

**Weatherford****ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG****BOREHOLE RECORD**

Last Edited: 29-JUN-2013 20:04

Bit Size inches	Depth From feet	Depth To feet
7.875	262.00	4850.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	262.00	23.00

REMARKS

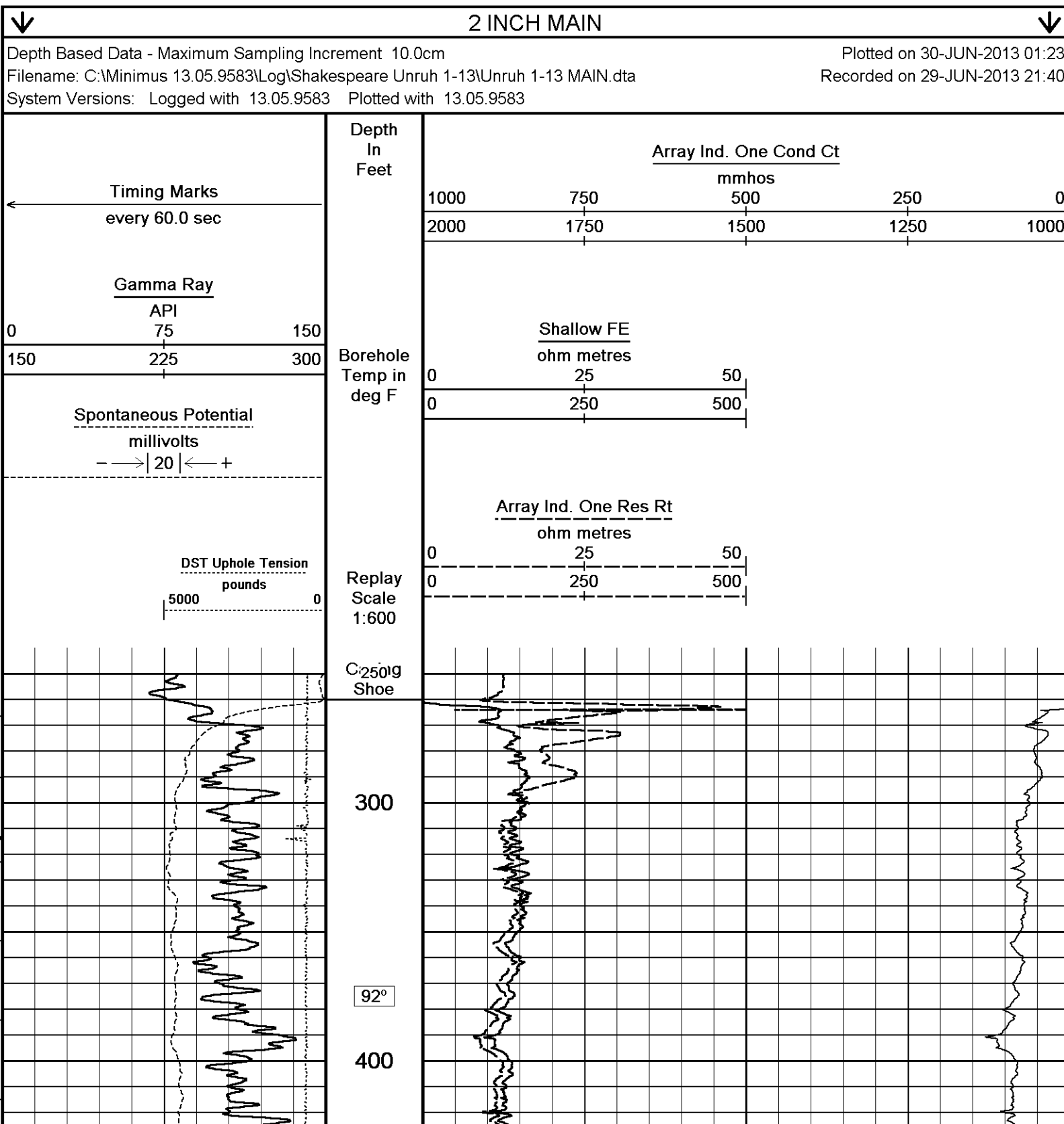
- SOFTWARE ISSUE: WLS 13.05.9583.
- MCG, MML, MDN, MPD, MFE, MSS, MAI RUN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 - 0.5 INCH STANDOFF USED ON MFE.
 - TWO 0.5 INCH STANDOFFS USED ON MSS.
 - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- 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: 2210 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO SURFACE CASING: 1450 CU. FT.

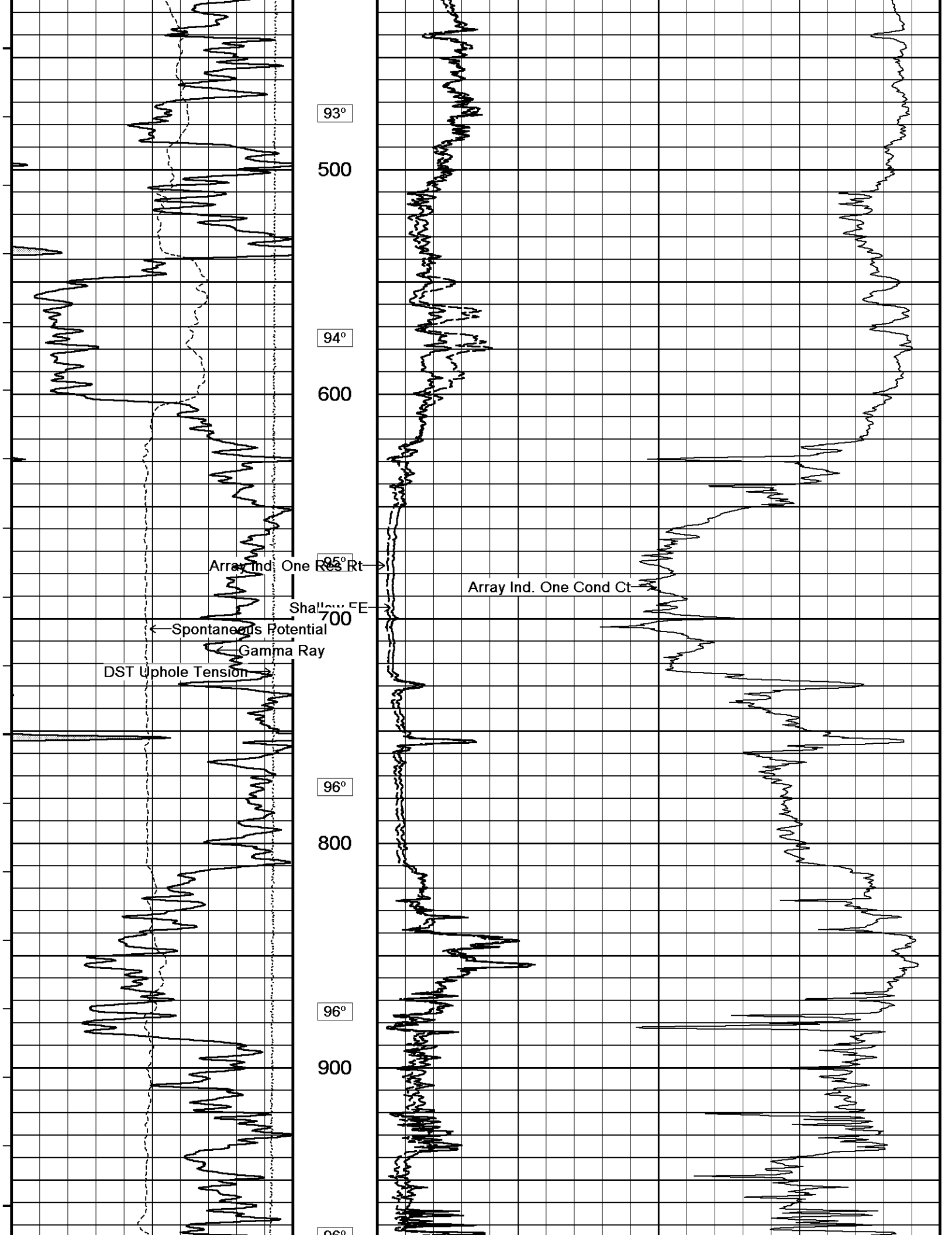
- RIG: HD DRILLING #3

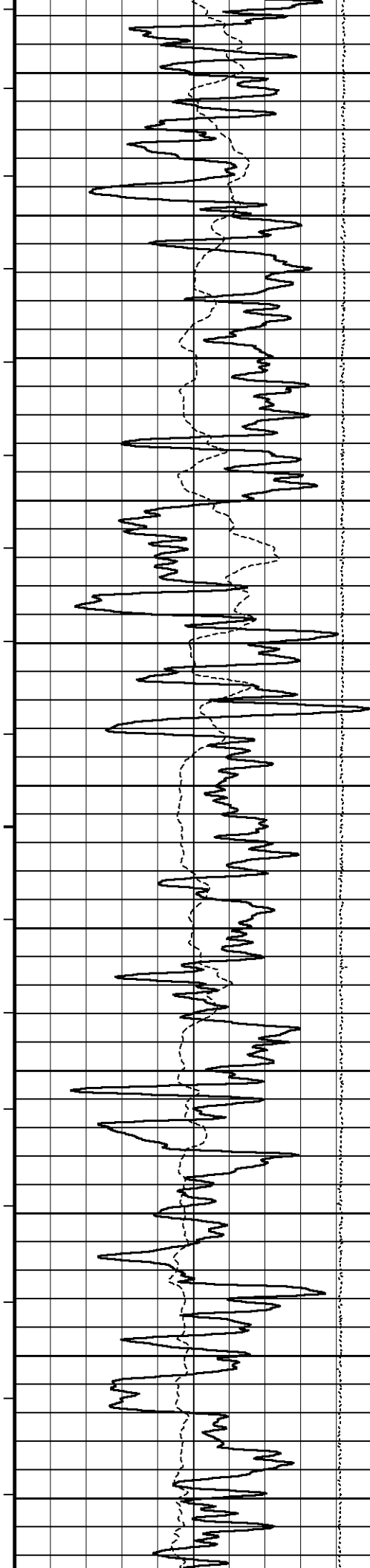
- ENGINEER: D. COLE

- OPERATOR(S): B. REEVES AND C. RIMEREZ

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.







