



ThruBit

A Schlumberger Company

SPECTRAL DENSITY DUAL SPACED NEUTRON GAMMA RAY MEMORY LOG

Company SANDRIDGE ENERGY
 Well RAYMOND 3505 1-7H
 Field HKW EAST
 County HARPER
 State KANSAS

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 Well RAYMOND 3505 1-7H
 Field HKW EAST
 County HARPER State KANSAS

Location: API #: 15077219870200
 SURF LOC: 200' FSL & 1300' FWL
 SEC 7 TWP 35S RGE 5W
 Permanent Datum G.L. Elevation 1256'
 Log Measured From D.F. 16' ABOVE PERM DATUM
 Drilling Measured From D.F.
 Other Services
 THRU BIT
 PORTAL
 BIT
 Elevation
 K.B. 1272'
 D.F. 1272'
 G.L. 1256'

Date	29 JANUARY 2014
Run Number	ONE
Depth Driller	9018'
Depth Logger	8987'
Bottom Logged Interval	8970'
Top Log Interval	3000'
Casing Driller	7" @ 5172'
Casing Logger	7" @ 5178'
Bit Size	6.125"
Type Fluid in Hole	WBM
Density / Viscosity	8.45 / 27
pH / Fluid Loss	8.0 / 100
Source of Sample	CALCULATED
Rm @ Meas. Temp	0.12 OHM@65DEGF
Rmf @ Meas. Temp	0.10 OHM@65DEGF
Rmc @ Meas. Temp	0.14 OHM@65DEGF
Source of Rmf / Rmc	CALCULATED
Rm @ BHT	0.06 OHMS@138DEGF
Time Circulation Stopped	20:50 29JAN2014
Time Logger on Bottom	22:00 29JAN2014
Maximum Recorded Temperature	139 DEGF
Equipment Number	T004
Location	OKC, OK
Recorded By	B. FRANTOM
Witnessed By	R. HAGOOD

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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: LEVEL 4 - HORZ MEMORY PUMP DOWN - BIT DEPTH: 8930' LOG TO: 3000'
ALL SCALES AND PRESENTATIONS PER CLIENT REQUEST
LIMESTONE MATRIX, 2.71 G/CC, USED TO MEASURE POROSITIES
TOOL STRING RAN WITH SWIVEL, SMALL DECENTRALIZER, NO STANDOFFS
TBHV = TOTAL BOREHOLE VOLUME, FT3
ABHV = ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CSG
PASON AND HSPM USED TO CREATE LOG DEPTH
LOG DEPTH CORRELATED TO MWD GAMMA AT CUSTOMERS REQUEST
BRINE PILL PUMPED DOWN PRIOR TO LOGGING


CREW: B. FRANTOM/K. REED/J. HIRST
RIG: UNIT #9

Service Ticket No.	2527	API No.	15077219870200	PGM Ver	Warrior 8
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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.	PS10T	Serial No.	PS5N	Serial No.	PS41D	Serial No.	PS38R
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	8987'	3000'		30			
DIRECTIONAL INFORMATION							
Maximum Deviation	95.2	deg. @	8478'	KOP	3907'		

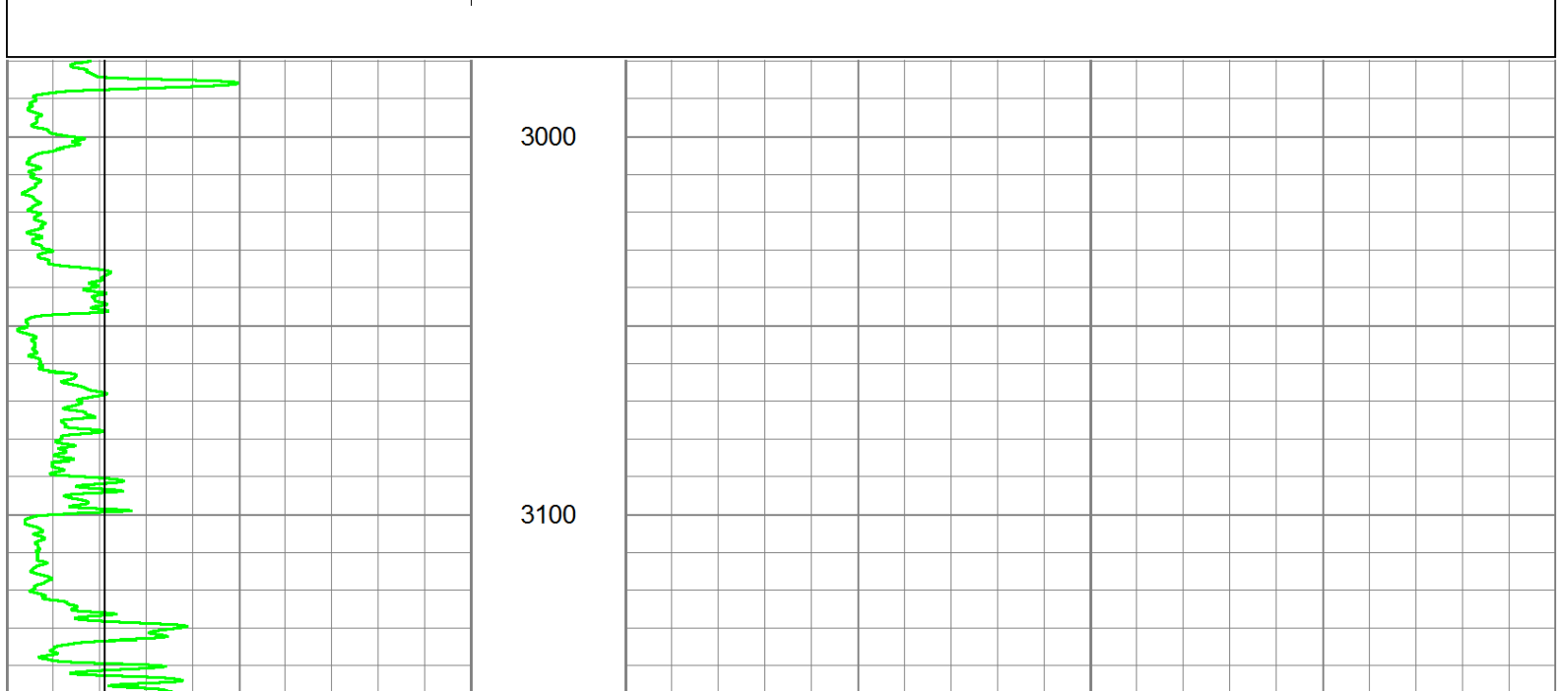


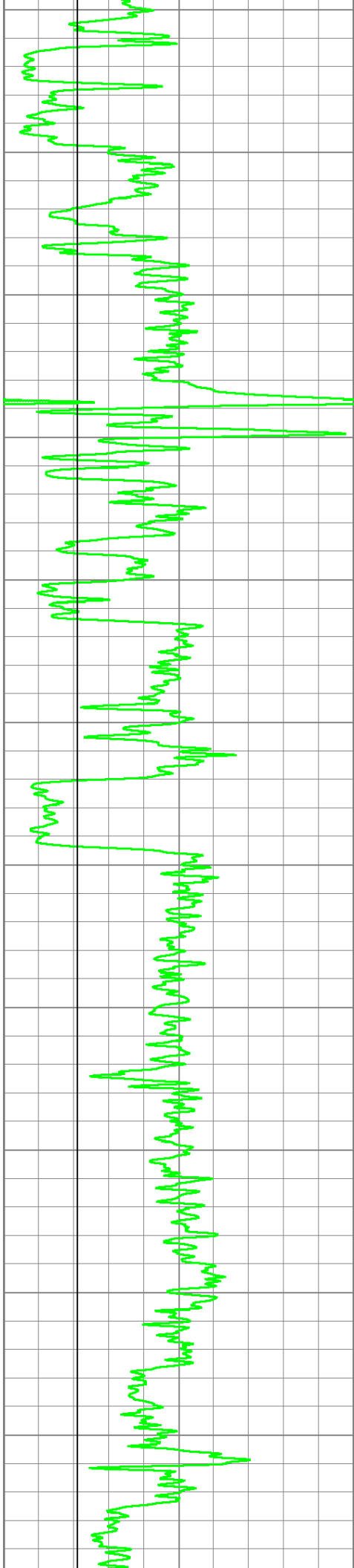
MAIN PASS

A Schlumberger Company

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Dataset Pathname	proc1/pass1.3
Presentation Format	6_2n_chk
Dataset Creation	Thu Jan 30 06:11:47 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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3300

