


LWD MEMORY LOG									
<div> <div> <div>BAKER HUGHES</div> <div>a GE company</div> </div> <div>  </div> </div> <div>Gamma Ray</div>				<div> <div>Scale: 1:240</div> <div>Measured Depth</div> <div>Depth Reference:</div> <div>Driller's Depth</div> <div>Status: Final Print</div> <div>API No: 05-123-48572-00</div> <div>Job ID: 109660744</div> <div>Permanent Datum (P.D.): Mean Sea Level</div> <div>Log Measured From: Rig Floor</div> </div> <div> <div>Company: Noble Energy</div> <div>Well: Vogler State D21-780</div> <div>Field: Wattenberg</div> <div>County: Weld</div> <div>State: Colorado</div> <div>Country: United States</div> </div> <div> <div>Surface Location:</div> <div>Latitude: 040° 12' 22.464" N</div> <div>Longitude: 104° 33' 44.028" W</div> <div>Other Services:</div> </div>					
<div> <div>Dates</div> <div> <div>Date From: 2019-03-02</div> <div>Date To: 2019-03-05</div> <div>Spud Date: 2019-03-01</div> </div> </div> <div> <div>Interval Drilled</div> <div> <div>Top: (ft) 1946.00</div> <div>Bottom: (ft) 17660.00</div> </div> </div>				<div> <div>Magnetic Field Reference</div> <div> <div>Azi Reference North: Grid</div> <div>Total Magnetic Field Strength: (nT) 52061</div> <div>Mag to Reference North Correction: (deg) 7.48</div> </div> </div>					
<div> <div>Borehole Record</div> <div> <div>Hole Size (in)</div> <div>From (ft)</div> <div>To (ft)</div> </div> </div> <div> <div>13.500</div> <div>30.00</div> <div>1946.00</div> </div> <div> <div>8.500</div> <div>1946.00</div> <div>17660.00</div> </div>				<div> <div>Casing Record</div> <div> <div>Size (in)</div> <div>Weight (lb/ft)</div> <div>From (ft)</div> <div>To (ft)</div> </div> </div> <div> <div>9.625</div> <div>36.00</div> <div>30.00</div> </div> <div> <div></div> <div></div> <div></div> </div>					
<div> <div>Mud Record</div> <div> <div>Type</div> <div>From (ft)</div> <div>To (ft)</div> </div> </div> <div> <div>Oil Based Mud</div> <div>1946.00</div> <div>17660.00</div> </div>				<div> <div>Deviation Record</div> <div> <div>Hole Size (in)</div> <div>Interval (ft)</div> <div>Inc Az (Start)</div> <div>Inc Az (End)</div> </div> </div> <div> <div>8.500</div> <div>15714.00</div> <div>0.25 210.28</div> <div>90.00 3.97</div> </div>					
<div> <div>Acquisition System</div> <div>Baker Hughes Cadence</div> <div>Plot Studio</div> </div> <div> <div>Software Version</div> <div>RT 5.0</div> <div>5.0.8260.3</div> </div>				<div> <div>Other</div> <div>Rig: H&P 517</div> <div>Contractor: Helmerich & Payne Drilling Co</div> <div>District: RMA</div> <div>Unit: D&E</div> </div>					

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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 (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	3.00	Rotary Steerable	1946.00	17647.00	1946.00	17660.00	2019-03-02 09:25	2019-03-05 03:00	61.20

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2019-02-28	2019-03-04	Adam Schlenz	2019-03-04	2019-03-05			

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2019-03-02 04:00	1	1946.00	Oil Based Mud	9.2	14	N/A	25.6	73/17	Active Pit	19589	0.00
2019-03-03 04:00	1	6667.00	Oil Based Mud	9.6	9	N/A	20.4	74/14	Active Pit	20078	0.00
2019-03-04 04:00	1	11475.00	Oil Based Mud	9.6	11	N/A	20.6	73/14	Active Pit	20568	0.00
2019-03-04 13:00	1	14032.00	Oil Based Mud	9.5	11	N/A	20.4	73/14	Active Pit	19589	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	14367828	Near Bit VSS	5.93	6.73	7.000	4.330
1	AutoTrak Curve Steering Unit	14367828	Near Bit Inclination	5.93	6.73	7.000	4.330
1	AutoTrak Curve MWD	12577852	Gamma (single)	2.75	12.90	7.000	3.250
1	AutoTrak Curve MWD	12577852	Directional (mag)	12.27	22.42	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
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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 the lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
- 2

Baker Hughes LWD run 1 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 1946 to 17660 feet MD (1946 to 6904 feet TVD).
- 3


The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.

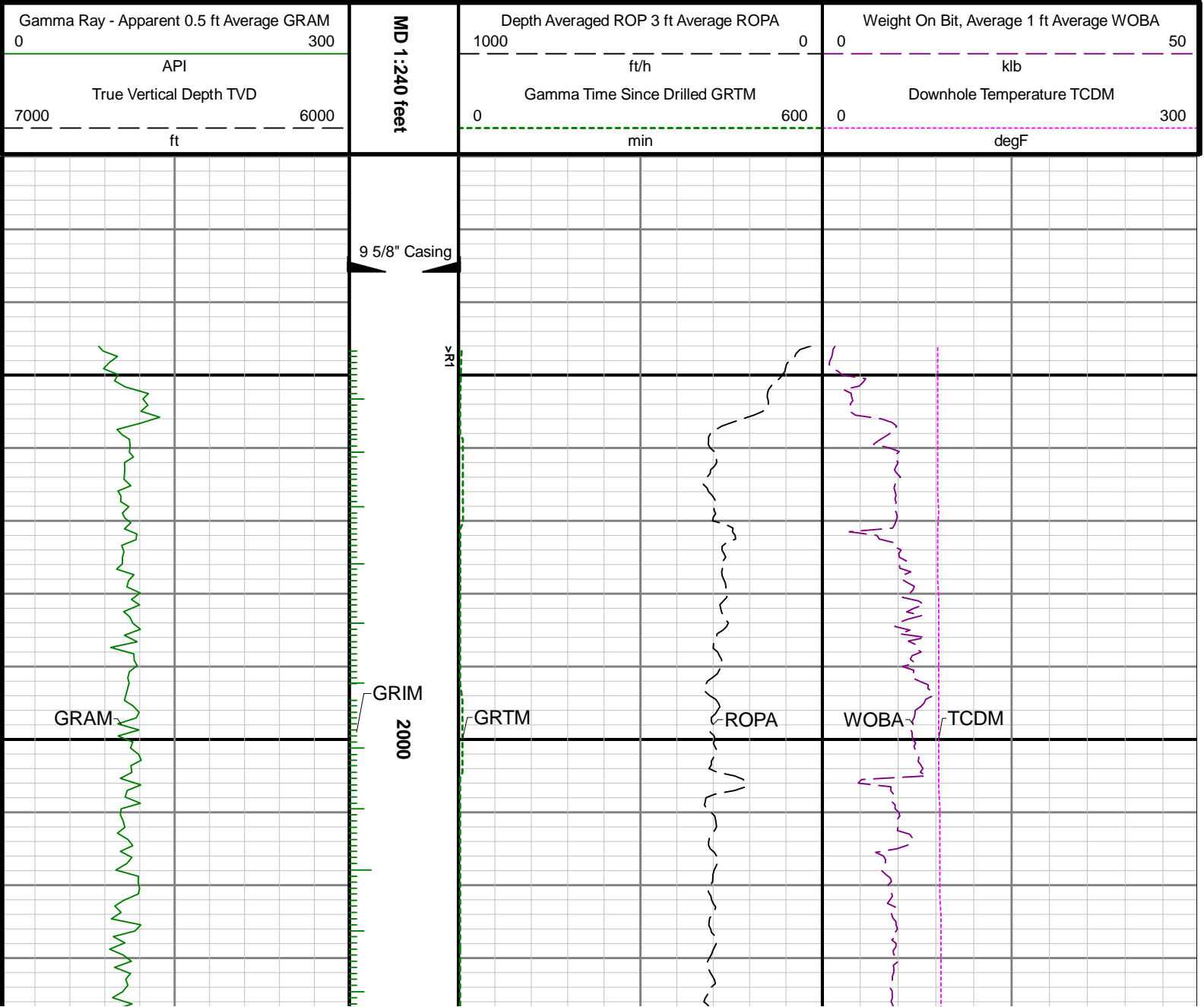
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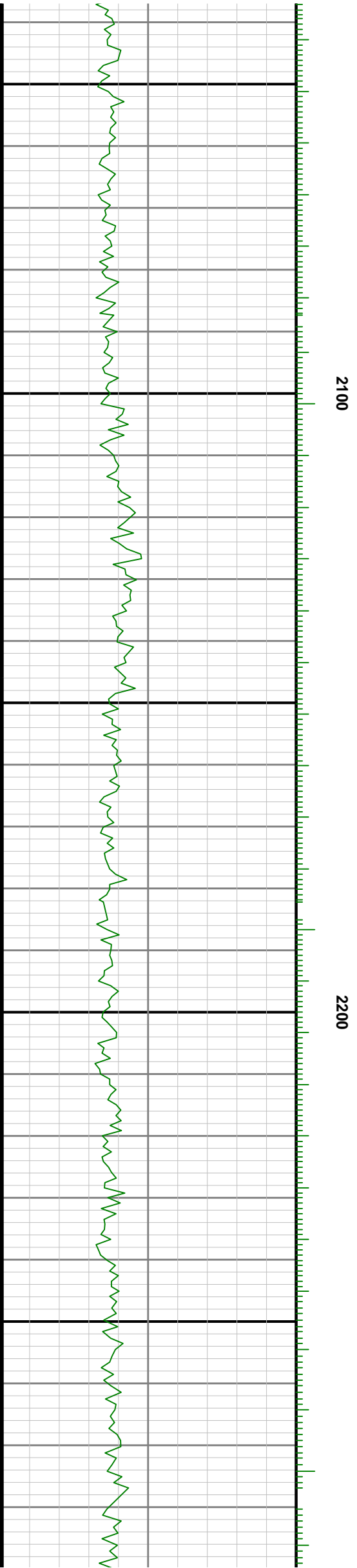
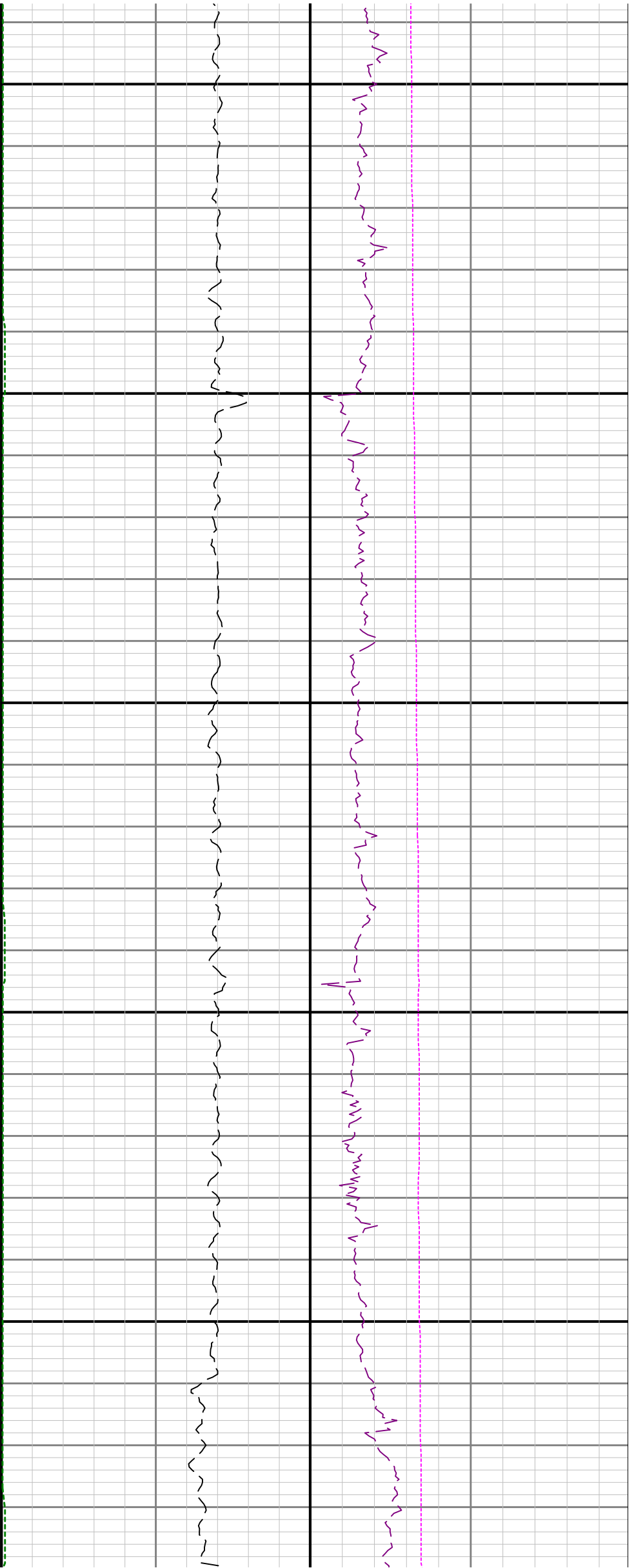
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	5367.00	8.500	1	The interval from 5306 to 5354 feet MD (5130 to 51785 feet TVD) does not have gamma ray data, due to bypassing to much flow while downlinking and terminating power to the rotary steerable assembly.
2	17660.00	8.500	1	The interval from 17647 to 17660 feet MD (6904 feet TVD) was not logged after being drilled due to sensor to bit offset at well TD.

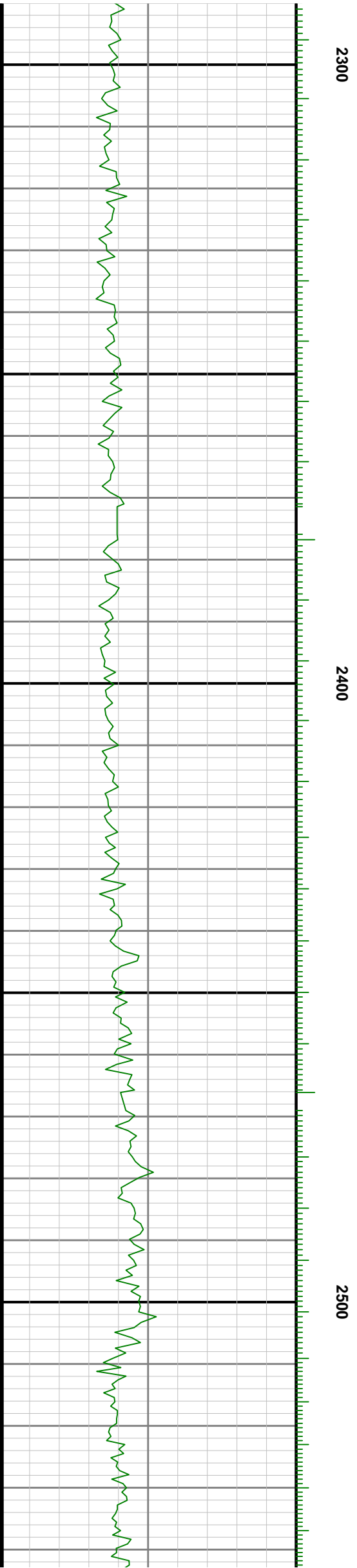
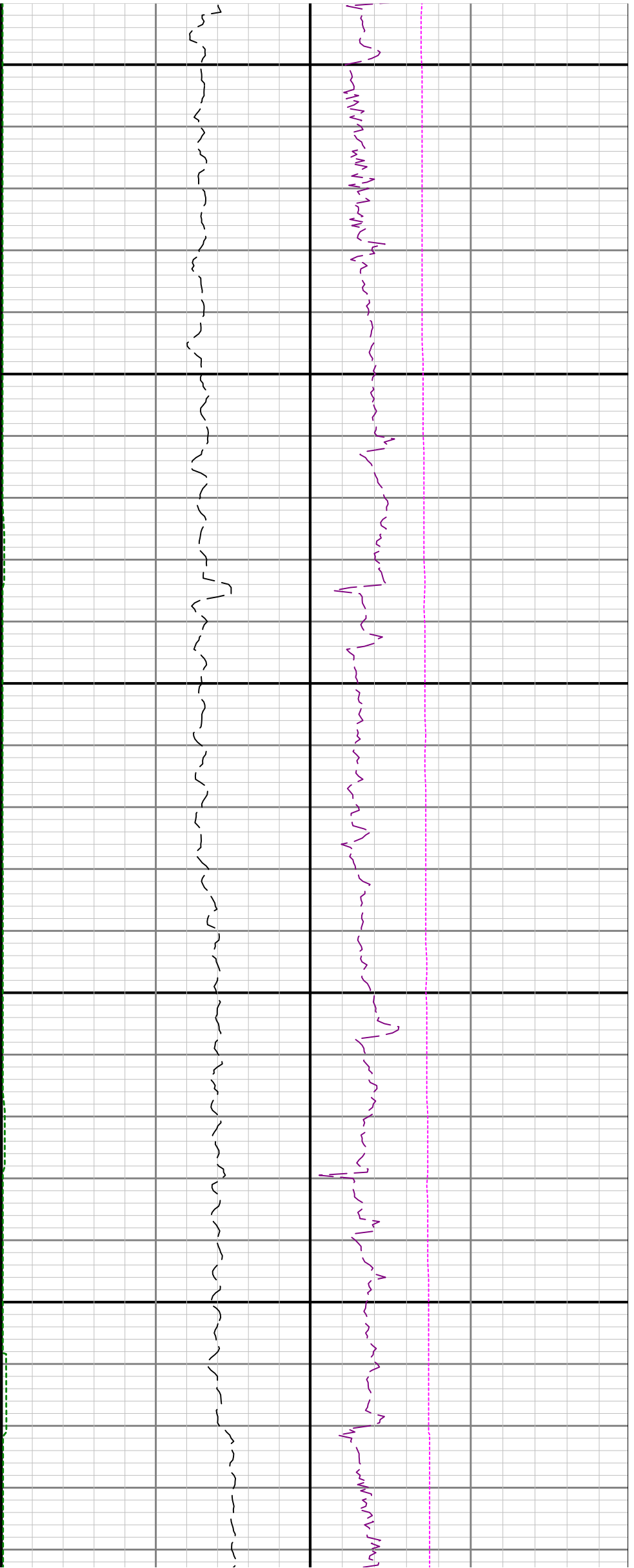
Curve Mnemonics

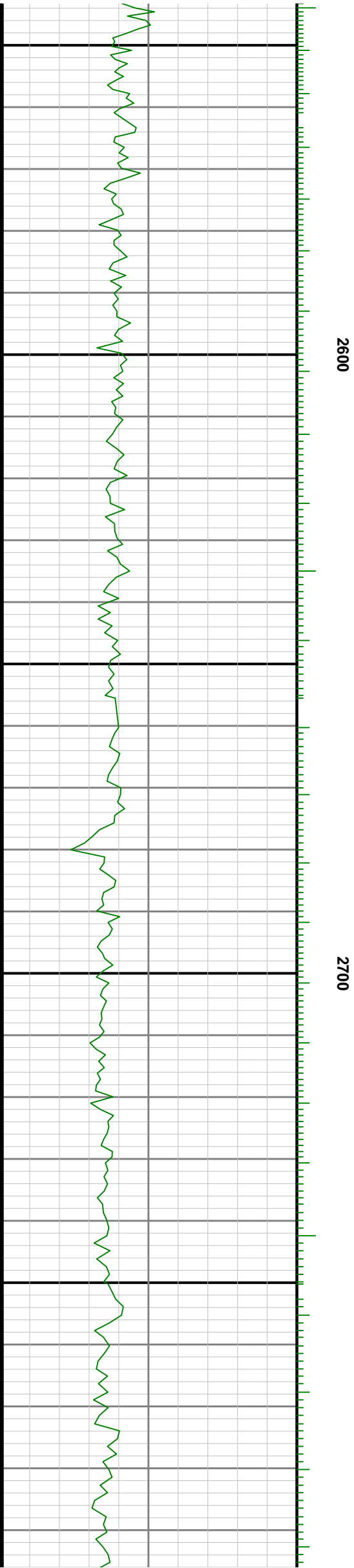
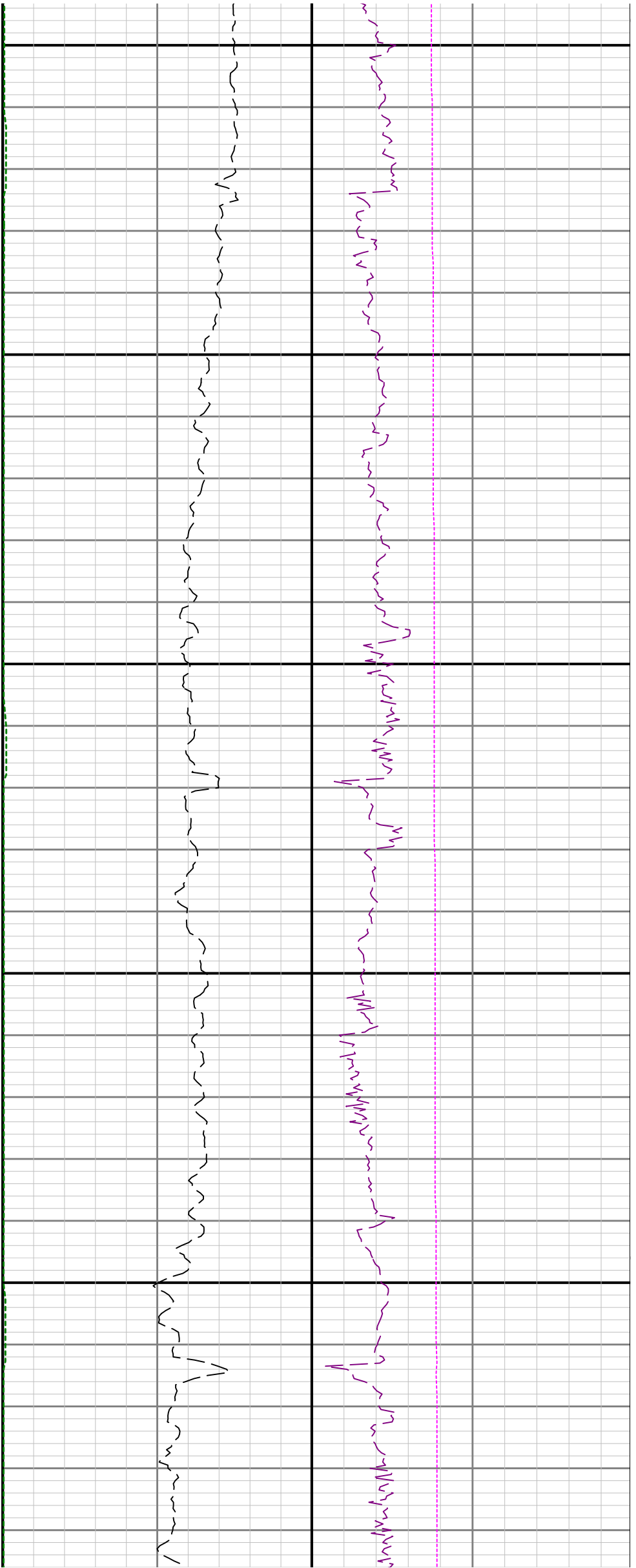
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	Gamma Ray - Time Since Drilled - Memory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

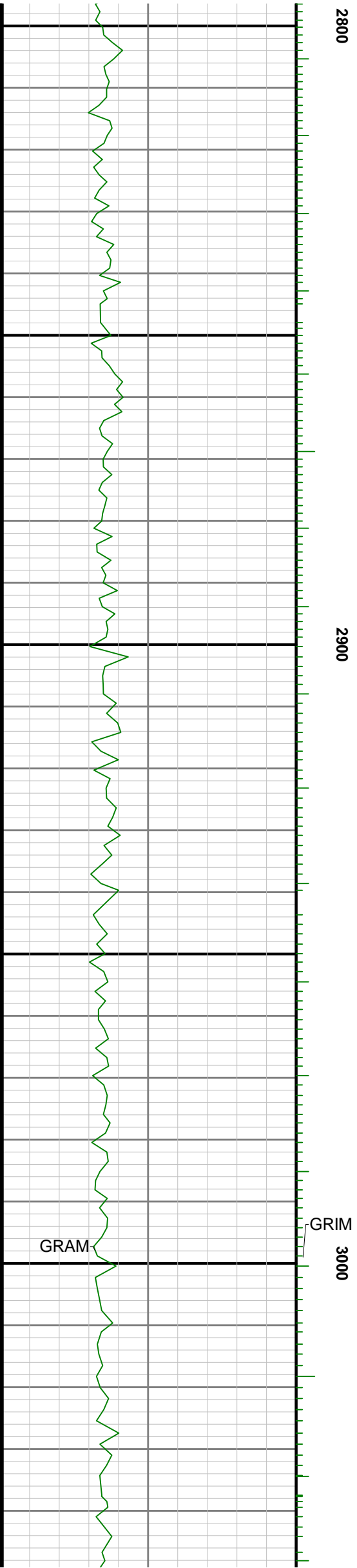
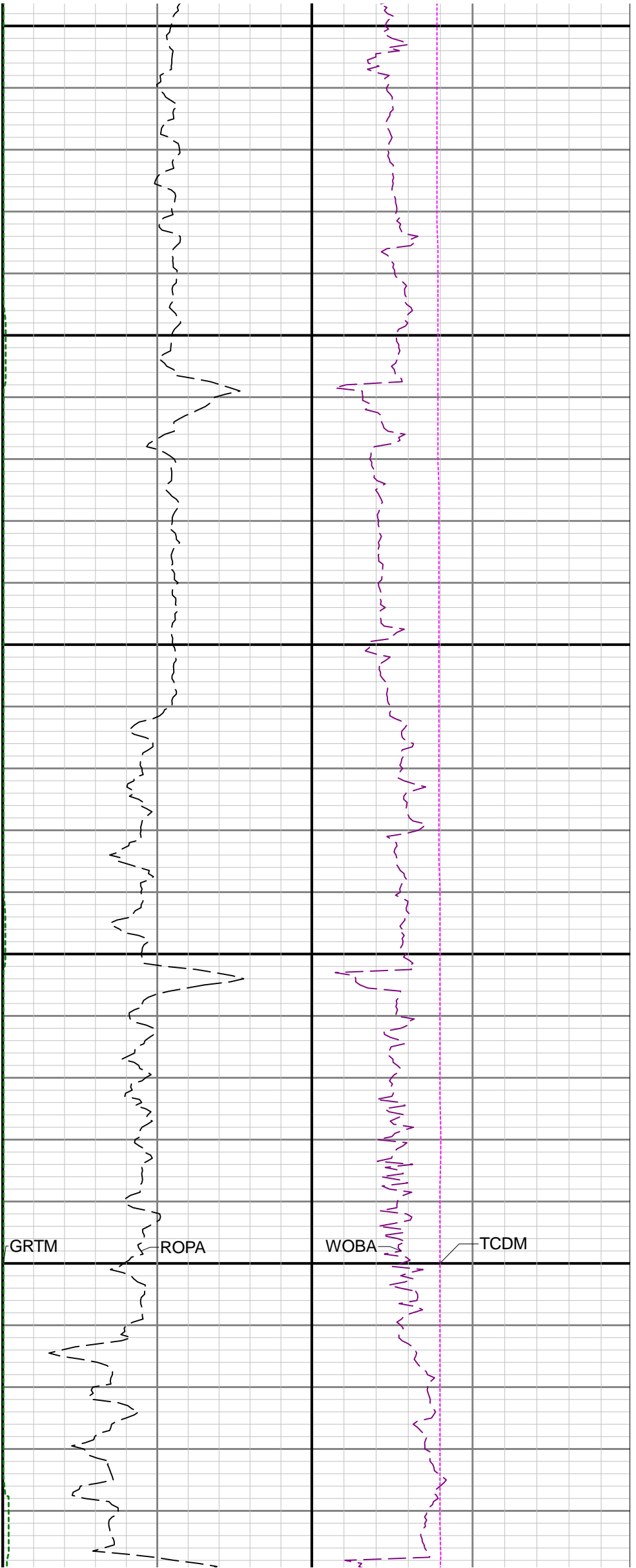
<div> <div>BAKER HUGHES</div> <div>a GE company</div> </div> <div>  </div>	Company	Noble Energy			
	Well	Vogler State D21-780			
	Interval	Date From:	2019-03-02 07:05	Top:	1946.00 ft
		Date To:	2019-03-05 08:13	Bottom:	17660.00 ft
	Created	2019-03-05 20:36:10			

