



LWD MEMORY LOG

Gamma Ray

Scale: 1:240 Measured Depth	Company: Noble Energy							
	Well: Guttersen D34-769							
	Field: Wattenberg							
	Depth Reference:		County: Weld		Country: United States			
	Driller's Depth		State: Colorado					
Status:	Final Print		Surface Location:		Other Services:			
				Latitude: 40° 12' 23.058" N				
API No: 05-123-48553-00				Longitude: 104° 32' 29.800" W		Directional		
Job ID: 110311131		SEC: 22 TWN: 3N RGE: 64W						
Permanent Datum (P.D.): Mean Sea Level		Elevation: Above P.D.: 4854.00 ft		Elev. KB: 4854.00 ft		N/A		
Log Measured From: Rig Floor				Elev. DF: 4824.00 ft		Elev. GL: 4824.00 ft		
Dates		Interval		Magnetic Field Reference				
From: 2020-03-14		Drilled (ft)		Logged (ft)		Azi Reference North: Grid Dip Angle: (deg) 66.63		
To: 2020-03-16		Top: 1965.00		Top: 1965.00		Total Magnetic Field Strength: (nT) 51979		
Spud: 2020-03-07		Bottom: 17435.00		Bottom: 17422.00		Mag to Reference North Correction: (deg) 7.38		
Borehole Record							Casing Record	
Hole Size (in)		From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)	
13.500		30.00	1965.00	9.625	36.00	30.00	1955.00	
8.500		1965.00	17435.00					
Mud Record							Deviation Record	
Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)		
Oil Based Mud	1965.00	17435.00	8.500	15471.00	0.46 184.95	90.18 178.87		
Acquisition System							Software Version	Other
Cadence	RT 5.5		Rig:	H&P 321				
Pilot Studio	5.5.87162		Contractor:	Helmerich & Payne Drilling Co		Unit: D&E		
			District:	RMA				

(C) 2019 Baker Hughes Company - All rights reserved. Baker Hughes Company and its affiliates ("BHC") provides this information on an "as is" basis for general information purposes and believes it to be accurate as of the date of publication. BHC does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. BHC hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. The BHC logo is a trademark of Baker Hughes Company.

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
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	3.00	AutoTrak Curve	1965.00	17422.00	1965.00	17435.00	2020-03-14 14:41	2020-03-16 22:44	48.49

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2020-03-14	2020-03-17						

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+ (%)
2020-03-14 16:00	1	2256.00	Oil Based Mud	9.4	11	N/A	19.2	71.8/17.2	Active Pit	26000	0.00
2020-03-15 16:00	1	9640.00	Oil Based Mud	9.6	12	N/A	18.3	70.2/18	Active Pit	29000	0.00
2020-03-16 16:00	1	16012.00	Oil Based Mud	9.6	14	N/A	18.8	71.4/16	Active Pit	25500	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	14381997	Near Bit VSS	5.93	6.73	7.500	4.330
1	AutoTrak Curve Steering Unit	14381997	Near Bit Inclination	5.93	6.73	7.500	4.330
1	AutoTrak Curve MWD	12118955	Gamma (single)	2.77	12.90	7.000	3.250
1	AutoTrak Curve MWD	12118955	Directional (mag)	12.27	22.40	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 1965 to 17435 feet MD (1965 to 6777 feet TVD).
- 3

The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.
- 4

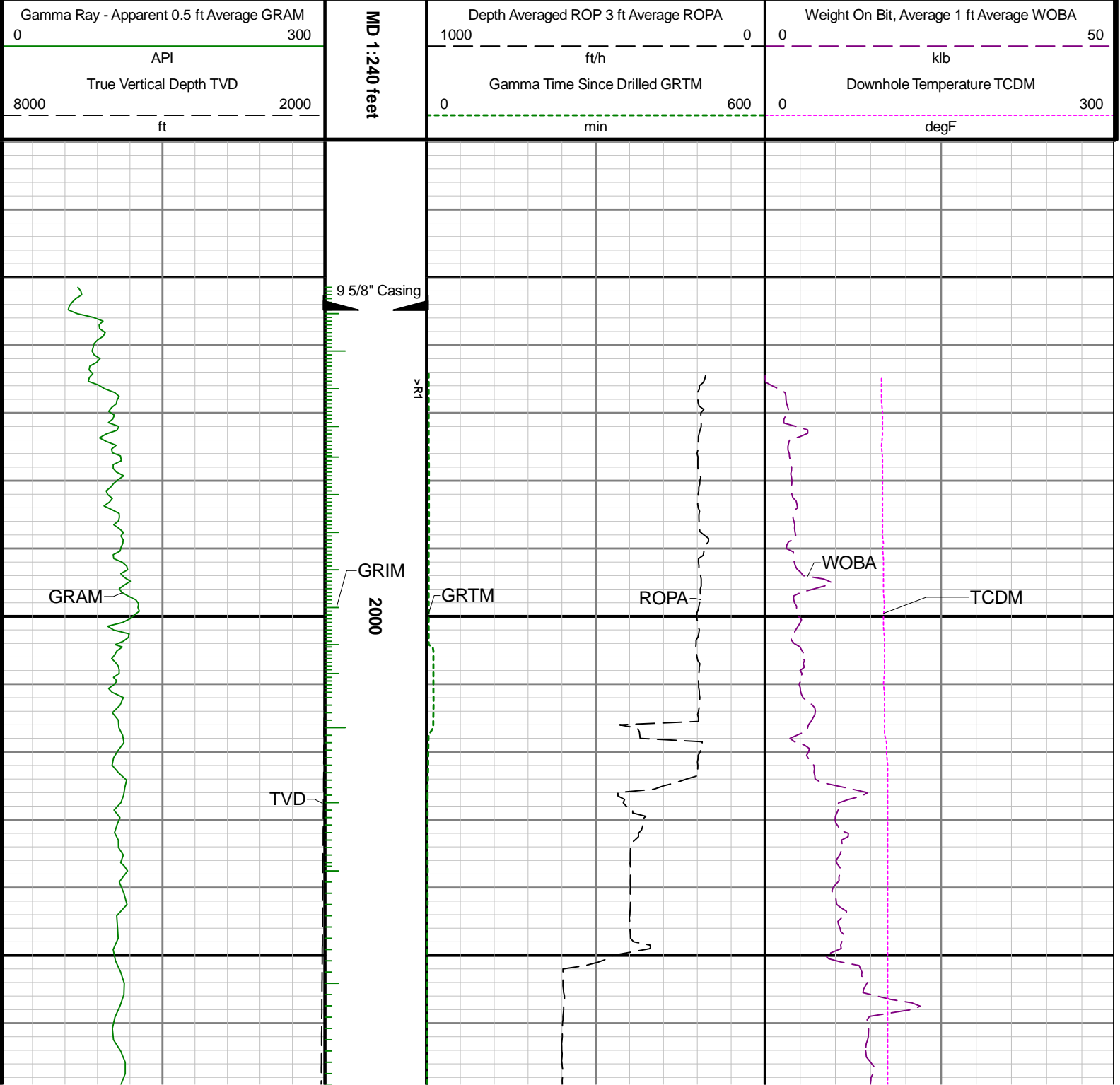
There are several gaps in Gamma Ray data due to drilling ahead before the tool could power on.

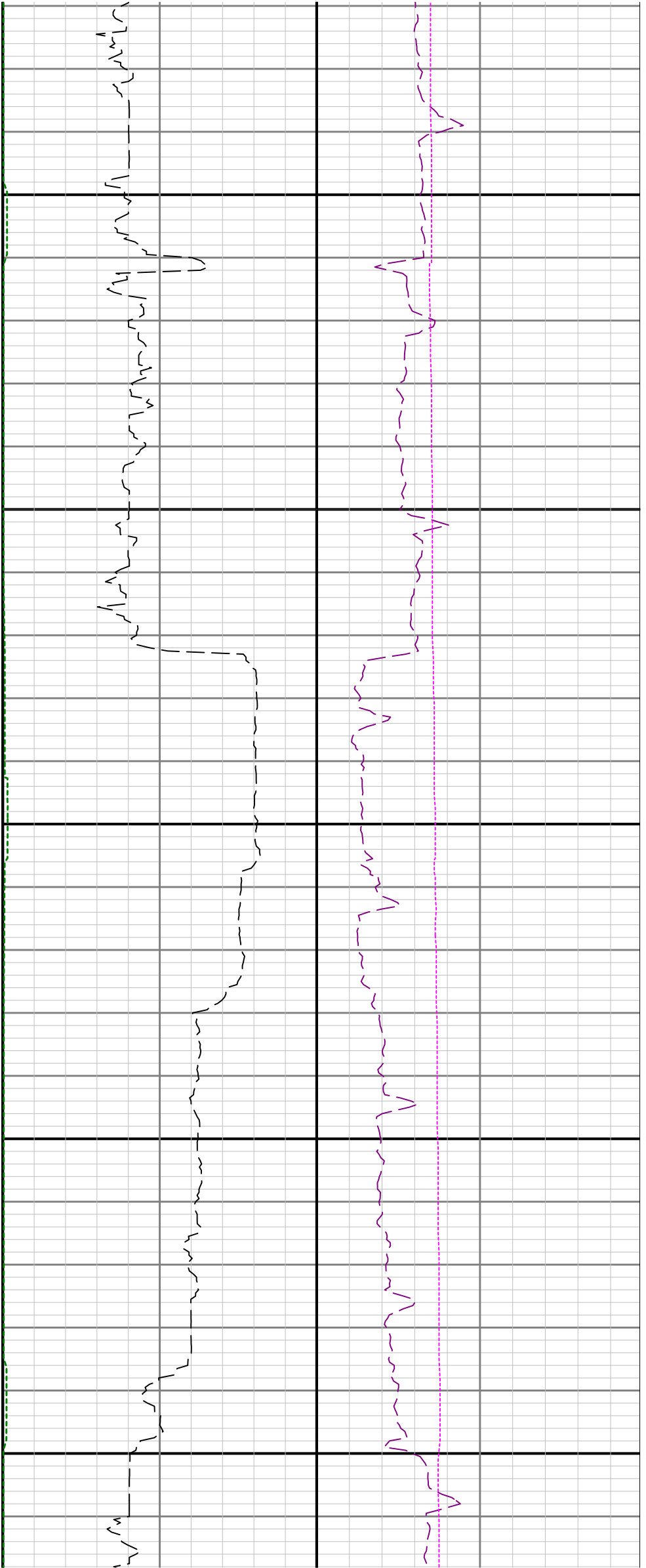
Remarks

Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	17422.00	8.500	1	The interval from 17422 to 17435 feet MD (6777 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
WOBA	Weight On Bit 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

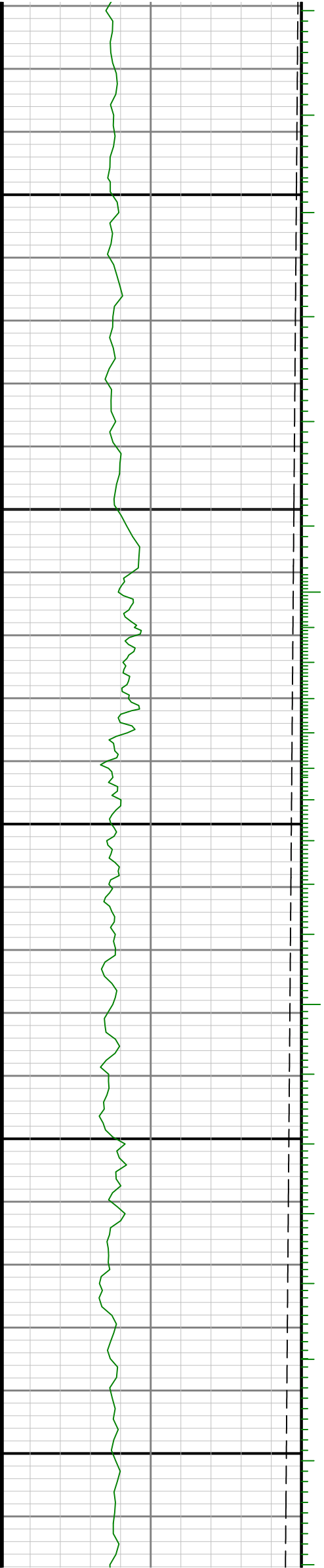


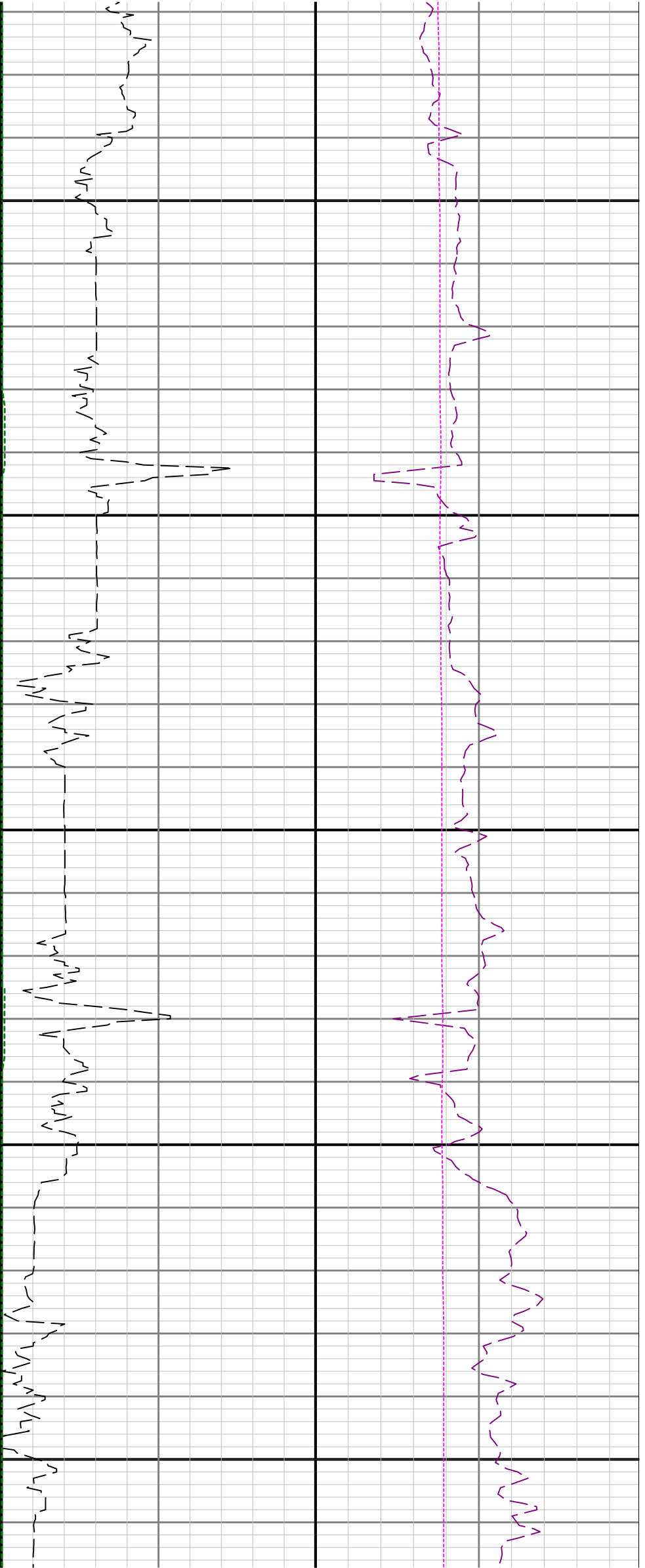


2100

2200

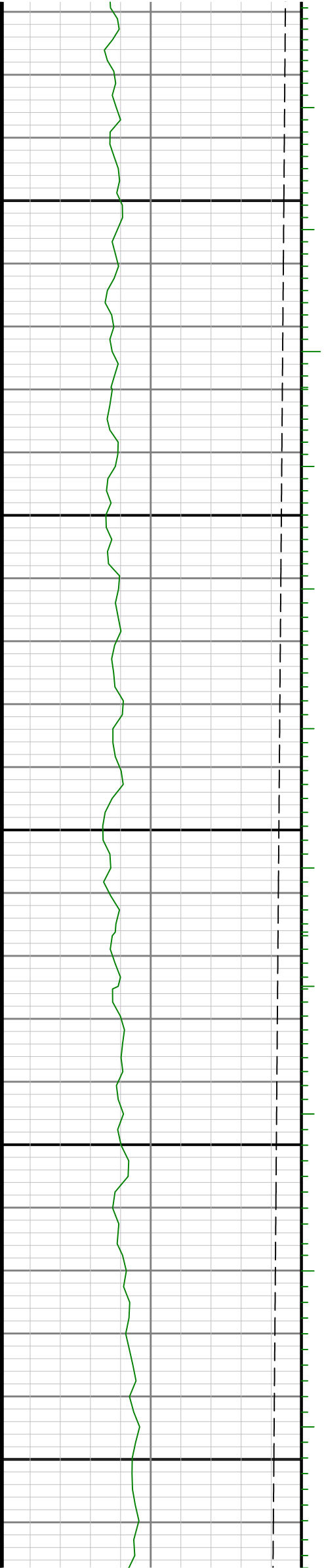
2300

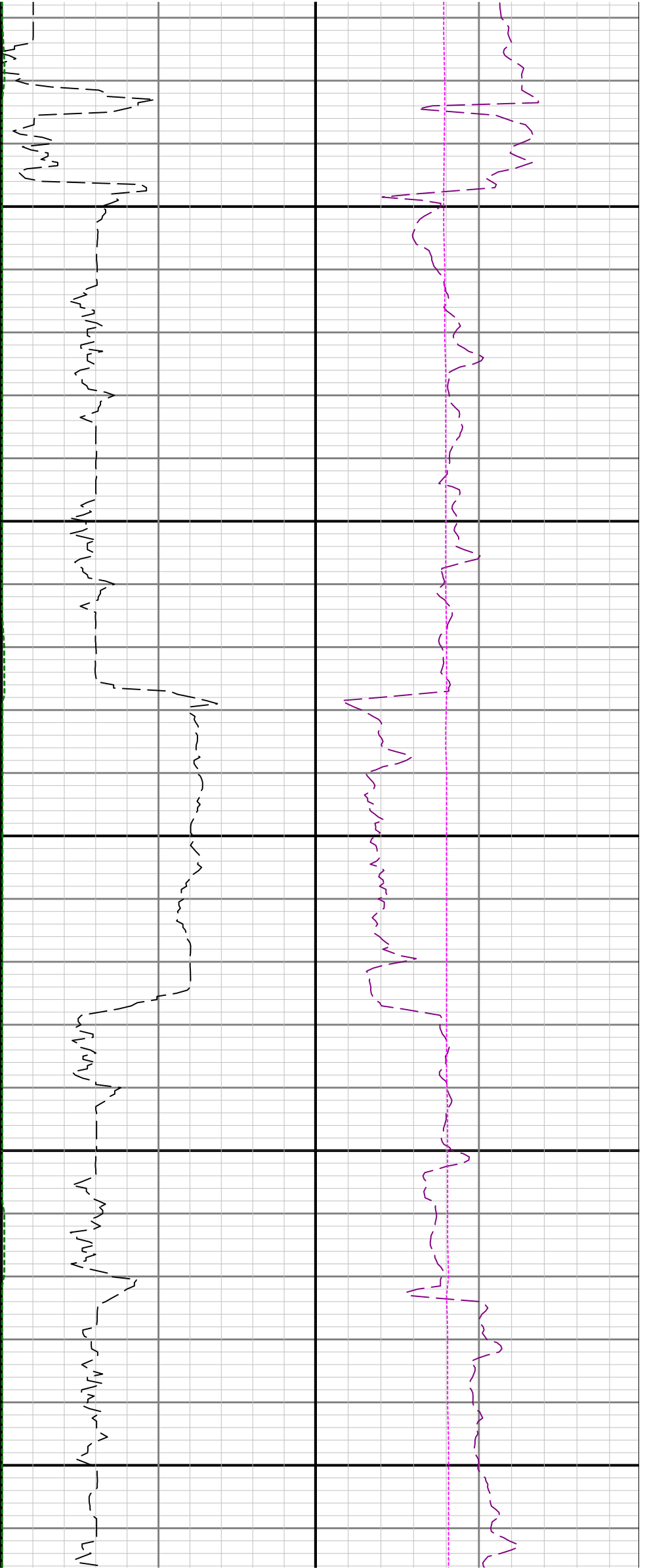




2400

2500

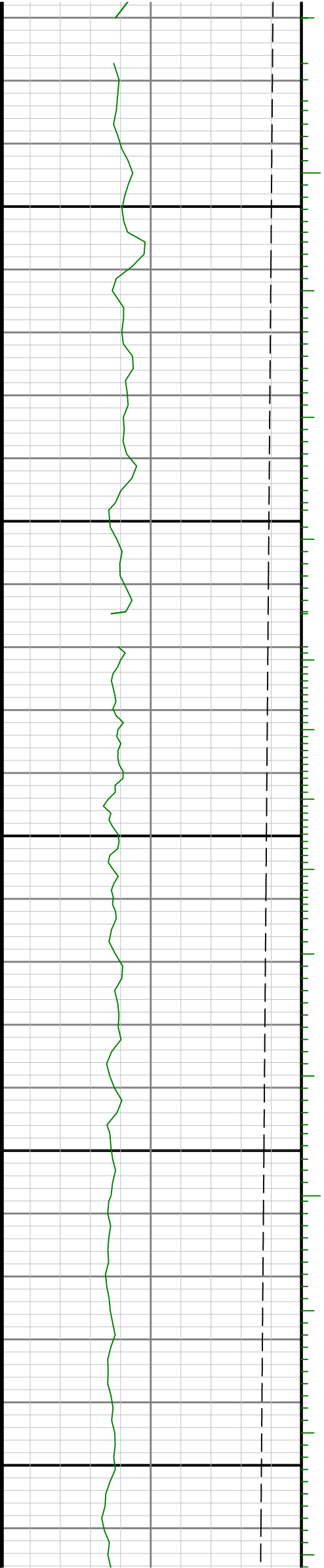
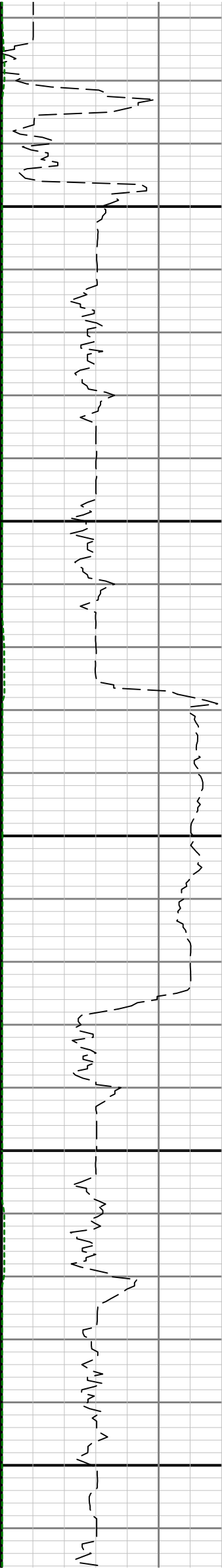


