



**Weatherford**<sup>®</sup>

**ARRAY INDUCTION  
SHALLOW FOCUSED  
ELECTRIC LOG**

COMPANY GRAND MESA OPERATING CO.  
 WELL VULGAMORE #2-31  
 FIELD WILDCAT  
 PROVINCE/COUNTY SCOTT  
 COUNTRY/STATE U.S.A. / KANSAS  
 LOCATION 1910' FSL & 610' FEL

SEC 31 TWP 19S RGE 33W Other Services MPD/MDN MML  
 API Number 15-171-20931  
 Permit Number

Permanent Datum G.L., Elevation 2991 feet  
 Log Measured From KB  
 Drilling Measured From K.B. @ 5 FEET

Date 15-MAR-2013 Elevations: KB 2996.00 DF 2994.00 GL 2991.00

Run Number	ONE
Service Order	3838997
Depth Driller	4790.00 feet
Depth Logger	4790.00 feet
First Reading	4787.00 feet
Last Reading	222.00 feet
Casing Driller	223.00 feet
Casing Logger	222.00 inches
Bit Size	7.875
Hole Fluid Type	CHEMICAL lb/USg
Density / Viscosity	9.35 lb/USg 48.00 CP
PH / Fluid Loss	9.50 9.50
Sample Source	MUDPIT
Rm @ Measured Temp	1.07 @ 66.0 ohm-m
Rmf @ Measured Temp	0.86 @ 66.0 ohm-m
Rmc @ Measured Temp	1.28 @ 66.0 ohm-m
Source Rmf / Rmc	CALC CALC
Rm @ BHT	0.65 @109.0 ohm-m
Time Since Circulation	3 HOURS
Max Recorded Temp	109.00 deg F
Equipment / Base	13025 LIB
Recorded By	R.HOFFMAN
Witnessed By	JOHN GOLDSMITH
JOB #	LB13-070

**BOREHOLE RECORD**

Last Edited: 15-MAR-2013 09:26

Bit Size inches 7.875	Depth From feet 222.00	Depth To feet 4790.00
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**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	222.00	24.00

**REMARKS**

Tools Ran: MCG,MML,MDN,MPD,MFE,MAI Ran in Combination  
 Hardware Used: MDN Dual Eccentralizer used. MPD 8 inch profile plate used.  
 MFE: 0.5 inch Standoff = 1  
 MAI: 0.5 inch Standoff = 1  
 2.71 g/cc Limestone Density Matrix used to calculate porosity.  
 Tight pulls, washouts, and borehole rugosity will affect data quality.  
 All intervals logged and scaled per customer's request.  
 Annular volume with 5.5 inch production casing from TD to 3600 = 235 cu. ft.  
 Total hole volume from TD to surface casing = 2127 cu. ft.  
 Service order: #3538997  
 Rig: Murfin Drilling #24  
 Engineers: R. Hoffman, Derek Carter  
 Operator(s): B. Johnson

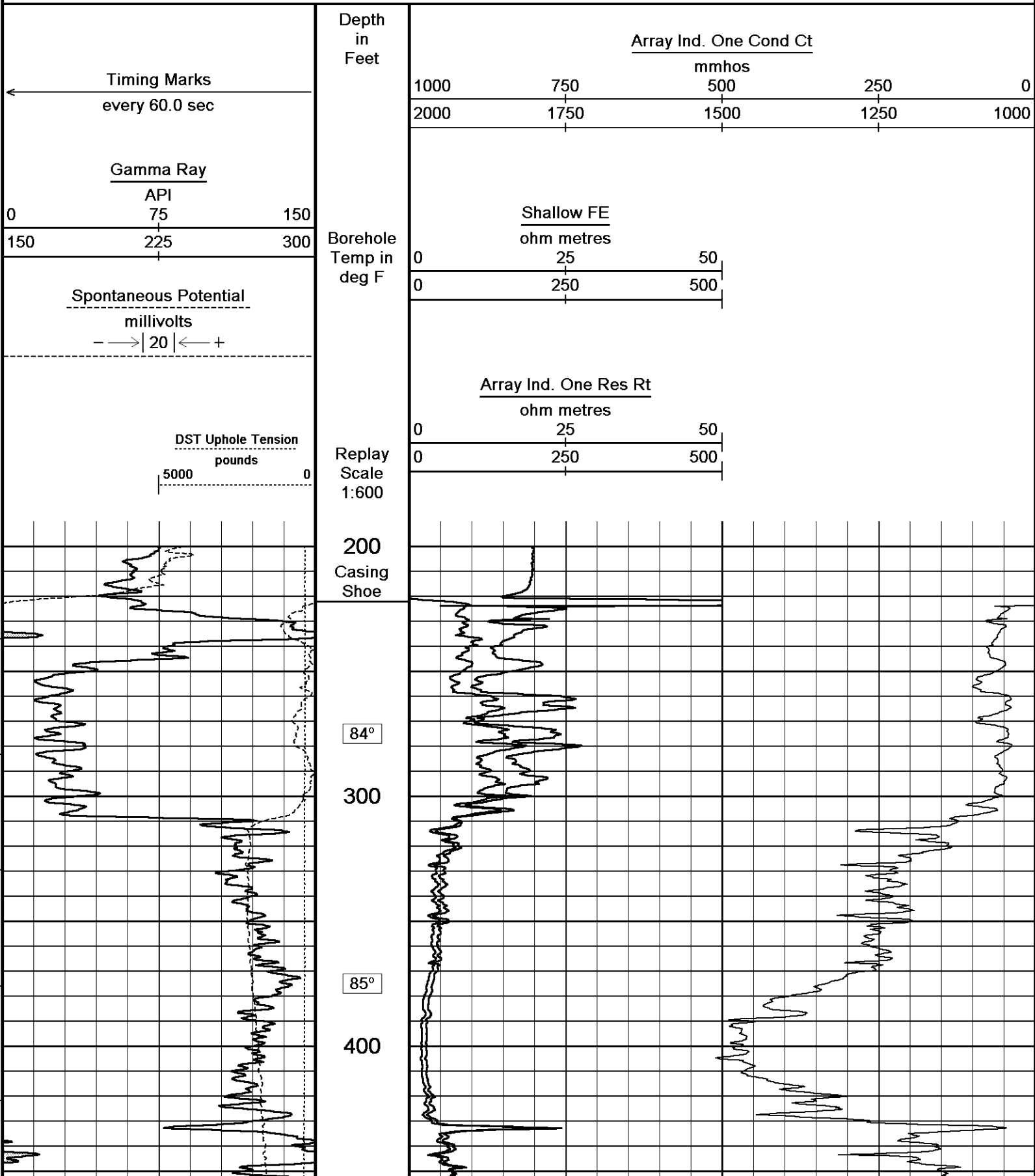
Software duplicates the pH value onto the fluid loss value. The fluid loss is 9.6 ml/30min.

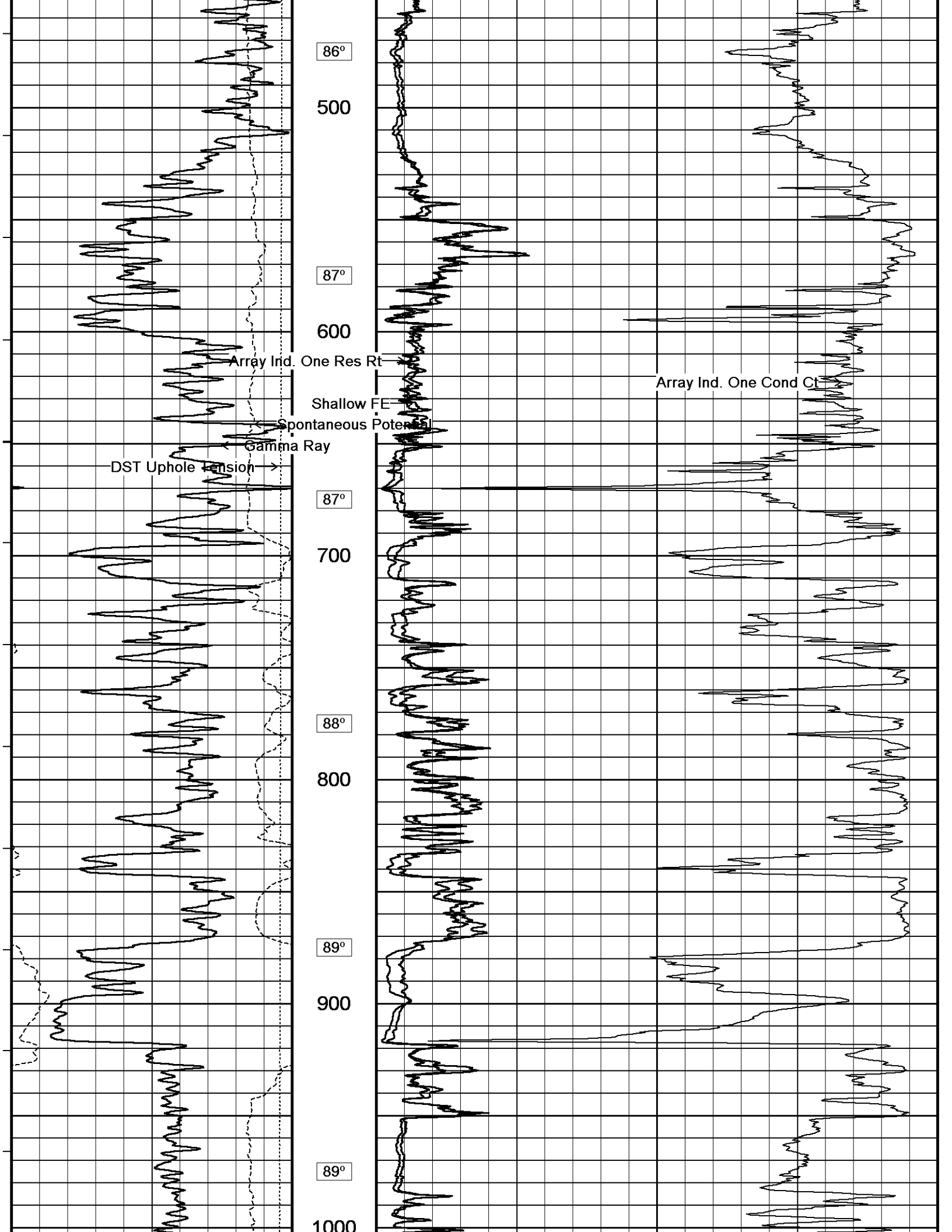
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy

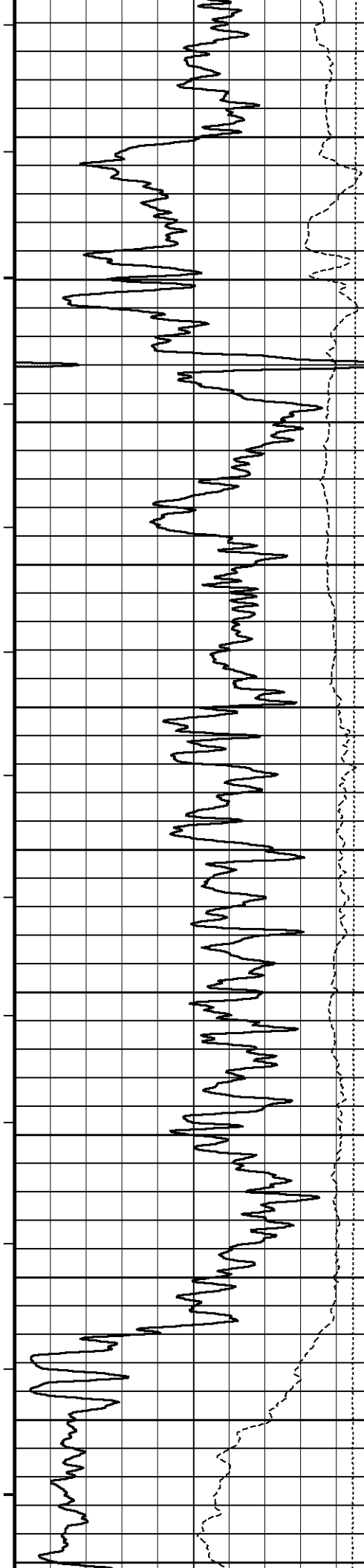
or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

**2 INCH MAIN**

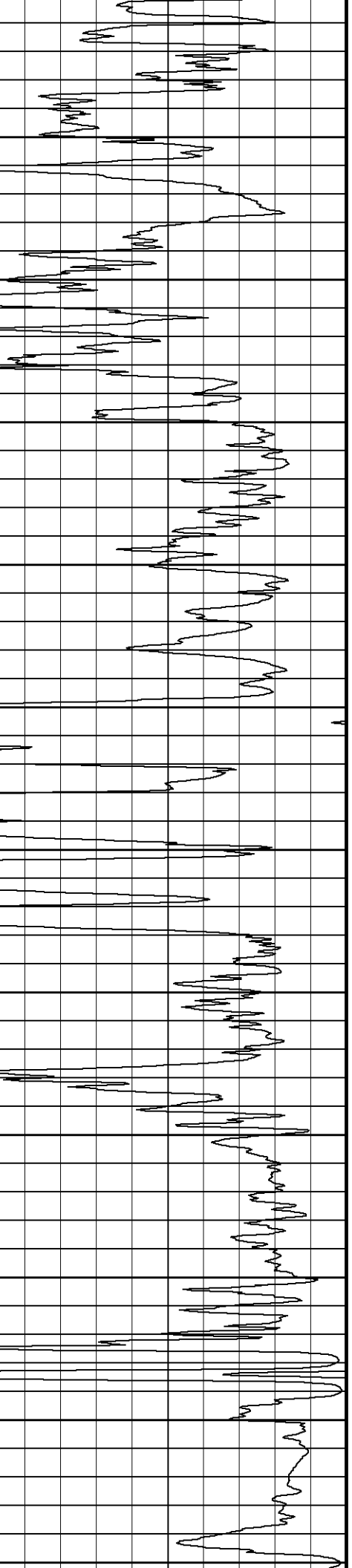
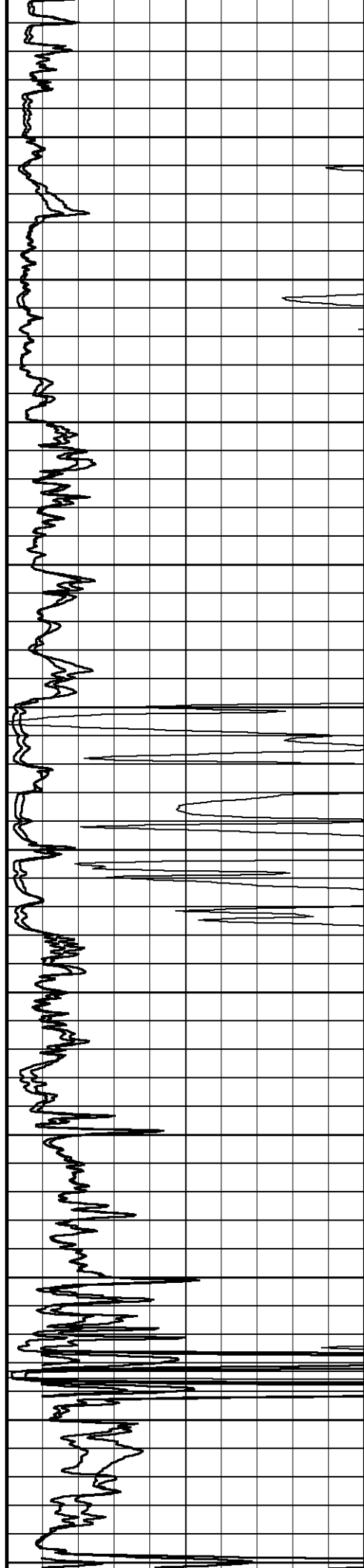
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 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamo...\Grand Mesa Vulgamore #2-31 Main.dta Recorded on 15-MAR-2013 10:38  
 System Versions: Processed with 13.04.8492 Plotted with 13.04.8492

