Weatherford®

ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG

COMPANY	WESTERN OPERATING COMPANY
WELL	FOX #2-8
FIELD	HELFRICH
PROVINCE/COUNTY	HAMILTON
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	1150' FNL & 1320' FWL S2 S2 N2 NW

SEC	TWP	RGE
8	25S	42W

API Number 15-075-20869
Permit Number

Other Services
MDN/MPD MML
MSS SGS

Permanent Datum GL, Elevation 3647 feet
Log Measured From KB
Drilling Measured From KB @ 11 FEET

Elevations:	feet
KB	3658.00
DF	3657.00
GL	3647.00

Date	7- JUL-2013			
Run Number	ONE			
Service Order	3539897			
Depth Driller	5467.00	feet		
Depth Logger	5460.00	feet		
First Reading	5457.00	feet		
Last Reading	924.00	feet		
Casing Driller	924.00	feet		
Casing Logger	924.00	feet		
Bit Size	7.875	inches		
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.40 lb/USg	56.00 CP		
PH / Fluid Loss	9.00	9.60 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.91 @ 85.0	ohm-m		
Rmf @ Measured Temp	0.73 @ 85.0	ohm-m		
Rmc @ Measured Temp	0.67 @ 85.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.61 @127.0	ohm-m		
Time Since Circulation	4 HOURS			
Max Recorded Temp	127.00	deg F		
Equipment / Base	13057	LIB		
Recorded By	W. STAMBAUGH			
Witnessed By	PETER DEBENHAM			
JOB #	LB13-196			

BOREHOLE RECORD

Last Edited: 08-JUL-2013 21:16

Bit Size inches	Depth From feet	Depth To feet
7.875	924.00	5460.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	924.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MSS, MAI RAN 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: 2350 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1620 CU. FT.

- RIG: MURFIN DRILLING RIG #21.

- ENGINEER: W. STAMBAUGH

- OPERATOR(S): D. CANADAY

2 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 08-JUL-2013 21:18

Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_003.dta — Recorded on 08-JUL-2013 17:58

System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− → | 20 | ← +

DST Uphole Tension
pounds
5000 0

Depth In Feet

Borehole Temp in deg F

Replay Scale 1:600

Array Ind. One Cond Ct
mmhos
1000 750 500 250 0
2000 1750 1500 1250 1000

Shallow FE
ohm metres
0 25 50
0 250 500

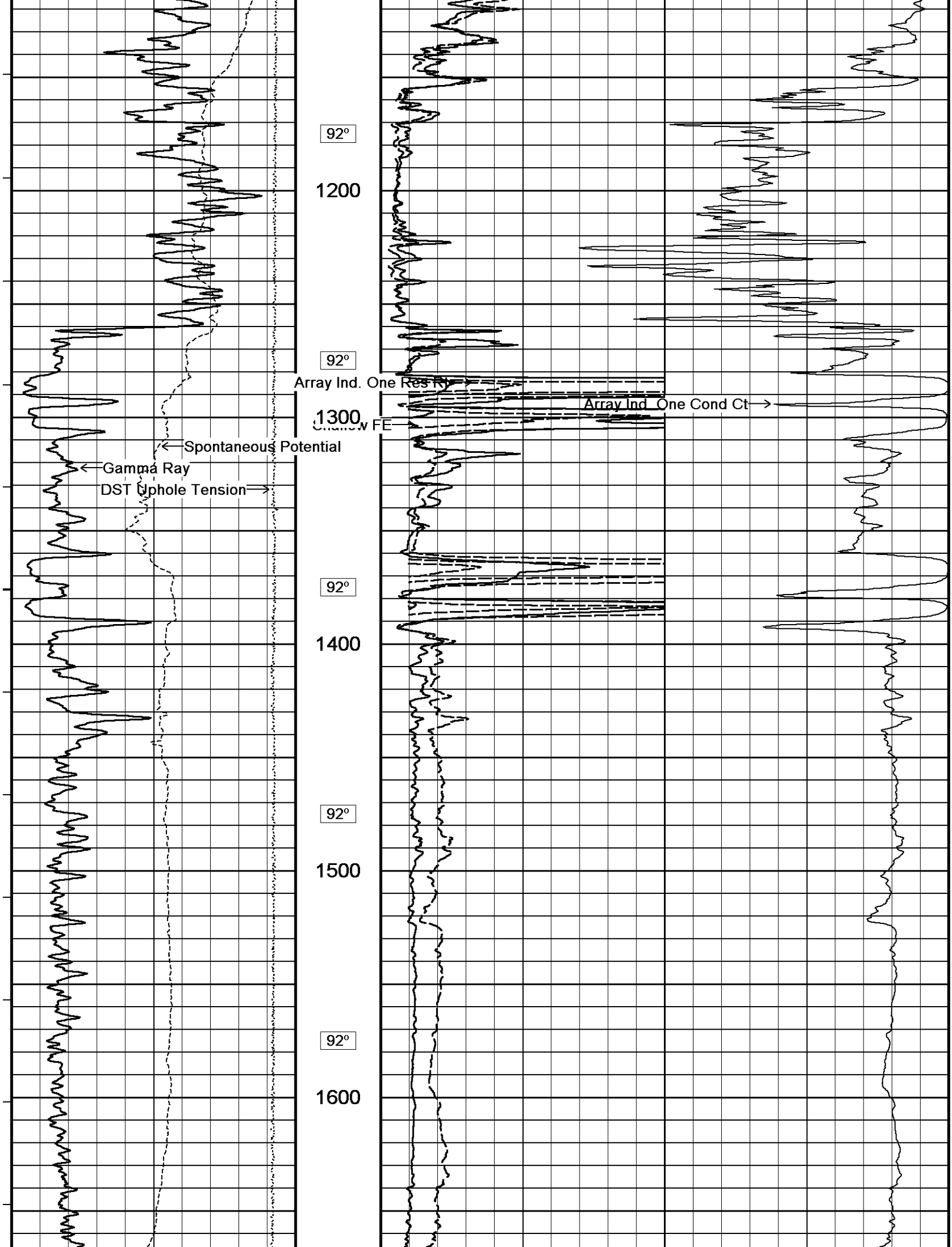
Array Ind. One Res Rt
ohm metres
0 25 50
0 250 500

