



Weatherford®

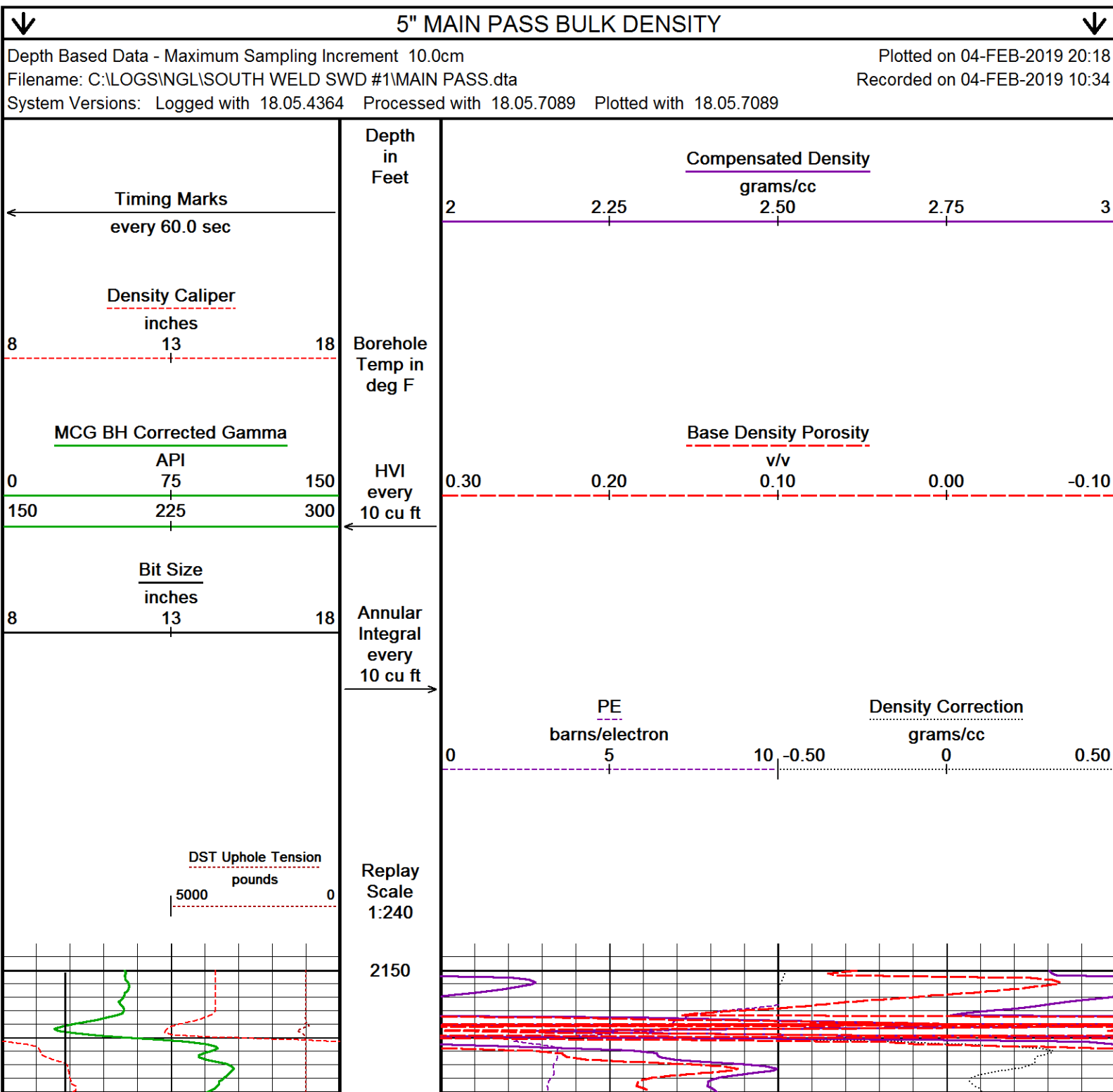
**PHOTO DENSITY
DUAL SPACED NEUTRON**

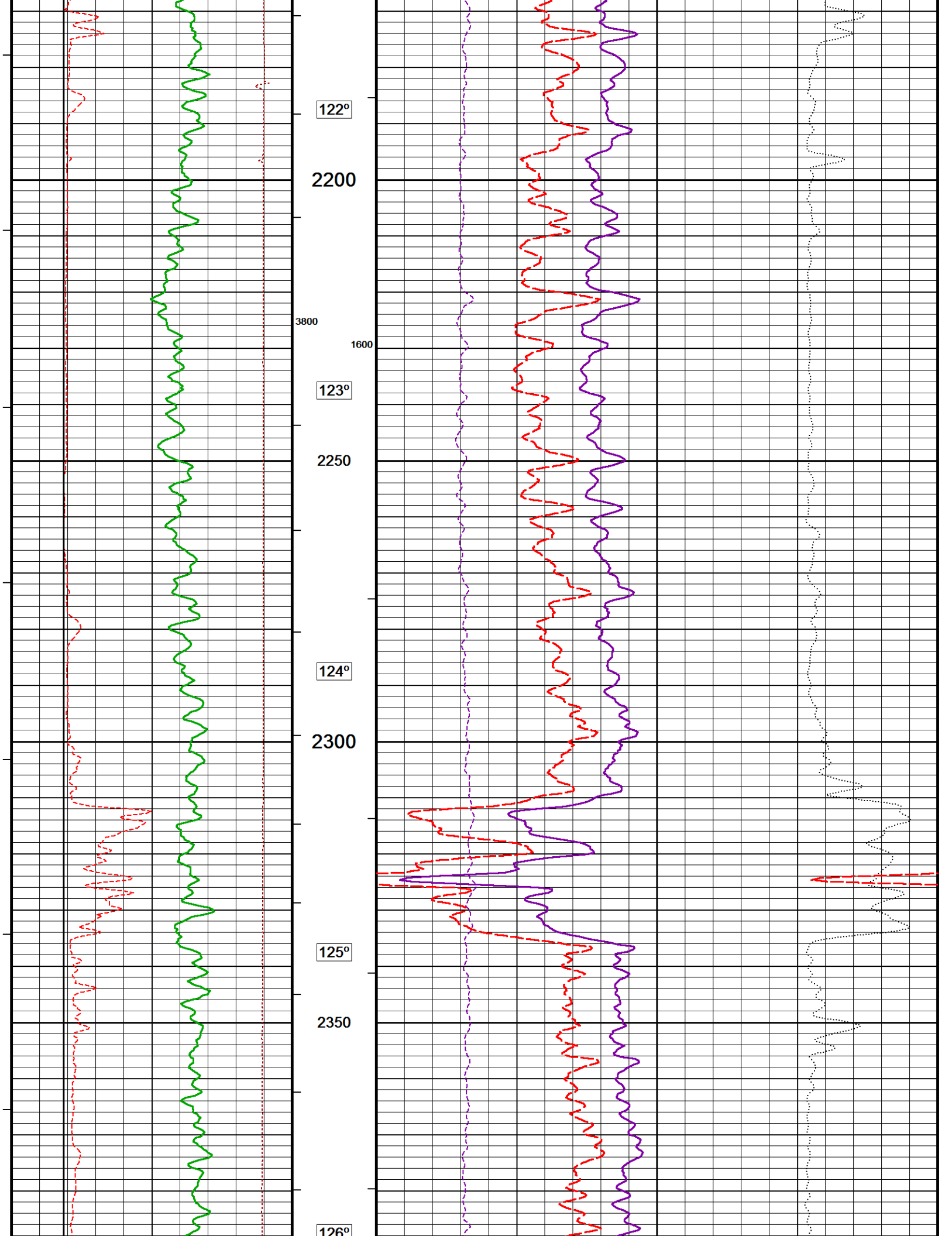
COMPANY		NGL ENERGY PARTNERS			
WELL		SOUTH WELD SWD #1			
FIELD		WATTENBERG			
PROVINCE/COUNTY		WELD COUNTY			
COUNTRY/STATE		USA/COLORADO			
LOCATION		SHL: SWNE 1615 FNL 1713 FEL			
SEC 30	TWP 1N	RGE 66W	Other Services		
Latitude		40.0256	ARRAY INDUCTION		
Longitude		-104.8165			
API Number		05-123-47682			
Permanent Datum GL, Elevation 4952 feet					Elevations:
Log Measured From KB, 25.00 feet above Permanent Datum					KB 4977.00
Drilling Measured From KB					DF 4977.00
					GL 4952.00
Date	04-FEB-2019				
Run Number	1				
Service Order	2938-233467273				
Depth Driller	9166.00				feet
Depth Logger	9168.00				feet
First Reading	9150.00				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				

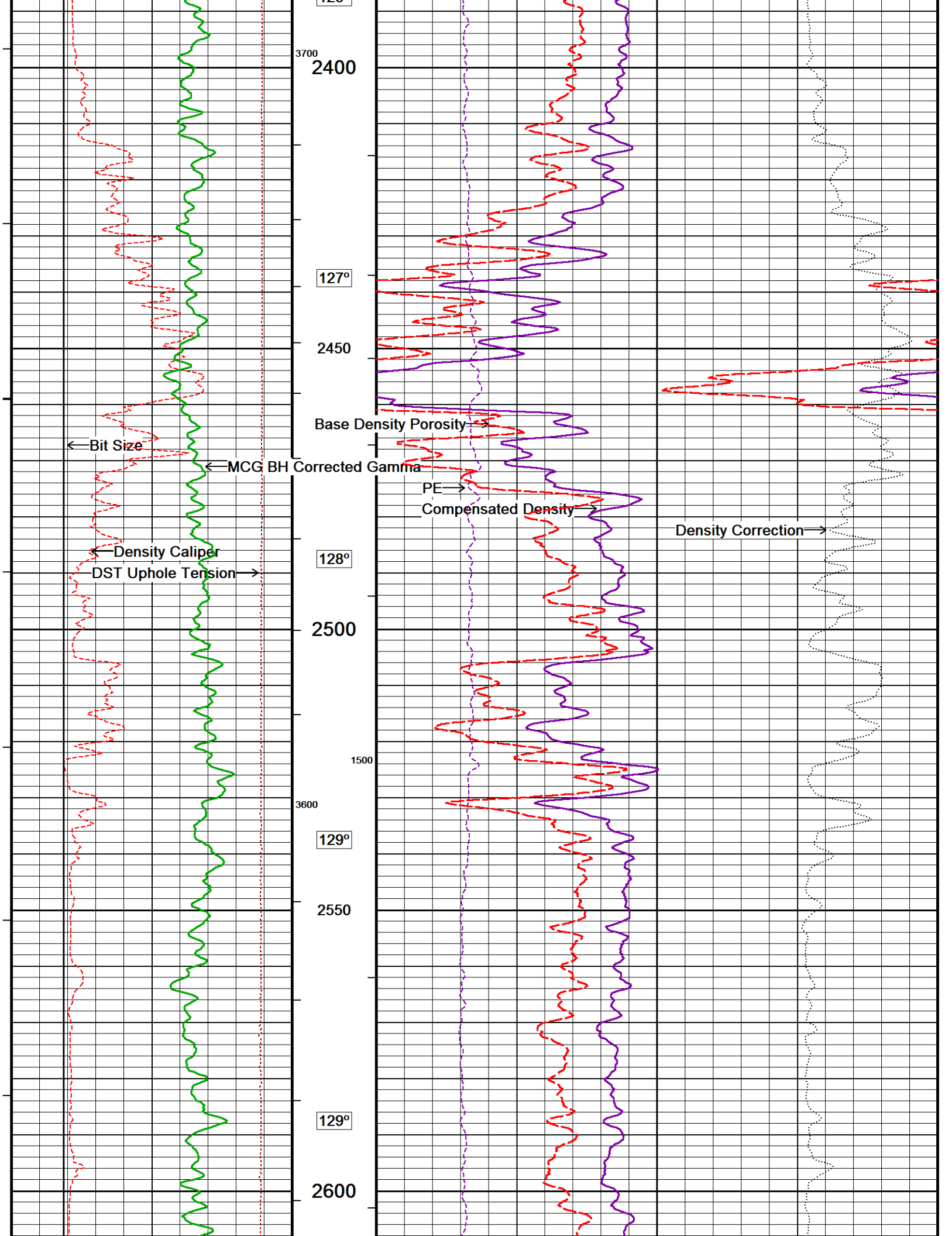
BOREHOLE RECORD					Last Edited: 04-FEB-2019 16:16
Bit Size inches		Depth From feet		Depth To feet	
9.875		1235.00		9166.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	10.750	0.00	1235.00	40.50	

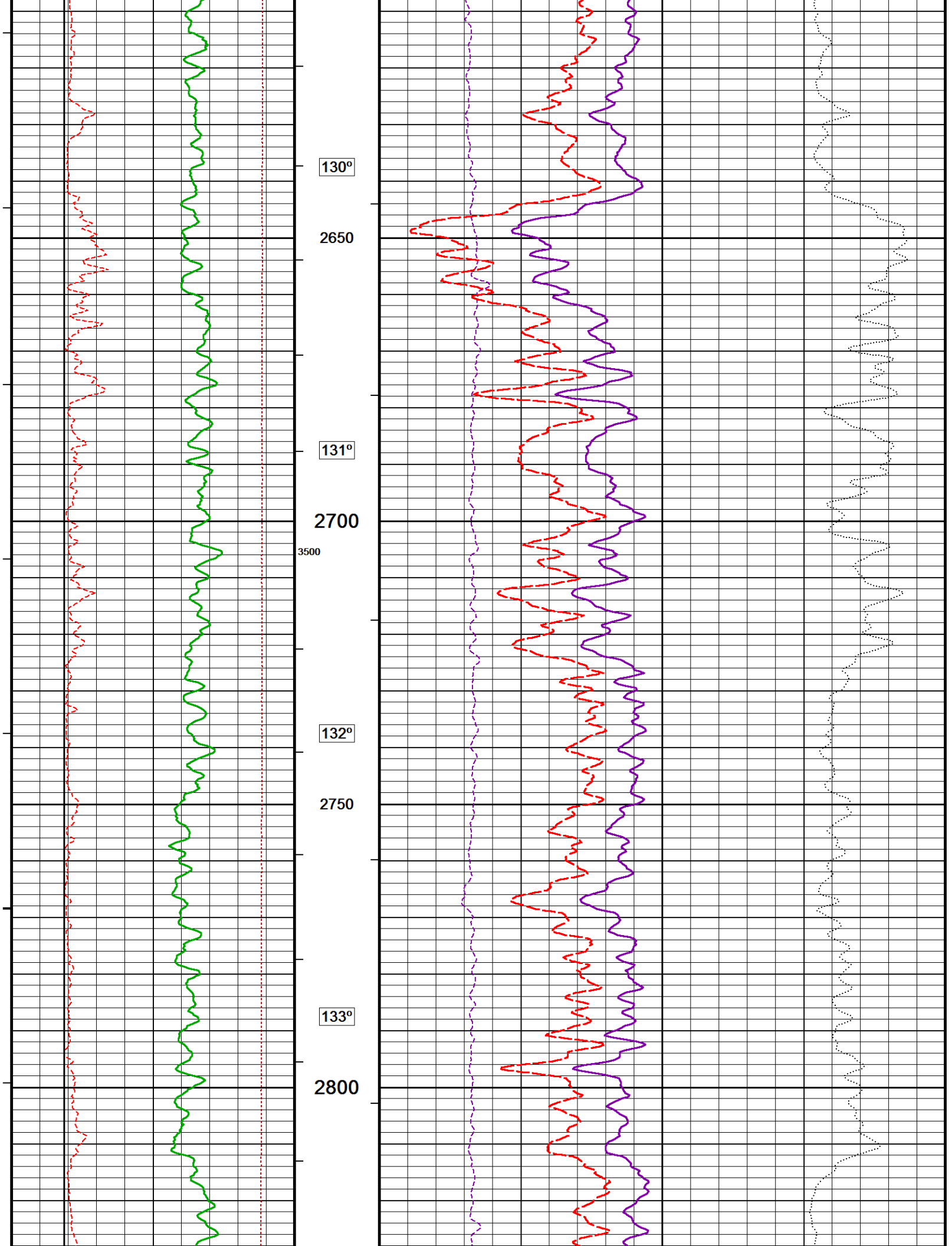
REMARKS
LOGGED WITH WLS 18.05.4364
TOOLSTRING RAN AS PER STRING DIAGRAM
HARDWARE: MMR: ABOVE MDN TO SIDEWALL
MATRIX CHANGES FROM SANDSTONE TO LIMESTONE AT 7198 FT
MATRIX CHANGES FROM LIMESTONE TO SANDSTONE AT 7564 FT
BRIDGED THREE TIMES AT THE FOLLOWING DEPTHS RESPECTIVELY: 1263 FT, 1261 FT, 1300 FT
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

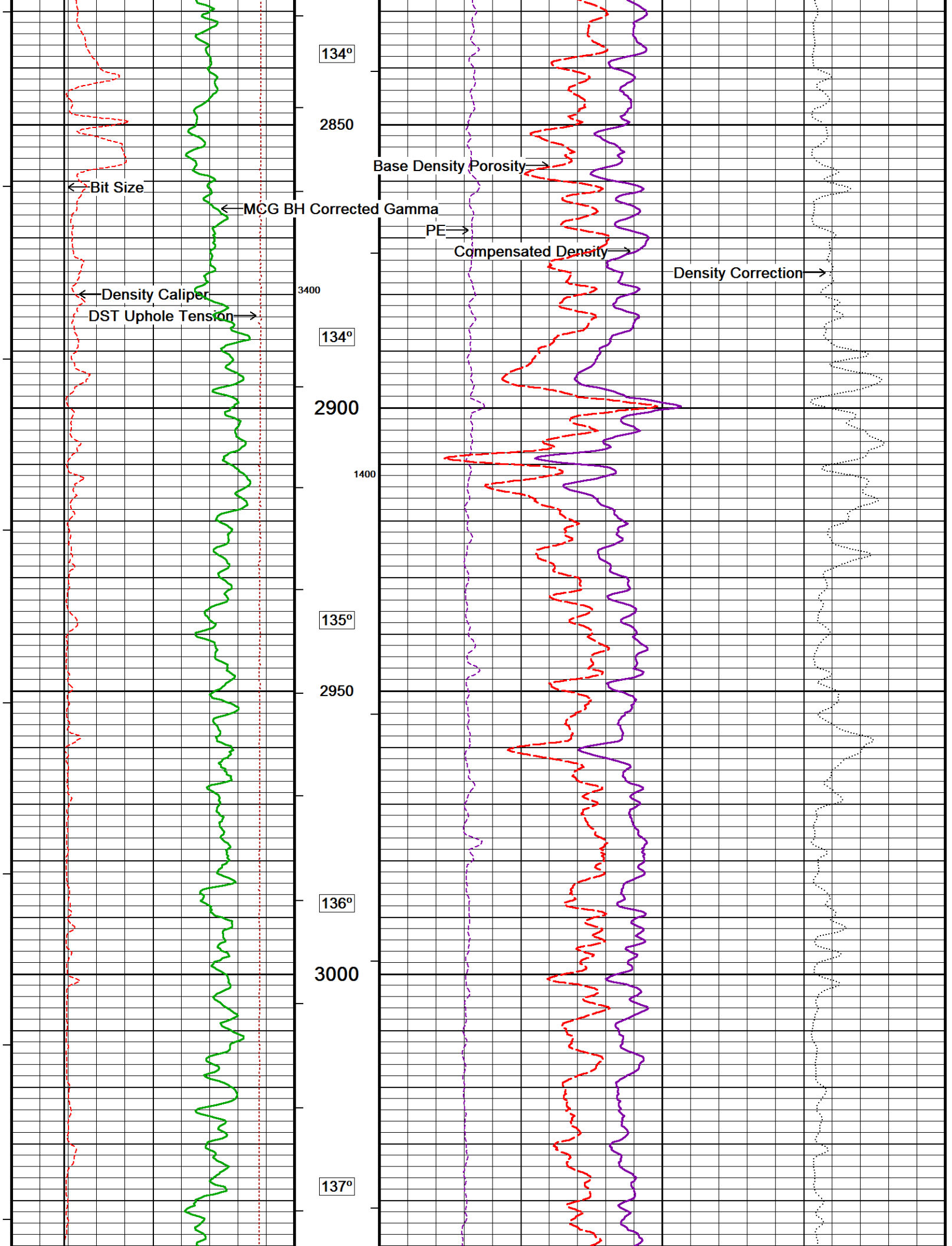
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will 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.

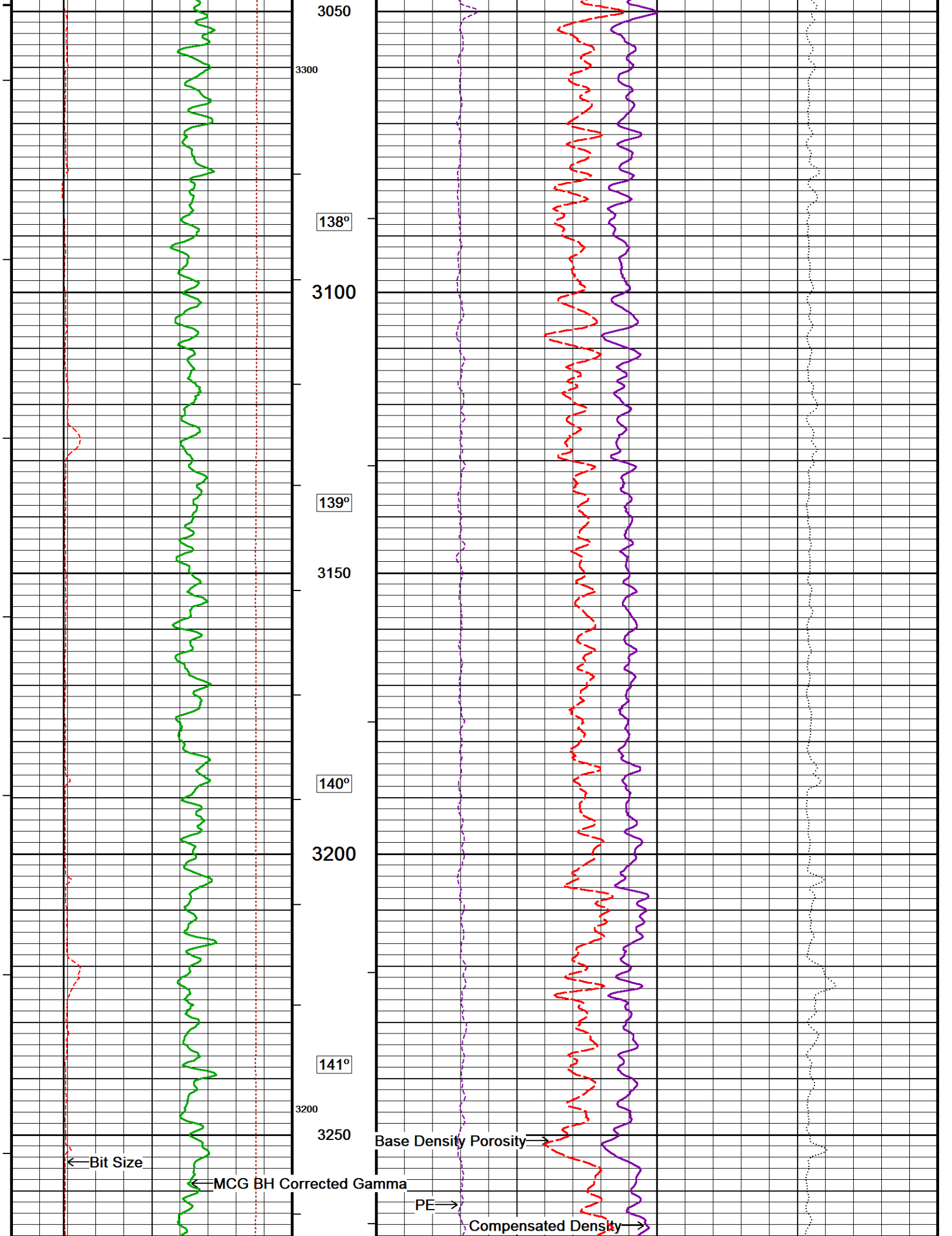


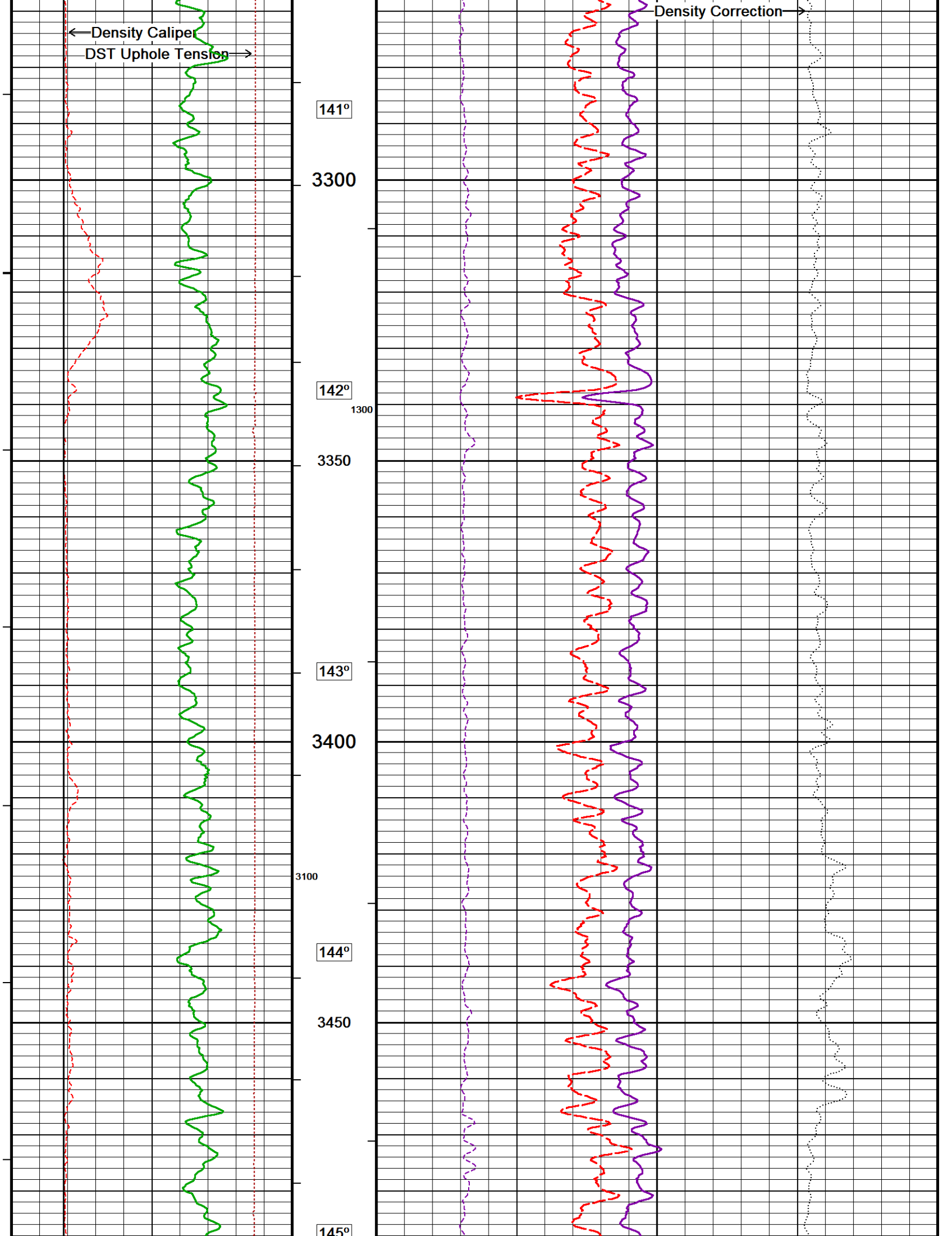


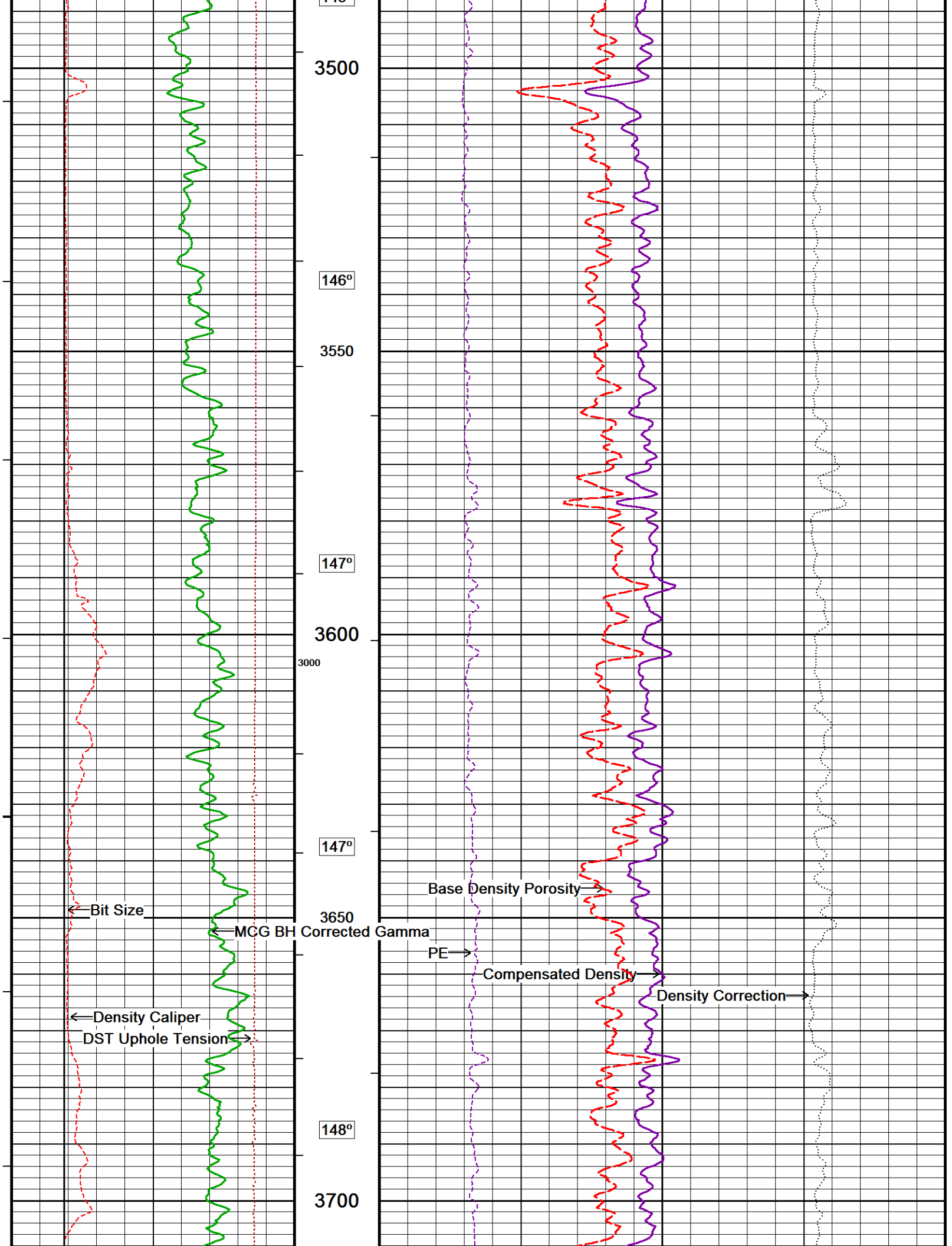


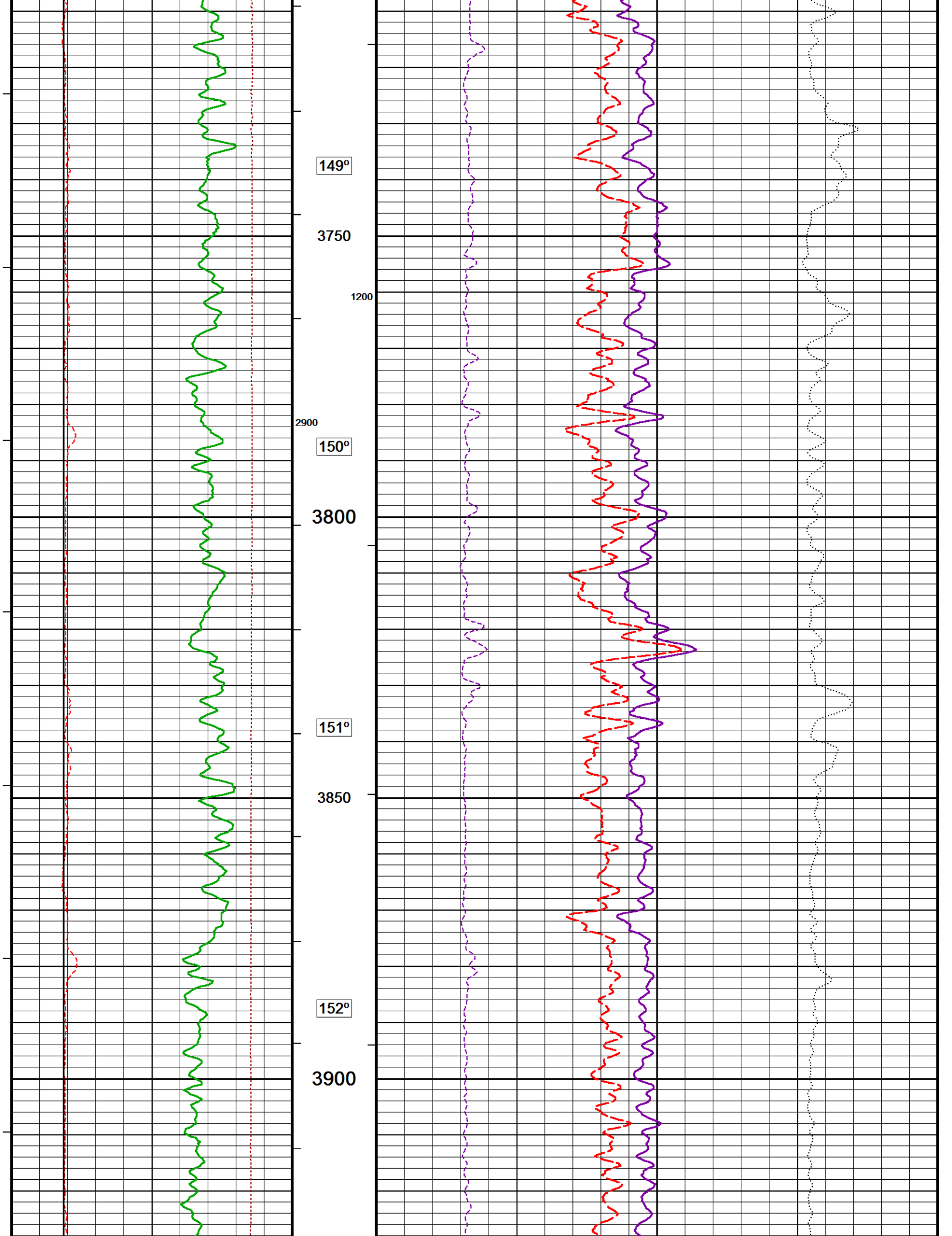


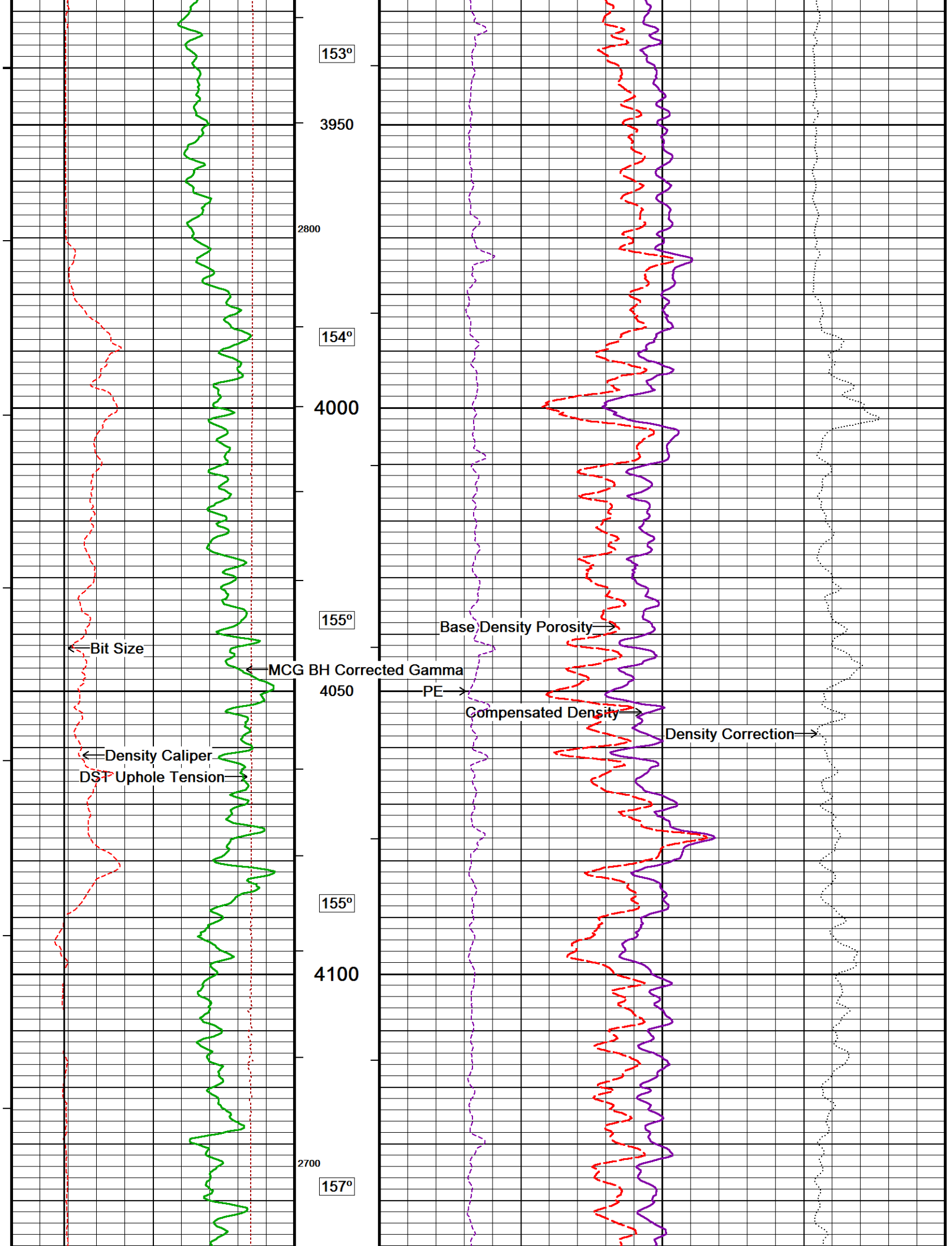


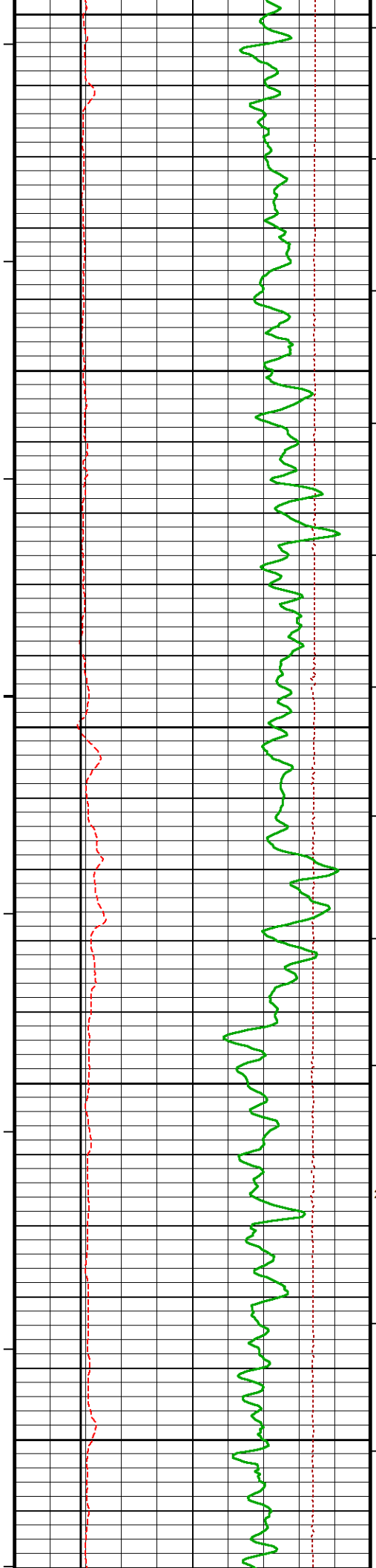




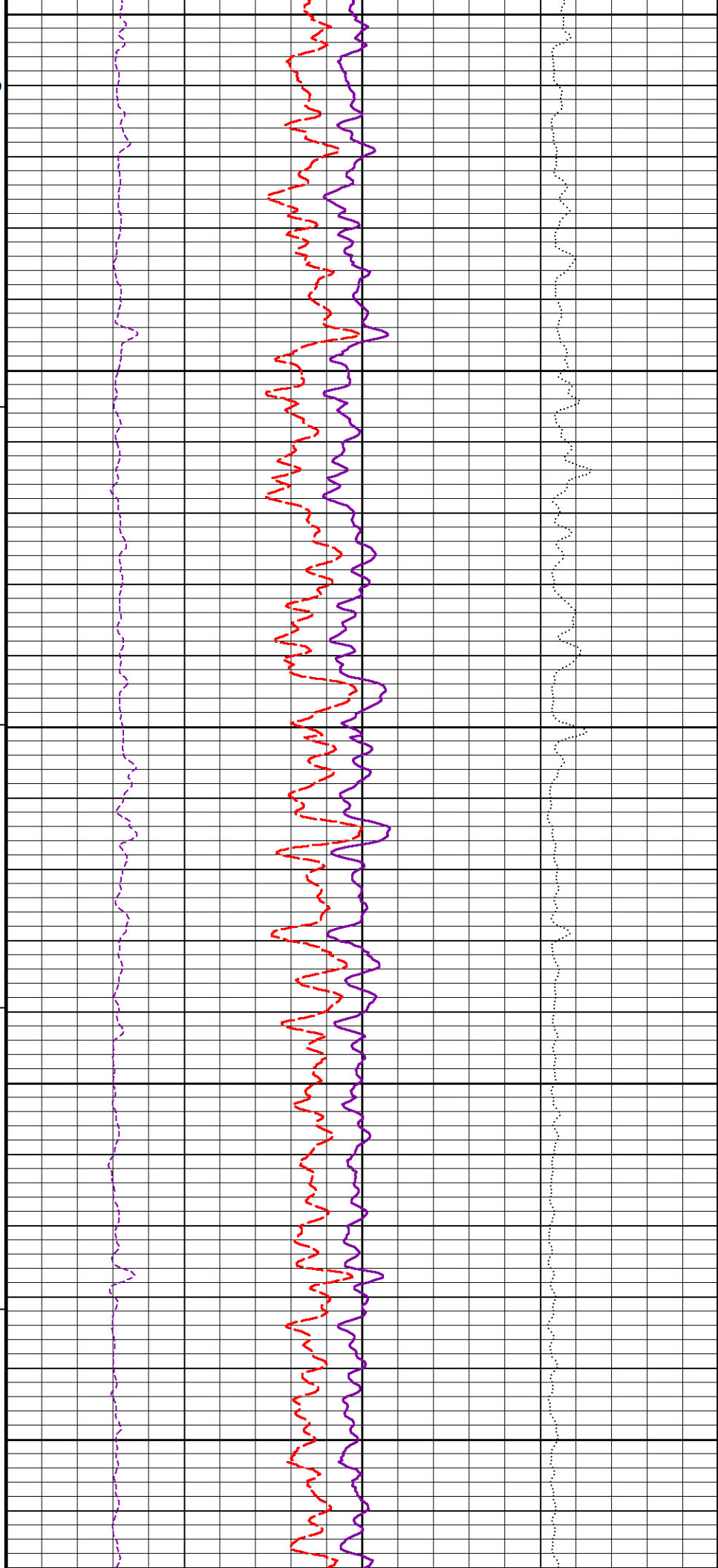


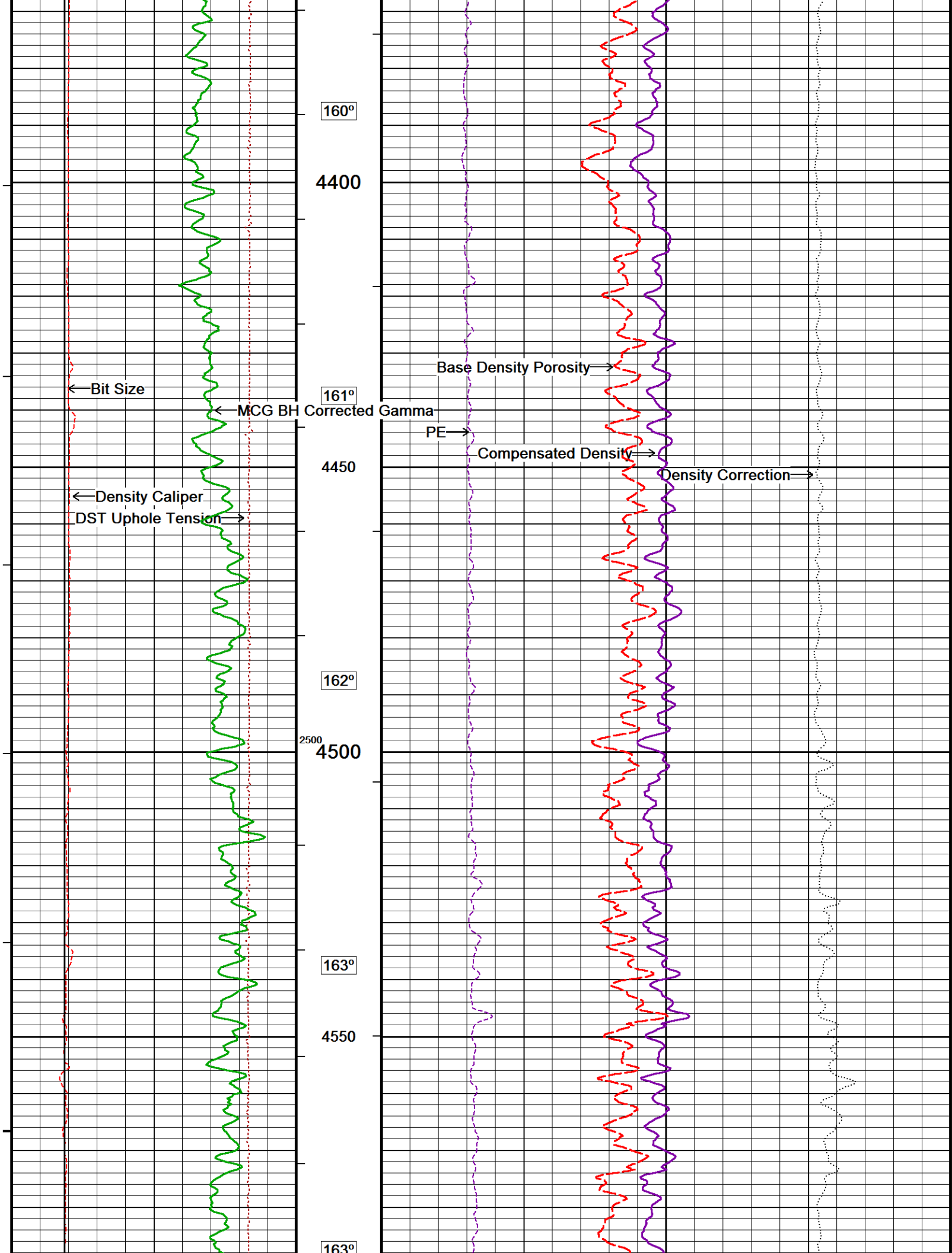


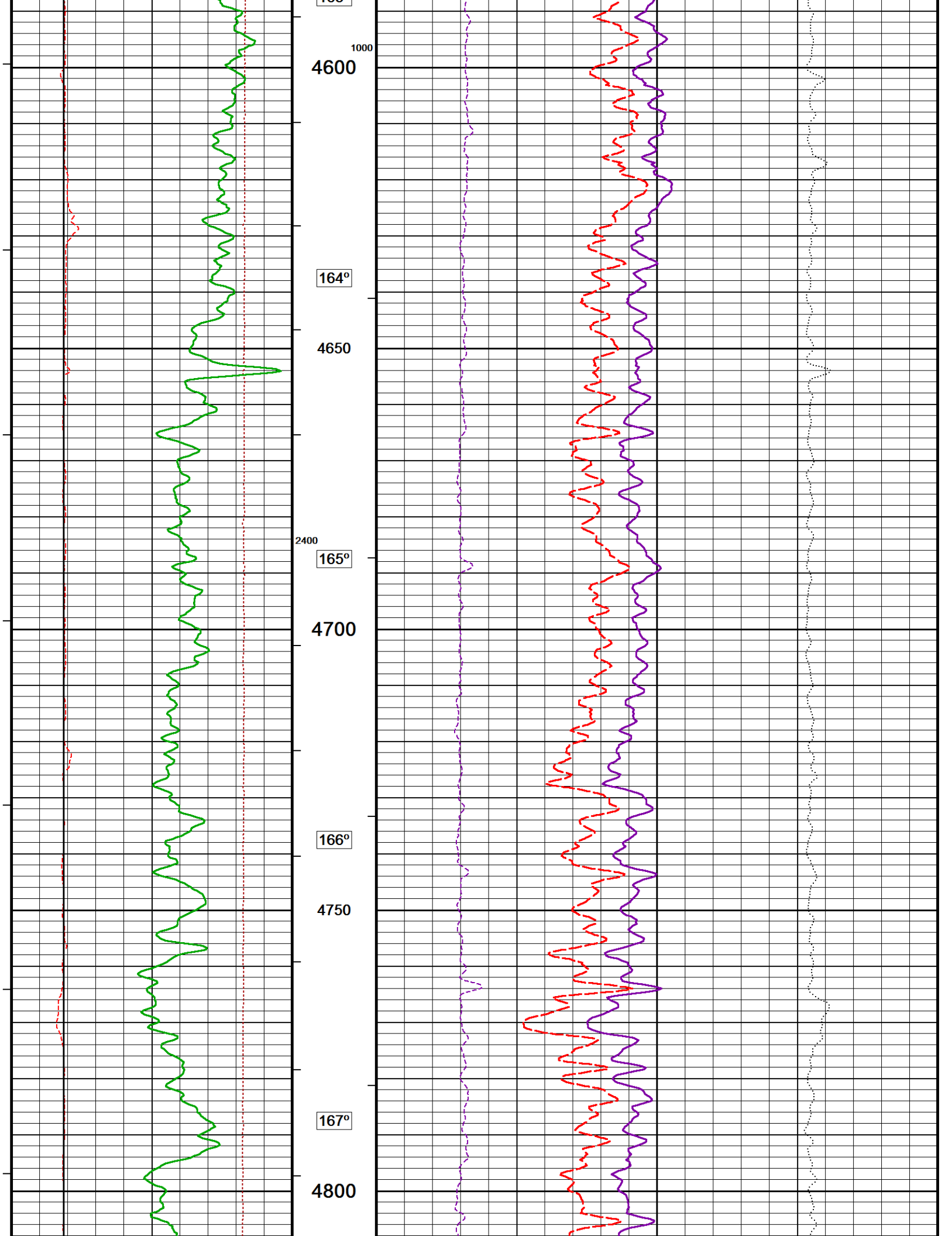


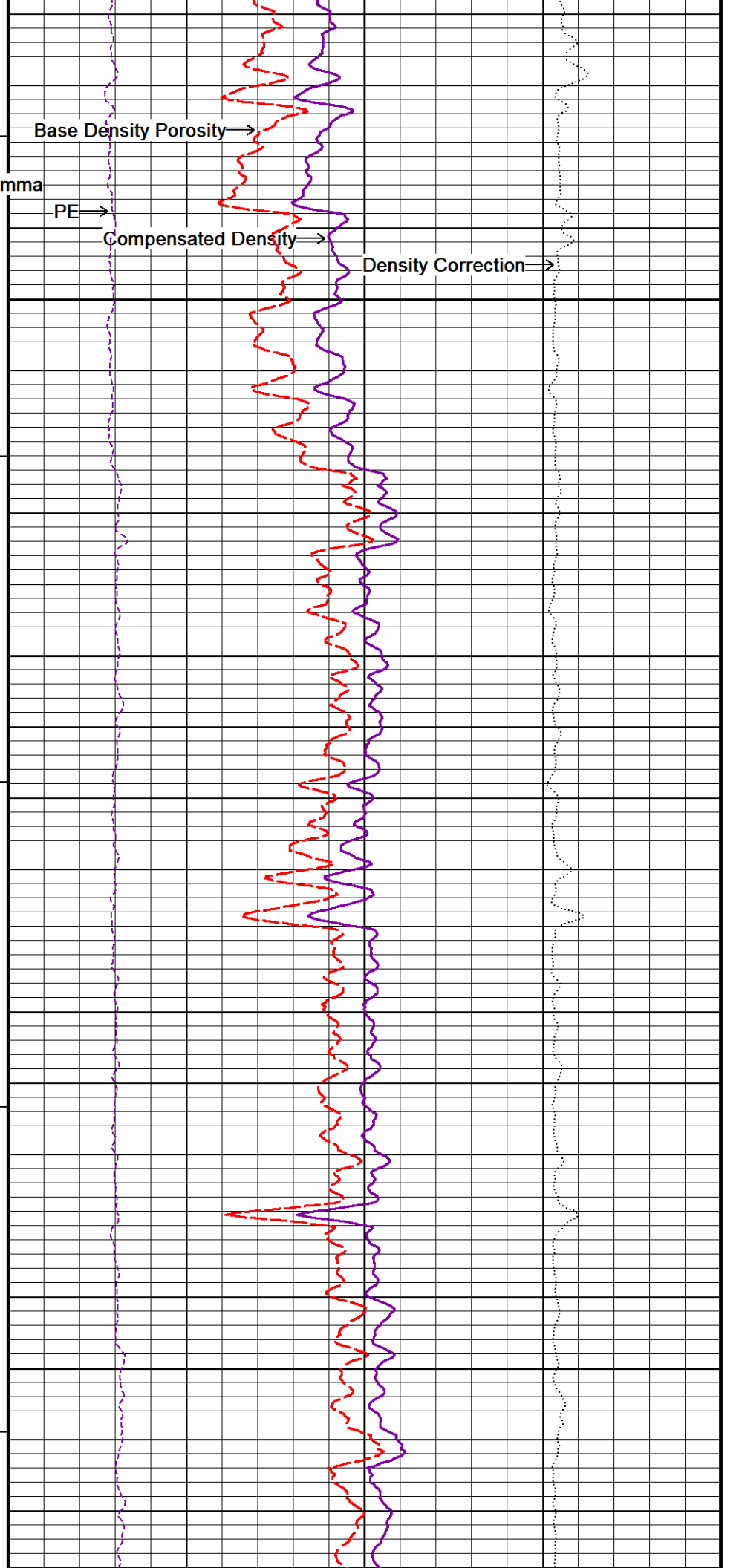
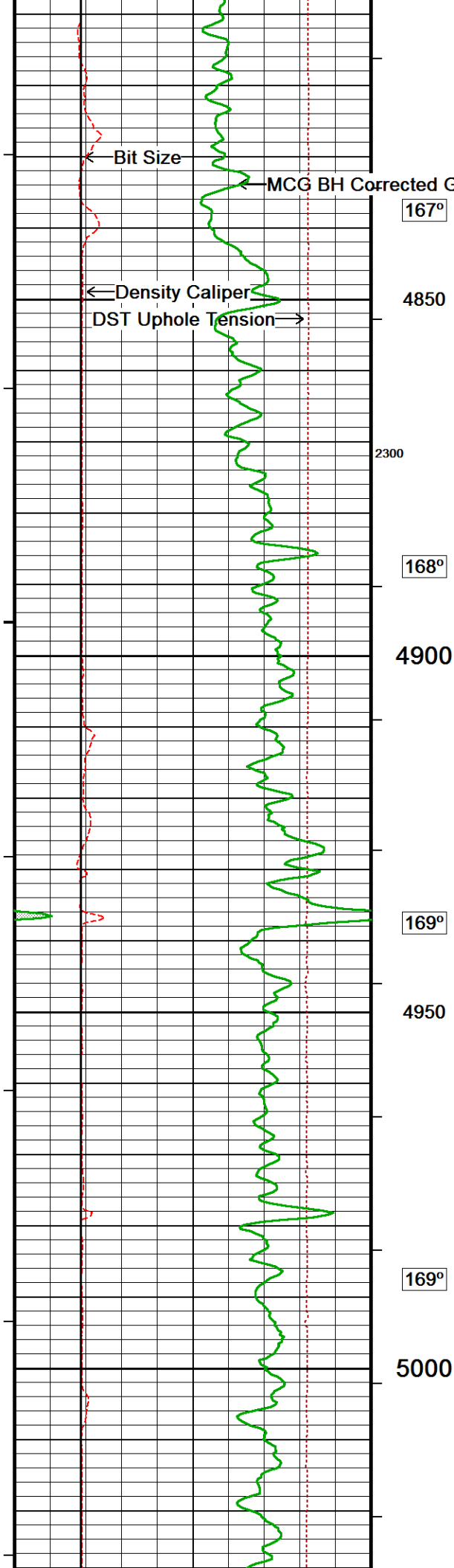


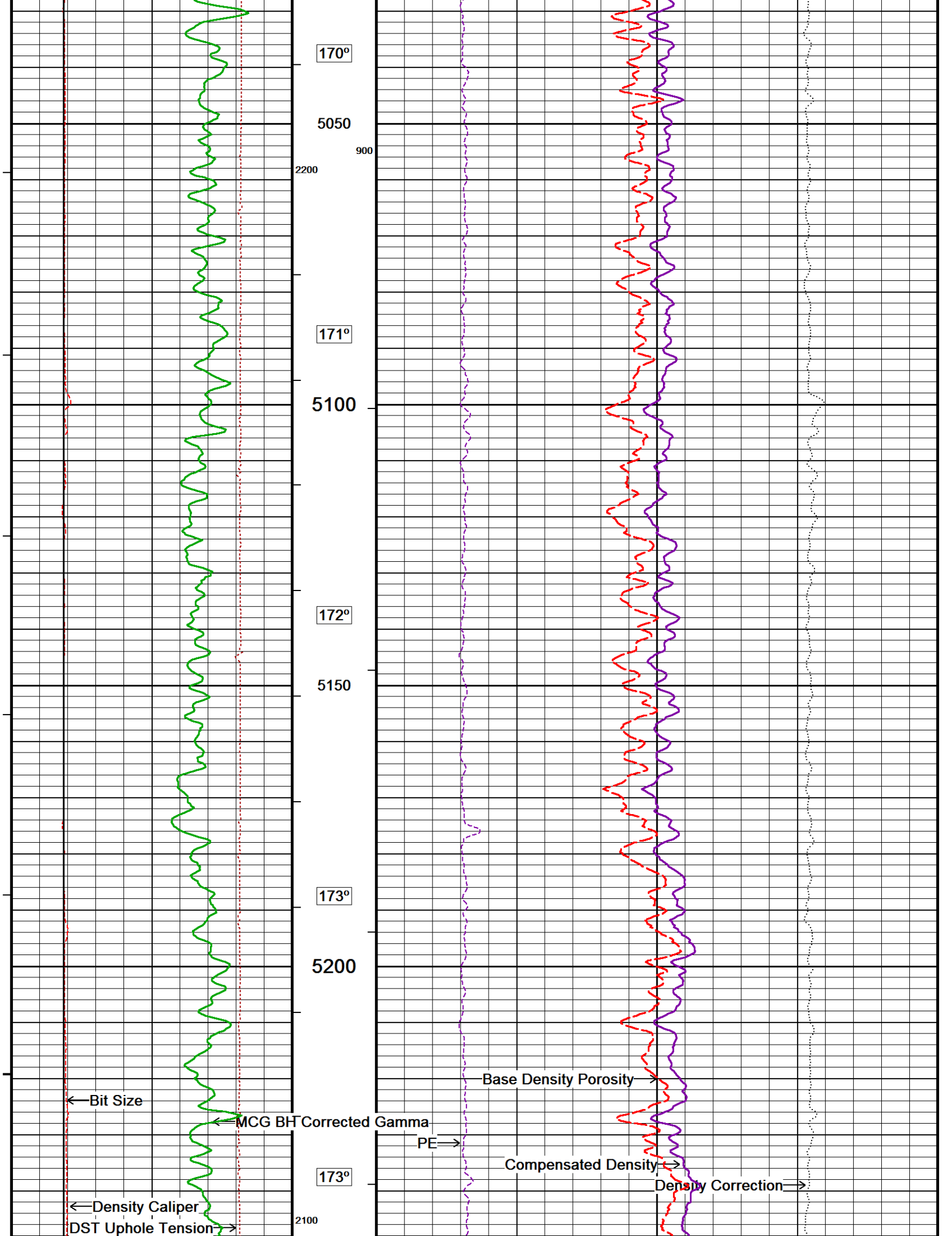
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1100
158°
4200
158°
4250
159°
4300
2600
160°
4350

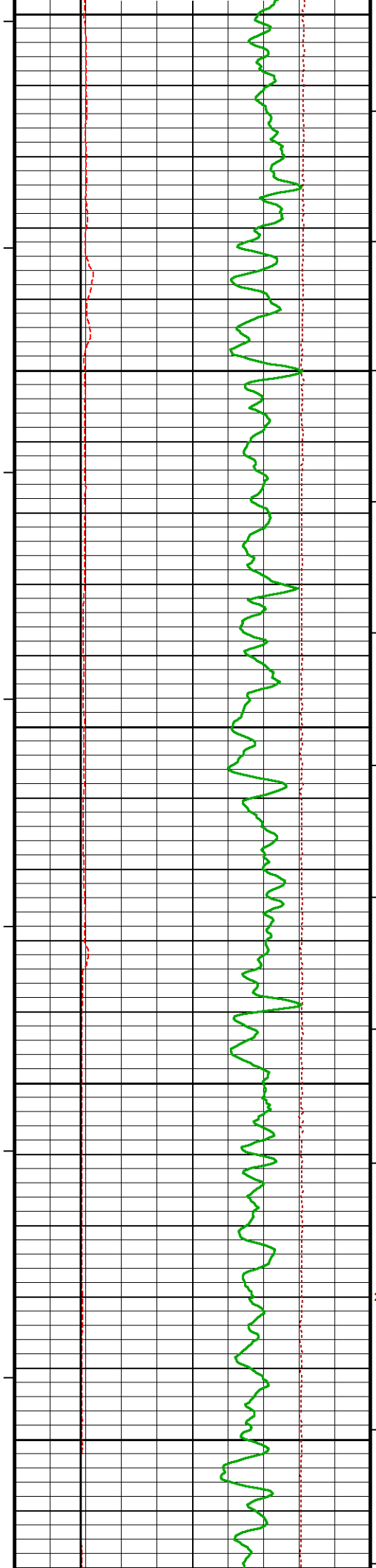




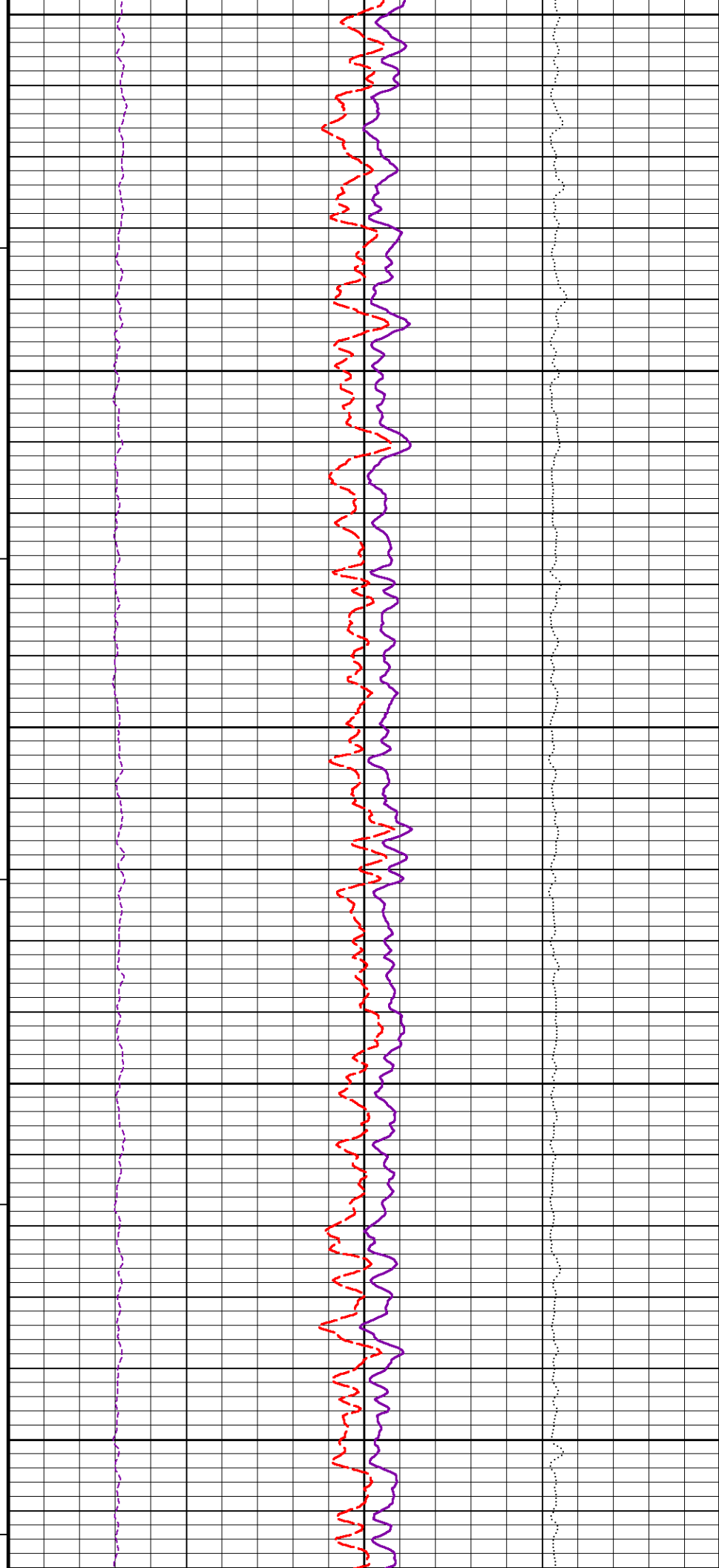


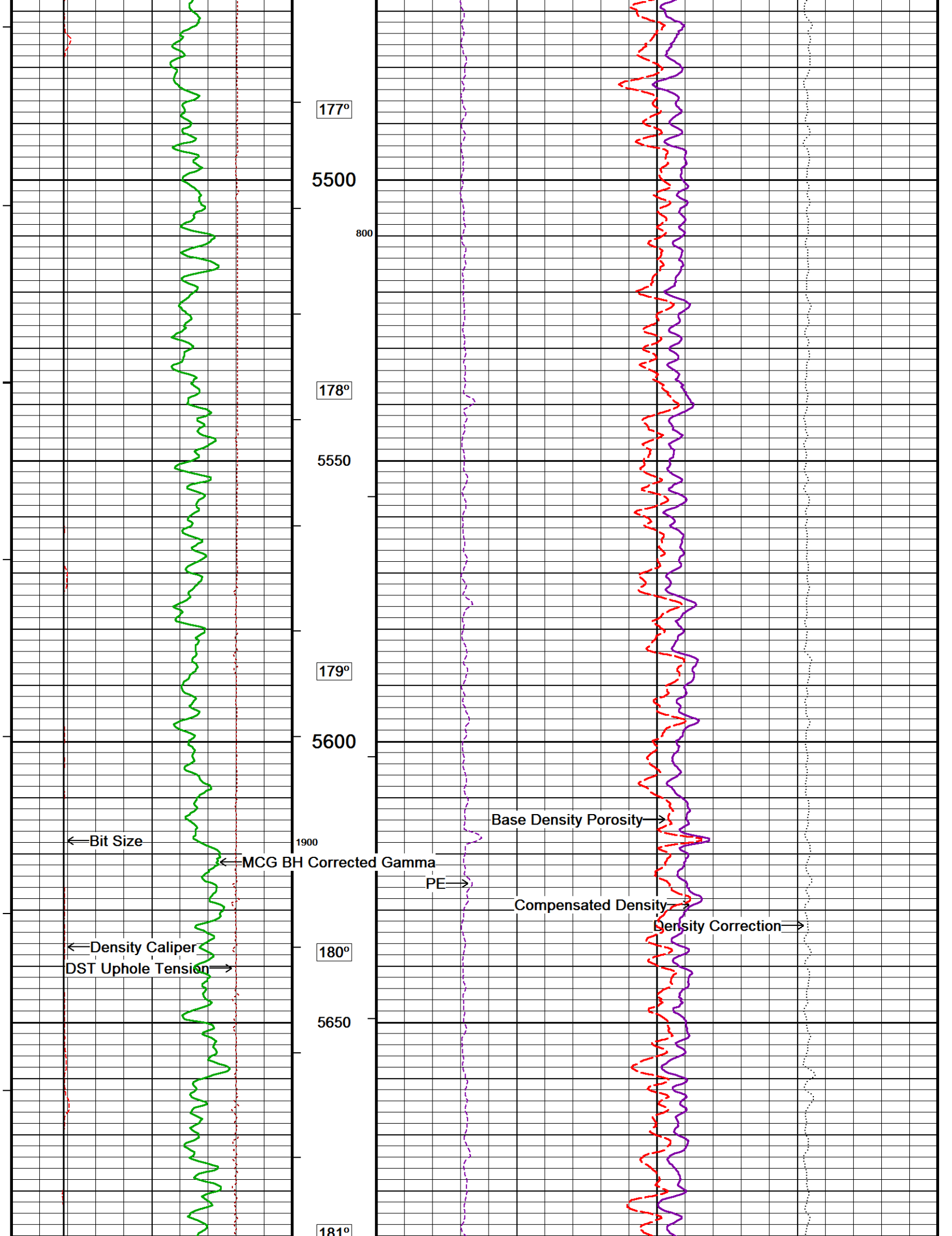


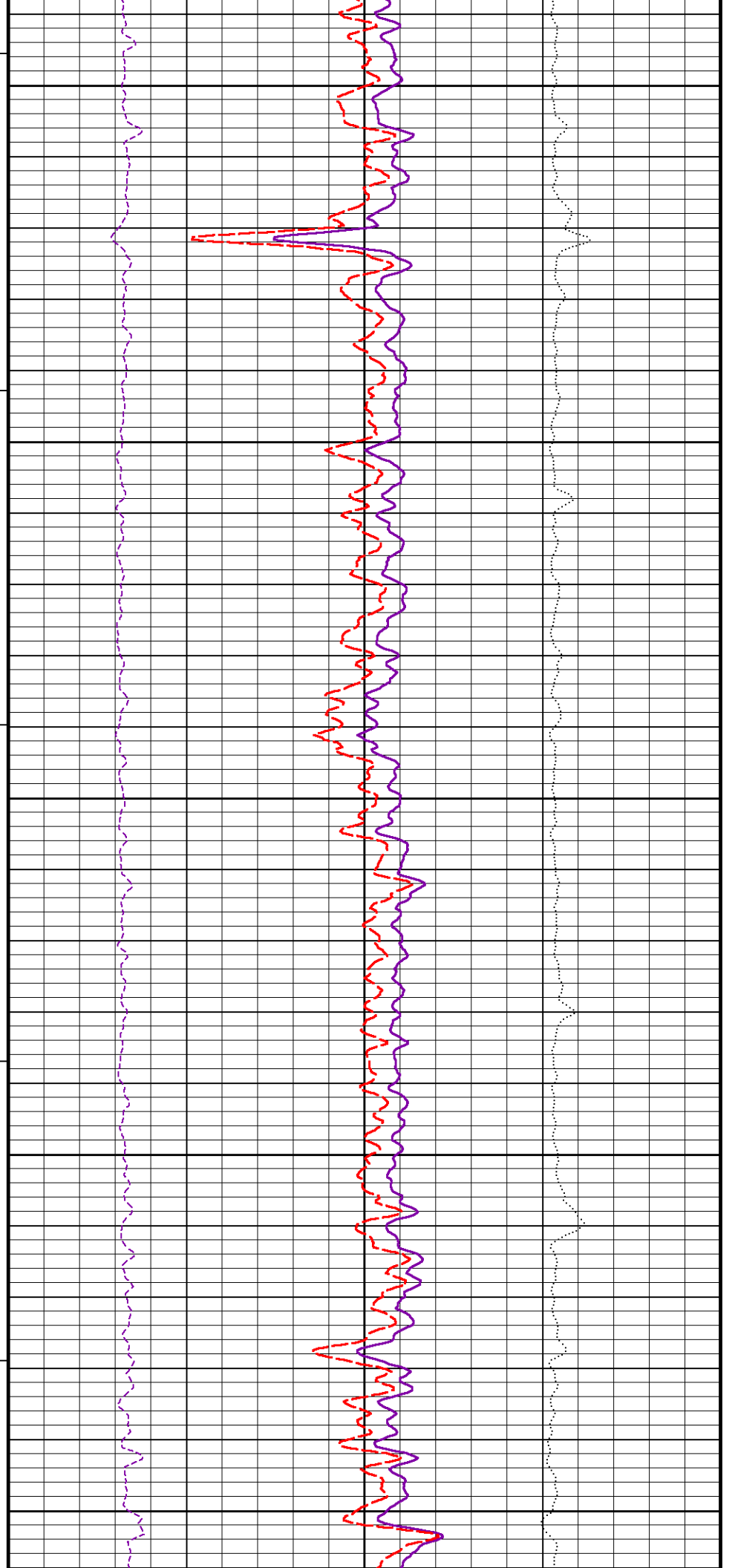
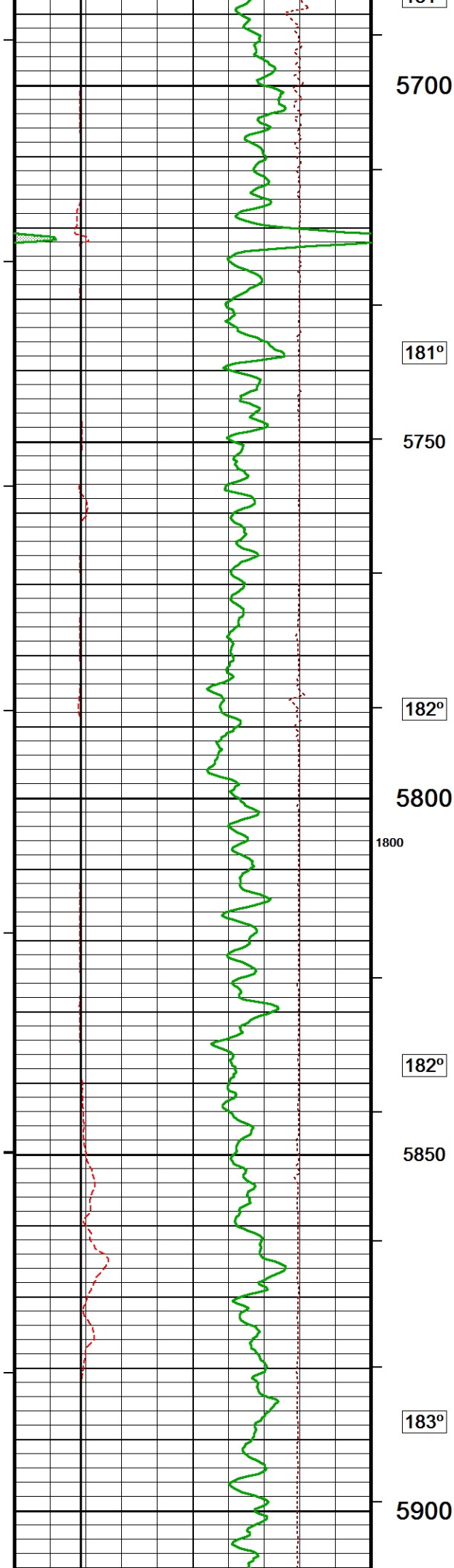


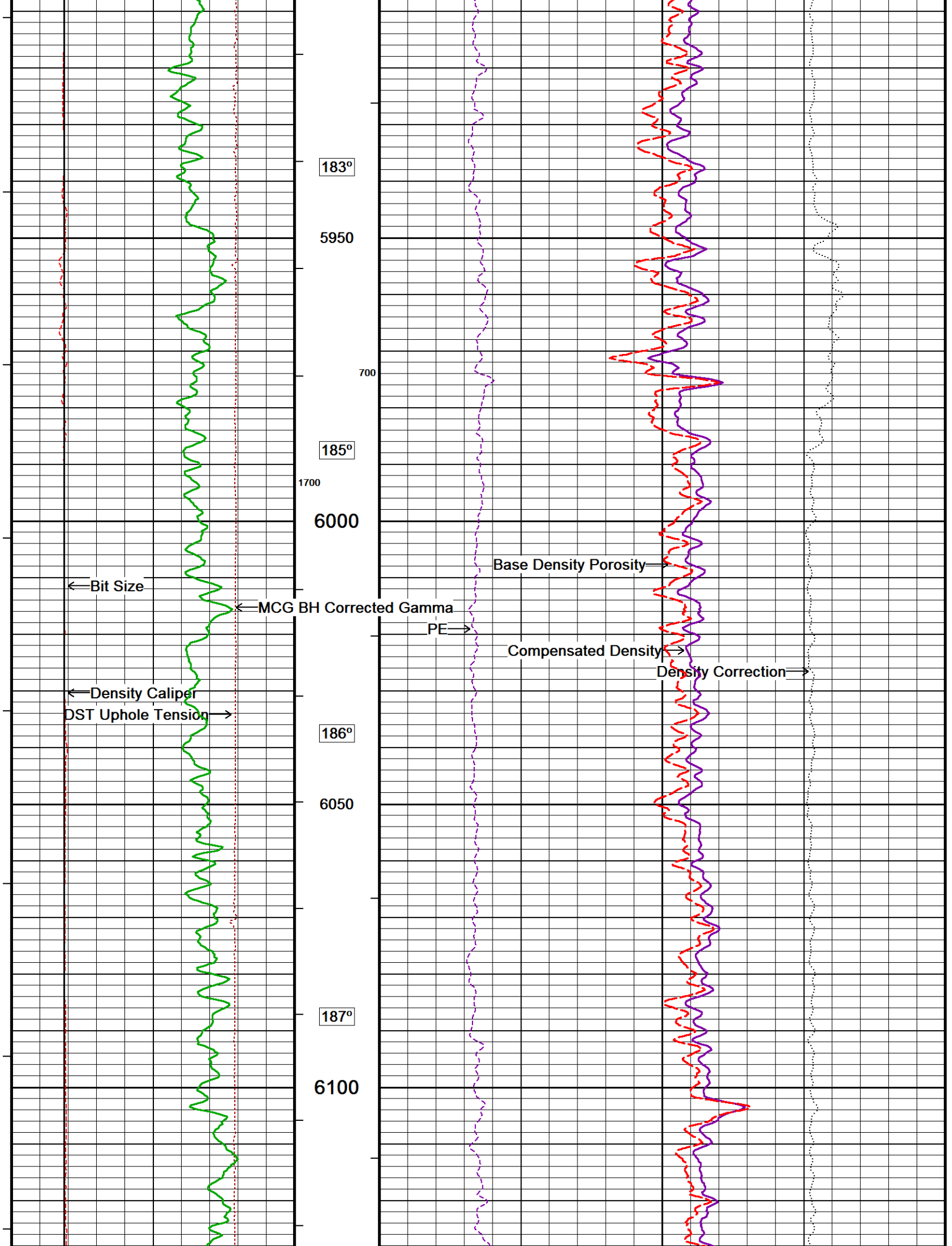


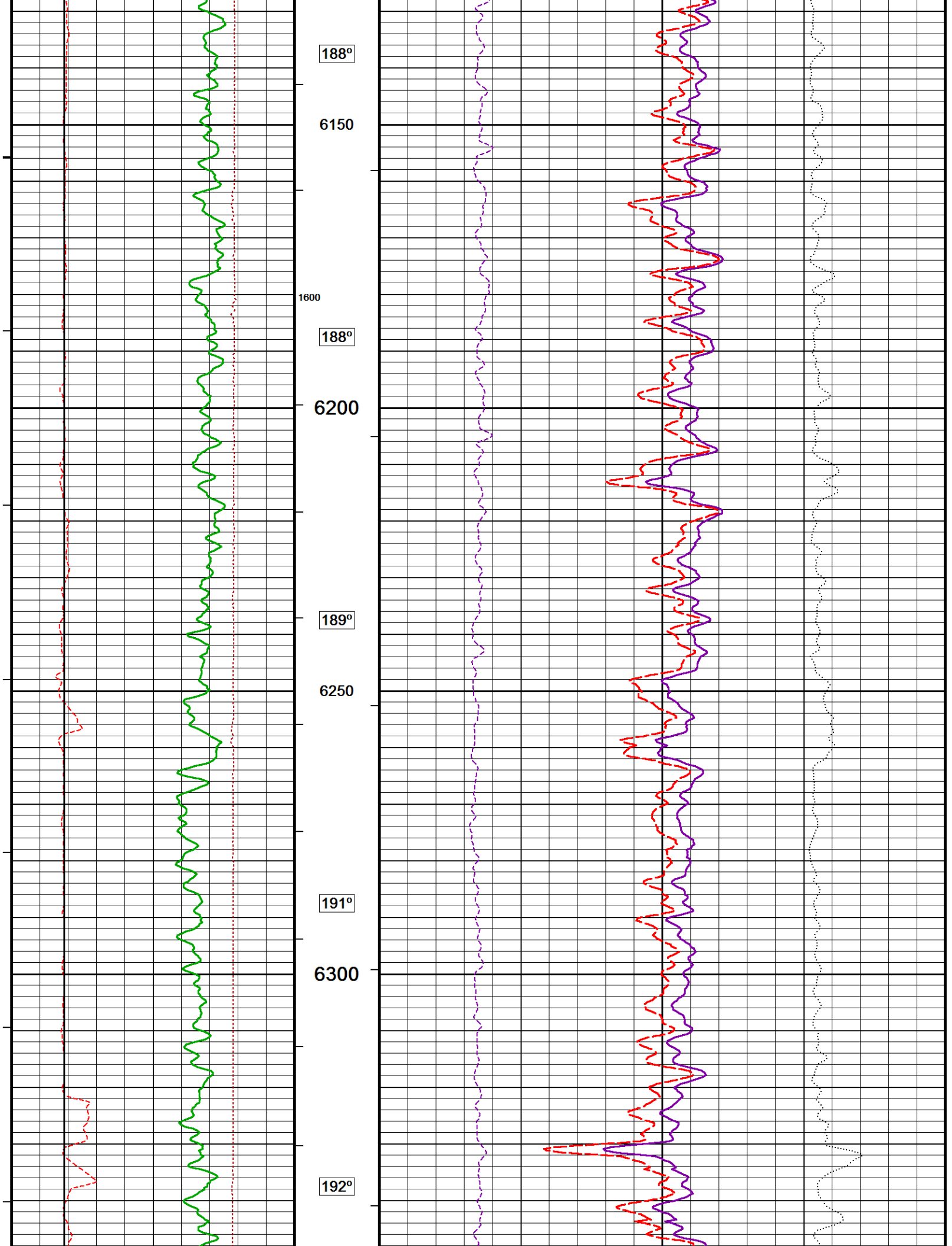
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174°
5300
175°
5350
175°
5400
2000
176°
5450

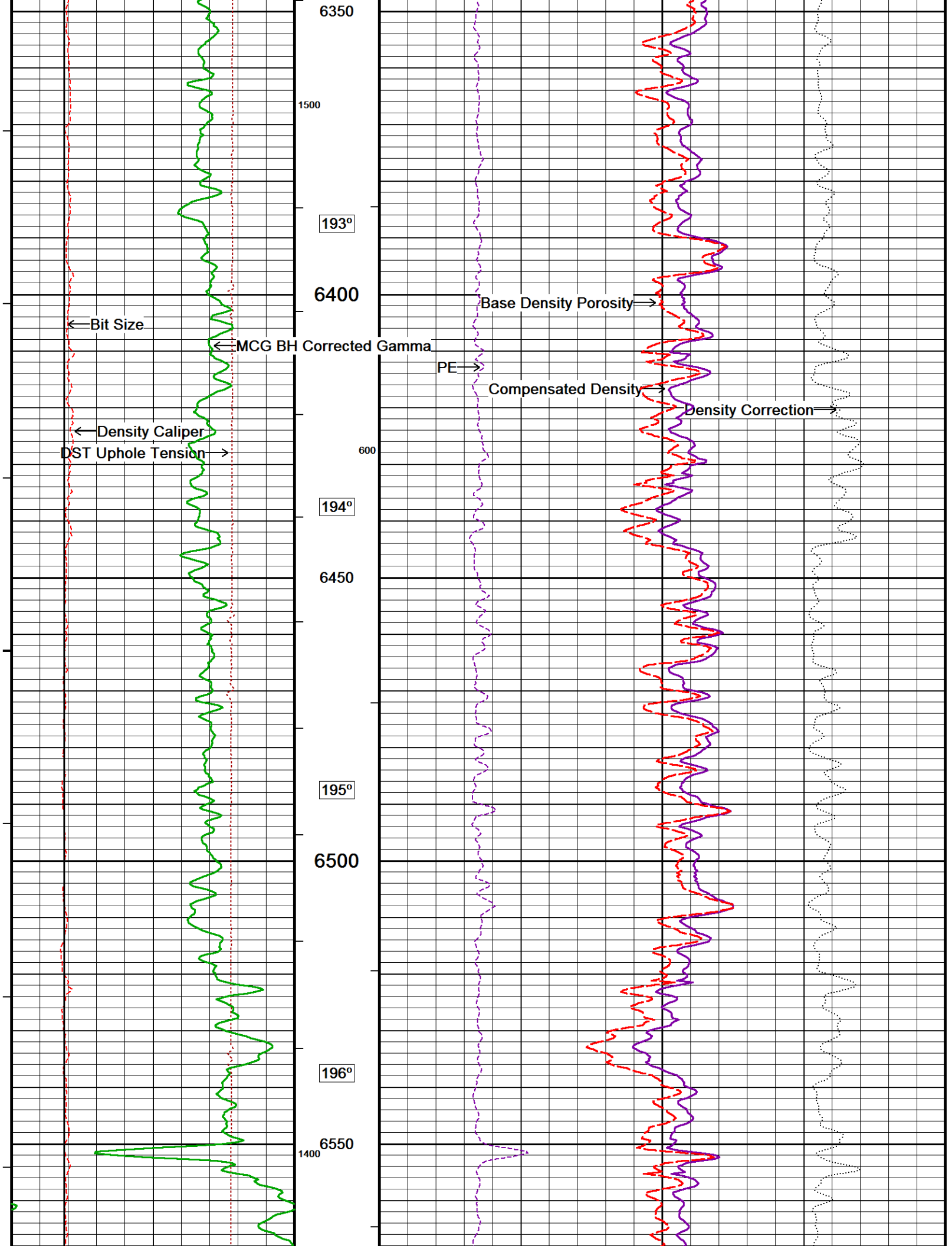


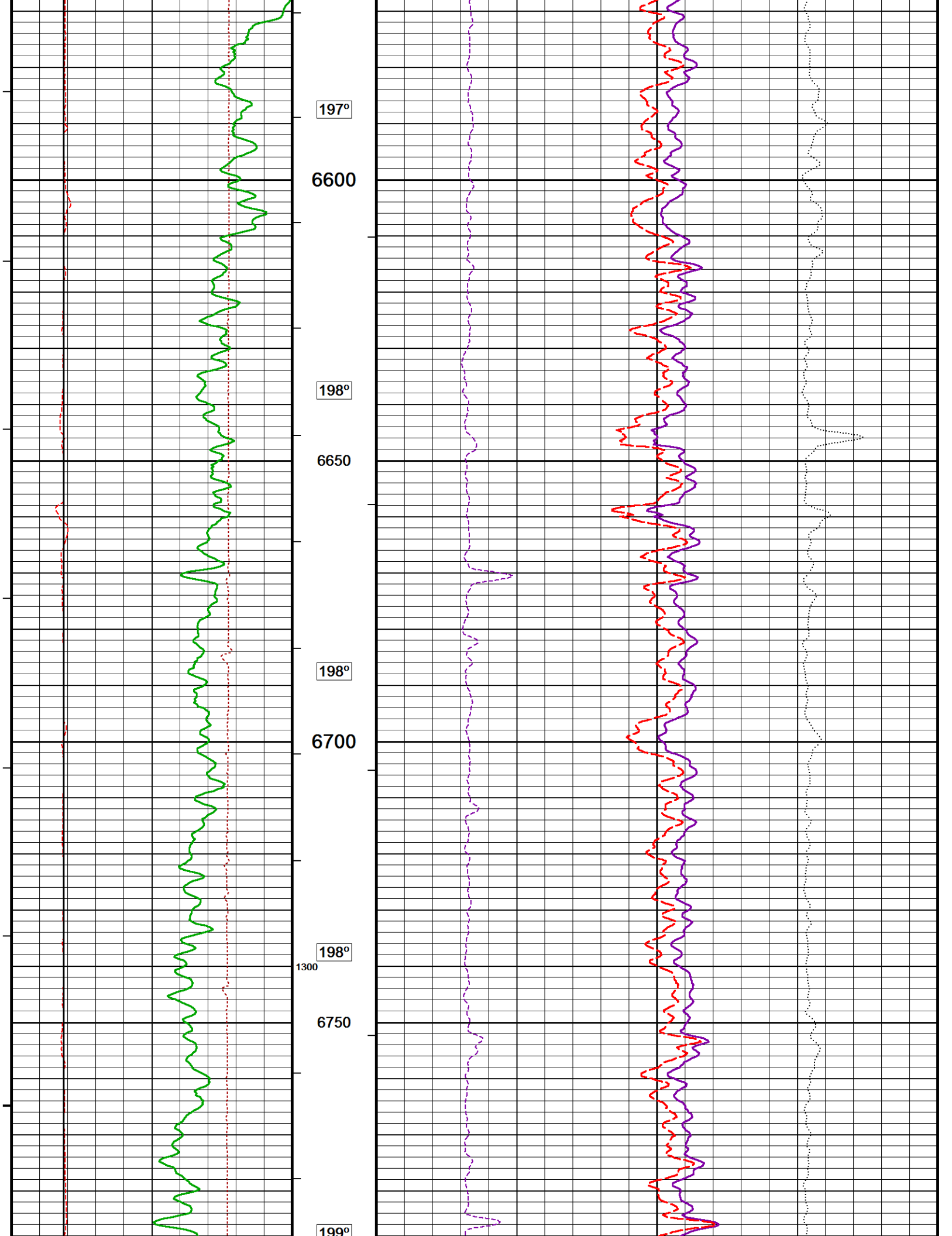


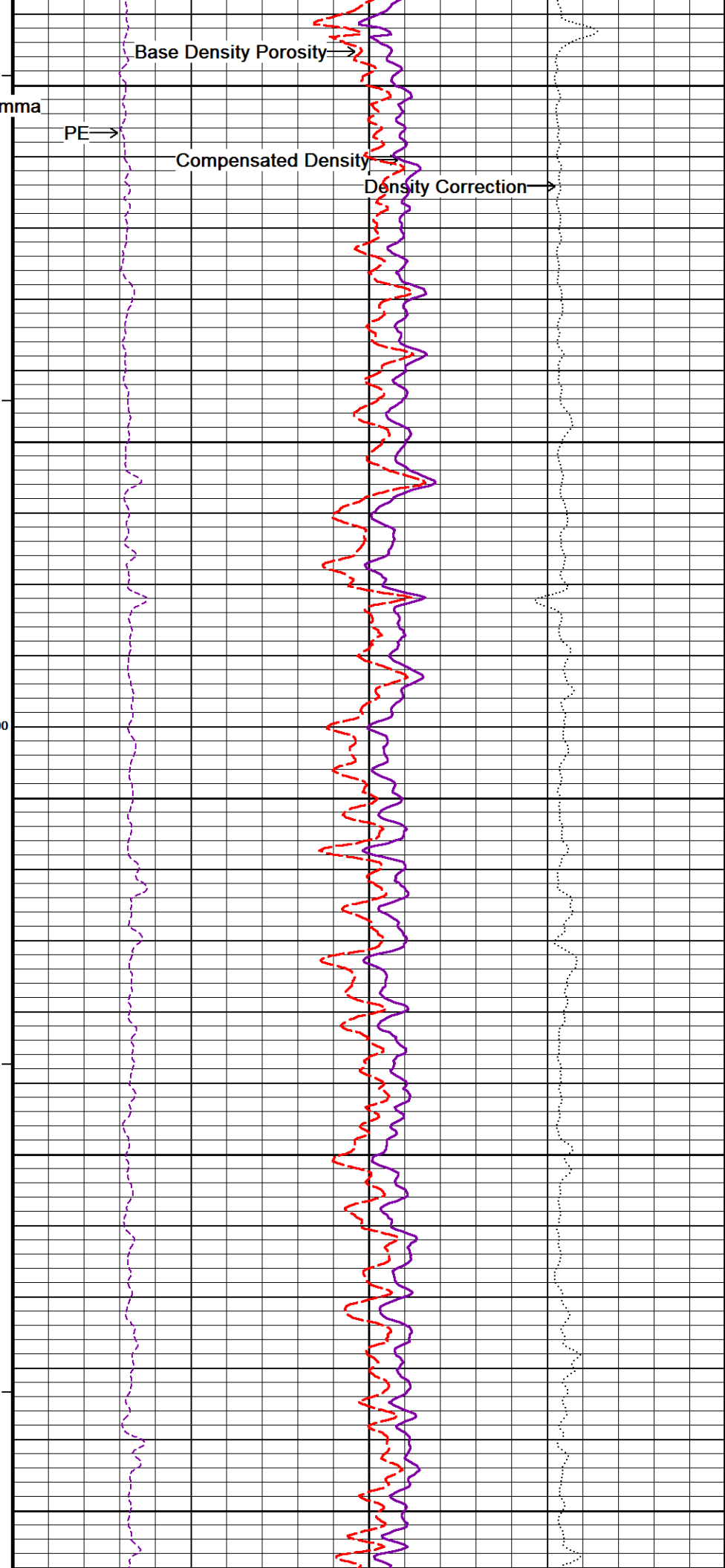
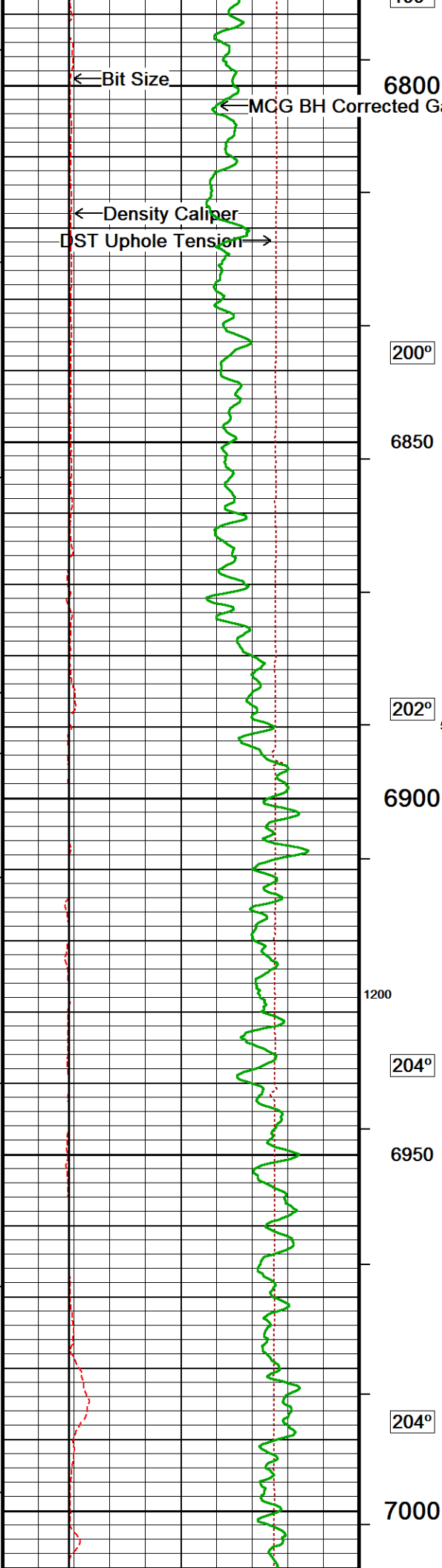


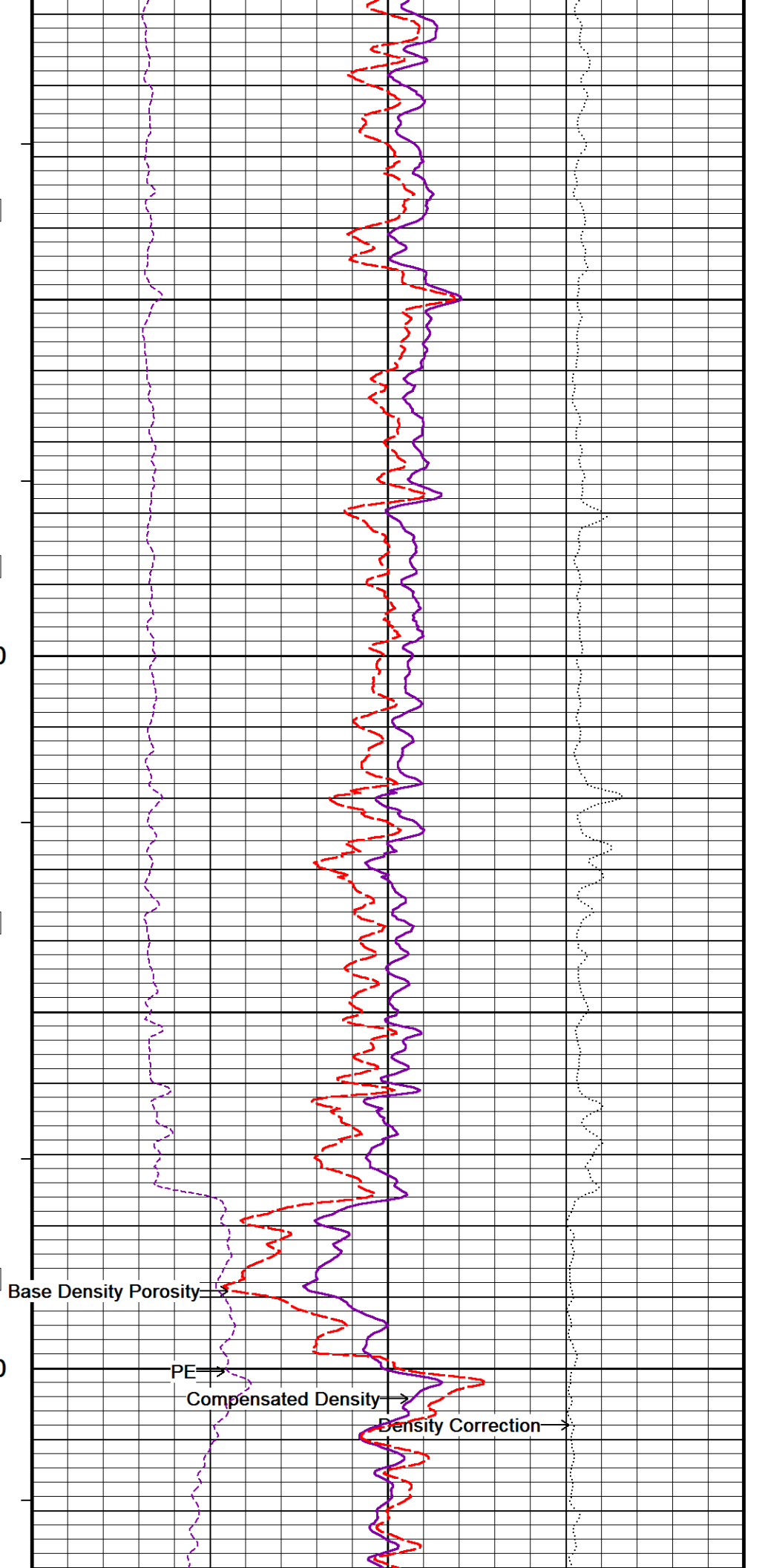
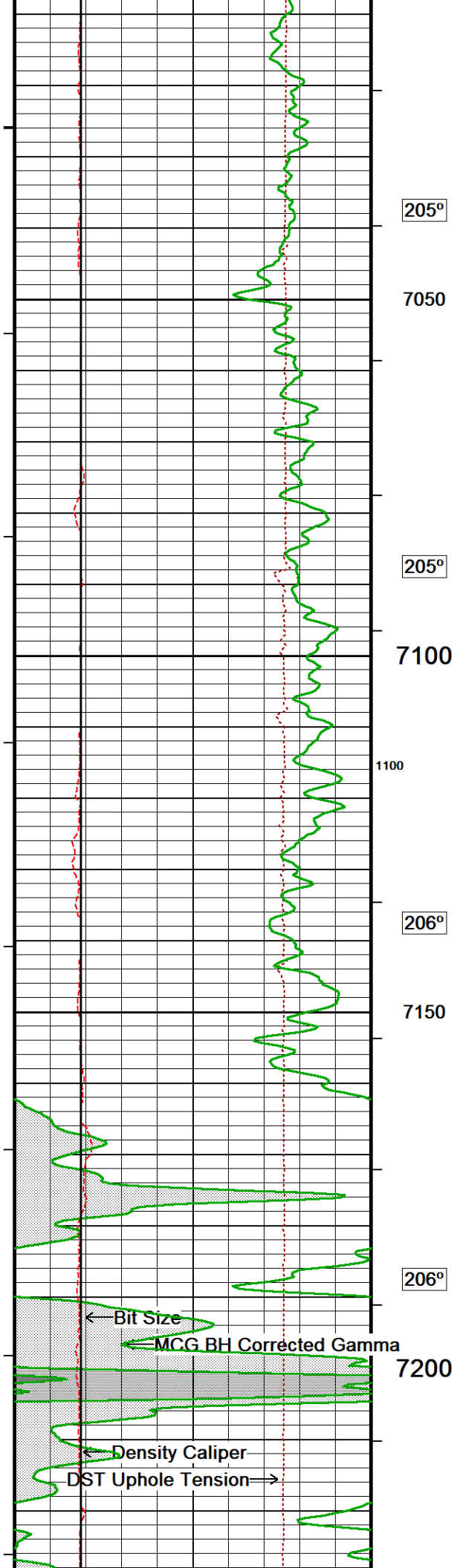


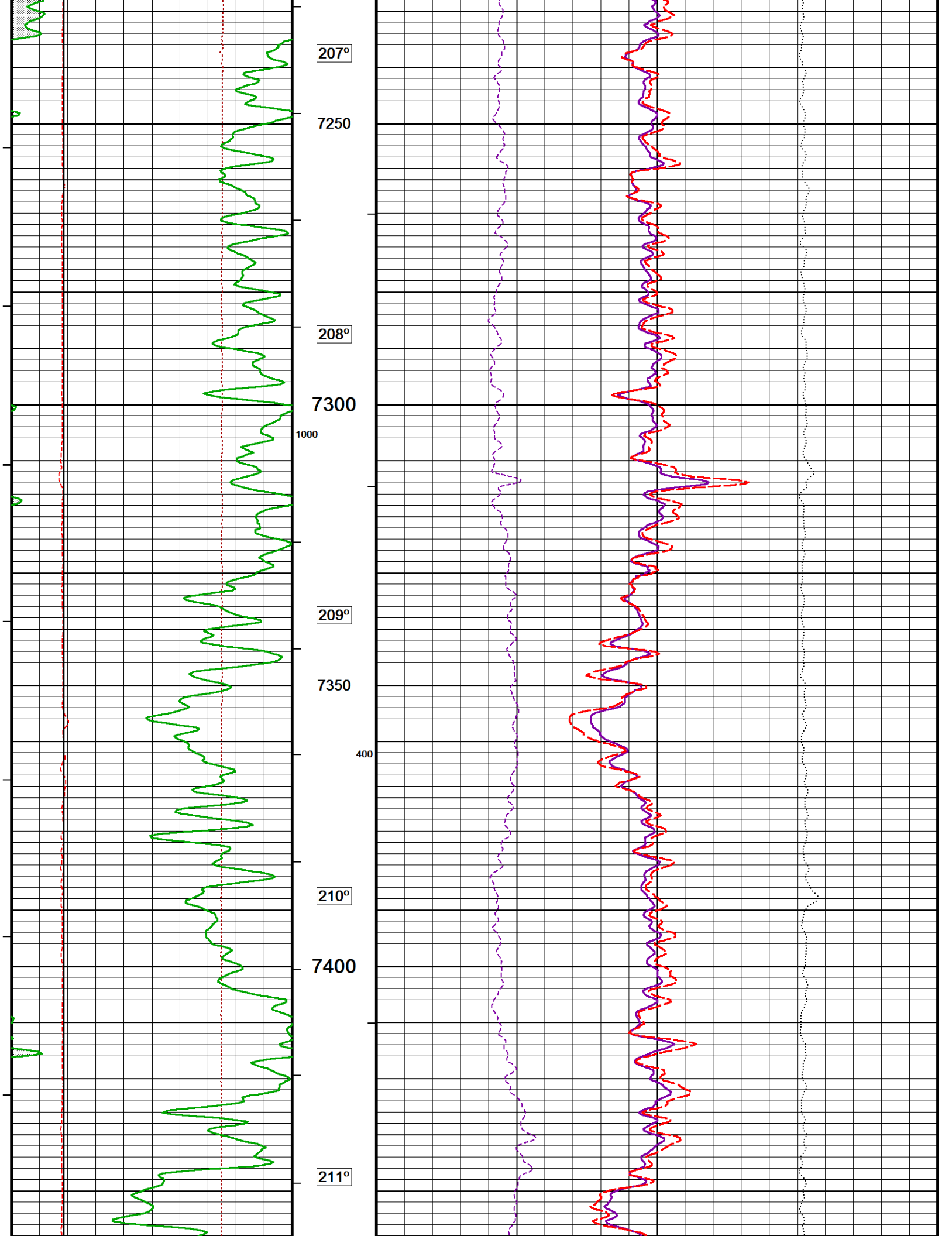


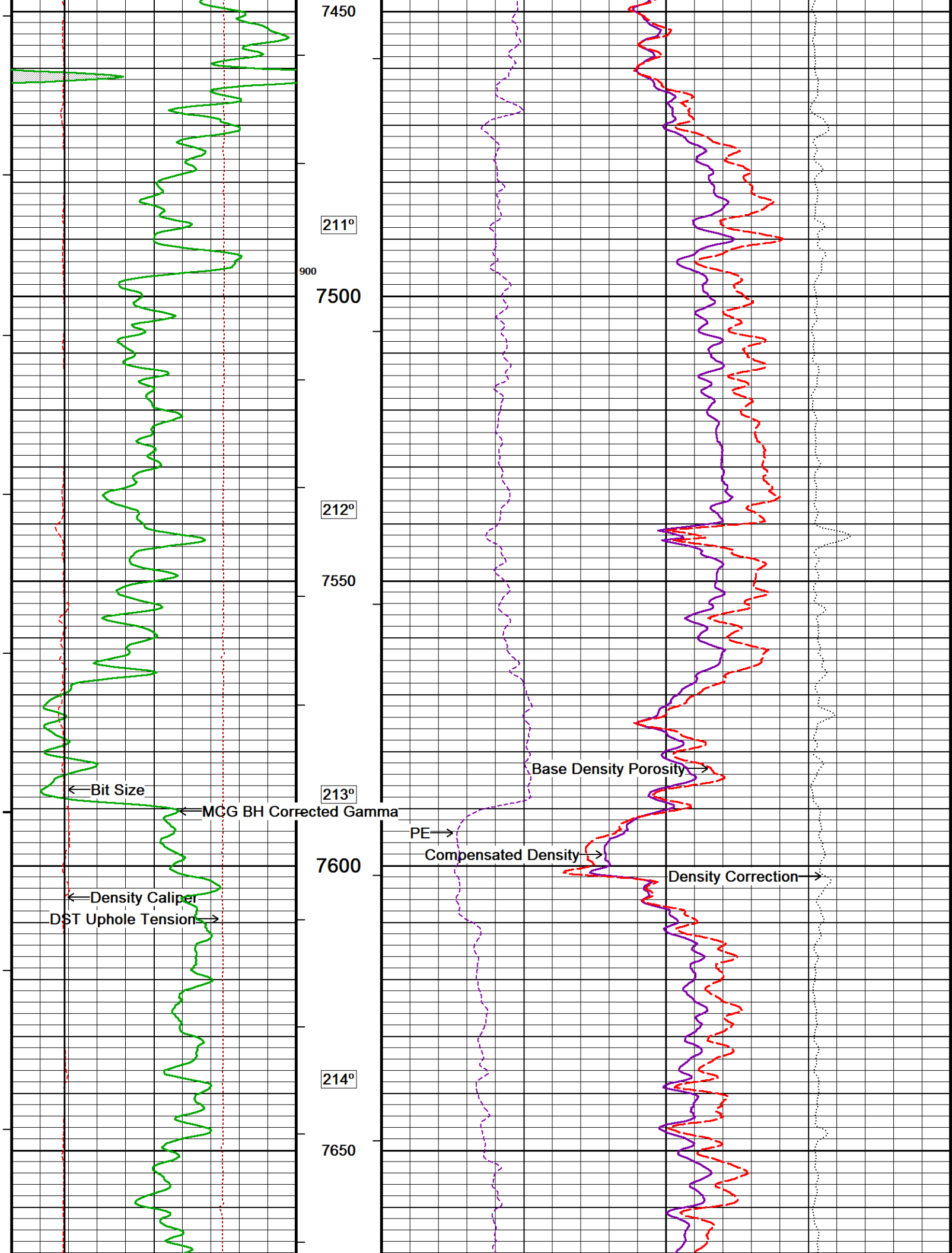


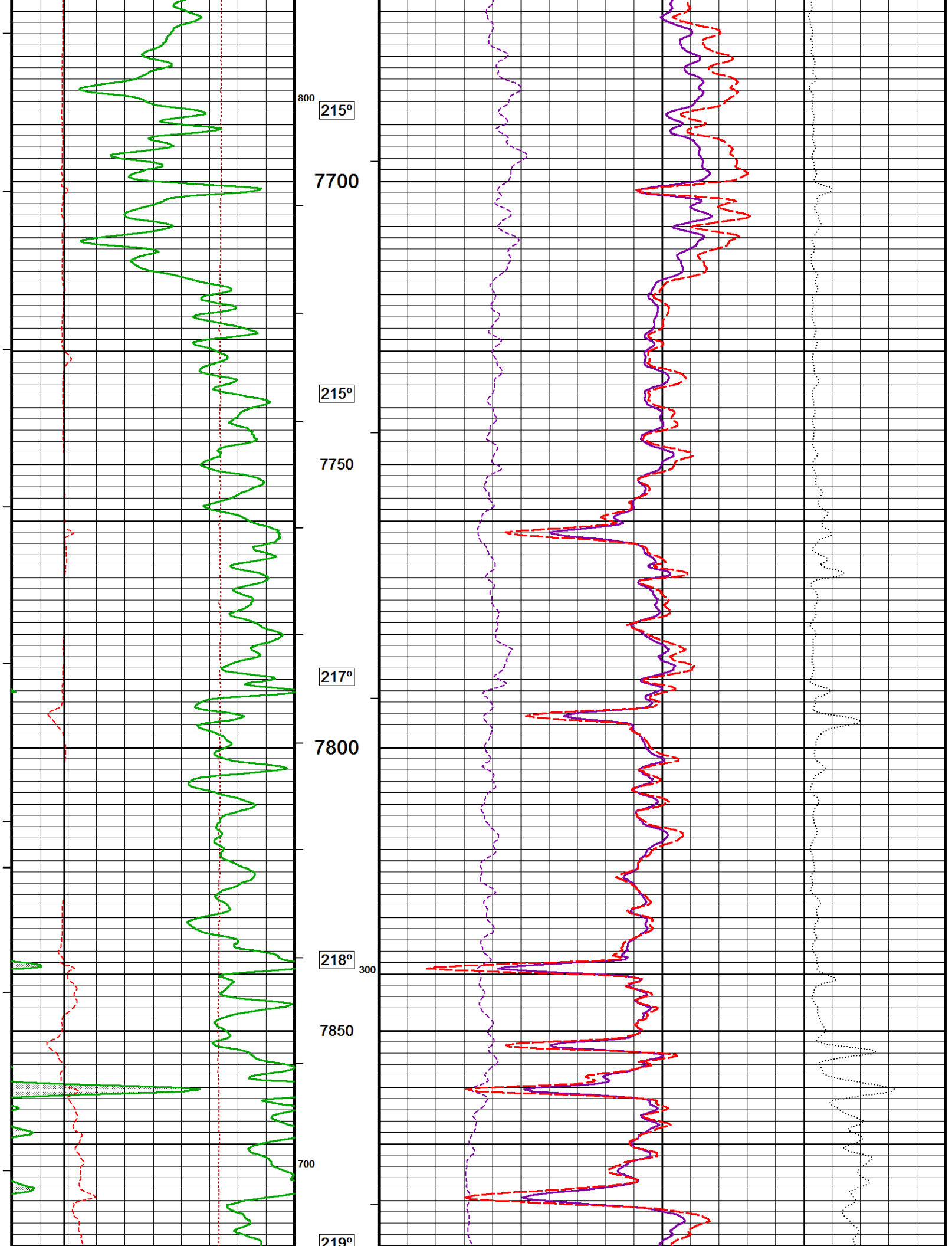


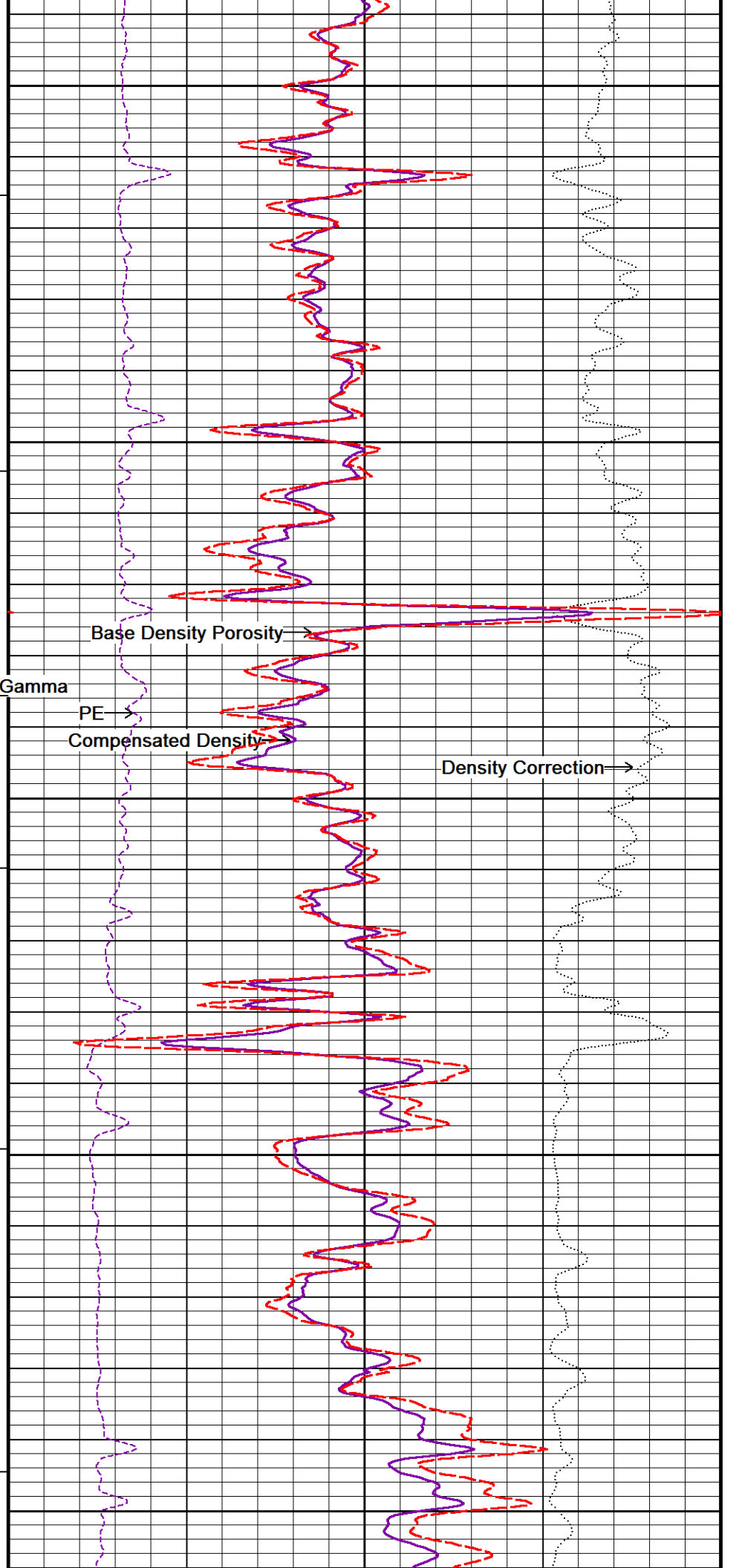
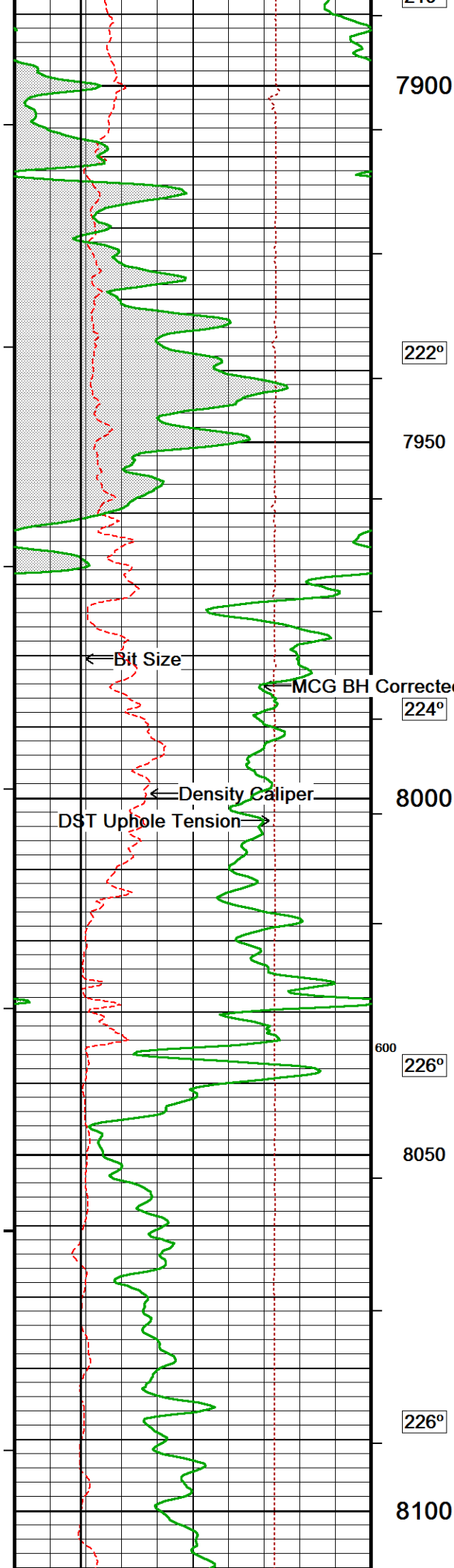


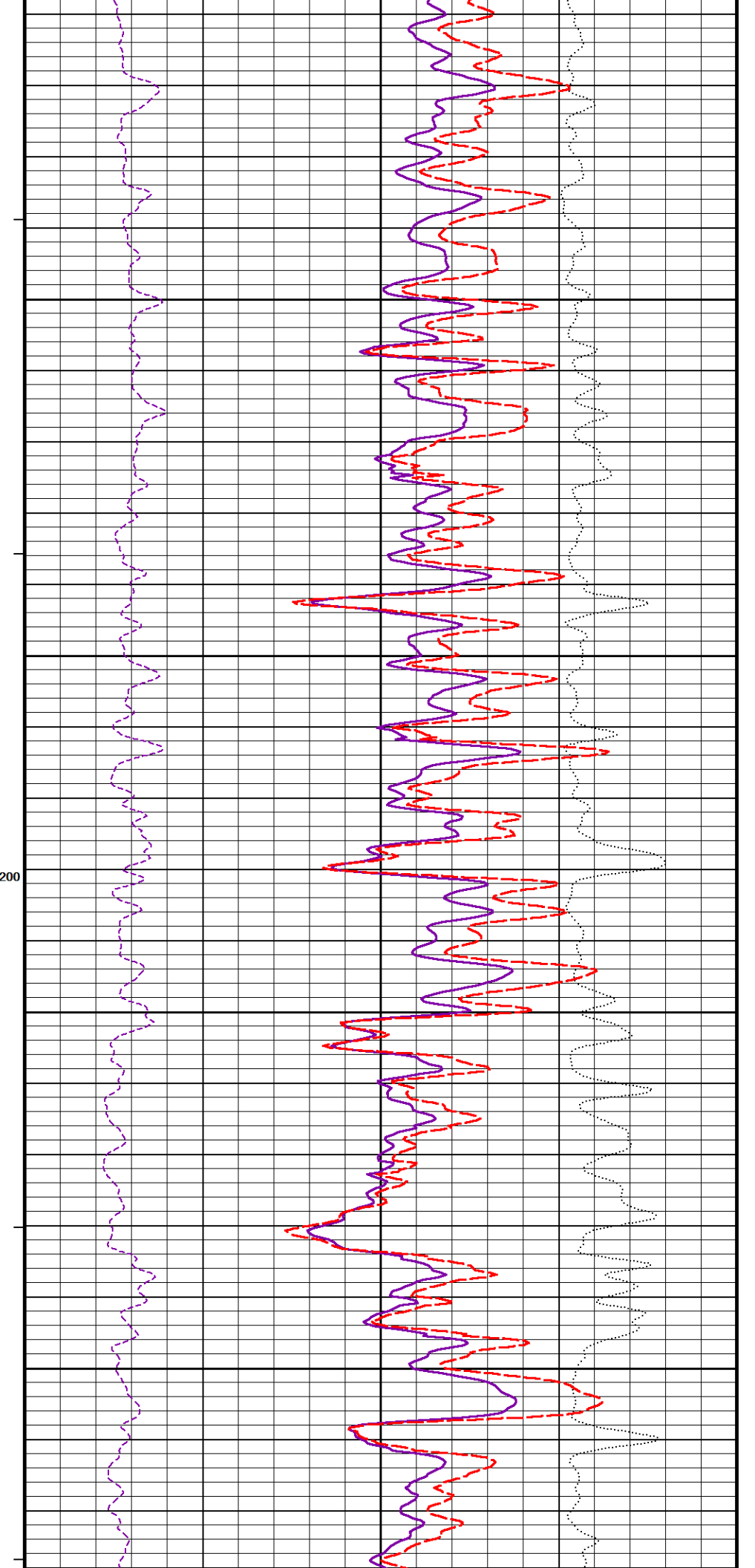
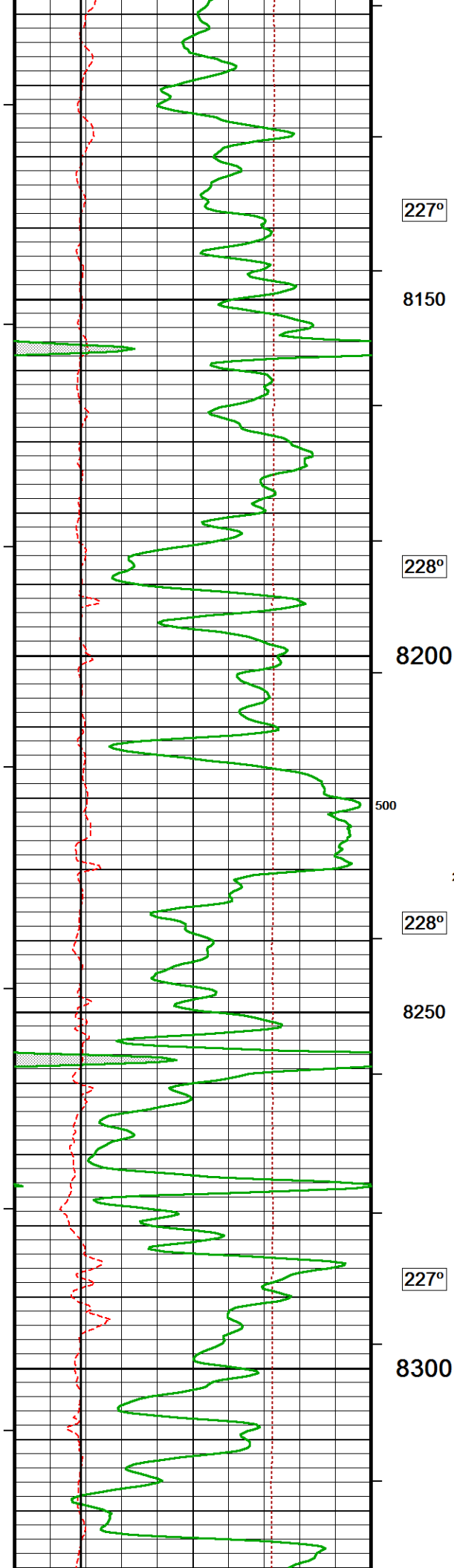


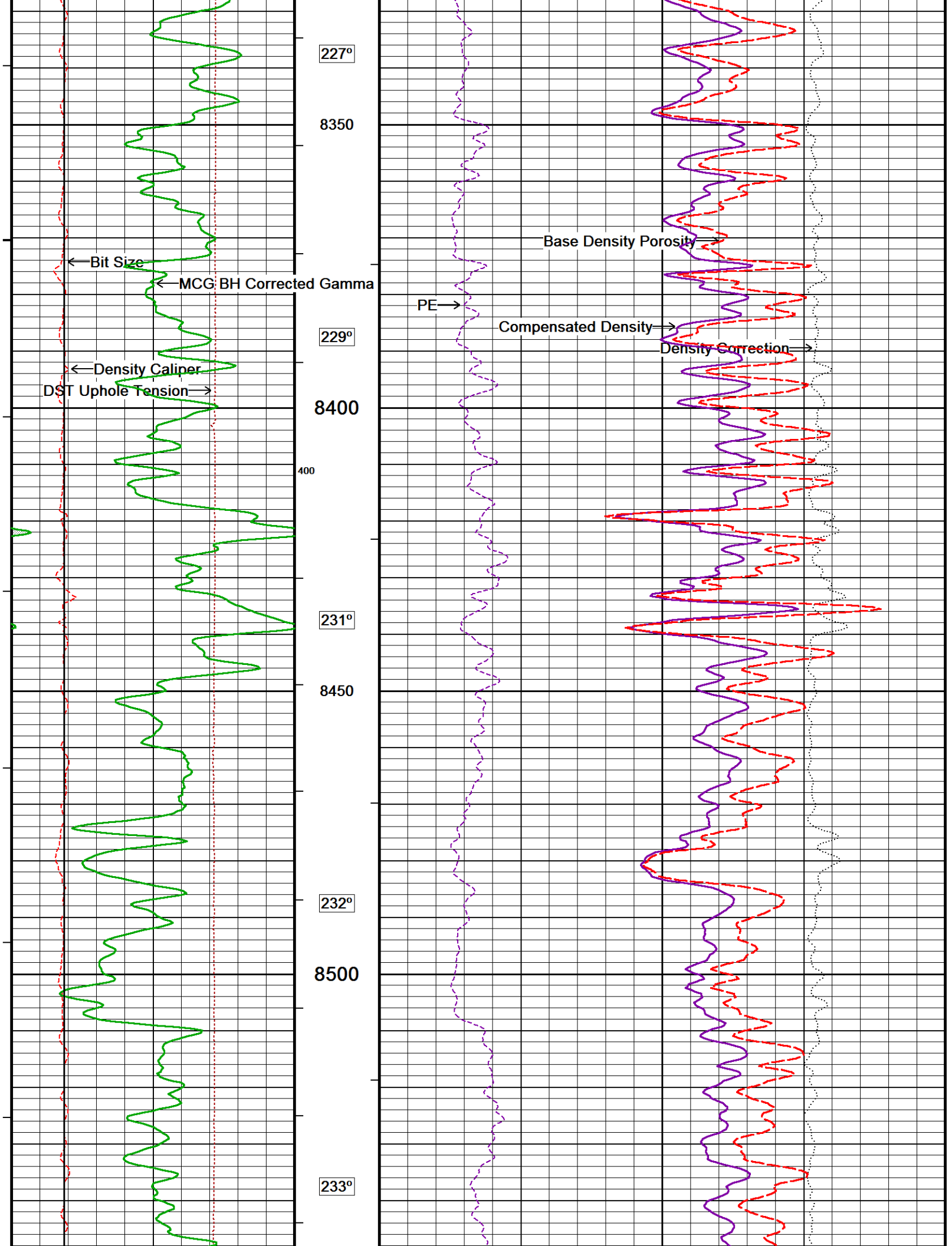


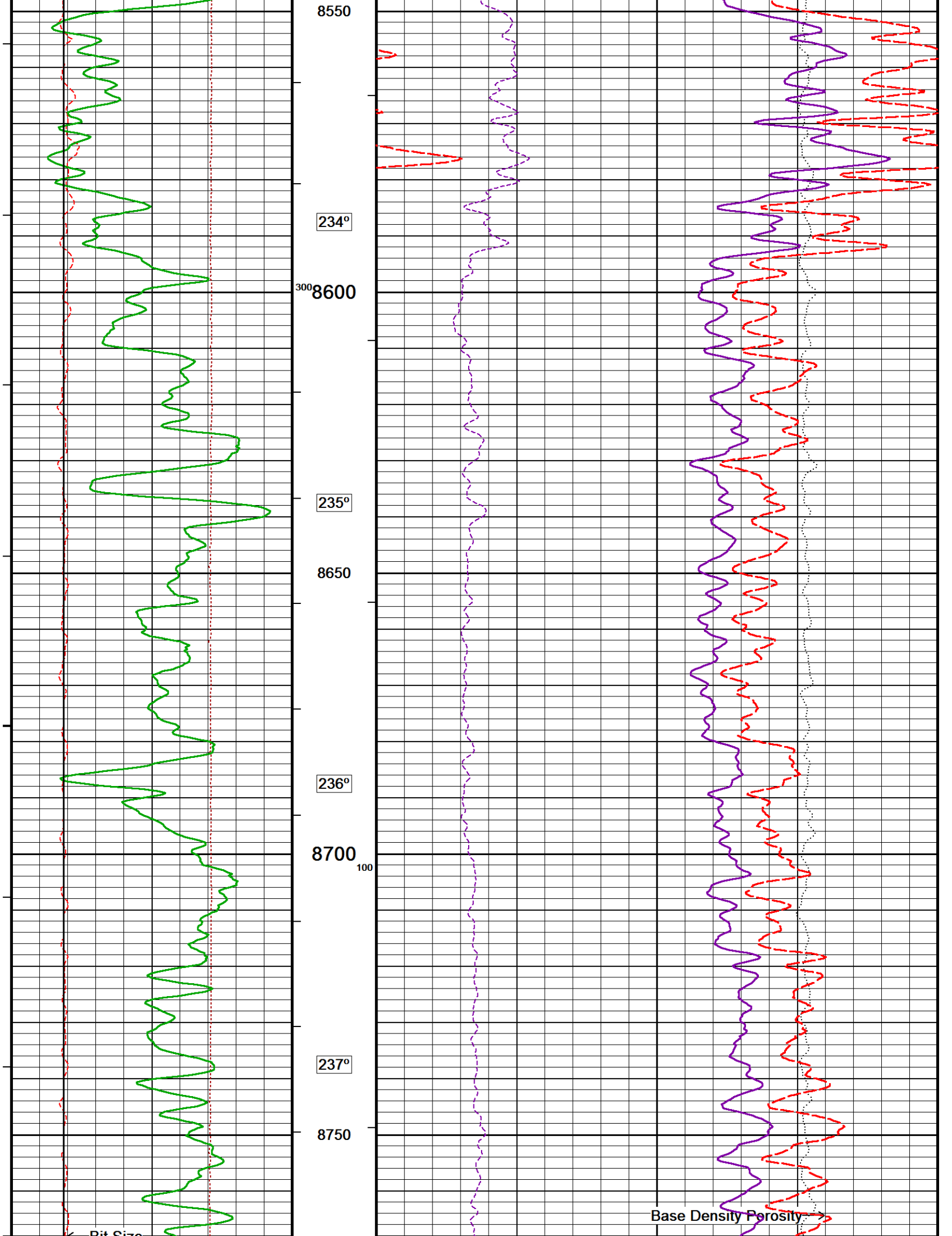


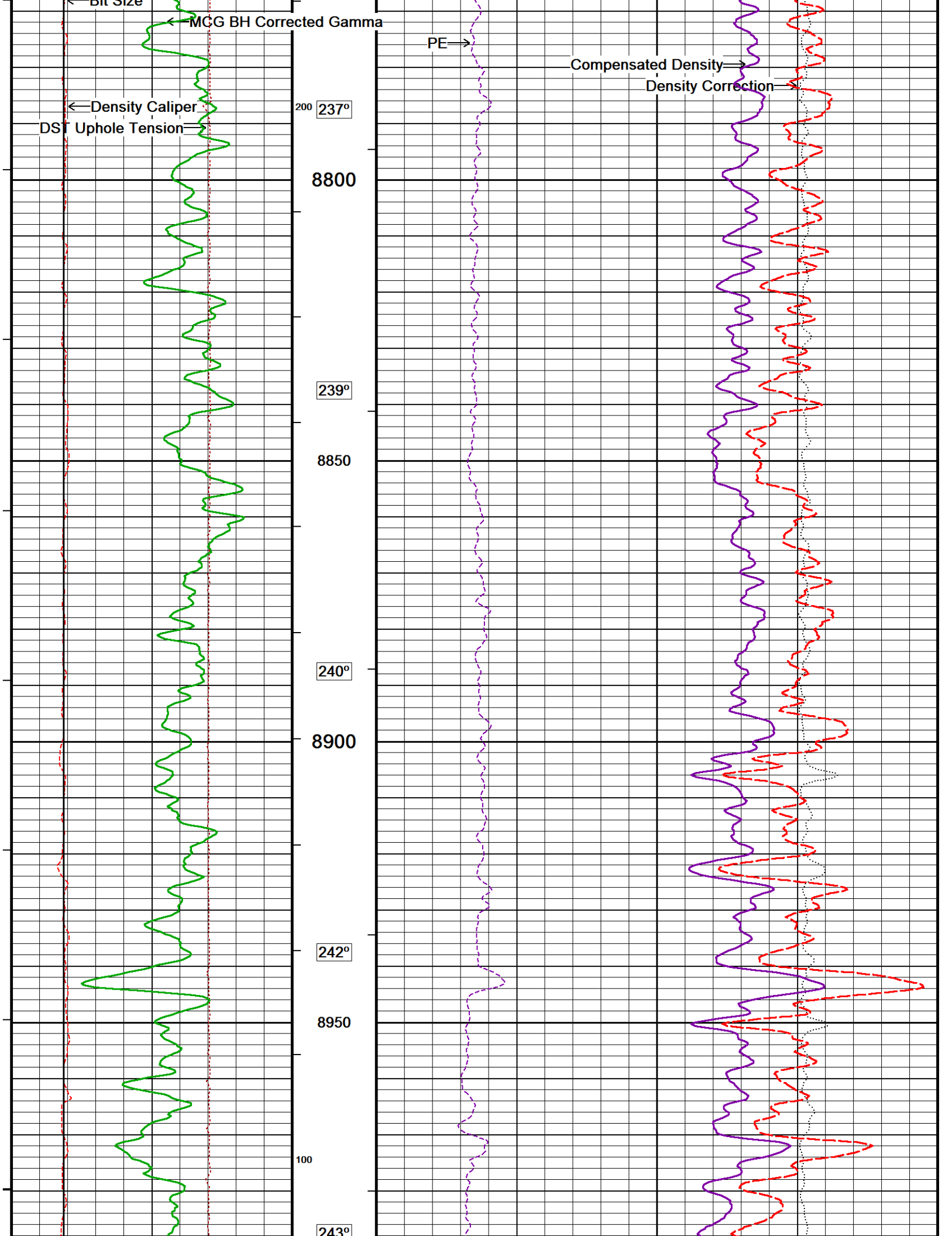


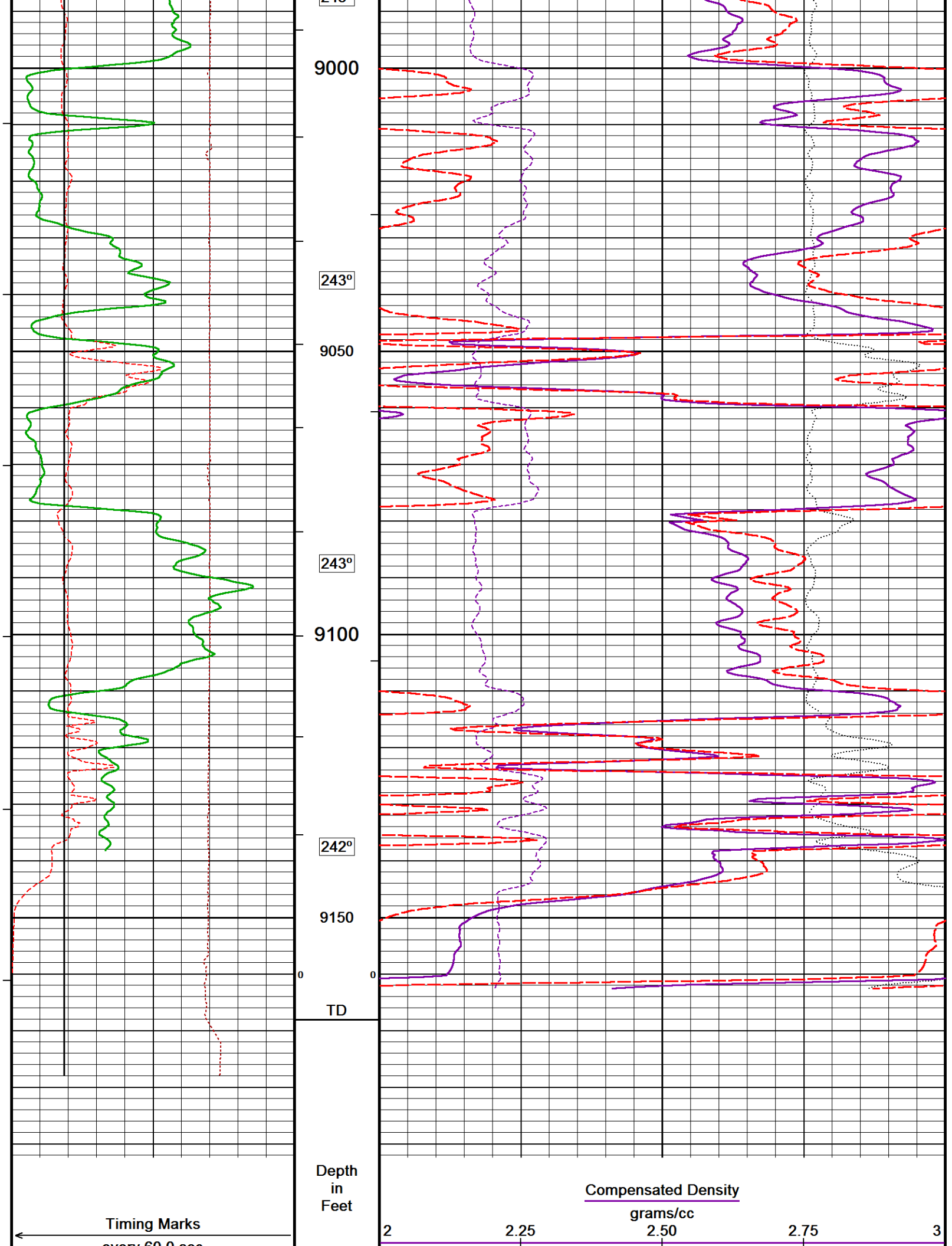












every 60.0 sec

Density Caliper

inches

8 13 18

Borehole
Temp in
deg F

MCG BH Corrected Gamma

API

0 75 150

150 225 300

HVI
every
10 cu ft

Bit Size

inches

8 13 18

Annular
Integral
every
10 cu ft

DST Uphole Tension

pounds

5000 0

Replay
Scale
1:240

Base Density Porosity

v/v

0.30 0.20 0.10 0.00 -0.10

PE

barns/electron

0 5 10 -0.50

Density Correction

grams/cc

0 0.50

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 04-FEB-2019 20:18

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 BULK DENSITY



5" MAIN PASS POROSITY



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 04-FEB-2019 20:18

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

Density Caliper

inches

8 13 18

Depth
in
Feet

Borehole
Temp in
deg F

MCG BH Corrected Gamma

API

0 75 150

150 225 300

HVI
every
10 cu ft

Bit Size

inches

8 13 18

Annular

Base Neutron Porosity

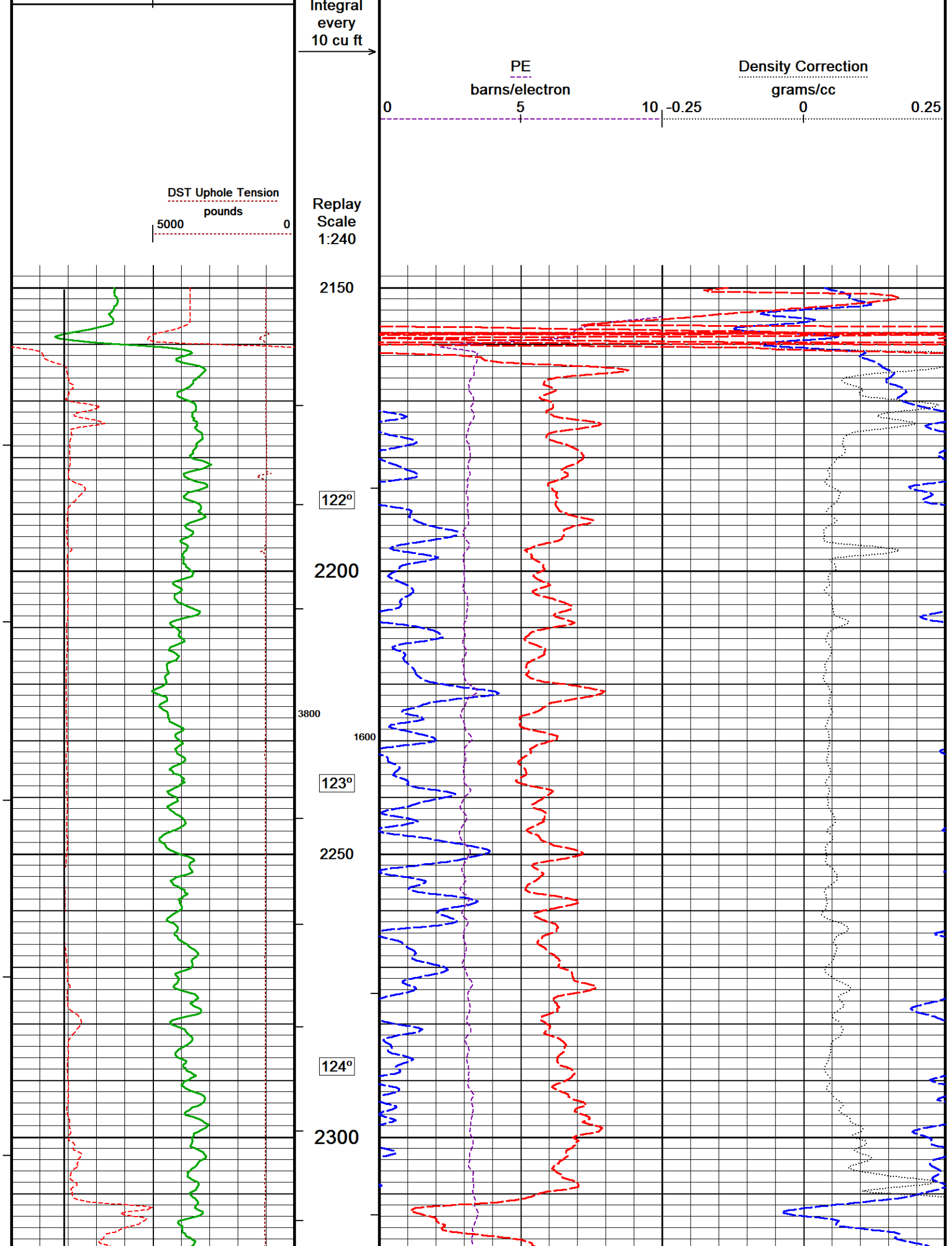
v/v

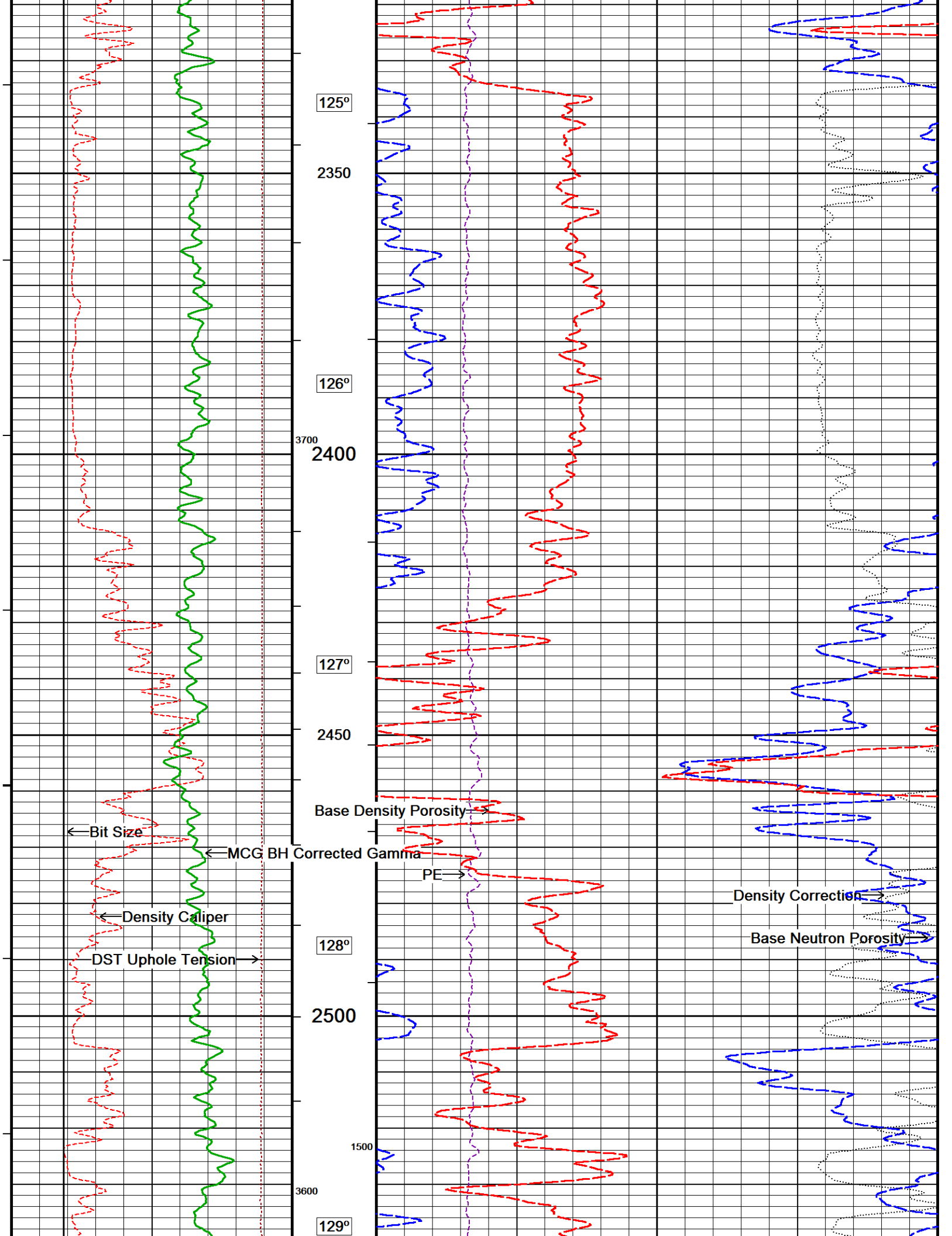
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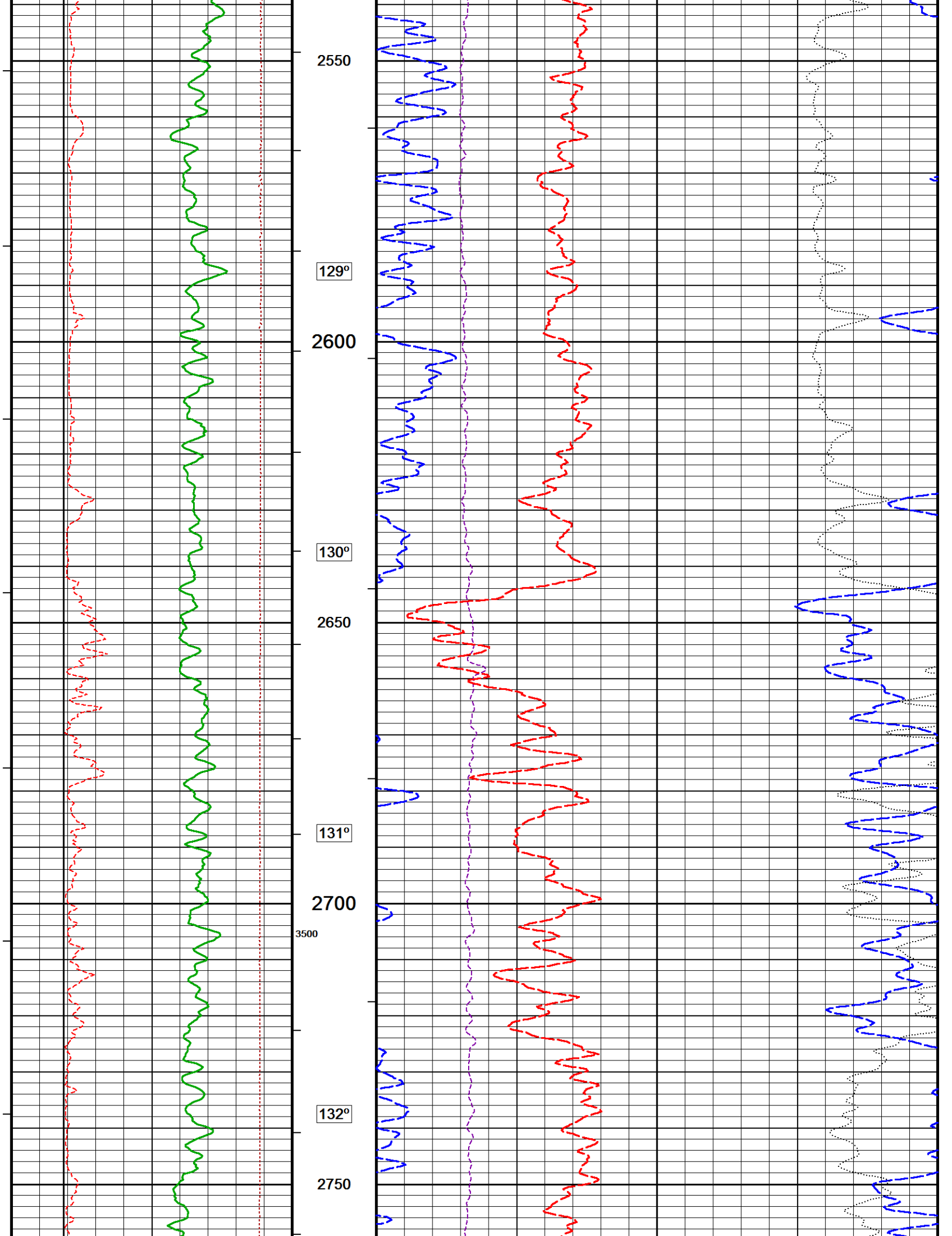
Base Density Porosity

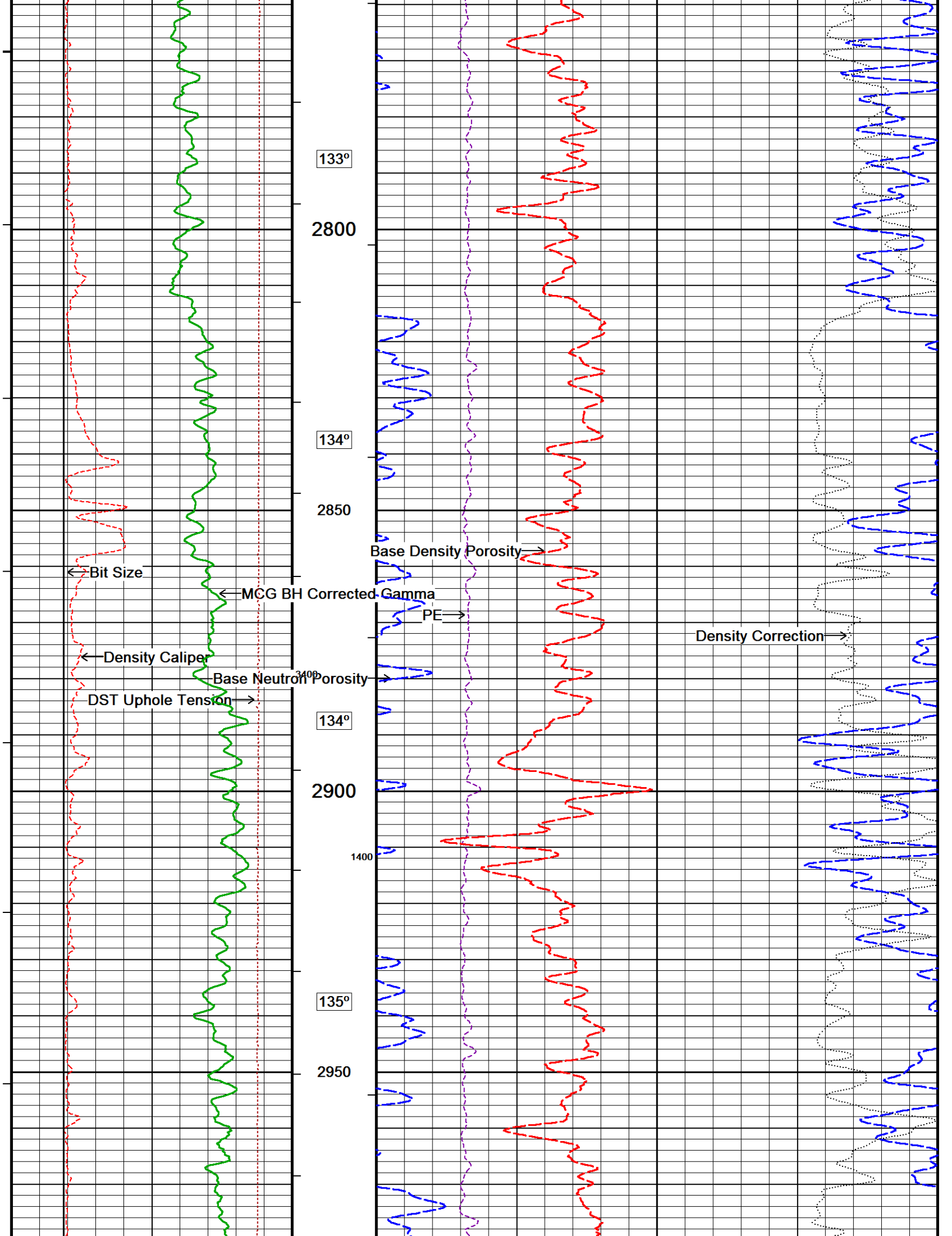
v/v

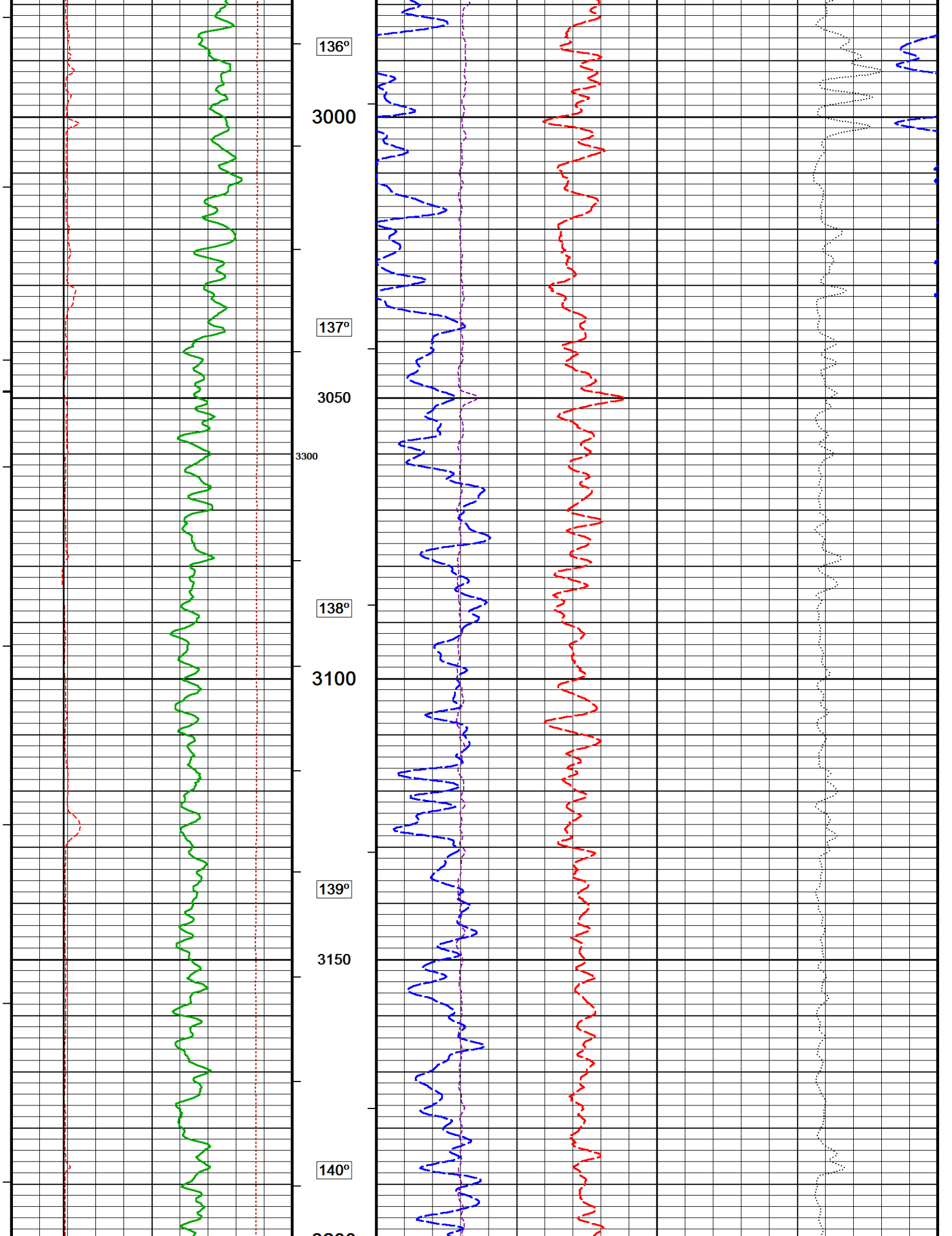
0.30 0.20 0.10 0.00 -0.10

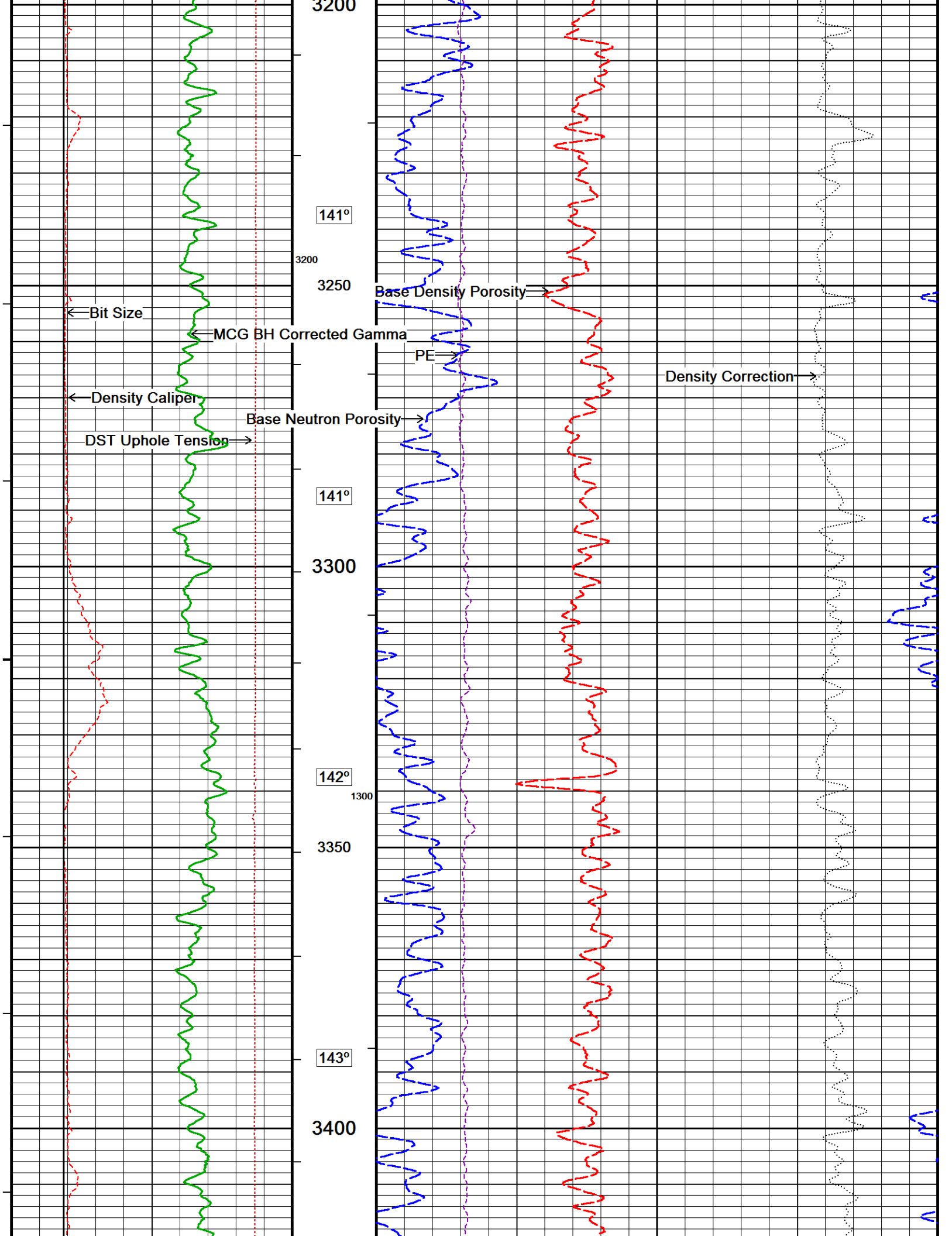


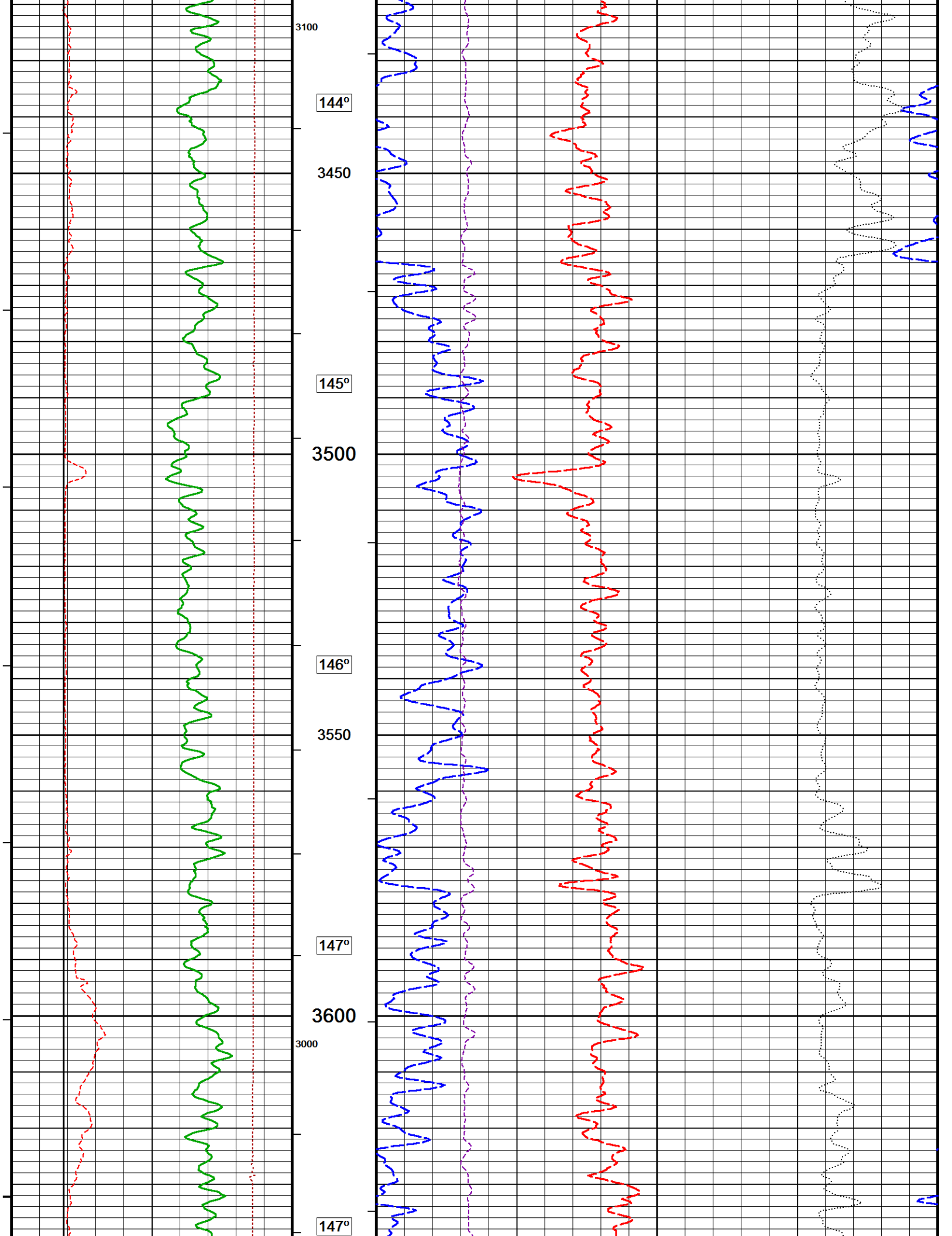


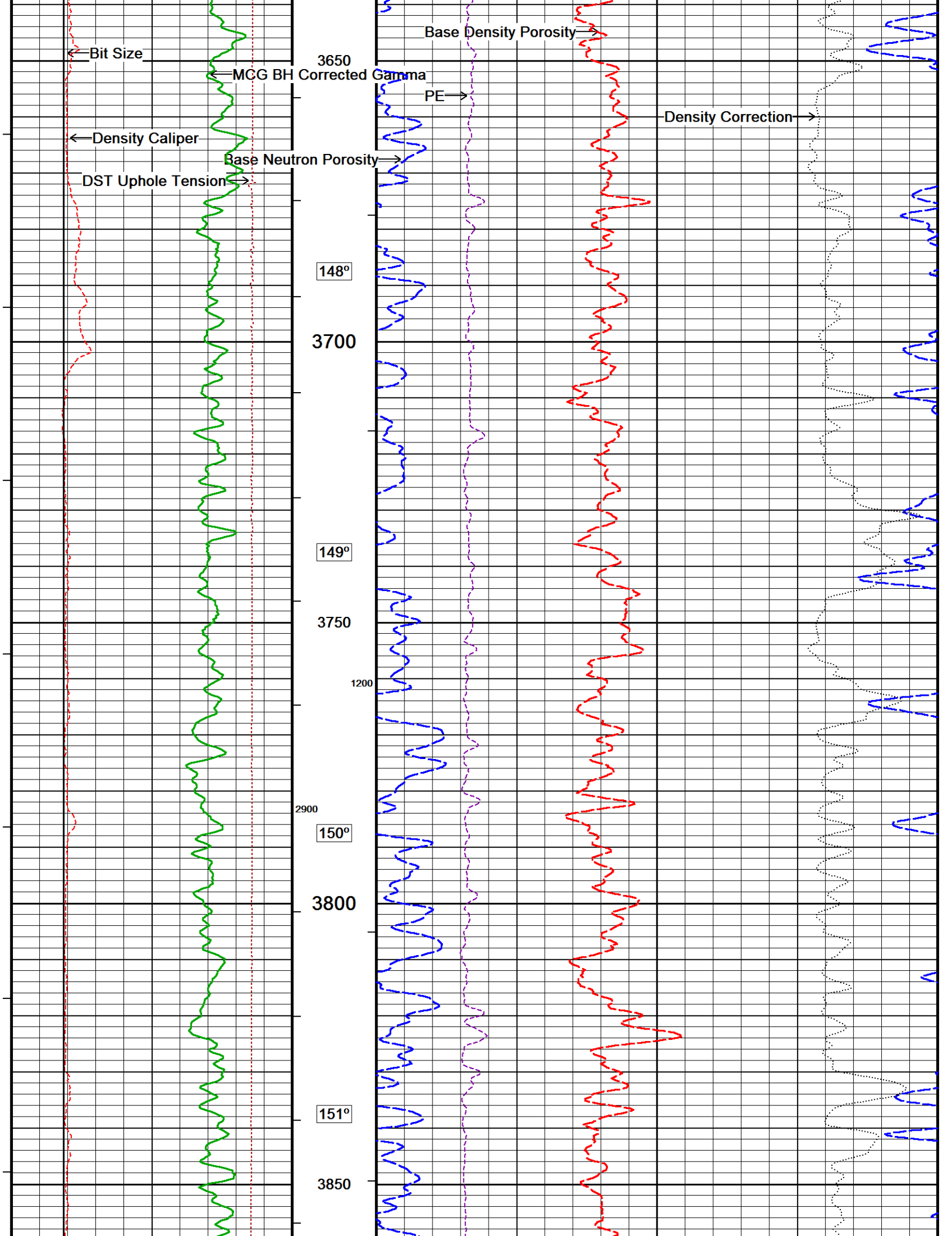


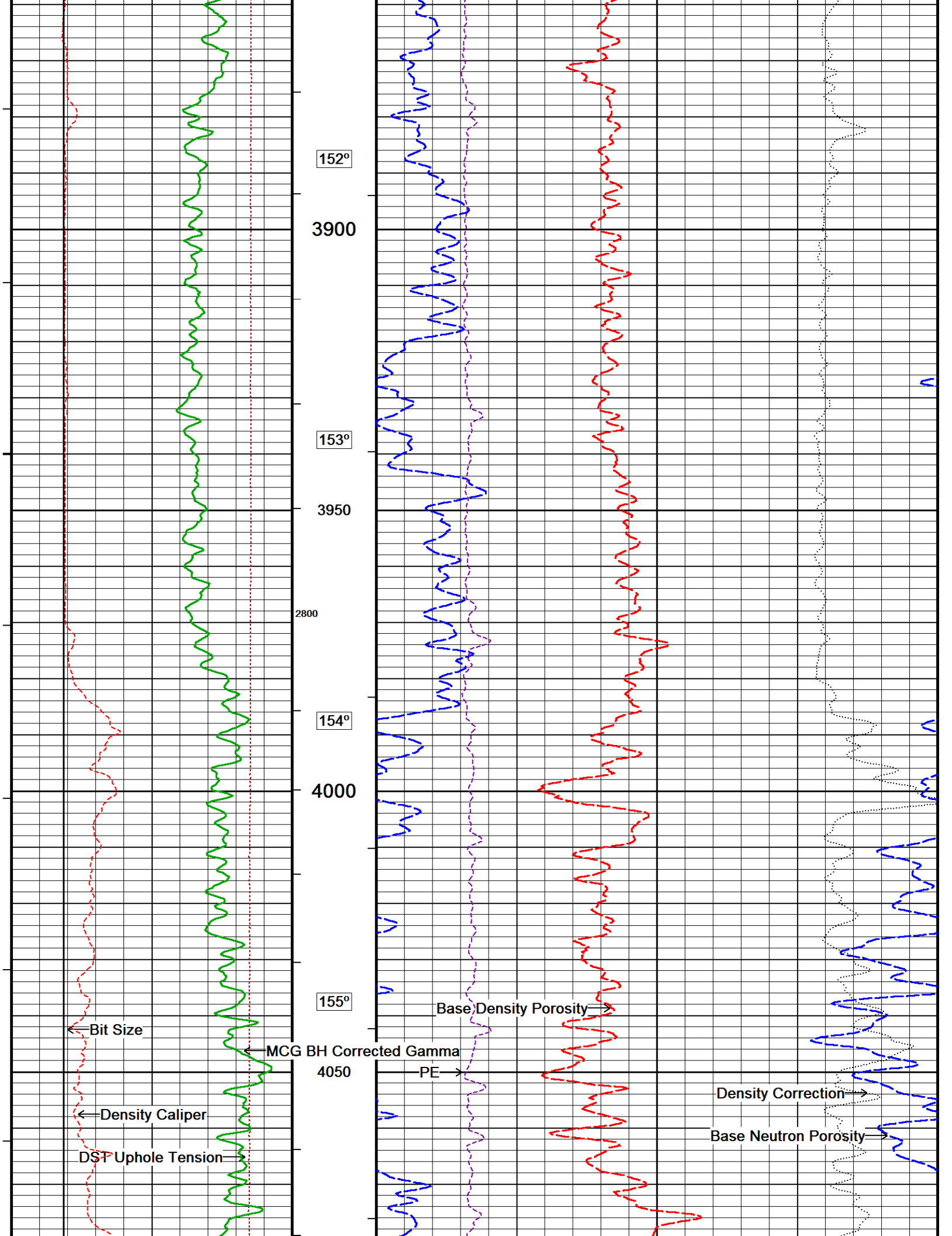


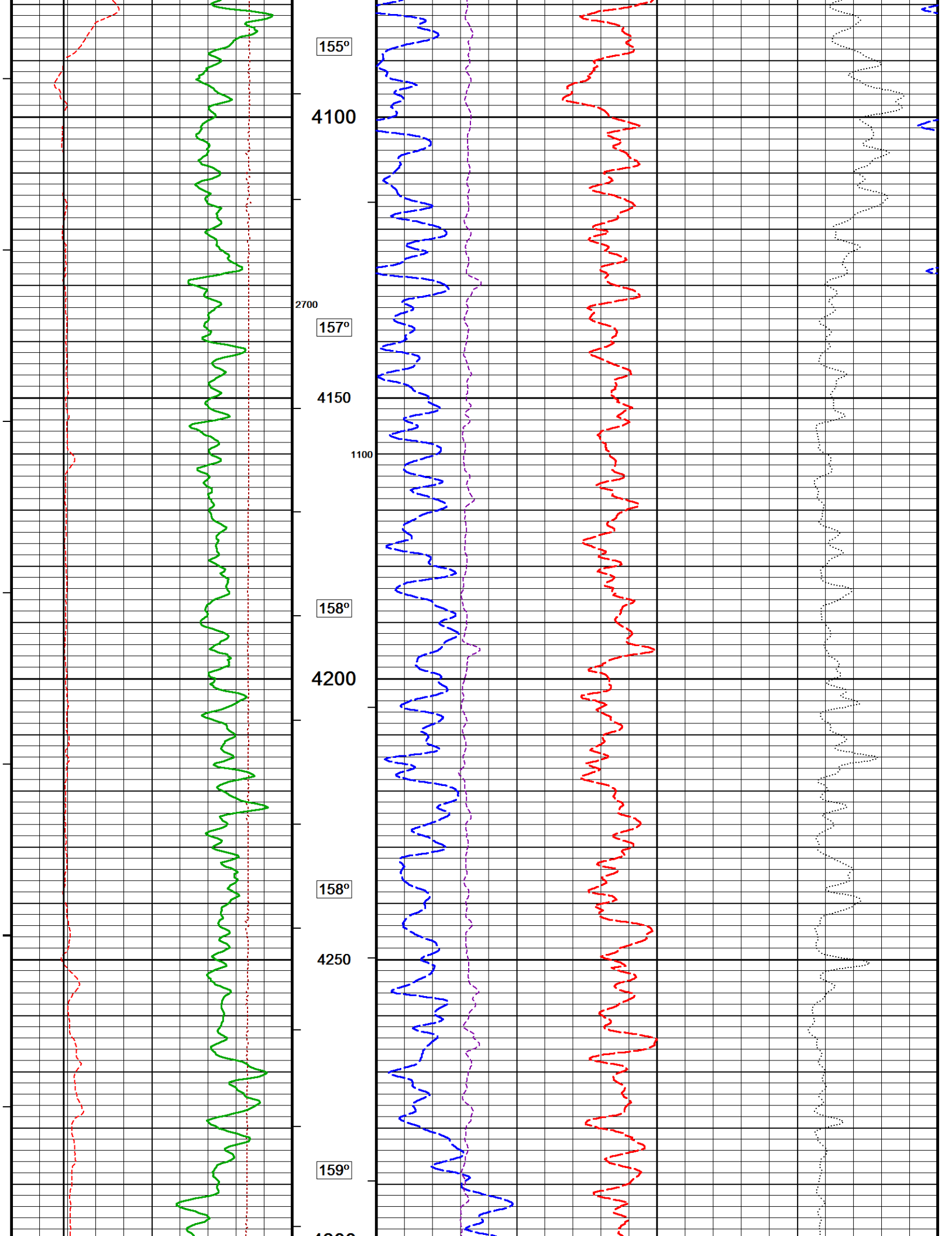


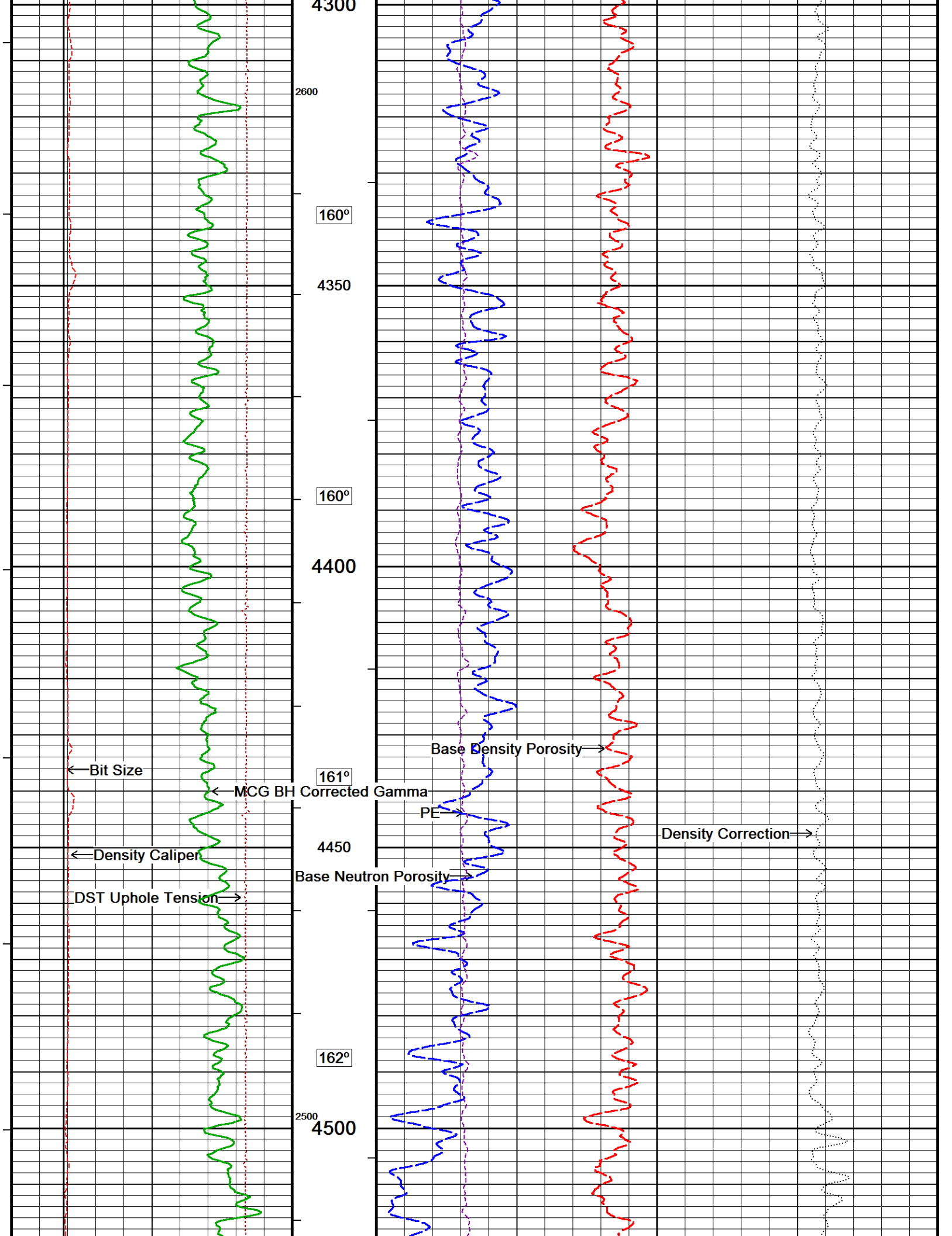


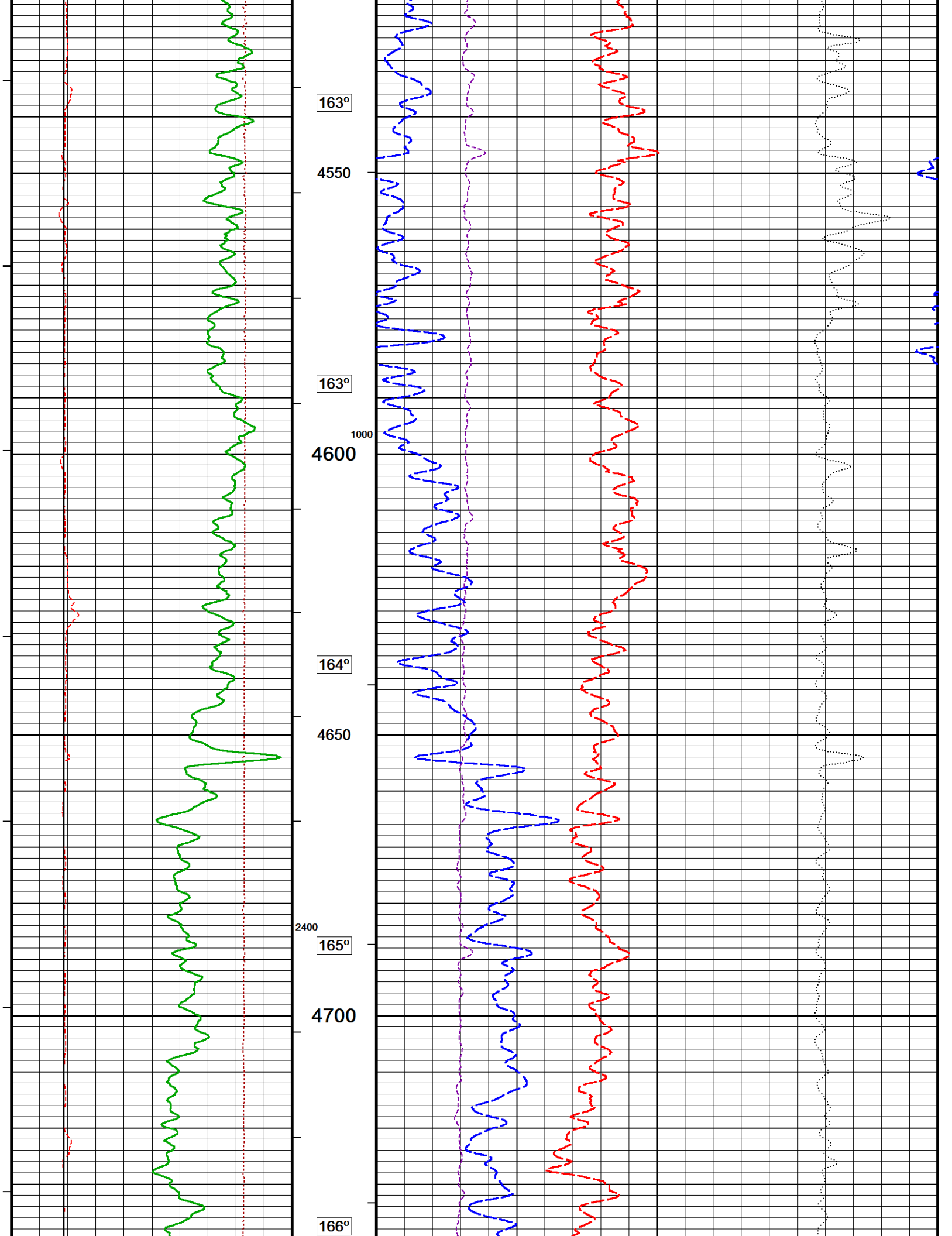


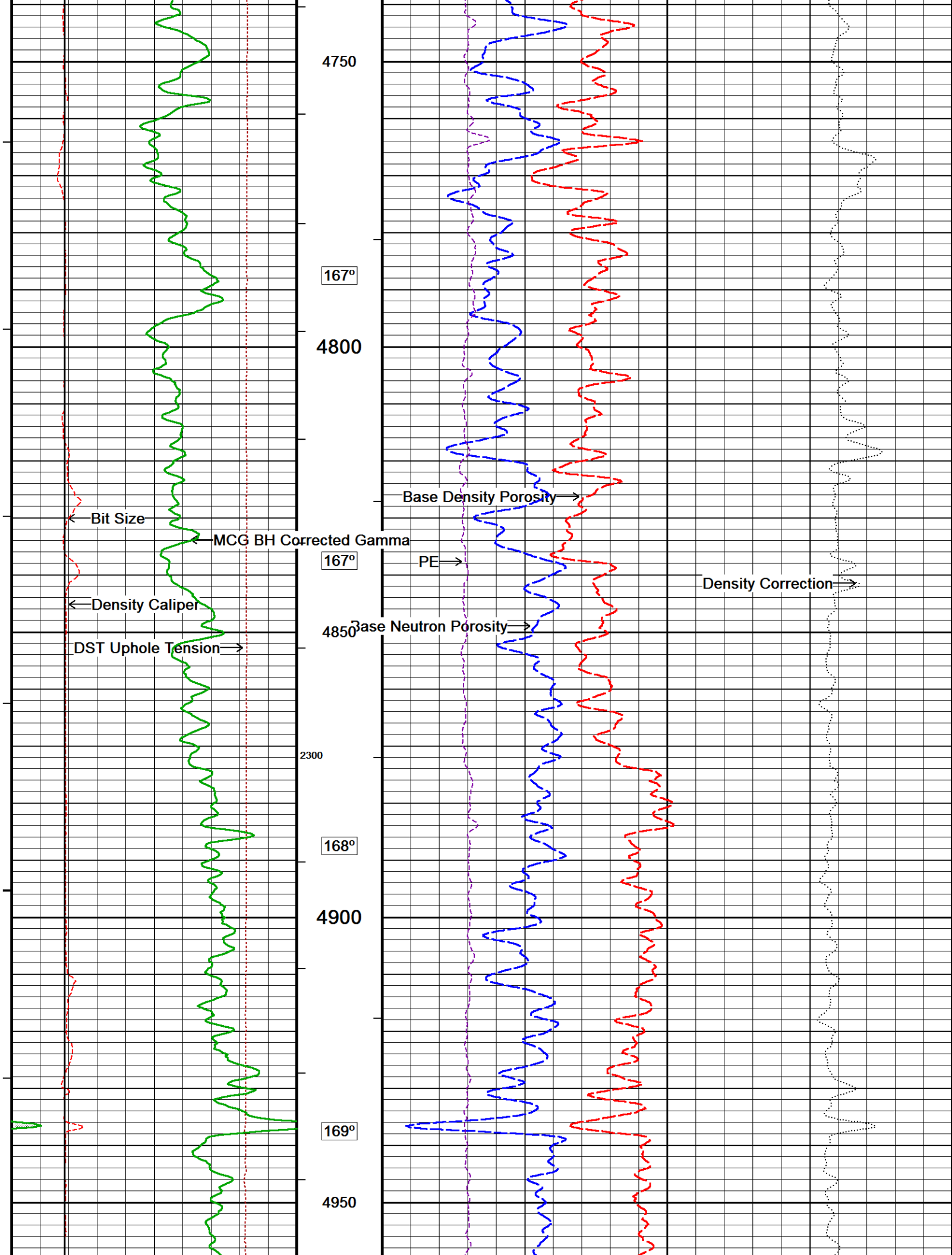


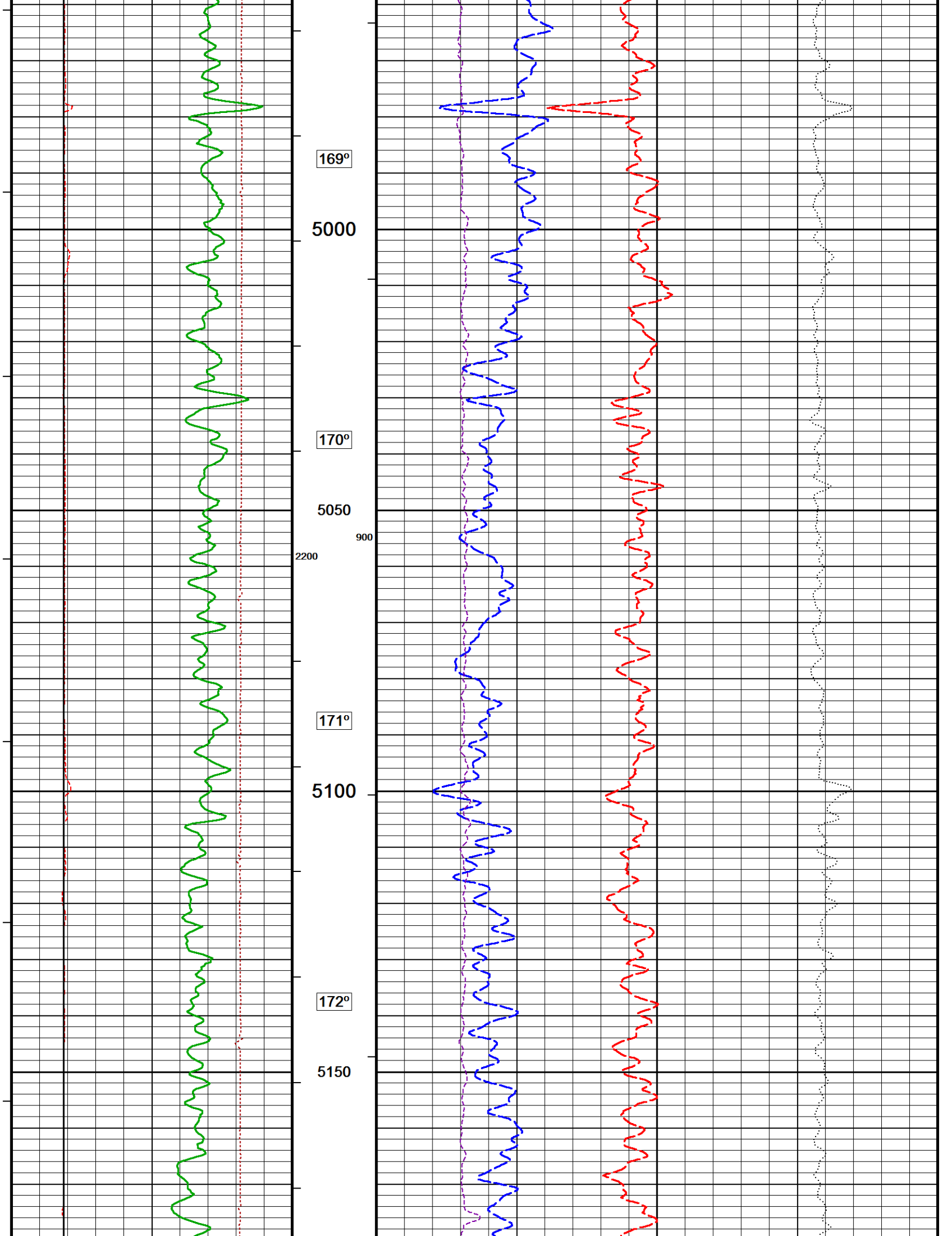


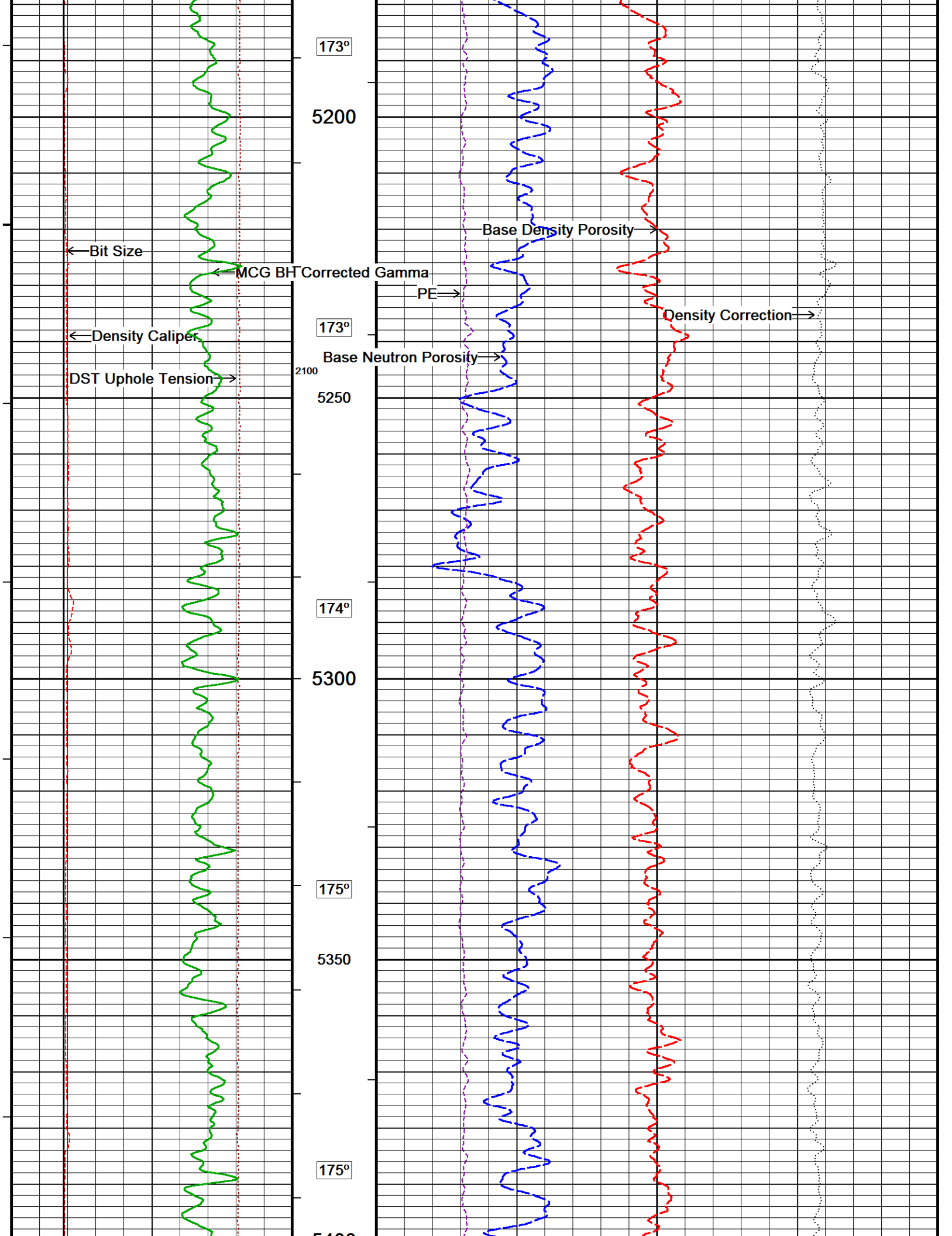


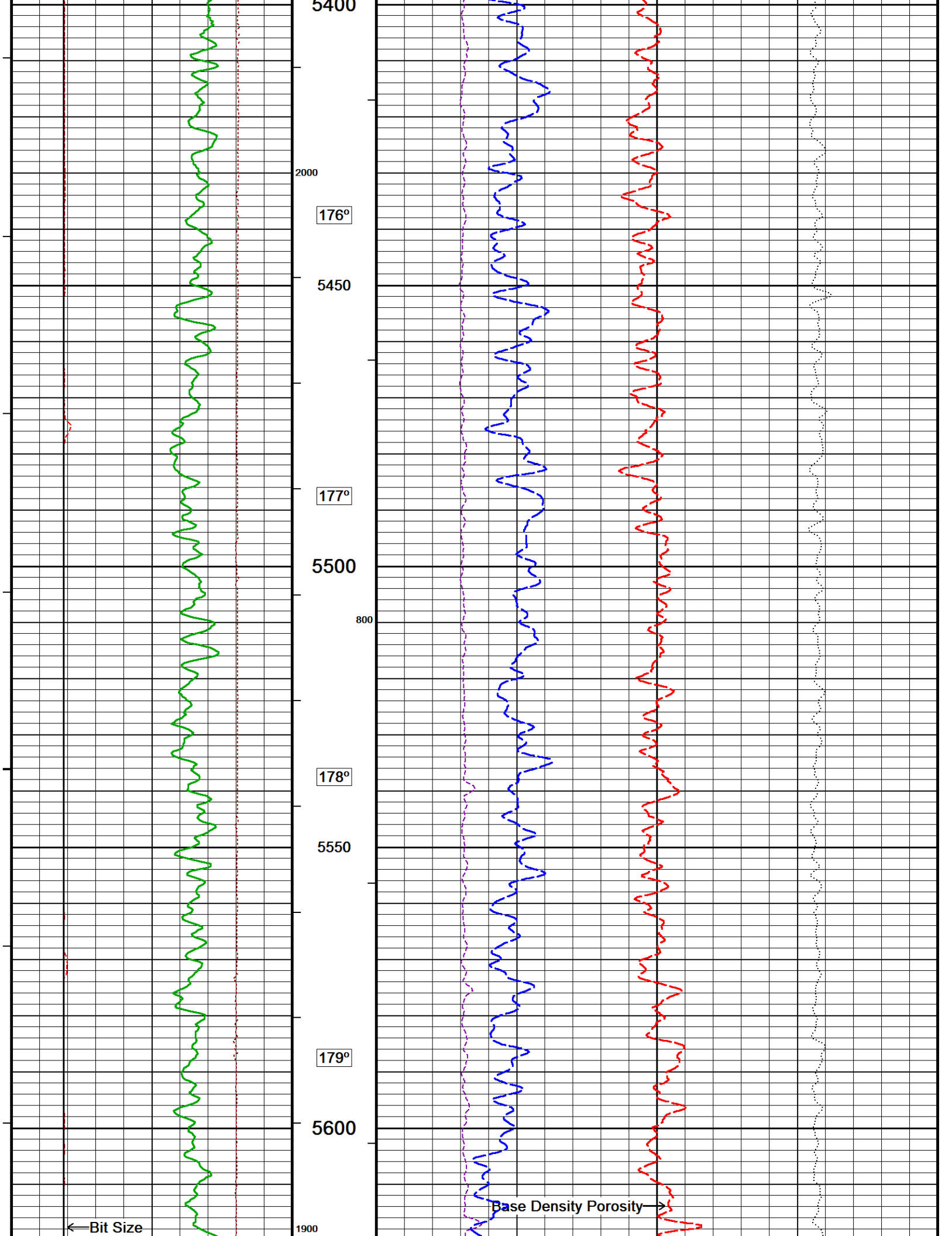


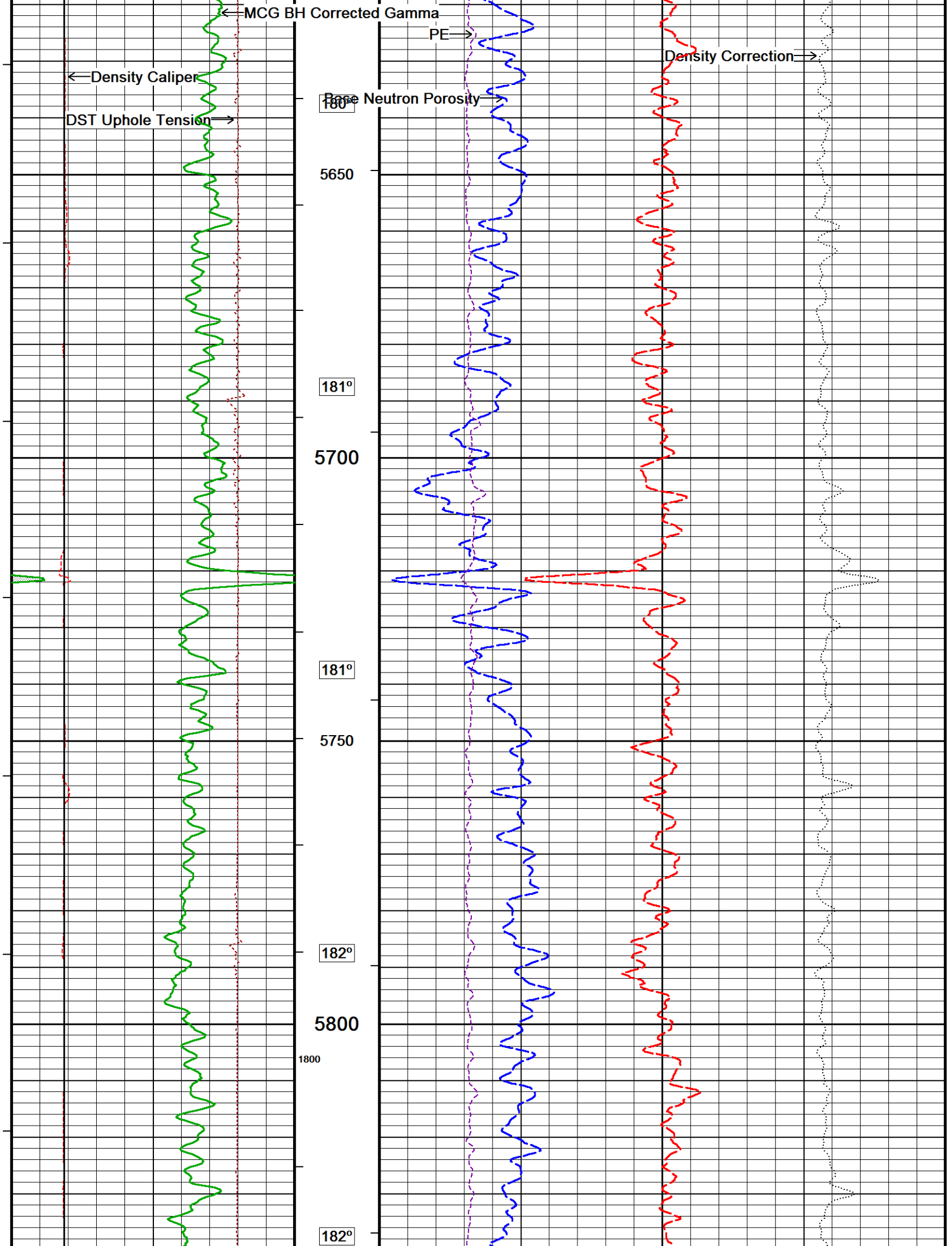


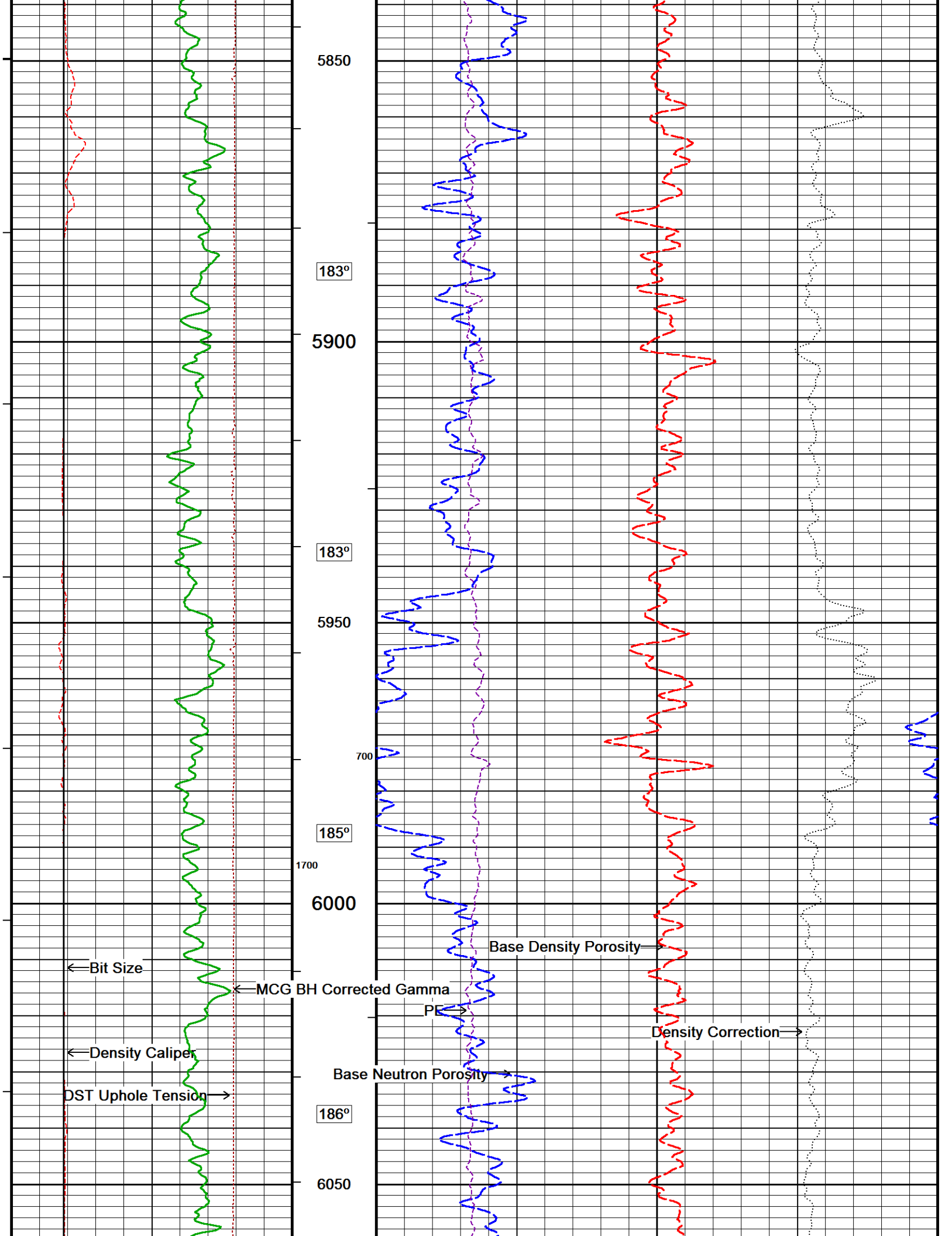


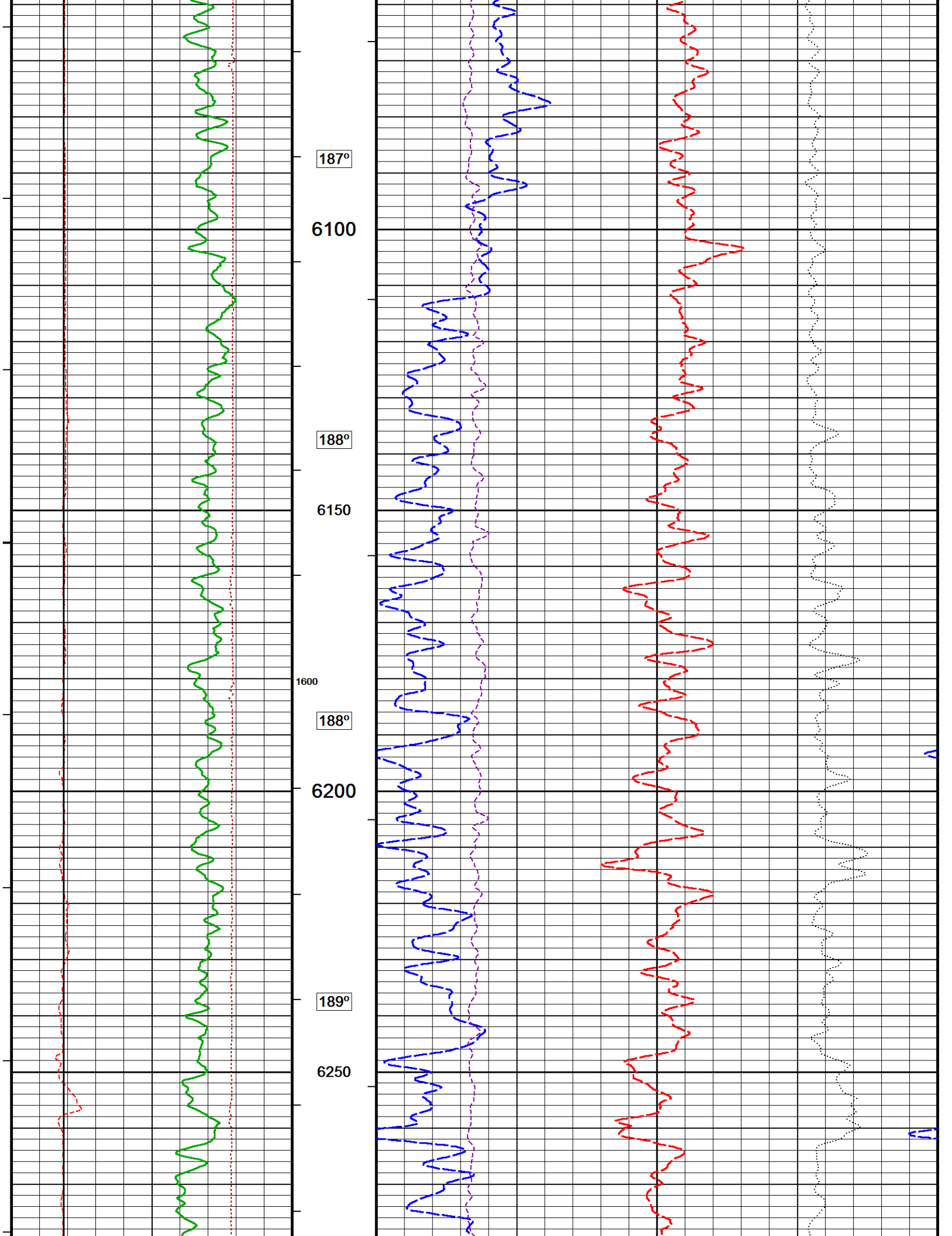


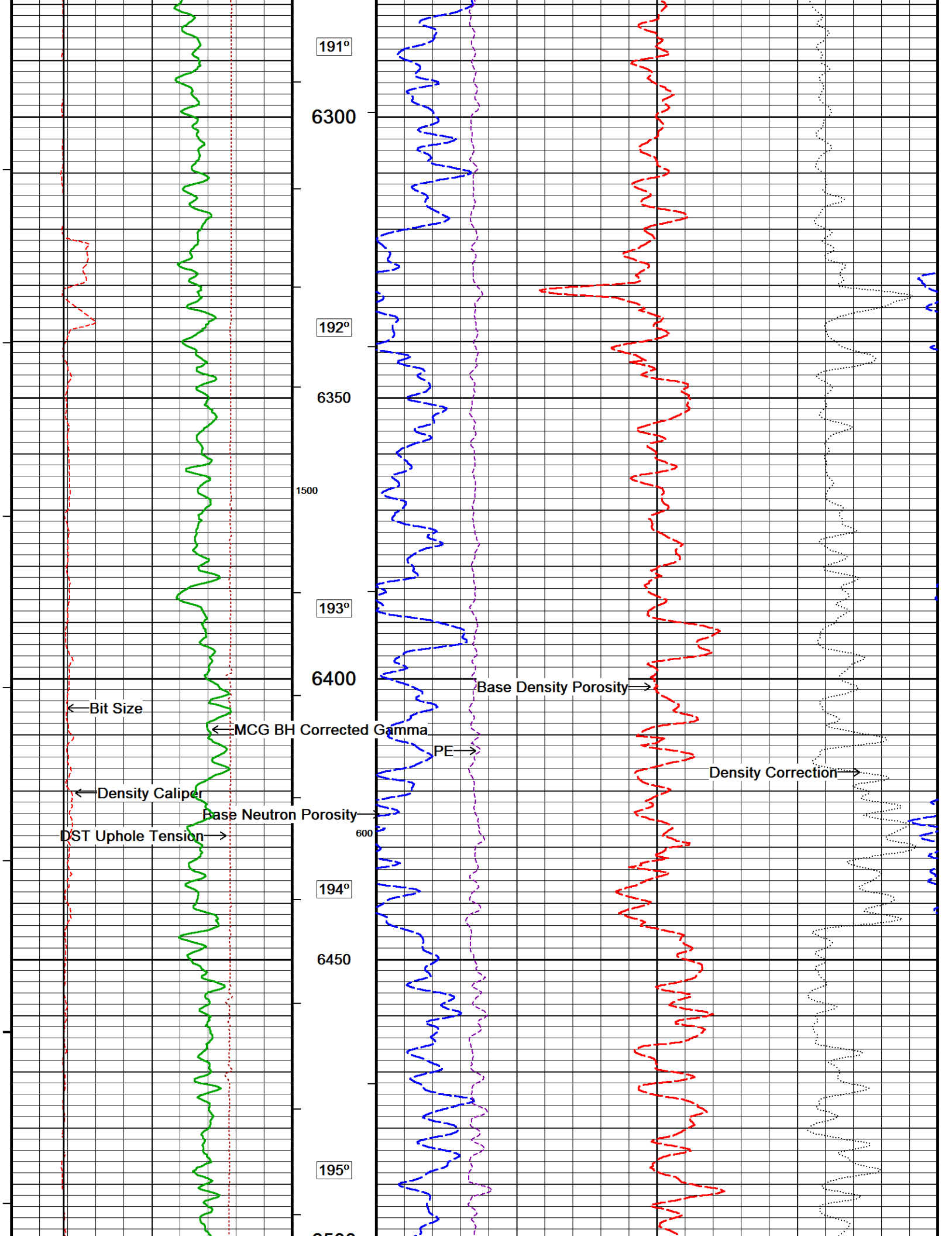


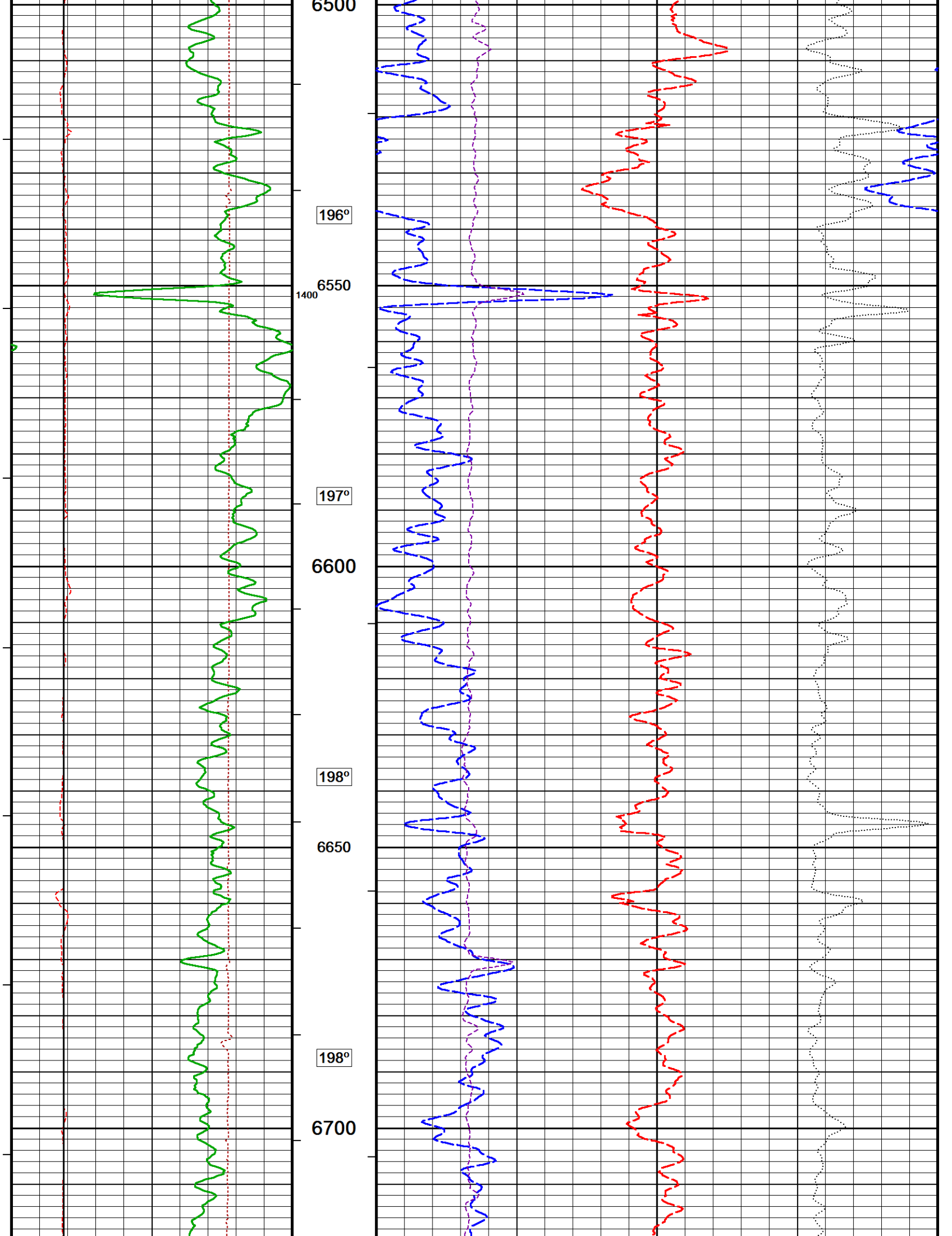


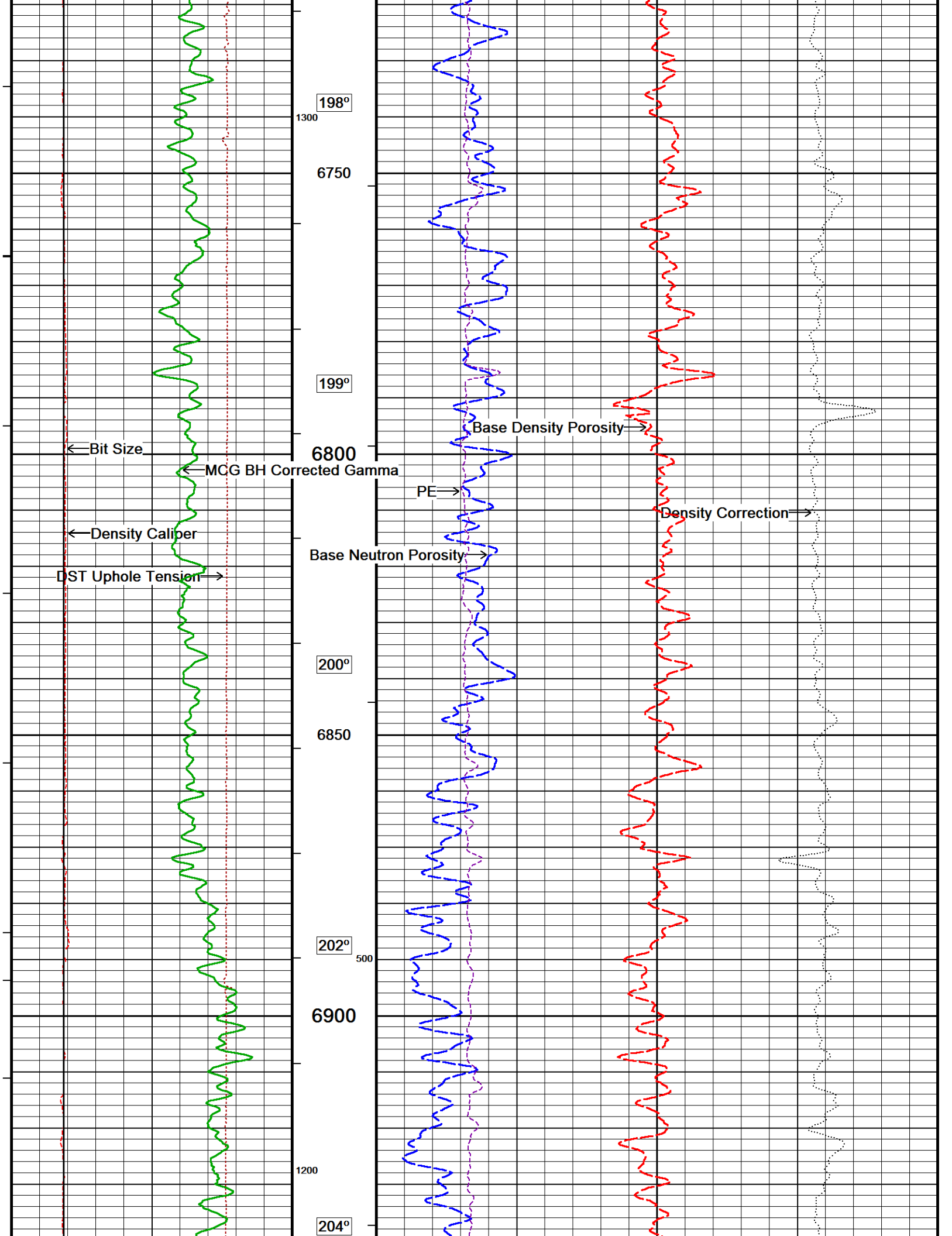


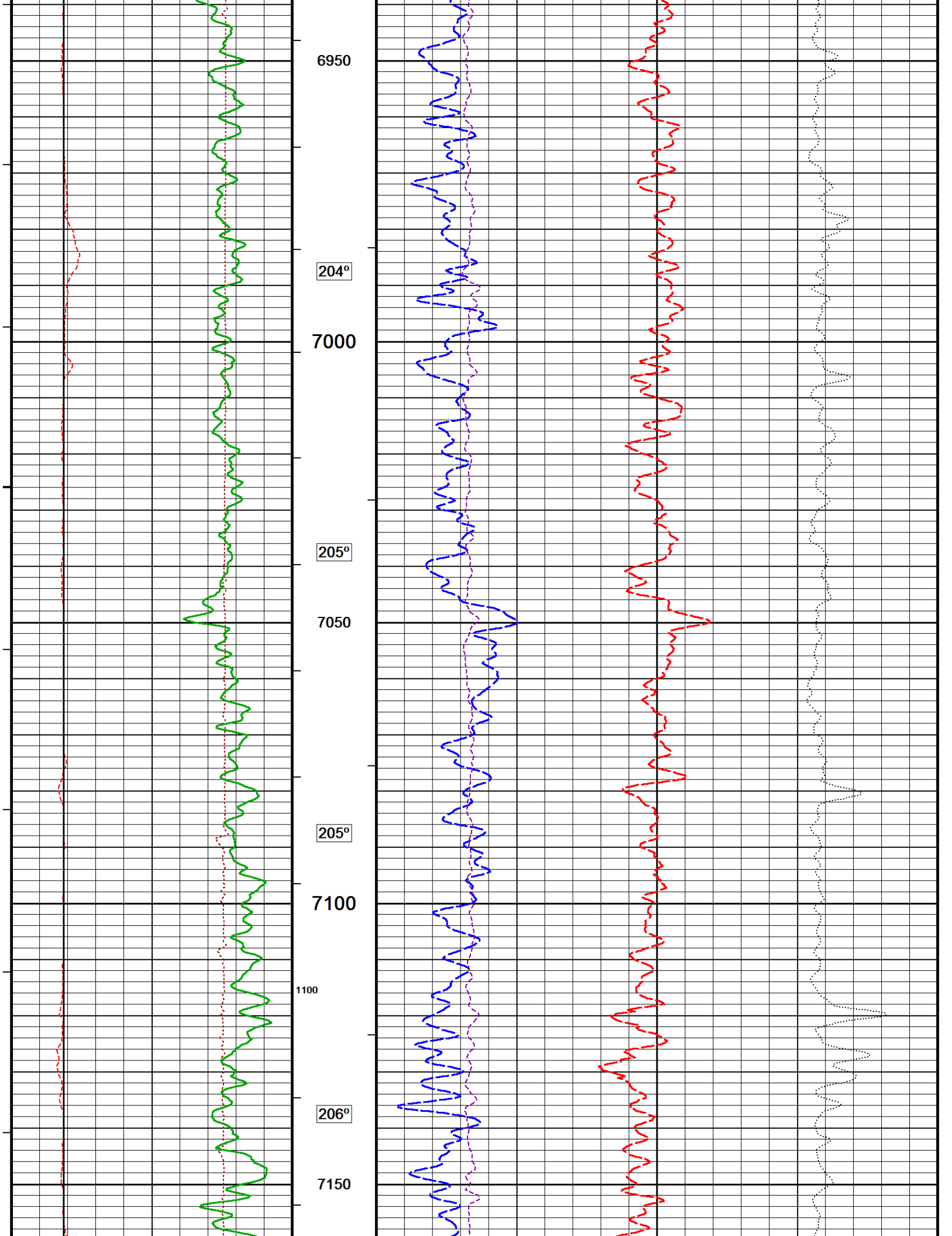


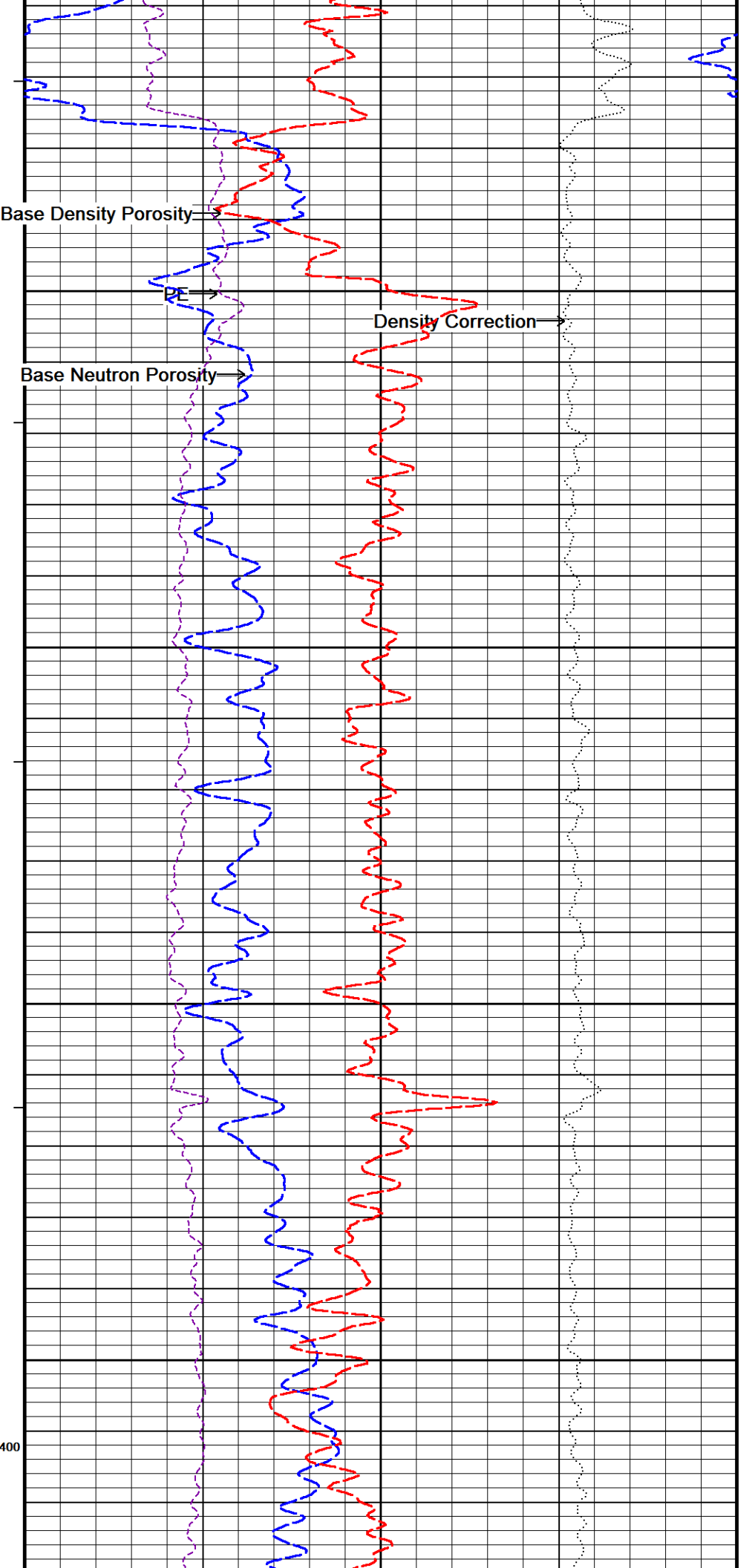
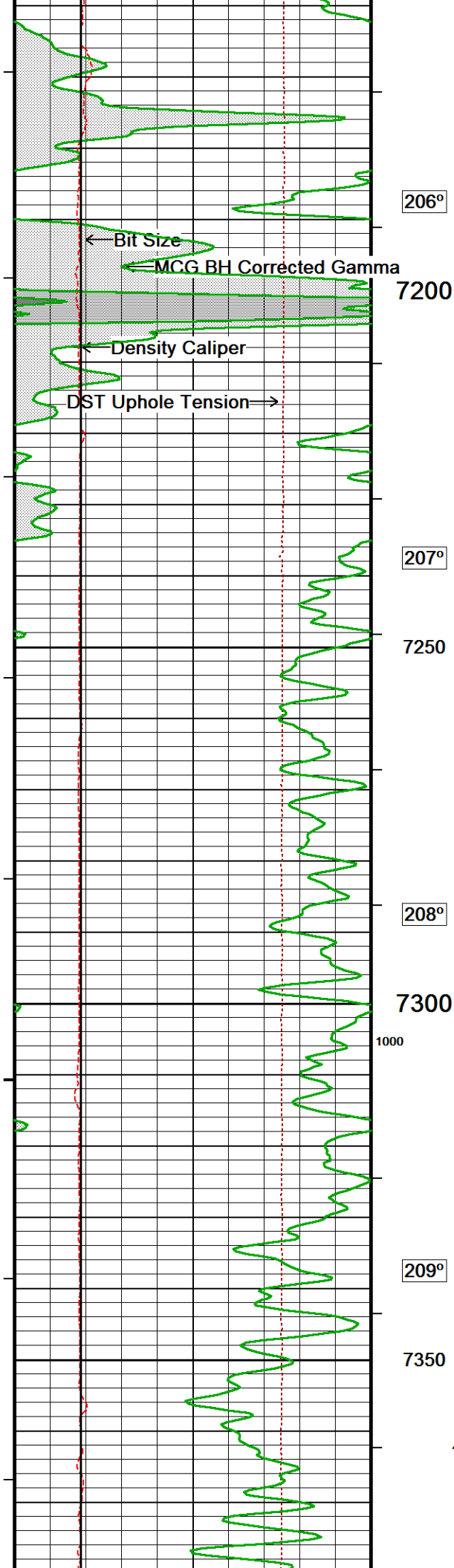


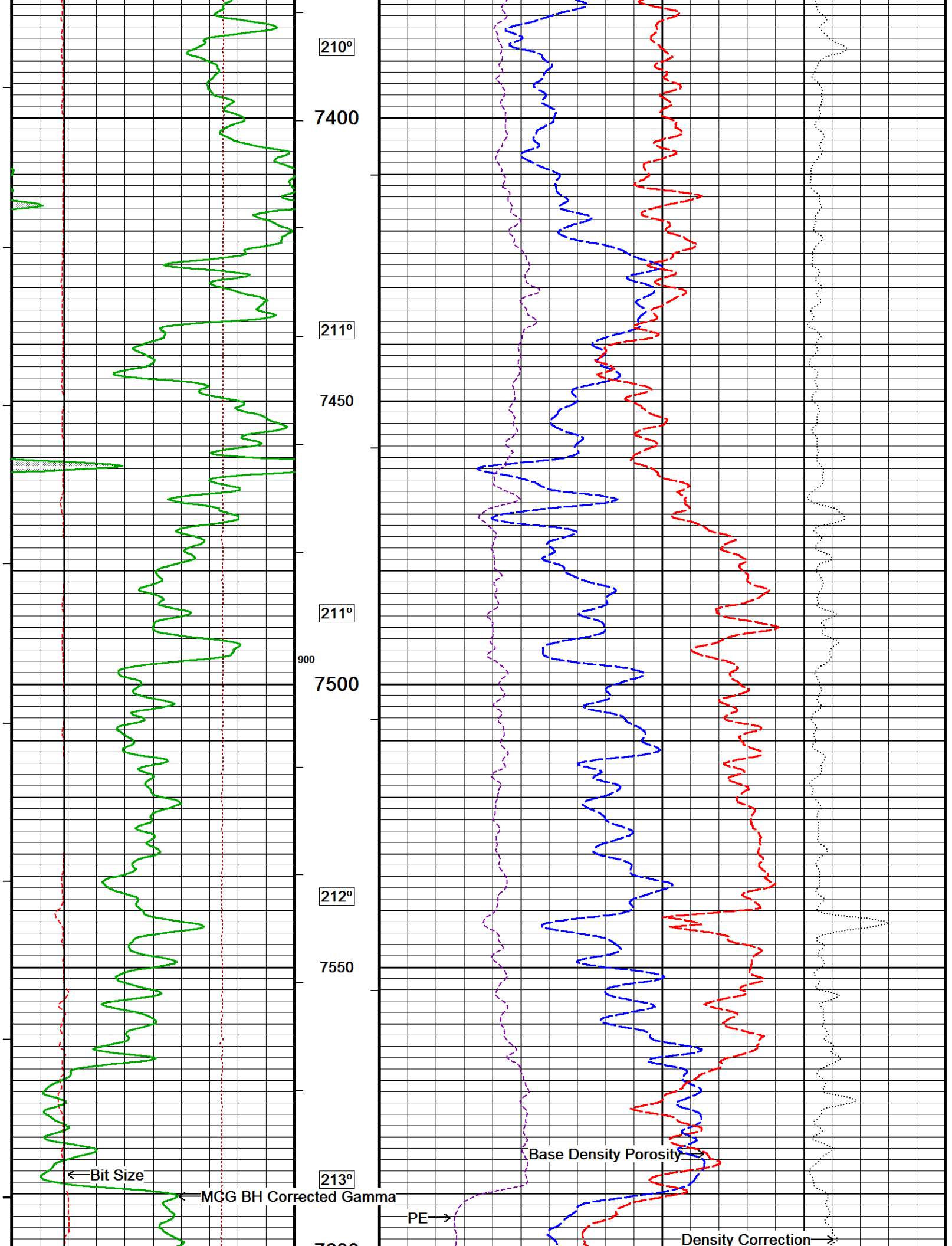


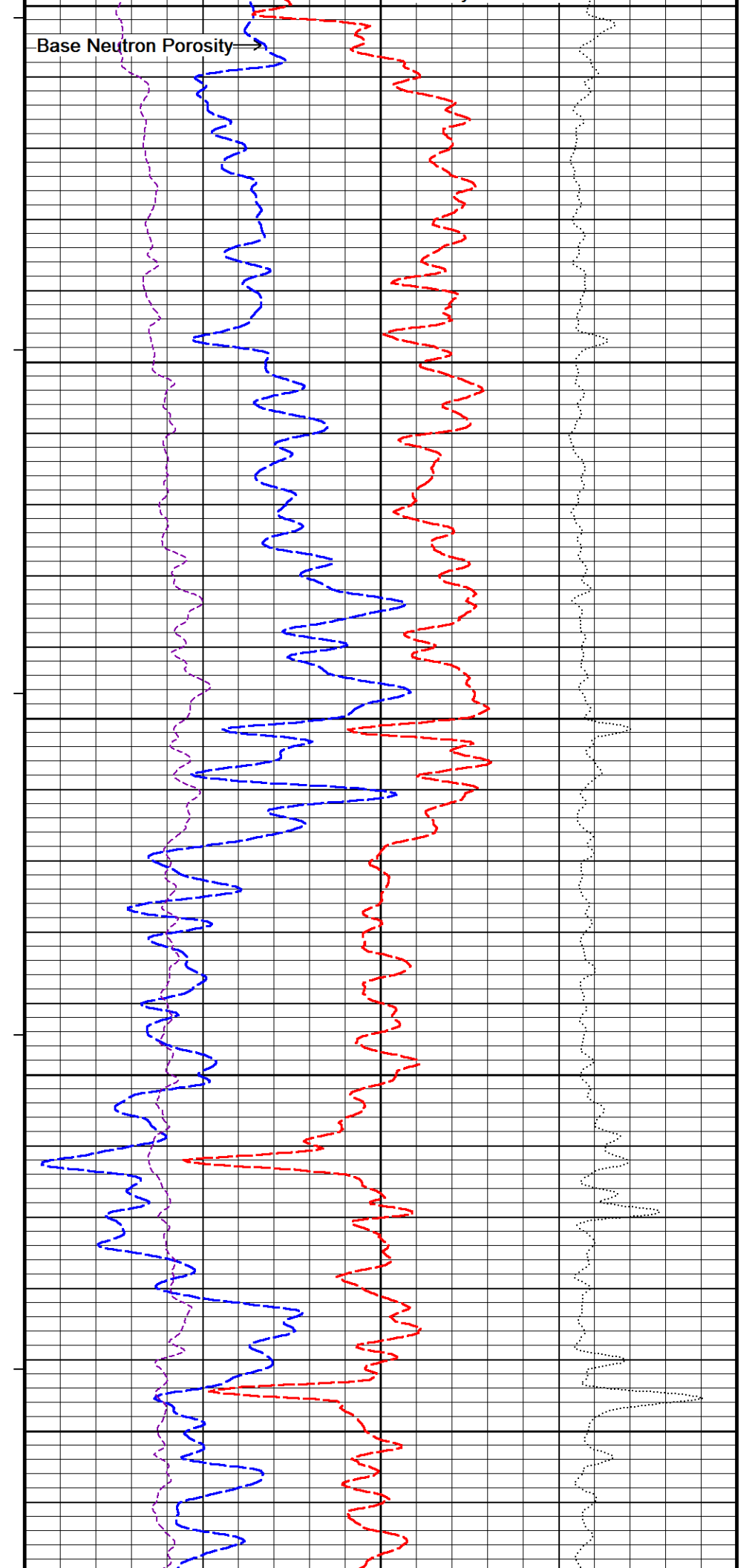
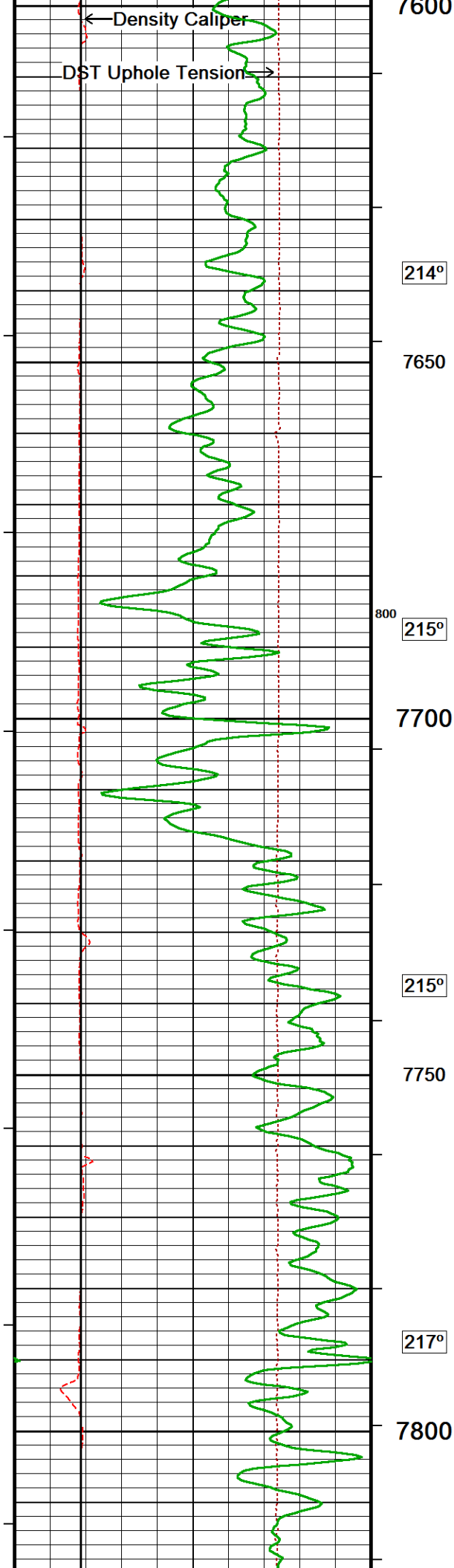


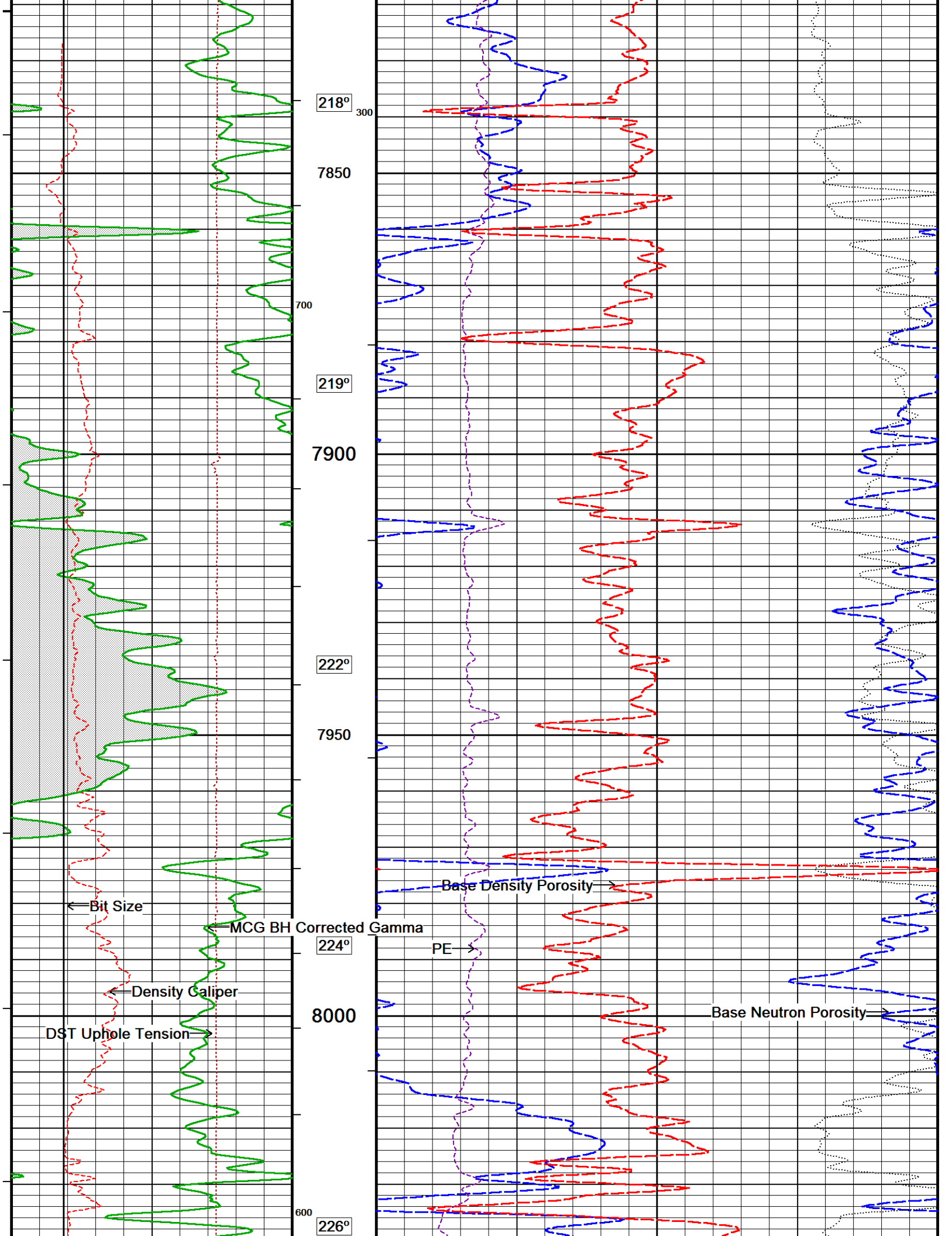


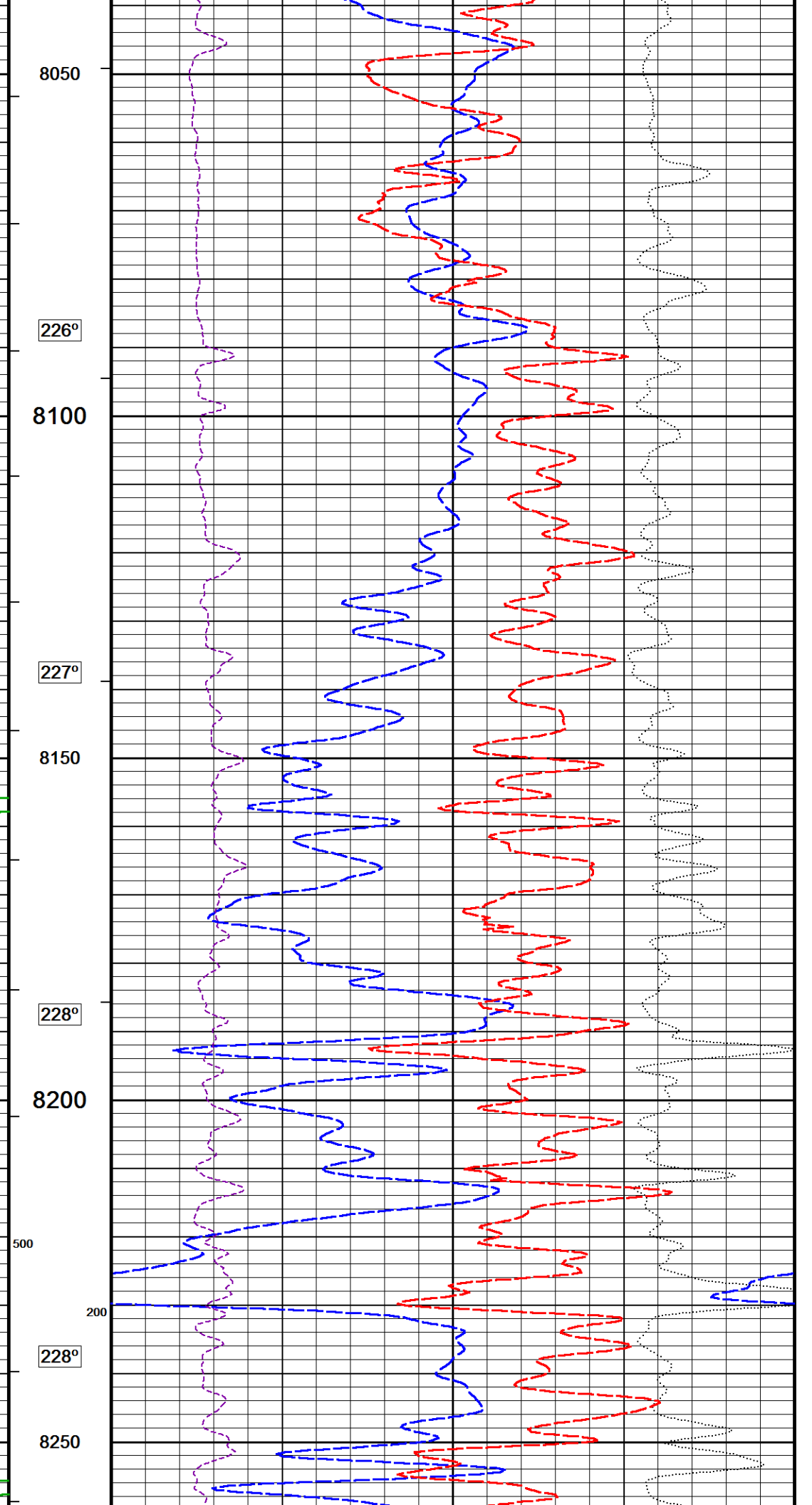
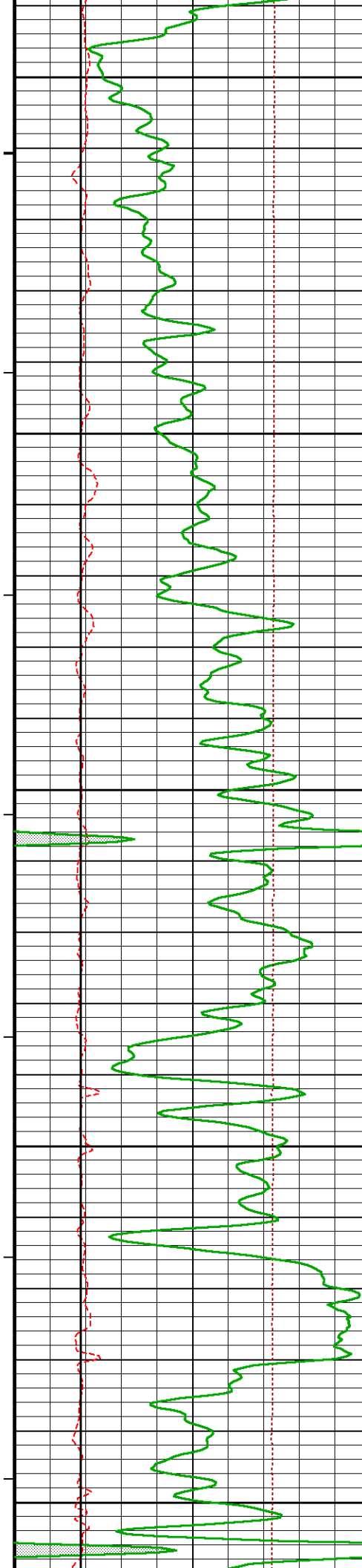


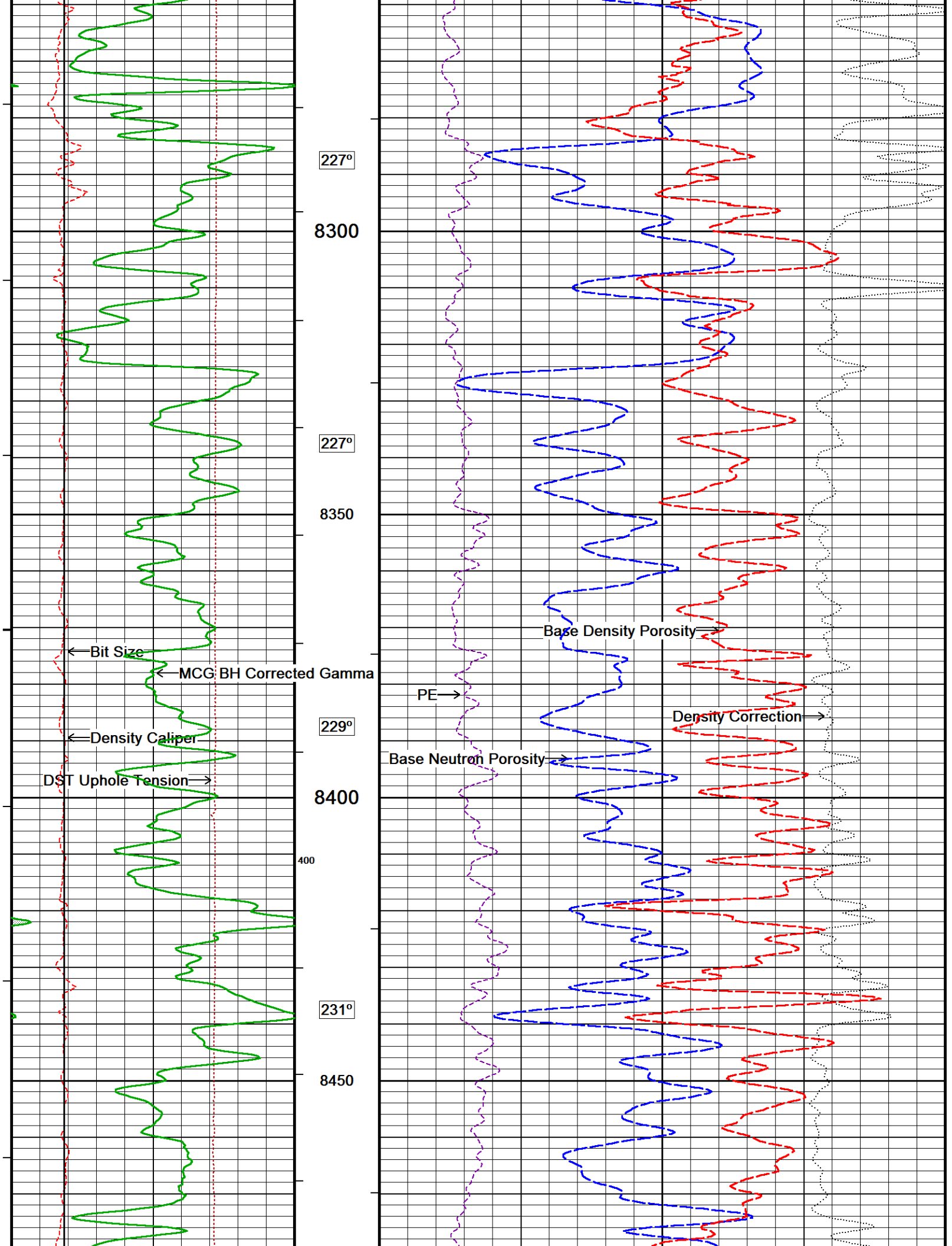


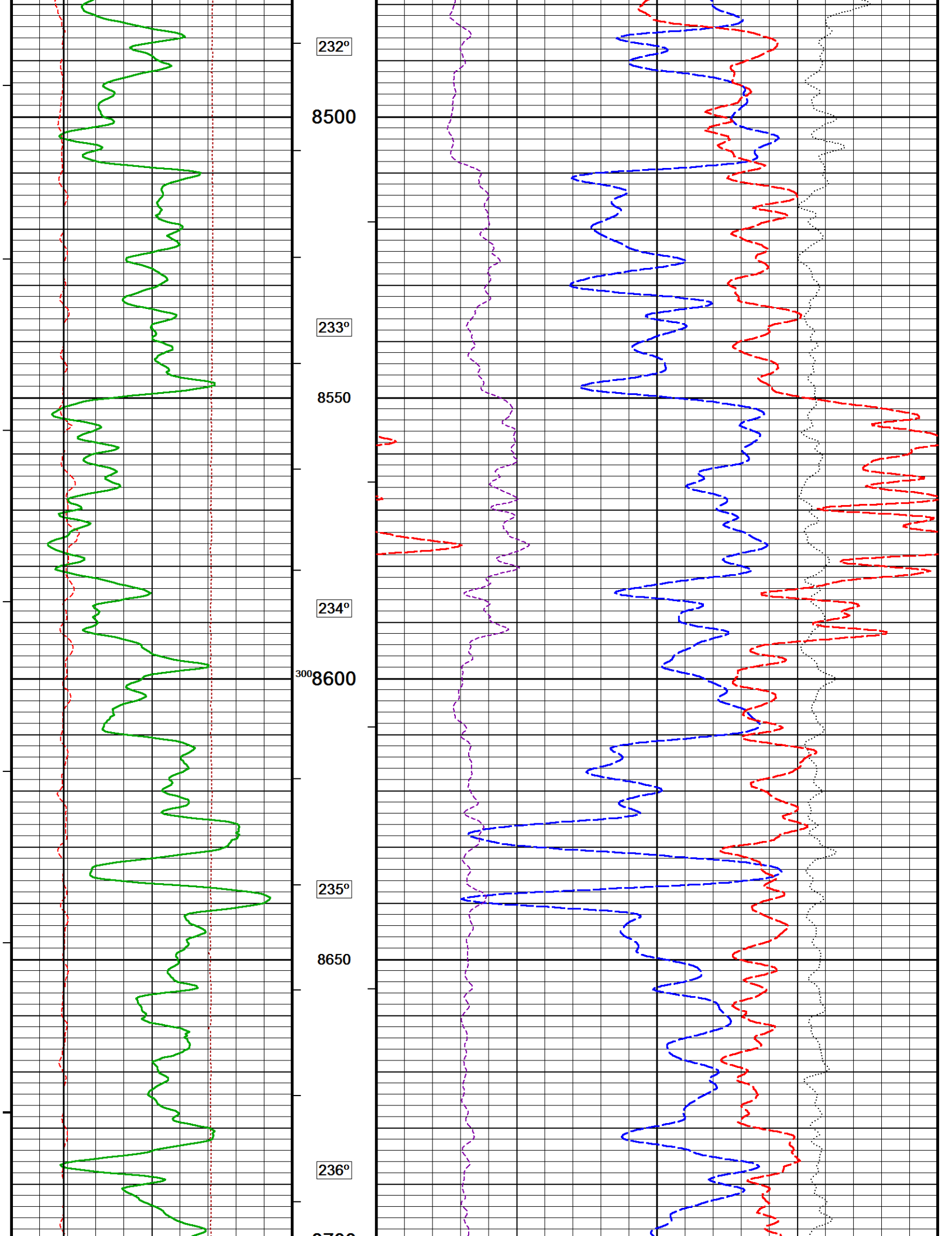


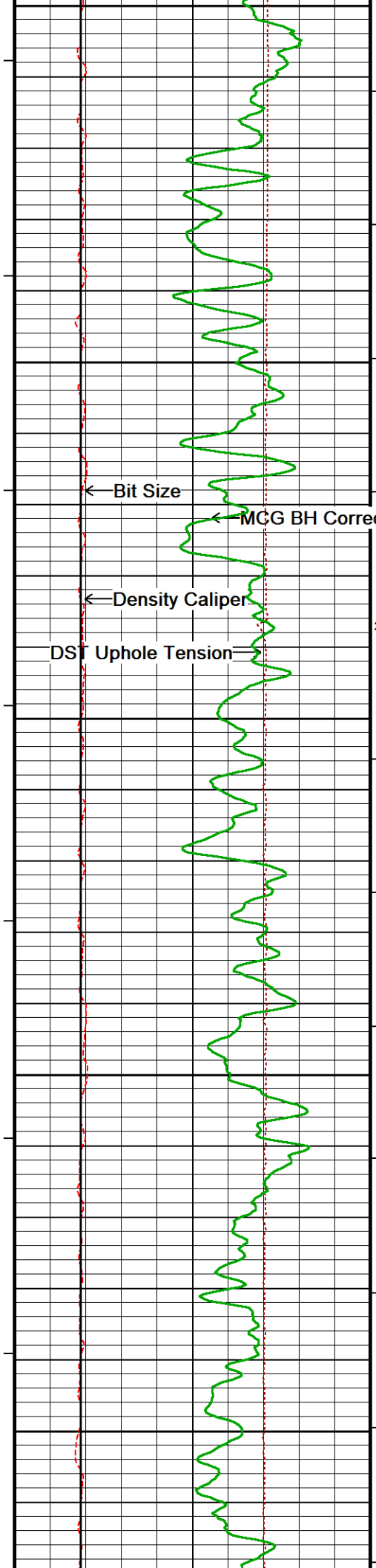




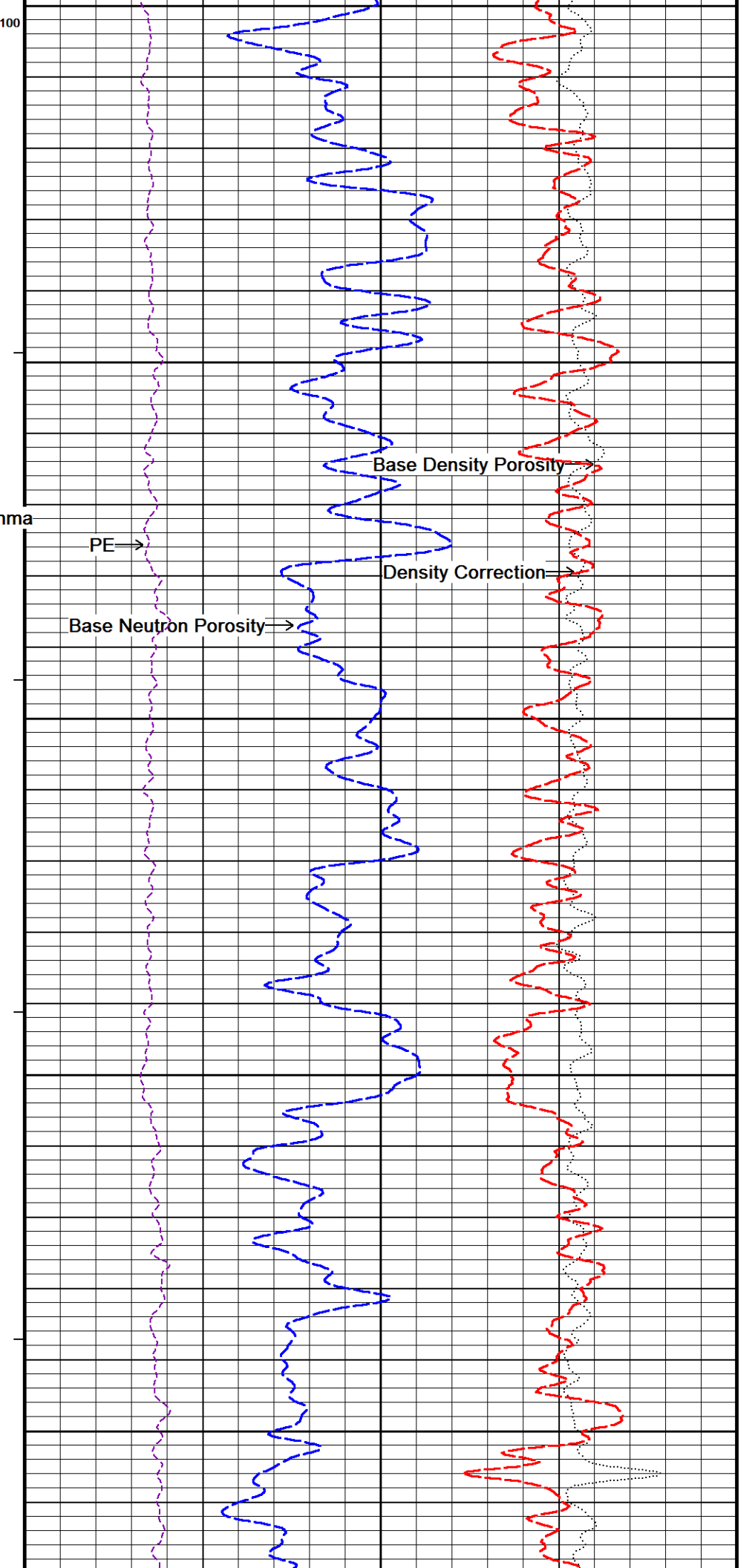


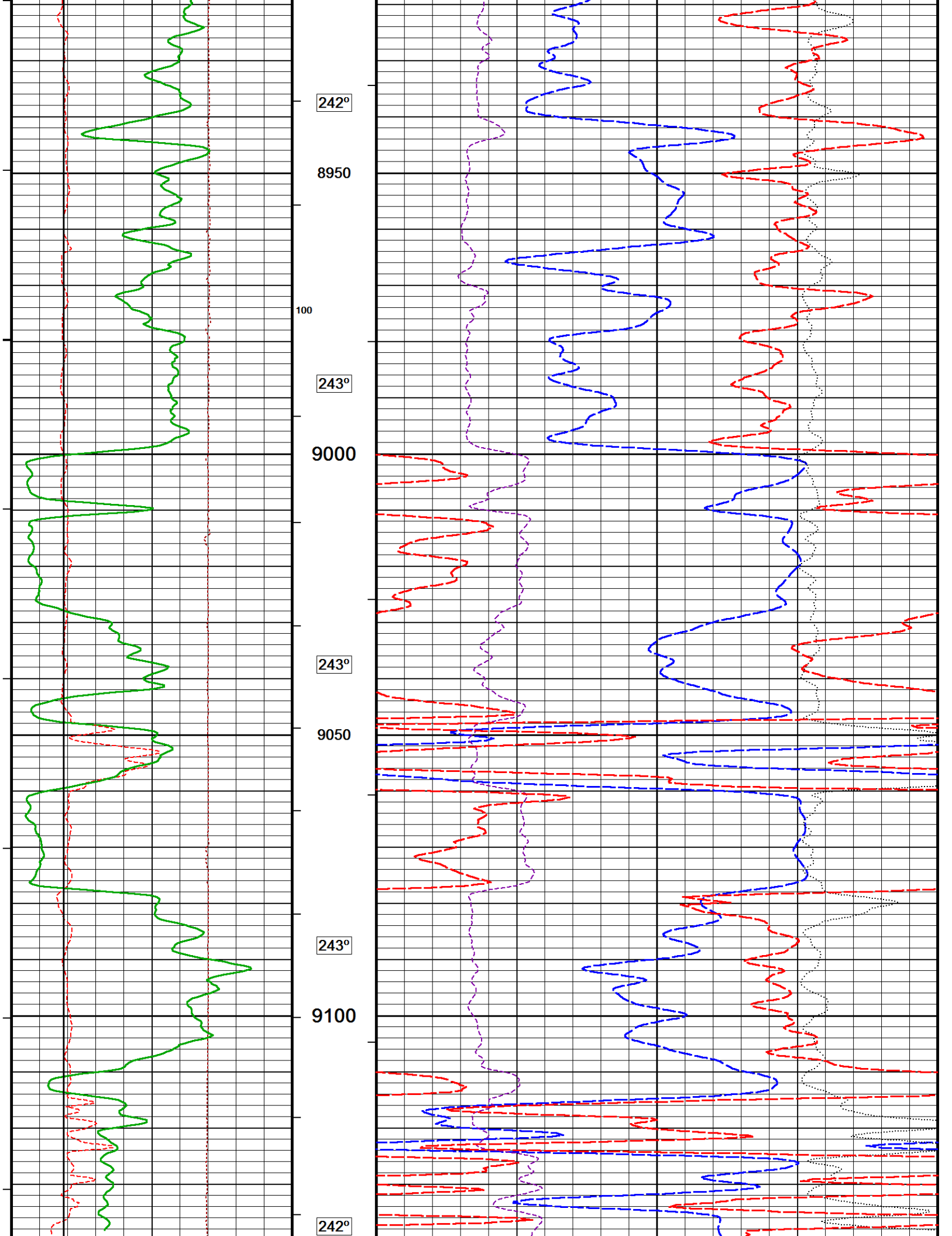


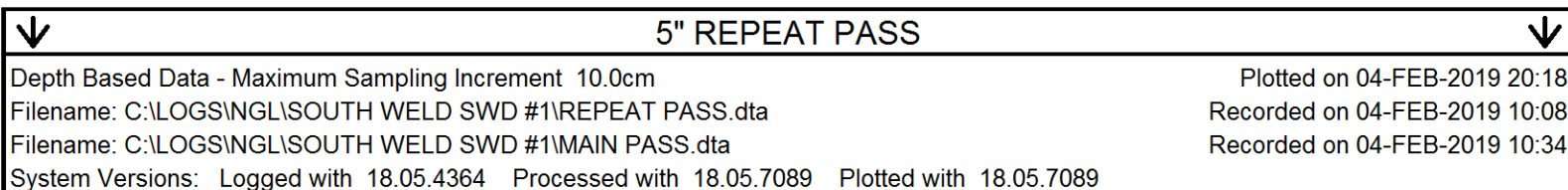


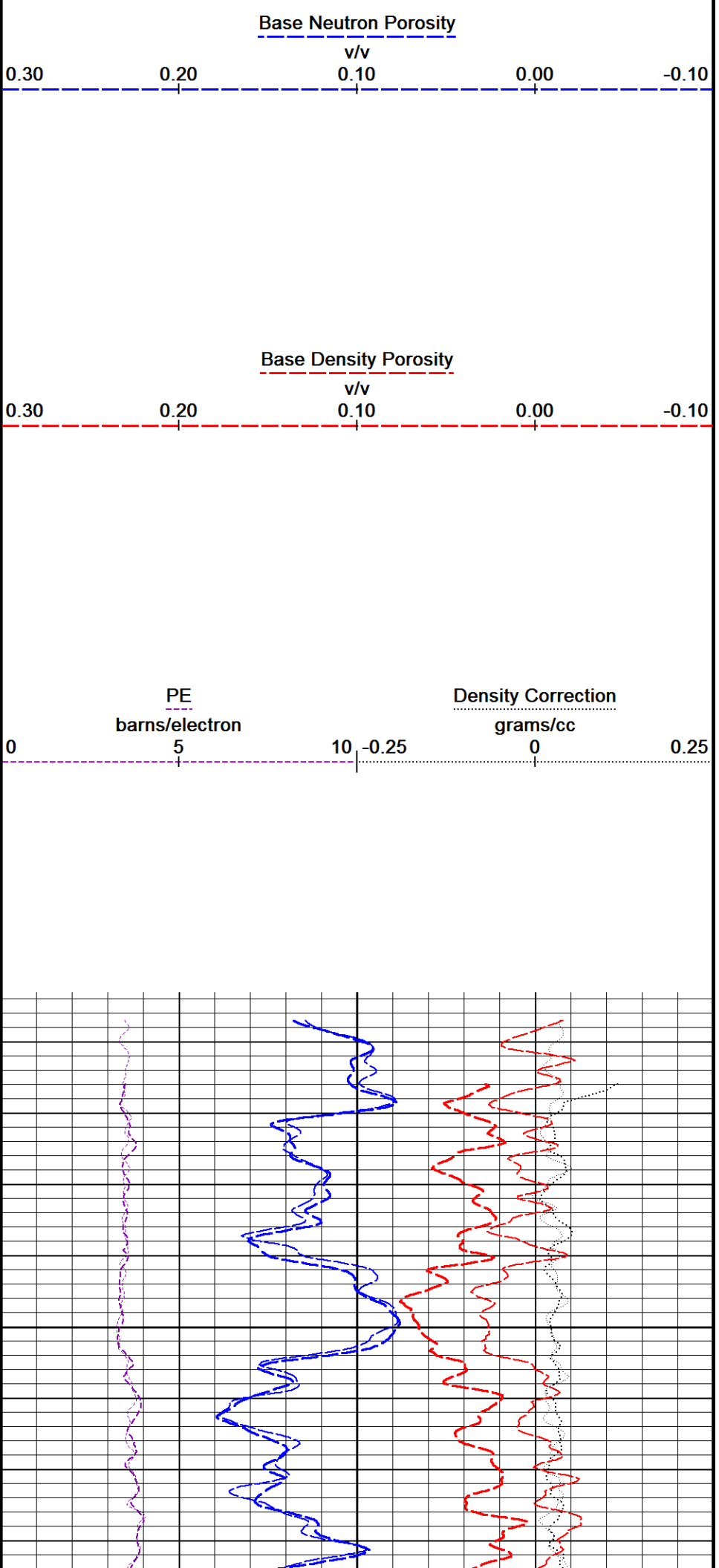
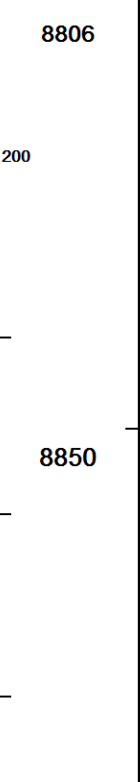
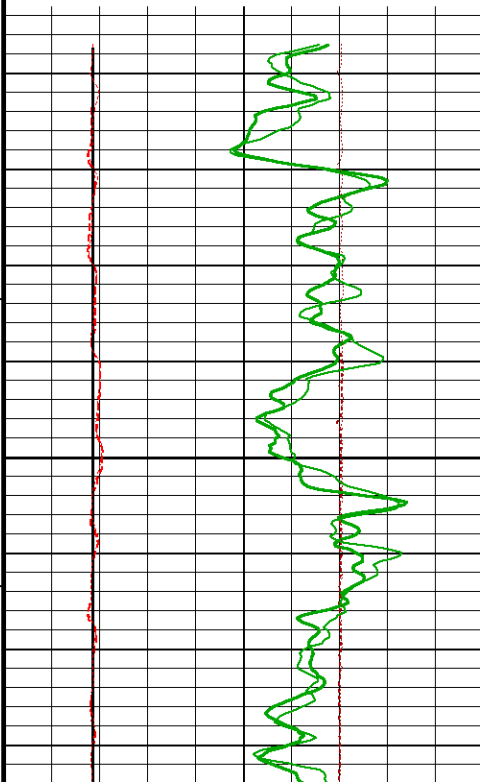
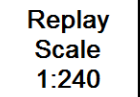
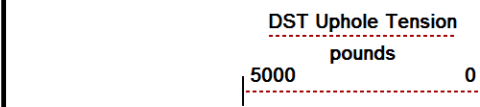
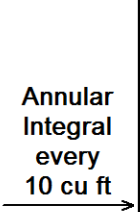
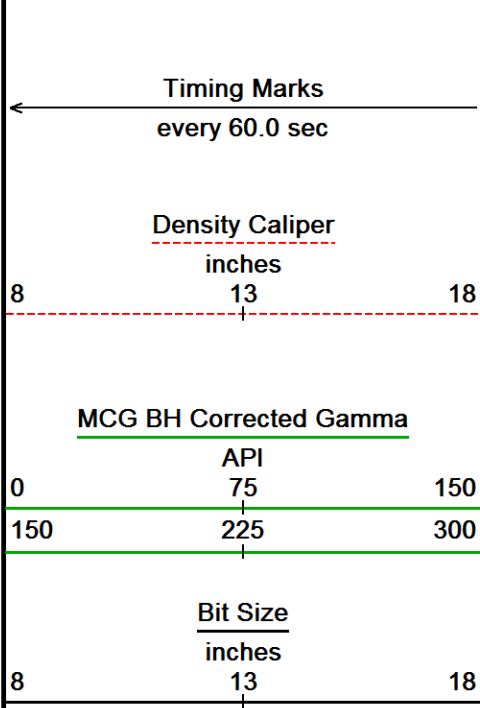


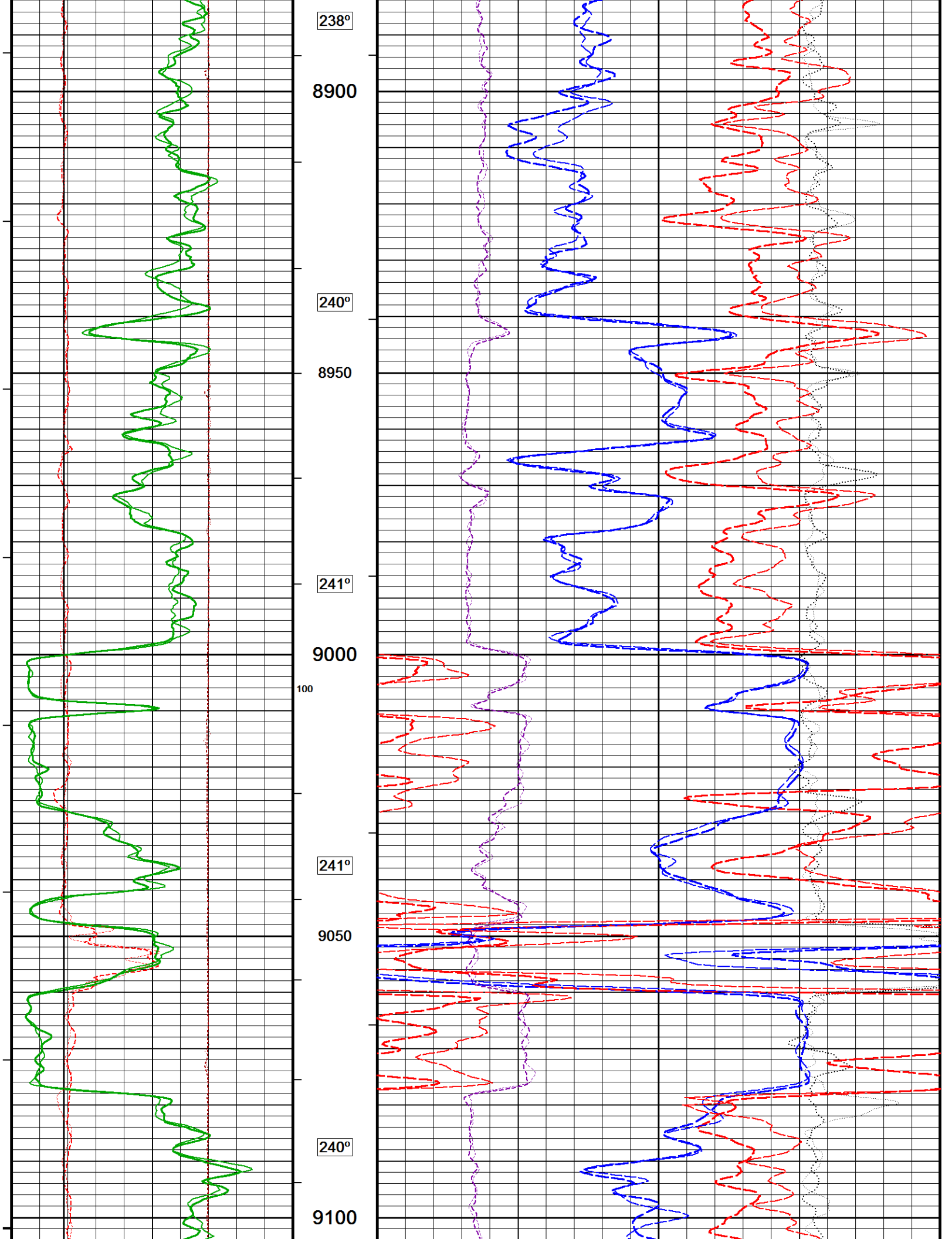
8700
237°
8750
237°
8800
239°
8850
240°
8900

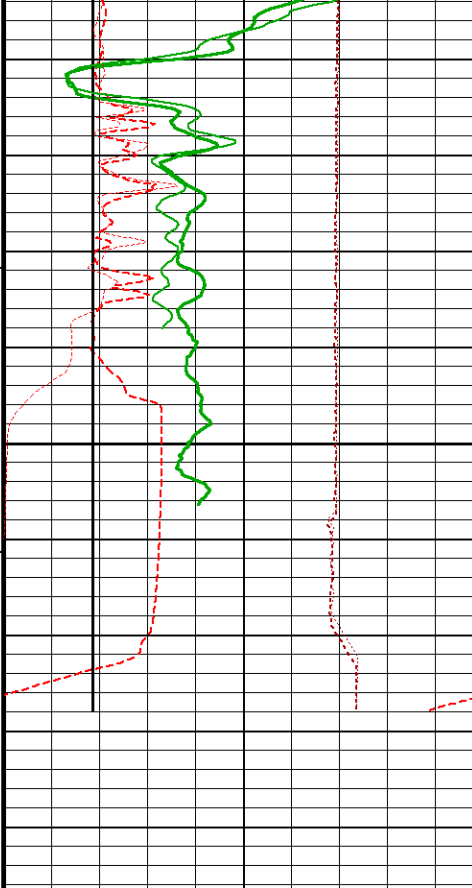








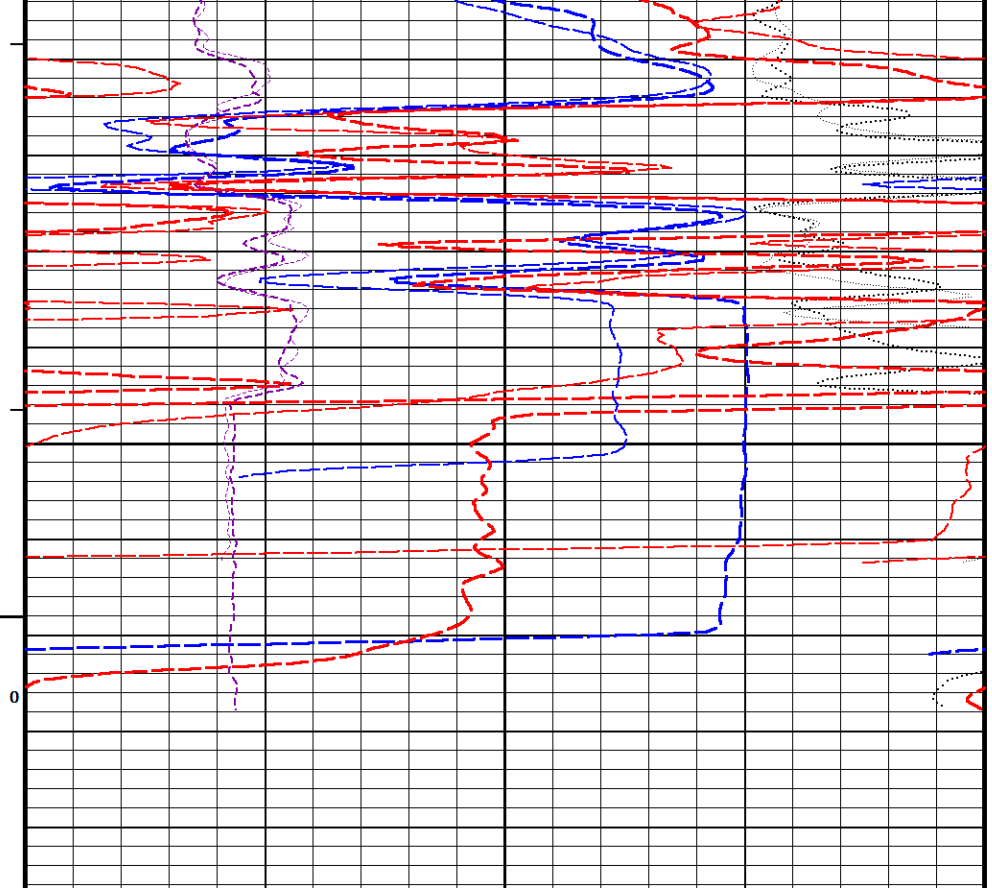




239°

9150

TD



Depth
in
Feet

← Timing Marks
every 60.0 sec

Density Caliper
inches
8 13 18

MCG BH Corrected Gamma
API
0 75 150
150 225 300

Bit Size
inches
8 13 18

Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft →

Base Neutron Porosity

v/v

0.30 0.20 0.10 0.00 -0.10

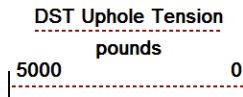
Base Density Porosity

v/v

0.30 0.20 0.10 0.00 -0.10

PE
barns/electron
0 5 10

Density Correction
grams/cc
-0.25 0 0.25



Replay
Scale
1:240

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 04-FEB-2019 20:18

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



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

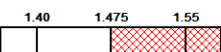
Porosity used	Base Density Porosity
Resistivity used	Array Ind. Two Res Rt
RWA Constant A	0.620
RWA Constant M	2.150
SW/APOR Tool Source	0.000

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		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

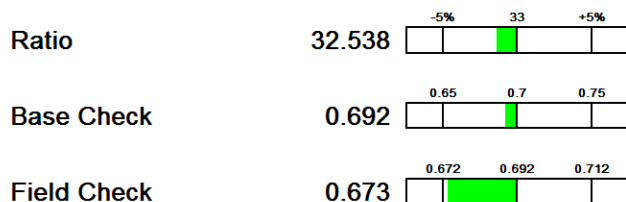
Field Check on 03-FEB-2019 01:19

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
Ratio	2917	90	3714	110
	32.538		33.764	

Field Calibrator at Base	Calibrated (cps)
Ratio	1637 2363
	0.692
Field Check	Calibrated (cps)
Ratio	1489 2211
	0.673

Neutron Calibration Tolerances MDN-B.J 430



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	N/A	kppm
Barite Mud Correction	Not Applied	

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
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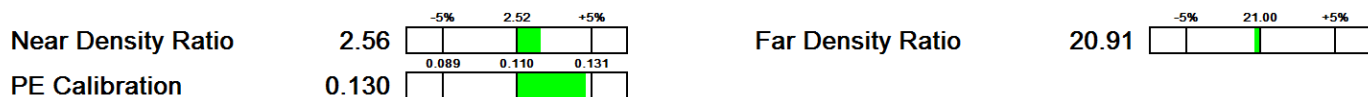
Field Check	1039.6	1109.7
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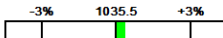
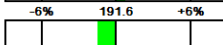
PE Calibration	Measured			Calibrated
Base Calibration	WS	WH	Ratio	Ratio
Background	192	936		
Reference 1	20039	47170	0.429	0.369
Reference 2	5473	19002	0.292	0.271

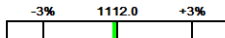
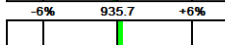
Field Check at Base	191.6	935.7
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Field Check	188.7	940.4
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Photo Density Calibration Tolerances MPD-C.J 378



Near Den. Field Check 1039.6 
 PE WS Field Check 188.7 

Far Den. Field Check 1109.7 
 PE WH Field Check 940.4 

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

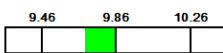
Caliper Calibration MPD-C.J 378

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

Long Arm Field Cal. 9.69  in

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



45.66 ft GGCE - MCG BH Corrected Gamma
 42.76 ft CGXT - MCG External Temperature

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

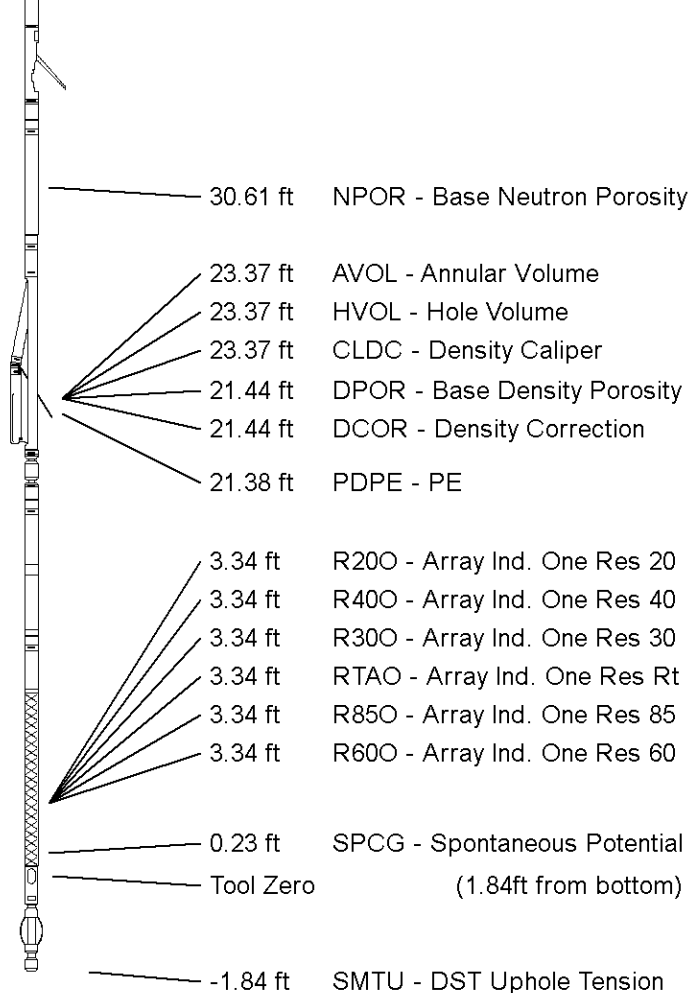
Compact Density/Caliper
MPD-C.J 378 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

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	9150.00	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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PHOTO DENSITY
DUAL SPACED NEUTRON