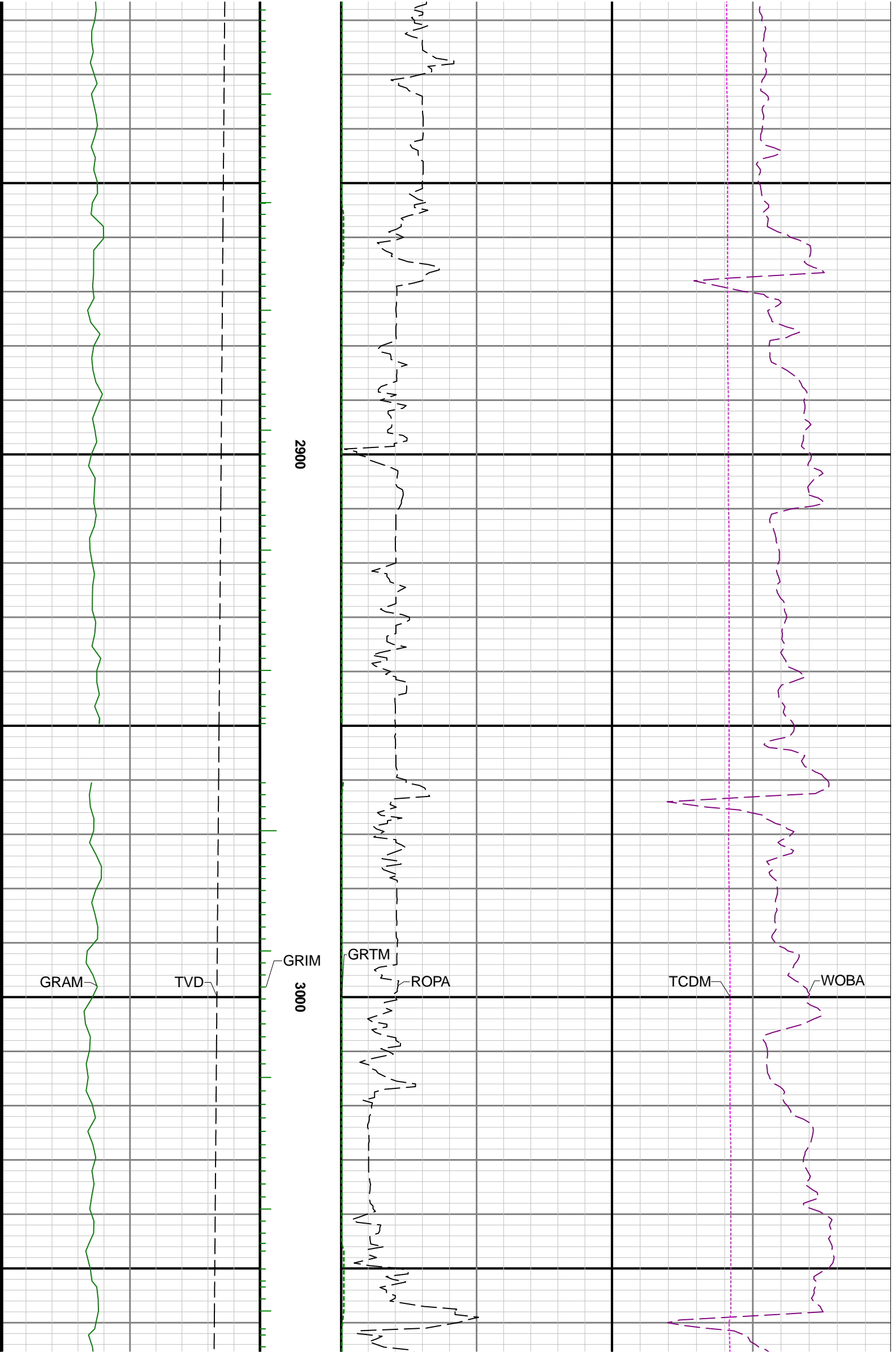


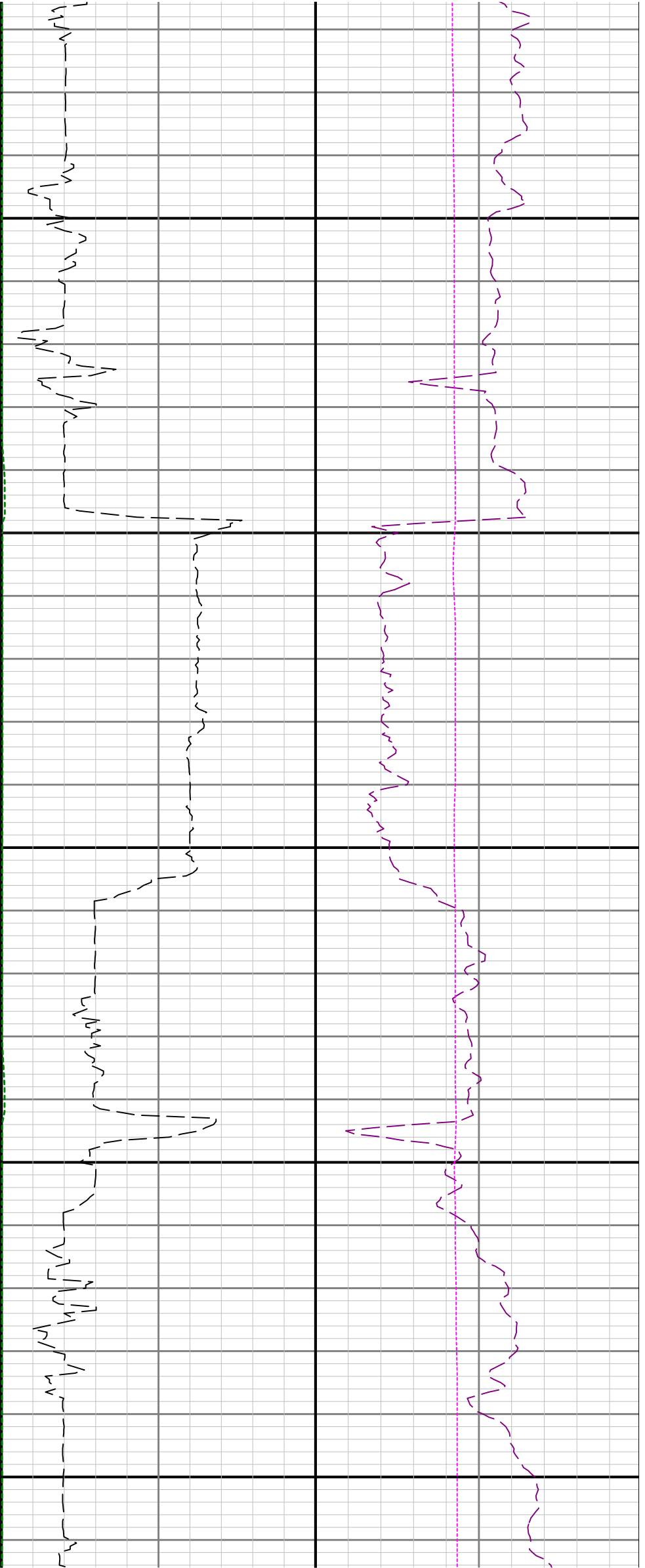
2600

2700

2800



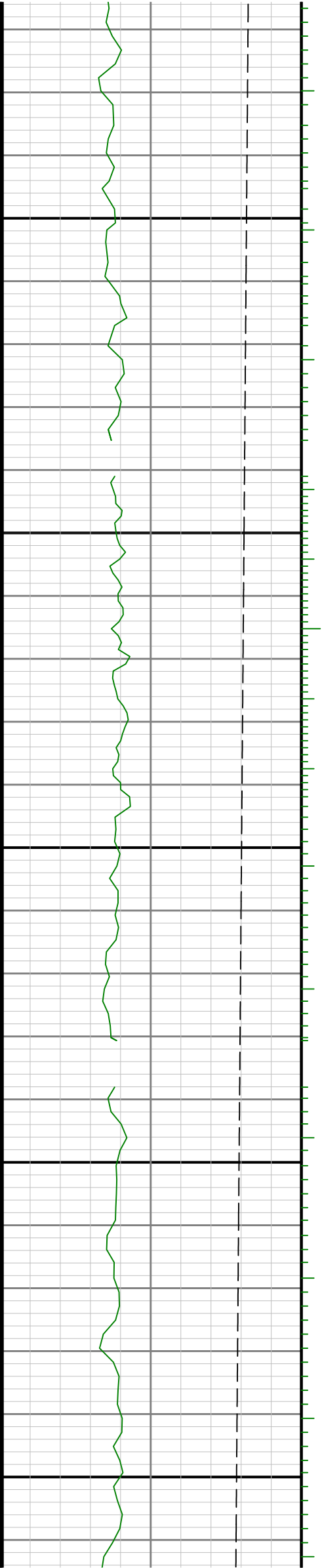


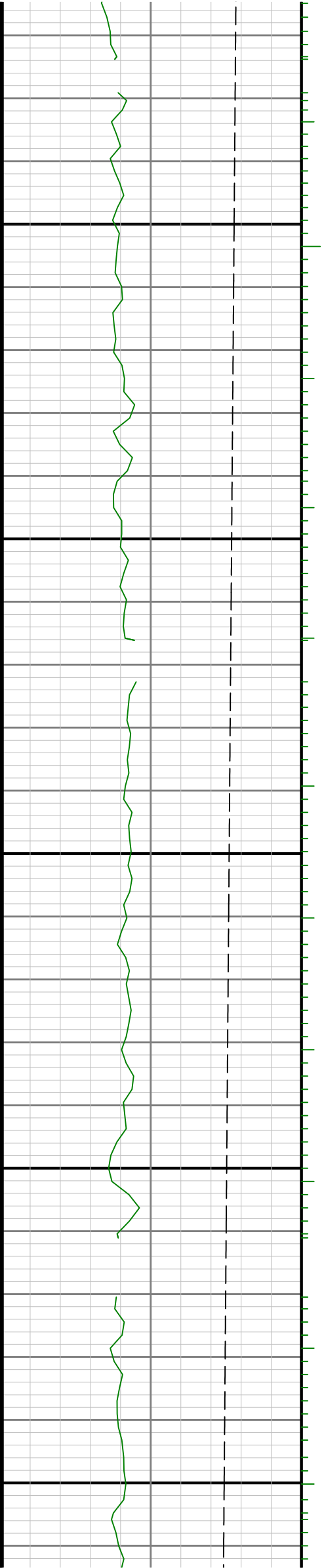
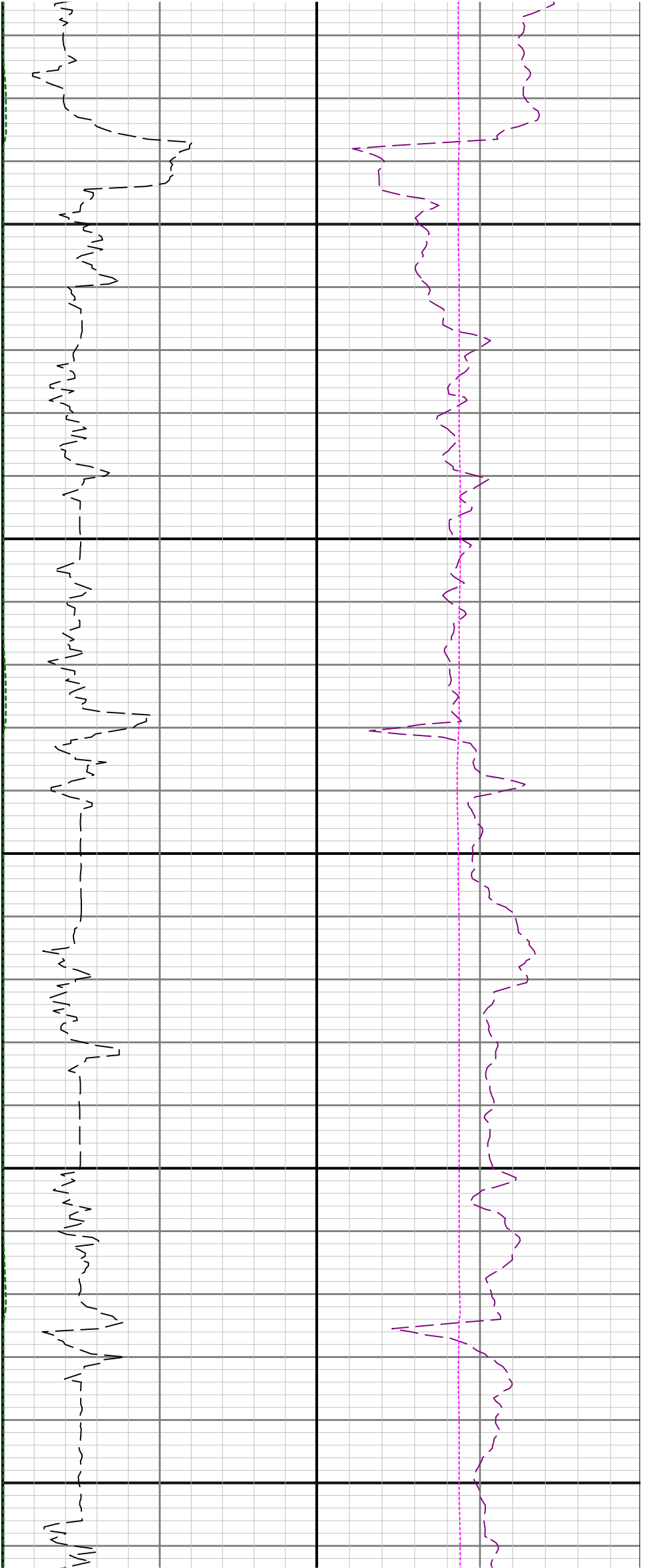


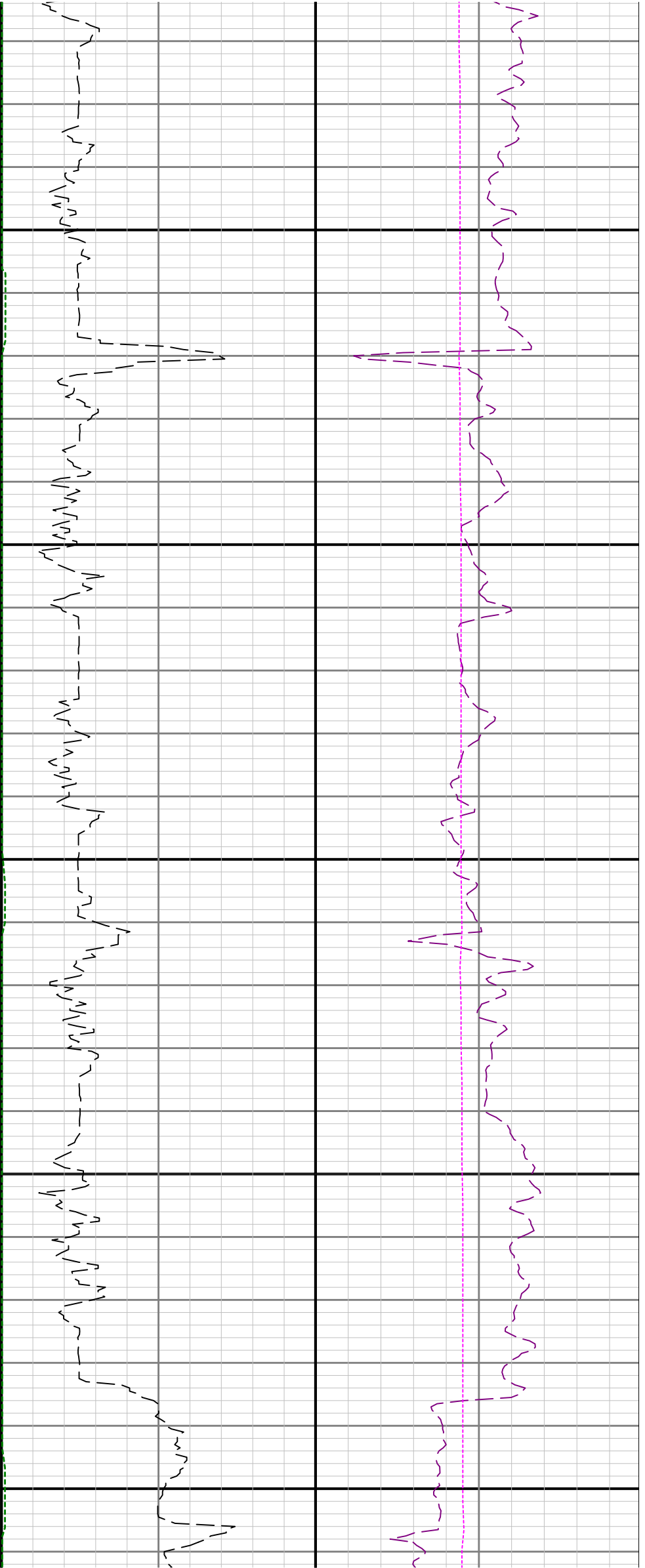
3100

3200

3300



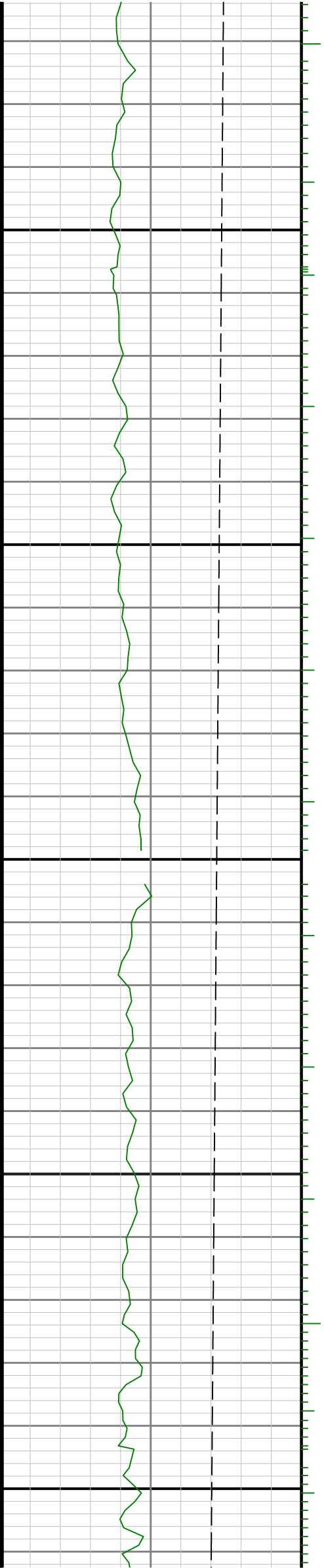


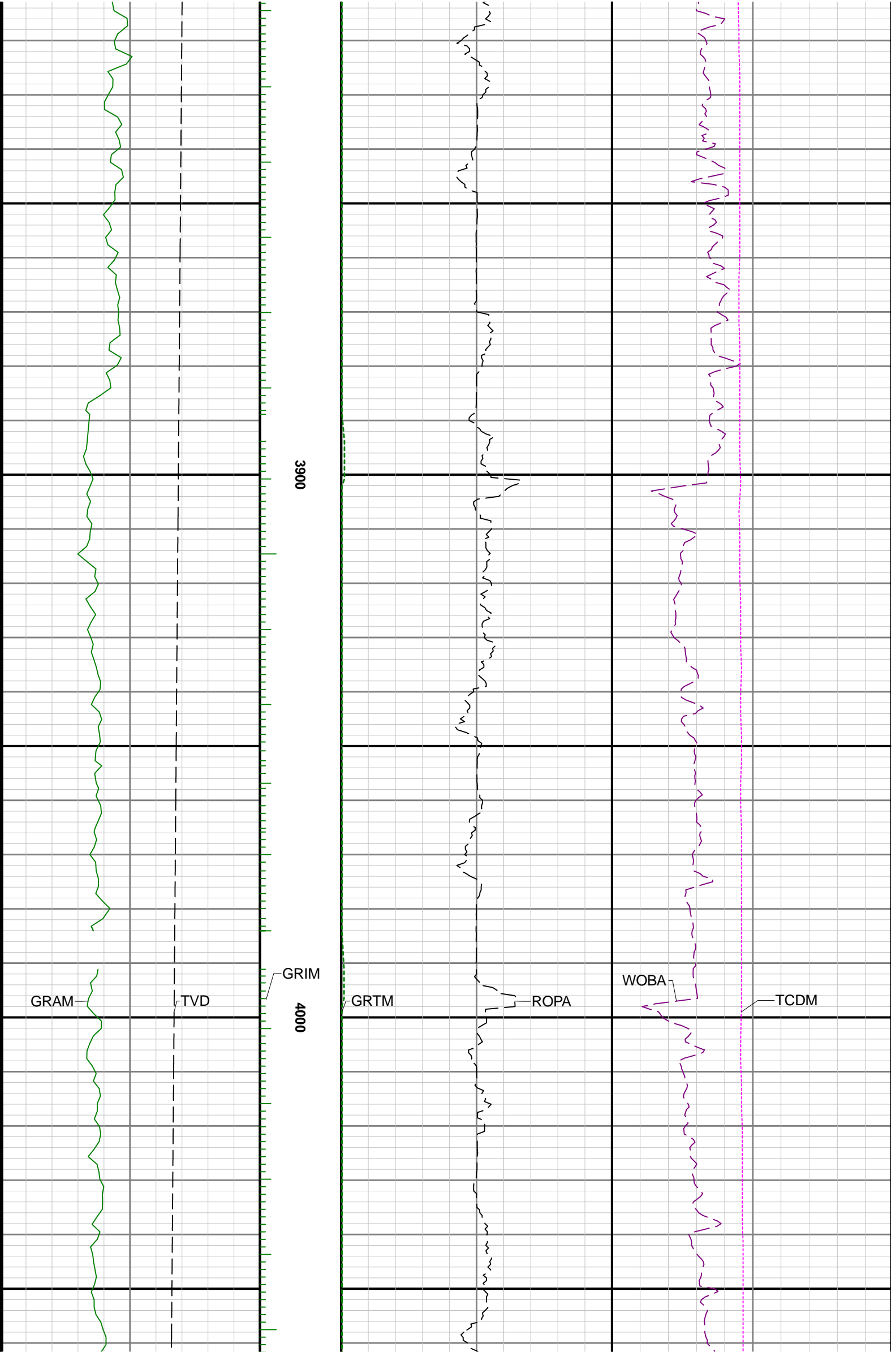


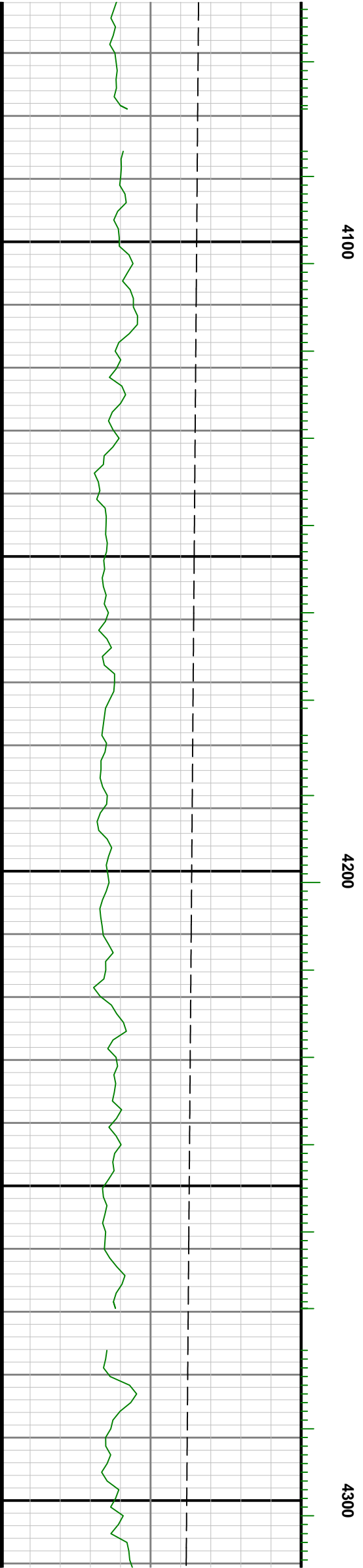
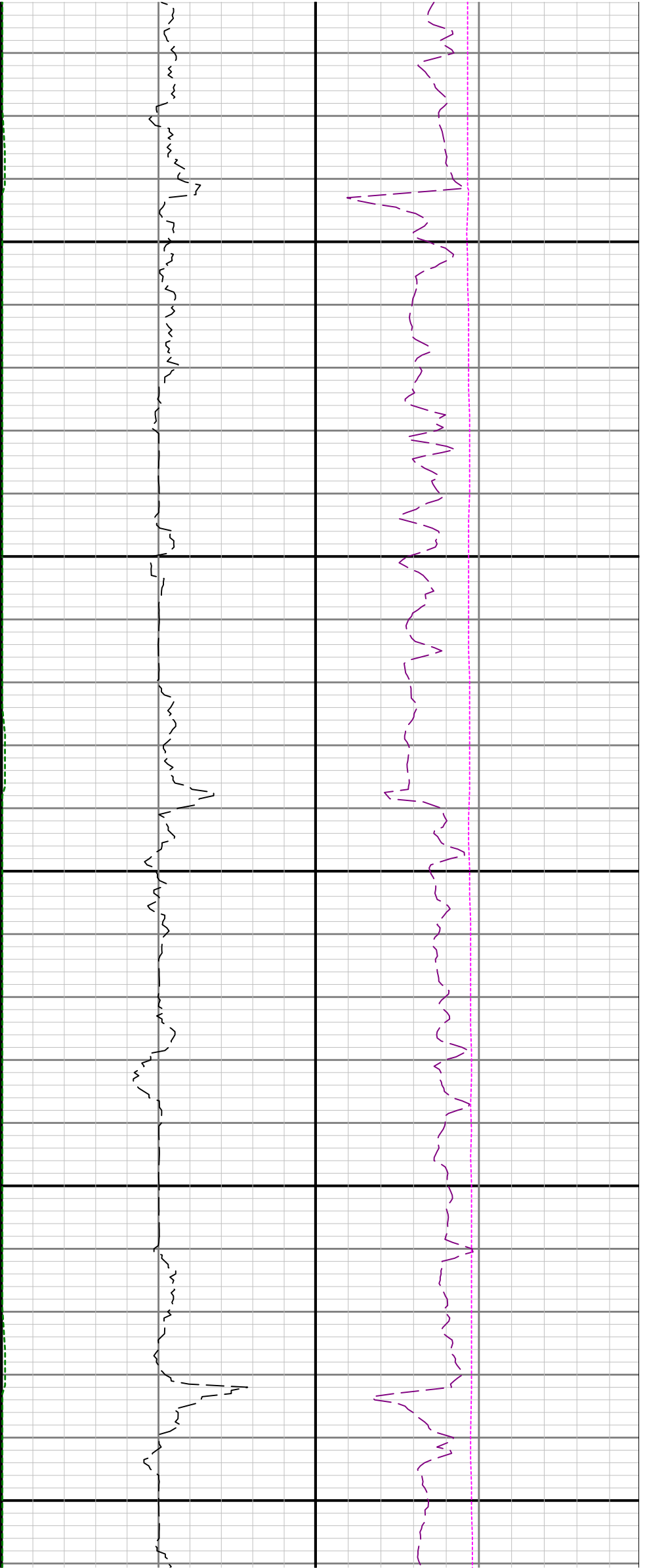
3600

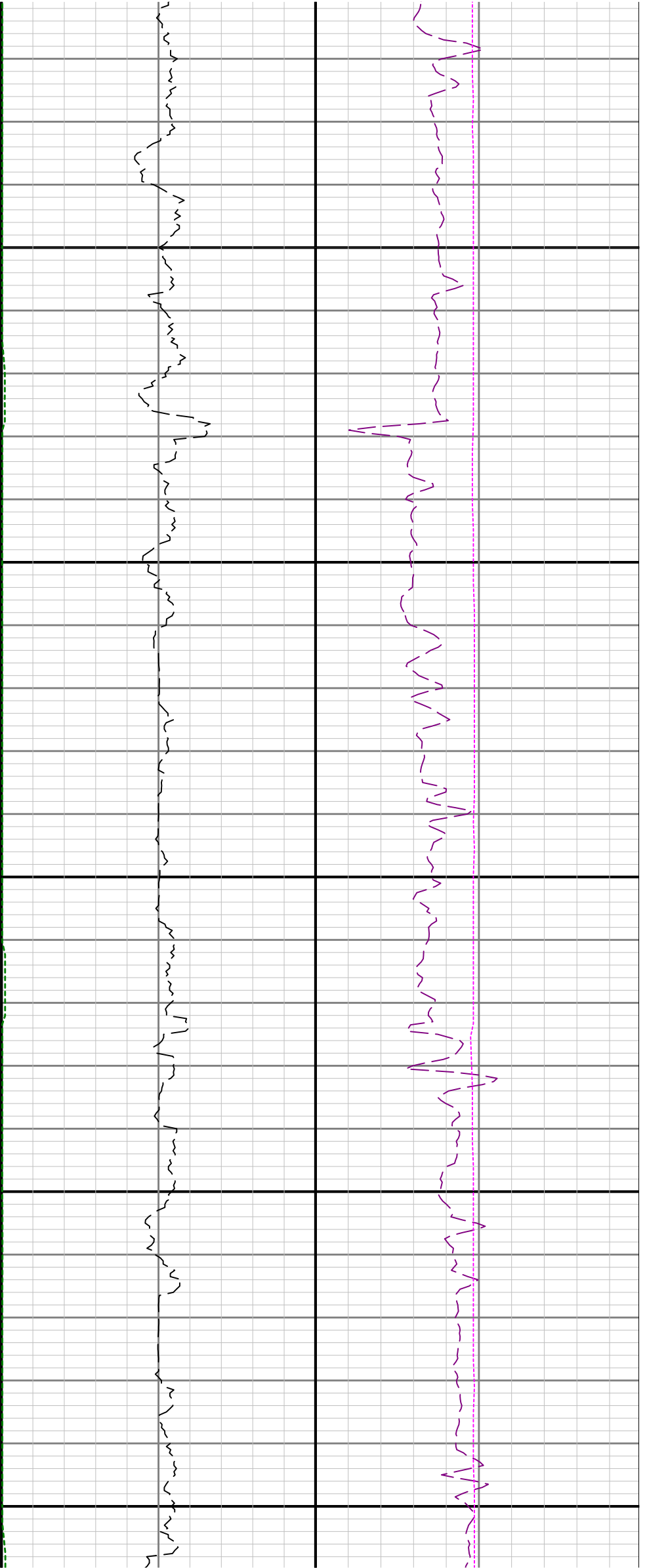
3700

3800



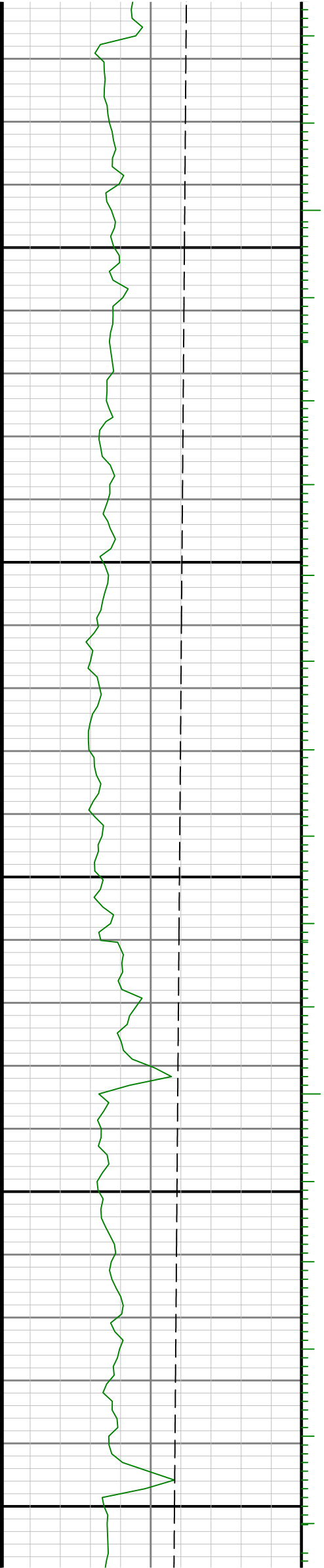


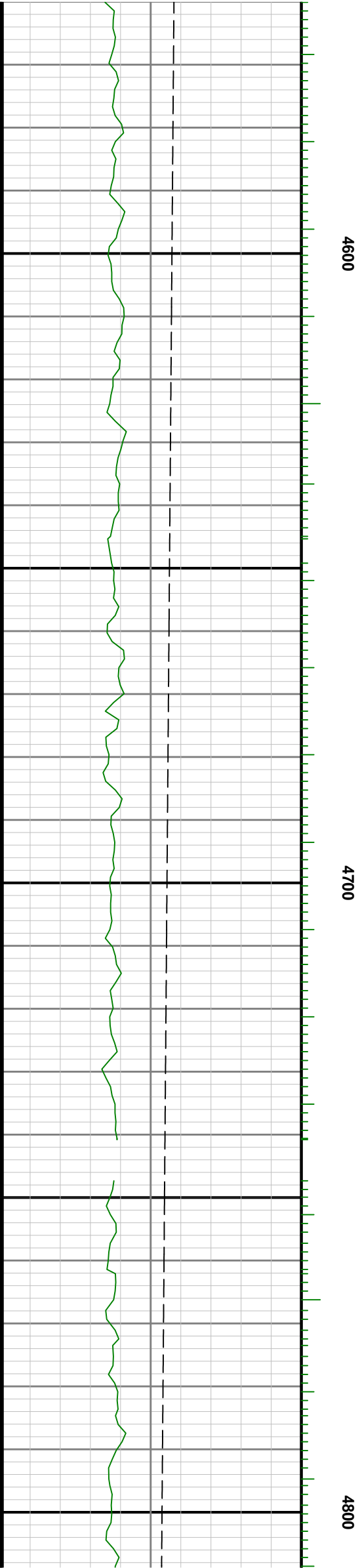
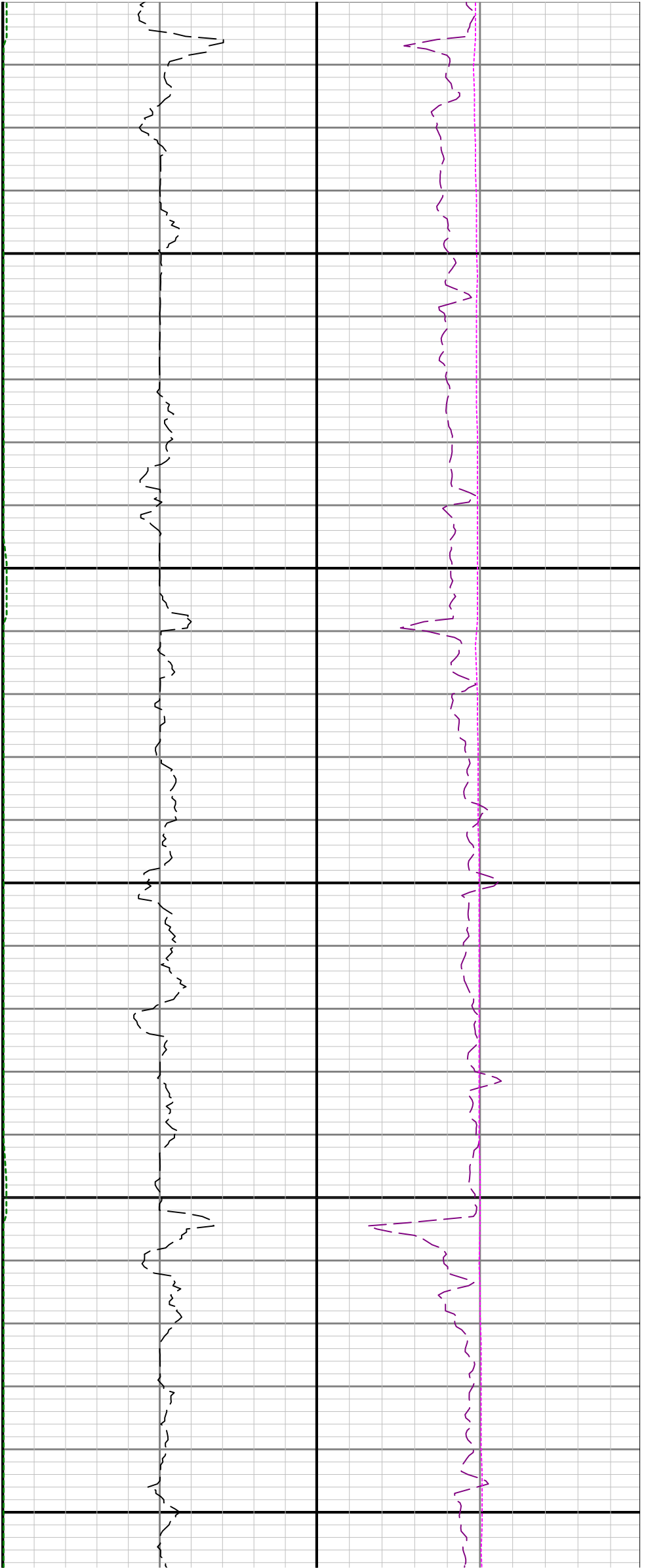


