



**ThruBit**  
A Schlumberger Company

**ARRAY INDUCTION  
DENSITY / NEUTRON  
GAMMA RAY  
MEMORY LOG**

Company	SHELL EXP. & PROD. CO., INC.	Company	SHELL EXP. & PROD. CO., INC.
Well	KNOCHE TRUST 2408 31-1H	Well	KNOCHE TRUST 2408 31-1H
Field	ARROWHEAD	Field	ARROWHEAD
County	RENO	County	RENO
State	KANSAS	State	KANSAS
Location:	API #: 15-155-21611-0100	Other Services	THRUBIT PORTAL BIT
SHL: 355' SOUTH, 1600' WEST FROM NE CORNER		Elevation	K.B. 1673.88'
LONG: -98.2390311 & LAT: 37.9255956			D.F. 1673.88
SEC 31 TWP 24S RGE 8W			G.L. 1642'
Permanent Datum	G.L.	Elevation	1642'
Log Measured From	D.F. 31.88' ABOVE PERM DATUM		
Drilling Measured From	D.F.		

Date	29 APR 2013
Run Number	ONE
Depth Driller	8945'
Depth Logger	8933'
Bottom Logged Interval	8922'
Top Log Interval	4290'
Casing Driller	7.0" @ 4290'
Casing Logger	4290'
Bit Size	6.125"
Type Fluid in Hole	WBM
Density / Viscosity	8.45 / 34
pH / Fluid Loss	8.0 / N/A
Source of Sample	FLOW LINE
Rim @ Meas. Temp	2.64 OHM @ 65 DEGF
Rinf @ Meas. Temp	2.24 OHM @ 65 DEGF
Rmc @ Meas. Temp	3.06 OHM @ 65 DEGF
Source of Rinf / Rmc	MEASURED
Rim @ BHT	1.90 OHM @ 118 DEGF
Time Circulation Stopped	21:04 28 APR 2013
Time Logger on Bottom	22:48 28 APR 2013
Maximum Recorded Temperature	114 DEGF
Equipment Number	T005
Location	OKC. OK
Recorded By	C.PARKER
Witnessed By	J.GARRETT

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The use of and reliance upon this recorded-data by the herein named company (and any of its affiliates, partners, representatives, agents, consultants and employees) is subject to the terms and conditions agreed upon between ThruBit LLC and the company, including: (a) Restrictions on use of the recorded-data; (b) Disclaimers and waivers of warranties and representations regarding company's use of and reliance upon the recorded-data; and (c) Customer's full and sole responsibility for any inference drawn or decision made in connection with the use of this recorded-data.

**Comments**

**SERVICE: LEVEL 4- HORIZONTAL MEMORY PUMPDOWN - BIT DEPTH 8877' LOG TO 4290'**  
**ALL SCALES AND PRESENTATION PER CLIENT REQUEST**  
**LIMESTONE POROSITY , 2.71 G/CC, USED FOR POROSITY CALCULATIONS**  
**LOG RAN WITH SWIVEL, DECENTRALIZER AND NO STANDOFFS**  
**TBHV REPRESENTS TOTAL BOREHOLE VOLUME, FT3**  
**ABHV REPRESENTS ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CASING**  
**RIG WATCH USED TO CREATE DEPTH LOG**  
**LOG DEPTH CORRELATED TO PIPE TALLY PROVIDED BY CUSTOMER**  
**CI = 6000 mg/l NaCl = 2195 mg/L NO BARITE NaCl EQUIVALENT (ppm) = CI (mg/l) \* 1.6488 \* 0.833**  
**CASING SIZE 7.00" 26.0 LB/FT ID = 6.276" CALI DIA 6.273" NO CORRECTION**

**RIG: NABORS 102**  
**CREW: C.PARKER I.HERNANDEZ R.WILSON**

Service Ticket No.	1870	API No.	15-155-21611-0100	PGM Ver	WARRIOR 7.0
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The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

**EQUIPMENT DATA**

GAMMA RAY	NEUTRON	DENSITY	INDUCTION
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Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	ENP5T	Serial No.	PS14N	Serial No.	PS01D	Serial No.	PS38R
Model No.	ENP	Model No.	PS	Model No.	PS	Model No.	PS
Diameter	2.125"	Diameter	2.125"	Diameter	2.125"	Diameter	2.125"

LOGGING DATA

General Data

Pass	Depths		Well Head	Speed	Logging Run Comments
No.	From	To	Pressure	Ft/Min	
ONE	8933'	4290'	0	35 FPM	

	GAMMA RAY		NEUTRON		DENSITY		INDUCTION	
Pass	Scale		Scale		Scale		Scale	
No.	L	R	L	R	L	R	L	R
ONE	0 API	150 API	45 %	-15 %	1.95 g/cc	2.95 g/cc	0.2 OHM-M	2000 OHM-M

DIRECTIONAL INFORMATION

Maximum Deviation	91.97	deg. @	8841'	KOP	3326'	
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Job Times□□□□
Job # :□1870□□□□
Operator :□Shell Oil□□□□
Well name :□Knoche Trust 2408 31-1H□□□□
Job level :□Level 4□□□□
□□□□
TimeLine of Bit Times□□□□
Date□Start Time□Elapsed Time (HH:MM)□Time Code□Notes
□□□□
TimeLine of Crew / Logging Equipment Times□□□□
Date□Start Time□Elapsed Time (HH:MM)□Time Code□Notes
27 Apr 2013□21:00□□L01 : Logging eqt travel time□Travel from OKC.
28 Apr 2013□01:30□04:30□L20 : Logging eqt standby time□Requested truck at 2AM. Sta
28 Apr 2013□21:00□19:30□L31 : Logging rig up / down time□"Rig up, pump down tool,
28 Apr 2013□23:00□02:00□L30 : Logging operating time□Logging on drill pipe.
29 Apr 2013□04:00□05:00□L31 : Logging rig up / down time□Rig up and retrieve loggi
29 Apr 2013□05:00□01:00□L80 : Data processing time□Process data.
29 Apr 2013□06:00□01:00□L01 : Logging eqt travel time□Travel back to OKC.
29 Apr 2013□10:00□04:00□L90 : Job cleanup □

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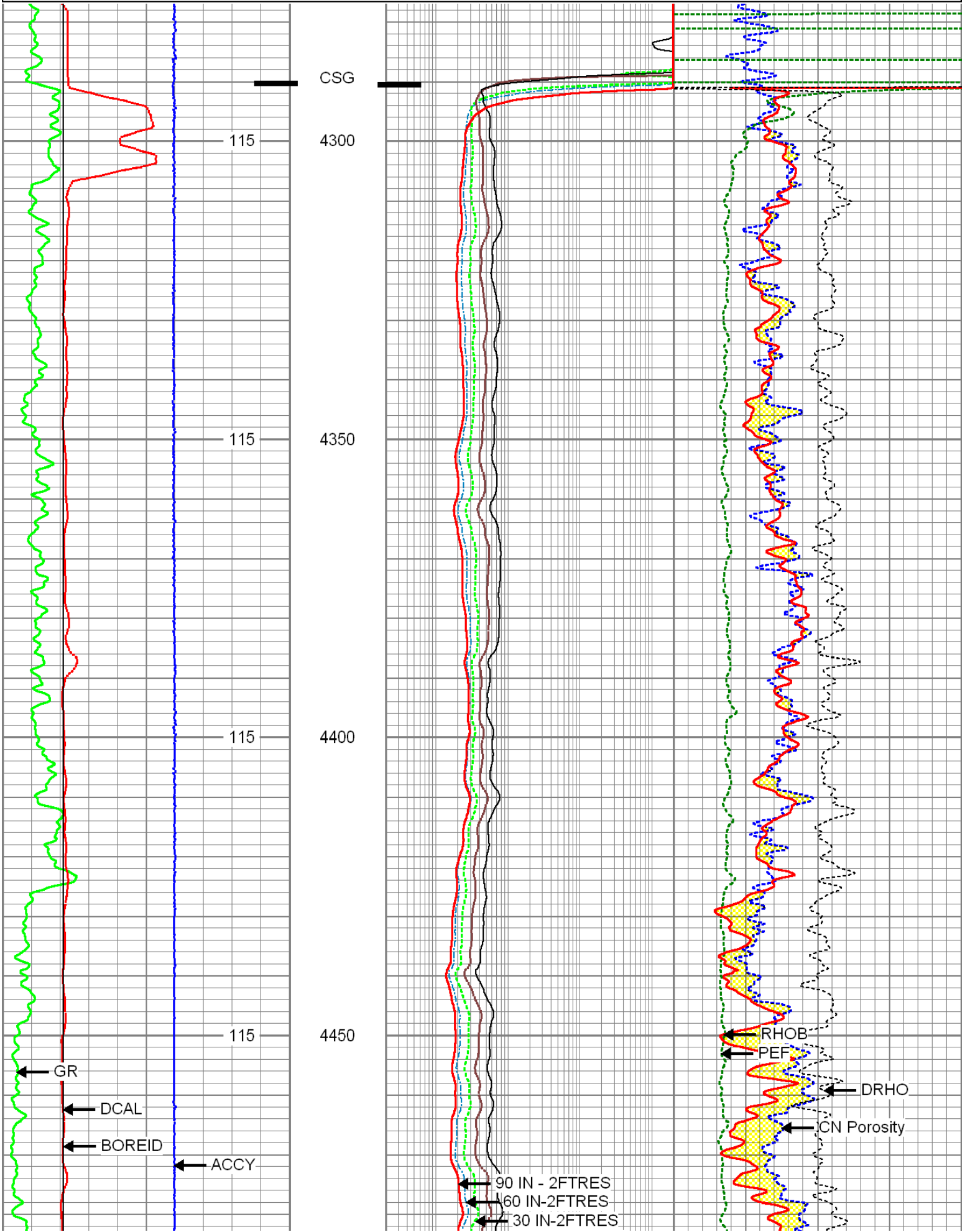
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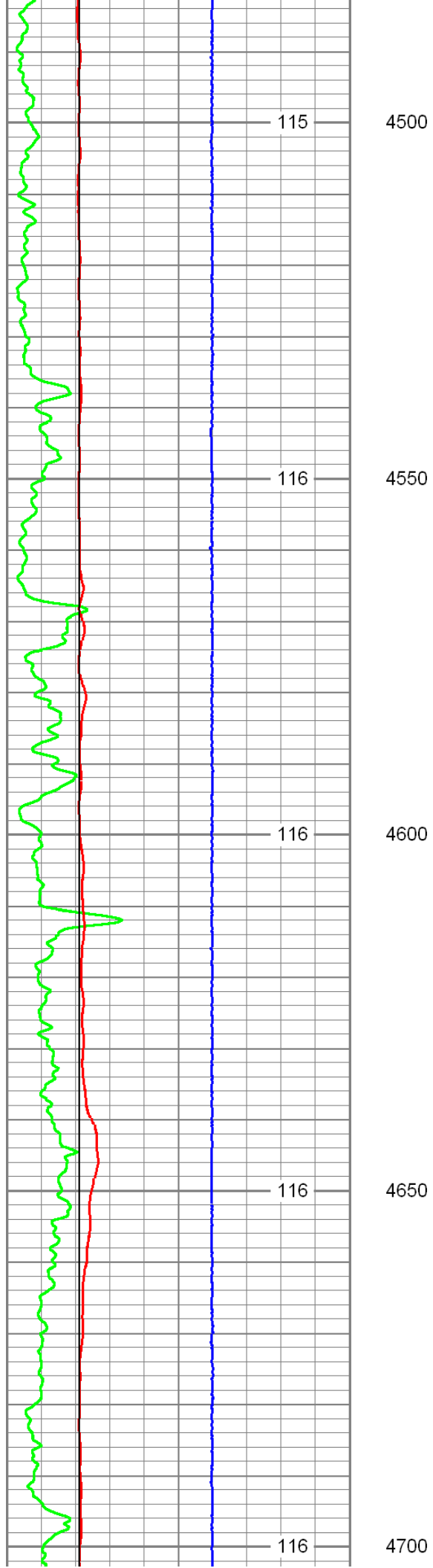
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Database File: c:\documents and settings\nparker\desktop\knoche trust 2408 31-1h\shell\_knoche\_2408\_31\_1h\_mem.db  
Dataset Pathname: proc1/pass1.4  
Presentation Format: shell\_6\_  
Dataset Creation: Mon Apr 29 05:14:26 2013  
Charted by: Depth in Feet scaled 1:240

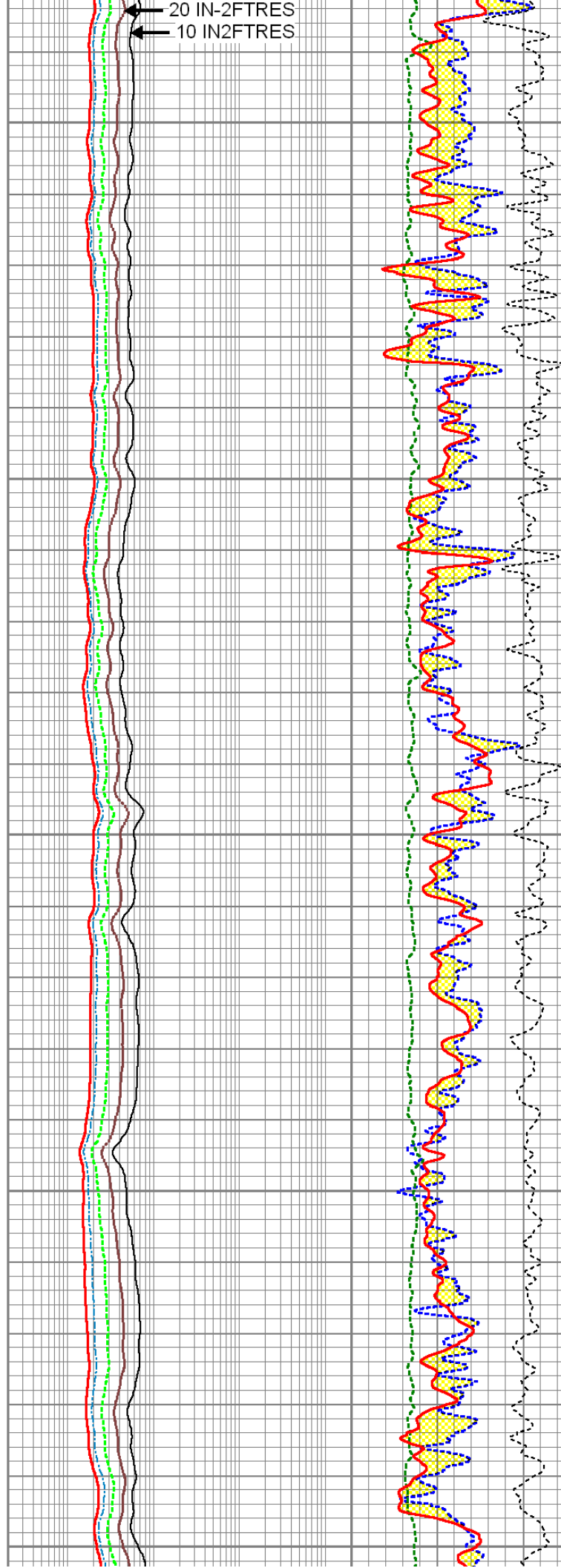
0	GR (GAPI)	150	0.2	60 IN-2FTRES (Ohm-m)	2000	45	CN Porosity (pu)	-15
-5	ACCY	5	0.2	30 IN-2FTRES (Ohm-m)	2000	0	PEF (barn)	10
4	DCAL (in)	14	0.2	20 IN-2FTRES (Ohm-m)	2000	1.95	RHOB (g/cc)	2.95

