Weatherford®

CML MESSENGER SHUTTLE
COMPACT TRIPLE COMBO
SPECTRAL GAMMA RAY

COMPANY	WHITING OIL AND GAS CORP
WELL	HORSETAIL 08B-1712
FIELD	REDTAIL
PROVINCE/COUNTY	WELD
COUNTRY/STATE	USA / COLORADO
LOCATION	NE NE 580'FNL & 1890'FEL
PERMIT NUMBER	AFE# 16-0400

SEC 08	TWP 10N	RGE 57W	Other Services
Latitude		40.854456	
Longitude		-103.817564	
API Number		05-123-41451	

Permanent Datum GL, Elevation 4890 feet
Log Measured From KB
Drilling Measured From KB @ 21' AGL

Elevations:	feet
KB	4911.00
DF	4911.00
GL	4890.00

Date	15-JUN-2016				
Run Number	ONE				
Service Order	3648-152951300				
Depth Driller	15992.00	feet			
Depth Logger	15992.00	feet			
First Reading	15946.00	feet			
Last Reading	5200.00	feet			
Casing Driller	2027.00	feet			
Casing Logger	2027.00	feet			
Bit Size	8.500	inches			
Hole Fluid Type	WBM				
Density / Viscosity	10.10 lb/USg		41.00 CP		
PH / Fluid Loss	9.20		7.40 ml/30Min		
Sample Source	FLOWLINE				
Rm @ Measured Temp	1.42 @ 75.0	ohm-m			
Rmf @ Measured Temp	1.14 @ 75.0	ohm-m			
Rmc @ Measured Temp	1.70 @ 75.0	ohm-m			
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	0.54 @209.0	ohm-m			
Time Since Circulation	1 HOUR				
Max Recorded Temp	209.00	deg F			
Equipment / Base	13173		CASPER		
Recorded By	GUTHMUELLER			D BEANS	
Witnessed By	M ODEGARD				

BOREHOLE RECORD

Last Edited: 15-JUN-2016 11:08

Bit Size inches	Depth From feet	Depth To feet
12.250	0.00	2027.00
8.500	2027.00	15992.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURF	9.625	0.00	2027.00	36.00

REMARKS

SOFTWARE: 16.01-9649
TOOLS:SRT-008;SHA-571;MBS-119;MMSF-249;MSG-111;MTI-075;MGS-218;MCL-129;SKJ-612;SHA-512;MISD-734;
MDN-463;MPD-460;MVC-141;SHA-506;SKJ-254;MISE-696;MFE-417;MISE-786;MAI-456;ISA

HARDWARE: MPD: 4 INCH PROFILE PLATE
MDN DUAL BOWSPRING ECCENTRILIZER
MVC POWERED DECENTRALIZER BELOW DENSITY
MFE :MISE STANDOFF
MAI:MISE STANDOFF AND ISA

2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY.
ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

ROTATED IN FROM 10285 TO 15972 AT 15 RPM

DRILL PIPE DEPTH - PRE-DEPLOMENT - 15846
TOOL DEPTH - POST DEPLOYMENT - 15951

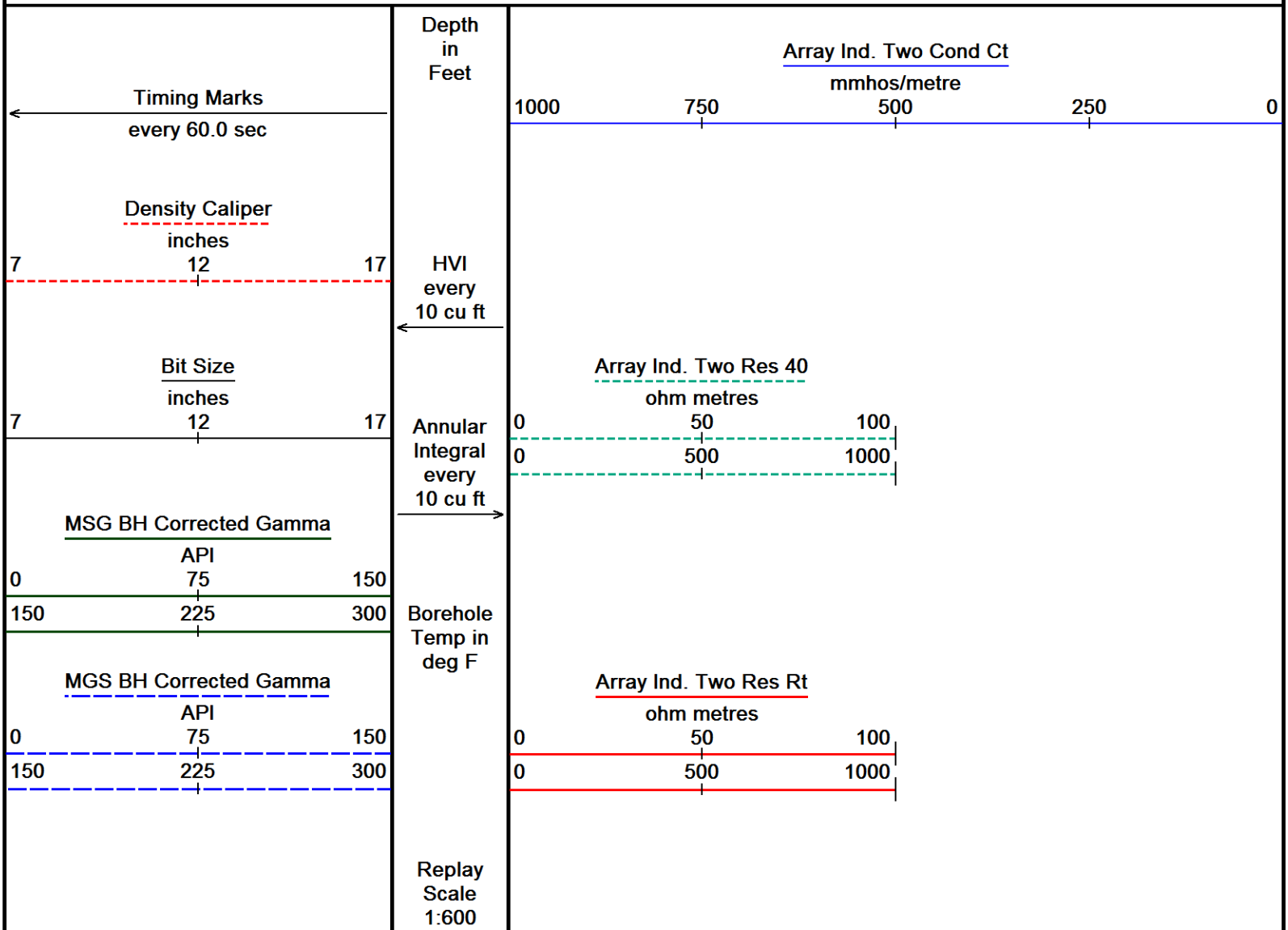
TOTAL HOLE VOLUME FROM TD - 5200 = 4500 CU FT
ANNULAR HOLE VOLME CALCULATED FOR 5.50 INCH CASING TD - 5200 = 2750 CU FT

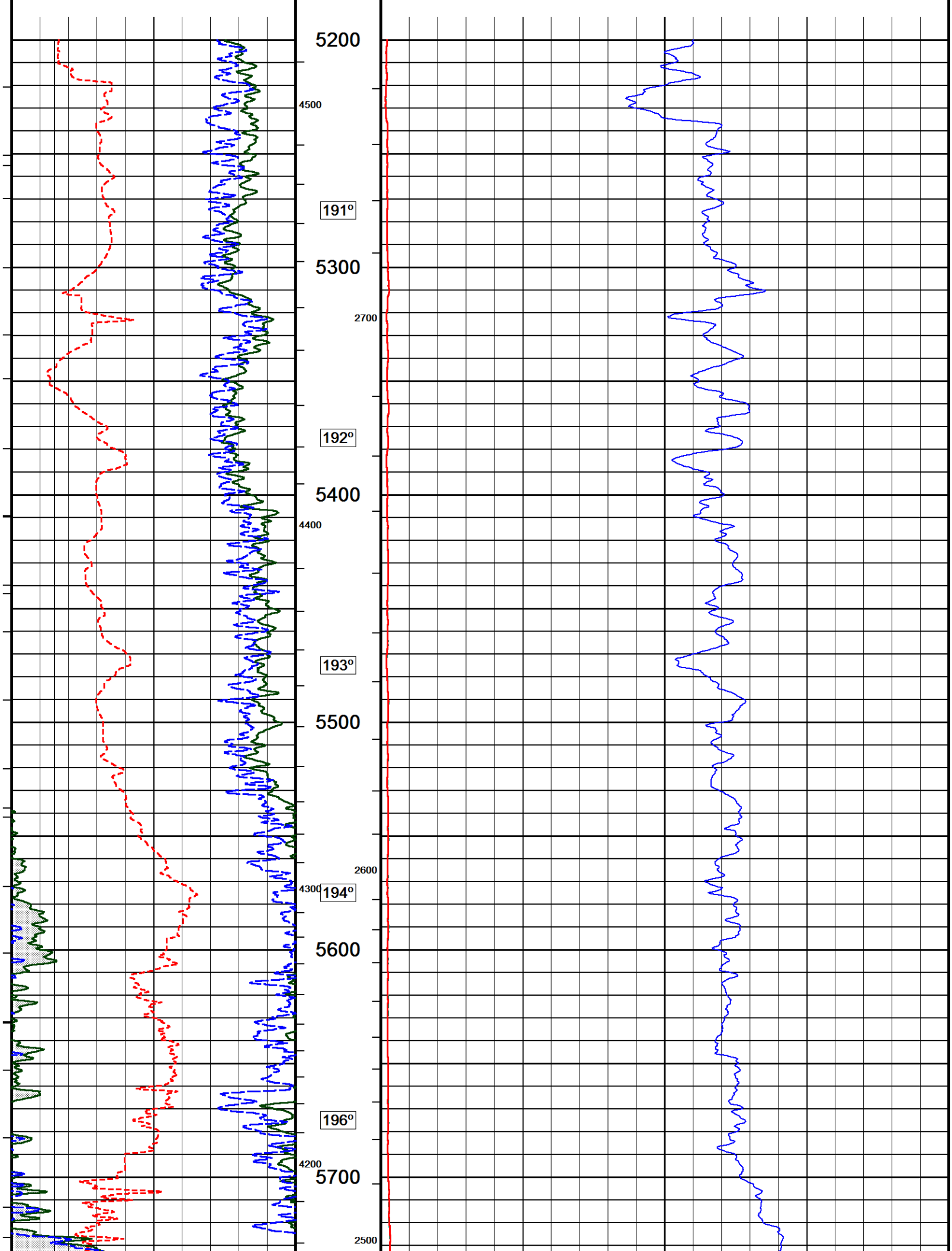
UNIT RIG 409

CREW:M DEBBAN;D BEANS

2 INCH MAIN LOG

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2016 16:45
Filename: C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta — Recorded on 15-JUN-2016 13:31
System Versions: Logged with 16.01.9649 Processed with 16.01.9649 Plotted with 16.01.9649

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4500
191°
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2700
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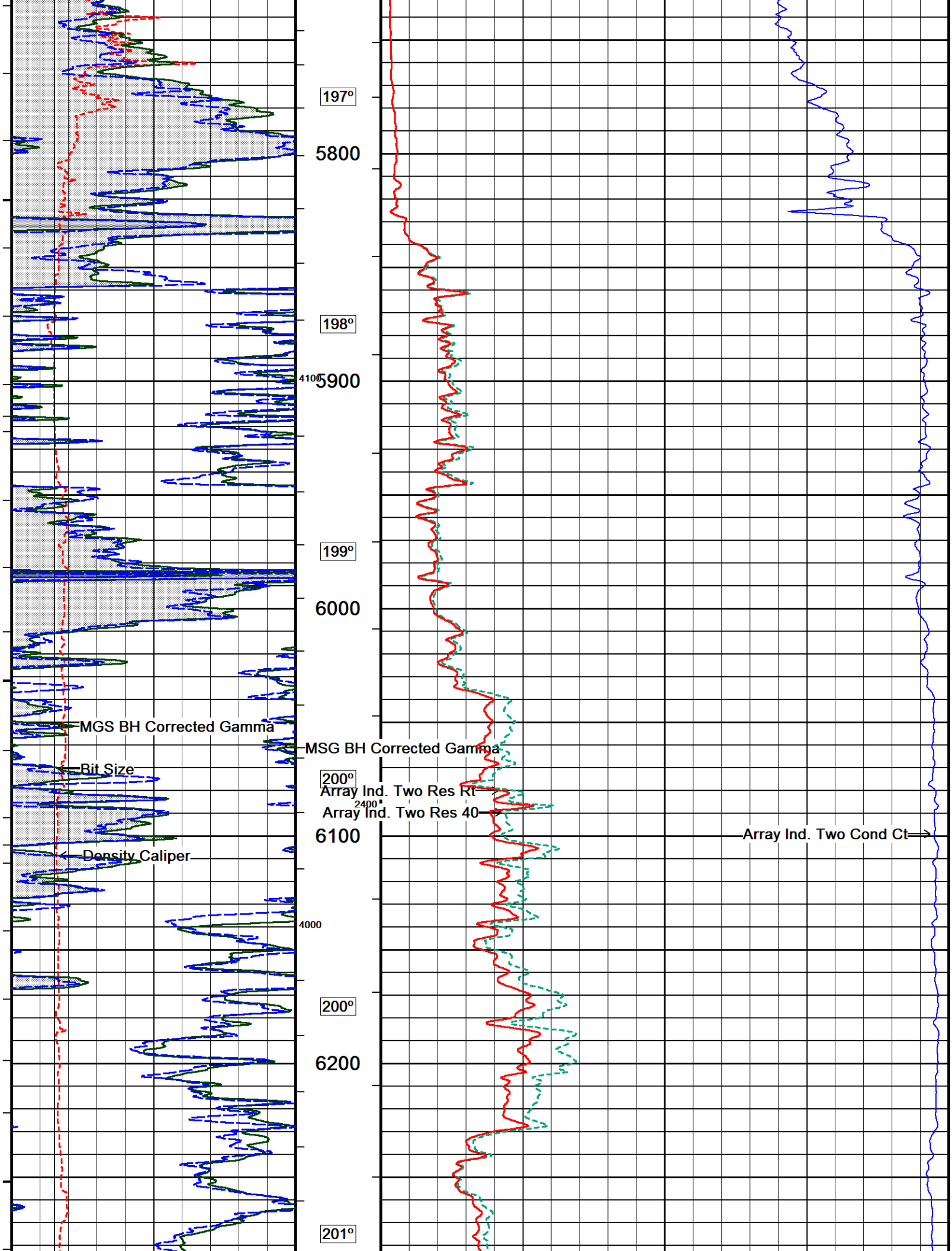
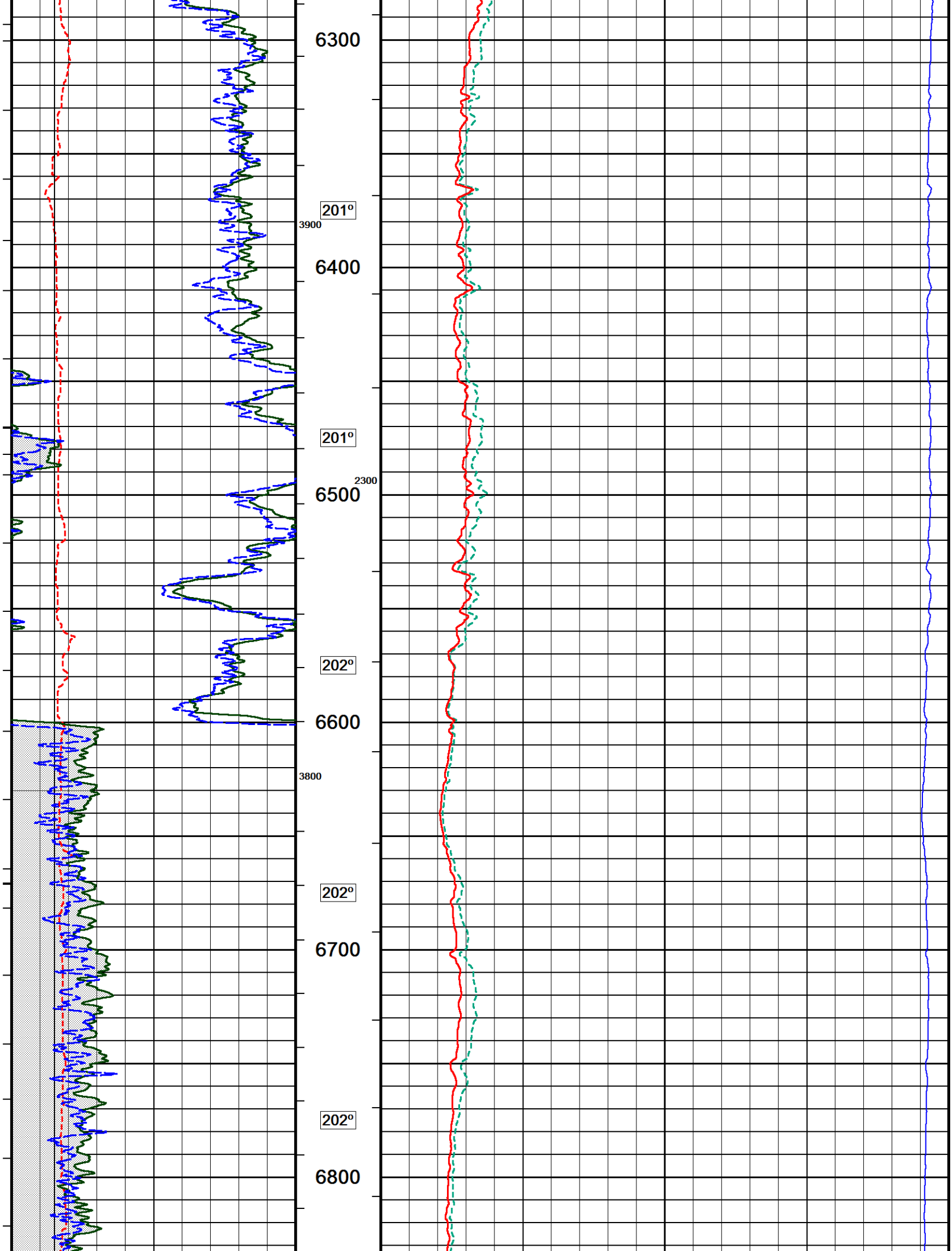
5500
2600
4300
194°
5600
196°
4200
5700
2500


197°
5800
198°
4100
5900
199°
6000
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
200°
Array Ind. Two Res Rt
2400
Array Ind. Two Res 40
6100
Array Ind. Two Cond Ct
Density Caliper
4000
200°
6200
201°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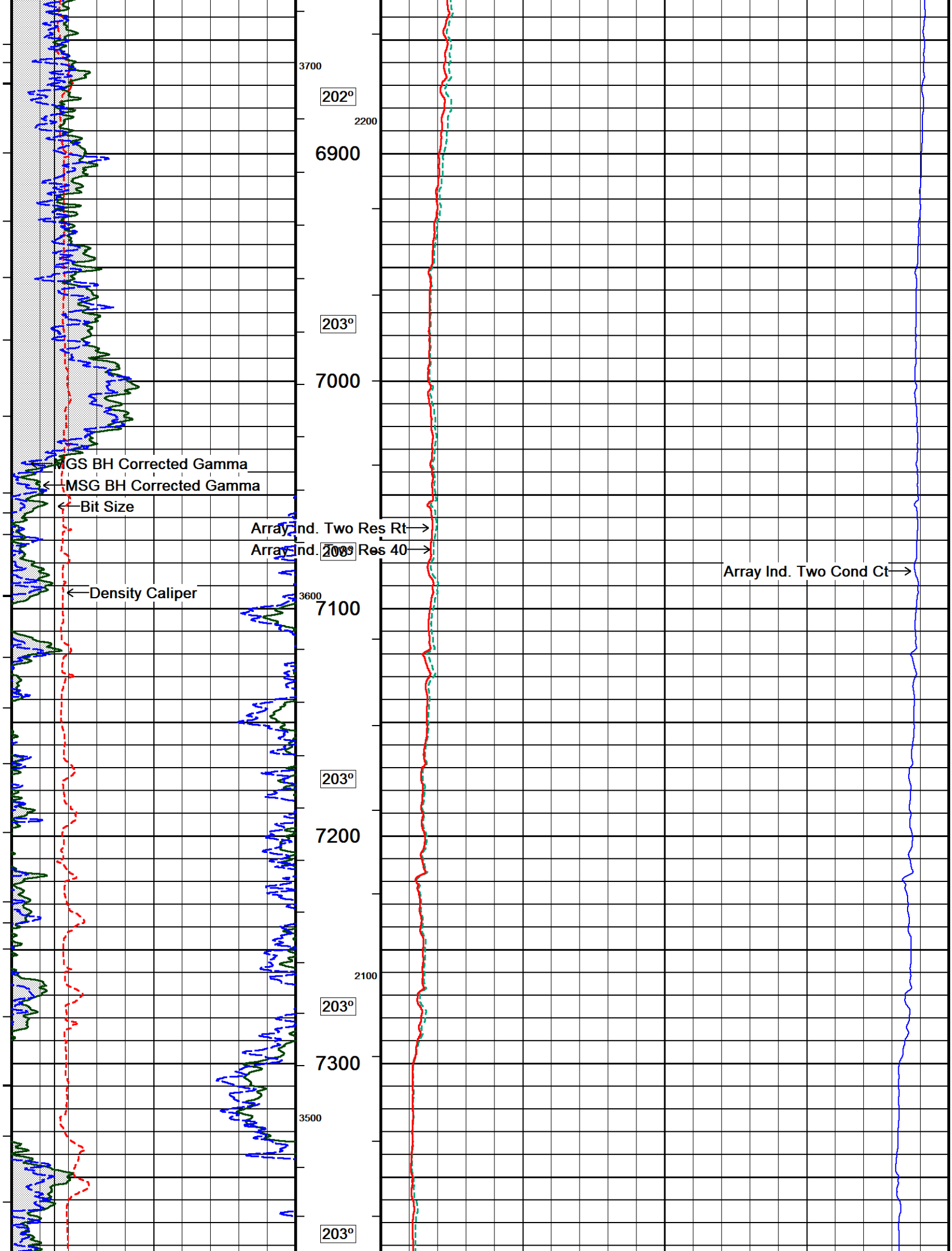
201°
3900
6400
201°
2300
6500
202°
6600
3800
202°
6700
202°
6800


3700
202°
2200
6900
203°
7000
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MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res Rt
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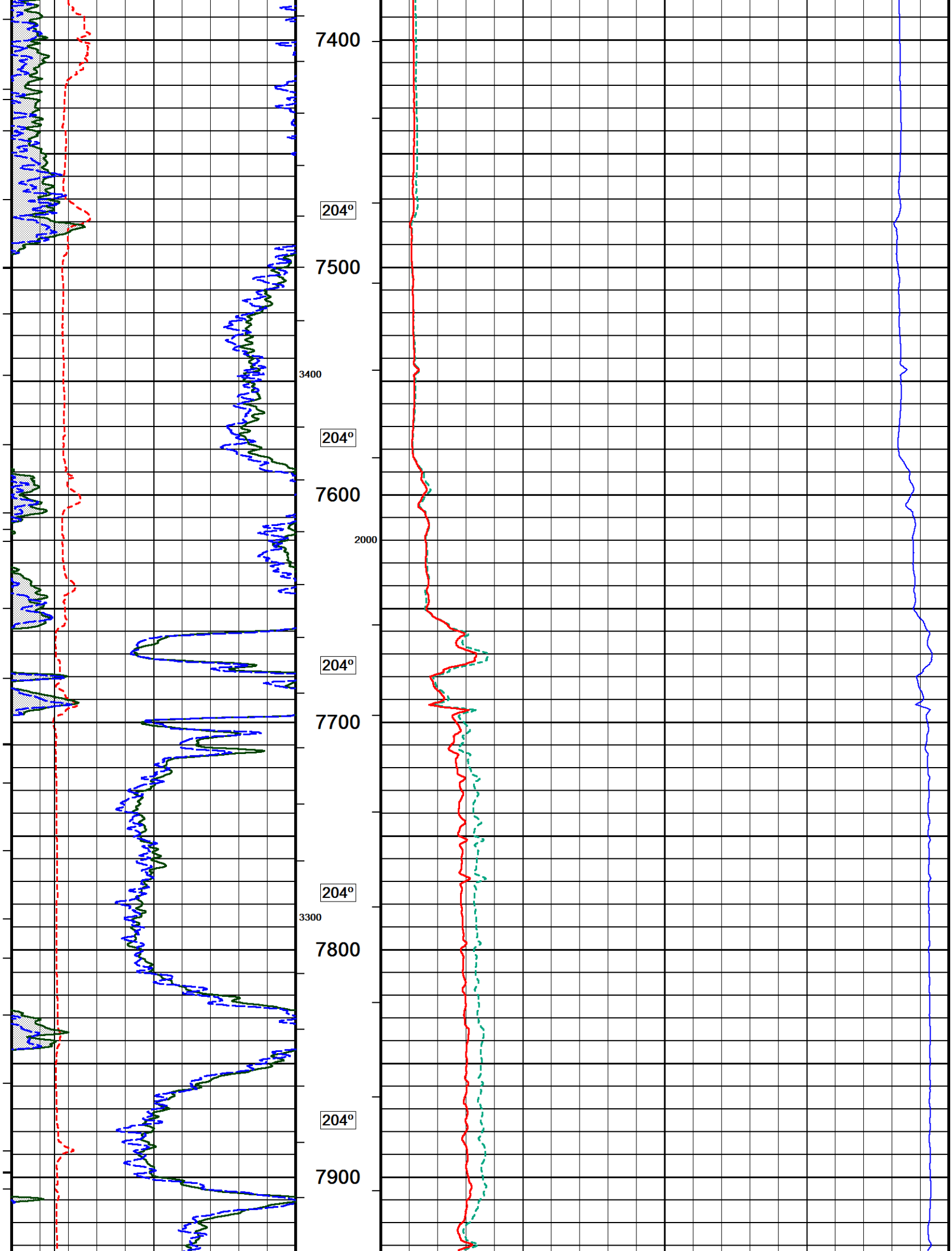
208°
Array Ind. Two Cond Ct
Density Caliper
3600
7100
203°
7200
2100
203°
7300
3500
203°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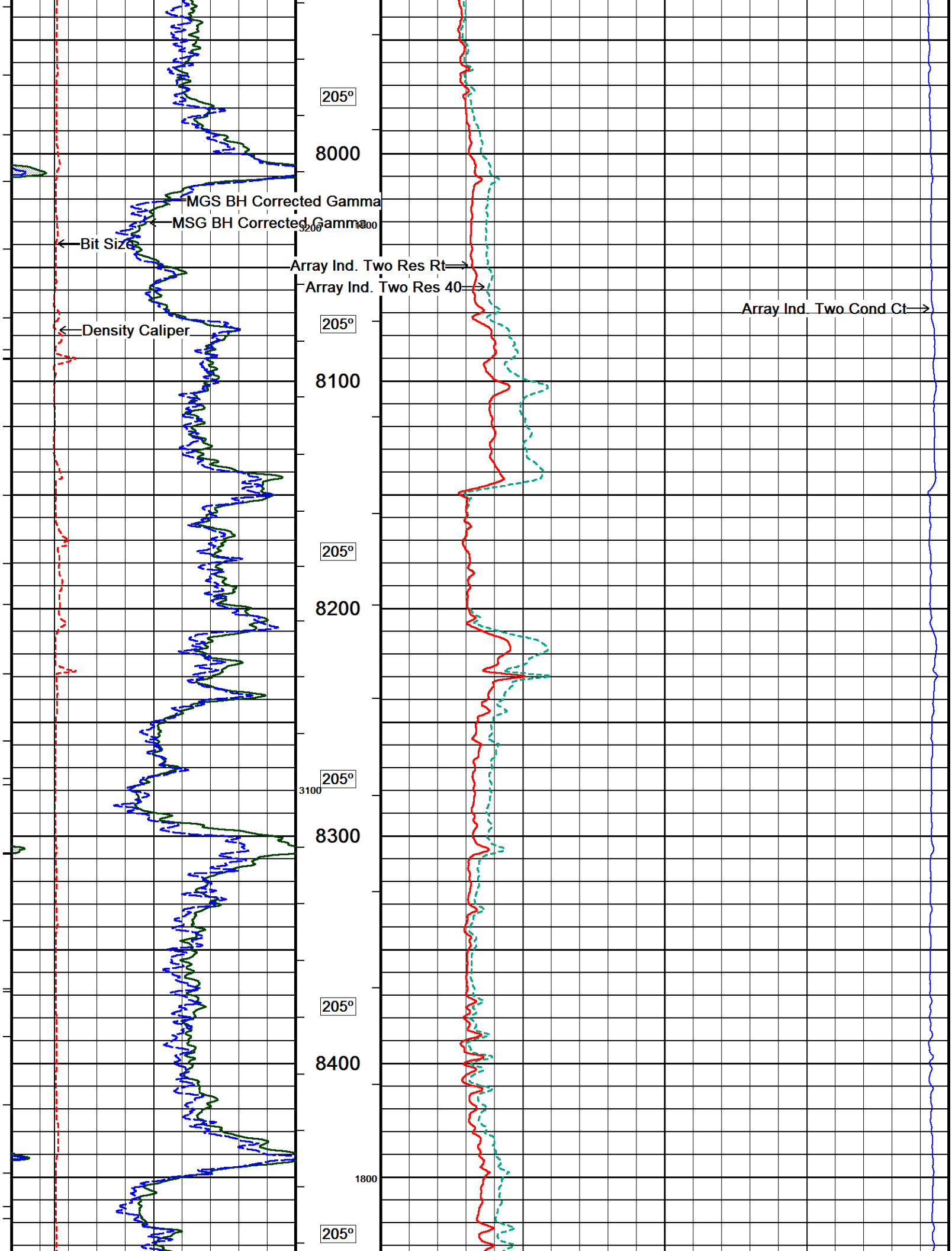
204°
7500
3400
204°
7600
2000
204°
7700
204°
3300
7800
204°
7900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MSG BH Corrected Gamma
Bit Size
Density Caliper
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Array Ind. Two Res 40
Array Ind. Two Cond Ct
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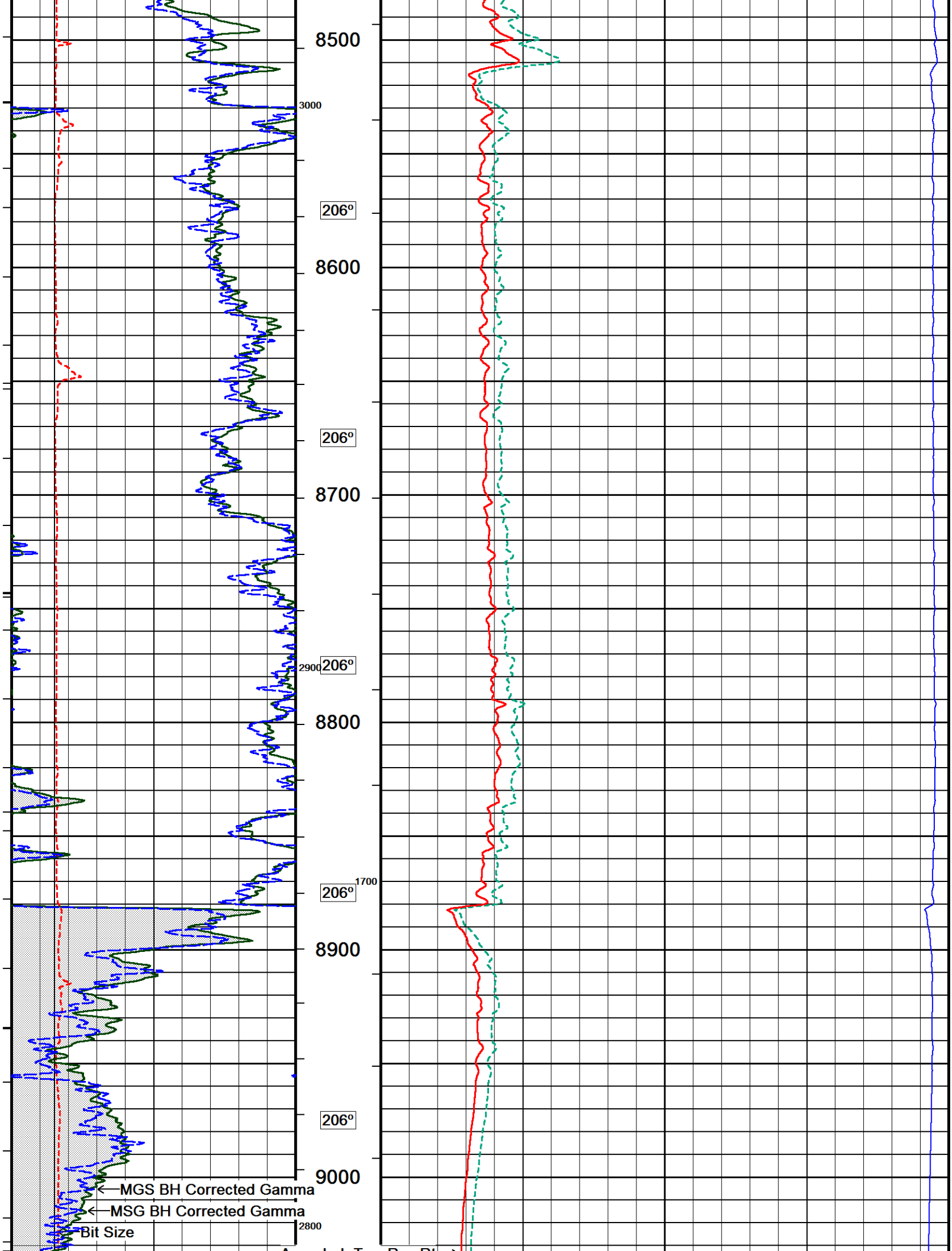
8000
205°
8100
205°
8200
205°
8300
205°
8400
205°
3200
3100
1800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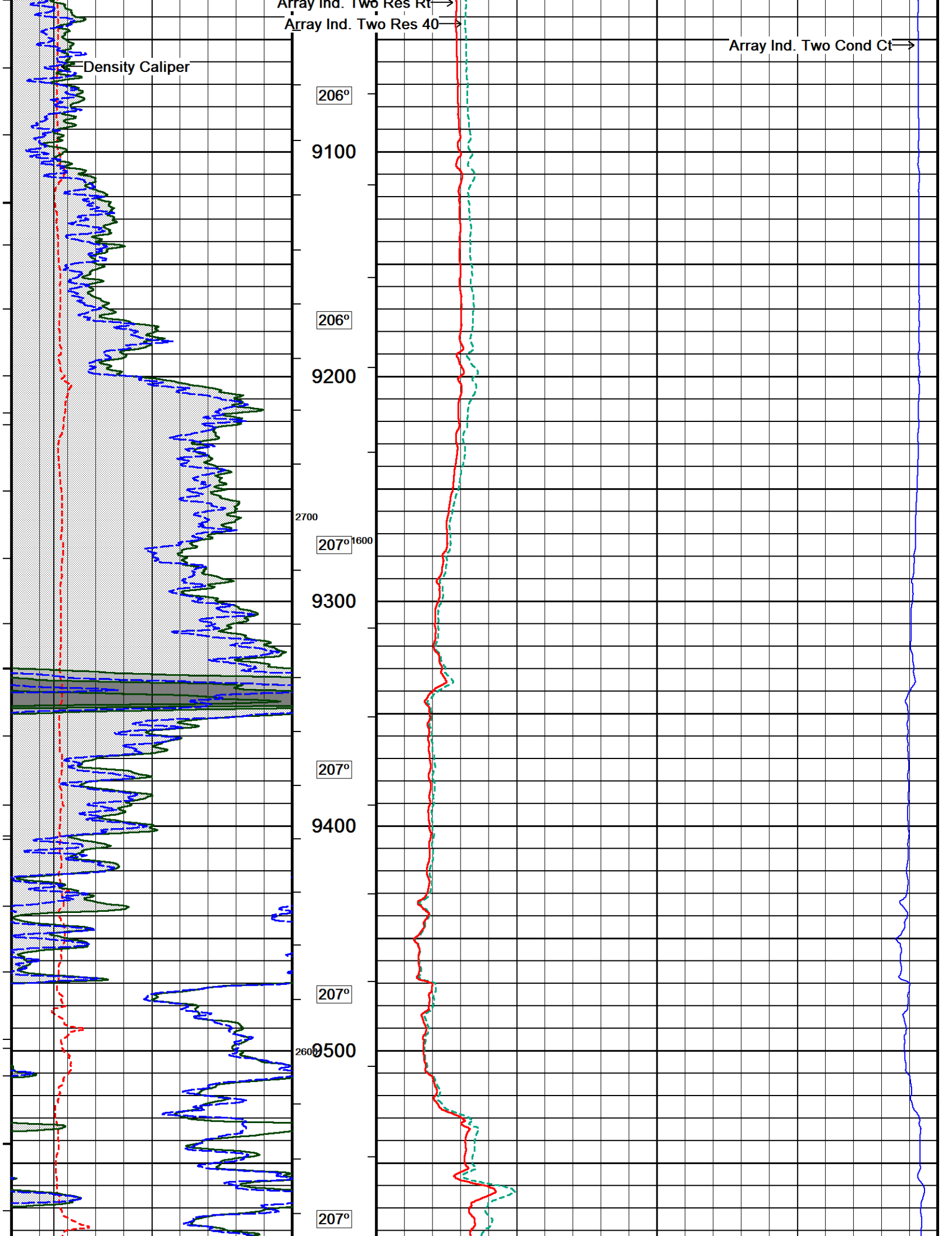
3000
206°
8600
206°
8700
2900
206°
8800
206°
1700
8900
206°
9000
2800
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size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Array Ind. Two Res 40
Array Ind. Two Cond Ct
Density Caliper
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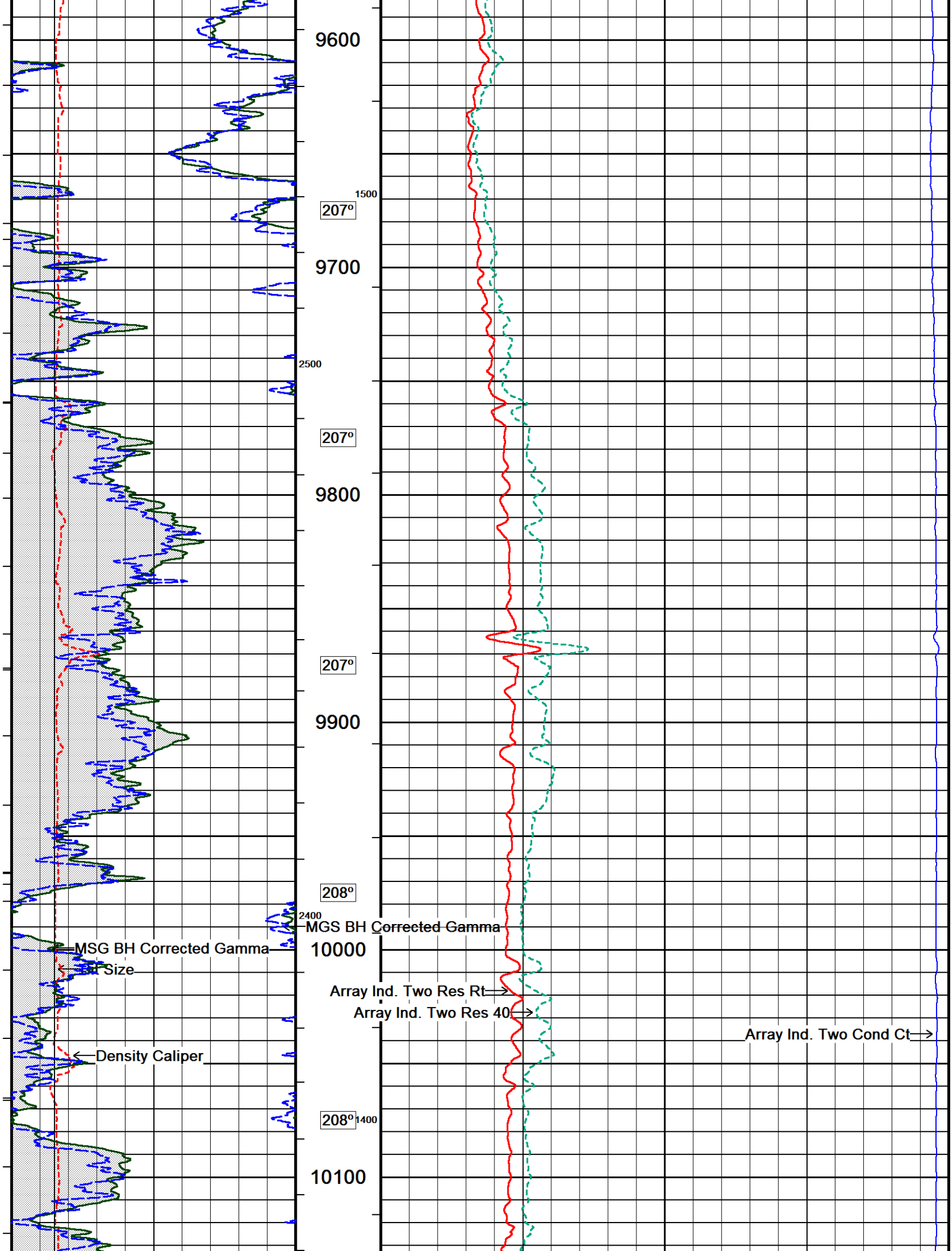
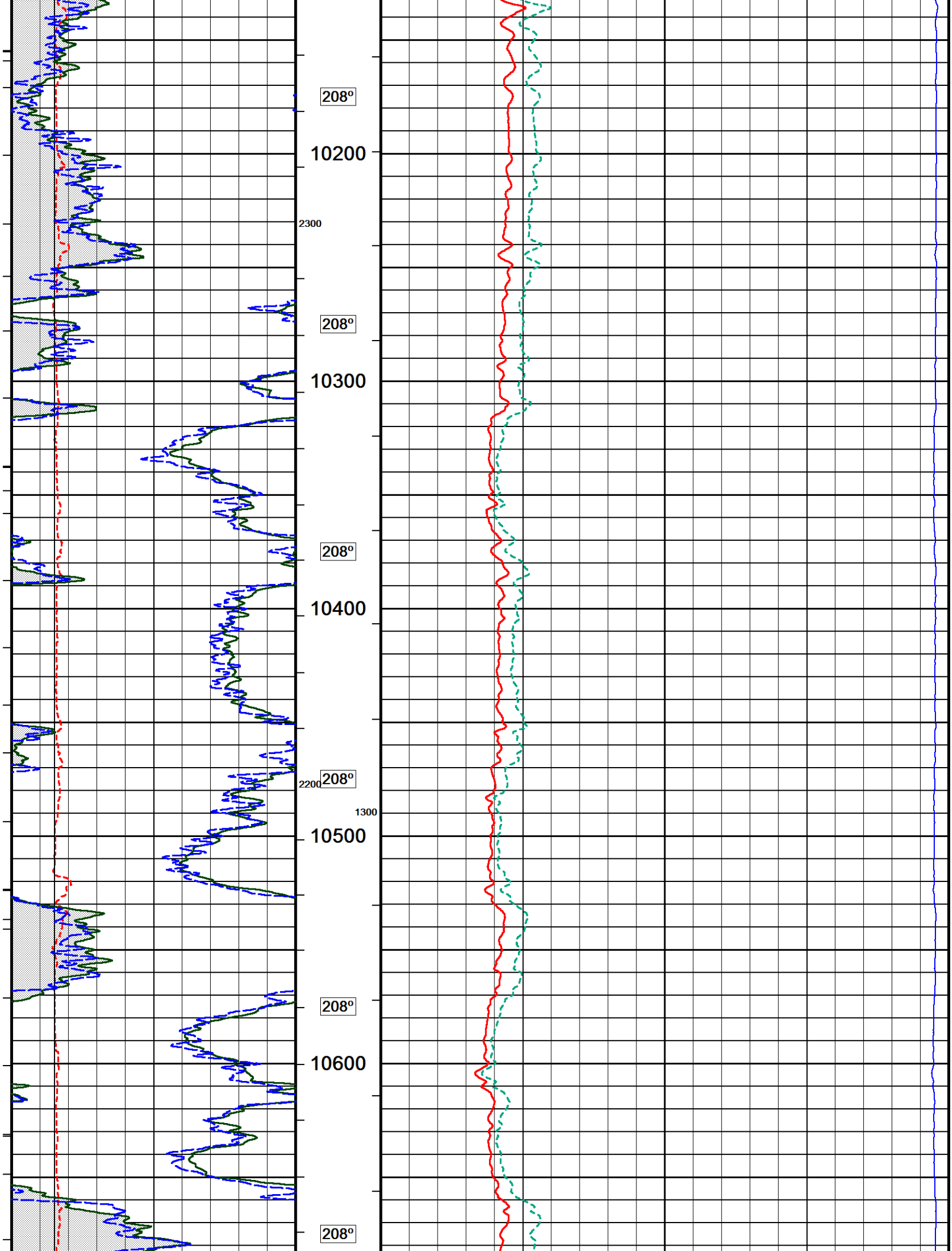
9100
206°
9200
2700
207°
1600
9300
207°
9400
207°
2600
9500
207°