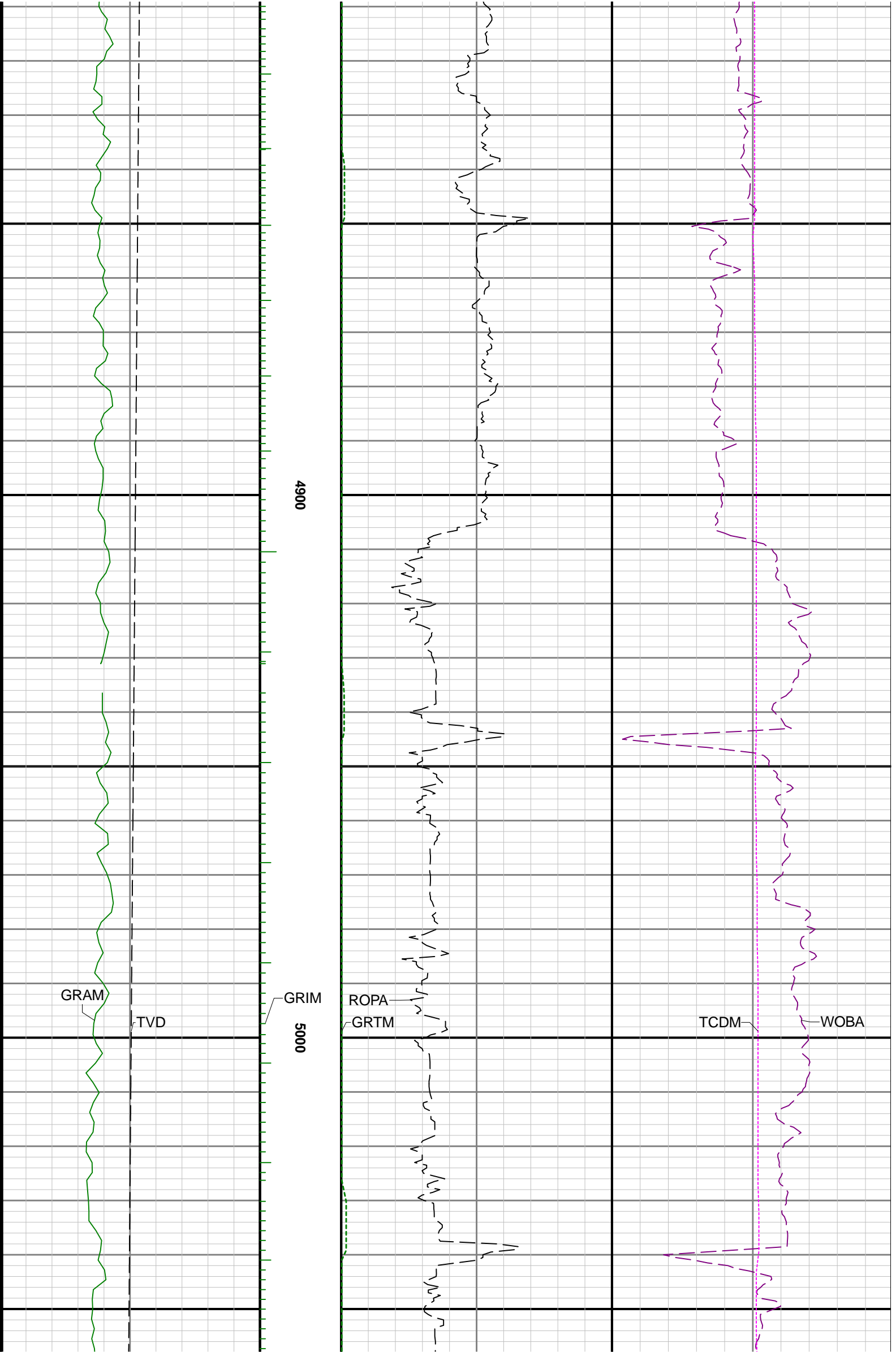


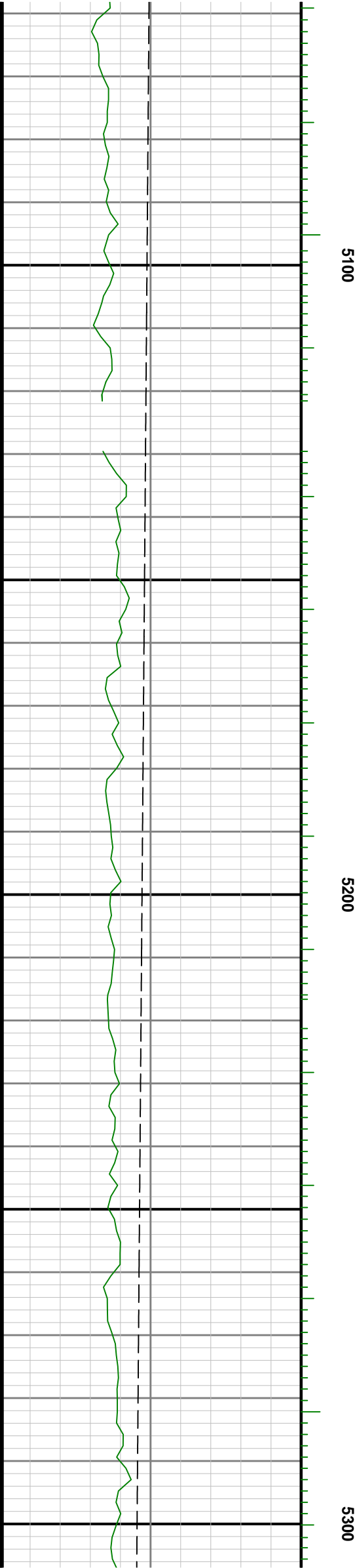
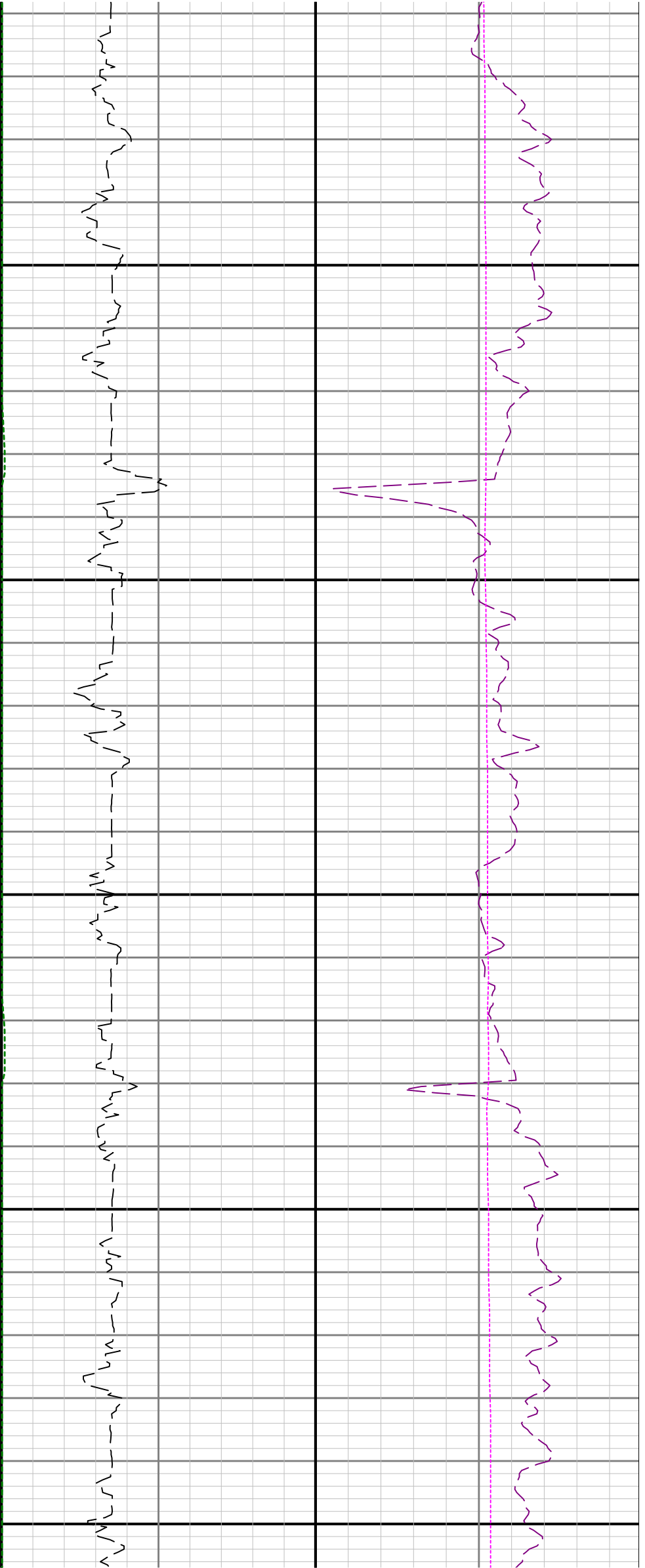
4400

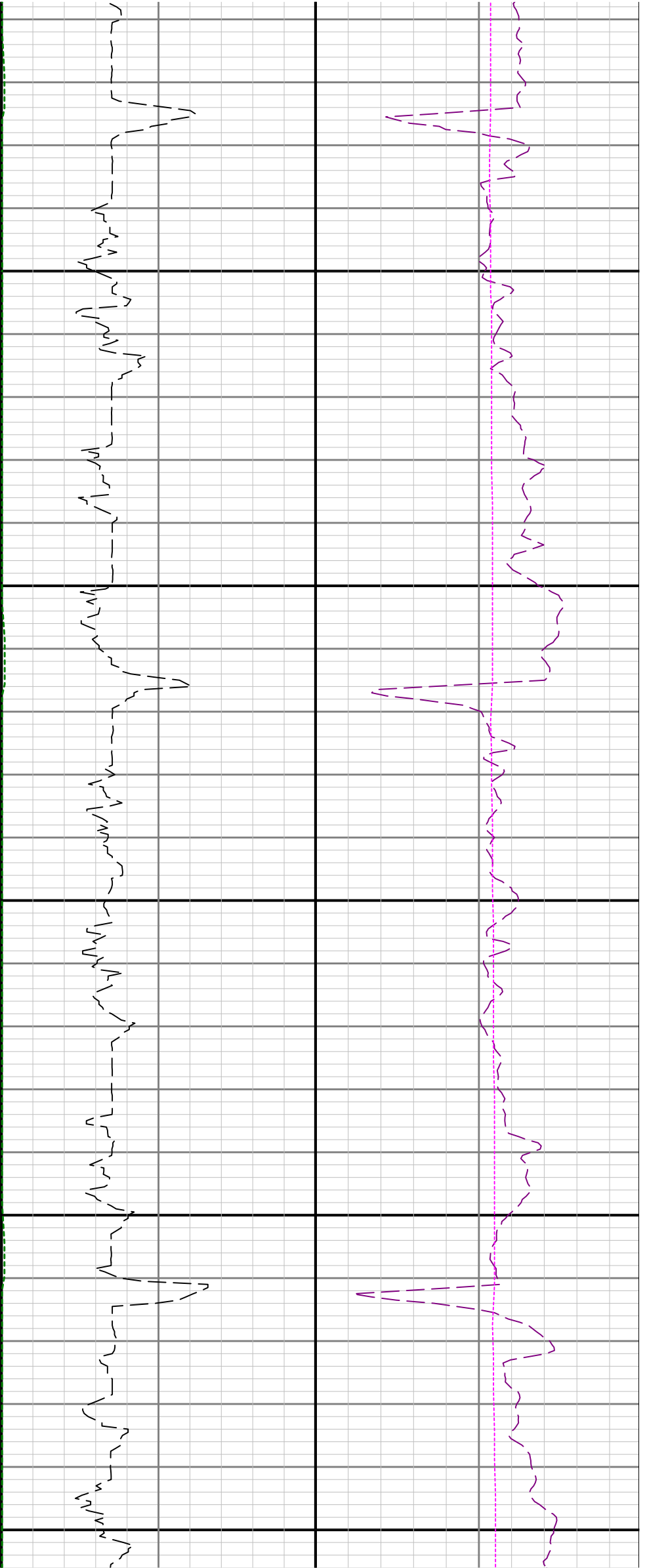
4500





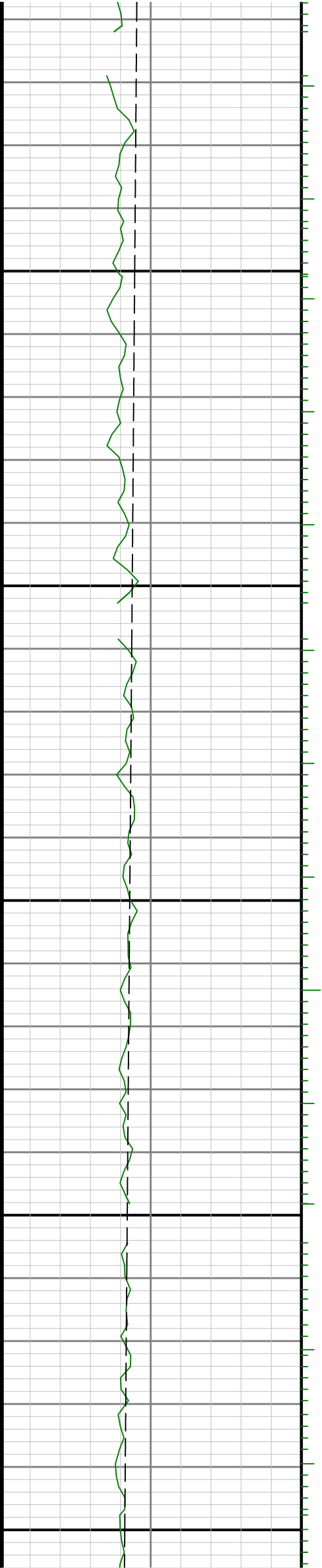


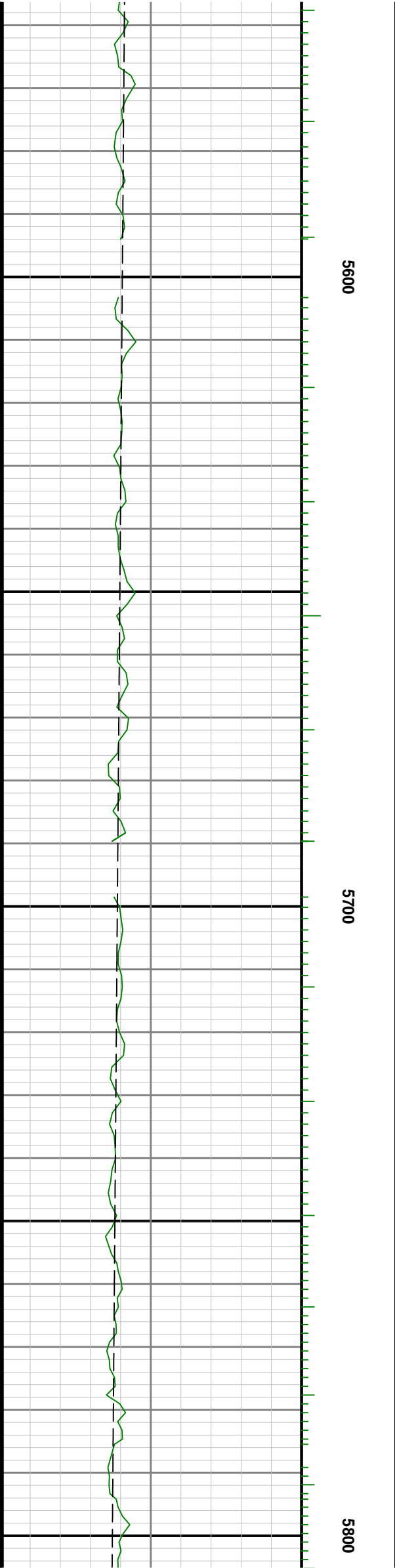
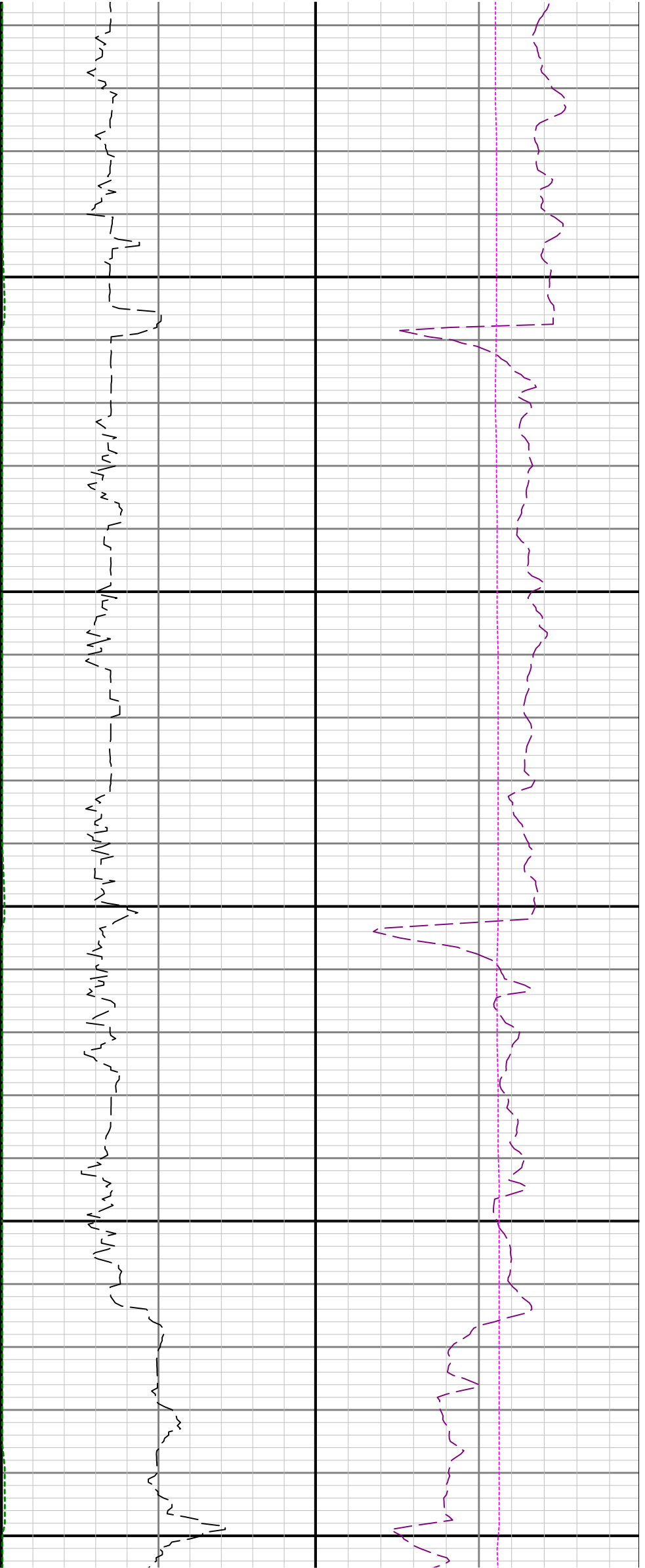




5400

5500



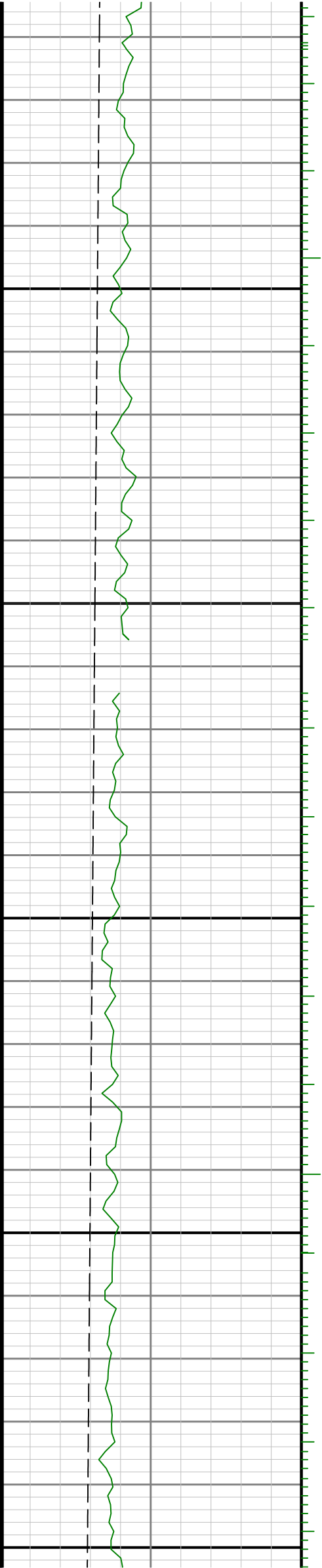


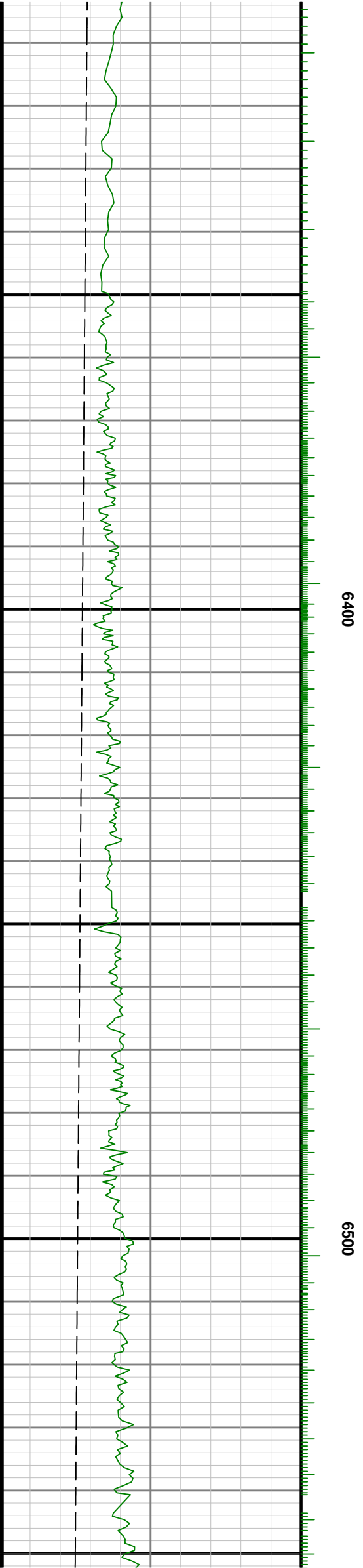
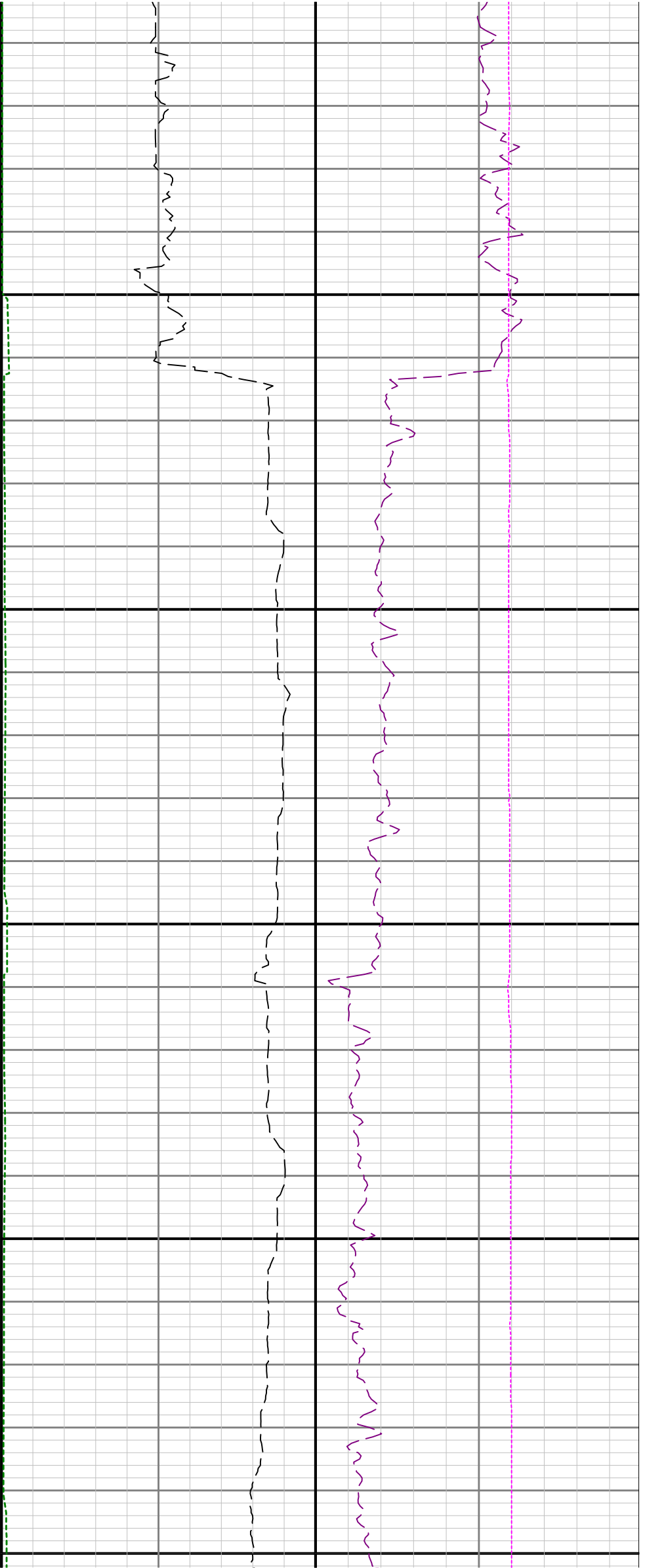