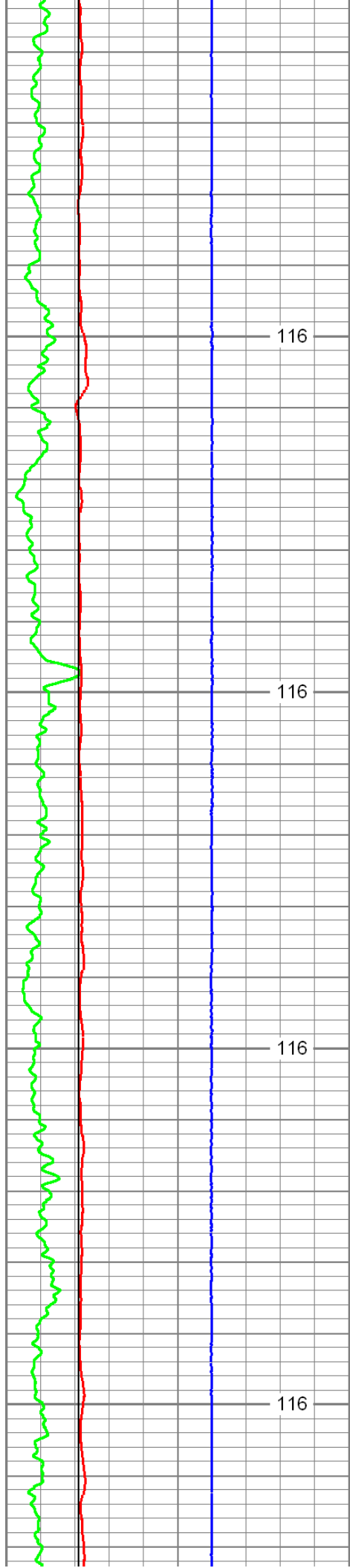
4	BOREID (in)	14	0.2	10 IN2FTRES (Ohm-m)	2000	-0.25	DRHO (g/cc)	0.25
	GRTEMP (degF)		0.2	90 IN - 2FTRES (Ohm-m)	2000			





4500  
4550  
4600  
4650  
4700



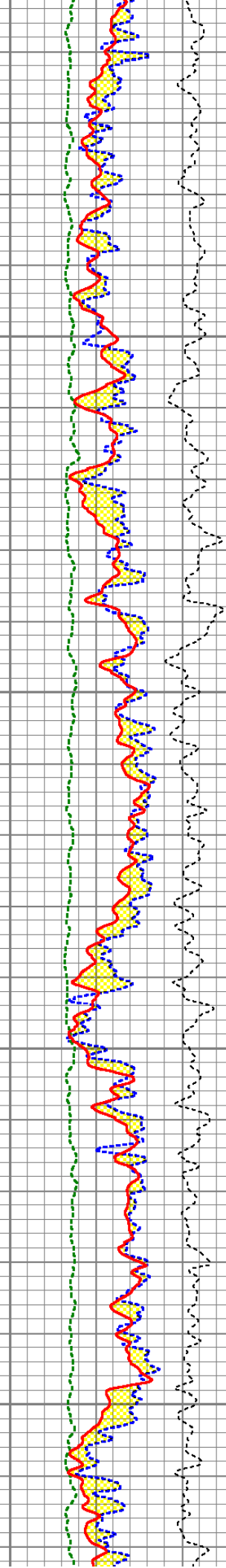
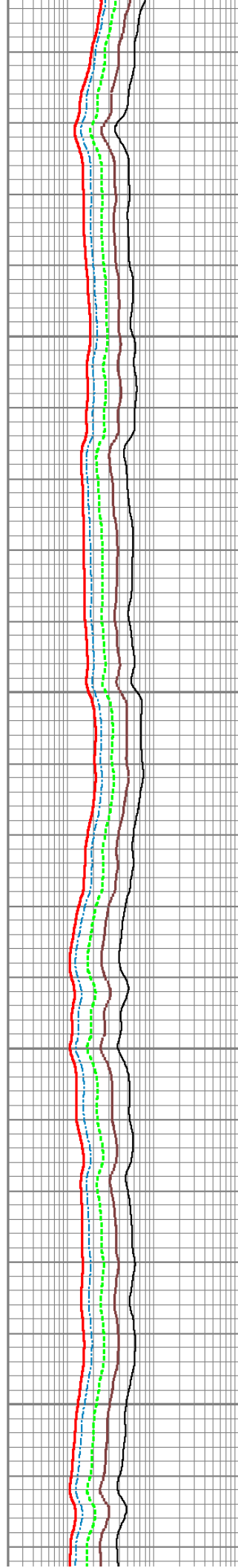


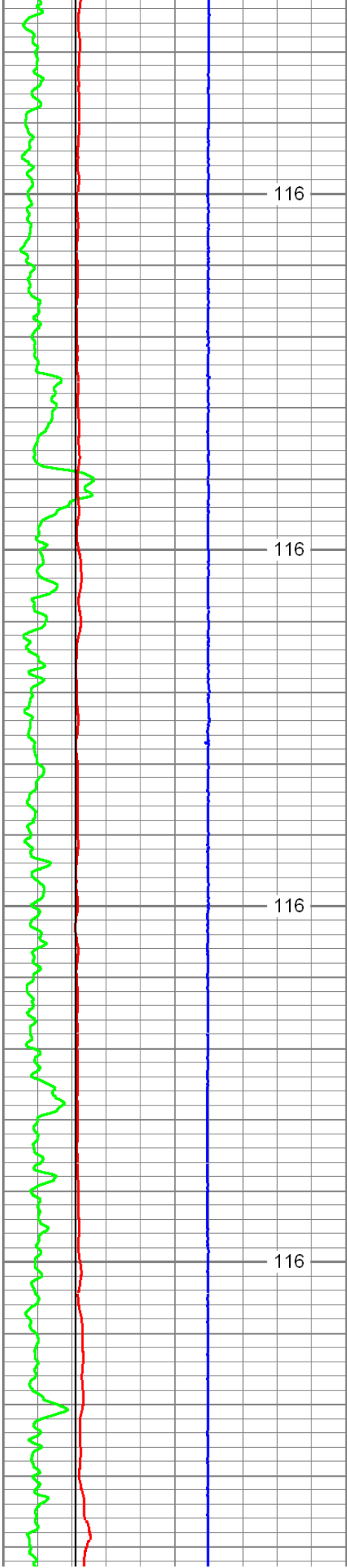
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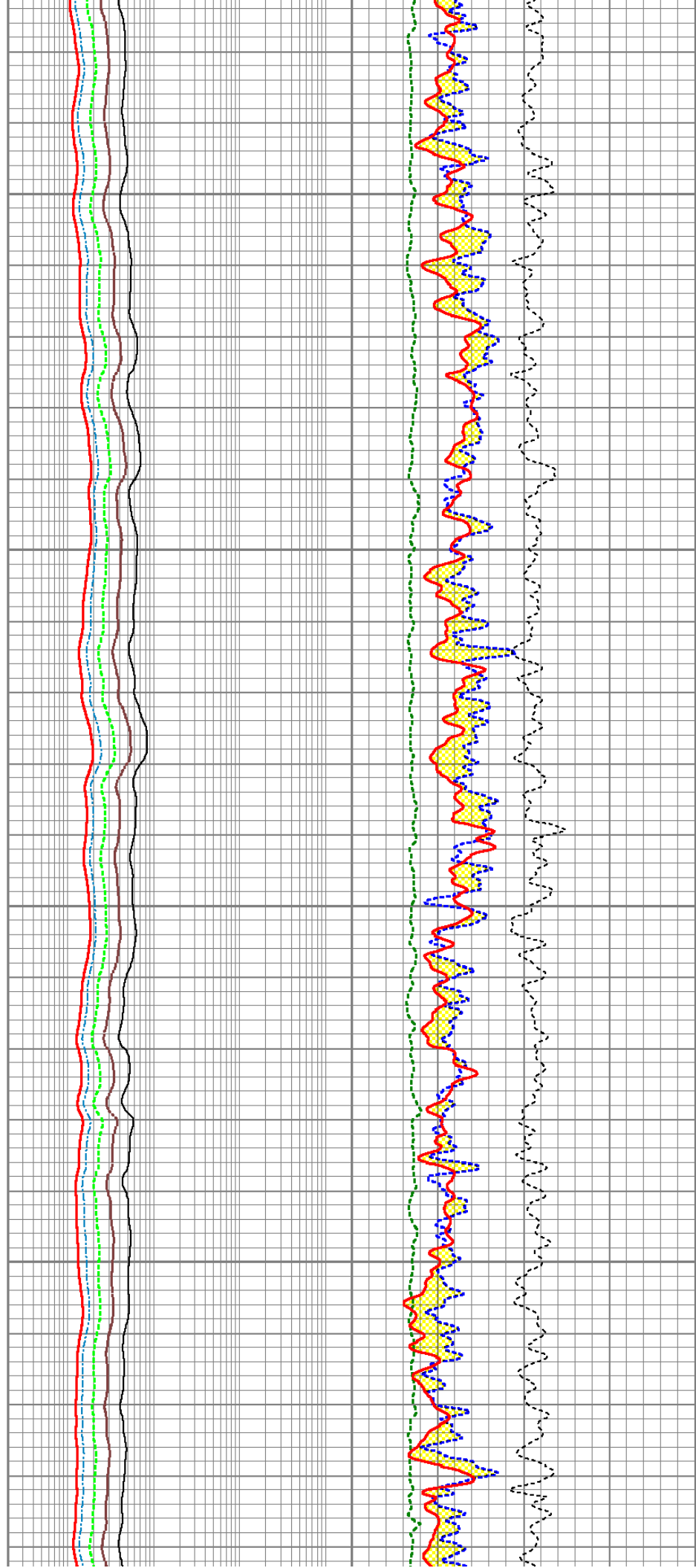


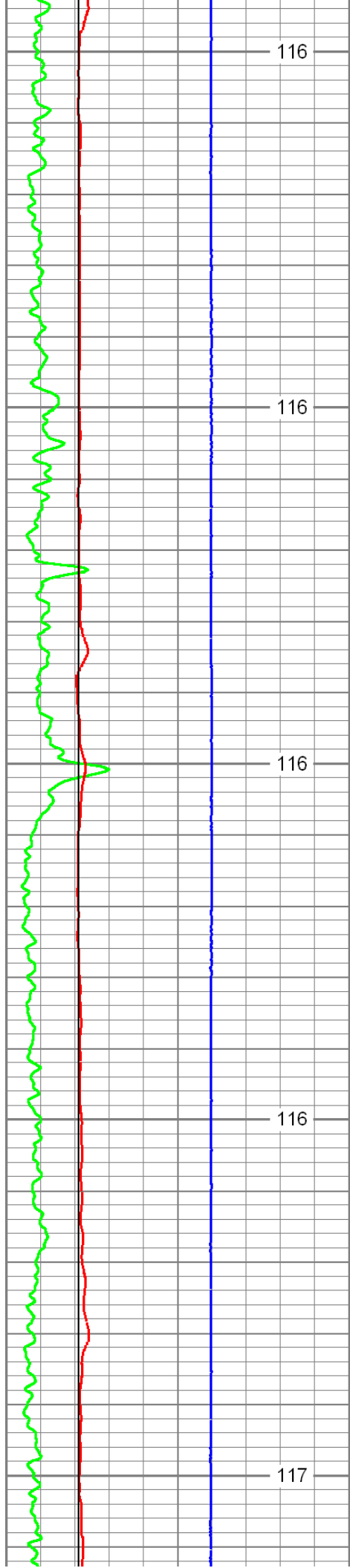
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5000

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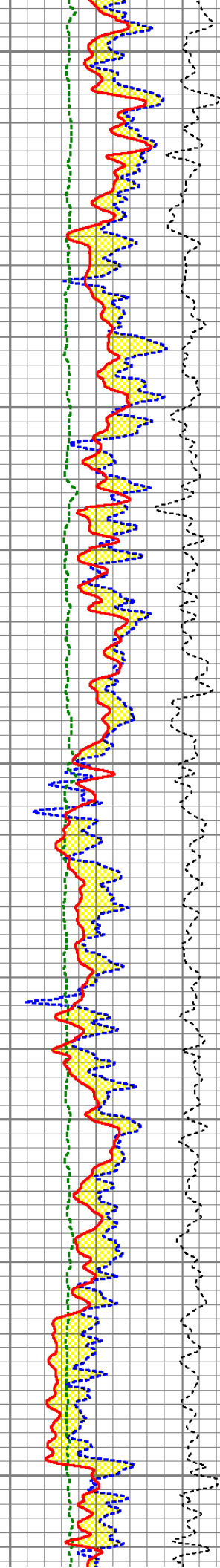
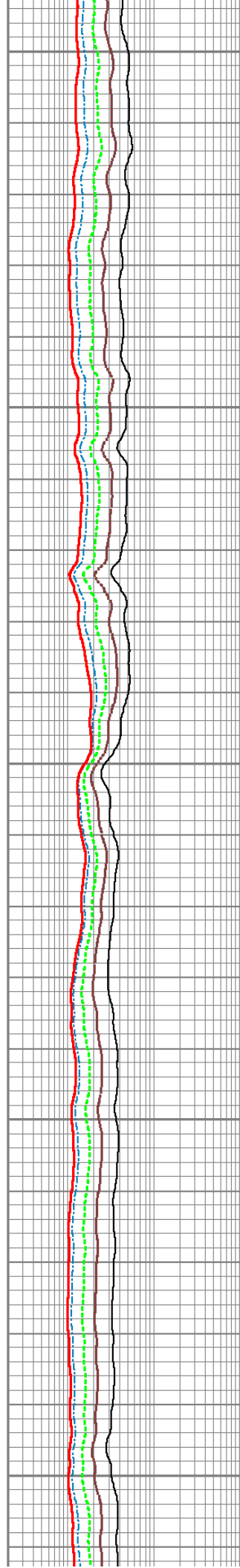
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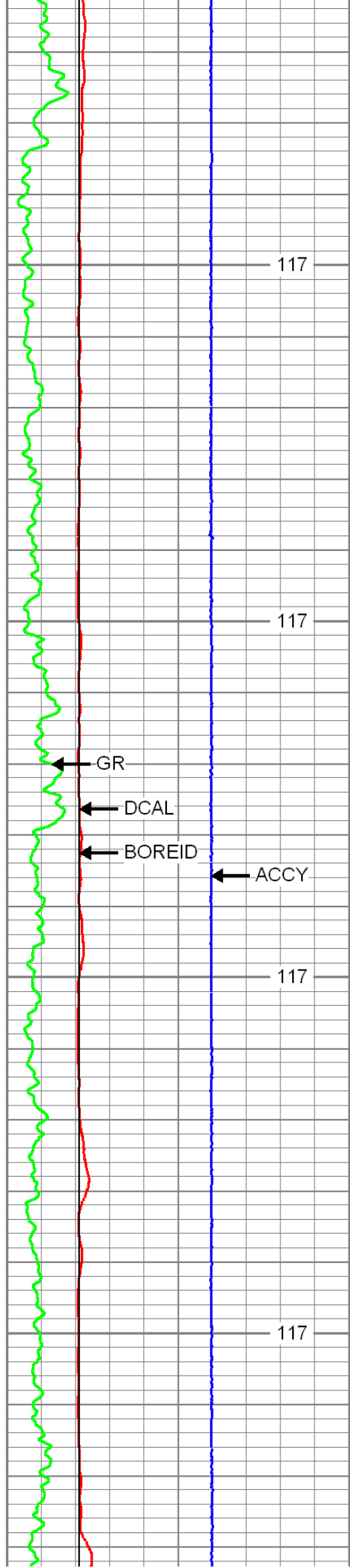
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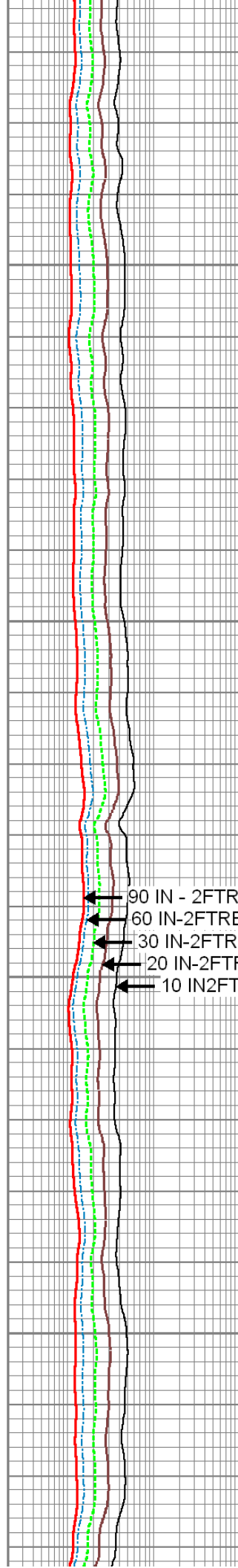
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GR

