



# ThruBit

A Schlumberger Company

## SPECTRAL DENSITY DUAL SPACED NEUTRON GAMMA RAY MEMORY LOG

Company SANDRIDGE ENERGY  
 Well WEST 3508 1-5H  
 Field BOUSE  
 County HARPER  
 State KANSAS

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Location: API #: 15-077-21997-0100  
 SHL: 240' FSL & 1720' FEL  
 SEC 32 TWP 35S RGE 8W  
 Permanent Datum G.L. Elevation 1236'  
 Log Measured From KB 18' ABOVE PERM DATUM  
 Drilling Measured From KB  
 Other Services  
 THURBIT PORTAL BIT  
 Elevation  
 KB: 1254'  
 D.F. 1254'  
 G.L. 1236'

Date	1 FEB 2014
Run Number	ONE
Depth Driller	9861'
Depth Logger	9820'
Bottom Logged Interval	9800'
Top Log Interval	3000'
Casing Driller	7.0" @ 5782'
Casing Logger	5780'
Bit Size	6.125"
Type Fluid in Hole	WBM
Density / Viscosity	8.5 / 35
pH / Fluid Loss	9.4 / 60
Source of Sample	MUD SENSOR
Rm @ Meas. Temp	4.50 OHM@65DEGF
Rmf @ Meas. Temp	3.85 OHM@65DEGF
Rmc @ Meas. Temp	4.93 OHM@65DEGF
Source of Rmf / Rmc	CALCULATED
Rm @ BHT	3.62 OHM@125DEGF
Time Circulation Stopped	14:32 1 FEB 2014
Time Logger on Bottom	15:16 1 FEB 2014
Maximum Recorded Temperature	125 DEGF
Equipment Number	T005
Location	OKC, OK
Recorded By	C.PARKER
Witnessed By	L.STRONG

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All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

### Comments


SERVICE: HORIZONTAL PUMP DOWN MEMORY BIT DEPTH: 9762' LOGGED TO: 3000'  
 ALL SCALES AND PRESENTATIONS PER CLIENT REQUEST  
 LIMESTONE MATRIX, 2.71 g/cc. USED FOR POROSITY MEASUREMENTS  
 TOOLSTING RAN WITH SWIVEL, KNUCKLE AND SMALL DE-CENTRALIZER  
 TBHV REPRESENTS TOTAL BOREHOLE VOLUME, ft3  
 ABHV REPRESENTS ANNULAR HOLE VOLUME, CALCULATED FOR 4.5" CSG., ft3  
 HSPM USED TO ACQUIRE LOG DEPTH  
 LOG CORRELATED TO MWD GR  
 RIG: LARIAT 40  
 CREW: C.PARKER R.CRESSWELL I.HERNANDEZ

Service Ticket No. 2536      API No. 15-077-21997-0100      PGM Ver WARRIOR 8.0

The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

### EQUIPMENT DATA

GAMMA RAY		NEUTRON		DENSITY		INDUCTION		
Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE	
Serial No.	PS27T	Serial No.	PS6N	Serial No.	PS1D	Serial No.	PS16R	
Model No.	PS	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	9861'	3000'	0 PSI	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	30 %	-10 %	30 %	-10 %	0.2 OHM-M	2000 OHM-M
DIRECTIONAL INFORMATION								
Maximum Deviation	93.3	deg. @	5831'	KOP	3845'			

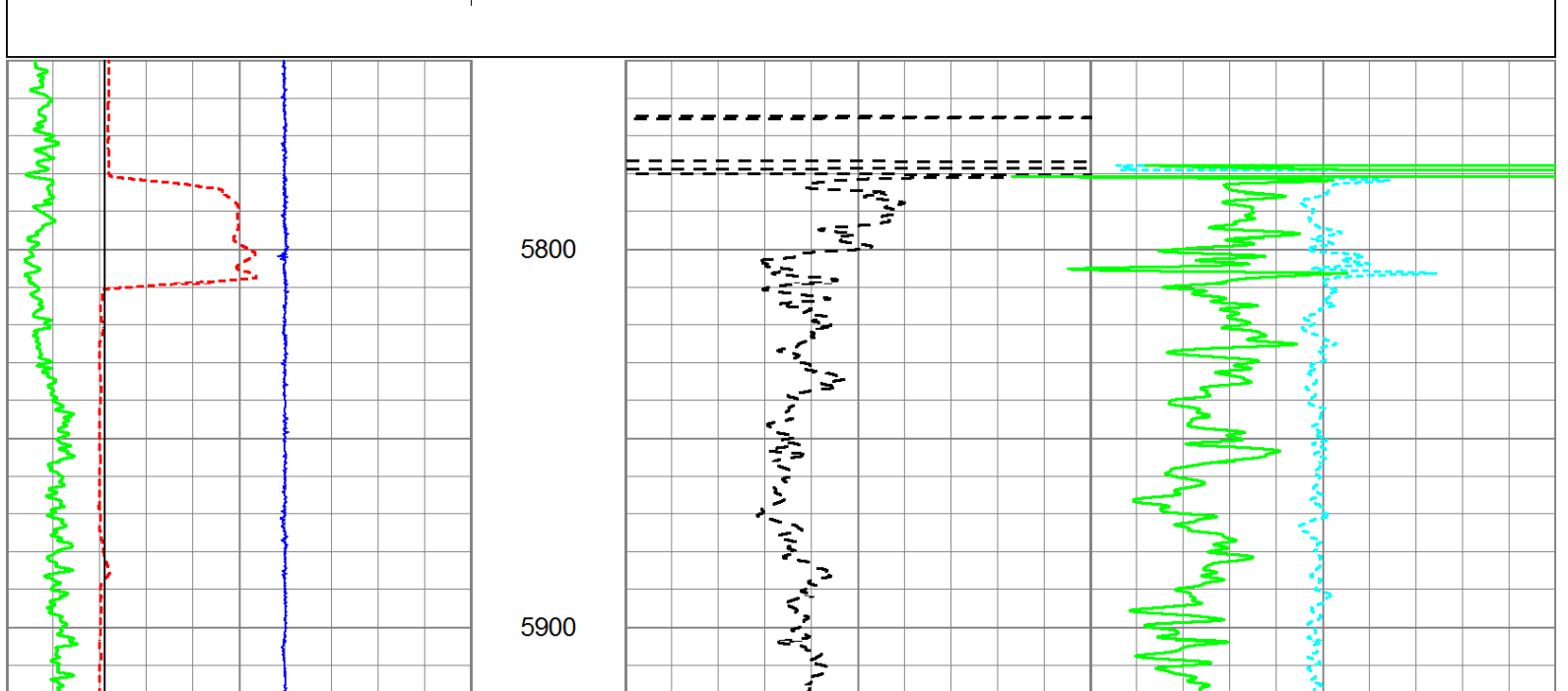


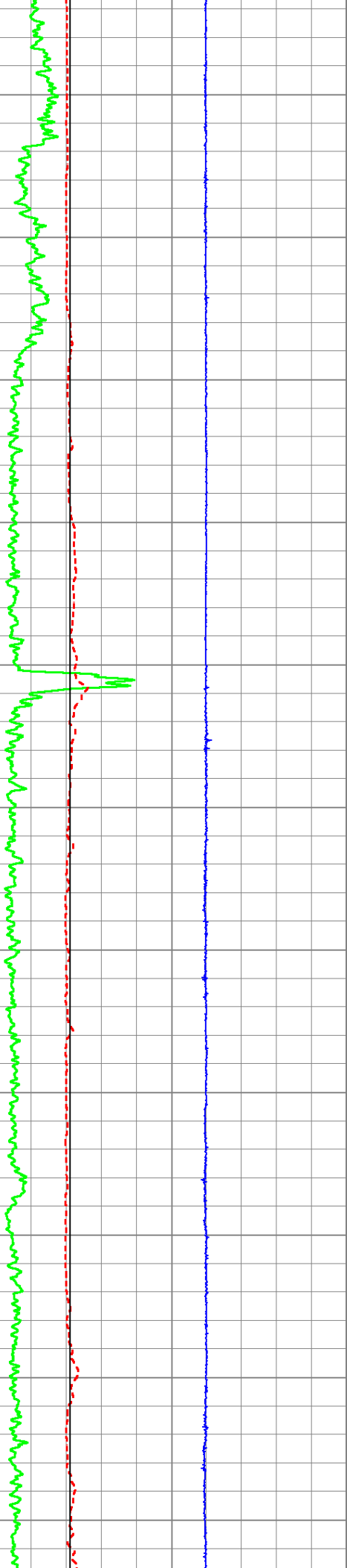
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 Presentation Format    6\_2n\_chk  
 Dataset Creation      Sat Feb 01 22:22:06 2014  
 Charted by            Depth in Feet scaled 1:600

0      GR (GAPI)      150	0      PEF (barn)      10	-0.5      DRHO (g/cc)      0.5
4      DCAL (in)      14	2      RHOB (g/cc)      3	
4      BOREID (in)      14		
-5      ACCY      5		





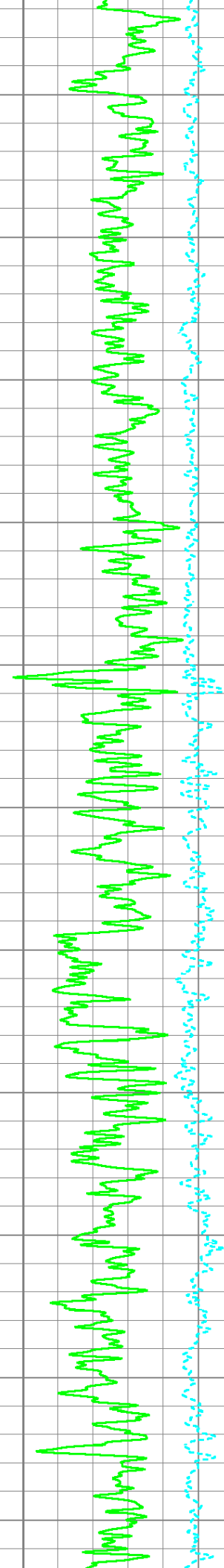
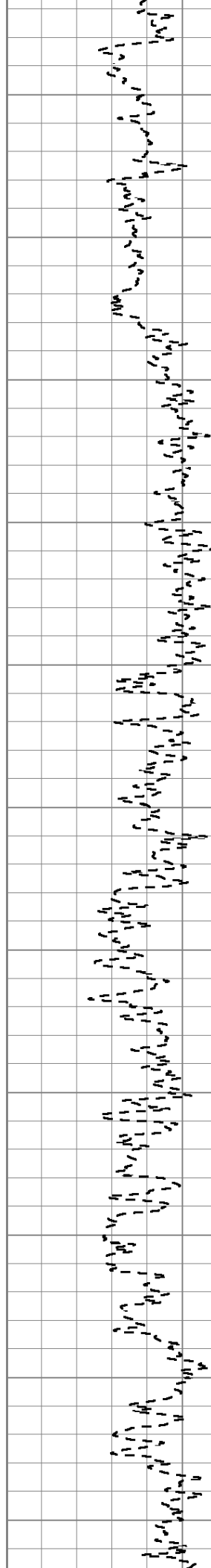
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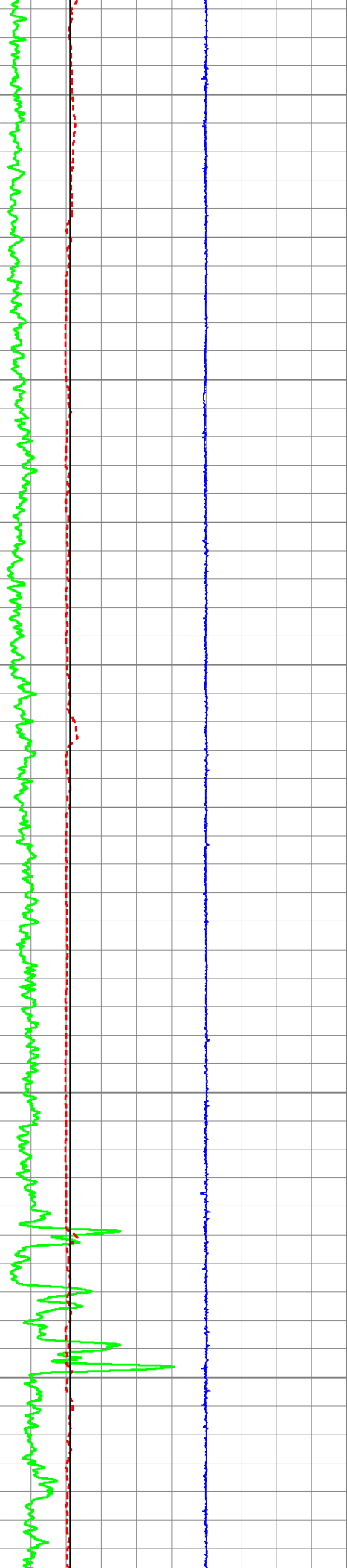
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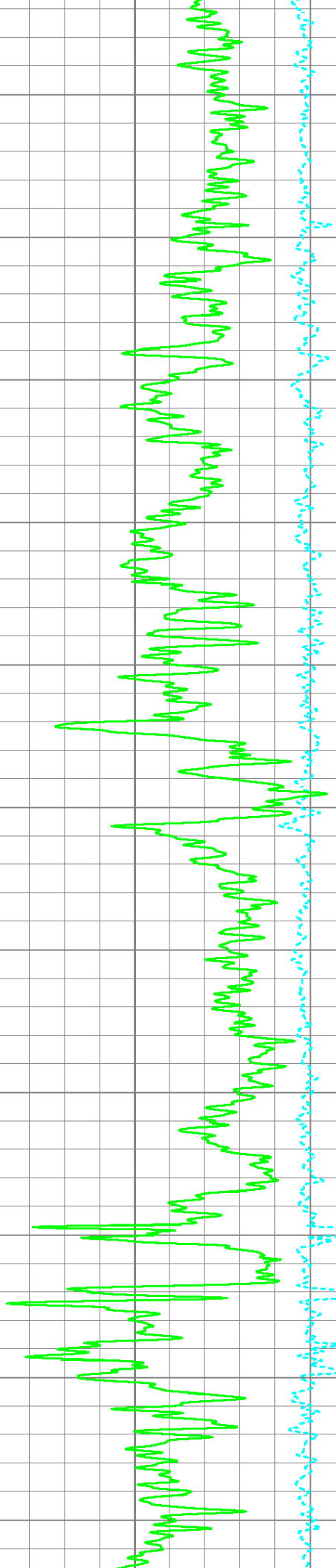
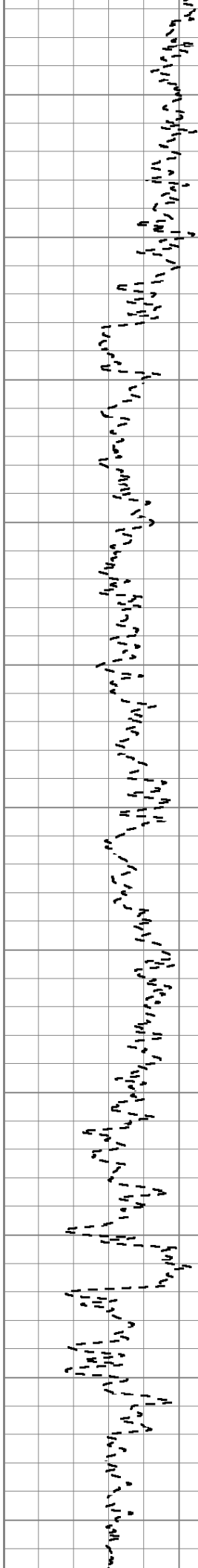
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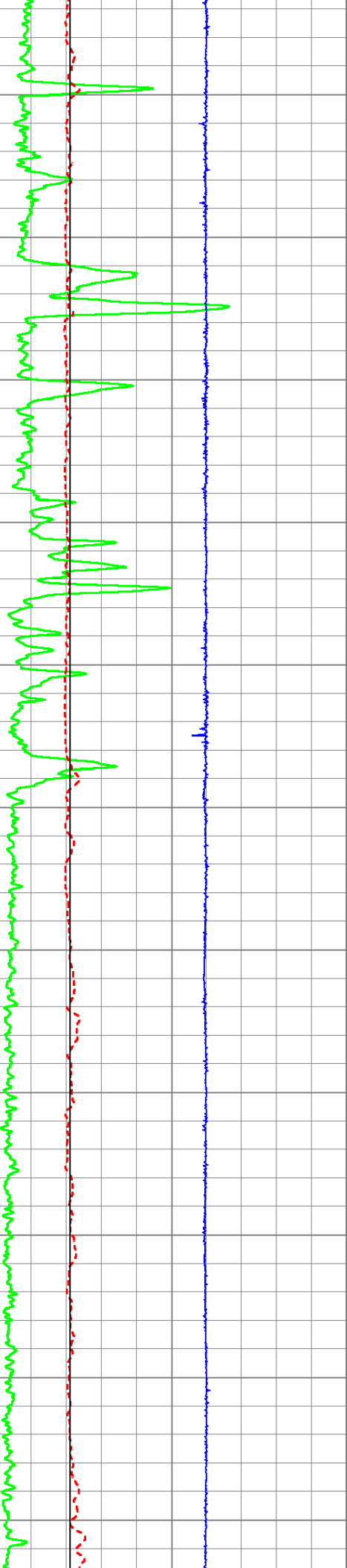
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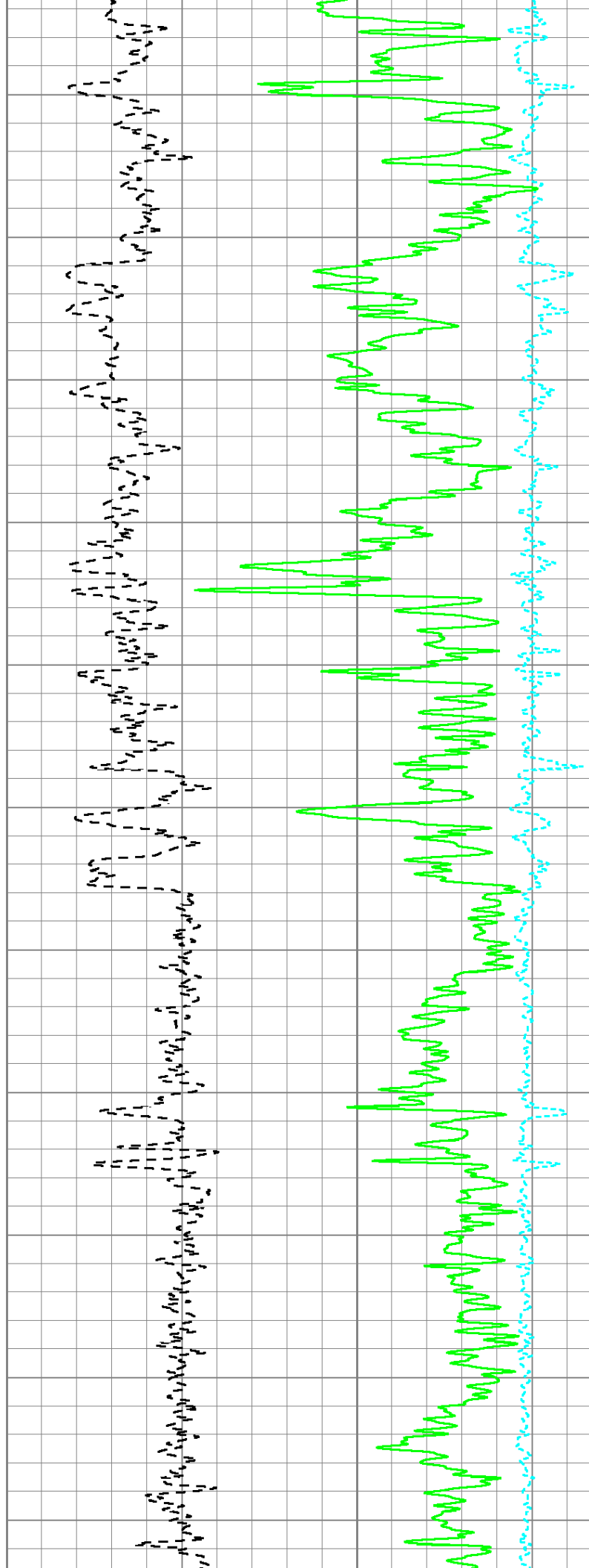
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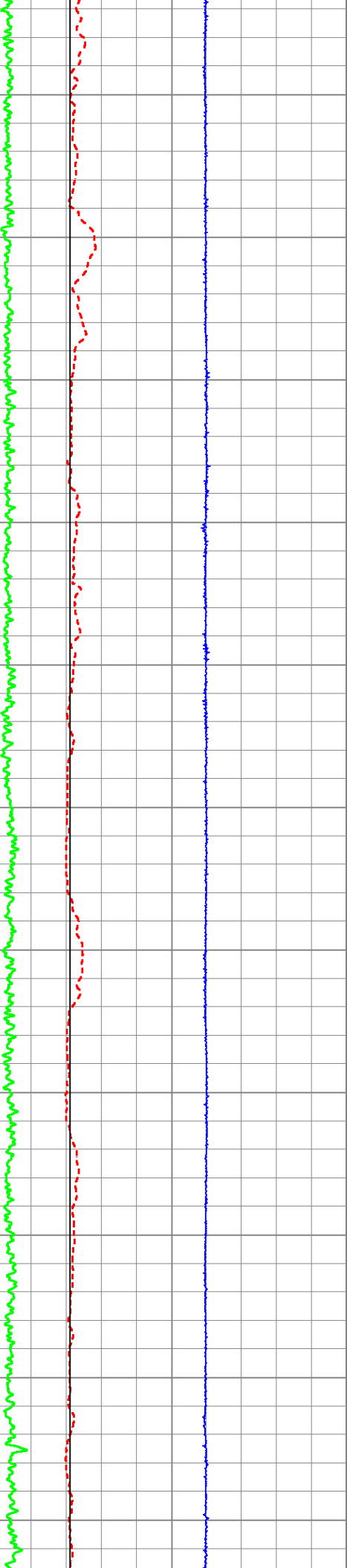
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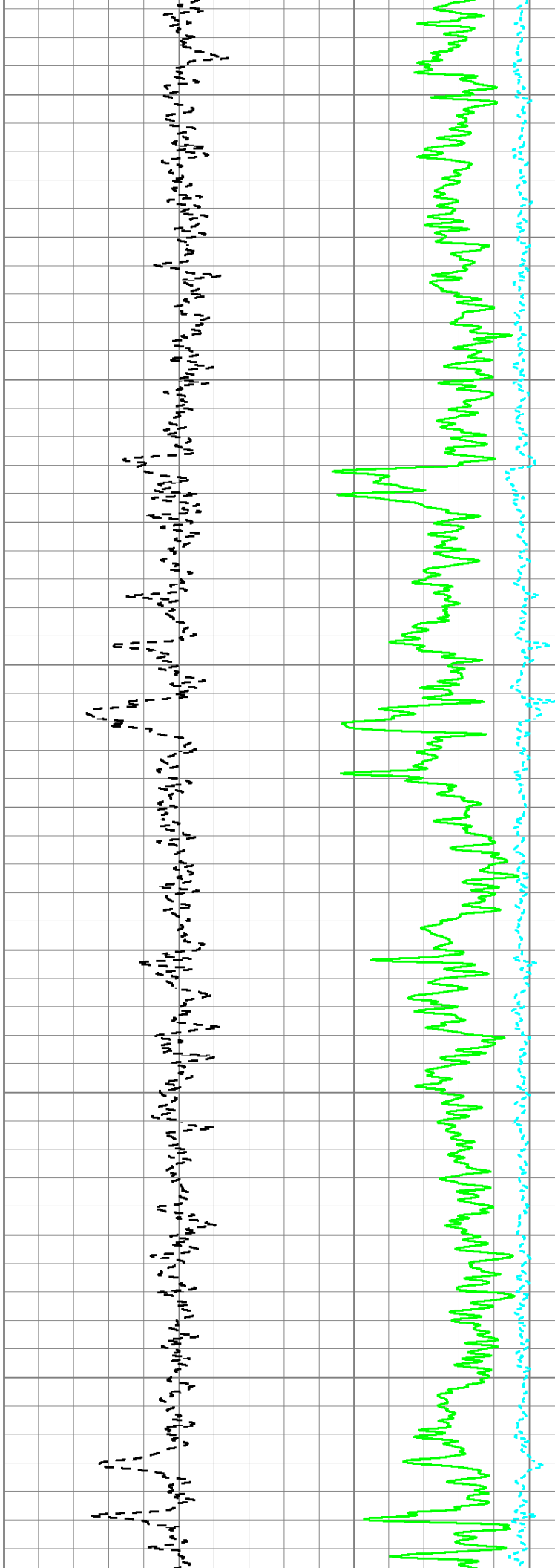
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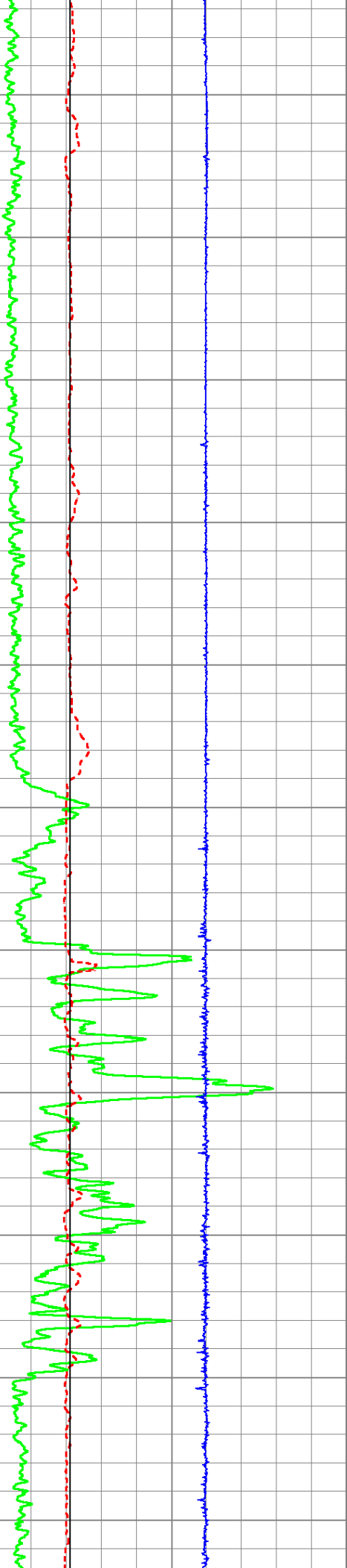
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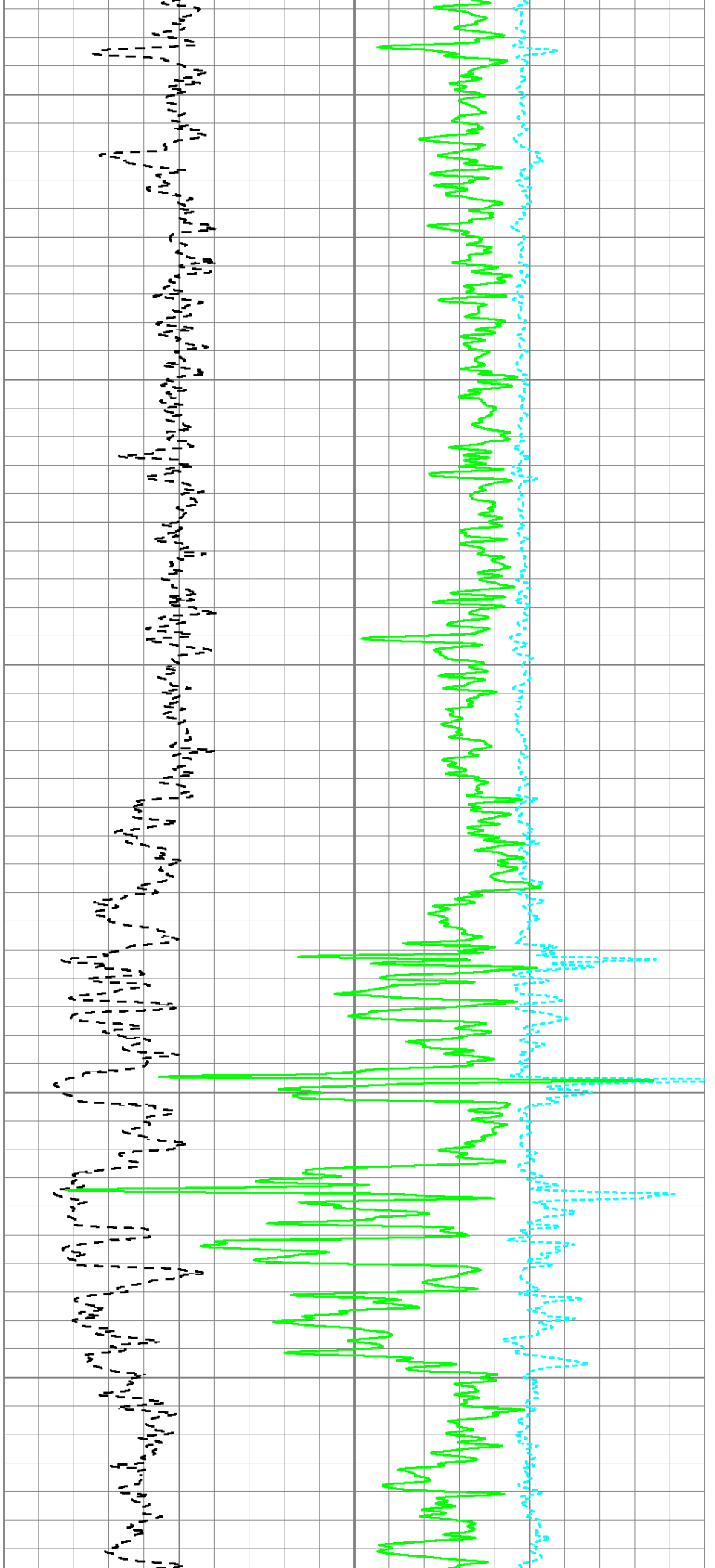
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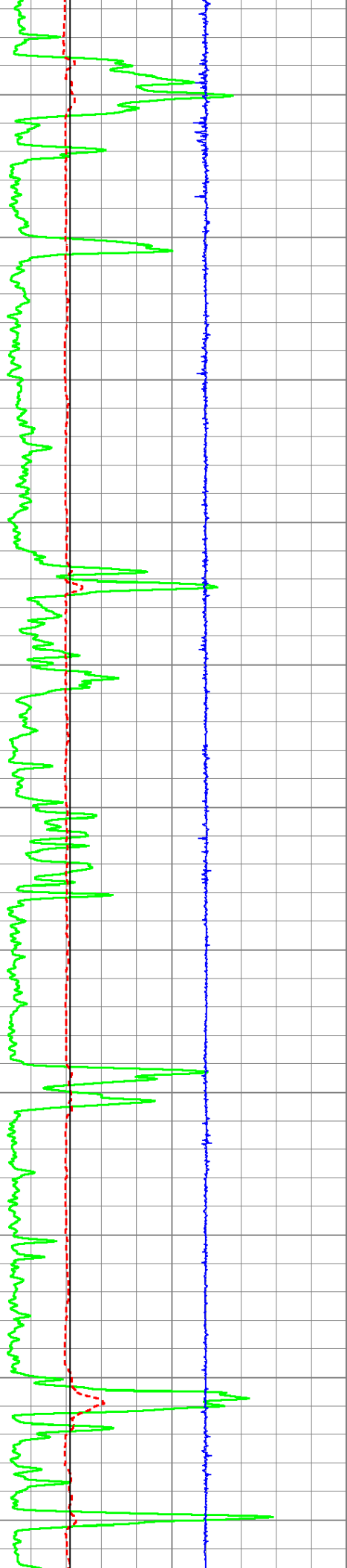
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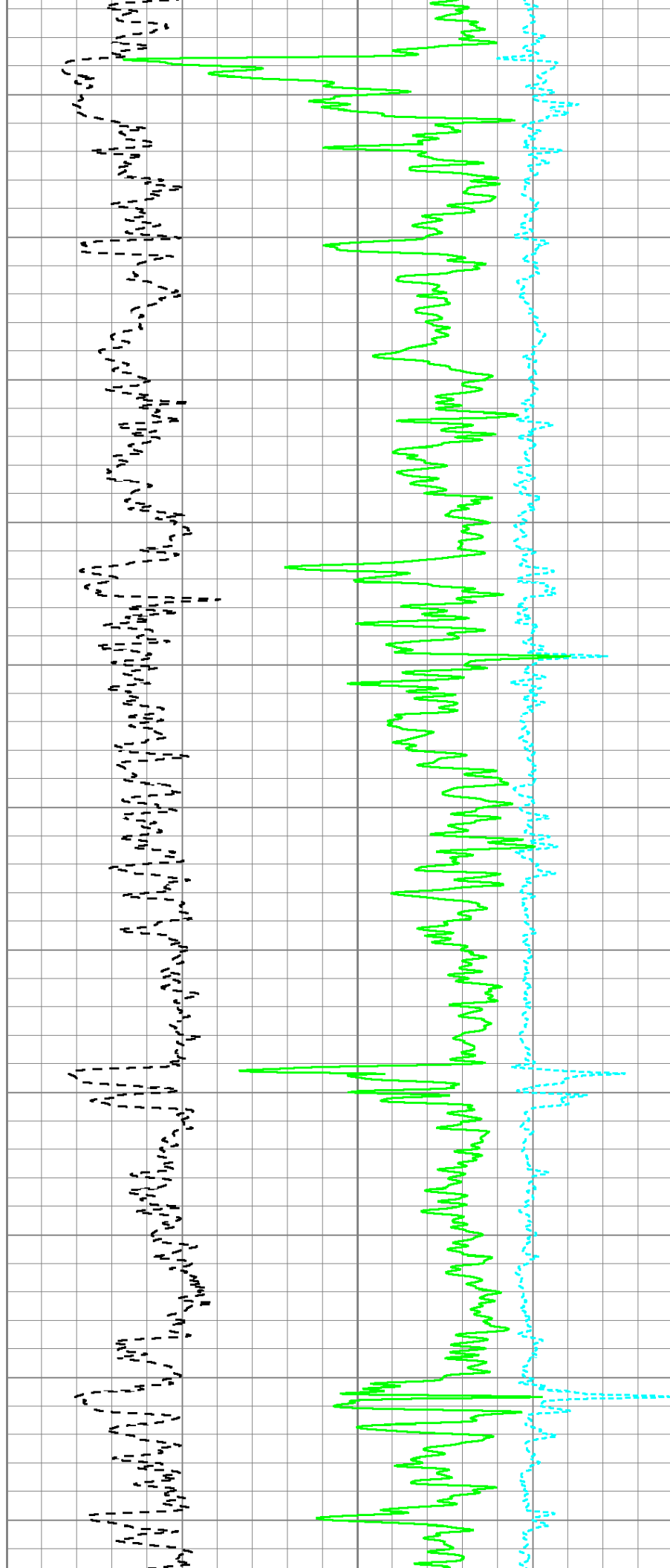
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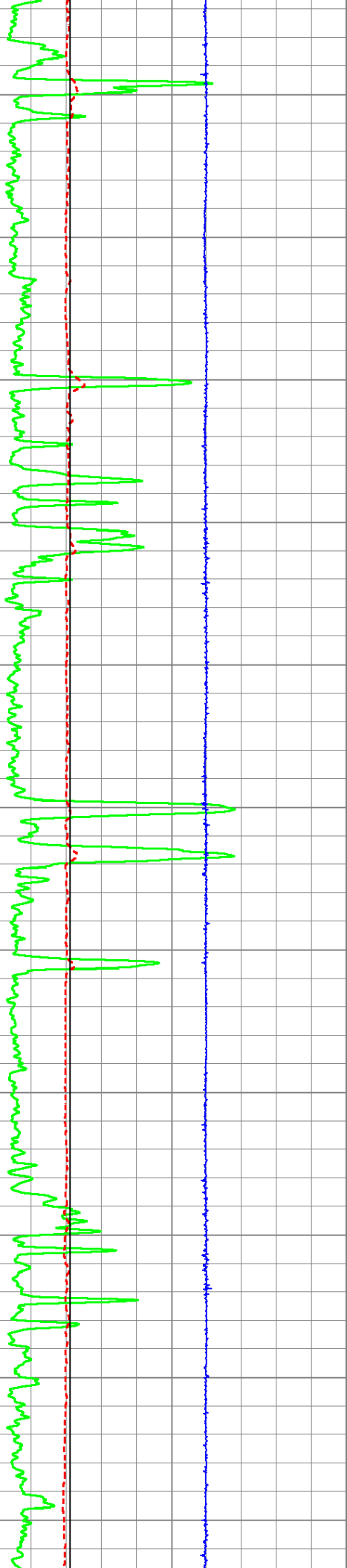
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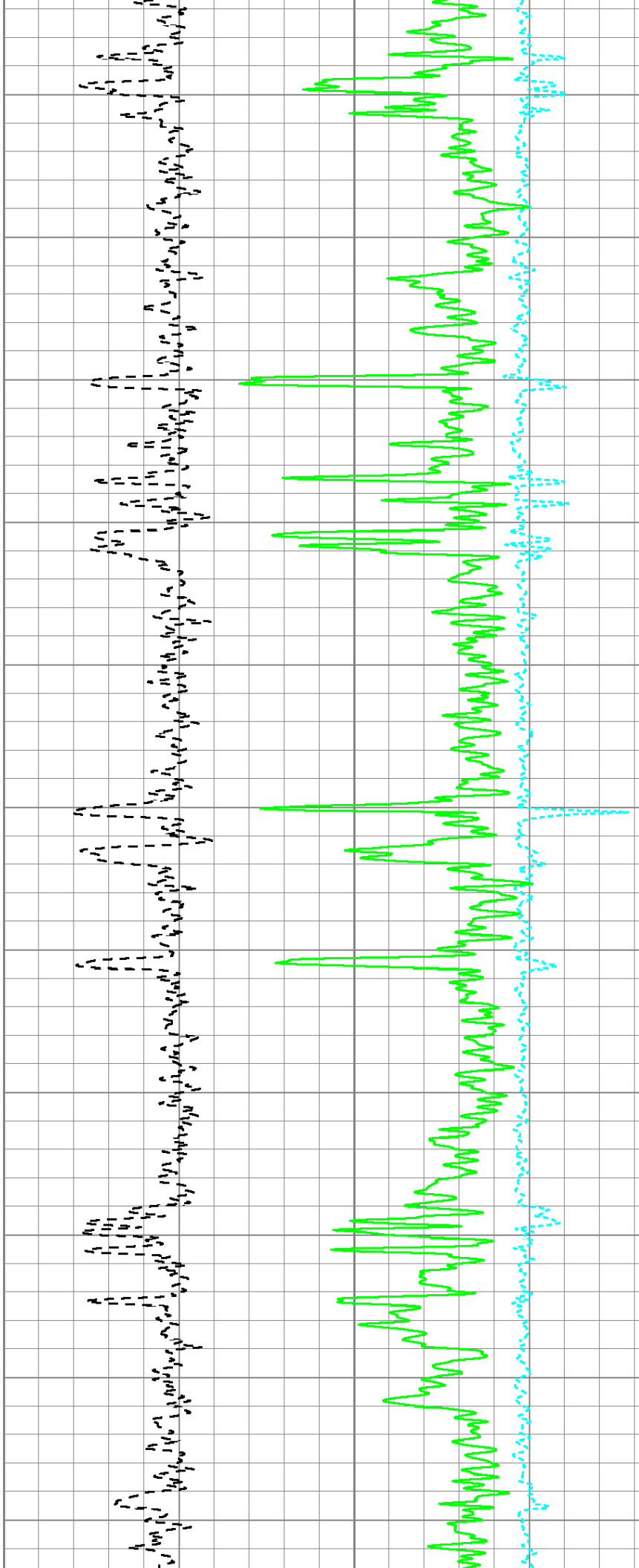
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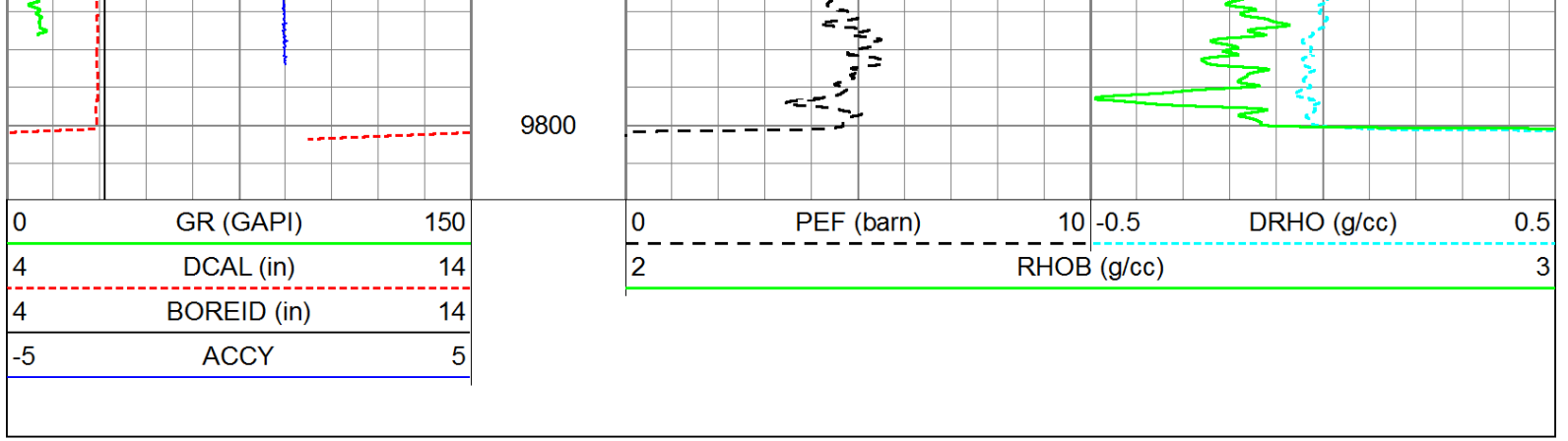