9600
1500
207°
9700
2500
207°
9800
207°
9900
208°
2400
MGS BH Corrected Gamma
10000
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct
Density Caliper
208°
1400
10100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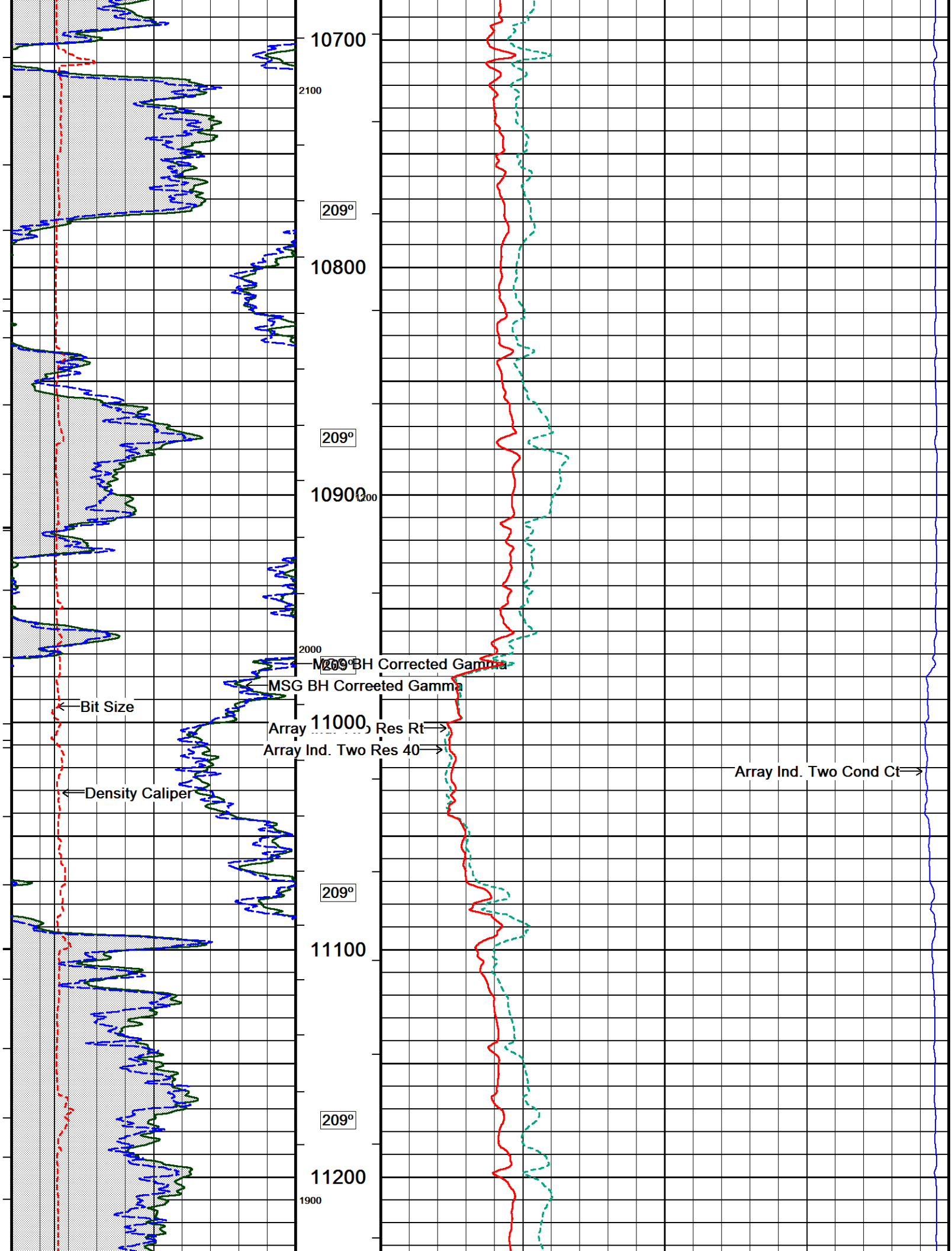
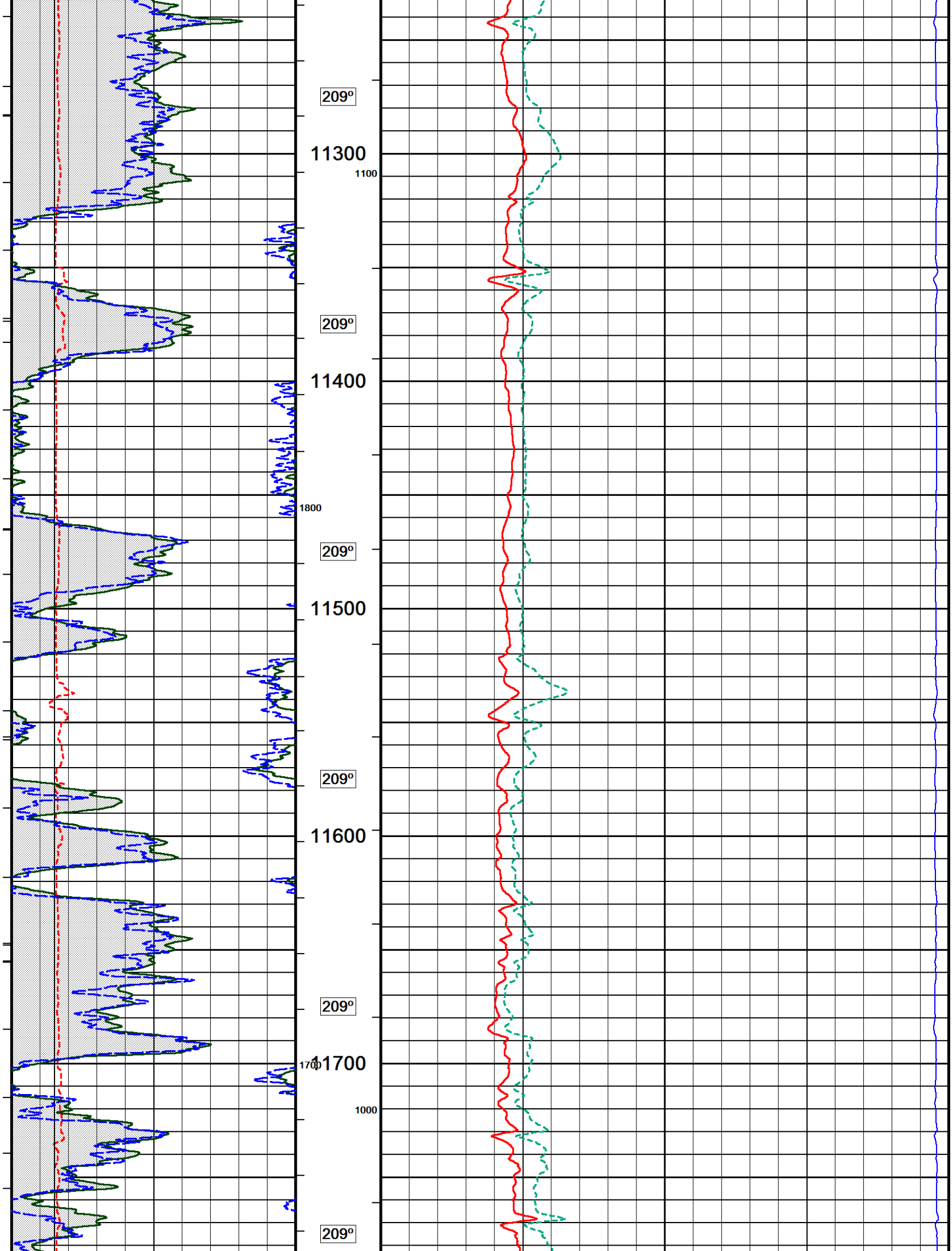
10200
2300
208°
10300
208°
10400
2200
208°
1300
10500
208°
10600
208°


10700
2100
209°
10800
209°
10900
200
2000
209°
11000
209°
11100
209°
11200
1900
Bit Size
Density Caliper
MSG BH Corrected Gamma
MSG BH Correeted Gamma
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct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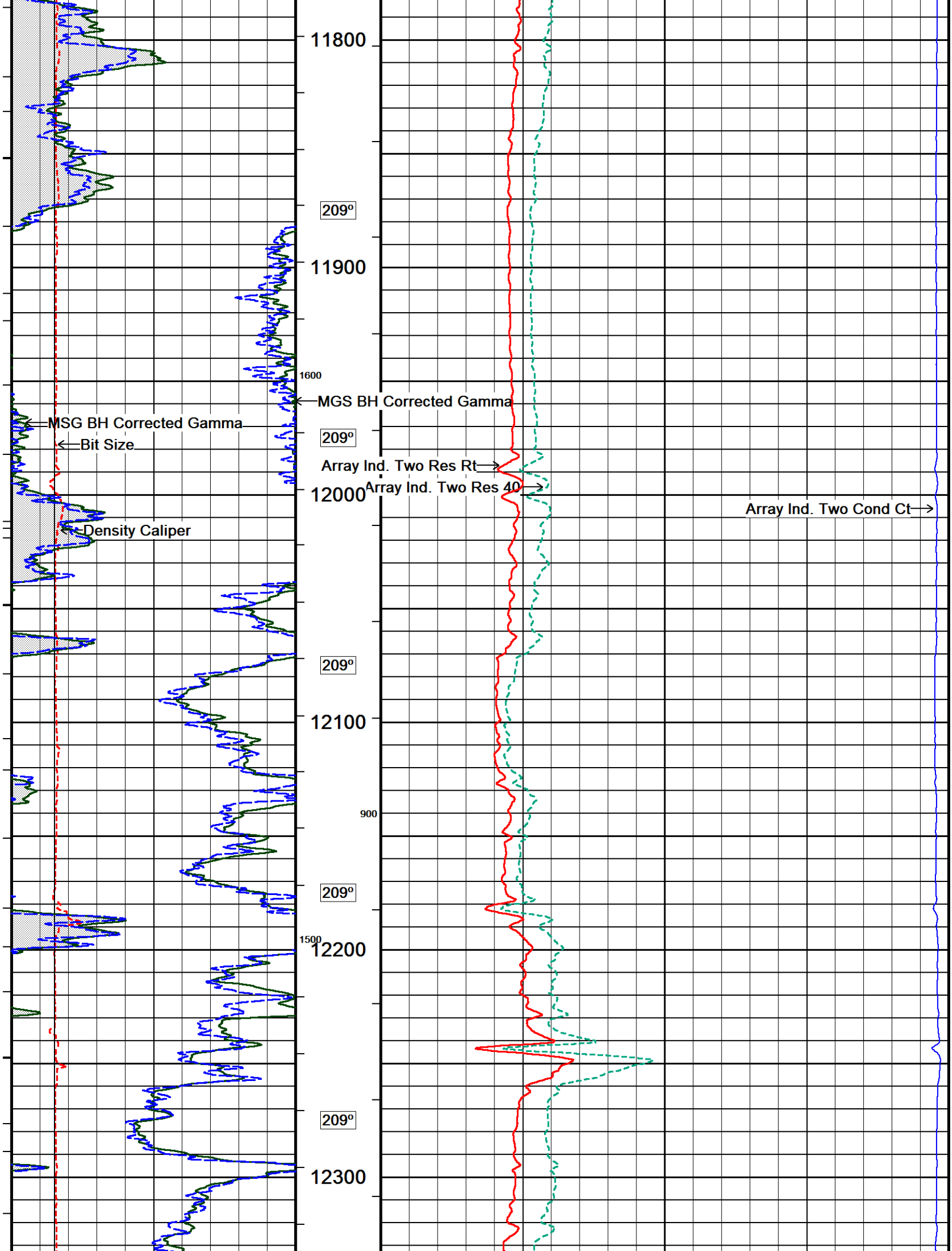
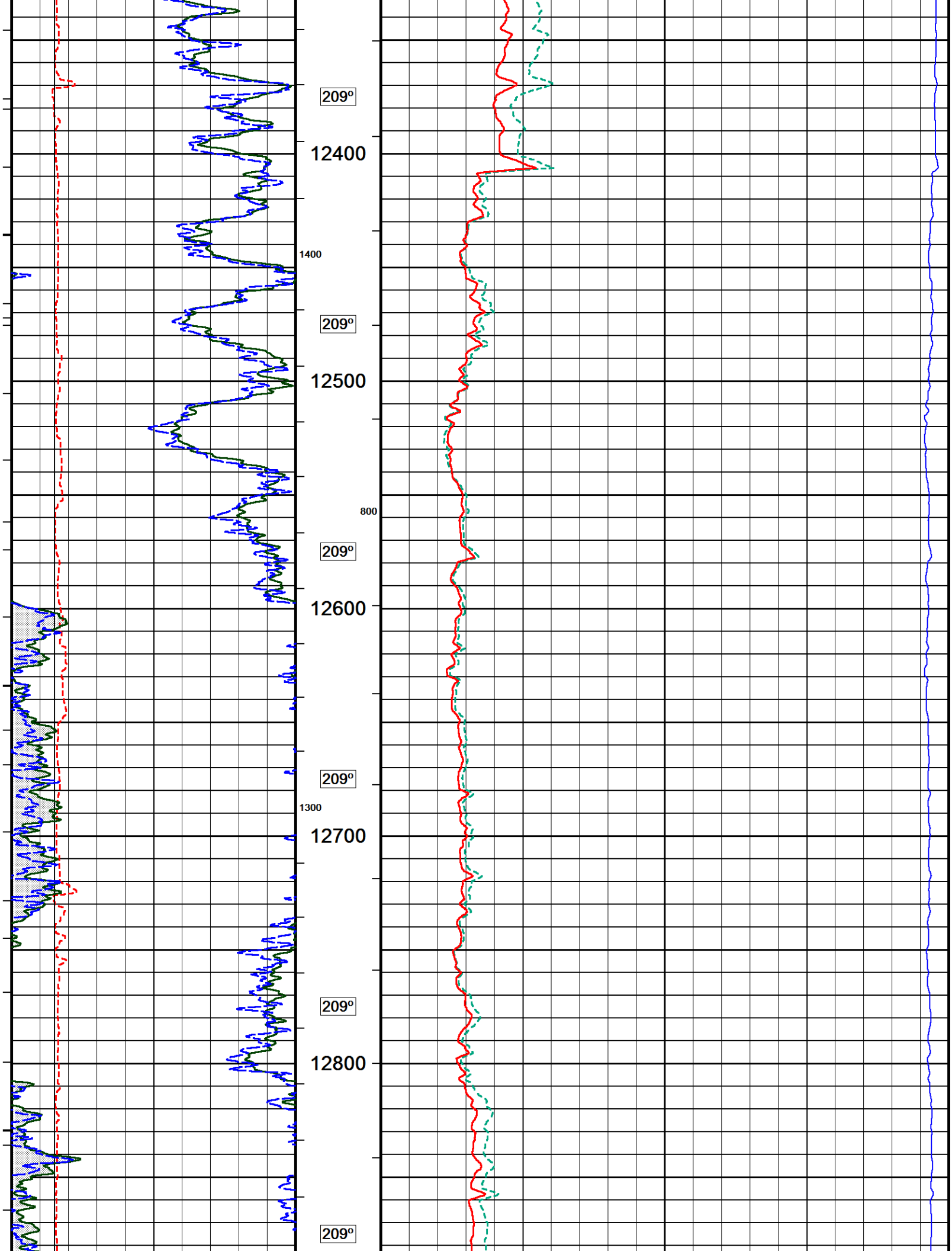
11300
1100
209°
11400
1800
209°
11500
209°
11600
209°
1700
11700
1000
209°


11800
209°
11900
1600
MGS BH Corrected Gamma
MSG BH Corrected Gamma
209°
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 40
12000
Array Ind. Two Cond Ct
Density Caliper
209°
12100
900
209°
1500
12200
209°
12300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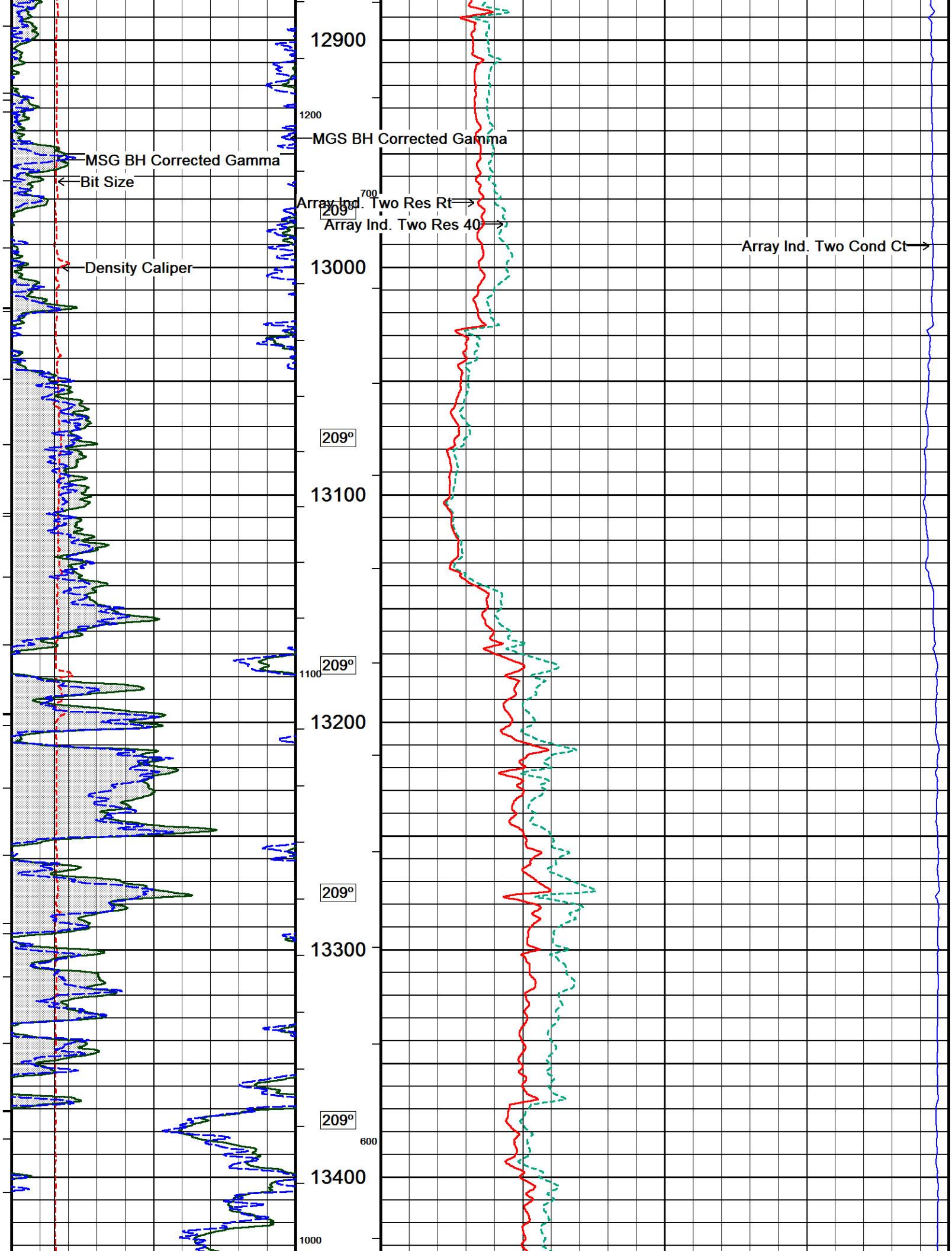
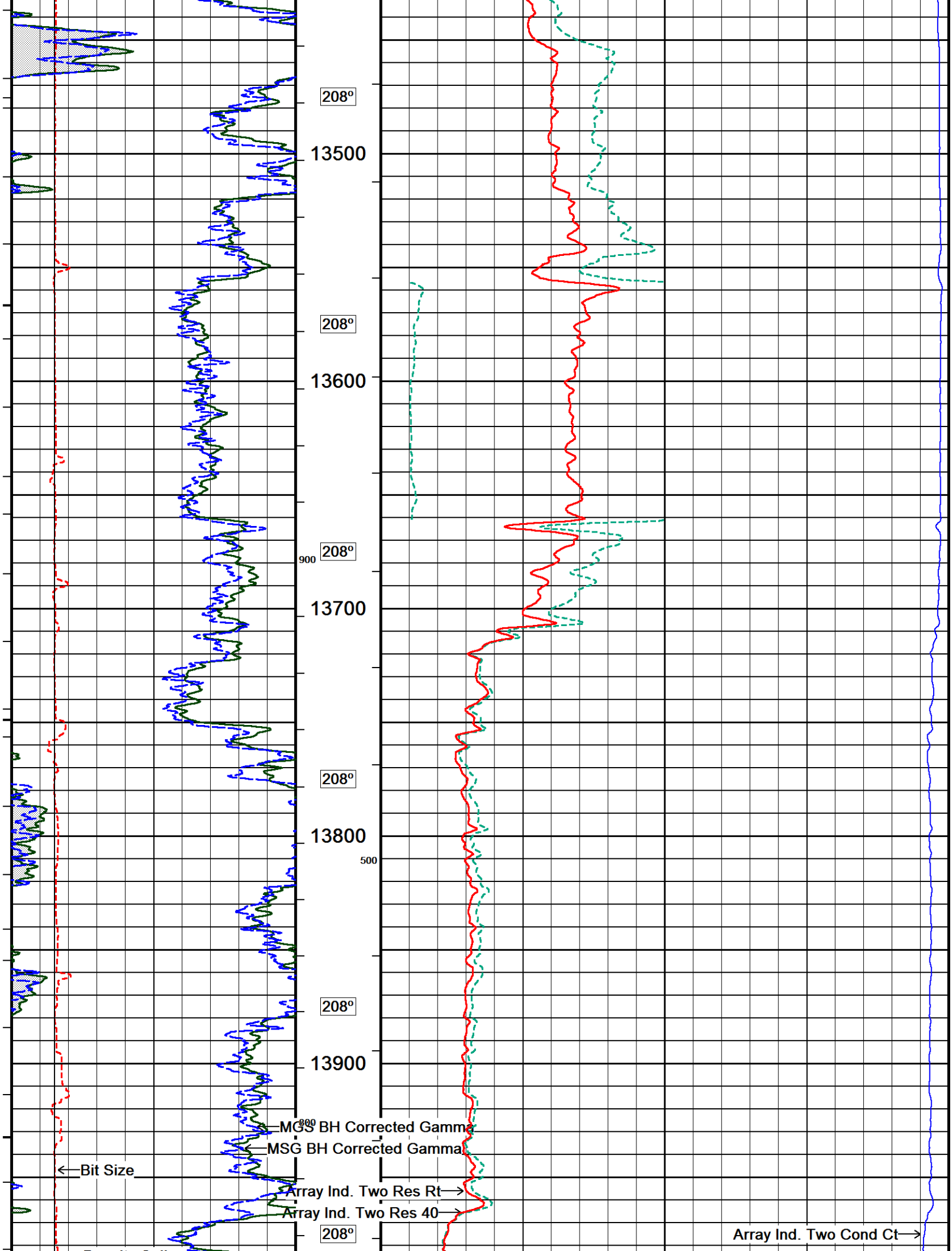
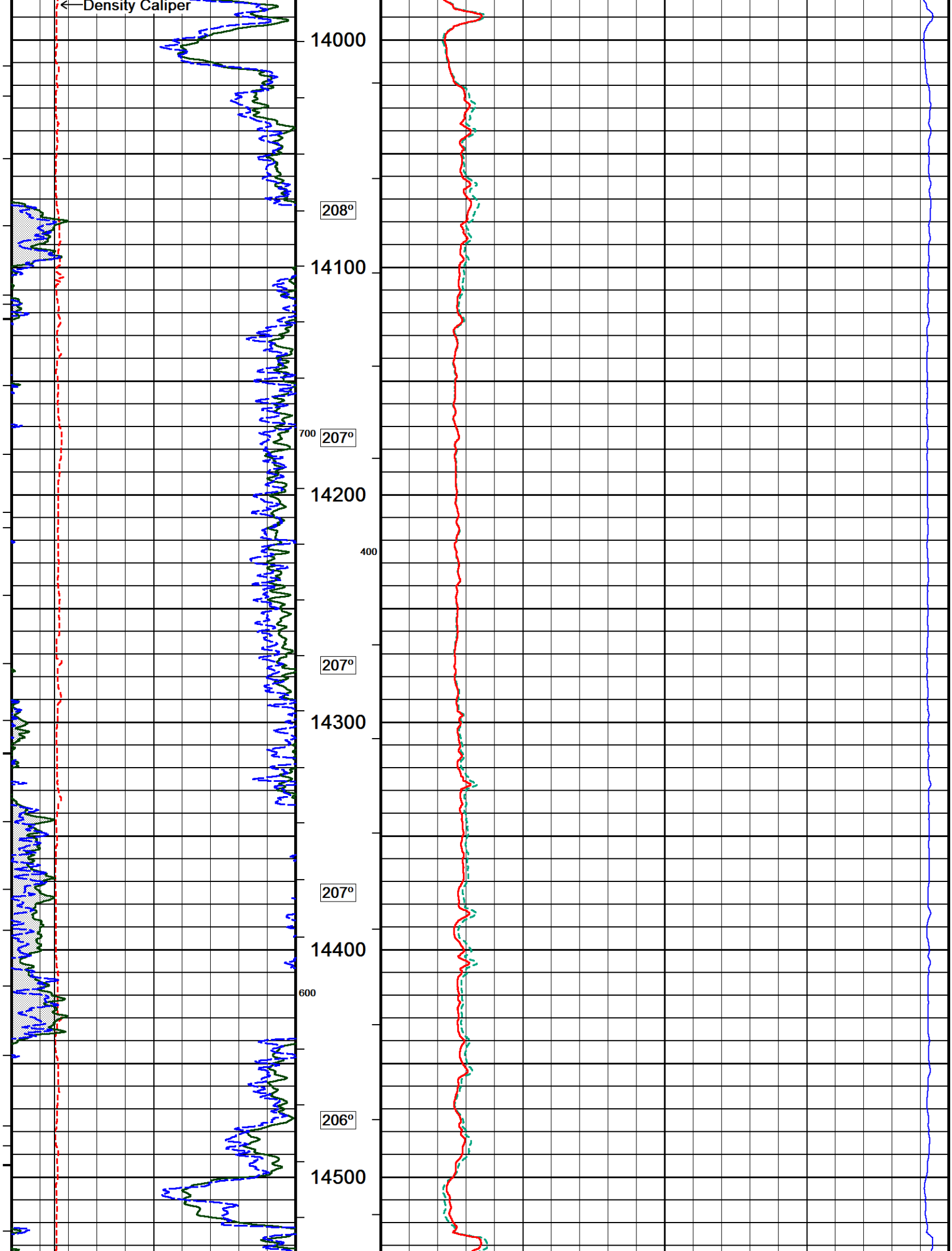
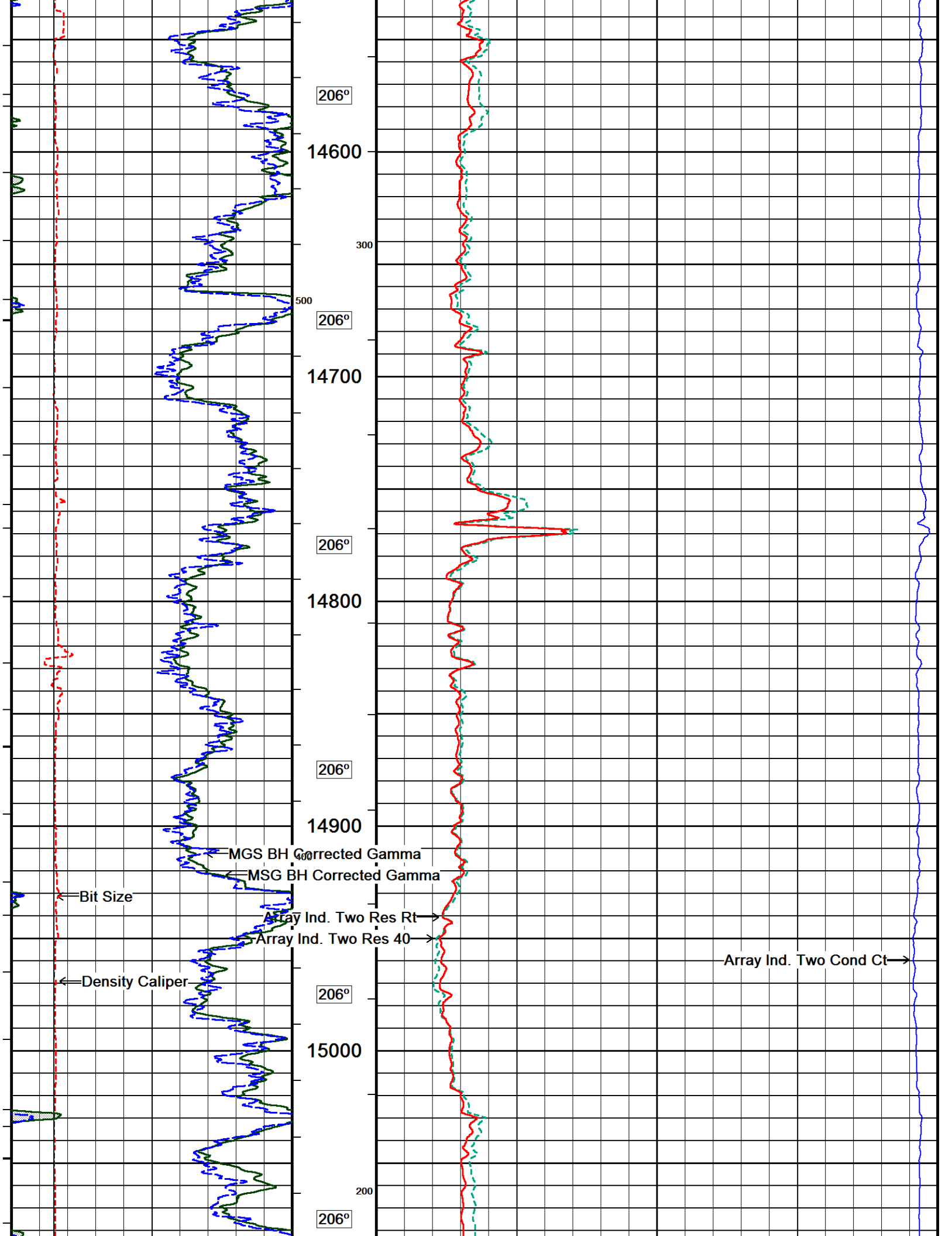
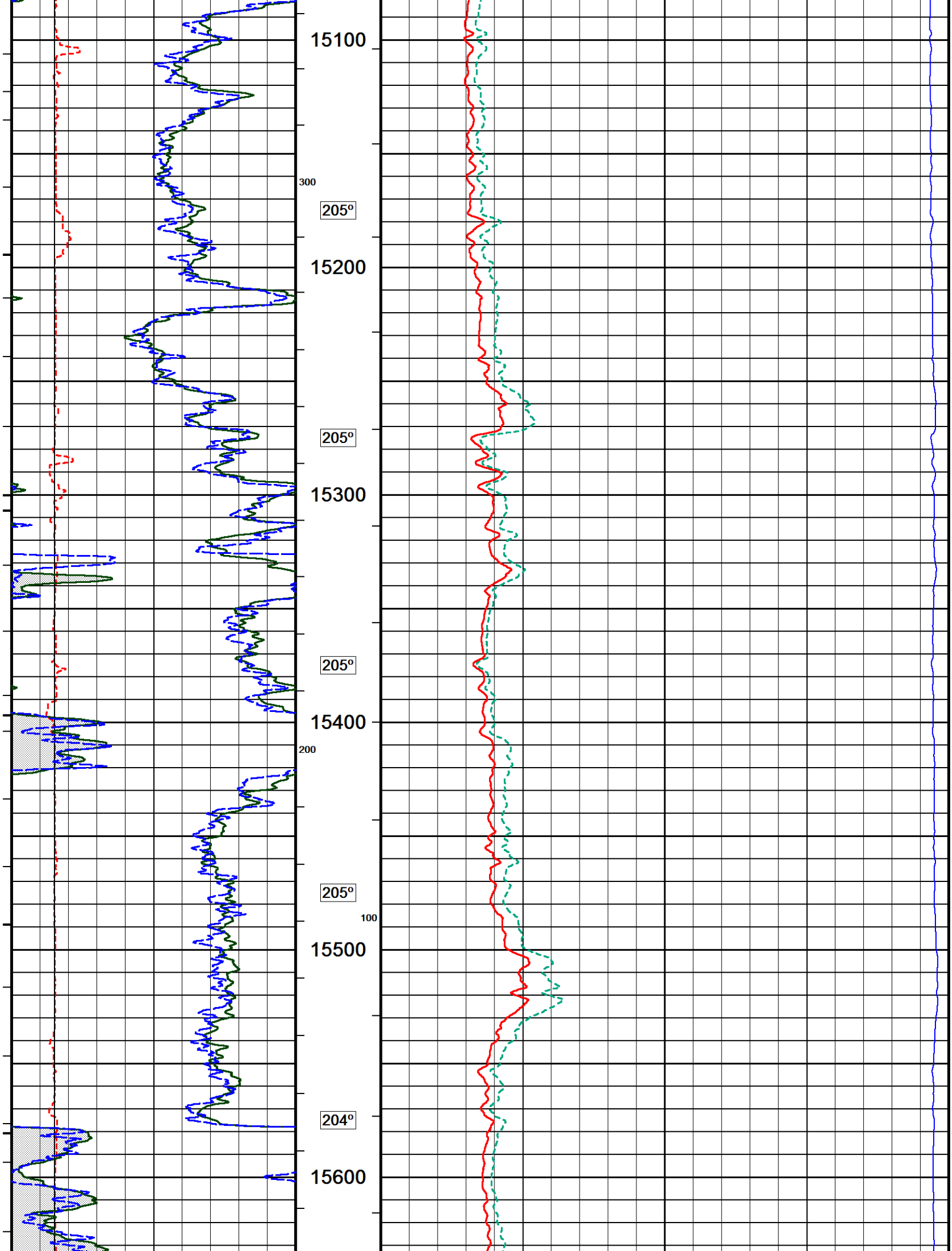
12400
1400
209º
12500
800
209º
12600
209º
1300
12700
209º
12800
209º


12900
1200
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
700
Array Ind. Two Res Rt
209º
Array Ind. Two Res 40
Array Ind. Two Cond Ct
Density Caliper
13000
209º
13100
209º
1100
13200
209º
13300
209º
600
13400
1000


208°
13500
208°
13600
208°
900
13700
208°
13800
500
208°
13900
800
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 40
208°
Array Ind. Two Cond Ct


⟵Density Caliper
14000
208°
14100
700
207°
14200
400
207°
14300
207°
14400
600
206°
14500


206°
14600
300
500
206°
14700
206°
14800
206°
14900
400
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct
Density Caliper
206°
15000
200
206°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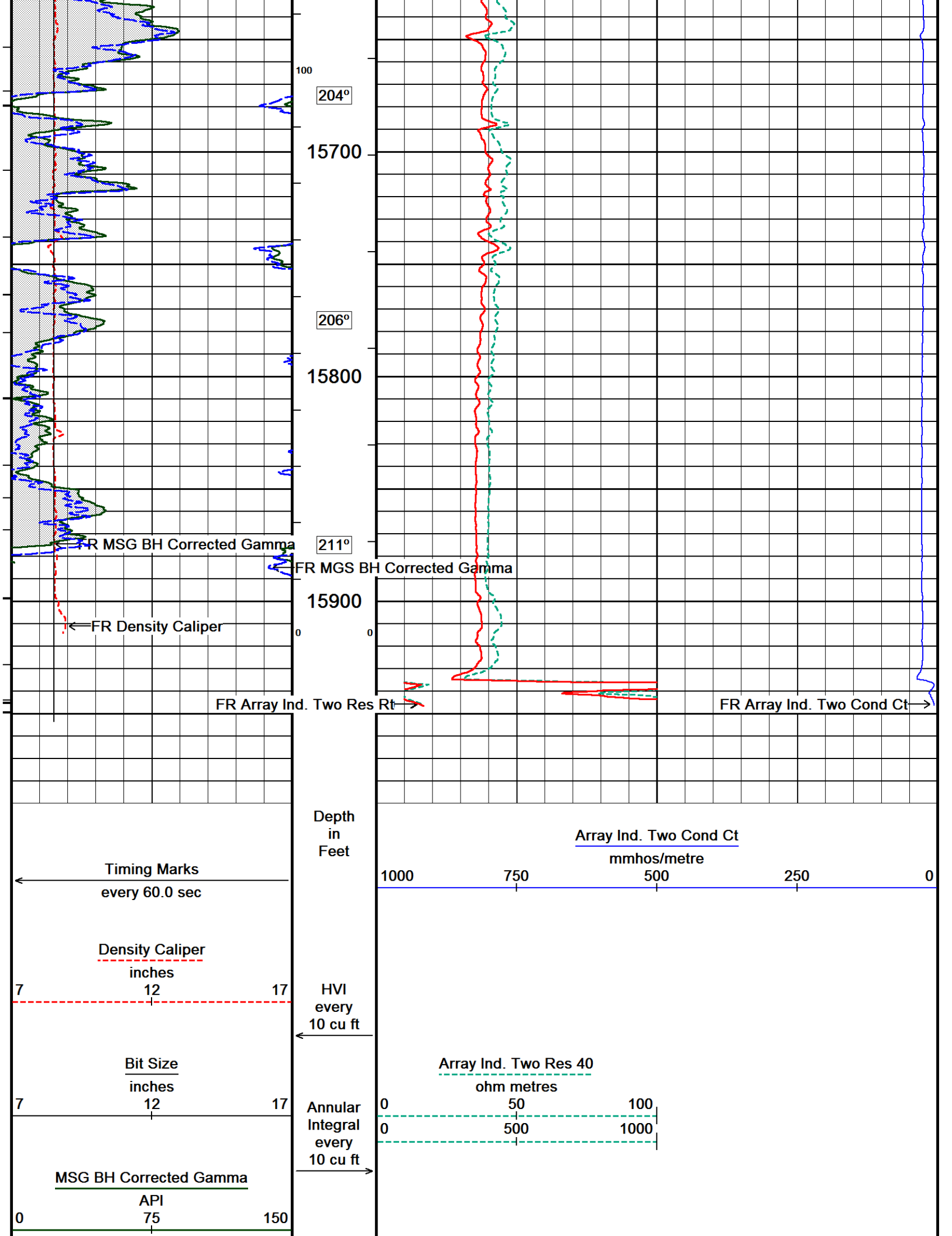
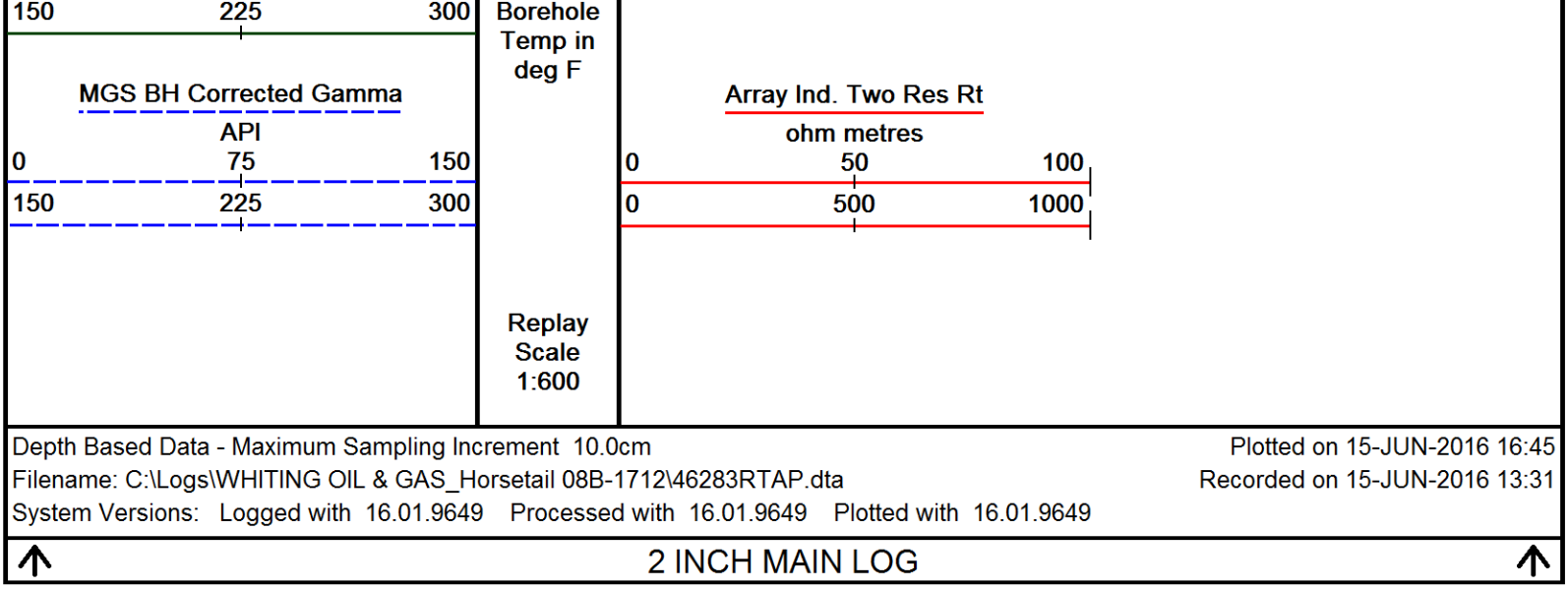
300
205°
15200
205°
15300
205°
15400
200
205°
100
15500
204°
15600


100
204°
15700
206°
15800
211°
15900
0
0
FR MSG BH Corrected Gamma
FR MGS BH Corrected Gamma
FR Density Caliper
FR Array Ind. Two Res Rt
FR Array Ind. Two Cond Ct
Depth
in
Feet
Timing Marks
every 60.0 sec
Array Ind. Two Cond Ct
mmhos/metre
1000
750
500
250
0
Density Caliper
inches
7
12
17
HVI
every
10 cu ft
Bit Size
inches
7
12
17
Array Ind. Two Res 40
ohm metres
0
50
100
0
500
1000
Annular
Integral
every
10 cu ft
MSG BH Corrected Gamma
API
0
75
150

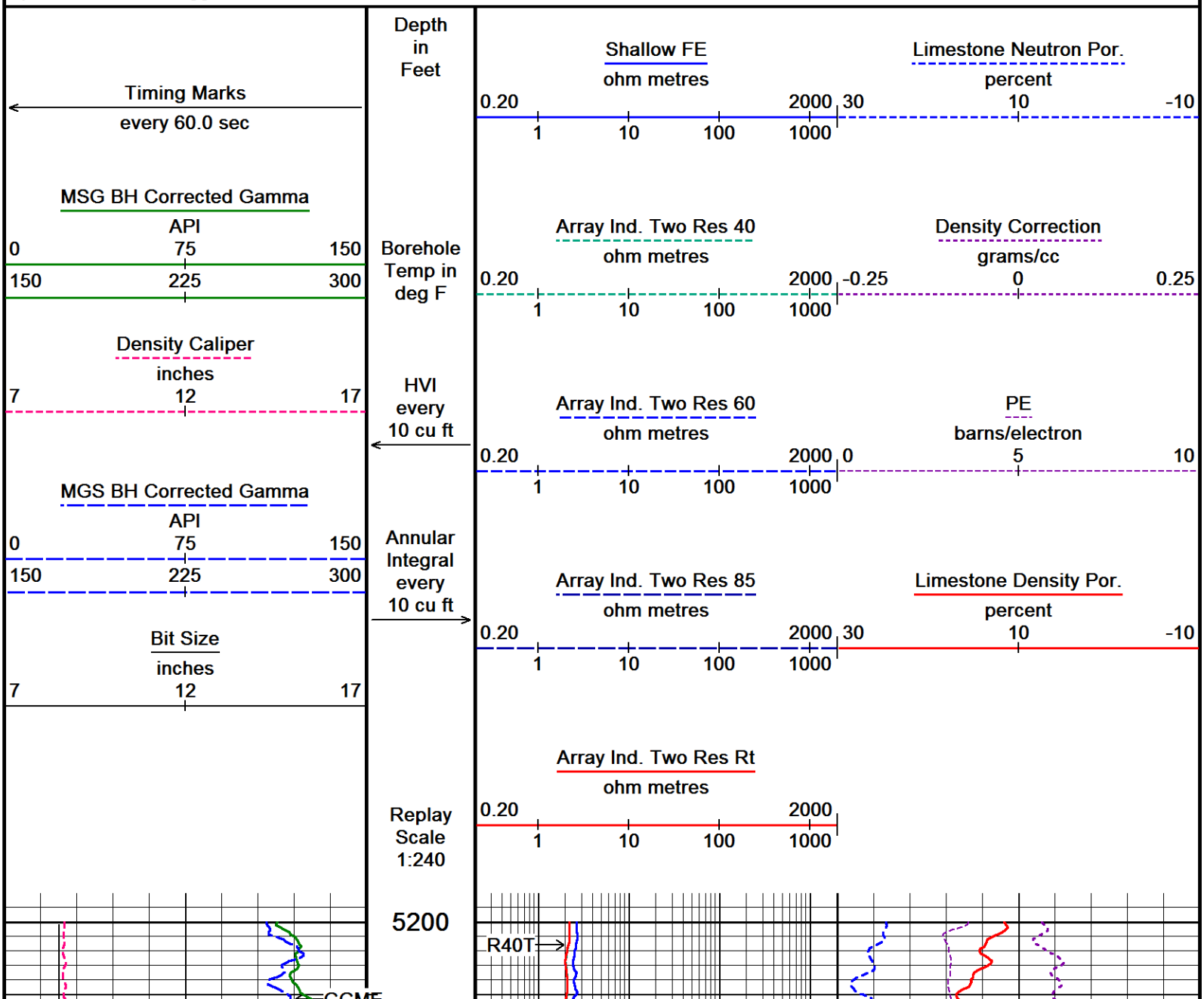


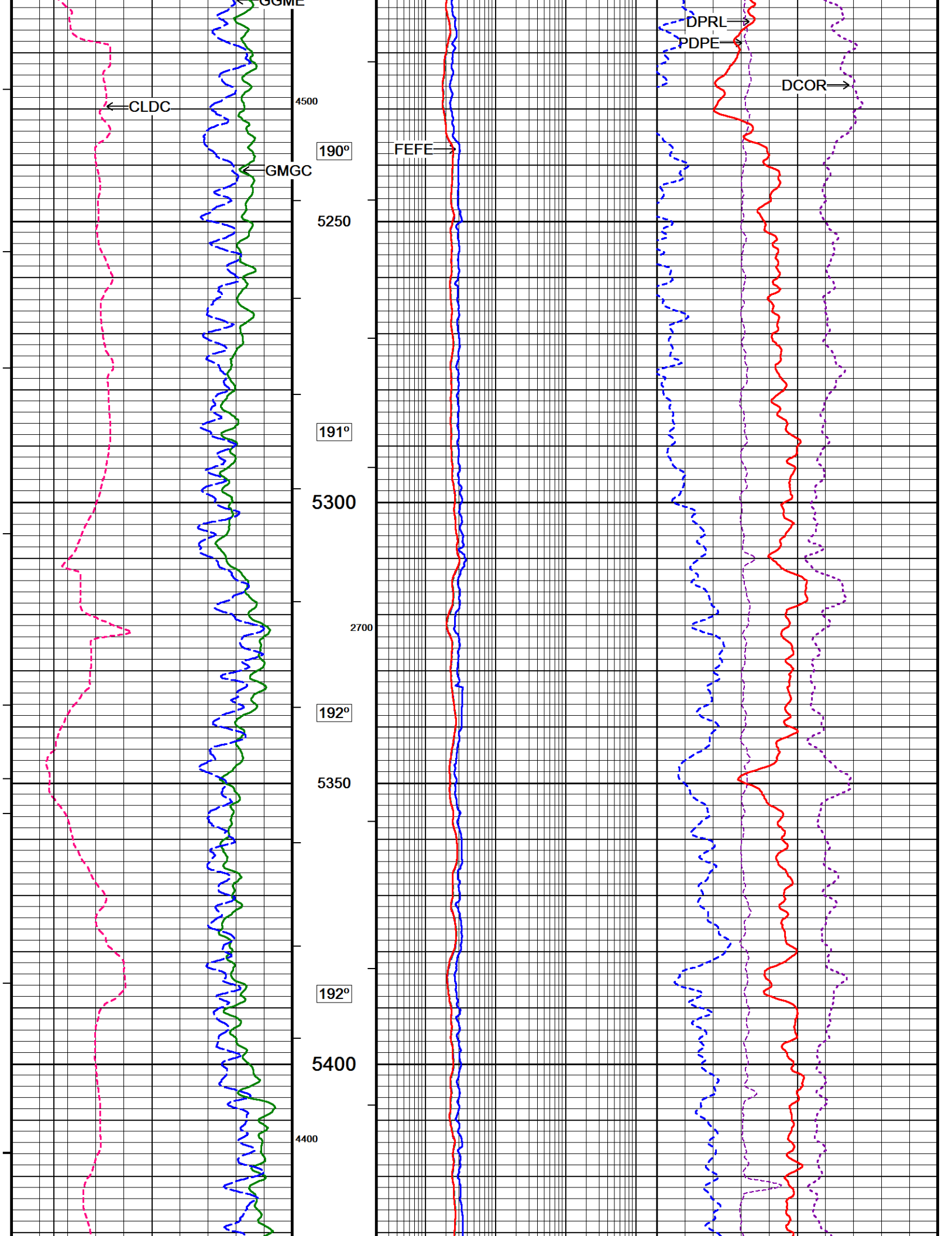
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2016 16:45
Filename: C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta — Recorded on 15-JUN-2016 13:31
System Versions: Logged with 16.01.9649 Processed with 16.01.9649 Plotted with 16.01.9649

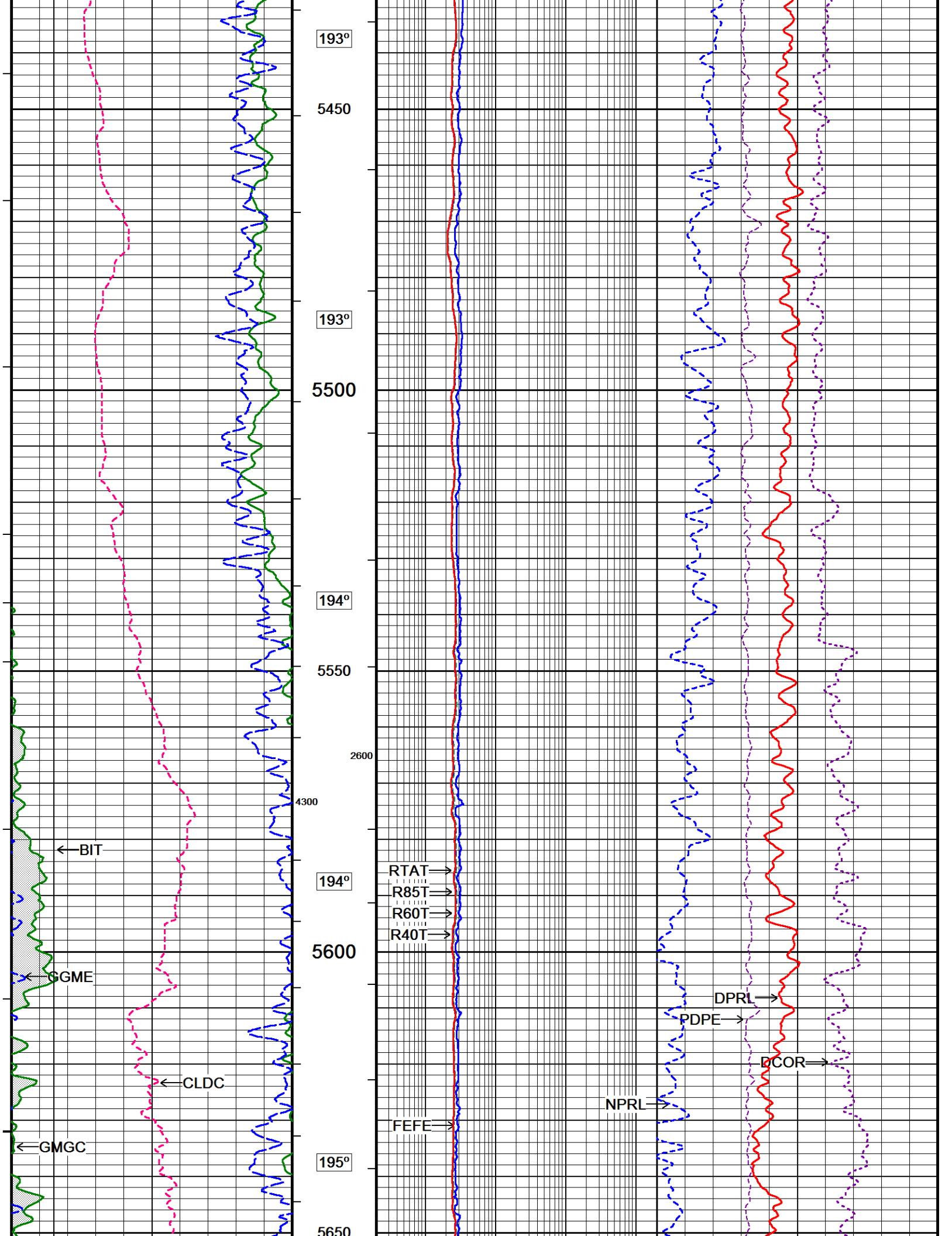
2 INCH MAIN LOG

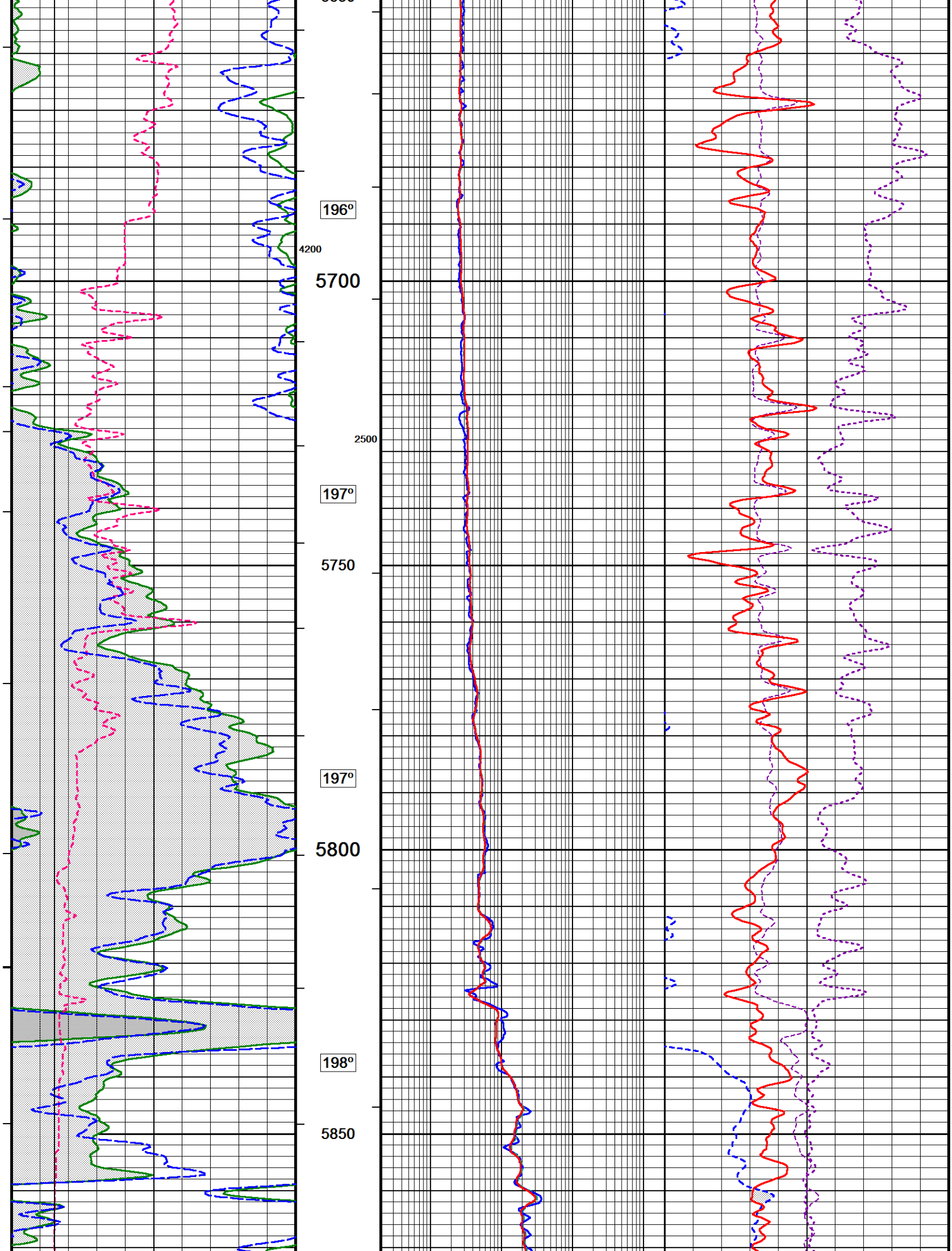
5 INCH MAIN LOG

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2016 16:45
Filename: C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta — Recorded on 15-JUN-2016 13:31
System Versions: Logged with 16.01.9649 Processed with 16.01.9649 Plotted with 16.01.9649




GGME
CLDC
GMGC
FEFE
DPRL
PDPE
DCOR
4500
190°
5250
191°
5300
2700
192°
5350
192°
5400
4400


193°
5450
193°
5500
194°
5550
2600
4300
194°
5600
195°
5650
BIT
SGME
CLDC
GMGC
RTAT
R85T
R60T
R40T
FEFE
DPRL
PDPE
DCOR
NPRL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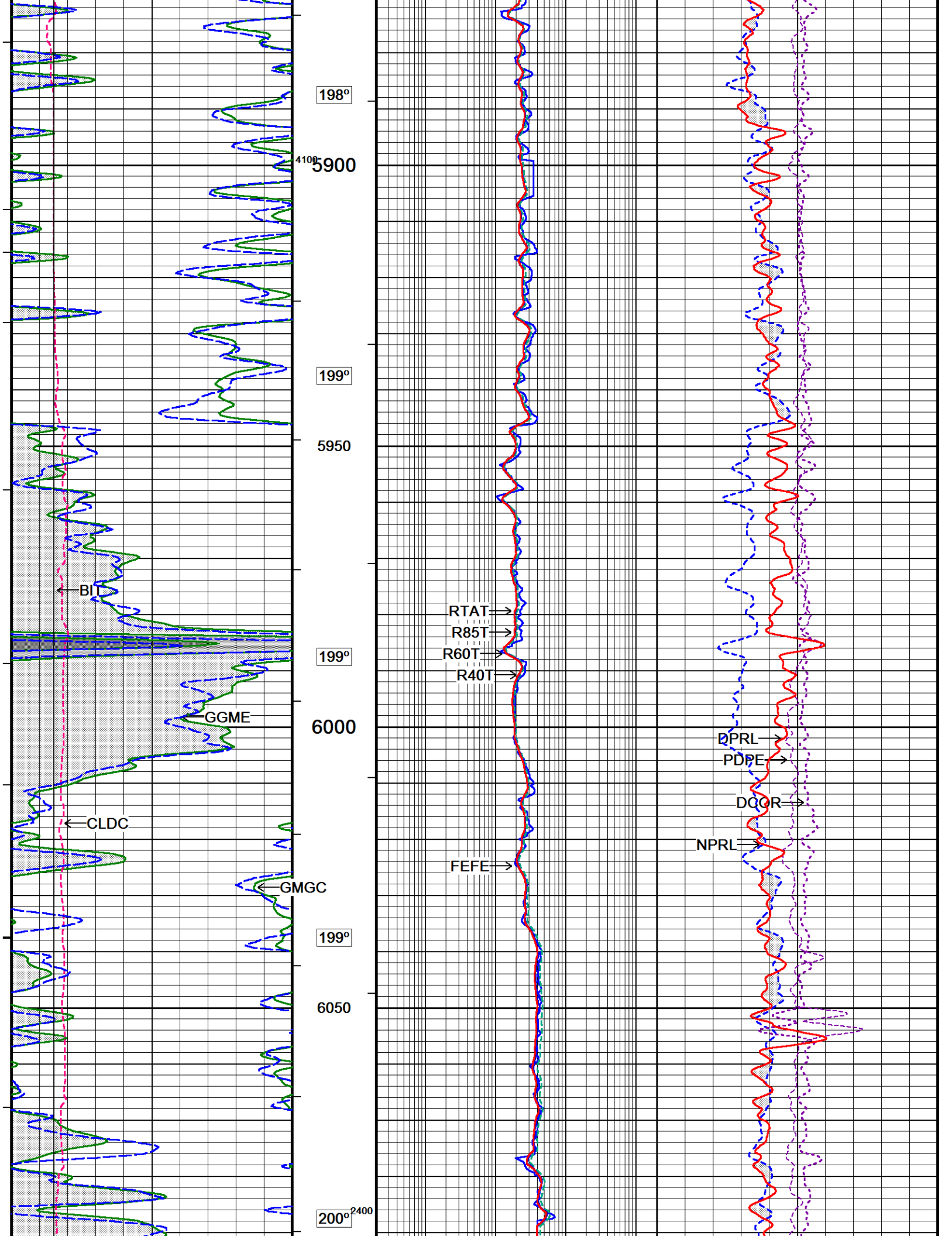
4200
5700
2500
197°
5750
197°
5800
198°
5850


198°
4100
5900
199°
5950
BIT
RTAT
R85T
R60T
R40T
199°
GGME
6000
DPRL
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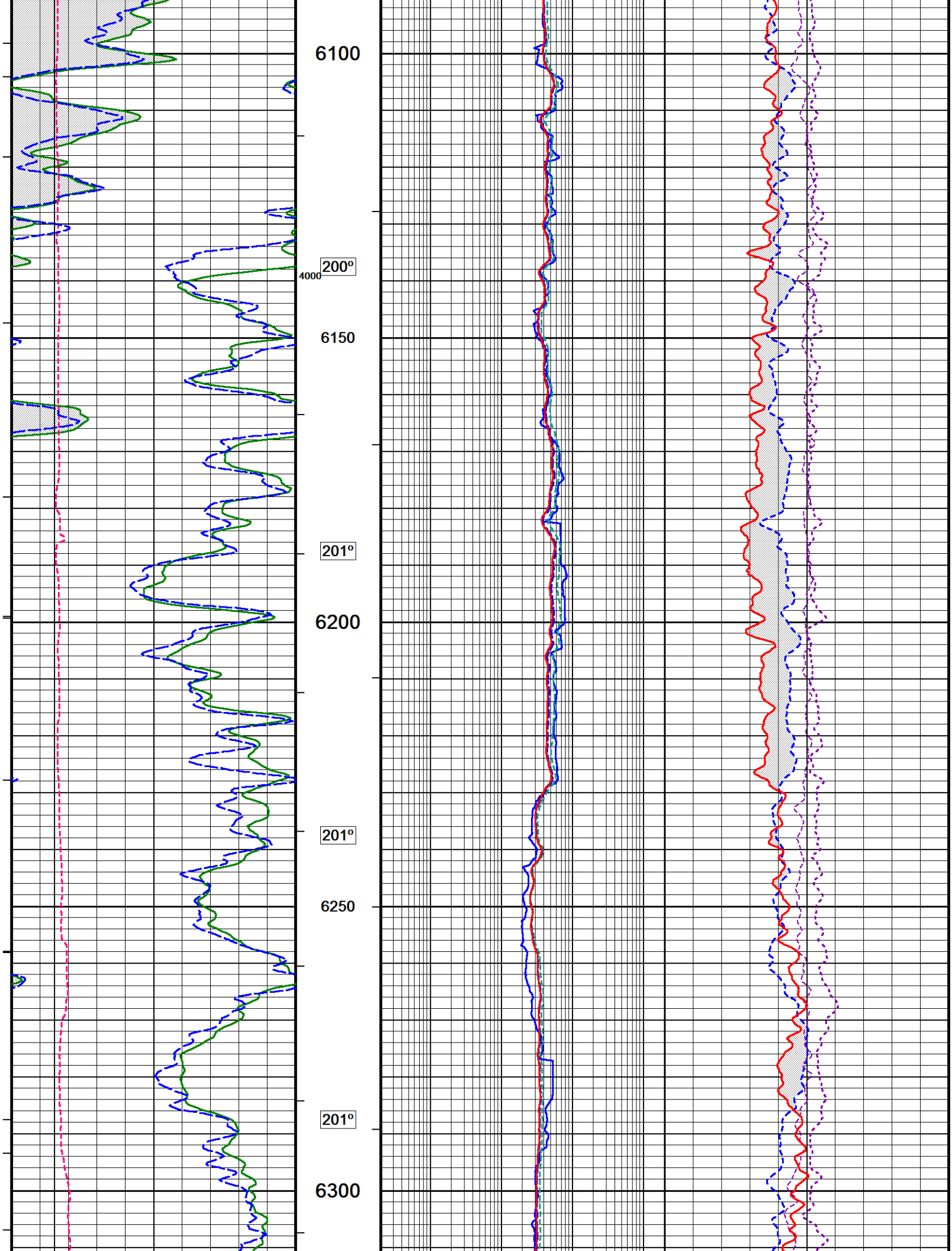
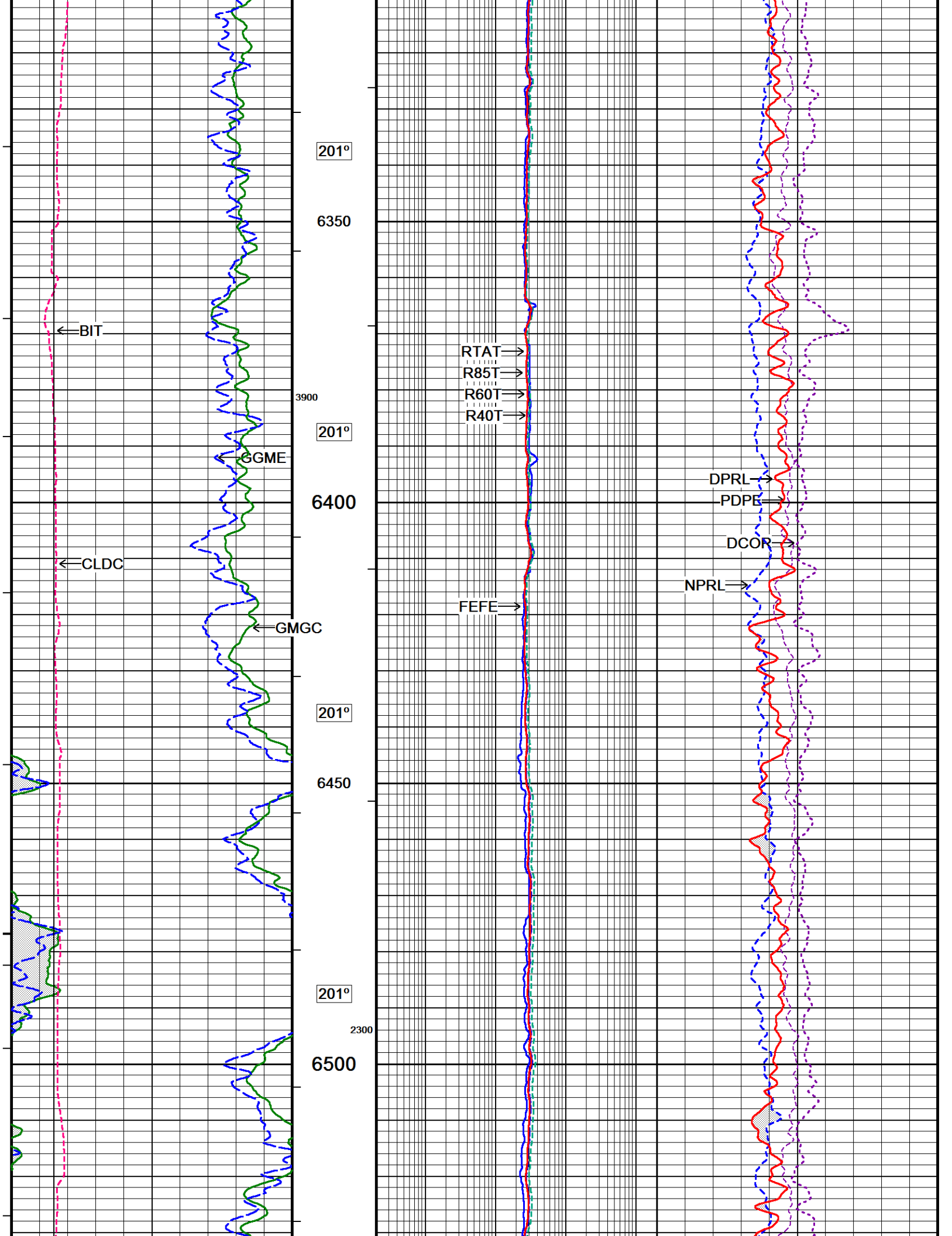
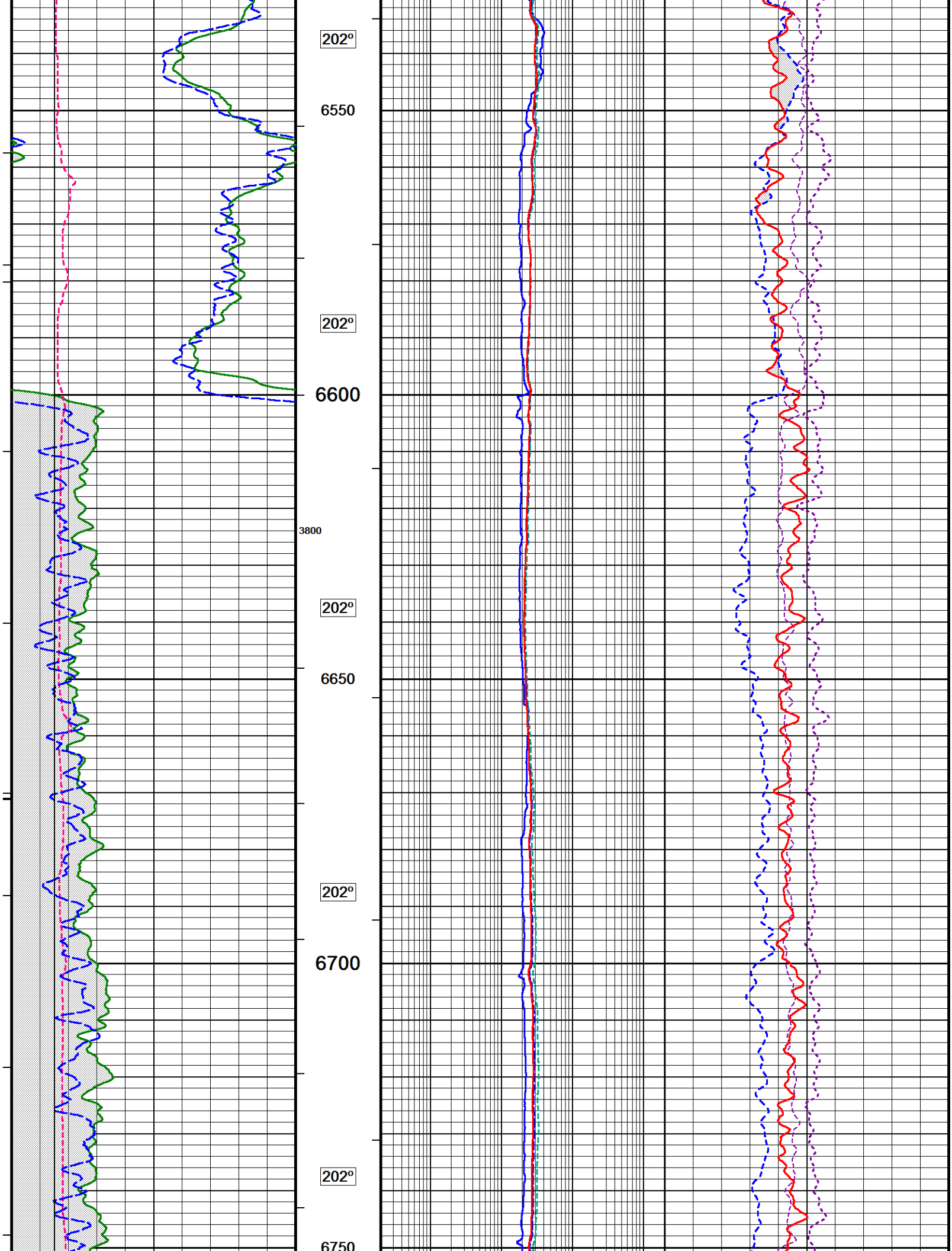
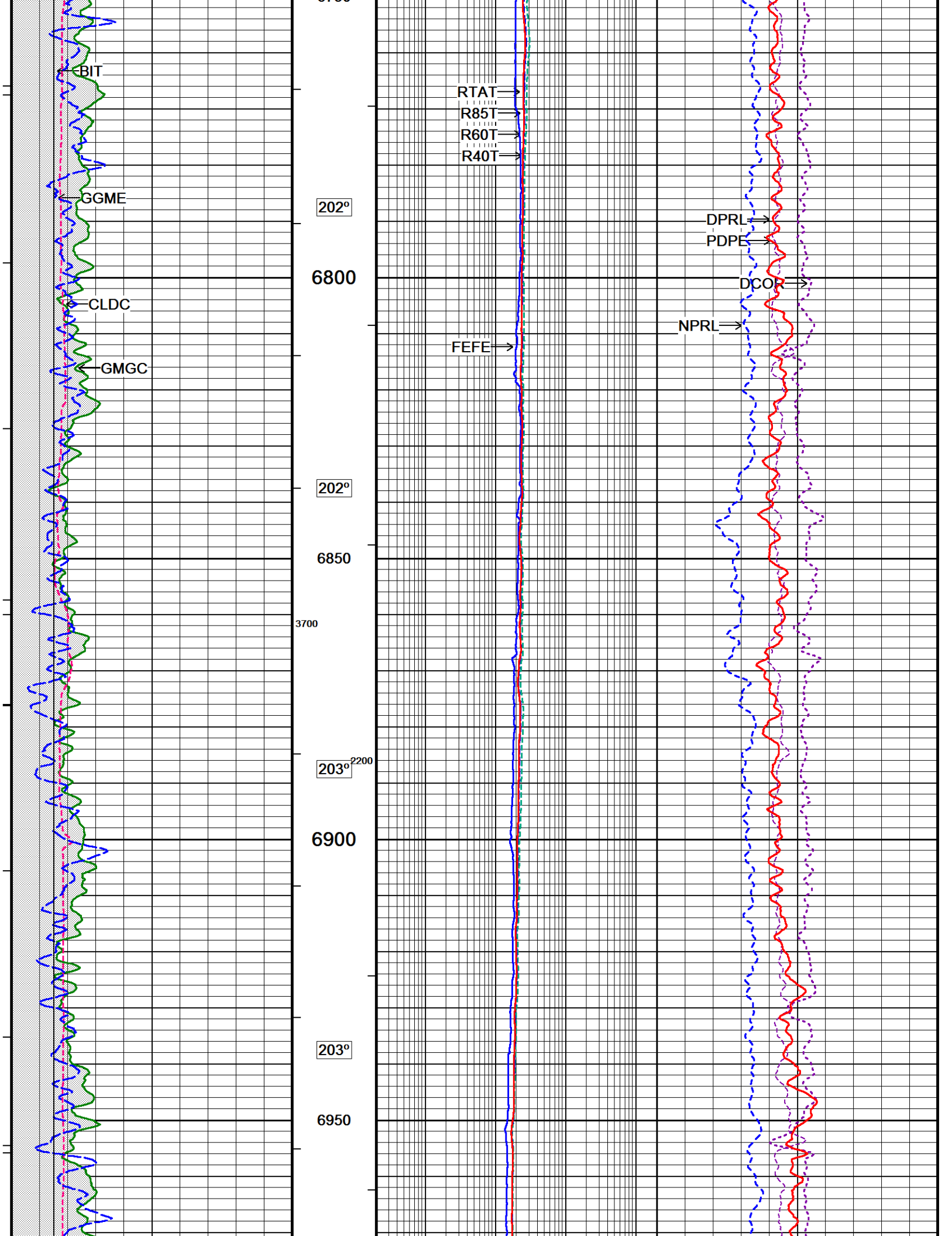
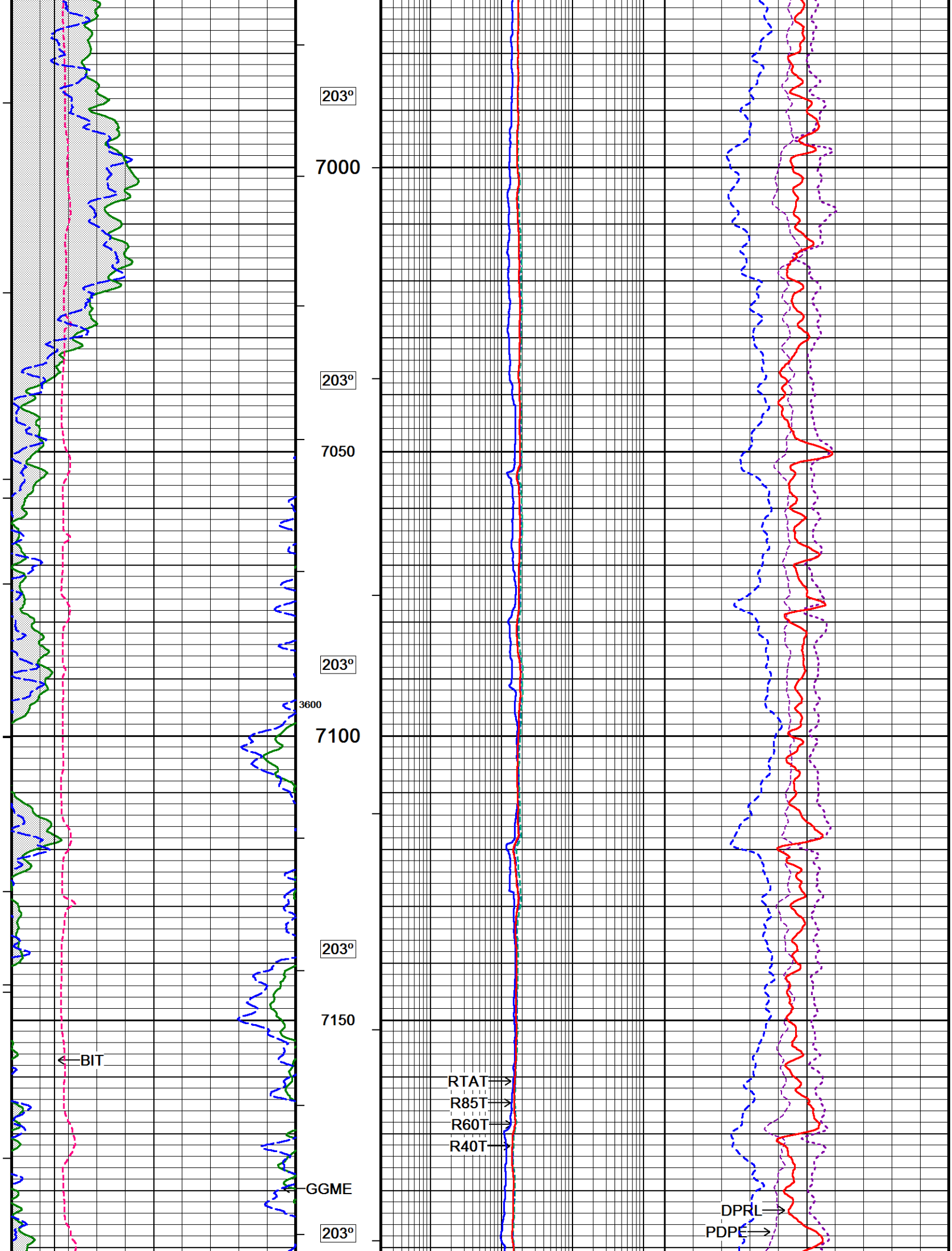
NPRL
FEFE
GMGC
199°
6050
200°
2400

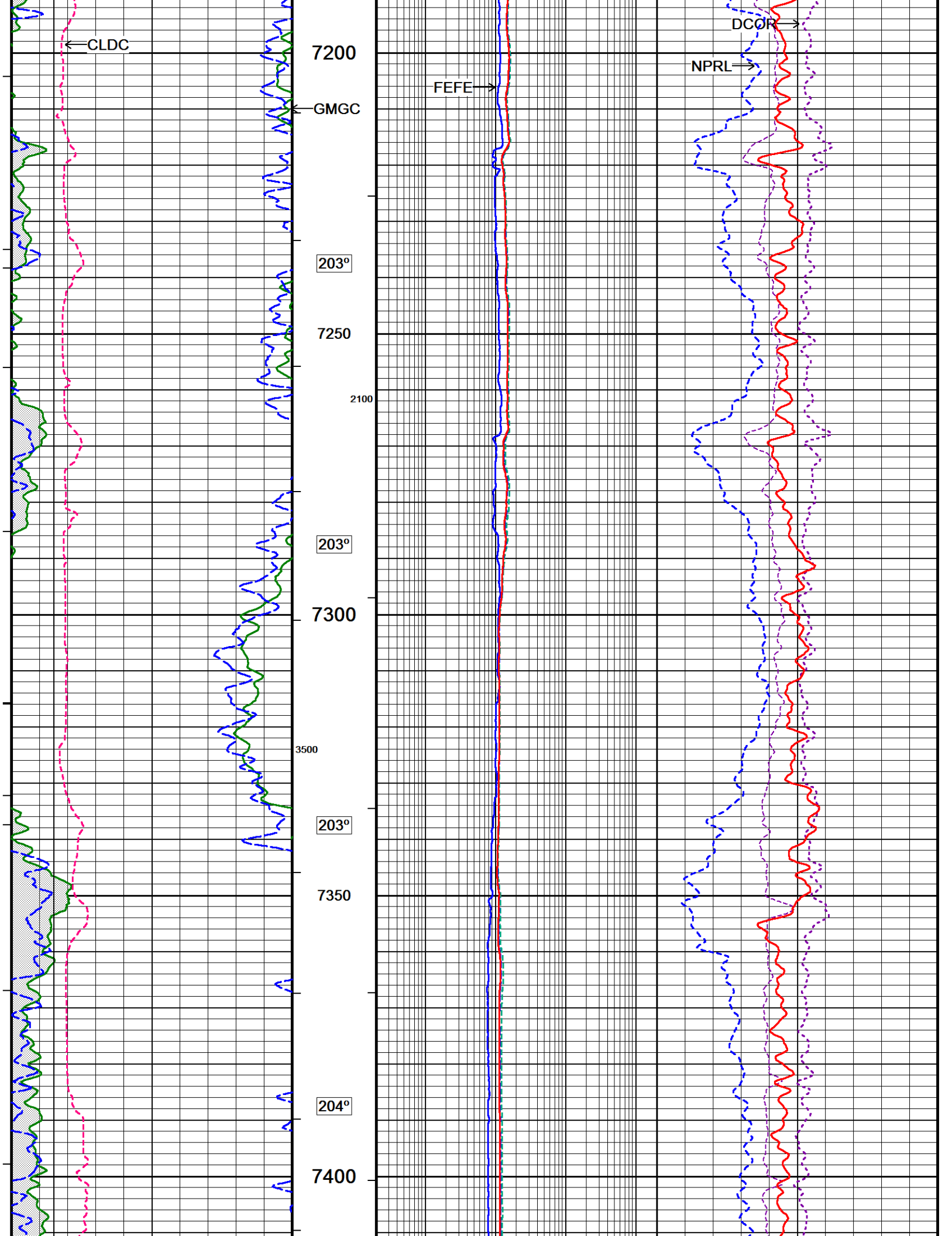

6100
4000
200°
6150
201°
6200
201°
6250
201°
6300


201°
6350
BIT
RTAT
R85T
R60T
R40T
3900
201°
GGME
6400
DPRL
PDPE
DCOR
CLDC
NPRL
FEFE
GMGC
201°
6450
201°
2300
6500


202°
6550
202°
6600
3800
202°
6650
202°
6700
202°
6750


BIT
GGME
CLDC
GMGC
RTAT
R85T
R60T
R40T
FEFE
DPRL
PDPE
DCOR
NPRL
202°
6800
202°
6850
3700
203°
2200
6900
203°
6950


203º
7000
203º
7050
203º
3600
7100
203º
7150
BIT
RTAT
R85T
R60T
R40T
GGME
203º
DPRL
PDPE


CLDC
GMGC
7200
203°
7250
2100
203°
7300
3500
203°
7350
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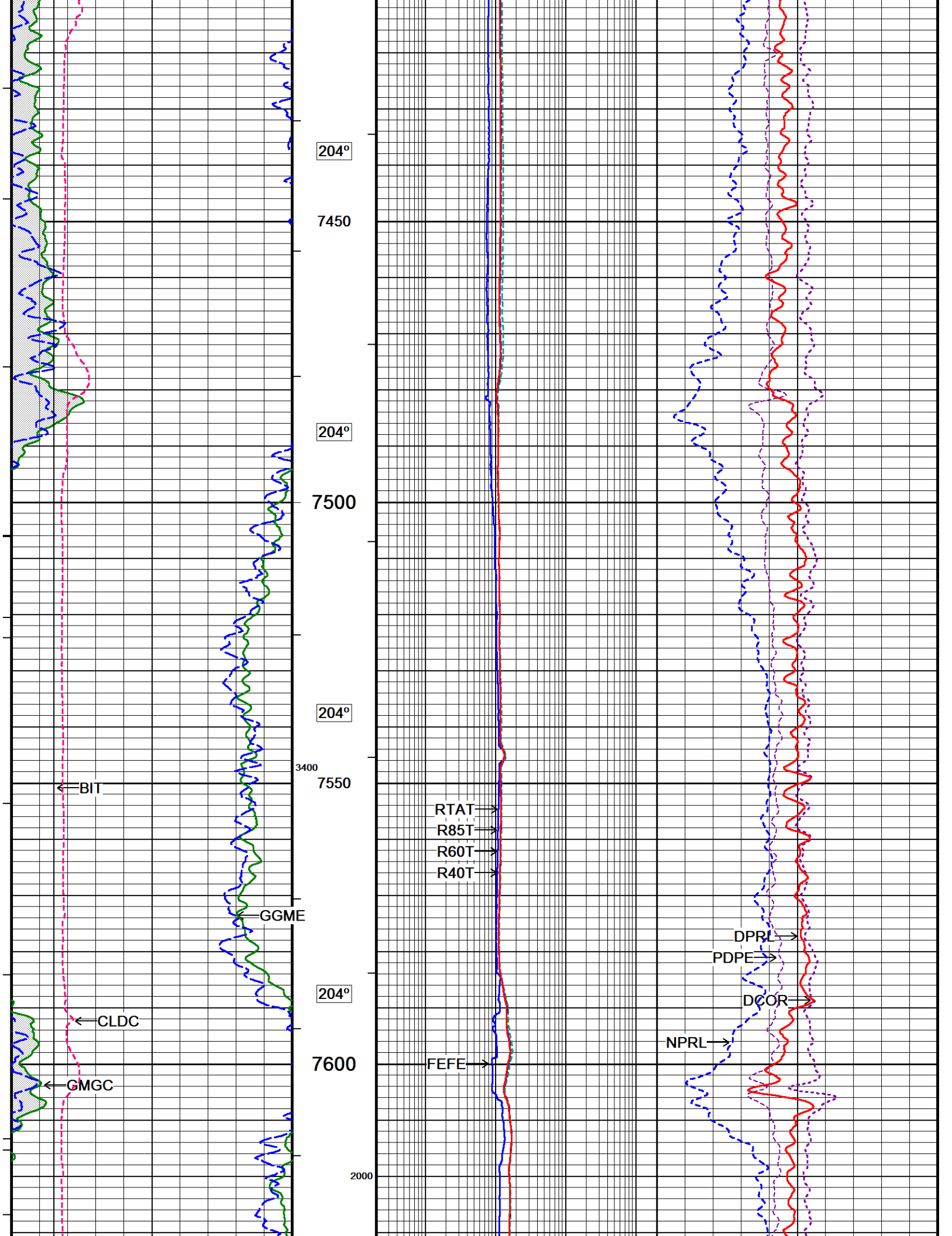
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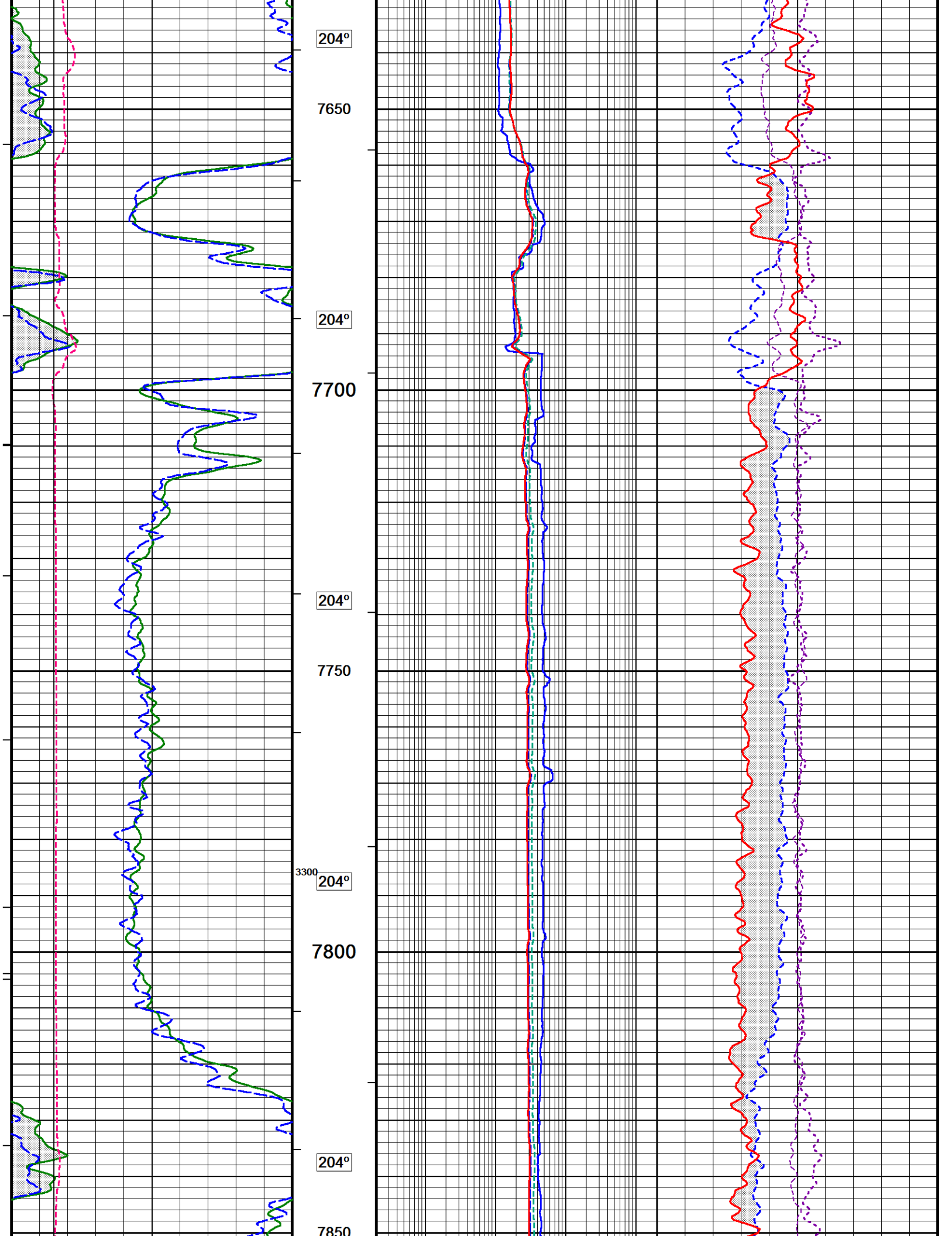
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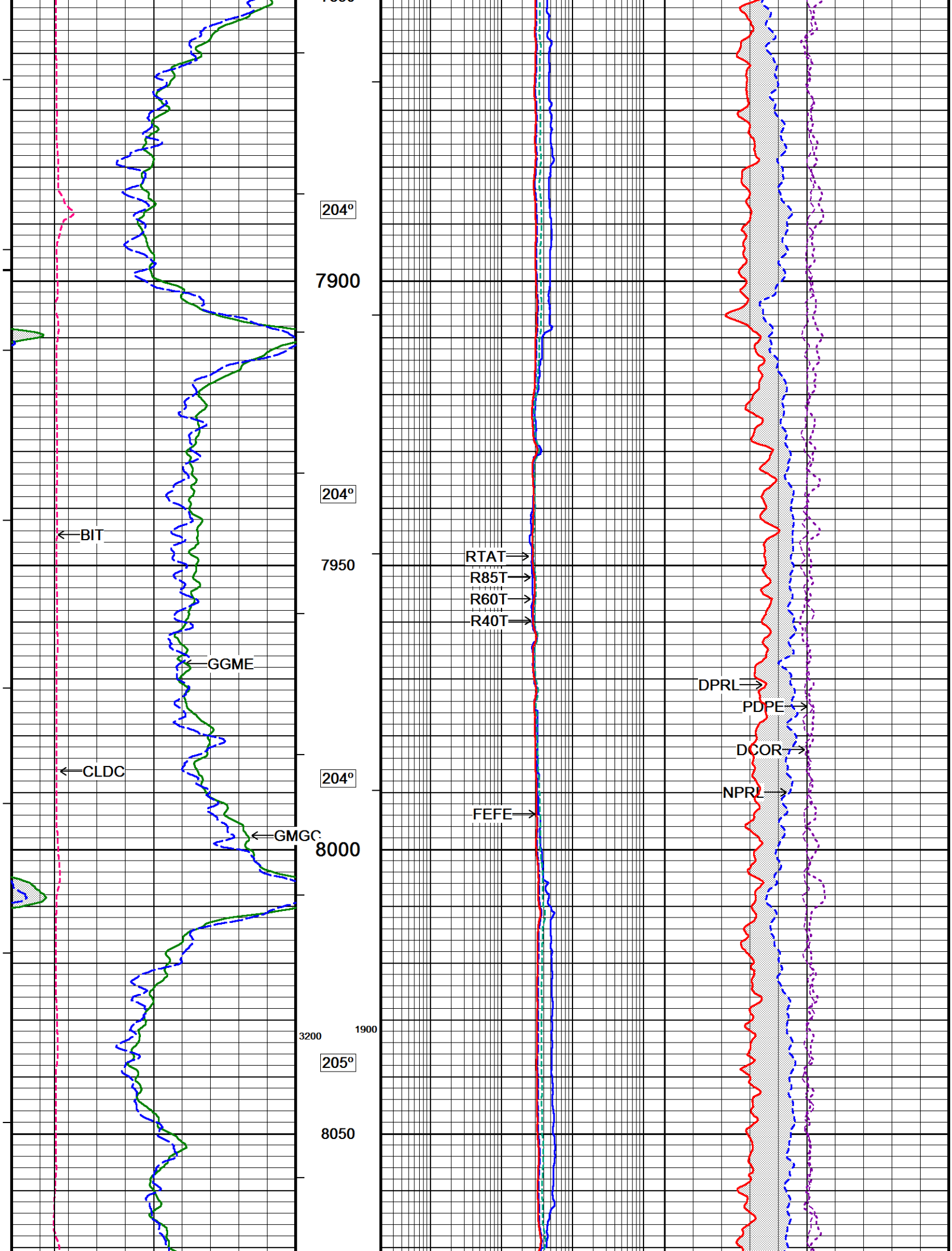
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FEFE
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205°
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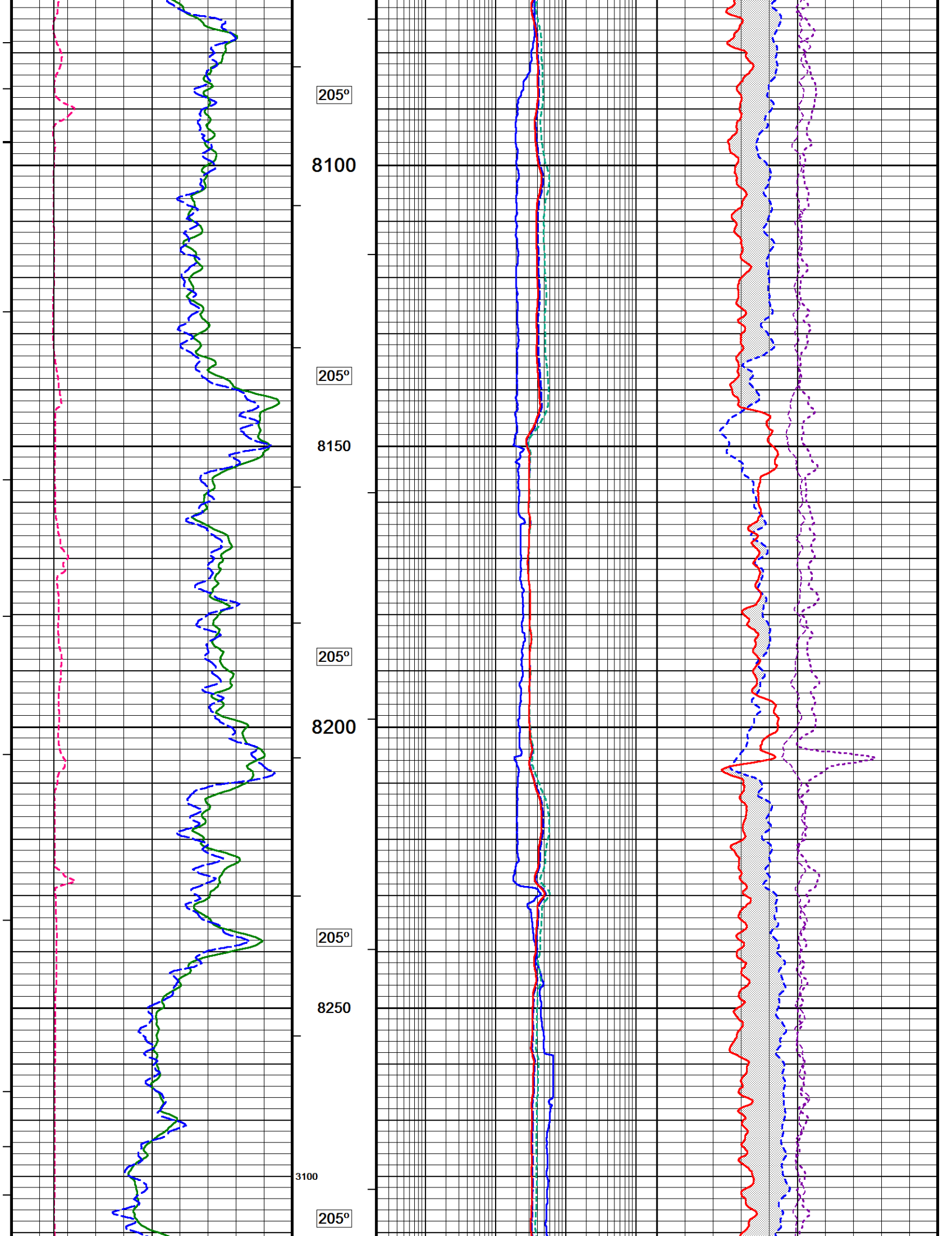
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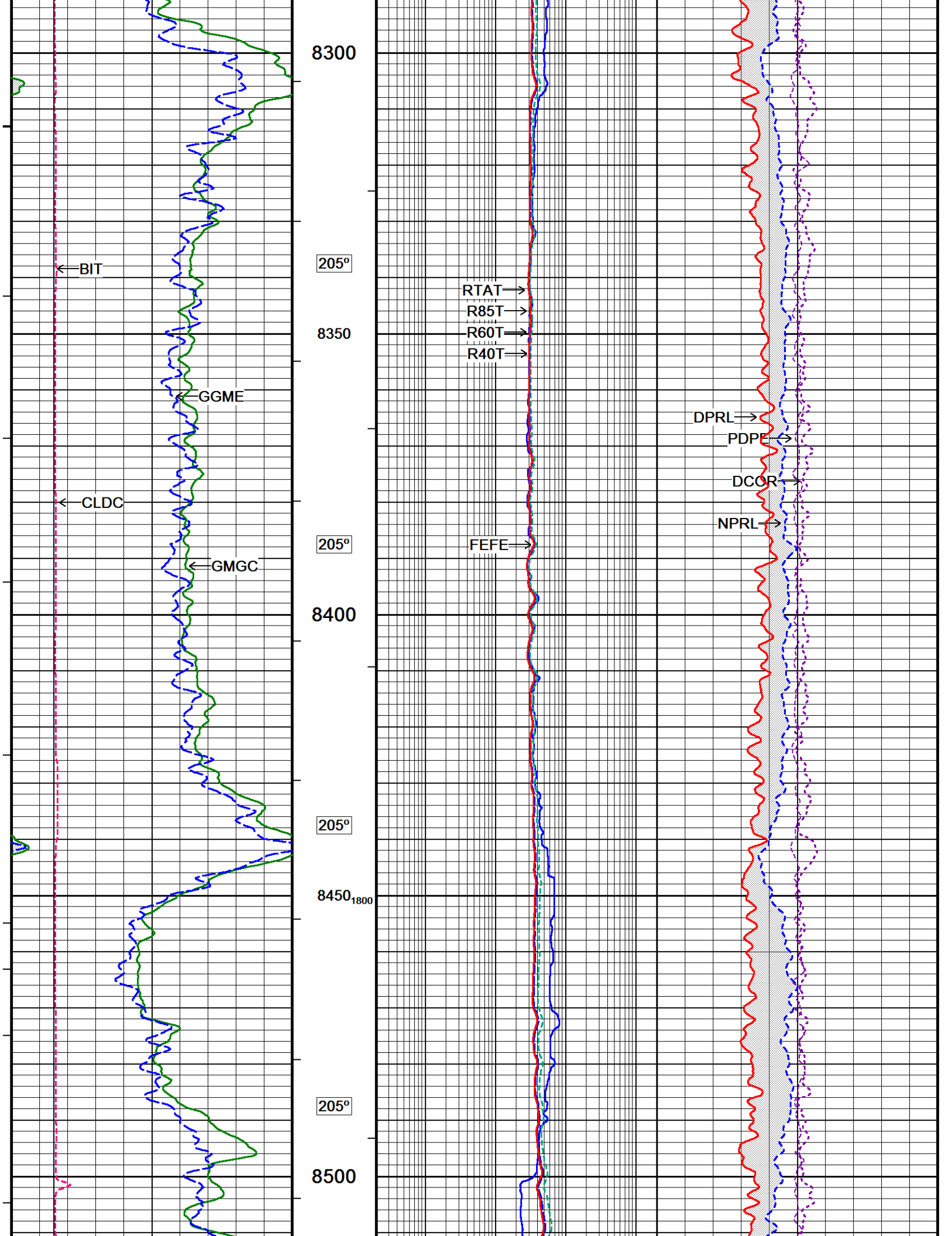
205°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DPRL
PDPE
DCOR
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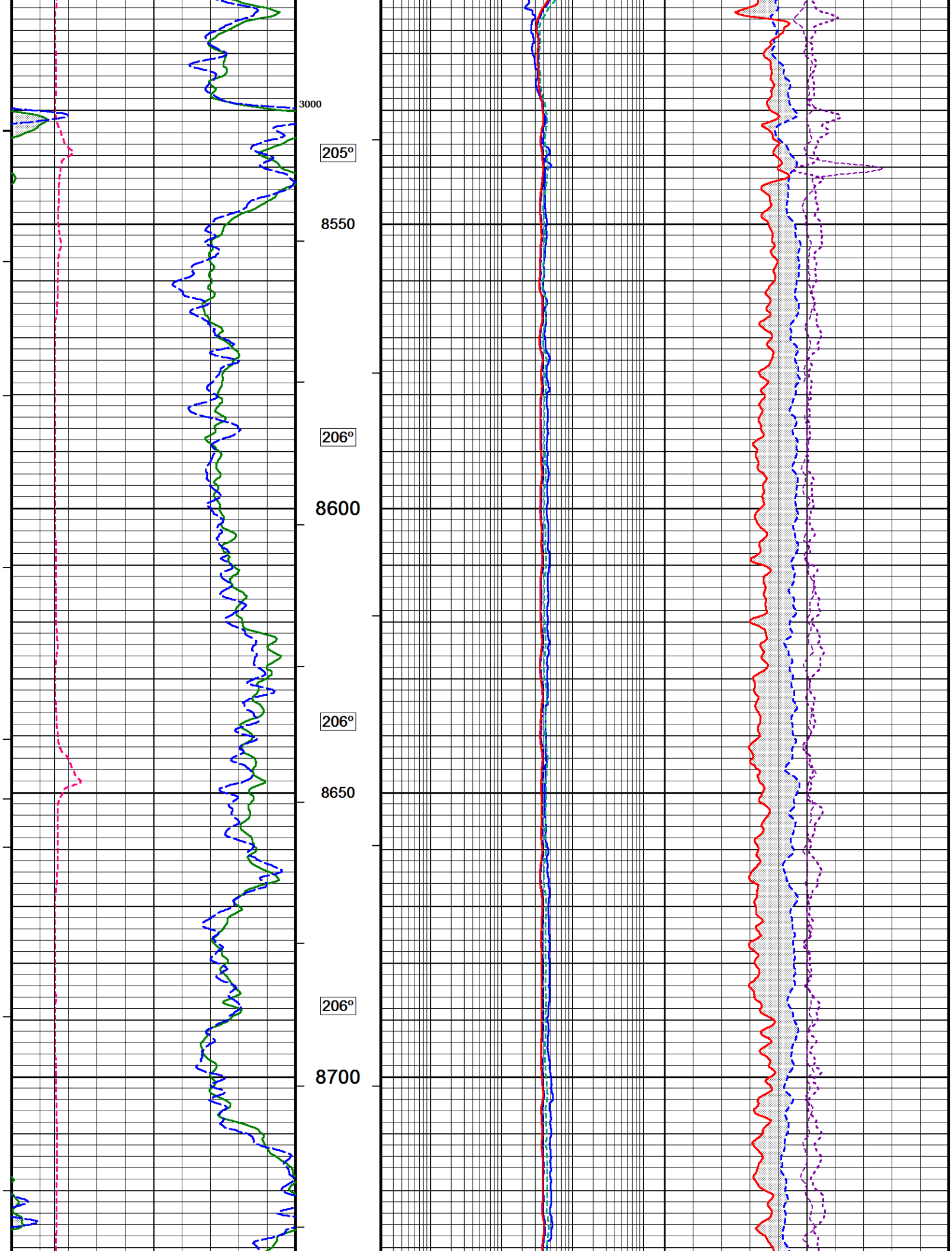
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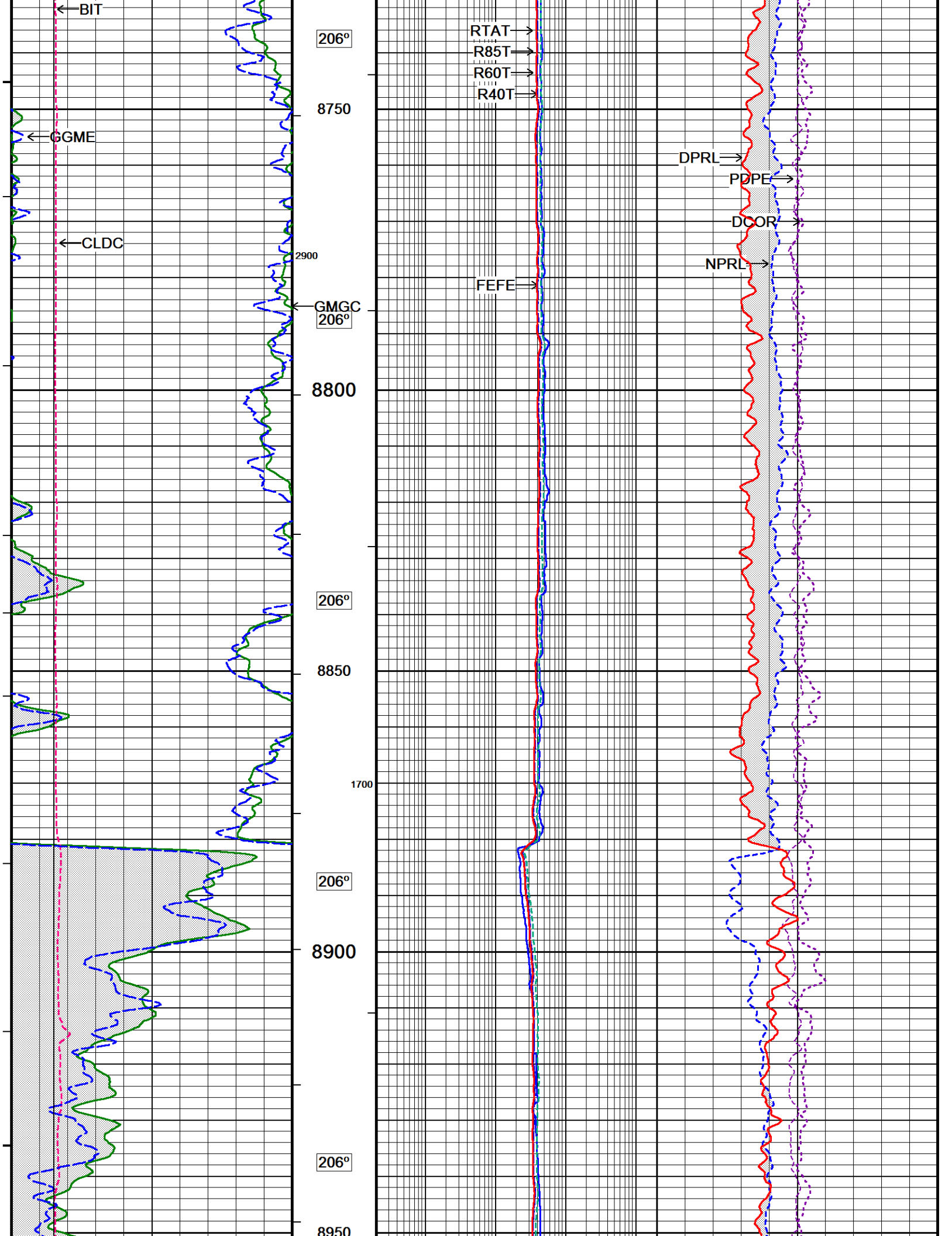
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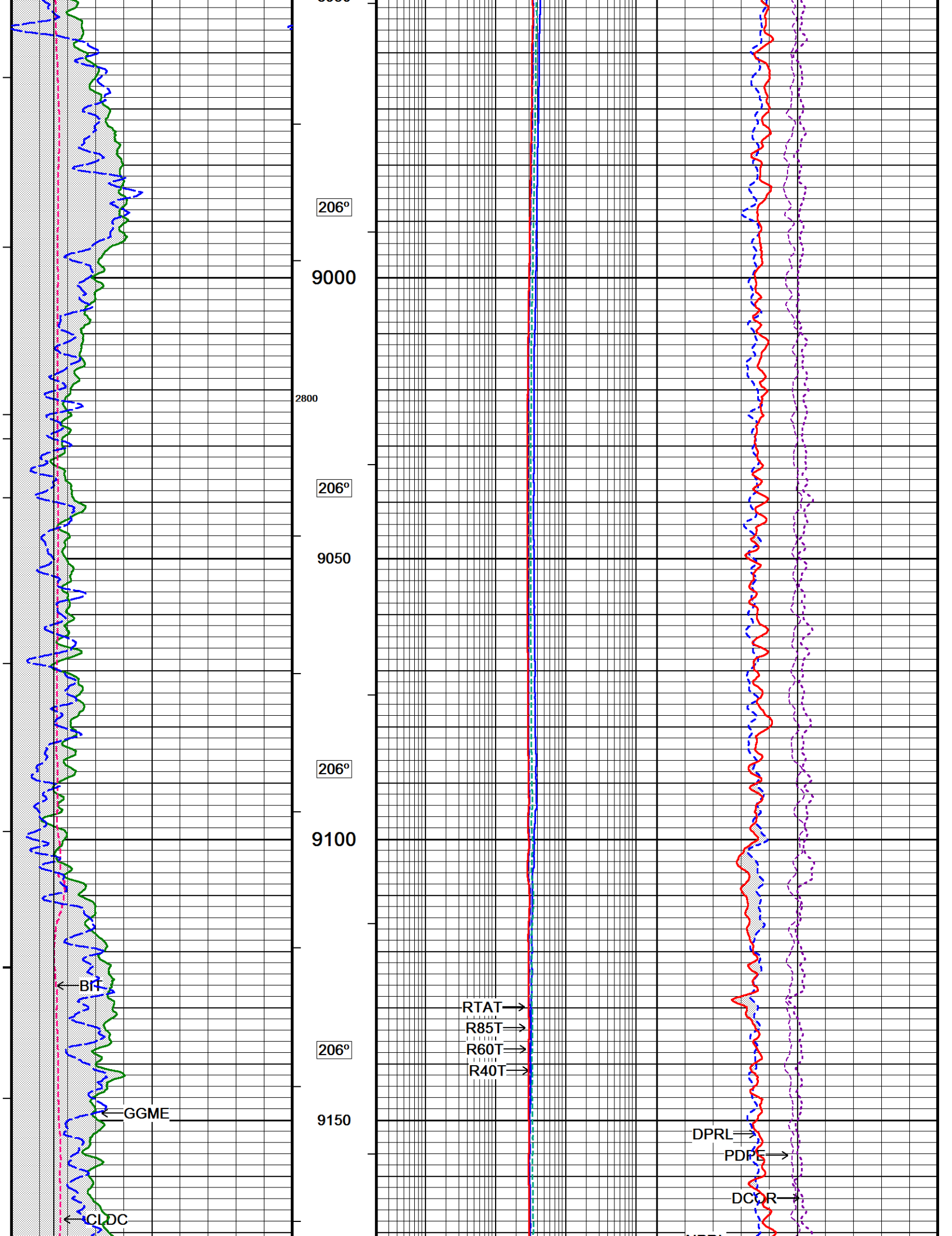
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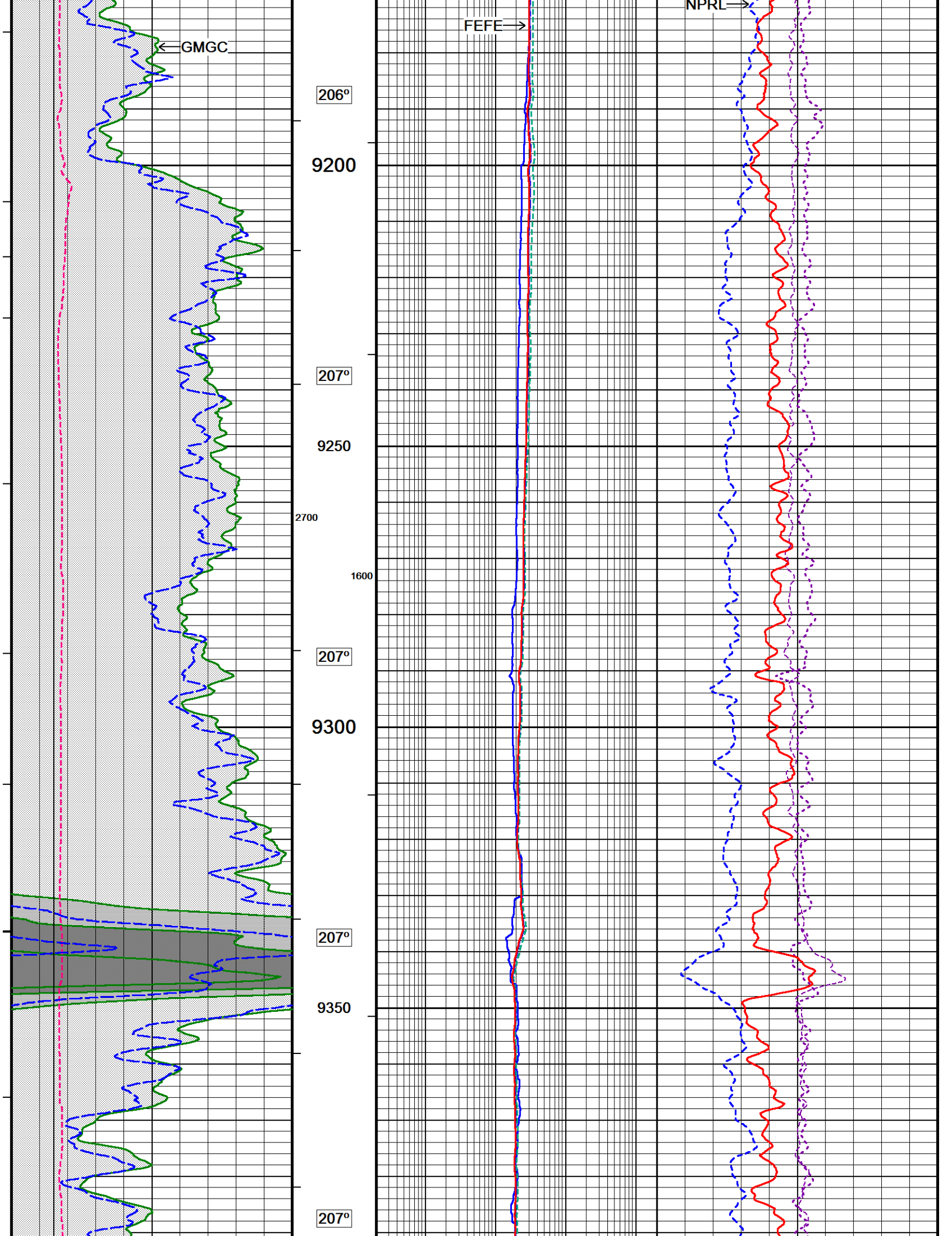
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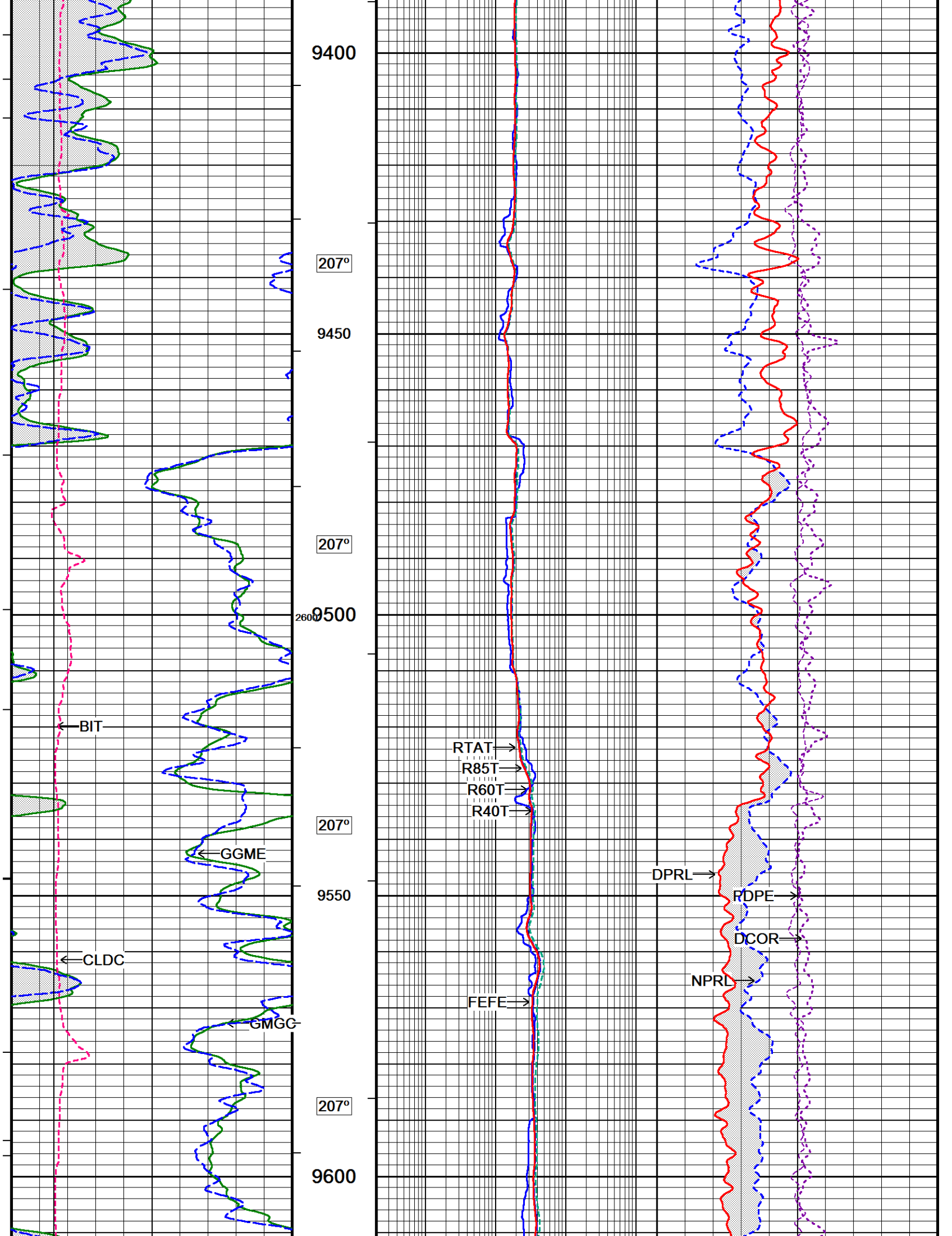
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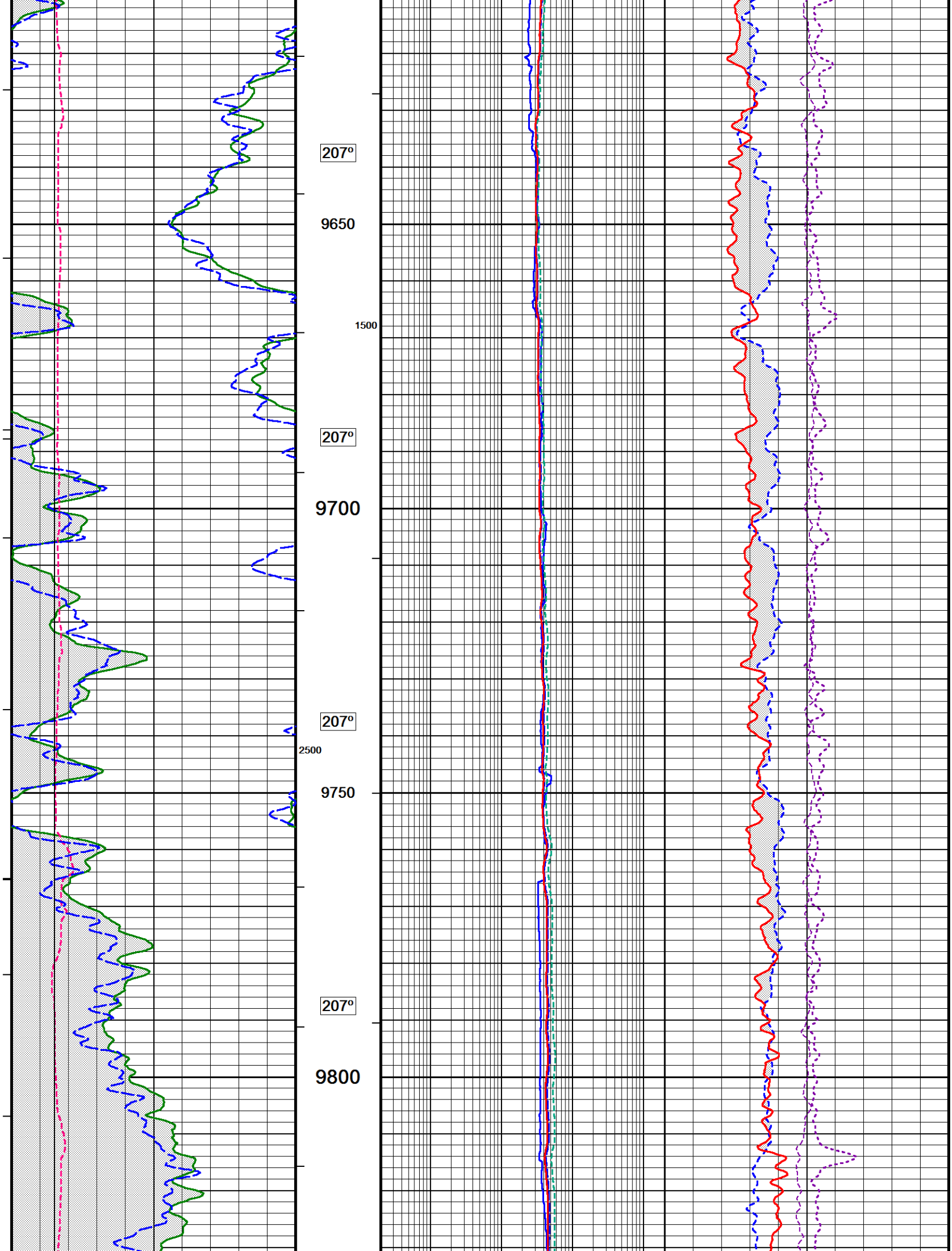
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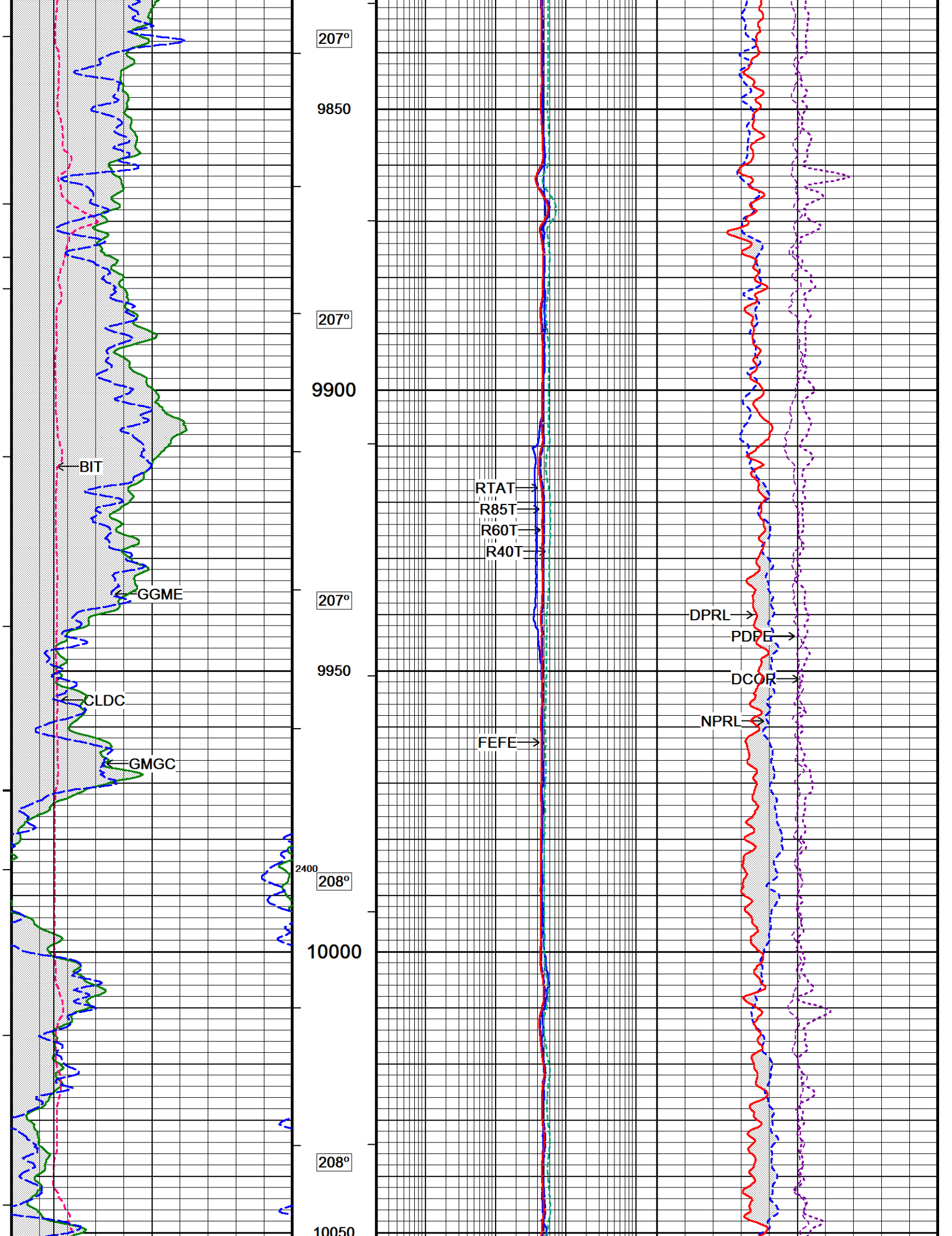
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BIT
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R60T
R40T
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GMGC
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208°
10000
208°
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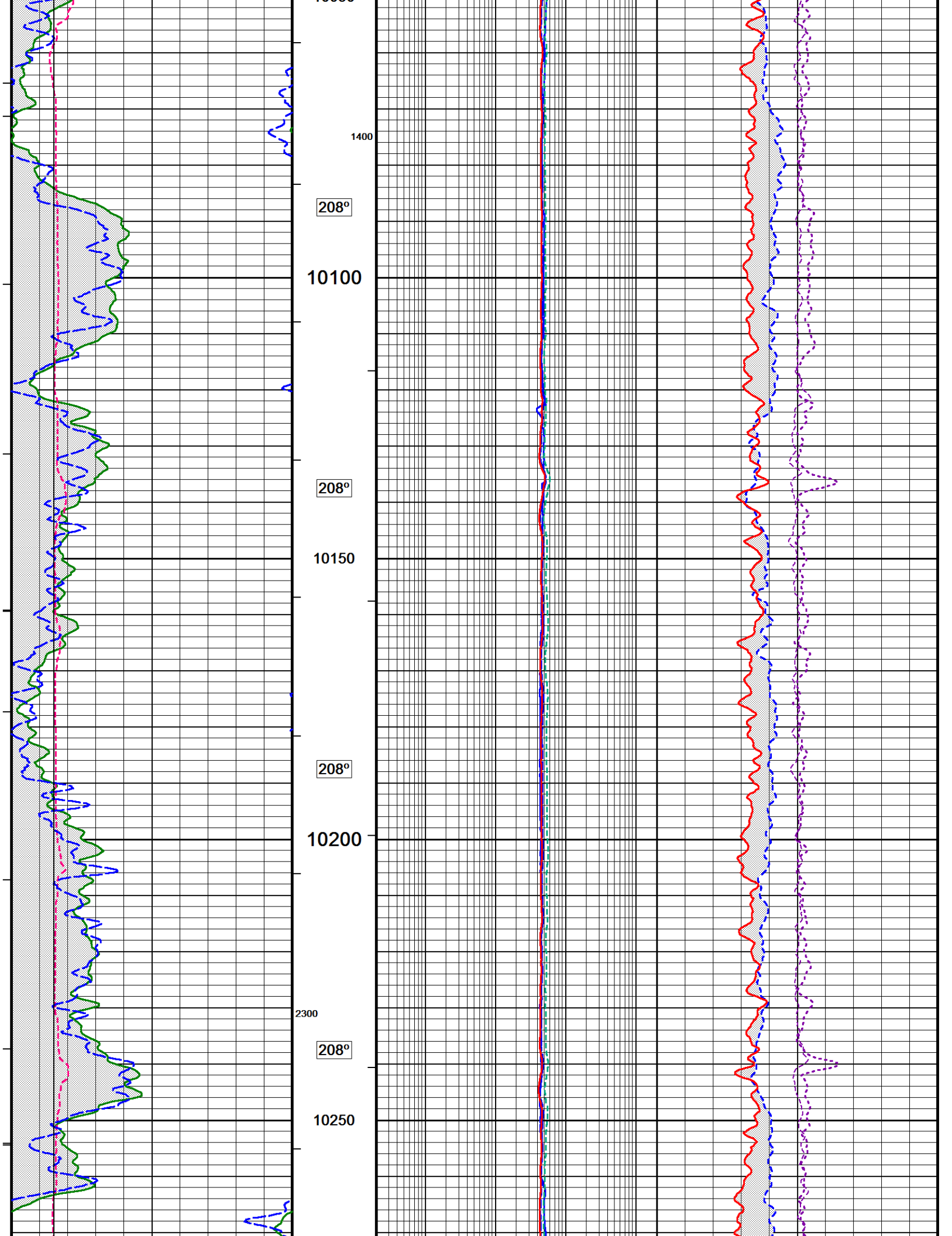
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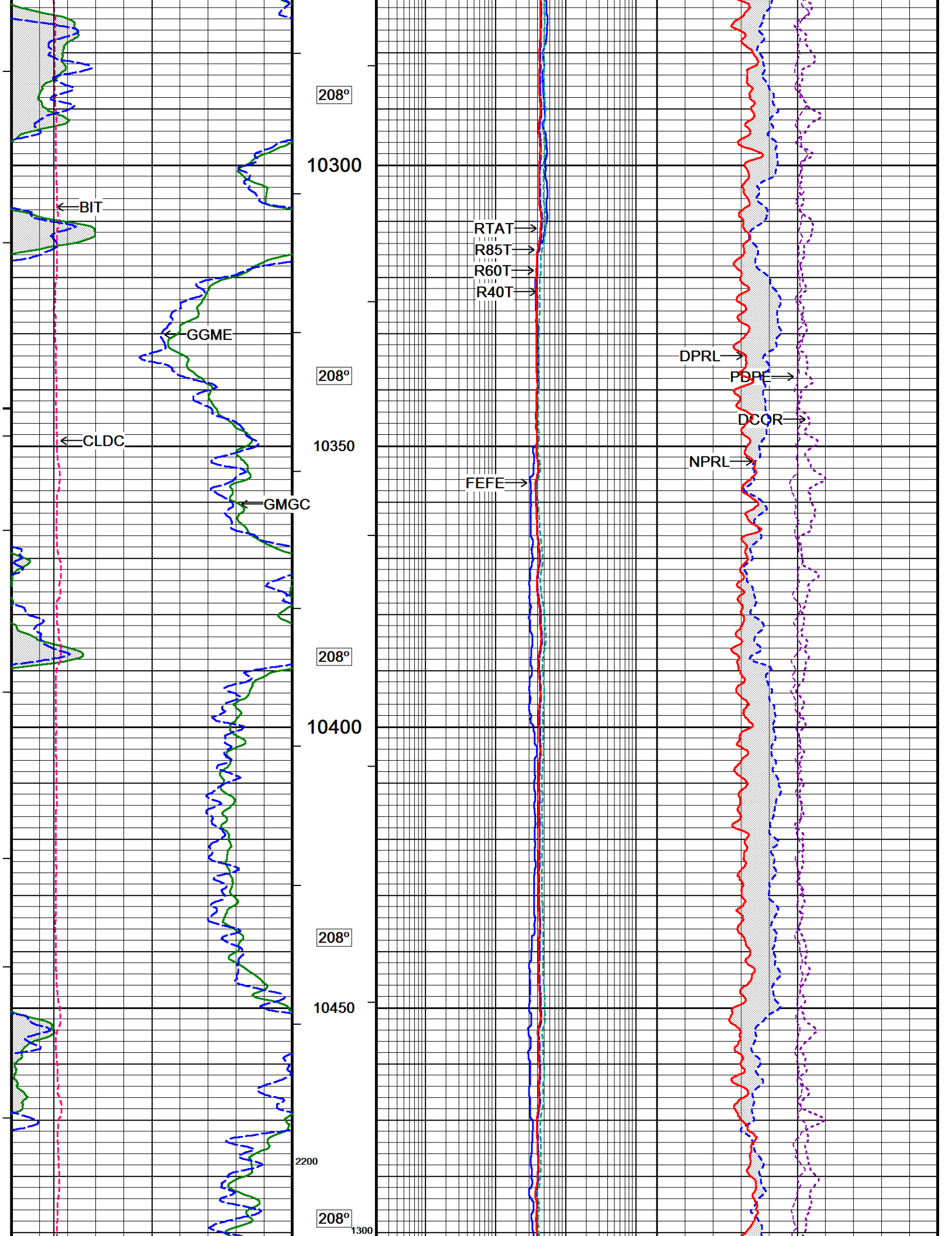
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R40T
GGME
208°
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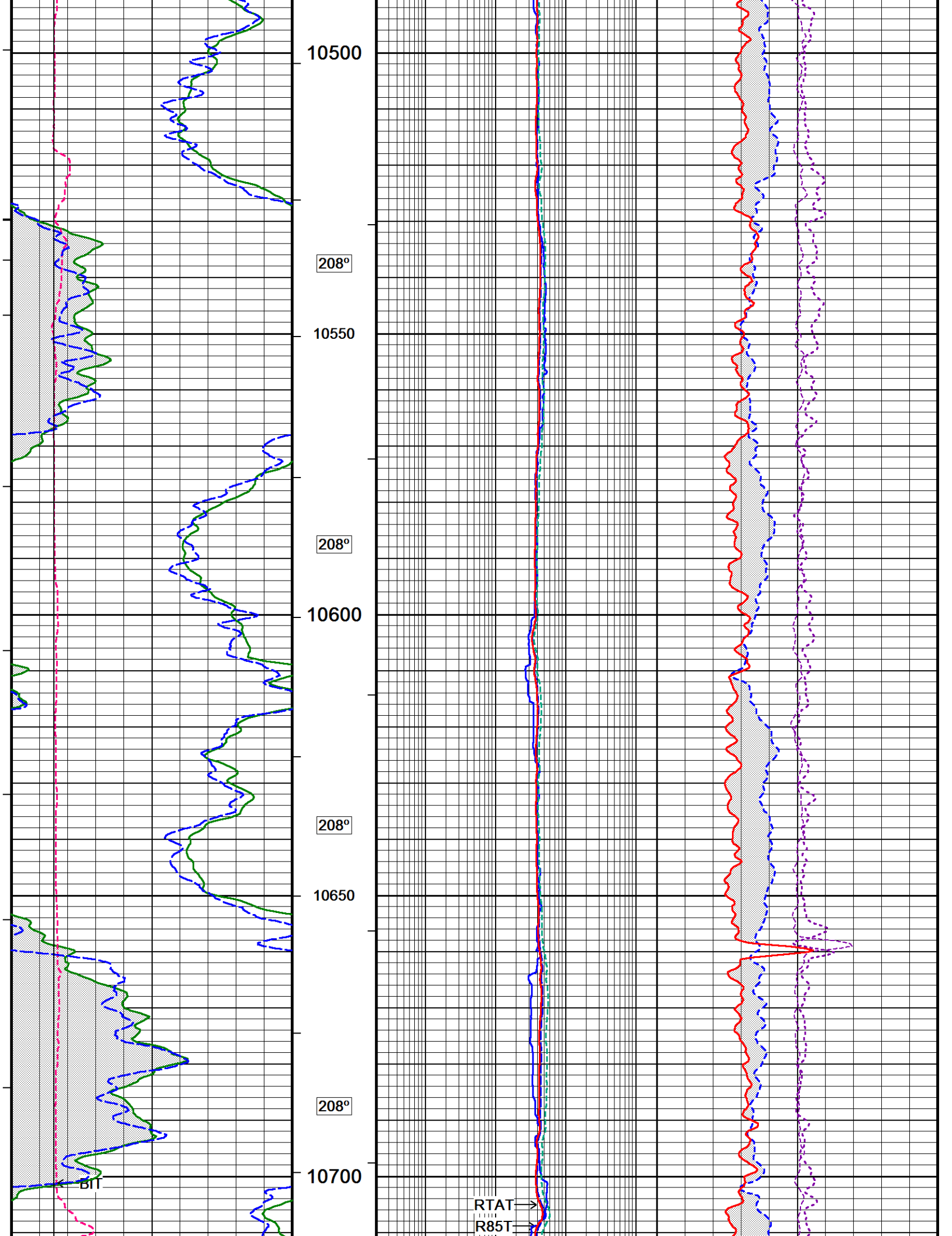
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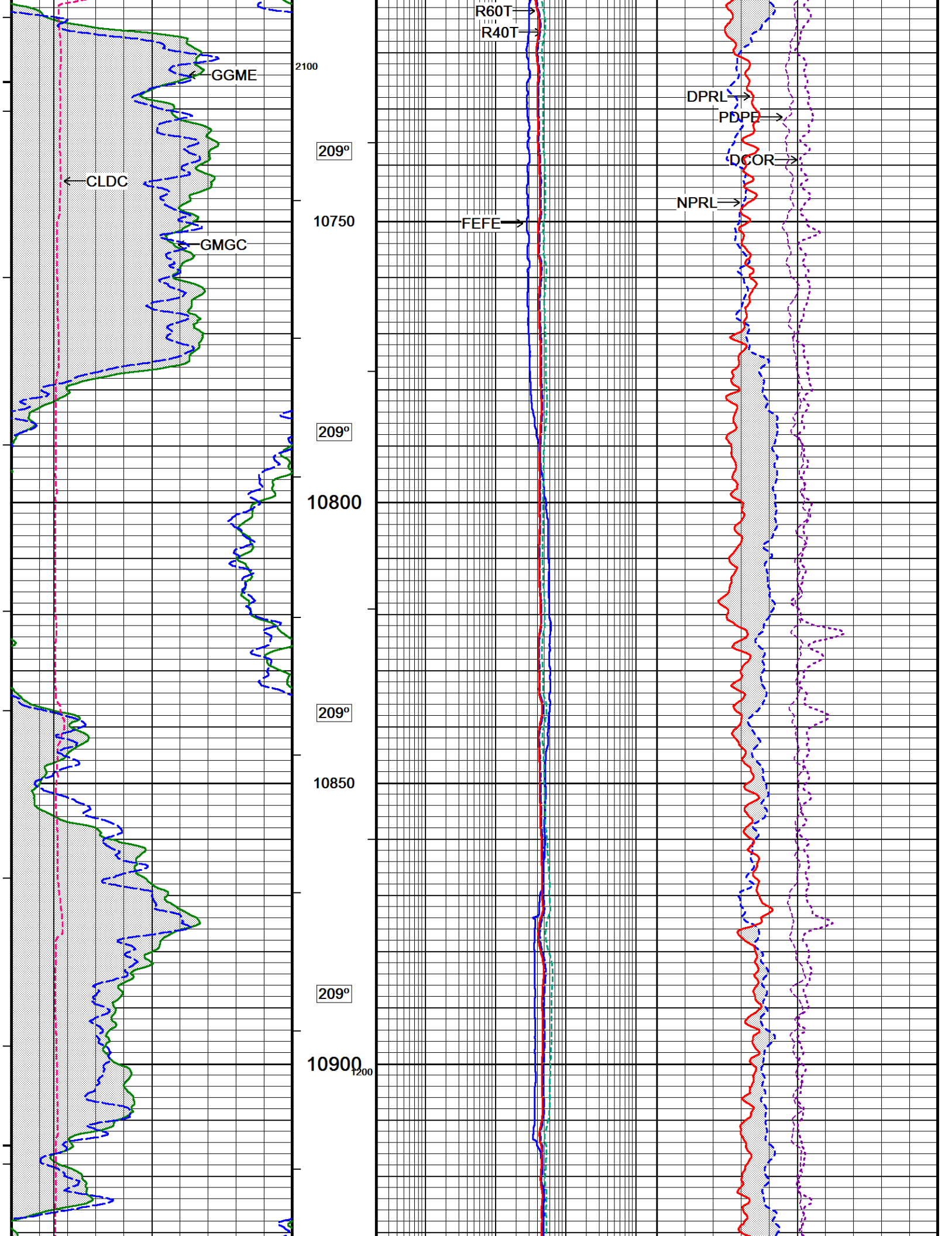
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CLDC
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DCOR
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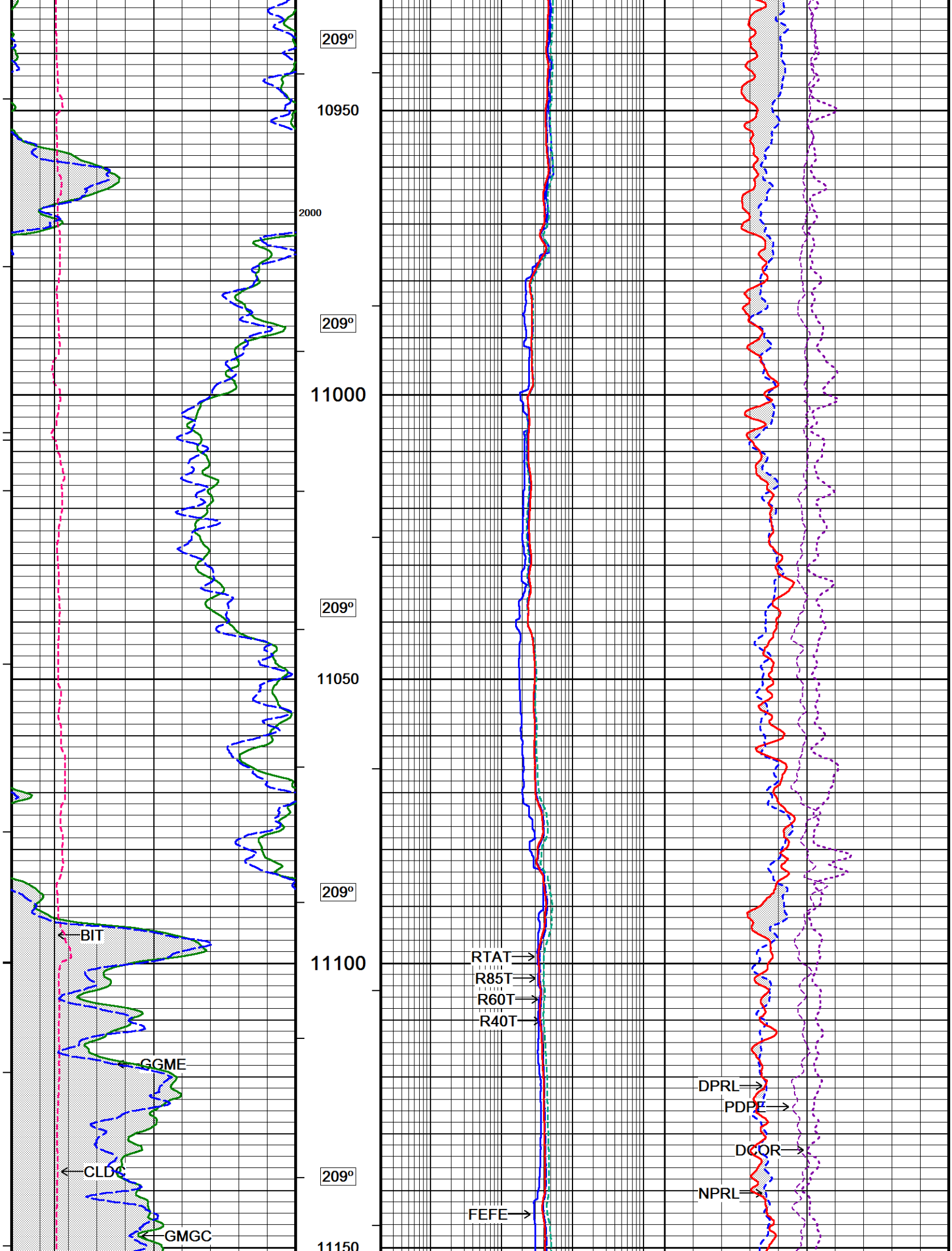
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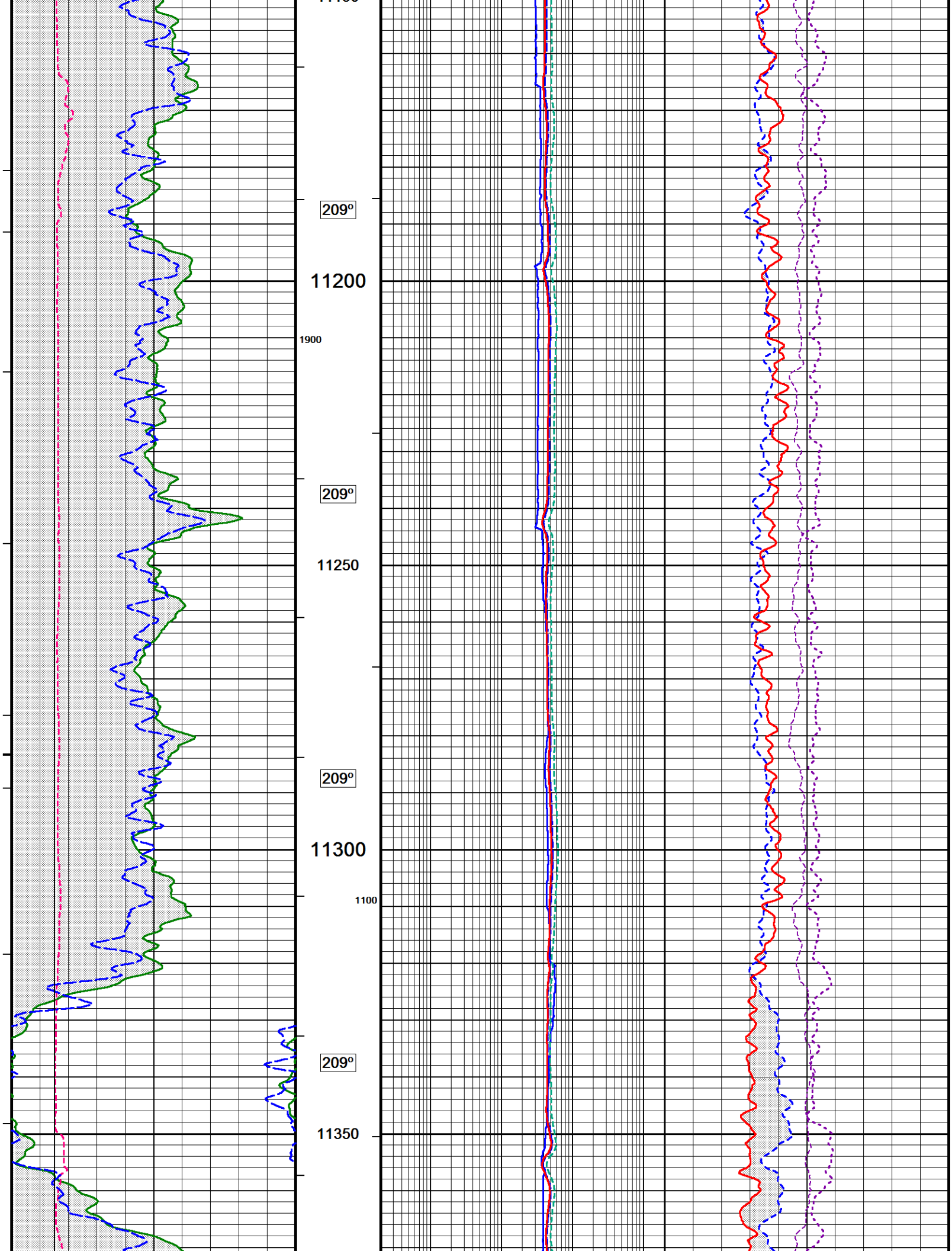
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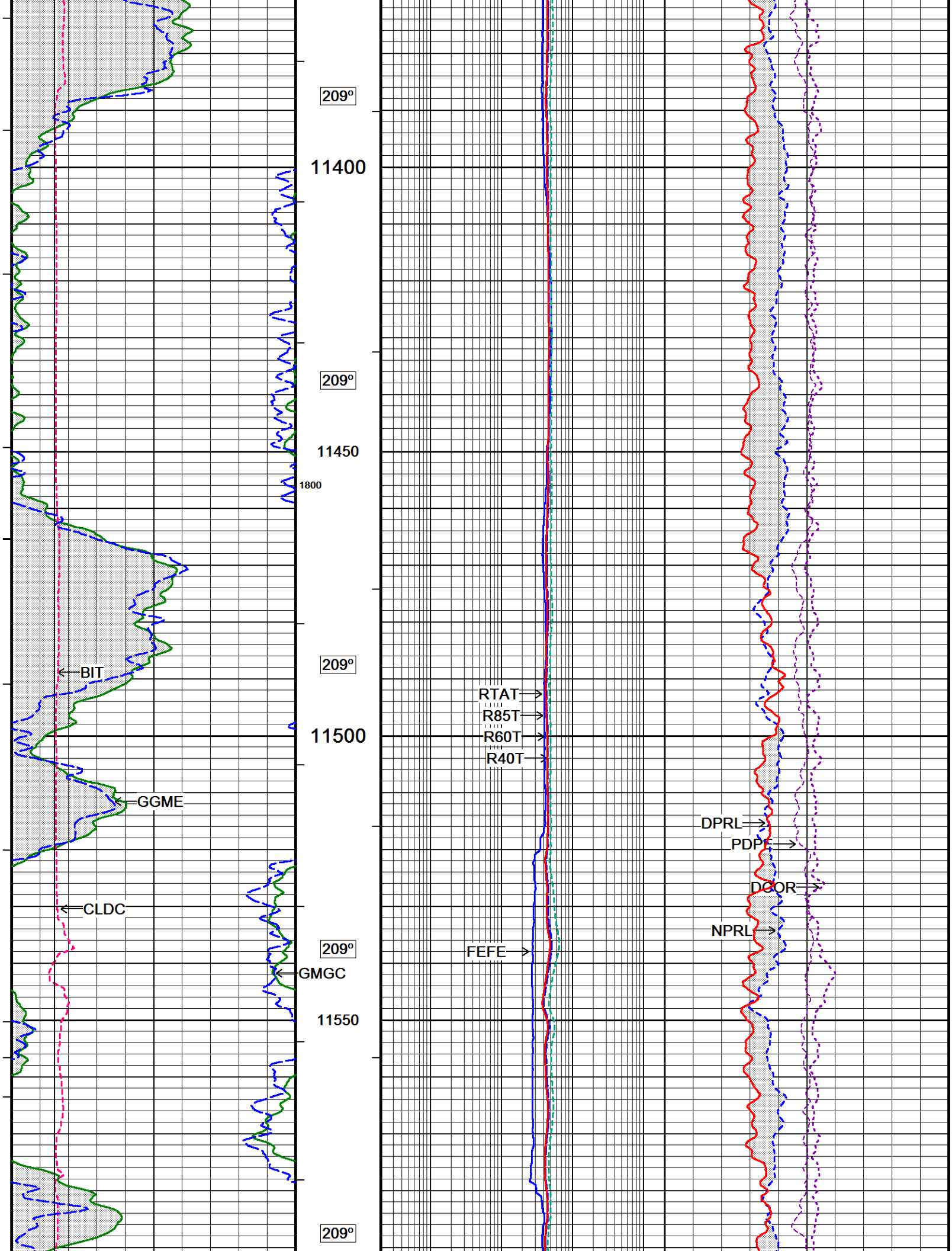
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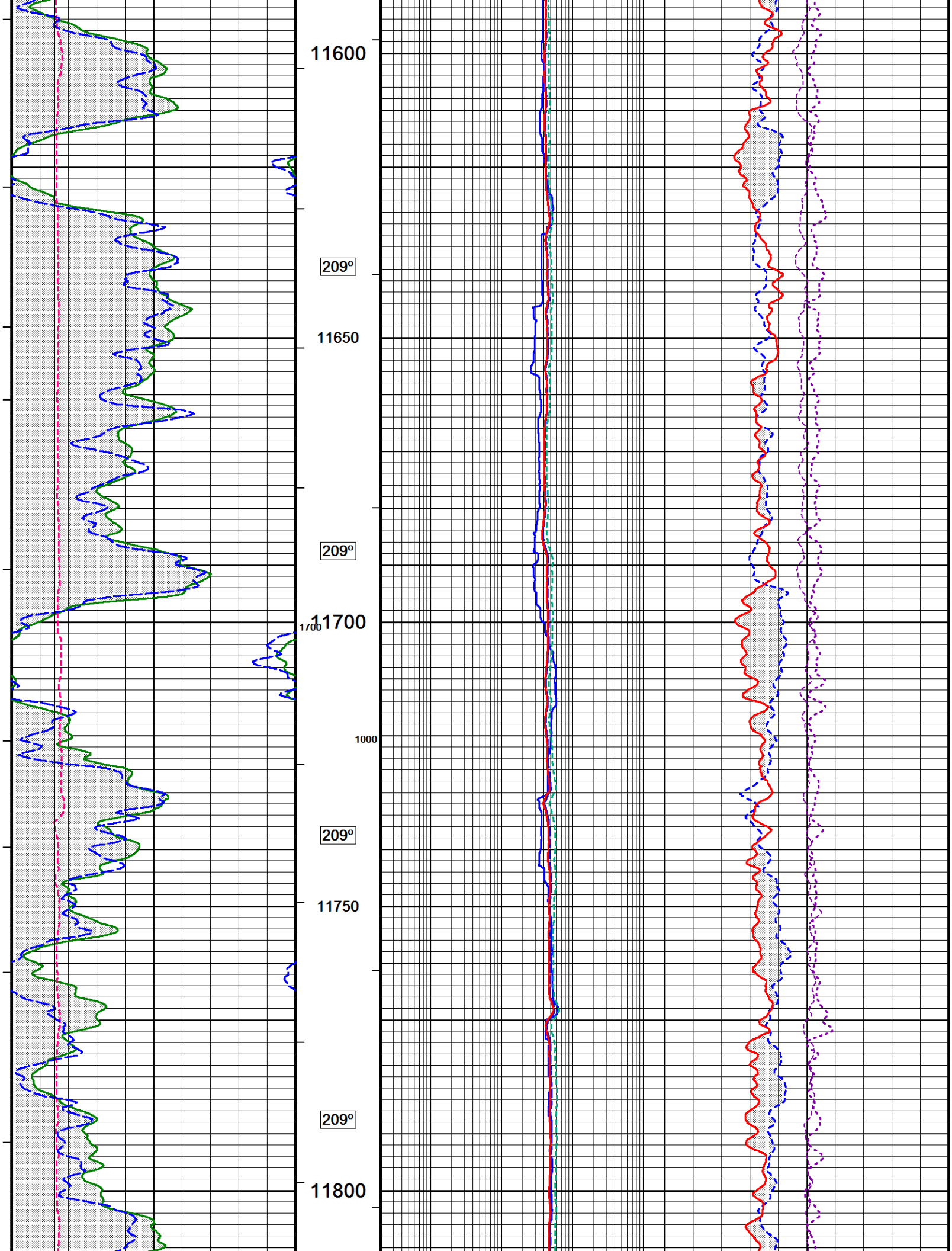
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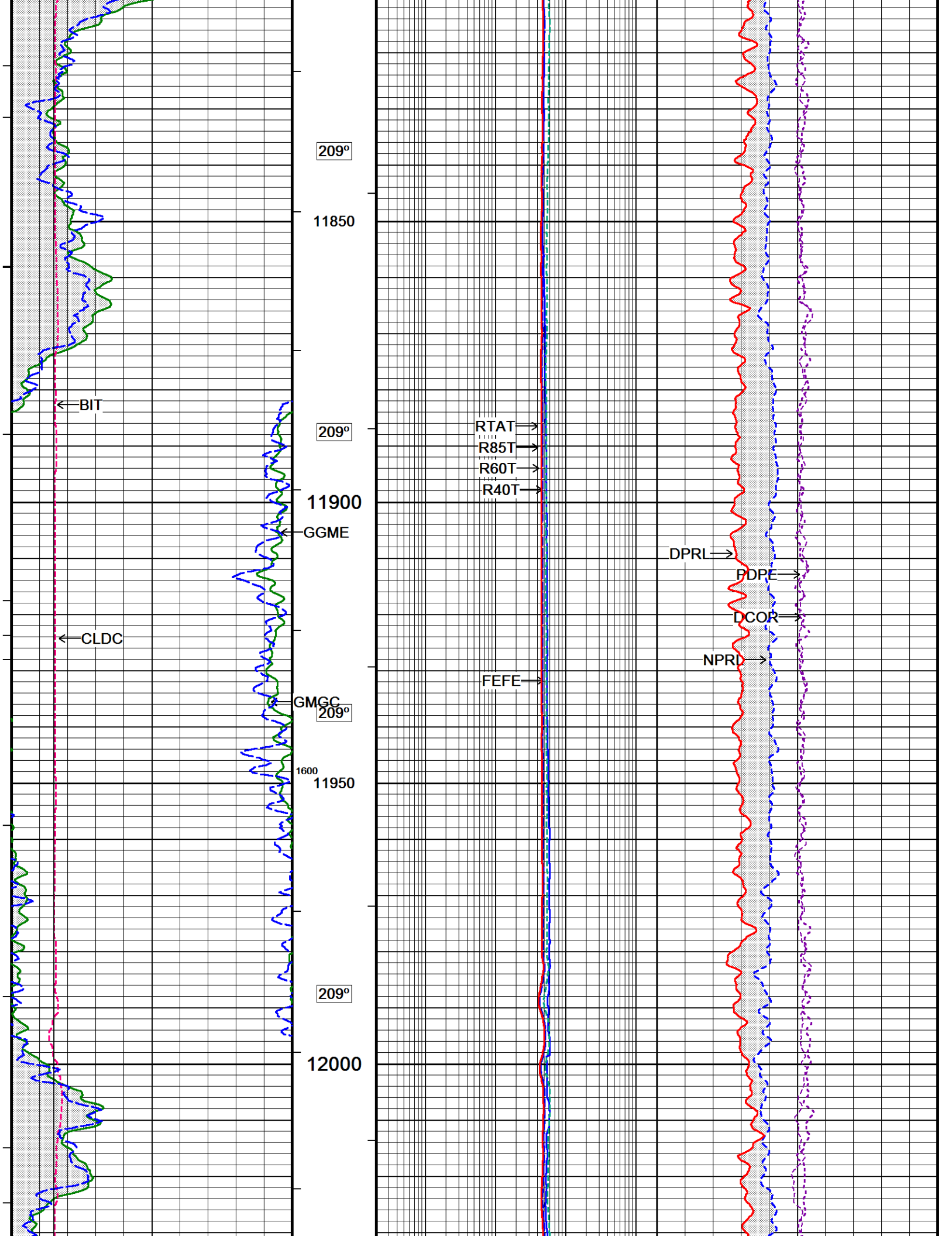
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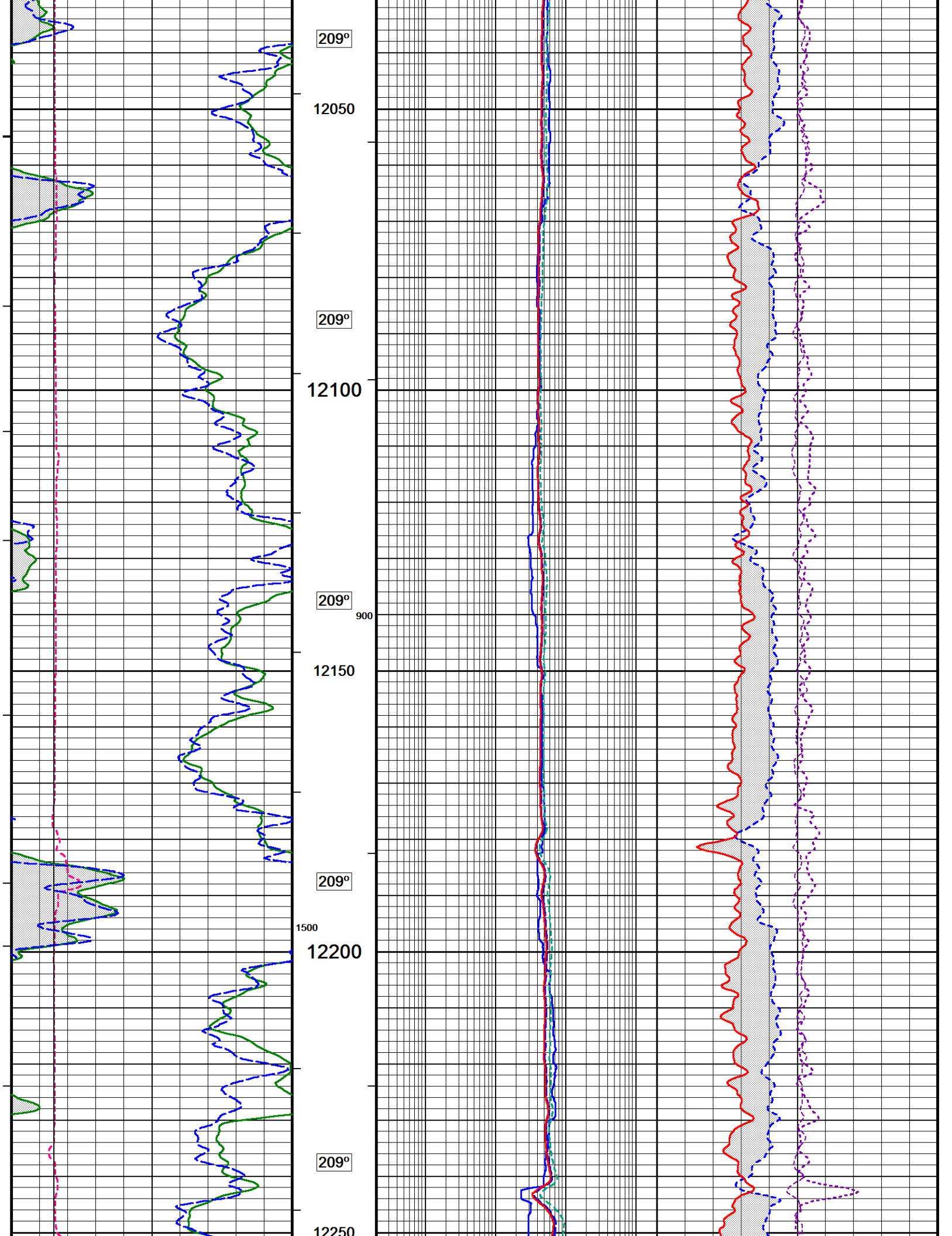
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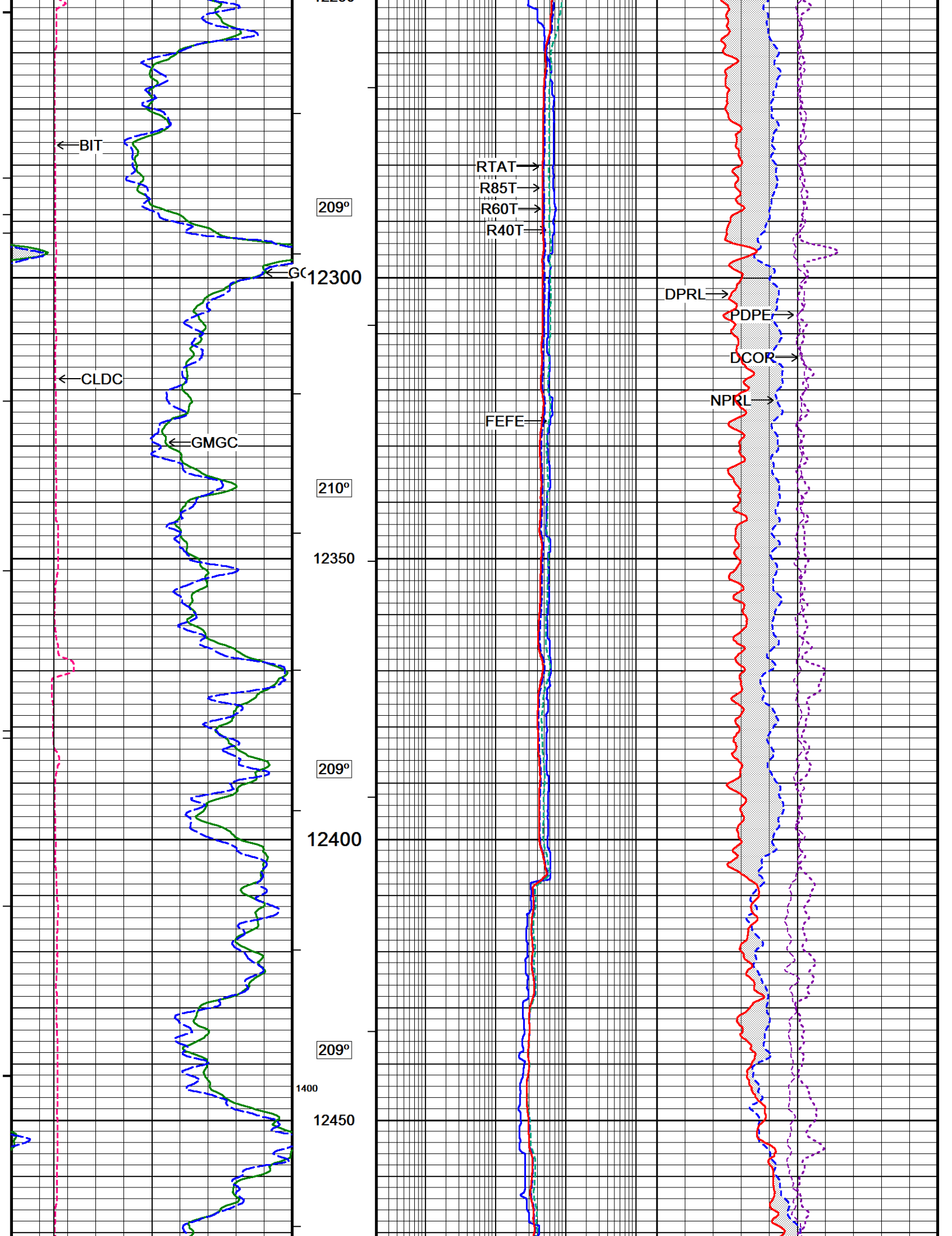
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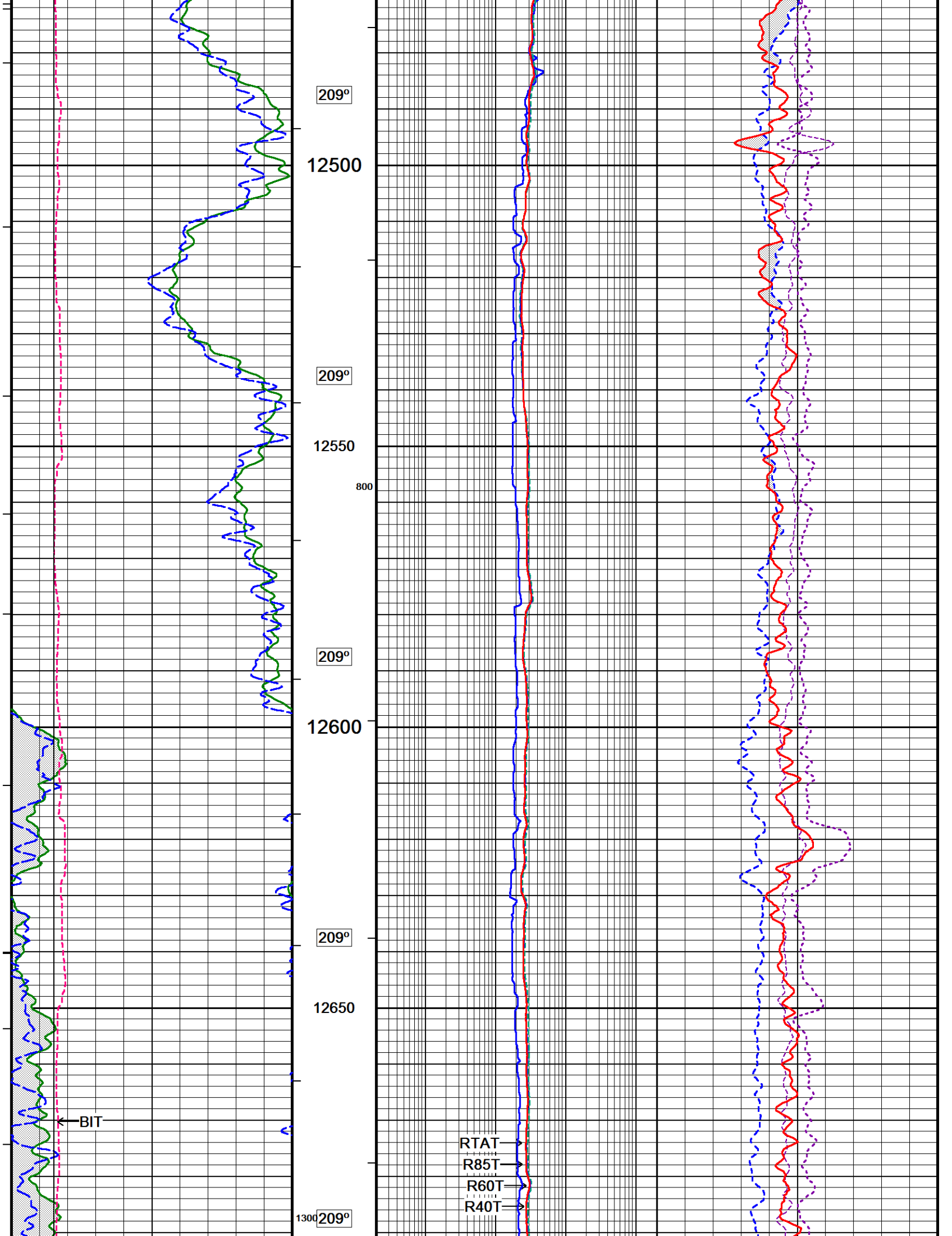
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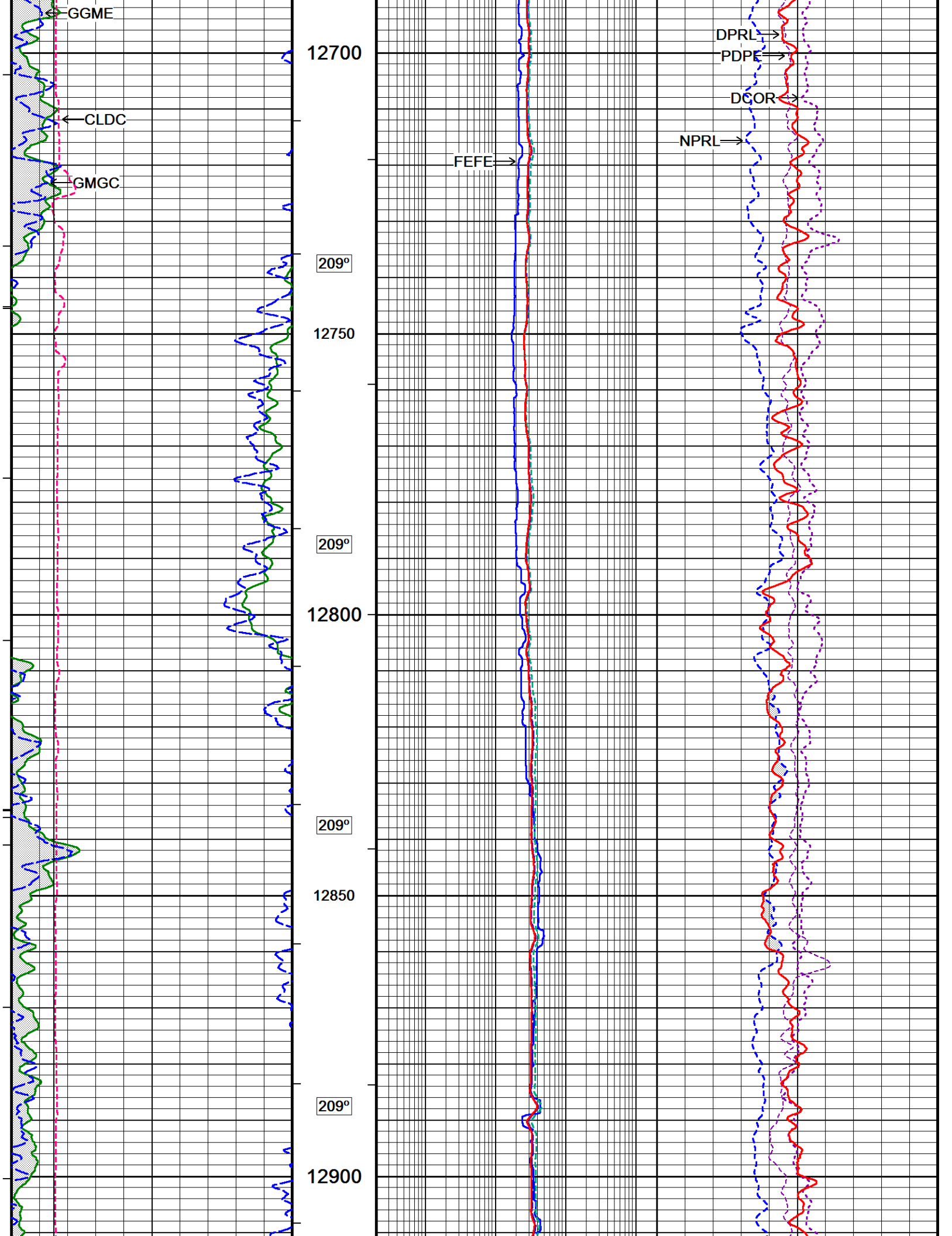
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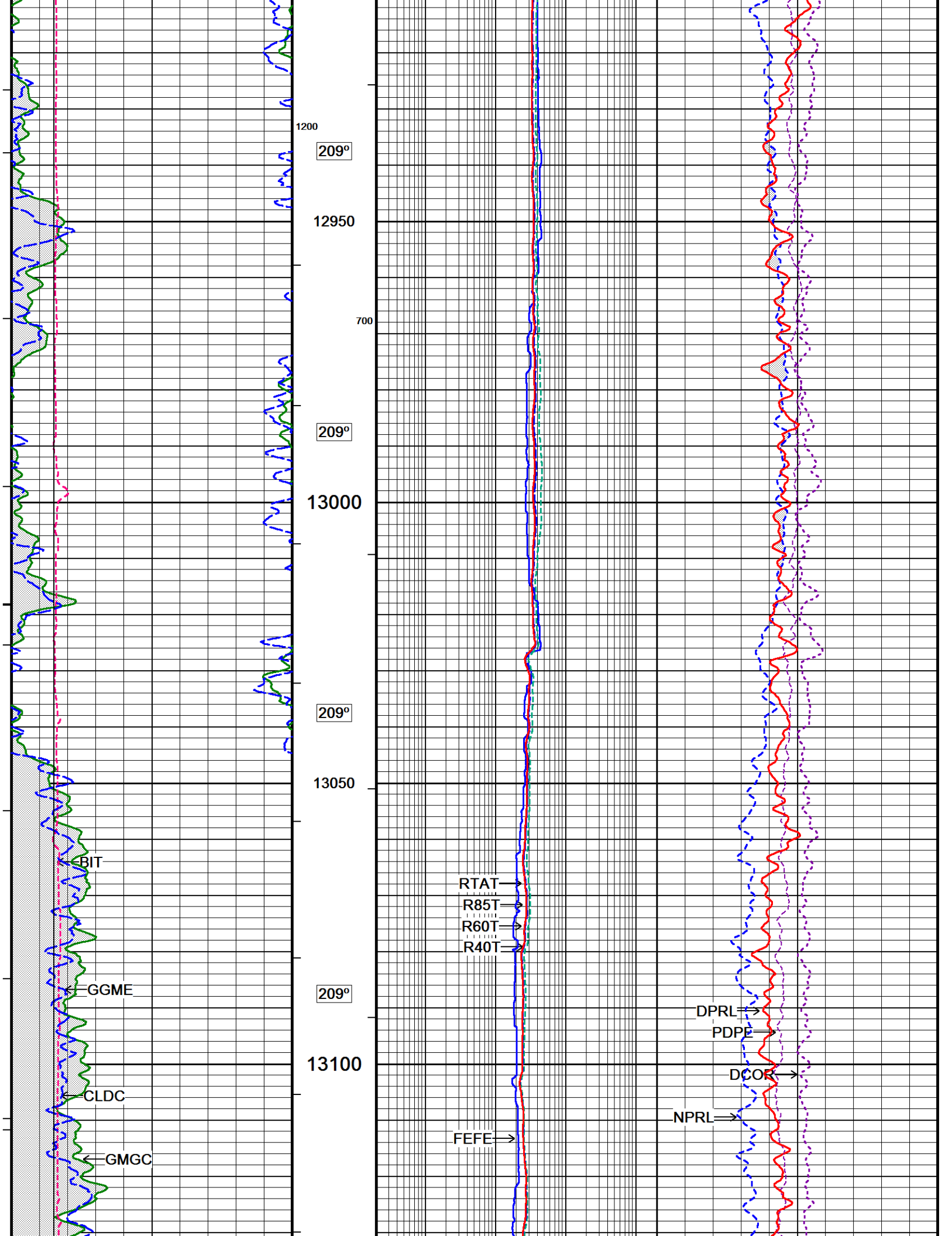
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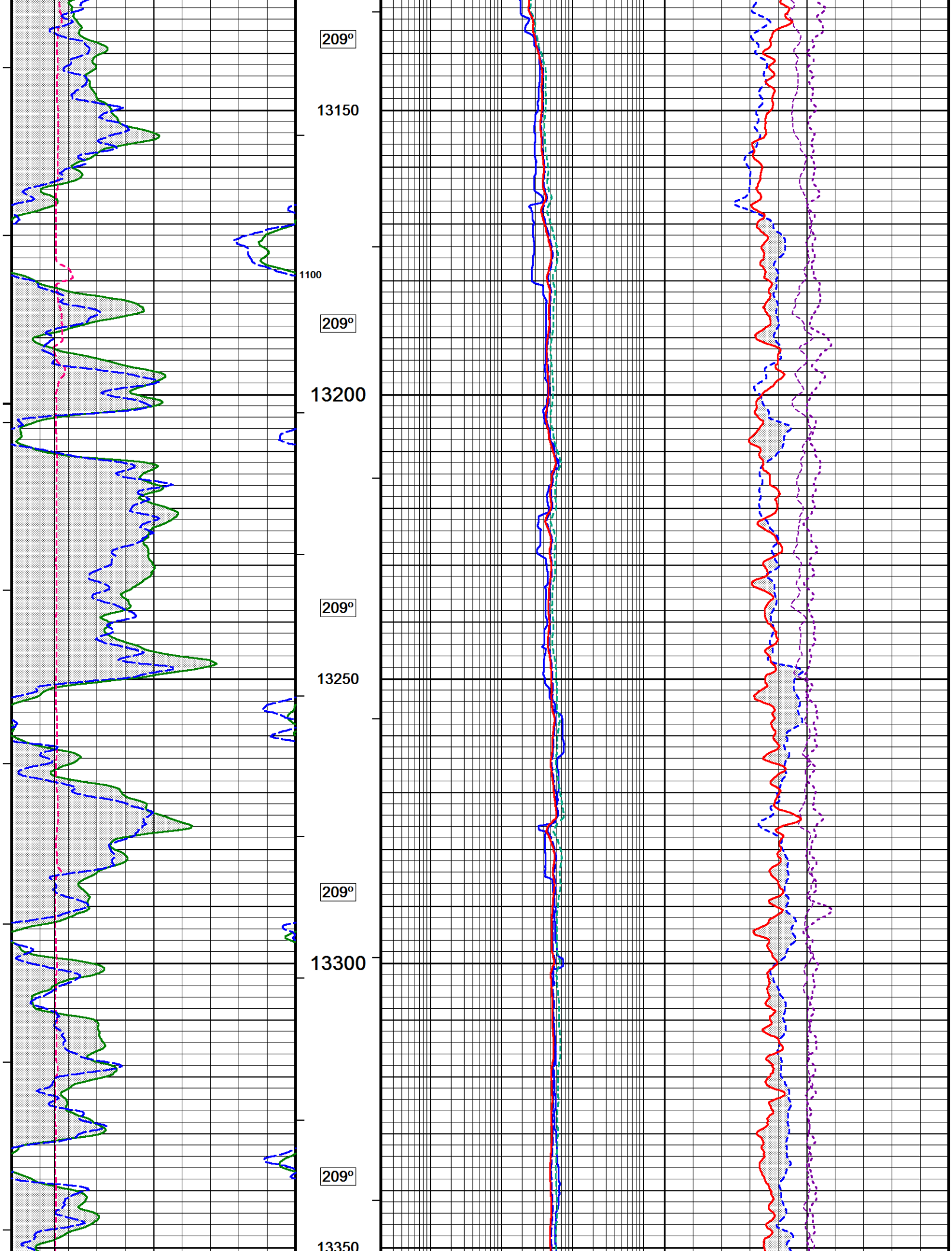
