



# GAMMA RAY NEUTRON LOG

**PIONEER**  
Pioneer Energy Services

Comp. PDC ENERGY INC.  
Well THISTLE DOWN 31G-402  
Field WATTENBERG  
Co. WELD  
State COLORADO

Company **PDC ENERGY INC.**  
Well **THISTLE DOWN 31G-402**  
Field **WATTENBERG**  
County **WELD** State **COLORADO**

Location: API # : 05-123-45746  
1519' FSL & 1357' FWL  
NE SW  
SEC 31 TWP 5N RGE 64W  
Permanent Datum GL Elevation 4805'  
Log Measured From KB 23' Above Perm. Datum  
Drilling Measured From KB  
Other Services  
SCBL  
K.B. 4828'  
D.F. N/A  
G.L. 4805'

Date of Service	31 JANUARY 2019		
Run Number	ONE		
Depth Driller or P8TD	N/A		
Depth Logger	7618'		
Bottom Log Interval	7618'		
Top Log Interval	SURFACE		
Open Hole Size	8.5"		
Type Fluid	WATER		
Fluid Level	FULL		
Fluid Density	N/A		
Max. Recorded Temperature	281 F		
Max. Wellhead Pressure	ZERO		
Wellhead Connection	OPEN		
Estimated Cement Top	N/A		
Unit Number	P-132		
Wireline Size	9/32"		
Location	FORT MORGAN		
Recorded By	SCHOENROGGE		
Witnessed By	MR. MYERS		
	Size	Wt/Ft	Top
Tubing Record			Bottom
Surface Casing	9.625"	36#	SURFACE
Production Casing	5.5"	20#	SURFACE
Liner Record			N/A

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All interpretations are opinions based on inferences from electrical or other measurements and Pioneer Wireline Services, LLC cannot and does not guarantee the accuracy or correctness of any interpretation, and Pioneer Wireline Services, LLC will not 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.

## Comments

N/A DENOTES NOT AVAILABLE OR NON-APPLICABLE.  
CORRELATED TO CUSTOMER MARKER JOINT

THANK YOU FOR USING PIONEER ENERGY SERVICES!

Your Pioneer Energy Services Crew

Tool Data - Services

Serial Number

Engineer: SCHOENROGGE  
Operator: TRAHAN  
Operator: PAXTON  
Operator:

SEE DIAGRAM  
PLUS OVERBODIES

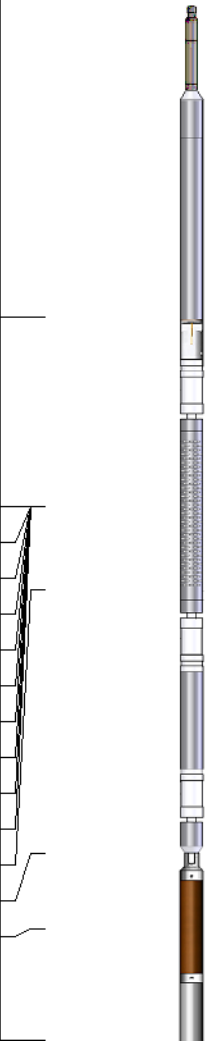
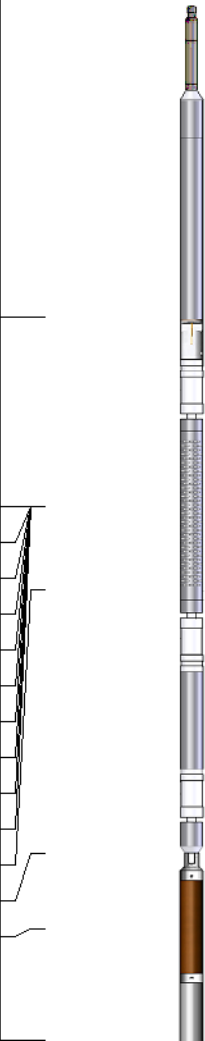
Top - Bottom

BHTEMP_Src TEMP	BOREID in 8.5	BOTTEMP degF 220	CASED? Yes	CASEOD in 5.5	CASETHCK in 0.361	CASEWGHT lb/ft 20
CMNTTHCK in 1.5	CMTTKCOR Off	CSTKCOR Off	MAXAMPL mV 71.2	MINAMPL mV 2.2	MINATTN db/ft 0.8	NPORSEL Limestone
PERFS 0	PPT usec 261	SRFTEMP degF 50	SZCOR Off	TDEPTH ft 7900		


Variable Description

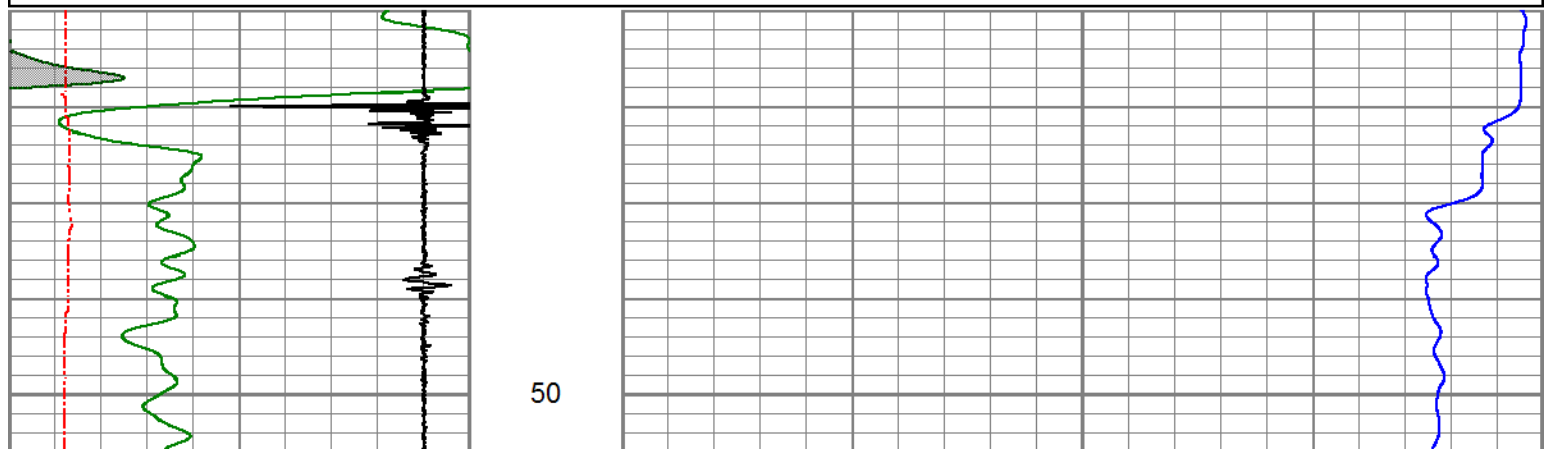
BHTEMP\_Src : BHTEMP Input Source Selector  
BOREID : Borehole I.D.  
BOTTEMP : Bottom Hole Temperature  
CASED? : Cased hole ?  
CASEOD : Casing O.D.  
CASETHCK : Casing Thickness  
CASEWGHT : Casing Weight  
CMNTTHCK : Cement Thickness  
CMTTKCOR : CN CemThk. Cor. ?  
CSTKCOR : CN CasThk. Cor. ?

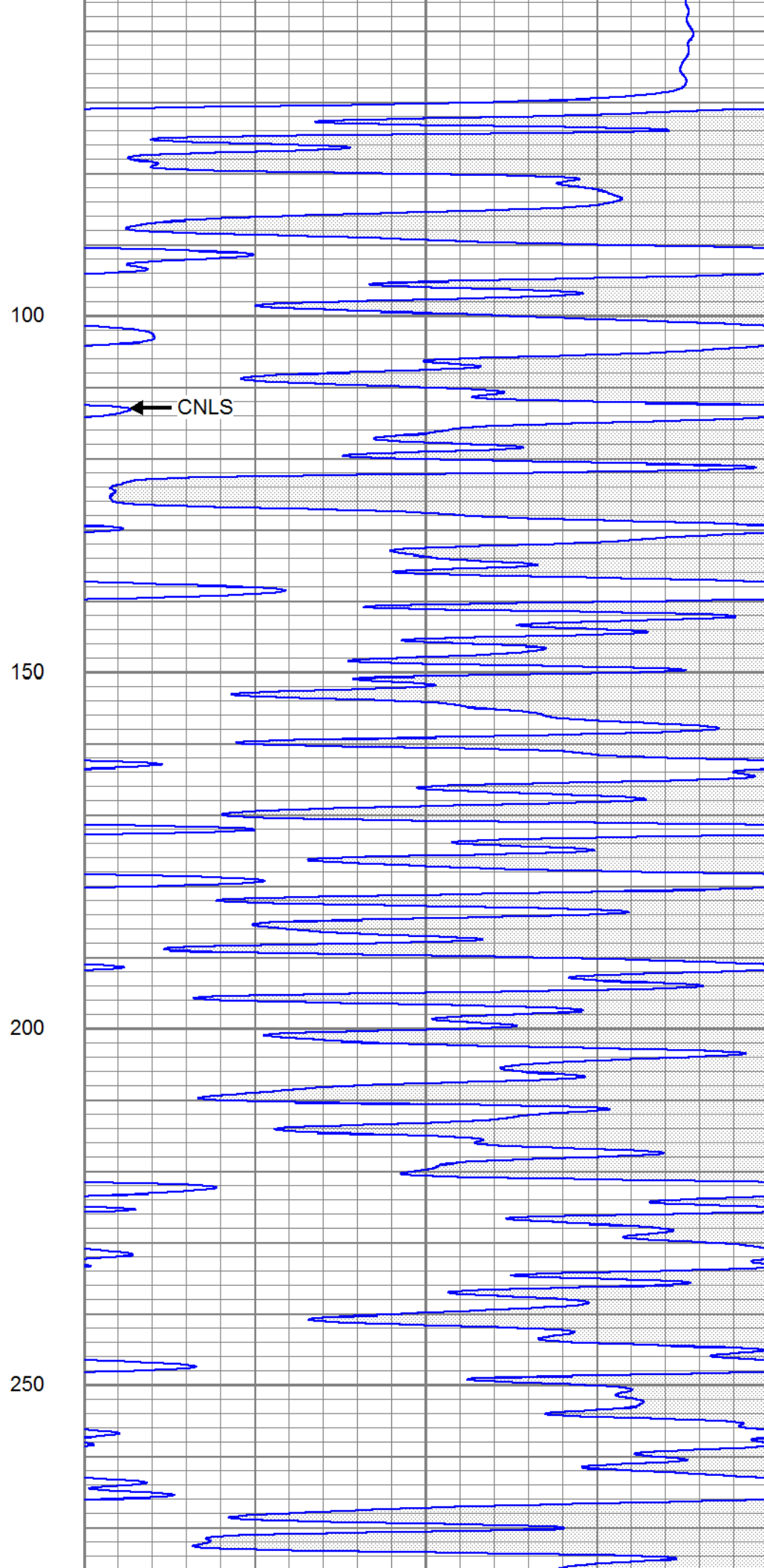
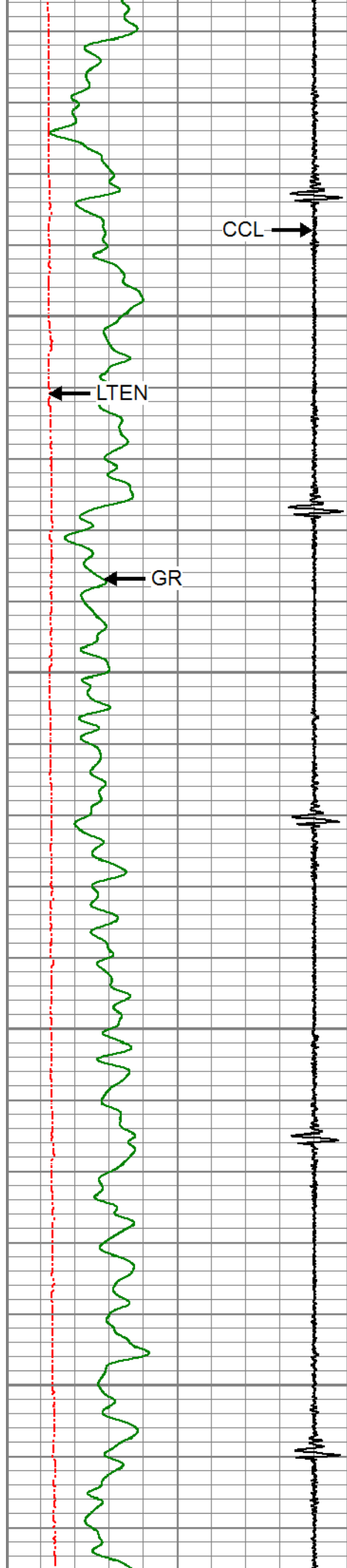
MAXAMPL : Maximum Amplitude  
MINAMPL : Minimum Amplitude  
MINATTN : Minimum Attenuation  
NPORSEL : Neutron Porosity Curve Select  
PERFS : Perforation Flag  
PPT : Predicted Pipe Time  
SRFTEMP : Surface Temperature  
SZCOR : CN Size Cor. ?  
TDEPTH : Total Depth

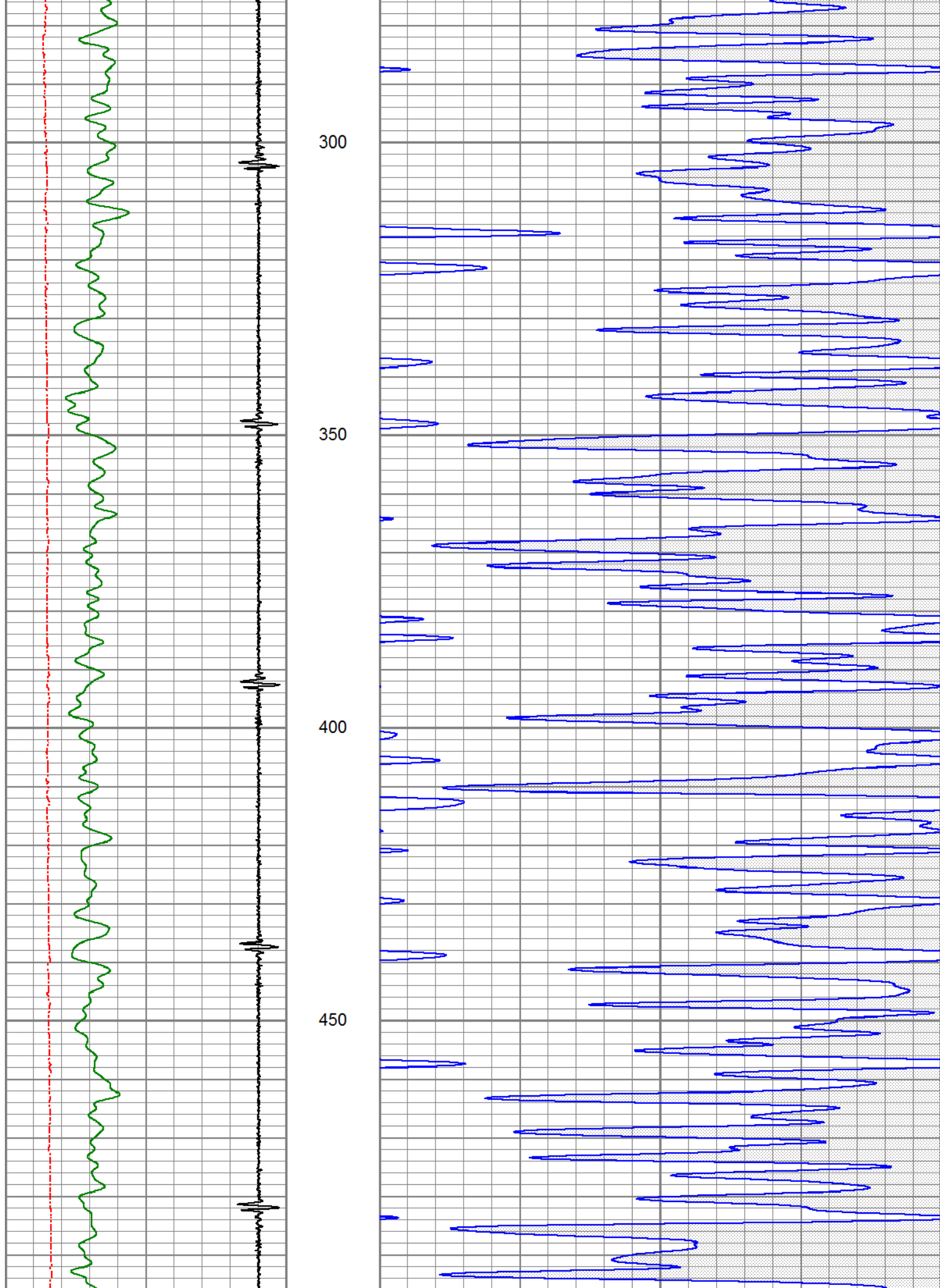
Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)
TEMP	19.11		Cable Head-Titan_144 1 7/16" Titan Cable Head	1.03	1.44	2.00
			PROBE-RBT-DIGITAL-RBL-DCT (FW1411-9.21) Probe 2 3/4" Radii Bond with Temp-Corrosion Package	11-9.21	2.75	105.00
WVFS8	16.82					
WVFS7	16.82					
WVFS6	16.82					
WVFS5	16.82					
WVFS4	16.82					
WVFS3	16.82					
WVFS2	16.82					
WVFS1	16.82					
WVFCAL	16.82					
WV3FT	16.82					
WV5FT	15.82					
HEADVOLT	12.63					
CCL	11.71					
GR	10.38					

GR	10.38		PROBE-GR/CCL-DIGITAL-275_6-PIN (1114.83)	2.75	50.00
			Probe 2 3/4" Gamma CCL 6-pin Bottom for CNT		
CNLSC	4.99		PROBE-CNT-DIGITAL-PRB_DIG (120509)	4.58	69.00
CNSSC	4.58		Probe 2.75 Digital CNT		
			Centralizer-275 Probe	2.88	15.00
			2 3/4" Probe Adjustable Spring Centralizer		
			Bullnose-PROBE	0.33	1.00
			Probe Go Pin Pressure Cap		
Dataset: pdc_thistle down31g-402_0512345746_20180131_scbl-cn1.db: field/well/run1/pass6 Total length: 22.87 ft Total weight: 242.00 lb O.D.: 2.75 in					

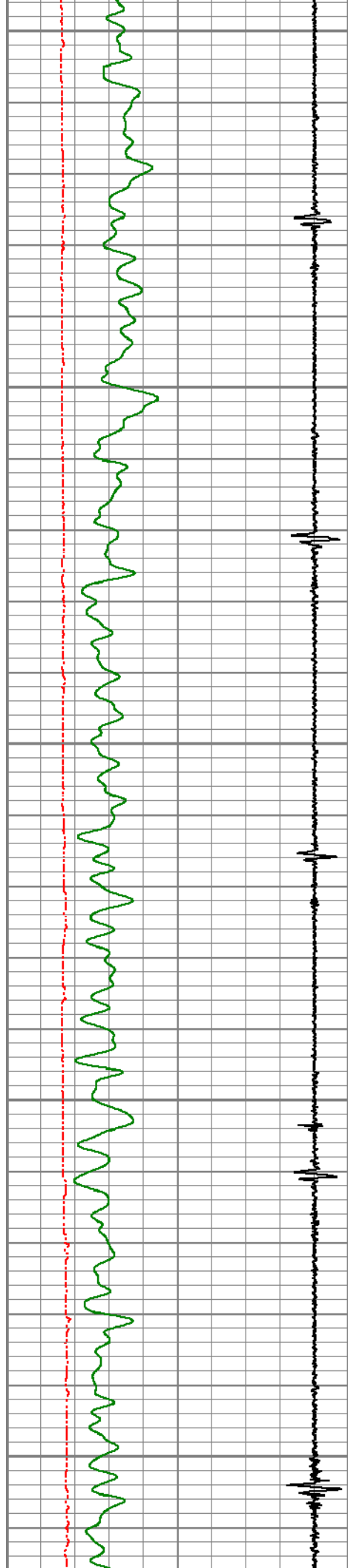
		MAIN LOG  ZERO PSI APPLIED AT SURFACE			
Database File	pdc_thistle down31g-402_0512345746_20180131_scbl-cn1.db				
Dataset Pathname	main				
Presentation Format	pinr_cn1_co				
Dataset Creation	Thu Jan 31 10:29:03 2019				
Charted by	Depth in Feet scaled 1:240				
0	Gamma Ray (GAPI)	150	40	CNPOR (pu)	0
-9	Collars	1	80	CNPOR (pu)	40
150	Gamma Ray (GAPI)	300			
0	LineTension (lb)	2000			











