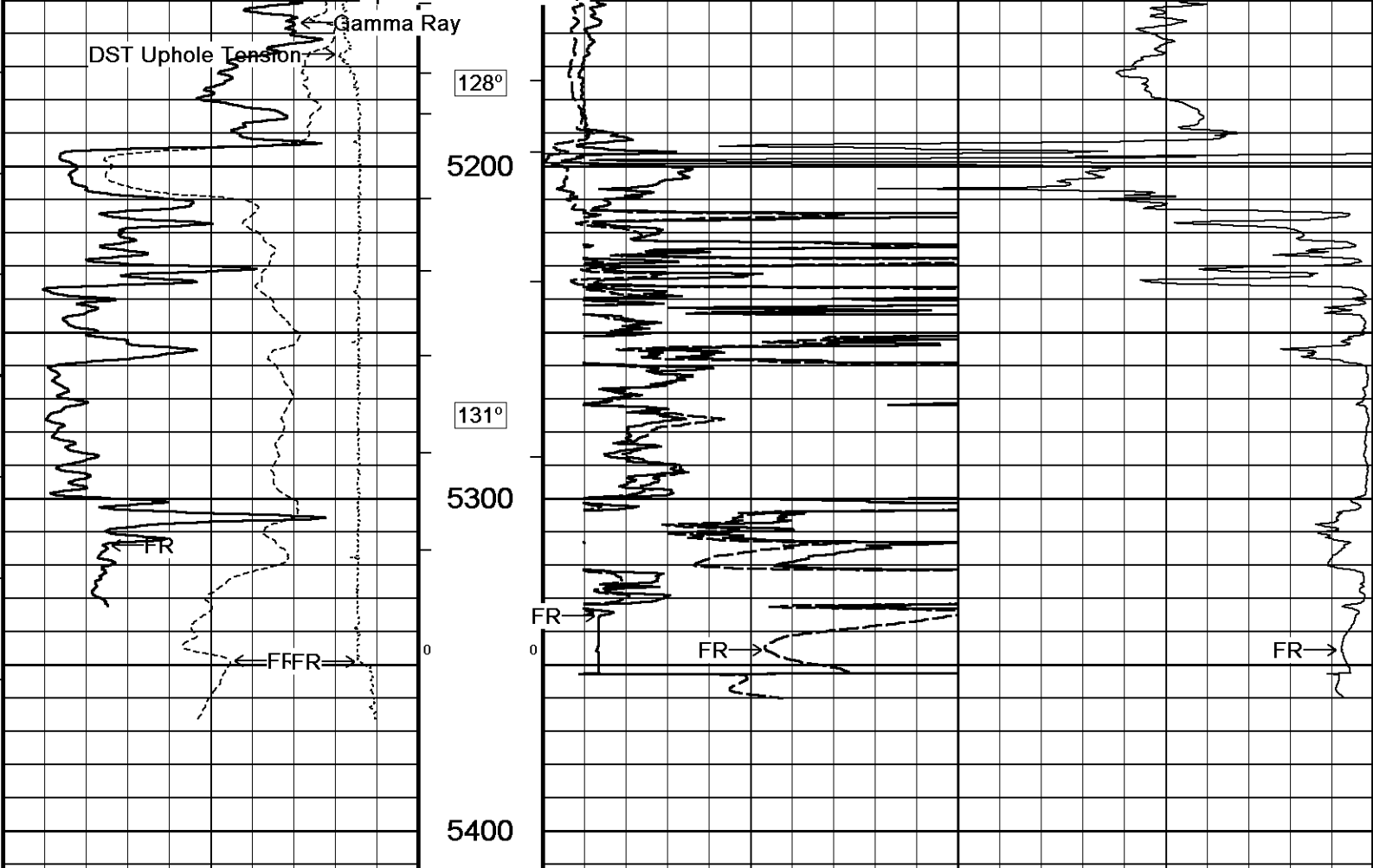










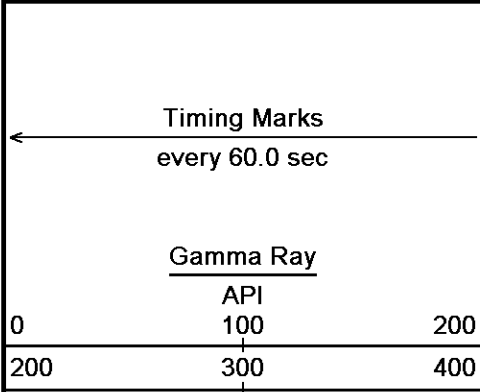


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 System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

↑ 2 INCH MAIN ↑

↓ 5 INCH MAIN ↓

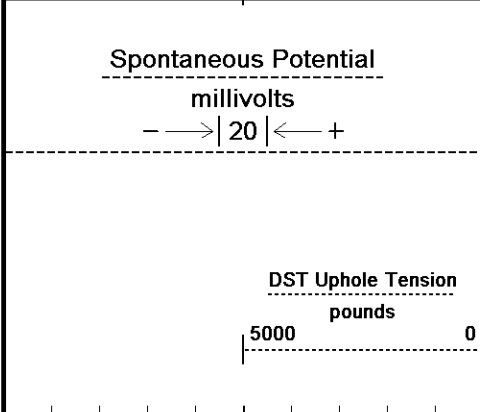
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 Recorded on 06-SEP-2014 22:19



Depth in Feet

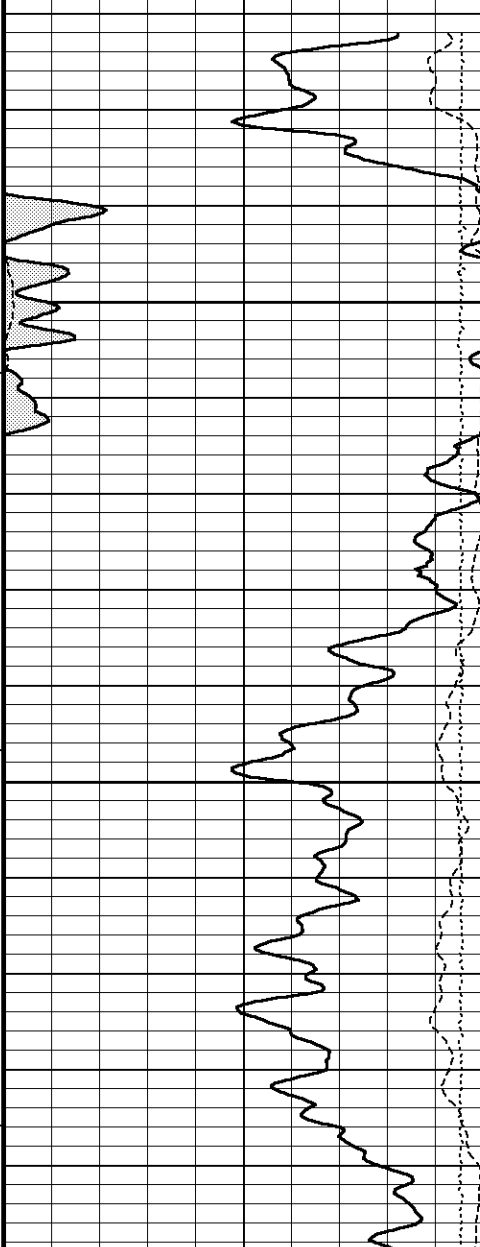
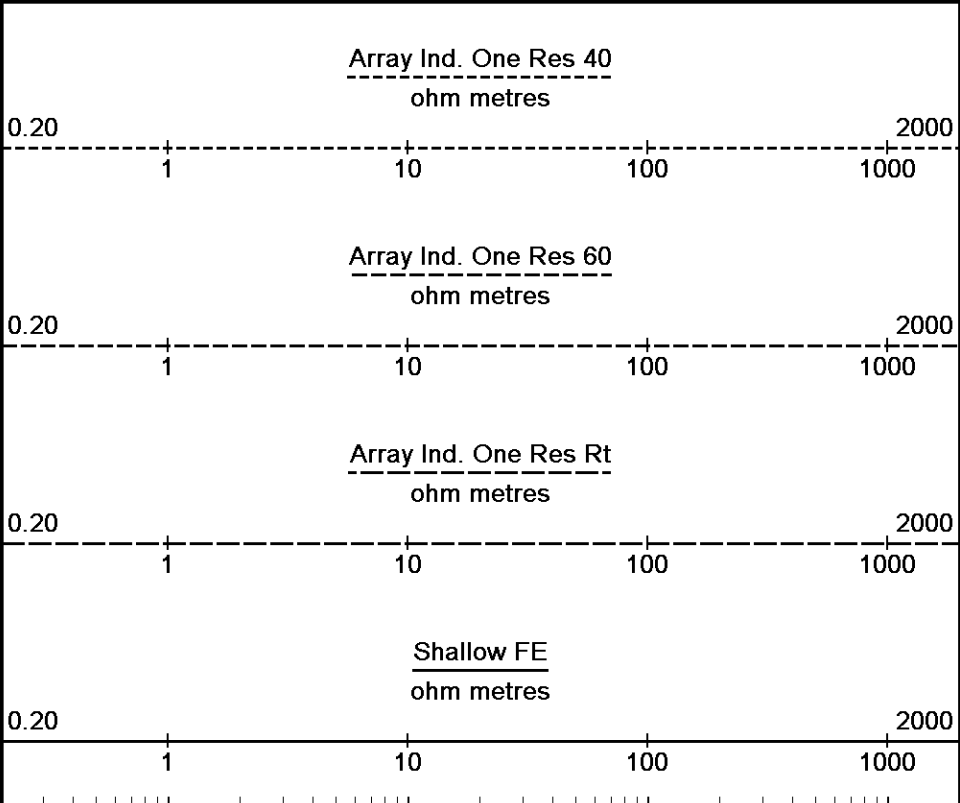
Borehole Temp in deg F

