



Weatherford®

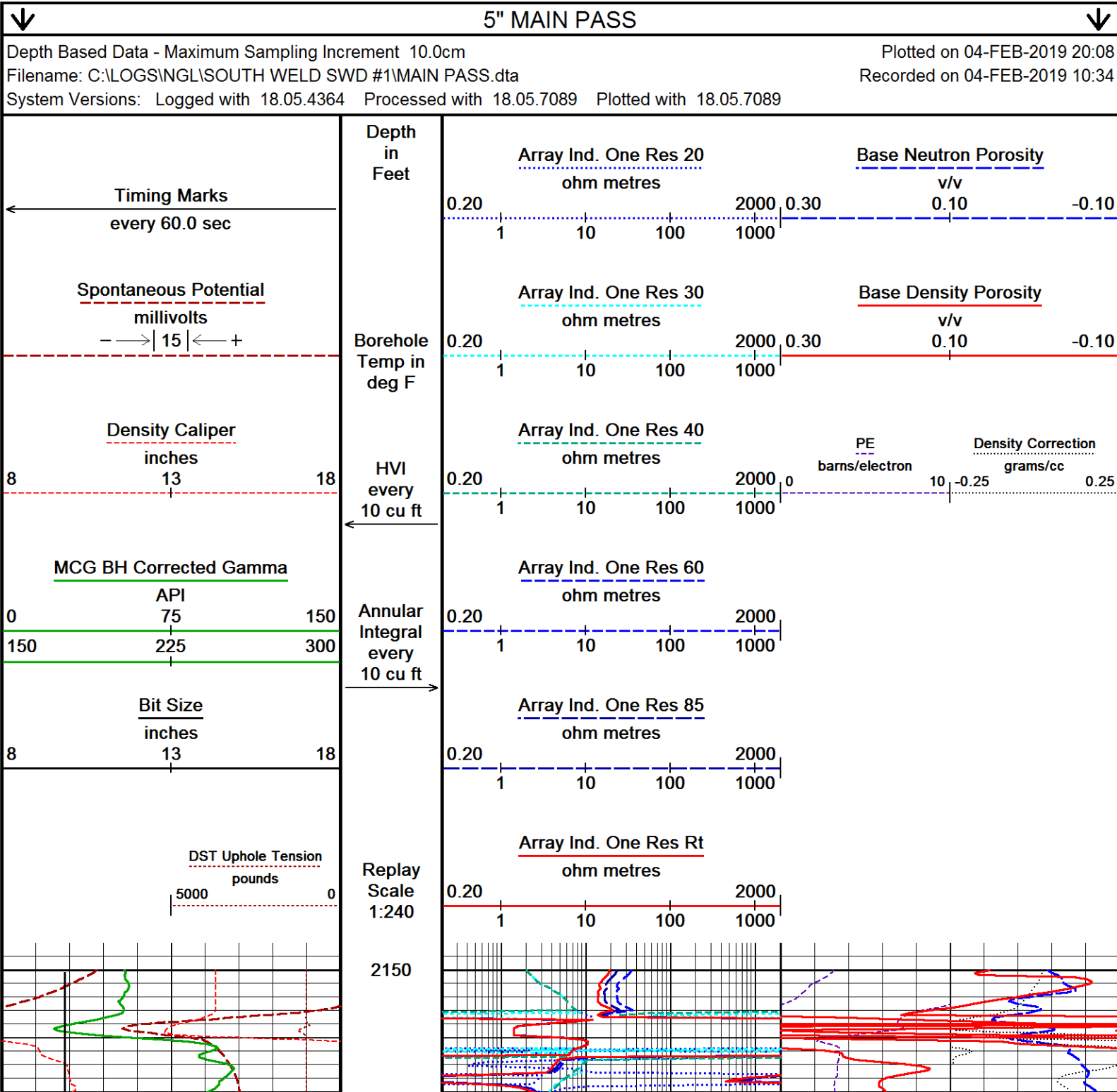
COMPOSITE LOG

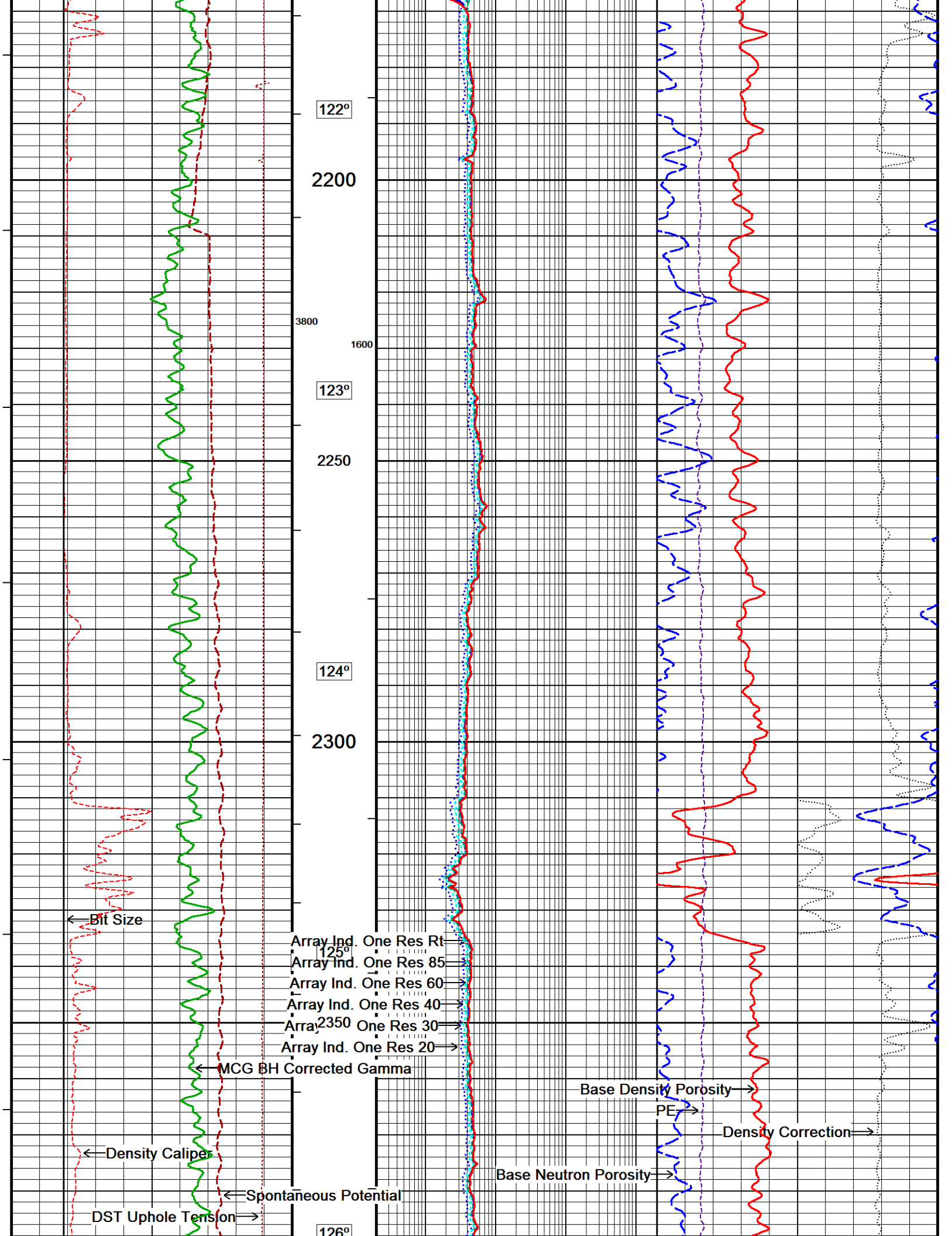
COMPANY			NGL ENERGY PARTNERS		
WELL			SOUTH WELD SWD #1		
FIELD			WATTENBERG		
PROVINCE/COUNTY			WELD COUNTY		
COUNTRY/STATE			USA/COLORADO		
LOCATION			SHL: SWNE 1615 FNL 1713 FEL		
SEC 30	TWP 1N	RGE 66W	Other Services		
Latitude	40.0256		Elevations: KB 4977.00 DF 4977.00 GL 4952.00		
Longitude	-104.8165				
API Number	05-123-47682				
Permanent Datum GL, Elevation 4952 feet					
Log Measured From KB, 25.00 feet above Permanent Datum					
Drilling Measured From KB					
Date	04-FEB-2019				
Run Number	1				
Service Order	2938-233467273				
Depth Driller	9166.00		feet		
Depth Logger	9168.00		feet		
First Reading	9160.00		feet		
Last Reading	2160.00		feet		
Casing Driller	1235.00		feet		
Casing Logger	1215.00		feet		
Bit Size	9.875		inches		
Hole Fluid Type	WBM				
Density / Viscosity	9.35	g/c3	53.00	sec/qt	
PH / Fluid Loss	8.40		5.20	ml/30Min	
Sample Source	FLOWLINE				
Rm @ Measured Temp	0.87 @ 62.8		ohm-m		
Rmf @ Measured Temp	0.65 @ 62.8		ohm-m		
Rmc @ Measured Temp	1.09 @ 62.8		ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.24 @243.0		ohm-m		
Time Since Circulation	20 HRS				
Max Recorded Temp	243.00		deg F		
Equipment / Base	14194		CASPER		
Recorded By	RAMIRO BRIGUEDA				
Witnessed By	DAVID SPERRY		TOM TOMAS		
RIG	PATTERSON 346				

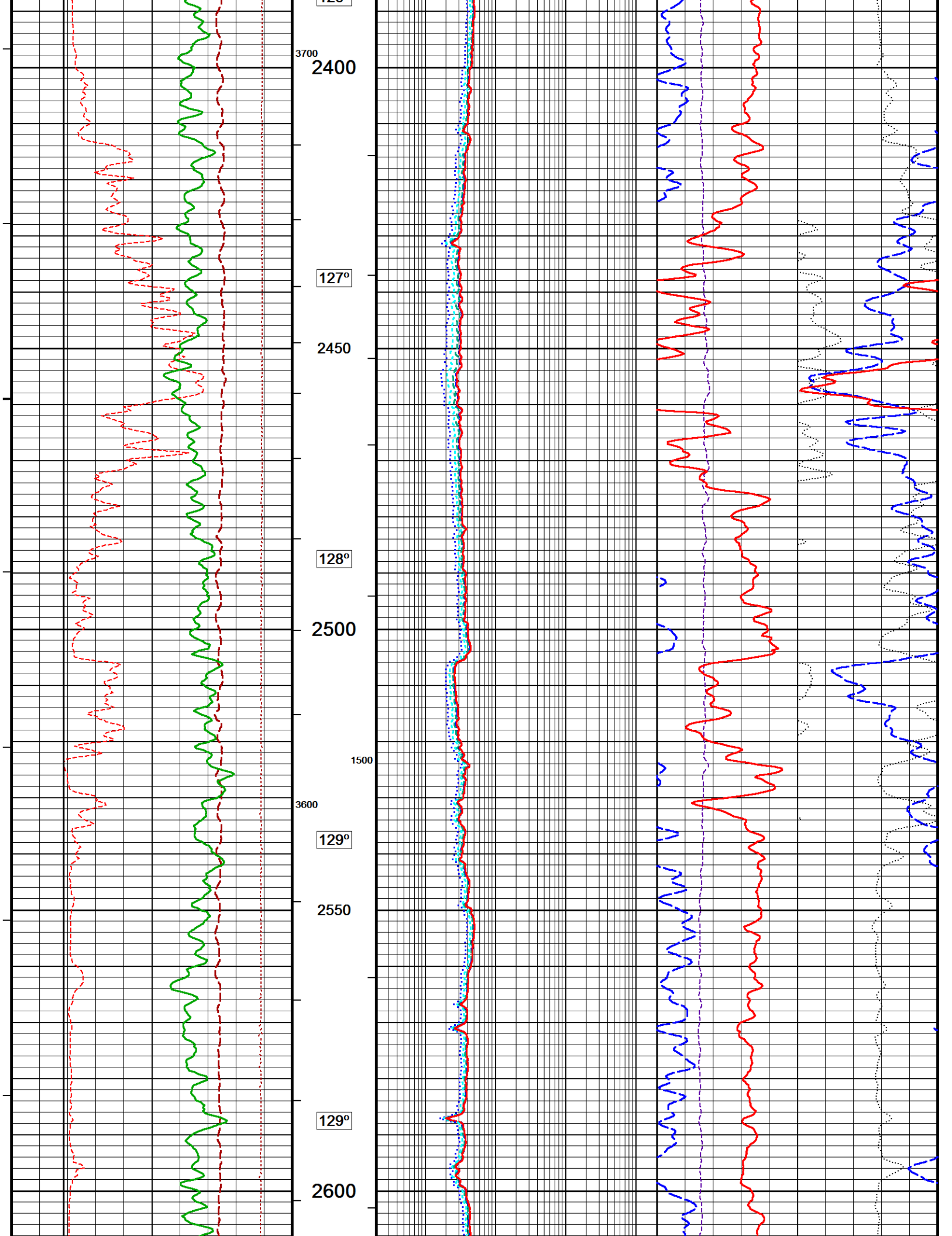
BOREHOLE RECORD					Last Edited: 04-FEB-2019 16:16
Bit Size inches		Depth From feet		Depth To feet	
9.875		1235.00		9166.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	10.750	0.00	1235.00	40.50	

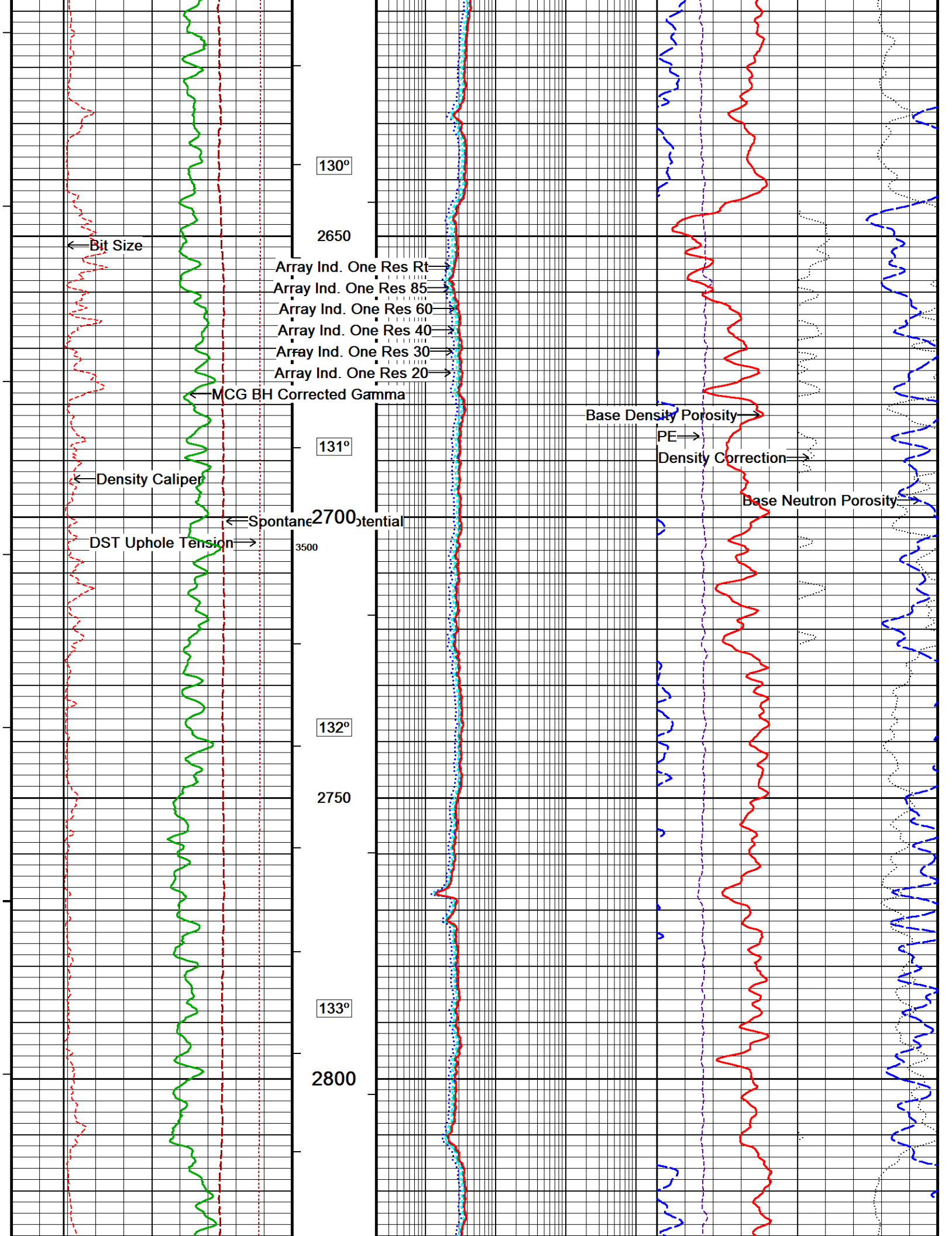
REMARKS
LOGGED WITH WLS 18.05.4364
TOOLSTRING RAN AS PER STRING DIAGRAM
HARDWARE: MMR: ABOVE MDN TO SIDEWALL
MATRIX CHANGES FROM SANDSTONE TO LIMESTONE AT 7198 FT
MATRIX CHANGES FROM LIMESTONE TO SANDSTONE AT 7564 FT
BRIDGED THREE TIMES AT THE FOLLOWING DEPTHS RESPECTIVELY: 1263 FT, 1261 FT, 1300 FT
THROUGH DRILLPIPE OPERATION WITH PIPE SET AT 2160 FT
ANNULAR VOLUME FROM T.D. TO 2160 FT BASED ON 7.625" CASING
ANNULAR AND HOLE VOLUME CALCULATED FROM DENSITY CALIPER

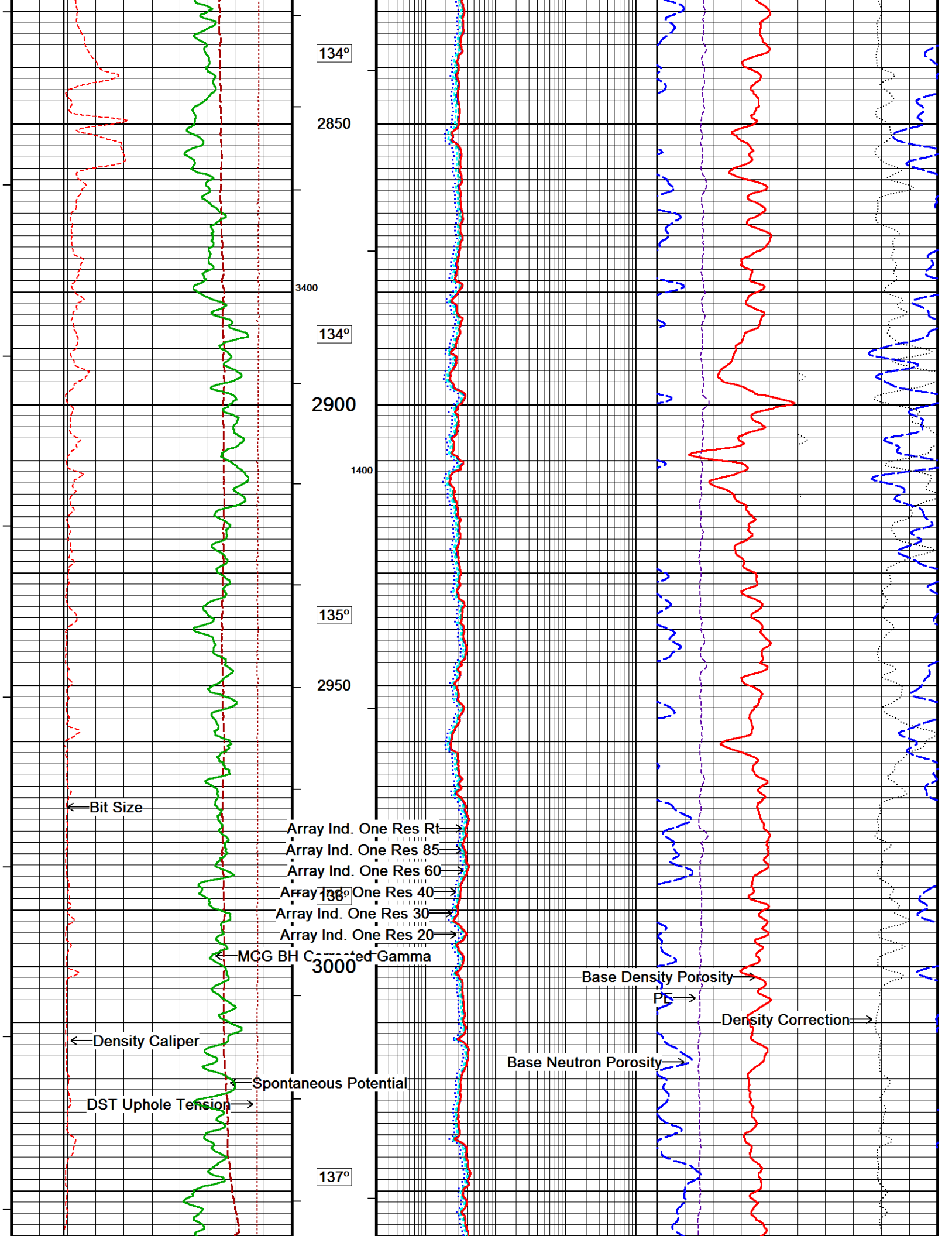
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.

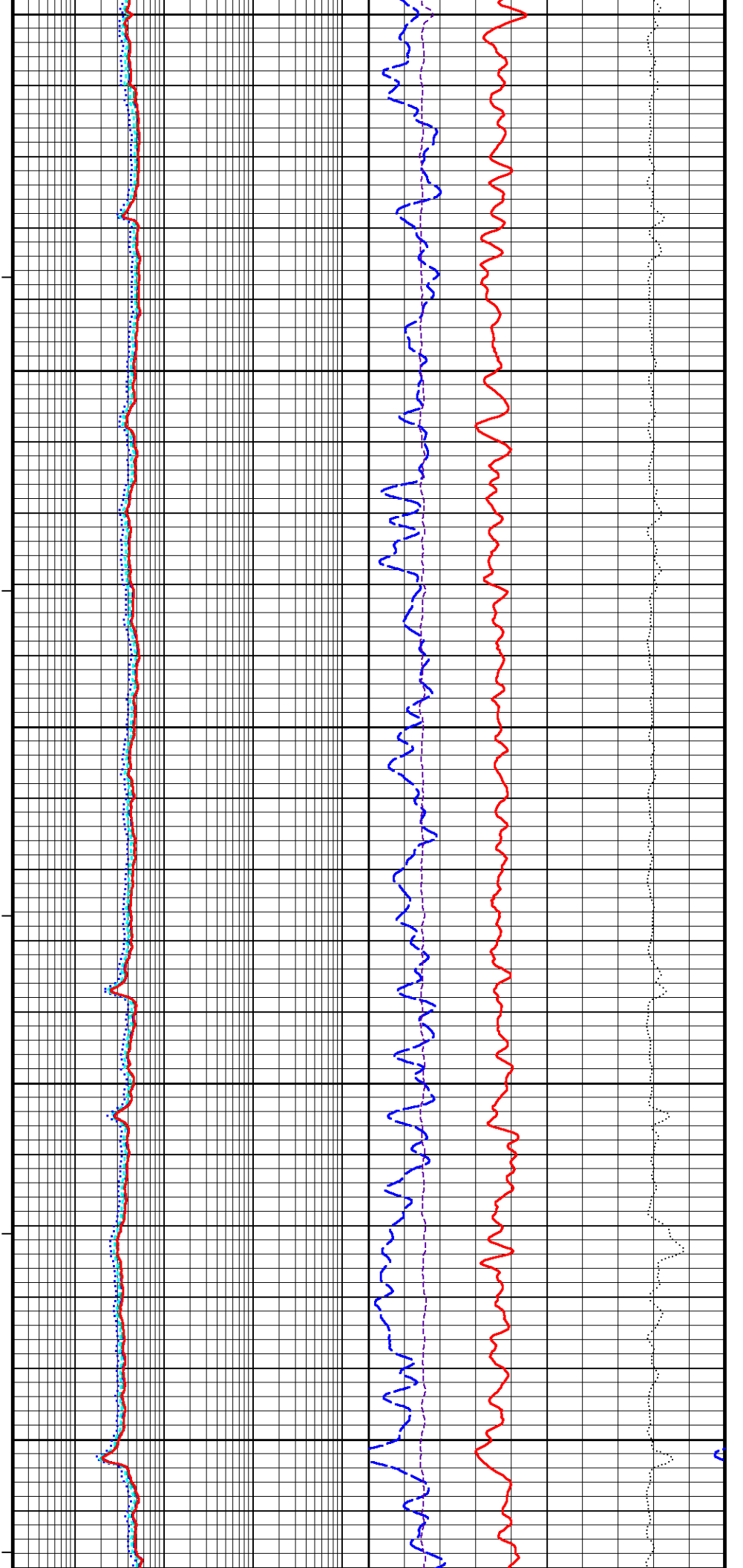
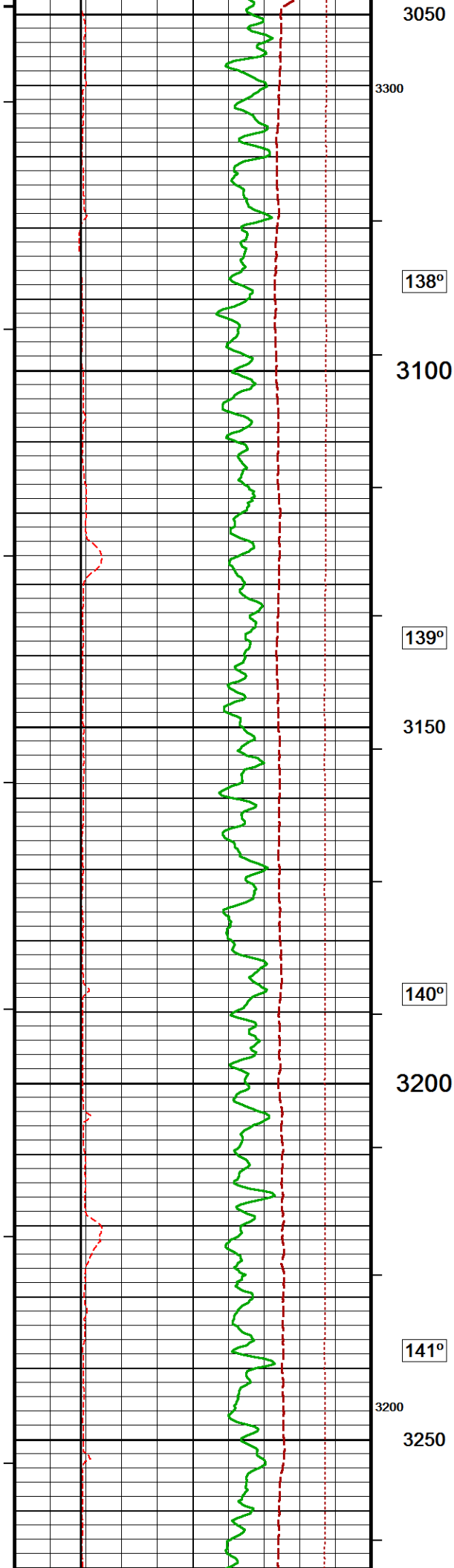


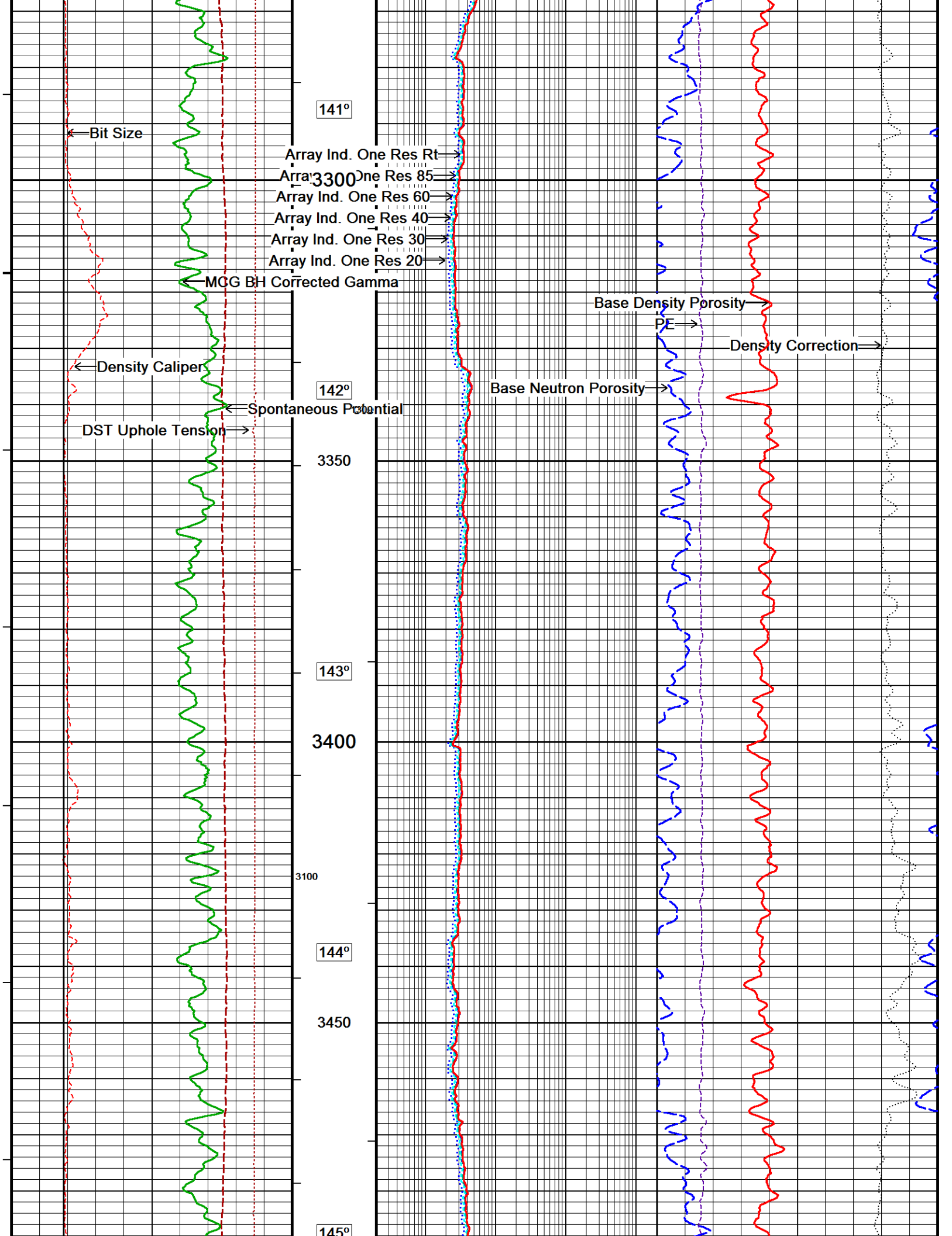


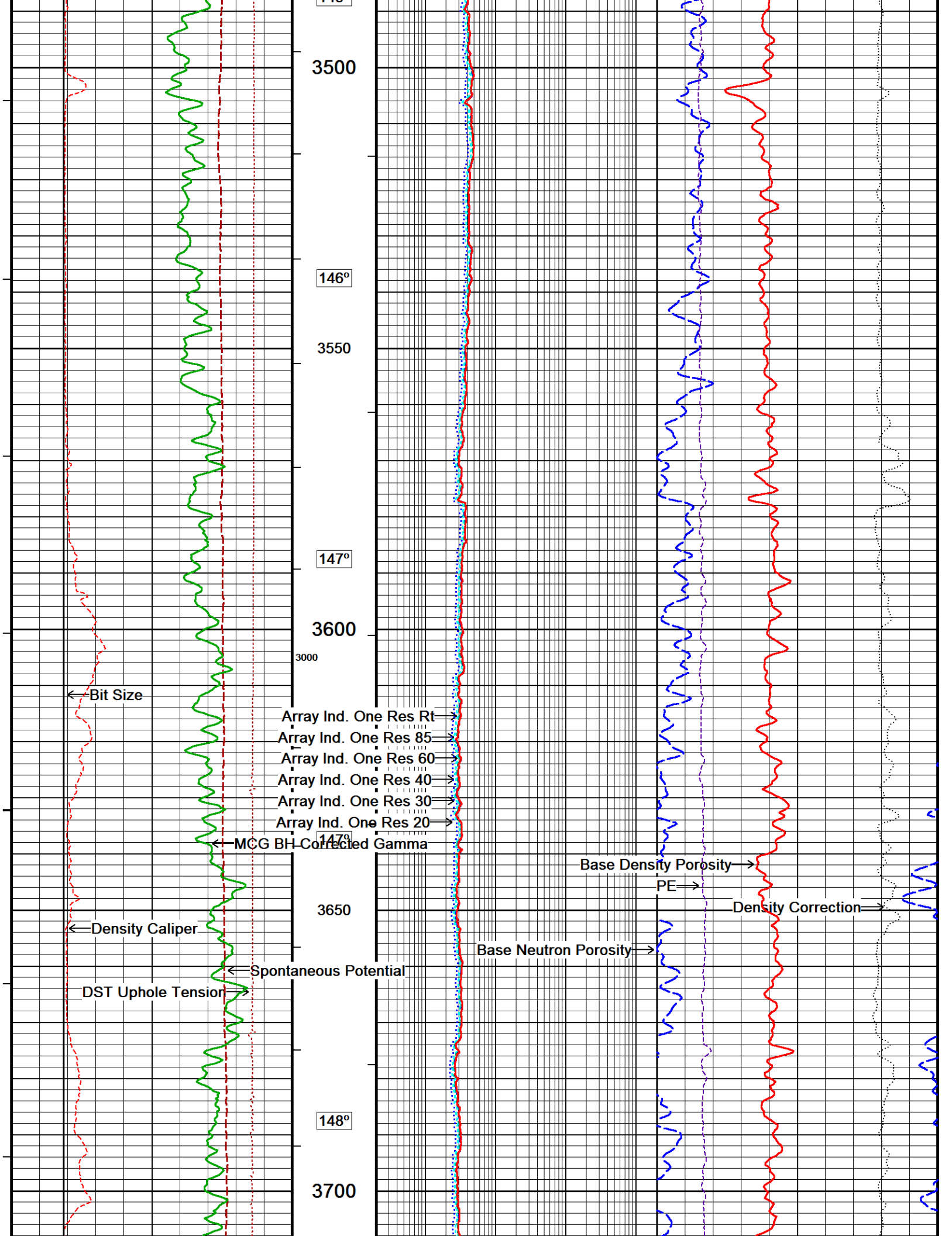


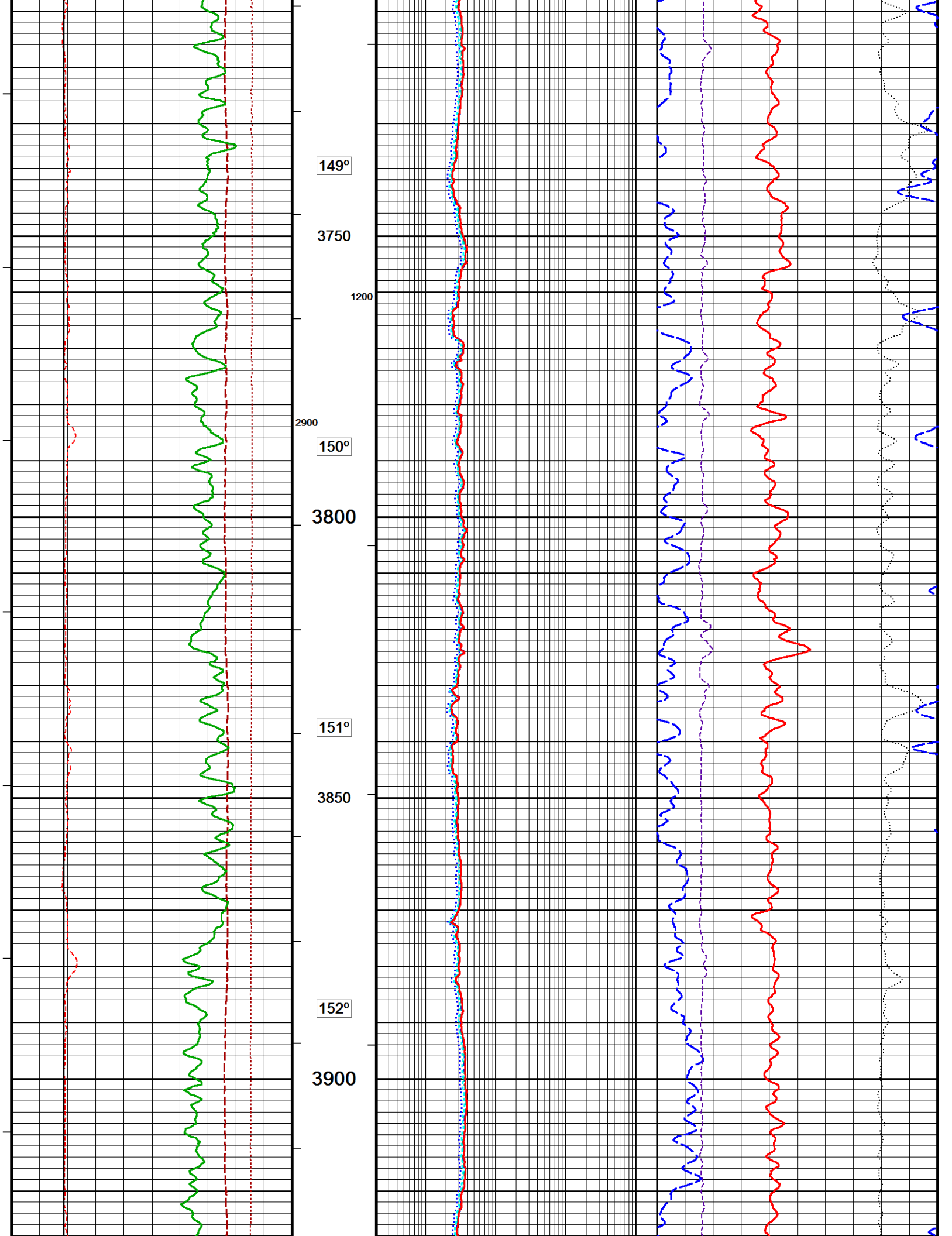


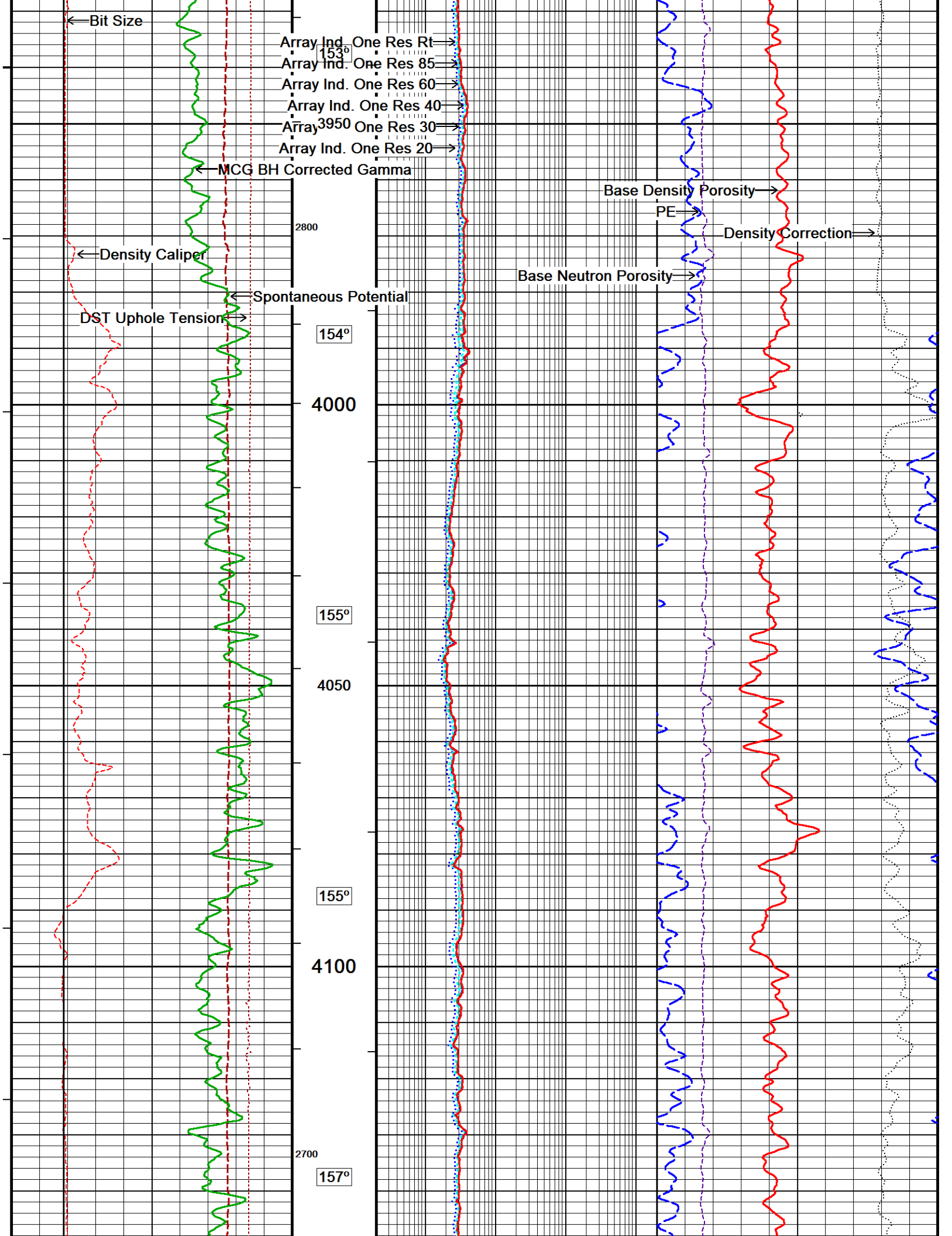


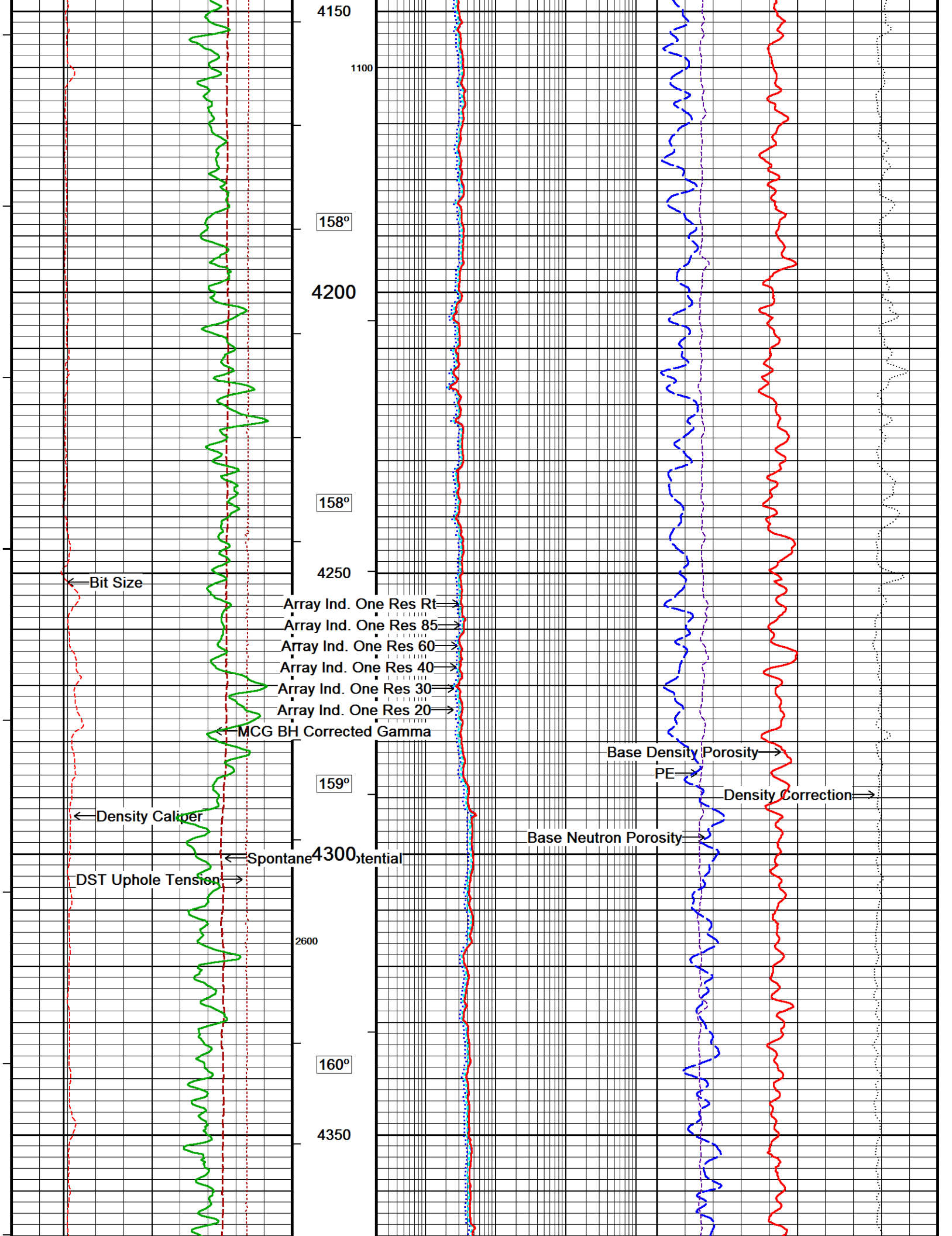


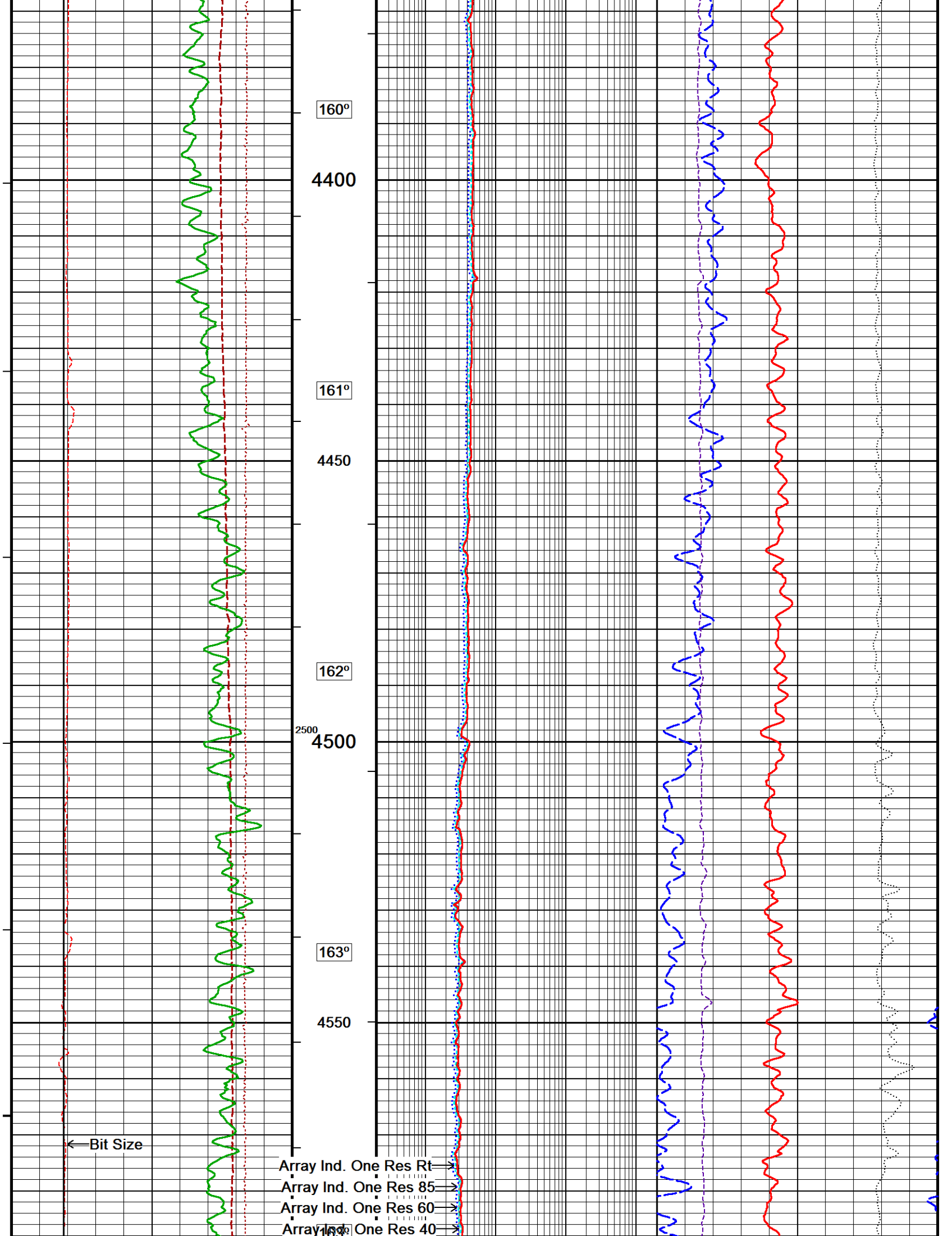


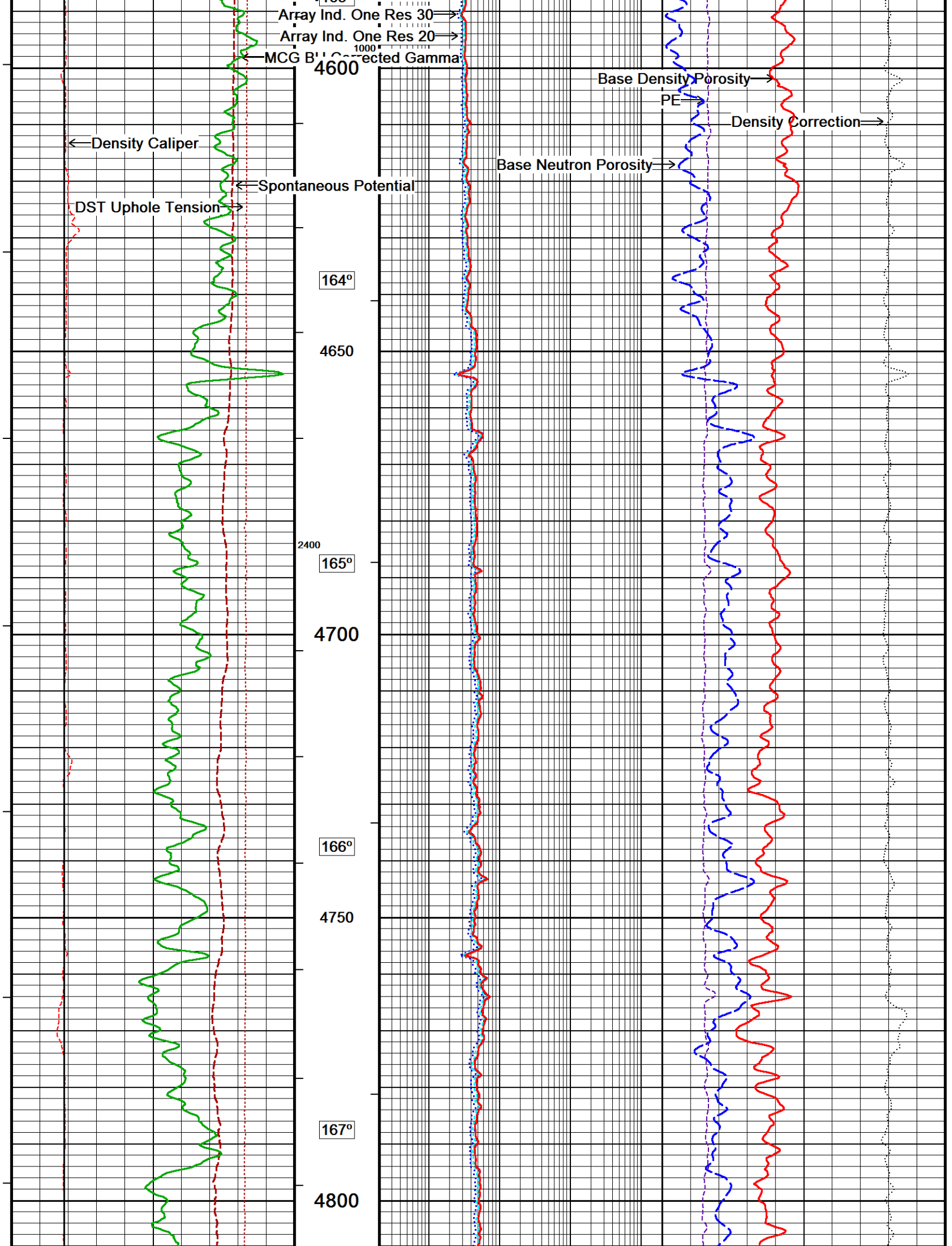


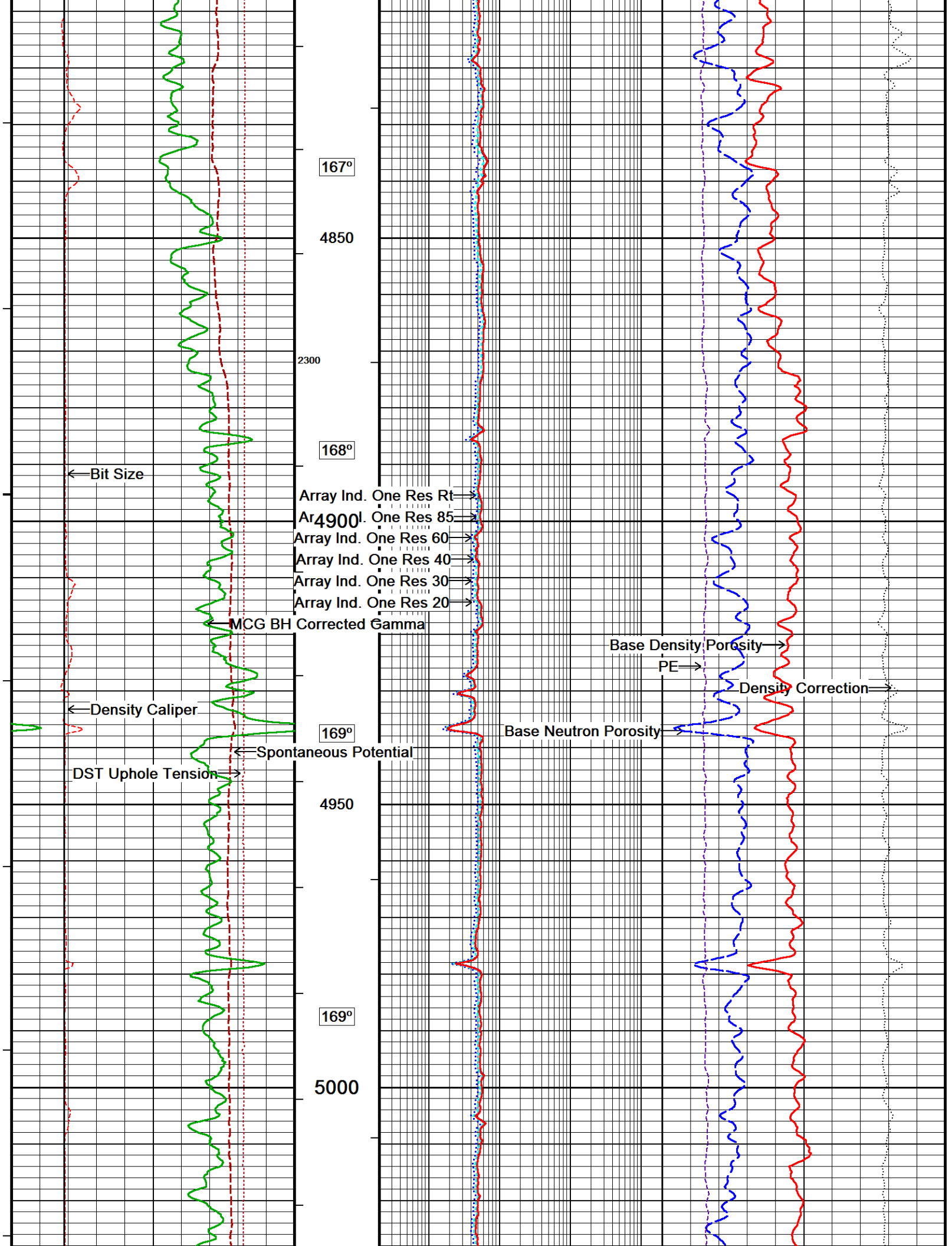


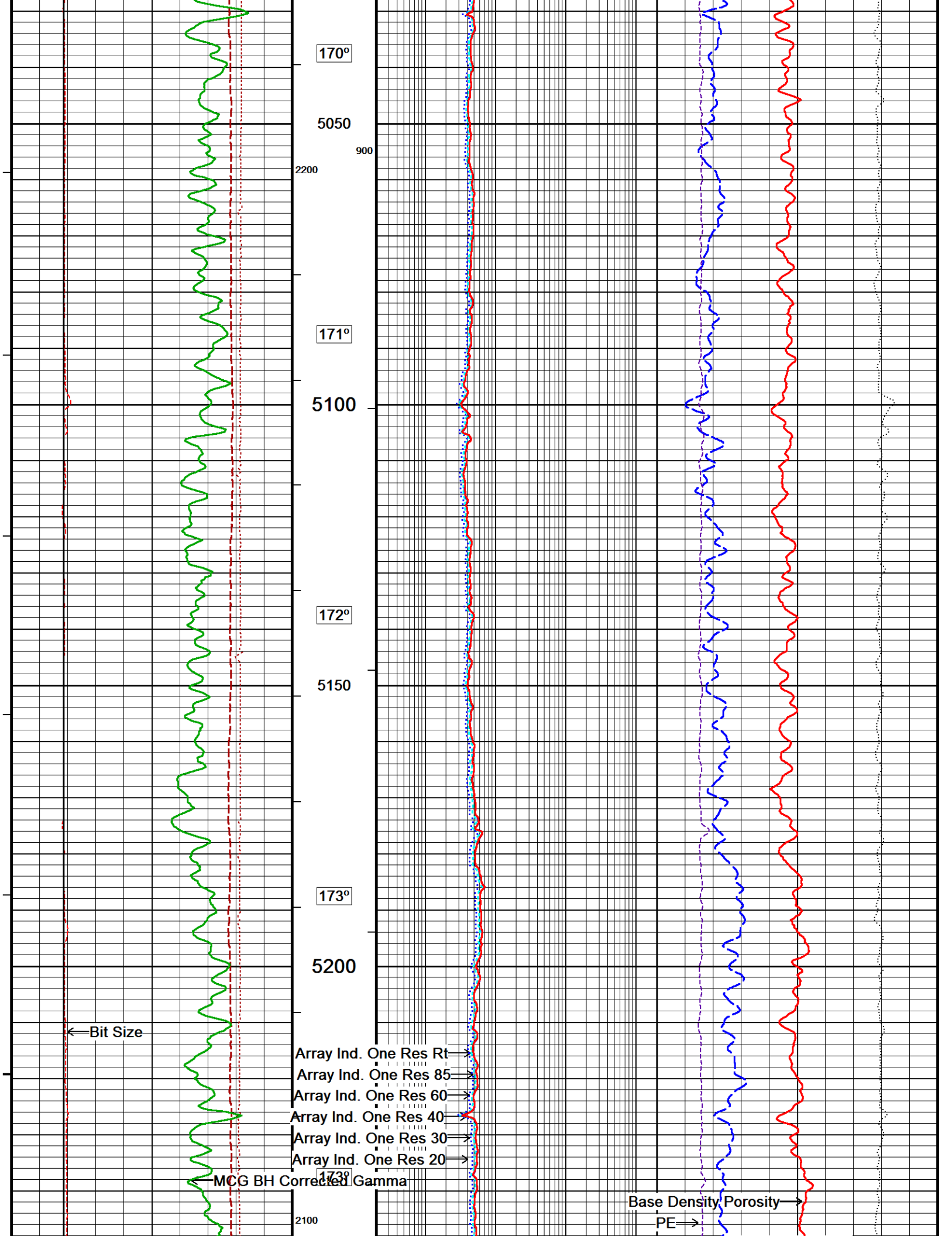


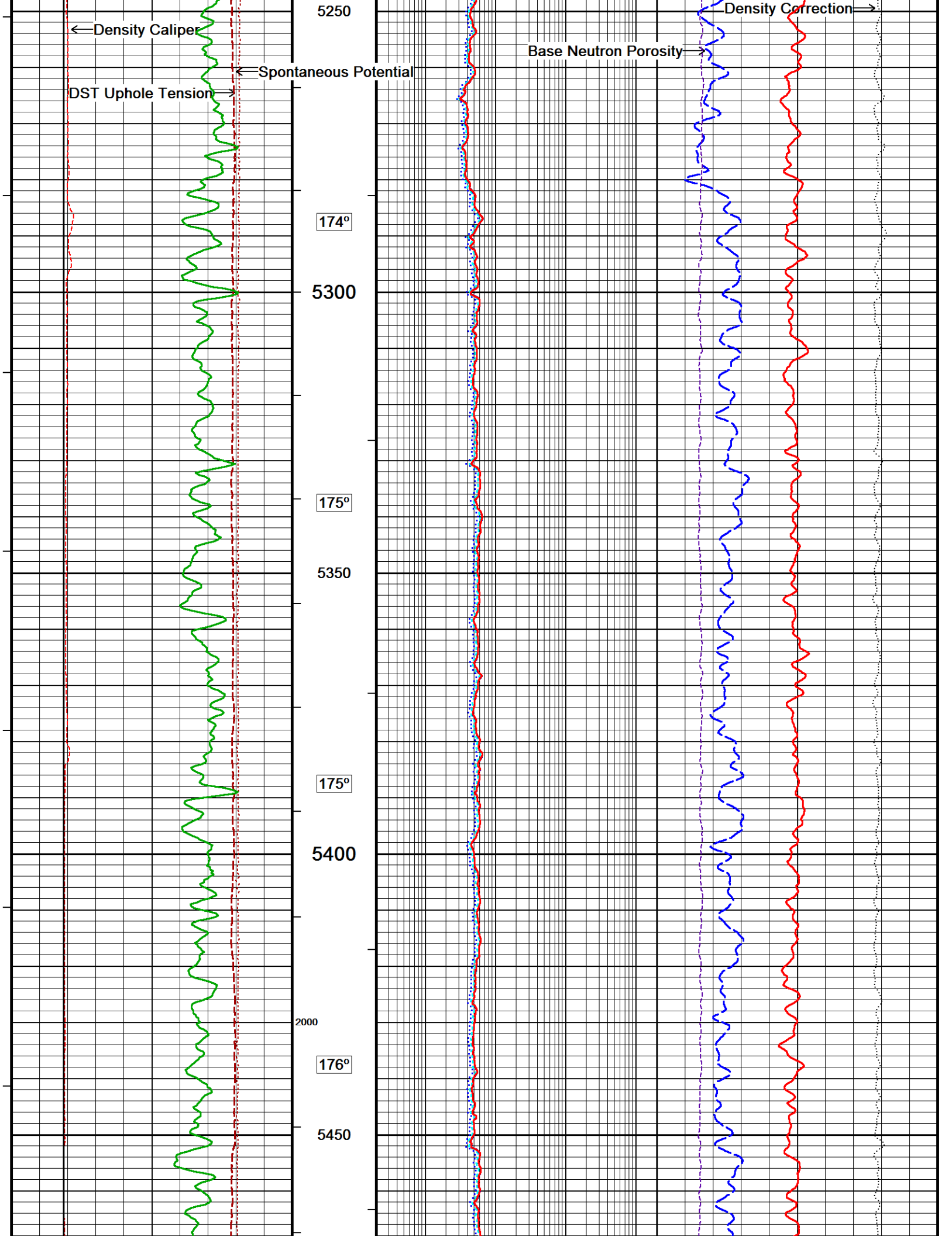


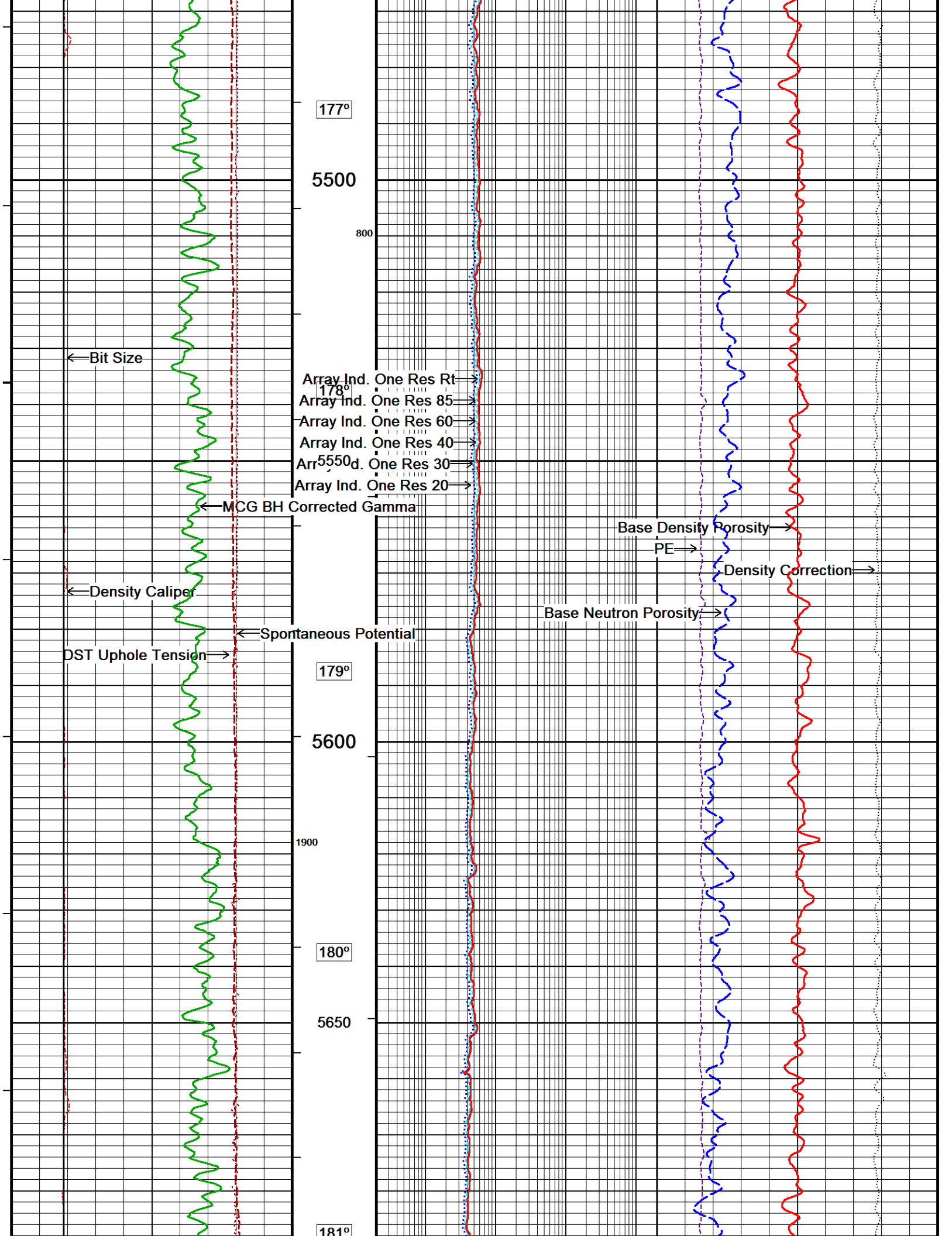


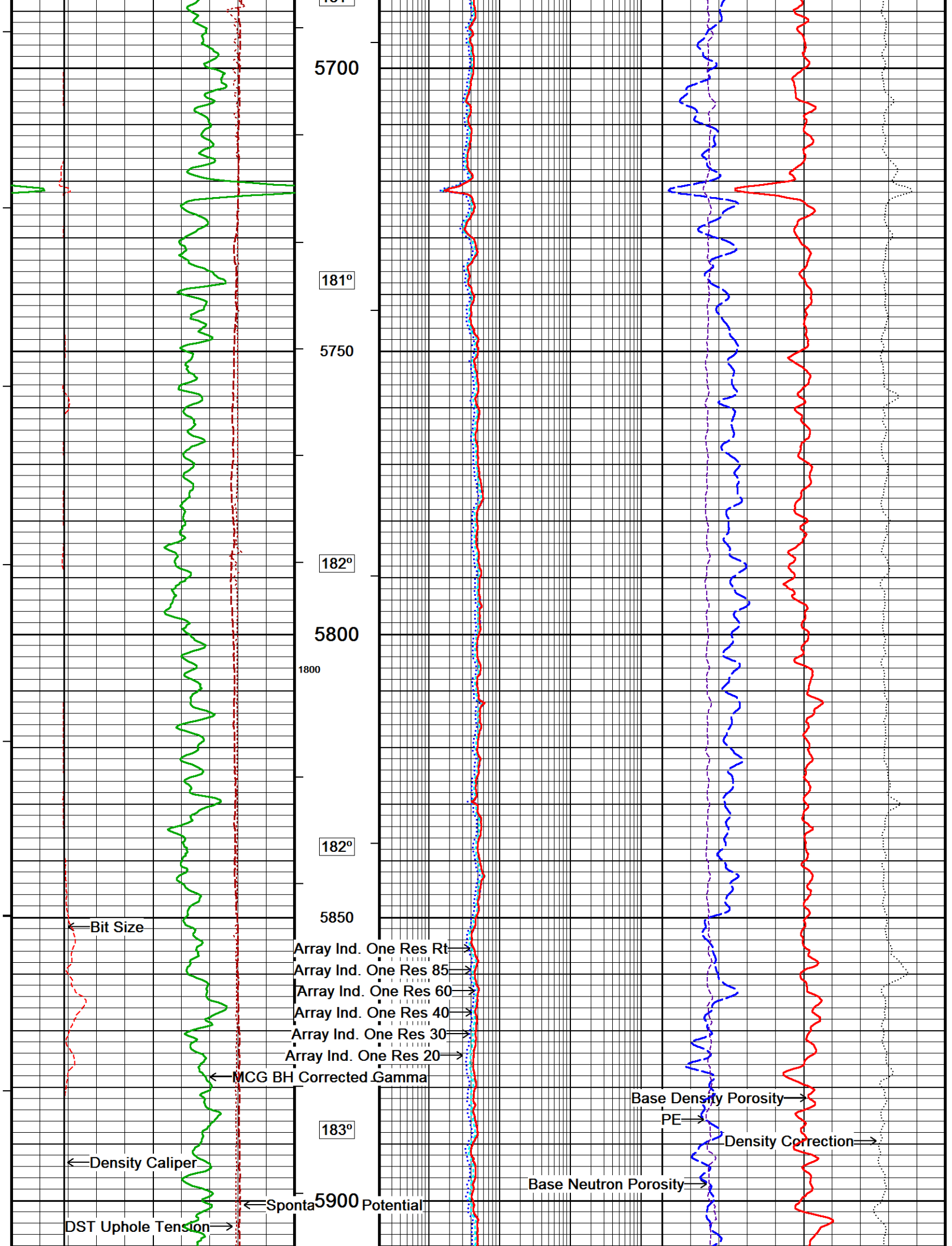


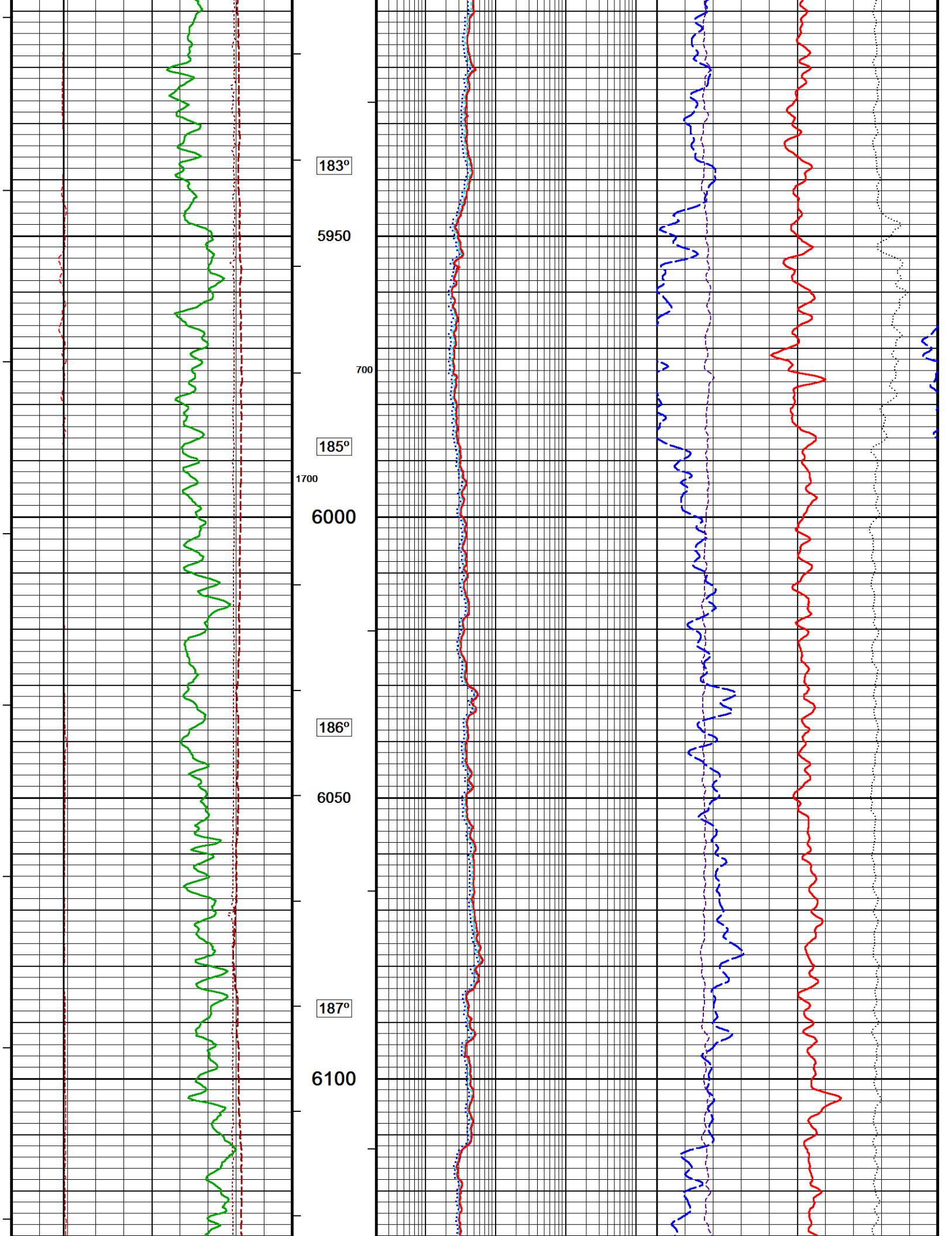


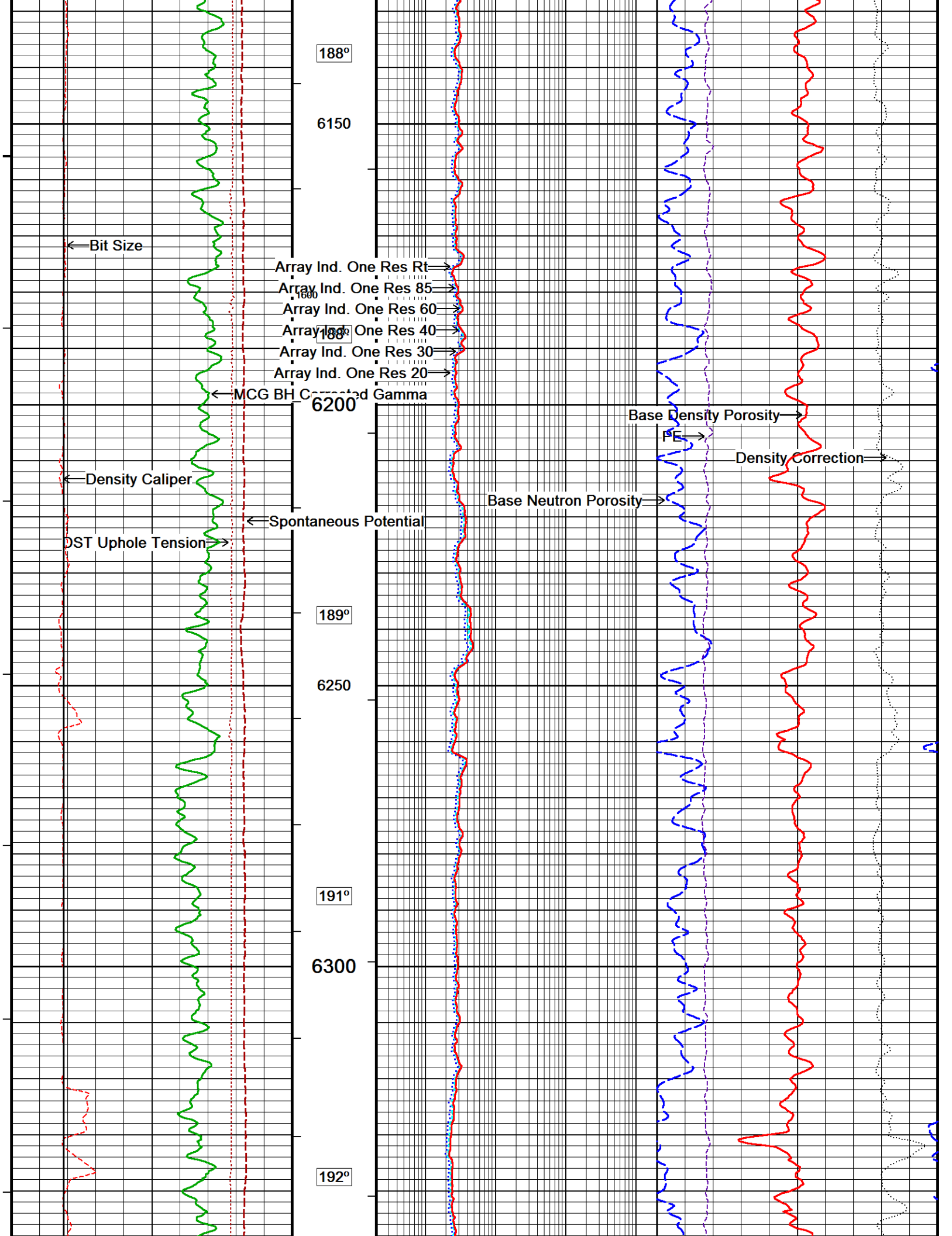


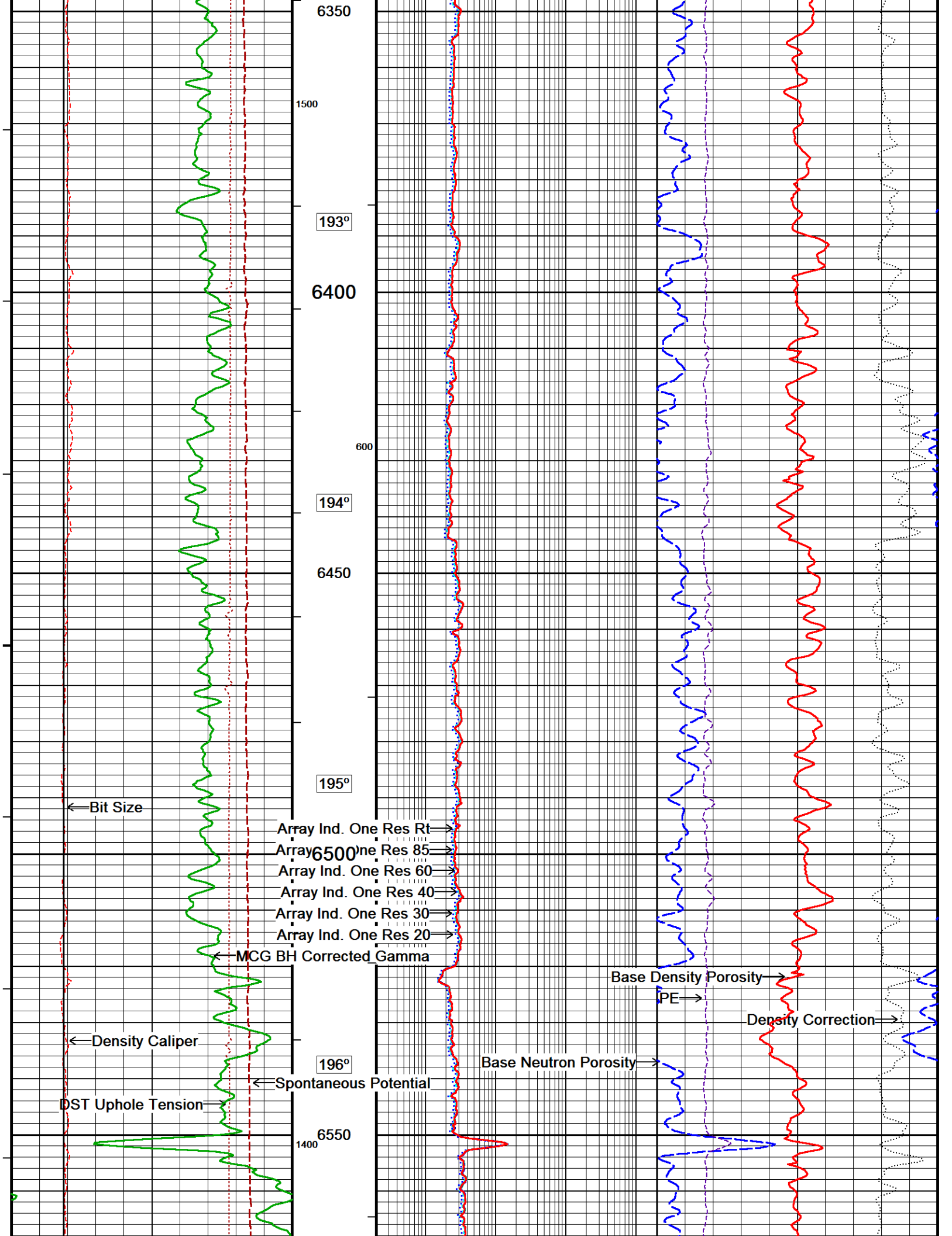


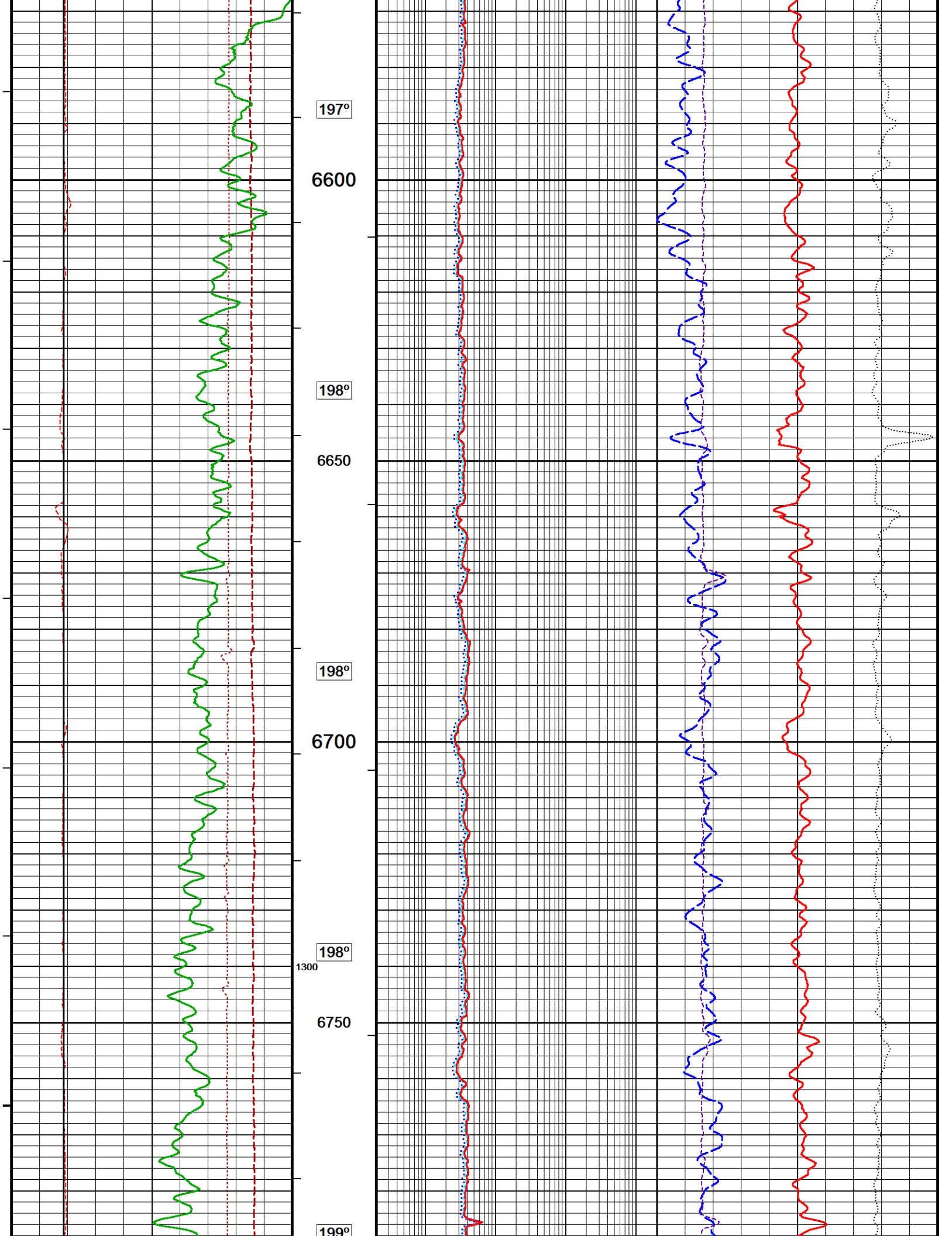


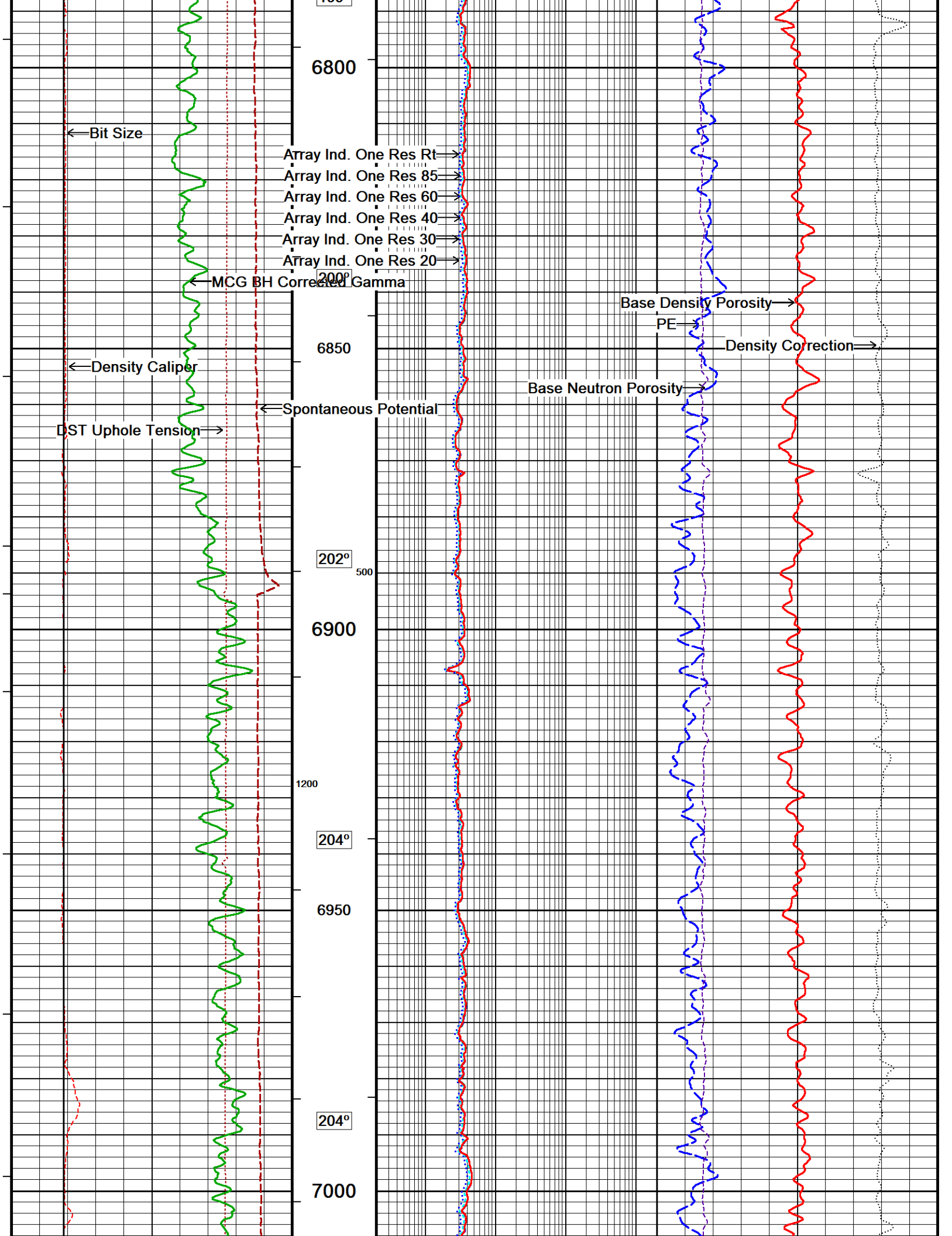


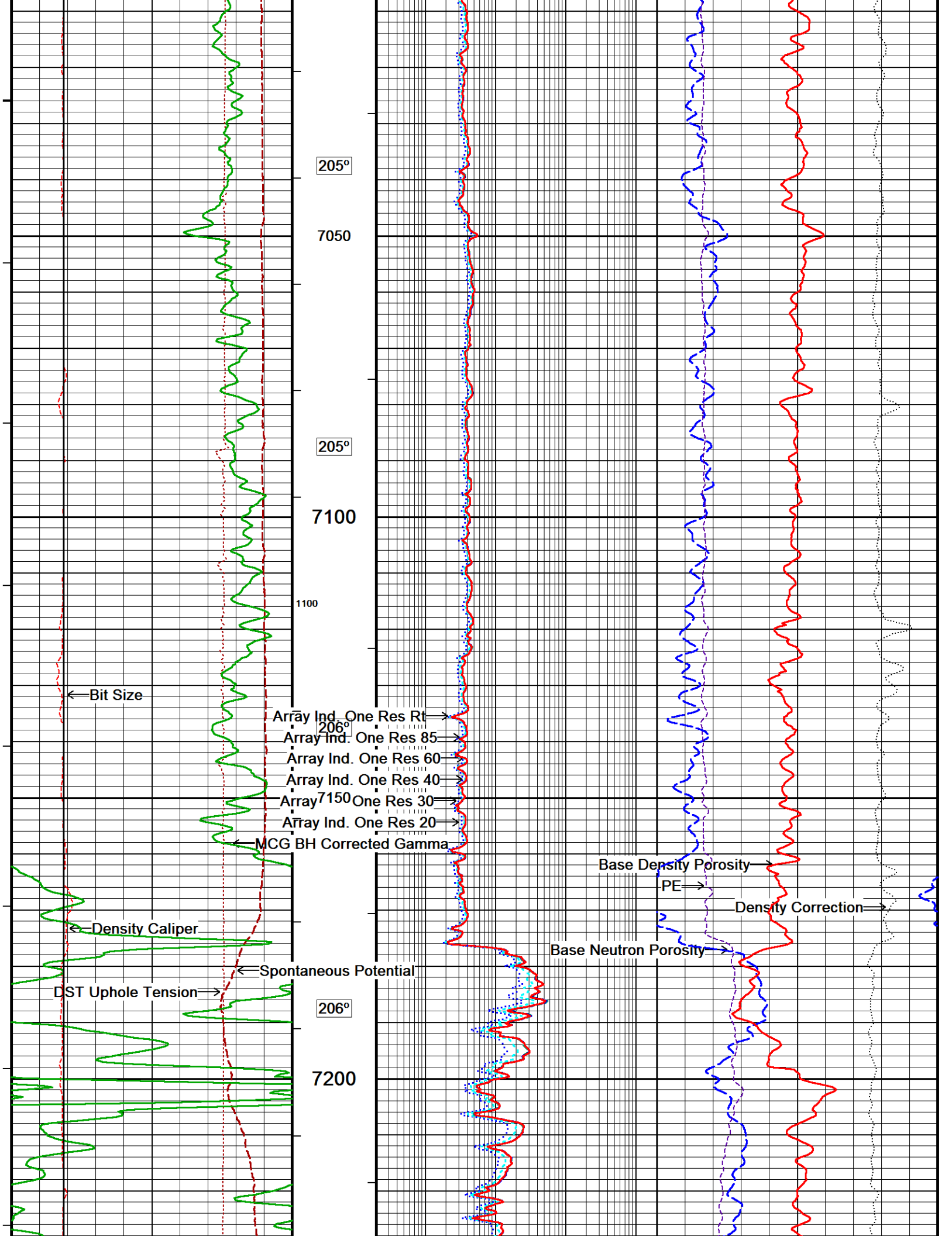


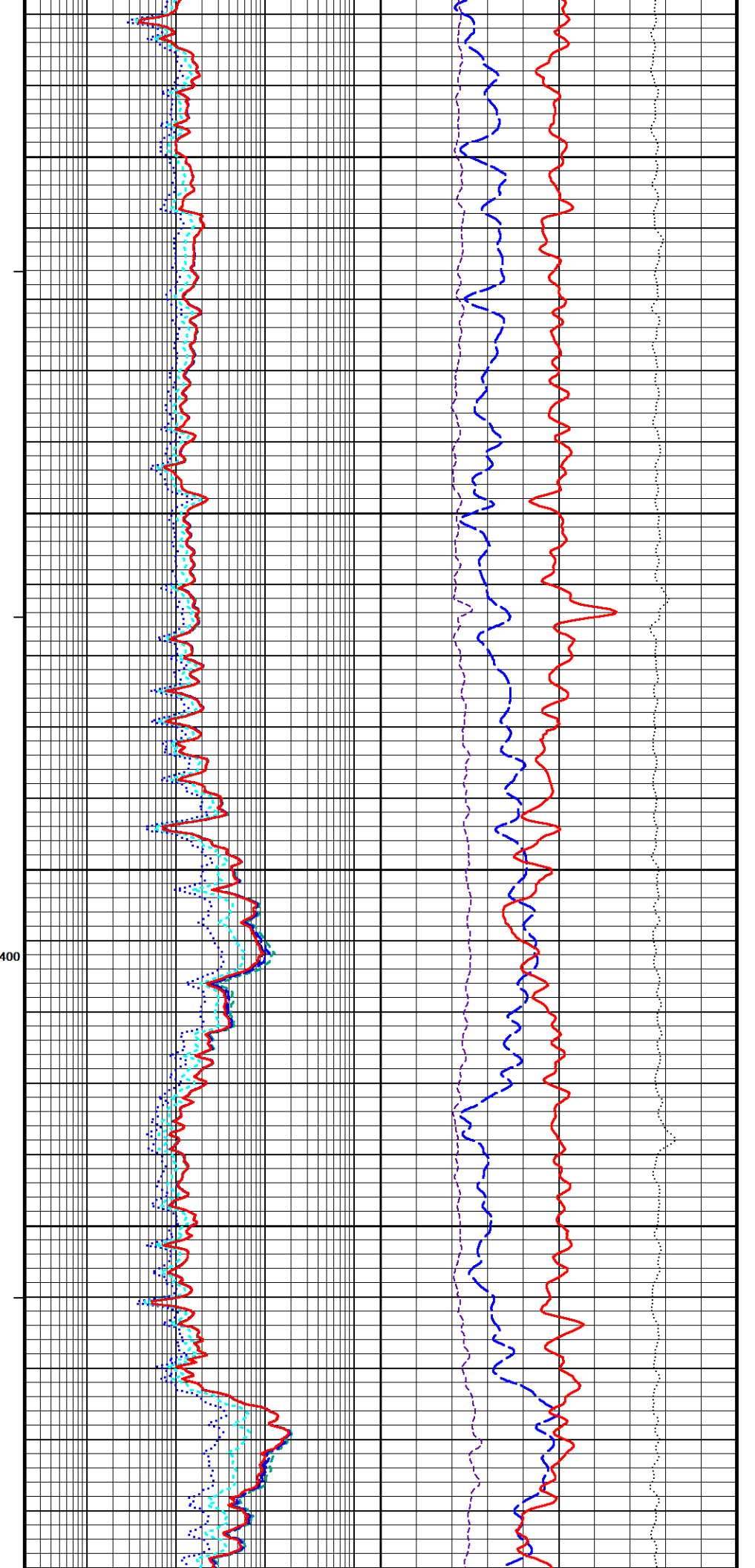
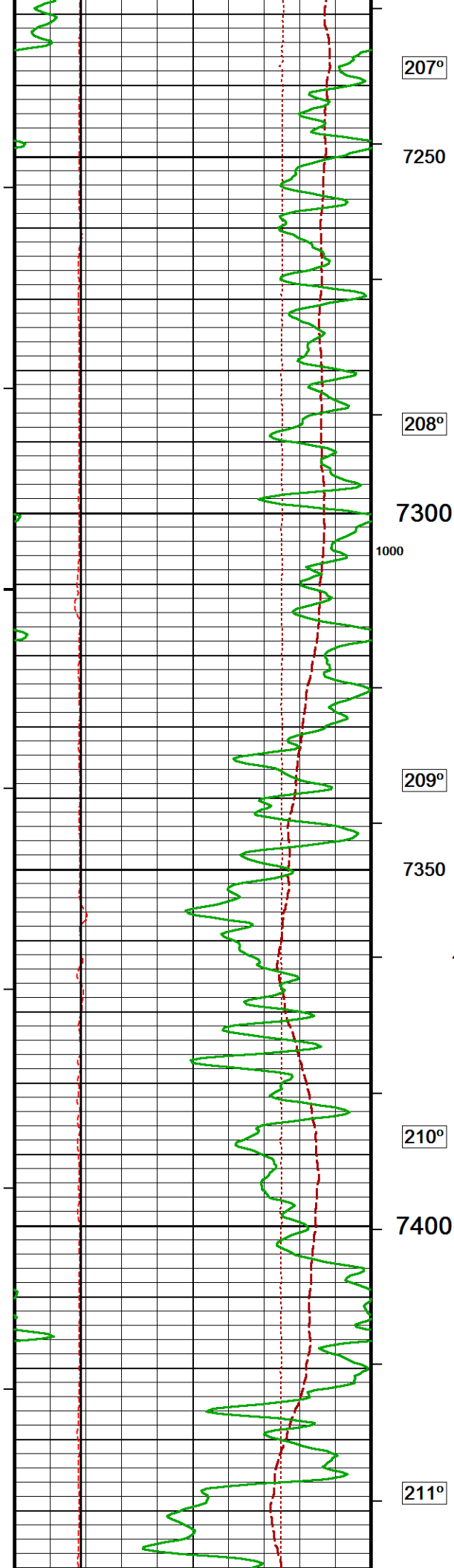


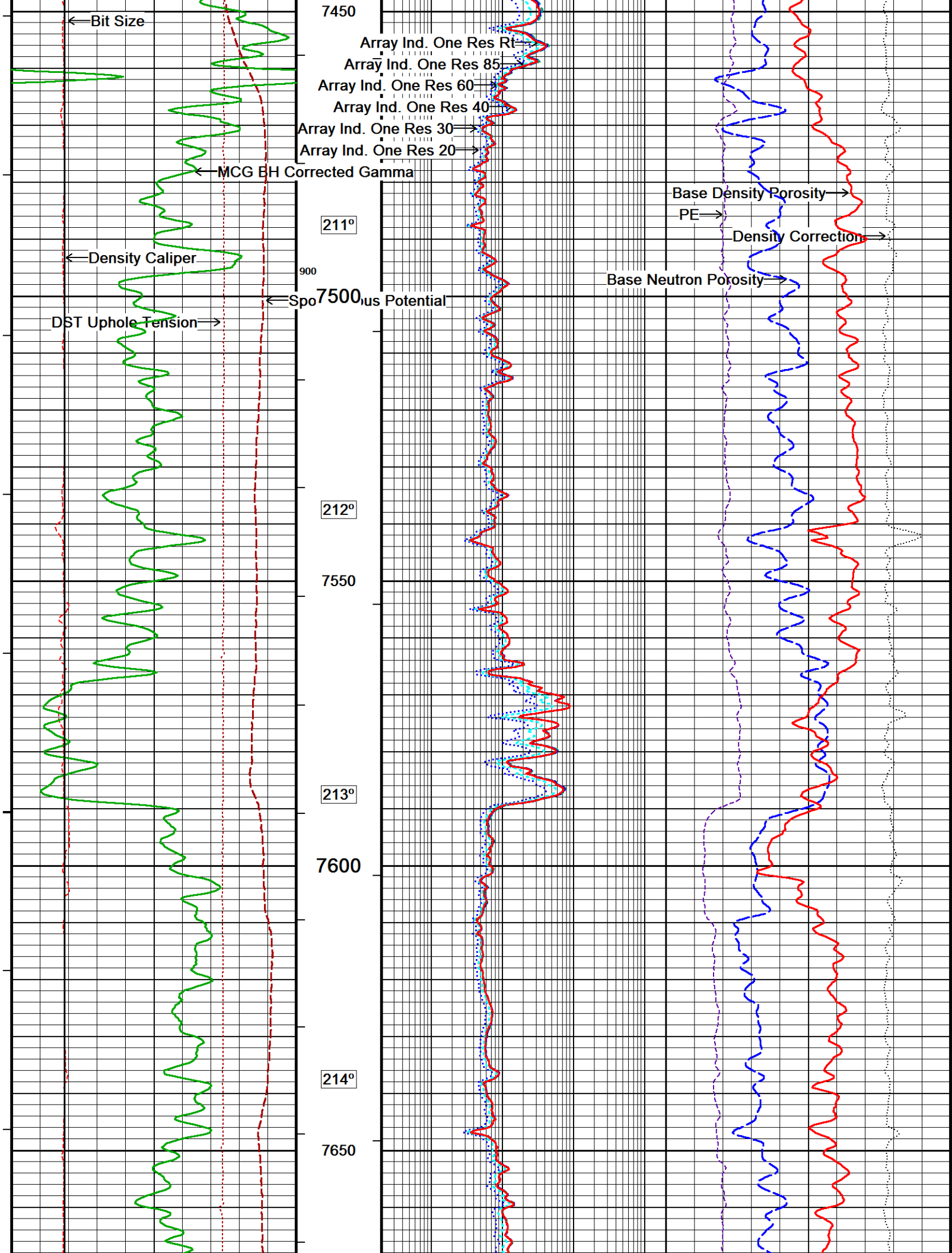


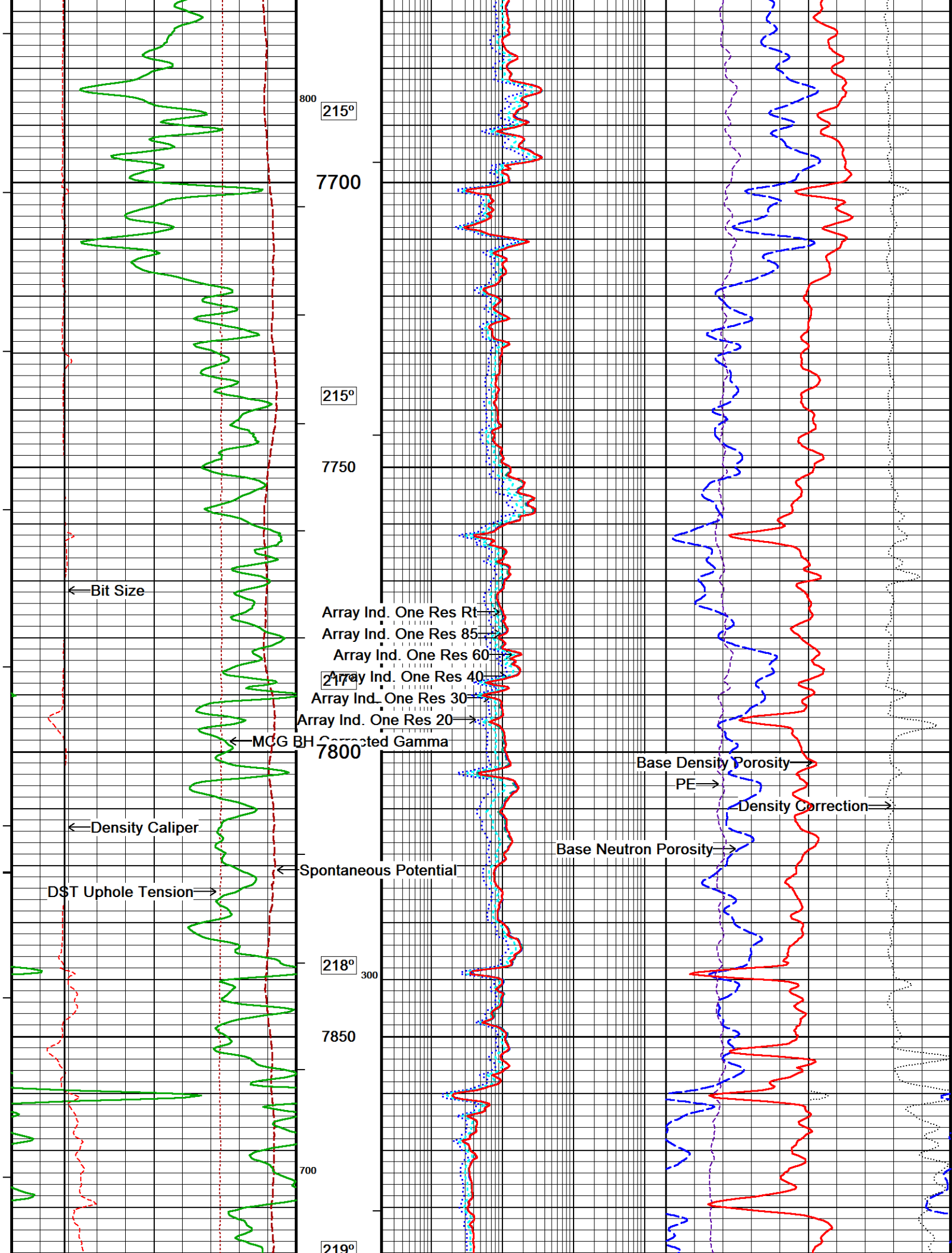


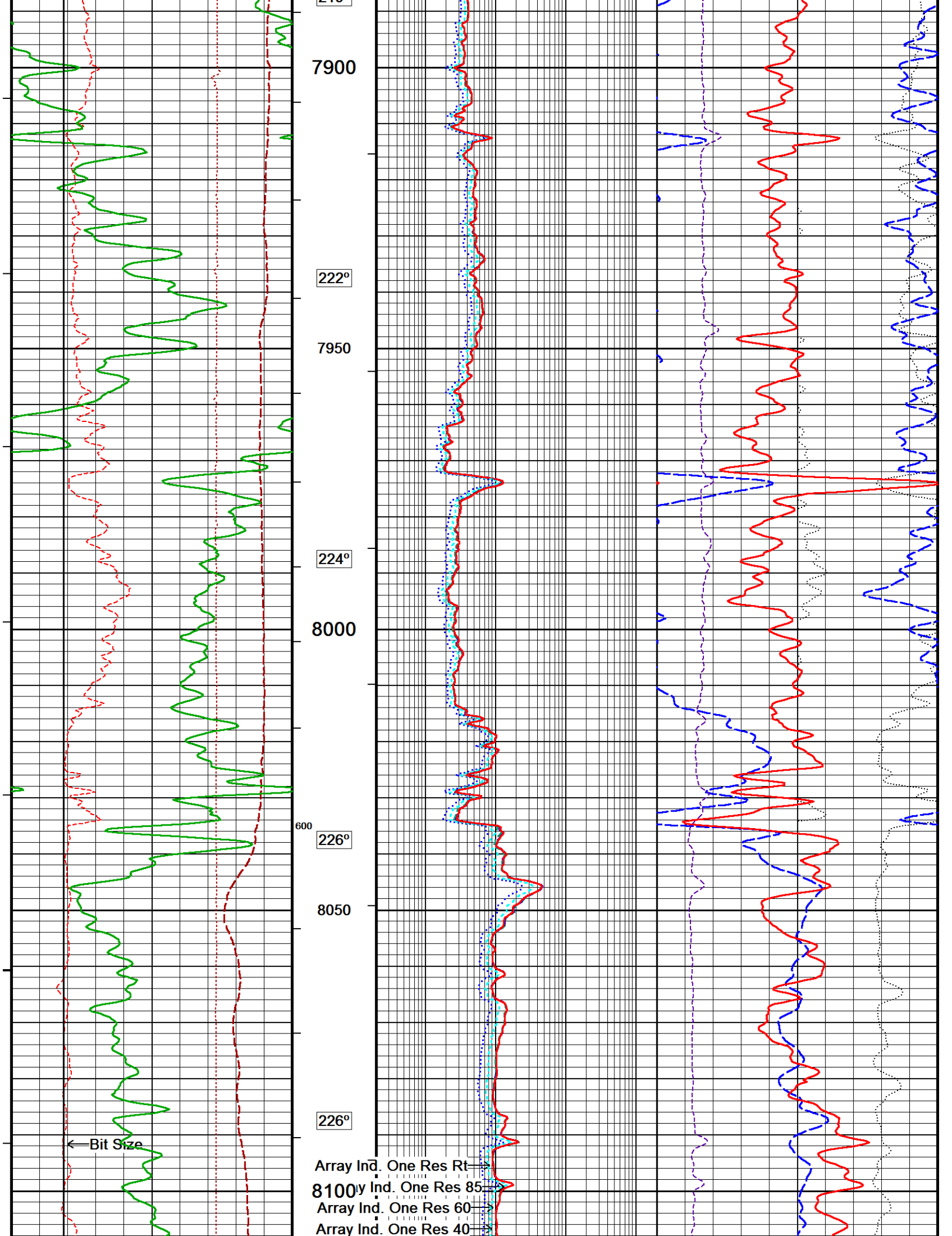


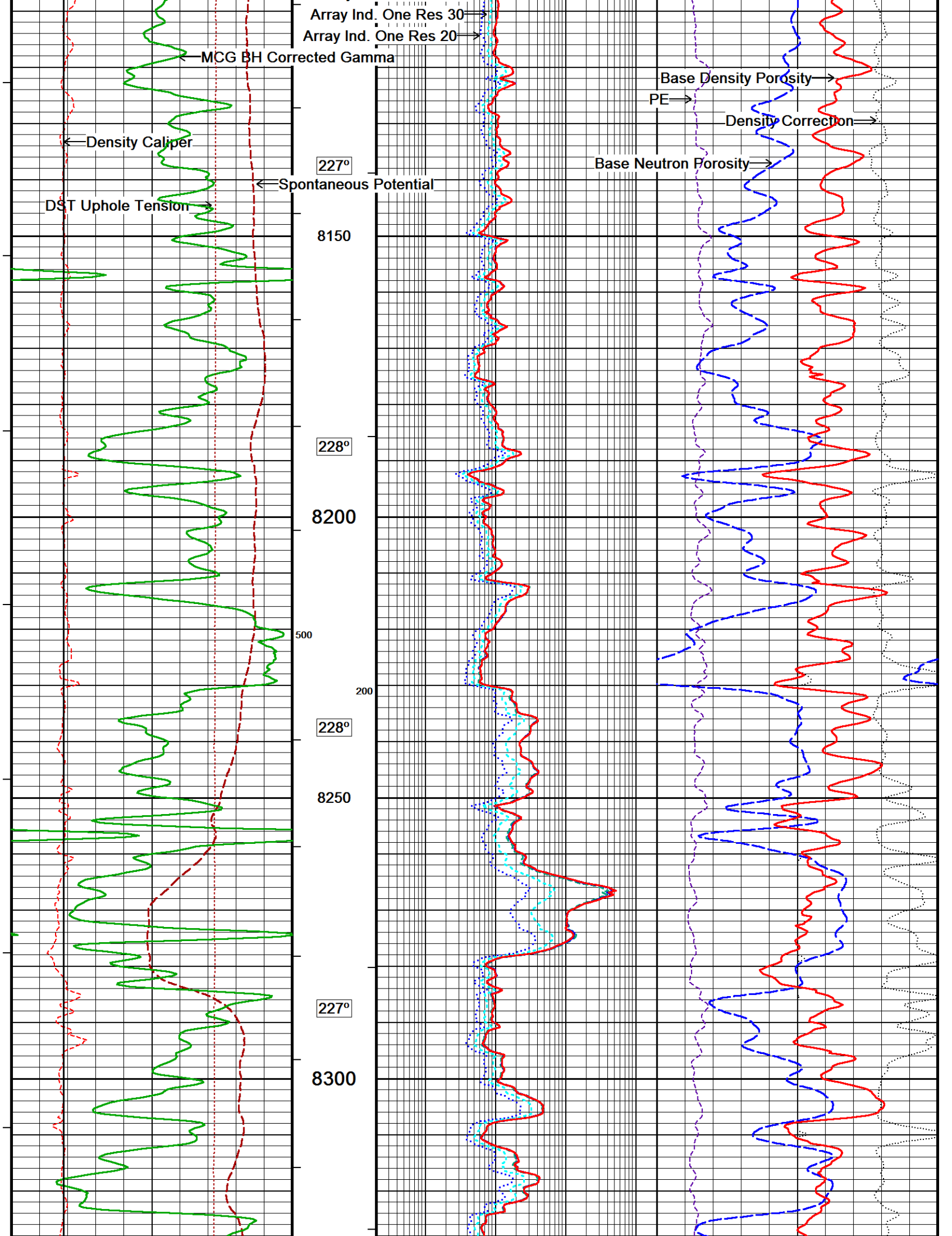


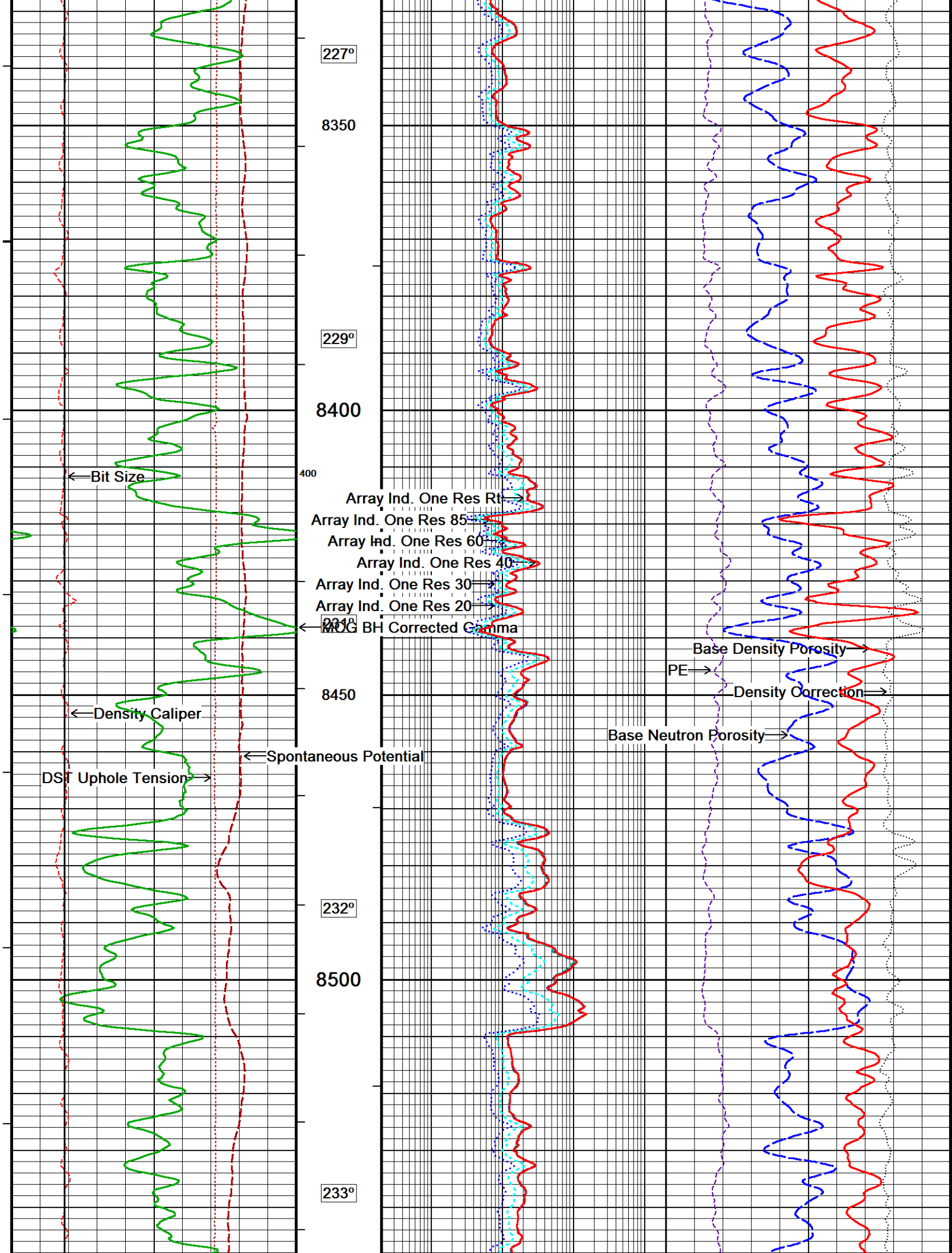


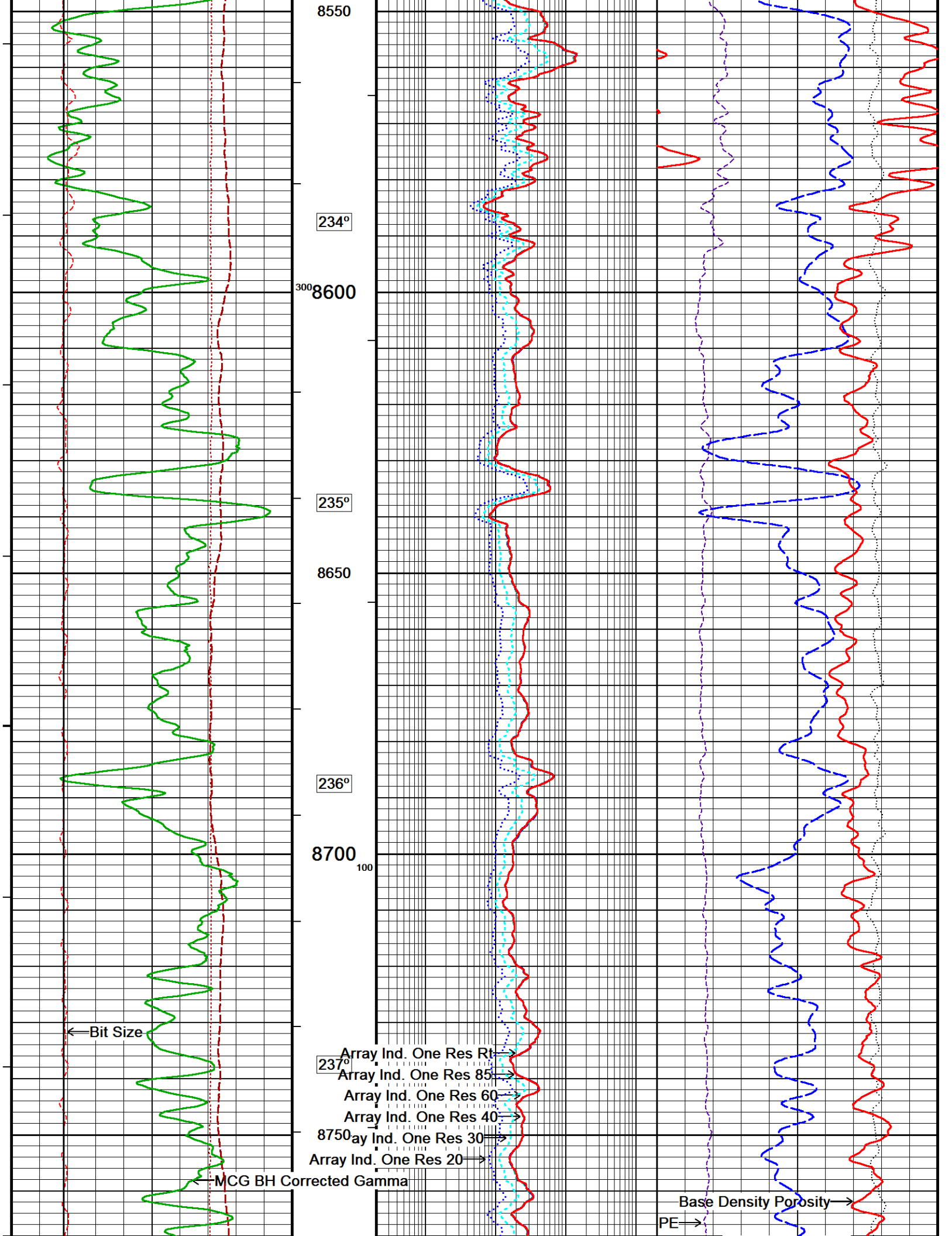


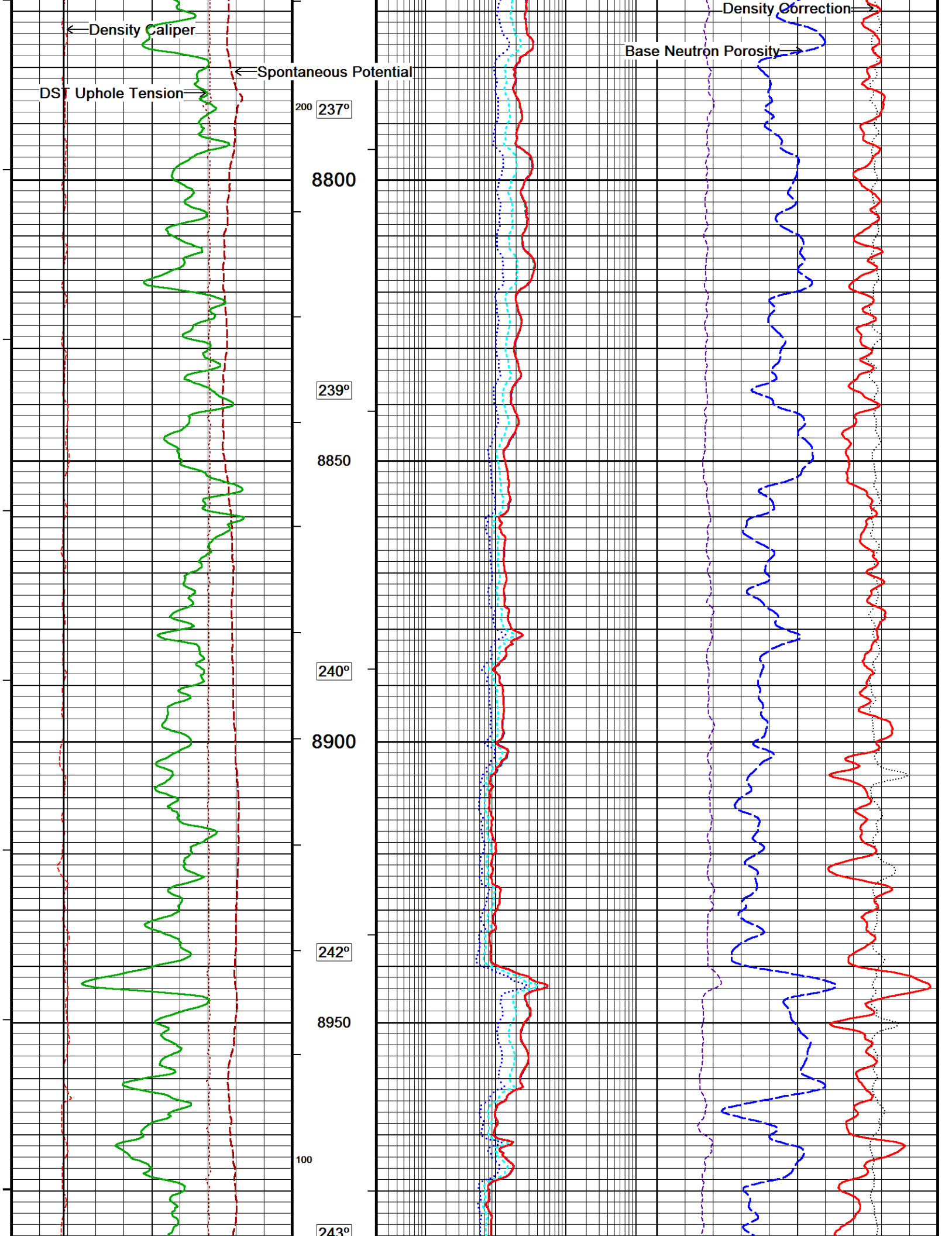


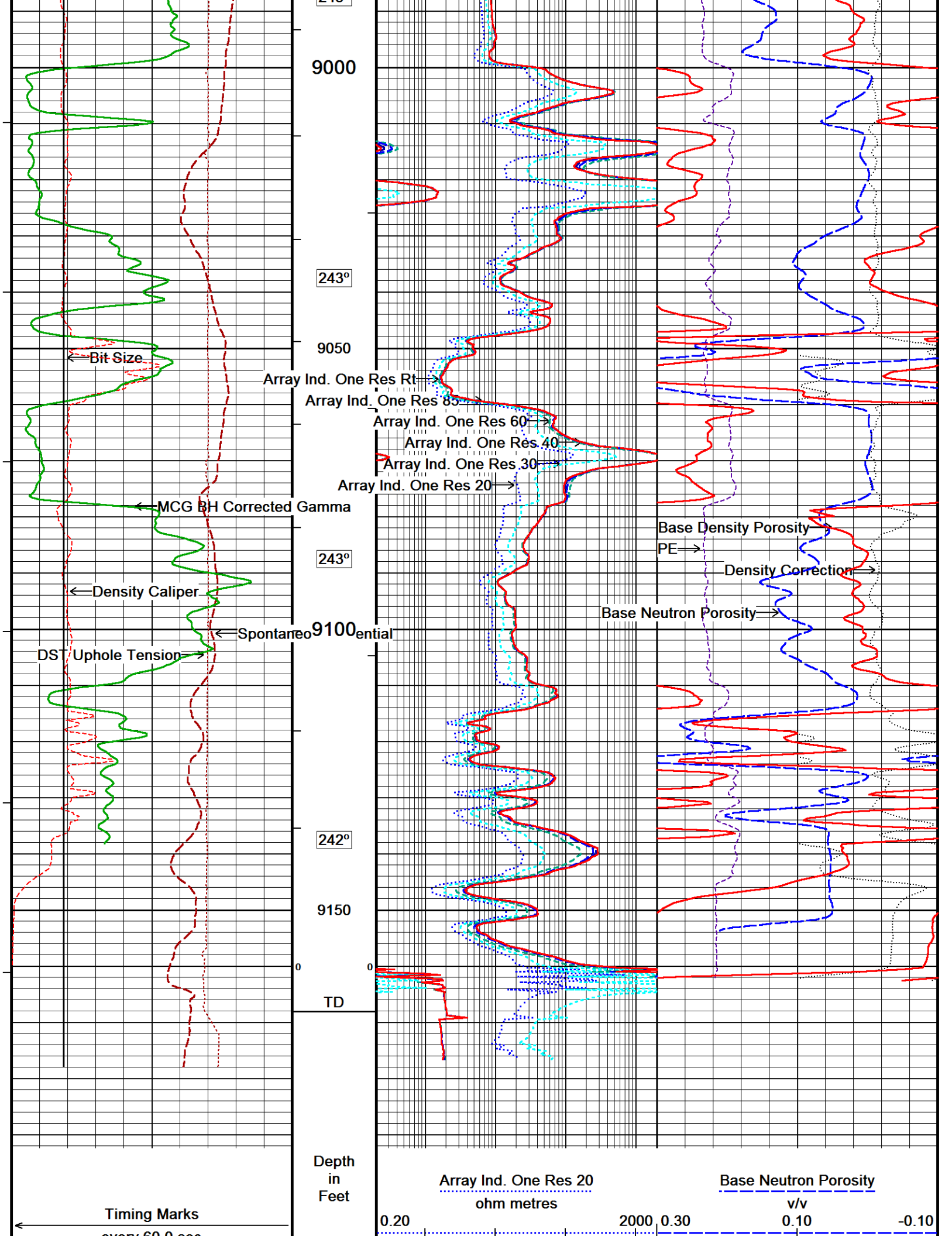












every 60.0 sec

Spontaneous Potential

millivolts

— → | 15 | ← +

Density Caliper

inches

8 13 18

MCG BH Corrected Gamma

API

0 75 150

150 225 300

Bit Size

inches

8 13 18

DST Uphole Tension

pounds

5000 0

Borehole
Temp in
deg F

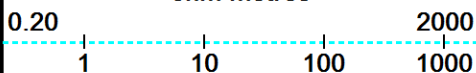
HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay
Scale
1:240

Array Ind. One Res 30

ohm metres



Base Density Porosity

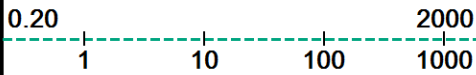
v/v

0.10

-0.10

Array Ind. One Res 40

ohm metres



PE
barns/electron

Density Correction
grams/cc

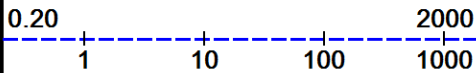
0 10

-0.25

0.25

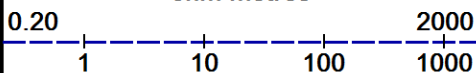
Array Ind. One Res 60

ohm metres



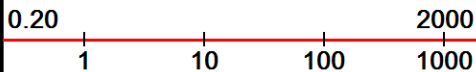
Array Ind. One Res 85

ohm metres



Array Ind. One Res Rt

ohm metres



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 04-FEB-2019 20:08

Filename: C:\LOGS\NGL\SOUTH WELD SWD #1\MAIN PASS.dta

Recorded on 04-FEB-2019 10:34

System Versions: Logged with 18.05.4364 Processed with 18.05.7089 Plotted with 18.05.7089



5" MAIN PASS



5" REPEAT PASS



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 04-FEB-2019 20:08

Filename: C:\LOGS\NGL\SOUTH WELD SWD #1\REPEAT PASS.dta

Recorded on 04-FEB-2019 10:08

Filename: C:\LOGS\NGL\SOUTH WELD SWD #1\MAIN PASS.dta

Recorded on 04-FEB-2019 10:34

System Versions: Logged with 18.05.4364 Processed with 18.05.7089 Plotted with 18.05.7089

Timing Marks

every 60.0 sec

Spontaneous Potential

millivolts

— → | 15 | ← +

Density Caliper

inches

8 13 18

MCG BH Corrected Gamma

API

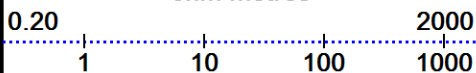
Depth
in
Feet

Borehole
Temp in
deg F

HVI
every
10 cu ft

Array Ind. One Res 20

ohm metres



Base Neutron Porosity

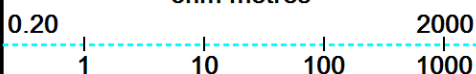
v/v

0.10

-0.10

Array Ind. One Res 30

ohm metres



Base Density Porosity

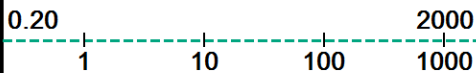
v/v

0.10

-0.10

Array Ind. One Res 40

ohm metres



PE
barns/electron

Density Correction
grams/cc

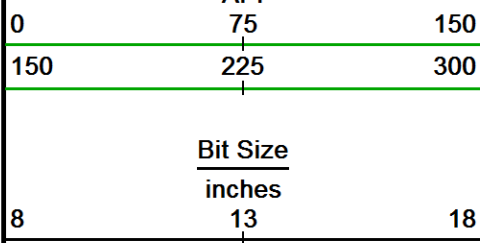
0 10

-0.25

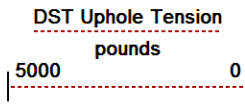
0.25

Array Ind. One Res 60

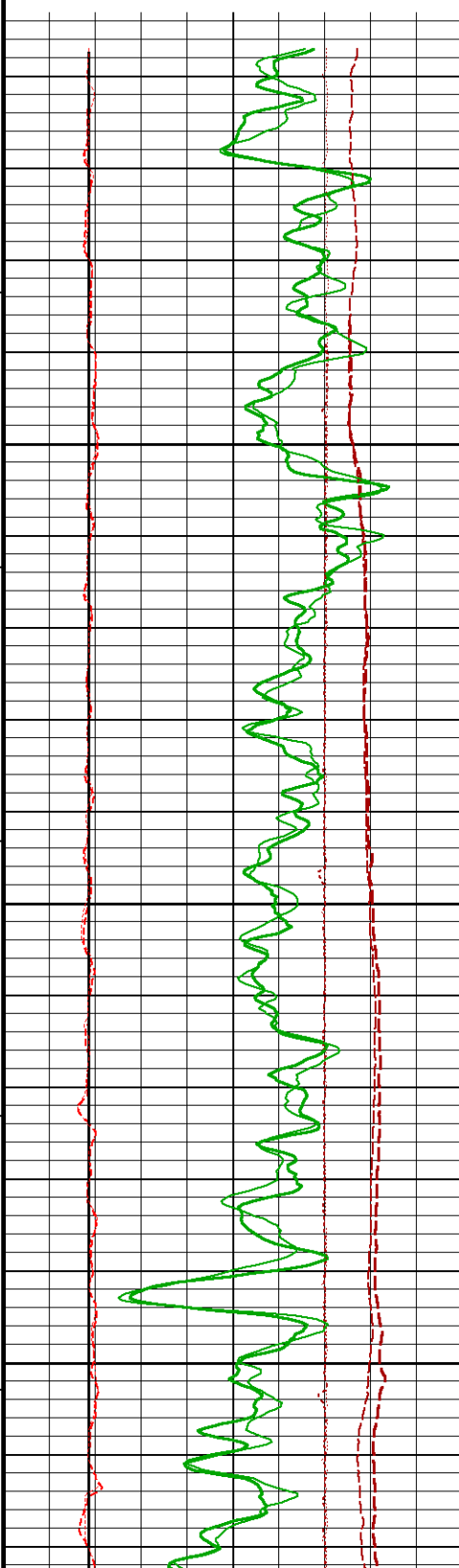
ohm metres



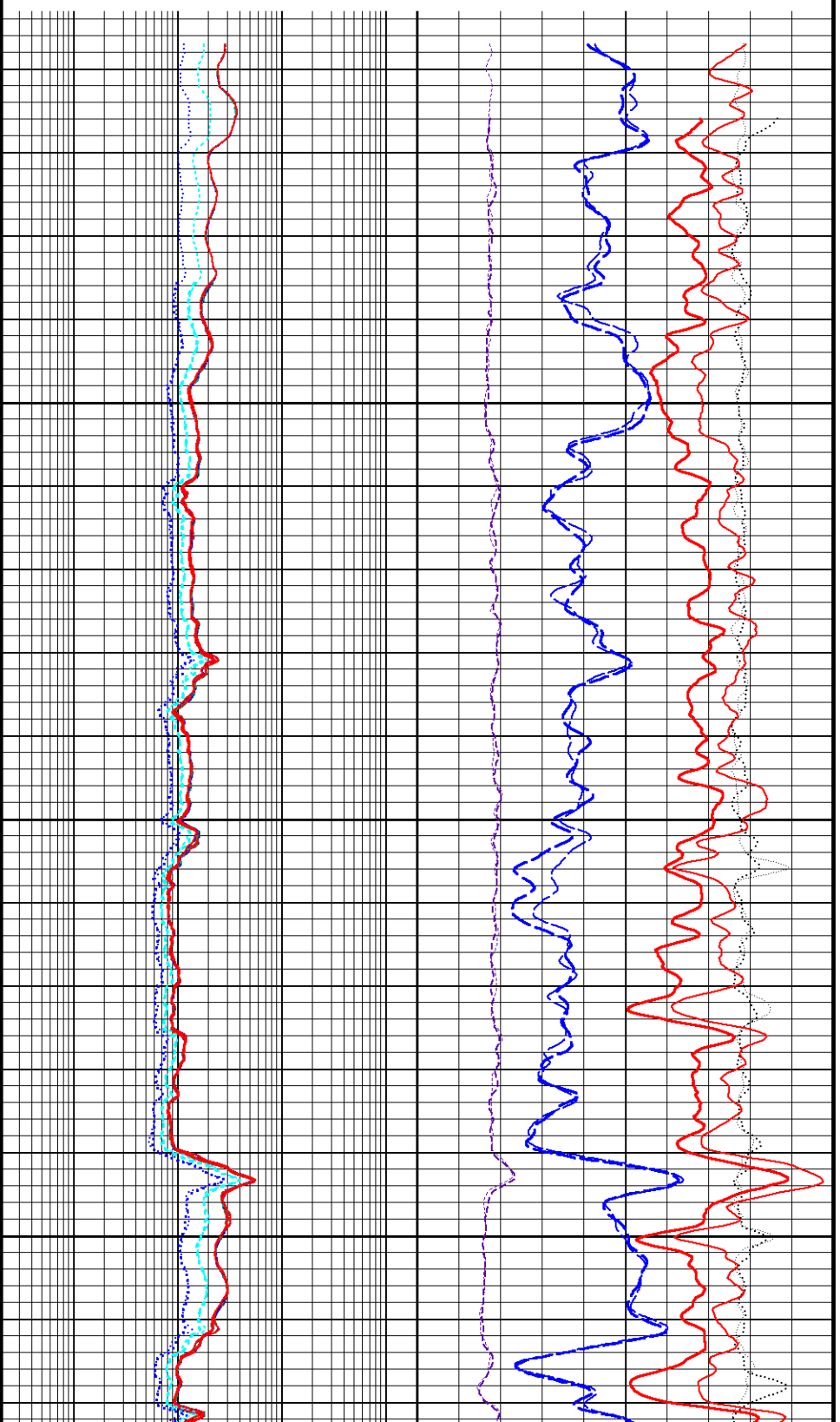
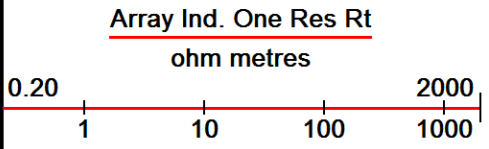
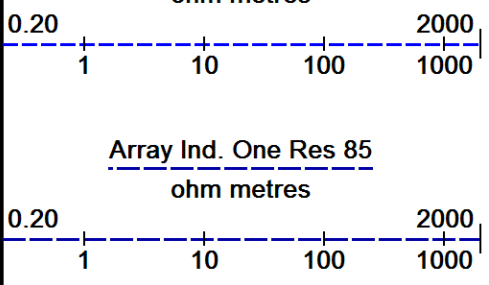
Annular
Integral
every
10 cu ft

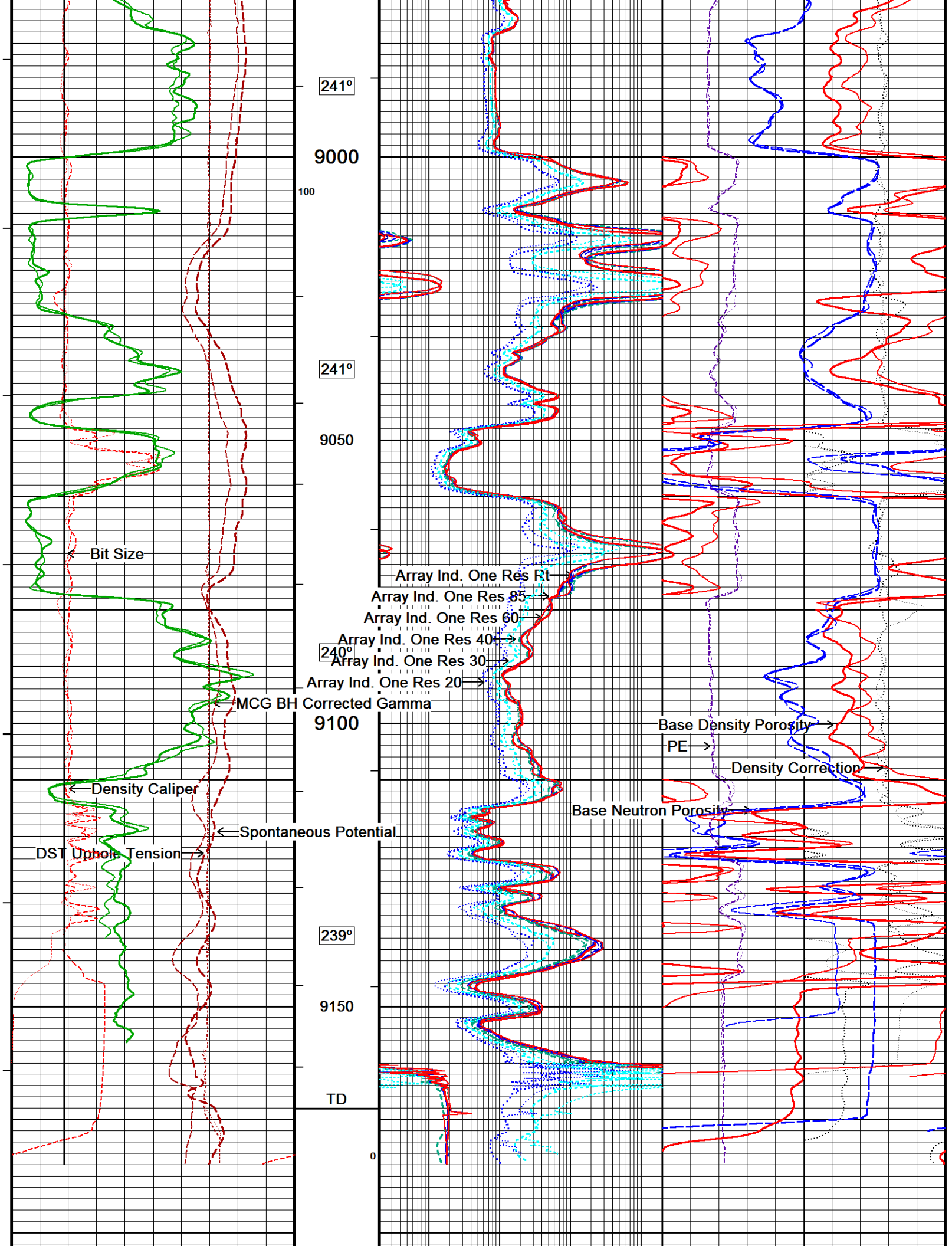


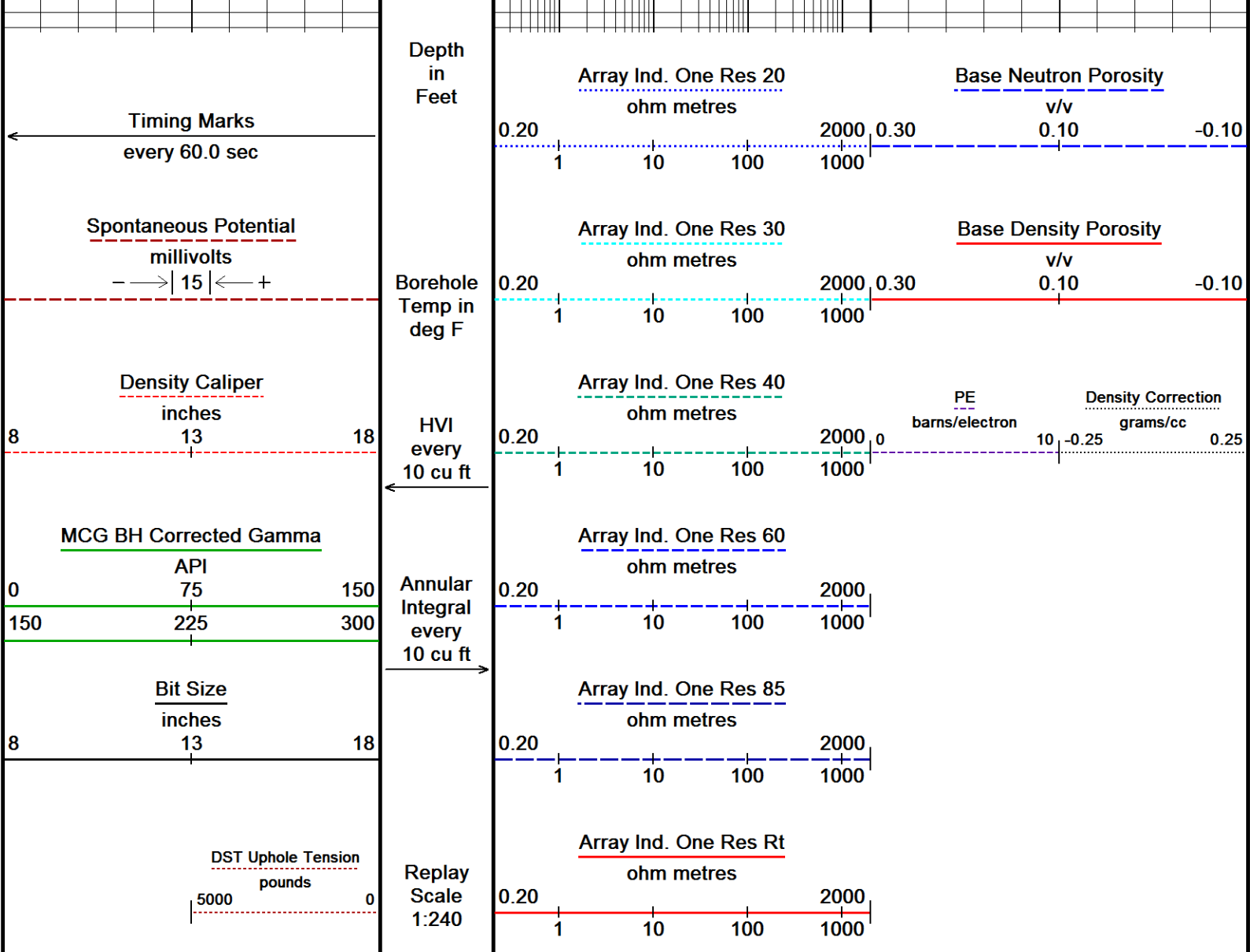
Replay
Scale
1:240



8806
200
8850
238°
8900
240°
8950







Depth Based Data - Maximum Sampling Increment 10.0cm
 Filename: C:\LOGS\NGL\SOUTH WELD SWD #1\REPEAT PASS.dta
 Filename: C:\LOGS\NGL\SOUTH WELD SWD #1\MAIN PASS.dta
 System Versions: Logged with 18.05.4364 Processed with 18.05.7089 Plotted with 18.05.7089

↑ 5" REPEAT PASS ↑

BEFORE SURVEY CALIBRATION		
C:\LOGS\NGL\SOUTH WELD SWD #1\MAIN PASS.dta		
General Constants All 000		Last Edited on 04-FEB-2019,06:03
General Parameters		
Mud Resistivity	0.870	ohm-metres
Mud Resistivity Temperature	62.800	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	7.625	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Two Res Rt	

RWA Constant A	0.620
RWA Constant M	2.150
SW/APOR Tool Source	0.000

Gamma Calibration MCG-D.K 487

Field Calibration on 03-FEB-2019 02:04

	Measured	Calibrated (API)
Background	128	79
Calibrator (Gross)	1146	705
Calibrator (Net)	1018	626

Gamma Calibration Tolerances MCG-D.K 487

Ratio	1.626	<div> <div>1.40</div> <div>1.475</div> <div>1.55</div> </div>	Counts/API
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Gamma Constants MCG-D.K 487

Last Edited on 03-FEB-2019,18:41

Gamma Calibrator Number	GRC 051	
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	%

High Resolution Temperature Constants MCG-D.K 487

Pre-filter Length	11
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Neutron Calibration MDN-B.J 430

Base Calibration on 01-JAN-2019 11:13
Field Check on 03-FEB-2019 01:19

Base Calibration			
	Measured	Calibrated (cps)	
	Near	Far	Near
	2917	90	3714
Ratio	32.538		33.764
Field Calibrator at Base		Calibrated (cps)	
		1637	2363
Ratio		0.692	
Field Check		Calibrated (cps)	
		1489	2211
Ratio		0.673	

Neutron Calibration Tolerances MDN-B.J 430

Ratio	32.538	<div> <div>-5%</div> <div>33</div> <div>+5%</div> </div>
Base Check	0.692	<div> <div>0.65</div> <div>0.7</div> <div>0.75</div> </div>
Field Check	0.673	<div> <div>0.672</div> <div>0.692</div> <div>0.712</div> </div>

Neutron Constants MDN-B.J 430

Last Edited on 04-FEB-2019,06:05

Neutron Source Id	P31131B	
Neutron Jig Number	6532NK	
Air Hole Processing	Modified Ratio	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.00	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	7.00	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	None	

Formation Fluid Salinity Source	N/A	kppm
Barite Mud Correction	Not Applied	

Induction Calibration MAI-B.J 437 Factory Loop Calibration 22-DEC-2018 15:23
Field Check on 03-FEB-2019 00:57

Factory Loop Calibration

High Conductivity Reference Resistor	3.3	ohm
Low Conductivity Reference Resistor	333.3	ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	15.2	433.1	9.3	966.2	2.290	-25.6
2	5.5	361.5	7.6	821.4	2.286	-5.0
3	3.0	249.1	5.2	566.0	2.278	-1.6
4 (far)	1.5	127.7	2.6	279.2	2.192	-0.8
Array Temperature	75.7		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		Deg F
	Low	High	Low	High	
1 (near)	17.0	4193.9	17.1	4194.2	
2	32.8	3729.0	32.8	3729.6	
3	30.5	3175.3	30.6	3175.6	
4 (far)	21.1	2160.4	21.1	2160.9	
Array Temperature	35.4		44.2		

Induction Check Tolerances MAI-B.J 437

Low Array 1	17.1	<div><div>15.5</div><div>17.0</div><div>18.5</div></div>	mmho/m	High Array 1	4194.2	<div><div>-0.5%</div><div>4193.9</div><div>+0.5%</div></div>	mmho/m
Low Array 2	32.8	<div><div>31.3</div><div>32.8</div><div>34.3</div></div>	mmho/m	High Array 2	3729.6	<div><div>-0.5%</div><div>3729.0</div><div>+0.5%</div></div>	mmho/m
Low Array 3	30.6	<div><div>29.0</div><div>30.5</div><div>32.0</div></div>	mmho/m	High Array 3	3175.6	<div><div>-0.5%</div><div>3175.3</div><div>+0.5%</div></div>	mmho/m
Low Array 4	21.1	<div><div>19.6</div><div>21.1</div><div>22.6</div></div>	mmho/m	High Array 4	2160.9	<div><div>-0.5%</div><div>2160.4</div><div>+0.5%</div></div>	mmho/m

Induction Constants MAI-B.J 437

Last Edited on 04-FEB-2019,10:30

Induction Model RtAP-WBM

Borehole Correction Constants

Tool Centred	No
Hole Size Source	Density Caliper
Hole Size Constant Value	N/A
Stand-off Type	Fins
Stand-off	0.00
Number of Fins on Stand-off	6.0000
Stand-off Fin Angle	60.00
Stand-off Fin Width	0.0000
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

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	

Photo Density Calibration MPD-C.J 378

Base Calibration on 31-DEC-2018 11:03
Field Check on 03-FEB-2019 01:03

Density Calibration		Measured		Calibrated (sdu)	
Base Calibration		Near	Far	Near	Far
Background		1035	1112		
Reference 1		47318	21685	59898	31131
Reference 2		19106	2096	24540	2525
Field Check at Base					
		1035.5	1112.0		
Field Check					
		1039.6	1109.7		

PE Calibration		Measured		Calibrated
Base Calibration		WS	WH	Ratio
Background		192	936	
Reference 1		20039	47170	0.429
Reference 2		5473	19002	0.292
Field Check at Base				
		191.6	935.7	
Field Check				
		188.7	940.4	

Photo Density Calibration Tolerances MPD-C.J 378

Near Density Ratio	2.56	<div><div></div><div></div><div></div><div></div><div></div></div>	Far Density Ratio	20.91	<div><div></div><div></div><div></div><div></div><div></div></div>
PE Calibration	0.130	<div><div></div><div></div><div></div><div></div><div></div></div>			
Near Den. Field Check	1039.6	<div><div></div><div></div><div></div><div></div><div></div></div>	Far Den. Field Check	1109.7	<div><div></div><div></div><div></div><div></div><div></div></div>
PE WS Field Check	188.7	<div><div></div><div></div><div></div><div></div><div></div></div>	PE WH Field Check	940.4	<div><div></div><div></div><div></div><div></div><div></div></div>

Density Constants MPD-C.J 378

Last Edited on 04-FEB-2019,18:56

Density Source Id	P21136B	
Nylon Calibrator Number	DNCE631	
Aluminium Calibrator Number	DACD631	
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 Type		
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	
Precision Enhanced Density Processing	Applied	
Matrix Density (gm/cc)	Depth (ft)	

2.65	2150.00
2.71	7198.00
2.65	7564.00
0.00	9178.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

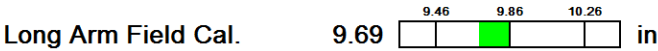
Caliper Calibration MPD-C.J 378

Base Calibration on 13-JAN-2019 20:47
Field Calibration on 03-FEB-2019 01:10

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	17181	4.00
2	25360	5.96
3	33973	7.98
4	42240	9.68
5	51280	11.88
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	9.69	9.86

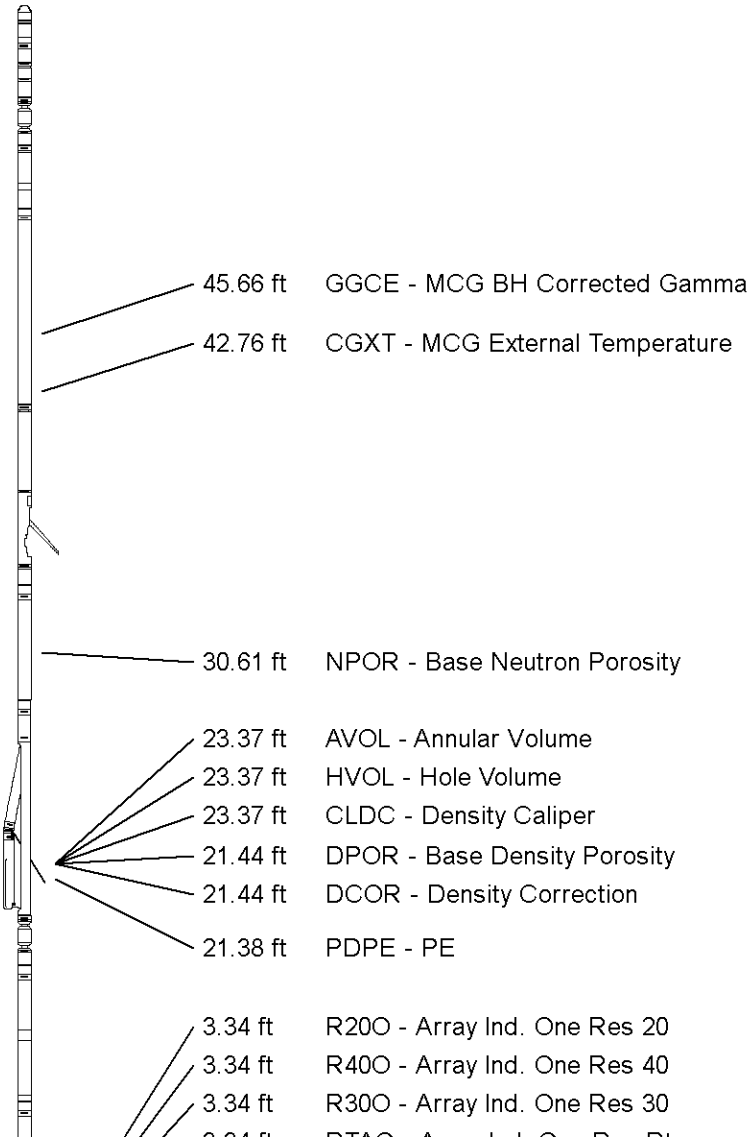
Caliper Calibration Tolerances MPD-C.J 378



DOWNHOLE EQUIPMENT

C:\LOGS\INGL\SOUTH WELD SWD #1\MAIN PASS.dta

- Cablehead, 11 pin
CBH-C 147 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in
- 11C-11B Compact Tool Adaptor
MTA-K.B 382 LG: 1.53 ft WT: 13.2 lb OD: 2.240 in
- Compact Knuckle Joint
SKJ-E.A 244 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in
- Compact Swivel Head Adaptor
SHA-J.B 589 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in
- Compact Comms Gamma
MCG-D.K 487 LG: 8.70 ft WT: 63.9 lb OD: 2.240 in
- Compact Micro-Resistivity
MMR-B.A 85 LG: 8.59 ft WT: 81.6 lb OD: 3.819 in
- Compact Neutron
MDN-B.J 430 LG: 5.04 ft WT: 50.7 lb OD: 2.240 in
- Compact Density/Caliper
MPD-C.J 378 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in
- Compact Knuckle Joint
SKJ-E.B 614 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in
- Compact Focussed Electric
MFE-C.A 400 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in



Compact Induction
MAI-B.J 437 LG: 12.52 ft WT: 48.5 lb OD: 2.240 in

Total Length: 61.05 ft Weight: 491.6 lb



All measurements relative to tool zero.

COMPANY	NGL ENERGY PARTNERS
WELL	SOUTH WELD SWD #1
FIELD	WATTENBERG
PROVINCE/COUNTY	WELD COUNTY
COUNTRY/STATE	USA/COLORADO

Elevation Kelly Bushing	4977	feet	First Reading	9160.00	feet
Elevation Drill Floor	4977	feet	Depth Driller	9166.00	feet
Elevation Ground Level	4952	feet	Depth Logger	9168.00	feet



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COMPOSITE LOG