



LWD MEMORY LOG

Gamma Ray

Scale:	<div>Company: Noble Energy</div>					
1:240 MD	<div>Well: Hullabaloo Y21-763</div>					
Depth Reference:	<div>Field:</div>		<div>Weld Country</div>			
Driller's Depth	<div>County:</div>		<div>Weld</div>		<div>Country: United States</div>	
Status:	<div>State: Colorado</div>			<div>Other Services:</div>		
Final Print	<div>Surface Location: Latitude: Longitude:</div>			<div>Directional</div>		
API No: 05-123-45236-00						
Job ID: 8739675						
Permanent Datum (P.D.): Ground Level	Elevation: 4912.00 ft	Elev. KB: N/A				
Log Measured From: Rig Floor	Above P.D.	30.00 ft	Elev. DF: 4942.00 ft	Elev. GL: 4912.00 ft		
Dates	Interval Logged			Magnetic Field Reference		
Date From: 2017-10-01	Top: (ft) 2020.00	Azi Reference North: Grid	Dip Angle: (deg)	66.66		
Date To: 2017-10-05	Bottom: (ft) 17477.00	Total Magnetic Field Strength: (nT)	52269			
Spud Date: 2017-09-30		Mag to Reference North Correction: (deg)	7.45 E			
Borehole Record						Casing Record
Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
13.500	30.00	2020.00	9.625	36.00	30.00	2010.00
8.500	2020.00	17477.00				
Mud Record						
Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
Oil Based Mud	2020.00	17477.00	8.500	15457.00	0.56 312.19	89.72 175.50
Acquisition System						
Baker Hughes Cadence	Software Version RTA.1		Other			
PilotStudio	4.1.7763.3		Rig: Contractor: District:	H&P 517 Helmerich & Payne Drilling Co RMA Unit: D&E		

"These interpretations and analyses ("Interpretations") are opinions provided by Baker Hughes Oilfield Operations, Inc ("Baker Hughes"), based upon industry practice, empirical relationships, assumptions and measurements, (many of which may be provided by the customer). The Interpretations are not infallible and may be subject to different opinions. Vjwu."Dcmgt"Jwi jgu"fqgu"pqv"ycttcpv"vjgkt"ceewtce{"eqttgevpguu."qt"eqornvgpguu."qt"vjcv"vjg"ewuvqogtøu"cpflqt"cp{"vjktf"rctv{øu"tgkncpeg"qp"uwej"Kpvgtrtgvcvkqpu"yknn"ceeqornkuj"cp{"rctvkewnct"tguwnvu0"Vjg"ewuvqogt"cuuwogu"hwnn" responsibility for the use of the Interpretations and for decisions based thereon and the customer agrees to release, defend and indemnify Baker Hughes, its parent, subsidiaries and affiliated or related entities, and subcontractors, together with its and their officers, directors, employees, agents and invitees against, any and all claims, losses, damages, or expenses sustained by the customer or any third party arising out of reliance upon or use of the Interpretations, without regard to the cause(s) thereof, including without limitation any form of negligence on the part of Baker Hughes. Unless other contract terms have been agreed to by the parties, each party's liabilities and qdnkicvkqpu"ujcnn"dg"iqxgtpgf"d{"Dcmgt"Jwi jgu"Kpeqtrqtcvgføu"Yqtnfykfg"Vgtou"cpf"Eqpfkvkqpu0\$"

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	Rotary Steerable	2020.00	14238.00	2020.00	14251.00	2017-10-01 08:57	2017-10-03 20:21	50.60
2	2	8.500	PDC	3.00	Rotary Steerable	14238.00	17464.00	14251.00	17477.00	2017-10-04 12:21	2017-10-05 06:15	18.89

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Adam Schlenz	2017-09-29	2017-10-05	Mark Herpin	2017-09-29	2017-10-05	Mohammad Odetallah	2017-10-04	2017-10-05

Mud Properties Record

[illegible]

2017-10-01 02:00	1	2020.00	Oil Based Mud	9.2	13	N/A	17.3	73.3/20.3	Active Pit	20300	0.00
2017-10-01 13:00	1	2484.00	Oil Based Mud	9.1	12	N/A	15.5	74/26	Active Pit	22500	0.00
2017-10-02 02:00	1	6655.00	Oil Based Mud	9.0	11	N/A	16.0	75/25	Active Pit	25000	0.00
2017-10-02 13:00	1	8429.00	Oil Based Mud	9.2	12	N/A	16.0	74.3/25.7	Active Pit	22500	0.00
2017-10-03 02:00	1	11270.00	Oil Based Mud	9.2	13	N/A	17.0	74.5/25.5	Active Pit	23000	0.00
2017-10-03 13:00	1	13192.00	Oil Based Mud	9.0	9	N/A	17.0	76.5/23.5	Active Pit	20000	0.00
2017-10-04 02:00	2	14251.00	Oil Based Mud	9.2	11	N/A	17.0	75.8/24.2	Active Pit	20500	0.00
2017-10-04 13:00	2	14389.00	Oil Based Mud	9.1	11	N/A	18.0	76.5/23.5	Active Pit	19000	0.00
2017-10-05 02:00	2	16316.00	Oil Based Mud	9.0	10	N/A	17.0	77/23	Active Pit	22500	0.00

Mud Resistivity Record				Surface				Downhole		
Date / Time	Run No.	Measured Depth (ft)	Surface Temp (degF)	Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)	BHCT (degF)	Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
2017-10-02 15:25	1	8902.00	N/A	100.000	N/A	N/A	250.0	100.000	N/A	N/A
2017-10-04 13:23	2	14452.00	N/A	100.000	N/A	N/A	260.0	100.000	N/A	N/A

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	ATC_SU	13867780	Near Bit VSS	5.93	6.73	7.000	4.330
1	ATC_SU	13867780	Near Bit Inclination	5.93	6.73	7.000	4.330
1	ATC_MWD	14131212	Gamma (single)	2.20	12.35	7.000	3.250
1	ATC_MWD	14131212	Directional (mag)	12.27	22.42	7.000	3.250
2	ATC_SU	12099238	Near Bit VSS	5.93	6.73	7.000	4.330
2	ATC_SU	12099238	Near Bit Inclination	5.93	6.73	7.000	4.330
2	ATC_MWD	14191725	Gamma (single)	2.74	12.90	7.000	3.250
2	ATC_MWD	14191725	Directional (mag)	12.26	22.42	7.000	3.250

Service and Tool Mnemonics		
Mnemonic	Name	Description
ATC_SU	ATC_SU	Auto Trak Curve Steering Unit
ATC_MWD	ATC_MWD	Auto Trak Curve MWD
ATC_LCPM	ATC_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 runs 1 and 2 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 2020 to 17477 feet MD (2020 to 7129 feet TVD).
3	VOA { aUaA] a^} oCUC Dazn A!^A^} cA/A A-CAUC A!A@A^•d { ^!qA^~^•dA

Remarks				
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	14251.00	8.500	1	The interval from 14238 to 14251 feet MD (7098 feet TVD) was logged more than 10 hours after being drilled due to, a trip out of the hole to pick up a new rotary steerable assembly.
2	17477.00	8.500	2	The interval from 17464 to 17477 feet MD (7129 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	OnTrak - Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	OnTrak - Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	OnTrak - Gamma Ray - Time Since Drilled - Memory	min
TCDM	Downhole Temperature	degF



Company

Well

Interval

Created

Noble Energy
Hullabaloo Y21-763

Date From: 2017-10-01 08:57:24

Date To: 2017-10-05 06:14:31

Created 2017-10-05 18:02:59

Top: 2020.00

Bottom: 17477.00

Gamma Ray - Apparent 0.5 ft Average GRAM
0 300

API

True Vertical Depth TVD

7500 6500
ft

MD 1:240 feet

Depth Averaged ROP 3 ft Average ROPA
1000 0

ft/h

Gamma Time Since Drilled GRTM

0 600
min

Weight On Bit, Average 1 ft Average WOBA
0 50

klb

Downhole Temperature TCDM

0 300
degF

2000

9 5/8" Casing

2100

GRAM

GRIM

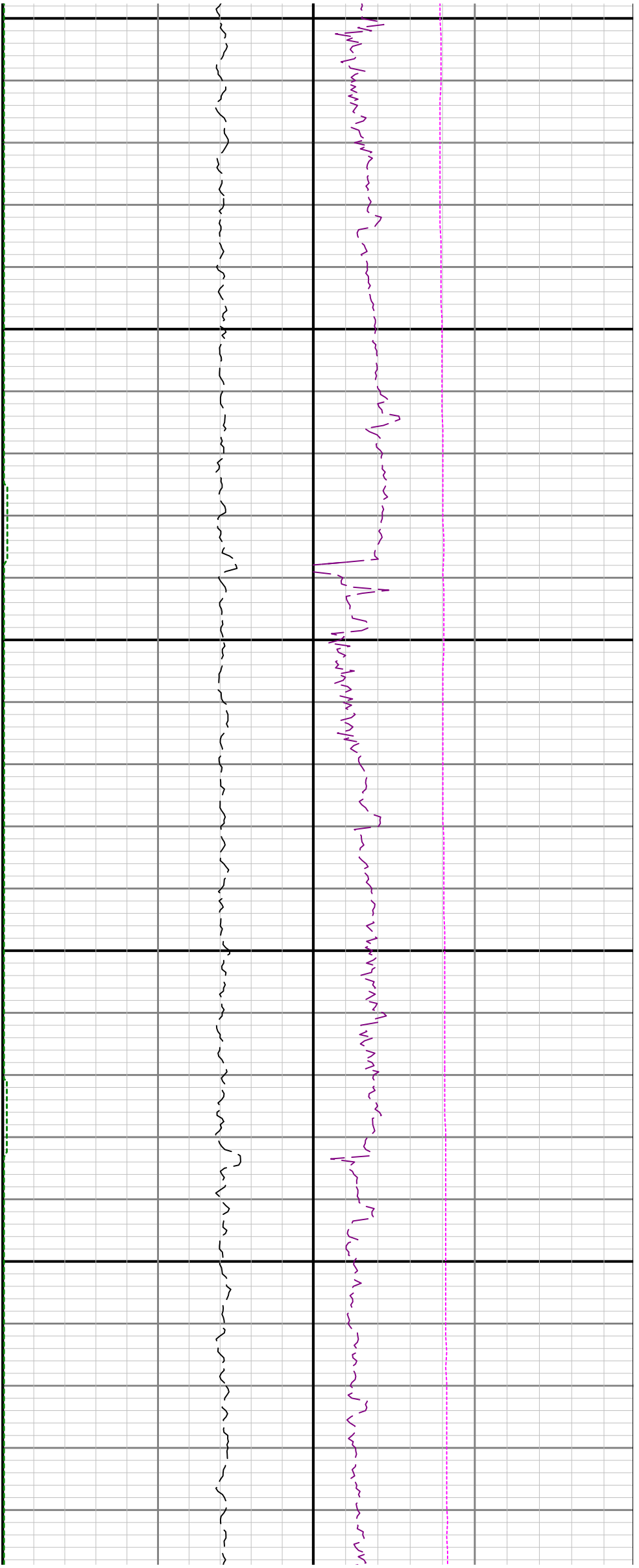
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GRTM

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WOBA

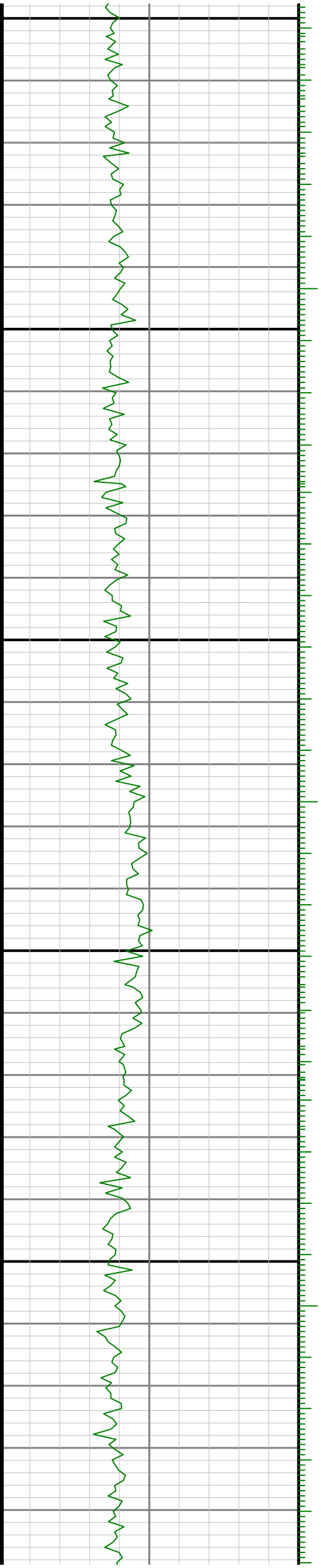
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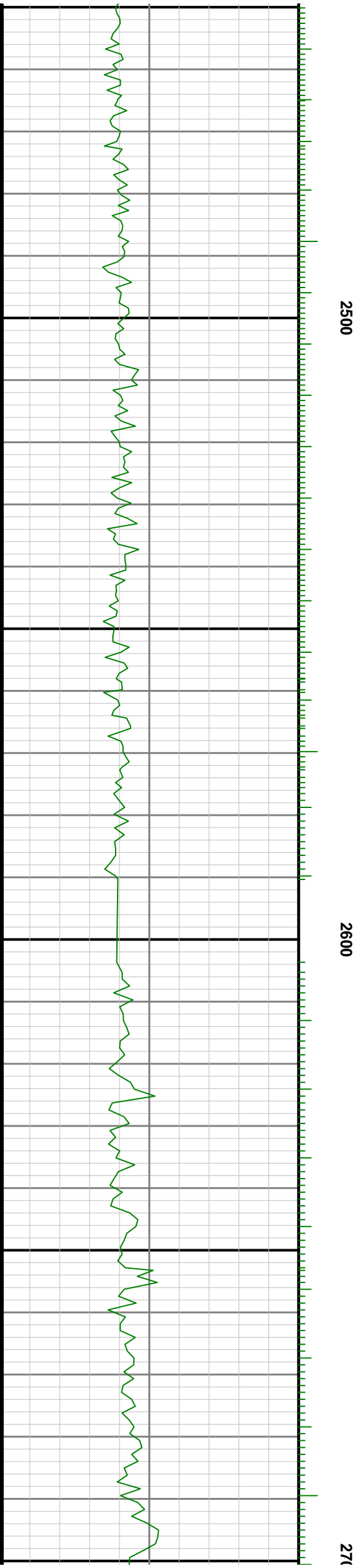
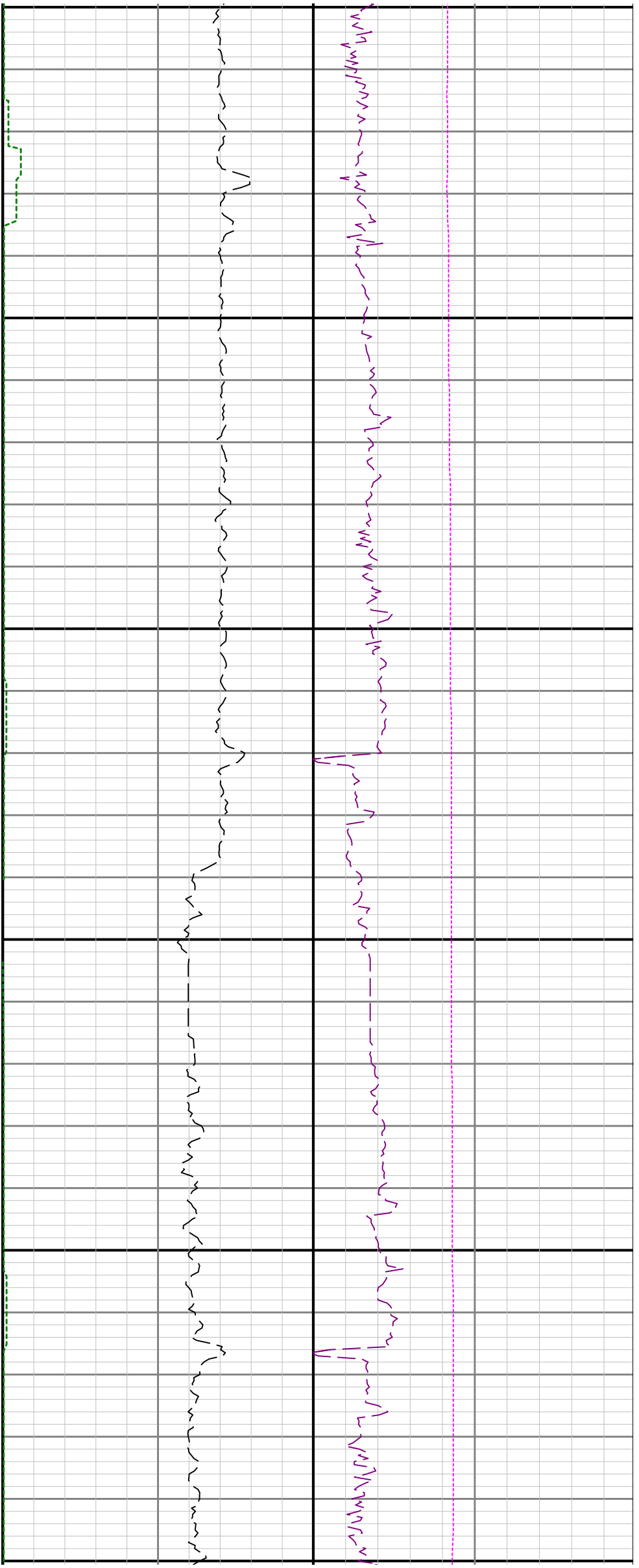


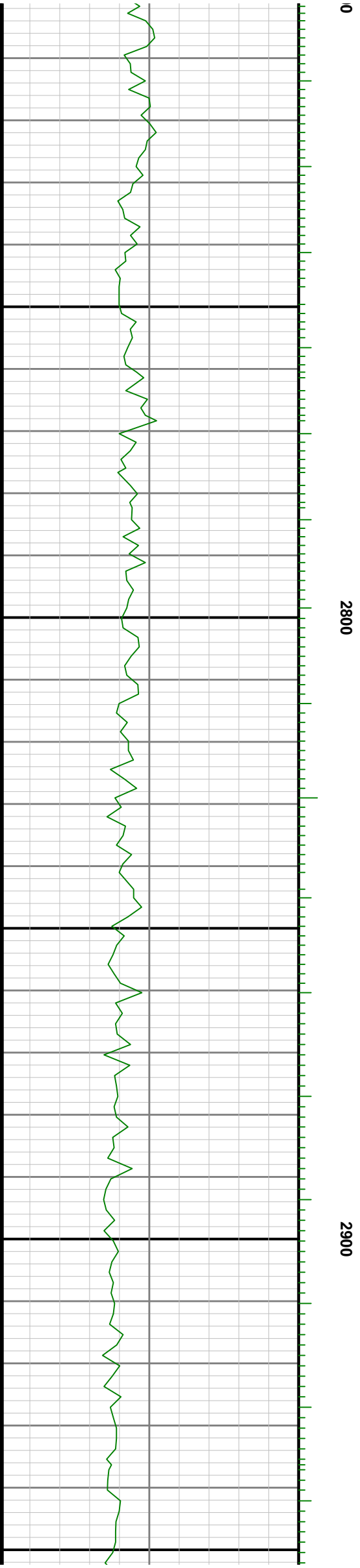
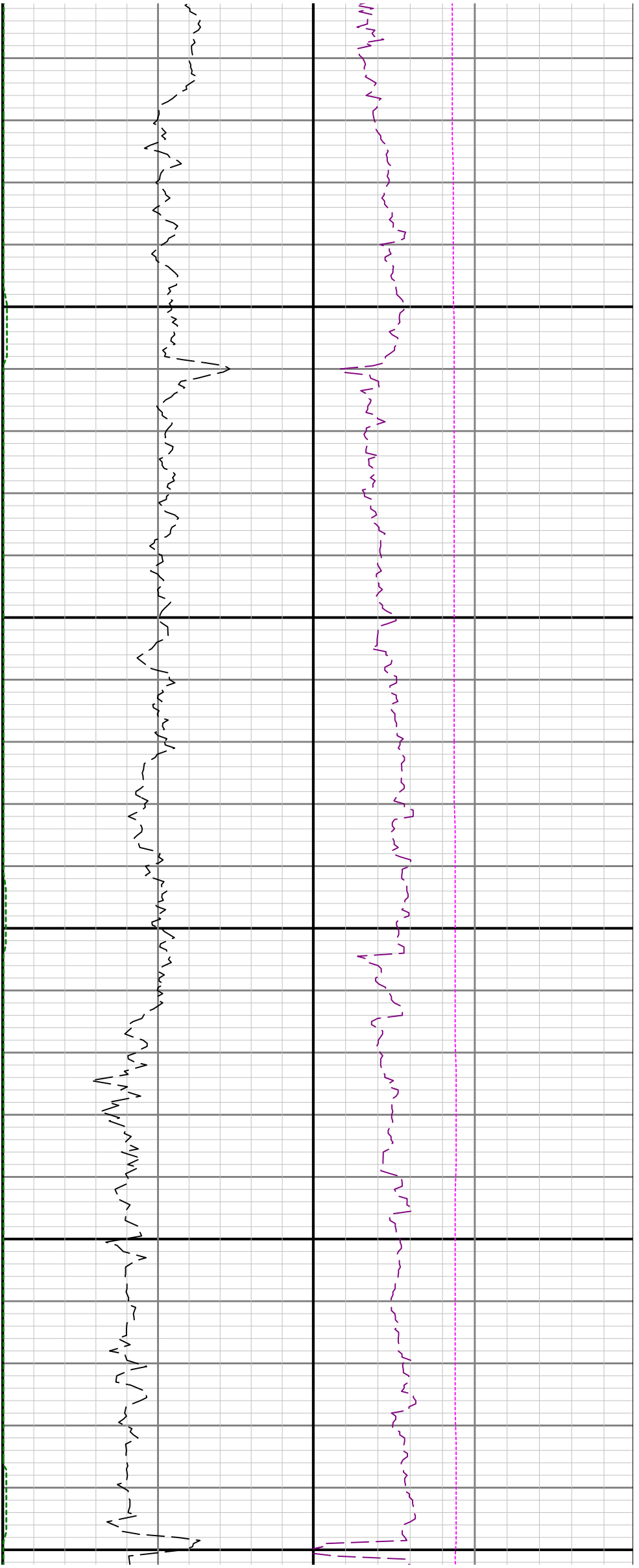
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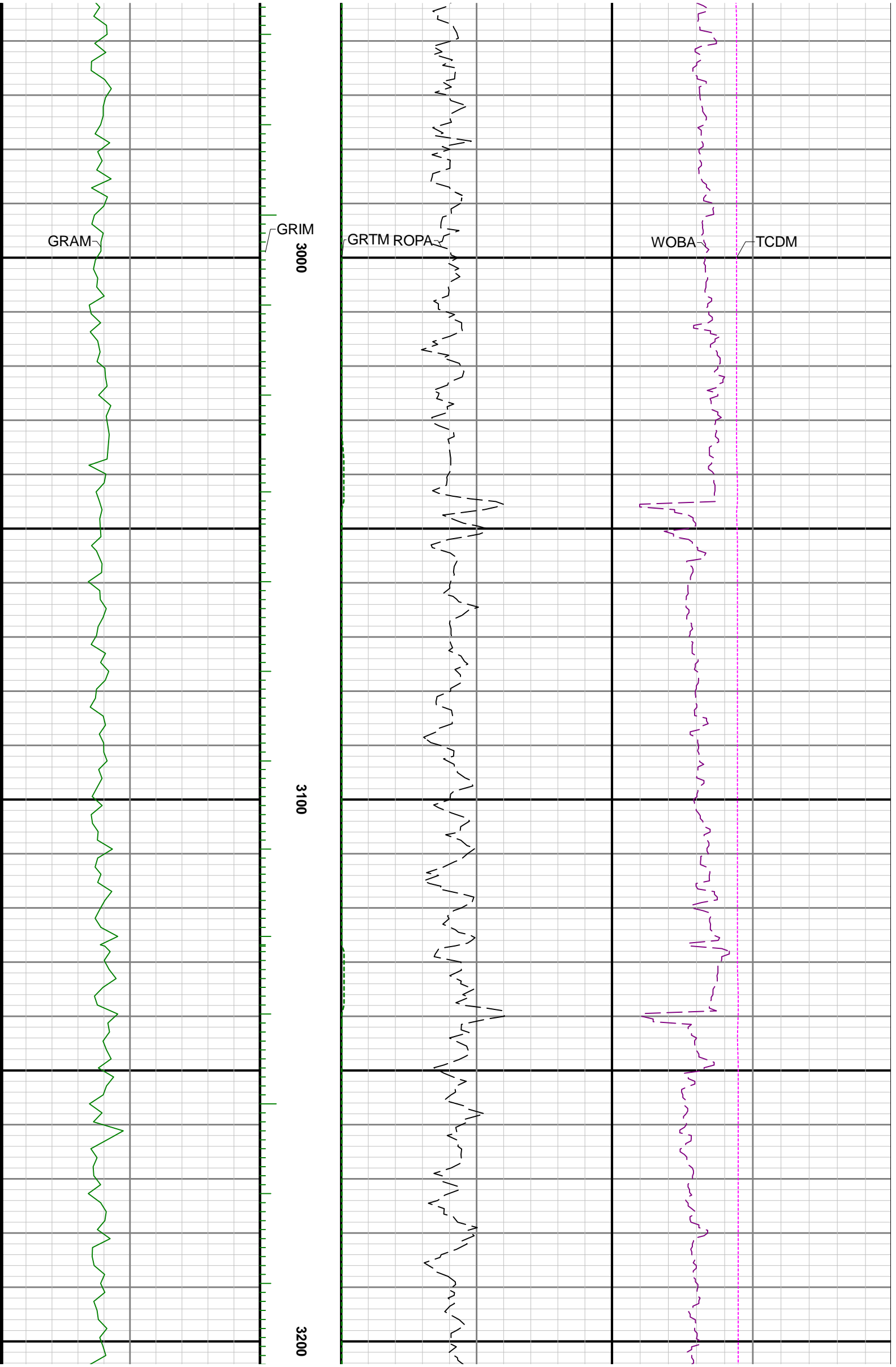
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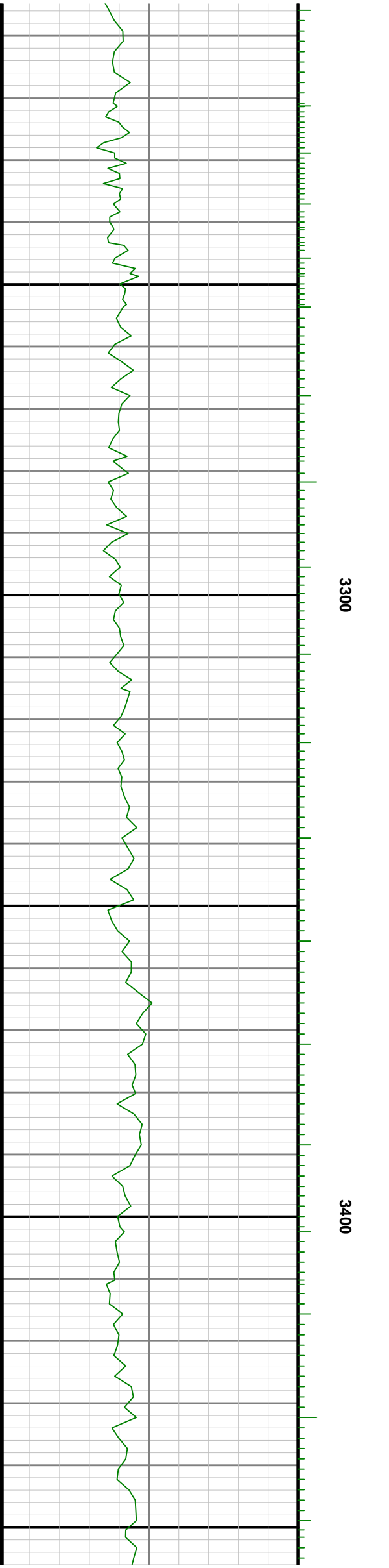
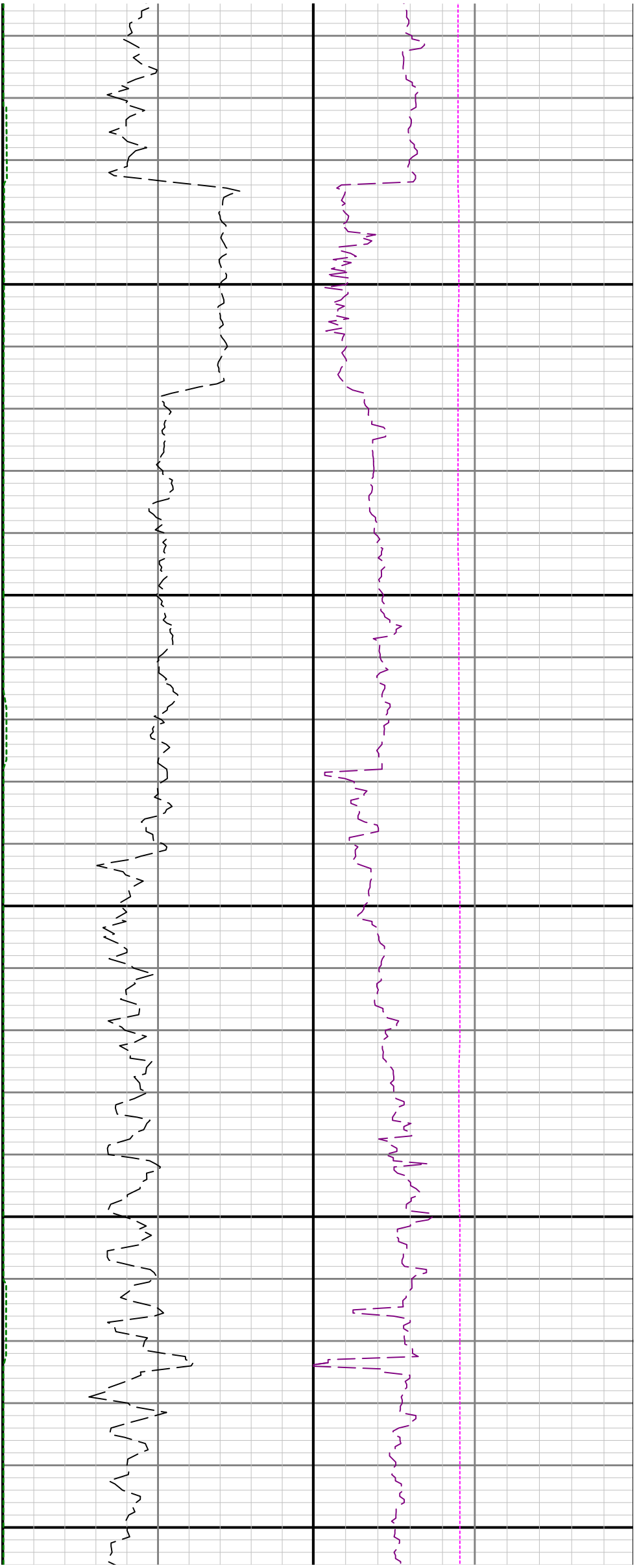
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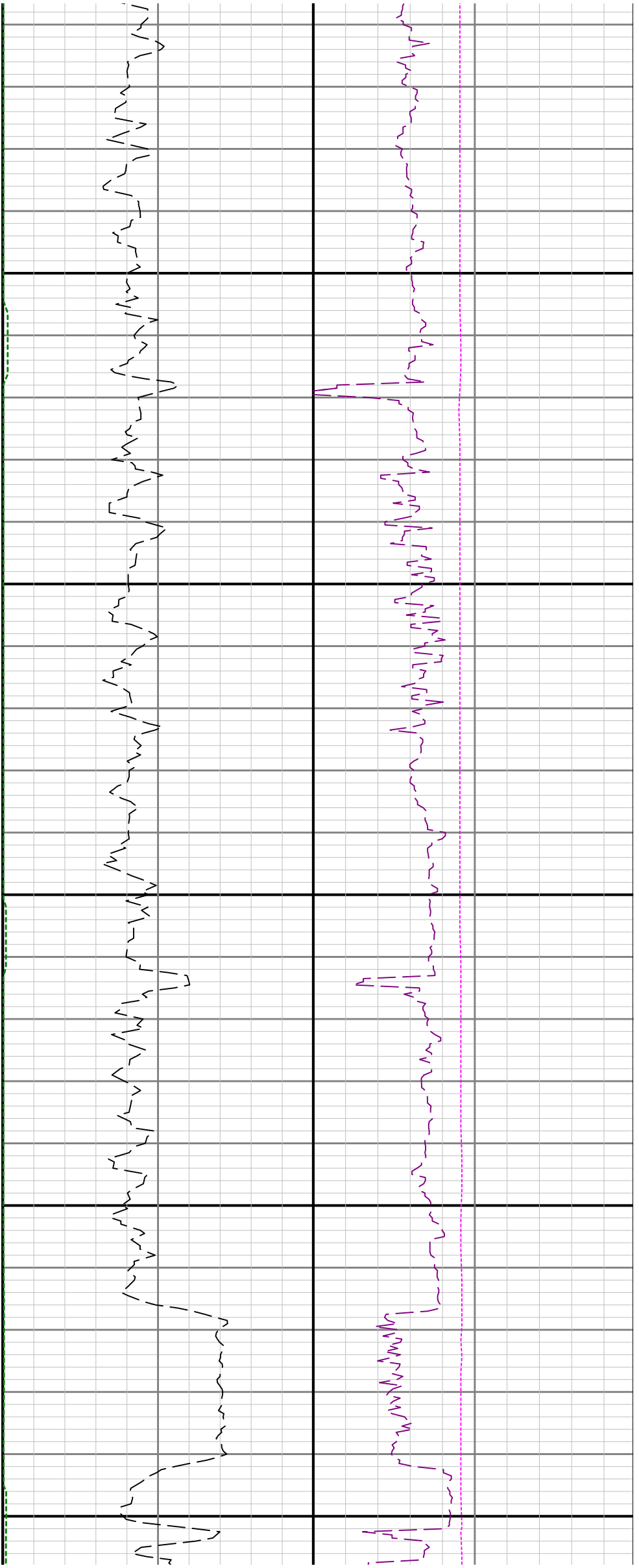