HVI every 10 cu ft



Annular Integral every 10 cu ft

Replay Scale 1:240



620

Casing Shoe

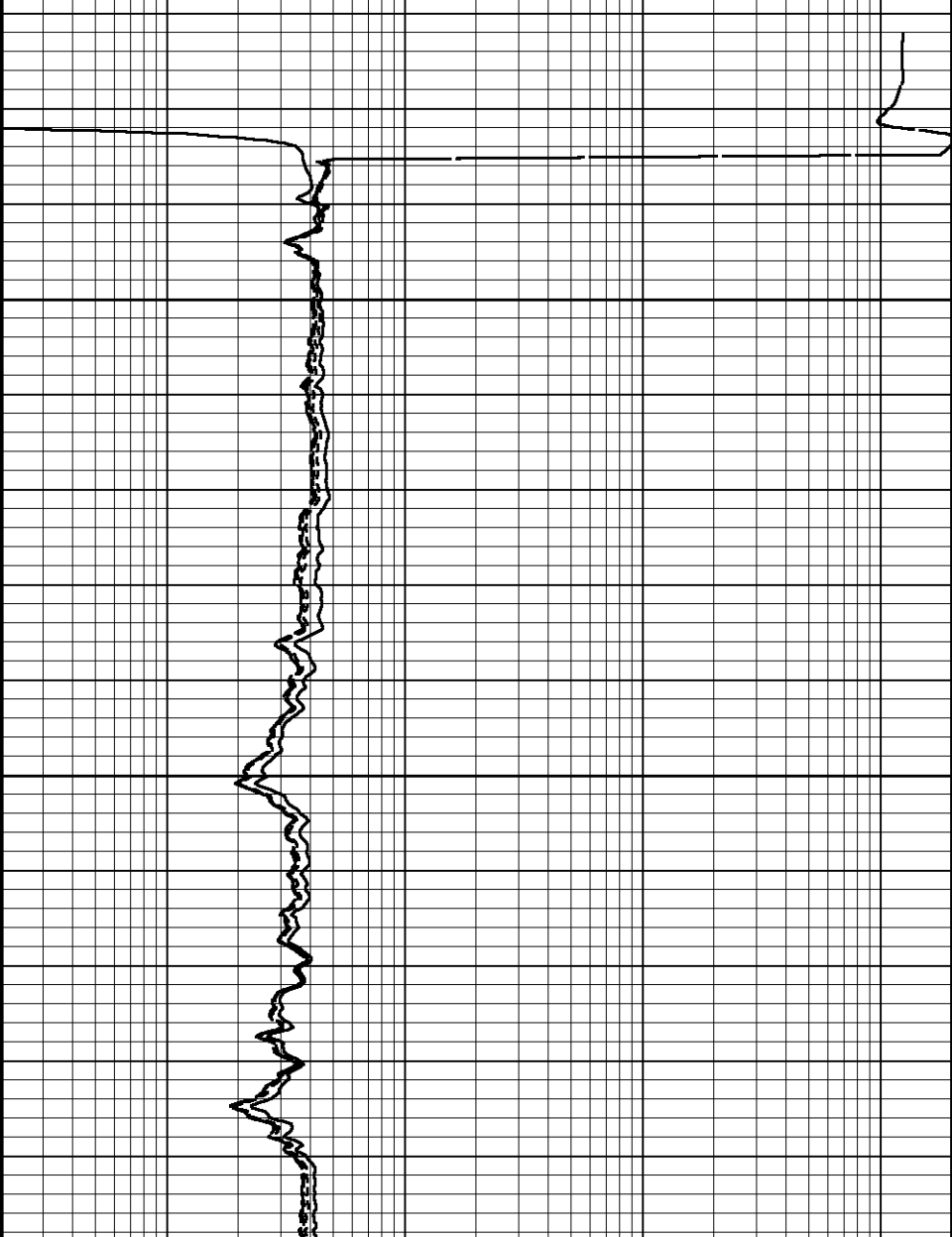
650

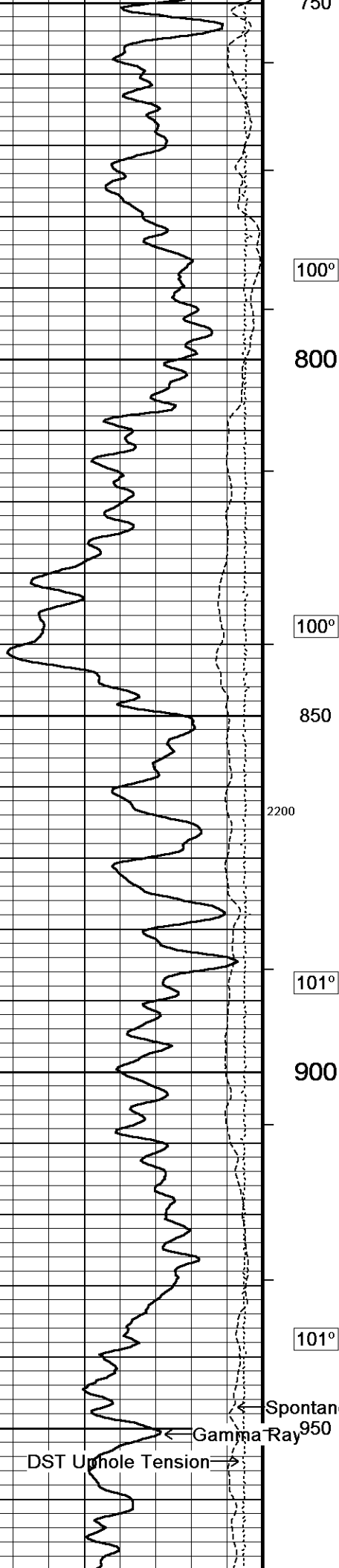
2300 99°

700

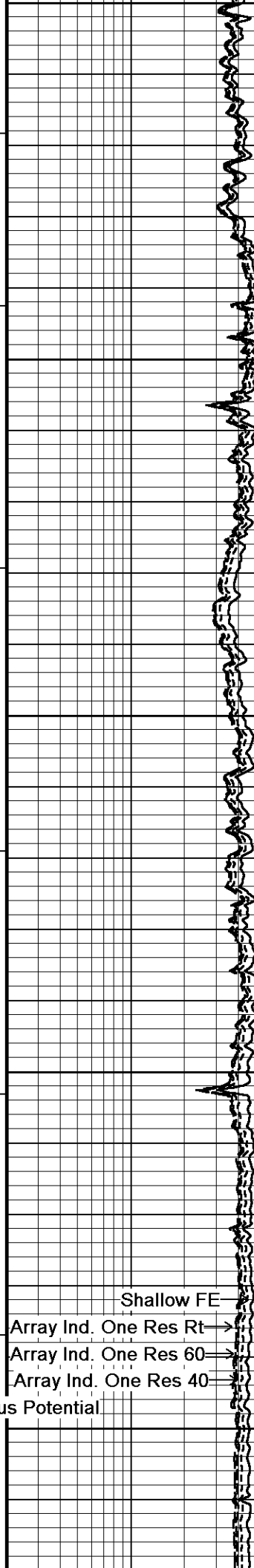
100°

1500



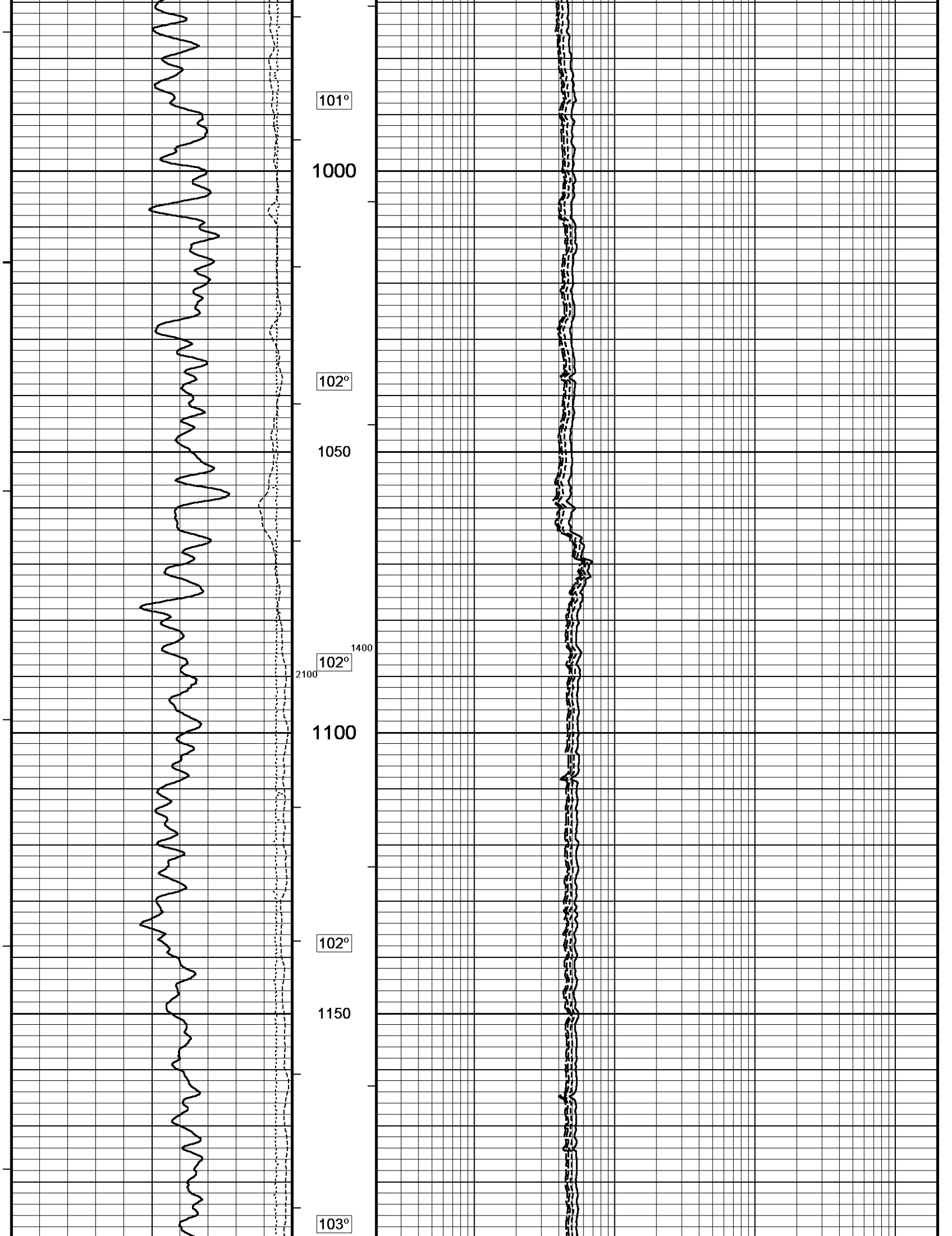


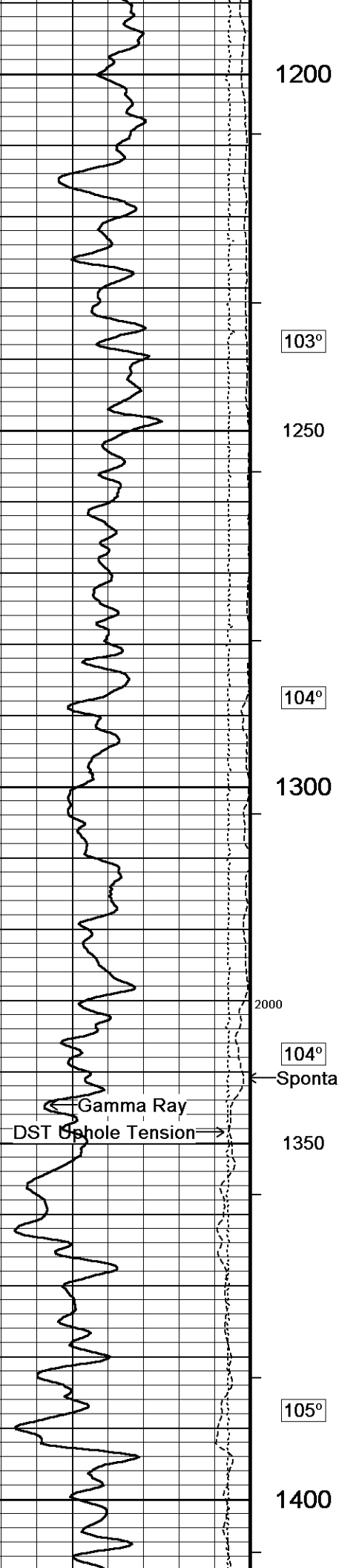
750
100°
800
100°
850
2200
101°
900
101°



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

← Spontaneous Potential
← Gamma Ray
DST Up-hole Tension →





1200

103°

1250

104°

1300

2000

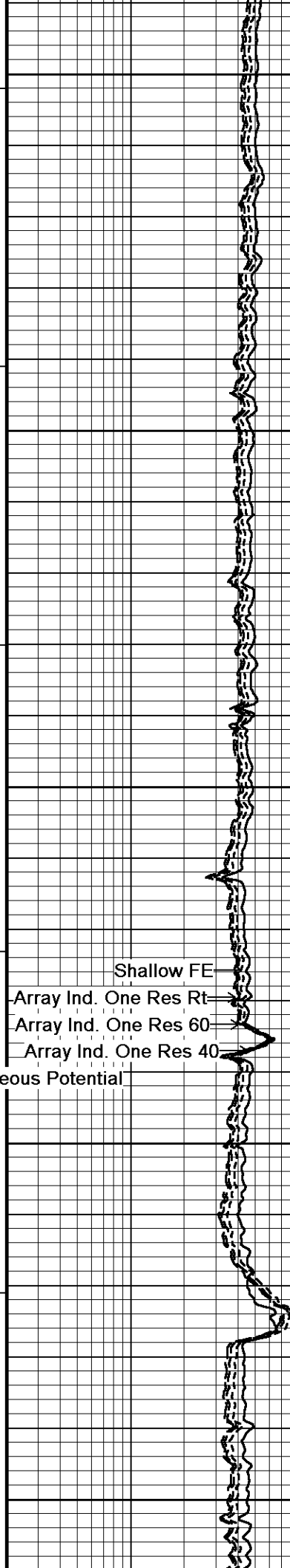
104°

1350

105°

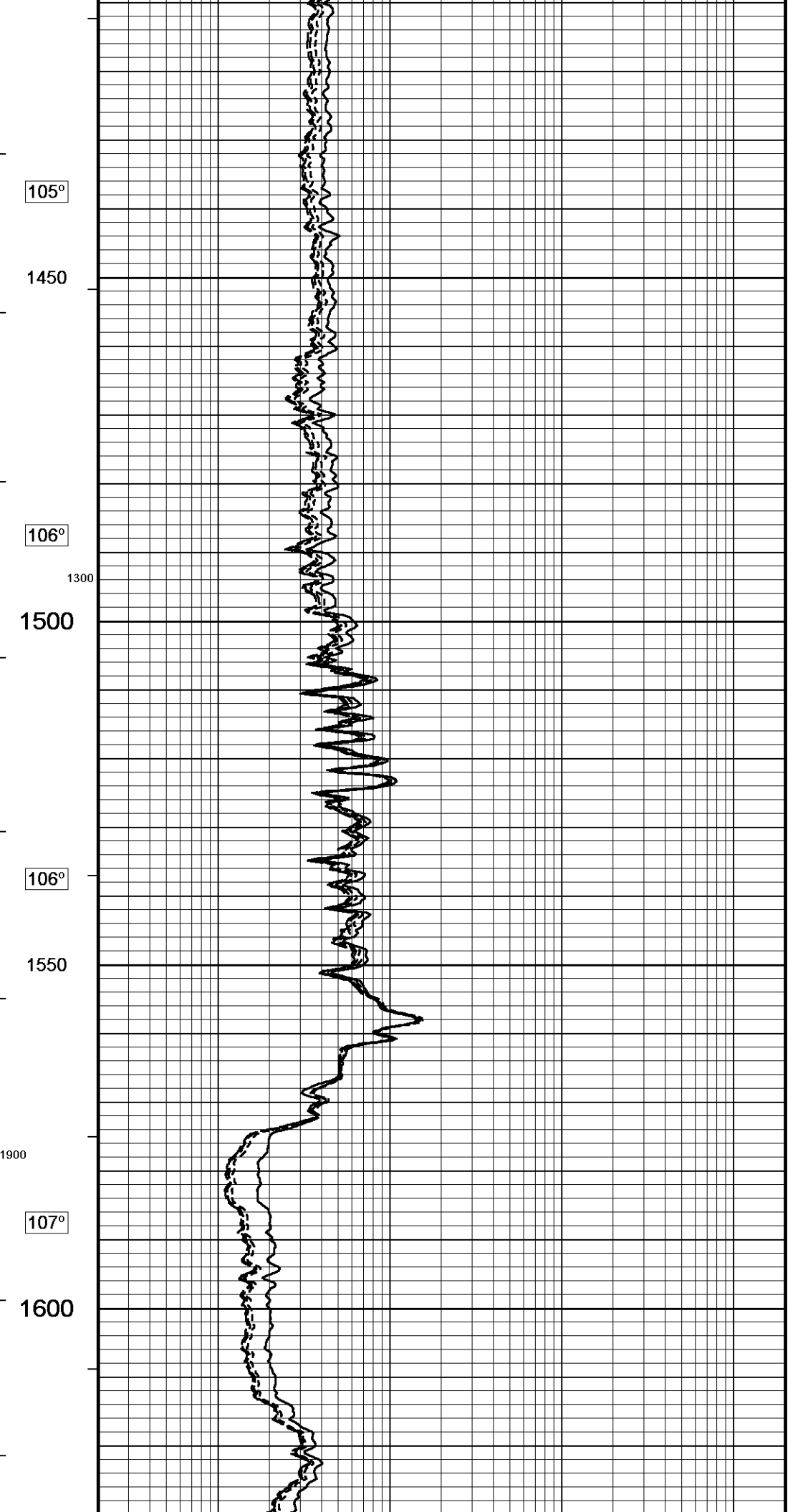
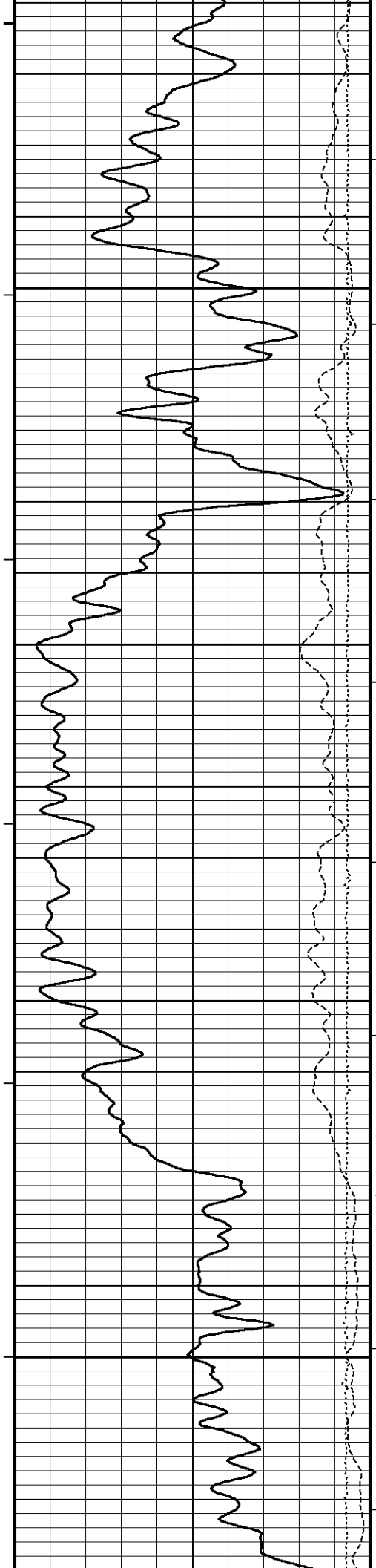
1400

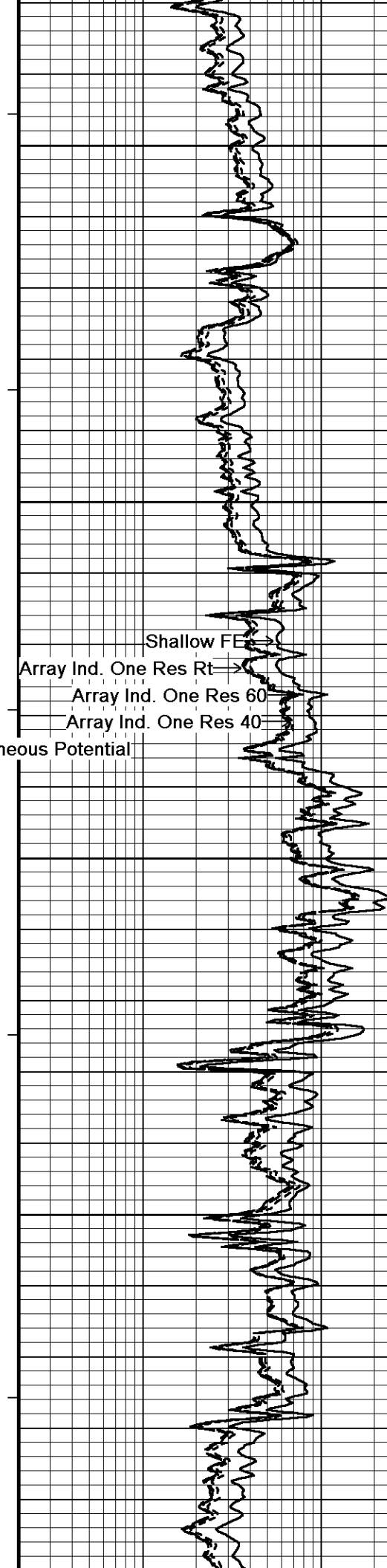
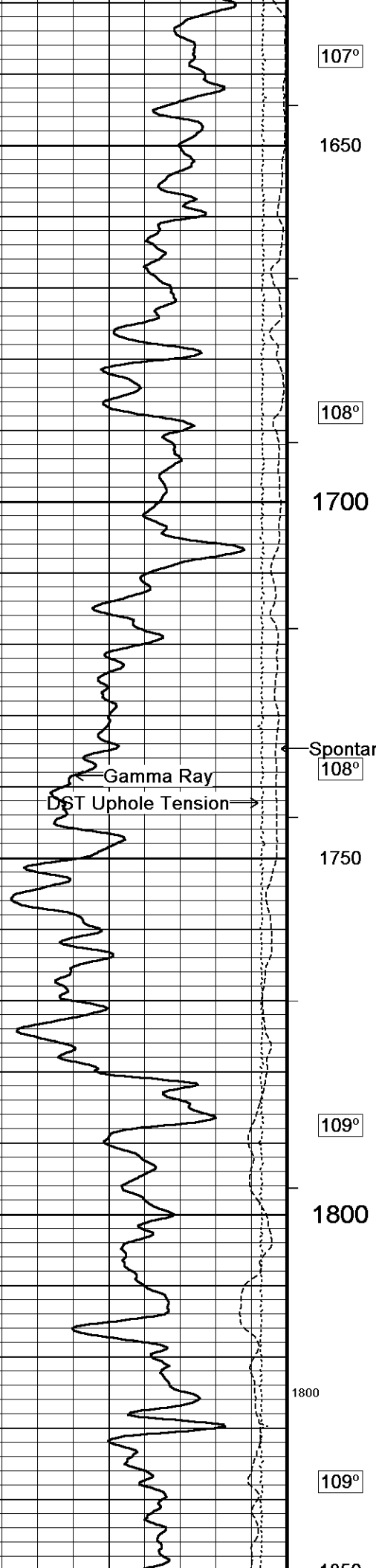
Gamma Ray
DST
Spontaneous Potential