3400

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3600

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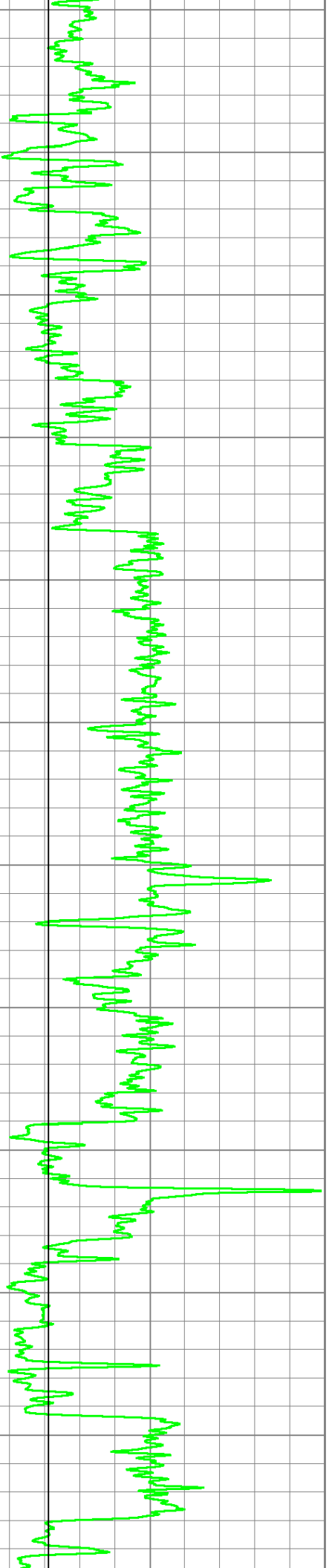
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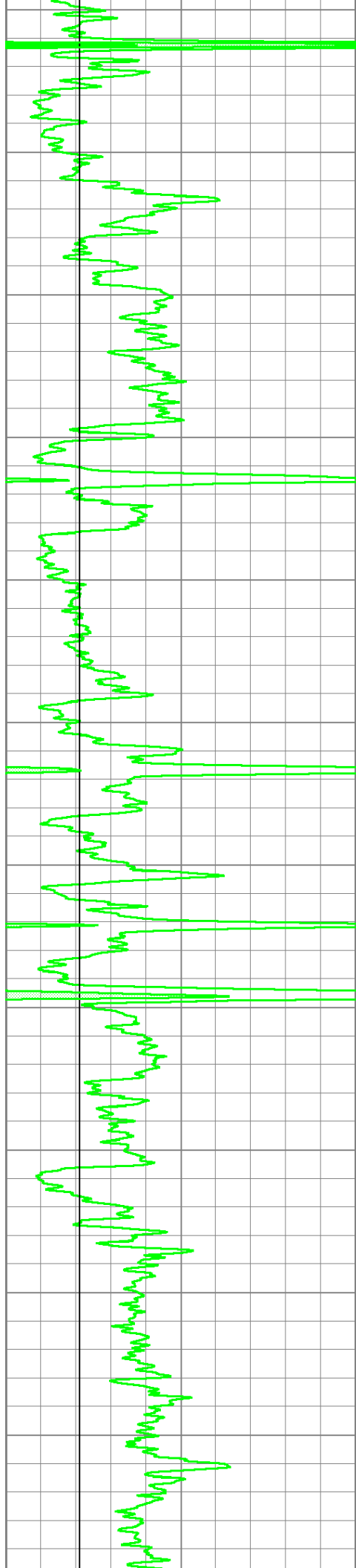
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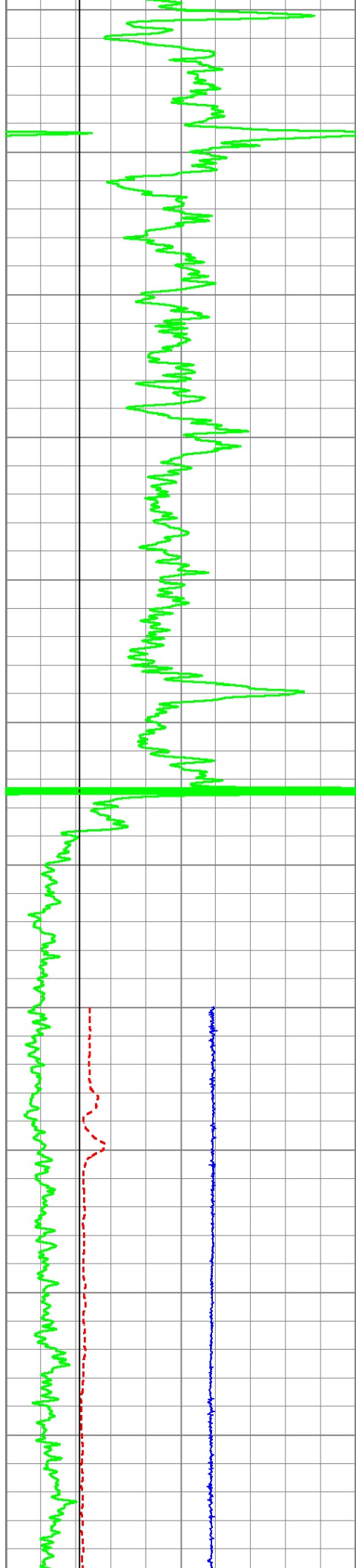
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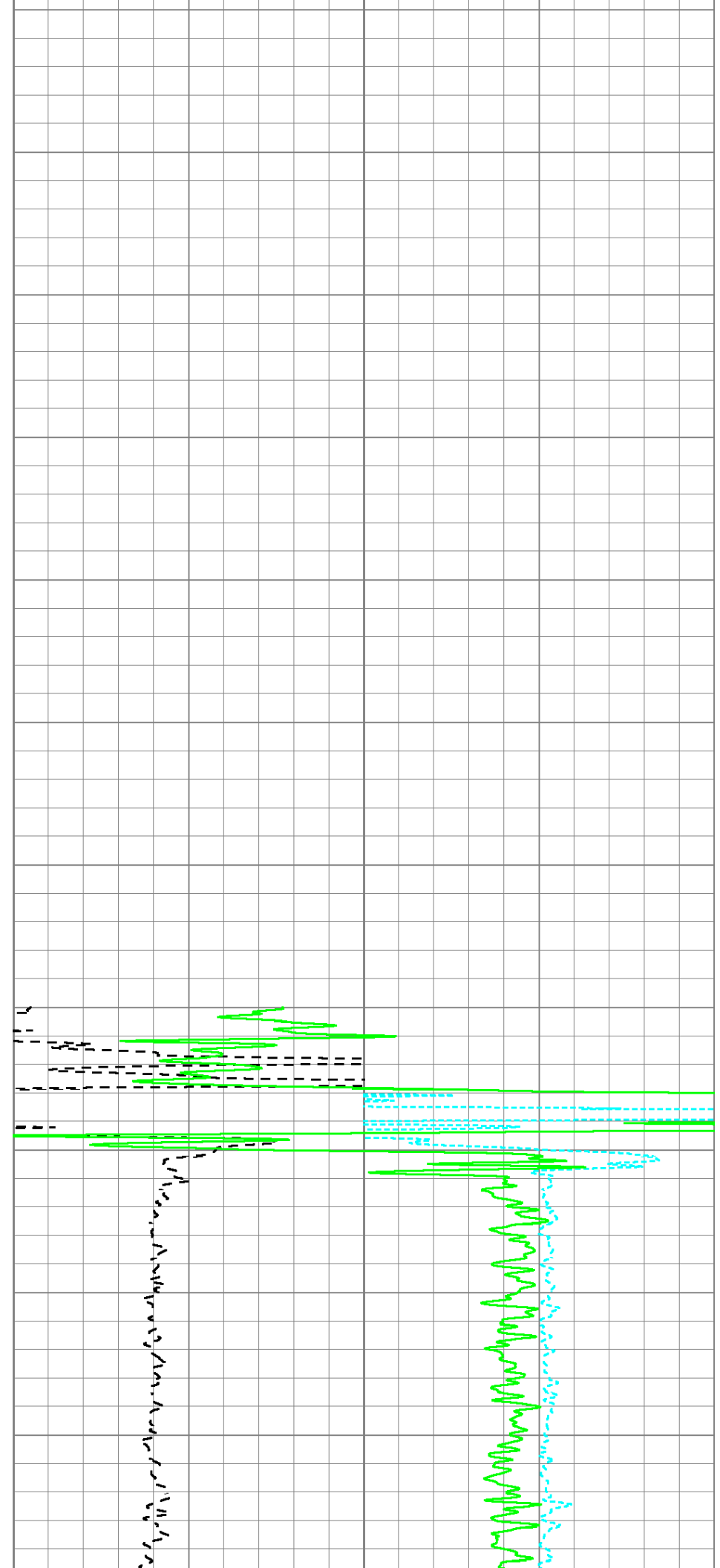
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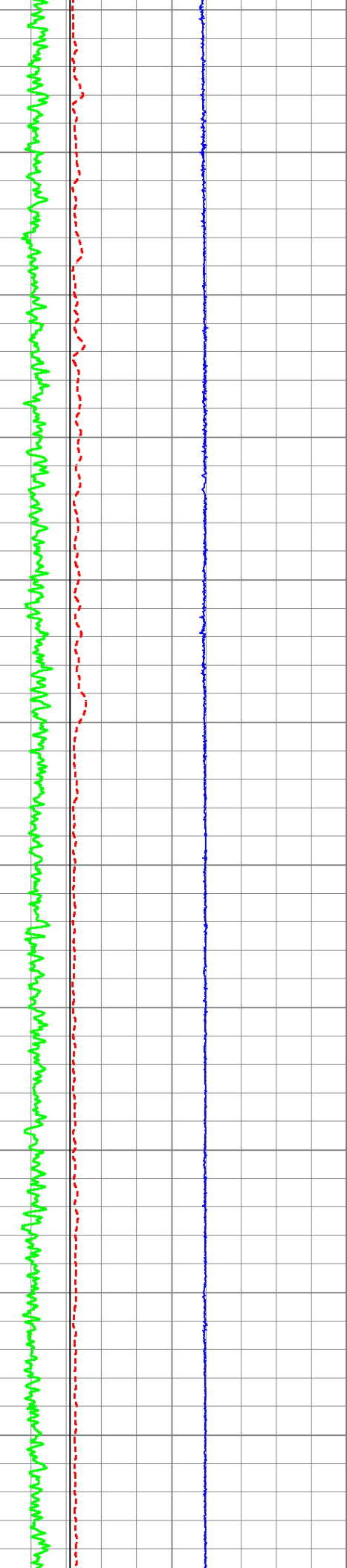
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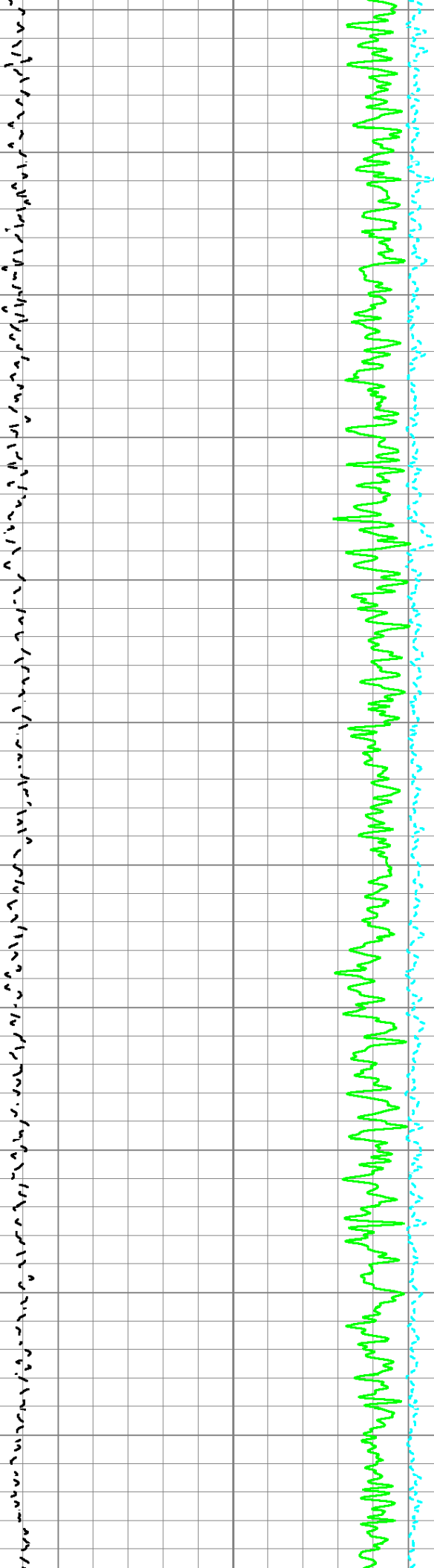
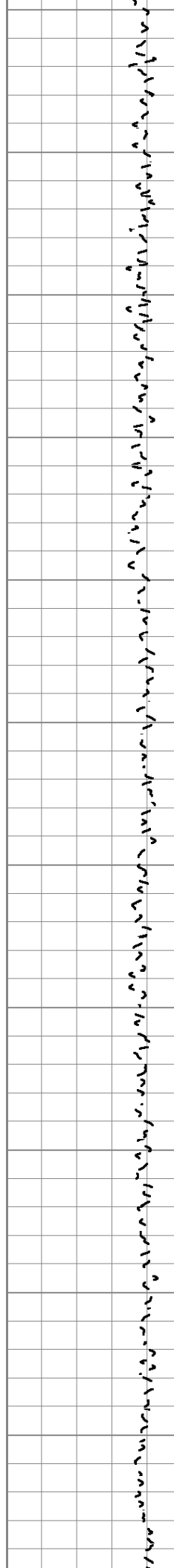
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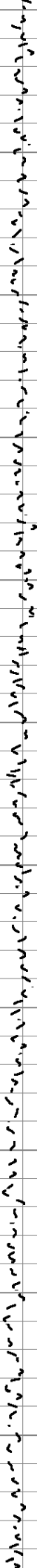
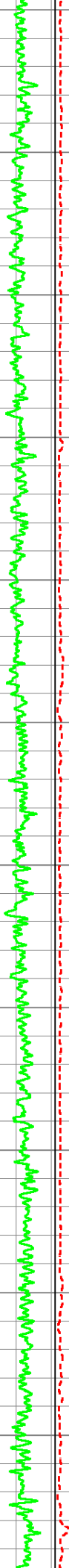
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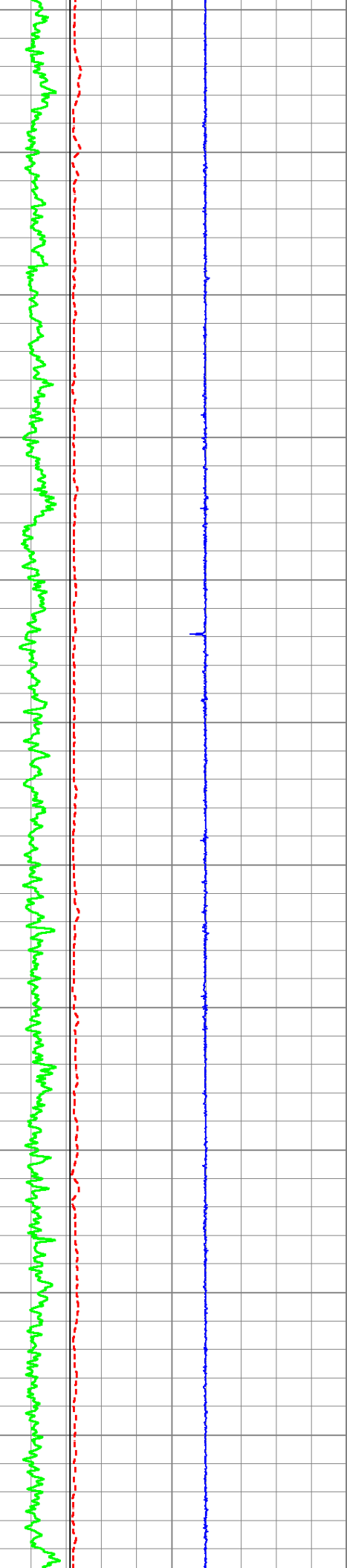
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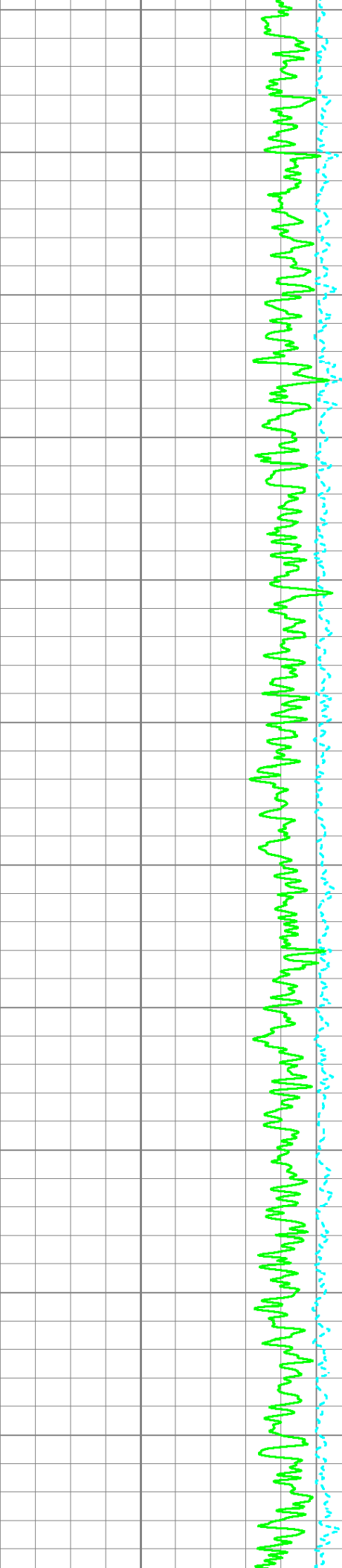
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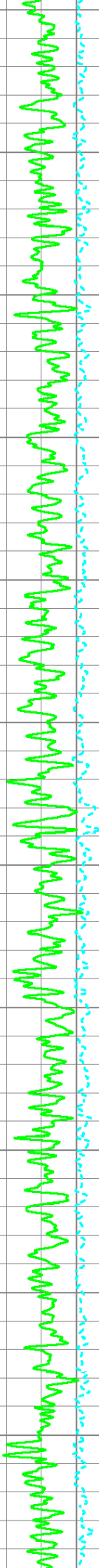
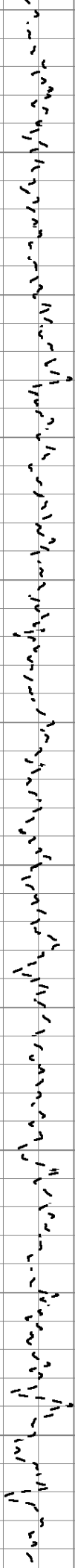
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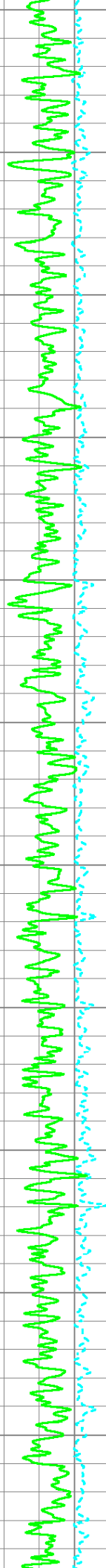
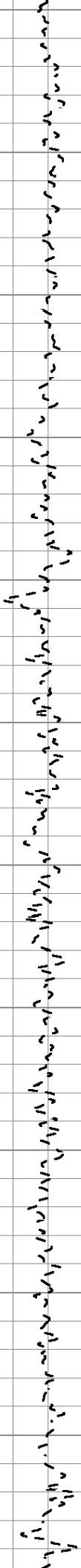
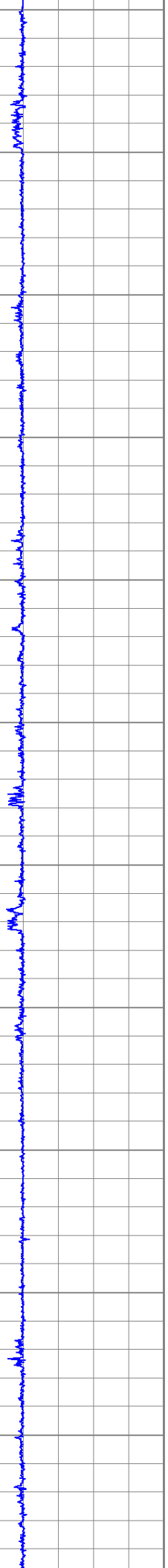
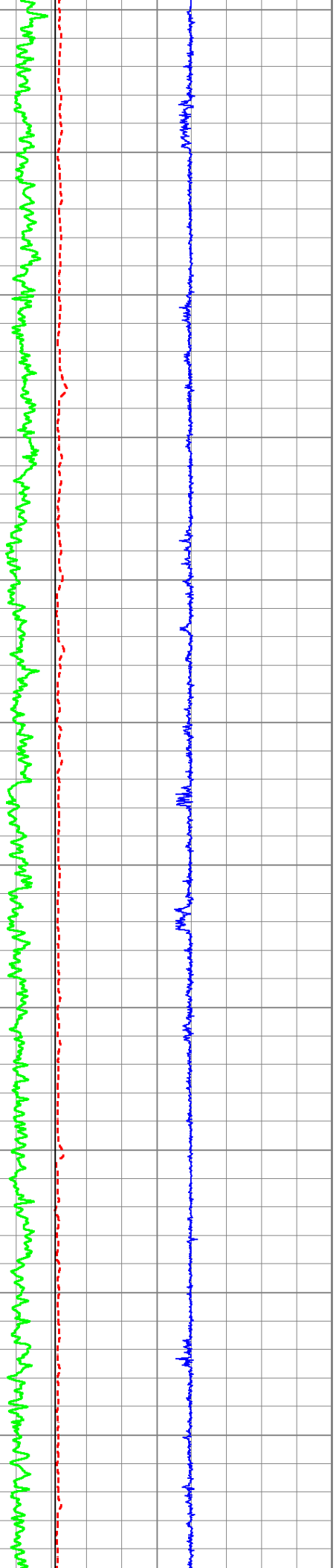
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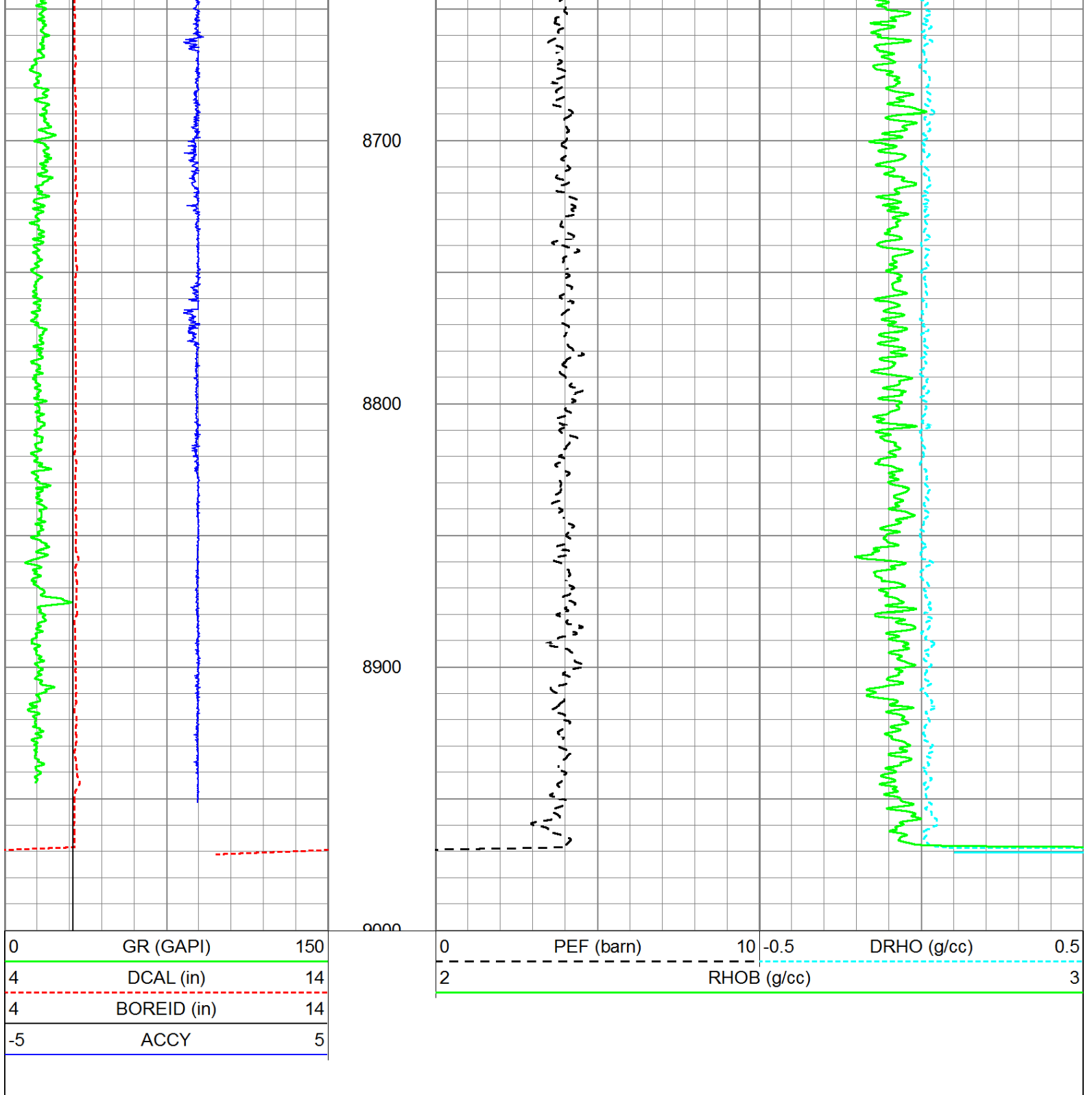
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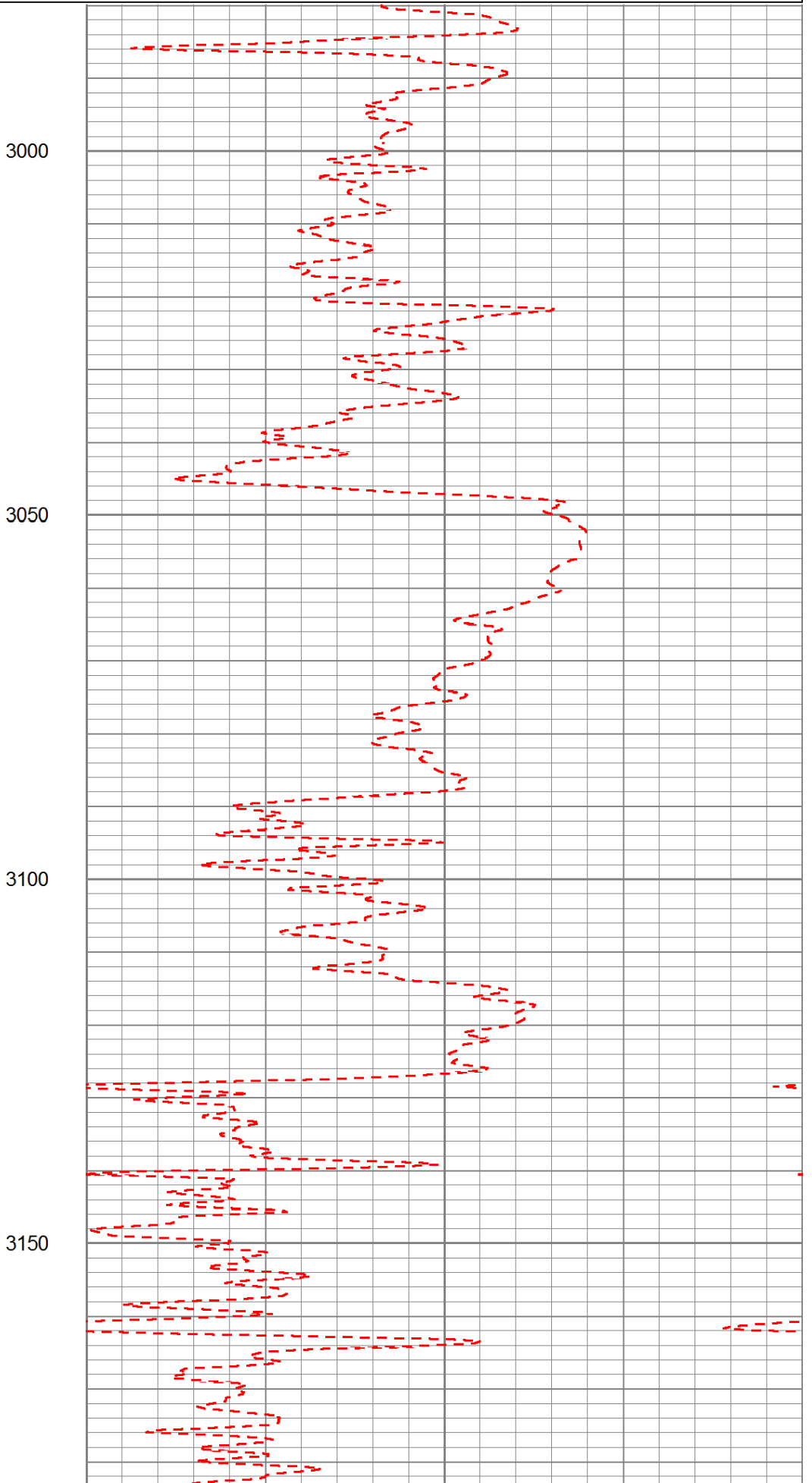
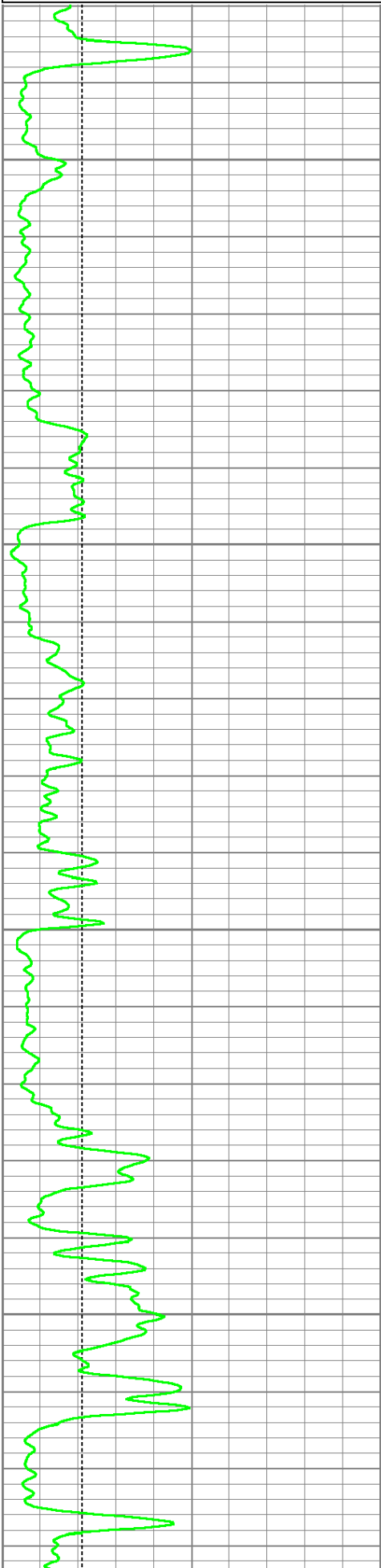
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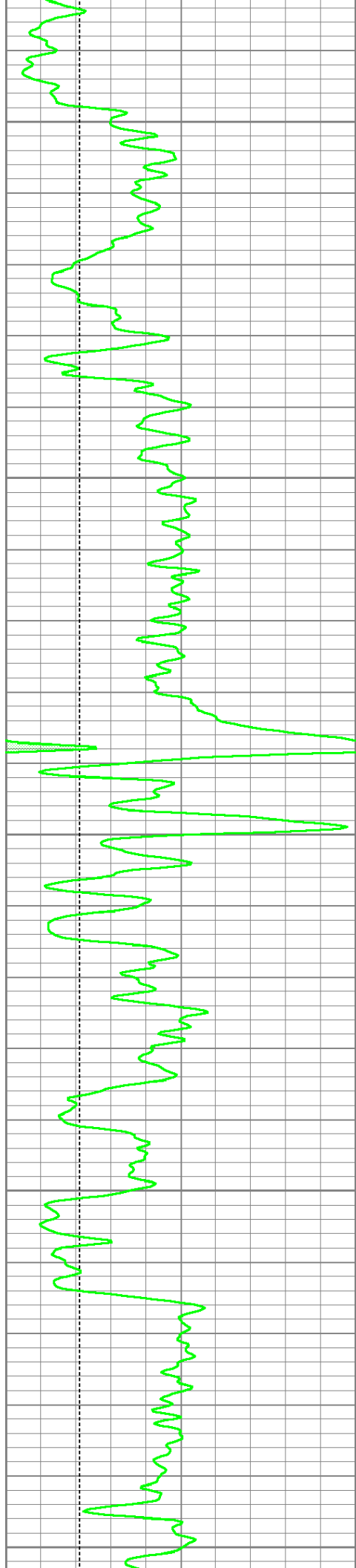
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 Presentation Format 6_5n_chk
 Dataset Creation Thu Jan 30 06:11:47 2014
 Charted by Depth in Feet scaled 1:240

4	DCAL (in)	14	30	CNPOR (pu)	-10
4	BOREID (in)	14	30	DPHI (pu)	-10

0	GR (GAPI)	150
-5	ACCY	5
	TBHV (ft3)	

0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
	ABHV (ft3)				





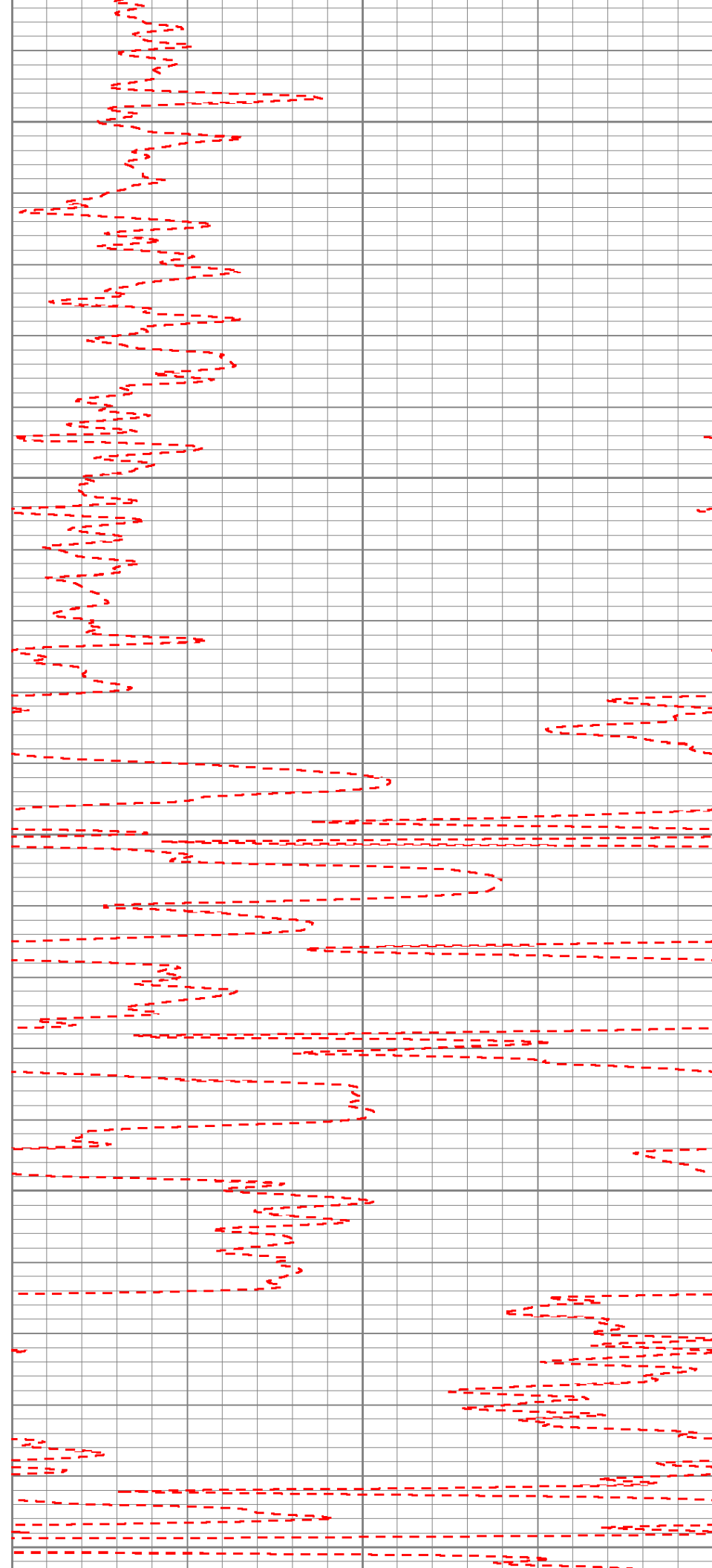
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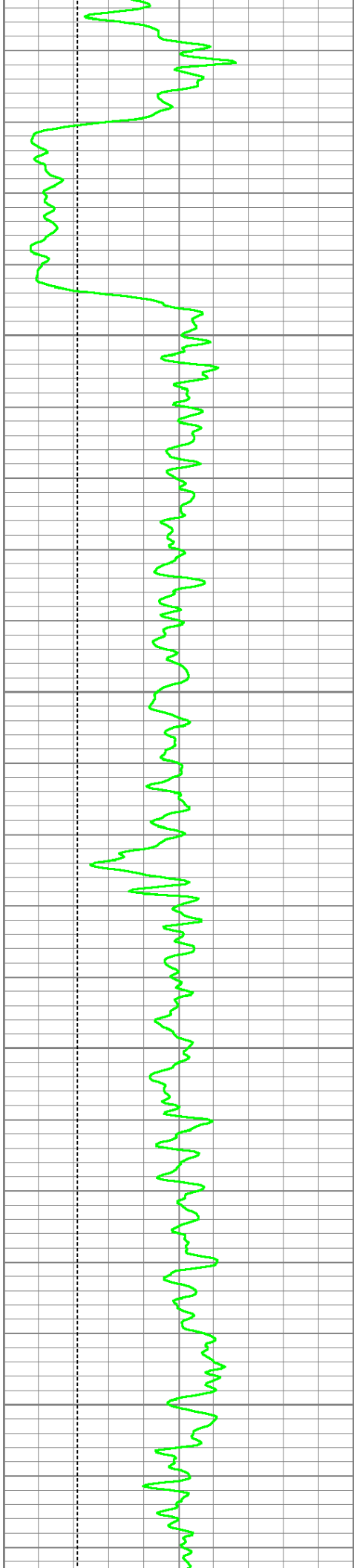
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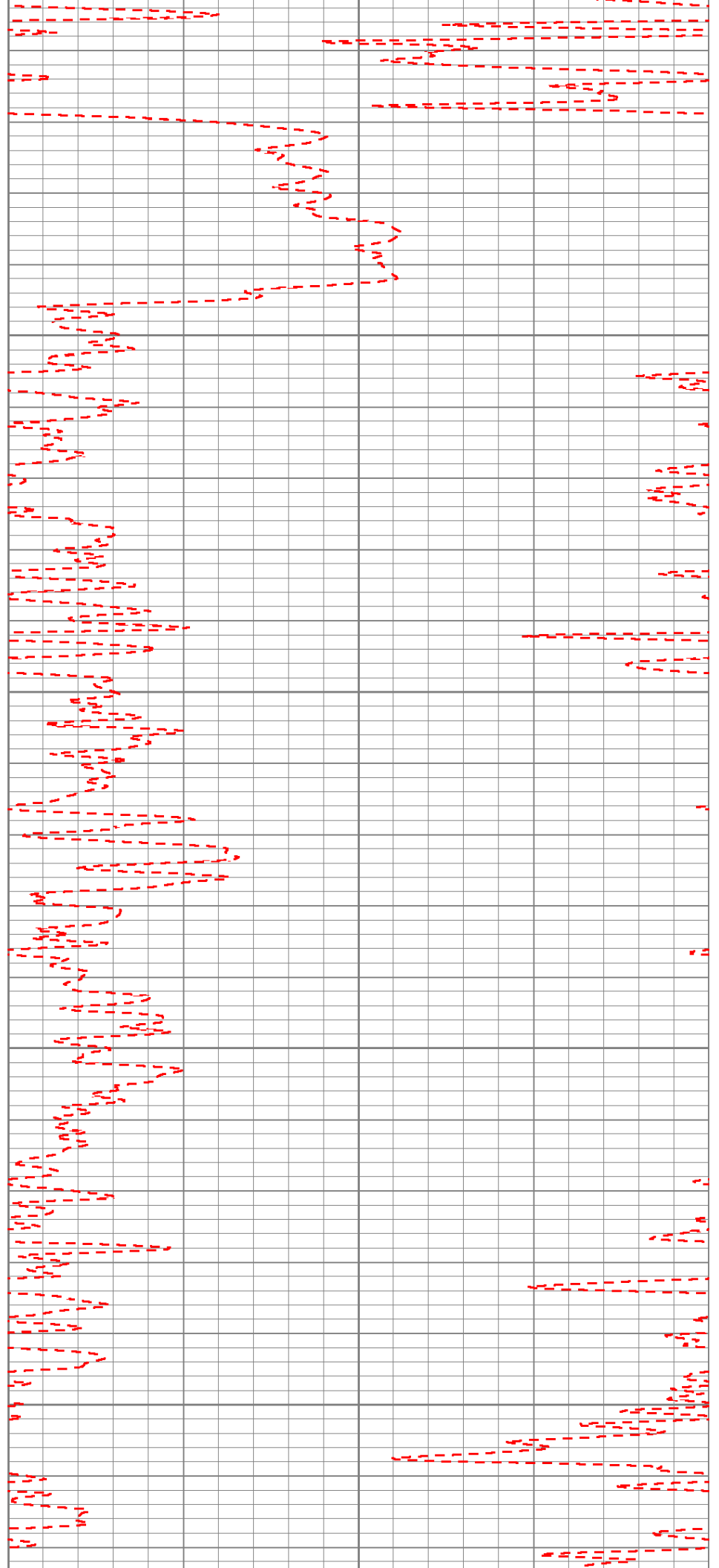