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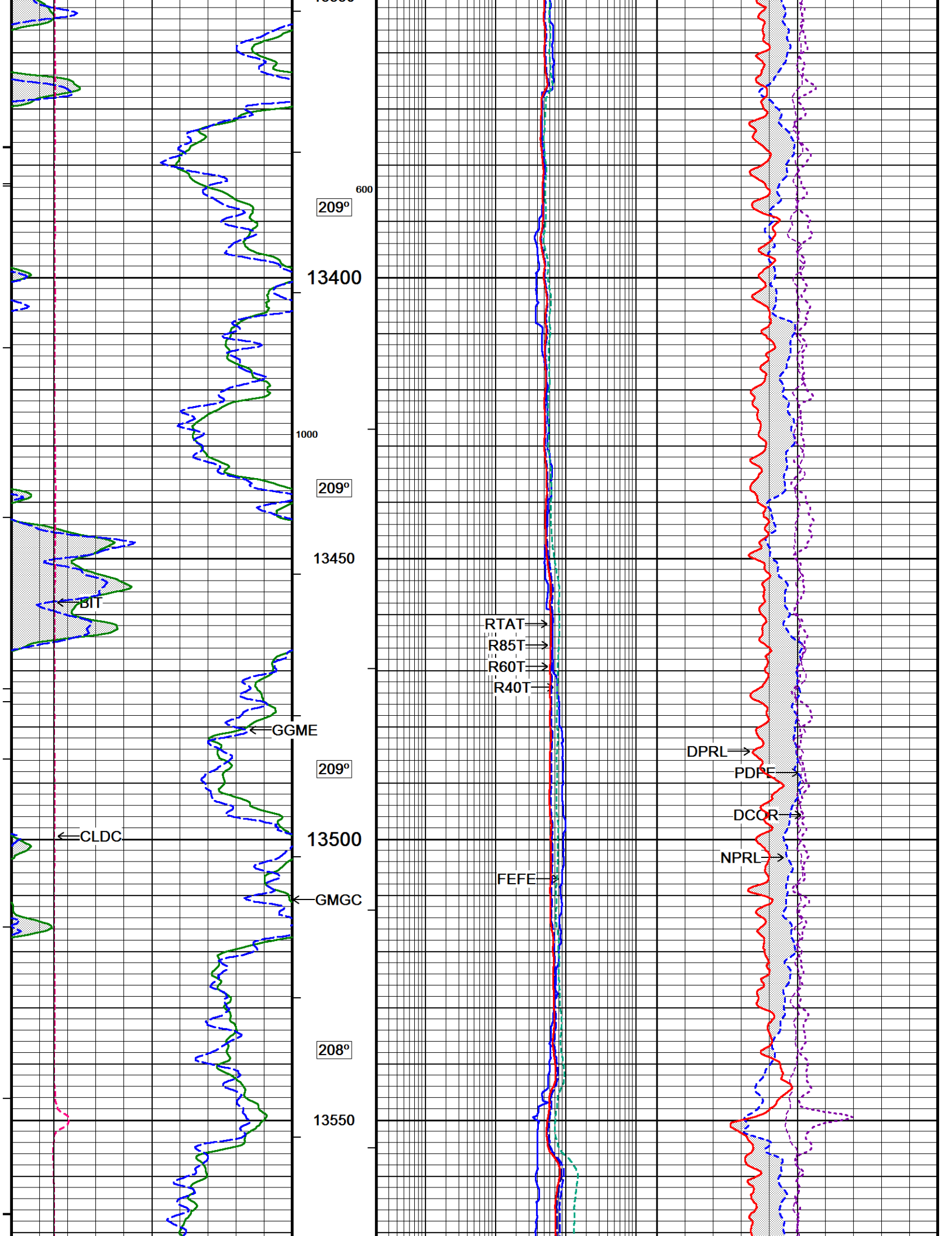
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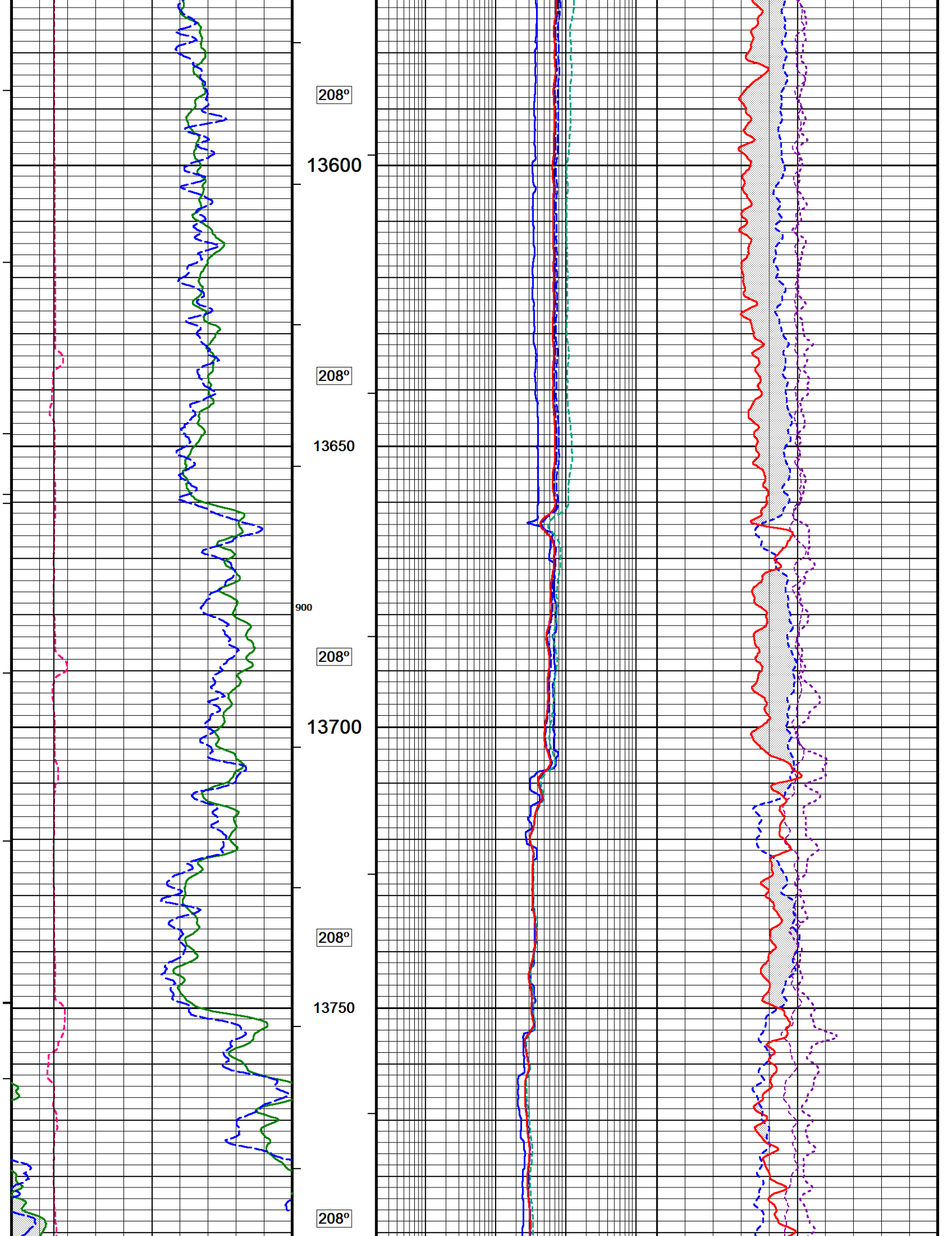
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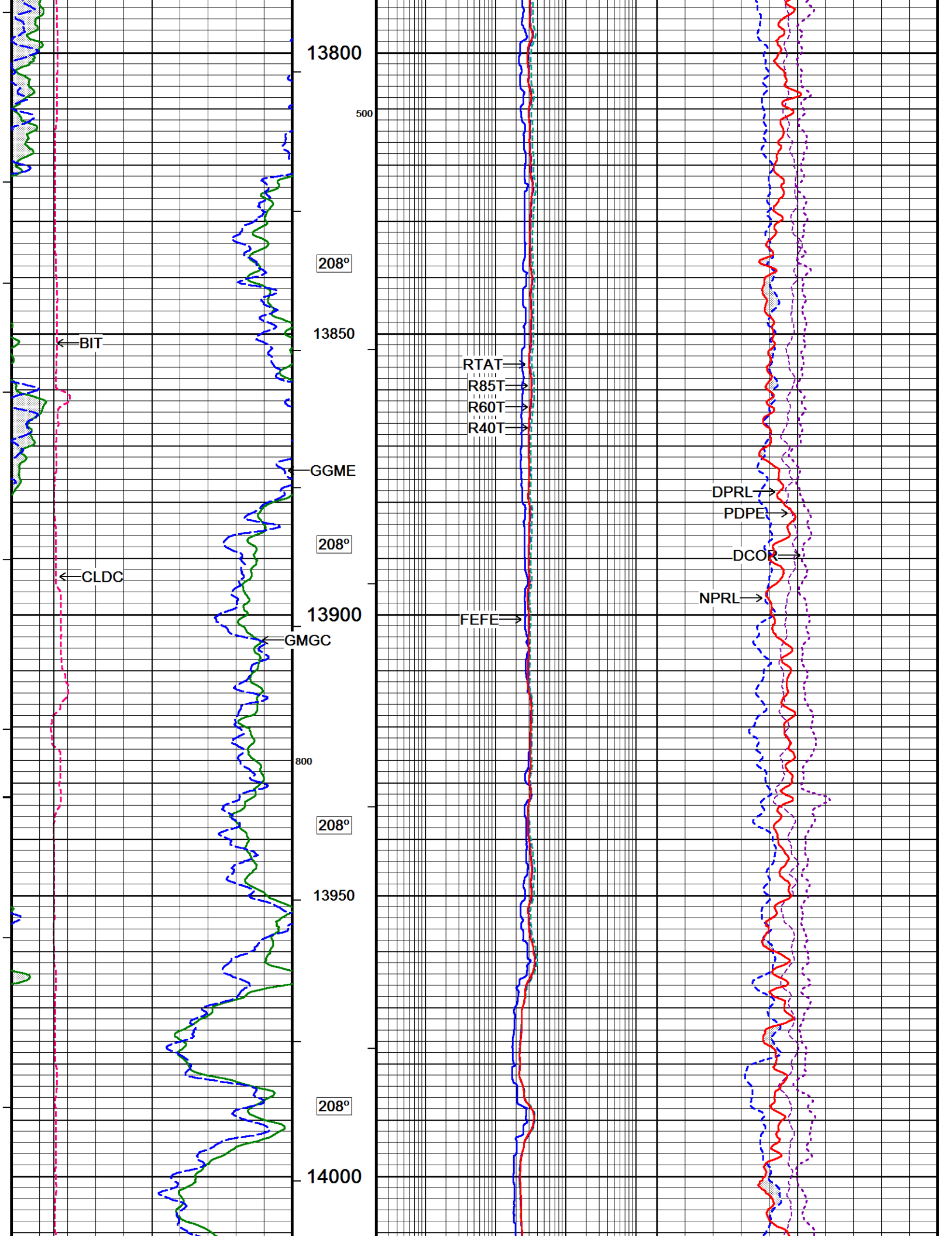
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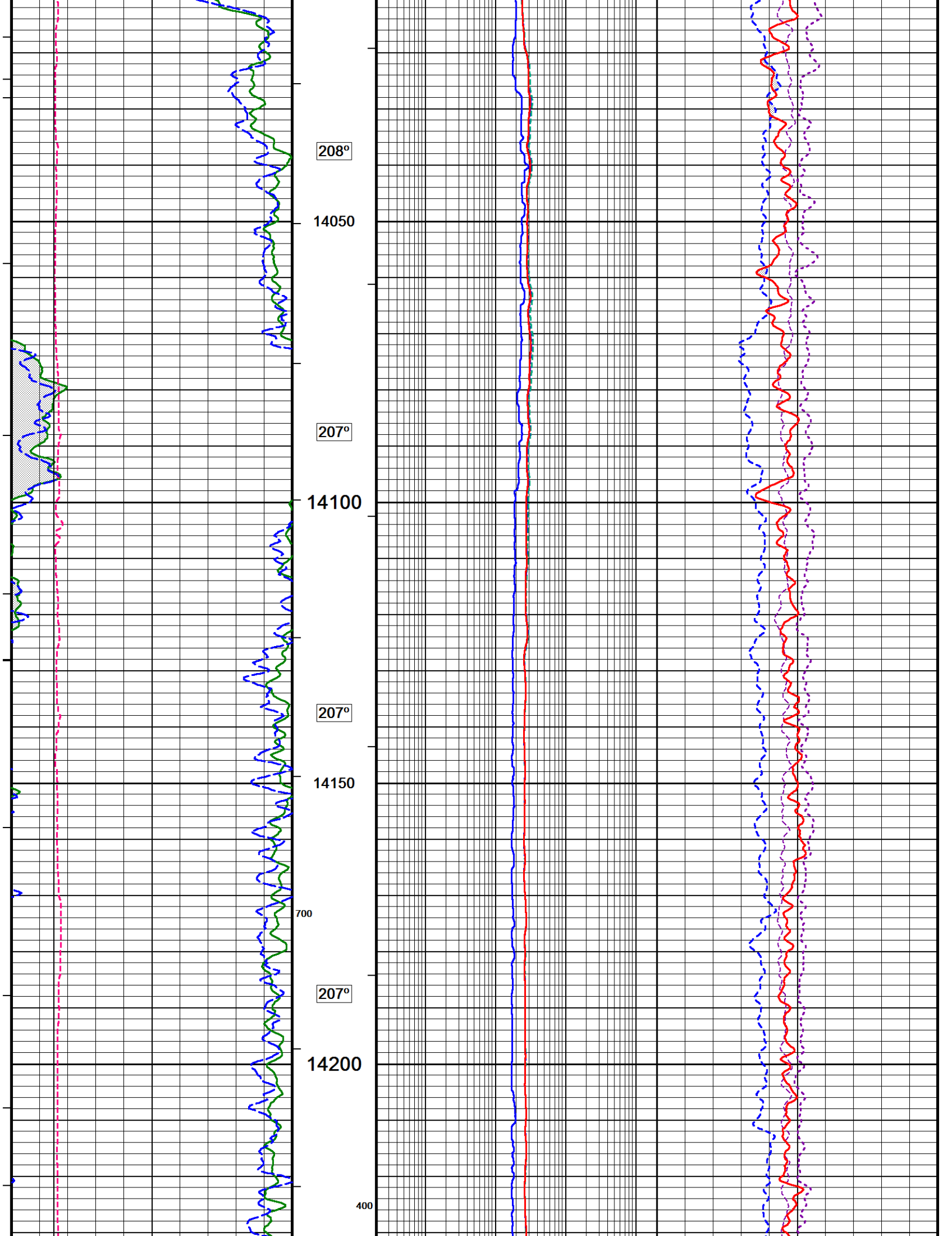
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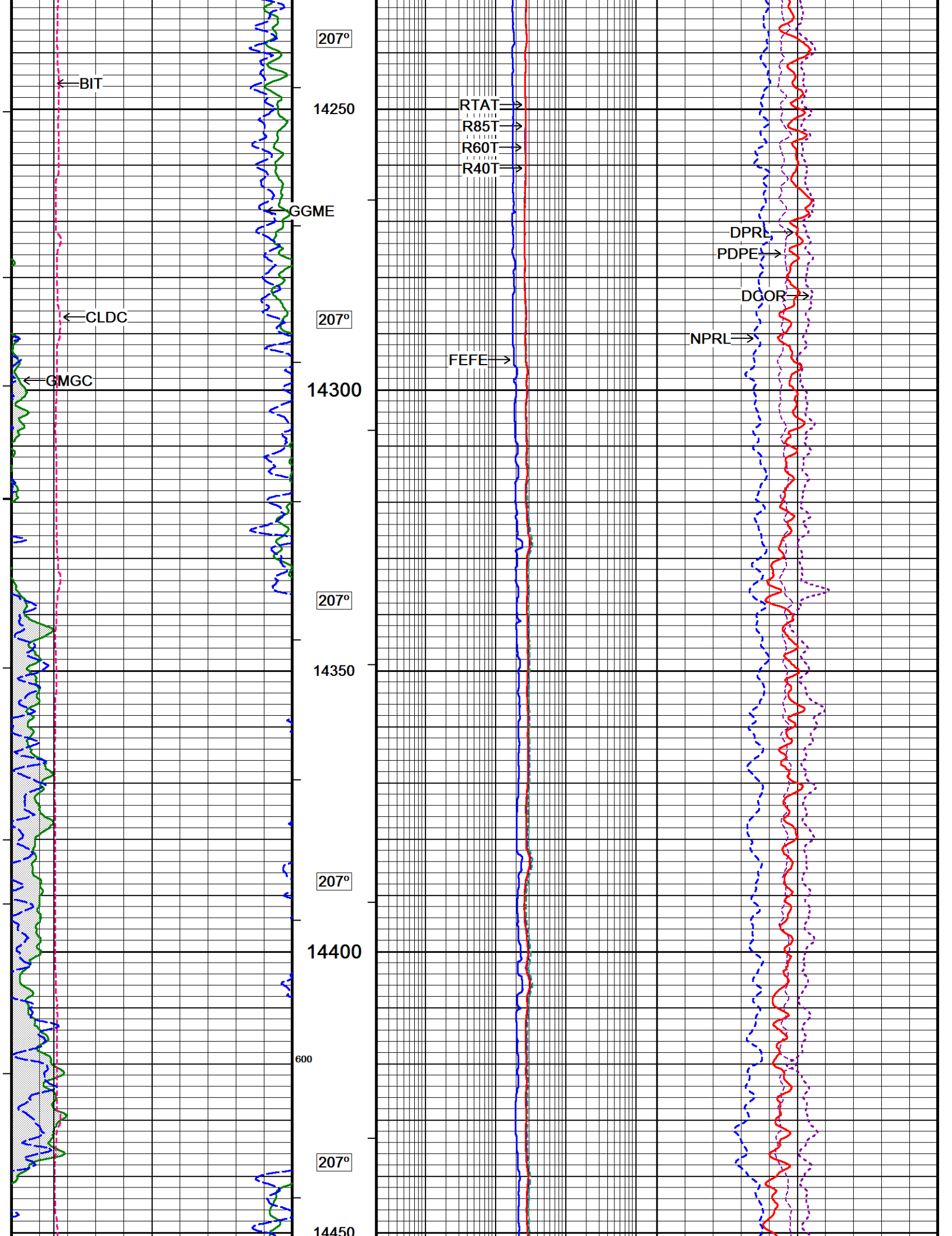
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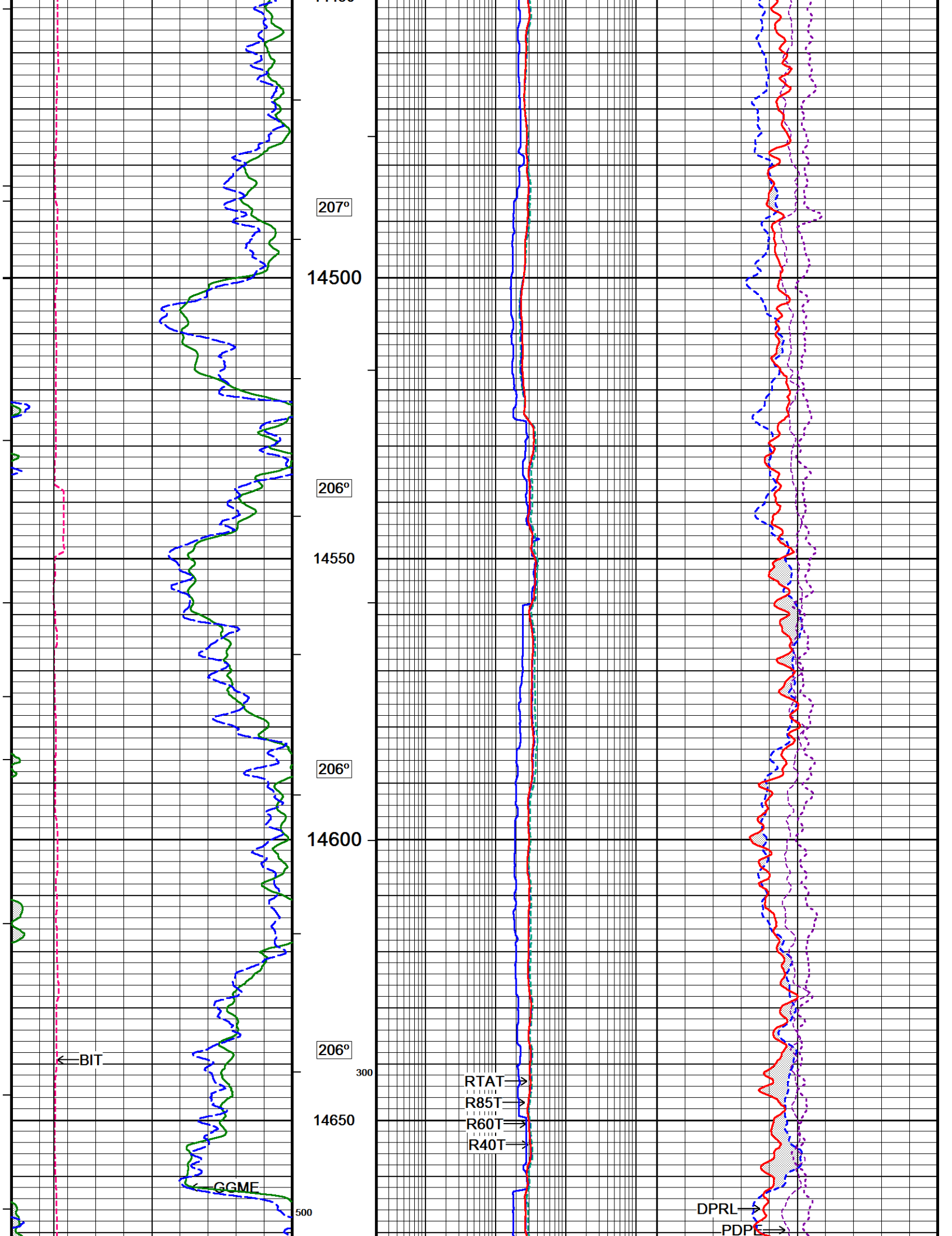
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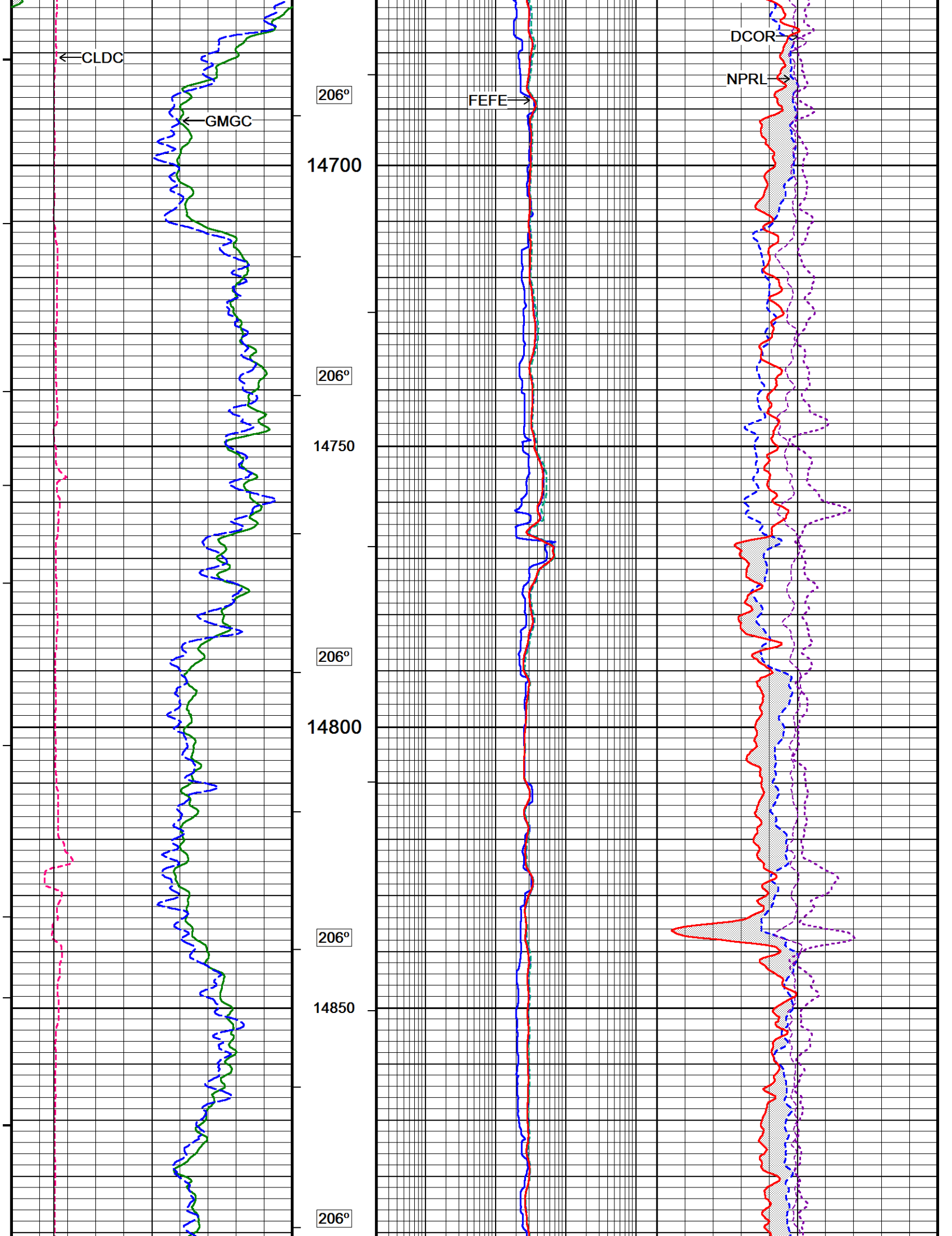
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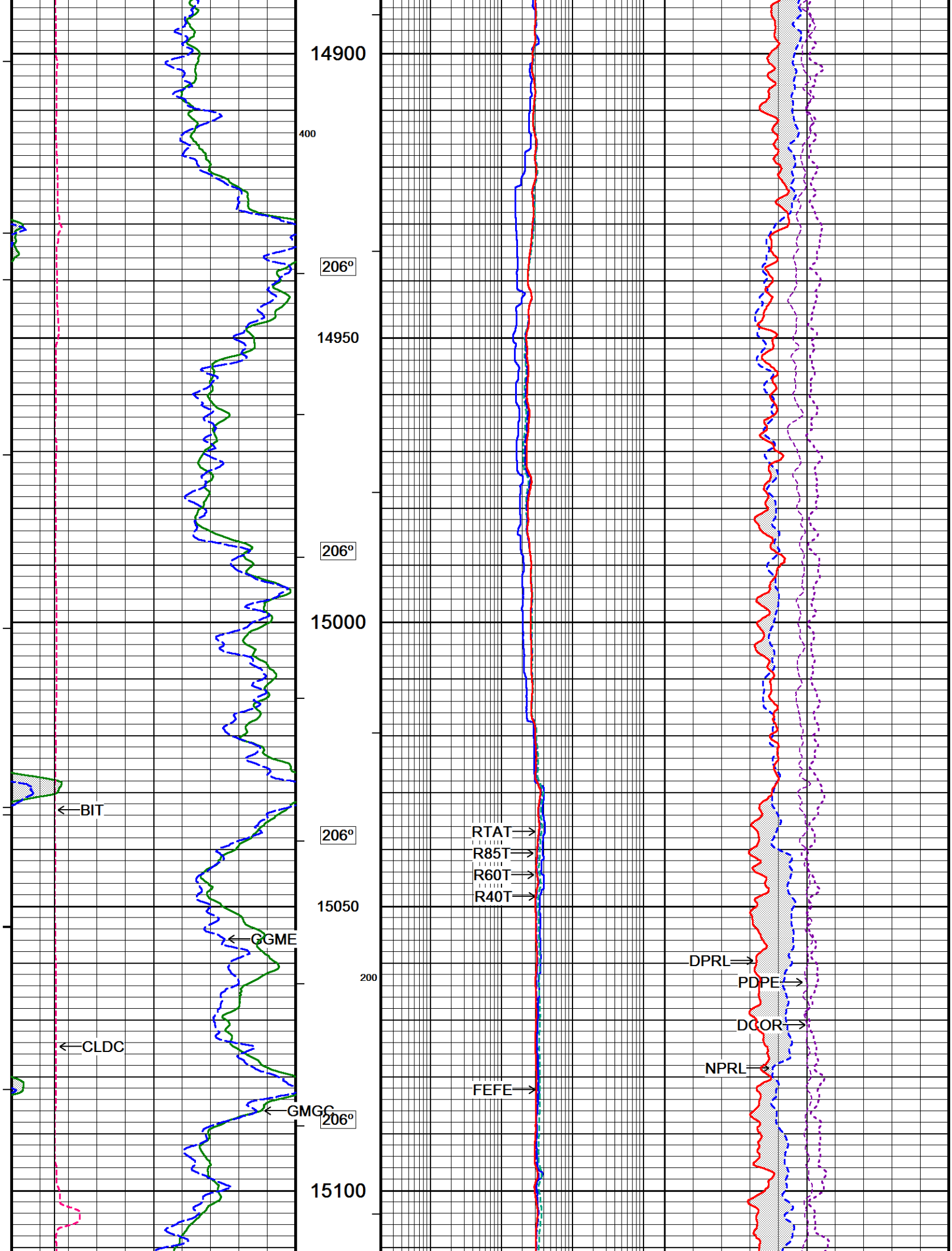
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206°
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GGME
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CLDC
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206°
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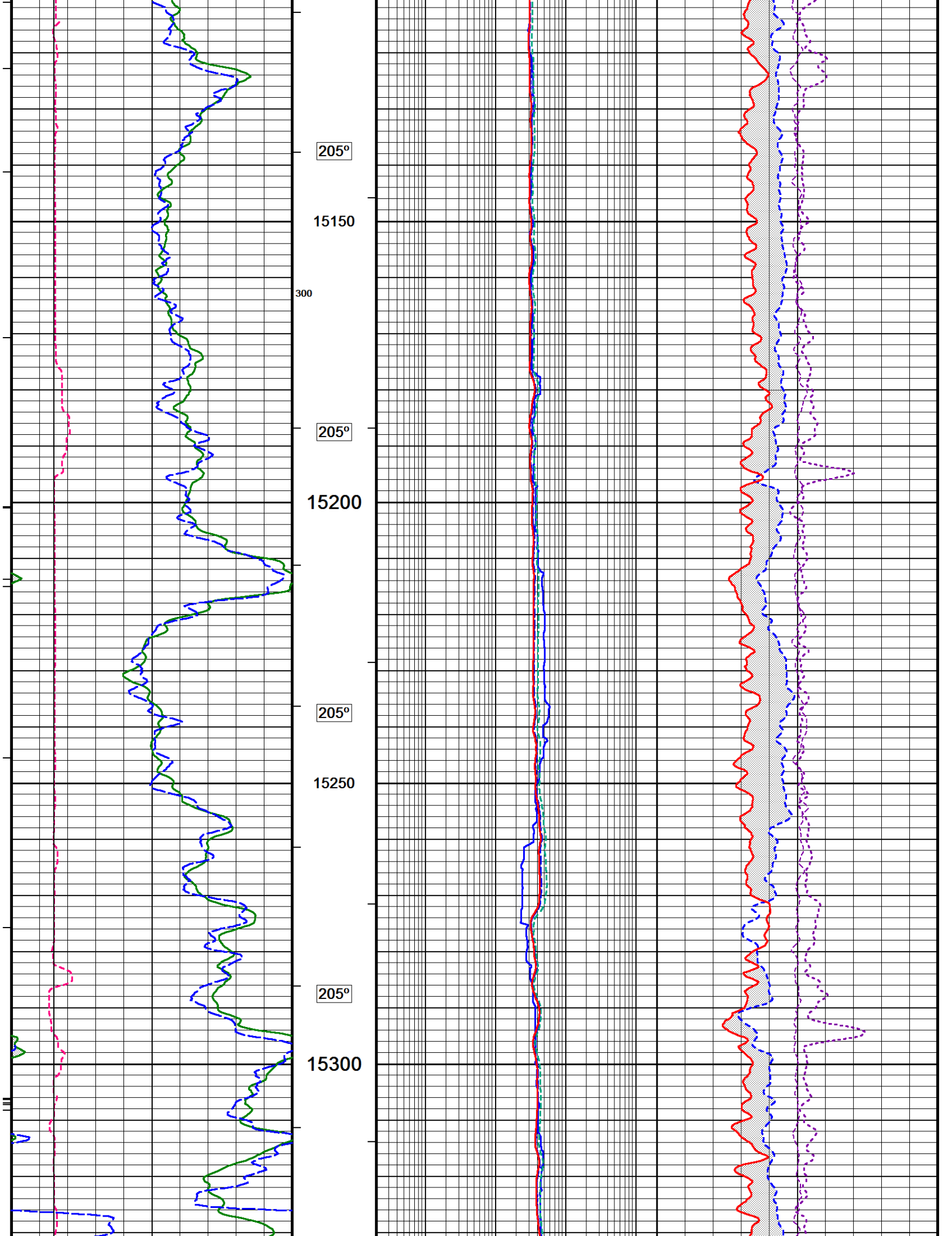
PDPE
DCOR
NPRL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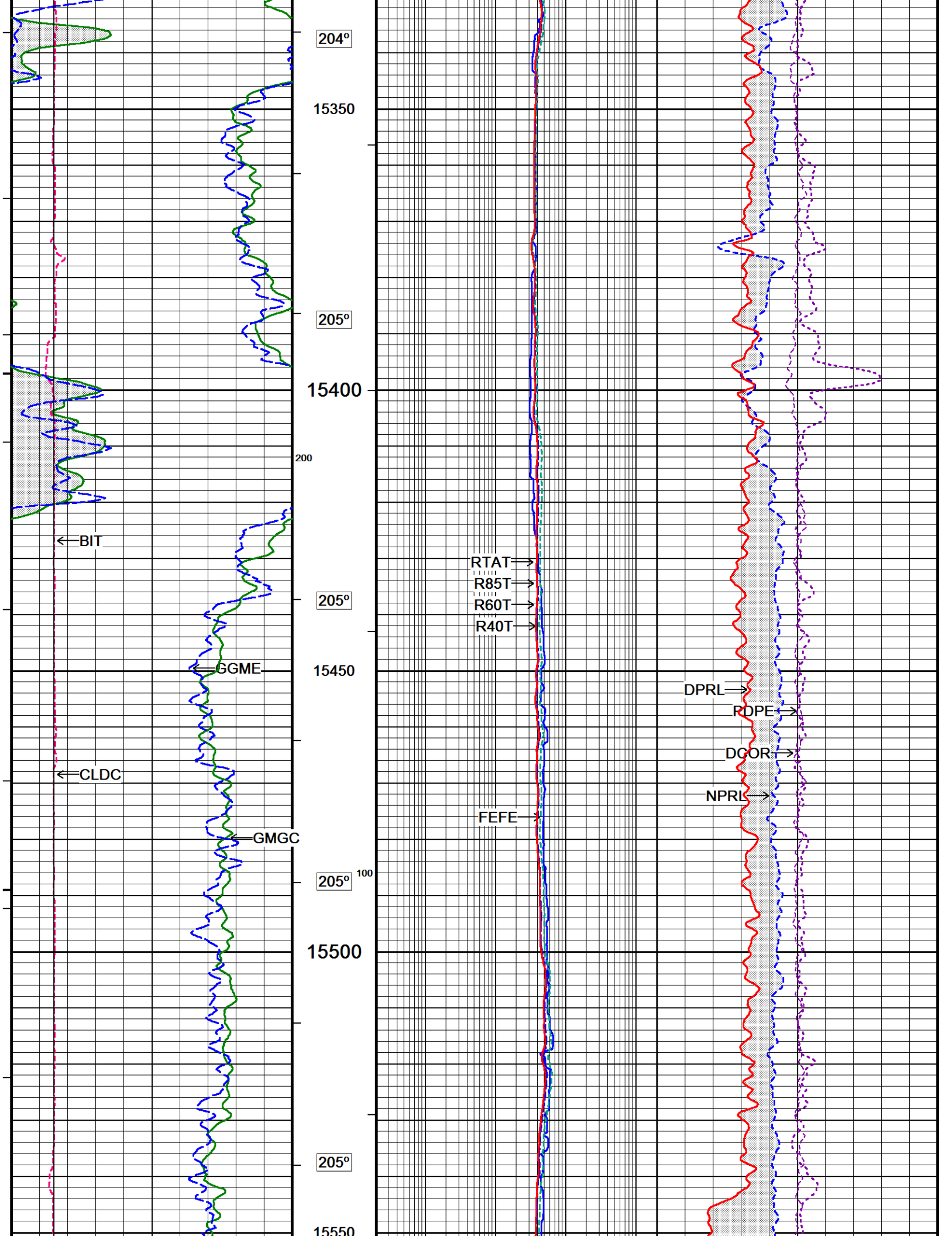
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DCOR
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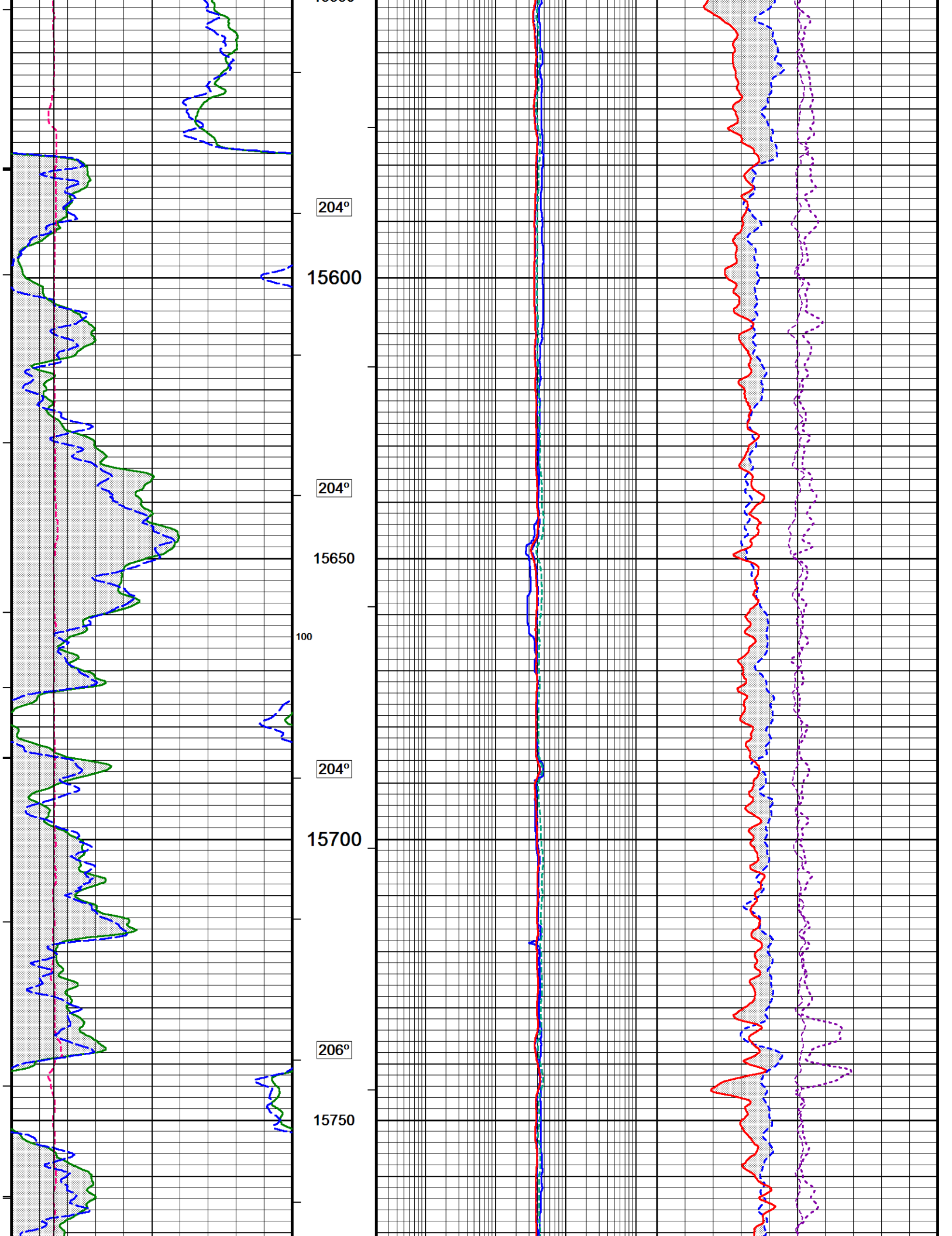
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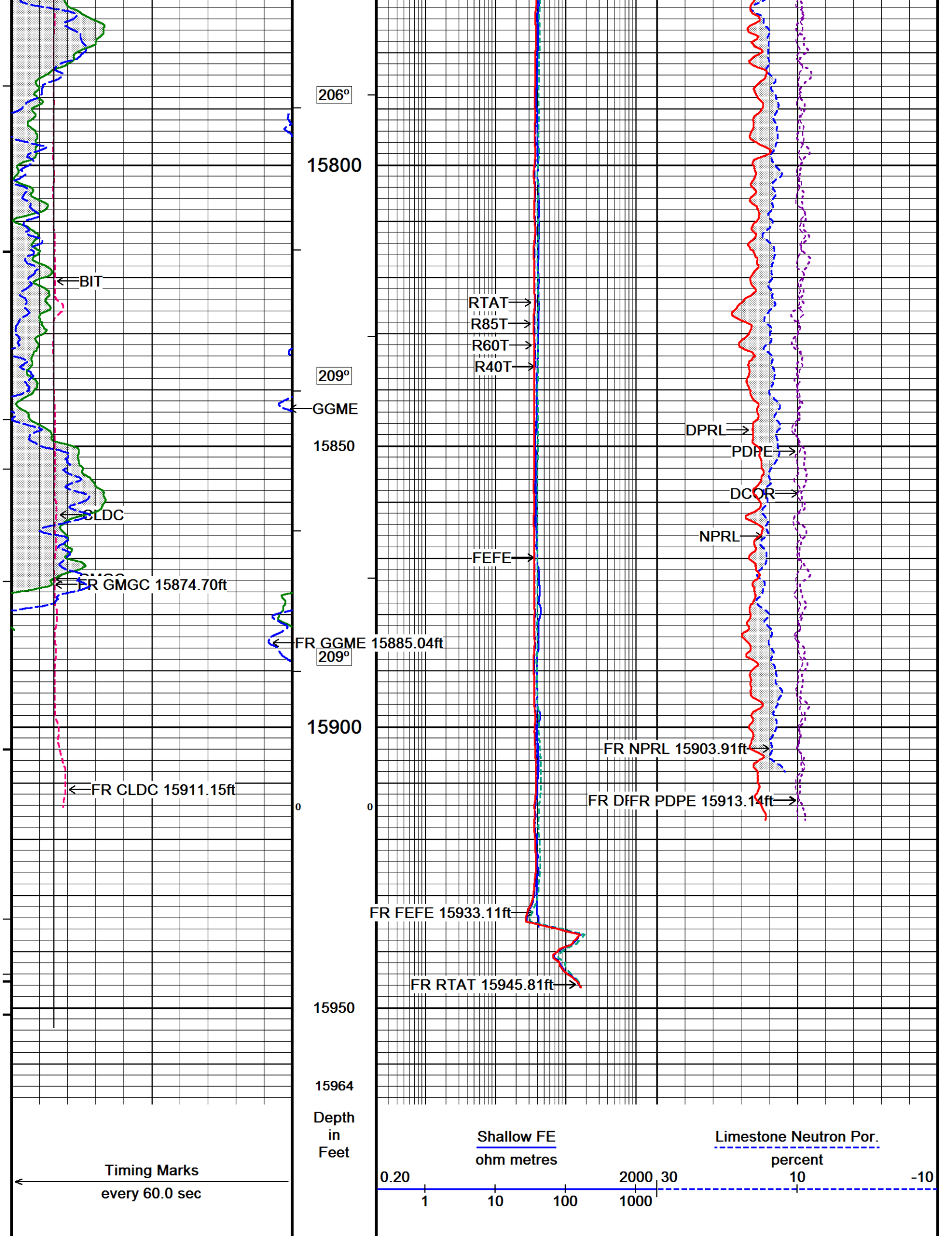
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R40T
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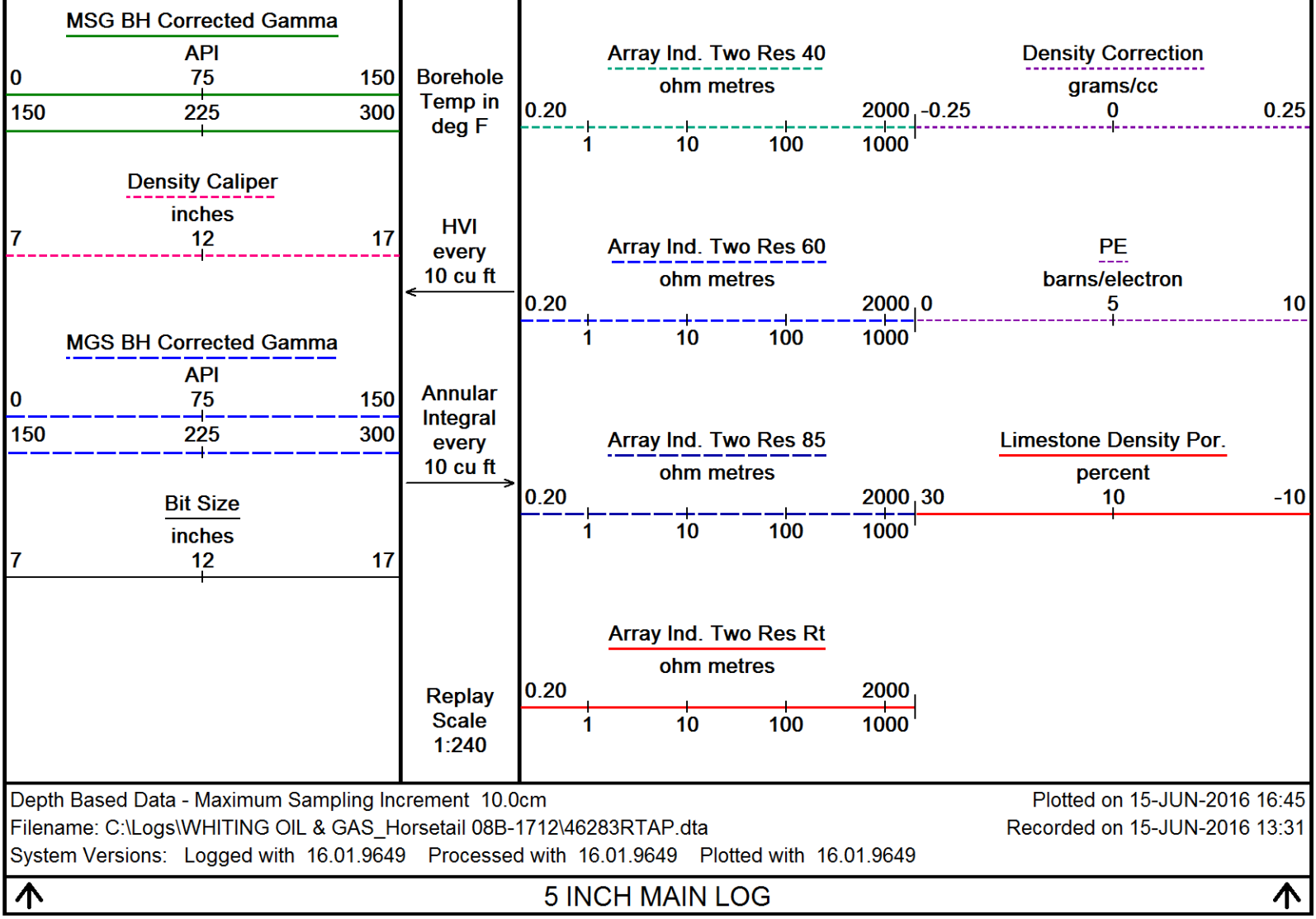
PDPE
DCOR
CLDC
NPRL
FEFE
FR GMGC 15874.70ft
FR GGME 15885.04ft
209°
15900
FR NPRL 15903.91ft
FR CLDC 15911.15ft
FR DIFR PDPE 15913.14ft
FR FEFE 15933.11ft
FR RTAT 15945.81ft
15950
15964
Depth
in
Feet
Timing Marks
every 60.0 sec
Shallow FE
ohm metres
0.20
1
10
100
2000
1000
Limestone Neutron Por.
percent
30
10
-10



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2016 16:45

Filename: C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta — Recorded on 15-JUN-2016 13:31

System Versions: Logged with 16.01.9649 Processed with 16.01.9649 Plotted with 16.01.9649

5 INCH MAIN LOG

BEFORE SURVEY CALIBRATION

C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta

Down-hole Tension Calibration All 000

Field Calibration on 24-OCT-2010 03:34

Reading No	Measured	
1	15659.85	0.00
2	15734.68	370.00

General Constants All 000

Last Edited on 15-JUN-2016,15:39

General Parameters		
Mud Resistivity	1.420	ohm-metres
Mud Resistivity Temperature	75.000	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	None	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0

Field Calibration on 07-JUN-2016 03:52

Reading No	Measured	Calibrated (lbs)
1	14502.95	0.00
2	15752.49	683.40

Strain Gauge Constants MMS-F.A 249

Last Edited on 11-JUN-2016,13:50

Atmospheric Pressure	14.70	psi
Serial Number	279865	
Calibration Date	08-Dec-2012	
Base Check Date		
Dead Weight Serial Number	0	
Dead Weight Gravitational Correction	1.0	

Temperature	75.0		150.0		250.0		350.0	degrees F
Pressure psia	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
0.0	-0.030	-0.029	-0.036	-0.036	-0.054	-0.054	-0.084	-0.083
3000.0	5.155	5.157	5.150	5.152	5.133	5.134	5.102	5.104
6000.0	10.348	10.353	10.345	10.349	10.329	10.332	10.298	10.303
9000.0	15.554	15.559	15.553	15.558	15.538	15.543	15.508	15.513
12000.0	20.772	20.776	20.773	20.777	20.760	20.764	20.731	20.735
15000.0	26.004		26.007		25.996		25.969	

MMS Parameters MMS-F.A 249

Last Edited on 14-JUN-2016 05:16

Logging Parameters

Firmware Version	2v59	
Caliper Open On	MAI	
Caliper Open Delay		minutes
Caliper Closed On	Unknown	
Caliper Closed Delay	N/A	minutes
Sample Rate	0.50	seconds
Use Deep Sleep	Yes	
Delay Deep Sleep	No	
Deep Sleep Wake Time	360.0	minutes
Deep Sleep Wake on Temperature	No	
Deep Sleep Wake Temperature	N/A	degrees C
Deep Sleep Wake on Pressure	No	
Deep Sleep Wake Pressure	N/A	psi
MMI Pad Pressure	0.0	

Release Parameters

Pulse Duration Base Level	10.0	seconds
Pulse Duration Transition Time	60.0	seconds
Pulse Duration Status Pulse From	20.0	seconds
Pulse Duration Caliper Close From	145.0	seconds
Pulse Duration Caliper Open From	150.0	seconds
Pulse Duration Release Pulse From	215.0	seconds
Pulse Duration Release Pulse To	280.0	seconds
Pulse Release Duration	240.0	seconds
Pulse Discriminator Pressure Band	96.0	seconds
Pulse Pressure Discriminator	213.0	seconds
Use Negative Pulsing	No	
Good Status Reply Open Hole	65535.0	seconds
Good Status Reply Cased Hole	20.0	seconds
Bad Status Reply	60.0	seconds
Status Pulse To	80.0	seconds
Caliper Close To		seconds
Caliper Open To	210.0	seconds

Configuration

MMS,MSG,MSG,MSG,MGS,MDN,MPD,MPD,MVC,MFE,MAI

Gamma Calibration MGS-D.A 218

Field Calibration on 14-JUN-2016 03:03

	Measured	Calibrated (API)
Background	138	92
Calibrator (Gross)	1502	1004
Calibrator (Net)	1364	912

Gamma Calibration Tolerances MGS-D.A 218

Ratio	1.495	1.40 1.475 1.55	Counts/API

Gamma Constants MGS-D.A 218

Last Edited on 14-JUN-2016,04:33

Gamma Calibrator Number	GRCC.072	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.21	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

SP Calibration MGS-D.A 218

Field Calibration on 14-JUN-2016,02:35

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

High Resolution Temperature Calibration MGS-D.A 218

Field Calibration on 14-JUN-2016,02:35

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MGS-D.A 218

Last Edited on 01-JAN-2016,11:23

Pre-filter Length	11

Neutron Calibration MDN-C.A 463

Base Calibration on 26-MAY-2016 08:58
Field Check on 14-JUN-2016 03:14

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	3167	96	3714	110
Ratio	32.957		33.764	

Field Calibrator at Base

	Calibrated (cps)	
	1354	2006
Ratio	0.675	

Field Check

	Calibrated (cps)	
	1399	2075
Ratio	0.675	

Neutron Calibration Tolerances MDN-C.A 463

Ratio	32.957	-5% 33 +5%
Base Check	0.675	0.65 0.7 0.75
Field Check	0.675	0.655 0.675 0.695

Neutron Constants MDN-C.A 463

Last Edited on 15-JUN-2016,14:43

Neutron Source Id	N-1057	
Neutron Jig Number	5922NE	
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	

Caliper Calibration MVC-A.A 141

Base Calibration on 14-JUN-2016,02:21
Field Calibration on 14-JUN-2016 02:22

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	9717	3.98
2	16615	5.96
3	23529	7.98
4	29994	9.84
5	37366	11.91
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
9.87	9.84

FE Calibration MFE-C.A 417

Base Calibration on 26-MAY-2016 14:05
Field Check on 14-JUN-2016 02:20

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.9	126.8
Base Check		280.9
Field Check		280.8

FE Calibration Tolerances MFE-C.A 417

Reference 2	964.9	-3% 980.0 +3%	ohm
Base Check	280.9	-2% 277.0 +2%	ohm-m
Field Check	280.8	-2% 280.9 +2%	ohm-m

FE Constants MFE-C.A 417

Last Edited on 15-JUN-2016,14:24

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.	MGS External Temperature	

High Resolution Temperature Calibration MAI-C.A 456

Field Calibration on 14-JUN-2016,02:16

	Measured	Calibrated(Deg F)
Lower	20.00	20.00
Upper	200.00	200.00

High Resolution Temperature Constants MAI-C.A 456

Last Edited on 26-JUN-2015,15:47

Pre-filter Length	11

Induction Calibration MAI-C.A 456

Base Calibration on 25-JAN-2016,09:48
Field Check on 14-JUN-2016 02:18

Base Calibration

Test Loop Calibration	Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High
1	16.2	452.6	9.3	966.2
2	5.6	366.0	7.6	821.4
3	2.9	251.0	5.2	566.0
4	1.3	130.8	2.6	279.2

Array Temperature	73.2	Deg F
Test Loop Calibration Verified	26-MAY-2016 08:28	

Test Loop Calibration Verified 26-MAY-2016 08:28

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High	
1	-4.6	2133.9	-4.2	2134.3	
2	14.6	1964.9	14.9	1965.1	
3	15.4	1681.4	15.7	1681.6	
4	11.1	1126.2	11.3	1126.3	
Deep	9.3	1071.7	9.5	1071.8	
Medium	24.1	2237.5	24.4	2237.6	
Shallow	21.4	2939.9	21.8	2940.1	
Array Temperature		59.8		62.1	Deg F

Induction Calibration Tolerances MAI-C.A 456

Low Conductivity 1	16.2	13.0 17.0 21.0	mmho/m	High Conductivity 1	452.6	430.0 475.0 520.0 mmho/m
Low Conductivity 2	5.6	4.5 6.0 7.5	mmho/m	High Conductivity 2	366.0	345.0 385.0 425.0 mmho/m
Low Conductivity 3	2.9	1.0 3.5 6.0	mmho/m	High Conductivity 3	251.0	240.0 260.0 280.0 mmho/m
Low Conductivity 4	1.3	0.0 2.0 4.0	mmho/m	High Conductivity 4	130.8	120.0 135.0 150.0 mmho/m
Background Vx 1	0.0	-110.0 -32.5 45.0	mmho/m	Phase Check Loop 1	0.0	-2.0 0.0 2.0 %
Background Vx 2	0.0	-35.0 20.0 75.0	mmho/m	Phase Check Loop 2	0.0	-2.0 0.0 2.0 %
Background Vx 3	0.0	-60.0 2.5 65.0	mmho/m	Phase Check Loop 3	0.0	-2.0 0.0 2.0 %
Background Vx 4	0.0	-50.0 -17.5 15.0	mmho/m	Phase Check Loop 4	0.0	-2.0 0.0 2.0 %

Induction Constants MAI-C.A 456

Last Edited on 15-JUN-2016,15:39

Induction Model	RtAP-WBM	
Borehole Correction Constants		
Tool Centred	Yes	
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Stand-off Type	N/A	
Stand-off	N/A	inches
Number of Fins on Stand-off	N/A	
Stand-off Fin Angle	N/A	degrees
Stand-off Fin Width	N/A	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MGS External Temperature	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

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	

Compact Spectral Gamma Calibration MSG-A.A 111

Base Calibration on 25-FEB-2016 14:23
Field Calibration on 14-JUN-2016 04:25

Base Calibration

Gamma Ray

	Measured	Calibrated (API)
Background	66	29
Calibrator (Gross)	697	300
Calibrator (Net)	630	271

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	53.9	8.6	2.3	0.6	1.0
Calibrator (Gross)	552.4	97.2	28.9	8.0	10.3
Calibrator (Net)	498.5	88.5	26.5	7.4	9.3

	K %	U ppm	Th ppm
Concentrations	5.9	13.6	43.7

Potassium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	53.9	8.6	2.3	0.6	1.0
Calibrator (Gross)	127.7	38.2	16.1	0.6	1.0
Calibrator (Net)	73.8	29.5	13.8	0.0	0.0

	K %	U ppm	Th ppm
Concentrations	5.8	0.0	0.0

Uranium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	53.9	8.6	2.3	0.6	1.0
Calibrator (Gross)	338.2	47.7	11.7	6.0	2.7
Calibrator (Net)	284.3	39.0	9.3	5.4	1.8

	K %	U ppm	Th ppm
Concentrations	0.0	17.8	0.0

Thorium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	53.9	8.6	2.3	0.6	1.0
Calibrator (Gross)	255.7	37.5	7.6	3.8	9.0
Calibrator (Net)	201.8	28.9	5.2	3.2	8.0

	K %	U ppm	Th ppm
Concentrations	0.0	0.0	46.3

Field @ Base Calibration

Calibration Type	SG Jigs
SGB Calibrator Serial Number	440
SGM Calibrator Serial Number	450

Gamma Ray

	Measured	Calibrated (API)
Background	64.2	27.7
Calibrator (Gross)	691.5	298.9
Calibrator (Net)	627.4	271.2

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	51.8	8.6	2.2	0.6	1.0
Calibrator (Gross)	548.1	96.7	28.7	7.8	10.3
Calibrator (Net)	496.3	88.1	26.5	7.2	9.3

Field Calibration

Calibration Type	SG Jigs
SGB Calibrator Serial Number	440
SGM Calibrator Serial Number	450

Gamma Ray

Gamma Ray

	Measured	Calibrated (API)
Background	161.6	70.1
Calibrator (Gross)	787.0	341.3
Calibrator (Net)	625.4	271.2

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	127.5	24.0	6.5	1.5	2.0
Calibrator (Gross)	623.6	110.3	32.8	8.6	11.6
Calibrator (Net)	496.1	86.4	26.3	7.1	9.6

Compact Spectral Gamma Calibration Tolerances MSG-A.A 111

Base Check K	5.79	-13.80% 5.90 +13.80%	%	Field @ Base Check K	5.80	-13.80% 5.80 +13.80% %
Base Check U	14.21	-13.80% 13.60 +13.80%	ppm	Field @ Base Check U	13.92	-13.80% 13.60 +13.80% ppm
Base Check T	45.34	-13.80% 43.70 +13.80%	ppm	Field @ Base Check T	45.80	-13.80% 43.70 +13.80% ppm
Field Check K	5.54	-13.80% 5.90 +13.80%	%			
Field Check U	13.72	-13.80% 13.60 +13.80%	ppm			
Field Check T	47.08	-13.80% 43.70 +13.80%	ppm			

Compact Spectral Gamma Constants MSG-A.A 111

Last Edited on 14-JUN-2016,04:39

Background Calibrator Number	440	
Mixture Calibrator Number	450	
Potassium Calibrator Number	500	
Uranium Calibrator Number	506	
Thorium Calibrator Number	503	
Mud Density	1.21	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

Photo Density Calibration MPD-D.A 460

Base Calibration on 25-MAY-2016 17:04
Field Check on 14-JUN-2016 02:35

Density Calibration

Base Calibration	Measured Near	Measured Far	Calibrated (sdu) Near	Calibrated (sdu) Far
Background	1284	1470		
Reference 1	54173	25945	59443	30683
Reference 2	22226	2632	24540	2525
Field Check at Base	1283.7	1469.6		
Field Check	1277.8	1475.3		

PE Calibration

Base Calibration	Measured WS	Measured WH	Measured Ratio	Calibrated Ratio
Background	247	1157		
Reference 1	23951	53977	0.449	0.372
Reference 2	6770	22089	0.312	0.271
Field Check at Base	246.8	1157.4		
Field Check	246.1	1153.0		

Photo Density Calibration Tolerances MPD-D.A 460

Near Density Ratio	2.53	-5% 2.52 +5%	Far Density Ratio	21.06	-5% 21.00 +5%
PE Calibration	0.126	0.089 0.110 0.131			
Near Den. Field Check	1277.8	-3% 1283.7 +3%	Far Den. Field Check	1475.3	-3% 1469.6 +3%

Near Den. Field Check	1277.8	Far Den. Field Check	1475.3
PE WS Field Check	246.1 (-6% 246.8 +6%)	PE WH Field Check	1153.0 (-6% 1157.4 +6%)

Density Constants MPD-D.A 460

Last Edited on 14-JUN-2016,04:34

Density Source Id	P50562B	
Nylon Calibrator Number	DNC.E.652	
Aluminium Calibrator Number	DAC.D.631	
Density Shoe Profile	4 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.21	gm/cc
Mud Density Z/A Multiplier	1.11	
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
Precision Enhanced Density Processing	Not Applied	

Matrix Density (gm/cc)	Depth (ft)
2.65	
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	

Caliper Calibration MPD-D.A 460

Base Calibration on 25-MAY-2016 10:26
Field Calibration on 14-JUN-2016 02:25

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	17090	3.98
2	25341	5.96
3	33707	7.97
4	41783	9.84
5	51414	11.91
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.92	7.97

Caliper Calibration Tolerances MPD-D.A 460

Short Arm Field Cal. 7.92 (7.77 7.97 8.17) in

AFTER SURVEY CALIBRATION

C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta

Gamma Check MGS-D.A 218

Field Calibration on 14-JUN-2016 03:03
After Survey Check on 15-JUN-2016 14:42

	Before (API)	After (API)
Background	92	89
Calibrator (Gross)	1004	1001
Calibrator (Net)	912	912

Gamma Check Tolerances MGS-D.A 218

Ratio 1.495 (1.40 1.475 1.55) Counts/API

Neutron Check MDN-C.A 463

Before Survey Check on 14-JUN-2016 03:14
After Survey Check on 15-JUN-2016 14:50

Near (cps)		Far (cps)	
Before	After	Before	After
1399	1390	2075	2035

Ratio	
Before	After
0.675	0.683

0.675 0.683

Neutron Check Tolerances MDN-C.A 463

		0.655	0.675	0.695
After Check	0.683			

FE Check MFE-C.A 417

Before Survey Check 14-JUN-2016 02:20
After Survey Check on 15-JUN-2016 14:25

Before (ohm-m)	After (ohm-m)
280.8	281.0

FE Calibration Tolerances MFE-C.A 417

		-2%	280.8	+2%	
After Check	281.0				ohm-m

Induction Check MAI-C.A 456

Before Survey Check on 14-JUN-2016 02:18
After Survey Check on 15-JUN-2016 14:23

Channel	Before Survey (mmho/m)		After Survey (mmho/m)		
	Low	High	Low	High	
1	-4.2	2134.3	-1.3	2137.9	
2	14.9	1965.1	15.6	1966.6	
3	15.7	1681.6	16.1	1682.5	
4	11.3	1126.3	11.5	1126.9	
Deep	9.5	1071.8	9.9	1072.5	
Medium	24.4	2237.6	24.6	2238.5	
Shallow	21.8	2940.1	22.9	2942.4	
Array Temperature		62.1		109.0	Deg F

Compact Spectral Gamma Check MSG-A.A 111

Before Survey Check on 14-JUN-2016 04:25
After Survey Check on 15-JUN-2016 15:37

Calibration Type	SG Jigs
SGB Calibrator Serial Number	440
SGM Calibrator Serial Number	450

Gamma Ray

	Before (API)	After (API)
Background	70.1	65
Calibrator (Gross)	341.3	336
Calibrator (Net)	271.2	271

Compact Spectral Gamma Ray (Before Survey)

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	127.5	24.0	6.5	1.5	2.0
Calibrator (Gross)	623.6	110.3	32.8	8.6	11.6
Calibrator (Net)	496.1	86.4	26.3	7.1	9.6

Compact Spectral Gamma Ray (After Survey)

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	122.9	19.1	5.7	1.2	2.0
Calibrator (Gross)	619.6	107.4	32.4	0.0	0.0
Calibrator (Net)	496.7	88.3	26.7	7.4	9.4

Compact Spectral Gamma Check Tolerances MSG-A.A 111

		-13.80%	5.90	+13.80%	
After Check K	5.85				%
		-13.80%	13.60	+13.80%	
After Check U	13.85				ppm
		-13.80%	43.70	+13.80%	
After Check T	46.07				ppm

Photo Density Check MPD-D.A 460

Before Survey Check on 14-JUN-2016 02:35
After Survey Check on 15-JUN-2016 14:29

Density Check

Near		Far	
Before	After	Before	After
1277.8	1281.7	1475.3	1471.5

PE Check

	Before	After
WS	246.1	244.9
WH	1153.0	1157.2

Photo Density Check Tolerances MPD-D.A 460

Near Den. After Check	1281.7	-3% 1277.8 +3%	Far Den. After Check	1471.5	-3% 1475.3 +3%
PE WS After Check	244.9	-6% 246.1 +6%	PE WH After Check	1157.2	-6% 1153.0 +6%

DOWNHOLE EQUIPMENT

C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta

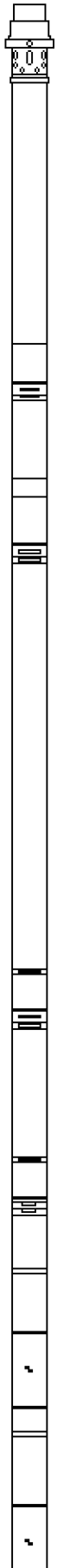
Shuttle Running Tool 3.5"
SRT-A 8 LG: 6.47 ft WT: 37.5 lb OD: 2.520 in

Compact Swivel Head Adaptor
SHA-J.B 571 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

200v Compact Battery Sub
MBS-G.A 119 LG: 17.06 ft WT: 123.5 lb OD: 2.240 in

Compact Memory Sub F.A
MMS-F.A 249 LG: 5.20 ft WT: 37.5 lb OD: 2.244 in

Compact Spectral Gamma
MSG-A.A 111 LG: 10.94 ft WT: 90.4 lb OD: 2.244 in



74.45 ft GMGC - MSG BH Corrected Gamma

Compact Tool Isolator sub.
MTI-B.A 75 LG: 1.54 ft WT: 13.2 lb OD: 2.244 in

Compact Short Gamma
MGS-D.A 218 LG: 3.41 ft WT: 24.3 lb OD: 2.244 in

64.11 ft GGME - MGS BH Corrected Gamma

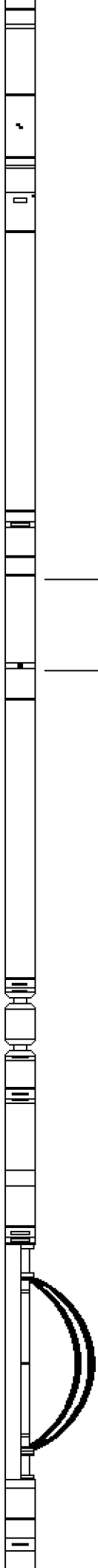
62.13 ft GSXT - MGS External Temperature

Compact Collar Locator
MCL-C.A 129 LG: 3.17 ft WT: 26.5 lb OD: 2.244 in

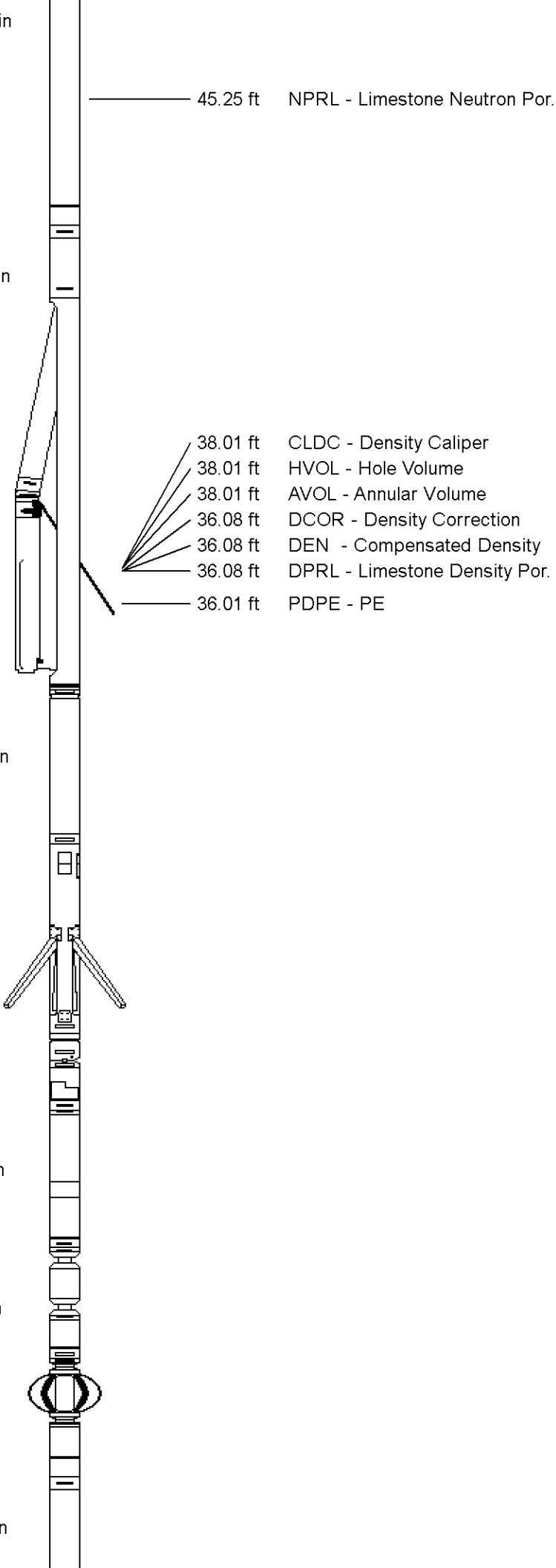
Compact Knuckle Joint
SKJ-E.B 612 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 512 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Inline Bowspring sub
MIS-D.B 734 LG: 5.70 ft WT: 33.1 lb OD: 2.240 in



Compact Neutron



Compact Neutron
MDN-C.A 463 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-D.A 460 LG: 9.59 ft WT: 90.4 lb OD: 2.244 in

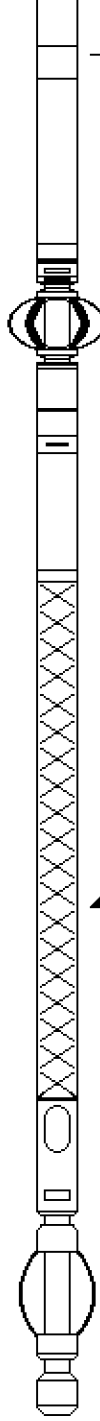
Compact Vee Arm Caliper
MVC-A.A 141 LG: 8.06 ft WT: 61.7 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 506 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Knuckle Joint
SKJ-E.A 254 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Inline Standoff sub
MIS-E.B 696 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

Compact Focussed Electric
MFE-C.A 417 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in



16.05 ft FEFE - Shallow FE

Compact Inline Standoff sub
MIS-E.B 786 LG: 2.14 ft WT: 15.4 lb OD: 2.244 in

Compact Induction
MAI-C.A 456 LG: 12.52 ft WT: 48.5 lb OD: 2.240 in

3.34 ft CTAT - Array Ind. Two Cond Ct
3.34 ft R40T - Array Ind. Two Res 40
3.34 ft R60T - Array Ind. Two Res 60
3.34 ft R85T - Array Ind. Two Res 85
3.34 ft RTAT - Array Ind. Two Res Rt

Tool Zero (1.84ft from bottom)

Total Length: 110.25 ft Weight: 831.1 lb

All measurements relative to tool zero.

COMPANY	WHITING OIL AND GAS CORP
WELL	HORSETAIL 08B-1712
FIELD	REDTAIL
PROVINCE/COUNTY	WELD
COUNTRY/STATE	USA / COLORADO

Elevation Kelly Bushing	4911.00	feet	First Reading	15946.00	feet
Elevation Drill Floor	4911.00	feet	Depth Driller	15992.00	feet
Elevation Ground Level	4890.00	feet	Depth Logger	15992.00	feet

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CML MESSENGER SHUTTLE
COMPACT TRIPLE COMBO
SPECTRAL GAMMA RAY

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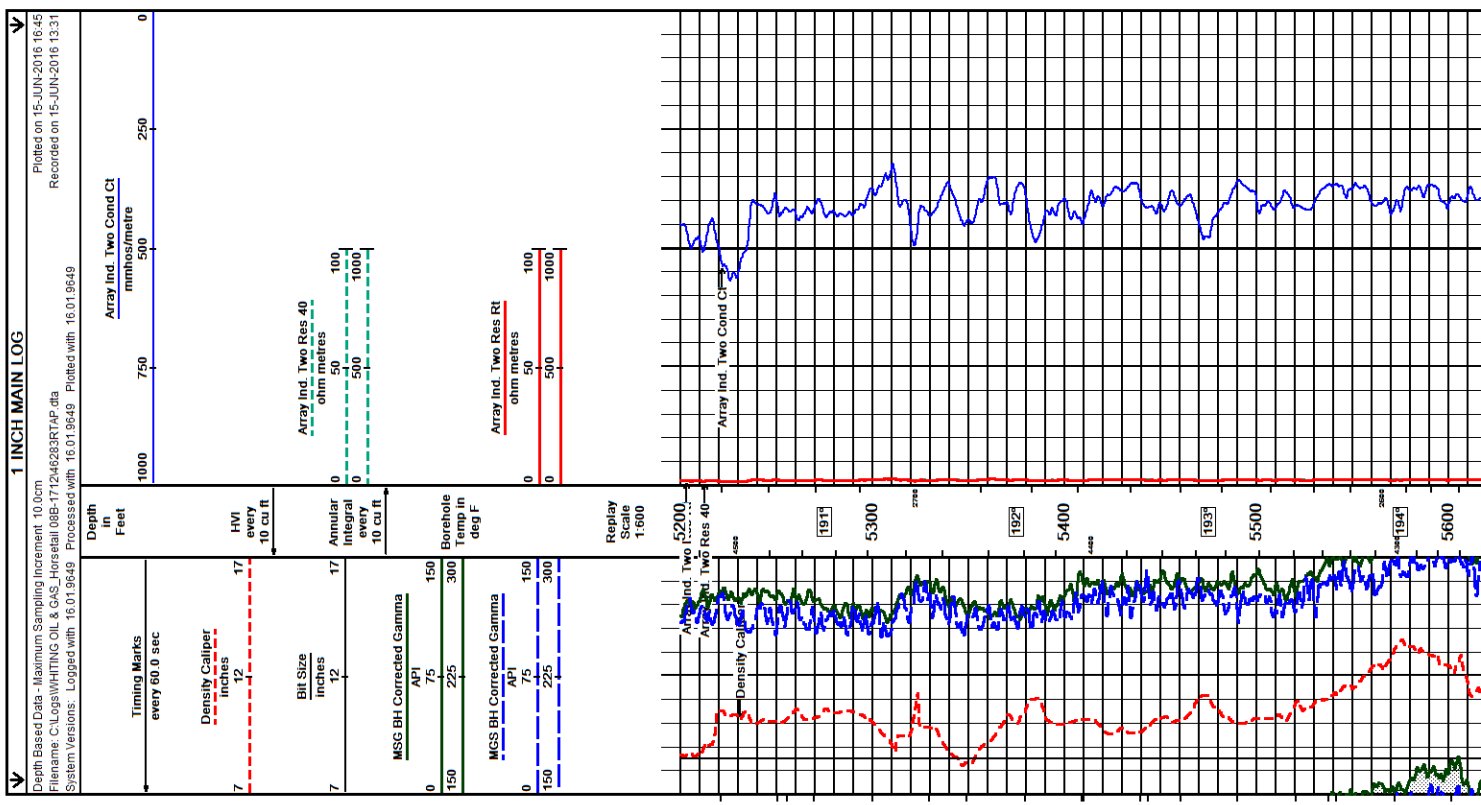
COMPACT TRIPLE COMBO
SPECTRAL GAMMA RAY

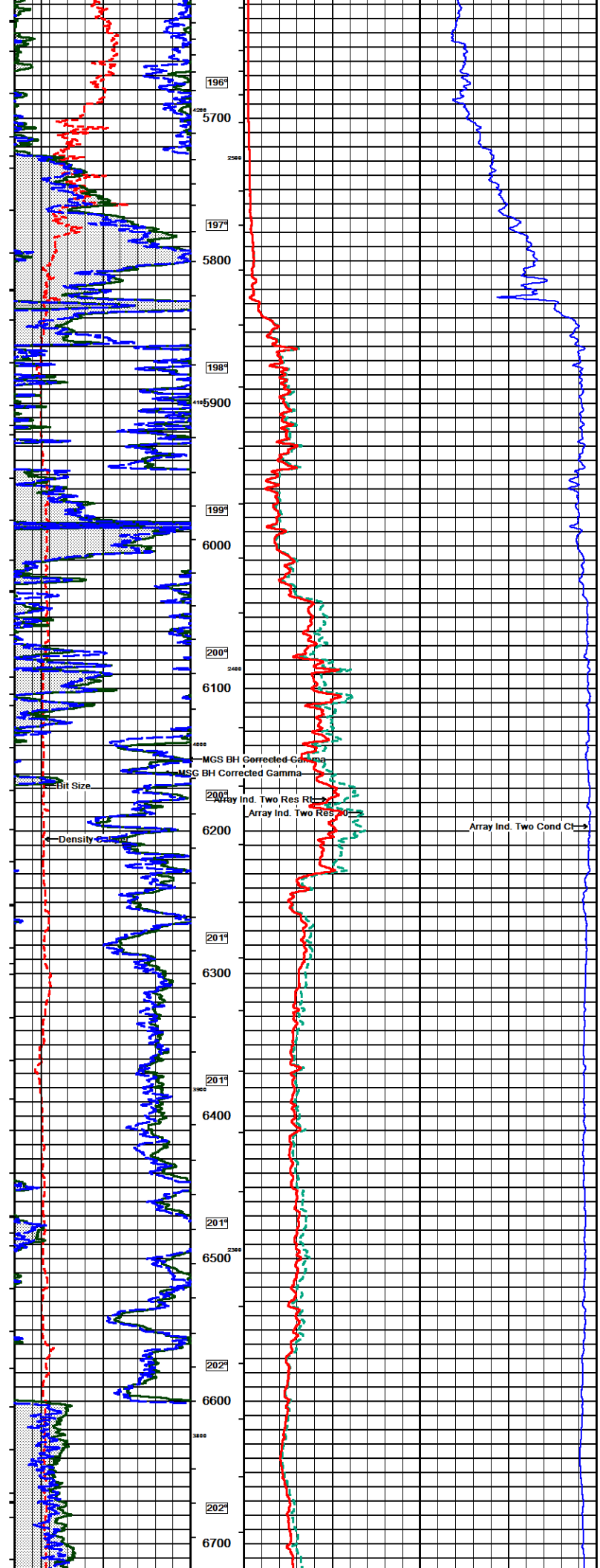
COMPANY	WHITING OIL AND GAS CORP
WELL	HORSETAIL 08B-1712
FIELD	REDTAIL
PROVINCE/COUNTY	WELD
COUNTRY/STATE	USA / COLORADO
LOCATION	NE NE 580'FNL & 1890'FEL
PERMIT NUMBER	AFE# 16-0400

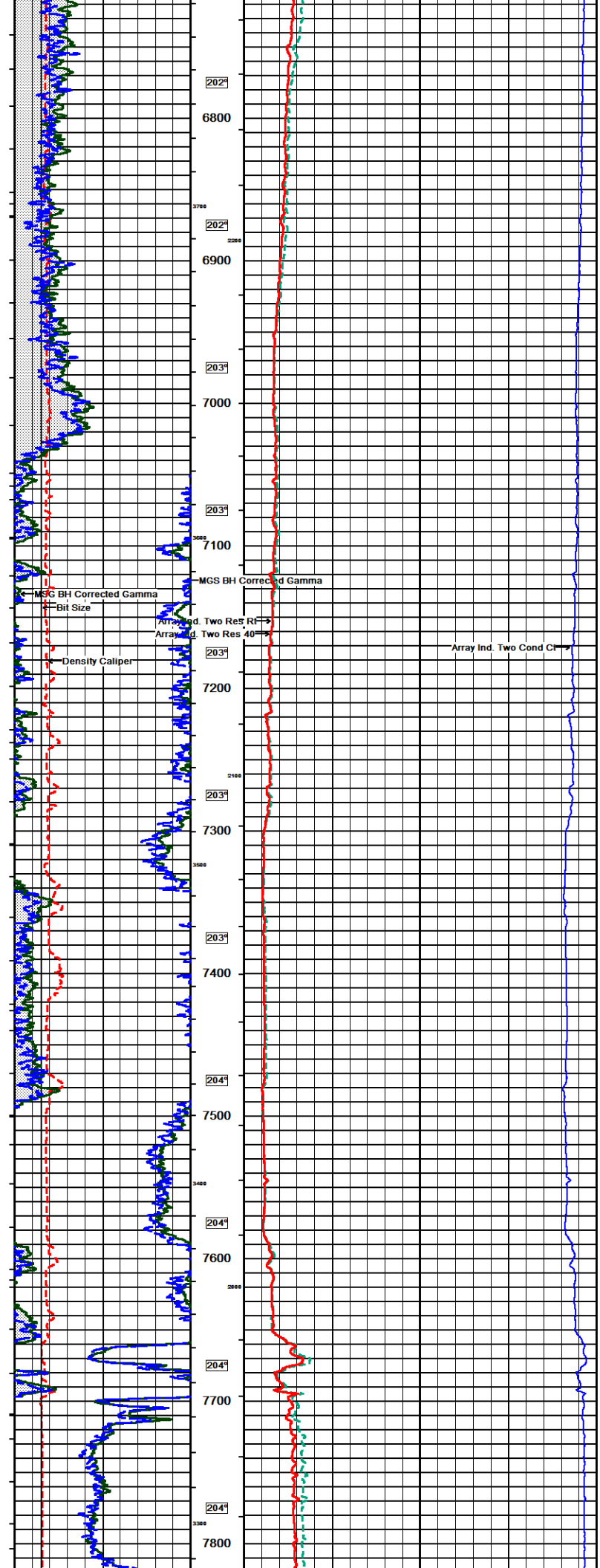
SEC 08	TWP 10N	RGE 57W	Other Services	
Latitude	40.854456			
Longitude	-103.817564			
API Number	05-123-41451			

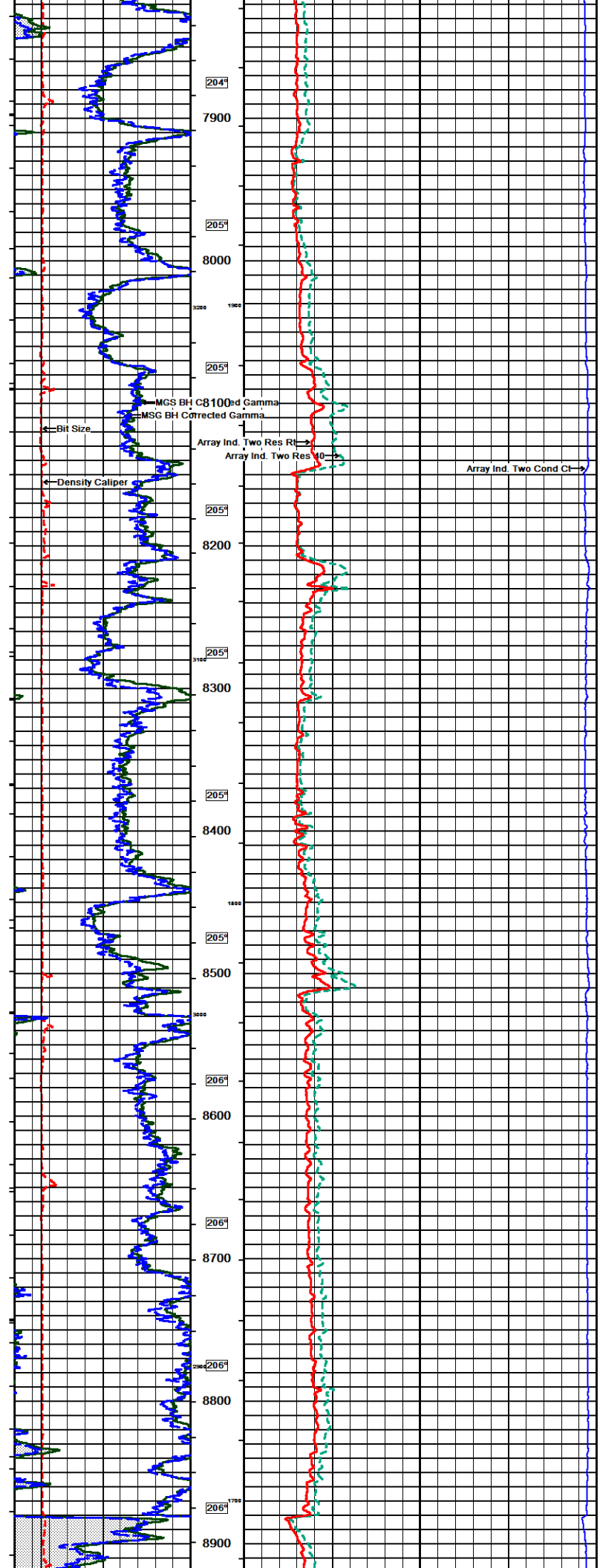
Permanent Datum GL, Elevation 4890 feet	Elevations:	feet
Log Measured From KB	KB	4911.00
Drilling Measured From KB @ 21' AGL	DF	4911.00
	GL	4890.00

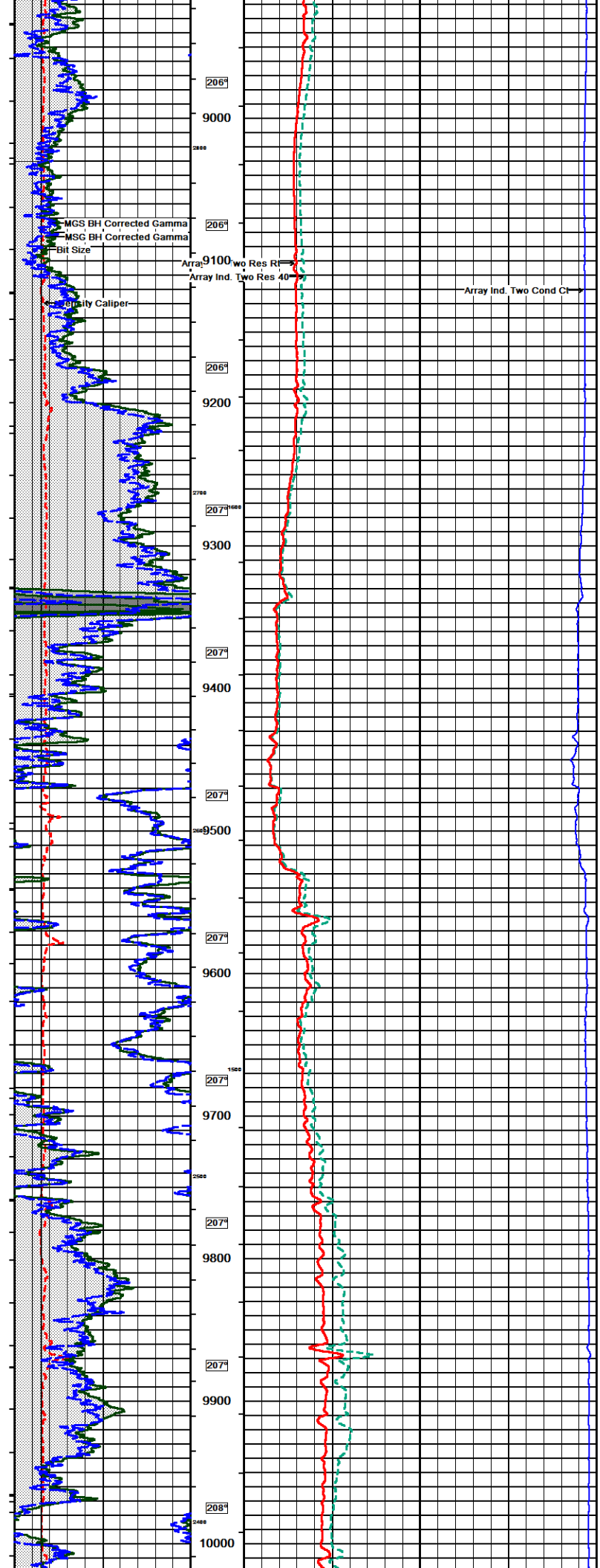
Date	15-JUN-2016			
Run Number	ONE			
Service Order	3648-152951300			
Depth Driller	15992.00	feet		
Depth Logger	15992.00	feet		
First Reading	15946.00	feet		
Last Reading	5200.00	feet		
Casing Driller	2027.00	feet		
Casing Logger	2027.00	feet		
Bit Size	8.500	inches		
Hole Fluid Type	WBM			
Density / Viscosity	10.10 lb/USg	41.00 CP		
PH / Fluid Loss	9.20	7.40 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	1.42 @ 75.0	ohm-m		
Rmf @ Measured Temp	1.14 @ 75.0	ohm-m		
Rmc @ Measured Temp	1.70 @ 75.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.54 @209.0	ohm-m		
Time Since Circulation	1 HOUR			
Max Recorded Temp	209.00	deg F		
Equipment / Base	13173	CASPER		
Recorded By	GUTHMUELLER		D BEANS	
Witnessed By	M ODEGARD			

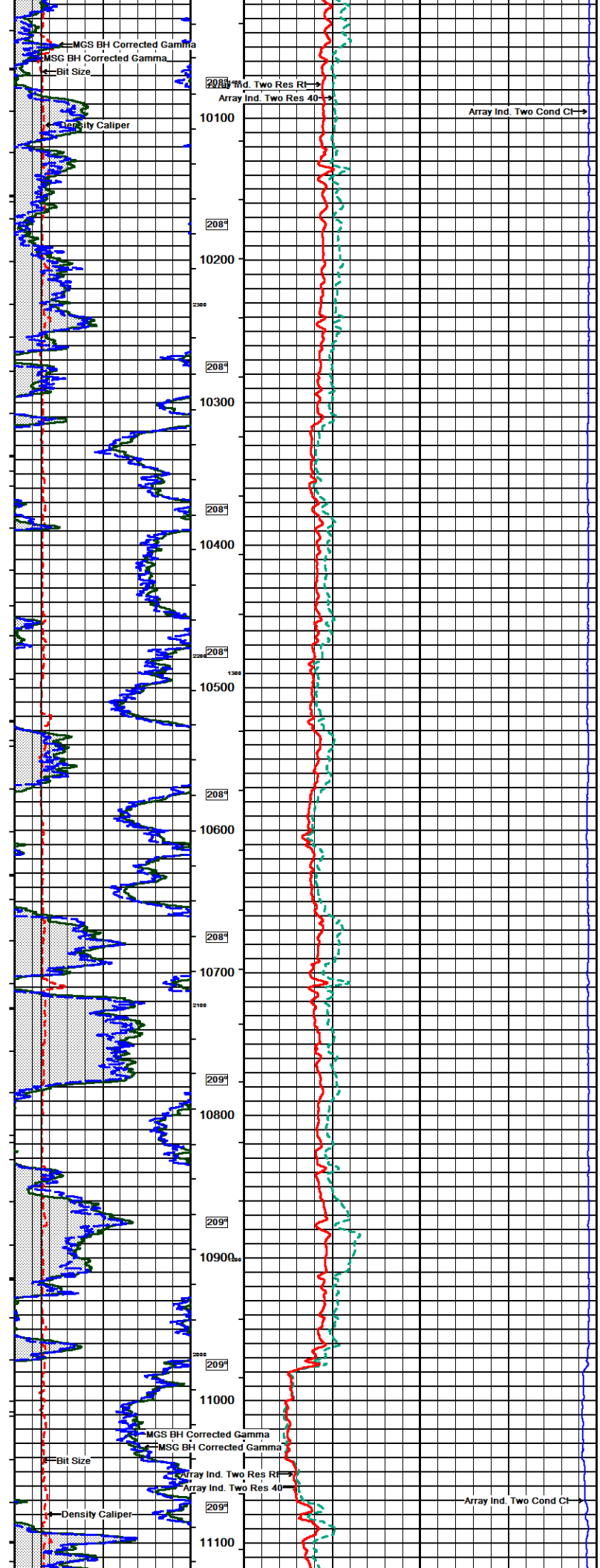


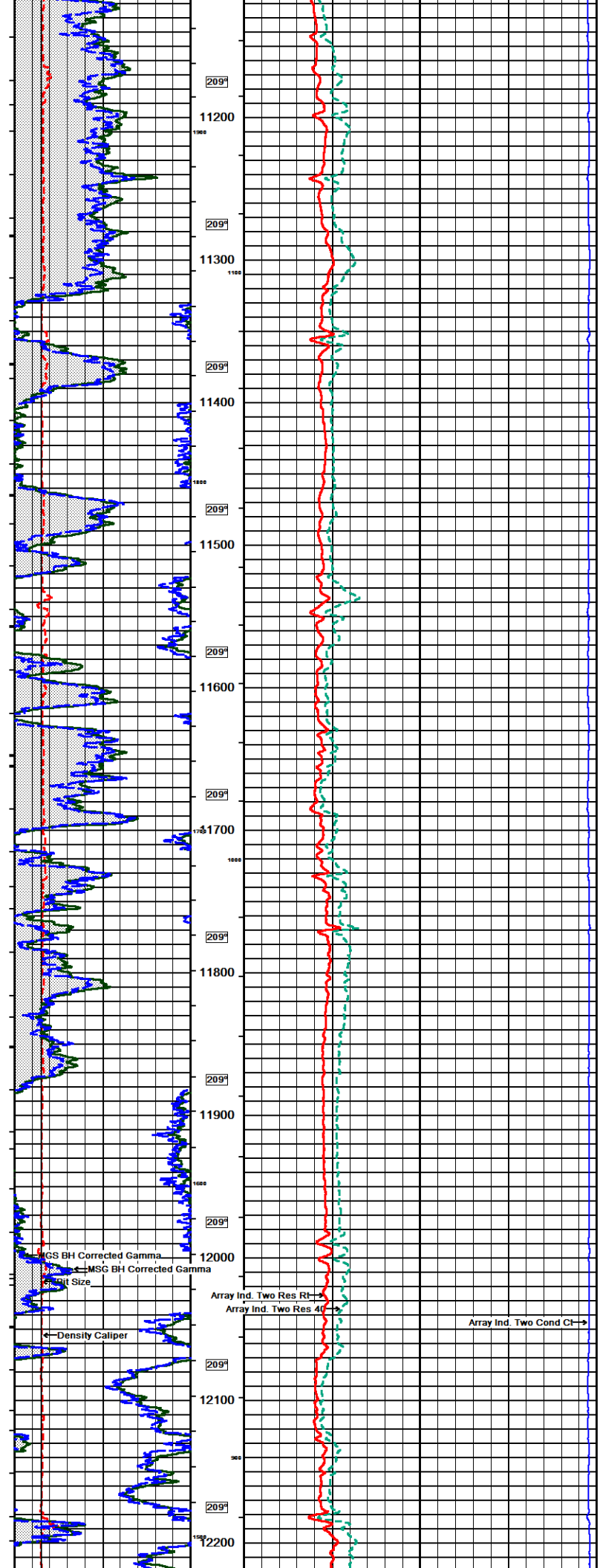

196°
5700
197°
5800
198°
5900
199°
6000
200°
6100
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
200°
Array Ind. Two Res Rt
Array Ind. Two Res
Array Ind. Two Cond Ct
Density Caliper
6200
201°
6300
201°
6400
201°
6500
202°
6600
202°
6700

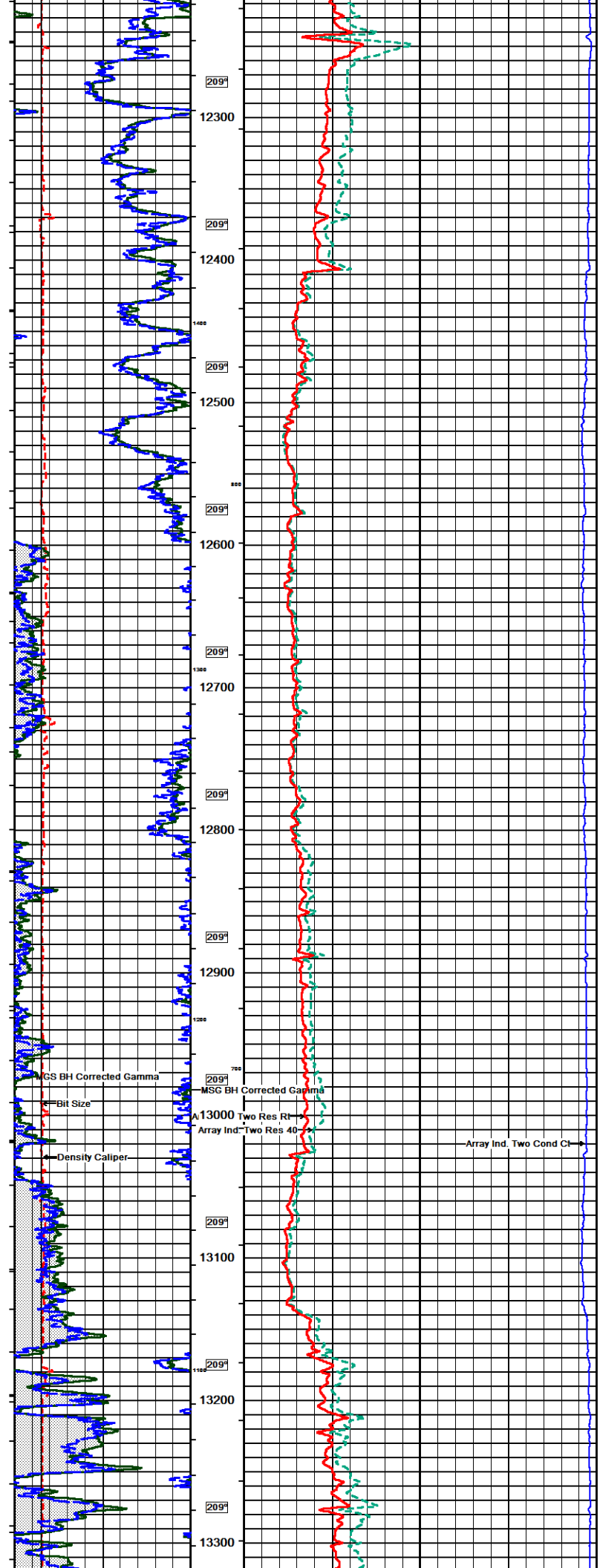

6800
6900
7000
7100
7200
7300
7400
7500
7600
7700
7800
MGS BH Corrected Gamma
Bit Size
Density Caliper
Array Ind. Two Res RT
Array Ind. Two Res 40
MGS BH Corrected Gamma
Array Ind. Two Cond CT

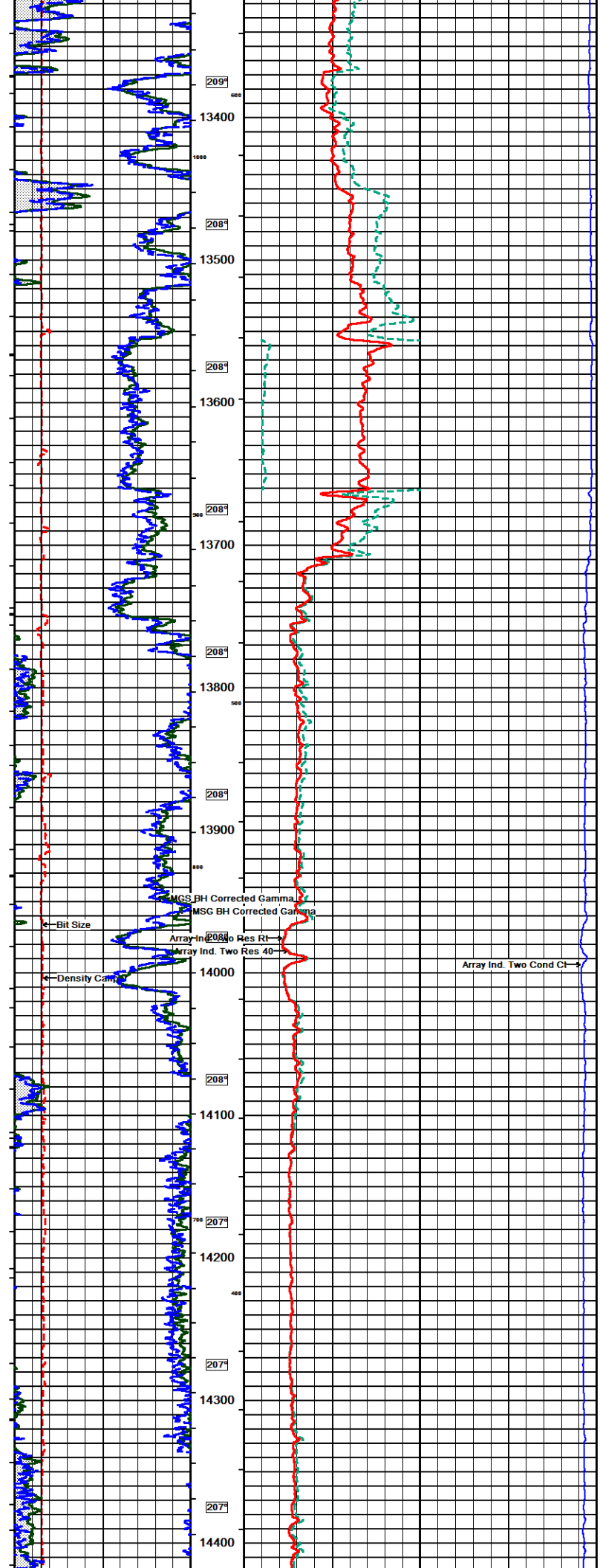

MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct
Density Caliper
7900
8000
8100
8200
8300
8400
8500
8600
8700
8800
8900

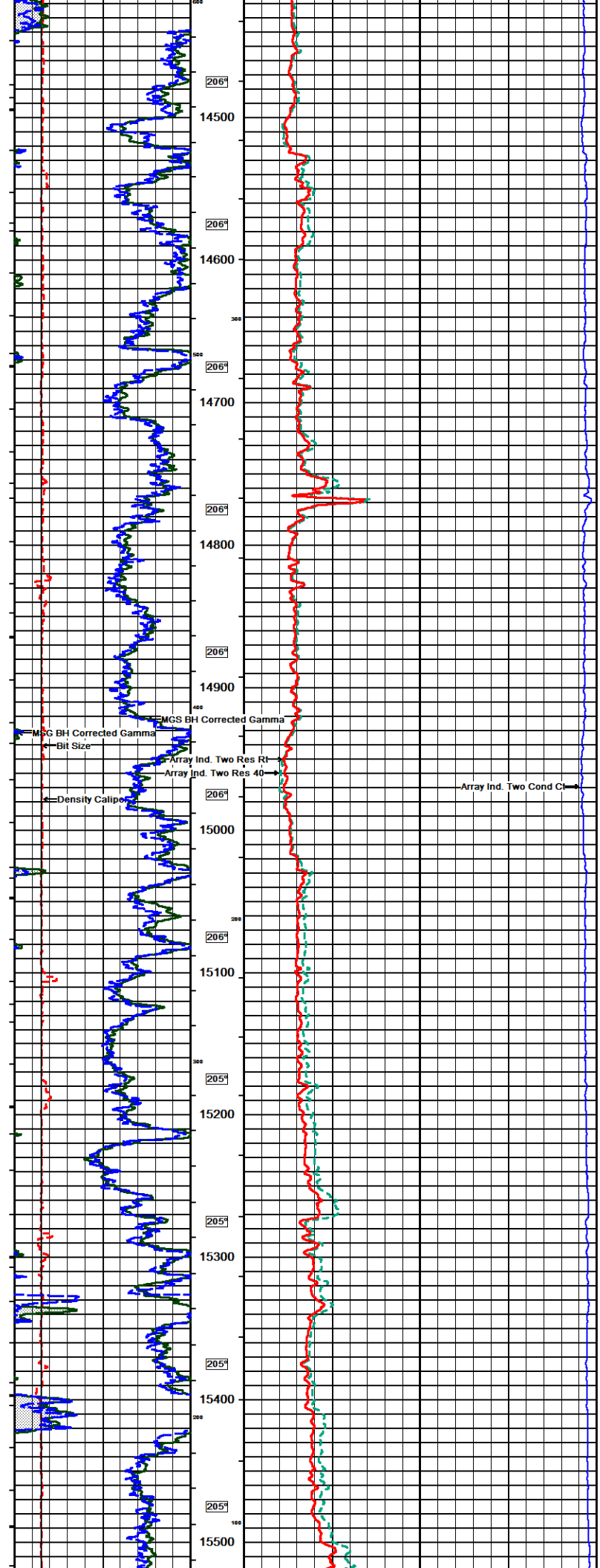

MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res 40
Array Ind. Two Cond Cl
Density Caliper
9000
9100
9200
9300
9400
9500
9600
9700
9800
9900
10000

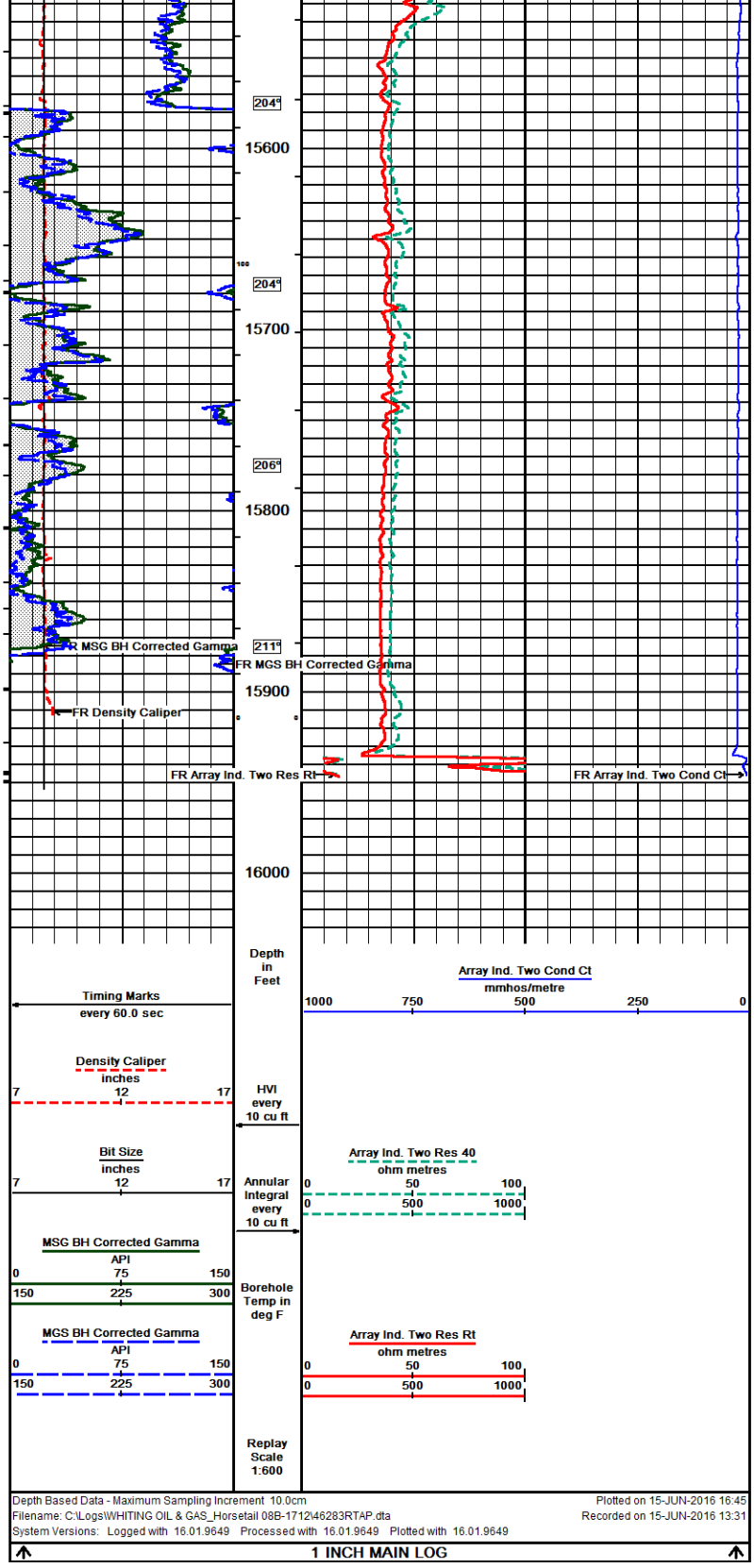

MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Density Caliper
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct
10100
10200
10300
10400
10500
10600
10700
10800
10900
11000
11100
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Density Caliper
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct


11200
11300
11400
11500
11600
11700
11800
11900
12000
12100
12200
MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Density Caliper
Array Ind. Two Res Rt
Array Ind. Two Res 40
Array Ind. Two Cond Ct


209°
12300
209°
12400
209°
12500
209°
12600
209°
12700
209°
12800
209°
12900
209°
13000
209°
13100
209°
13200
209°
13300
MSG BH Corrected Gamma
Bit Size
Density Caliper
MSG BH Corrected Gamma
Two Res RT
Array Ind. Two Res 40
Array Ind. Two Cond Cl


MGS BH Corrected Gamma
MSG BH Corrected Gamma
Bit Size
Array Ind. Two Res RT
Array Ind. Two Res 40
Array Ind. Two Cond CT
Density Cam
13400
13500
13600
13700
13800
13900
14000
14100
14200
14300
14400


MSG BH Corrected Gamma
Bit Size
MGS BH Corrected Gamma
Array Ind. Two Res RI
Array Ind. Two Res 40
Density Caliper
Array Ind. Two Cond CI
14500
14600
14700
14800
14900
15000
15100
15200
15300
15400
15500



Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2016 16:45
Filename: C:\Logs\WHITING OIL & GAS_Horsetail 08B-1712\46283RTAP.dta
Recorded on 15-JUN-2016 13:31
System Versions: Logged with 16.01.9649 Processed with 16.01.9649 Plotted with 16.01.9649

1 INCH MAIN LOG

COMPANY	WHITING OIL AND GAS CORP
WELL	HORSETAIL 08B-1712
FIELD	REDTAIL
PROVINCE/COUNTY	WELD
COUNTRY/STATE	USA / COLORADO

Elevation Kelly Bushing	4911.00	feet	First Reading	15946.00	feet
Elevation Drill Floor	4911.00	feet	Depth Driller	15992.00	feet
Elevation Ground Level	4890.00	feet	Depth Logger	15992.00	feet

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