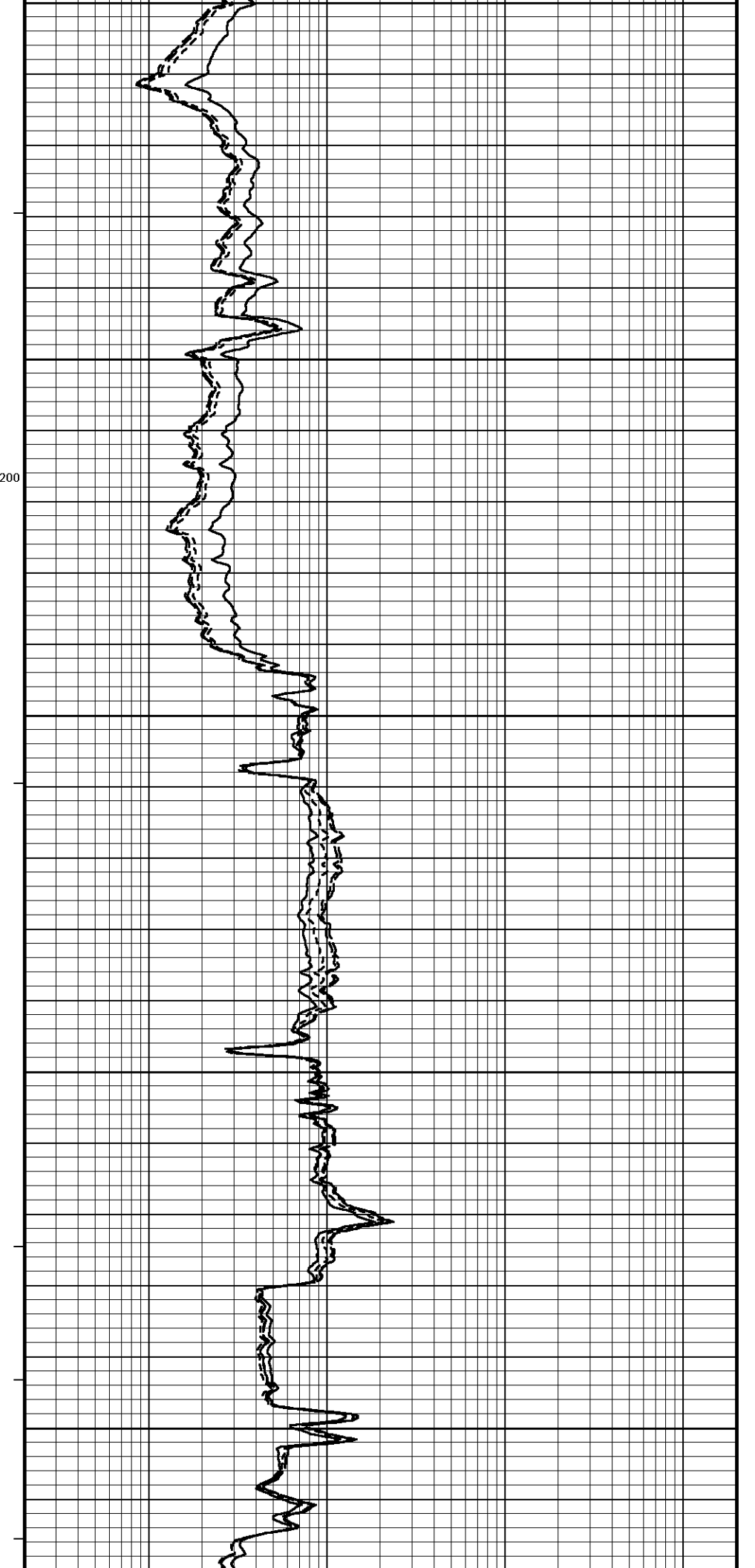
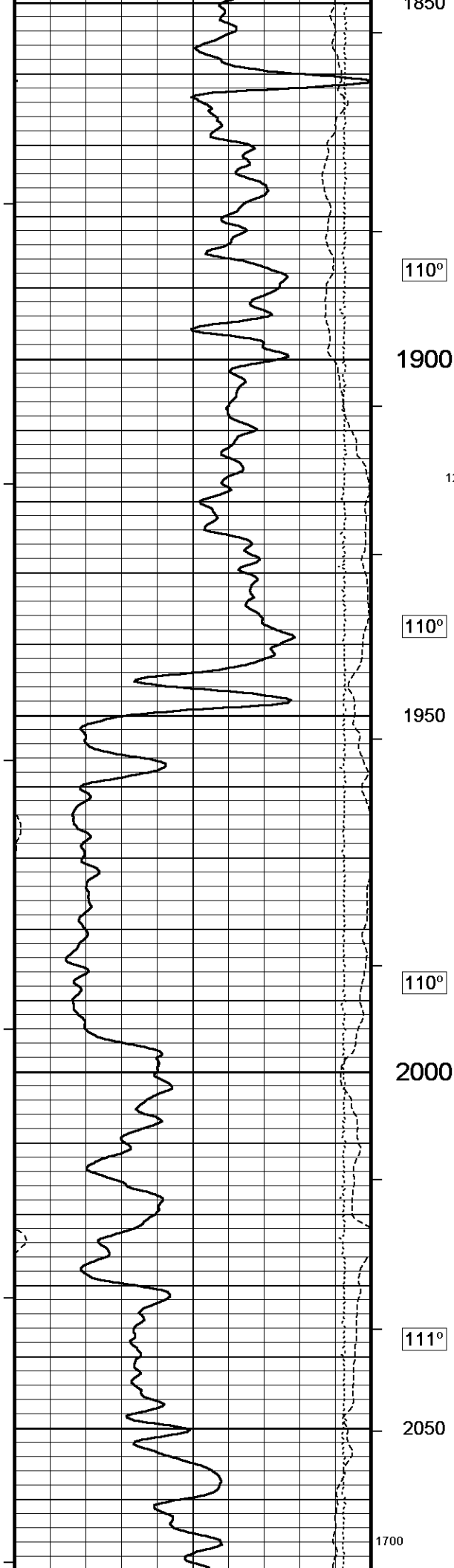


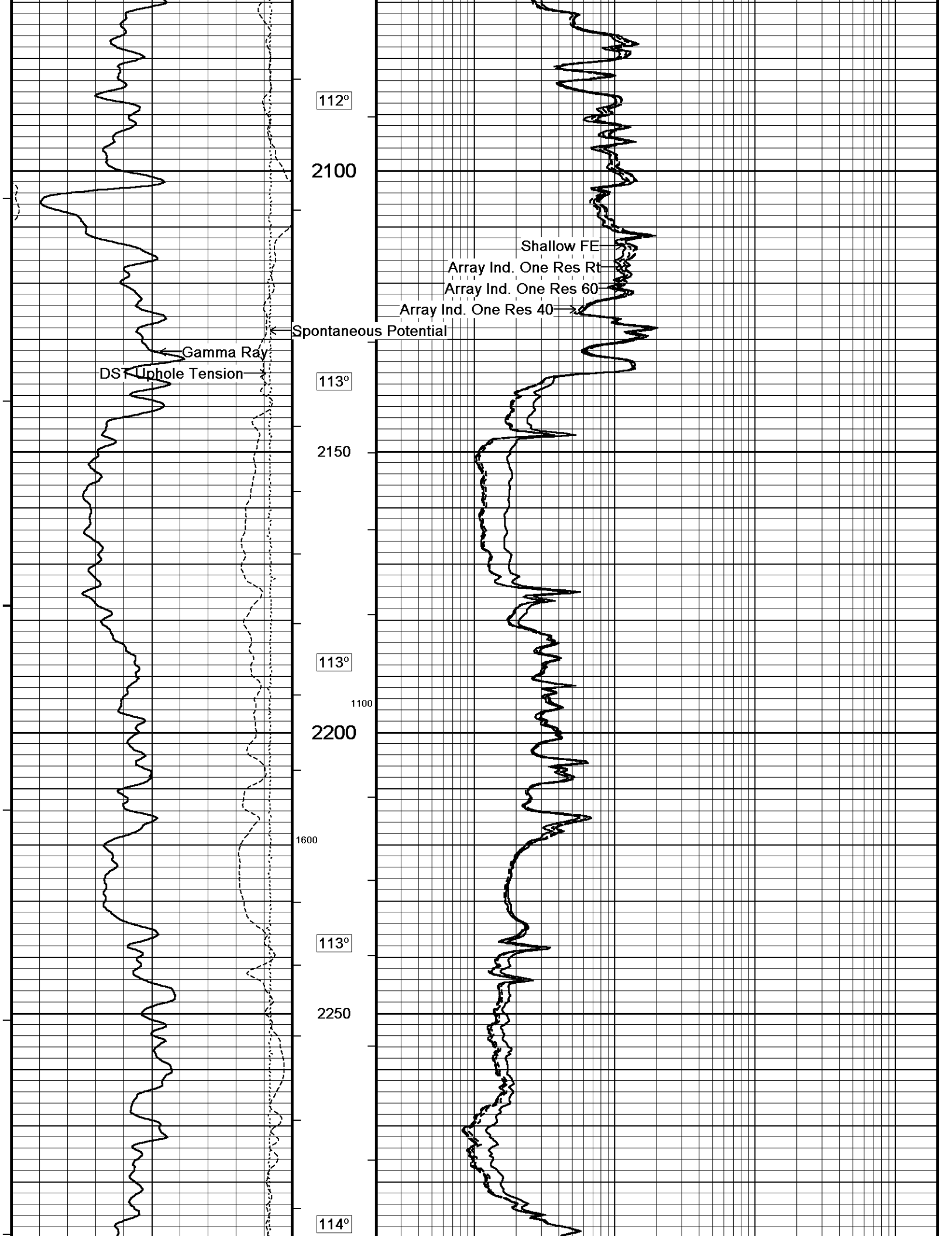
Shallow FE
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40