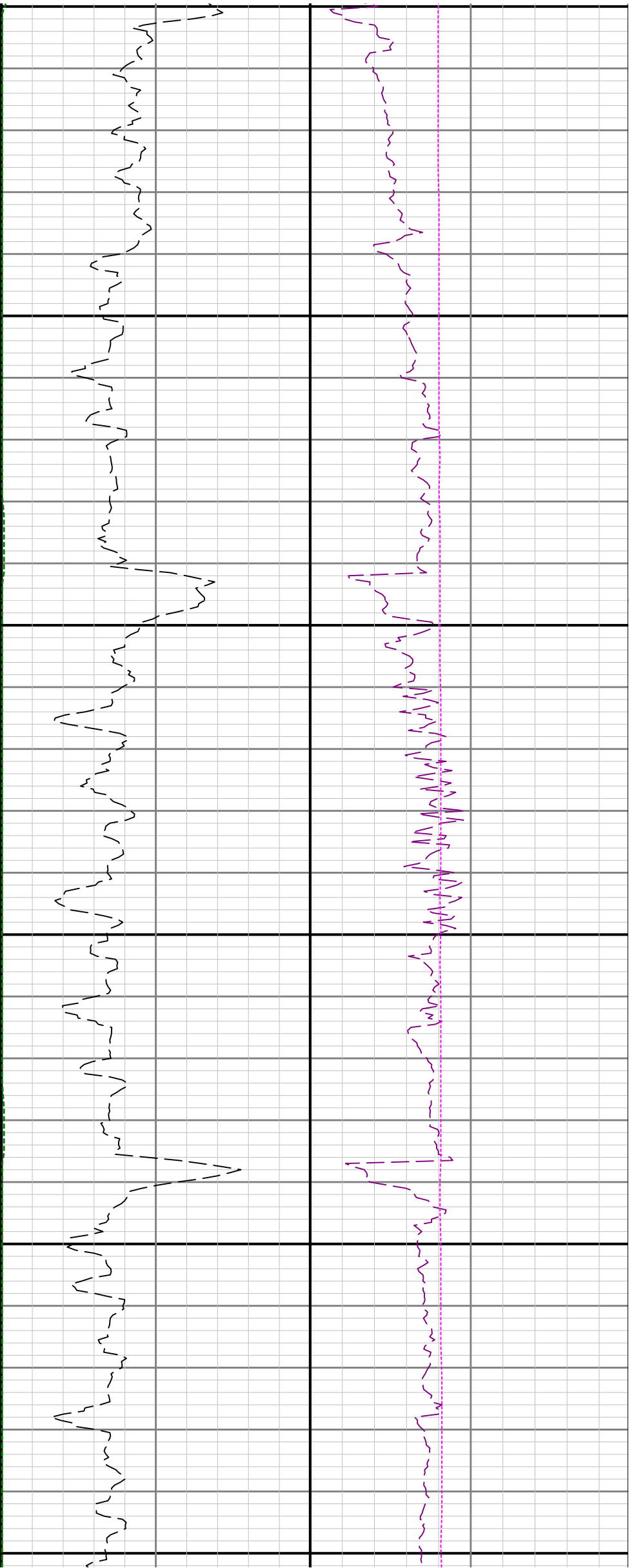








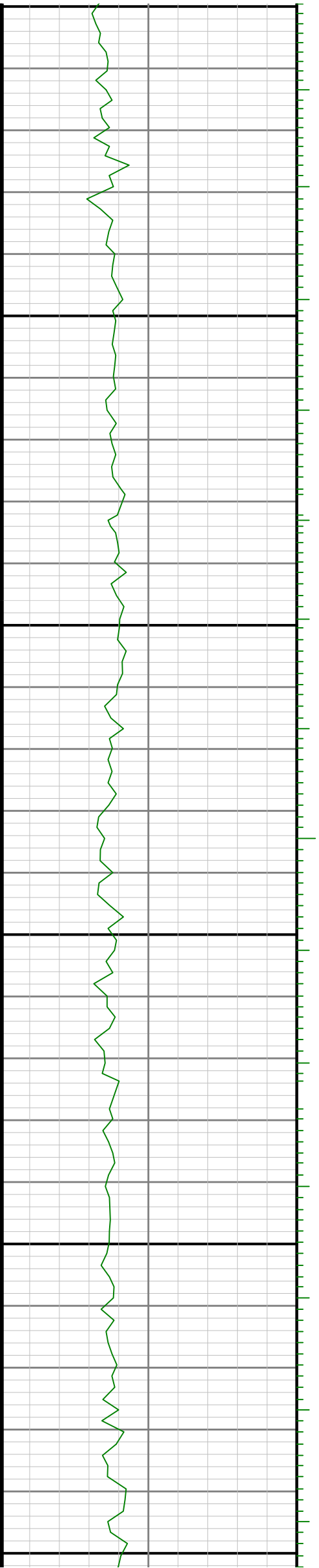


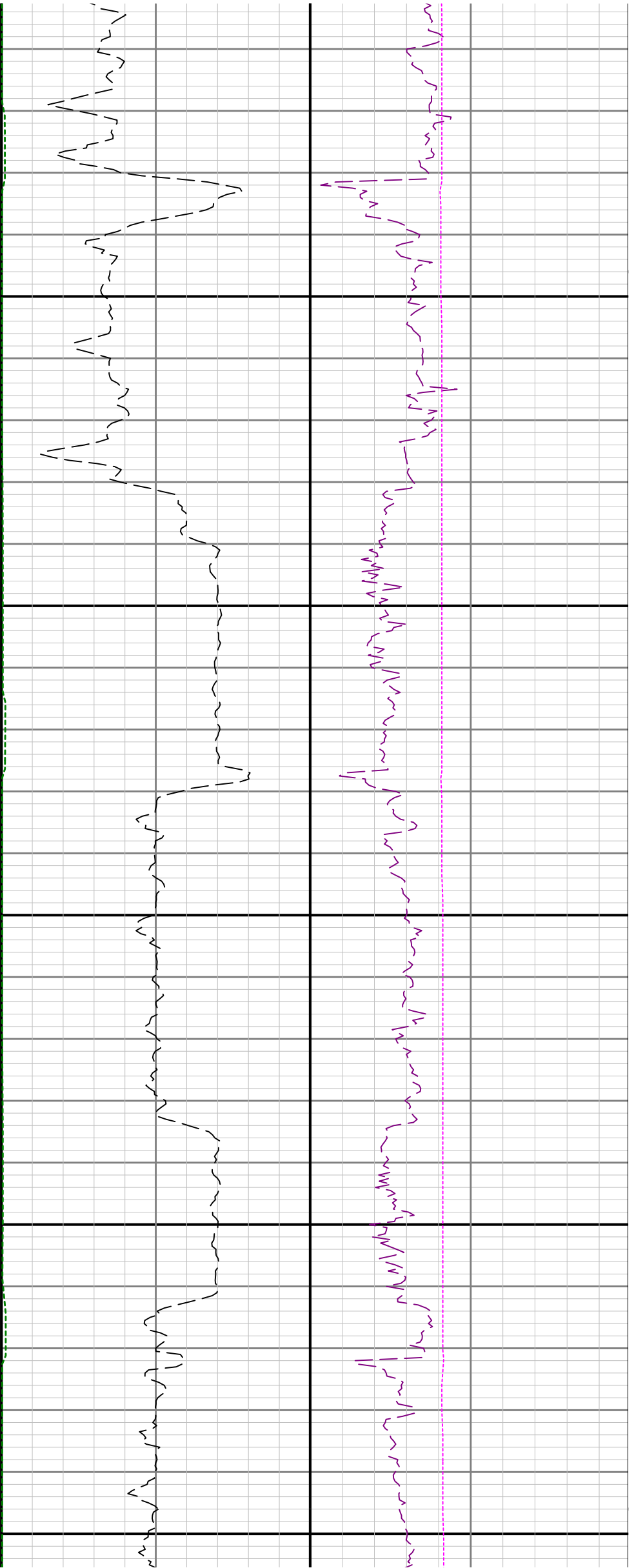


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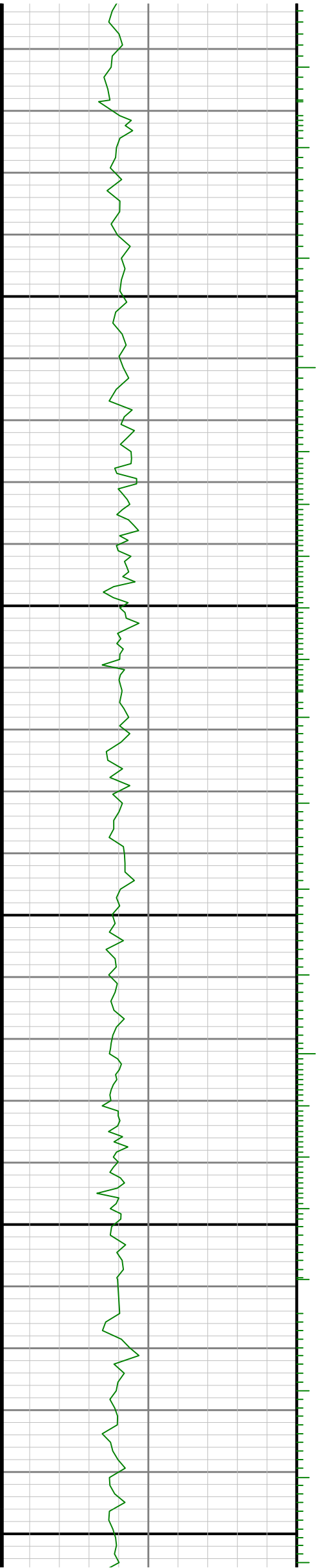
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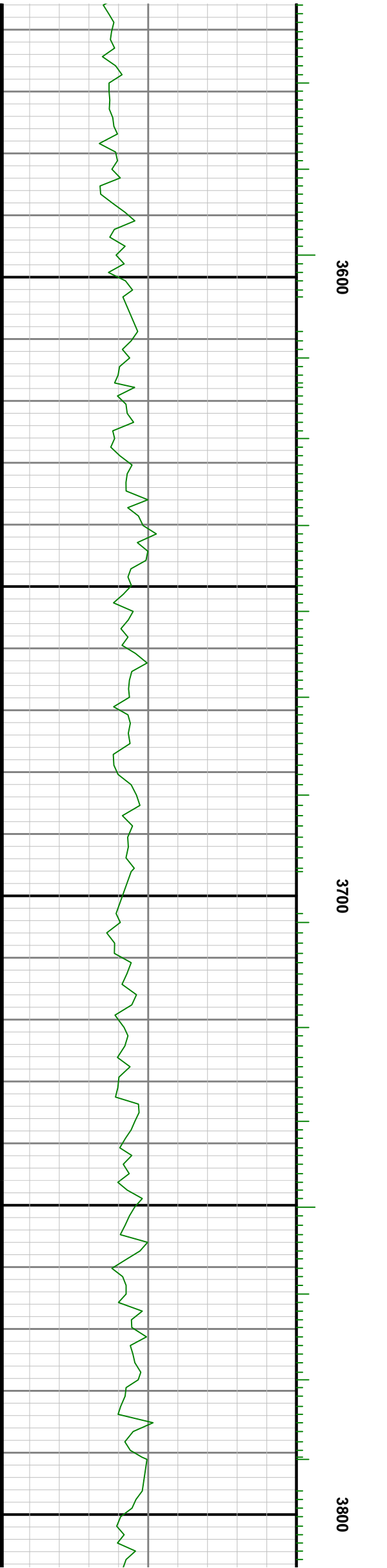
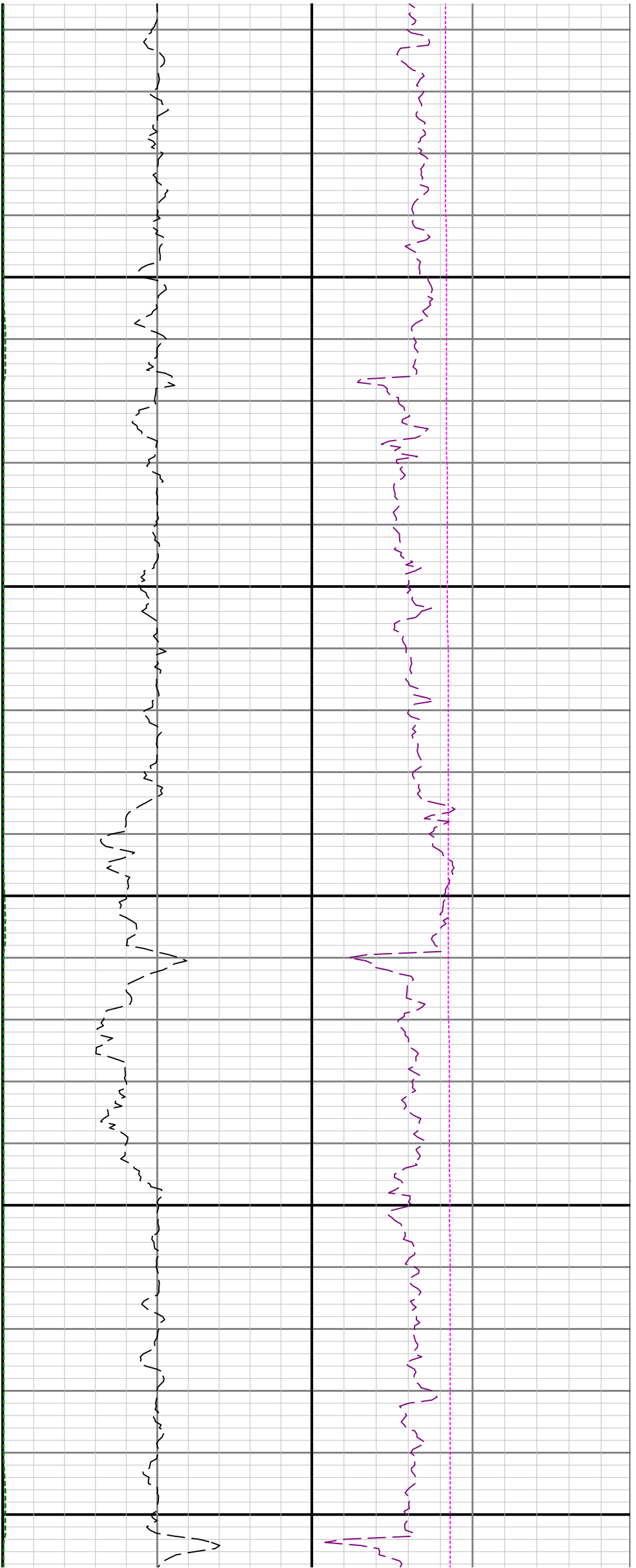


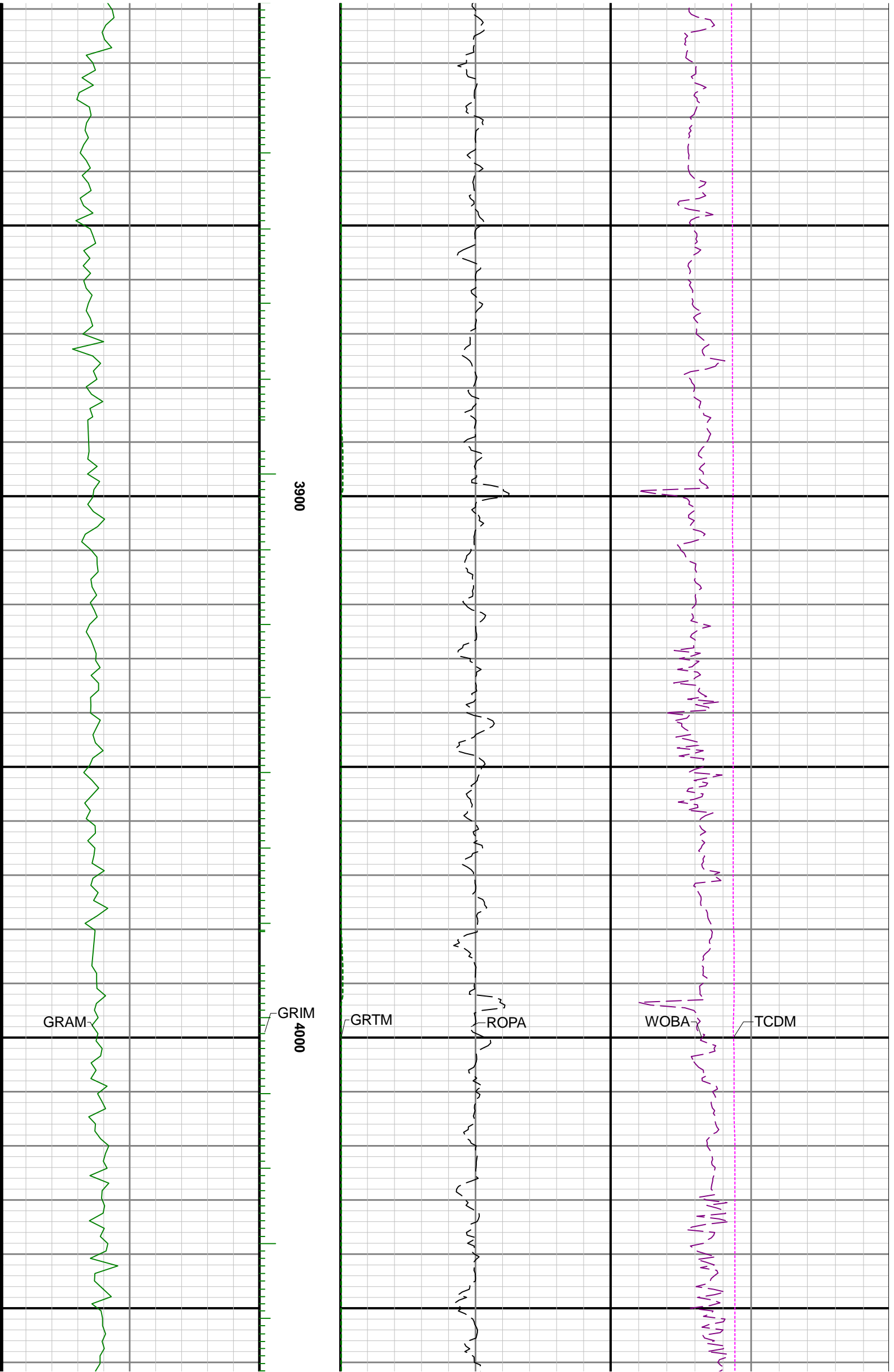


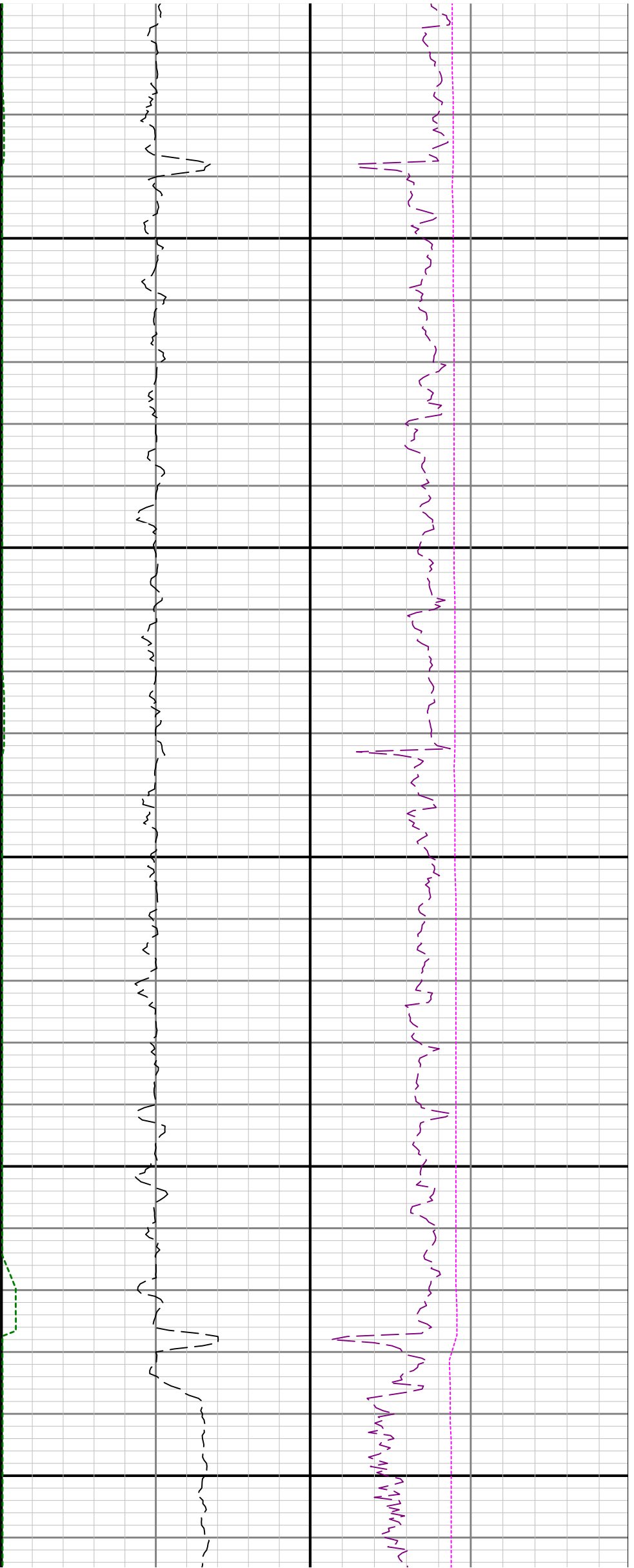
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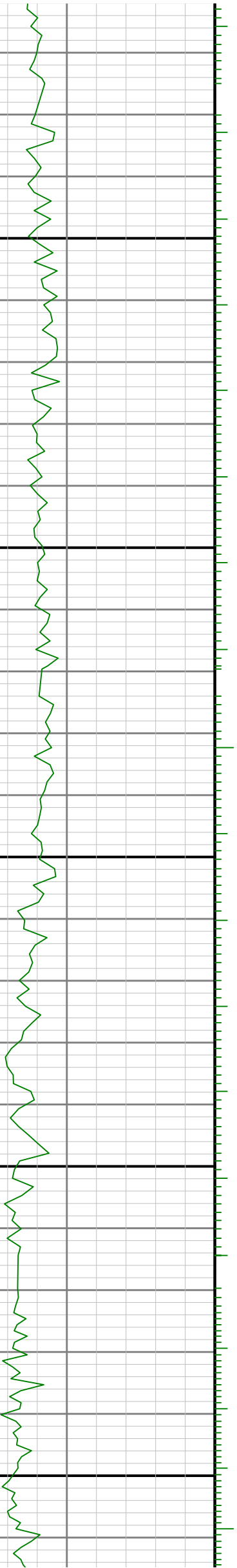


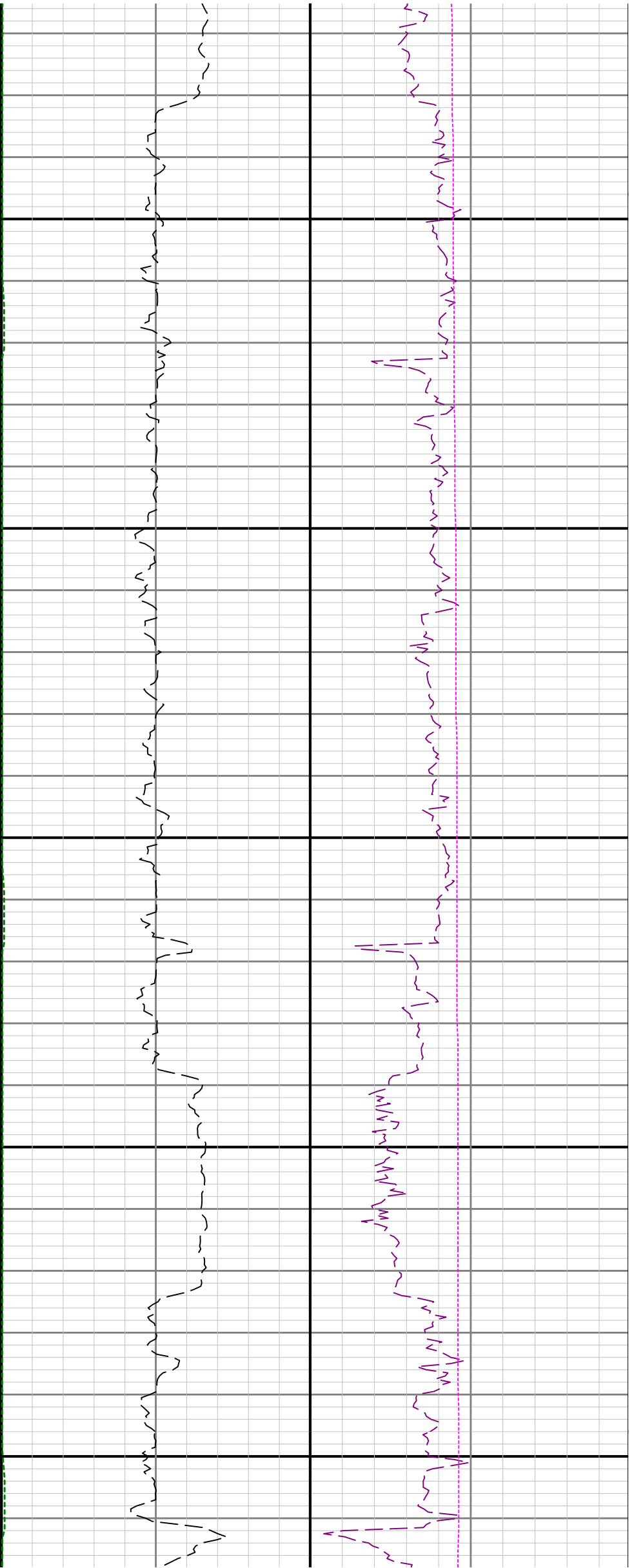


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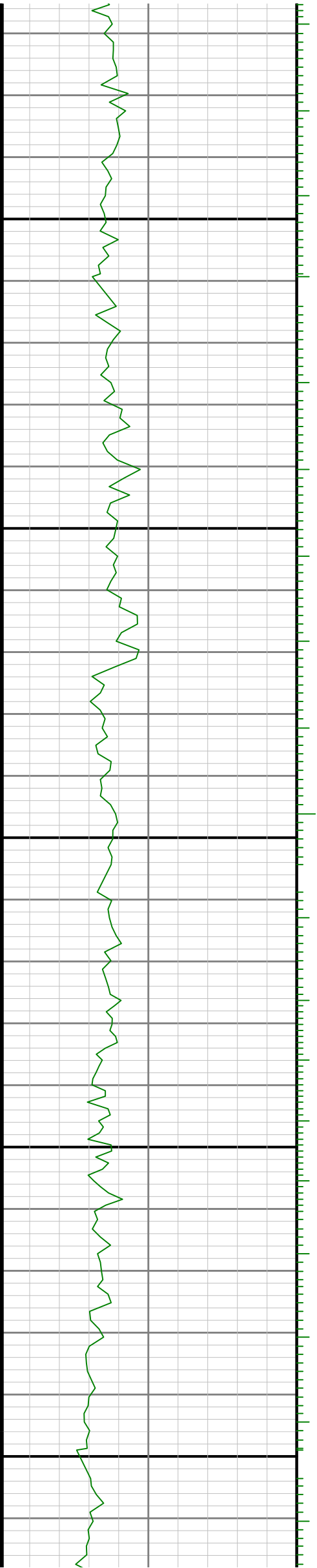
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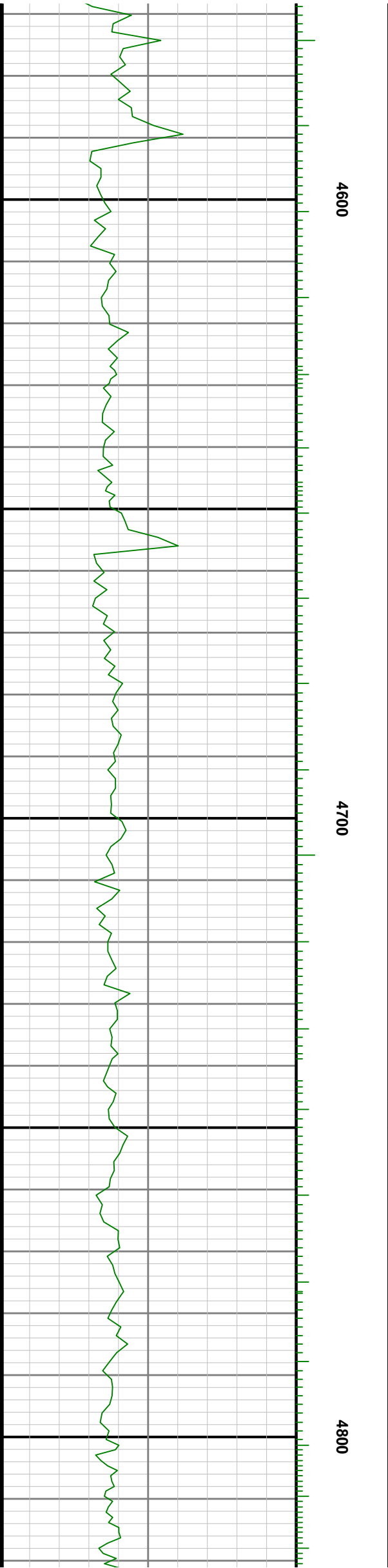


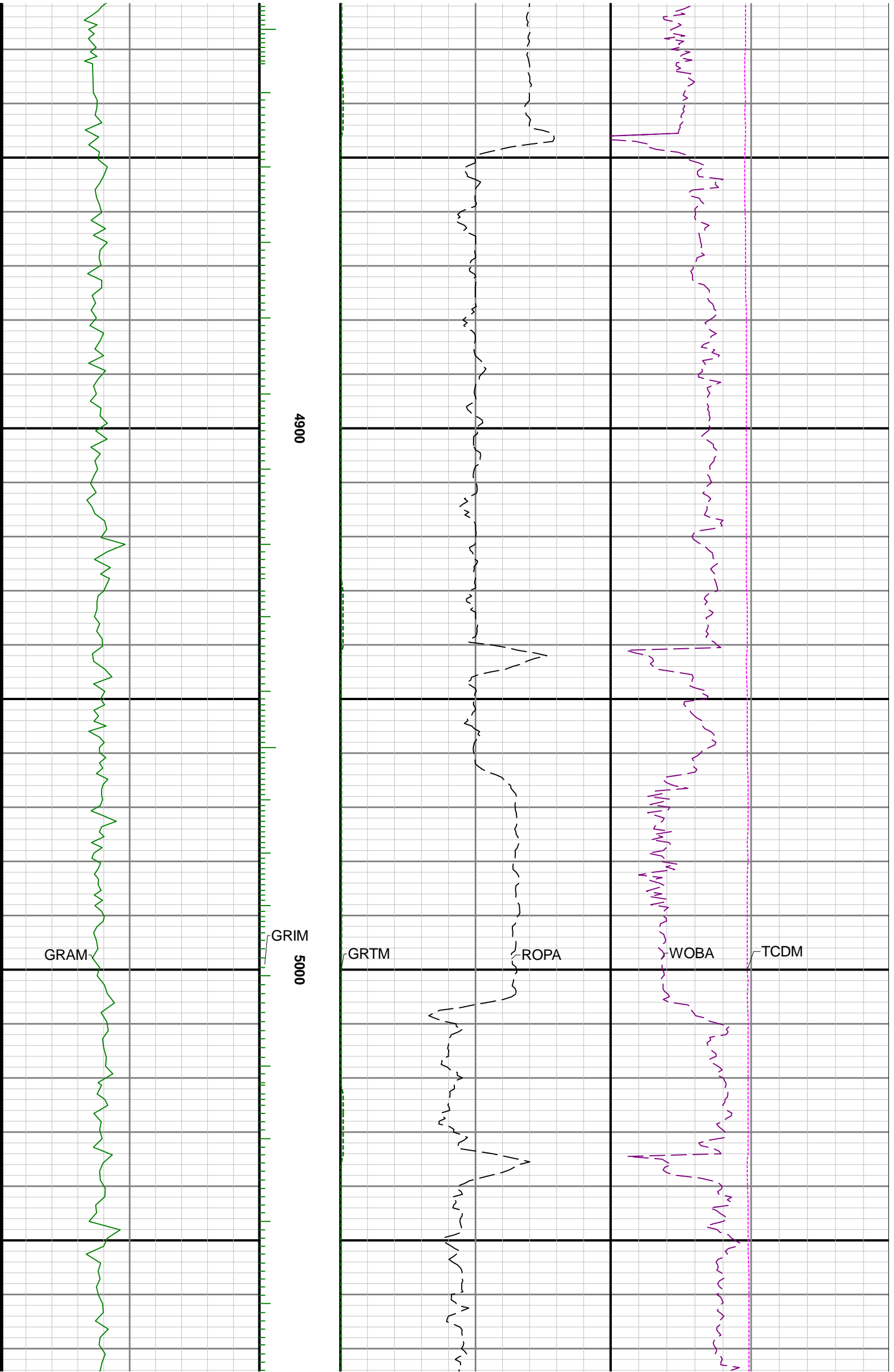


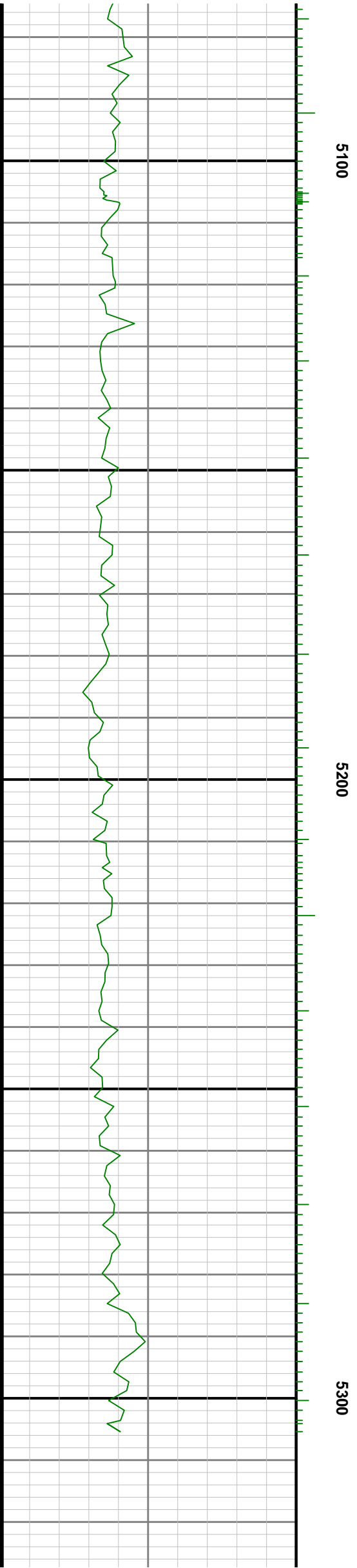
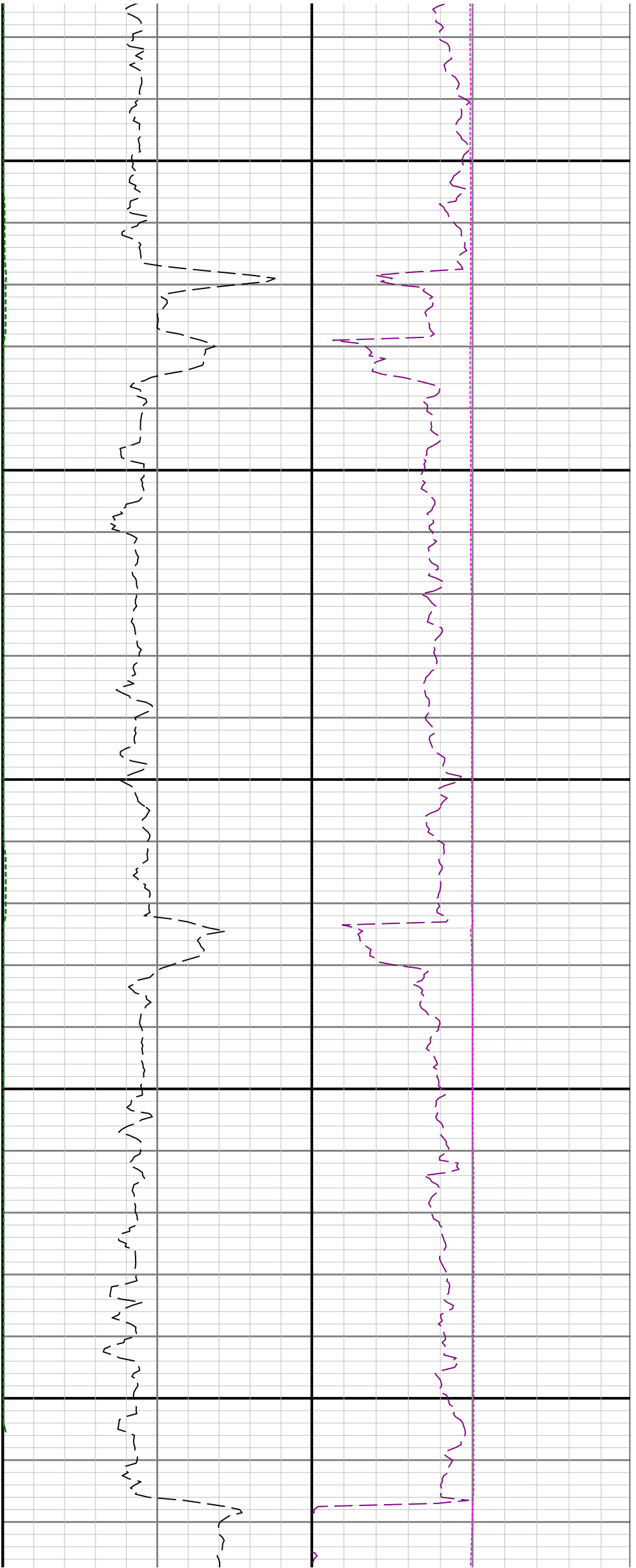
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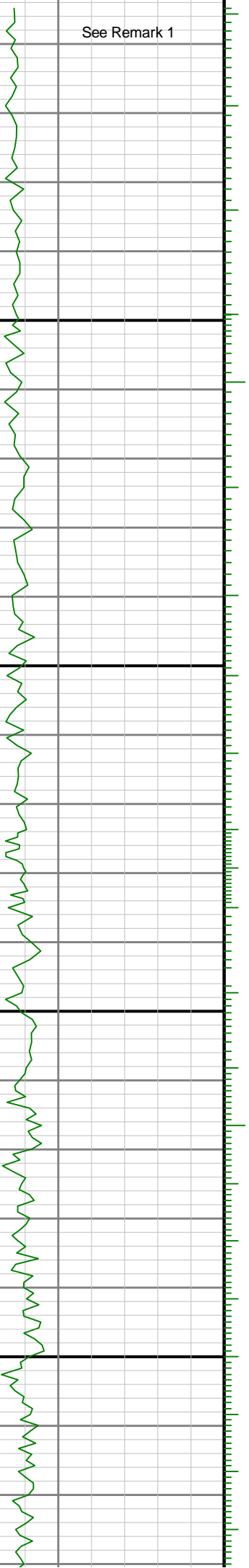