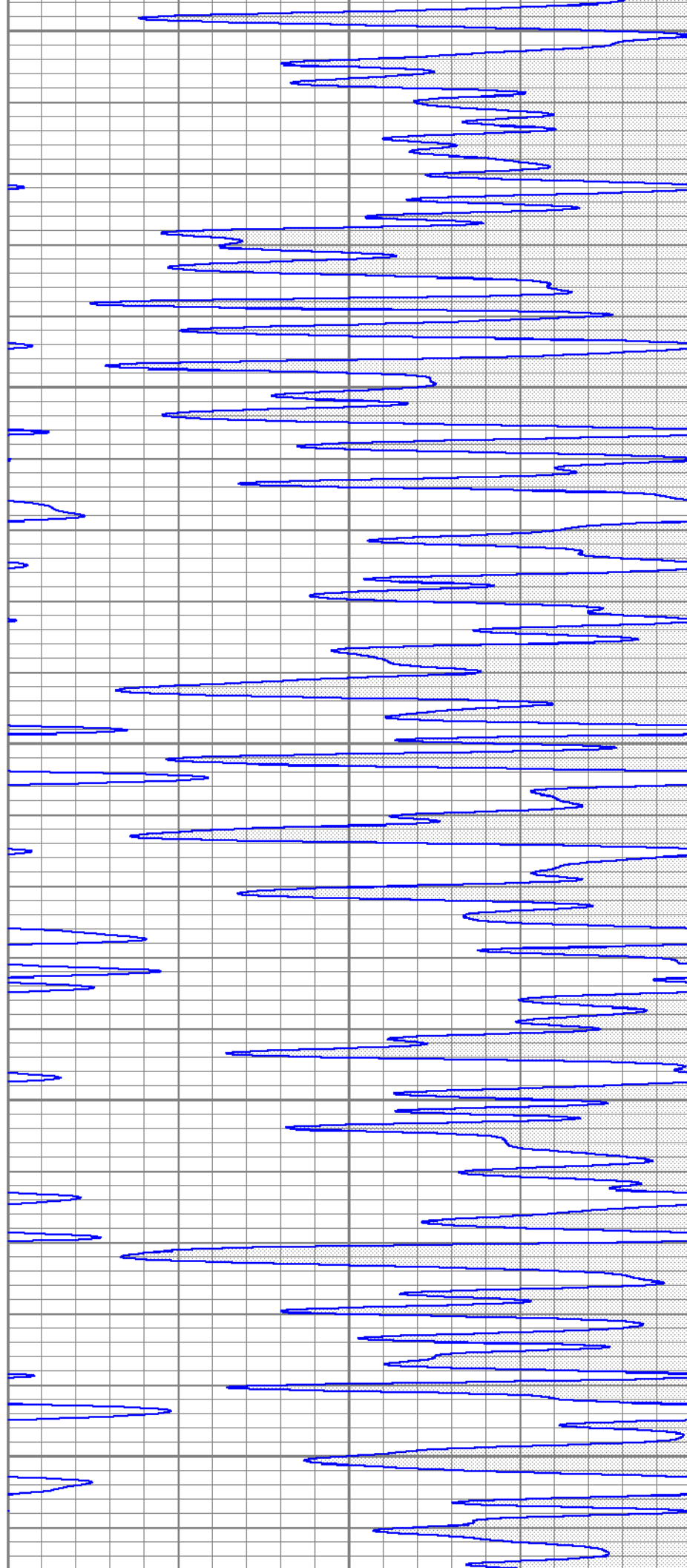
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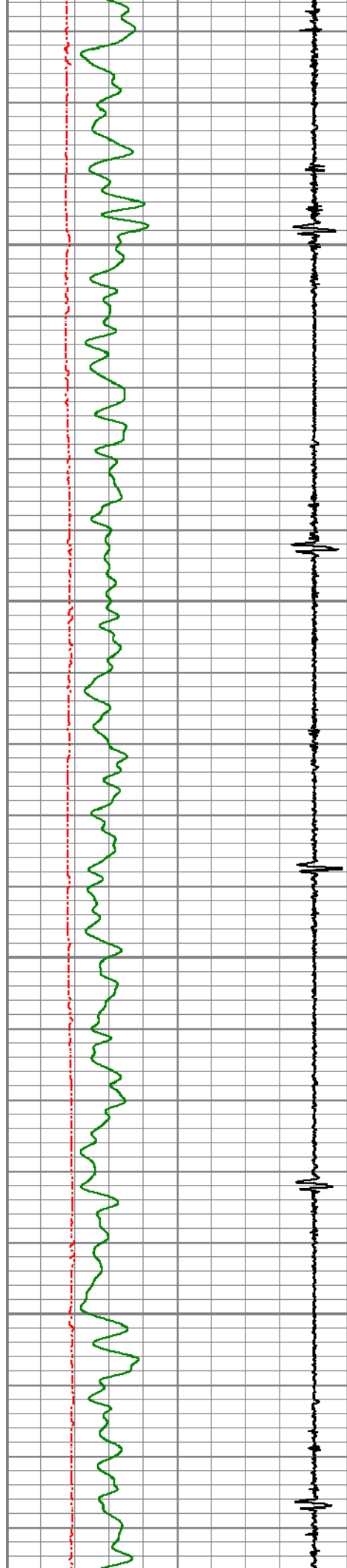
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600

650

700



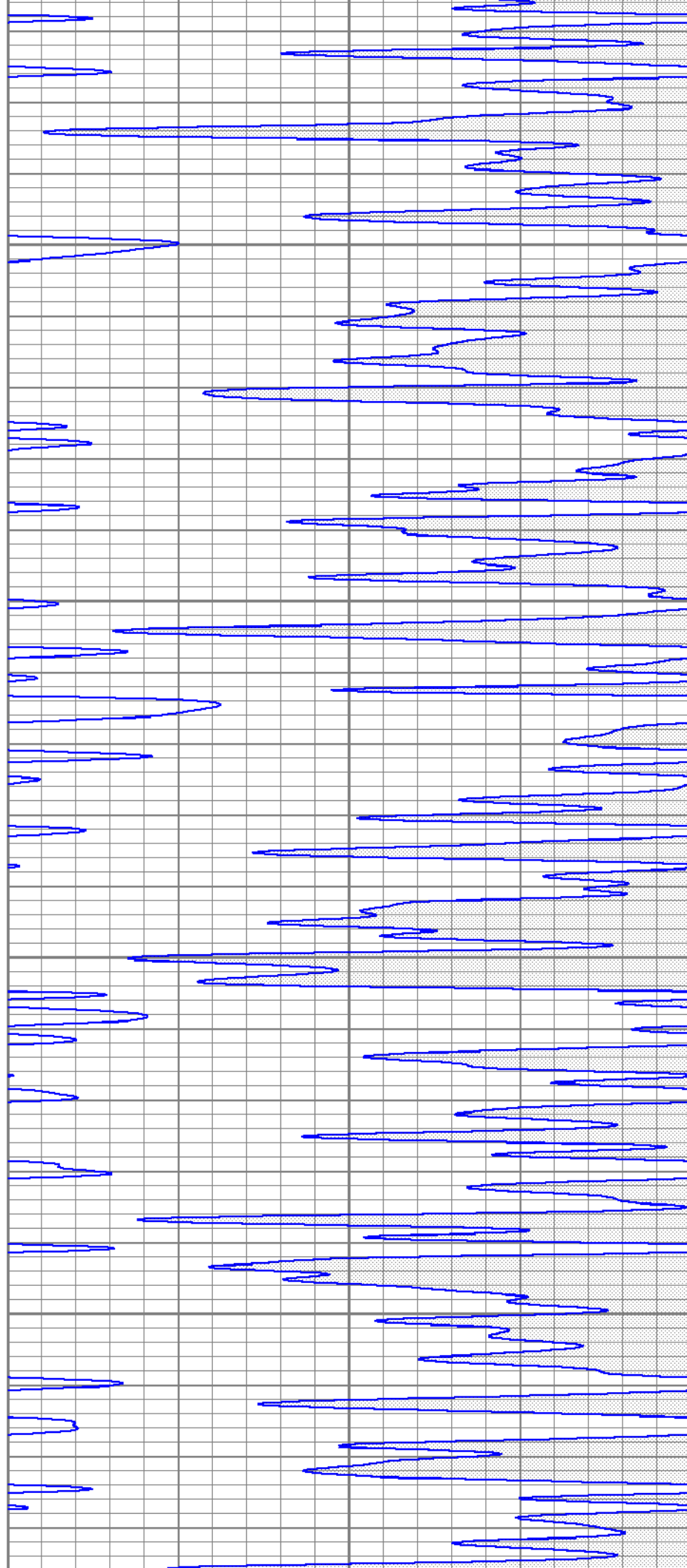


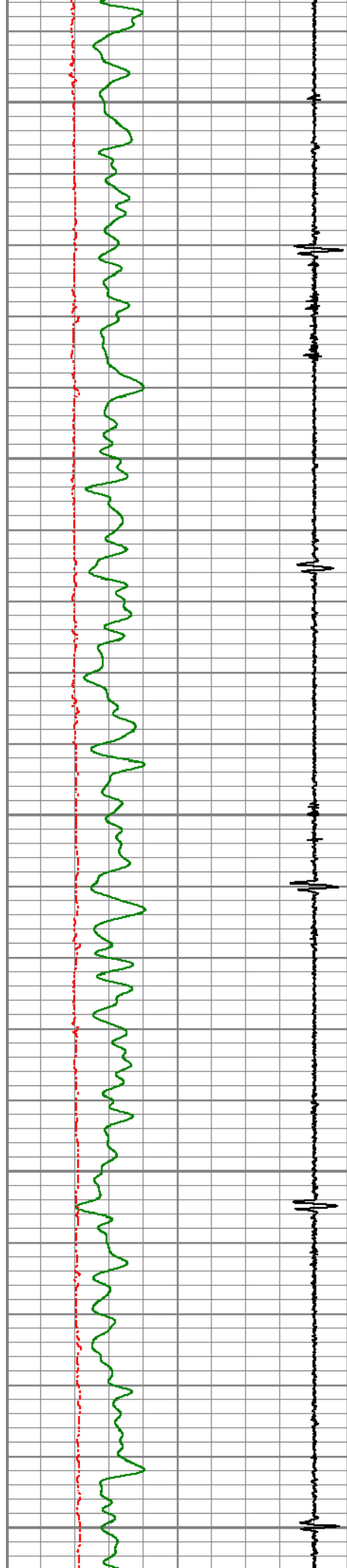
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800

850

900





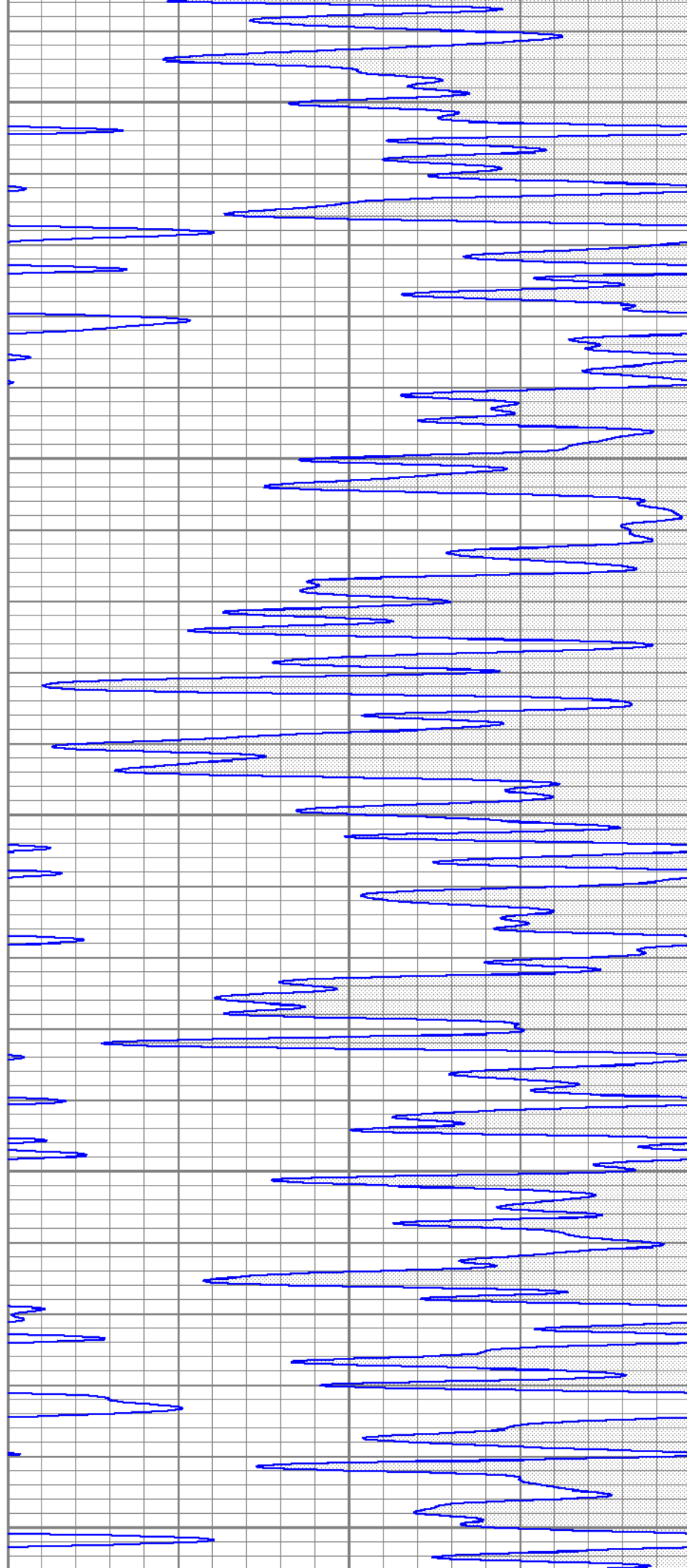
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1000

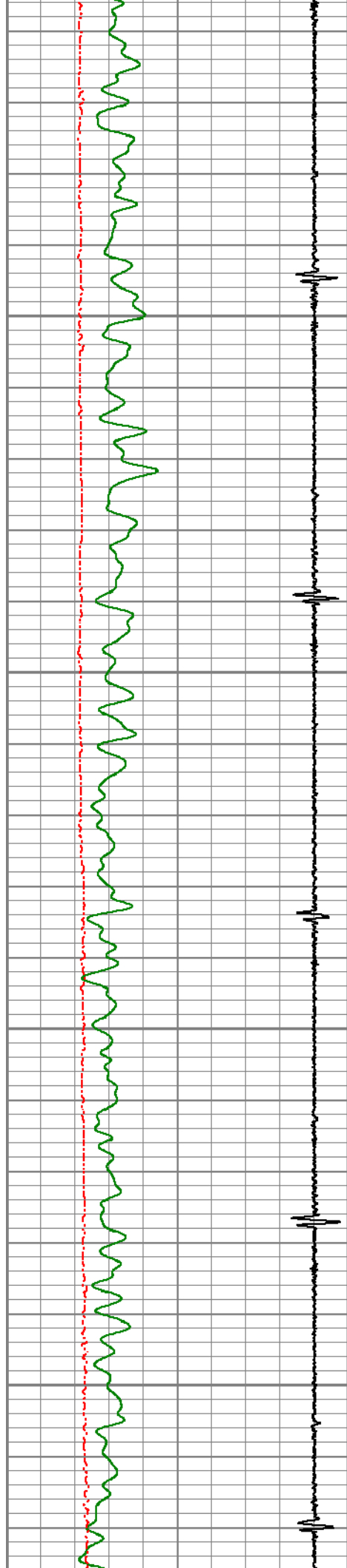
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1100

1150





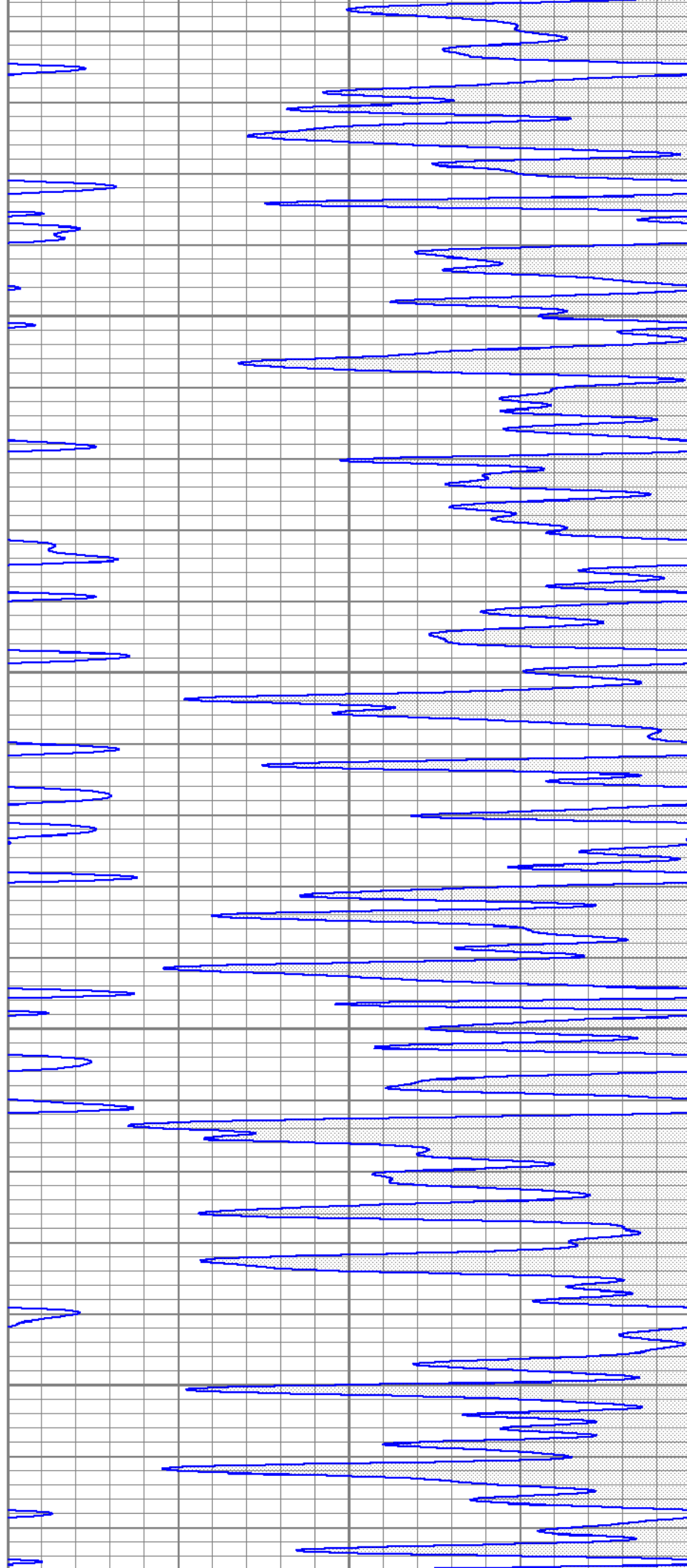


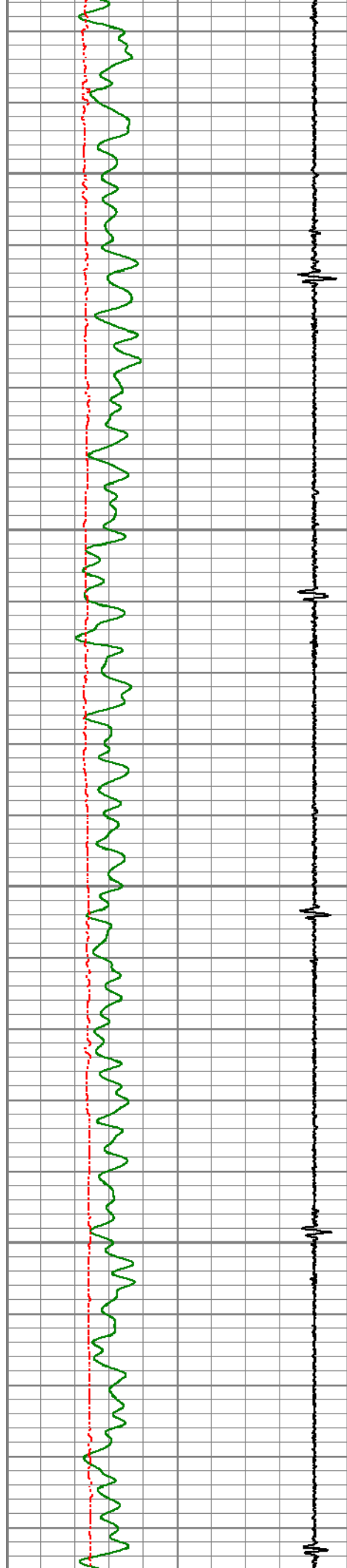
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1250

1300

1350



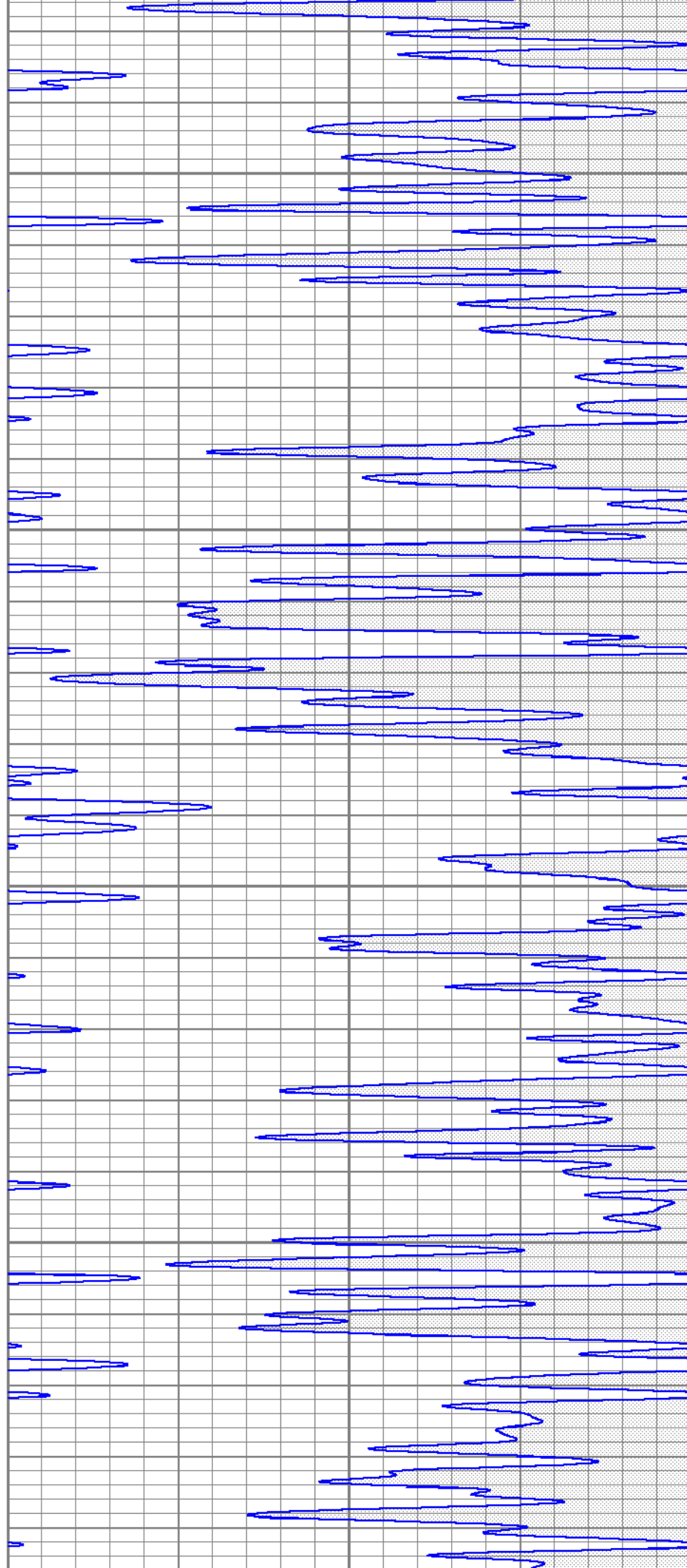


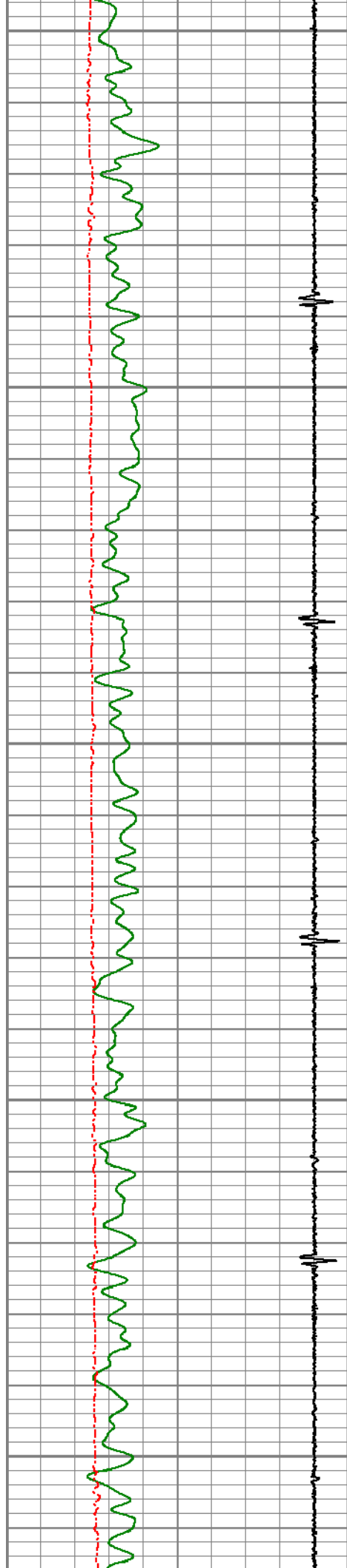
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1450