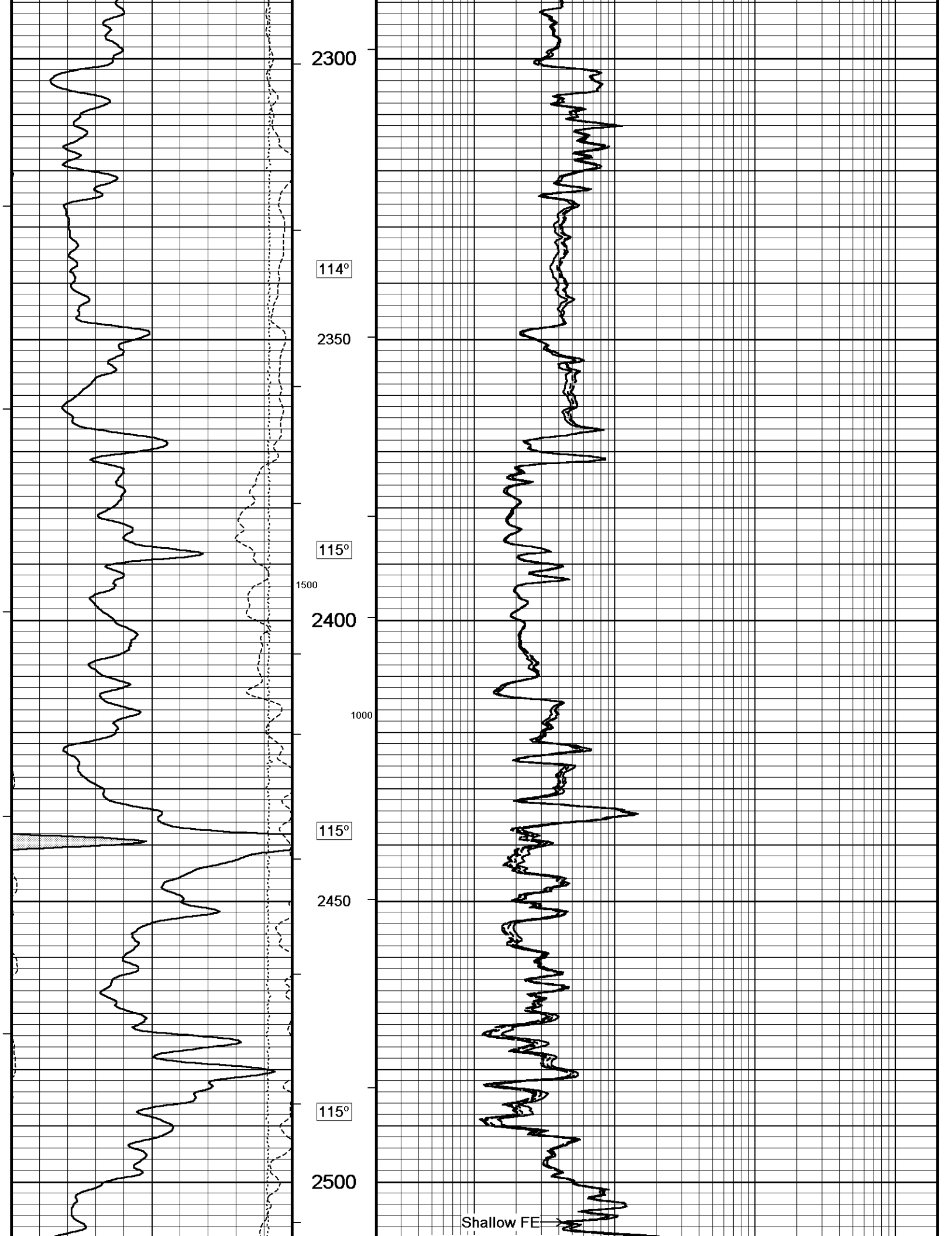
Spontaneous Potential

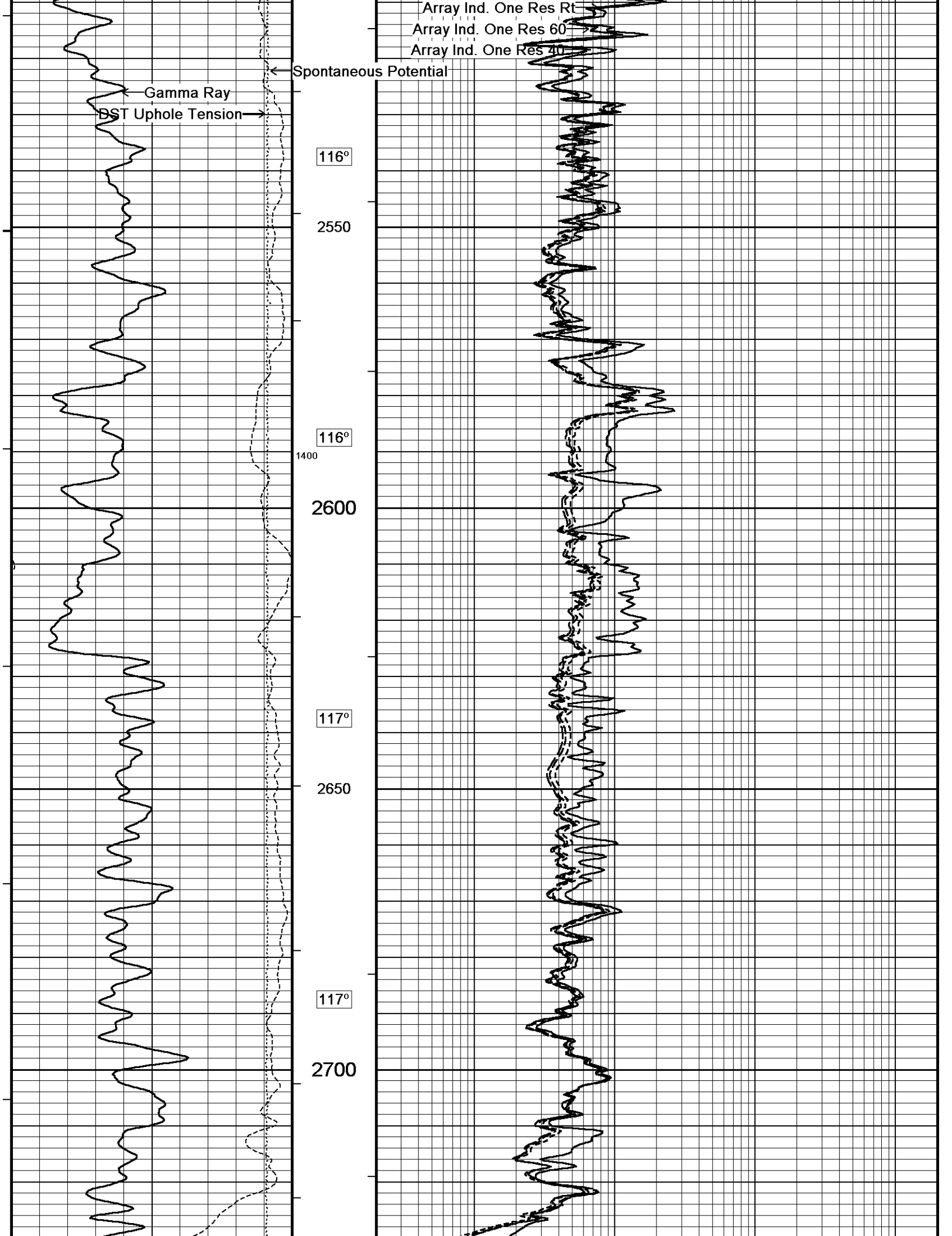


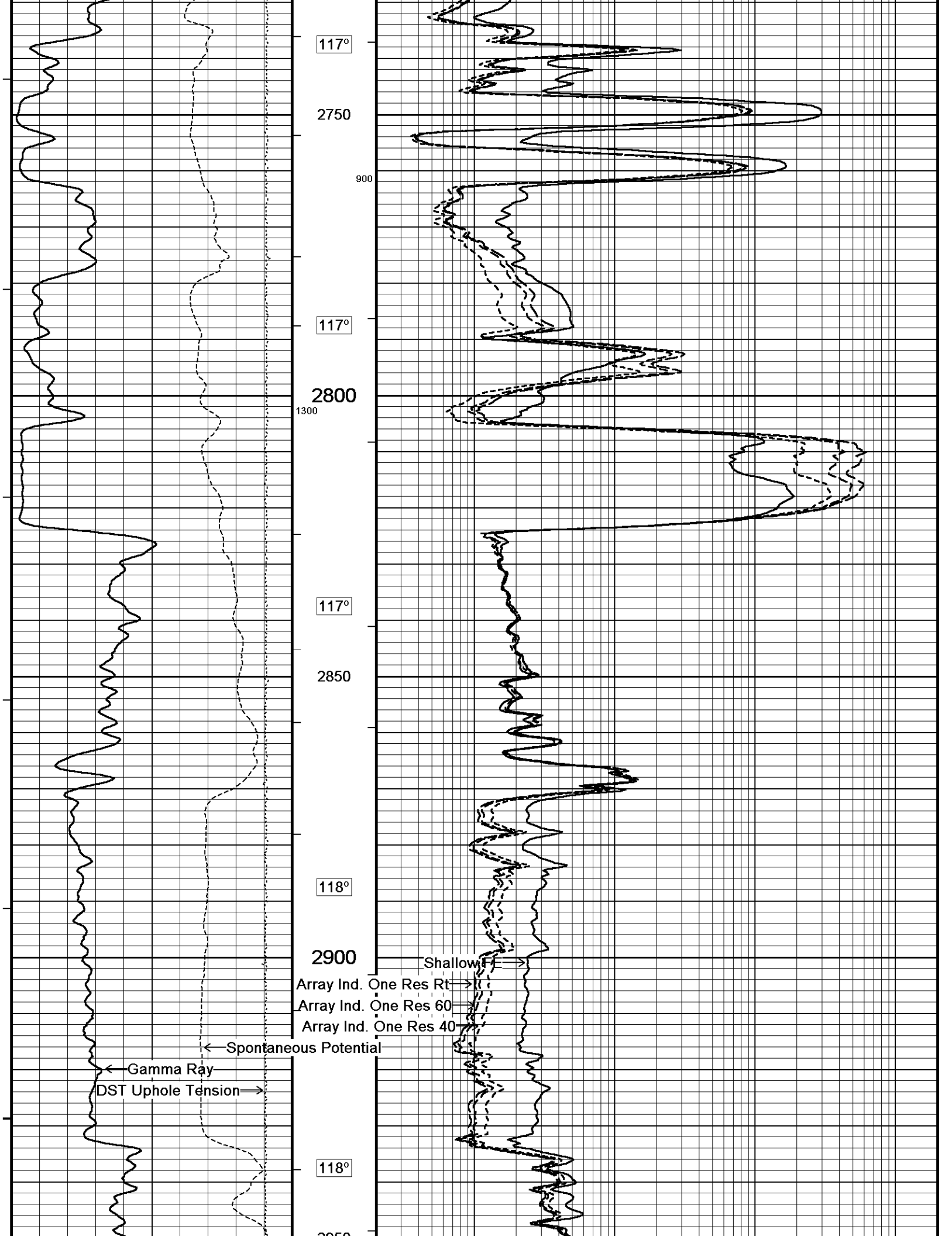


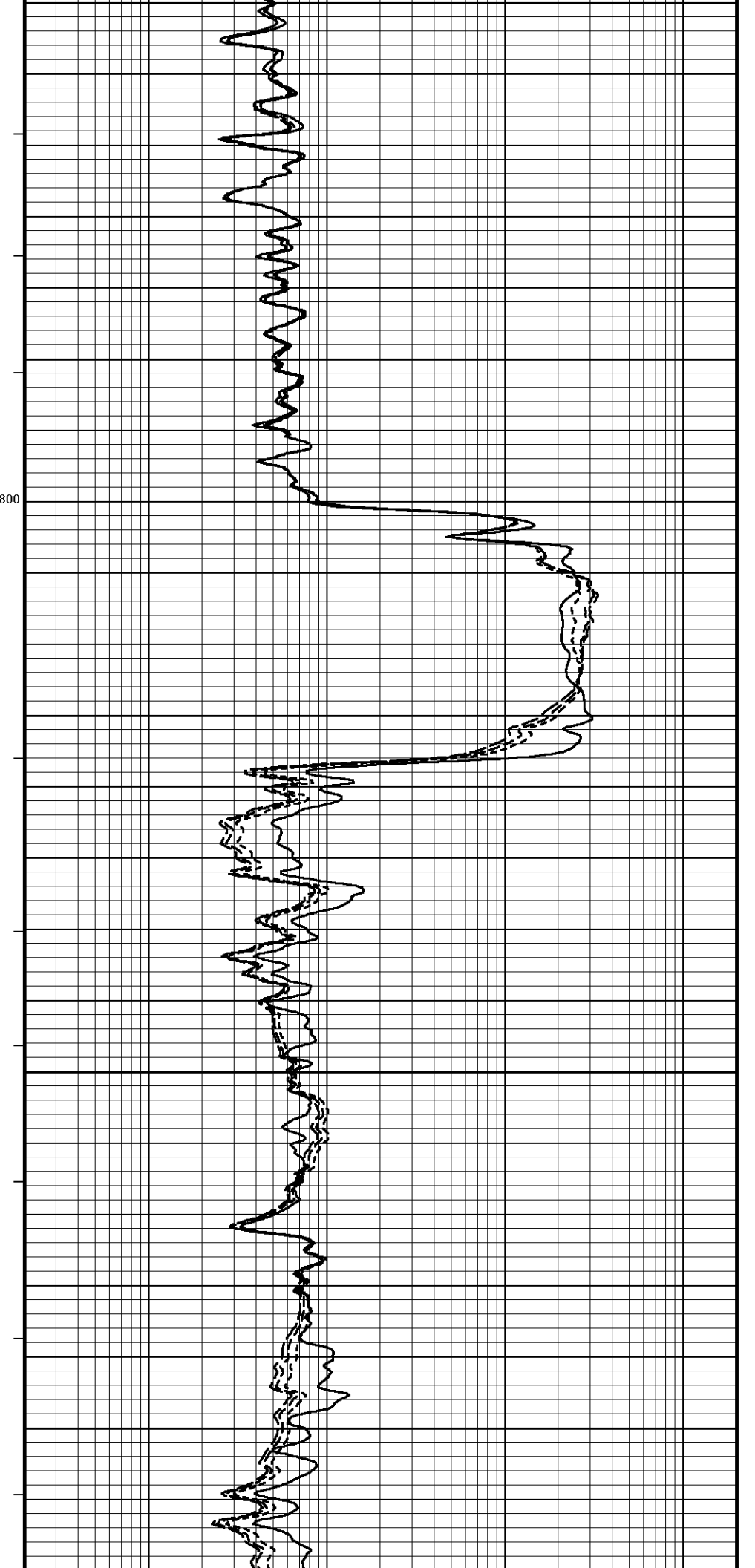
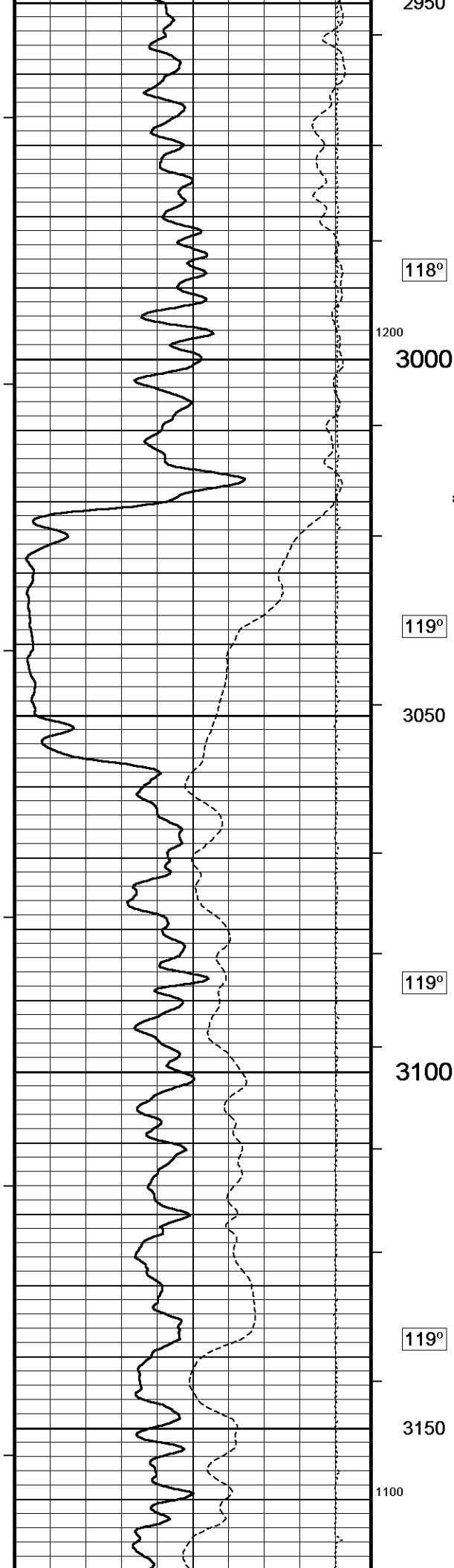


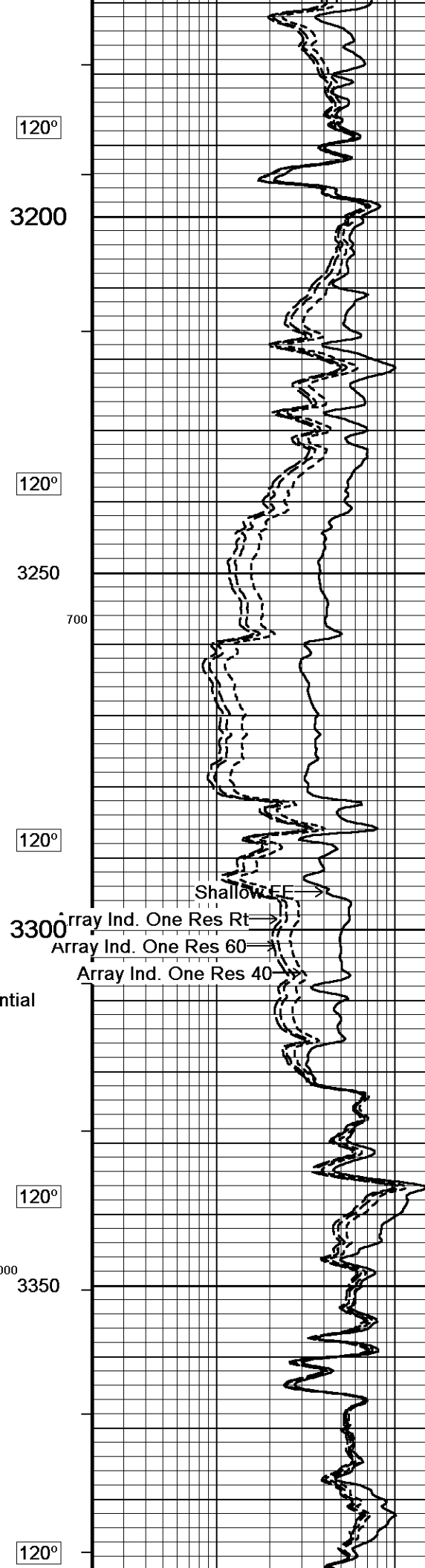
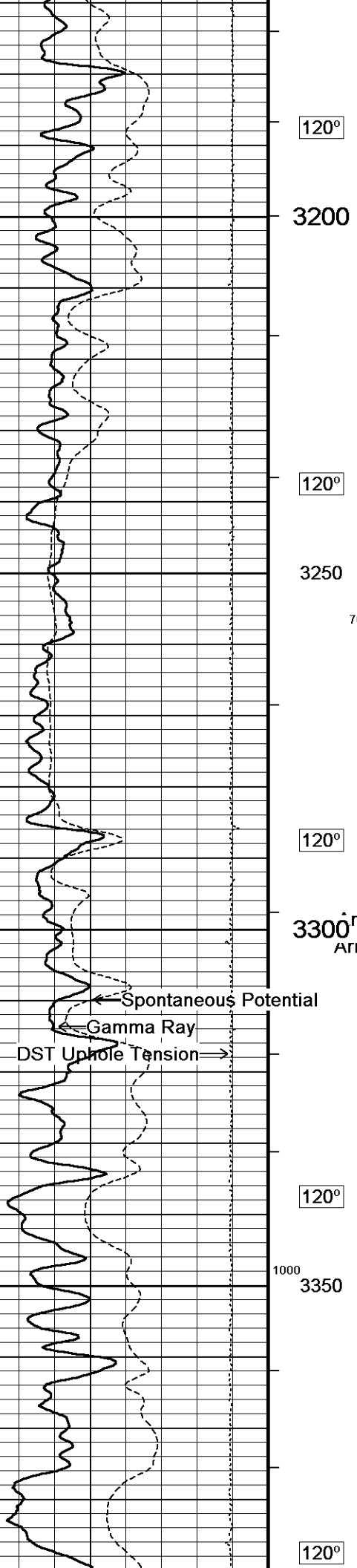