DCAL

BOREID

ACCY



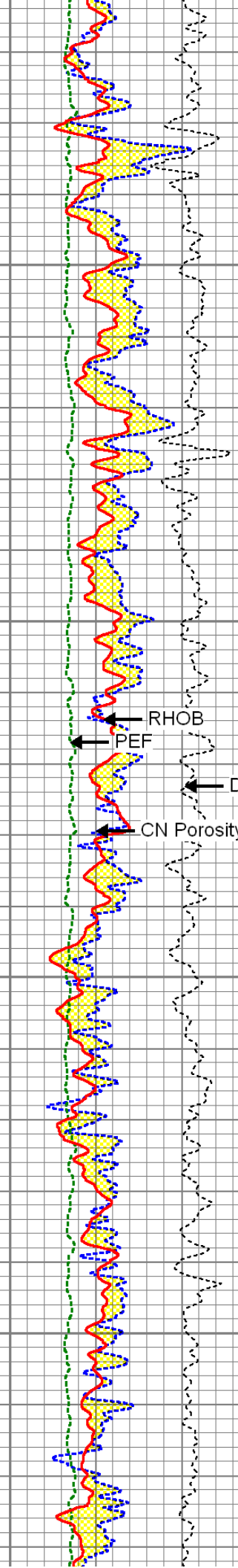
90 IN - 2FTRES

60 IN-2FTRES

30 IN-2FTRES

20 IN-2FTRES

10 IN2FTRES



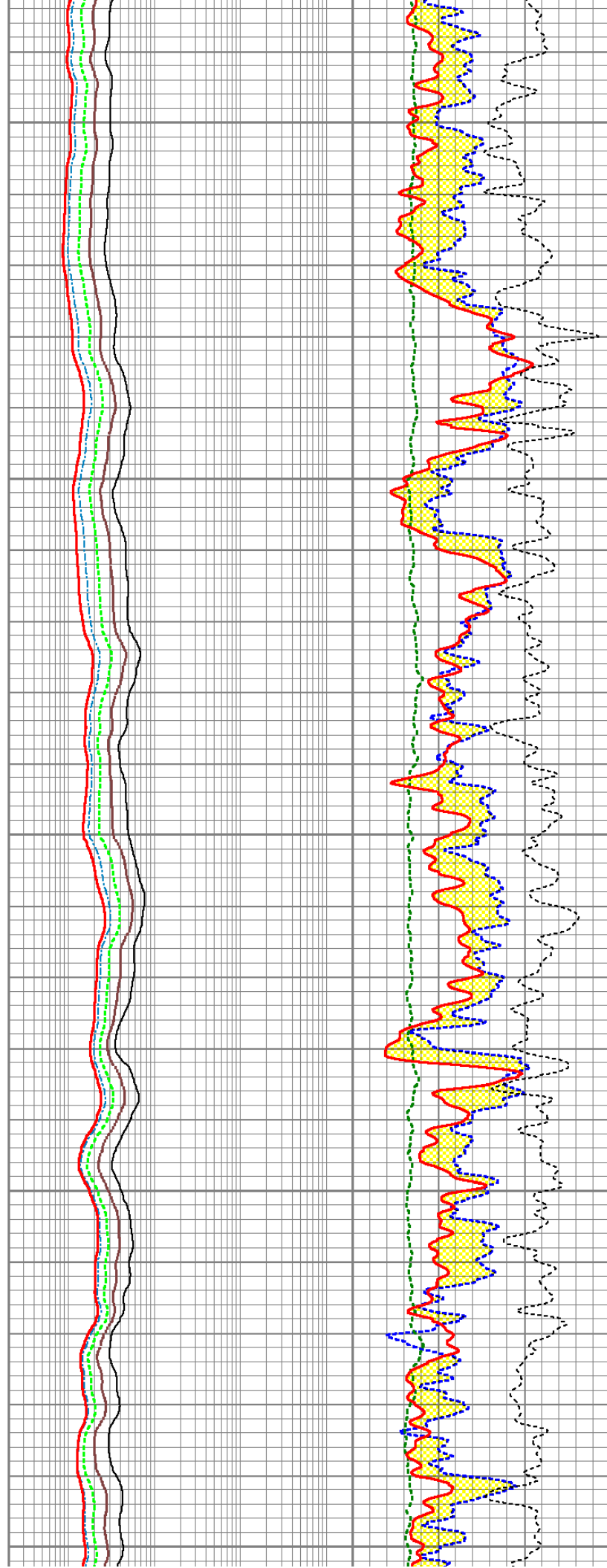
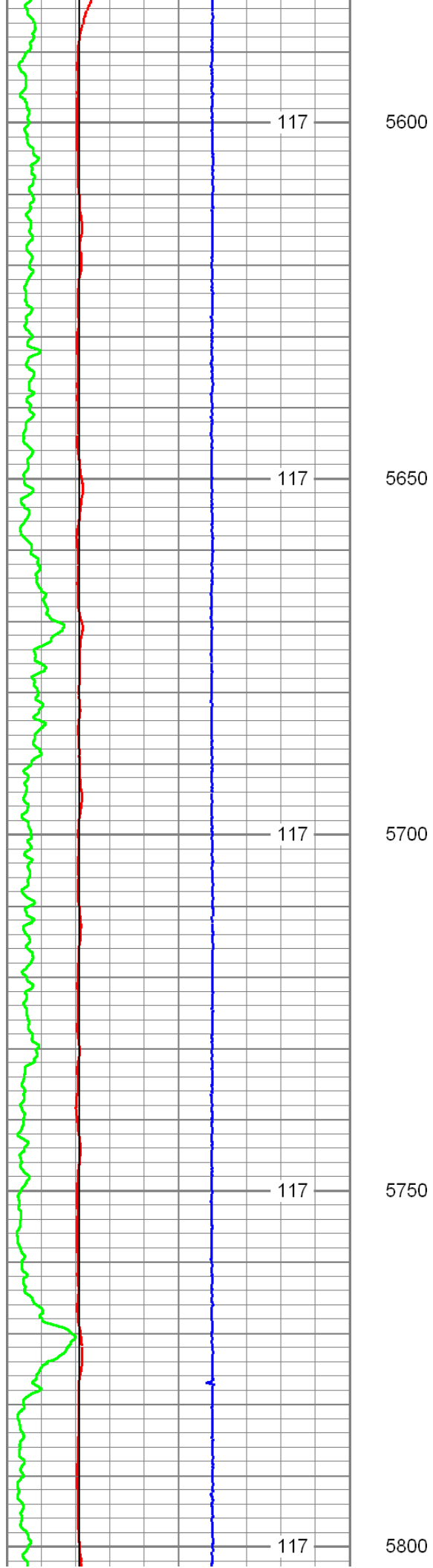
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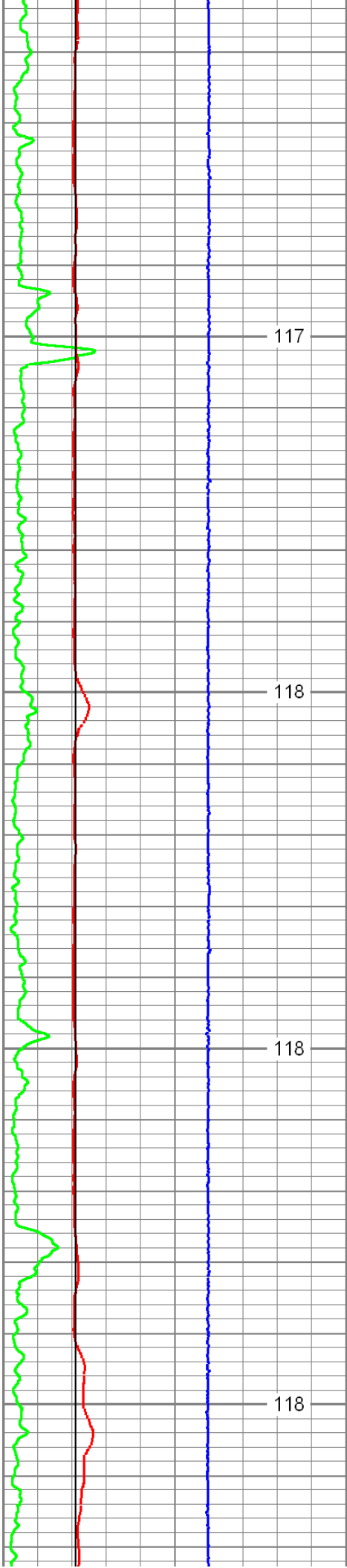
PEF

DRHO

CN Porosity





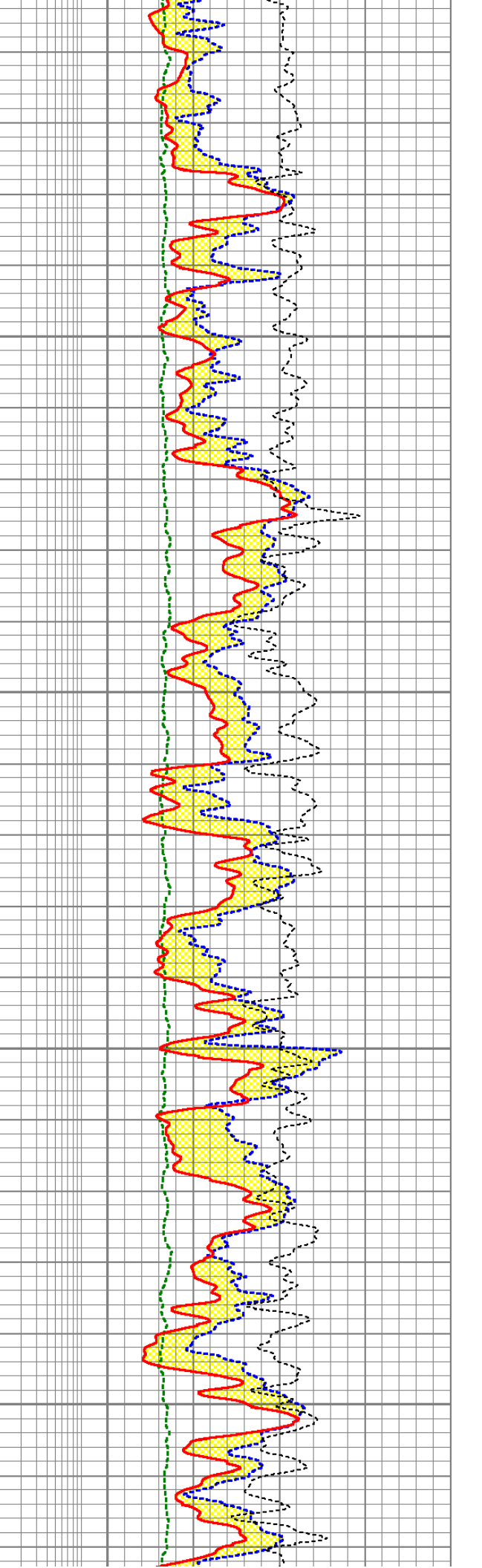
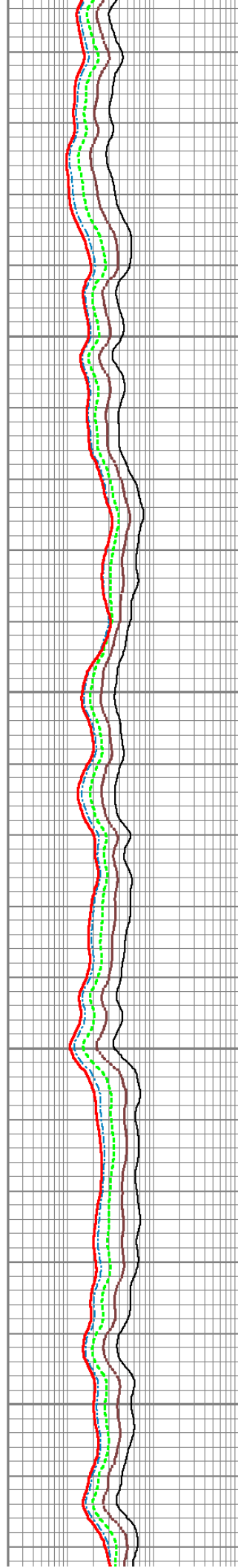