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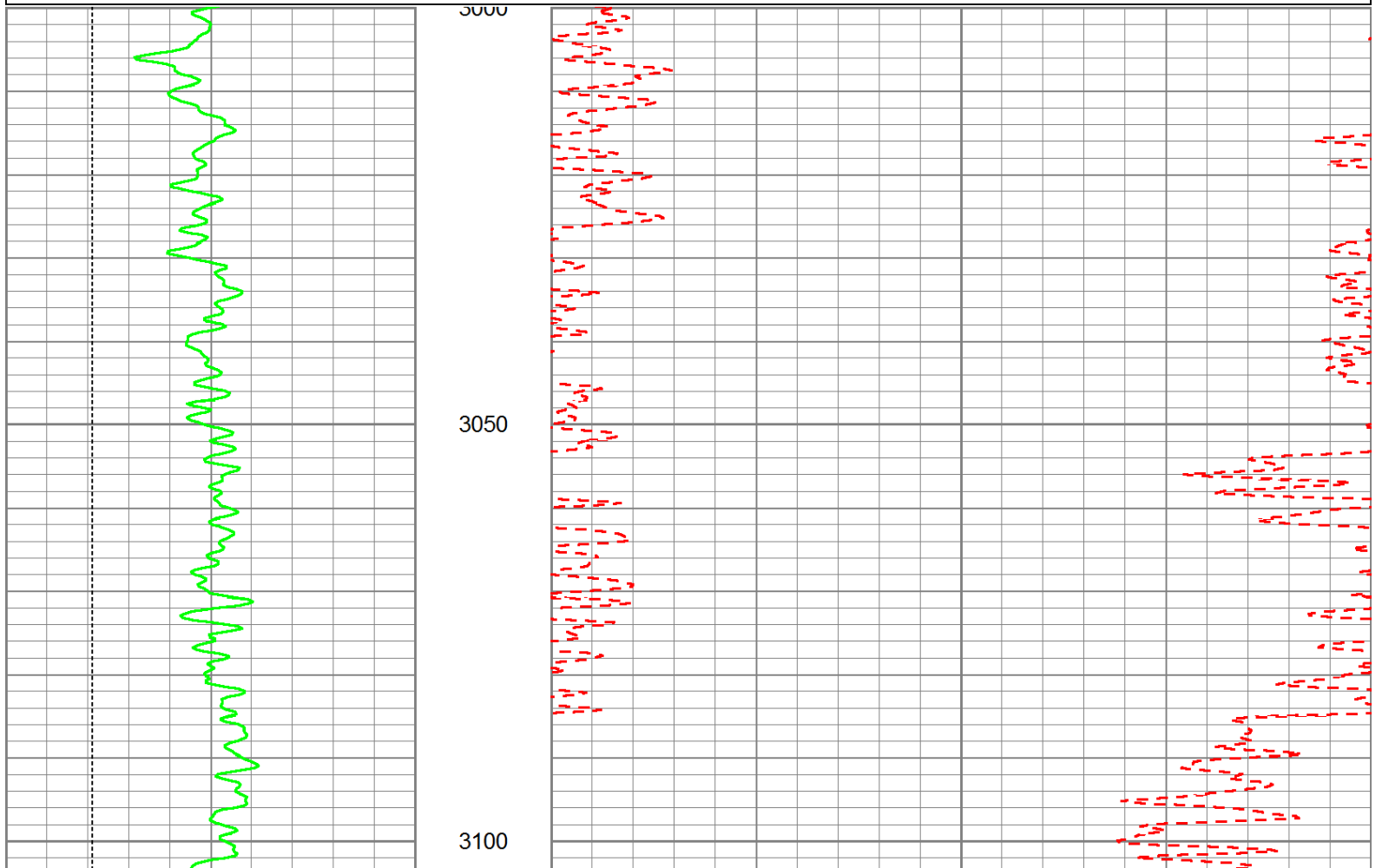



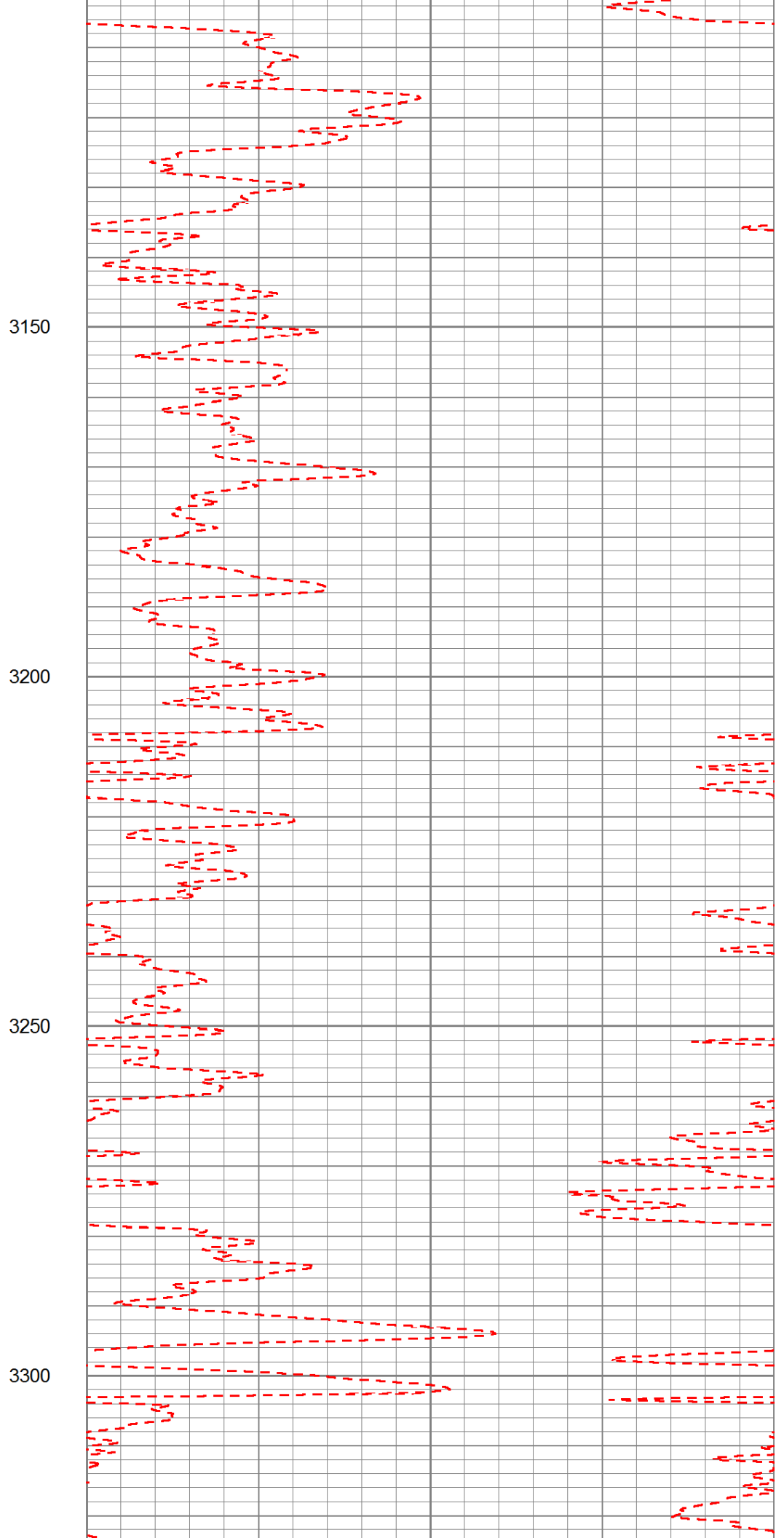
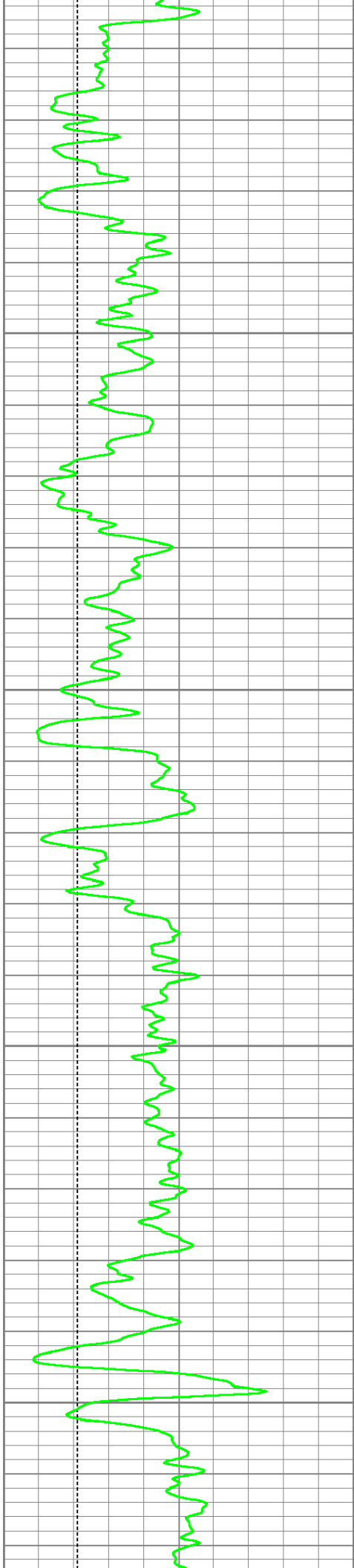
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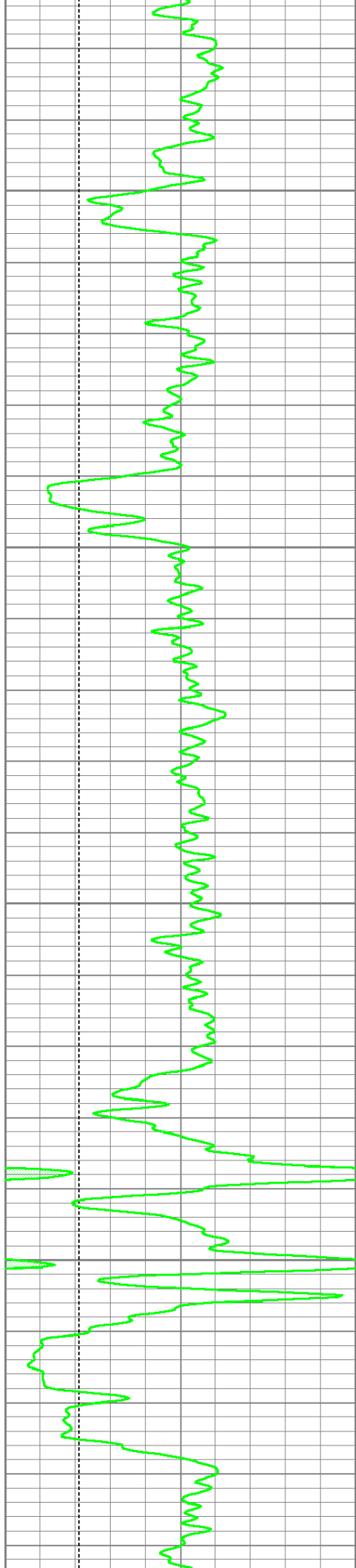
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4	DCAL (in)	14	30	CNPOR (pu)	-10			
4	BOREID (in)	14	30	DPHI (pu)	-10			
0	GR (GAPI)	150	0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
-5	ACCY	5	ABHV (ft3)					
	TBHV (ft3)							