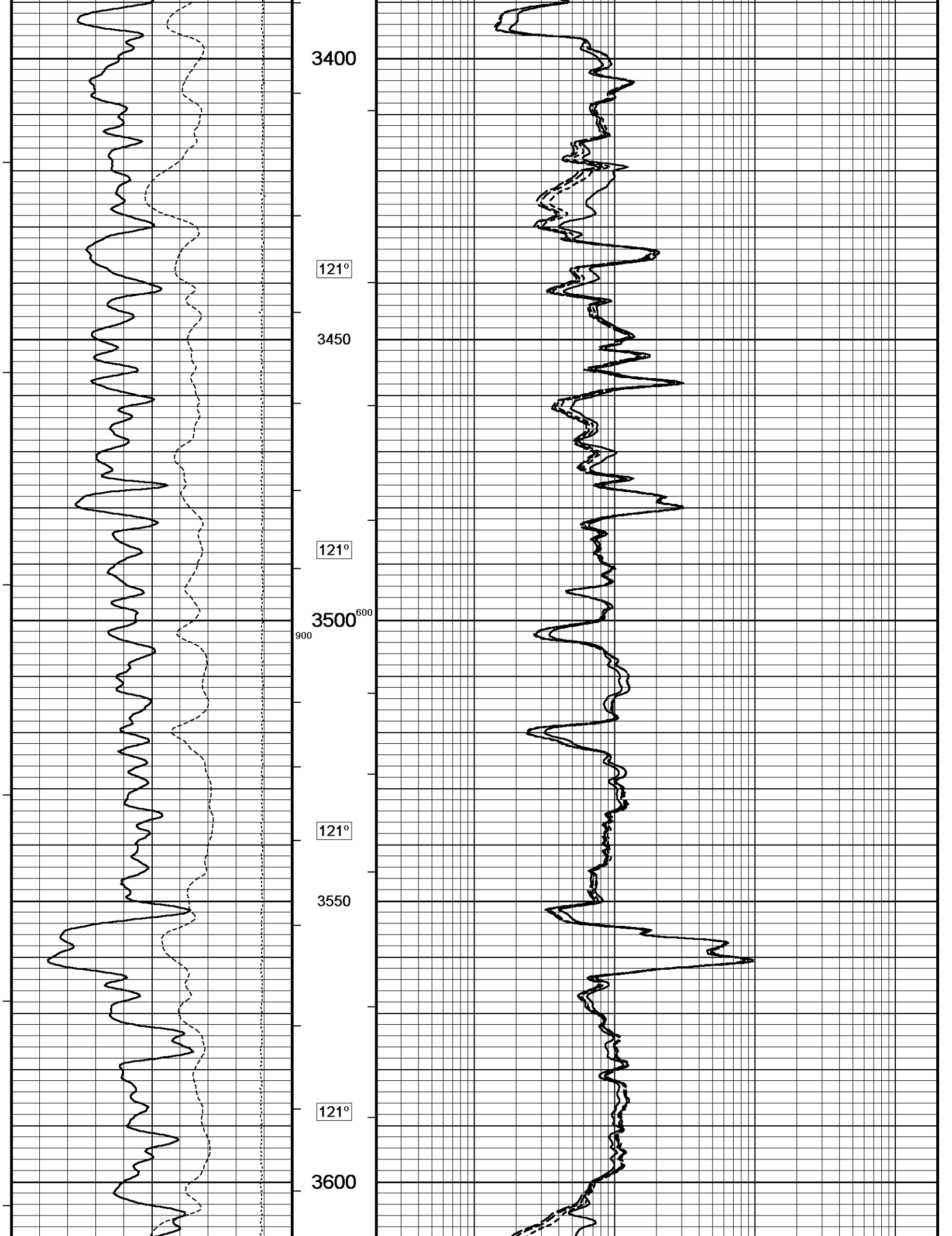


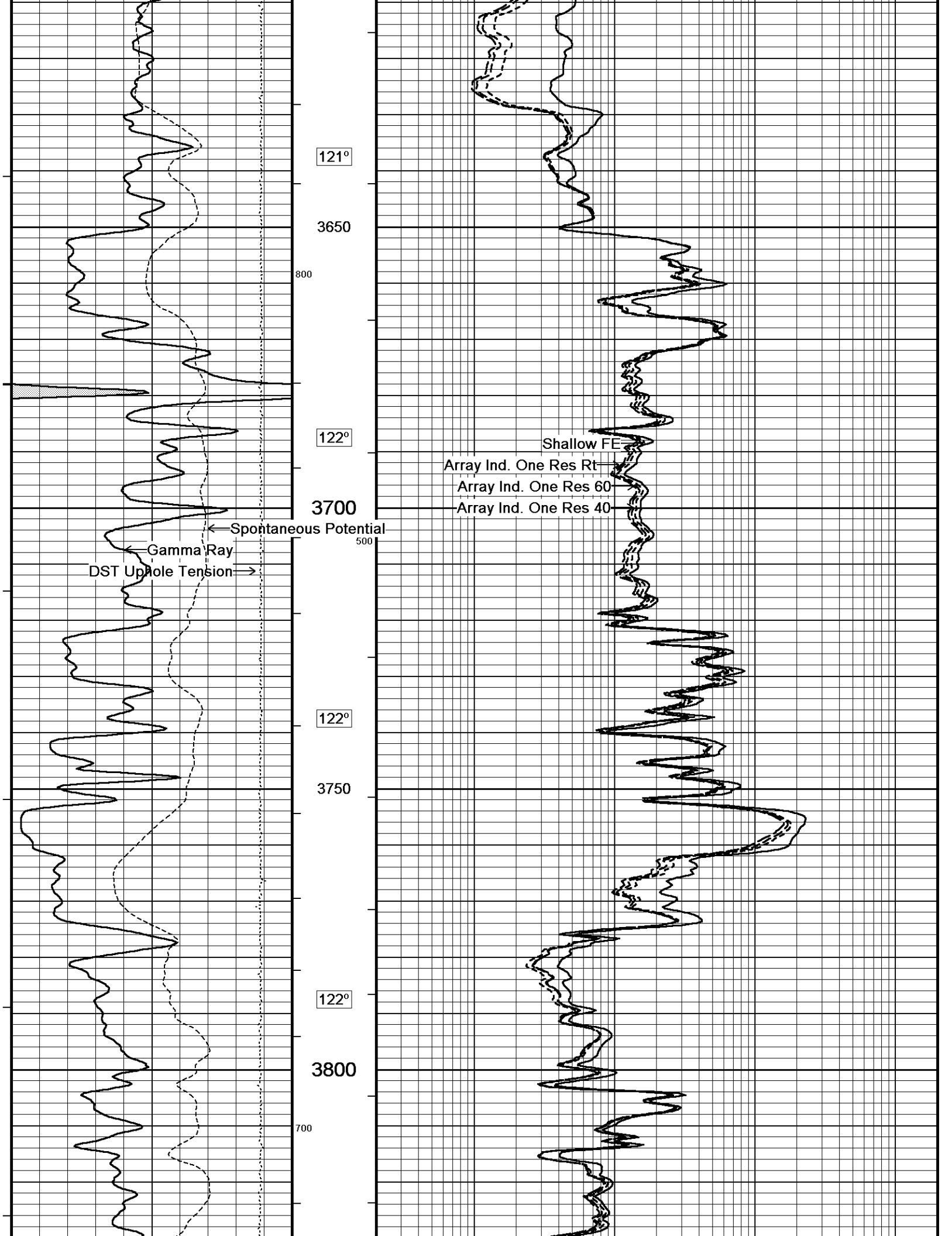


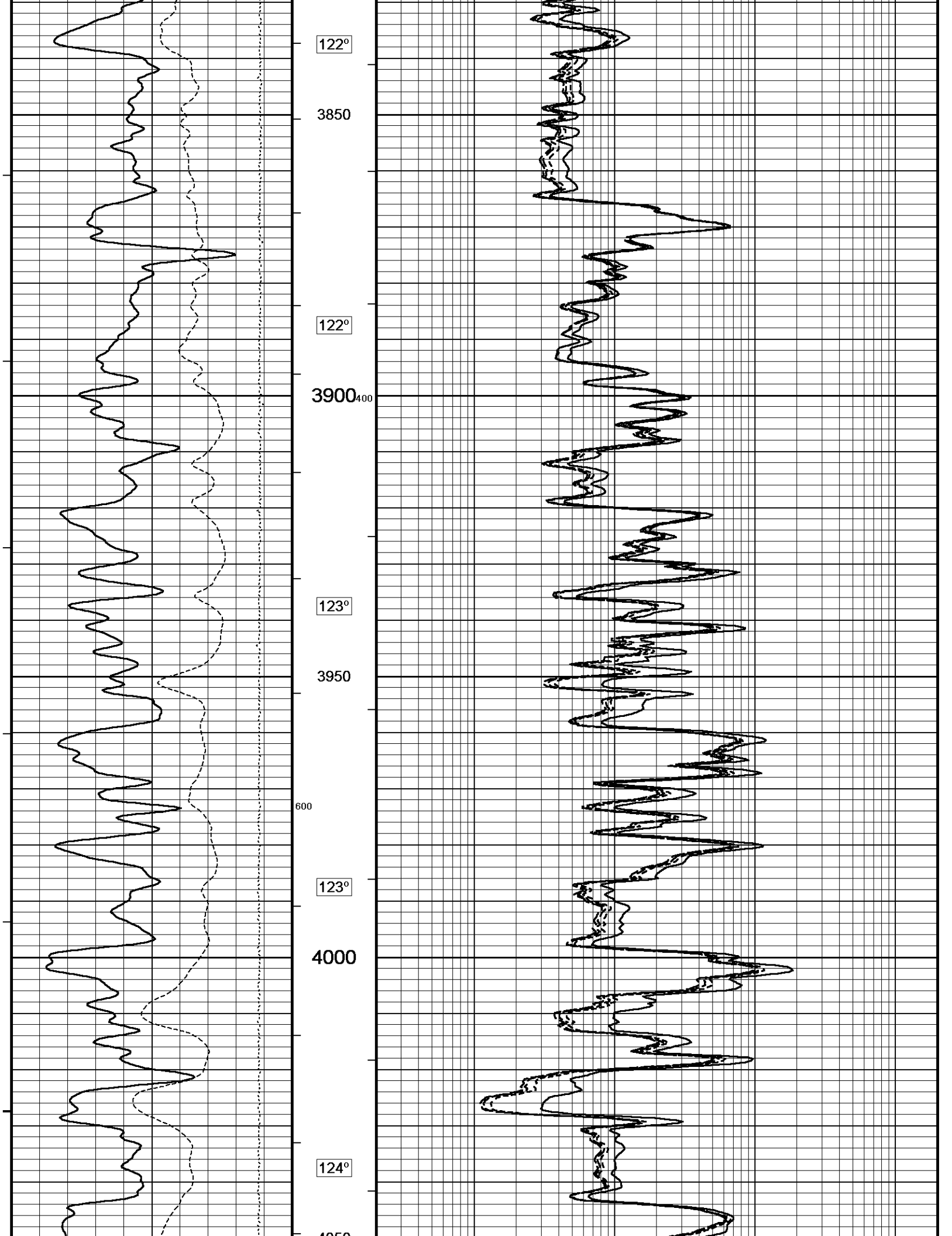


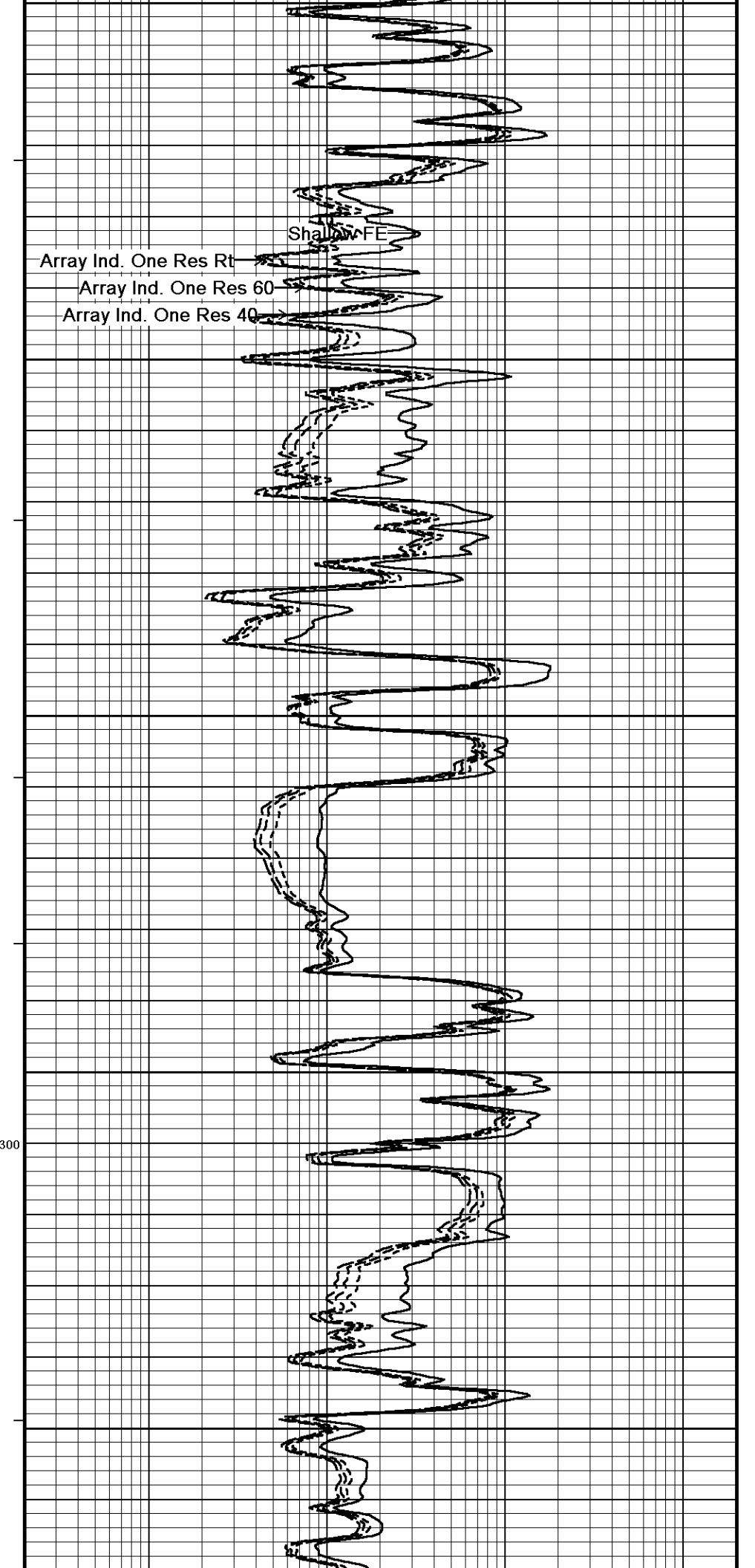
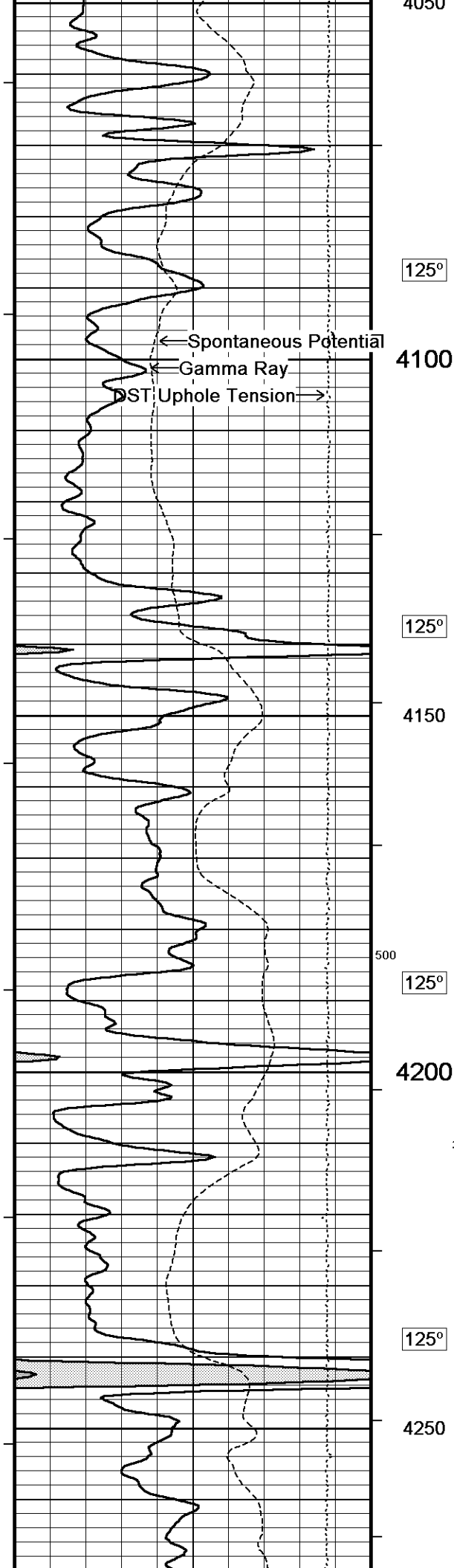
← Spontaneous Potential
← Gamma Ray
DST Uphole Tension →

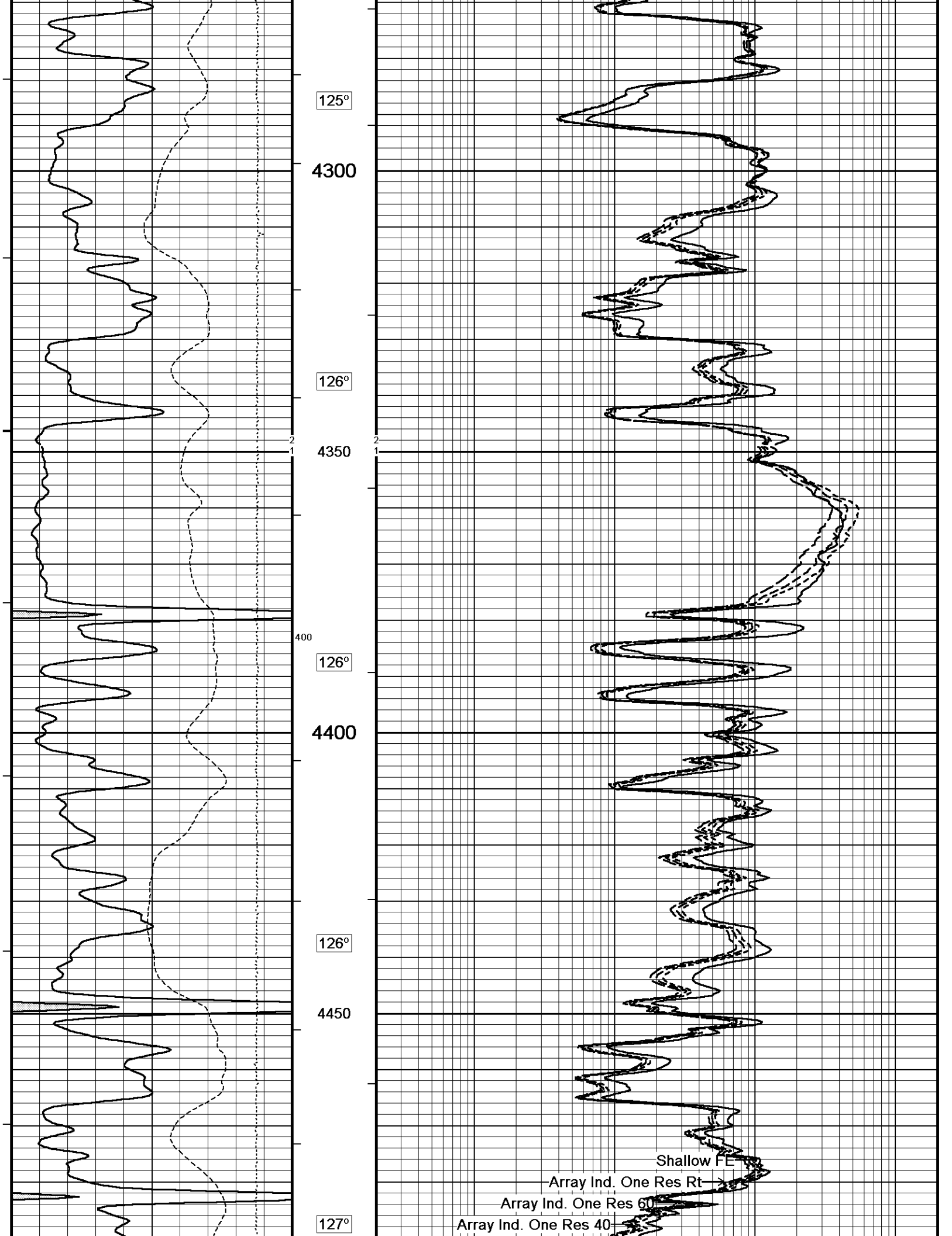
Shallow EE →
Array Ind. One Res Rt →
Array Ind. One Res 60 →
Array Ind. One Res 40 →