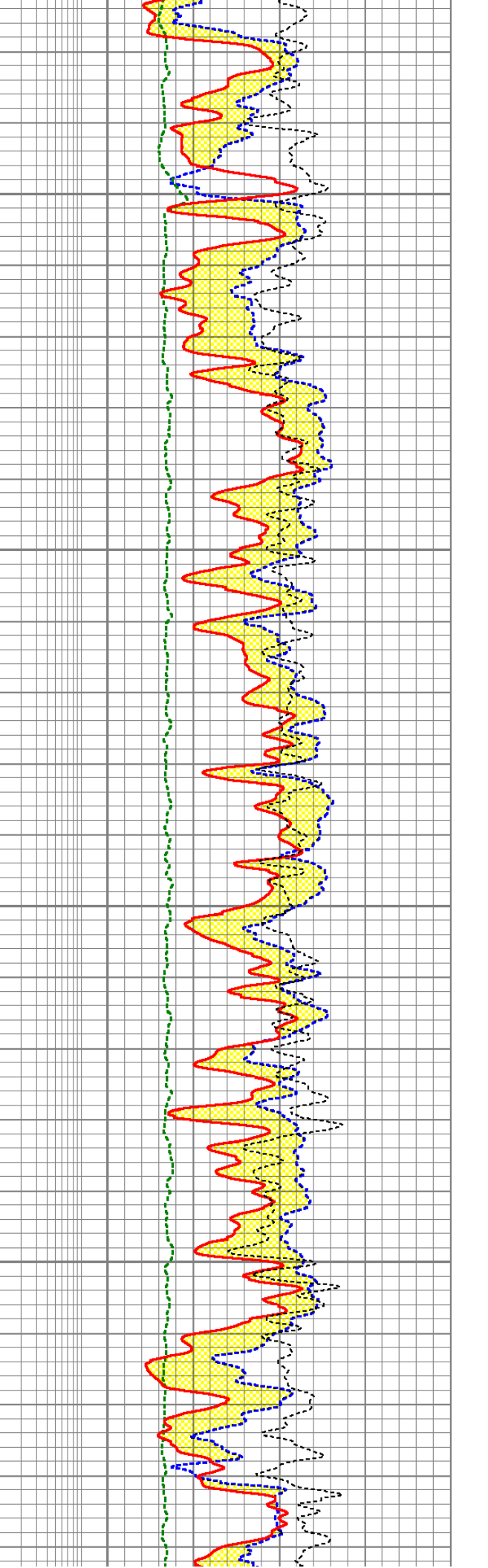
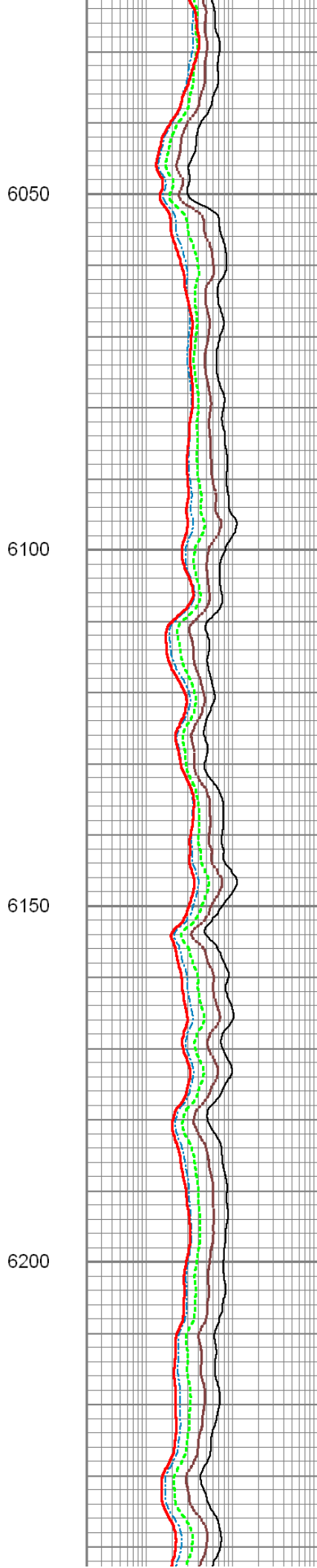
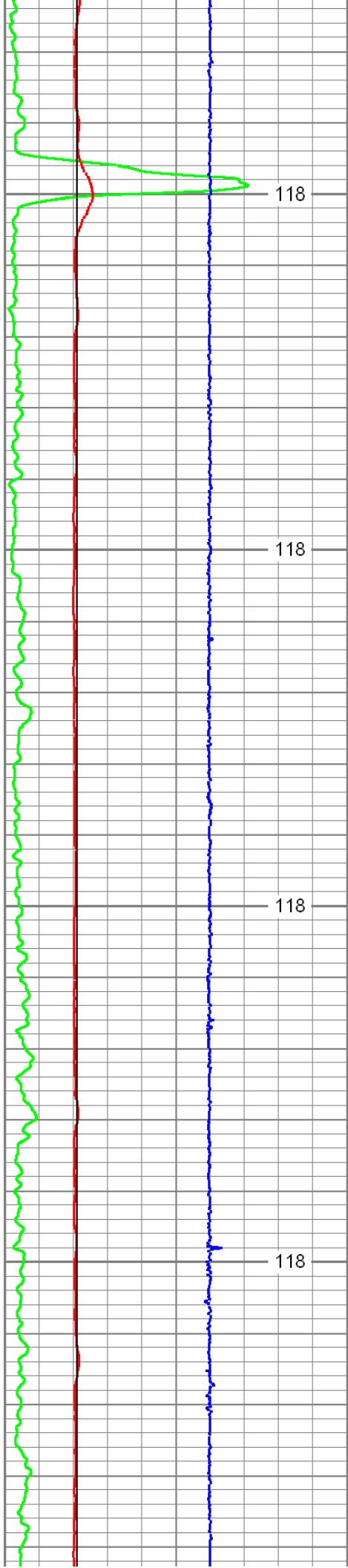
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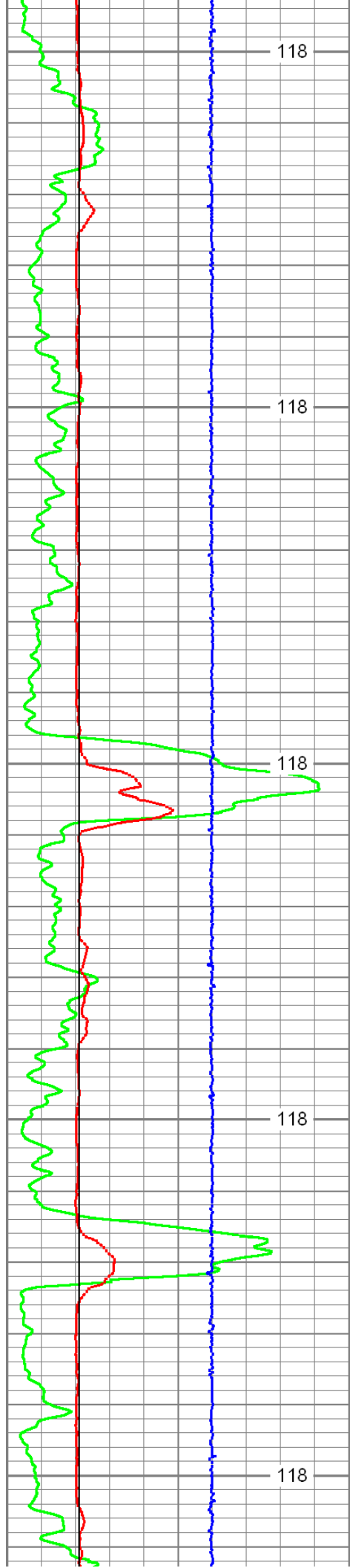
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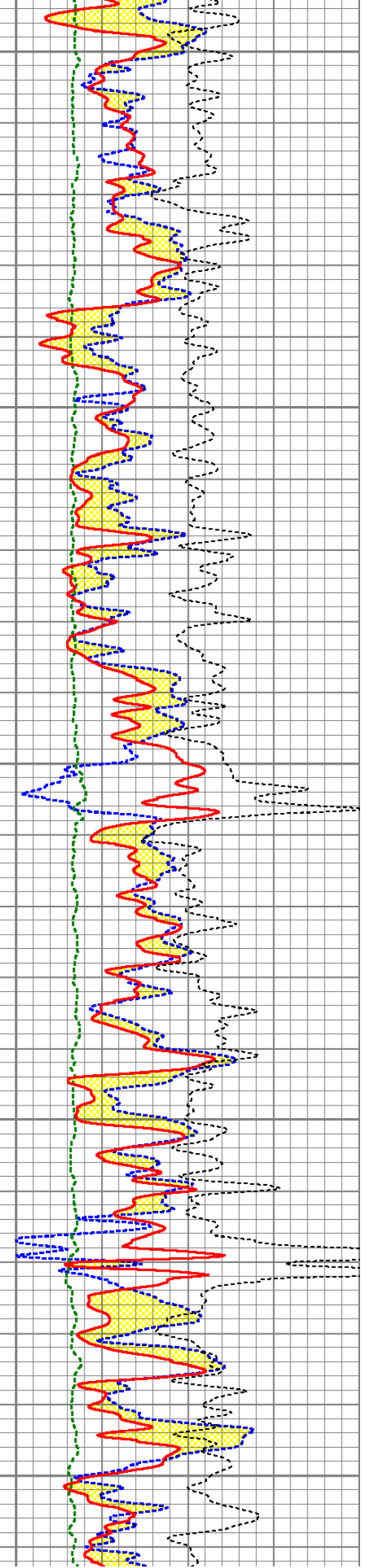
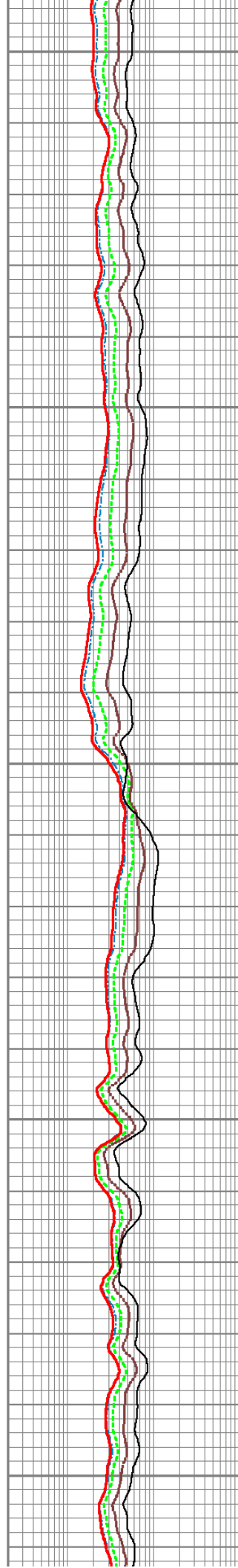
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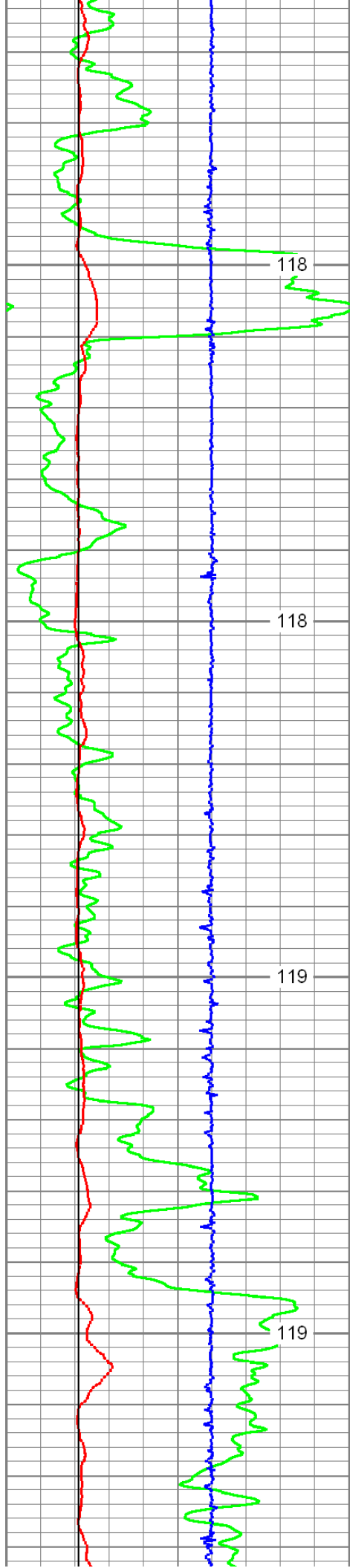
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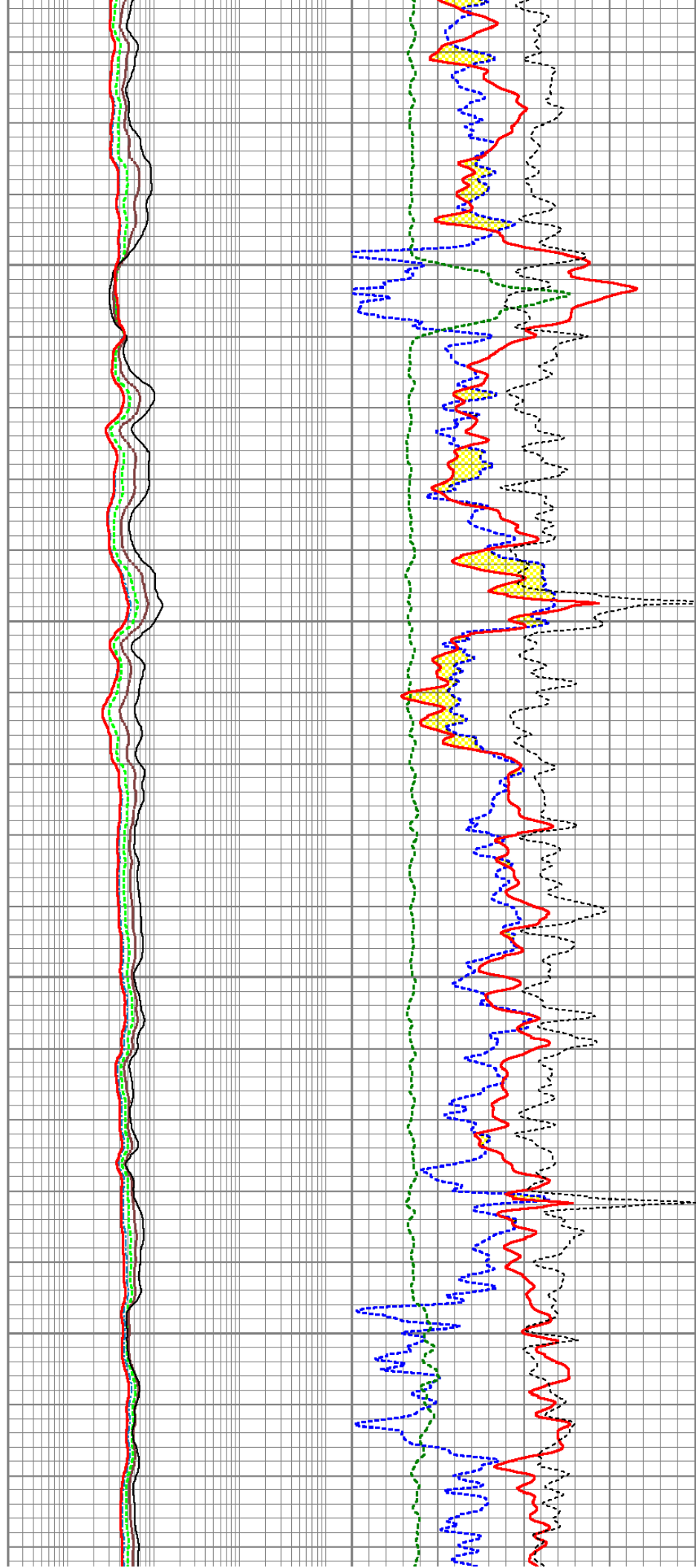


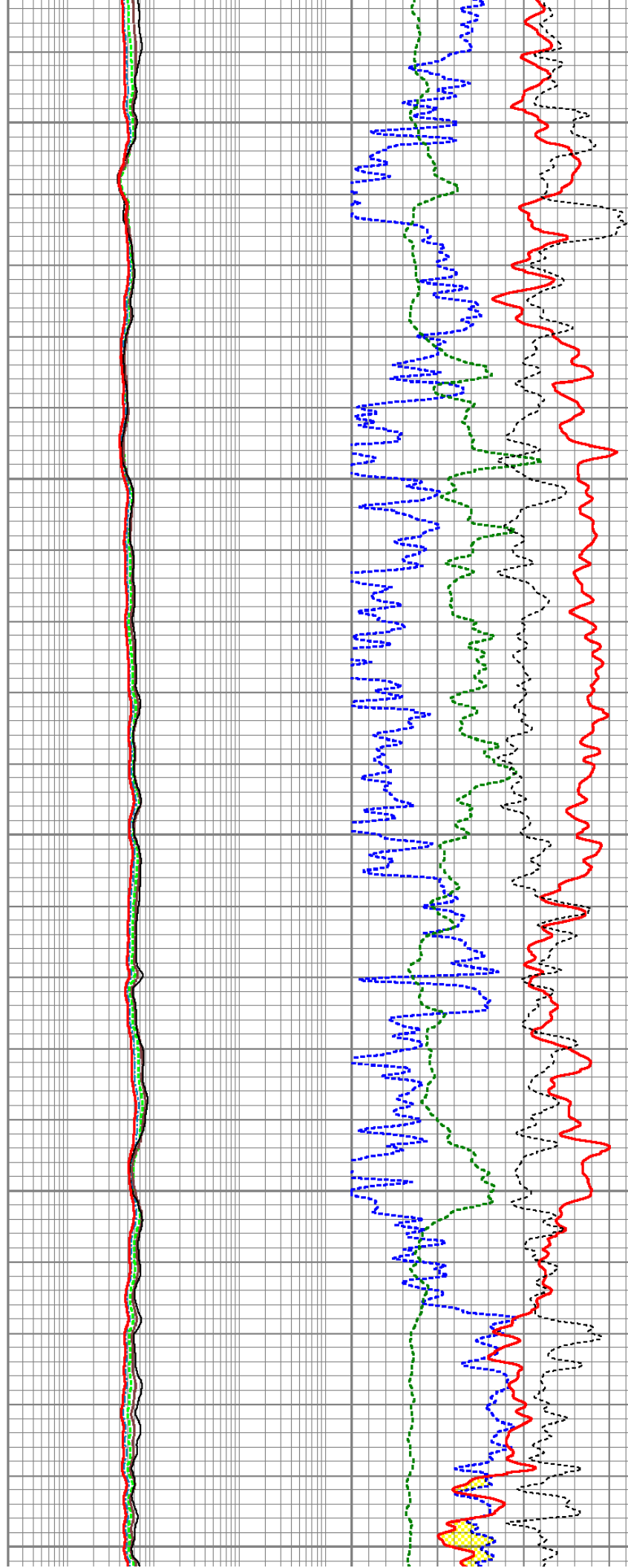
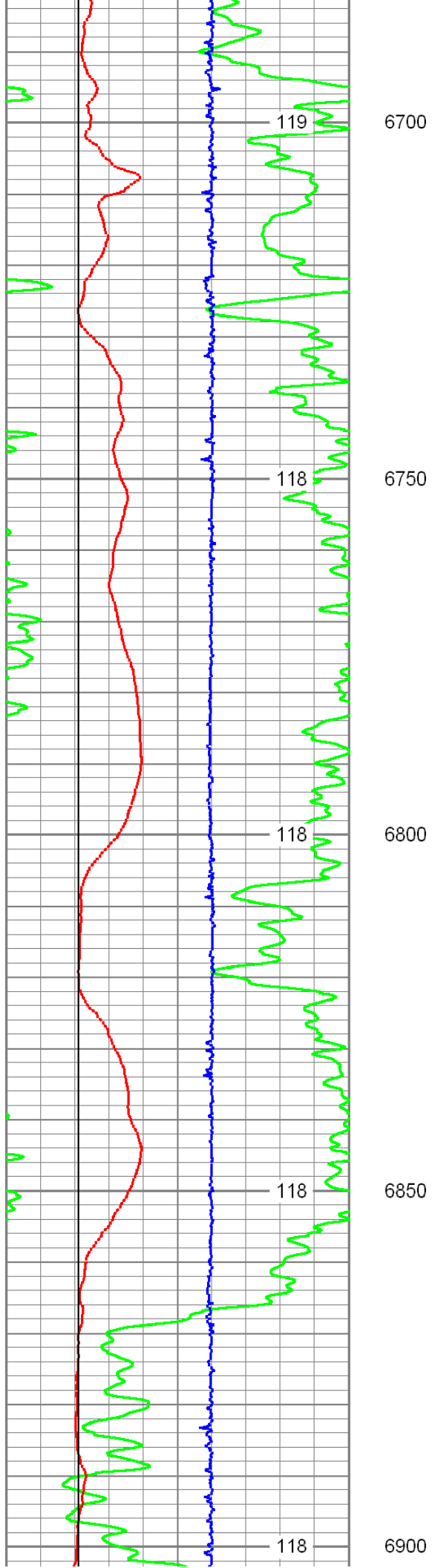
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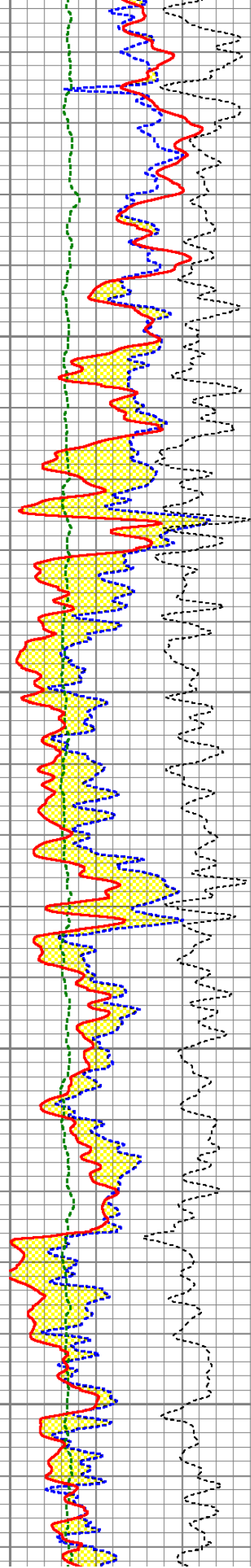
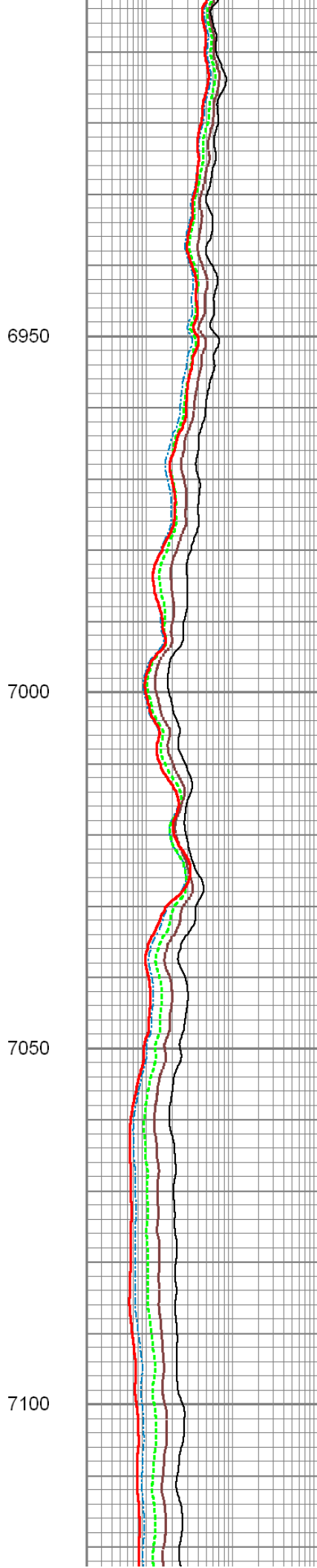
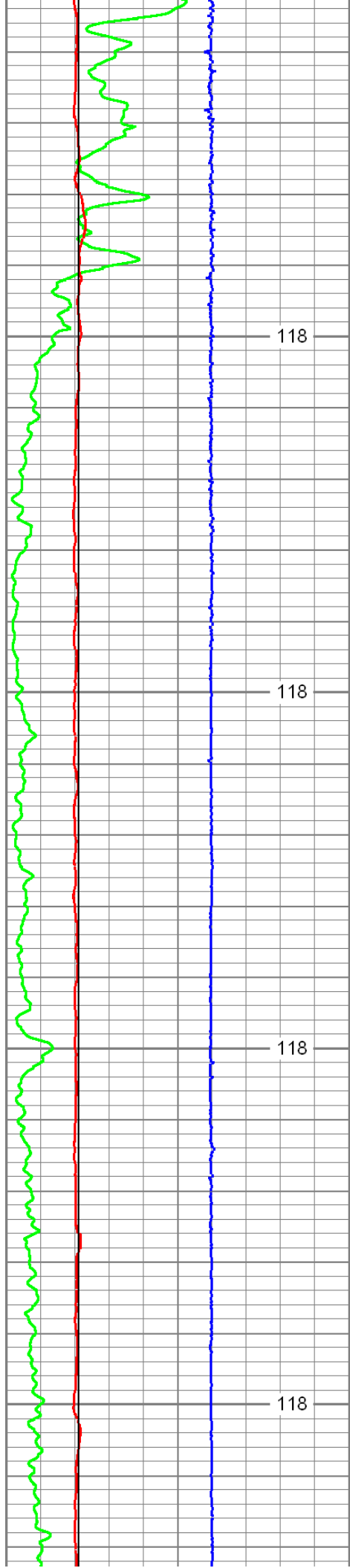
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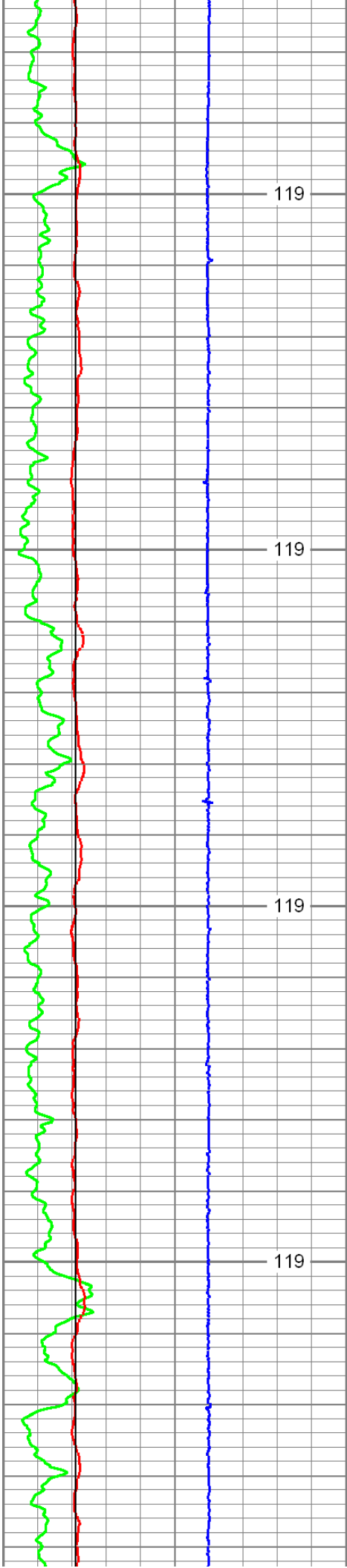
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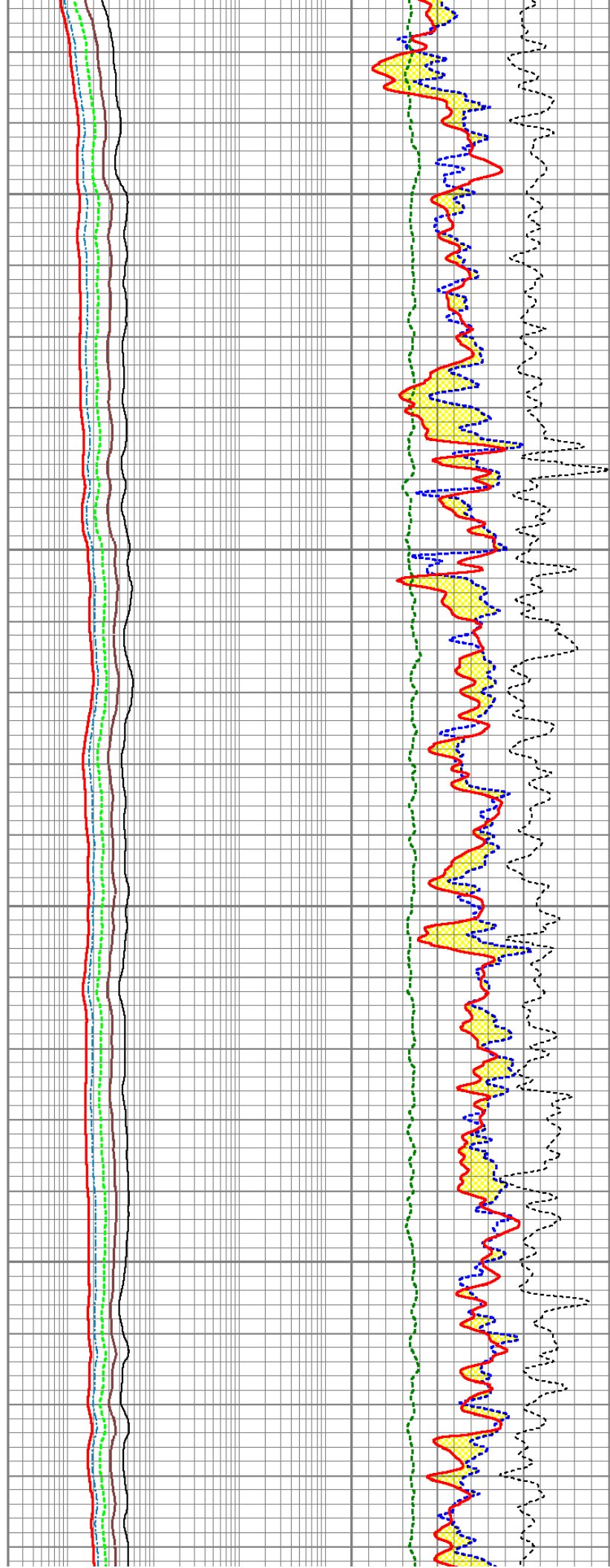