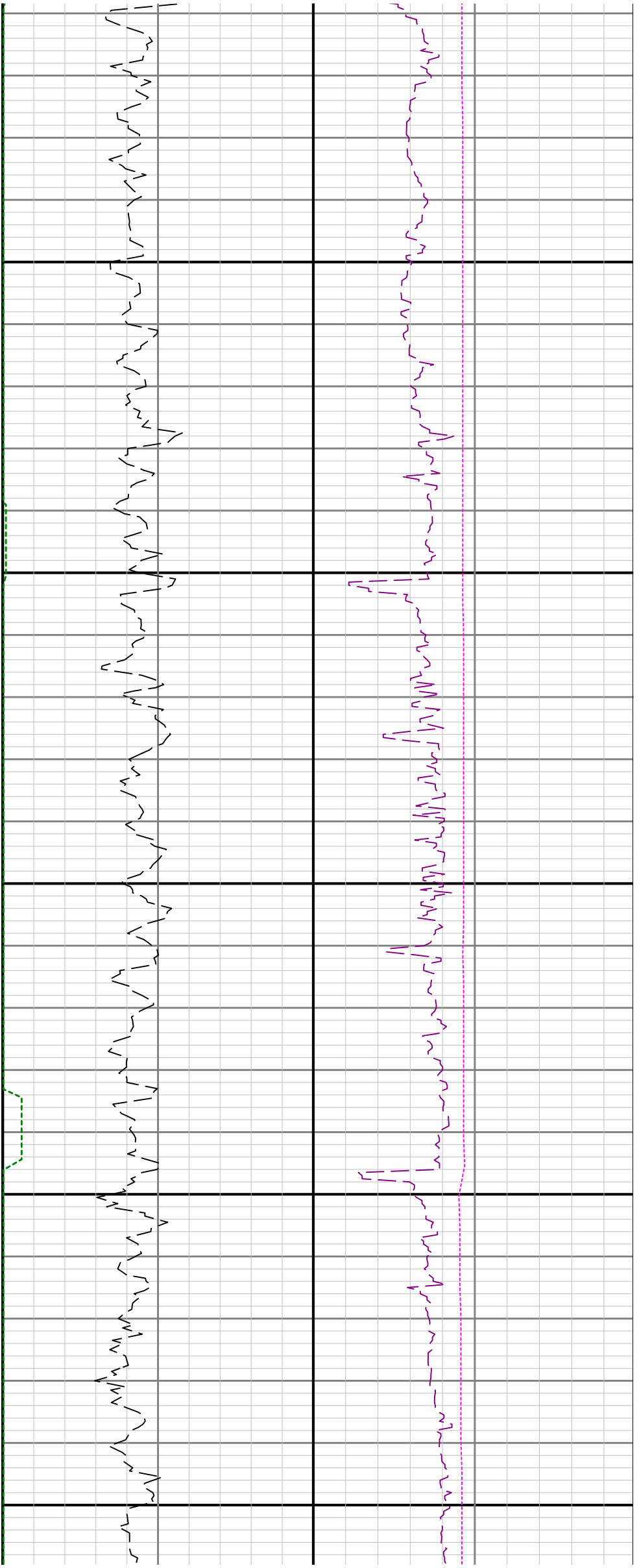




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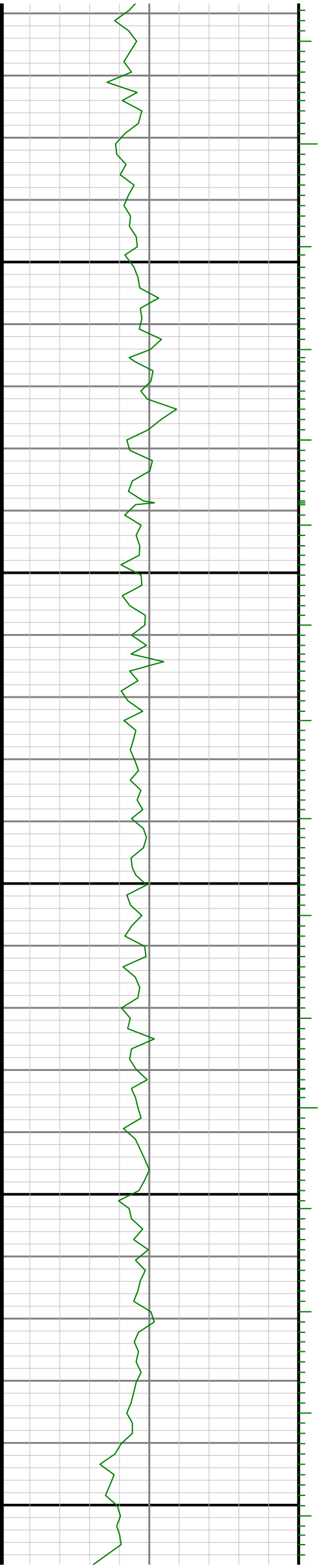
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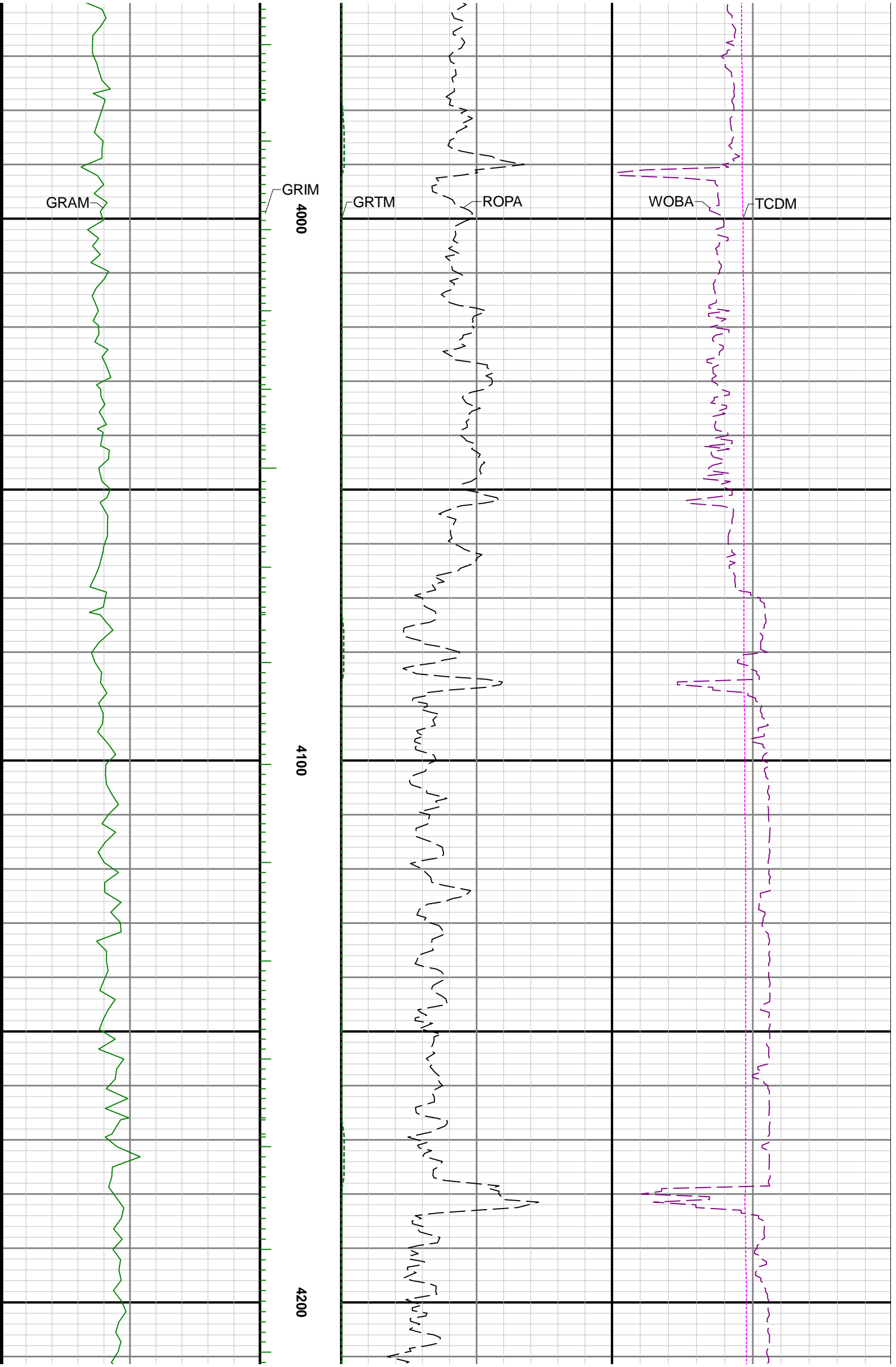
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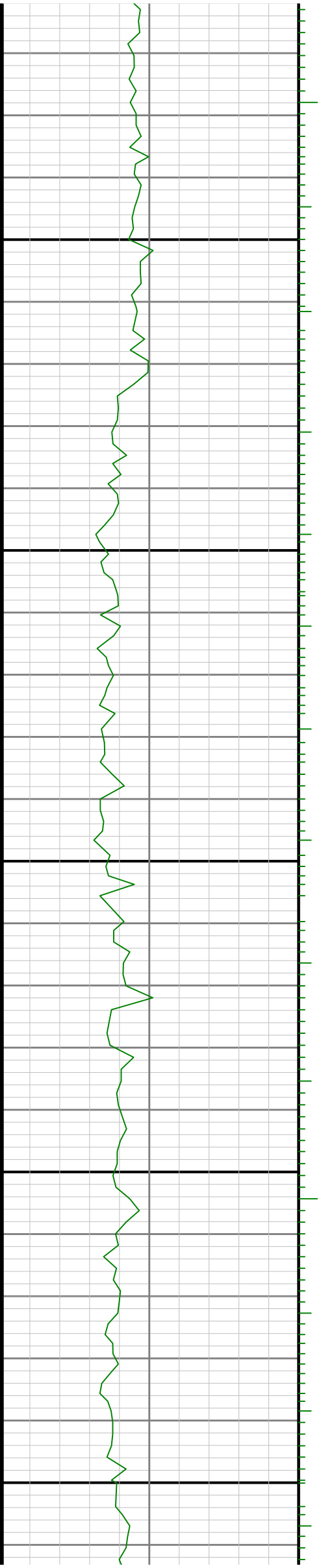
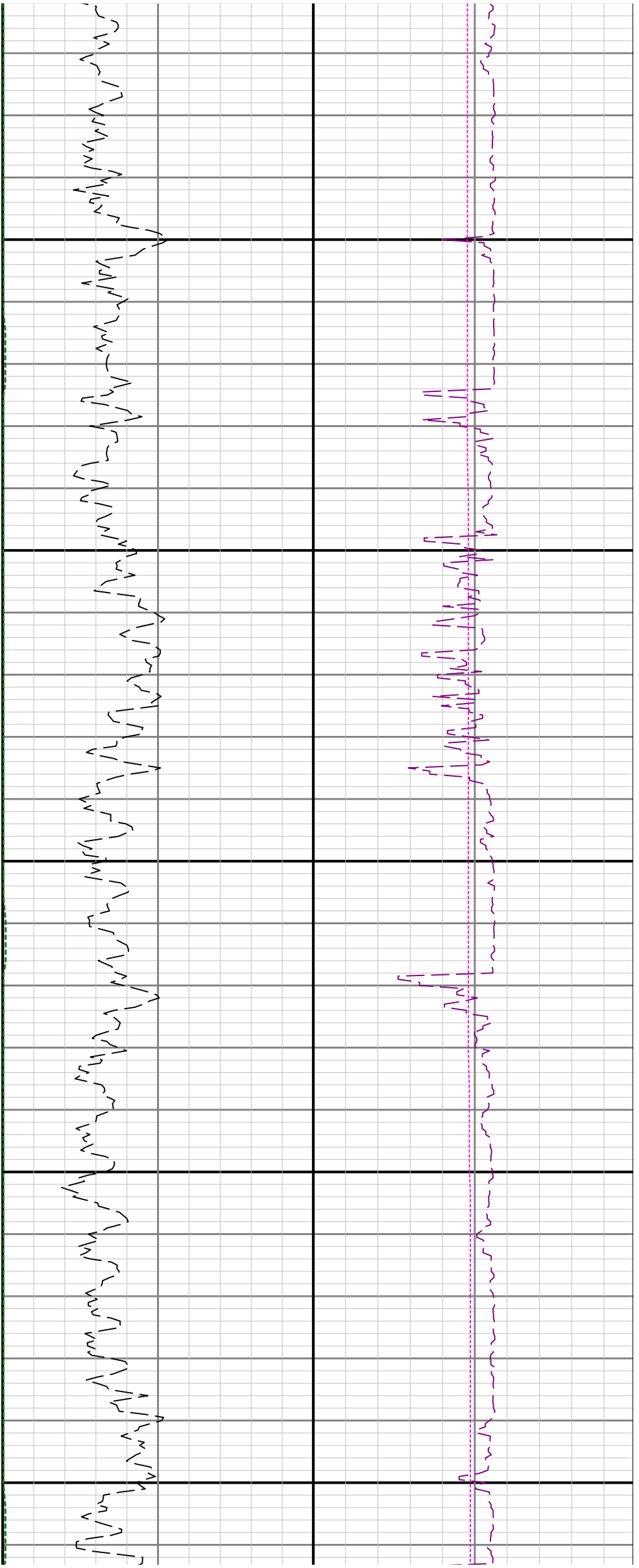


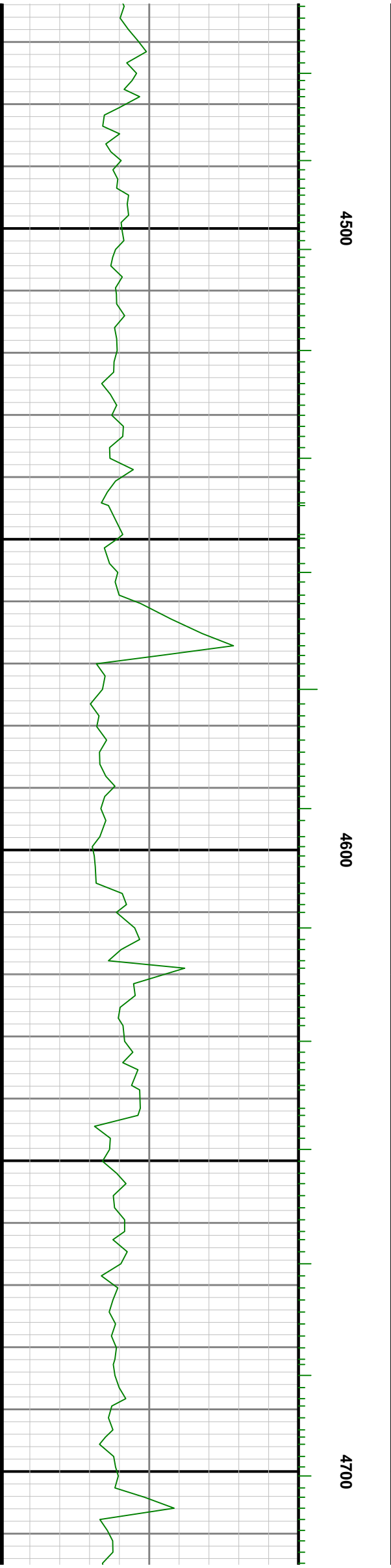
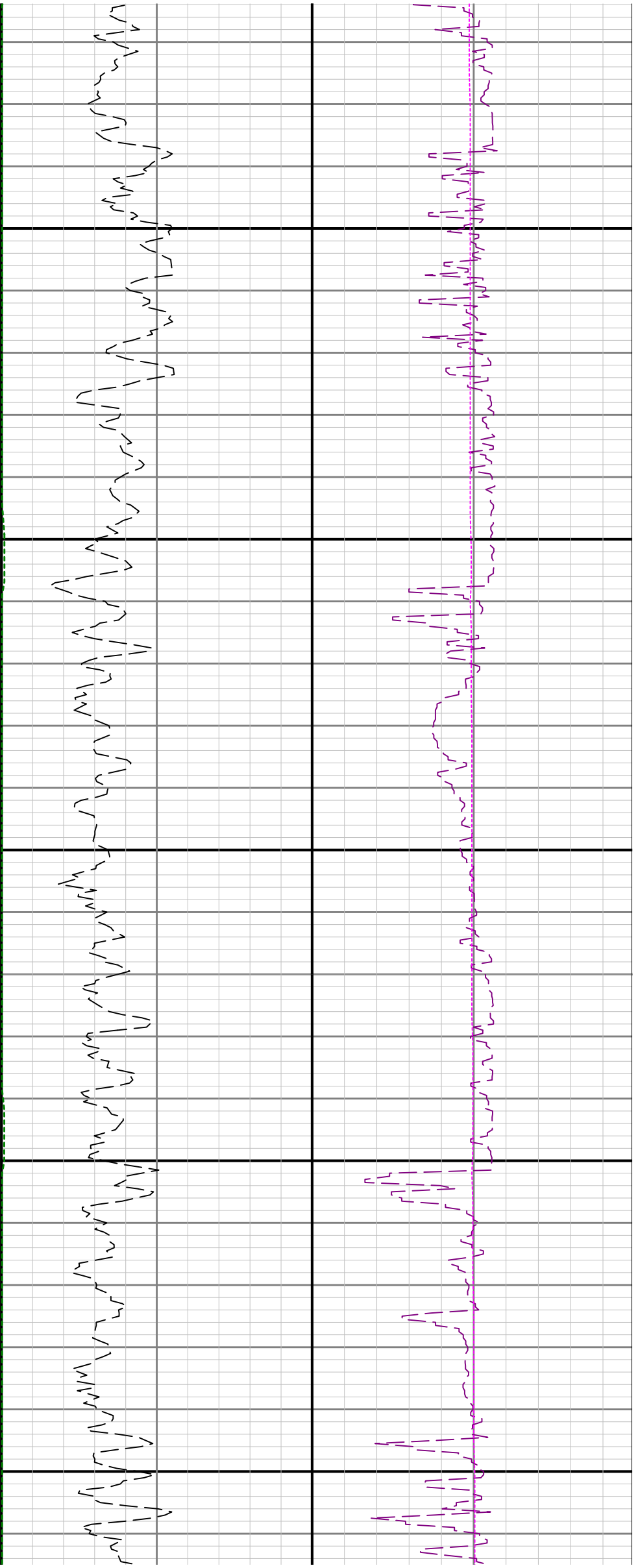
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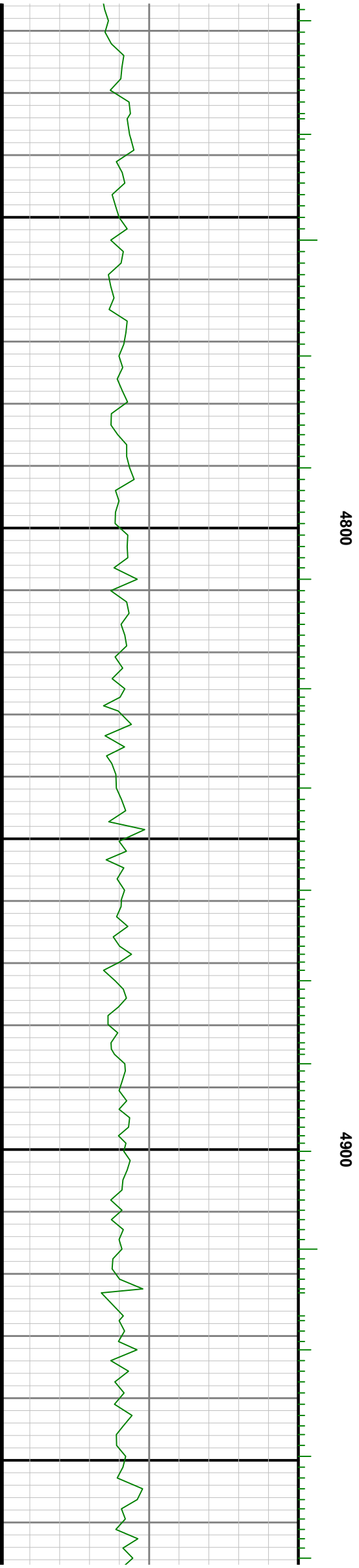
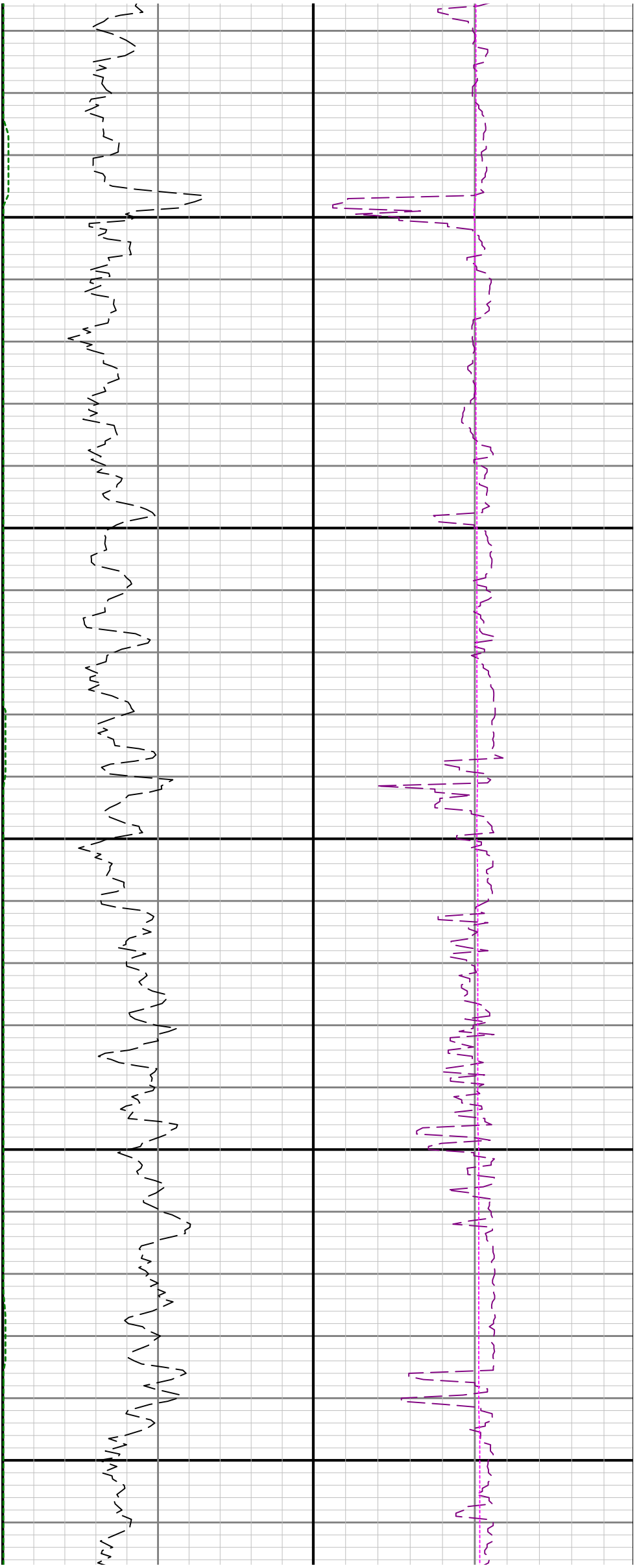
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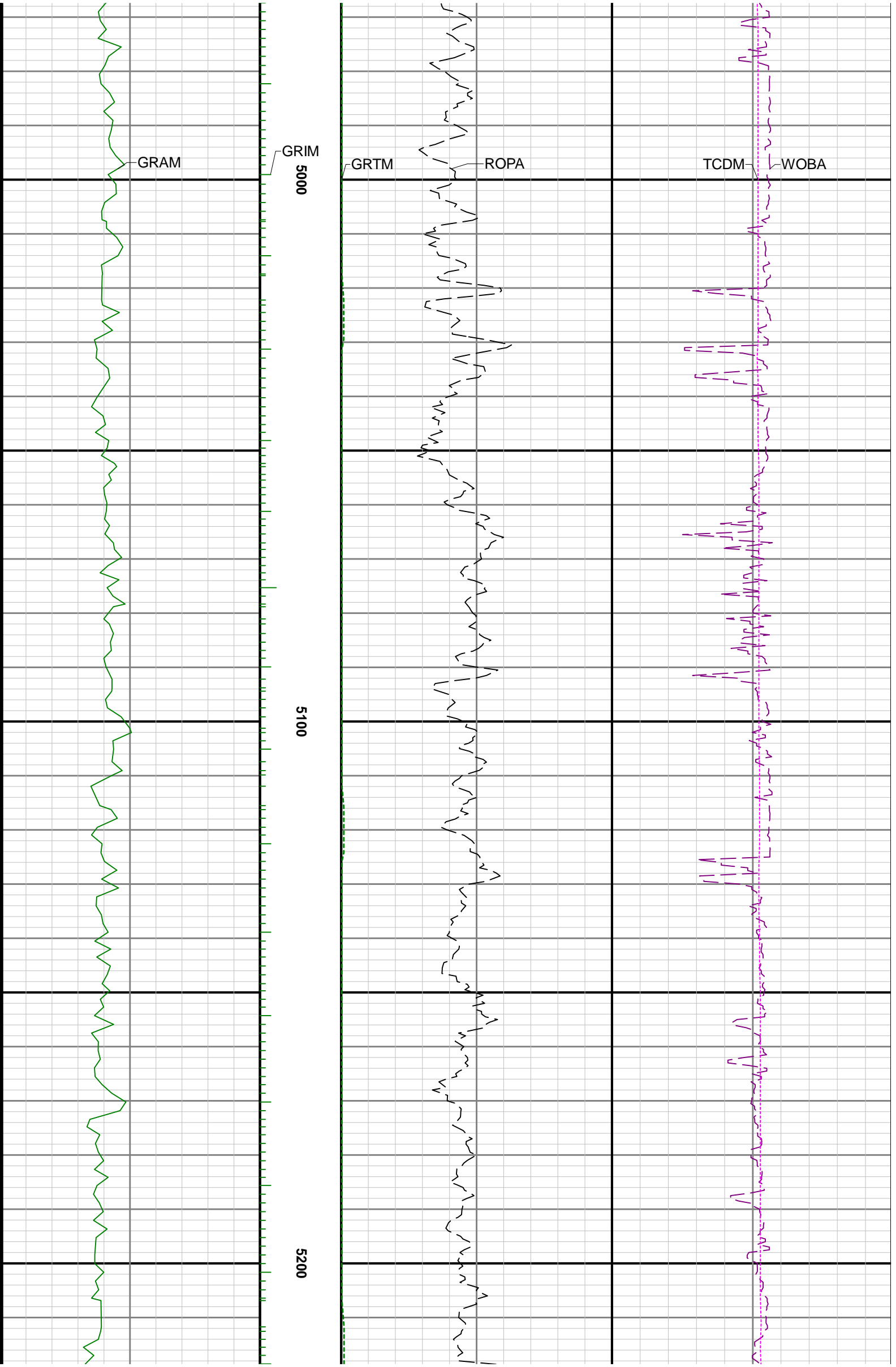


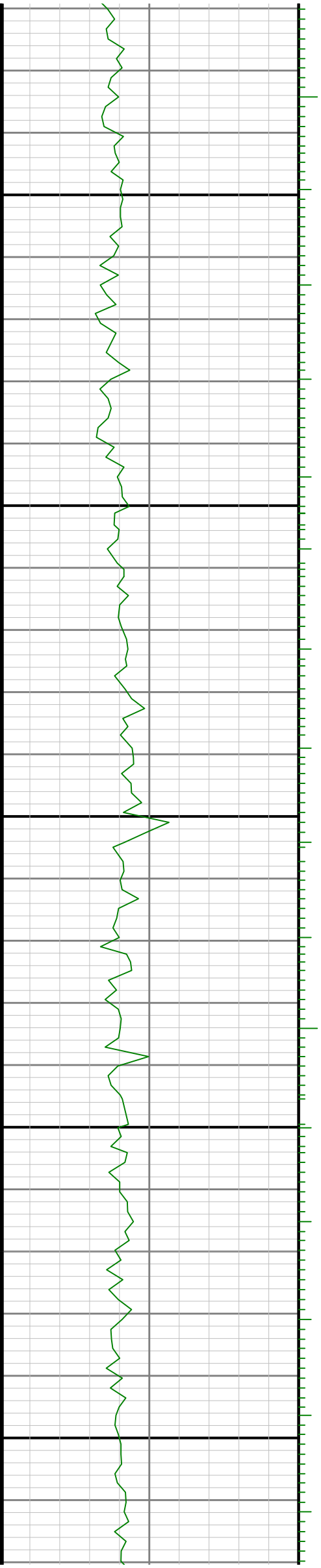


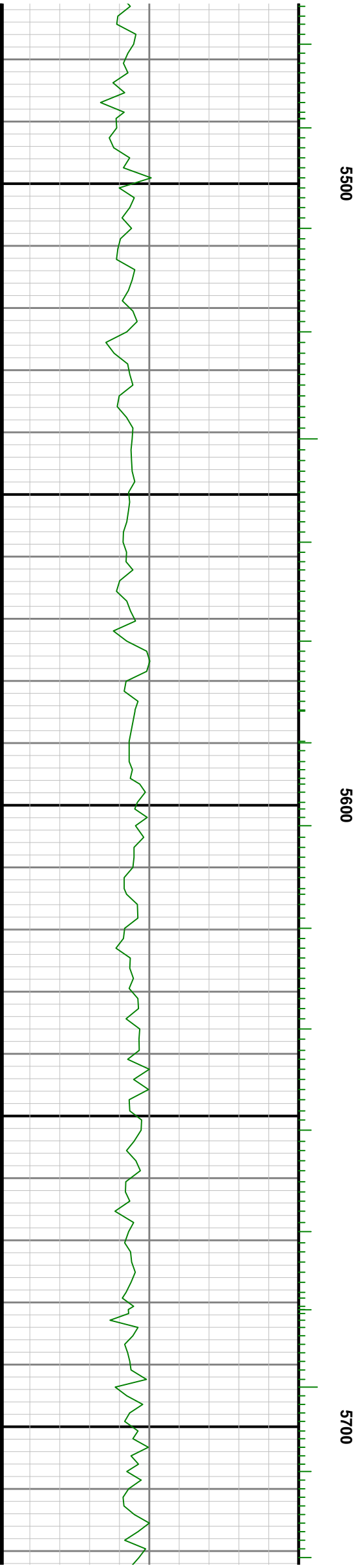
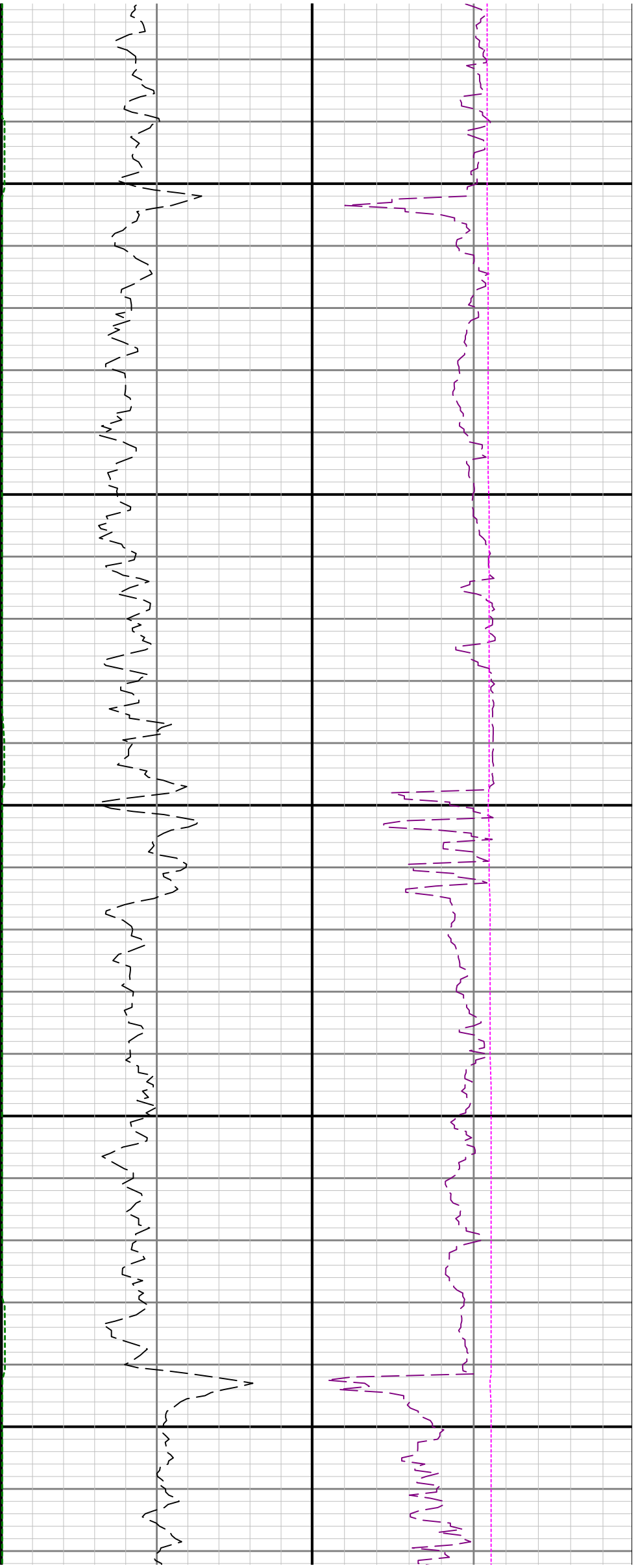


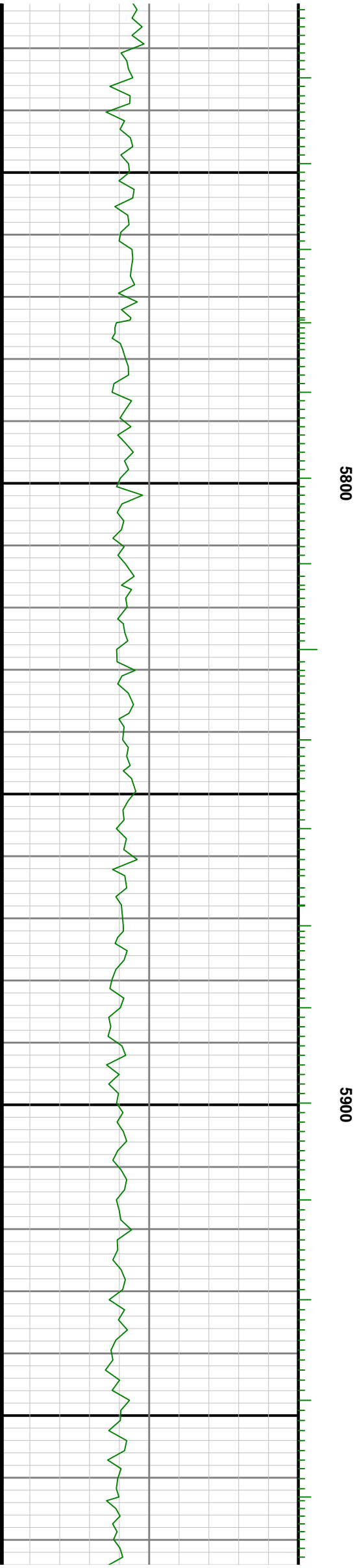
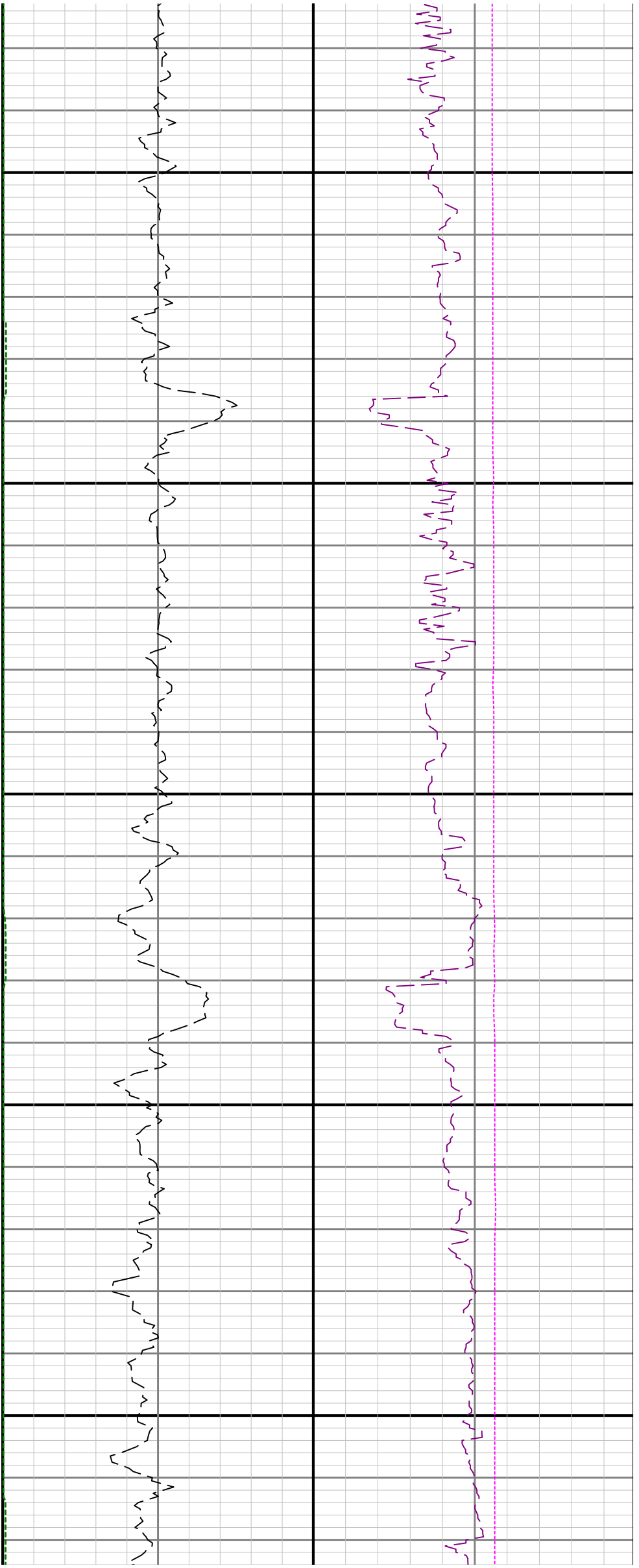


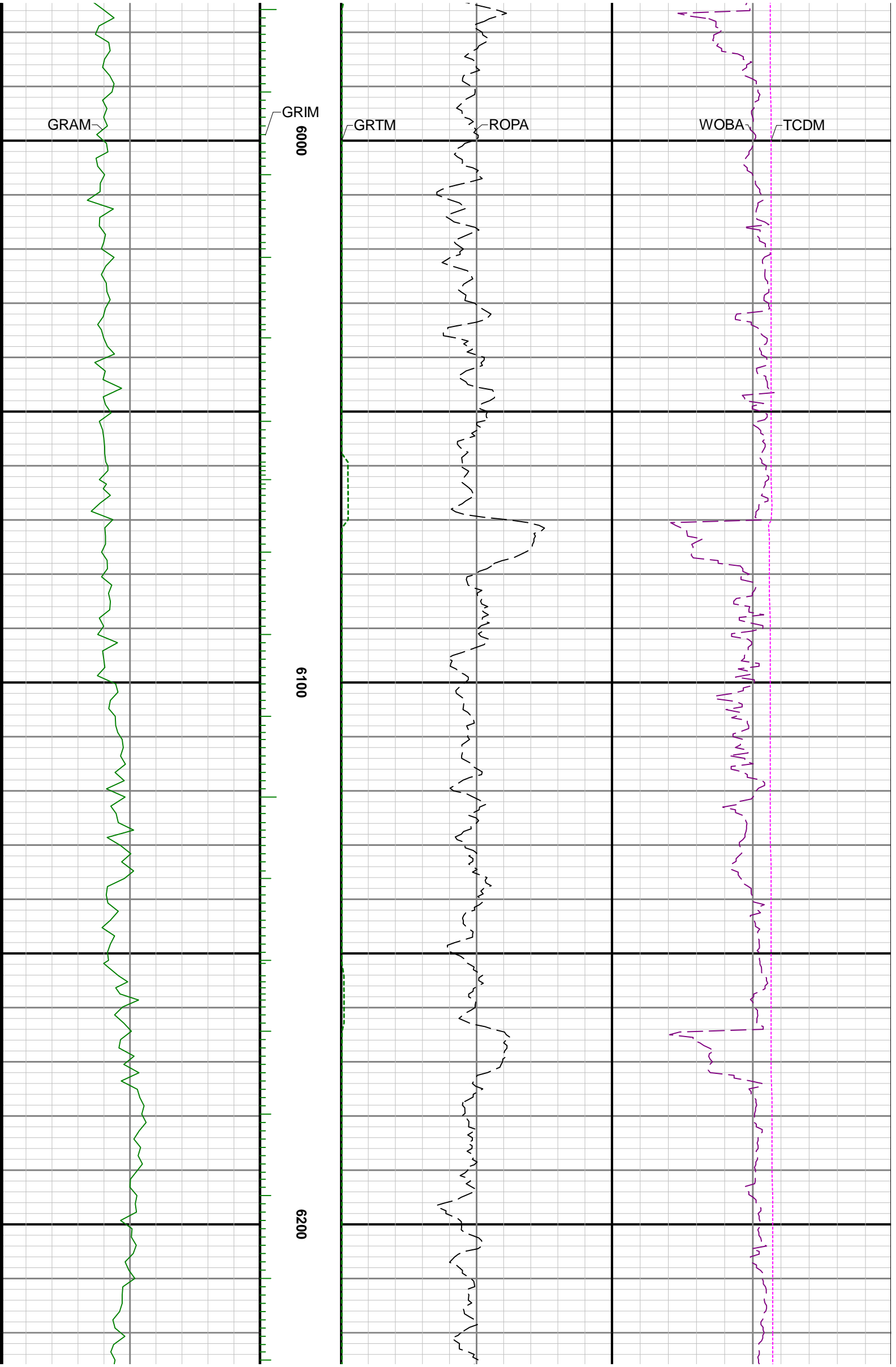


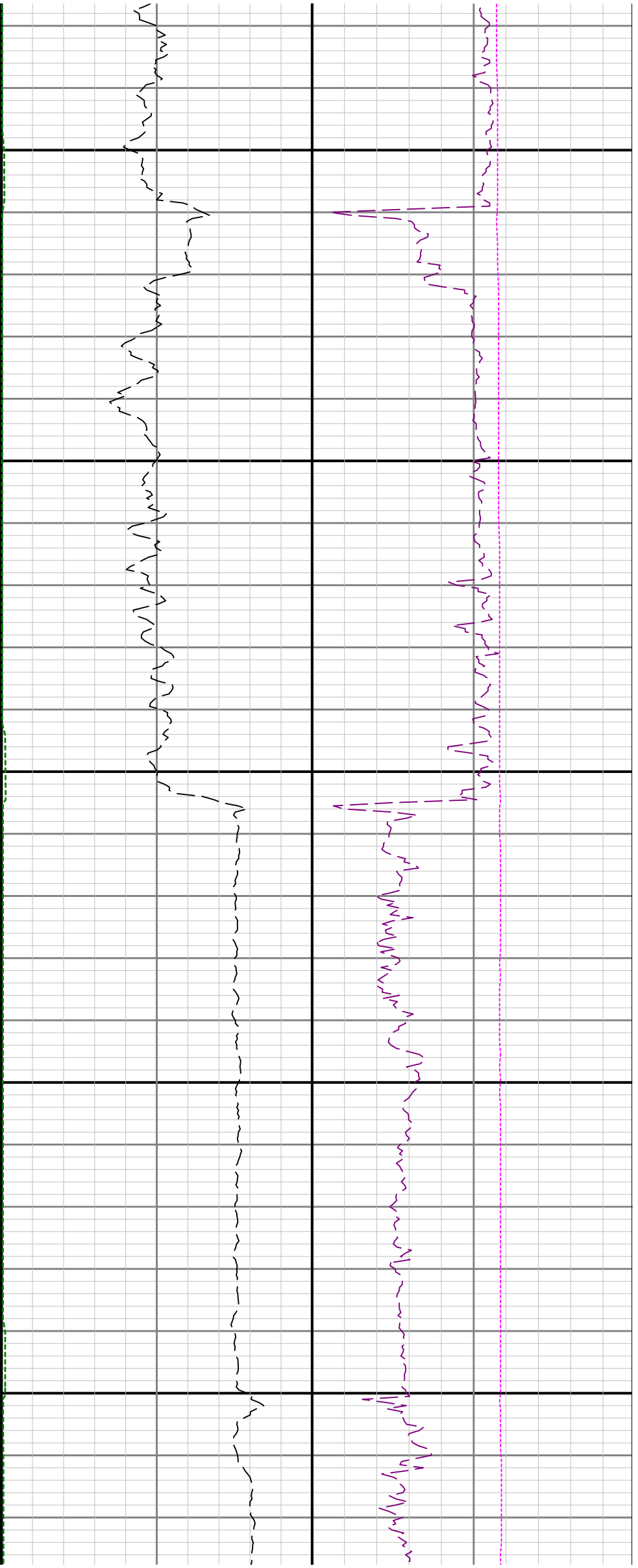






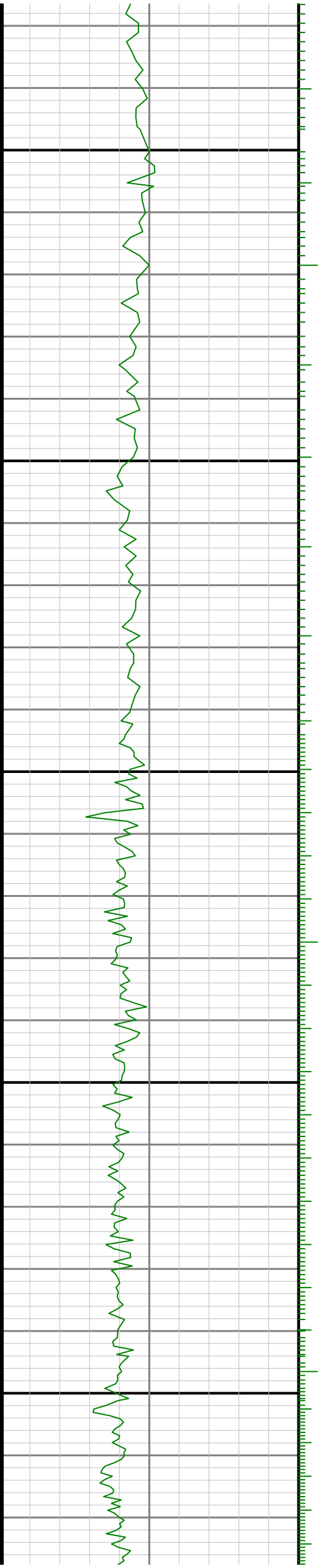


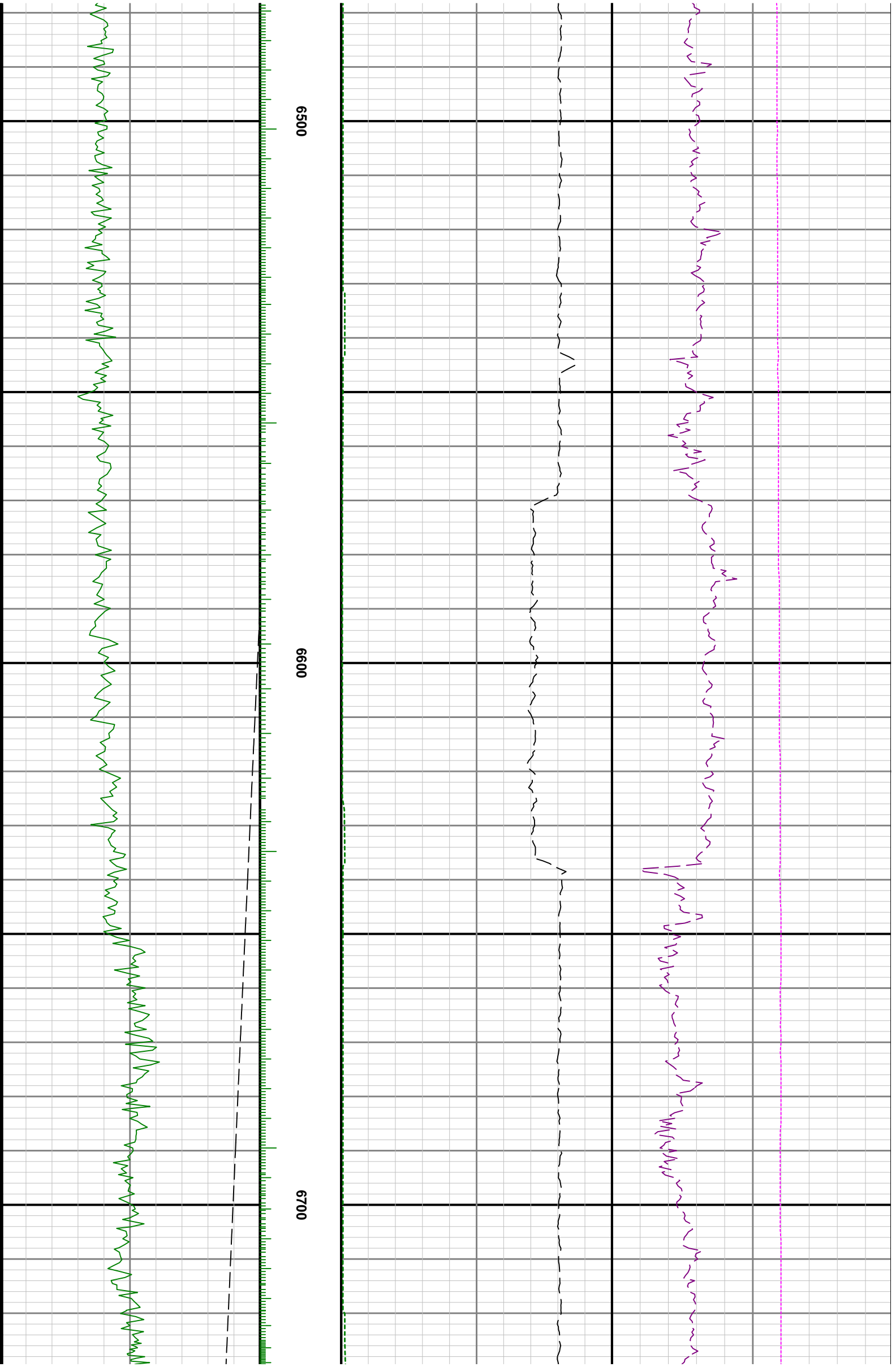


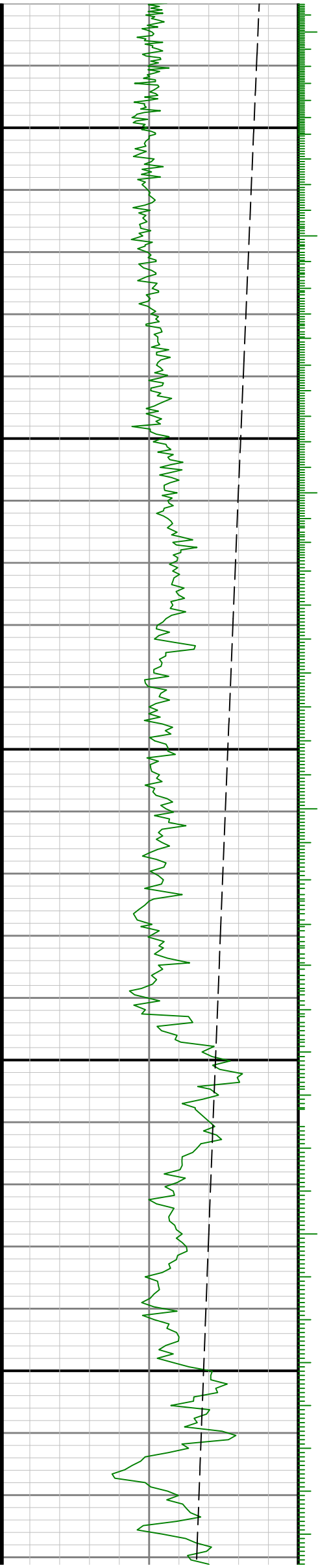


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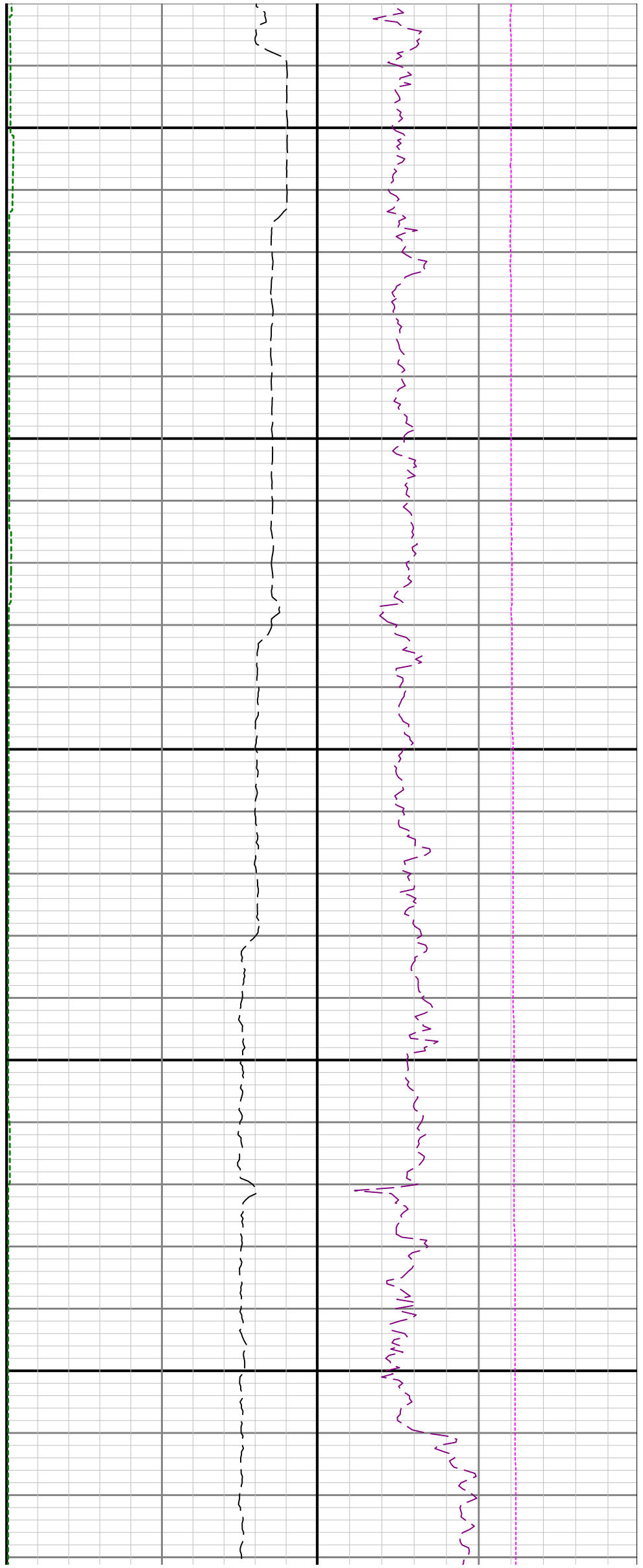


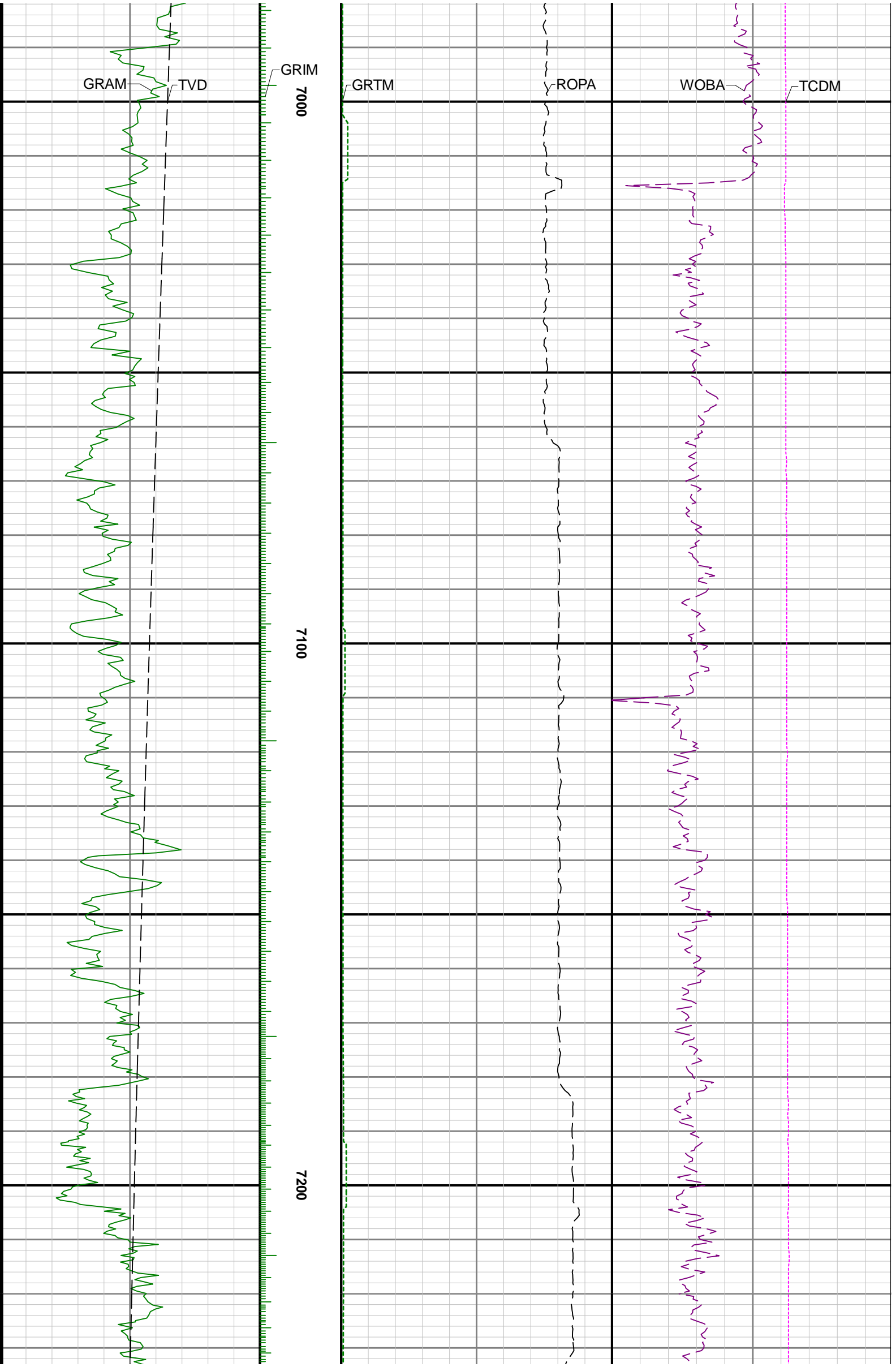


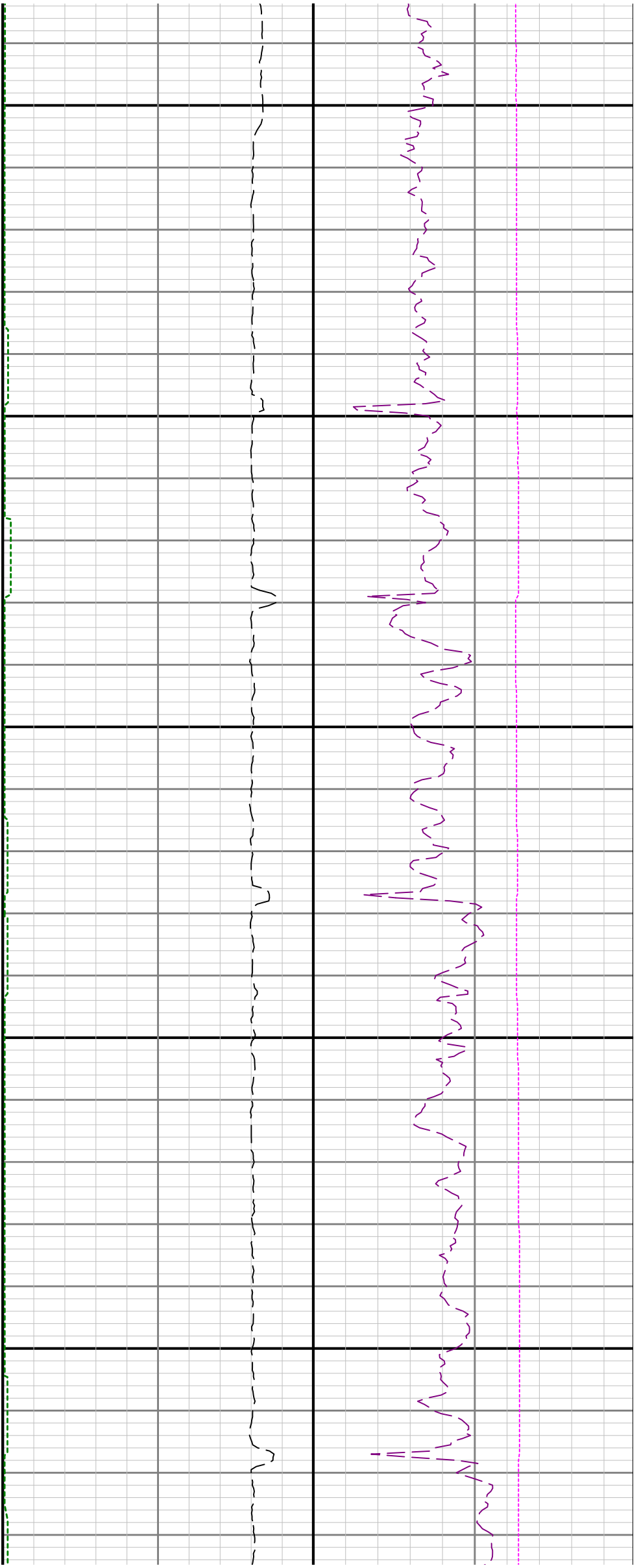


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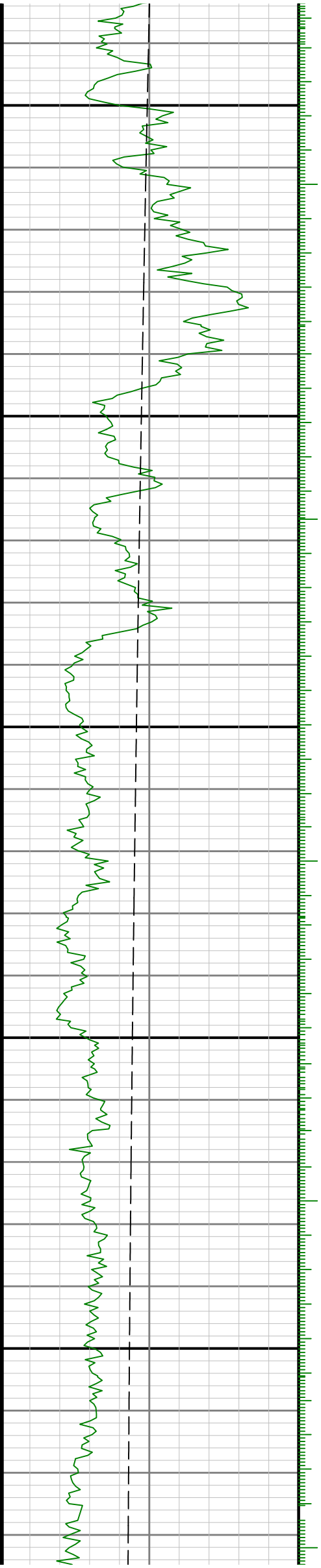


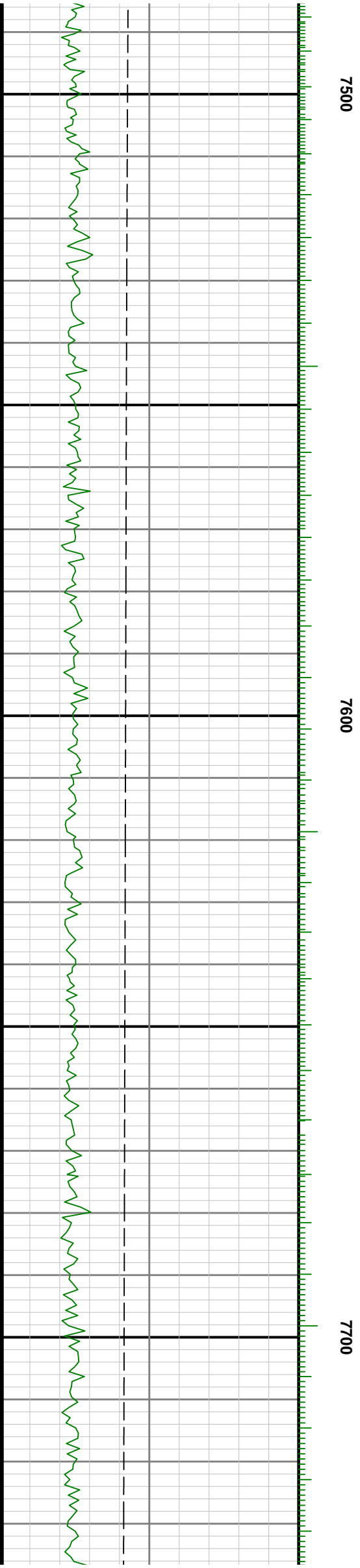
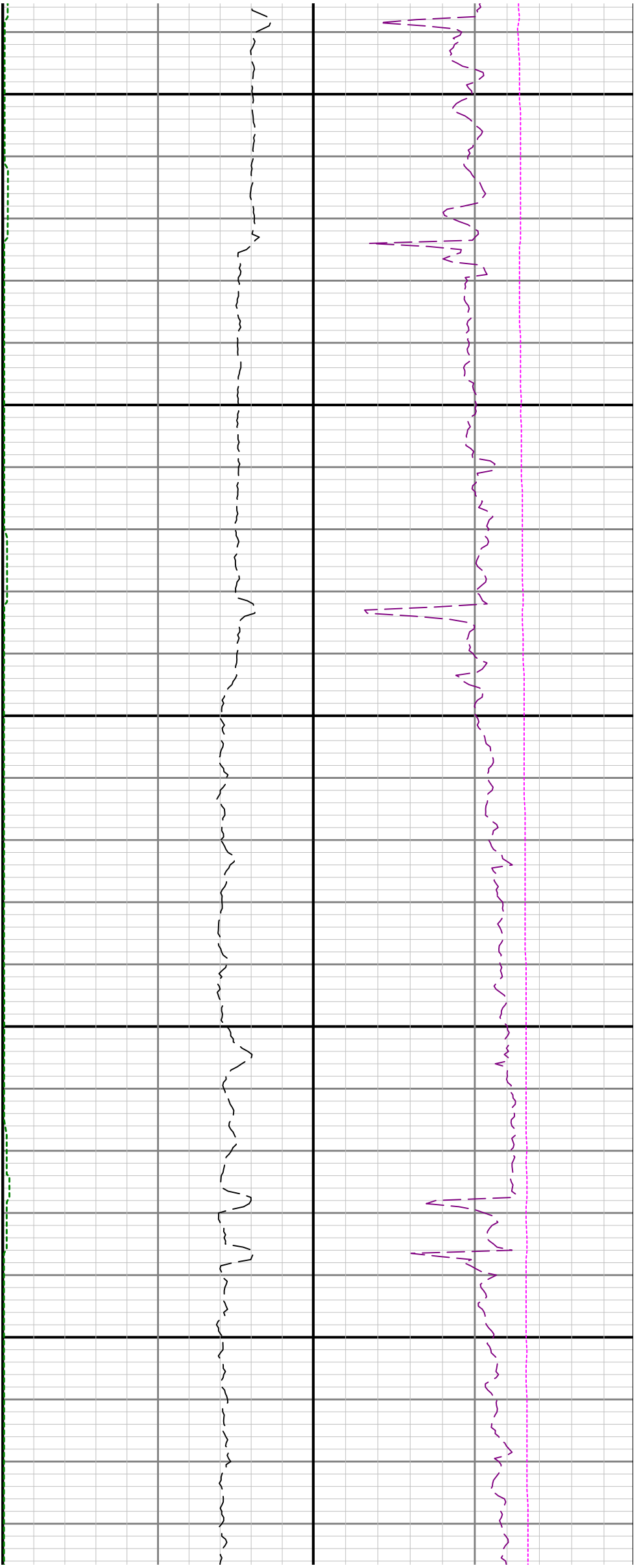


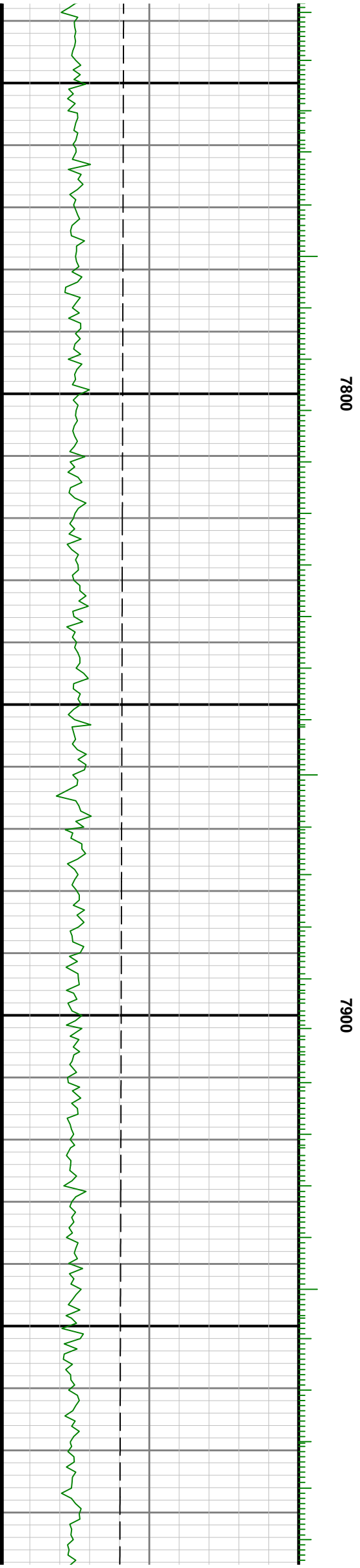
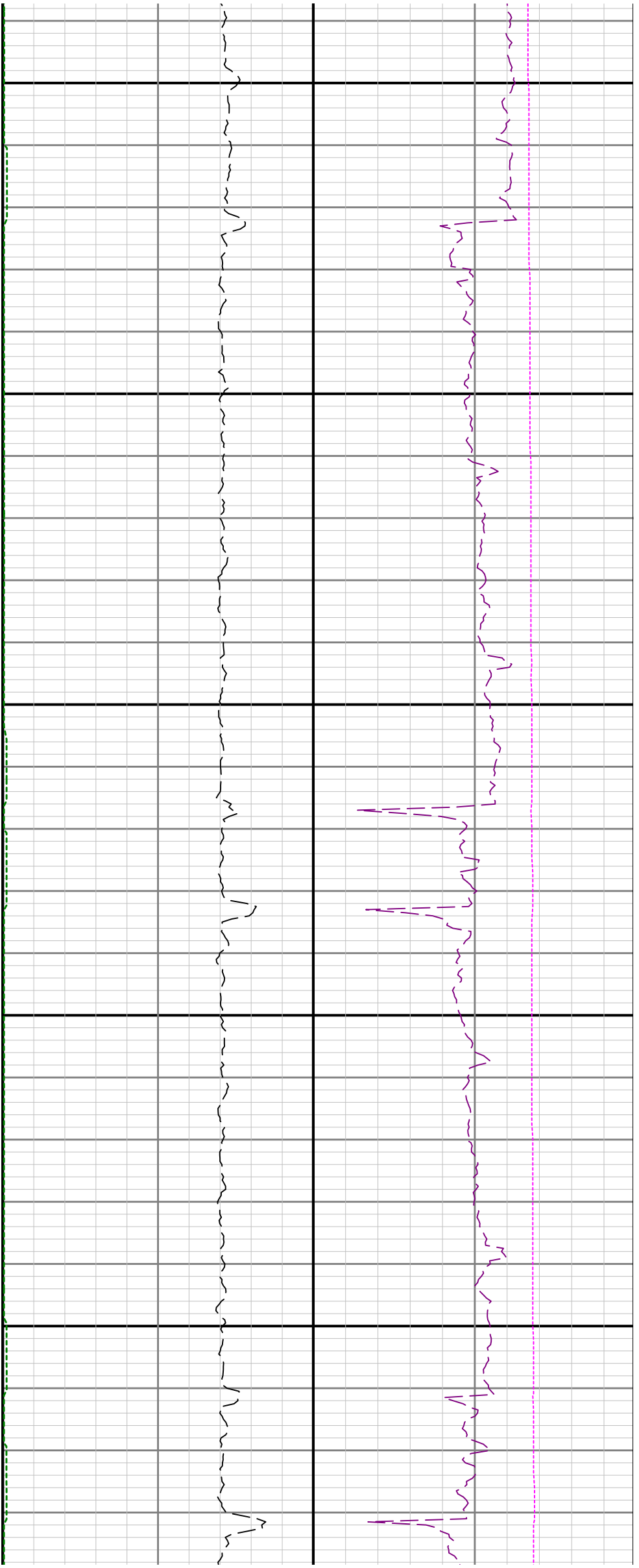


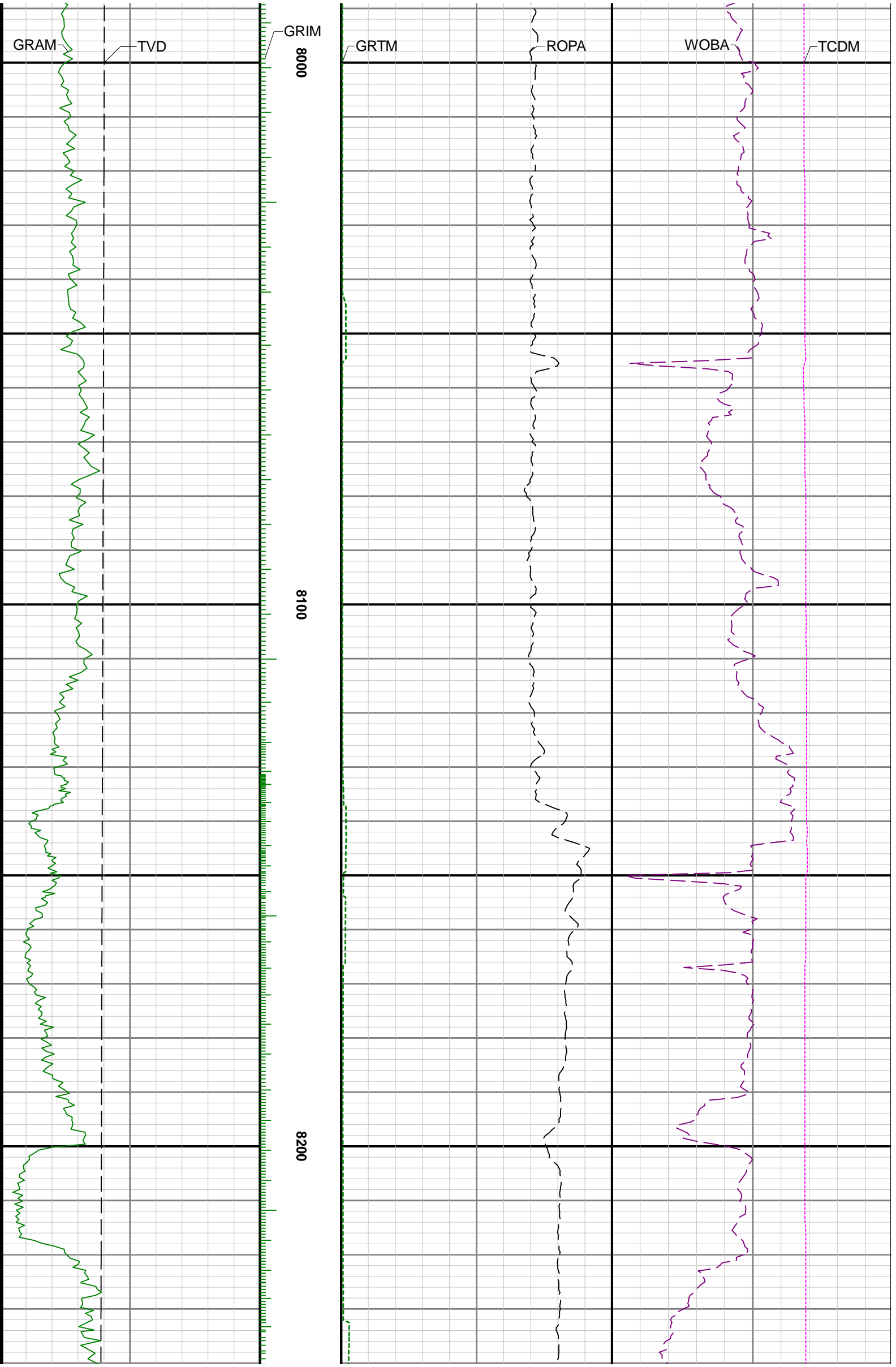
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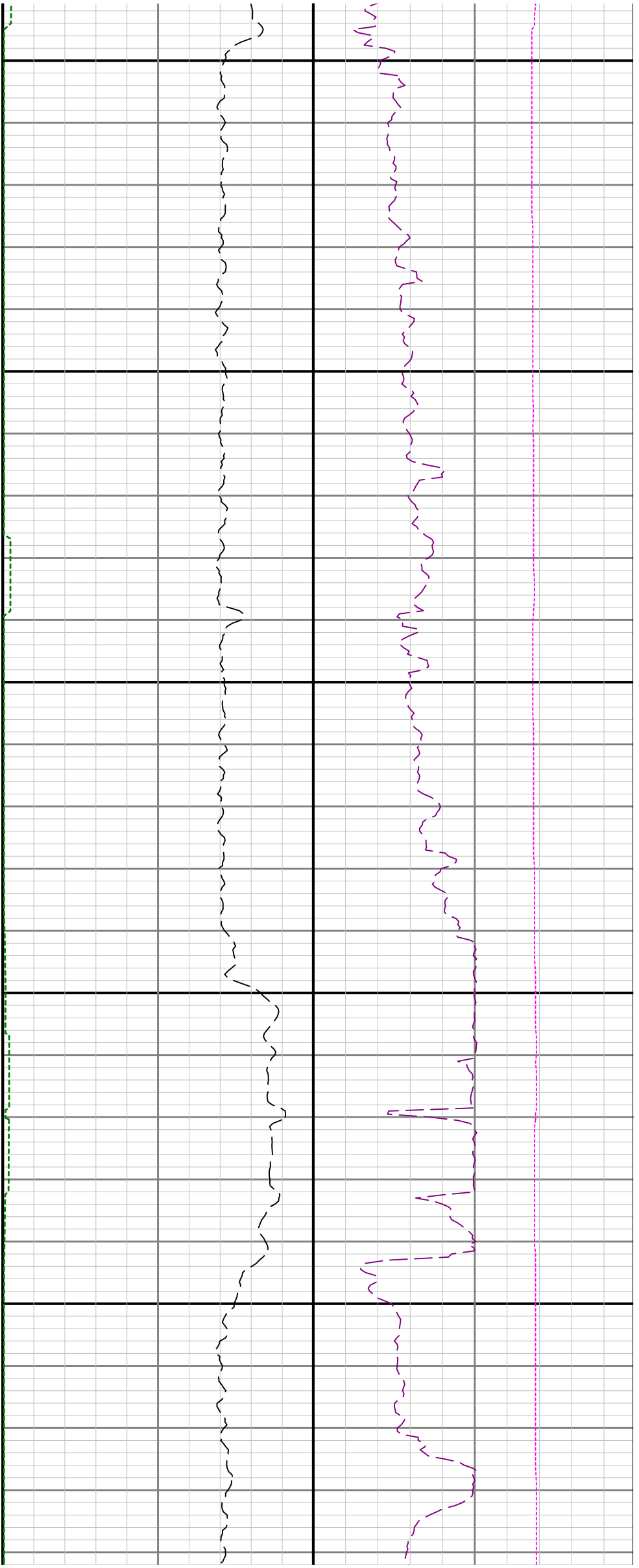
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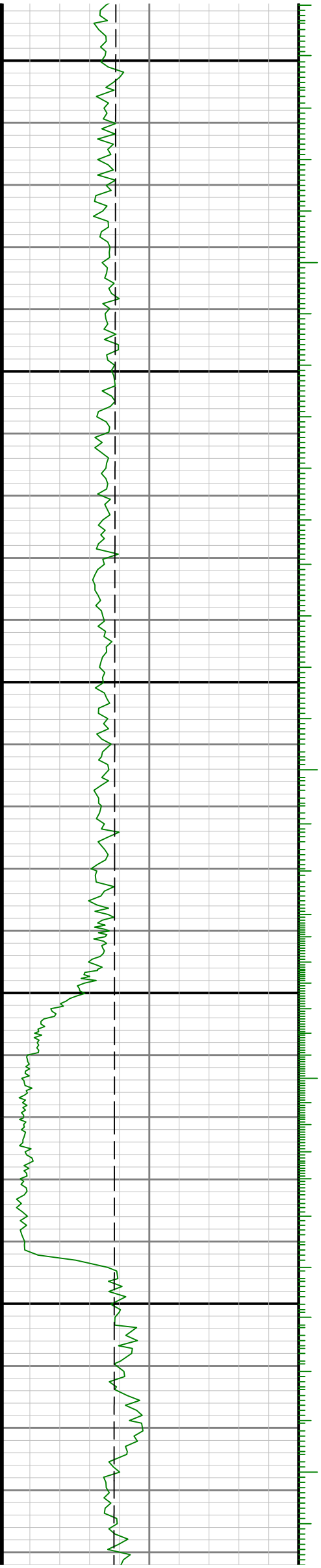


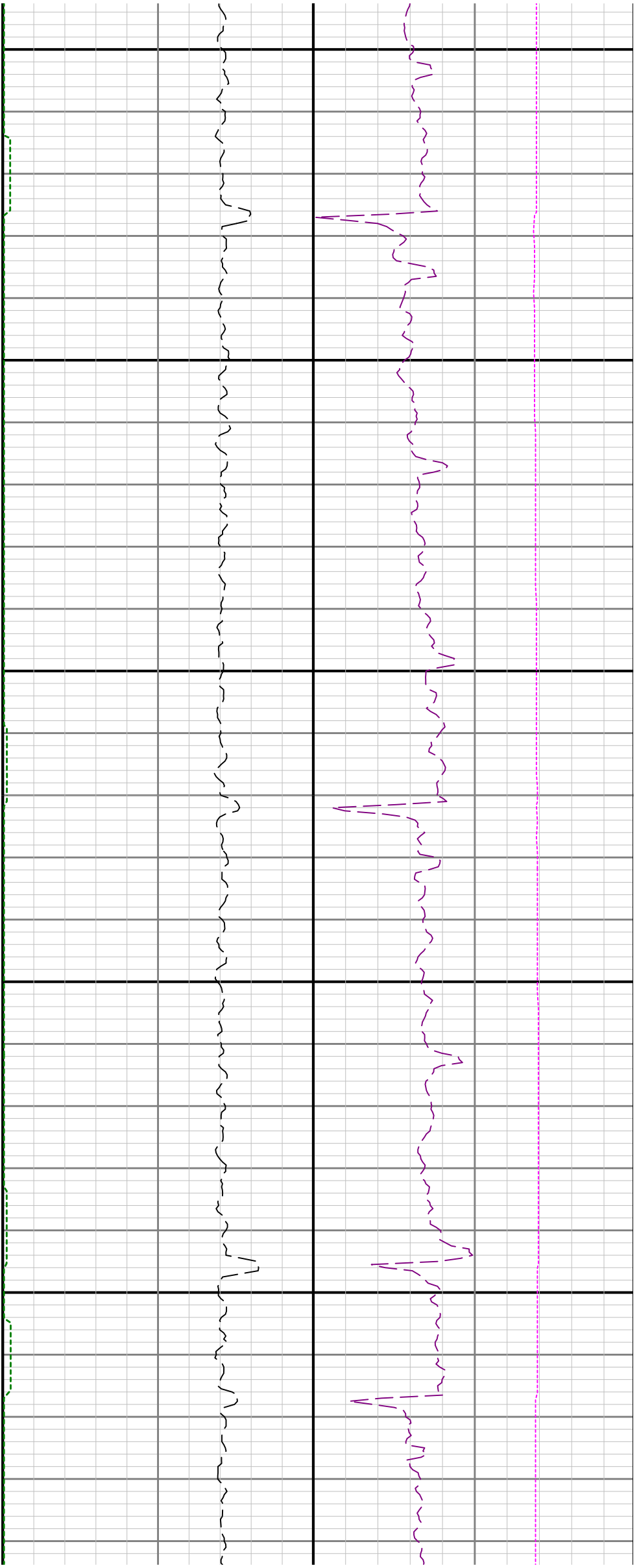




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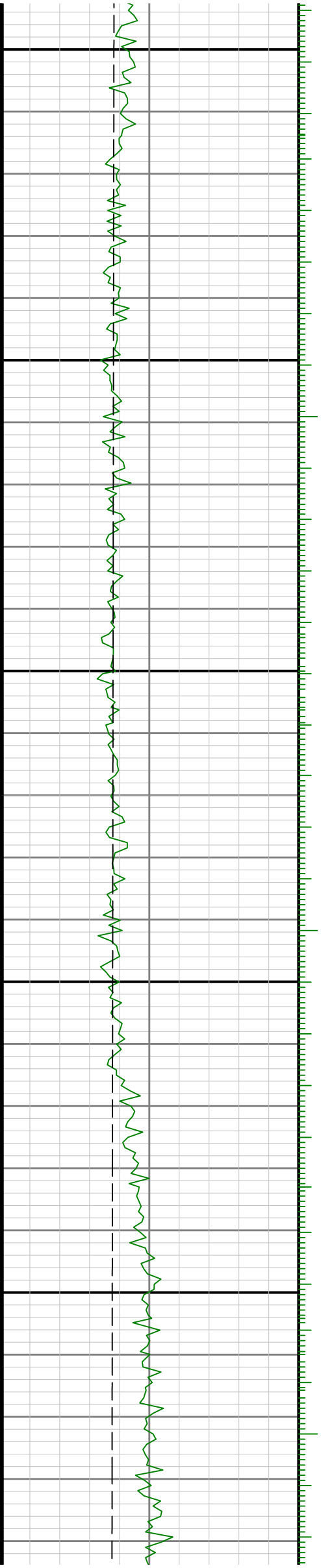


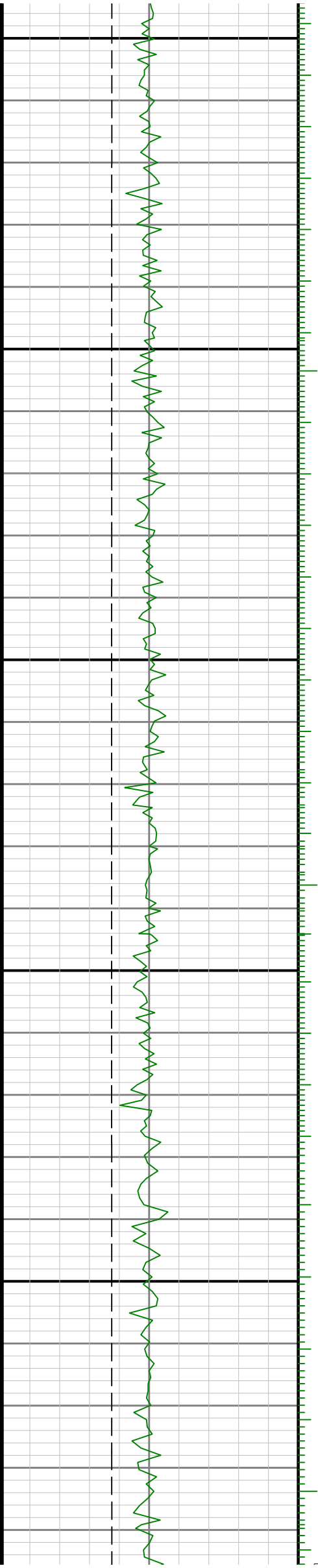


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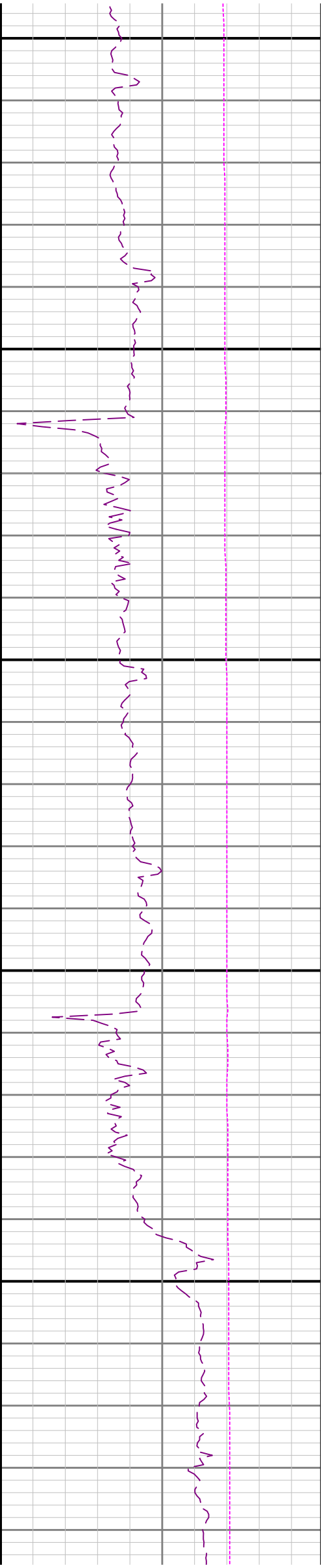
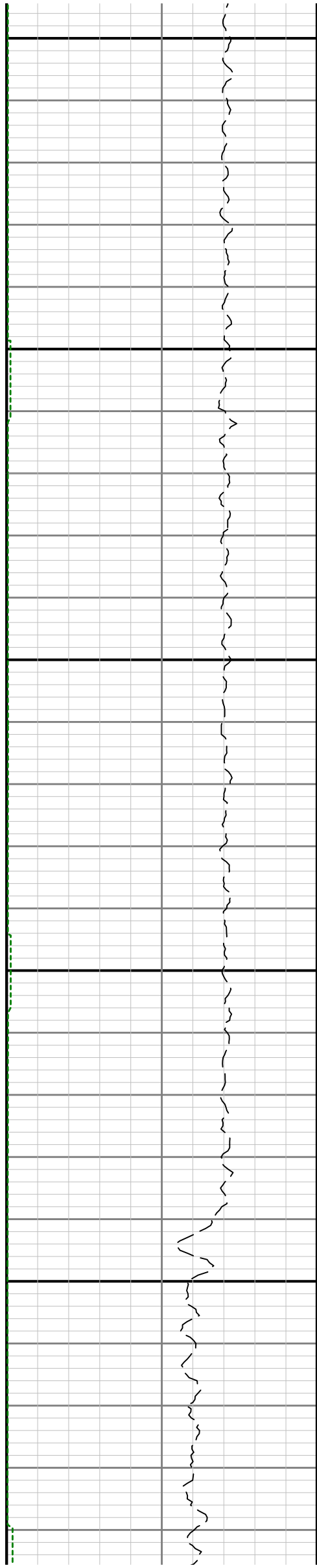


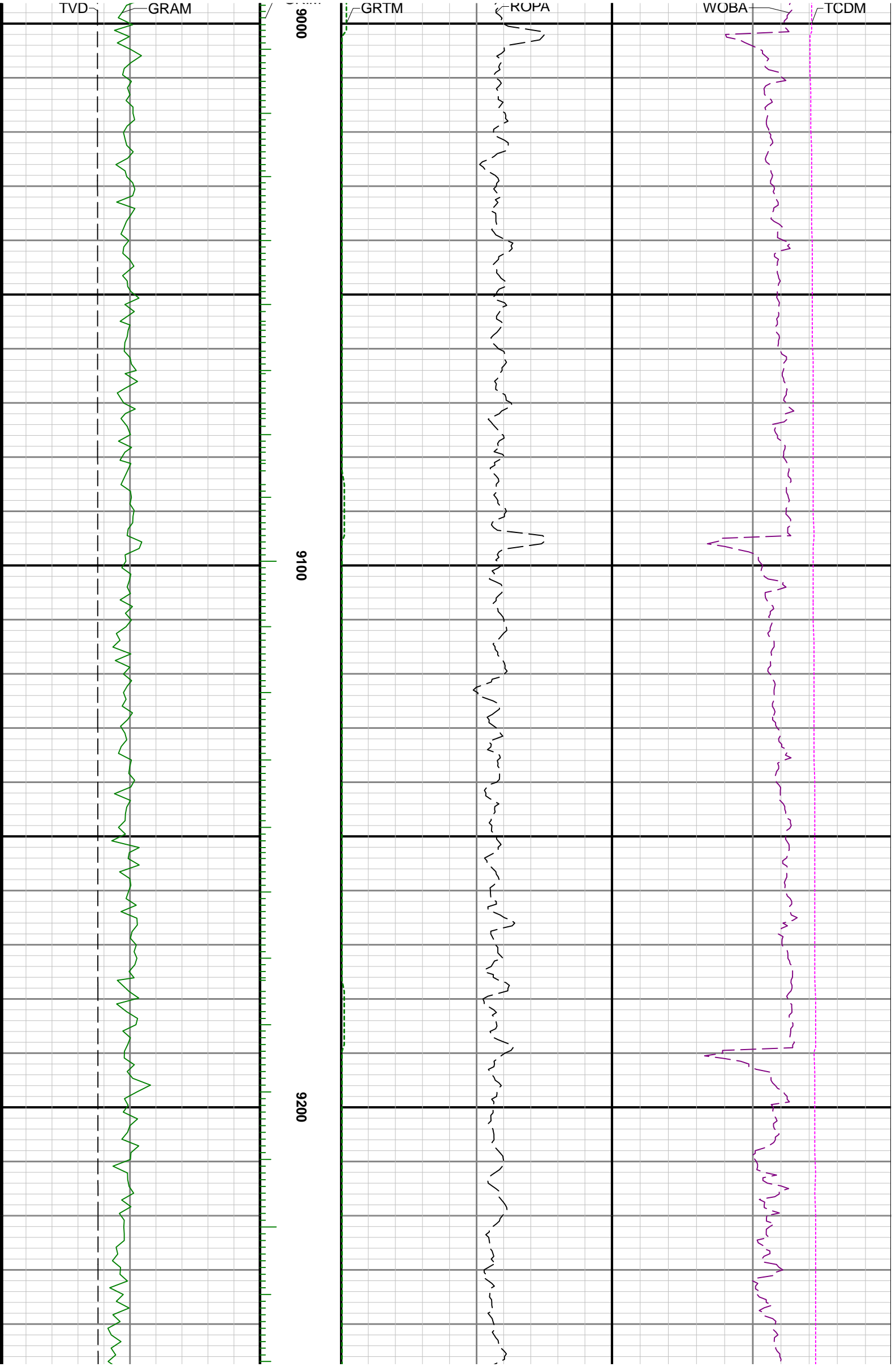


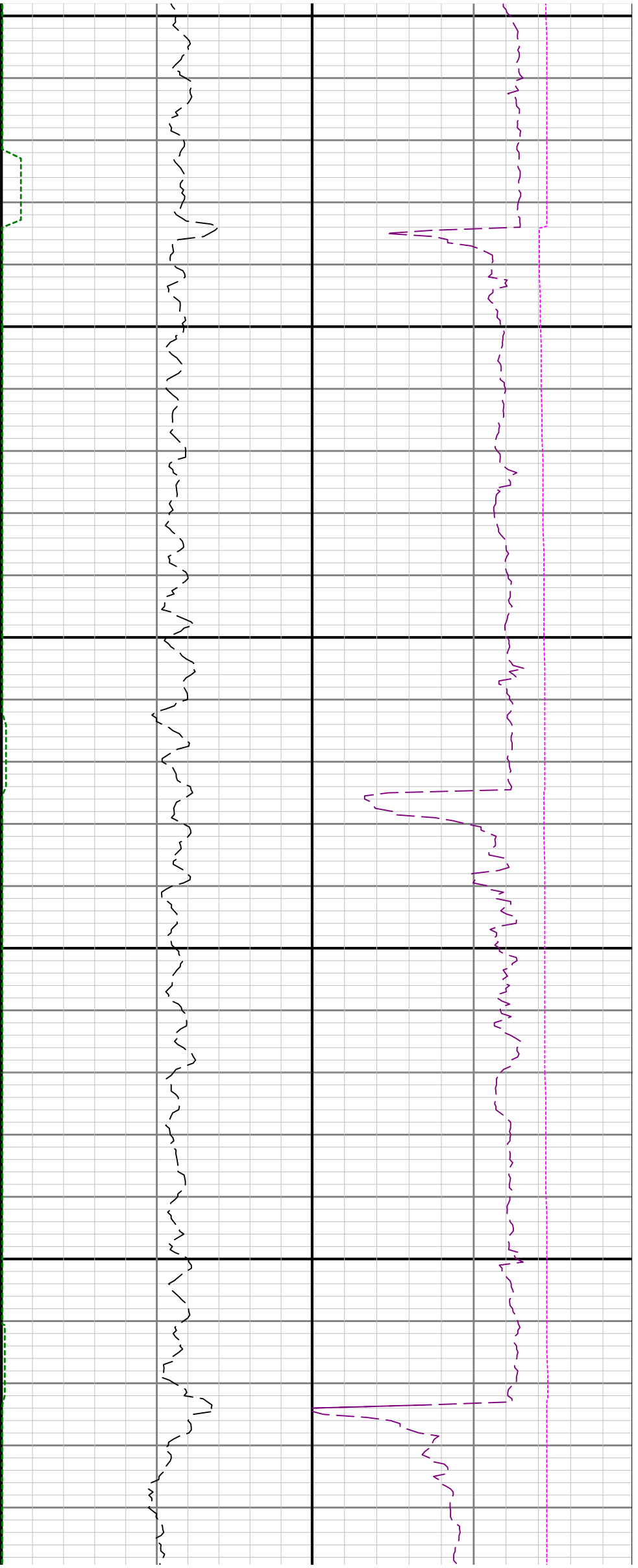
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GRIM



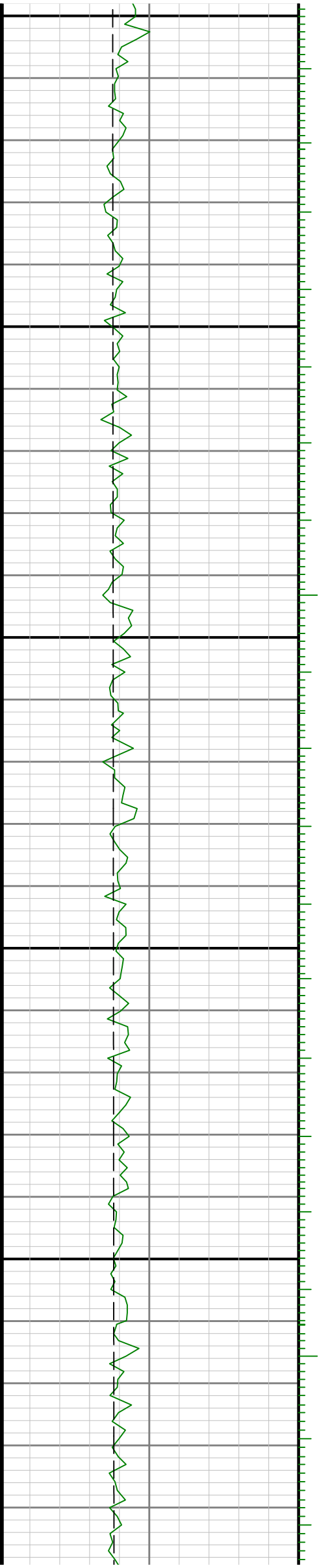


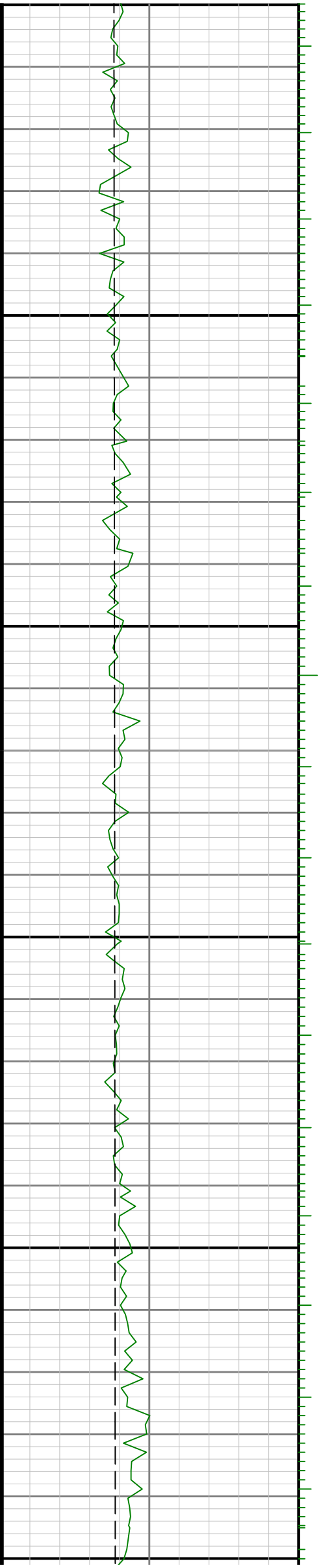


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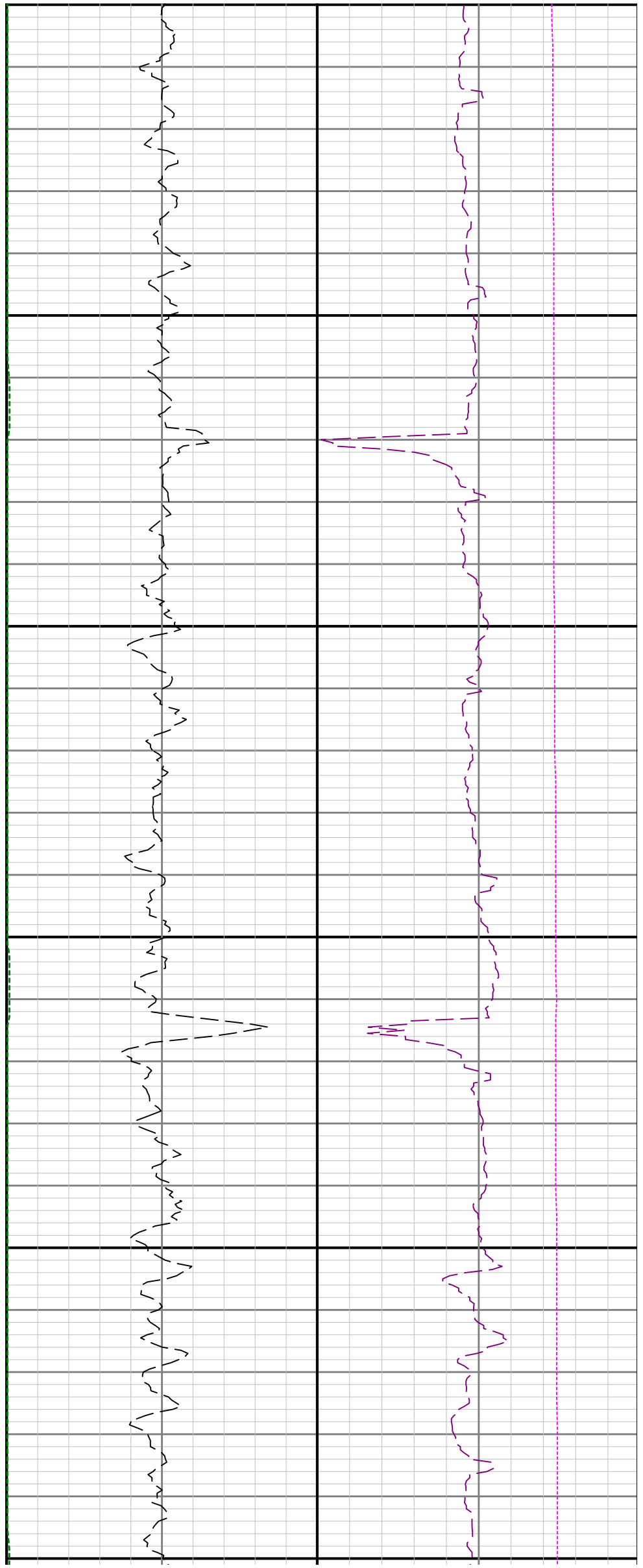


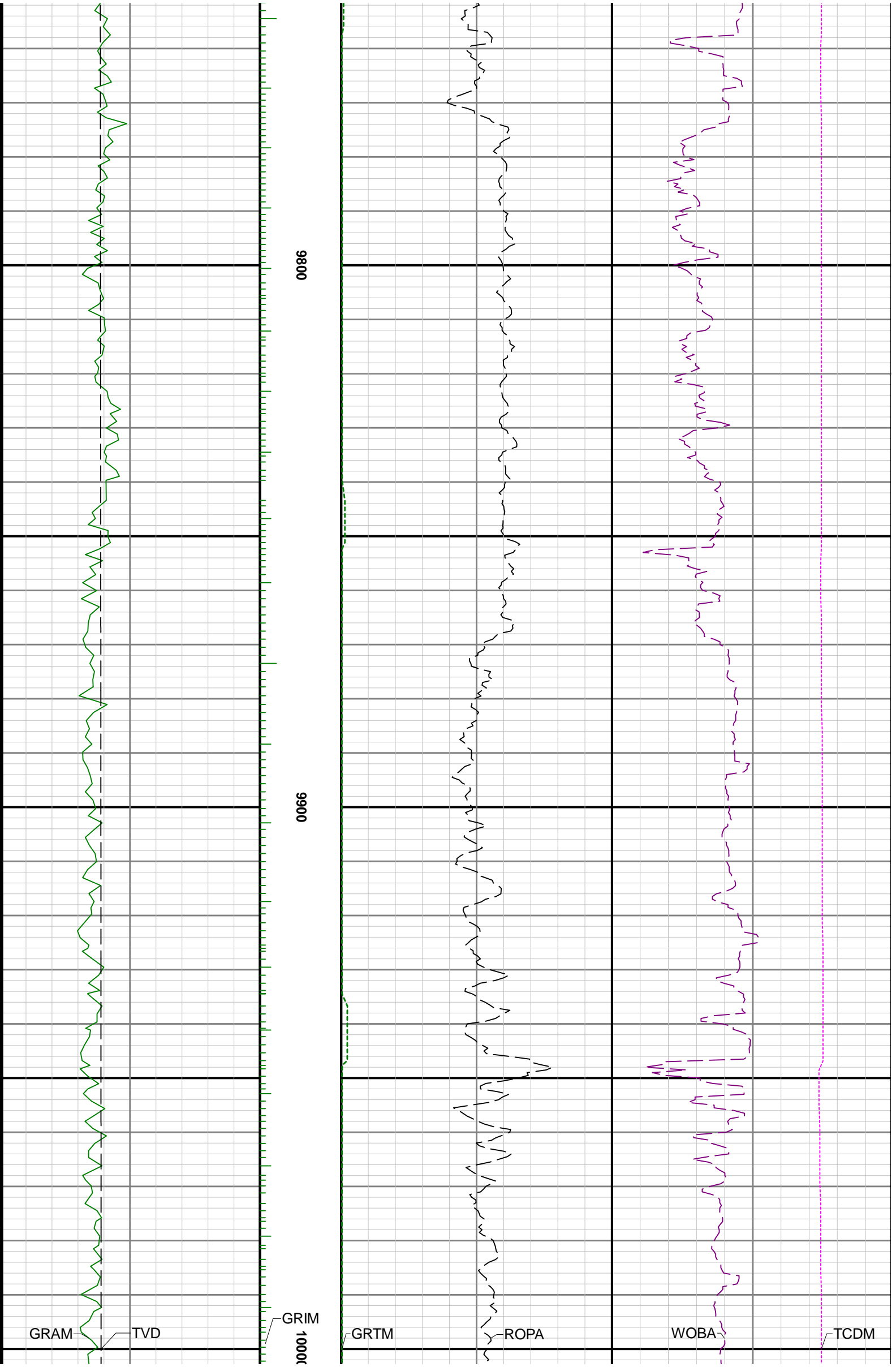


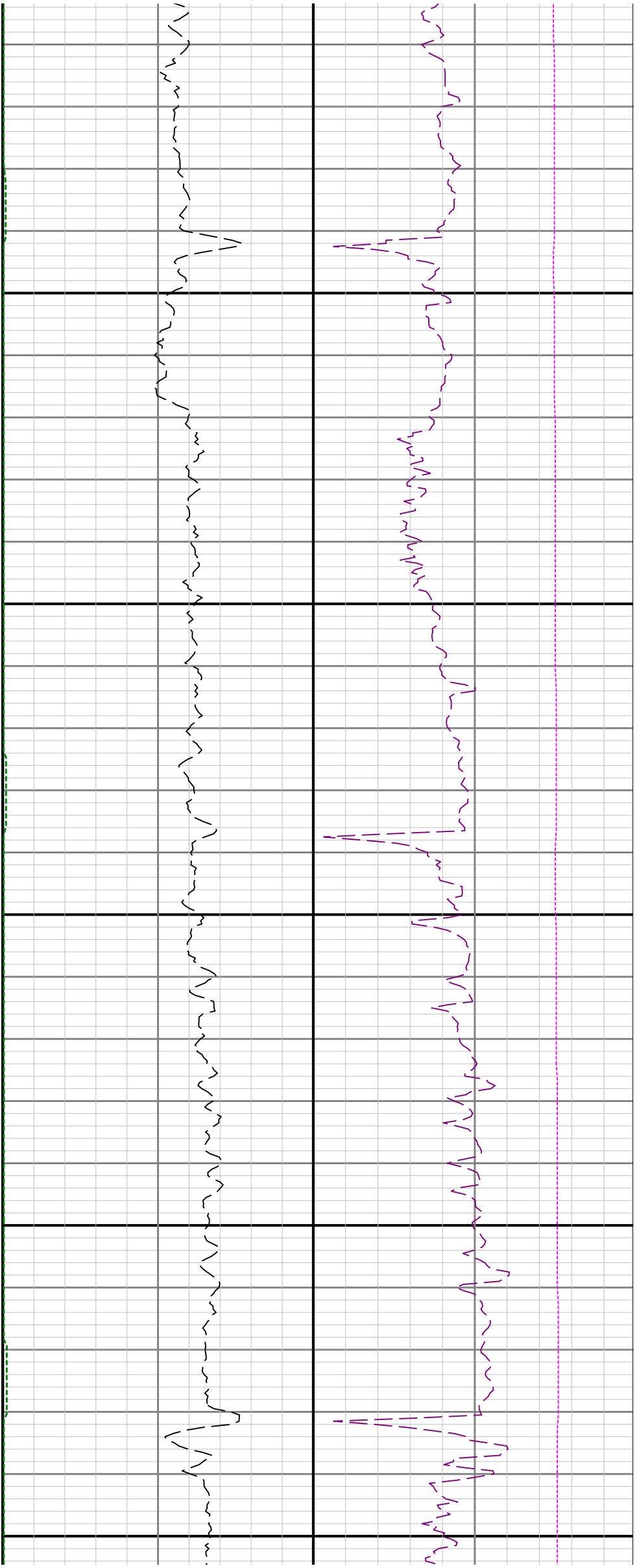
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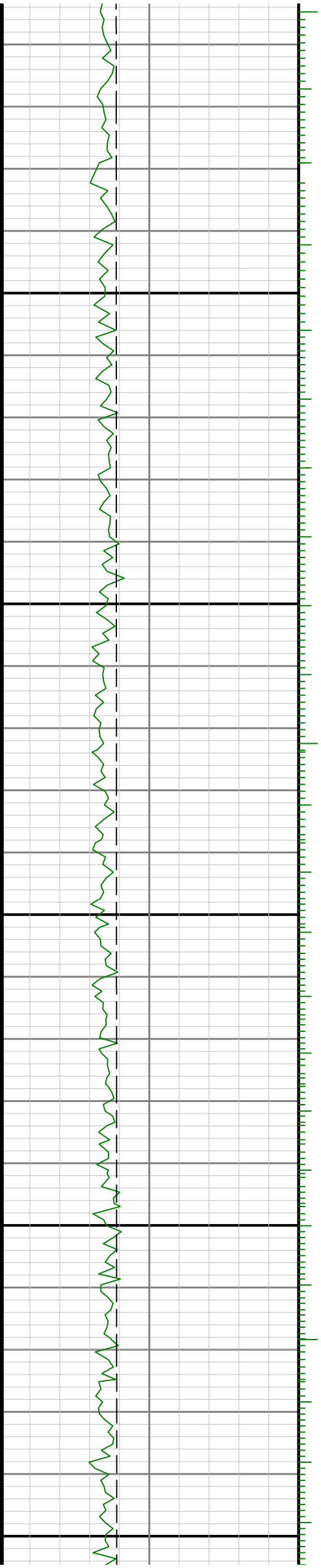


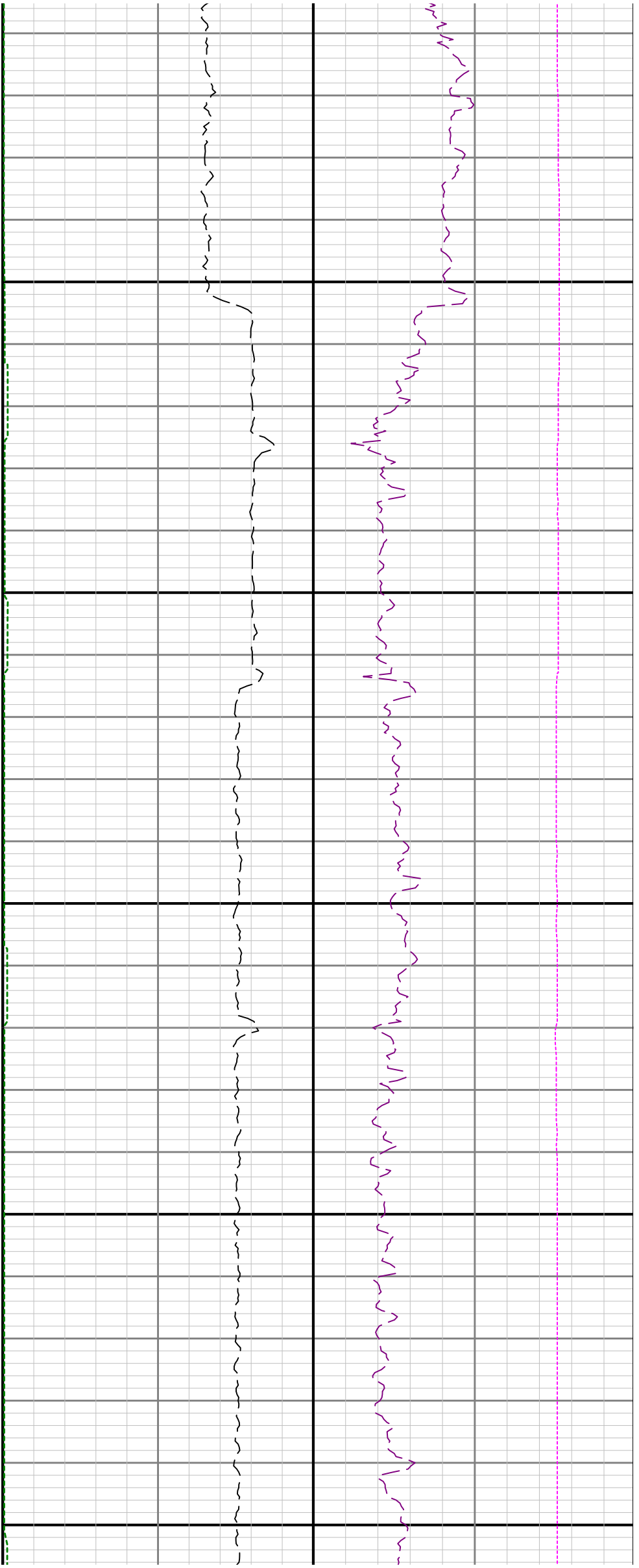




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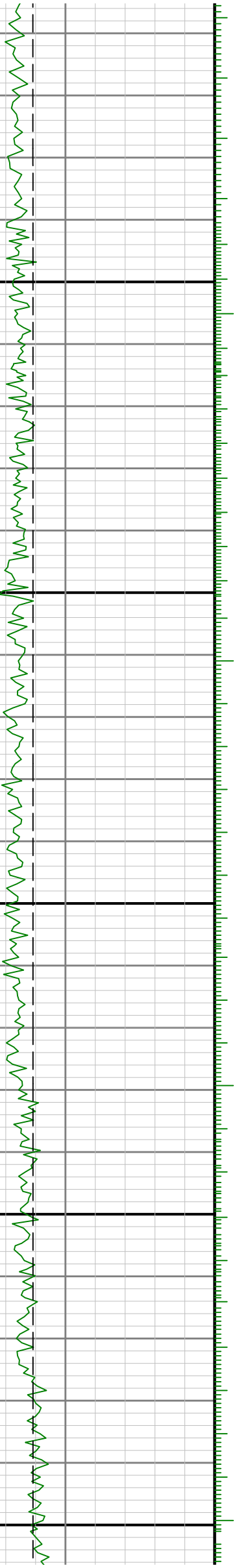


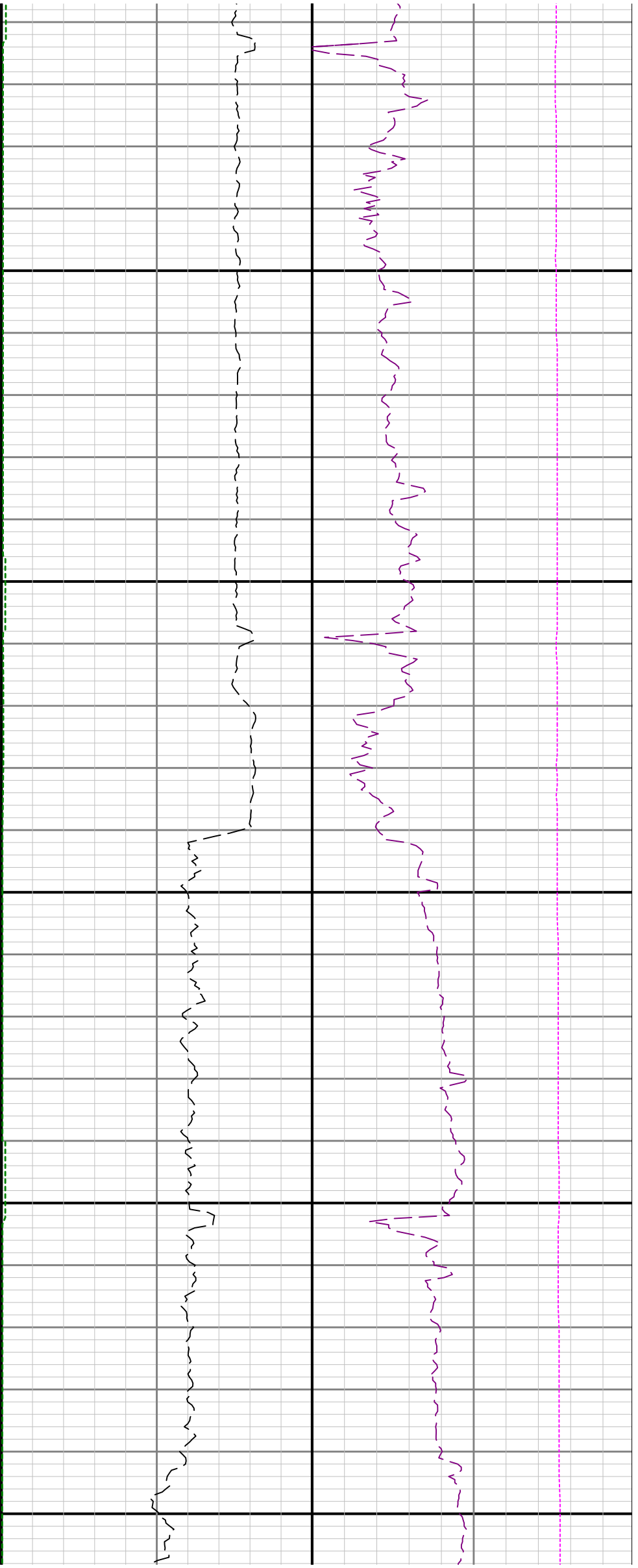


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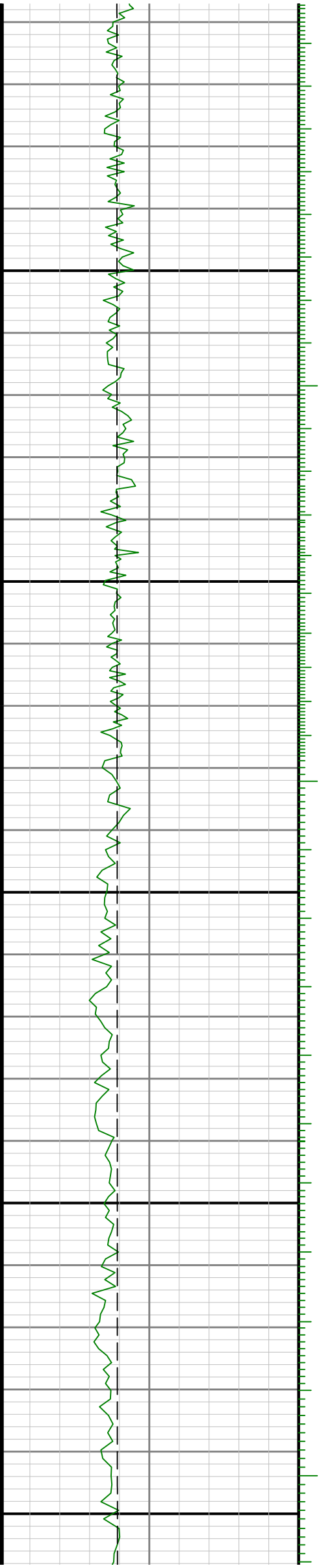
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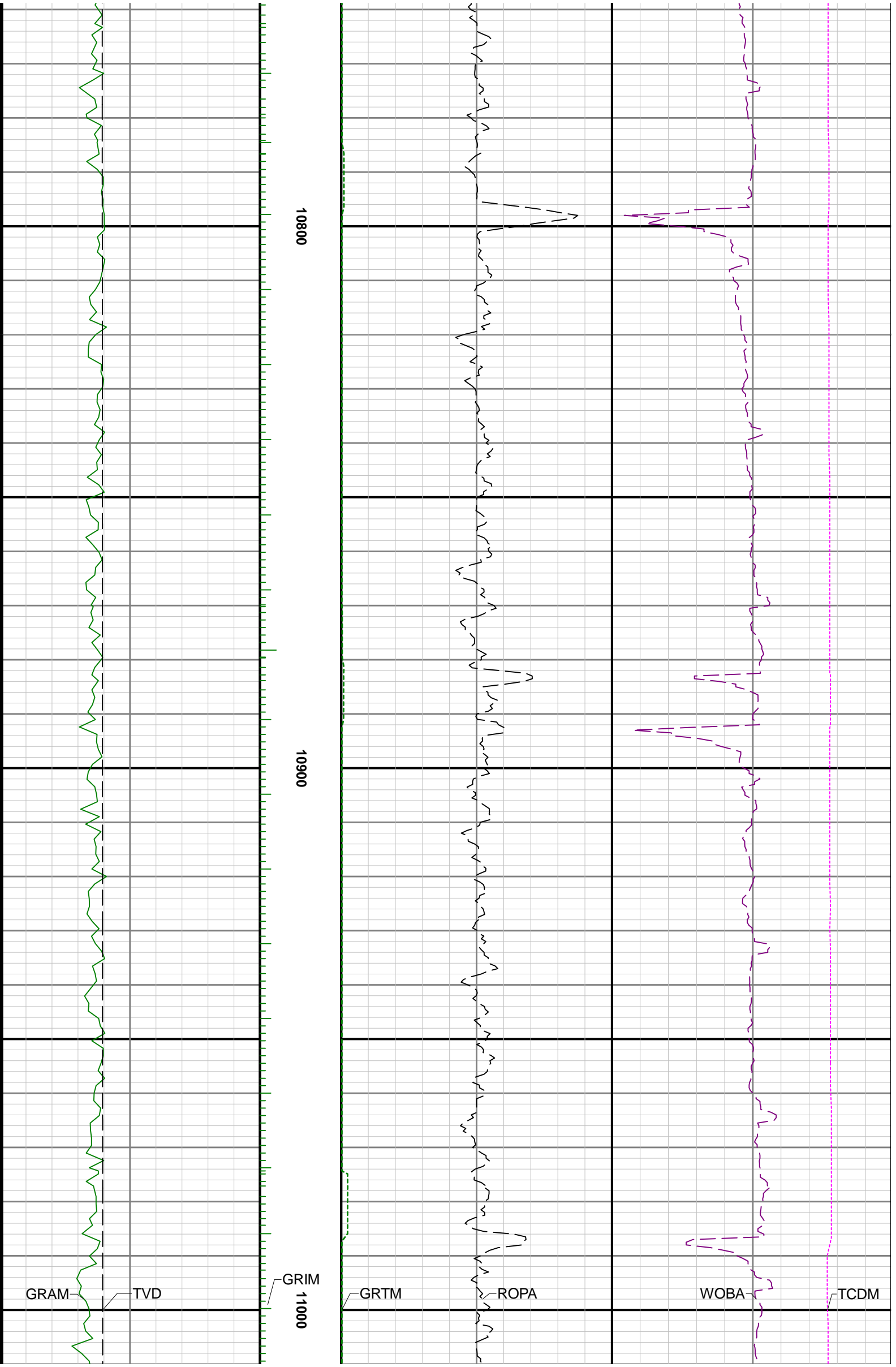




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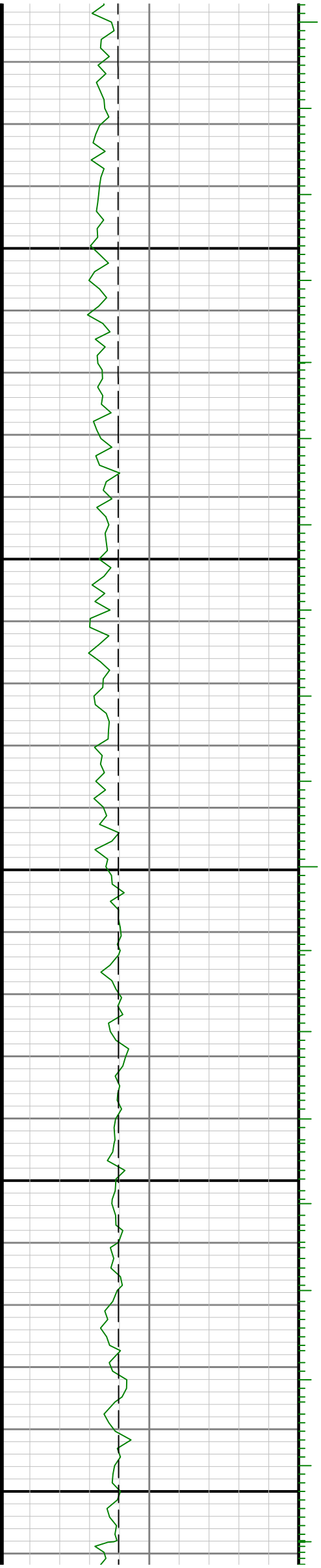


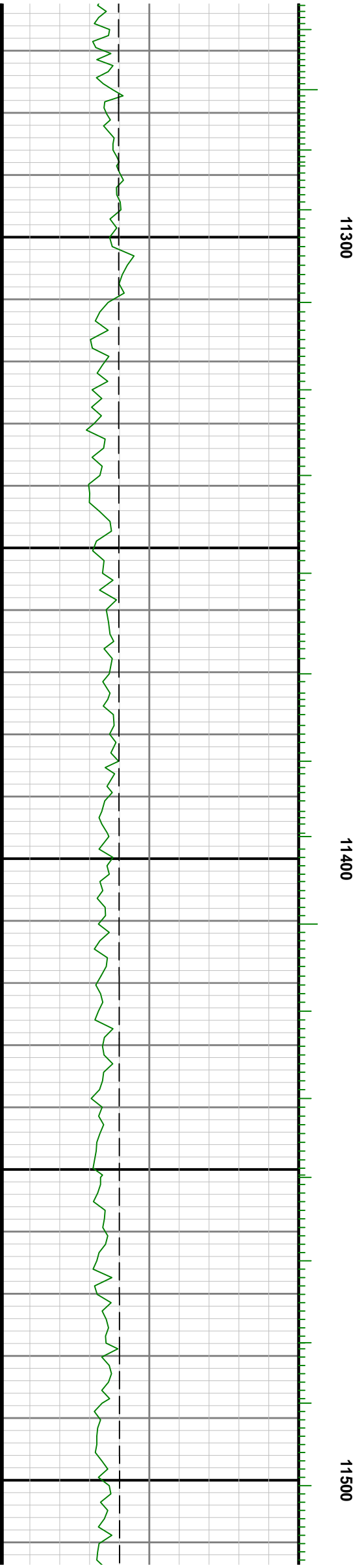
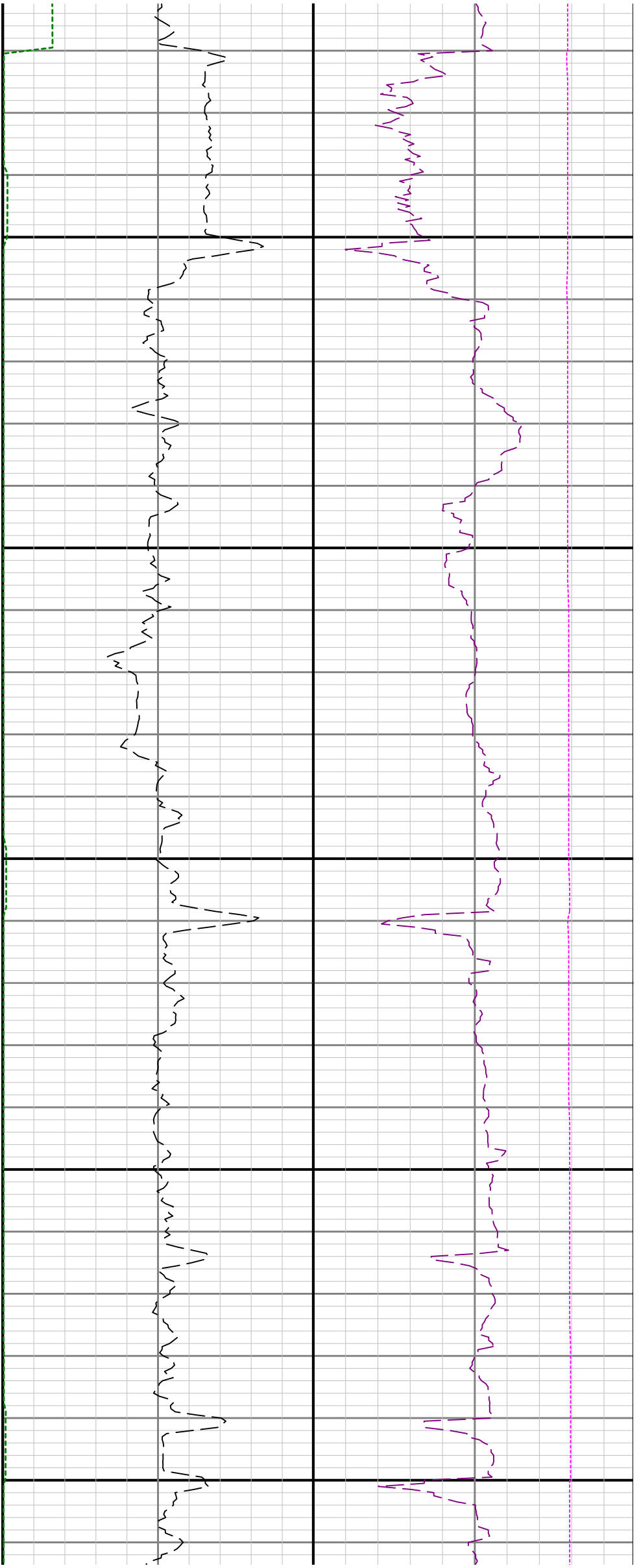


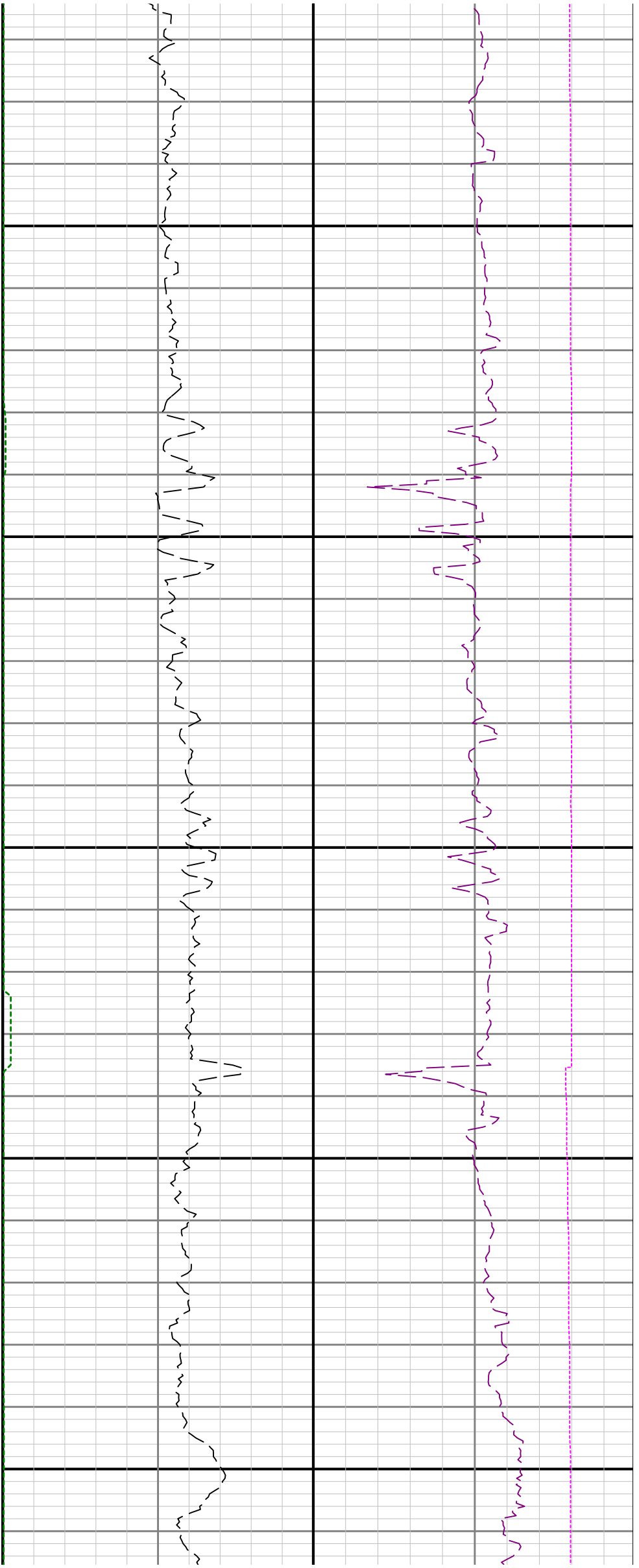


11100

11200

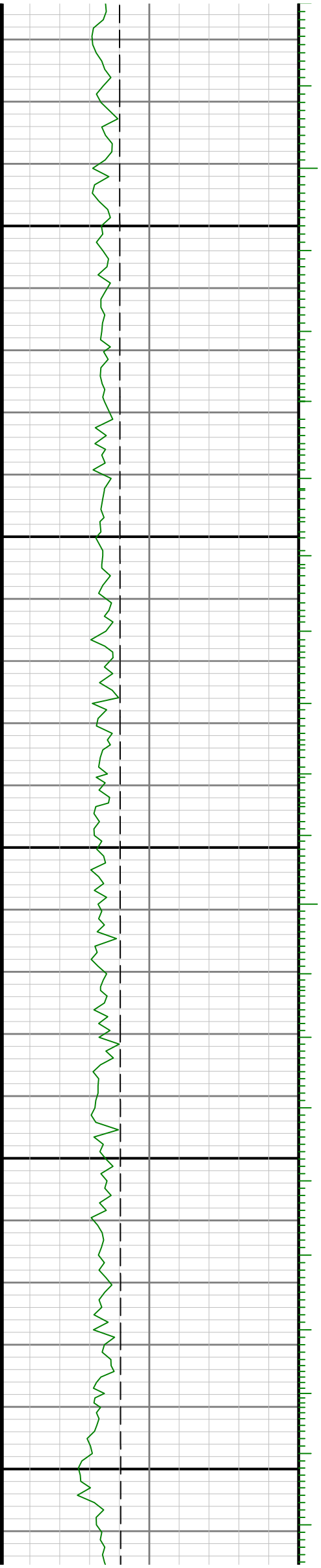




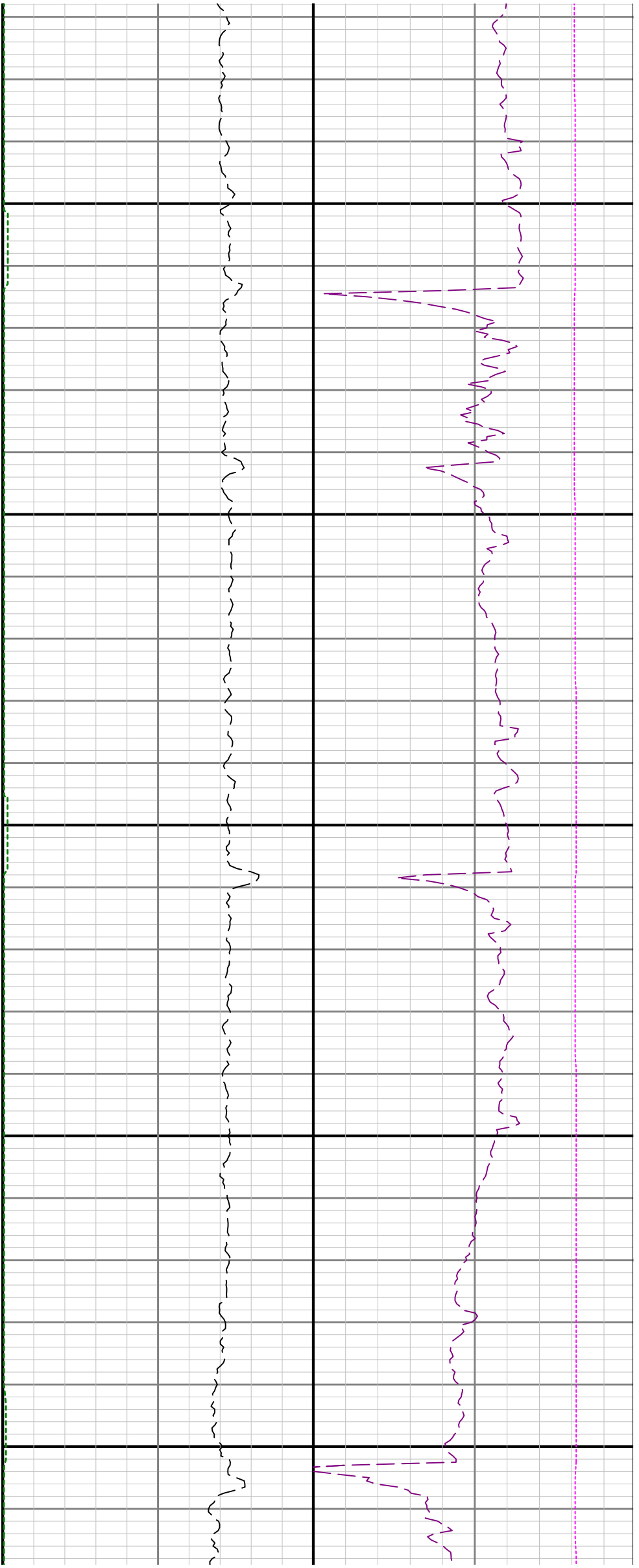


11600

11700

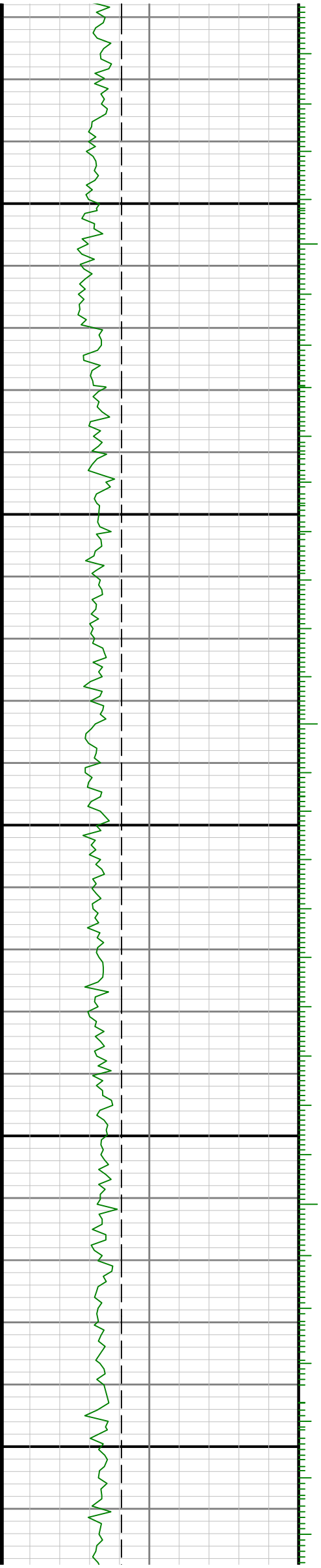


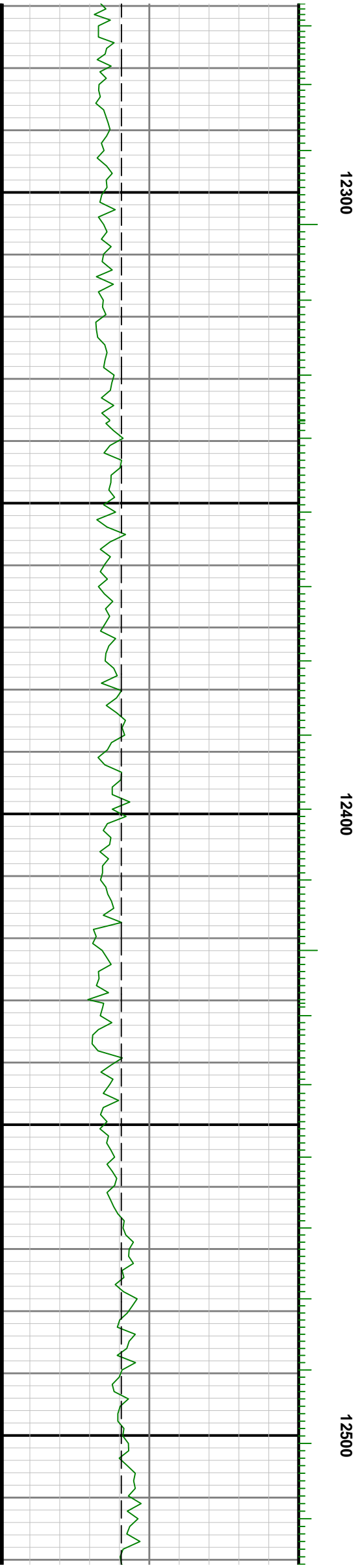




12100

12200

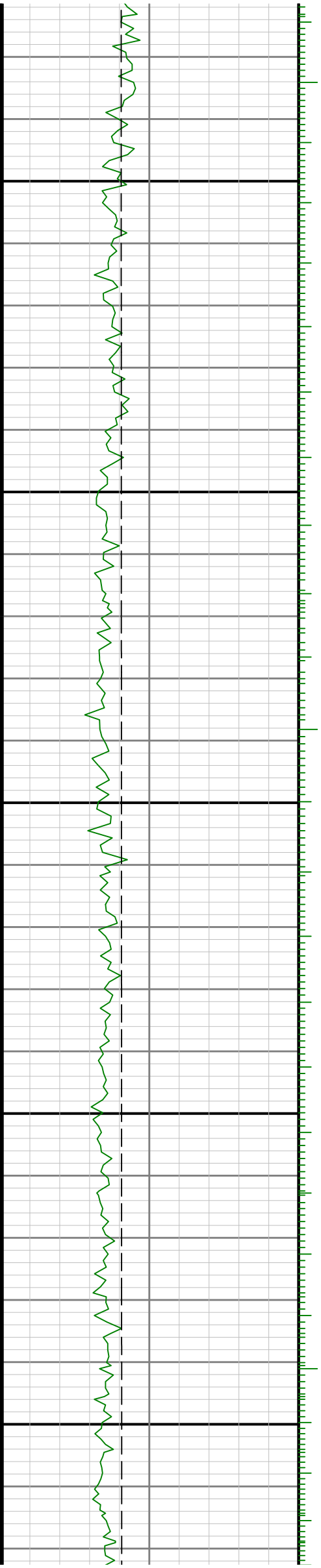


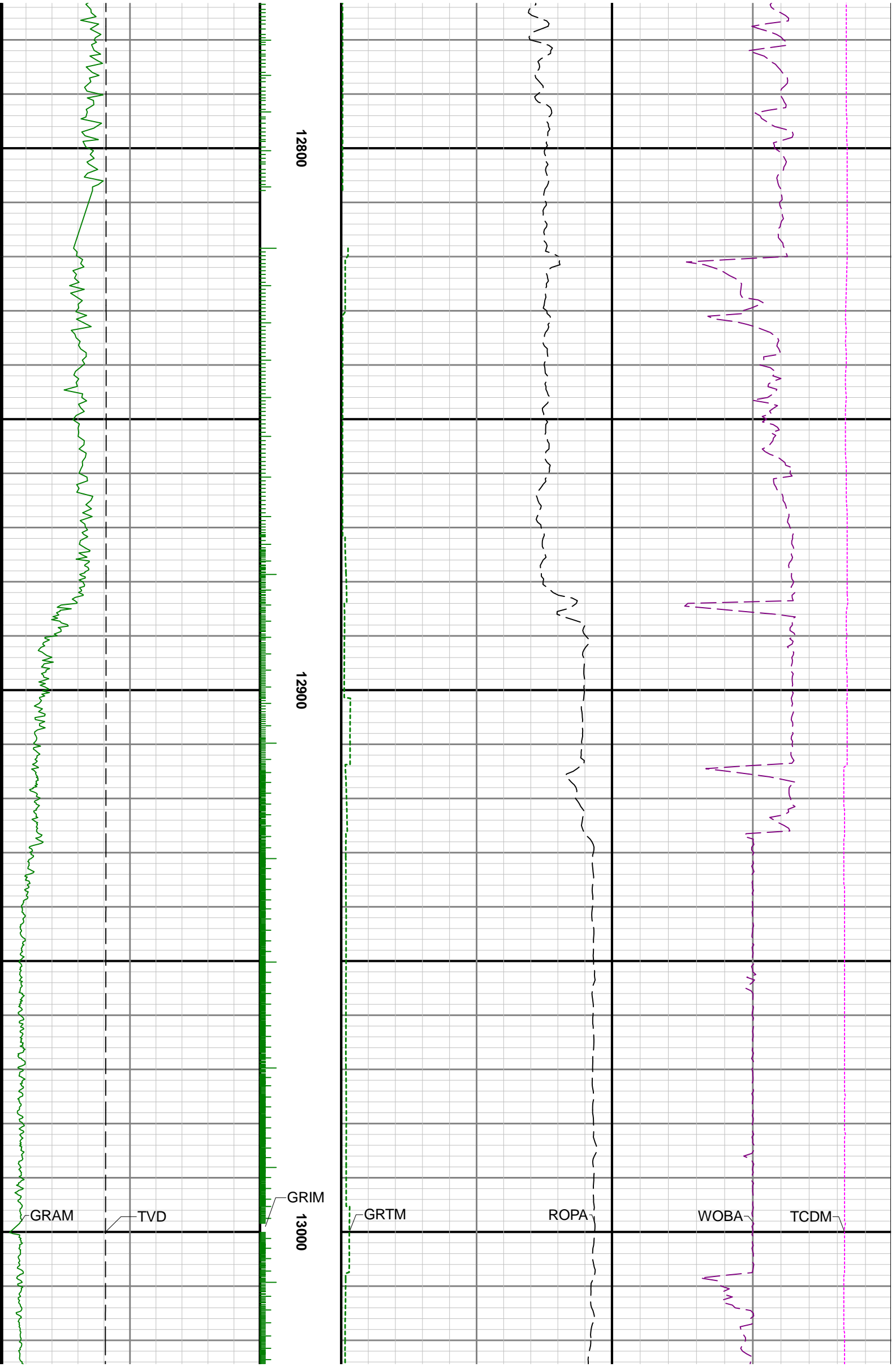




12600

12700

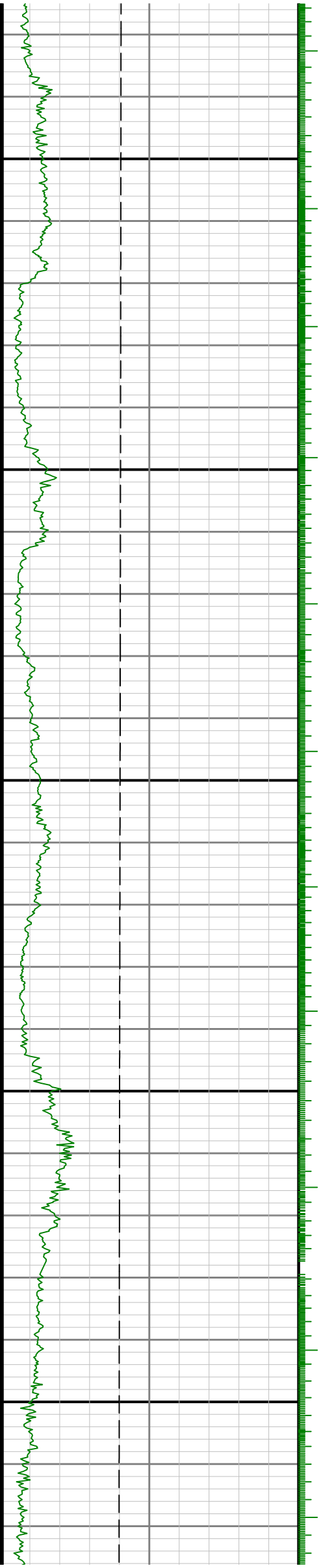


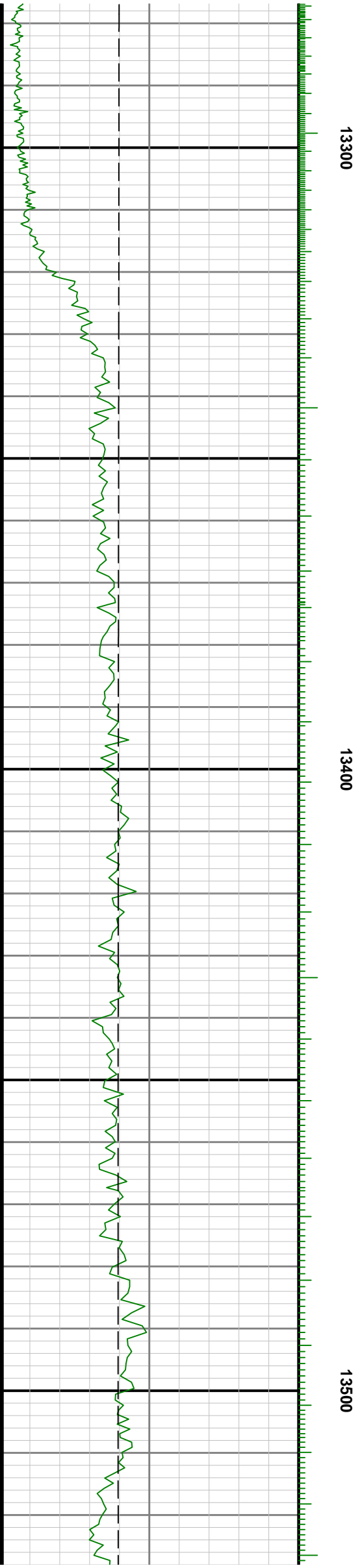
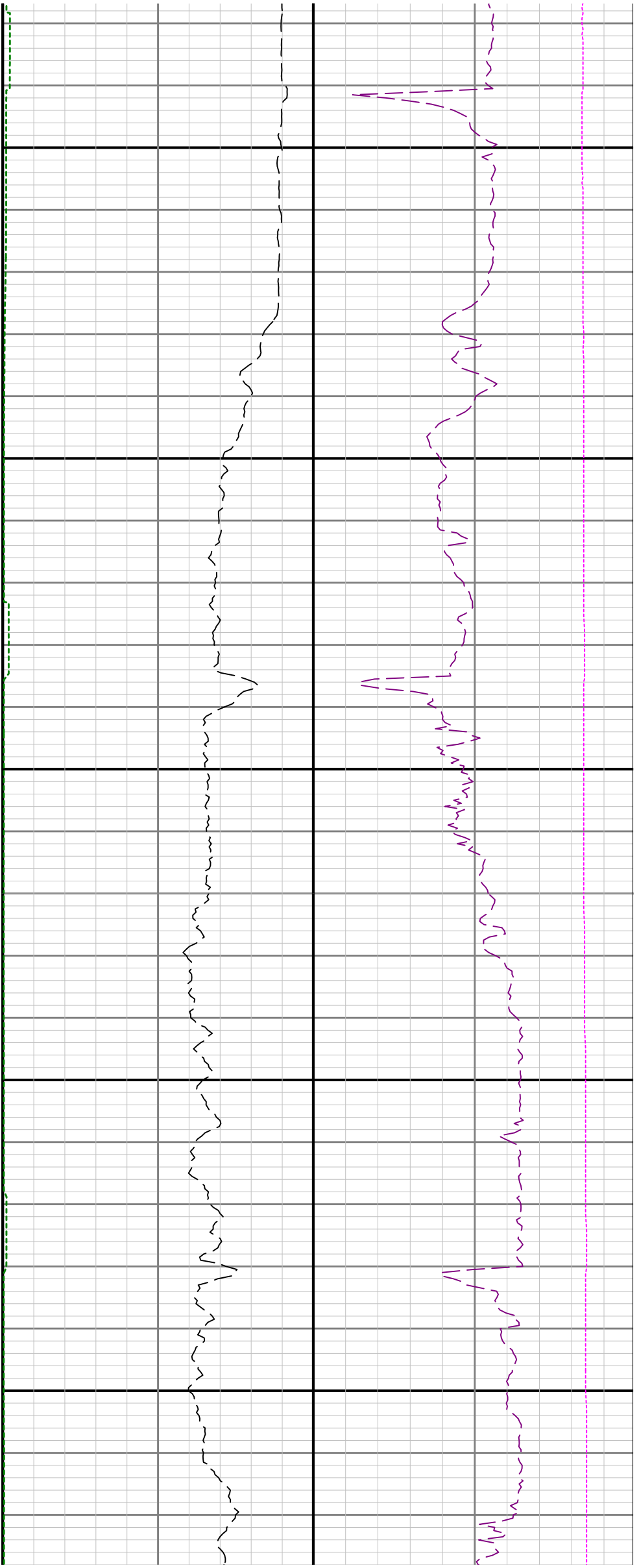


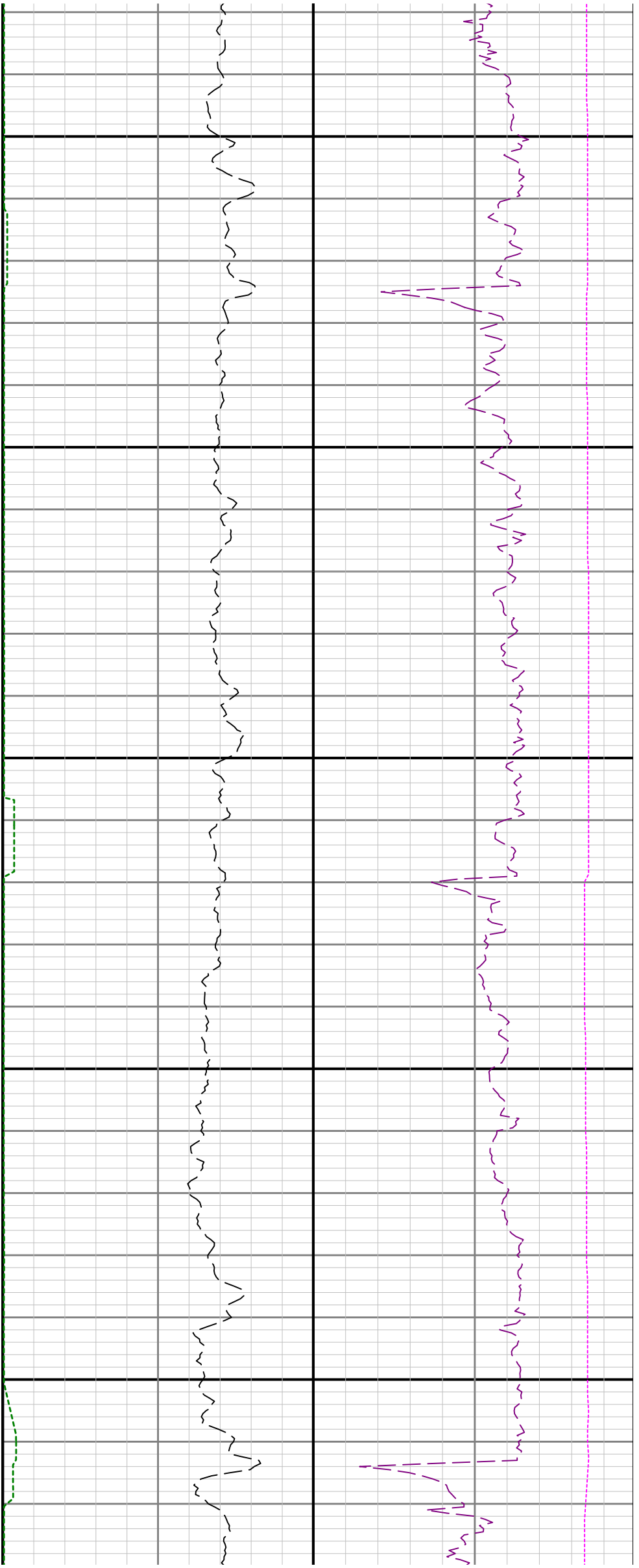


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13200

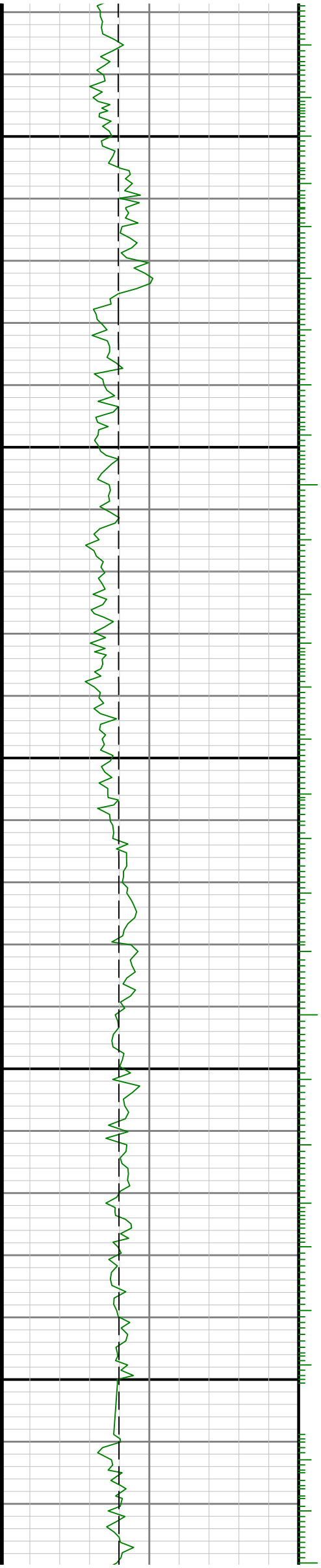


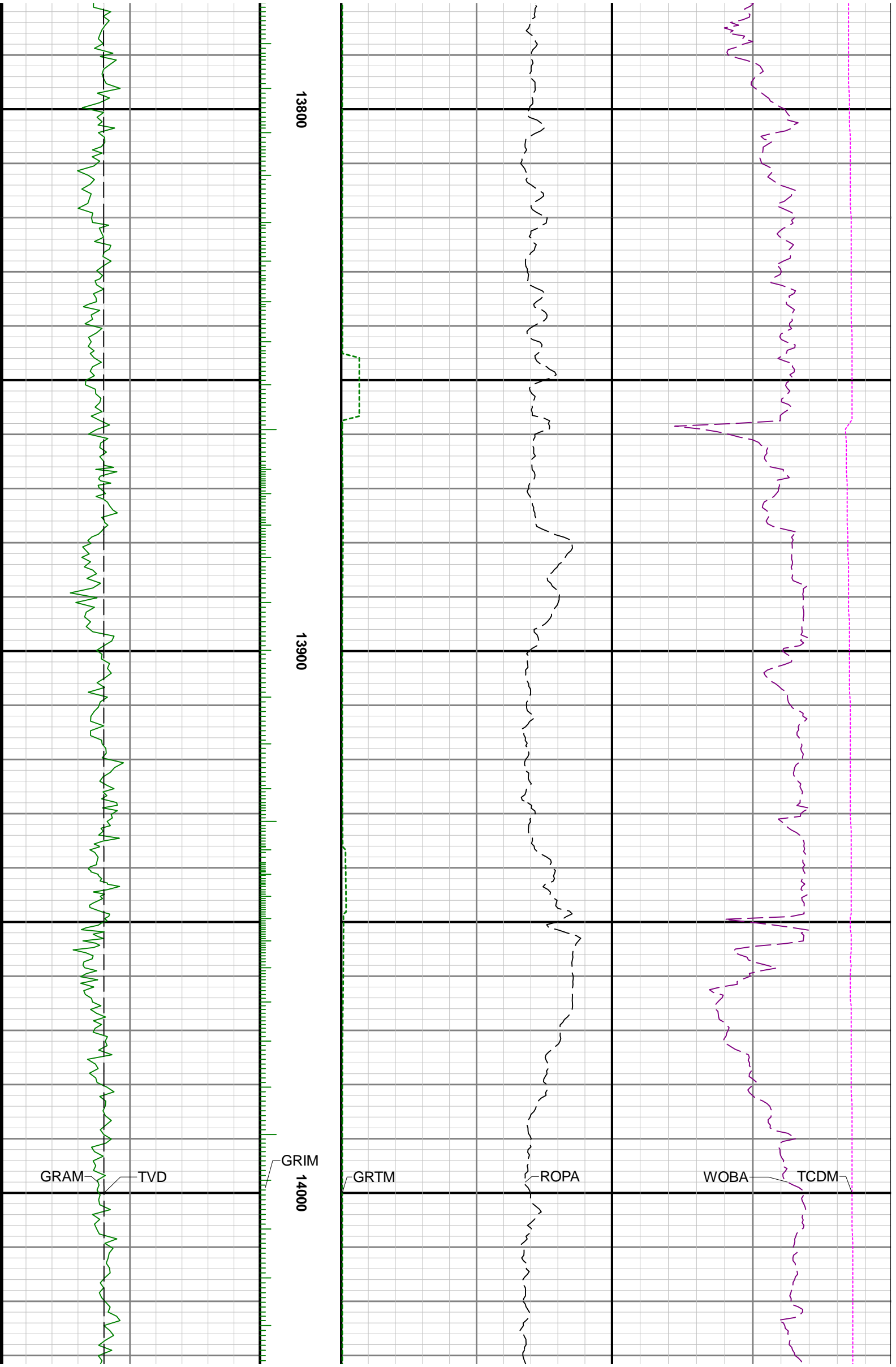


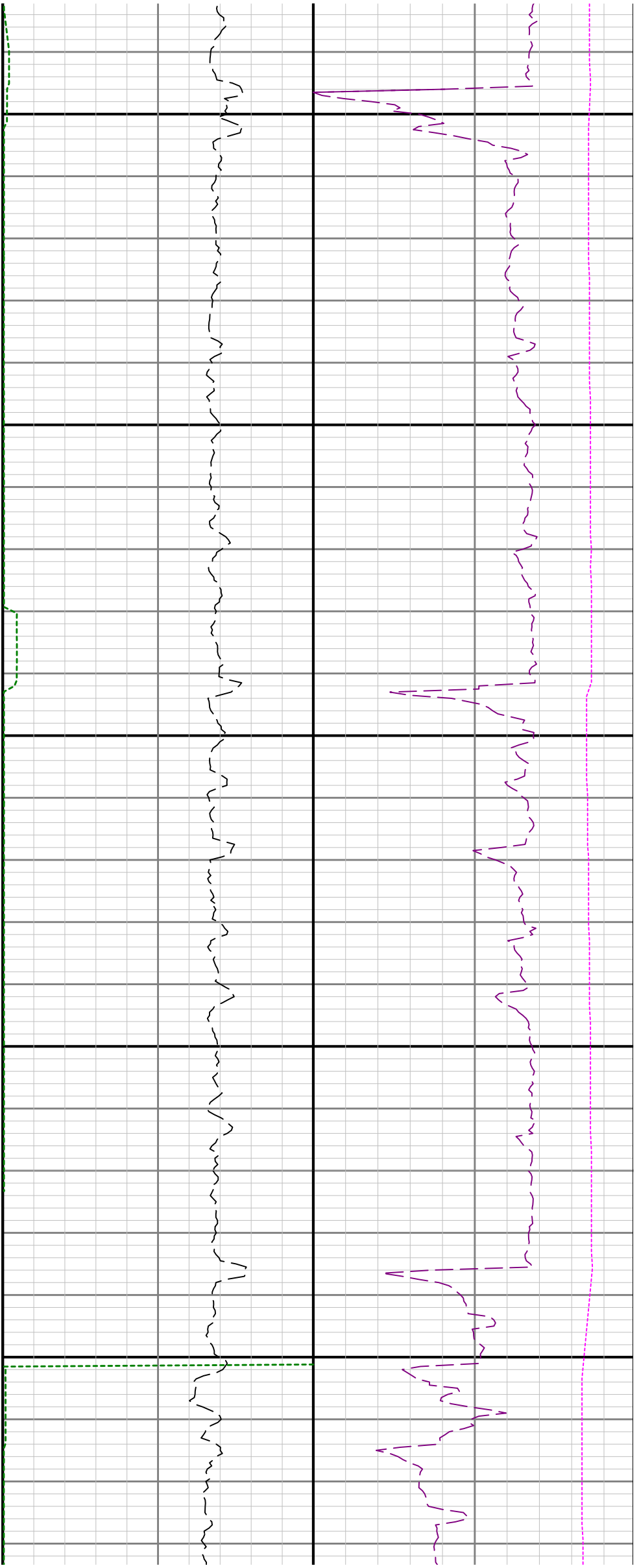


13600

13700





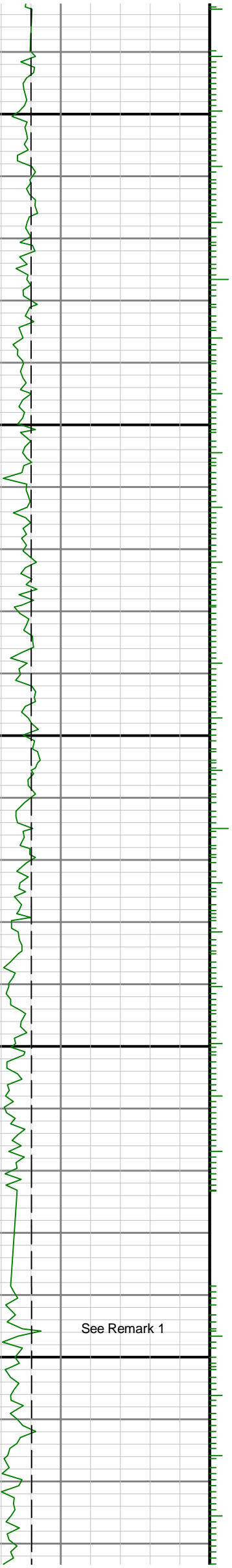


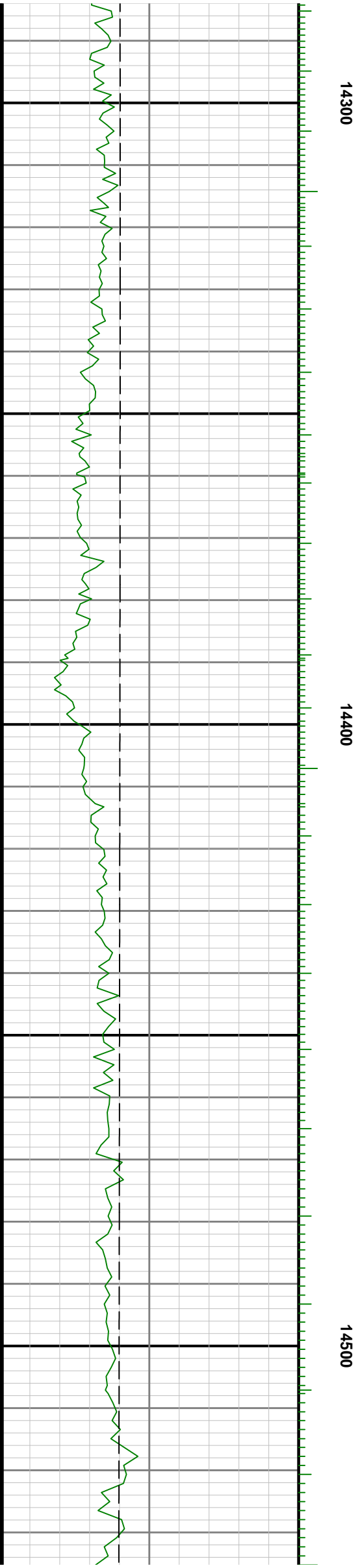
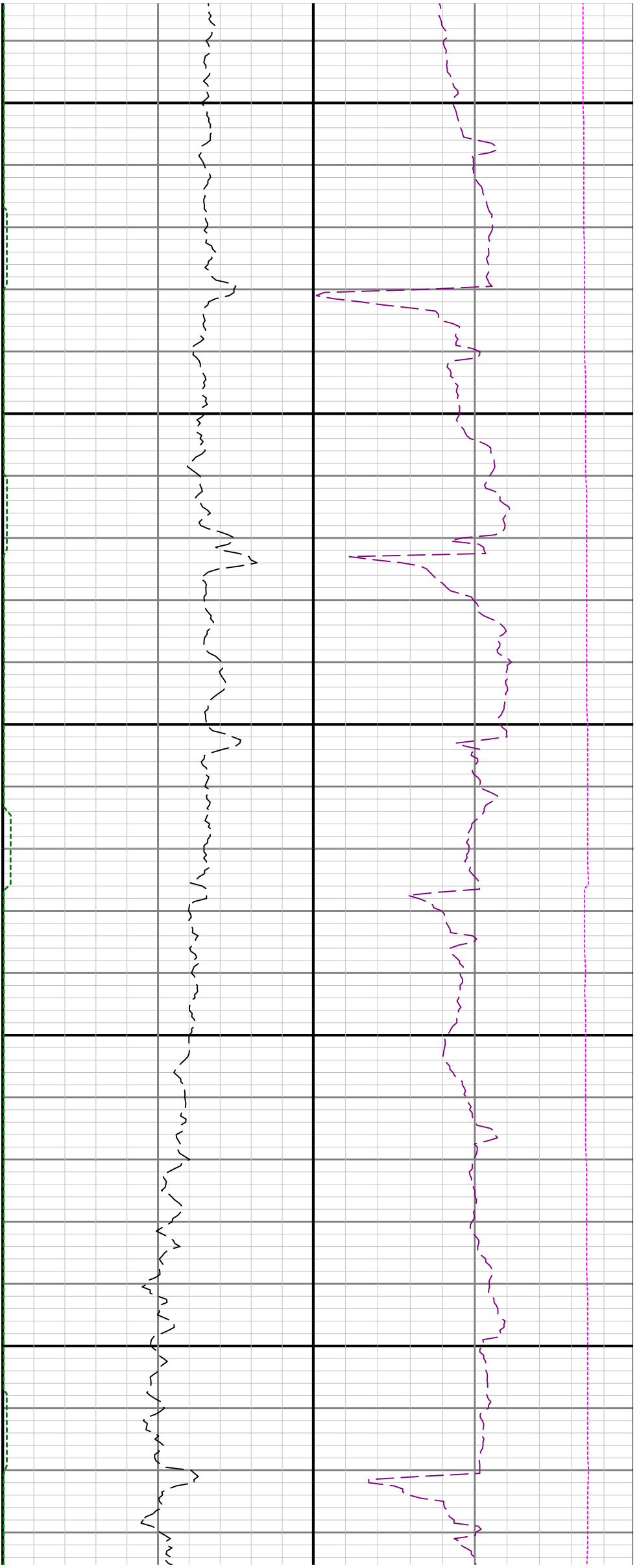
R1 < R2

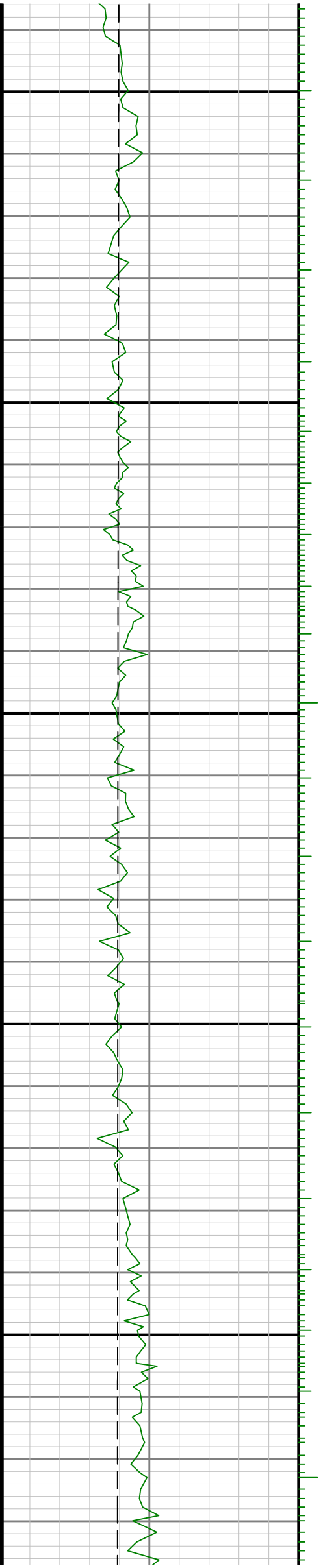
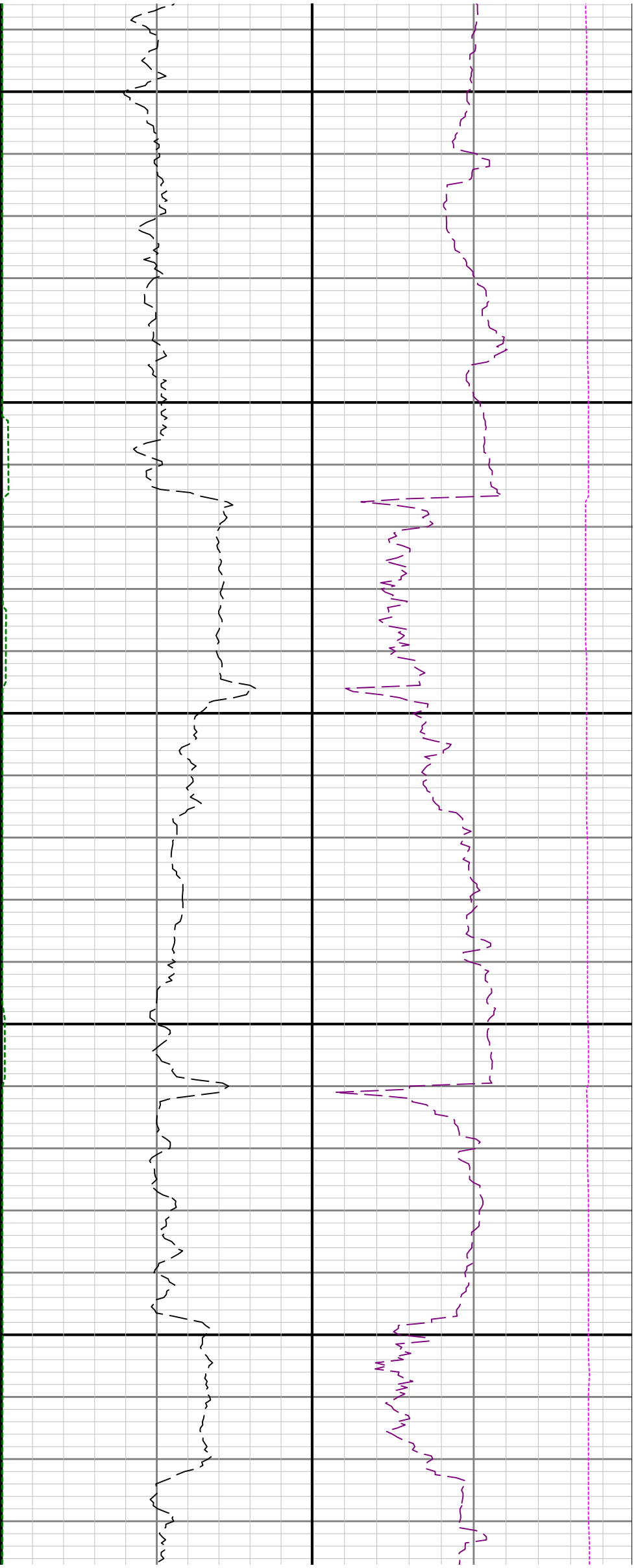
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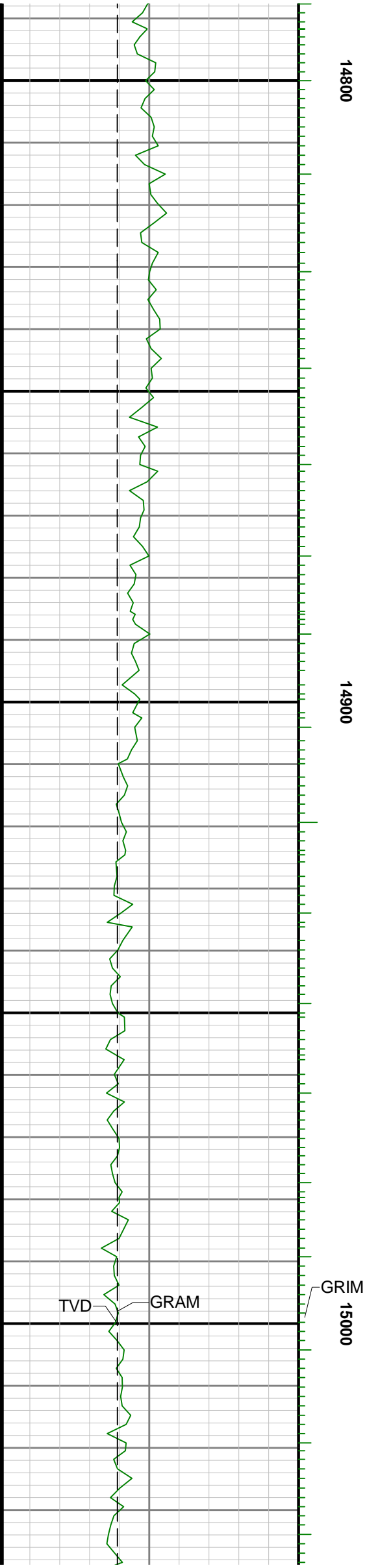
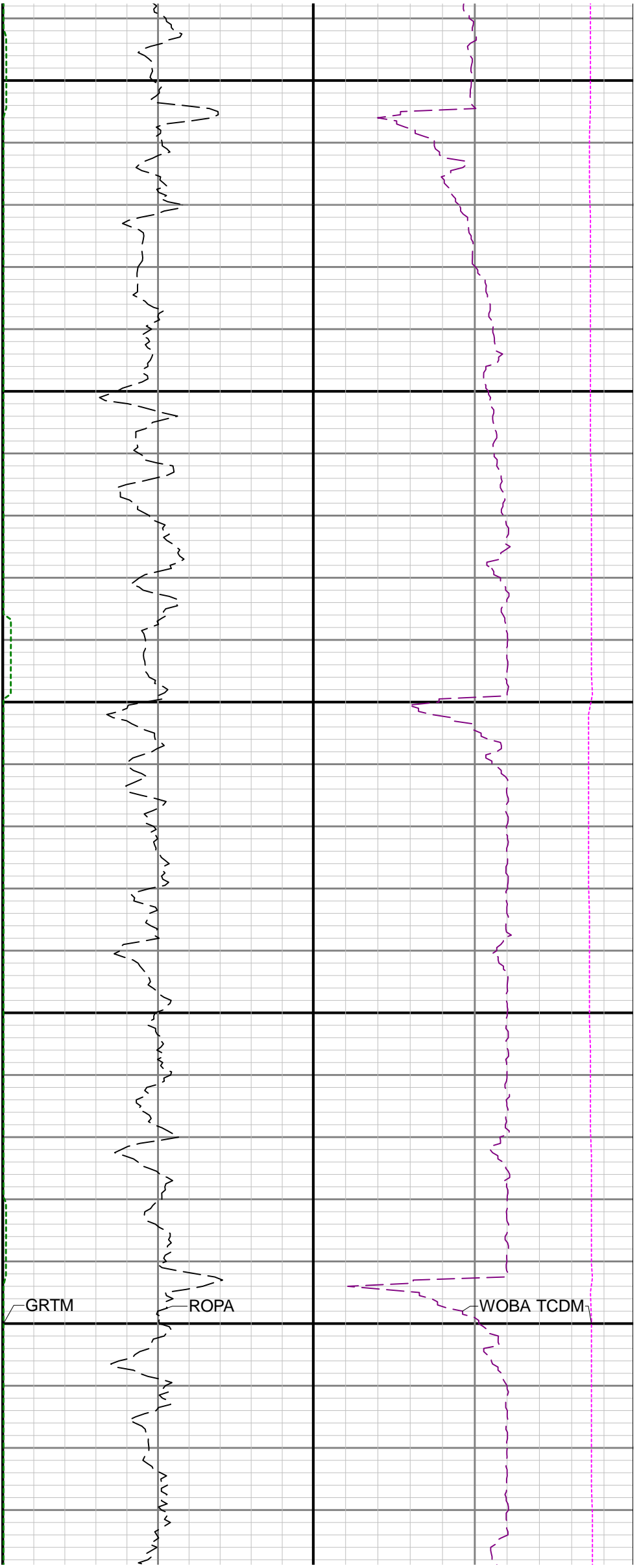
14200

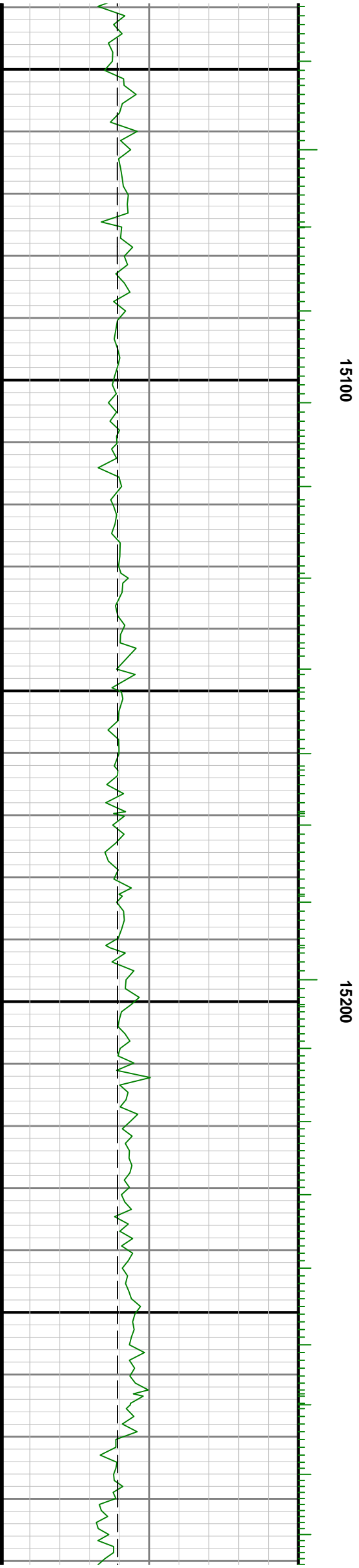
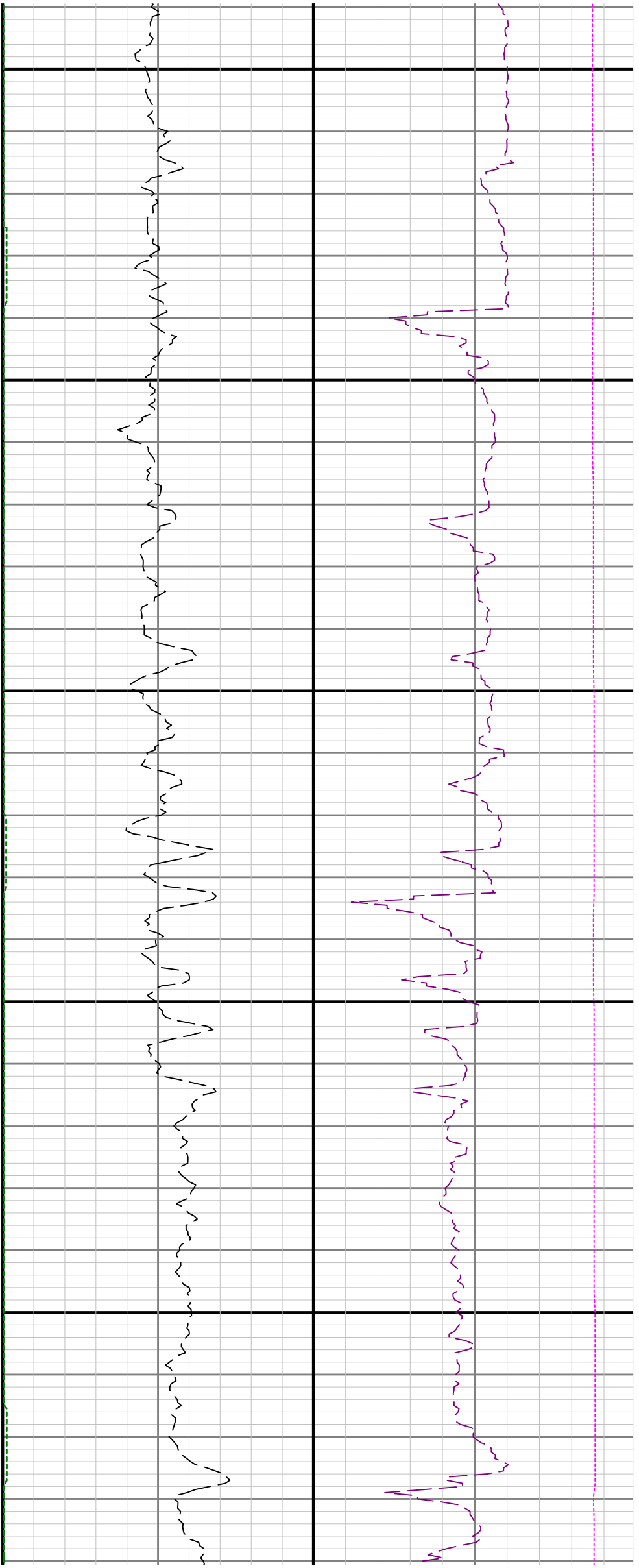
See Remark 1

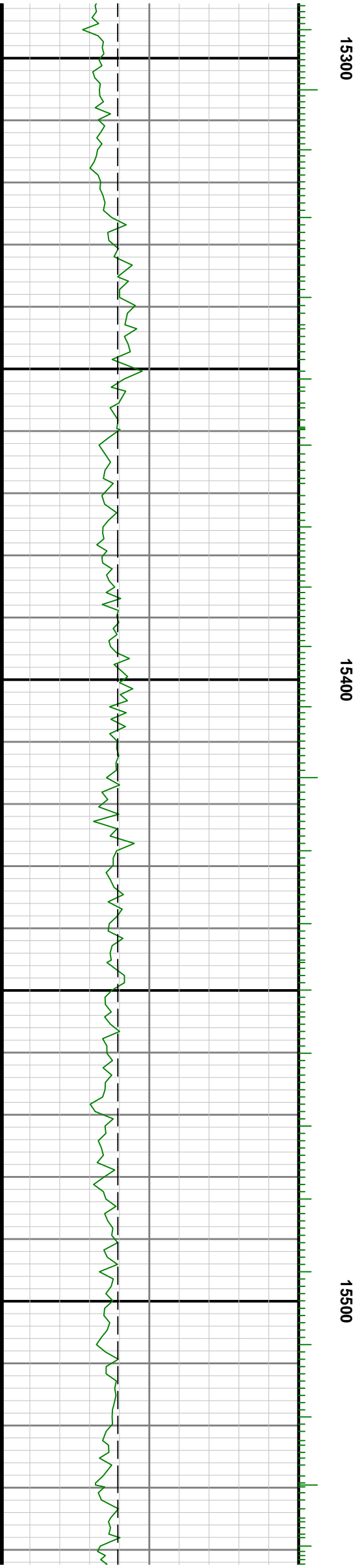
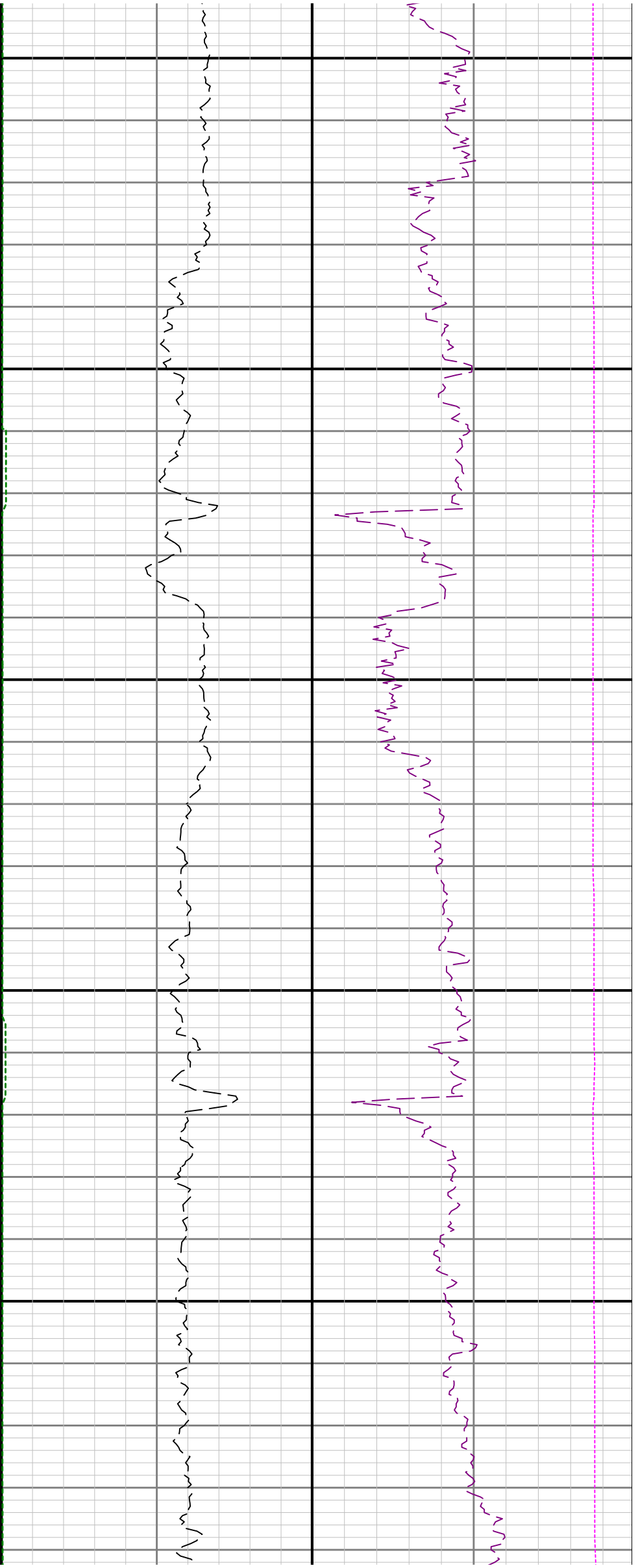


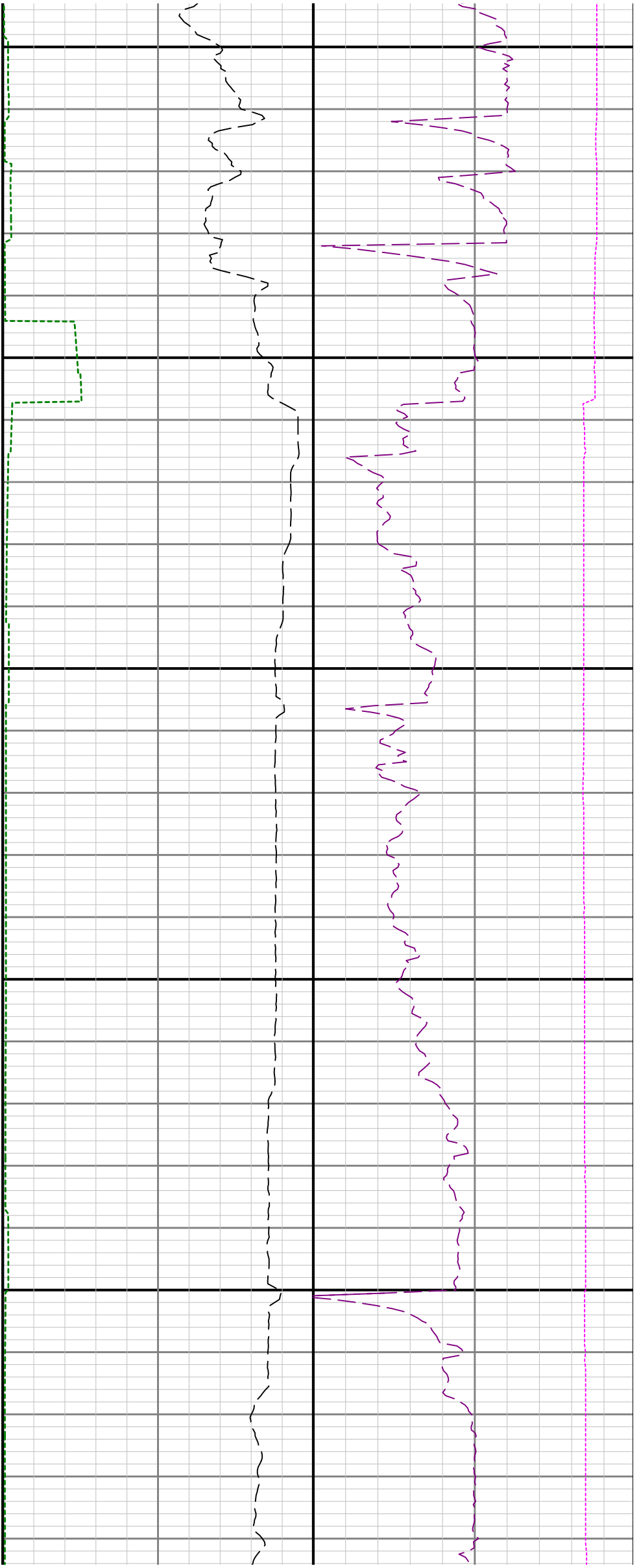






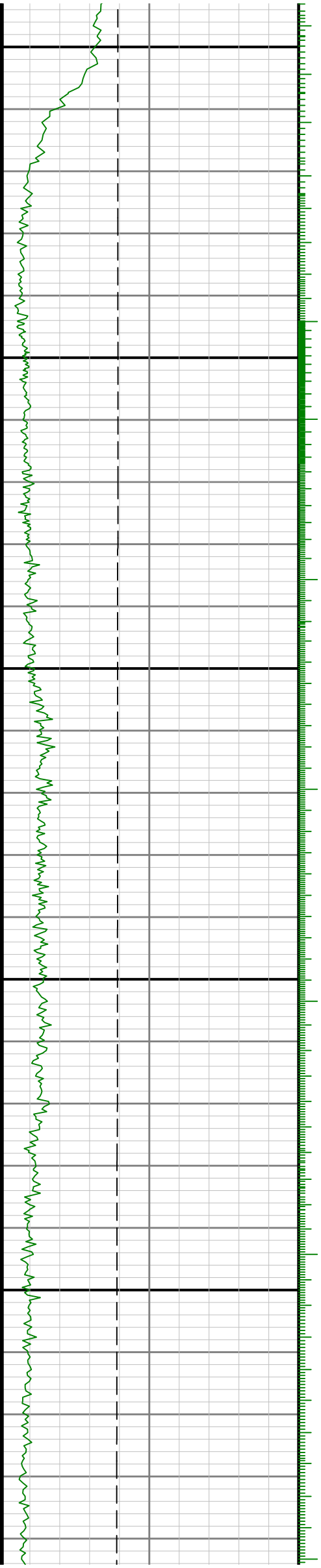


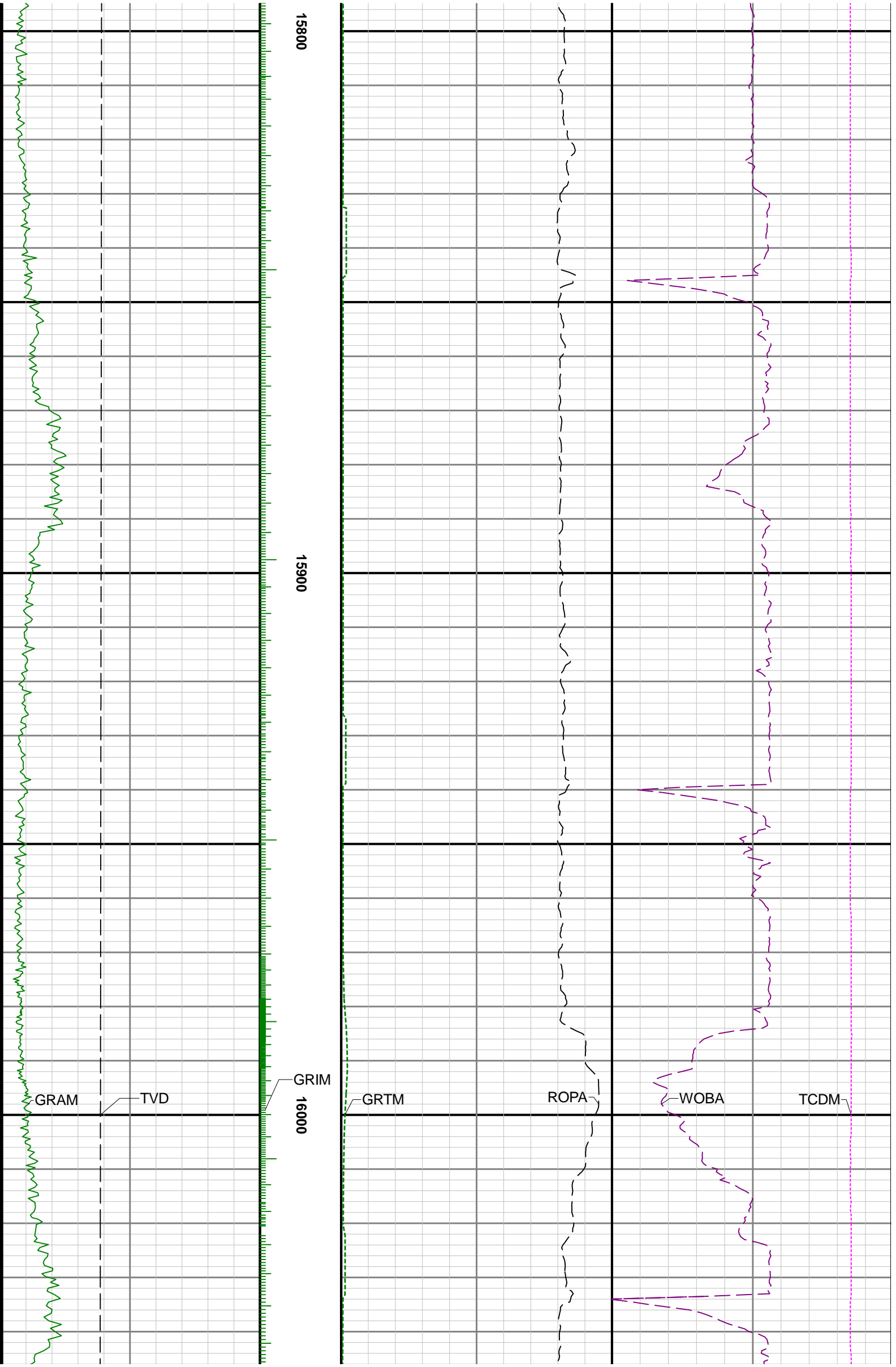


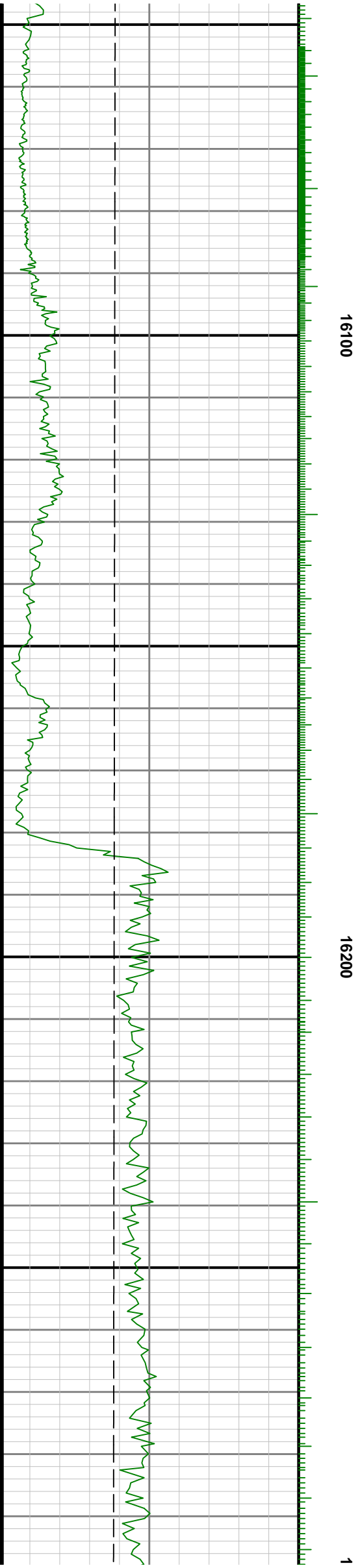
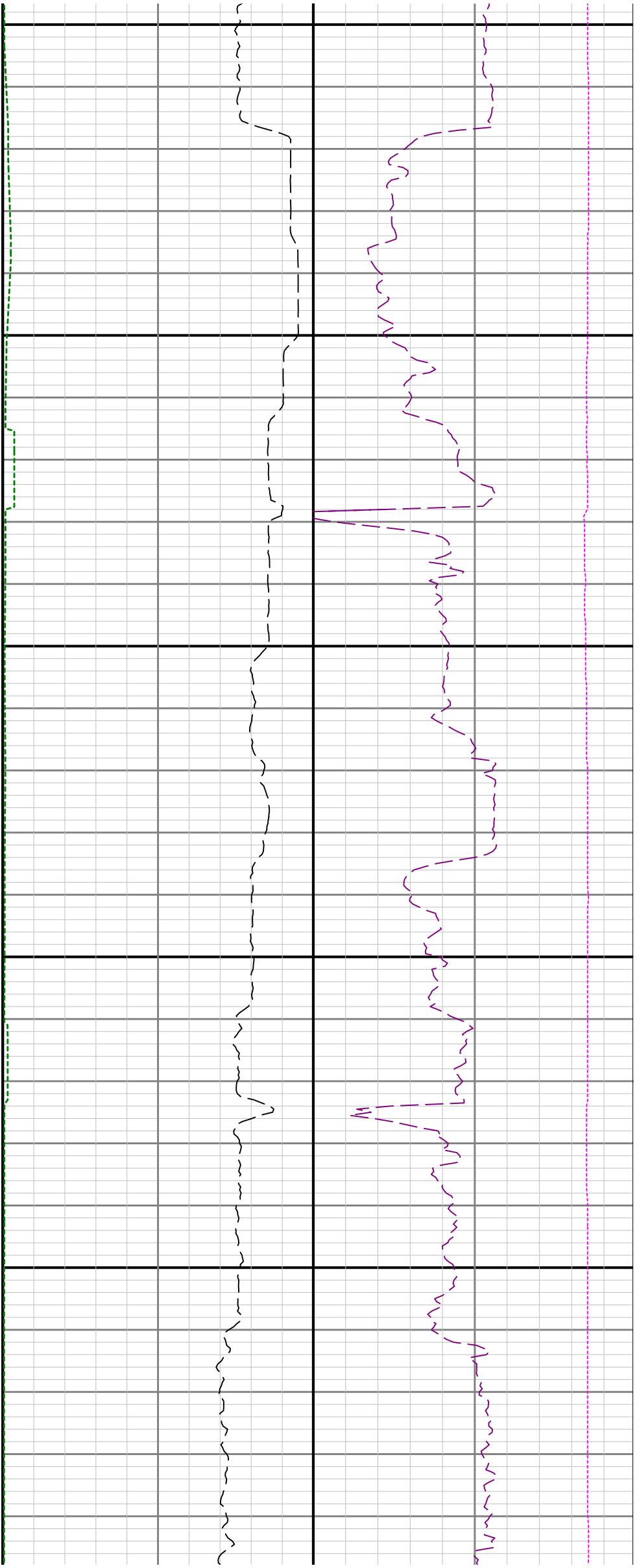


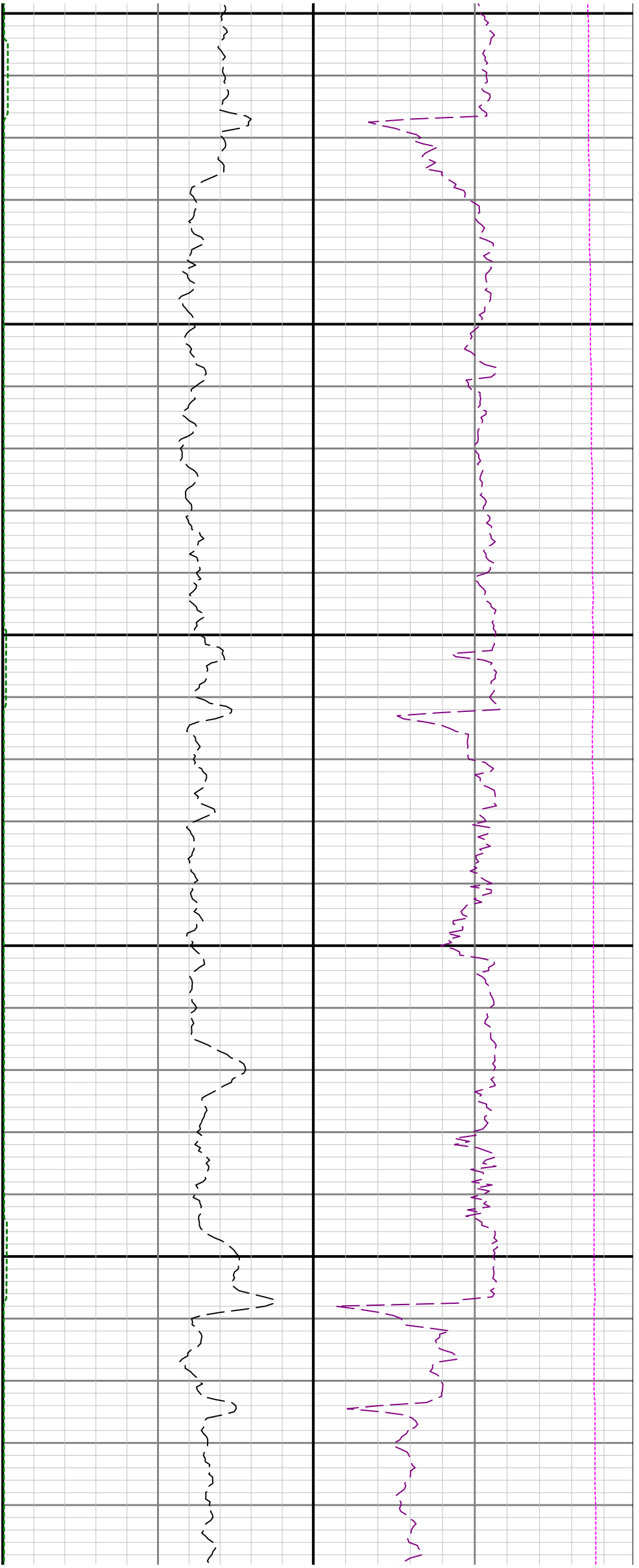
15600

15700





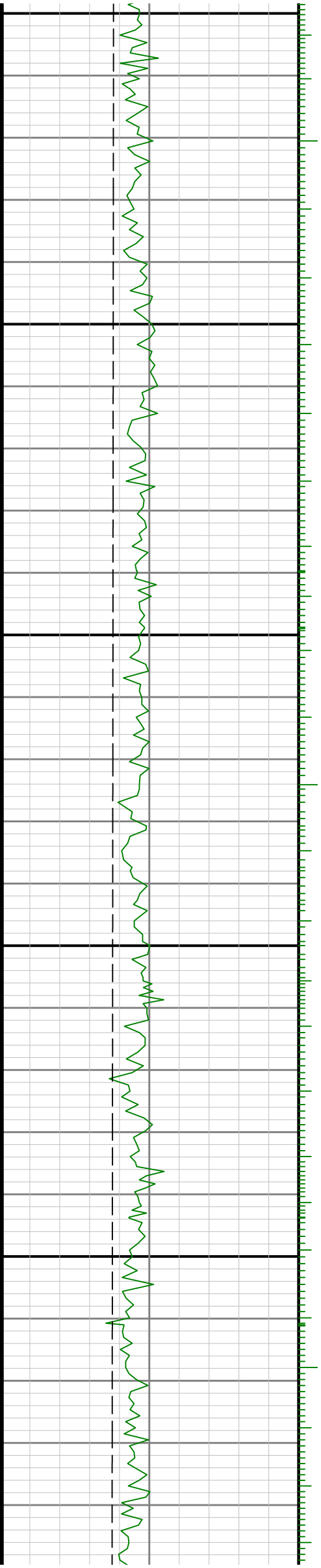


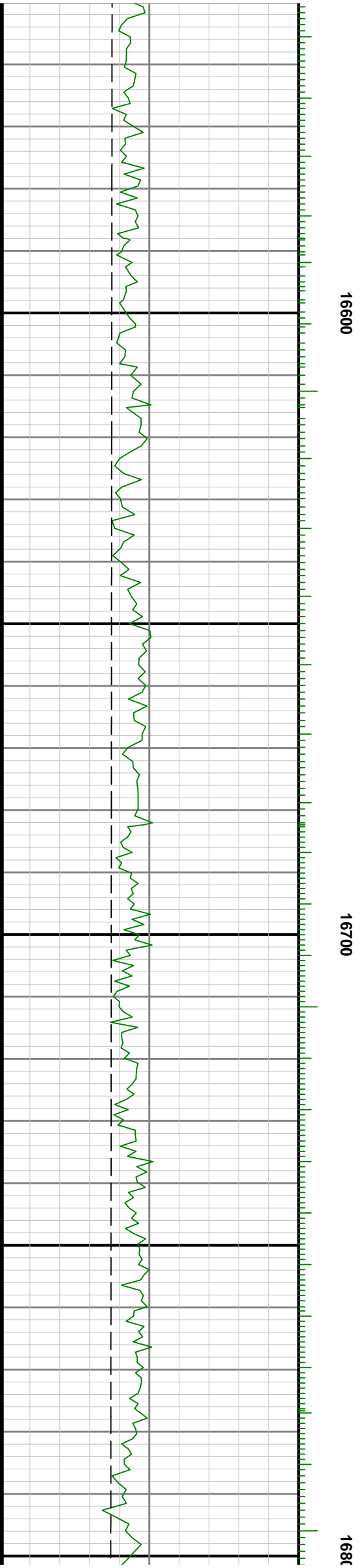
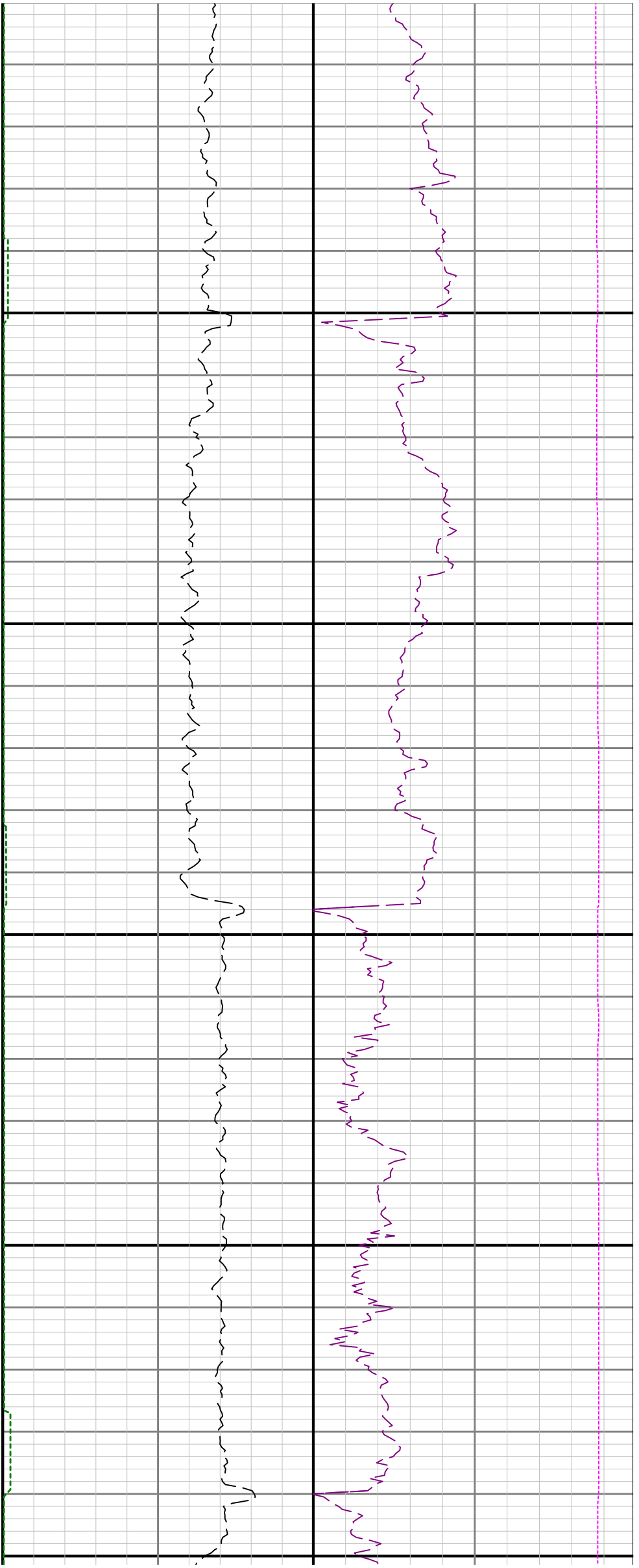


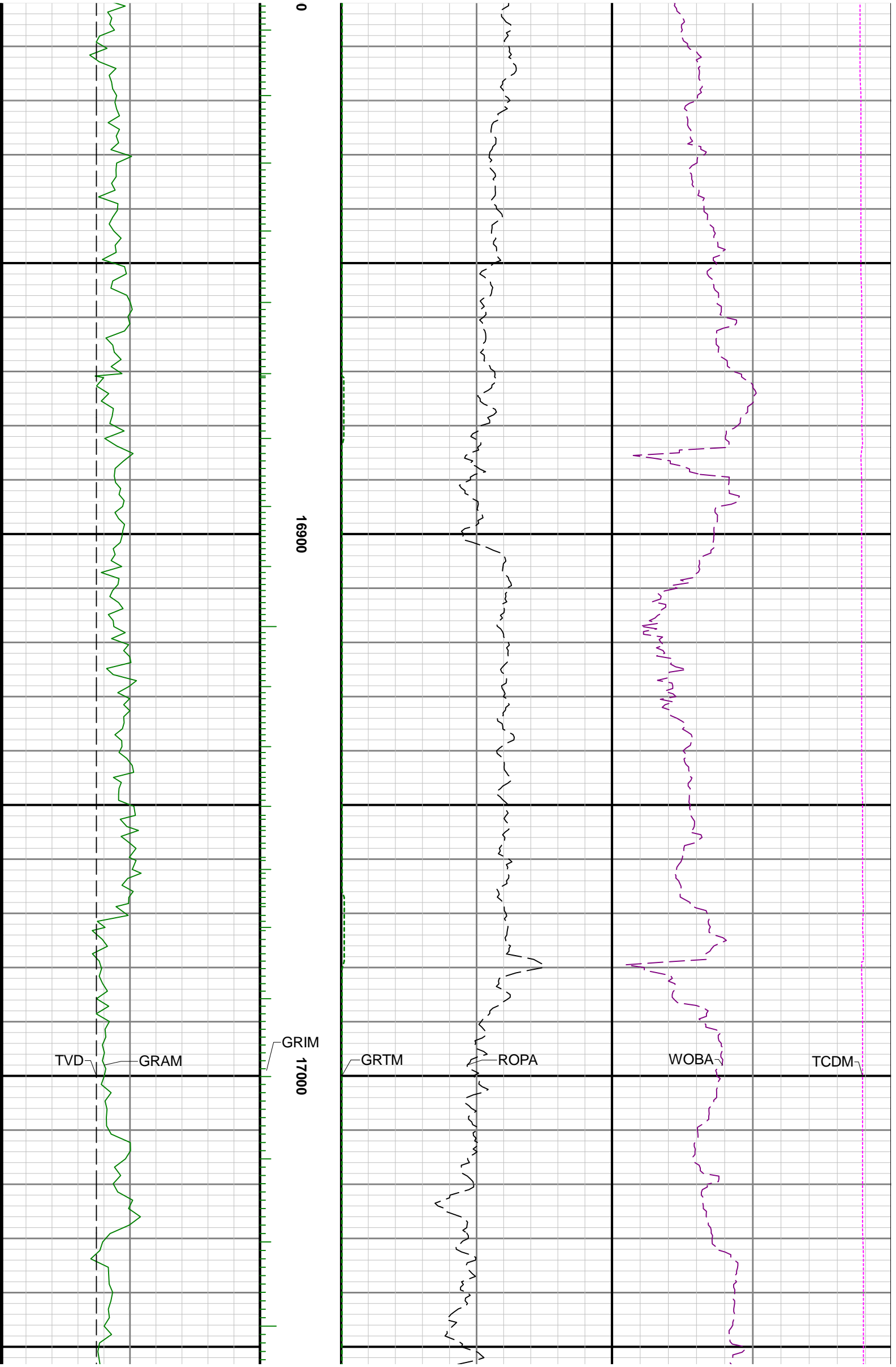
16300

16400

16500









17100

17200

17300

