



Weatherford®

**ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG**

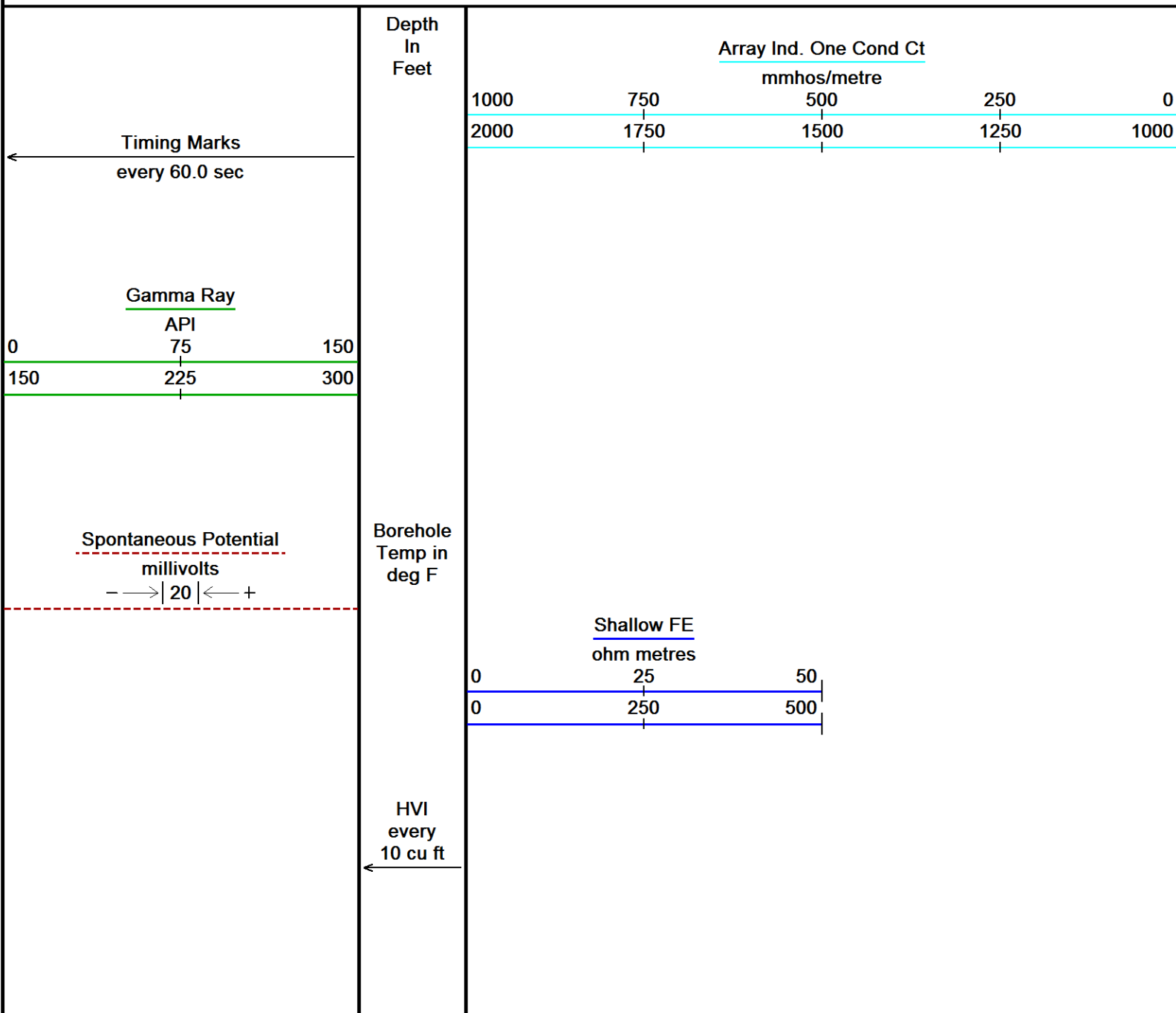
COMPANY		GRAND MESA OPERATING COMPANY			
WELL		SEQUOIA #1-36			
FIELD		WILDCAT			
PROVINCE/COUNTY		WASHINGTON			
COUNTRY/STATE		U.S.A. / COLORADO			
LOCATION		1172' FNL & 932' FEL			
SEC 36	TWP 7S	RGE 55W	Other Services		
Latitude	39.40027778		MPD/MDN		MML
Longitude	-103.49444444		MSS		
API Number	05-073-06730				
Permanent Datum GL, Elevation 5451 feet					Elevations: KB 5470.00 DF 5468.00 GL 5451.00
Log Measured From KB, 19.00 feet above Permanent Datum					
Drilling Measured From KB					
Date	20-DEC-2017				
Run Number	ONE				
Service Order	17937-200937803				
Depth Driller	8462.00				feet
Depth Logger	8457.00				feet
First Reading	8454.00				feet
Last Reading	437.00				feet
Casing Driller	437.00				feet
Casing Logger	437.00				feet
Bit Size	7.875				inches
Hole Fluid Type	CHEMICAL				
Density / Viscosity	9.30 lb/USg		75.00	sec/qt	
PH / Fluid Loss	10.50		6.40	ml/30Min	
Sample Source	FLOWLINE				
Rm @ Measured Temp	1.10 @ 77.0				ohm-m
Rmf @ Measured Temp	0.88 @ 77.0				ohm-m
Rmc @ Measured Temp	1.32 @ 77.0				ohm-m
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.49 @177.0				ohm-m
Time Since Circulation	6 HOURS				
Max Recorded Temp	177.00		deg F		
Equipment / Base	13057		OKC		
Recorded By	M. MCGLOTHLIN		H. LEJEUNE		
Witnessed By	KENT MATSON				

BOREHOLE RECORD					Last Edited: 20-DEC-2017 10:34
Bit Size inches		Depth From feet		Depth To feet	
7.875		437.00		8500.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	437.00	24.00	

REMARKS
- SOFTWARE ISSUE: WLS 17.05.5956.
- RUN ONE: SHA, MCG, MML, MDN, MPD, SKJ, 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: 3530 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 2210 CU.FT.

- OPERATOR: D. GILLISPIE.

↓	2 INCH MAIN	↓
Depth Based Data - Maximum Sampling Increment 10.0cm		Plotted on 20-DEC-2017 13:45
Filename: C:\Minimus 17.05.5956\Data\GRAND MESA (SEQUOIA #1-36)\MAIN PASS.dta		Recorded on 20-DEC-2017 07:52
System Versions: Logged with 17.05.5956 Plotted with 17.05.5956		



Annular
Integral
every
10 cu ft

Array Ind. One Res Rt
ohm metres

0 25 50
0 250 500

DST Uphole Tension
pounds
5000 0

Replay
Scale
1:600

Casing
430
Since

2200

500

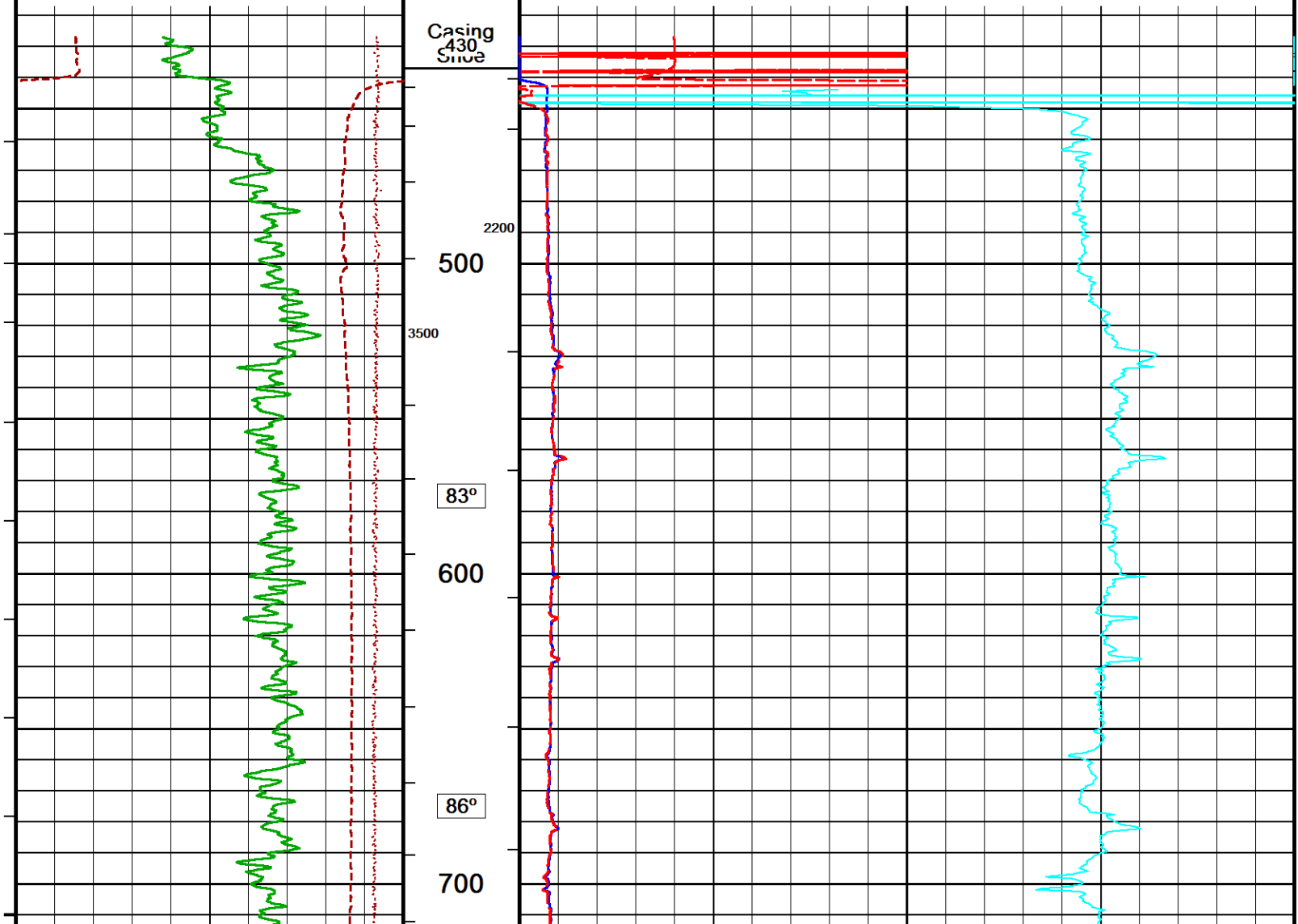
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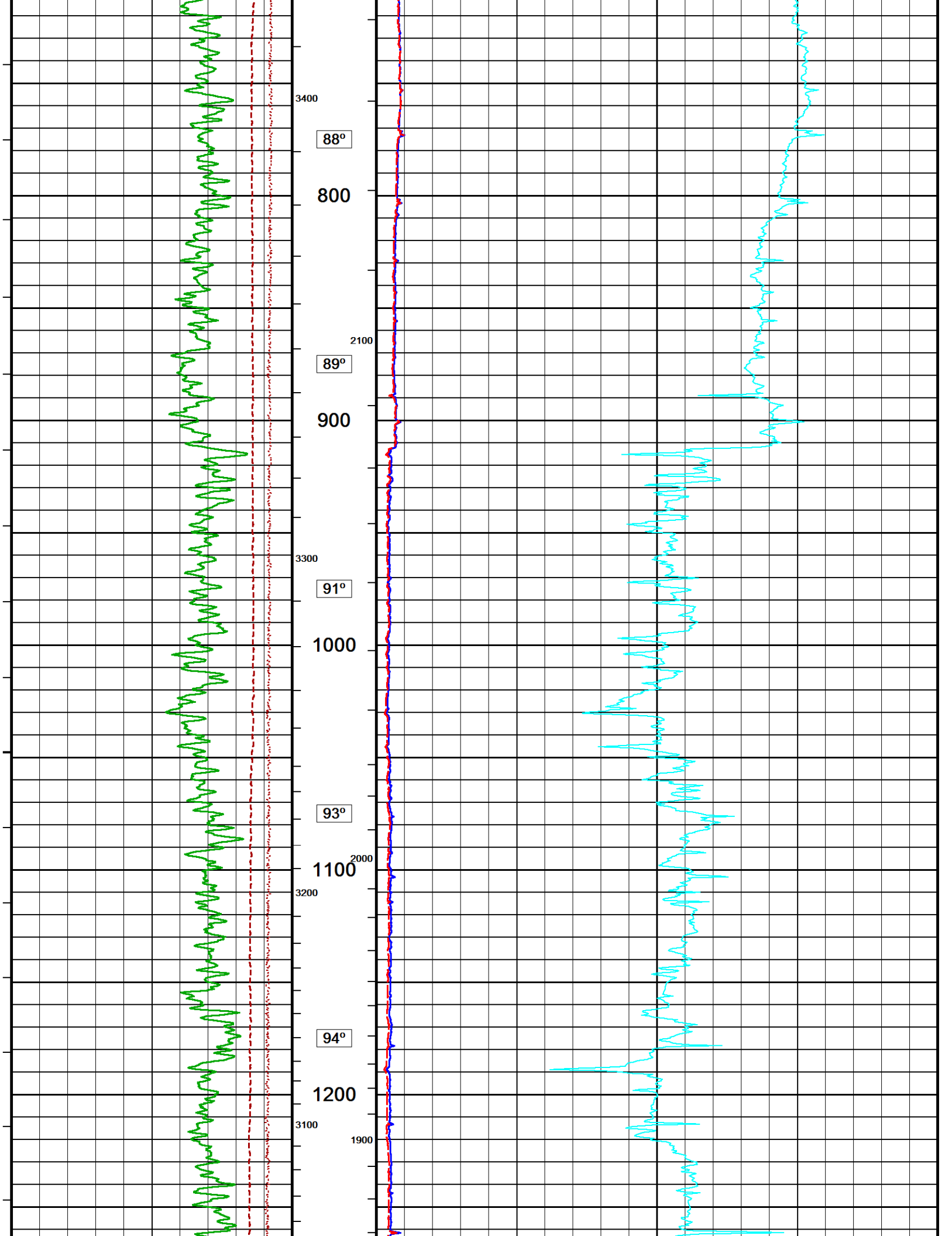
83°

600

86°

700





DST Uphole Tension →

Array Ind. One Res Rt →

1300

Shallow FE →

← Spontaneous Potential

← Gamma-Ray

Array Ind. One Cond Ct →

3000

96°

1400

1800

97°

1500

98°

2900

99°

1600

101°

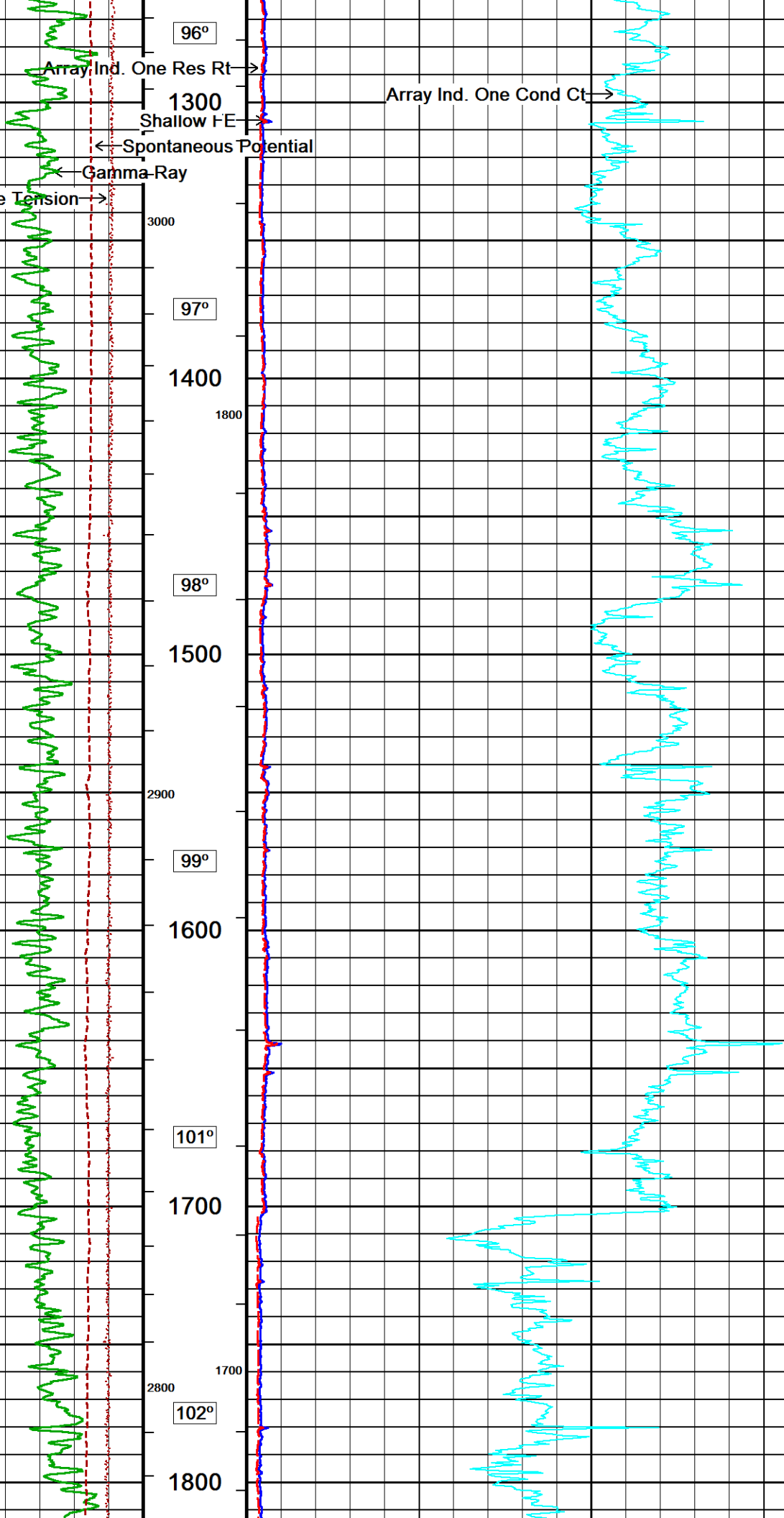
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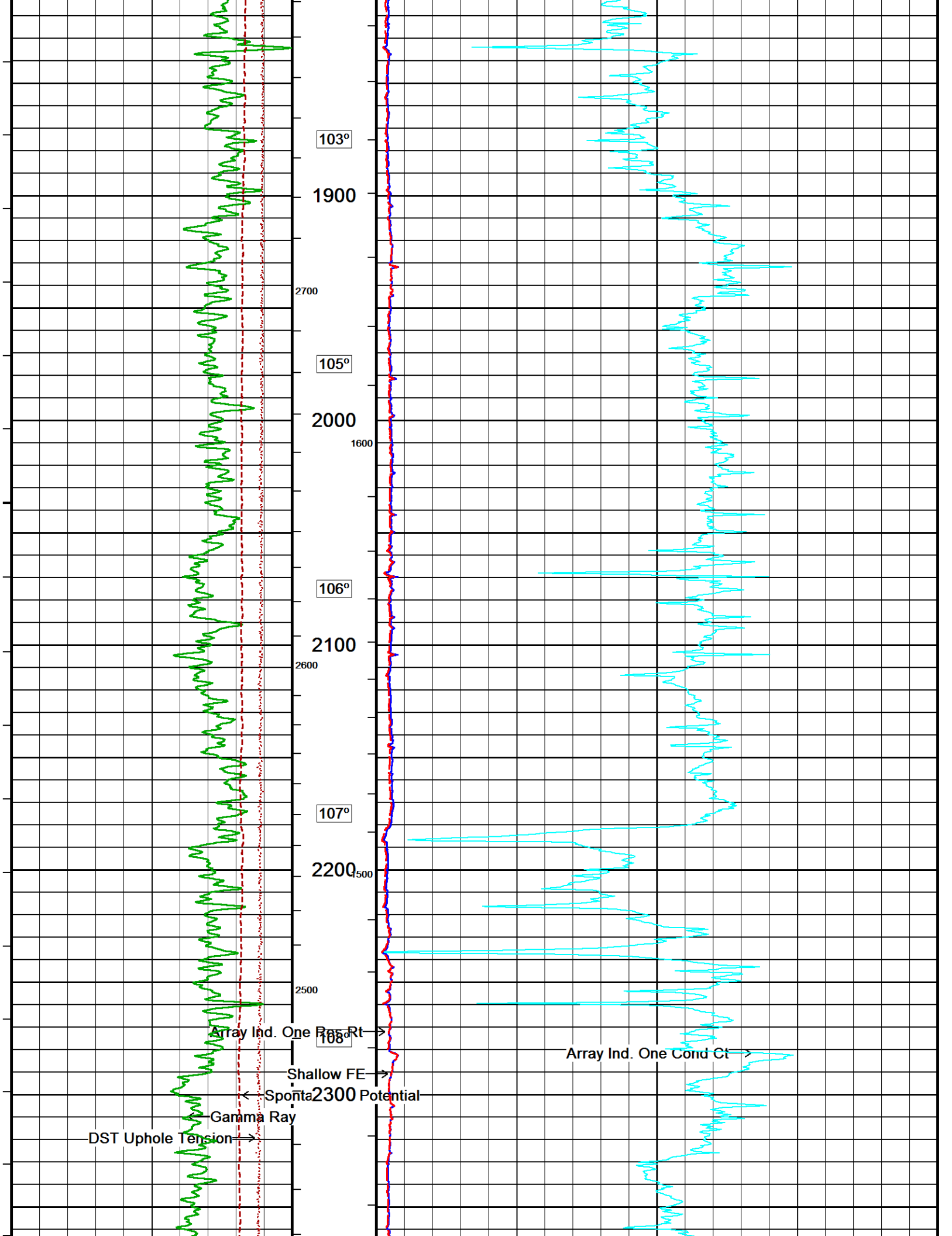
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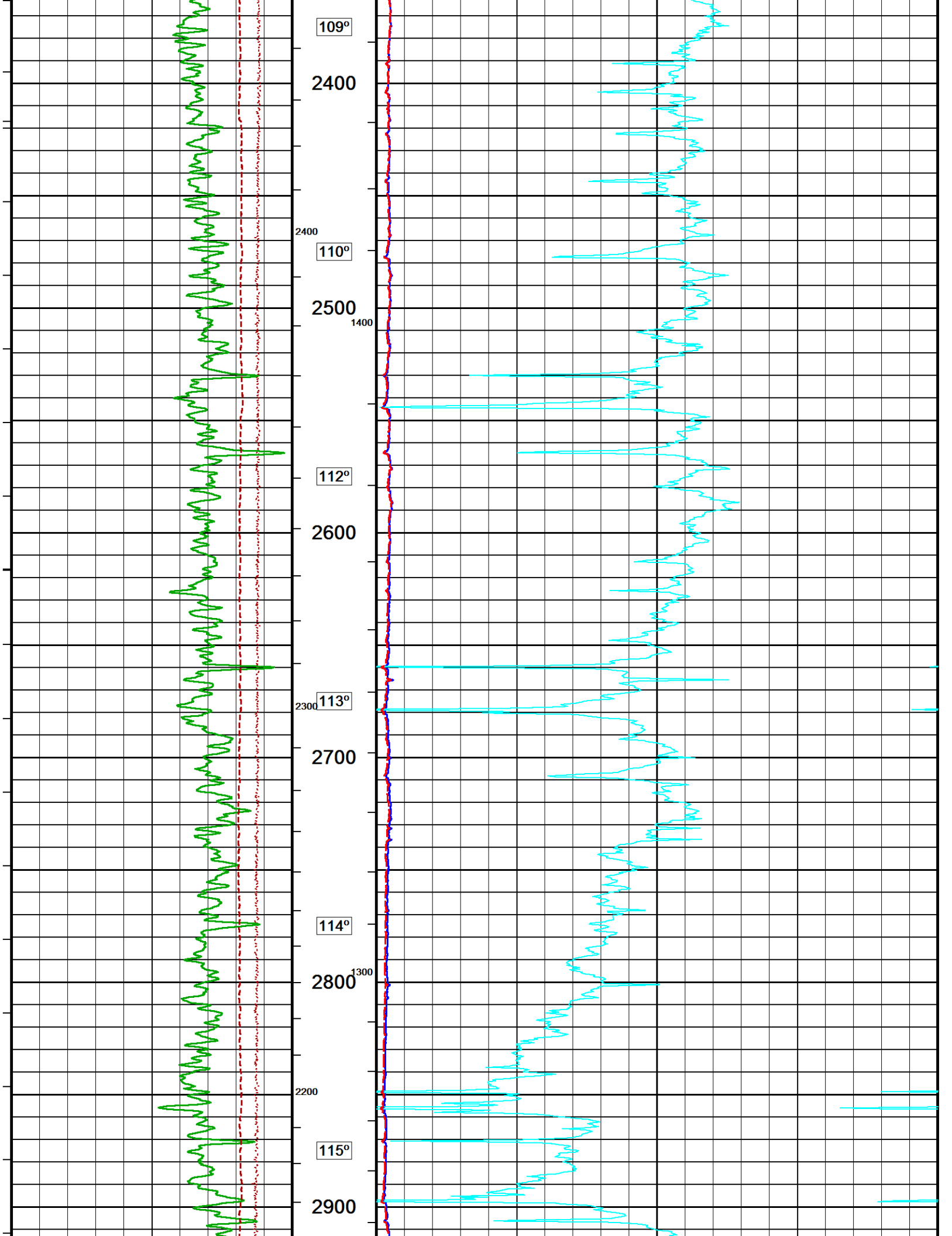
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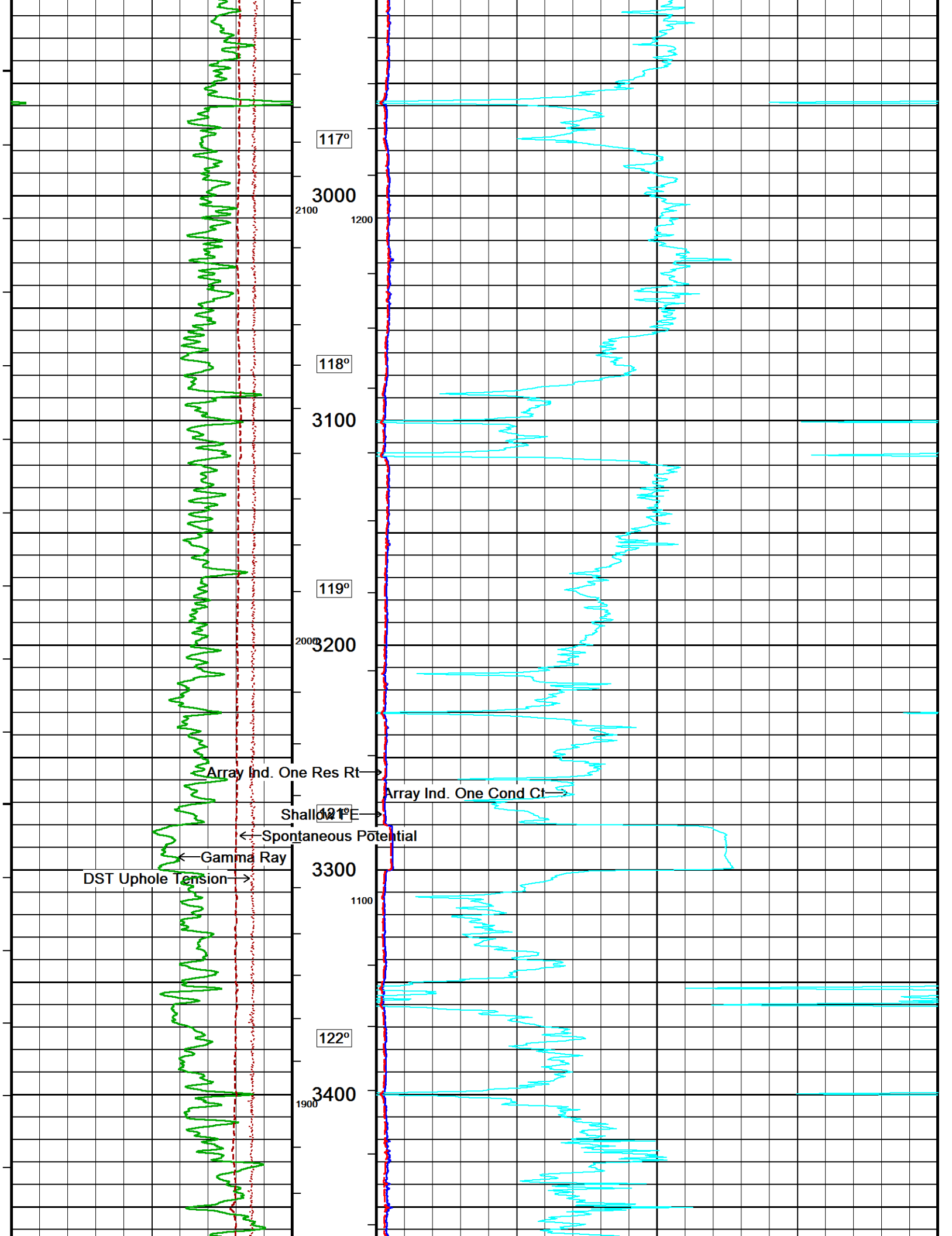
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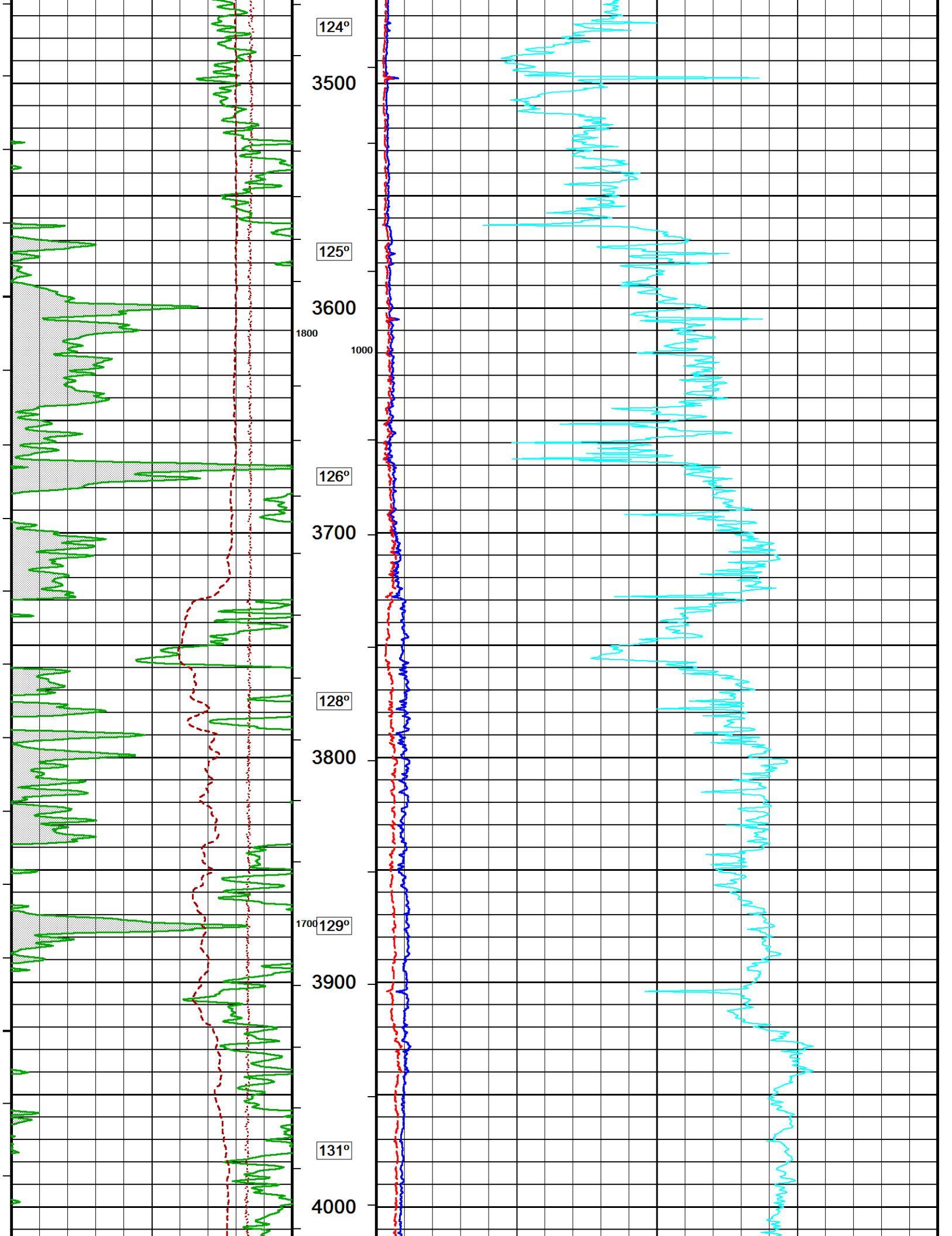
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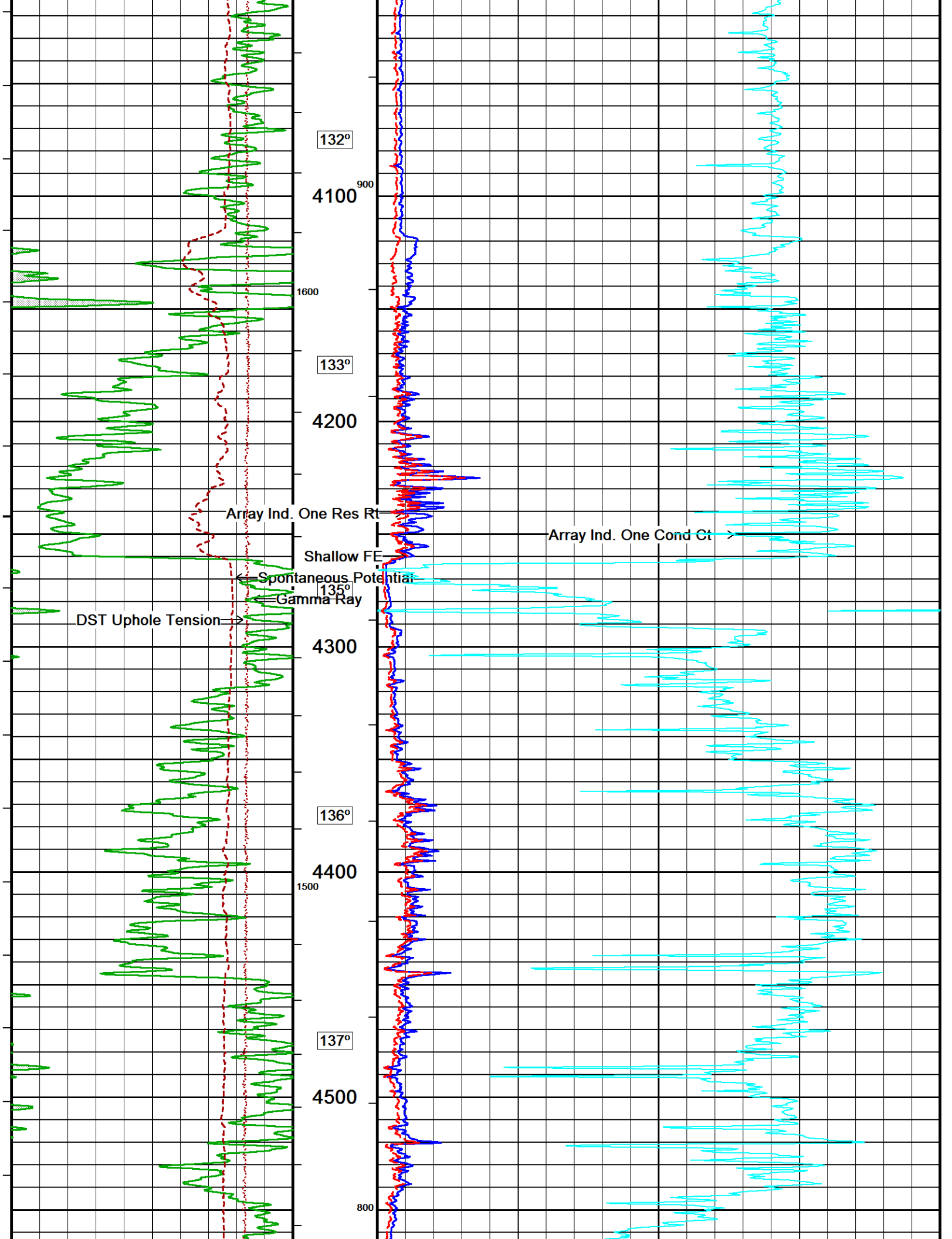