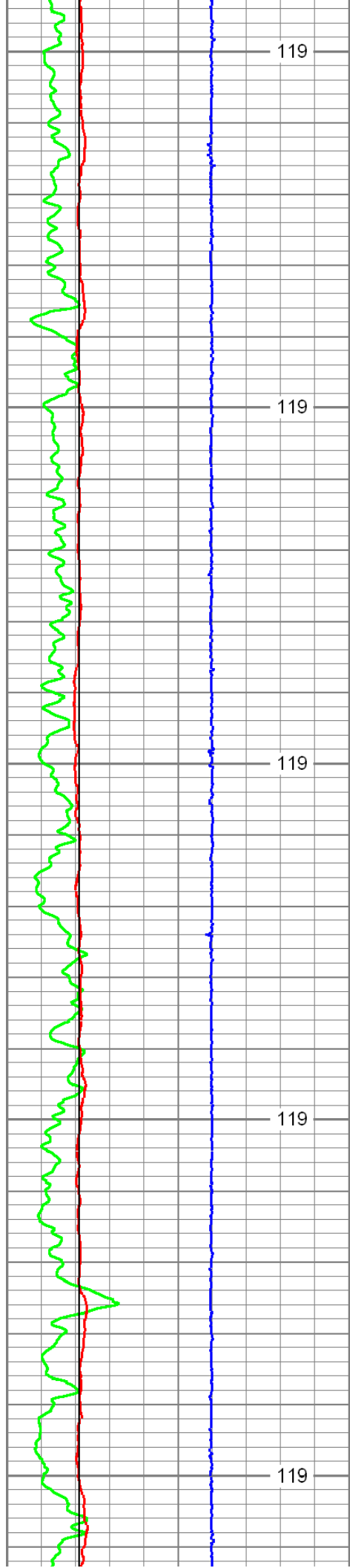
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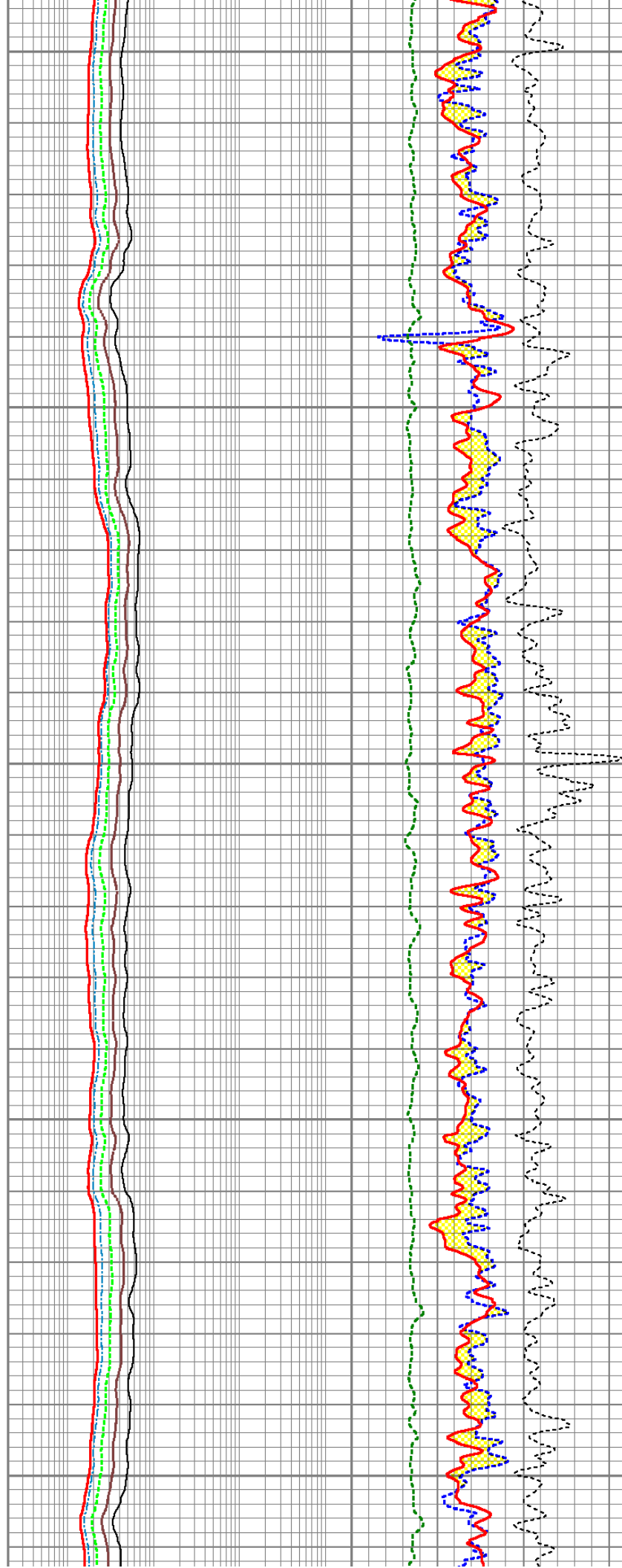
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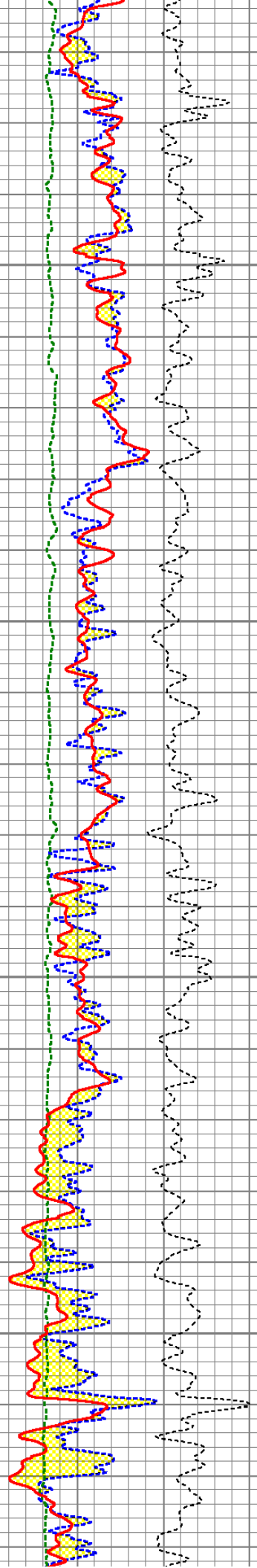
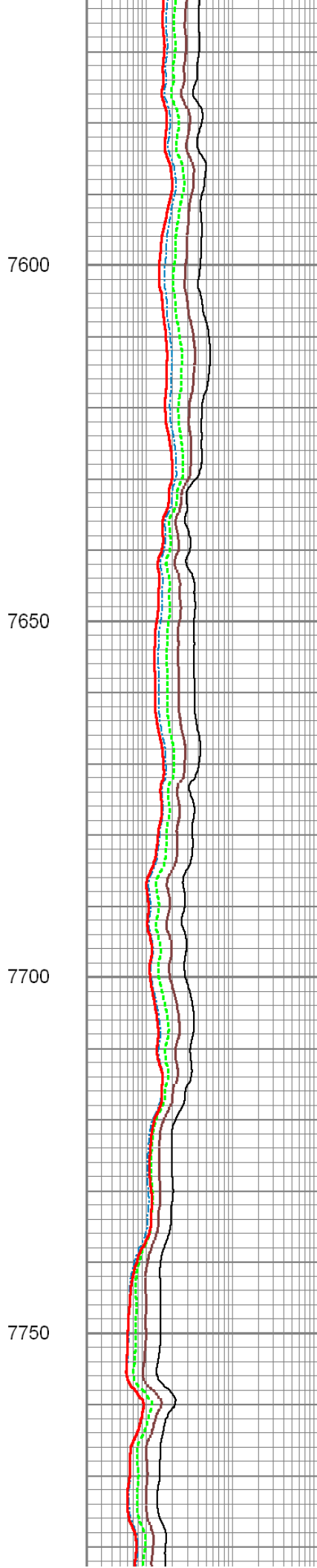
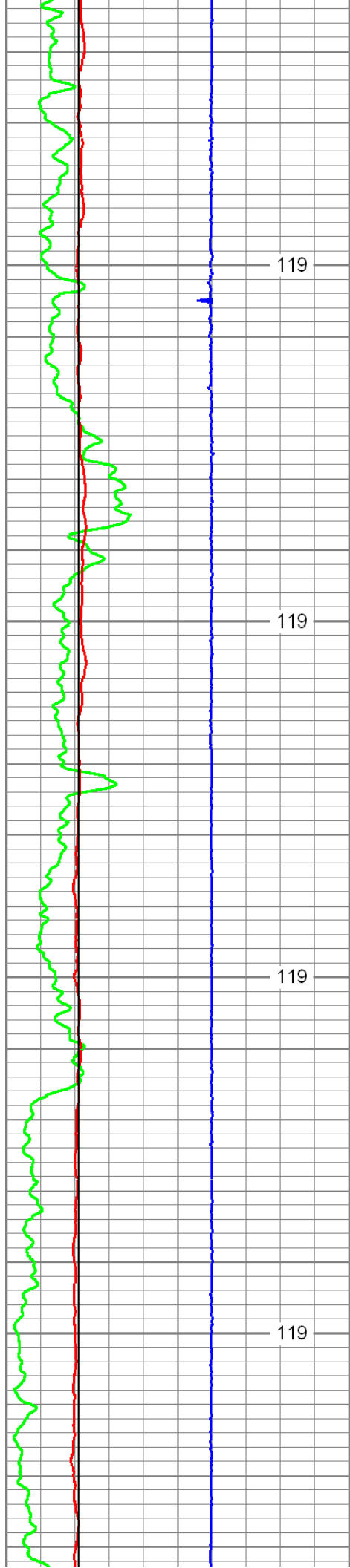
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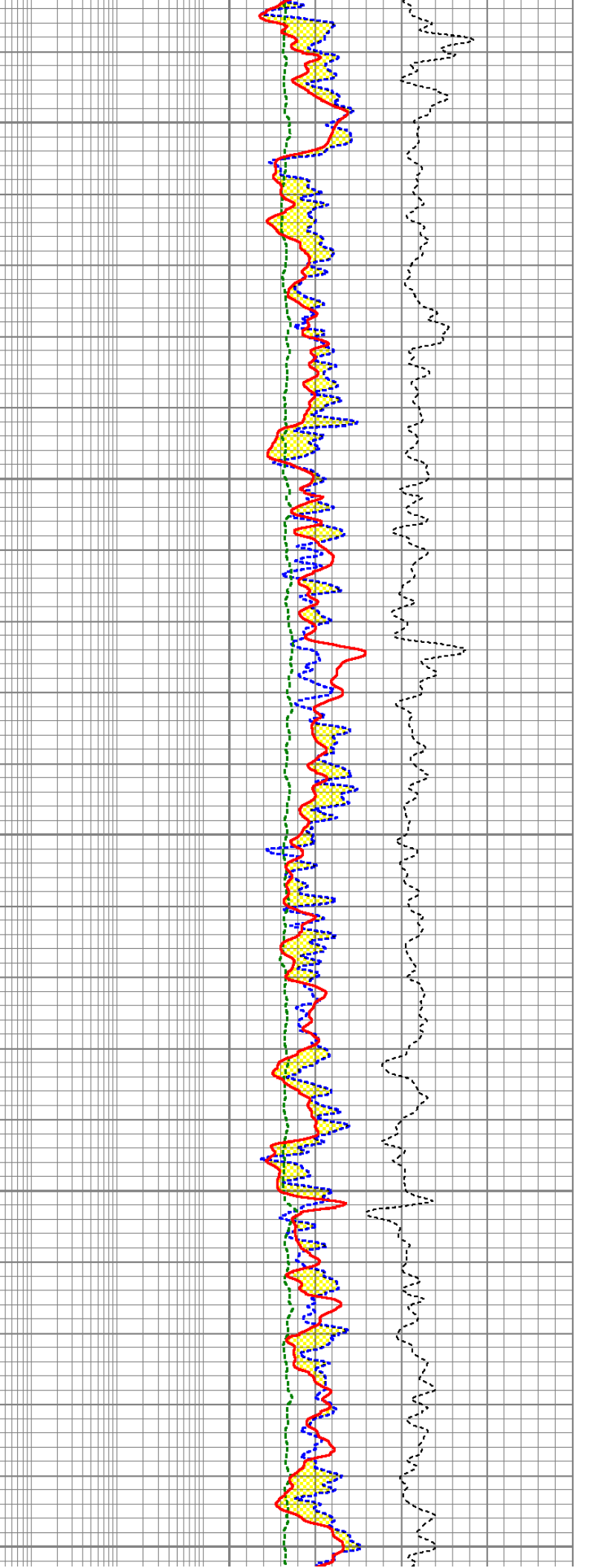
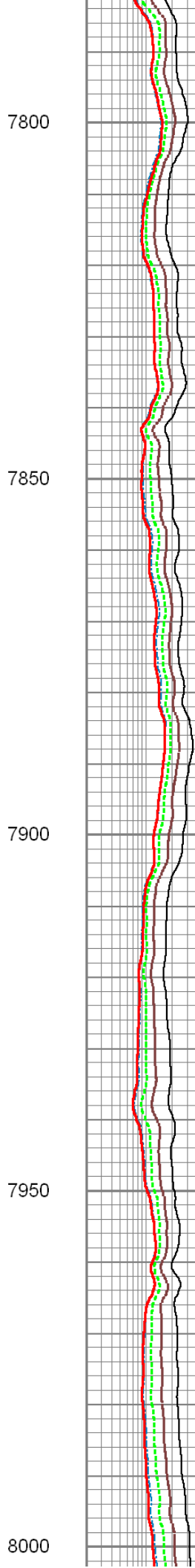
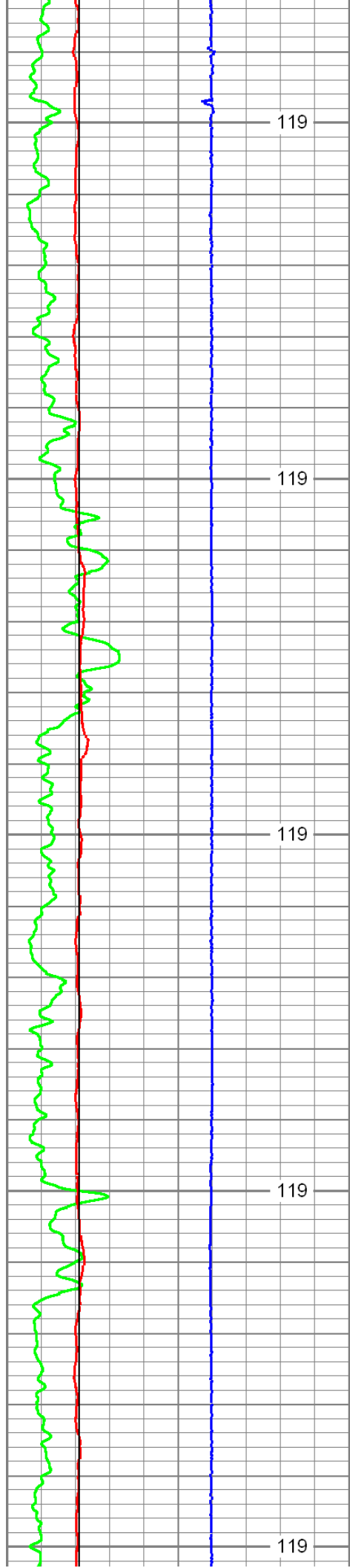
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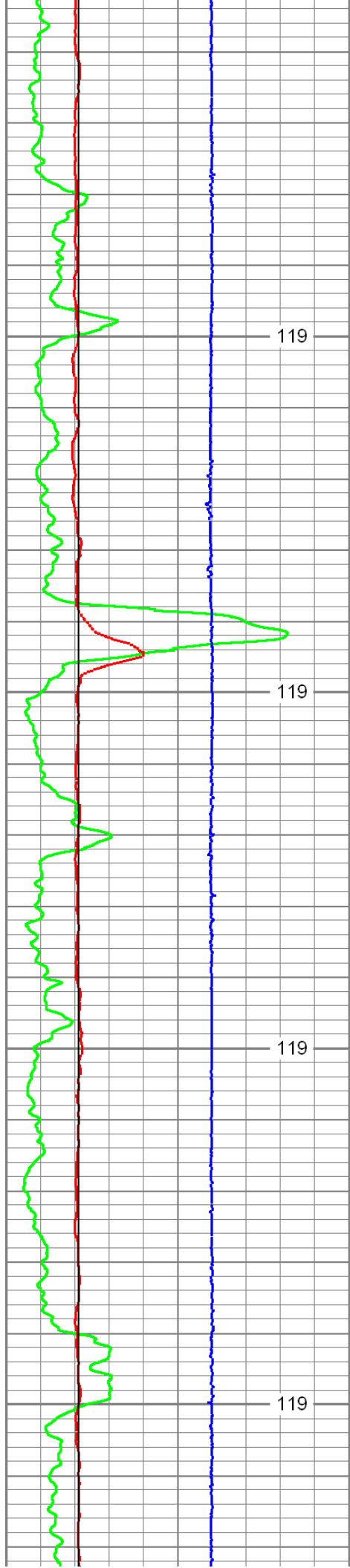
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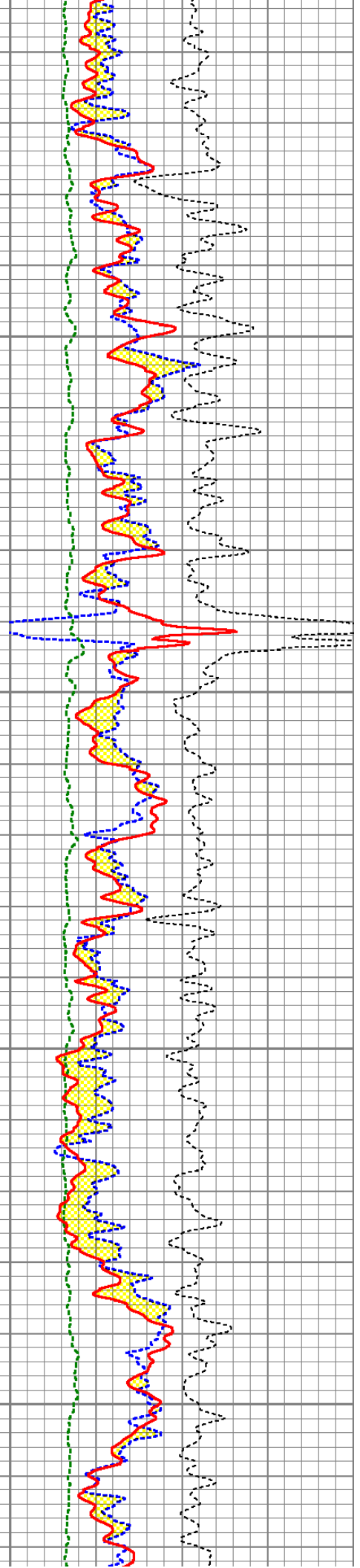
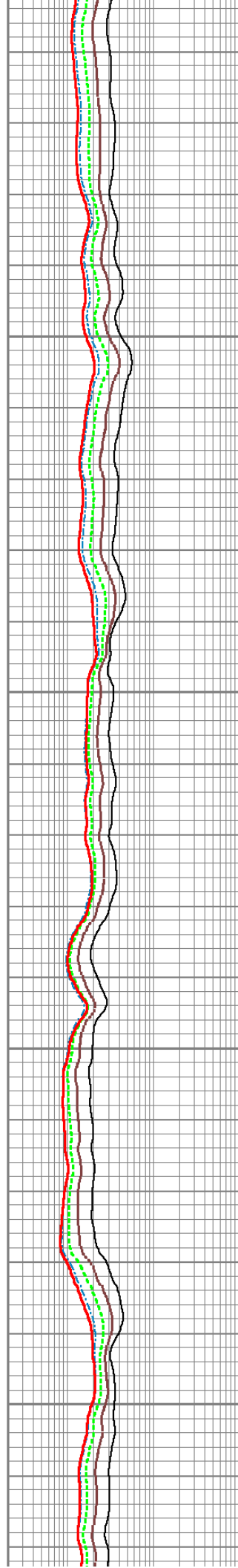