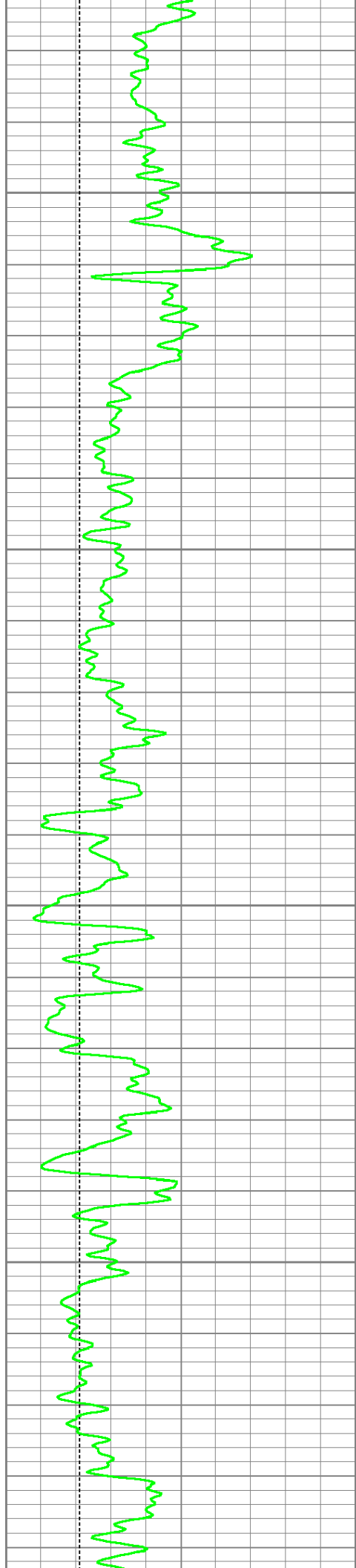
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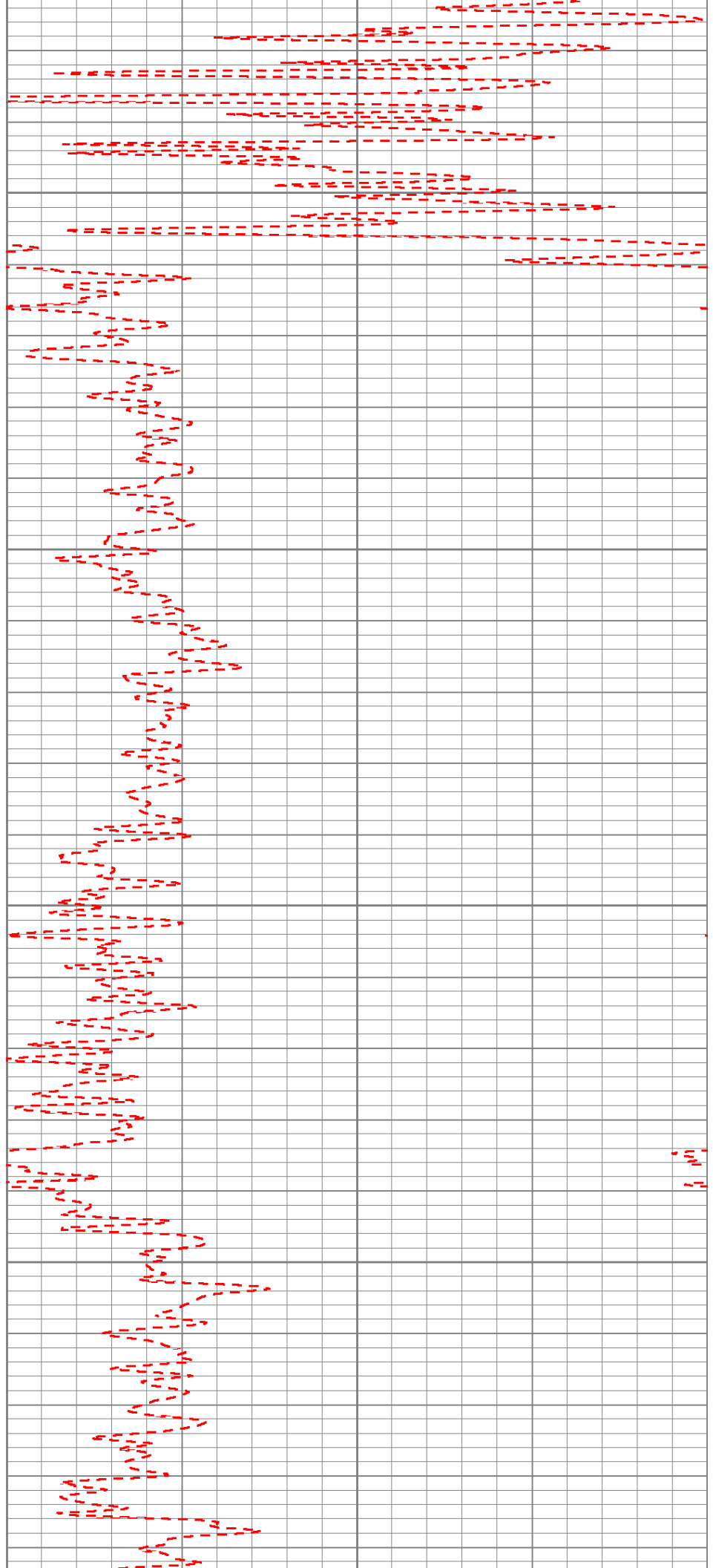


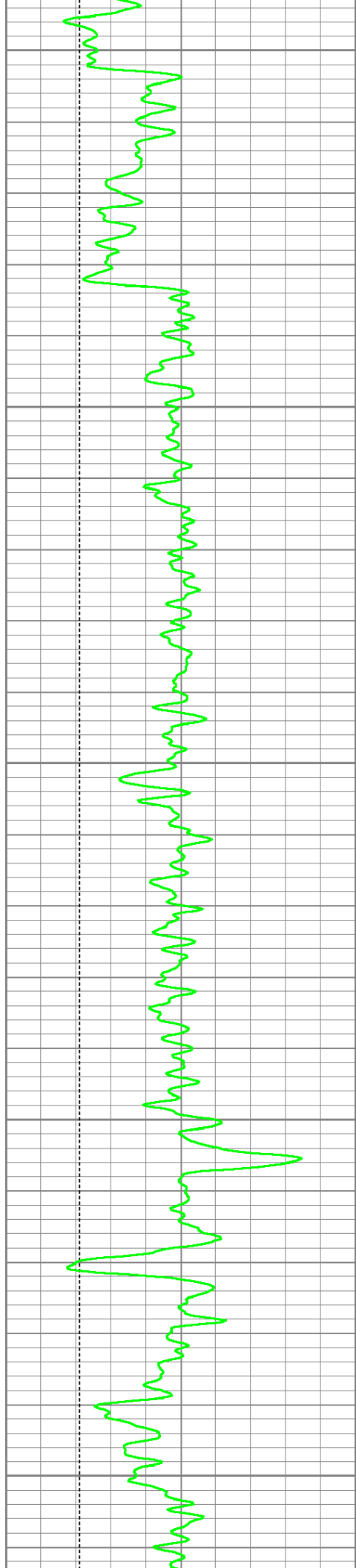
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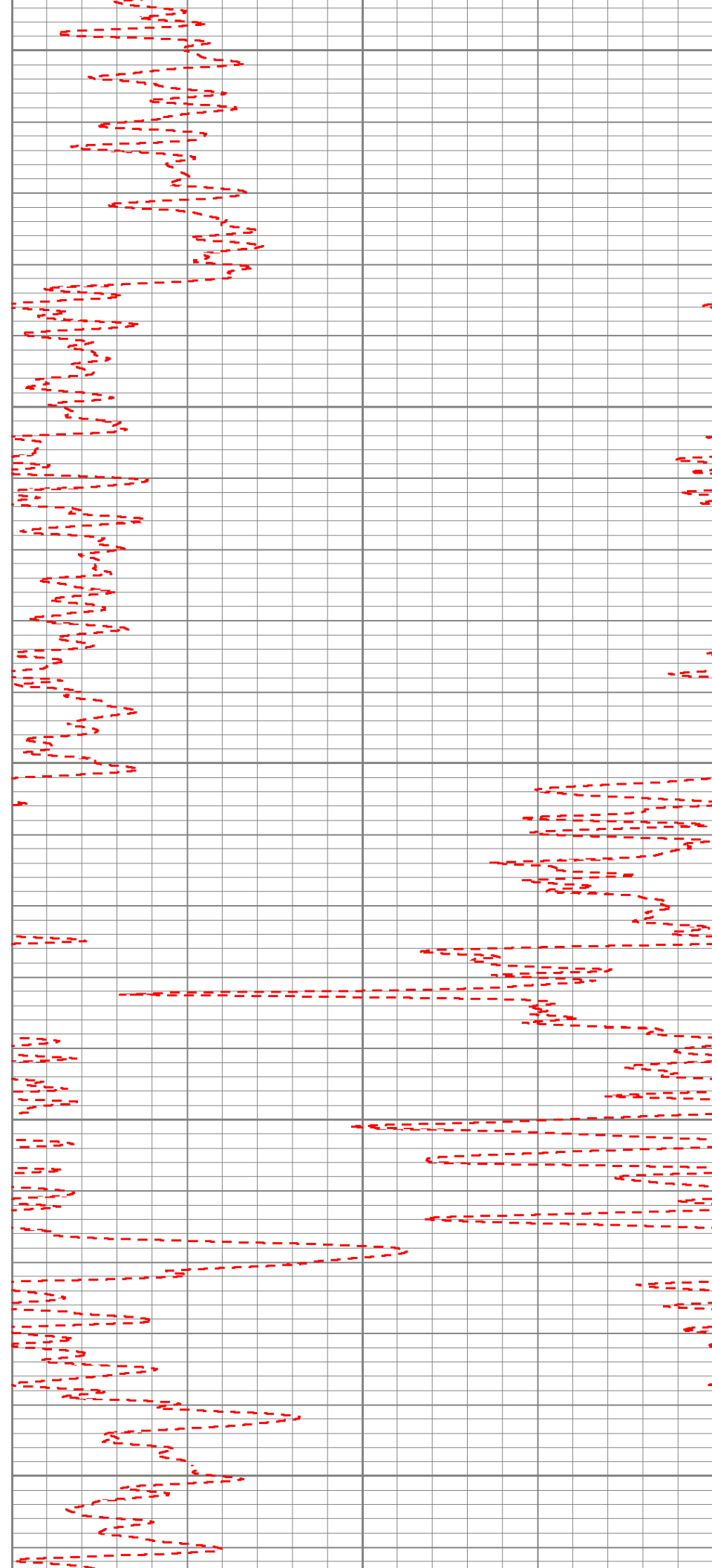
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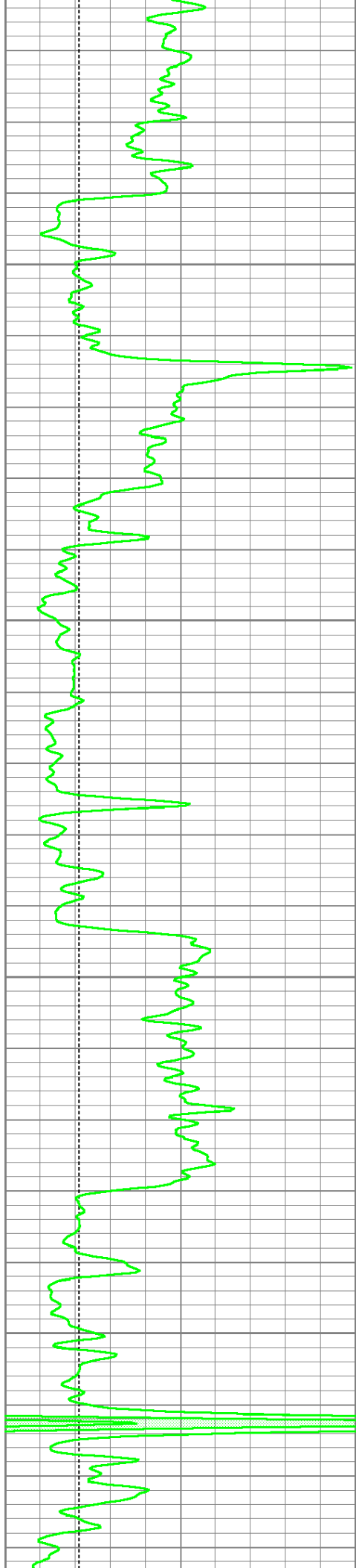
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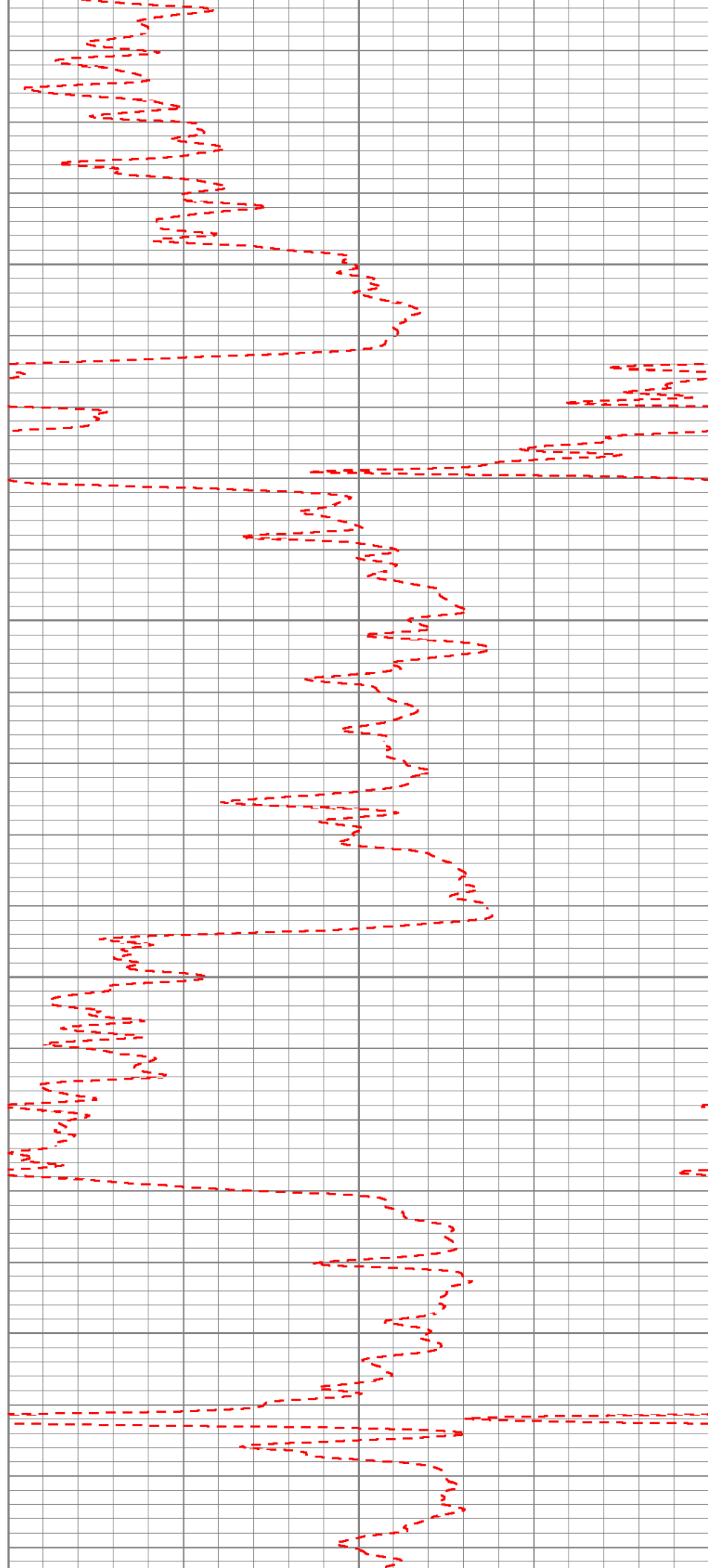