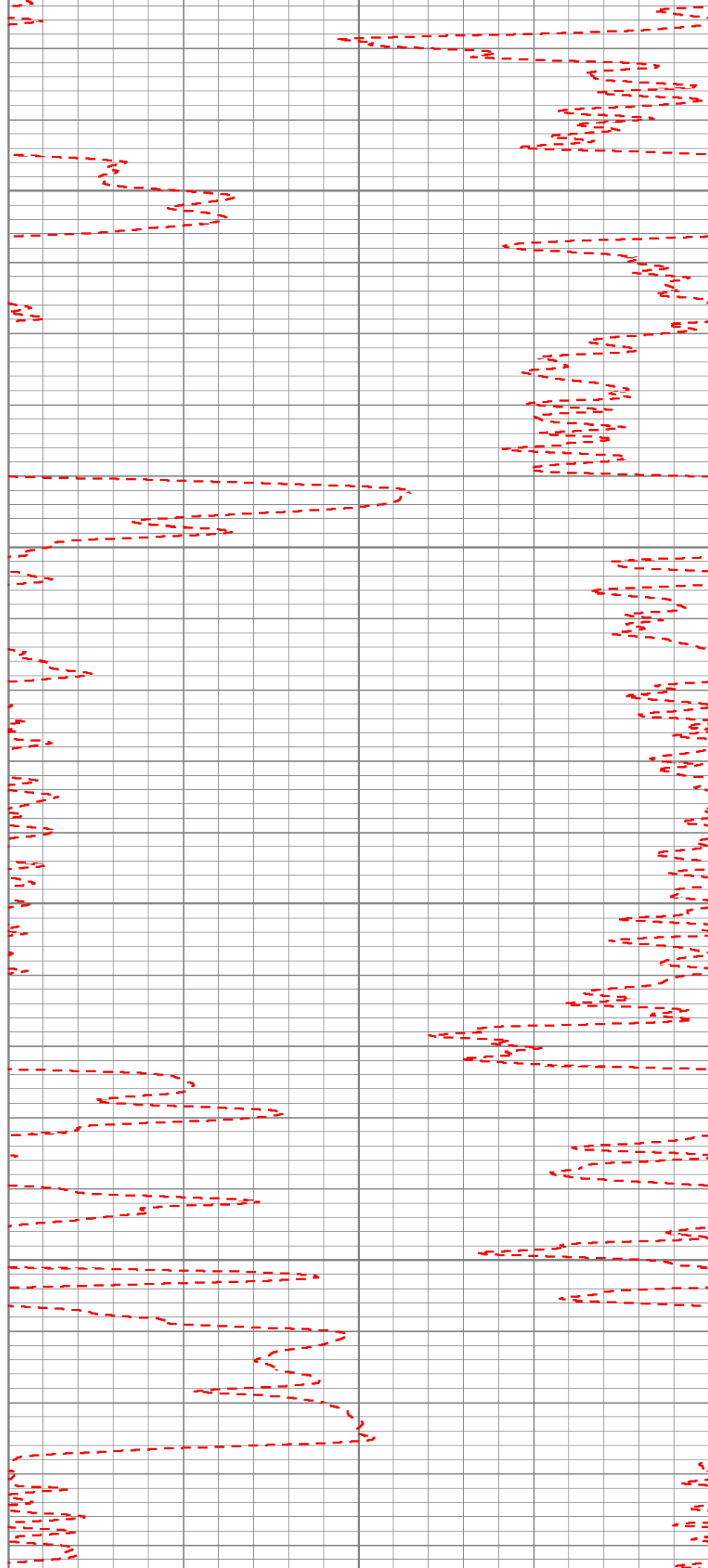


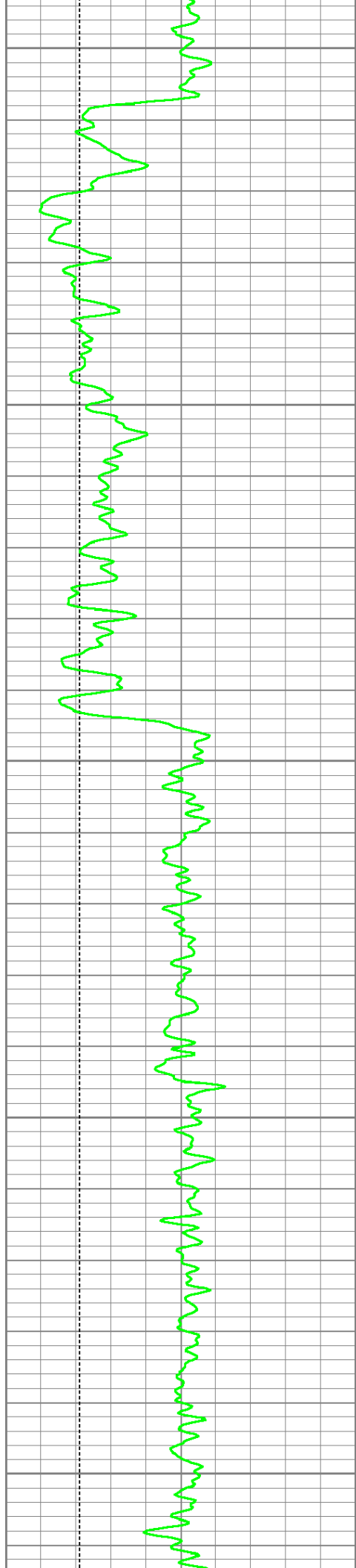
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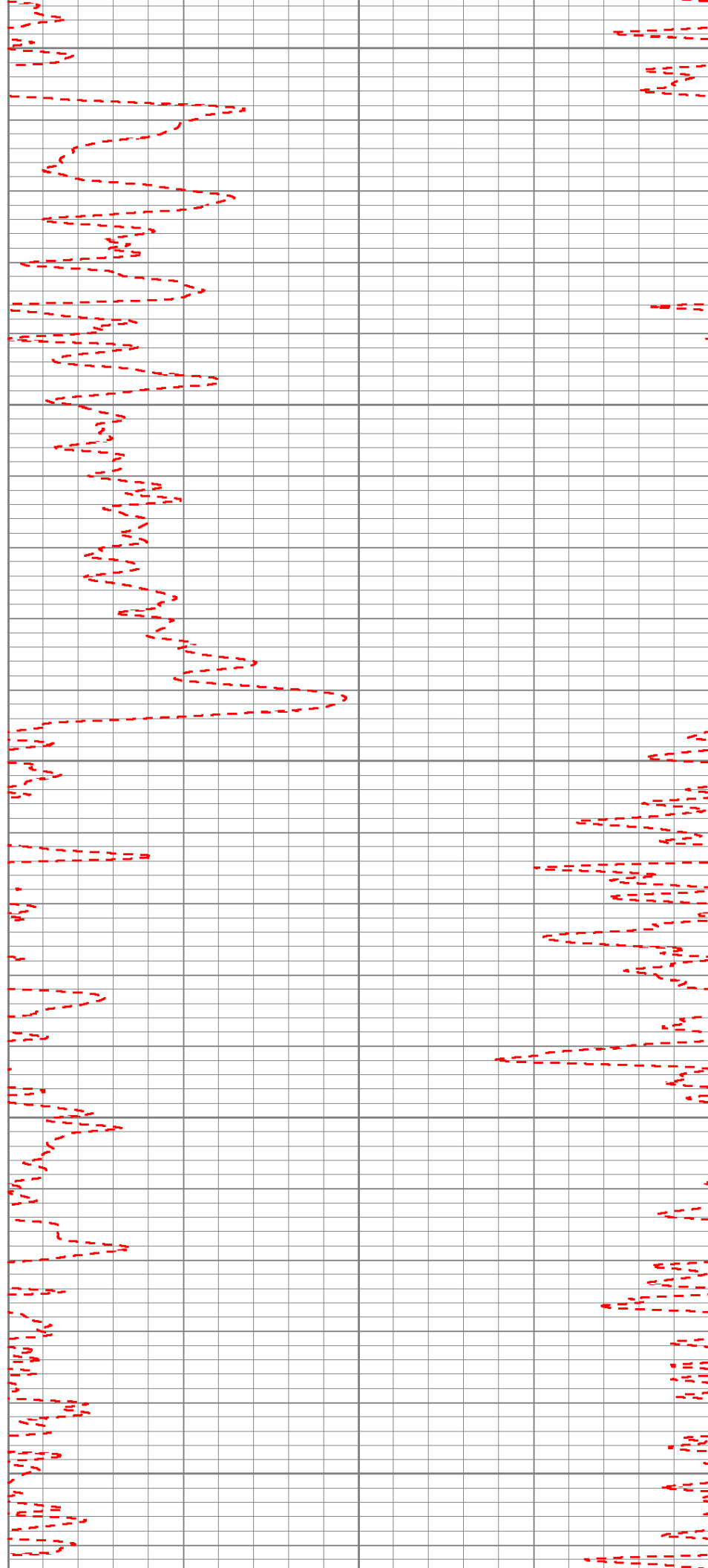
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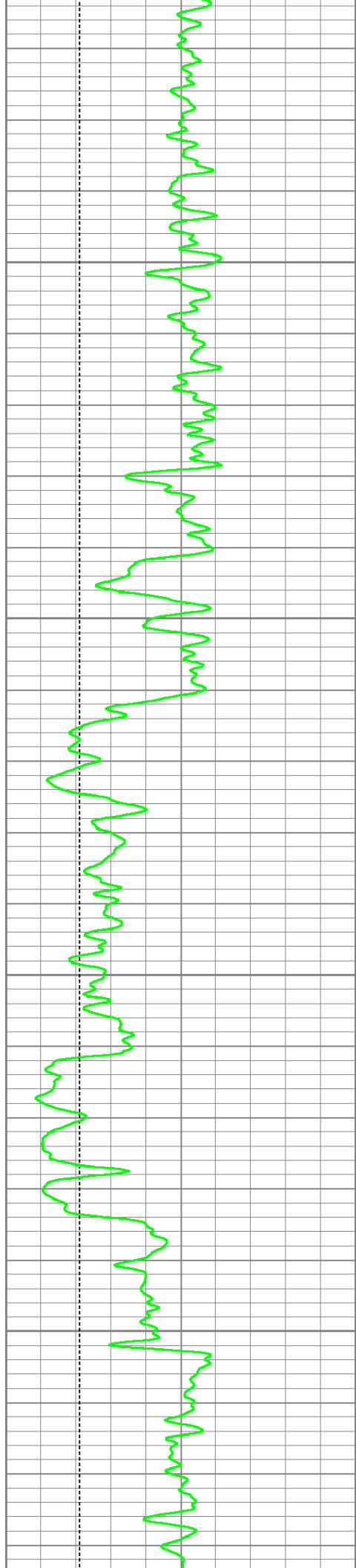
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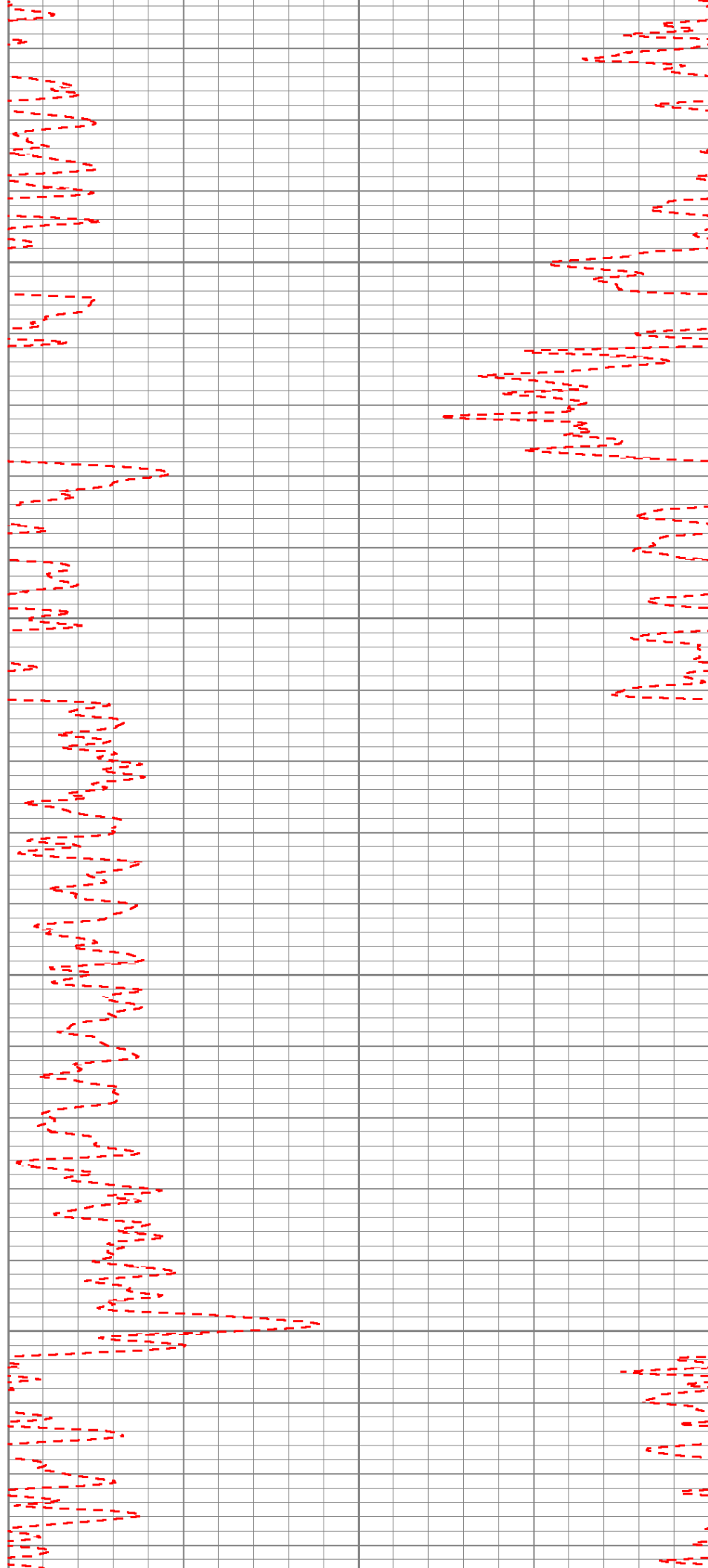


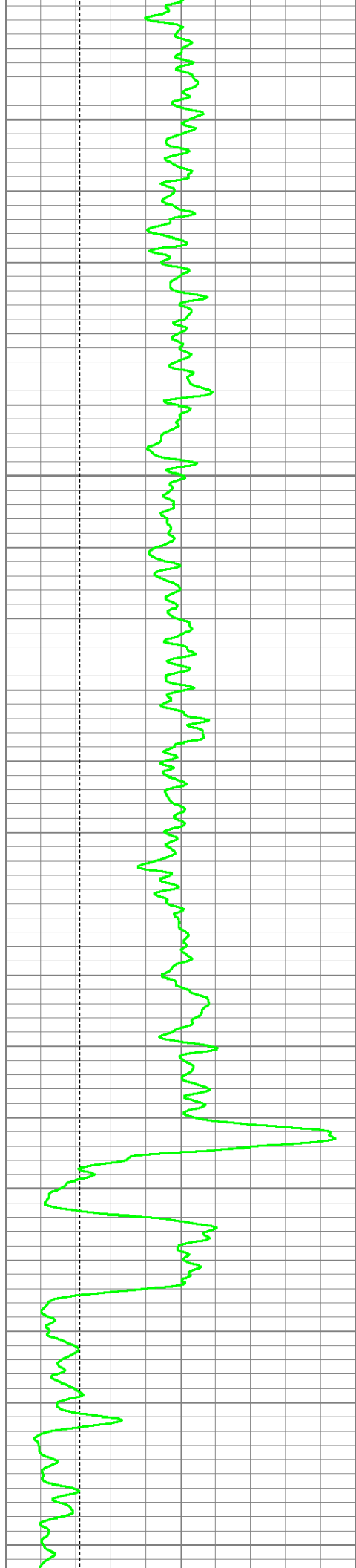
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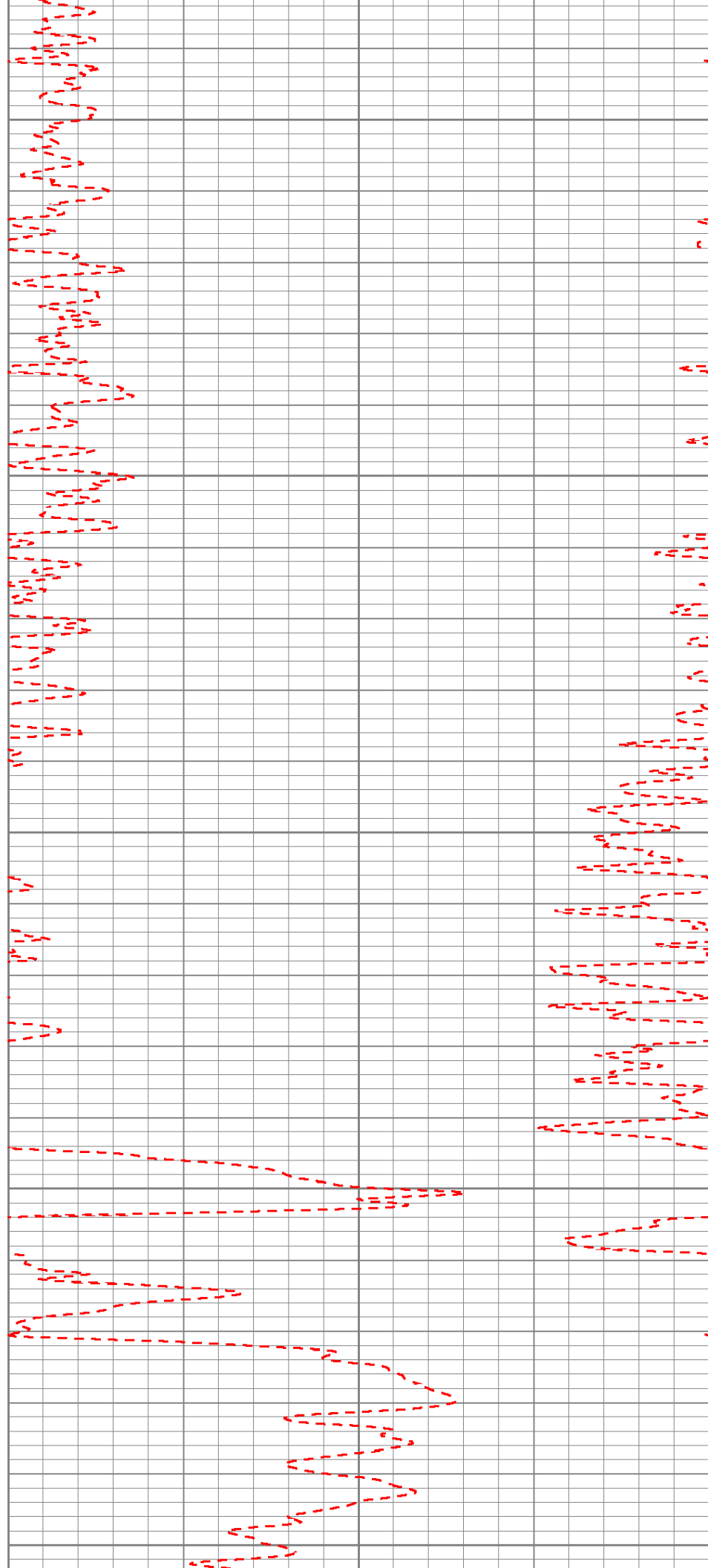
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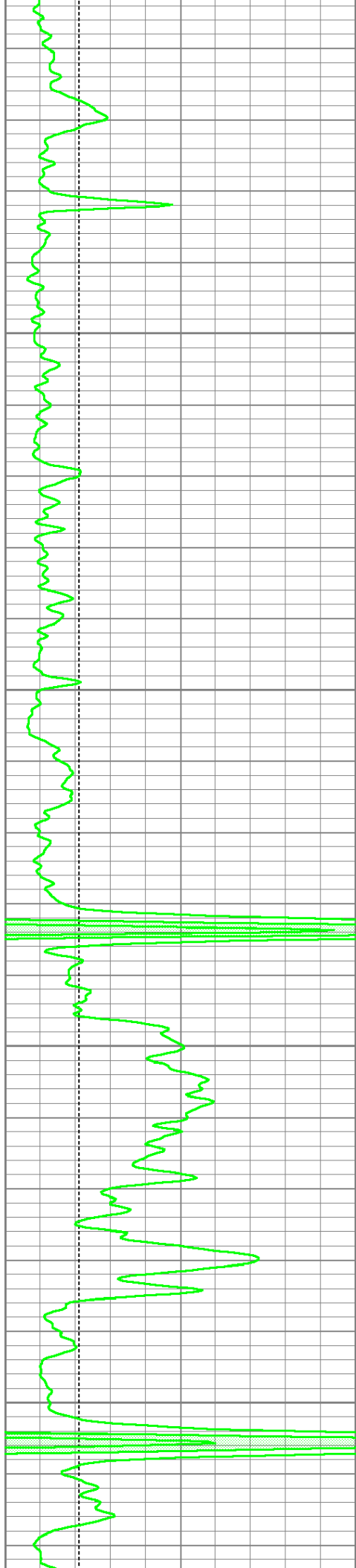
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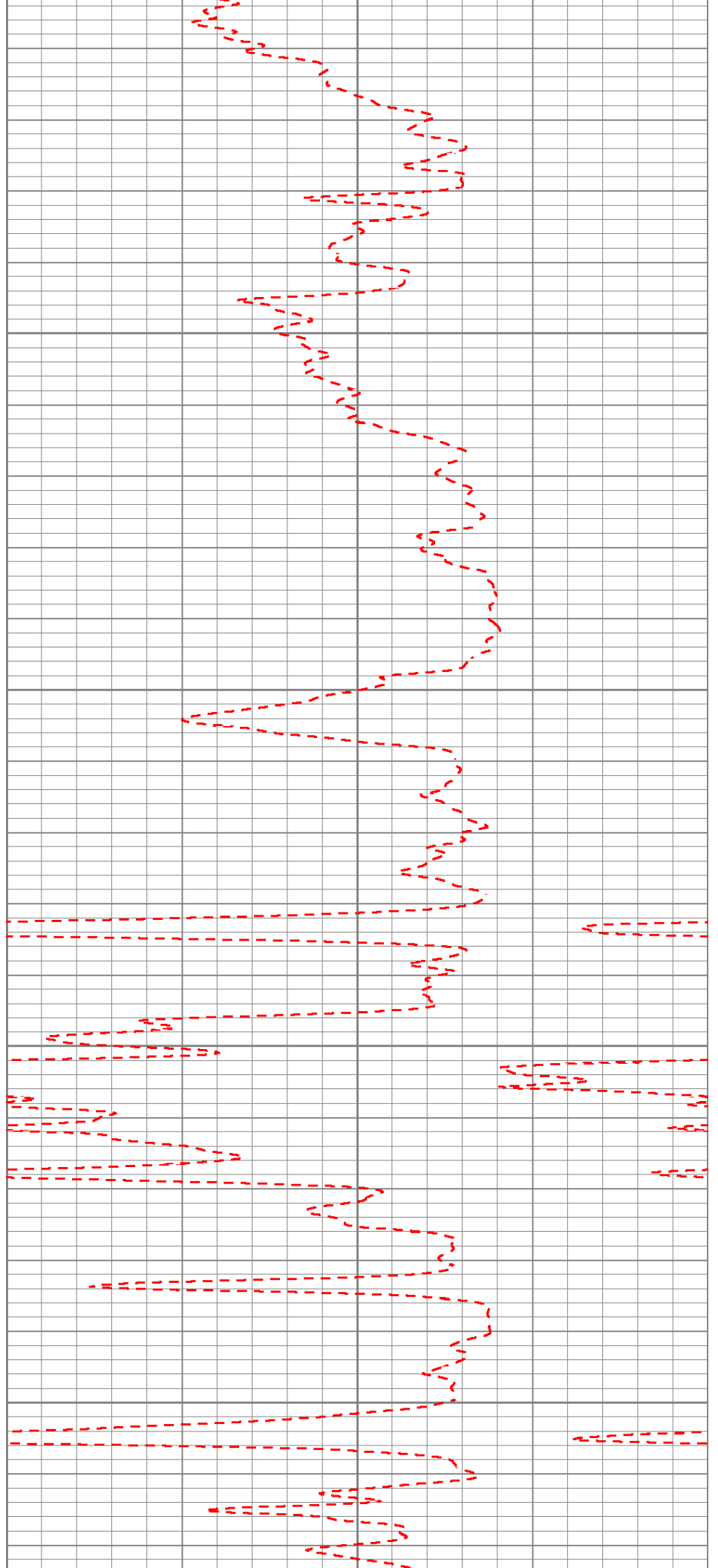