96°

1000

97°

1100

97°

1200

98°

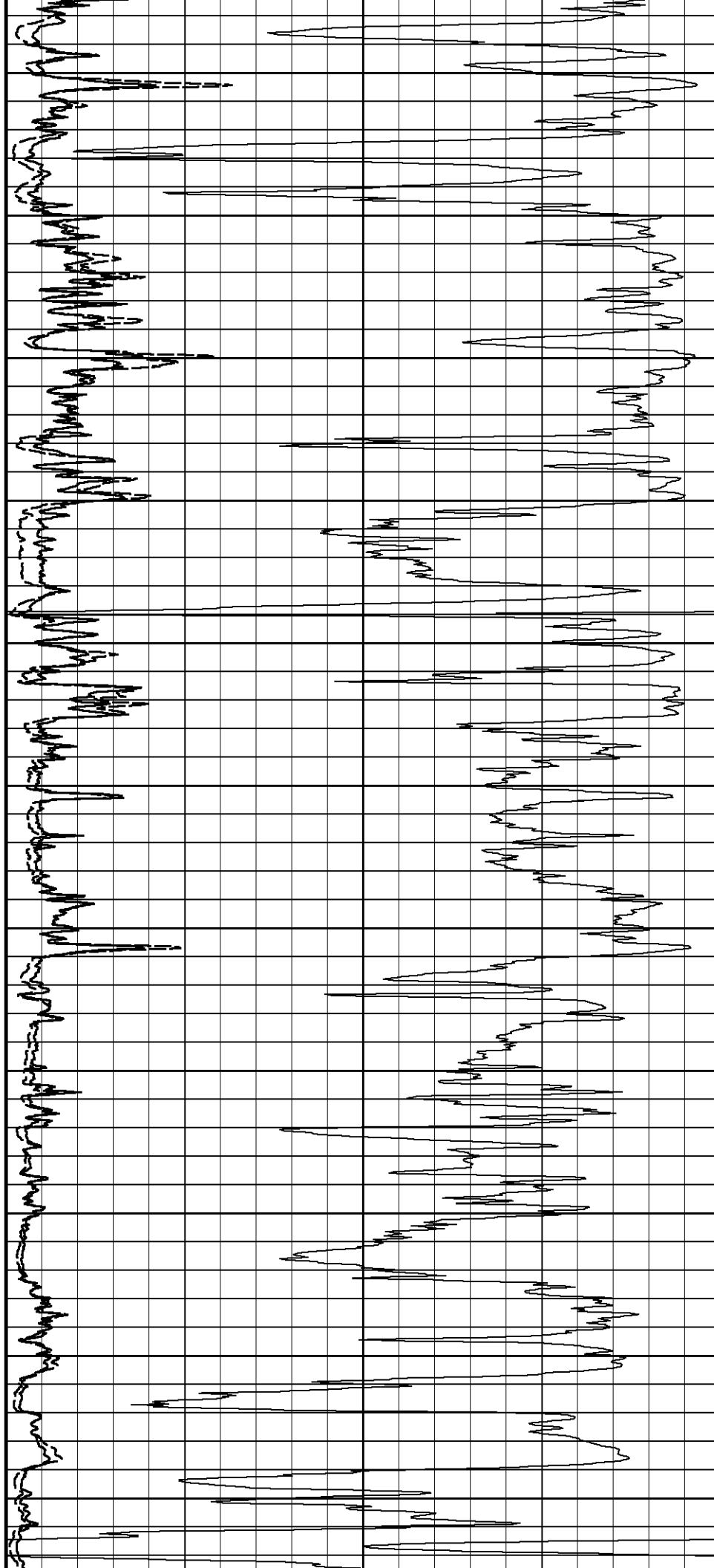
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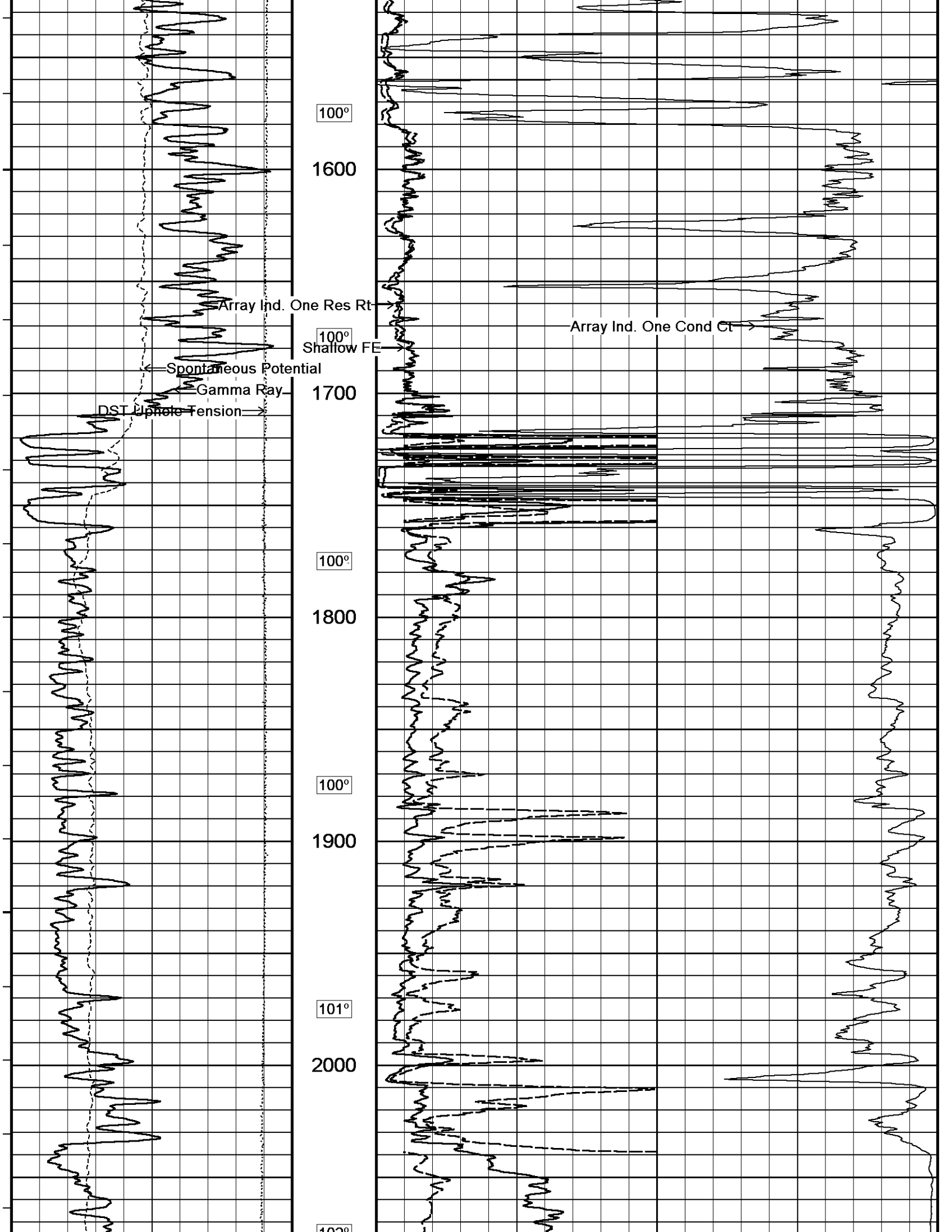
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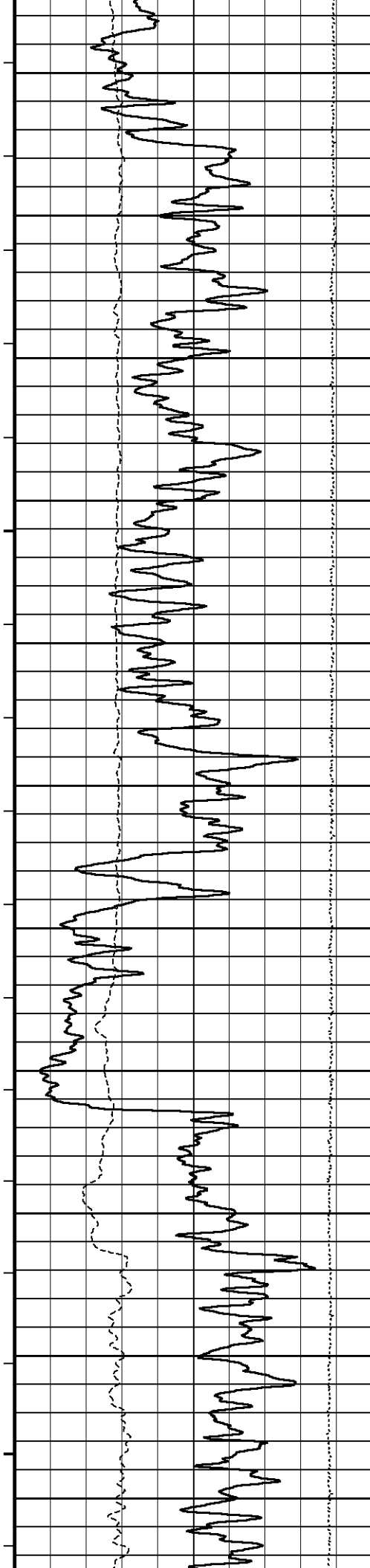
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99°

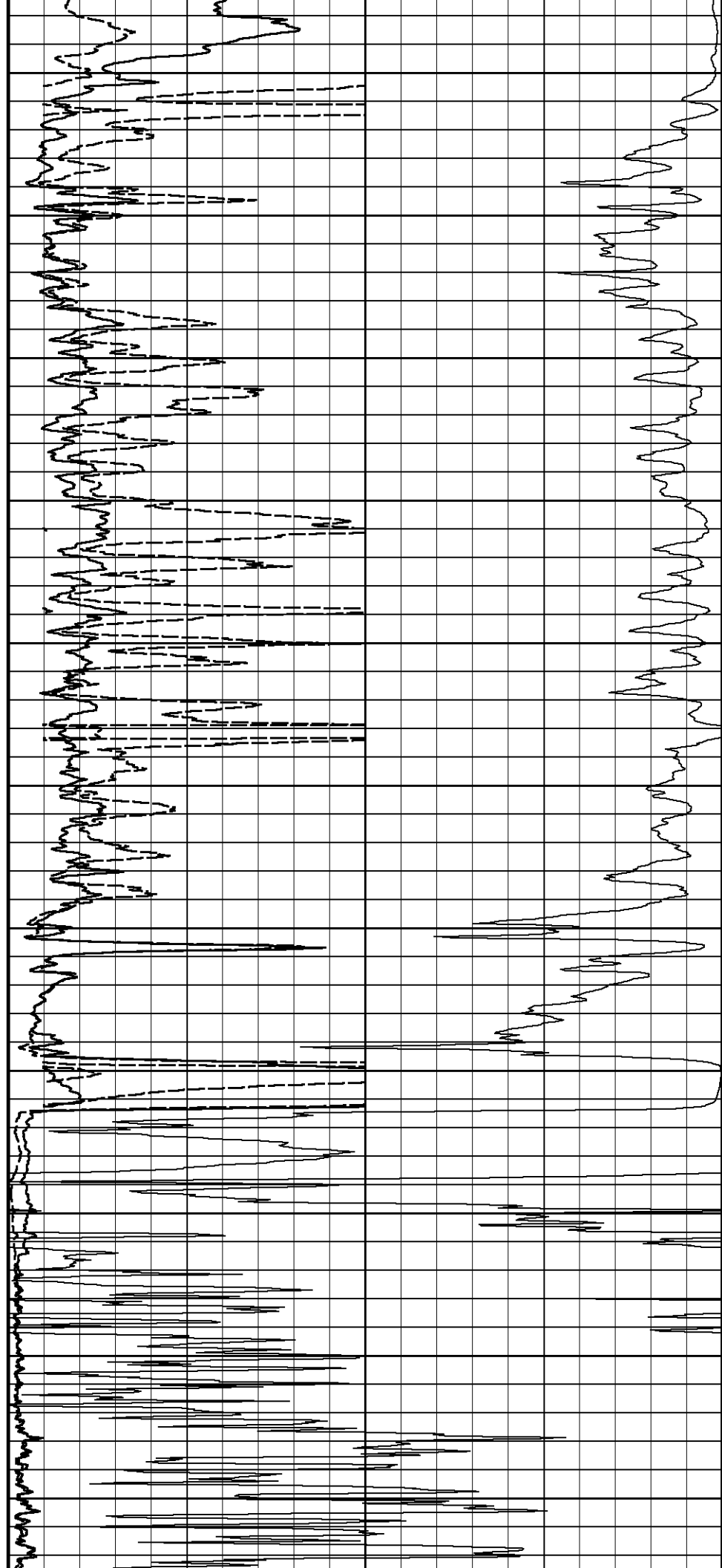
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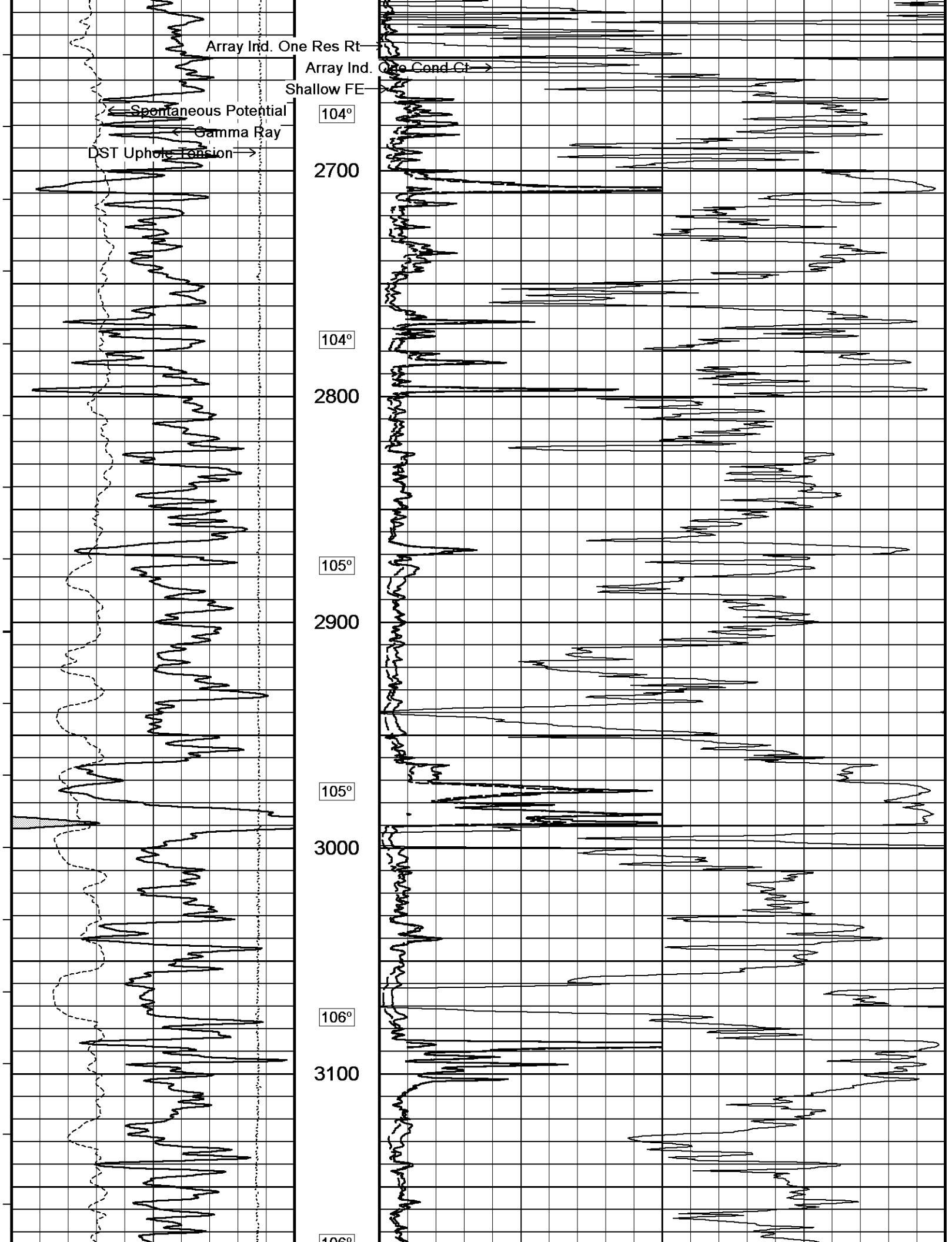


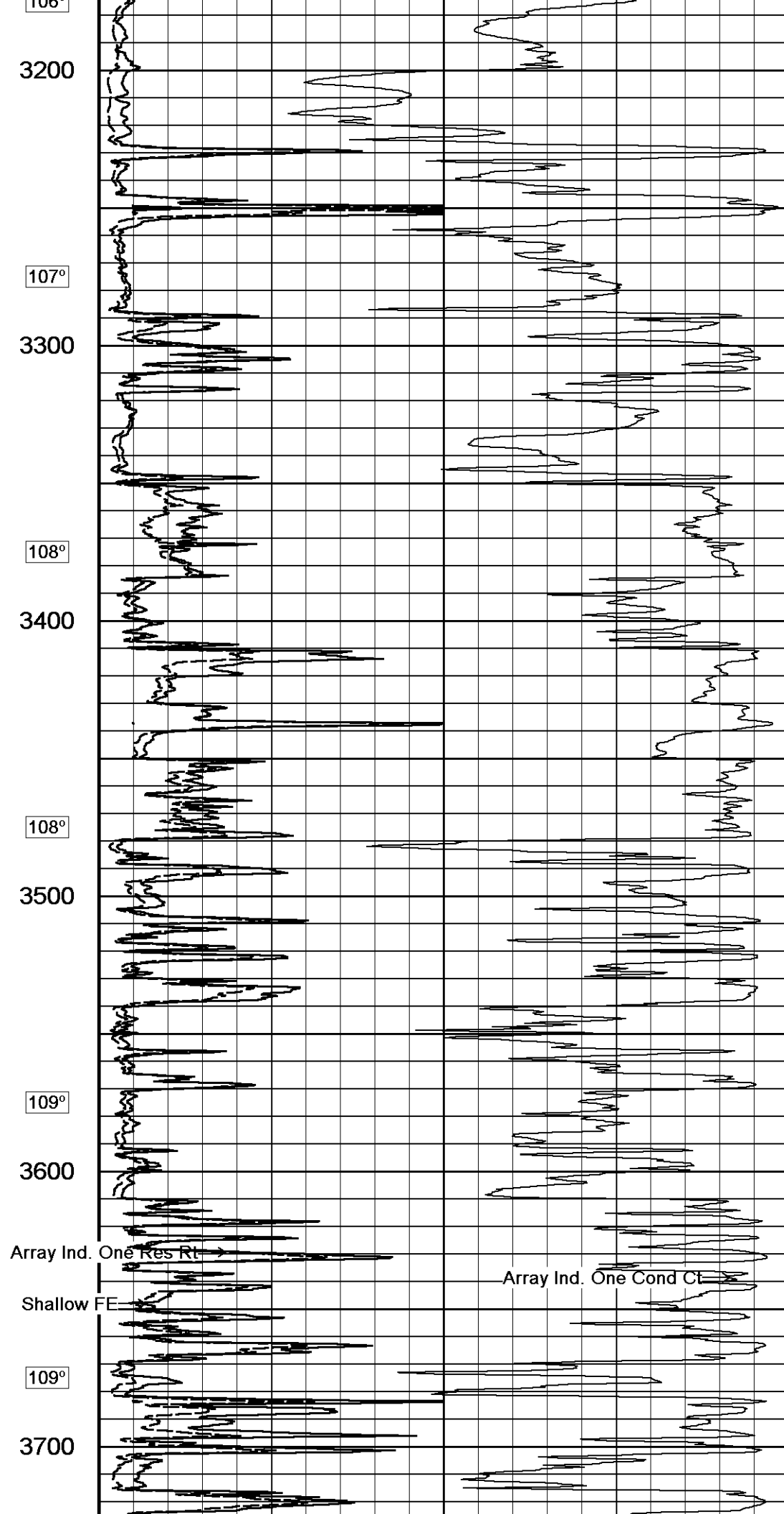
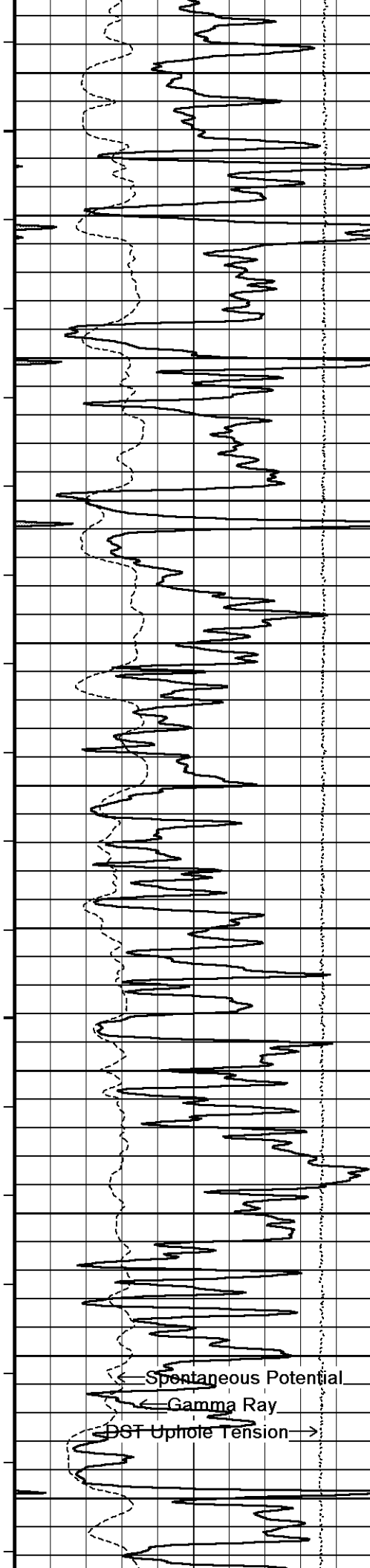




102°
2100
101°
2200
102°
2300
103°
2400
103°
2500
104°
2600







3200

107°

3300

108°

3400

108°

3500

109°

3600

Array Ind. One Res Rt

Shallow FE

Array Ind. One Cond Ct

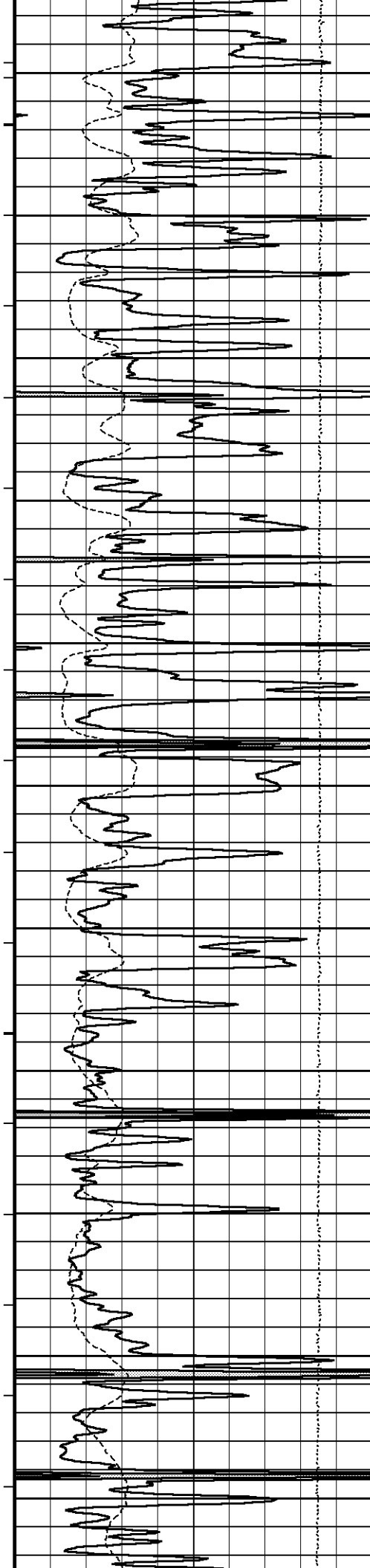
109°

3700

Spontaneous Potential

Gamma Ray

DST Uphole Tension



110°

3800

110°

3900

111°

4000

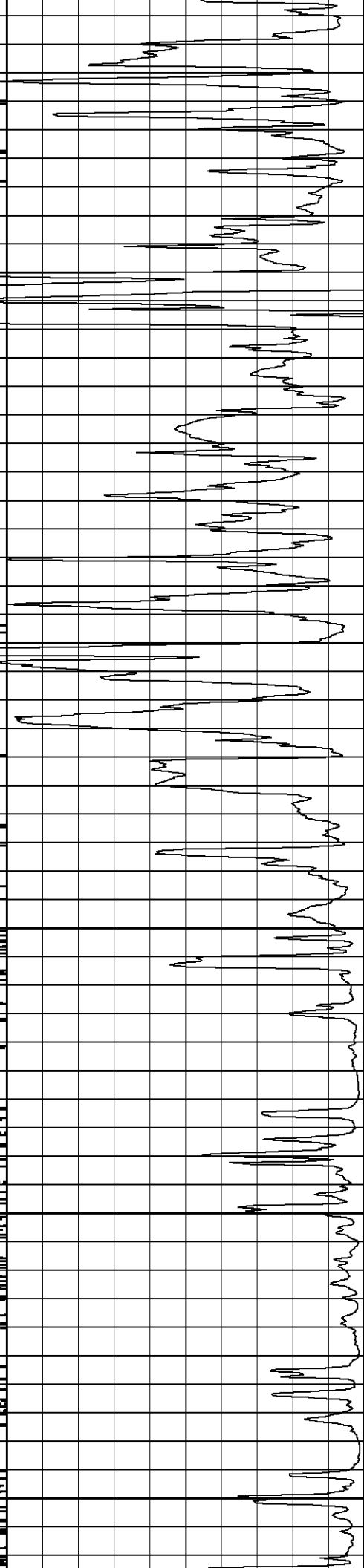
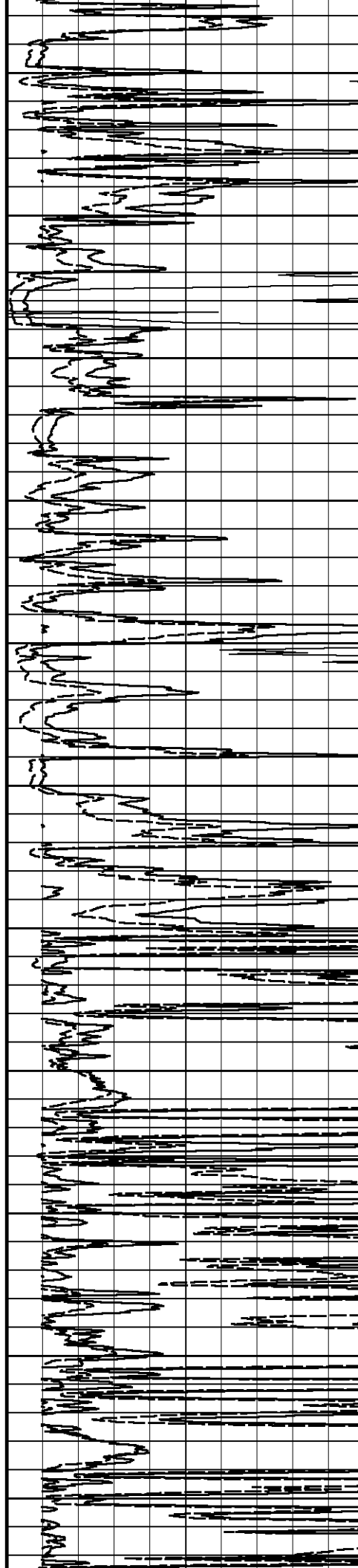
111°

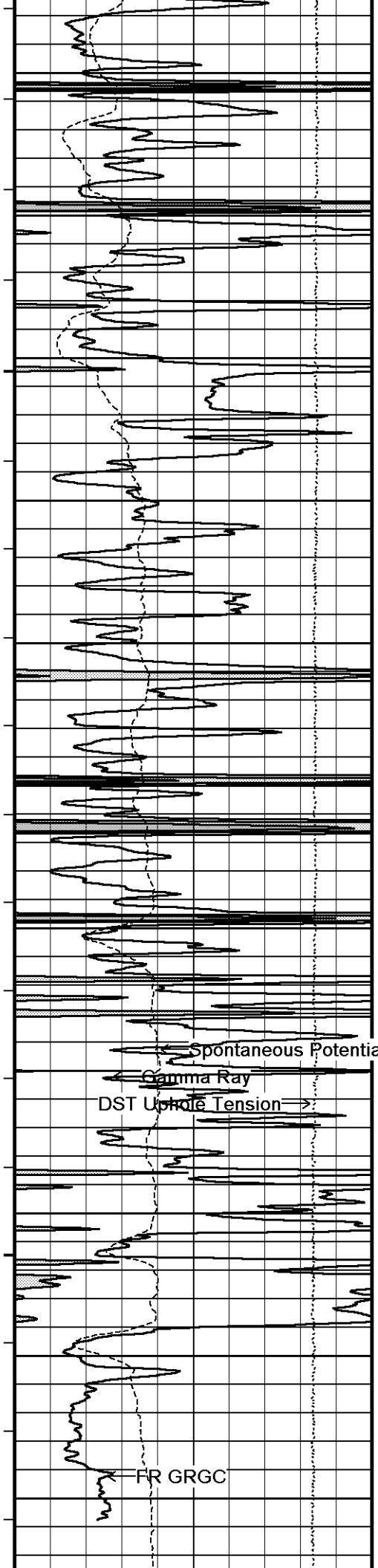
4100

112°

4200

112°





112°
4300

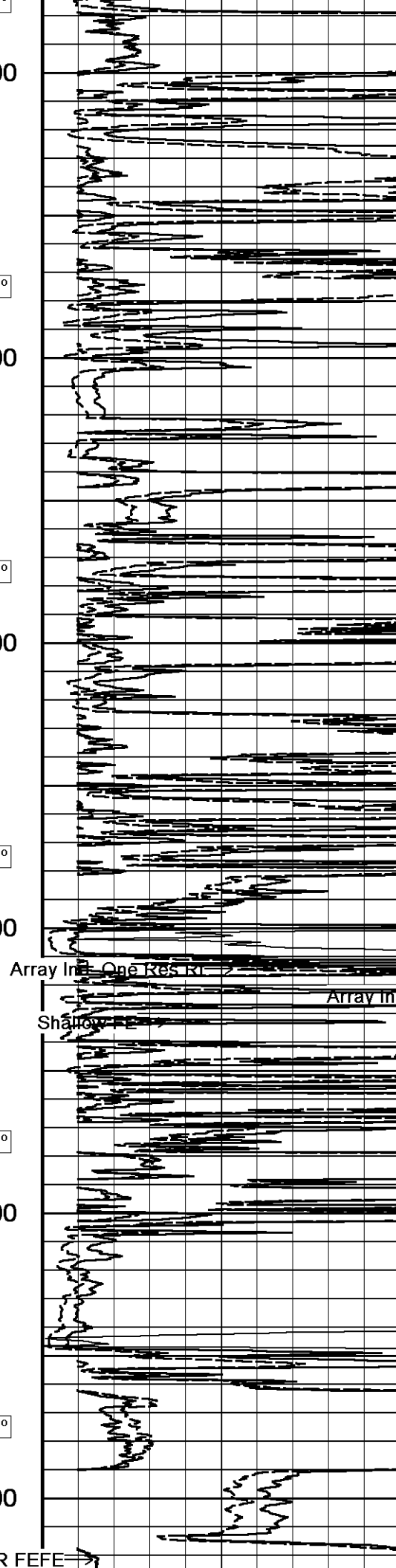
113°
4400

114°
4500

114°
4600

115°
4700

114°
4800



Shallow FR

FR FEFE

← FR SMTU →

FR RTAO →

FR CTAO →

4890
Depth
In
Feet

Timing Marks
every 60.0 sec

Gamma Ray

API

75

0 150

150 225 300

Spontaneous Potential

millivolts

— → | 20 | ← +

DST Uphole Tension
pounds

5000 0

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

Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: C:\Minimus 13.05.9583\Log\Shakespeare Unruh 1-13\Unruh 1-13 MAIN.dta

System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

Plotted on 30-JUN-2013 01:23

Recorded on 29-JUN-2013 21:40



2 INCH MAIN



5 INCH MAIN



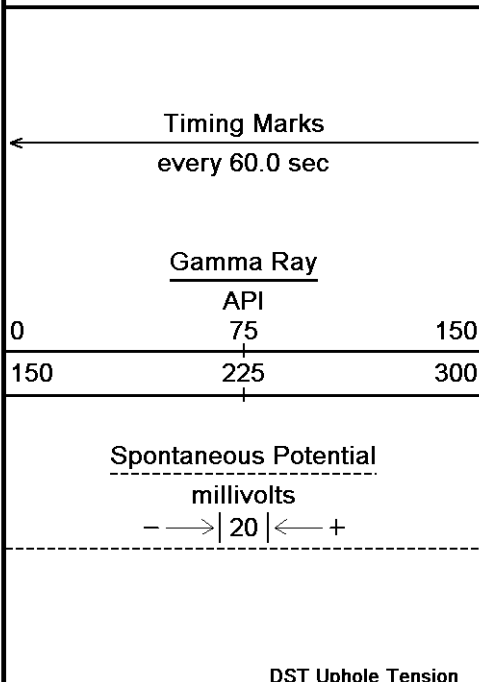
Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: C:\Minimus 13.05.9583\Log\Shakespeare Unruh 1-13\Unruh 1-13 MAIN.dta