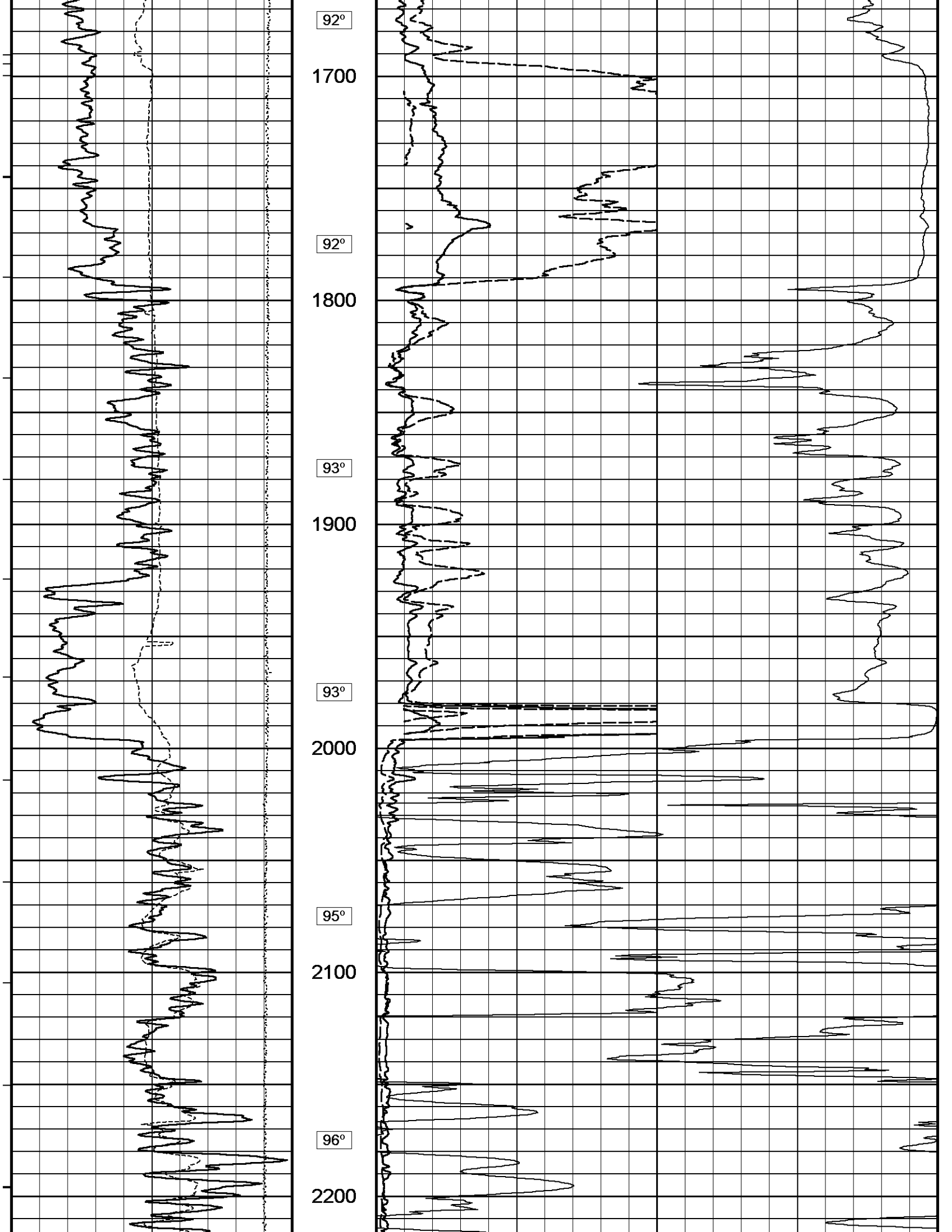
930

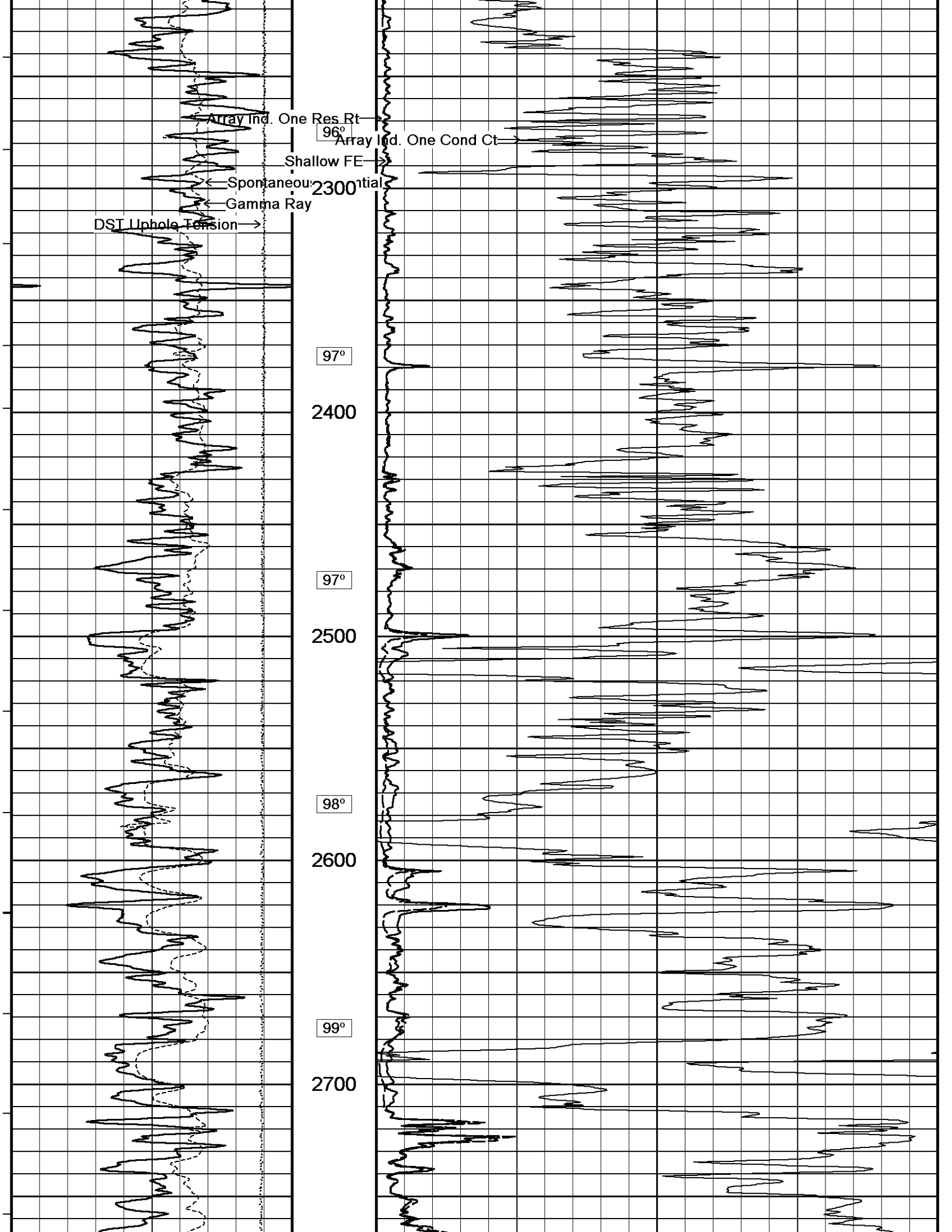
1000

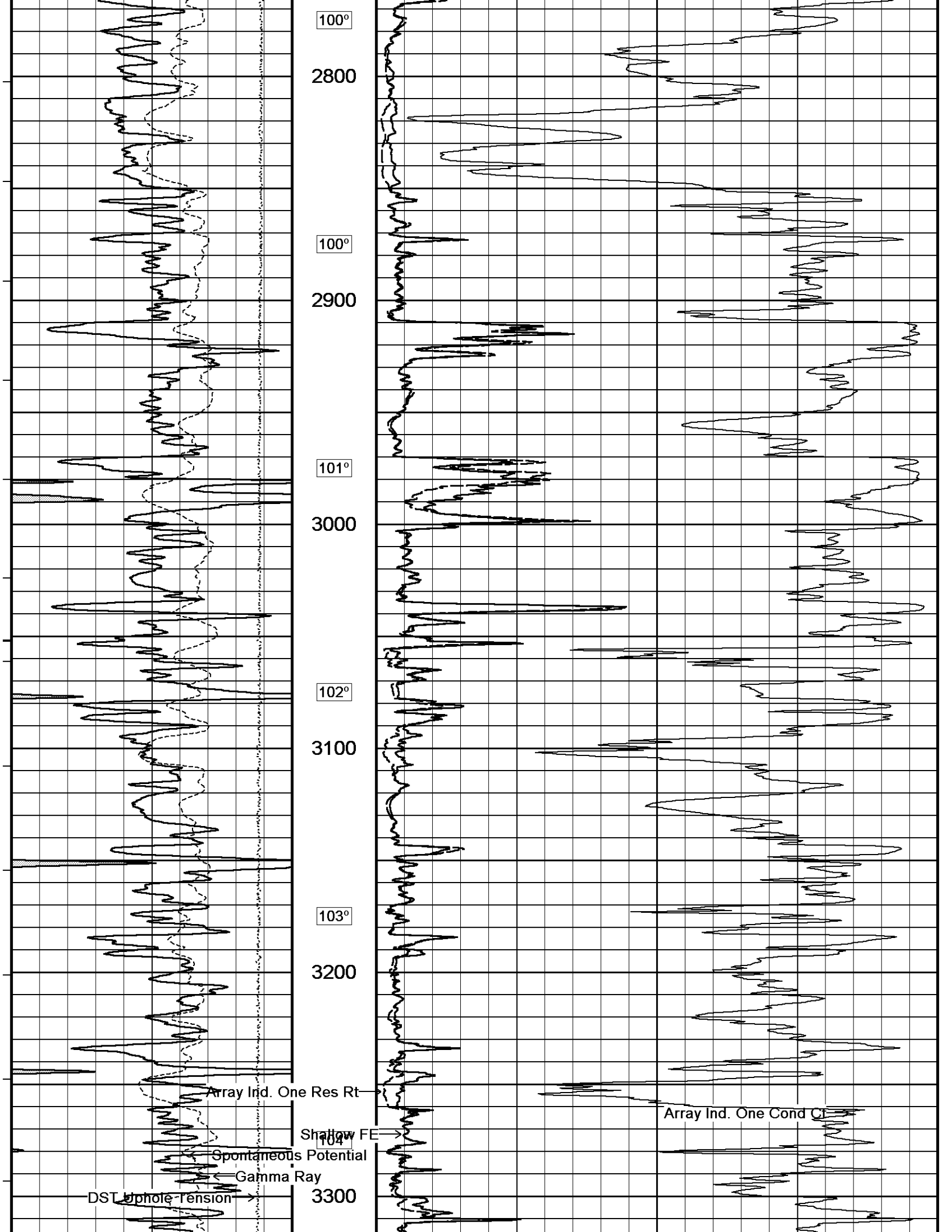
91°

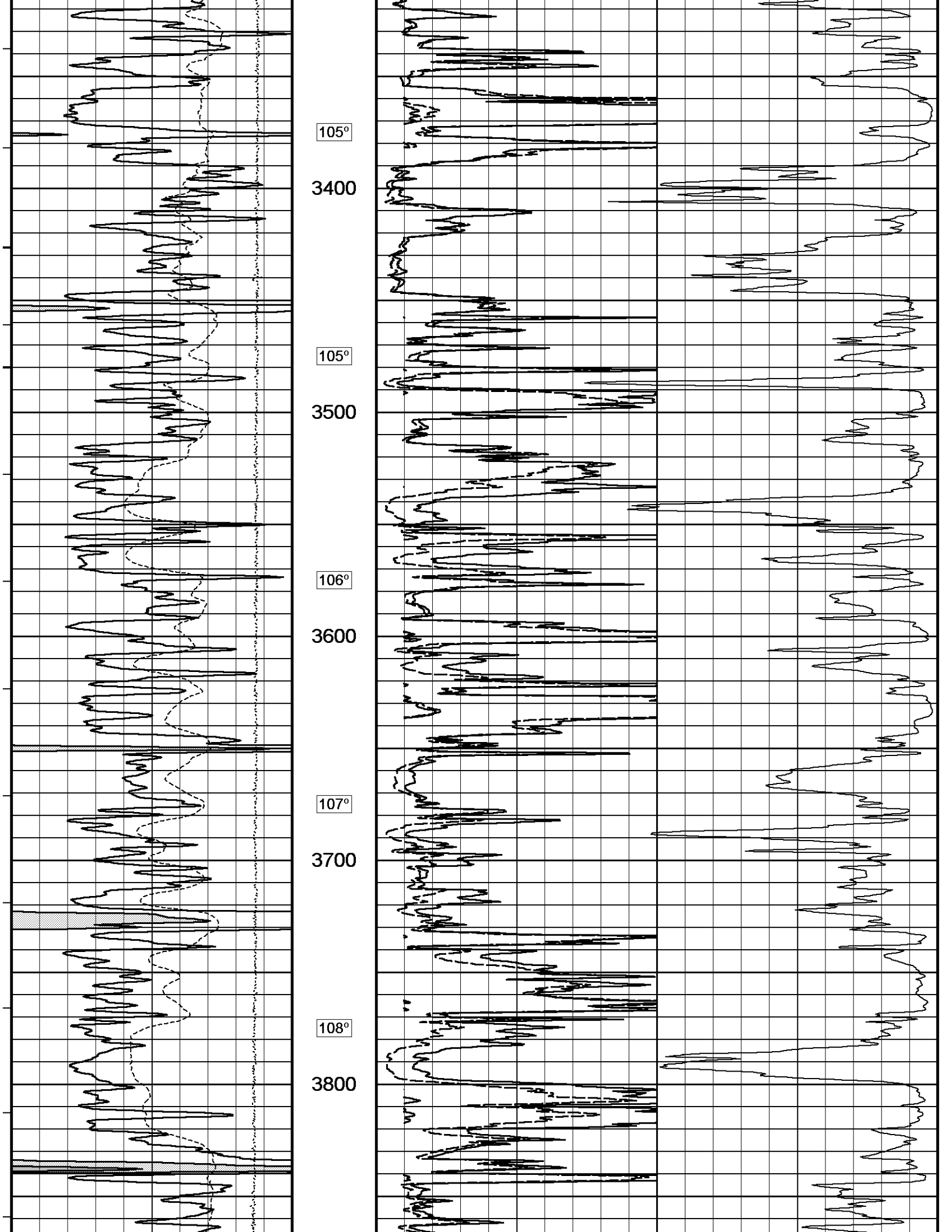
1100

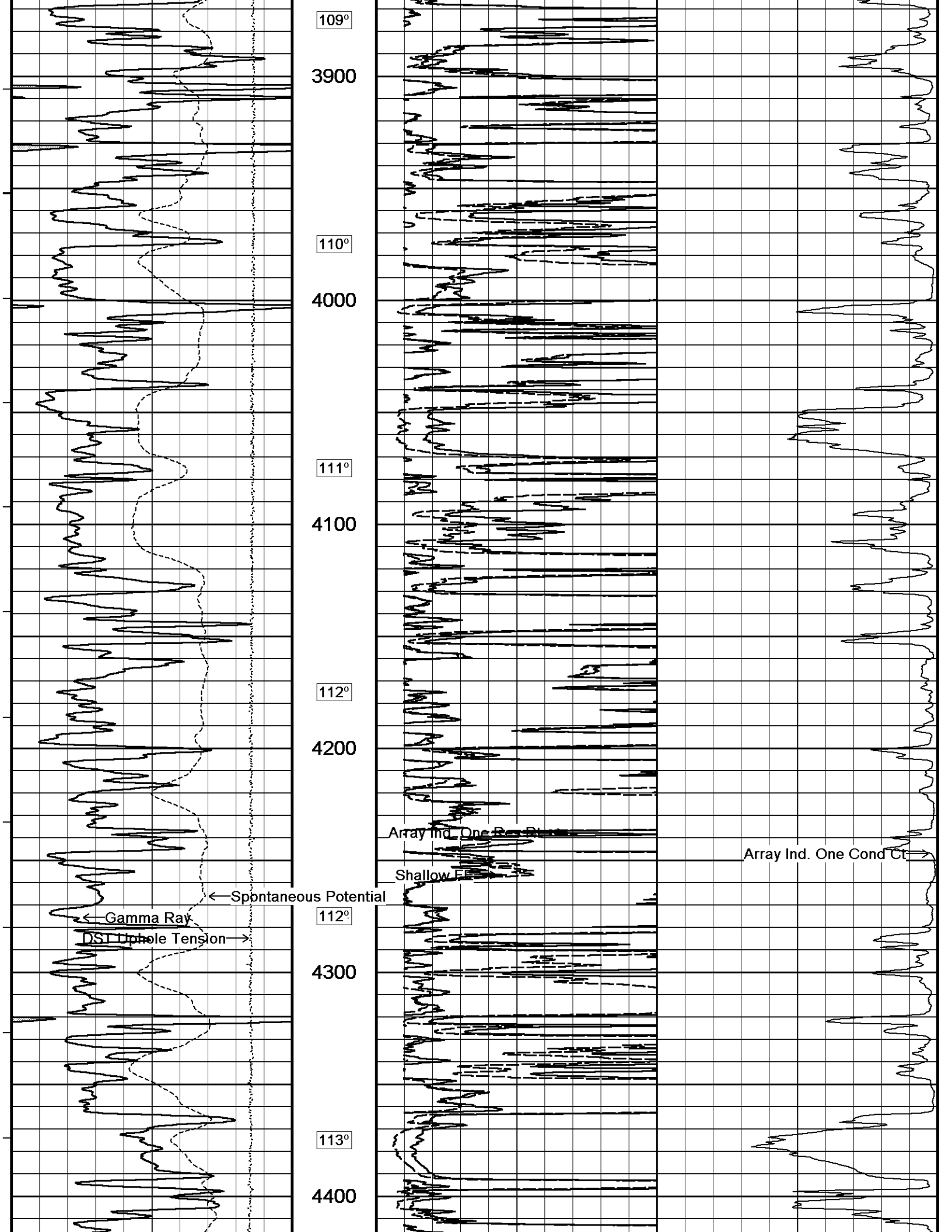

92°
1200
92°
Array Ind. One Res Rt
Array Ind. One Cond Ct
1300
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
92°
1400
92°
1500
92°
1600

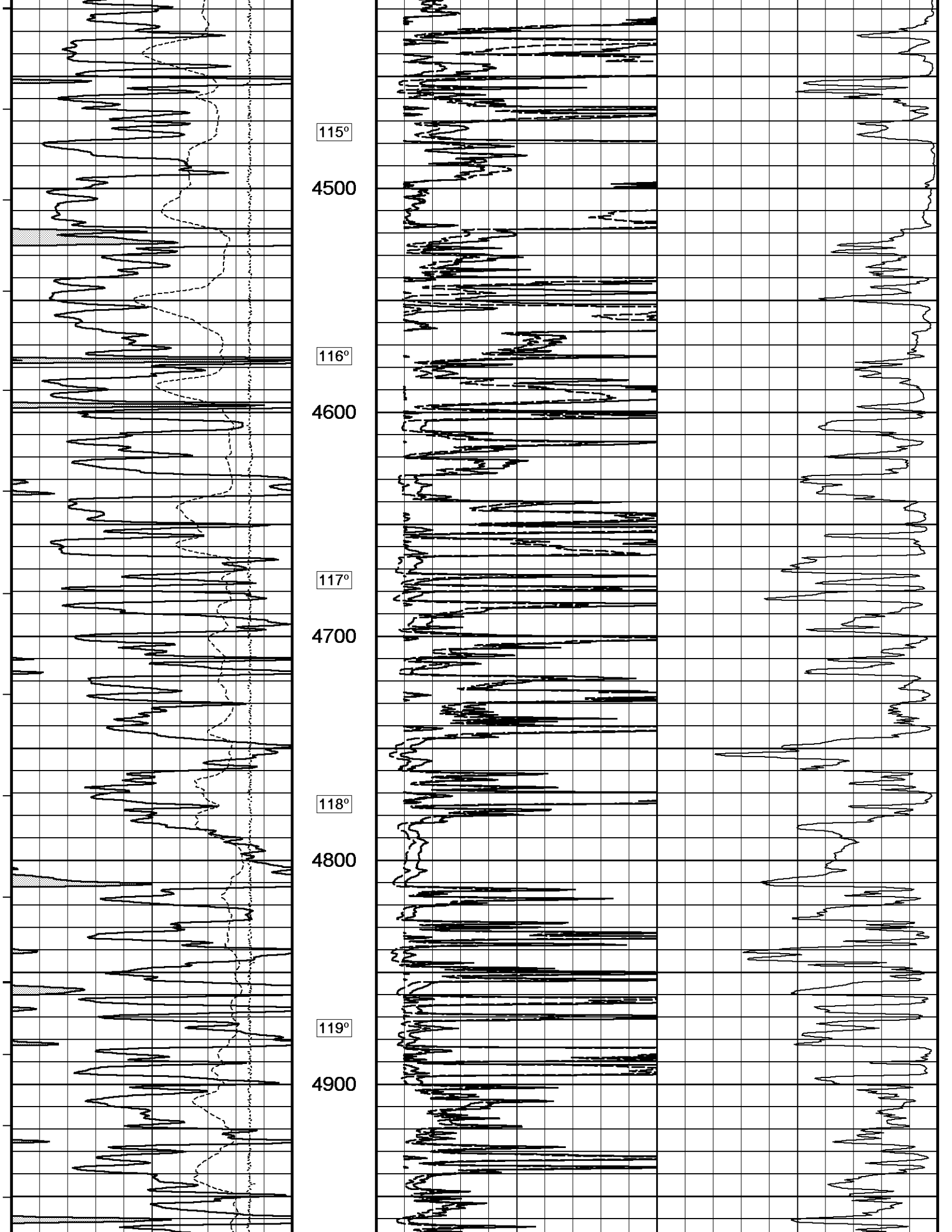

92°
1700
92°
1800
93°
1900
93°
2000
95°
2100
96°
2200

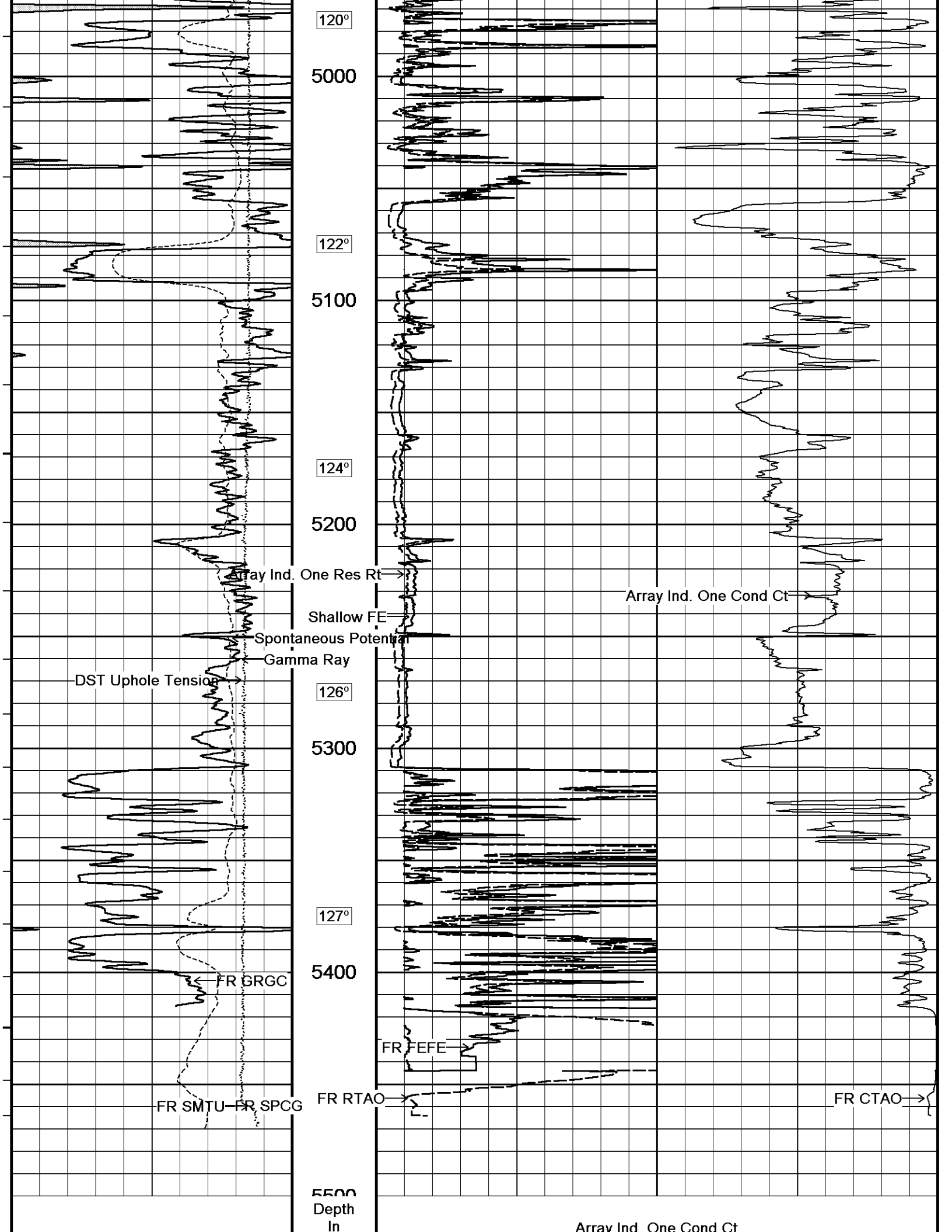

Array Ind. One Res Rt
96°
Array Ind. One Cond Ct
Shallow FE
Spontaneou
tial
2300
Gamma Ray
DST Uphole Tension
97°
2400
97°
2500
98°
2600
99°
2700


100°
2800
100°
2900
101°
3000
102°
3100
103°
3200
104°
3300
Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Ct


105°
3400
105°
3500
106°
3600
107°
3700
108°
3800


109°
3900
110°
4000
111°
4100
112°
4200
Array Ind. One Cond Ct
Shallow I
Spontaneous Potential
Gamma Ray
112°
DST Uphole Tension
4300
113°
4400


115°
4500
116°
4600
117°
4700
118°
4800
119°
4900


120°
5000
122°
5100
124°
5200
Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
126°
5300
127°
5400
FR GRGC
FR SMTU
FR SPCG
FR FEFE
FR RTAO
Array Ind. One Cond Ct
FR CTAO
5500
Depth
In
Array Ind. One Cond Ct

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− → | 20 | ← +

DST Uphole Tension
pounds
5000 0

Depth In Feet

Borehole Temp in deg F

Replay Scale 1:600

mmhos
1000 750 500 250 0
2000 1750 1500 1250 1000

Shallow FE
ohm metres
0 25 50
0 250 500

Array Ind. One Res Rt
ohm metres
0 25 50
0 250 500

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_003.dta — Recorded on 08-JUL-2013 17:58
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

2 INCH MAIN

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_003.dta — Recorded on 08-JUL-2013 17:58
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− → | 20 | ← +

DST Uphole Tension
pounds
5000 0

Depth In Feet

Borehole Temp in deg F

Replay Scale 1:240

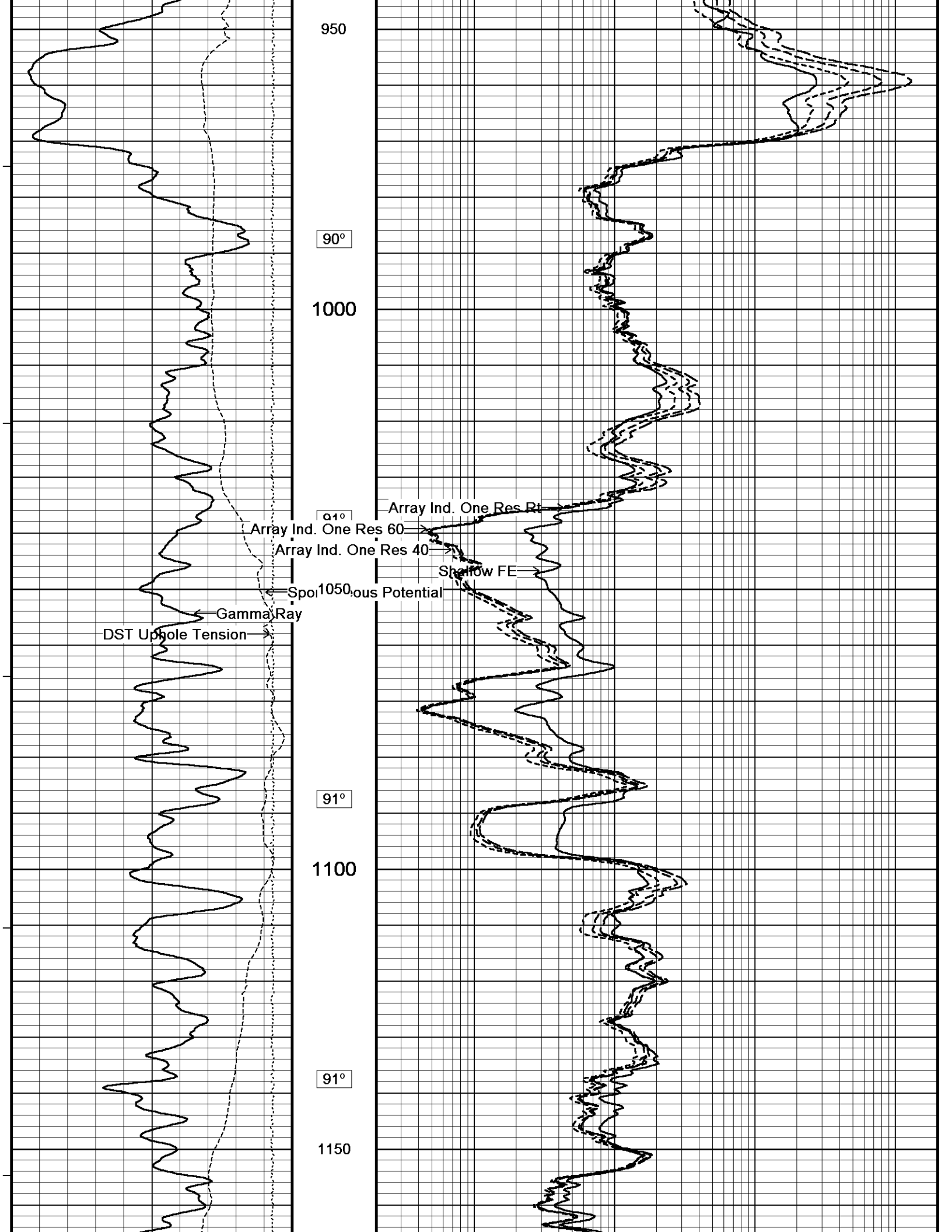
Shallow FE
ohm metres
0.20 1 10 100 2000