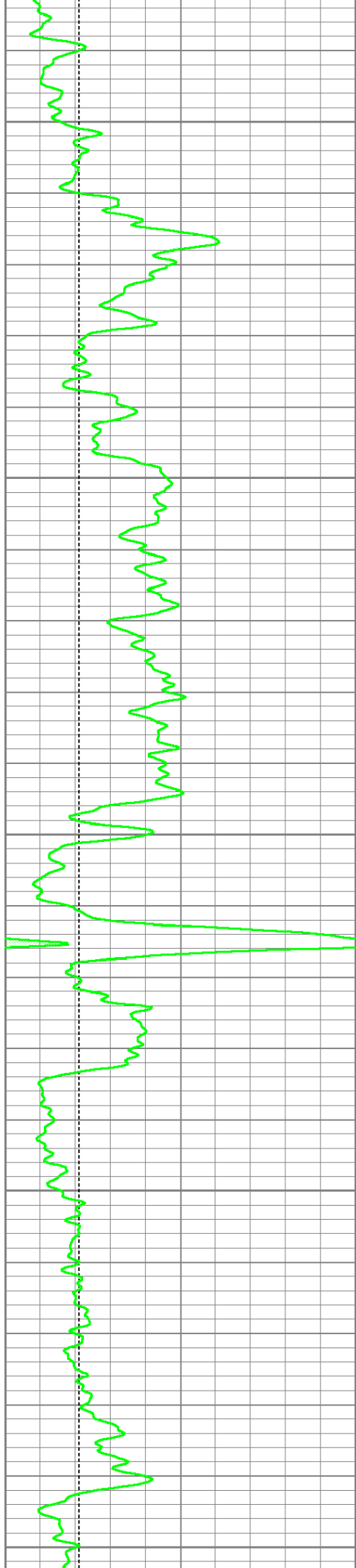
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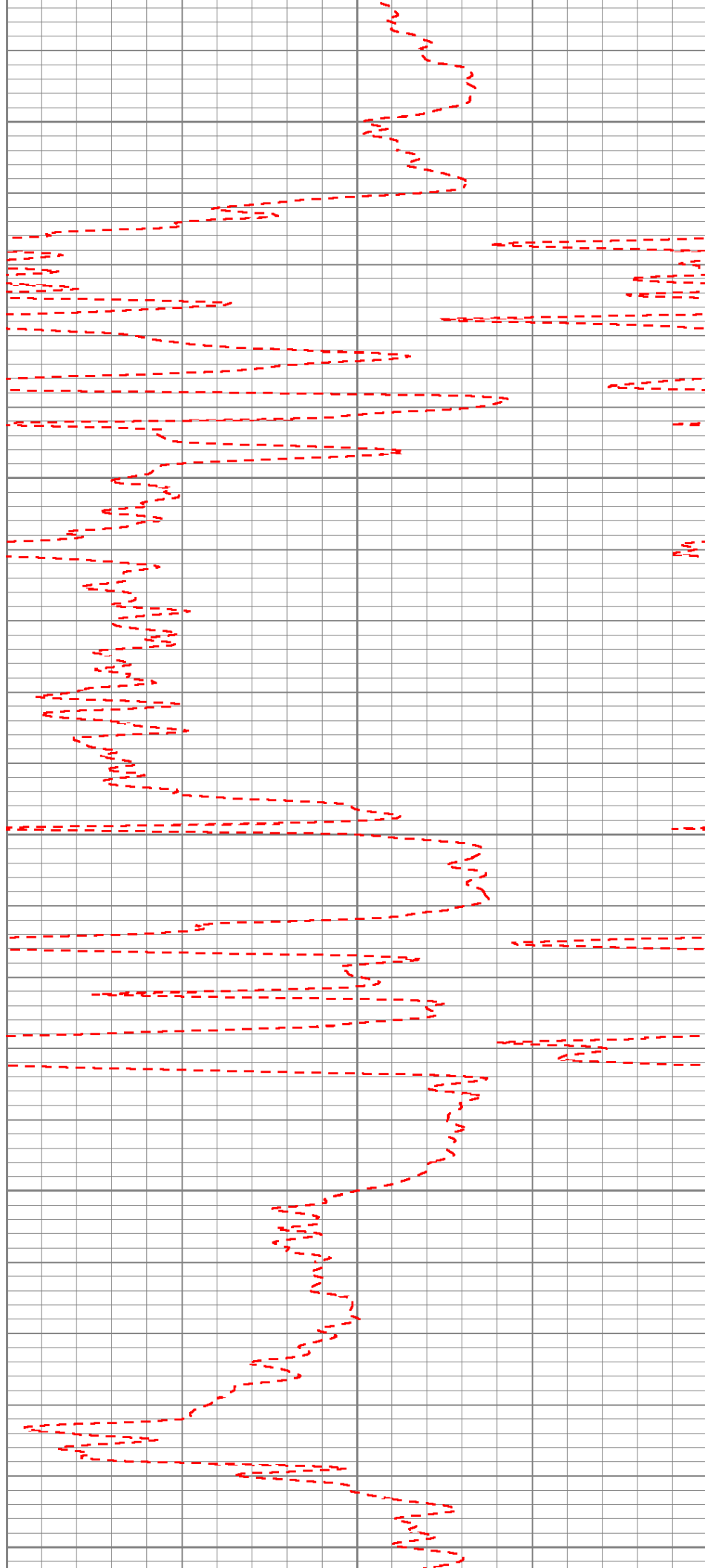
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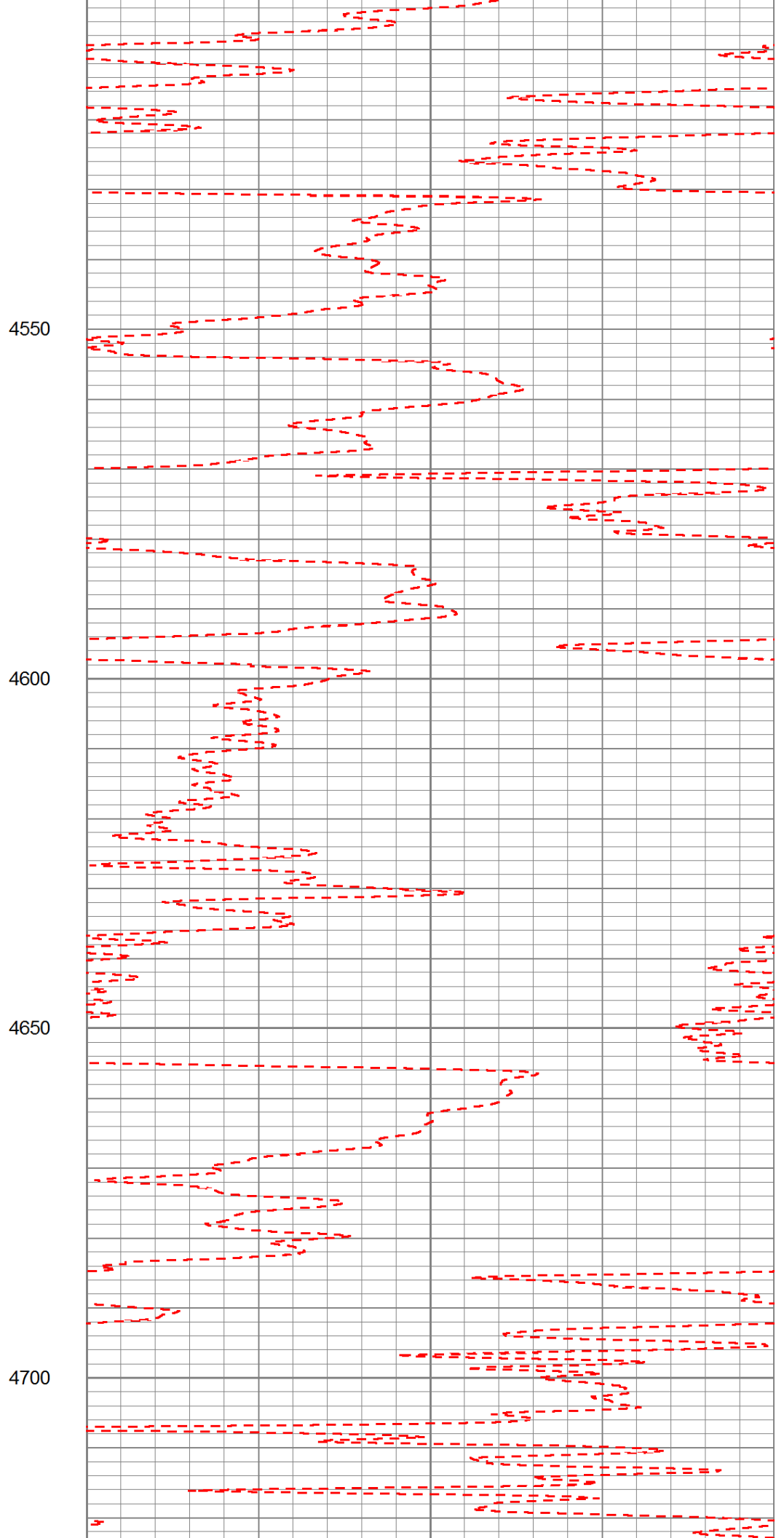
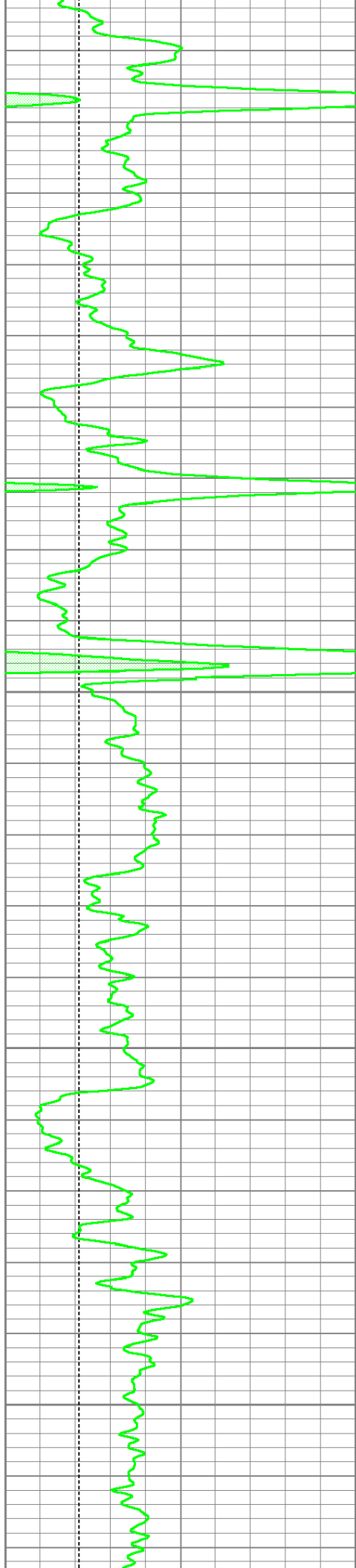
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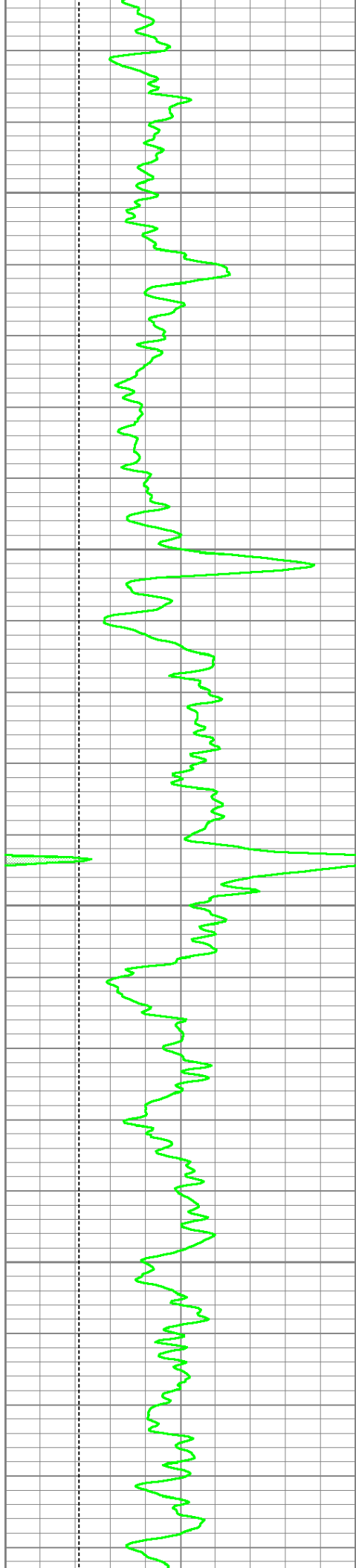
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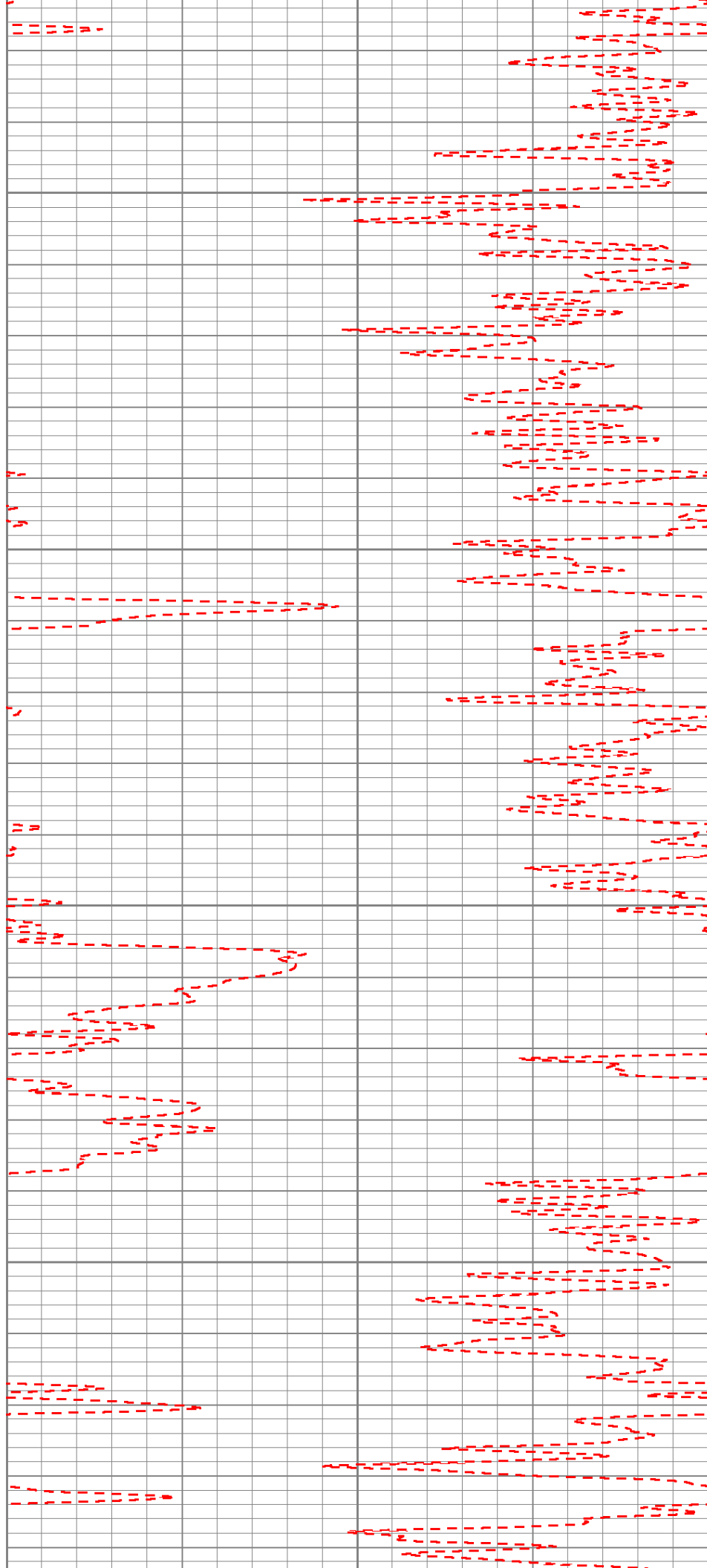