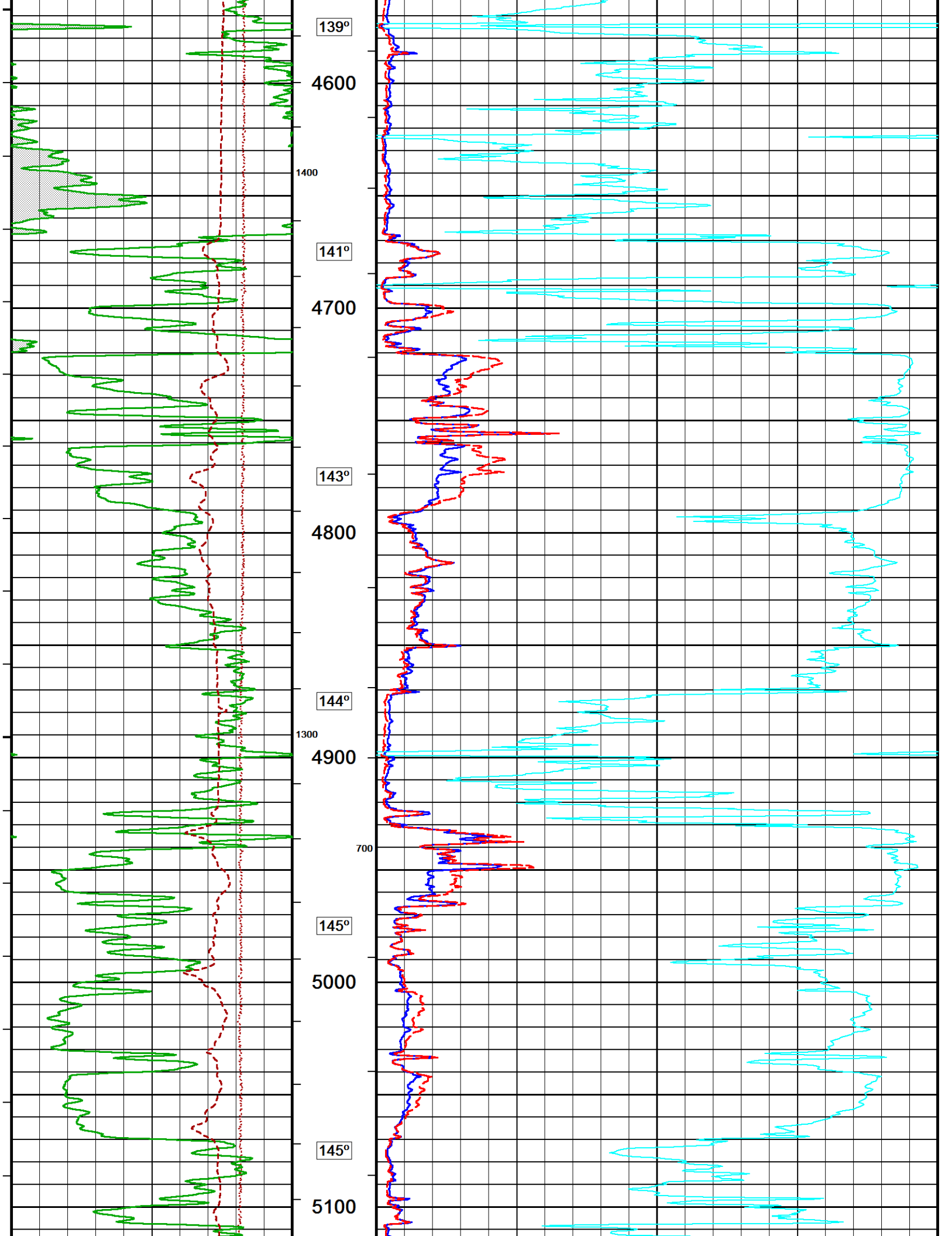


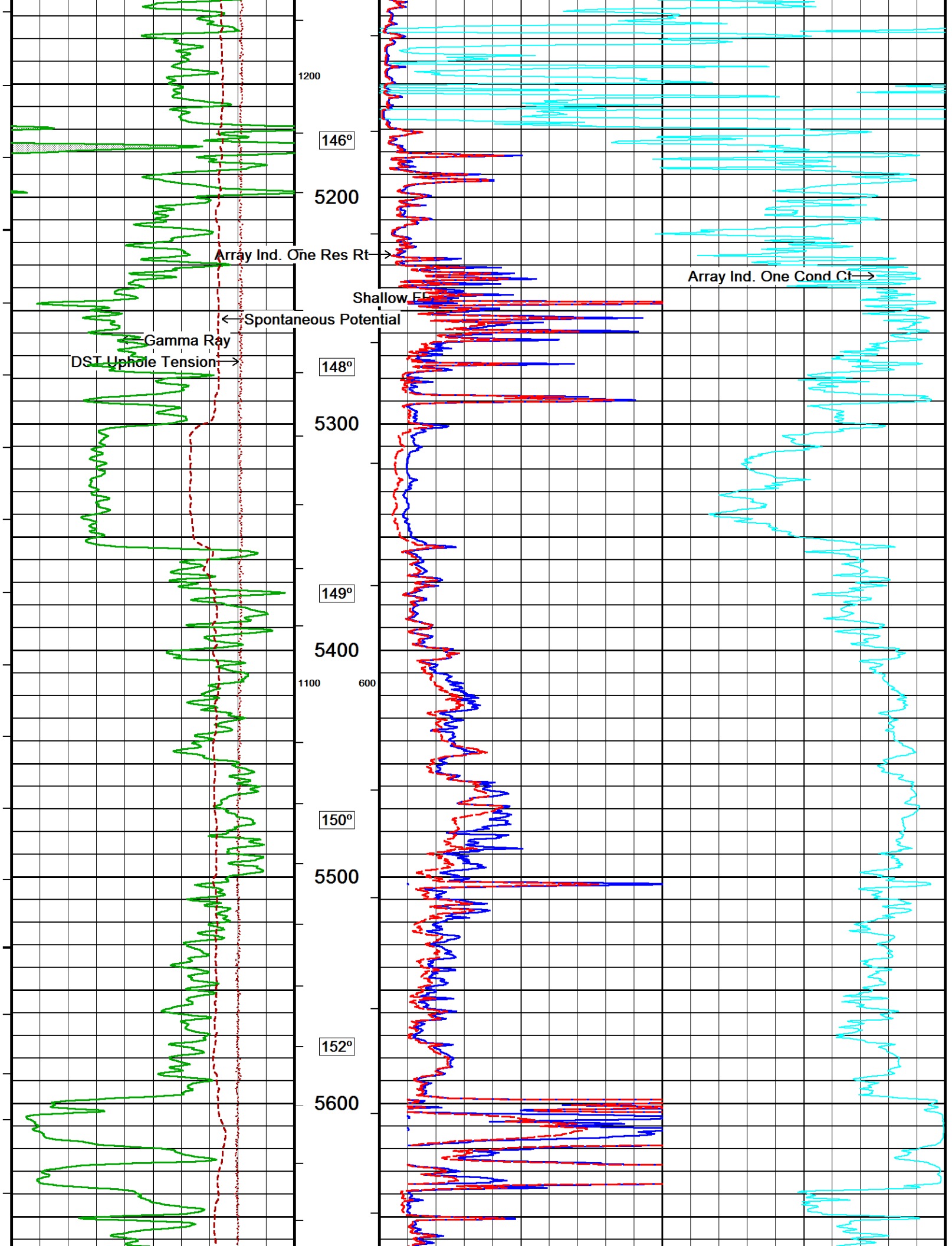


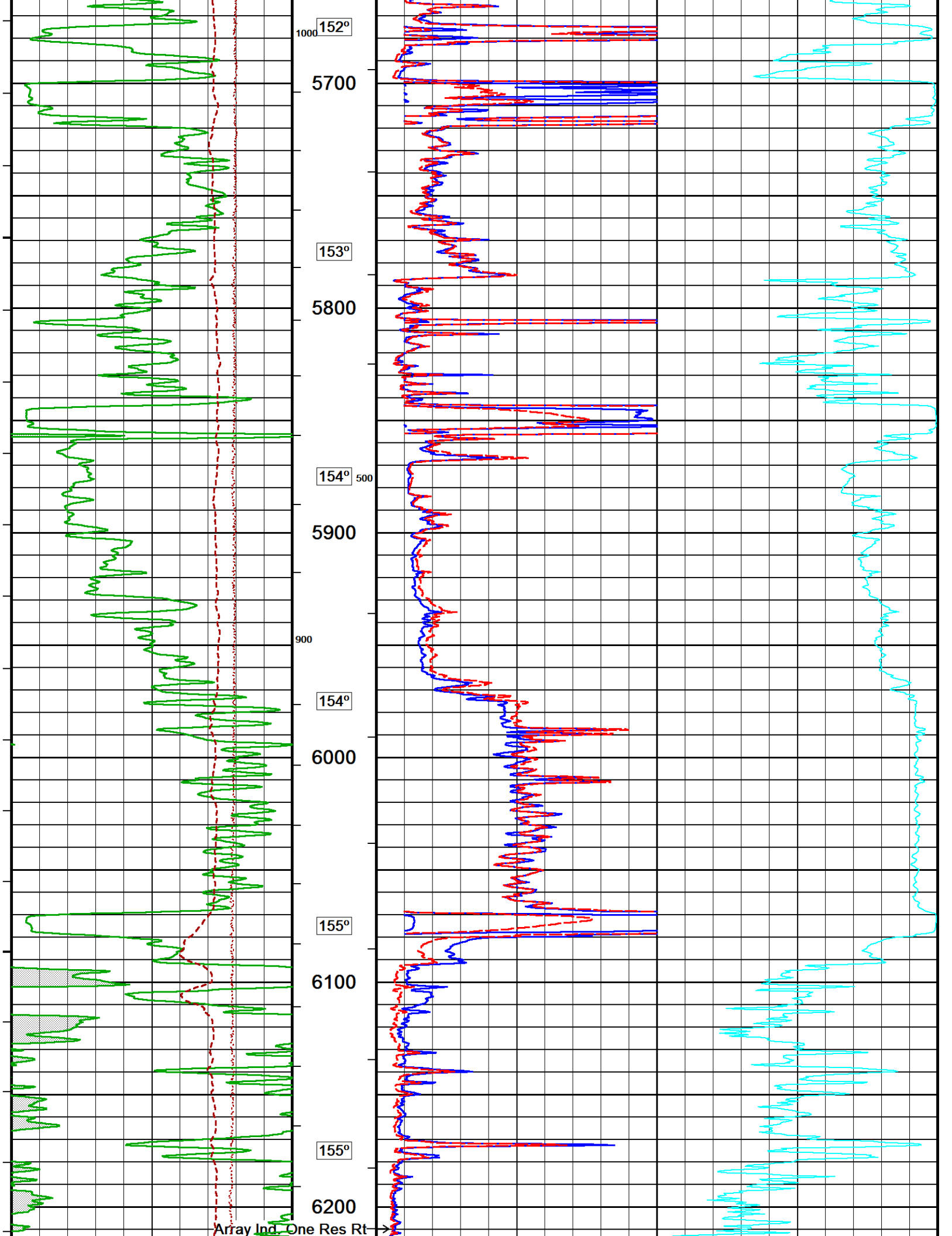


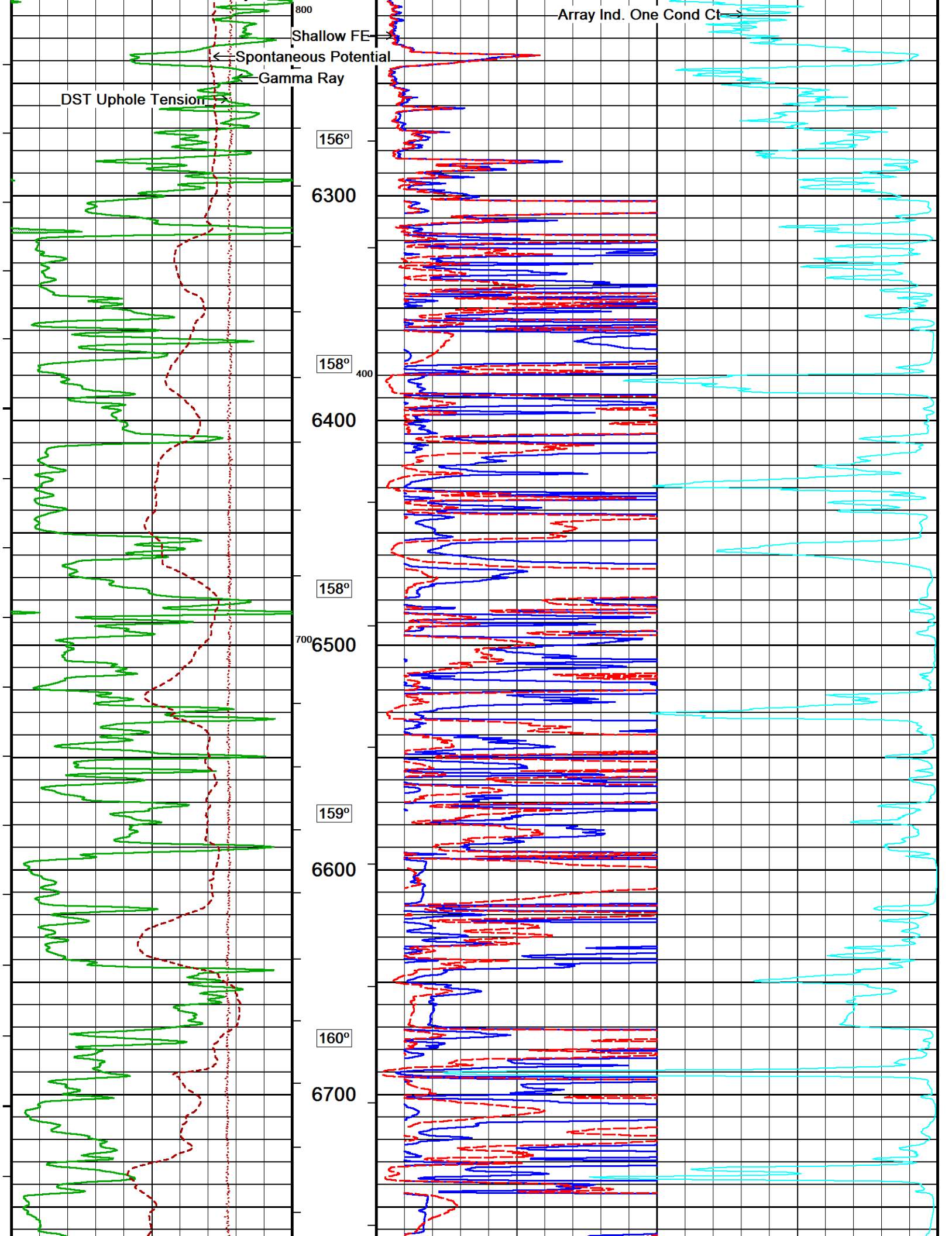


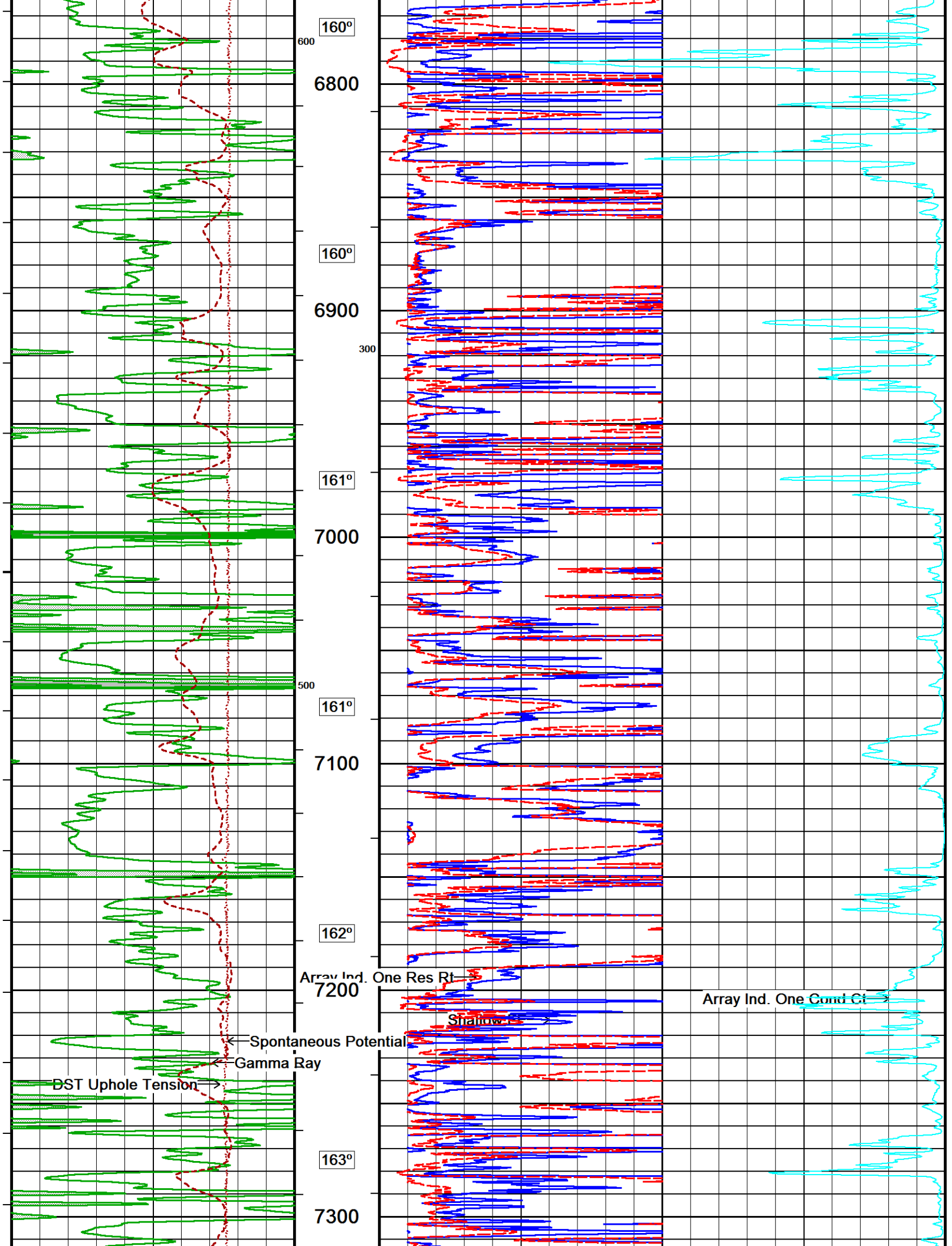


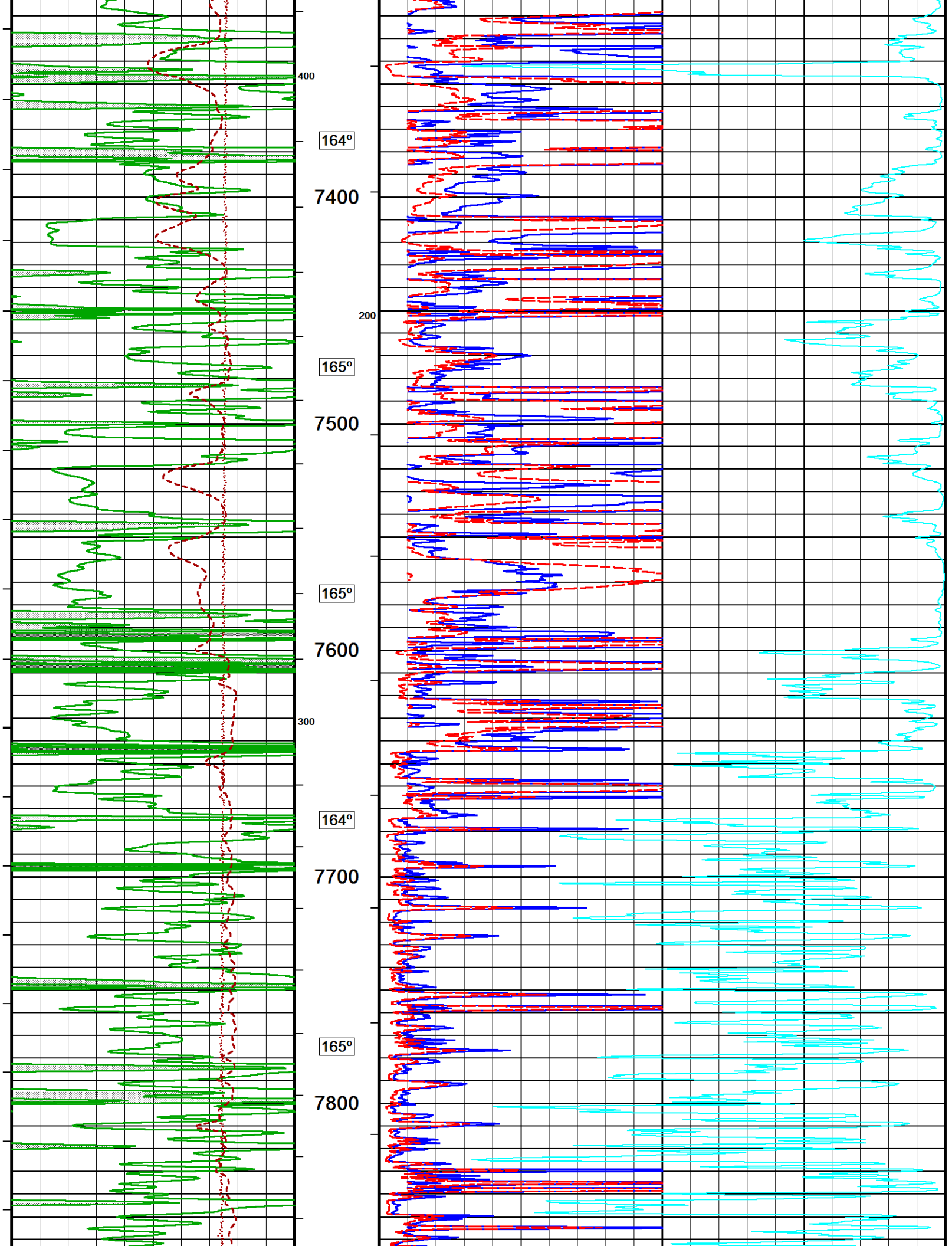


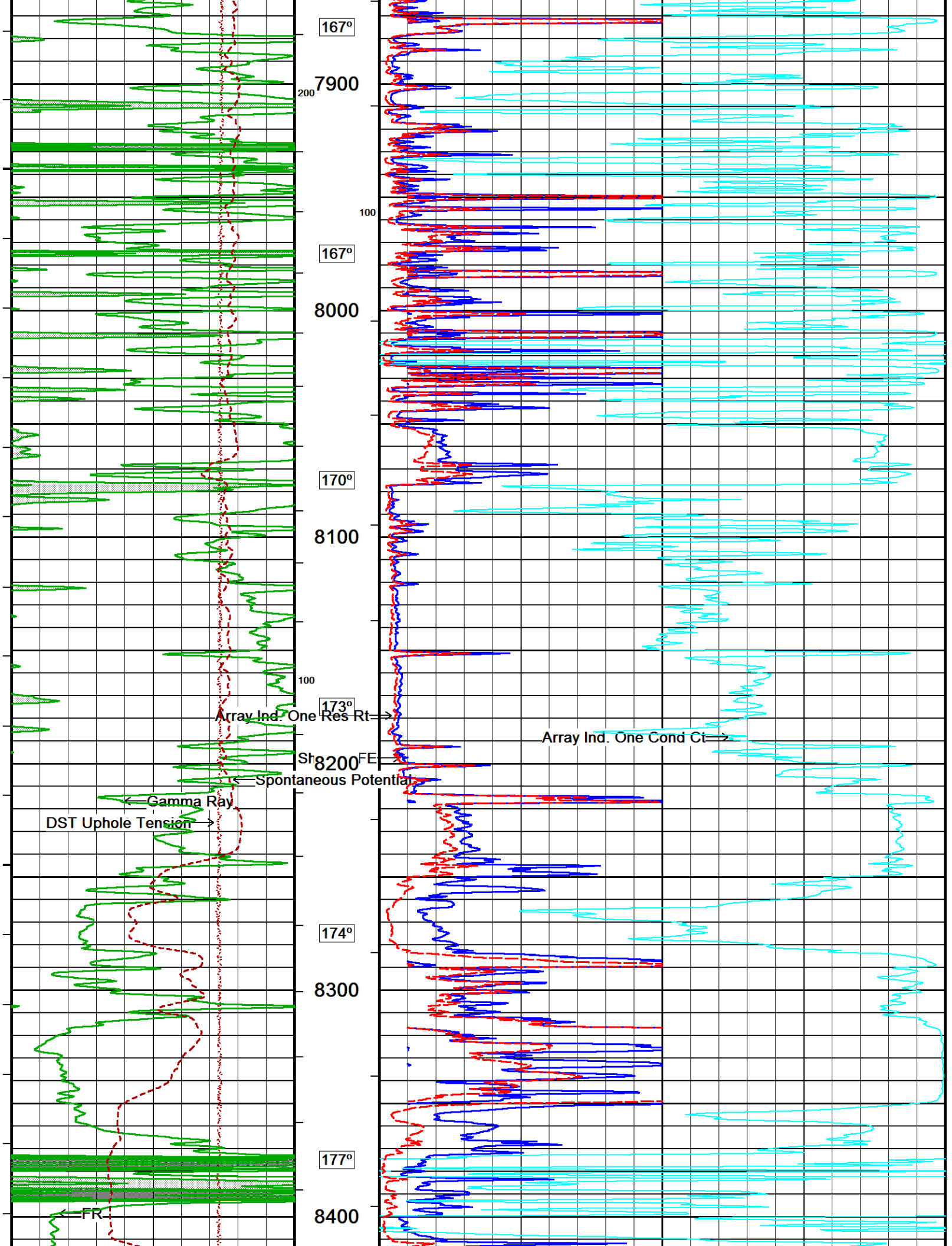


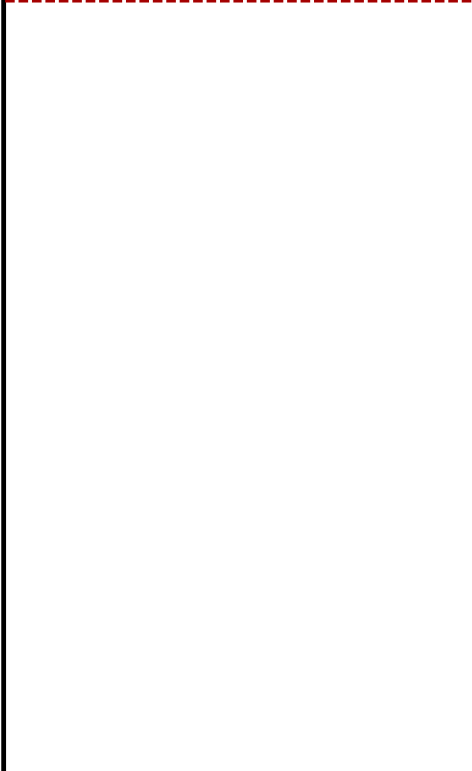
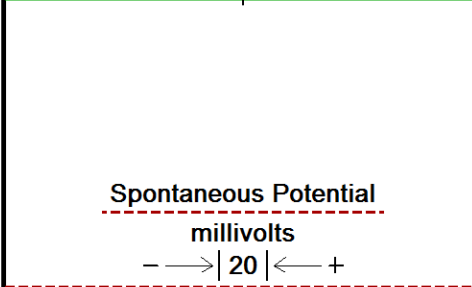
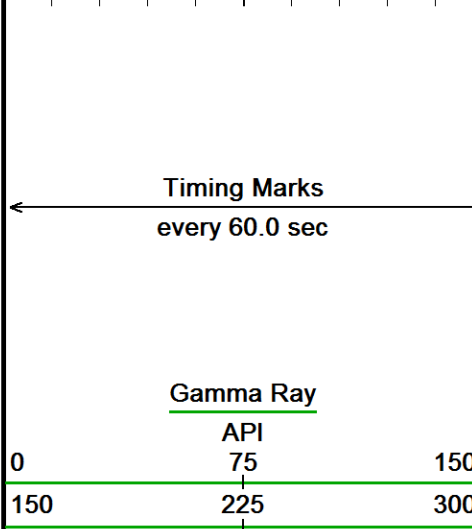
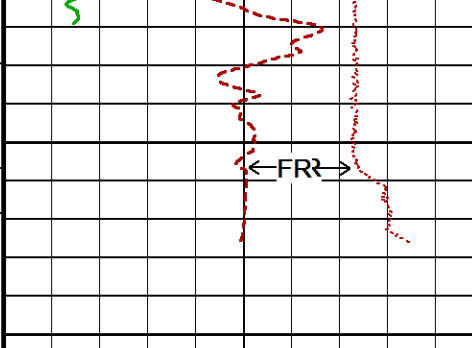






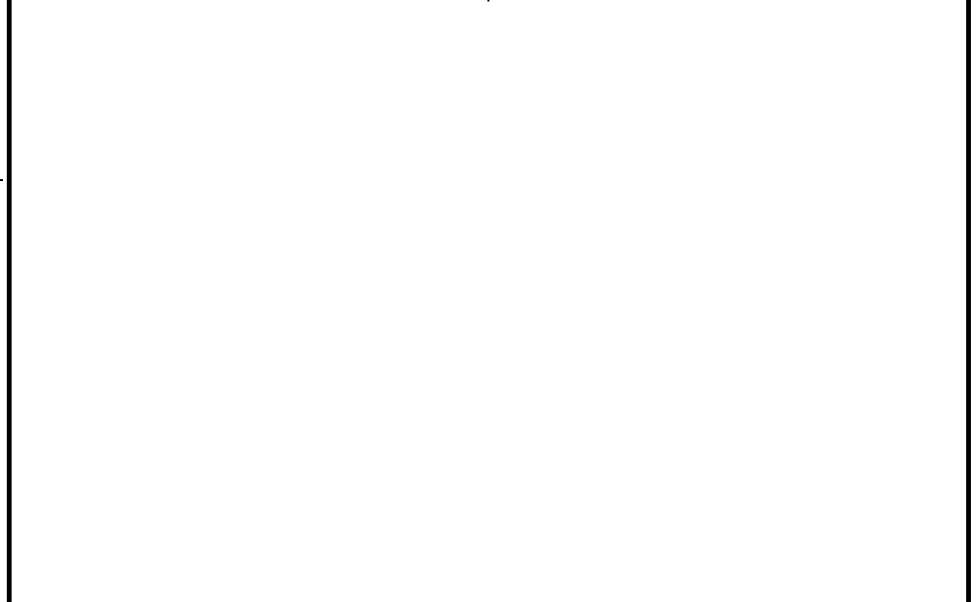
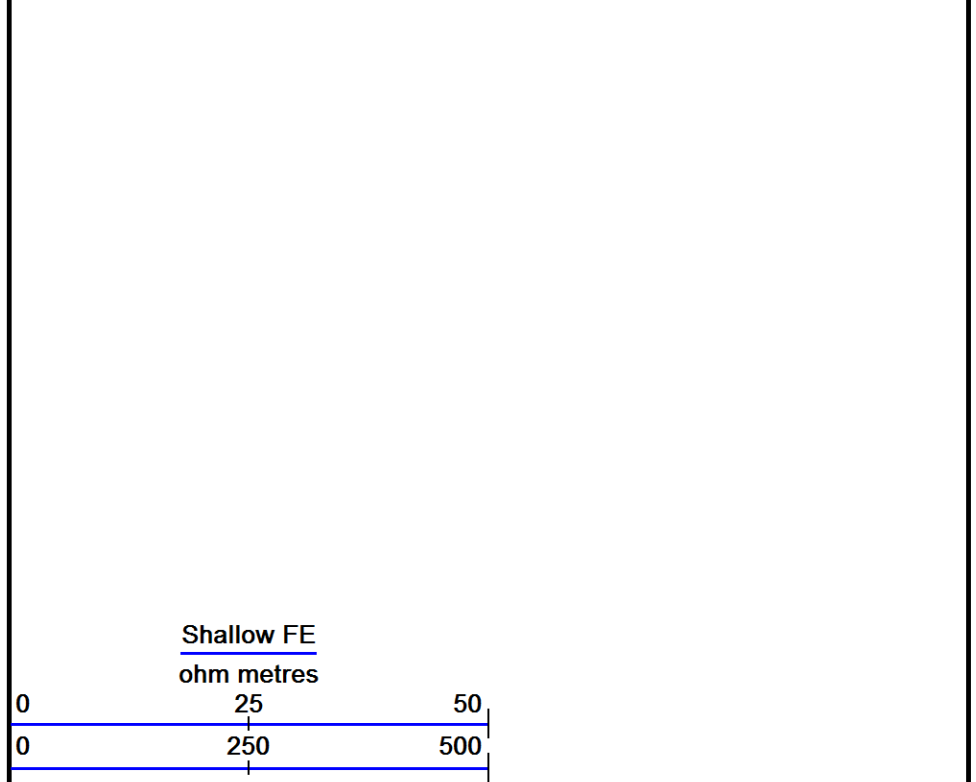
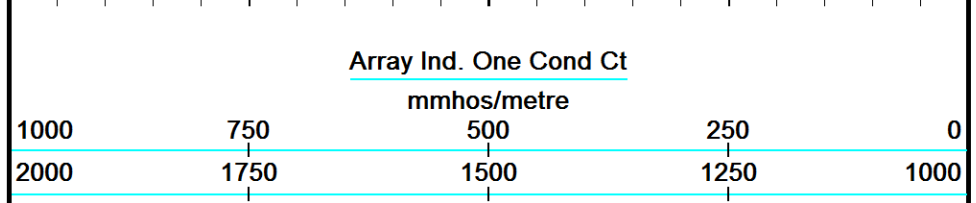
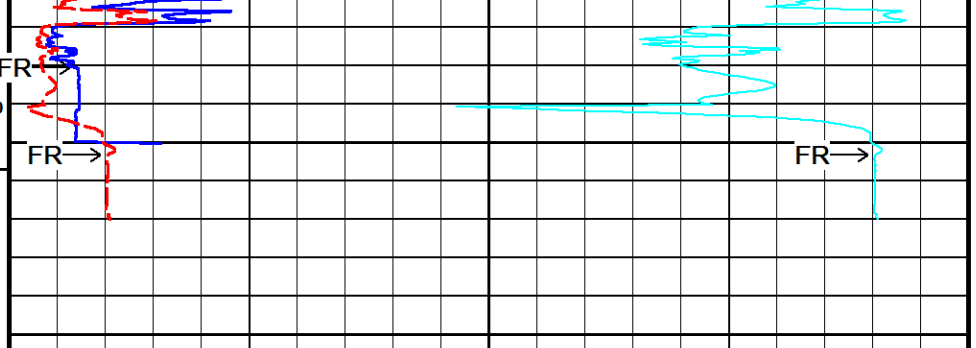


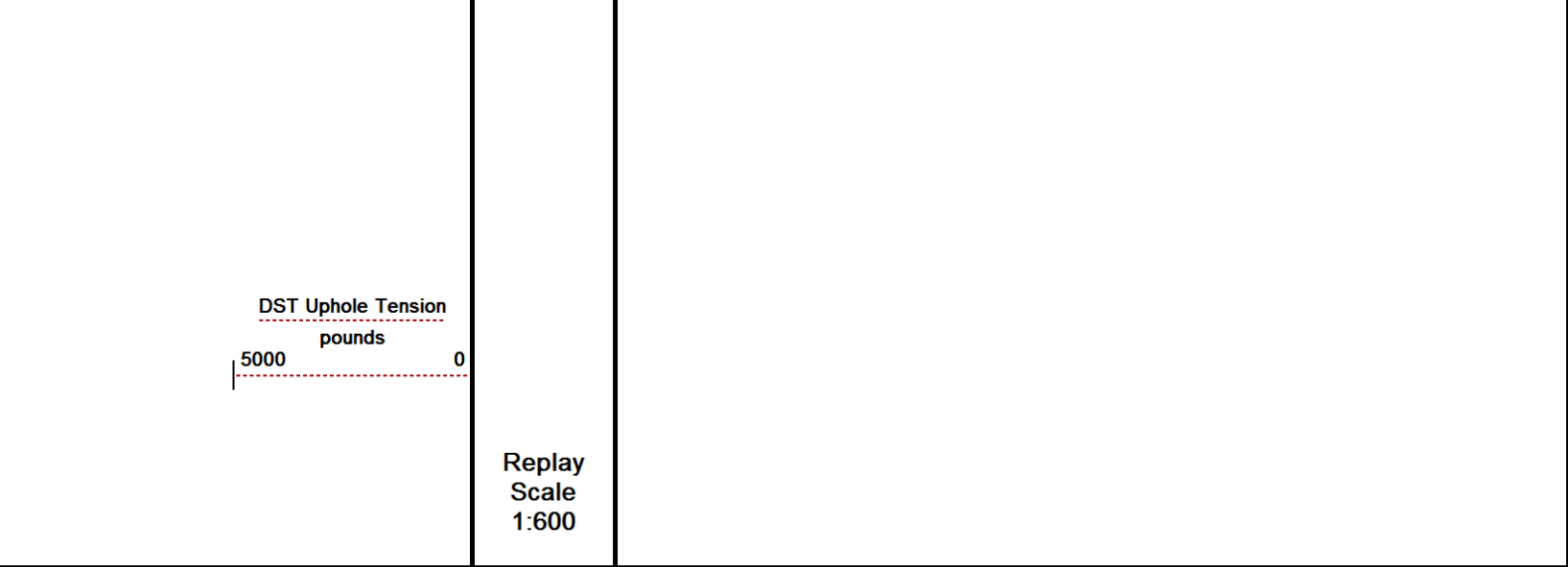




8500
Depth
In
Feet

TD





Depth Based Data - Maximum Sampling Increment 10.0cmPlotted on 20-DEC-2017 13:45

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System Versions: Logged with 17.05.5956 Plotted with 17.05.5956

↑

2 INCH MAIN

↑

↓

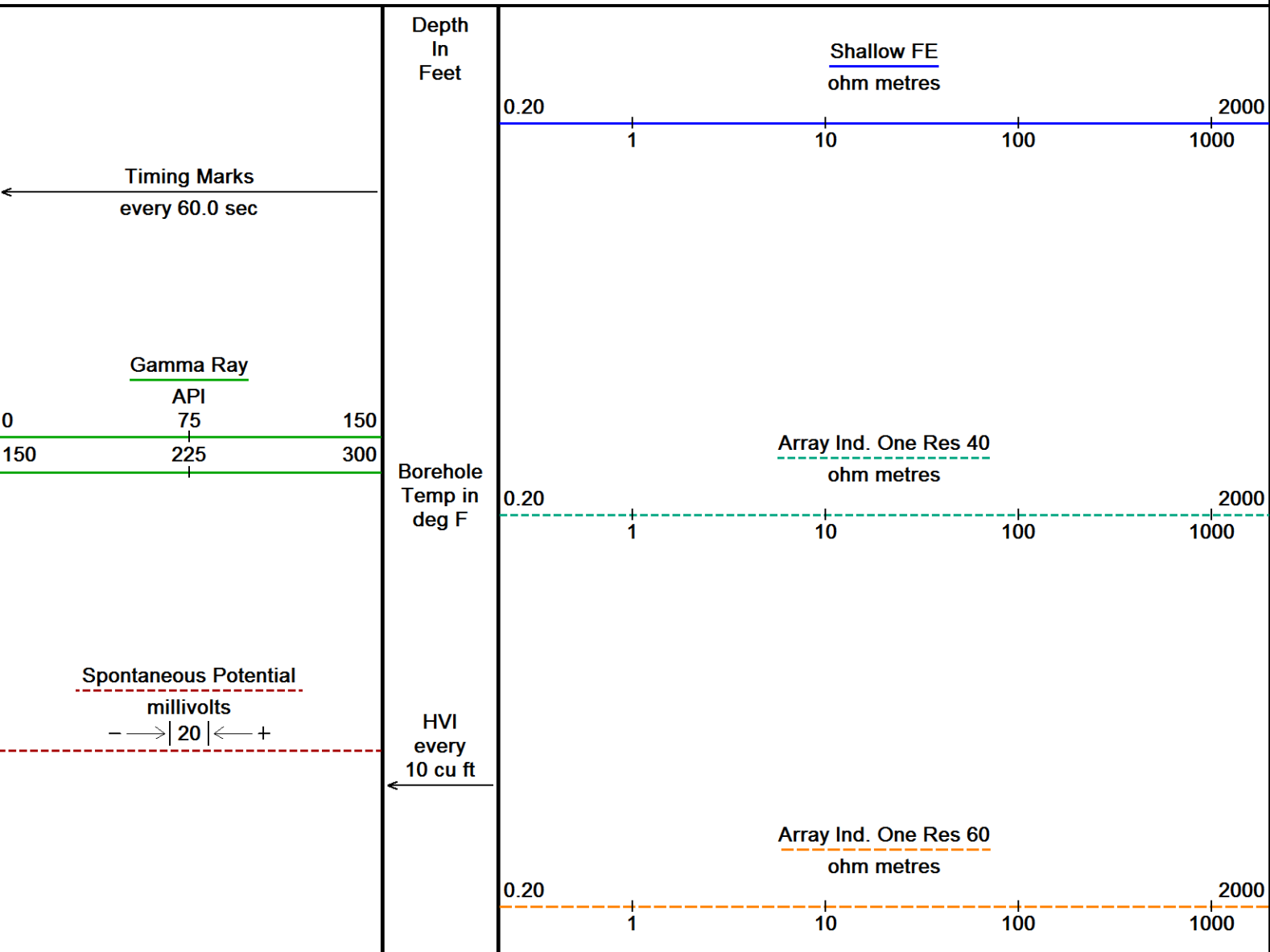
5 INCH MAIN

↓

Depth Based Data - Maximum Sampling Increment 10.0cmPlotted on 20-DEC-2017 13:45

Filename: C:\Minimus 17.05.5956\Data\GRAND MESA (SEQUOIA #1-36)\MAIN PASS.dtaRecorded on 20-DEC-2017 07:52