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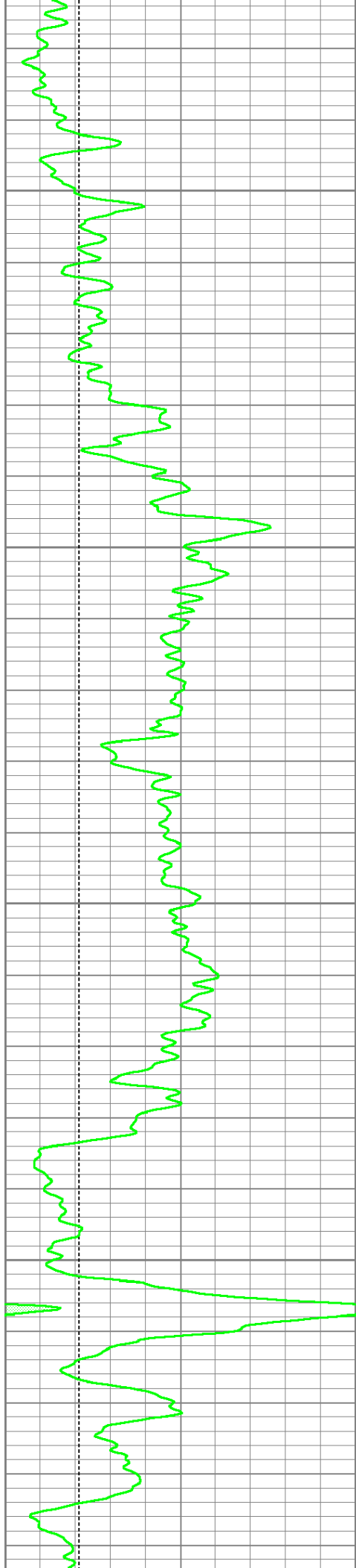
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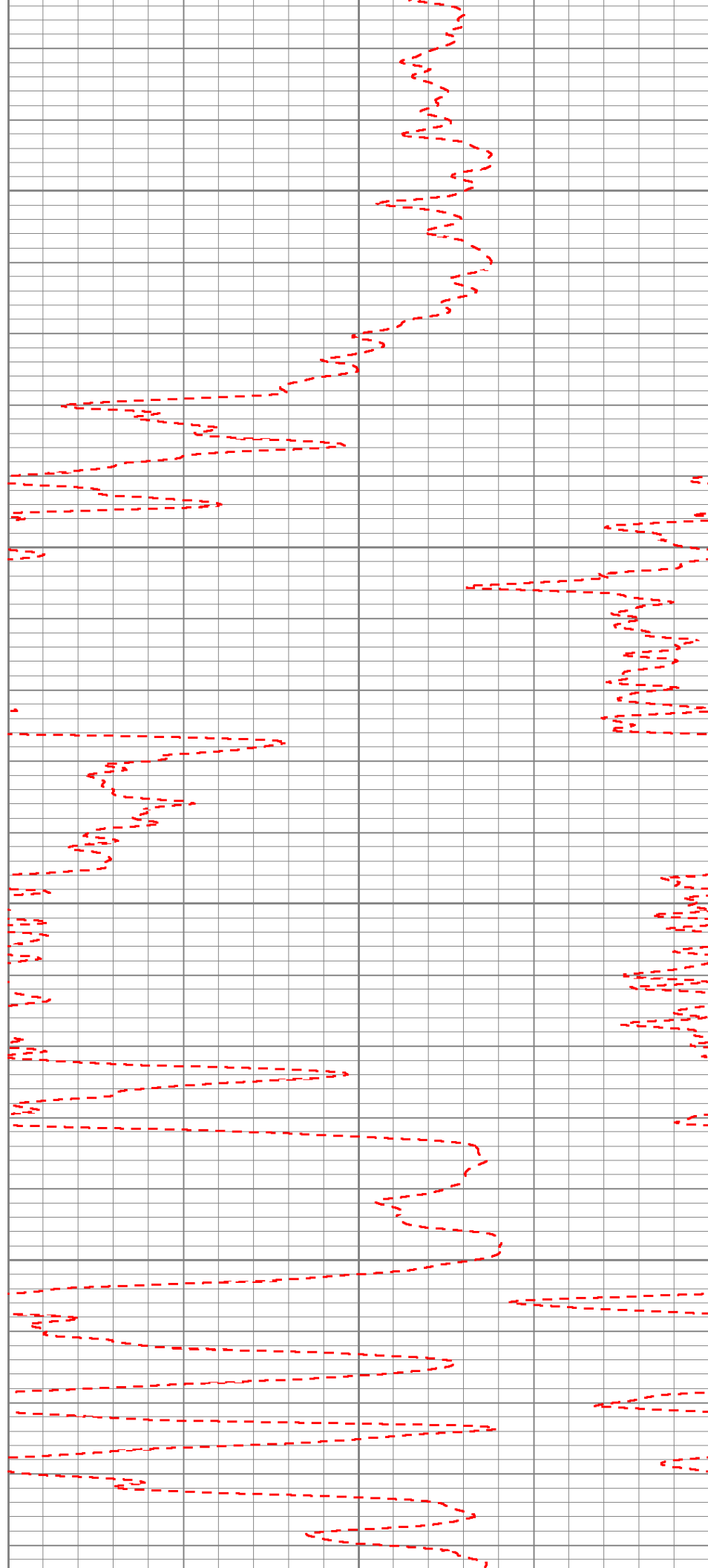


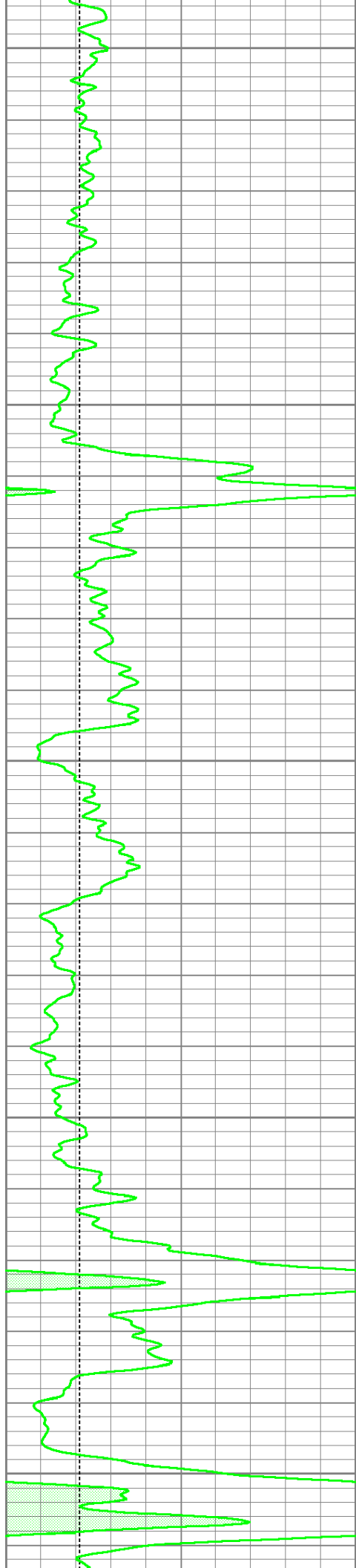
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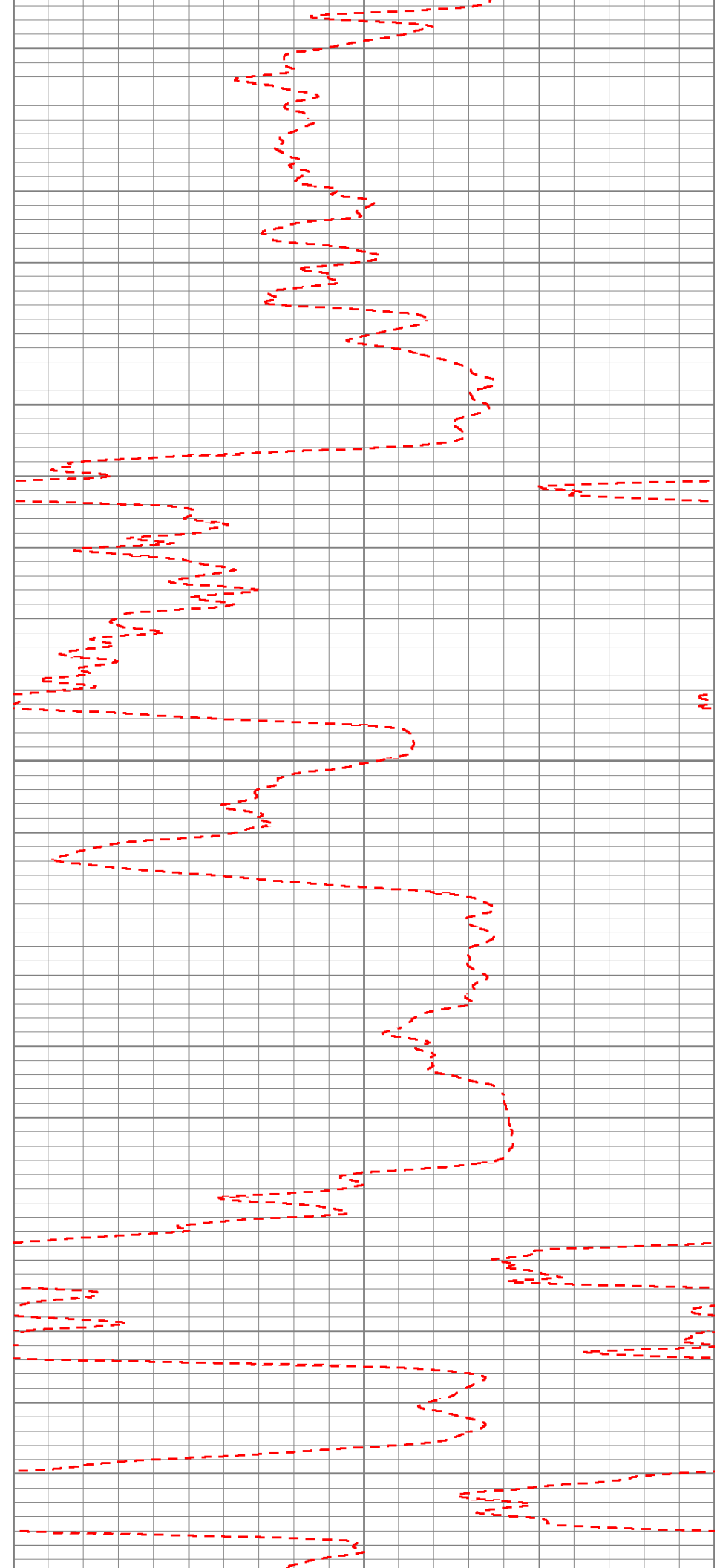
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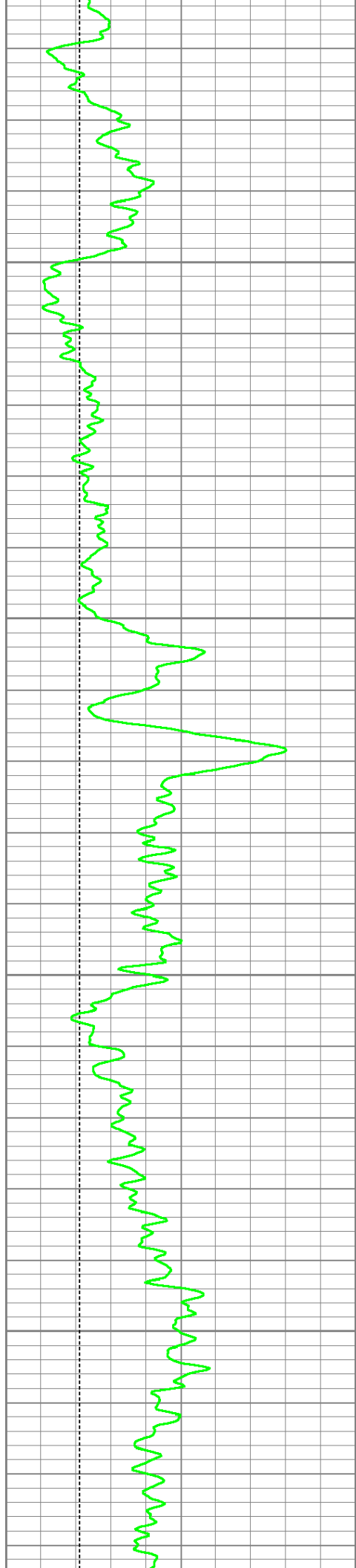
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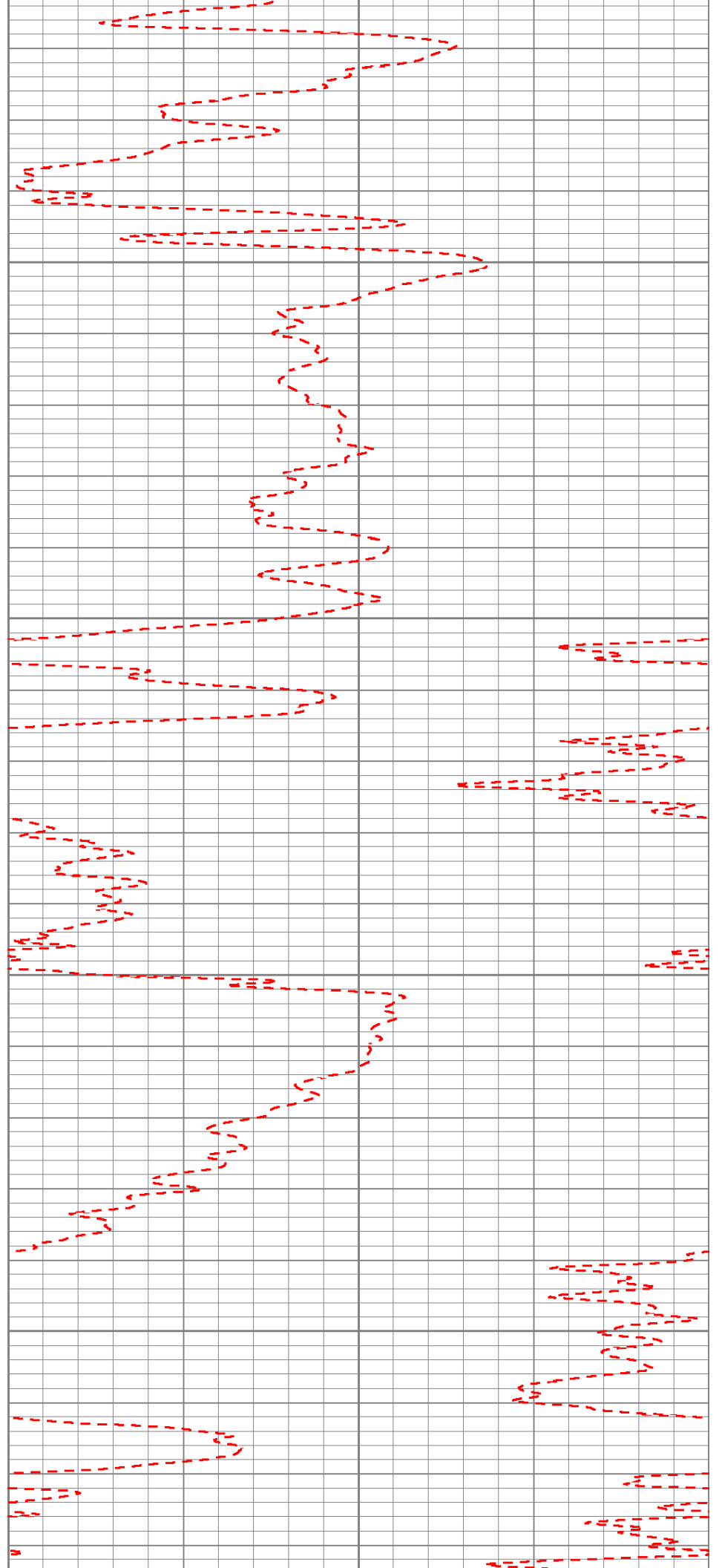


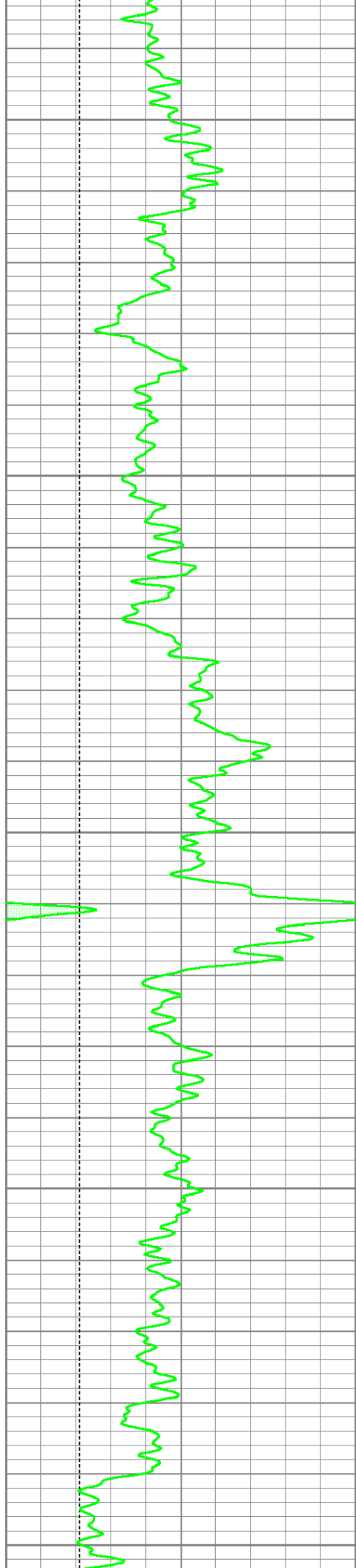
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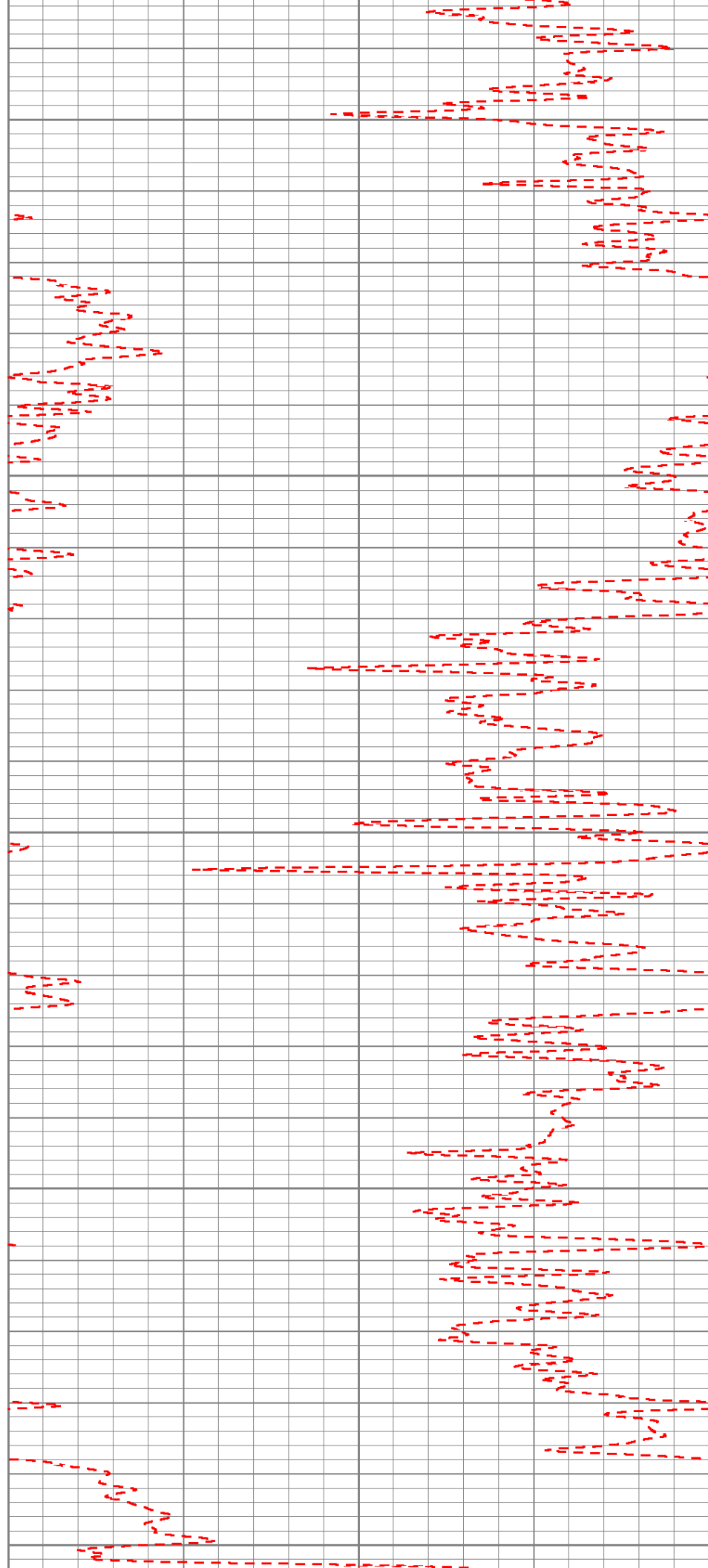
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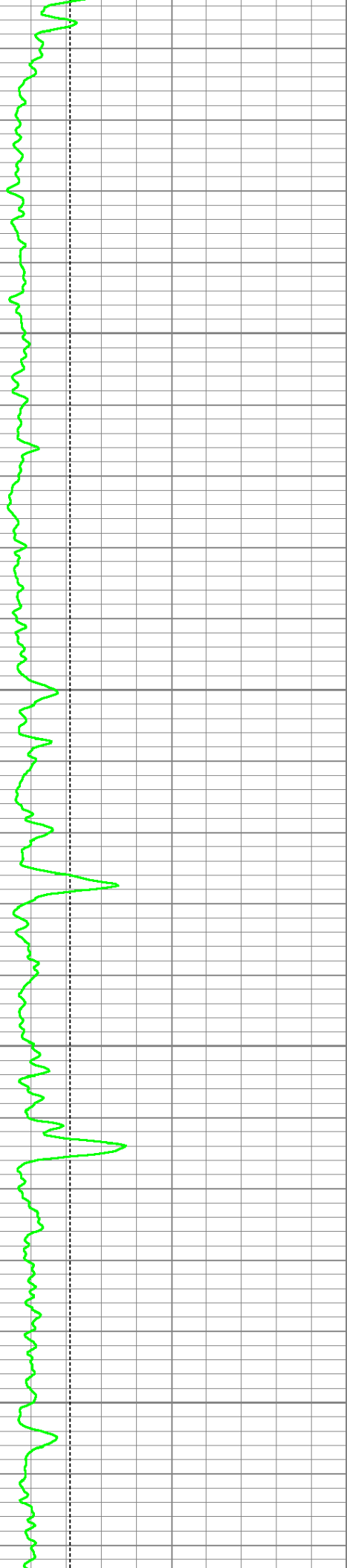
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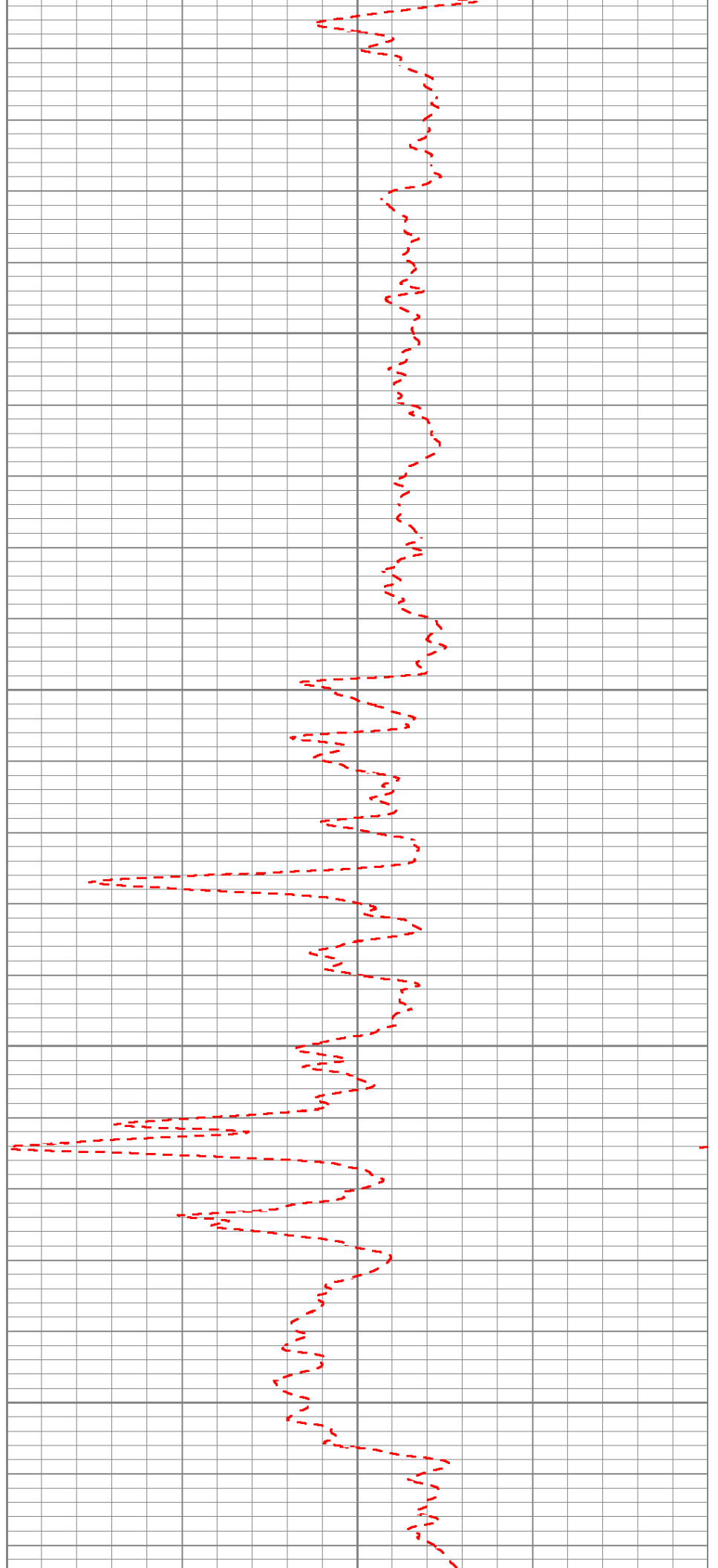