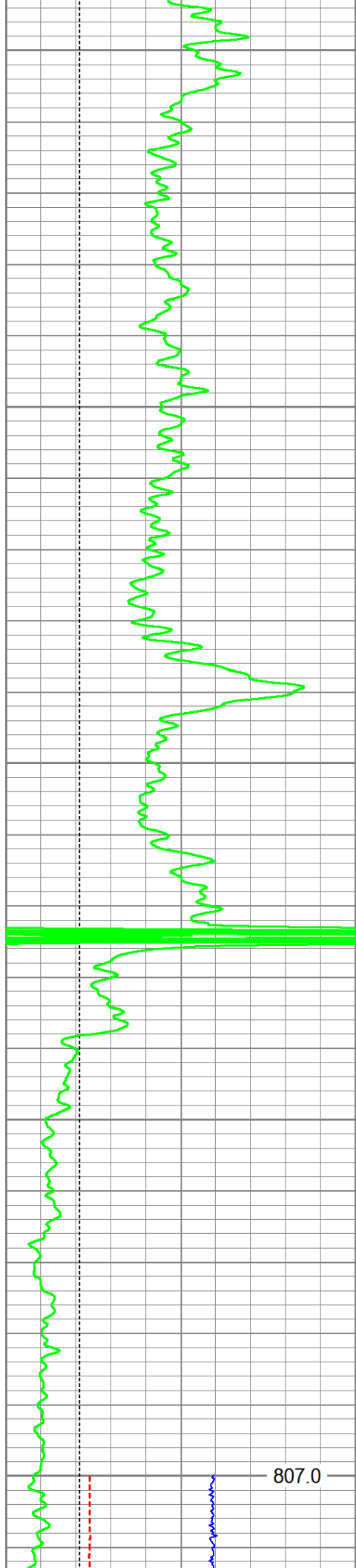
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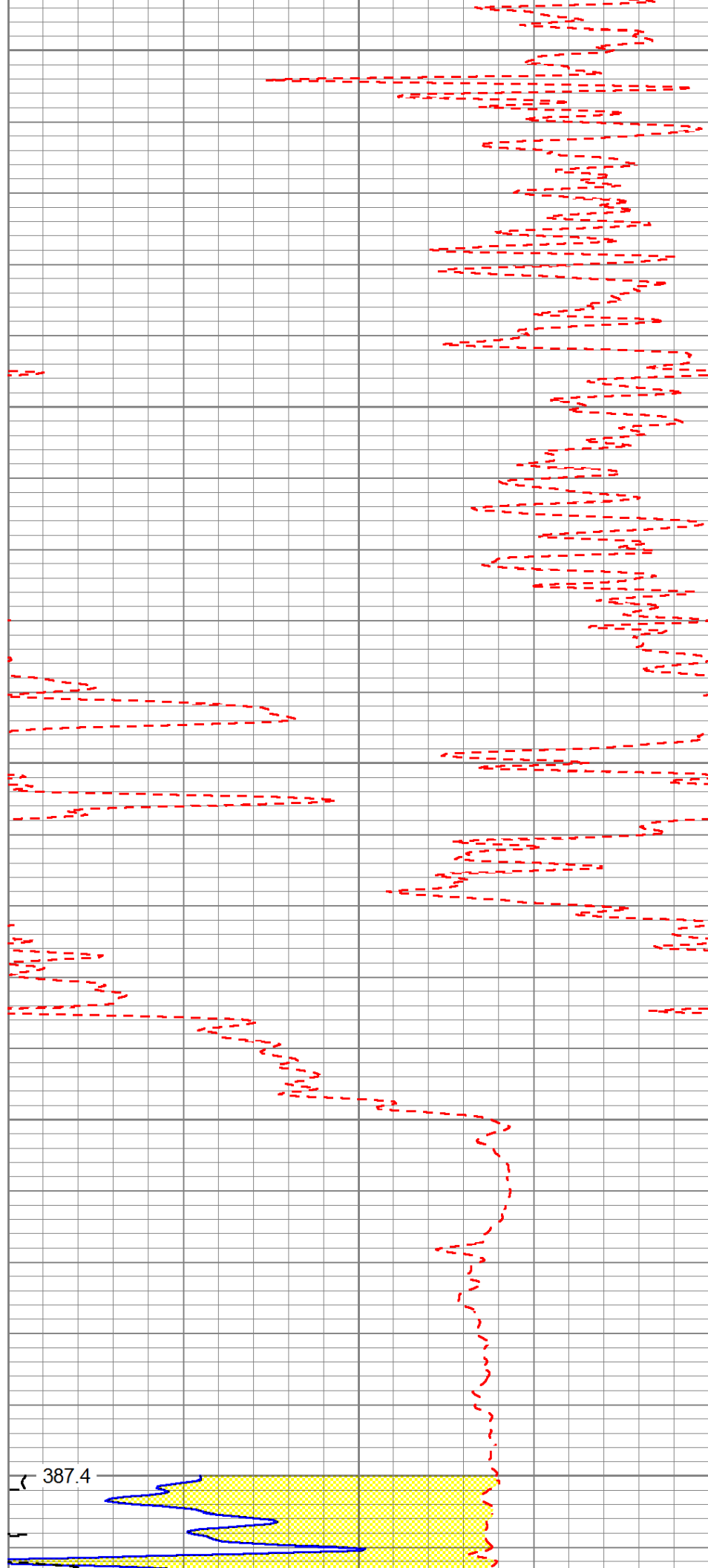
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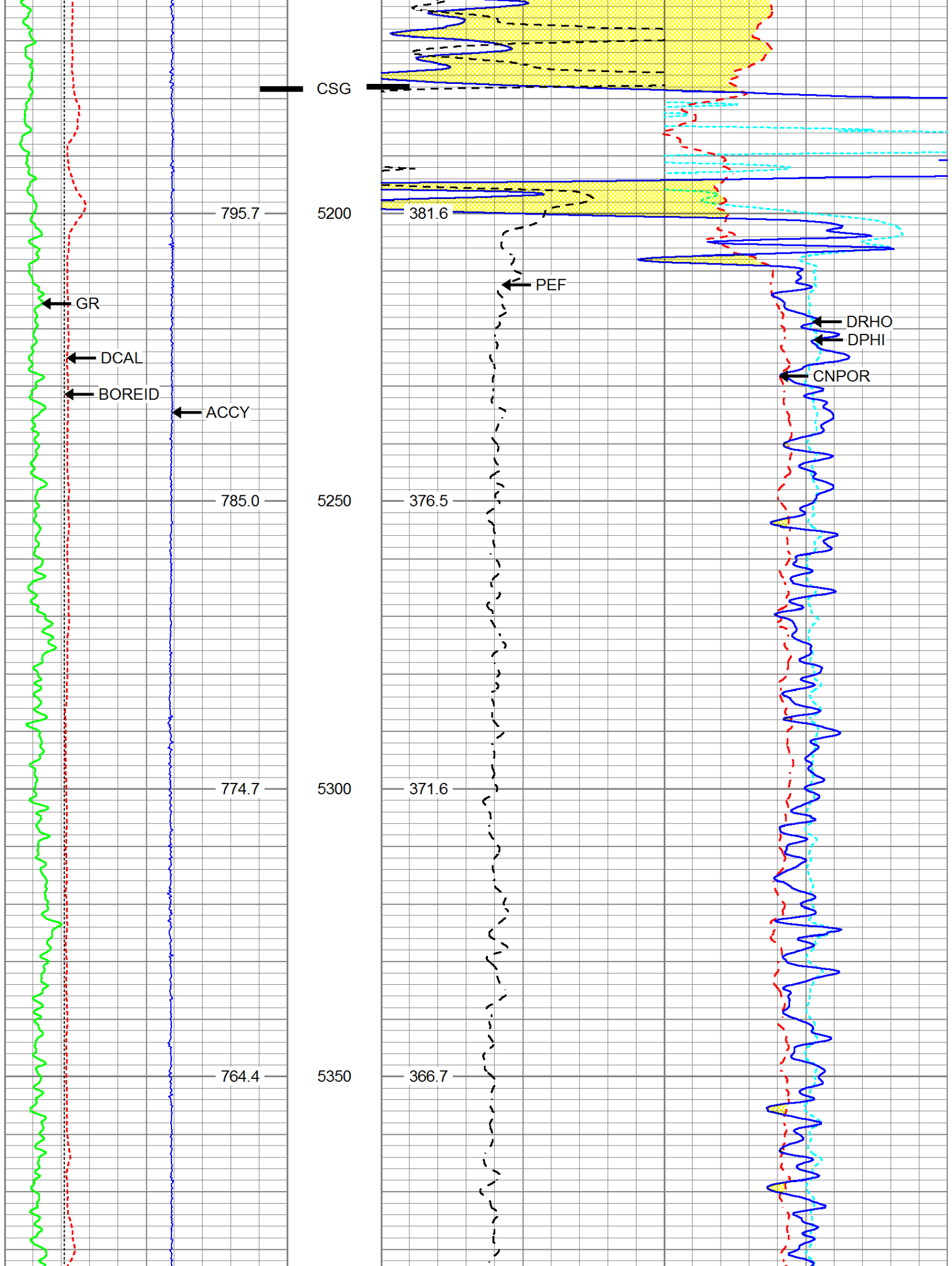
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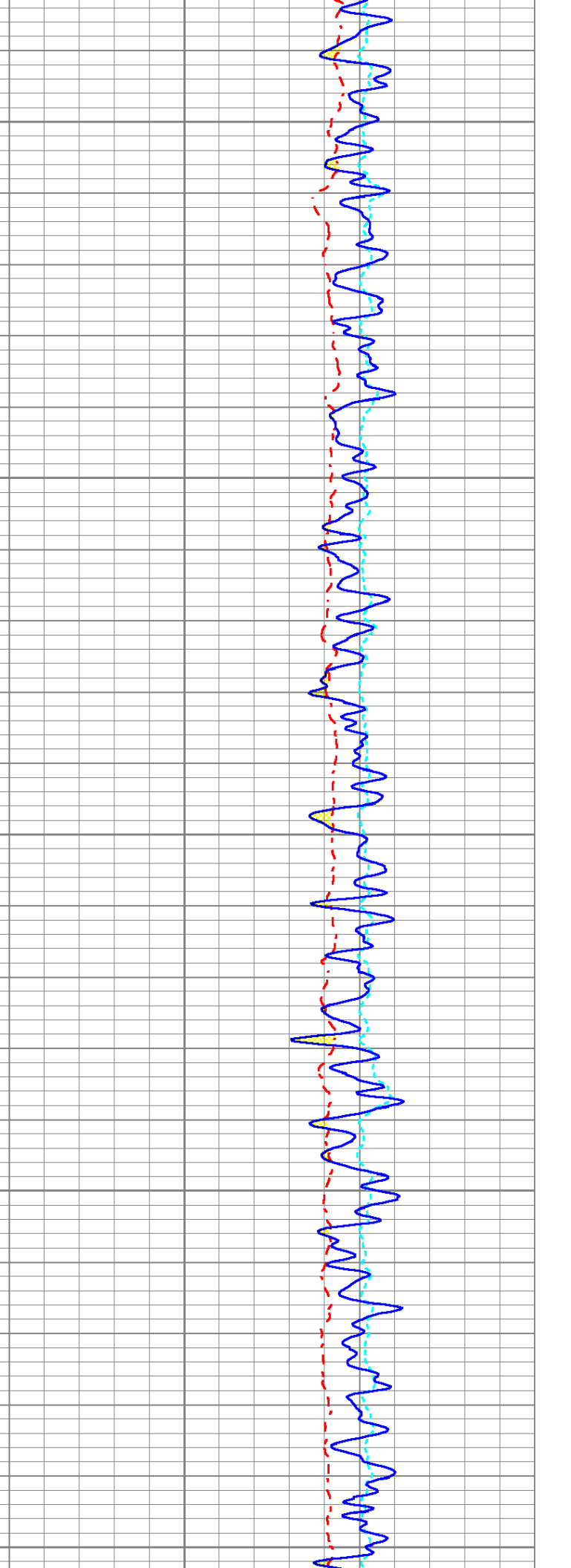
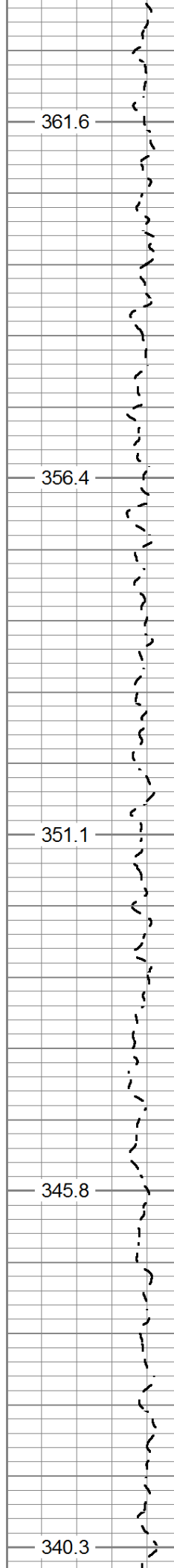
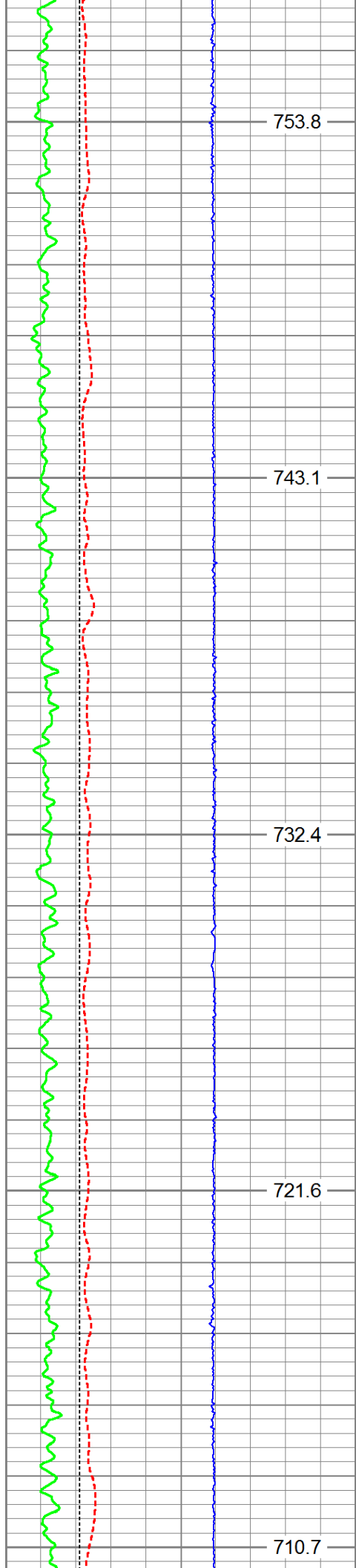
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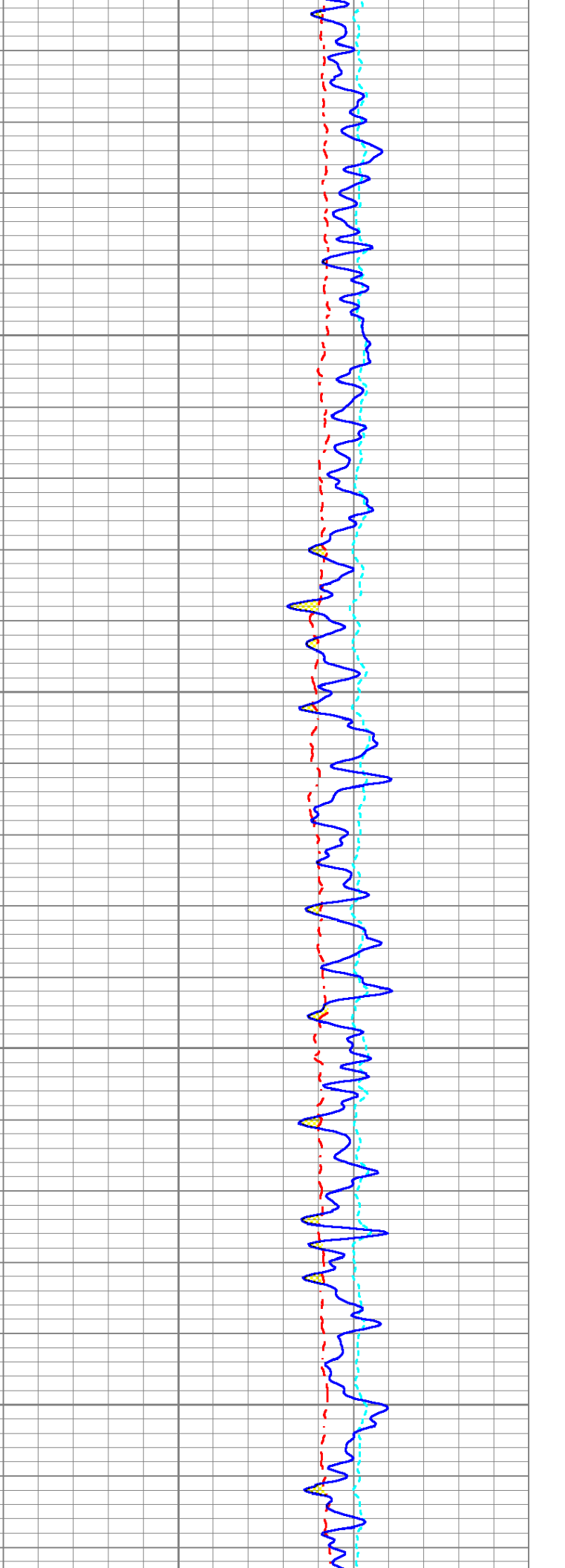
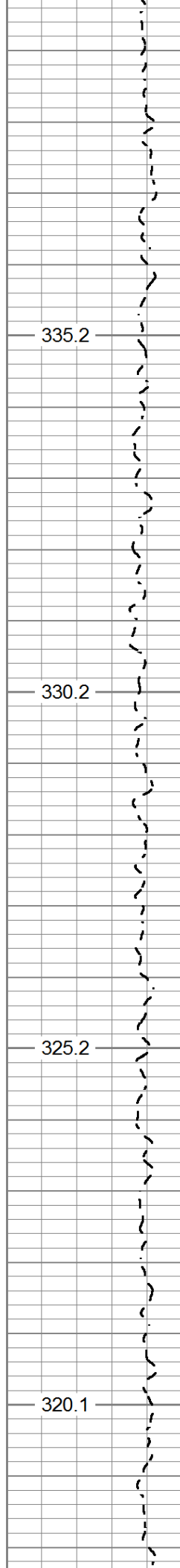
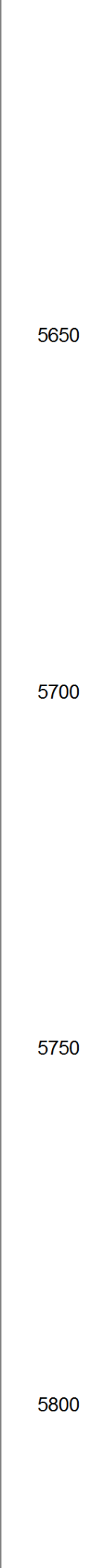
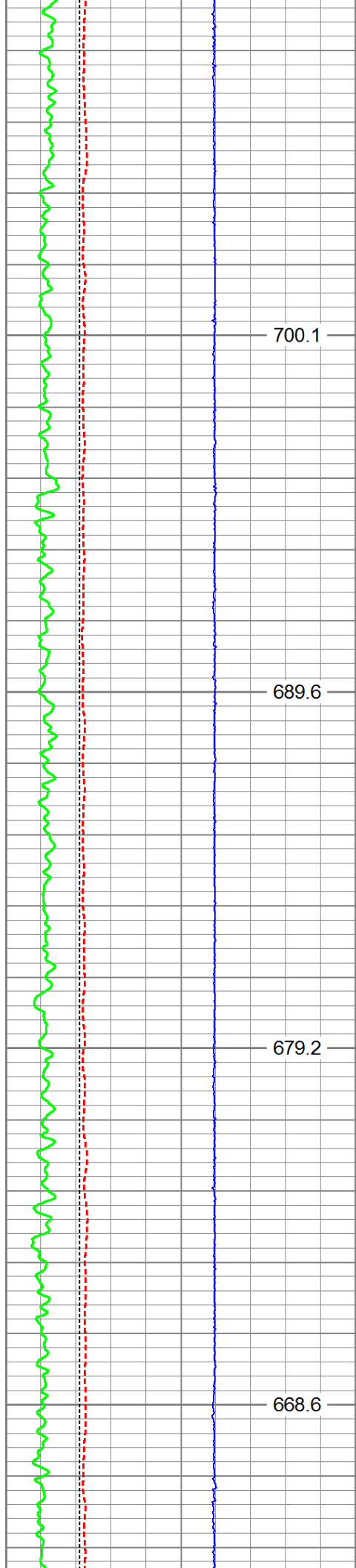
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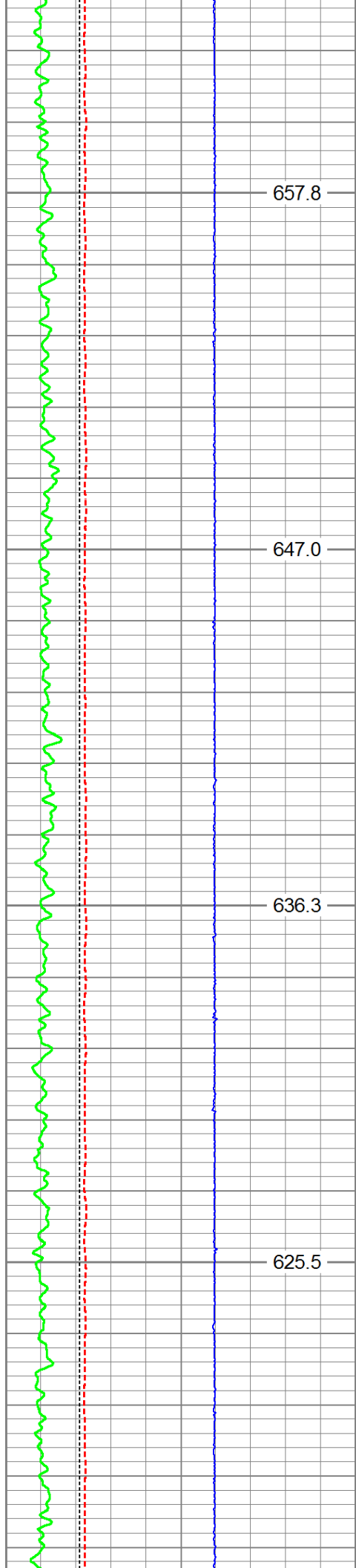
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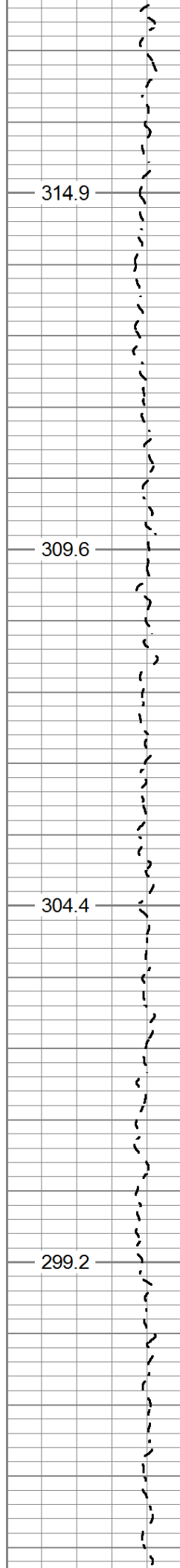
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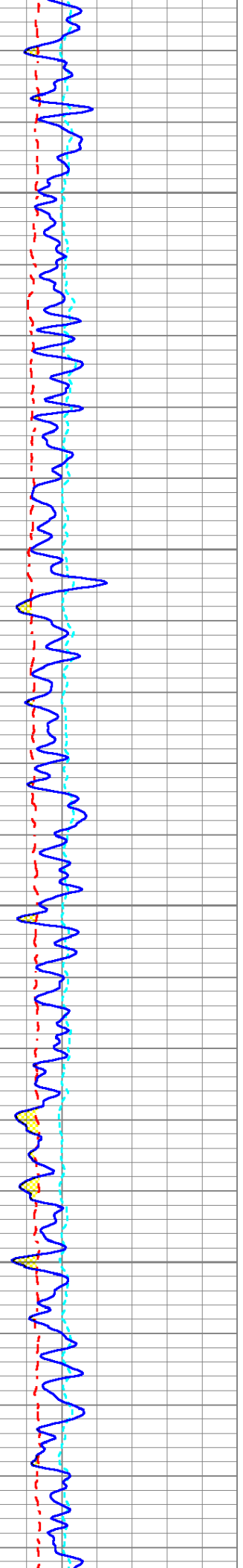
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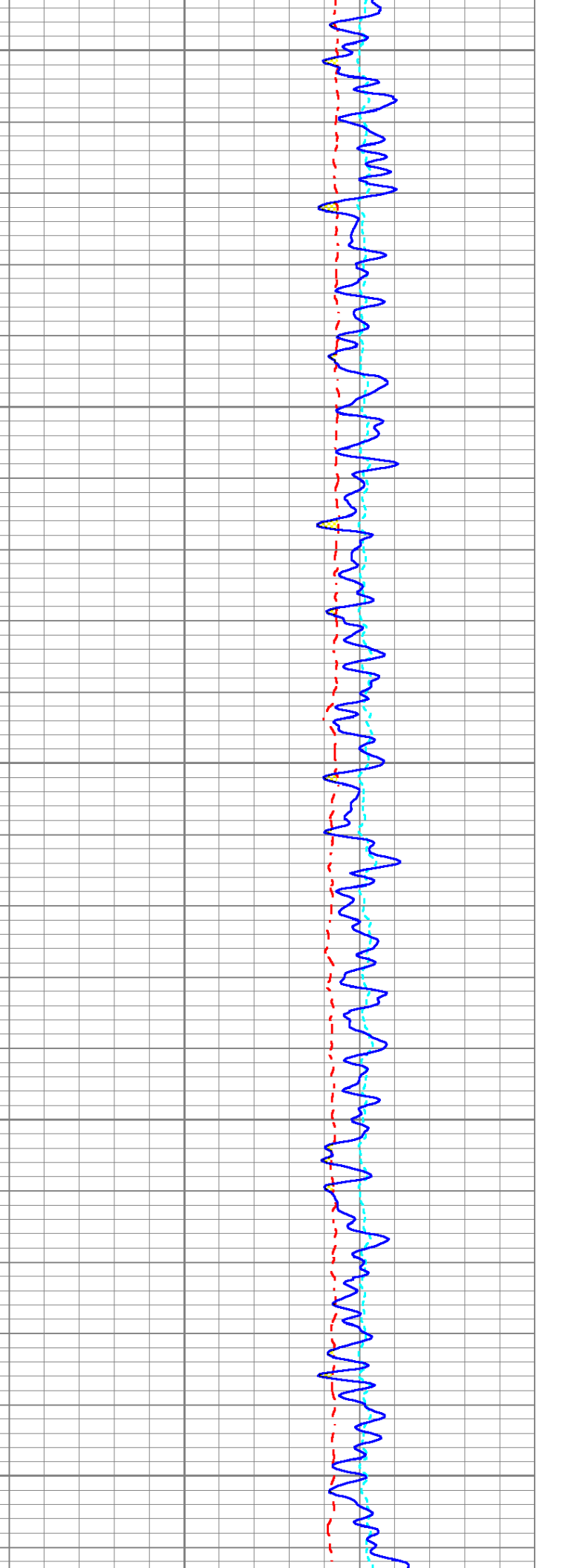
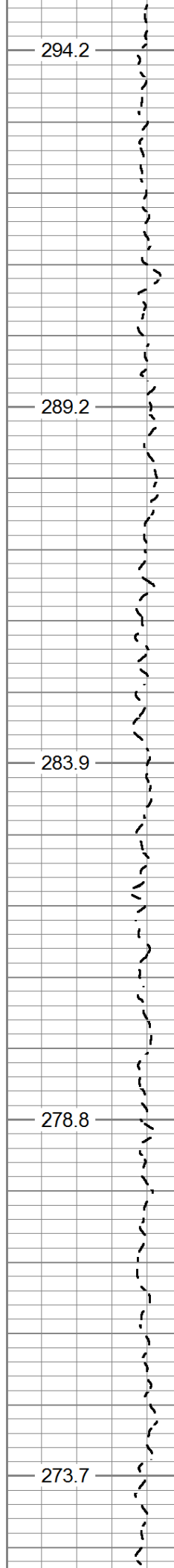
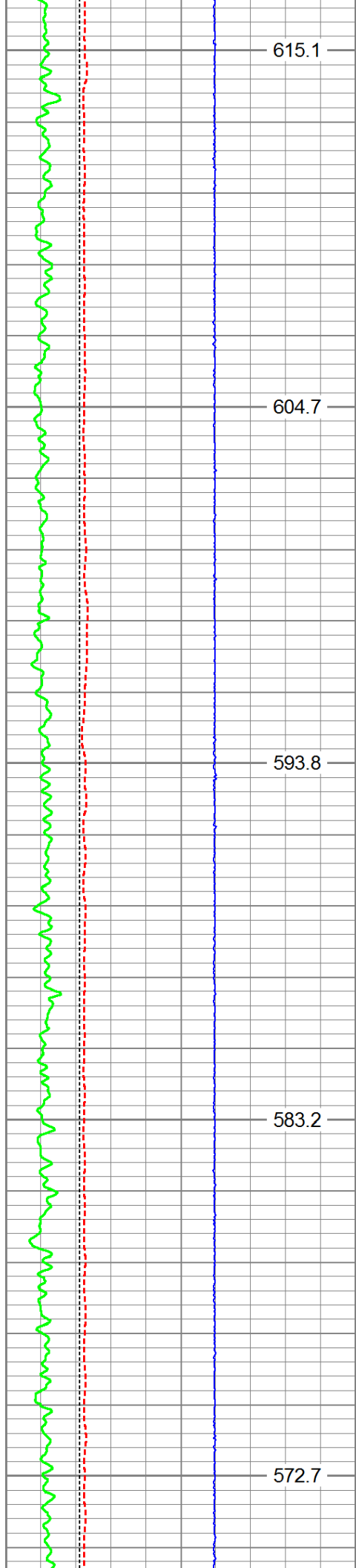
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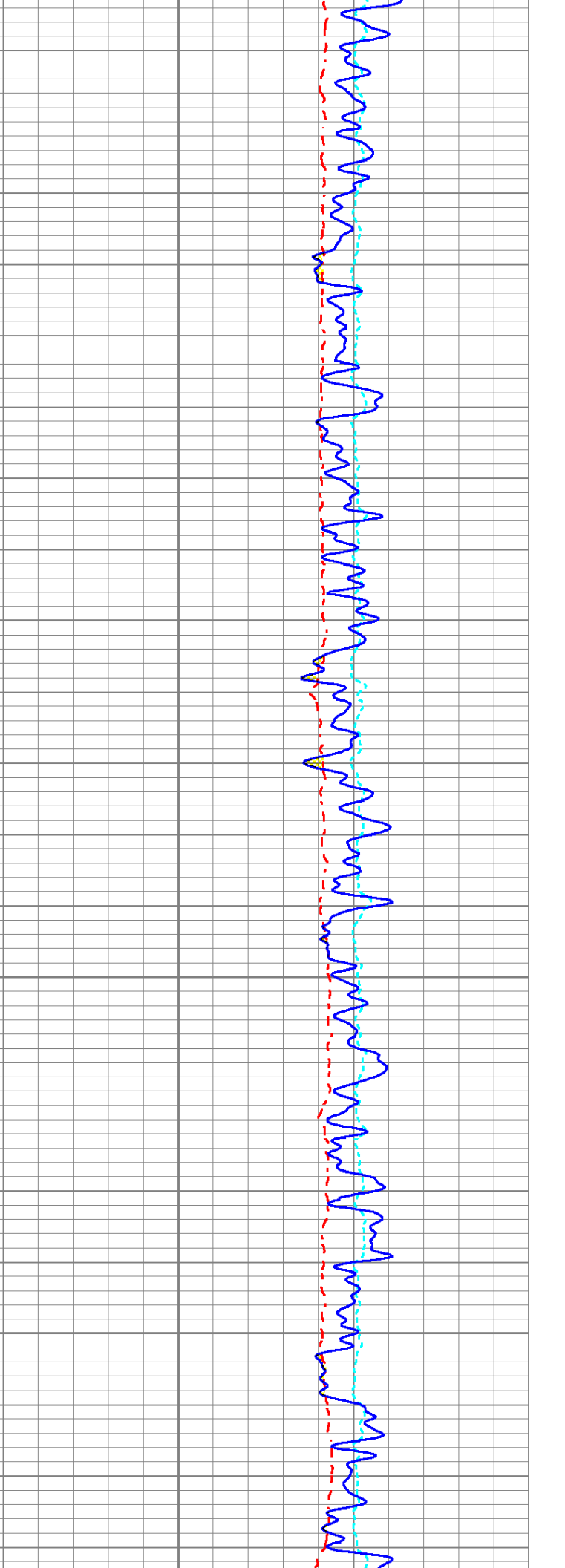
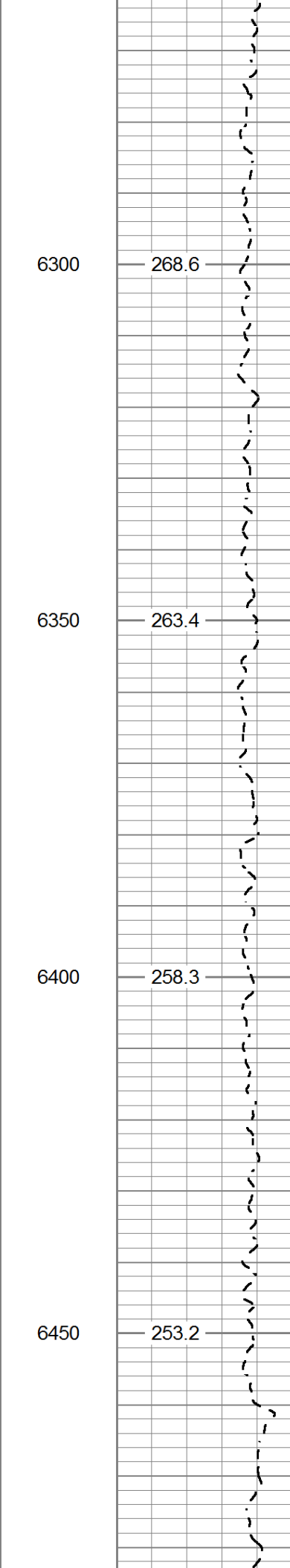
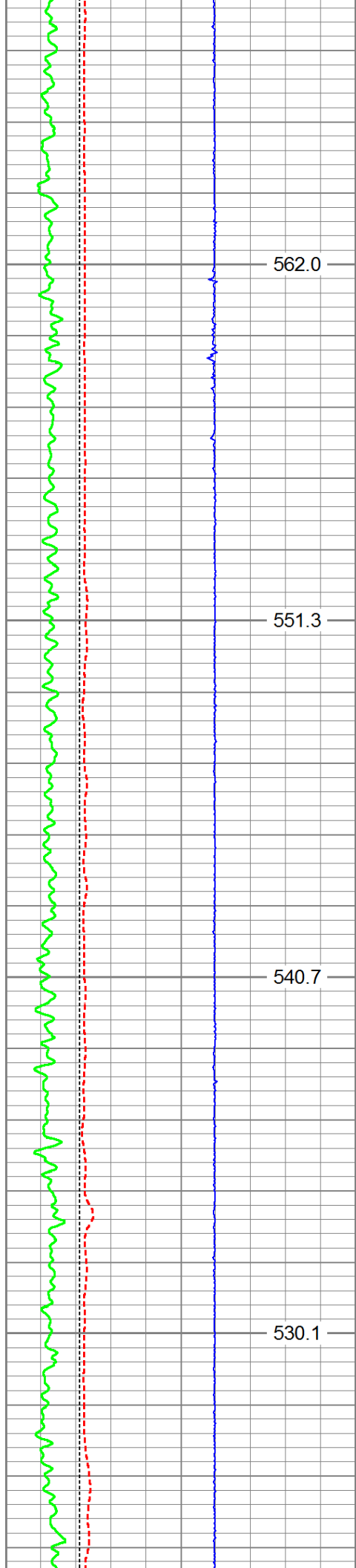
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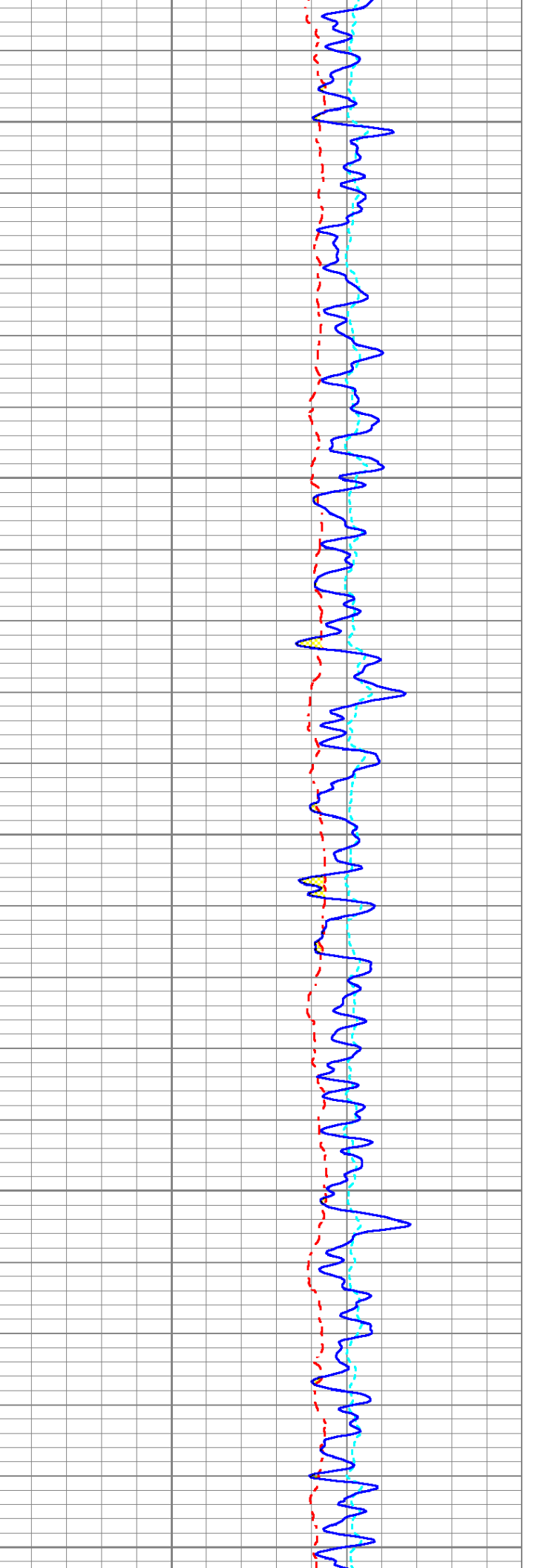
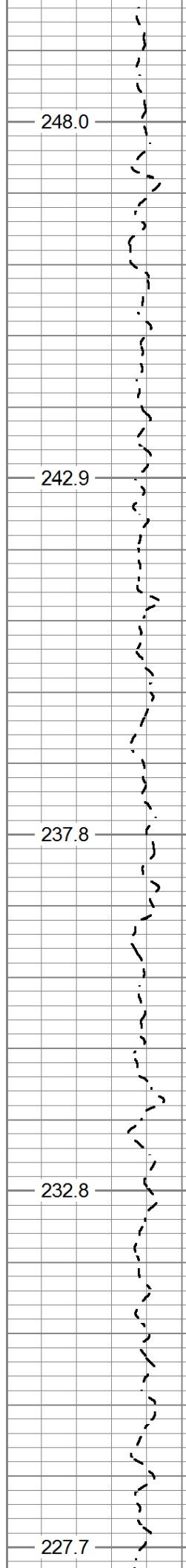
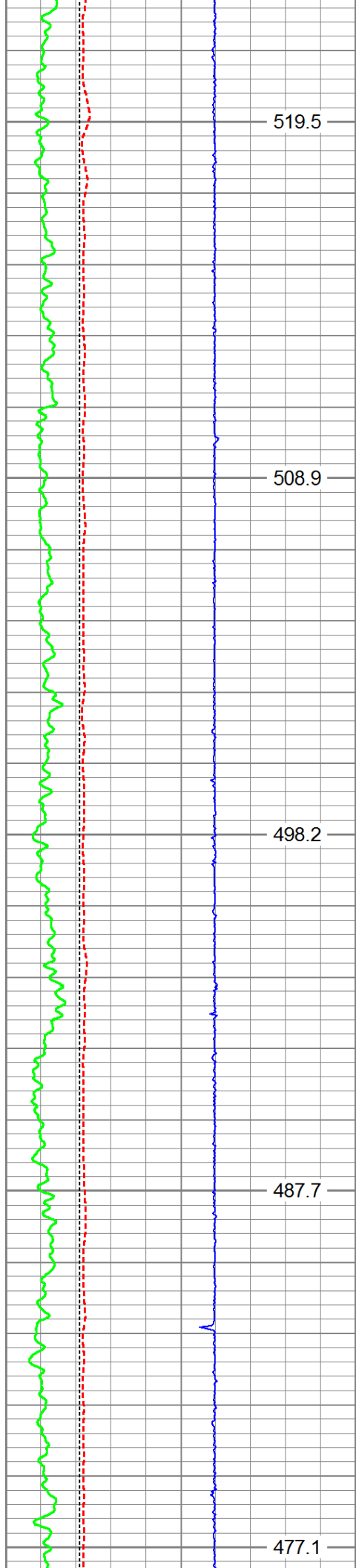
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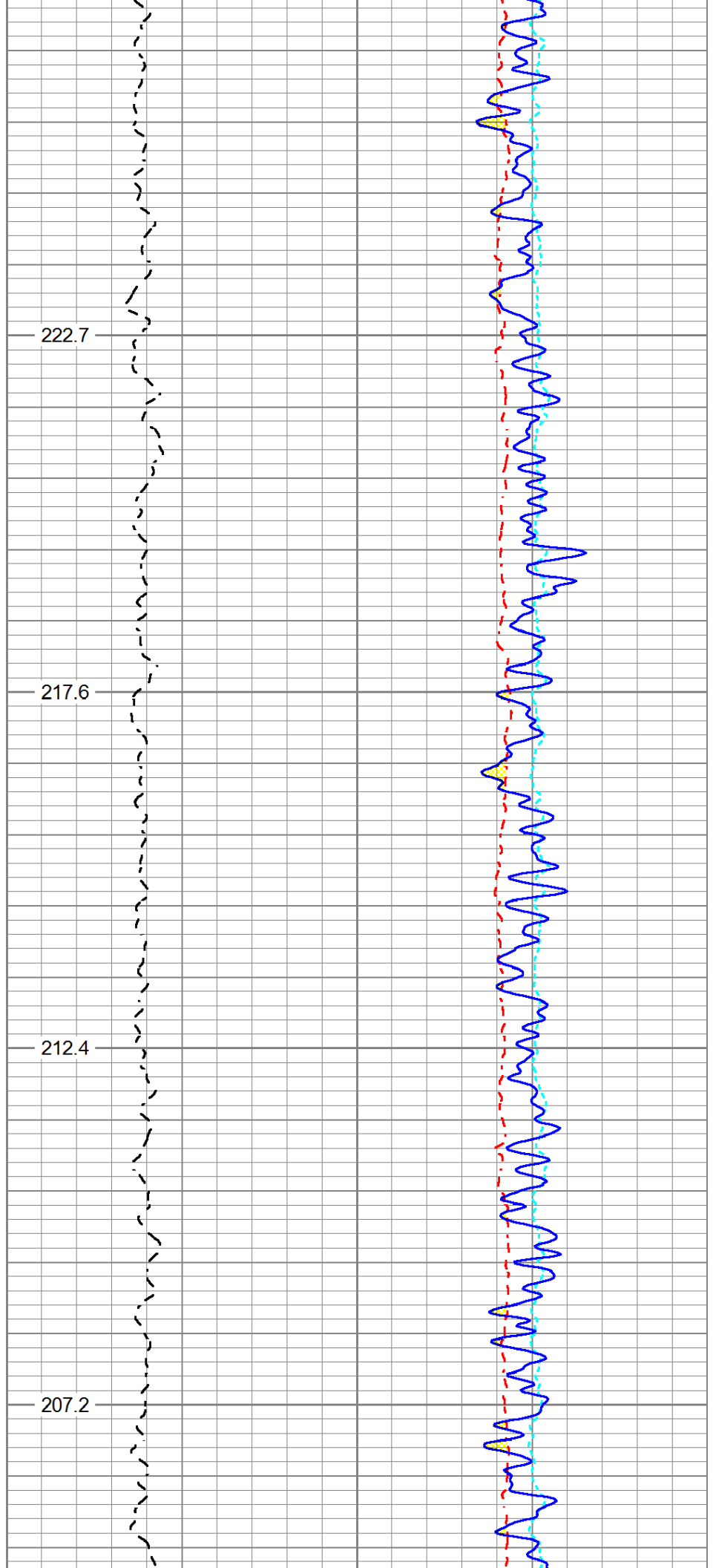
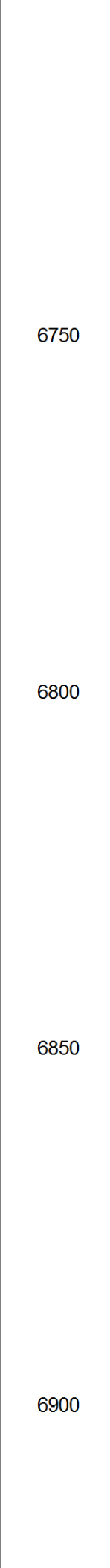
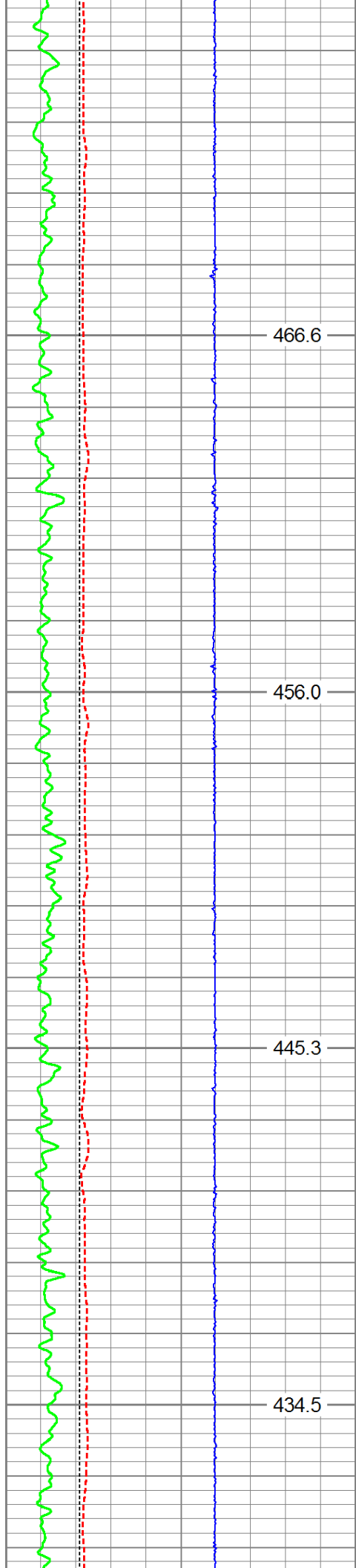
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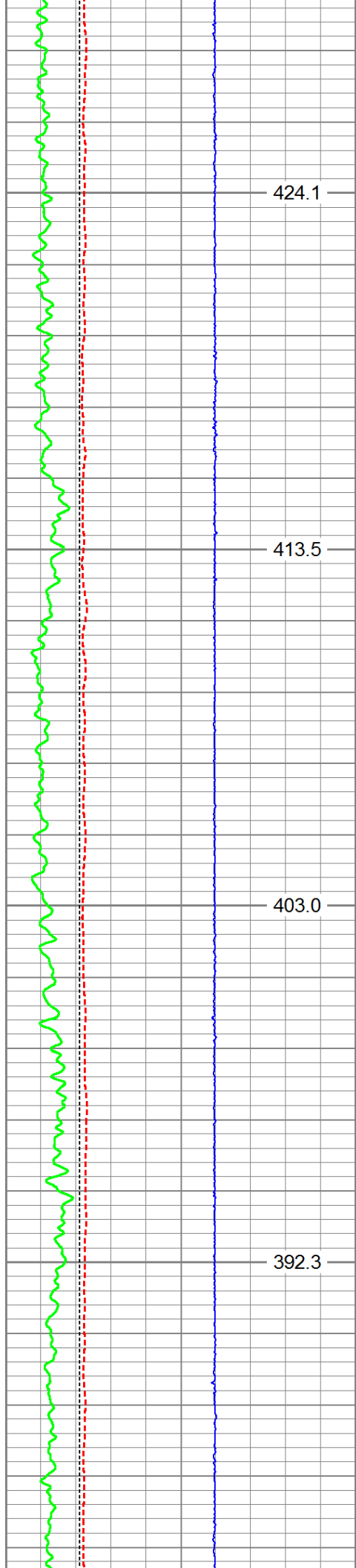
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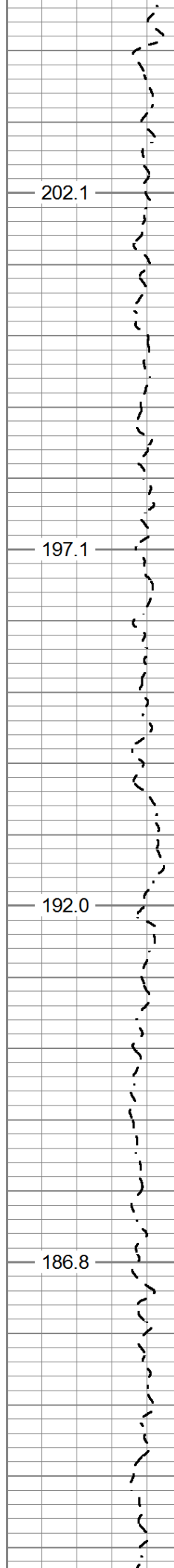