System Versions: Logged with 17.05.5956 Plotted with 17.05.5956



Annular
Integral
every
10 cu ft



Array Ind. One Res Rt
ohm metres

0.20

1

10

100

1000

2000

DST Uphole Tension
pounds

5000

0

Replay
Scale
1:240

426

Casing
Shoe

450

Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FE

82°

2200

← Spontaneous Potential

← Gamma Ray

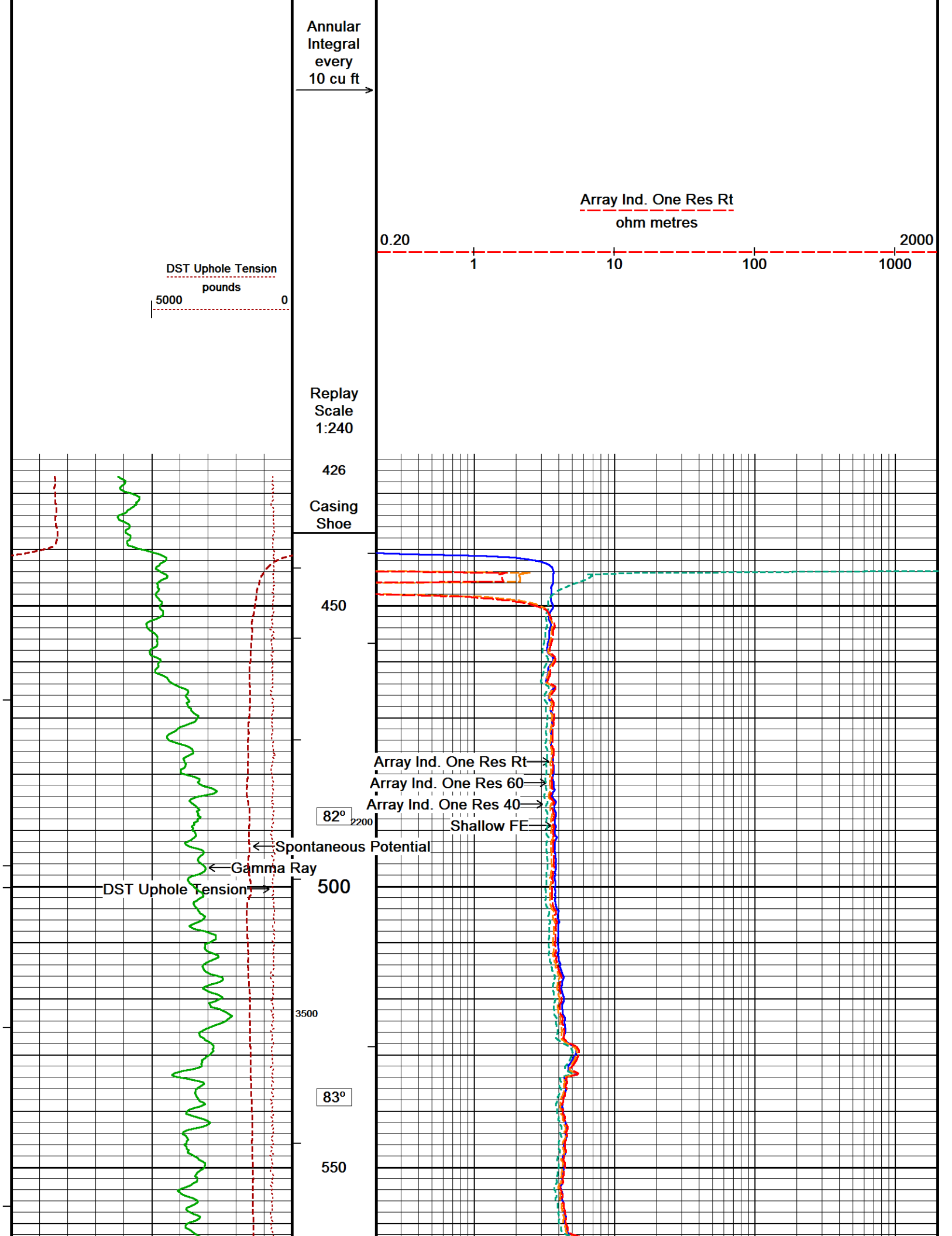
DST Uphole Tension

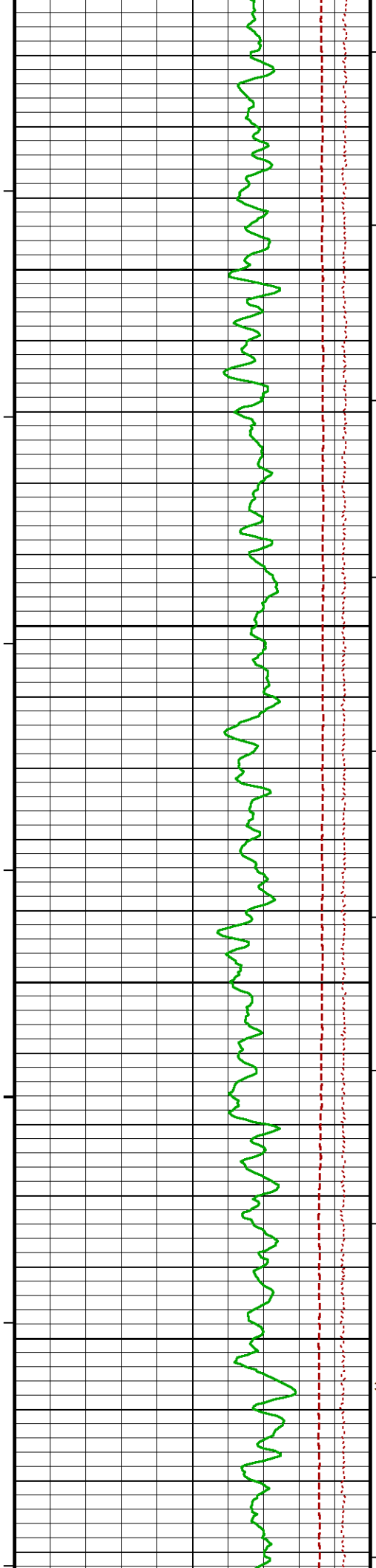
500

3500

83°

550





84°

600

85°

650

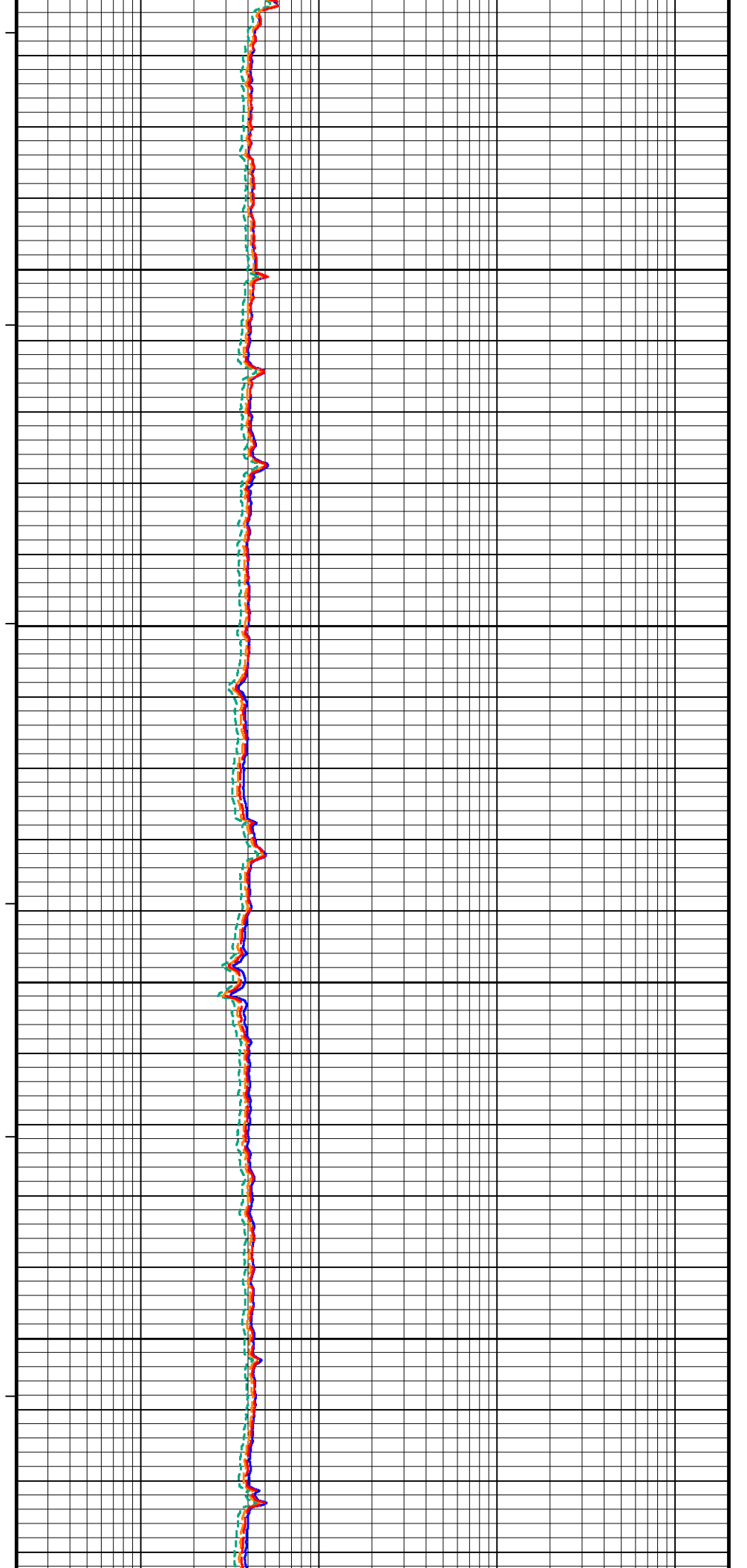
86°

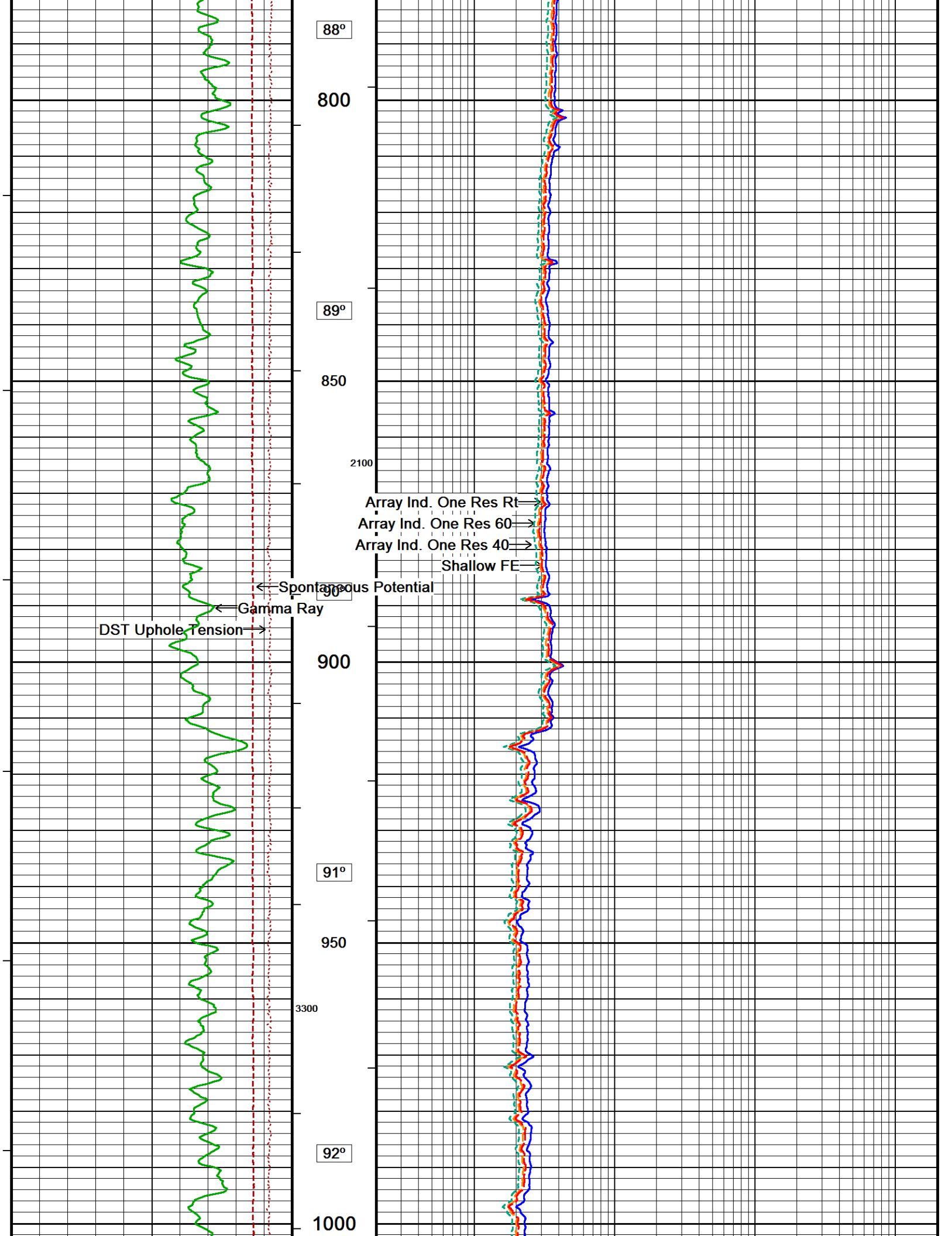
700

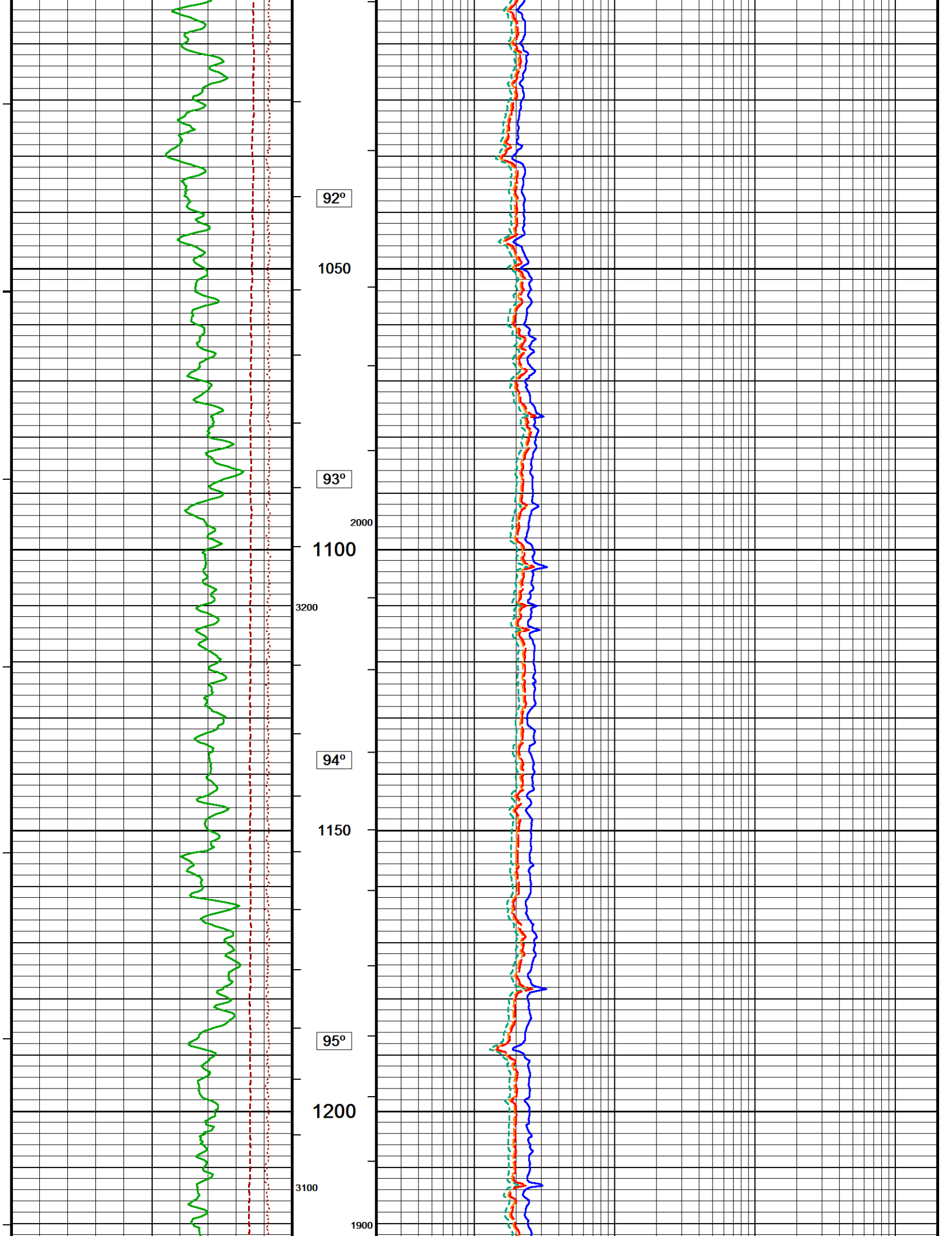
87°

750

3400







DST Uphole Tension

Spontaneous Potential
Gamma Ray

95°

1250

1300

97°

3000

1350

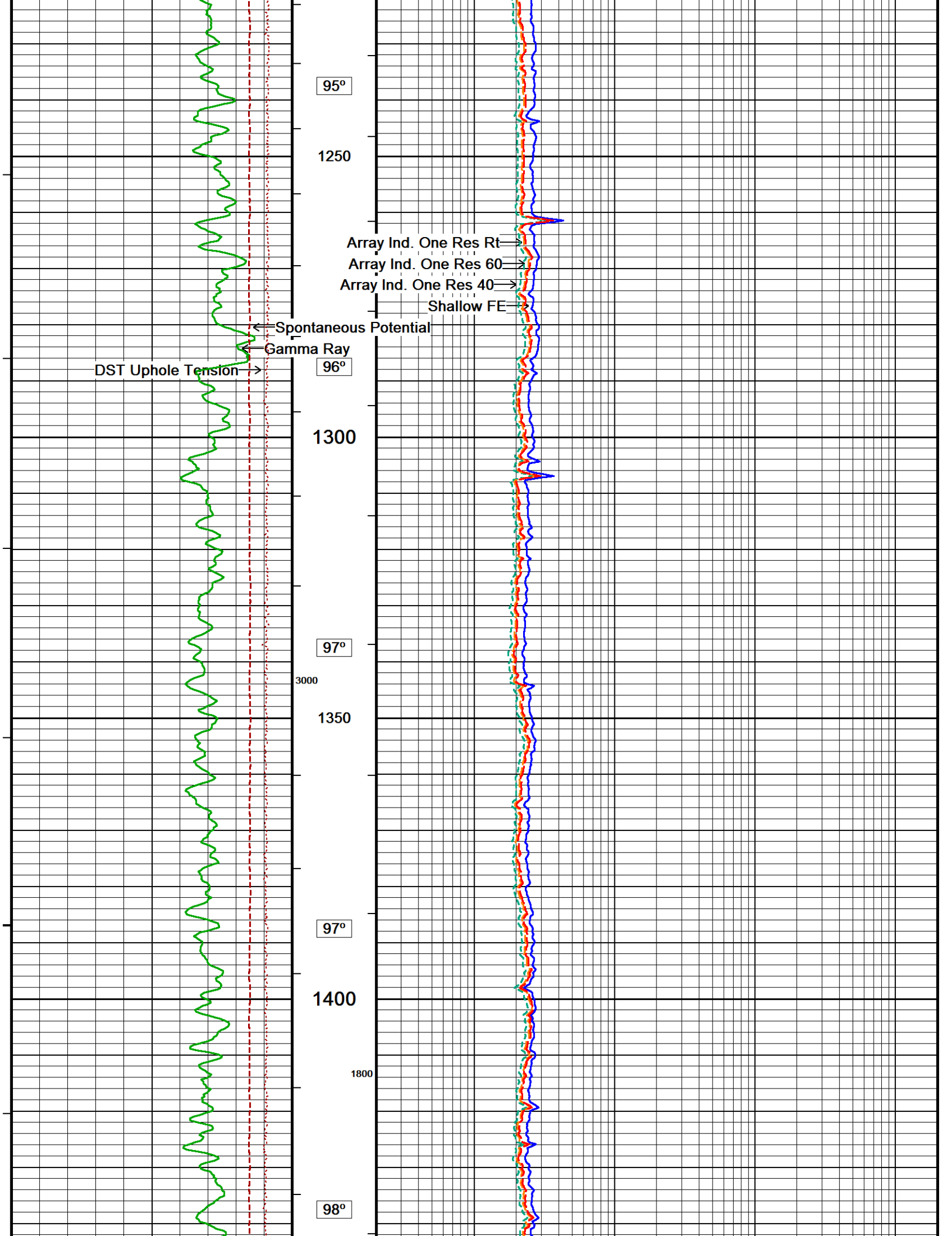
97°

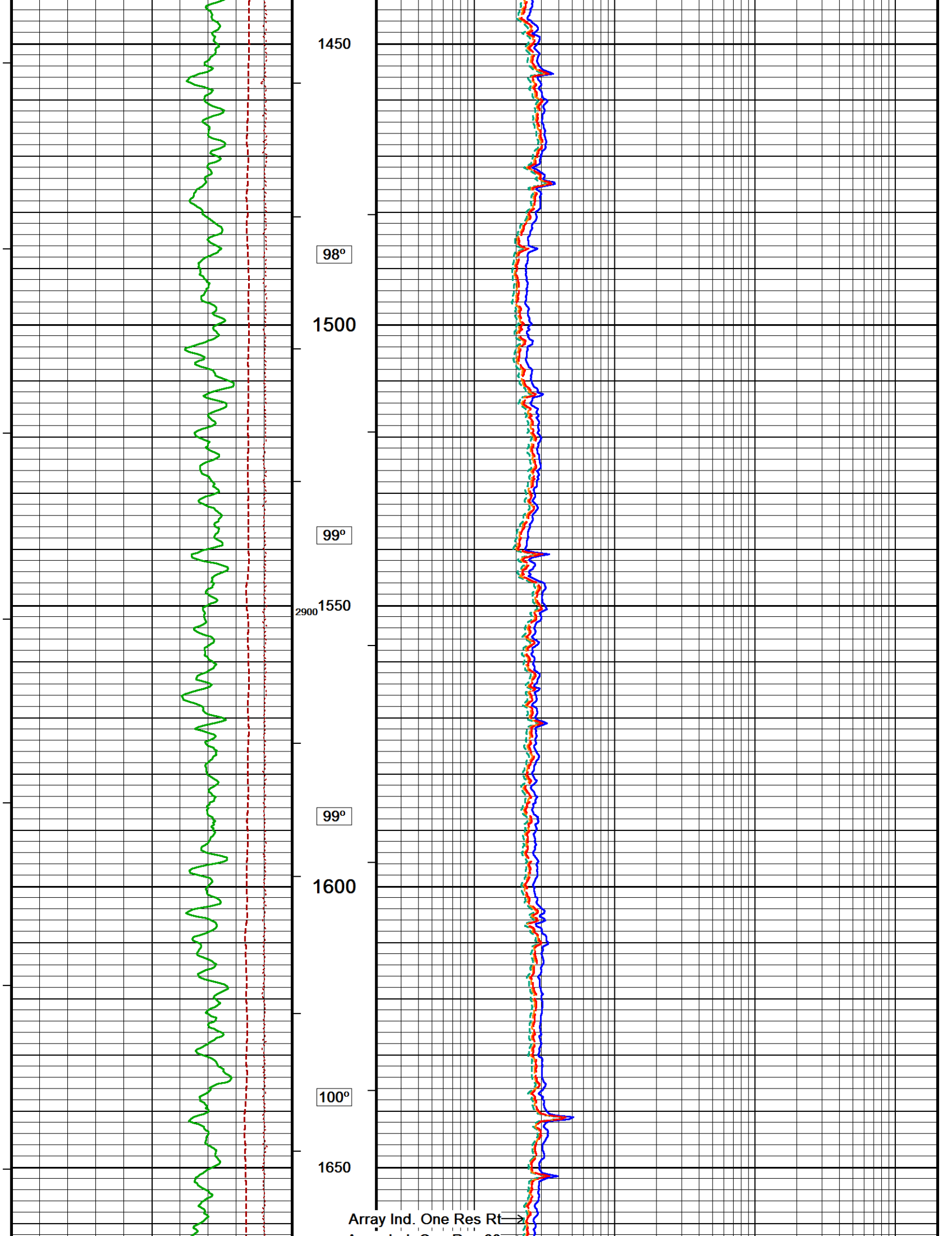
1400

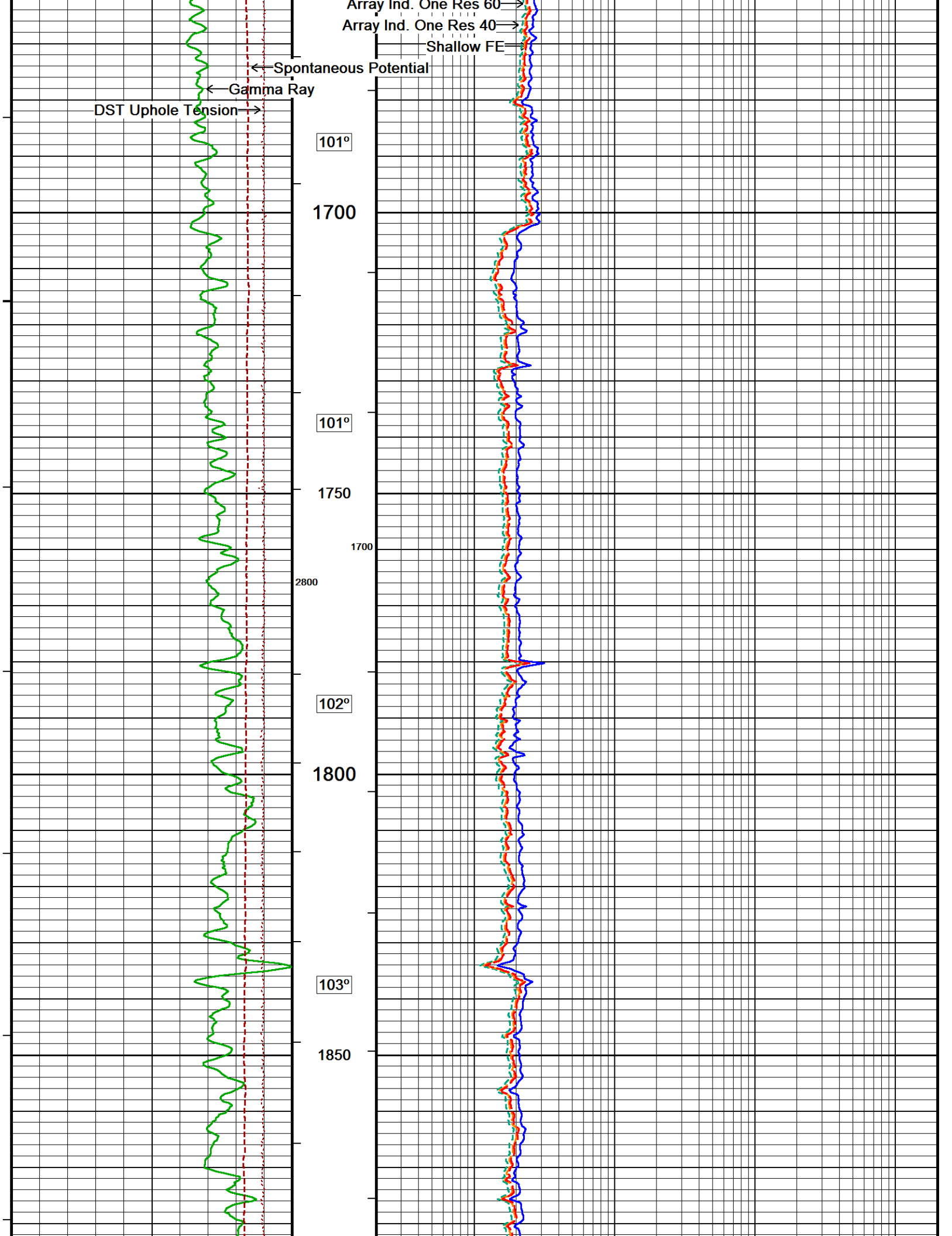
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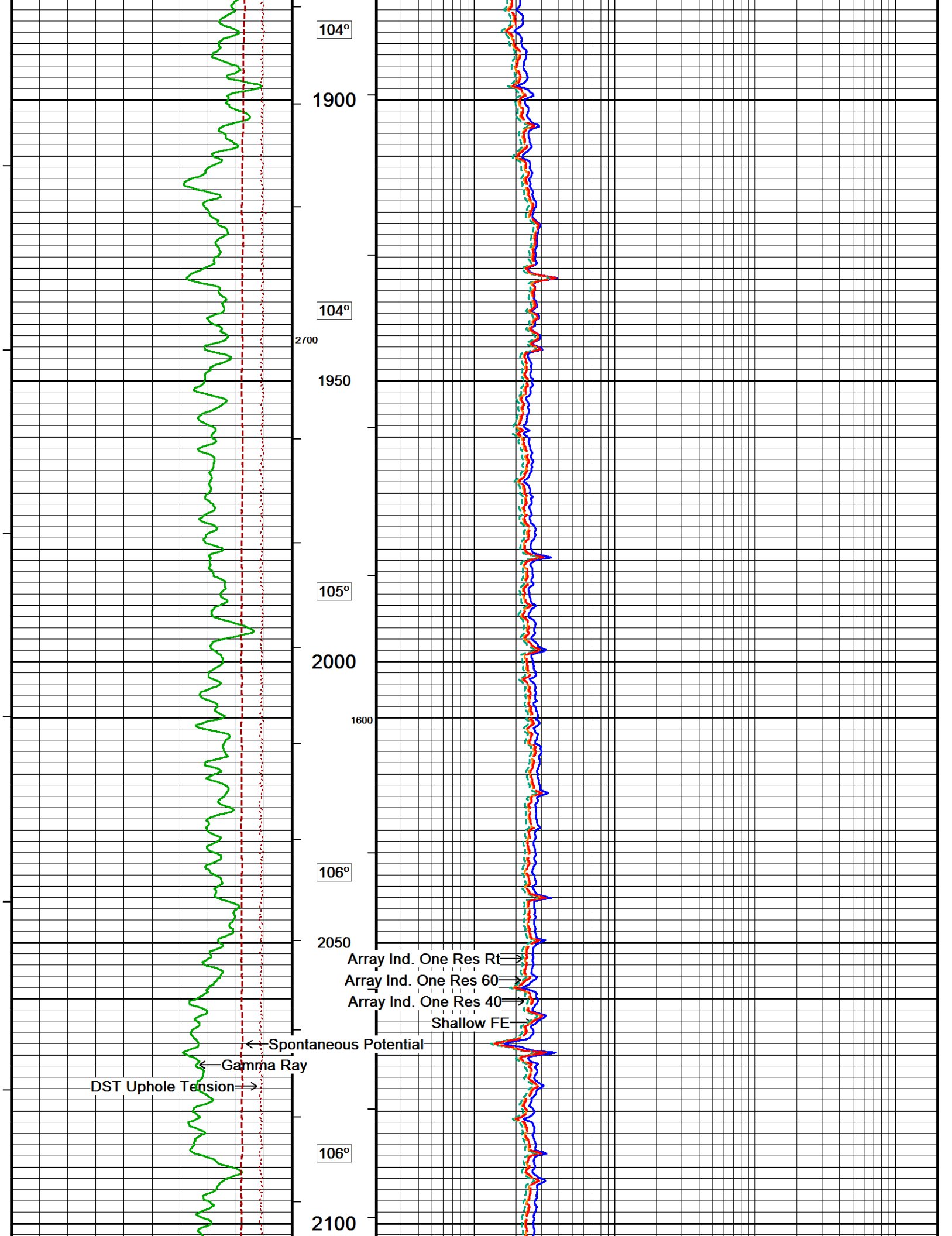
98°

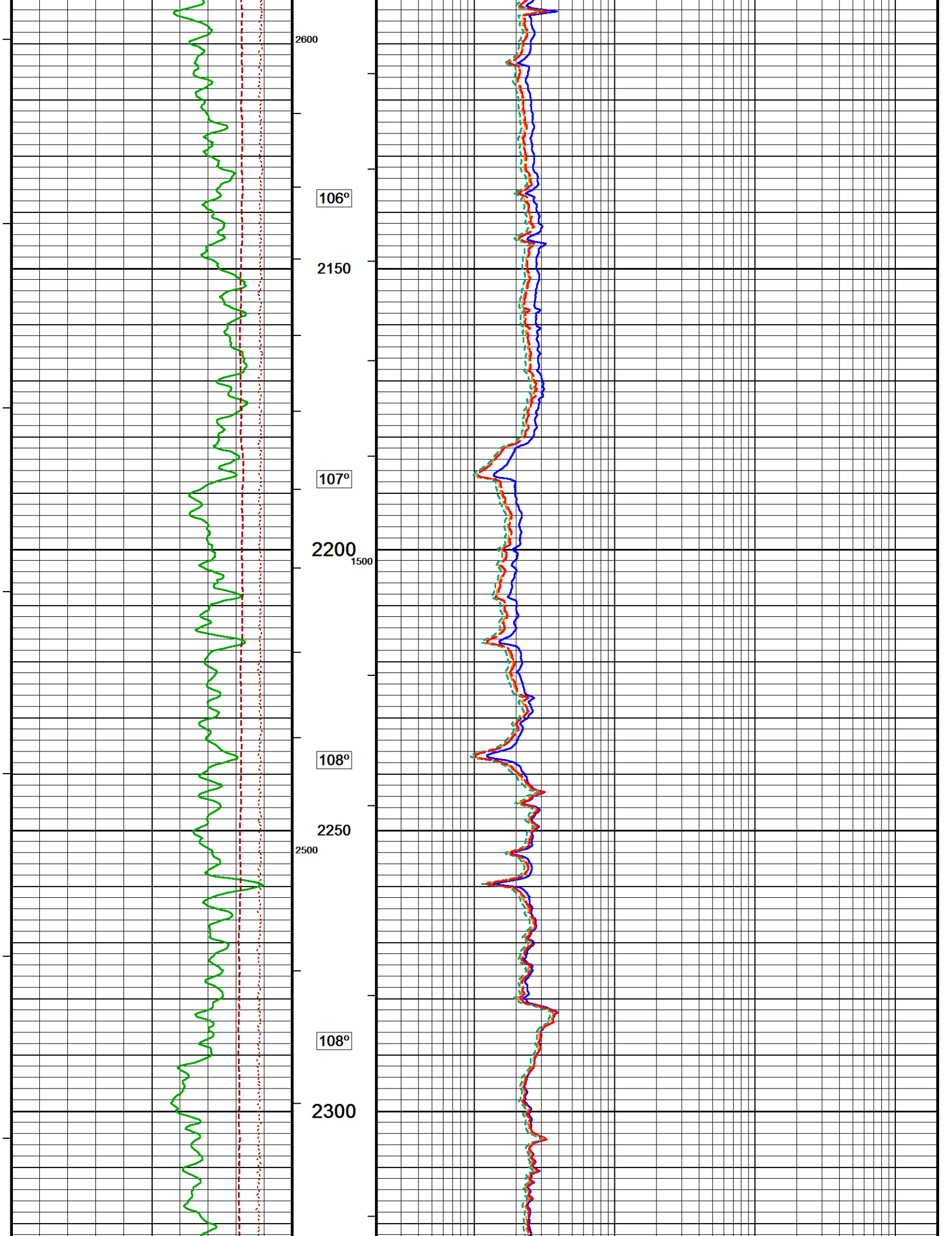
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

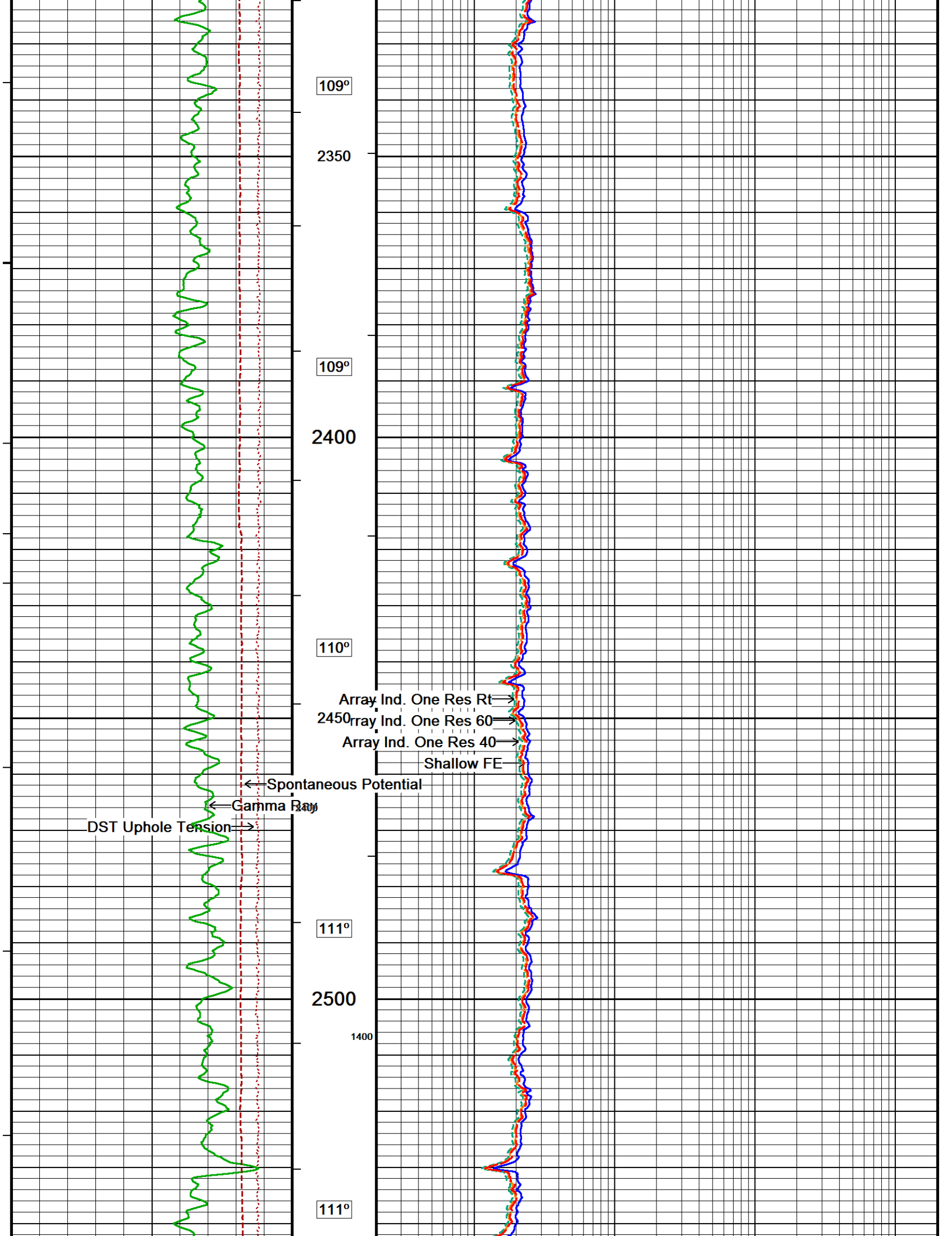


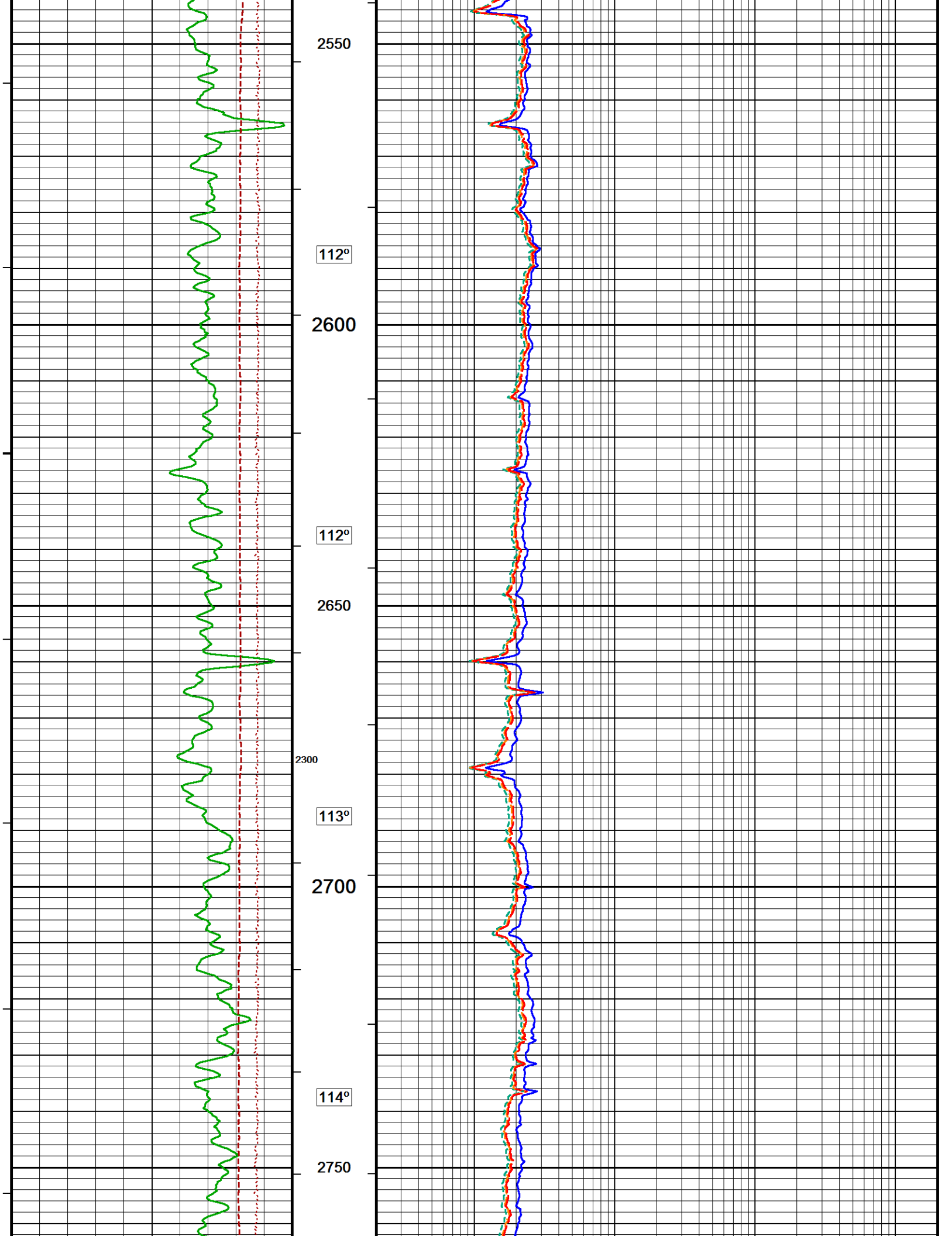


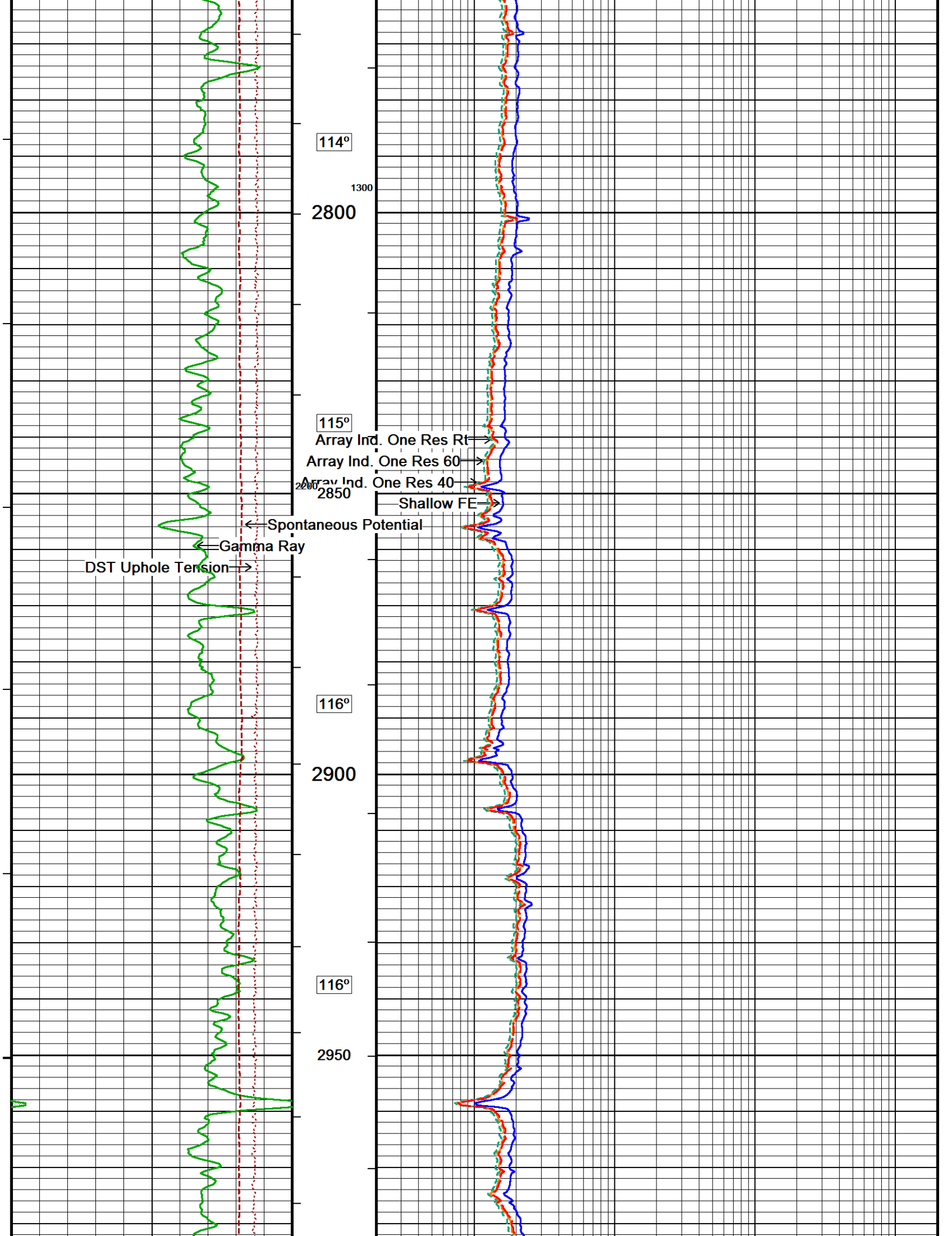


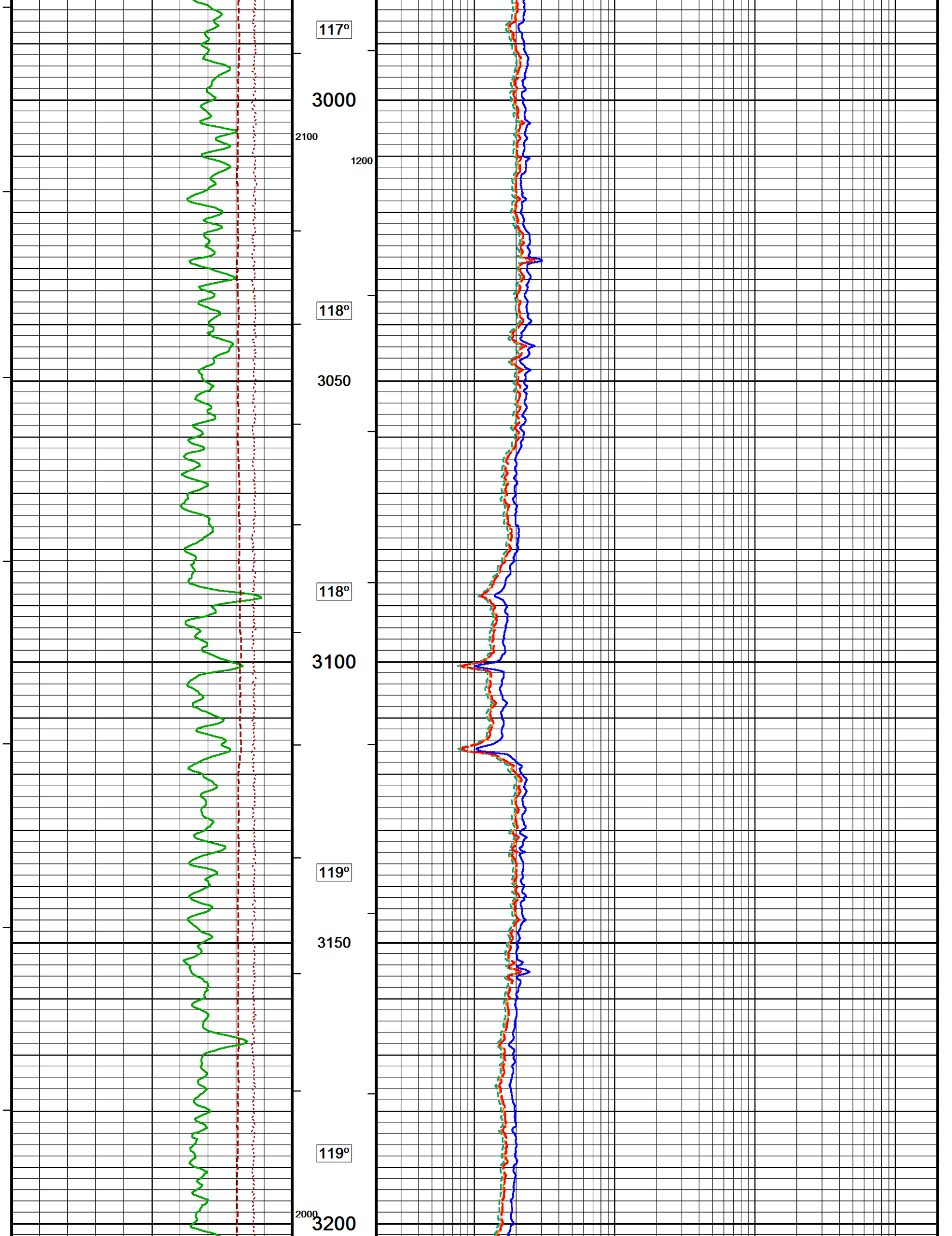


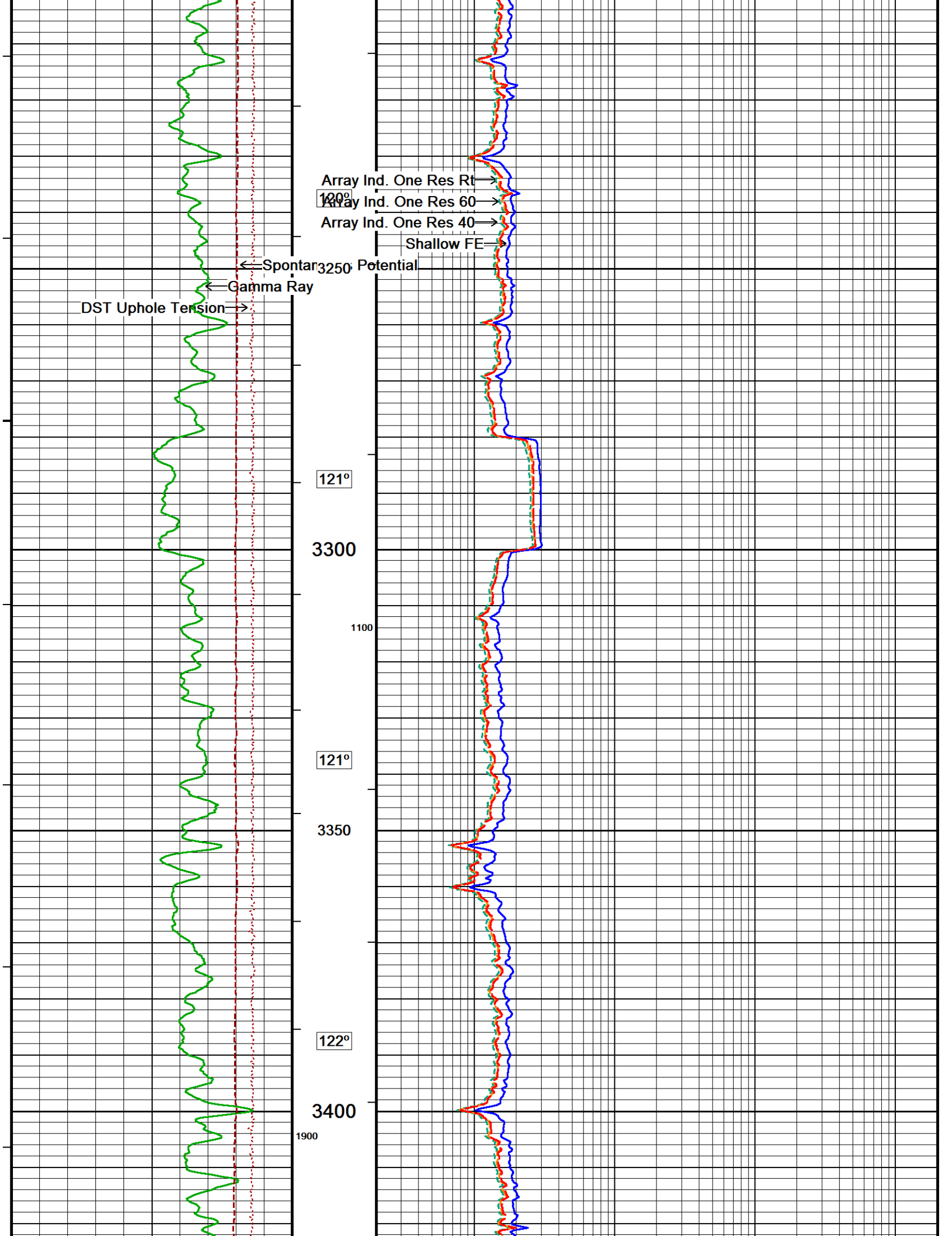


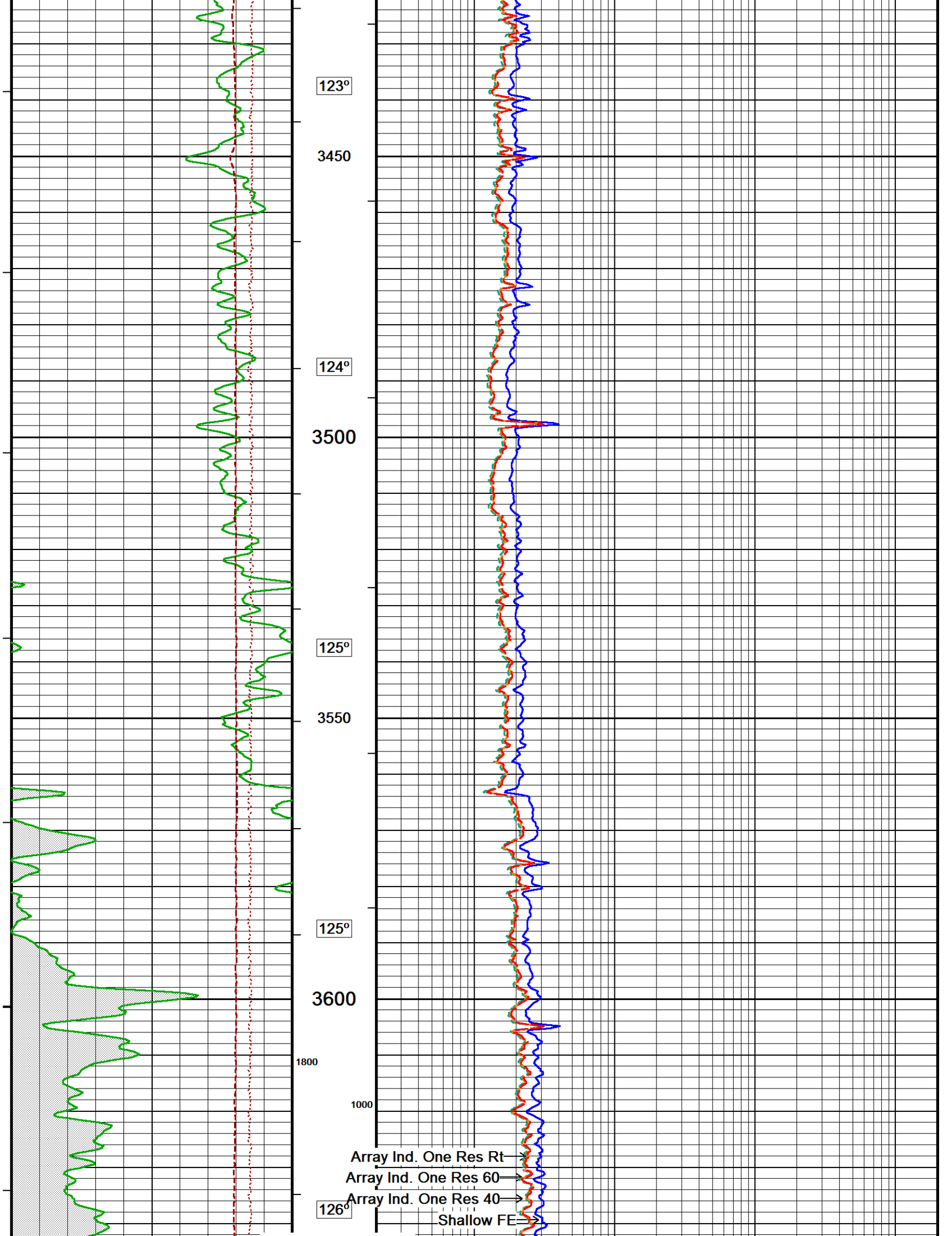


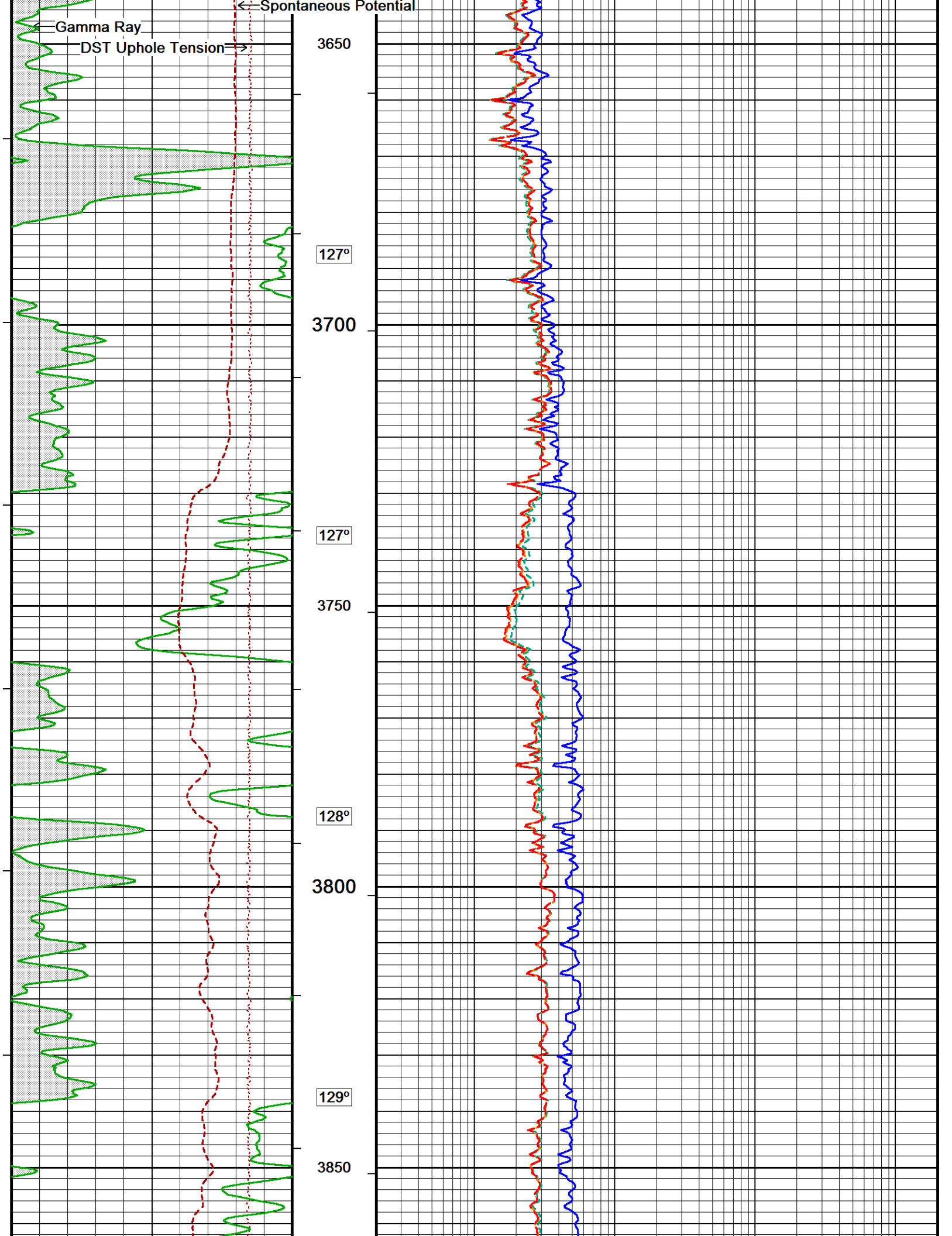


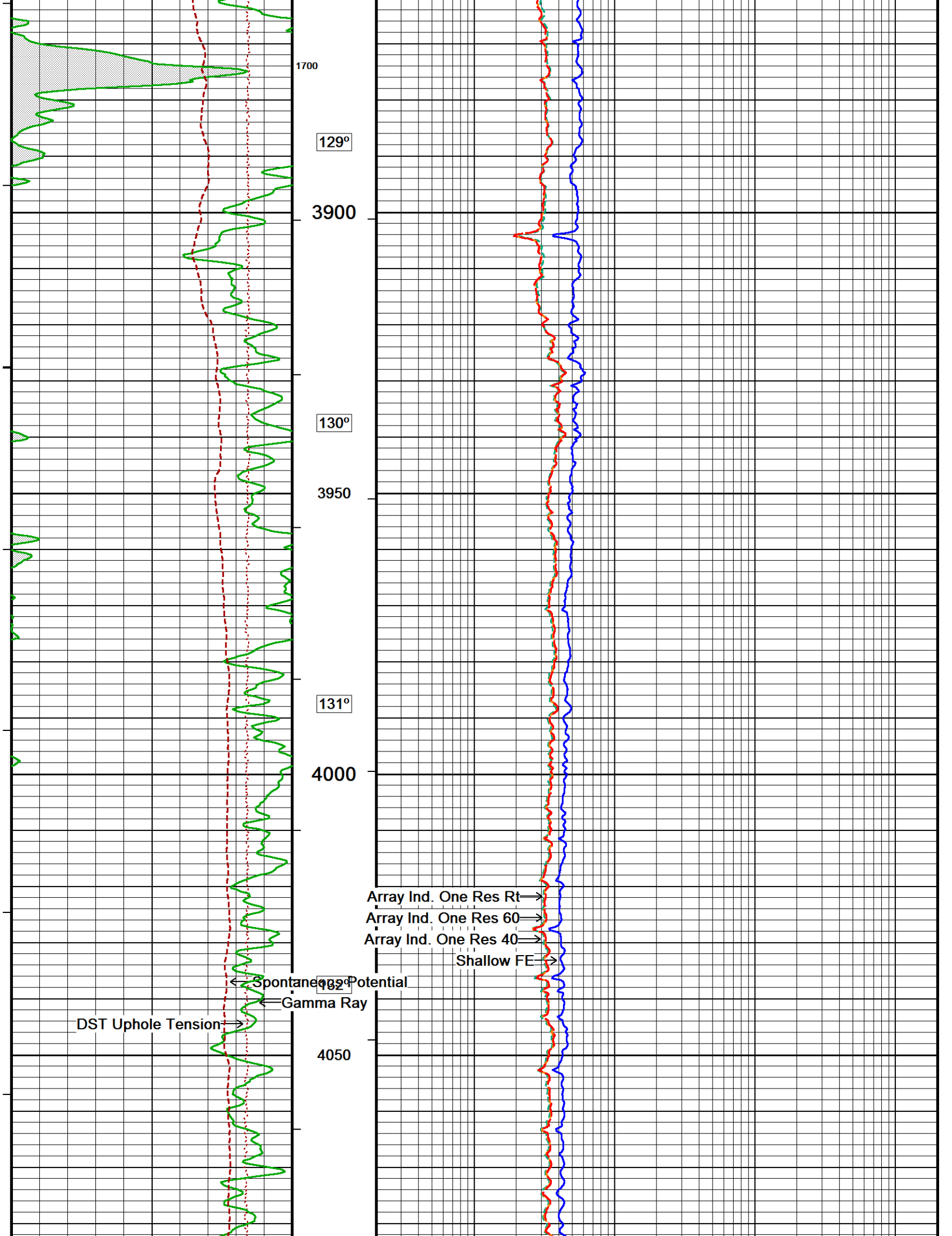


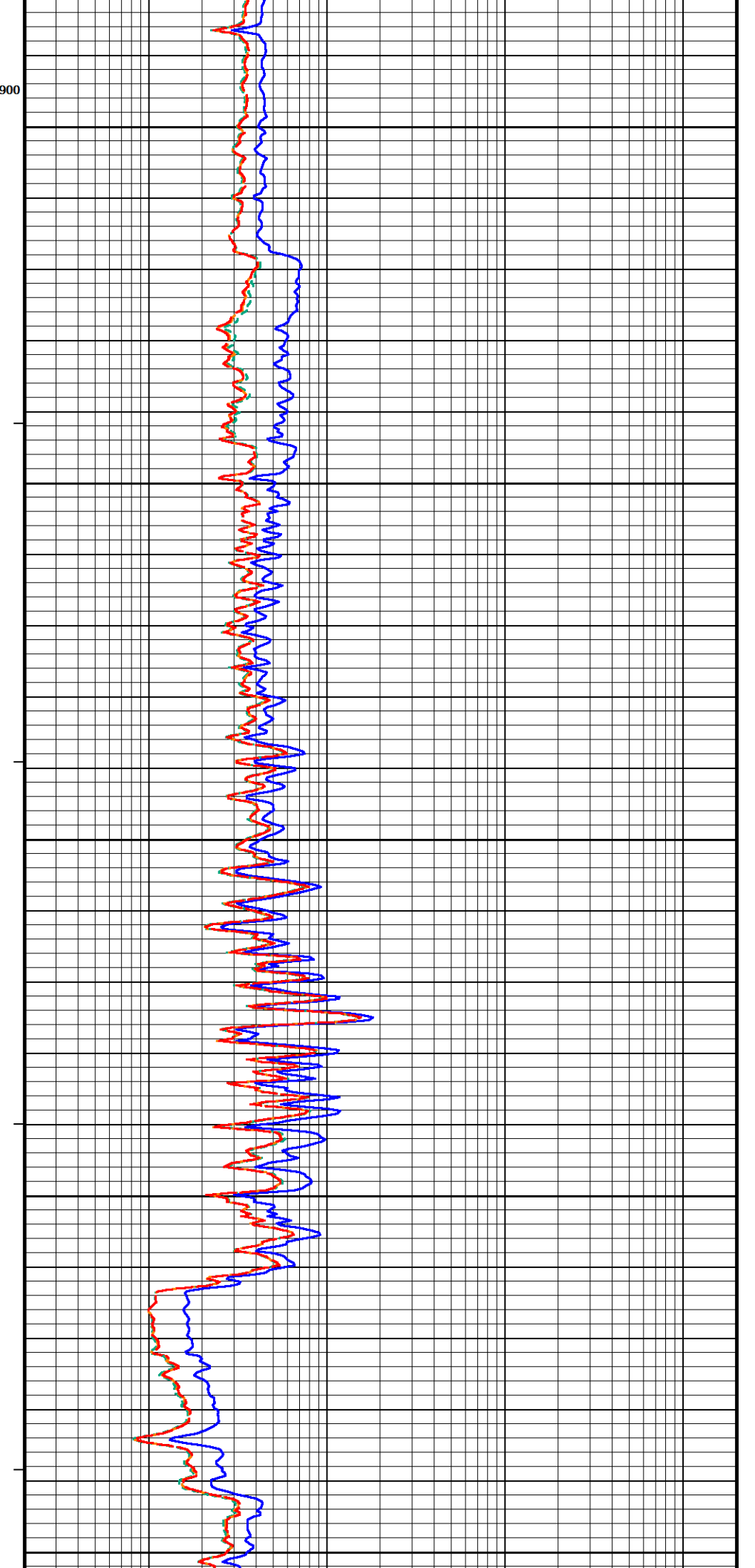
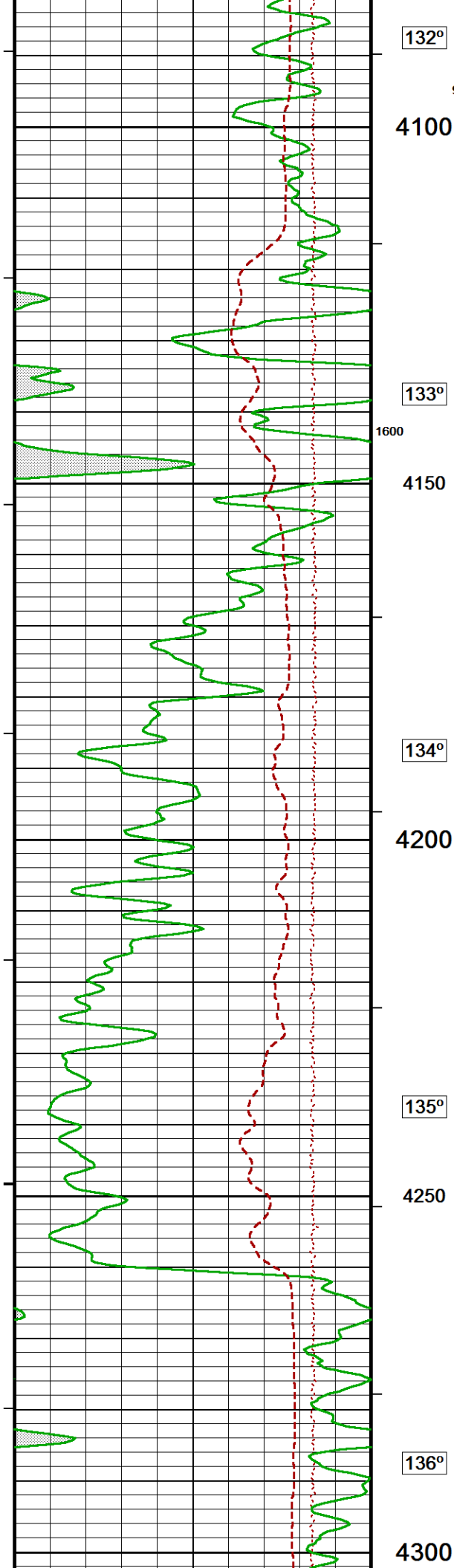


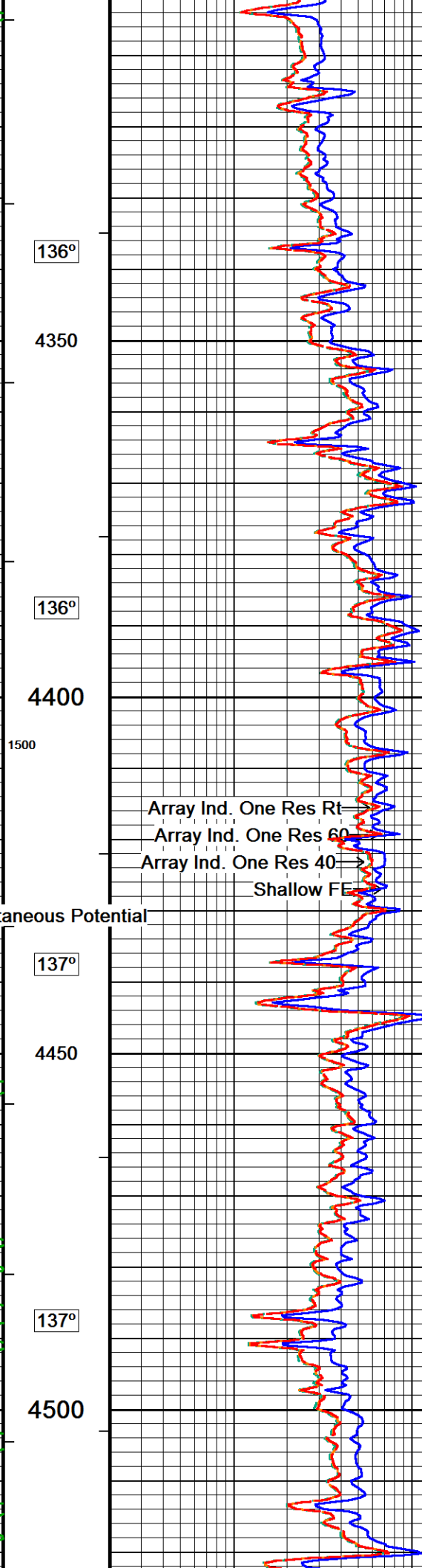
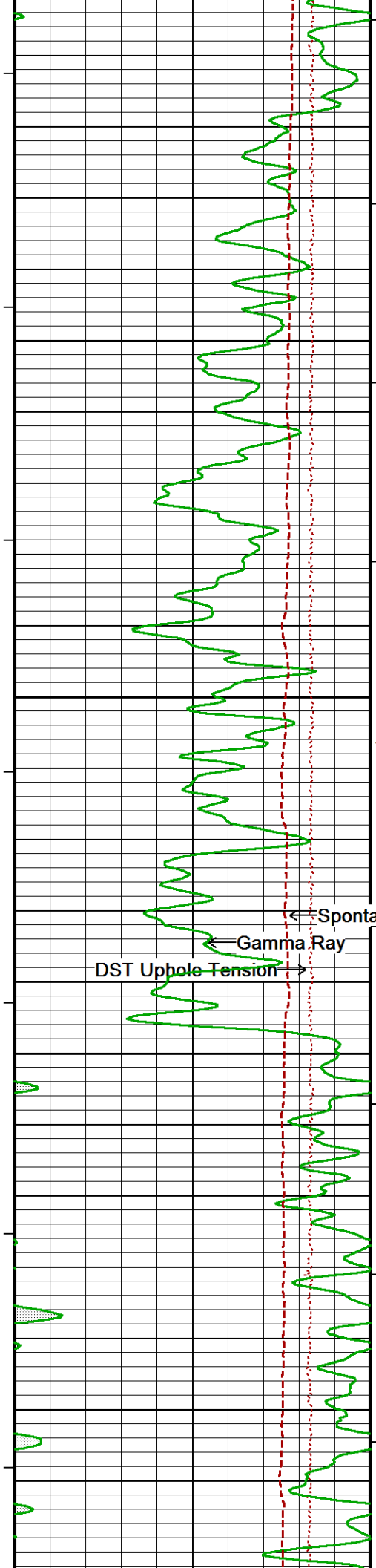












136°

4350

136°

4400

1500

Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FEF

← Spontaneous Potential

← Gamma Ray

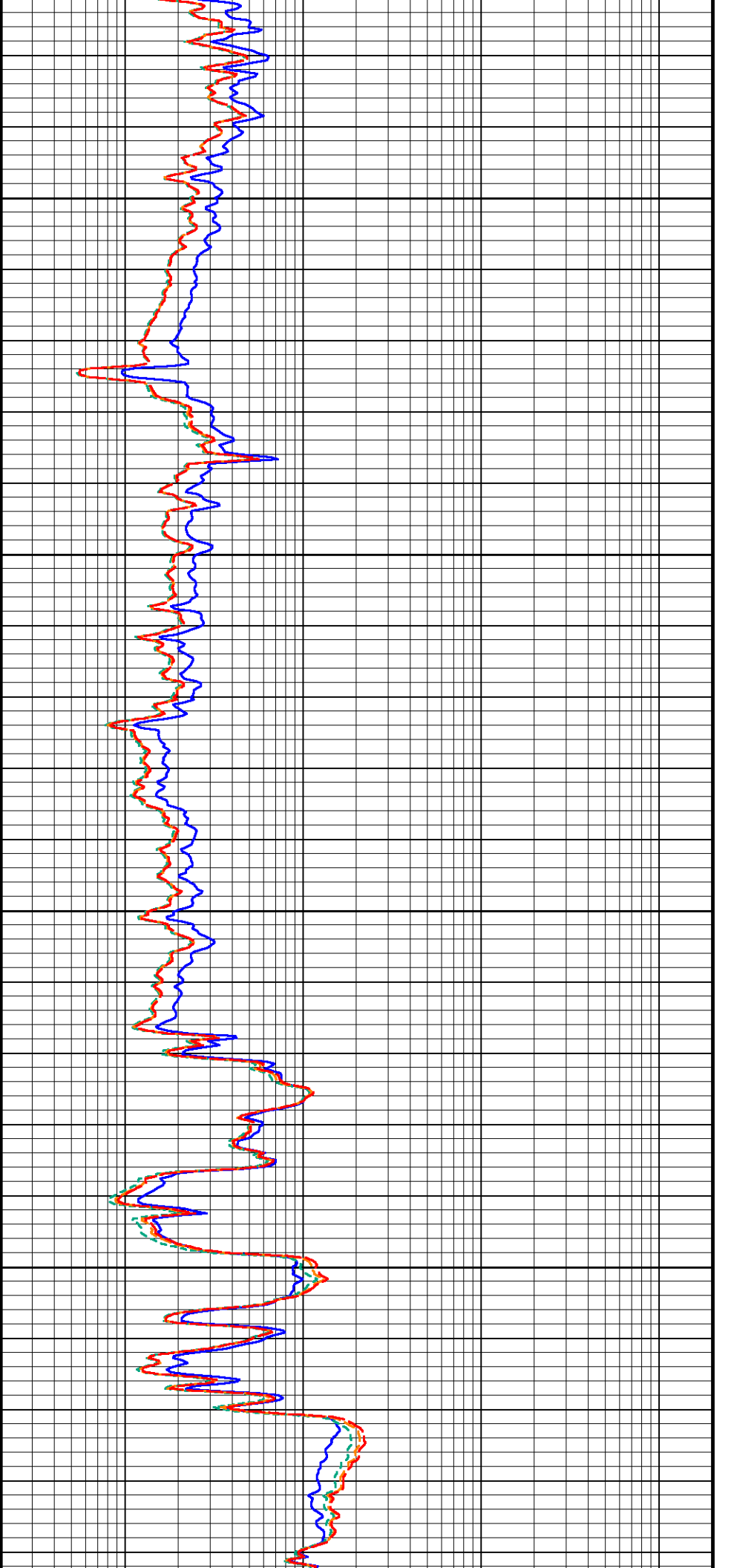
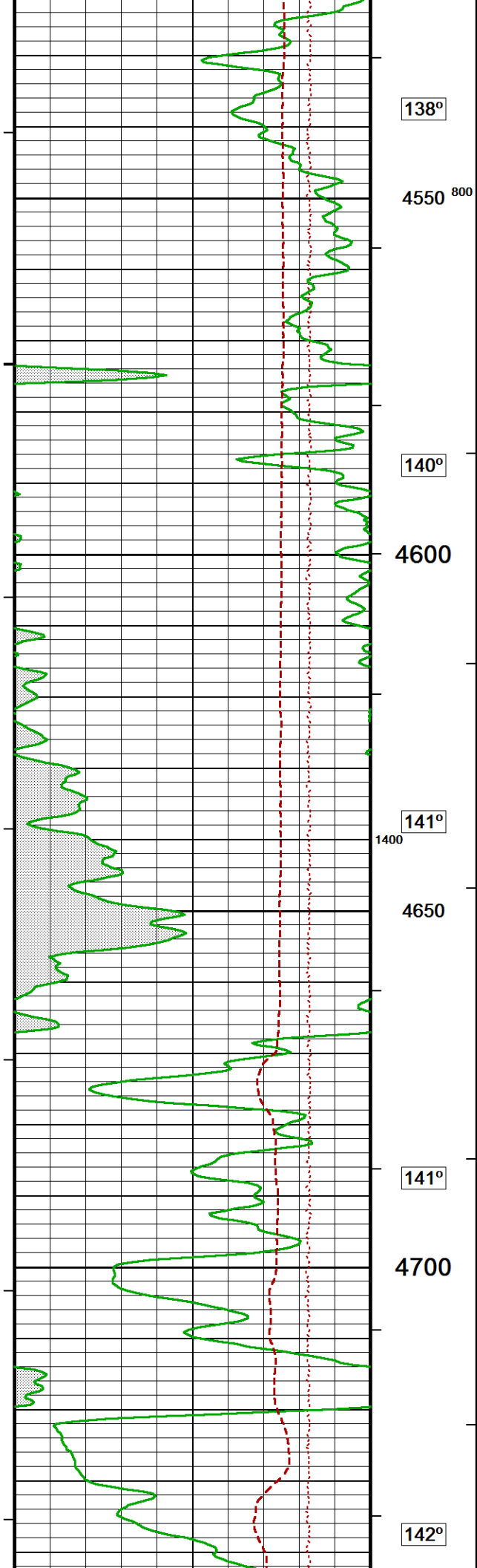
DST Uphole Tension →