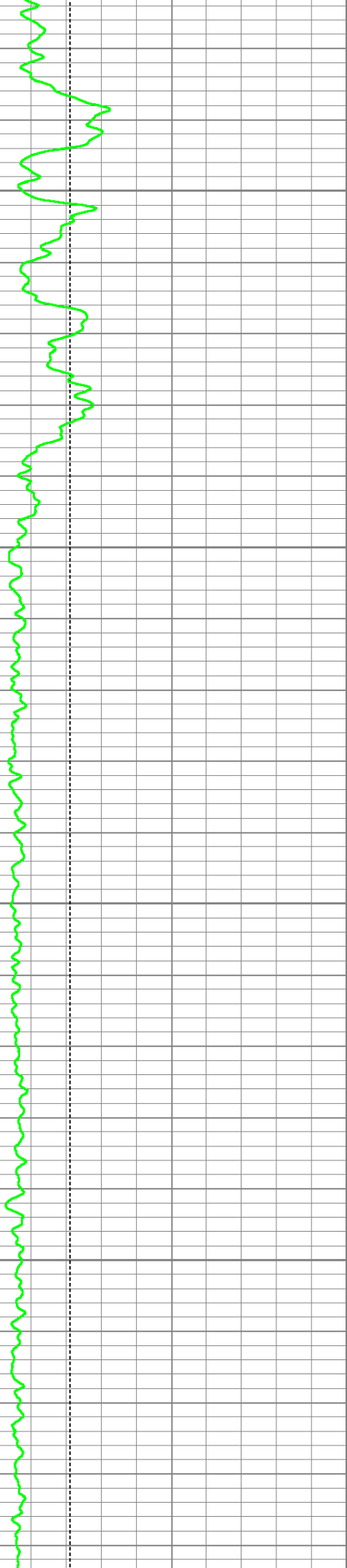
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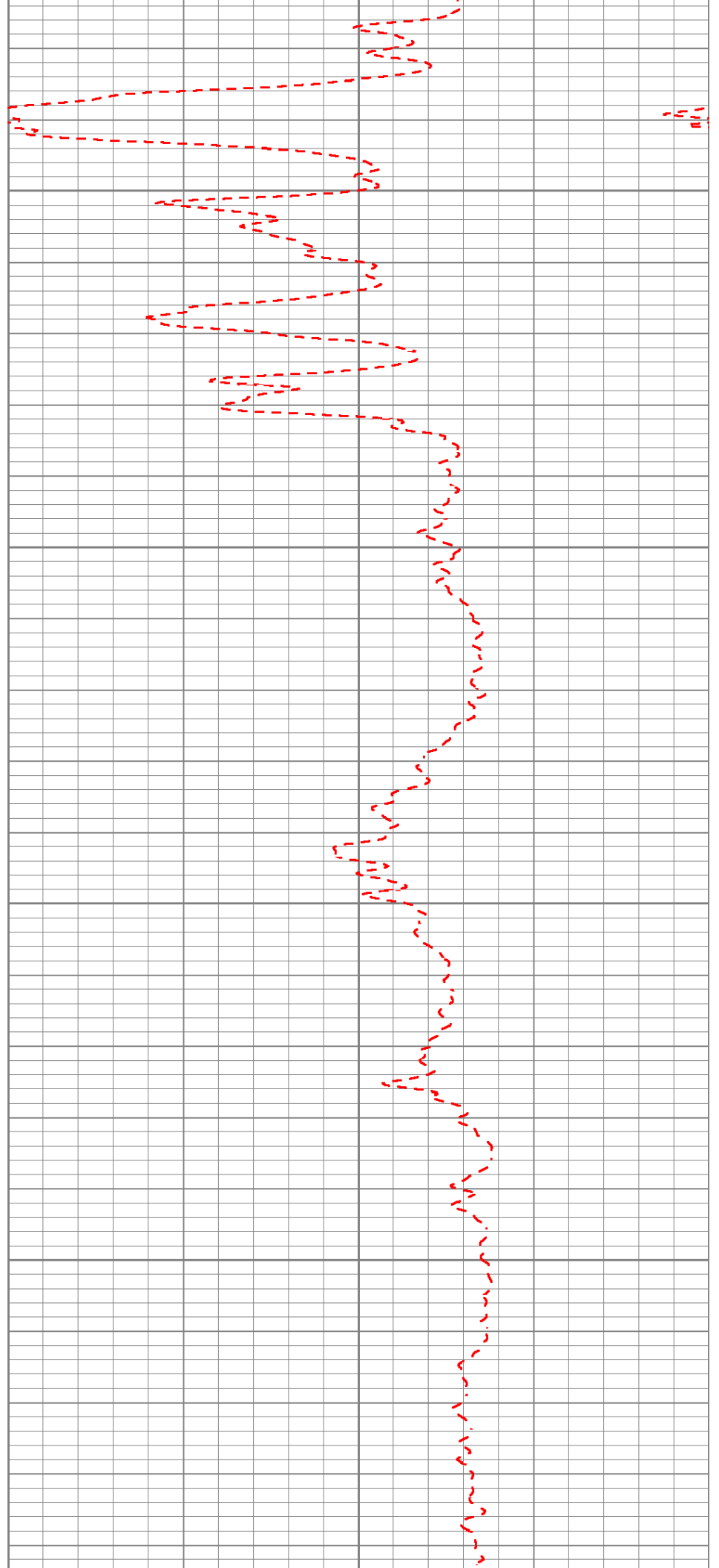


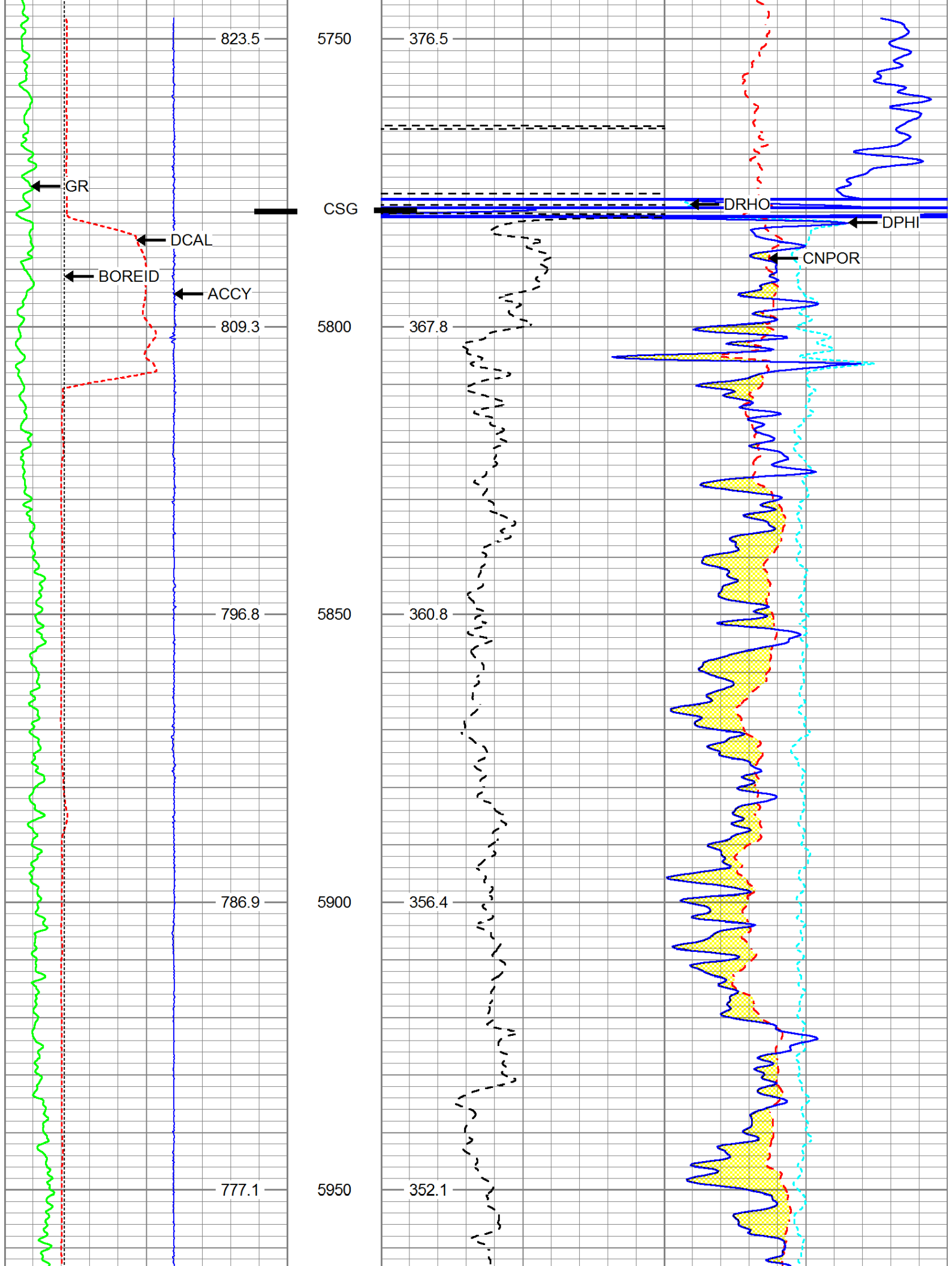
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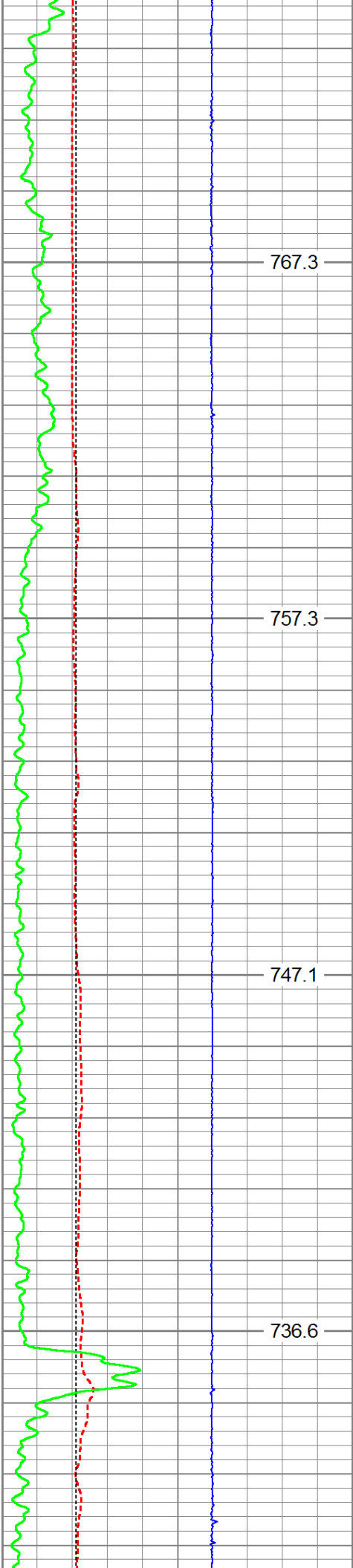
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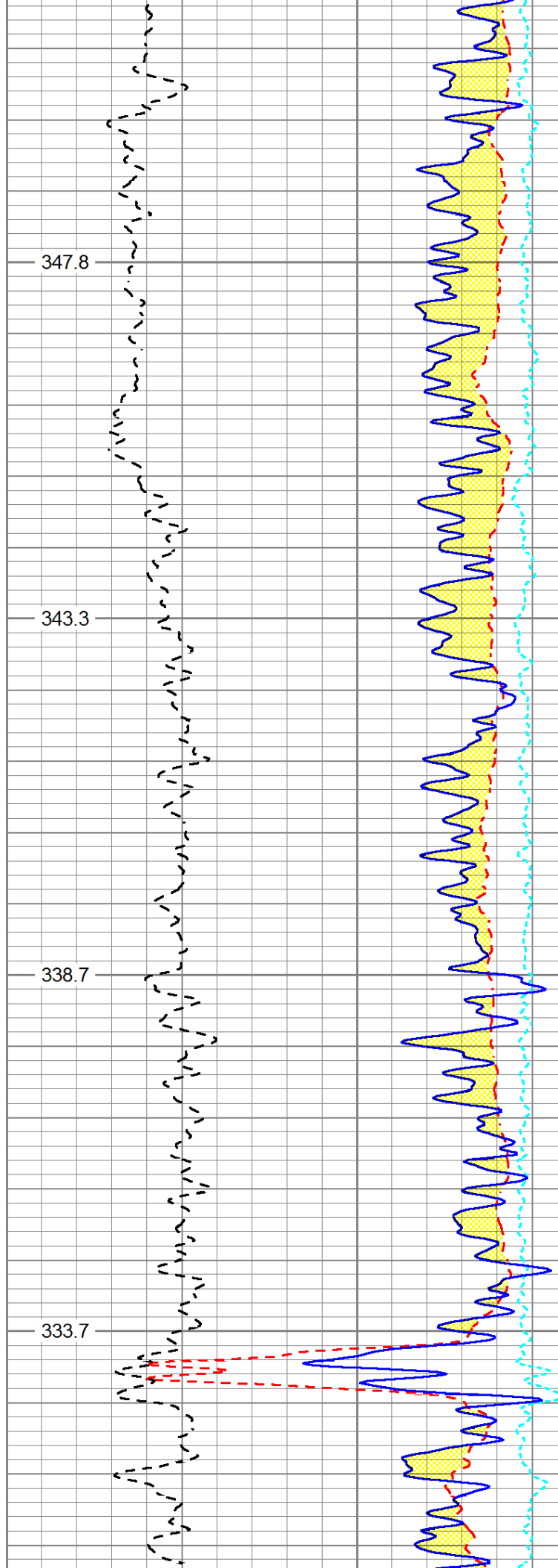
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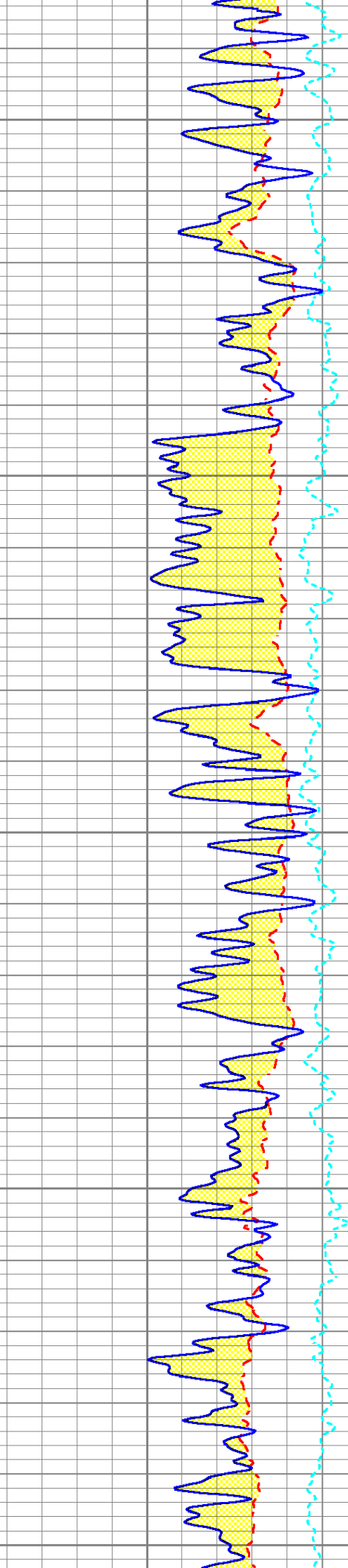
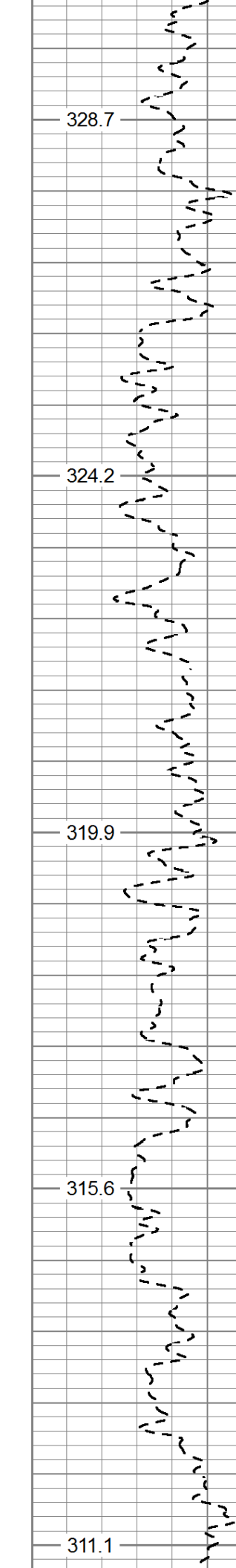
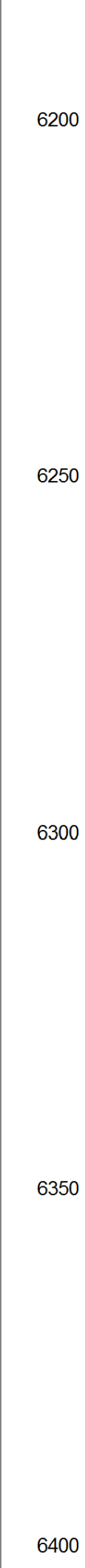
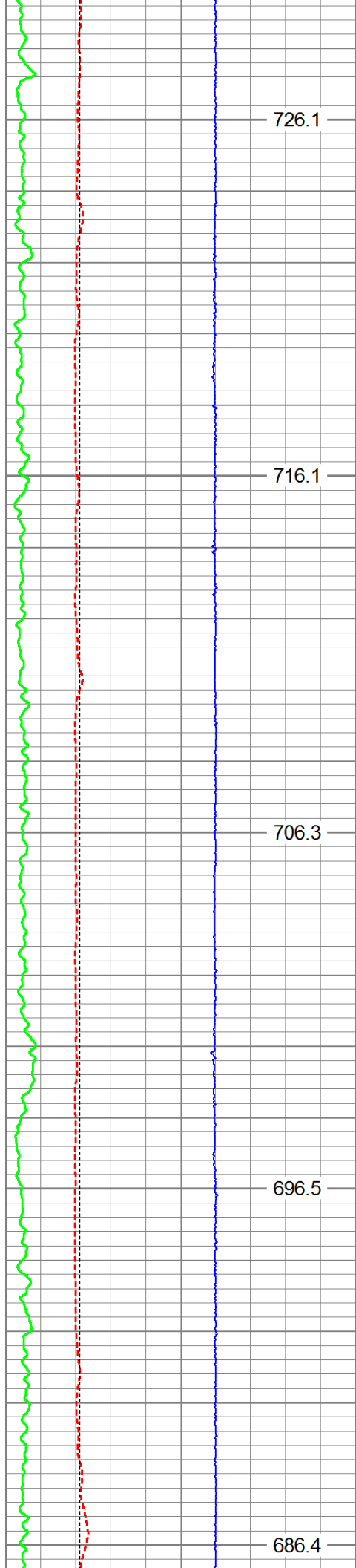


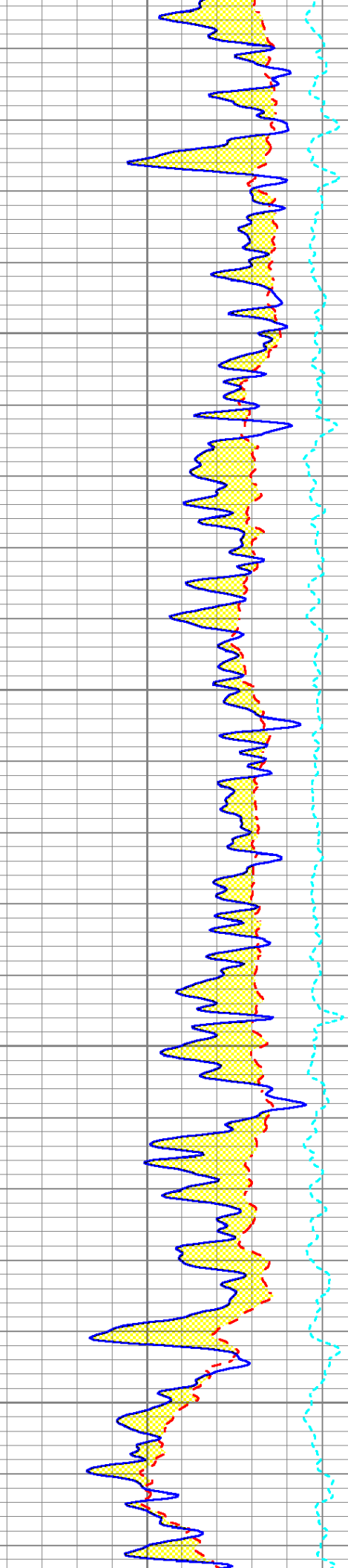
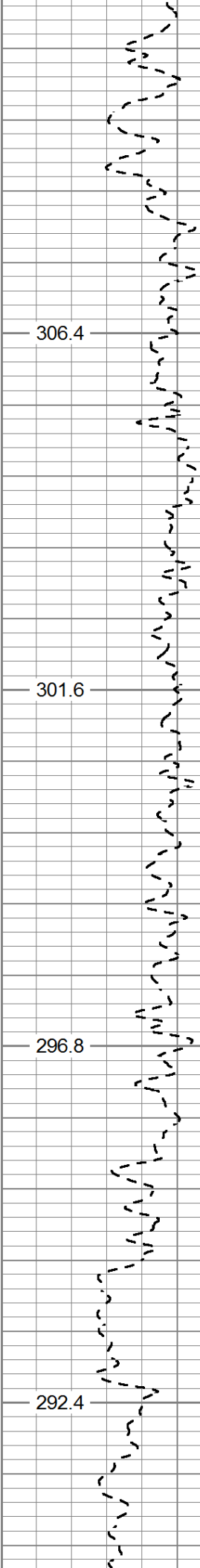
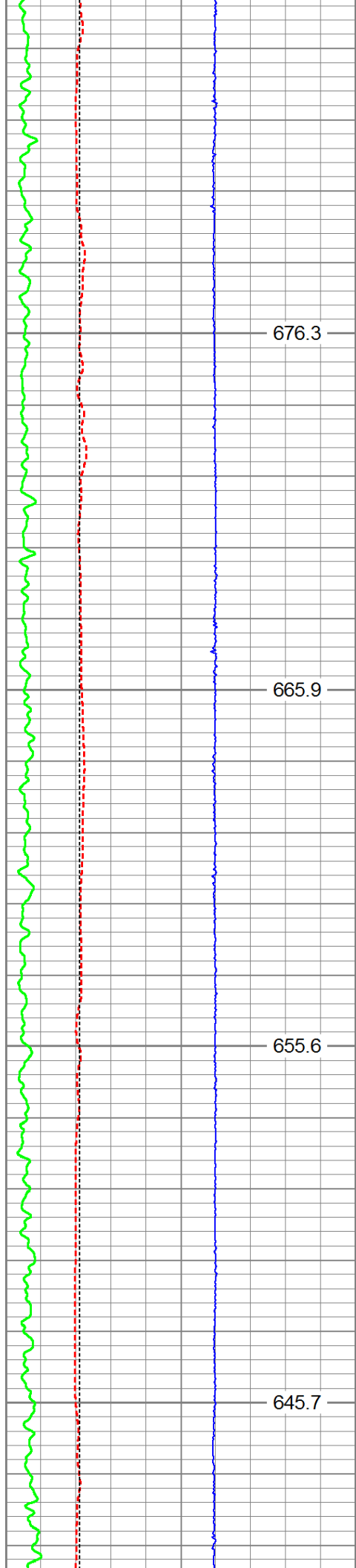


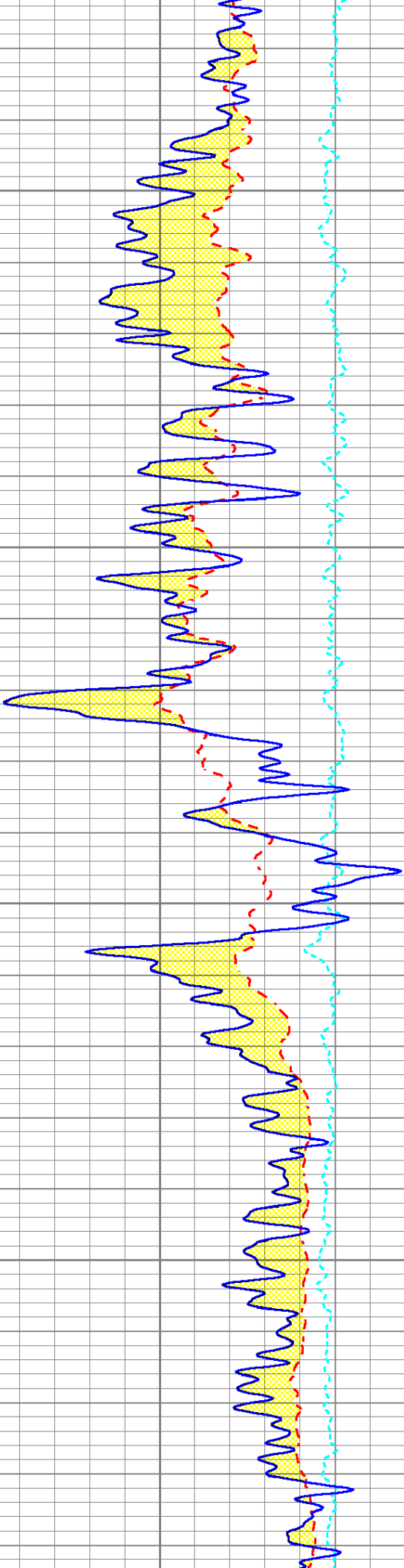
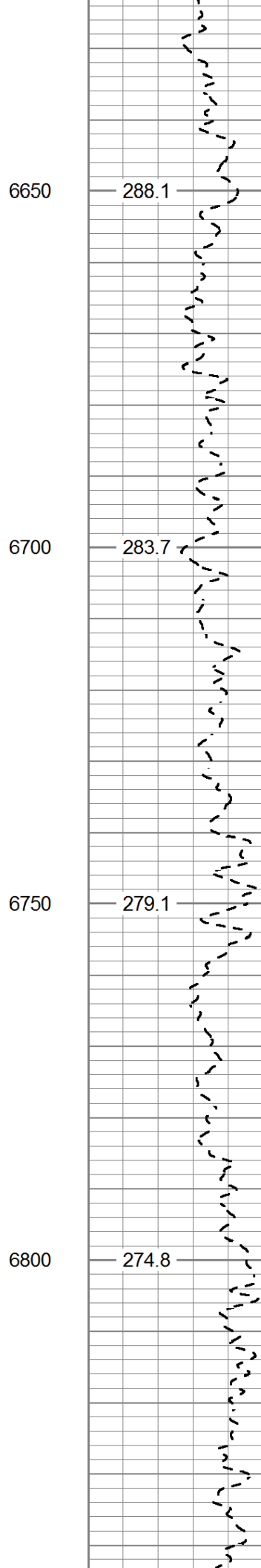
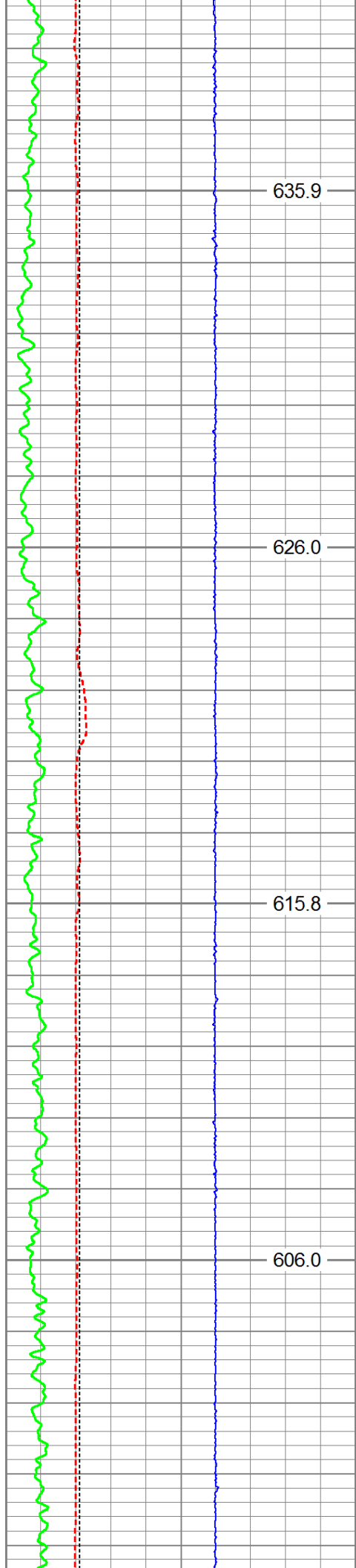
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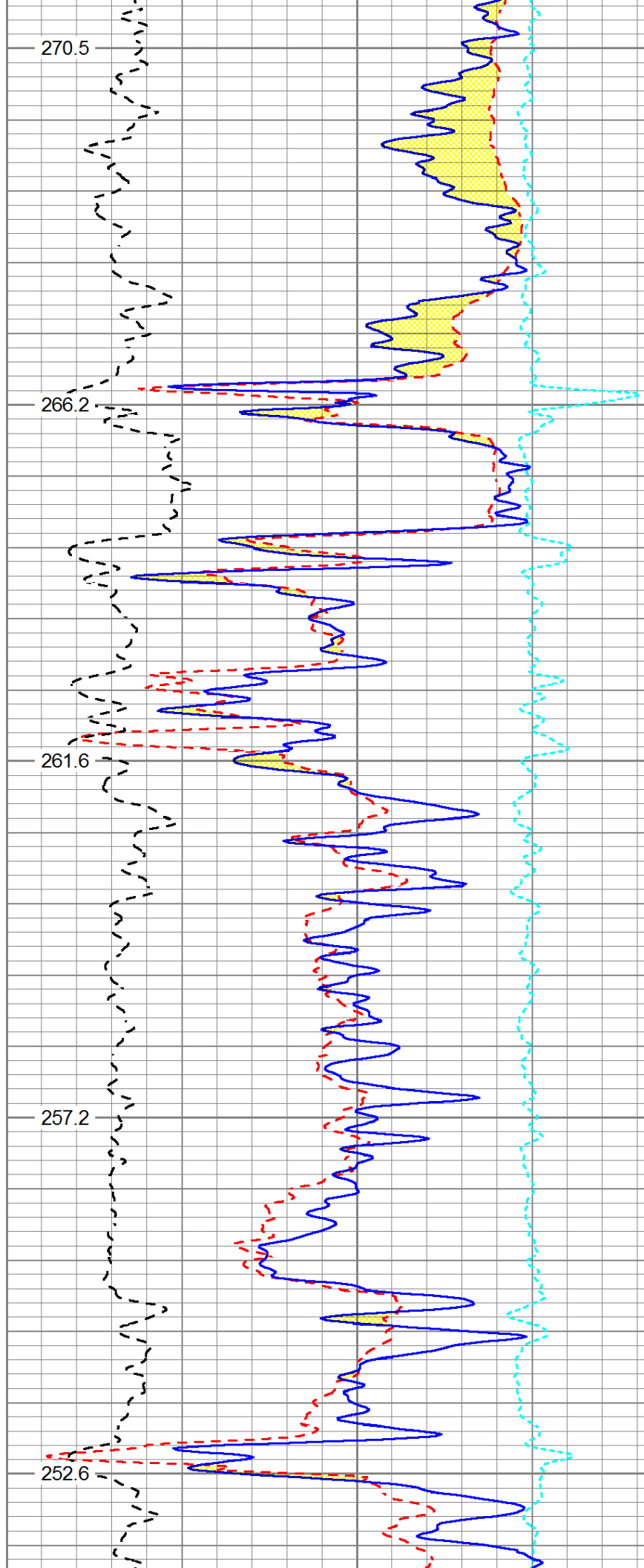
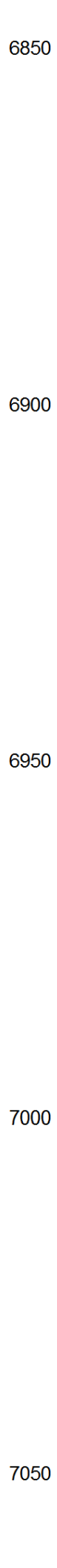
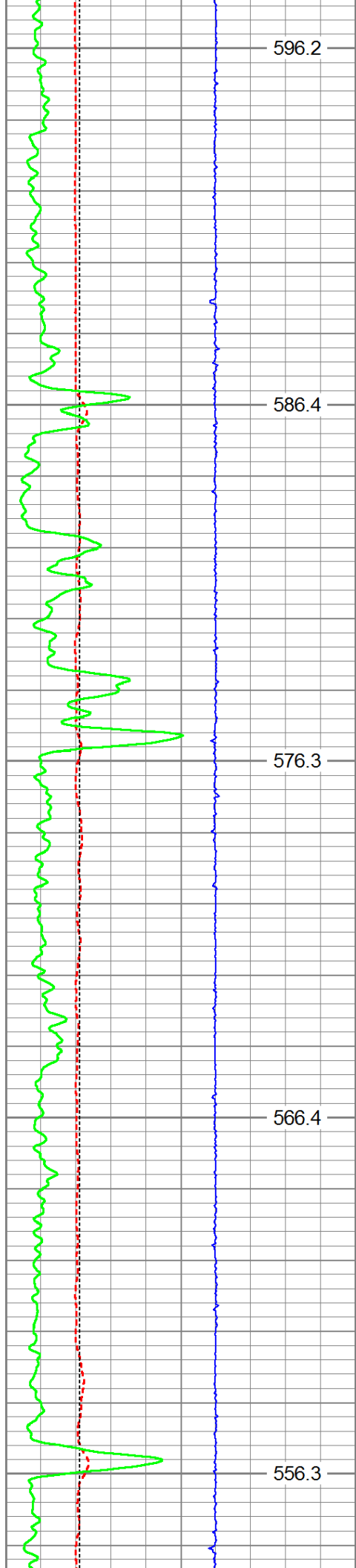


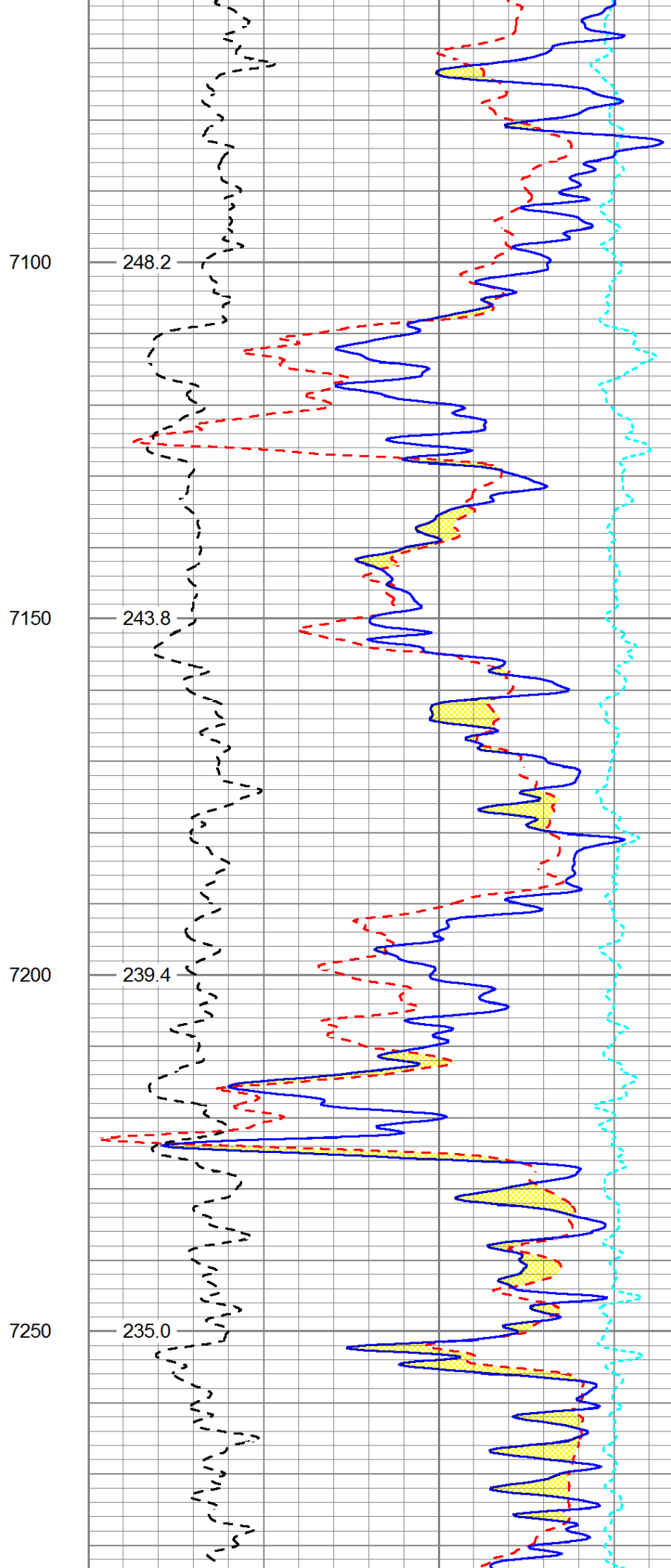
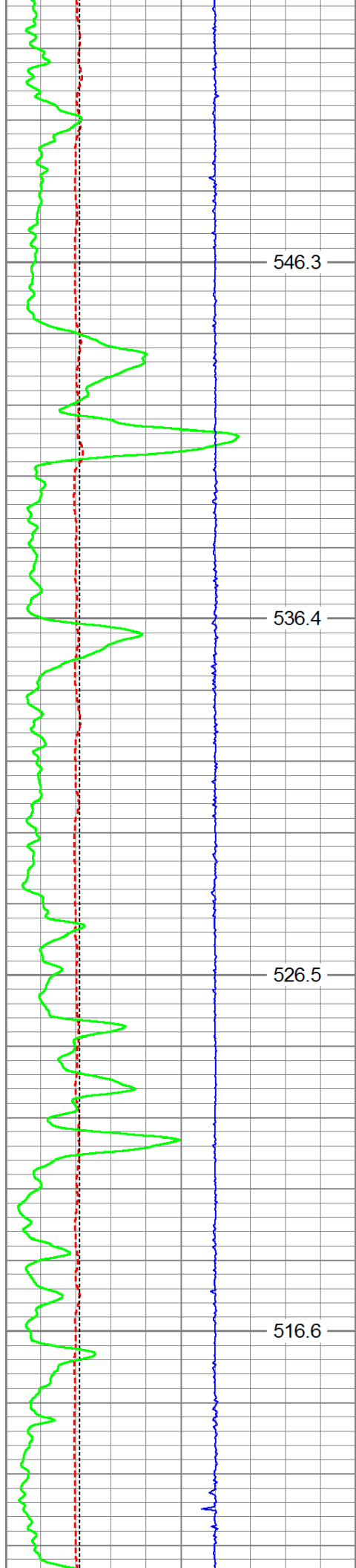


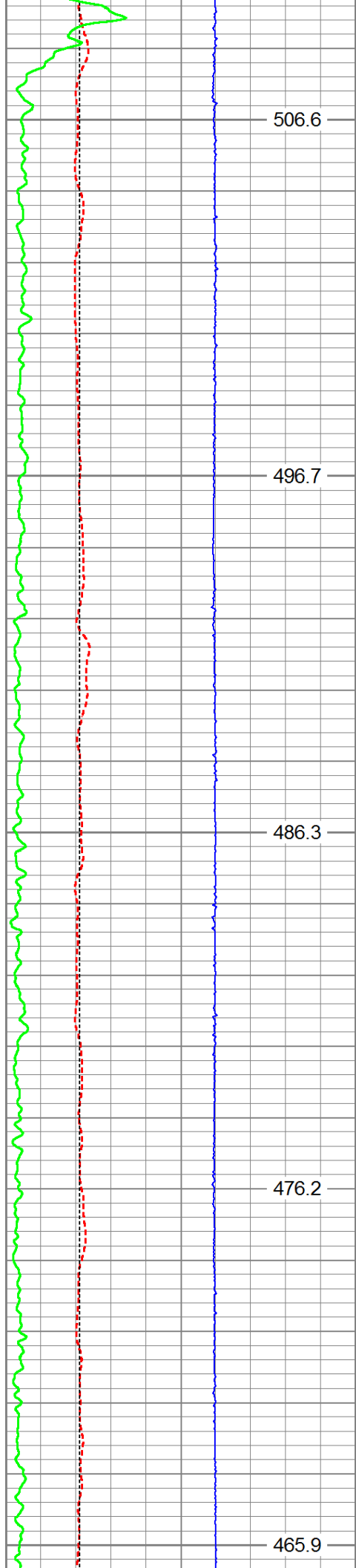




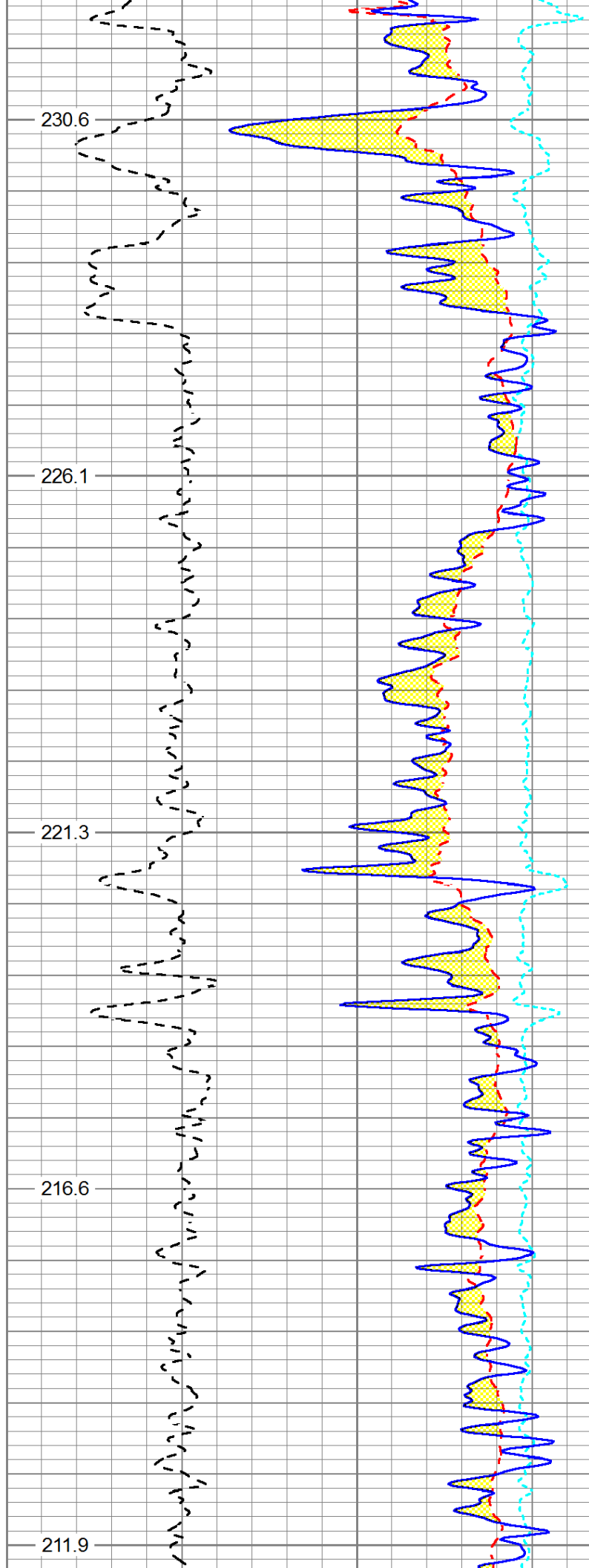


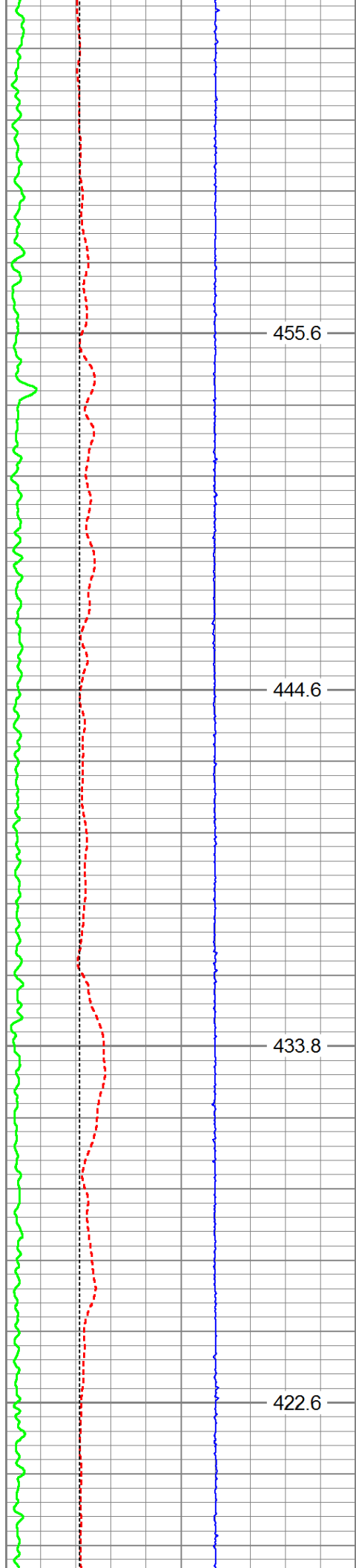




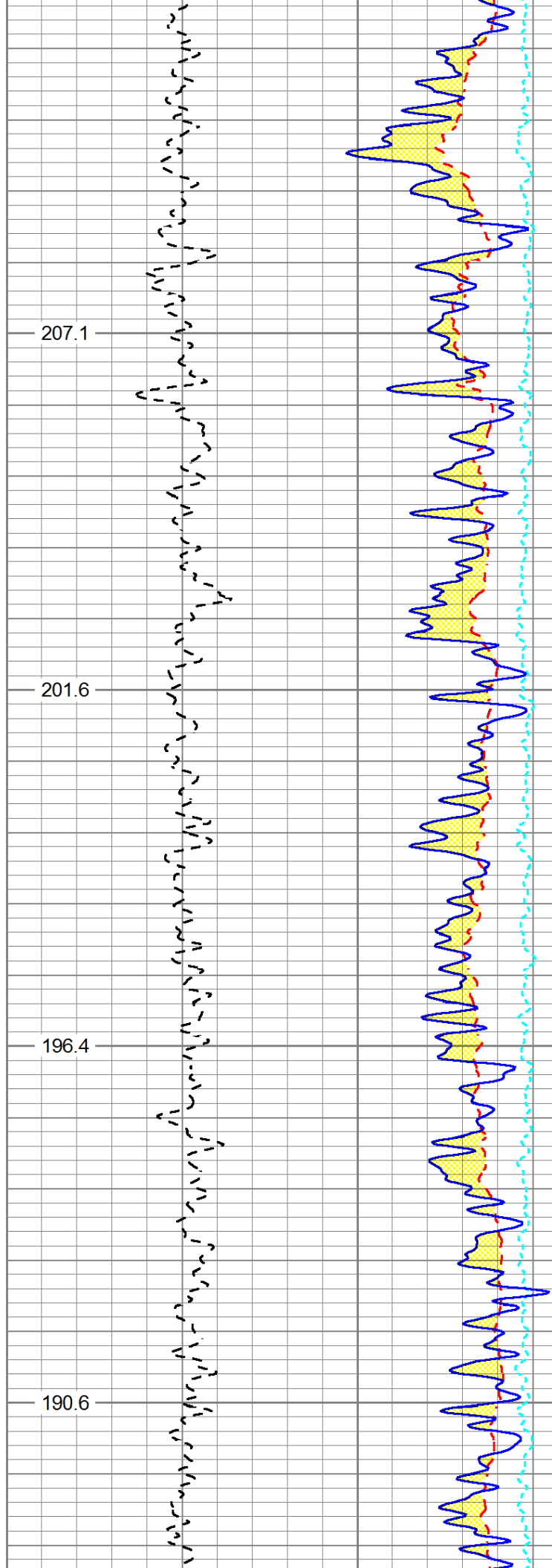


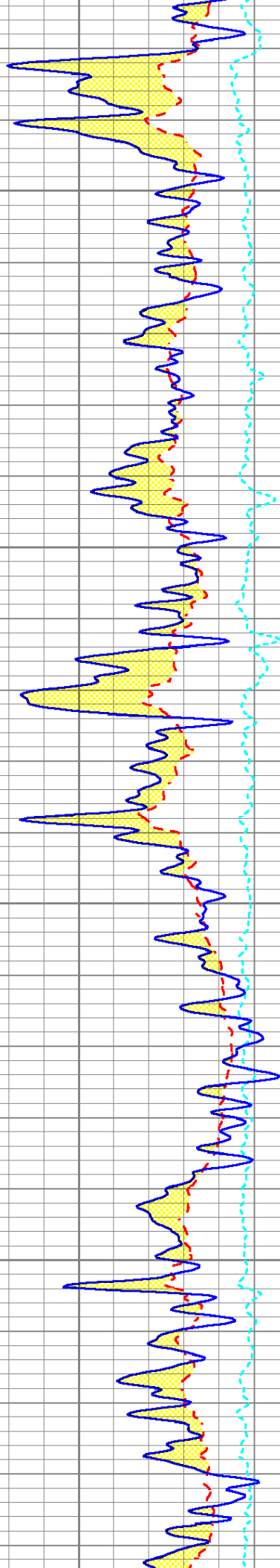
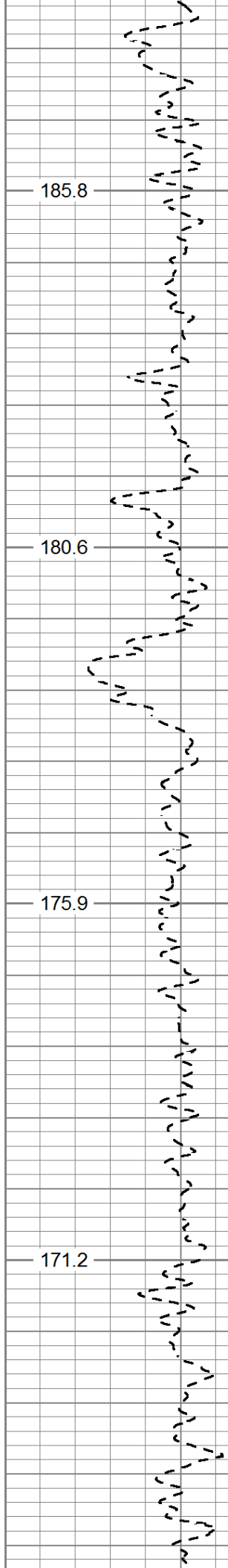
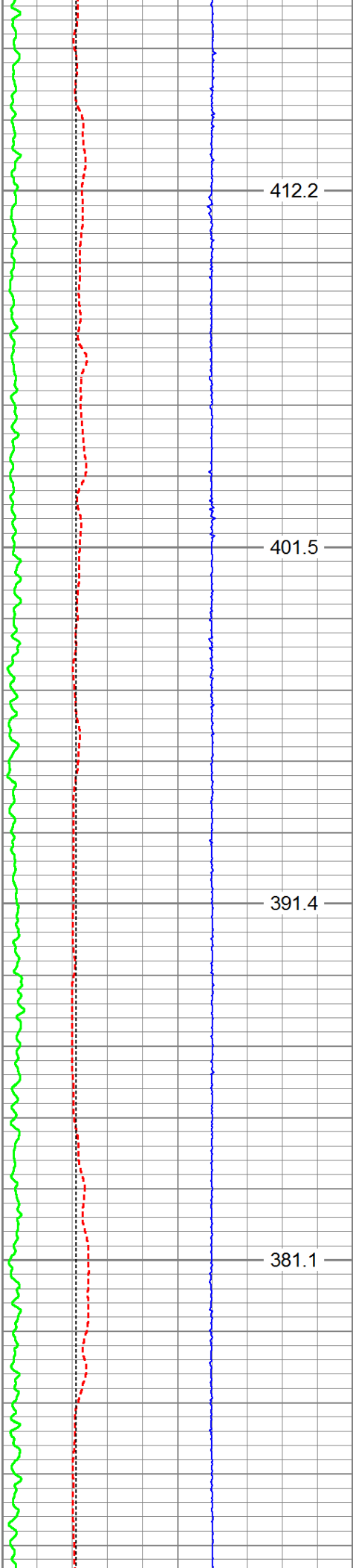
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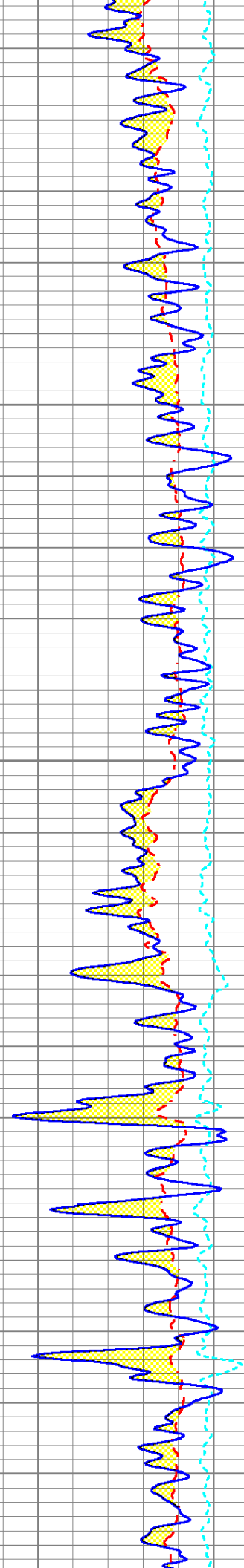
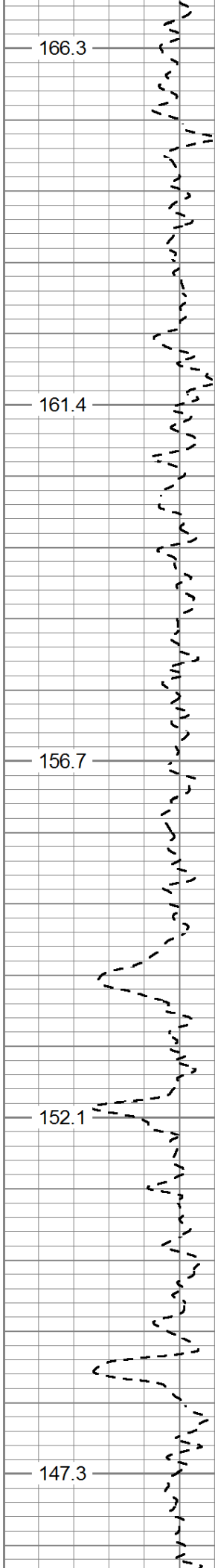
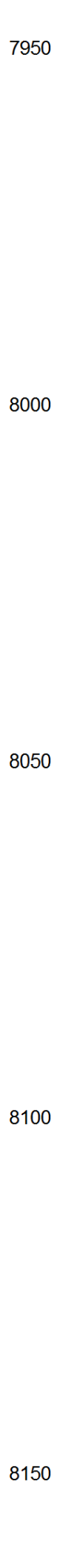
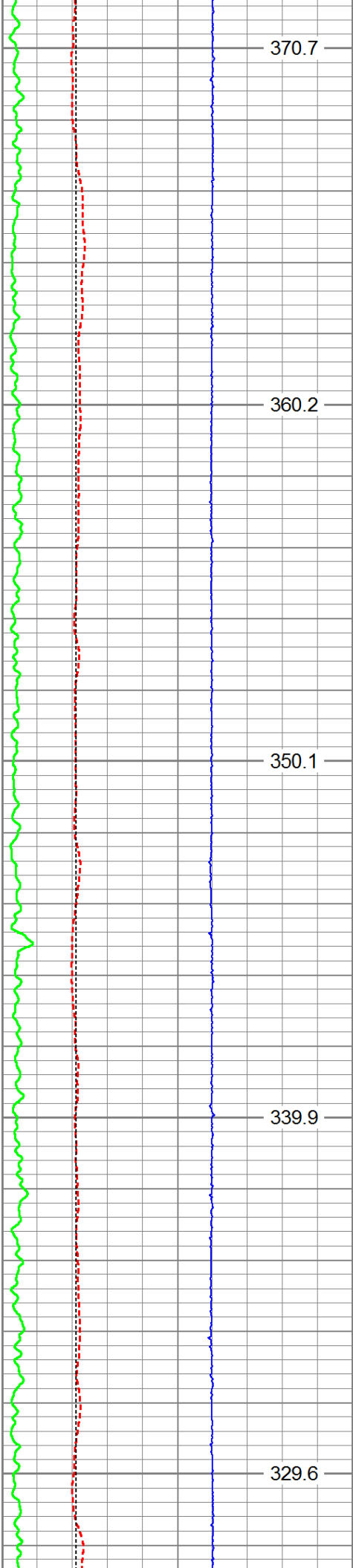