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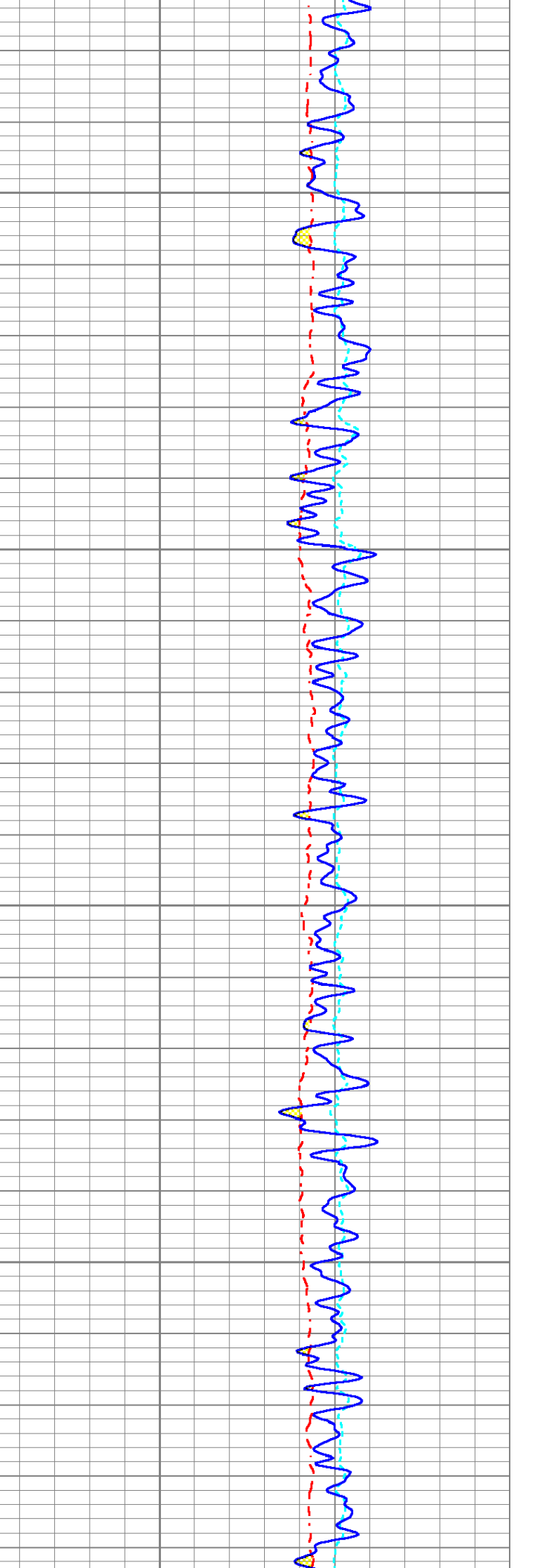


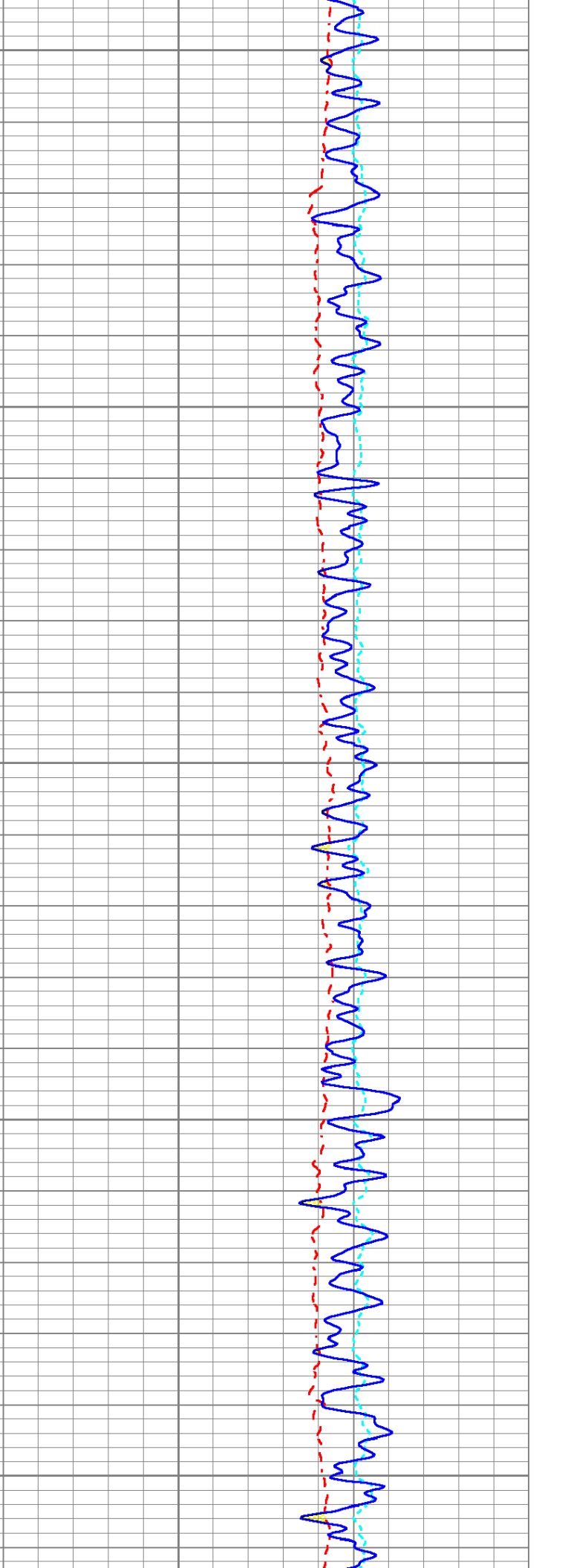
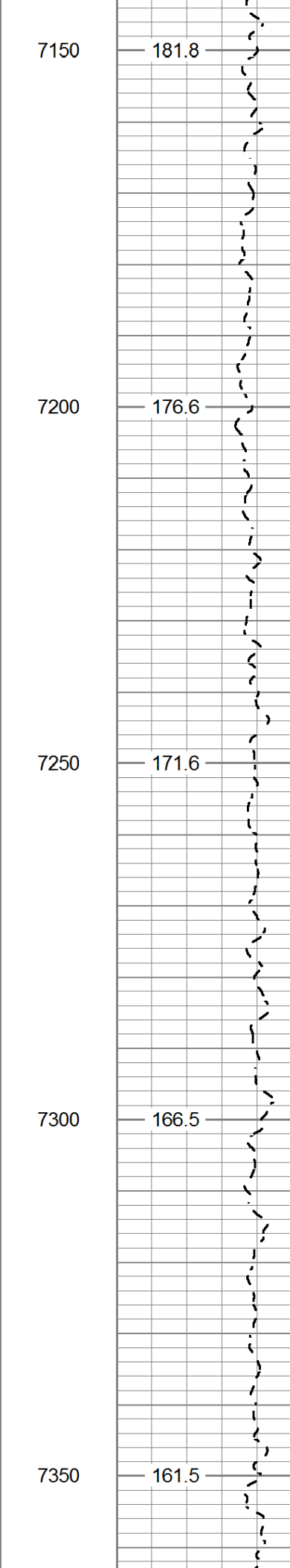
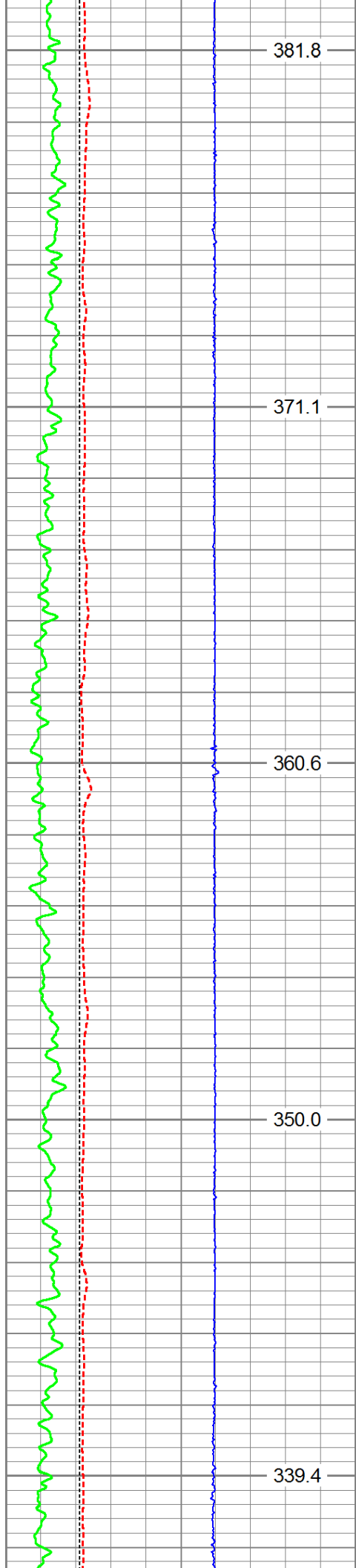
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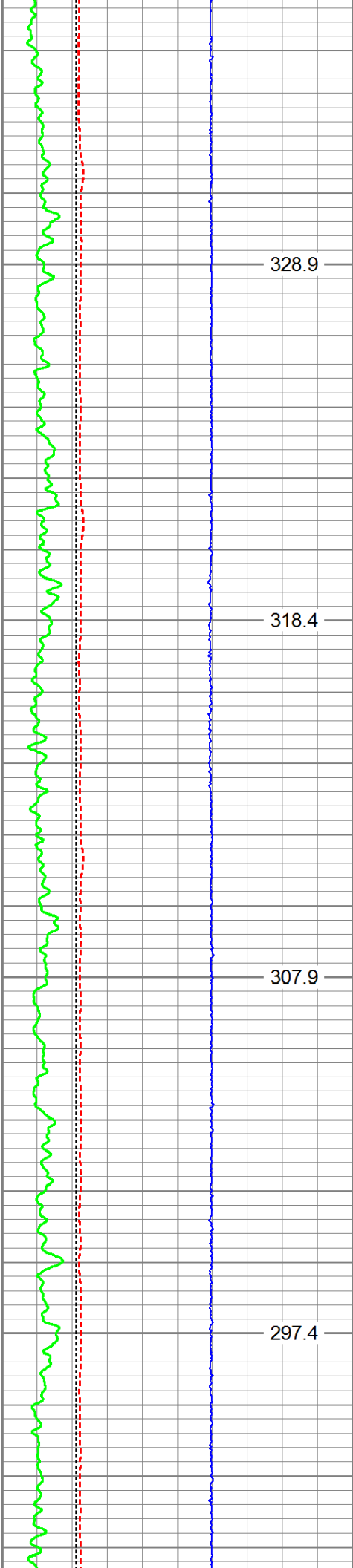
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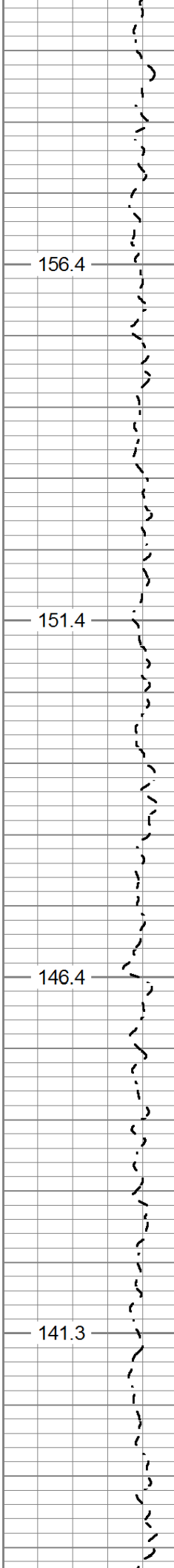


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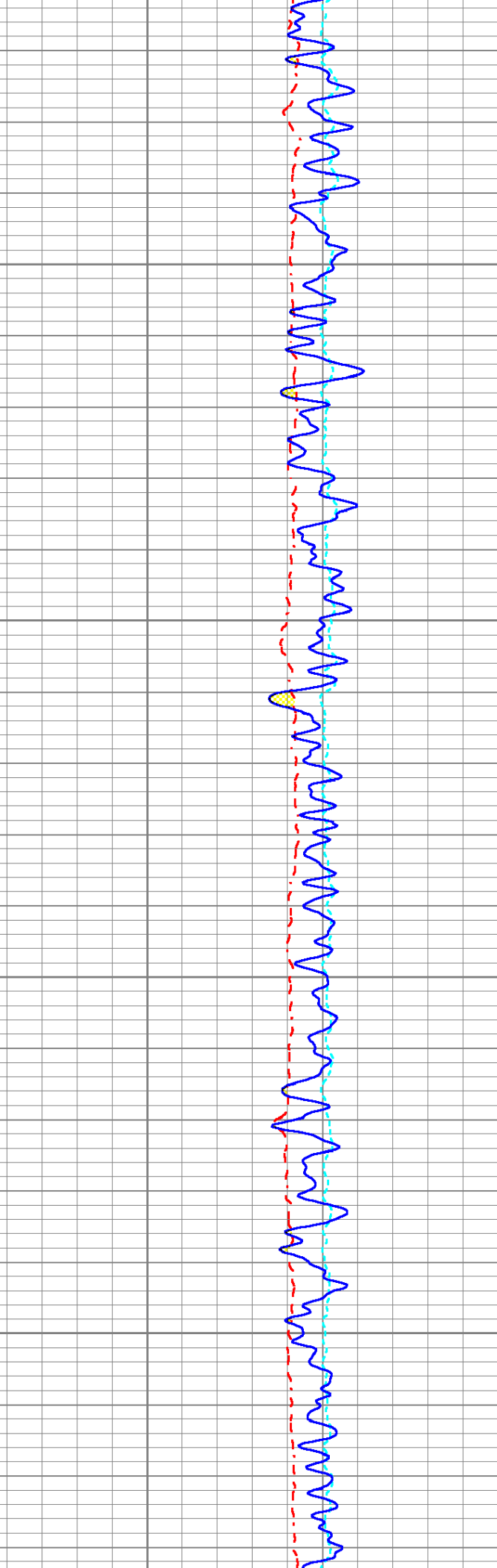