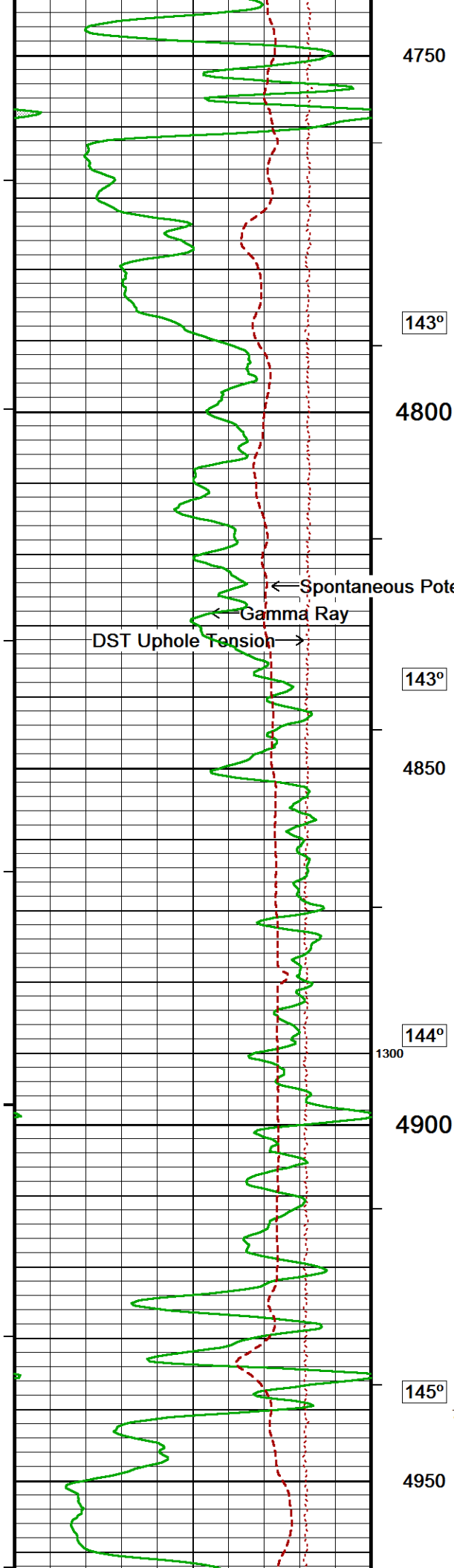
137°

4450

137°

4500





4750

143°

4800

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →

143°

4850

144°

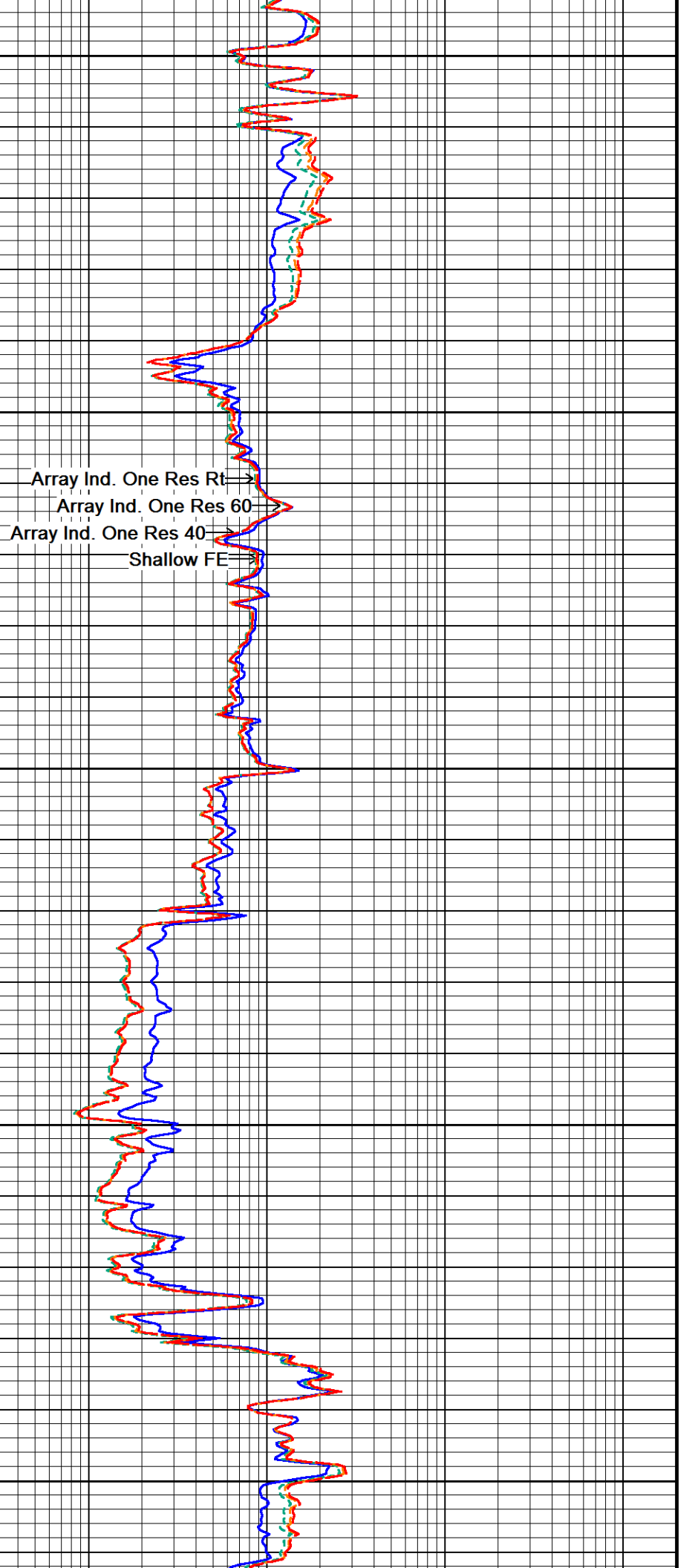
1300

4900

145°

700

4950

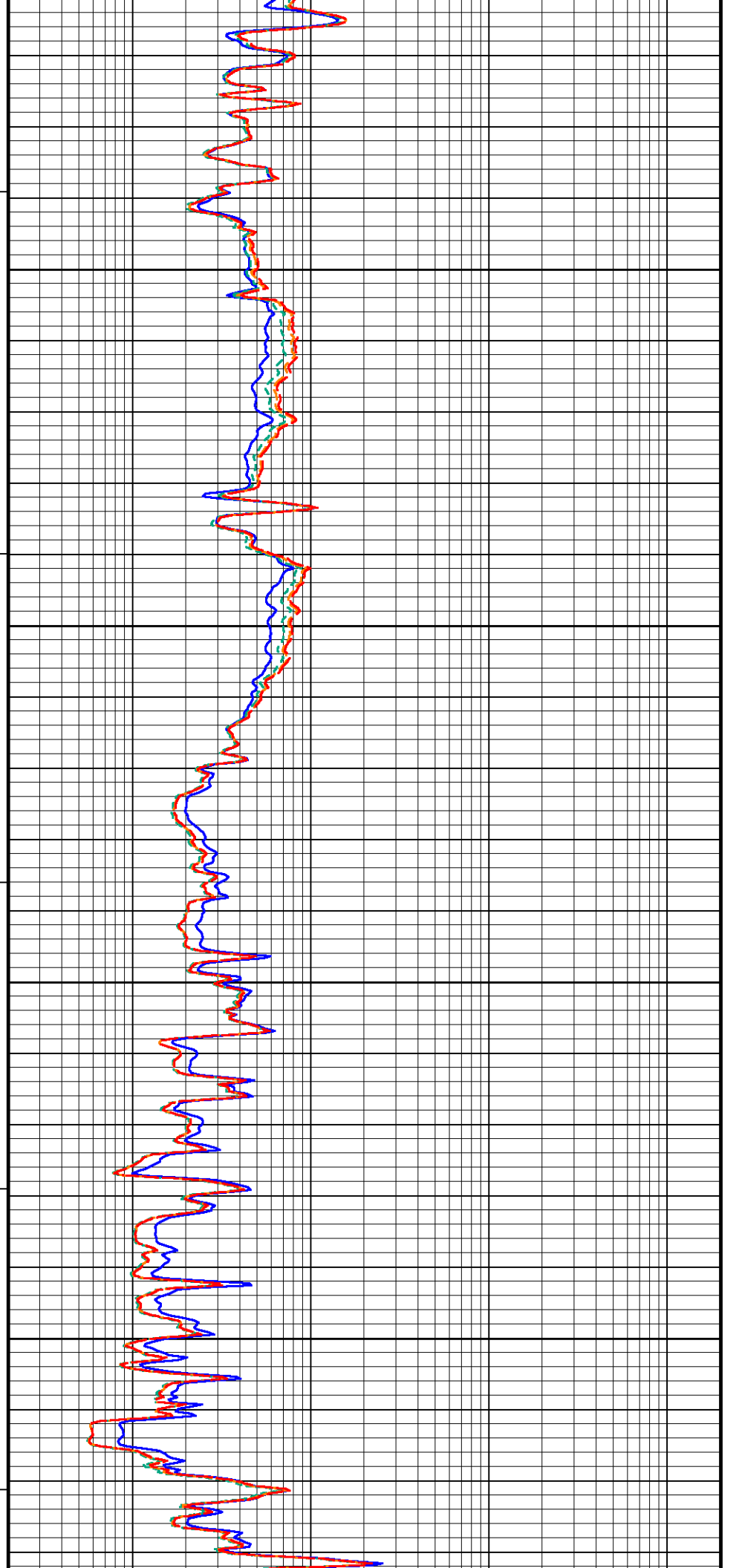
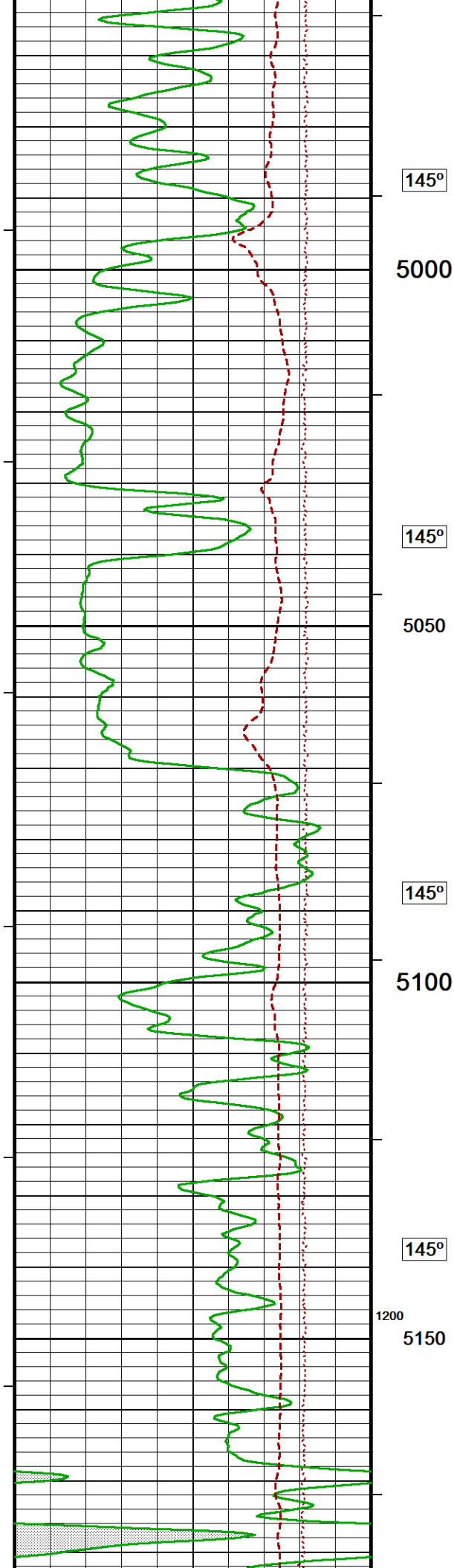


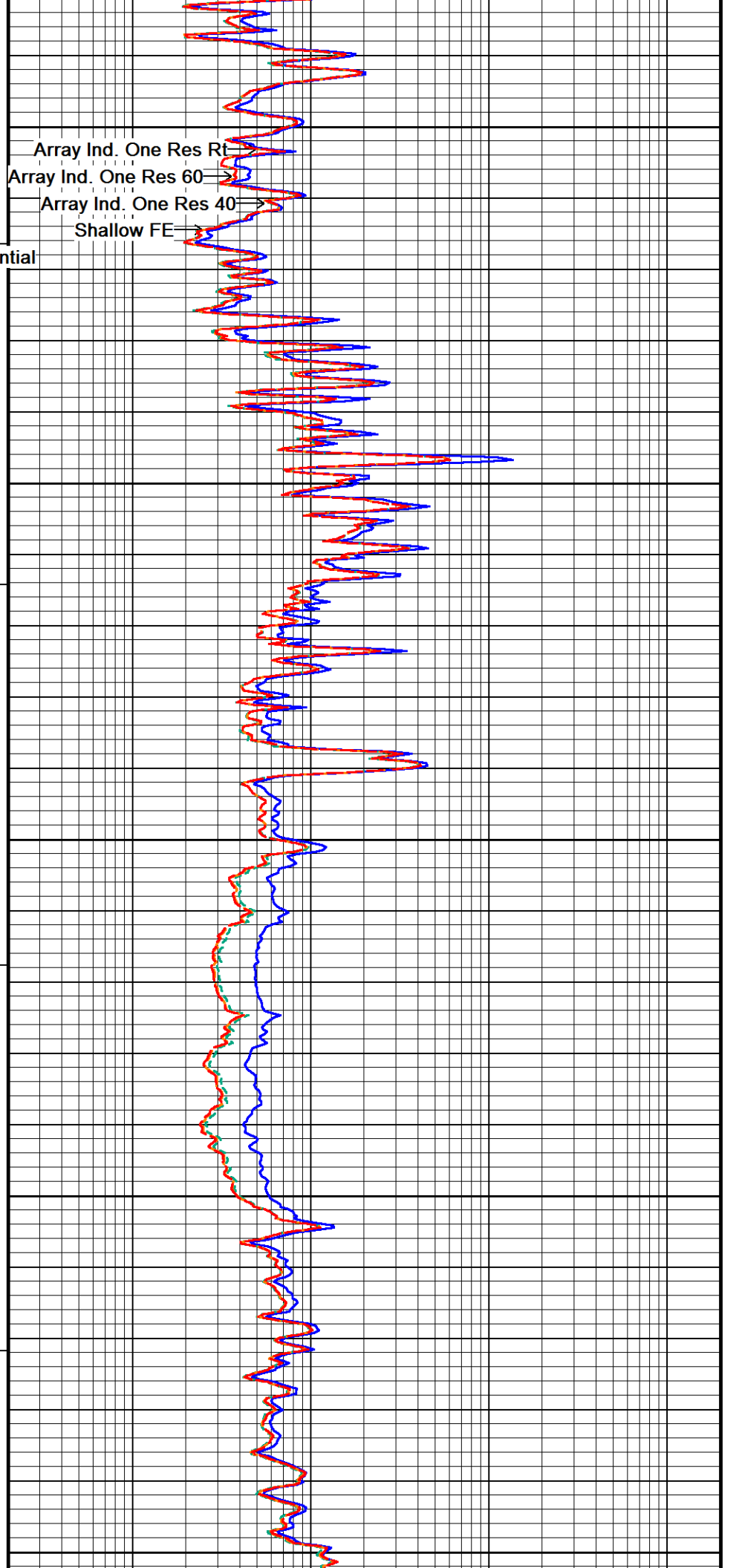
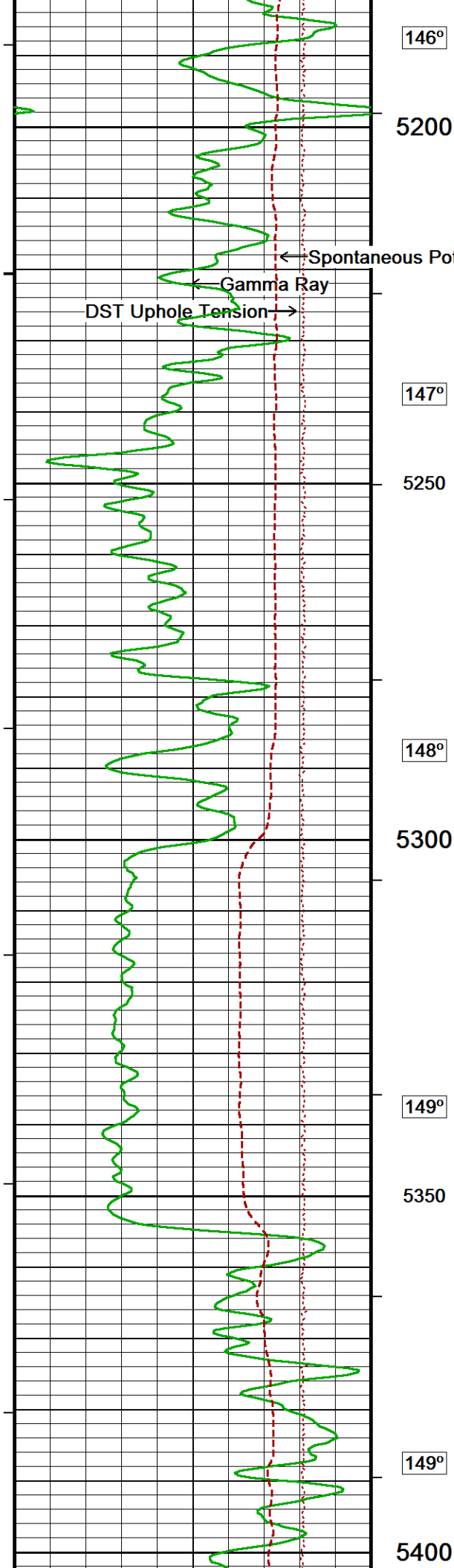
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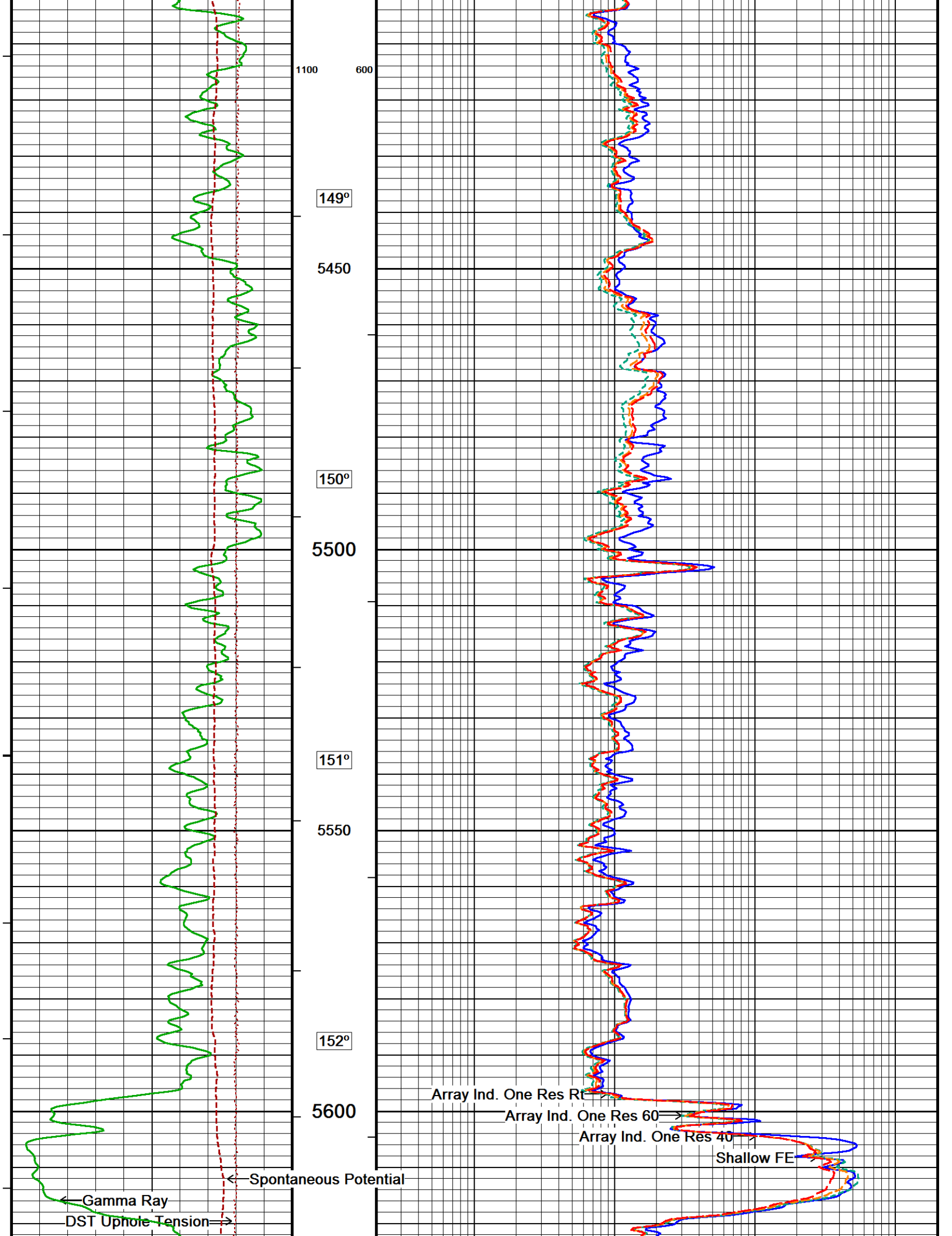
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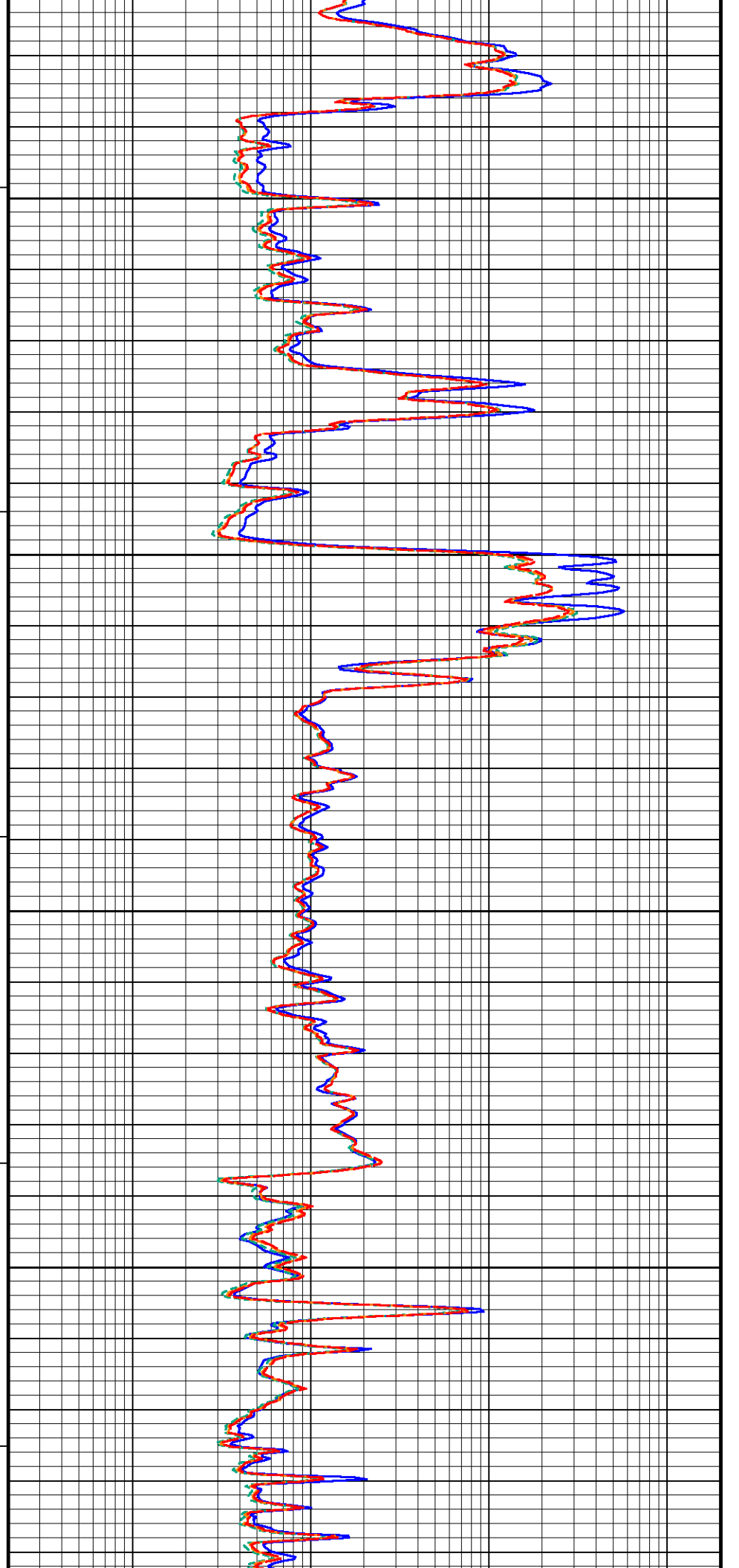
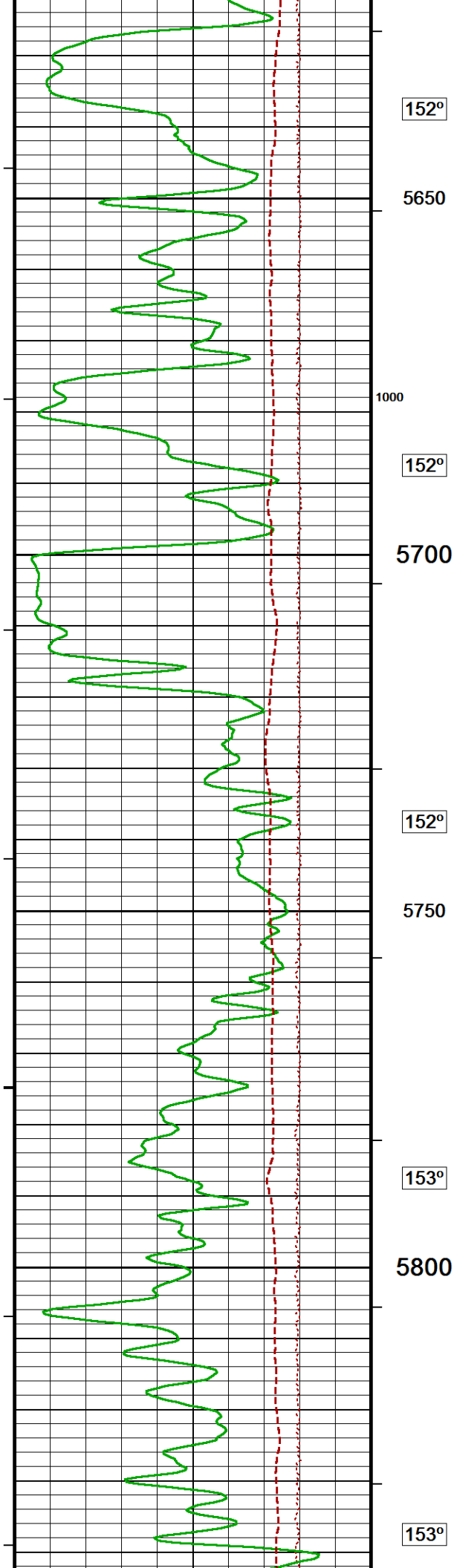
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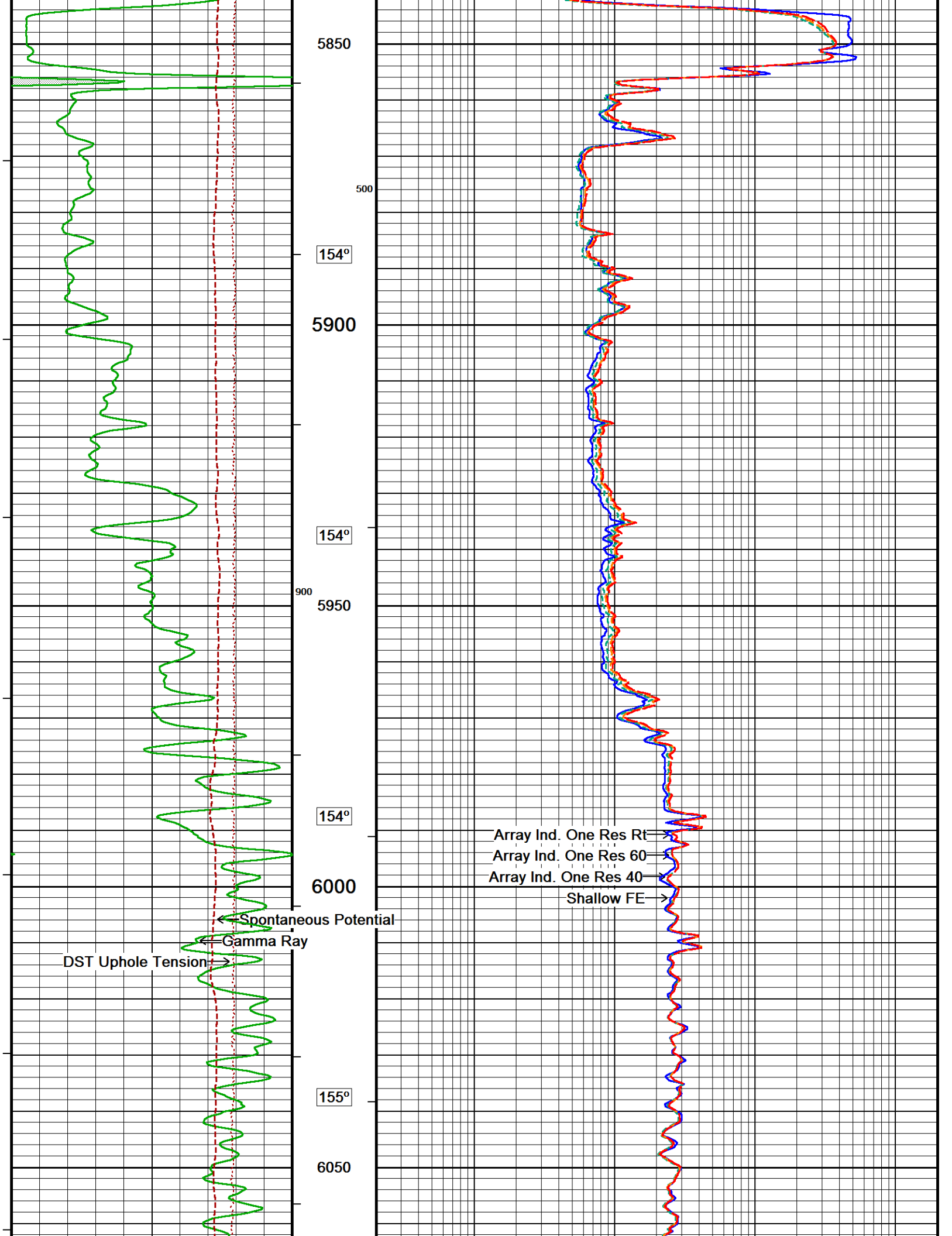
Shallow FE →

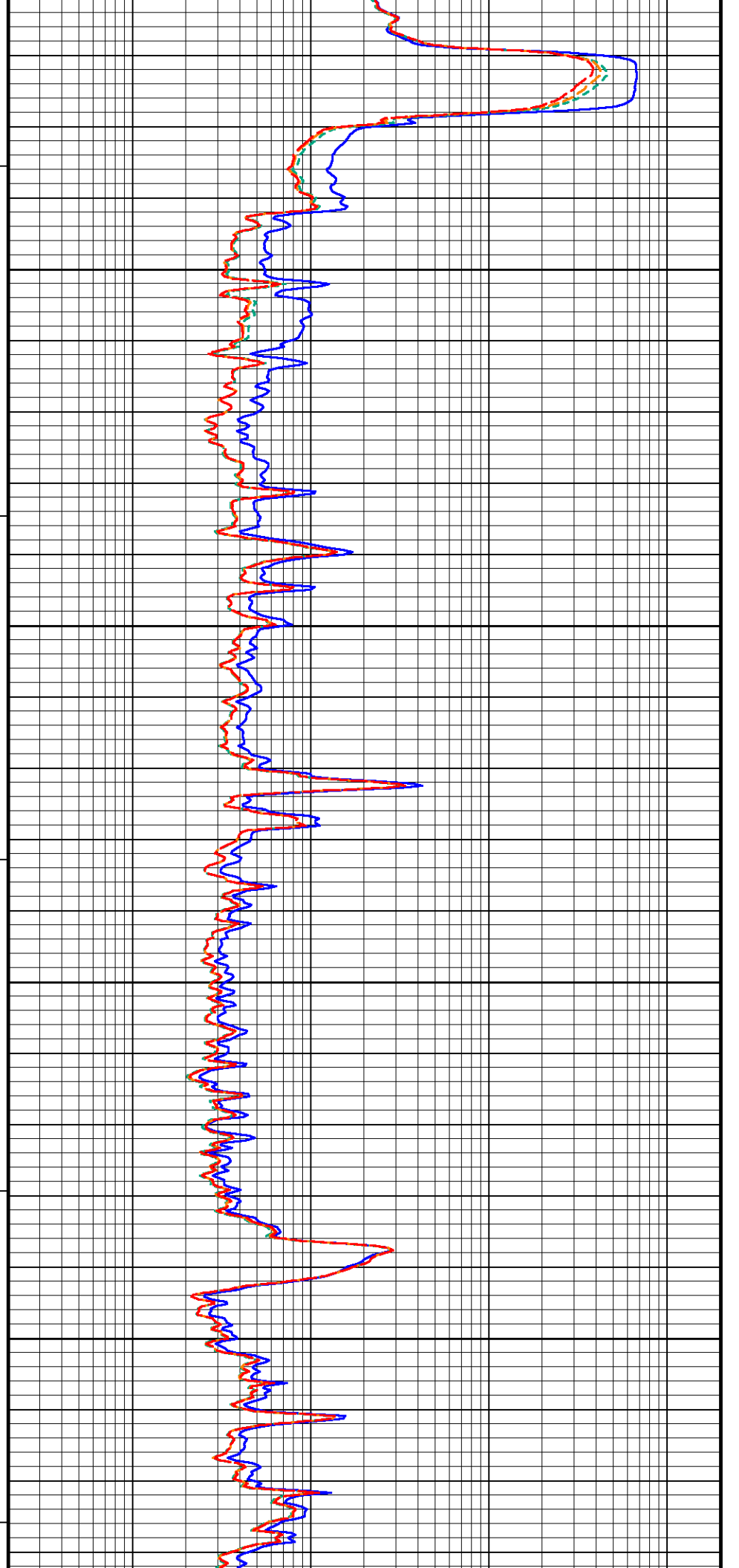
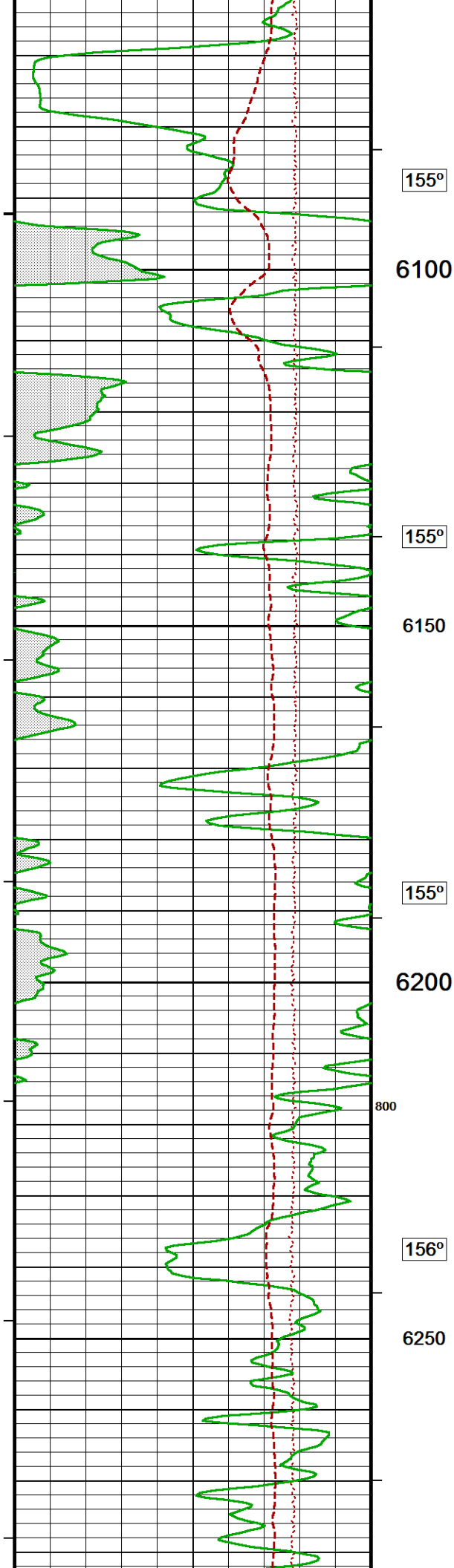


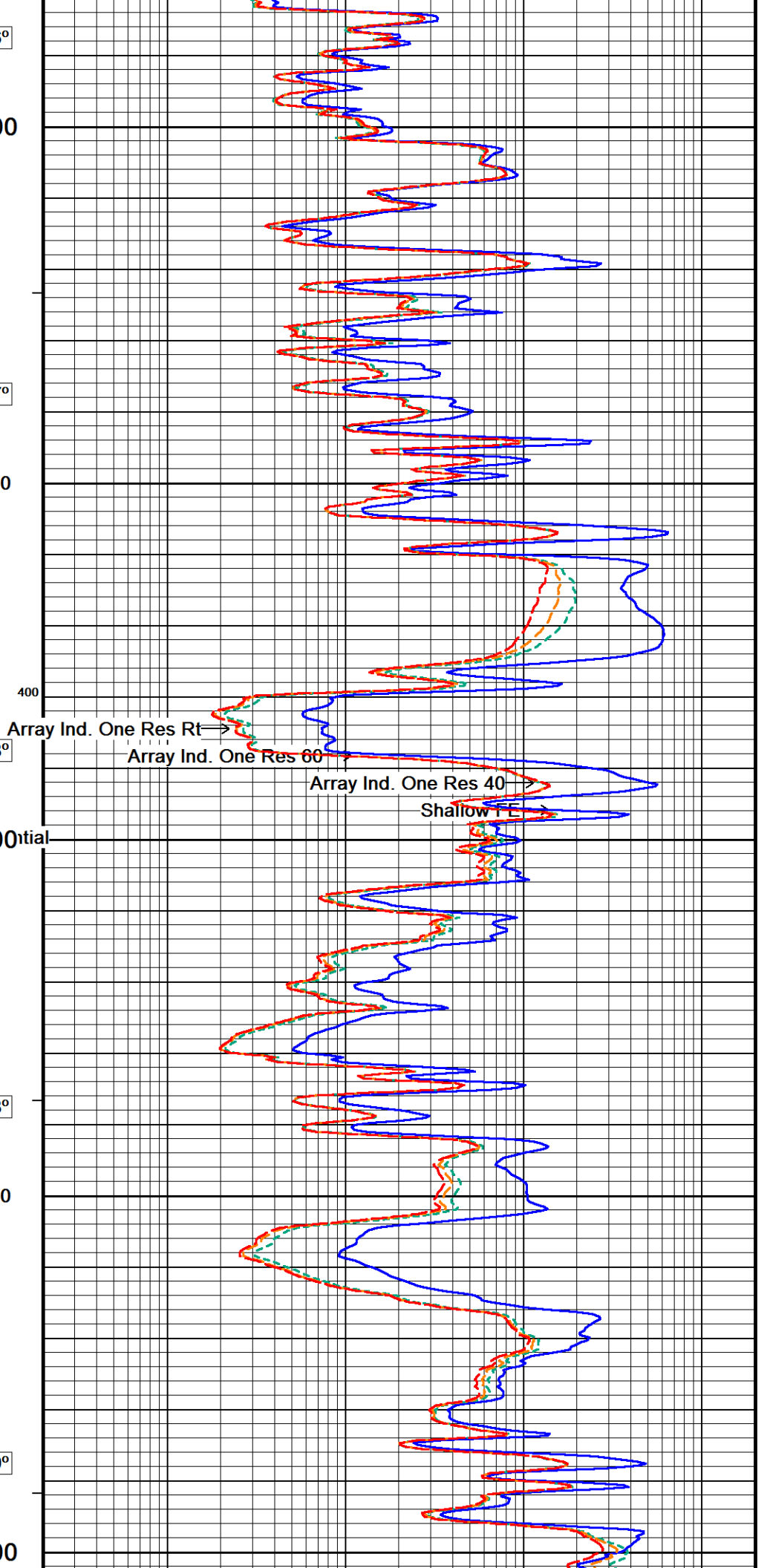
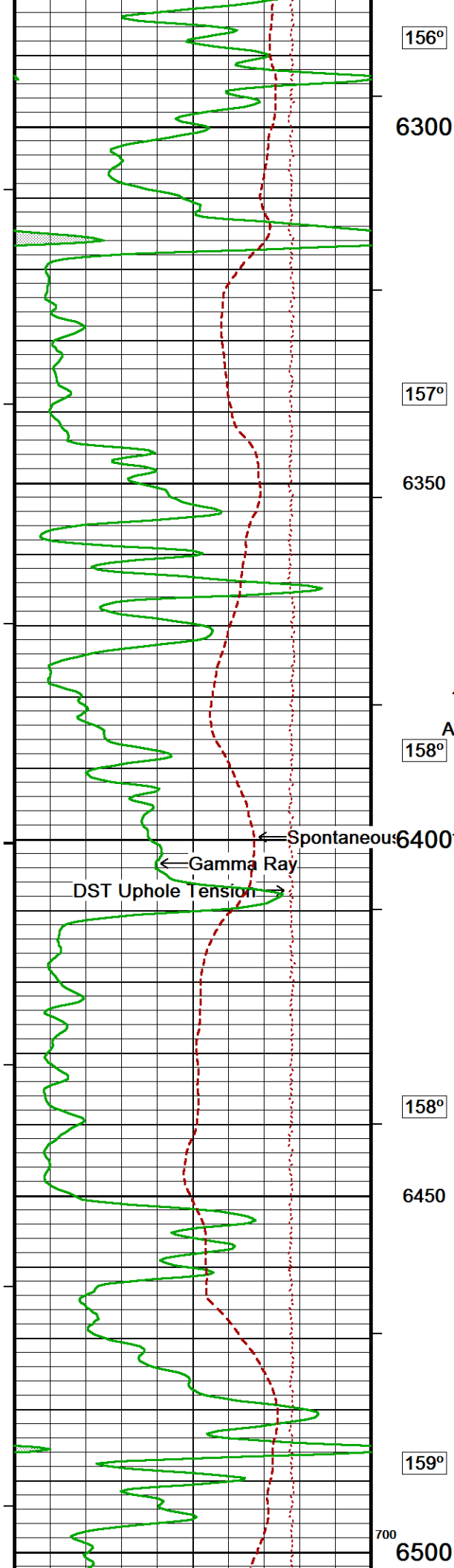


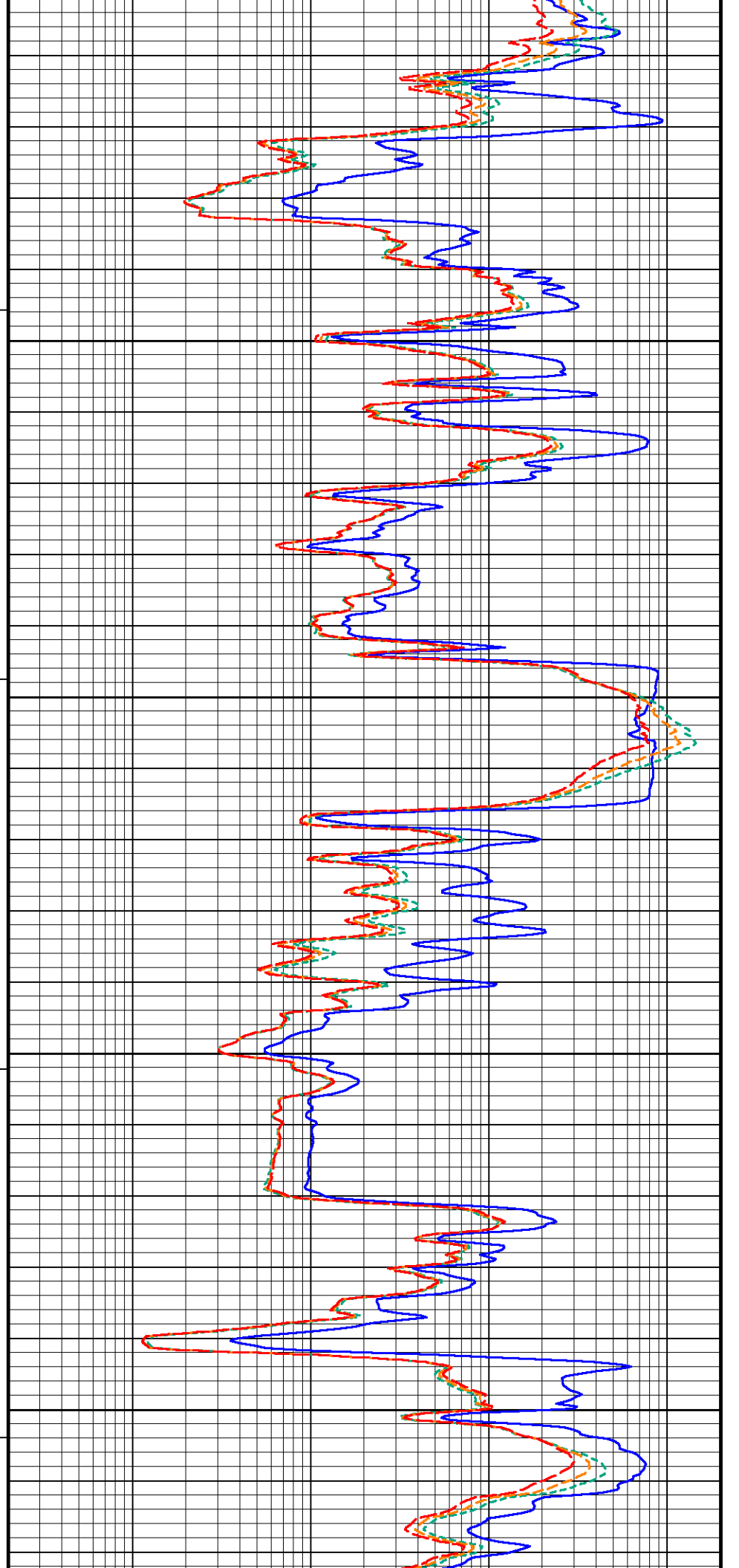
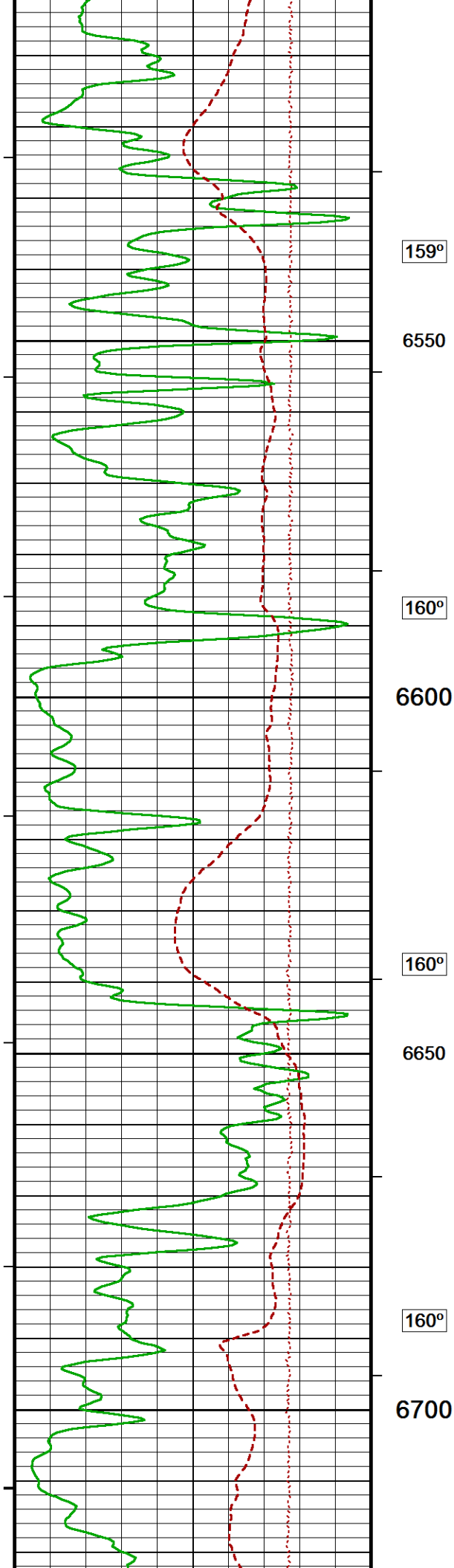


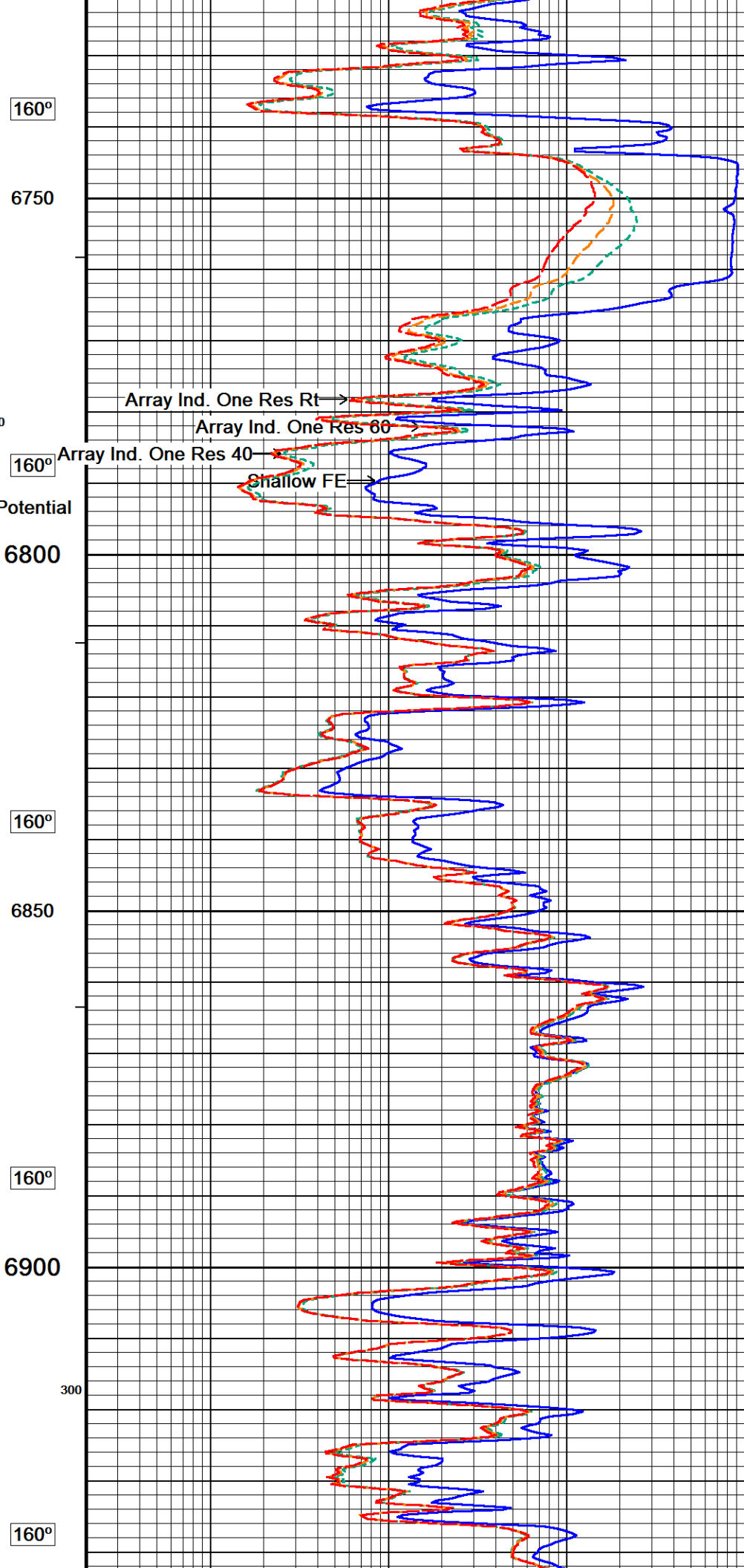
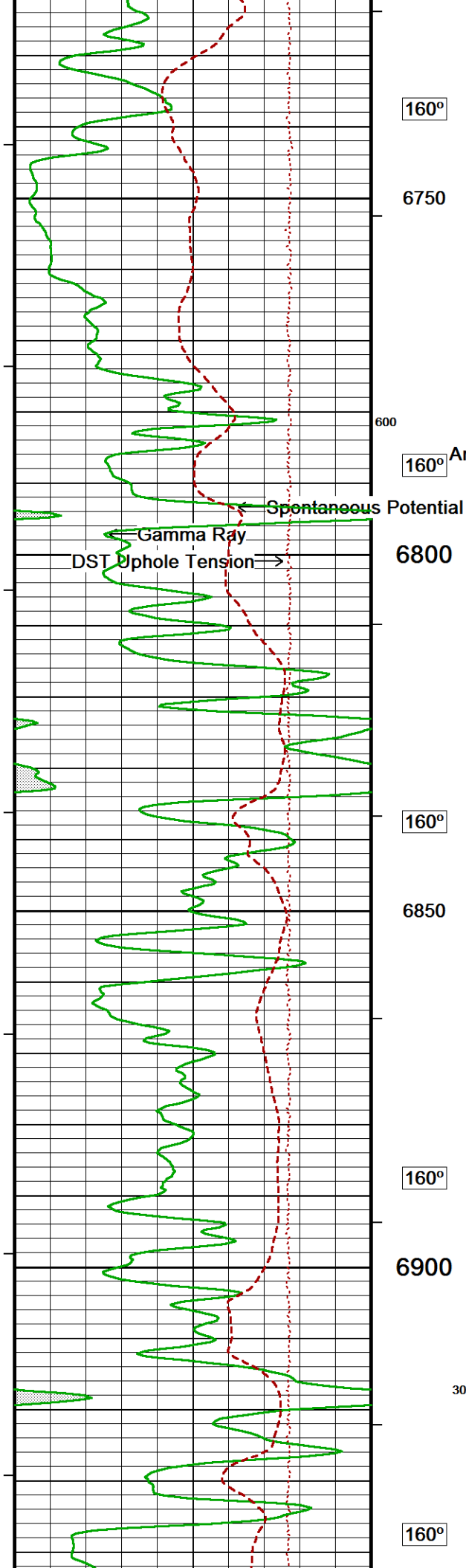


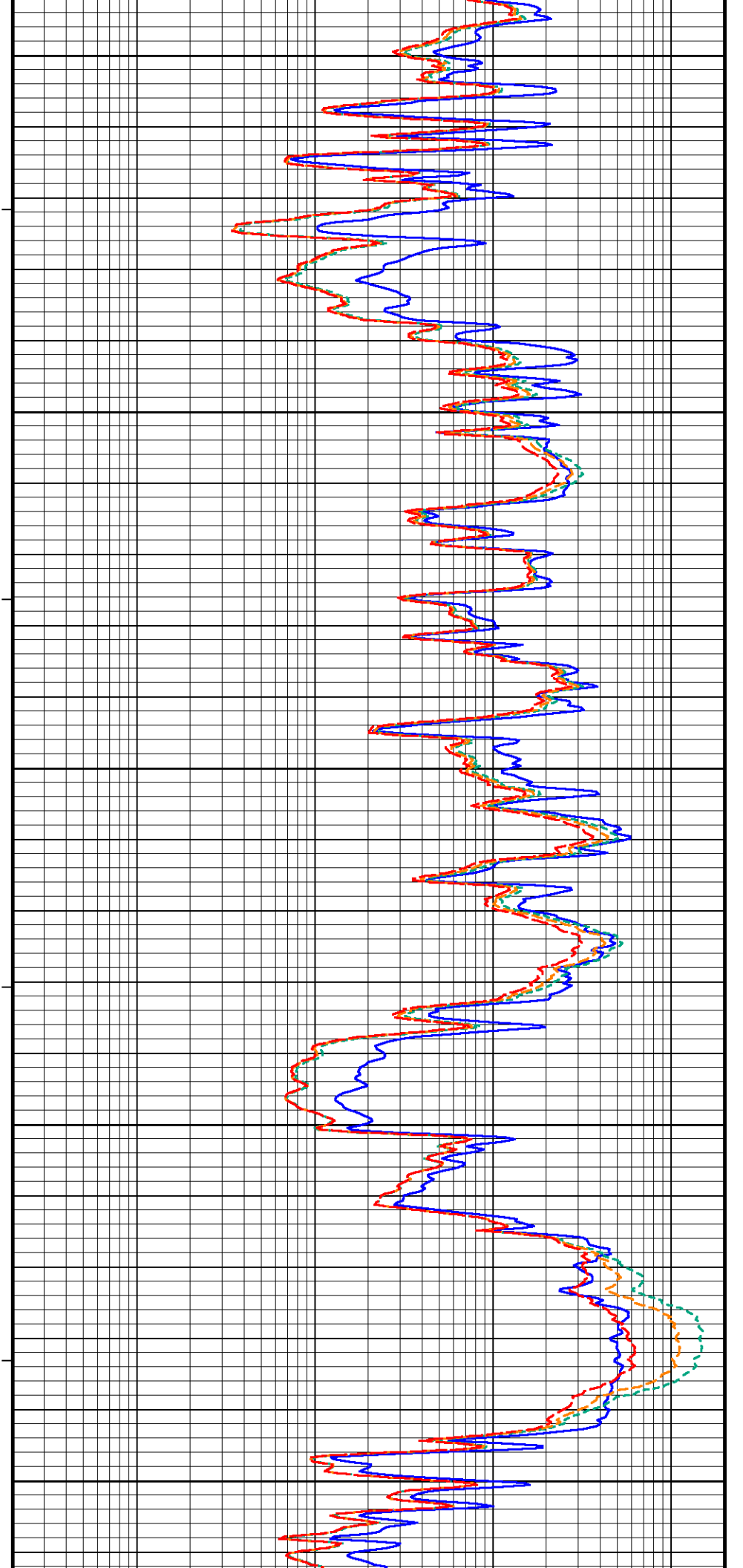
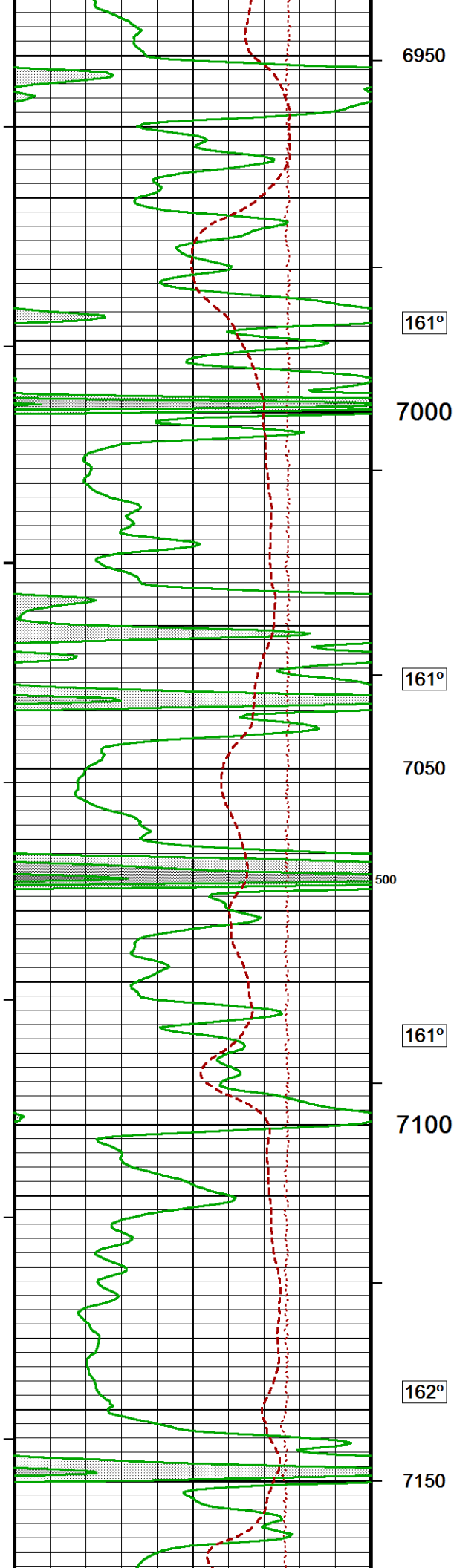


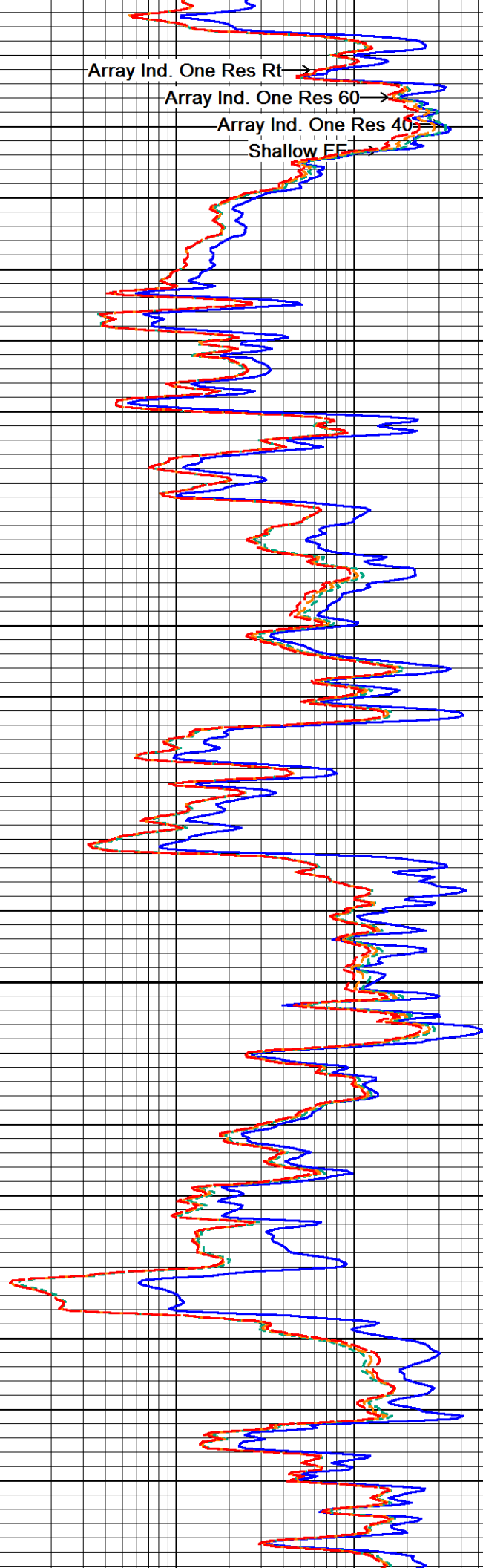
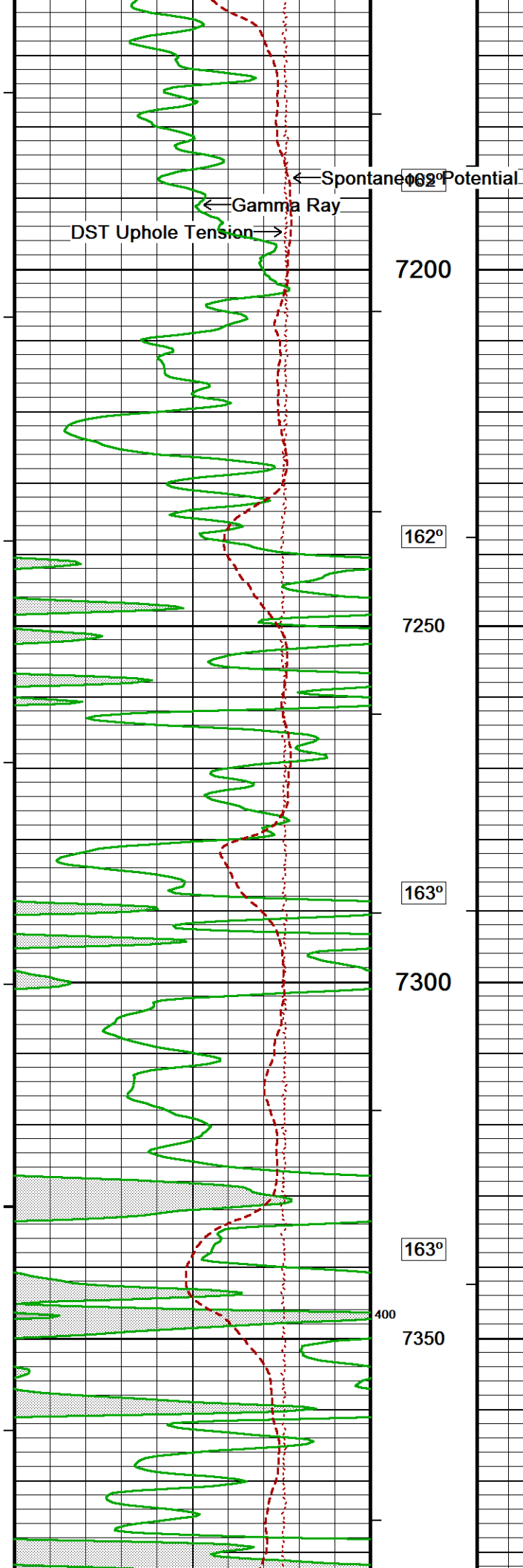


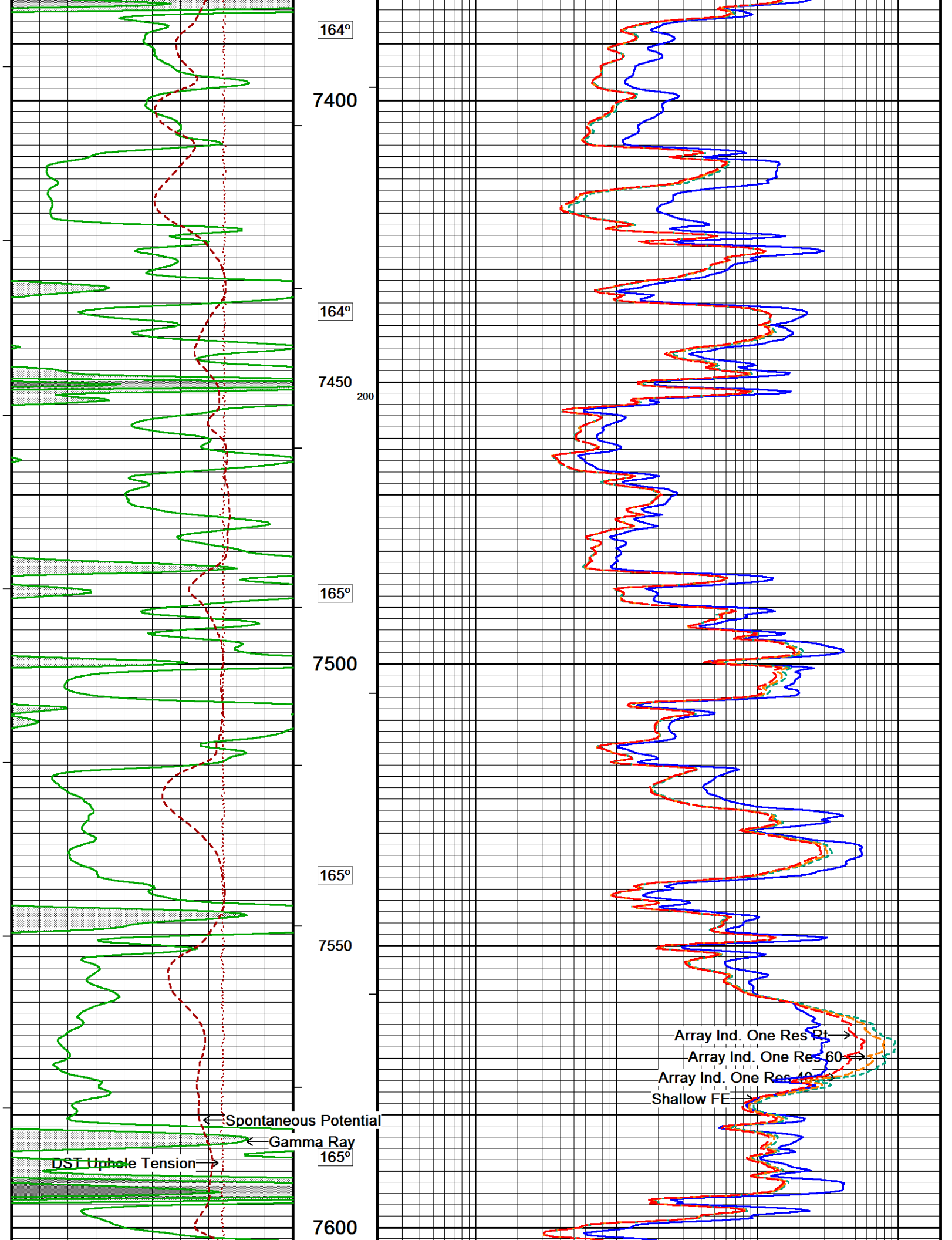


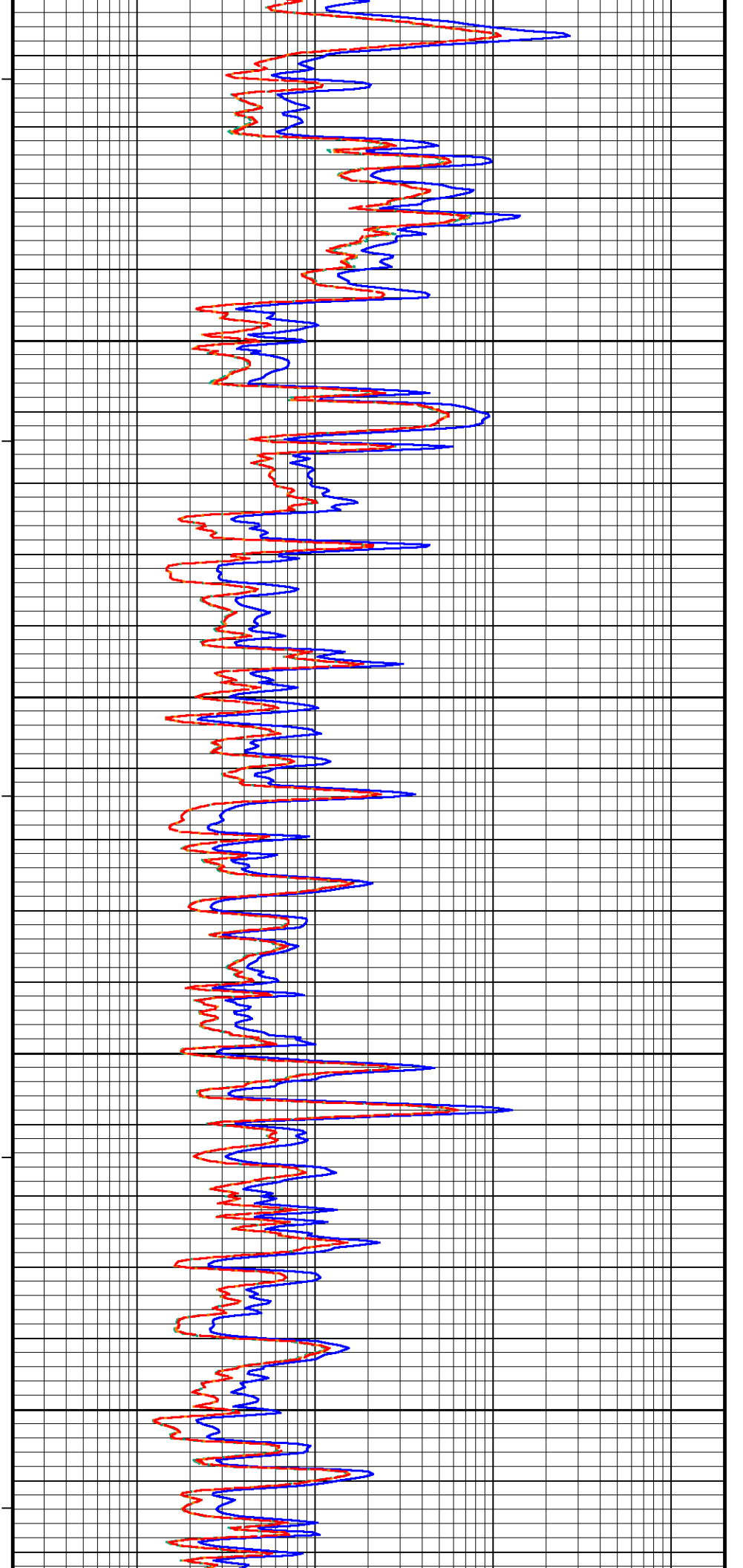
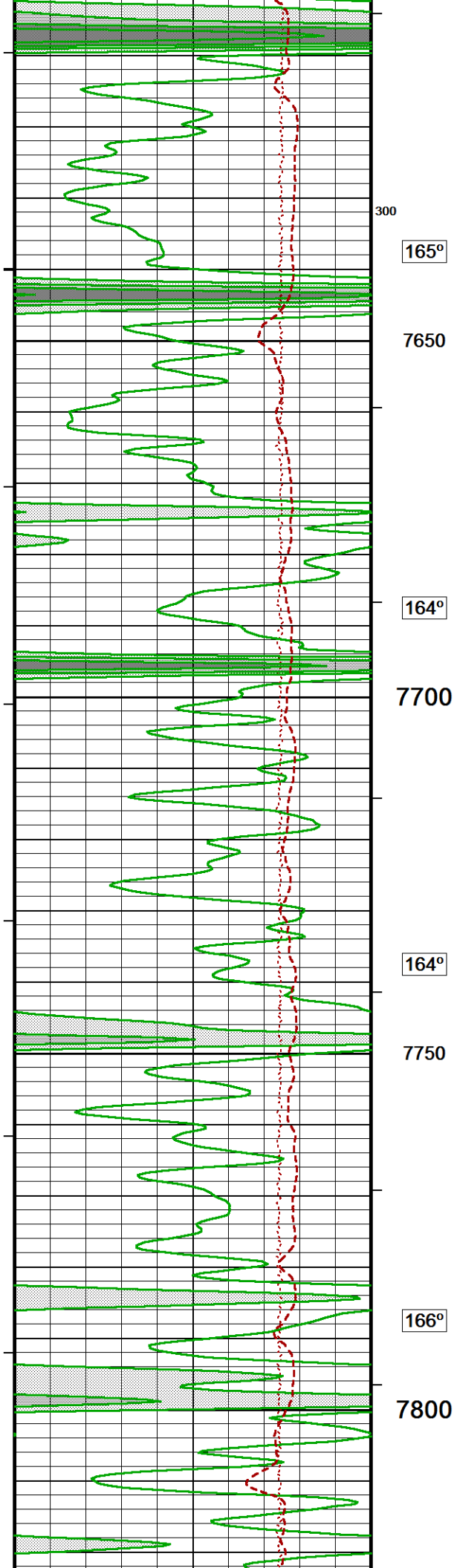


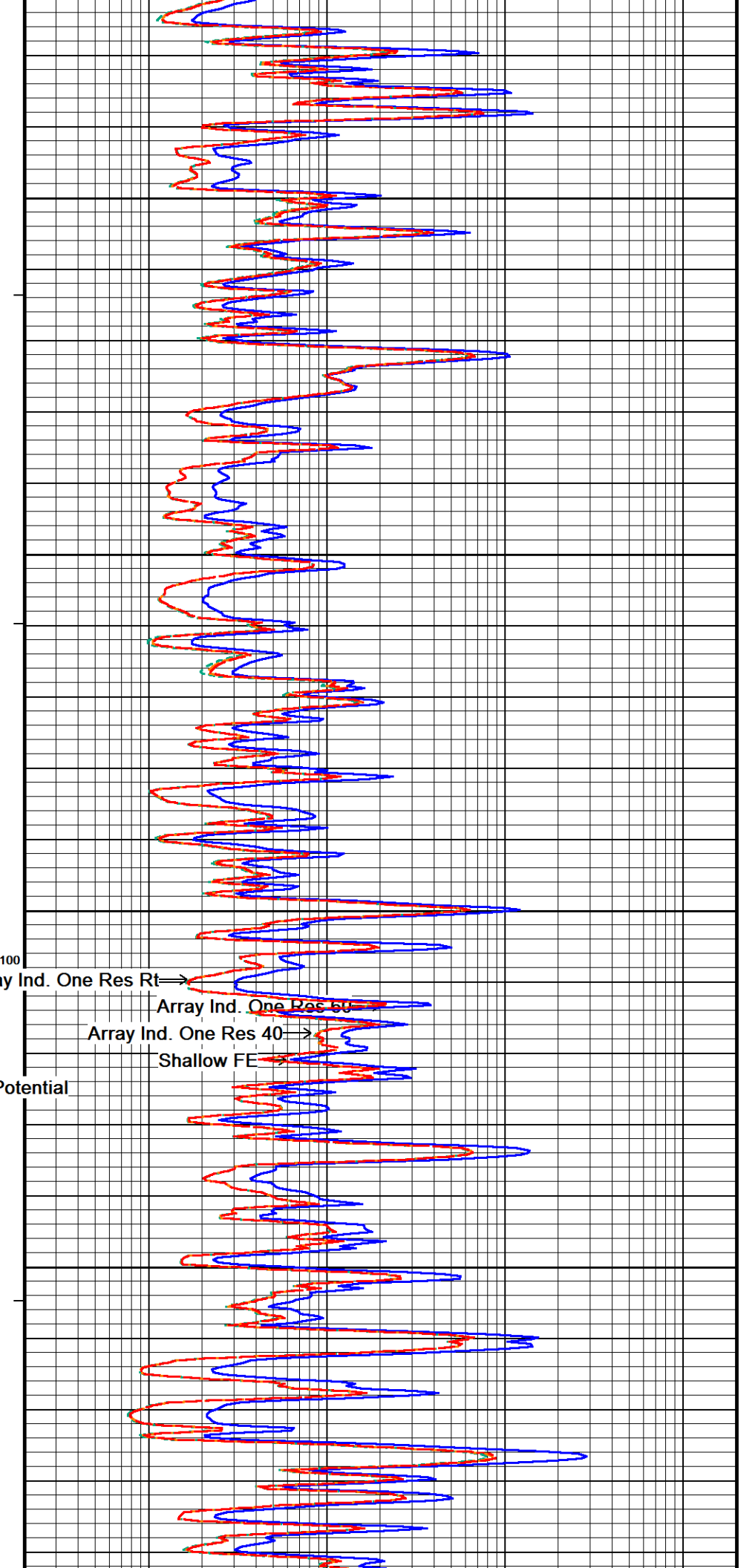
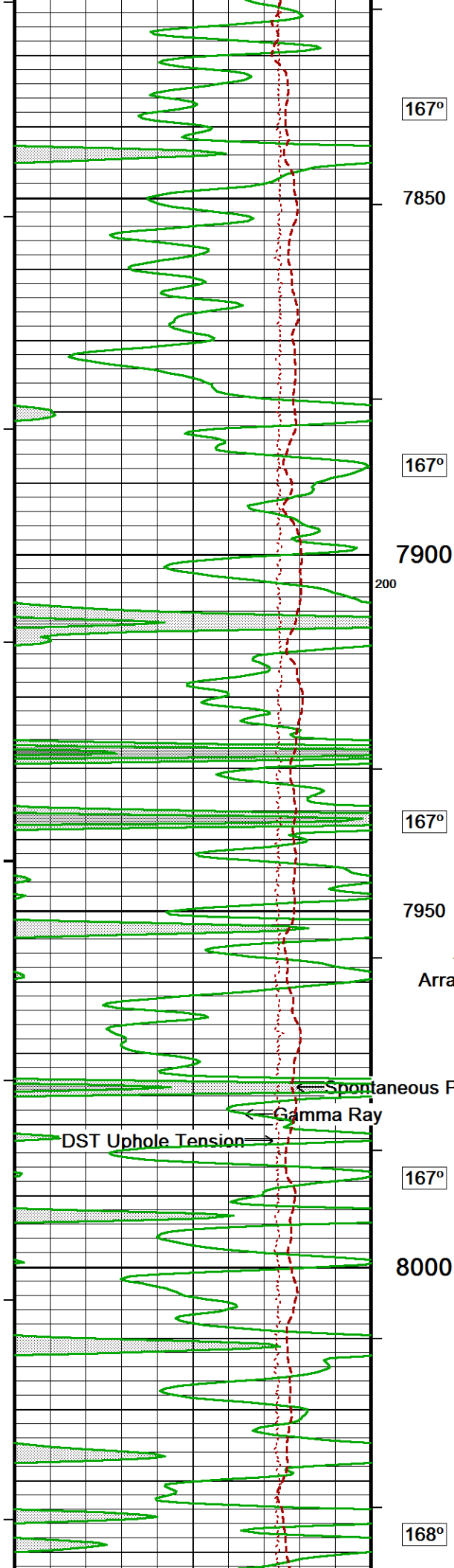


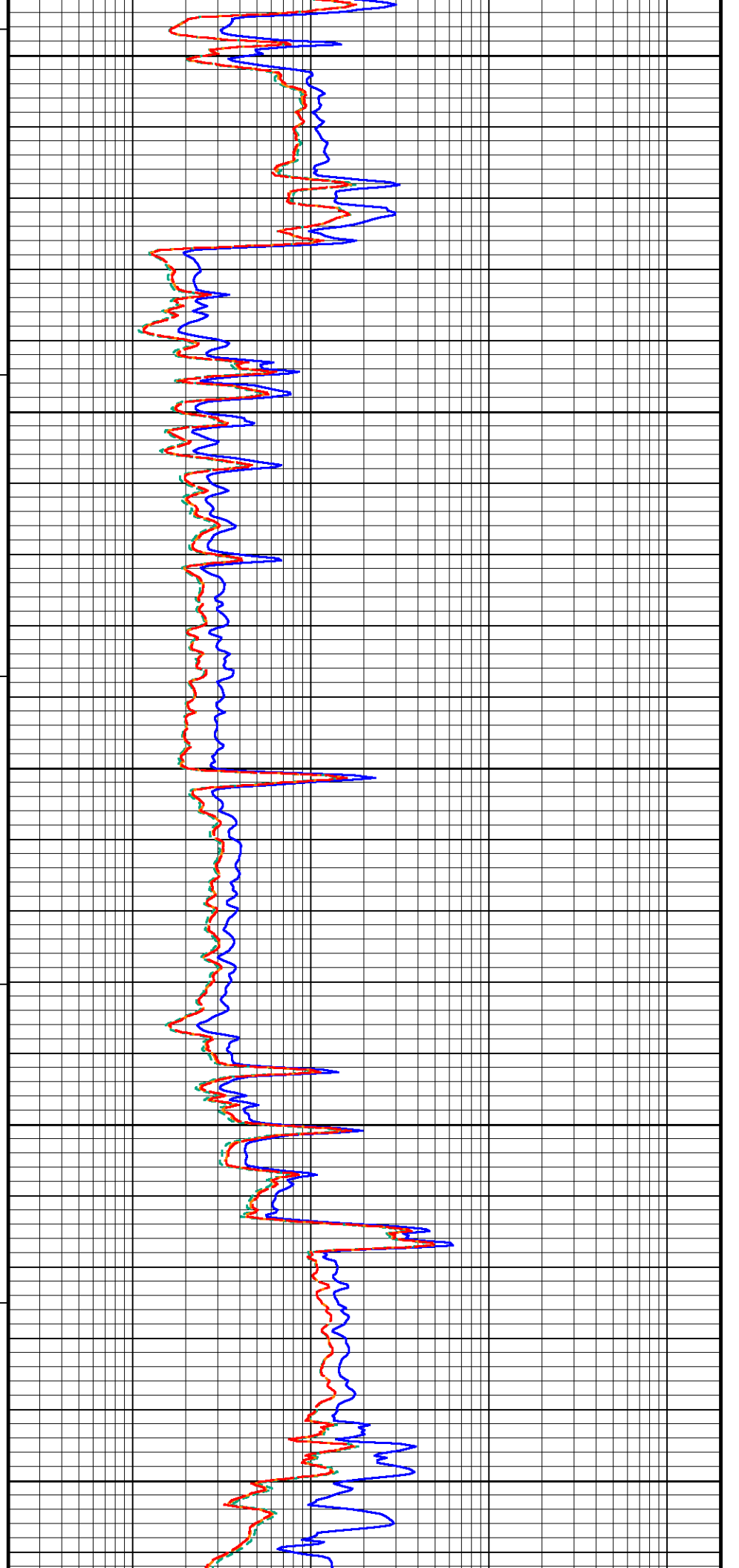
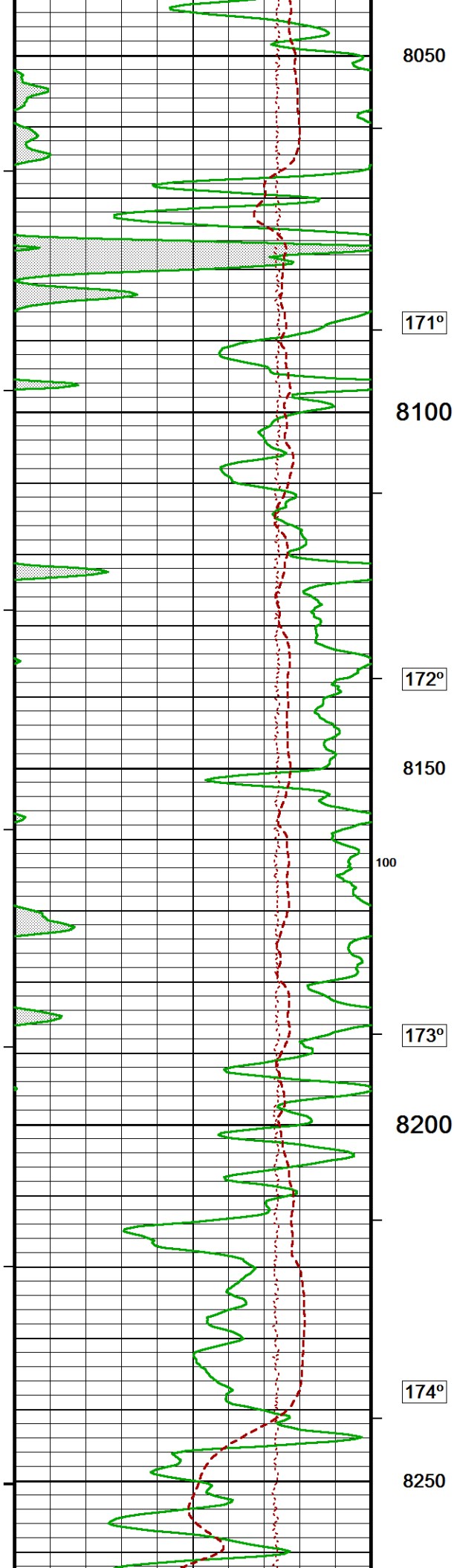


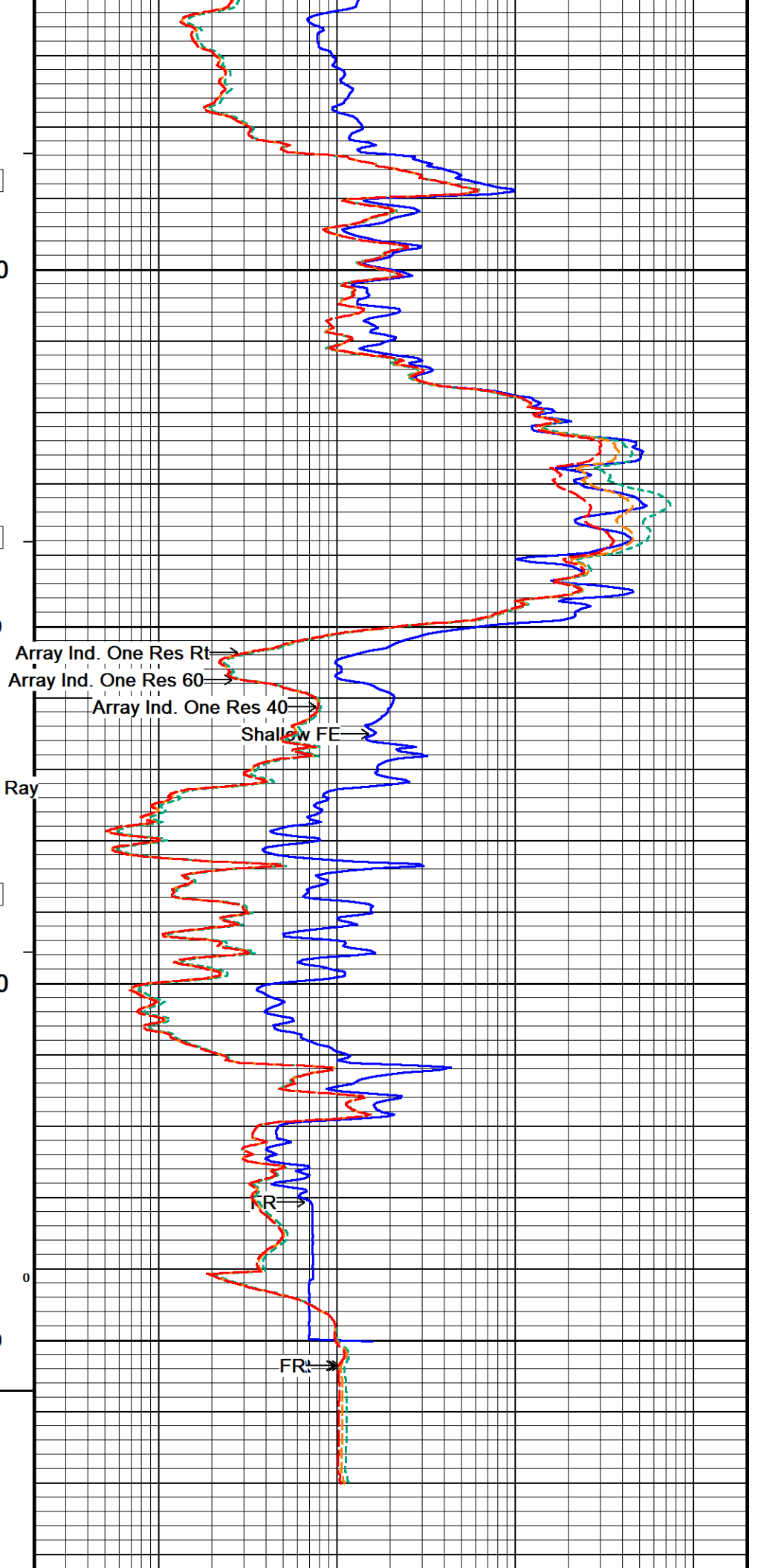
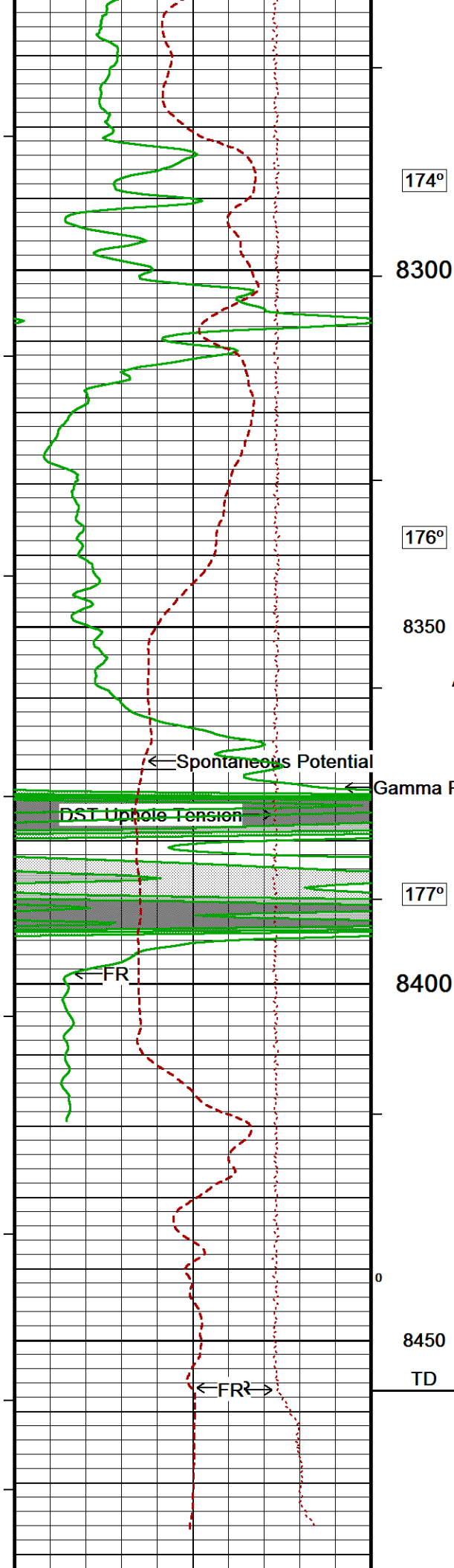


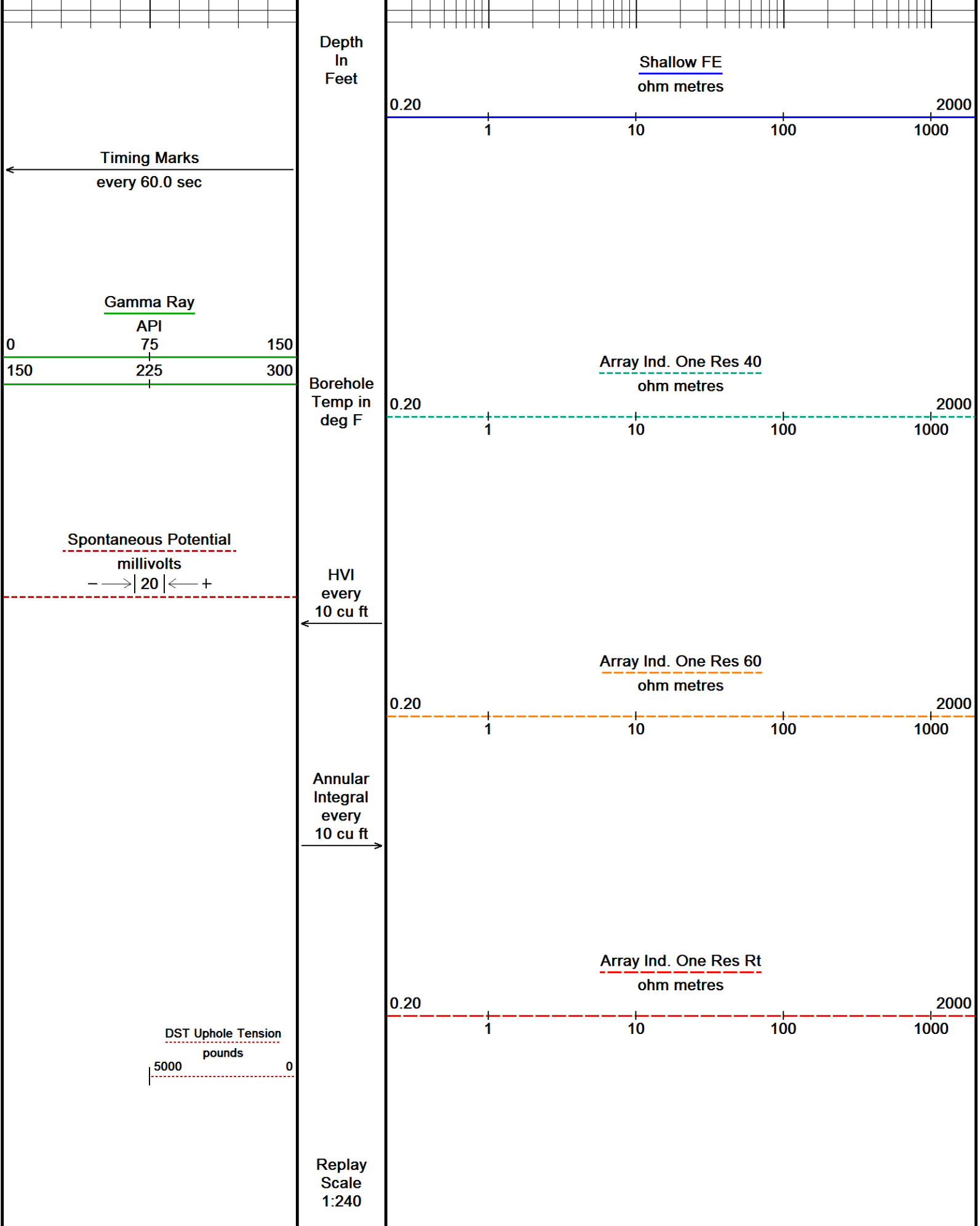


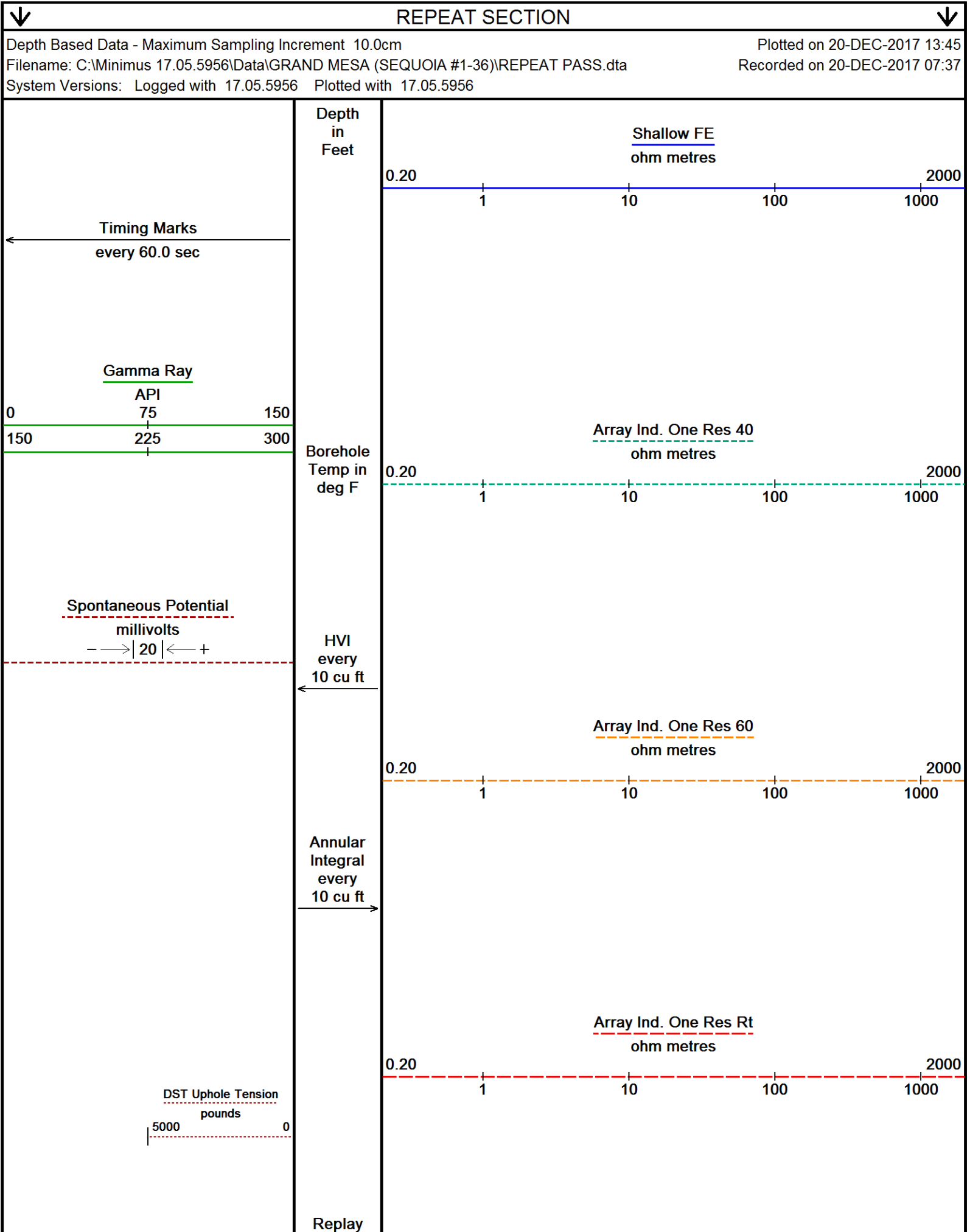


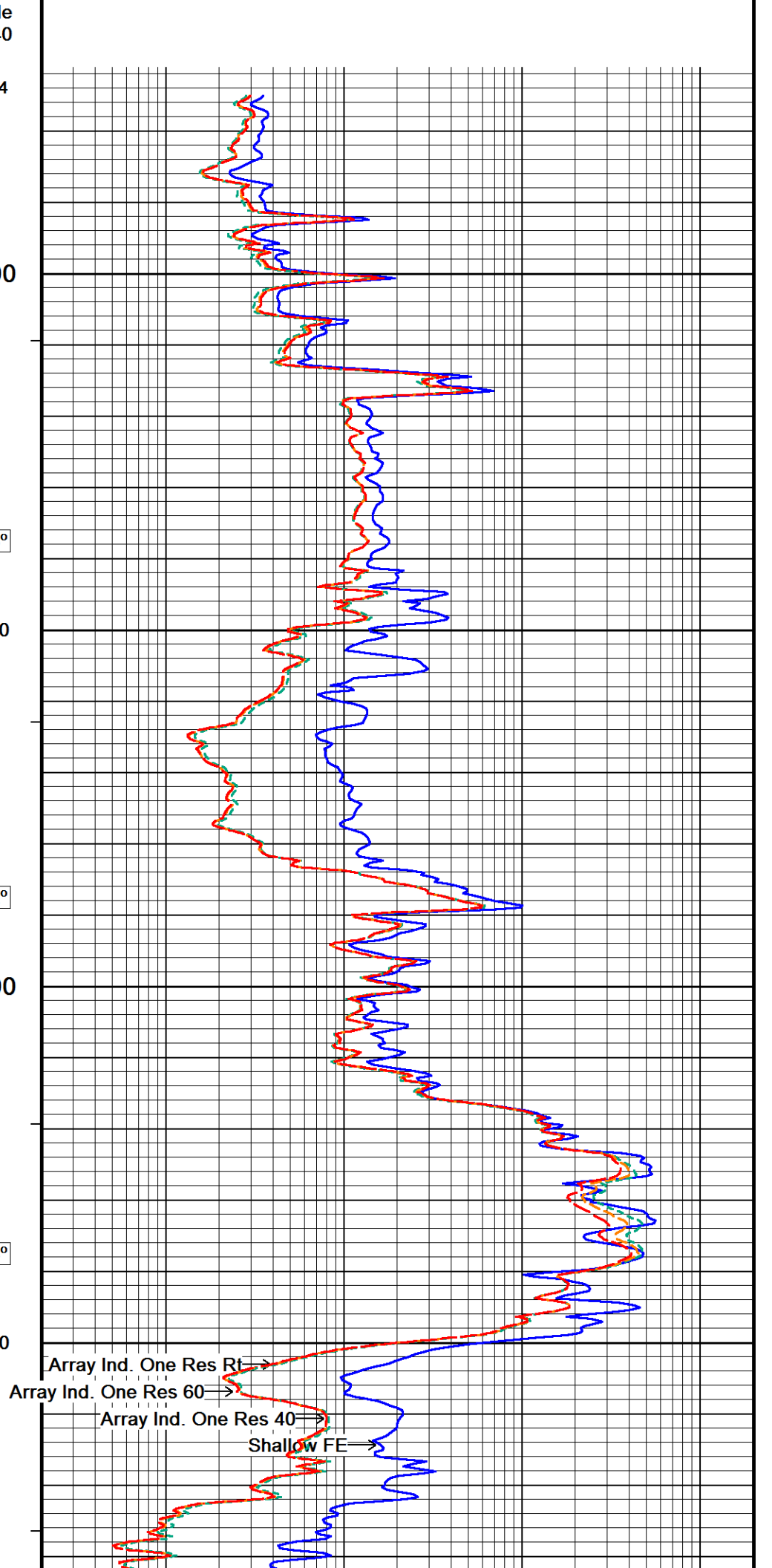
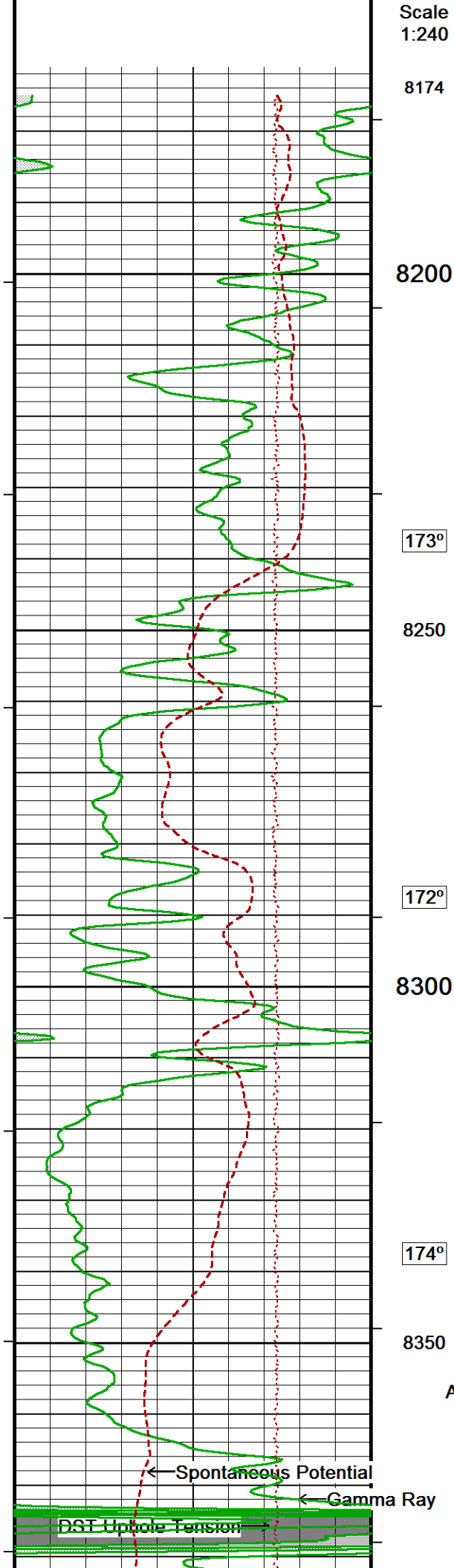


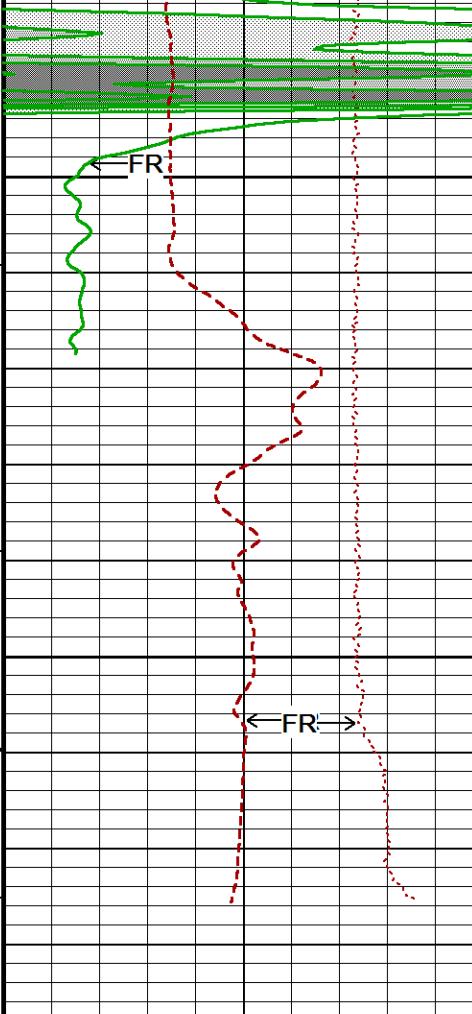












173°

8400

0

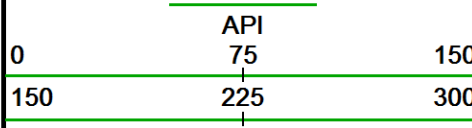
8450

TD

Depth
in
Feet

Timing Marks
every 60.0 sec

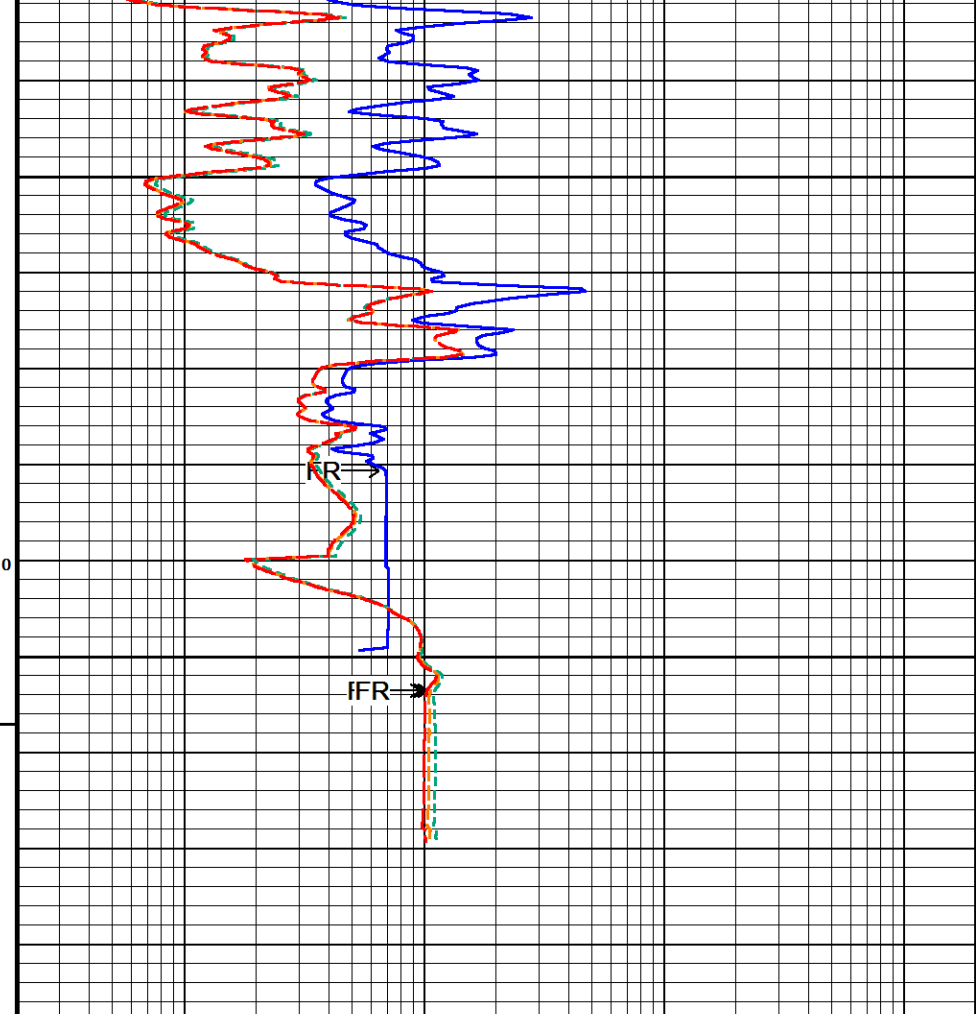
Gamma Ray



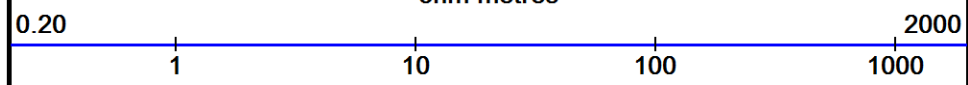
Borehole
Temp in
deg F

Spontaneous Potential
millivolts
— —> | 20 | <— +

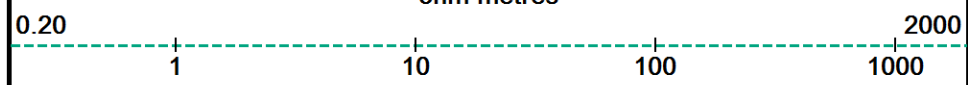
HVI
every
10 cu ft



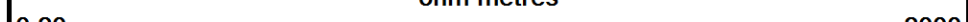
Shallow FE
ohm metres

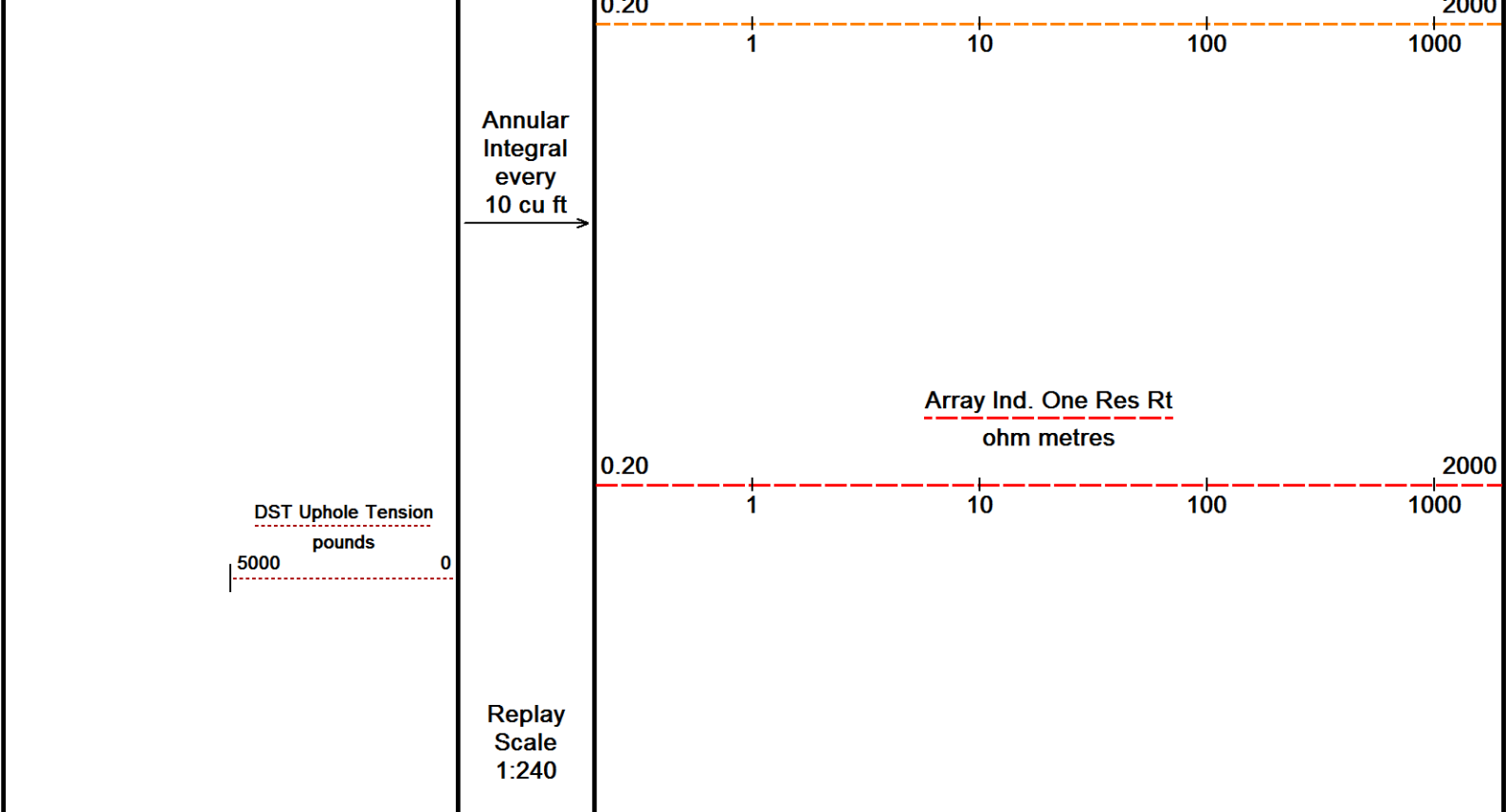


Array Ind. One Res 40
ohm metres



Array Ind. One Res 60
ohm metres





Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 20-DEC-2017 13:45
Filename: C:\Minimus 17.05.5956\Data\GRAND MESA (SEQUOIA #1-36)\REPEAT PASS.dta Recorded on 20-DEC-2017 07:37
System Versions: Logged with 17.05.5956 Plotted with 17.05.5956

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION

C:\Minimus 17.05.5956\Data\GRAND MESA (SEQUOIA #1-36)\MAIN PASS.dta

General Constants All 000 Last Edited on 16-DEC-2017,09:16

General Parameters		
Mud Resistivity	1.000	ohm-metres
Mud Resistivity Temperature	73.000	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. One Res Rt	
RWA Constant A	0.620	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

High Resolution Temperature Calibration MCG-D.K 475			Field Calibration on 15-DEC-2017,10:22
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	200.00	200.00	

High Resolution Temperature Constants MCG-D.K 475 Last Edited on 11-MAY-2016 11:23

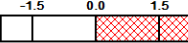
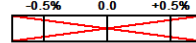
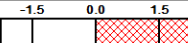
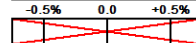
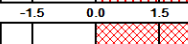
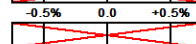
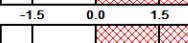
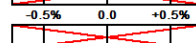
Pre-filter Length 11

Gamma Calibration MCG D K 475

Gamma Calibration MCG-D.K 475		Field Calibration on 20-DEC-2017,05:33	
	Measured	Calibrated (API)	
Background	46	31	
Calibrator (Gross)	1905	1292	
Calibrator (Net)	1859	1261	
Gamma Calibration Tolerances MCG-D.K 475			
Ratio	1.474	<div><div>1.40</div><div>1.475</div><div>1.55</div></div>	Counts/API
Gamma Constants MCG-D.K 475		Last Edited on 16-DEC-2017,09:16	
Gamma Calibrator Number	GRC.C 46		
GRC-M Calibrator Jig in Use?	NO		
Inactive Background Jig in Use?	NO		
Mud Density	1.12	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Potassium Equivalence	Chloride		
K Mud Concentration	0.00	%	
FE Calibration MFE-B.A 261		Base Calibration on 01-DEC-2017 13:55 Field Check on 20-DEC-2017 05:26	
	Resistor 1 (ohm)	Resistor 2 (ohm)	
	0.0	1000.0	
Base Calibration			
	Measured	Calibrated (ohm-m)	
Reference 1	0.0	0.0	
Reference 2	974.4	126.8	
Base Check		278.2	
Field Check		278.1	
FE Calibration Tolerances MFE-B.A 261			
Reference 2	974.4	<div><div>-3%</div><div>980.0</div><div>+3%</div></div>	ohm
Base Check	278.2	<div><div>-2%</div><div>277.0</div><div>+2%</div></div>	ohm-m
Field Check	278.1	<div><div>-2%</div><div>278.2</div><div>+2%</div></div>	ohm-m
FE Constants MFE-B.A 261		Last Edited on 20-DEC-2017,06:23	
Running Mode	No Sleeve		
MFE K Factor	0.1268		
Borehole Correction Constants			
Sonde Position	0.5	inches	
Hole Size Source	Density Caliper		
Hole Size Constant Value	N/A	inches	
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		
Induction Calibration MAI-B.J 426		Factory Loop Calibration 01-DEC-2017,12:00 Field Check on 20-DEC-2017 05:28	
Factory Loop Calibration			
High Conductivity Reference Resistor	3.3	ohm	
Low Conductivity Reference Resistor	333.3	ohm	
	Measured Signal (unitless)	Reference Conductivity (mmho/m)	
Array	Low	High	Calibration
1 (near)	15.9	452.0	Low High Gain Offset
2	5.1	359.5	9.3 966.2 2.195 -25.7
3	3.0	246.4	7.6 821.4 2.297 -4.2
4 (far)	2.1	128.2	5.2 566.0 2.303 -1.6
			2.6 279.2 2.193 -2.0
Array Temperature	74.8	Deg F	
Tool Checks			
	Factory Reference (mmho/m)	Before Survey (mmho/m)	

Array	Factory tolerance (mmho/m)	Low	High	Low	High
1 (near)				17.6	4018.1
2				36.1	3747.6
3				32.9	3210.4
4 (far)				21.3	2160.1
Array Temperature		0.0		74.6	Deg F

Induction Check Tolerances MAI-B.J 426

Low Array 1	17.6		mmho/m	High Array 1	4018.1		mmho/m
Low Array 2	36.1		mmho/m	High Array 2	3747.6		mmho/m
Low Array 3	32.9		mmho/m	High Array 3	3210.4		mmho/m
Low Array 4	21.3		mmho/m	High Array 4	2160.1		mmho/m

Induction Constants MAI-B.J 426

Last Edited on 20-DEC-2017,05:27

Induction Model	RtAP-WBM		
Borehole Correction Constants			
Tool Centred	No		
Hole Size Source	Density Caliper		
Hole Size Constant Value	N/A		
Stand-off Type	Pineapple		
Stand-off	0.49		
Number of Fins on Stand-off	5.0000		
Stand-off Fin Angle	72.00		
Stand-off Fin Width	1.3878		
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		
Borehole Correction Method	Default		
Squasher Start	0.0020	mhos/metre	
Squasher Offset	N/A	mhos/metre	
Borehole Normalisation			
DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000
Calibration Site Corrections			
Channel 1	0.00	mmhos/metre	
Channel 2	0.00	mmhos/metre	
Channel 3	0.00	mmhos/metre	
Channel 4	0.00	mmhos/metre	
Symmetrised Receiver Gains			
Receiver 1	1.00		
Receiver 2	1.00		
Receiver 3	1.00		
Receiver 4	1.00		
Apparent Porosity and Water Saturation Constants			
Archie Constant (A)	1.00		
Cementation Exponent (M)	2.00		
Saturation Exponent (N)	2.00		
Saturation of Water for Apor	100.00	percent	
Resistivity of Water for Apor and Sw	0.05	ohm-m	
Resistivity of Mud Filtrate for Sw	0.00	ohm-m	
Source for Rt	0.00		
Source for Rxo	0.00		

Caliper Calibration MPD-B 120

Base Calibration on 04-DEC-2017 08:42
Field Calibration on 20-DEC-2017 06:25

Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	17603	4.00	

1	17005	4.00
2	26000	5.96
3	34637	7.96
4	43056	9.86
5	52138	11.88
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.97	8.12

Caliper Calibration Tolerances MPD-B 120

Short Arm Field Cal.	7.97	7.92	8.12	8.32	in
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DOWNHOLE EQUIPMENT

C:\Minimus 17.05.5956\Data\GRAND MESA (SEQUOIA #1-36)\MAIN PASS.dta

11B Tension Cablehead

MCB-A.A 2 LG: 2.40 ft WT: 19.8 lb OD: 2.244 in

Compact Swivel Head Adaptor

SHA-J.A 438 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma

MCG-D.K 475 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity

MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron

MDN-B.J 388 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper

MPD-B 120 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint

SKJ-E.A 166 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric

MFE-B.A 261 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

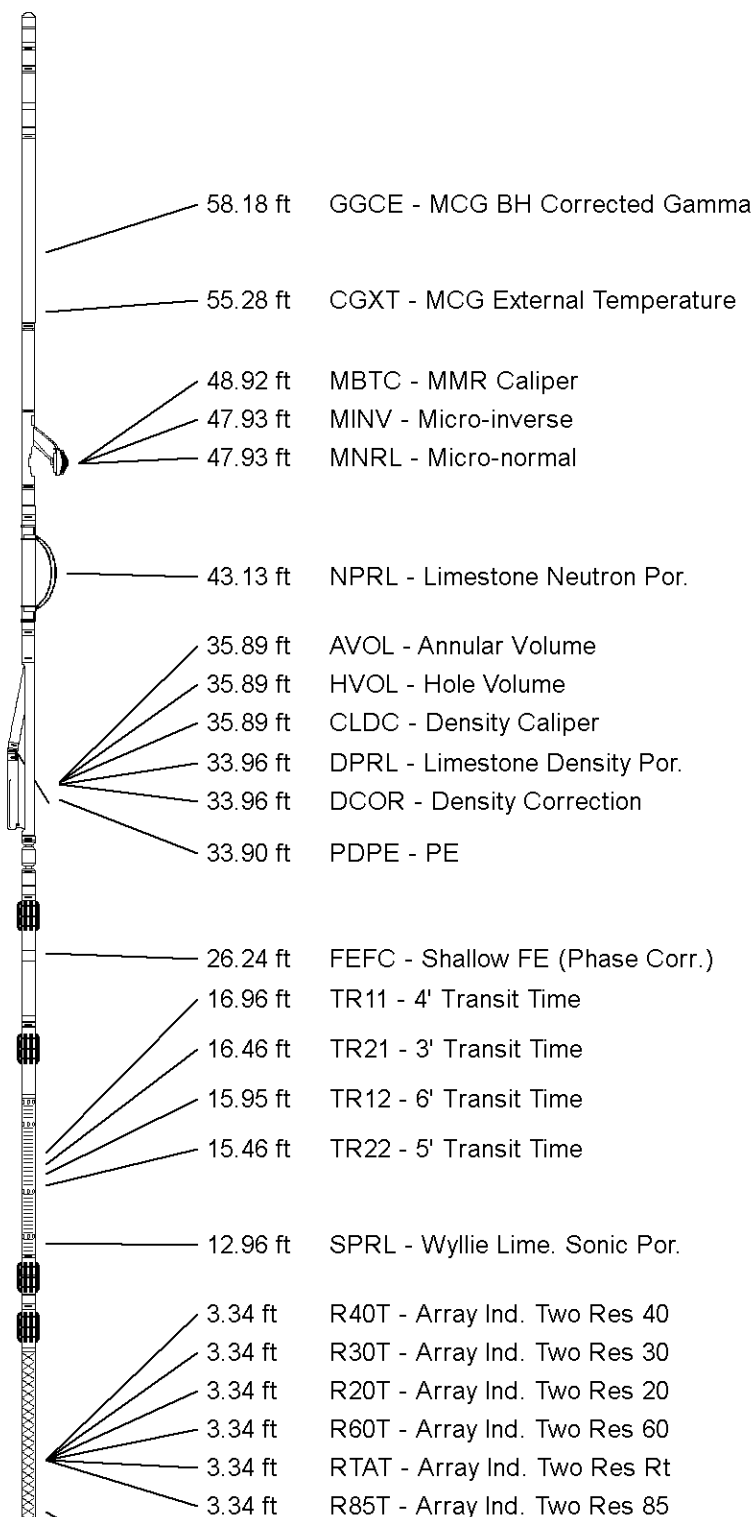
Compact Sonic

MSS-C.A 147 LG: 12.52 ft WT: 72.8 lb OD: 2.240 in

Compact Induction

MAI-B.J 426 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 68.16 ft Weight: 522.5 lb



All measurements relative to tool zero.

Elevation Kelly Bushing	5470	feet	First Reading	8454.00	feet
Elevation Drill Floor	5468	feet	Depth Driller	8462.00	feet
Elevation Ground Level	5451	feet	Depth Logger	8457.00	feet



1 INCH MAIN

Depth Based Data - Maximum Sampling Increment: 10.0cm
 Filename: C:\Minimus 17.05.5956\data\GRAND MESA (SEQUOIA #1-36)\MAIN PASS.dta
 System Metrics: Logged with: 17.05.5956 Plotted with: 17.05.5956

Plotted on 20-DEC-2017 13:45
 Recorded on 20-DEC-2017 07:52

Timing Marks
 every 60.0 sec

Gamma Ray
 API
 0 75 150
 150 225 300

Spontaneous Potential
 millivolts
 - 20 | + 20

Depth In Feet
 1000 750 500 250 0
 2000 1750 1500 1250 1000

Array Ind. One Cond Ct
 mmhos/metre

Borehole Temp in deg F
 Shallow FE
 ohm metres
 0 25 50
 0 250 500

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Array Ind. One Res Rt
ohm metres

0 25 50
0 250 500

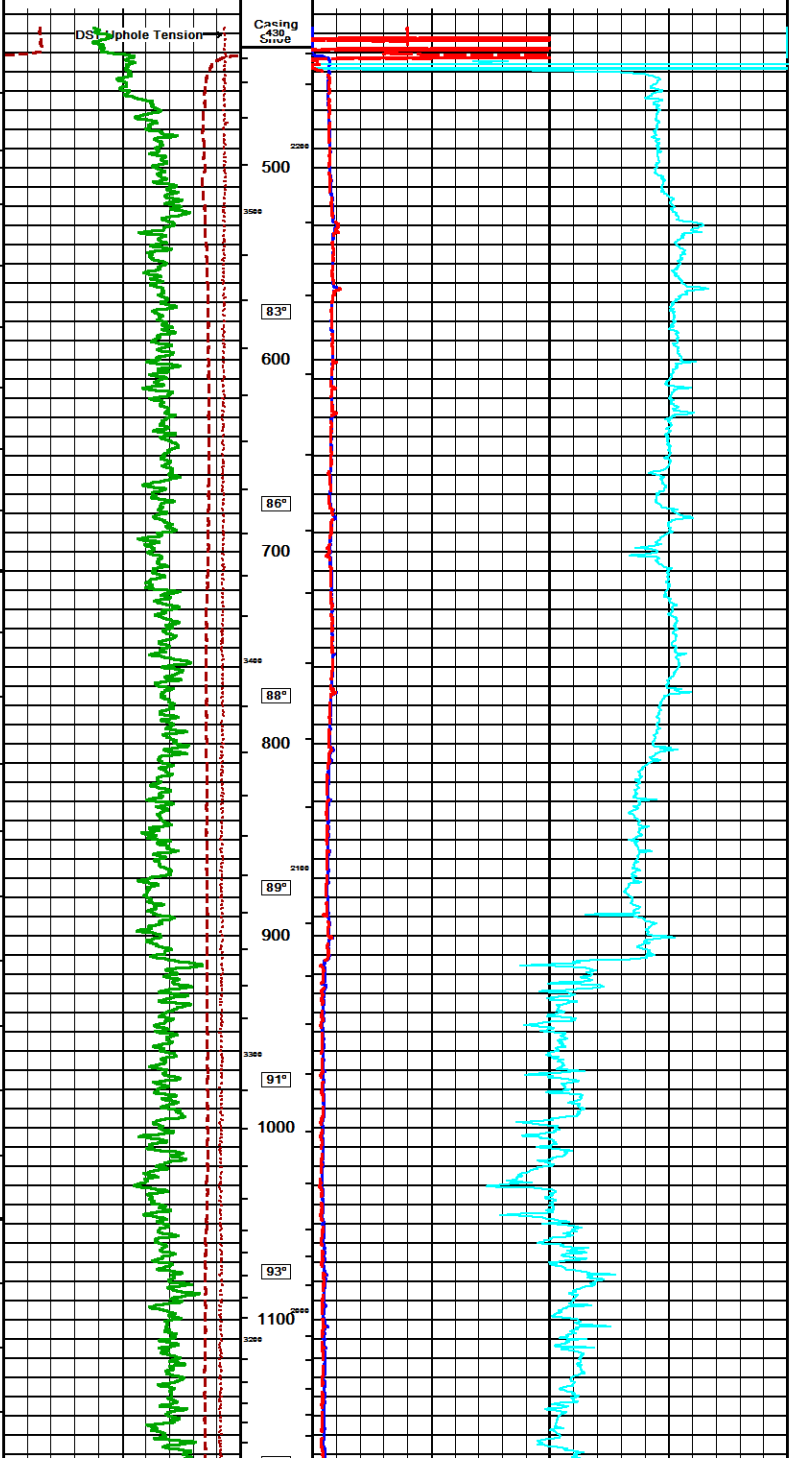
DST Uphole Tension
pounds

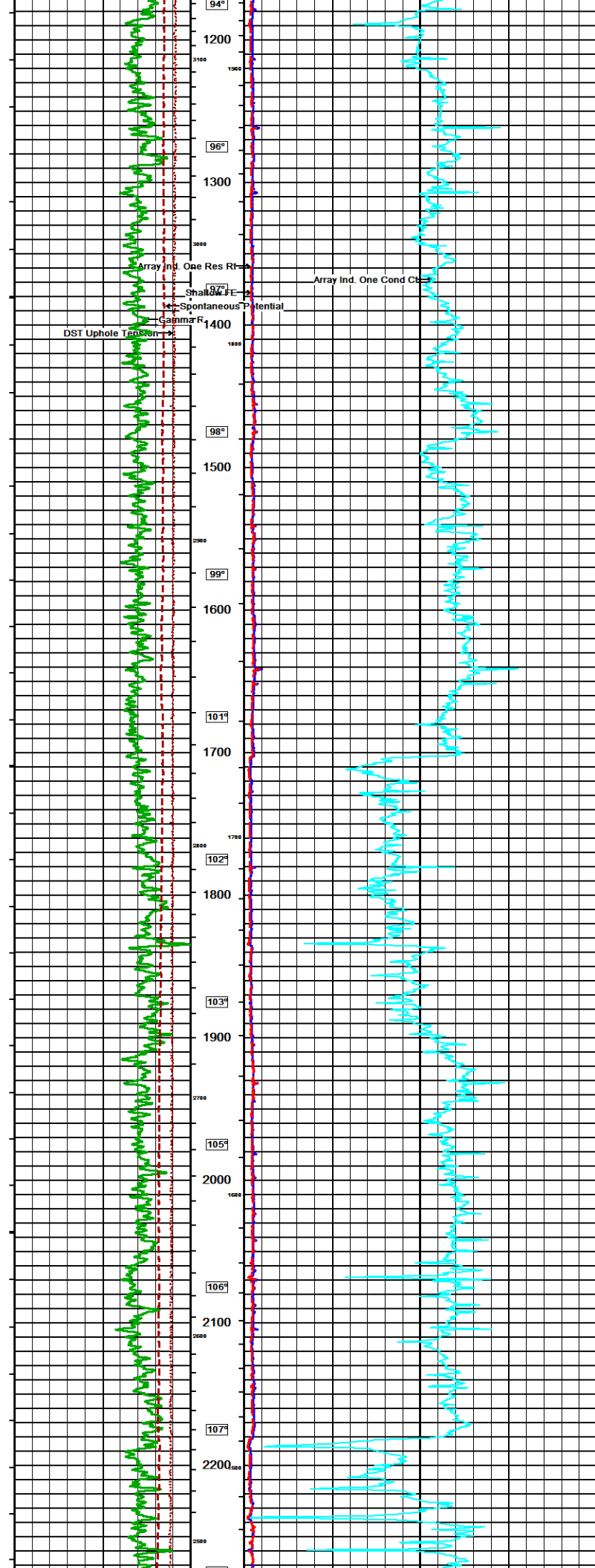
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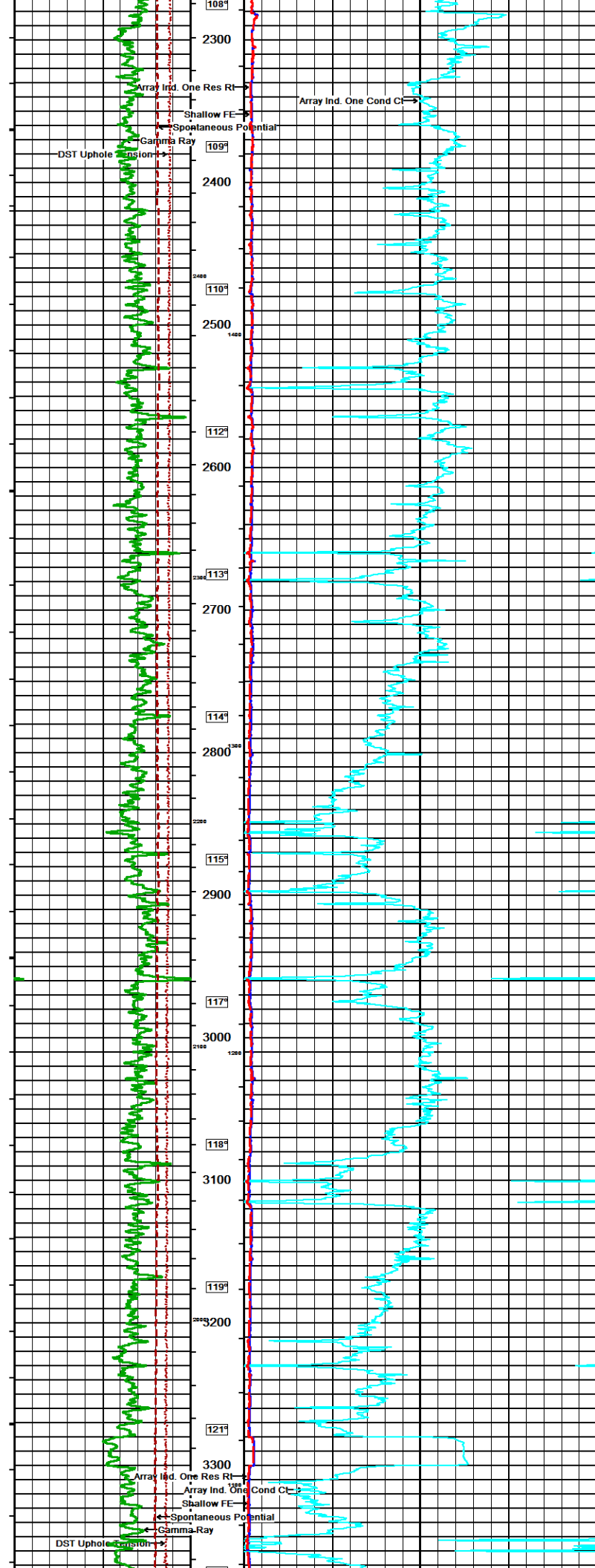
Replay
Scale
1.600

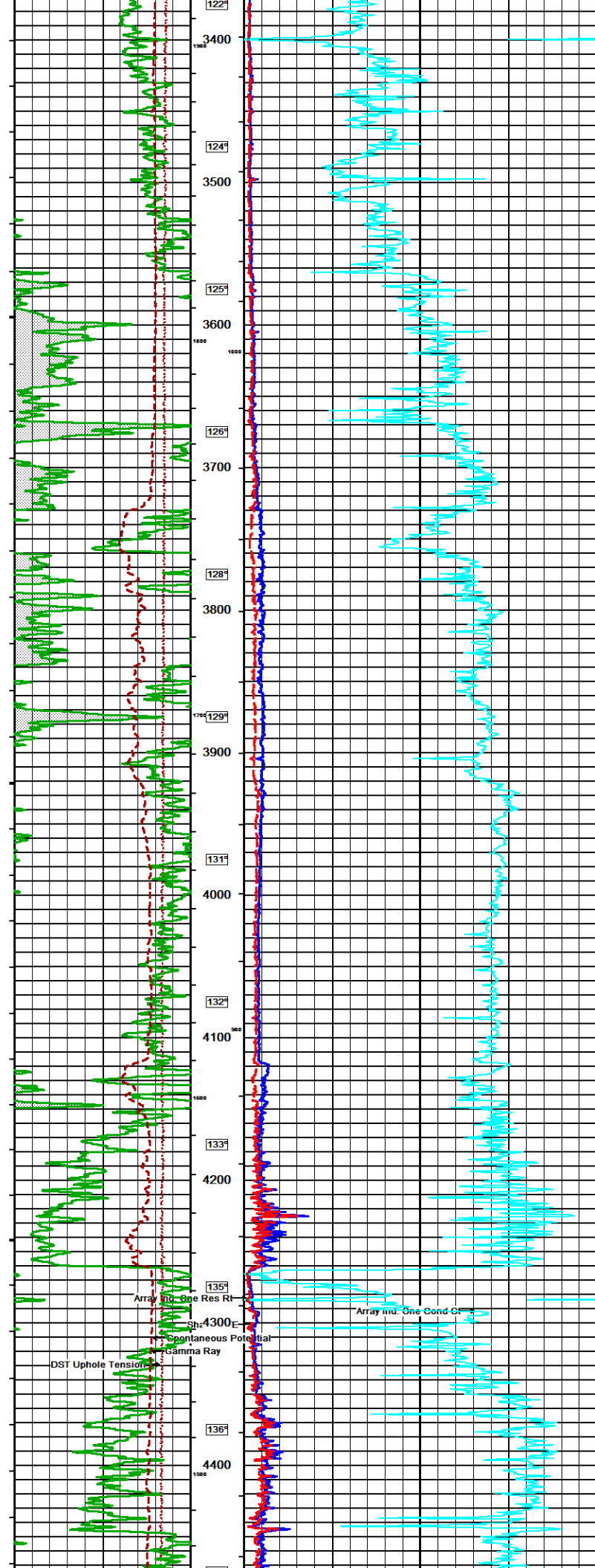
Casing
430
Slide

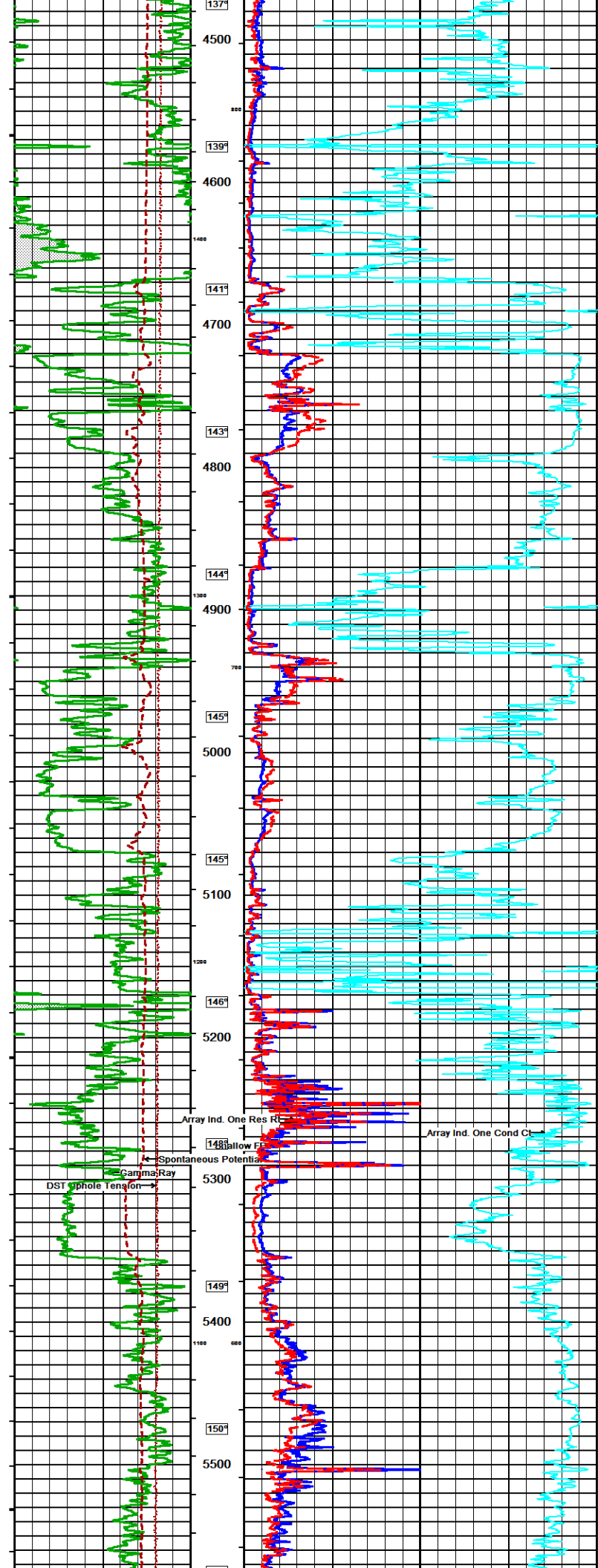
DST Uphole Tension

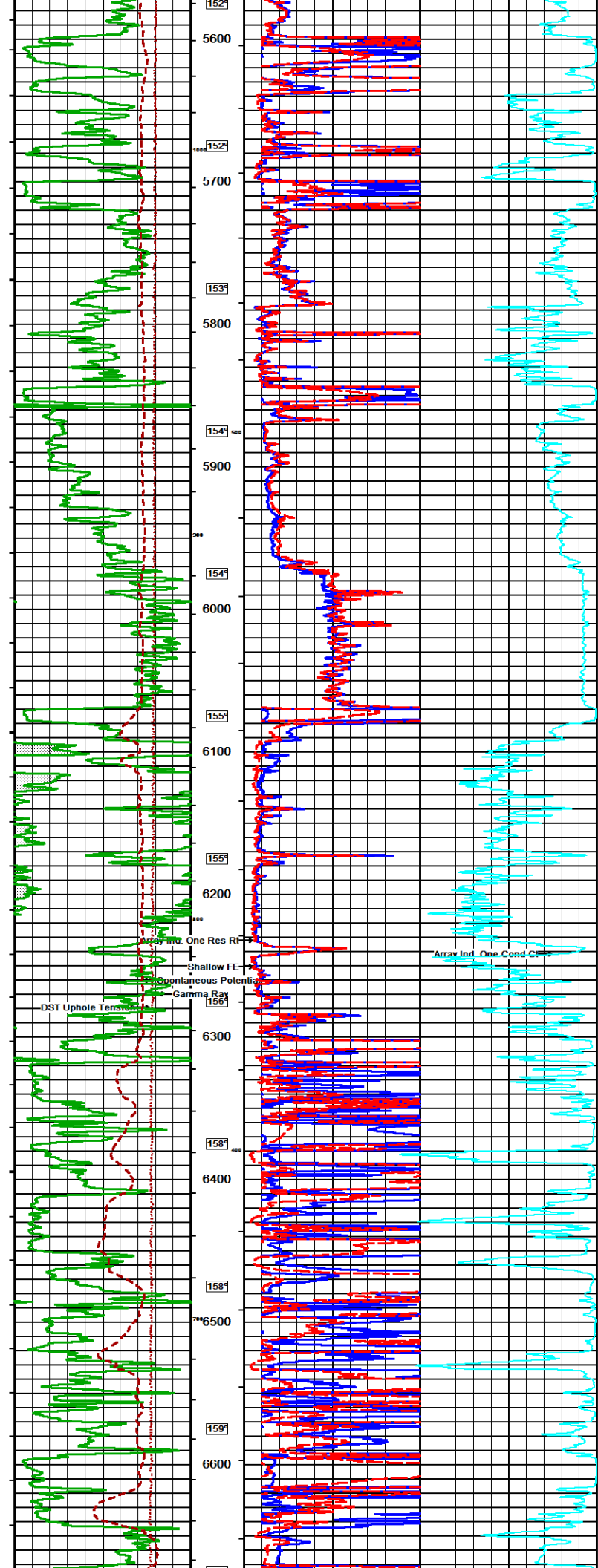


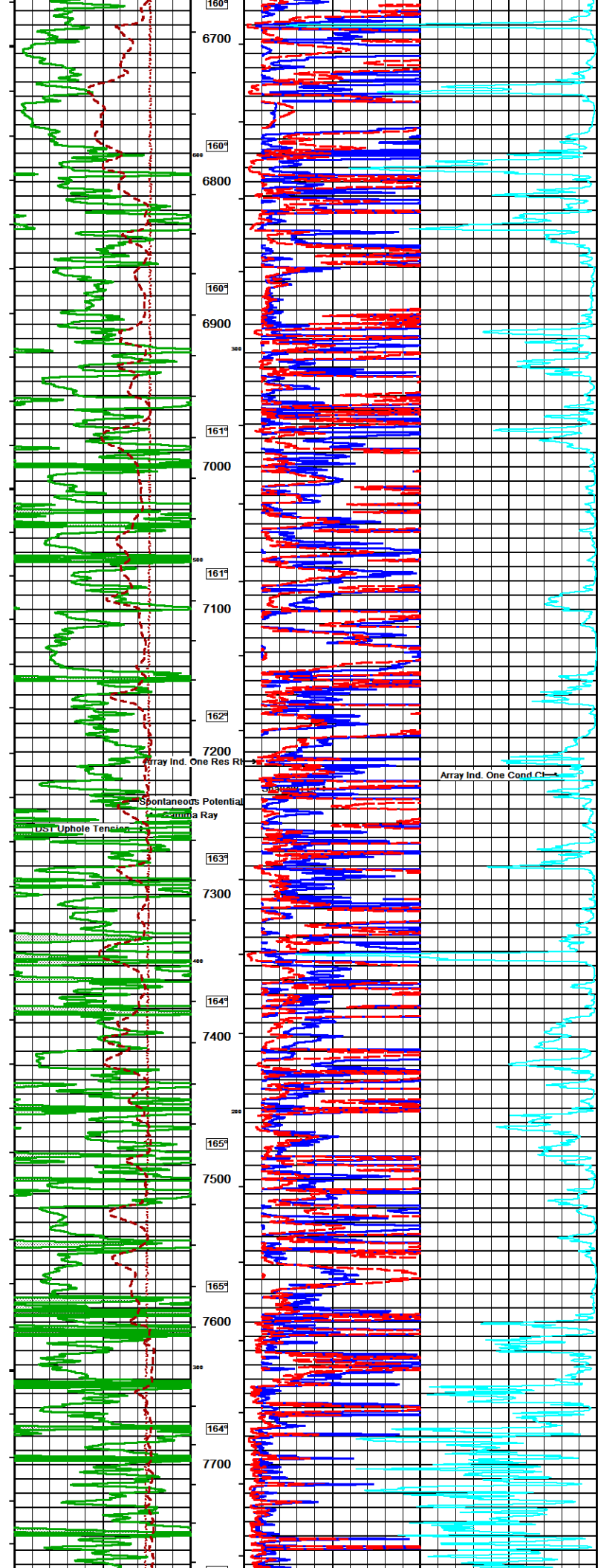


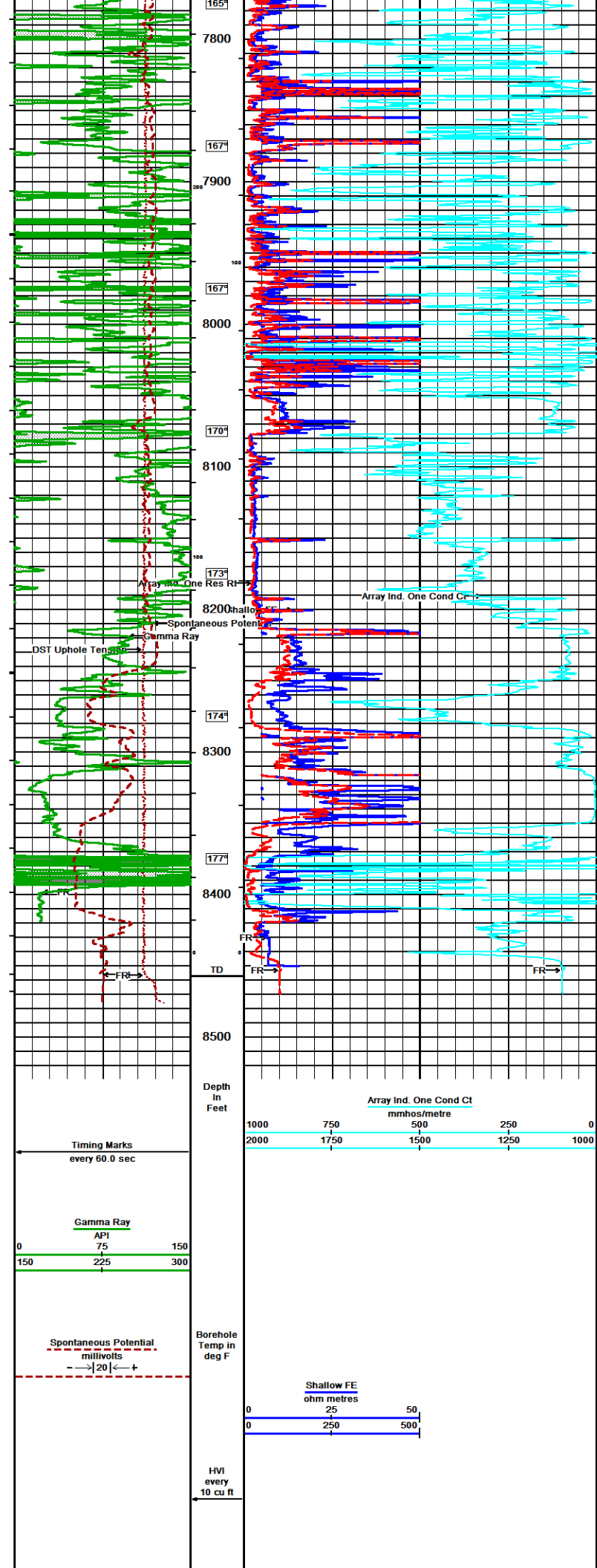


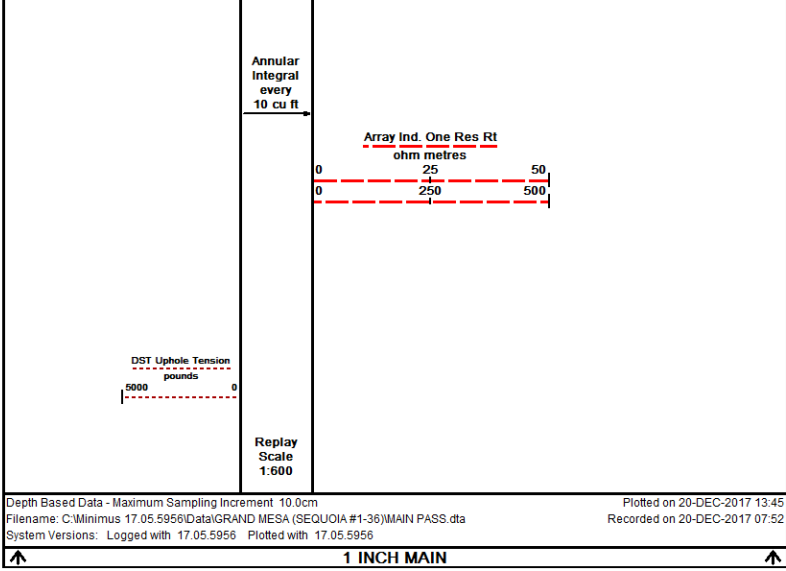













COMPANY	GRAND MESA OPERATING COMPANY			
WELL	SEQUOIA #1-36			
FIELD	WILDCAT			
PROVINCE/COUNTY	WASHINGTON			
COUNTRY/STATE	U.S.A. / COLORADO			
Elevation Kelly Bushing	5470	feet	First Reading	8454.00 feet
Elevation Drill Floor	5468	feet	Depth Driller	8462.00 feet
Elevation Ground Level	5451	feet	Depth Logger	8457.00 feet
		ARRAY INDUCTION		
		SHALLOW FOCUSED		
		ELECTRIC LOG		