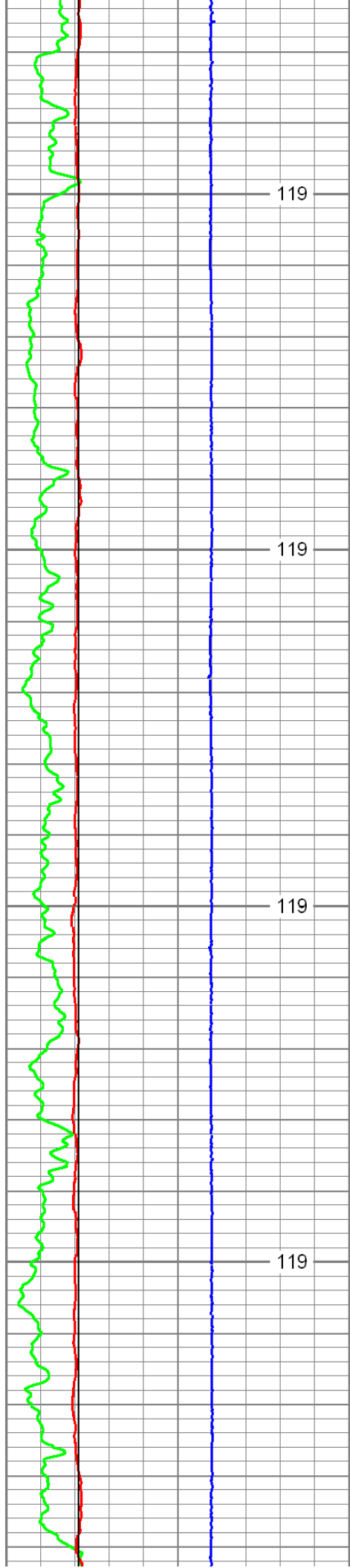
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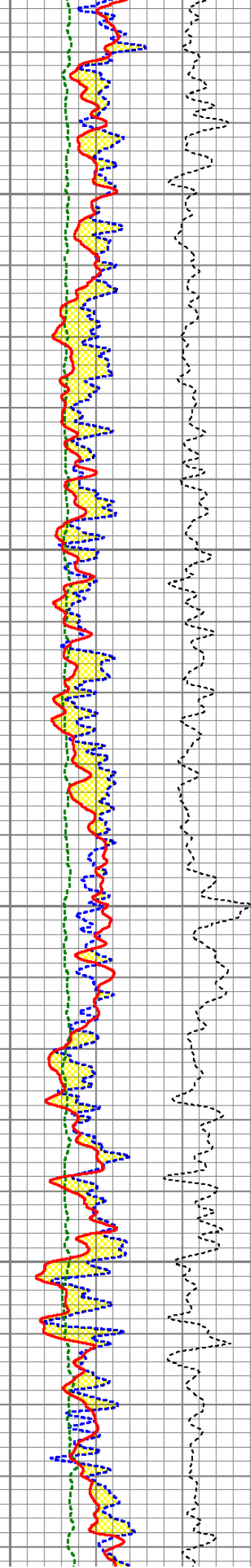


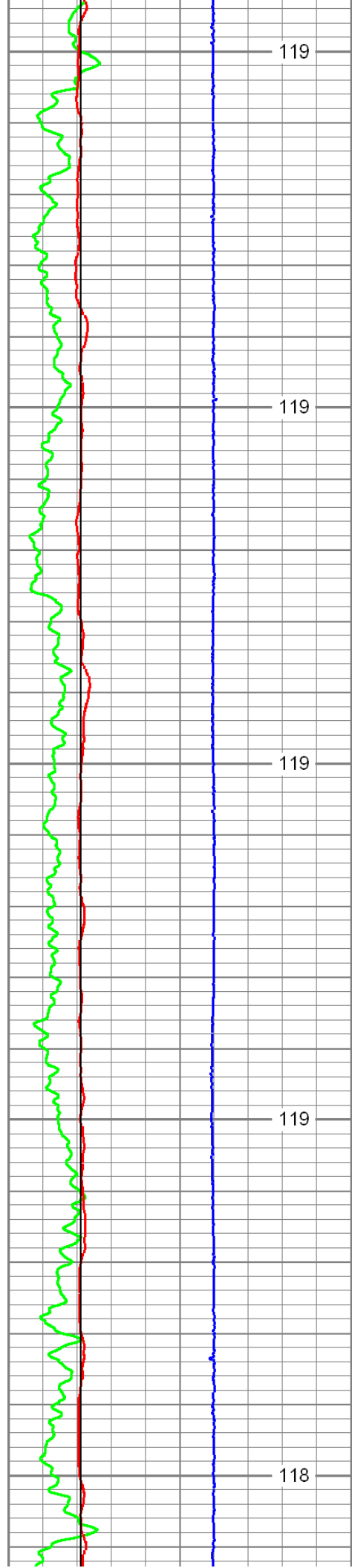
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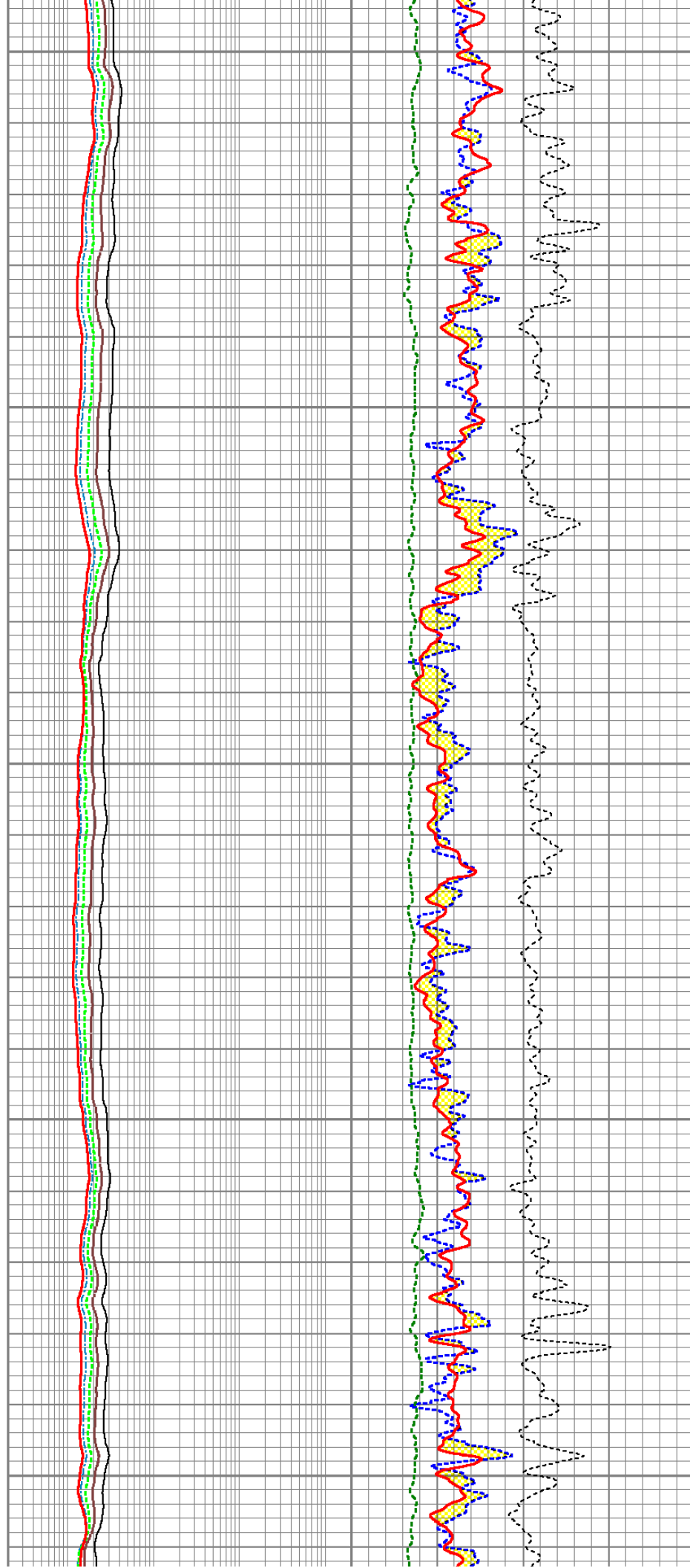
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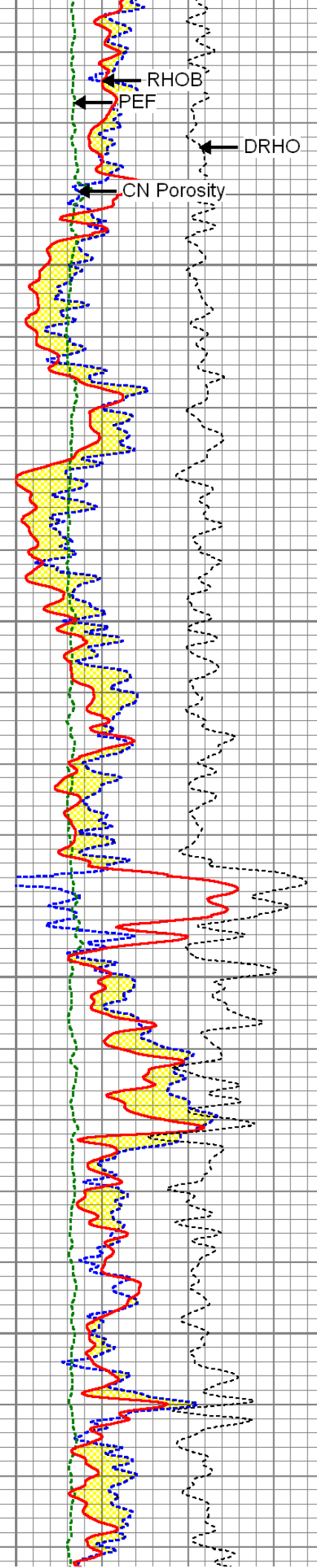
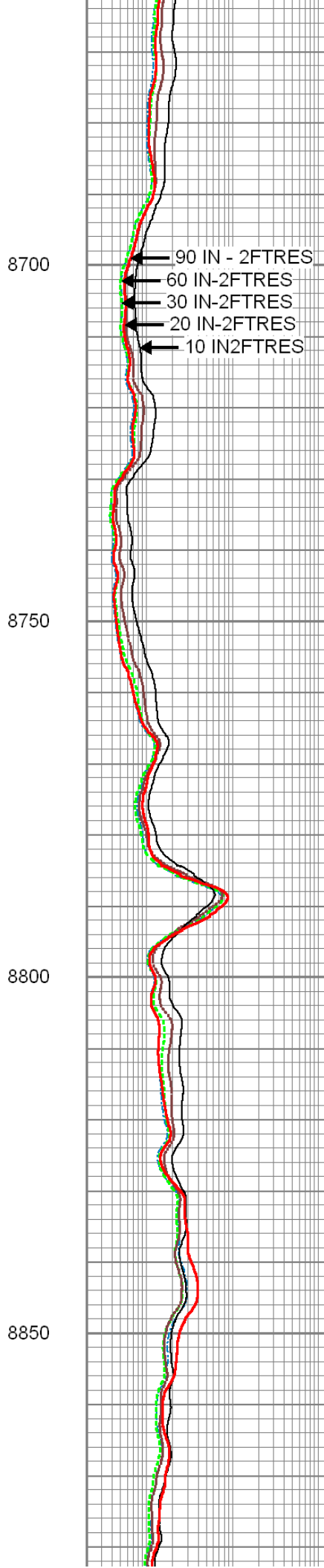
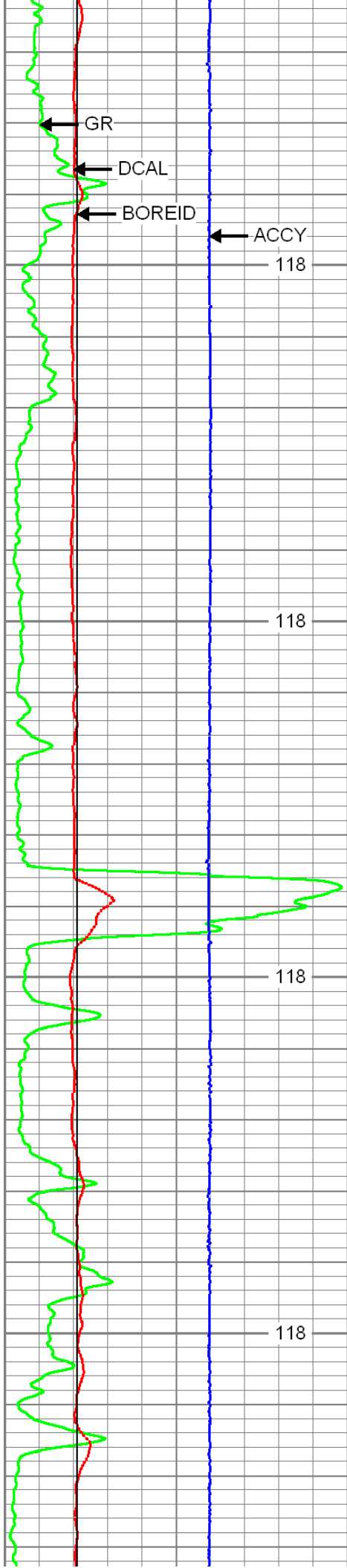
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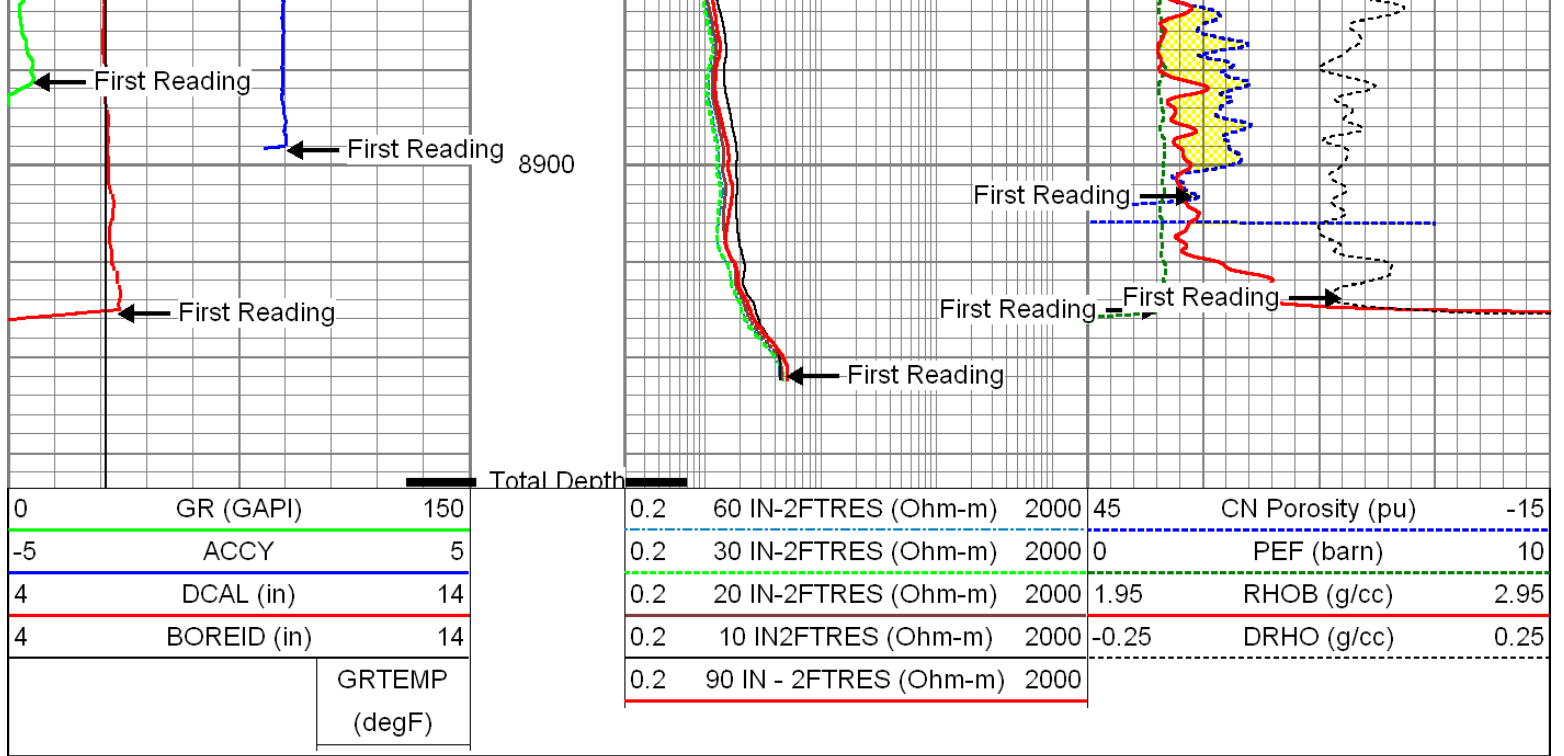
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## Log Variables

Database: c:\documents and settings\nparker\desktop\knoche trust 2408 31-1h\shell\_knoche\_2408\_31\_1h\_mem.db  
 Dataset: field/well/proc1/pass1.4

### Top - Bottom

A	BHCOR	BHFL_TYPE	BHFLRES Ohm-m	BHFLRESSRC	BHIDSRC	BOREID in
1	On	WBM	1	MUDCELL	CURVE	6.125
BOTTEMP degF	CASED?	CASEOD in	CASETHCK in	CEMWATERSA kppm	CMNTHCK in	DNBHC?
118	No	4.5	0	0	0	NO
DPORSEL	FLUIDDEN g/cc	FRMSALIN kppm	LATNOR	M	MATRXDEN g/cc	MUDSALIN kppm
RHOB	1	0	Off	2	2.71	1.6
MudWgt lb/gal	NPORSEL	PEBHC?	PERFS	RESTMPSRC	SO in	SRFTEMP degF
8.45	Limestone	YES	0	INTERNAL	0.5	65
SZCOR	TDEPTH ft	TMPCOR	TOOLPOS			
On	8945	On	Ec-centered			

### Calibration Report

Database File: c:\documents and settings\nparker\desktop\knoche trust 2408 31-1h\shell\_knoche\_2408\_31\_1h\_mem.db  
 Dataset Pathname: proc1/pass1.4  
 Dataset Creation: Mon Apr 29 05:14:26 2013

### ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS38R  
 Shop Calibration Performed: Fri Mar 01 12:30:29 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-478.4900	[-500.00, -400.00]	175.3190	[-500.00, 500.00]
A2	-135.7360	[-180.00, -100.00]	302.3650	[-500.00, 500.00]
A3	-26.2781	[-50.00, -10.00]	-65.5454	[-500.00, 500.00]
A4	-16.7549	[-30.00, -10.00]	254.1780	[-500.00, 500.00]
A5	-14.3211	[-30.00, -10.00]	151.4720	[-500.00, 500.00]
Freq 2				
A1	-252.3300	[-280.00, -180.00]	90.6894	[-500.00, 500.00]
A2	-86.4805	[-130.00, -50.00]	170.3340	[-500.00, 500.00]
A3	-19.2593	[-50.00, -10.00]	-94.3423	[-500.00, 500.00]
A4	-19.7630	[-30.00, -10.00]	78.5474	[-500.00, 500.00]
A5	-19.2330	[-30.00, -10.00]	2.2441	[-500.00, 500.00]
Freq 3				
A1	-162.5760	[-180.00, -80.00]	-2.4436	[-500.00, 500.00]
A2	-65.8174	[-130.00, -30.00]	84.6667	[-500.00, 500.00]
A3	-15.1583	[-50.00, -10.00]	-126.5820	[-500.00, 500.00]
A4	-21.2009	[-30.00, -10.00]	-38.0339	[-500.00, 500.00]
A5	-21.8735	[-30.00, -10.00]	-105.2590	[-500.00, 500.00]
Freq 4				
A1	-89.4241	[-120.00, -40.00]	-152.8680	[-500.00, 500.00]
A2	-46.8994	[-110.00, -10.00]	-29.1757	[-500.00, 500.00]
A3	-12.3098	[-50.00, -10.00]	-189.9740	[-500.00, 500.00]
A4	-23.7794	[-30.00, -10.00]	-211.1800	[-500.00, 500.00]
A5	-26.9272	[-30.00, -10.00]	-283.6760	[-500.00, 500.00]

CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9910	[0.95, 1.05]	0.0019	[-0.05, 0.05]
A2	0.9910	[0.95, 1.05]	0.0018	[-0.05, 0.05]
A3	1.0009	[0.95, 1.05]	-0.0054	[-0.05, 0.05]
A4	0.9885	[0.95, 1.05]	0.0047	[-0.05, 0.05]
A5	0.9939	[0.95, 1.05]	0.0015	[-0.05, 0.05]
Freq 2				
A1	0.9860	[0.95, 1.05]	-0.0059	[-0.05, 0.05]
A2	0.9858	[0.95, 1.05]	-0.0055	[-0.05, 0.05]
A3	0.9901	[0.95, 1.05]	-0.0051	[-0.05, 0.05]
A4	0.9836	[0.95, 1.05]	-0.0030	[-0.05, 0.05]
A5	0.9887	[0.95, 1.05]	-0.0069	[-0.05, 0.05]
Freq 3				
A1	0.9930	[0.95, 1.05]	-0.0045	[-0.05, 0.05]
A2	0.9931	[0.95, 1.05]	-0.0041	[-0.05, 0.05]
A3	0.9966	[0.95, 1.05]	-0.0041	[-0.05, 0.05]
A4	0.9891	[0.95, 1.05]	-0.0015	[-0.05, 0.05]
A5	0.9978	[0.95, 1.05]	-0.0052	[-0.05, 0.05]
Freq 4				
A1	0.9848	[0.95, 1.05]	-0.0070	[-0.05, 0.05]
A2	0.9844	[0.95, 1.05]	-0.0066	[-0.05, 0.05]
A3	0.9901	[0.95, 1.05]	-0.0084	[-0.05, 0.05]
A4	0.9809	[0.95, 1.05]	-0.0036	[-0.05, 0.05]
A5	0.9965	[0.95, 1.05]	-0.0100	[-0.05, 0.05]
Temperature	34.5229 degC			

ThruBit Density Calibration Report

Tool Model-Serial Number:

PS-PS01D

Source Number:

Shop Calibration Performed:

Tue Apr 16 14:16:56 2013

REFERENCE

	Density	Units
Aluminium	2.607	g/cc
Magnesium	1.752	g/cc

READINGS

Outputs	Counts	Units	Expected
SS1 Background	134.71	cps	[130.00, 170.00]
LS1 Background	144.11	cps	[130.00, 170.00]
LS4 Background	30.89	cps	[27.00, 35.00]
SS1 Aluminium	4829.85	cps	[4500.00, 5500.00]
LS1 Aluminium	888.69	cps	[750.00, 950.00]
LS4 Aluminium	1022.63	cps	[843.00, 1068.00]
SS1 Magnesium	7979.36	cps	[7000.00, 9000.00]
LS1 Magnesium	5766.10	cps	[5250.00, 6250.00]
LS1 Al + Fe	765.36	cps	[650.00, 800.00]
LS4 Al + Fe	470.51	cps	[382.00, 471.00]

RESULTS

SS Slope	1.67	[1.52, 1.77]
LS Slope	0.42	[0.38, 0.45]
PEF K Factor	5.039	[3.510, 6.170]
PEF B Factor	-0.594	[-0.700, -0.410]

Caliper Shop Calibration performed:

Tue Apr 16 14:16:56 2013

RESULTS

Reference	Reading	Units
12.00	1835.24	in
9.00	1997.22	in
6.00	2157.79	in

DENSITY PRE-SURVEY CHECK Performed:

Mon Apr 08 09:30:56 2013

Outputs	Counts	Units	Expected
SS1 Background	134.25	cps	[130.67, 138.76]
LS1 Background	143.04	cps	[139.79, 148.43]
LS4 Background	31.47	cps	[29.03, 32.74]

CALIPER PRE-SURVEY CHECK Performed:

Thu Apr 04 15:27:52 2013

Reference	Readings	Units	Expected
6.00	5.99	in	[5.80, 6.20]

Compensated Neutron Calibration Report

Tool Model-Serial Number:

PS-PS14N

Source Number:

Source Number:

Calibration Tank Temperature:

64.1 degF

Shop Calibration Performed:

Tue Apr 23 09:59:33 2013

BACKGROUND MEASUREMENT

Outputs	Measured	Units	Expected
SS Counts	3.5	cps	<10
LS Counts	0.1	cps	<4

WATER TANK REFERENCE

Outputs	Measured	Units	Expected
SS Counts	756.9	cps	
LS Counts	25.8	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	29.3291	SS/LS	
Tank Ratio Gain	1.0555		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
SS Counts	8461.5	cps	
LS Counts	814.1	cps	
Al Ratio Ref	10.797	SS/LS	
Al Ratio	10.971	SS/LS	
Al Ratio Gain	0.98		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed:

Wed Apr 24 10:26:33 2013

Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

Gamma Ray Calibration Report

Tool Model-Serial Number:	ENP-ENP5T		
Performed:	Wed Apr 24 10:34:01 2013		
Calibrator Value:	165.0	GAPI	
Background Reading:	68.2	cps	
Calibrator Reading:	447.3	cps	
Sensitivity:	0.3650	GAPI/cps	

Inclinometer Calibration Report

Performed: Sun Jun 13 14:33:21 1993

Low Ref High Ref Low Ref High Ref

	Low Read.	High Read.	Low Rel.	High Rel.	
X Accelerometer	0.00	1.00	0.00	1.00	gee
Y Accelerometer	0.00	1.00	0.00	1.00	gee
Z Accelerometer	0.00	1.00	0.00	1.00	gee

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
ThruBit	66.92		Cablehead-S Solid Weakpoint	2.31	2.13	5.00
ThruBit	64.61		PSBDOT	3.87	2.25	35.00
ThruBit	60.75		HangOff_Tool	5.00	2.38	60.00
ThruBit	55.75		10-1	0.88	2.13	3.95
ThruBit	54.87		Universal Joint	1.46	2.06	15.00
TBBAT	53.41		TBBAT-A (PS13B) ThruBit Battery	6.13	2.13	38.20
TBBAT2	47.29		TBBAT2-A (PS33B) ThruBit Battery	6.13	2.13	40.00
TMG	41.16		TMG-ENP (ENP5T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
GR	41.04					
GRTEMP	40.20					
ThruBit	35.04		Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS14N) ThruBit Neutron	4.77	2.13	63.00
LSW1	18.04		TBD-PS (PS01D) ThruBit Density	10.48	2.13	91.00
	DCAL					
A1_P	10.60		TBI-PS (PS38R)	15.29	2.13	94.00
A2_P	10.10					
A3_P	9.35					

A4\_P  
A5\_P

8.35  
6.60



ThruBit Induction

Dataset: shell\_knoche\_2408\_31\_1h\_mem.db: field/well/proc1/pass1.4  
Total Length: 66.92 ft  
Total Weight: 560.15 lb  
O.D. 2.38 in



**ThruBit**

A Schlumberger Company

Company SHELL EXP. & PROD. CO., INC.  
Well KNOCHE TRUST 2408 31-1H  
Field ARROWHEAD  
County RENO  
State KANSAS