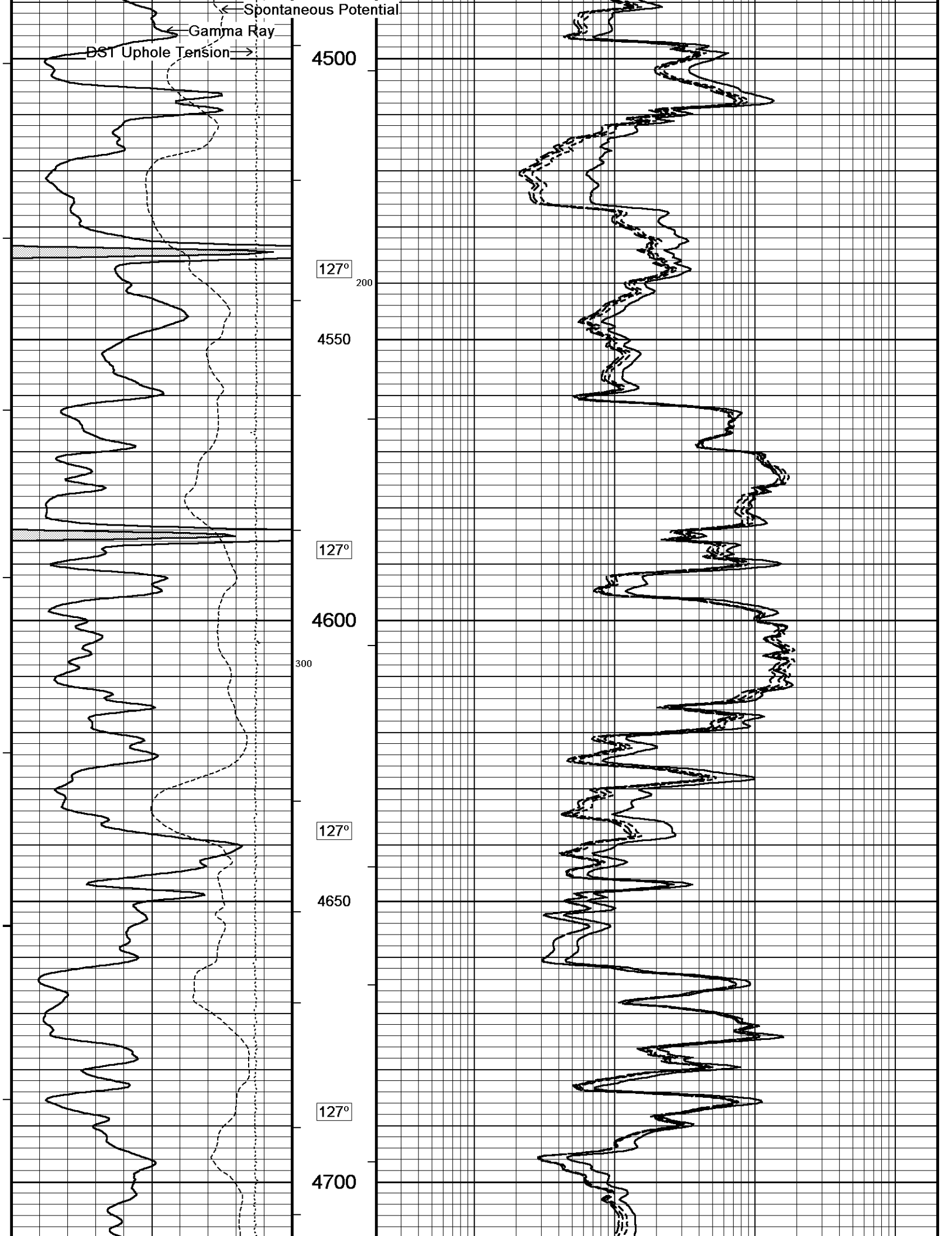


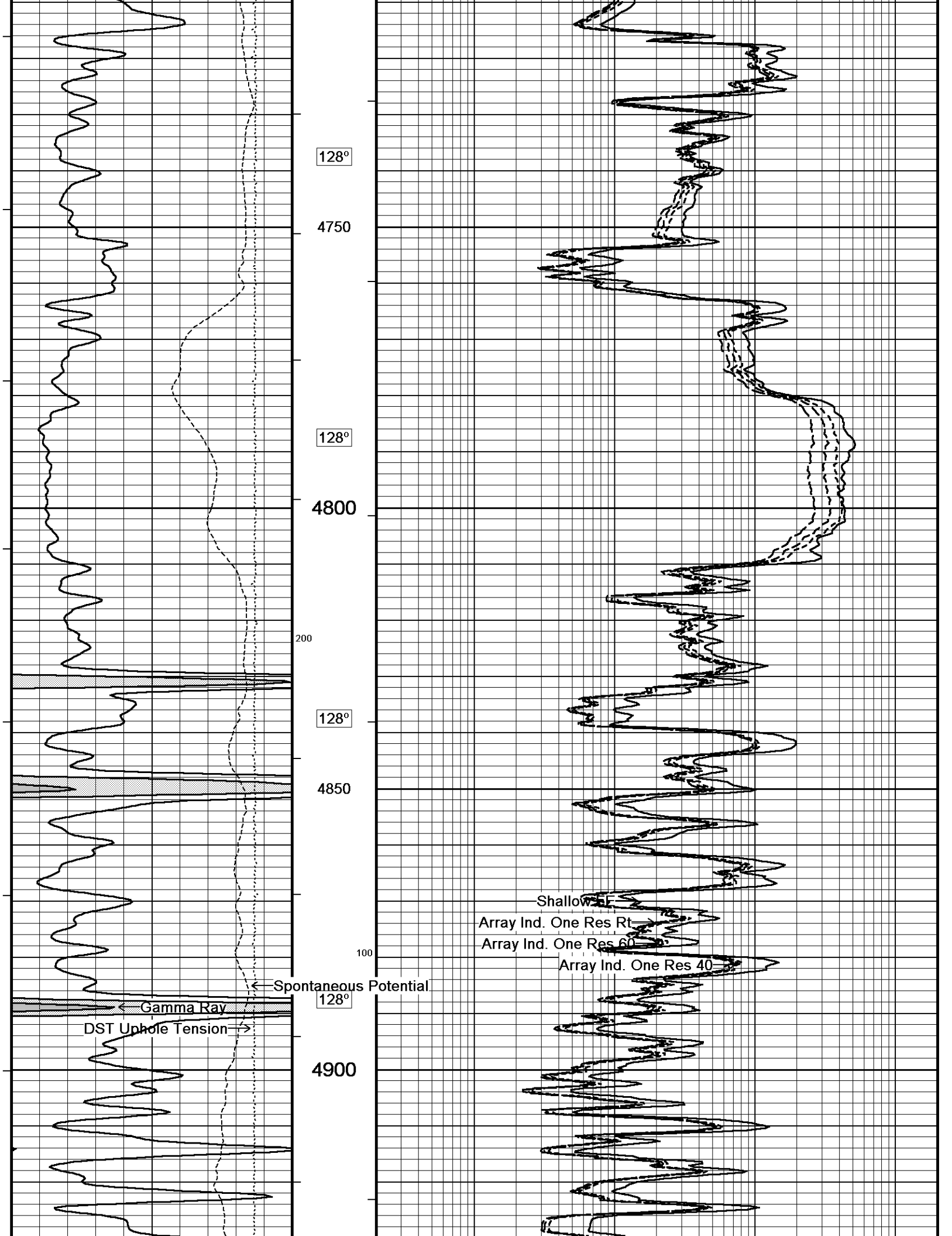


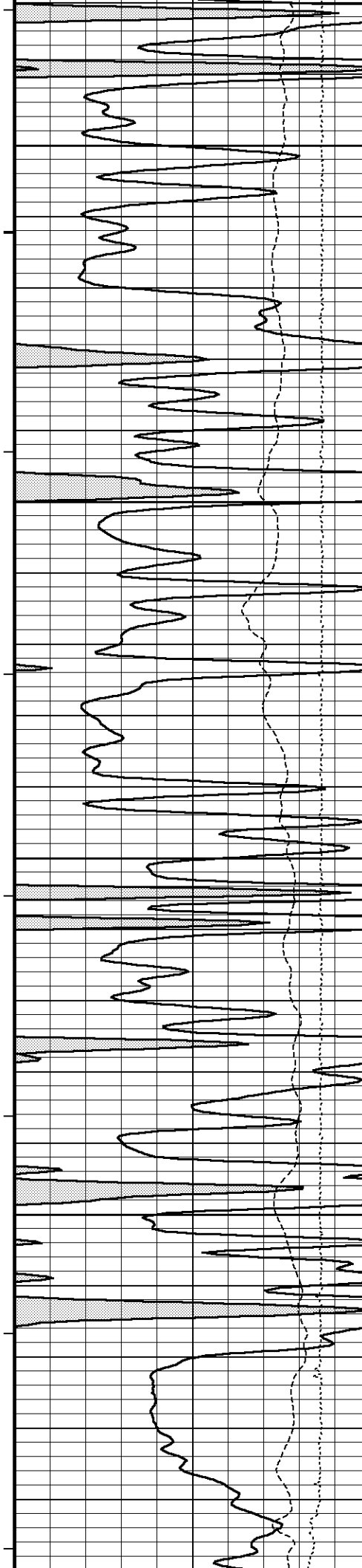












129°

4950

129°

5000

130°

5050

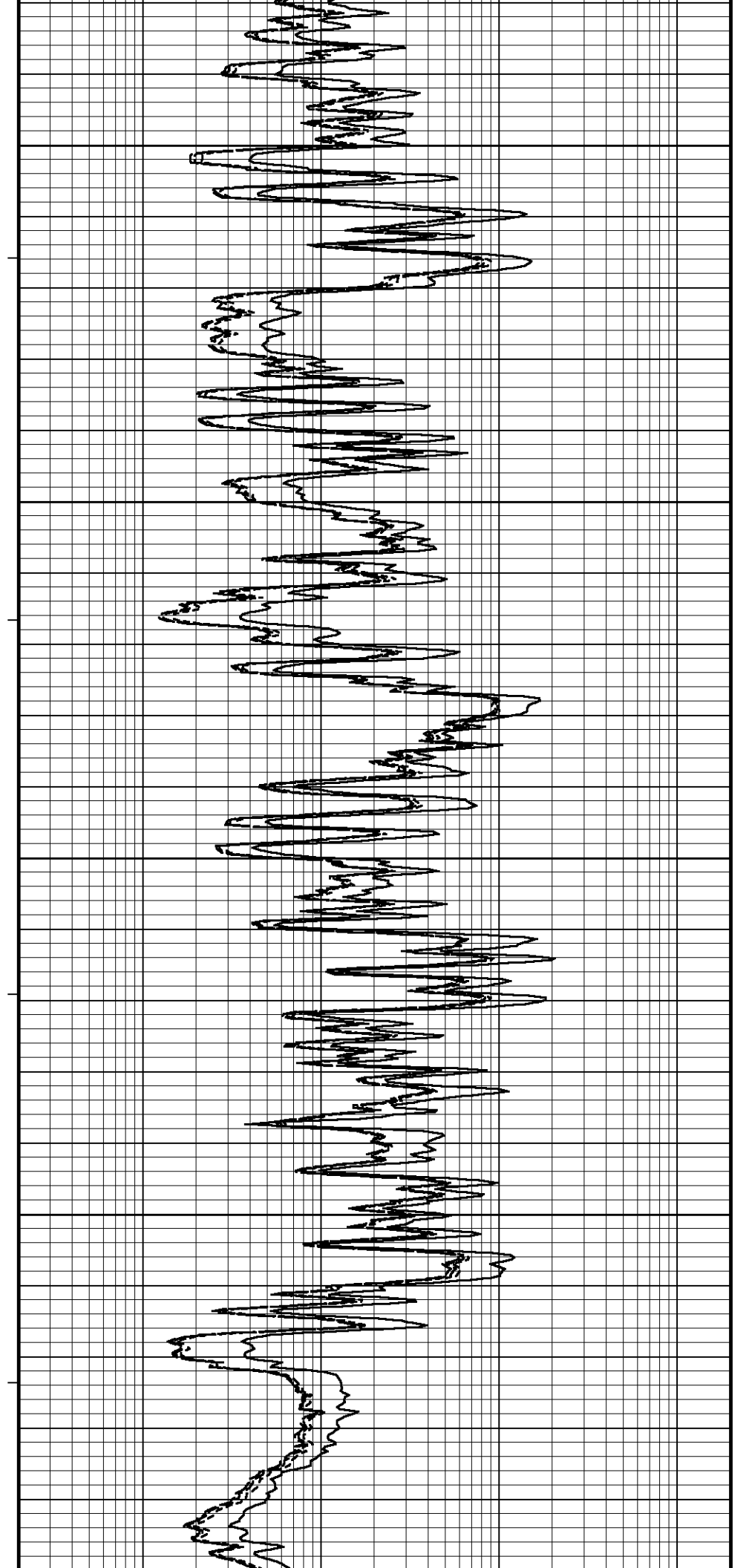
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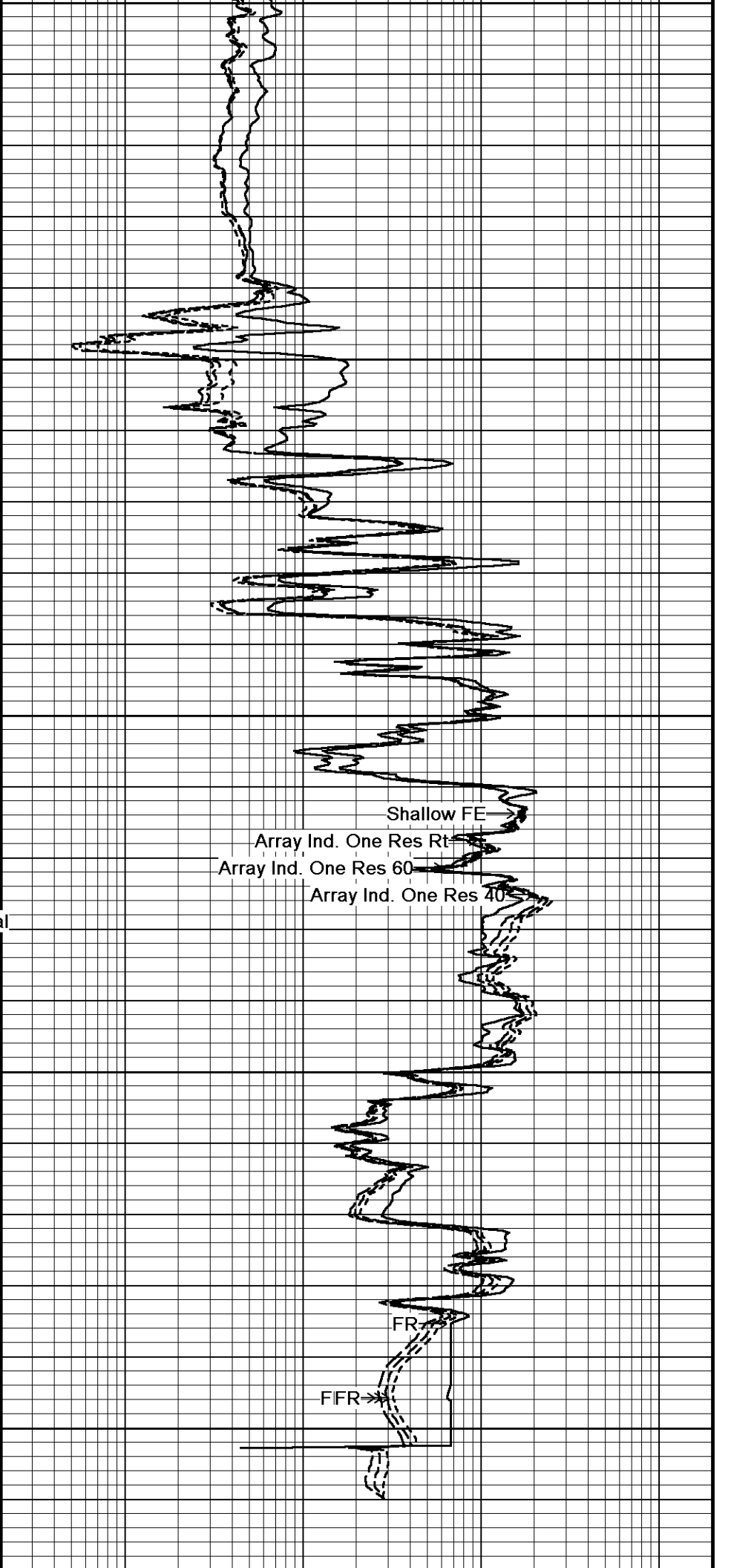
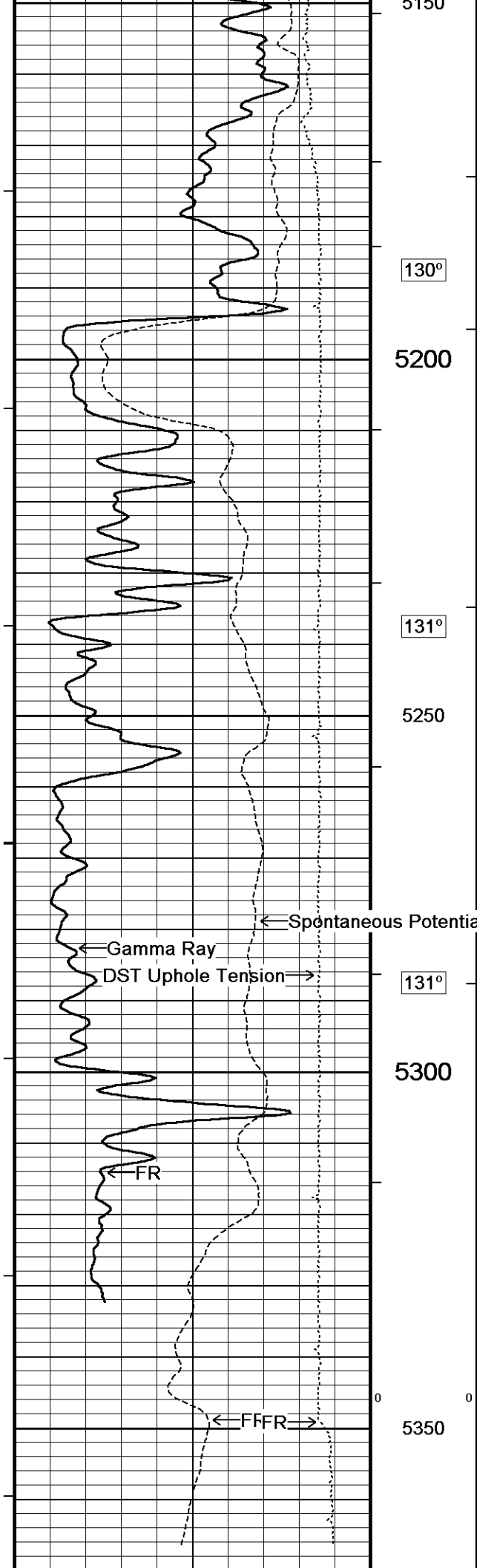
129°