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151.4

146.4

141.3

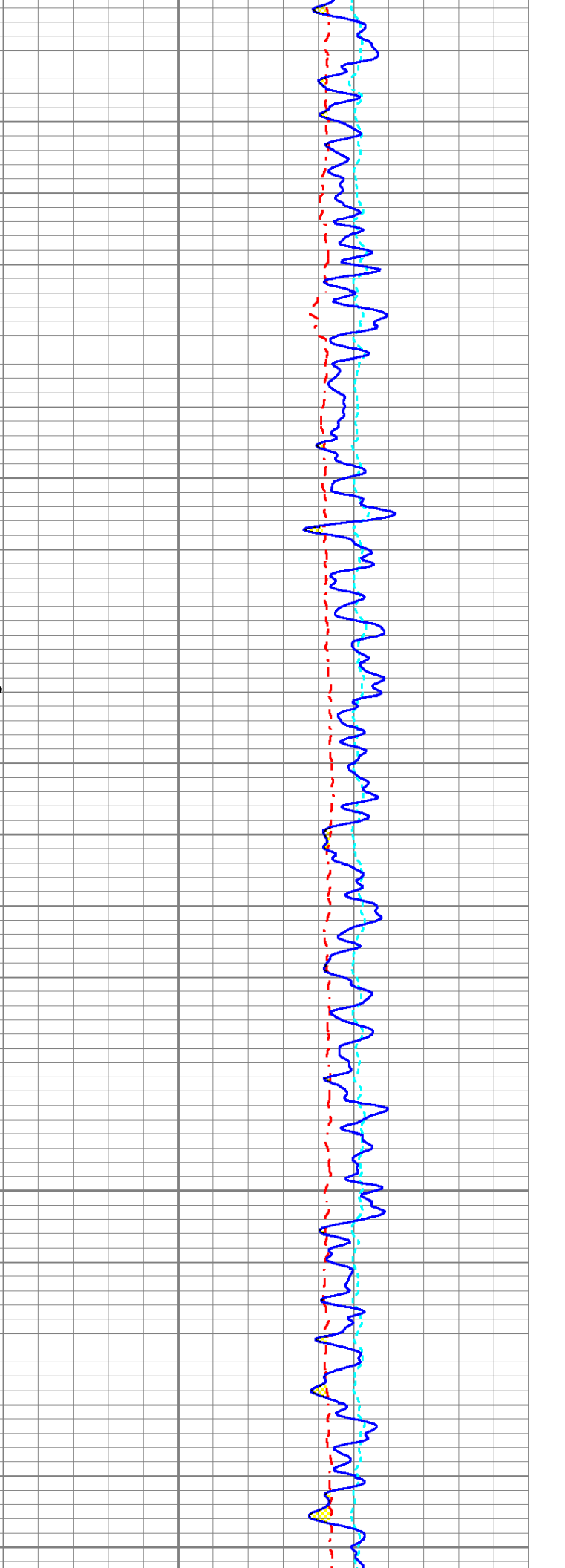
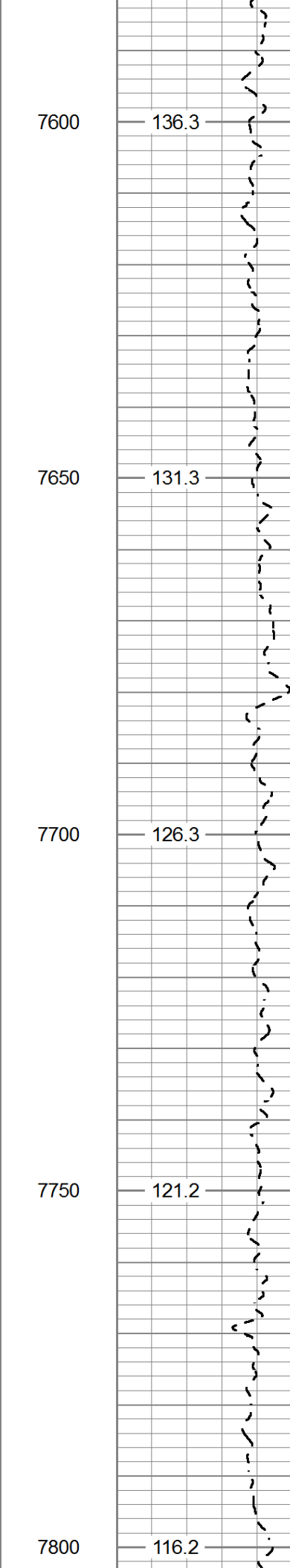
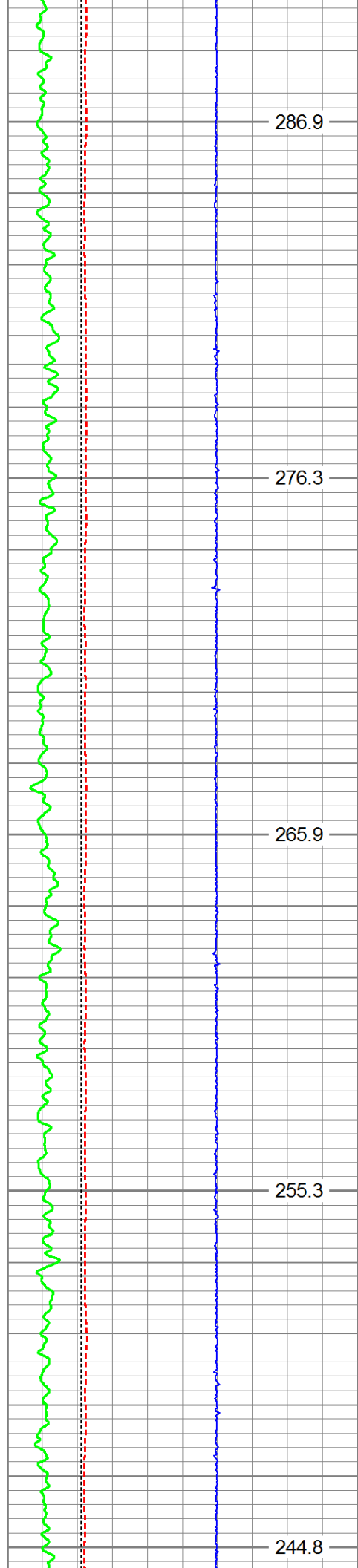


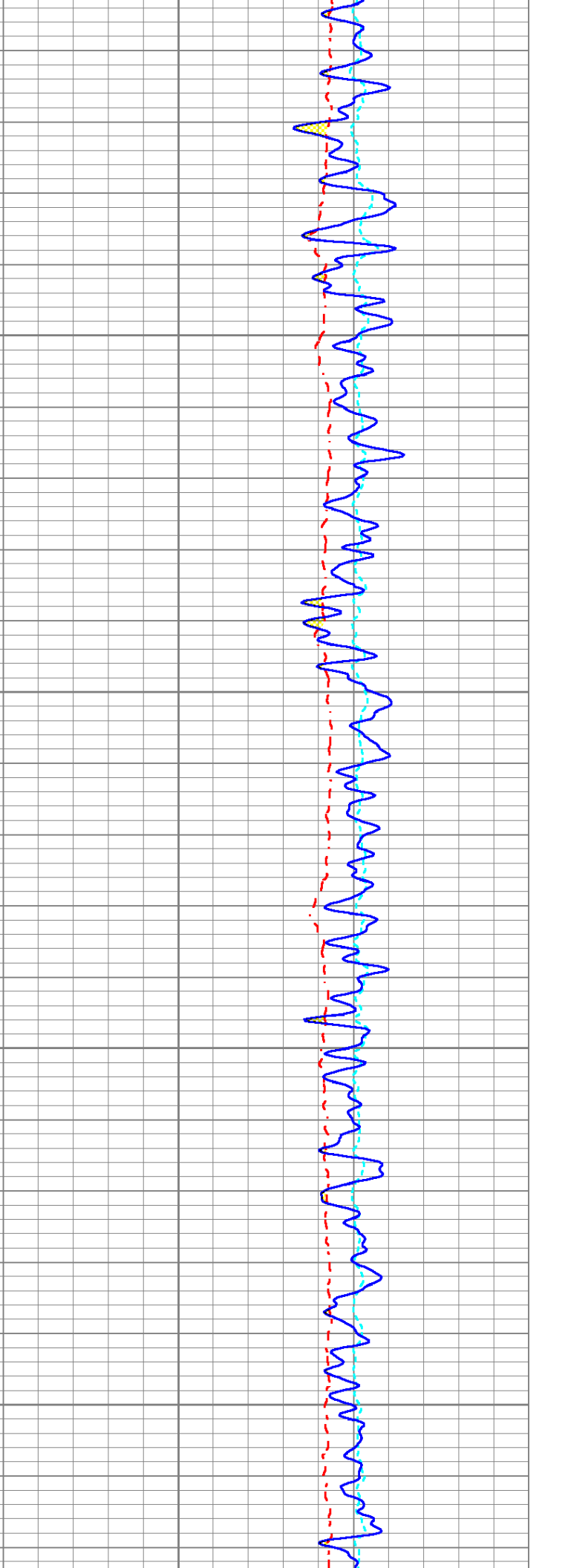
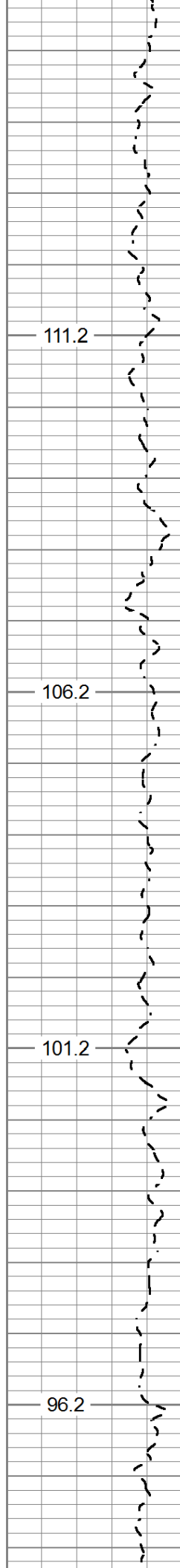
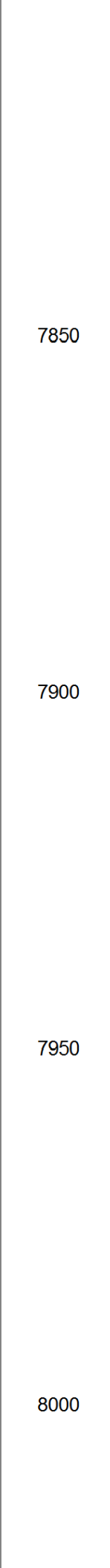
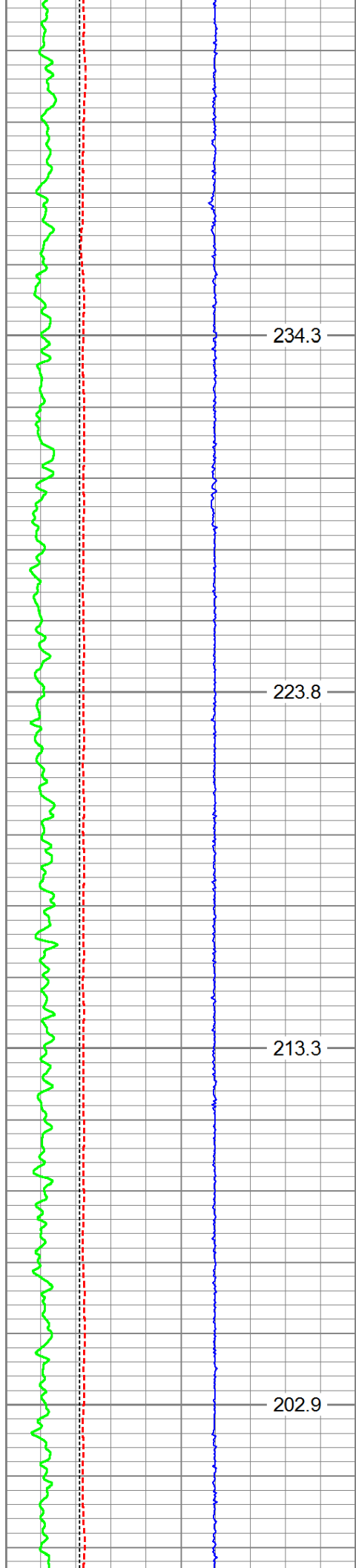
156.4

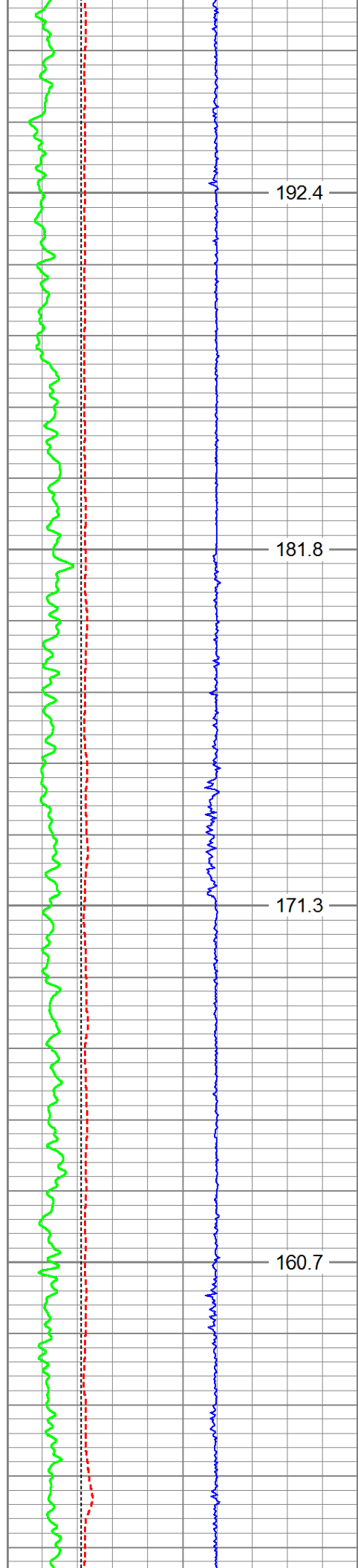
151.4

146.4

141.3





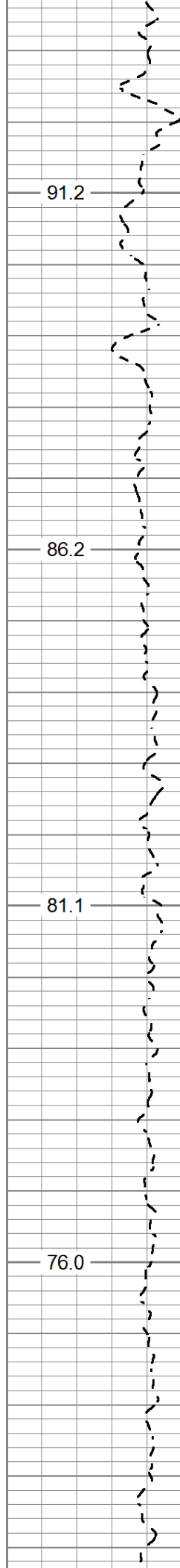


8050

8100

8150

8200



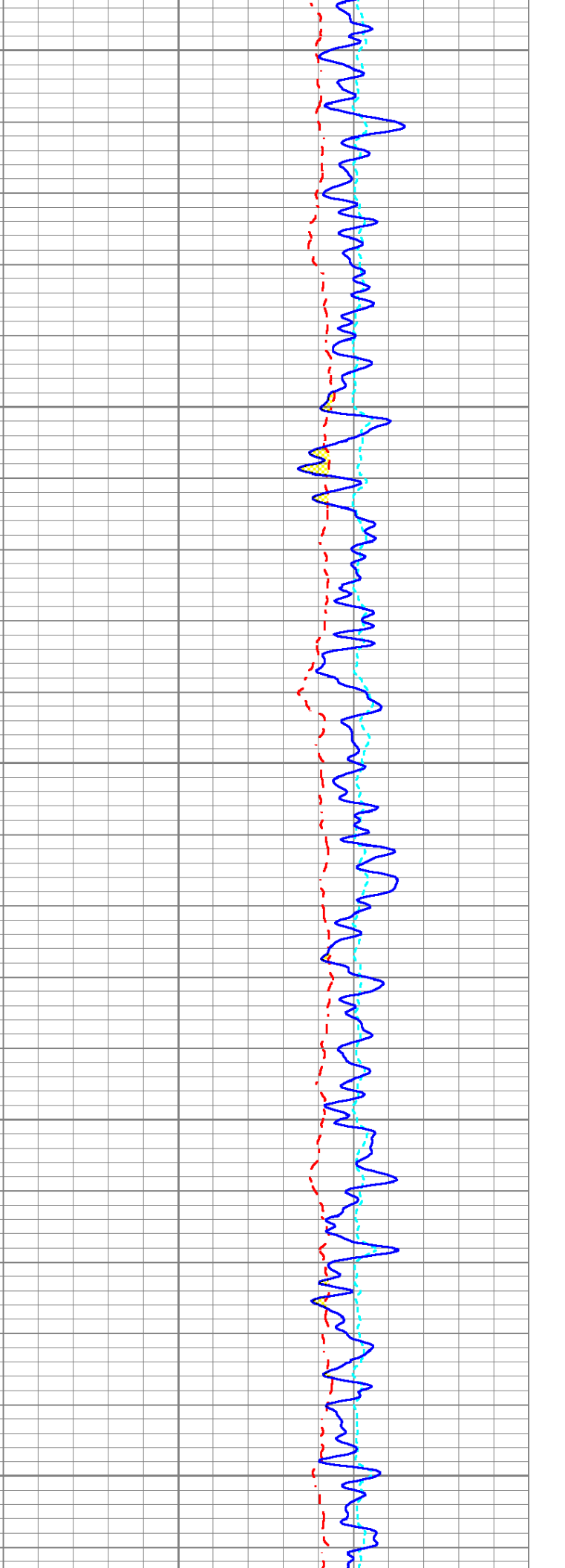
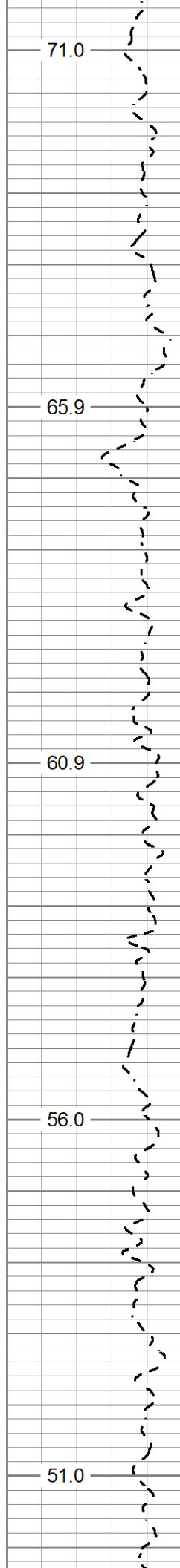
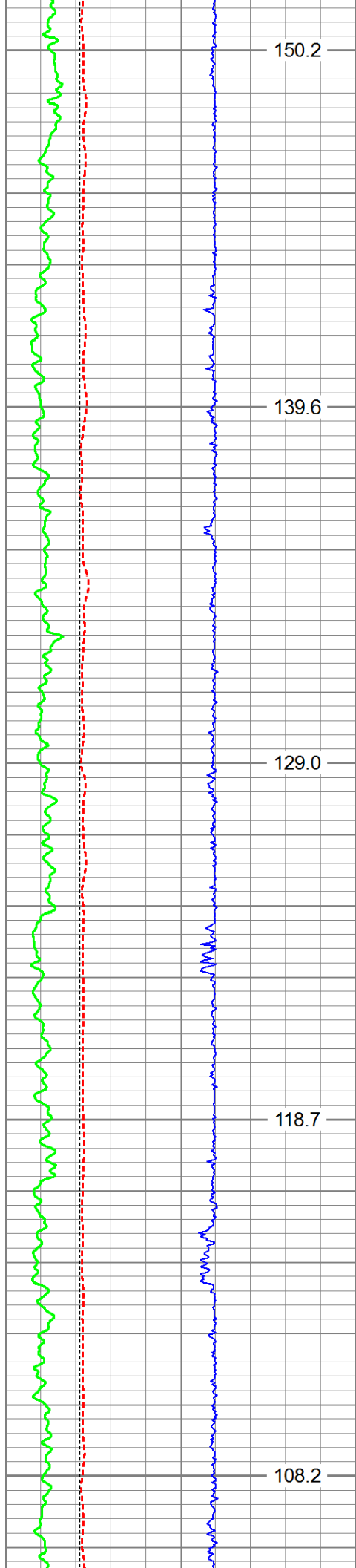
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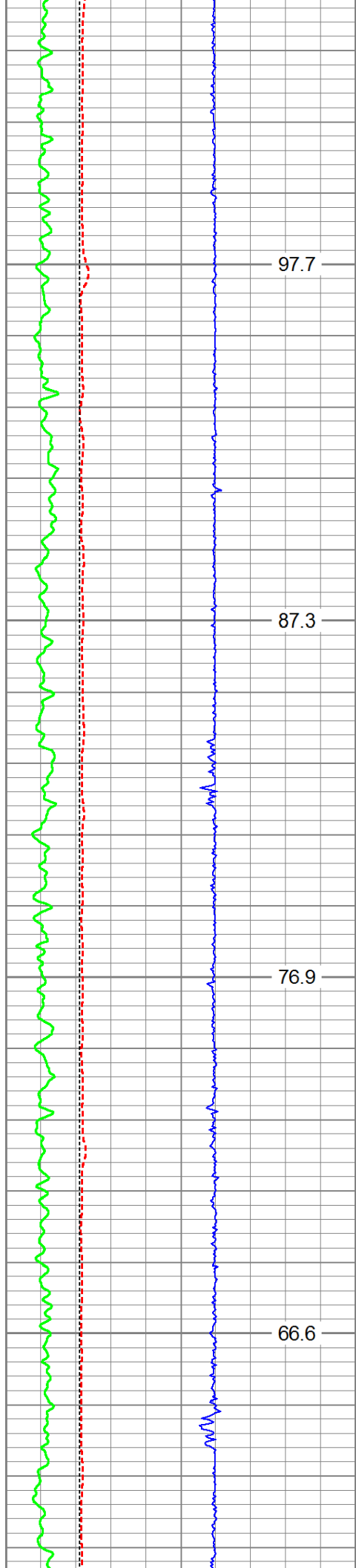
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8150

8200







97.7

87.3

76.9

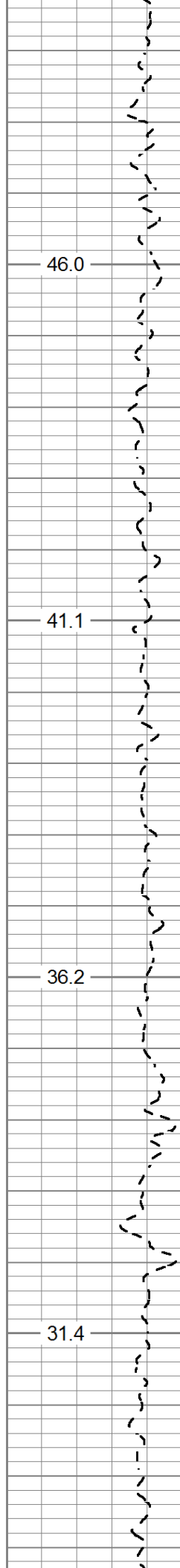
66.6

8500

8550

8600

8650

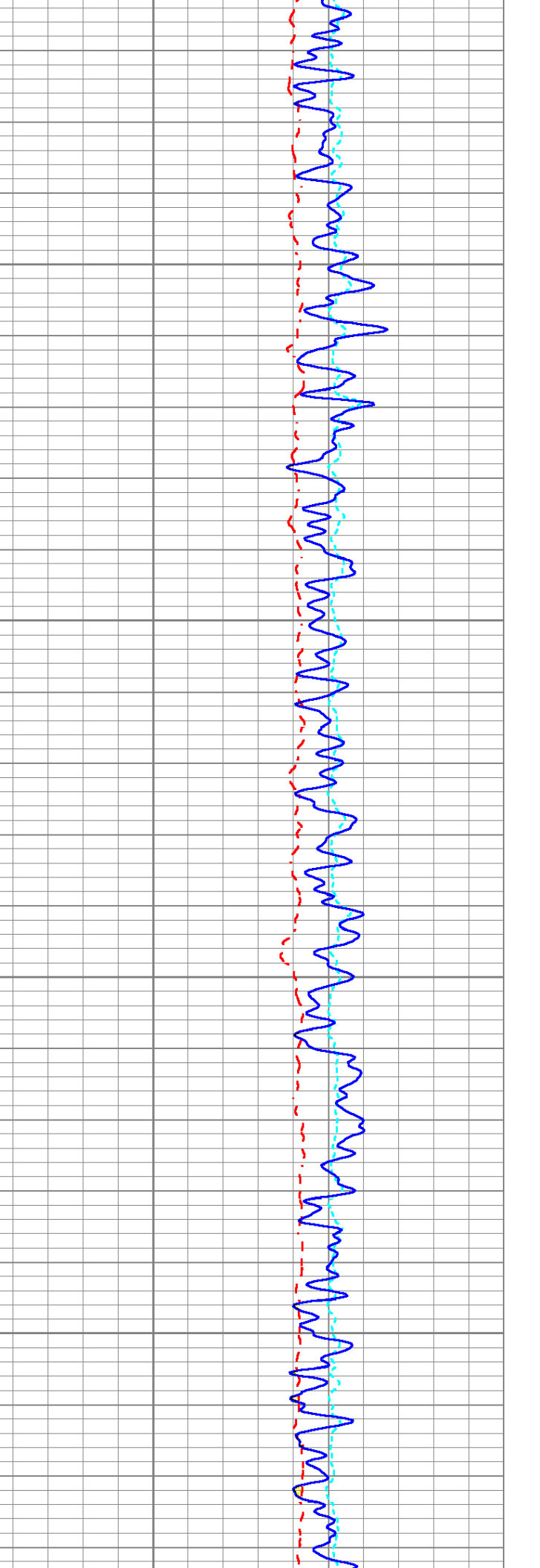


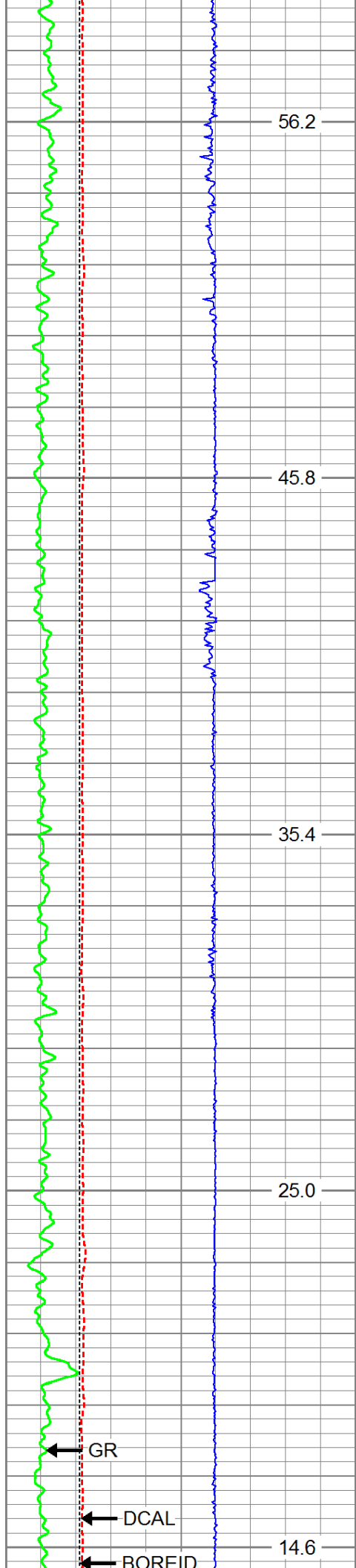
46.0

41.1

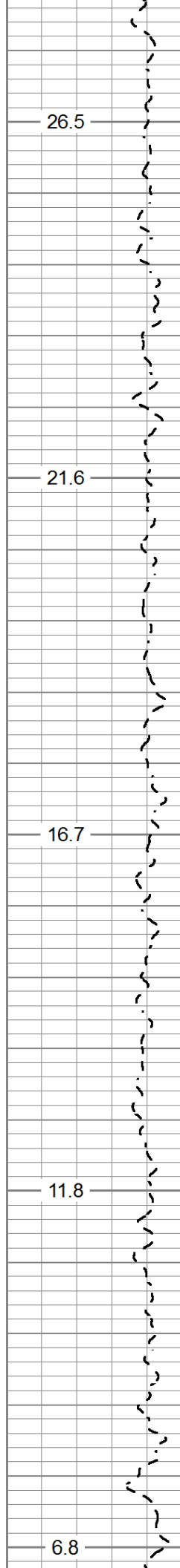
36.2

31.4

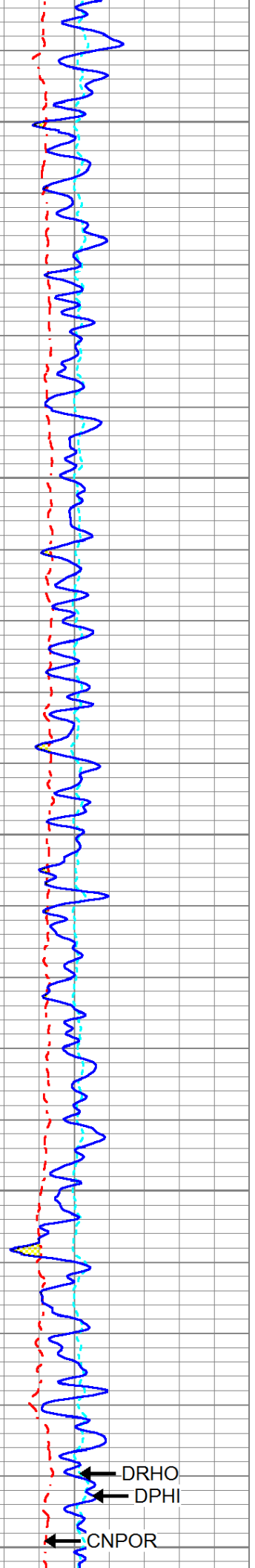




8700
8750
8800
8850
8900



8700
8750
8800
8850
8900



GR

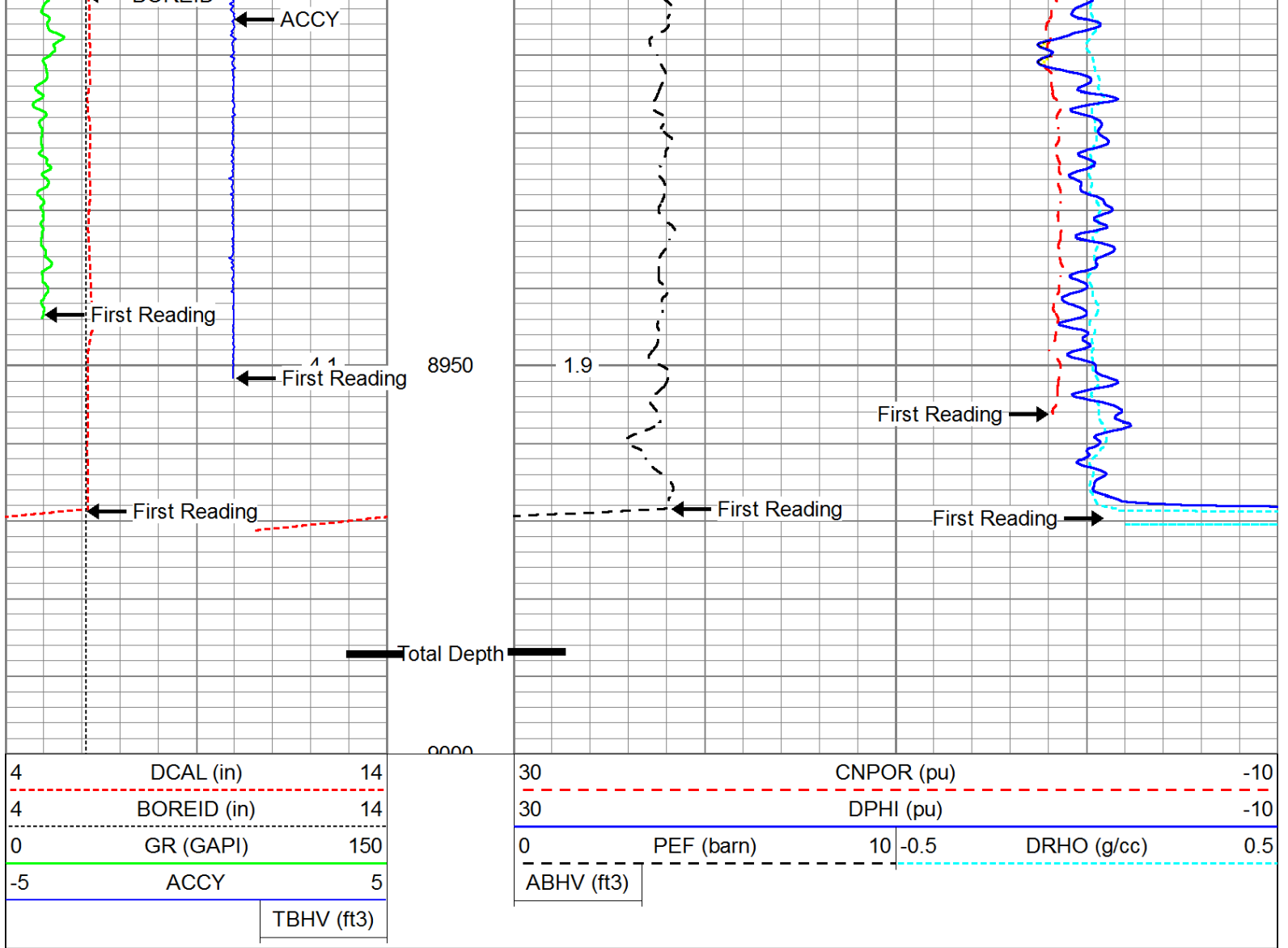
DCAL

BOREID

DRHO

DPHI

CNPOR



Log Variables

DatabaseC:\ProgramData\Warrior\Data\raymond_mem.db
 Dataset field/well/proc1/pass1.3

Top - Bottom

A	BHCOR	BHFL_TYPE	BHFLRES Ohm-m	BHFLRESSRC	BHIDSRC	BOREID in	BOTTEMP degF
1	On	WBM	1	MUDCELL	CURVE	6.125	138
CASED?	CASEOD in	CASETHCK in	CEMWATERSAL kppm	INCMTTHCK in	DNBHC?	DPORSEL	FLUIDDEN g/cc
No	4.5	0	0	0	NO	RHOB	1
FRMSALIN kppm	LATNOR	M	MATRXDEN g/cc	MUDSALIN kppm	MudWgt lb/gal	NPORSEL	PEBHC?
0	Off	2	2.71	10	8.45	Limestone	YES
PERFS	RESTMPSRC	SO in	SRFTEMP degF	SZCOR	TDEPTH ft	TMPCOR	TOOLPOS
0	1	0.5	65	On	8998	On	Ec-centered
XXXX							
0							

Calibration Report

Database File raymond_mem.db
 Dataset Pathname proc1/pass1.3
 Dataset Creation Thu Jan 30 06:11:47 2014

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS38R
 Shop Calibration Performed: Wed Nov 20 15:41:53 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-472.3810	[-536.000, -387.000]	86.6787	[-500.000, 1100.000]
A2	-141.7800	[-162.000, -120.000]	9.0611	[-75.000, 700.000]
A3	-29.3611	[-38.000, -18.000]	-136.2050	[-375.000, 475.000]
A4	-16.8612	[-24.000, -8.000]	235.2940	[25.000, 575.000]
A5	-14.6911	[-21.000, -7.000]	147.1060	[25.000, 275.000]
Freq 2				
A1	-249.2410	[-293.000, -186.000]	26.2440	[-375.000, 675.000]
A2	-90.8768	[-106.000, -76.000]	-24.8920	[-100.000, 425.000]
A3	-20.8931	[-28.000, -13.000]	-141.5550	[-325.000, 250.000]
A4	-20.0141	[-28.000, -10.000]	64.5928	[-75.000, 275.000]
A5	-19.5184	[-27.000, -10.000]	-1.7777	[-125.000, 75.000]
Freq 3				
A1	-160.4060	[-193.000, -108.000]	-51.7879	[-375.000, 425.000]
A2	-68.7679	[-81.000, -57.000]	-62.1568	[-125.000, 250.000]
A3	-17.3280	[-23.000, -11.000]	-163.1780	[-300.000, 125.000]
A4	-21.6642	[-31.000, -11.000]	-50.3343	[-200.000, 100.000]
A5	-22.1622	[-32.000, -11.000]	-110.0060	[-250.000, -25.000]
Freq 4				
A1	-89.7509	[-108.000, -54.000]	-191.7340	[-450.000, 75.000]
A2	-49.2204	[-60.000, -41.000]	-129.0840	[-200.000, 50.000]
A3	-14.0715	[-19.000, -8.000]	-216.6030	[-350.000, -25.000]
A4	-24.7461	[-37.000, -11.000]	-223.0840	[-400.000, -75.000]
A5	-27.8306	[-43.000, -12.000]	-290.7630	[-475.000, -125.000]

CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9980	[0.950, 1.050]	-0.0058	[-0.050, 0.050]
A2	0.9916	[0.950, 1.050]	-0.0006	[-0.050, 0.050]
A3	1.0003	[0.950, 1.050]	-0.0062	[-0.050, 0.050]
A4	0.9883	[0.950, 1.050]	0.0036	[-0.050, 0.050]
A5	0.9928	[0.950, 1.050]	0.0009	[-0.050, 0.050]
Freq 2				
A1	0.9917	[0.950, 1.050]	-0.0118	[-0.050, 0.050]
A2	0.9852	[0.950, 1.050]	-0.0069	[-0.050, 0.050]
A3	0.9882	[0.950, 1.050]	-0.0057	[-0.050, 0.050]
A4	0.9828	[0.950, 1.050]	-0.0035	[-0.050, 0.050]
A5	0.9887	[0.950, 1.050]	-0.0070	[-0.050, 0.050]
Freq 3				
A1	1.0010	[0.950, 1.050]	-0.0124	[-0.050, 0.050]
A2	0.9945	[0.950, 1.050]	-0.0082	[-0.050, 0.050]
A3	0.9970	[0.950, 1.050]	-0.0075	[-0.050, 0.050]
A4	0.9921	[0.950, 1.050]	0.0051	[-0.050, 0.050]
A5	0.9921	[0.950, 1.050]	0.0051	[-0.050, 0.050]

A4	0.9904	[0.950, 1.050]	-0.0051	[-0.050, 0.050]
A5	0.9984	[0.950, 1.050]	-0.0086	[-0.050, 0.050]
Freq 4				
A1	0.9961	[0.950, 1.050]	-0.0078	[-0.050, 0.050]
A2	0.9889	[0.950, 1.050]	-0.0053	[-0.050, 0.050]
A3	0.9933	[0.950, 1.050]	-0.0067	[-0.050, 0.050]
A4	0.9845	[0.950, 1.050]	-0.0025	[-0.050, 0.050]
A5	0.9993	[0.930, 1.070]	-0.0090	[-0.050, 0.050]
Temperature	18.1713 degC			

ThruBit Density Calibration Report

Tool Model-Serial Number:	B-PS41D
Source Number:	A3366
Source Type:	Cs-137
Shop Calibration Performed:	Tue Jan 28 13:19:16 2014

REFERENCE

	Density	Units
Aluminium	2.700	g/cc
Magnesium	1.686	g/cc

BACKGROUND READINGS

Outputs	Counts	Units	Expected
SS1 Background	146.99	cps	[100.00, 186.00]
SS2 Background	39.13	cps	[27.00, 50.00]
SS3 Background	23.33	cps	[16.00, 30.00]
SS4 Background	32.21	cps	[22.00, 40.00]
SS Valley Background	4.18	cps	[0.00, 6.00]
SS Low Background	27.31	cps	[24.00, 35.00]
SS High Background	27.16	cps	[24.00, 35.00]
SS Above Background	1.93	cps	[0.00, 3.00]
LS1 Background	159.12	cps	[101.00, 187.00]
LS2 Background	41.88	cps	[26.00, 48.00]
LS3 Background	24.64	cps	[15.00, 29.00]
LS4 Background	32.07	cps	[21.00, 38.00]
LS Valley Background	4.85	cps	[0.00, 7.00]
LS Low Background	29.36	cps	[23.00, 35.00]
LS High Background	30.28	cps	[24.00, 35.00]
LS Above Background	2.32	cps	[0.00, 4.00]

ALUMINIUM BLOCK READINGS

SS1 Aluminium	7364.46	cps	[5500.00, 10200.00]
SS2 Aluminium	3812.17	cps	[2800.00, 5200.00]
SS3 Aluminium	3224.09	cps	[2350.00, 4360.00]
SS4 Aluminium	3093.26	cps	[2260.00, 4200.00]
SS Valley Aluminium	27.74	cps	[8.00, 15.00]
SS Low Aluminium	32.19	cps	[20.00, 35.00]
SS High Aluminium	30.61	cps	[20.00, 35.00]
SS Above Aluminium	6.76	cps	[0.00, 5.00]
LS1 Aluminium	1264.34	cps	[850.00, 1570.00]
LS2 Aluminium	1137.76	cps	[780.00, 1440.00]
LS3 Aluminium	1006.30	cps	[710.00, 1300.00]
LS4 Aluminium	699.86	cps	[530.00, 990.00]
LS Valley Aluminium	6.80	cps	[1.00, 7.00]
LS Low Aluminium	29.77	cps	[20.00, 35.00]
LS High Aluminium	30.76	cps	[20.00, 35.00]
LS Above Aluminium	2.56	cps	[0.00, 4.00]

MAGNESIUM BLOCK READINGS

Outputs	Counts	Units	Expected
SS1 Magnesium	11927.03	cps	[8920.00, 16560.00]
SS2 Magnesium	6315.20	cps	[4670.00, 8670.00]
SS3 Magnesium	5203.64	cps	[3780.00, 7020.00]
SS4 Magnesium	5017.52	cps	[3670.00, 6810.00]
SS Valley Magnesium	47.09	cps	[10.00, 25.00]
SS Low Magnesium	38.06	cps	[24.00, 35.00]
SS High Magnesium	35.16	cps	[24.00, 35.00]
SS Above Magnesium	10.67	cps	[0.00, 10.00]
LS1 Magnesium	8312.96	cps	[5670.00, 10530.00]
LS2 Magnesium	7736.19	cps	[5360.00, 9950.00]
LS3 Magnesium	6704.84	cps	[4760.00, 8840.00]
LS4 Magnesium	4446.85	cps	[3400.00, 6300.00]
LS Valley Magnesium	26.39	cps	[10.00, 15.00]
LS Low Magnesium	33.22	cps	[24.00, 35.00]
LS High Magnesium	33.02	cps	[24.00, 35.00]
LS Above Magnesium	6.86	cps	[0.00, 10.00]

ALUMINIUM + Fe SLEEVE READINGS

SS1 Al + Fe	6348.65	cps	[4300.00, 8000.00]
SS2 Al + Fe	3124.05	cps	[2130.00, 4000.00]
SS3 Al + Fe	2265.45	cps	[1533.00, 2850.00]
SS4 Al + Fe	1770.75	cps	[1190.00, 2200.00]
SS Valley Al + Fe	21.51	cps	[1.00, 7.00]
SS Low Al + Fe	31.14	cps	[20.00, 35.00]
SS High Al + Fe	29.80	cps	[20.00, 35.00]
SS Above Al + Fe	5.53	cps	[3.00, 4.00]
LS1 Al + Fe	1112.56	cps	[680.00, 1260.00]
LS2 Al + Fe	930.75	cps	[580.00, 1080.00]
LS3 Al + Fe	695.58	cps	[460.00, 850.00]
LS4 Al + Fe	416.77	cps	[300.00, 550.00]
LS Valley Al + Fe	6.42	cps	[1.00, 7.00]
LS Low Al + Fe	29.57	cps	[20.00, 35.00]
LS High Al + Fe	30.40	cps	[20.00, 35.00]
LS Above Al + Fe	2.56	cps	[3.00, 4.00]

RESULTS

SS BKG ATTN	2143.81	[500, 3000]
LS BKG ATTN	1826.08	[500, 3000]

Caliper Shop Calibration performed:

Tue Jan 28 13:19:16 2014

RESULTS

Reference	Reading	Units
12.00	1853.84	in
9.00	2024.85	in
6.00	2189.33	in

DENSITY PRE-SURVEY CHECK Performed:

Wed Dec 31 18:00:00 1969

Outputs	Counts	Units	Expected
SS1 Background	0.00	cps	[142.58, 151.40]
LS1 Background	0.00	cps	[154.35, 163.90]
LS4 Background	0.00	cps	[30.14, 33.99]

DENSITY POST-SURVEY CHECK Performed:

Wed Dec 31 18:00:00 1969

Outputs	Counts	Units	Expected
SS1 Background	0.00	cps	[142.58, 151.40]
LS1 Background	0.00	cps	[154.35, 163.90]
LS4 Background	0.00	cps	[30.14, 33.99]

CALIPER PRE-SURVEY CHECK Performed:

Tue Jan 28 14:58:26 2014

Reference	Readings	Units	Expected
6.00	6.01	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-PS05N
 Source Number:
 Calibration Tank Temperature: 57.4 degF
 Shop Calibration Performed: Tue Jan 28 14:04:34 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	2253.0	cps	
LS Counts	76.0	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	29.6384	SS/LS	
Tank Ratio Gain	1.0445		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
---------	----------	-------	----------

SS Counts	25878.8	cps	
LS Counts	2418.5	cps	
AI Ratio Ref	10.797	SS/LS	
AI Ratio	11.177	SS/LS	
AI Ratio Gain	0.97		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed: Tue Jan 28 14:57:52 2014

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

POST-SURVEY BACKGROUND CHECK Performed:

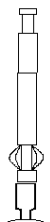
Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.0	cps	<4

Gamma Ray Calibration Report

Tool Model-Serial Number:	PS-PS10T		
Performed:	Tue Jan 28 14:51:22 2014		
Calibrator Value:	170.6	GAPI	
Background Reading:	67.5	cps	
Calibrator Reading:	483.8	cps	
Sensitivity:	0.3850	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-Cablehead-S Solid Weakpoint	2.31	2.13	5.00
			Thrubit-PSBDOT	3.87	2.25	35.00

			Thrubit-HangOff_Tool	5.00	2.38	60.00
			Thrubit-10-1	0.88	2.13	3.95
			Thrubit-Universal Joint	1.46	2.06	15.00
			TBBAT-A (PS07B) Thrubit Battery	6.13	2.13	38.20
			TBBAT2-A (PS40B) Thrubit Battery	6.13	2.13	40.00
GR	41.04					
GRTEMP	40.20					
			TMG-PS (PS10T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
			Thrubit-Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS05N) ThruBit Neutron	4.77	2.13	63.00
			TBD-B (PS41D) Thrubit Density	10.48	2.13	91.00
LSW1	18.04					
DCAL	17.13					
A1_P	10.60					
A2_P	10.10					
A3_P	9.35					
A4_P	8.35					
A5_P	6.60					
			TBI-PS (PS38R) Thrubit Induction	15.29	2.13	94.00

Dataset: raymond_mem.db: field/well/proc1/pass1.3
 Total length: 66.92 ft
 Total weight: 560.15 lb
 O.D.: 2.38 in



Company SANDRIDGE ENERGY
 Well RAYMOND 3505 1-7H
 Field HKW EAST
 County HARPER

A Schlumberger Company

State

KANSAS

Country