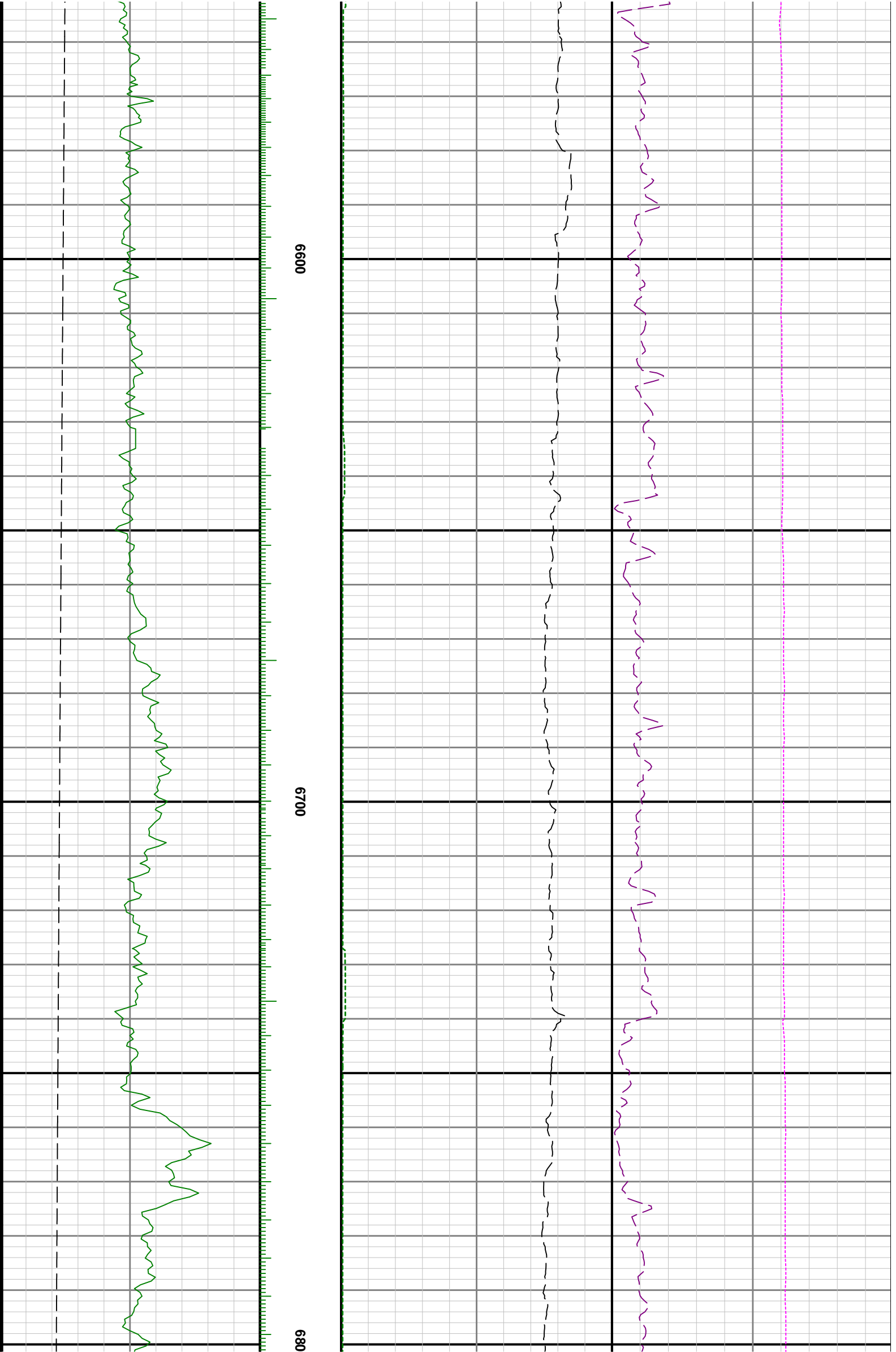
6100

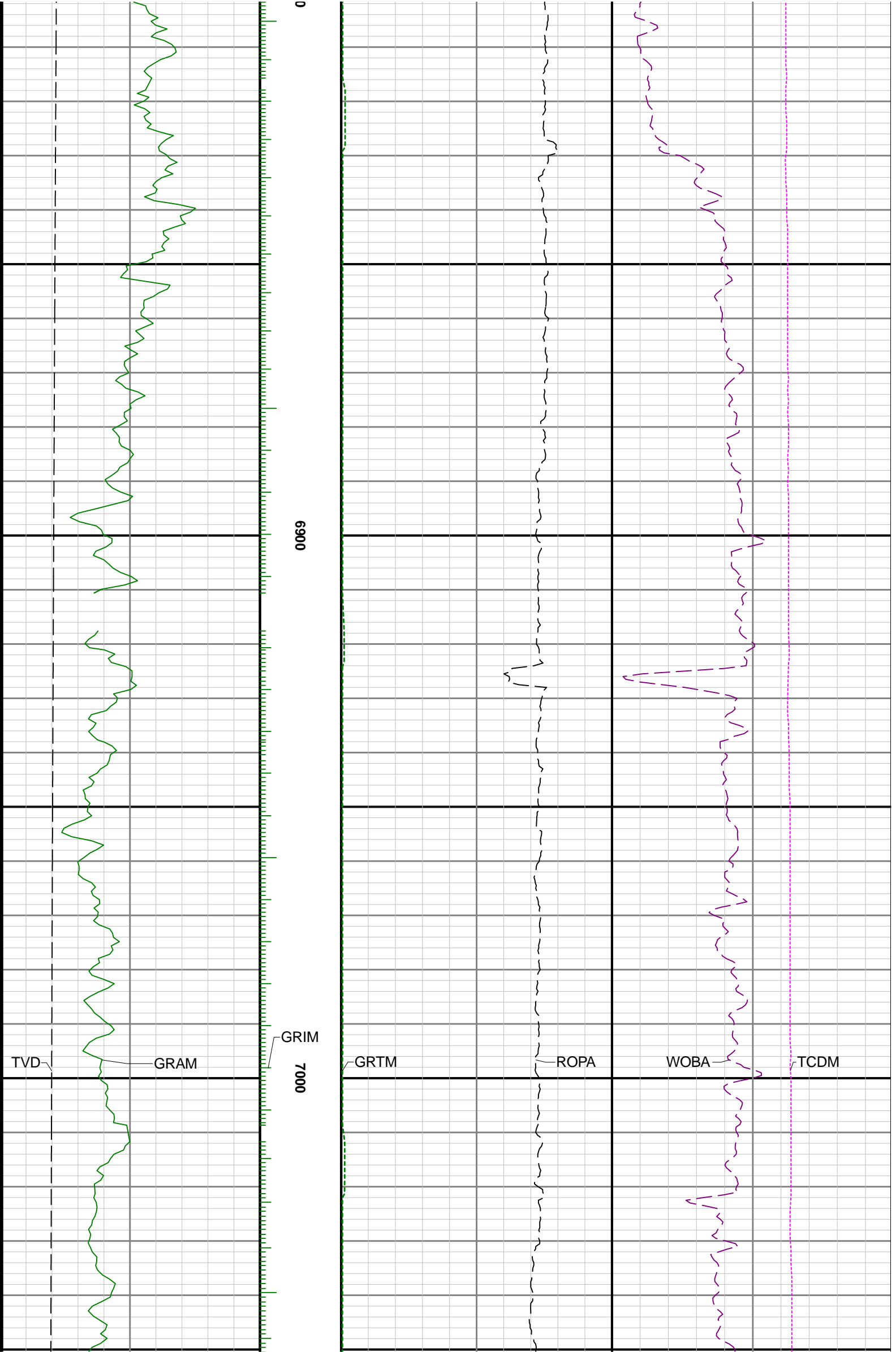
6200

6300







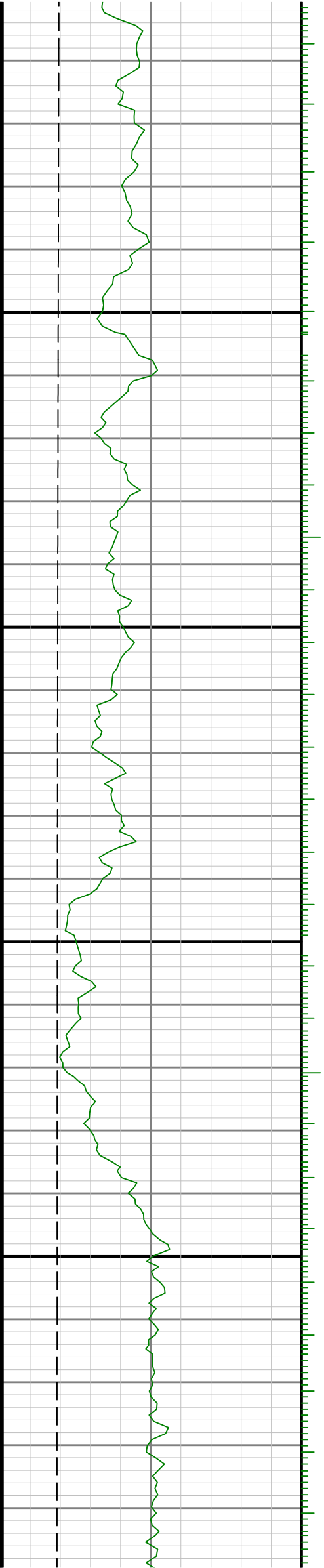




7100

7200

73

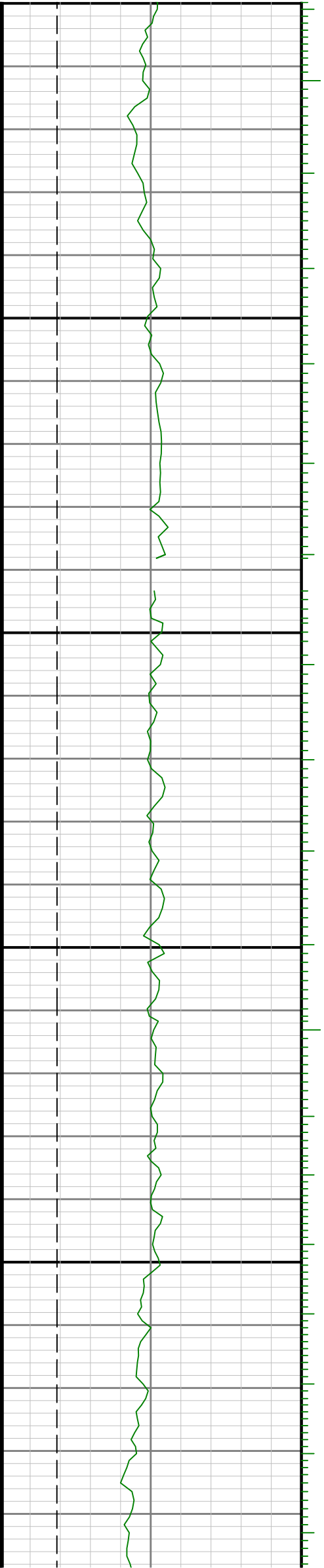


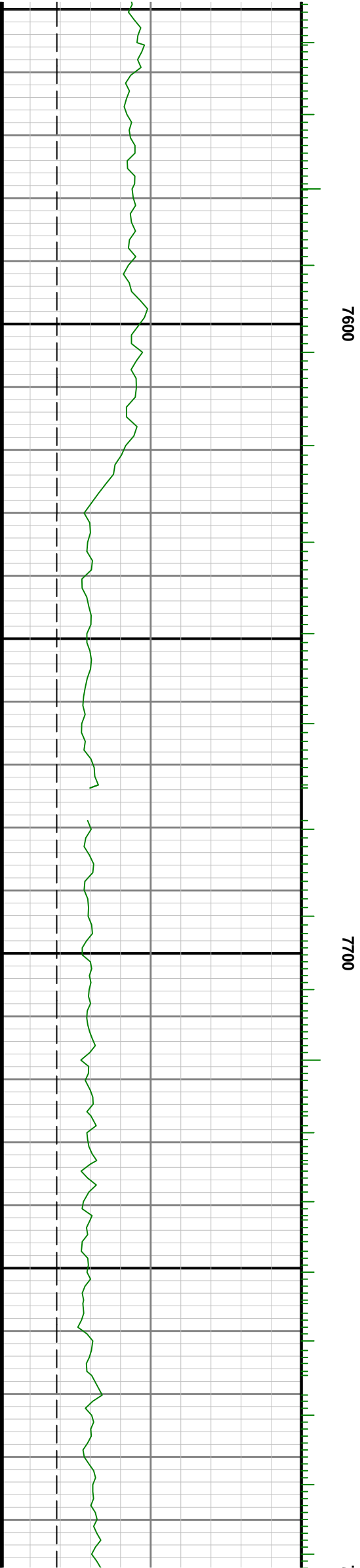
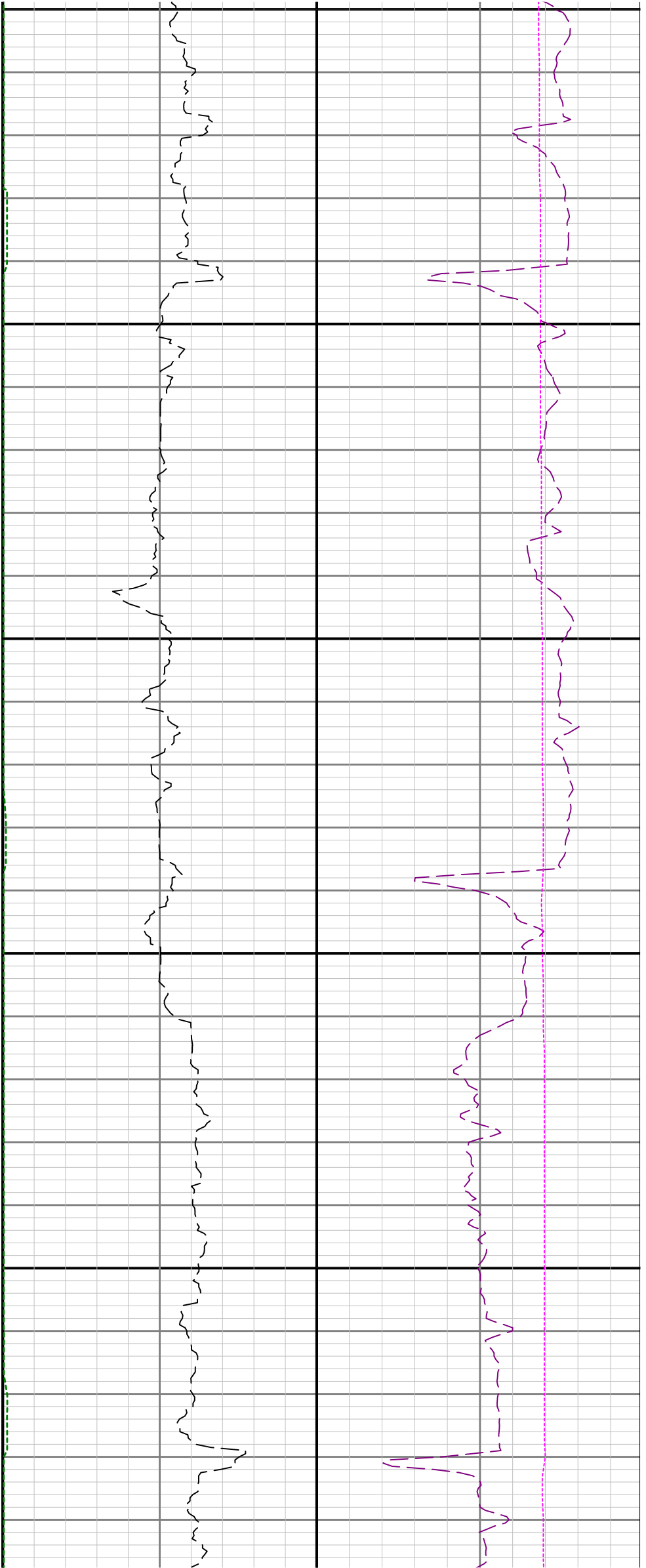


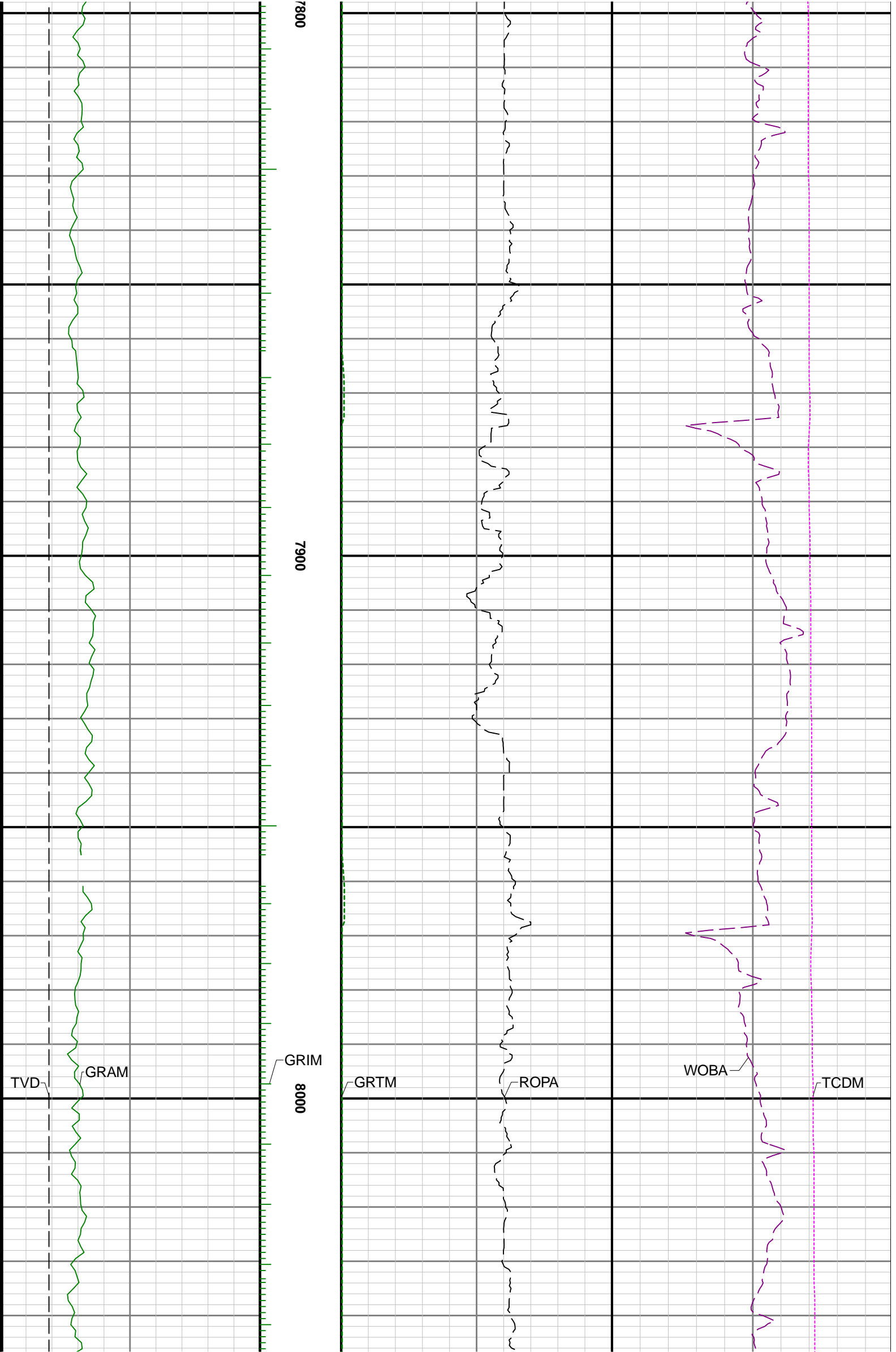
00

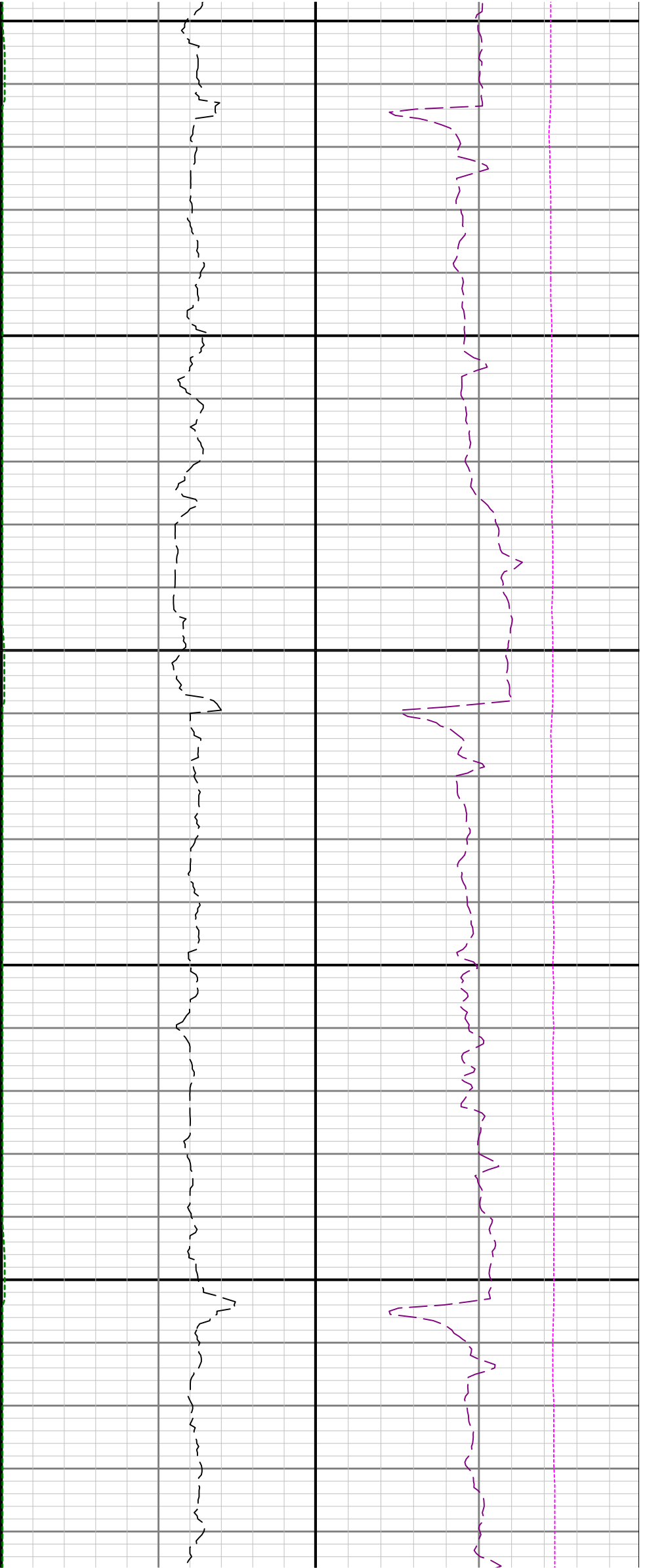
7400

7500



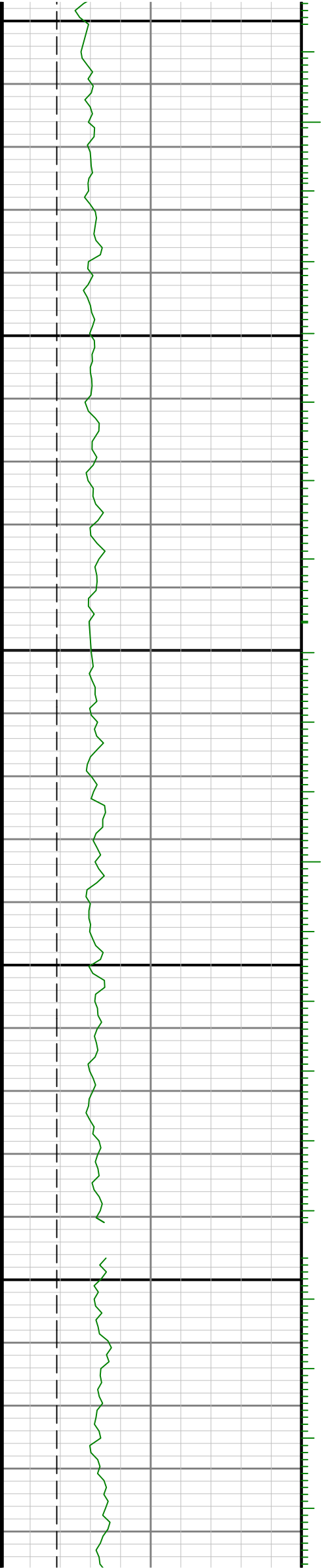


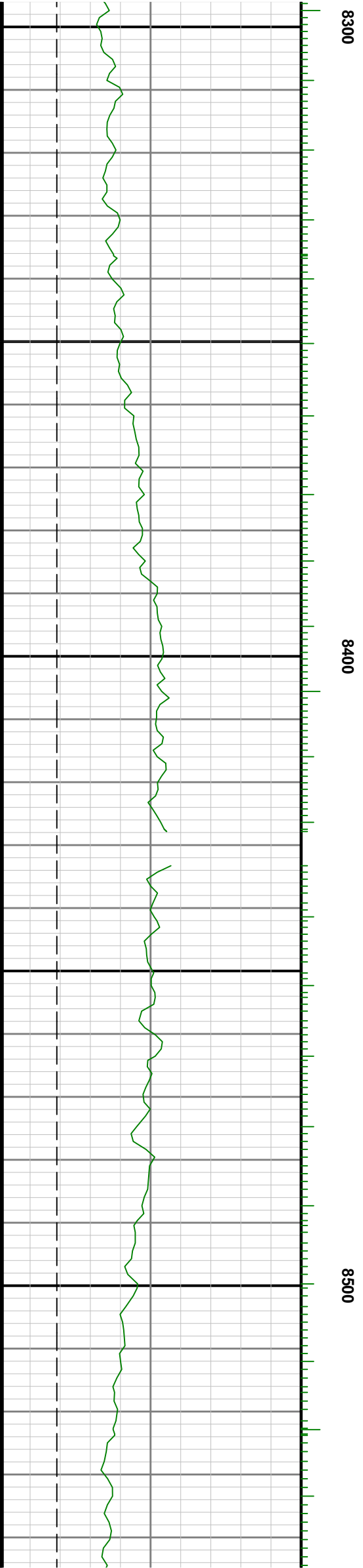
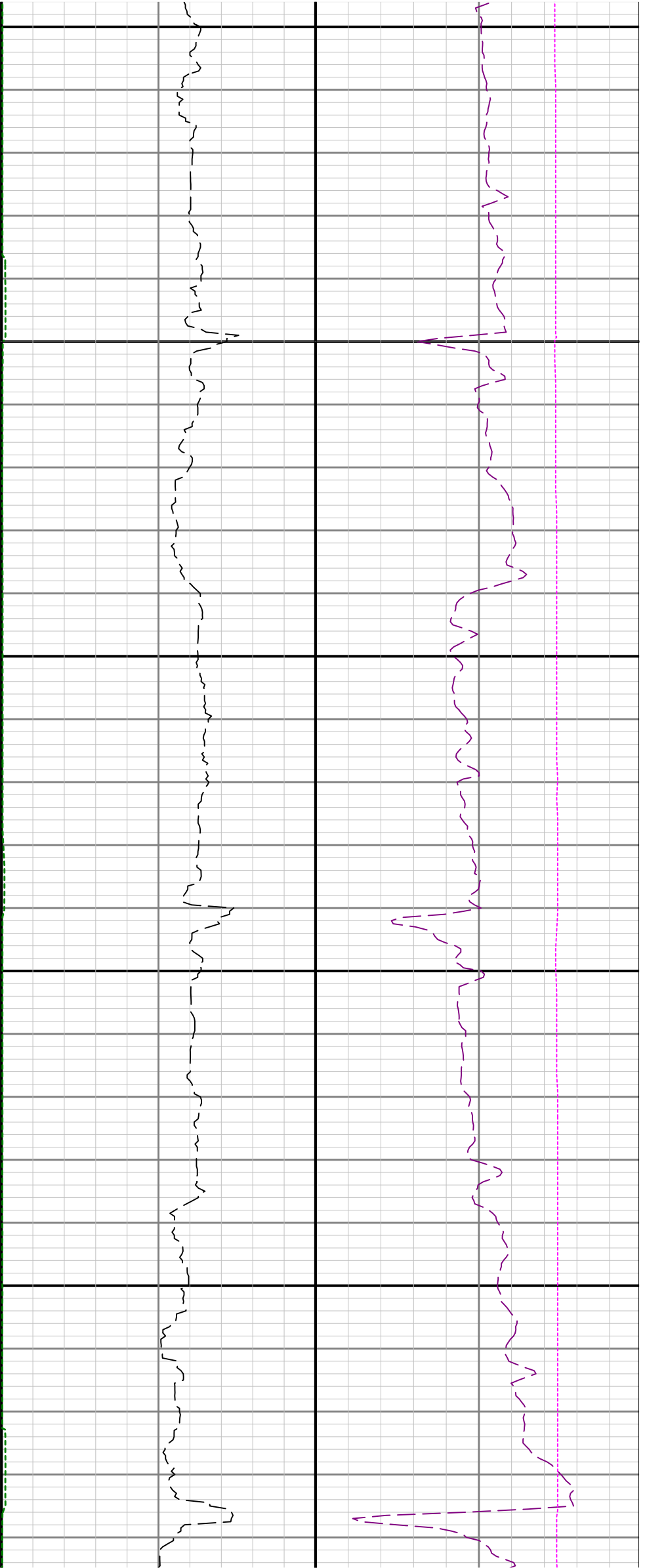


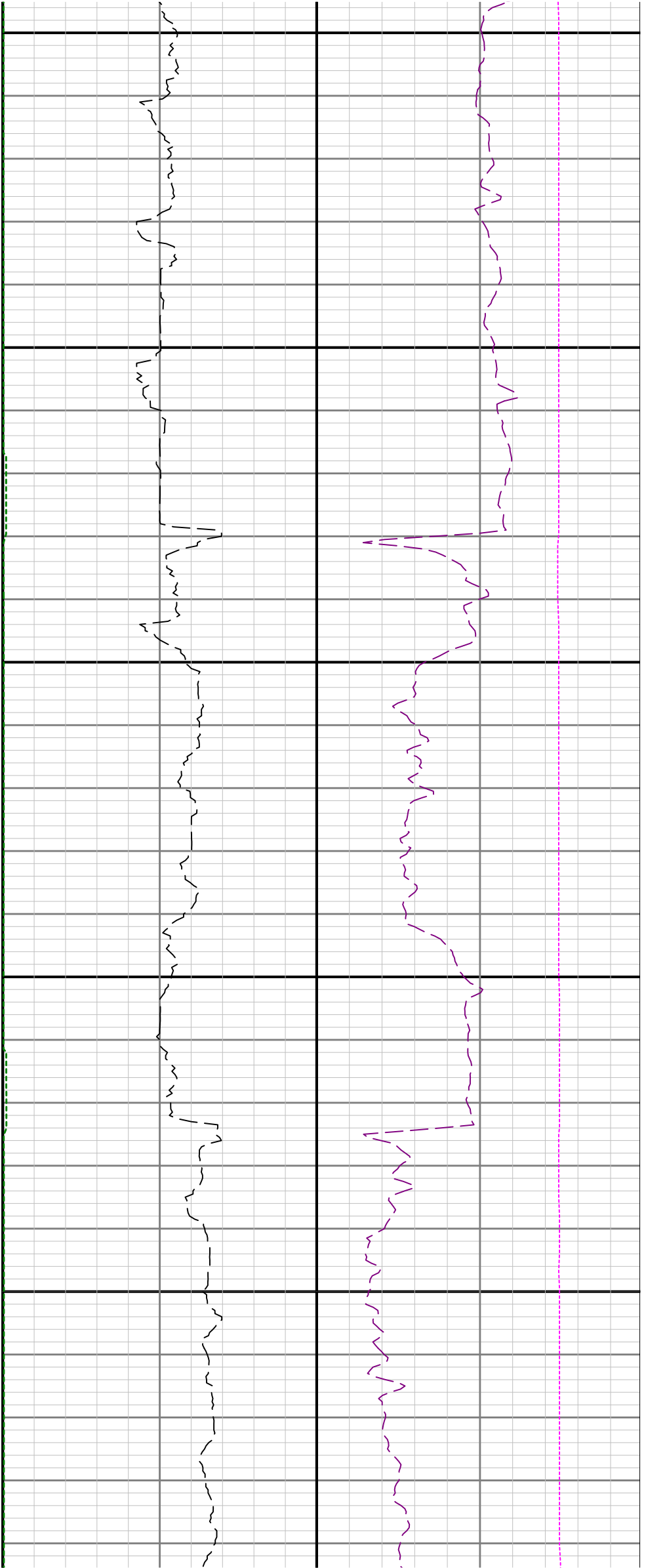


8100

8200

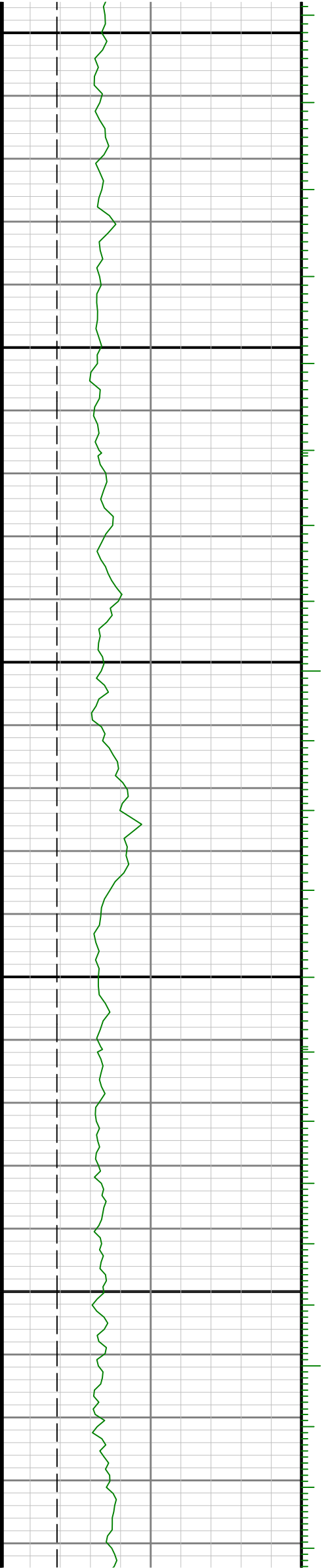


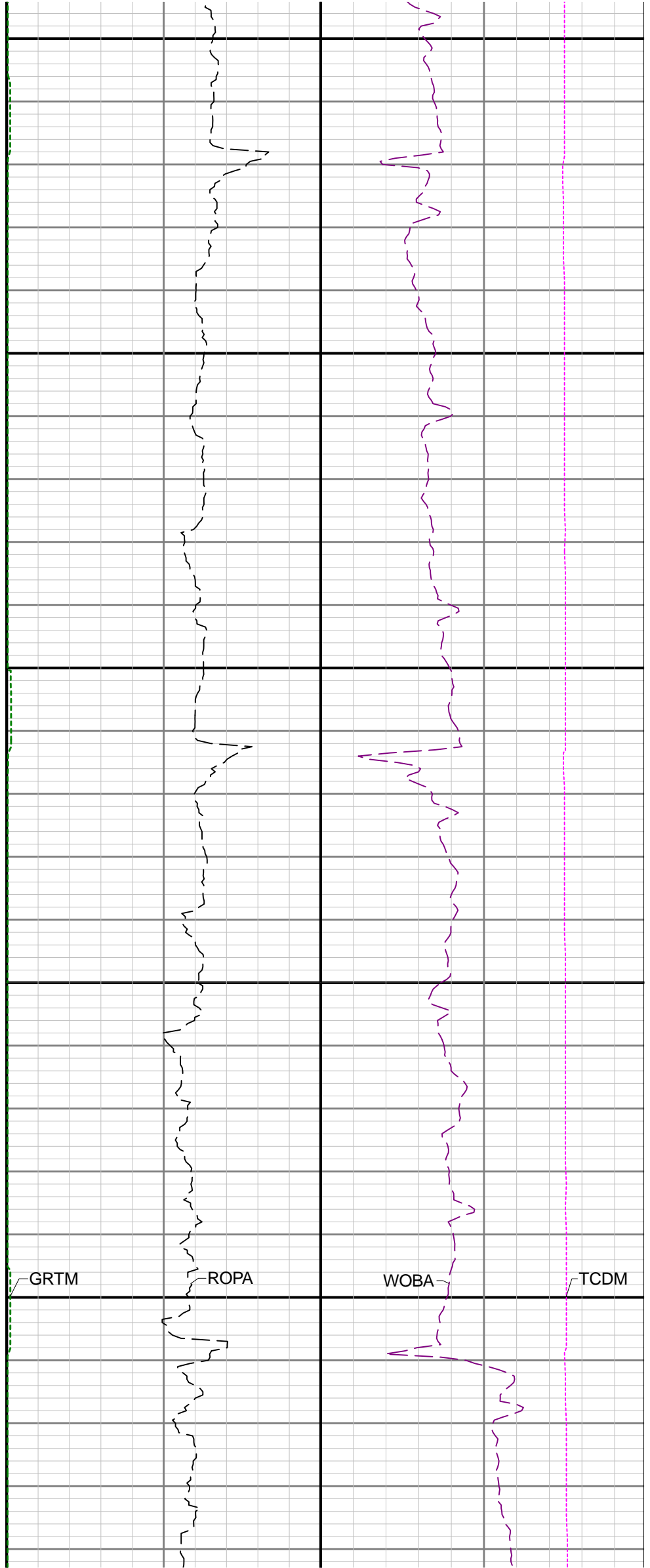
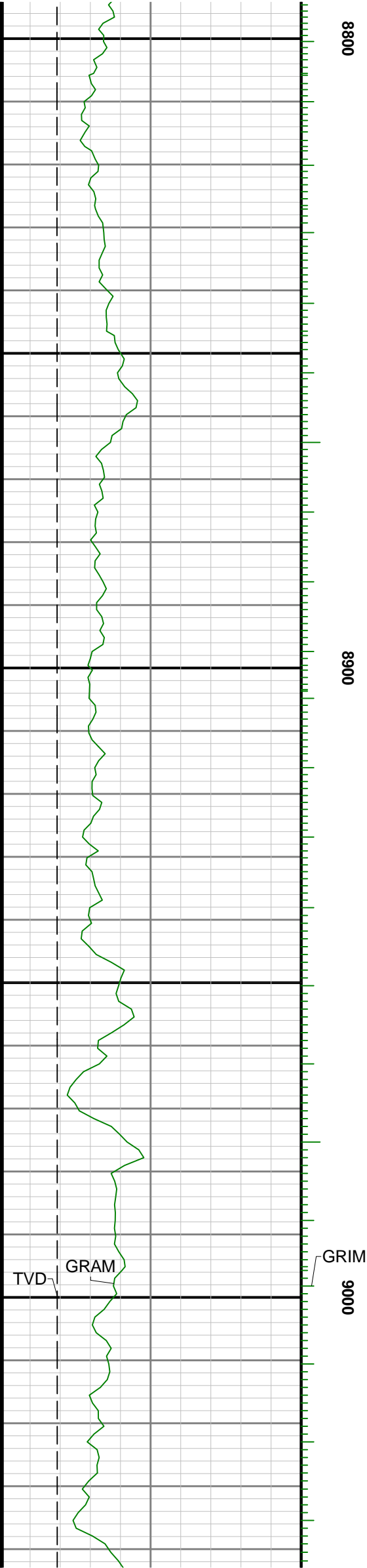