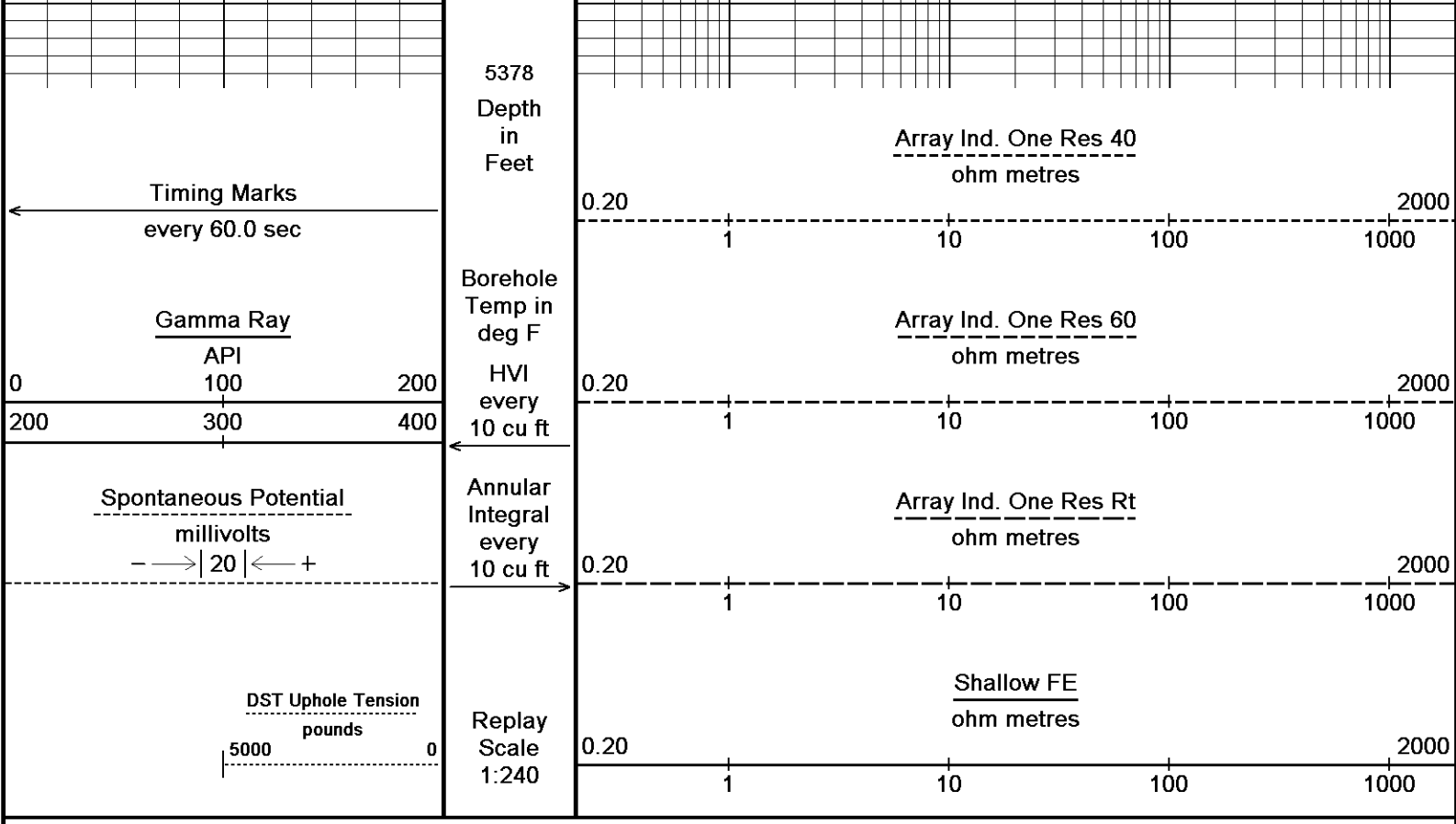
5100

128°

5150







Depth Based Data - Maximum Sampling Increment 10.0cm
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 Plotted on 07-SEP-2014 01:30
 Recorded on 06-SEP-2014 22:19

↑ 5 INCH MAIN ↑

BEFORE SURVEY CALIBRATION

C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta

General Constants All 000

Last Edited on 06-SEP-2014,20:43

General Parameters

Mud Resistivity 1.510 ohm-metres
 Mud Resistivity Temperature 96.000 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 None

Rwa Parameters

Porosity used Crossplot Porosity
 Resistivity used Array Ind. One Res Rt
 RWA Constant A 0.610
 RWA Constant M 2.150
 SW/APOR Tool Source 0.000

Down-hole Tension Calibration SMS 0

Field Calibration on 06-SEP-2014 21:23

Reading No	Measured	Calibrated (lbs)
1	15737.84	0.00
2	16034.73	326.30

SP Calibration MCG-C 208

Field Calibration on 05-SEP-2014 13:40

Measured Calibrated (mV)

Reference 1	99.8	98.7
Reference 2	-97.8	-98.9

High Resolution Temperature Calibration MCG-C 208			Field Calibration on 23-JAN-2014,17:11
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	

High Resolution Temperature Constants MCG-C 208			Last Edited on 23-JAN-2014,17:11
Pre-filter Length	11		

Gamma Calibration MCG-C 208			Field Calibration on 05-SEP-2014 13:53
	Measured	Calibrated (API)	
Background	66	45	
Calibrator (Gross)	1122	770	
Calibrator (Net)	1056	725	

Gamma Constants MCG-C 208			Last Edited on 06-SEP-2014,20:43
Gamma Calibrator Number	GRC038		
Mud Density	1.02	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl		kppm	
K Mud Type	Chloride		
K Mud Concentration	0.00	%	

Neutron Calibration MDN-B.J 387			Base Calibration on 31-JUL-2014 11:36	Field Check on 05-SEP-2014 13:58
Base Calibration				
		Measured	Calibrated (cps)	
	Near	Far	Near	Far
	2985	92	3714	110
Ratio	32.470		33.764	
Field Calibrator at Base				
			Calibrated (cps)	
			1675	2460
Ratio	0.681			
Field Check				
			Calibrated (cps)	
			1683	2443
Ratio	0.689			

Neutron Constants MDN-B.J 387			Last Edited on 06-SEP-2014,20:42
Neutron Source Id	P58125B		
Neutron Jig Number	5824NE		
Epithermal Neutron			
Caliper Source for Processing	Density Caliper		
Stand-off	0.00	inches	
Mud Density	1.00	gm/cc	
Limestone Sigma	7.10	cu	
Sandstone Sigma	4.26	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	Constant Value		
Temperature	68.00	degrees F	
Mud Salinity	0.00	kppm	
Salinity Correction	Not Applied		
Formation Fluid Salinity Source	None		
Formation Fluid Salinity	N/A	kppm	
Barite Mud Correction	Not Applied		

FE Calibration MFE-A.A 55			Base Calibration on 05-SEP-2014 14:08	Field Check on 05-SEP-2014 14:12
Base Calibration				
		Measured	Calibrated (ohm-m)	
Reference 1		0.0	0.0	
Reference 2		951.0	126.8	

Base Check 281.6

Field Check 281.6

FE Constants MFE-A.A 55

Last Edited on 06-SEP-2014,20:42

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

Induction Calibration MAI-A.A 5

Base Calibration on 21-JAN-2014,09:50

Field Check on 05-SEP-2014 13:23

Base Calibration

Test Loop Calibration		Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High	
1	16.3	470.8	9.3	966.2	
2	5.6	376.1	7.6	821.4	
3	2.6	266.1	5.2	566.0	
4	1.6	130.0	2.6	279.2	

Array Temperature 71.1 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1	0.0	0.0	15.2	3862.7
2	0.0	0.0	31.8	3591.0
3	0.0	0.0	29.8	2971.7
4	0.0	0.0	20.8	2126.4
Deep			18.5	1912.4
Medium			43.1	3861.6
Shallow			47.4	5372.8

Array Temperature 0.0 73.9 Deg F

Induction Constants MAI-A.A 5

Last Edited on 06-SEP-2014,20:42

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 5

Field Calibration on 21-JAN-2014,15:43

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

High Resolution Temperature Constants MAI-A.A 5

Last Edited on 27-JUN-2014,14:12

Pre-filter Length 11

Caliper Calibration MPD-D.A 481

Base Calibration on 23-AUG-2014 13:39

Field Calibration on 05-SEP-2014 13:28

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	17257	3.99
2	27352	5.98
3	37398	7.97
4	47224	9.86
5	58327	11.92
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.95	7.97

Photo Density Calibration MPD-D.A 481

Base Calibration on 23-AUG-2014 14:06

Field Check on 05-SEP-2014 13:32

Density Calibration				
Base Calibration				
	Near	Far	Near	Far
Background	1216	1426		
Reference 1	55706	26385	59556	30836
Reference 2	22306	2607	24941	2541

Field Check at Base
1215.9 1425.6

Field Check
1213.8 1423.6

PE Calibration				
Base Calibration				
	WS	WH	Ratio	Calibrated Ratio
Background	232	1087		
Reference 1	24125	55503	0.439	0.371
Reference 2	6847	22166	0.314	0.272

Field Check at Base
232.2 1087.0

Field Check
230.3 1084.6

Density Constants MPD-D.A 481

Last Edited on 06-SEP-2014,20:42

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	1.02	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	

DNC1	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
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 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta

CBH-C, Cablehead, 11 pin
CBH-C 265 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in

Compact Comms Gamma
MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.240 in

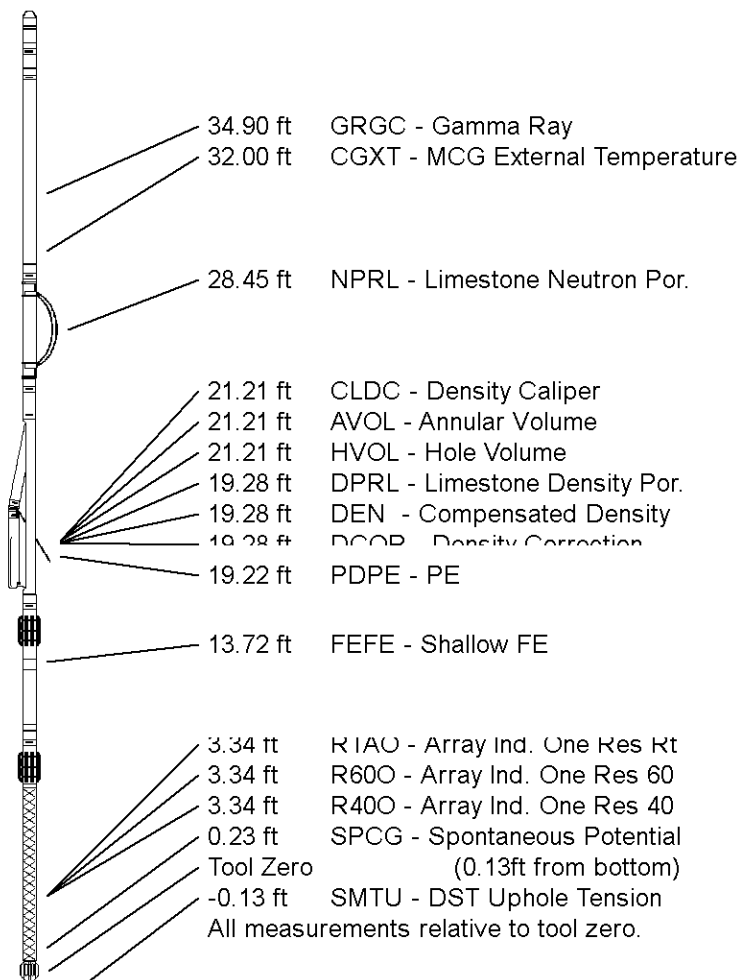
Compact Neutron
MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-D.A 481 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-A.A 5 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 42.59 ft Weight: 326.3 lb



COMPANY	MID-CON ENERGY OPERATING, INC.
WELL	HRMU 14-1
FIELD	HARKER RANCH MORROW UNIT
PROVINCE/COUNTY	CHEYENNE
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	4045.19	feet	First Reading	5345.85	feet
Elevation Drill Floor	4043.19	feet	Depth Driller	5350.00	feet
Elevation Ground Level	4028.59	feet	Depth Logger	5349.00	feet



ARRAY INDUCTION
SHALLOW FOCUSED

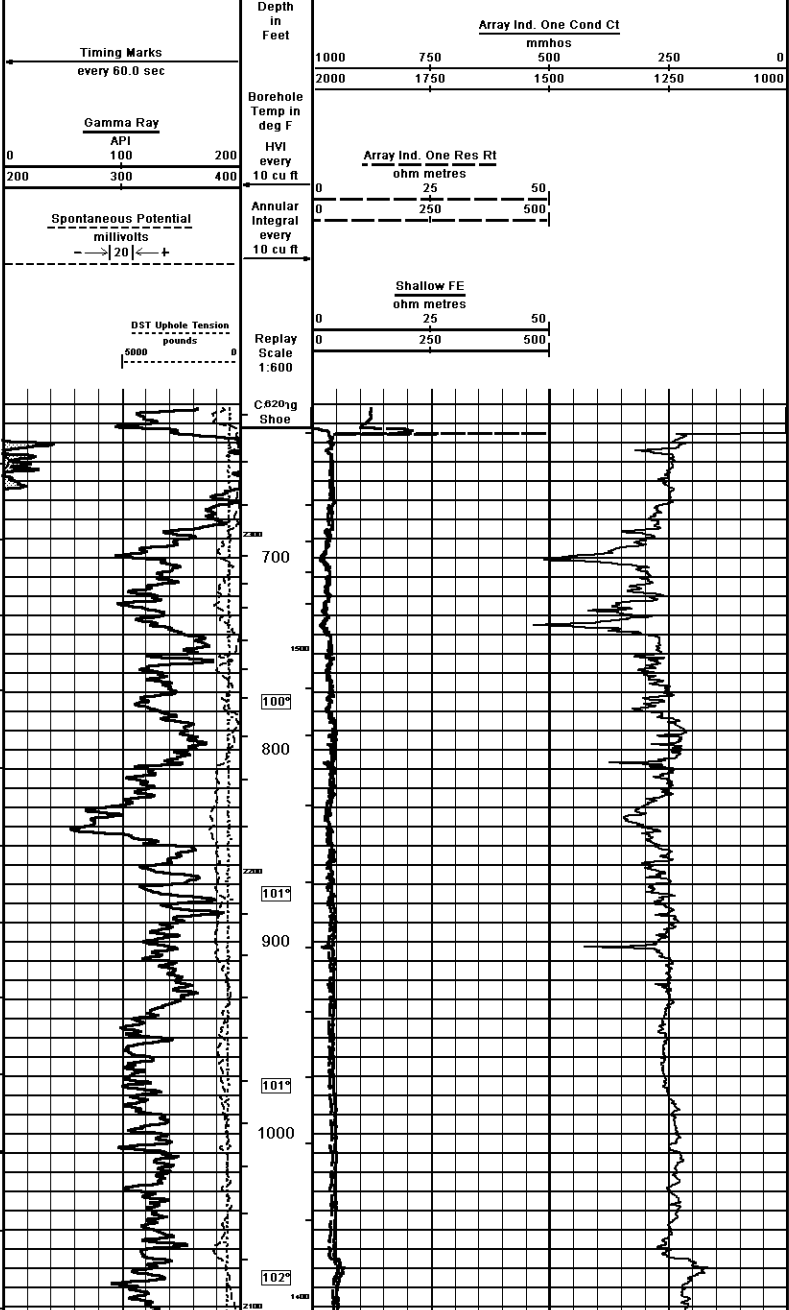


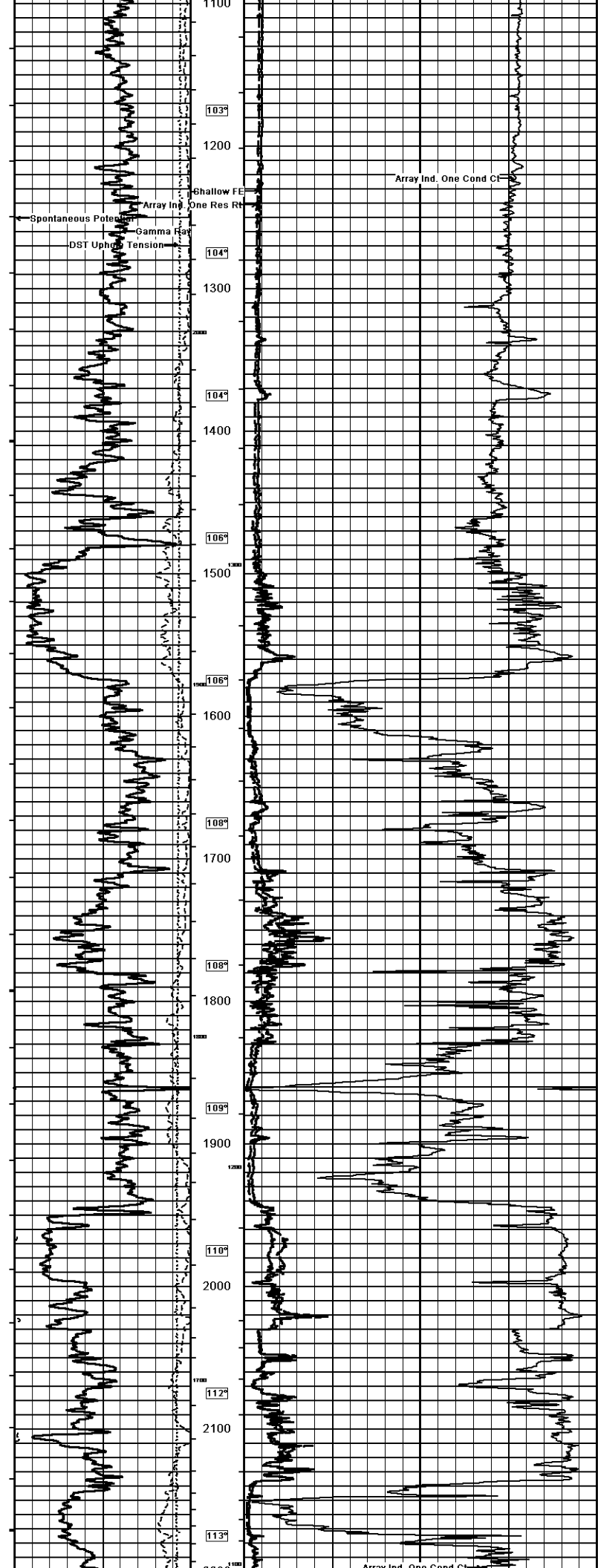
ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG

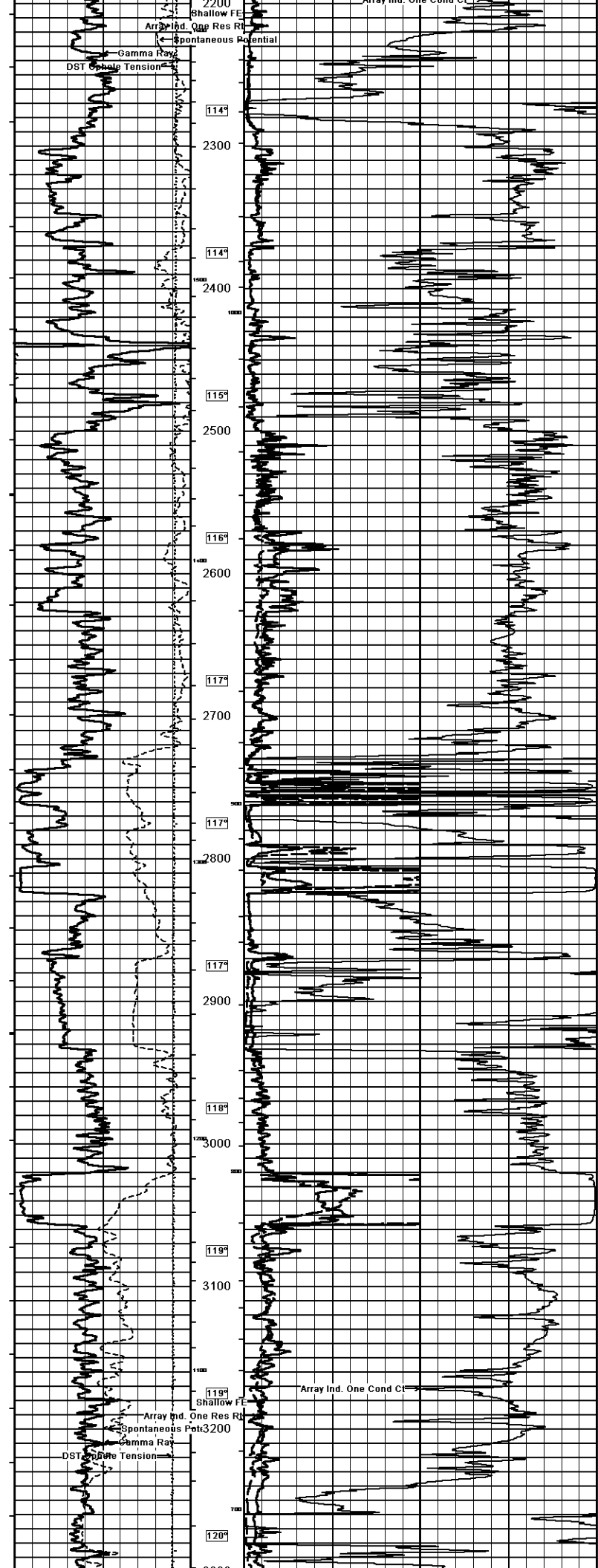
COMPANY	MID-CON ENERGY OPERATING, INC.
WELL	HRMU 14-1
FIELD	HARKER RANCH MORROW UNIT
PROVINCE/COUNTY	CHEYENNE
COUNTRY/STATE	U.S.A. / COLORADO
LOCATION	489' ESL & 1320' FML OF SW/4
SEC. 1	Twp. 13S Rge. 43W Tones Services
Latitude	40.01720714800
Longitude	106.5872014
Run Number	1100
Service Order	7577-9721236
Depth Driller	5356100
Depth Logger	5349100
First Reading	534589
Last Reading	632100
Casing Driller	626100
Casing Logger	632100
Bit Size	7.875
Hole Fluid Type	CHEMICAL
Density/Viscosity	8.50 lbm/gal
PH/Fluid Loss	11.00
Sample Source	MUD PIT
Rm @ Measured Temp	1.51 @ 96.0
Rm @ Measured Temp	1.21 @ 96.0
Rm @ Measured Temp	1.81 @ 96.0
Source Rm / Rm	CALC
Rm @ BHT	1.12 @ 31.0
Time Since Circulation	3.5 HOURS
Max Recorded Temp	131.00
Equipment/Phase	13244
Recorded By	JEFFREY RANDLE
Witnessed By	CLINT ARNOLD
LOG #	LR14-204

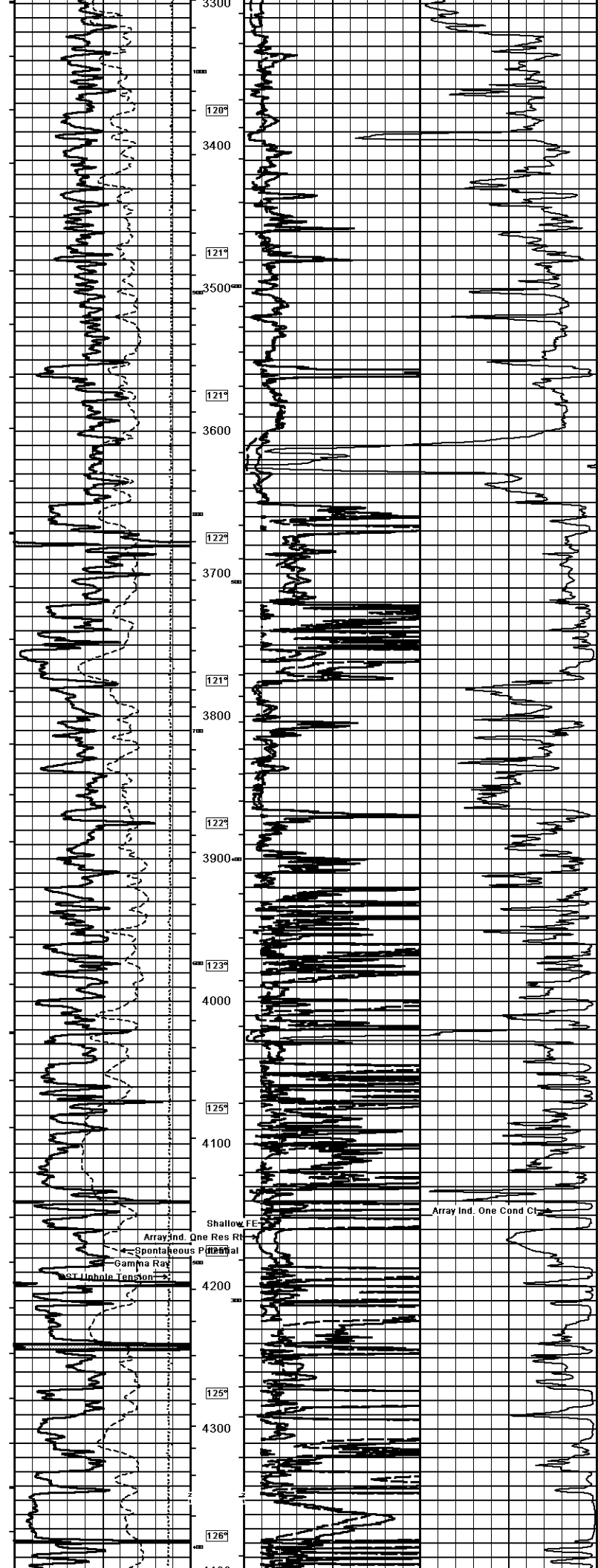
1 INCH MAIN

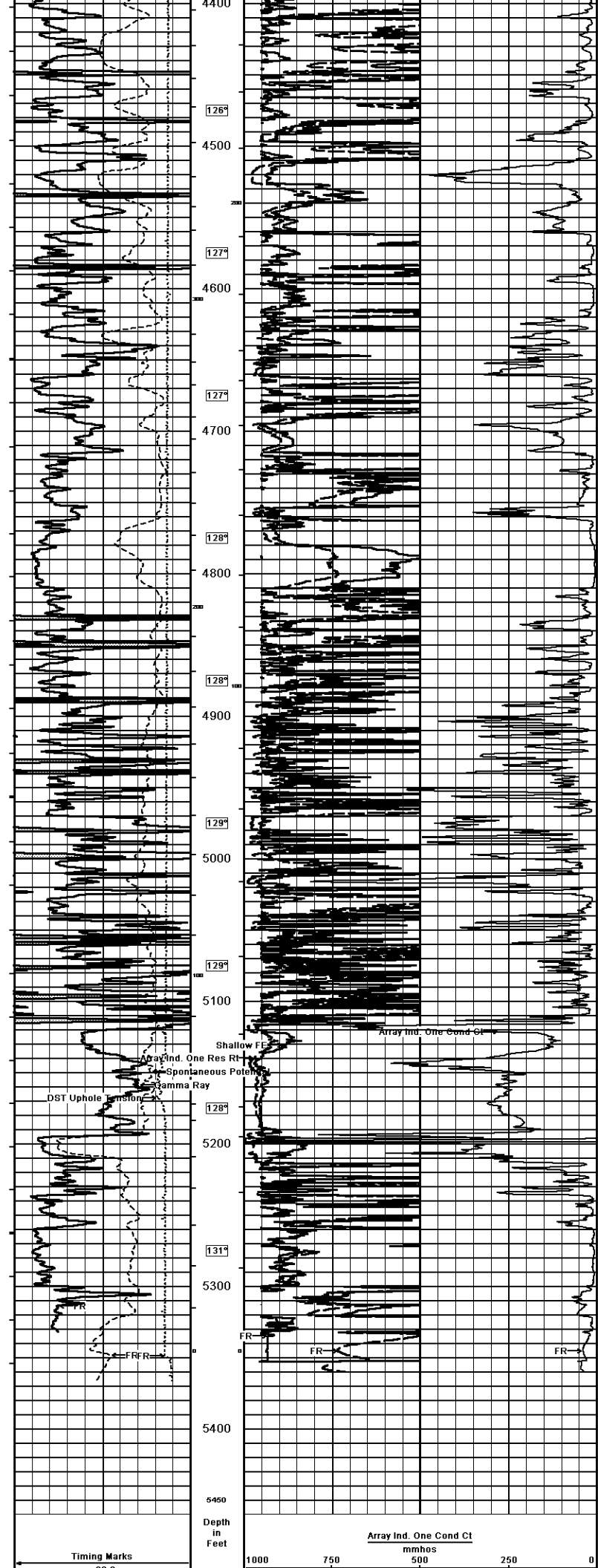
Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 07-SEP-2014 01:30
 Filename: C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta
 Recorded on 06-SEP-2014 22:19
 System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

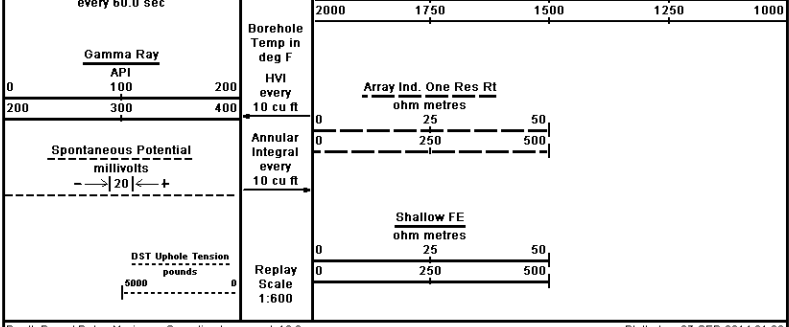













Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 07-SEP-2014 01:30
 Filename: C:\Minimus 13.08.2113\Logs\Mid-Con HRMU 14-1\Mid-Con HRMU 14-1 Repeat.dta
 Recorded on 06-SEP-2014 22:19
 System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

1 INCH MAIN

COMPANY	MID-CON ENERGY OPERATING, INC.				
WELL	HRMU 14-1				
FIELD	HARKER RANCH MORROW UNIT				
PROVINCE/COUNTY	CHEYENNE				
COUNTRY/STATE	U.S.A. / COLORADO				
Elevation Kelly Bushing	4045.19	feet	First Reading	5345.85	feet
Elevation Drill Floor	4043.19	feet	Depth Driller	5350.00	feet
Elevation Ground Level	4028.59	feet	Depth Logger	5349.00	feet



ARRAY INDUCTION
 SHALLOW FOCUSED
 ELECTRIC LOG