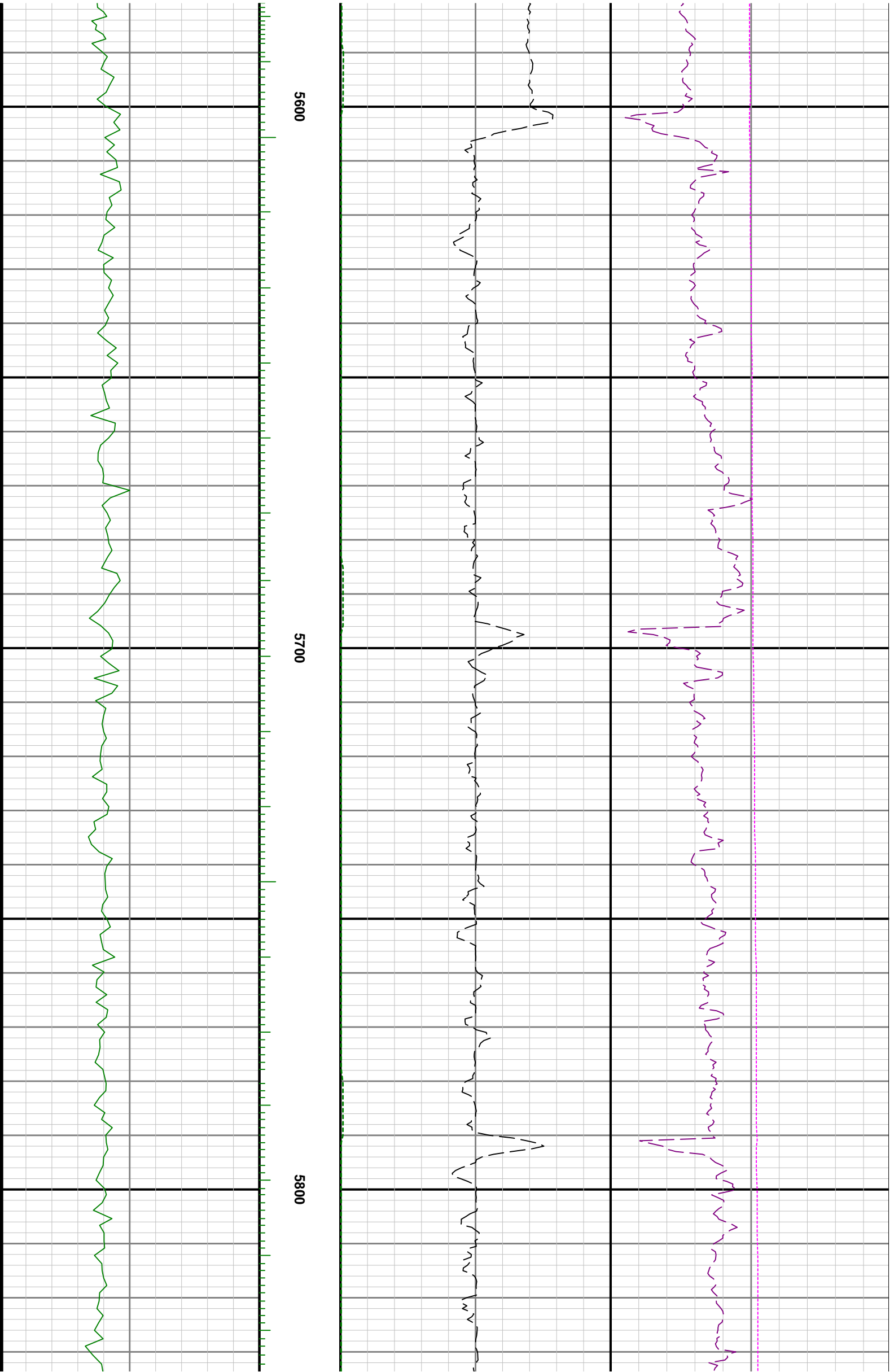


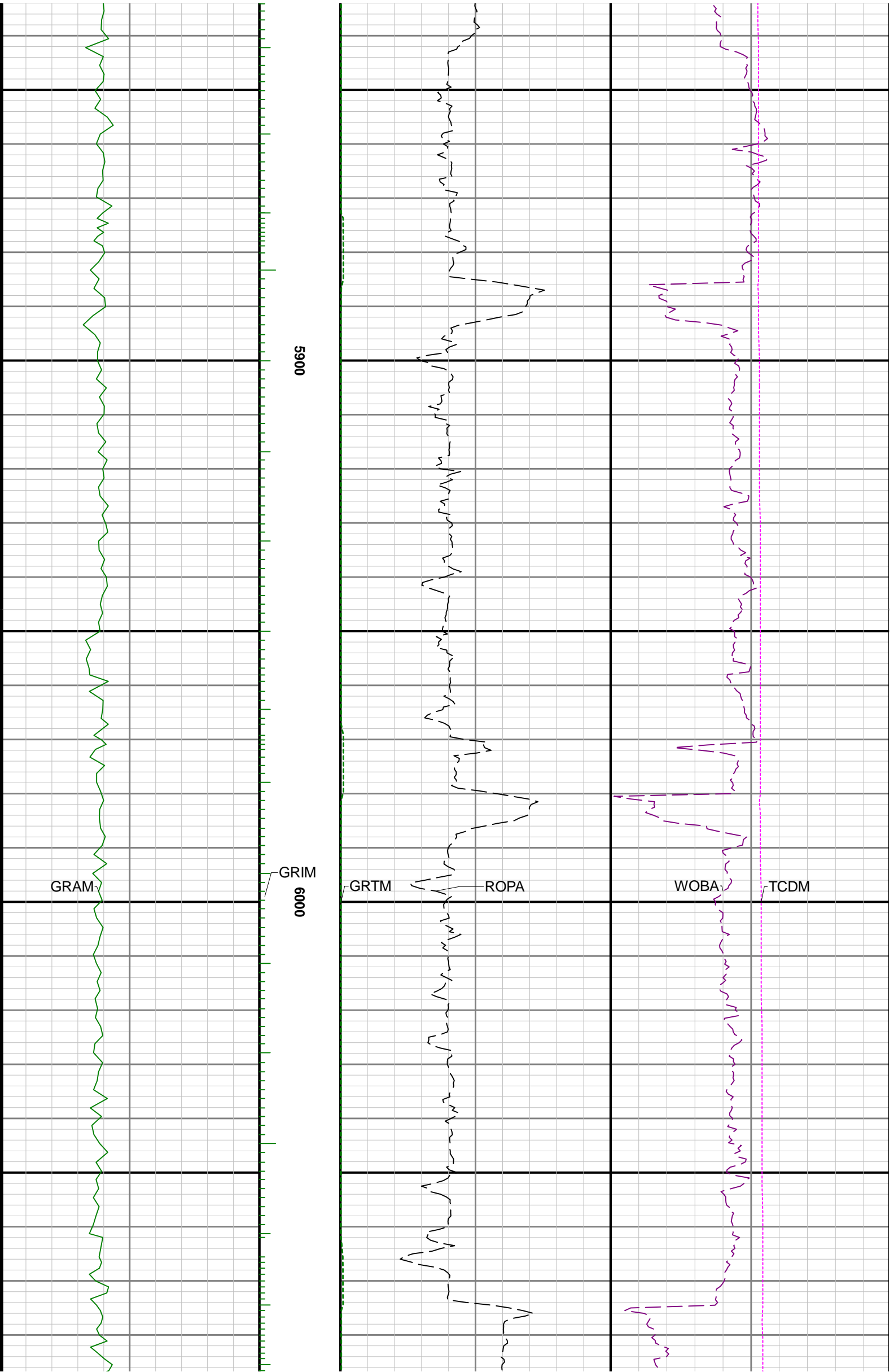
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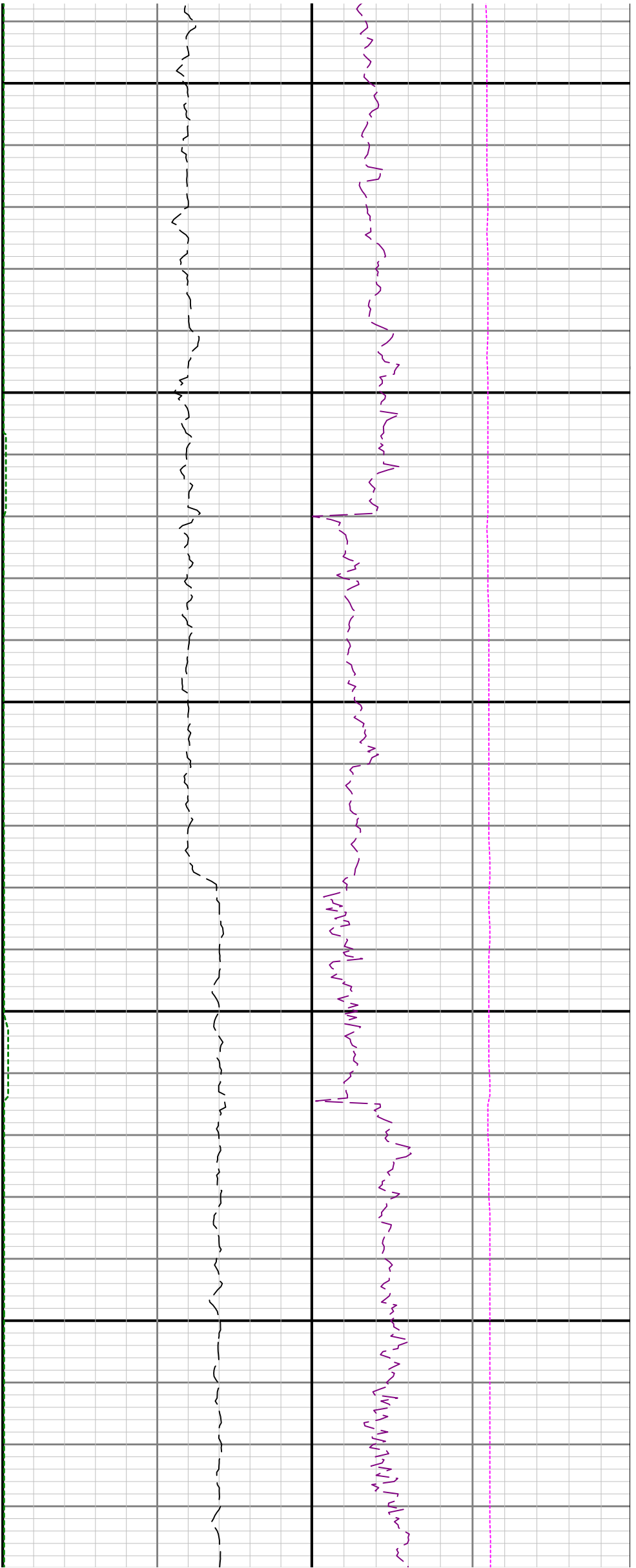
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See Remark 1





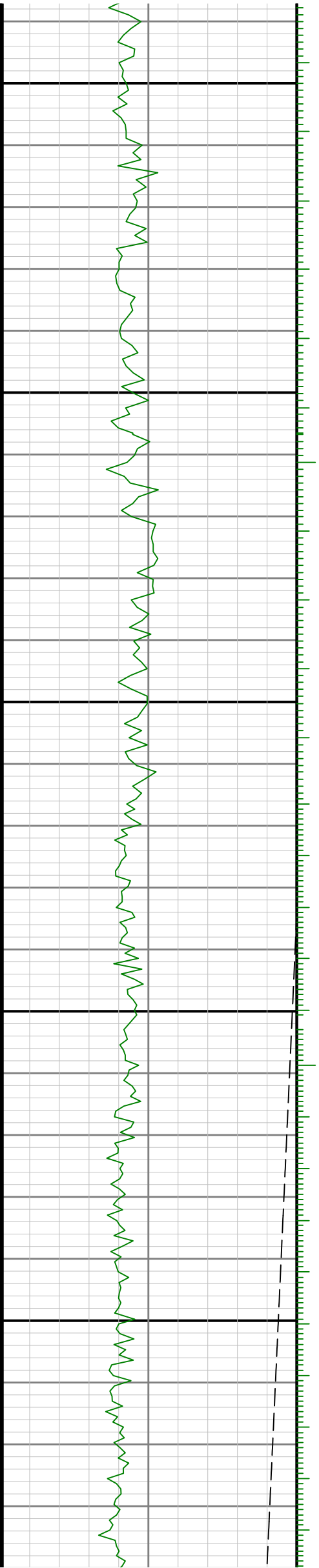


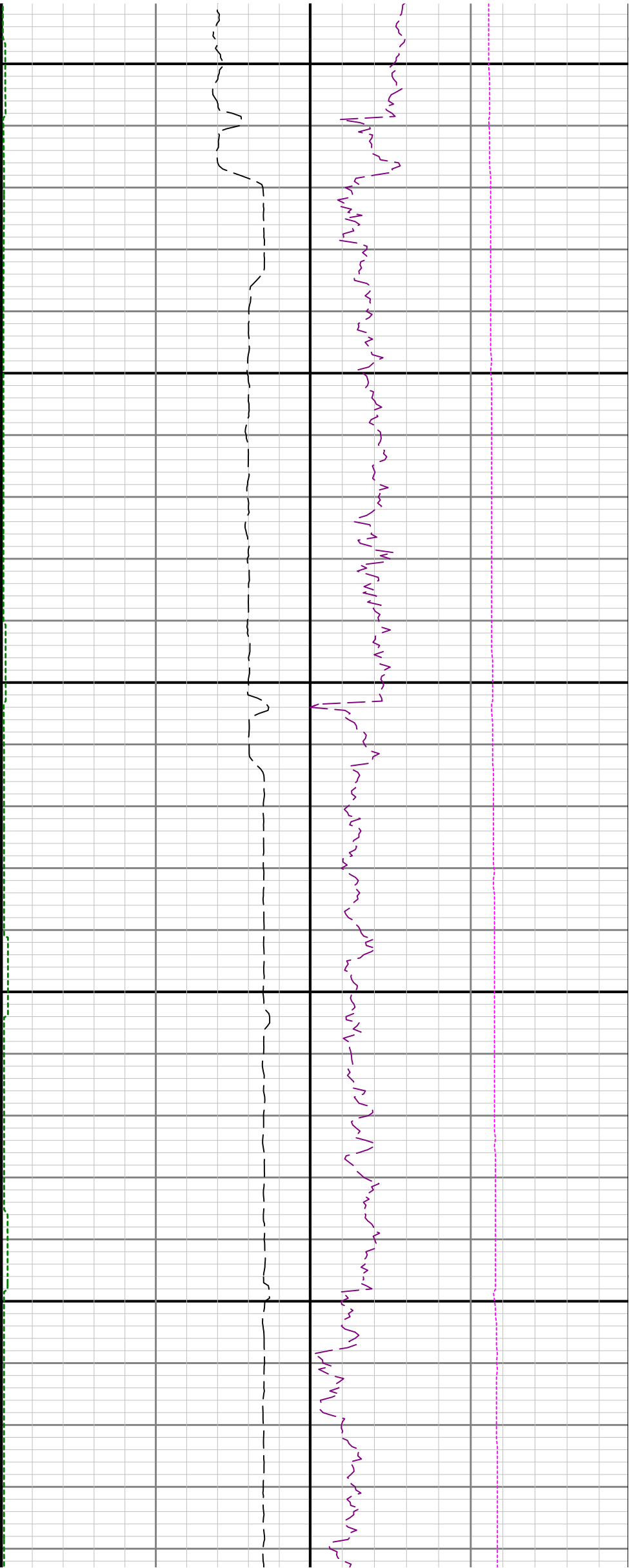


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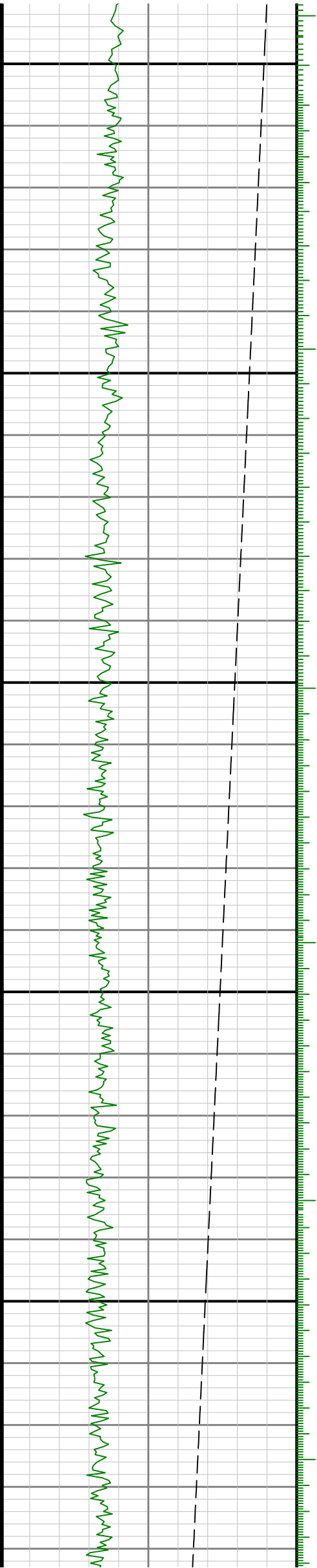
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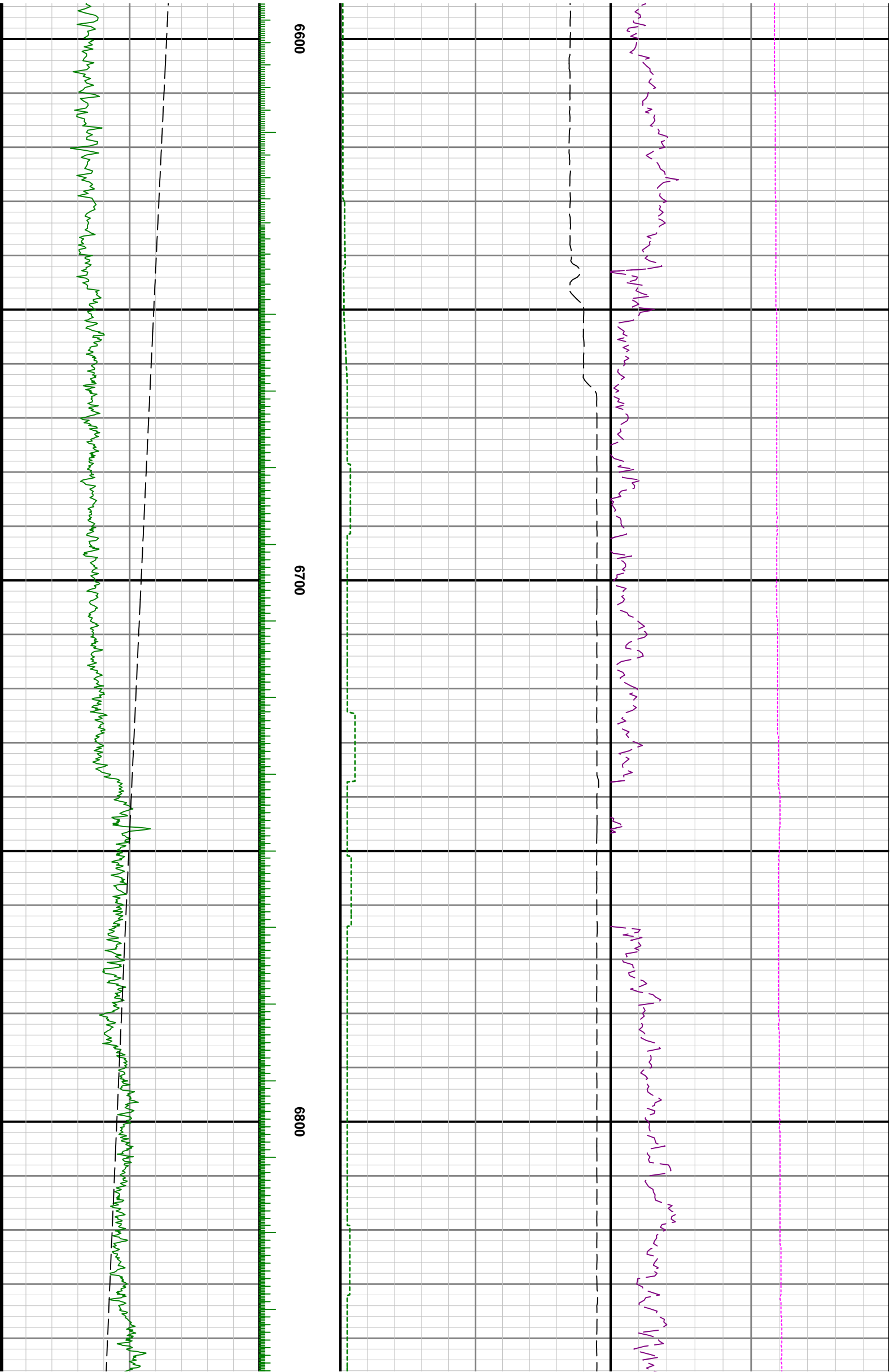


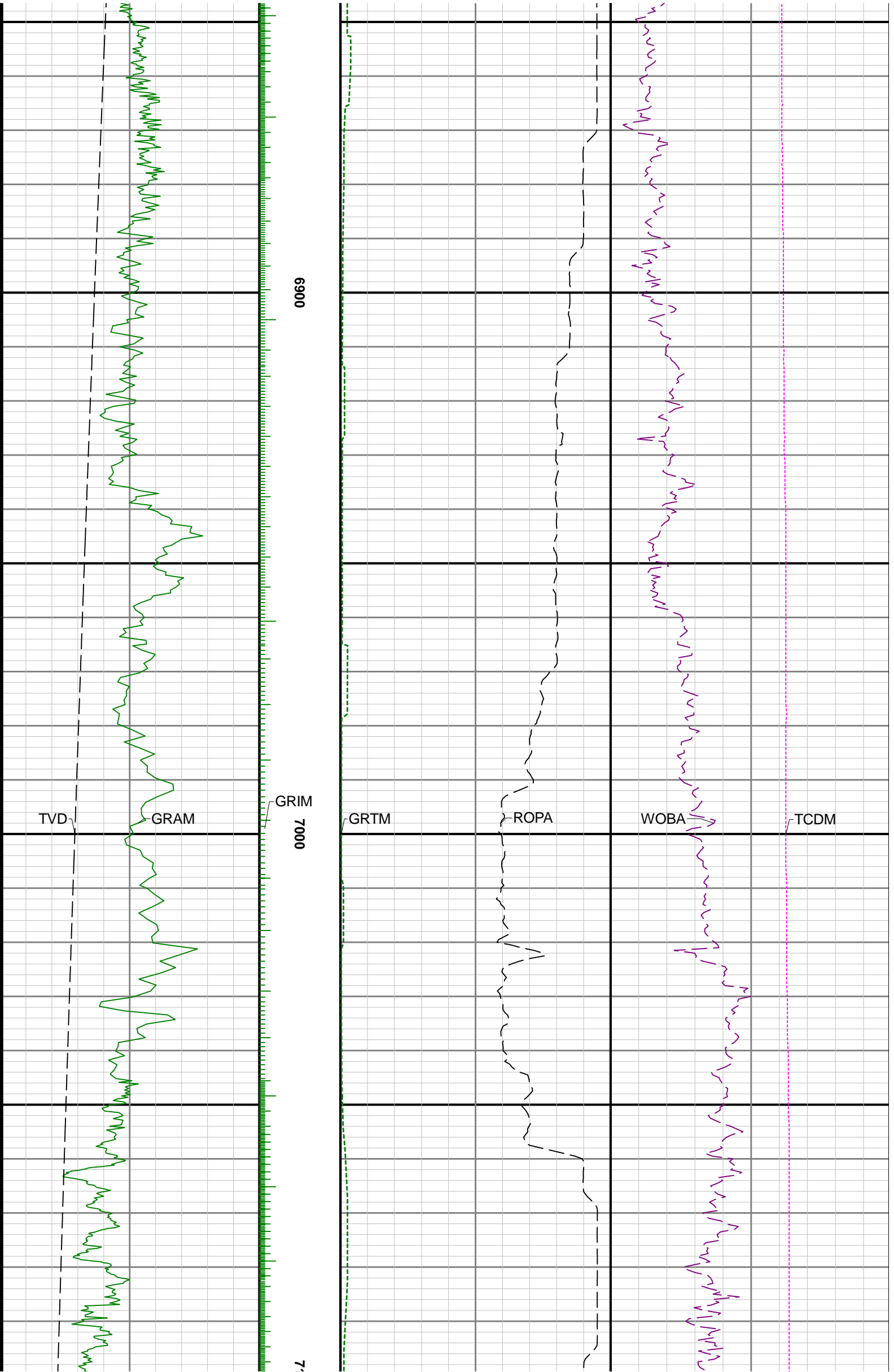


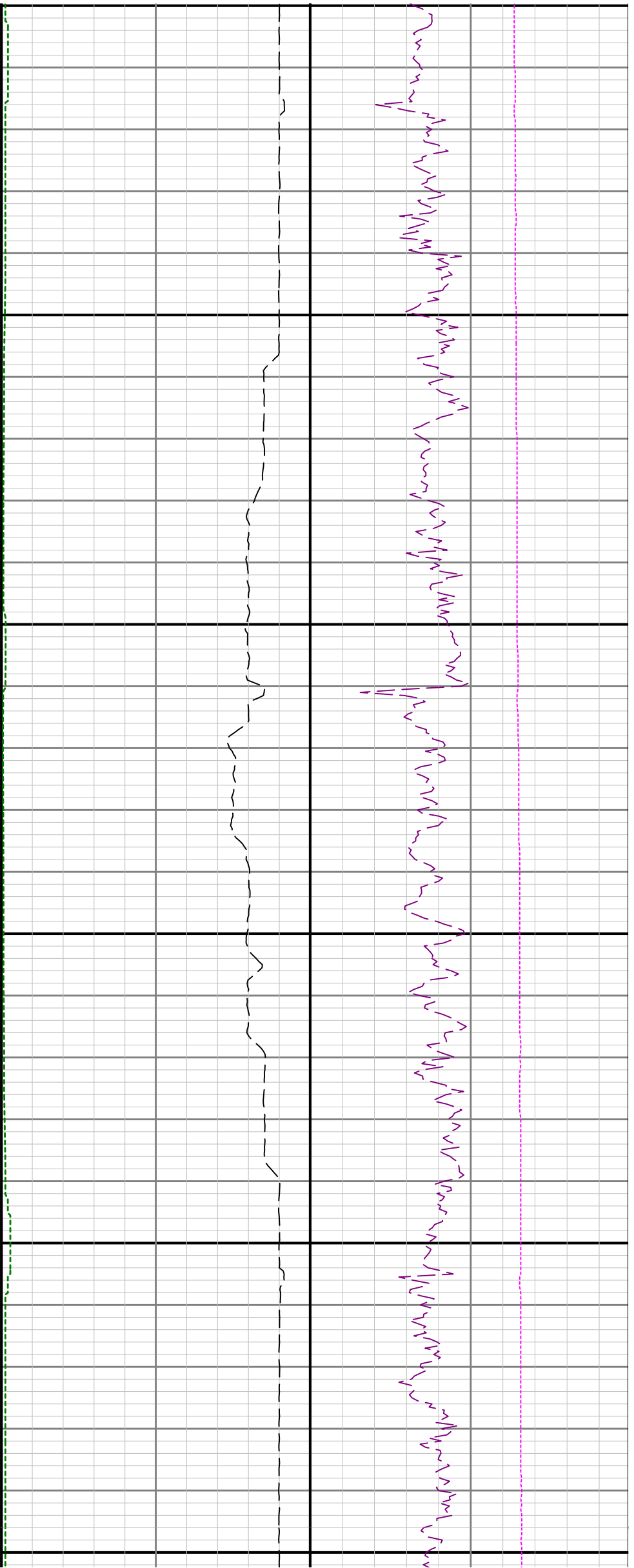
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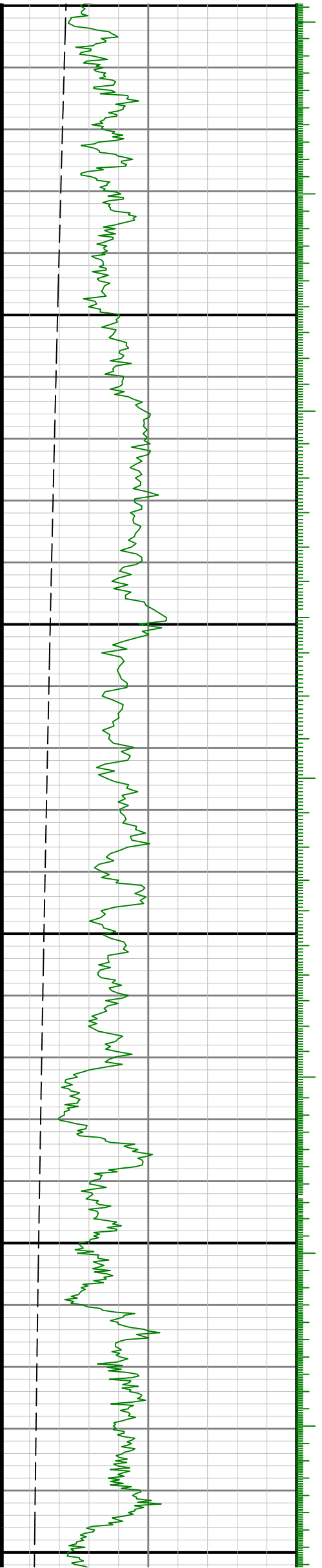


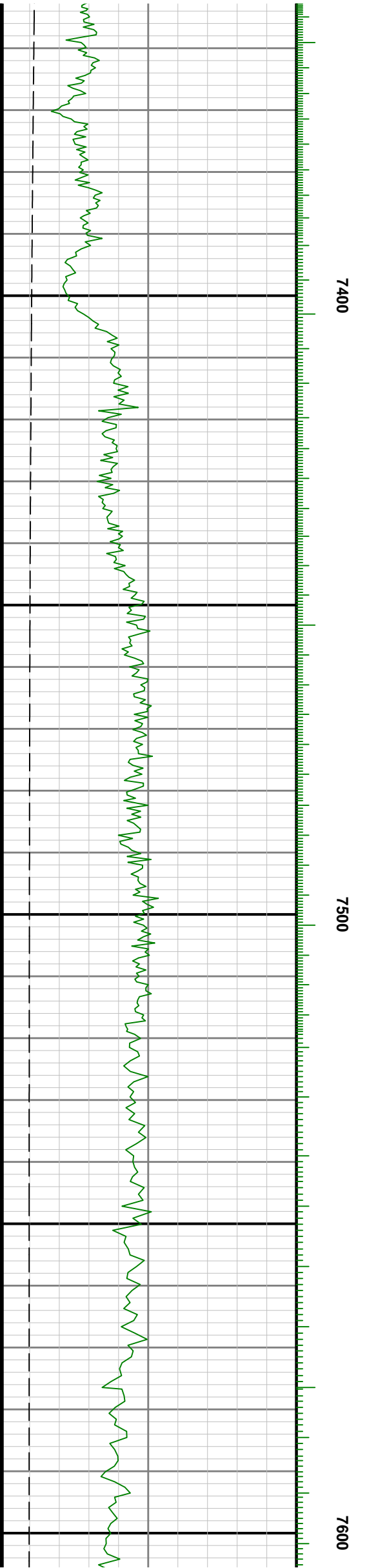
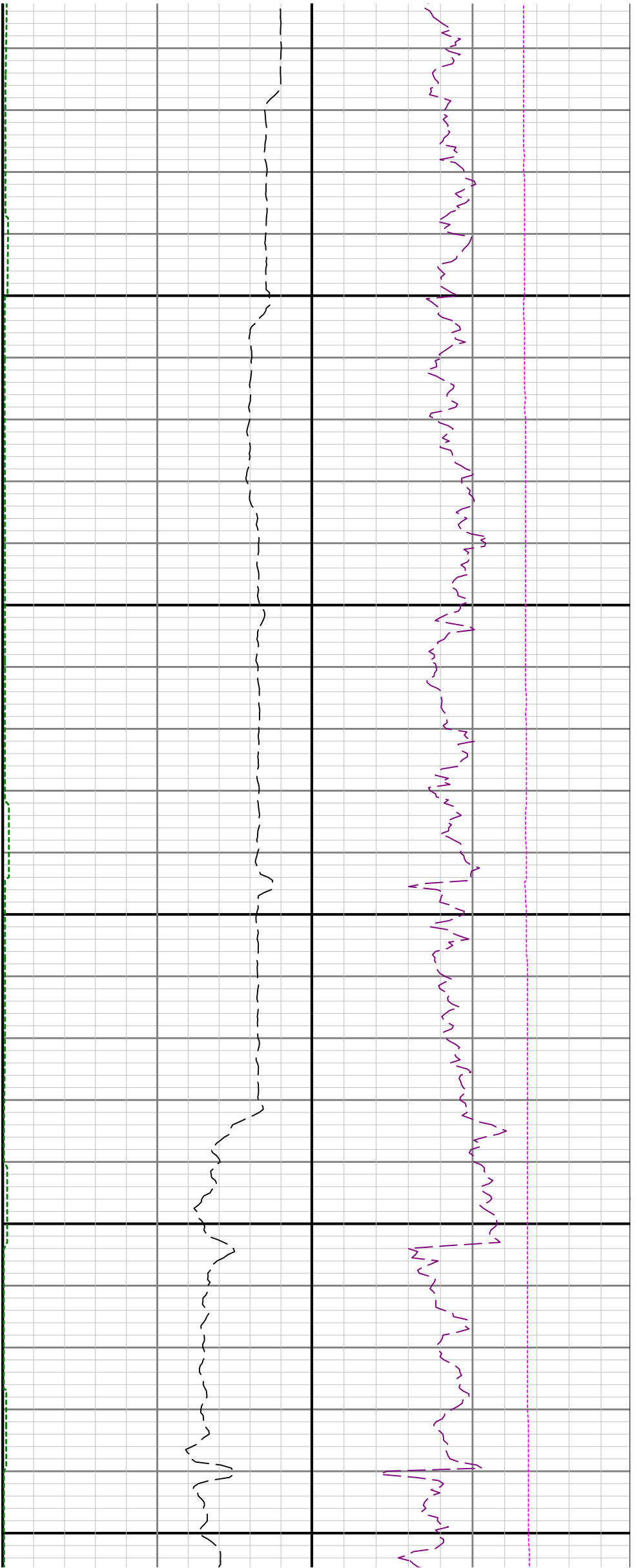


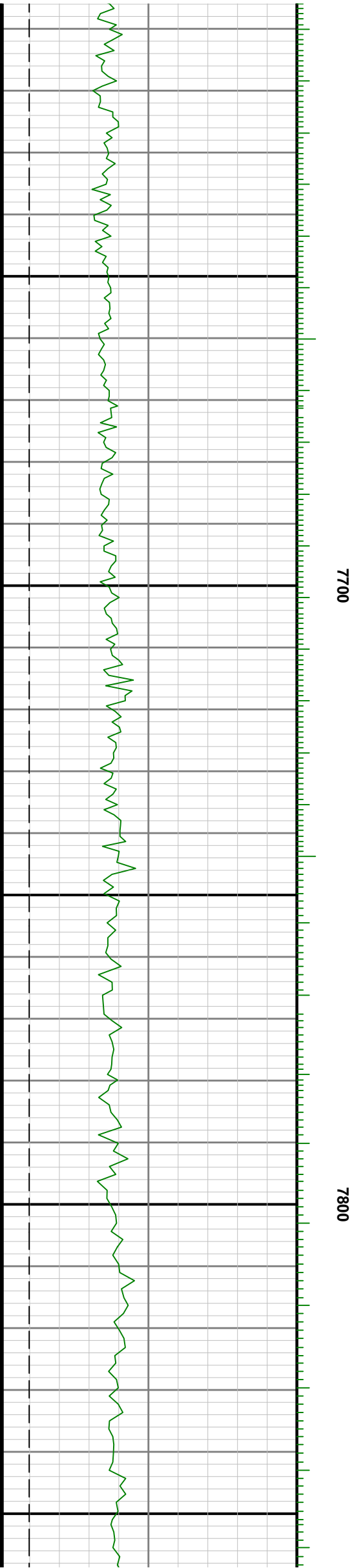
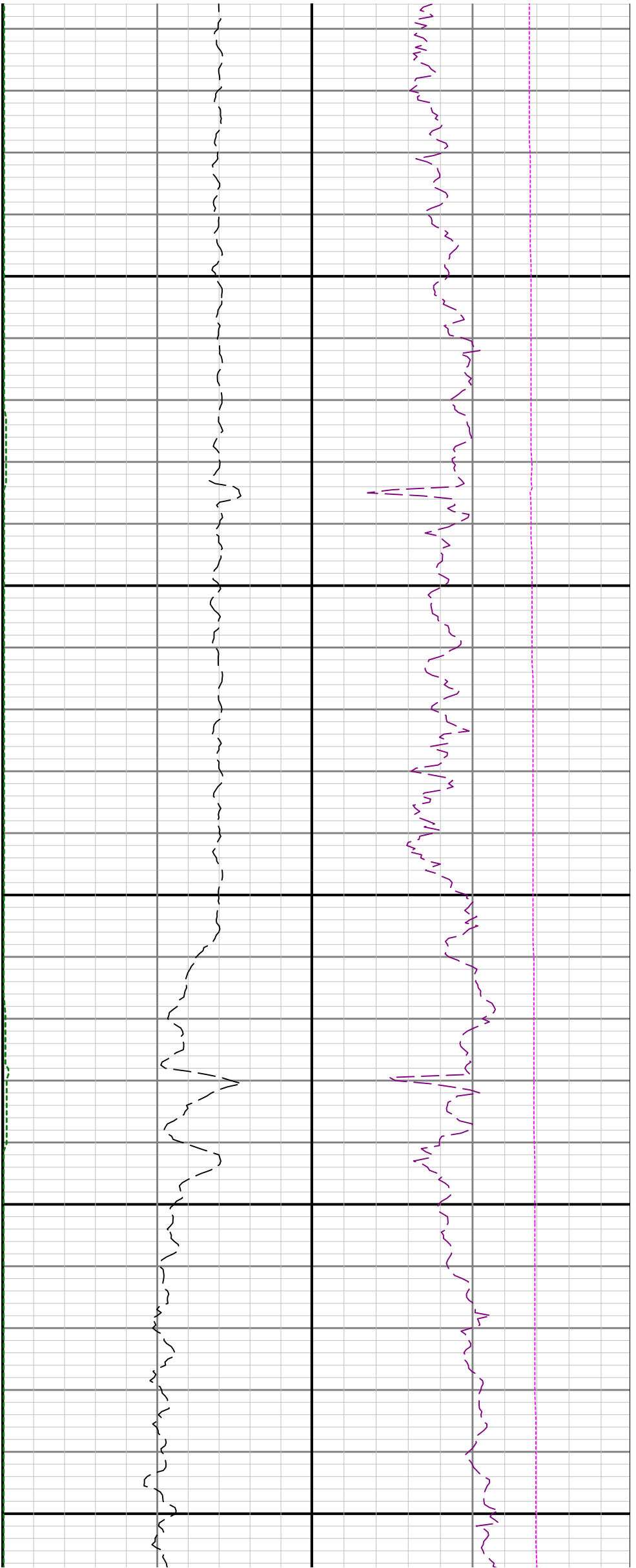
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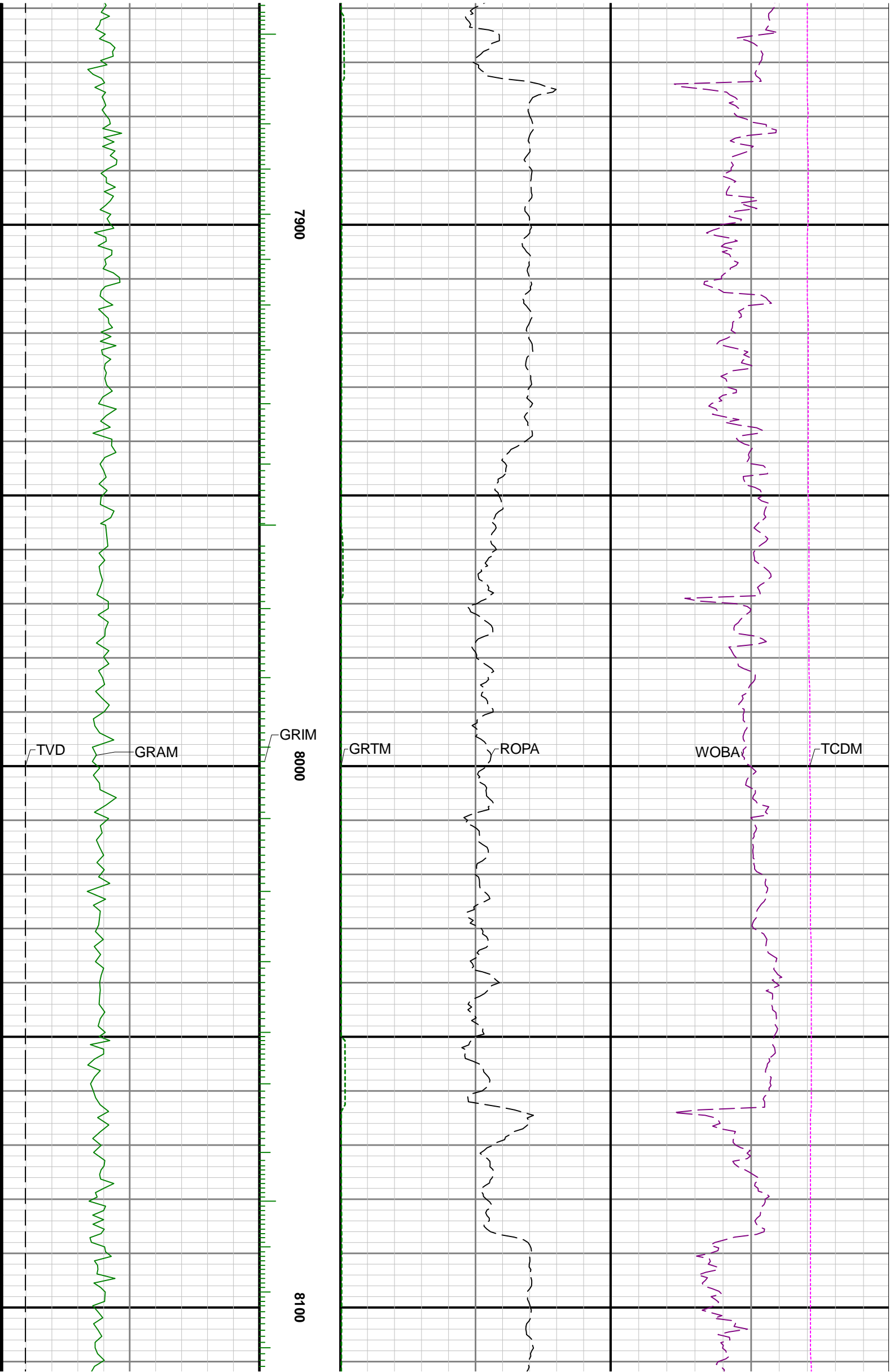
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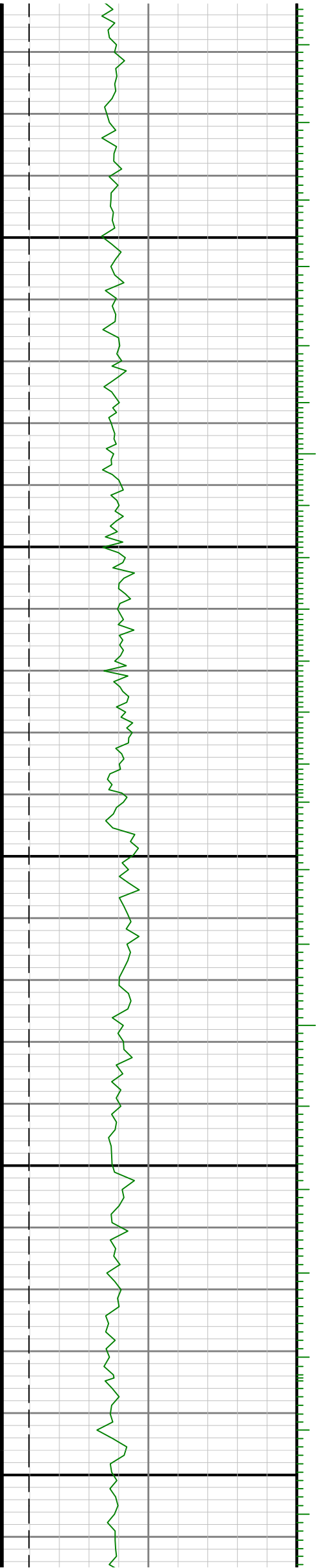
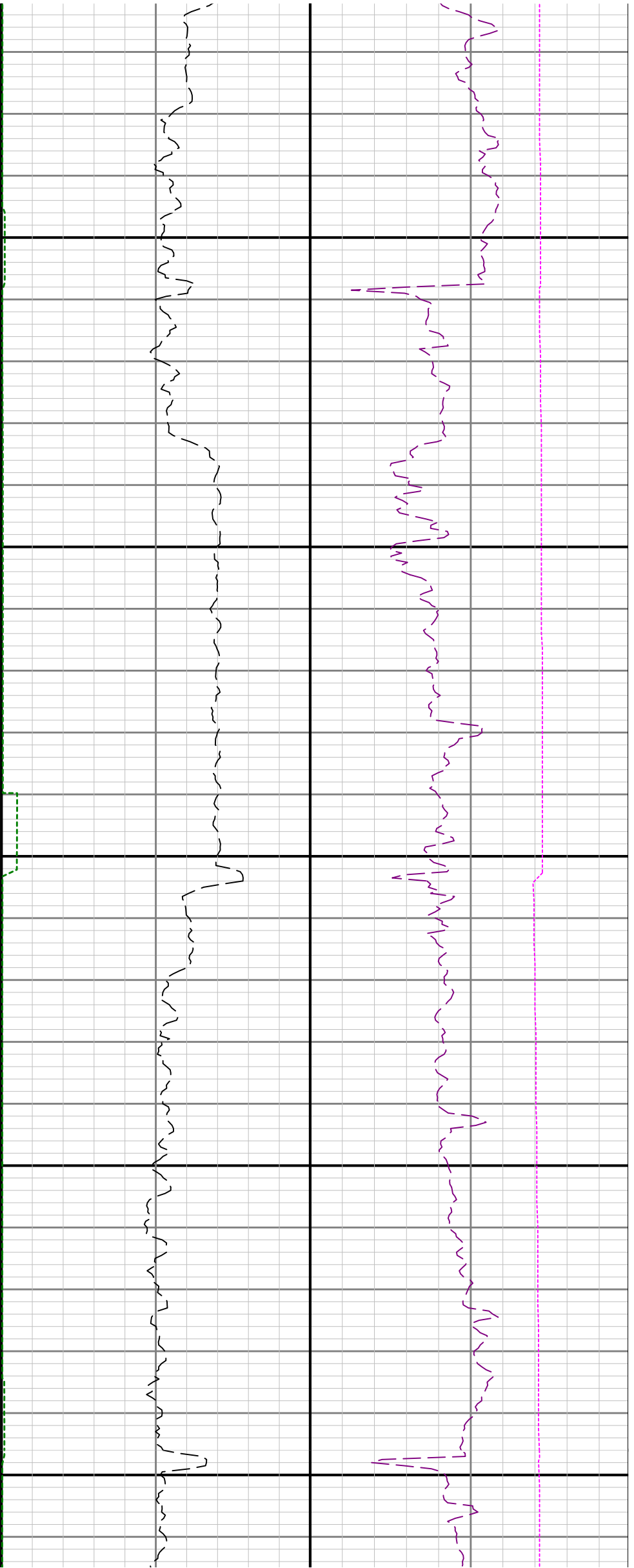
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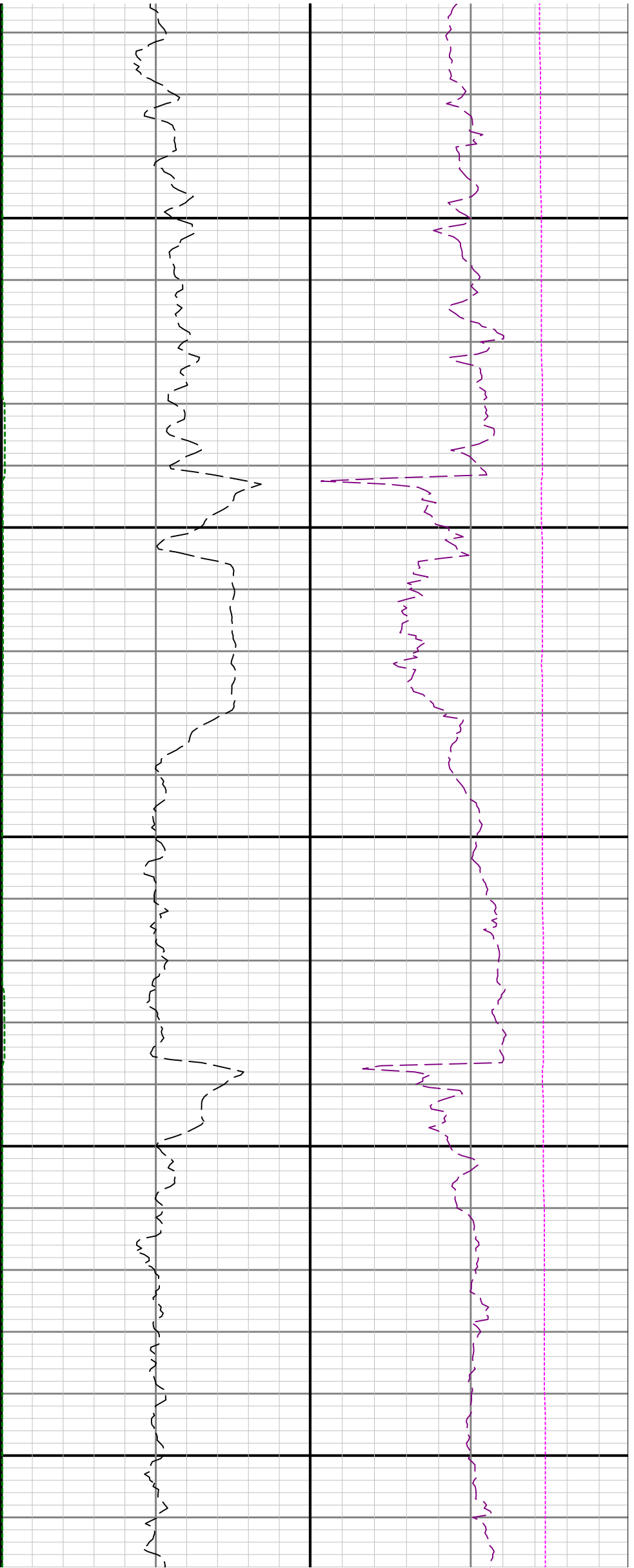








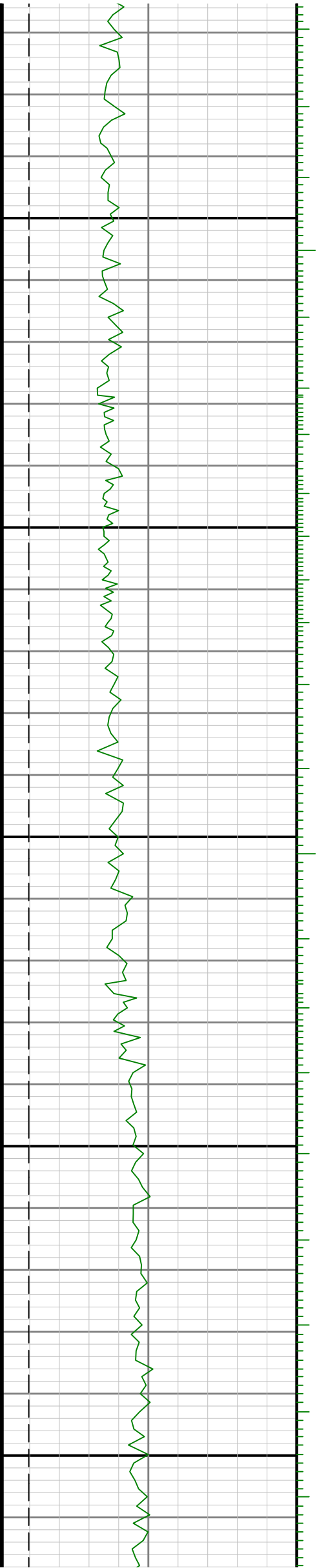


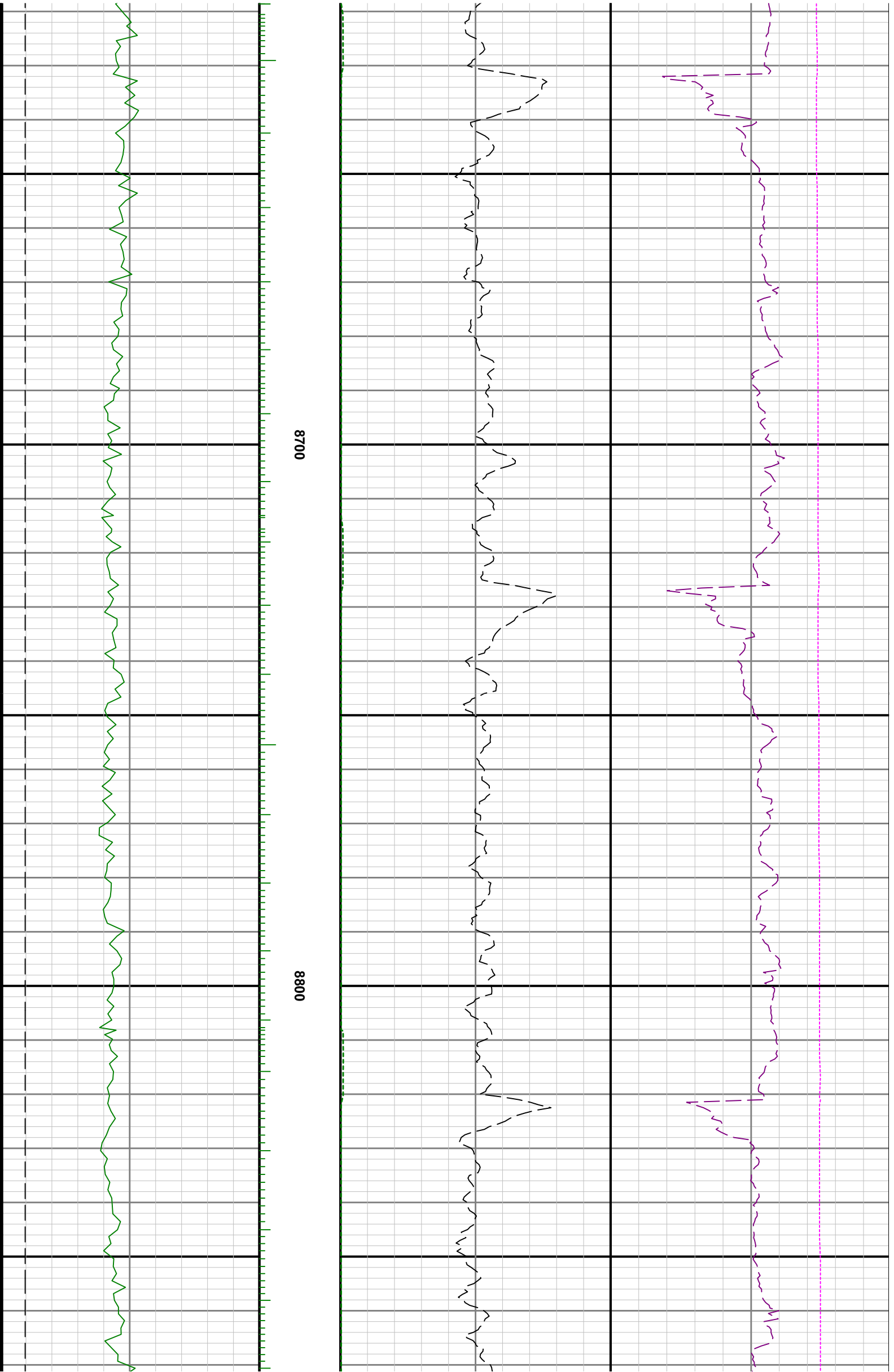


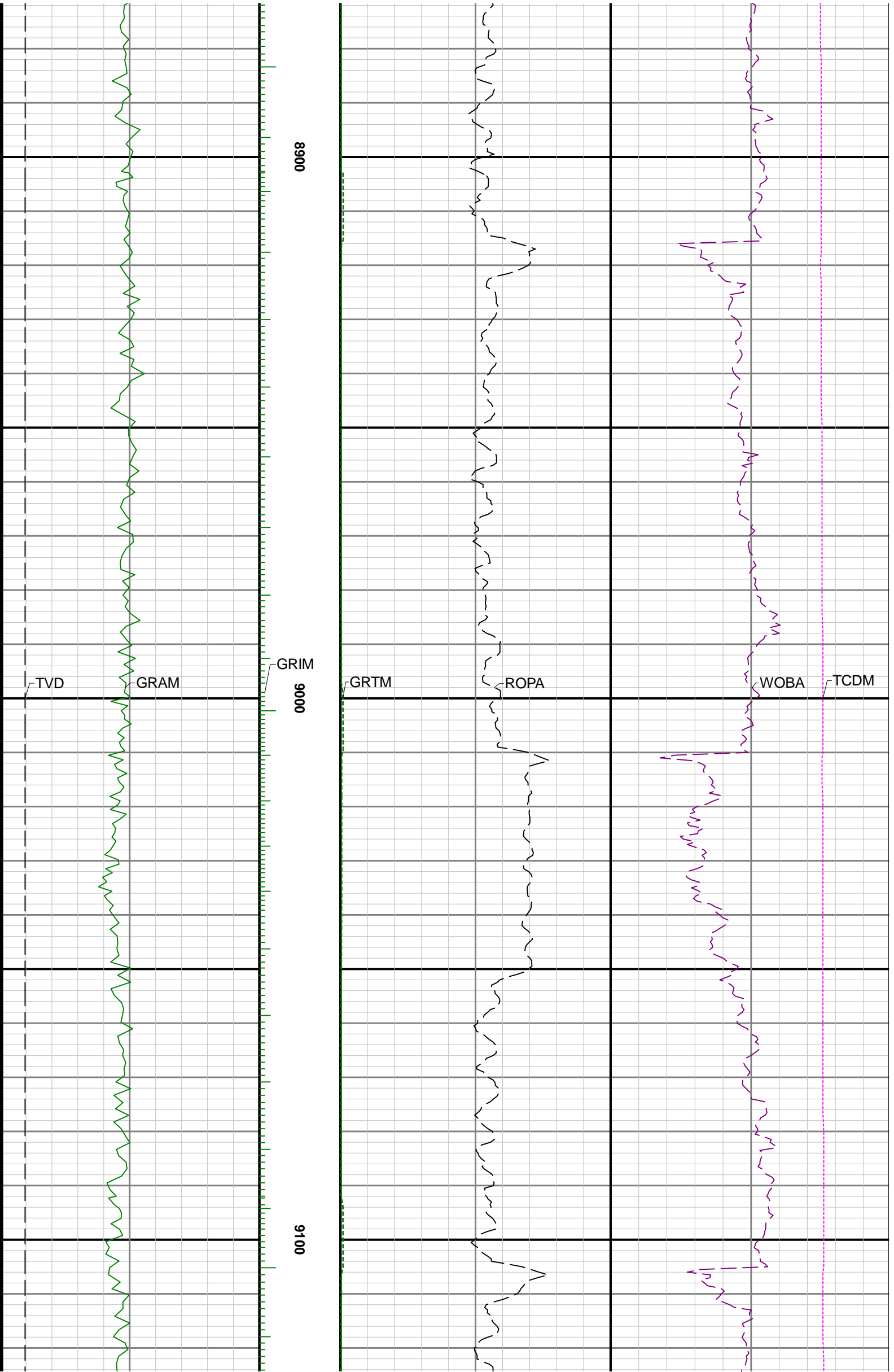
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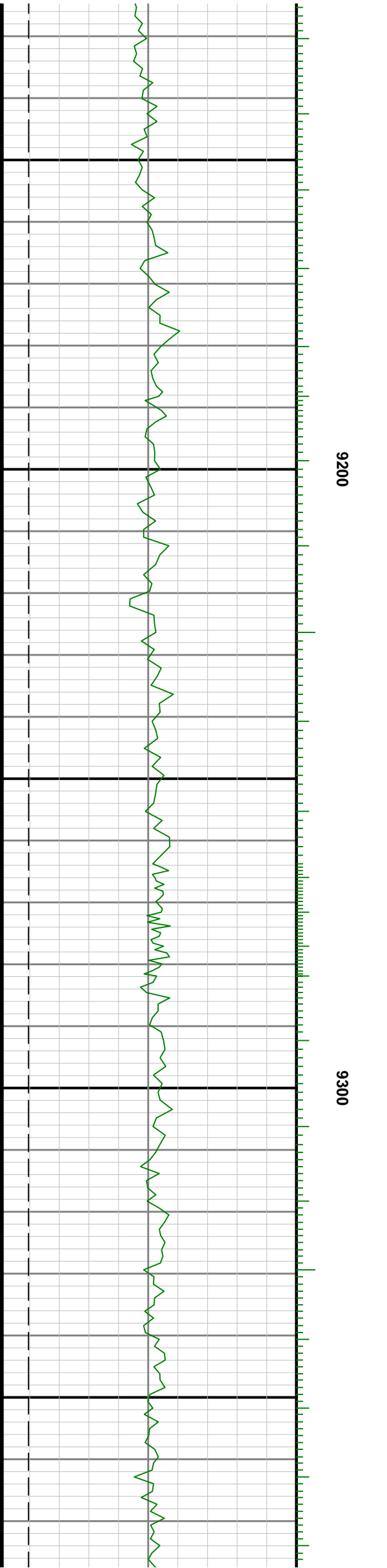
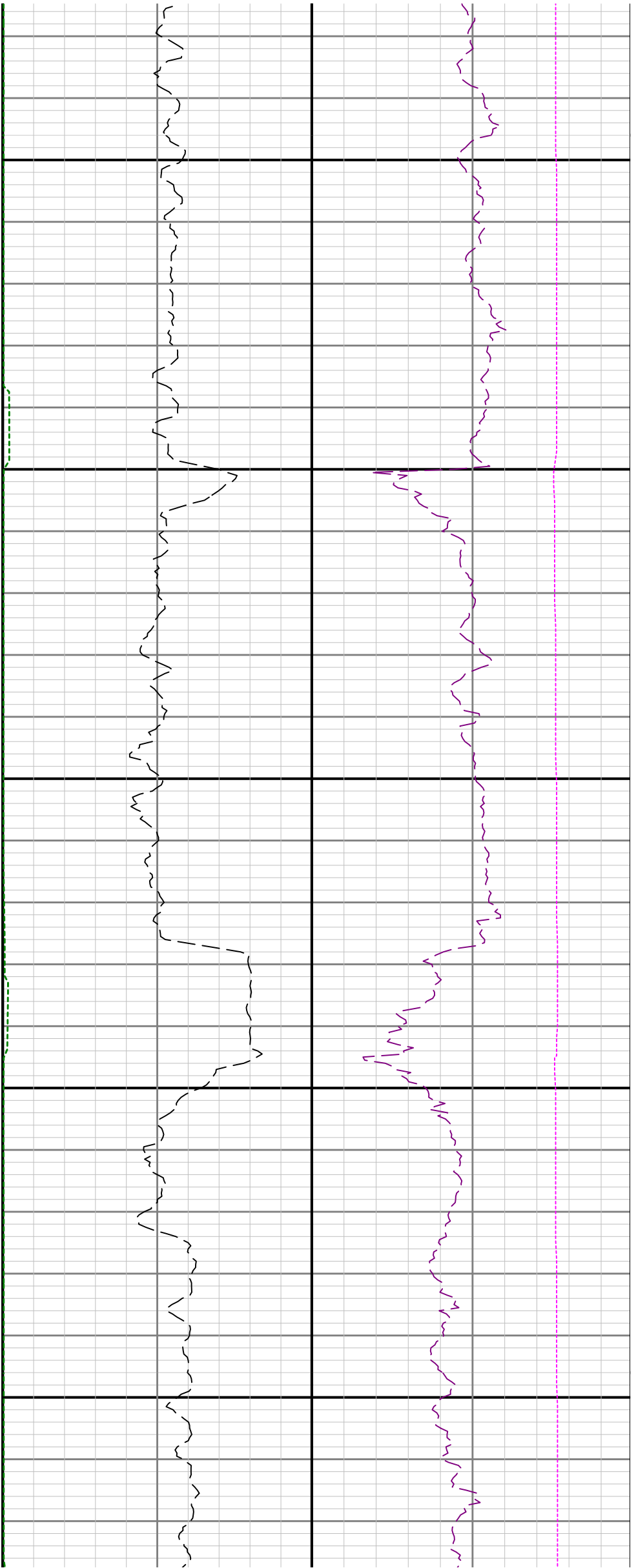
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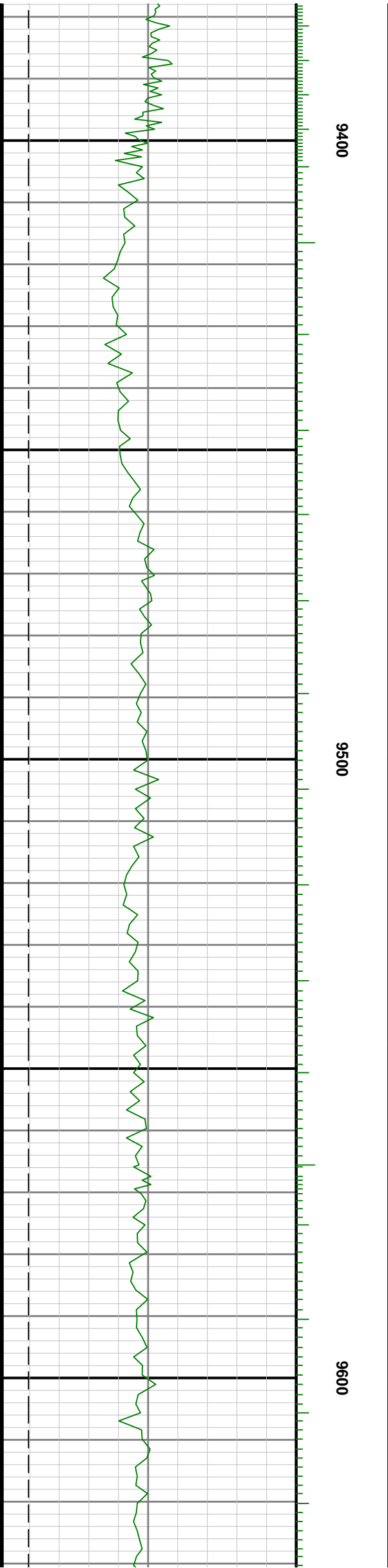
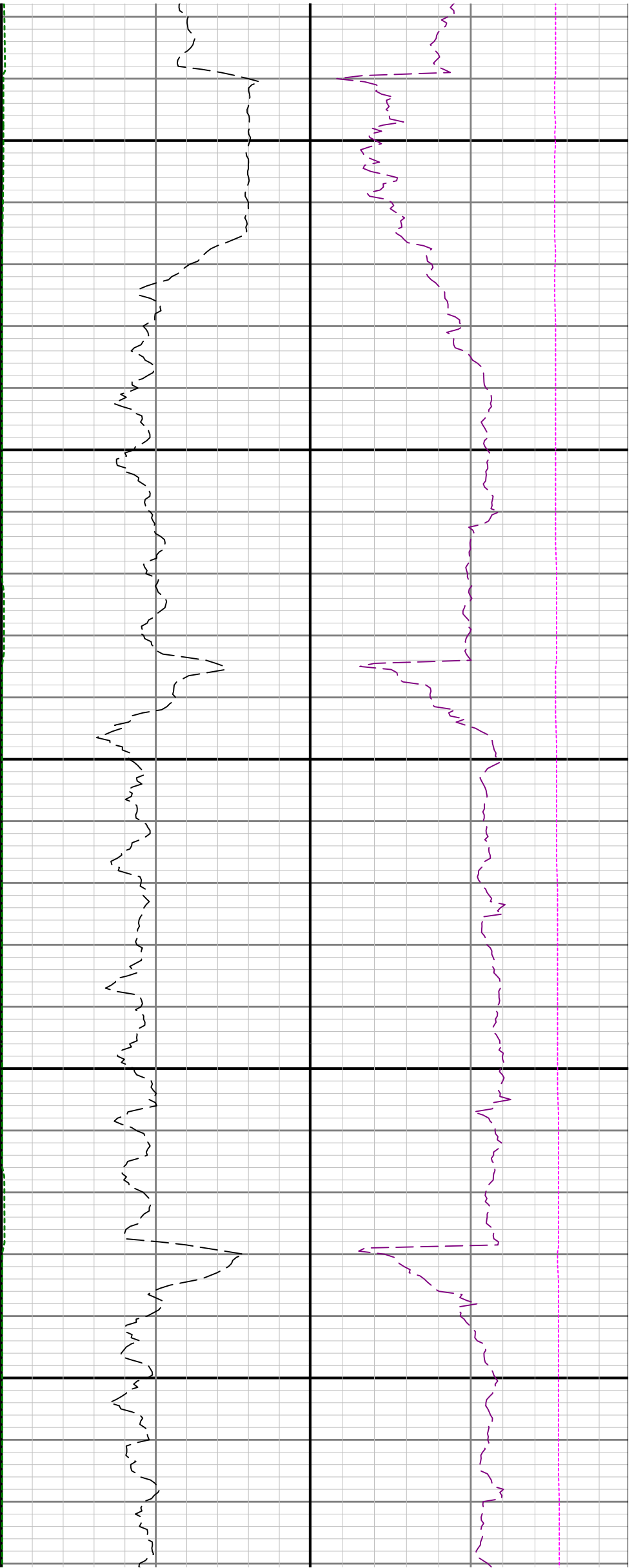
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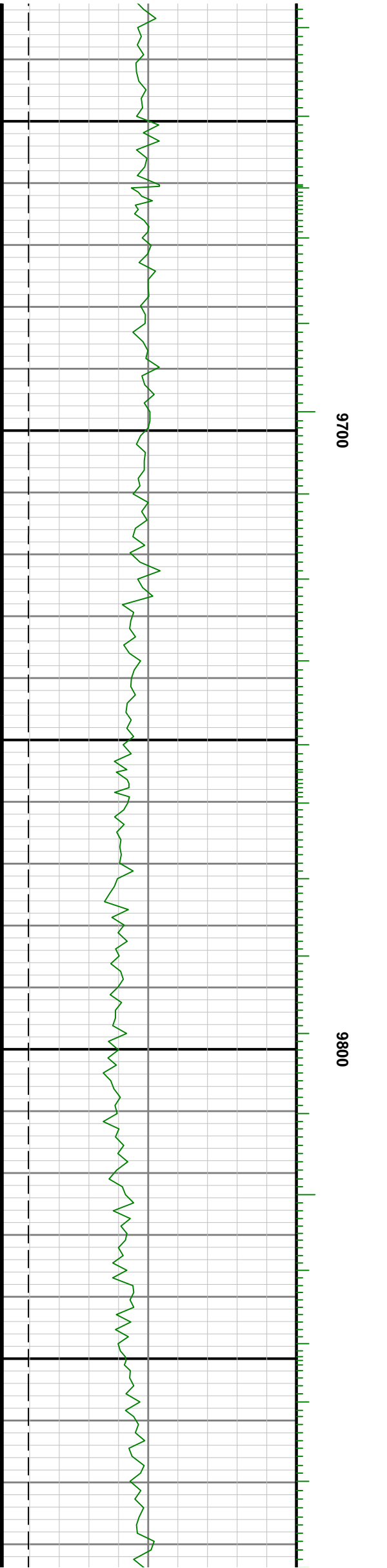
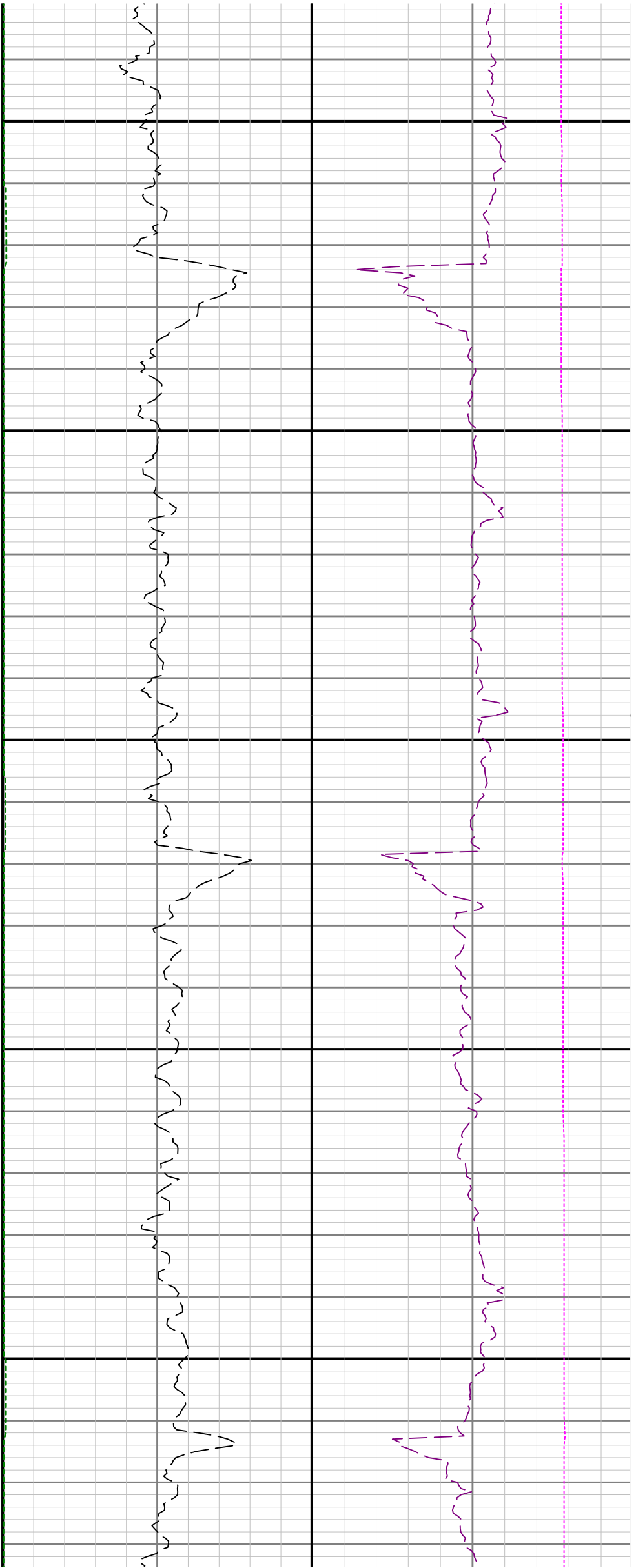


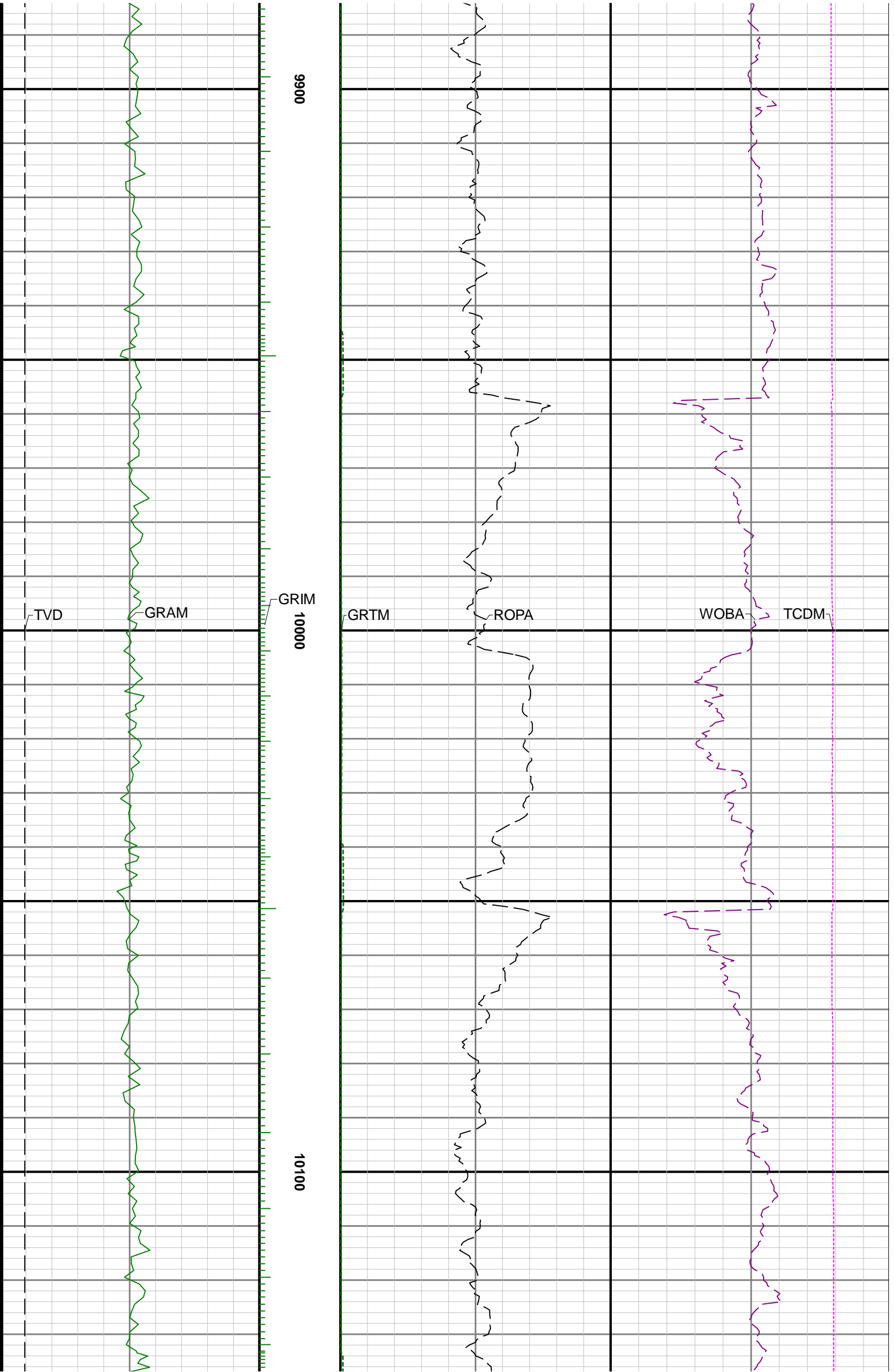


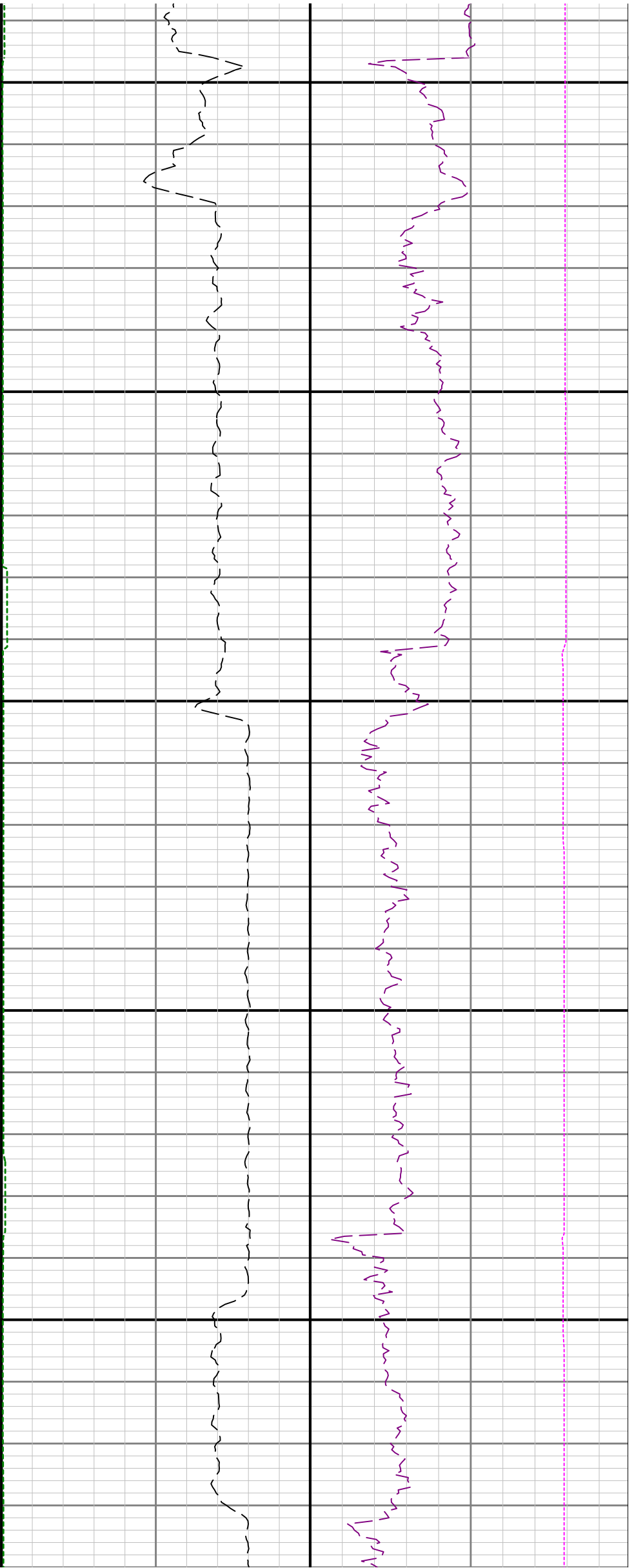






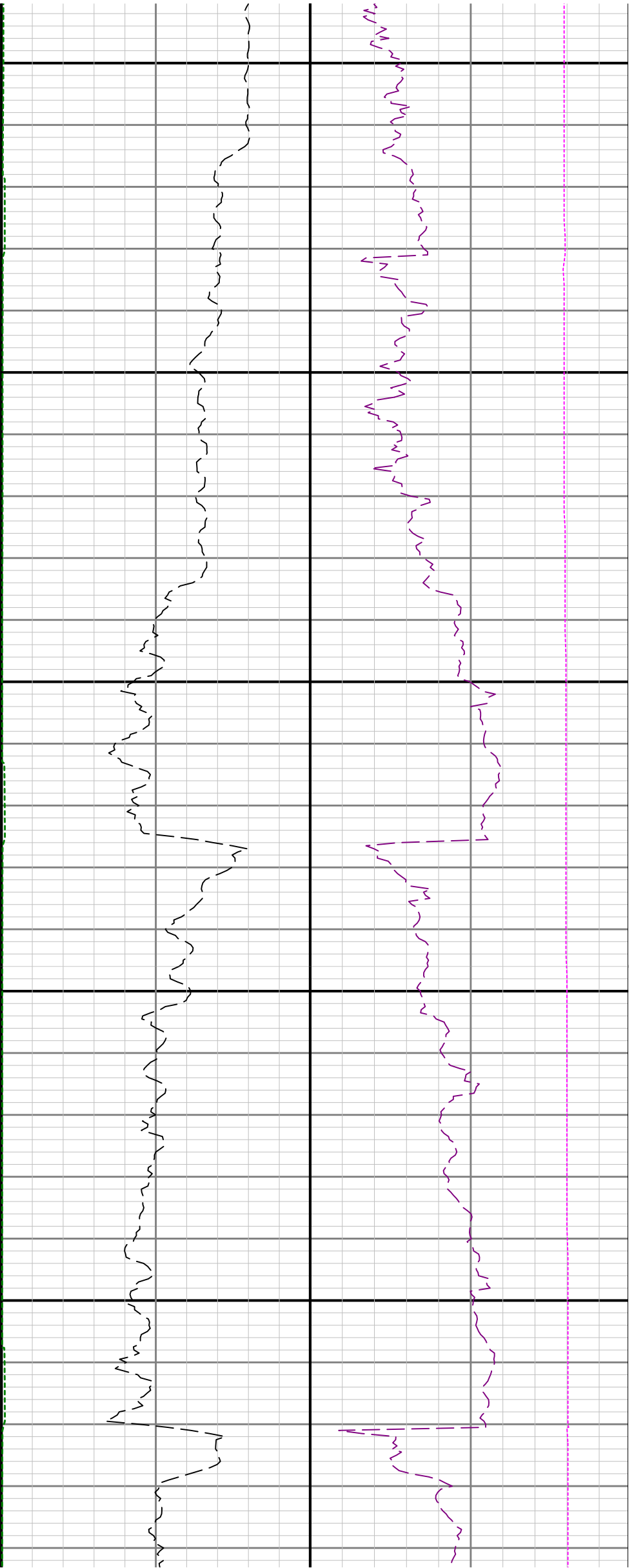






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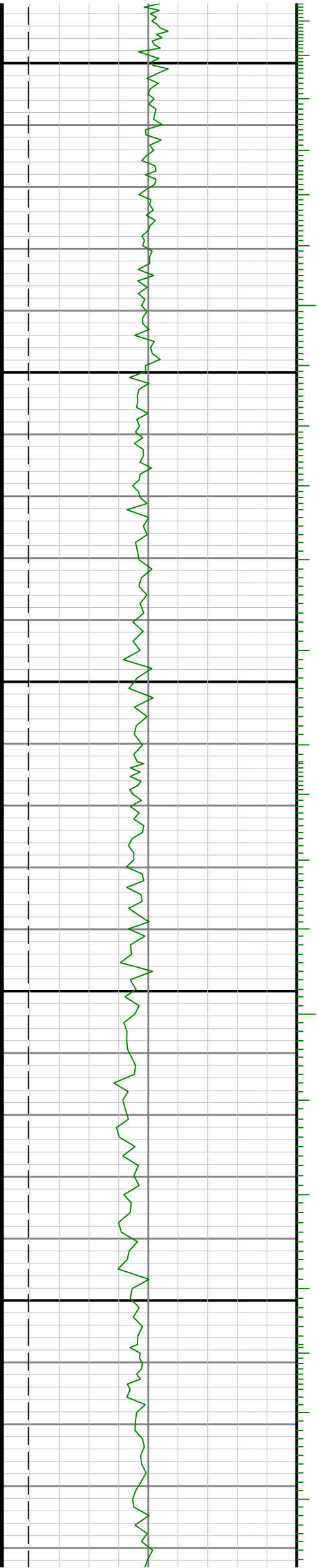
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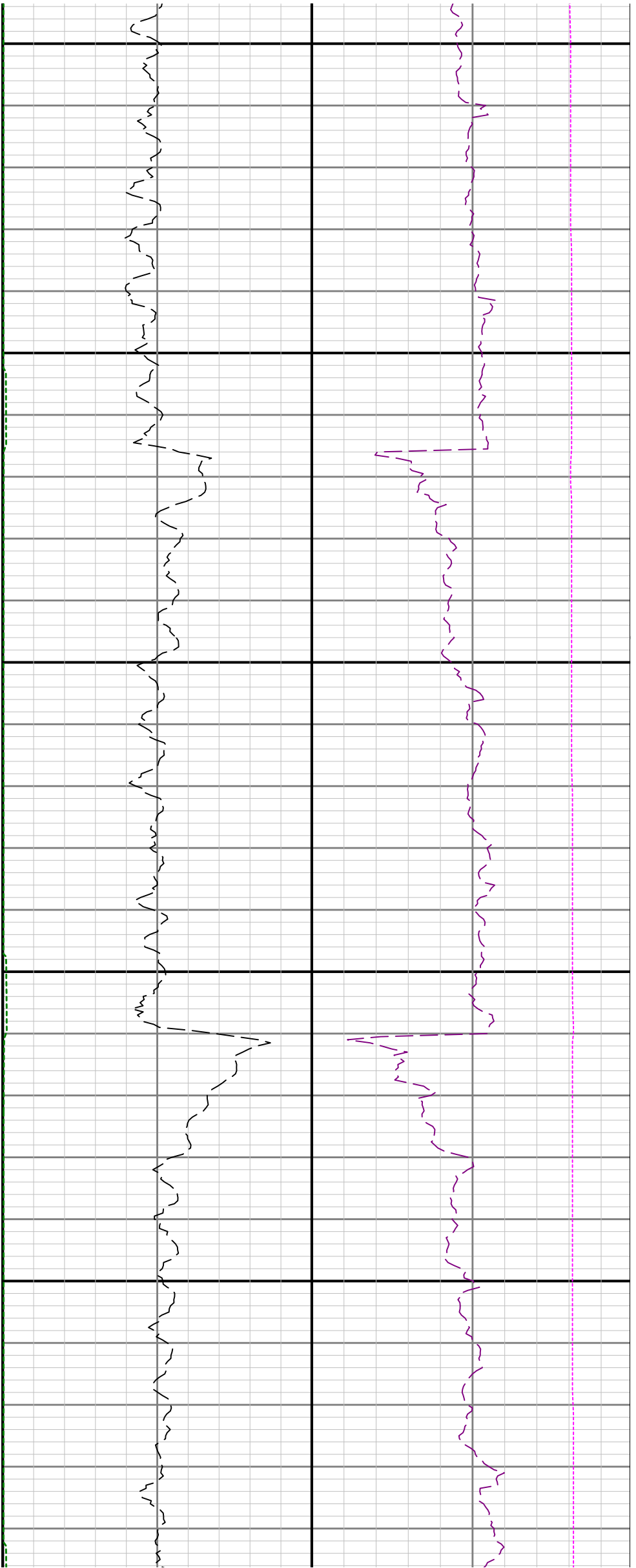


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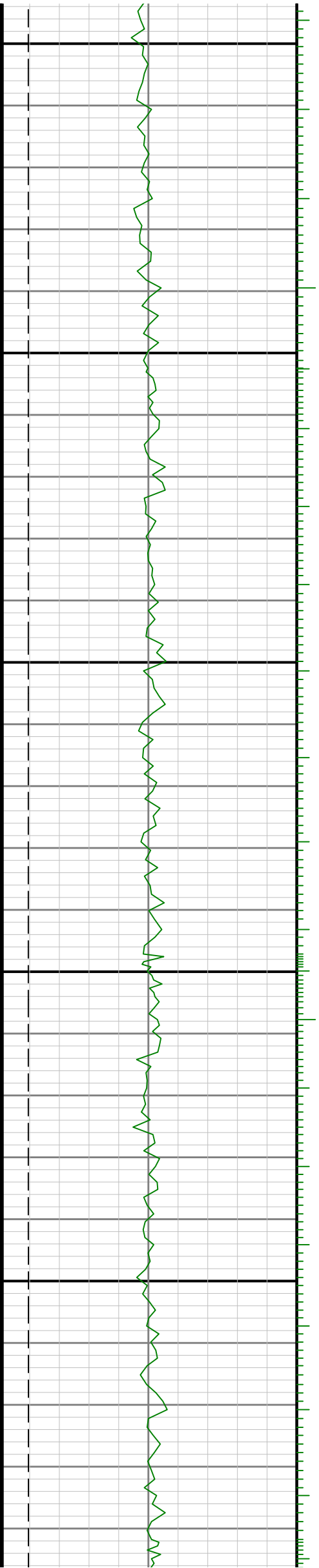
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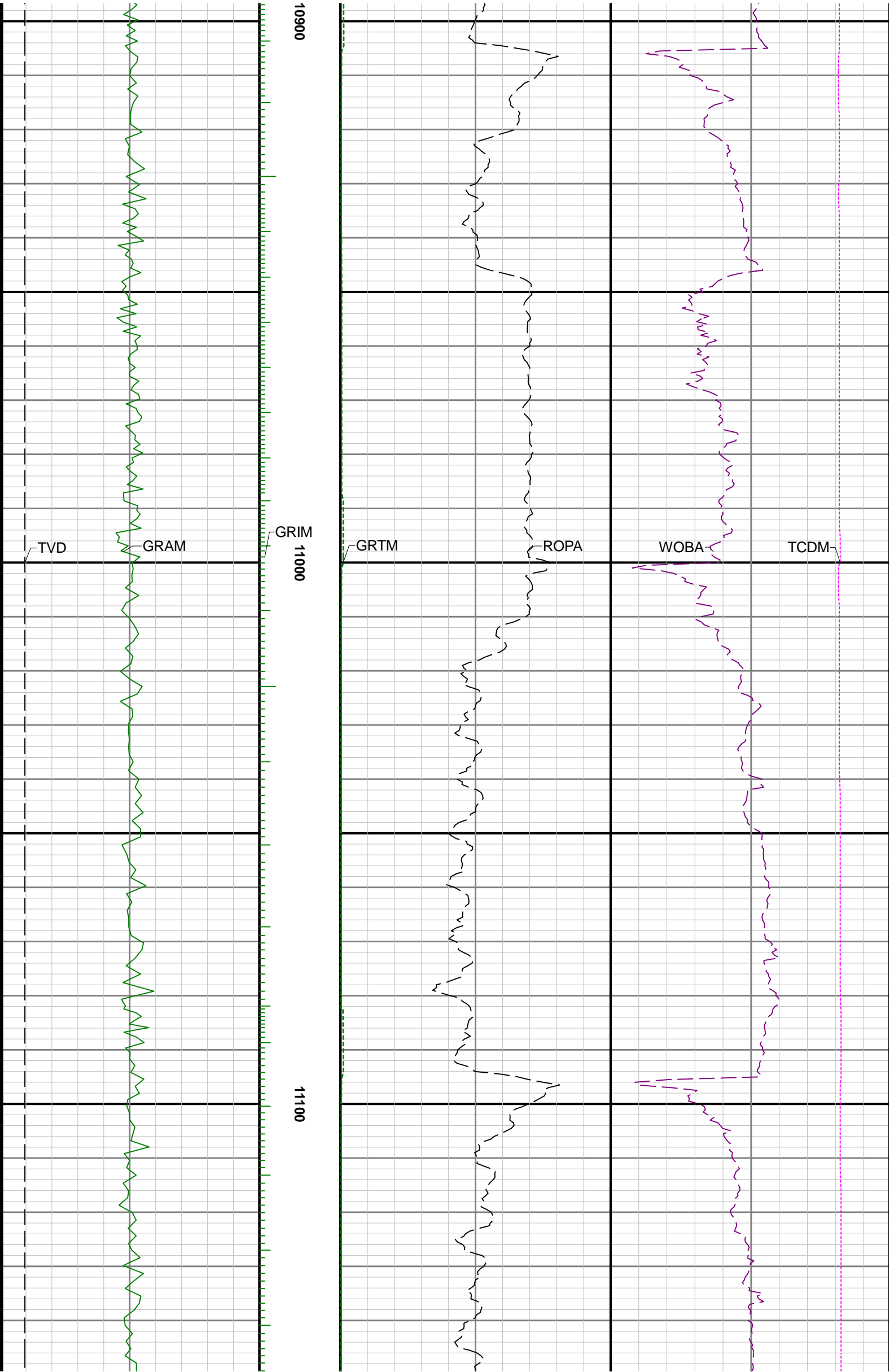




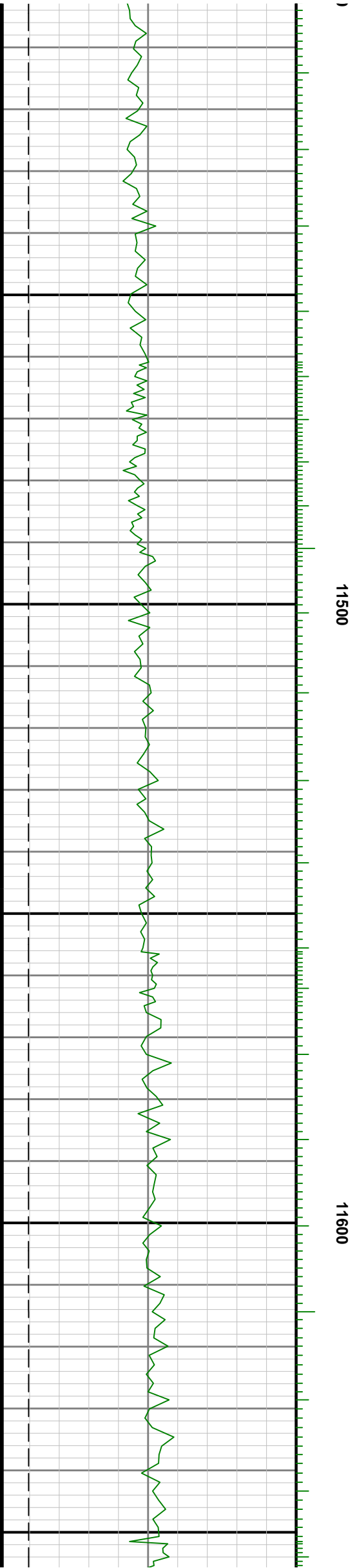
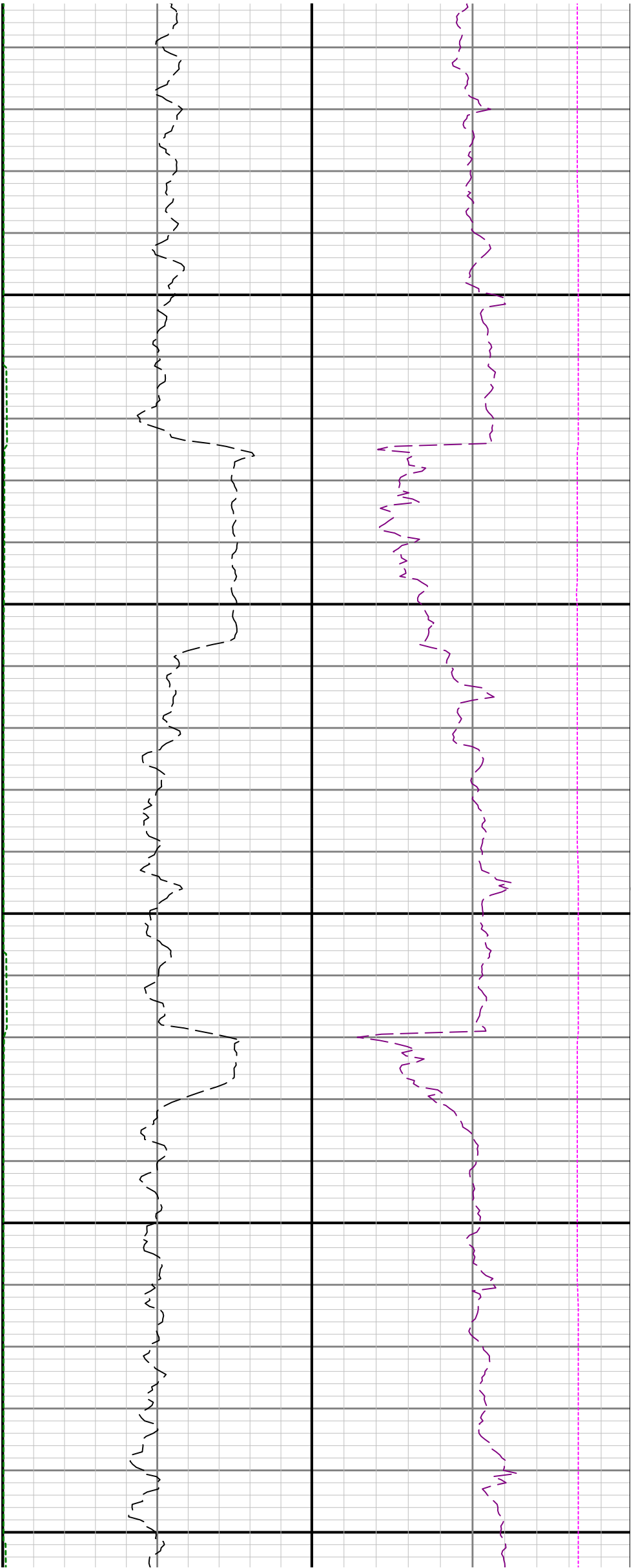
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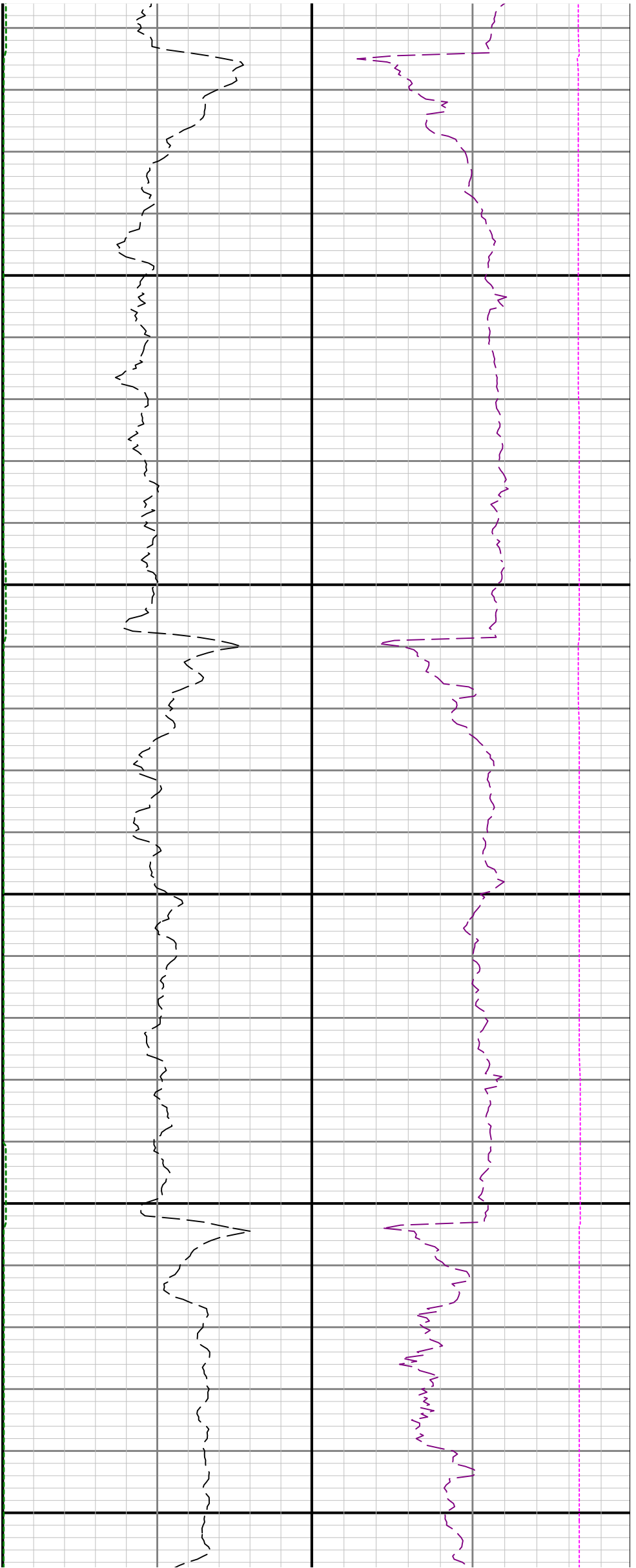
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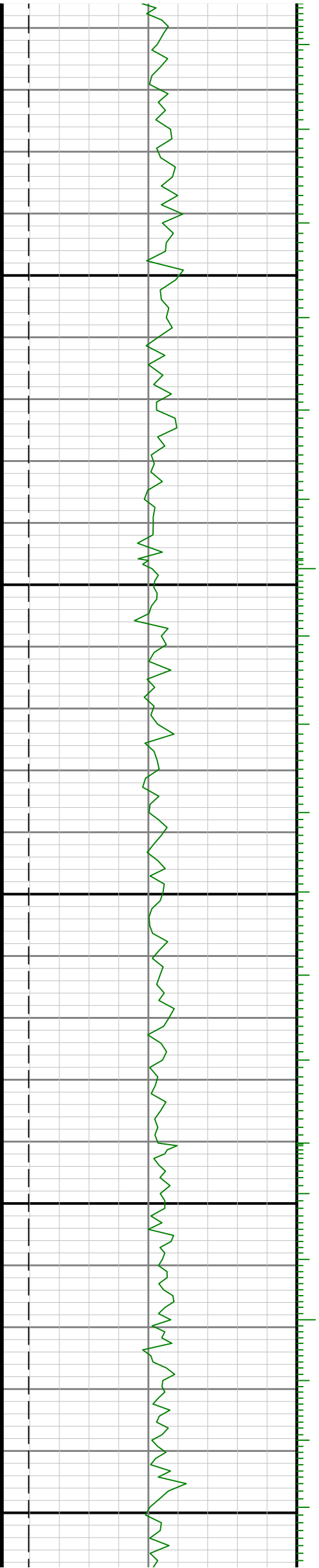


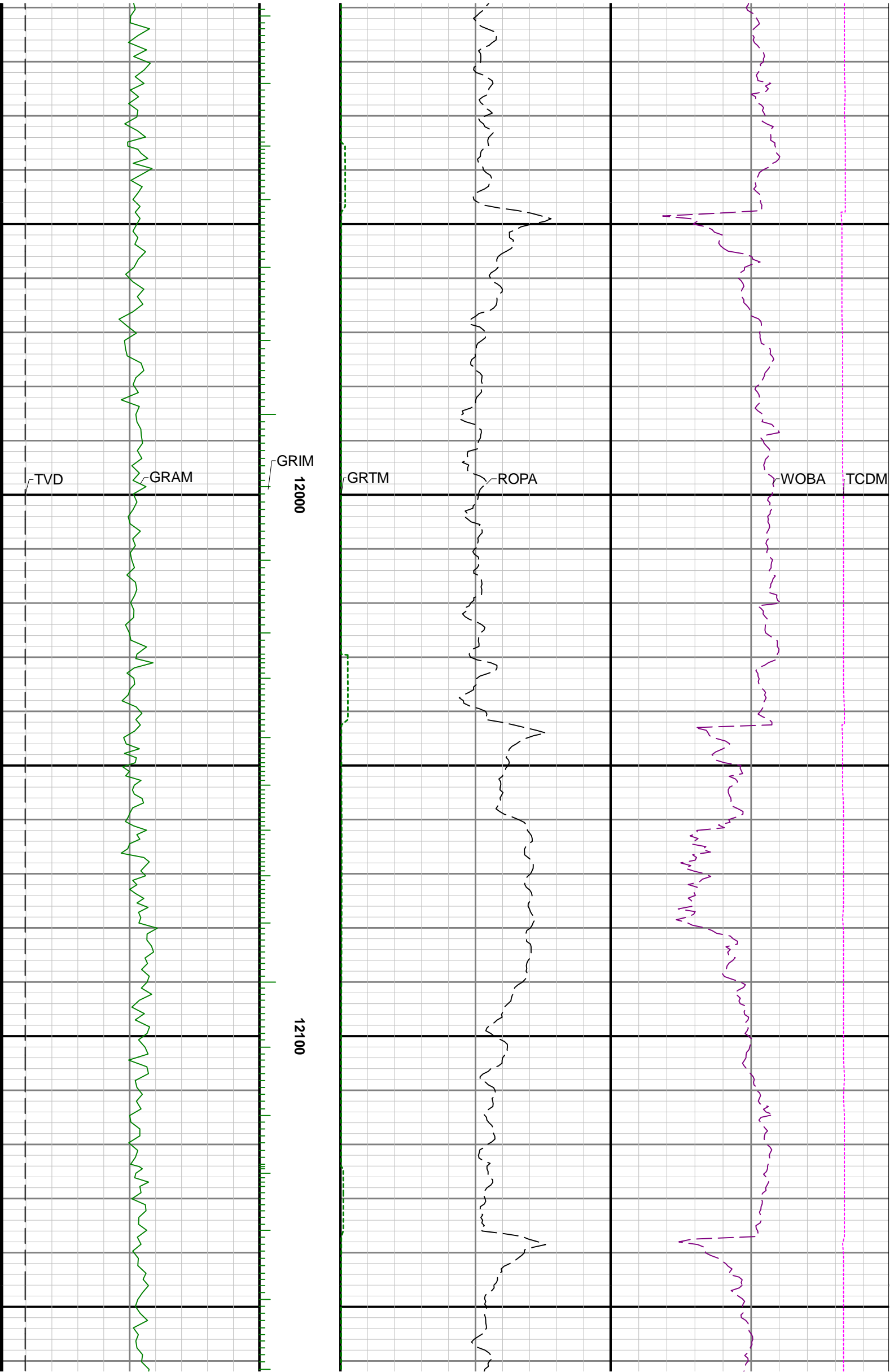


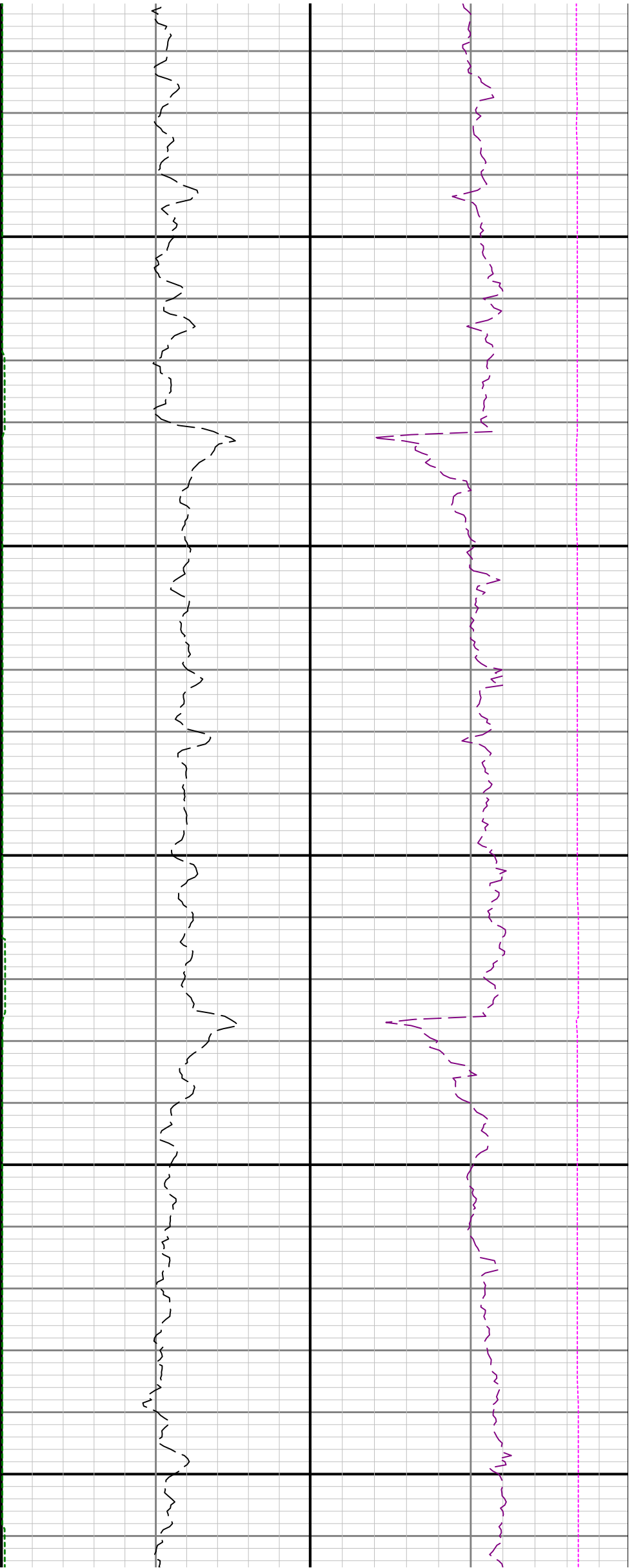
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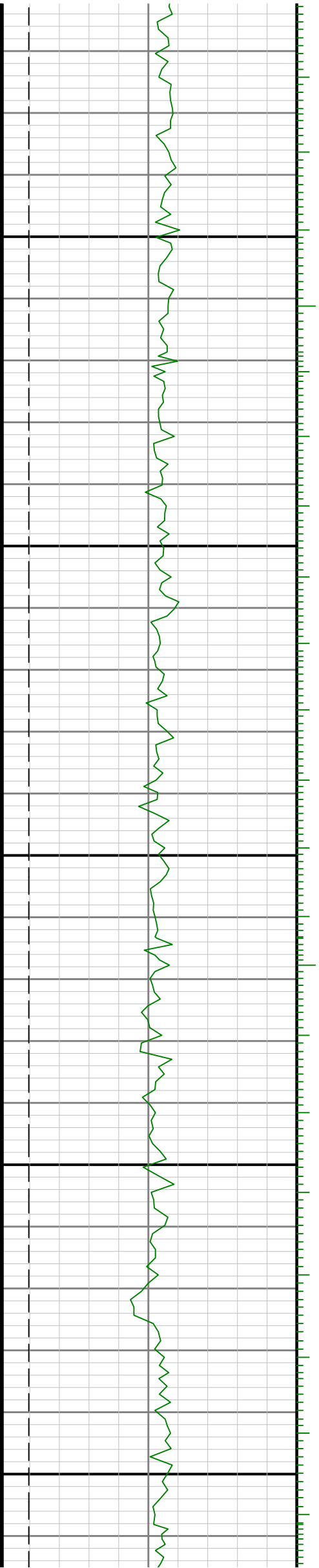


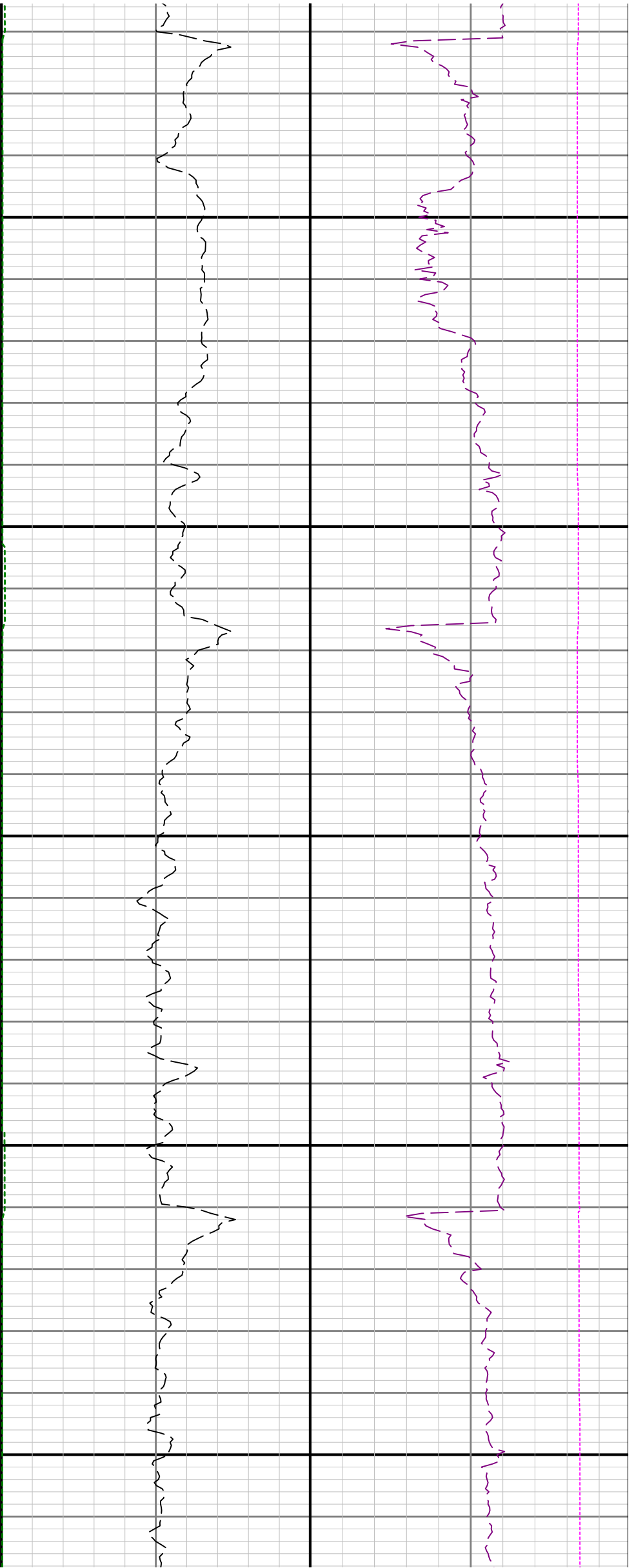


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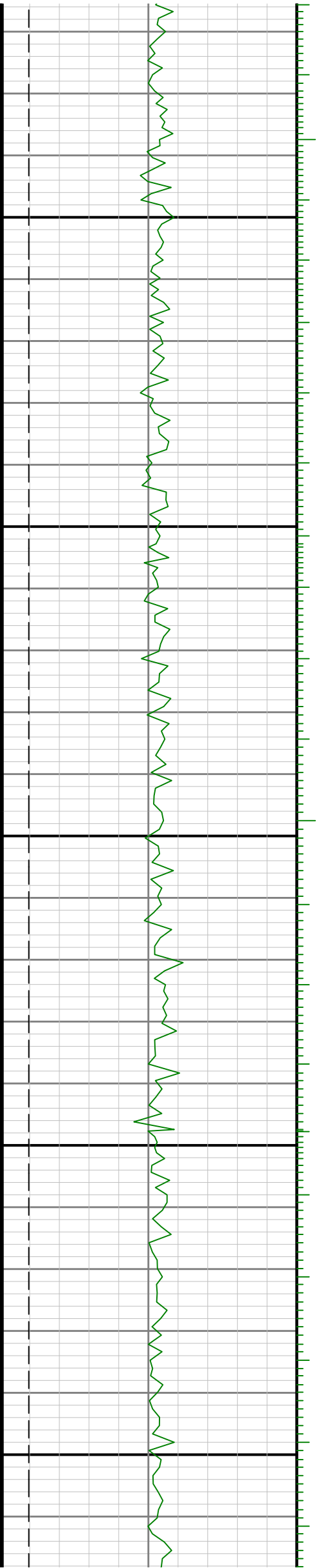
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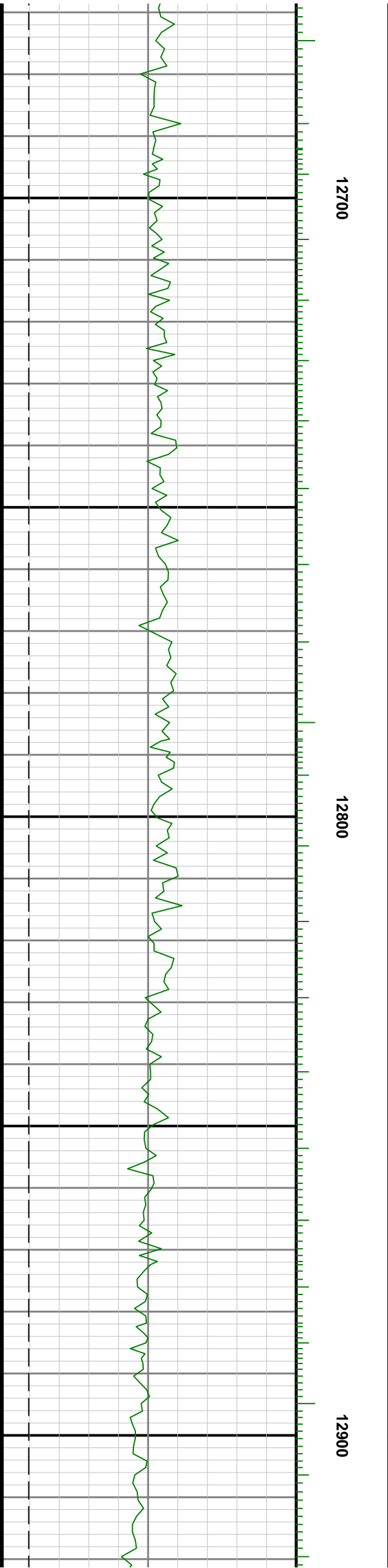
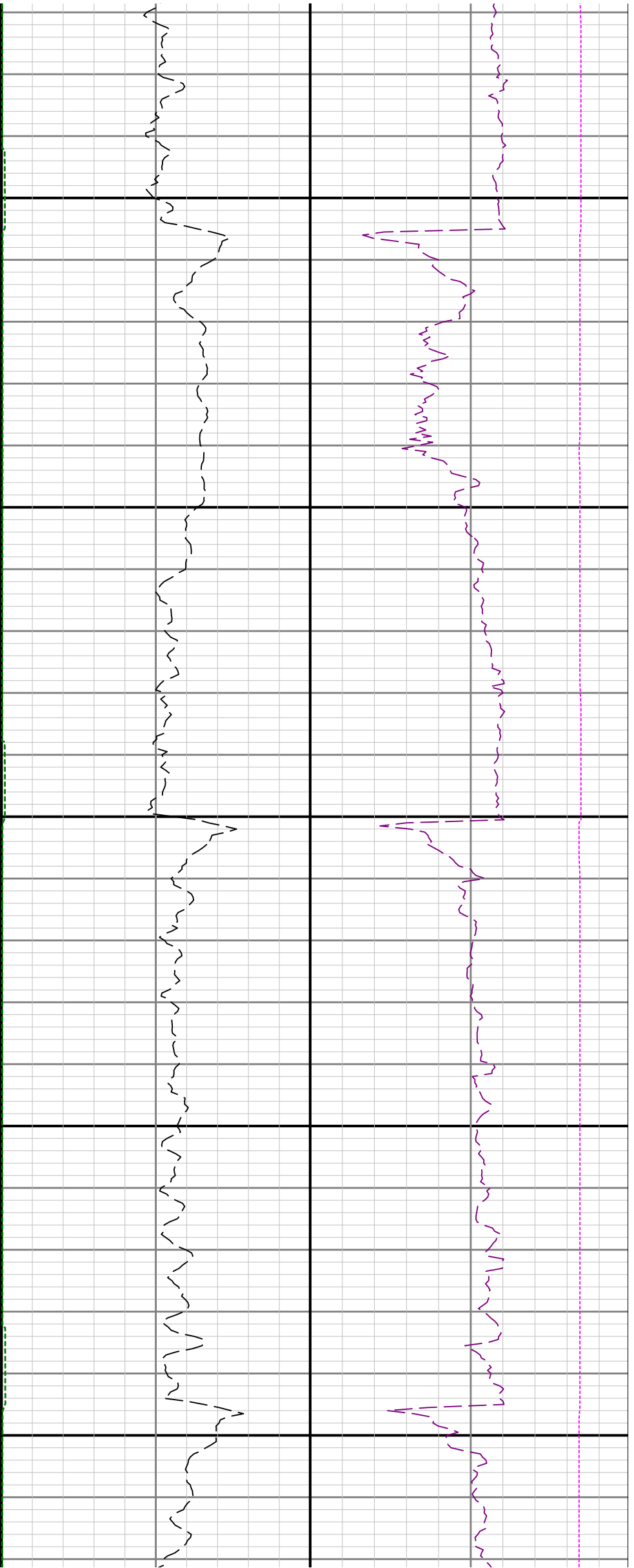


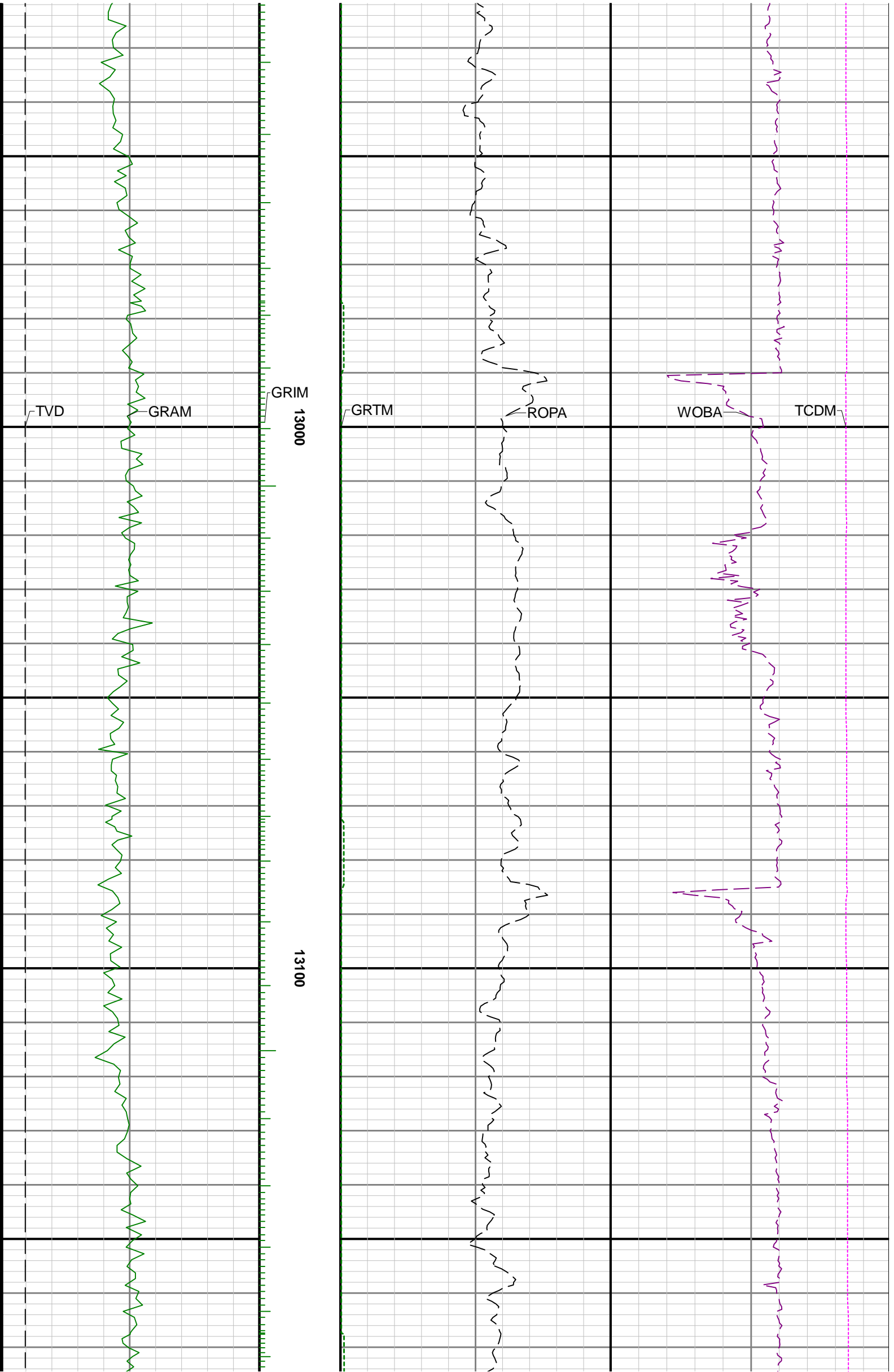


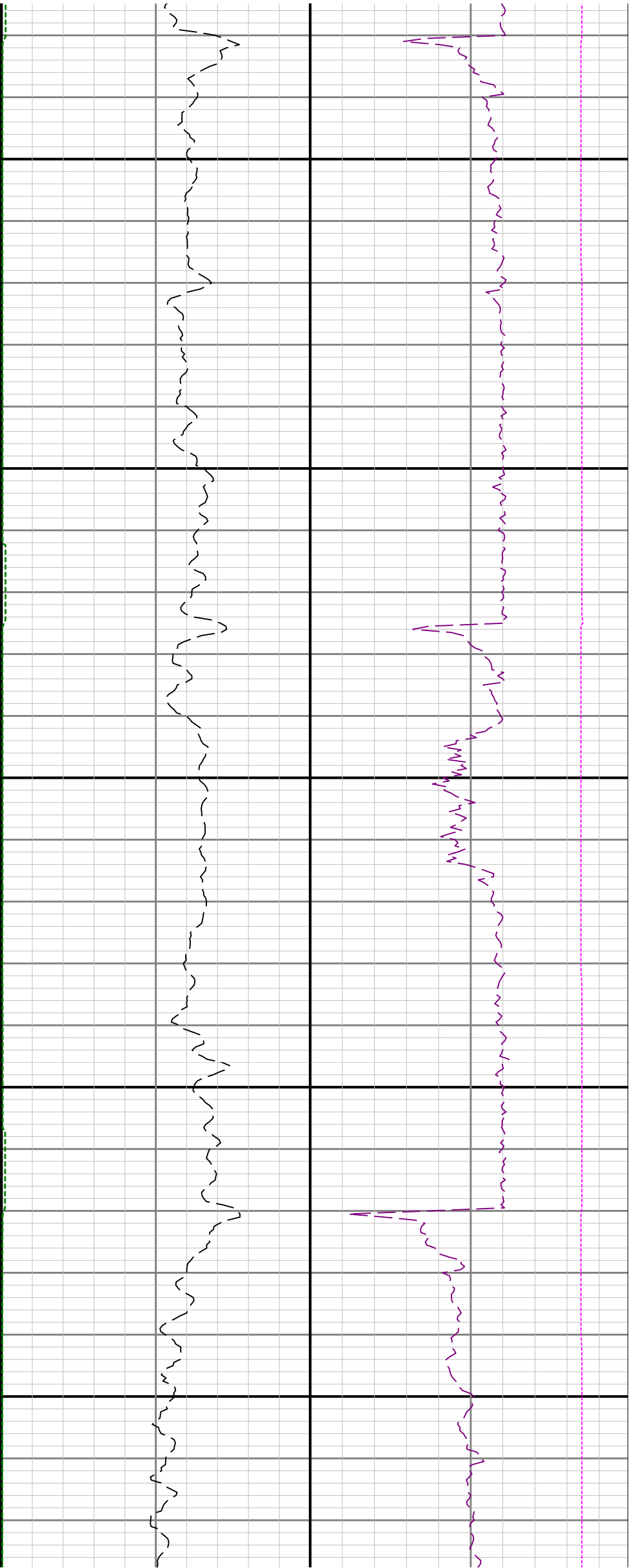
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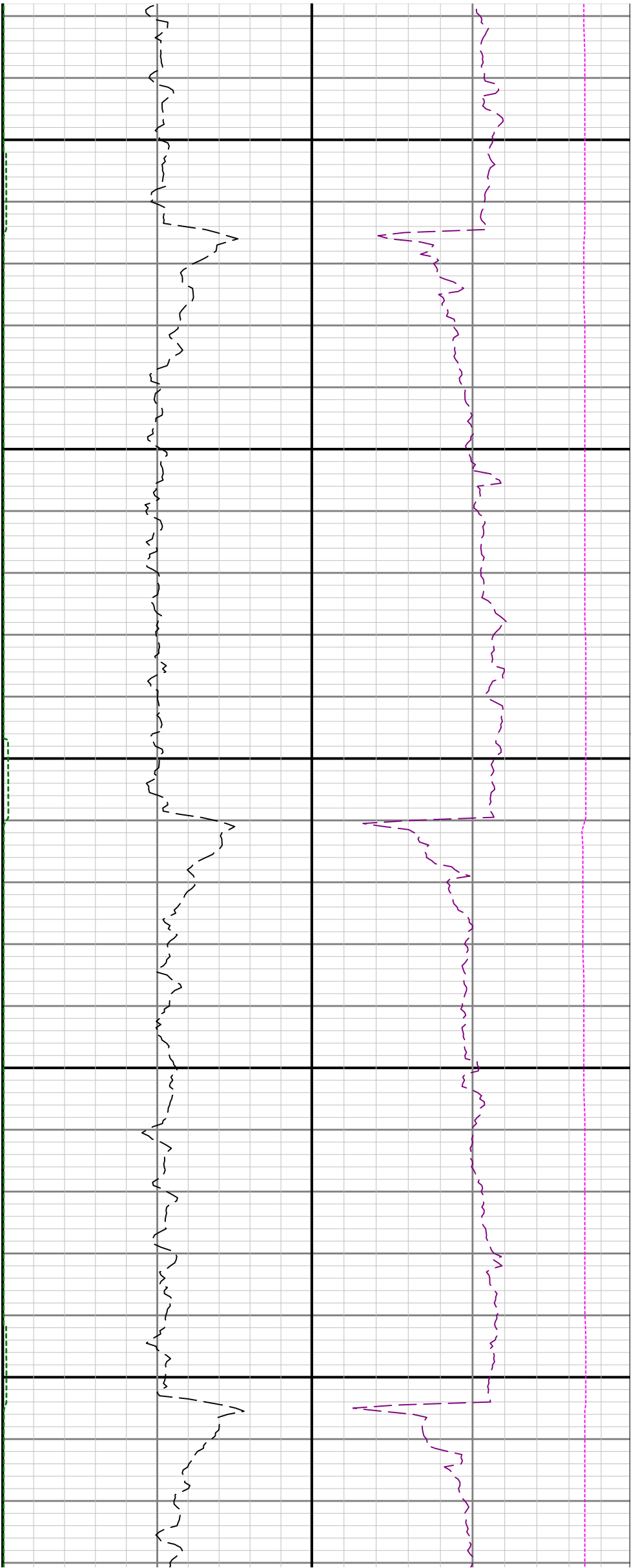




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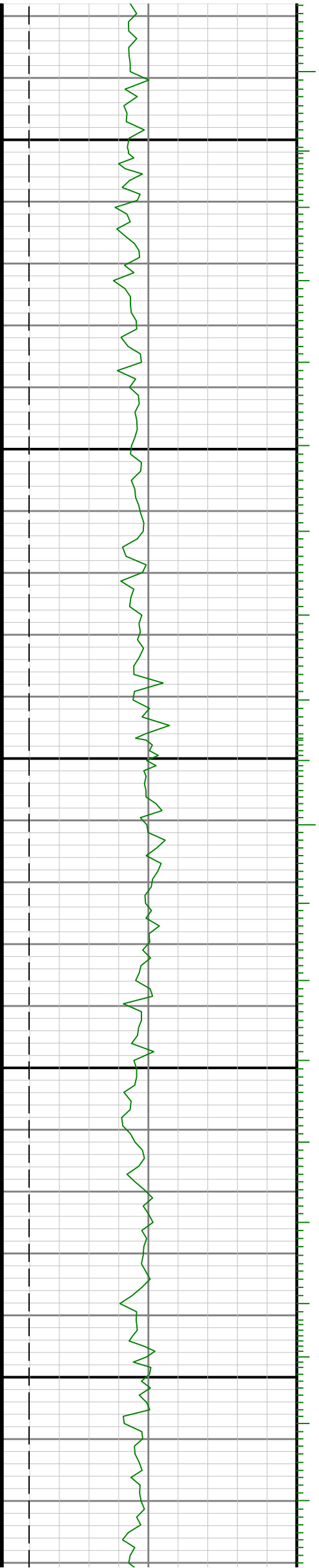
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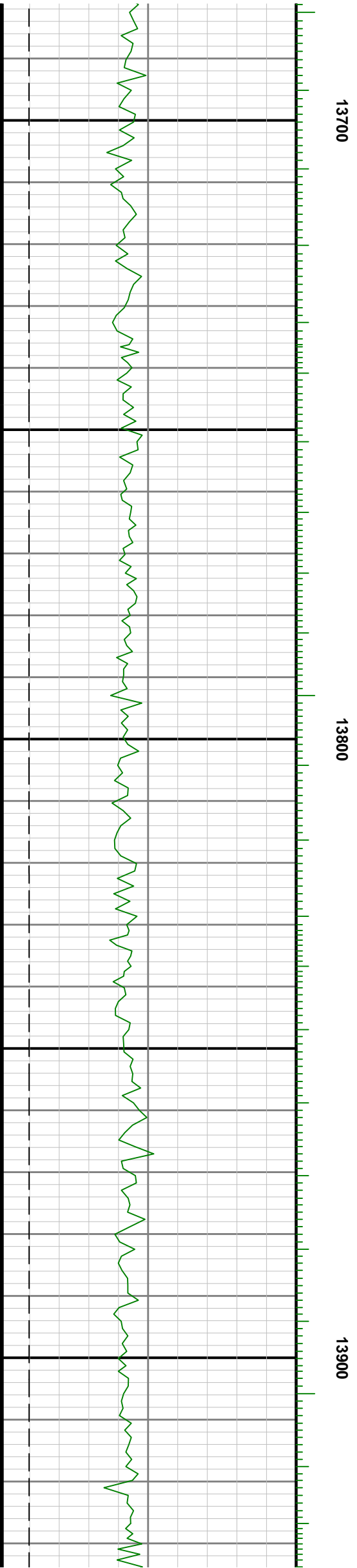
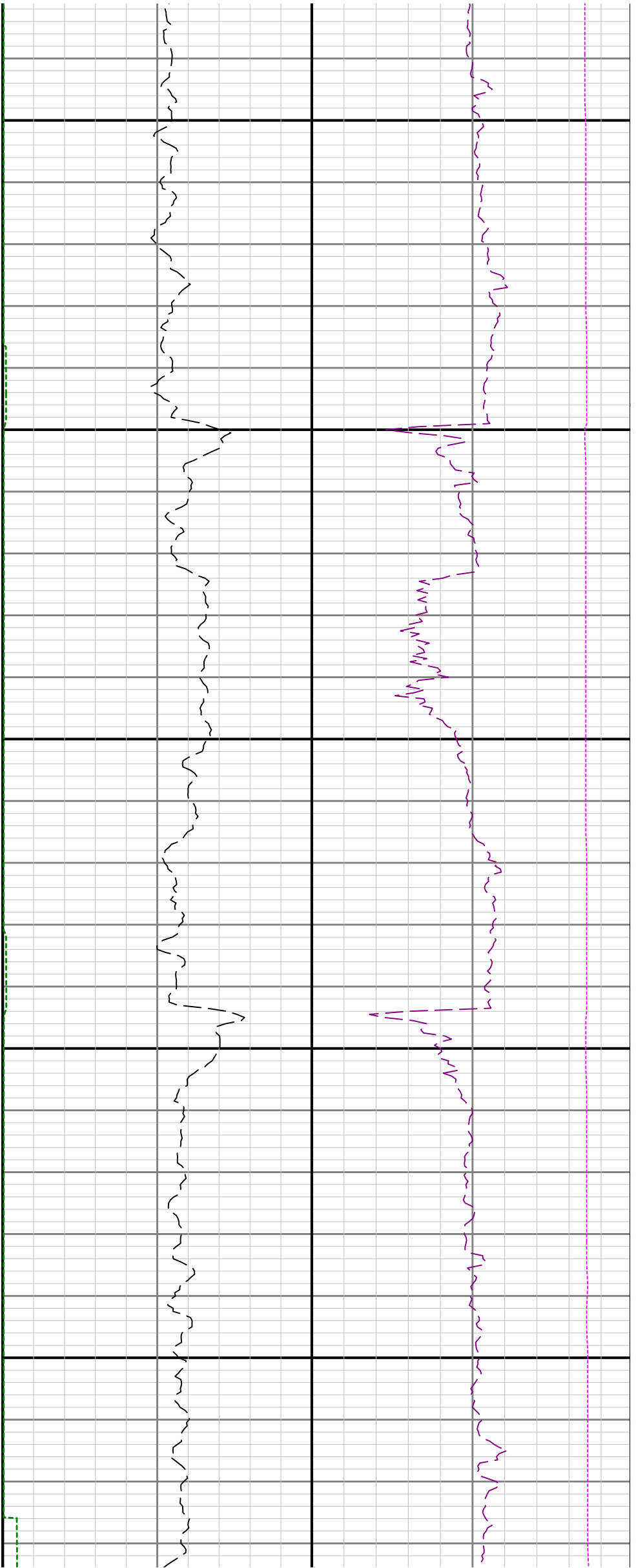
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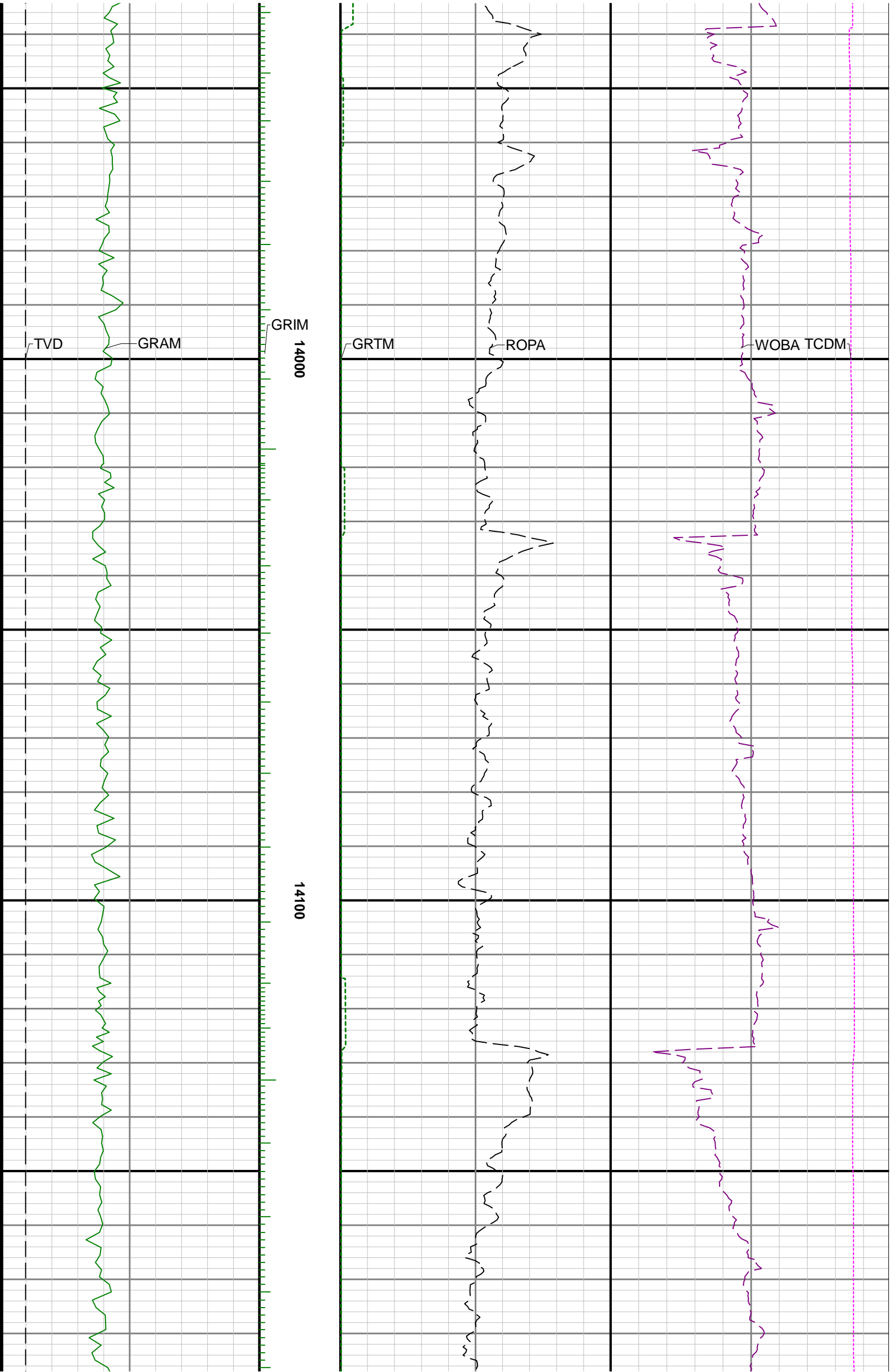


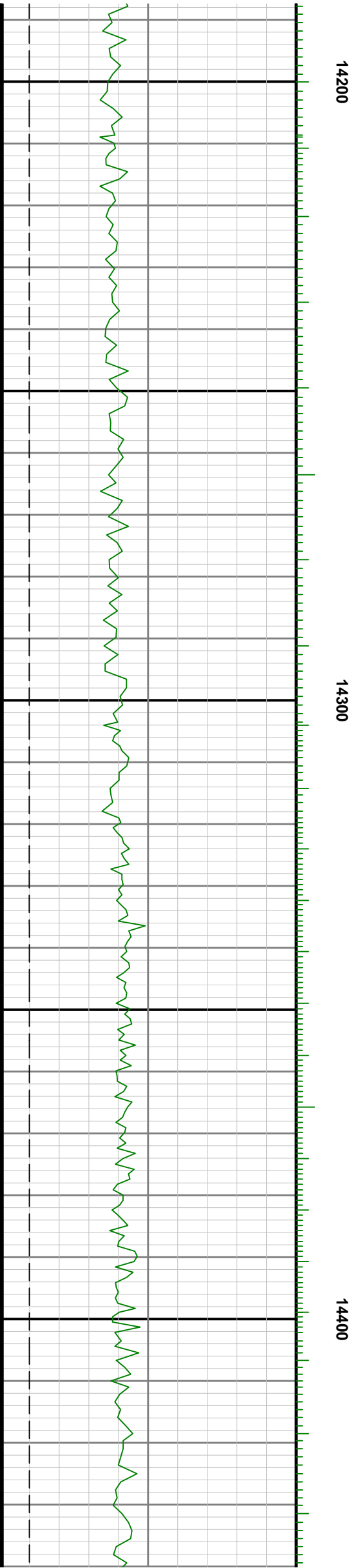
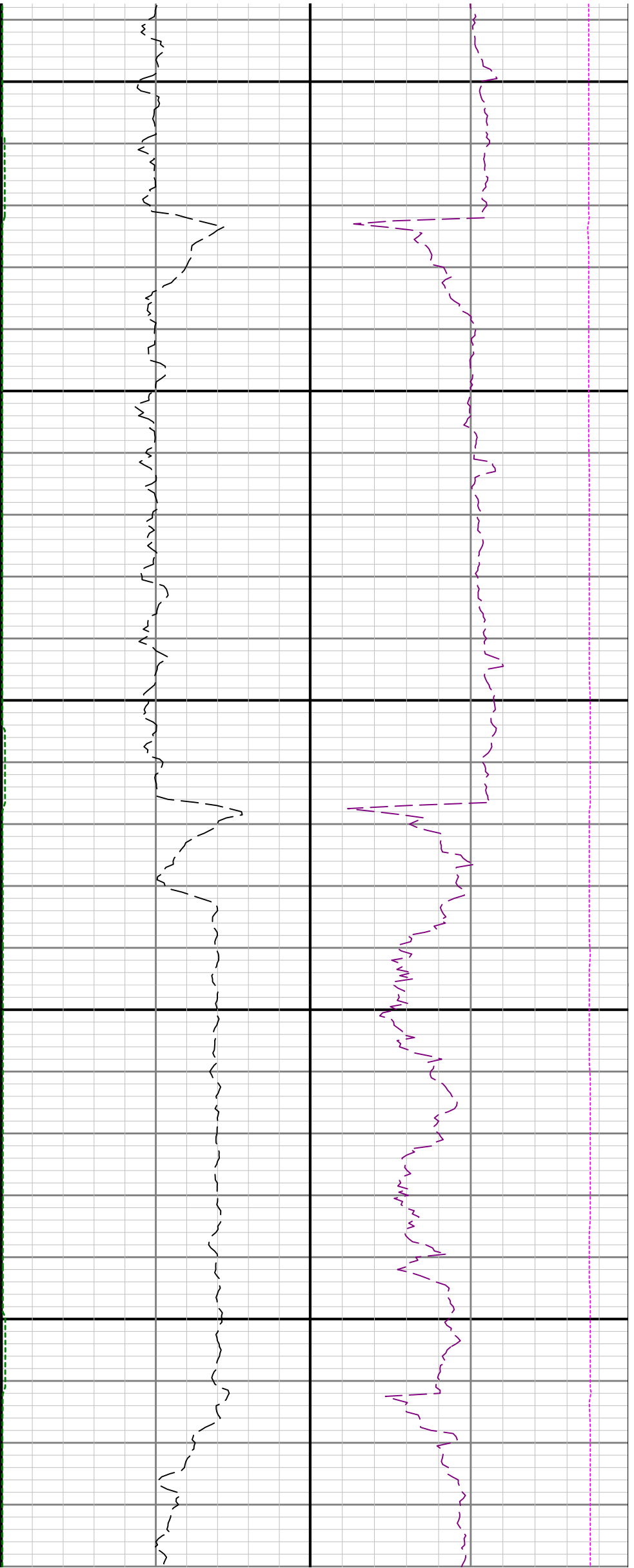
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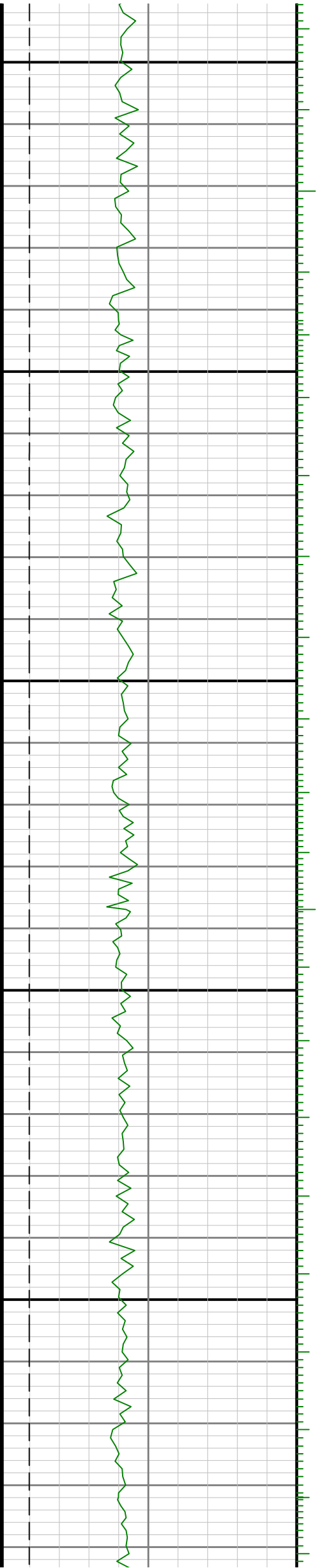
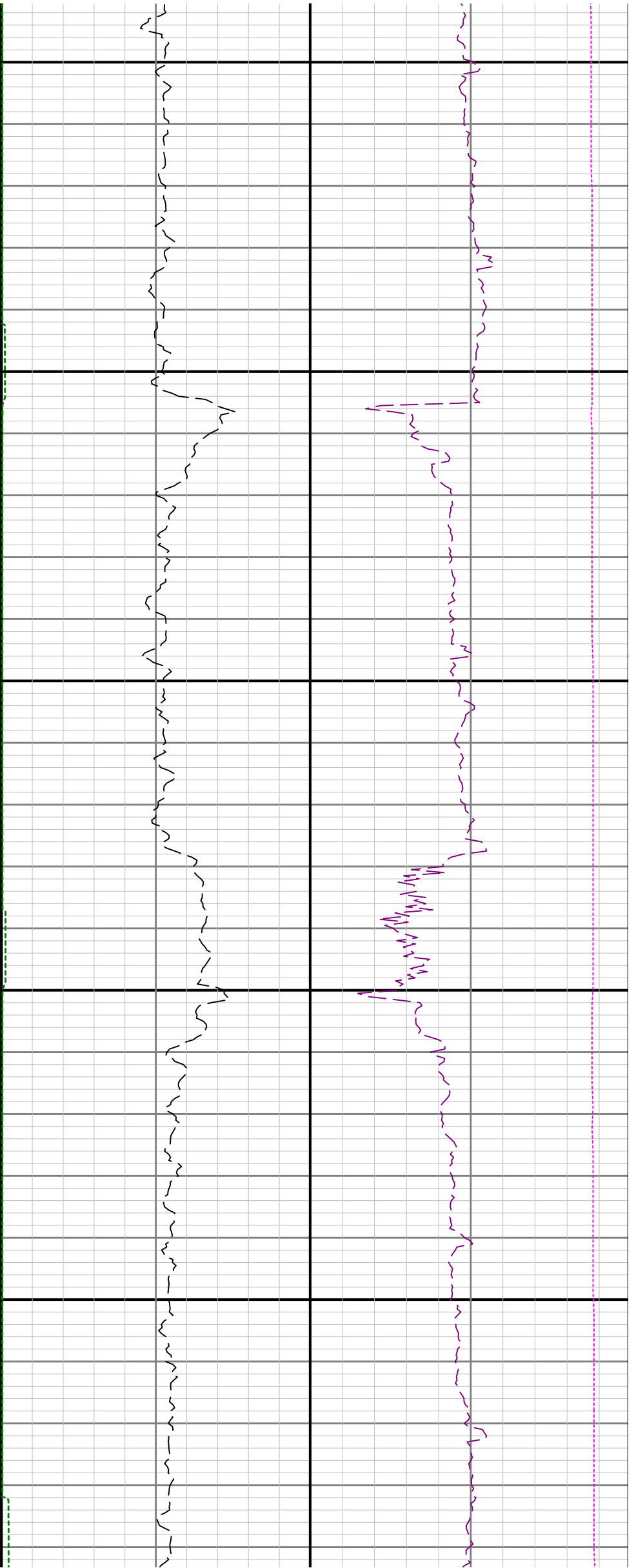
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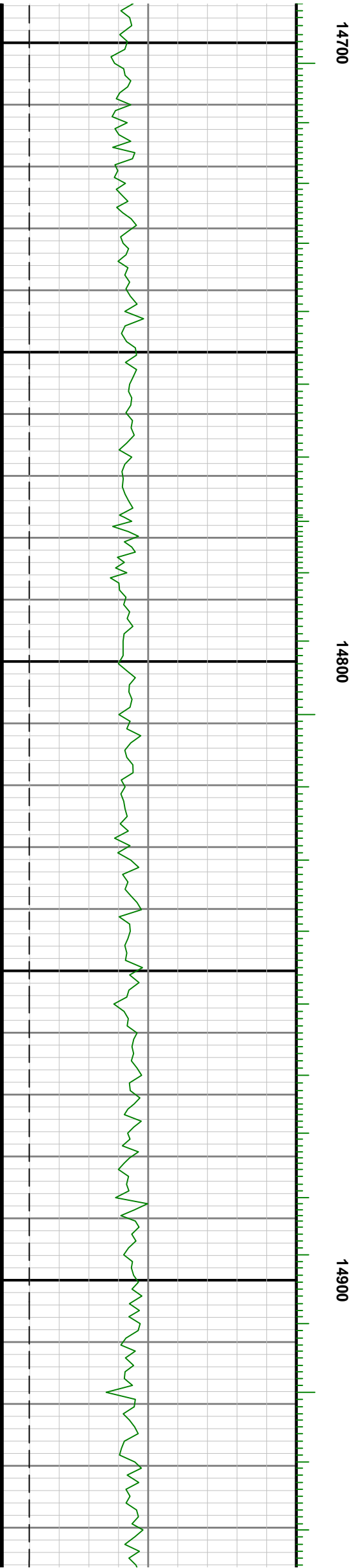
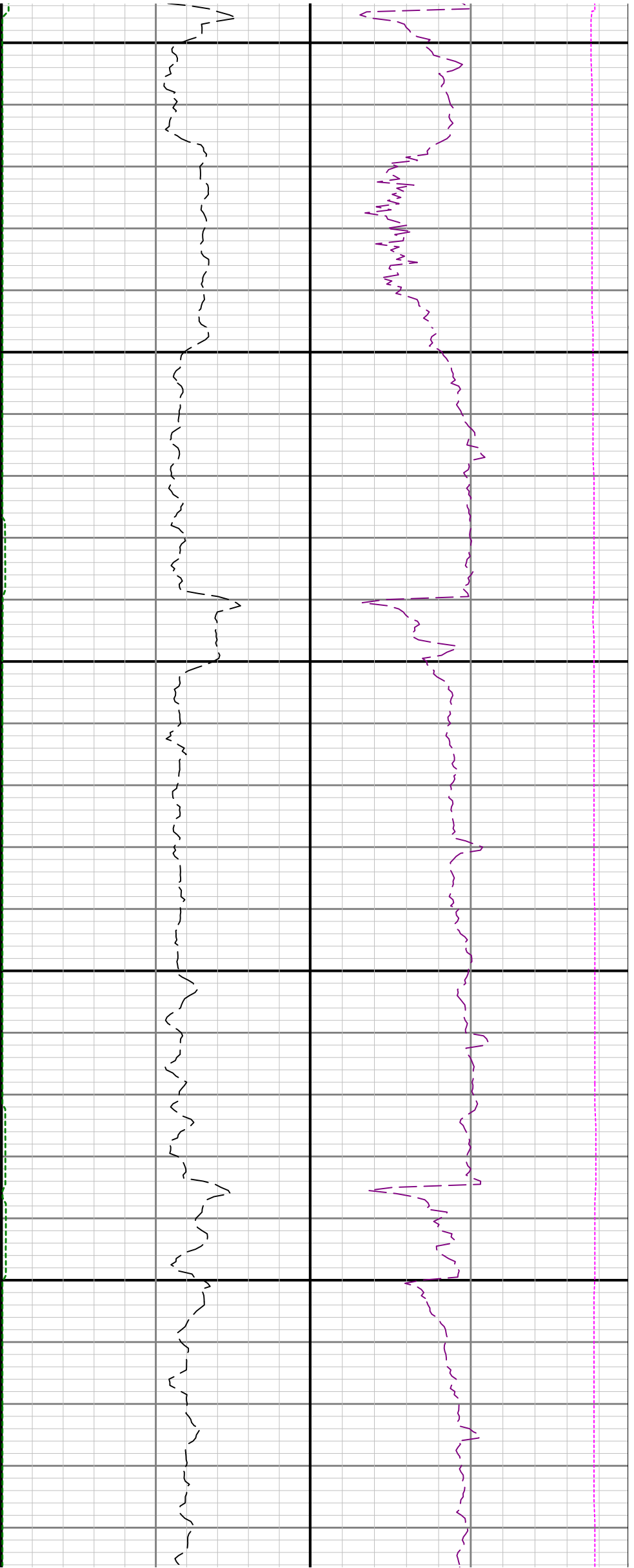


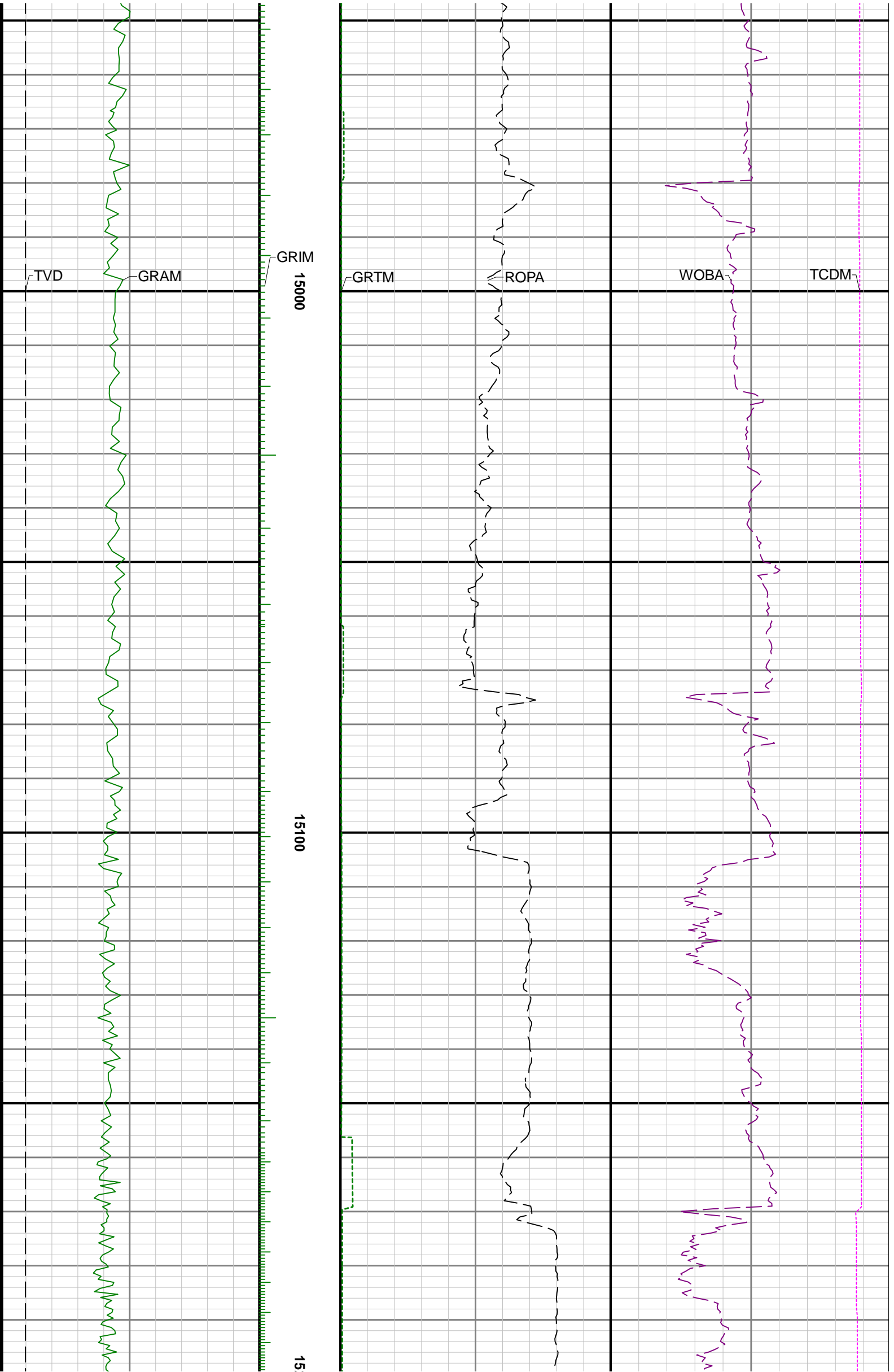


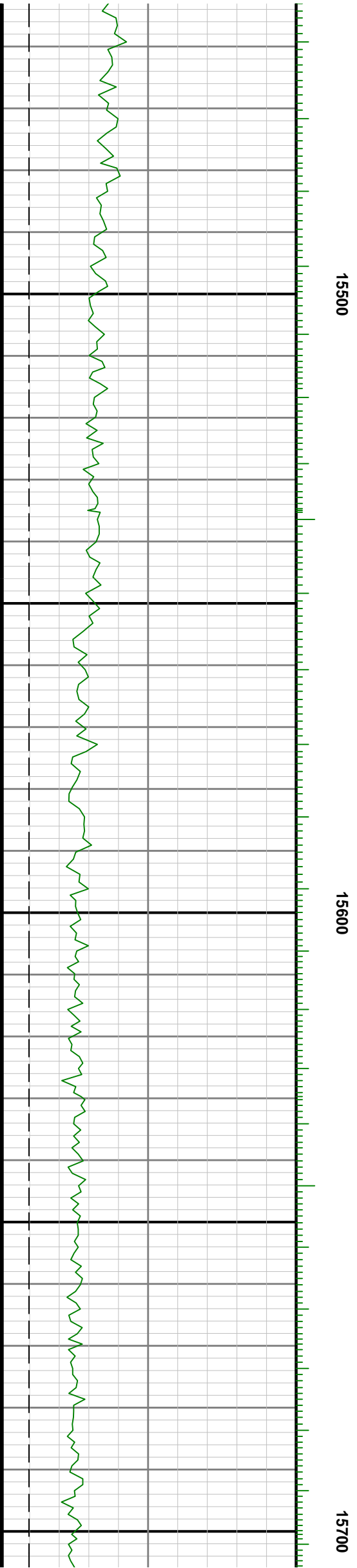
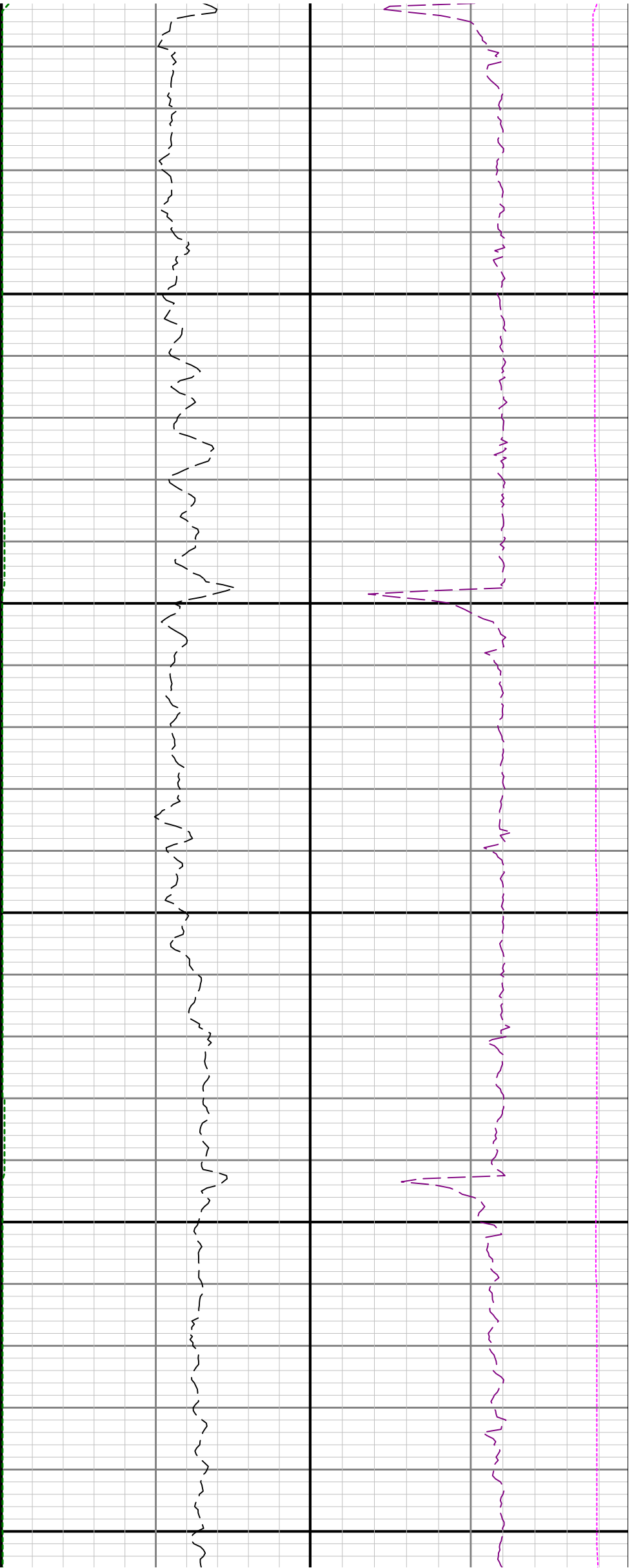


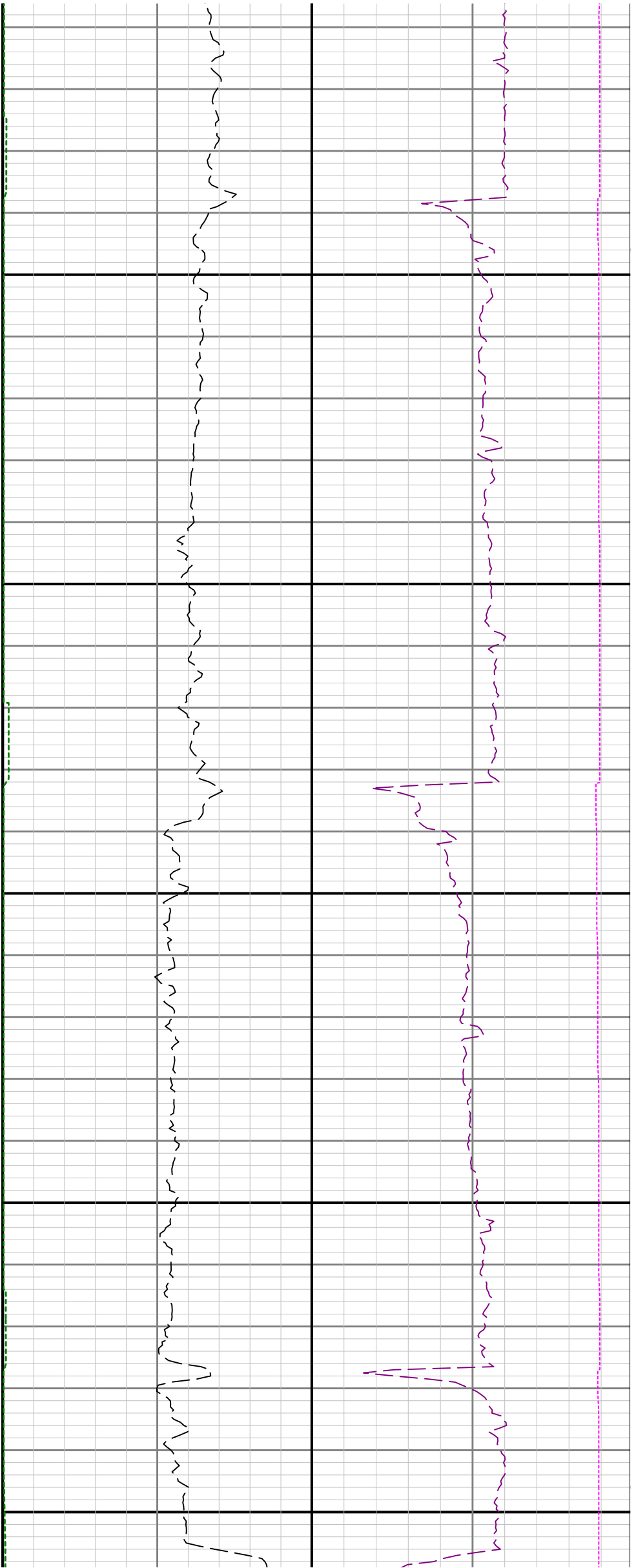




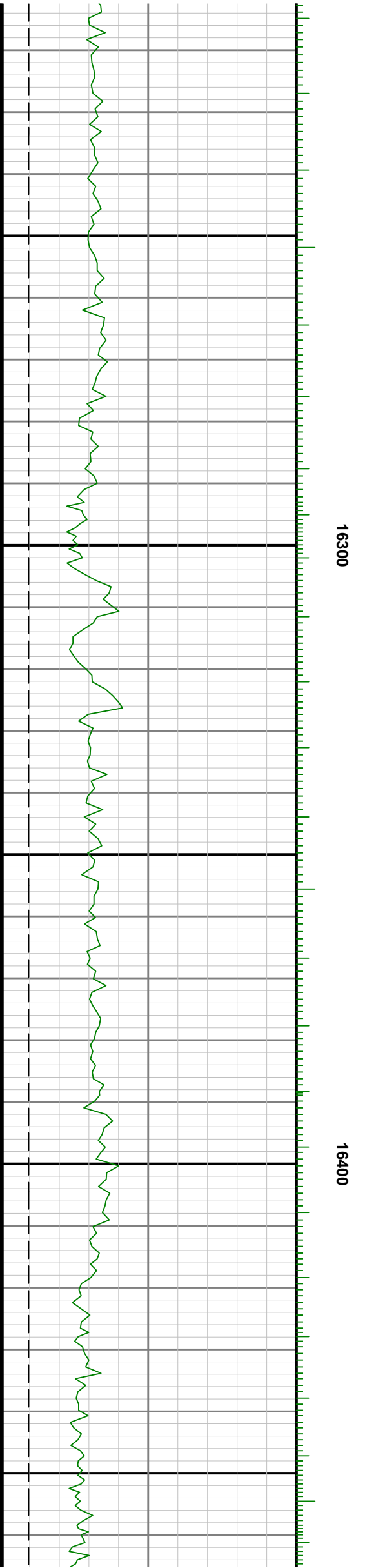
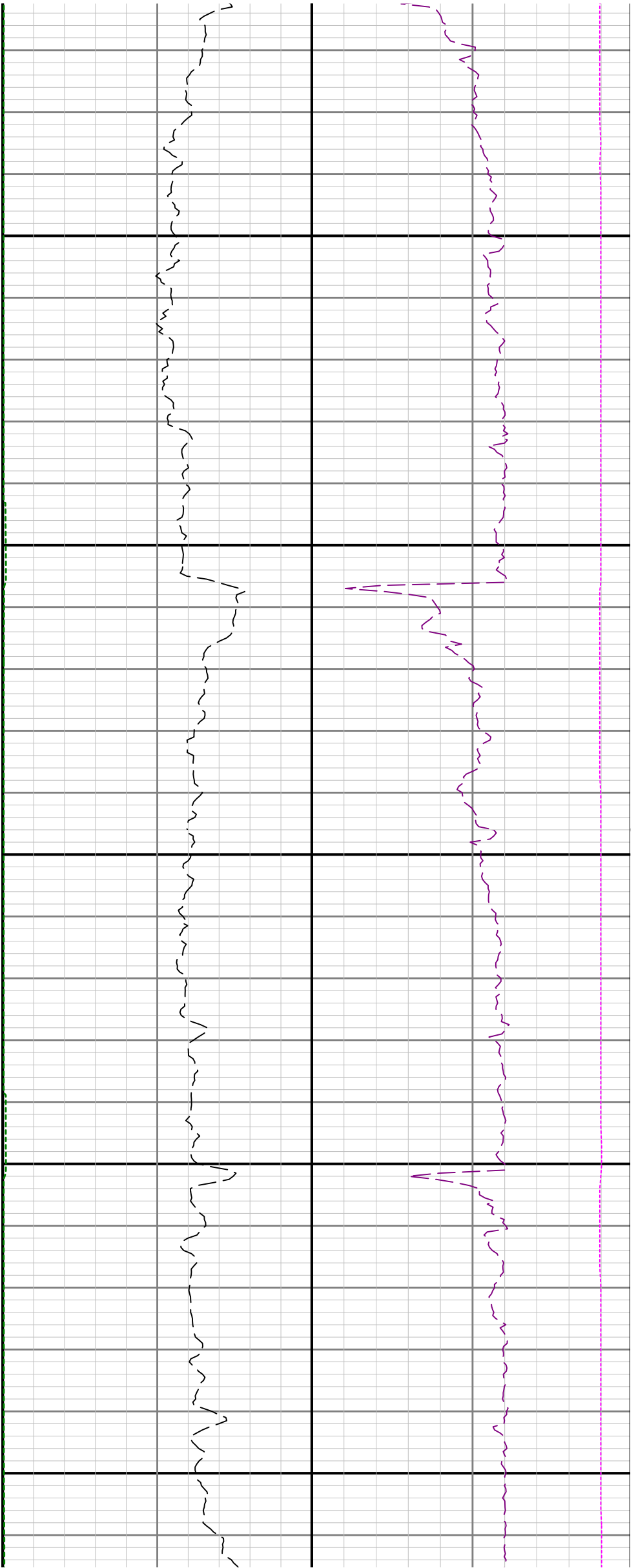


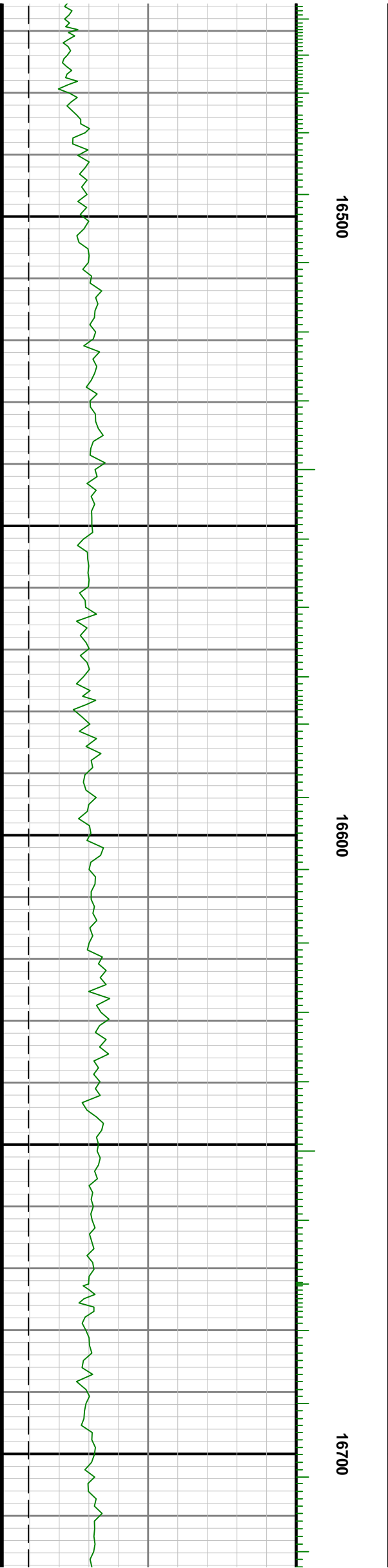
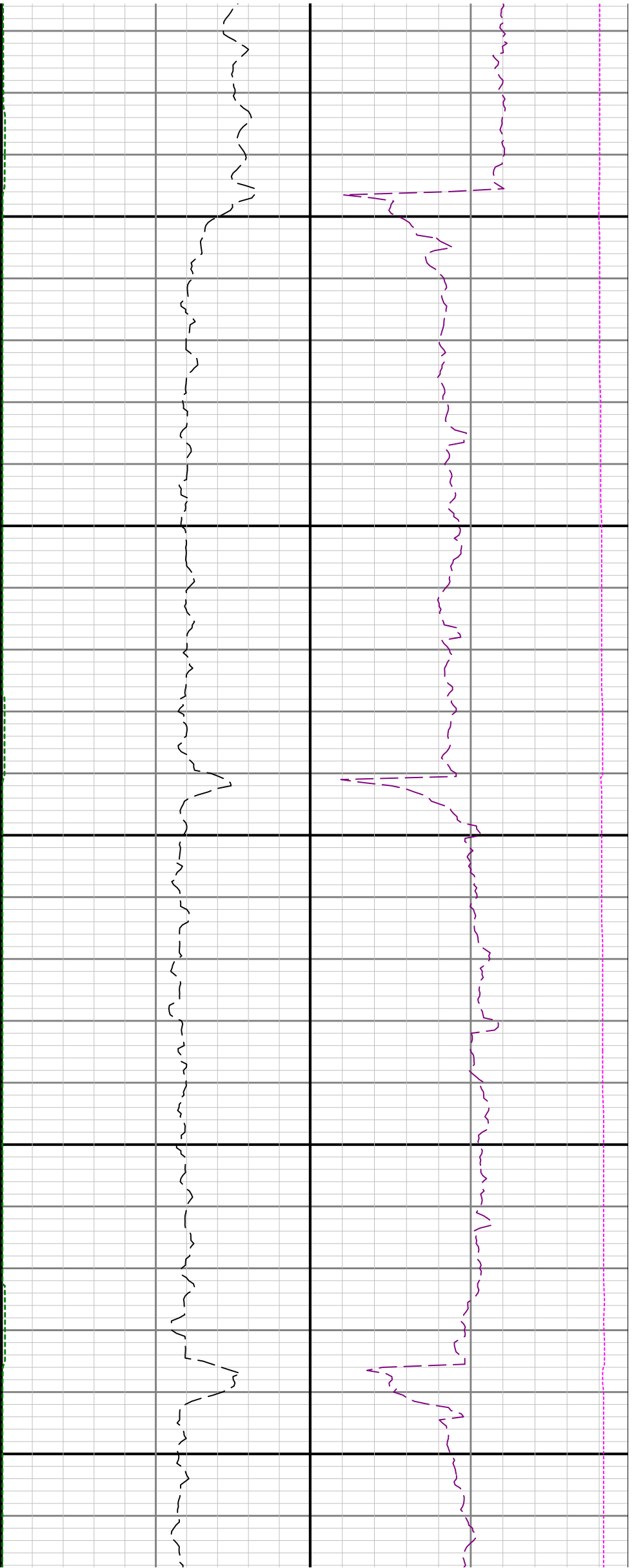


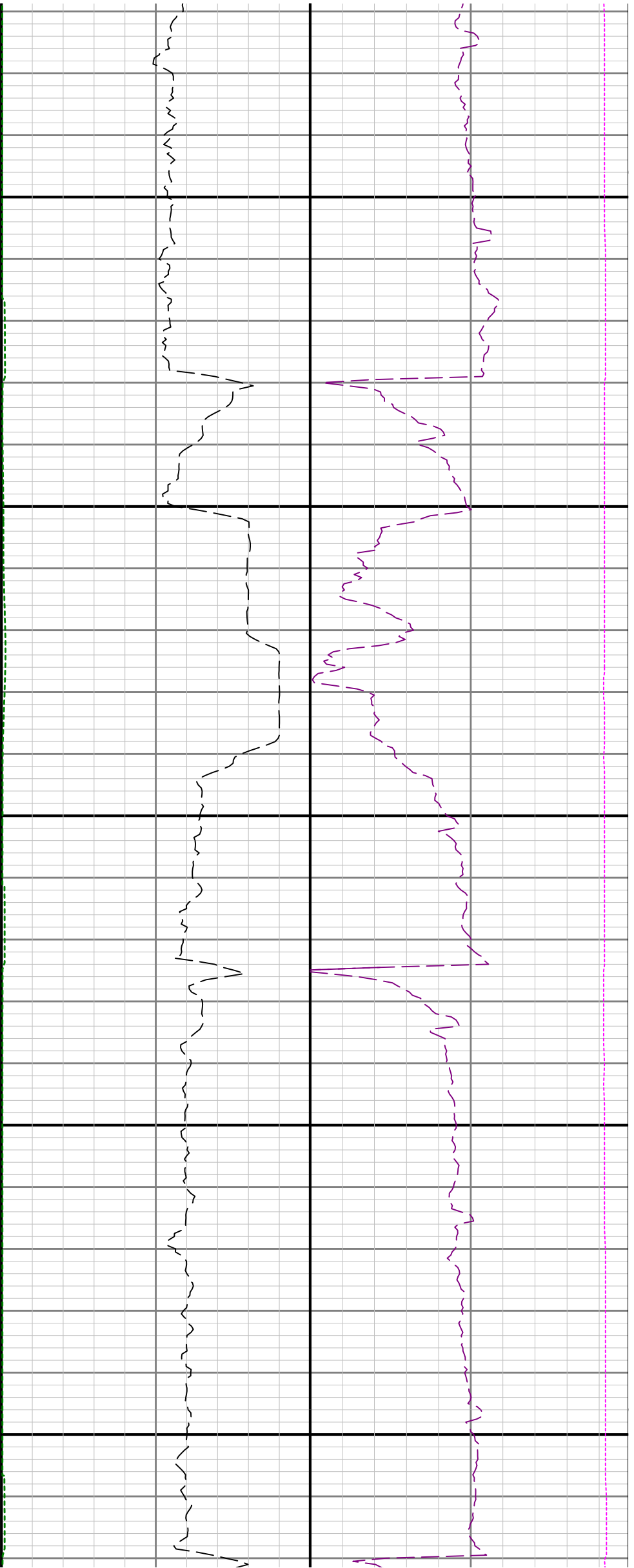






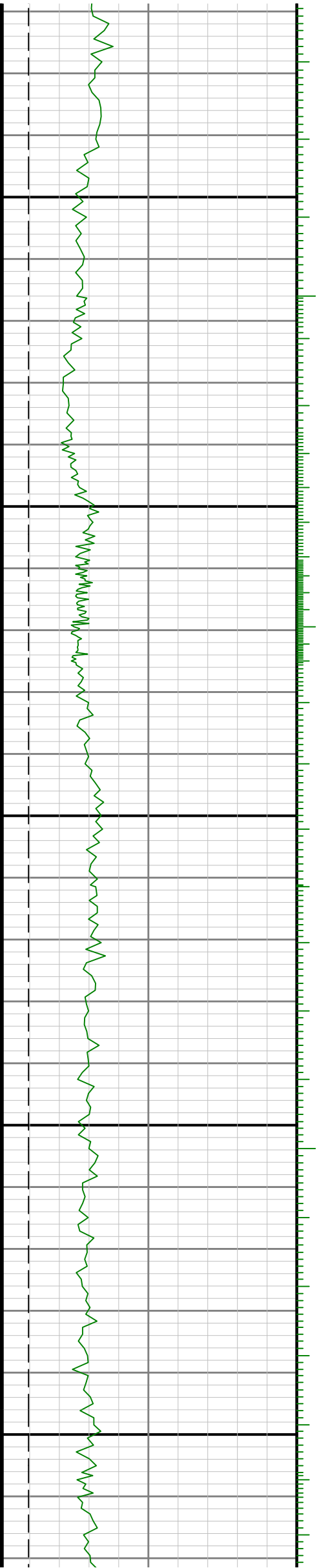


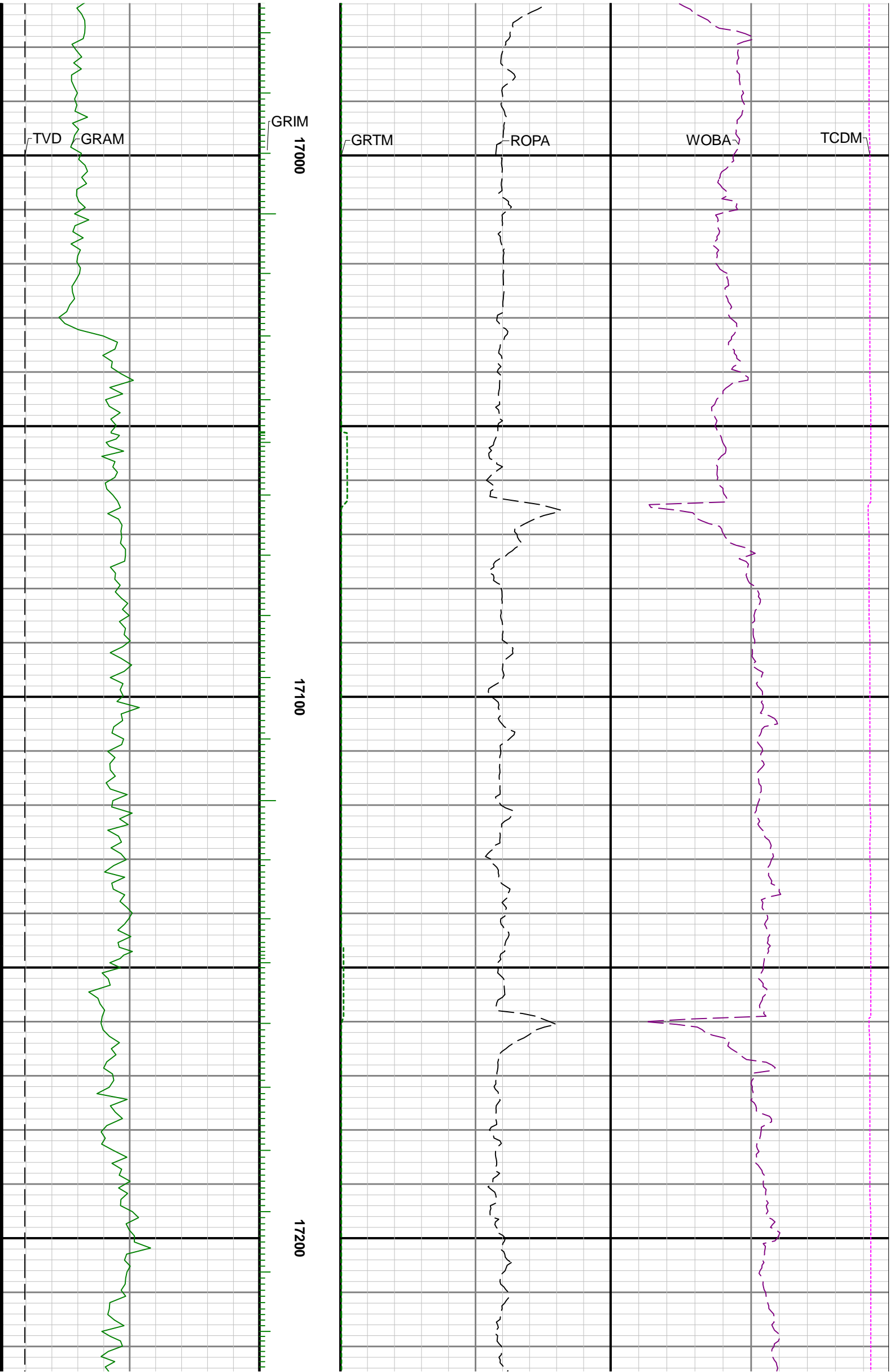


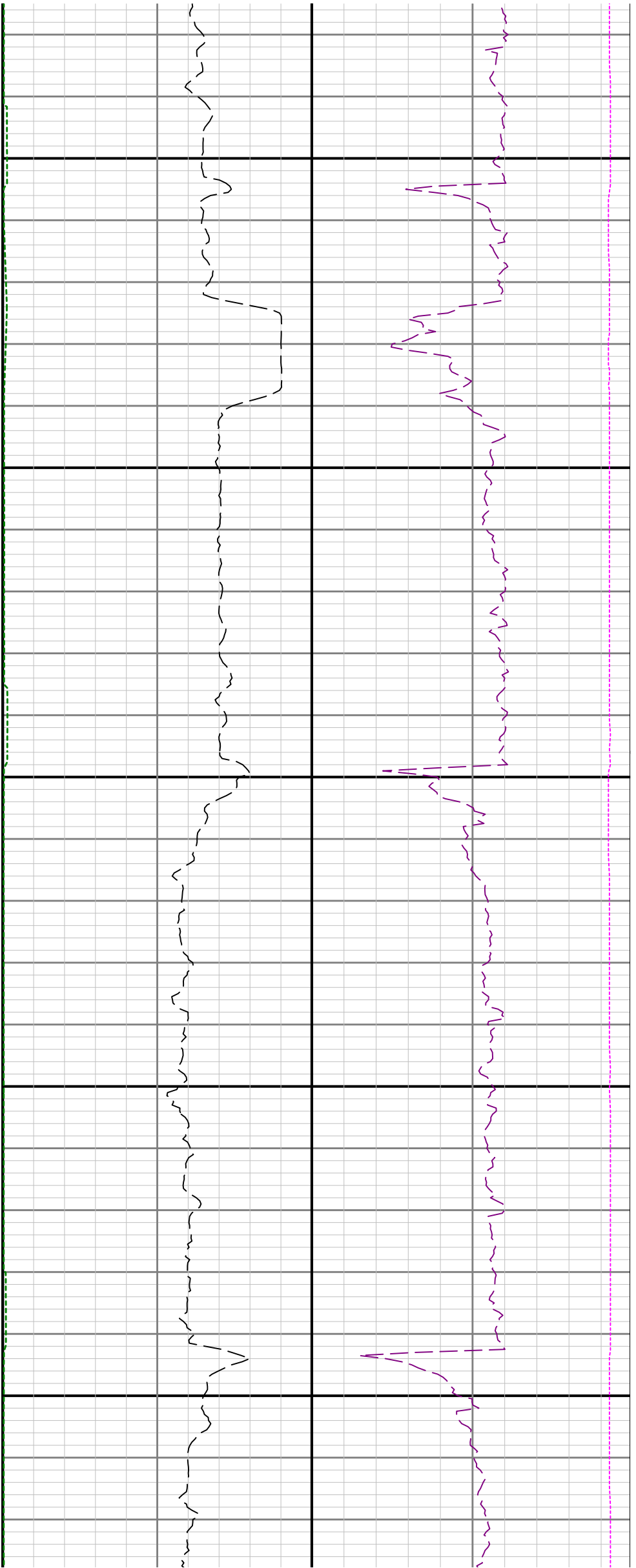


16800

16900







17300

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