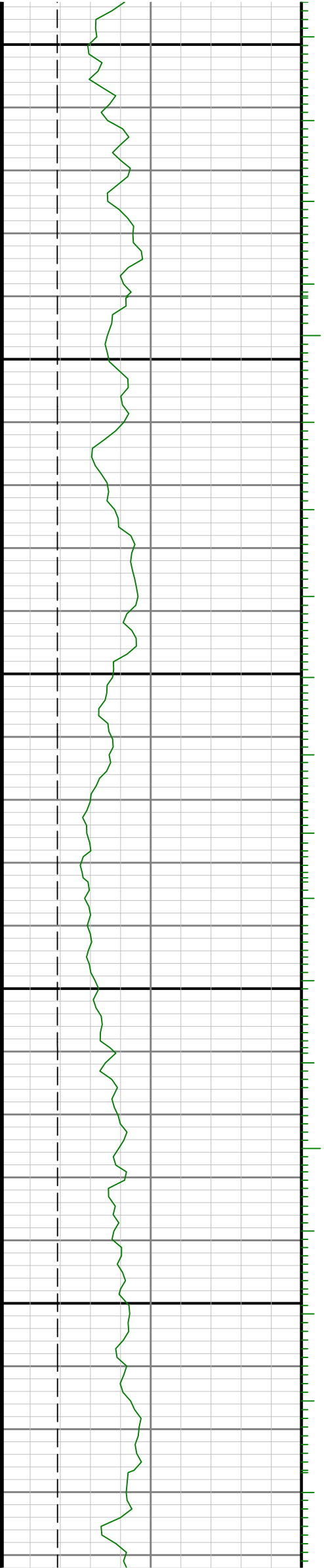
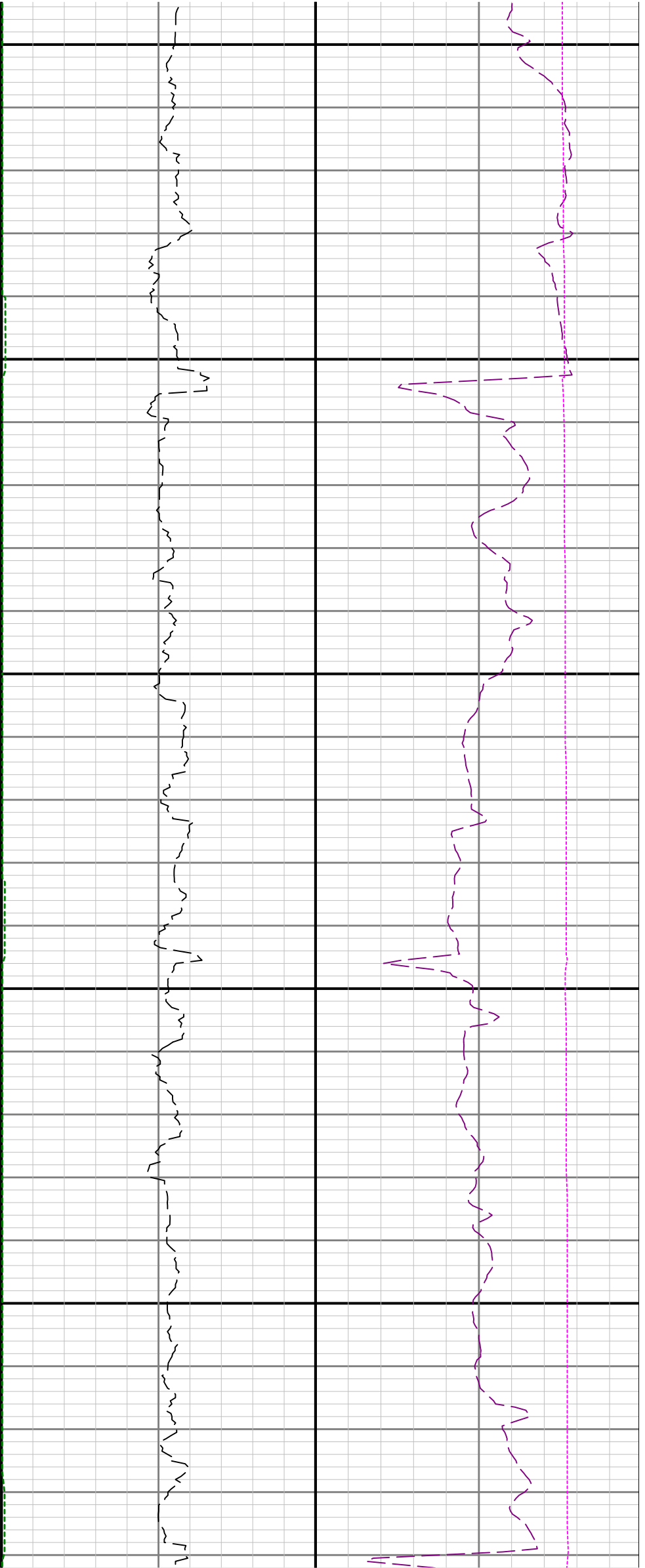


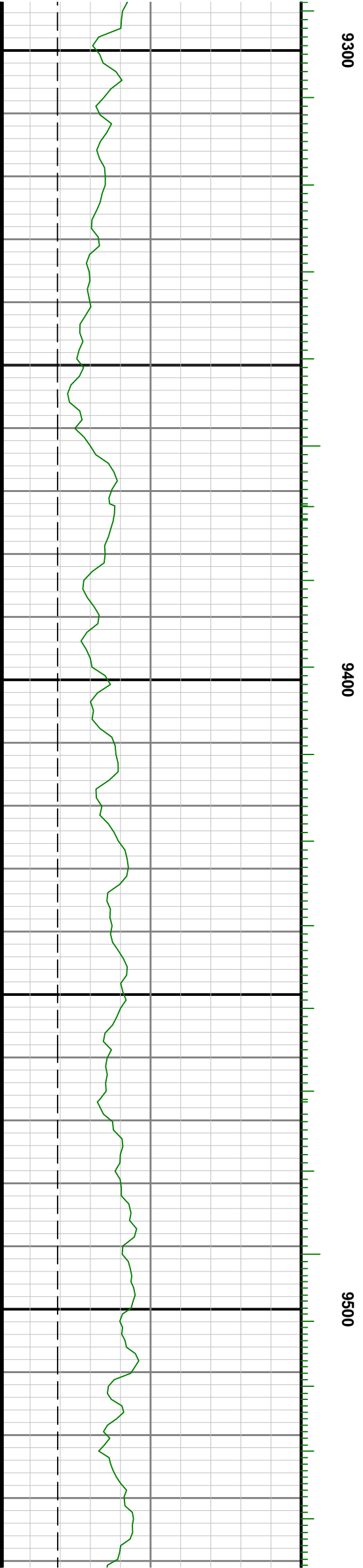
8600

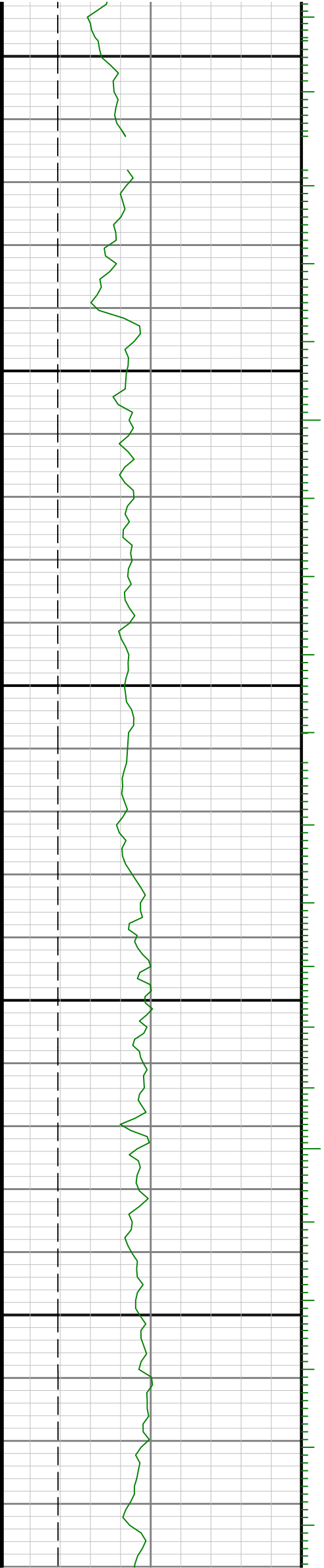
8700





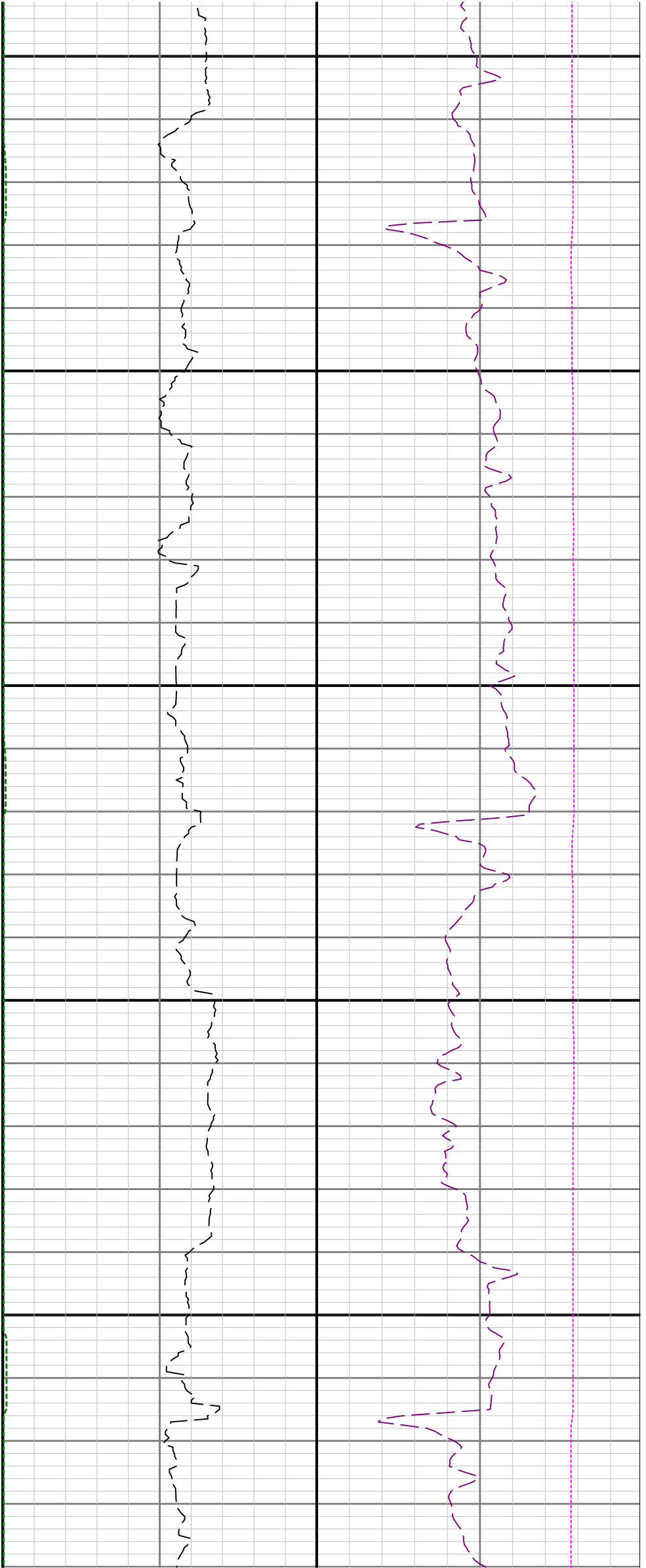


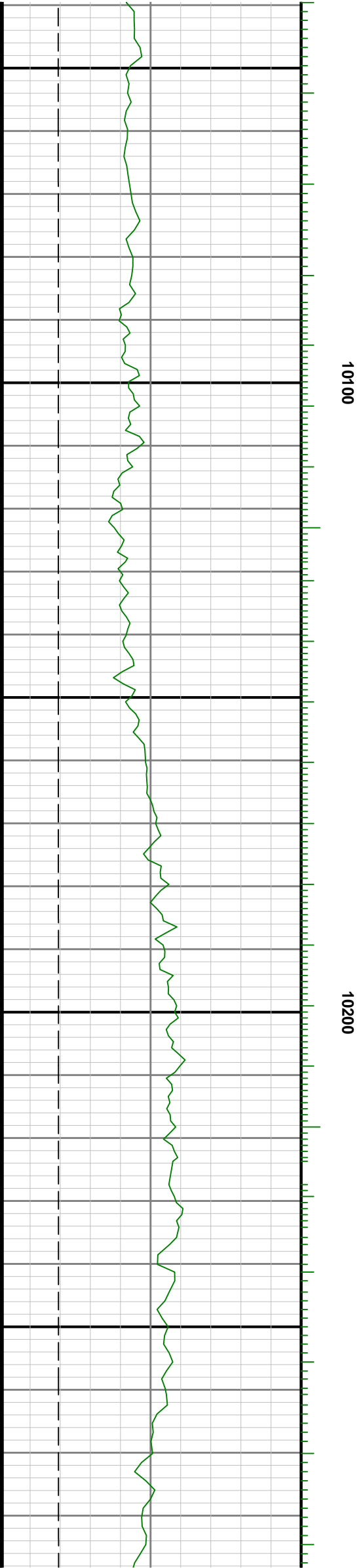
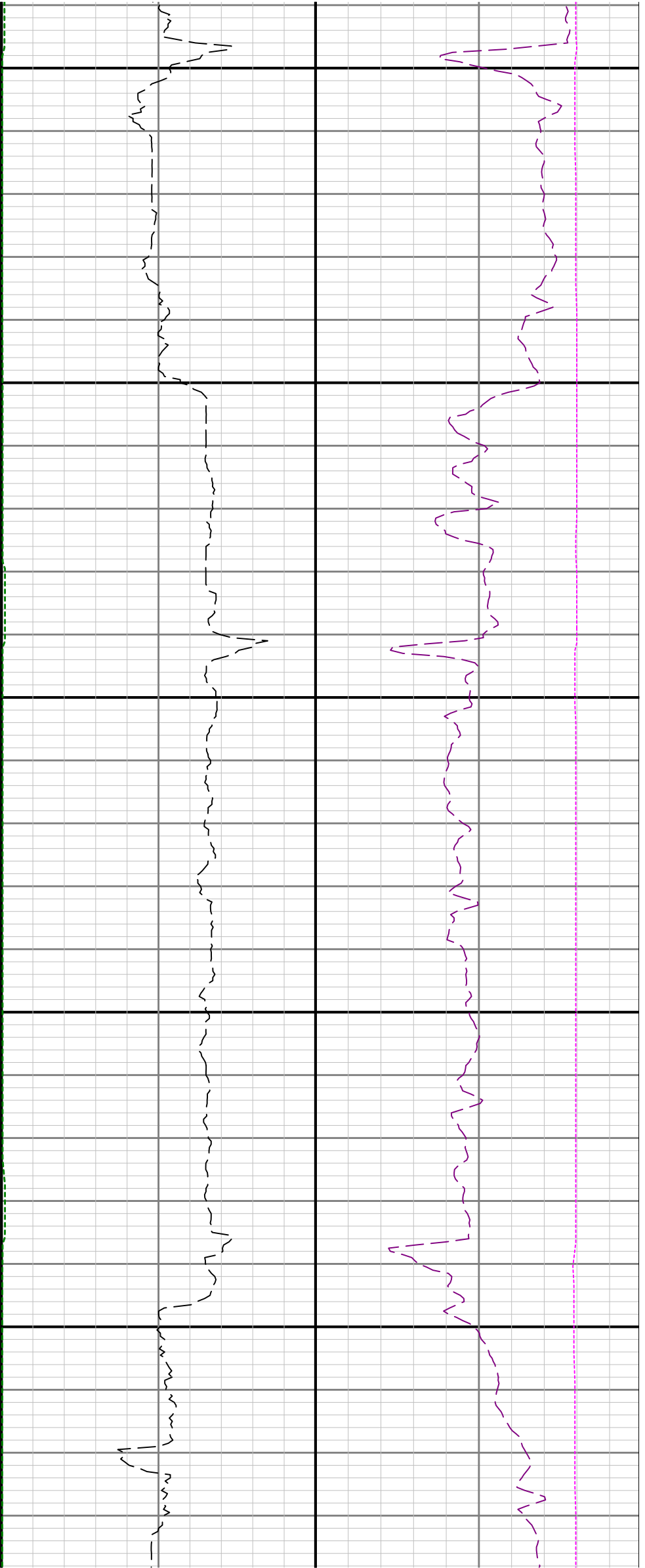


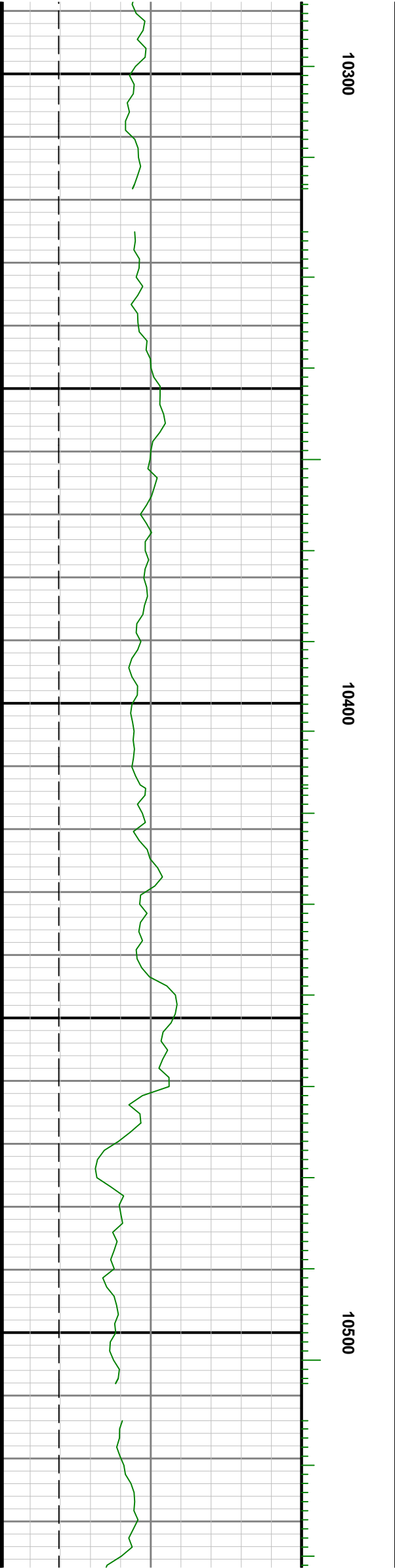
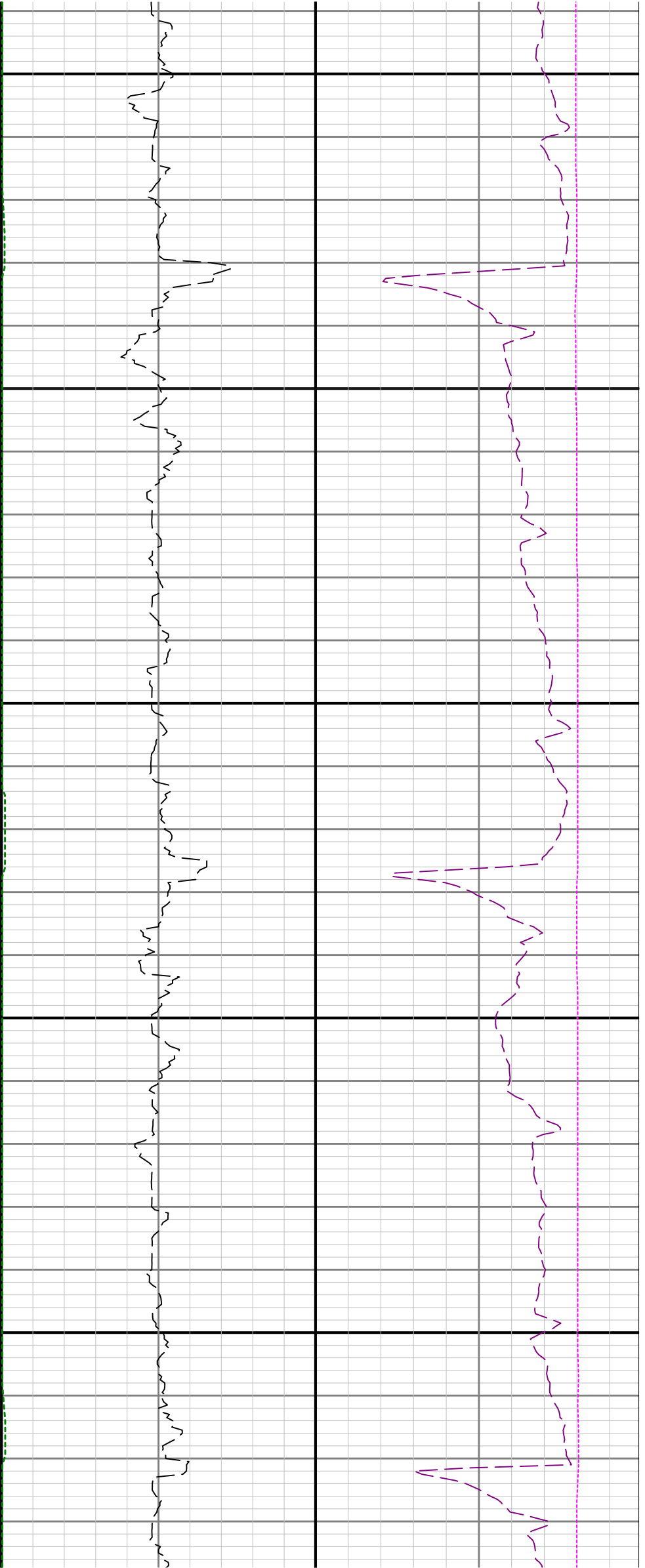


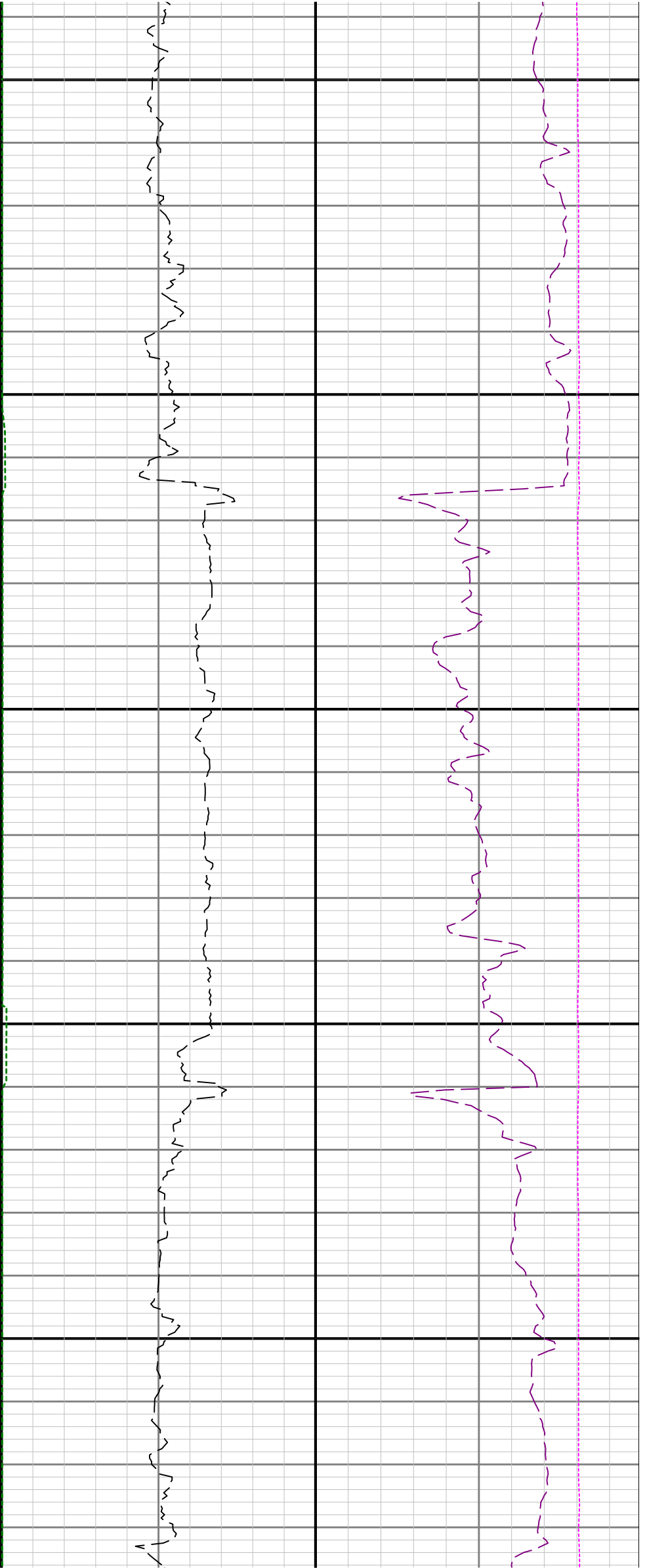
9600

9700



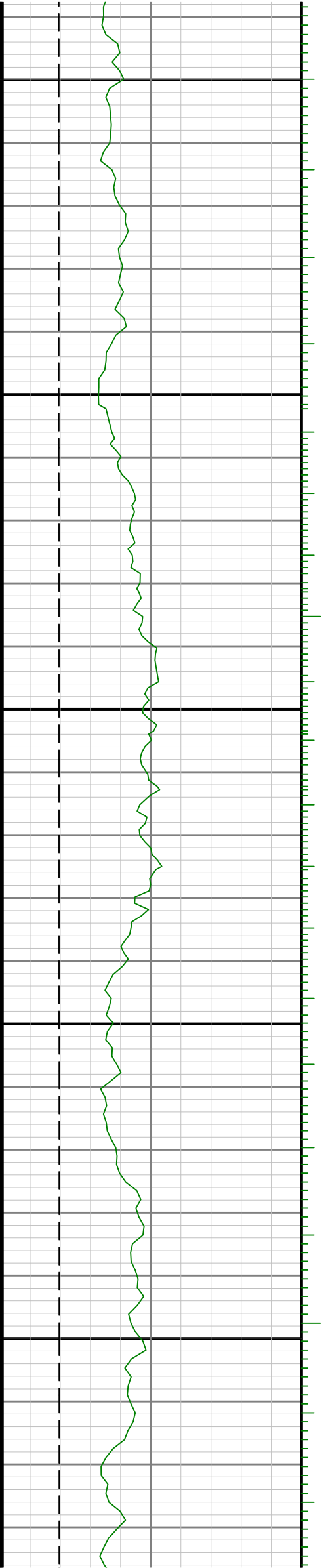


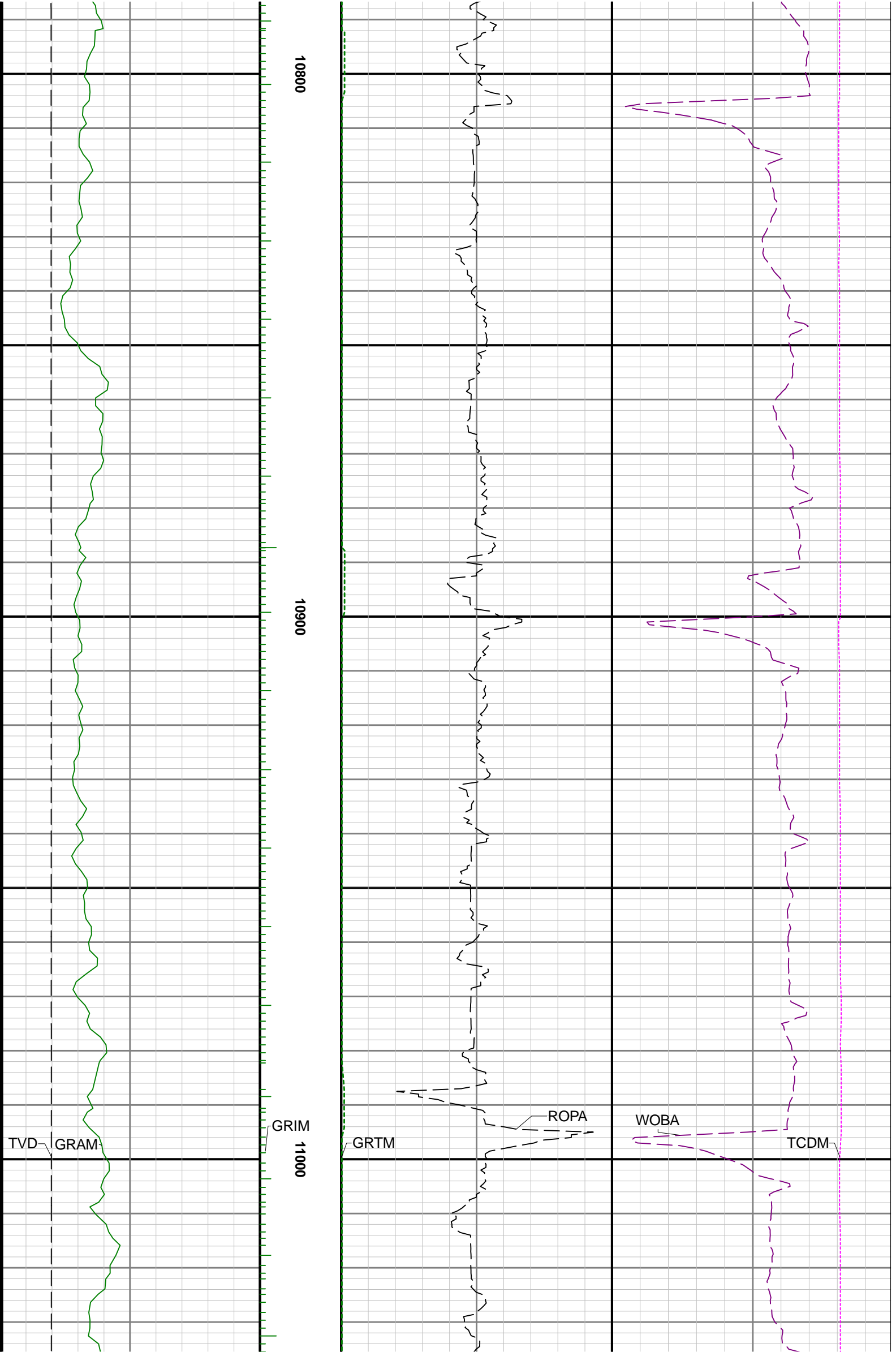


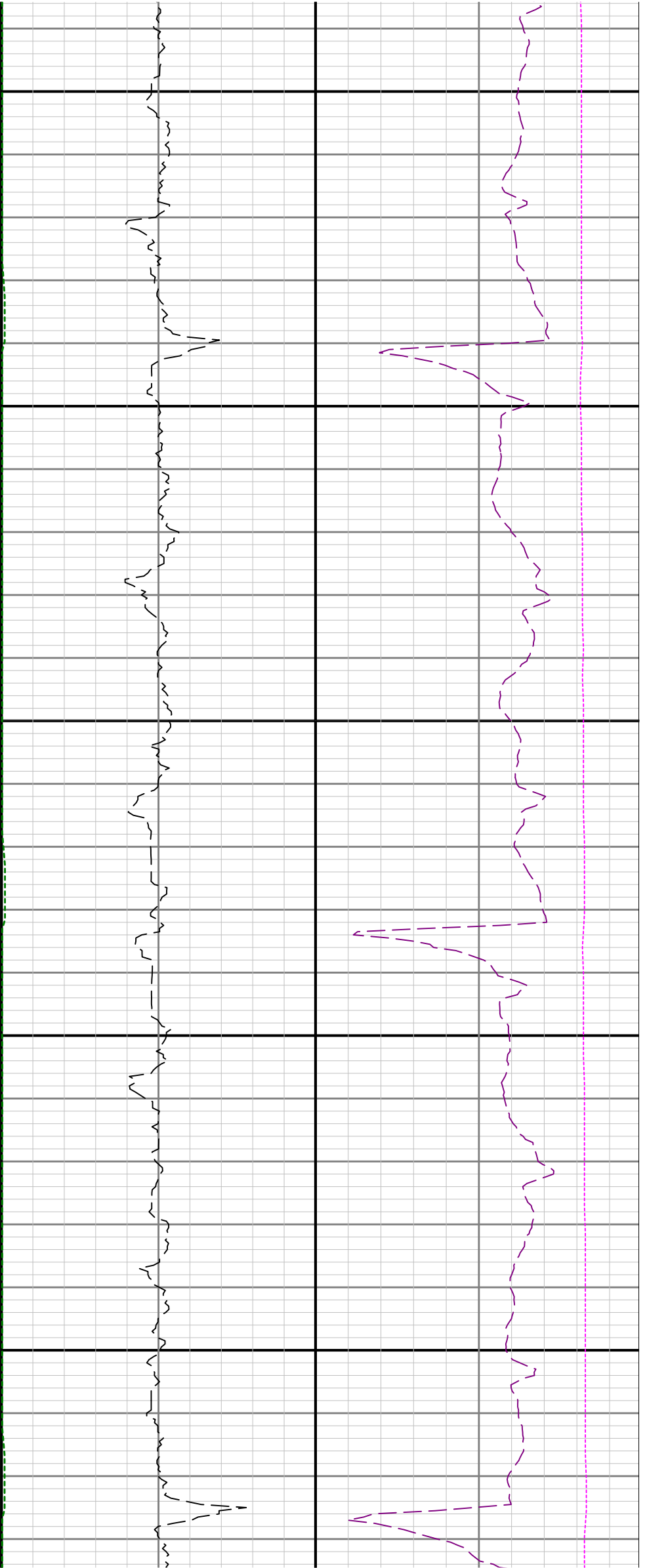


10600

10700

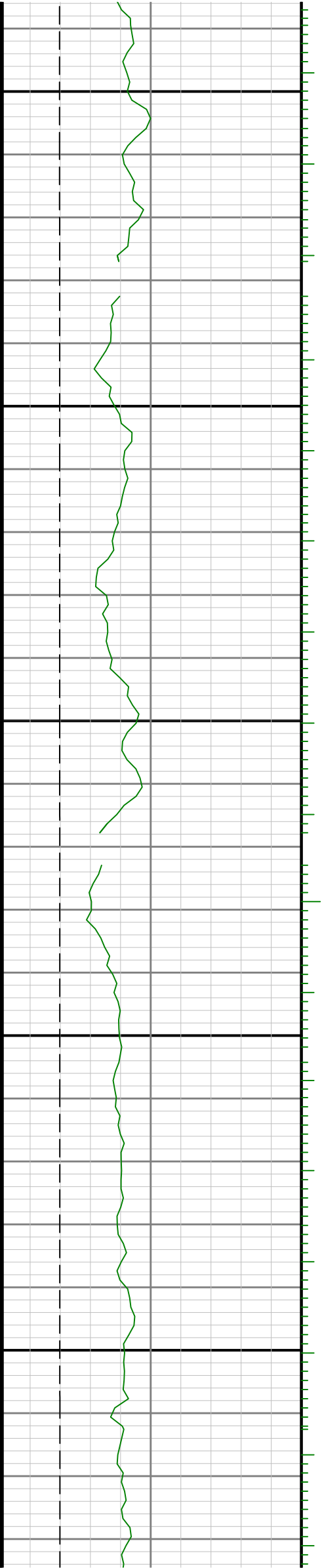






11100

11200

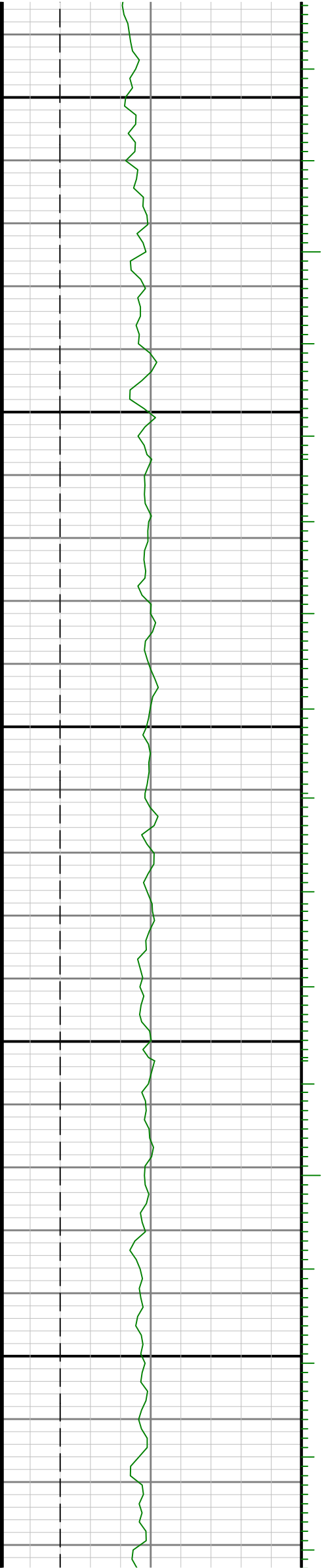


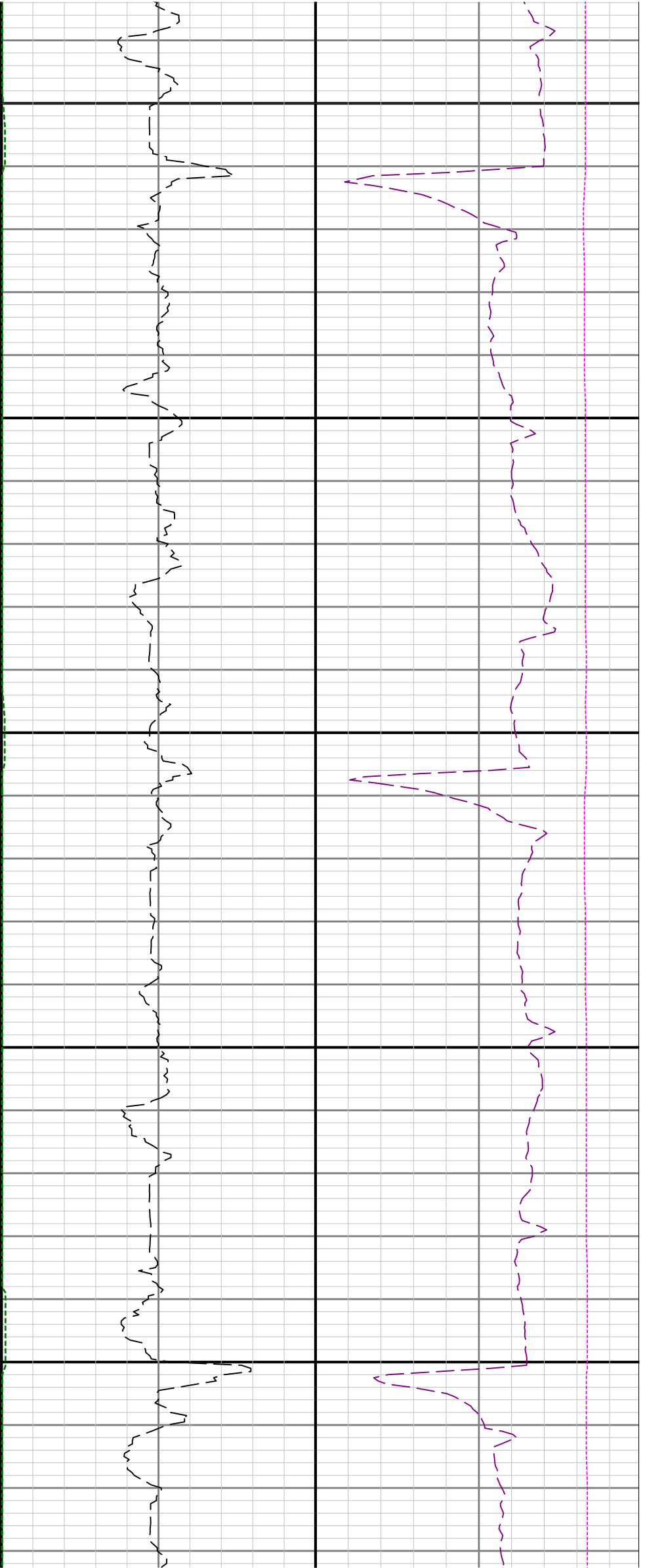


11300

11400

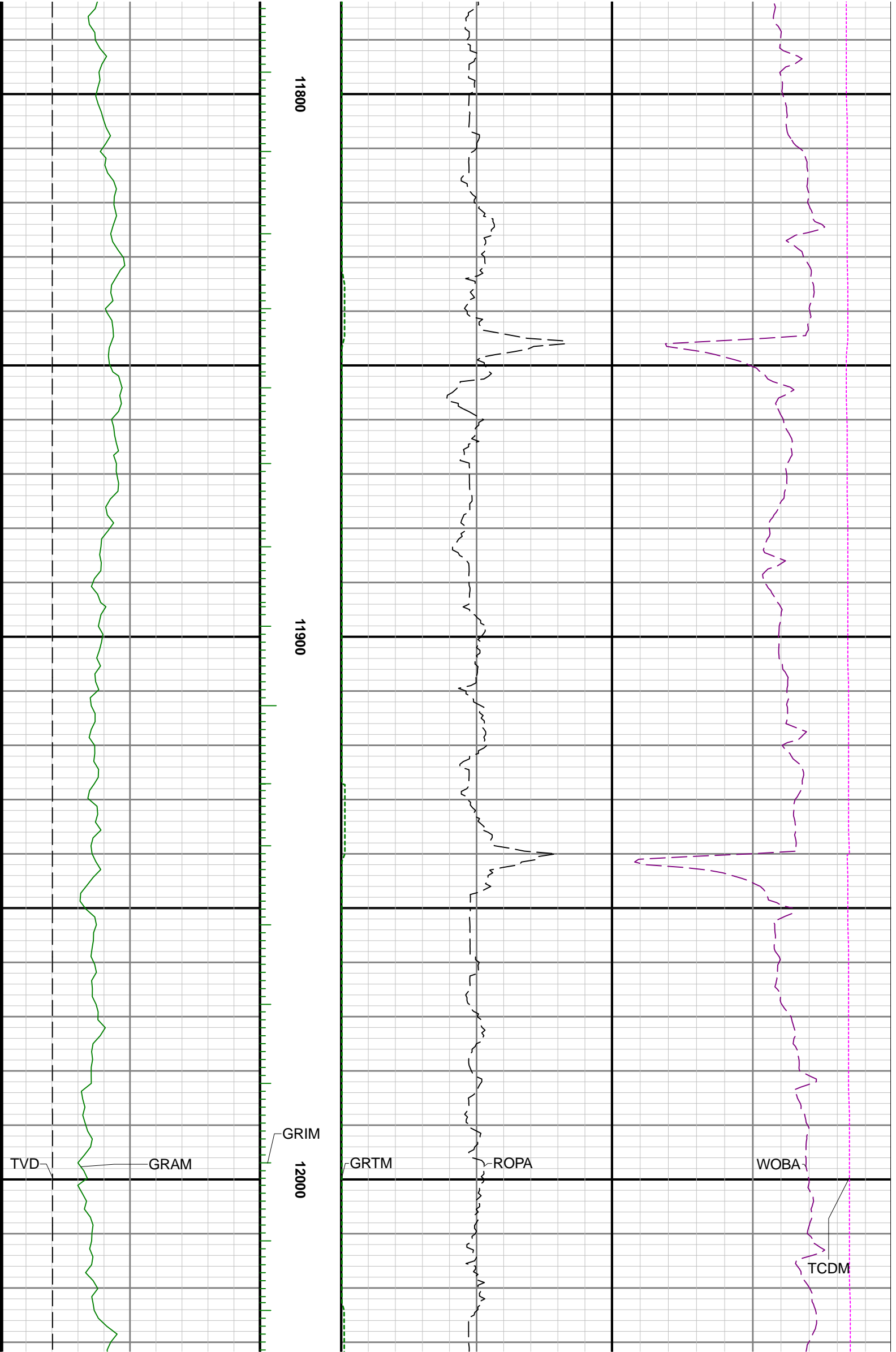
11500

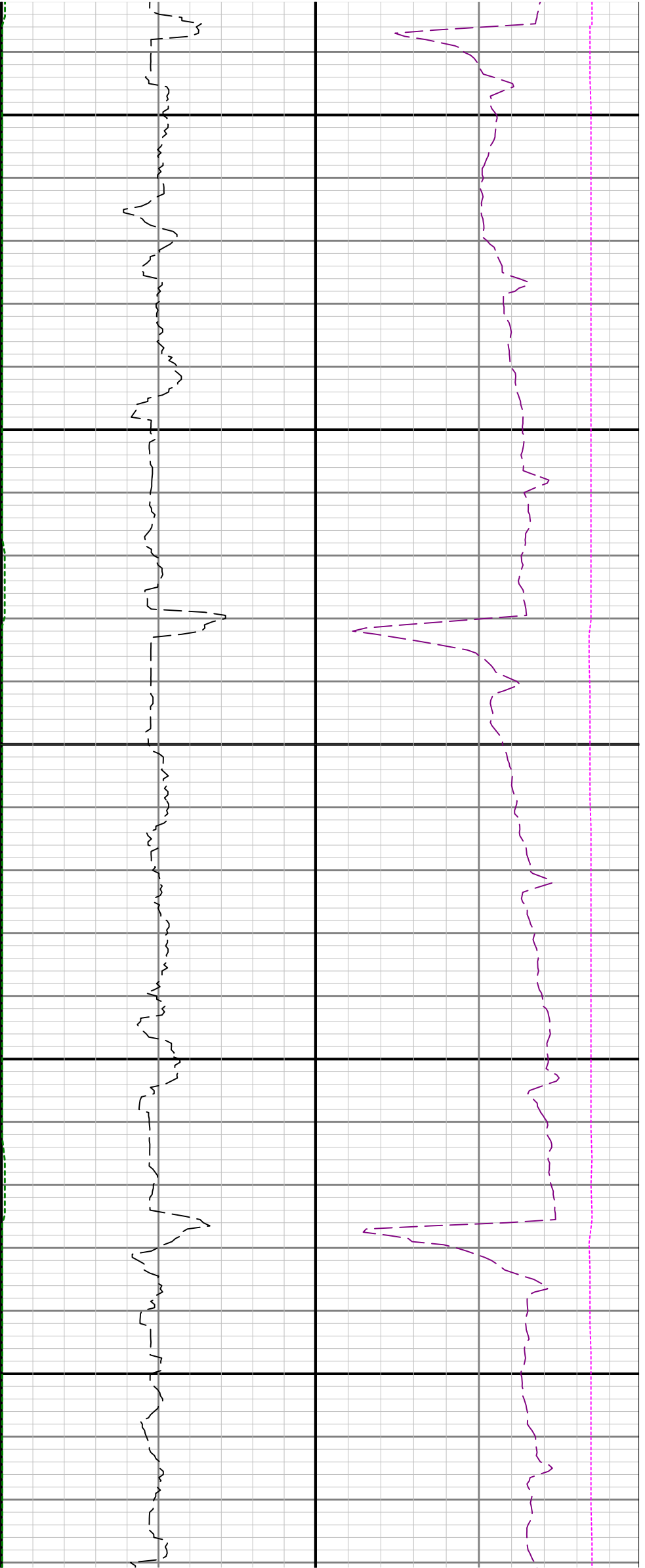




11600

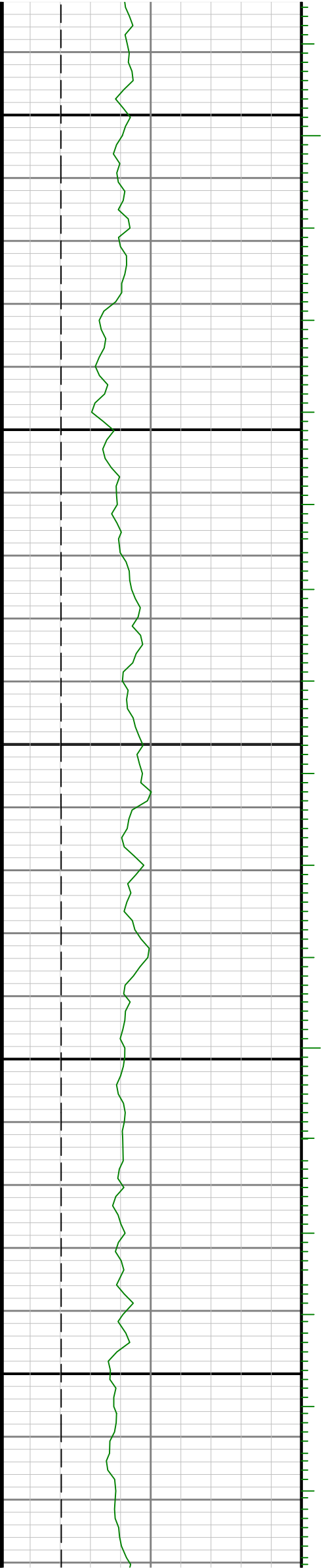
11700

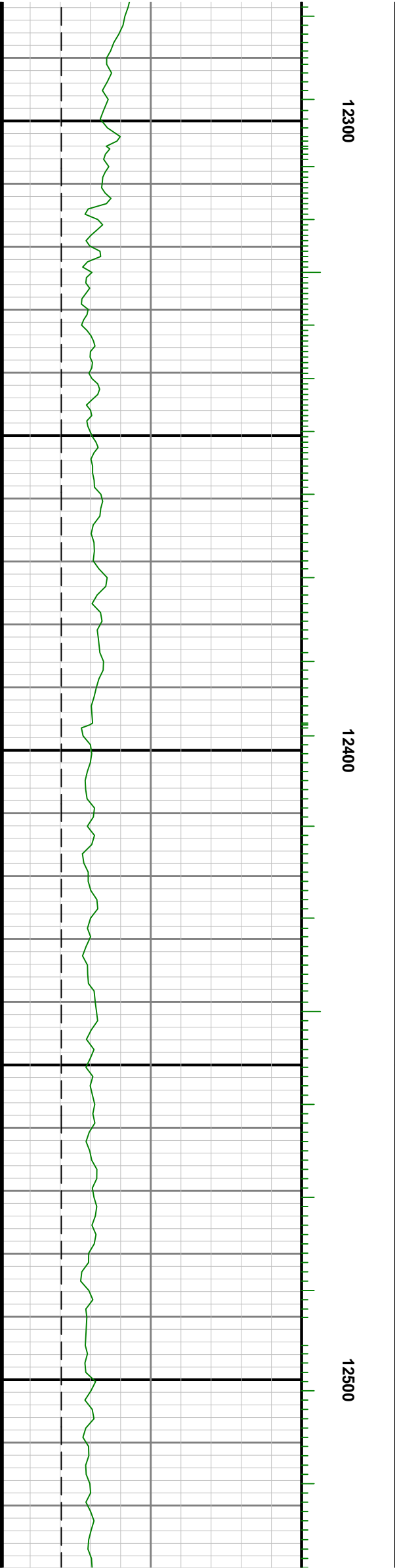


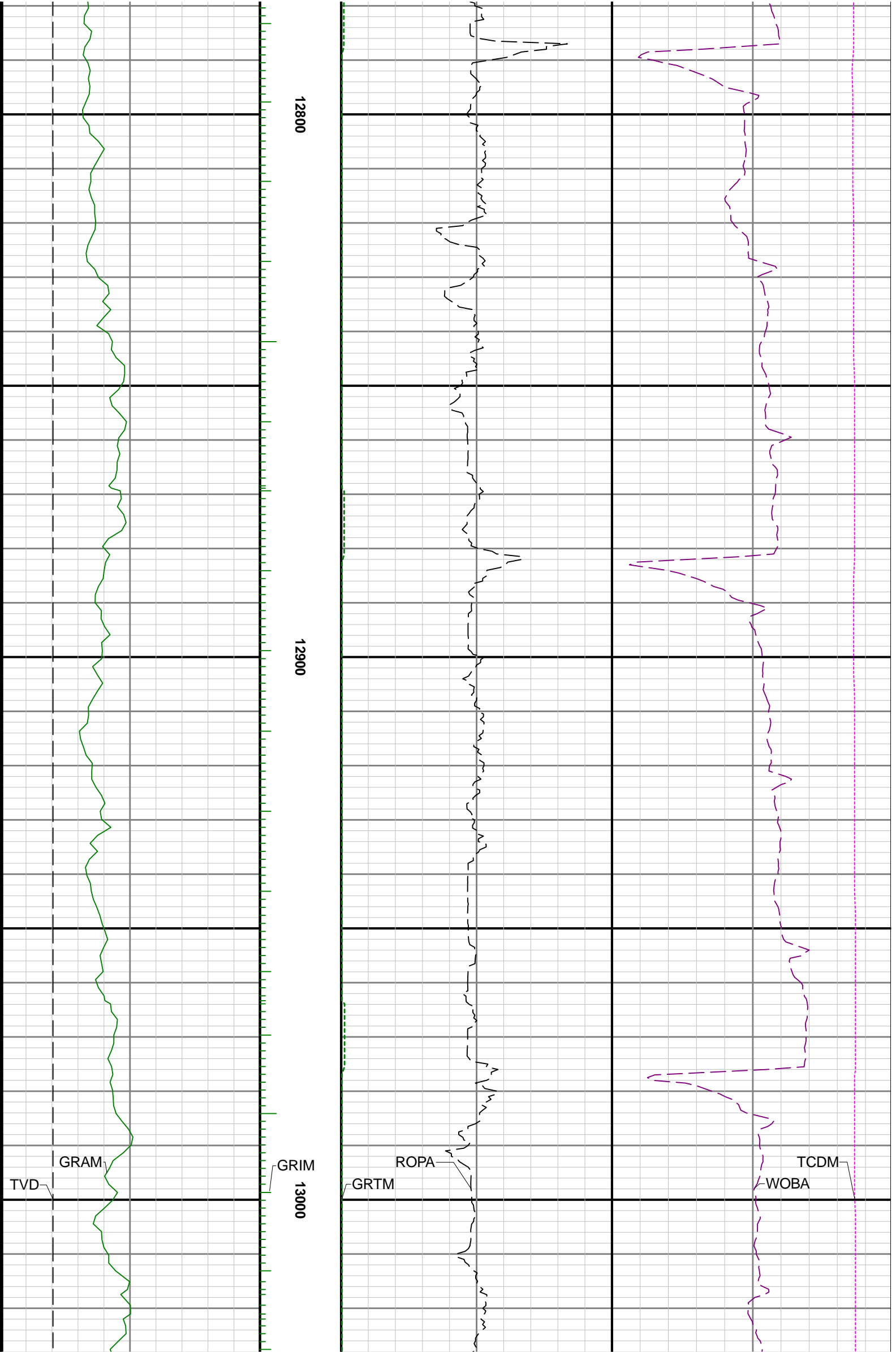


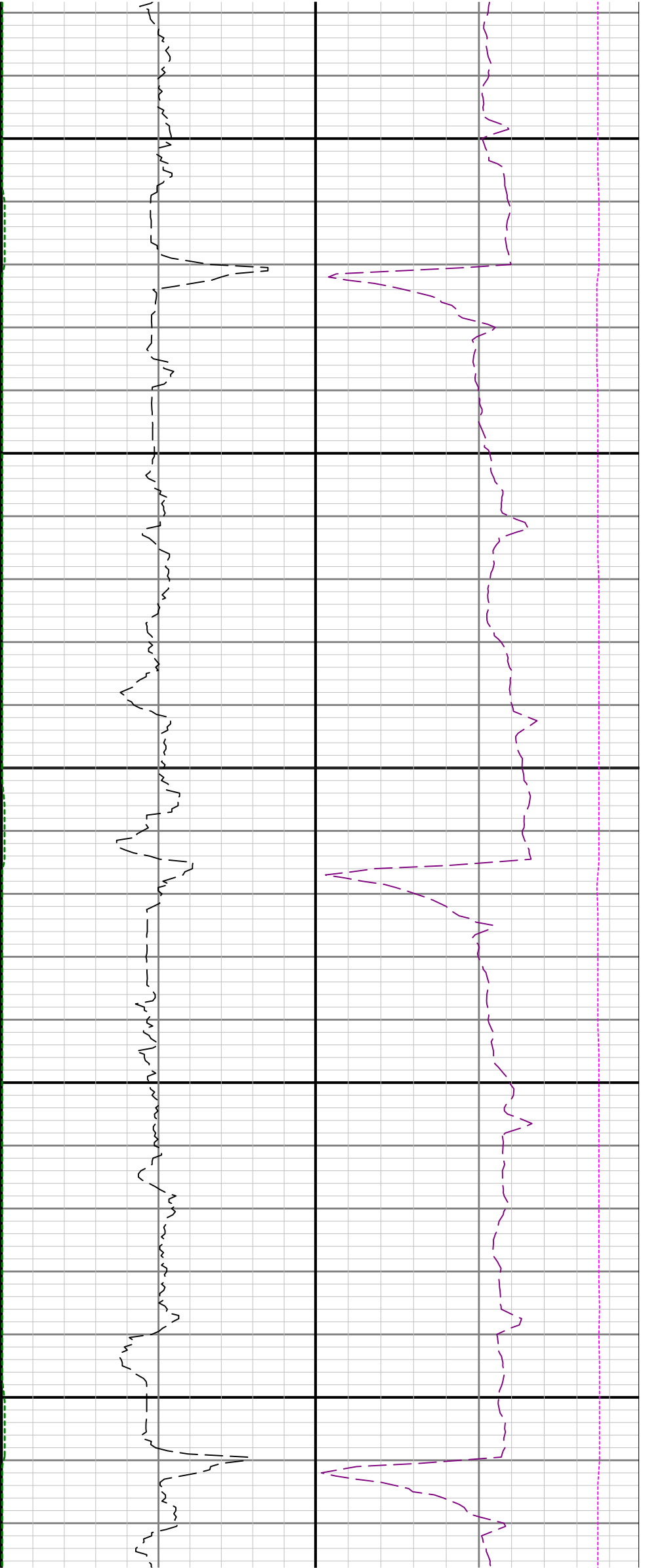
12100

12200



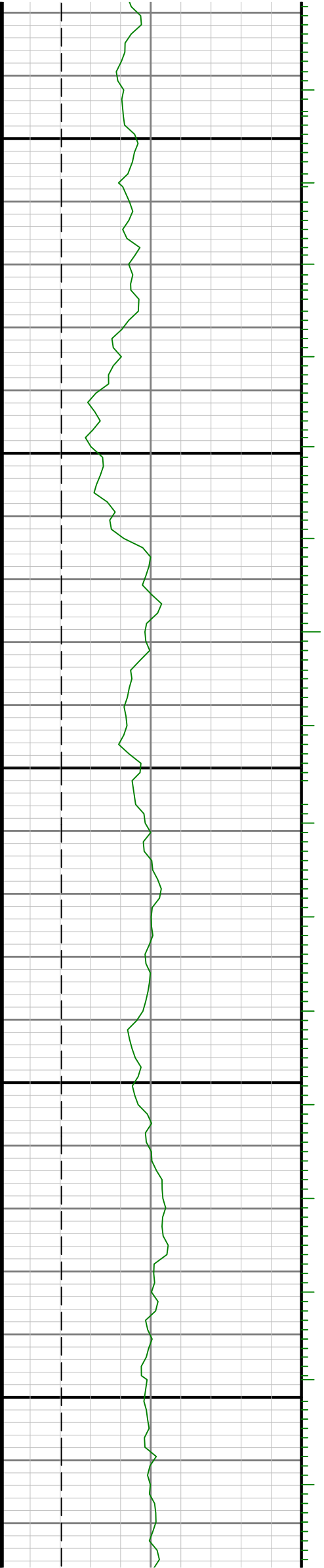


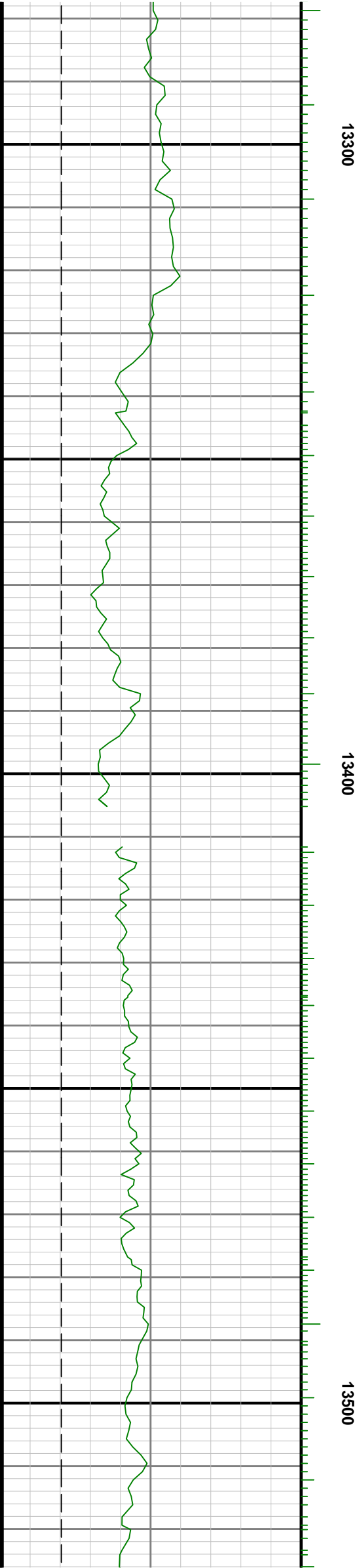
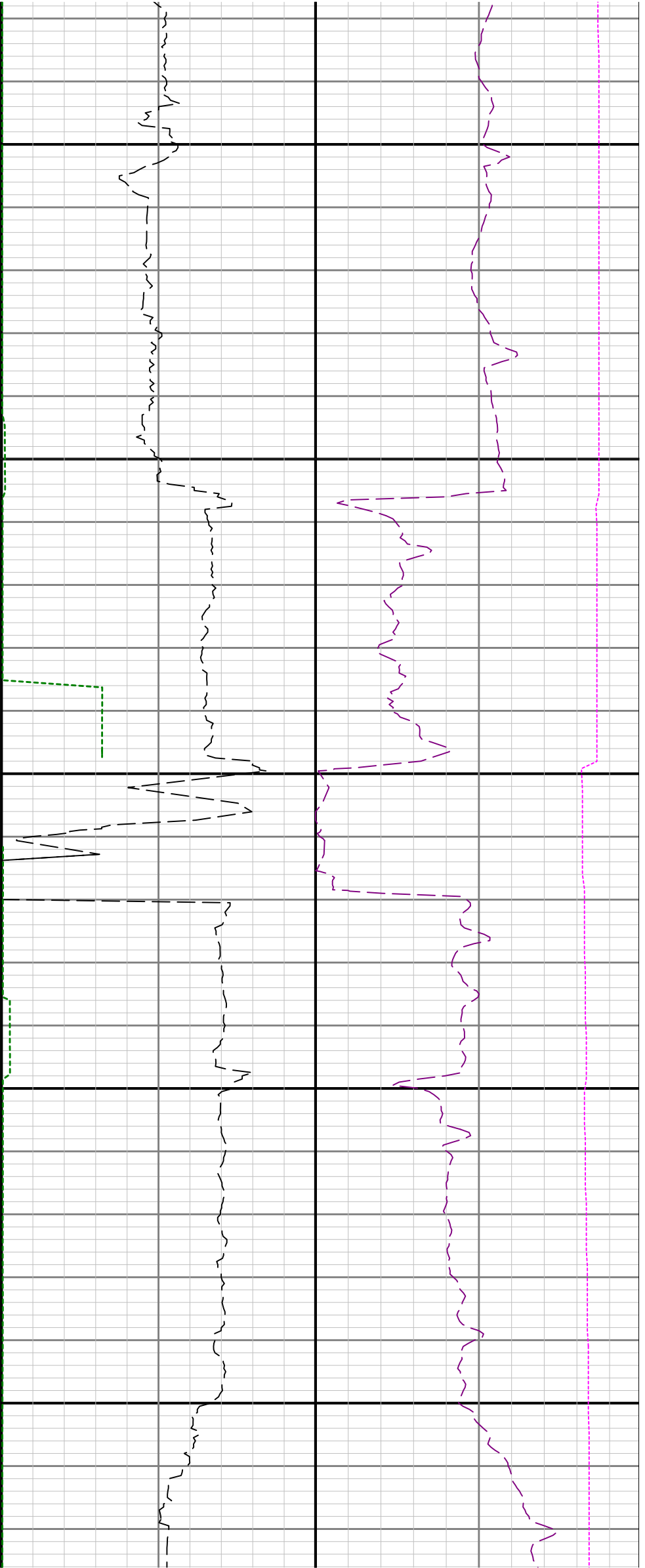