1500

1550





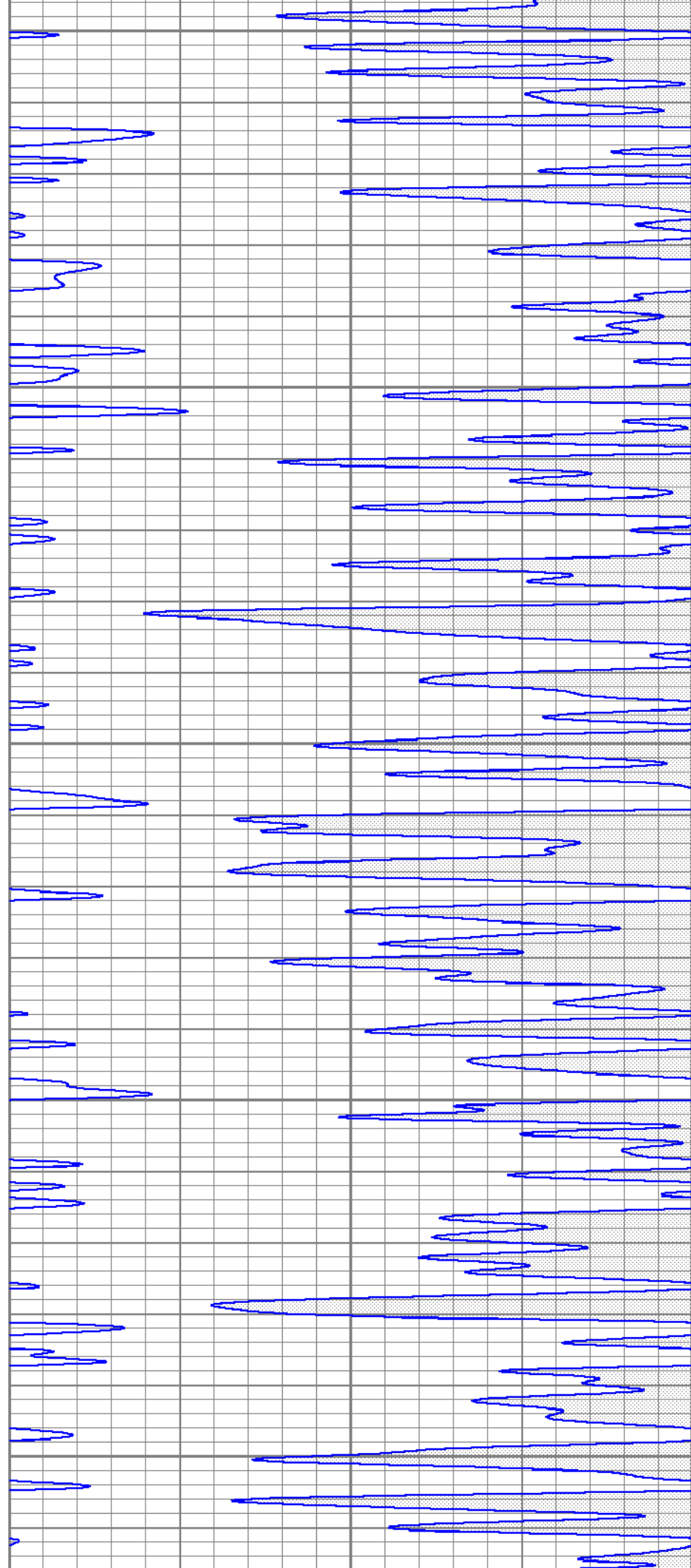
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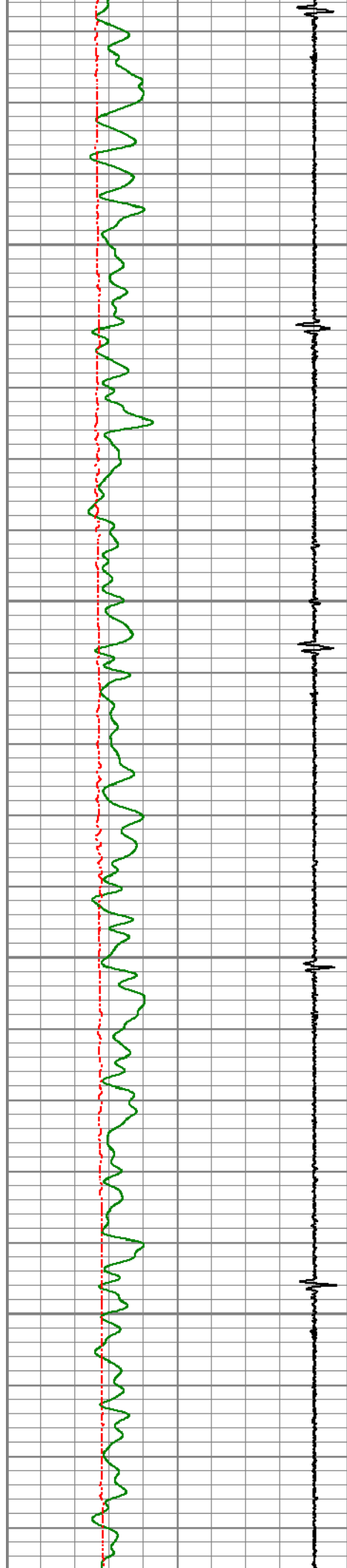
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1750

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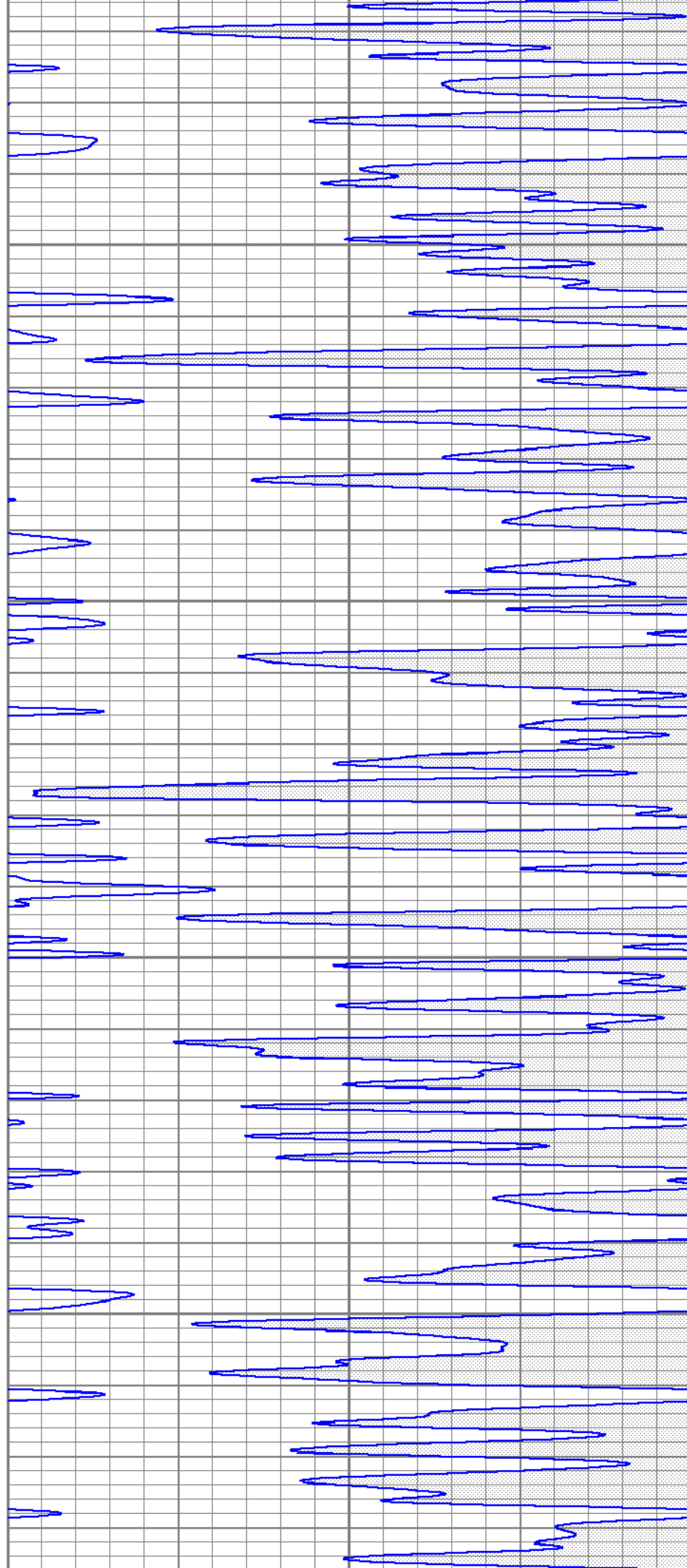


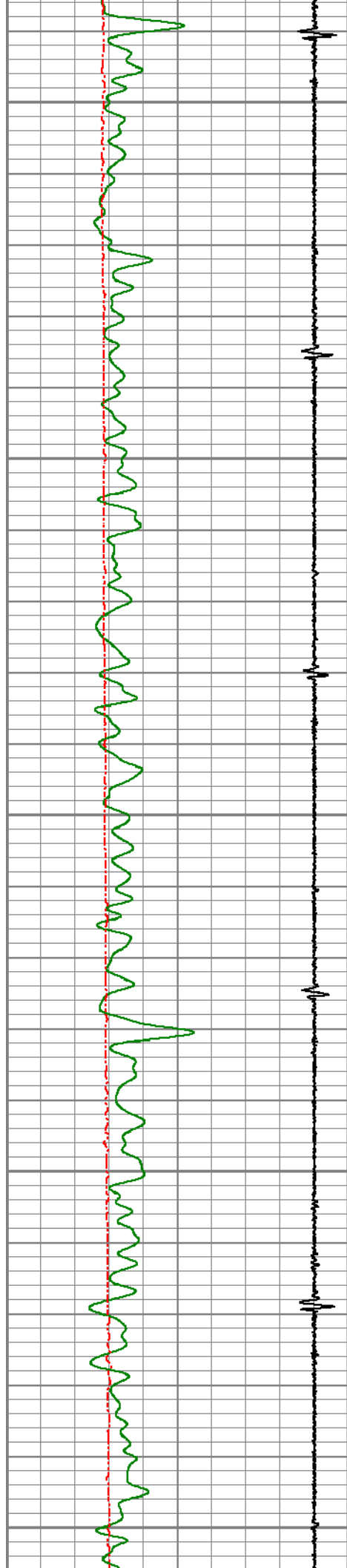
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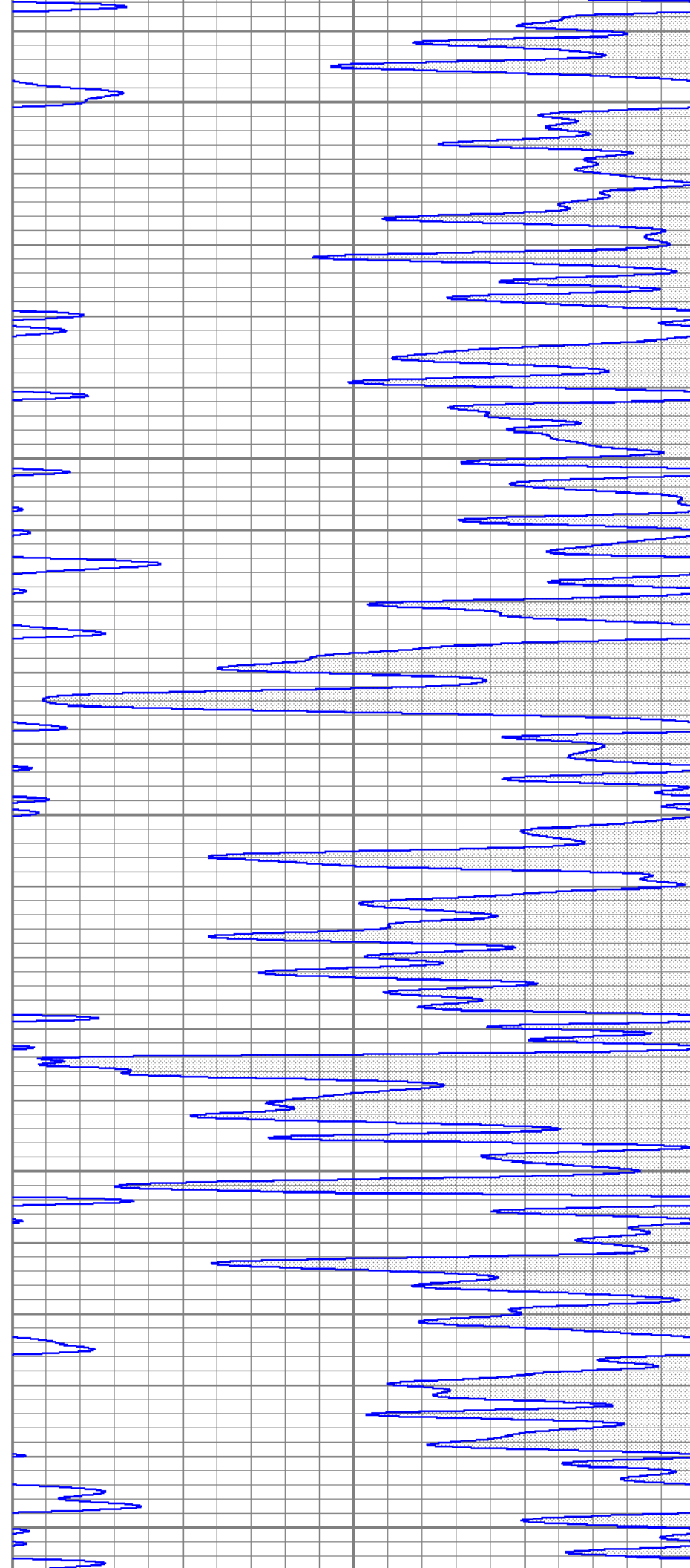
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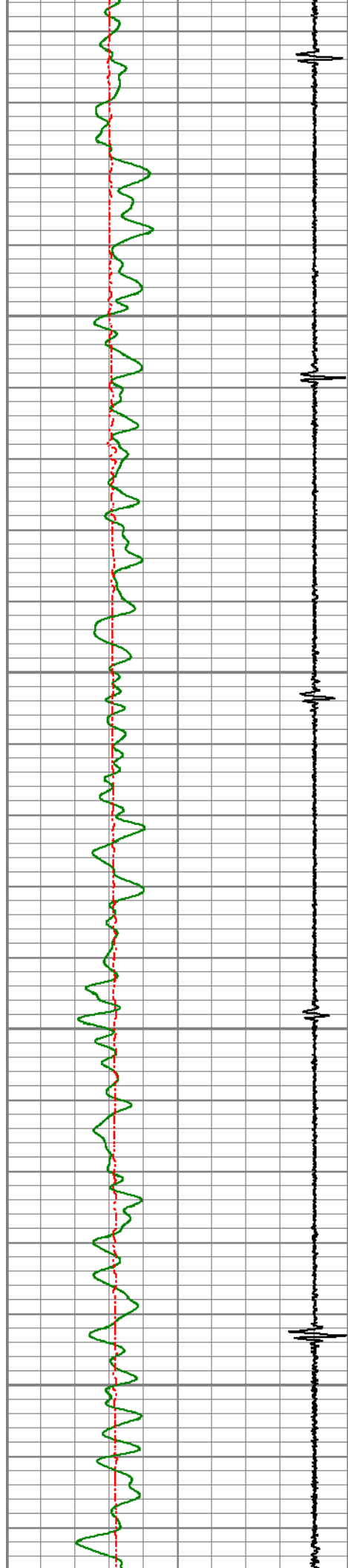
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2250





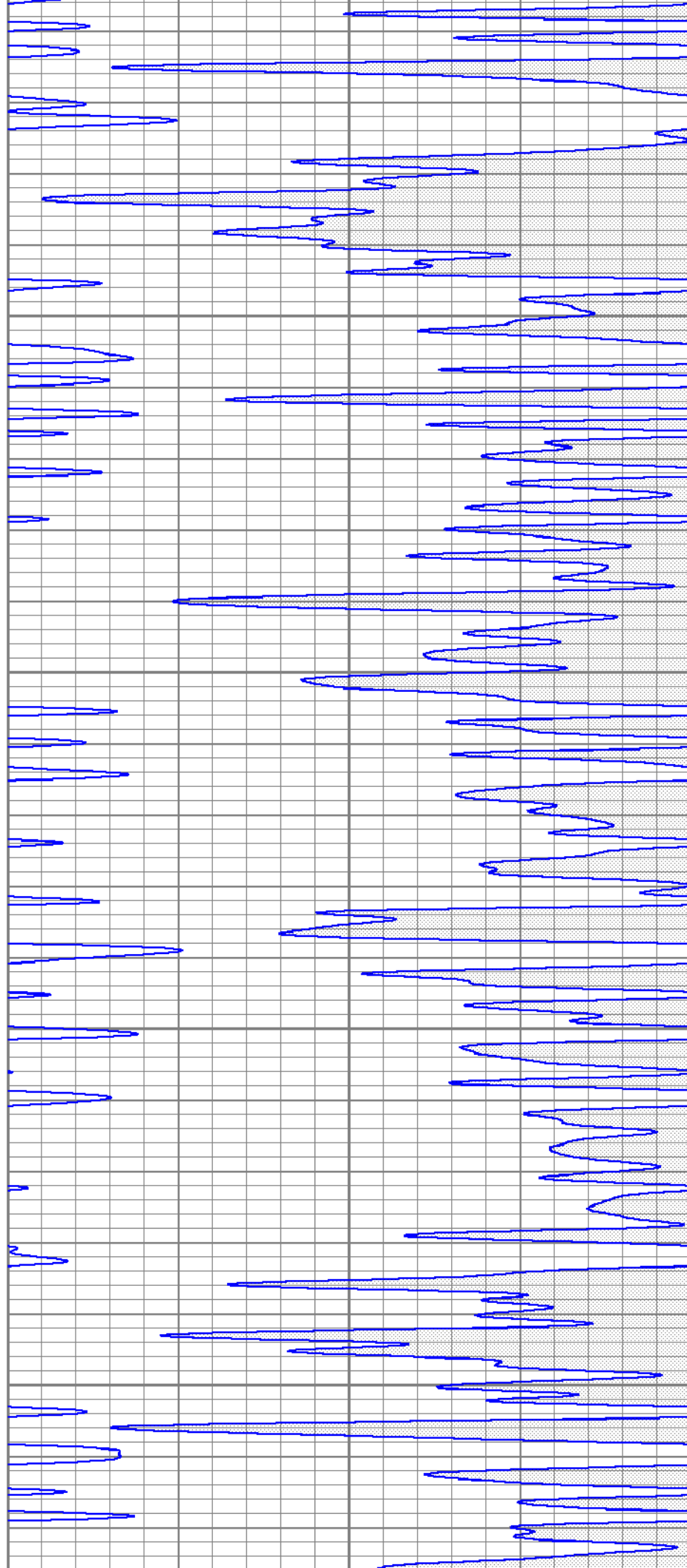


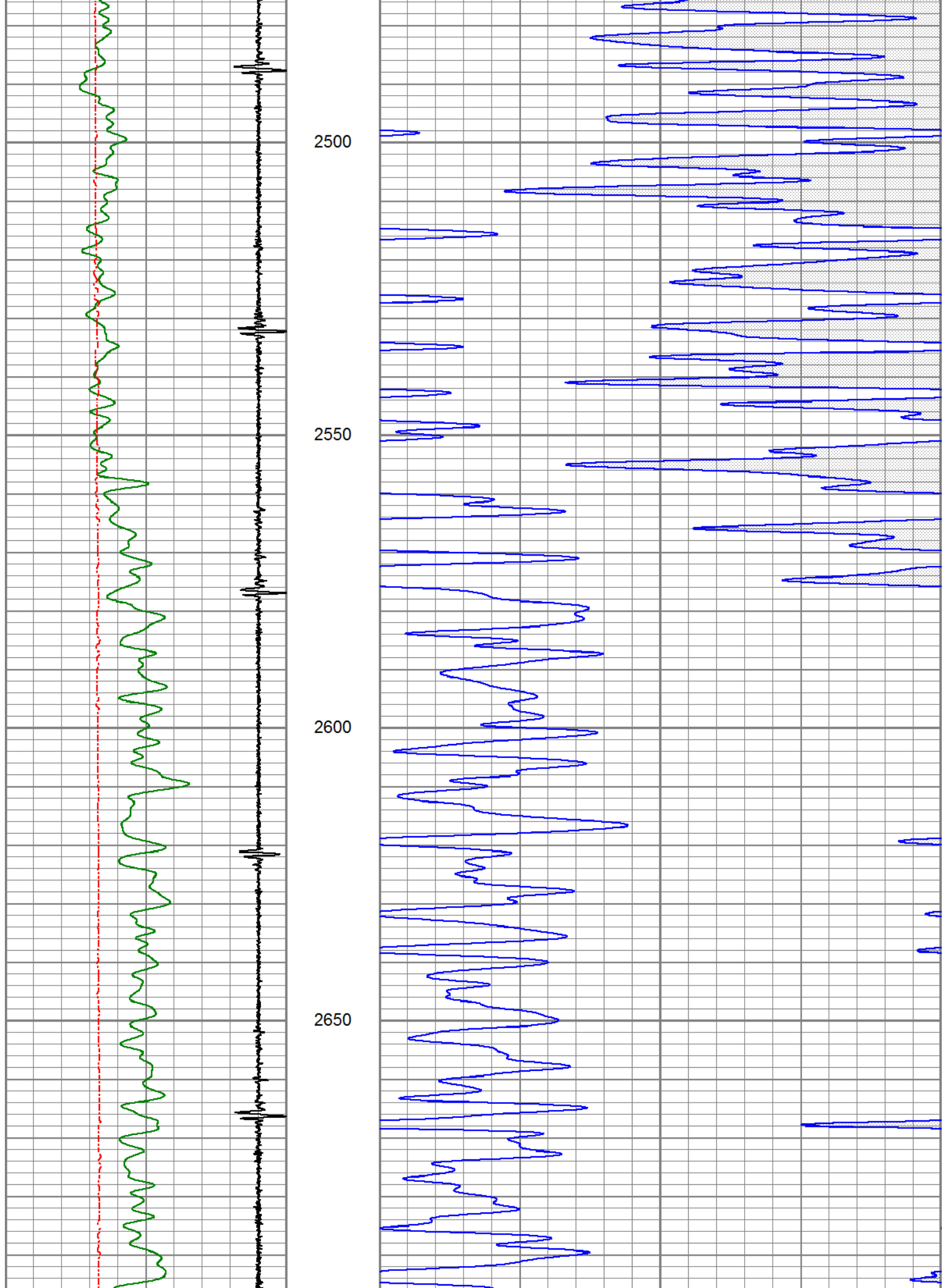
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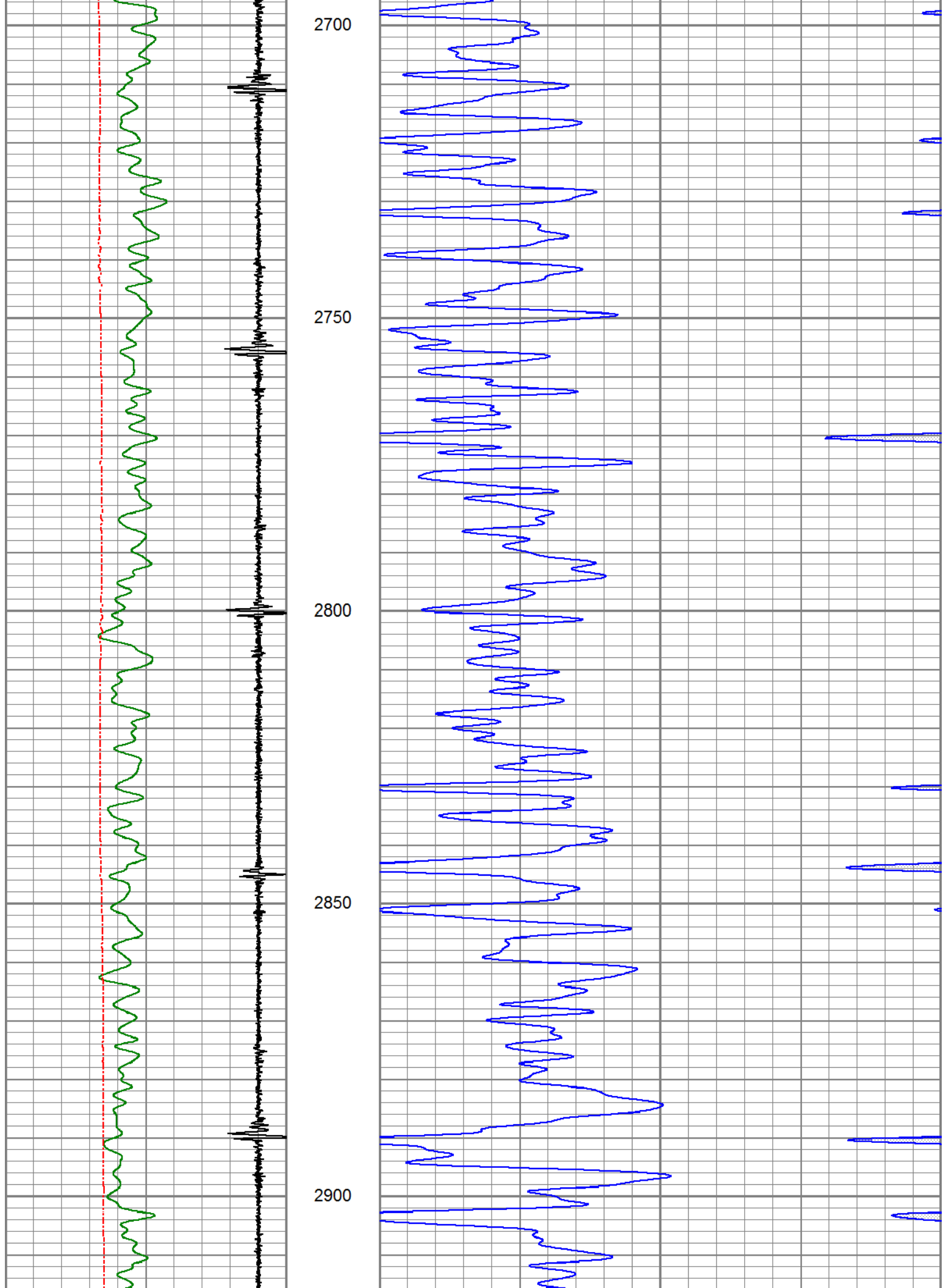
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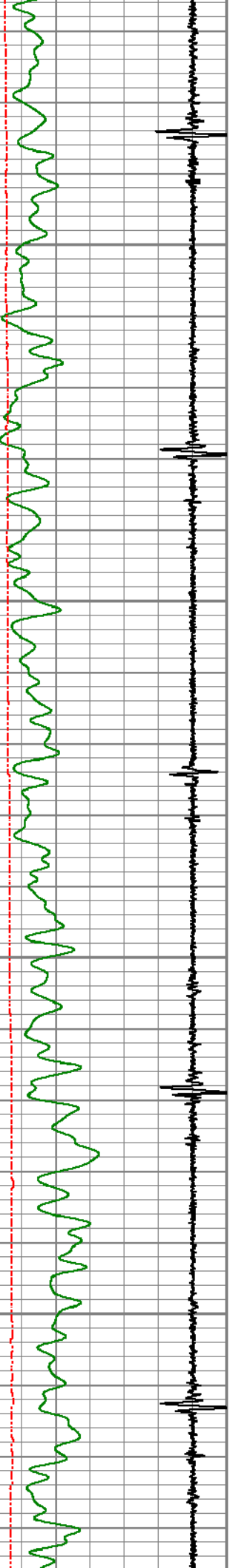
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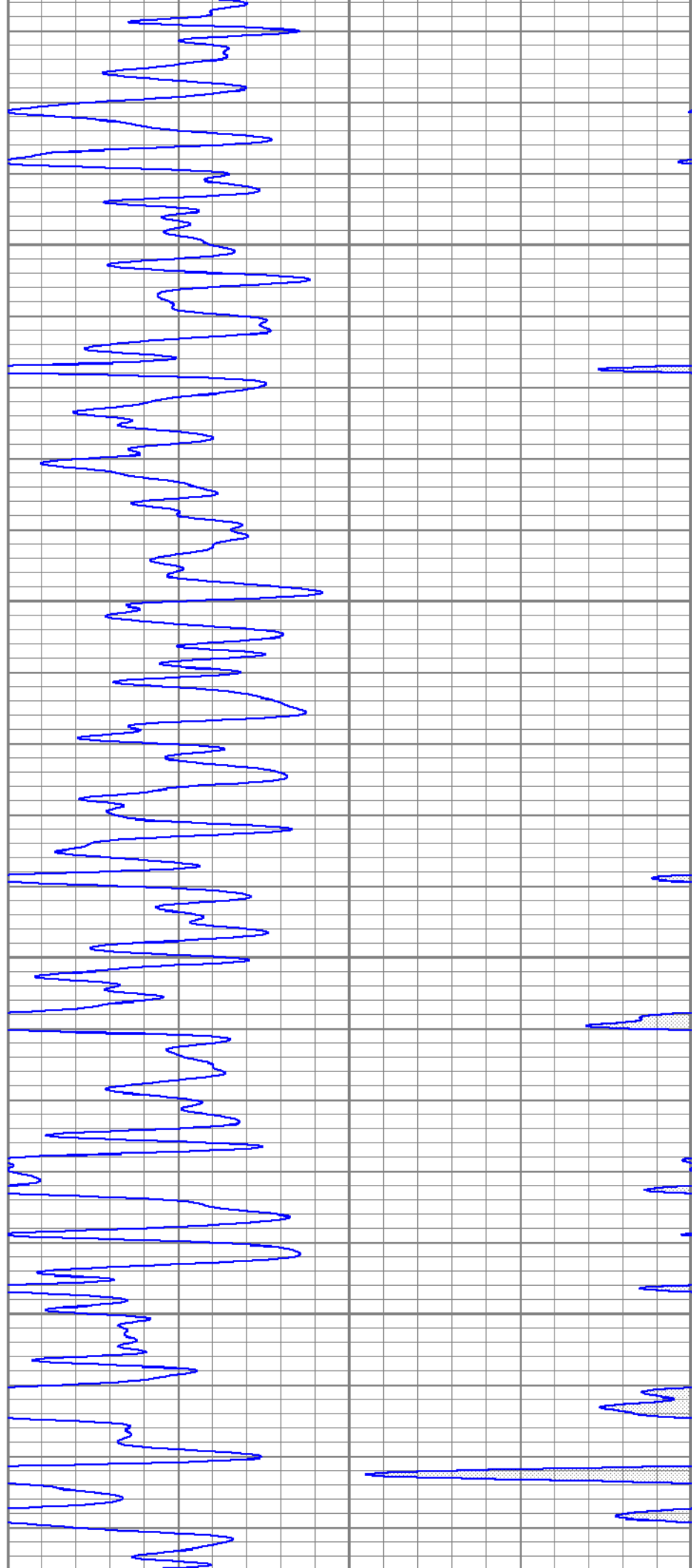


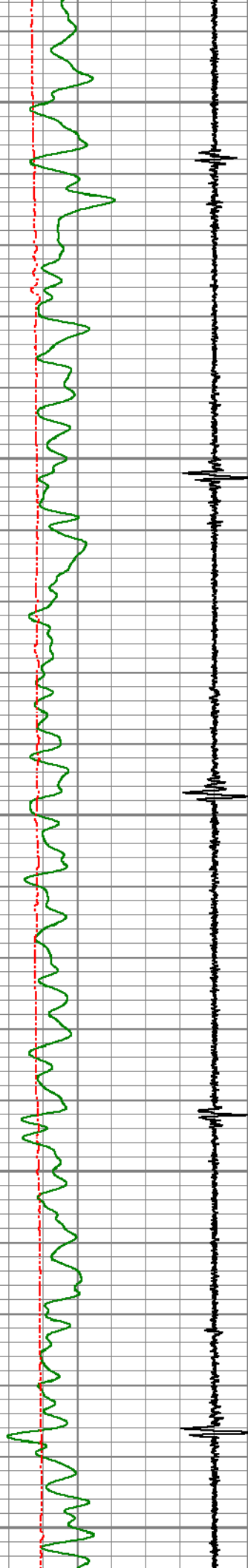
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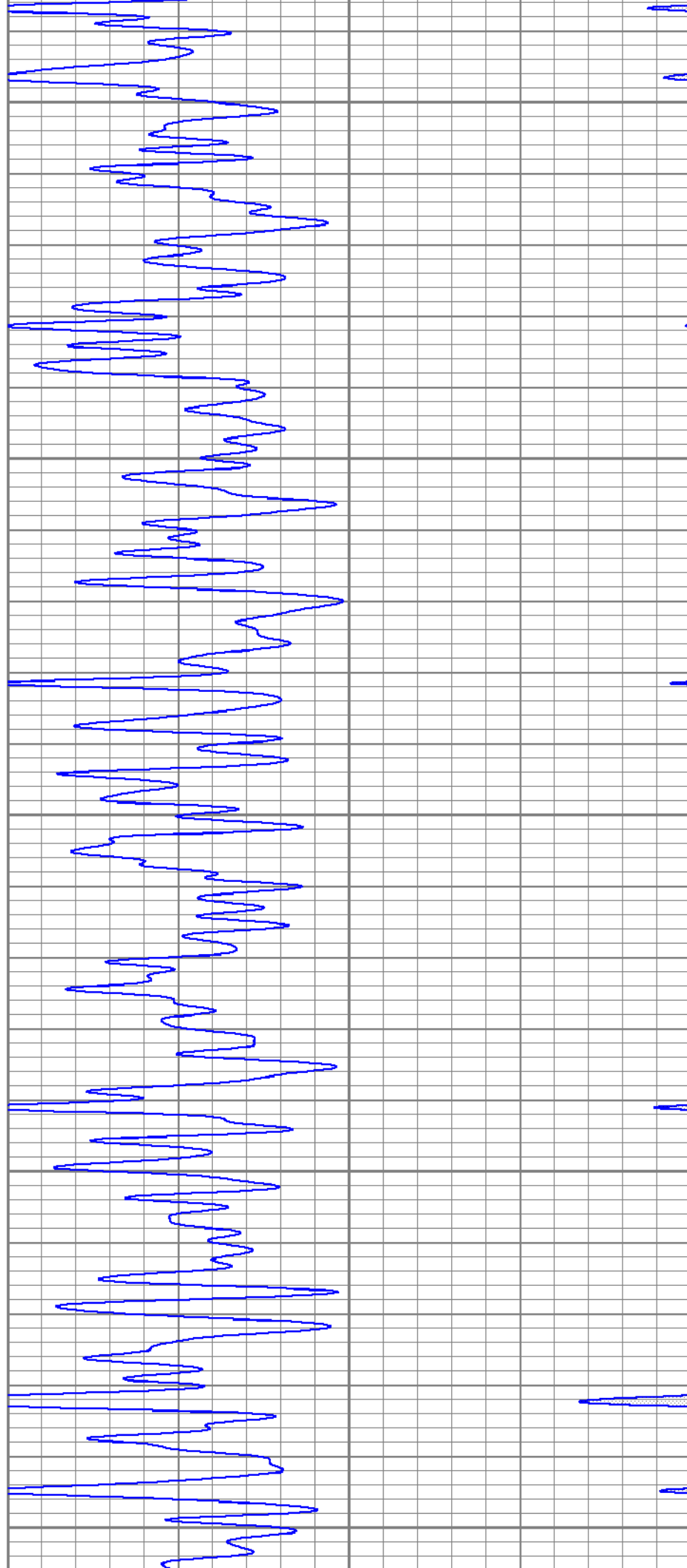
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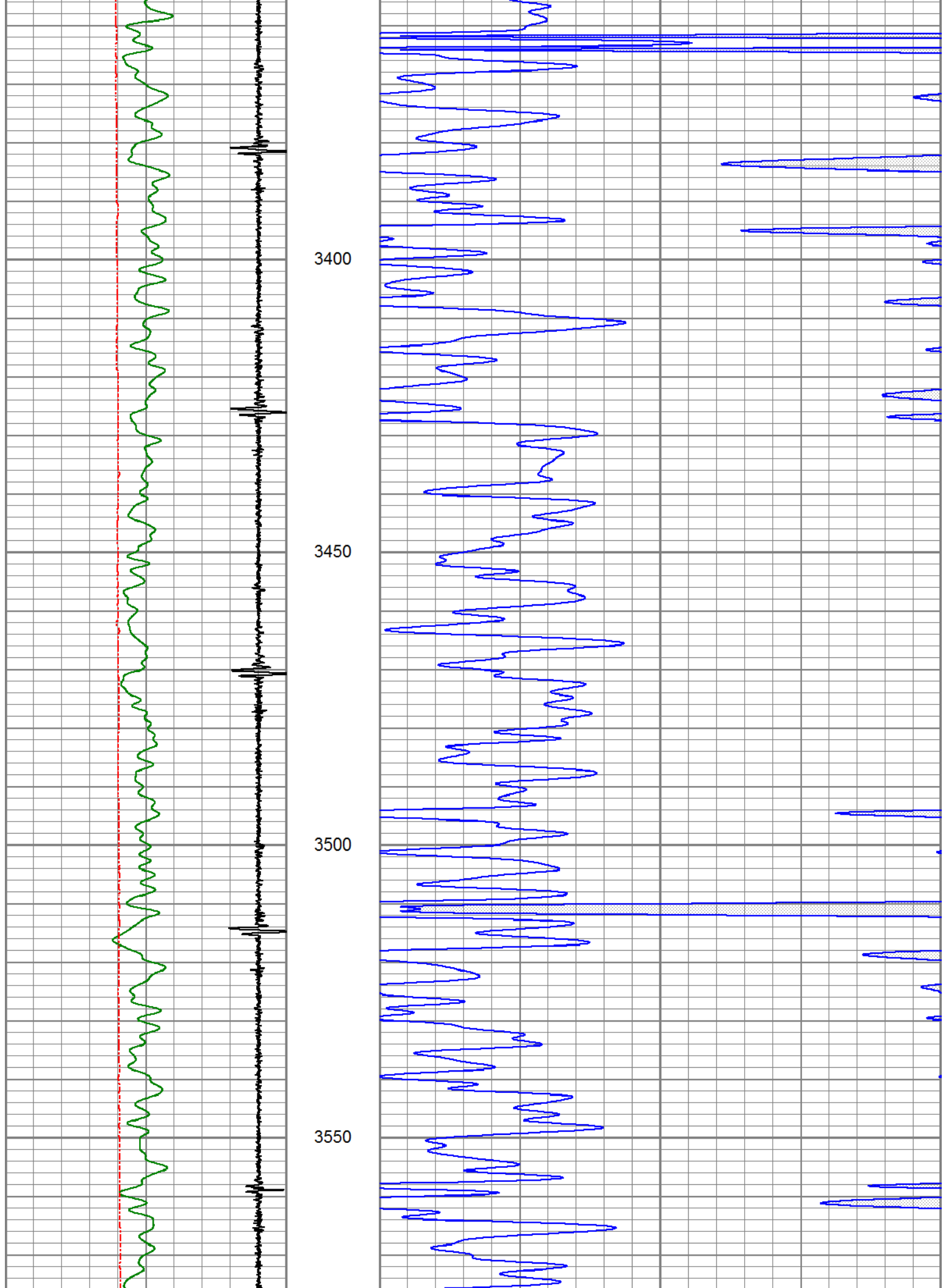
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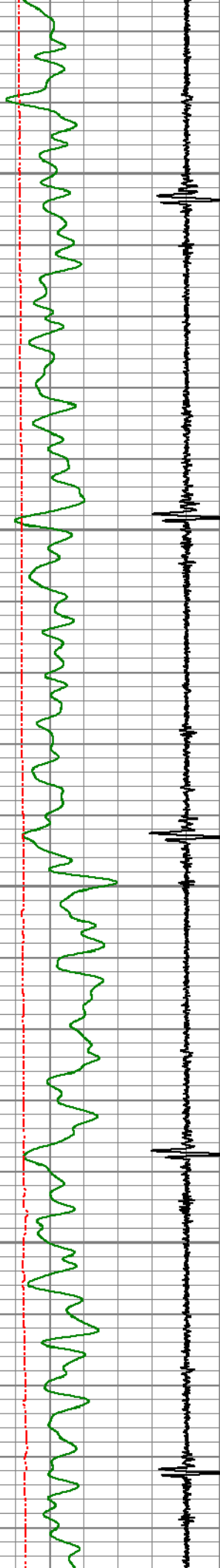
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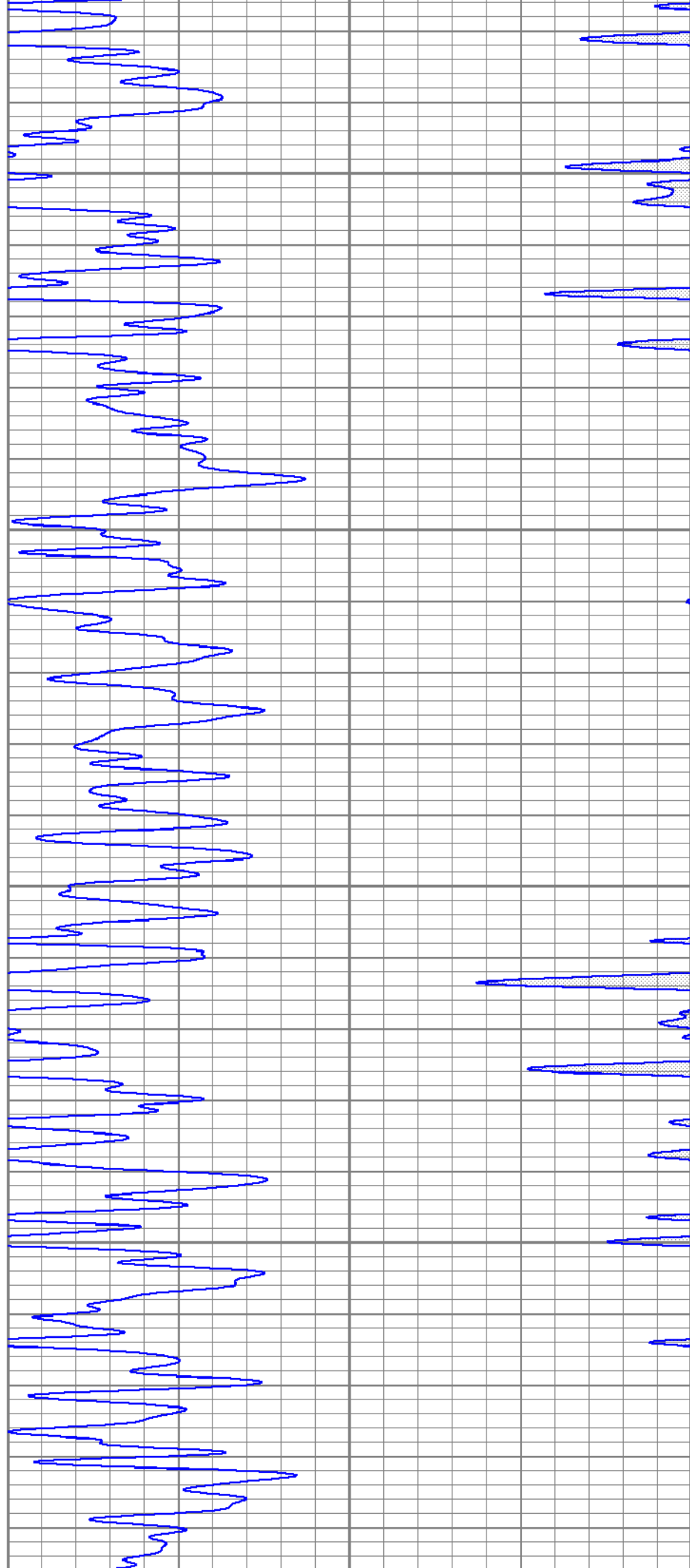


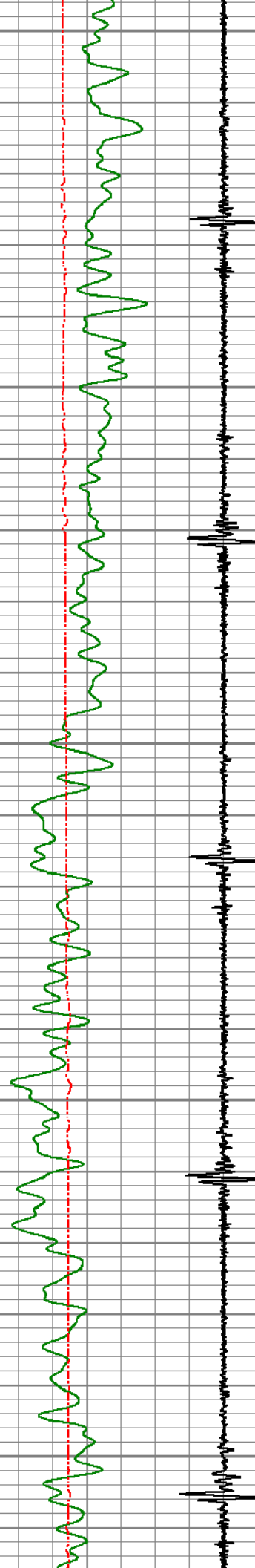
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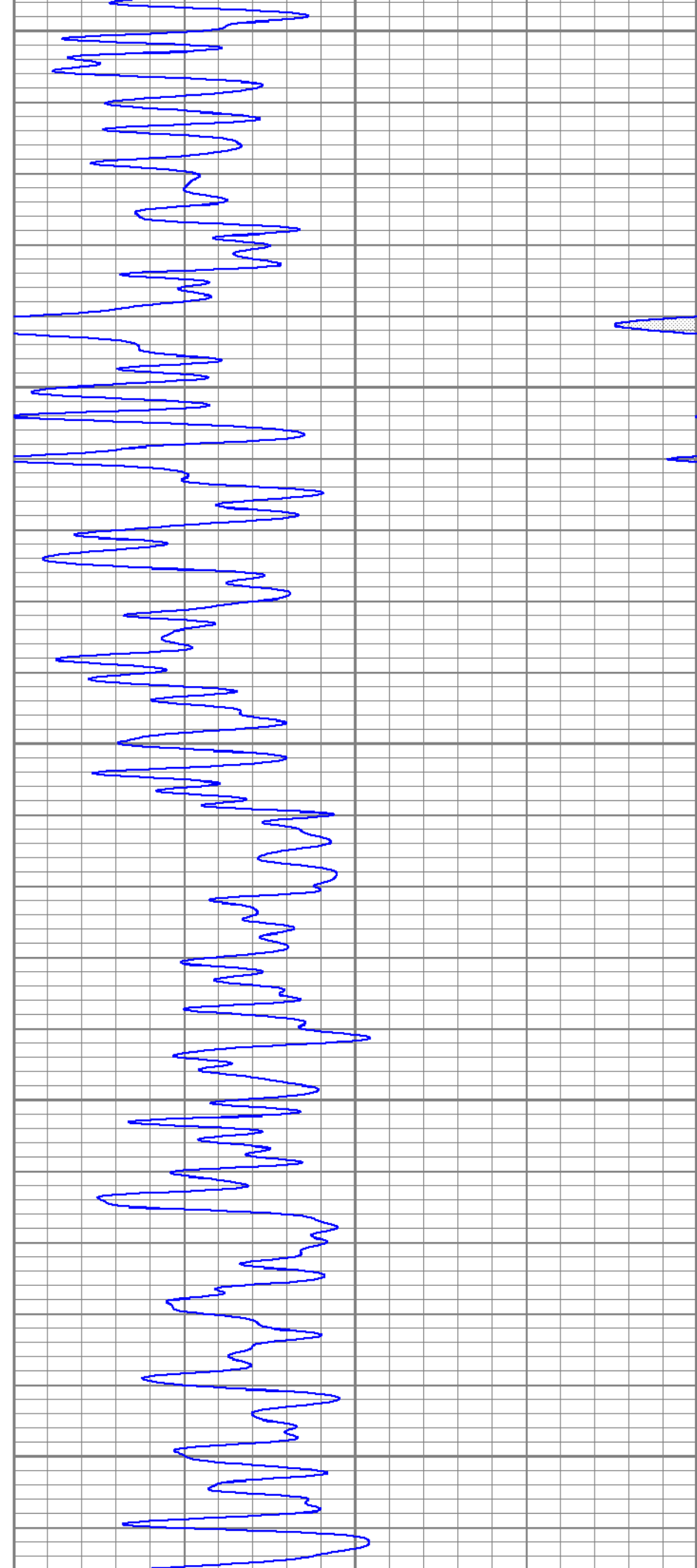
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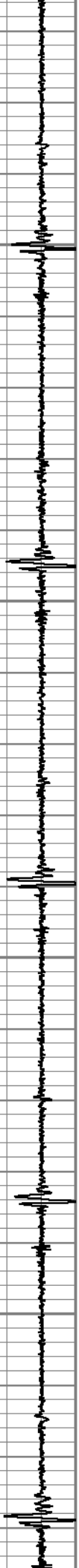
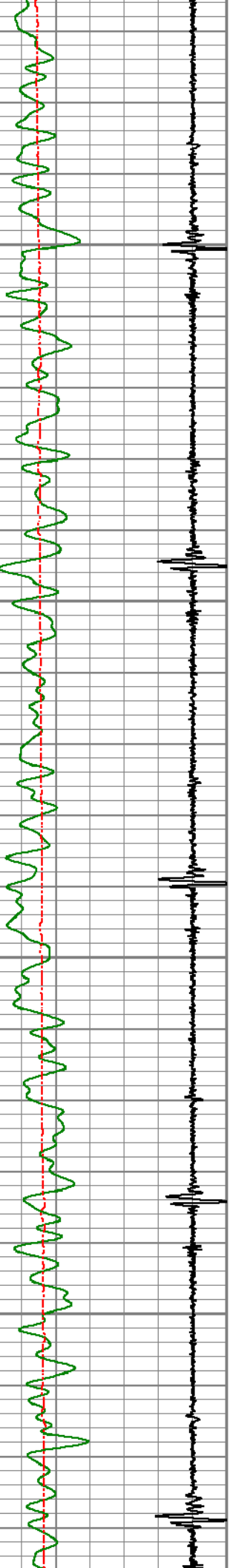
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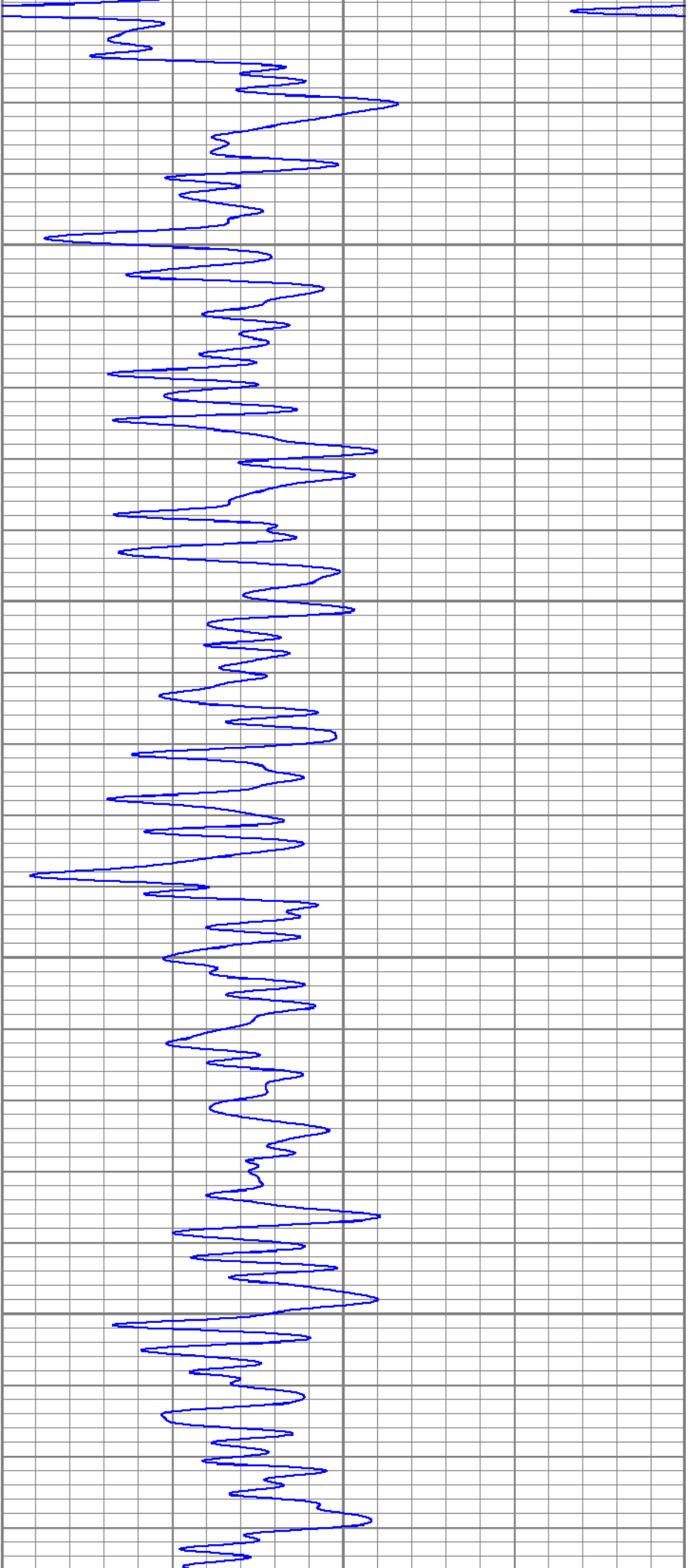


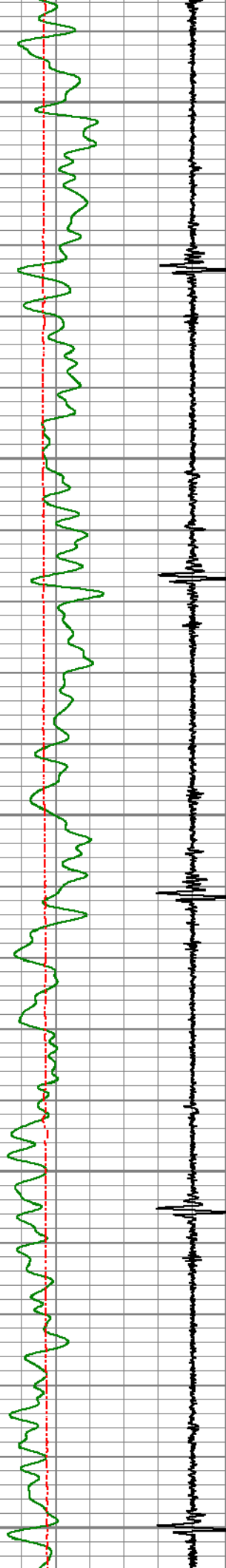
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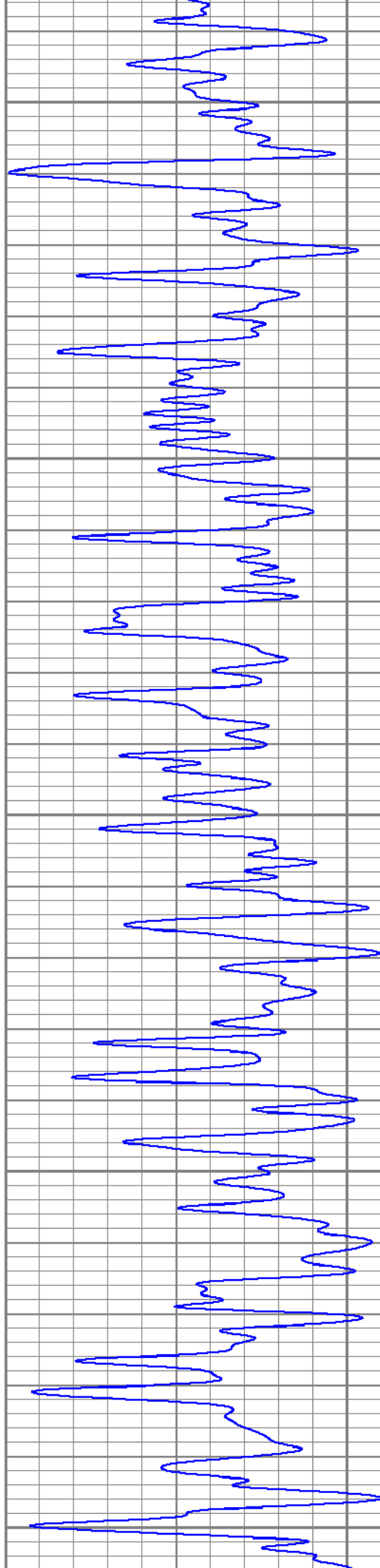
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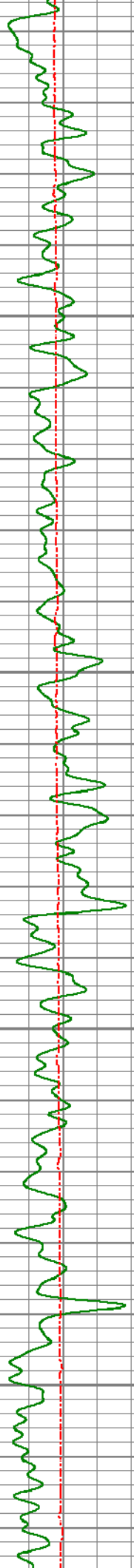
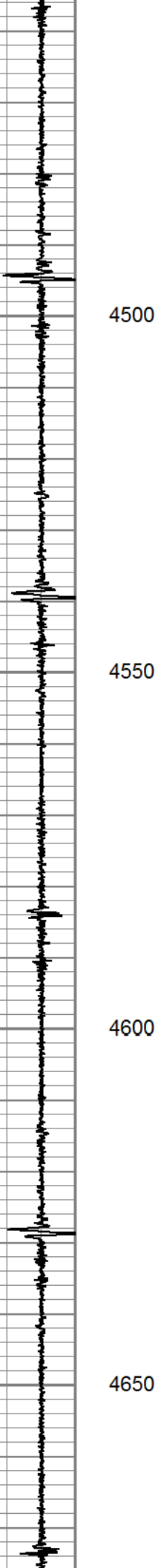
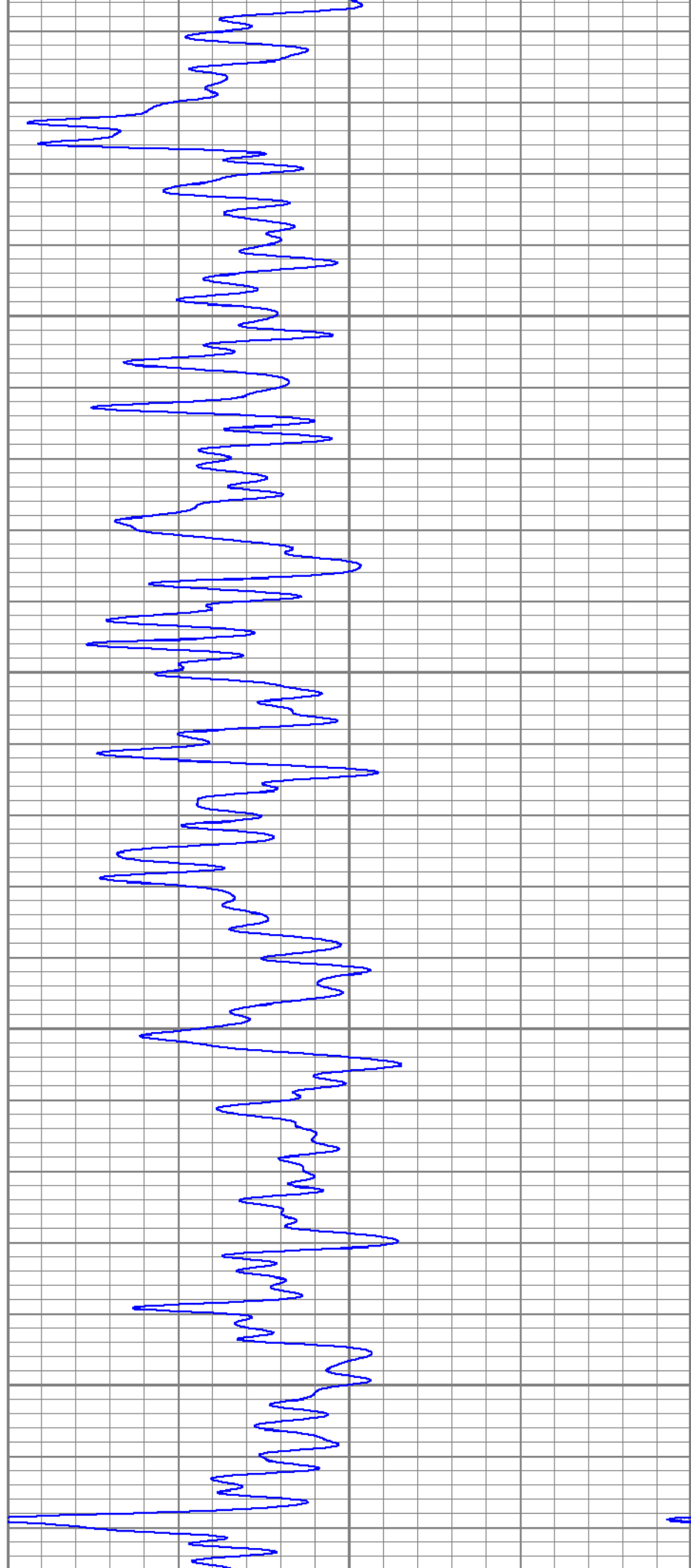
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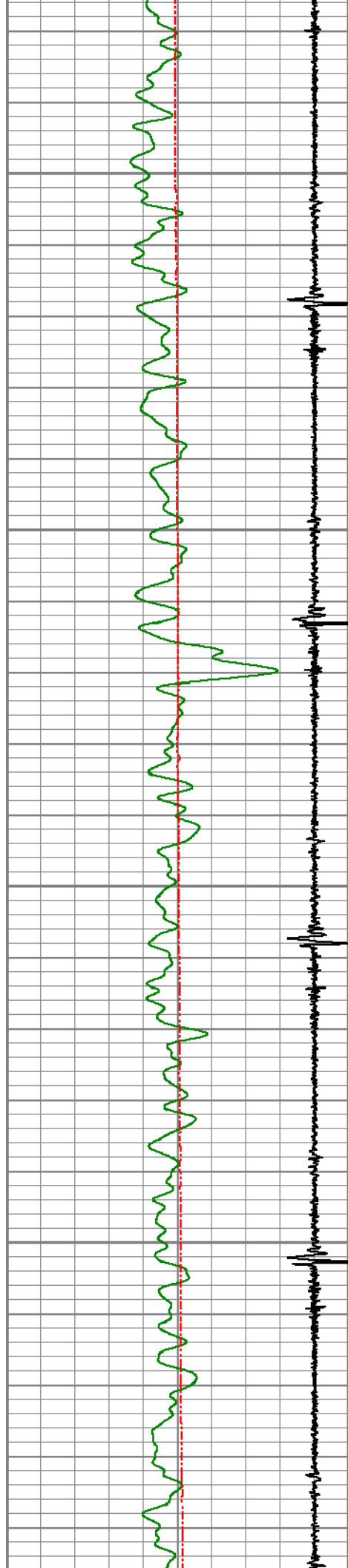
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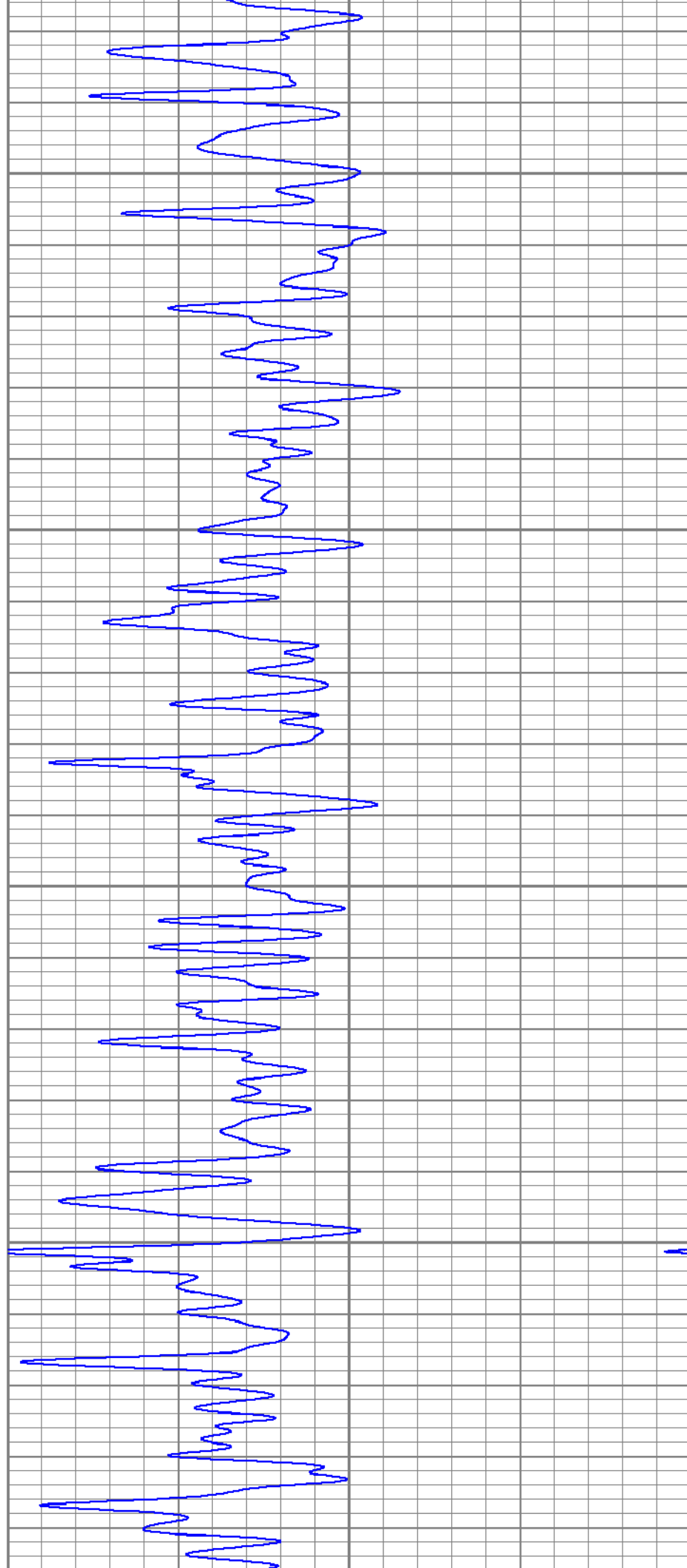


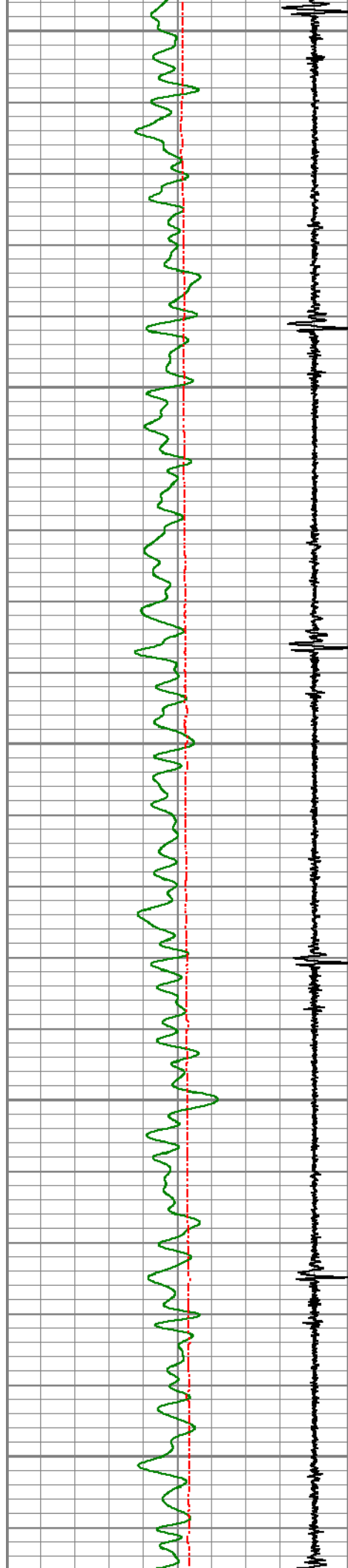
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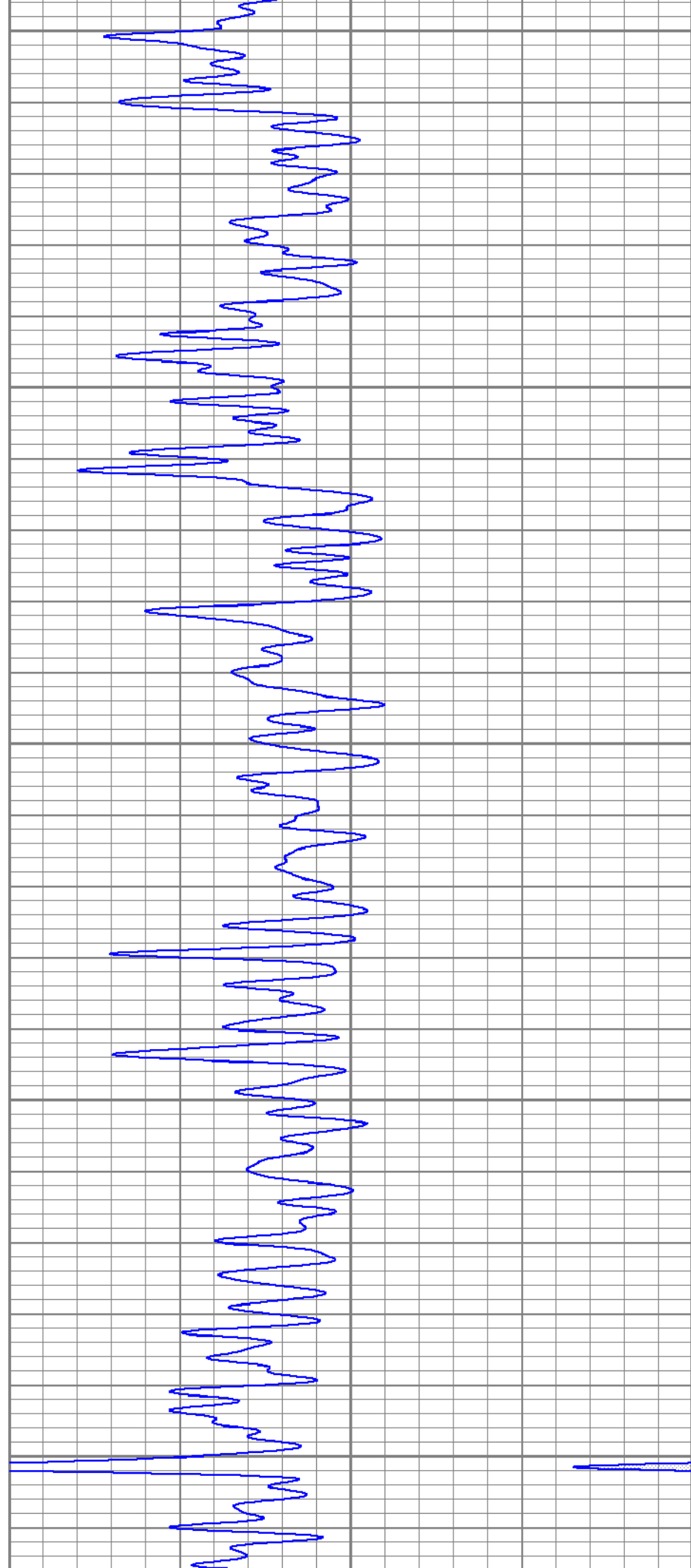
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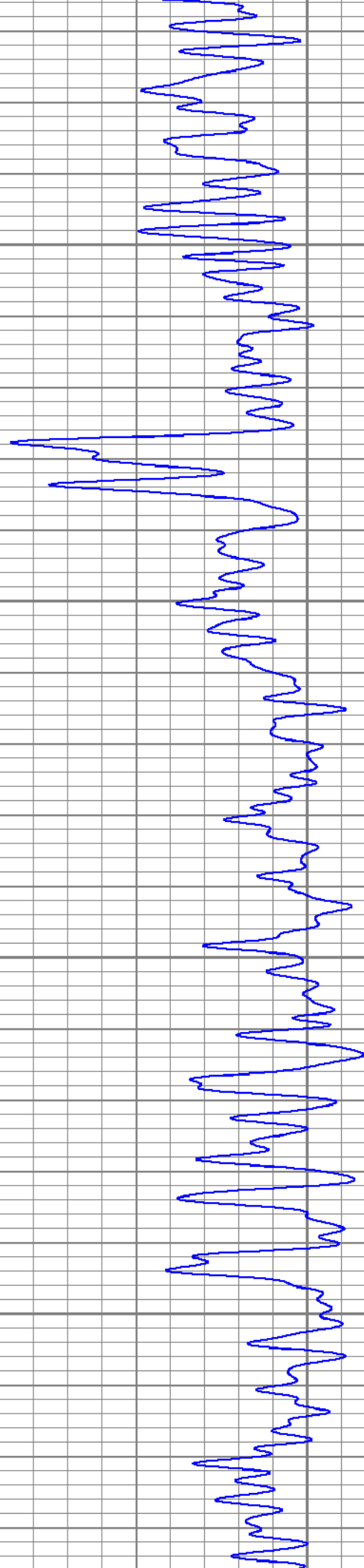
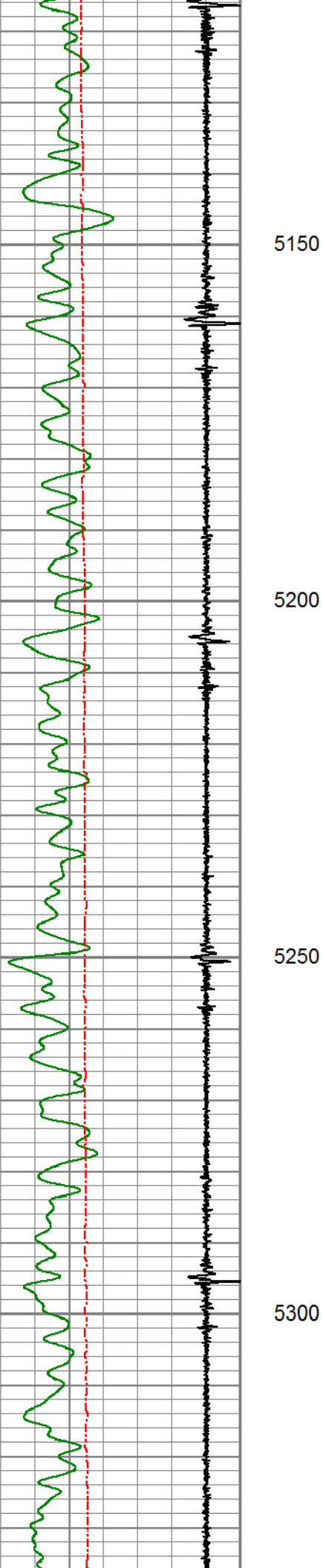
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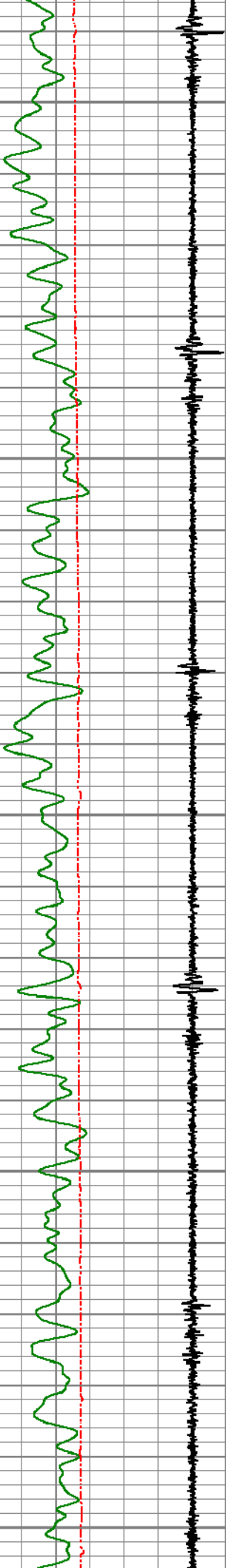
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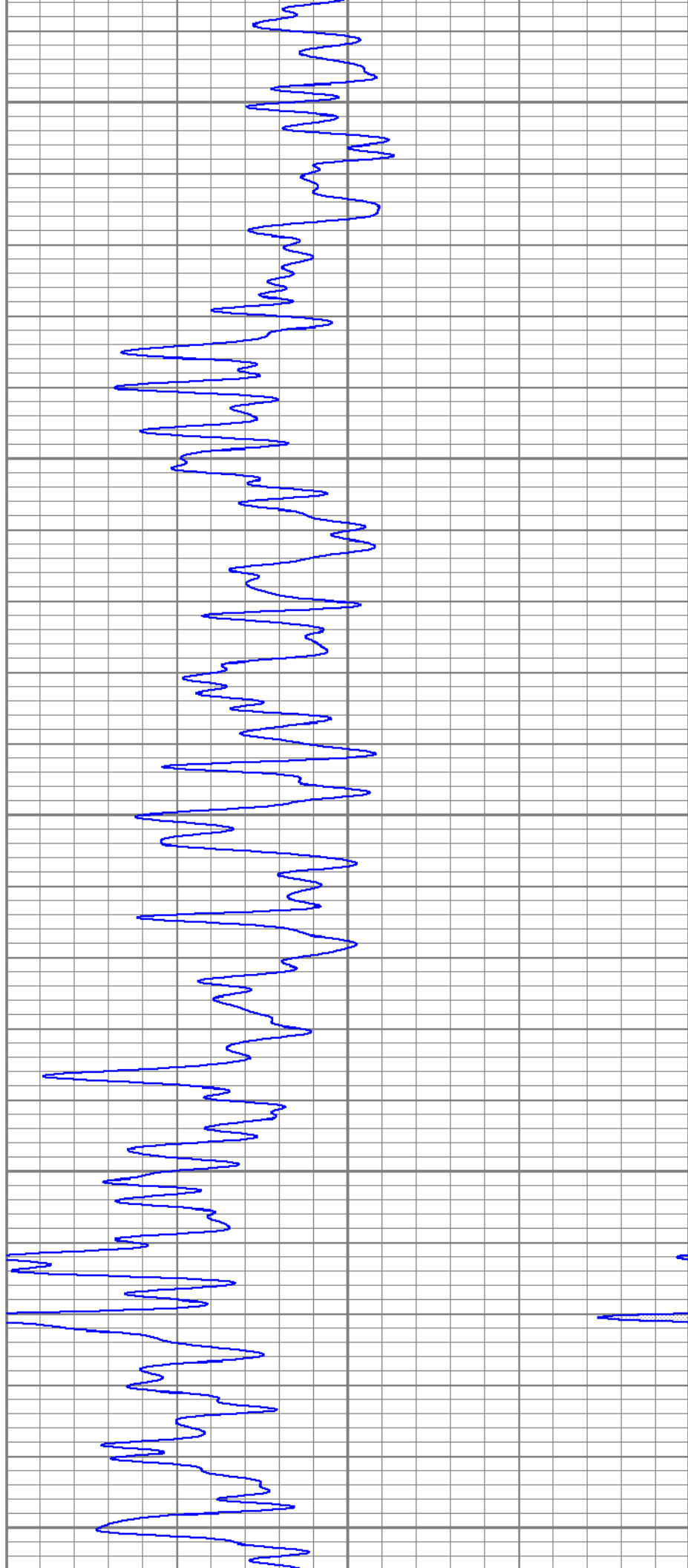
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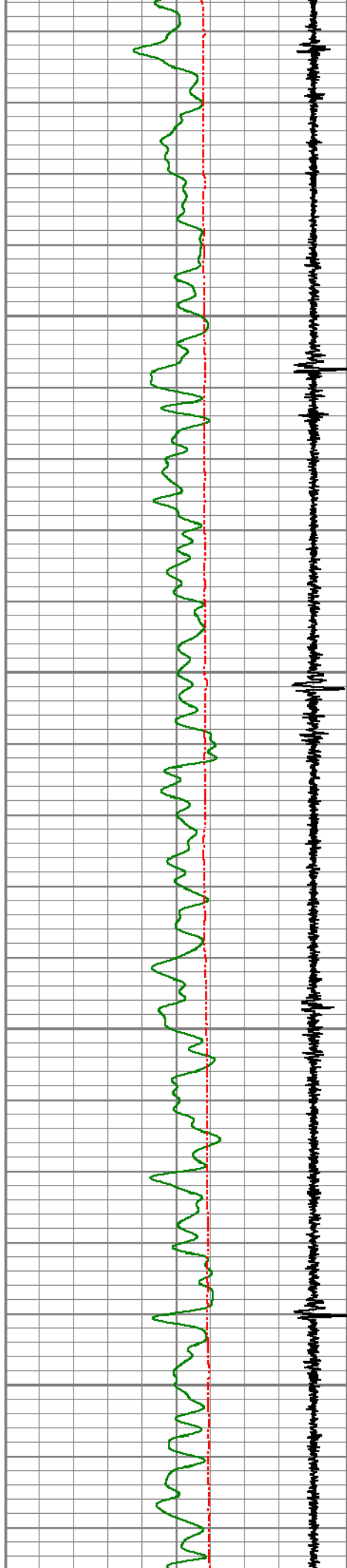
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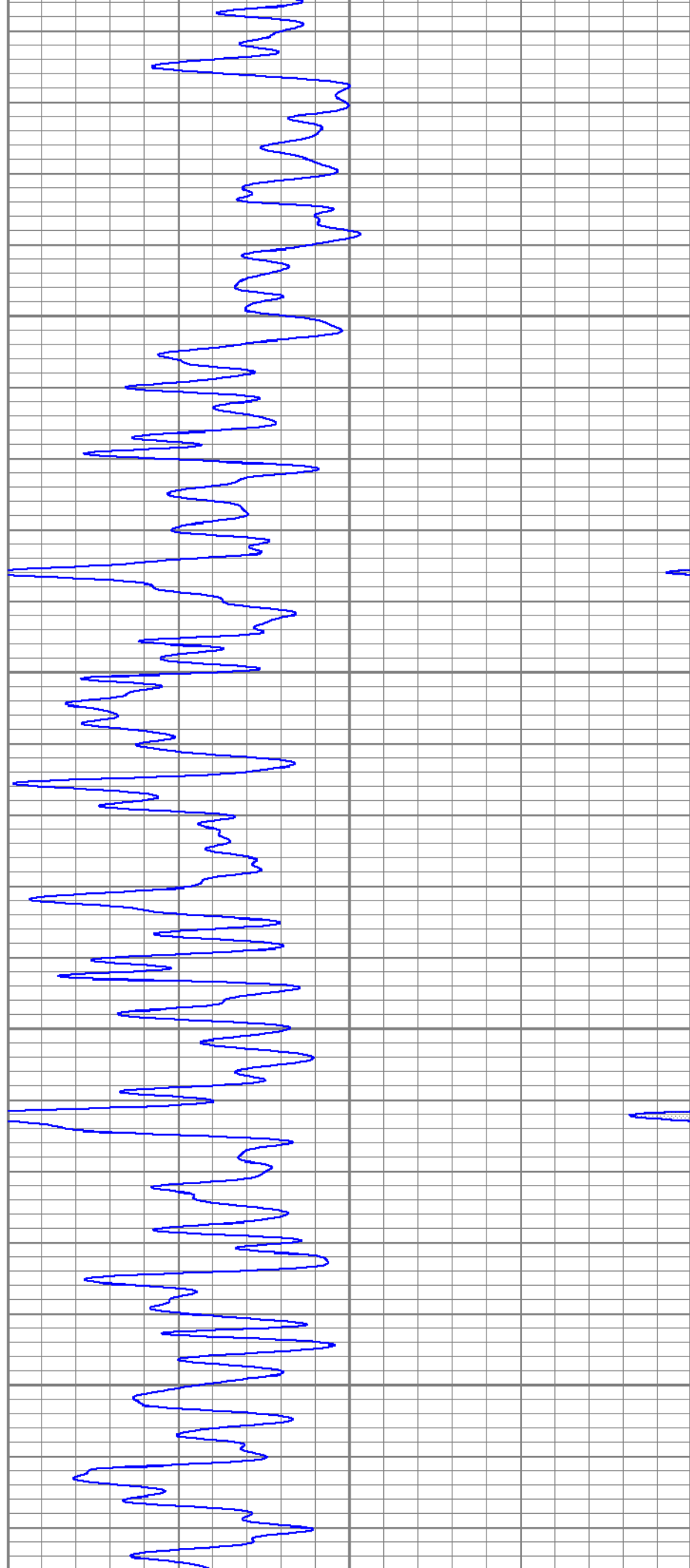


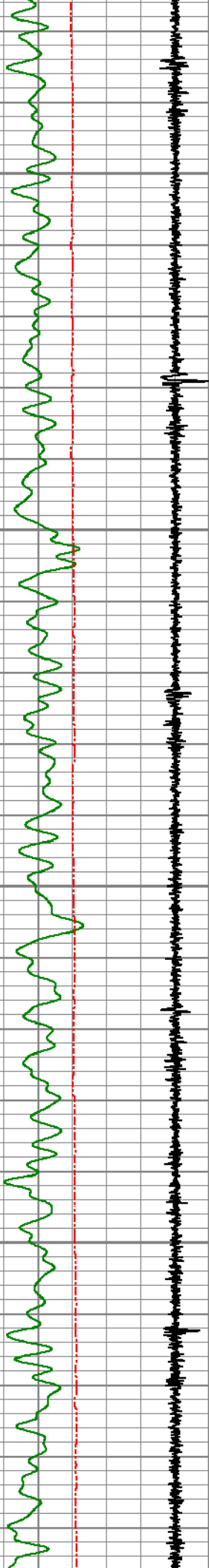
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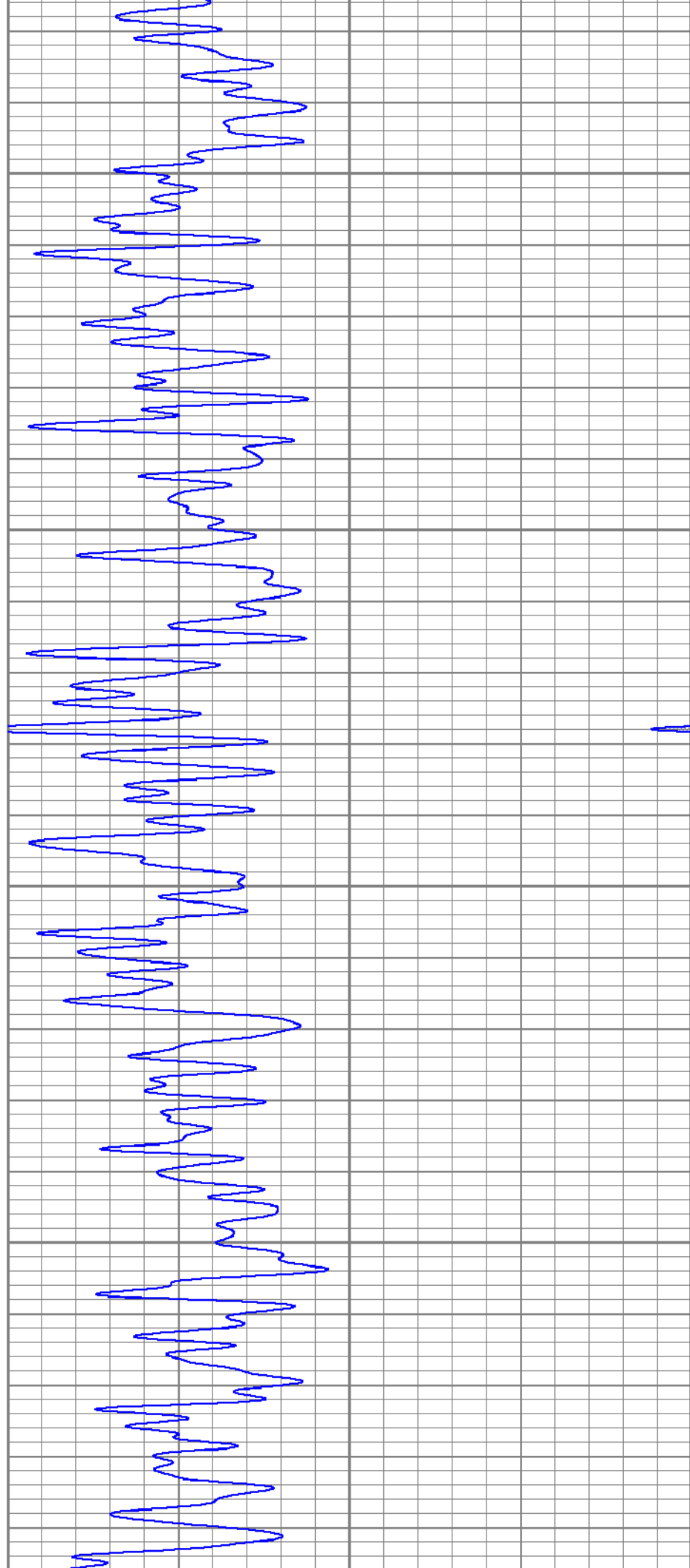


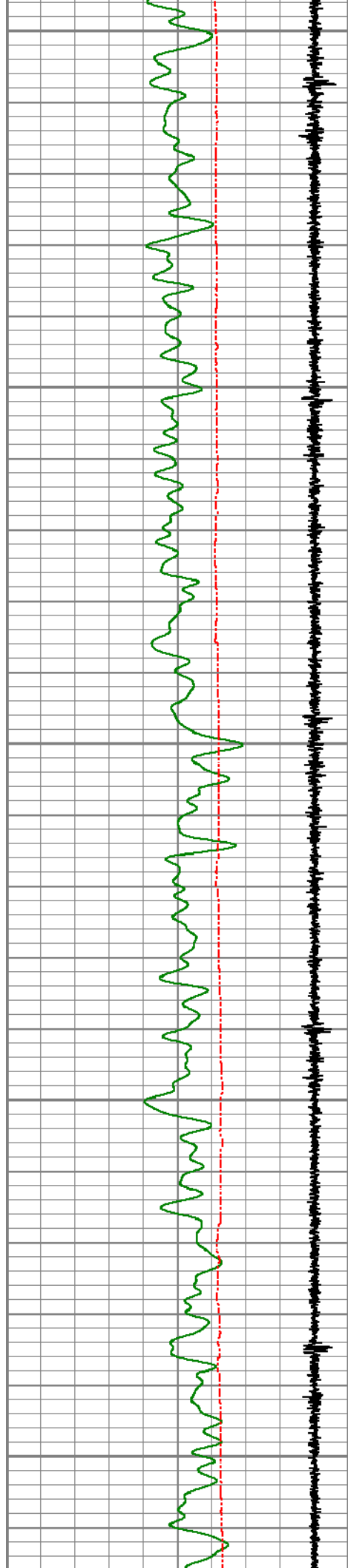
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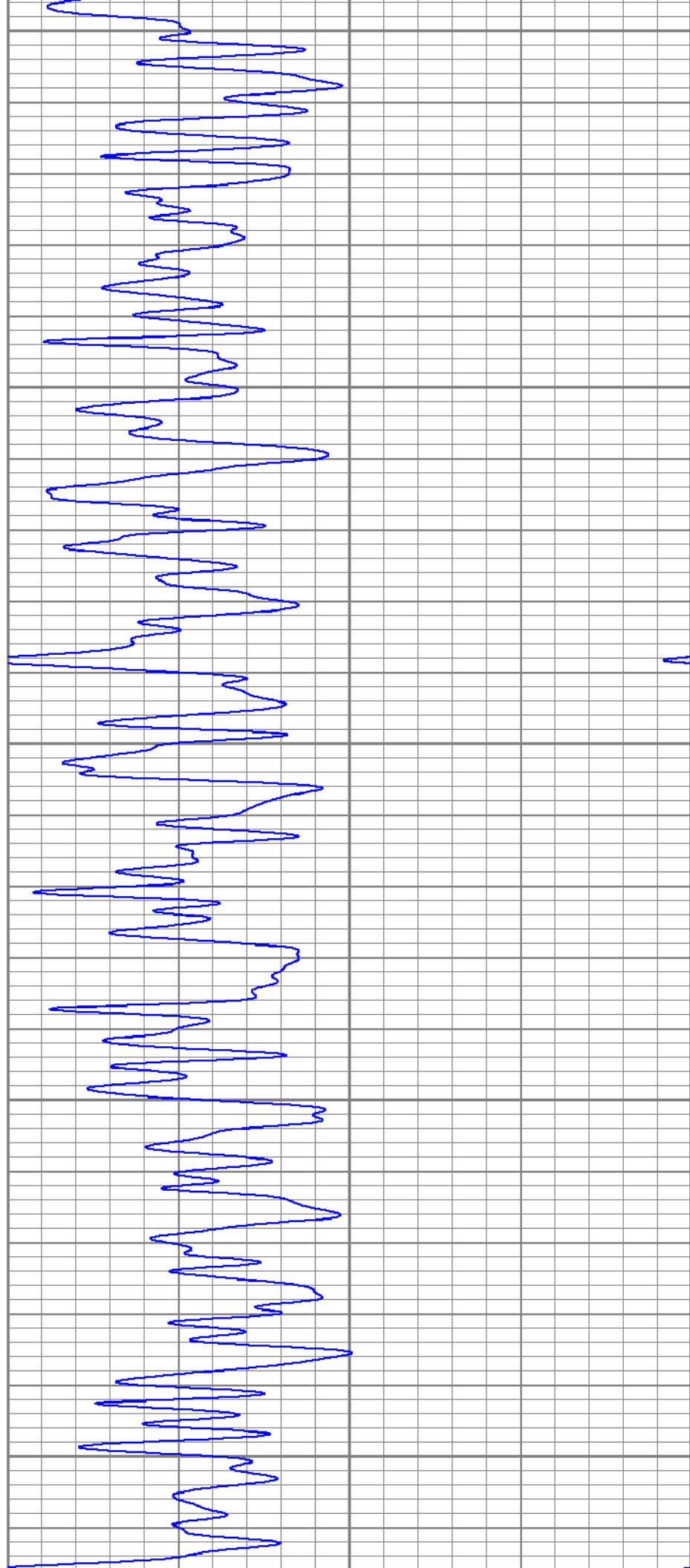
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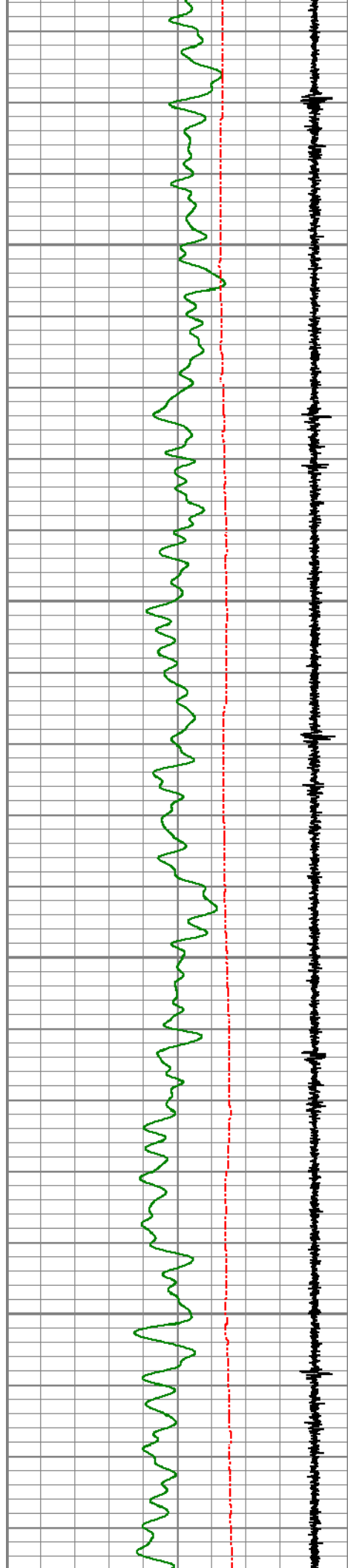
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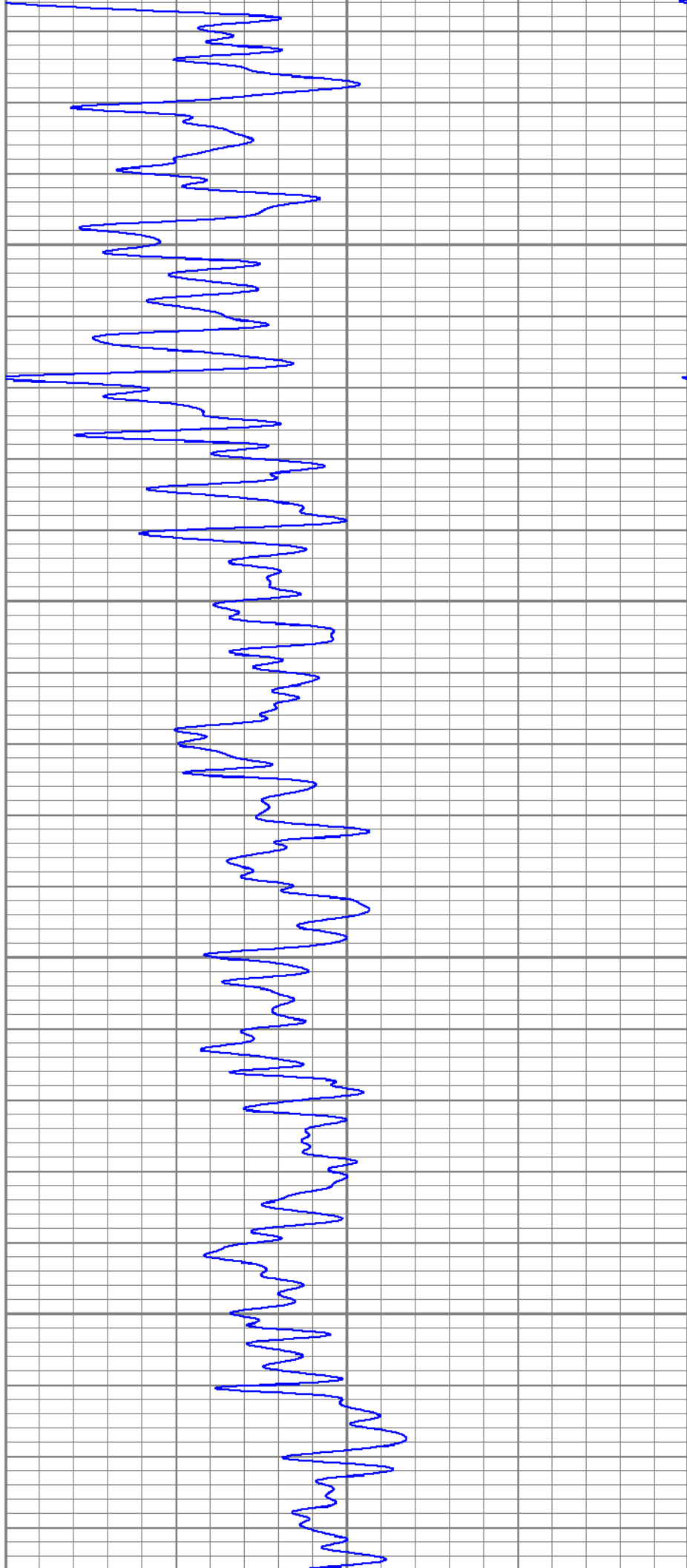


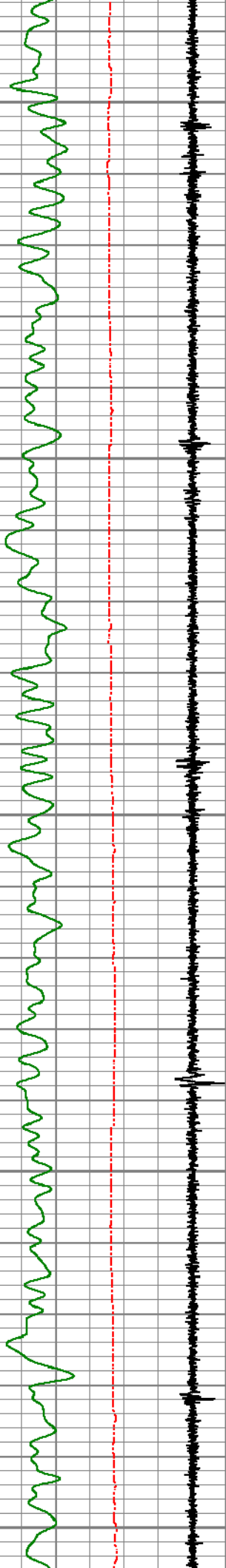
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6400





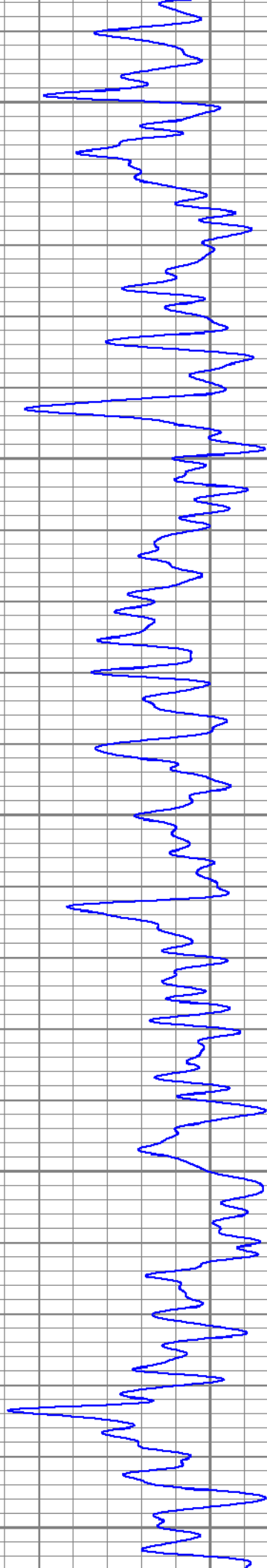
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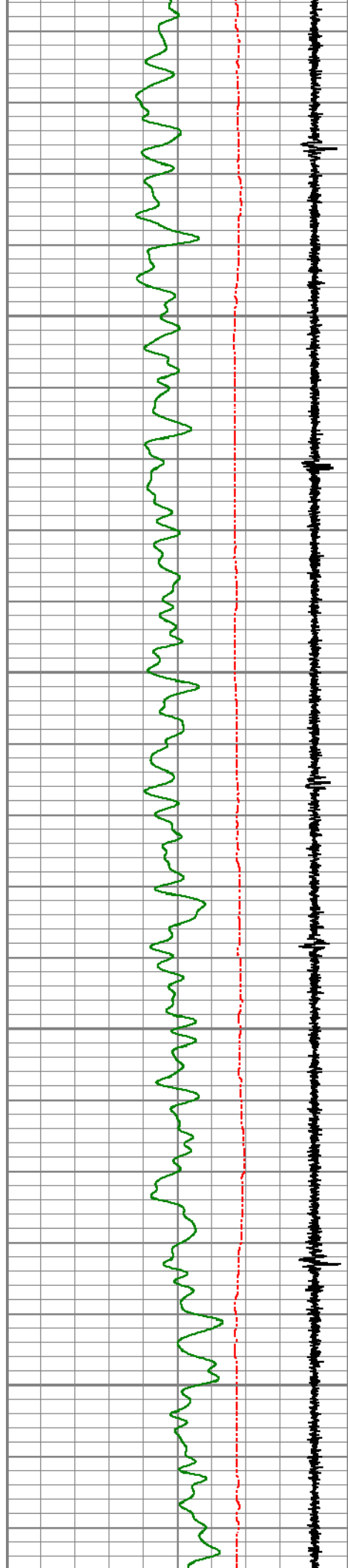
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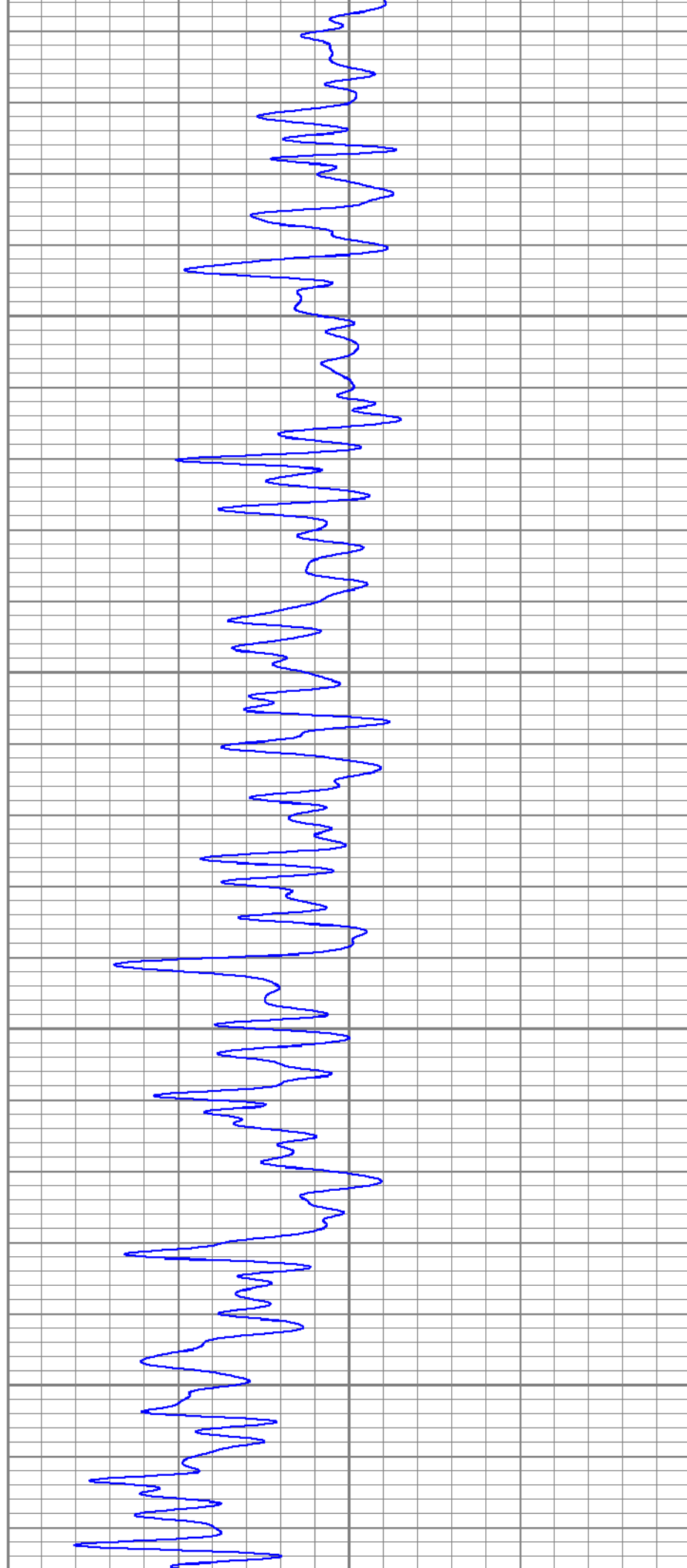


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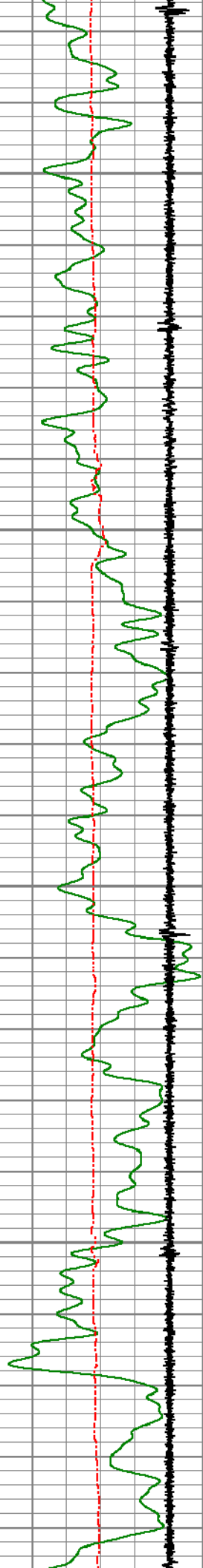
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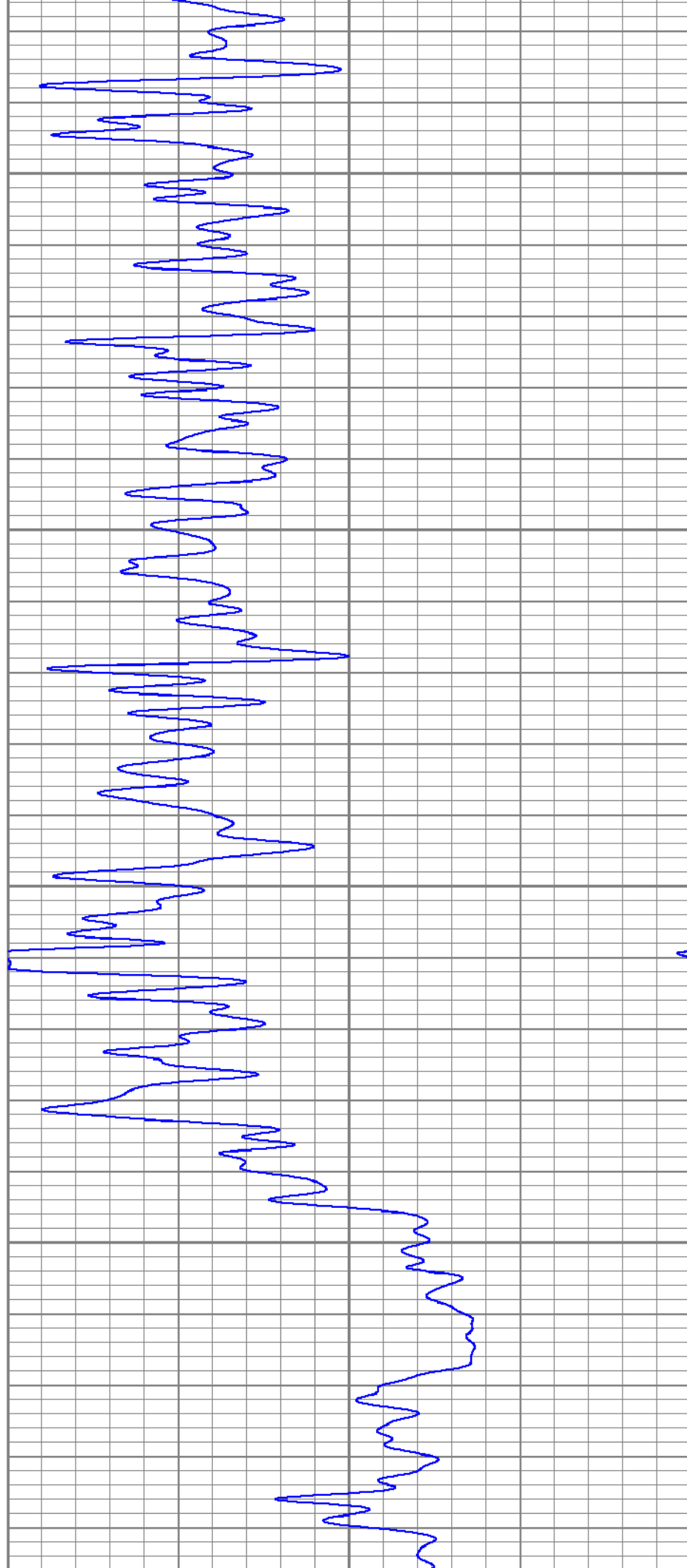


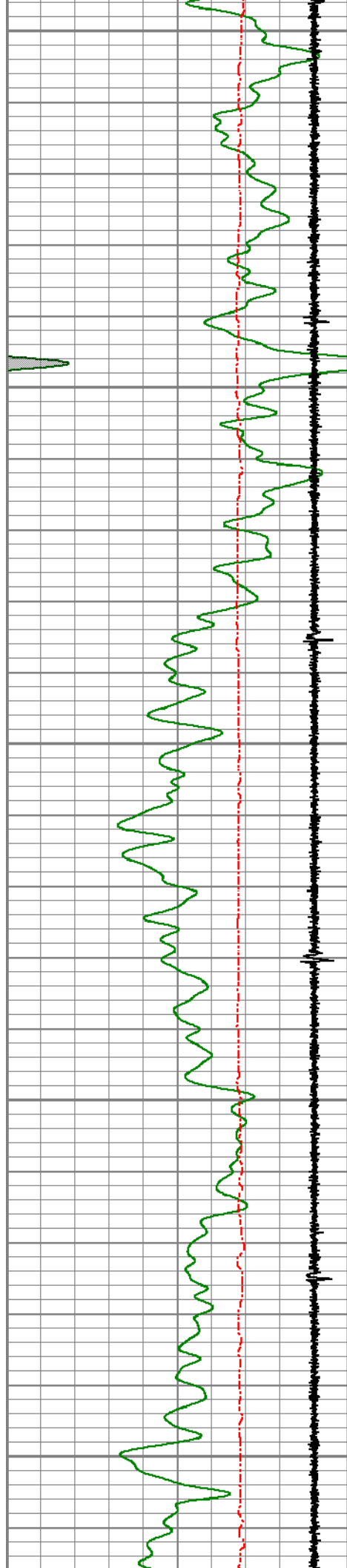
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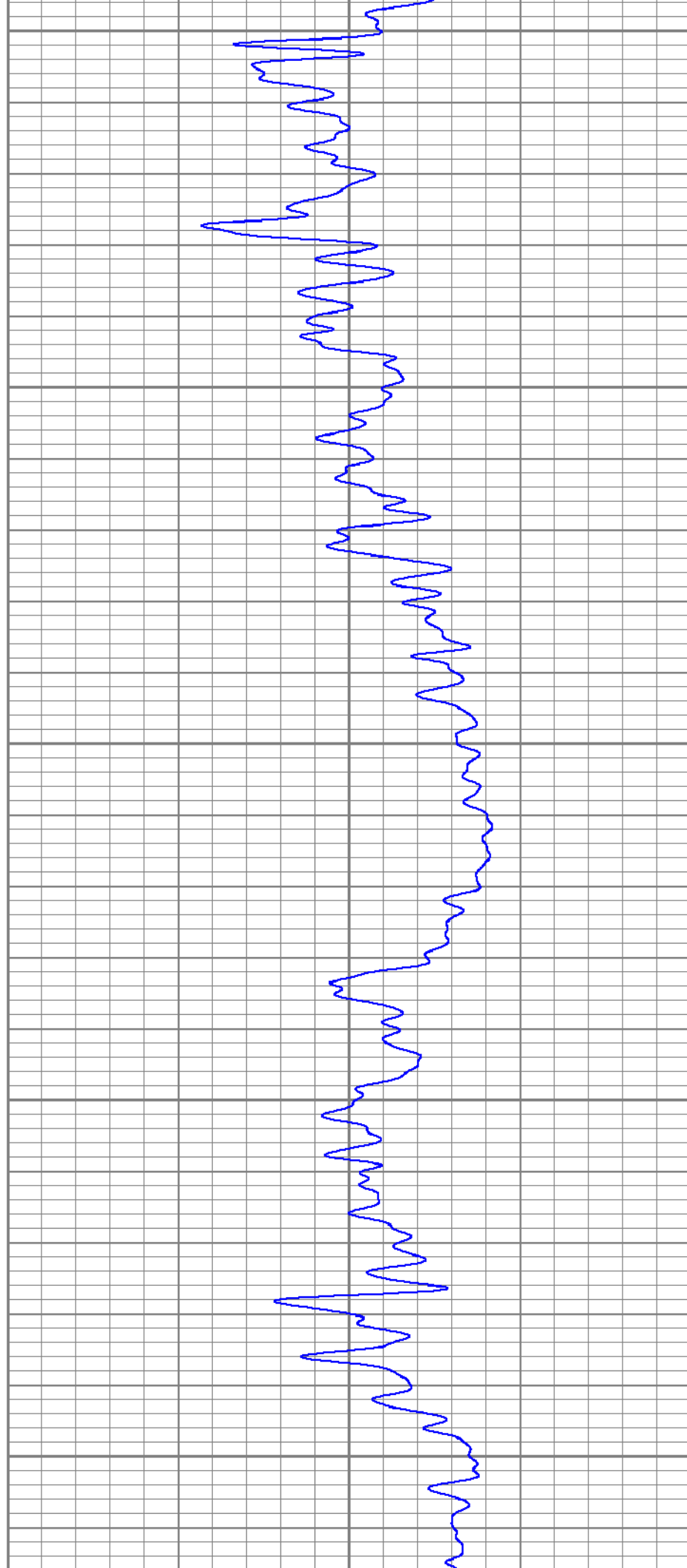
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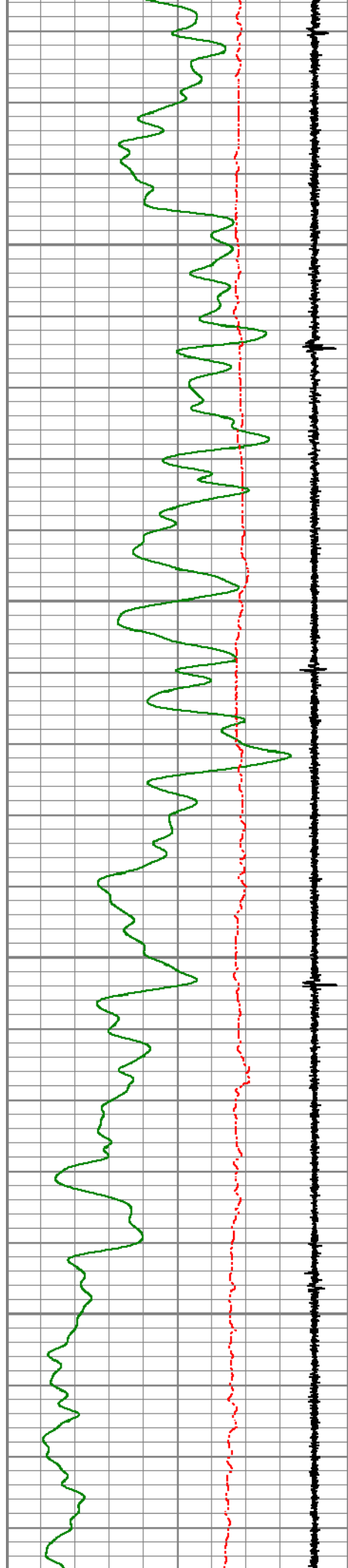
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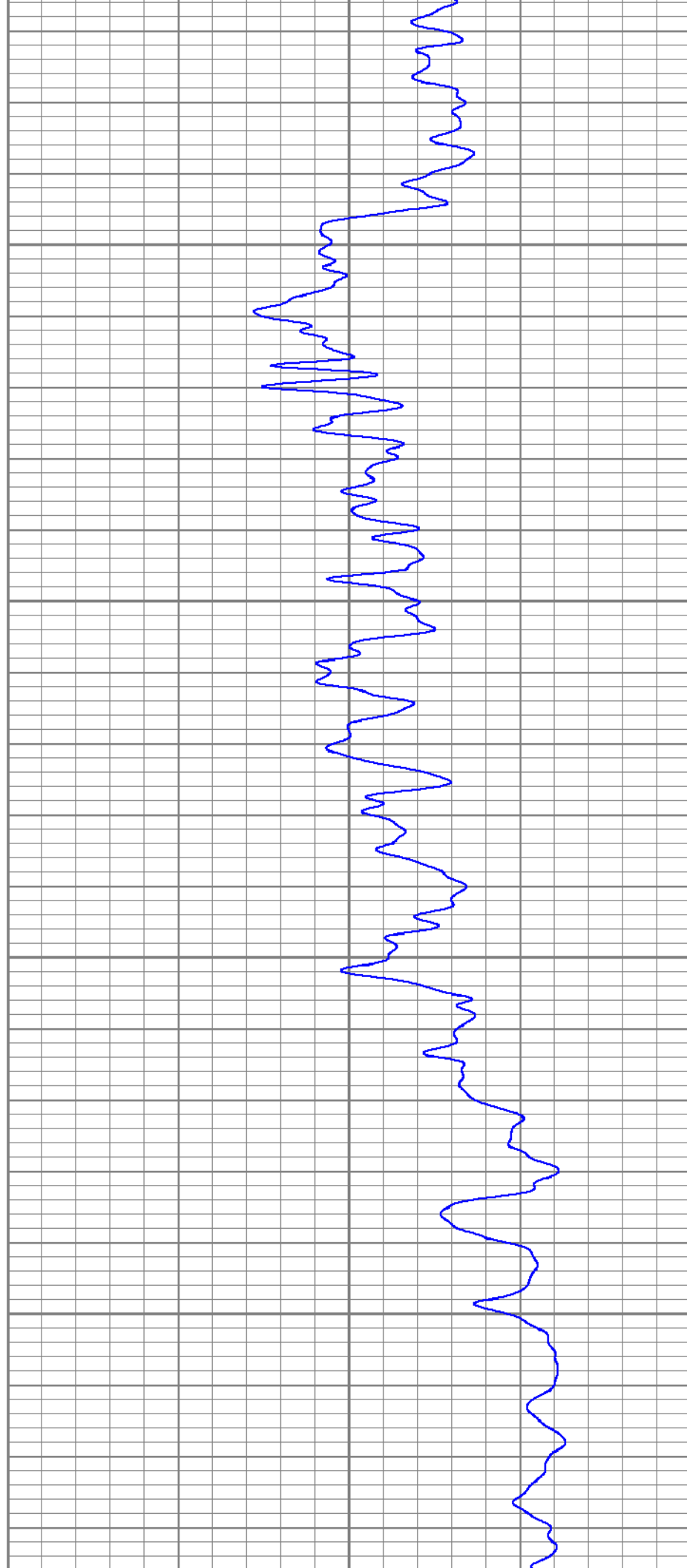


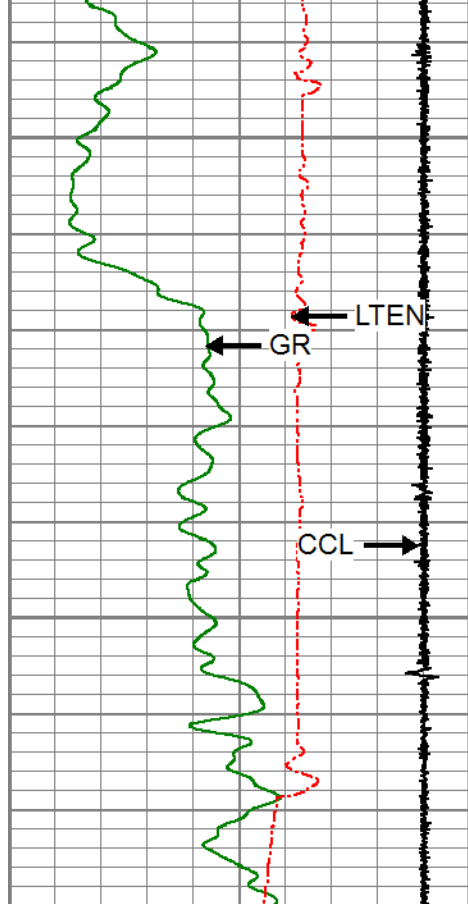
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7450

7500





7550

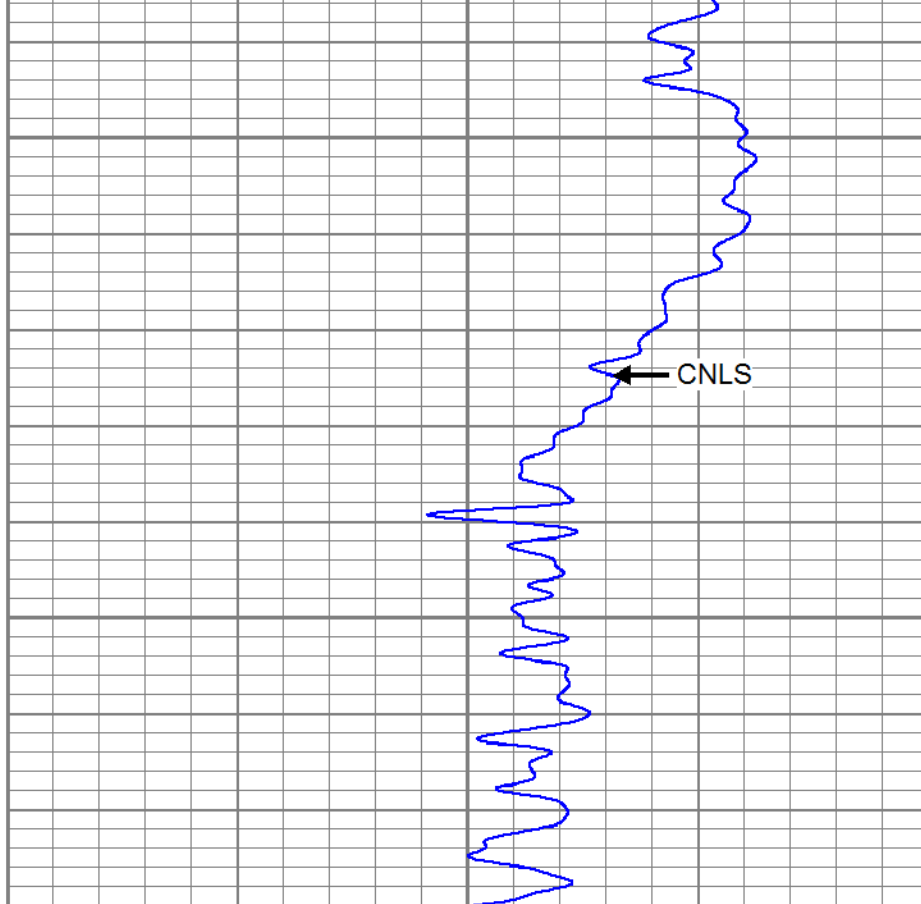
LTEN

GR

CCL

7600

0	Gamma Ray (GAPI)	150
-9	Collars	1
150	Gamma Ray (GAPI)	300
0	LineTension (lb)	2000



CNLS

40	CNPOR (pu)	0
80	CNPOR (pu)	40



**PIONEER**  
Pioneer Energy Services

## MAIN LOG

ZERO PSI APPLIED AT SURFACE



**PIONEER**  
Pioneer Energy Services

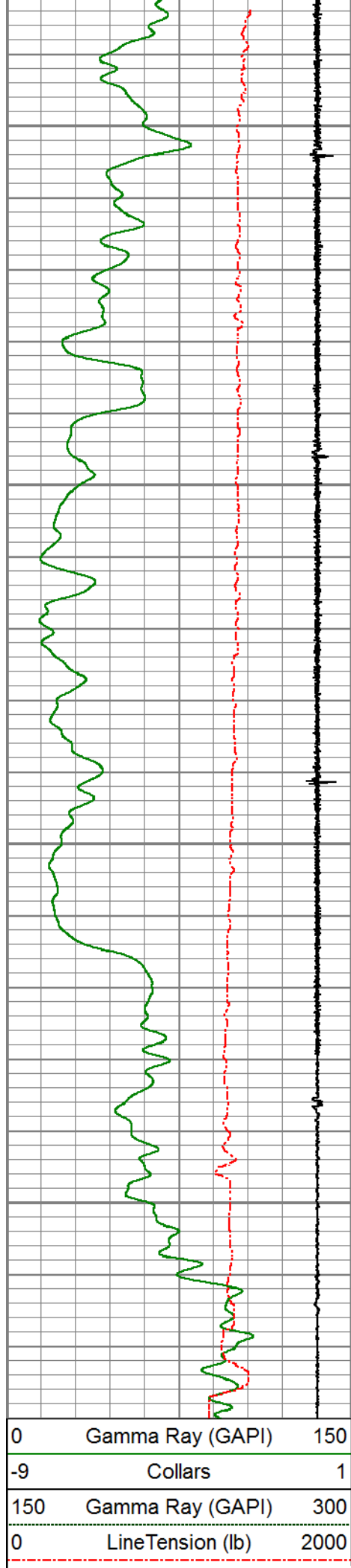
## REPEAT SECTION

ZERO PSI APPLIED AT SURFACE

Database File pdc\_thistle down31g-402\_0512345746\_20180131\_scbl-cn1.db  
 Dataset Pathname pass5  
 Presentation Format pinr\_cn1\_co  
 Dataset Creation Thu Jan 31 08:30:35 2019  
 Charted by Depth in Feet scaled 1:240

0	Gamma Ray (GAPI)	150
-9	Collars	1
150	Gamma Ray (GAPI)	300
0	LineTension (lb)	2000

40	CNPOR (pu)	0
80	CNPOR (pu)	40



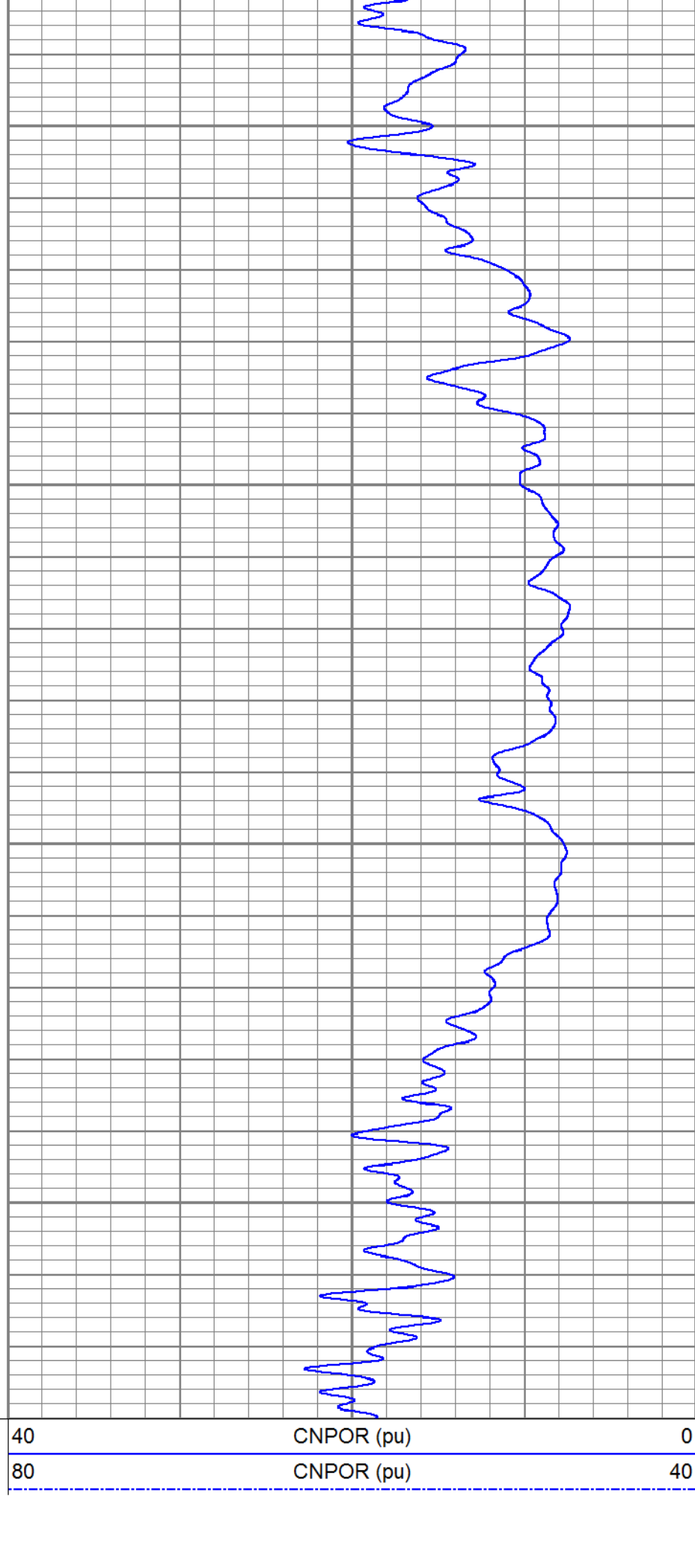
7450

7500

7550

7600

0	Gamma Ray (GAPI)	150
-9	Collars	1
150	Gamma Ray (GAPI)	300
0	LineTension (lb)	2000



40	CNPOR (pu)	0
80	CNPOR (pu)	40

Calibration Report						
Database File	pdc_thistle down31g-402_0512345746_20180131_scbl-cn1.db					
Dataset Pathname	pass6					
Dataset Creation	Thu Jan 31 08:39:19 2019					
Compensated Neutron Calibration Report						
			Type / Serial:	PRB_DIG / 120509		
			Source / Verifier:	/		
			Temperature:			
SHOP CALIBRATION		Tue Nov 20 10:02:13 2012				
	Cal Tube	Units				
Tank Ratio		SS/LS				
Tank Porosity		pu				
LS Detector		cps				
SS Detector		cps				
Tool Ratio		SS/LS				
Tool Porosity		pu				
Tool Constant =						
Field Verifier	SS Detector	LS Detector	Ratio	Porosity		
PRE-SURVEY VERIFICATION						
	SS Detector	LS Detector	Ratio	Porosity		
POST-SURVEY VERIFICATION						
	SS Detector	LS Detector	Ratio	Porosity		
Gamma Ray Calibration Report						
Serial Number:	111212					
Tool Model:	275_6-PIN					
Performed:	Mon Oct 01 12:13:05 2018					
Calibrator Value:	1.0	GAPI				
Background Reading:	0.0	cps				
Calibrator Reading:	1.0	cps				
Sensitivity:	0.6900	GAPI/cps				
Segmented Cement Bond Log Calibration Report						
Serial Number:	FW1411-67-T					
Tool Model:	RBL-DCT					
Calibration Casing Diameter:	5.500	in				
Calibration Depth:	0.000	ft				
Master Calibration, performed Wed Jan 02 13:04:30 2019:						
Raw (v)		Calibrated (mv)		Results		
Zero	Cal	Zero	Cal	Gain	Offset	



3'	0.002	1.194	0.700	71.921	59.742	0.597
CAL	0.011	1.509				
5'	0.133	1.145	0.700	71.921	70.399	-8.656
SUM						
S1	0.068	1.236	0.000	100.000	85.601	-5.830
S2	0.004	1.293	0.000	100.000	77.576	-0.327
S3	0.004	1.247	0.000	100.000	80.502	-0.351
S4	0.001	1.227	0.000	100.000	81.611	-0.112
S5	0.004	1.232	0.000	100.000	81.393	-0.314
S6	0.001	1.206	0.000	100.000	83.012	-0.098
S7	0.000	1.209	0.000	100.000	82.718	-0.039
S8	0.000	1.195	0.000	100.000	83.716	-0.036

Air Zero Calibration, performed Thu Nov 29 15:51:21 2018:

	Raw (v)	Calibrated (v)	Results
	Zero	Zero	Offset
3'	0.000	0.000	0.000
5'	0.000	0.000	0.000
SUM			
S1	0.000	0.000	0.000
S2	0.000	0.000	0.000
S3	0.000	0.000	0.000
S4	0.000	0.000	0.000
S5	0.000	0.000	0.000
S6	0.000	0.000	0.000
S7	0.000	0.000	0.000
S8	0.000	0.000	0.000

#### Temperature Calibration Report

Serial Number: FW1411-67-T  
Tool Model: RBL-DCT  
Performed: (Not Performed)

	Reference	Reading
Low Reference:	0.00 degF	0.00 degF
High Reference:	1.00 degF	1.00 degF

Gain: 1.00  
Offset: 0.00  
Delta Spacing 1



Company PDC ENERGY INC.  
Well THISTLE DOWN 31G-402  
Field WATTENBERG  
County WELD  
State COLORADO