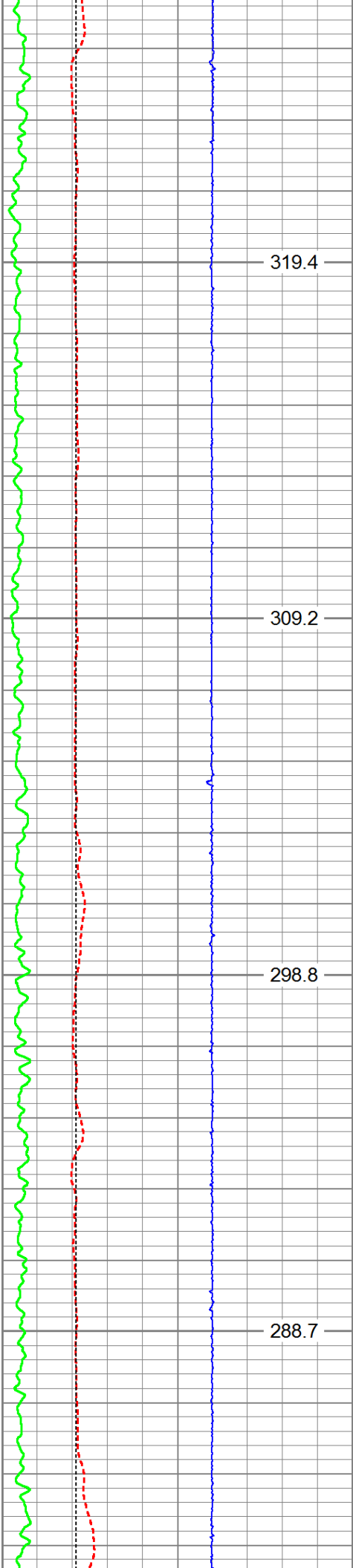
7550  
7600  
7650  
7700











8200

8250

8300

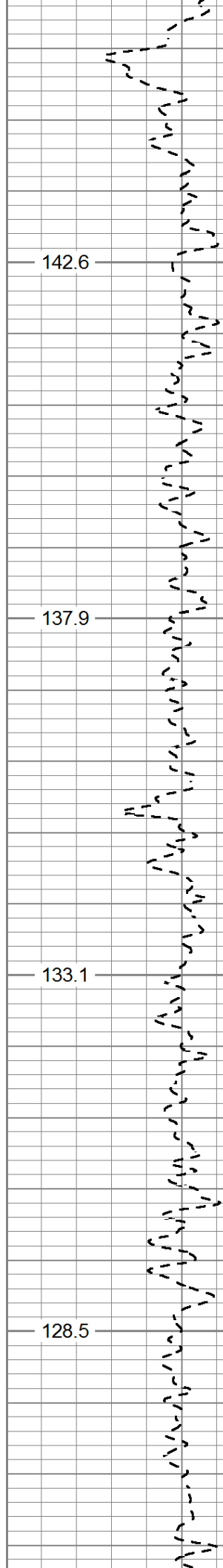
8350

319.4

309.2

298.8

288.7

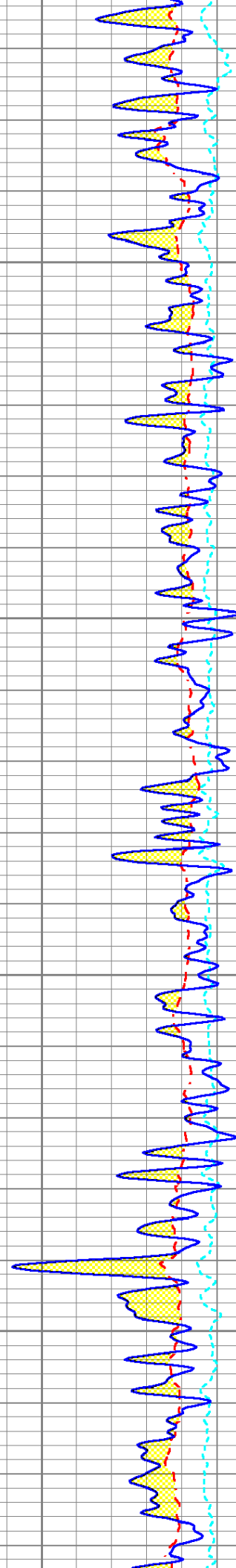


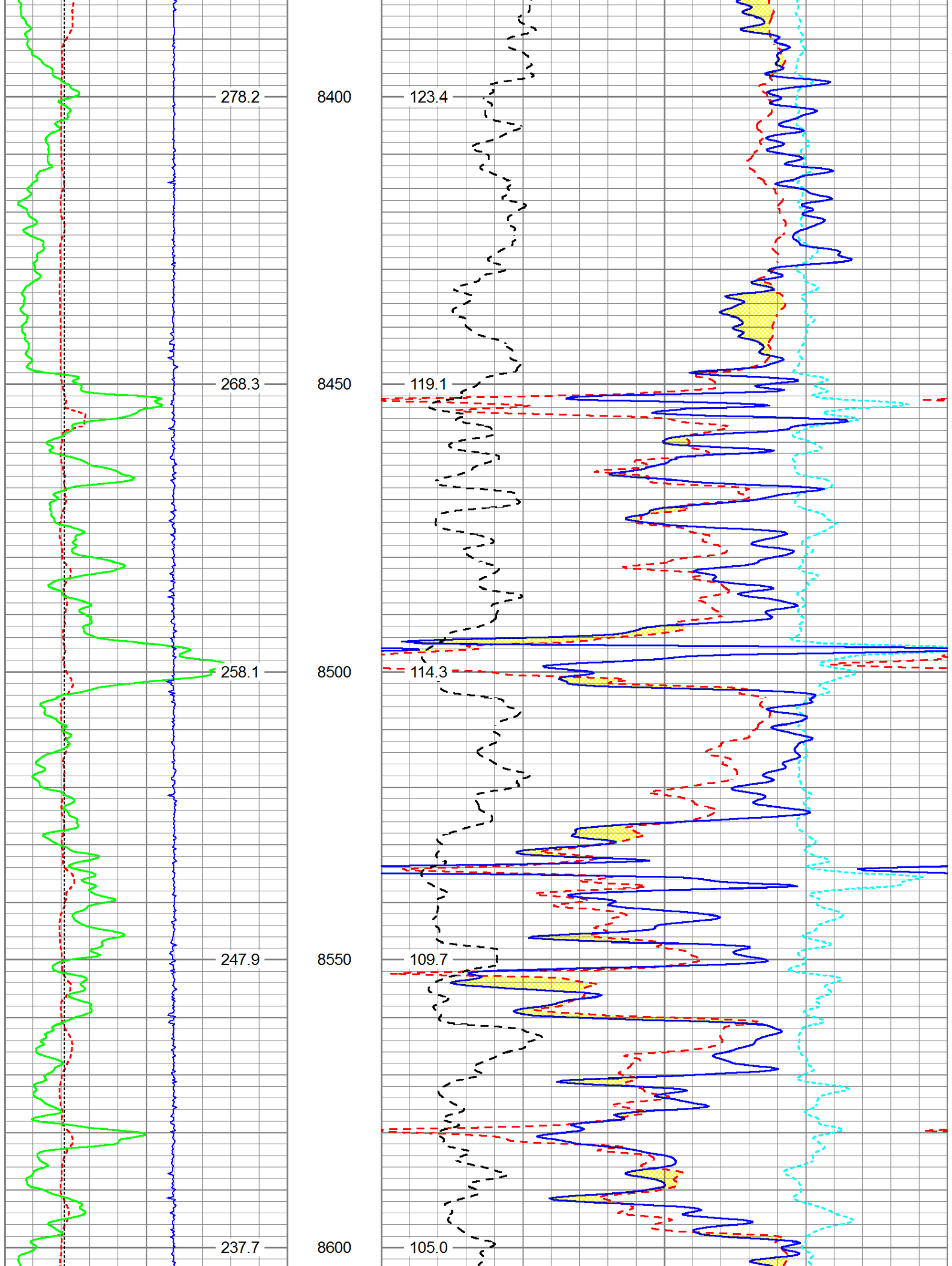
142.6

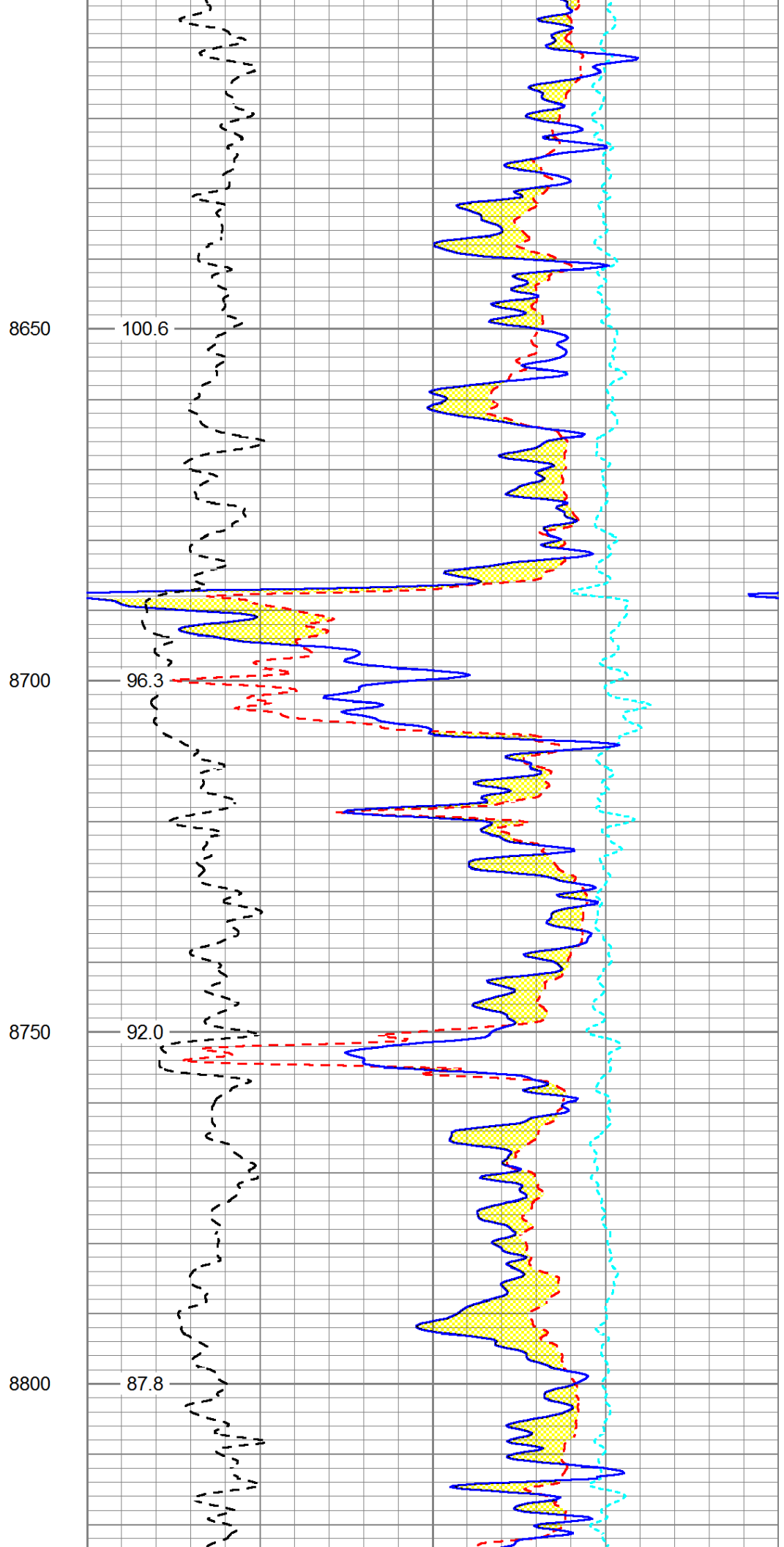
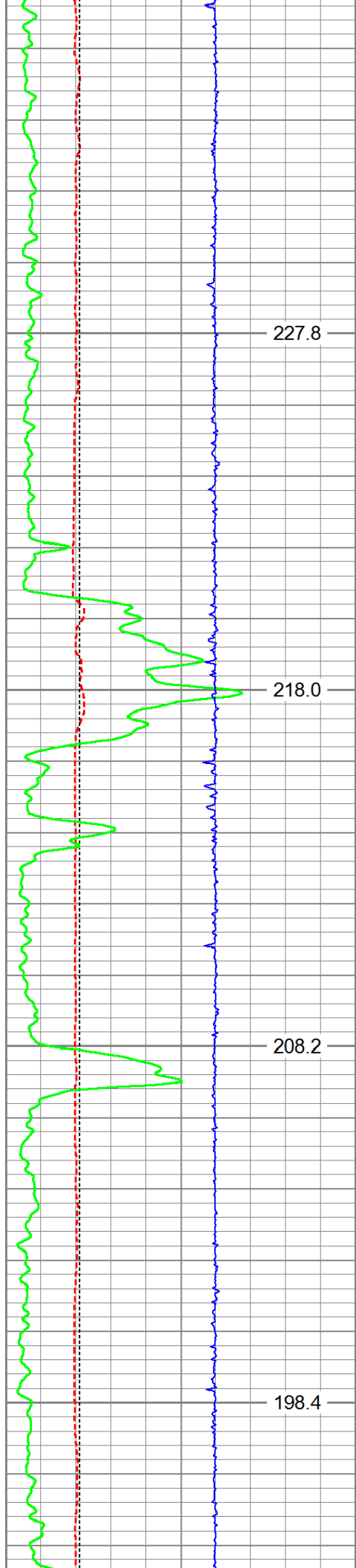
137.9

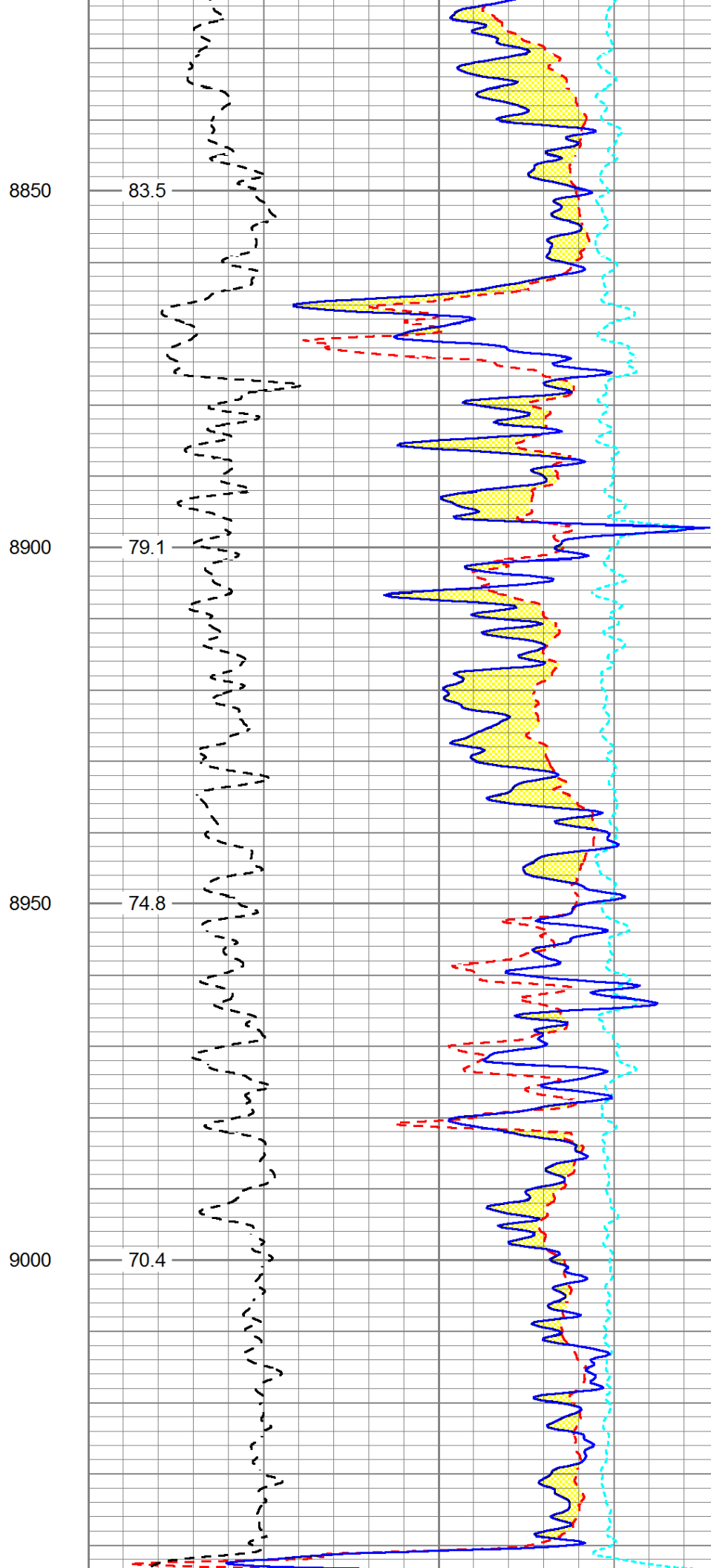
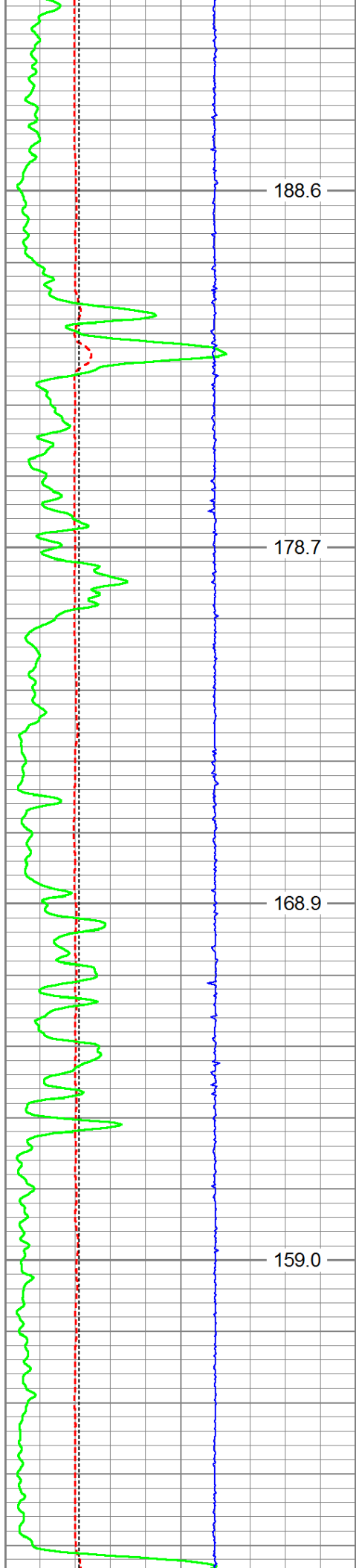
133.1

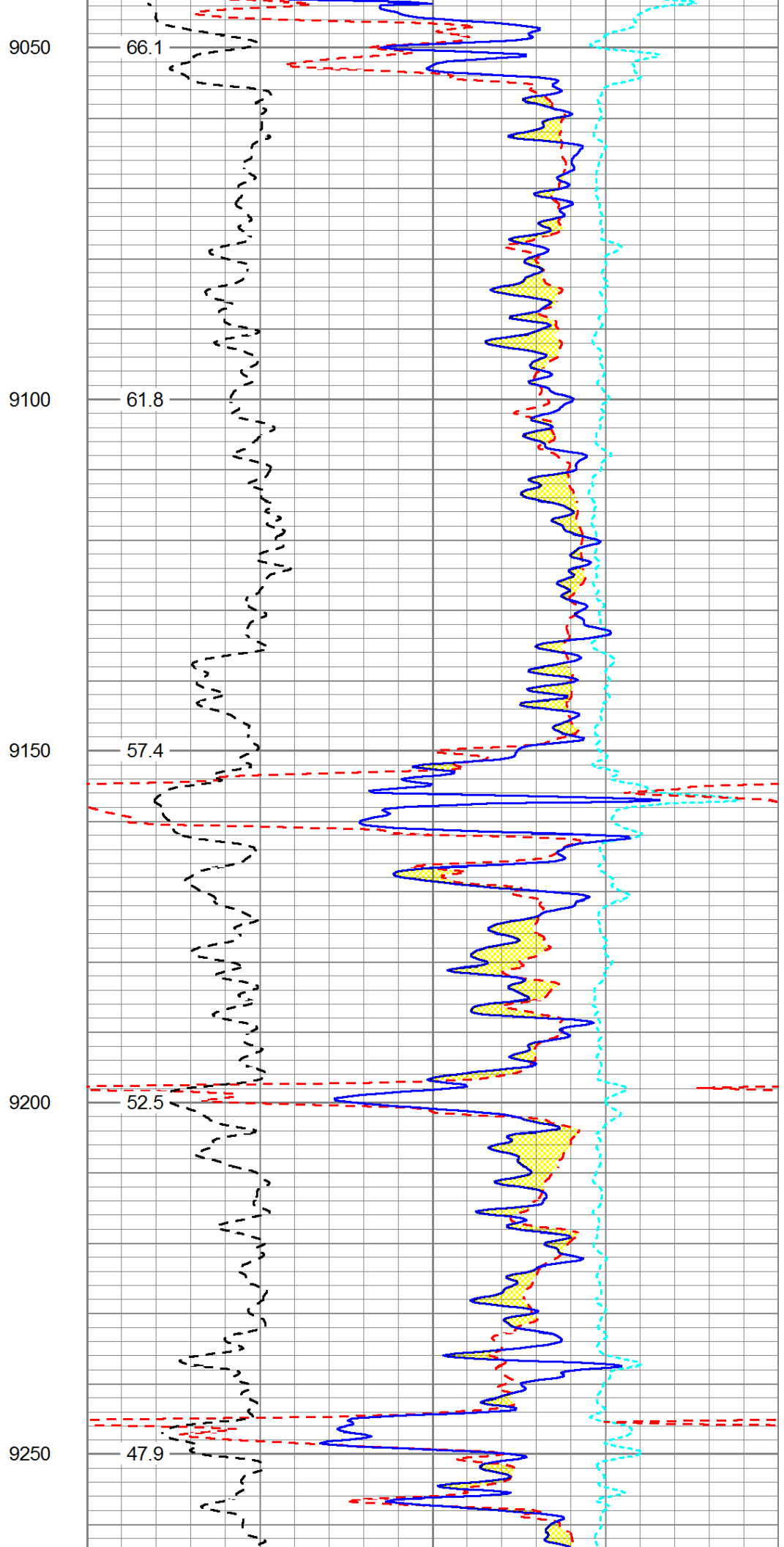
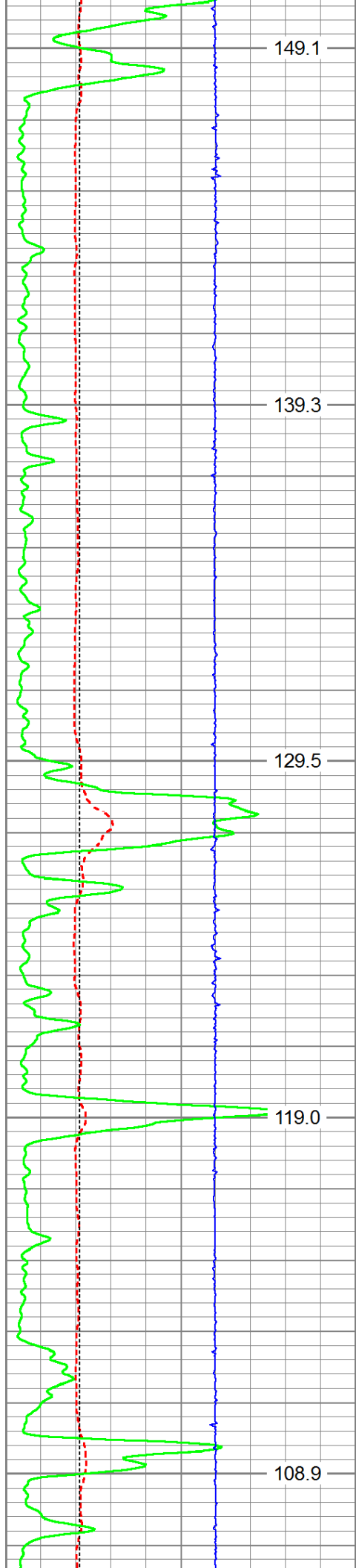
128.5

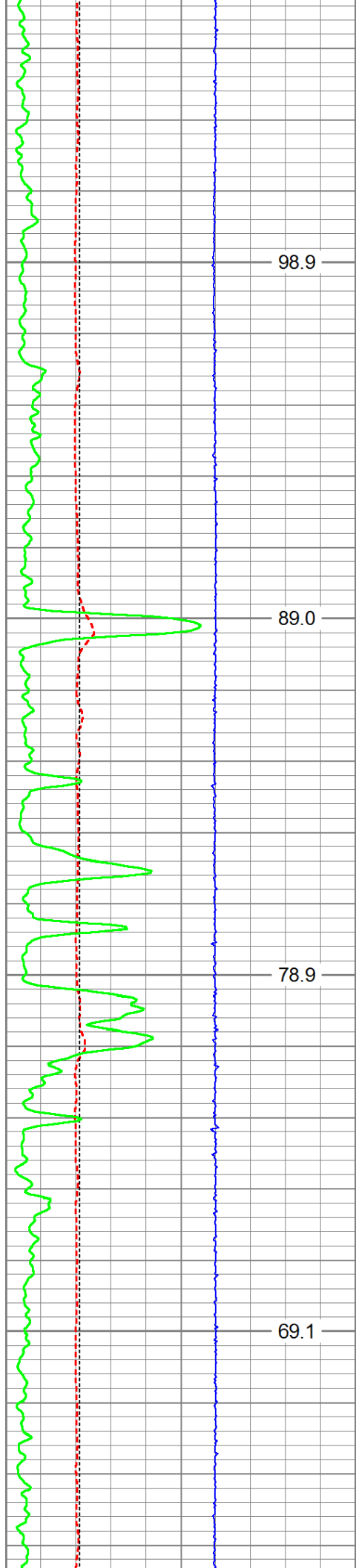












9300

9350

9400

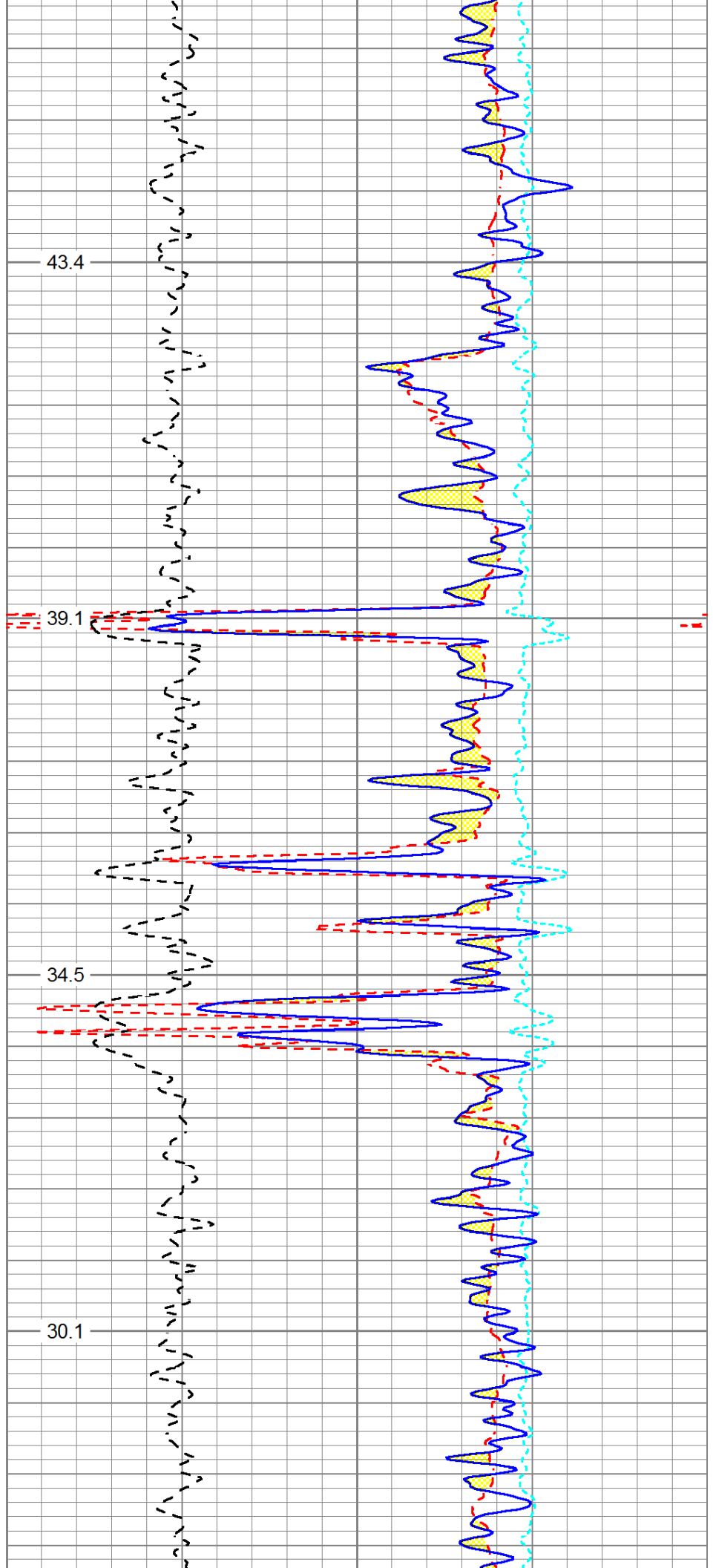
9450

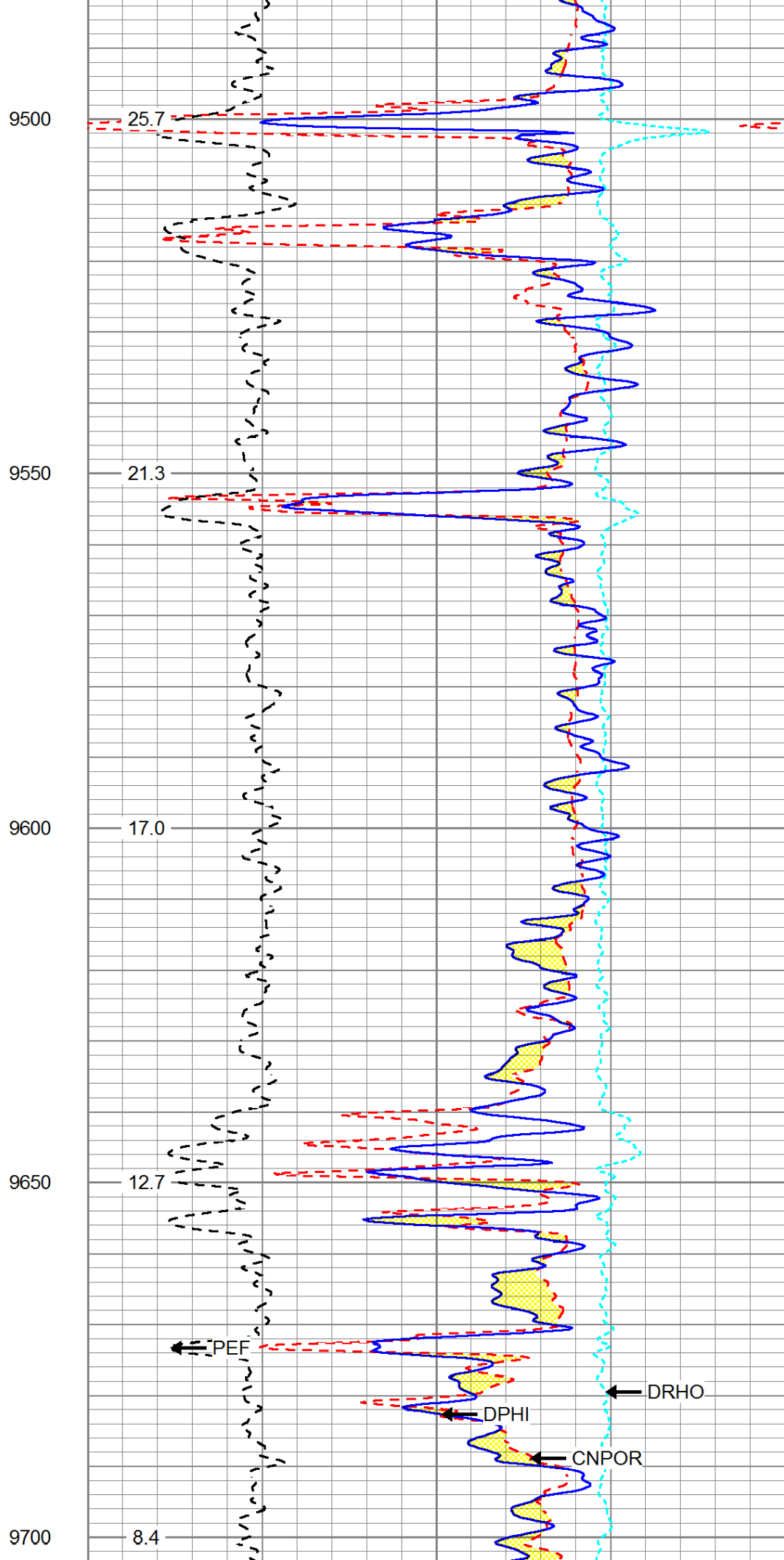
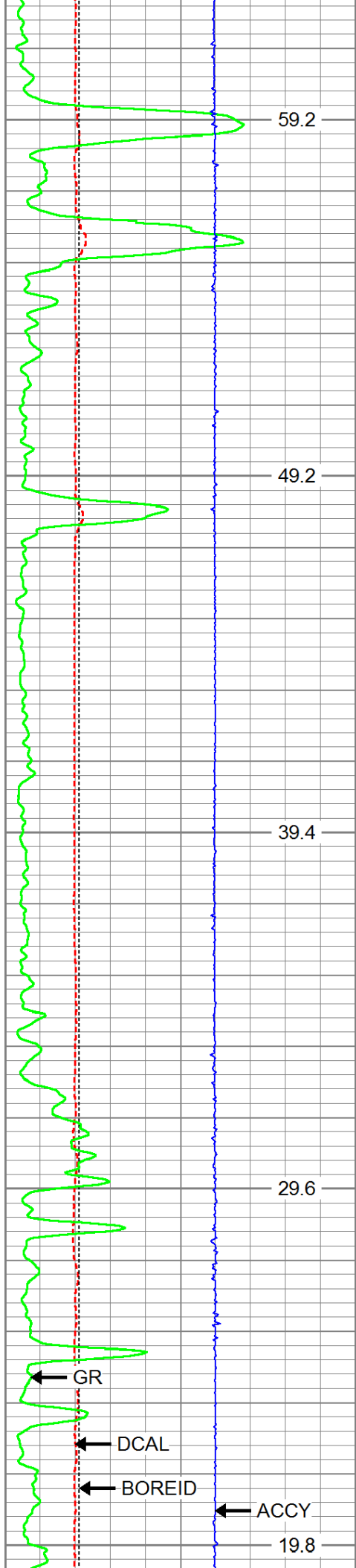
43.4

39.1

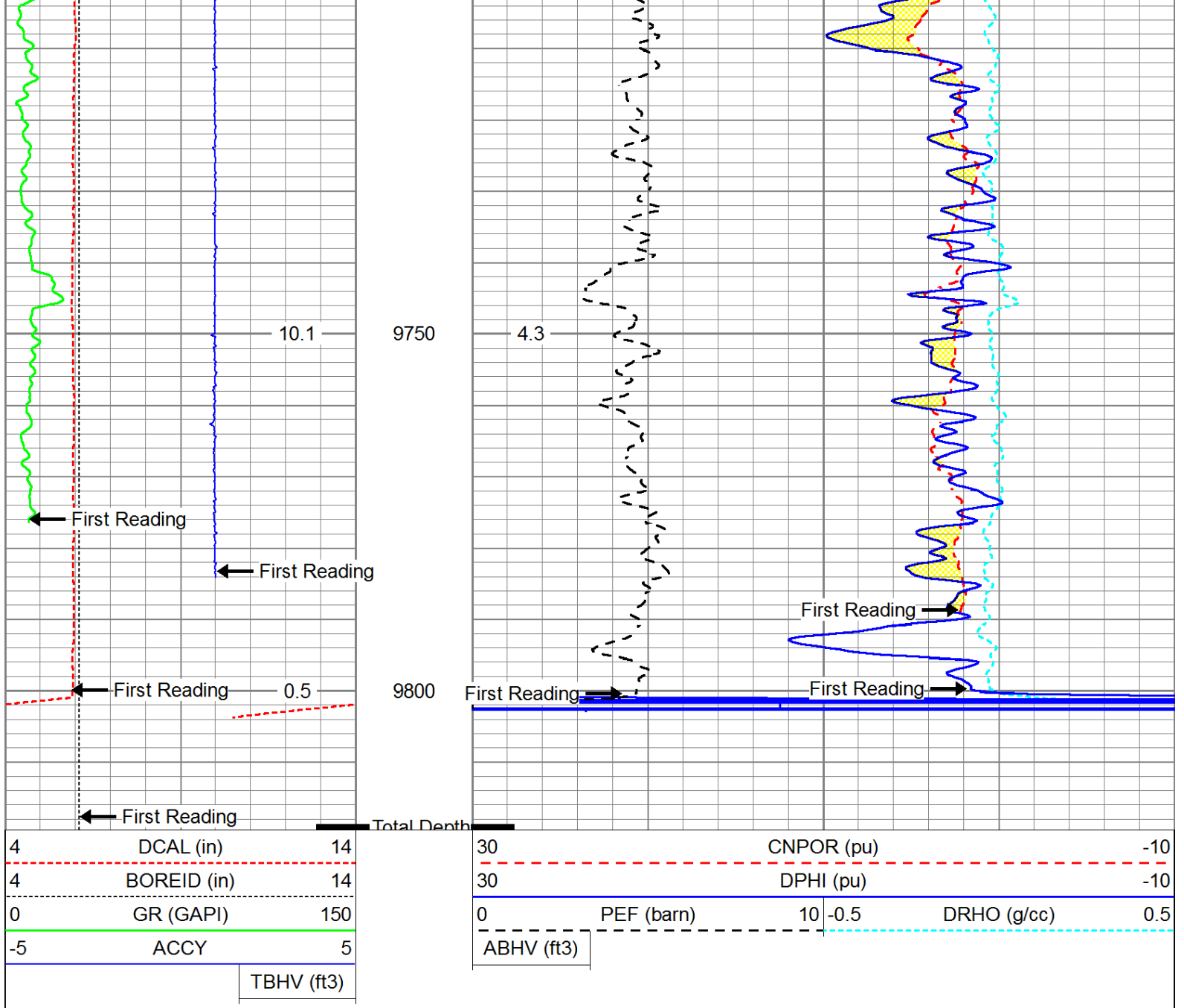
34.5

30.1









## Log Variables

Database: \users\administrator.slb-6mk87p1\desktop\sandridge west 3508 1-5\sandridge\_west\_mem.db  
 Dataset: field/well/proc1/pass1.2

### Top - Bottom

A	BHCOR	BHFL_TYPE	BHFLRES	BHFLRESSRC	BHIDSRC	BOREID	BOTTEMP
1	On	WBM	Ohm-m 1	MUDCELL	CURVE	in 6.125	degF 125
CASED?	CASEOD	CASETHCK	CASEWATERSAL	INCMTTHCK	DNBHC?	DPORSEL	FLUIDDEN
No	in 4.5	in 0	kppm 0	in 0	NO	RHOB	g/cc 1
FRMSALIN	LATNOR	M	MATRXDEN	MUDSALIN	MudWgt	NPORSEL	PEBHC?
kppm 0	Off	2	g/cc 2.71	kppm 1.2	lb/gal 8.5	Limestone	YES
PERFS	RESTMPSRC	SO	SRFTEMP	SZCOR	TDEPTH	TMPCOR	TOOLPOS
0	1	in 0.5	degF 0	On	ft 9861	On	Ec-centered

Calibration Report

Database File c:\users\administrator.slb-6mk87p1\desktop\sandrdige west 3508 1-5h\sandrdige\_west\_mem.db  
 Dataset Pathname proc1/pass1.2  
 Dataset Creation Sat Feb 01 22:22:06 2014

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS16R  
 Shop Calibration Performed: Thu Dec 19 10:53:14 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-474.2930	[-536.000, -387.000]	8.6506	[-500.000, 1100.000]
A2	-153.9010	[-162.000, -120.000]	44.4956	[-75.000, 700.000]
A3	-29.7528	[-38.000, -18.000]	17.1136	[-375.000, 475.000]
A4	-17.2246	[-24.000, -8.000]	411.5530	[25.000, 575.000]
A5	-13.4994	[-21.000, -7.000]	131.8710	[25.000, 275.000]
Freq 2				
A1	-251.4560	[-293.000, -186.000]	-27.5671	[-375.000, 675.000]
A2	-99.9483	[-106.000, -76.000]	0.0165	[-100.000, 425.000]
A3	-21.5114	[-28.000, -13.000]	-41.8548	[-325.000, 250.000]
A4	-19.5416	[-28.000, -10.000]	186.1720	[-75.000, 275.000]
A5	-18.5218	[-27.000, -10.000]	-8.5555	[-125.000, 75.000]
Freq 3				
A1	-158.7100	[-193.000, -108.000]	-94.7517	[-375.000, 425.000]
A2	-75.9105	[-81.000, -57.000]	-43.1739	[-125.000, 250.000]
A3	-17.2526	[-23.000, -11.000]	-90.4127	[-300.000, 125.000]
A4	-21.0501	[-31.000, -11.000]	45.7675	[-200.000, 100.000]
A5	-21.2165	[-32.000, -11.000]	-110.4930	[-250.000, -25.000]
Freq 4				
A1	-87.8124	[-108.000, -54.000]	-226.7930	[-450.000, 75.000]
A2	-54.9891	[-60.000, -41.000]	-116.5990	[-200.000, 50.000]
A3	-13.9617	[-19.000, -8.000]	-171.6790	[-350.000, -25.000]
A4	-24.1456	[-37.000, -11.000]	-148.7500	[-400.000, -75.000]
A5	-27.2389	[-43.000, -12.000]	-281.7390	[-475.000, -125.000]

CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9967	[0.950, 1.050]	-0.0013	[-0.050, 0.050]
A2	0.9934	[0.950, 1.050]	0.0014	[-0.050, 0.050]
A3	0.9973	[0.950, 1.050]	-0.0071	[-0.050, 0.050]
A4	0.9923	[0.950, 1.050]	0.0034	[-0.050, 0.050]
A5	1.0000	[0.950, 1.050]	-0.0028	[-0.050, 0.050]
Freq 2				
A1	0.9906	[0.950, 1.050]	-0.0102	[-0.050, 0.050]
A2	0.9868	[0.950, 1.050]	-0.0078	[-0.050, 0.050]
A3	0.9850	[0.950, 1.050]	-0.0087	[-0.050, 0.050]
A4	0.9868	[0.950, 1.050]	-0.0054	[-0.050, 0.050]

A5	0.9963	[0.950, 1.050]	-0.0131	[-0.050, 0.050]
Freq 3				
A1	0.9998	[0.950, 1.050]	-0.0029	[-0.050, 0.050]
A2	0.9966	[0.950, 1.050]	-0.0008	[-0.050, 0.050]
A3	0.9943	[0.950, 1.050]	-0.0021	[-0.050, 0.050]
A4	0.9955	[0.950, 1.050]	0.0017	[-0.050, 0.050]
A5	1.0070	[0.950, 1.050]	-0.0067	[-0.050, 0.050]
Freq 4				
A1	0.9942	[0.950, 1.050]	-0.0035	[-0.050, 0.050]
A2	0.9906	[0.950, 1.050]	-0.0020	[-0.050, 0.050]
A3	0.9905	[0.950, 1.050]	-0.0052	[-0.050, 0.050]
A4	0.9903	[0.950, 1.050]	0.0013	[-0.050, 0.050]
A5	1.0095	[0.930, 1.070]	-0.0122	[-0.050, 0.050]
Temperature	16.5623 degC			

ThruBit Density Calibration Report

Tool Model-Serial Number: PS-PS01D  
Source Number: A3216  
Shop Calibration Performed: Thu Jan 23 10:09:42 2014

REFERENCE

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

READINGS

Outputs	Counts	Units	Expected
SS1 Background	131.93	cps	[100.00, 185.00]
LS1 Background	141.16	cps	[100.00, 187.00]
LS4 Background	30.20	cps	[20.00, 38.00]
SS1 Aluminium	4750.25	cps	[4076.00, 5613.00]
LS1 Aluminium	873.34	cps	[750.00, 982.00]
LS4 Aluminium	1003.70	cps	[796.00, 1169.00]
SS1 Magnesium	7733.74	cps	[6695.00, 9269.00]
LS1 Magnesium	5605.22	cps	[5158.00, 6486.00]
LS1 Al + Fe	774.67	cps	[650.00, 838.00]
LS4 Al + Fe	485.87	cps	[382.00, 638.00]

RESULTS

SS Slope	1.72	[1.52, 1.77]
LS Slope	0.43	[0.38, 0.45]
PEF K Factor	4.901	[3.510, 6.170]
PEF B Factor	-0.640	[-0.700, -0.410]

Caliper Shop Calibration performed: Thu Jan 23 10:09:42 2014

RESULTS

Reference	Reading	Units
12.00	1831.42	in
9.00	1993.76	in
6.00	2151.94	in

DENSITY PRE-SURVEY CHECK Performed:			Tue Jan 28 13:34:59 2014
Outputs	Counts	Units	Expected
SS1 Background	130.94	cps	[127.98, 135.89]
LS1 Background	139.84	cps	[136.93, 145.40]
LS4 Background	30.21	cps	[28.39, 32.02]

CALIPER PRE-SURVEY CHECK Performed:			Tue Jan 28 13:37:03 2014
Reference	Readings	Units	Expected
6.00	5.97	in	[5.80, 6.20]

DENSITY PRE-SURVEY CHECK Performed:			Tue Jan 28 13:34:59 2014
Outputs	Counts	Units	Expected
SS1 Background	130.94	cps	[127.98, 135.89]
LS1 Background	139.84	cps	[136.93, 145.40]
LS4 Background	30.21	cps	[28.39, 32.02]

DENSITY POST-SURVEY CHECK Performed:			Wed Dec 31 18:00:00 1969
Outputs	Counts	Units	Expected
SS1 Background	0.00	cps	[127.98, 135.89]
LS1 Background	0.00	cps	[136.93, 145.40]
LS4 Background	0.00	cps	[28.39, 32.02]

CALIPER PRE-SURVEY CHECK Performed:			Tue Jan 28 13:37:03 2014
Reference	Readings	Units	Expected
6.00	5.97	in	[5.80, 6.20]

CALIPER POST-SURVEY CHECK Performed:			Wed Dec 31 18:00:00 1969
Reference	Readings	Units	Expected
0.00	0.00	in	[-0.20, 0.20]

Compensated Neutron Calibration Report

Tool Model-Serial Number:	PS-PS06N
Source Number:	
Calibration Tank Temperature:	59.1 degF
Shop Calibration Performed:	Thu Jan 16 11:44:08 2014

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

WATER TANK REFERENCE

Outputs	Measured	Units	Expected
SS Counts	2862.8	cps	
LS Counts	96.5	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	29.6517	SS/LS	
Tank Ratio Gain	1.0441		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
SS Counts	34195.1	cps	
LS Counts	3216.1	cps	
Al Ratio Ref	10.797	SS/LS	
Al Ratio	11.101	SS/LS	
Al Ratio Gain	0.97		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed:

Tue Jan 28 13:30:05 2014

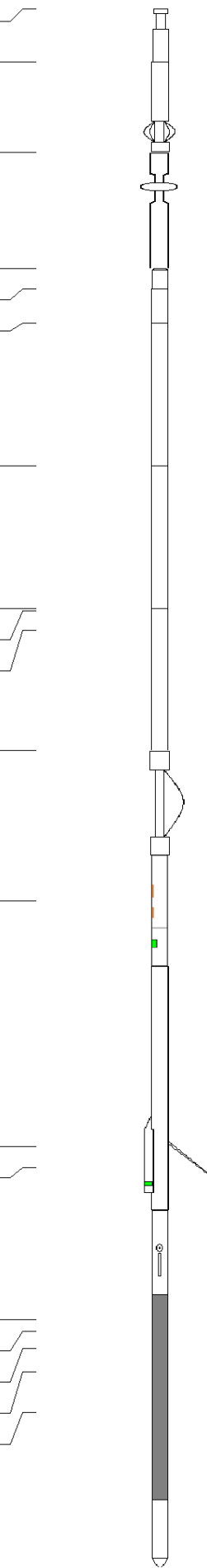
Outputs	Measured	Units	Expected
SS Counts	0.1	cps	<10
LS Counts	0.1	cps	<4

Gamma Ray Calibration Report

Tool Model-Serial Number:	PS-PS27T	
Performed:	Sat Jan 11 02:53:47 2014	
Calibrator Value:	166.7	GAPI
Background Reading:	59.0	cps
Calibrator Reading:	449.6	cps
Sensitivity:	0.3950	GAPI/cps

Inclinometer Calibration Report

Performed:	Sun Jun 13 14:33:21 1993				
	Low Read.	High Read.	Low Ref.	High Ref.	
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	Length (ft)	O.D. (in)	Weight (lb)
Thrubit	66.92		Thrubit-Cablehead-S Solid Weakpoint	2.31	2.13	5.00
Thrubit	64.61		Thrubit-PSBDOT	3.87	2.25	35.00
Thrubit	60.75		Thrubit-HangOff_Tool	5.00	2.38	60.00
Thrubit	55.75		Thrubit-10-1	0.88	2.13	3.95
Thrubit	54.87		Thrubit-Universal Joint	1.46	2.06	15.00
TBBAT	53.41		TBBAT-A (PS07B) Thrubit Battery	6.13	2.13	38.20
TBBAT2	47.29		TBBAT2-A (PS40B) Thrubit Battery	6.13	2.13	40.00
TMG GR GRTEMP	41.16 41.04 40.20		TMG-PS (PS27T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
Thrubit	35.04		Thrubit-Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS06N) ThruBit Neutron	4.77	2.13	63.00
			TBD-PS (PS01D) Thrubit Density	10.48	2.13	91.00
LSW1 DCAL	18.04 17.13					
A1_P A2_P A3_P A4_P A5_P	10.60 10.10 9.35 8.35 6.60		TBI-PS (PS16R) Thrubit Induction	15.29	2.13	94.00

Dataset: sandrdige\_west\_mem.db: field/well/raw1/pass1  
Total length: 66.92 ft

Total weight: 560.15 lb  
O.D.: 2.38 in



***ThruBit***

A Schlumberger Company

Company	SANDRIDGE ENERGY
Well	WEST 3508 1-5H
Field	BOUSE
County	HARPER
State	KANSAS