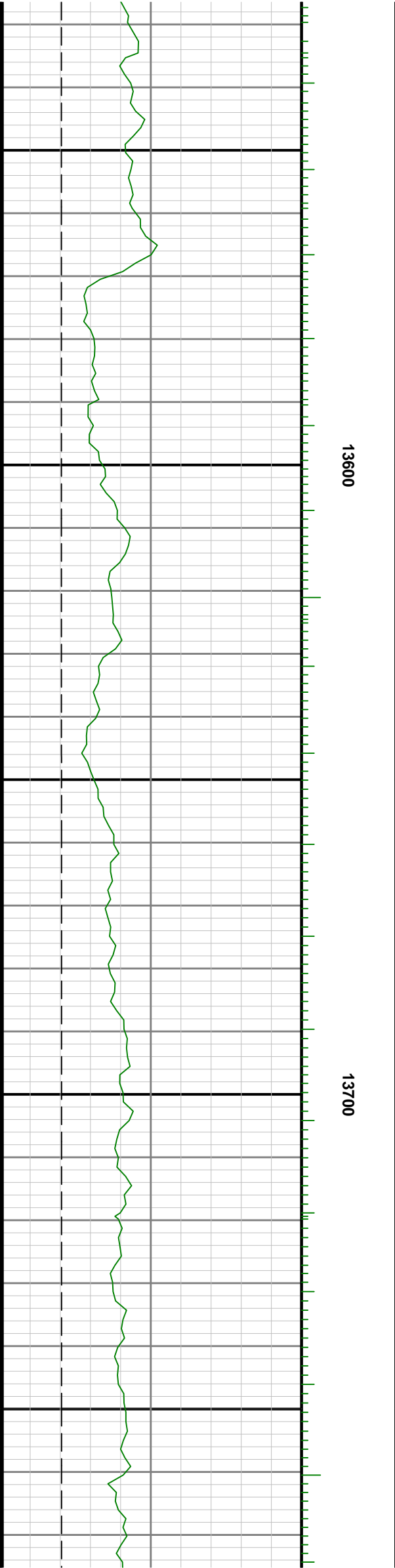
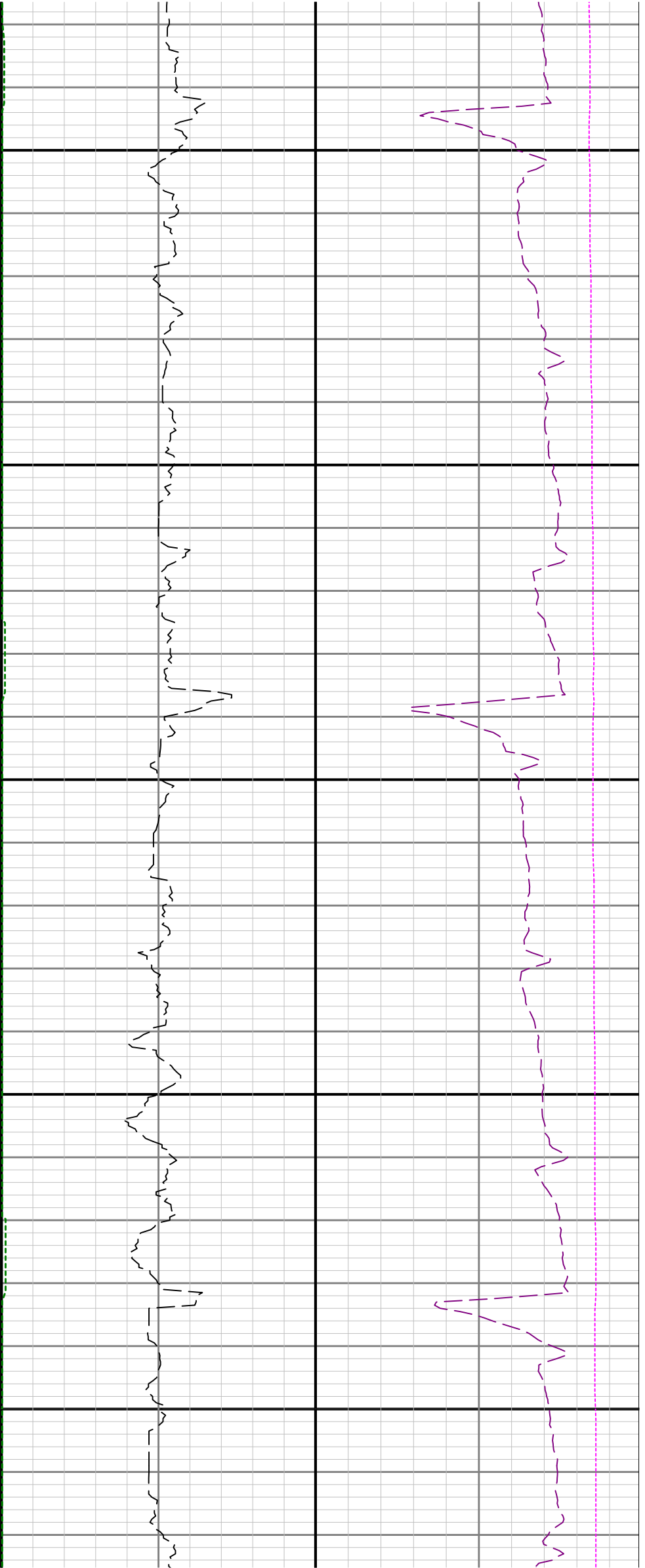


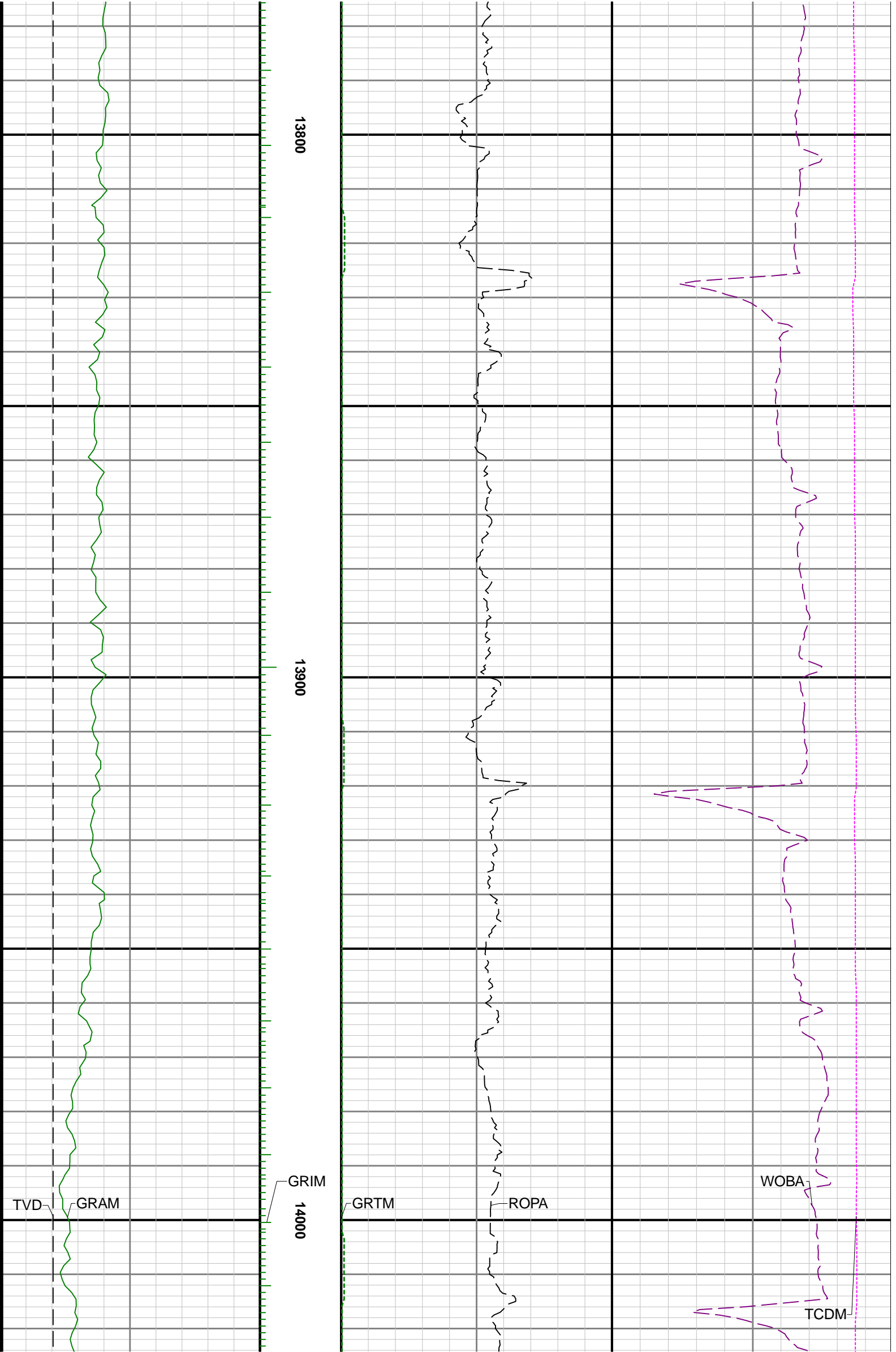
13100

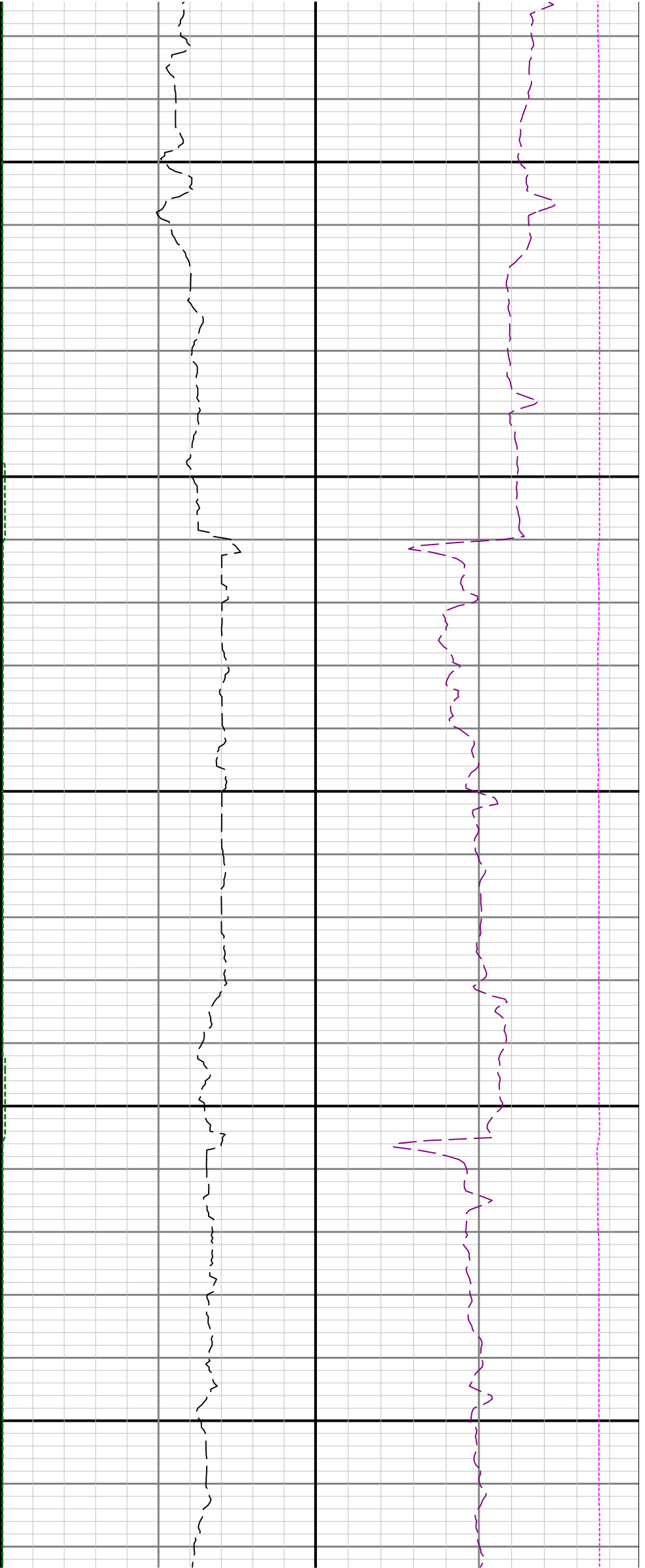
13200





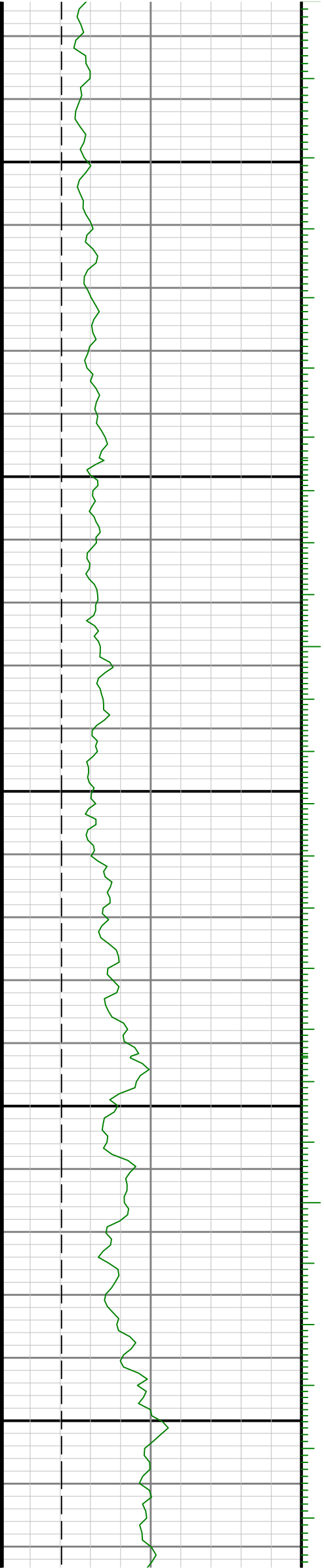


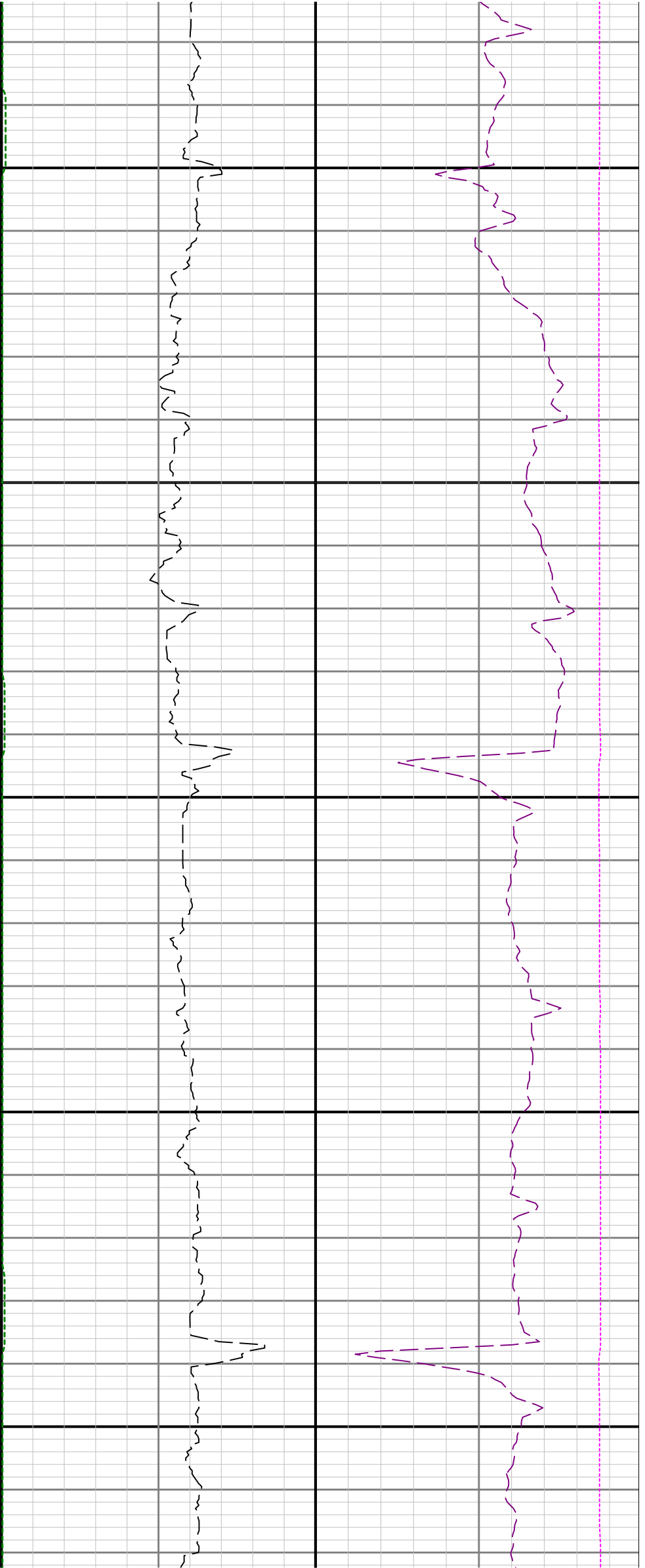




14100

14200

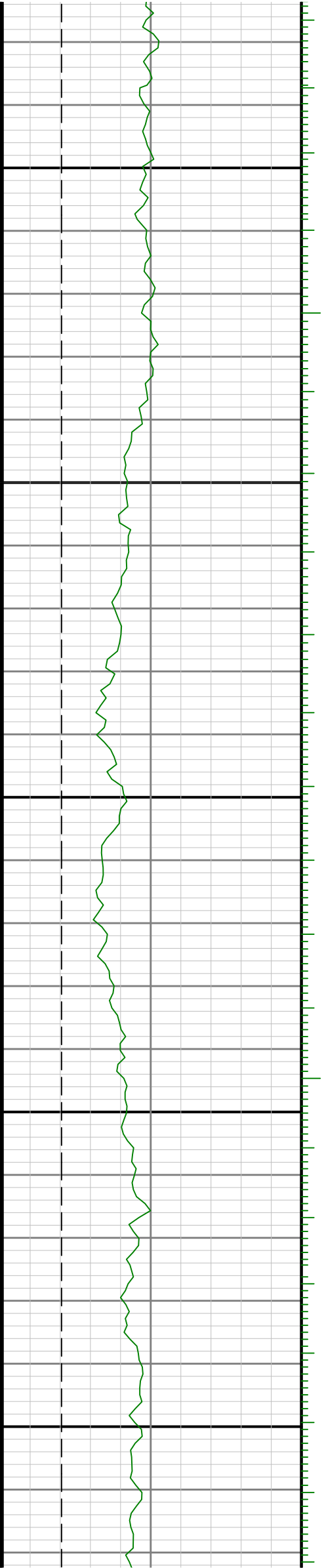


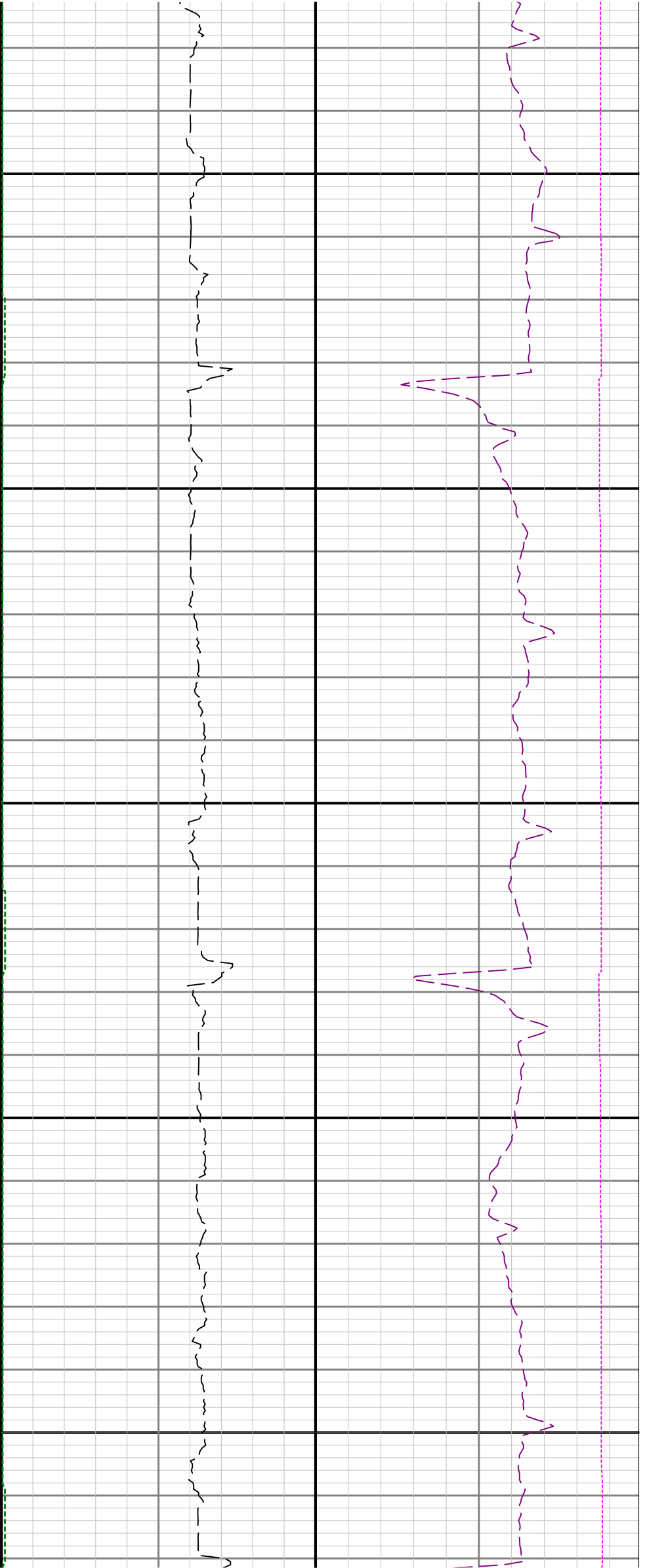


14300

14400

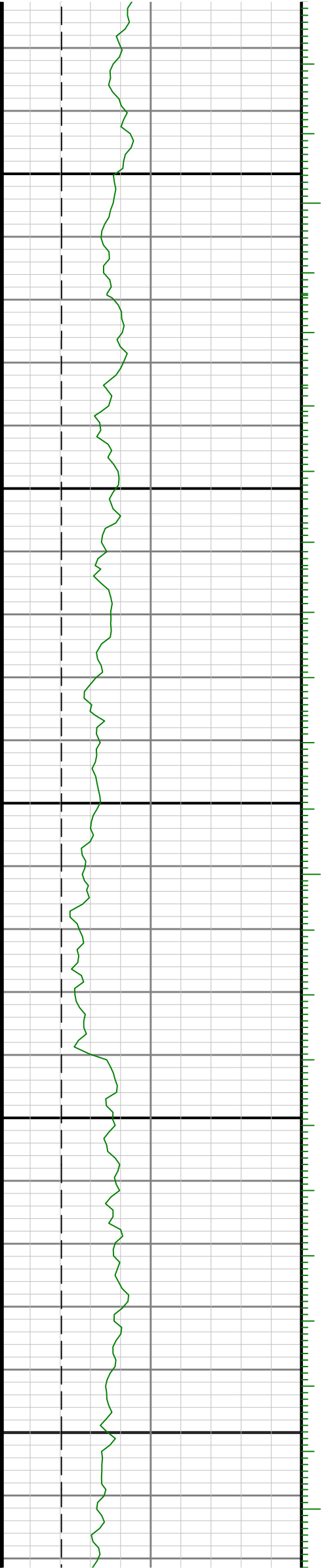
14500

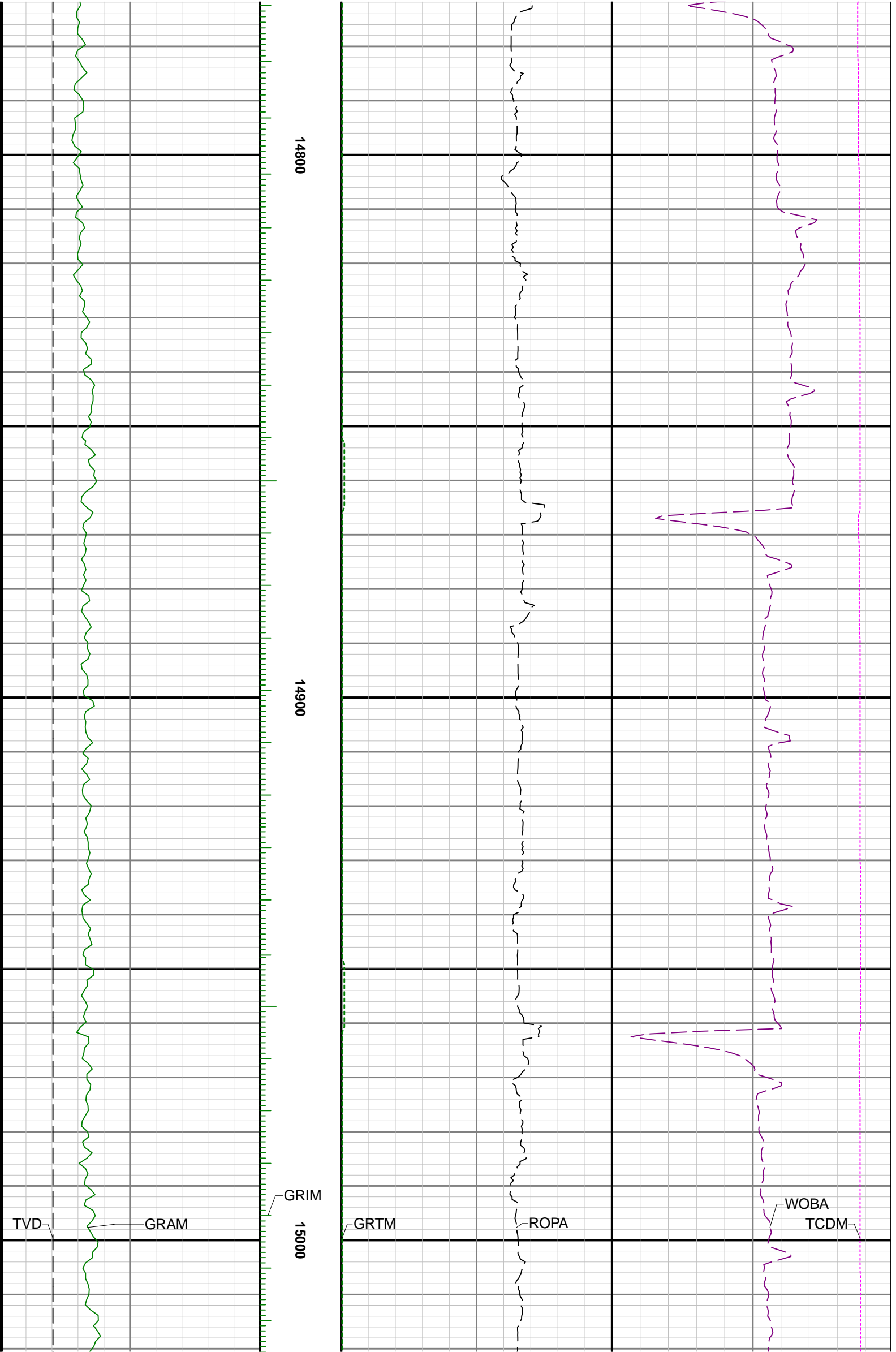


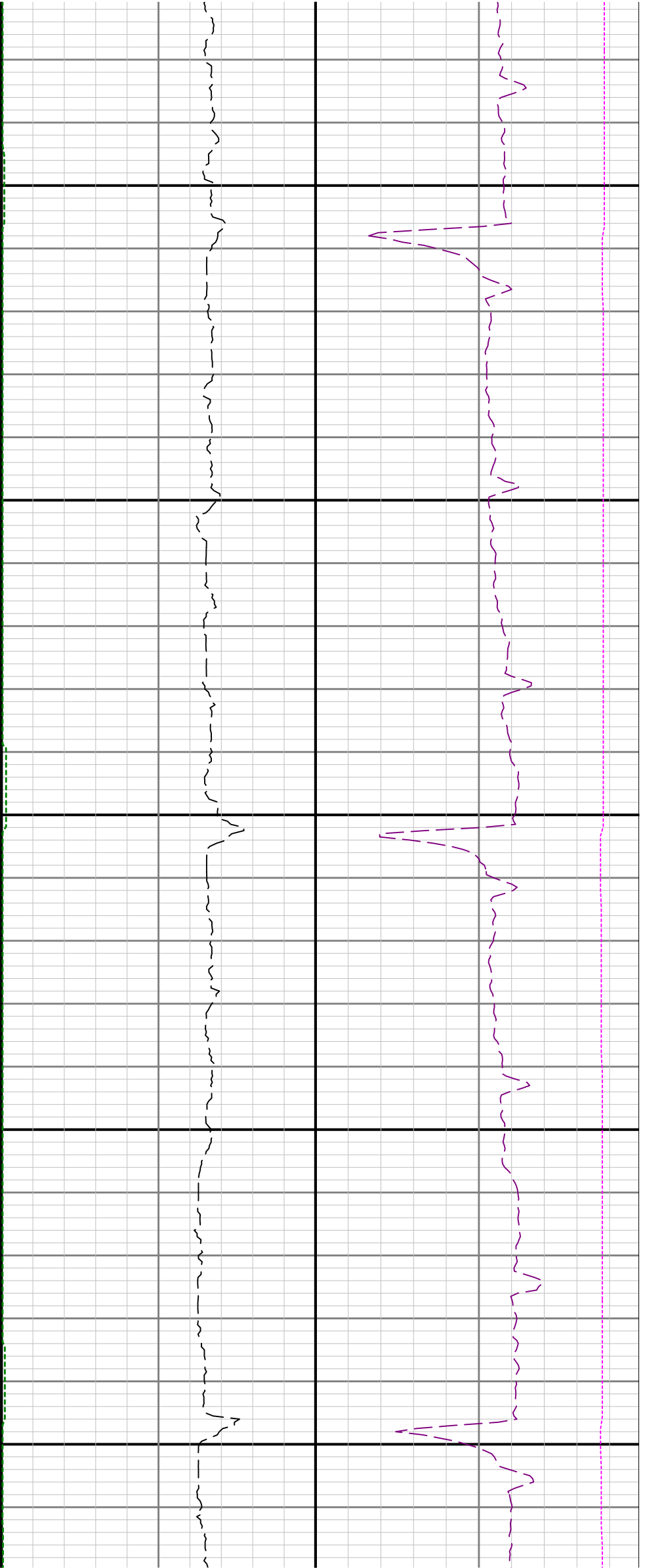


14600

14700

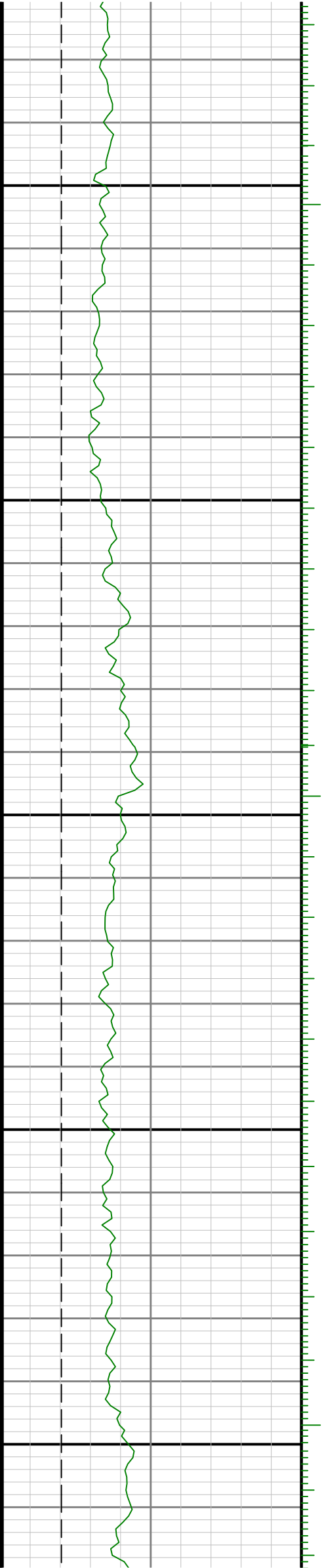


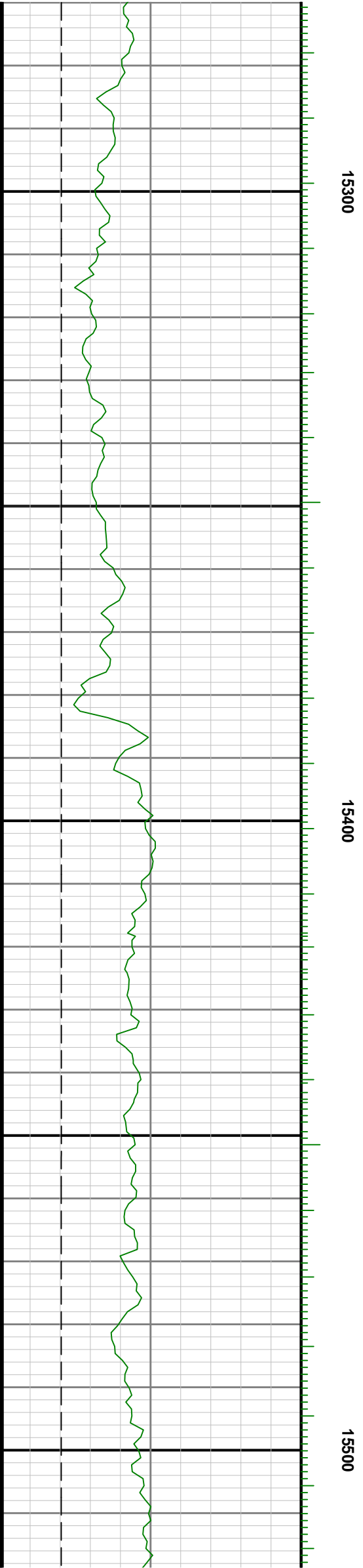
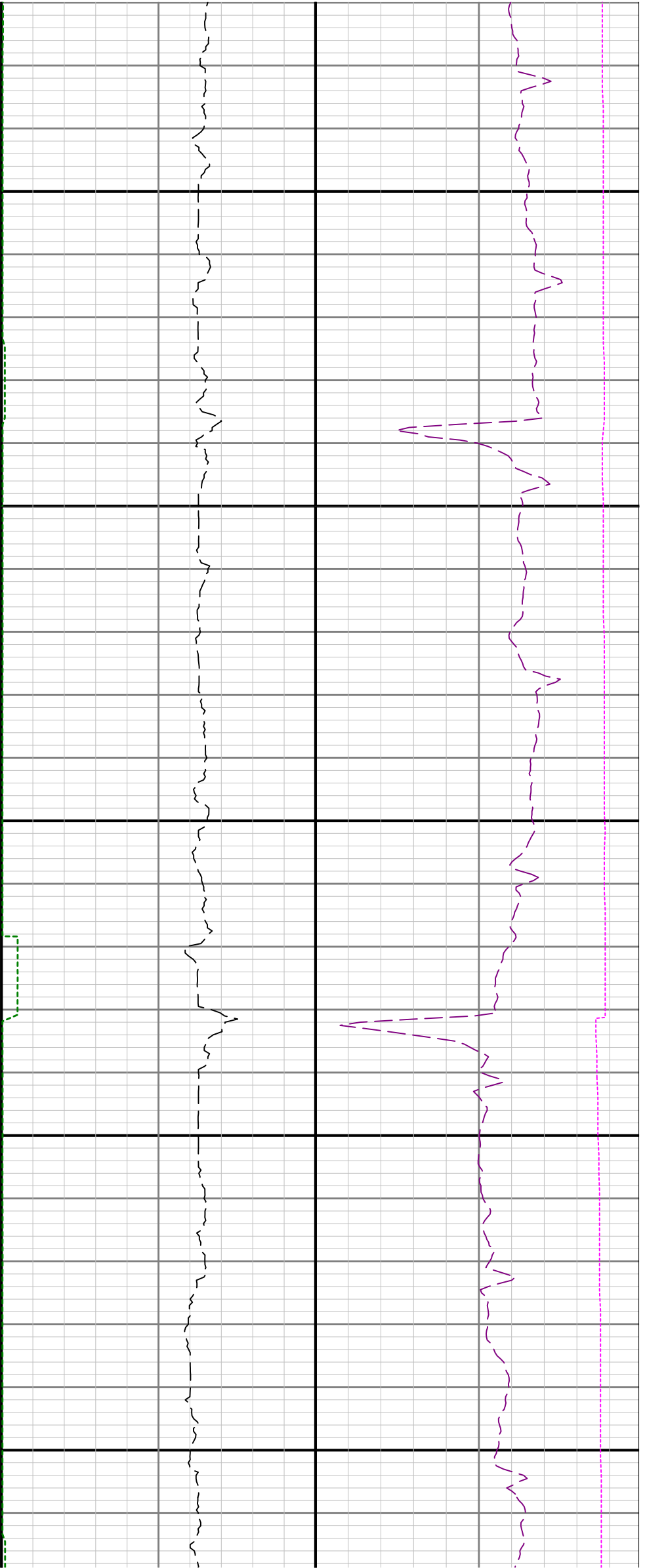




15100

15200

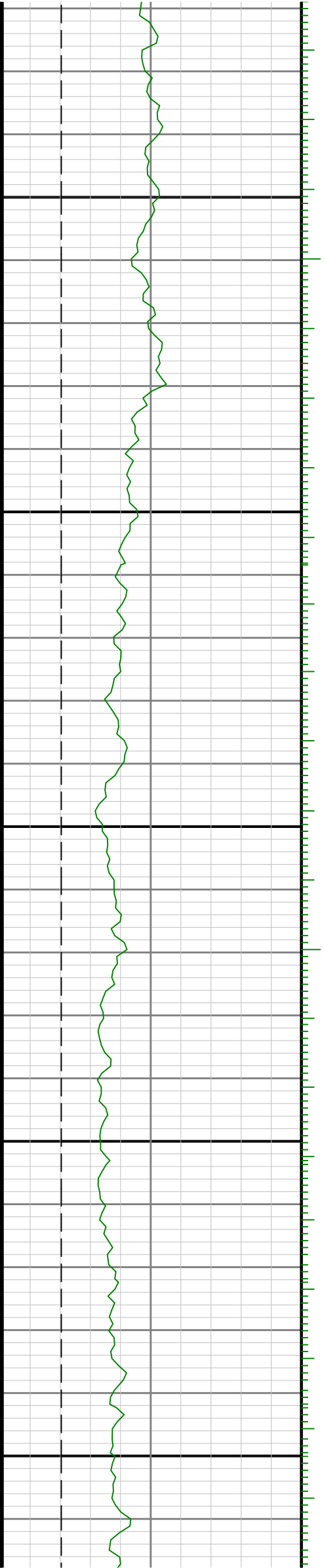




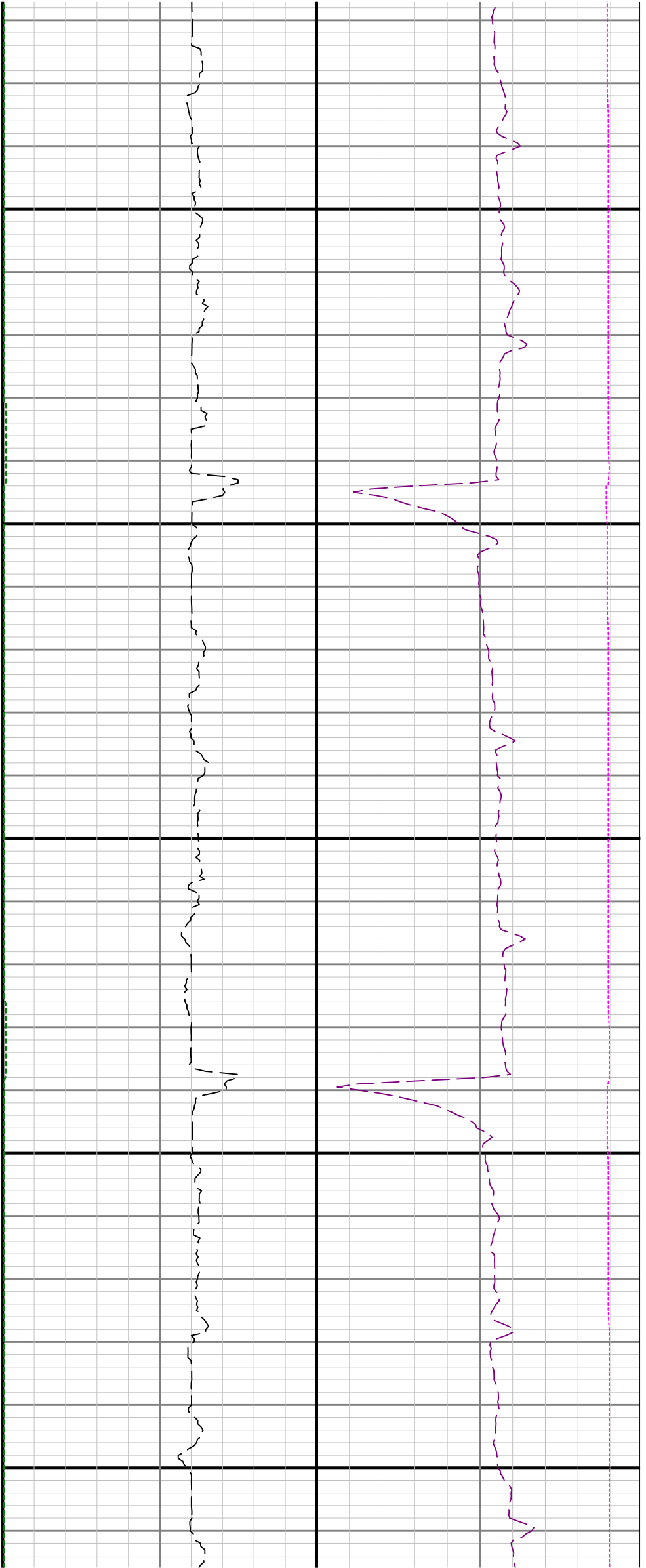


15600

15700

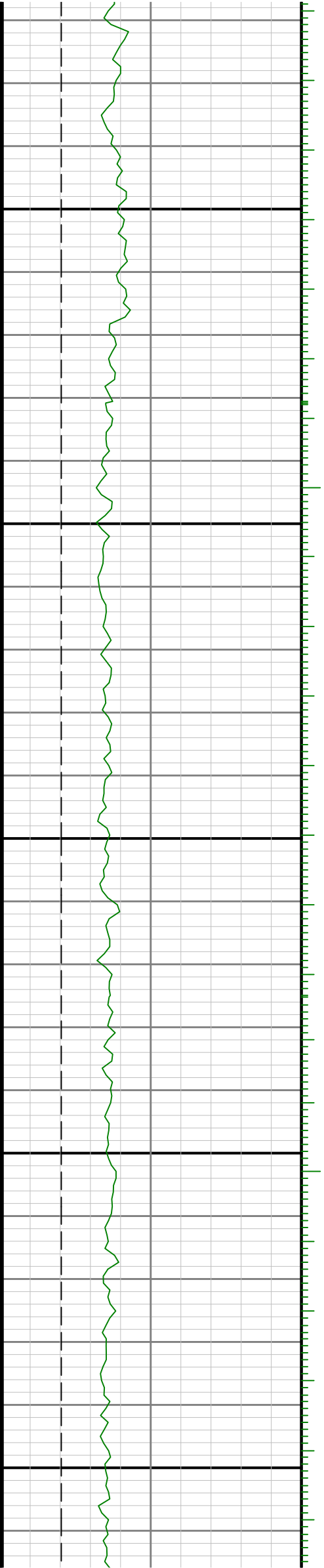


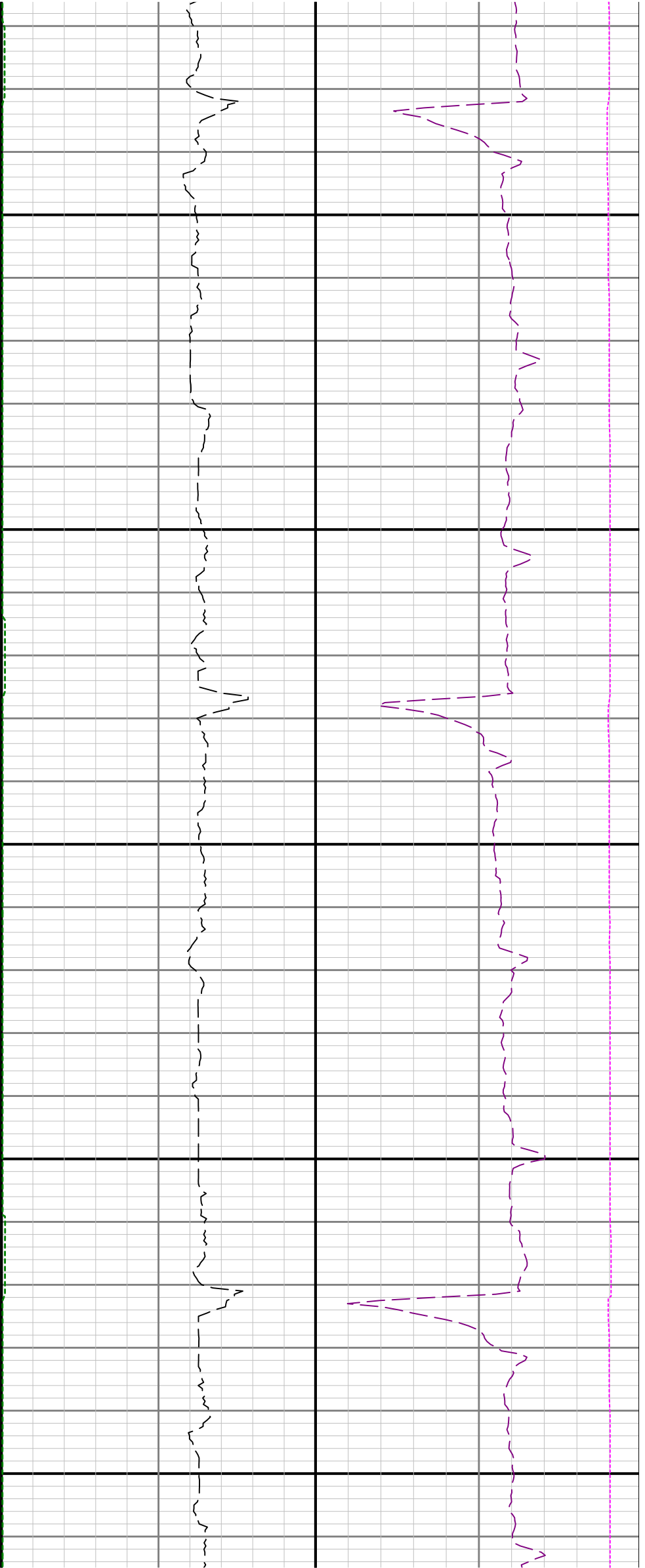




16100

16200

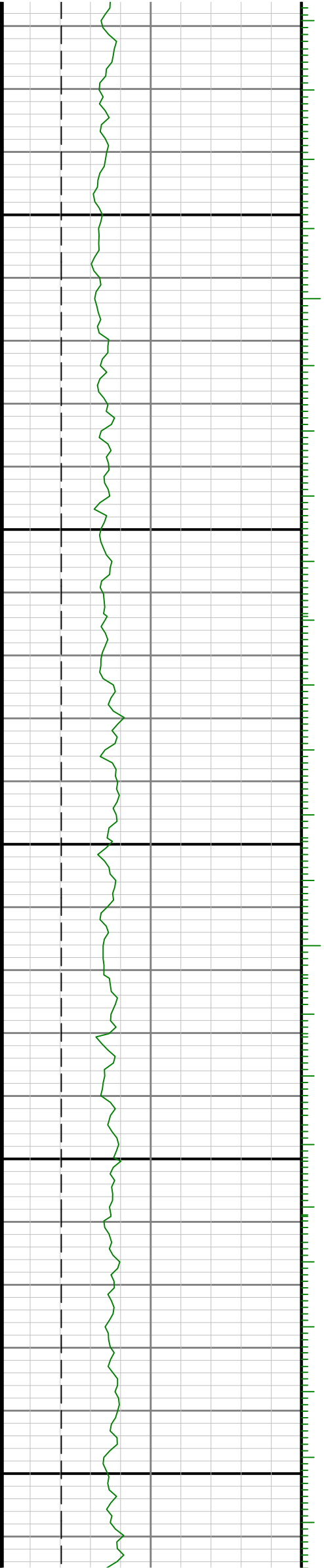


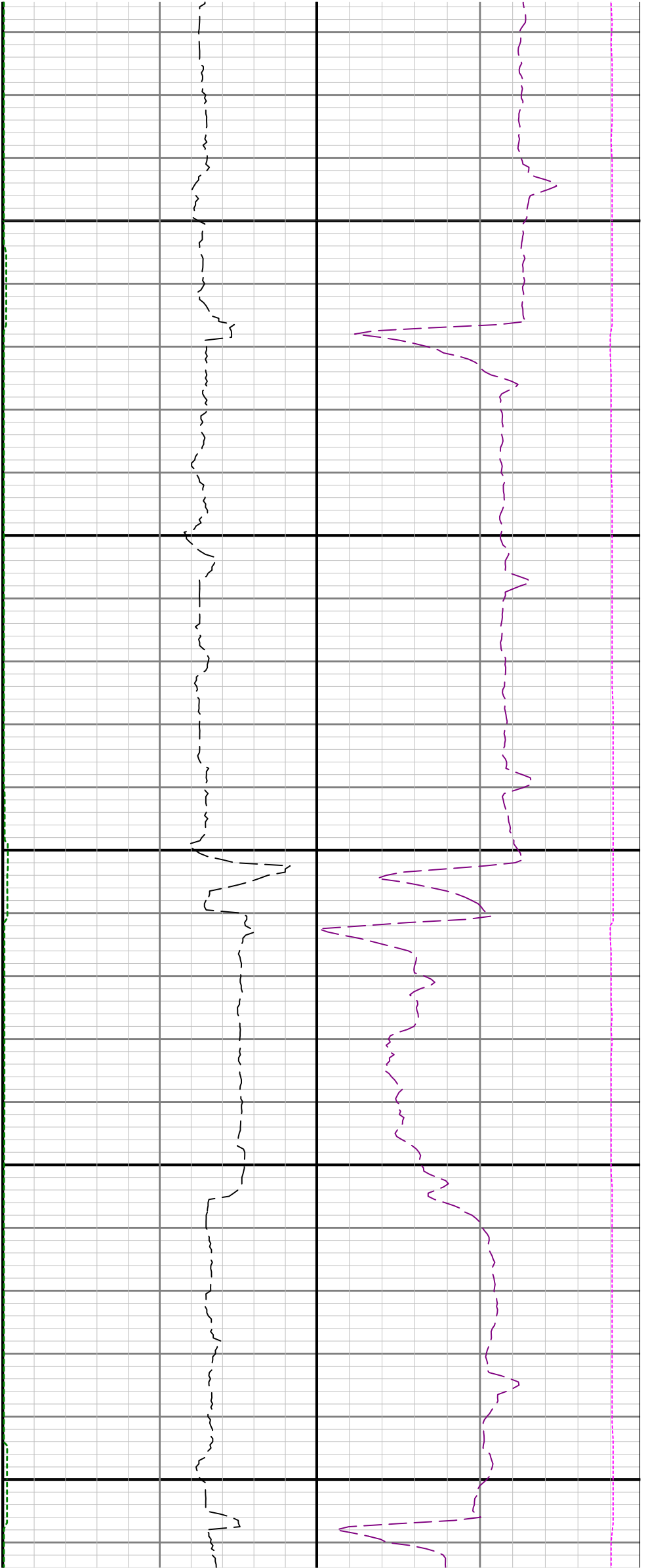


16300

16400

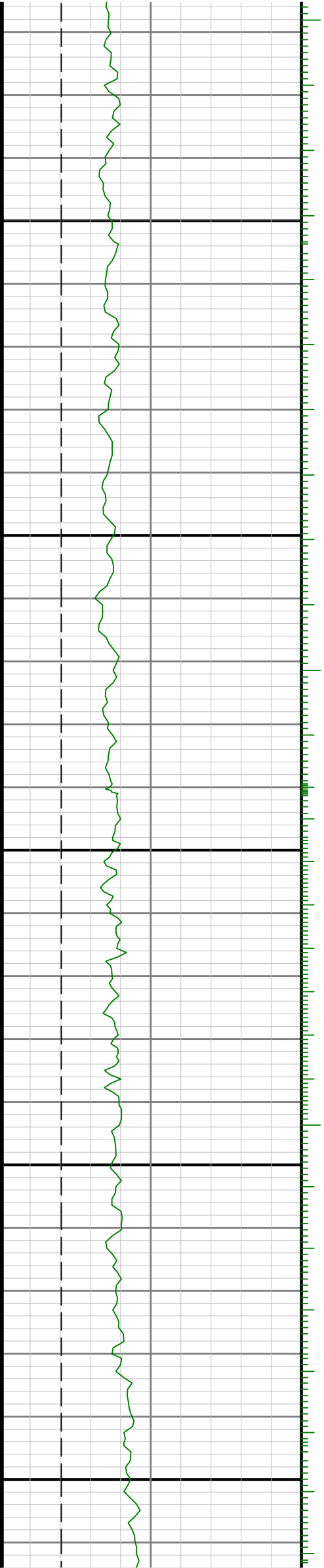
16500

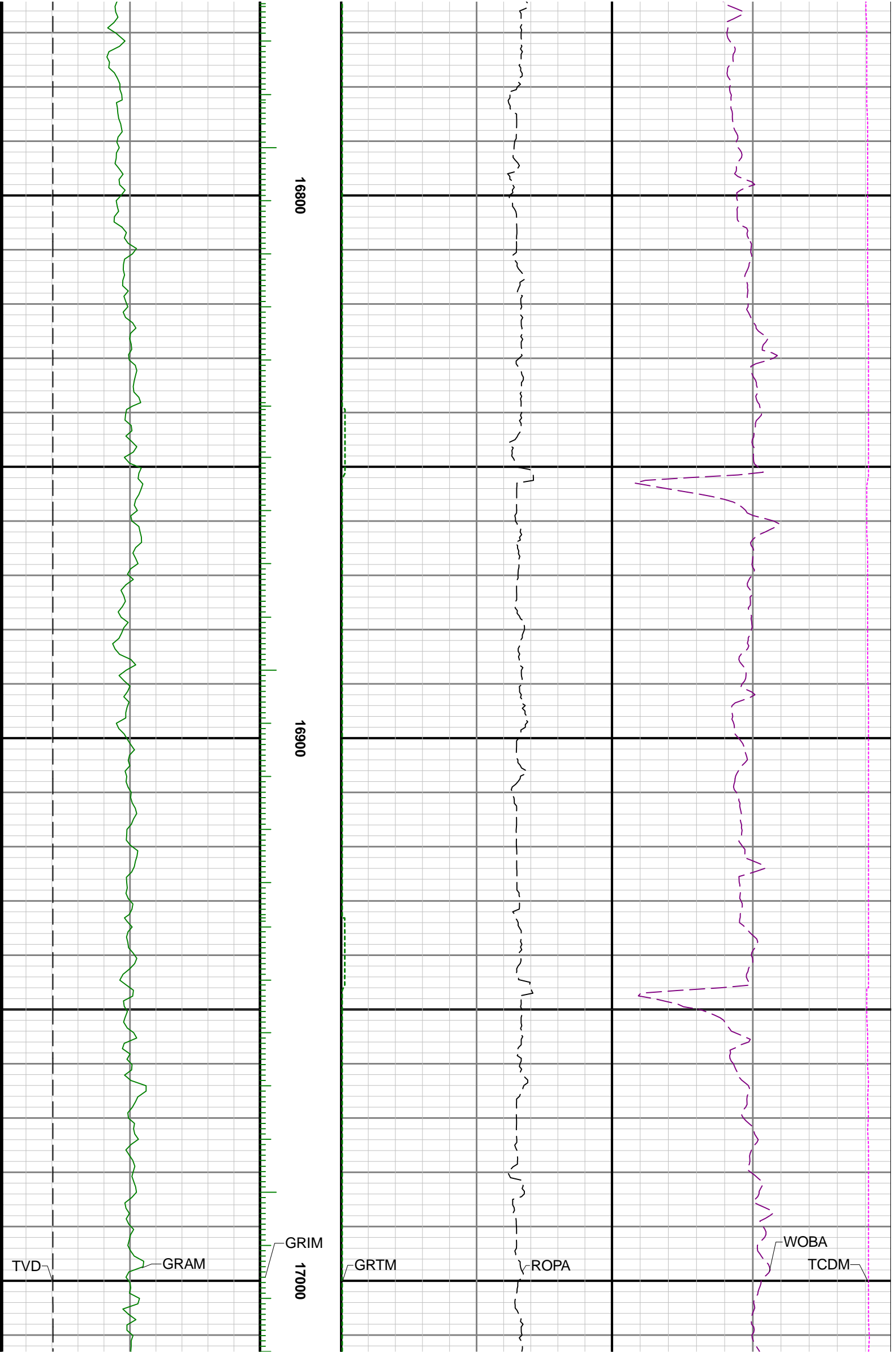


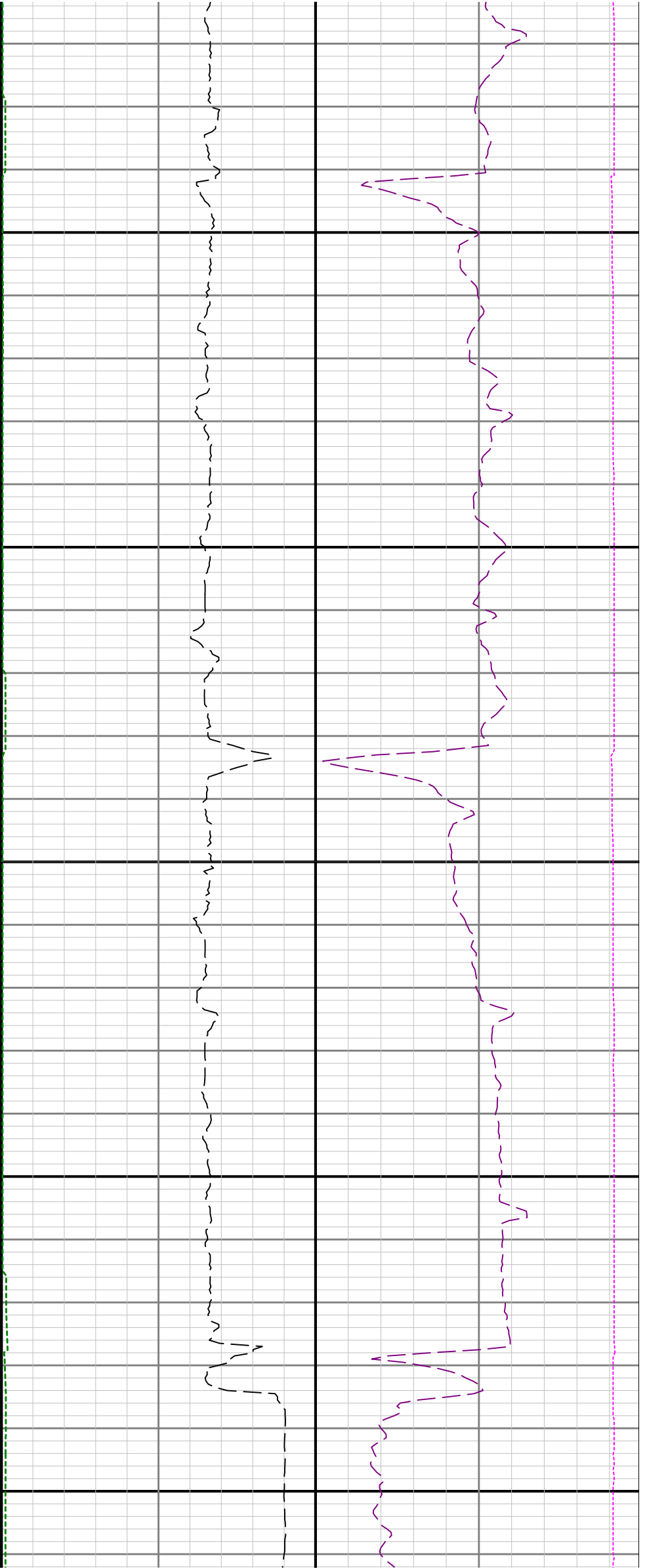


16600

16700







17100

17200