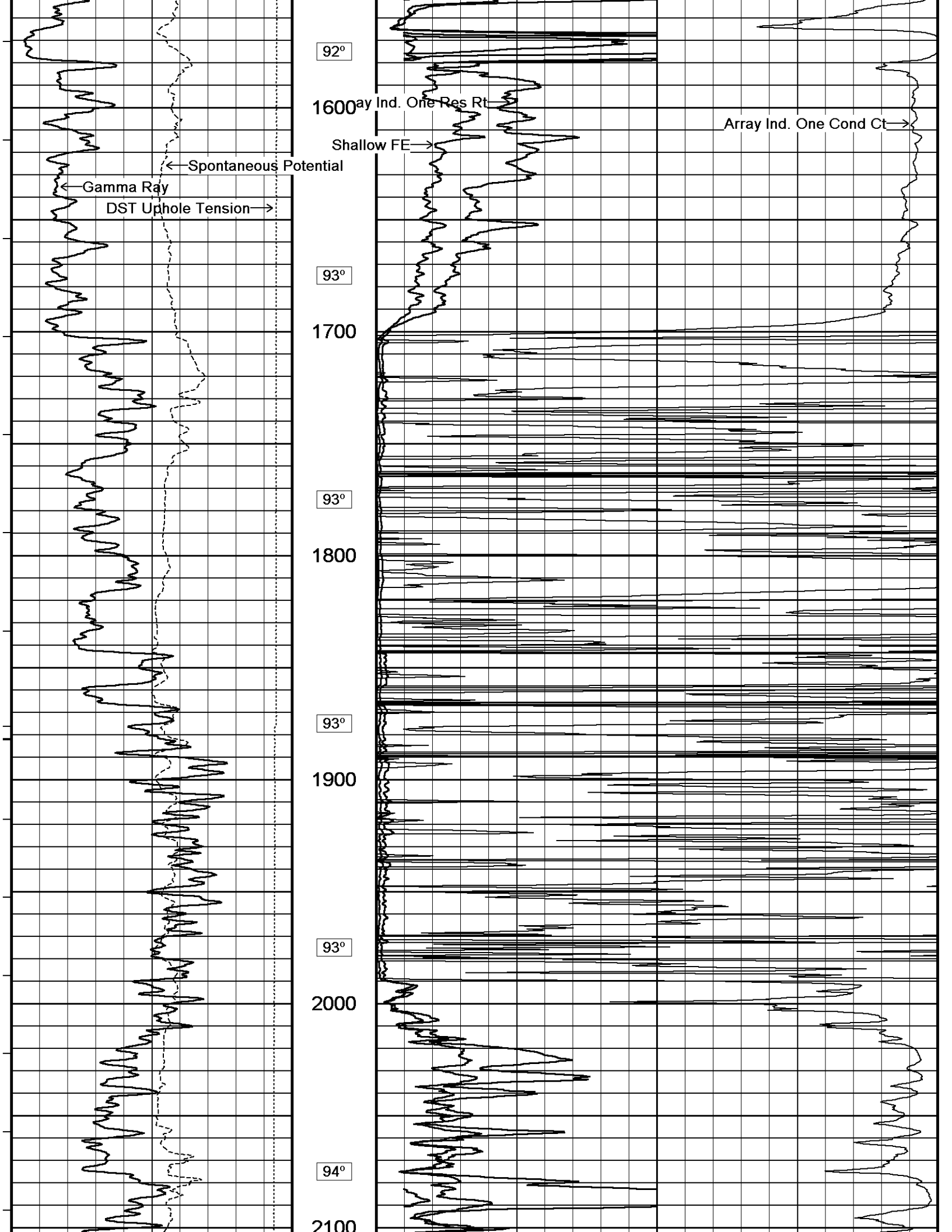


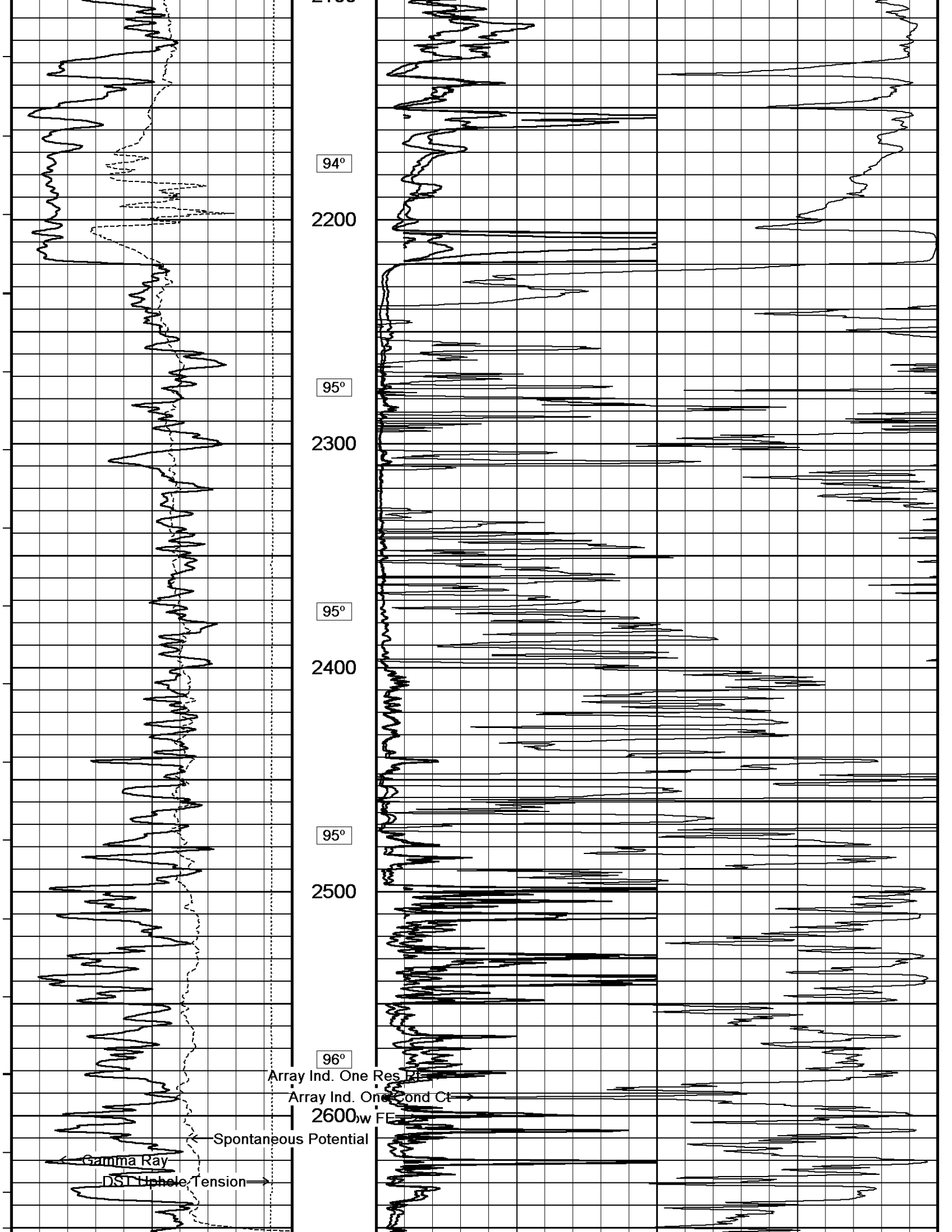


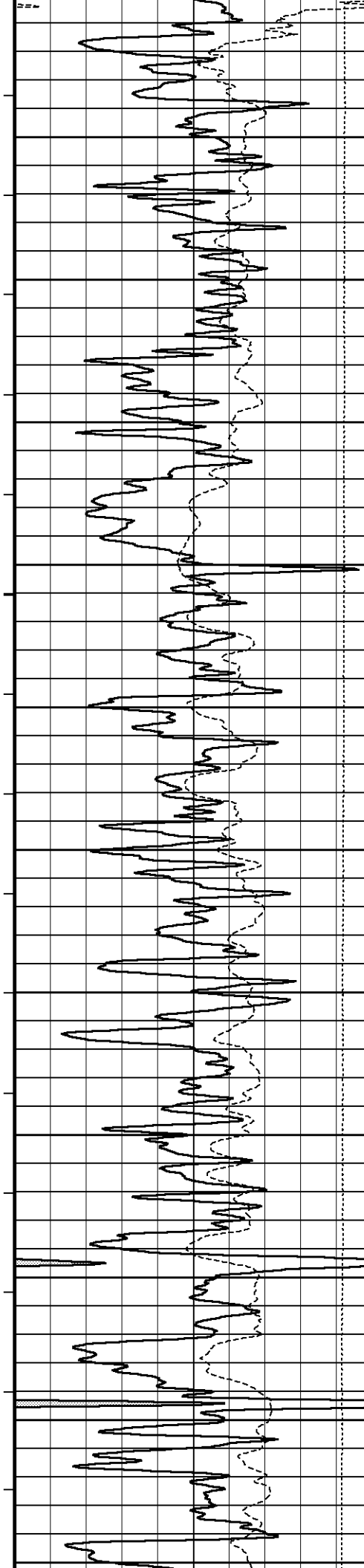


1000  
90°  
1100  
90°  
1200  
91°  
1300  
91°  
1400  
92°  
1500









97°

2700

97°

2800

97°

2900

98°

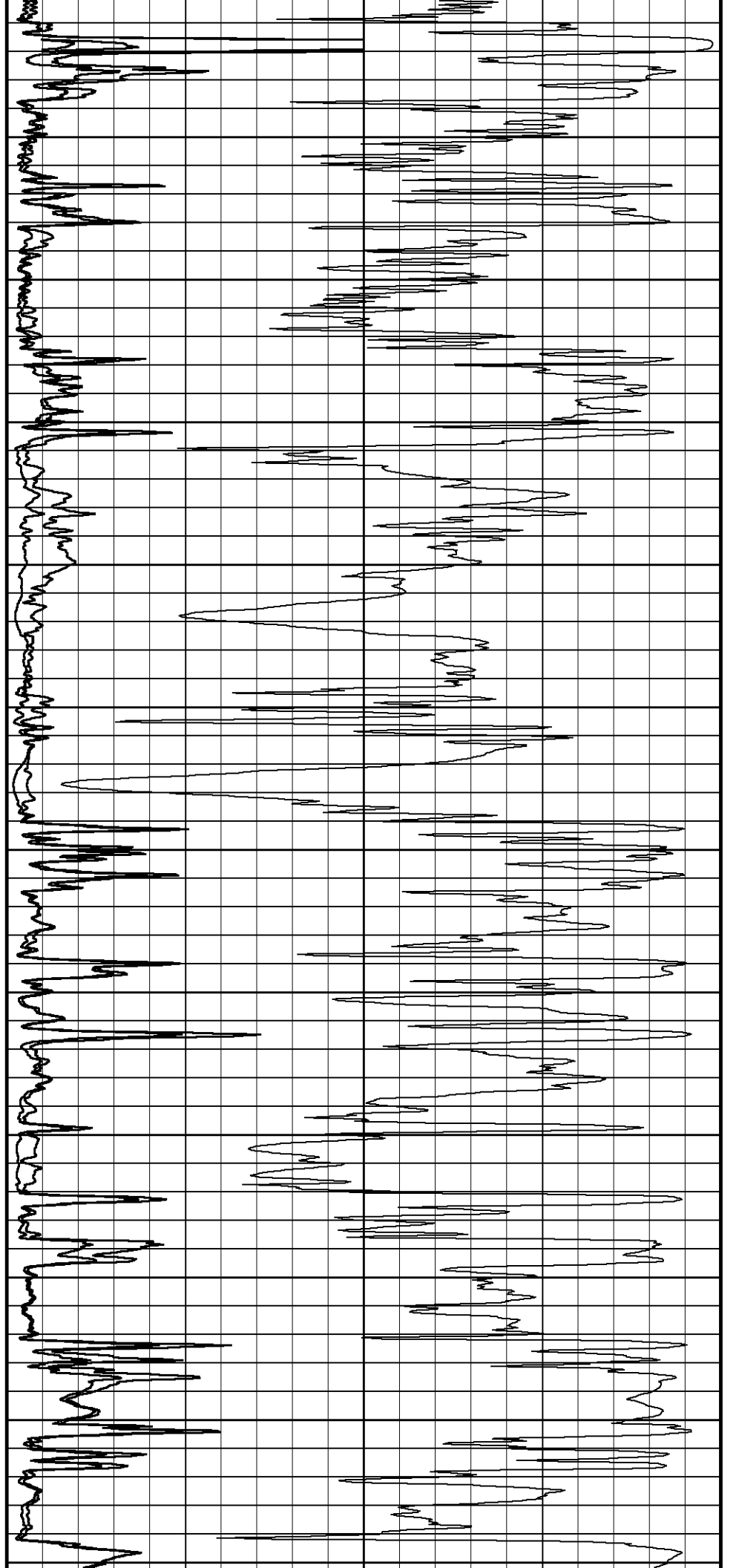
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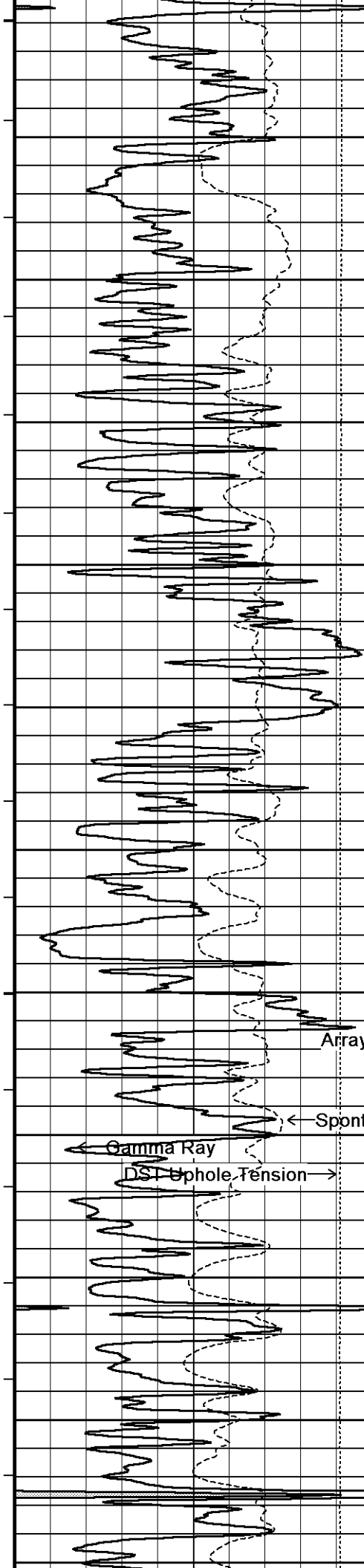
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3100

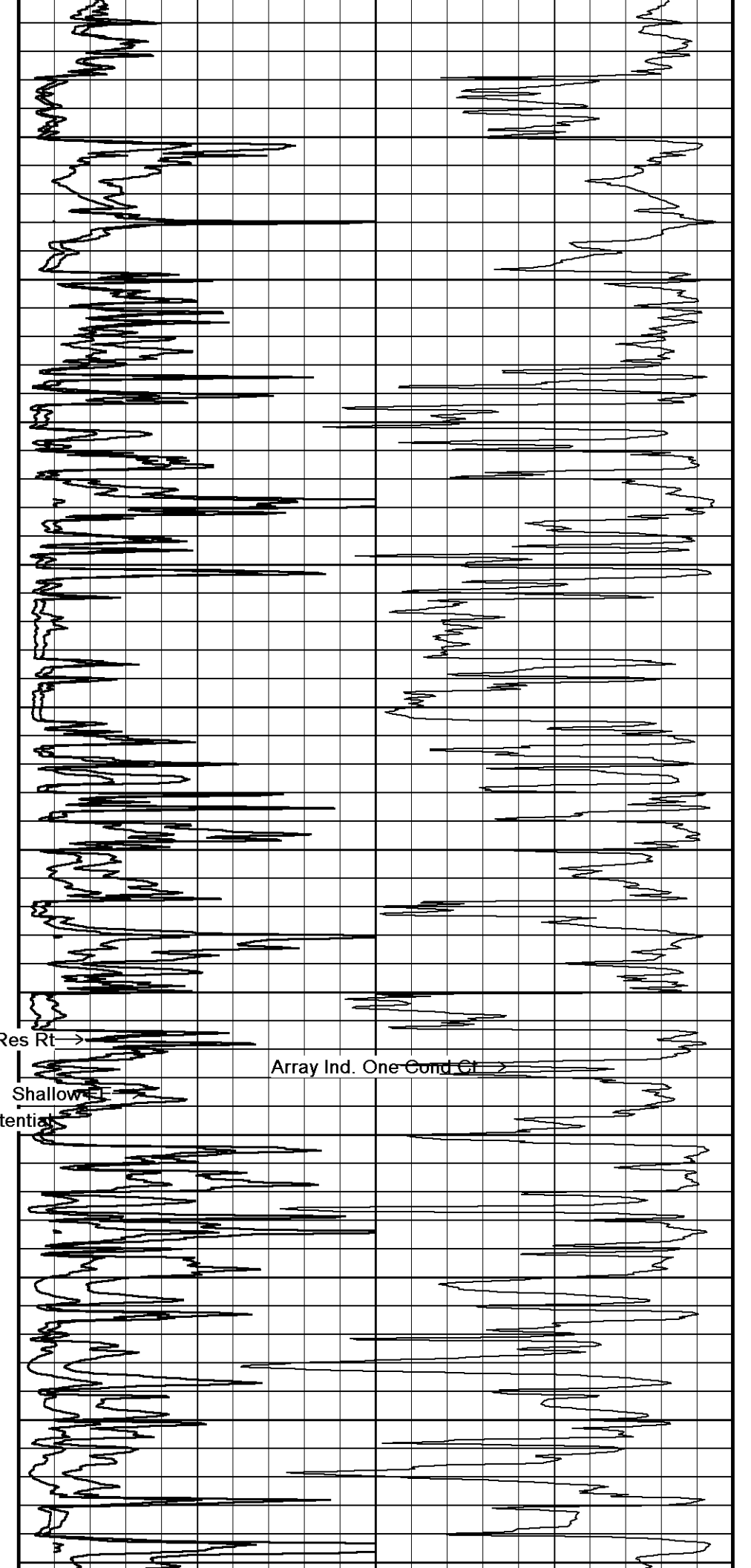
99°

3200





3200  
99°  
3300  
100°  
3400  
100°  
3500  
101°  
3600  
101°  
3700



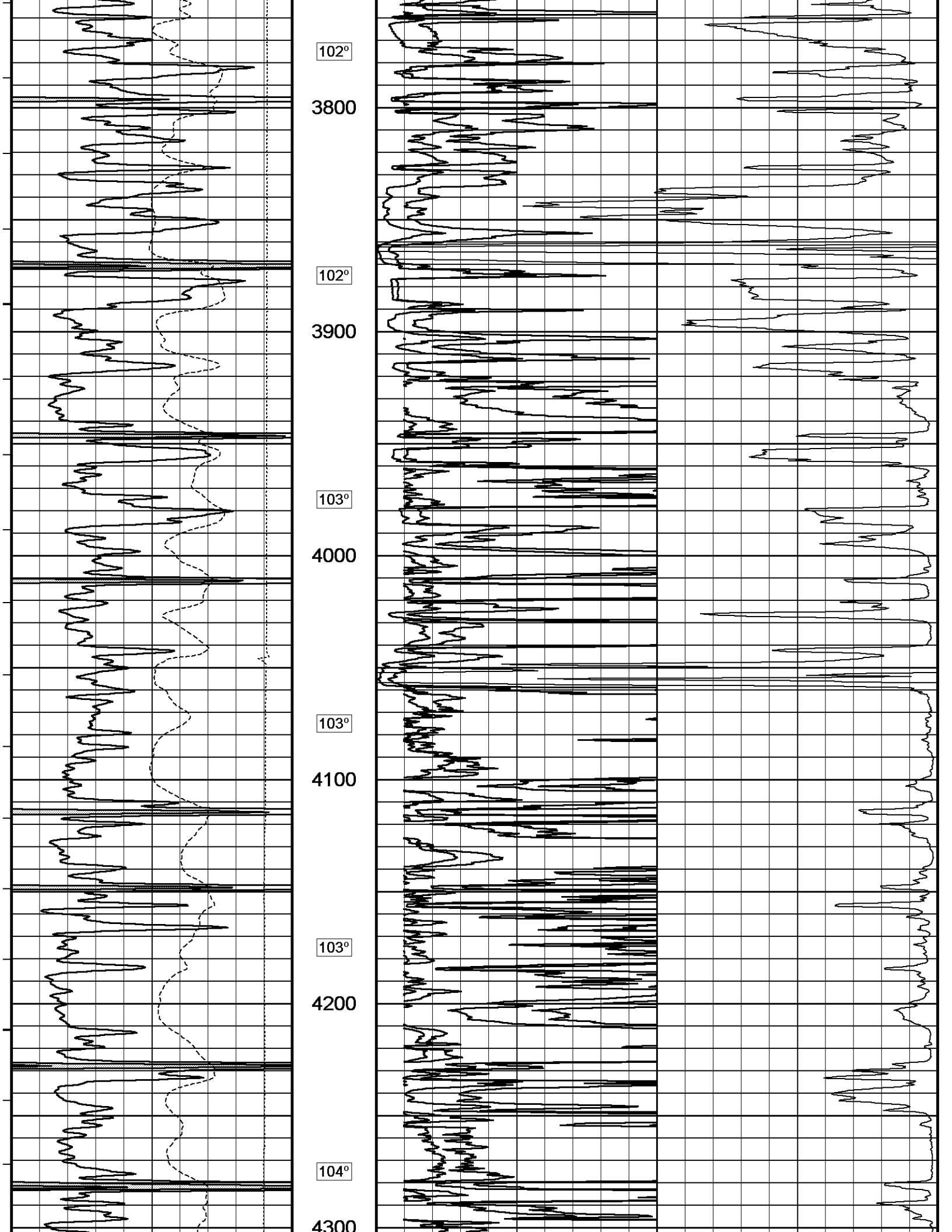
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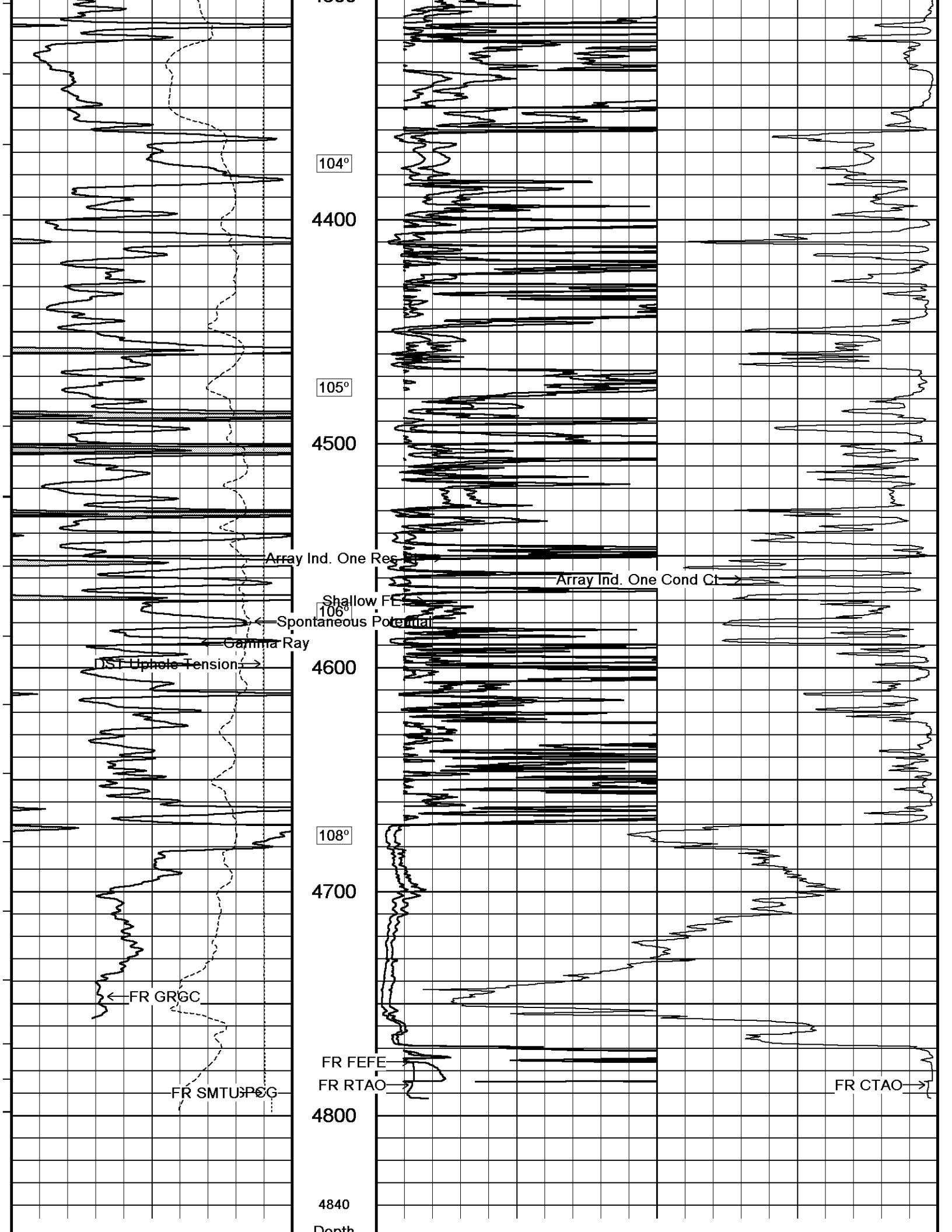
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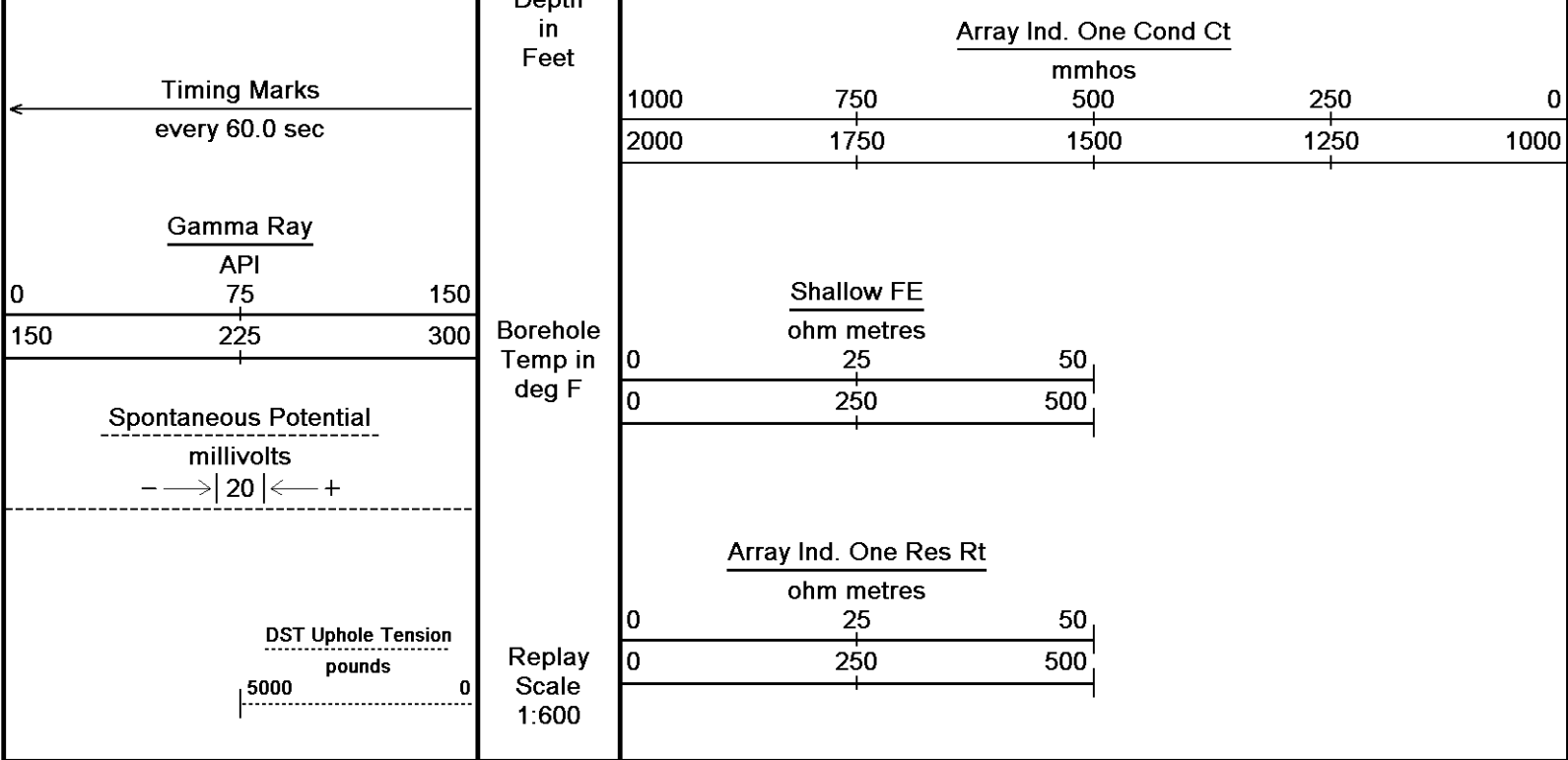
Shallow ←

← Spontaneous Potential

Gamma Ray  
DST Uphole Tension →





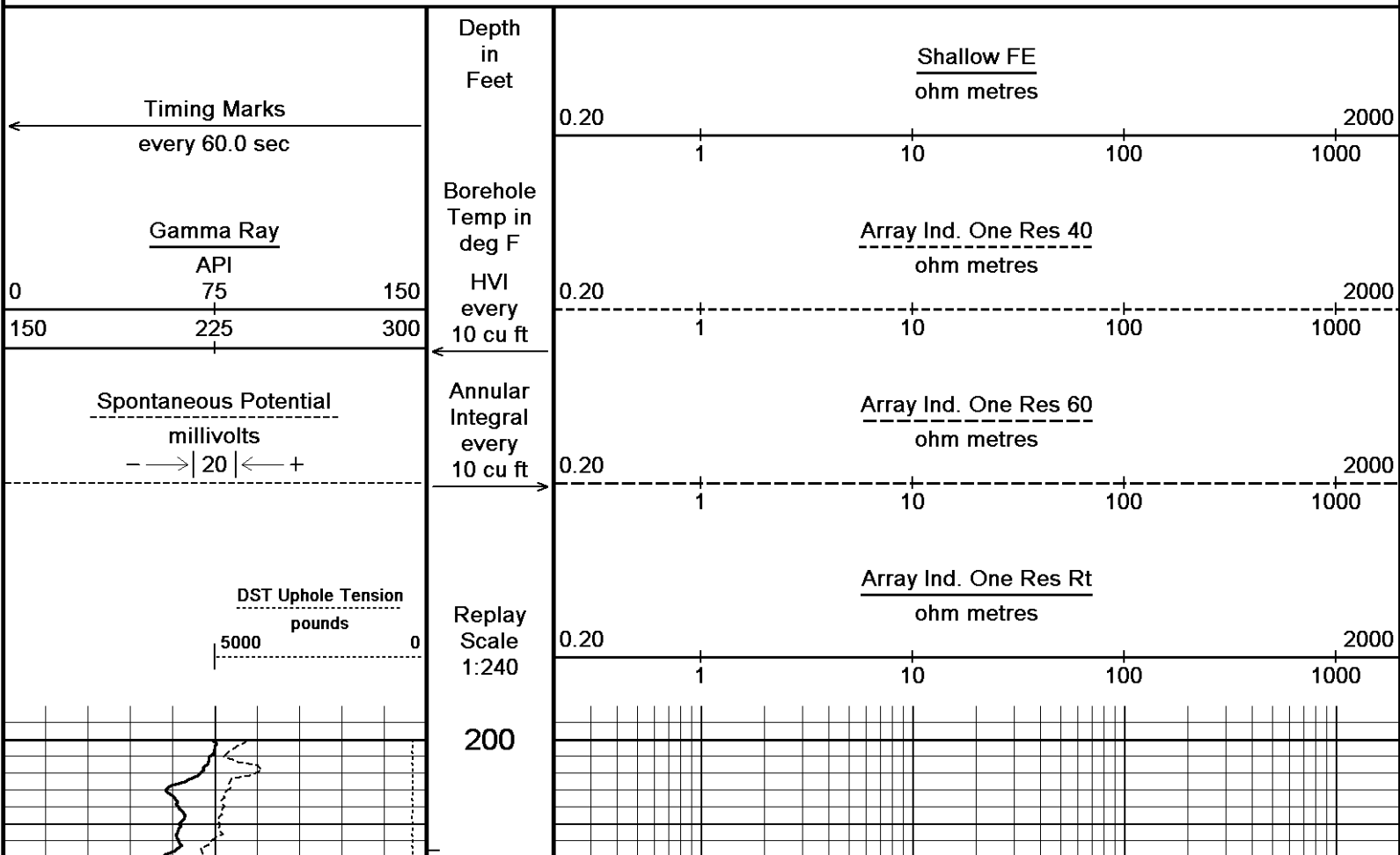


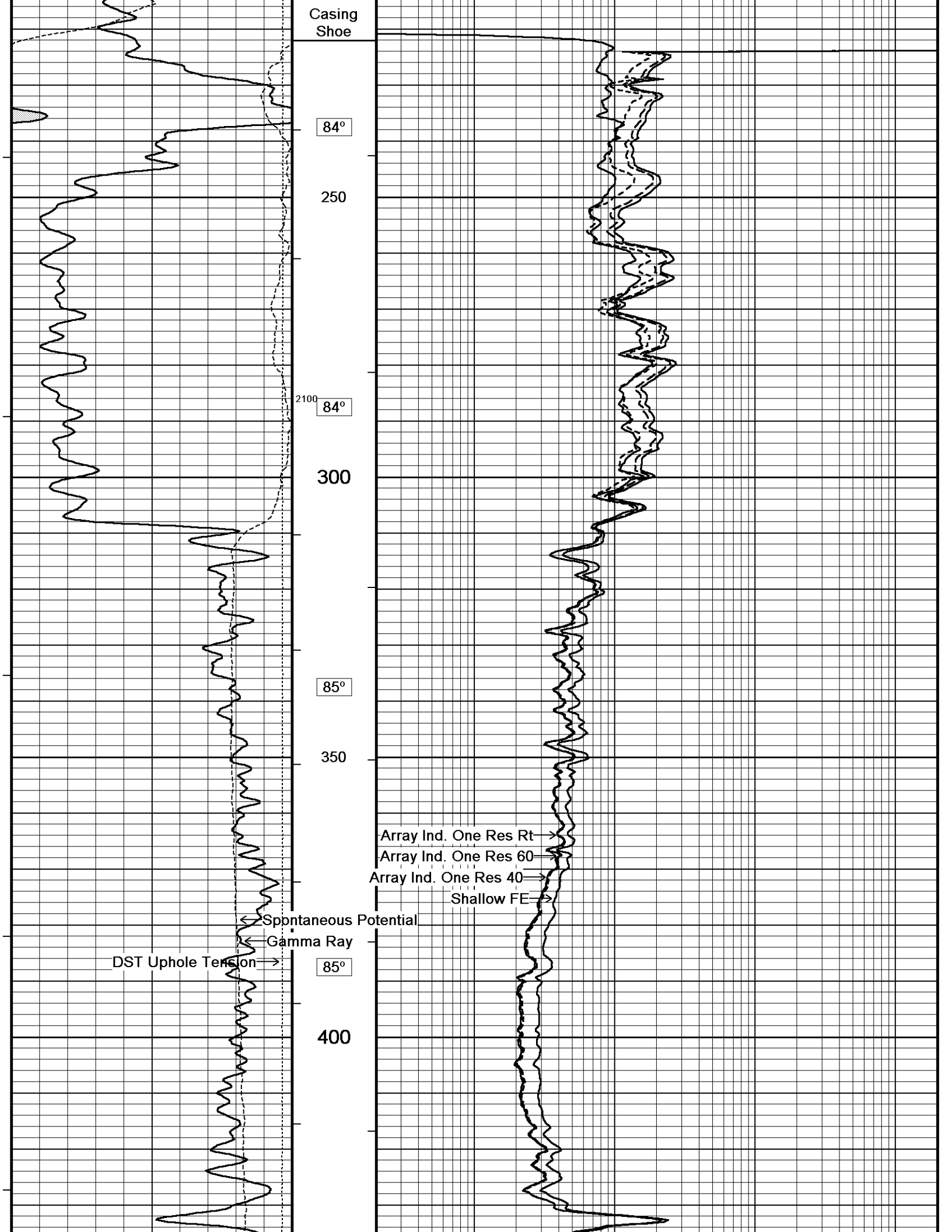
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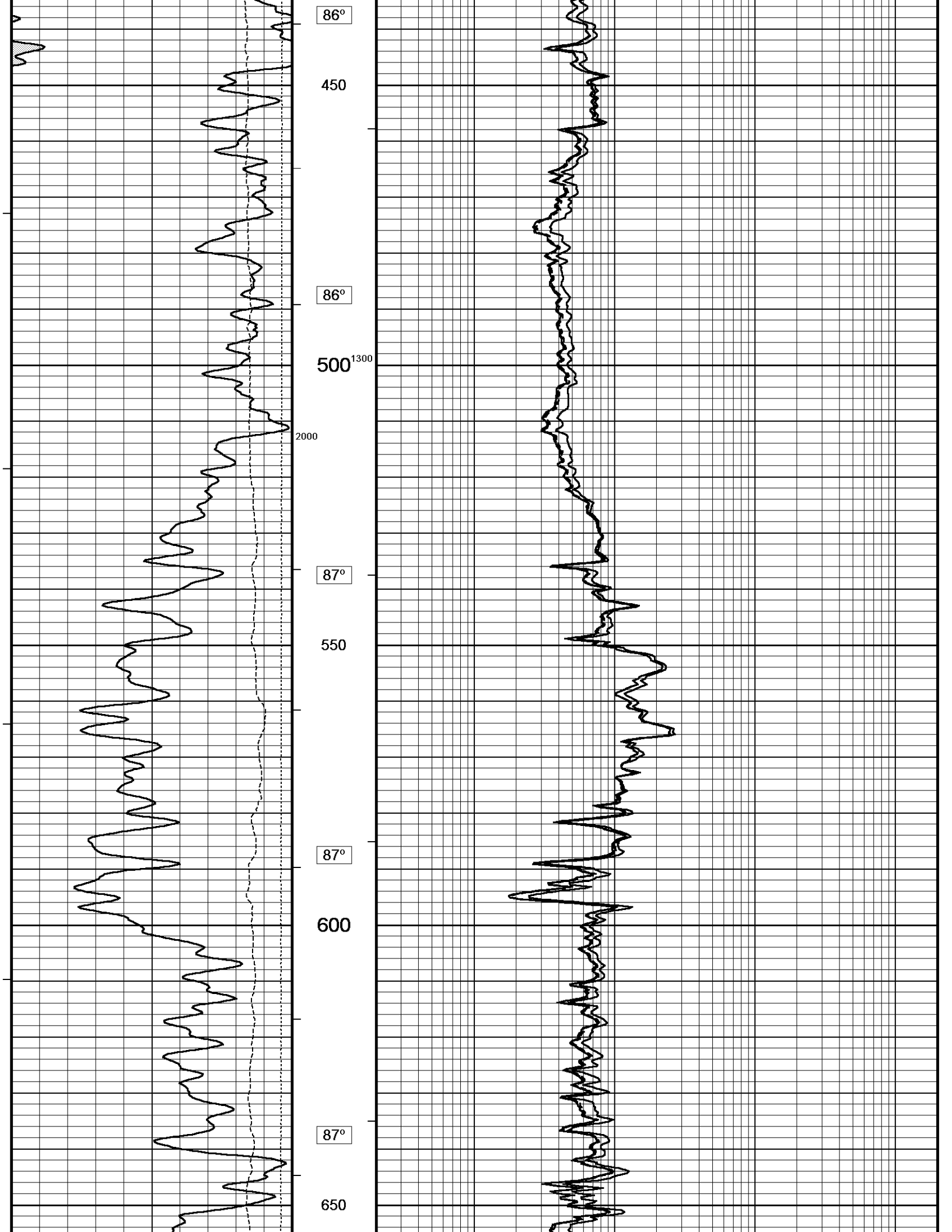
↑ 2 INCH MAIN ↑

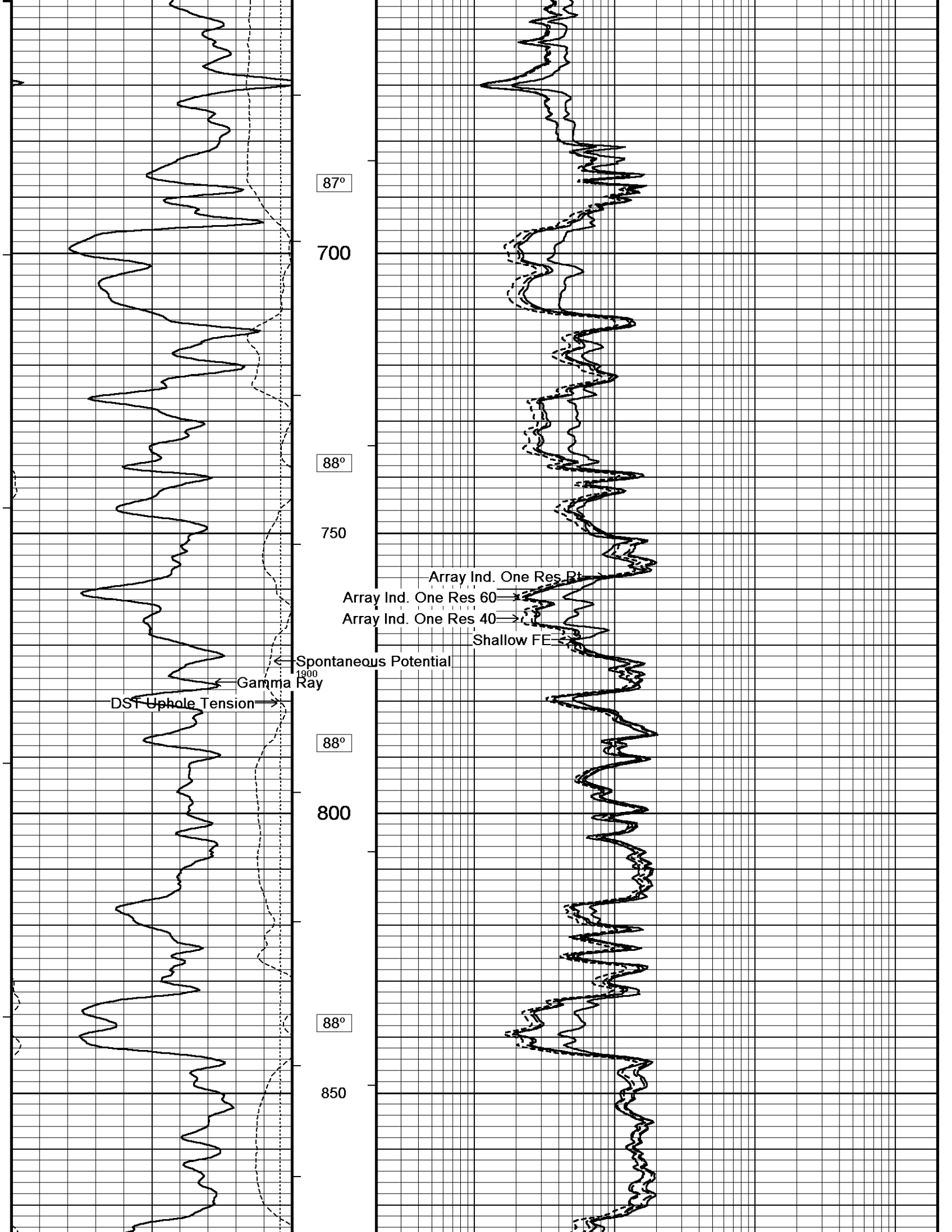
↓ 5 INCH MAIN ↓

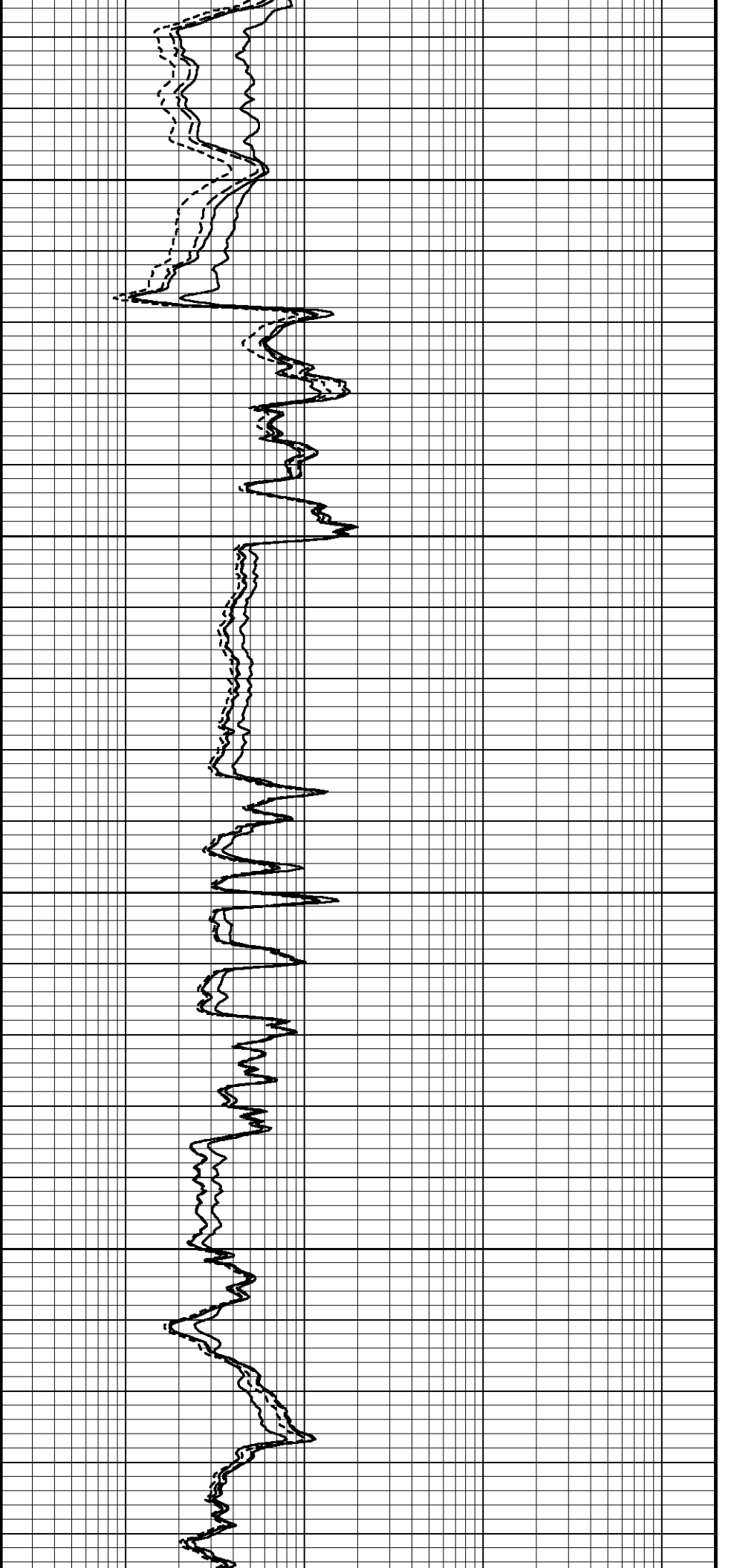
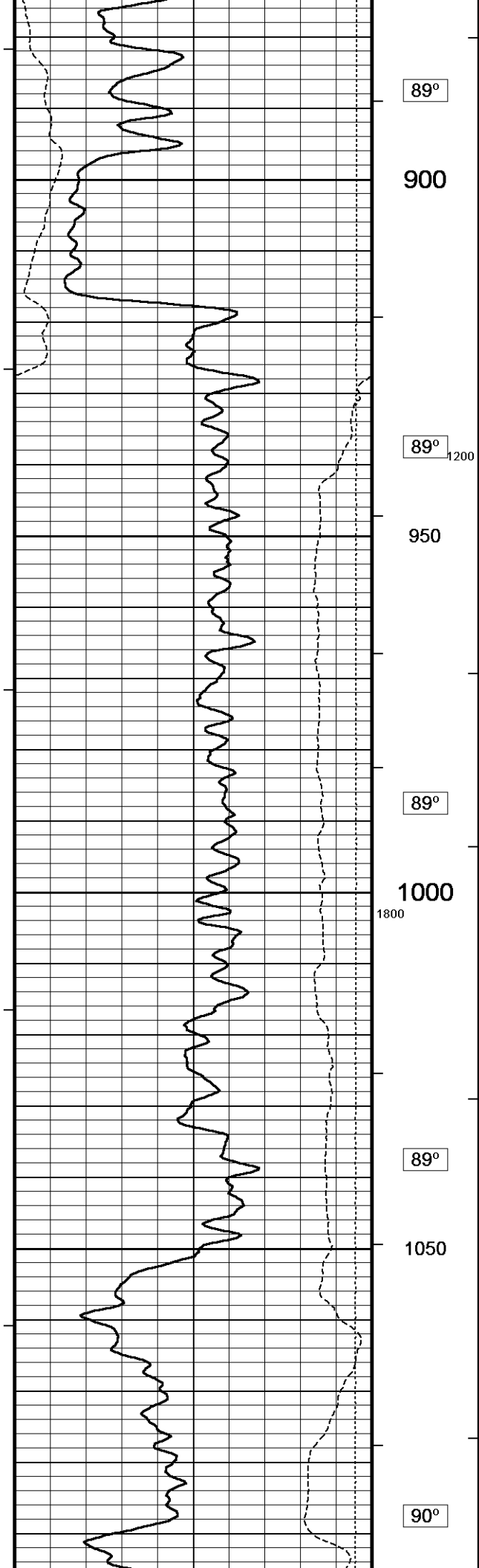
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 15-MAR-2013 13:44  
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamo...\Grand Mesa Vulgamore #2-31 Main.dta Recorded on 15-MAR-2013 10:38  
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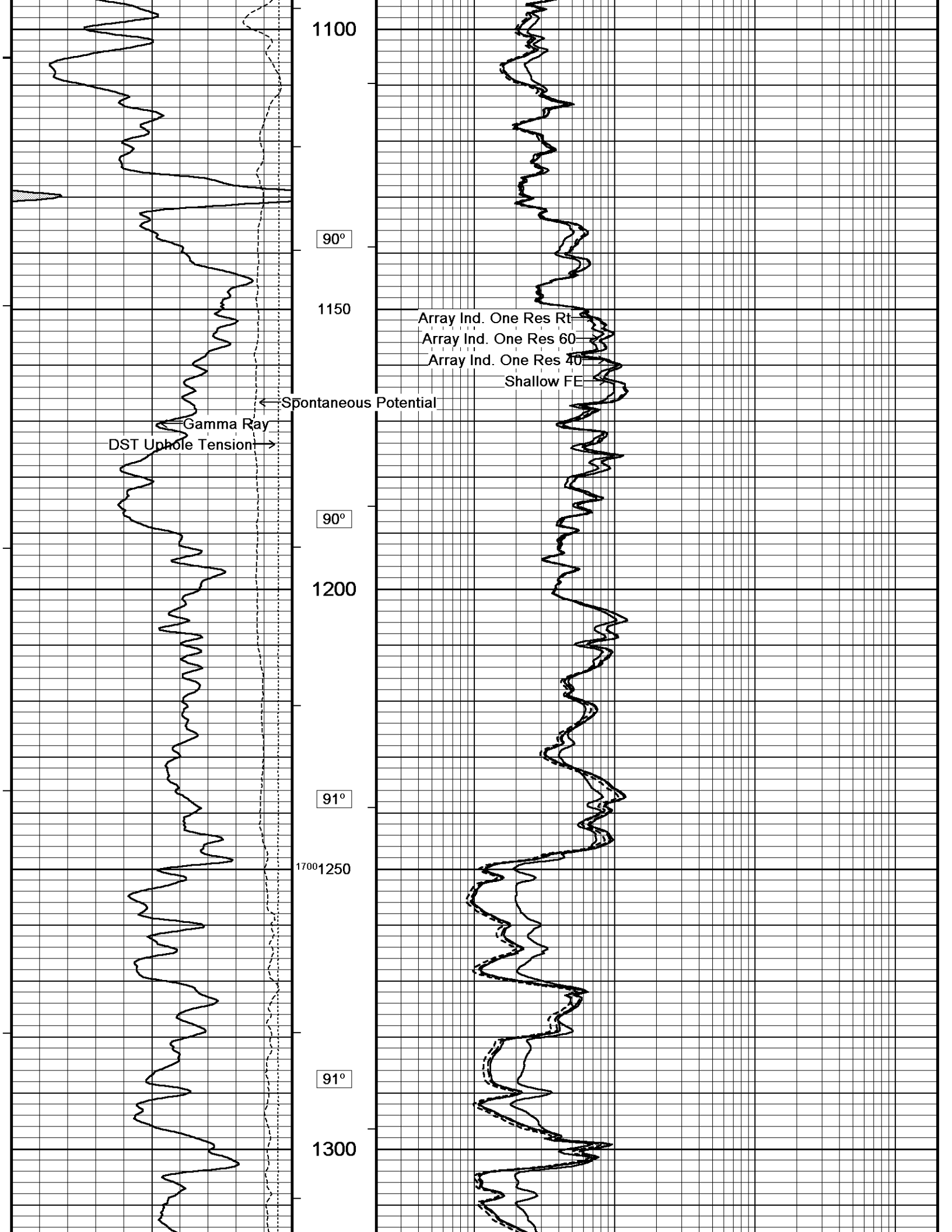


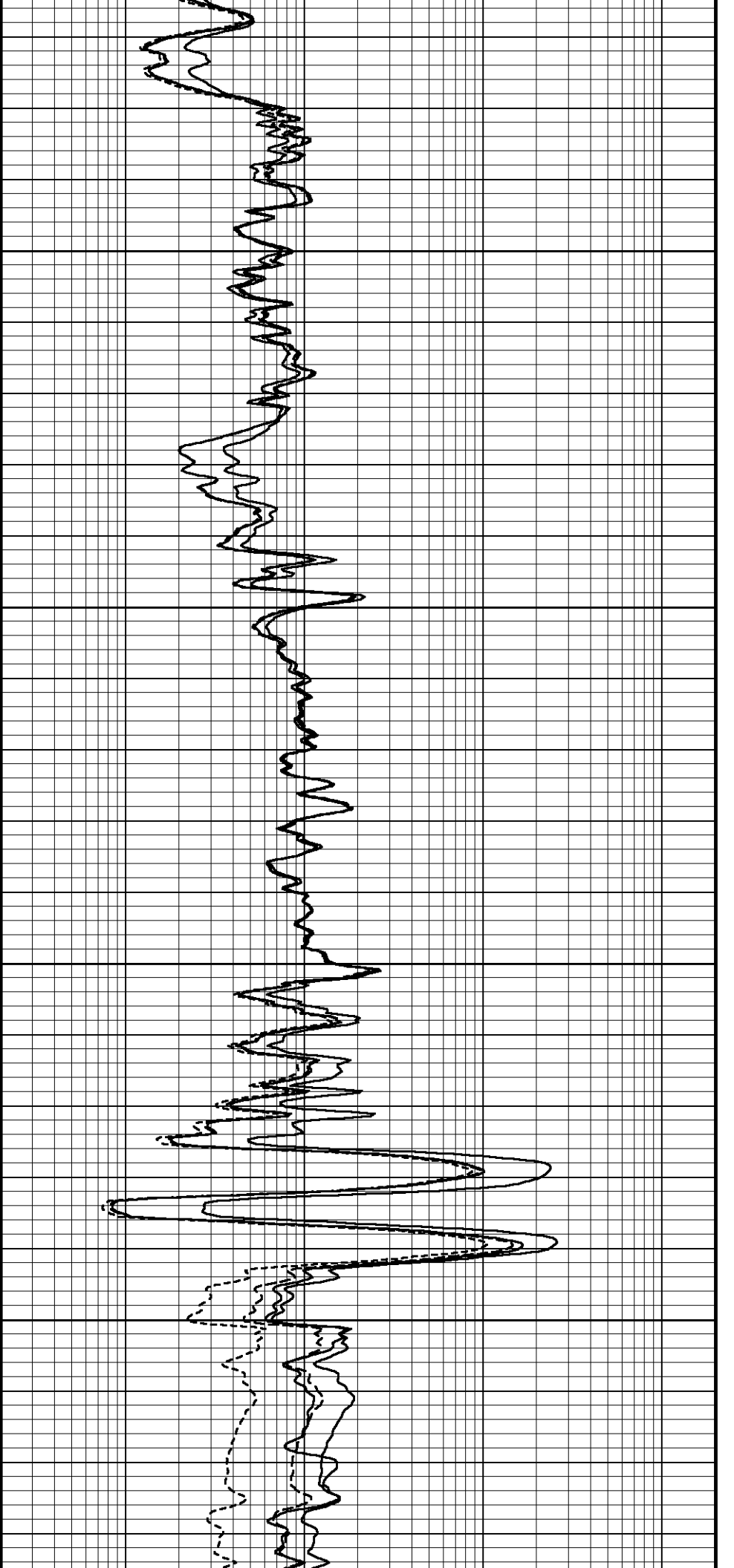
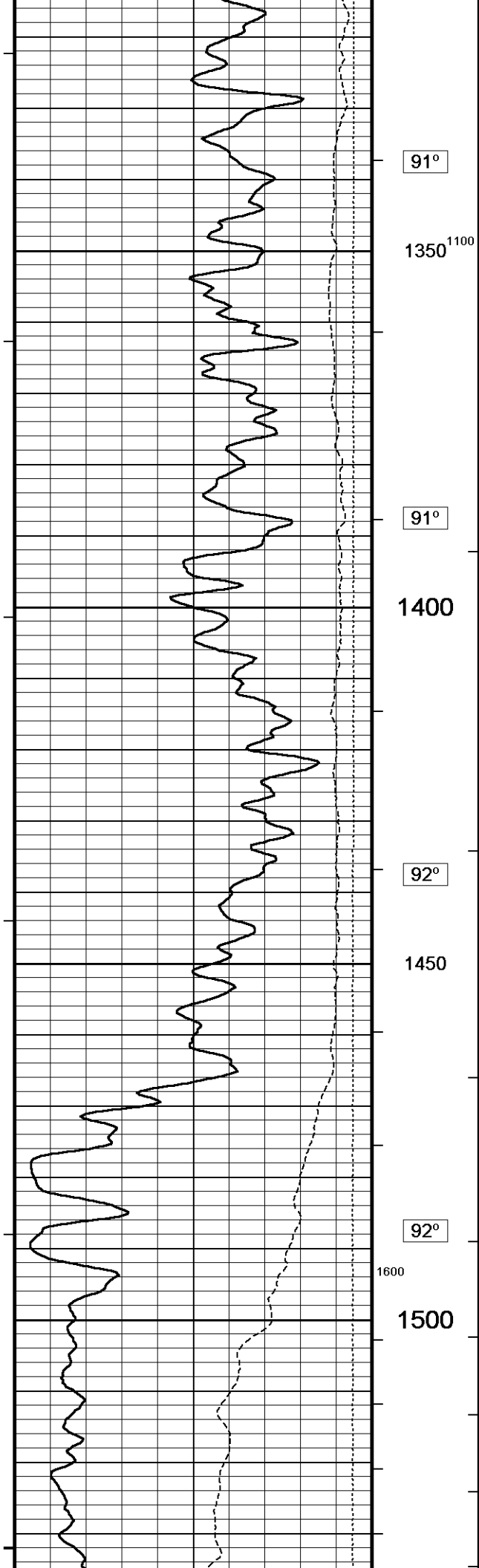


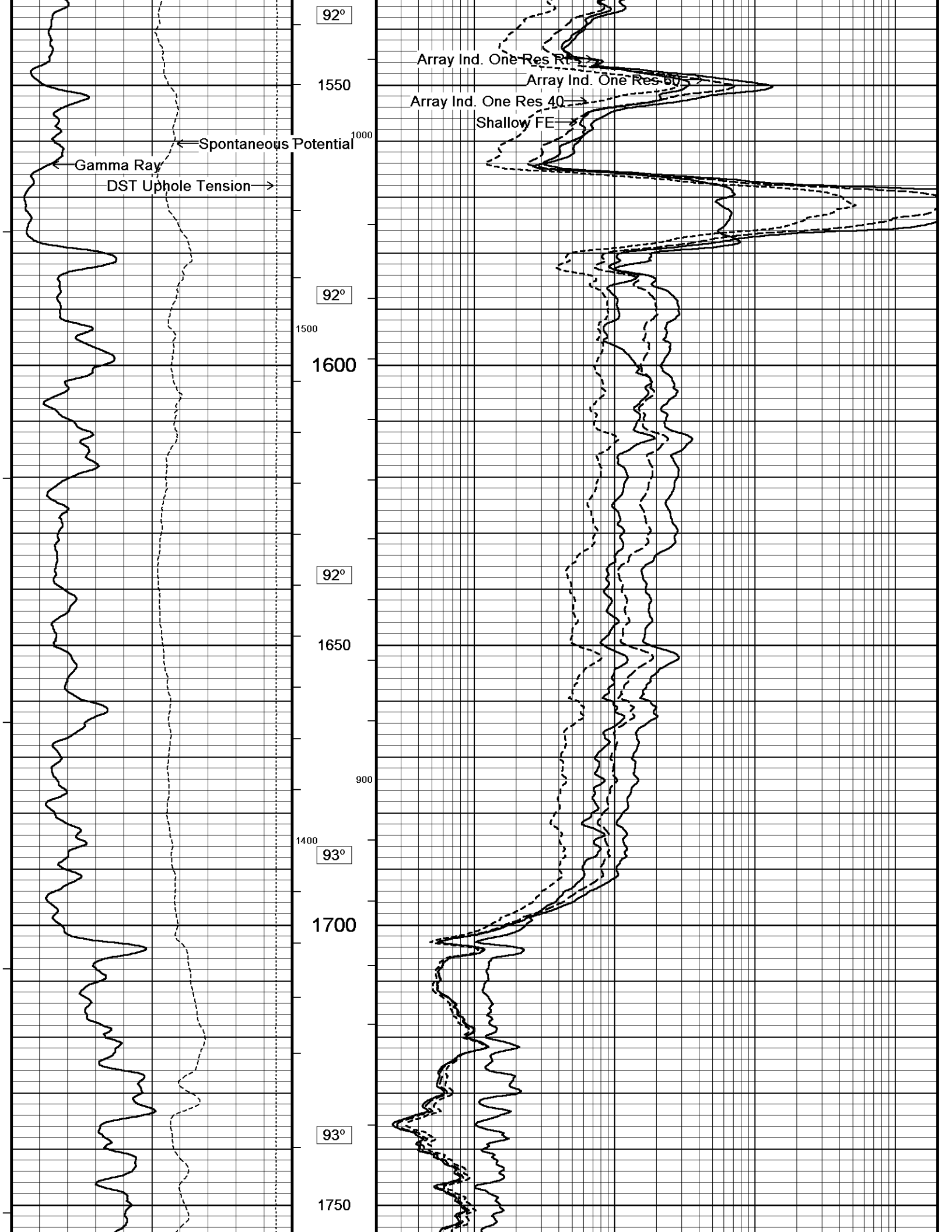


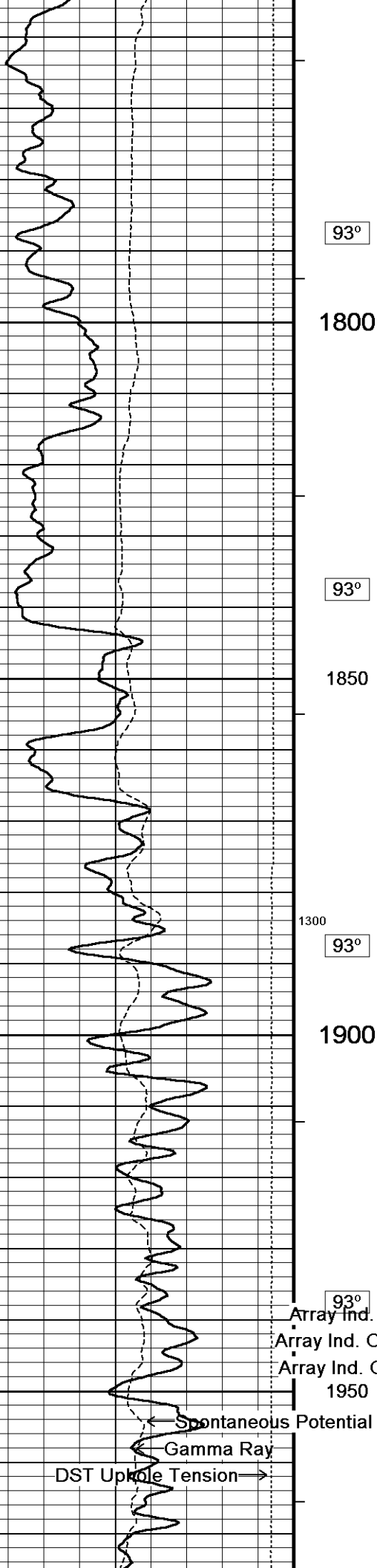












93°

1800

93°

1850

1300

93°

1900

93°

Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

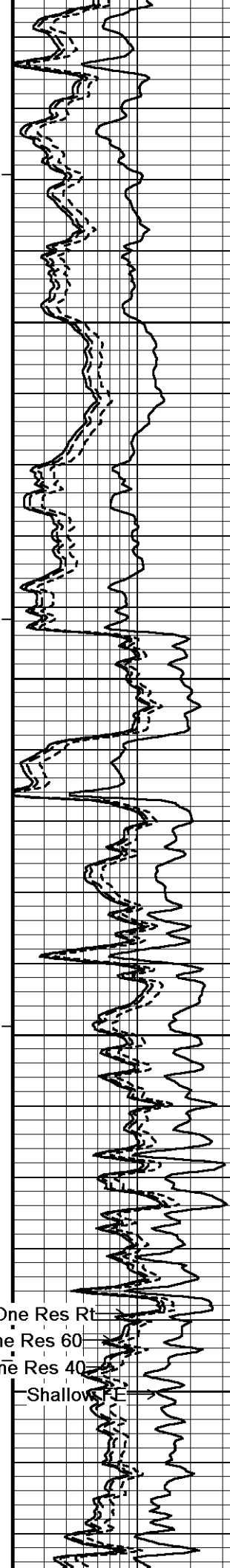
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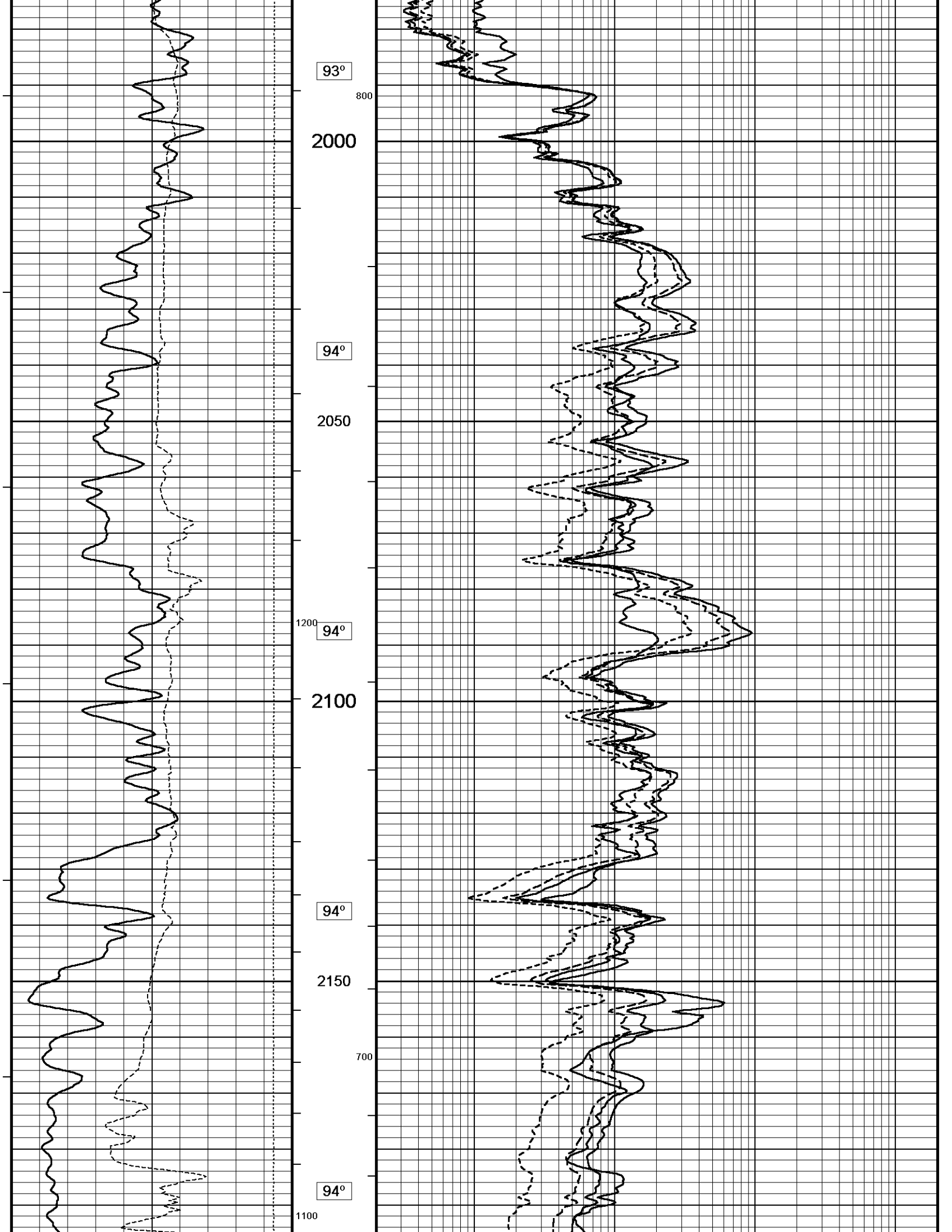
Shallow FE

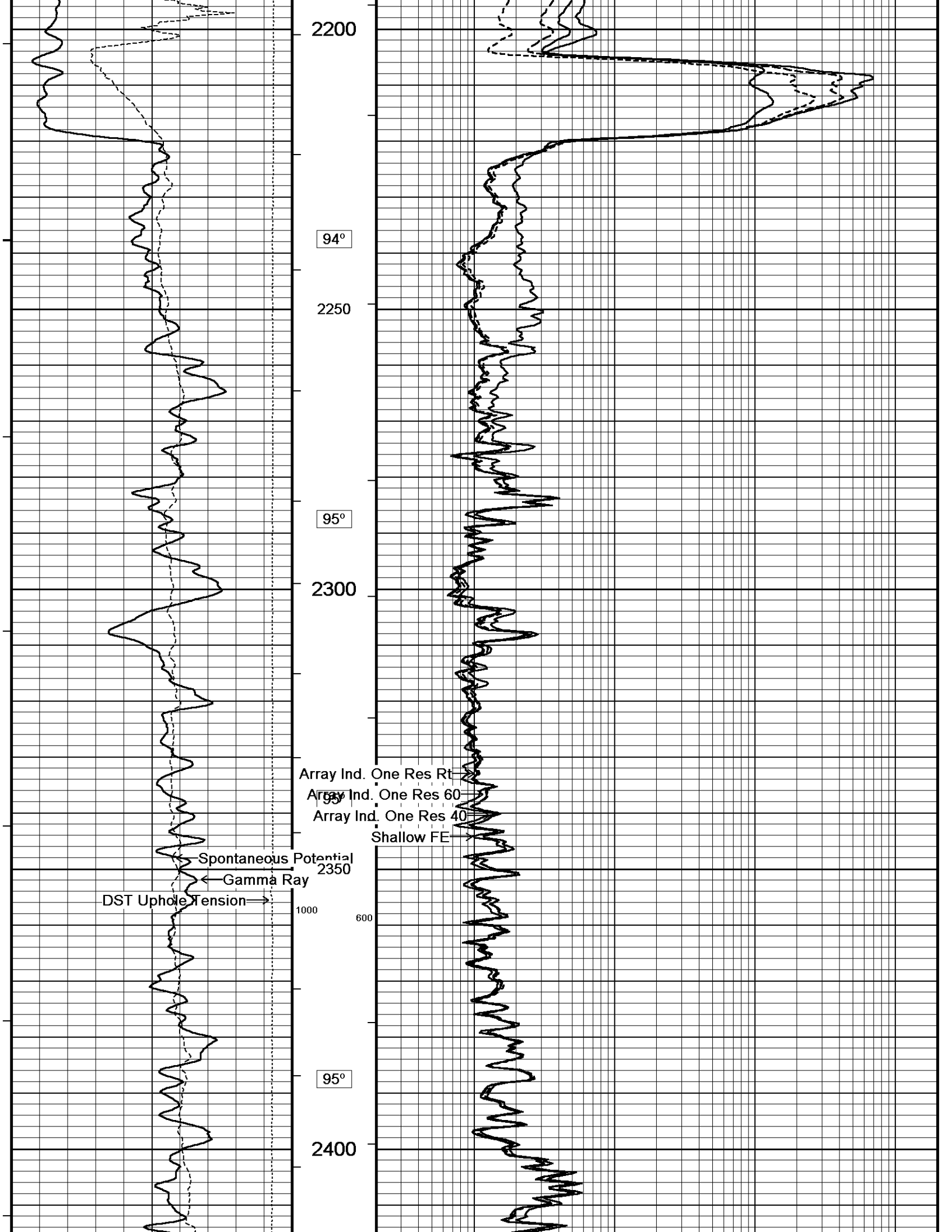
DST Uphole Tension →

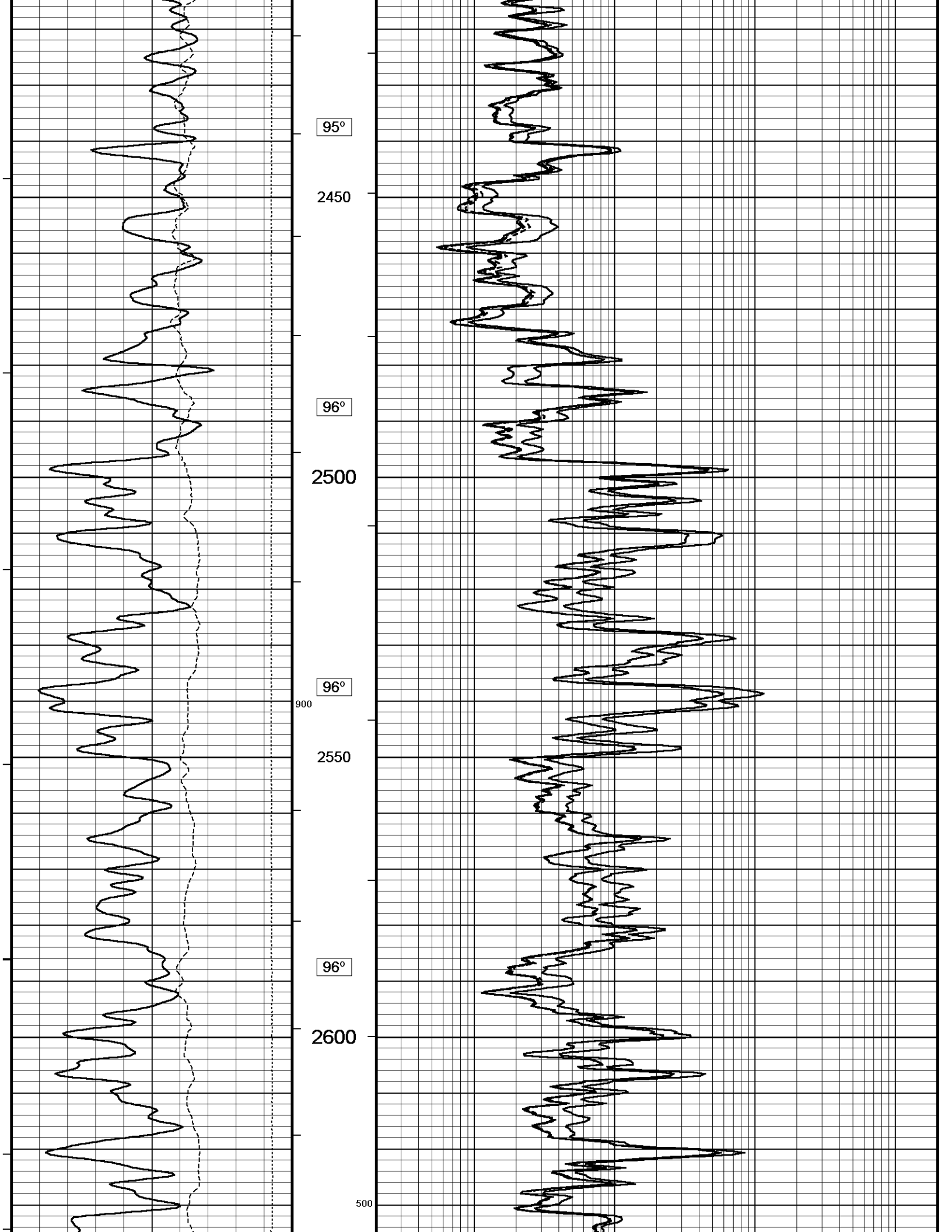
← Gamma Ray

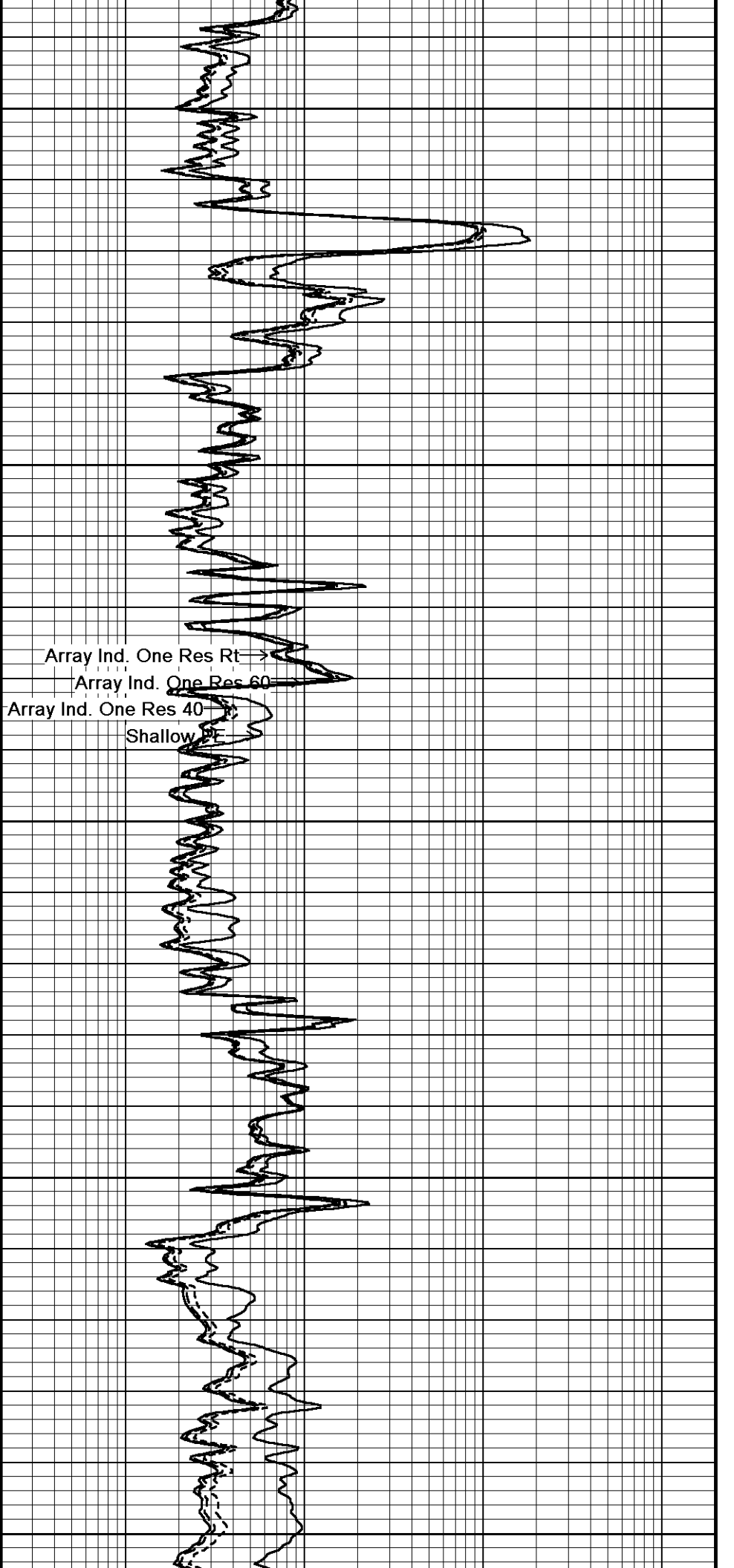
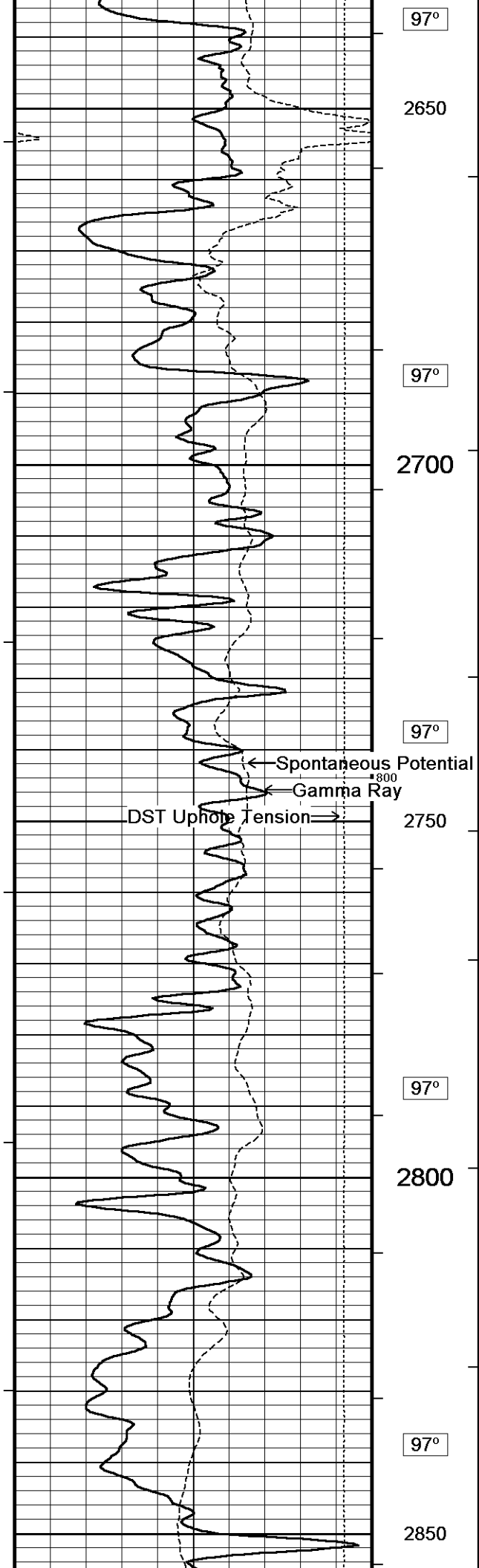
← Spontaneous Potential

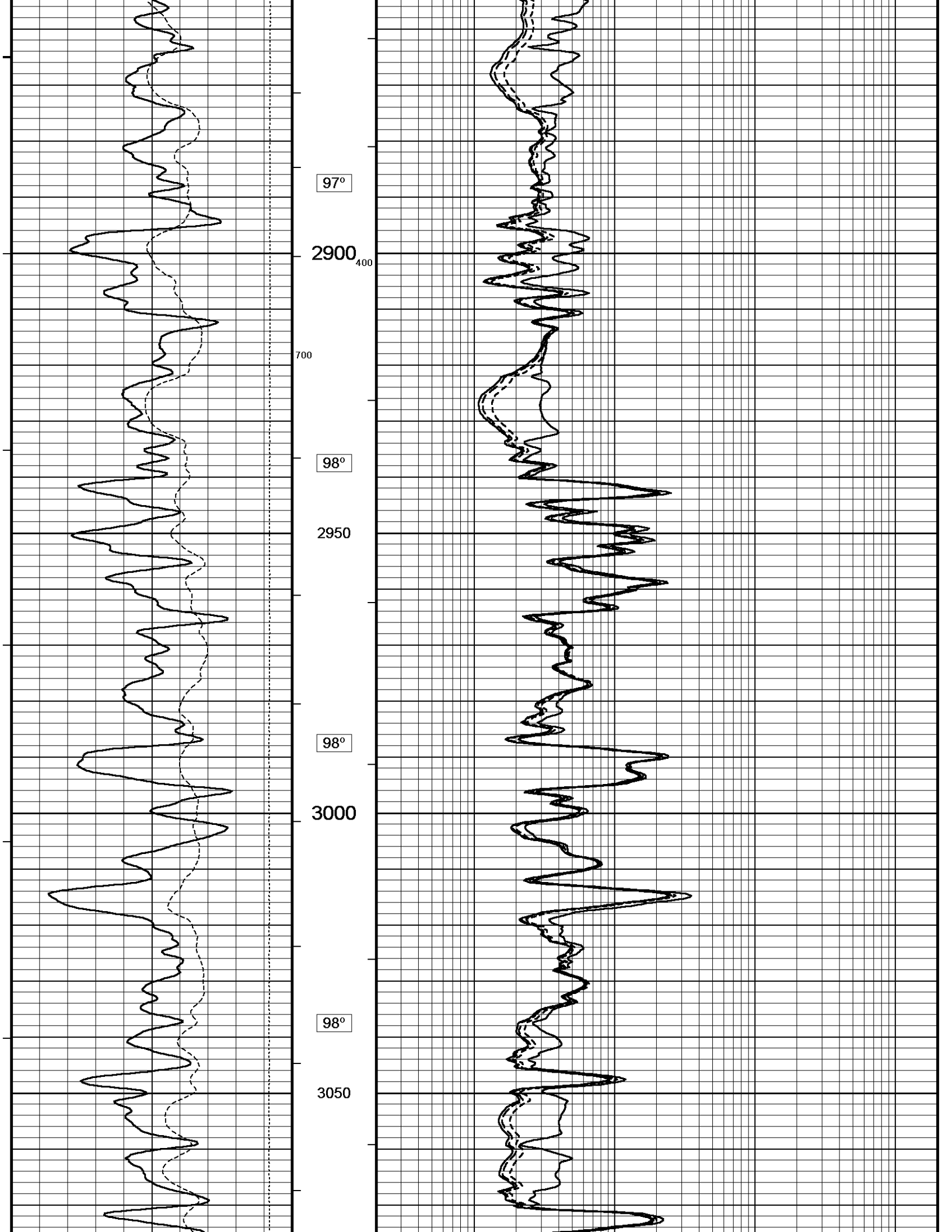


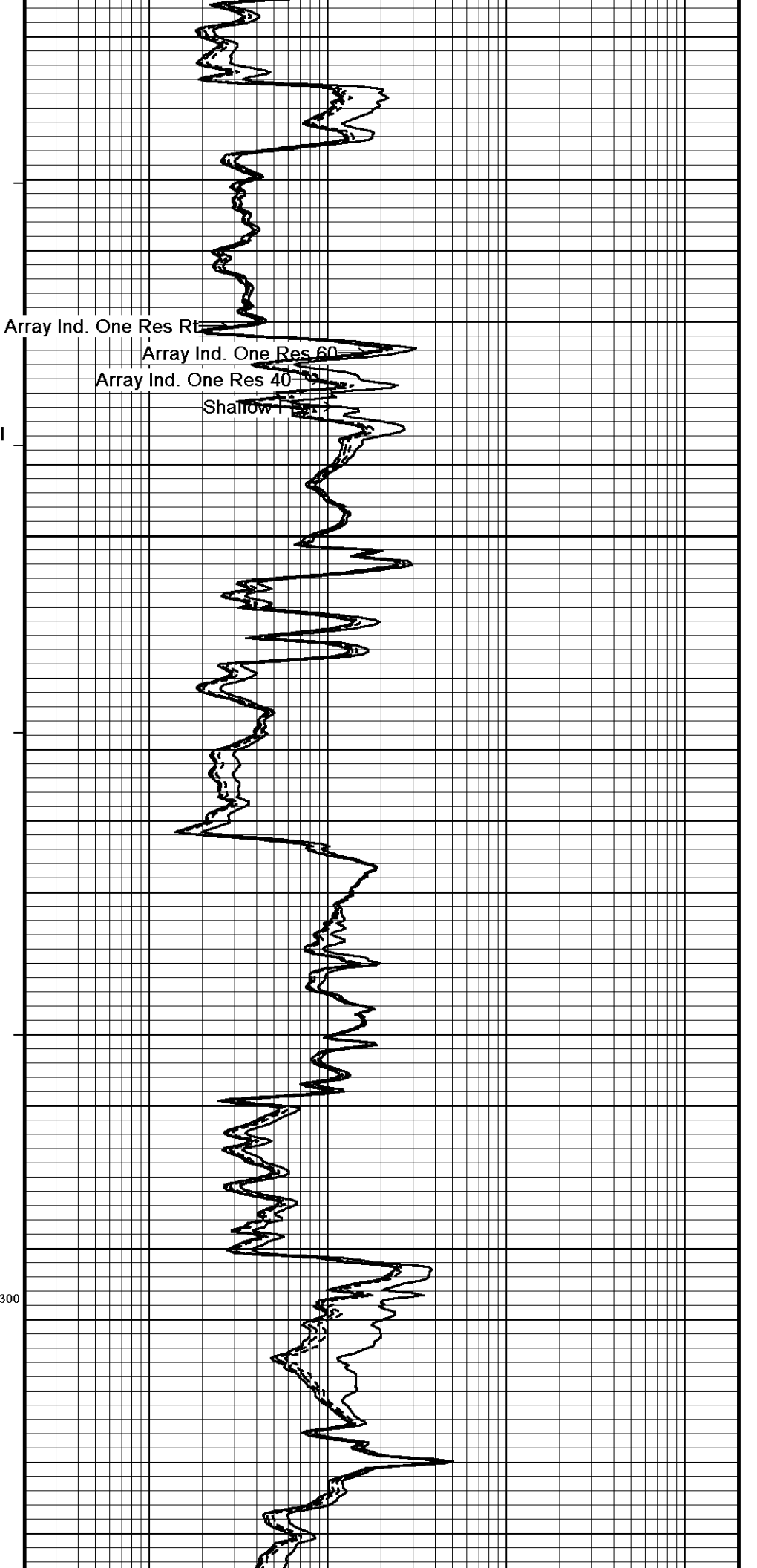
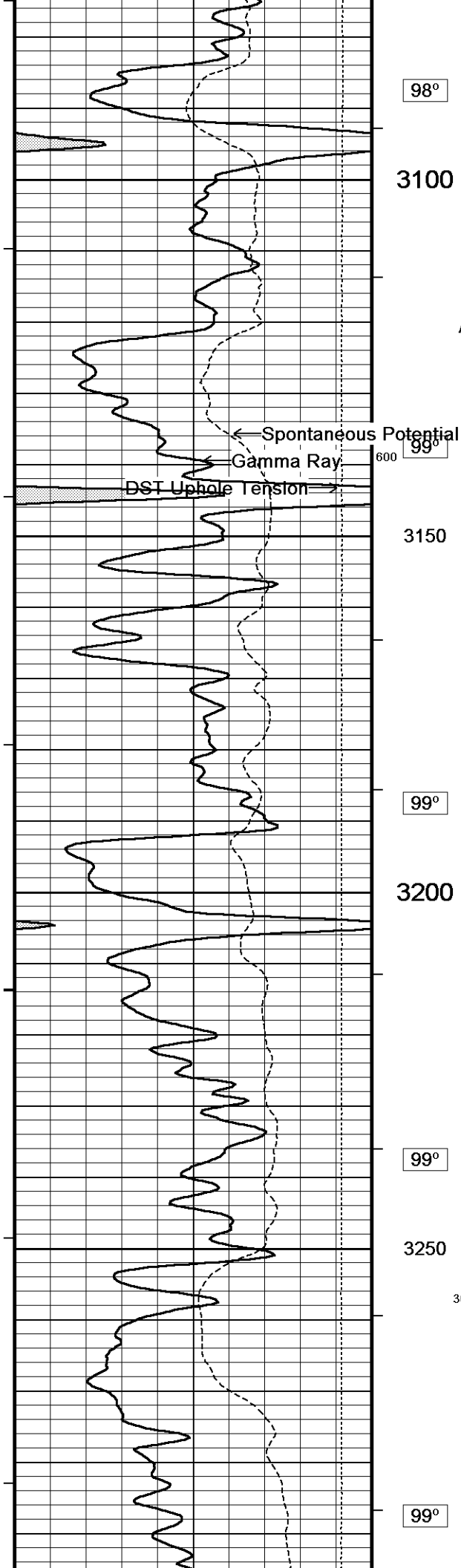


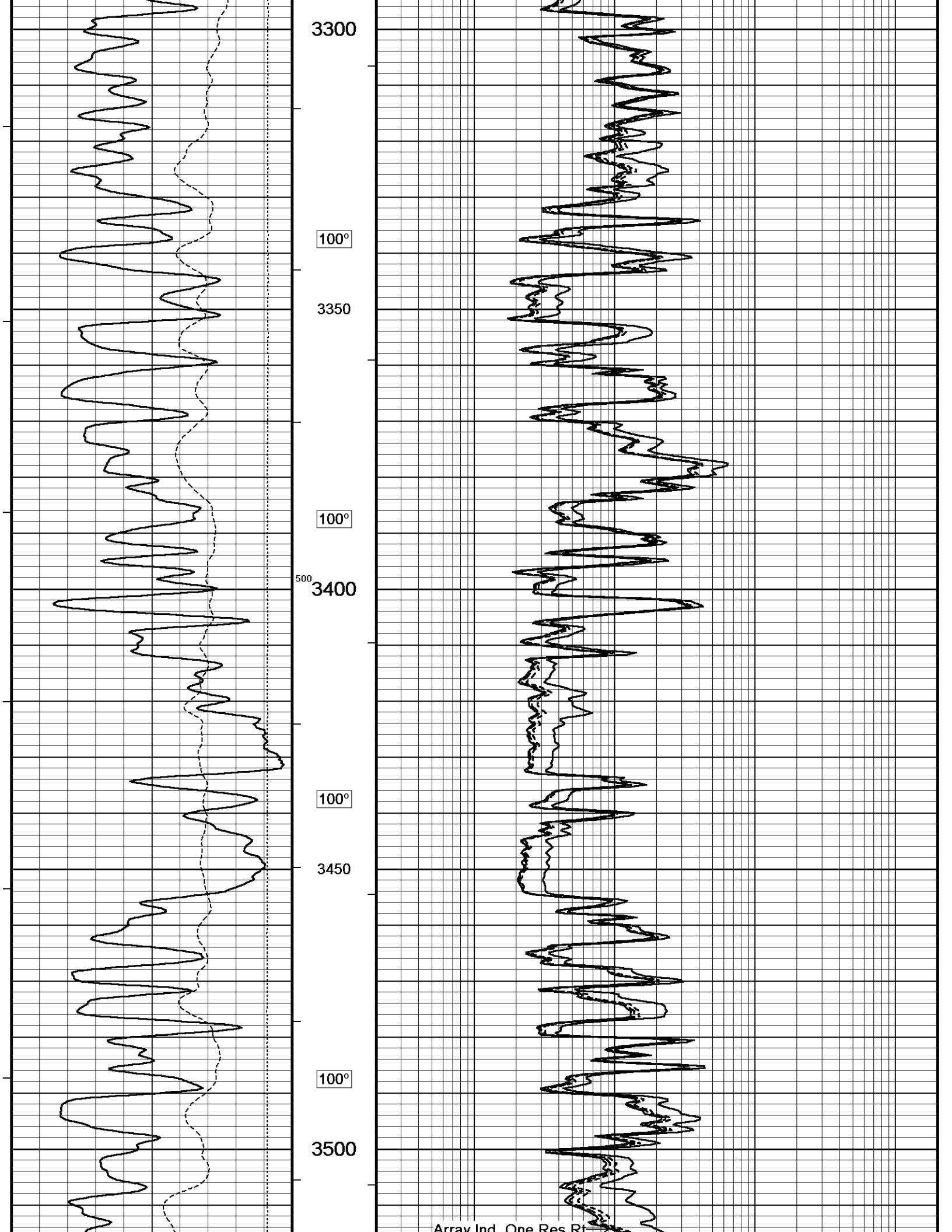


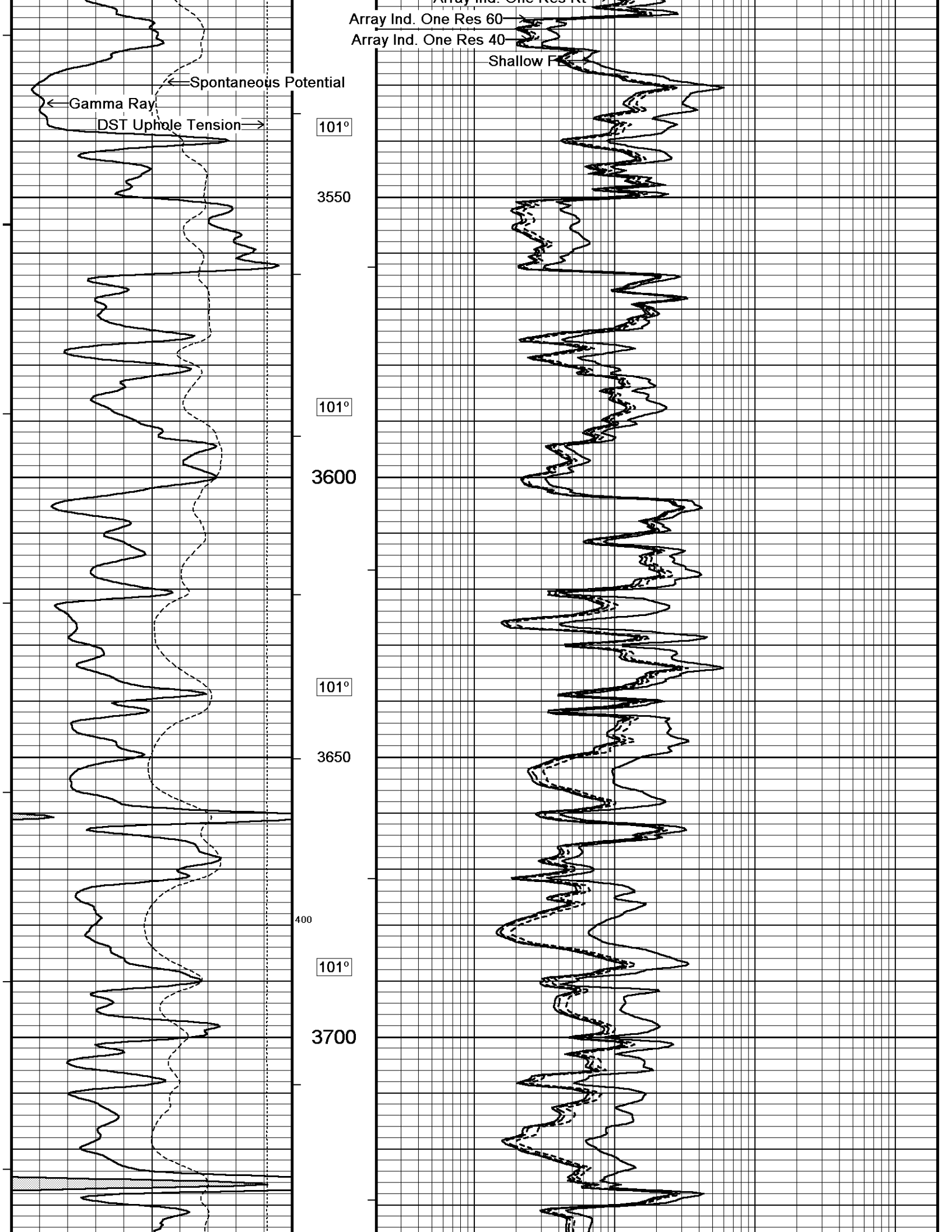


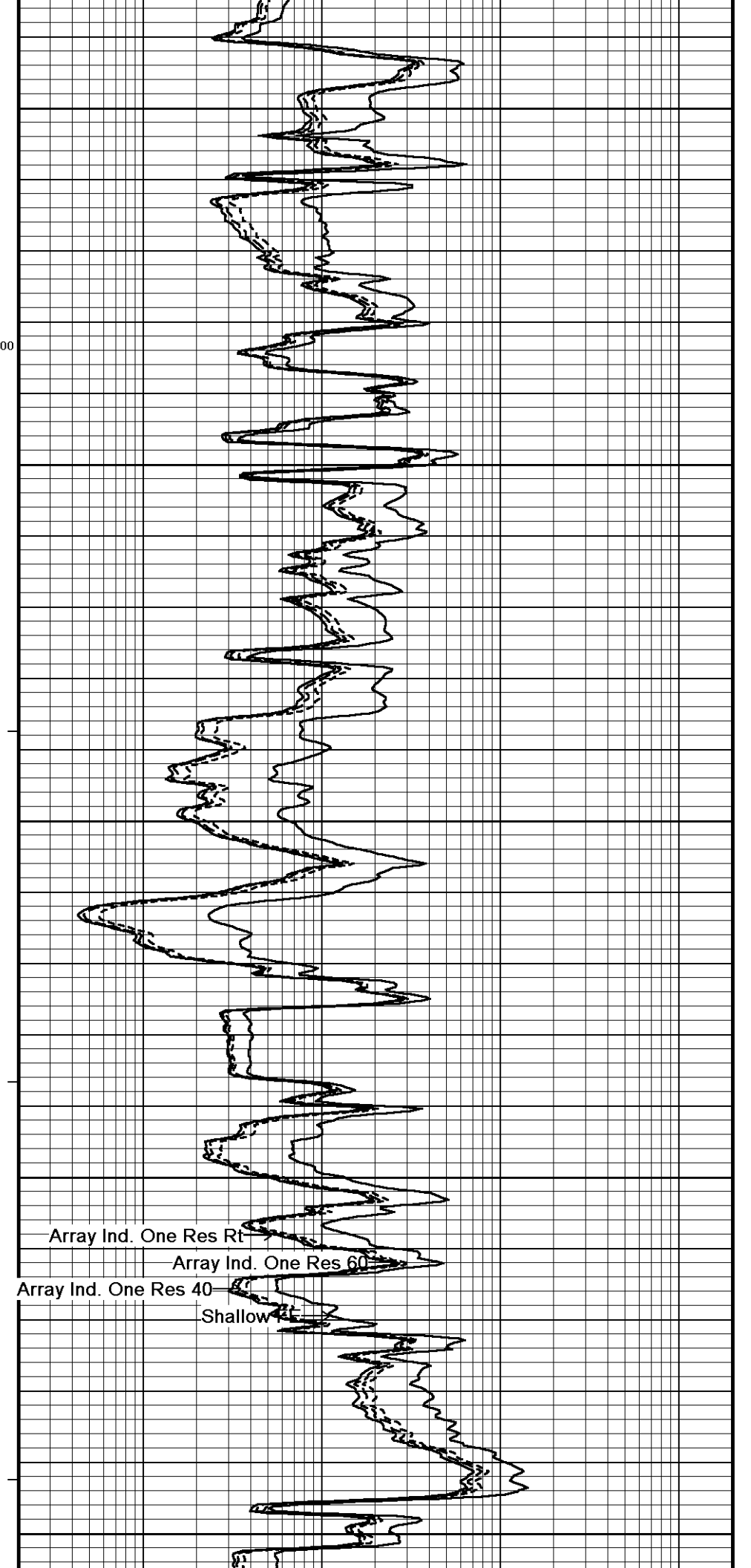
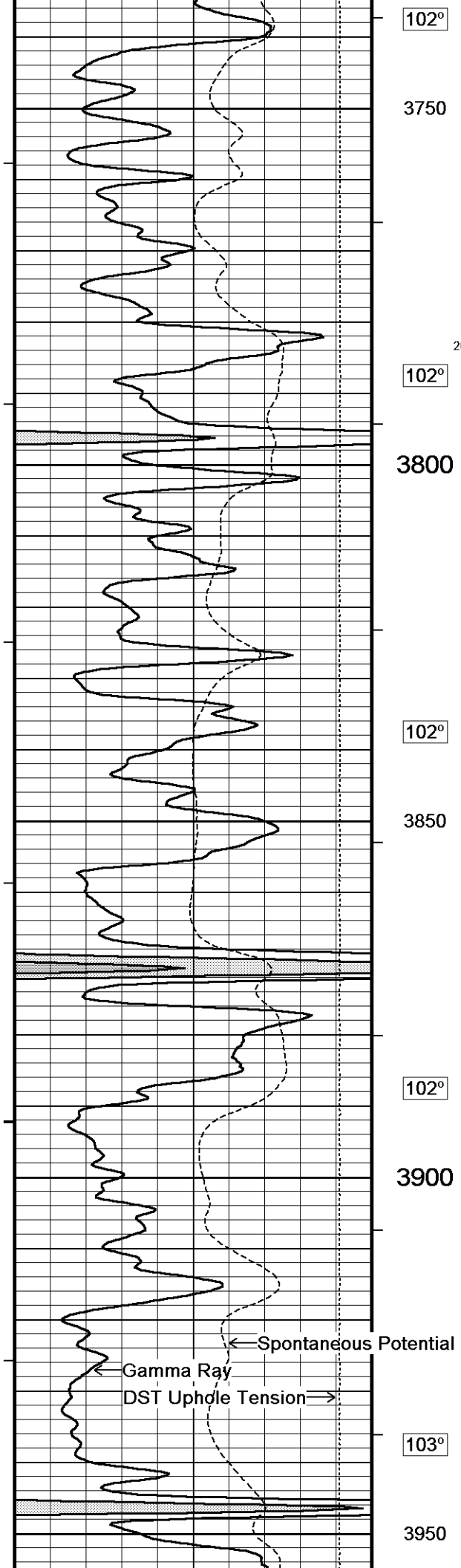












102°

3750

102°

3800

102°

3850

102°

3900

103°

3950

200

Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

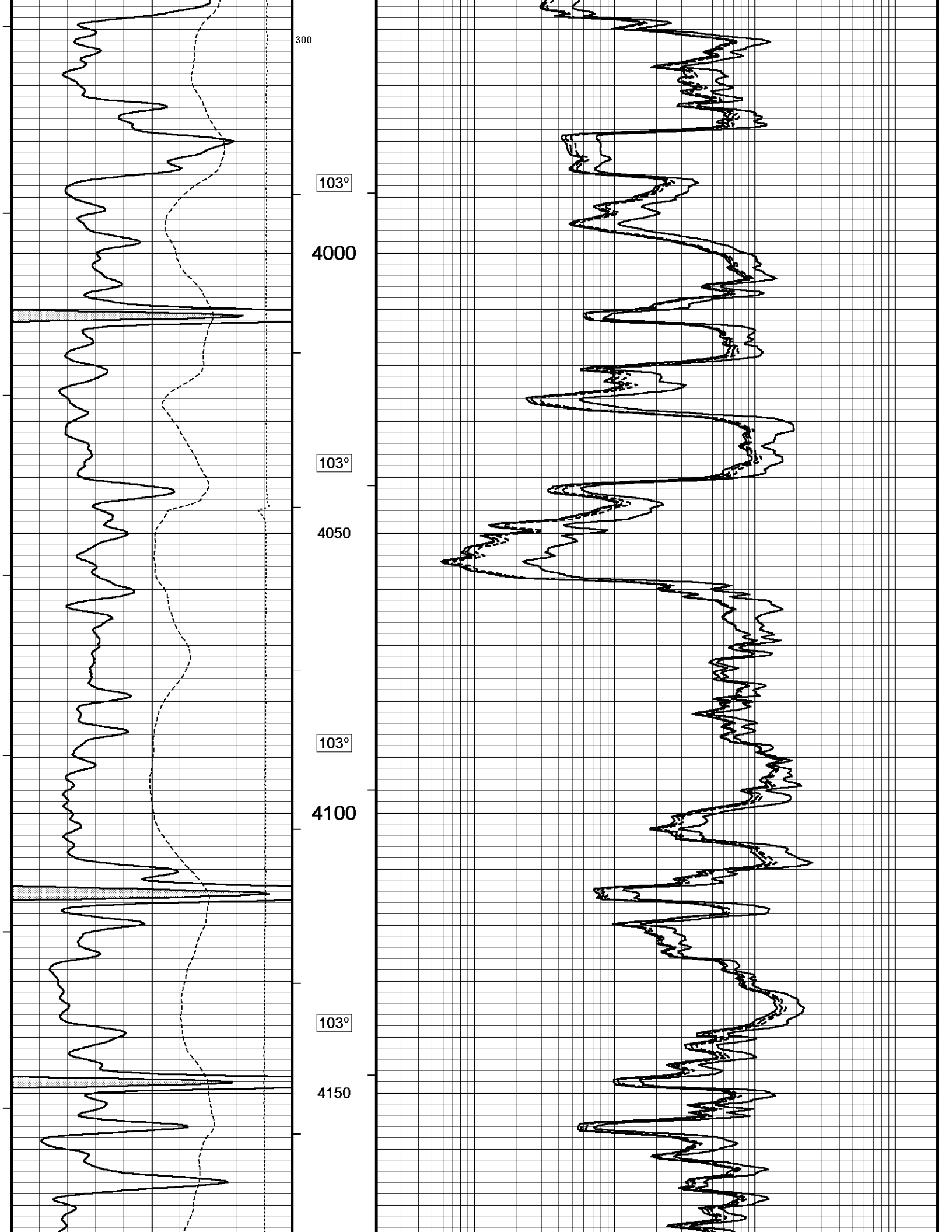
Shallow RT

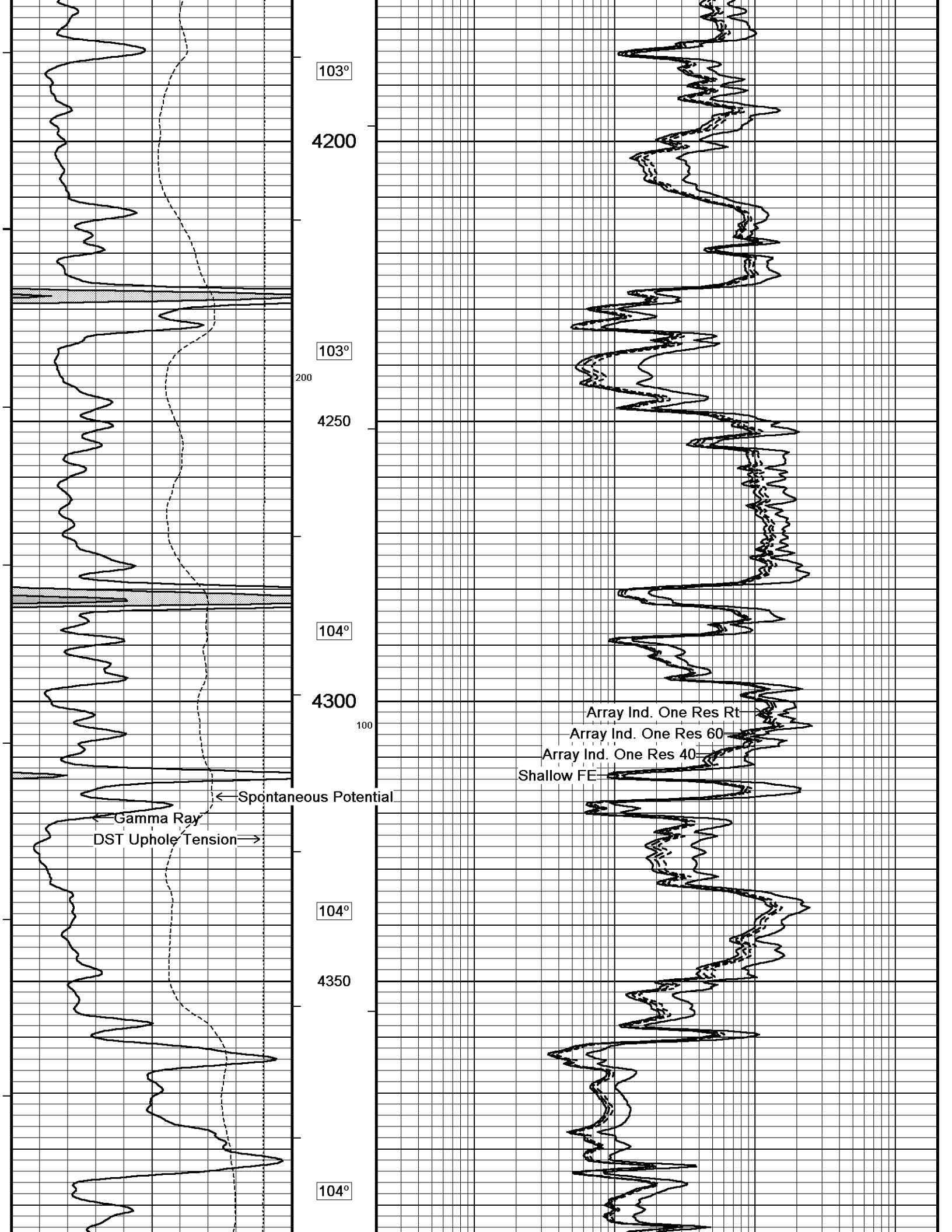
← Spontaneous Potential

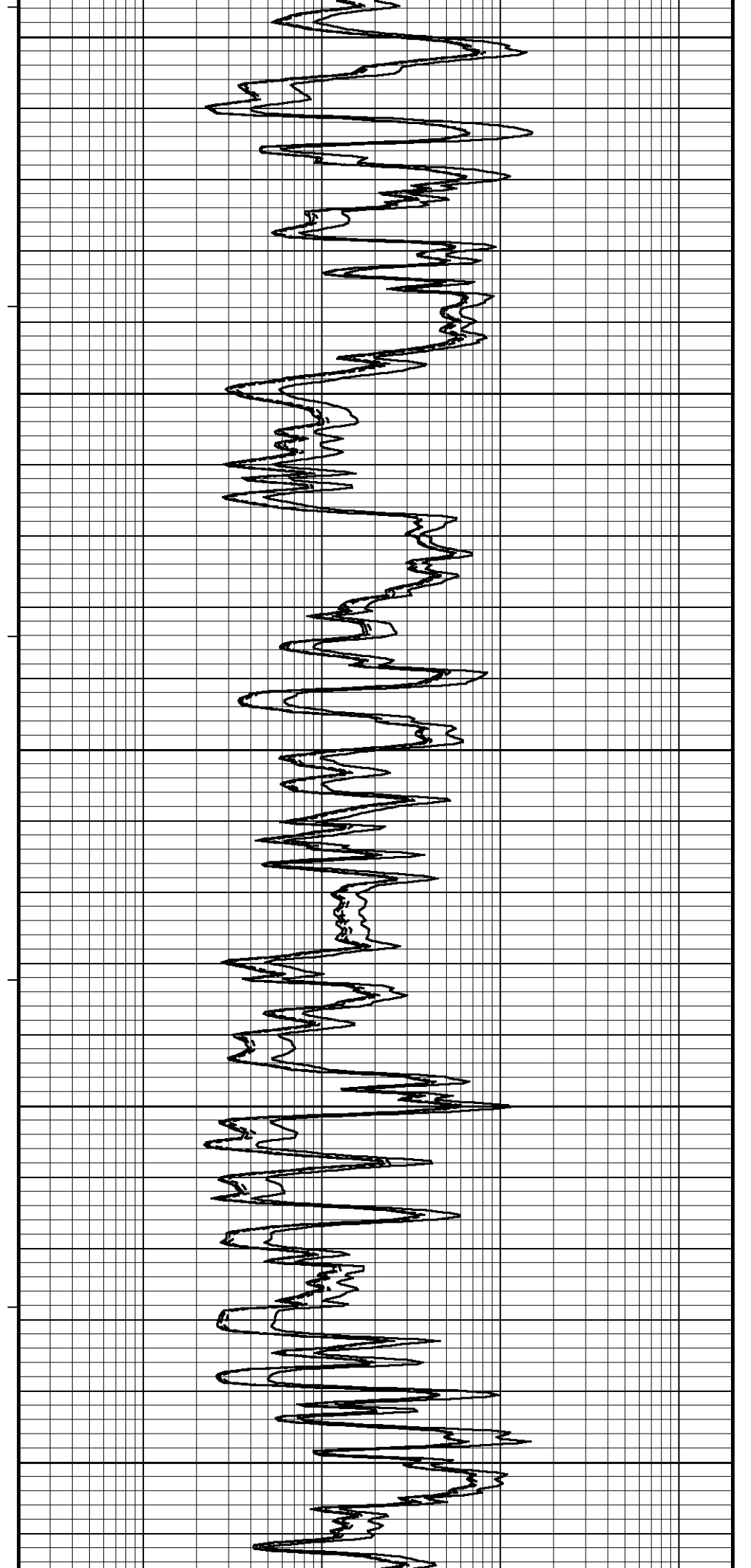
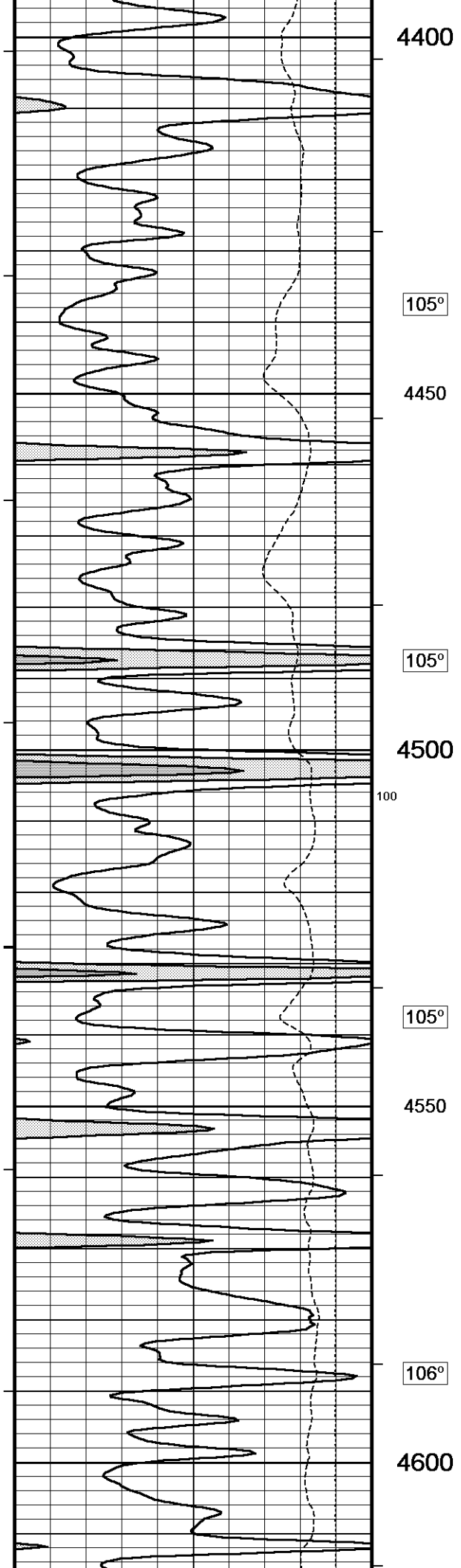
← Gamma Ray

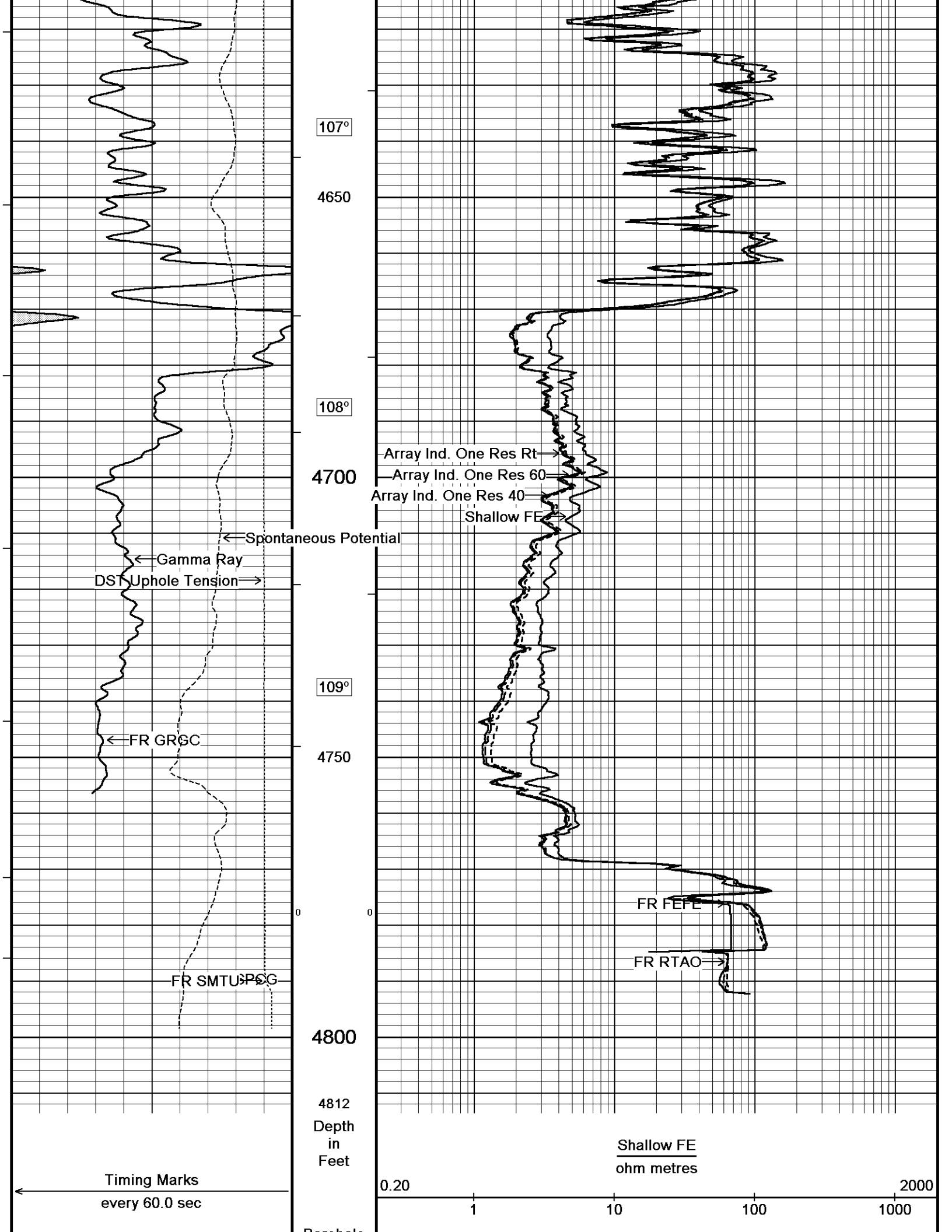
DST Uphole Tension →

31

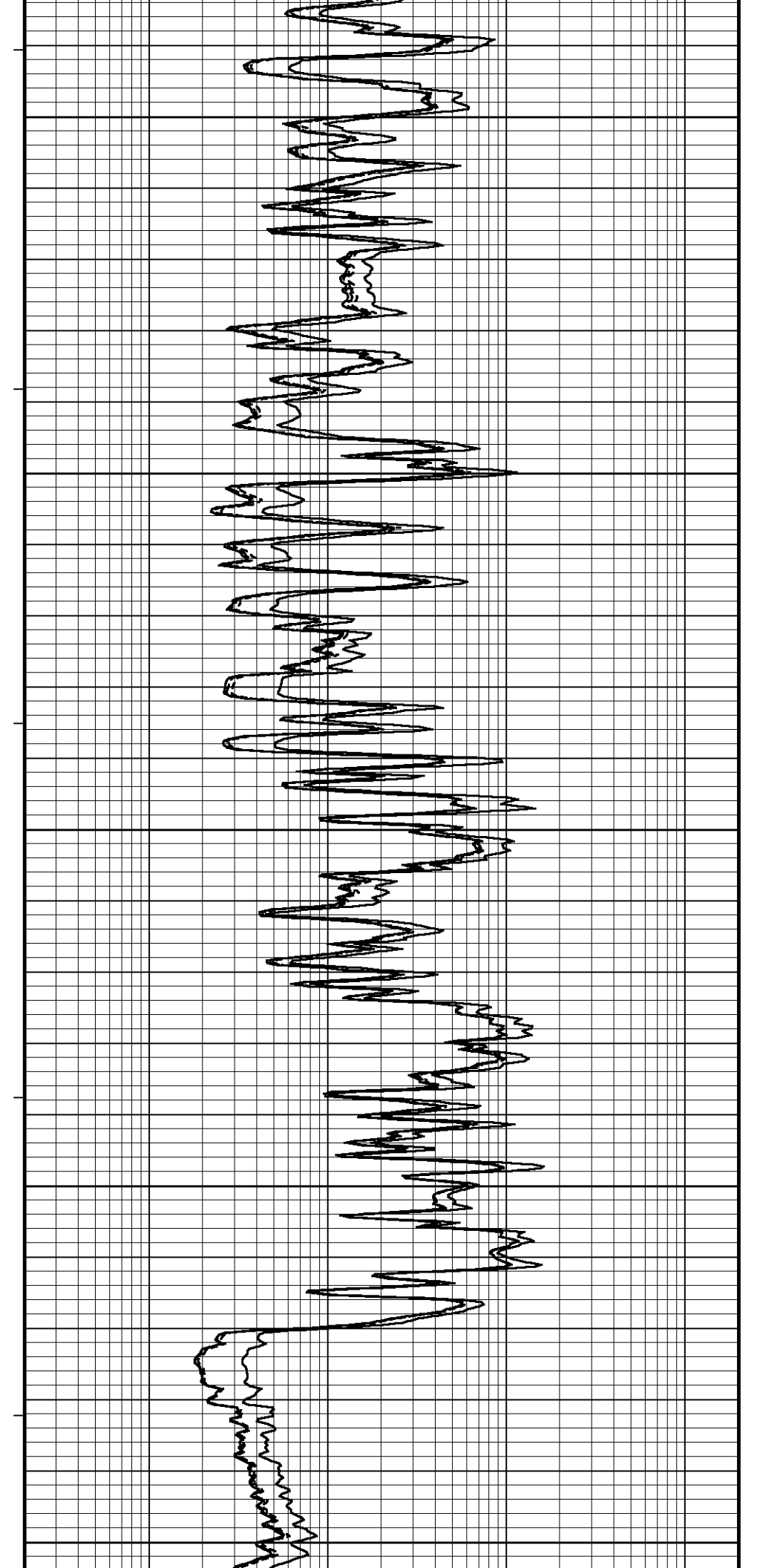
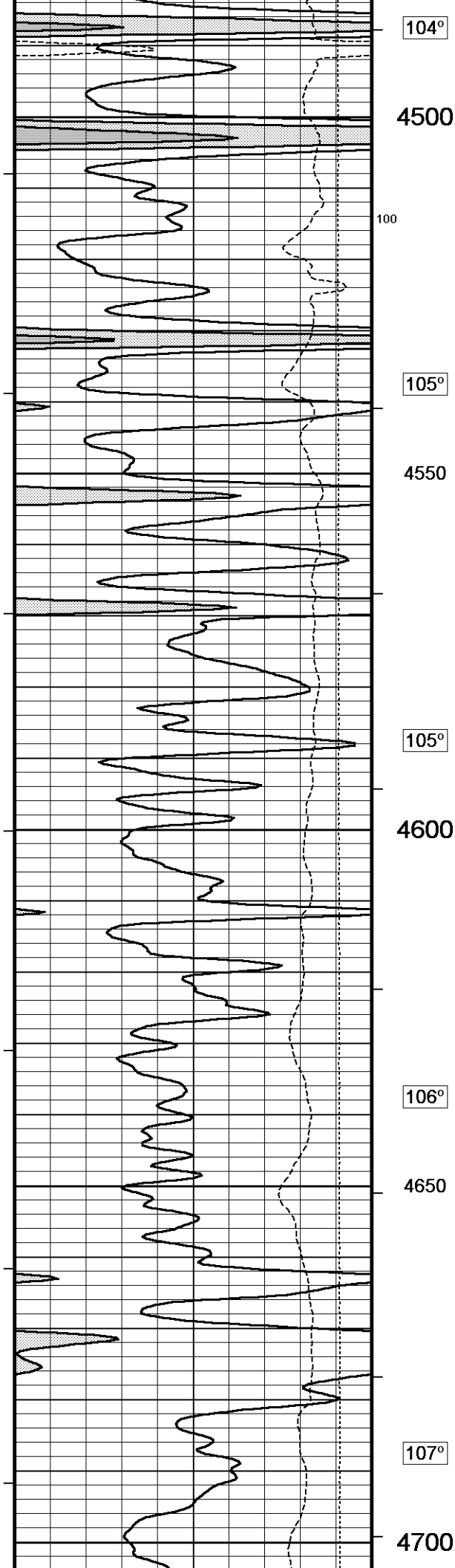


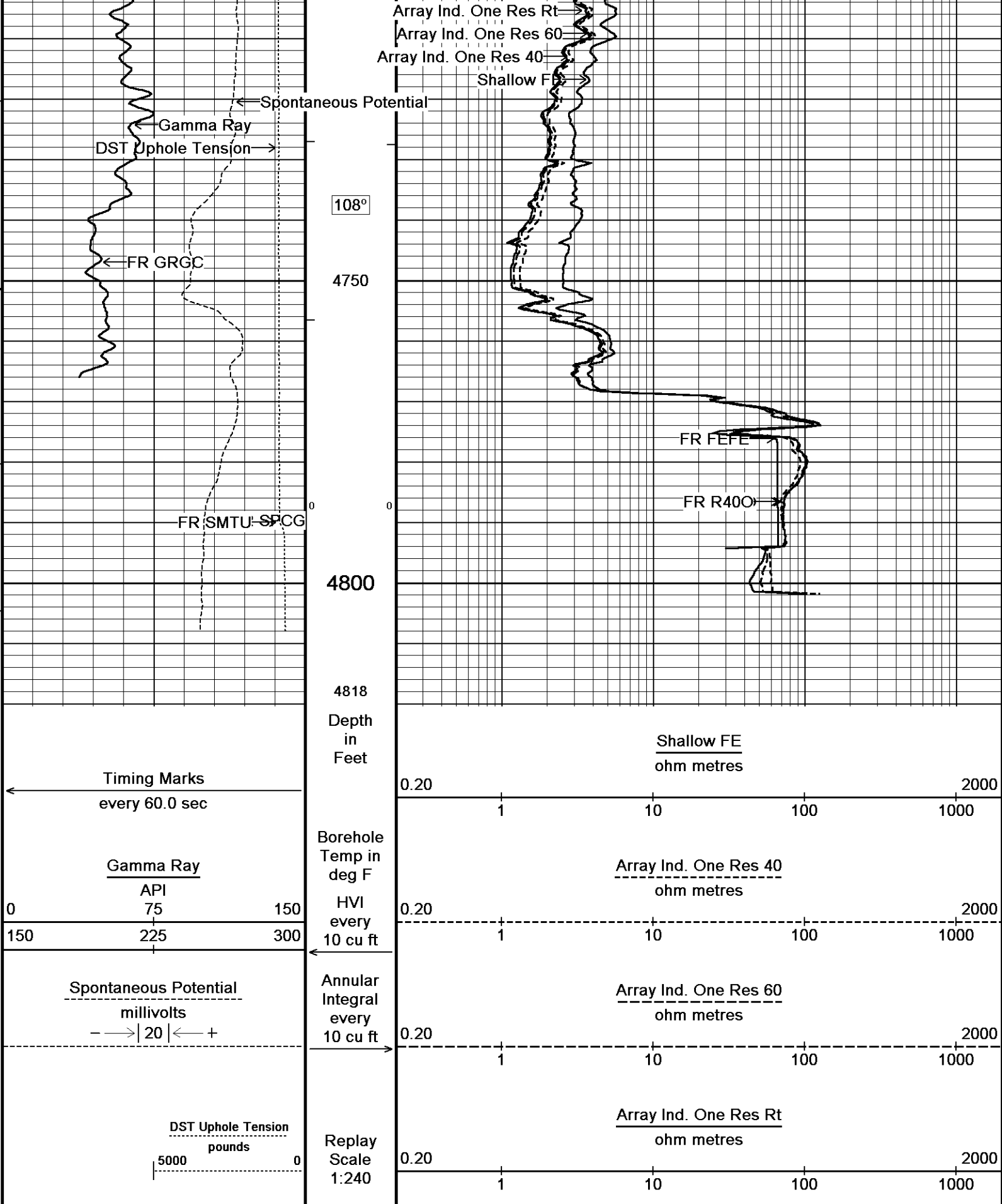












Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 15-MAR-2013 13:44  
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulga...\Grand Mesa Vulgamore #2-31 Repeat.dta  
 Recorded on 15-MAR-2013 09:59  
 System Versions: Processed with 13.04.8492 Plotted with 13.04.8492

**BEFORE SURVEY CALIBRATION**

C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31\Grand Mesa Vulgamore #2-31 Main.dta

**General Constants All 000**

Last Edited on 15-MAR-2013,13:23

**General Parameters**

Mud Resistivity	1.070	ohm-metres
Mud Resistivity Temperature	66.000	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. Six Res Rt
RWA Constant A	1.000
RWA Constant M	2.000

**Down-hole Tension Calibration SMS 0**

Field Calibration on 09-FEB-2013 07:52

Reading No	Measured	Calibrated (lbs)
1	15612.38	0.00
2	16153.00	384.00

**Gamma Calibration MCG-C 84**

Field Calibration on 14-MAR-2013 10:31

	Measured	Calibrated (API)
Background	76	52
Calibrator (Gross)	1151	777
Calibrator (Net)	1075	725

**Gamma Constants MCG-C 84**

Last Edited on 14-MAR-2013,19:57

Gamma Calibrator Number	GRC38	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

**SP Calibration MCG-C 84**

Field Calibration on 20-FEB-2013,08:14

	Measured	Calibrated (mV)
Reference 1	101.0	100.0
Reference 2	-99.0	-100.0

**High Resolution Temperature Calibration MCG-C 84**

Field Calibration on 20-FEB-2013,08:14

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

**High Resolution Temperature Constants MCG-C 84**

Last Edited on 20-FEB-2013,08:14

Pre-filter Length 11

**Micro Normal and Micro Inverse Calibration MML-A 16**

Base Calibration on 03-MAR-2013 21:50  
Field Check on 14-MAR-2013 10:26

**Base Calibration**

Channel	Measured		Calibrated (ohm-m)	
	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.2	60.2	5.0	25.0
Micro Inverse	15.6	78.3	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	62.9	62.9
Micro Inverse	48.2	48.2

Pad Type 8-12 in Soft Rubber Inflatable 006-9011-159  
 Micro Normal K Factor 1.0000  
 Micro Inverse K Factor 1.0000  
 Standoff Offset N/A inches

Caliper Calibration MML-A 16

Base Calibration on 03-MAR-2013 21:58  
 Field Calibration on 14-MAR-2013 10:24

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14207	5.98
2	17398	7.97
3	20559	9.86
4	24346	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.95	5.98

Neutron Calibration MDN-B.J 387

Base Calibration on 19-FEB-2013 14:31  
 Field Check on 14-MAR-2013 10:36

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
Ratio	2848	86	3714	110
	33.156		33.764	

Field Calibrator at Base

	Calibrated (cps)
Ratio	1727 2589
	0.667

Field Check

	Calibrated (cps)
Ratio	1748 2586
	0.681

Neutron Constants MDN-B.J 387

Last Edited on 14-MAR-2013,10:31

Neutron Source Id P58125B  
 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 None  
 Temperature N/A degrees F  
 Mud Salinity 0.00 kppm  
 Salinity Correction Not Applied  
 Formation Fluid Salinity Source Constant Value  
 Formation Fluid Salinity 0.00 kppm  
 Barite Mud Correction Not Applied

FE Calibration MFE-A.A 55

Base Calibration on 19-FEB-2013 15:08  
 Field Check on 14-MAR-2013 10:14

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	962.2	126.8
Base Check		278.4
Field Check		278.6

FE Constants MFE-A.A 55

Last Edited on 14-MAR-2013,10:13

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

High Resolution Temperature Calibration MAI-A.A 178

Field Calibration on 13-DEC-2012,11:50

	Measured	Calibrated(Deg F)
Lower	1.00	33.80
Upper	11.00	51.80

High Resolution Temperature Constants MAI-A.A 178

Last Edited on 13-DEC-2012,11:50

Pre-filter Length 11

Induction Calibration MAI-A.A 178

Base Calibration on 15-MAY-2012,14:15  
Field Check on 14-MAR-2013 10:12

Base Calibration

Test Loop Calibration		Measured		Calibrated (mmho/m)	
Channel		Low	High	Low	High
1		17.6	484.7	9.3	966.2
2		6.2	391.4	7.6	821.4
3		4.0	264.5	5.2	566.0
4		2.3	135.1	2.6	279.2
Array Temperature		77.0		Deg F	

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			12.1	3763.9
2			29.6	3468.2
3			27.3	3014.9
4			18.8	2065.4
Deep			15.9	1995.7
Medium			40.3	3956.4
Shallow			45.4	5083.9
Array Temperature			68.7	Deg F

Induction Constants MAI-A.A 178

Last Edited on 14-MAR-2013,10:10

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	2.500	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

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	

Photo Density Calibration MPD-B 59

Base Calibration on 19-FEB-2013 11:59  
Field Check on 14-MAR-2013 10:22

Density Calibration					
Base Calibration		Measured		Calibrated (sdu)	
	Near	Far	Near	Far	
Reference 1	56259	27502	59556	30836	
Reference 2	22873	2493	24941	2541	
Field Check at Base					
	1193.1	1265.6			
Field Check					
	1198.6	1267.3			

PE Calibration					
Base Calibration		Measured		Calibrated	
	WS	WH	Ratio	Ratio	
Background	217	1070			
Reference 1	21109	56074	0.380	0.371	
Reference 2	6069	22738	0.270	0.272	
Field Check at Base					
	216.6	1070.1			
Field Check					
	217.3	1076.2			

Density Constants MPD-B 59

Last Edited on 14-MAR-2013,19:57

Density Source Id	P50557B	
Nylon Calibrator Number	DNCE695	
Aluminium Calibrator Number	DACD698	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.12	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
Matrix density (gm/cc)	Depth (m)	
2.71	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	
0.00	0.00	

Caliper Calibration MPD-B 59

Base Calibration on 19-FEB-2013 11:40  
Field Calibration on 14-MAR-2013 10:17

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	17738	3.99
2	26272	5.98
3	35152	7.97
4	43249	9.86
5	52268	11.92

## Field Calibration

Measured Caliper (in)  
5.97

Actual Caliper (in)  
5.98

## DOWNHOLE EQUIPMENT

C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31\Grand Mesa Vulgamore #2-31 Main.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-C 84 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

## Compact Micro-log

MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

## Compact Neutron

MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

## Compact Density/Caliper

MPD-B 59 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

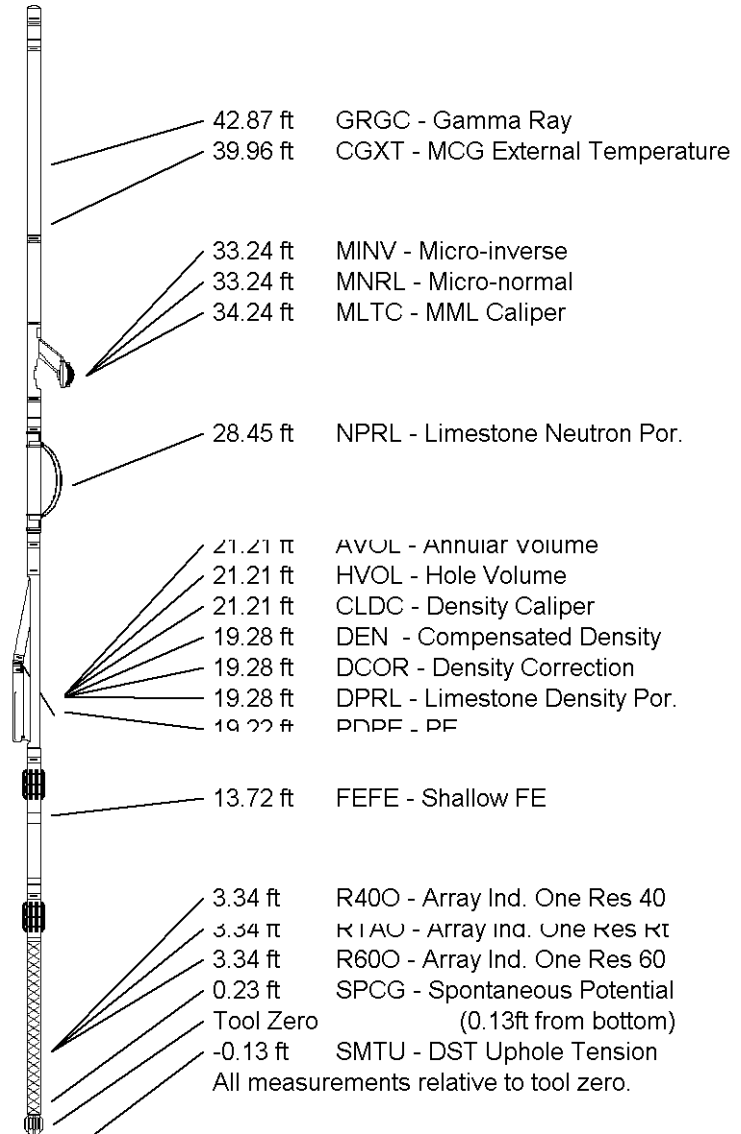
## Compact Focussed Electric

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

## Compact Induction

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

Total Length: 49.73 ft Weight: 399.0 lb



COMPANY

GRAND MESA OPERATING CO.

WELL

VULGAMORE #2-31

FIELD

WILDCAT

PROVINCE/COUNTY

SCOTT

COUNTRY/STATE

U.S.A. / KANSAS

Elevation Kelly Bushing	2996.00	feet
Elevation Drill Floor	2994.00	feet
Elevation Ground Level	2991.00	feet

First Reading	4787.00	feet
Depth Driller	4790.00	feet
Depth Logger	4790.00	feet



ARRAY INDUCTION  
SHALLOW FOCUSED  
ELECTRIC LOG

**Weatherford**<sup>®</sup>



**COMPACT PHOTO DENSITY  
COMPENSATED NEUTRON  
MICRORESISTIVITY LOG**

COMPANY: GRAND MESA OPERATING CO.  
FIELD: VUL GAMORE #2-31  
WILDCAT  
PROVINCE/COUNTY: SCOTT  
U.S.A. / KANSAS  
COUNTRY/STATE: U.S.A. / KANSAS  
LOCATION: 1910 FSL & 610 FFL

SEC: 31 TYPE: 198 PGE: 33W Other Services: MEDLINE  
Well Number: 15-171-20931  
Permit Number: 15-171-20931  
Log Measured From: KB @ 5 FEET  
Drilling Measured From: K.B @ 5 FEET  
Date: 15-MAR-2013

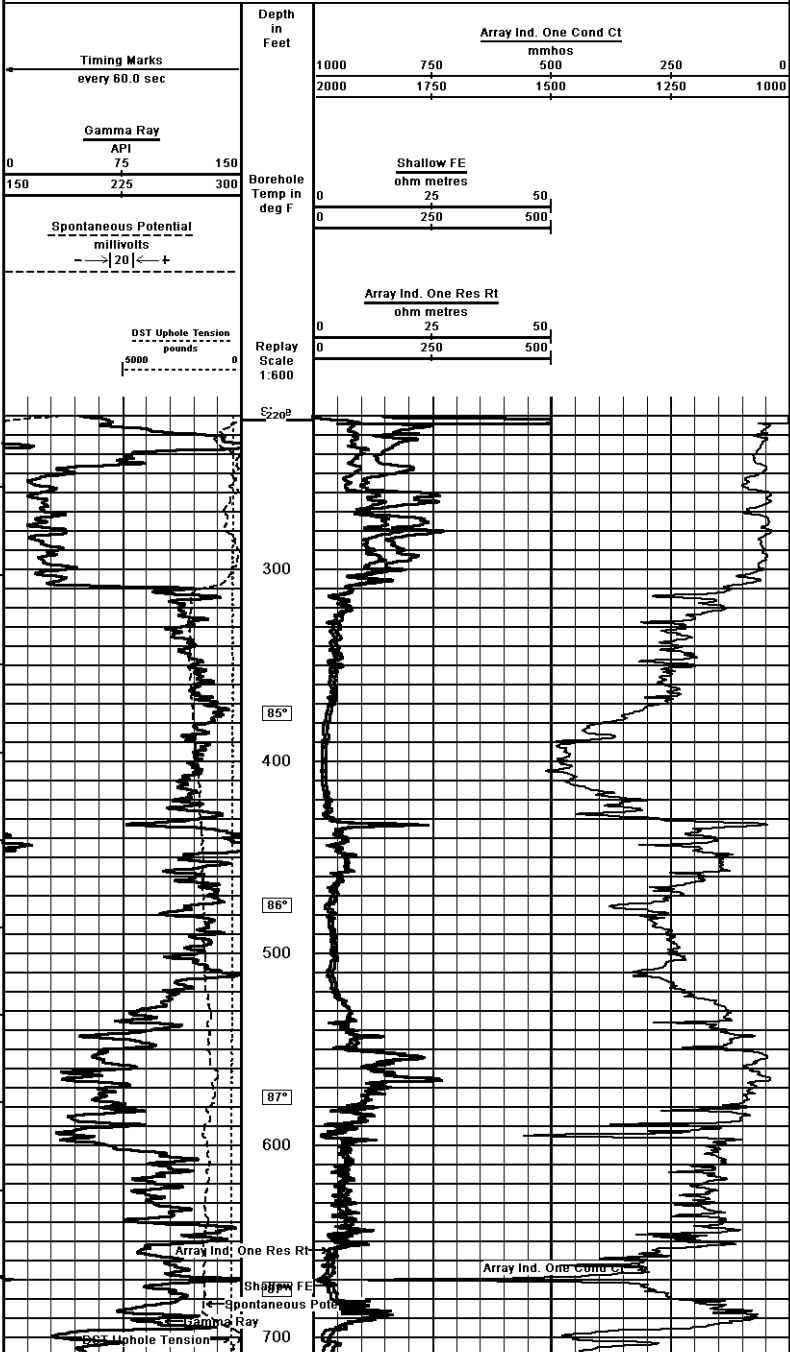
Run Number: ONE  
Service Order: 3838997  
Depth Diller: 4790.00 feet  
Depth Logger: 4790.00 feet  
First Reading: 4777.00 feet  
Last Reading: 3600.00 feet  
Casing Diller: 223.00 feet  
Casing Logger: 223.00 inches  
Bit Size: 7.675

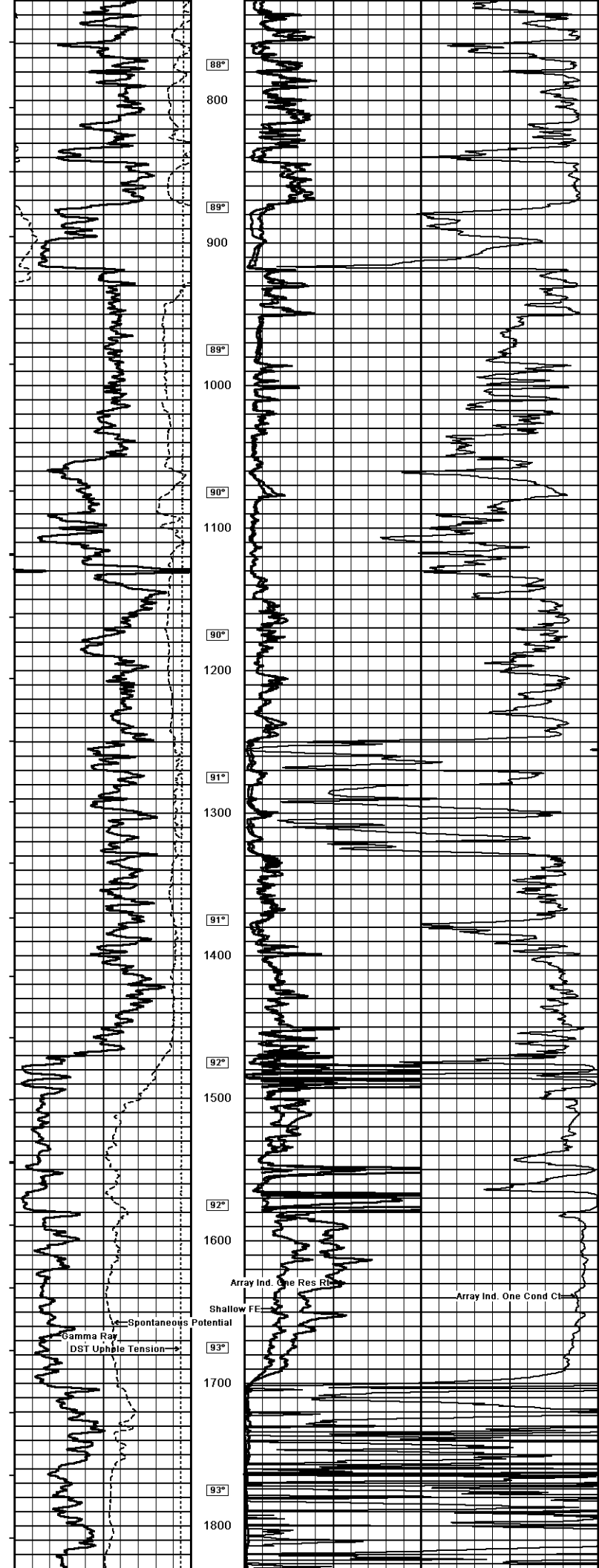
Hole Fluid Type: CHEMICAL  
Density/Viscosity: 9.35 lbm/sg 48.00 CP  
PH/Fundus: 9.50  
Sample Source: MUDPT  
Rm @ Measured Temp: 1.07 @ 86.0 ohm-m  
Rm @ Measured Temp: 0.88 @ 86.0 ohm-m  
Rm @ Measured Temp: 1.28 @ 86.0 ohm-m  
Source Rm / Rmc: CALC  
Rm @ BHT: 0.65 @ 109.0 ohm-m  
Time Since Circulation: 3 HOURS  
Max Recorded Temp: 109.00 deg F  
Equipment Base: 13025  
Recorded By: R.HOFFMAN  
Witnessed By: JOHN GOLDSMITH

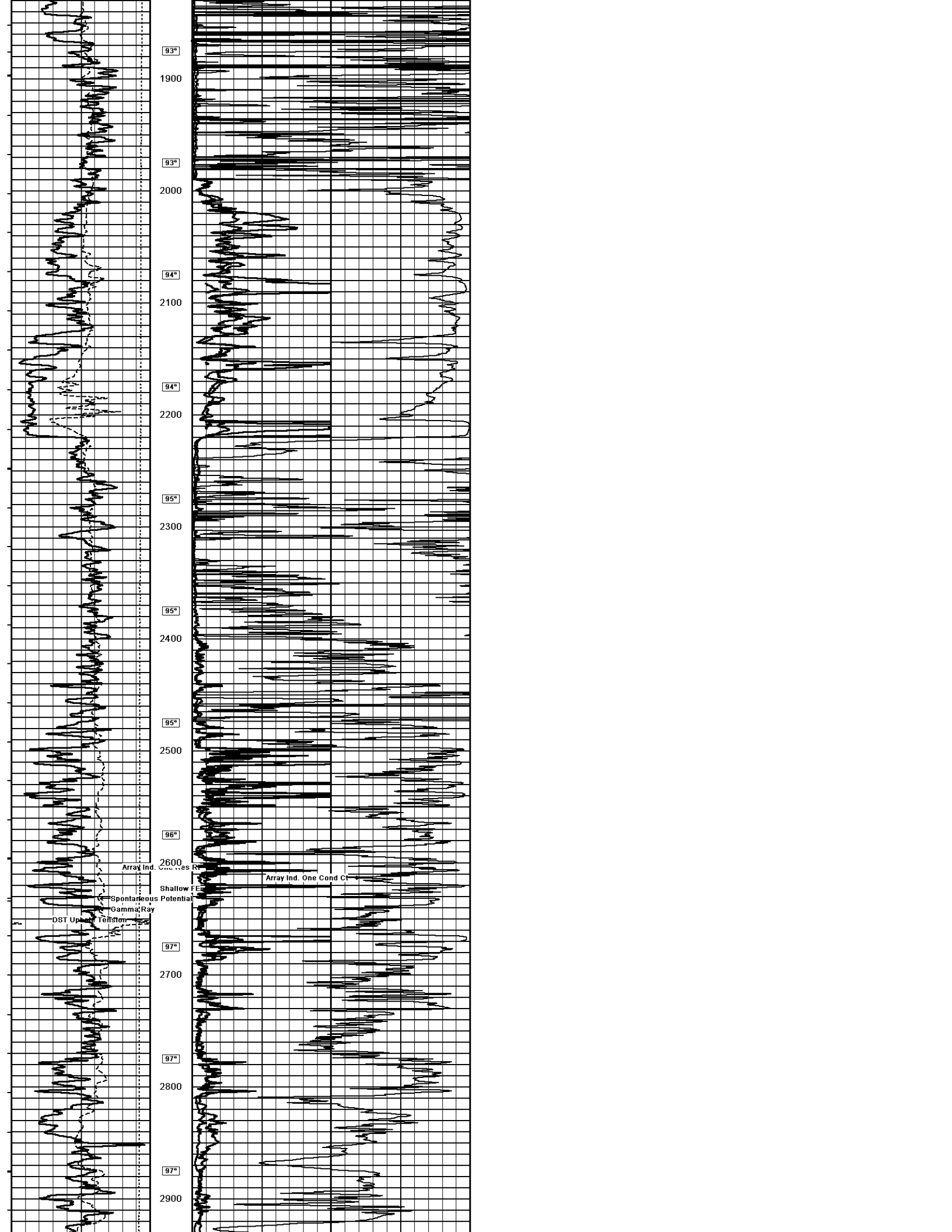
Equipment Base: 13025  
Recorded By: R.HOFFMAN  
Witnessed By: JOHN GOLDSMITH  
DOB#

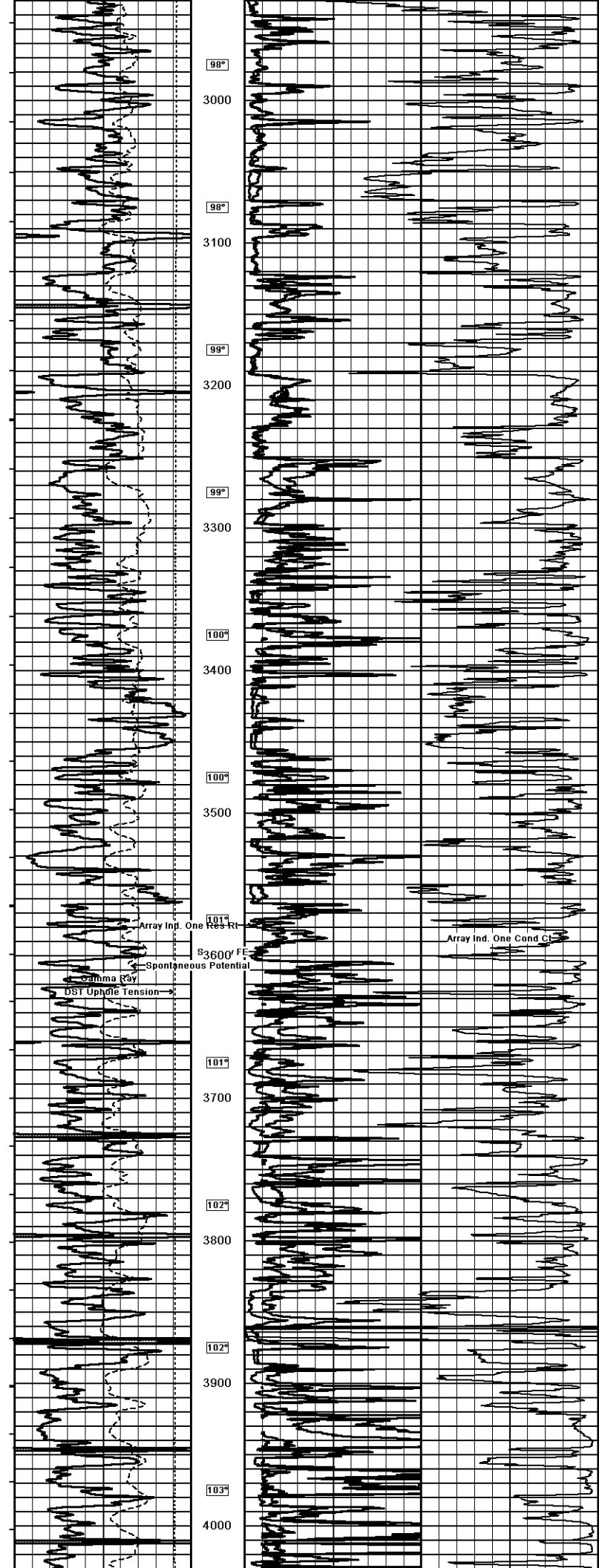
DOB#

1 INCH MAIN  
Depth Based Data - Maximum Sampling Increment 10.0cm  
Plotted on 15-MAR-2013 13:44  
Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #2-31 Main Data Recorded on 15-MAR-2013 10:38  
System Versions: Processed with 13.04.8492 Plotted with 13.04.8492









98°

3000

98°

3100

99°

3200

99°

3300

100°

3400

100°

3500

101°

3600

101°

3700

102°

3800

102°

3900

103°

4000

Array Ind. One Res Rt

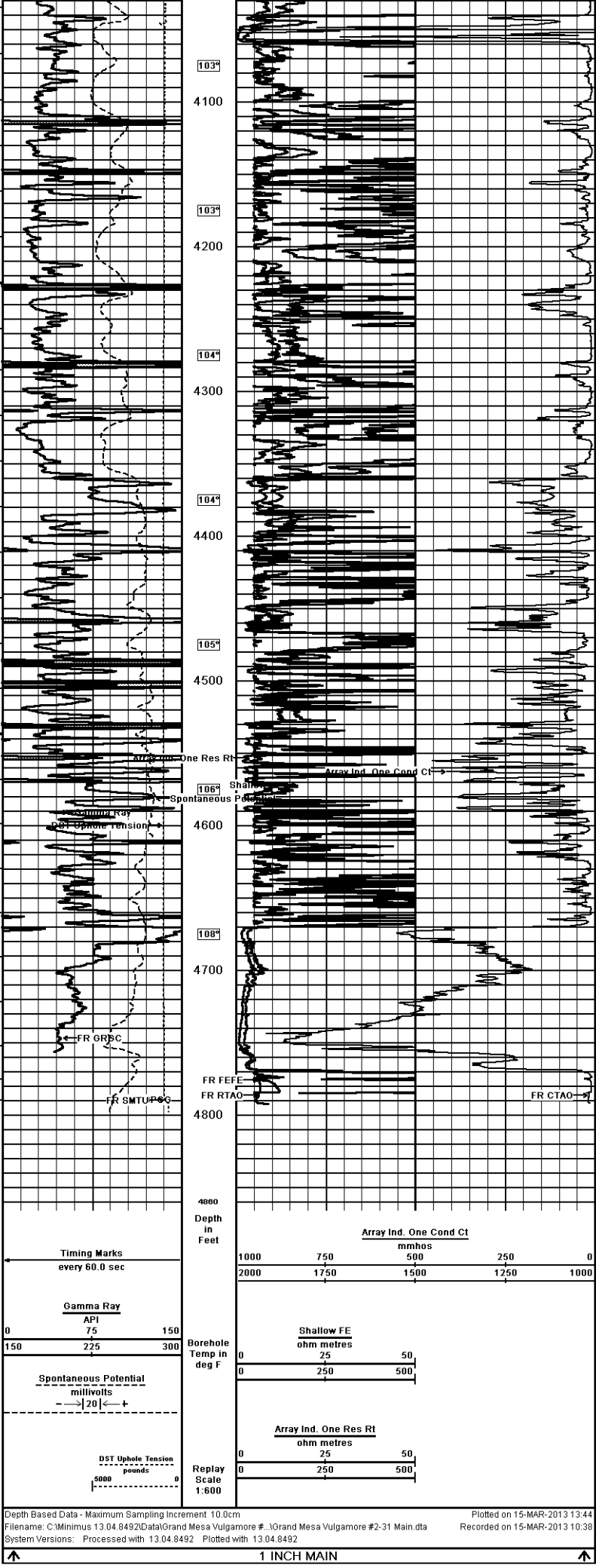
Spontaneous Potential

Gamma Ray

DST Uphole Tension

3600' FE

Array Ind. One Cond Cl



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

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

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

Depth Based Data - Maximum Sampling Increment 10.0cm  
Plotted on 15-MAR-2013 13:44  
Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Vulgamore #...Grand Mesa Vulgamore #2-31 Main.dta  
Recorded on 15-MAR-2013 10:38  
System Versions: Processed with 13.04.8492 Plotted with 13.04.8492

COMPANY GRAND MESA OPERATING CO.  
WELL VULGAMORE #2-31  
FIELD WILDCAT  
PROVINCE/COUNTY SCOTT  
COUNTRY/STATE U.S.A. / KANSAS

Elevation Kelly Bushing	2996.00	feet	First Reading	4771.00	feet
Elevation Drill Floor	2994.00	feet	Depth Driller	4790.00	feet
Elevation Ground Level	2991.00	feet	Depth Logger	4790.00	feet

 COMPACT PHOTO DENSITY  
COMPENSATED NEUTRON  
MICRORESISTIVITY LOG