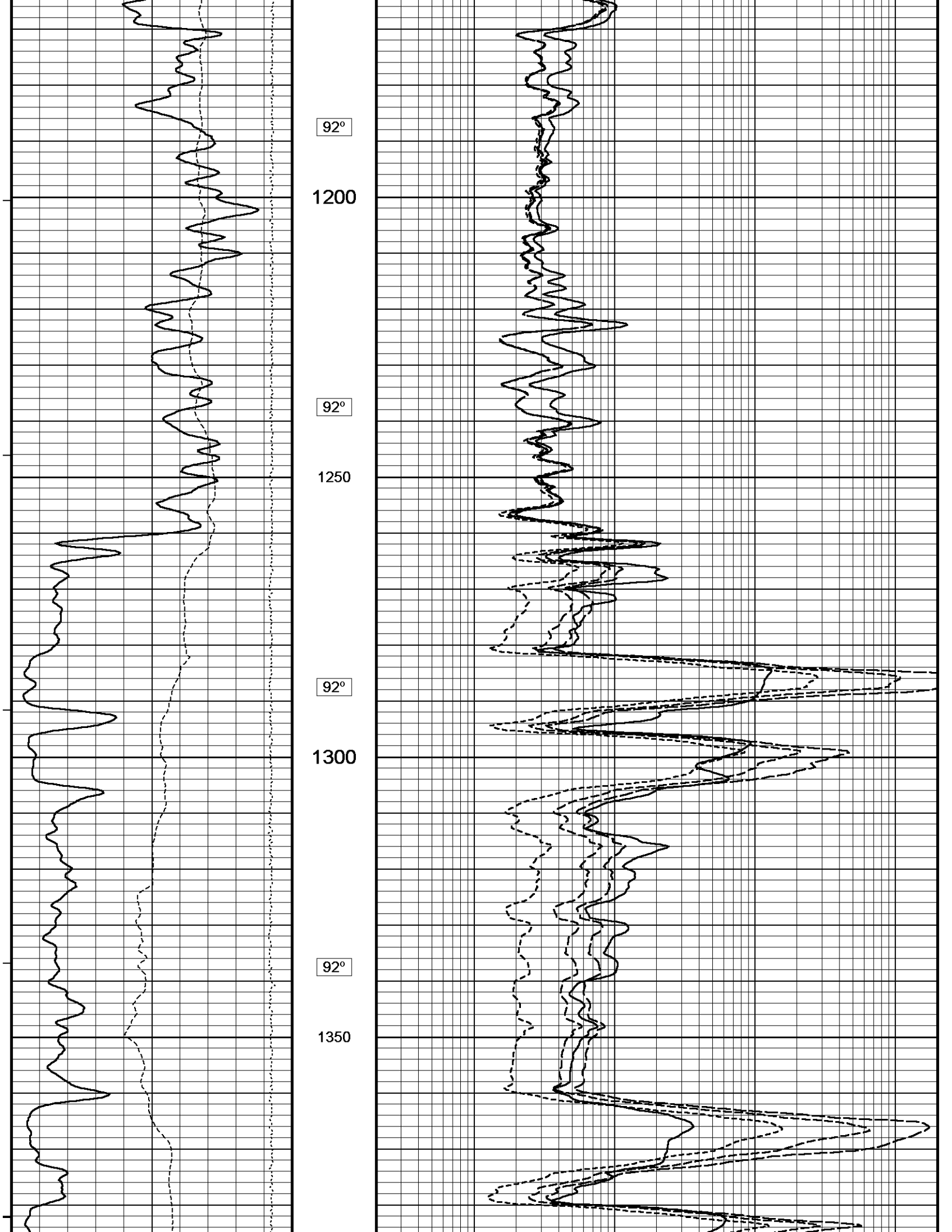
Array Ind. One Res 40
ohm metres
0.20 1 10 100 2000

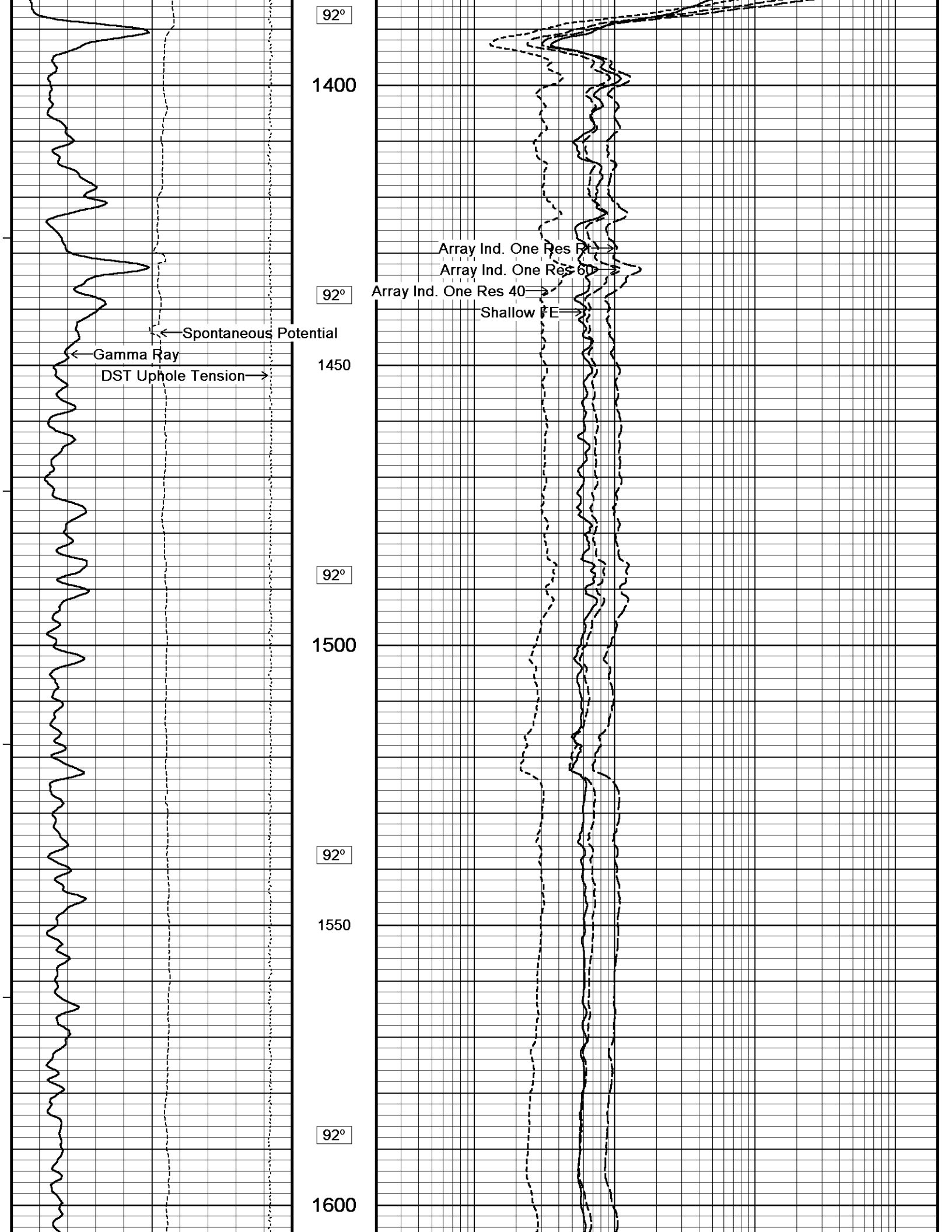
Array Ind. One Res 60
ohm metres
0.20 1 10 100 2000

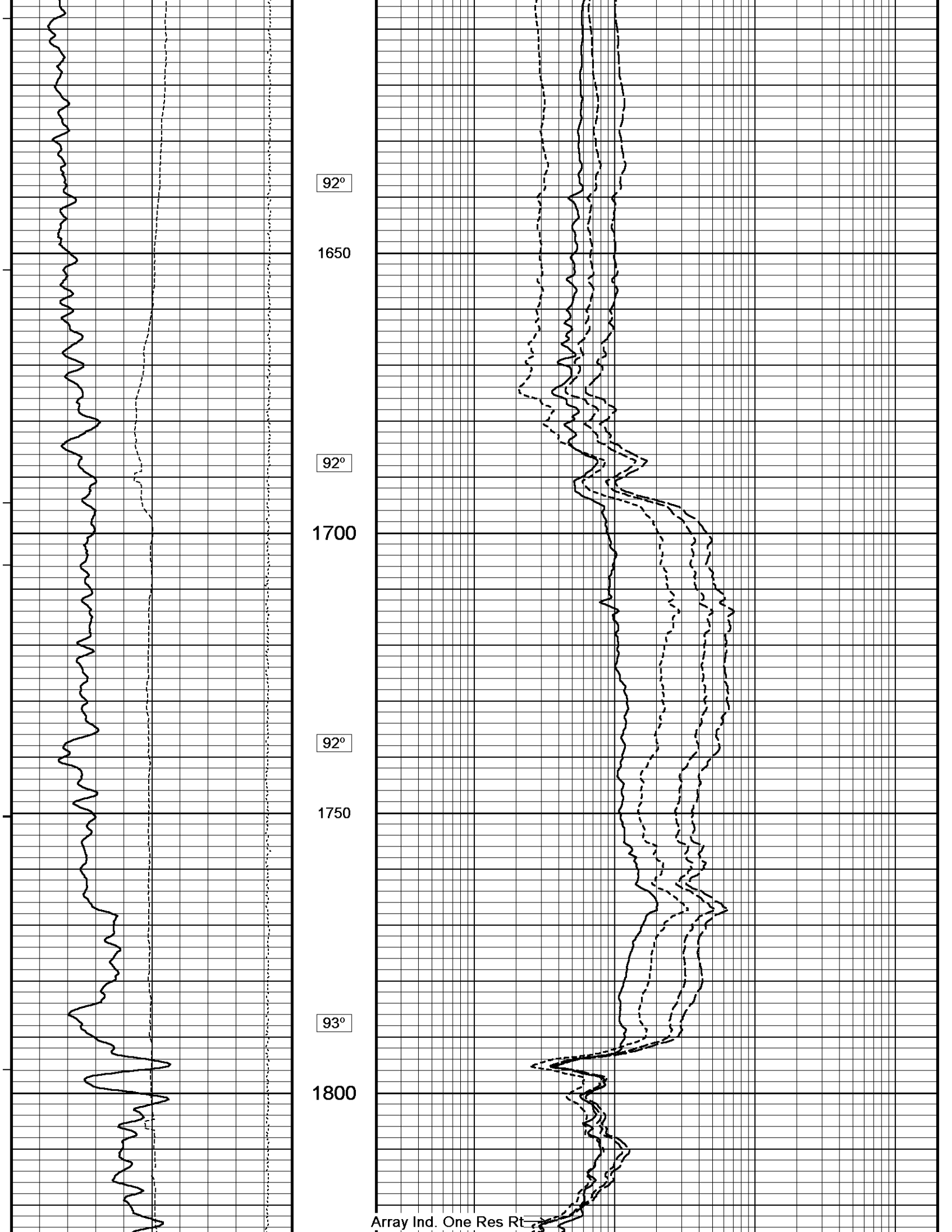
Array Ind. One Res Rt
ohm metres
0.20 1 10 100 2000

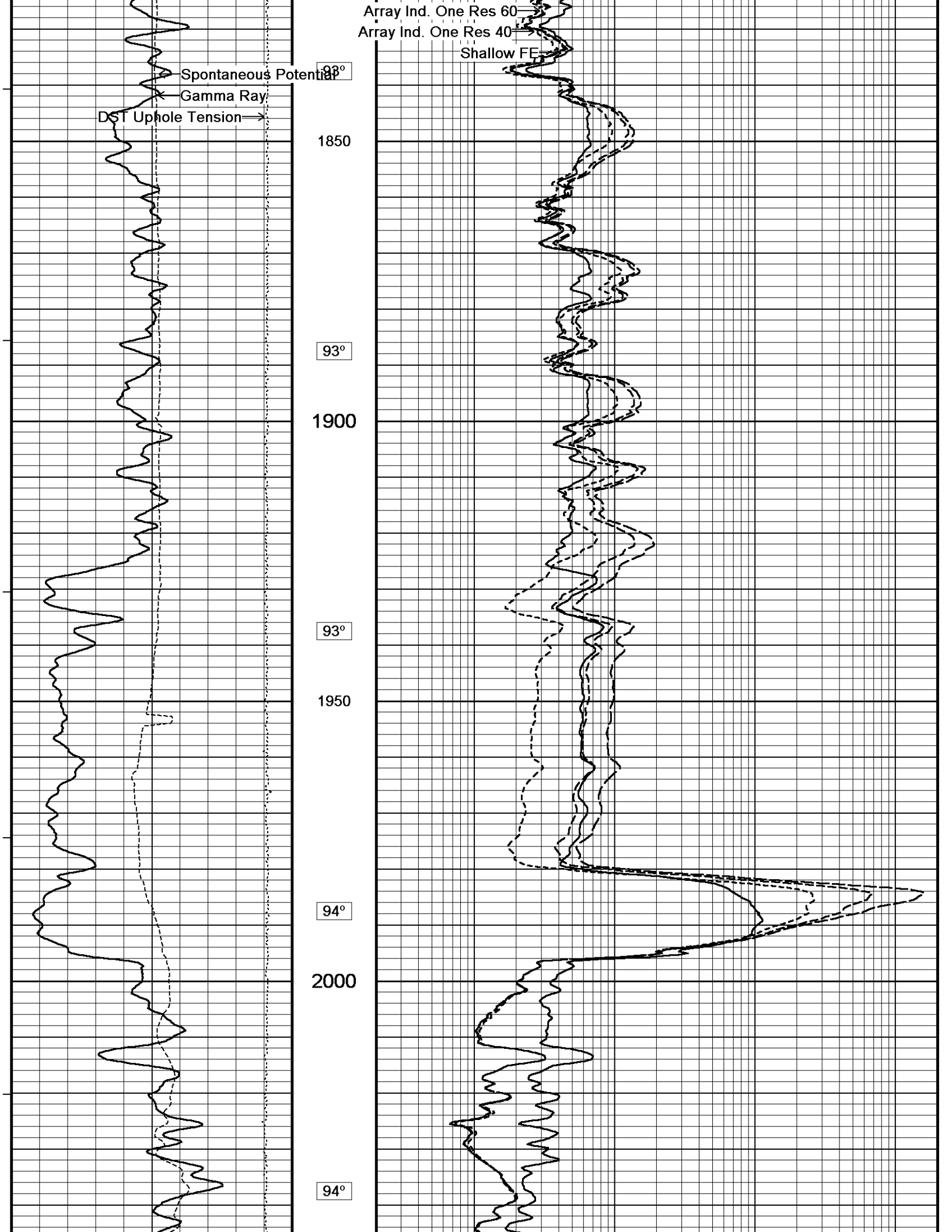
924

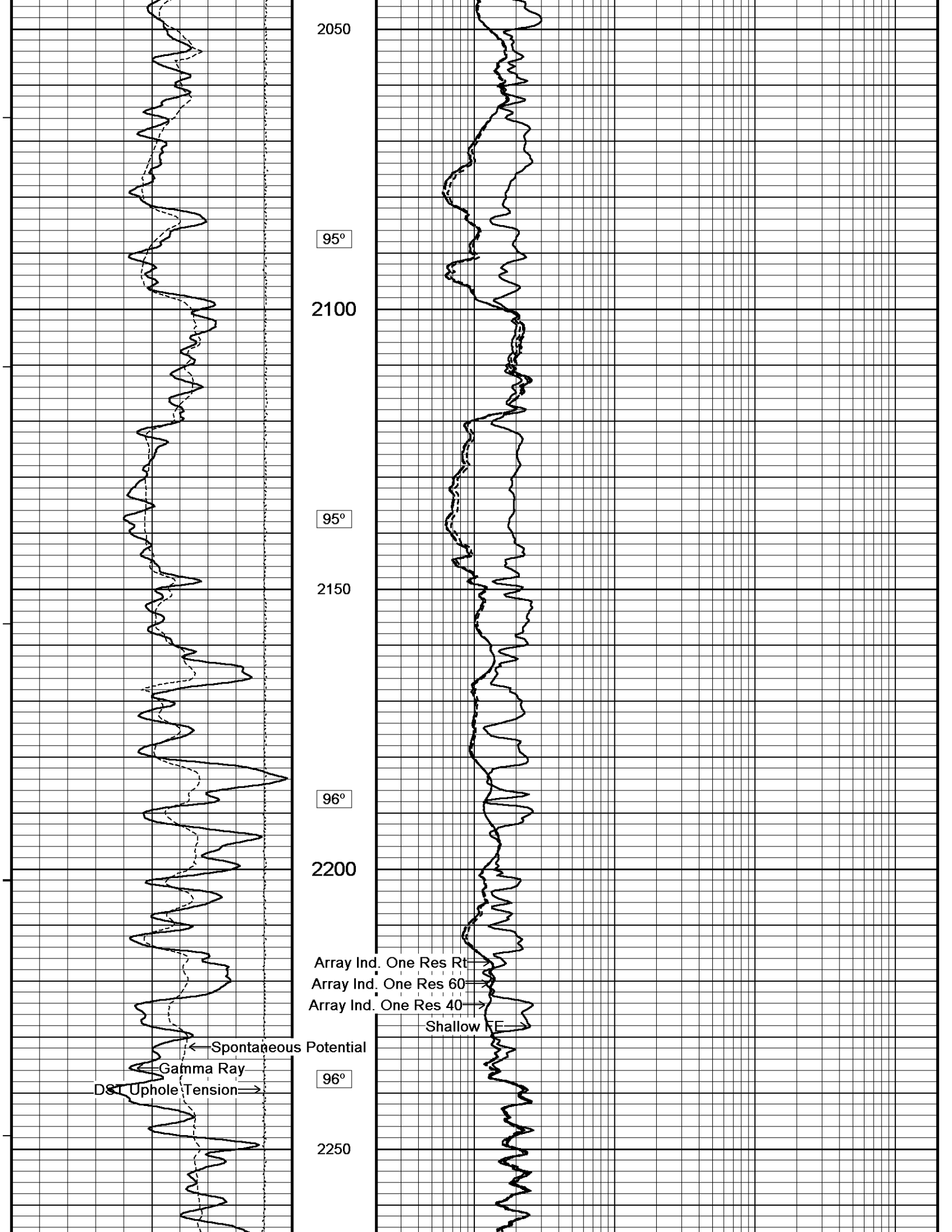

950
90°
1000
91°
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
1050
Gamma Ray
DST Uphole Tension
91°
1100
91°
1150

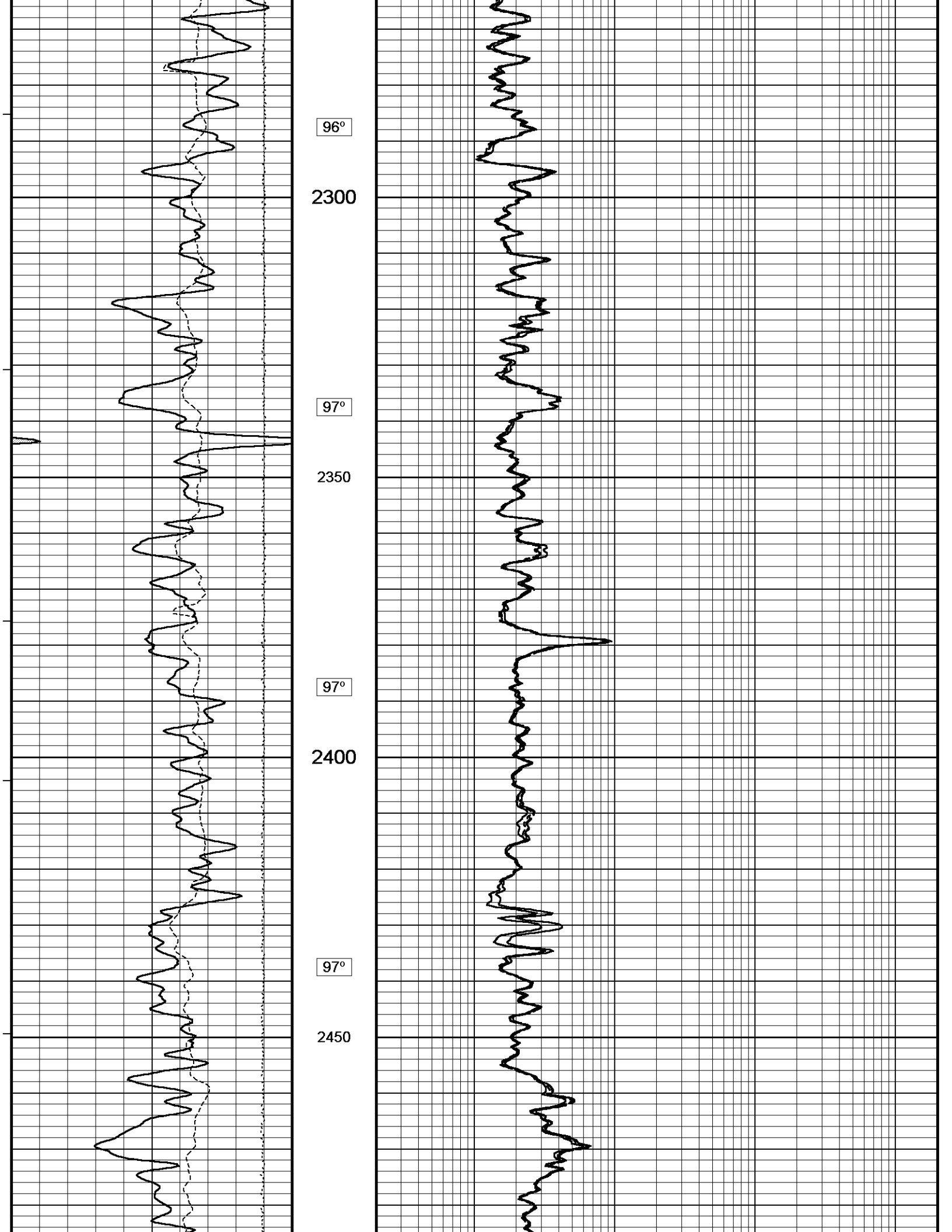

92°
1200
92°
1250
92°
1300
92°
1350

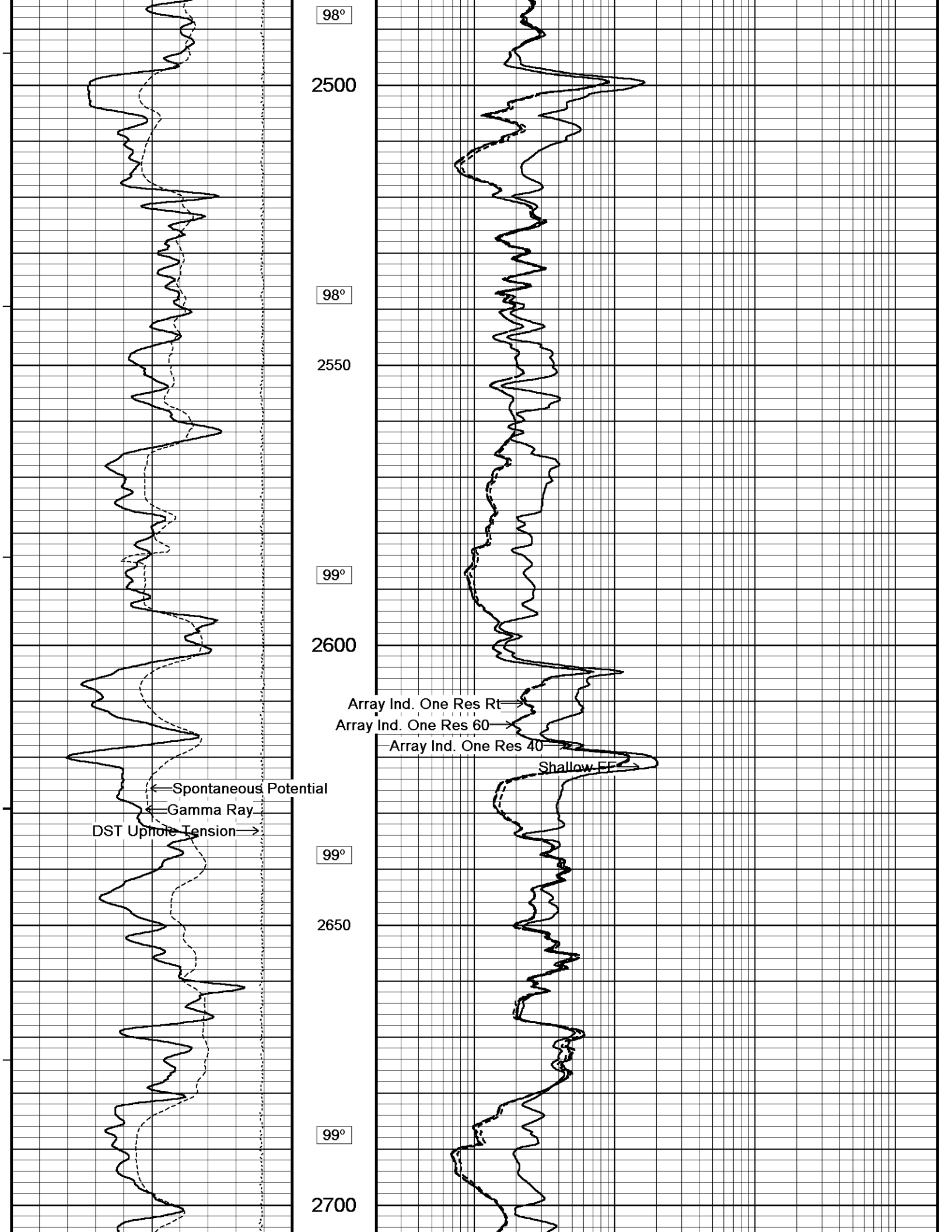

92°
1400
Array Ind. One Res R
Array Ind. One Res 60
92°
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
1450
92°
1500
92°
1550
92°
1600

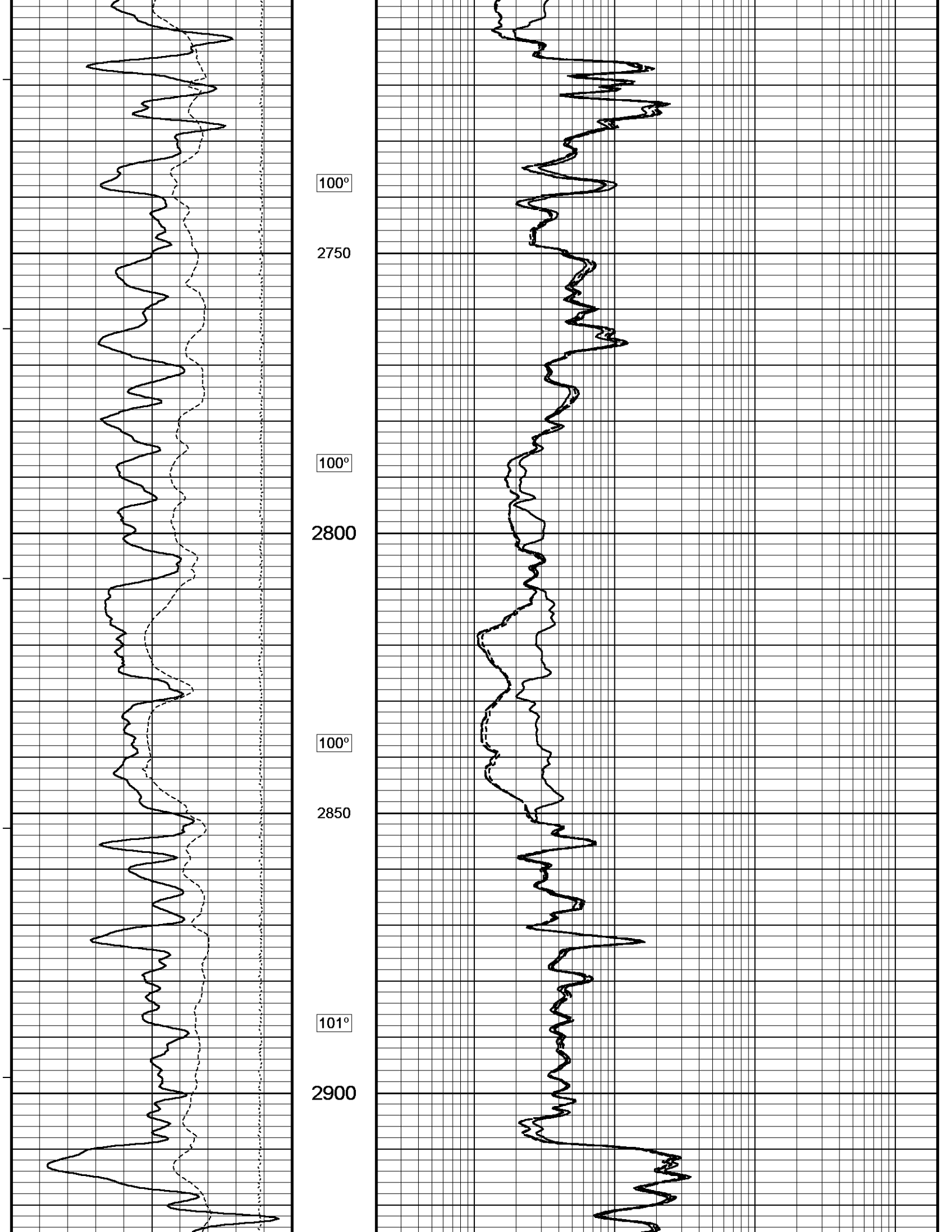

92°
1650
92°
1700
92°
1750
93°
1800
Array Ind. One Res Rt

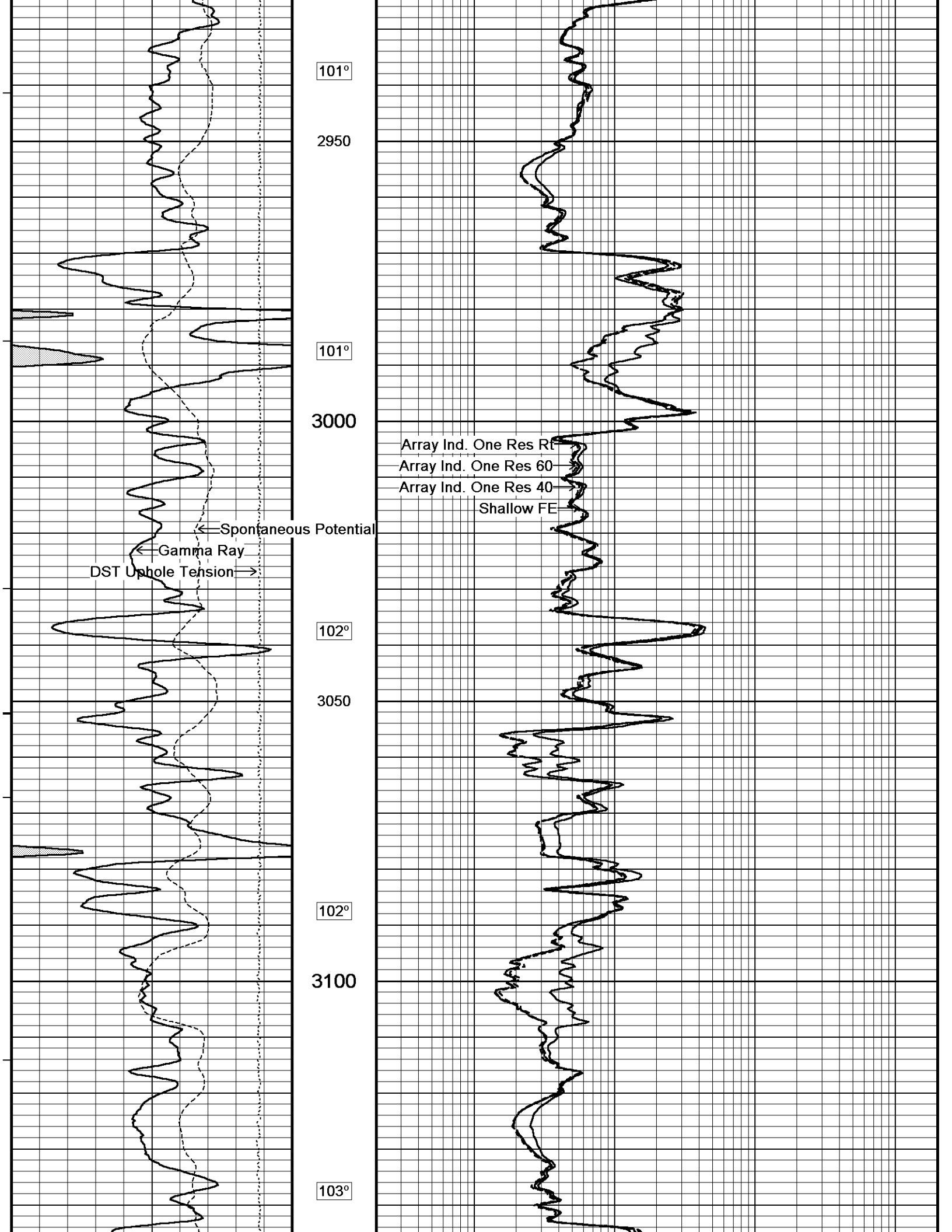

Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
93°
1850
93°
1900
93°
1950
94°
2000
94°

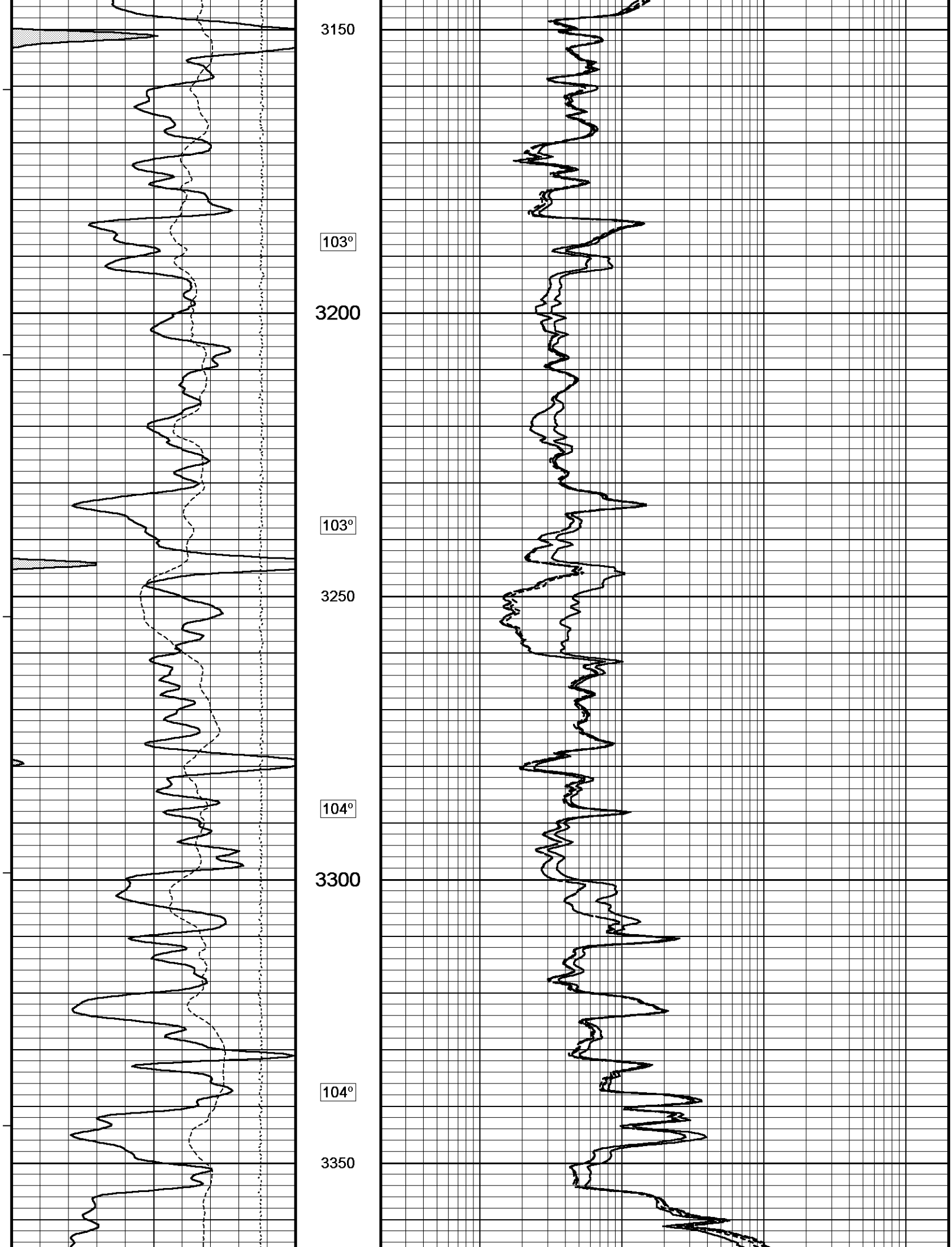

2050
95°
2100
95°
2150
96°
2200
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
96°
2250