System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

Plotted on 30-JUN-2013 01:23

Recorded on 29-JUN-2013 21:40



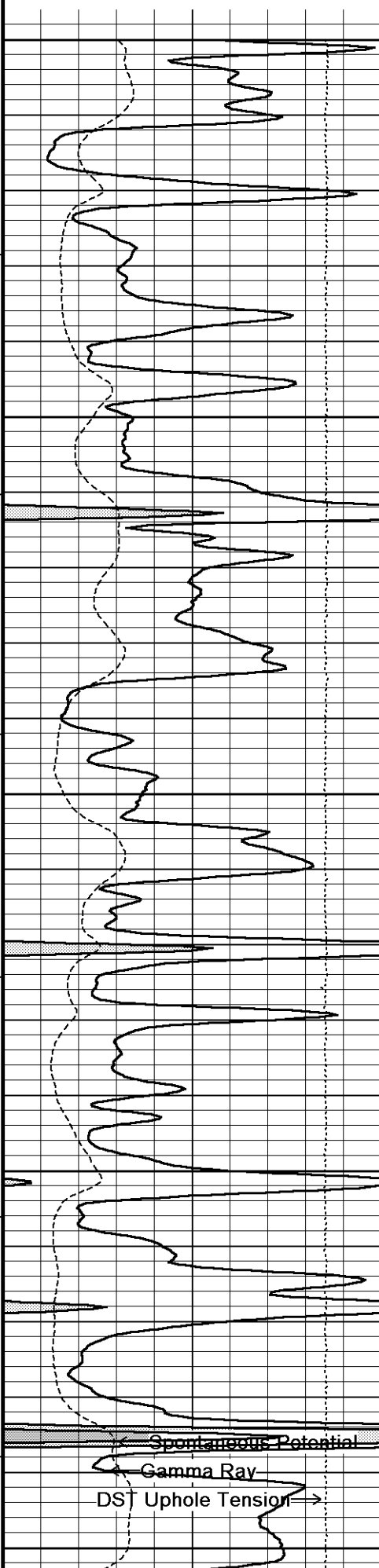
Depth
In
Feet

Borehole
Temp in

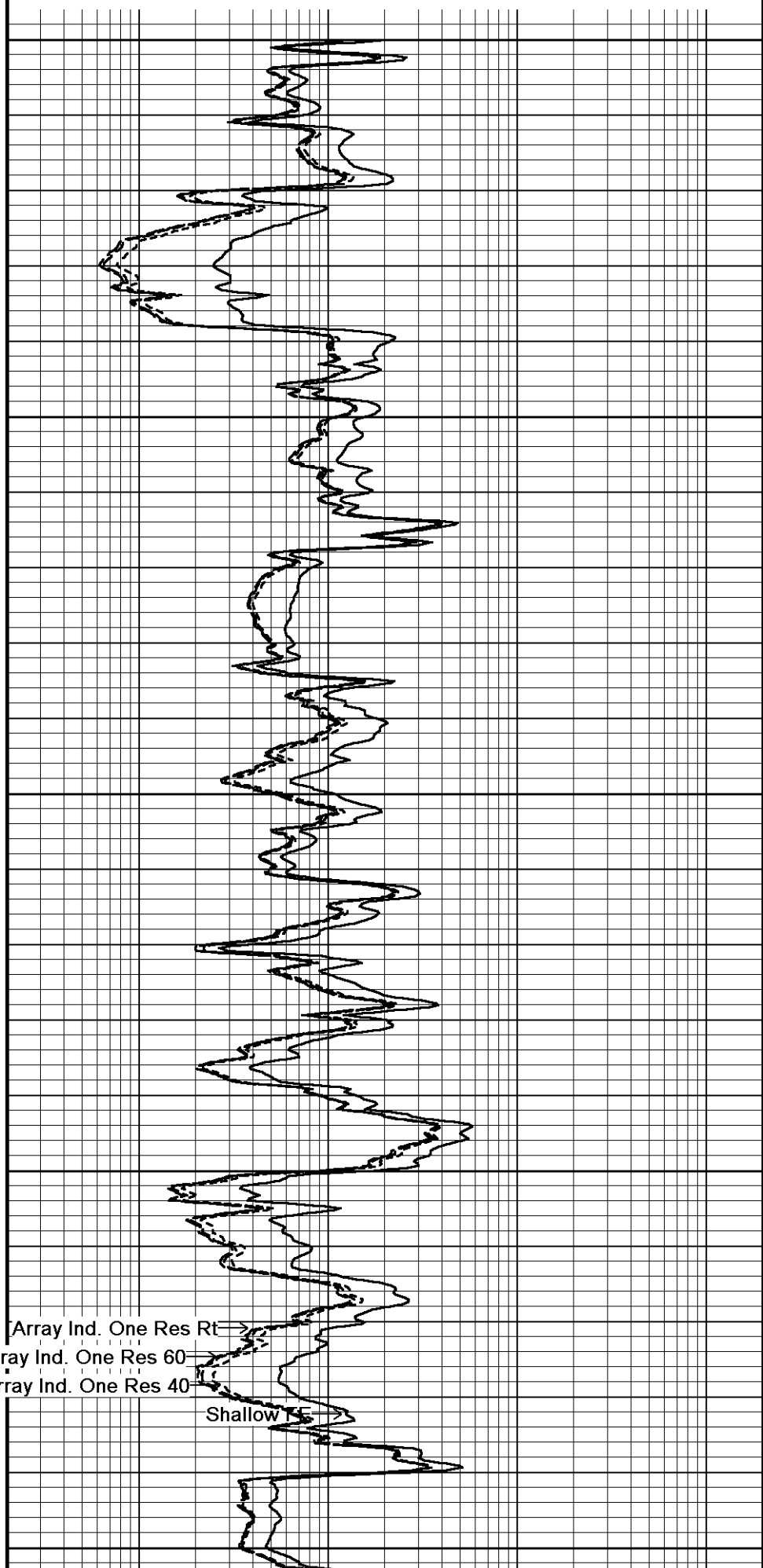
pounds
5000 0

Replay
Scale
1:240

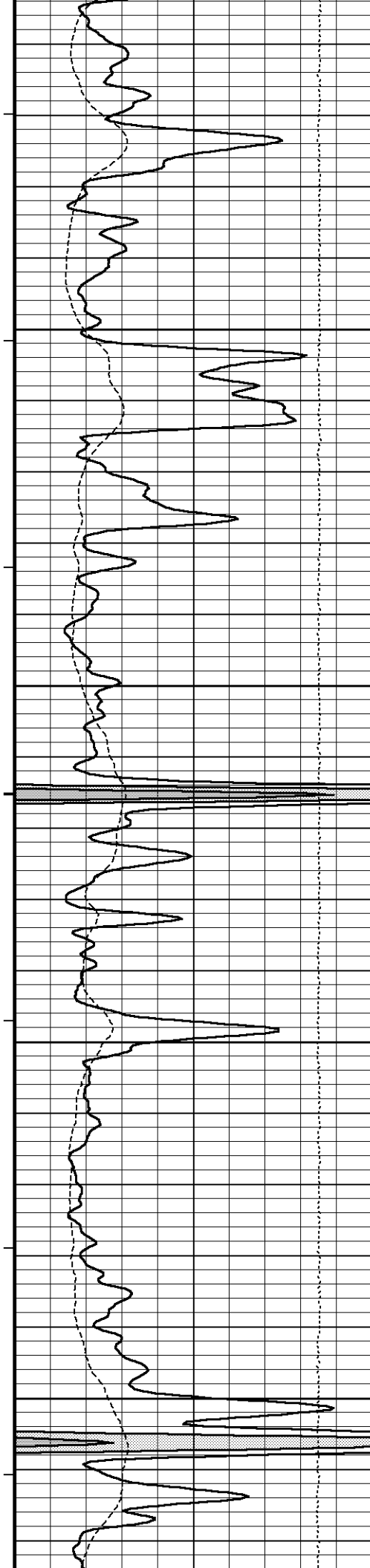
ohm metres
0.20 1 10 100 2000



3800
110°
3850
110°
3900
111°
3950
111°
4000



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



111°

4050

111°

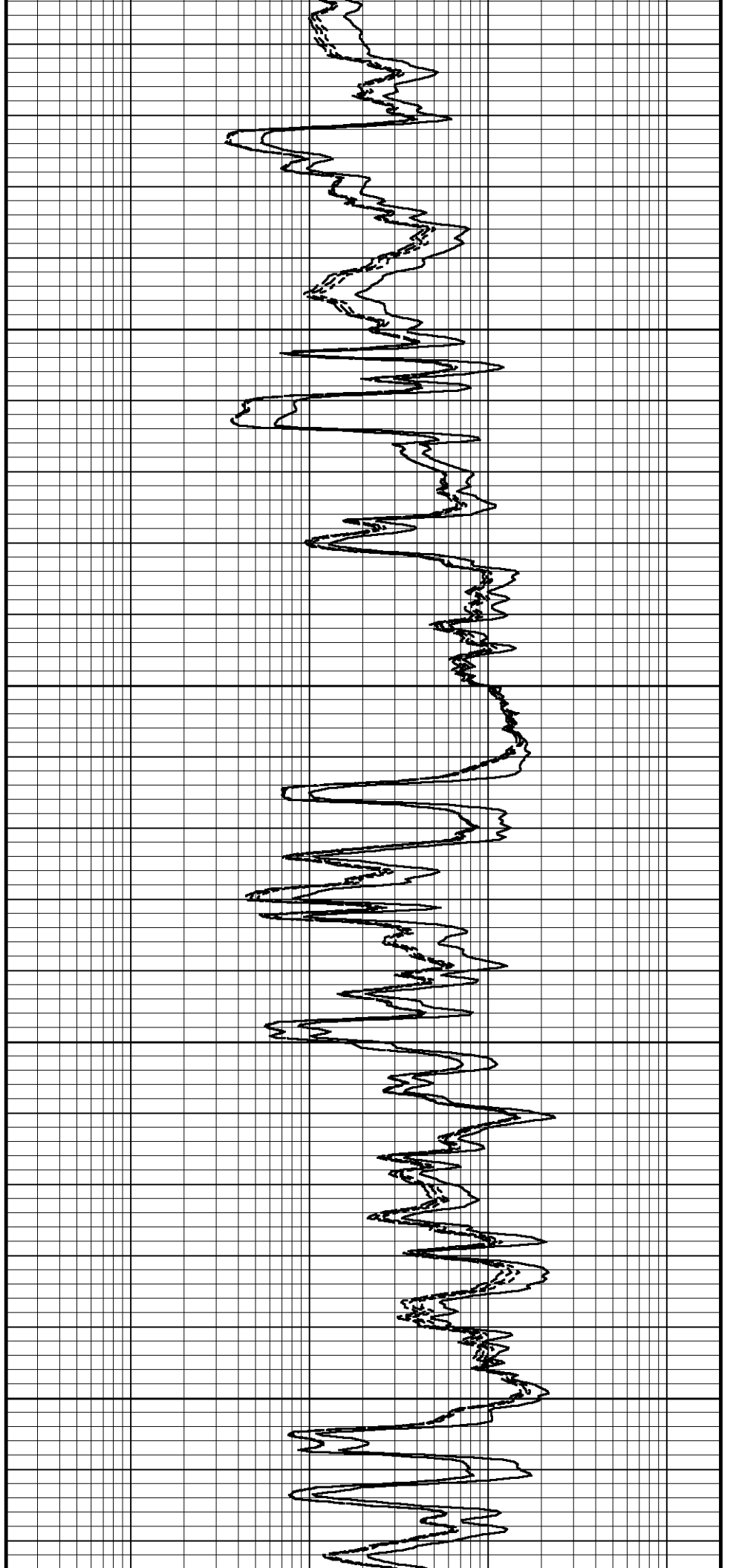
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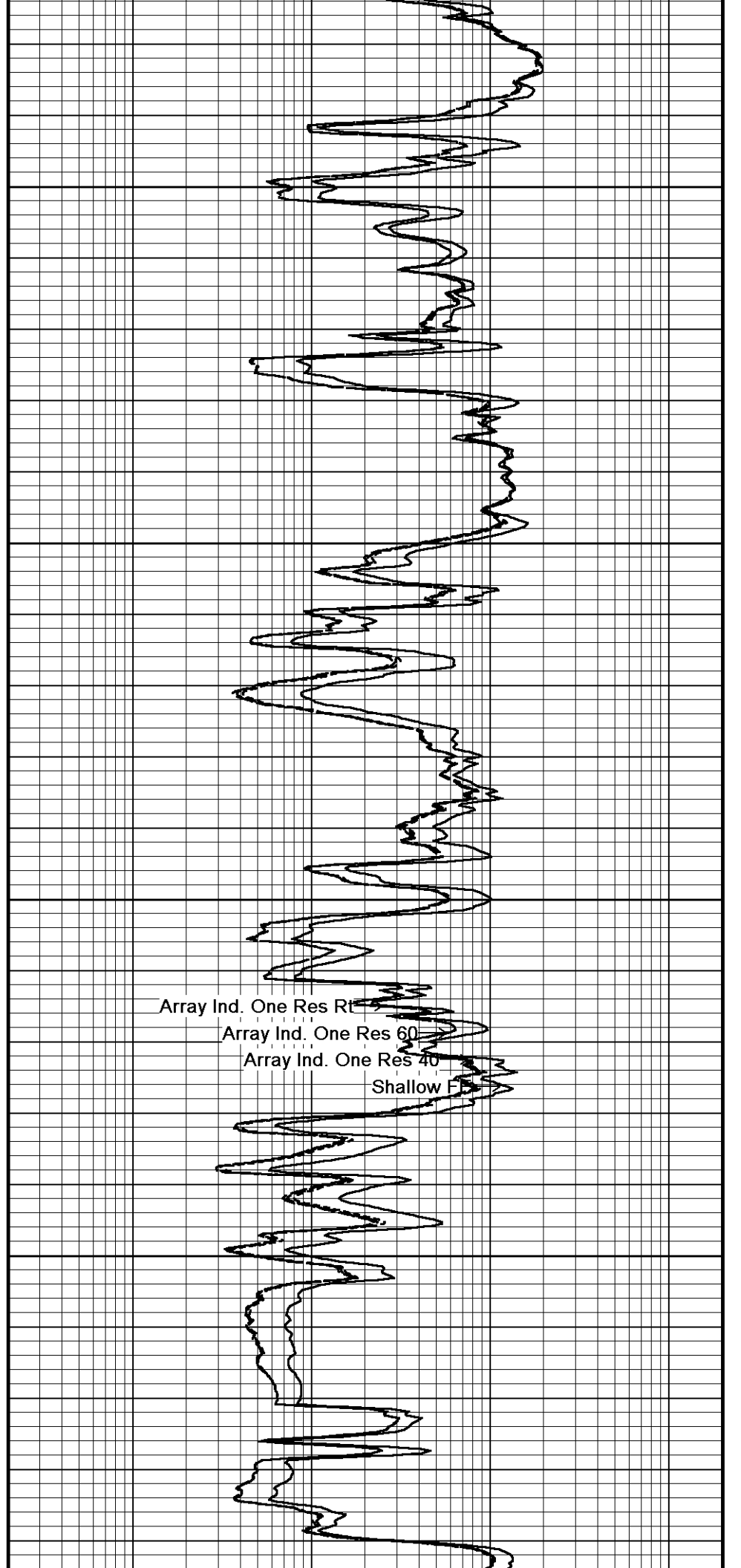
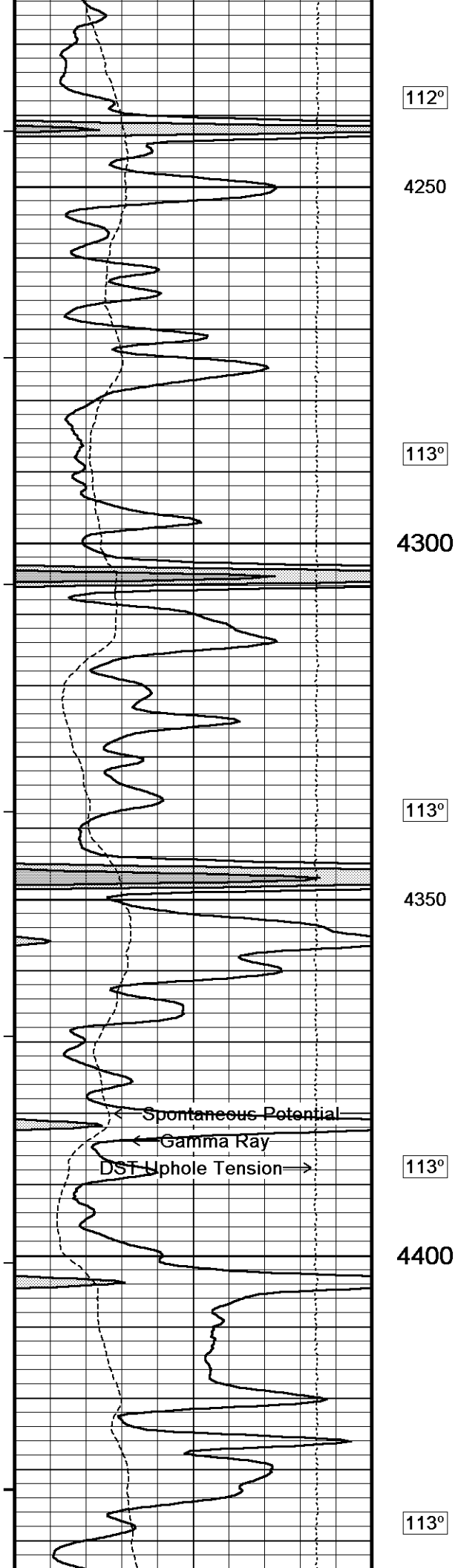
112°

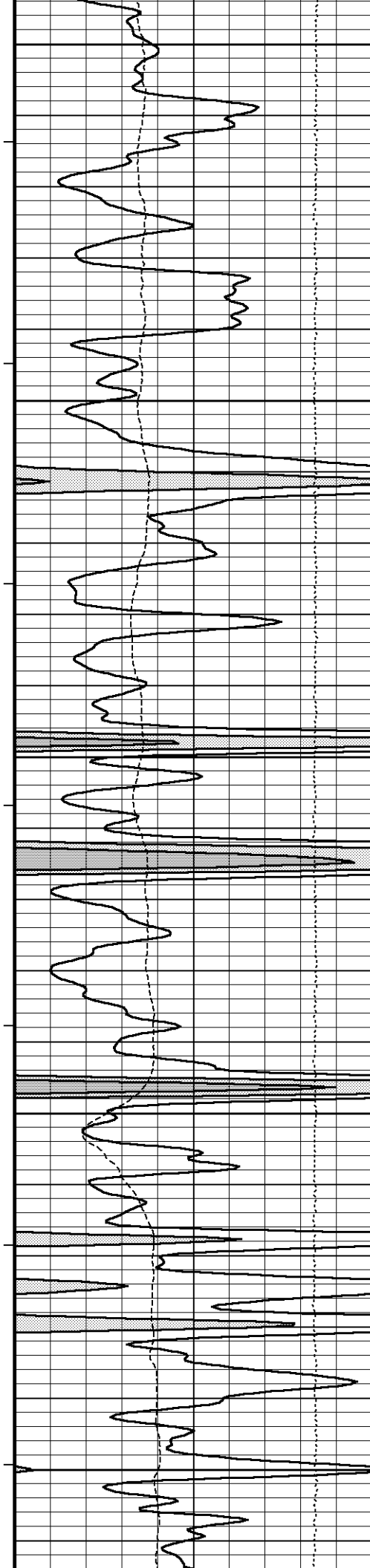
4150

112°

4200







4450

114°

4500

114°

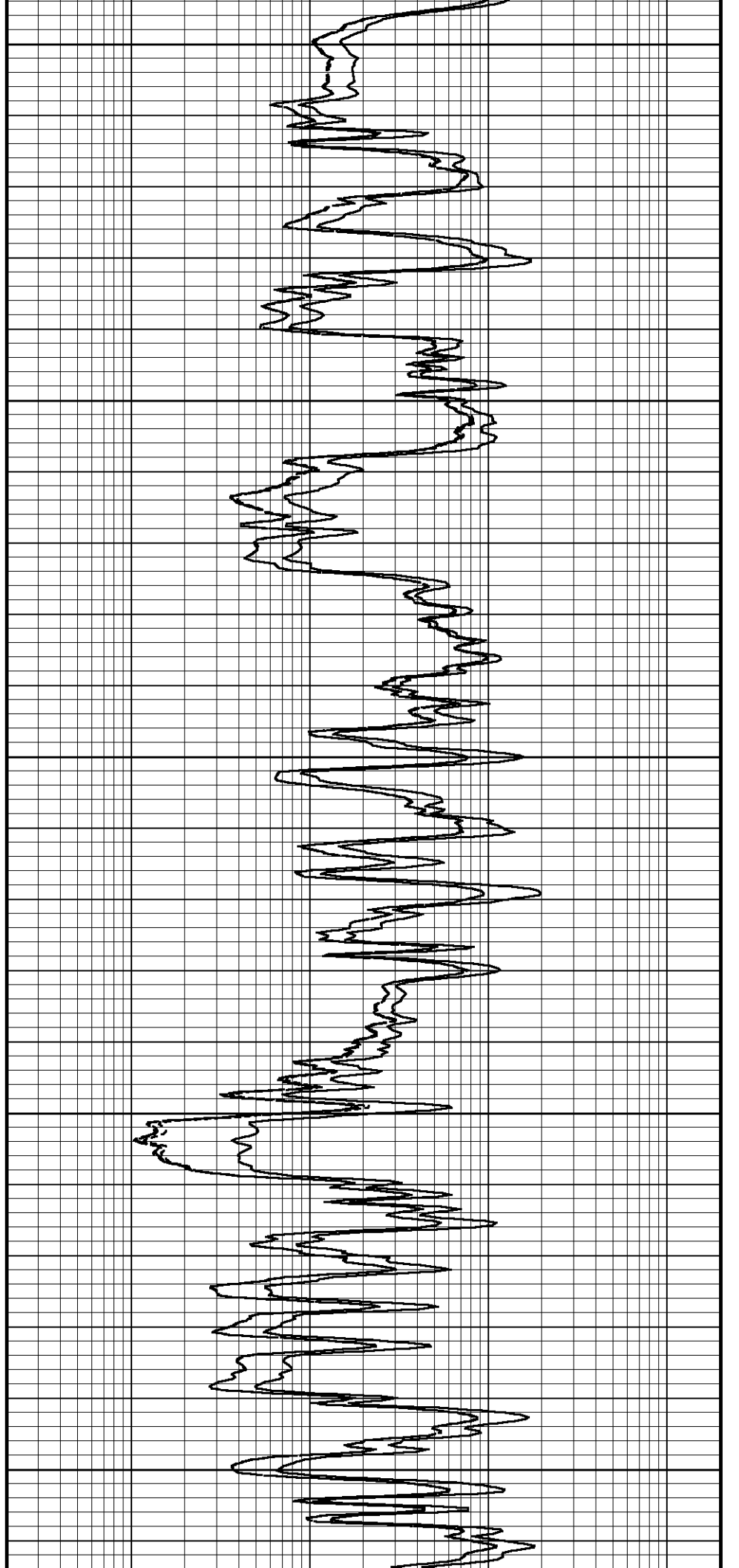
4550

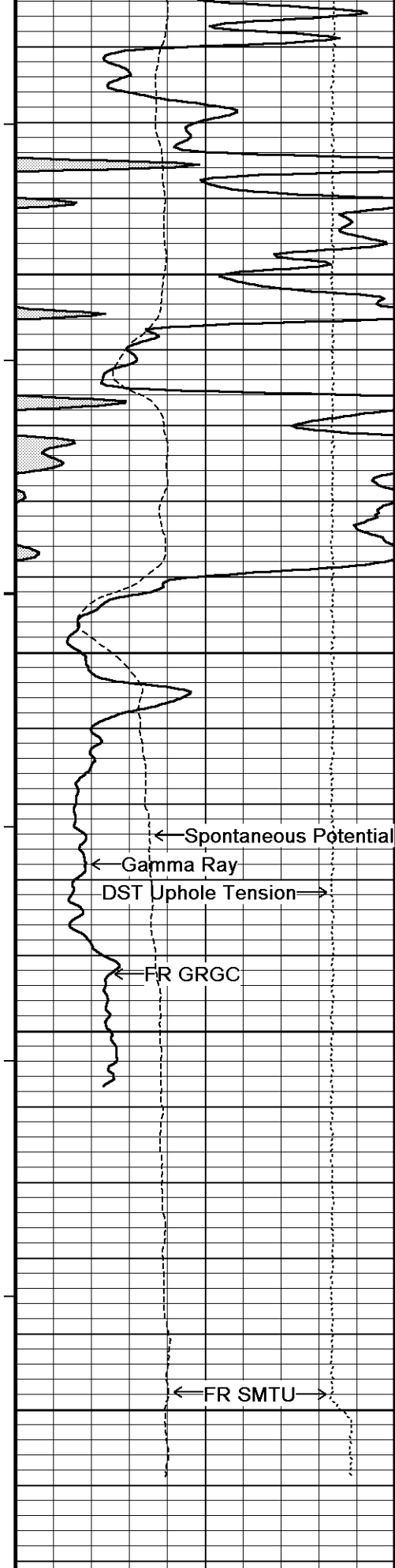
115°

4600

115°

4650





115°

4700

114°

4750

114°

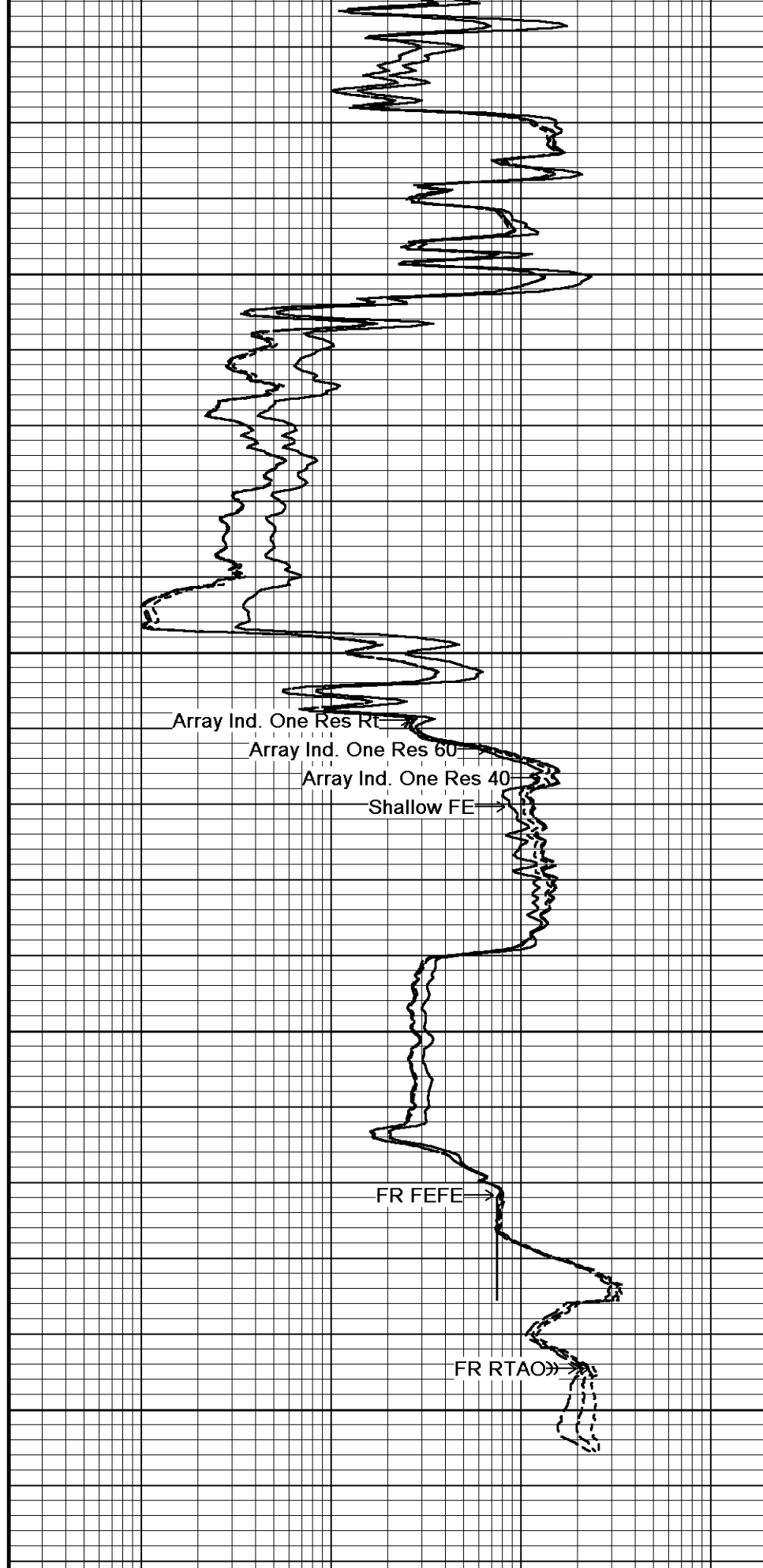
4800

4850

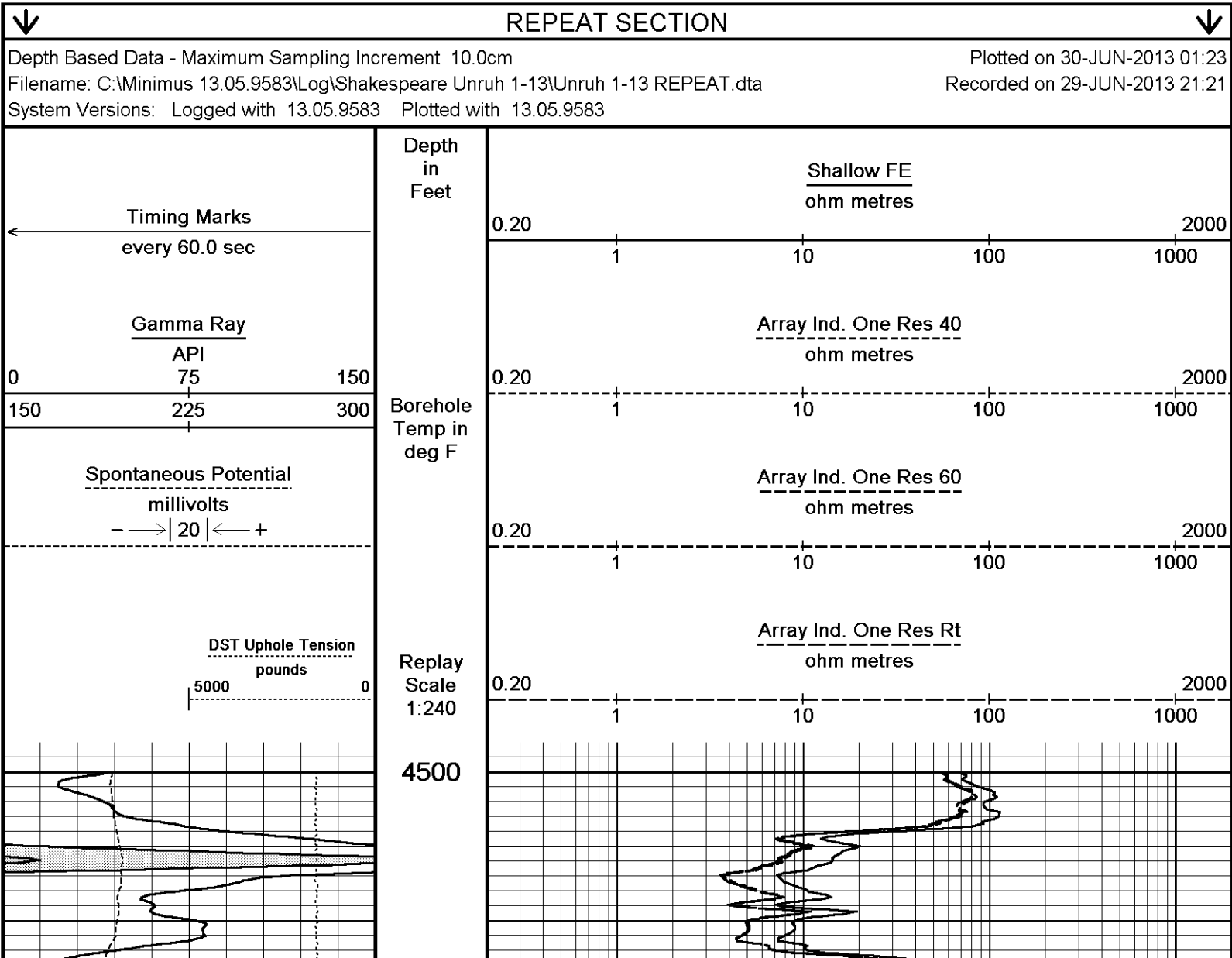
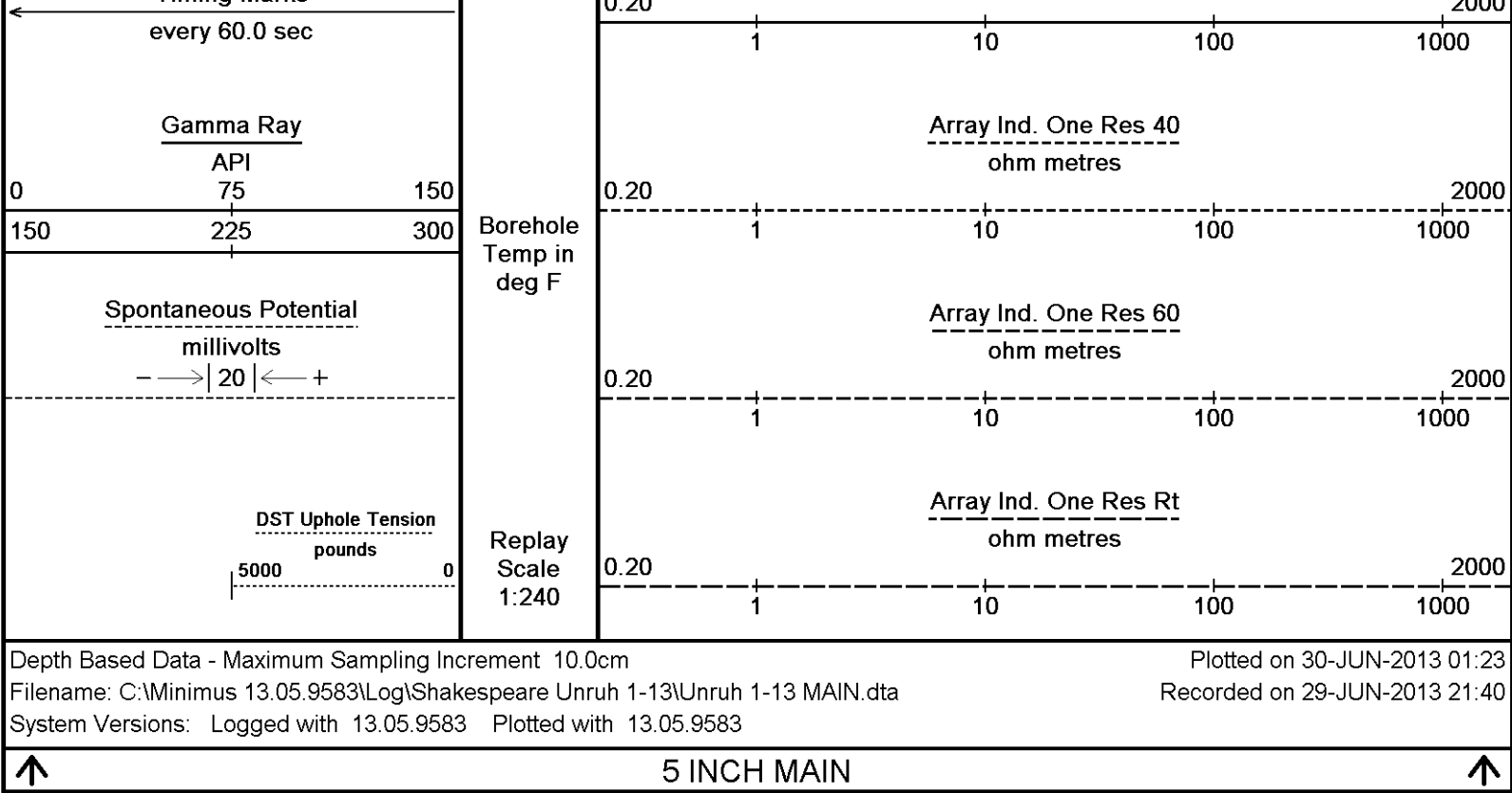
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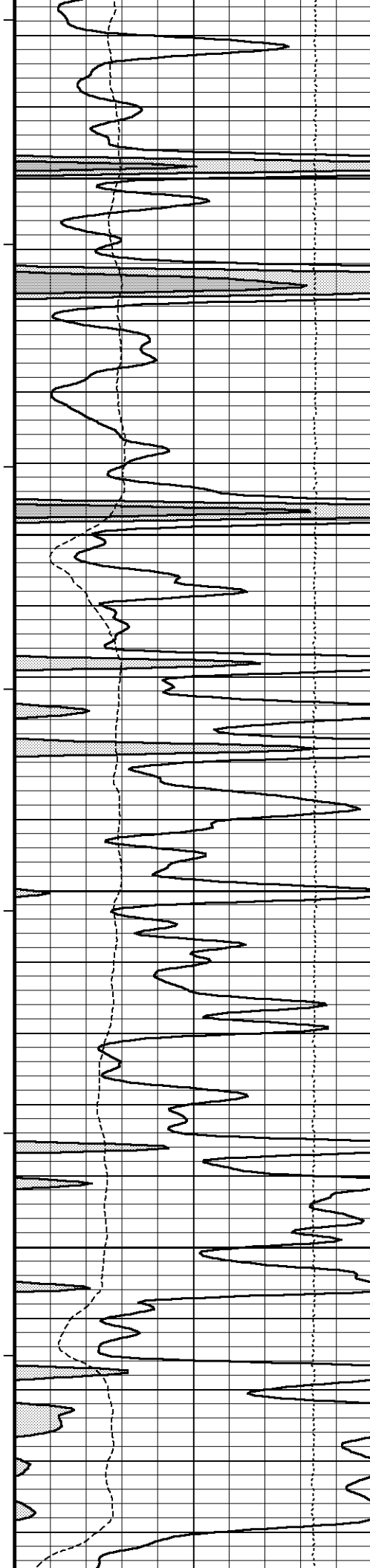
Depth
In
Feet

Timing Marks



Shallow FE
ohm metres





114°

4550

114°

4600

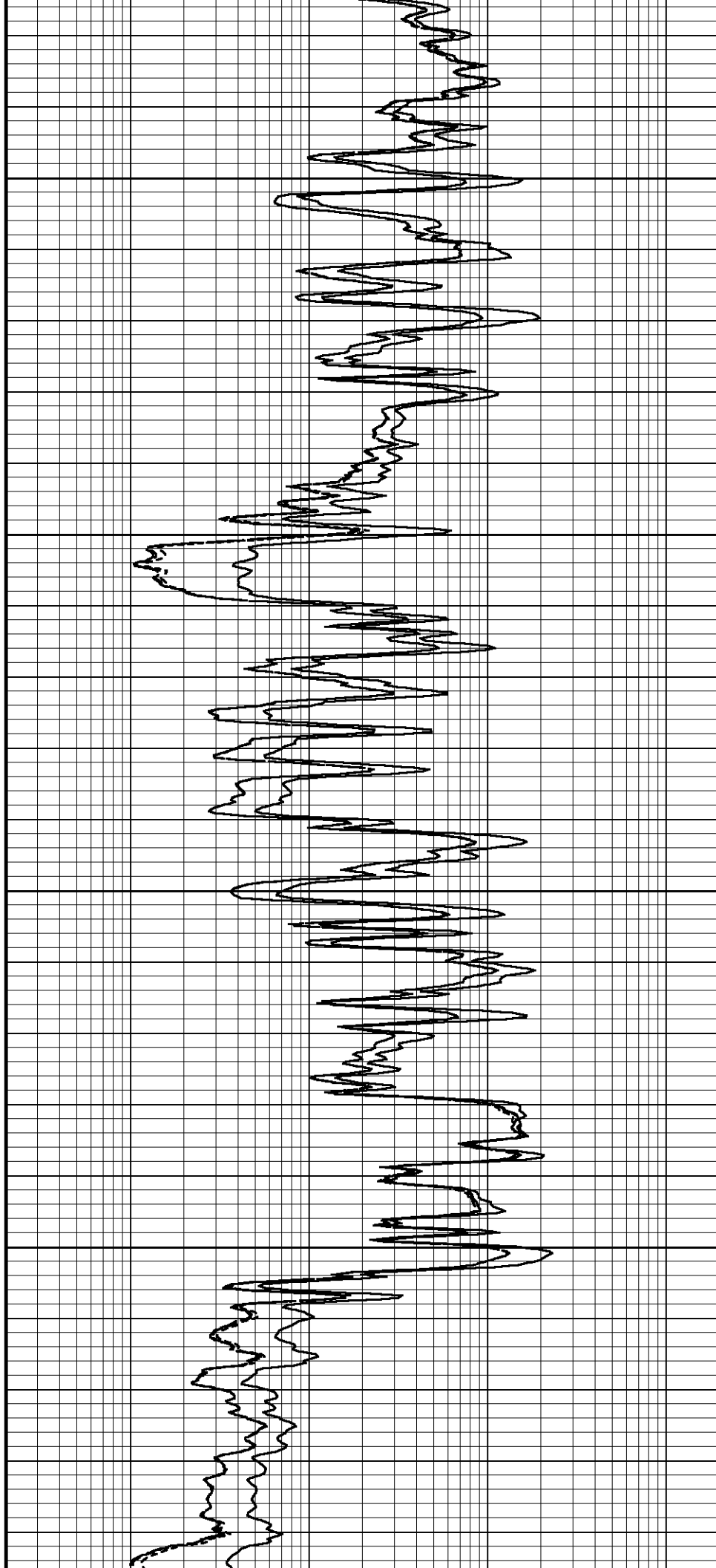
114°

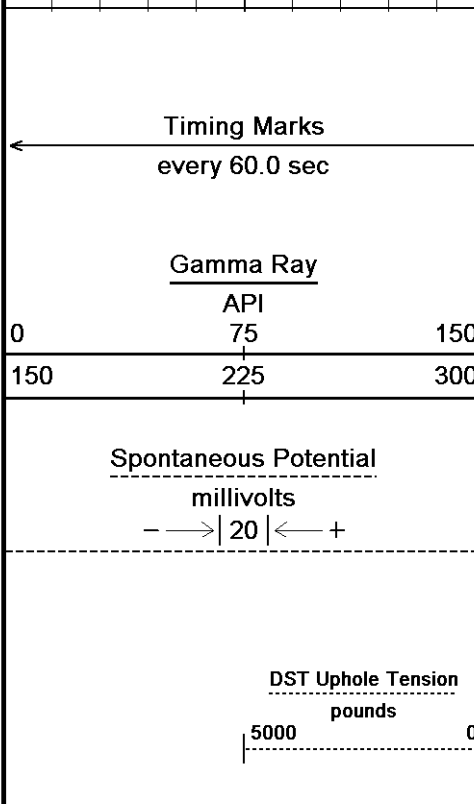
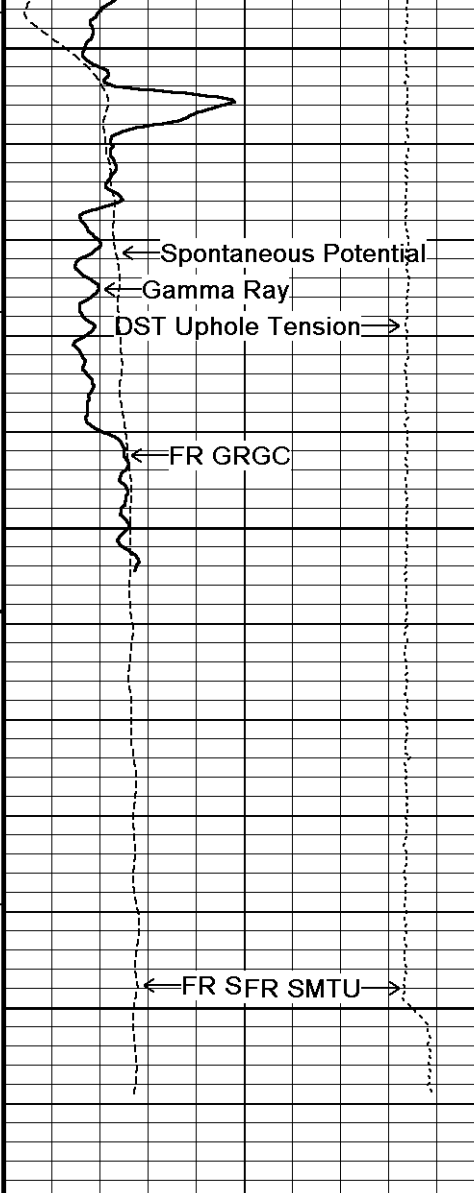
4650

114°

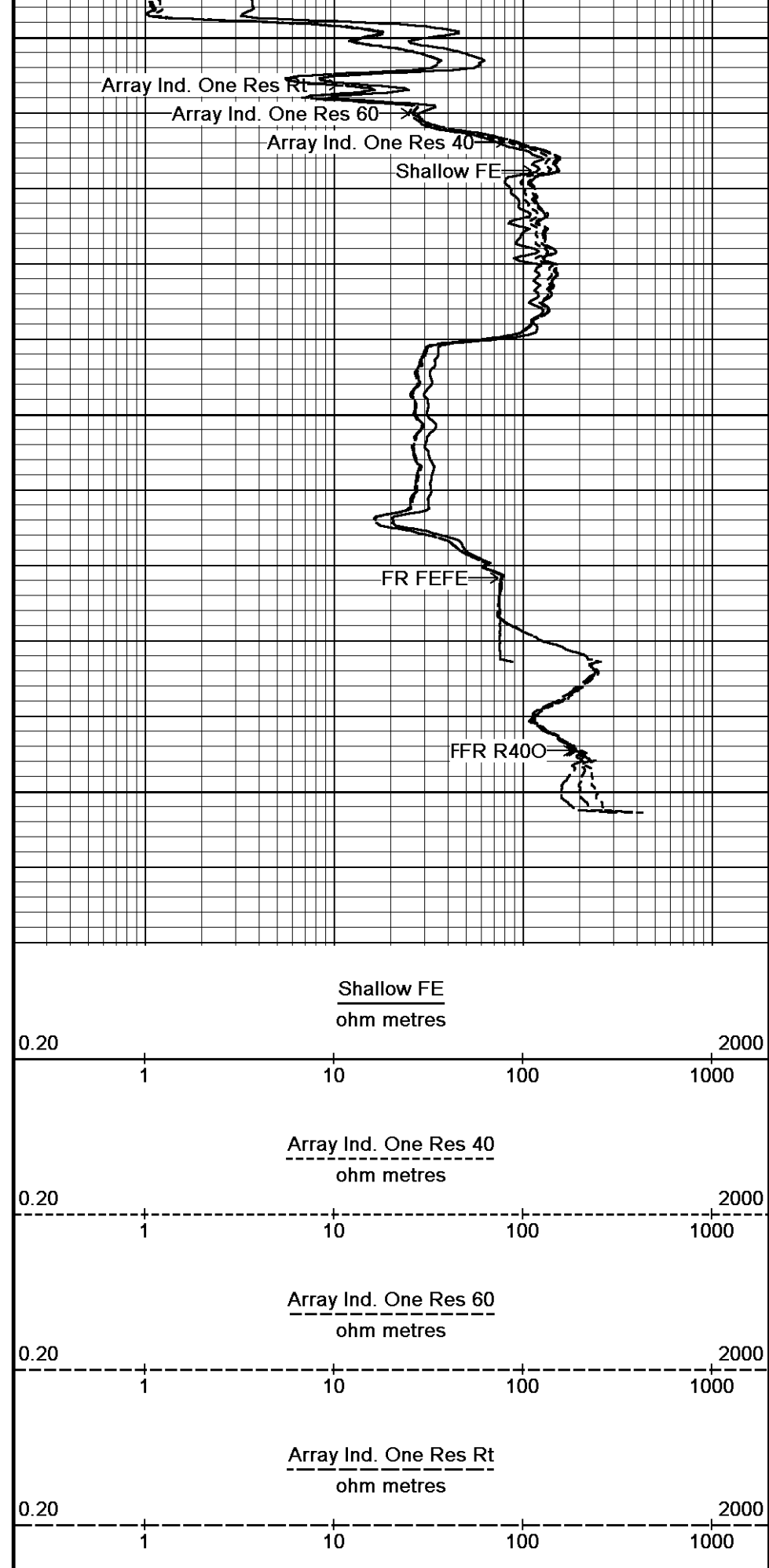
4700

114°





4750
 113°
 4800
 4850
 4868
 Depth
 in
 Feet
 Borehole
 Temp in
 deg F
 Replay
 Scale
 1:240





BEFORE SURVEY CALIBRATION

C:\Minimus 13.05.9583\Log\Shakespeare Unruh 1-13\Unruh 1-13 REPEAT.dta

General Constants All 000

Last Edited on 29-JUN-2013,19:31

General Parameters

Mud Resistivity	0.550	ohm-metres
Mud Resistivity Temperature	78.000	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	MML Caliper	

Rwa Parameters

Porosity used	Crossplot Porosity
Resistivity used	Array Ind. Six Res Rt
RWA Constant A	1.000
RWA Constant M	2.000
SW/APOR Tool Source	0.000

Gamma Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013 10:15

	Measured	Calibrated (API)
Background	78	54
Calibrator (Gross)	1127	779
Calibrator (Net)	1049	725

Gamma Constants MCG-D.K 469

Last Edited on 29-JUN-2013,19:15

Gamma Calibrator Number	GRC38	
Mud Density	1.11	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013,10:23

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-D.K 469

Last Edited on 28-JUN-2013,10:23

Pre-filter Length	11
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FE Calibration MFE-B.J 353

Base Calibration on 22-MAY-2013 08:22

Field Check on 28-JUN-2013 09:55

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.9	126.8
Base Check		280.9
Field Check		280.7

FE Constants MFE-B.J 353

Last Edited on 29-JUN-2013,19:32

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 167

Base Calibration on 19-APR-2013,13:41

Field Check on 28-JUN-2013 10:23

Base Calibration

Test Loop Calibration

Channel	Measured		Calibrated (mmho/m)	
	Low	High	Low	High
1	17.3	474.2	9.3	966.2
2	6.3	388.4	7.6	821.4
3	3.3	259.4	5.2	566.0
4	1.9	133.0	2.6	279.2

Array Temperature 76.8 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			13.6	3838.5
2			29.7	3475.0
3			29.2	3051.2
4			19.8	2080.6
Deep			18.7	2048.0
Medium			42.2	3988.4
Shallow			43.1	5051.1

Array Temperature 83.0 Deg F

Induction Constants MAI-A.A 167

Last Edited on 29-JUN-2013,19:32

Induction Model

Caliper for Borehole Corr.	RtAP-WBM	
Hole Size for Borehole Correction	Density Caliper	
Tool Centred	N/A	inches
Stand-off Type	No	
Stand-off	Fins	
Stand-off	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	60.00	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)		

CBH-C, Cablehead, 11 pin
CBH-CA 900 LG: 2.40 ft WT: 24.3 lb OD: 2.24 in

Compact Comms Gamma
MCG-D.K 469 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 3 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

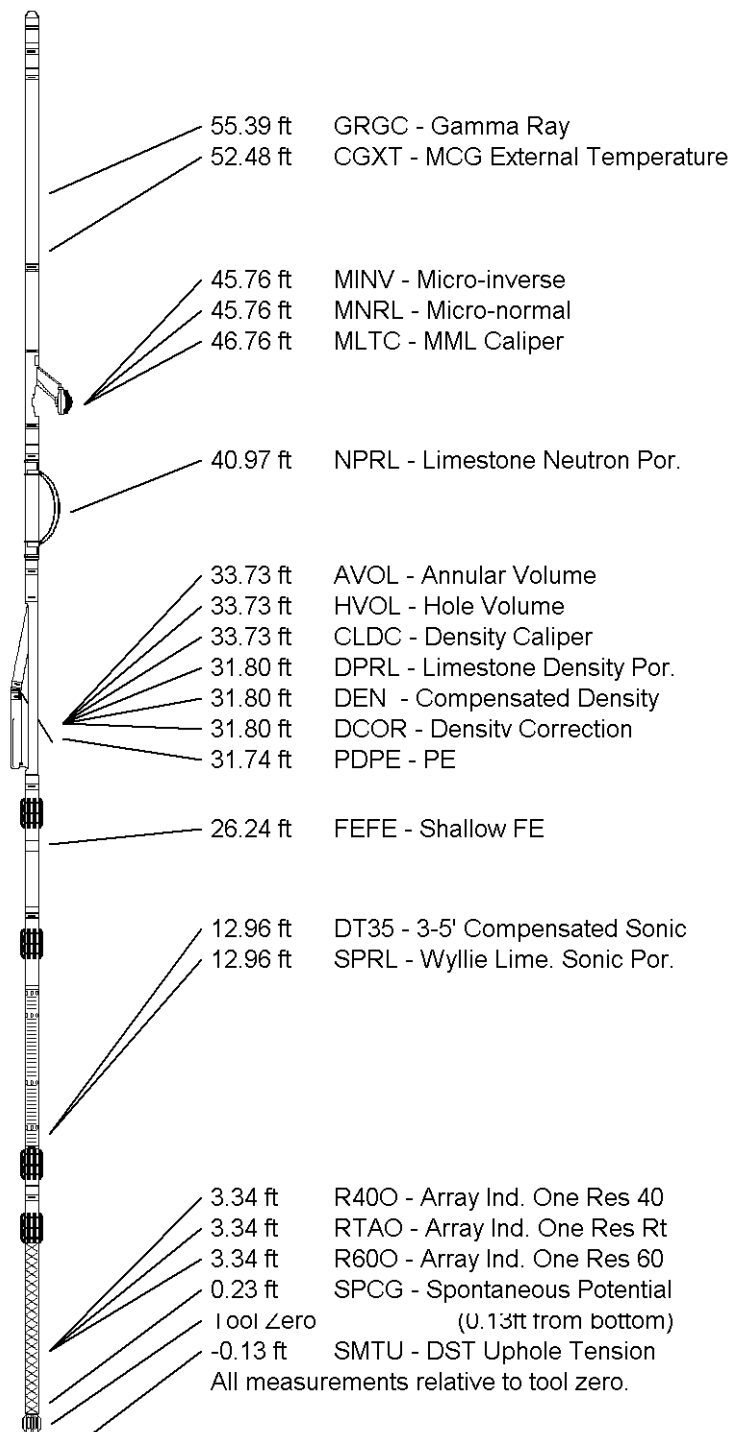
Compact Density/Caliper
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

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

Compact Induction
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 63.07 ft Weight: 480.6 lb



COMPANY	SHAKESPEARE OIL COMPANY		
WELL	UNRUH 1-13		
FIELD	WILDCAT		
PROVINCE/COUNTY	SCOTT		
COUNTRY/STATE	UNITED STATES / KANSAS		

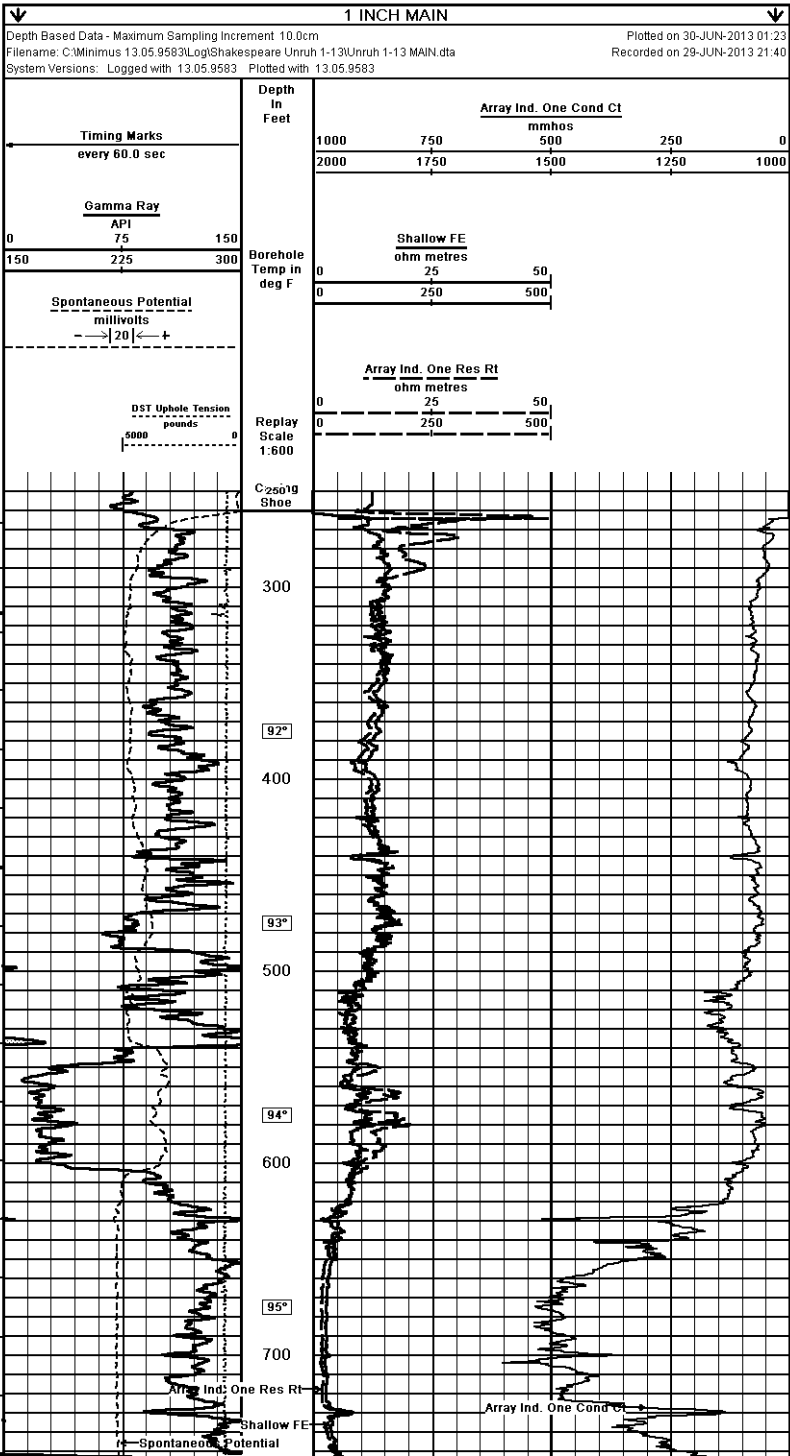
Elevation Kelly Bushing	3113.00	feet	First Reading	4845.00	feet
Elevation Drill Floor	3112.00	feet	Depth Driller	4850.00	feet
Elevation Ground Level	3106.00	feet	Depth Logger	4848.00	feet

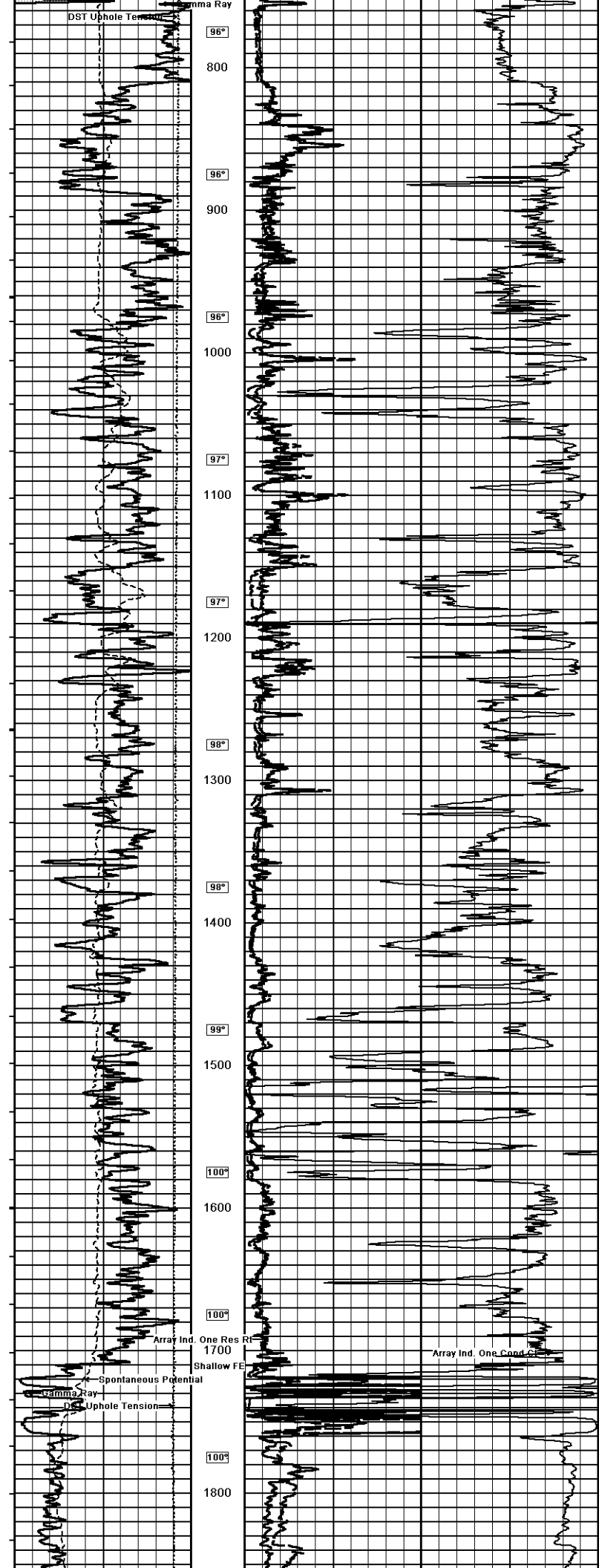


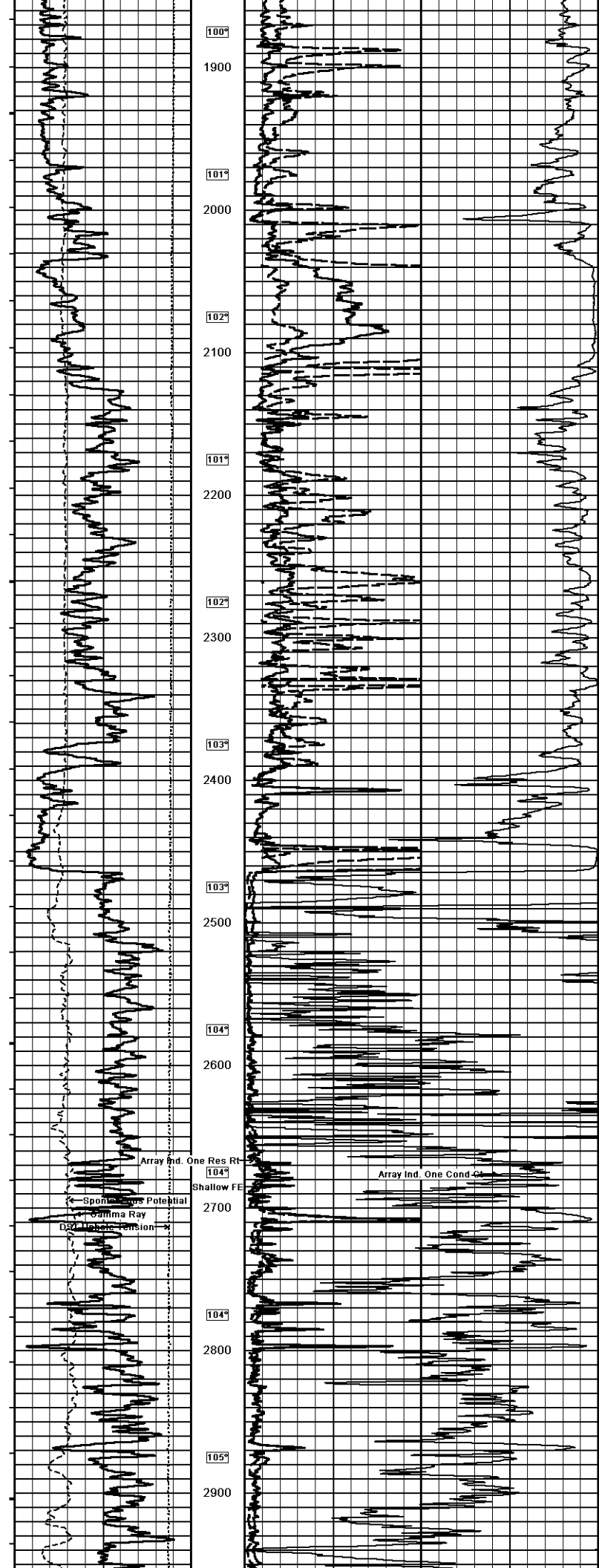
Weatherford®

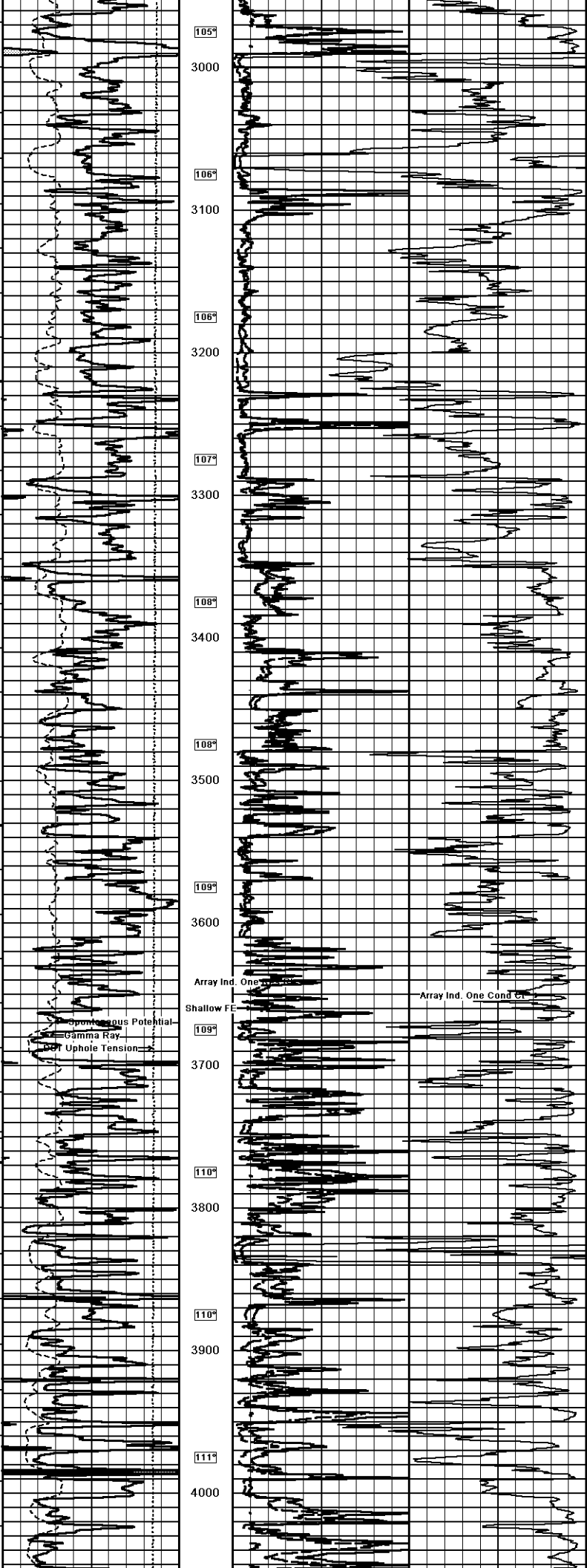
ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

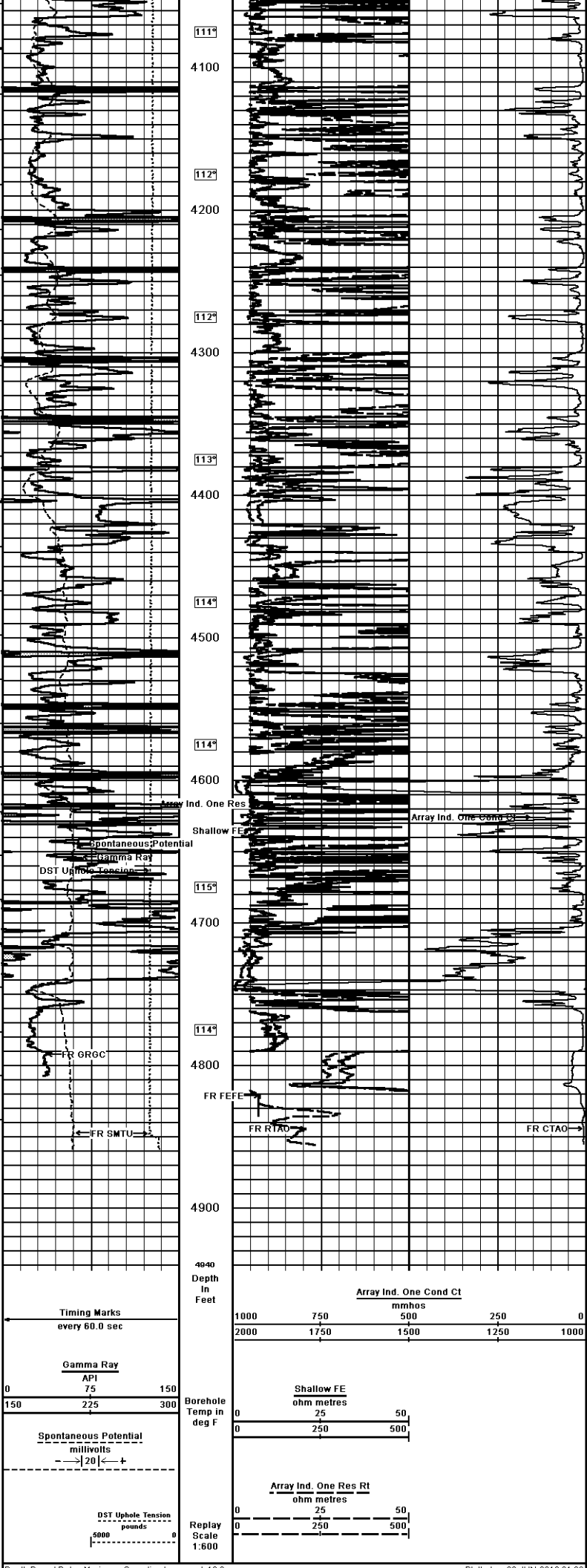
Weatherford		ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG	
COMPANY	SHAKESPEARE OIL COMPANY		
WELL	UNRUH 1-13		
FIELD	WILDCAT		
PROVINCE/COUNTY	SCOTT		
COUNTRY/STATE	UNITED STATES / KANSAS		
LOCATION	2540' FWL & 520' FWL SE SW SW NW		
SSC	TYPE REG	Other Services	
13	IOS 34W	MD/DI/MIN	
Permit Number	15-171-20890	MKS	
Permanent Datum O.L., Elevation 3106 feet			Elevation: 3106
Log Measured From KB			3113.00
Drilling Measured From K.B. @ 7 FEET			3106.00
Date	29-JUN-2013		
Run Number	ONE		
Sample Order	3539945		
Depth Driller	4850.00	feet	
Depth Logger	4848.00	feet	
First Reading	4845.00	feet	
Last Reading	260.00	feet	
Casing Driller	260.00	feet	
Casing Logger	260.00	feet	
Bit Size	7.875	inches	
Hole Fluid Type	CHEMICAL		
Density/Viscosity	9.30 lb/dl@9	53.00 cP	
PI / Fluid Loss	10.00	8.80 ml/30Min	
Sample Source	FLOW LINE		
Rim @ Measured Temp	0.55 @ 78.0	ohm-m	
Rim @ Measured Temp	0.44 @ 78.0	ohm-m	
Rim @ Measured Temp	0.66 @ 78.0	ohm-m	
Source Rim / Rimc	CALC	CALC	
Rim @ BHT	0.37 @ 15.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	115.00	deg F	
Equipment Base	13008		
Recorded By	D. COLE		
Witnessed By	S. DENNIS		
UTM#	LE13-188		











COMPANY	SHAKESPEARE OIL COMPANY				
WELL	UNRUH 1-13				
FIELD	WILDCAT				
PROVINCE/COUNTY	SCOTT				
COUNTRY/STATE	UNITED STATES / KANSAS				
Elevation Kelly Bushing	3113.00	feet	First Reading	4845.00	feet
Elevation Drill Floor	3112.00	feet	Depth Driller	4850.00	feet
Elevation Ground Level	3106.00	feet	Depth Logger	4848.00	feet
 ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG					