



LWD MEMORY LOG

Gamma Ray

Company: Noble Energy

Well: Guttersten State DD30-773

Measured Depth	Field: Wattenberg
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County: Weid County: United states

Driller's Depth **State:** **Colorado**

Status:	Surface Location:	Other Services:
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Latitude: 40° 11' 25.368" N
Longitude: 104° 20' 53.572" W

API No: 05-123-48664-00	Directional
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ob ID:	110089460	SEC:	30	TWN:	3N	RGE:	63W
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Permanent Datum (P.D.):	Mean Sea Level	Elevation:	0.00 ft	Elev. KB:	N
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Log Measured From:	Rig Floor	Above P.D.:	4824.00 ft	Elev. G.I.:	4794.00
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[illegible]

From: 2019-11-07	Drilled (ft)	Logged (ft)	Azi Reference North:	Grid	Dip Angle: (deg)	bb
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Year	Top	Bottom	Mean to Performance North Carolina: (doc)
2010-10-30	16866.00	16867.00	

Bottom:	16865.00	Bottom:	16852.00	Mag to Reference North Correction
Bottom:	16865.00	Bottom:	16852.00	Mag to Reference North Correction

Borehole Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
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13.500	30.00	1940.00	9.625	36.00	30.00	1930

[illegible]

[illegible][illegible]

Mud Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
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Oil Based Mud	1940.00	16865.00	8.500	14925.00	0.53	339.09	90.03	356
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[illegible][illegible][illegible][illegible]

adence	RT 5.4	Riq:	H&P 321
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Contractor: Helmerich & Payne Drilling Co

District:	RMA	Unit:	D&E
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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours (h)
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	3.00	AutoTrak Curve	1940.00	16852.00	1940.00	16865.00	2019-11-05 04:31	2019-11-07 12:31	50.60

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2019-11-04	2019-11-08						

Mud Properties Record

Date / Time	Run No.	Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2019-11-05 16:00	1	6048.00	Oil Based Mud	9.1	10	N/A	N/A	72/18	Active Pit	29440	0.00
2019-11-06 16:00	1	10235.00	Oil Based Mud	9.3	10	N/A	N/A	72/17.6	Active Pit	27992	0.00
2019-11-07 16:00	1	16865.00	Oil Based Mud	9.5	14	N/A	N/A	70/18	Active Pit	24295	0.00

Equipment and Service Data

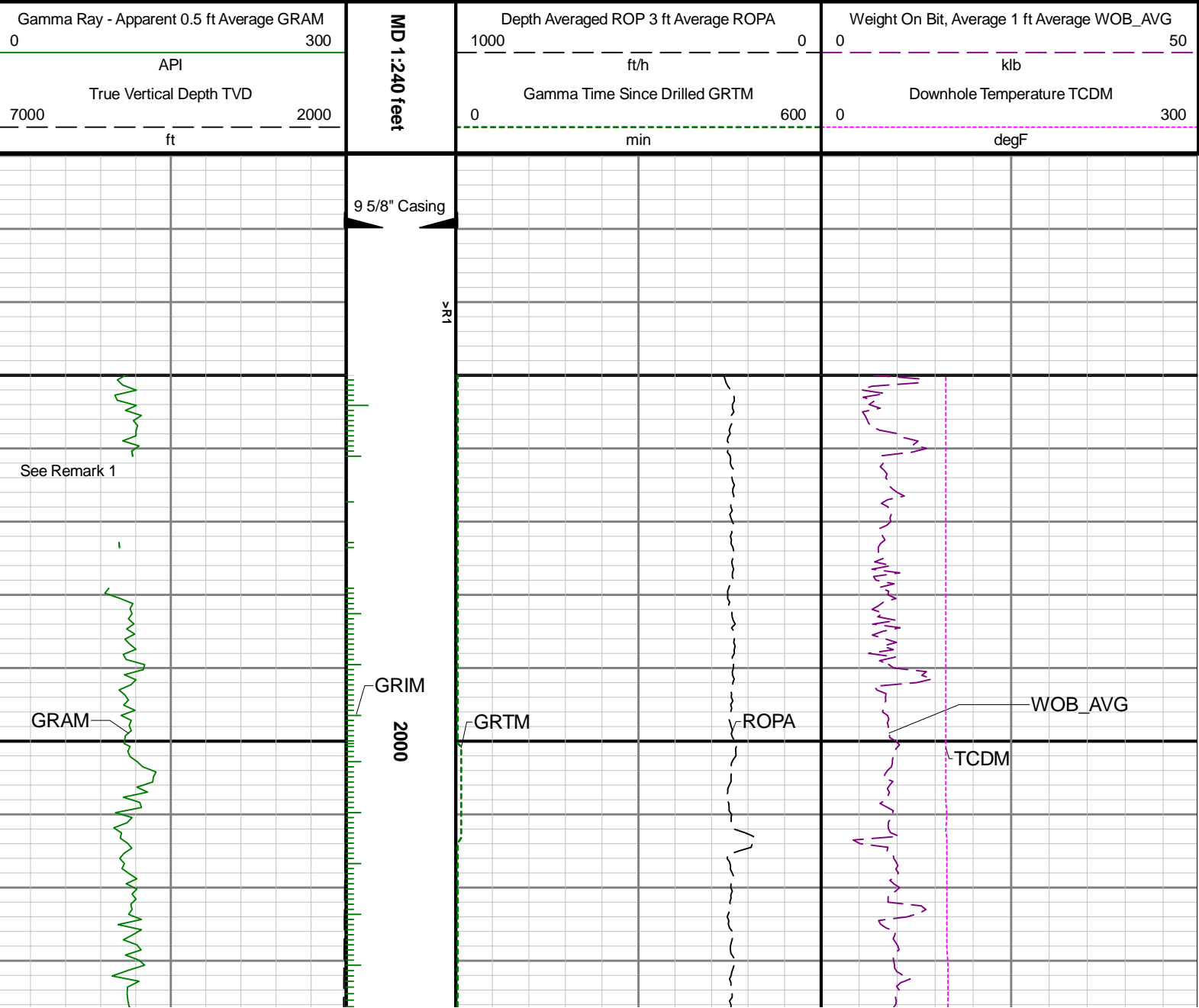
Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	AutoTrak Curve Steering Unit	14316020	Near Bit Inclination	5.93	6.79	7.000	4.330
1	AutoTrak Curve Steering Unit	14316020	Near Bit VSS	5.93	6.79	7.000	4.330
1	AutoTrak Curve MWD	12188140	Gamma (single)	2.75	12.96	7.000	3.250
1	AutoTrak Curve MWD	12188140	Directional (mag)	12.27	22.48	7.000	3.250

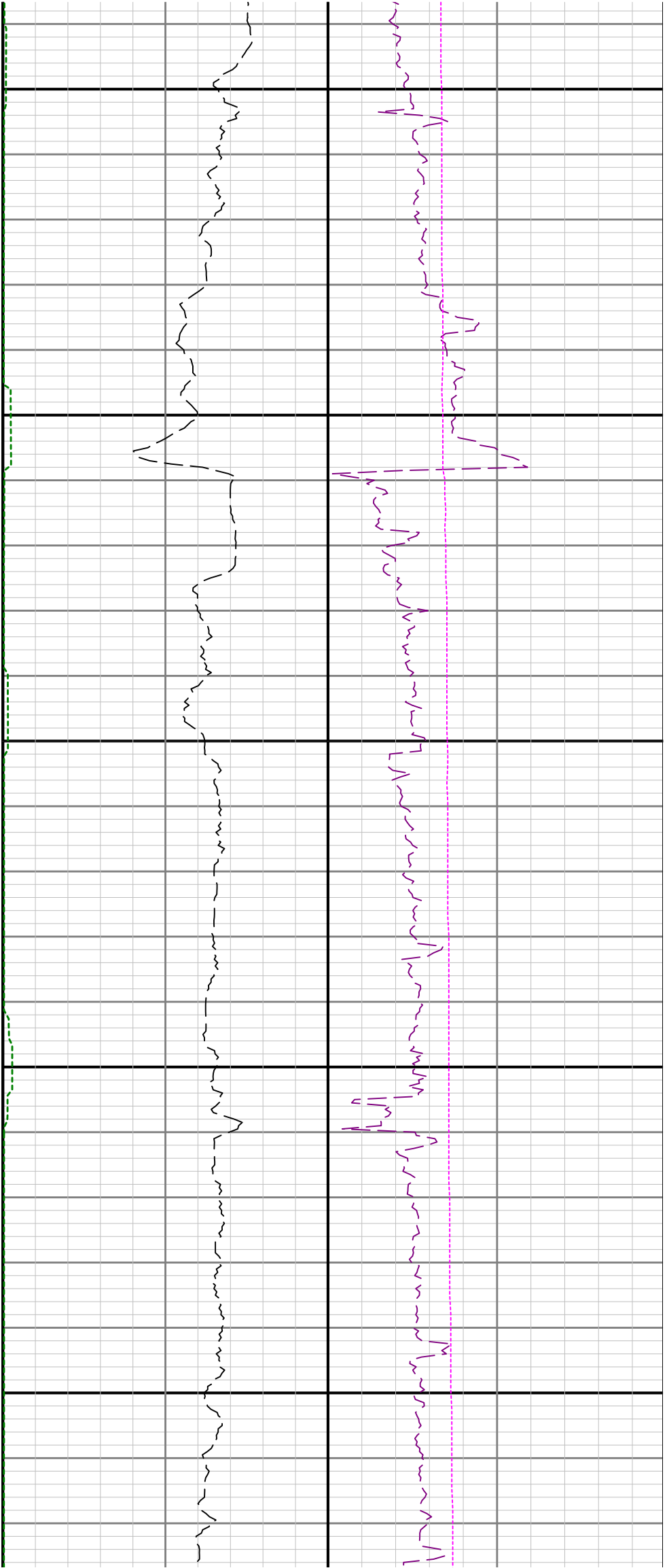
Service and Tool Mnemonics		
Mnemonic	Name	Description
ATC SU	AutoTrak Curve SU	Auto Trak Curve Steering Unit
ATC MWD	AutoTrak Curve MWD	Auto Trak Curve MWD
ATC LCPM	AutoTrak Curve LCPM	Auto Trak Curve LCPM

Comments	
1	Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
2	Baker Hughes LWD Run 1 utilized 6 ¾ inch NaviGamma service (Gamma Ray and Directional) behind an 8 1/2 inch bit and rotary steerable assembly from 1940 to 16865 feet MD (1940 to 6730 feet TVD).
3	The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.
4	Several gaps in the log are present due to drilling ahead before the MWD tool could power on.

Remarks				
Number	Depth	Hole Section	Run No.	Remark
	(ft)	(in)		
1	1960.00	8.500	1	The interval from 1960 to 1979 feet MD (1960 to 1979 feet TVD) has missing Gamma Ray data due to the lower flow failing to power on the MWD tool.
2	16852.00	8.500	1	The interval from 16852 to 16865 feet MD (6730 feet TVD) was not logged due to sensor to bit offset at well TD.

Curve Mnemonics		
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
WOB_AVG	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	Gamma Ray - Time Since Drilled - Memory	min
TCDM	Directional Real-Time Survey Temperature	degF

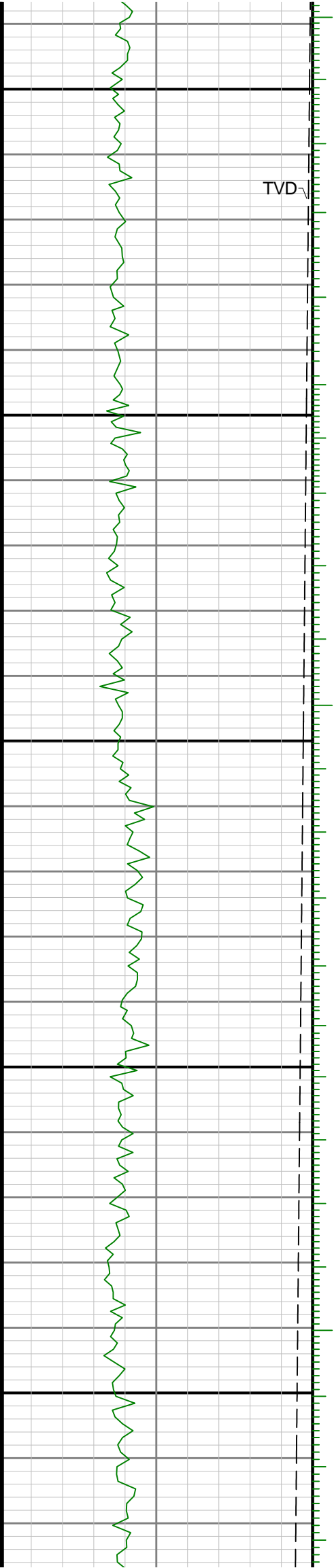


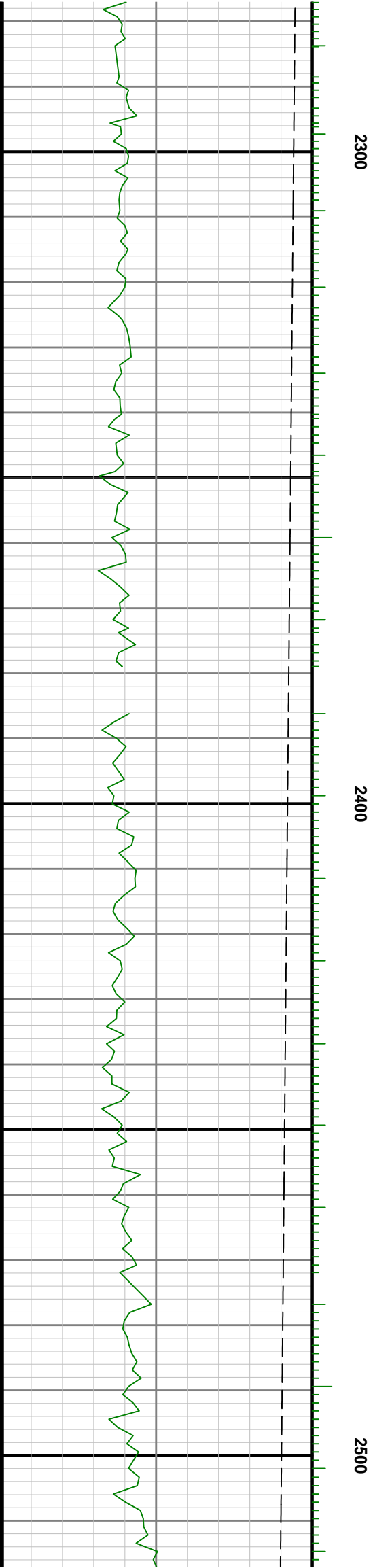
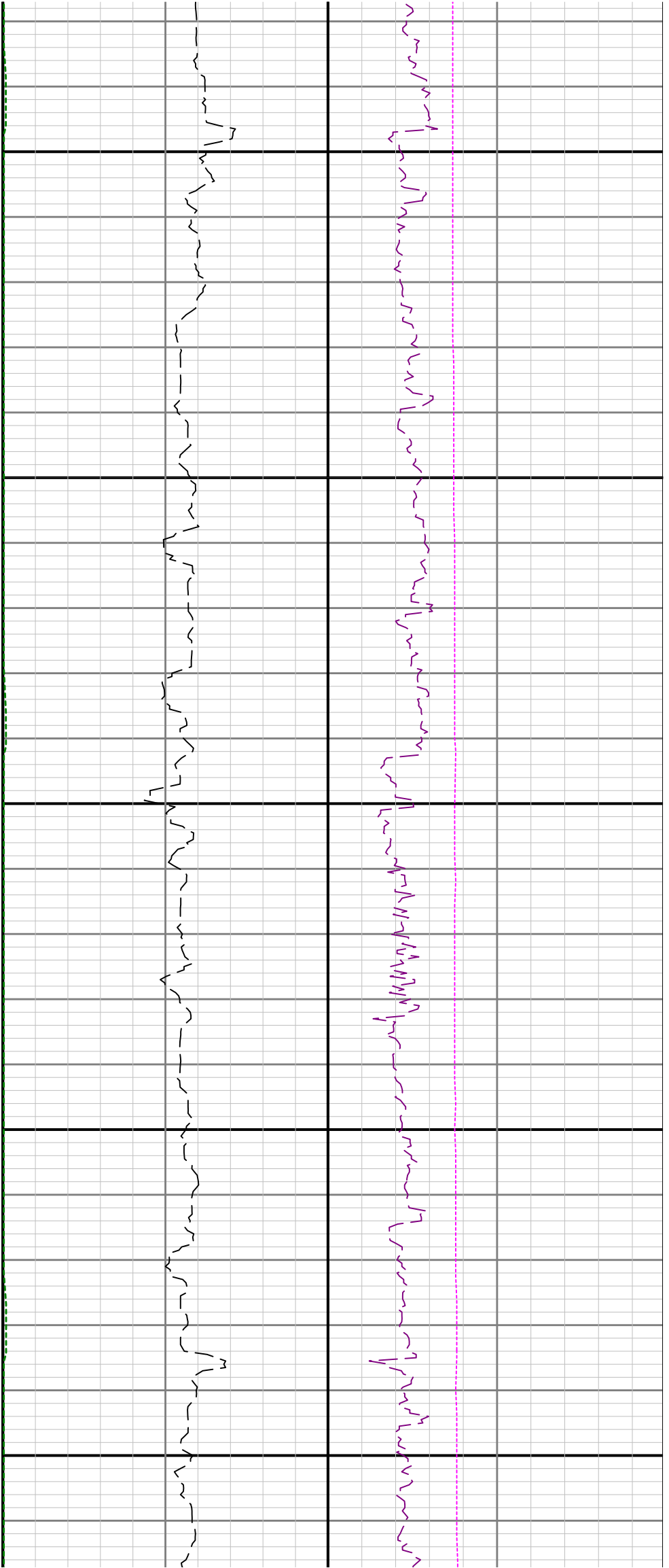


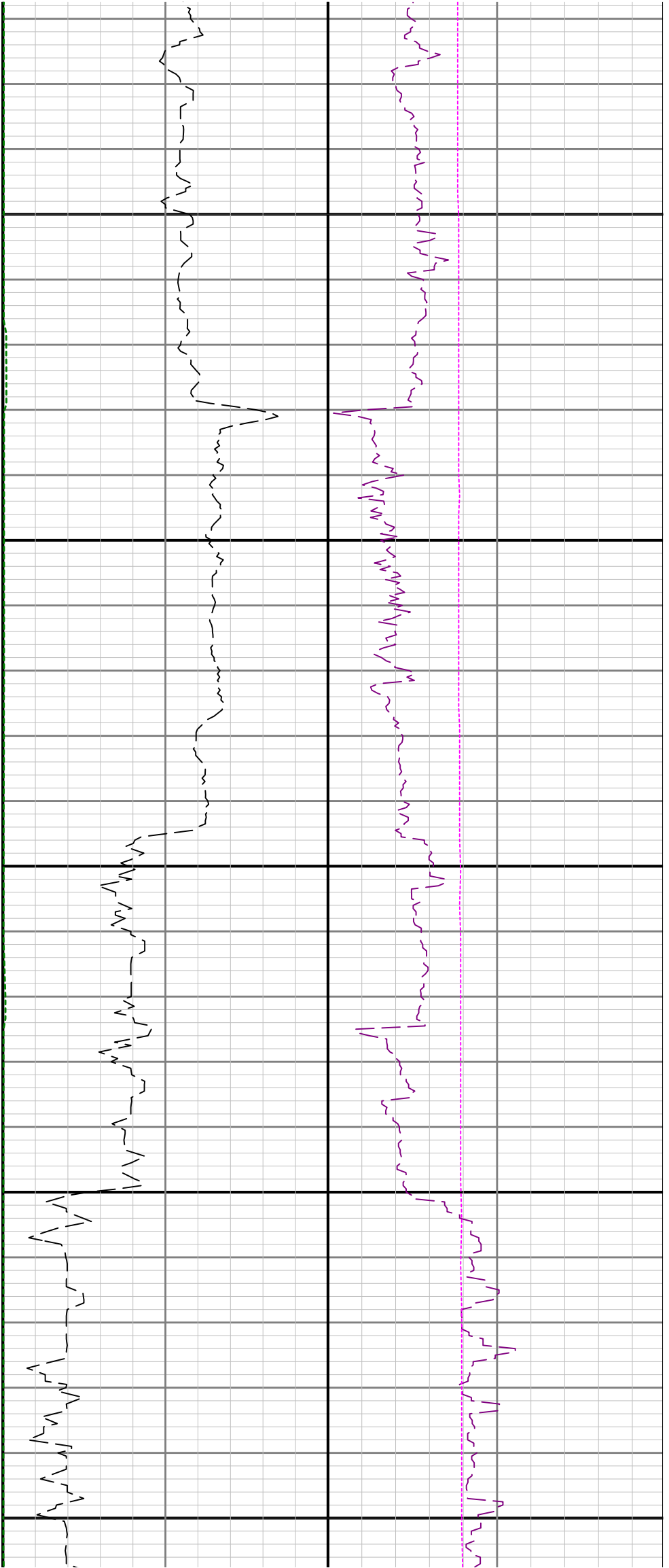
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2200

TVD

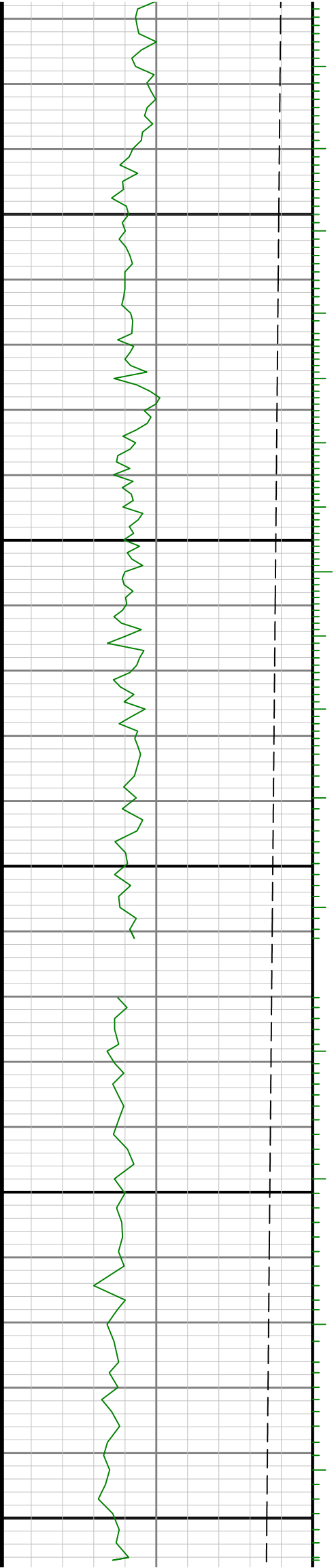


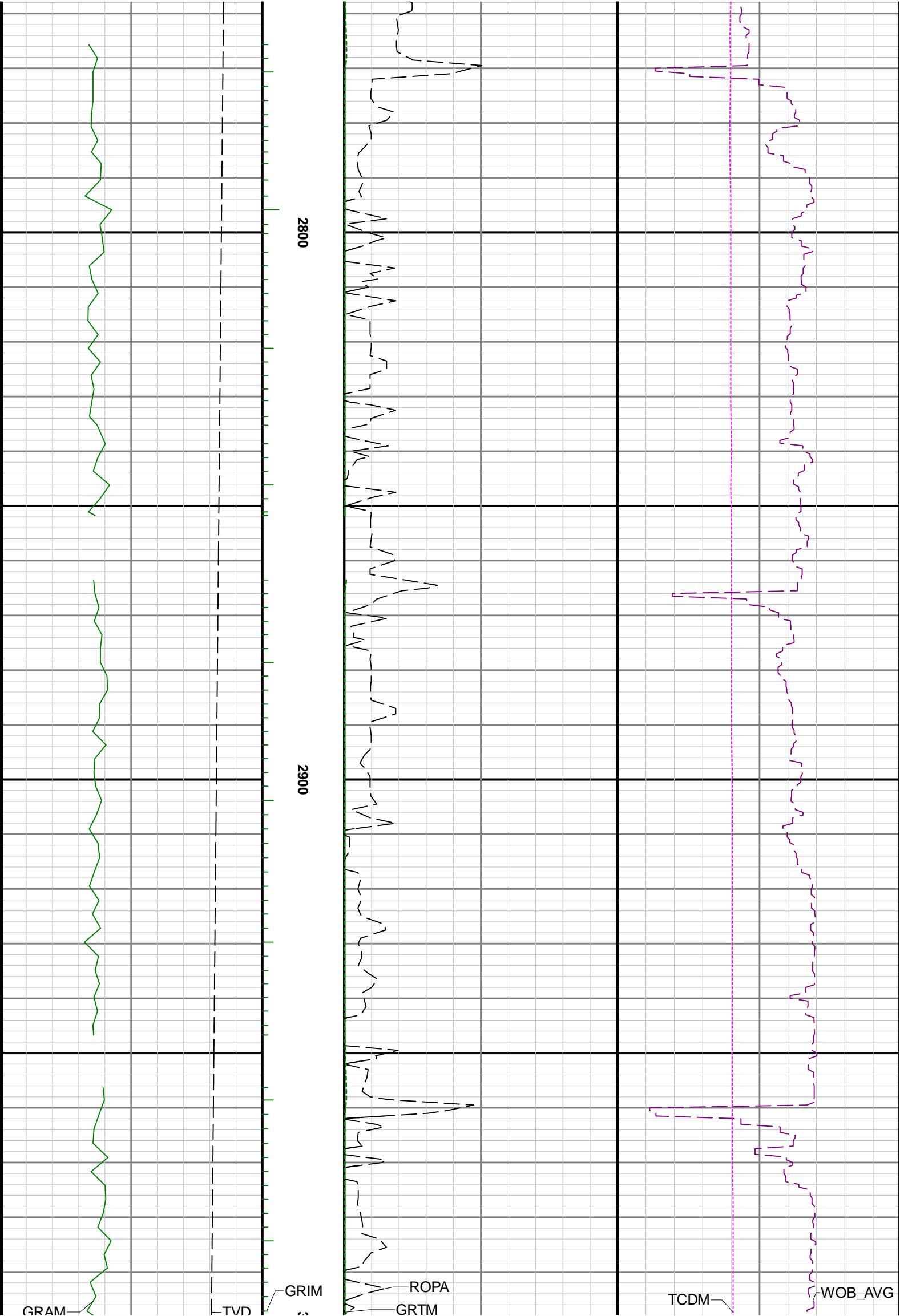


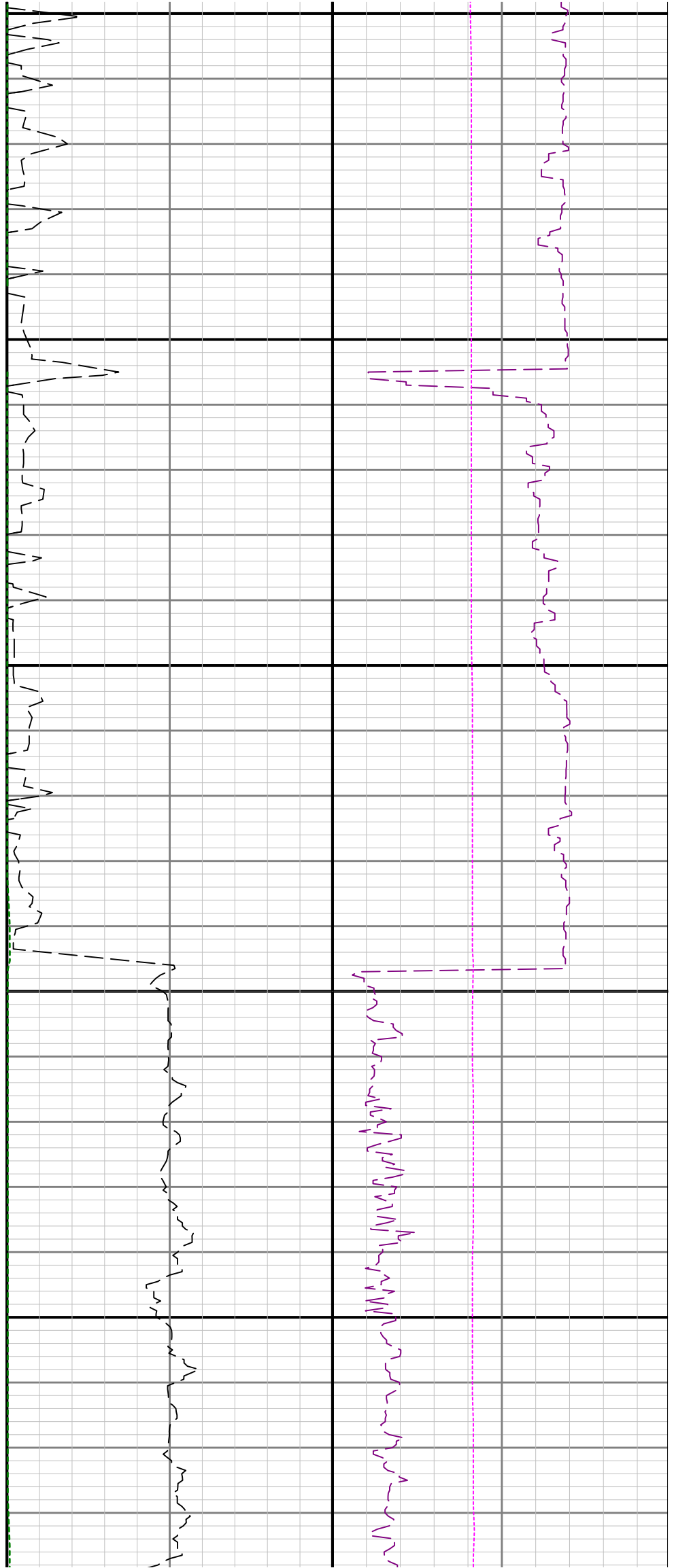


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2700



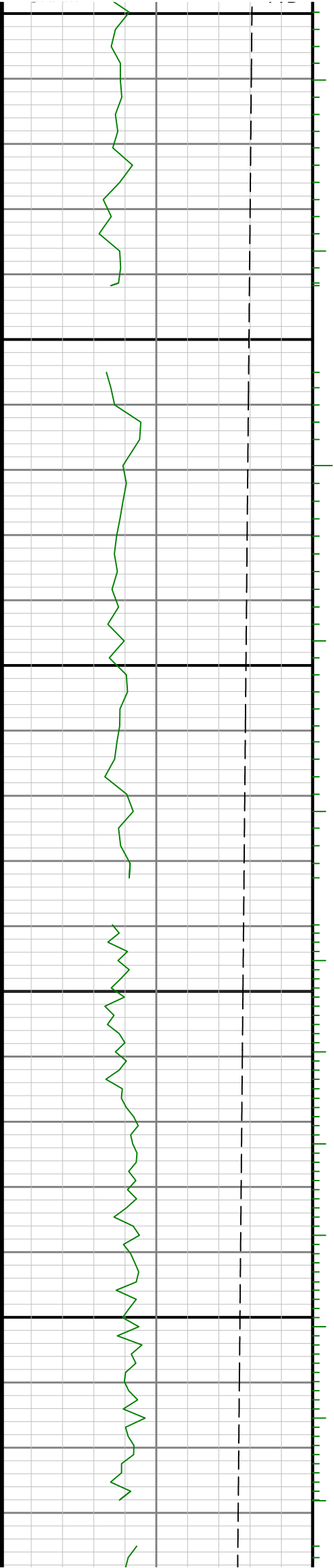


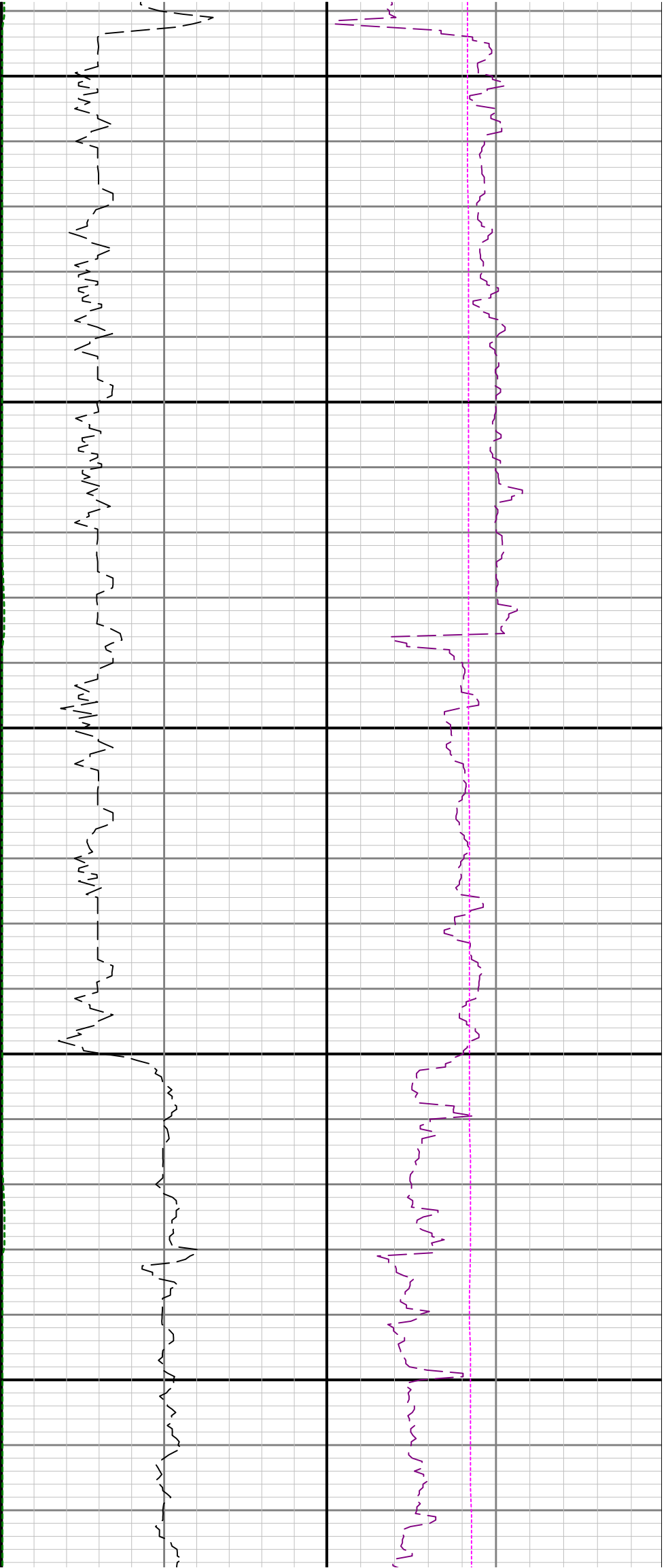


1000

3100

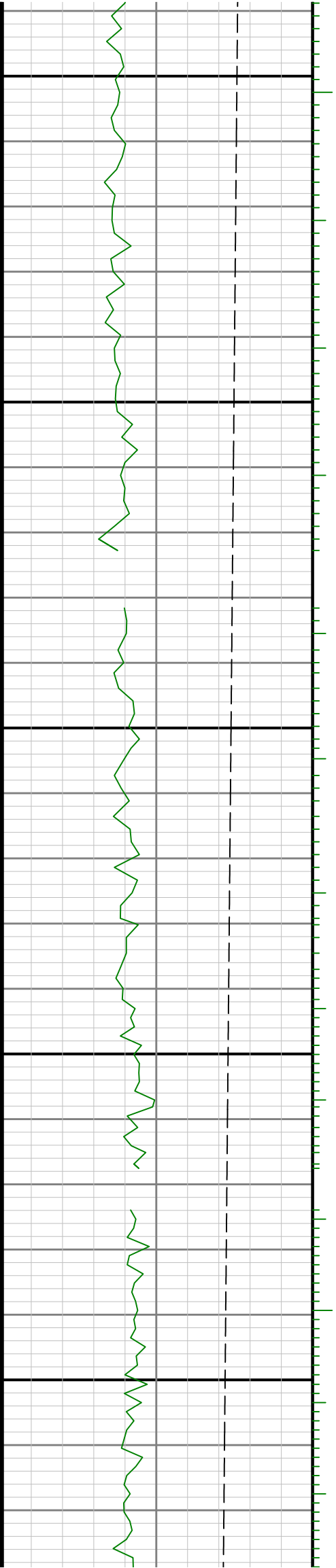
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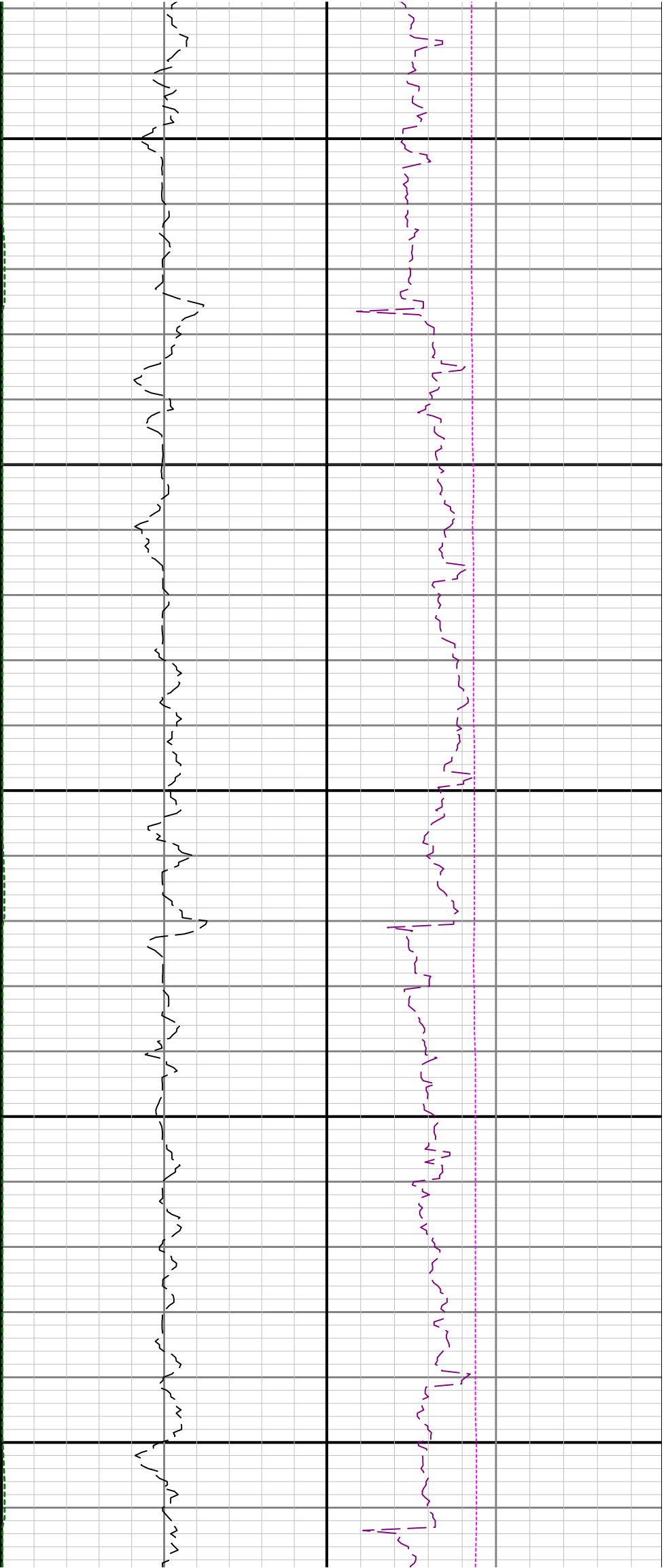




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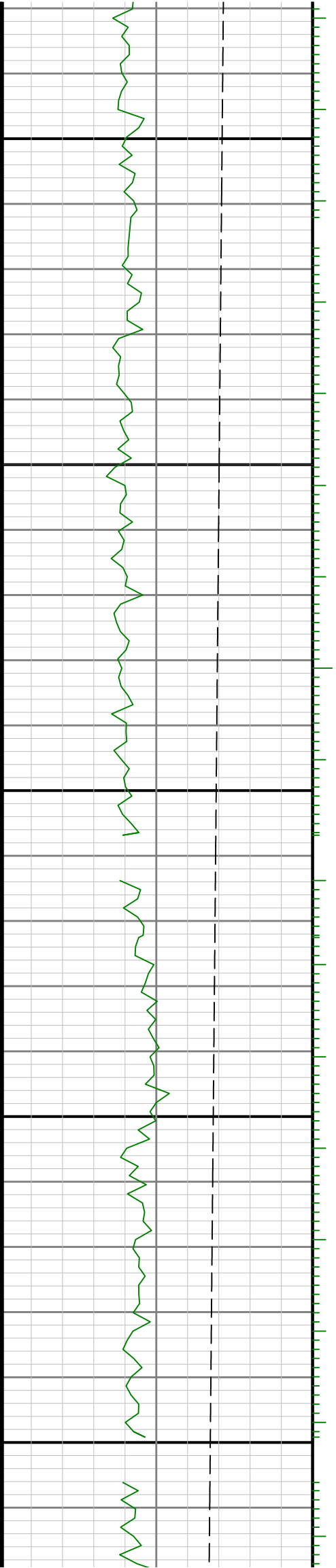


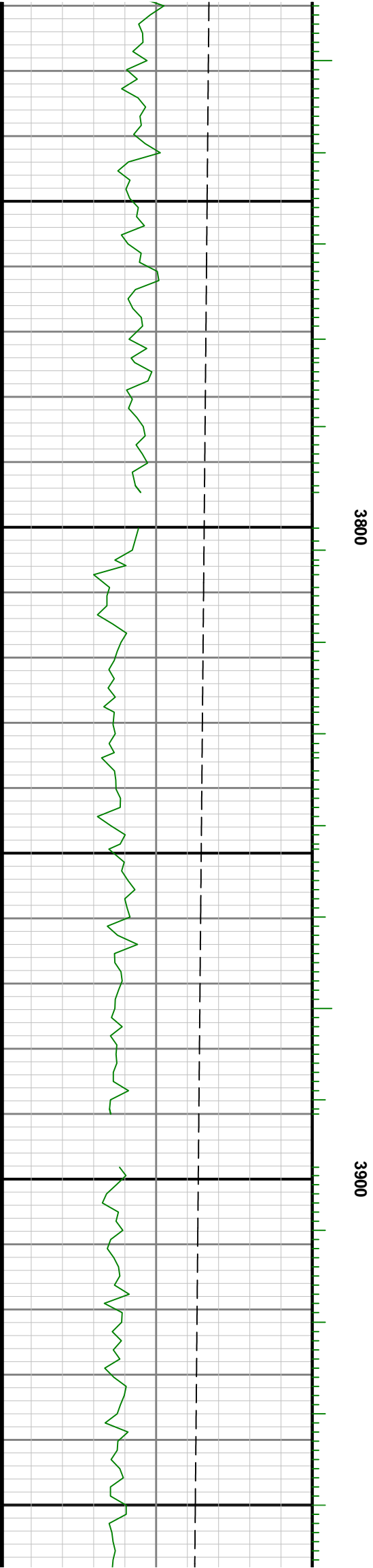
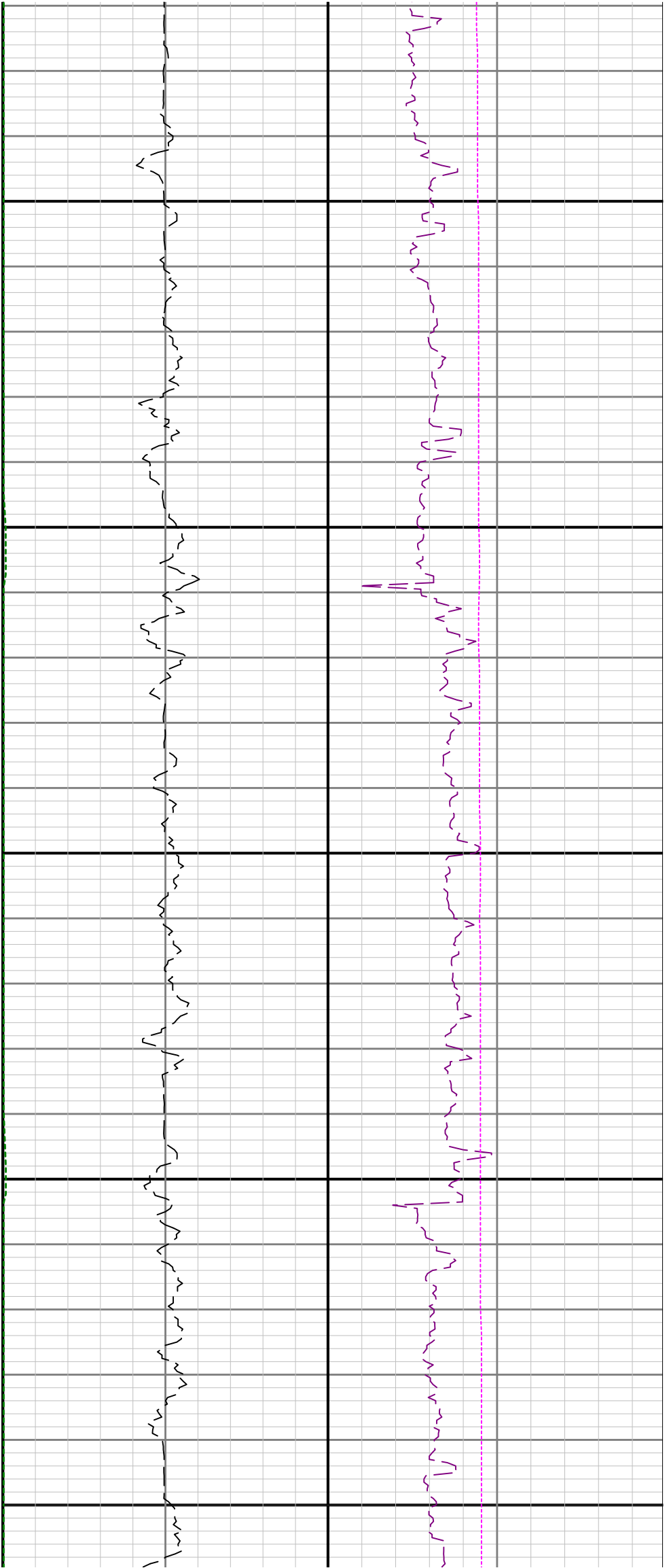


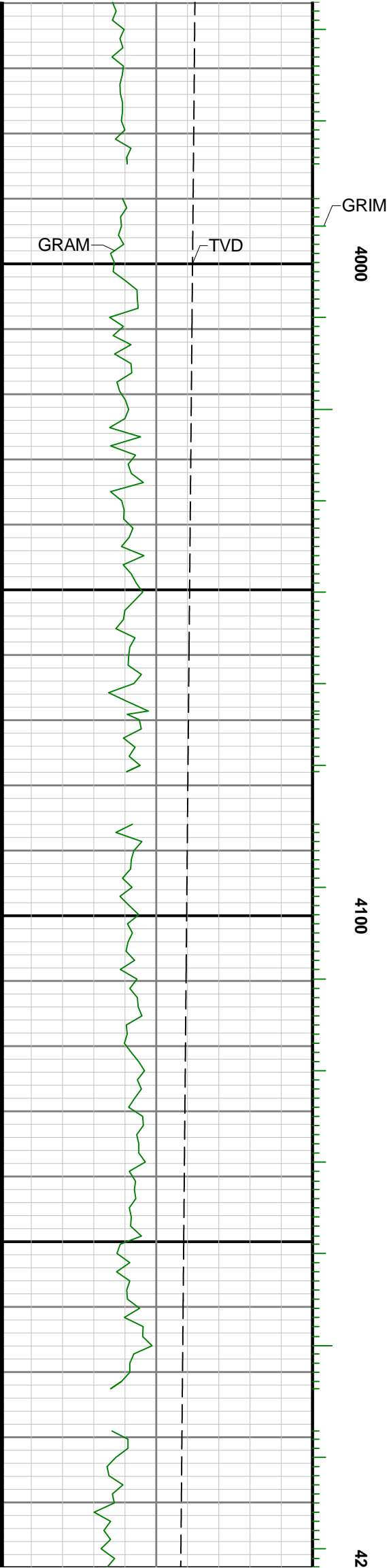
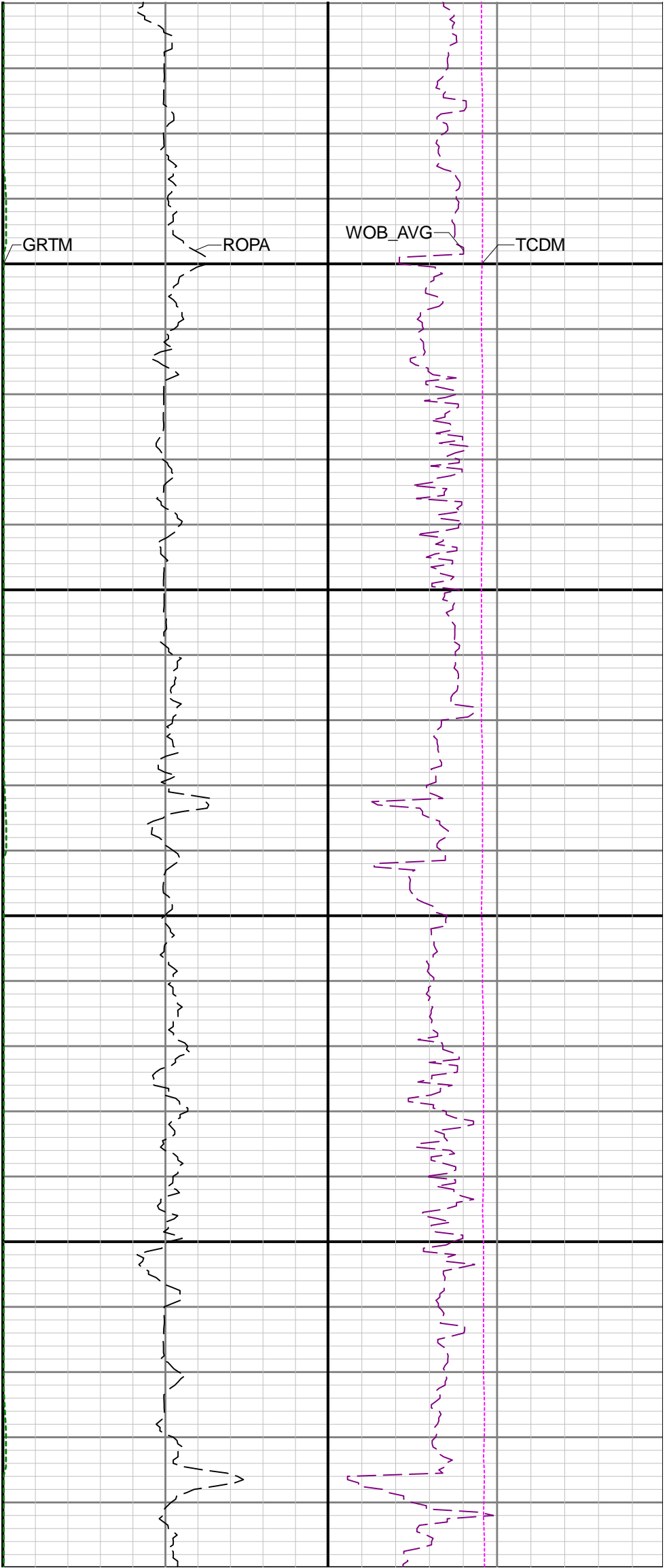
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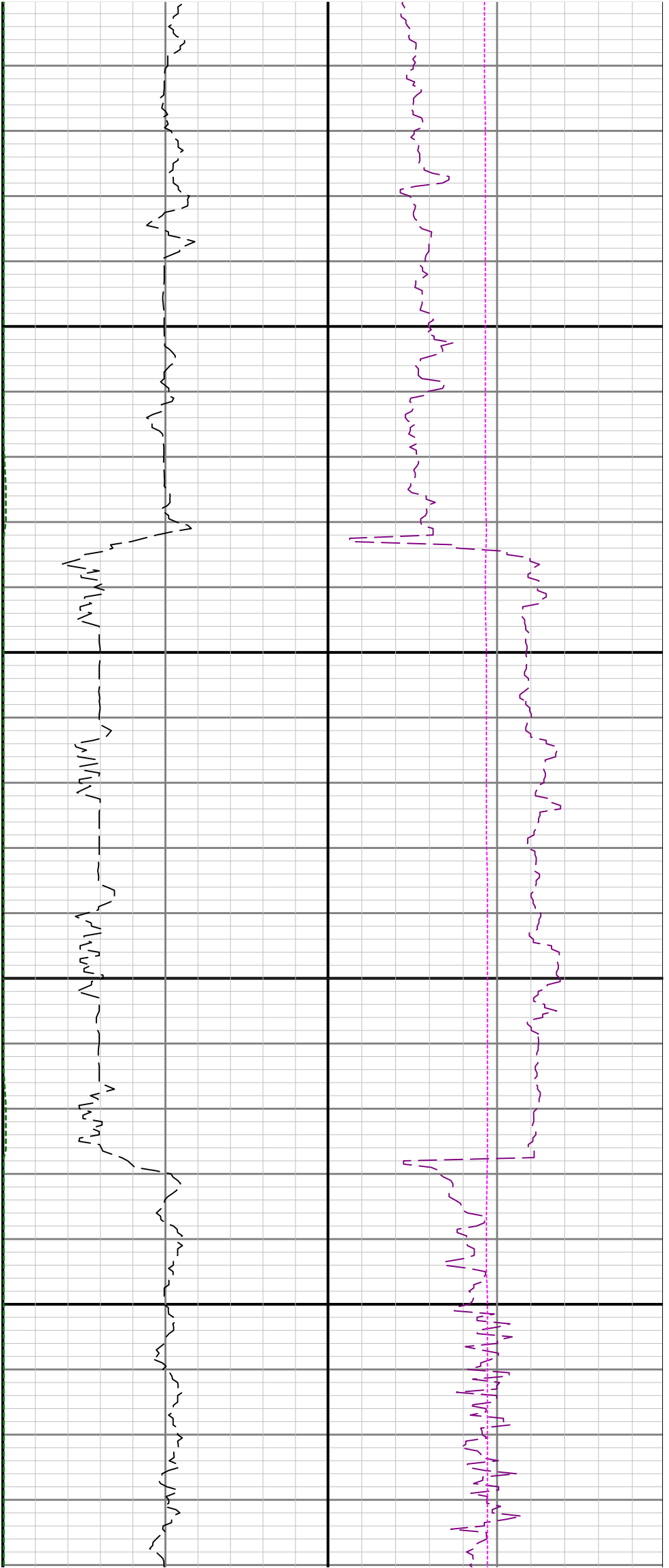
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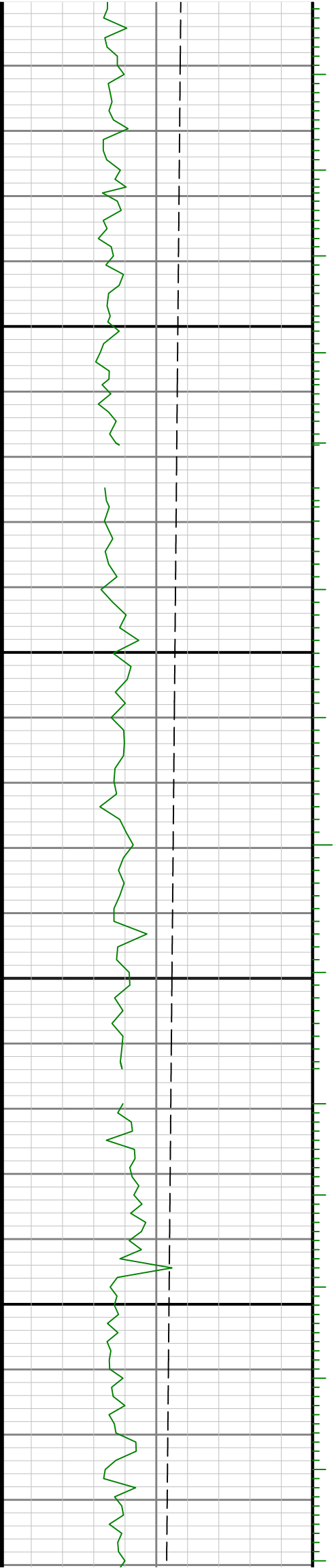


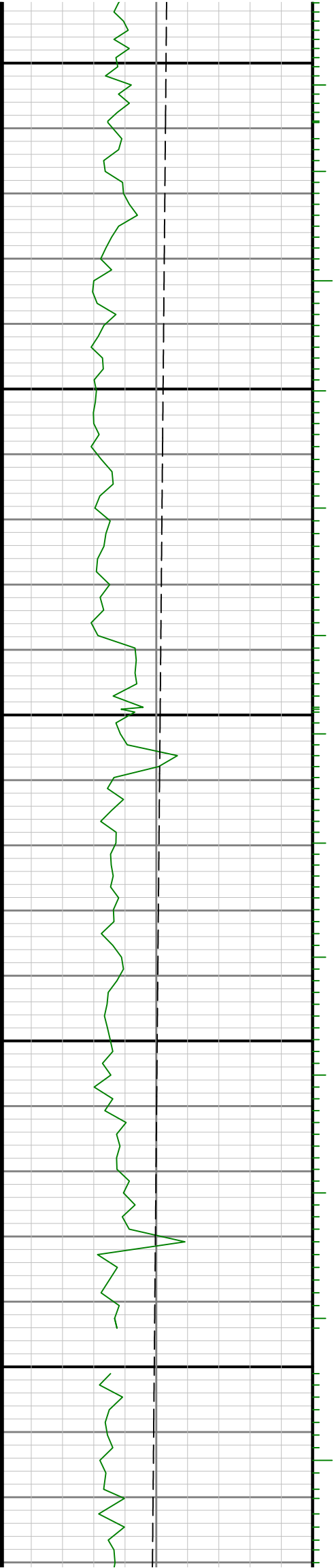
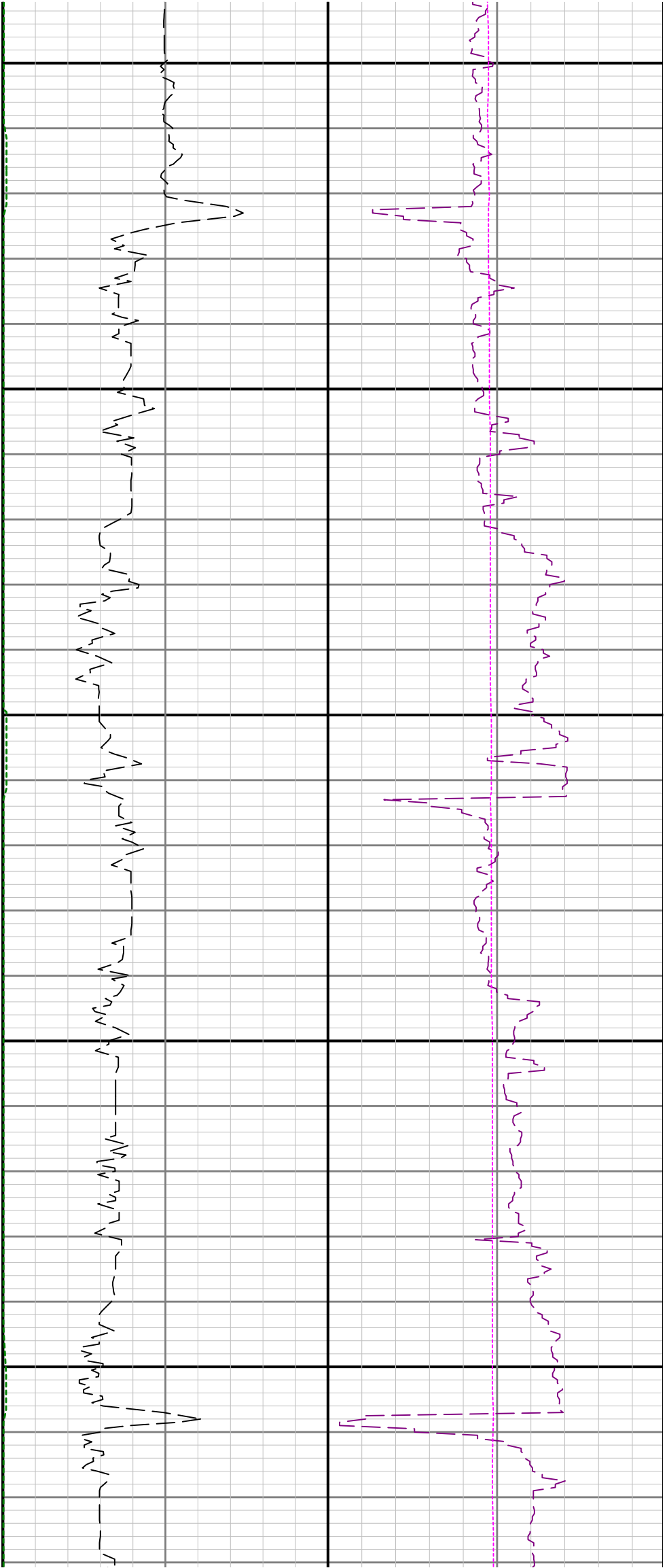


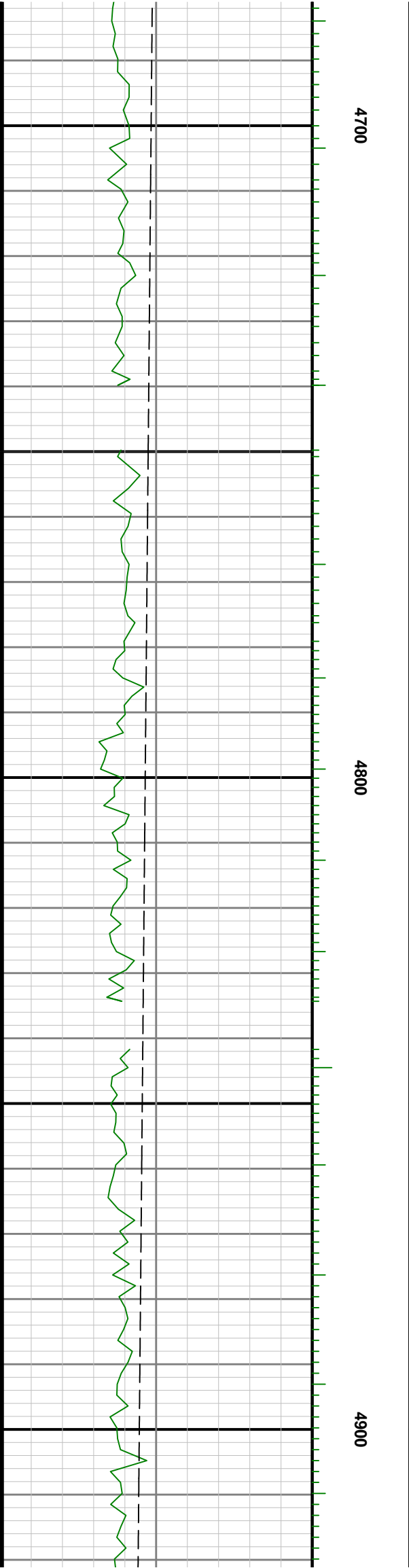
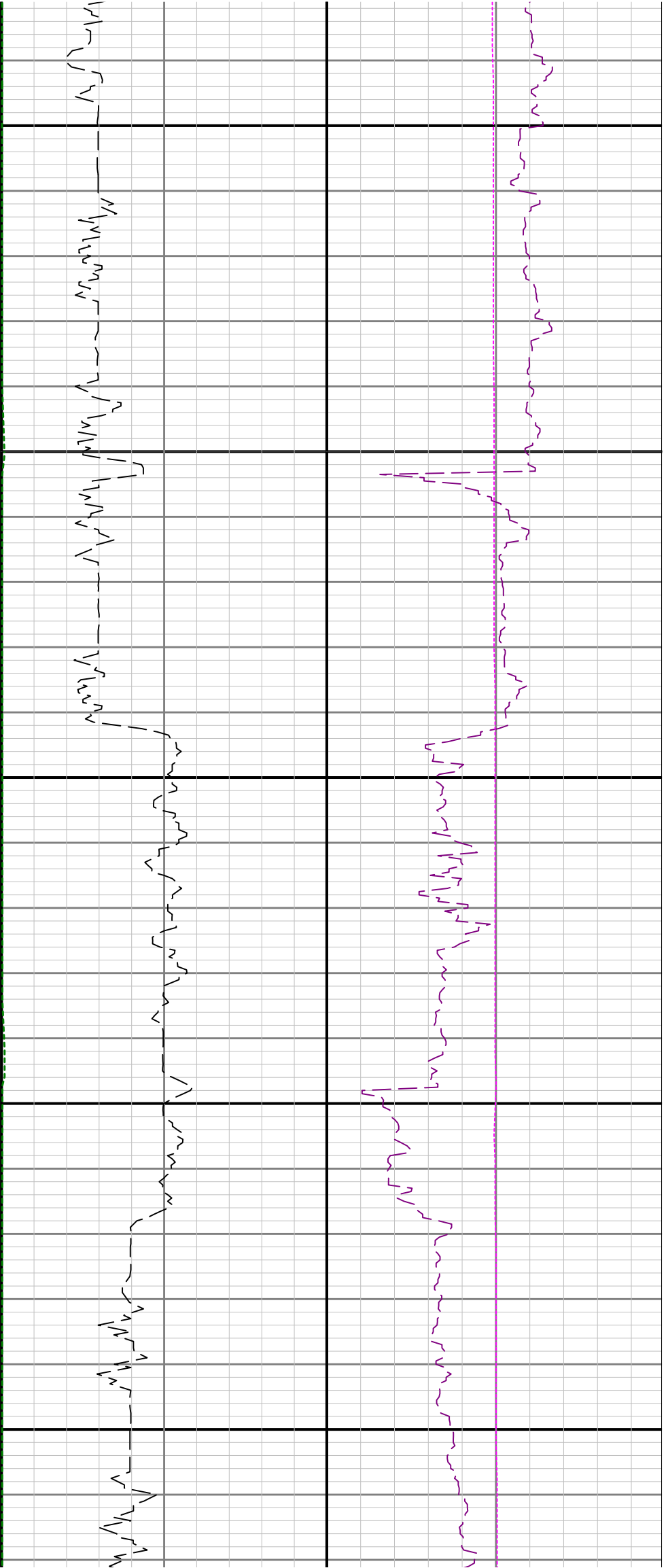
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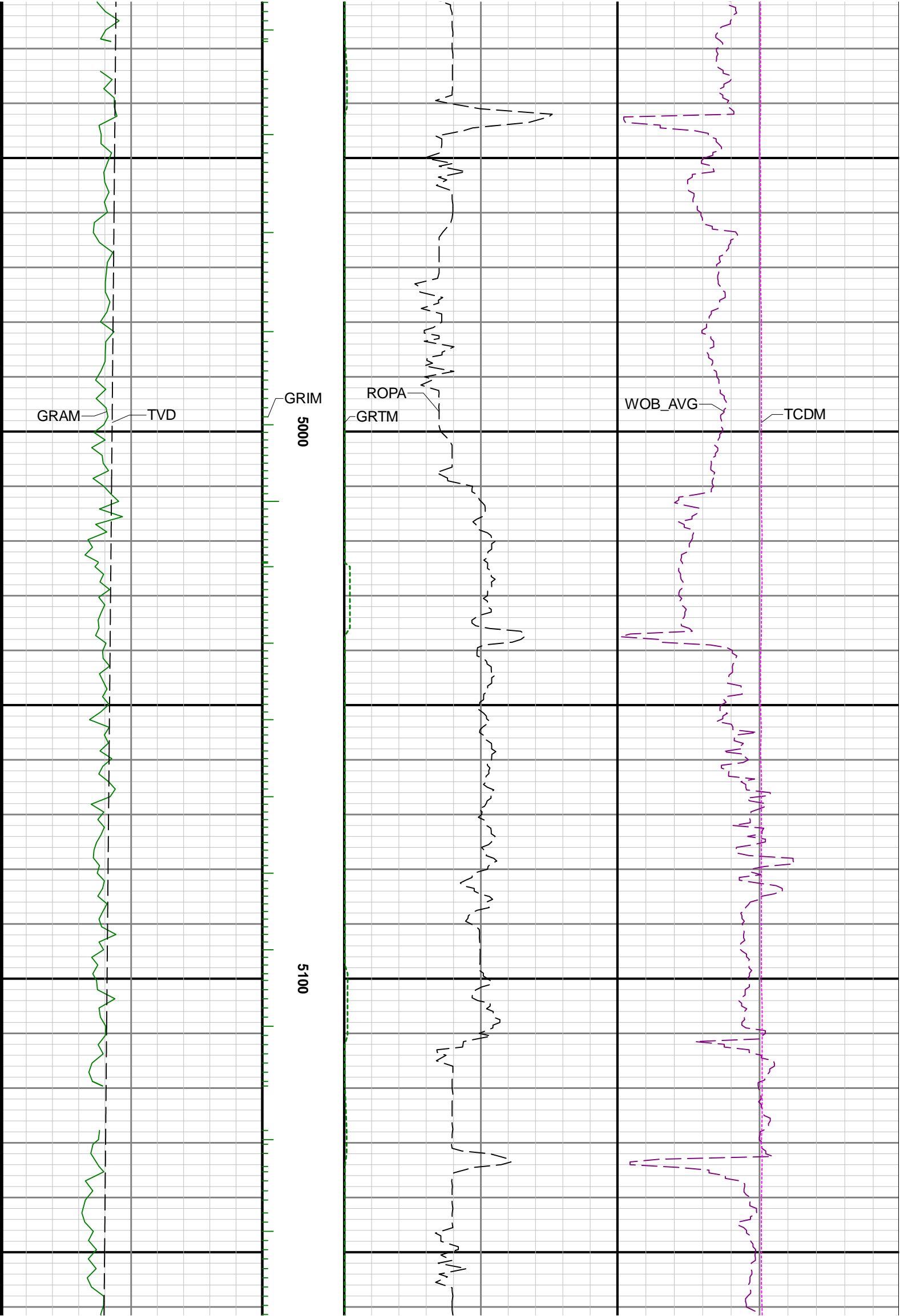
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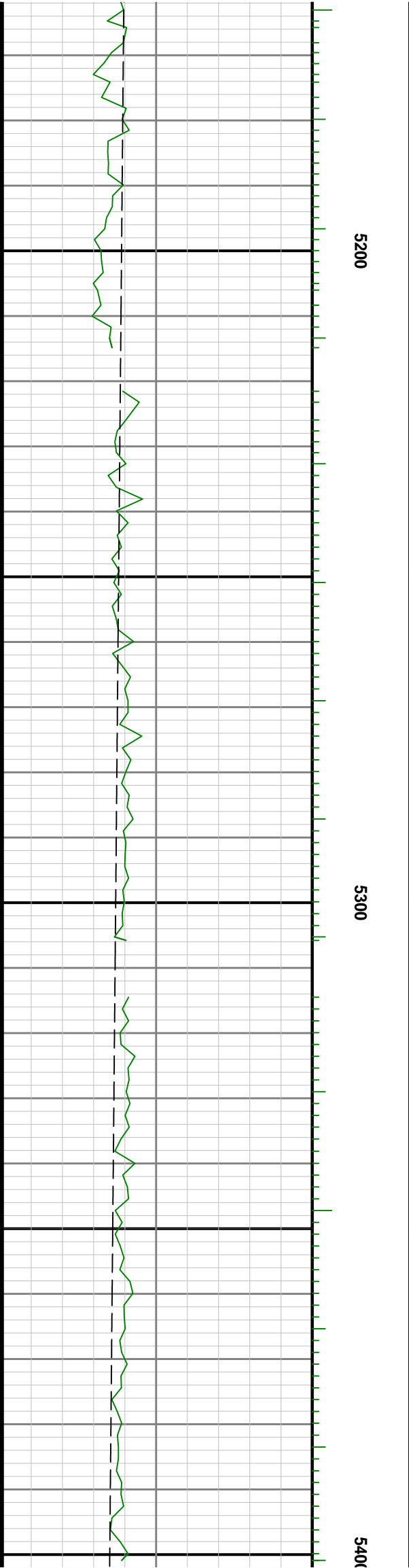
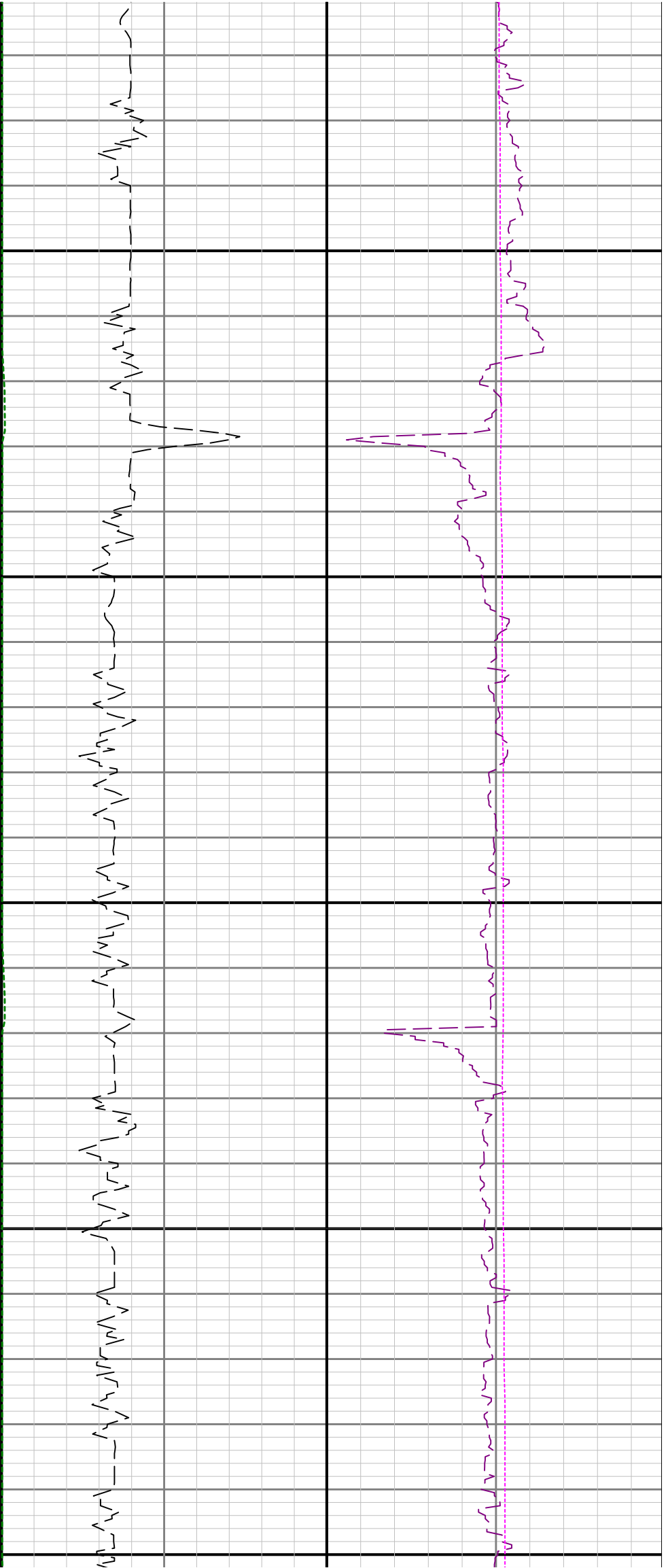
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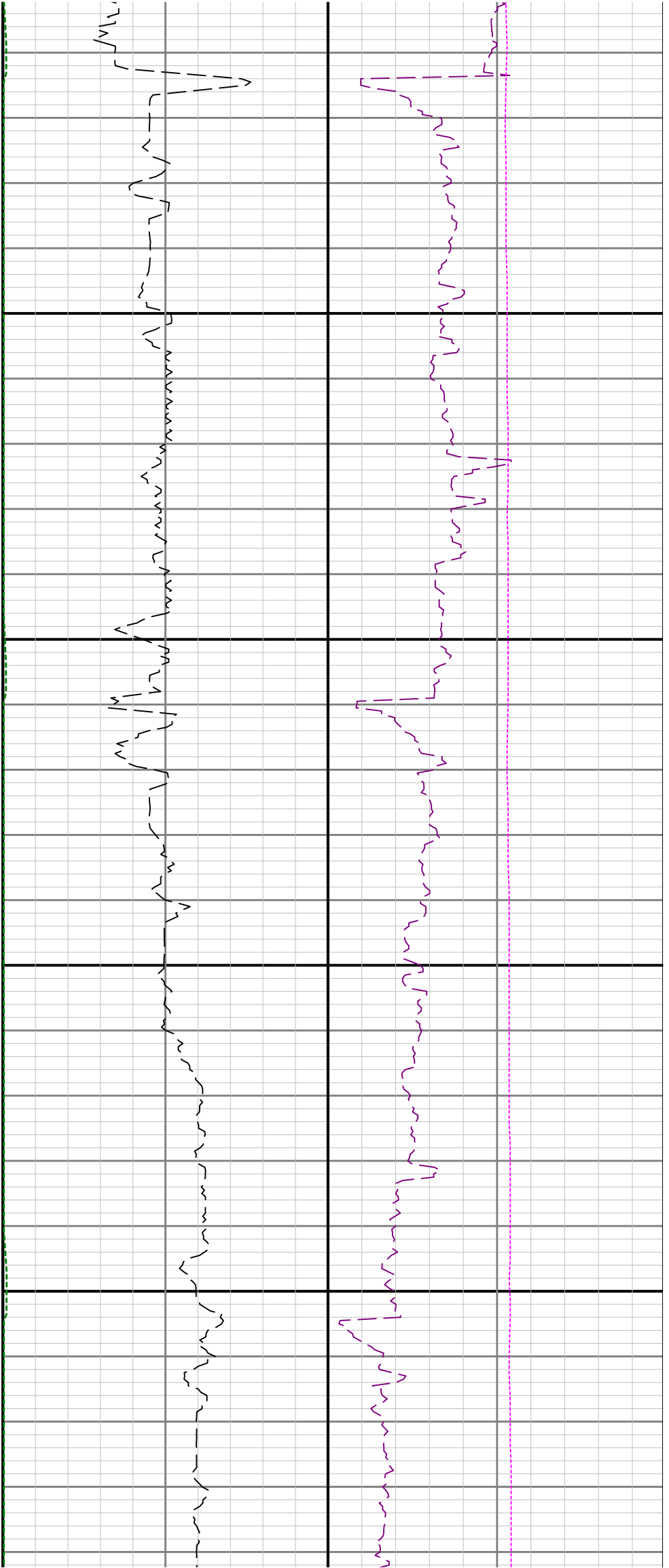






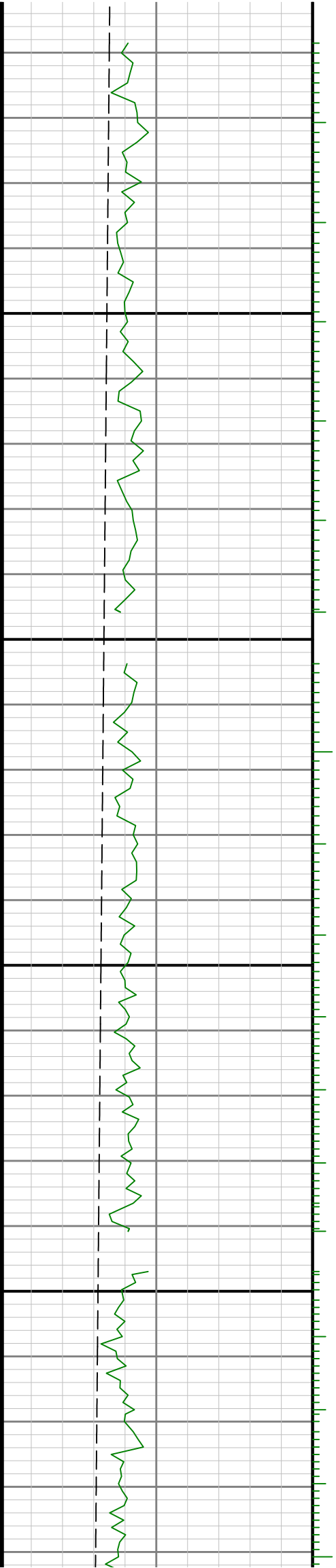


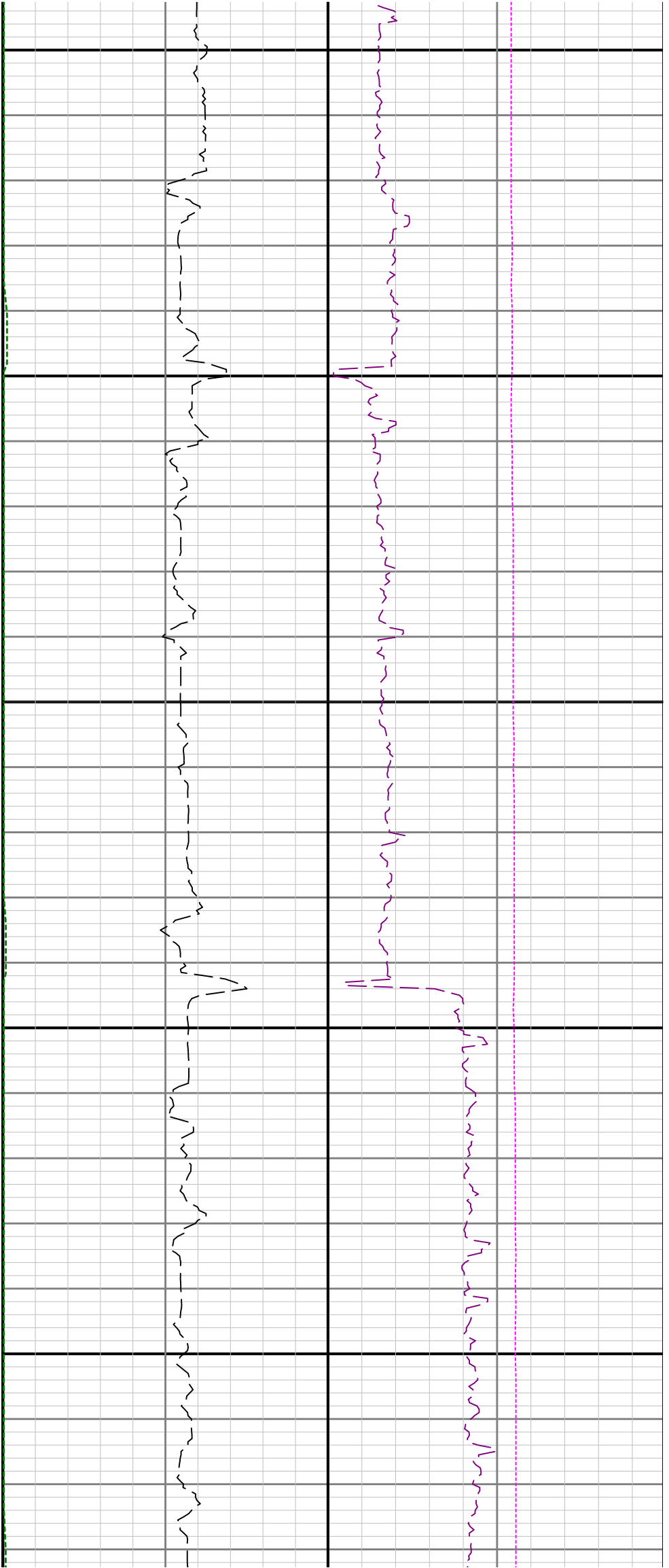




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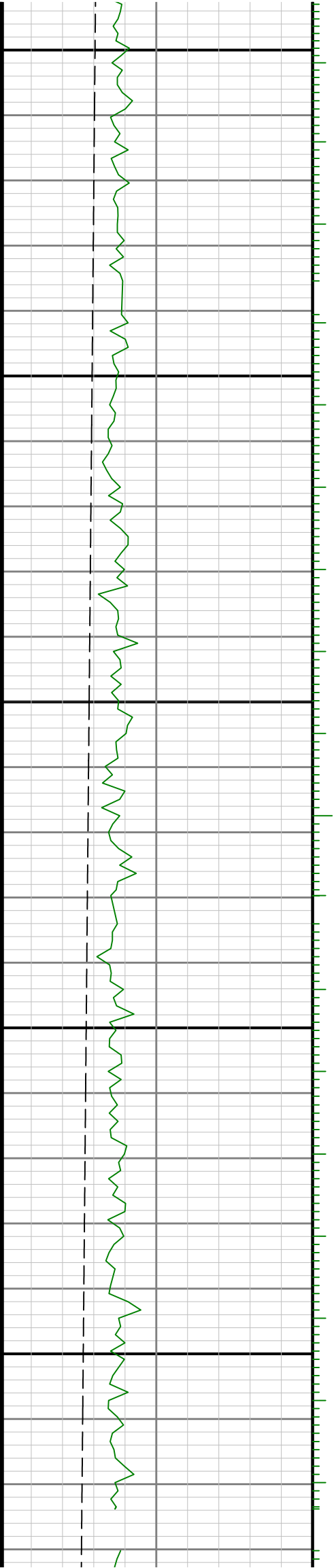
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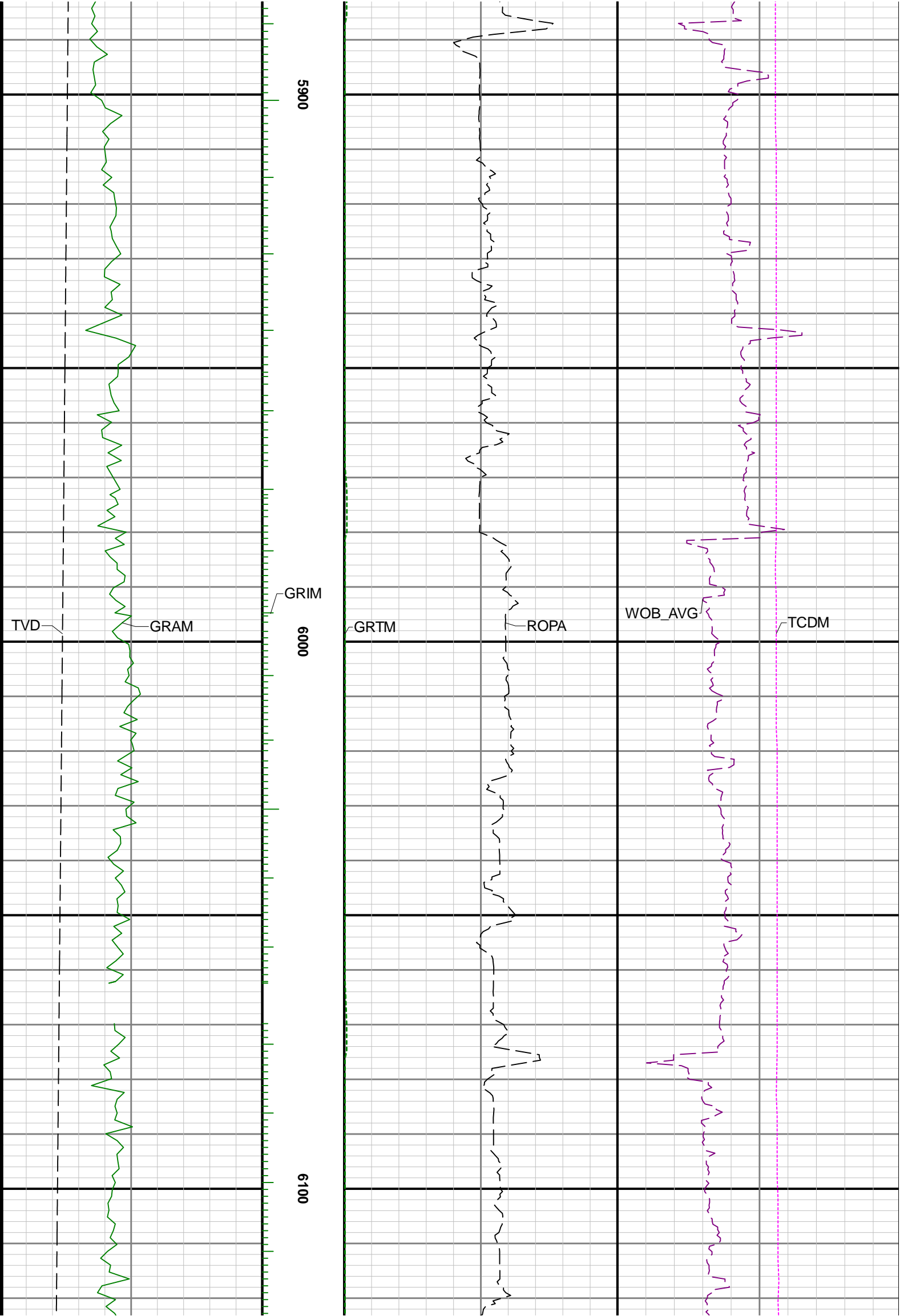


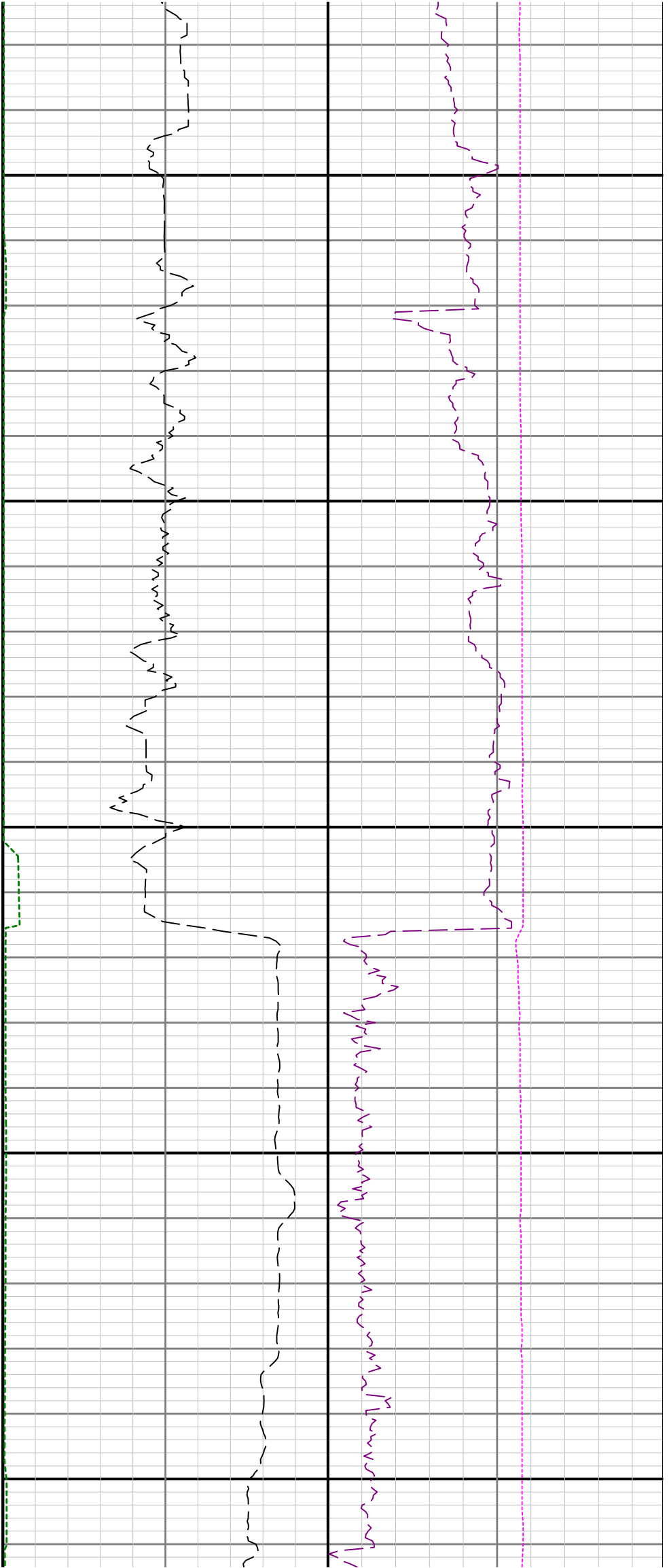


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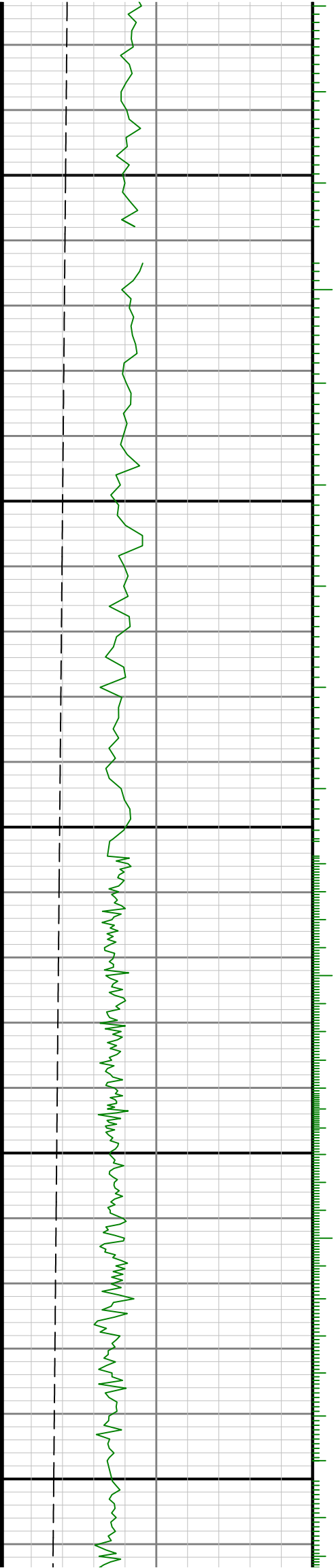


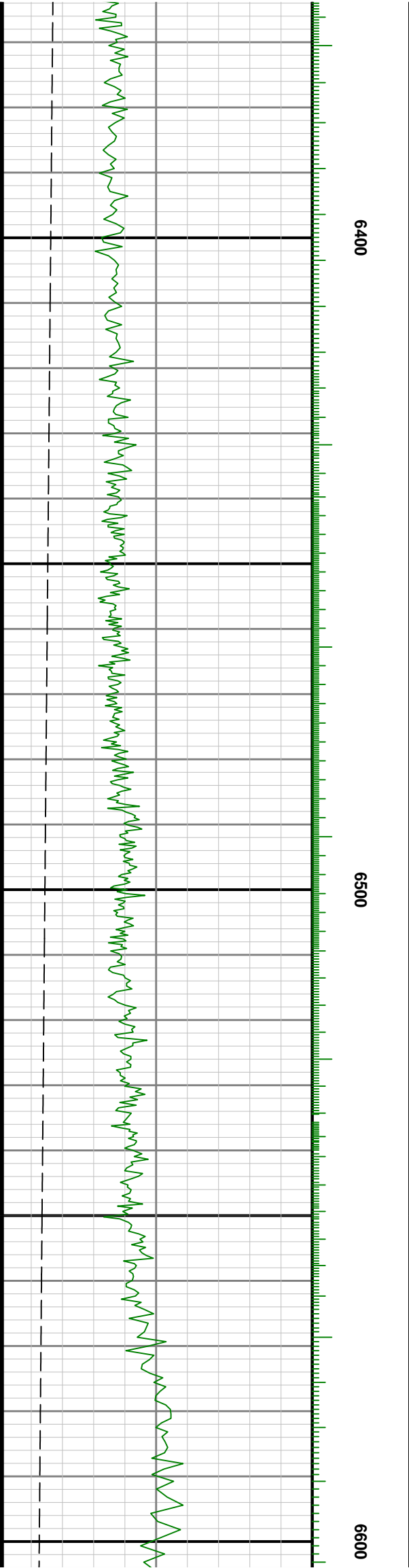
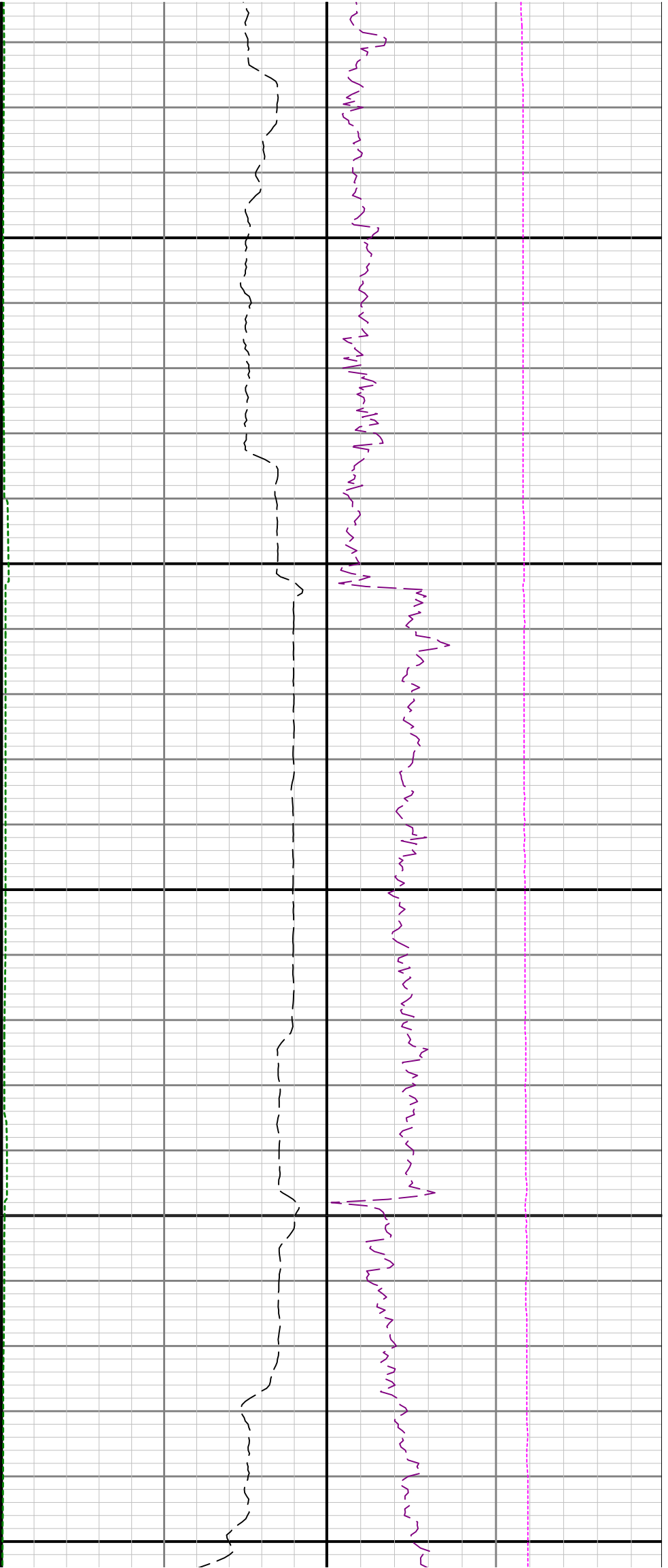


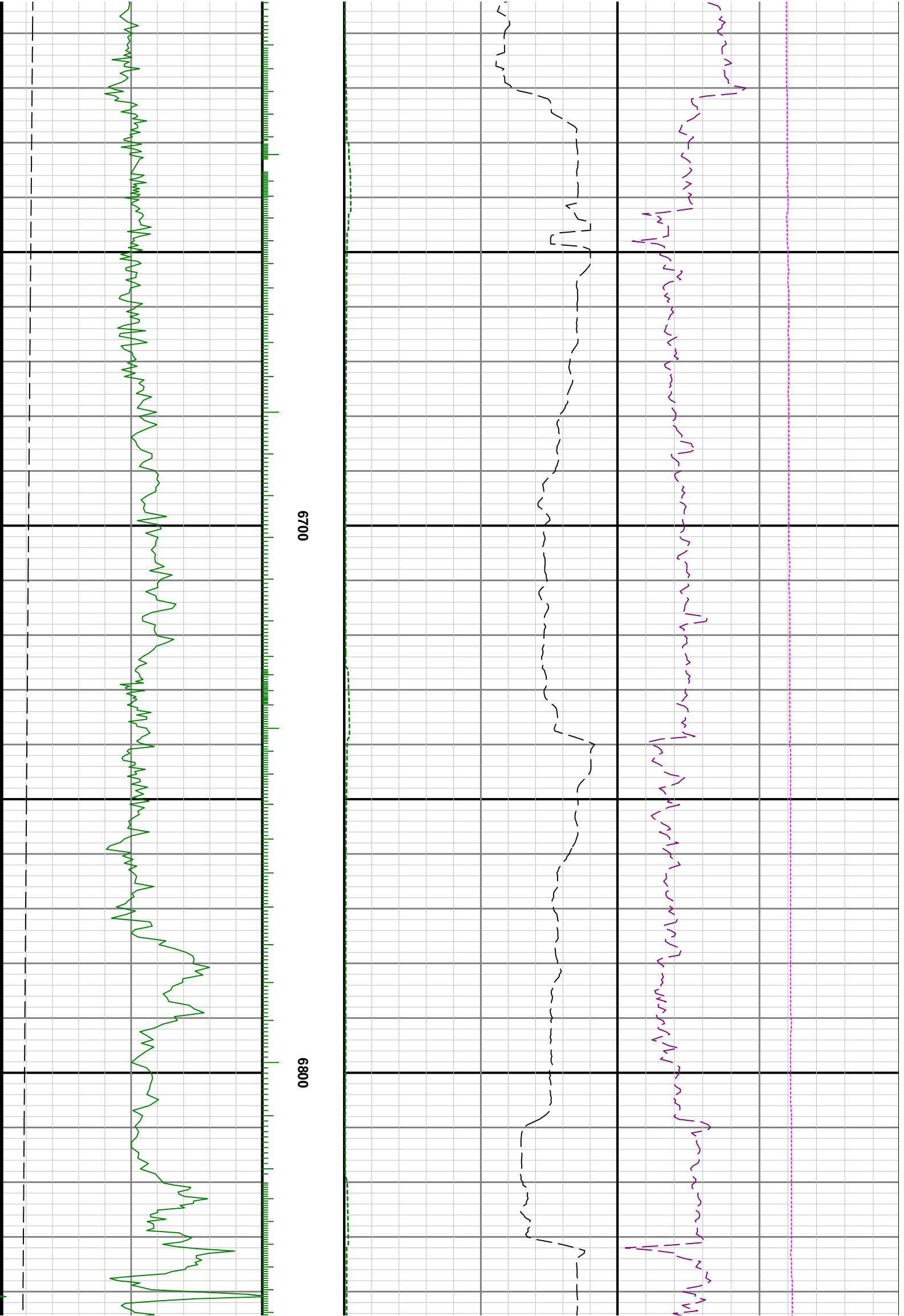


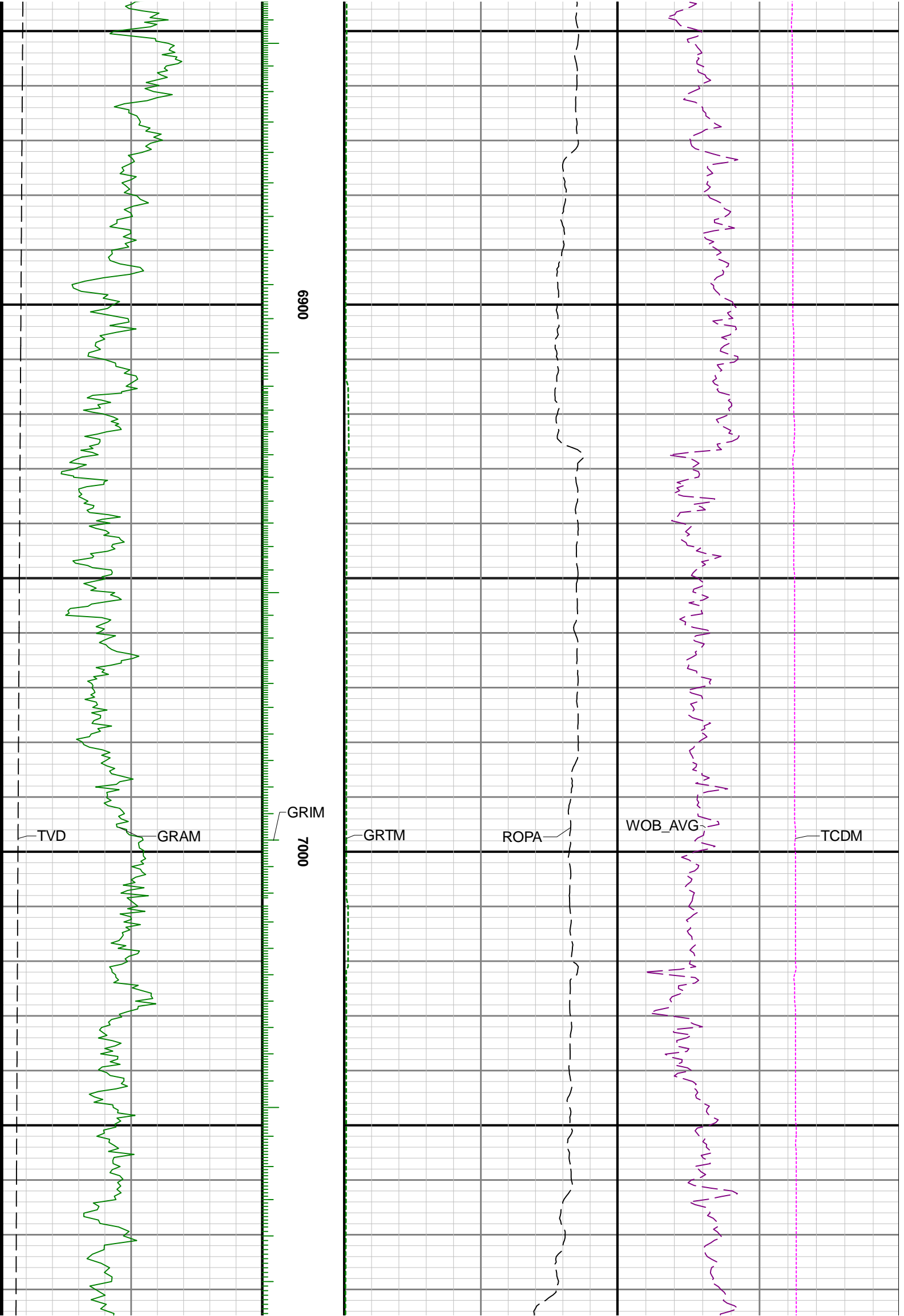
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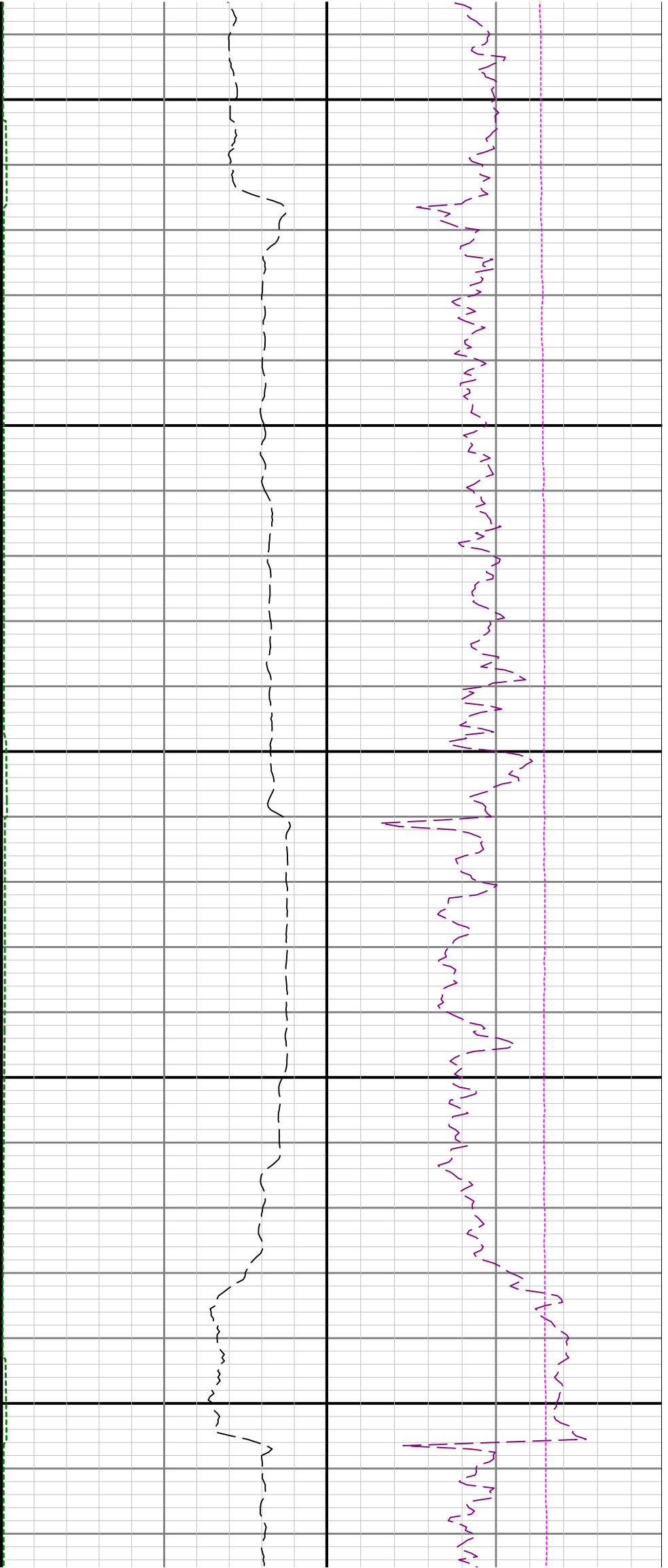
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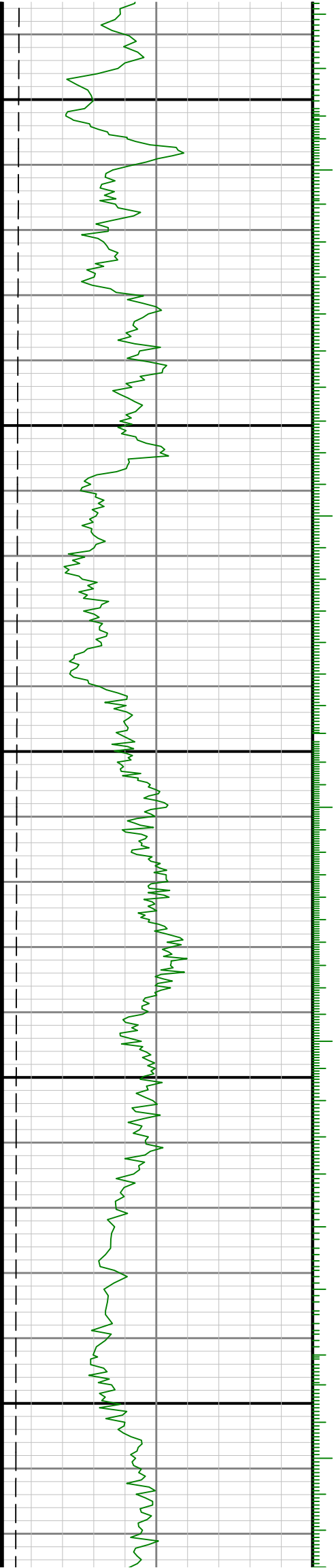


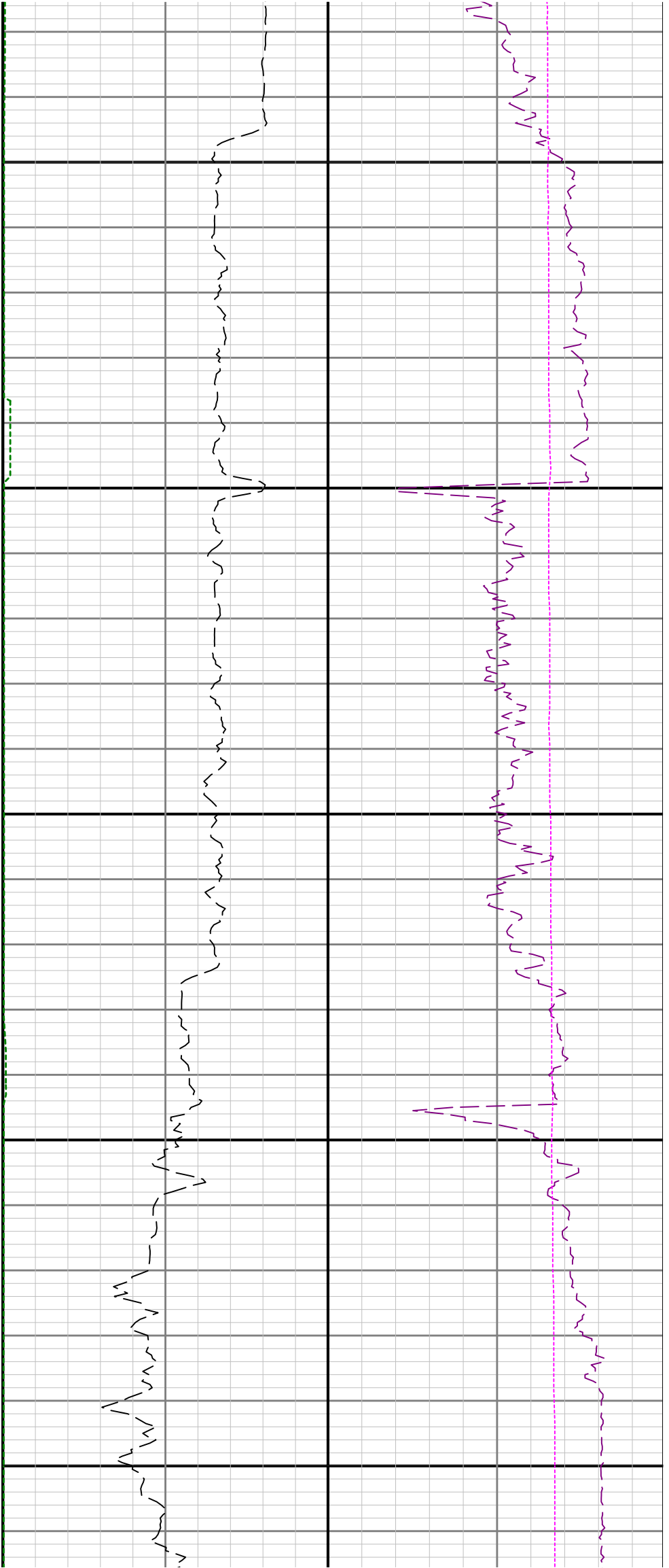


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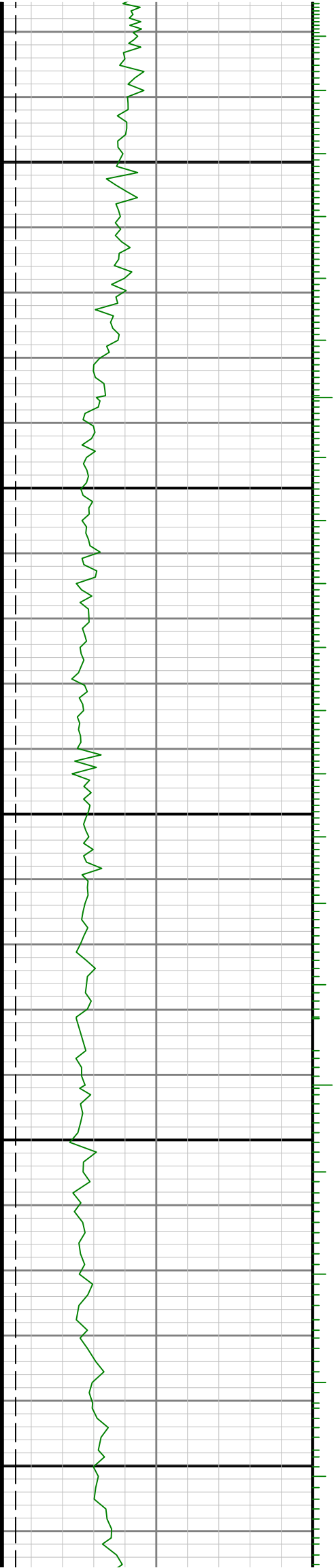
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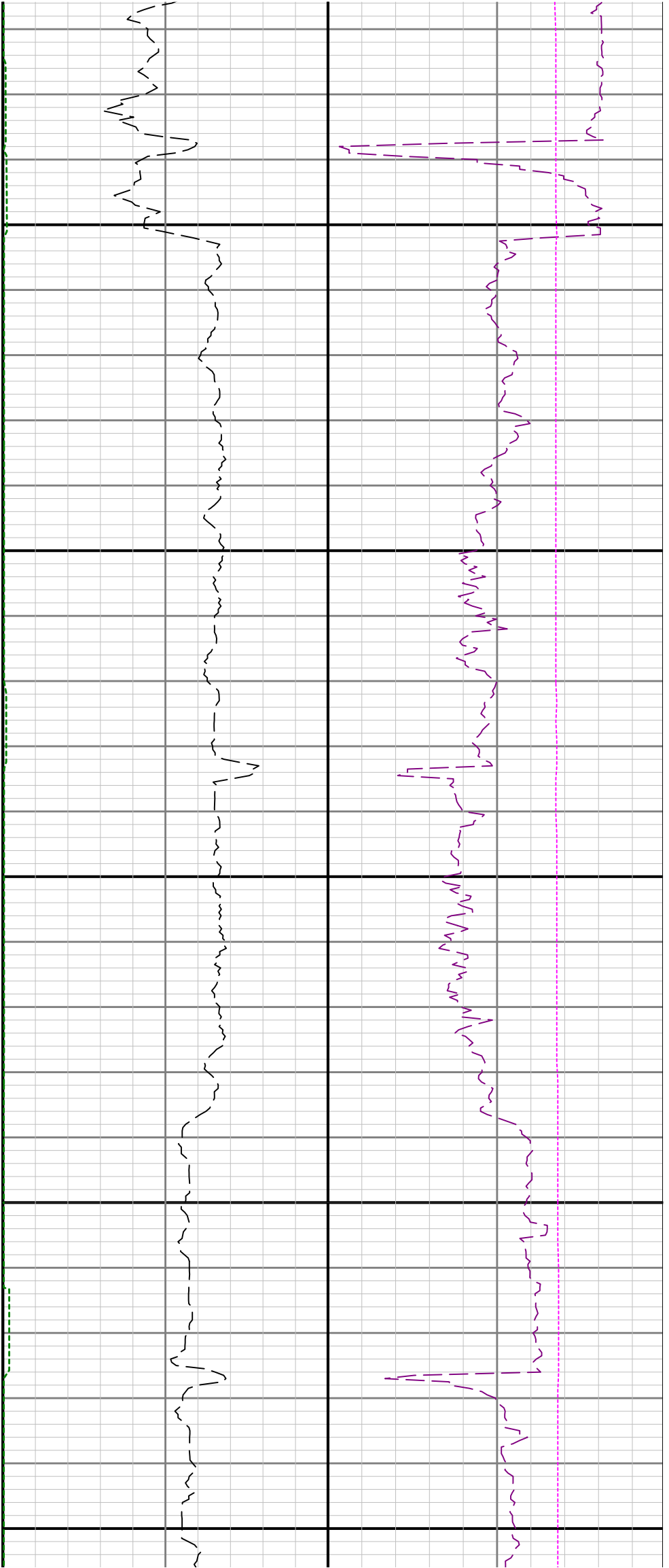




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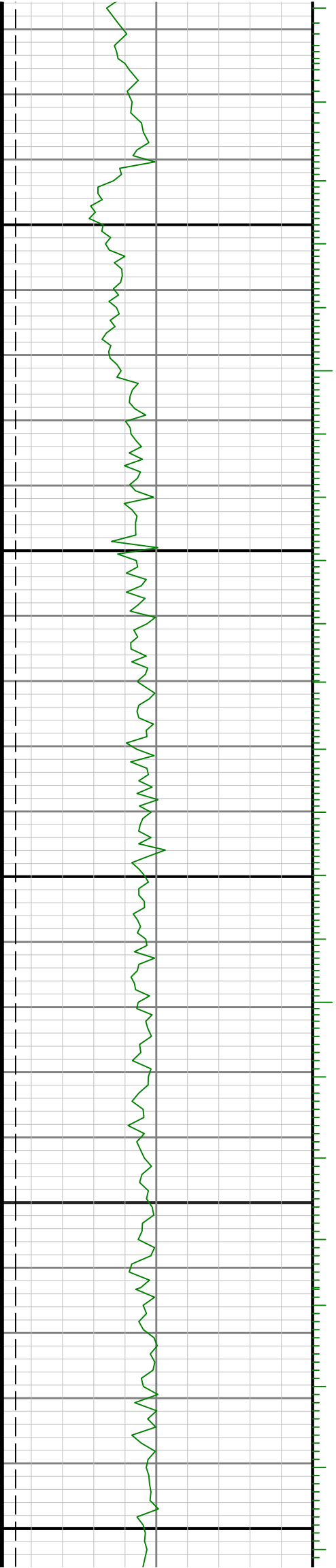


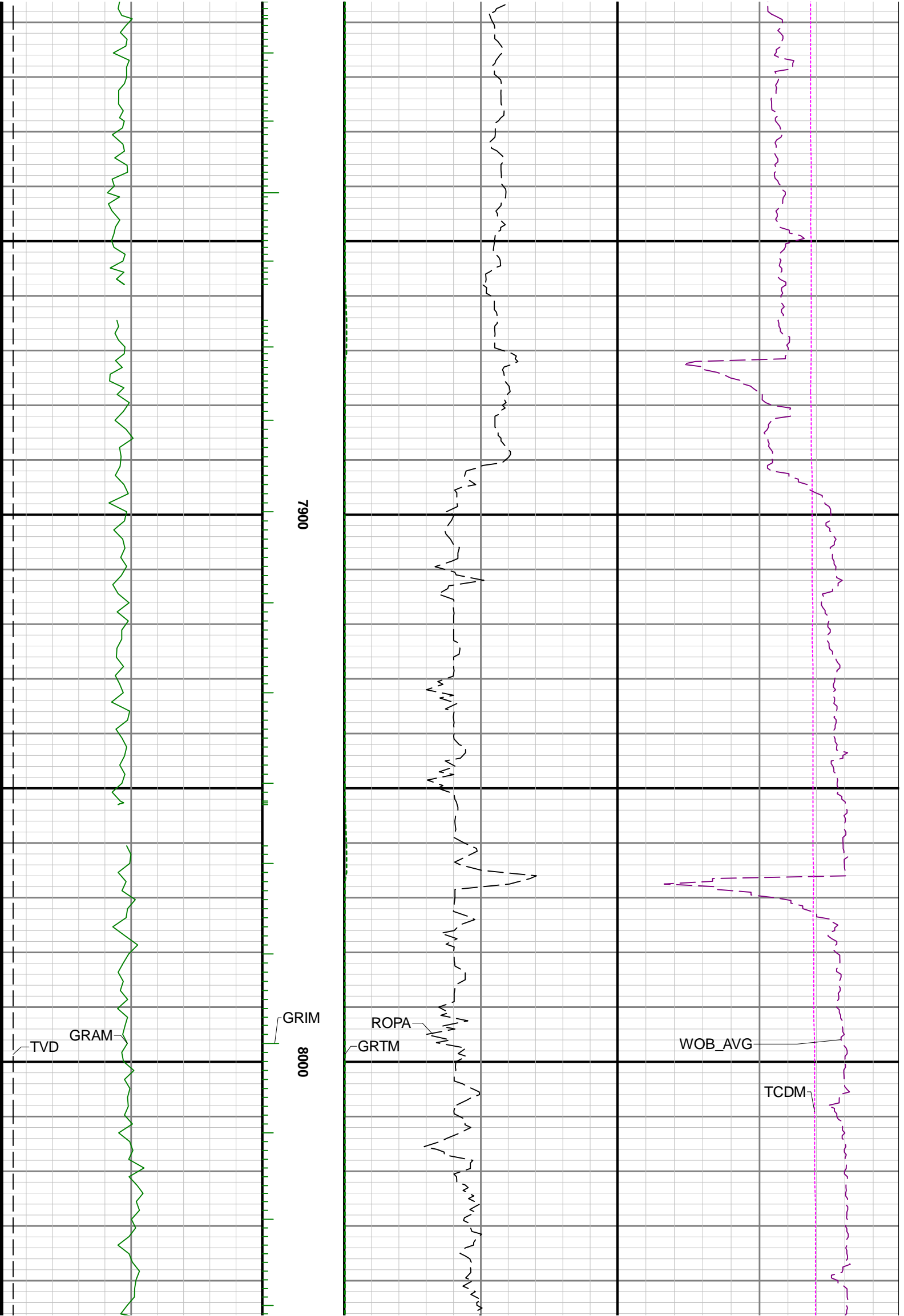


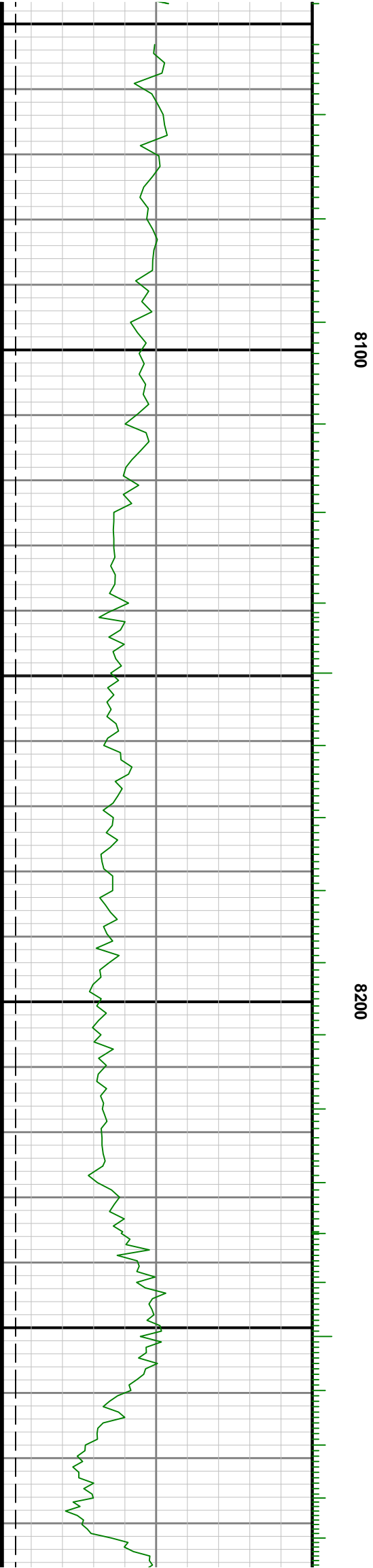
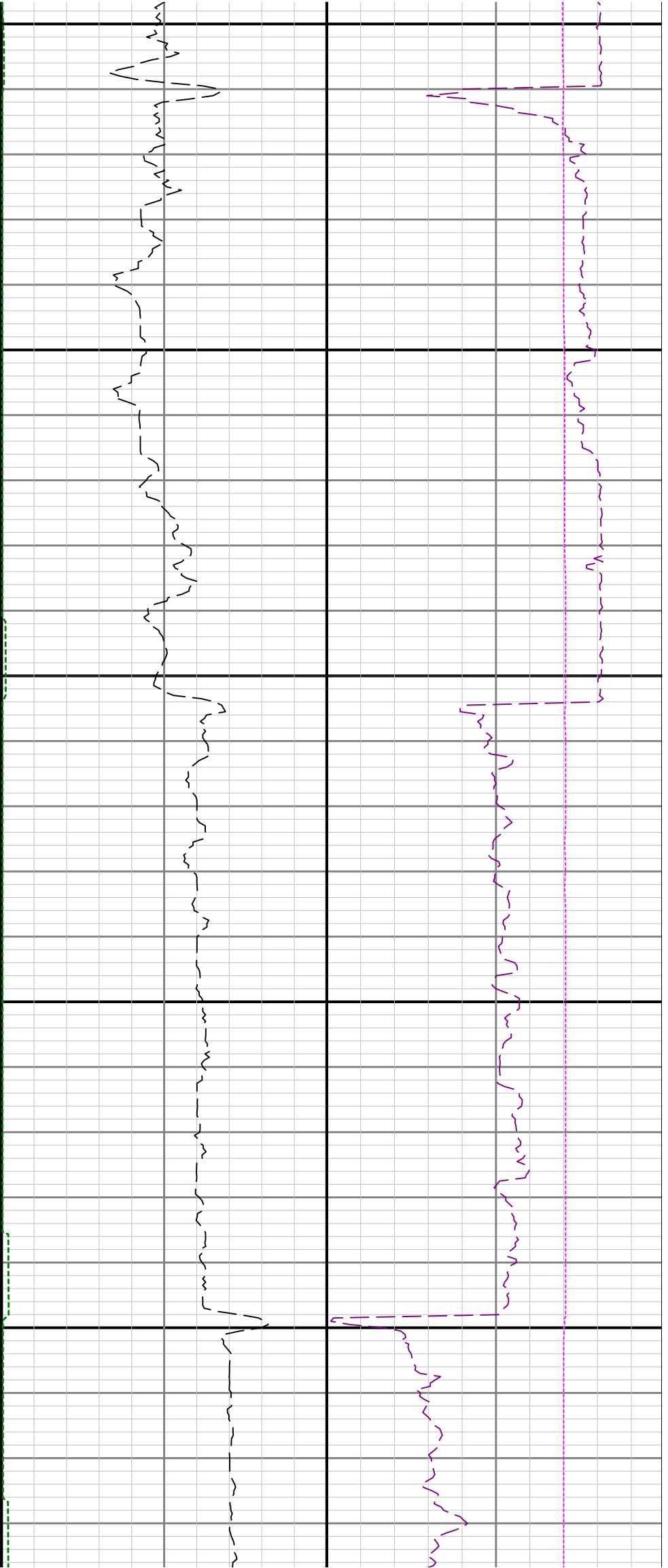
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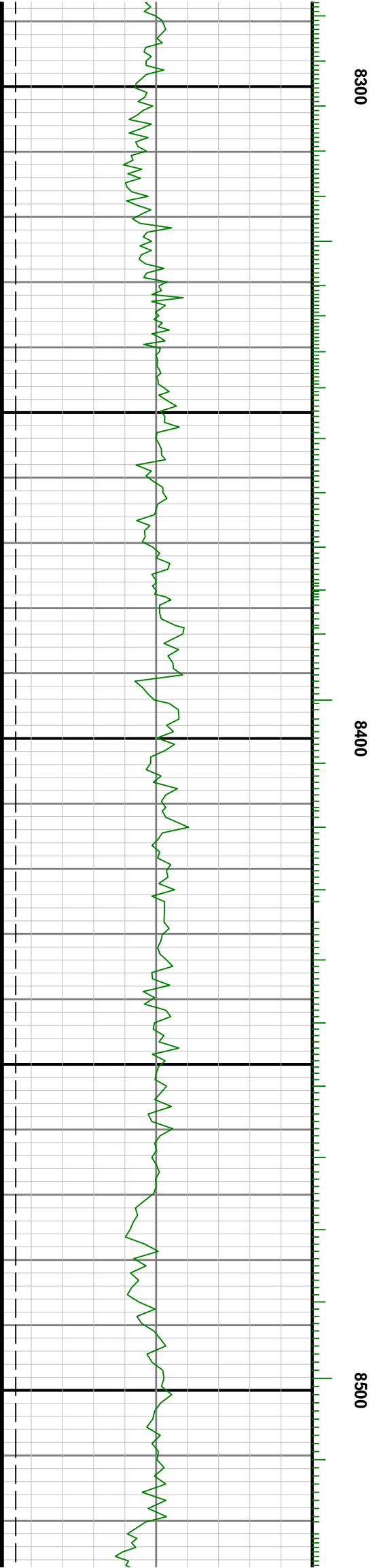
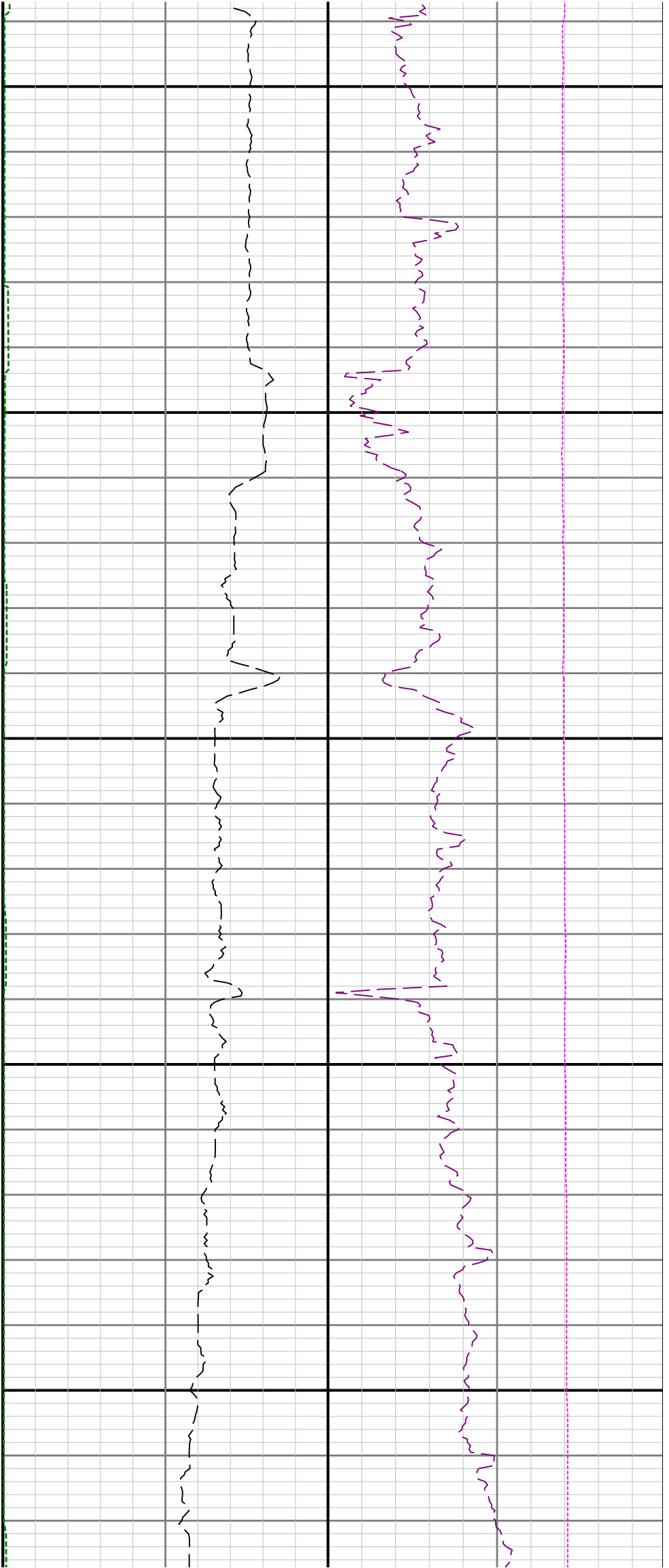
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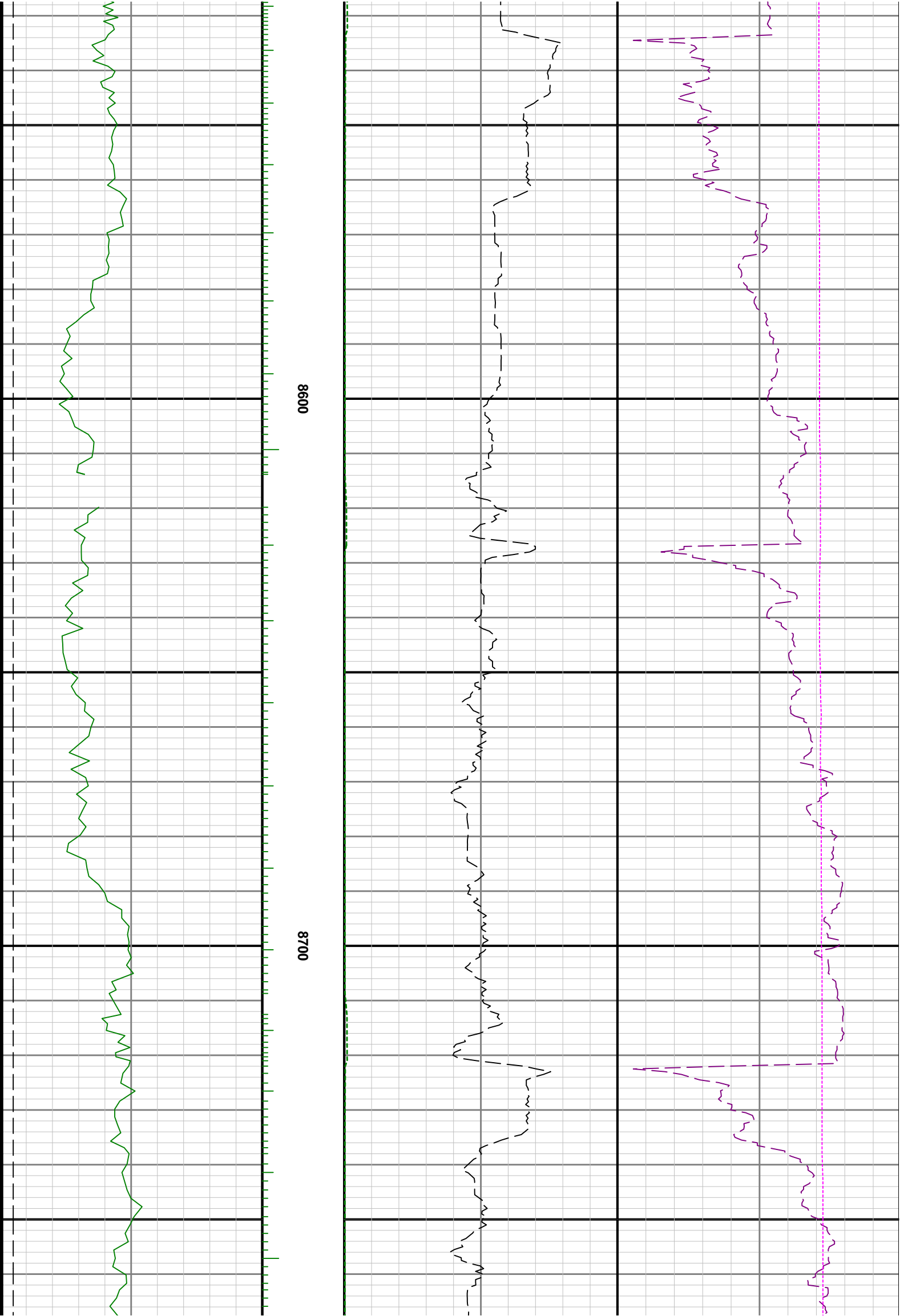
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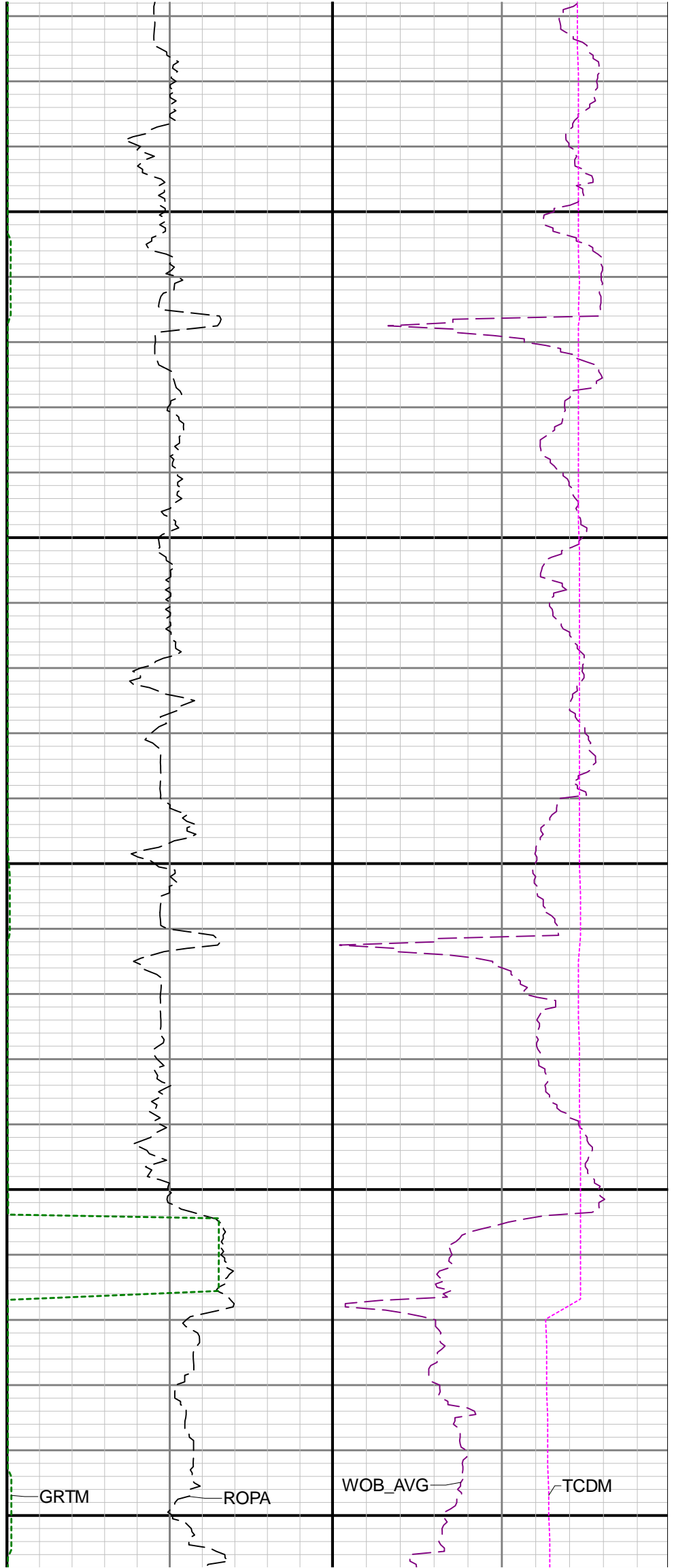
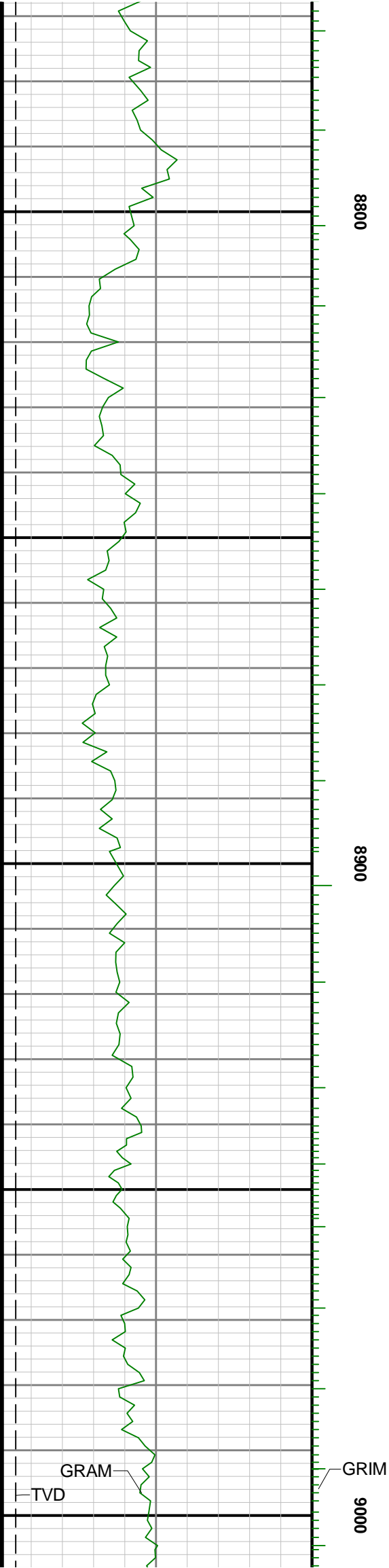








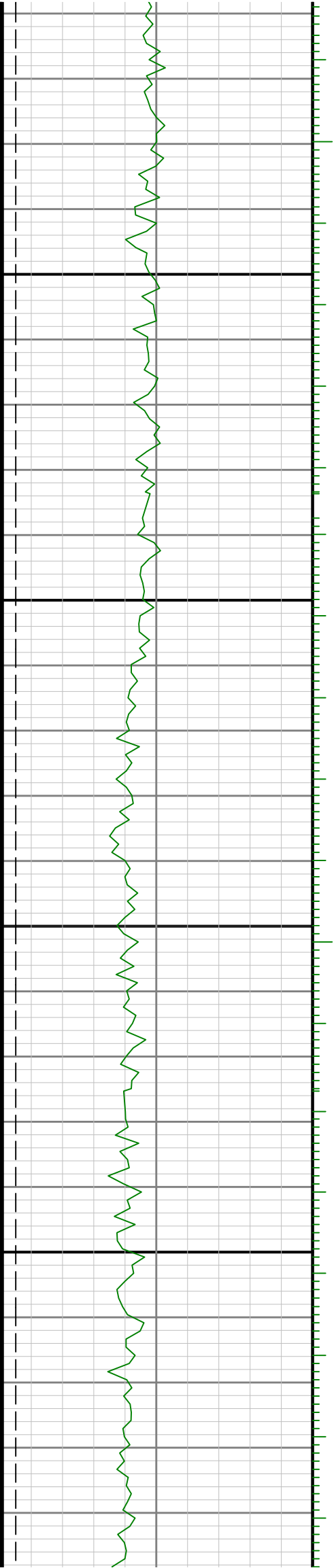


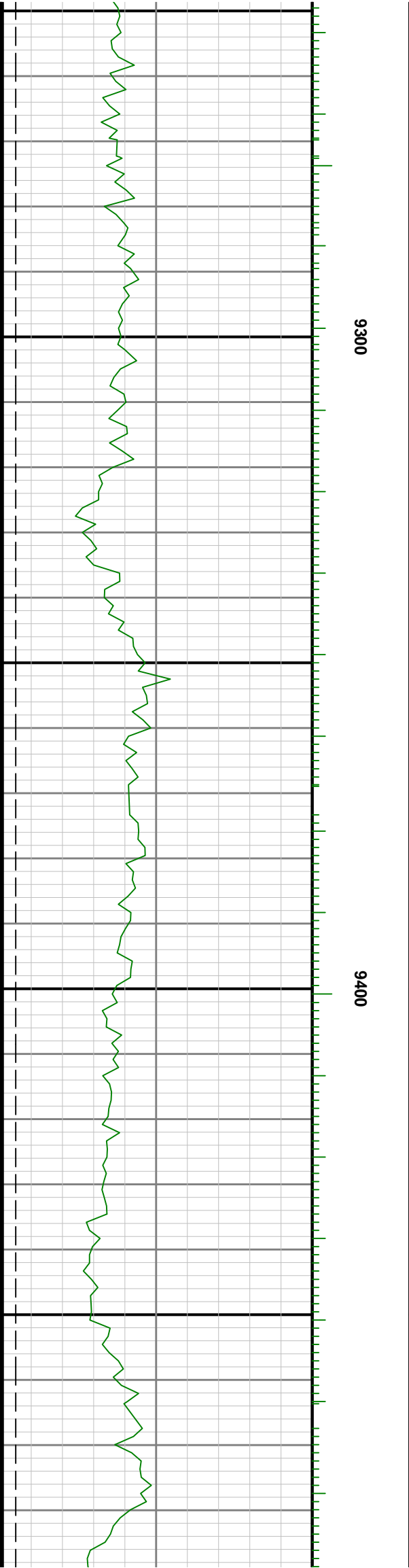
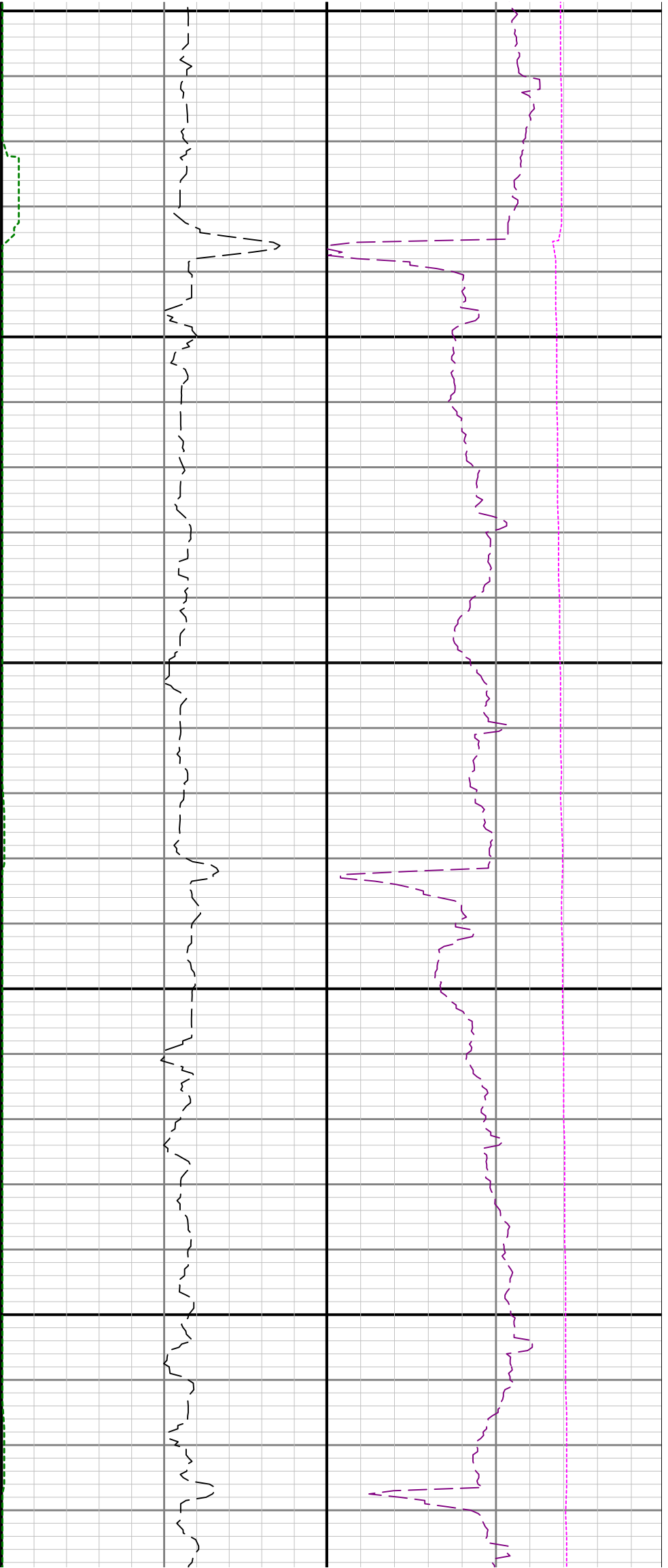


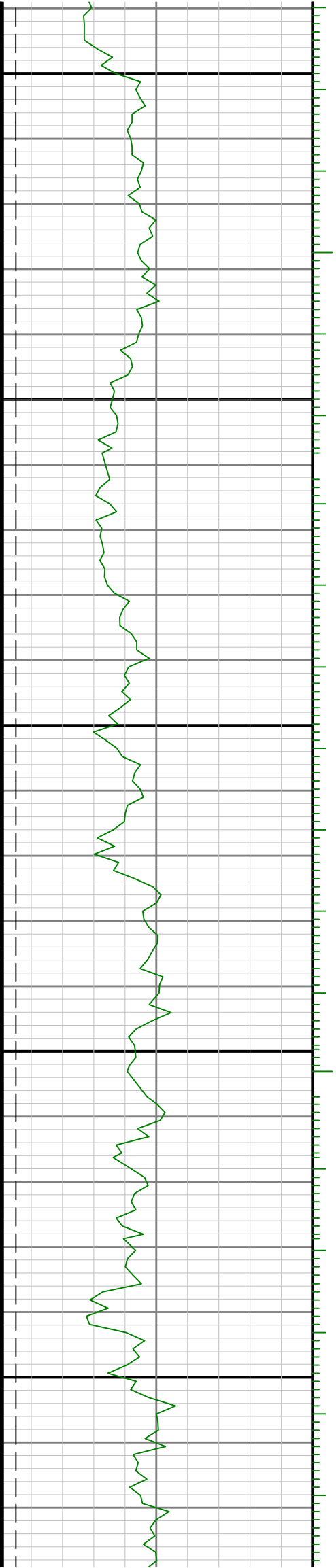


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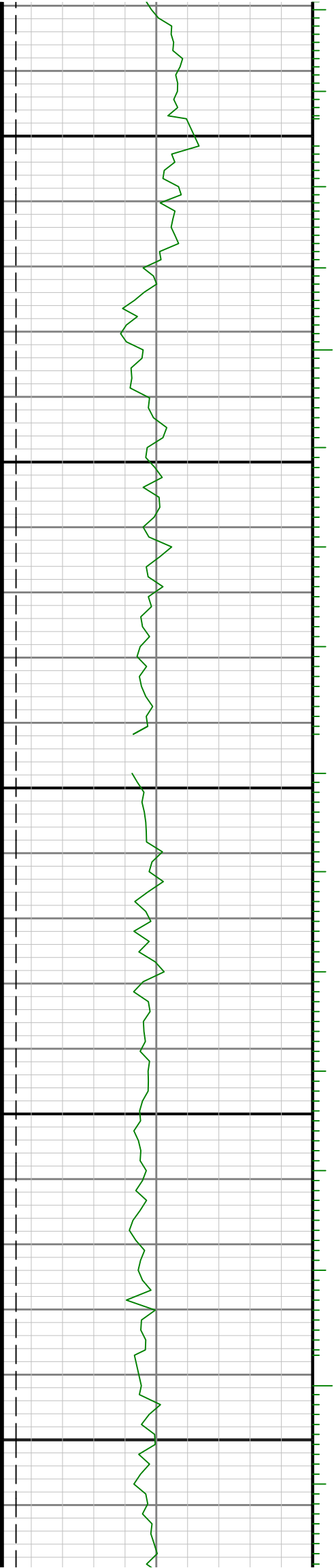


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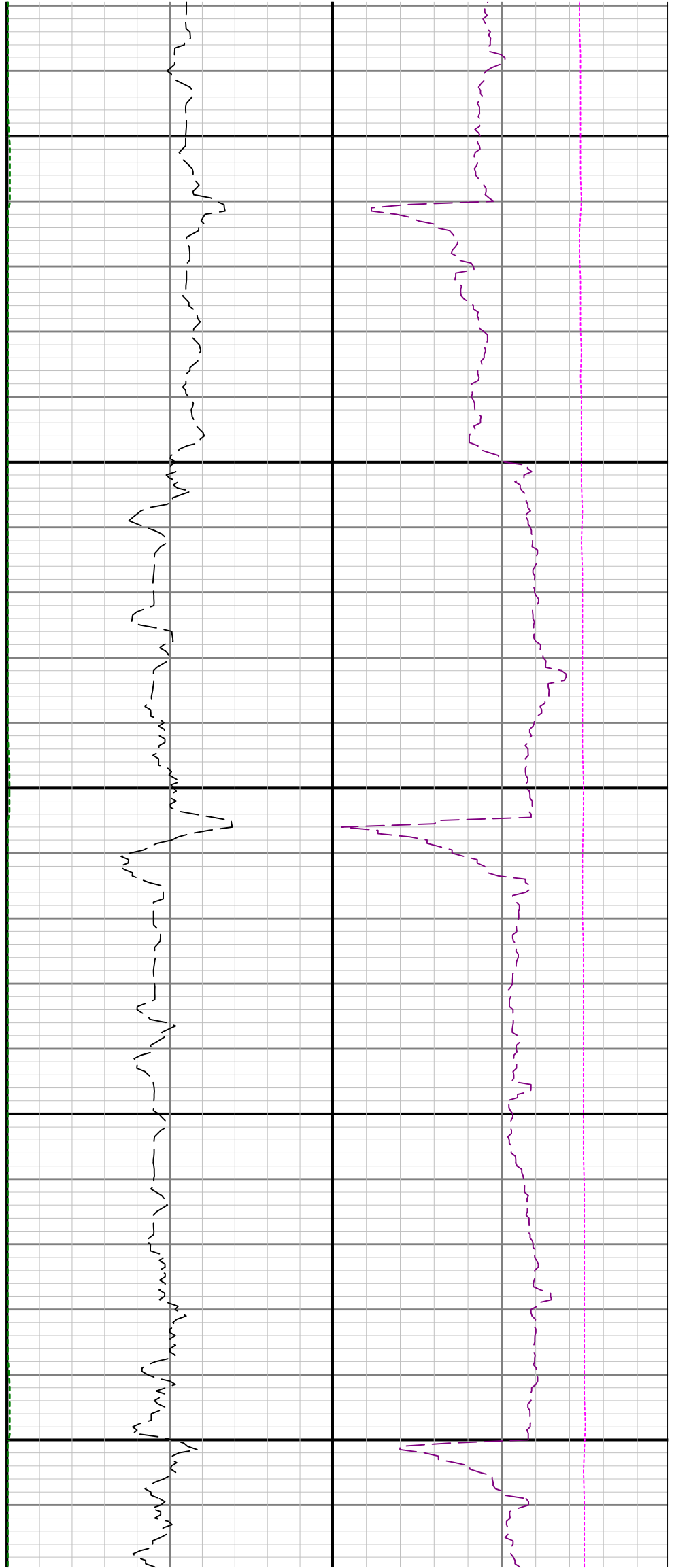
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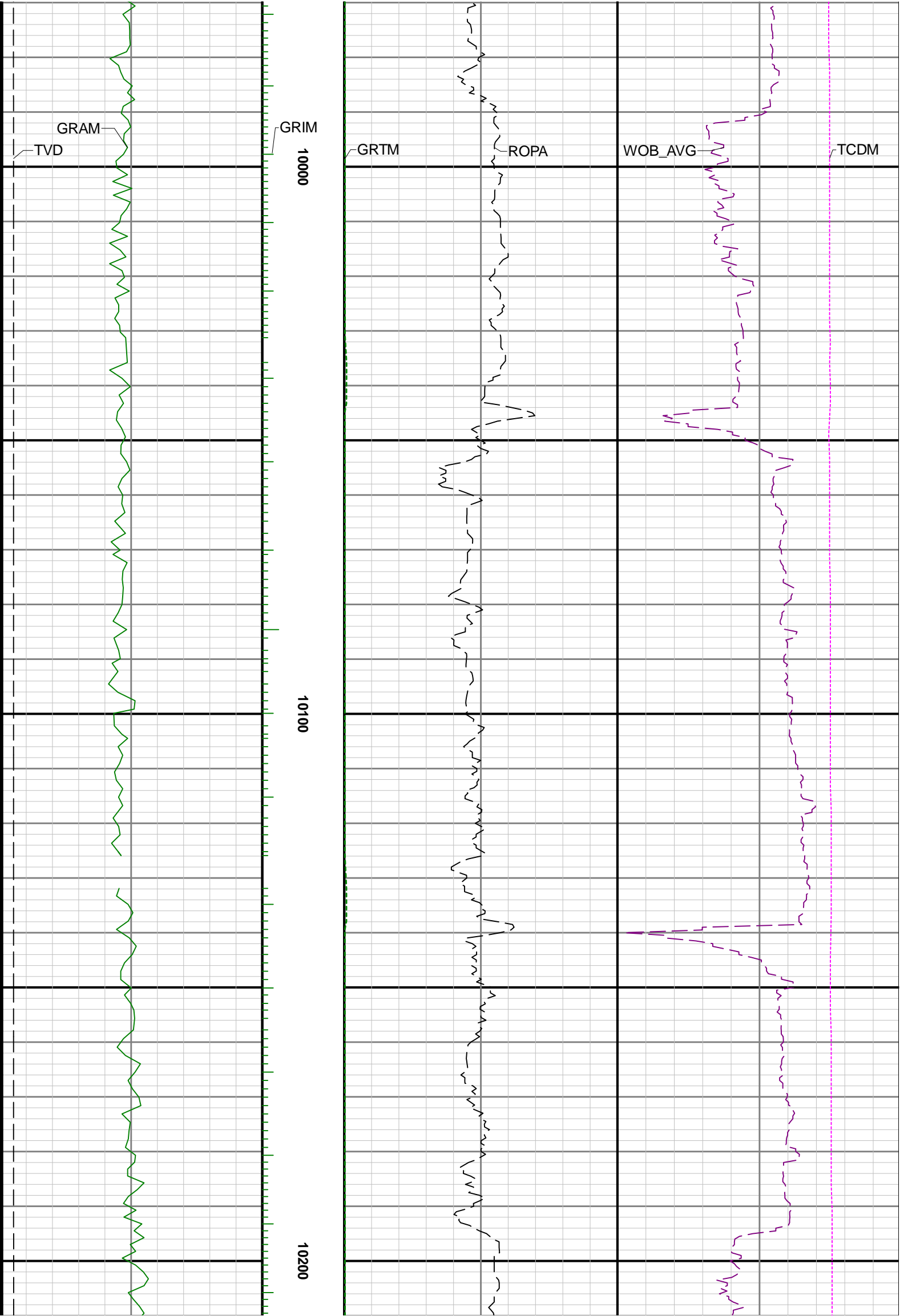


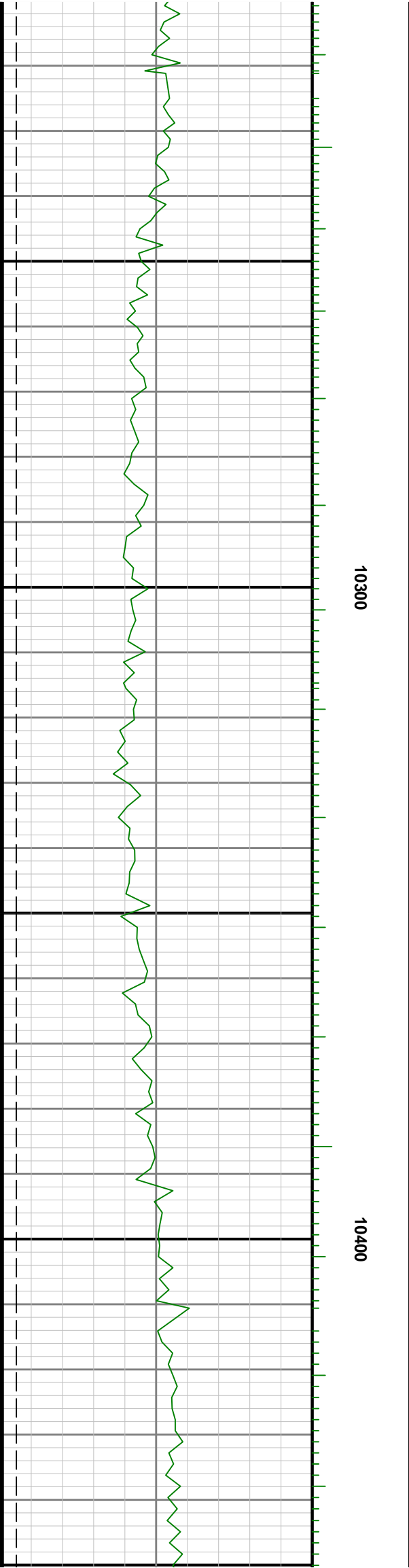
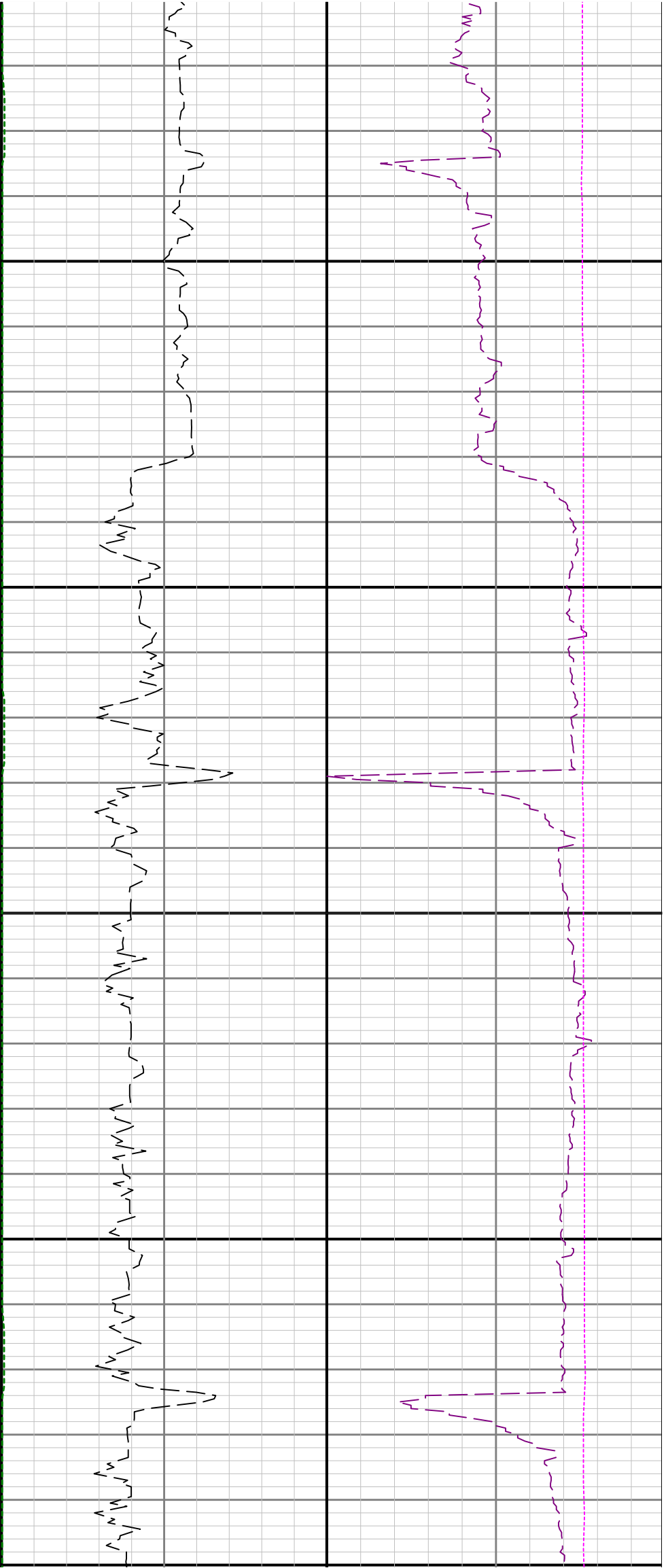


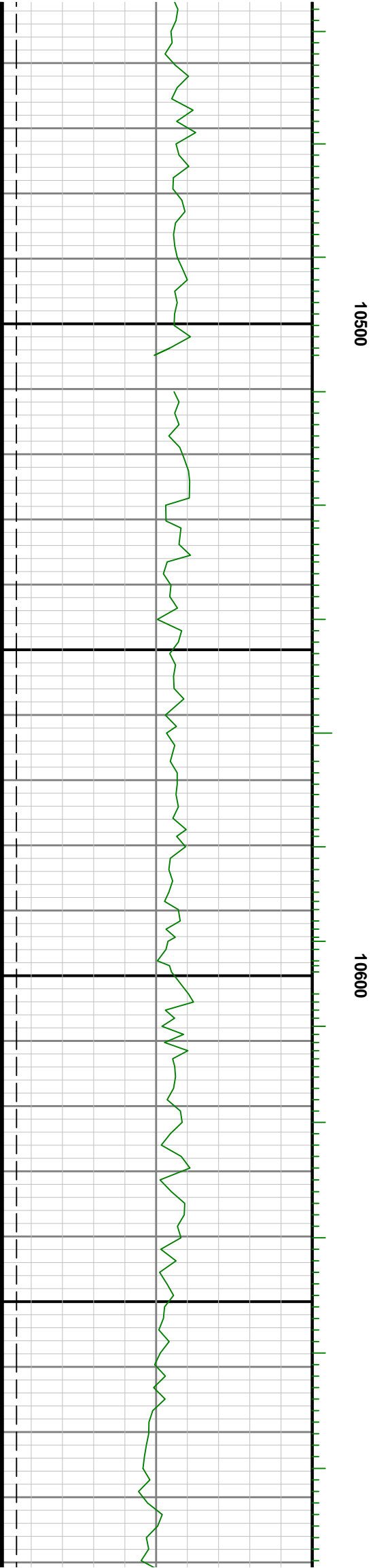
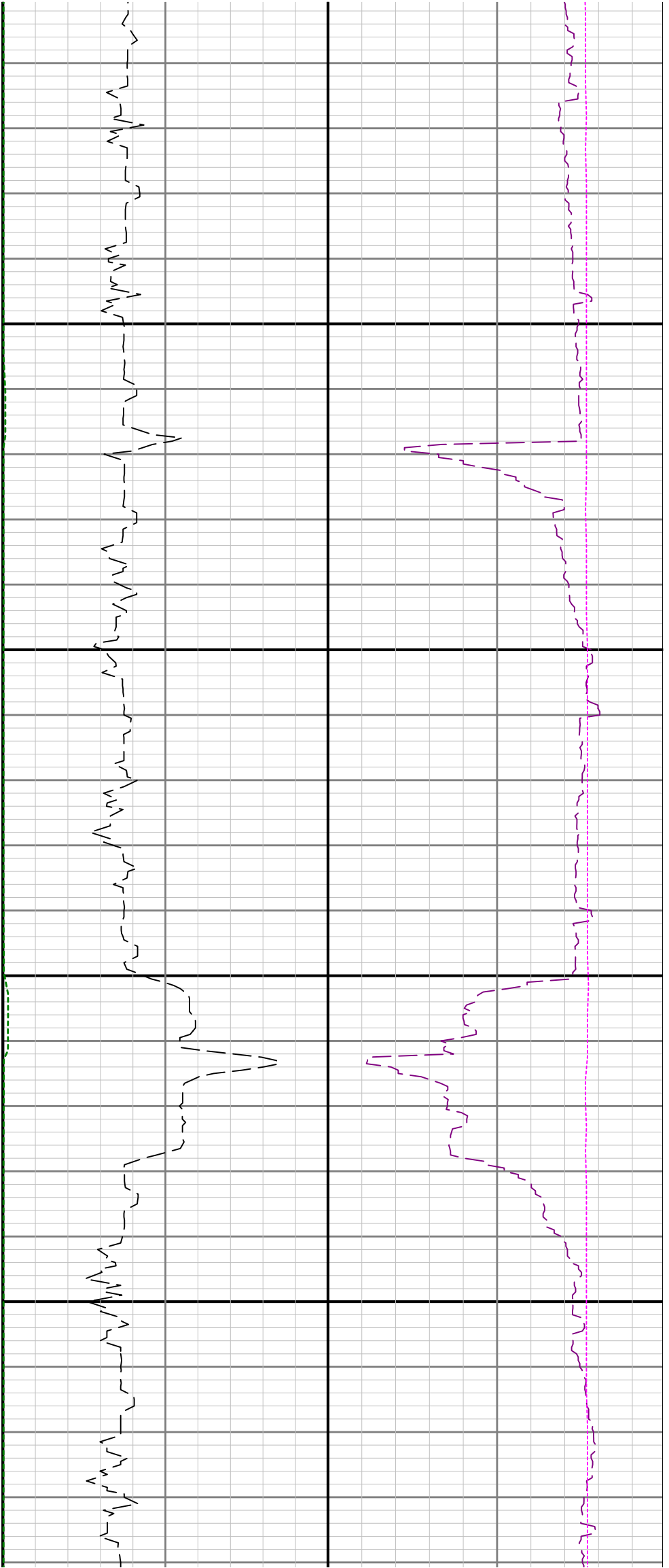
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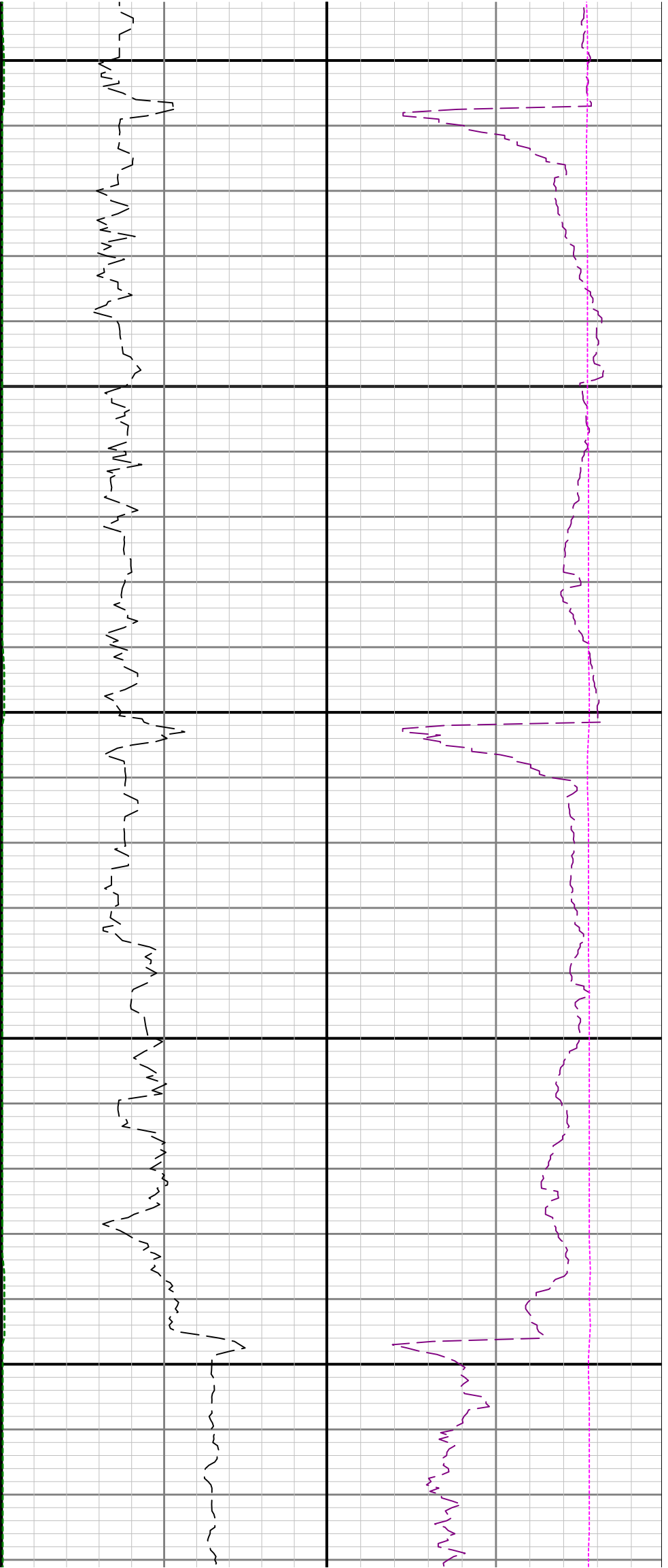
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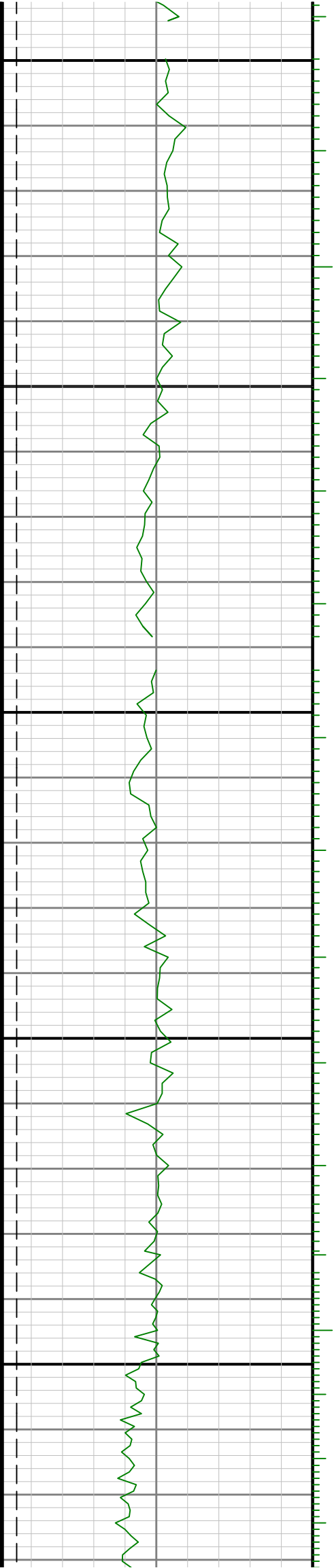


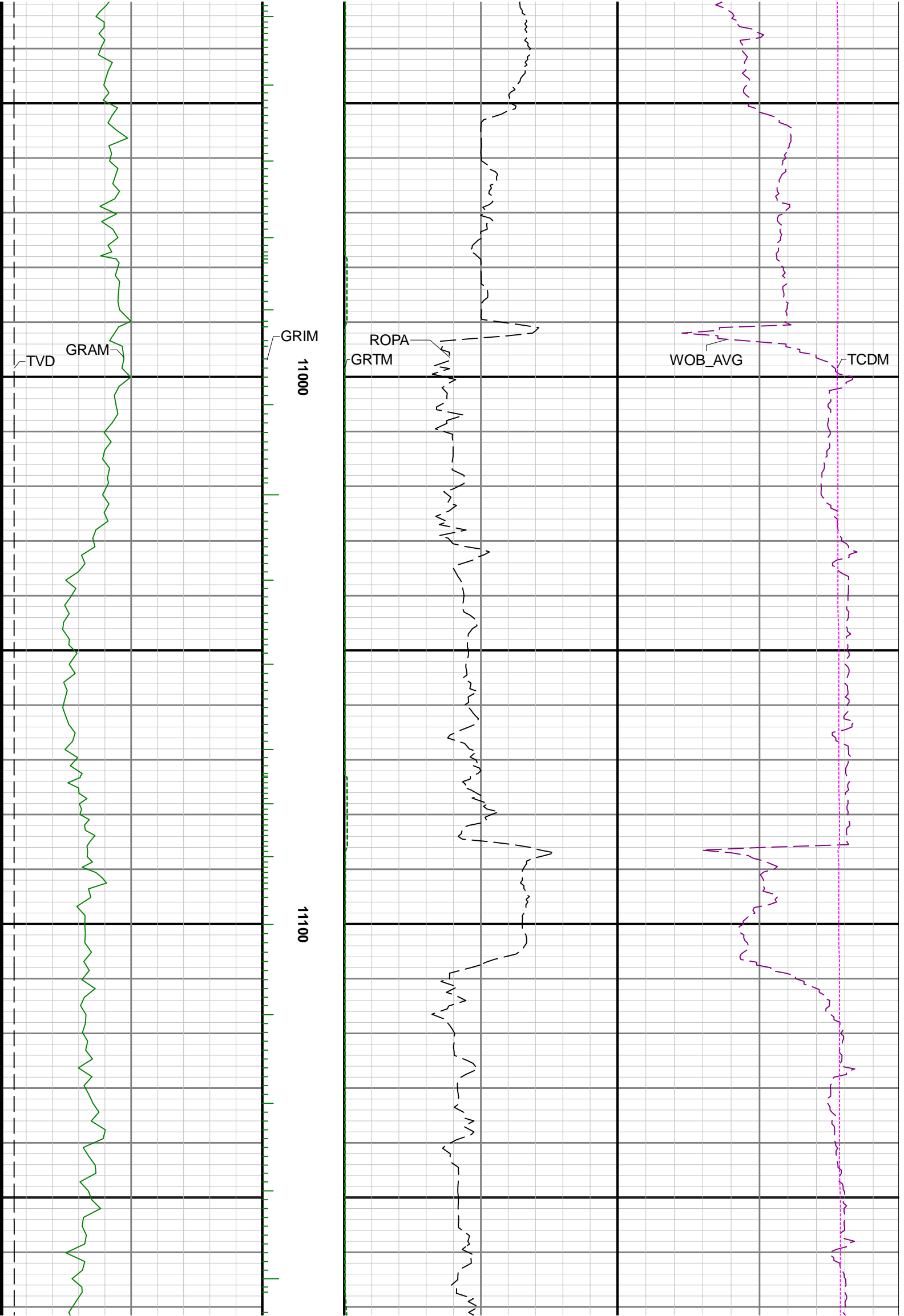


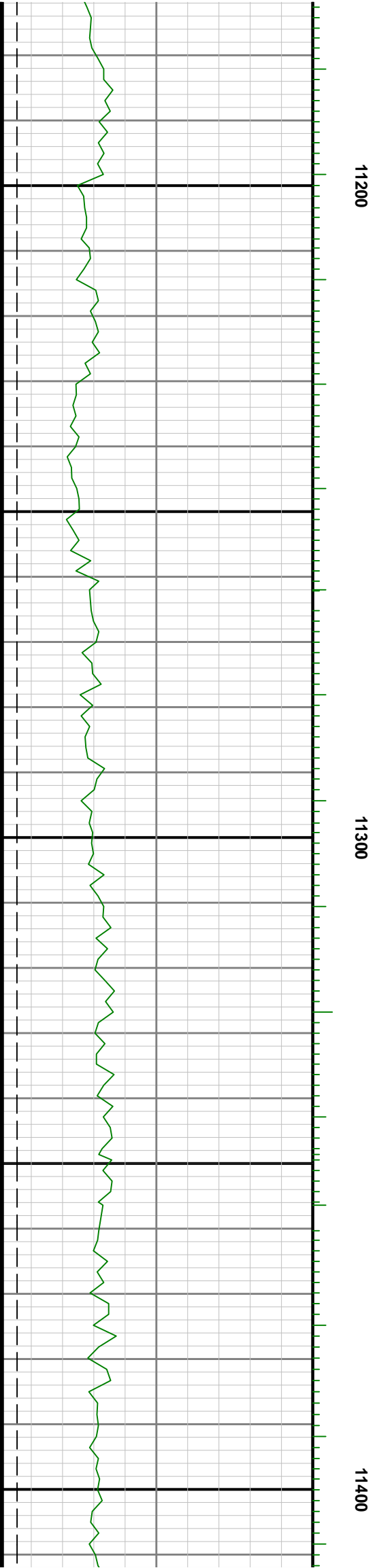
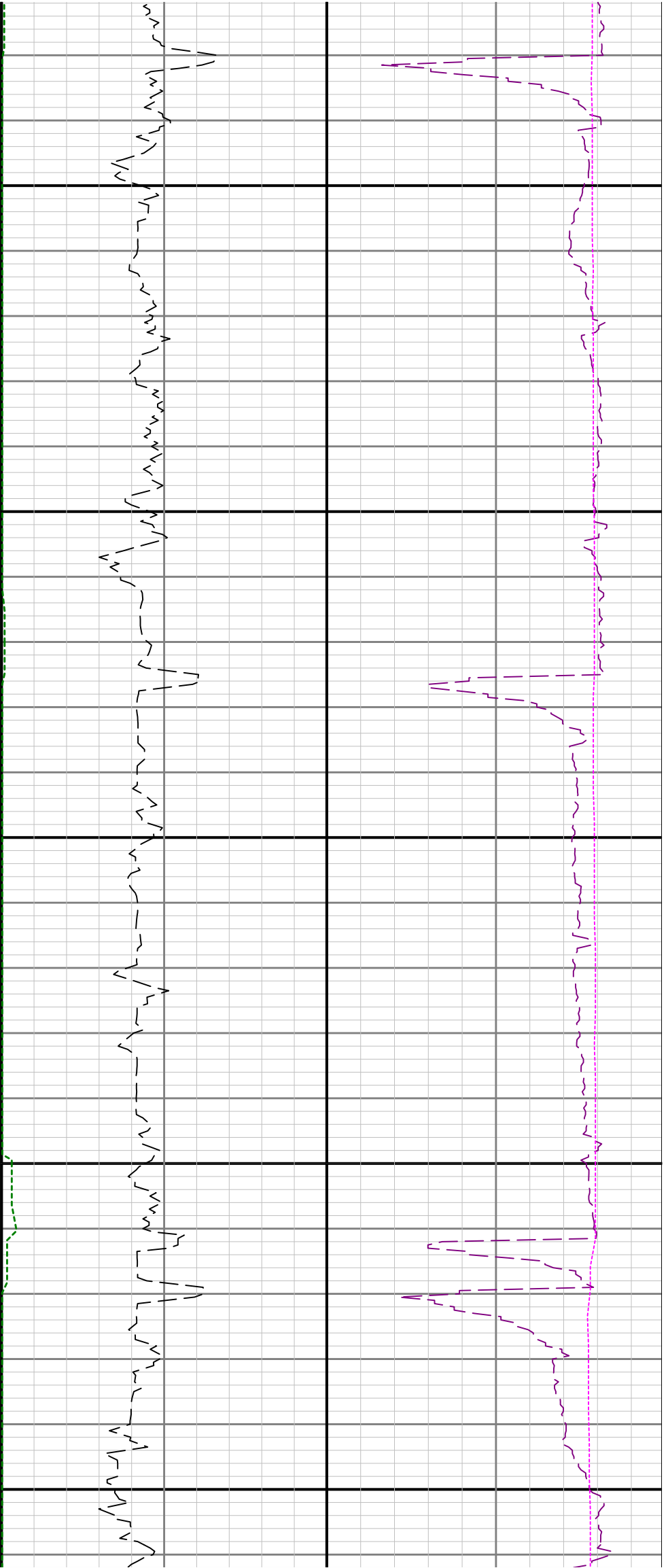
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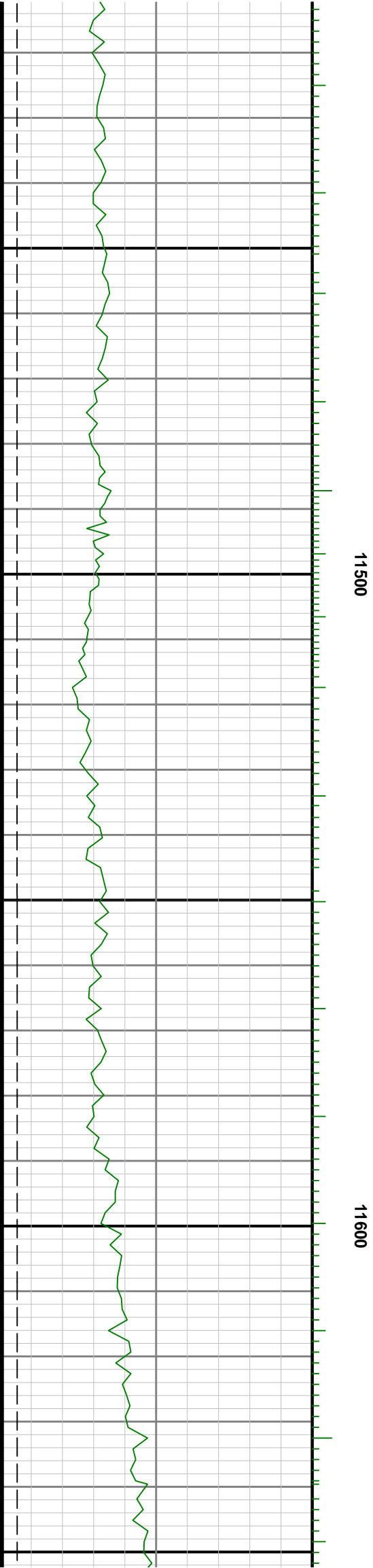
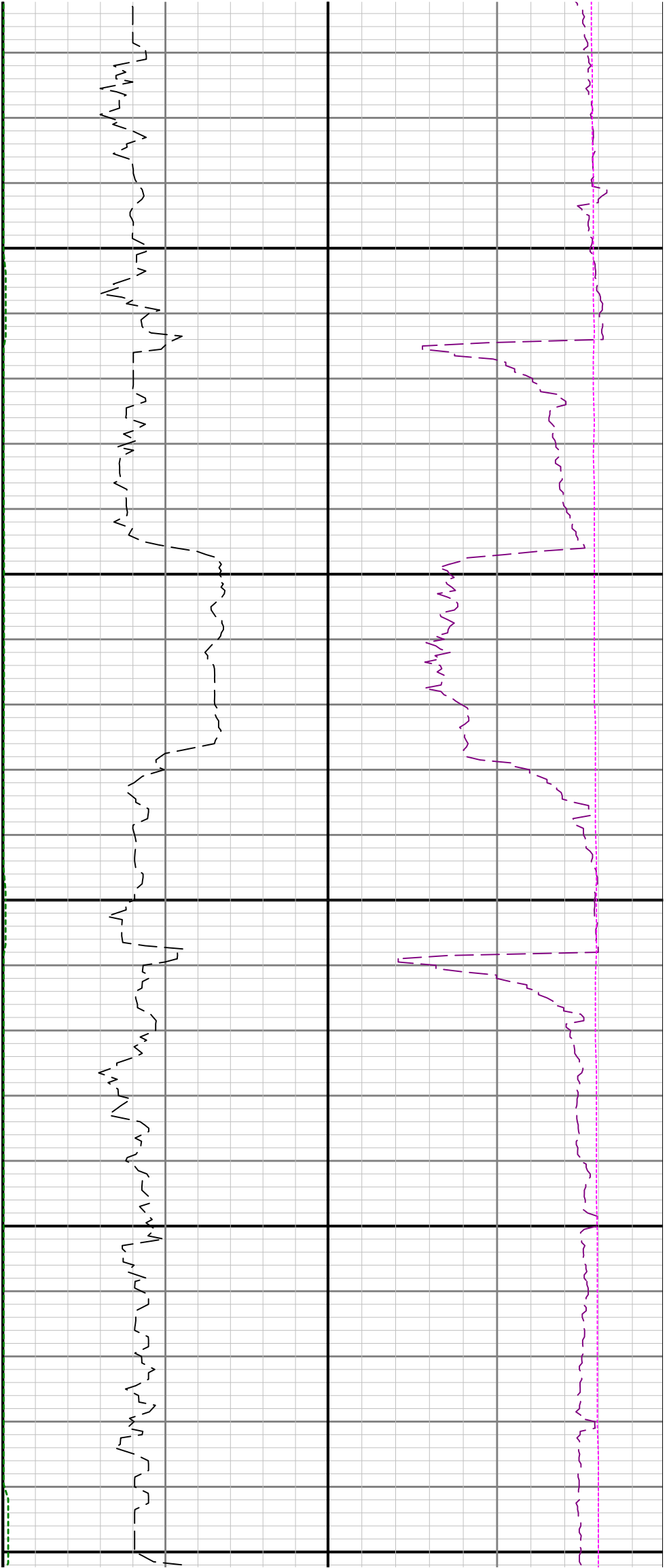
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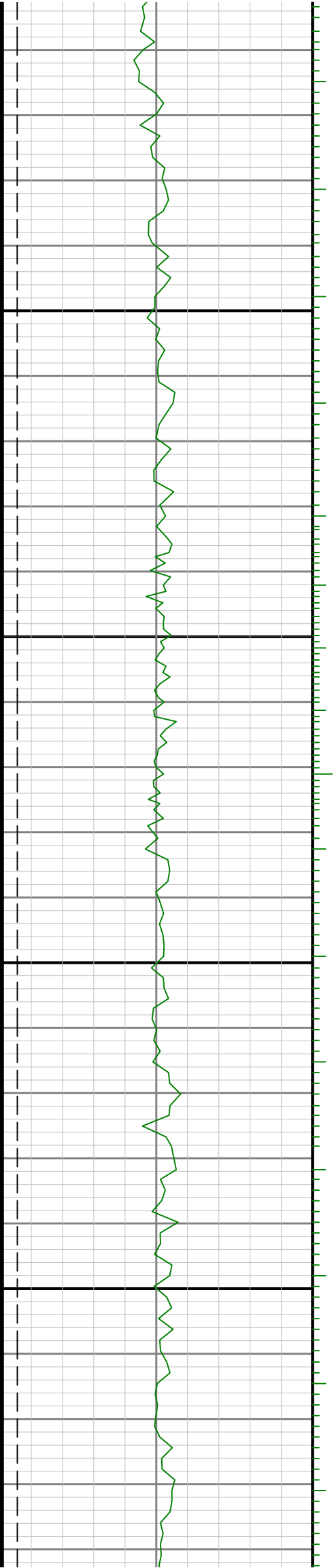
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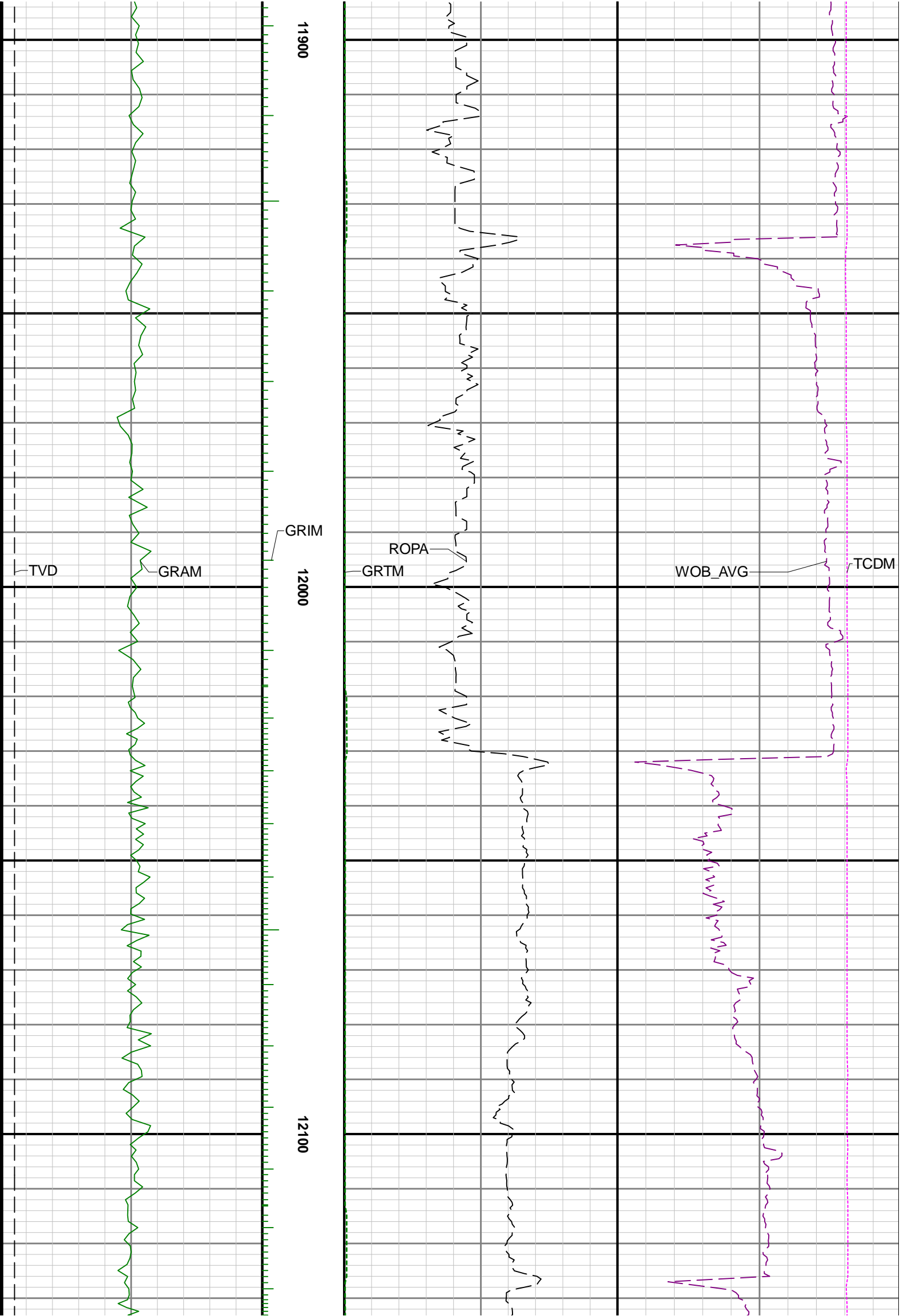


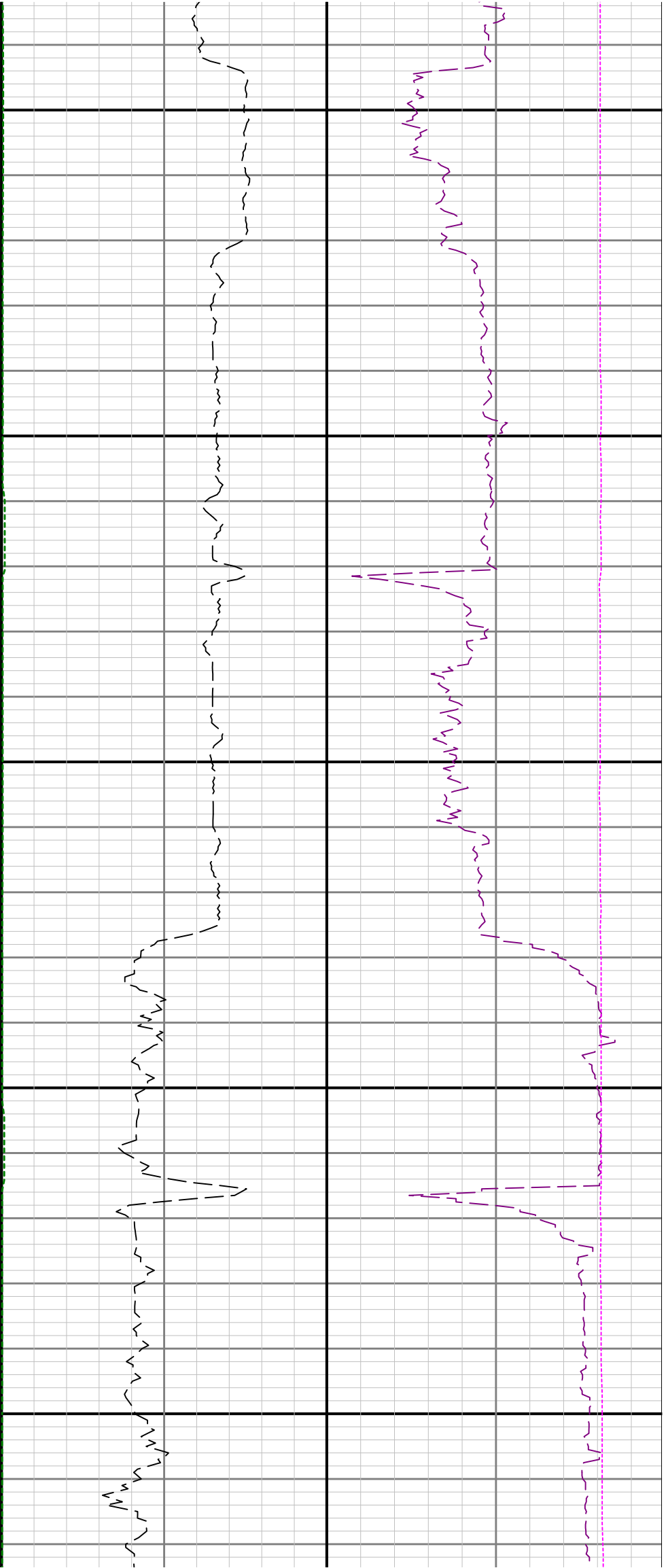






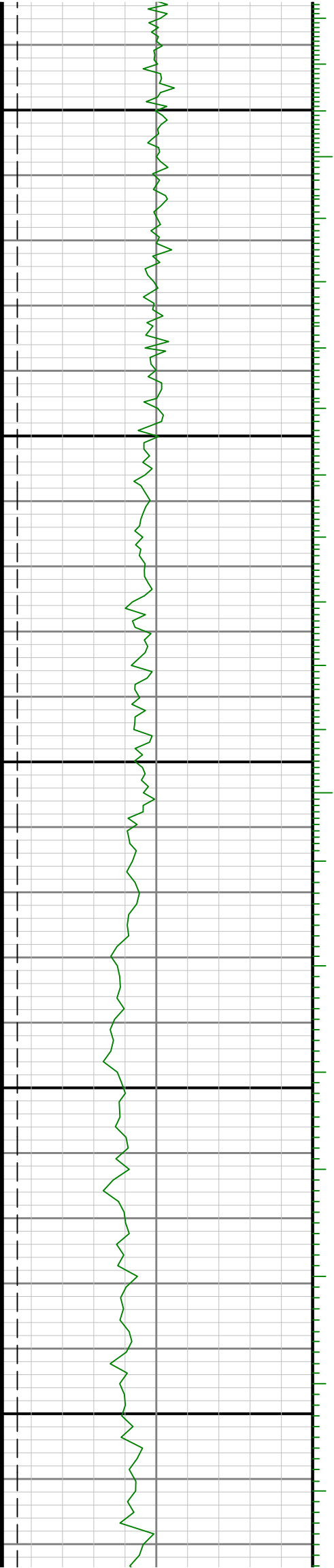


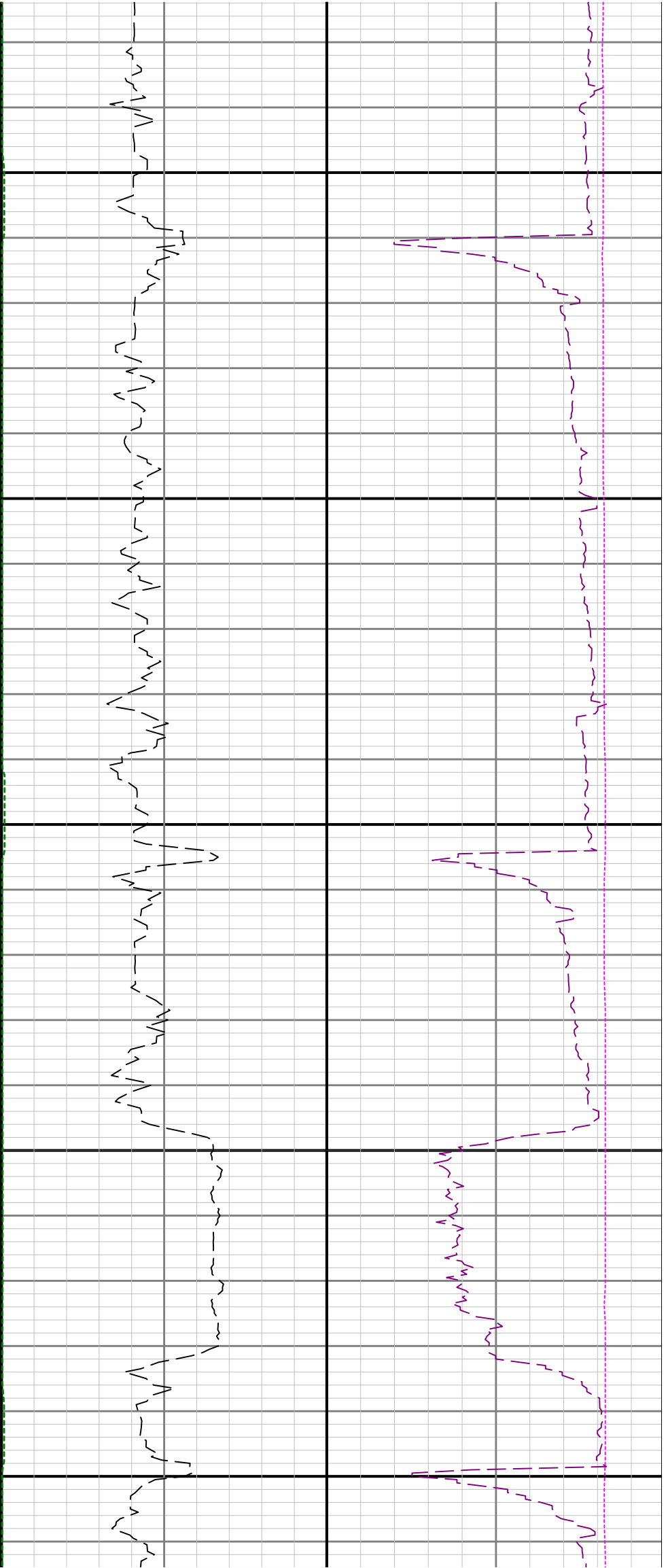




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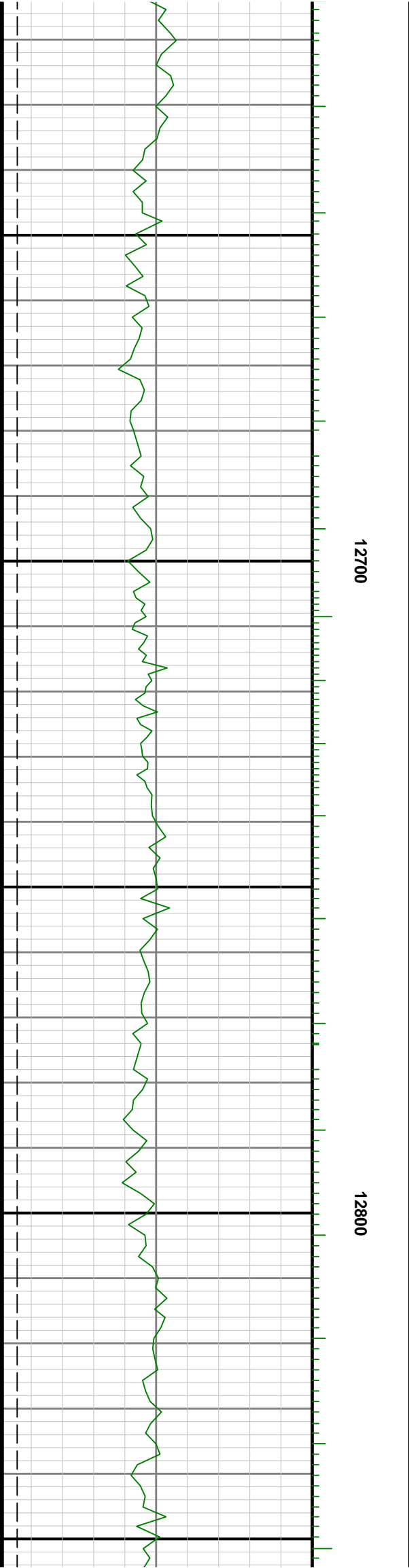
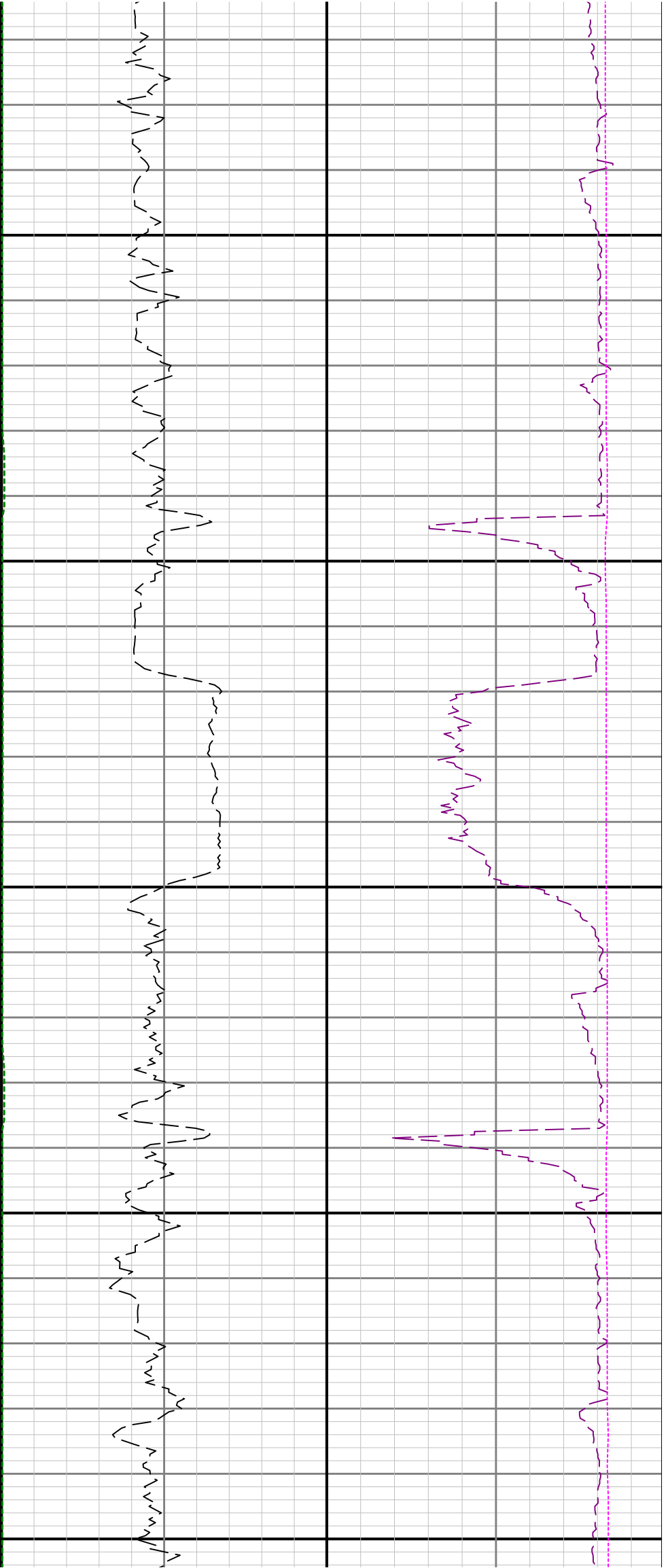


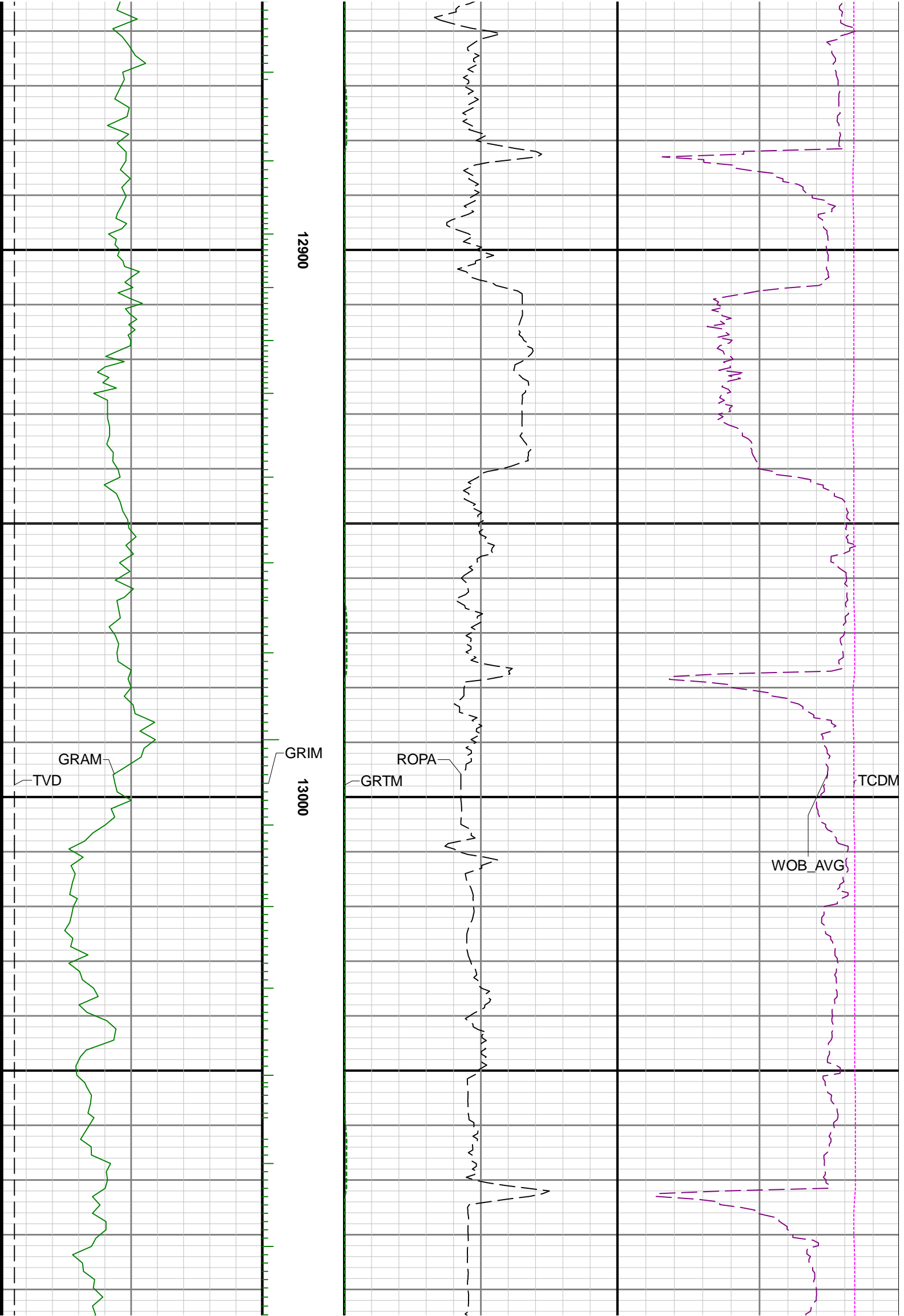


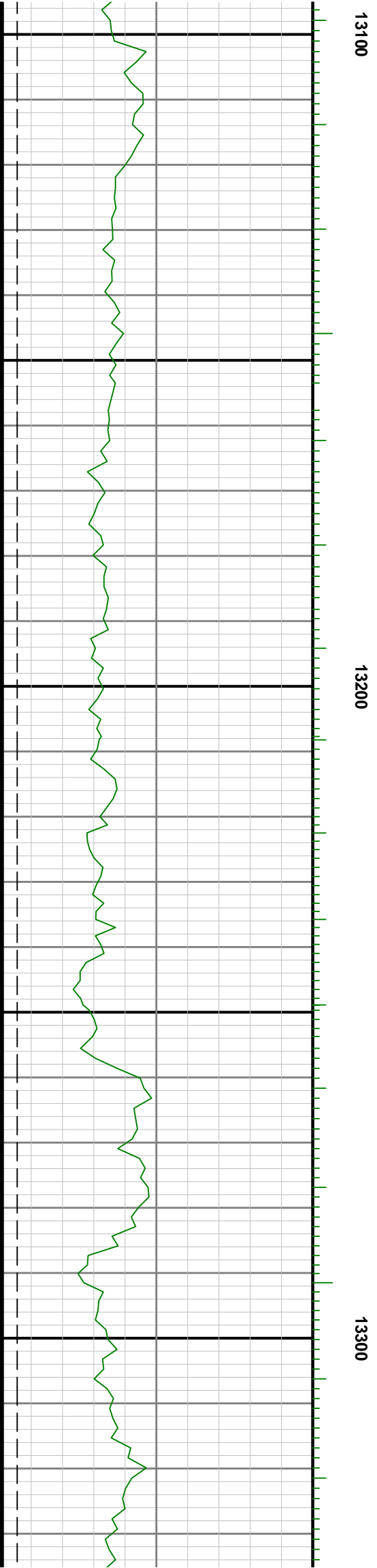
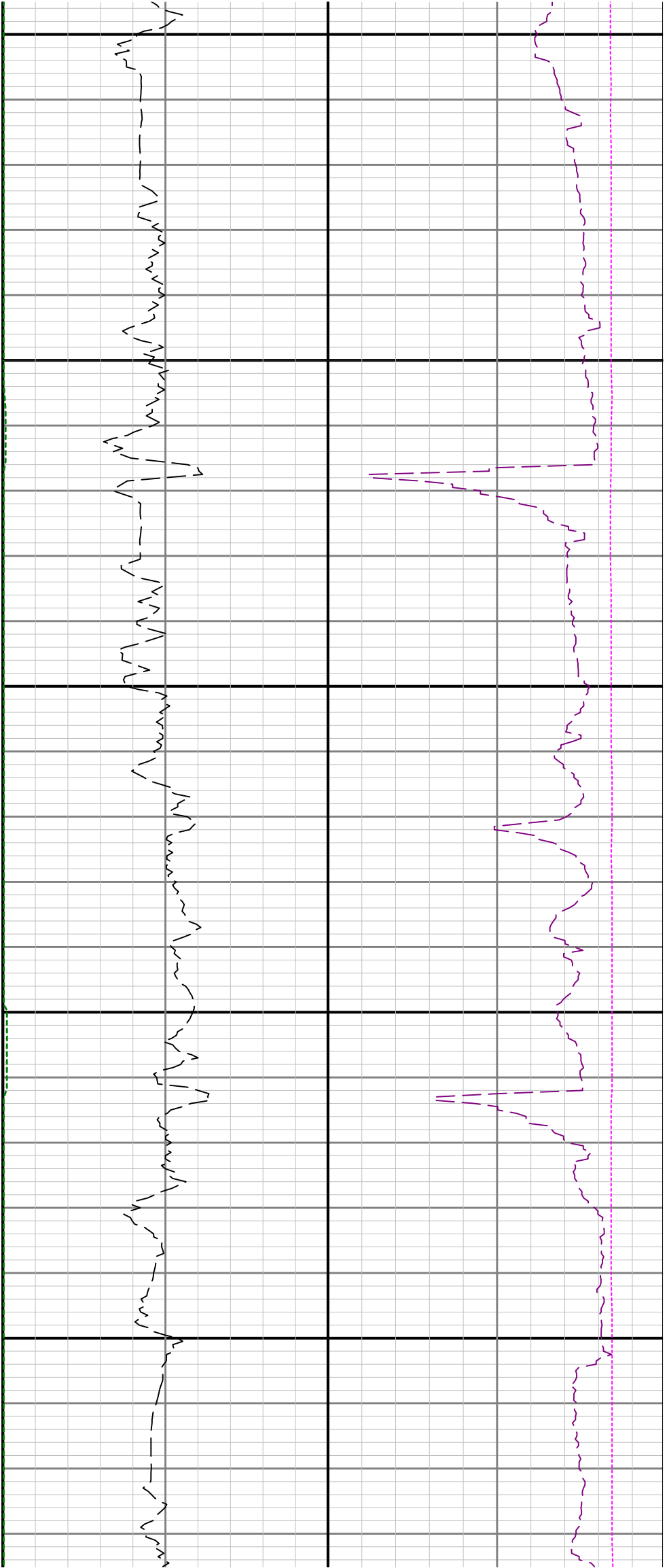
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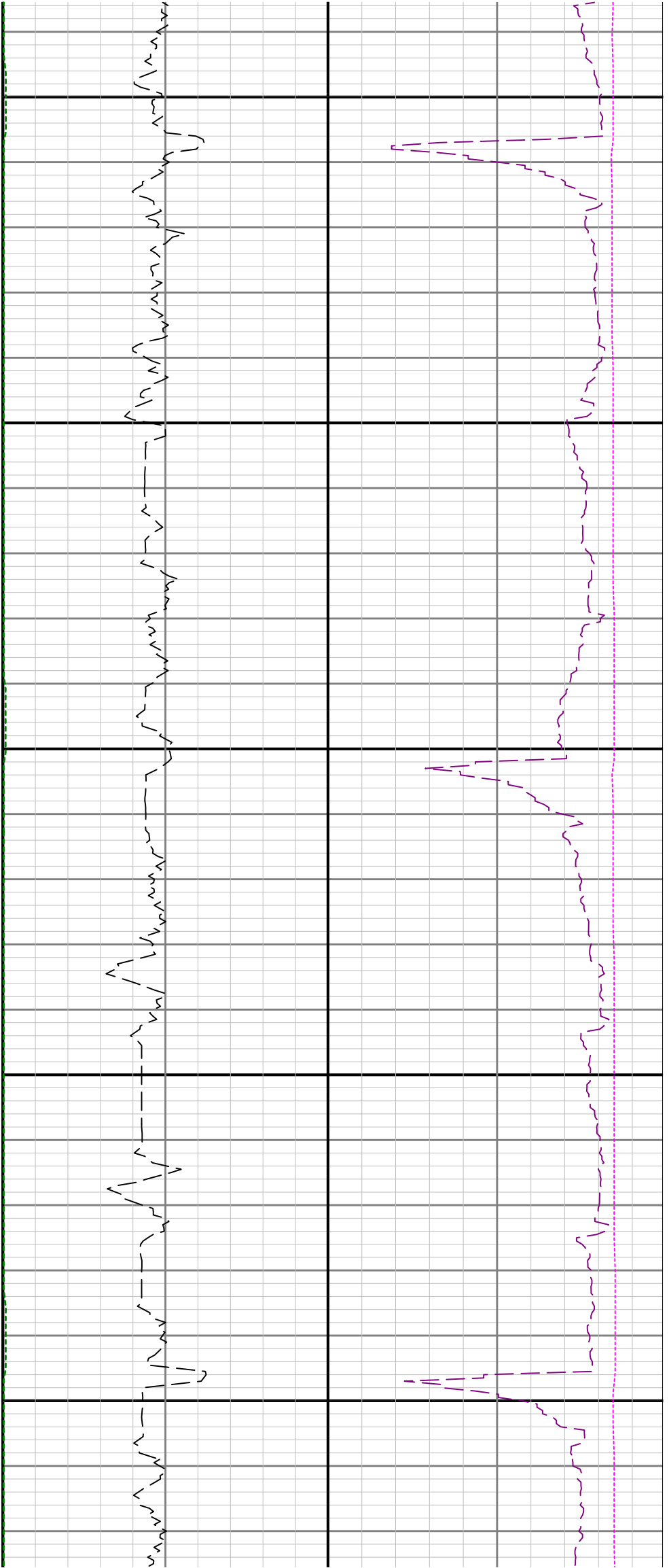
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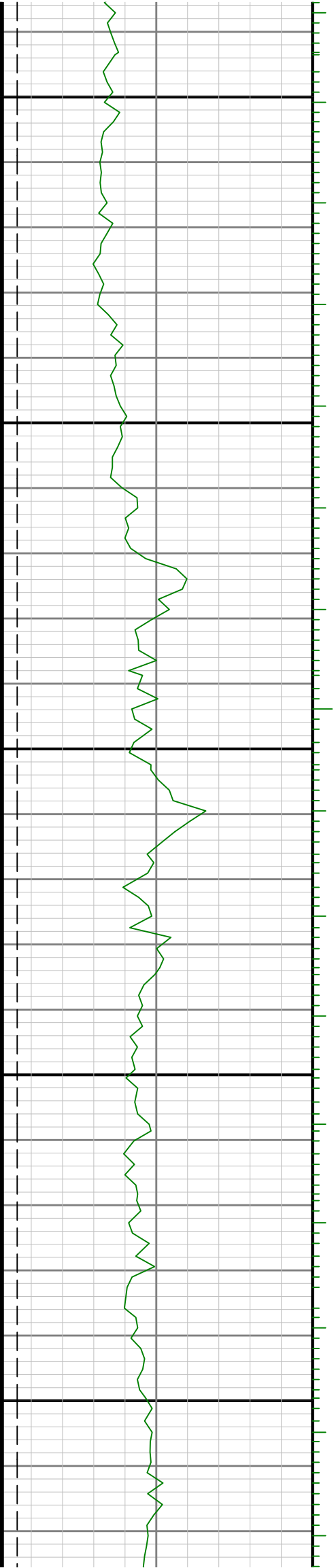


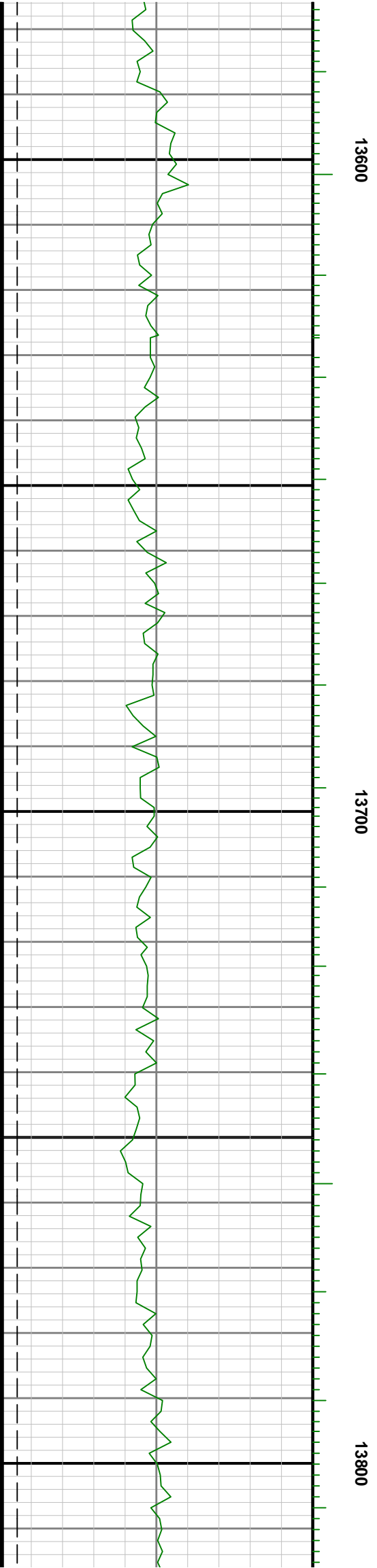
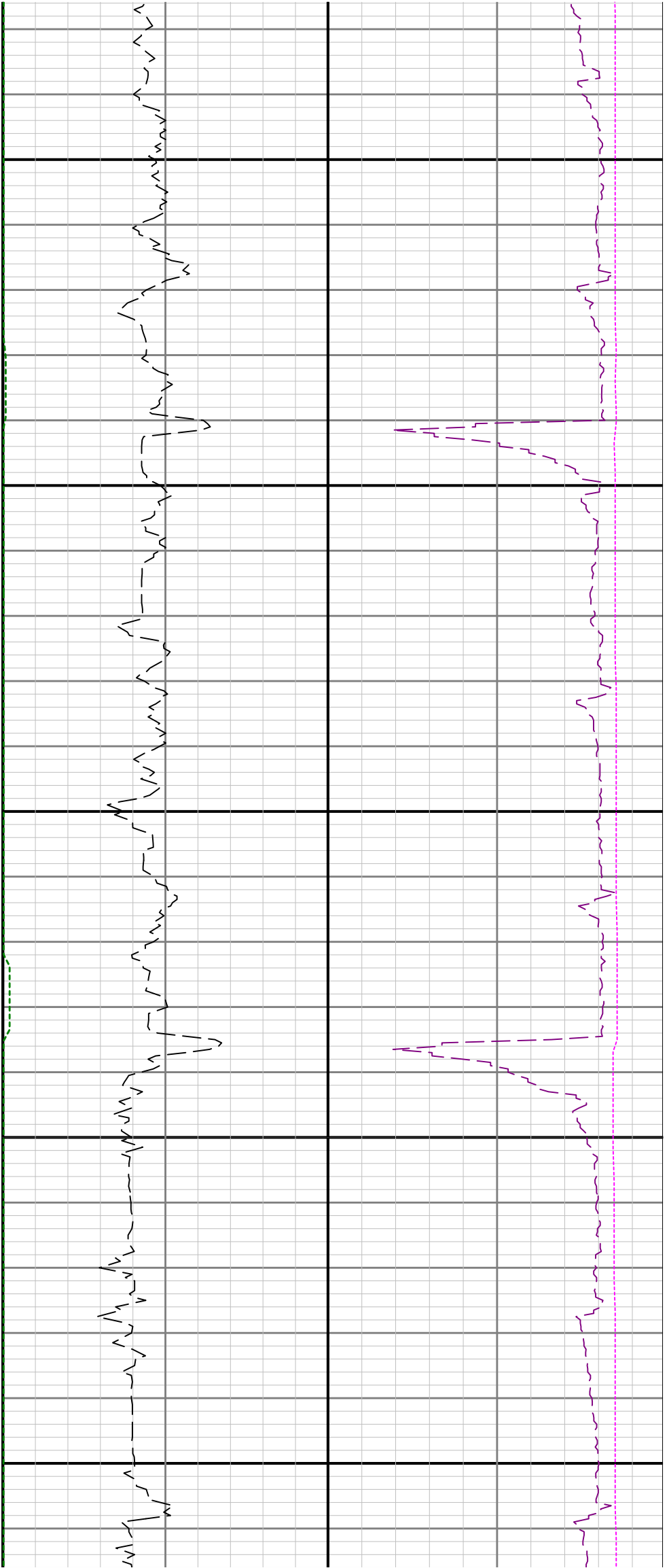


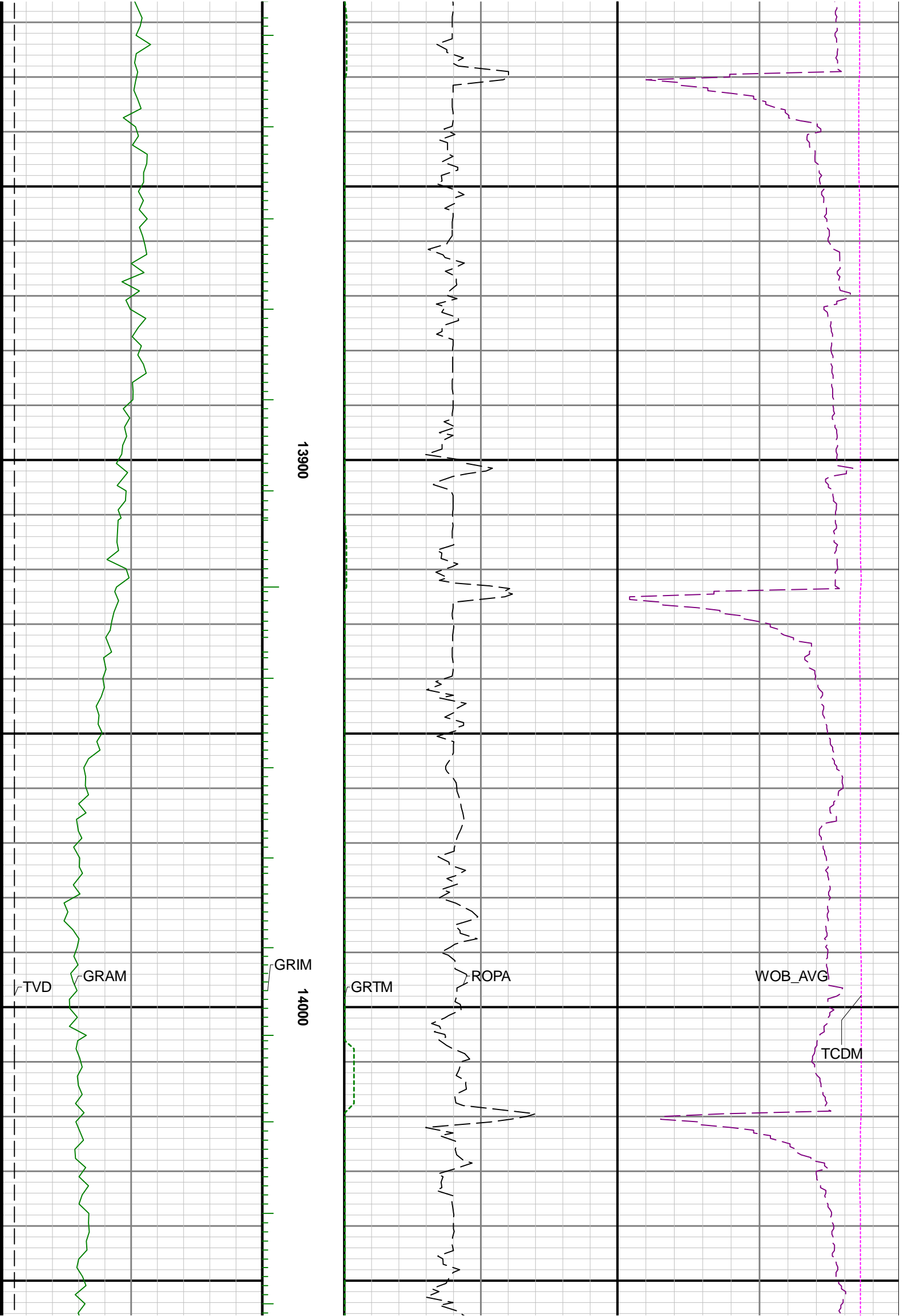


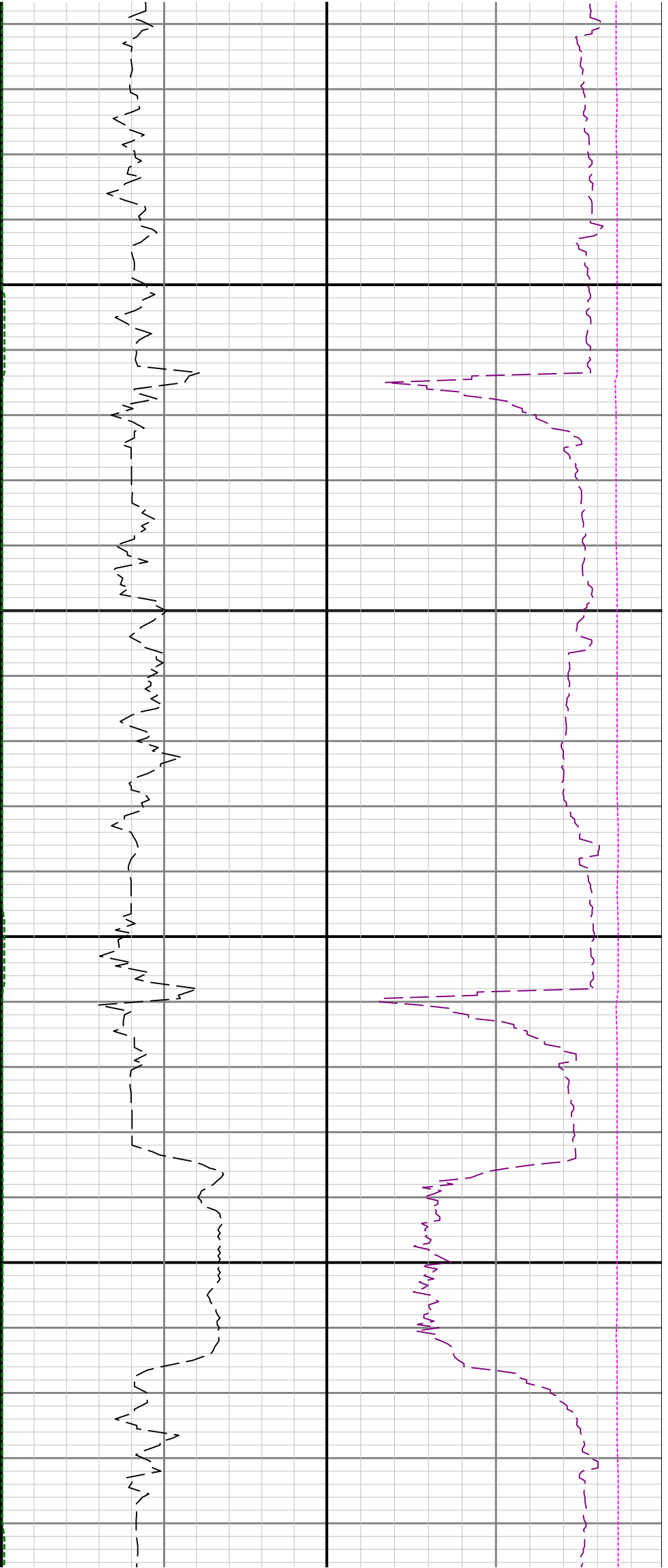
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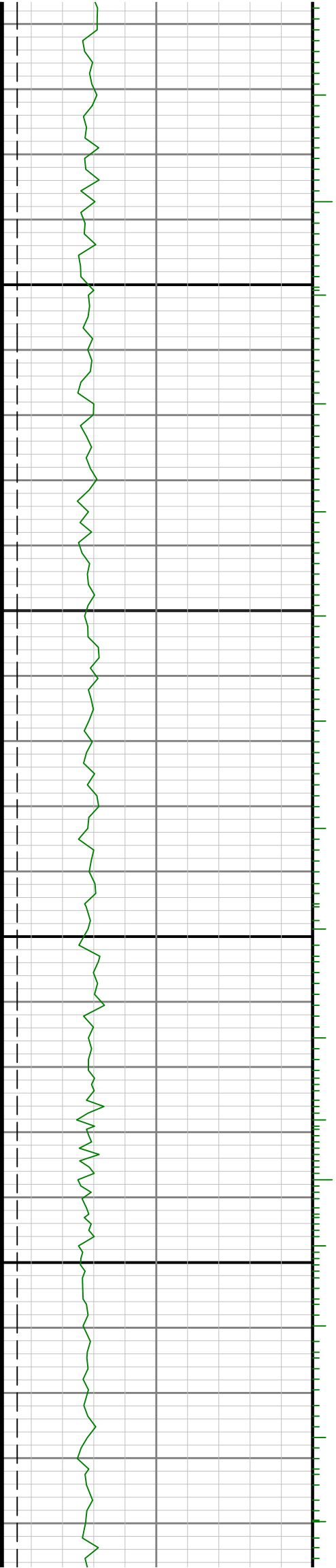


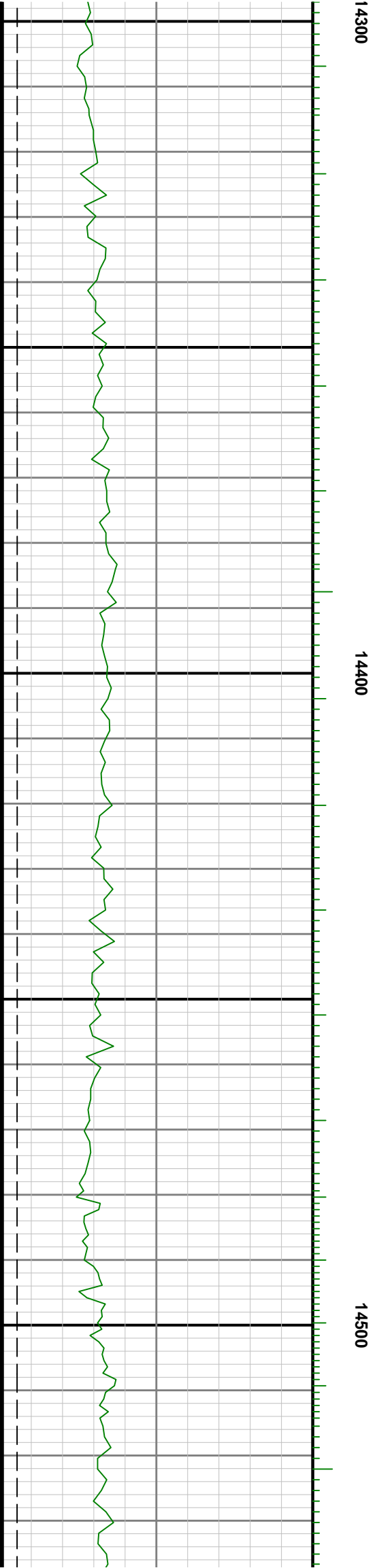




14100

14200







14600

14700