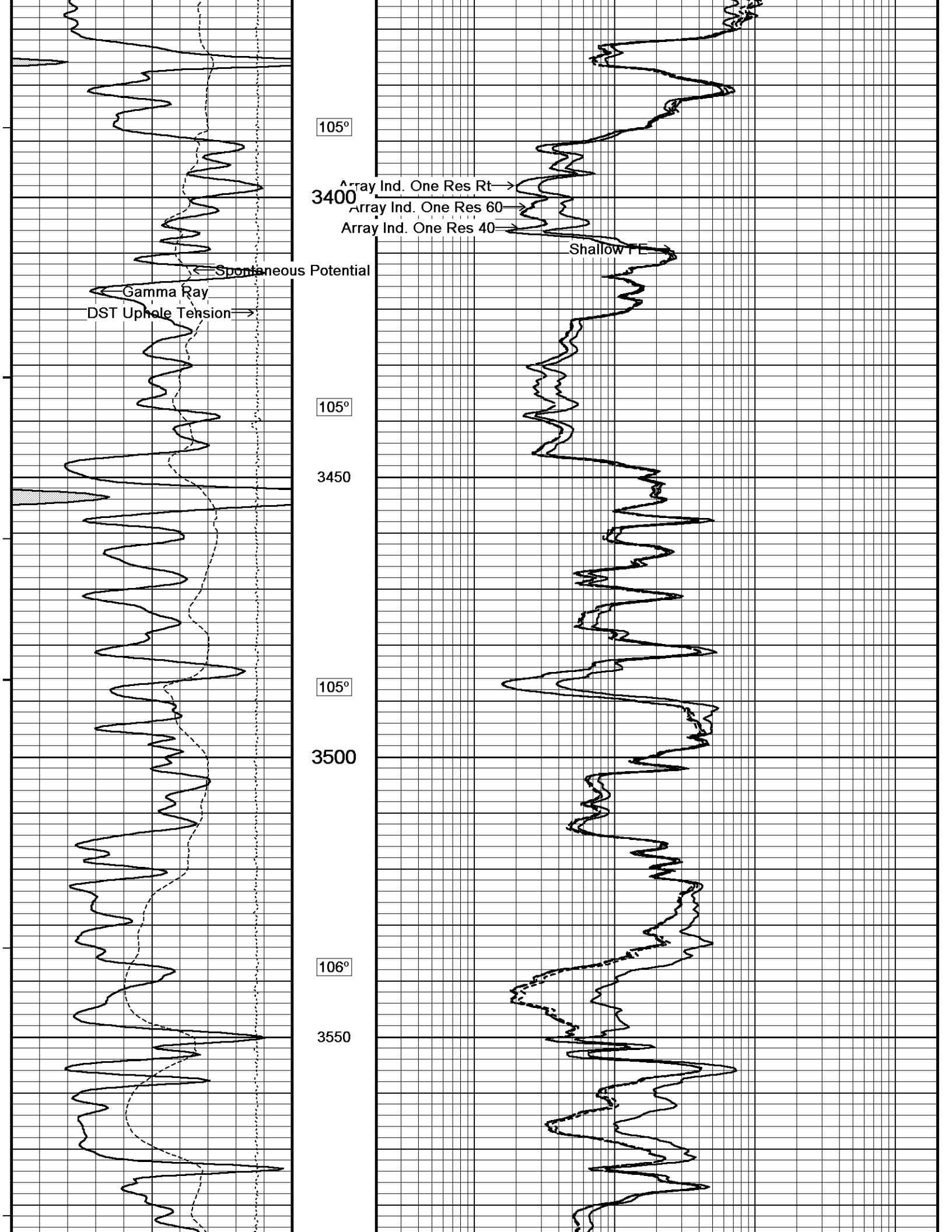

96°
2300
97°
2350
97°
2400
97°
2450

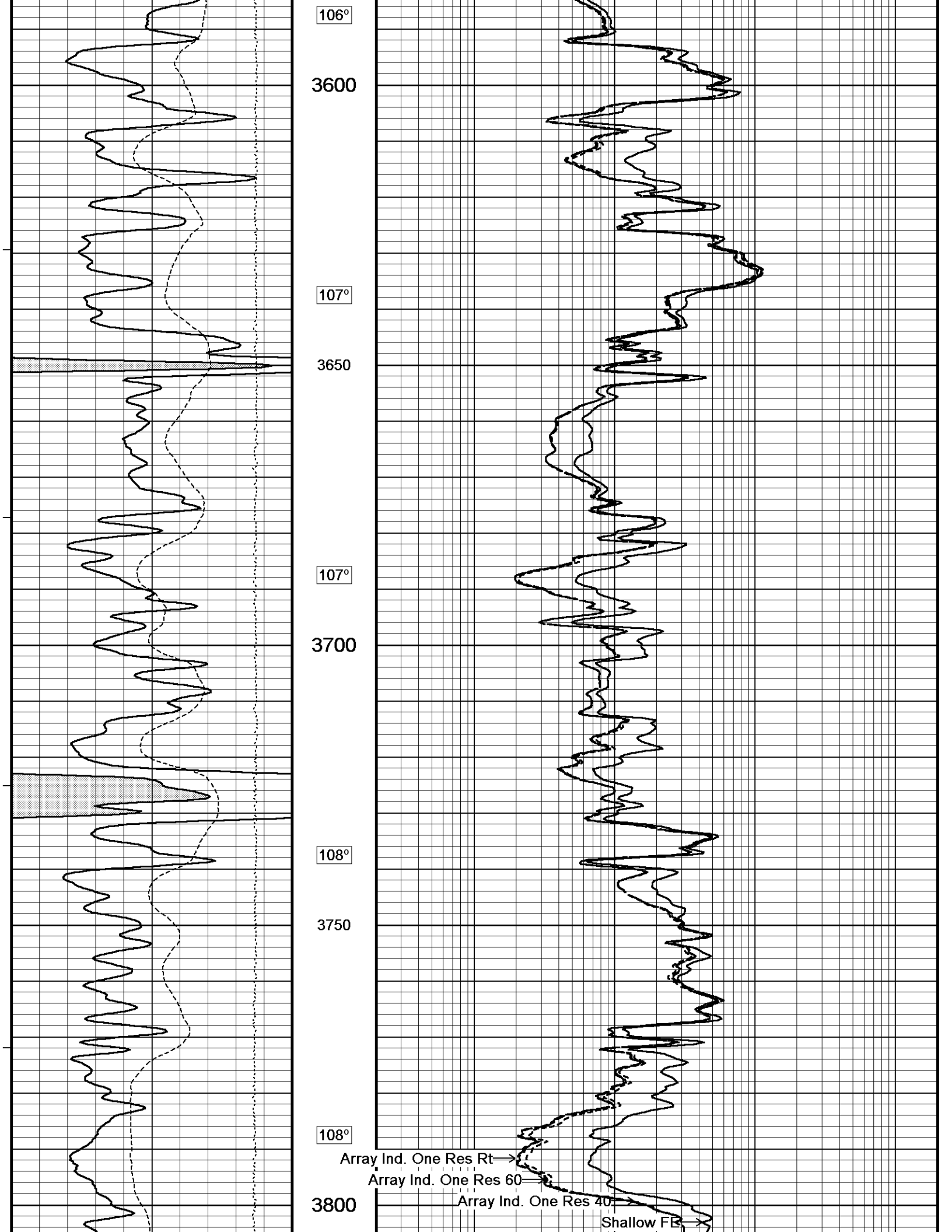

98°
2500
98°
2550
99°
2600
99°
2650
99°
2700
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FF
Spontaneous Potential
Gamma Ray
DST Uphole Tension

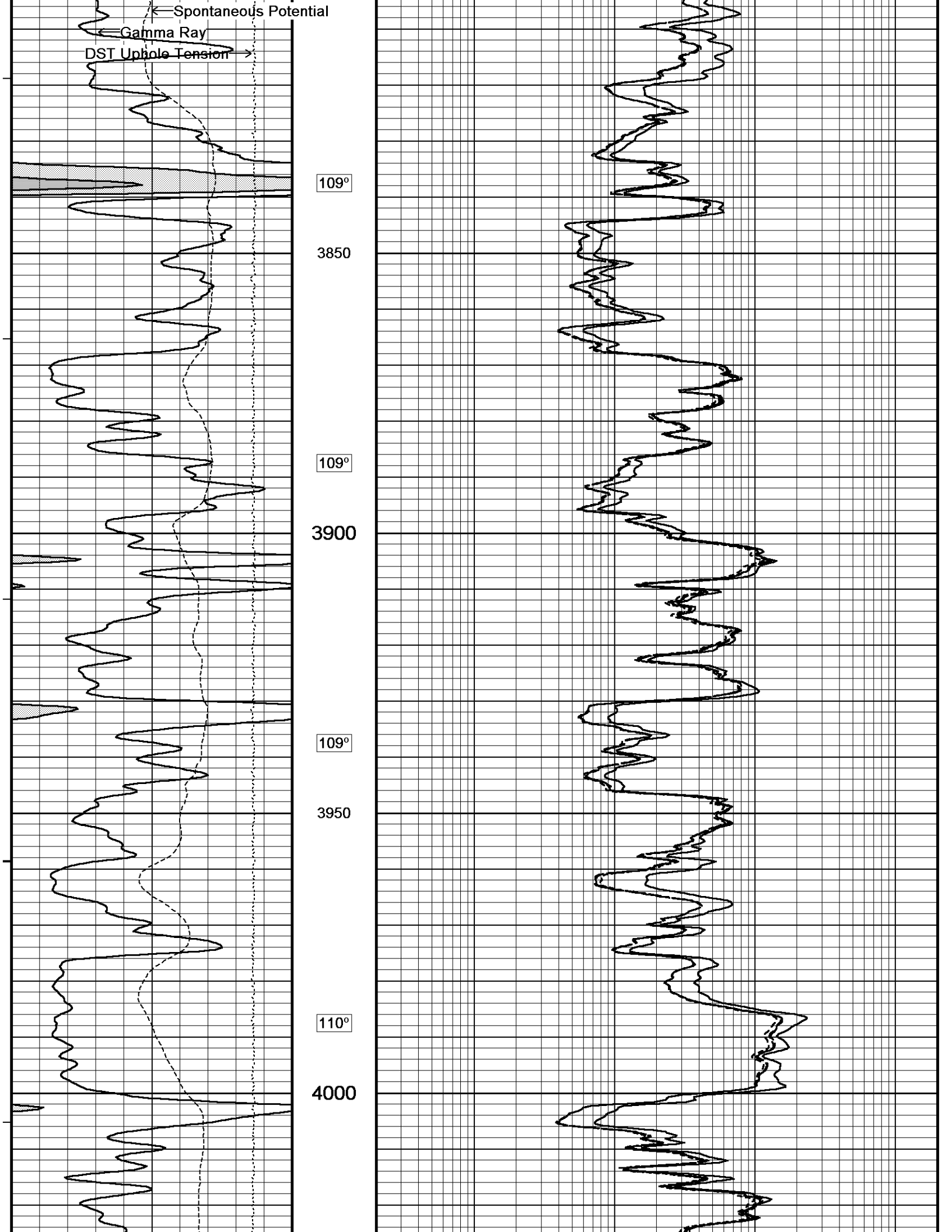

100°
2750
100°
2800
100°
2850
101°
2900

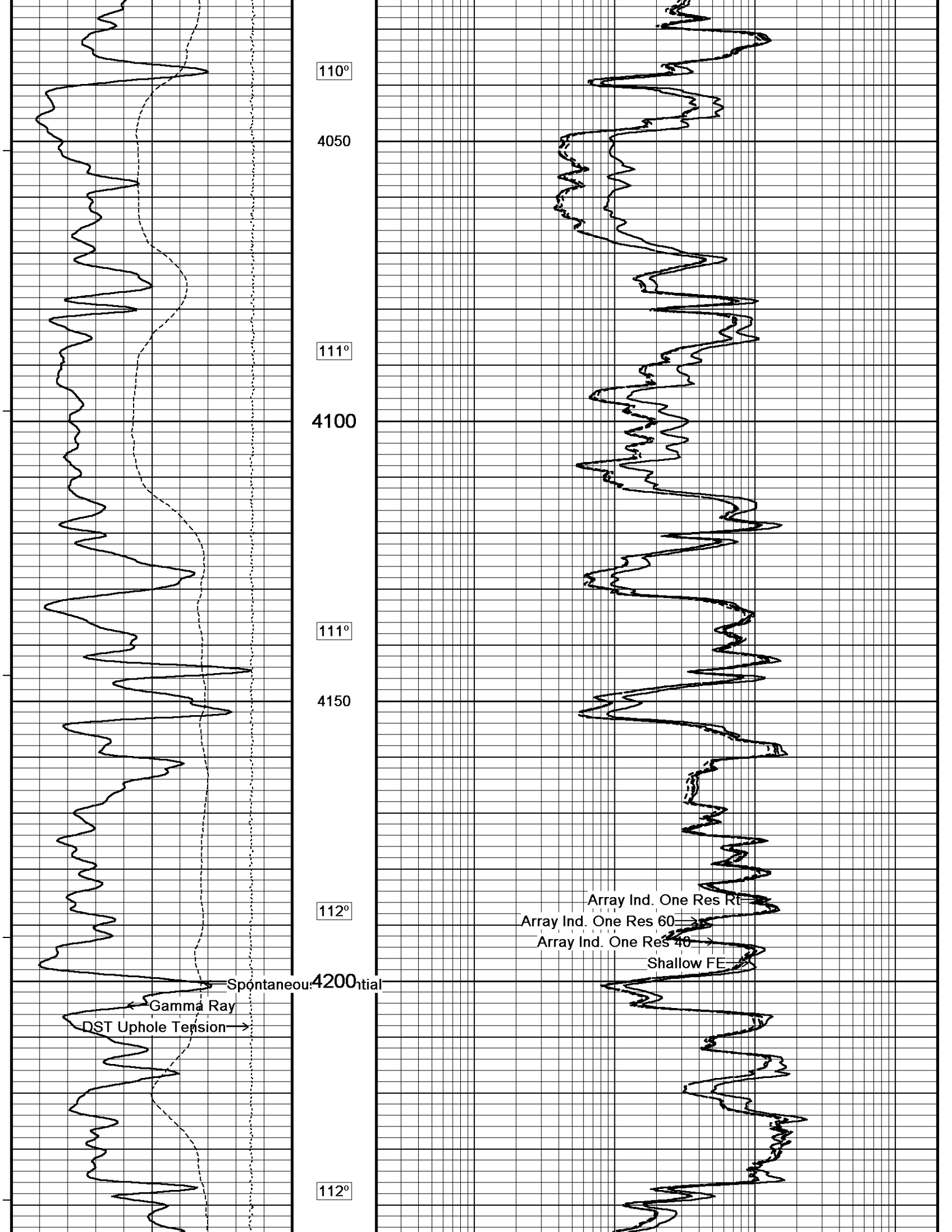

101°
2950
101°
3000
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
102°
3050
102°
3100
103°

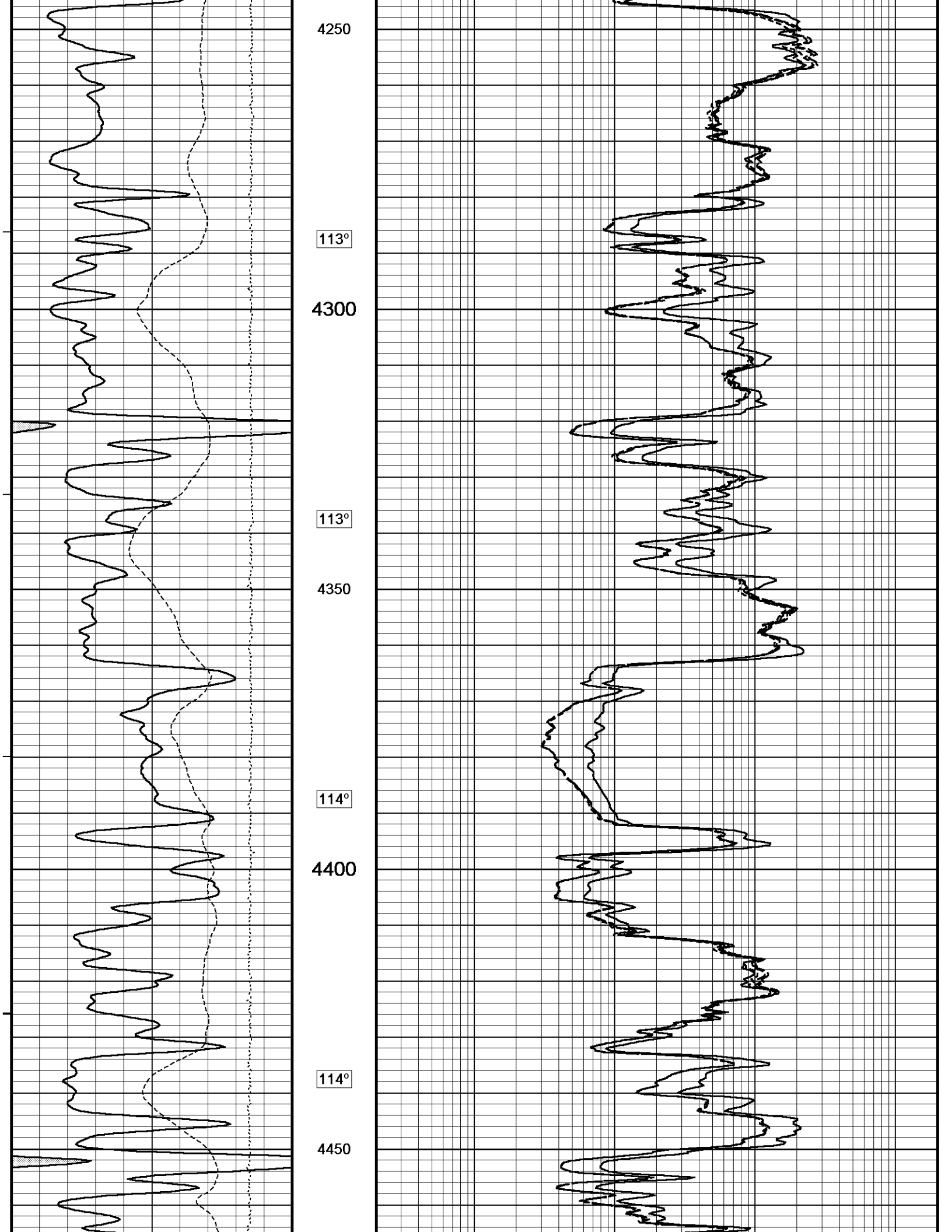

3150
103°
3200
103°
3250
104°
3300
104°
3350

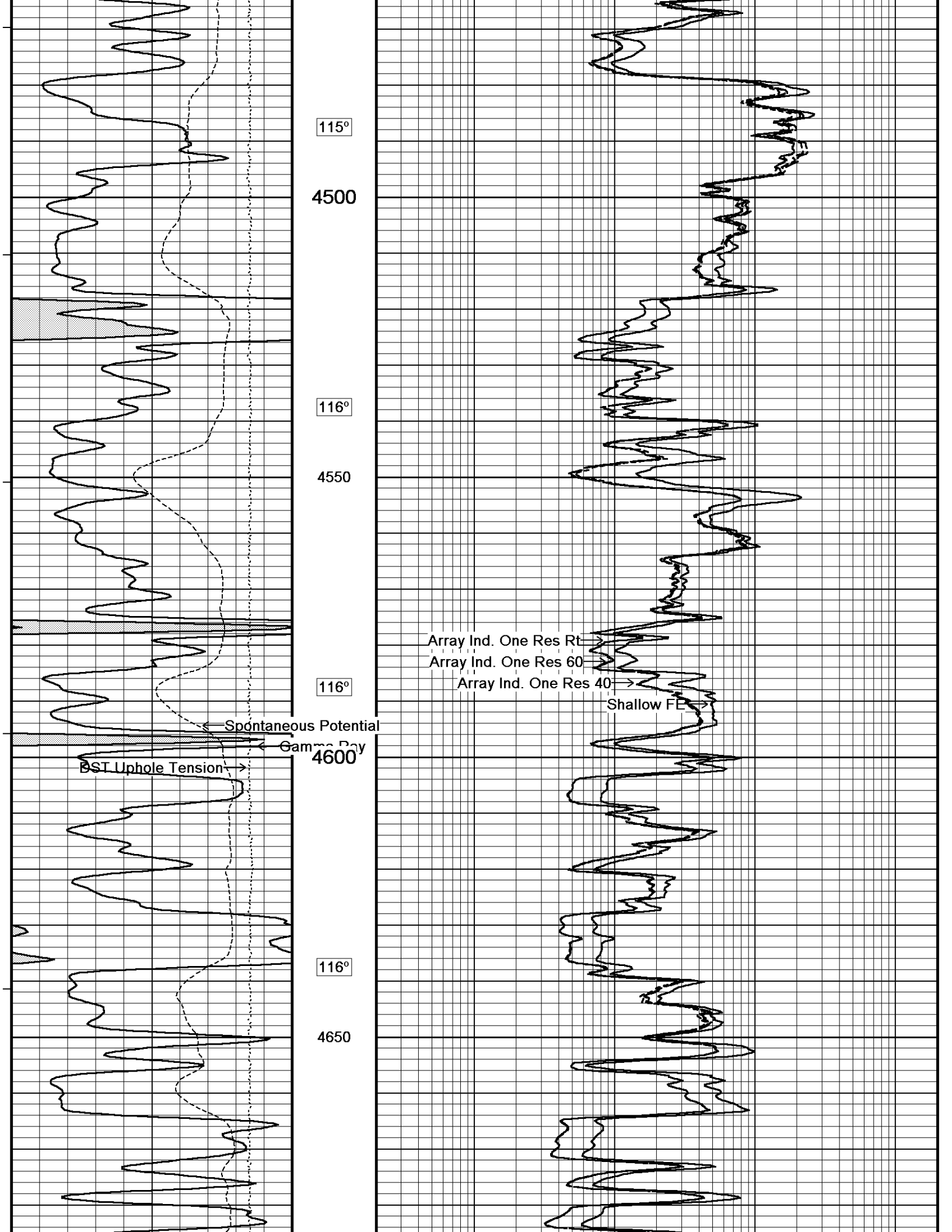

105°
Array Ind. One Res Rt
3400
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
105°
3450
105°
3500
106°
3550

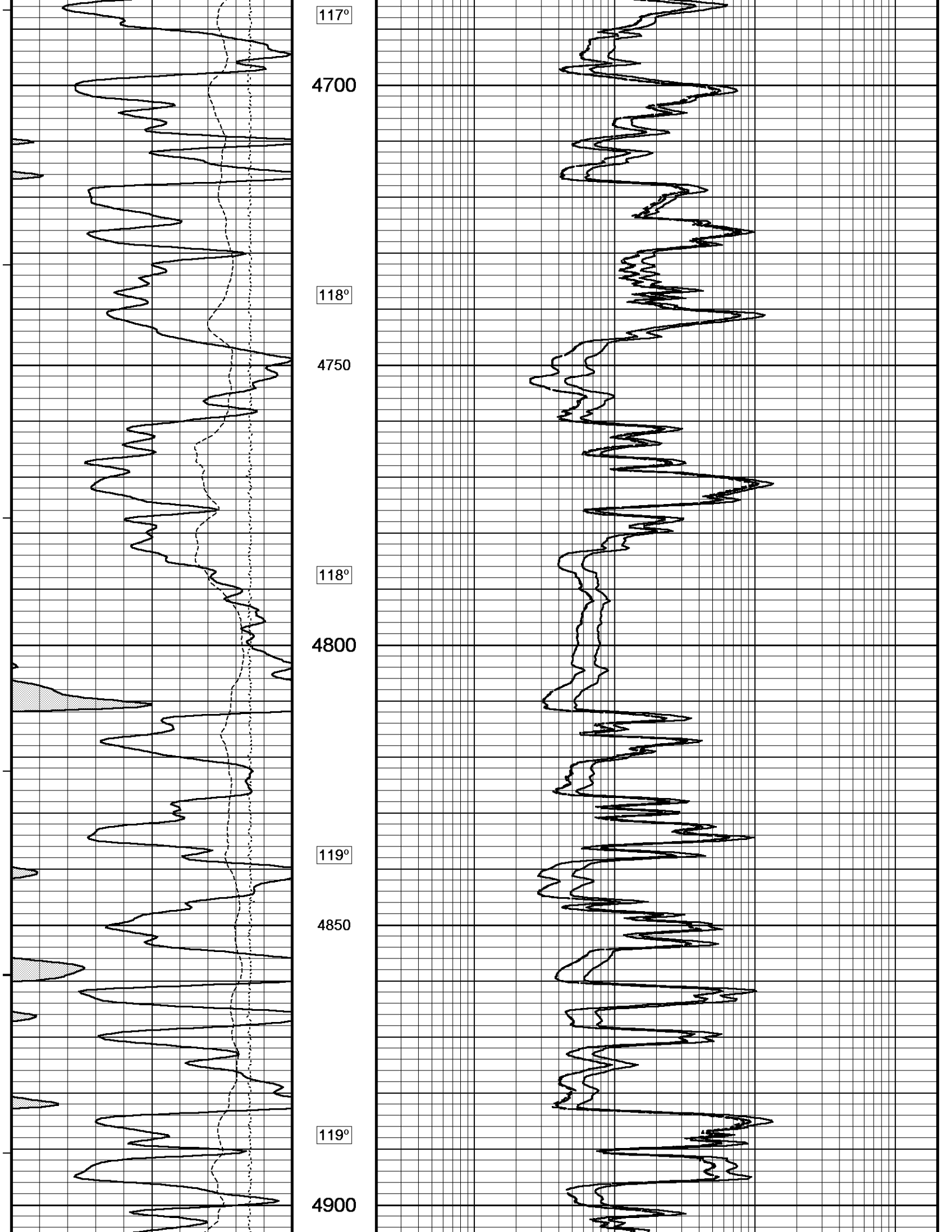

106°
3600
107°
3650
107°
3700
108°
3750
108°
3800
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

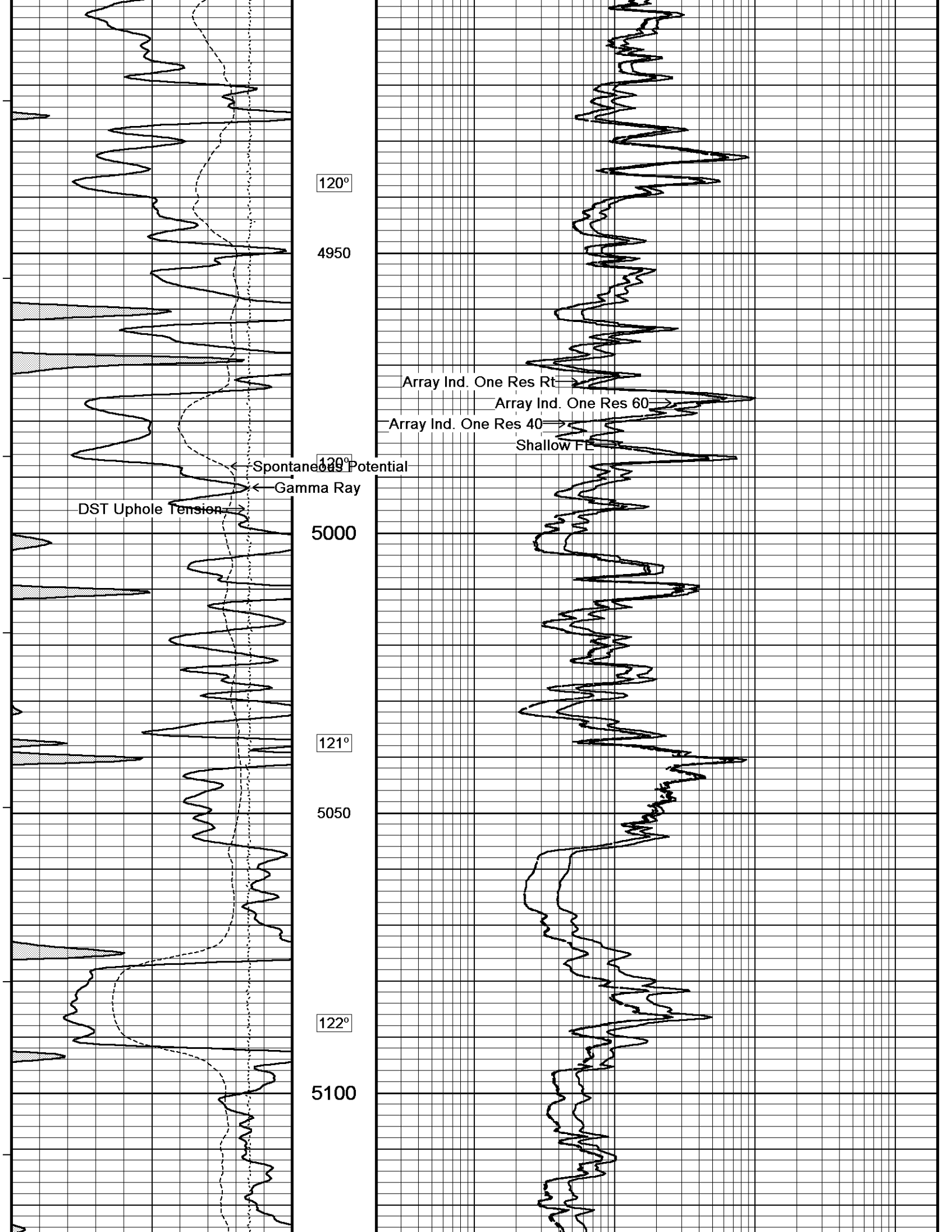

Spontaneous Potential
Gamma Ray
DST Uphole Tension
109°
3850
109°
3900
109°
3950
110°
4000

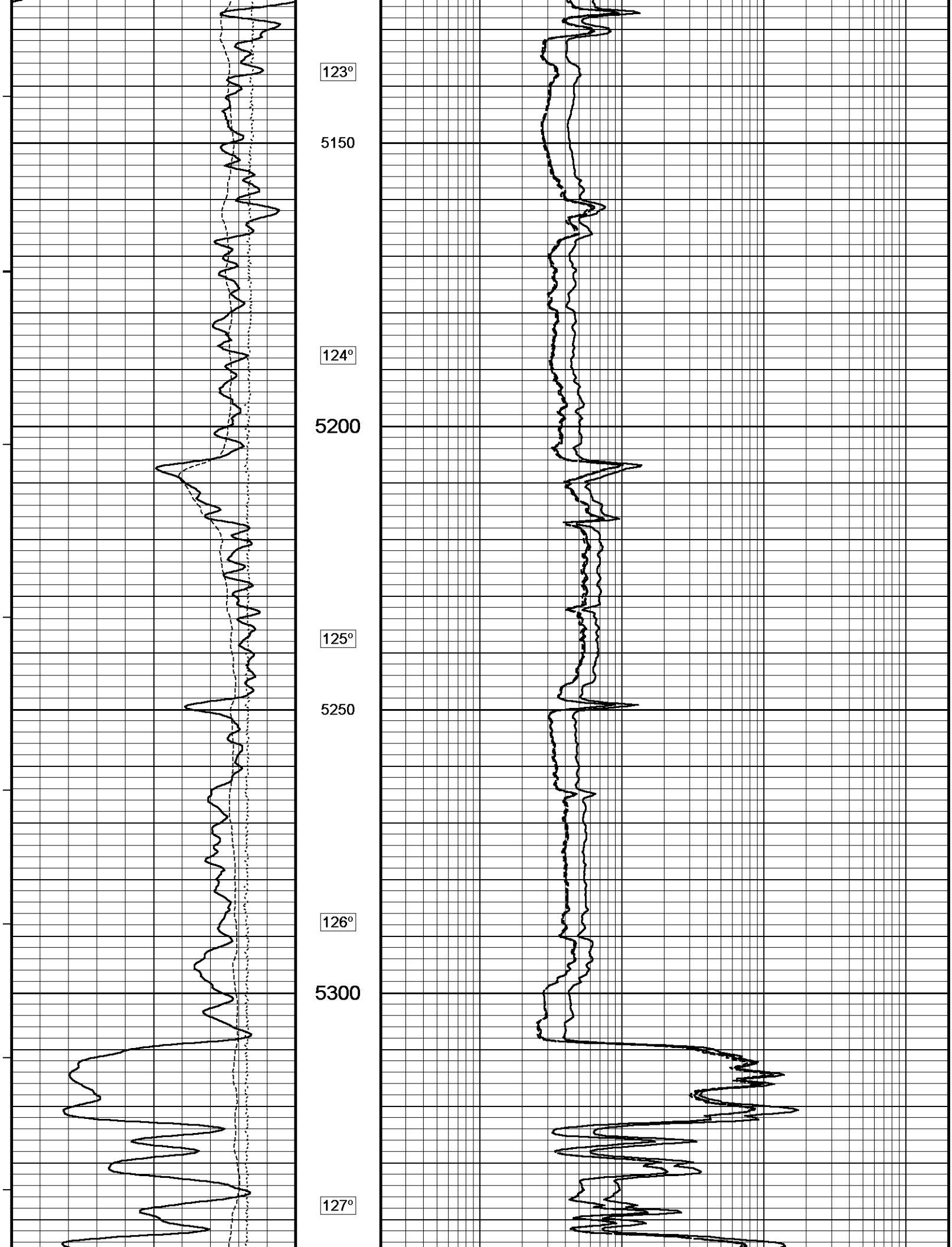

110°
4050
111°
4100
111°
4150
112°
4200
112°
Spontaneou
tial
Gamma Ray
DST Uphole Tension
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

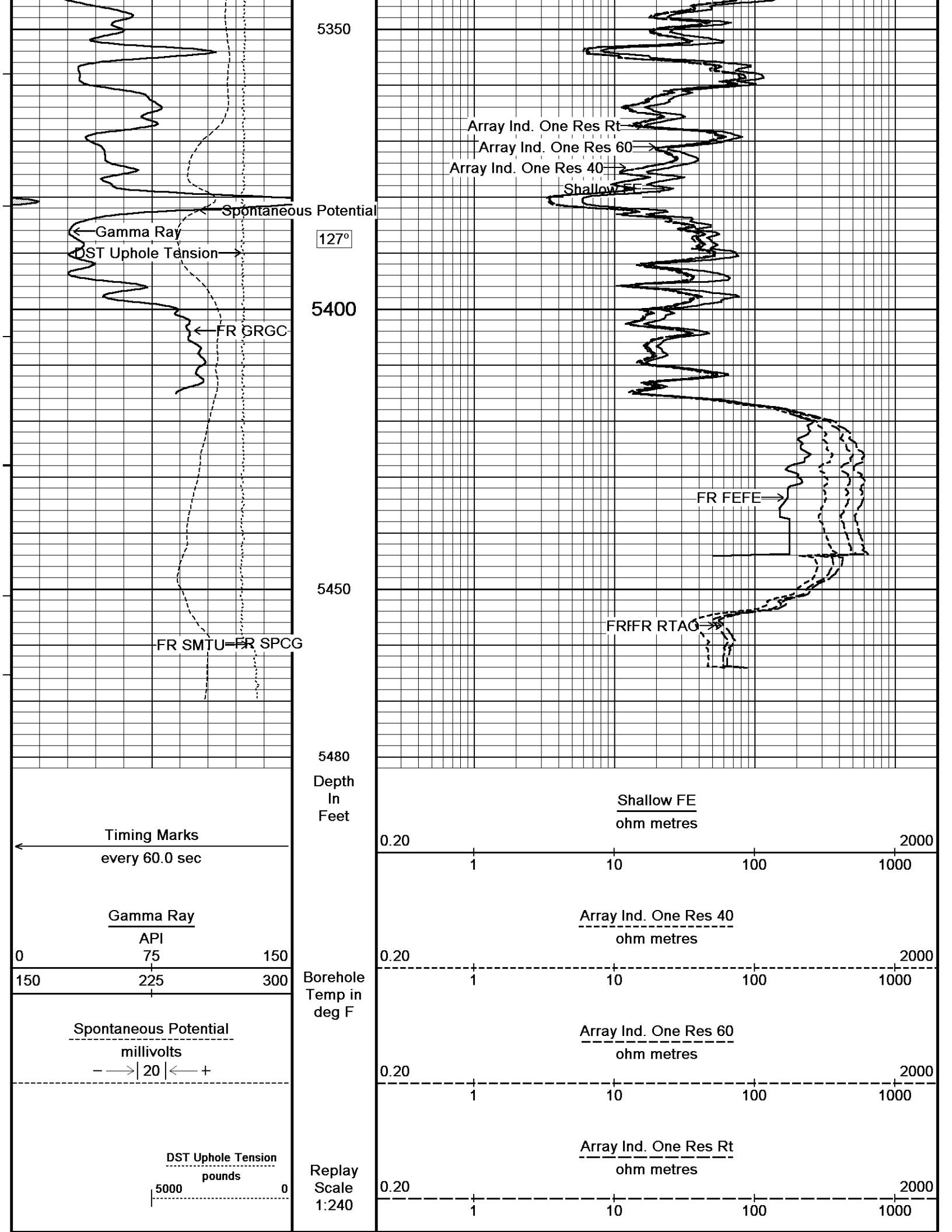

4250
113°
4300
113°
4350
114°
4400
114°
4450


115°
4500
116°
4550
116°
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
4600
DST Uphole Tension
116°
4650


117°
4700
118°
4750
118°
4800
119°
4850
119°
4900


120°
4950
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
120°
Spontaneous Potential
Gamma Ray
DST Uphole Tension
5000
121°
5050
122°
5100


123°
5150
124°
5200
125°
5250
126°
5300
127°


5350
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
127°
5400
FR GRGC
FR FEFE
5450
FR SMTU
FR SPCG
FR RTAO
5480
Depth
In
Feet
Timing Marks
every 60.0 sec
Shallow FE
ohm metres
0.20
2000
1
10
100
1000
Gamma Ray
API
0
75
150
150
225
300
Array Ind. One Res 40
ohm metres
Borehole
Temp in
deg F
Spontaneous Potential
millivolts
20
Array Ind. One Res 60
ohm metres
DST Uphole Tension
pounds
5000
0
Array Ind. One Res Rt
ohm metres
Replay
Scale
1:240

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_003.dta
Recorded on 08-JUL-2013 17:58
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_002.dta
Recorded on 08-JUL-2013 17:25
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
– → | 20 | ← +

DST Uphole Tension
pounds
5000 0

Depth in Feet

Borehole Temp in deg F

Replay Scale 1:240

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

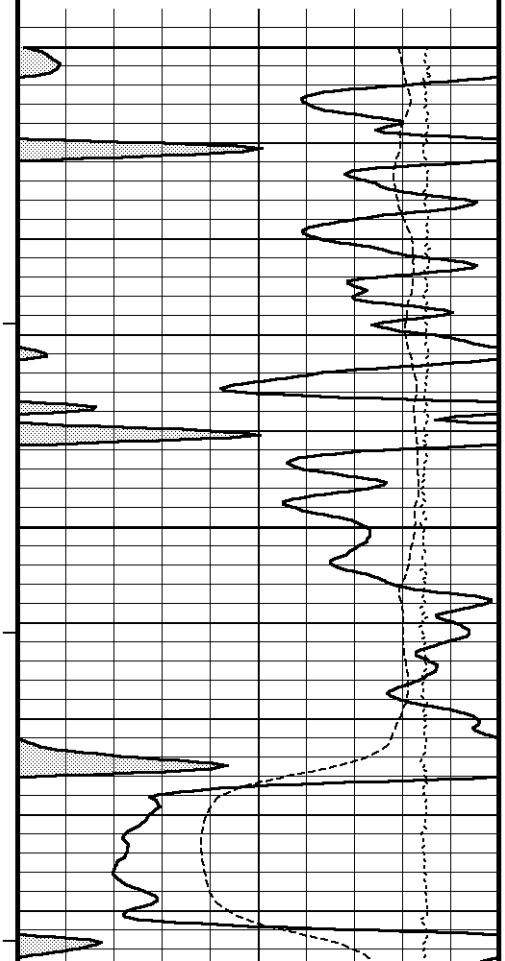
Array Ind. One Res Rt
ohm metres
0.20 1 10 100 1000 2000

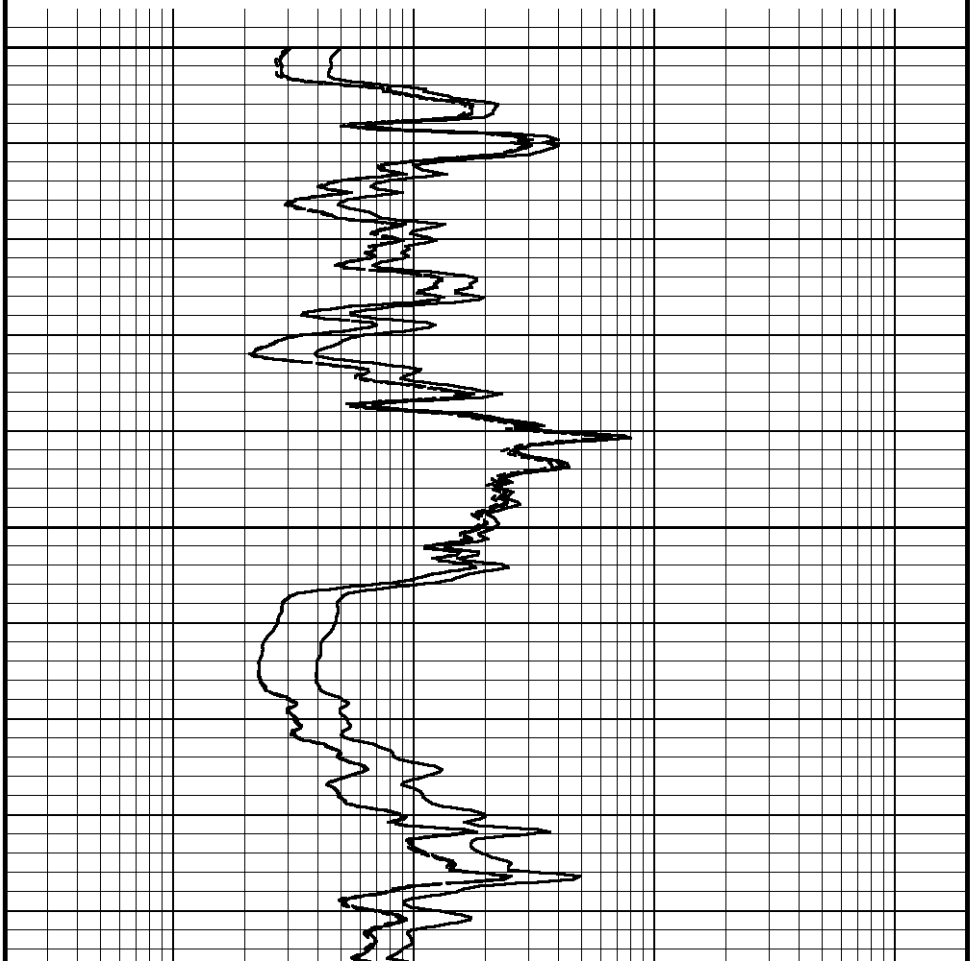
5000

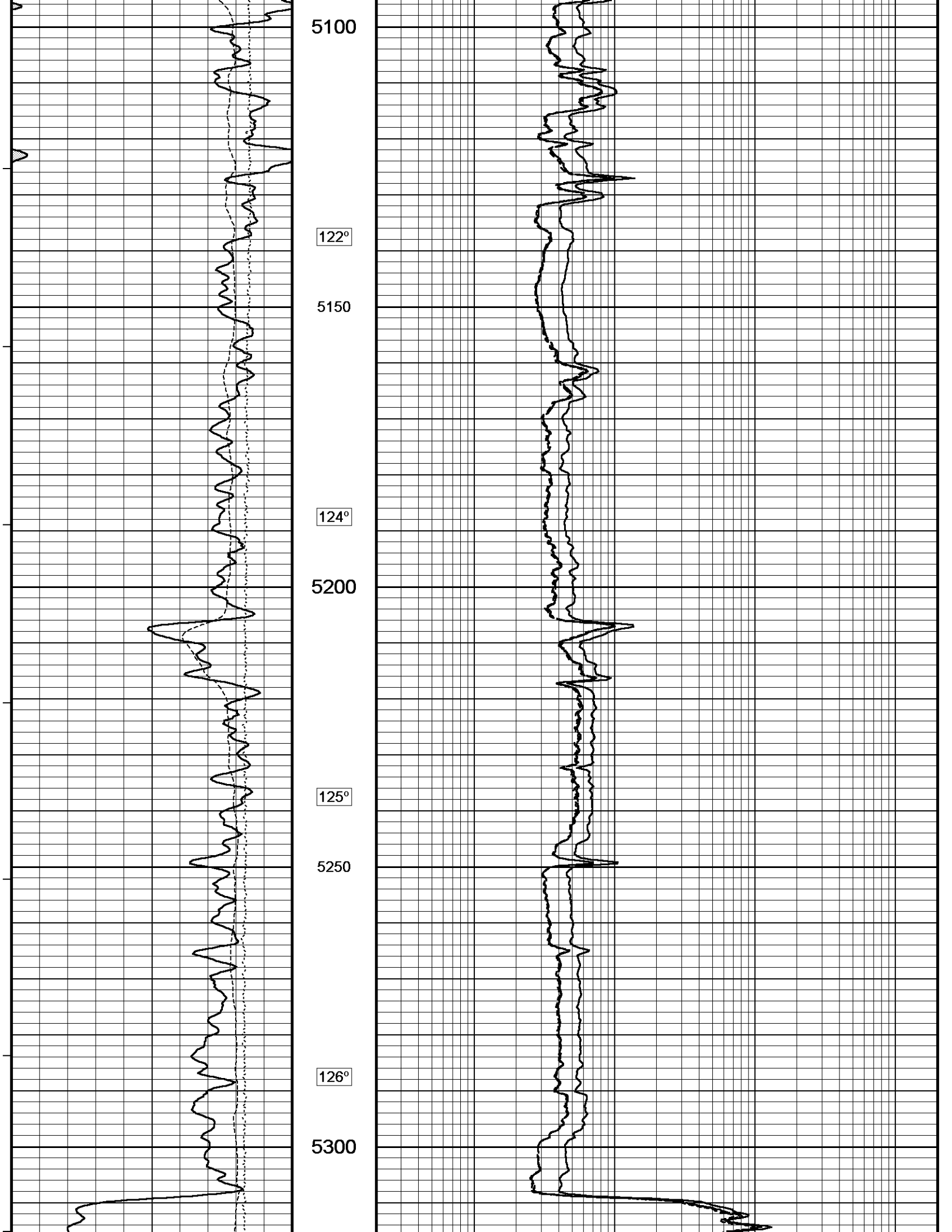
121°

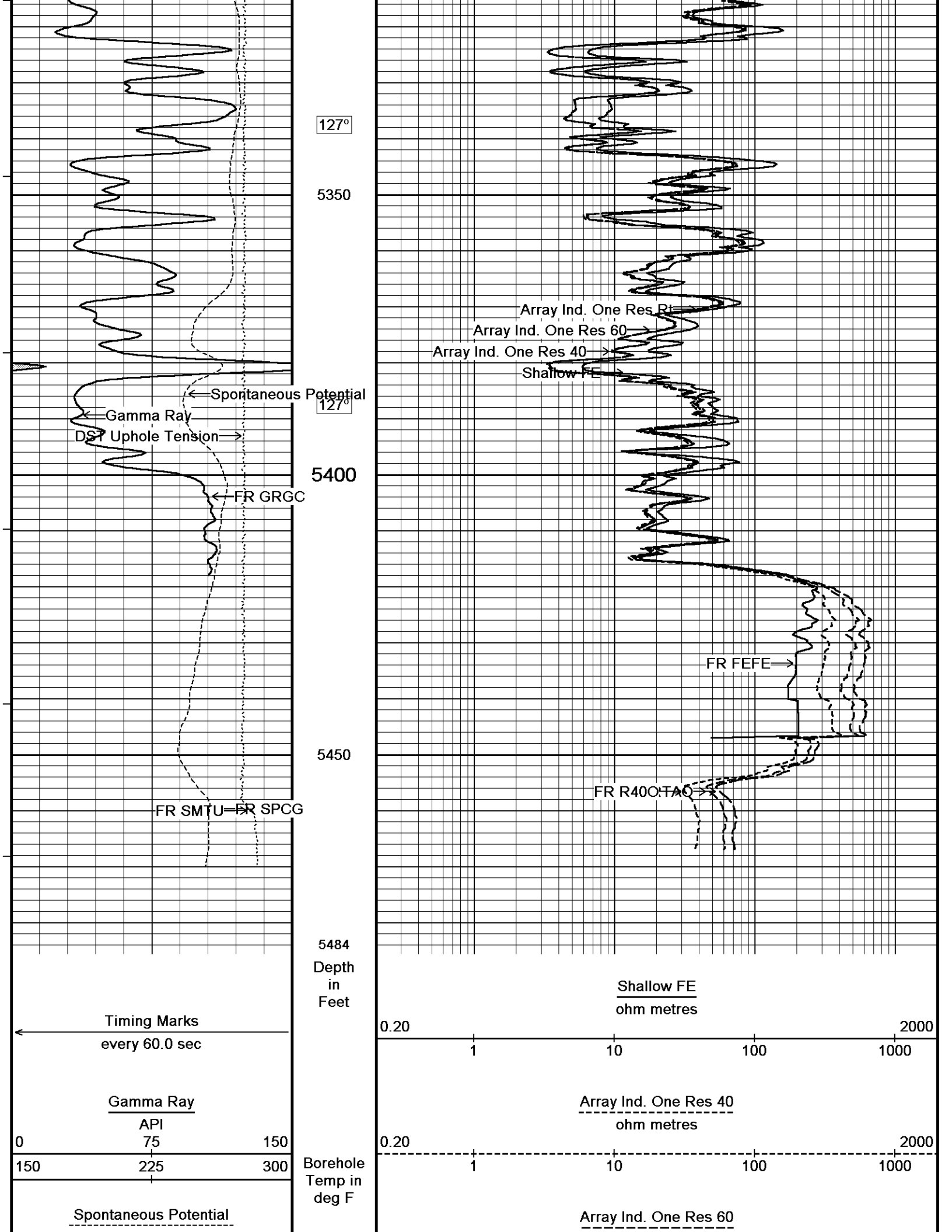
5050

121°






5100
122°
5150
124°
5200
125°
5250
126°
5300


127°
5350
Array Ind. One Res RI
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
127°
Gamma Ray
DST Uphole Tension
5400
FR GRGC
FR FEFE
5450
FR R40O TAO
FR SMTU
FR SPCG
5484
Depth in Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Borehole Temp in deg F
Spontaneous Potential
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

millivolts
− ⟶| 20 |⟵ +

DST Uphole Tension
pounds
5000 0

Replay Scale 1:240

ohm metres
0.20 2000
1 10 100 1000

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

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Op...\Western Operating Company FOX #2-8_002.dta — Recorded on 08-JUL-2013 17:25
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 13.05.9583\Logs\Western Operating Company FOX #2-8\Western Operating Company FOX #2-8_003.dta

General Constants All 000

Last Edited on 08-JUL-2013,21:11

General Parameters		
Mud Resistivity	0.910	ohm-metres
Mud Resistivity Temperature	85.000	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	Base Density Porosity	
Resistivity used	Array Ind. Six 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 08-JUL-2013 11:04

Reading No	Measured	Calibrated (lbs)
1	15944.27	0.00
2	16762.46	471.80

SP Calibration MCG-D.K 442

Field Calibration on 30-APR-2013 09:21

	Measured	Calibrated (mV)
Reference 1	100.9	100.0
Reference 2	-100.5	-100.0

High Resolution Temperature Calibration MCG-D.K 442

Field Calibration on 24-APR-2013,09:31

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

High Resolution Temperature Constants MCG-D.K 442

Last Edited on 07-JUL-2013,12:48

Pre-filter Length	11

Gamma Calibration MCG-D.K 442

Field Calibration on 07-JUL-2013 12:54

	Measured	Calibrated (API)
Background	107	75
Calibrator (Gross)	1144	800
Calibrator (Net)	1037	725

Gamma Constants MCG-D.K 442

Last Edited on 07-JUL-2013,23:52

Gamma Calibrator Number	GRC38	
Mud Density	1.10	gm/cc
Caliper Source for Processing	Bit Size	
Tool Position	Centred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

Micro Laterolog Calibration MMR-A 11

Base Calibration on 31-DEC-1999 00:00
Field Check on 31-DEC-1999 00:00

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-A 11

Last Edited on

Pad Type	6 in Solid Nylon B23059	
Micro Laterolog K Factor	0.0128	
Standoff Offset	0.0000	inches

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.	68.00	Deg F
Mud Cake Resistivity Source	Constant Value	
Temp. Source Rmc Correc.	MCG External Temperature	

Caliper Calibration MMR-A 11

Base Calibration on 07-JUL-2013 11:39
Field Calibration on 07-JUL-2013 11:40

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13951	5.98
2	17042	7.97
3	20153	9.86
4	24125	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 MMR-A 11

Base Calibration on 07-JUL-2013 11:25
Field Check on 07-JUL-2013 11:27

Base Calibration

		Measured	Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.0	58.0	5.0	25.0
Micro Inverse	15.3	75.4	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	79.0	79.0
Micro Inverse	60.5	60.5

Micro Normal and Micro Inverse Constants MMR-A 11

Last Edited on 18-APR-2013,13:52

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	0.0000	inches

Neutron Calibration MDN-A.B 65

Base Calibration on 07-JUL-2013,11:46
Field Check on 07-JUL-2013 11:50

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far

	Near	Far	Near	Far
	3104	96	3714	110
Ratio	32.242		33.764	

Field Calibrator at Base	Calibrated (cps)	
	1657	2415
Ratio	0.686	

Field Check	Calibrated (cps)	
	1673	2406
Ratio	0.695	

Neutron Constants MDN-A.B 65

Last Edited on 07-JUL-2013,11:51

Neutron Source Id	PN-521	
Neutron Jig Number	5824NE	
Epithermal Neutron	No	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	4.26	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	None	
Formation Pressure	N/A	kpsi
Temperature Source	Constant Value	
Temperature	68.00	degrees F
Mud Salinity	0.00	kppm
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-B.J 352

Base Calibration on 07-JUL-2013 11:12
Field Check on 07-JUL-2013 11:17

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	962.8	126.8
Base Check		281.6
Field Check		281.5

FE Constants MFE-B.J 352

Last Edited on 07-JUL-2013,11:07

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 368

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'					
4'					
5'					
6'					

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	

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

High Resolution Temperature Calibration MAI-A.A 45

Field Calibration on 03-JUN-2013,06:17

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

High Resolution Temperature Constants MAI-A.A 45

Last Edited on 06-JUL-2013,09:59

Pre-filter Length	11

Induction Calibration MAI-A.A 45

Base Calibration on 07-JUL-2013,13:00
Field Check on 07-JUL-2013 13:10

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) High
1	14.4	472.6	9.3	966.2
2	5.7	374.0	7.6	821.4
3	3.4	261.2	5.2	566.0
4	2.5	133.9	2.6	279.2

Array Temperature 0.0 Deg F

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1	17.8	3850.7	17.8	3850.7
2	30.0	3627.4	30.0	3627.5
3	27.0	3047.7	27.0	3047.7
4	17.2	2077.8	17.2	2077.9
Deep	15.1	1910.1	15.1	1910.0
Medium	40.2	4058.2	40.2	4058.2
Shallow	47.0	5480.1	47.0	5480.5

Array Temperature	89.3	89.6	Deg F

Induction Constants MAI-A.A 45

Last Edited on 07-JUL-2013,13:03

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Bit Size	
Hole Size for Borehole Correction	N/A	inches
Tool Centred	No	
Stand-off Type	Fins	
Stand-off	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	

Caliper Calibration MPD-B 64

Base Calibration on 07-JUL-2013 12:44
Field Calibration on 07-JUL-2013 12:48

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	15196	3.99
2	23984	5.98
3	32640	7.97
4	41136	9.86
5	50467	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.96	5.98

Photo Density Calibration MPD-B 64

Base Calibration on 07-JUL-2013,12:26
Field Check on 07-JUL-2013 12:35

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	48588	26152	59556	30836
Reference 2	19414	2488	24941	2541

Field Check at Base

1163.3	1351.8

Field Check

1163.2	1355.4

PE Calibration

Base Calibration	WS	Measured WH	Ratio	Calibrated Ratio
Background	209	1036		
Reference 1	18274	48405	0.381	0.371
Reference 2	5262	19278	0.277	0.272
Field Check at Base	209.5	1036.3		
Field Check	210.0	1032.5		

Density Constants MPD-B 64

Last Edited on 07-JUL-2013,12:05

Density Source Id	254	
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	1.00	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	

Matrix Density (gm/cc)	Depth (ft)
2.71	
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

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Logs\Western Operating Company FOX #2-8\Western Operating Company FOX #2-8_003.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

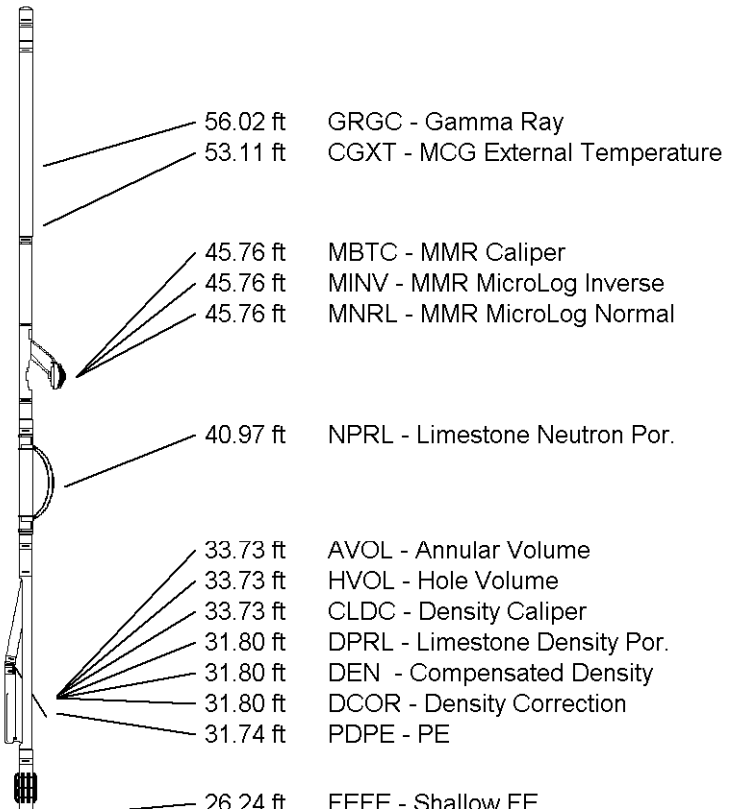
Compact Comms Gamma
MCG-D.K 442 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-Resistivity
MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.88 in

Compact Neutron
MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric

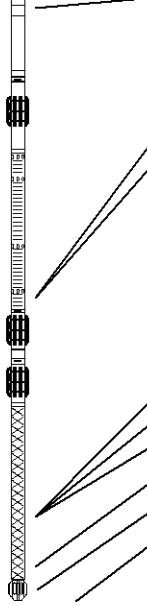


Compact Focused Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Sonic
MSS-C.K 368 LG: 12.52 ft WT: 72.8 lb OD: 2.24 in

Compact Induction
MAI-A.A 45 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 62.88 ft Weight: 471.8 lb



12.96 ft	DT35 - 3-5' Compensated Sonic
12.96 ft	SPRL - Wyllie Lime. Sonic Por.
3.34 ft	R40O - Array Ind. One Res 40
3.34 ft	RTAO - Array Ind. One Res Rt
3.34 ft	R60O - Array Ind. One Res 60
0.23 ft	SPCG - Spontaneous Potential
Tool Zero	(0.13ft from bottom)
-0.13 ft	SMTU - DST Uphole Tension

All measurements relative to tool zero.

COMPANY	WESTERN OPERATING COMPANY
WELL	FOX #2-8
FIELD	HELFRICH
PROVINCE/COUNTY	HAMILTON
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3658.00	feet	First Reading	5457.00	feet
Elevation Drill Floor	3657.00	feet	Depth Driller	5467.00	feet
Elevation Ground Level	3647.00	feet	Depth Logger	5460.00	feet

Weatherford®

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

Weatherford

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

COMPANY: WESTERN OPERATING COMPANY
WELL: FOX #2-8
FIELD: HELFRICH
PROVINCE/COUNTY: HAMILTON
COUNTRY/STATE: U.S.A. / KANSAS
LOCATION: 1150' FNL & 1320' FWL S2 S2 N2 NW

SEC	8
TWP	25S
RGE	42W
API Number	15-075-20869
Permanent Datum	GL Elevation 3647 feet
Log Measured From	KB @ 11 FEET
Drilling Measured From	KB
Other Services	MDN/MPD MSS
Elevations: KB	3658.00 feet
DF	3657.00
GL	3647.00

Date	7-JUL-2013		
Run Number	ONE		
Service Order	3539897		
Depth Driller	5467.00	feet	
Depth Logger	5460.00	feet	
First Reading	5457.00	feet	
Last Reading	924.00	feet	
Casing Driller	924.00	feet	
Casing Logger	924.00	feet	
Bit Size	7.875	inches	
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.40 lbm/Usg	56.00 CP	
PH / Fluid Loss	9.00	9.60 ml/30Min	
Sample Source	FLOWLINE		
Rm @ Measured Temp	0.91 @ 85.0	ohm-m	
Rmf @ Measured Temp	0.73 @ 85.0	ohm-m	
Rmc @ Measured Temp	0.67 @ 85.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.61 @ 127.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	127.00	deg F	
Equipment / Base	13057	LIB	
Recorded By	W. STAMBAUGH		
Witnessed By	PETER DEBENHAM		
JOB #	LB13-136		

1 INCH MAIN

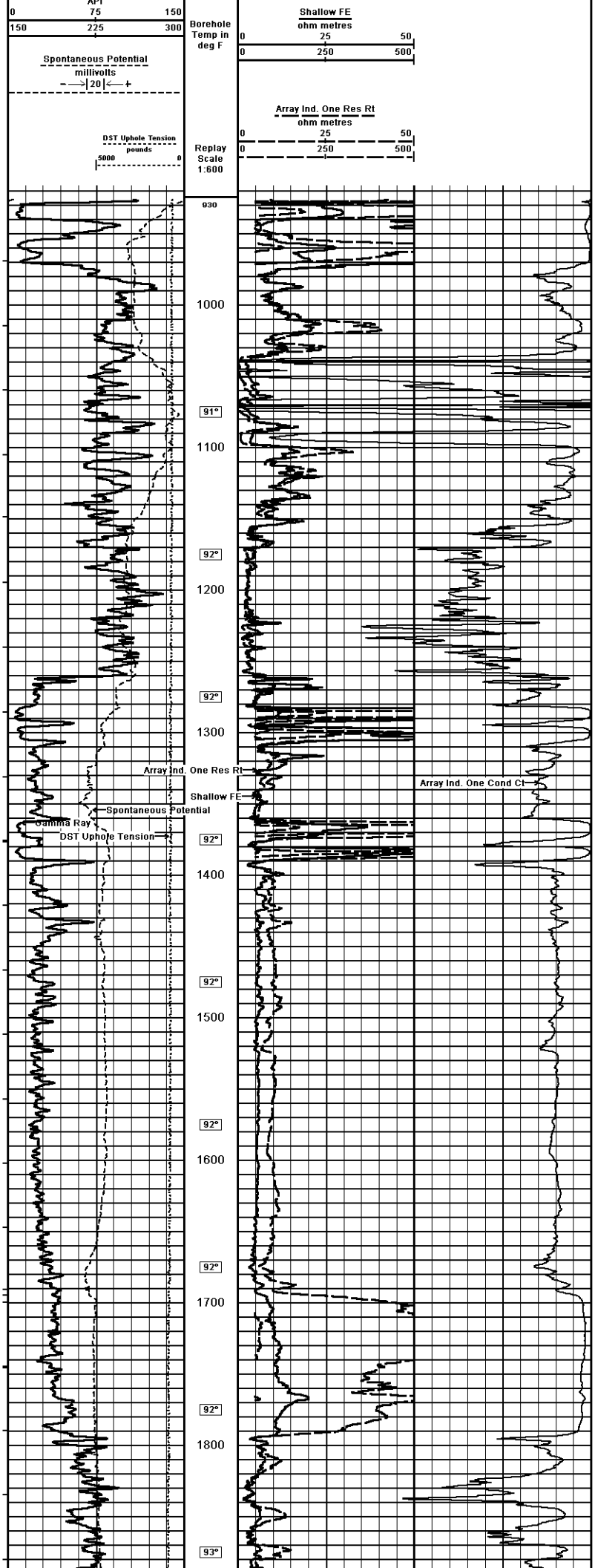
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 08-JUL-2013 21:18
Filename: C:\Minimus 13.05.9583\Logs\Western Operati...\Western Operating Company FOX #2-8_003.dta
Recorded on 08-JUL-2013 17:58
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

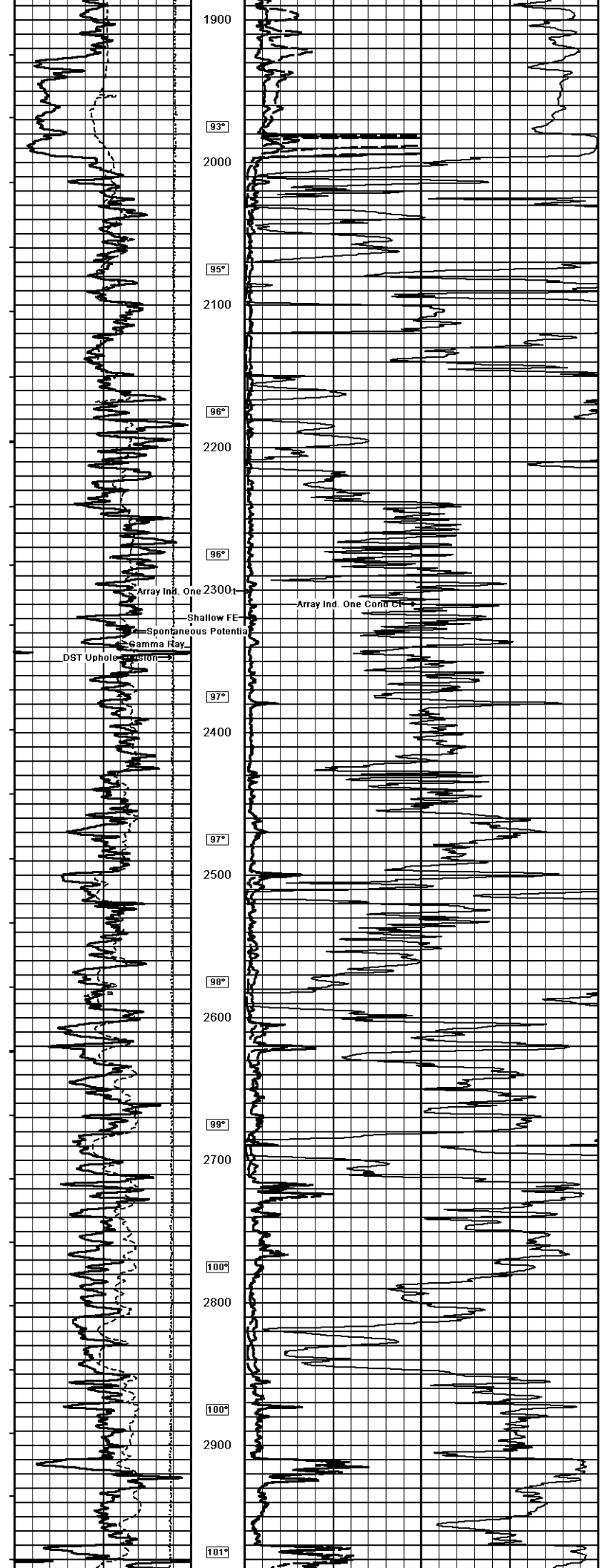
Timing Marks every 60.0 sec

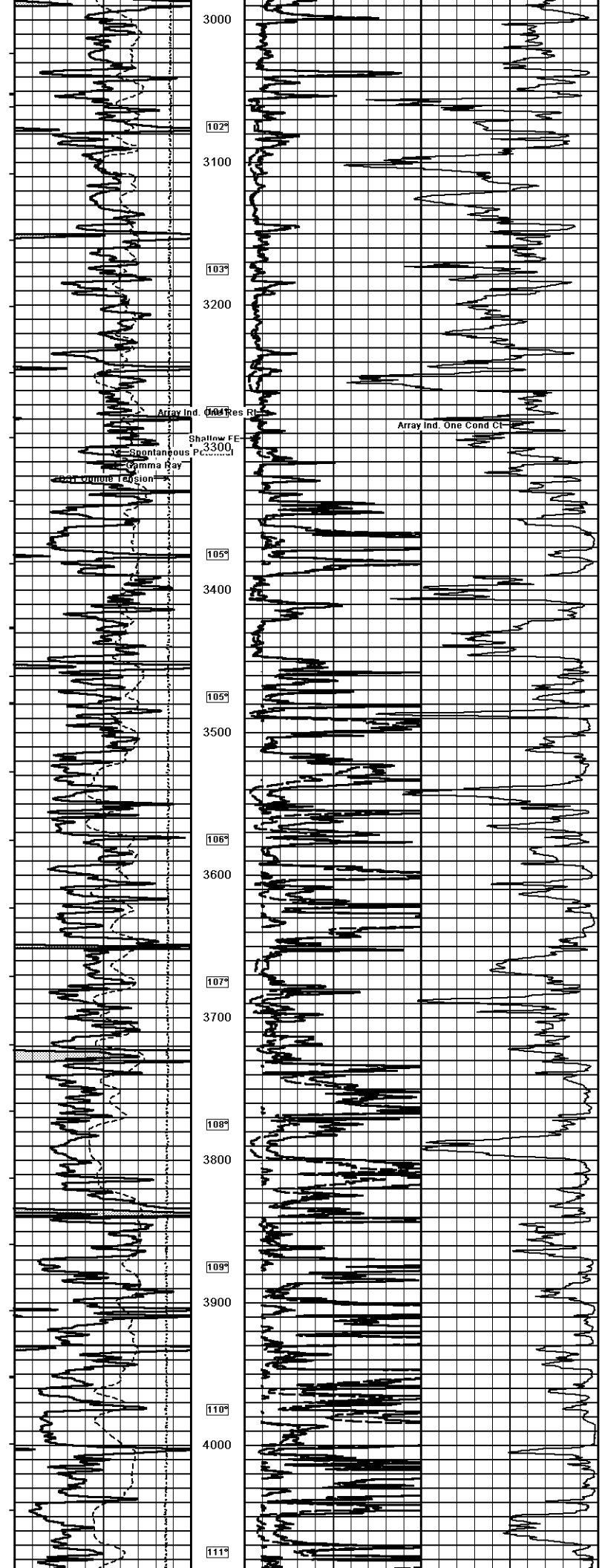
Gamma Ray

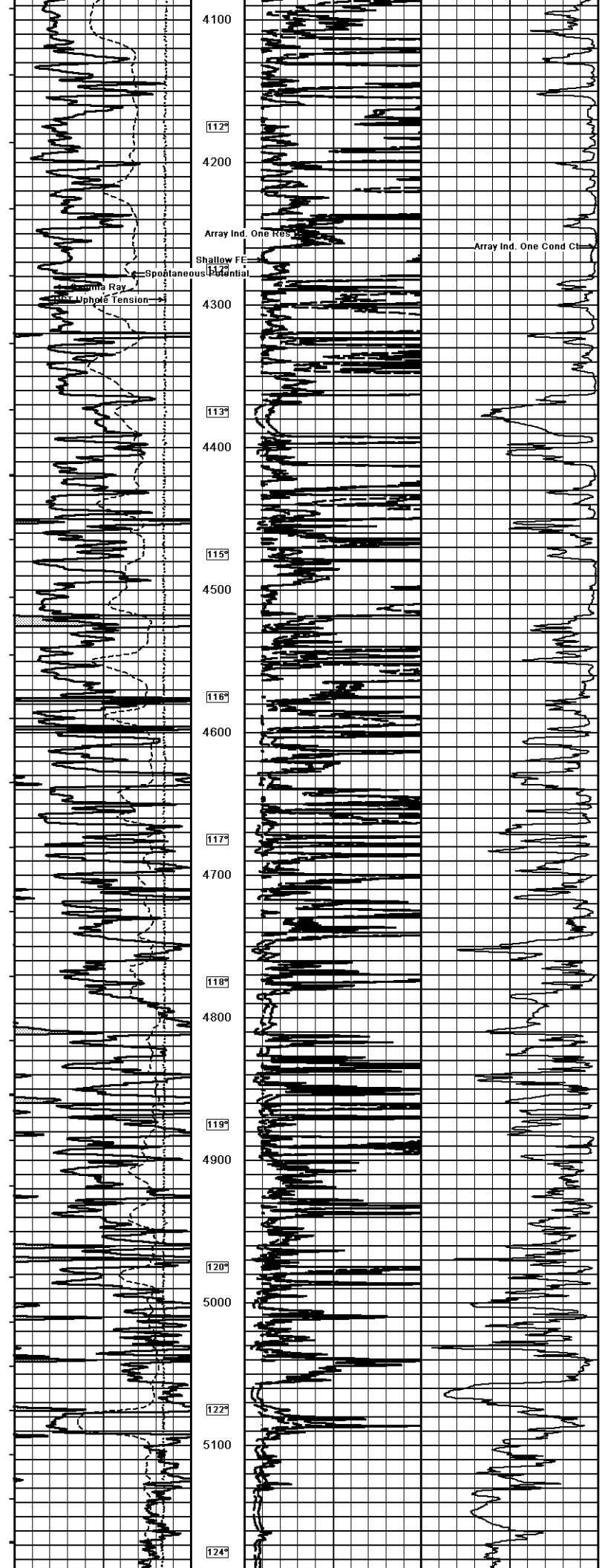
Depth In Feet

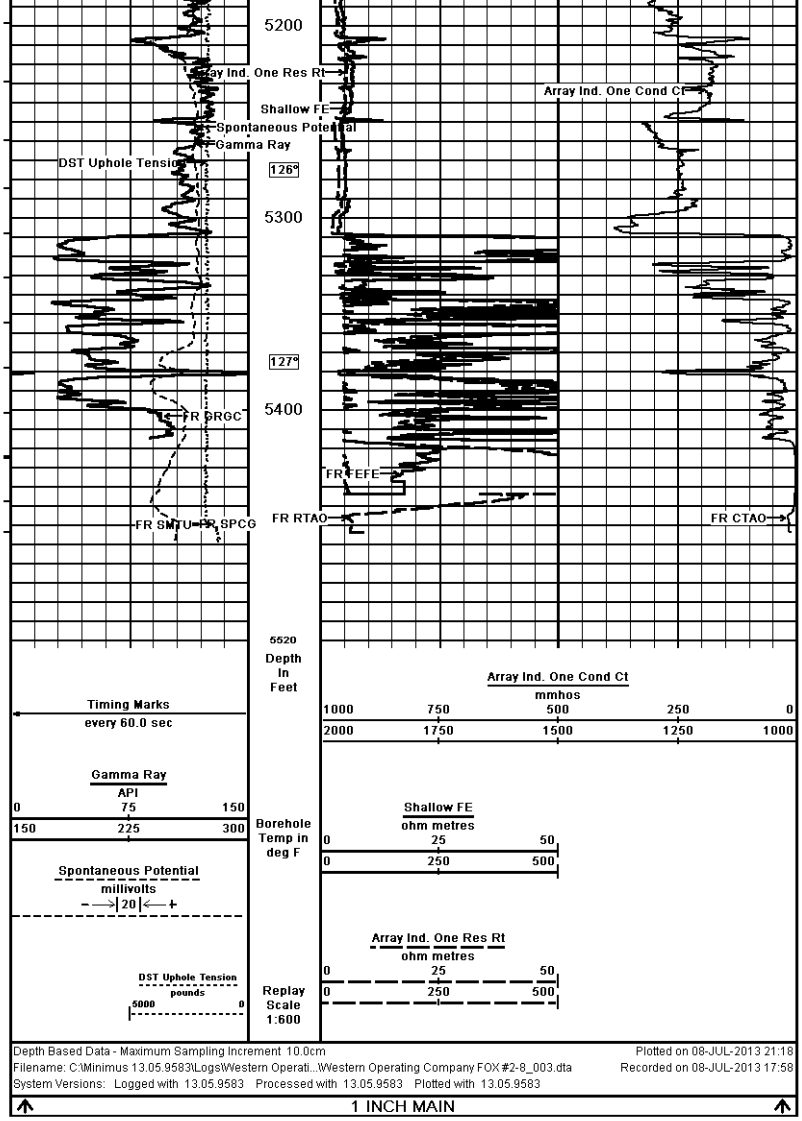
Array Ind. One Cond Ct
mmhos
1000 750 500 250 0
2000 1750 1500 1250 1000


API
0
75
150
150
225
300
Spontaneous Potential
millivolts
20
DST Uphole Tension
pounds
5000
0
Borehole Temp in deg F
Shallow FE
ohm metres
0
25
50
0
250
500
Array Ind. One Res Rt
ohm metres
0
25
50
0
250
500
Replay Scale 1:600
930
1000
91°
1100
92°
1200
92°
1300
Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Ct
92°
1400
92°
1500
92°
1600
92°
1700
92°
1800
93°


1900
93°
2000
95°
2100
96°
2200
96°
Array Ind. One
2300
Array Ind. One Cond Ct
Shallow FE
Spontaneous Potentia
Gamma Ray
DST Uphole Tension
97°
2400
97°
2500
98°
2600
99°
2700
100°
2800
100°
2900
101°


3000
102°
3100
103°
3200
Array Ind. One Res Rt
Array Ind. One Cond Ct
Shallow FE
3300
Spontaneous Potential
Gamma Ray
Cable Tension
105°
3400
105°
3500
106°
3600
107°
3700
108°
3800
109°
3900
110°
4000
111°


4100
112°
4200
Array Ind. One Res
Array Ind. One Cond Ct
Shallow FE
113°
Spontaneous Potential
Gamma Ray
Cable Uphole Tension
4300
113°
4400
115°
4500
116°
4600
117°
4700
118°
4800
119°
4900
120°
5000
122°
5100
124°



COMPANY	WESTERN OPERATING COMPANY
WELL	FOX #2-8
FIELD	HELFRICH
PROVINCE/COUNTY	HAMILTON
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3658.00	feet	First Reading	5457.00	feet
Elevation Drill Floor	3657.00	feet	Depth Driller	5467.00	feet
Elevation Ground Level	3647.00	feet	Depth Logger	5460.00	feet

Weatherford

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG