



LWD MEMORY LOG

Gamma Ray

Company: Noble Energy

Well: Guttersen Y05-756

Field: Wattenberg

County: Weld Country: United States

State: Colorado

Surface Location: 40° 11' 50.927" N
Longitude: 104° 34' 34.340" W
Other Services: Directional

Final Print

API No: 05-123-48046-00

Job ID: 110182383

SEC: 29 TWN: 3N RGE: 64W

Permanent Datum (P.D.): Mean Sea Level

Elevation: 0.00 ft

Log Measured From: Rig Floor

Above P.D.: 4810.00 ft

Elev. KB: N/A
Elev. DF: 4810.00 ft
Elev. GL: 4780.00 ft

Dates Interval Magnetic Field Reference

From: 2020-01-11	Drilled (ft)	Logged (ft)	Azi Reference North:	Grid	Dip Angle: (deg)	66.63
To: 2020-01-13	Top: 1939.00	Top: 1939.00	Total Magnetic Field Strength: (nT)			51983
Spud: 2020-01-08	Bottom: 19850.00	Bottom: 19837.00	Mag to Reference North Correction: (deg)			7.39

Borehole Record

Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
13.500	30.00	1939.00	9.625	36.00	30.00	1929.00
8.500	1939.00	19850.00				

Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Azi (Start)	Inc Azi (End)
Oil Based Mud	1939.00	19850.00	8.500	17911.00	0.60 284.89	89.88 178.29

Acquisition System

Software Version

Other

Cadence RT 5.5
DeliverableGen 5.5.8715.2

Rig: H&P 321
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 (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	3.00	AutoTrak Curve	1939.00	19837.00	1939.00	19850.00	2020-01-09 06:28	2020-01-11 21:22	52.08

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Andrew Hays	2020-01-09	2020-01-10	Tien Bui	2020-01-10	2020-01-12			

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+ (%)
2020-01-08 17:03	1	1939.00	Oil Based Mud	9.5	17	N/A	25.0	77.3/22.7	Active Pit	28000	0.00
2020-01-11 09:30	1	17230.00	Oil Based Mud	9.8	15	N/A	19.0	81.2/18.8	Active Pit	29000	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	15092344	Near Bit VSS	5.93	6.73	7.000	4.330
1	AutoTrak Curve Steering Unit	15092344	Near Bit Inclination	5.93	6.73	7.000	4.330
1	AutoTrak Curve MWD	12211066	Gamma (single)	2.80	12.90	7.000	3.250
1	AutoTrak Curve MWD	12211066	Directional (mag)	12.27	22.37	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

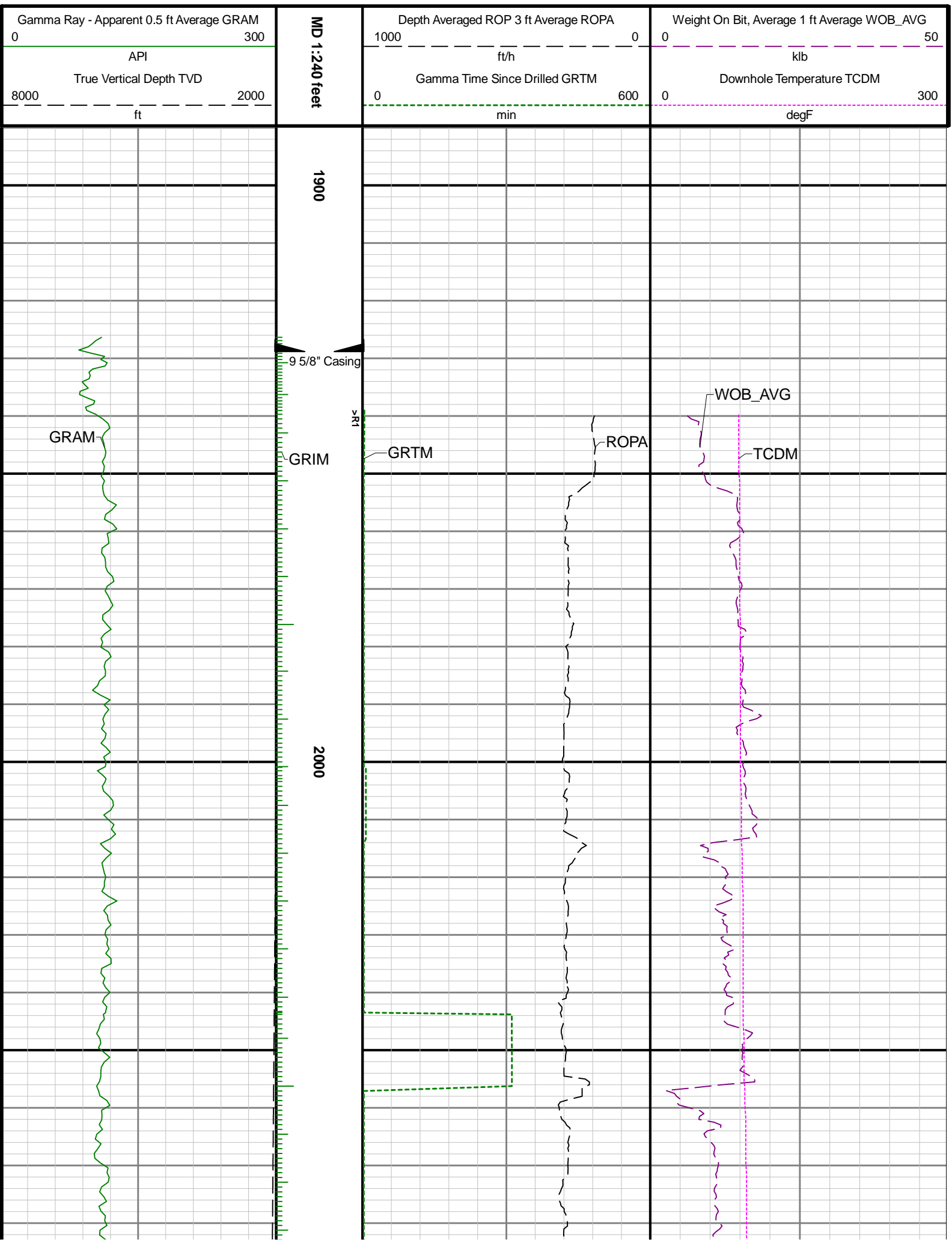
- 1 Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 2 Baker Hughes LWD Run 1 utilized 6 ¾ inch NaviGamma service (Gamma Ray and Directional) behind an 8 1/2 inch bit and rotary steerable assembly from 1939 to 19850 feet MD (1939 to 6874 feet TVD).
- 3 The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.
- 4 Several gaps appear in the log due to drilling ahead before the assembly had time to properly power on.

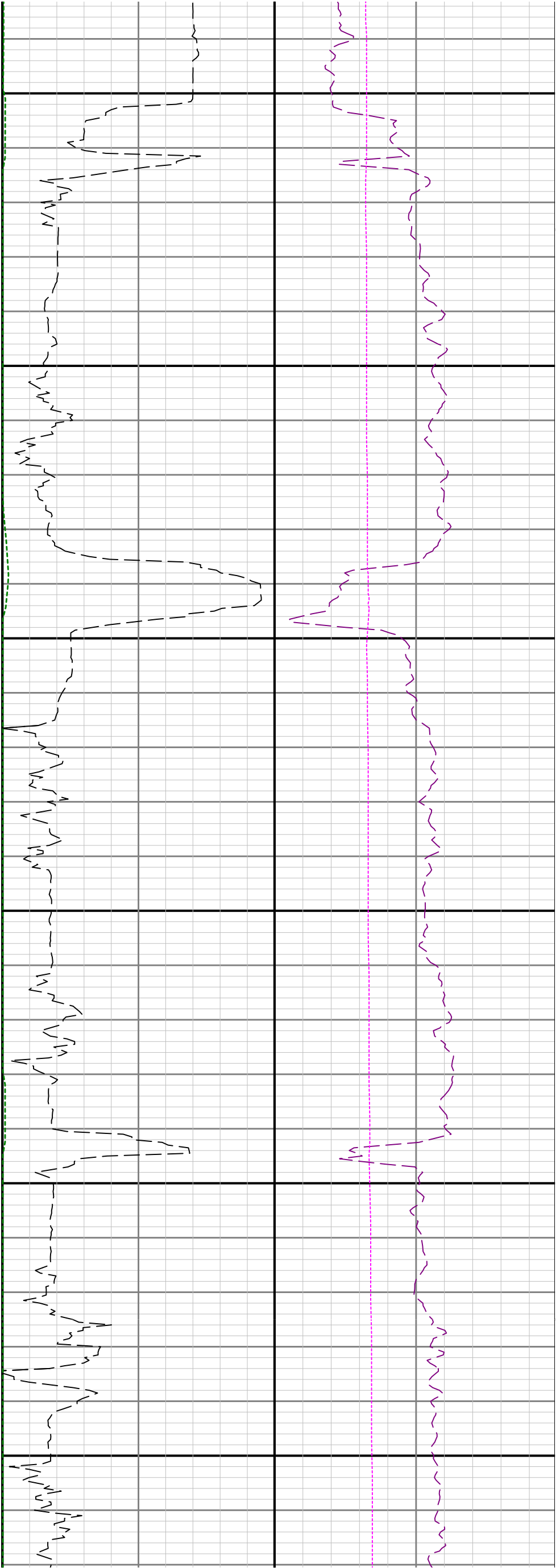
Remarks

Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	7390.00	8.500	1	The interval from 7390 to 7428 feet MD (6929 to 6931 feet TVD) was not logged due to tool not power up.
2	12392.00	8.500	1	The interval from 12392 to 12496 feet MD (6925 feet TVD) was not logged due to tool not power up.
3	12500.00	8.500	1	The Weight On Bit curve was not logged after 12500 feet MD (6922 feet TVD) due to error in the surface data acquisition system.
4	13620.00	8.500	1	The interval from 13620 to 13724 feet MD (6926 feet TVD) was not logged due to tool not power up.
5	17503.00	8.500	1	The interval from 17503 to 175206 feet MD (6889 feet TVD) was not logged due to tool not power up.
6	17786.00	8.500	1	The interval from 17786 to 17806 feet MD (6885 feet TVD) was not logged due to tool not power up.
7	18352.00	8.500	1	The interval from 18352 to 18418 feet MD (6878 feet TVD) was not logged due to tool not power up.
8	19206.00	8.500	1	The interval from 19206 to 19243 feet MD (6875 feet TVD) was not logged due to tool not power up.
9	19786.00	8.500	1	The interval from 19786 to 19850 feet MD (6874 feet TVD) was not logged due to sensor to bit offset at well TD and tool not power up.

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 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

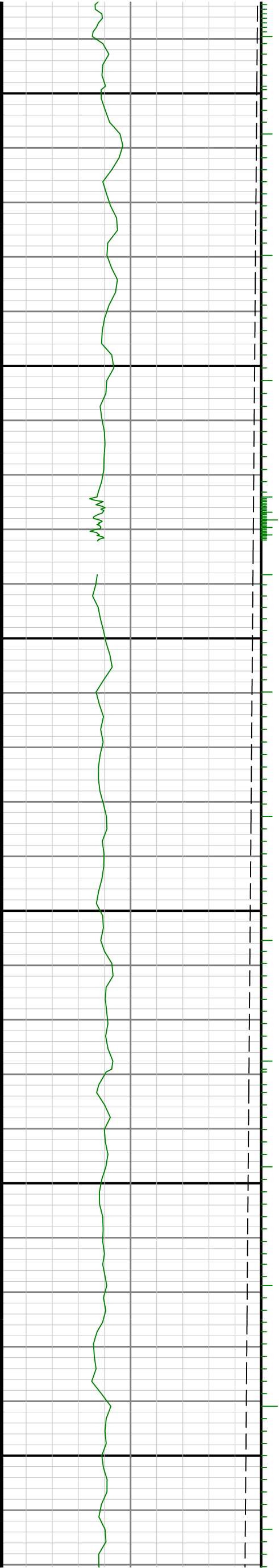


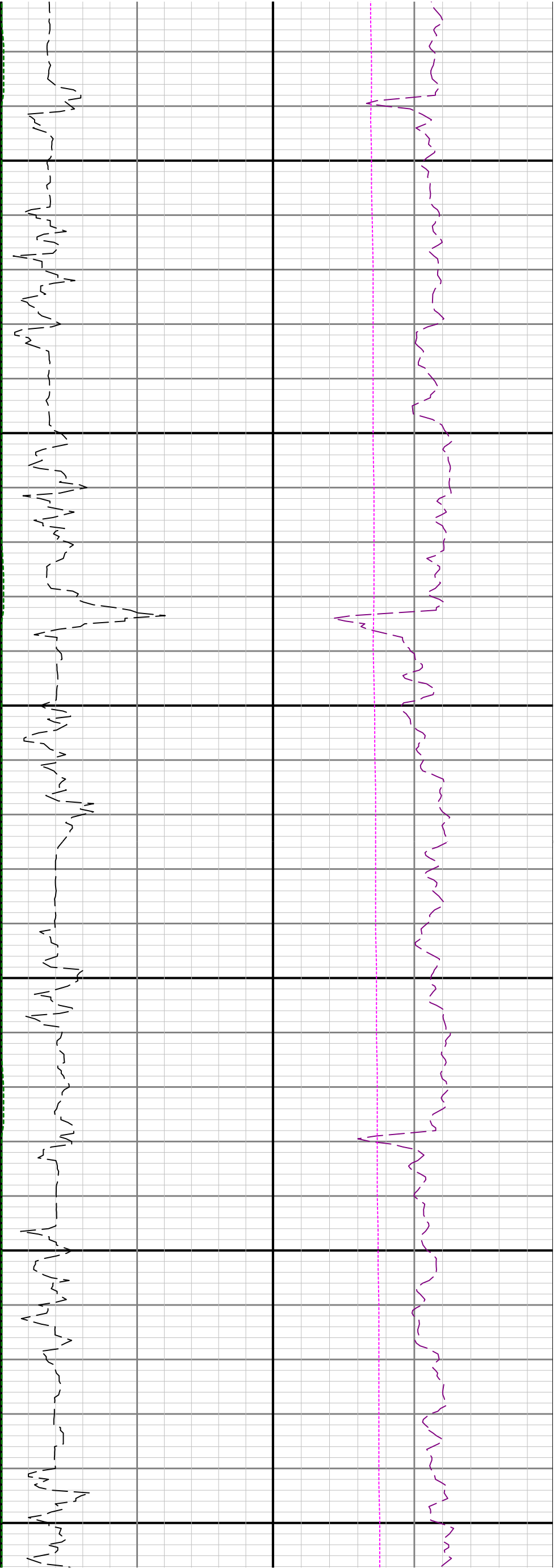


2100

2200

2300

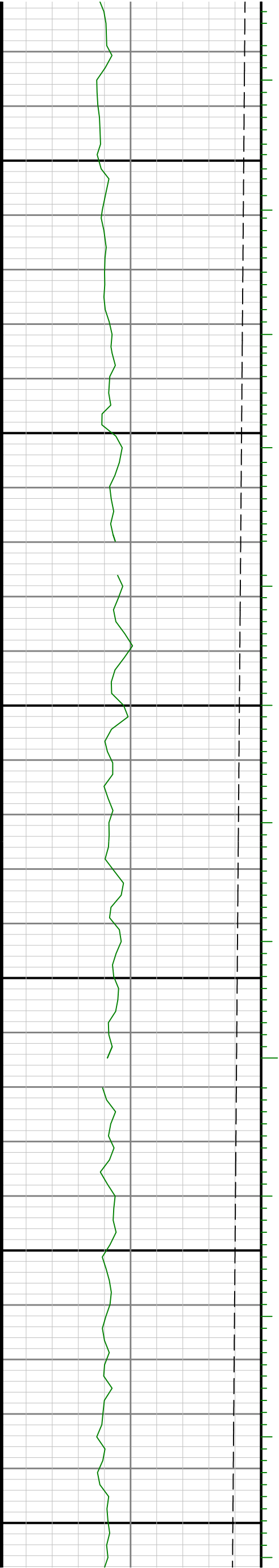


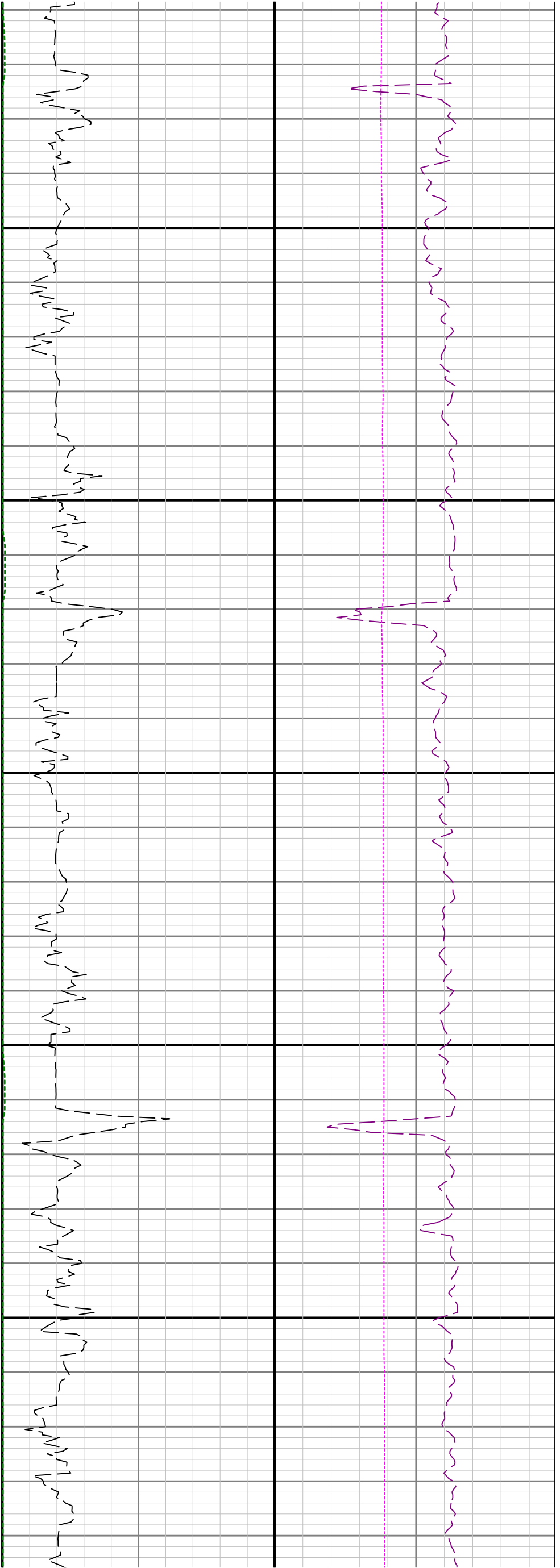


2400

2500

2600

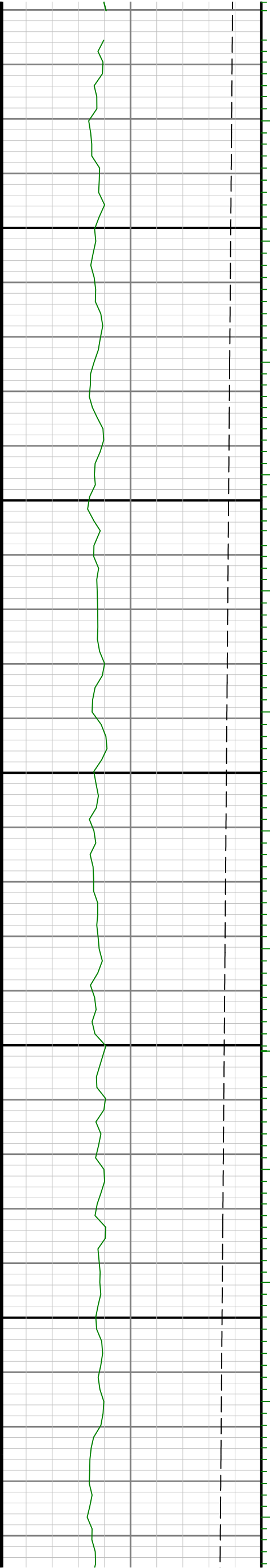


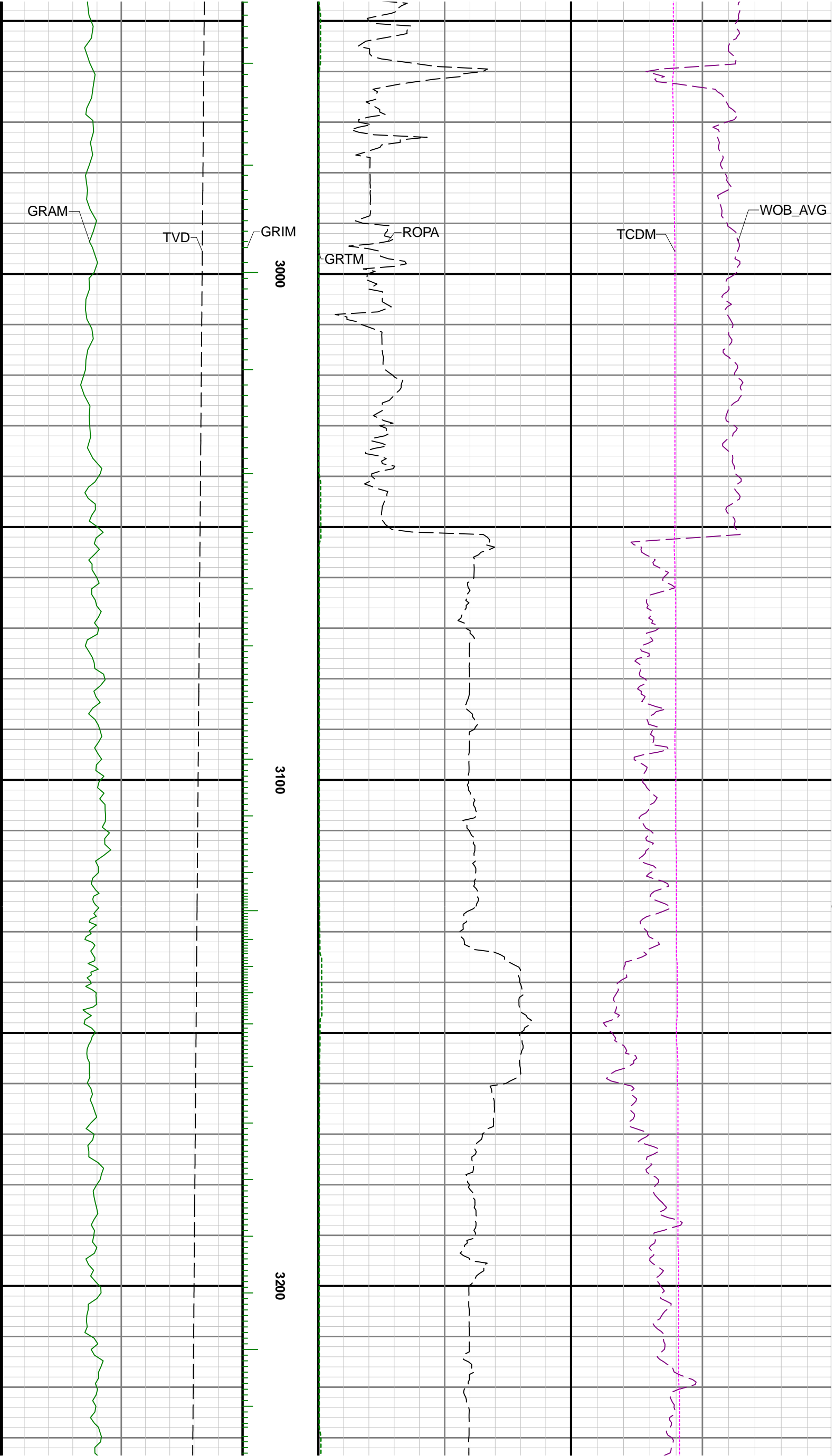


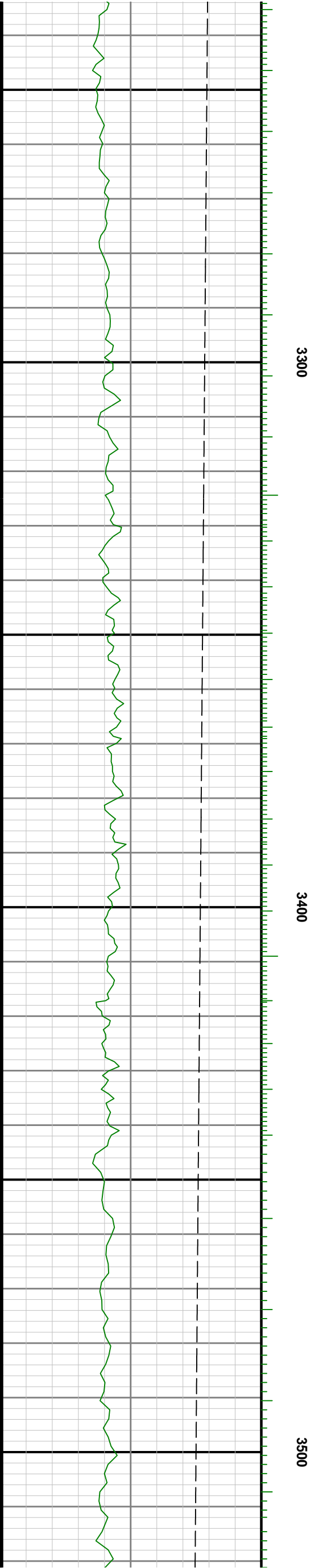
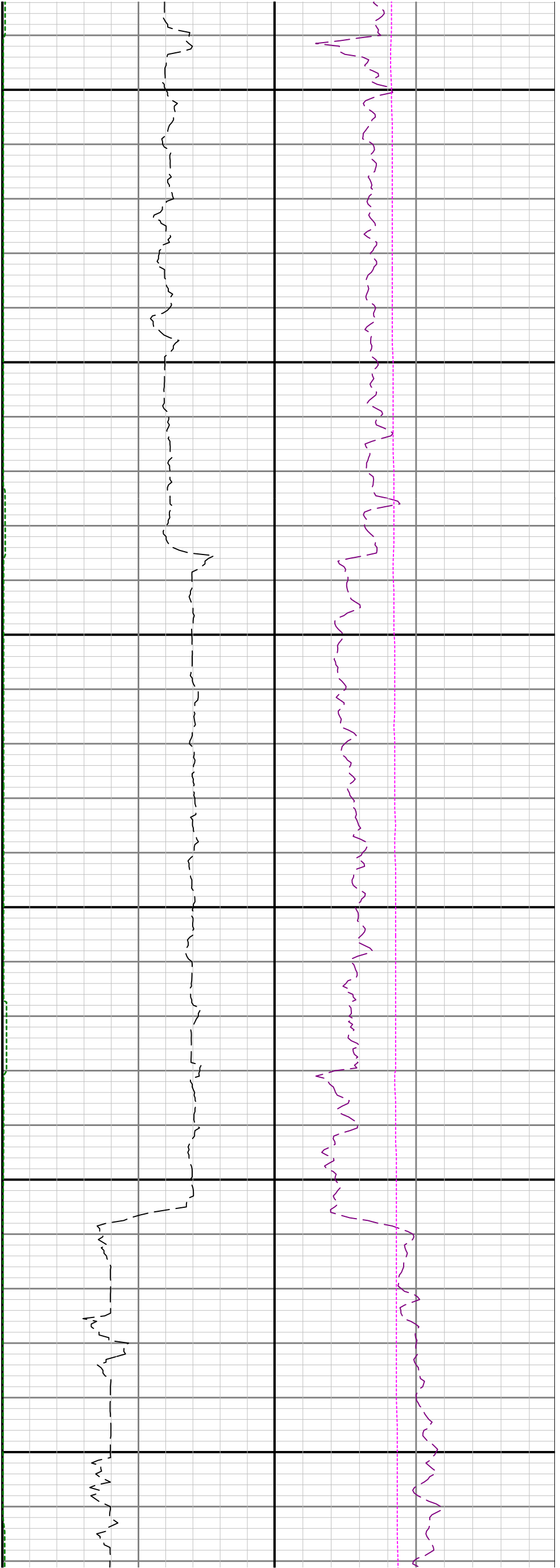
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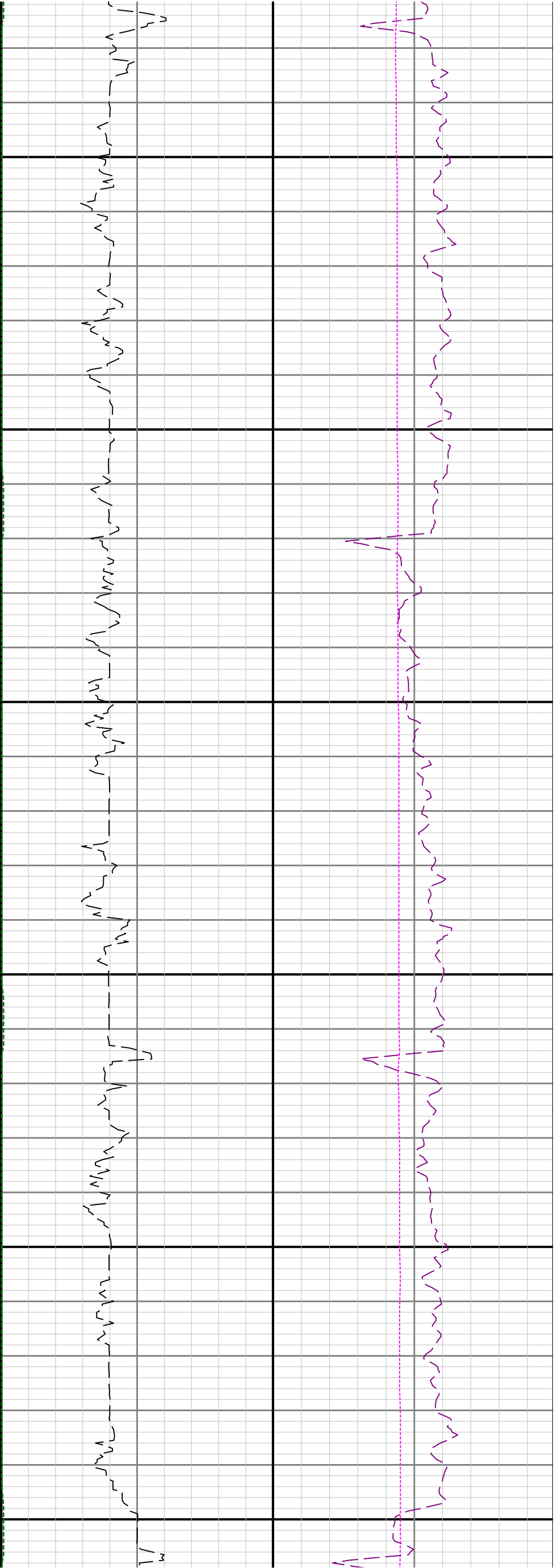
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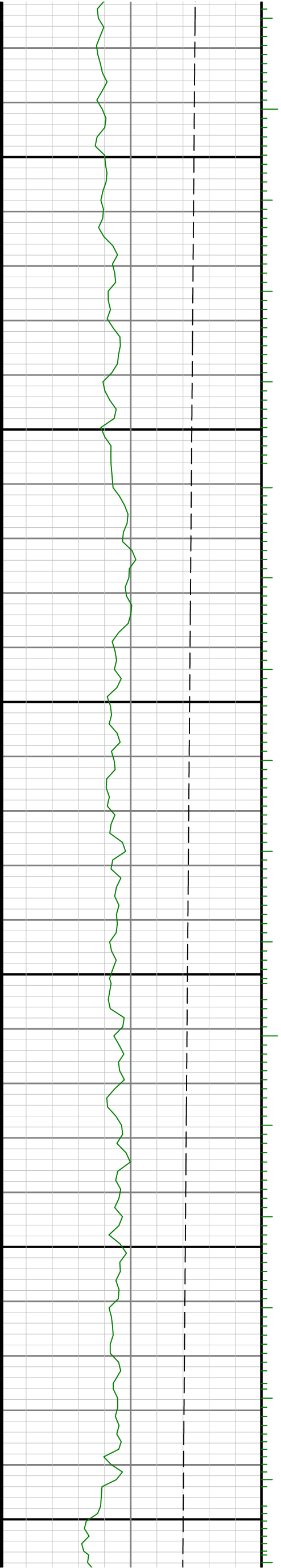


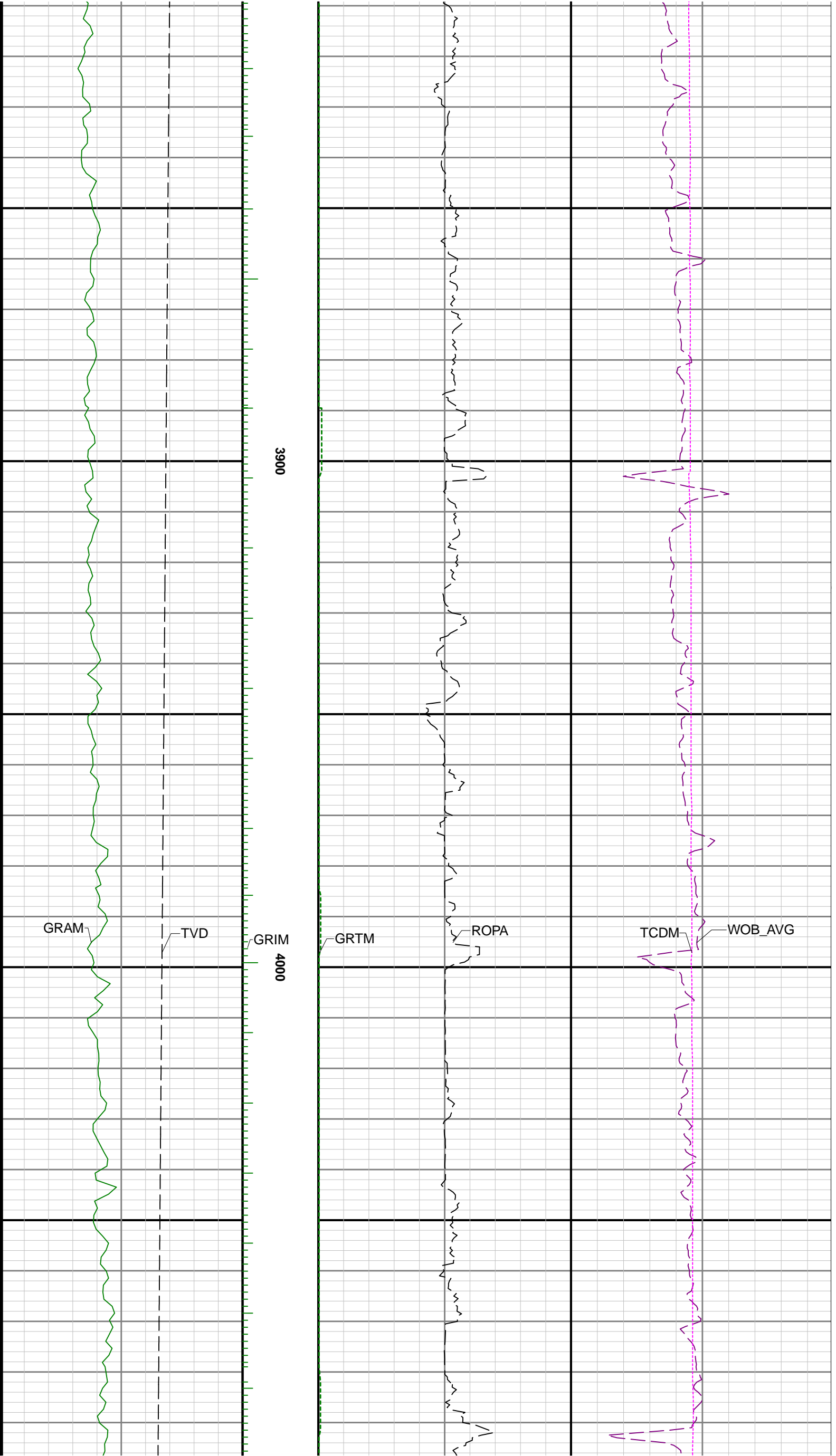


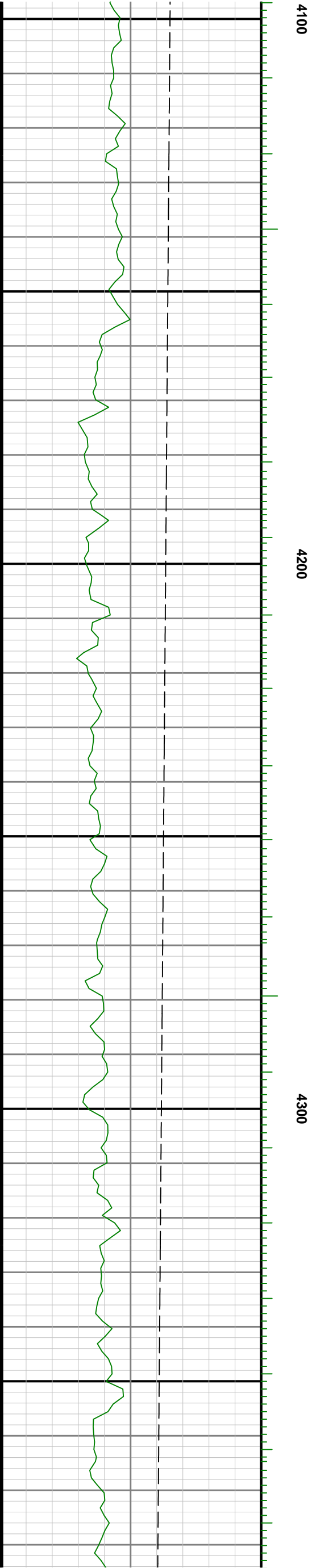
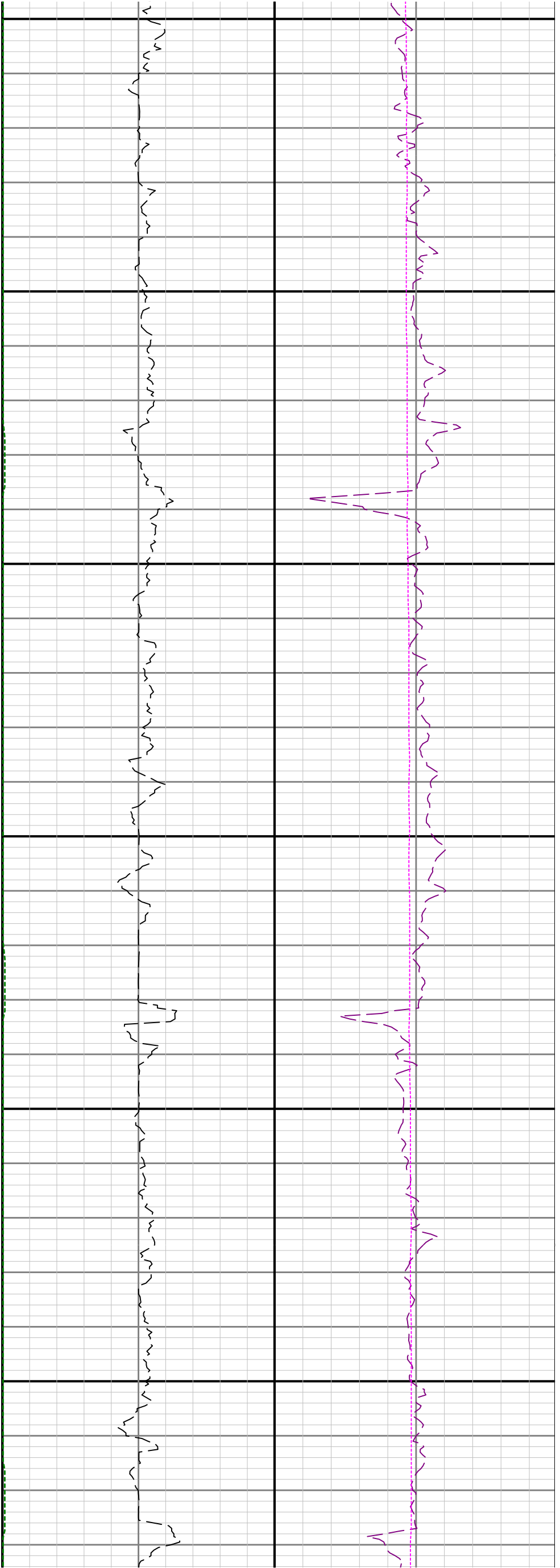
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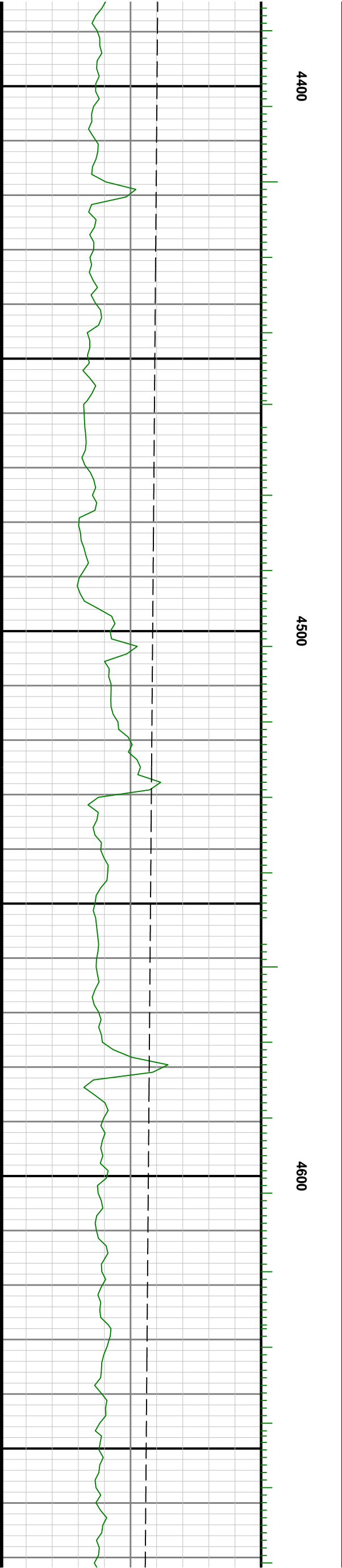
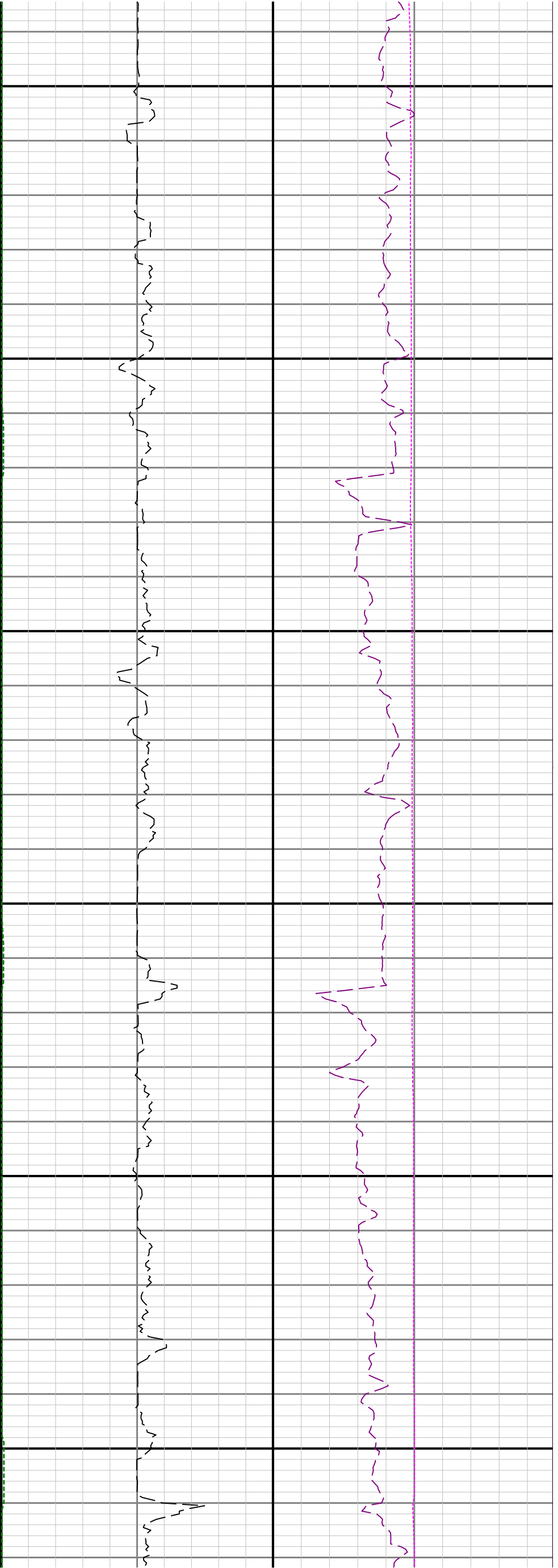
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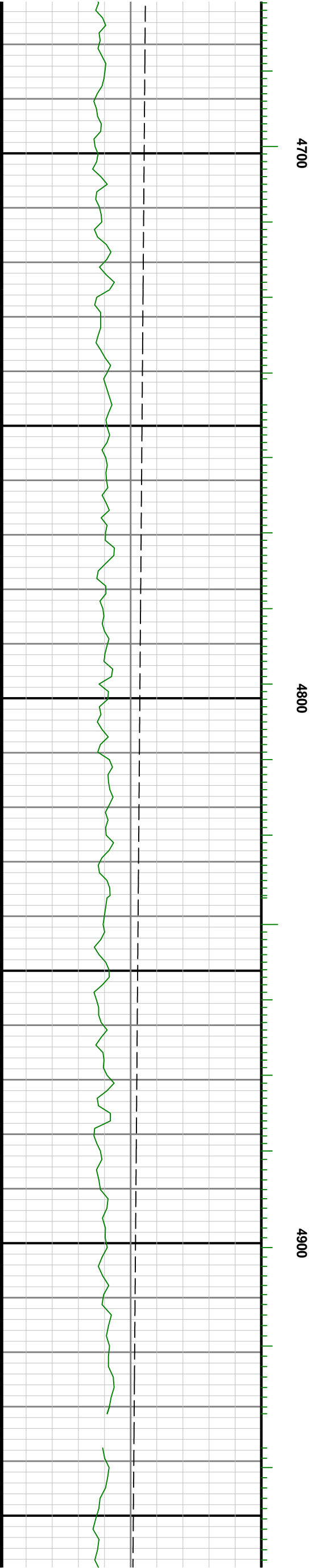
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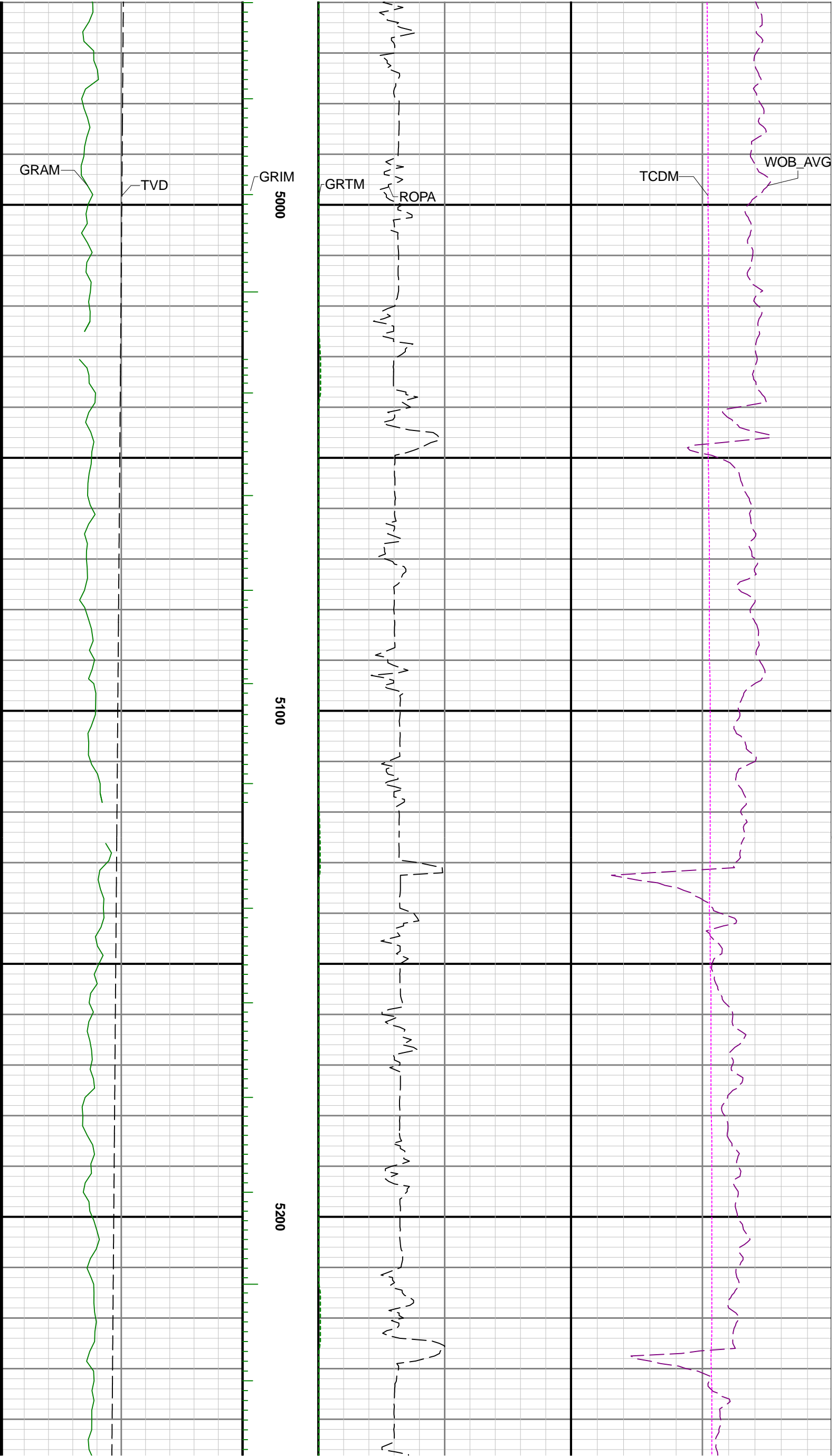


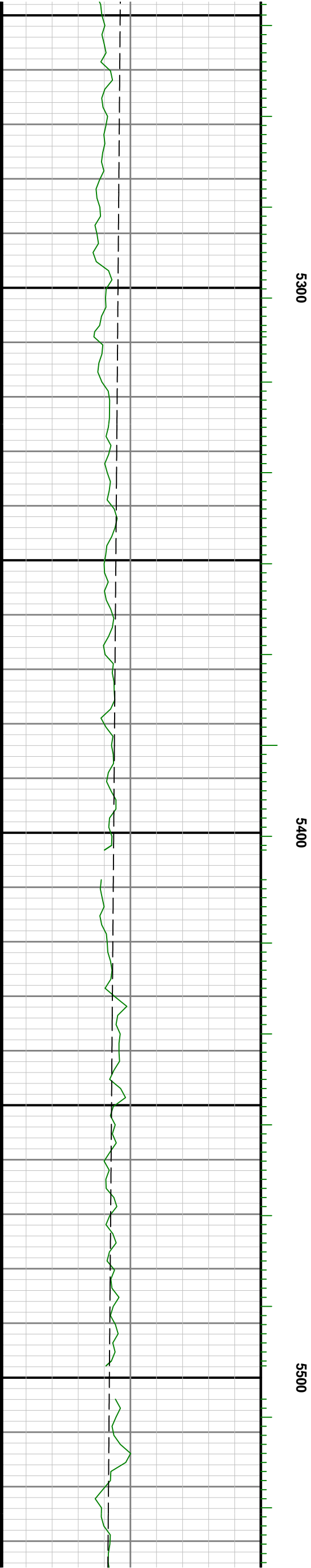
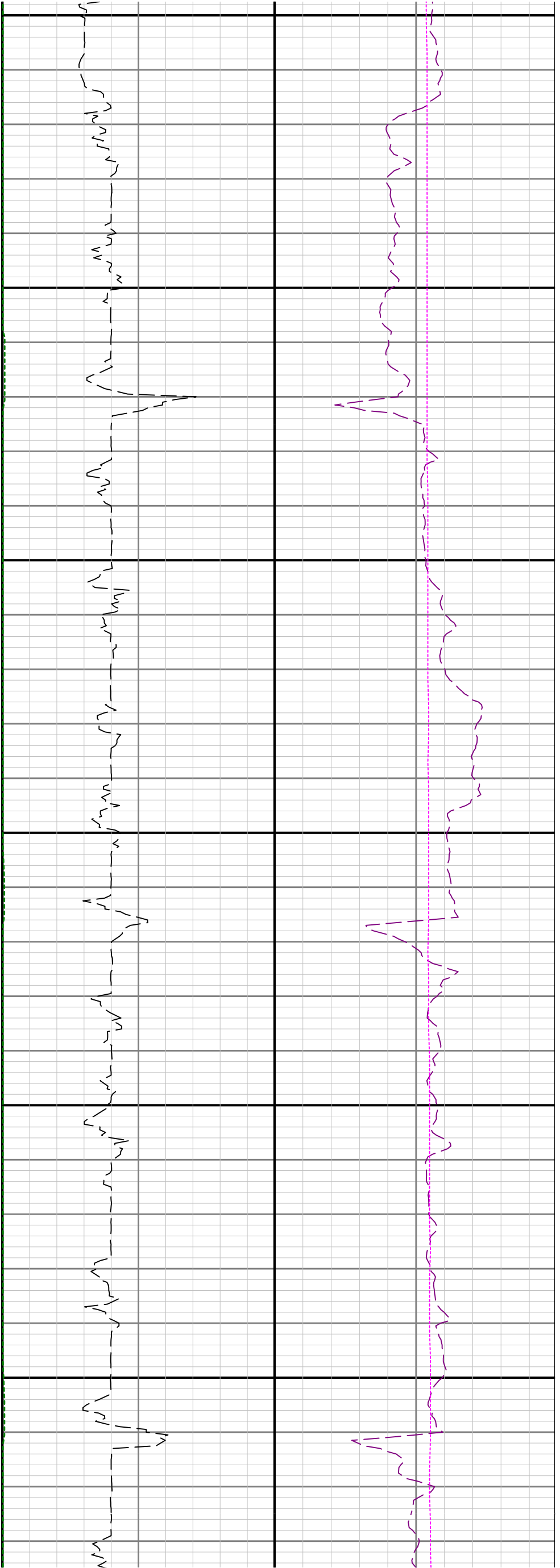


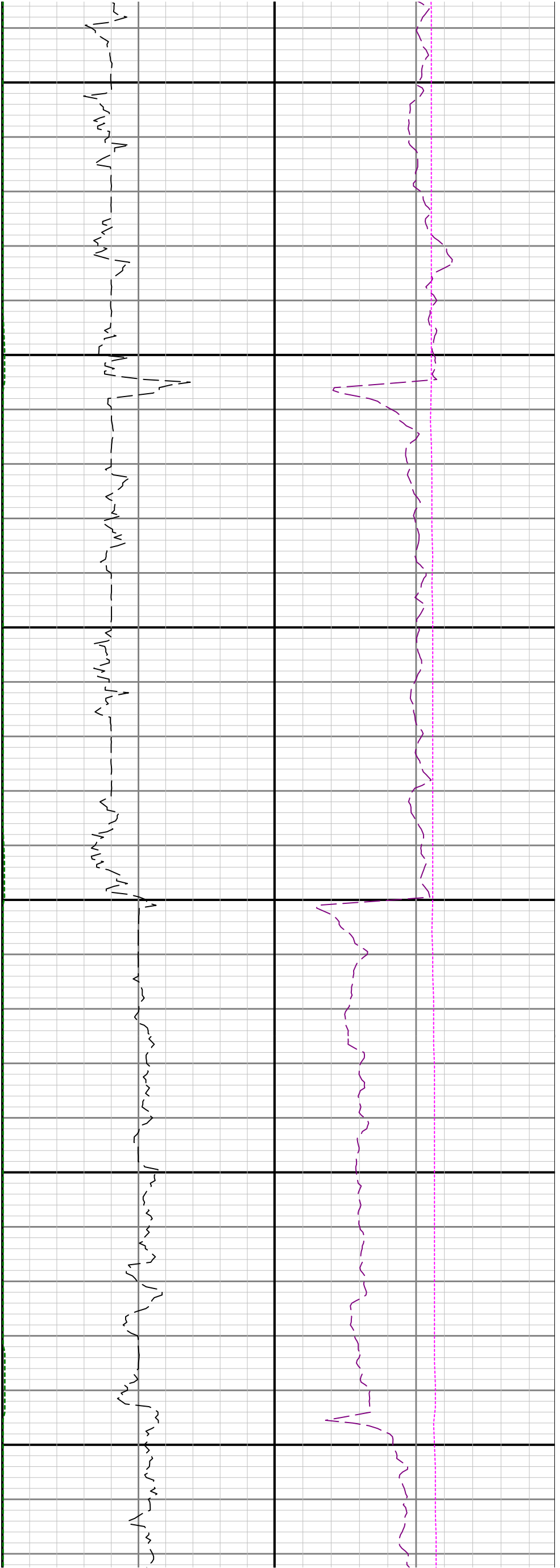








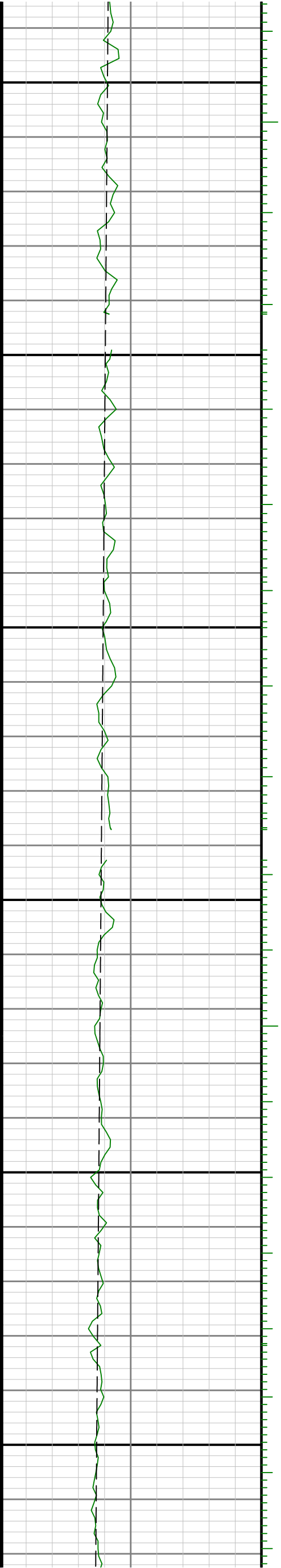


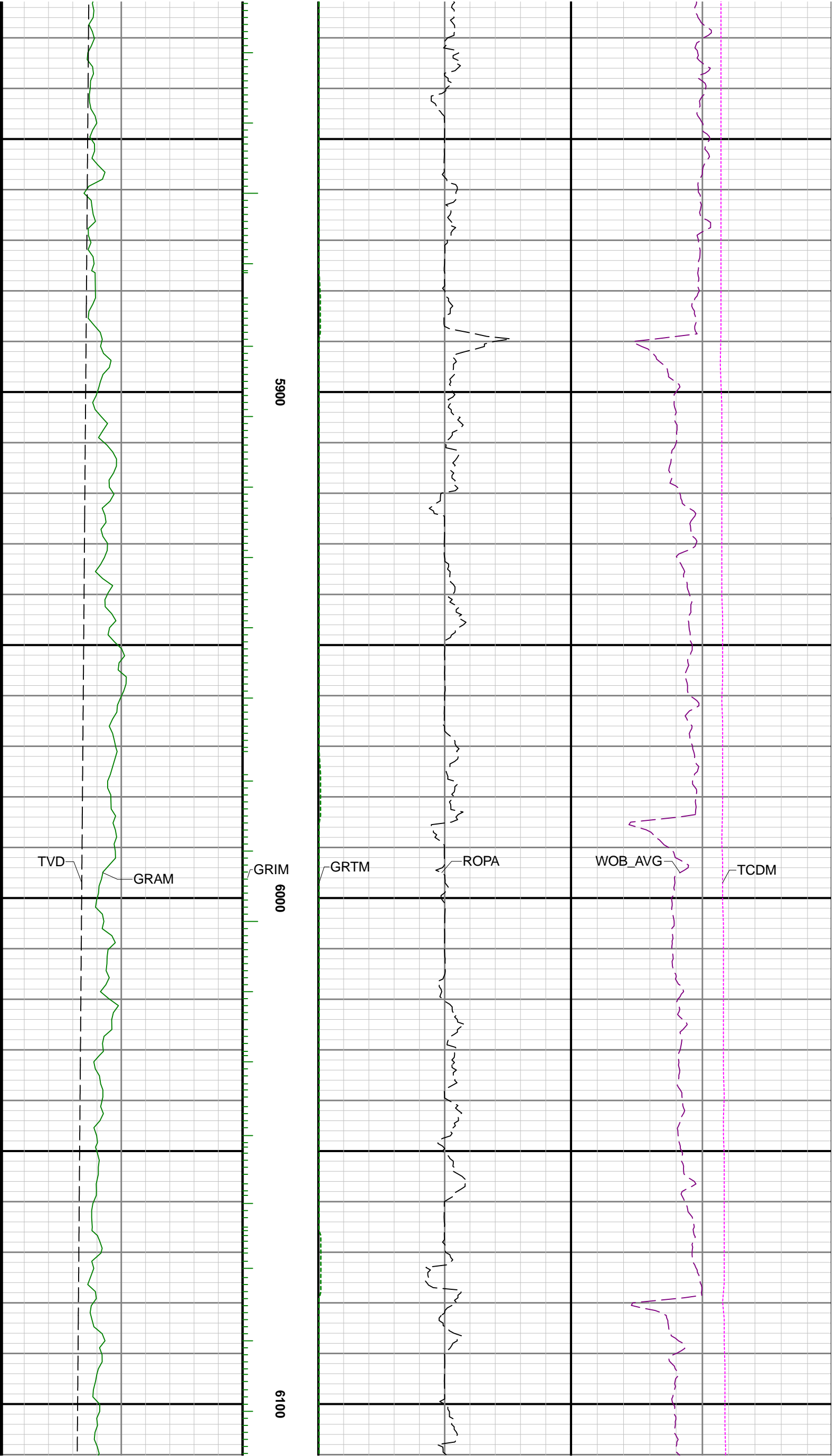


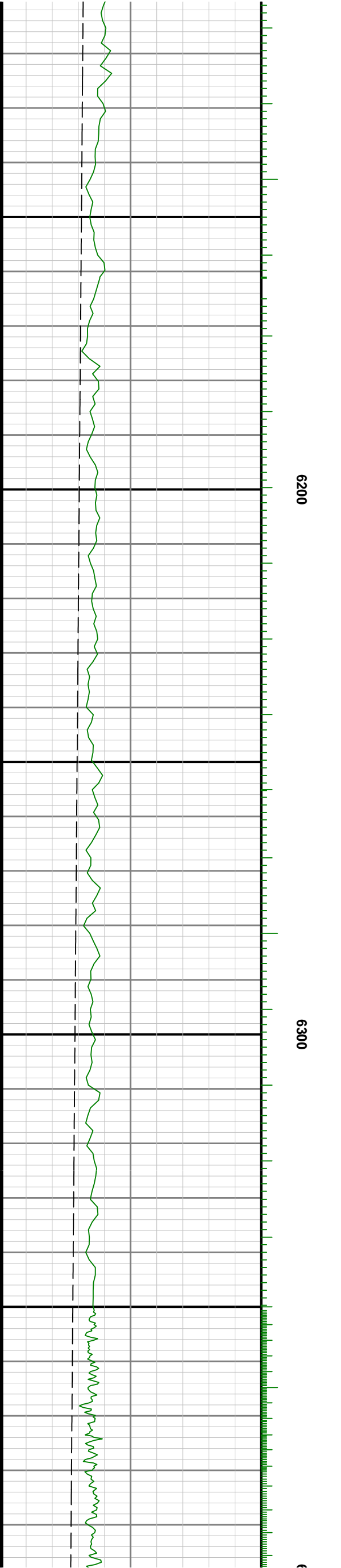
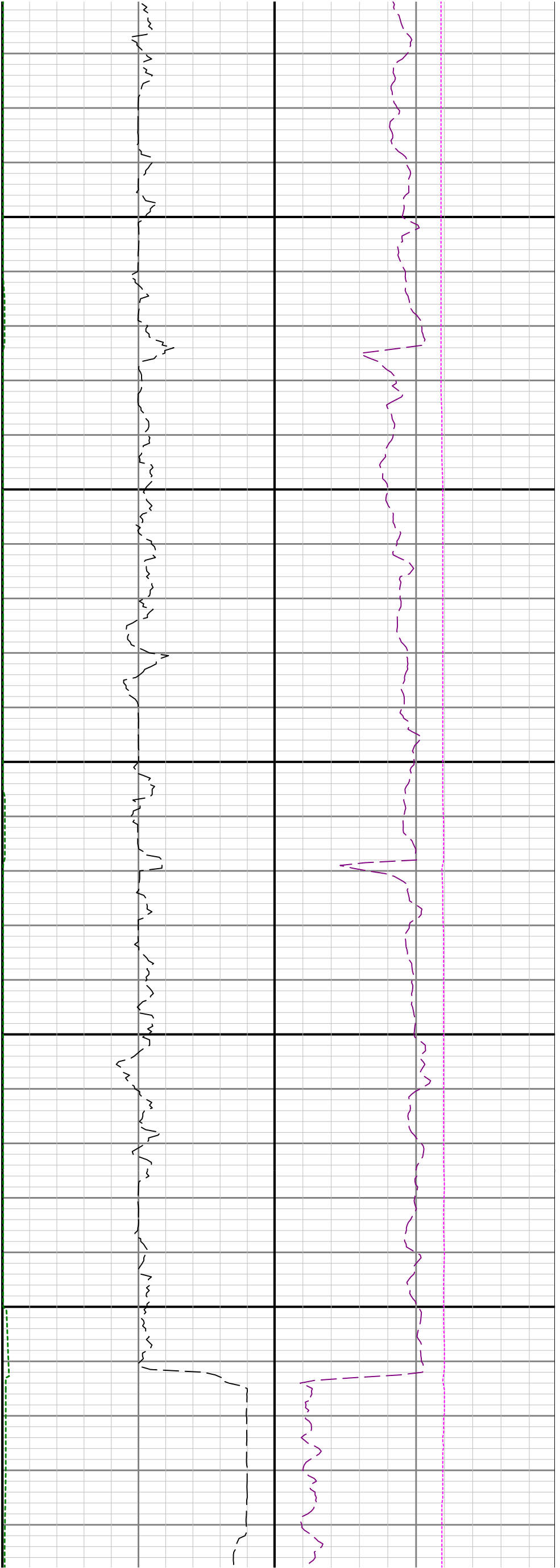
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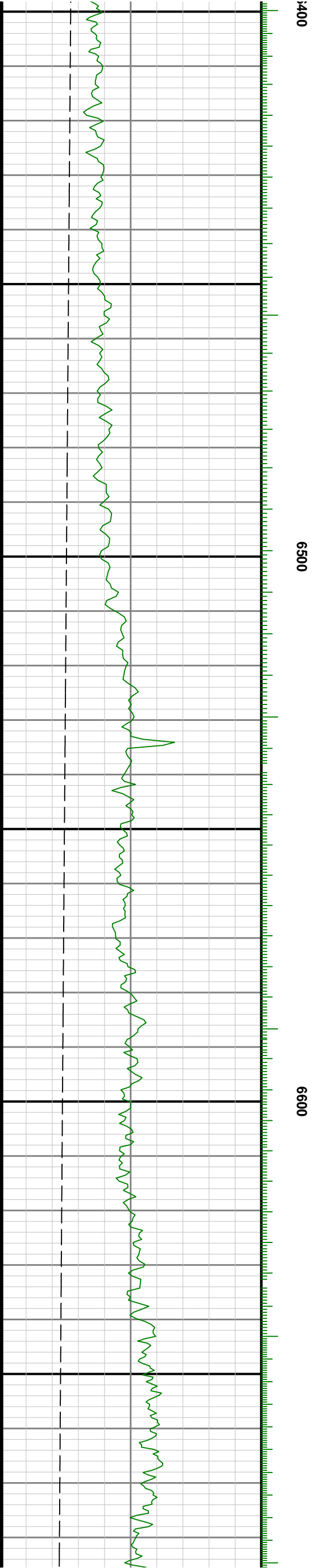
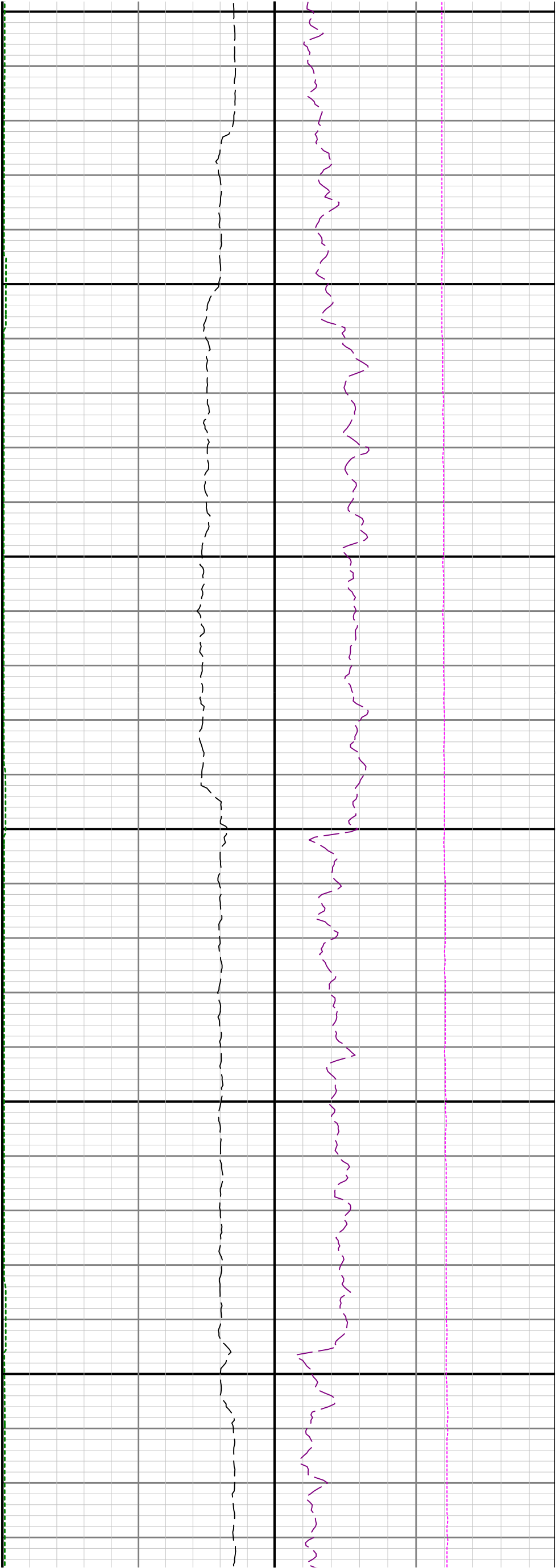
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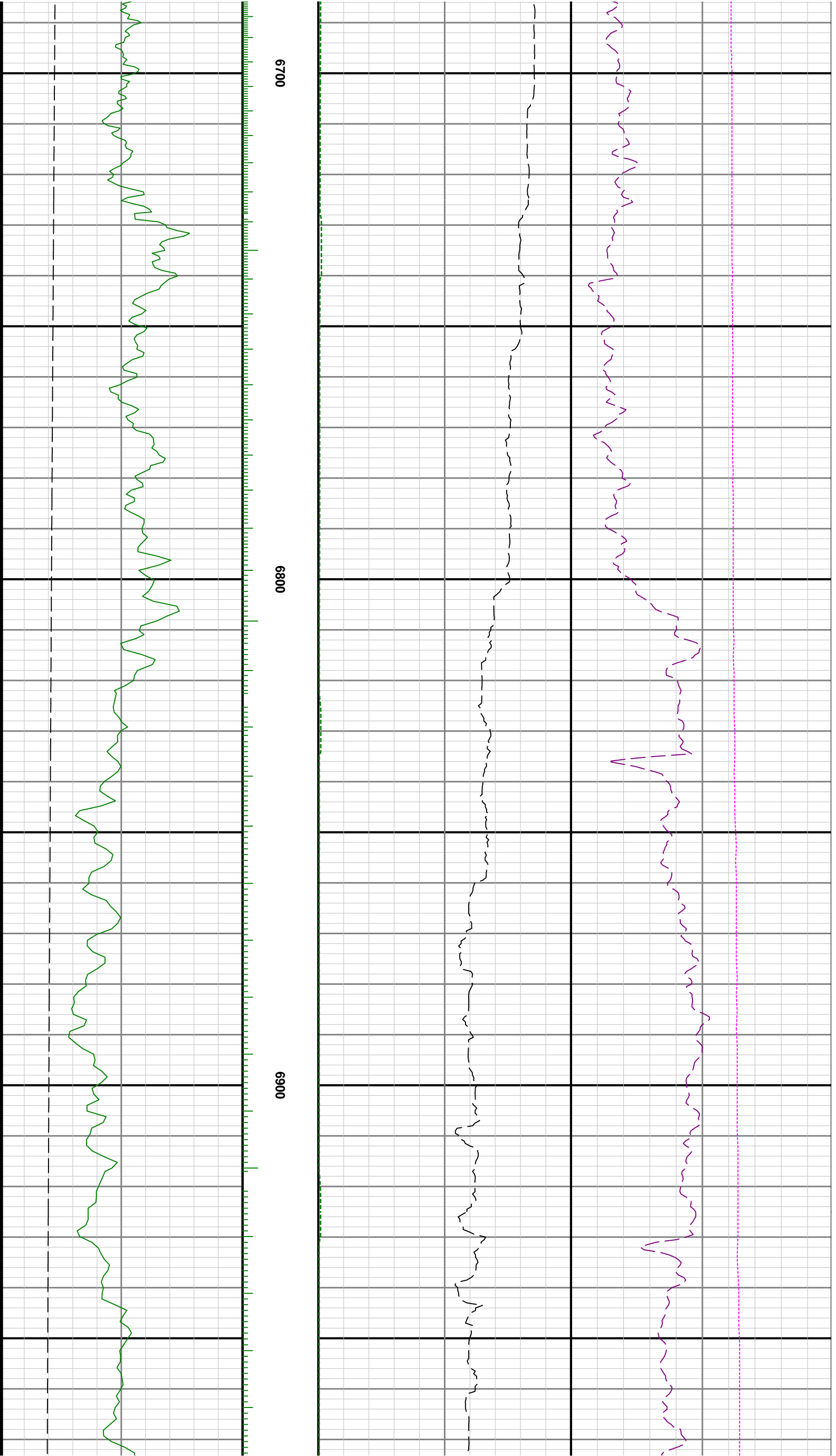
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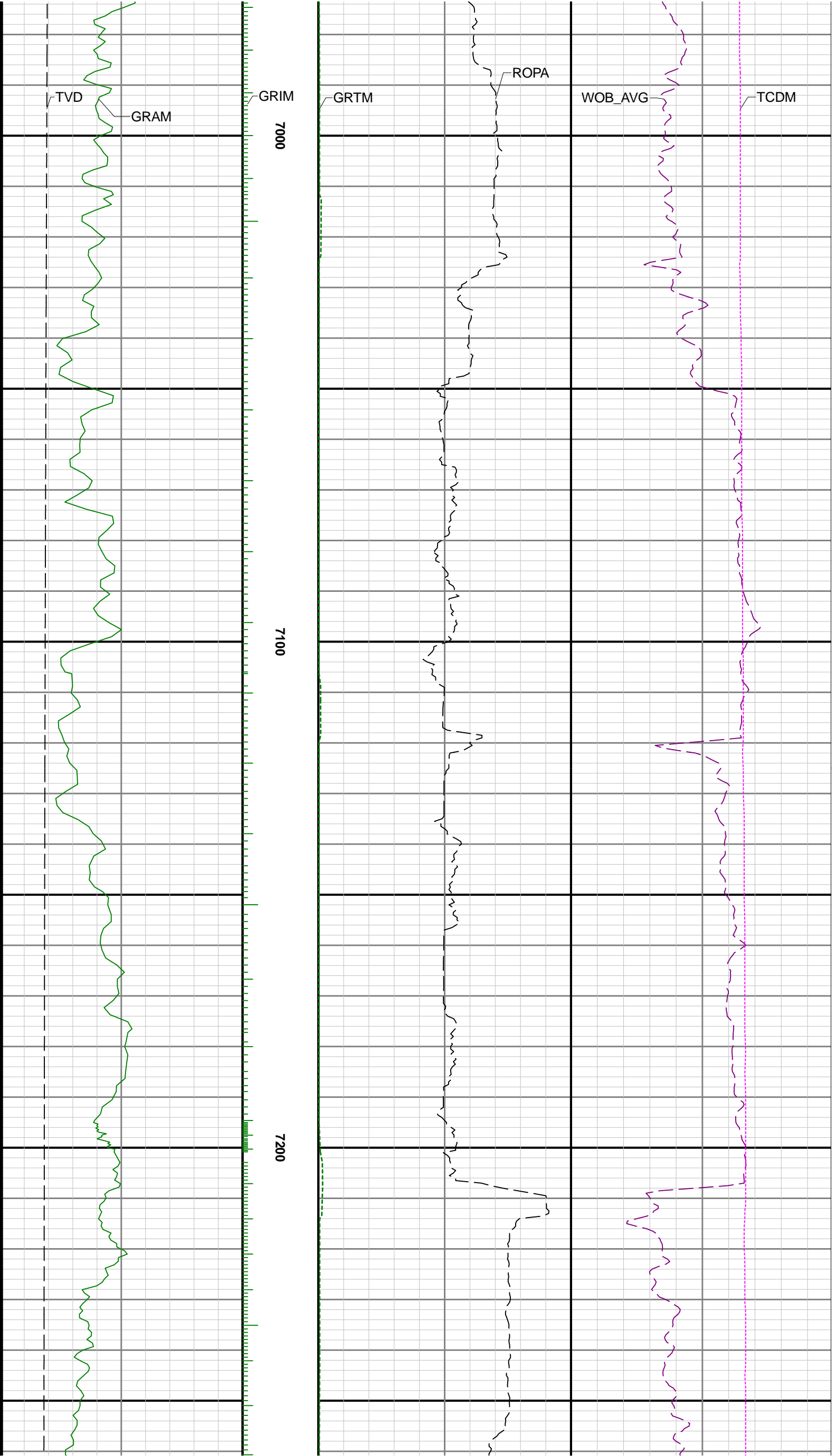


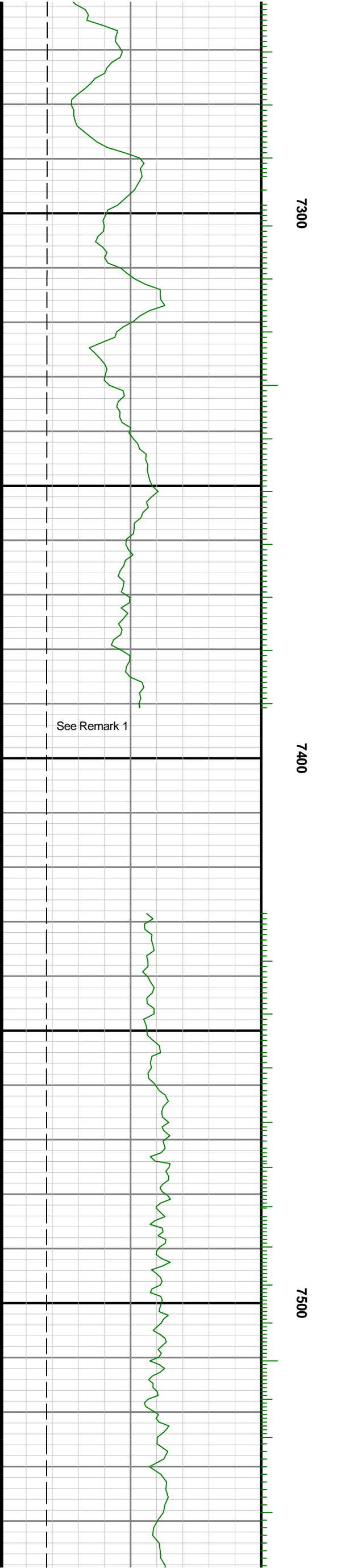


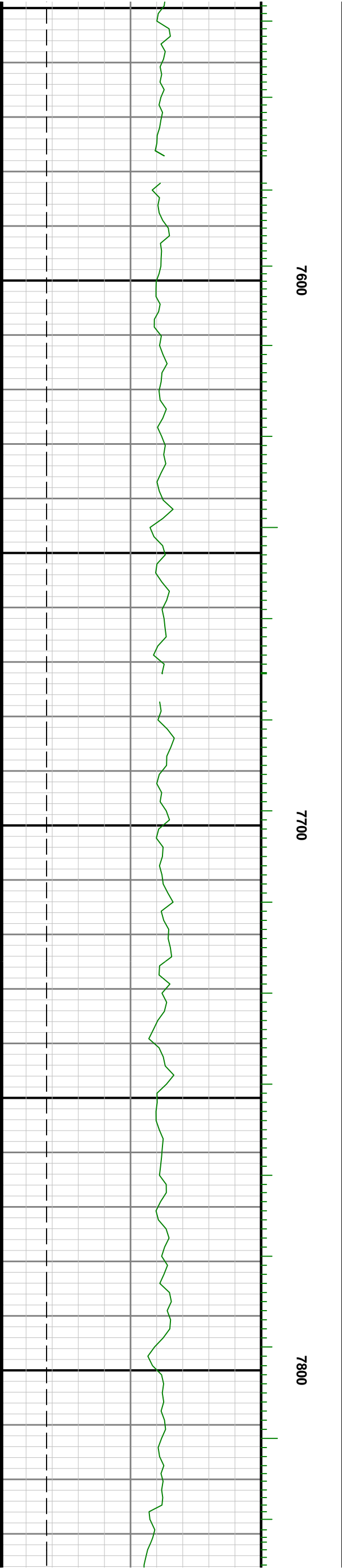
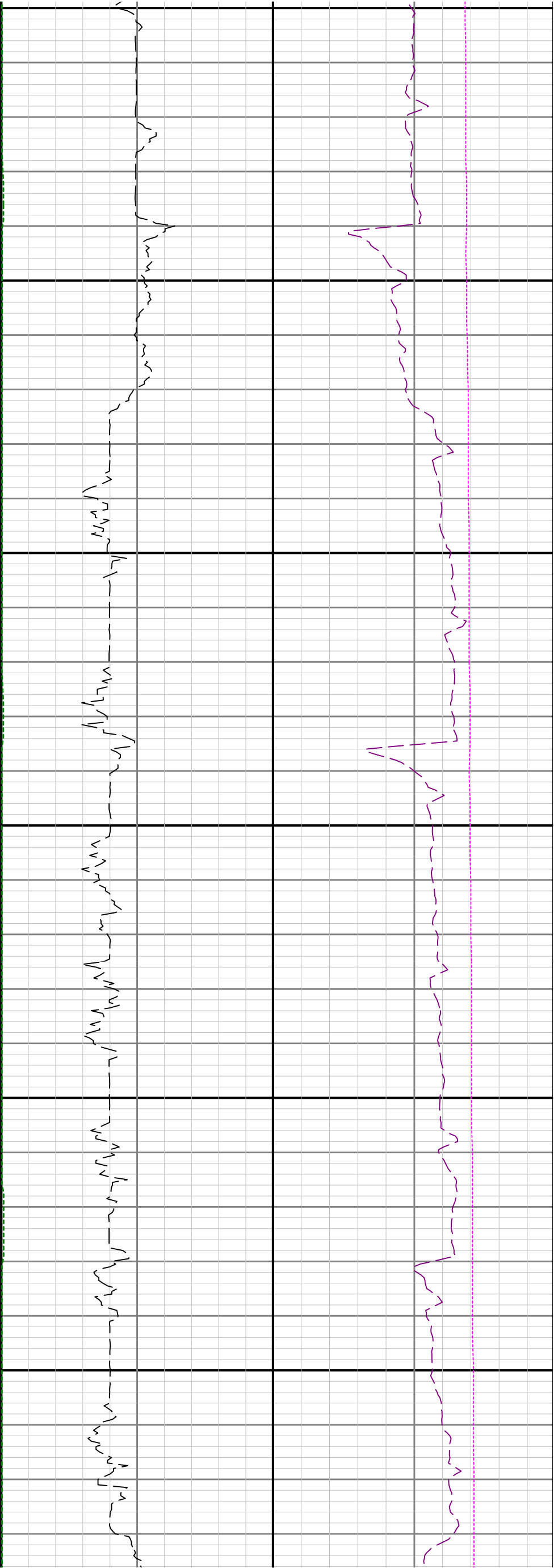


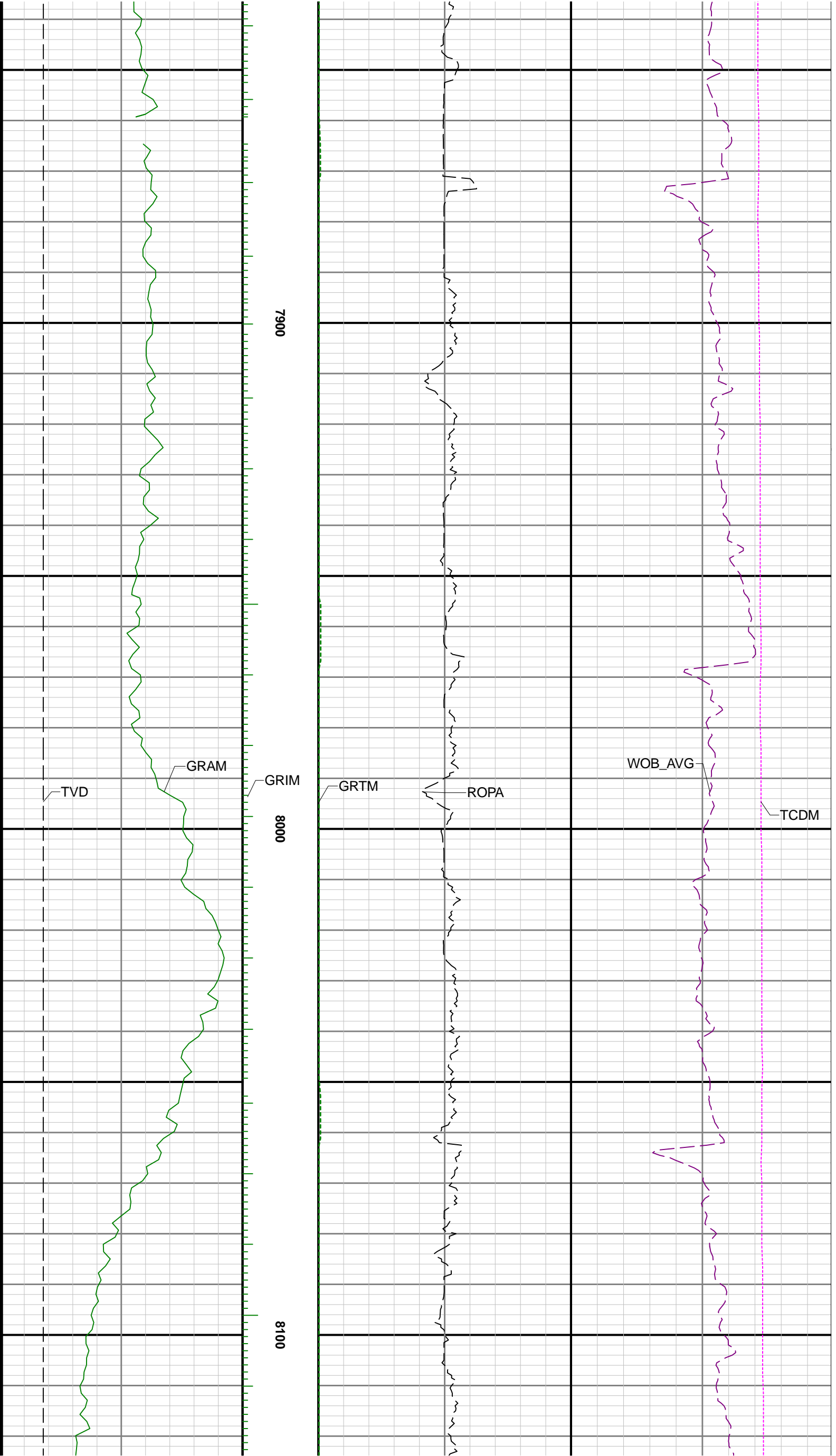


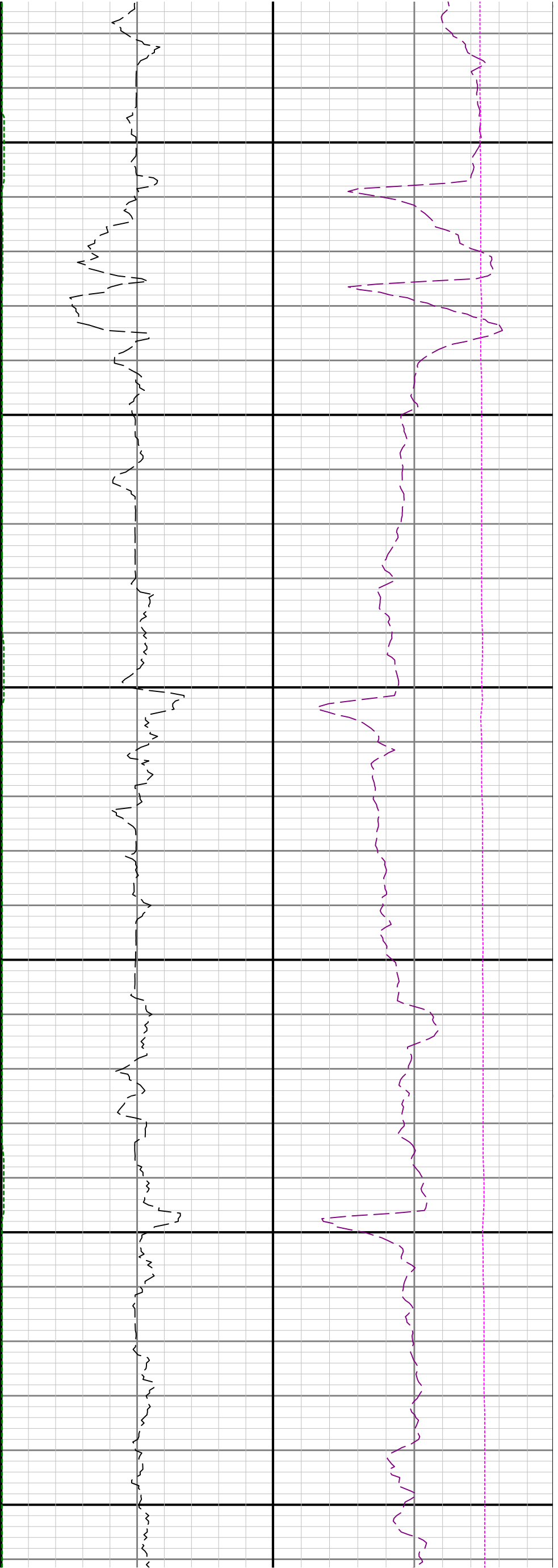








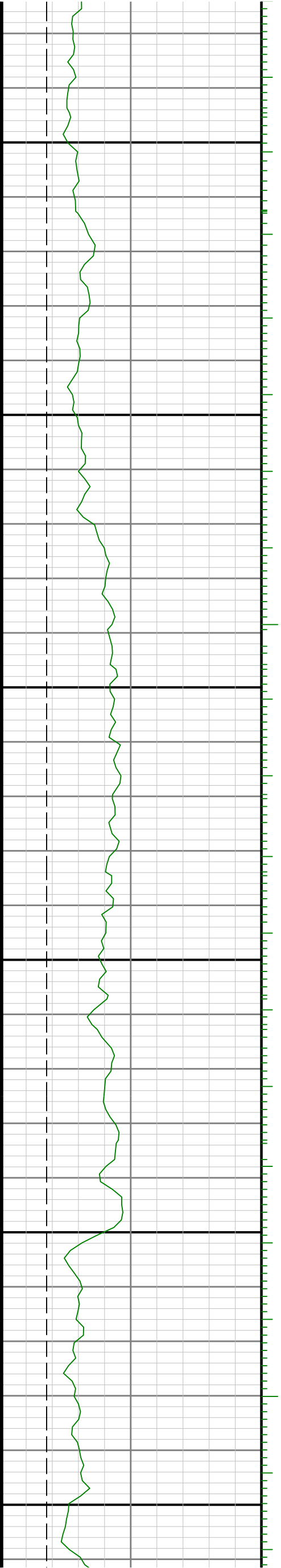


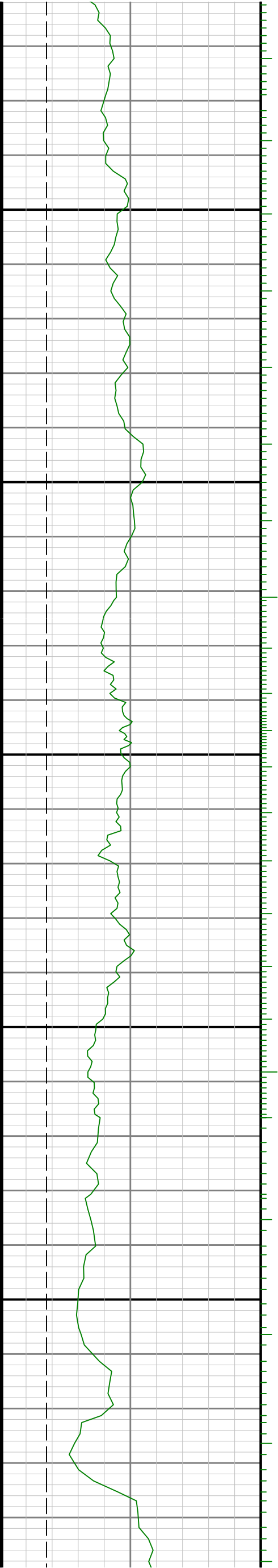


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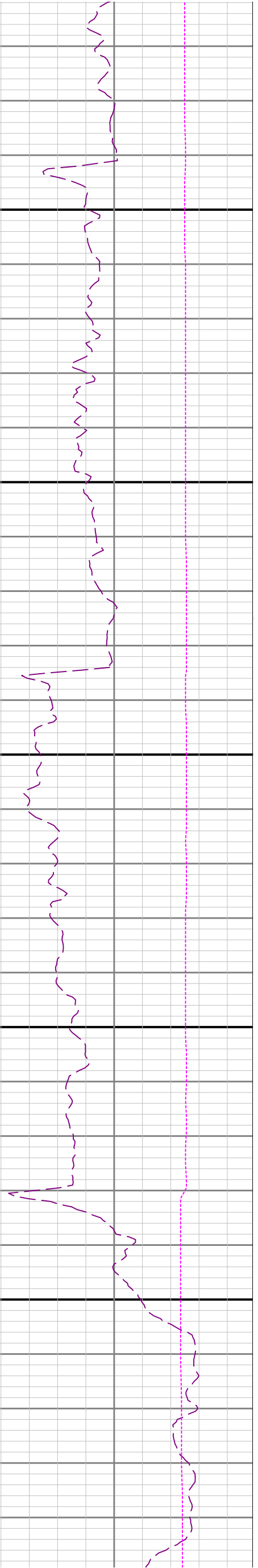
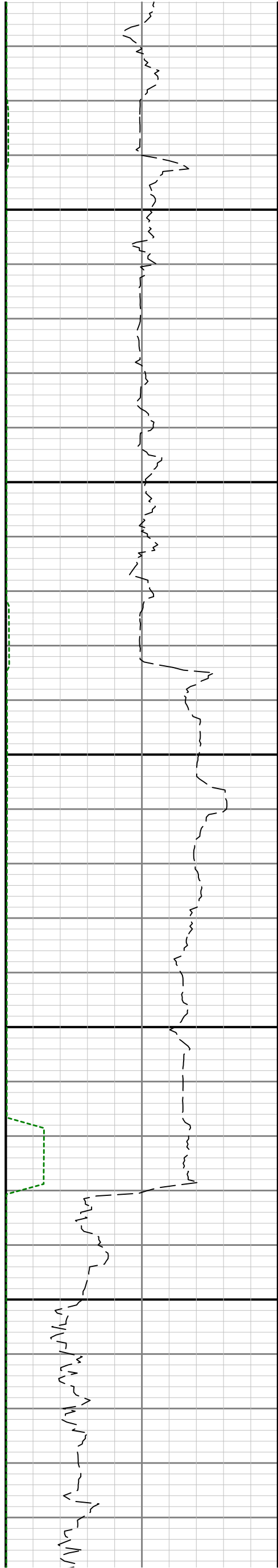


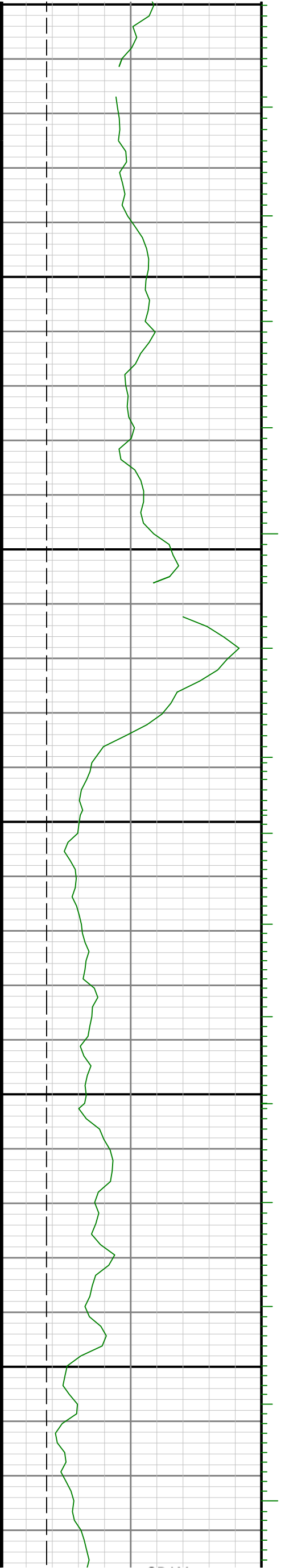


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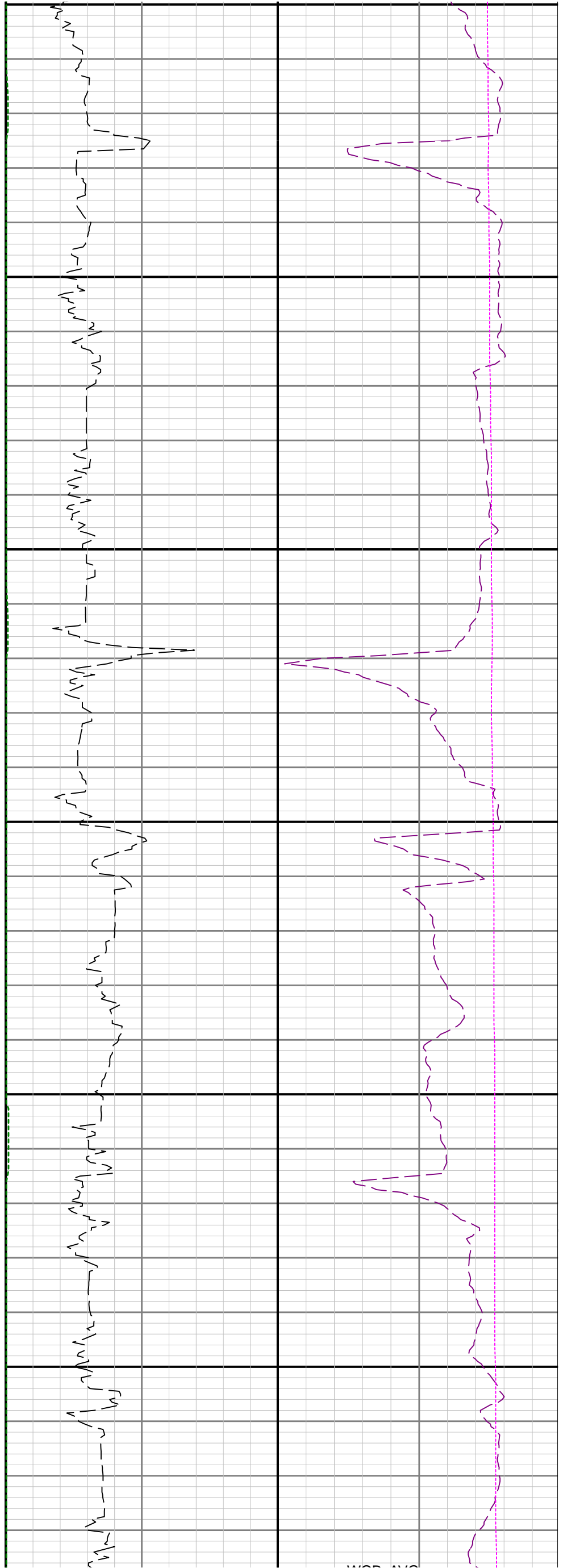


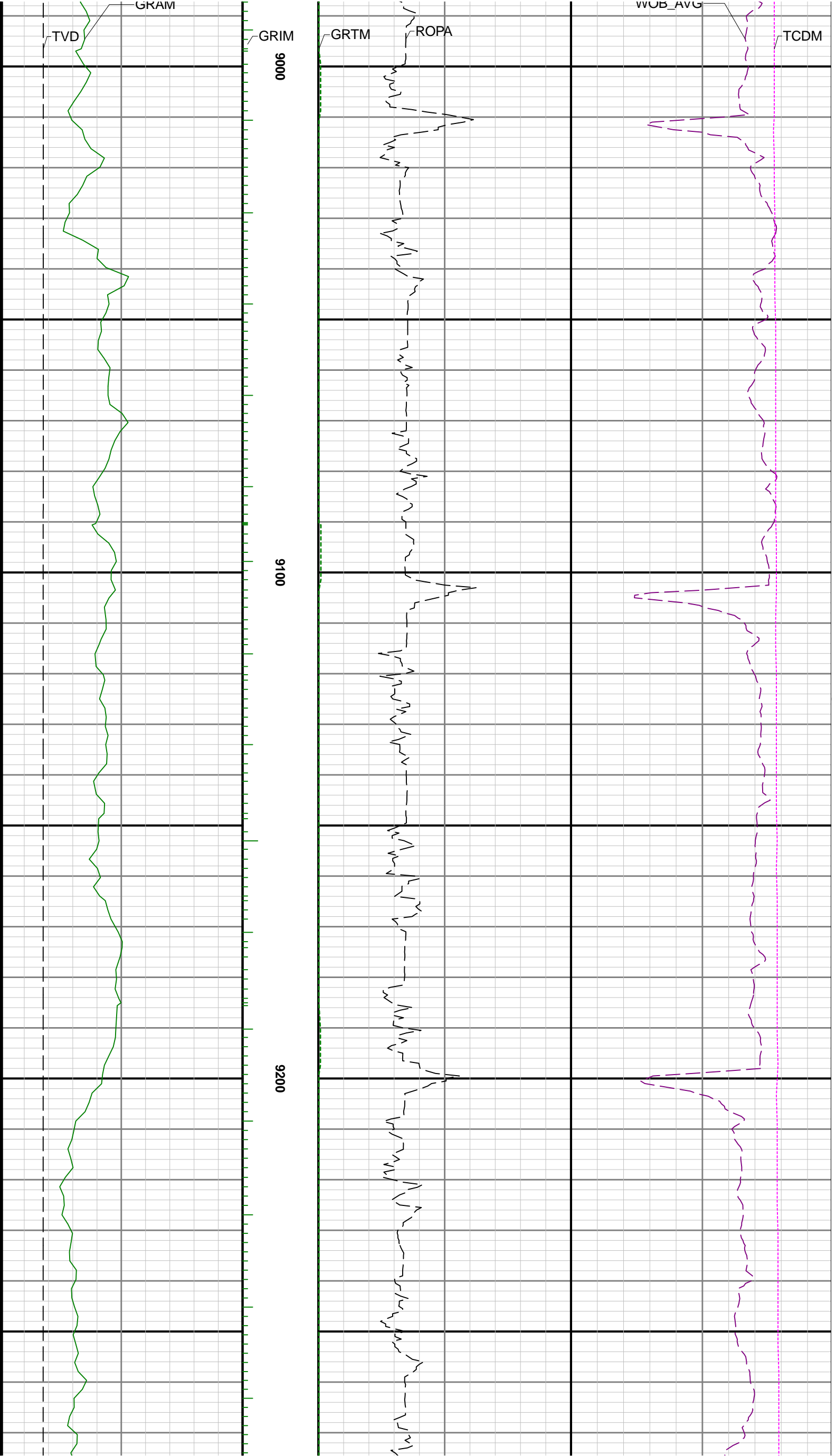


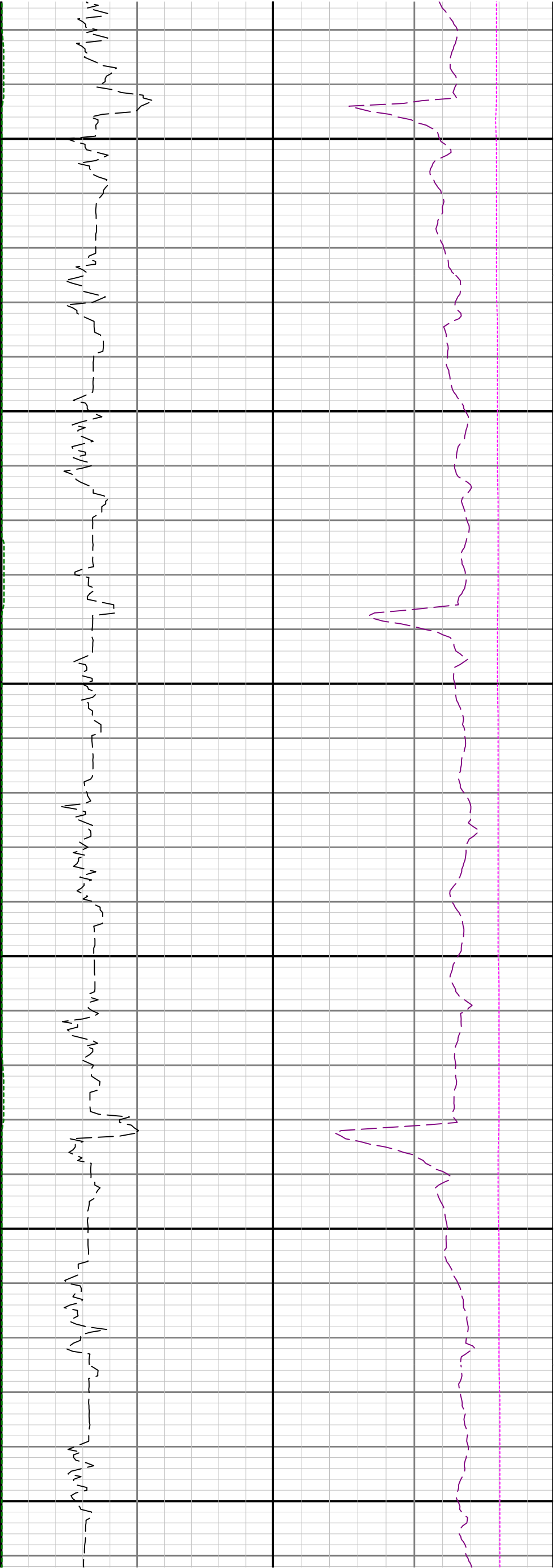
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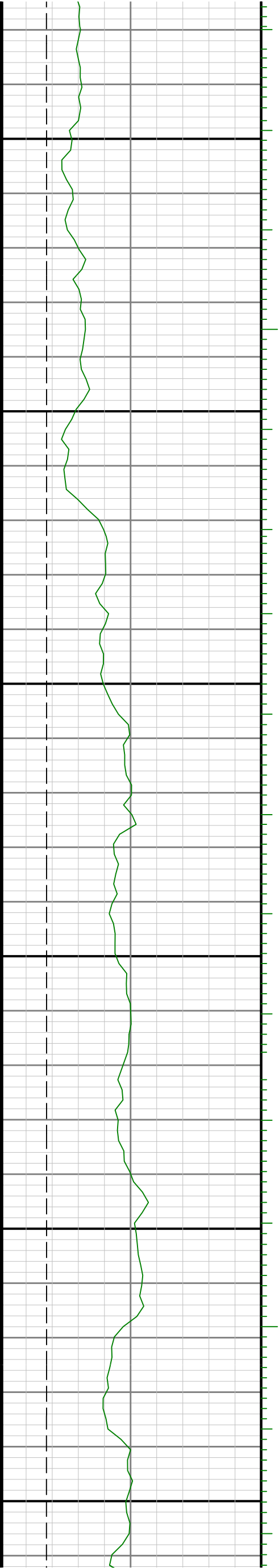


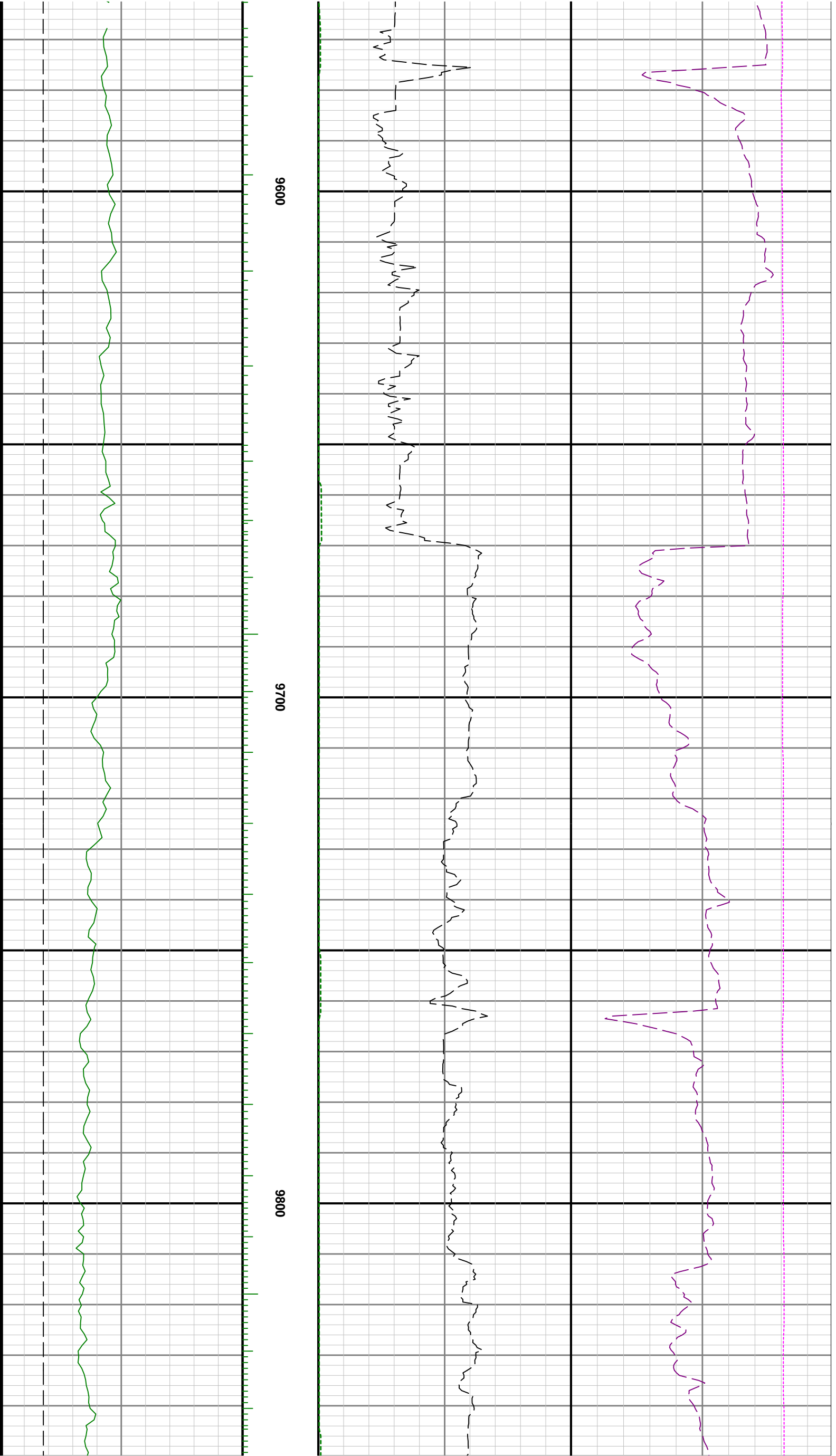


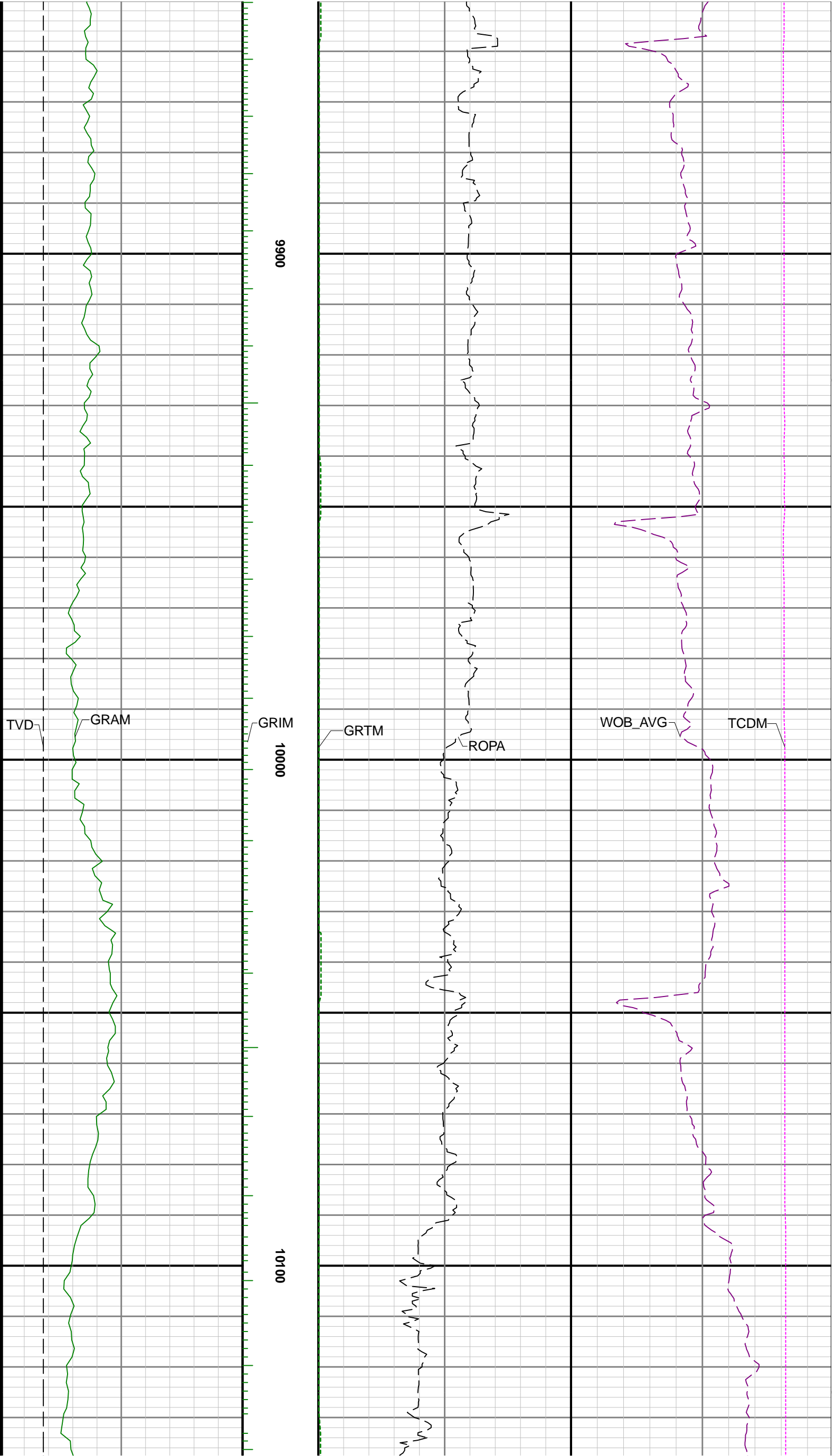
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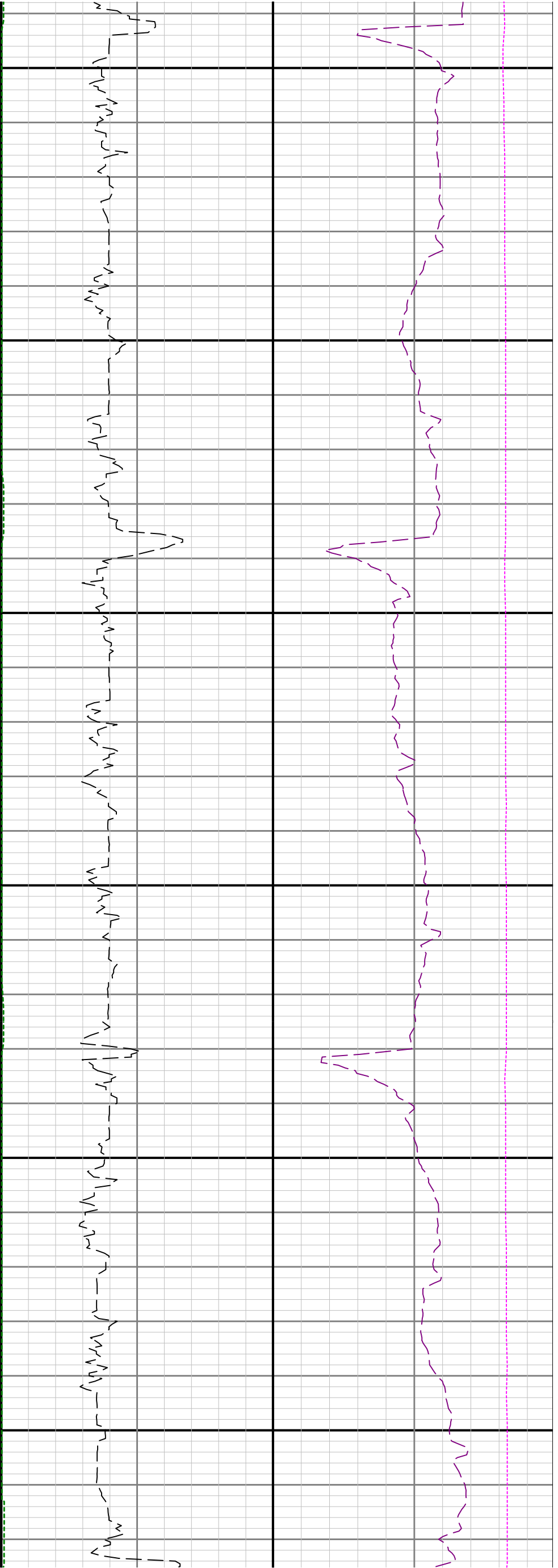
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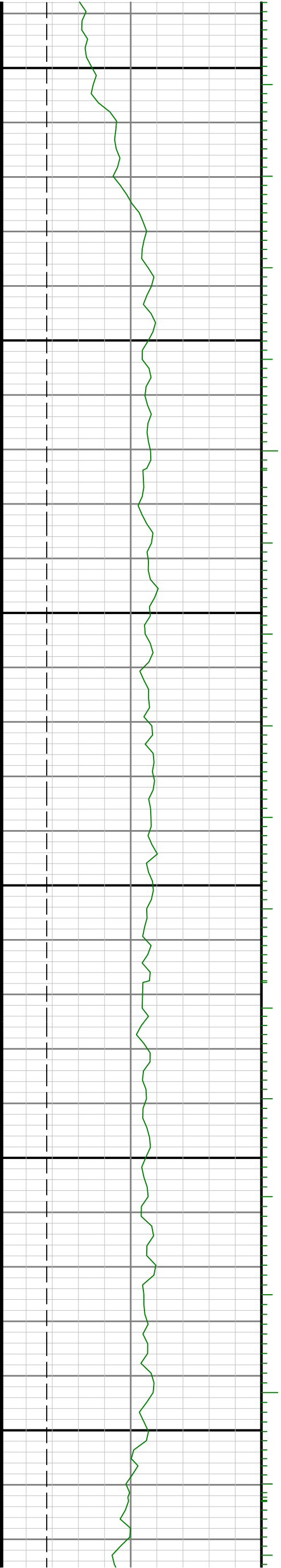


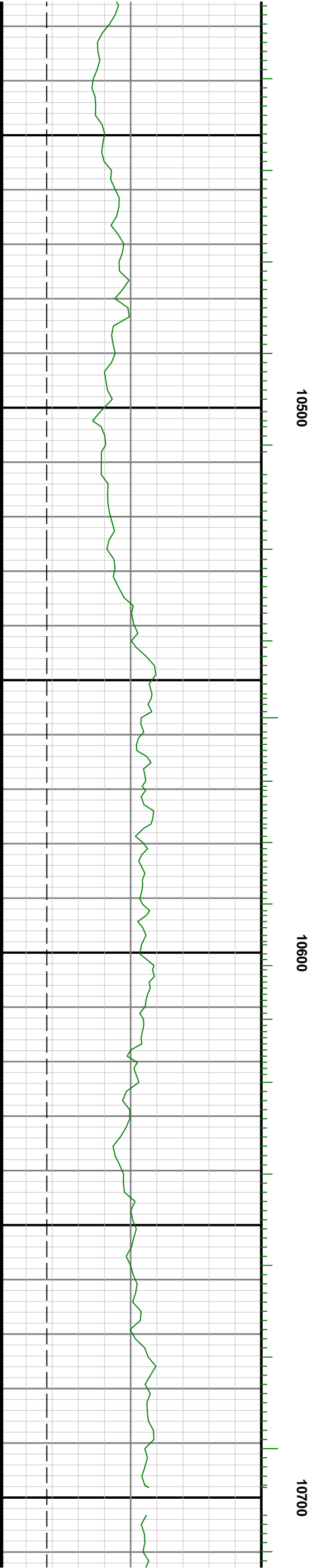
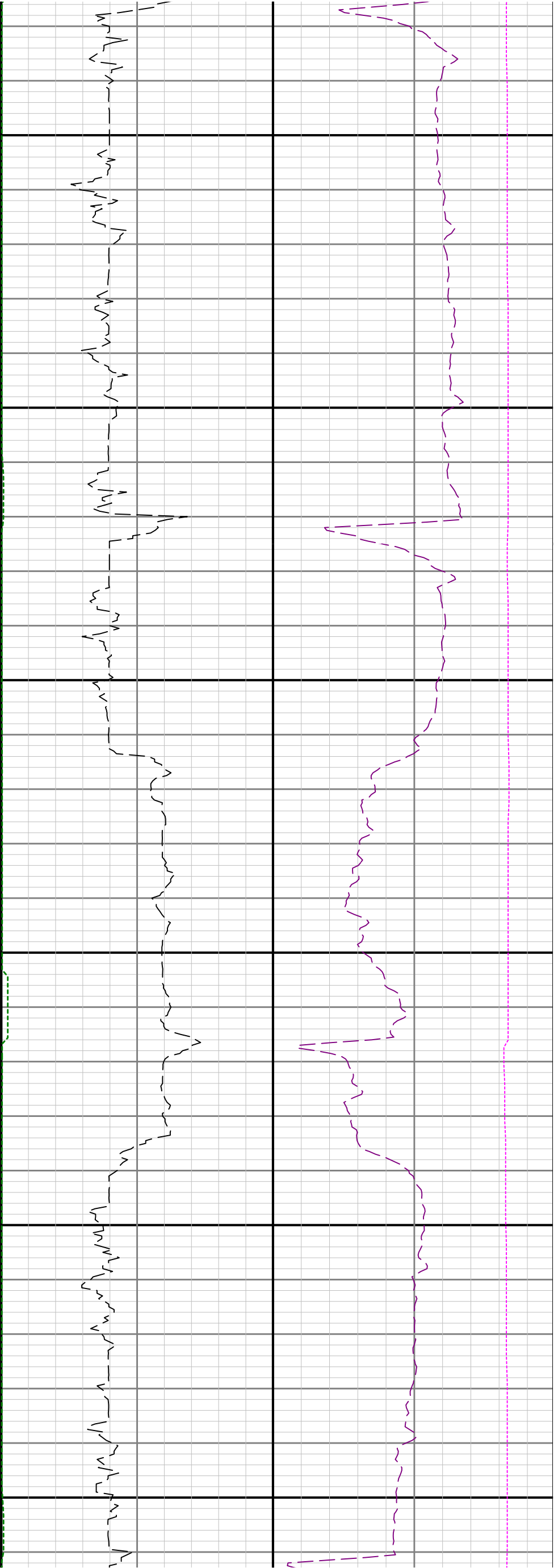


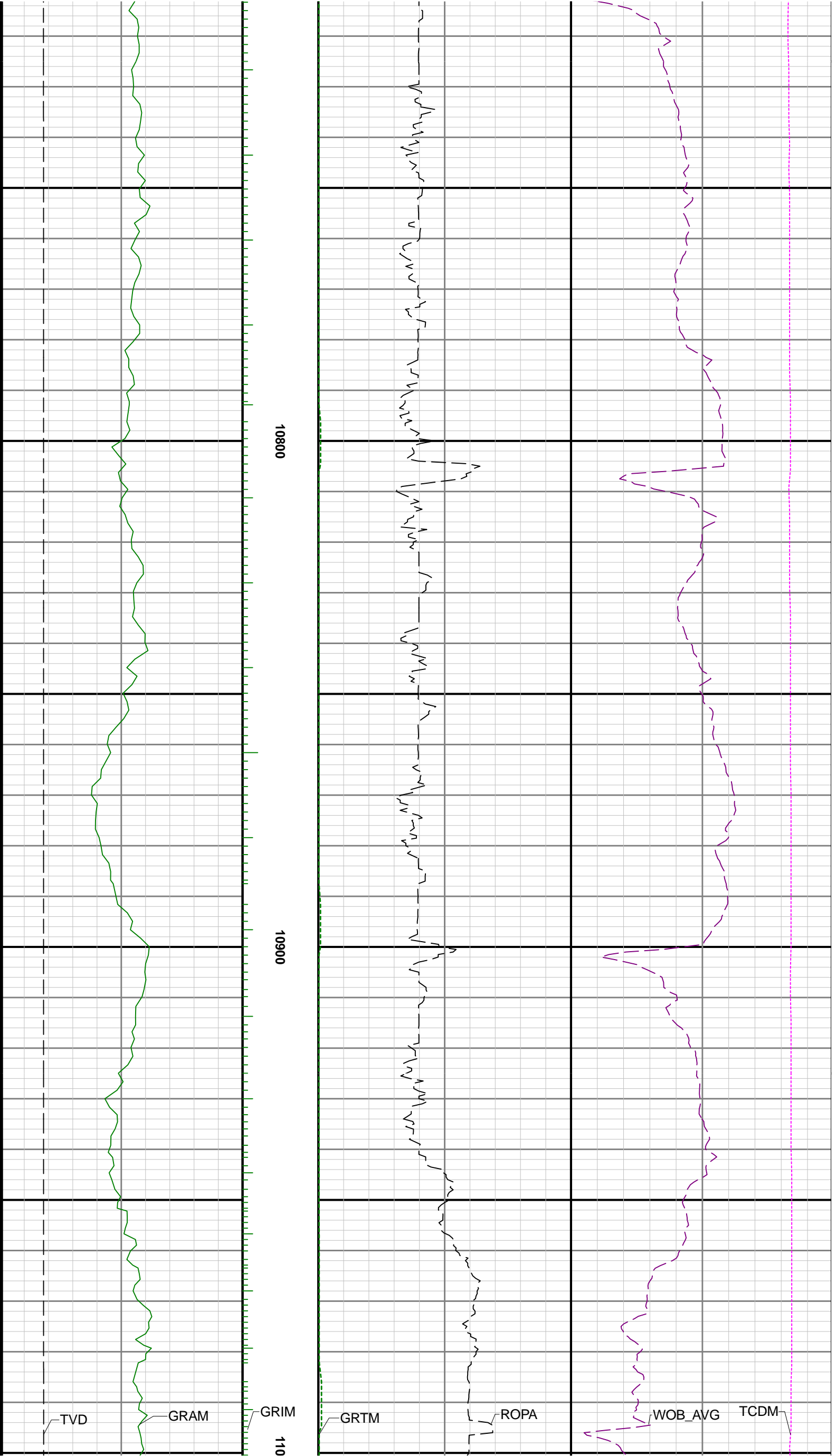
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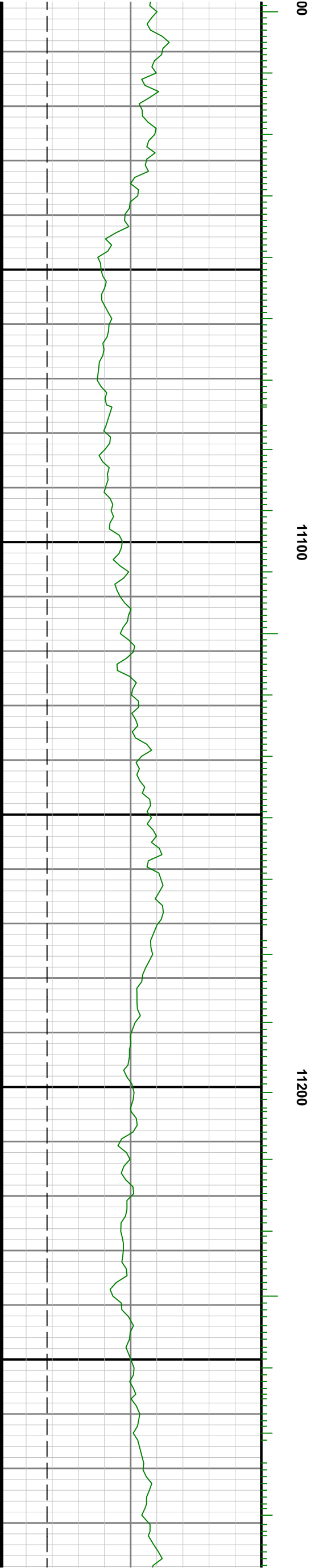
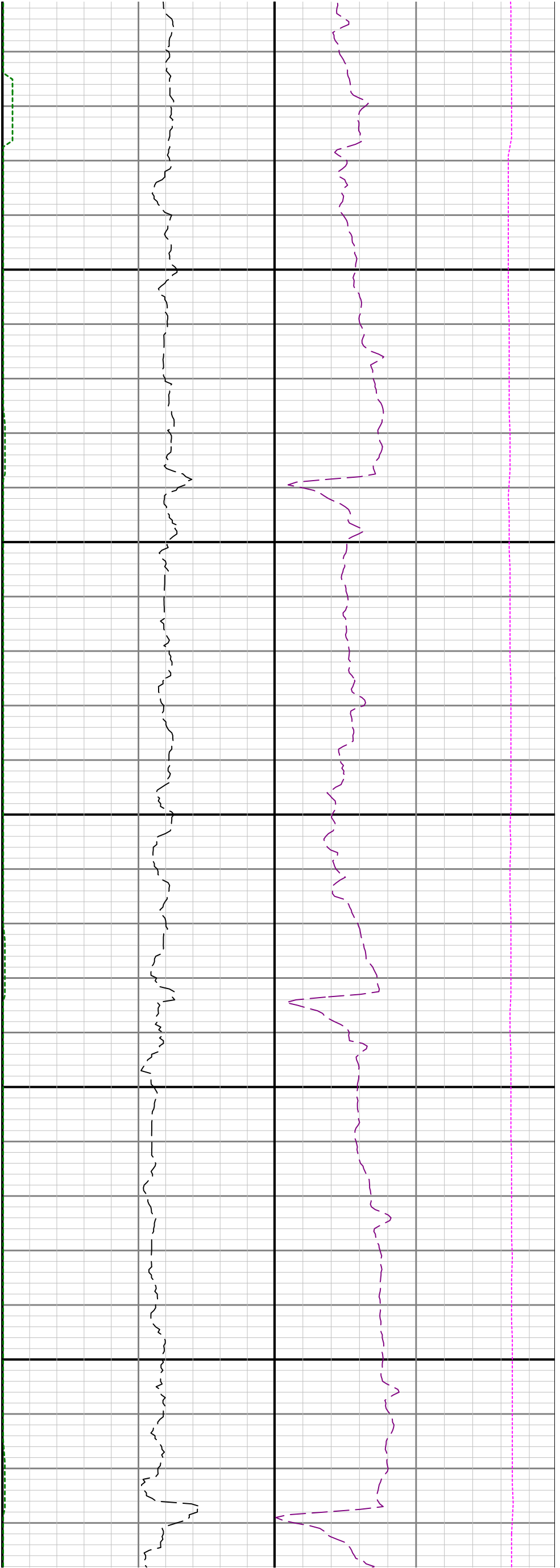
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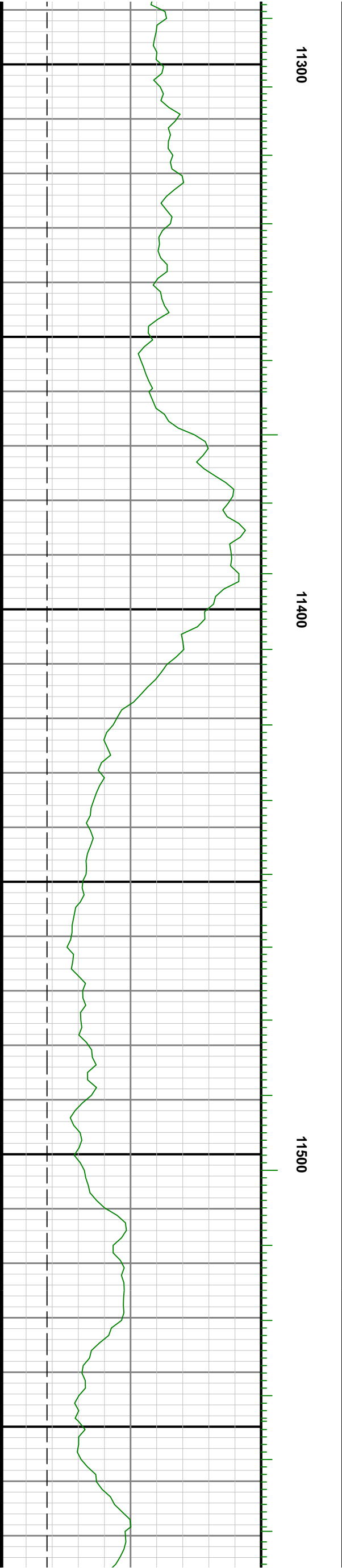
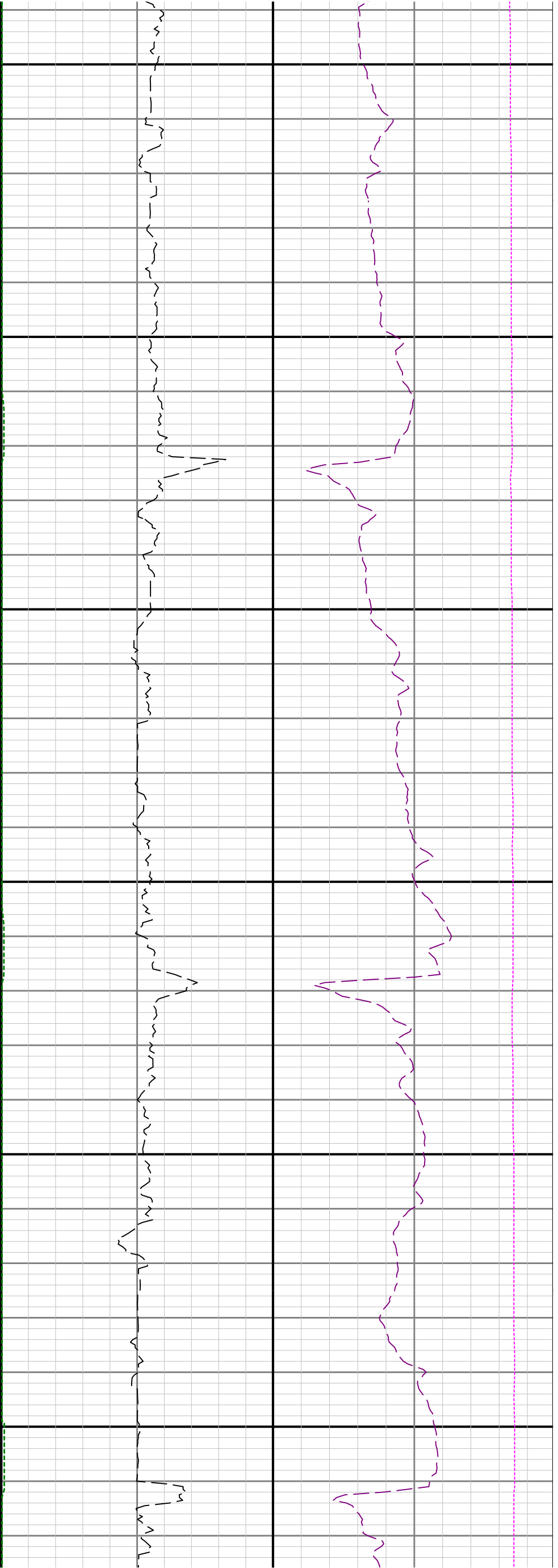
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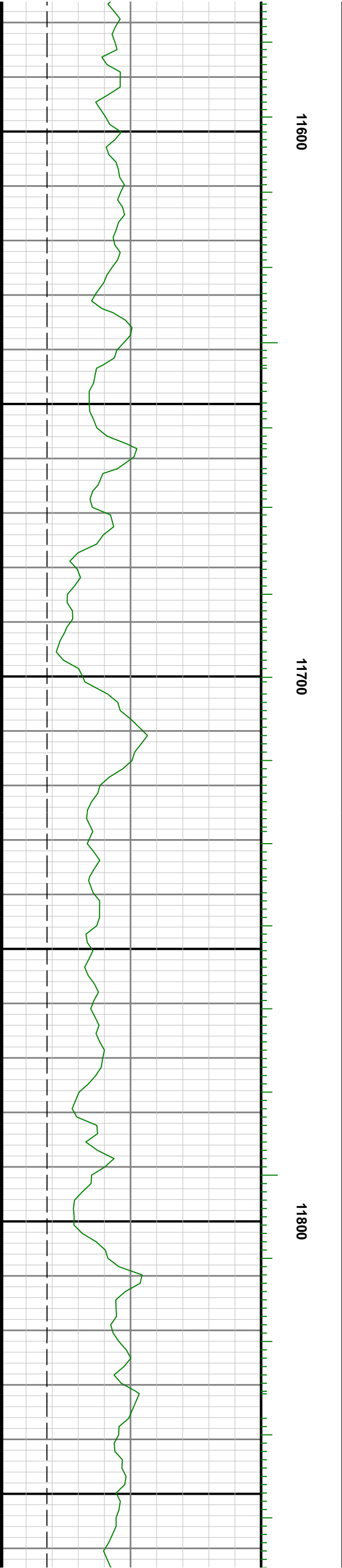
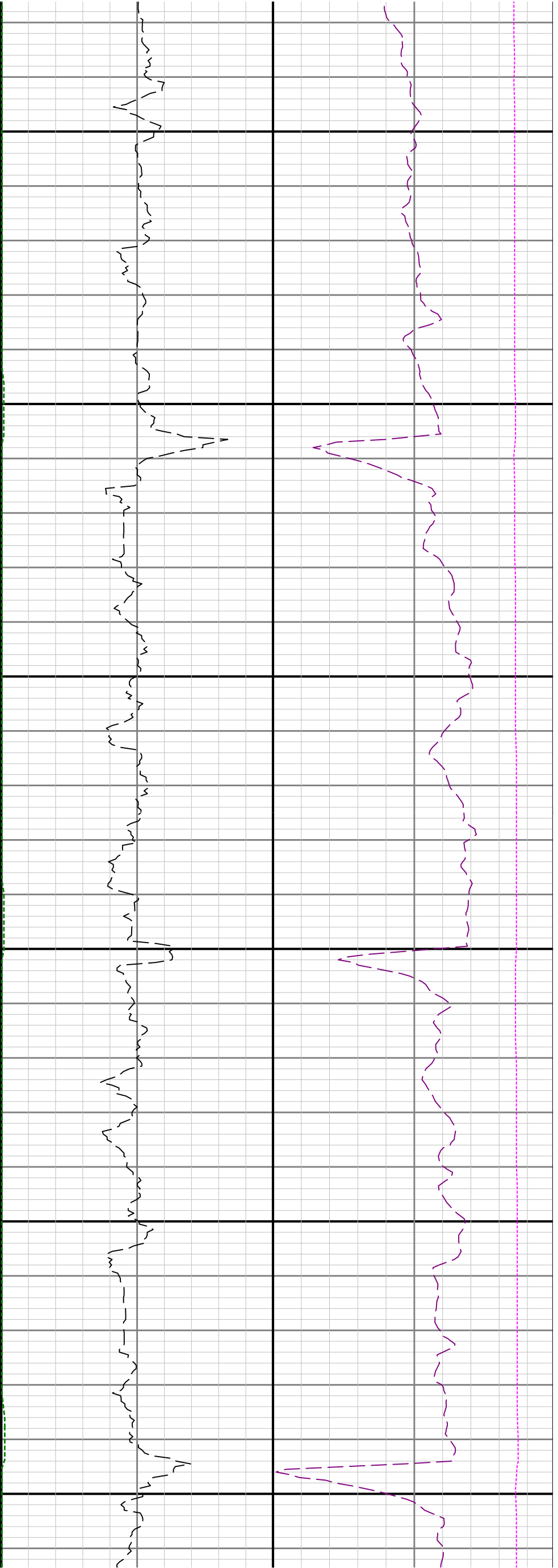


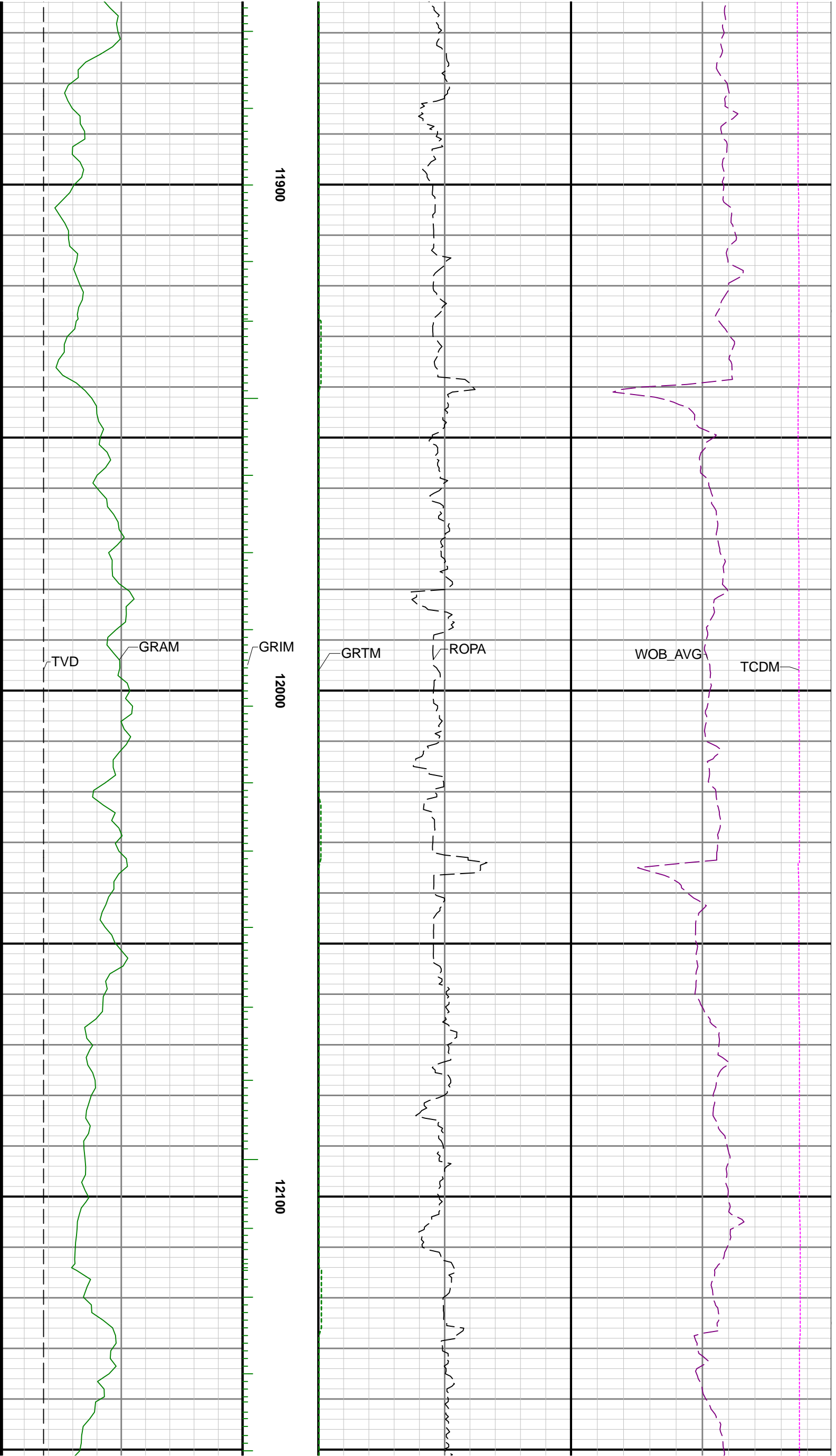


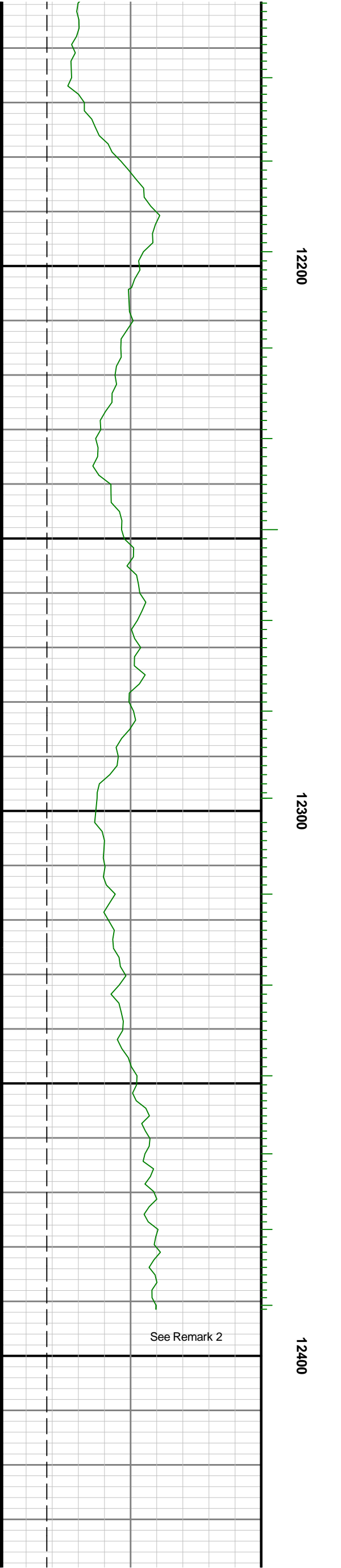


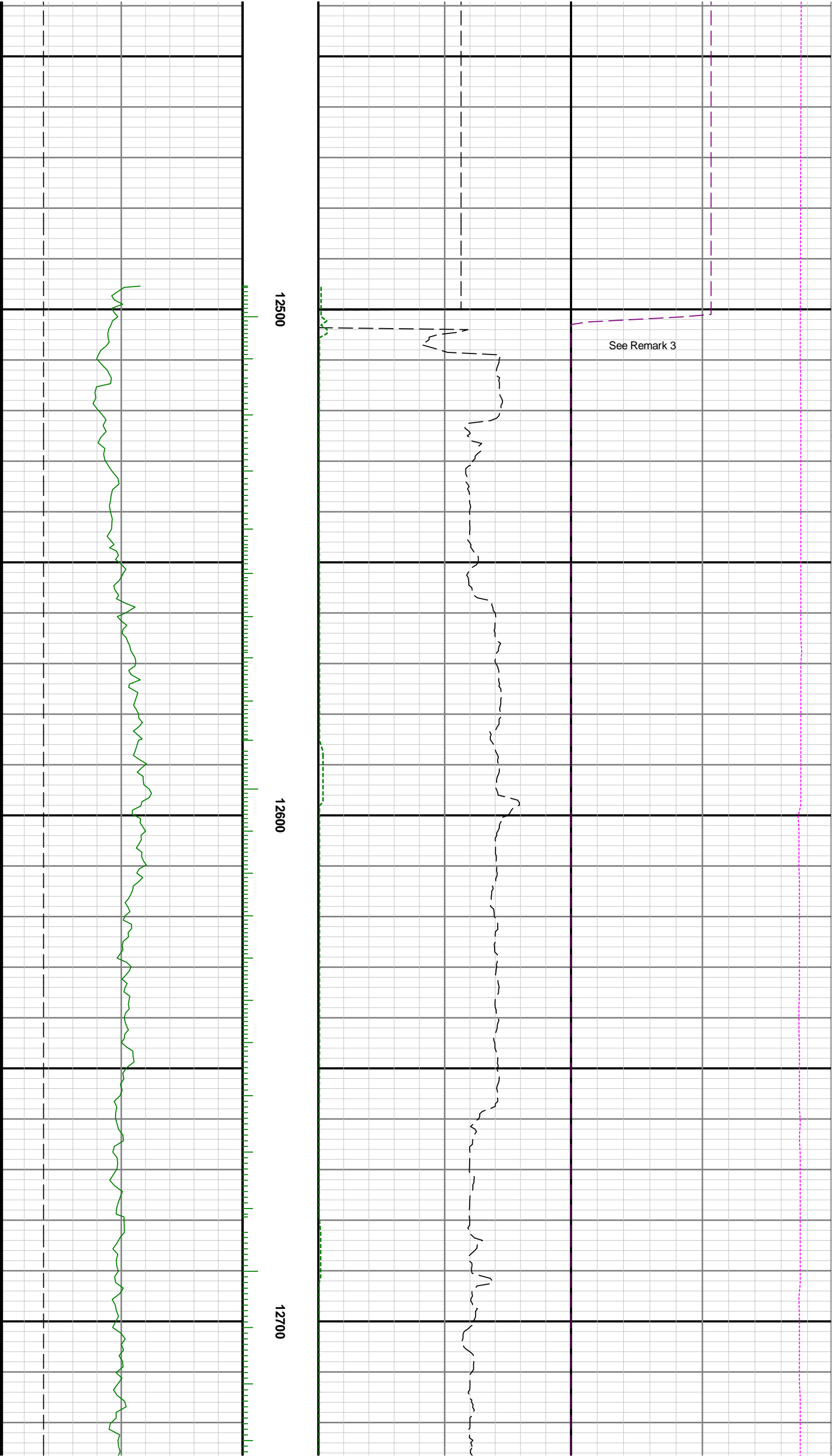


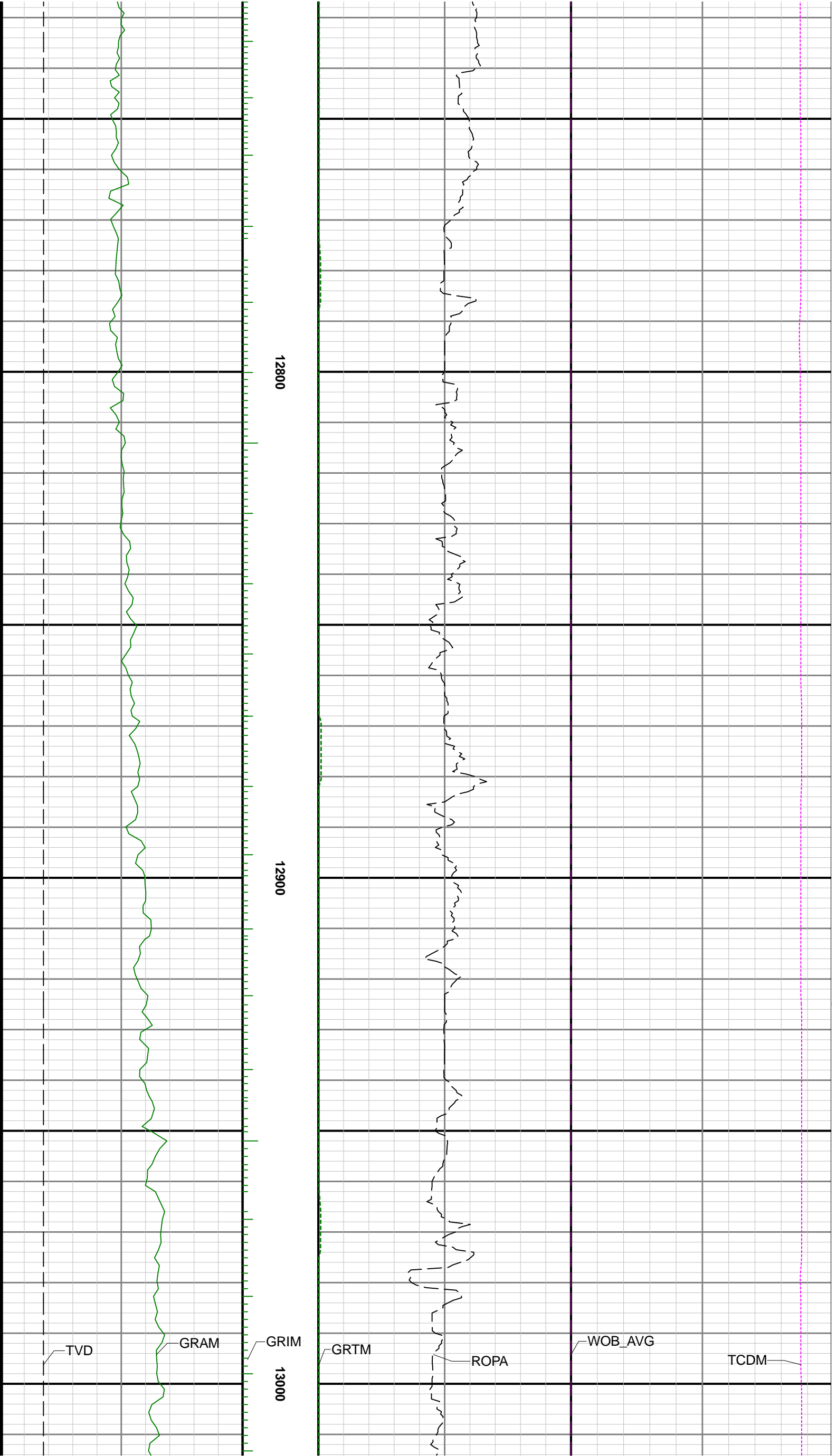


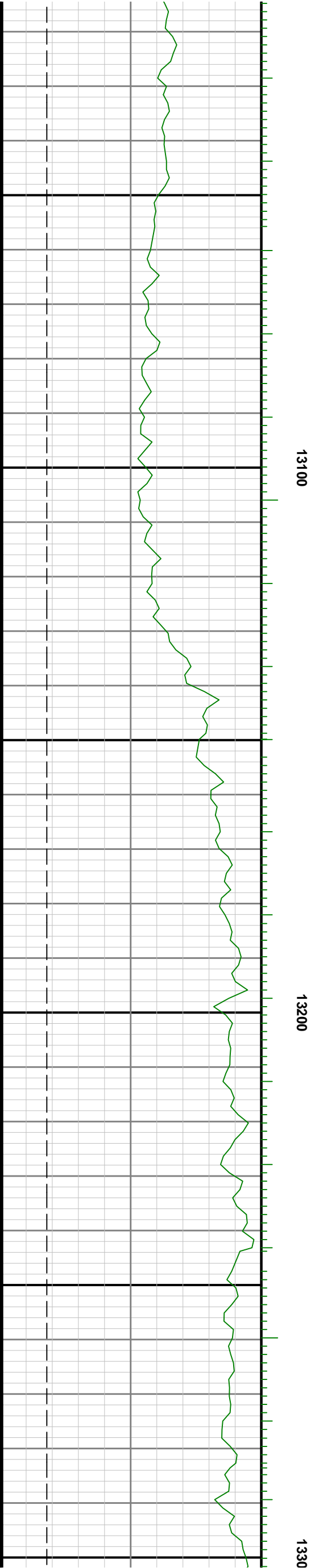
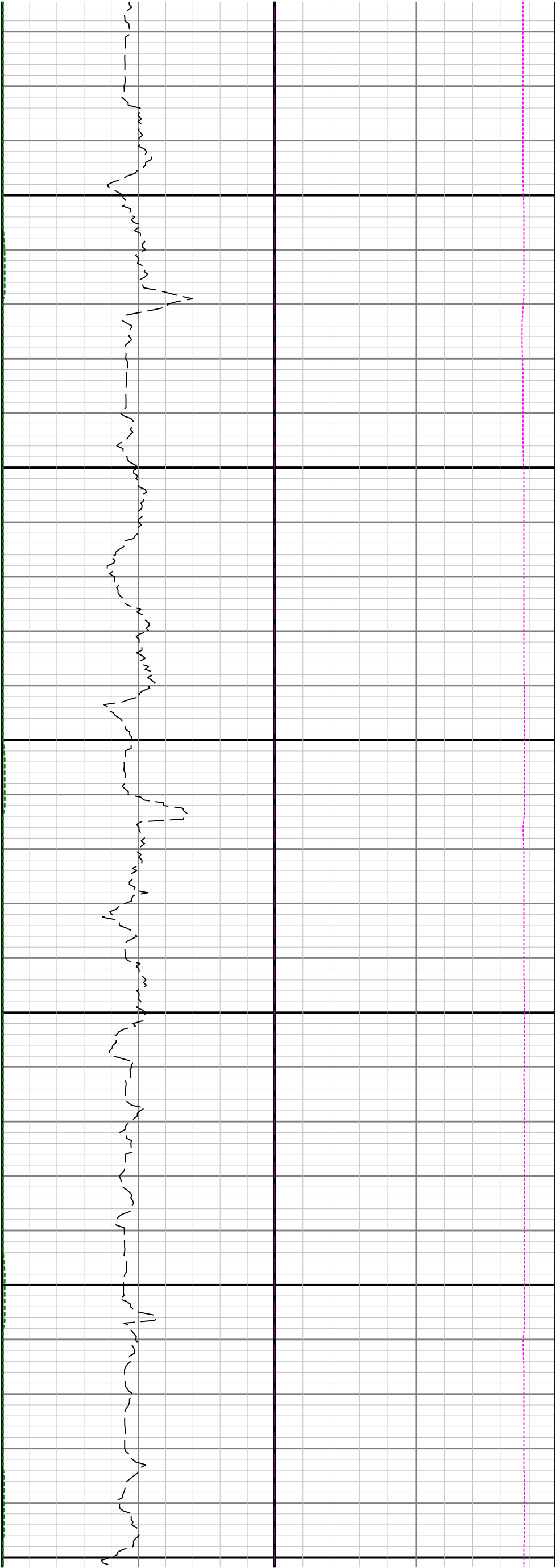


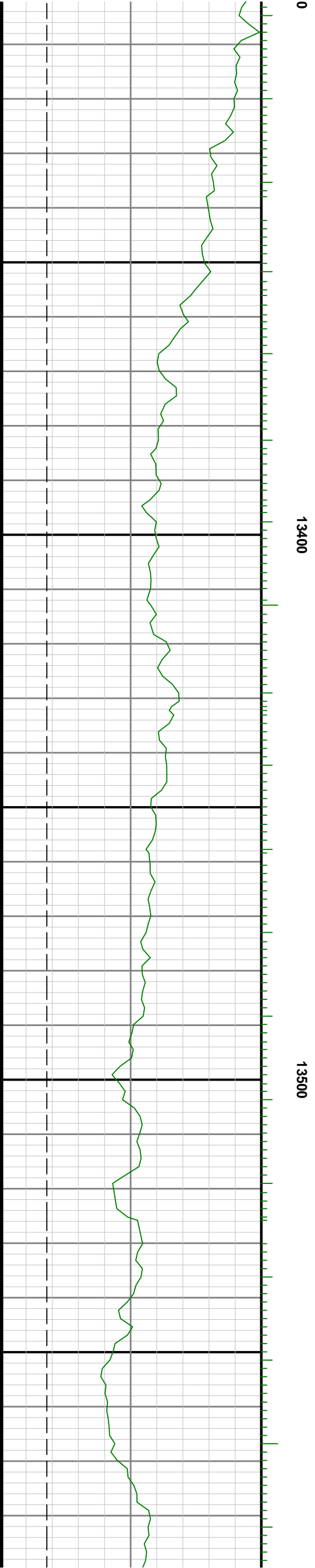
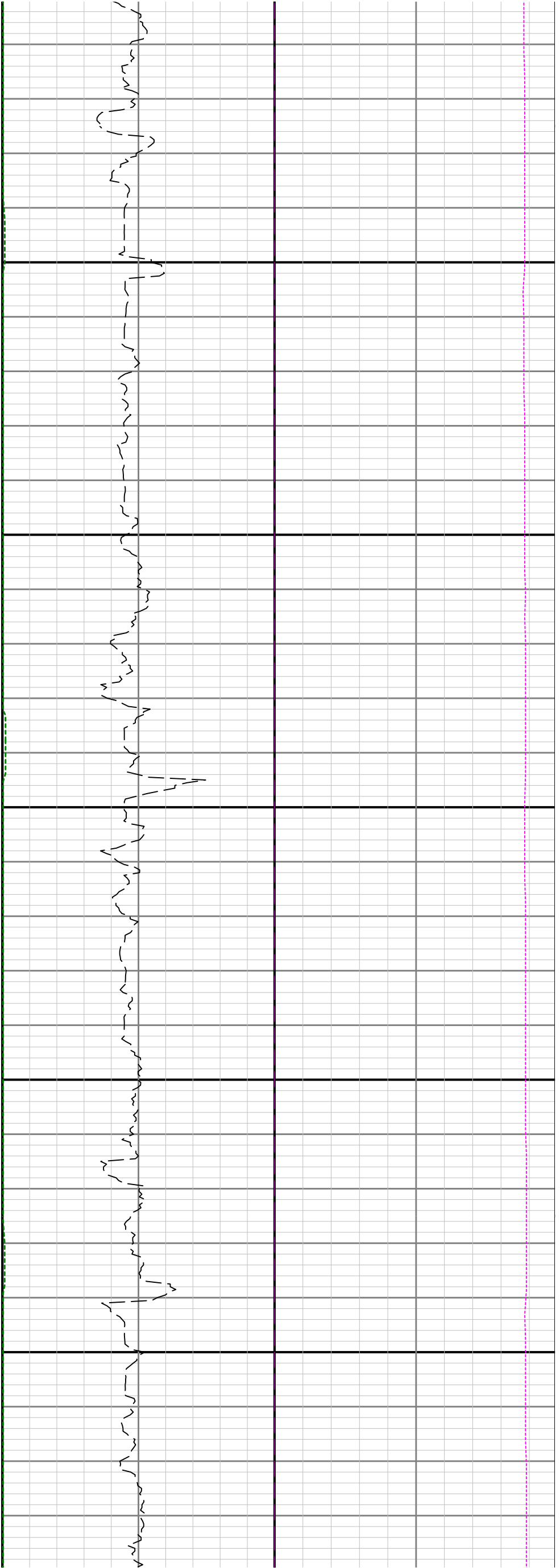


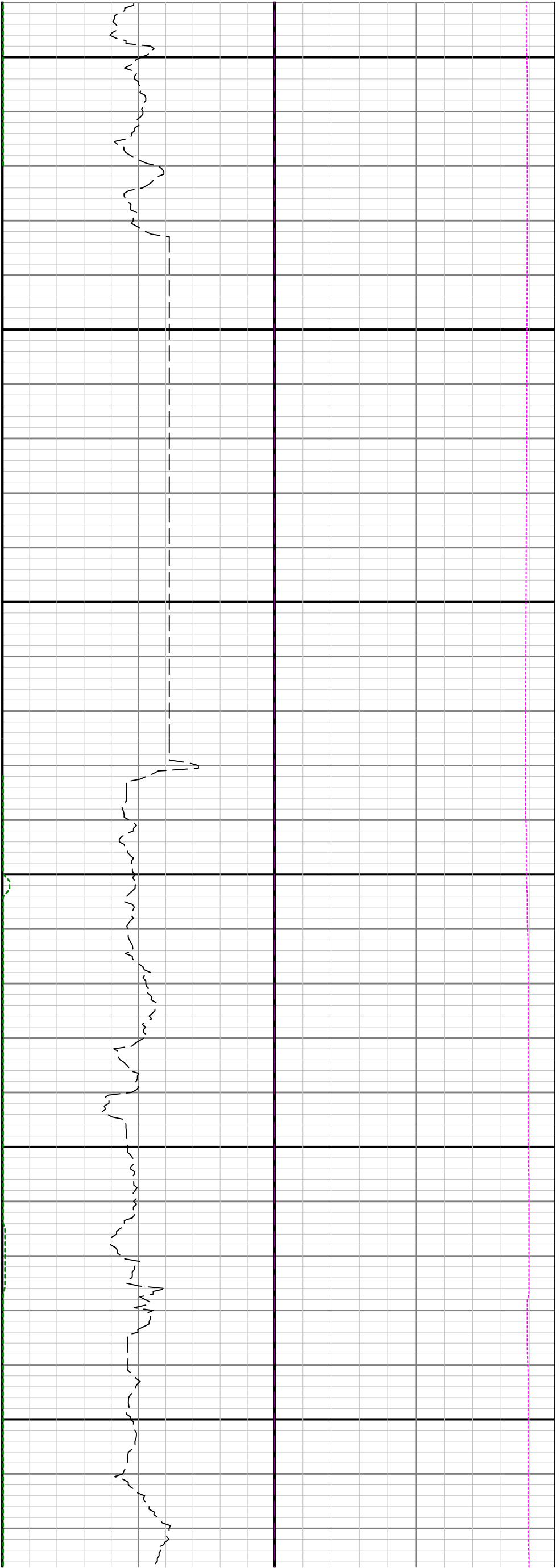










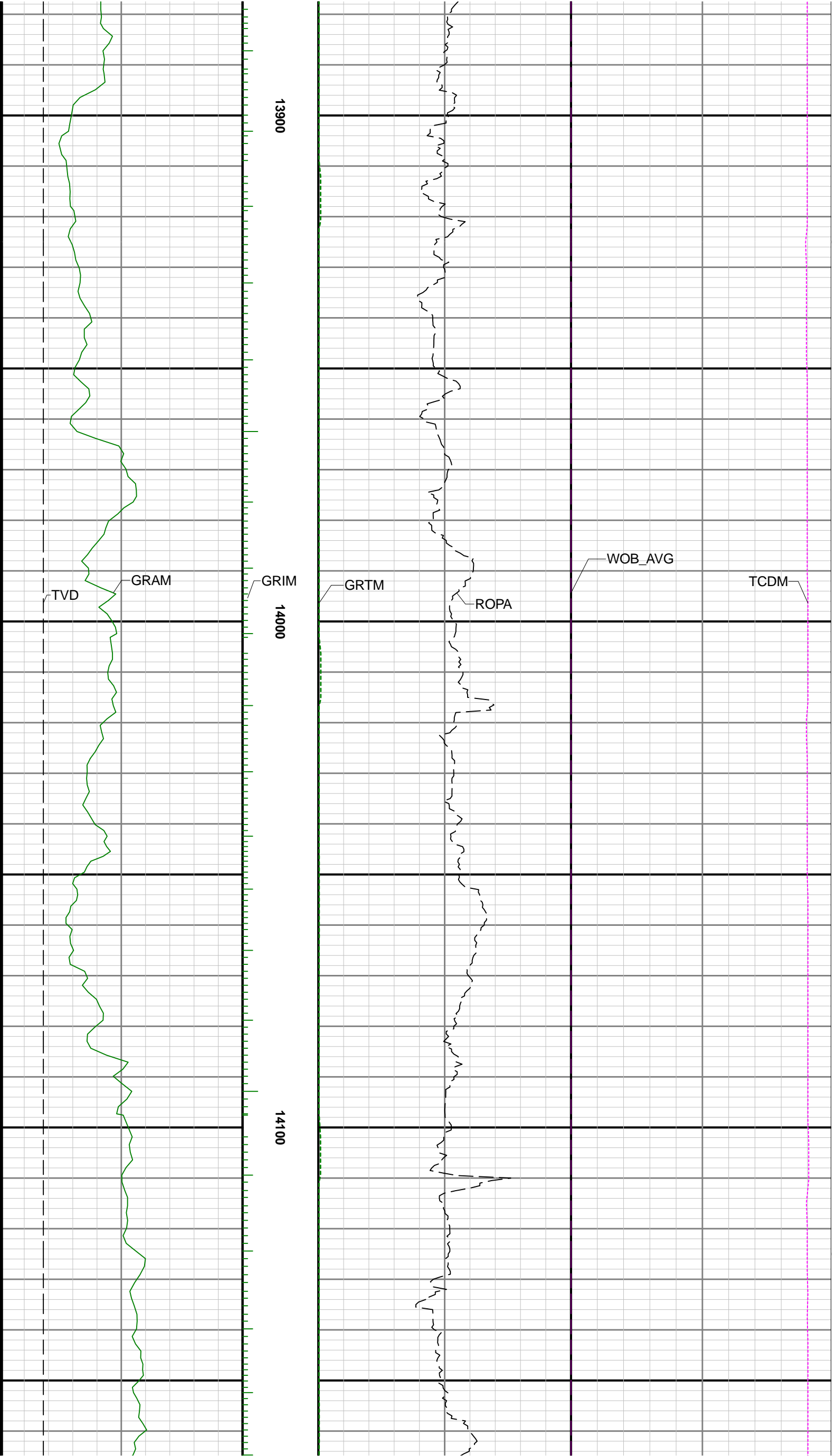


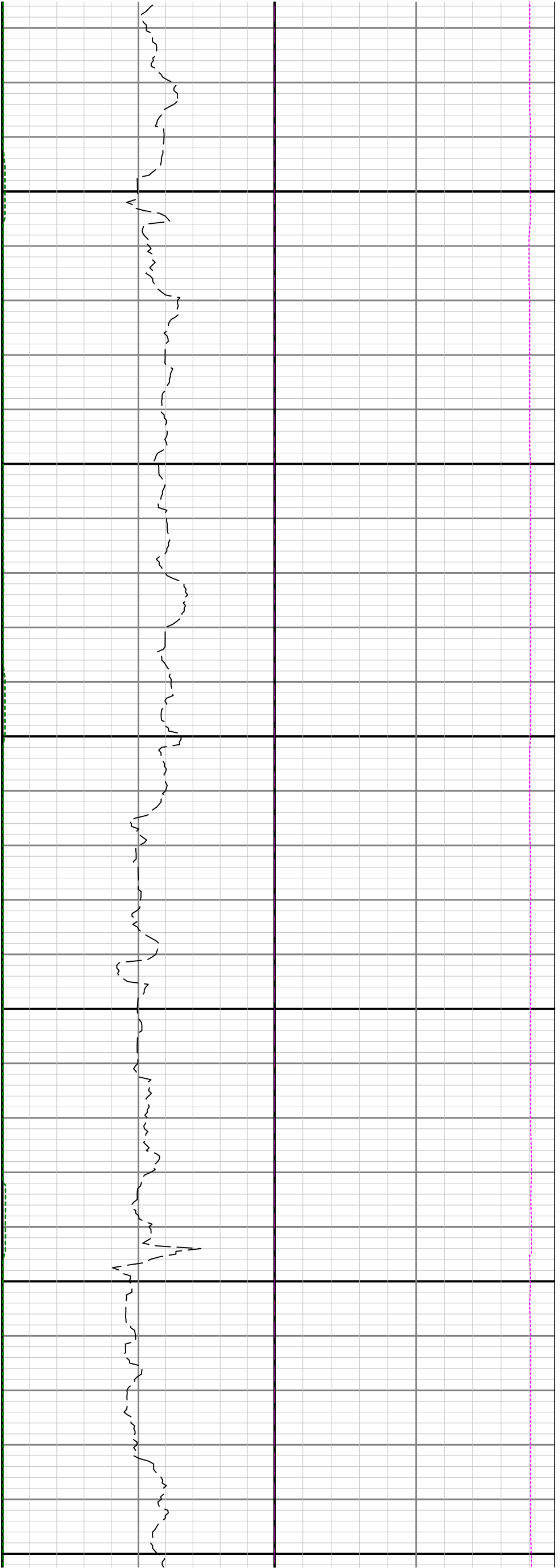
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See Remark 4

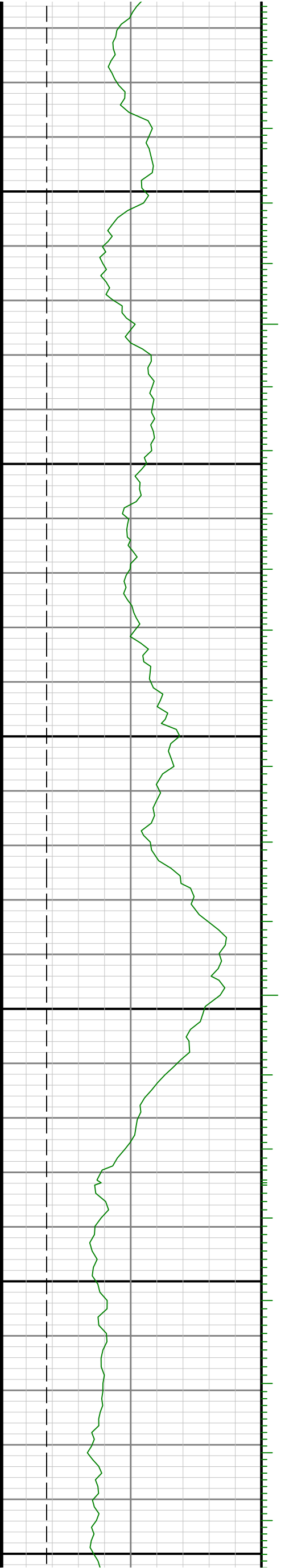


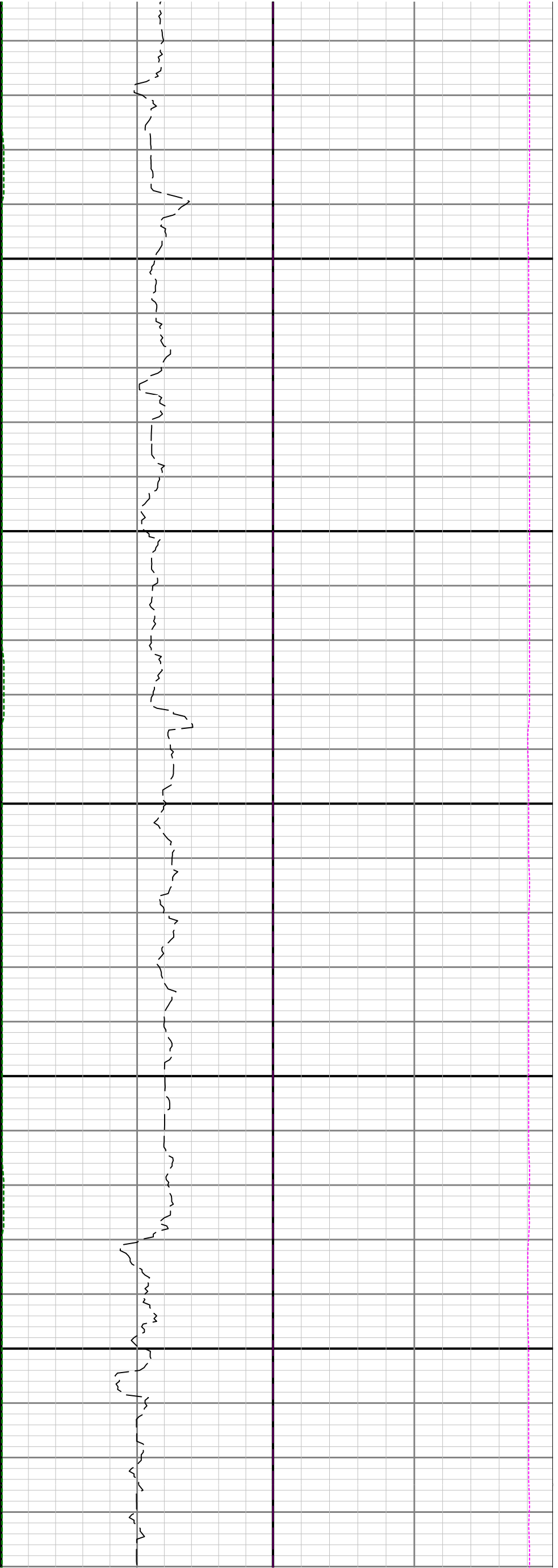


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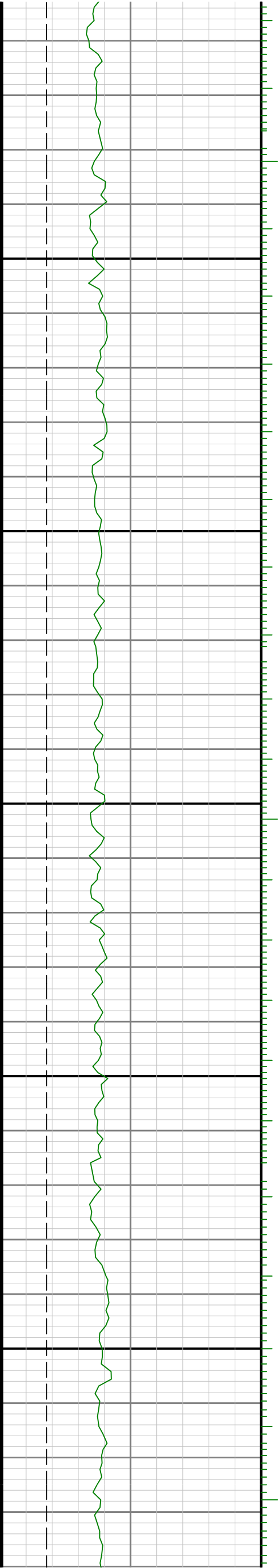


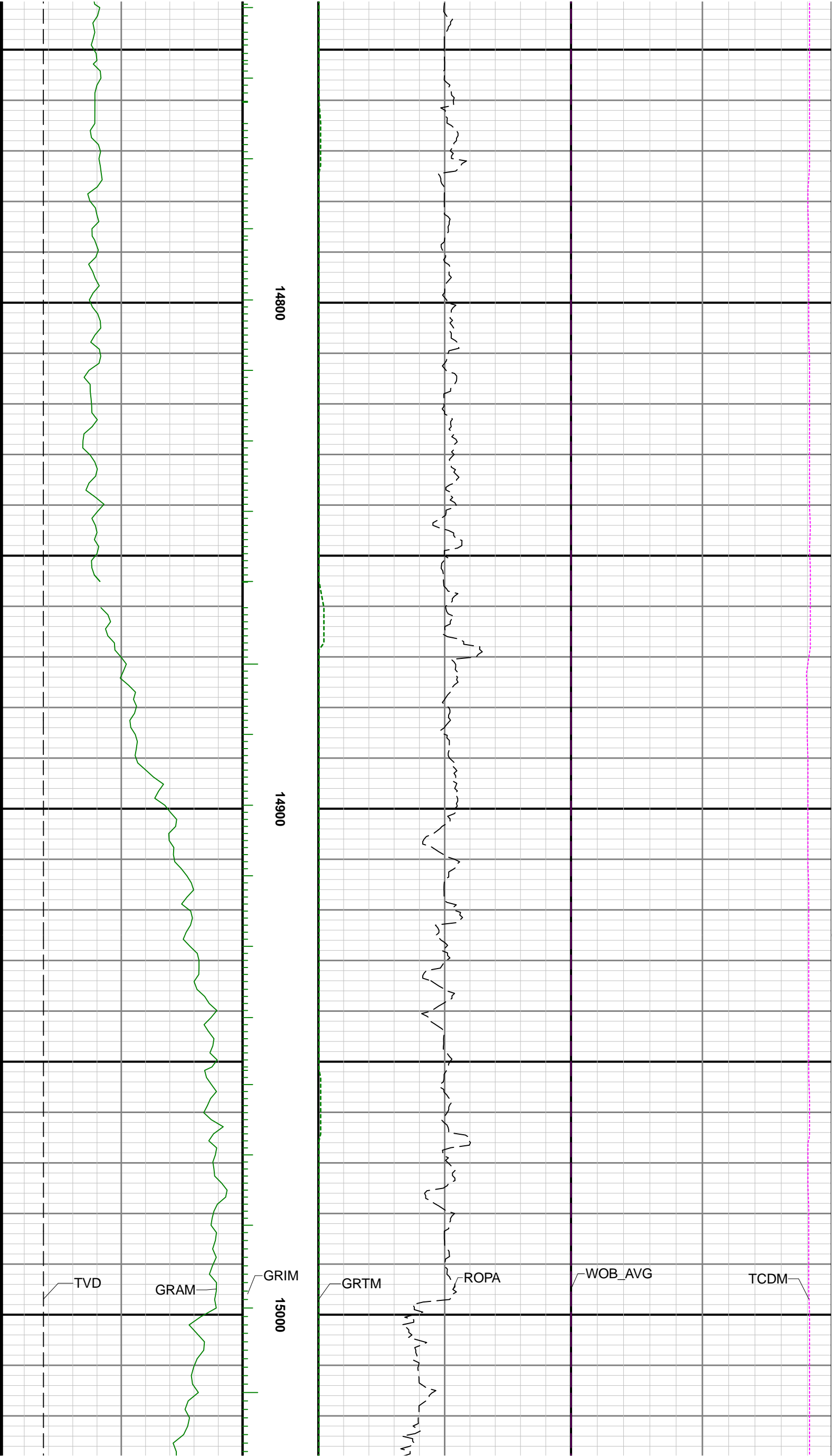


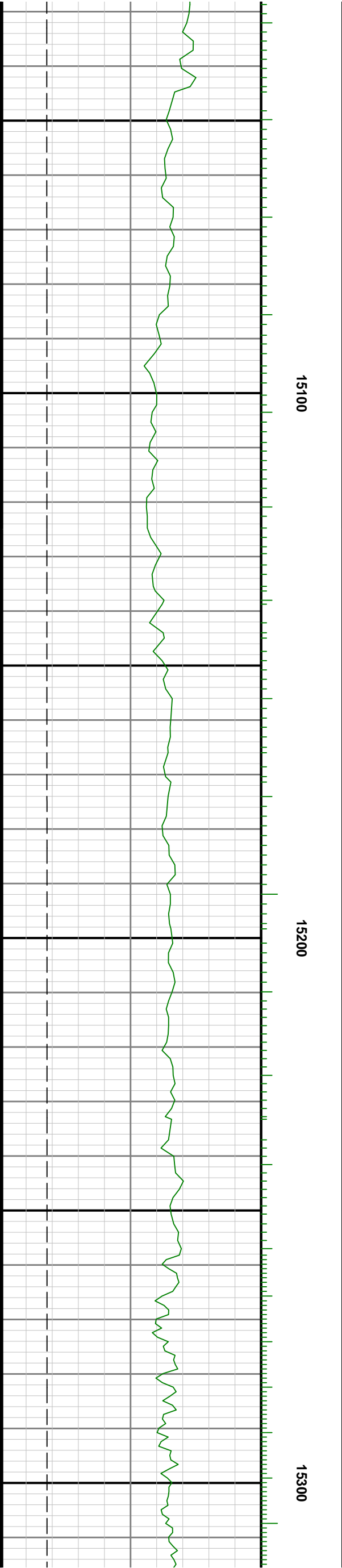
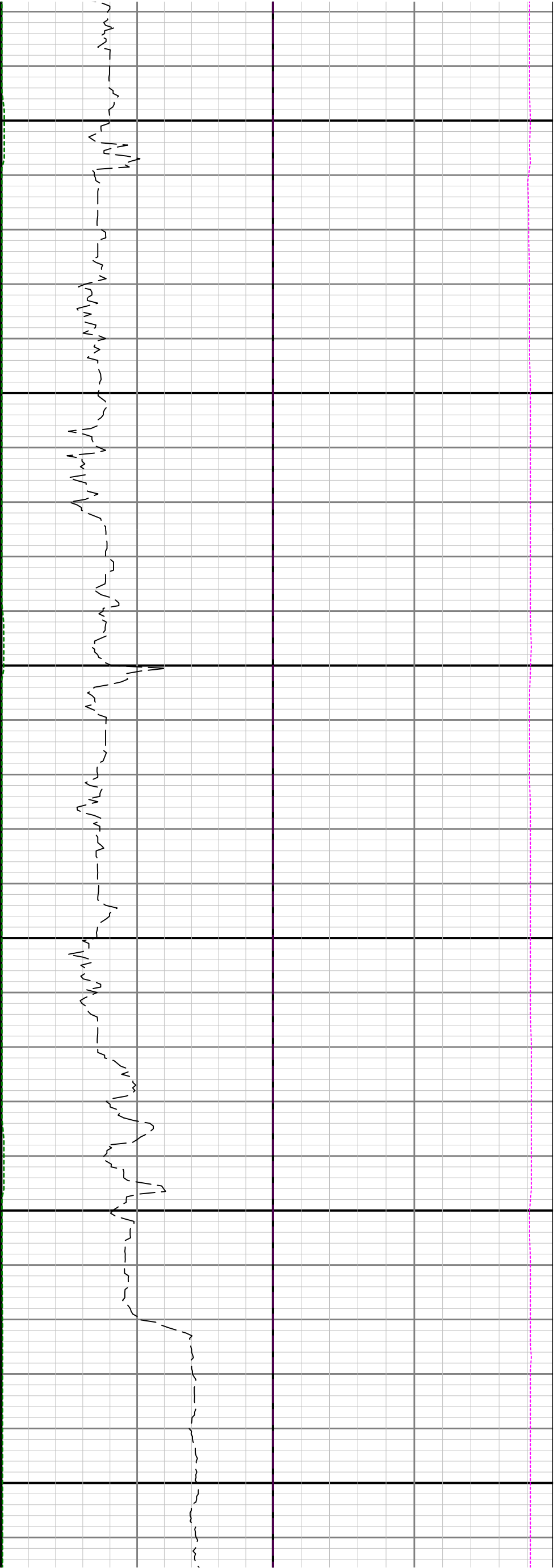
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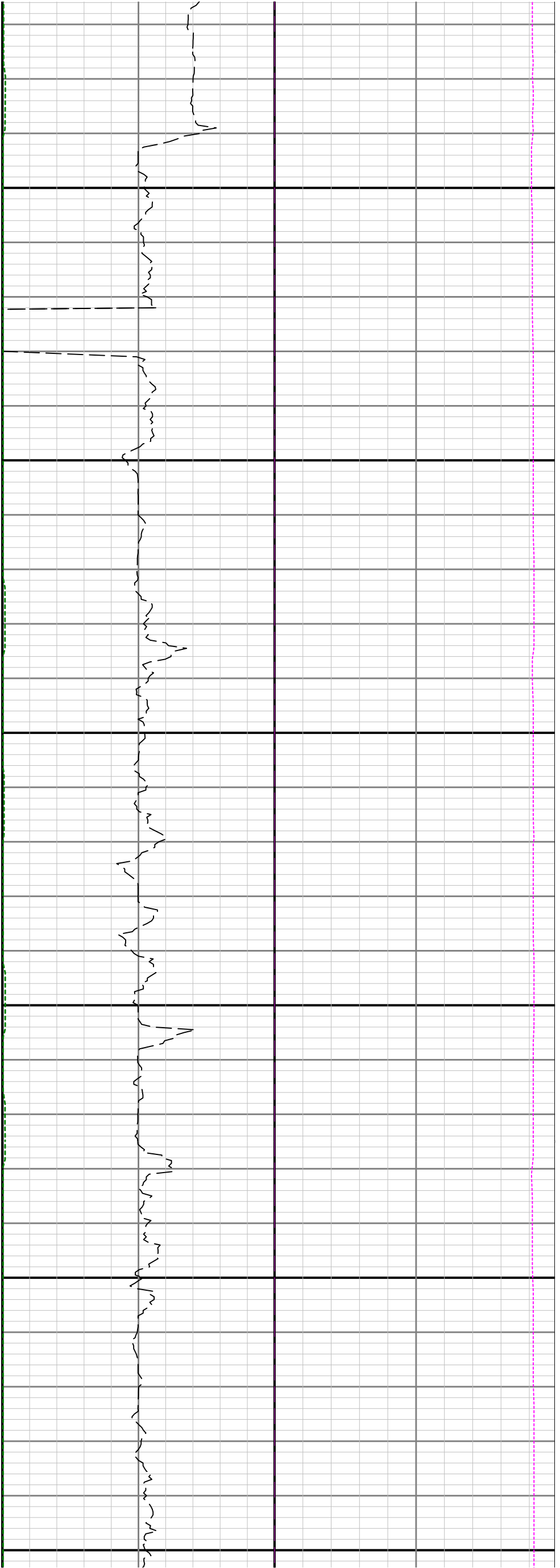
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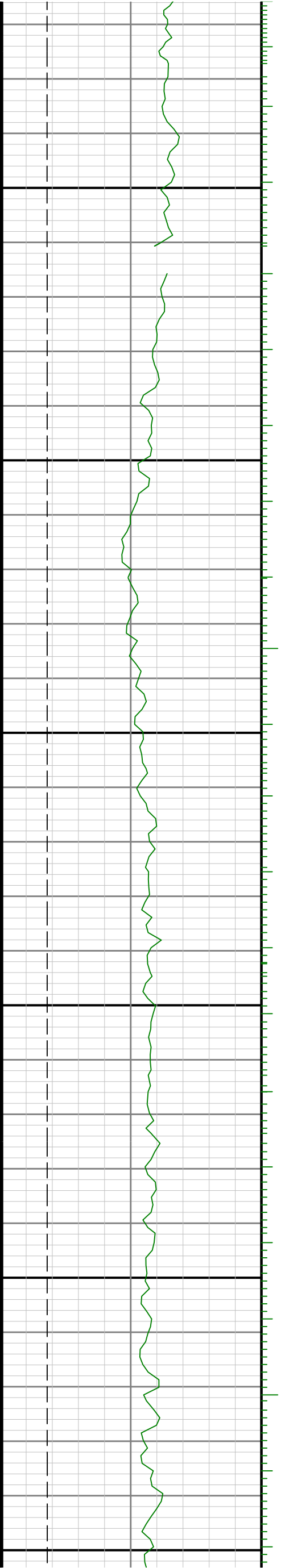


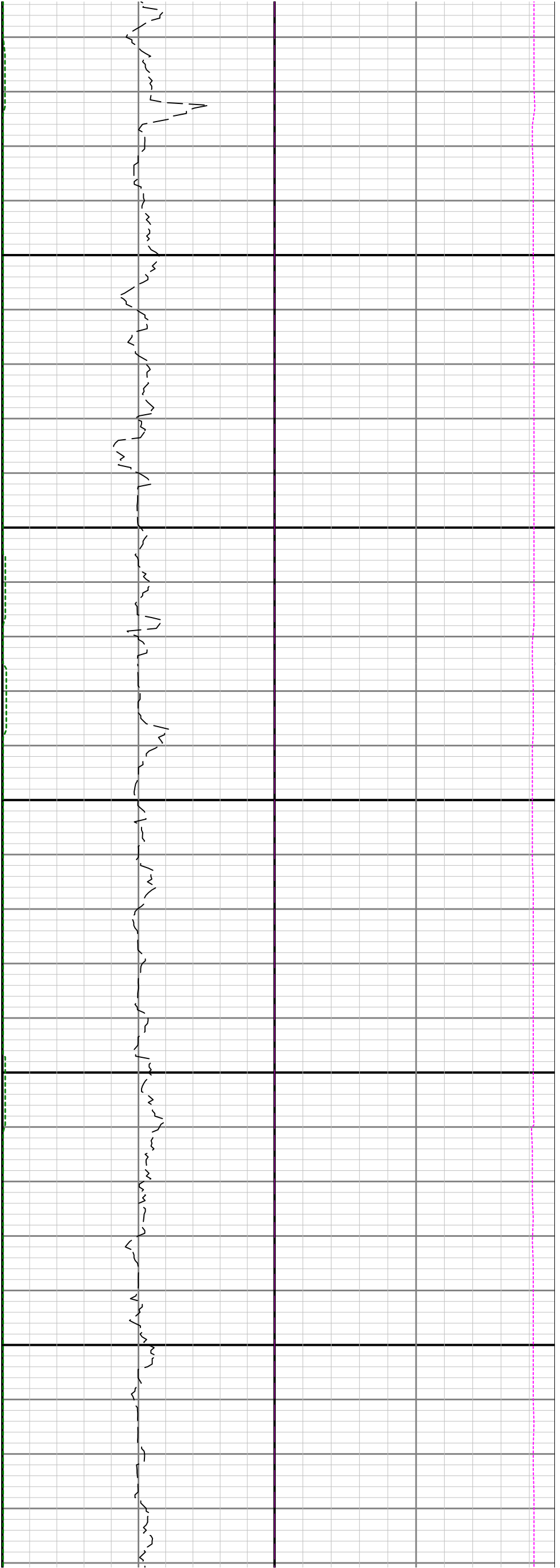


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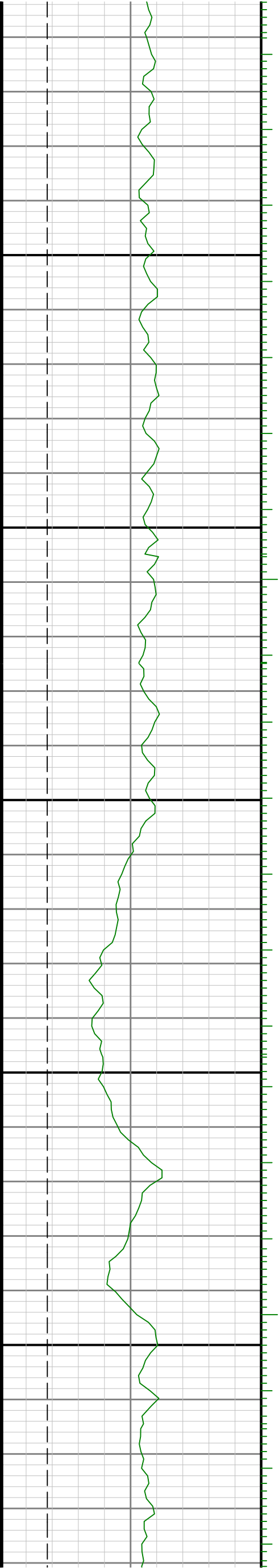
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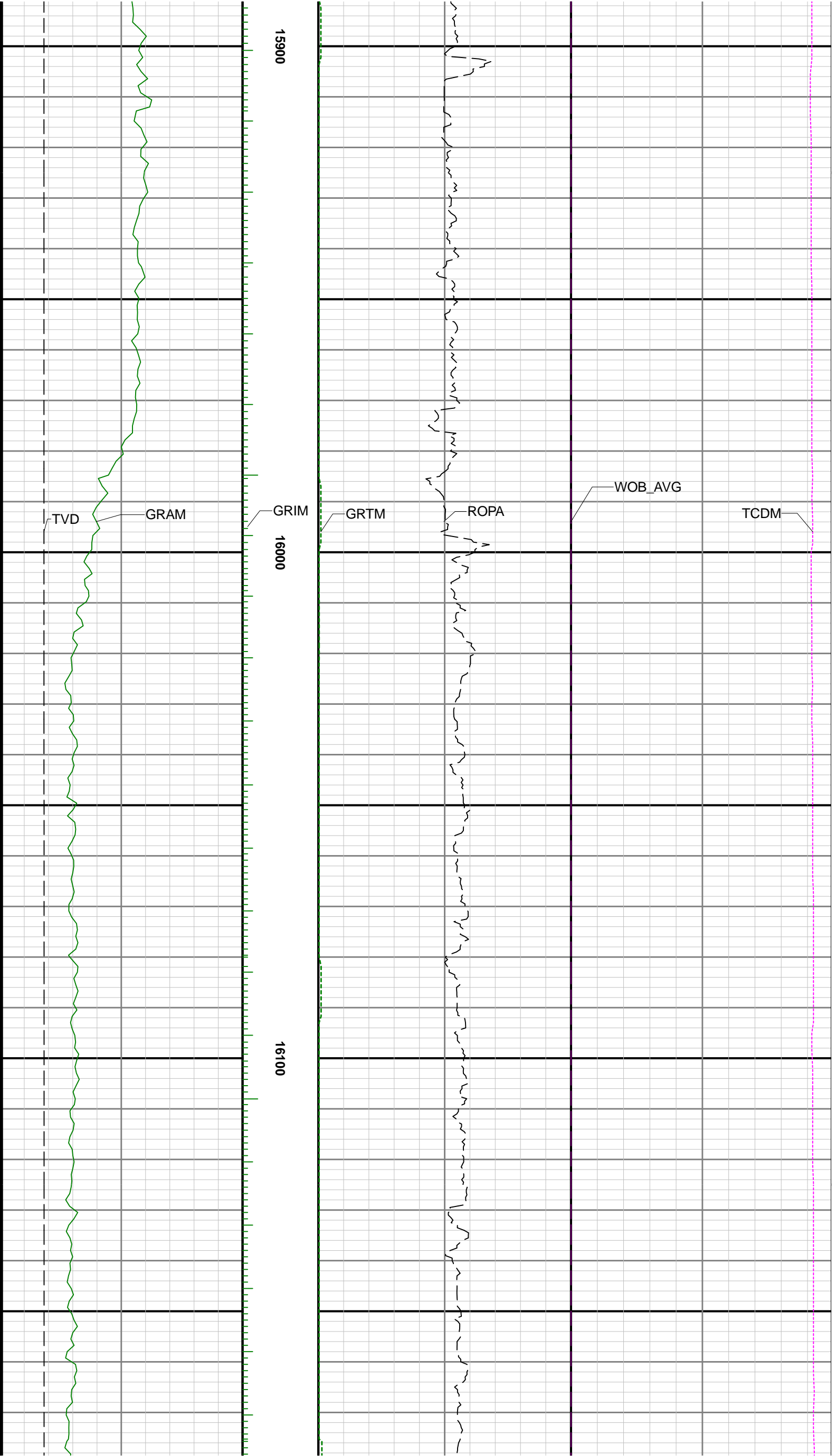


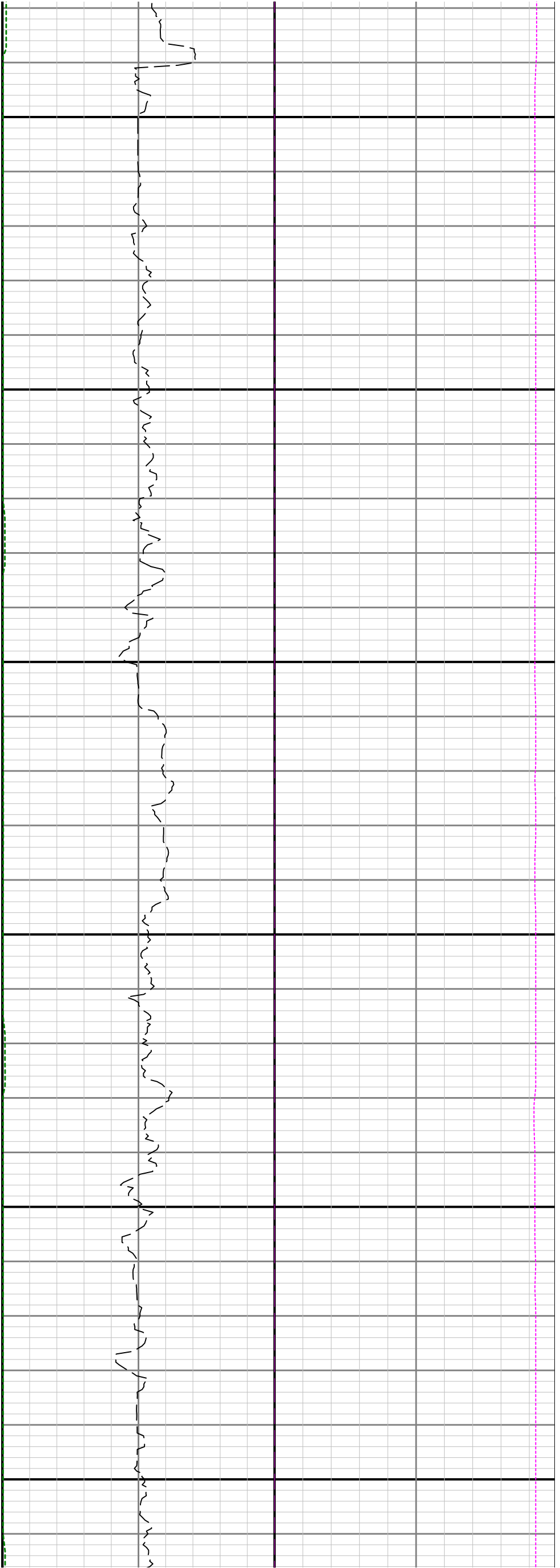


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15800



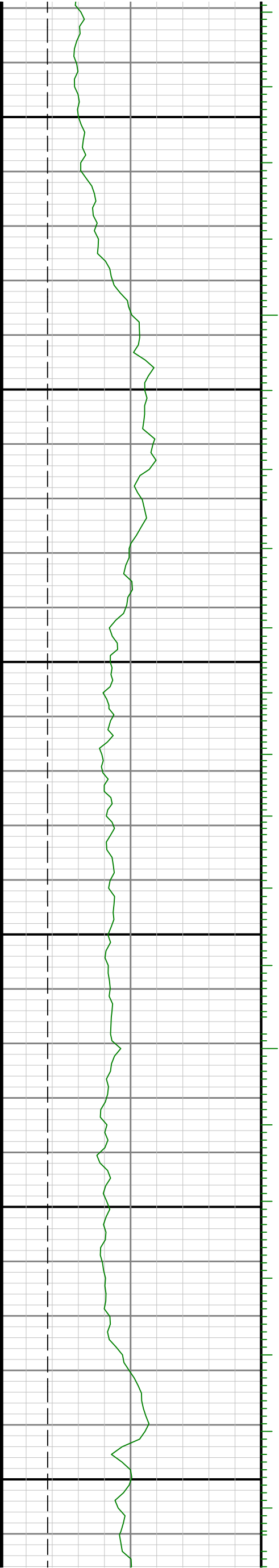


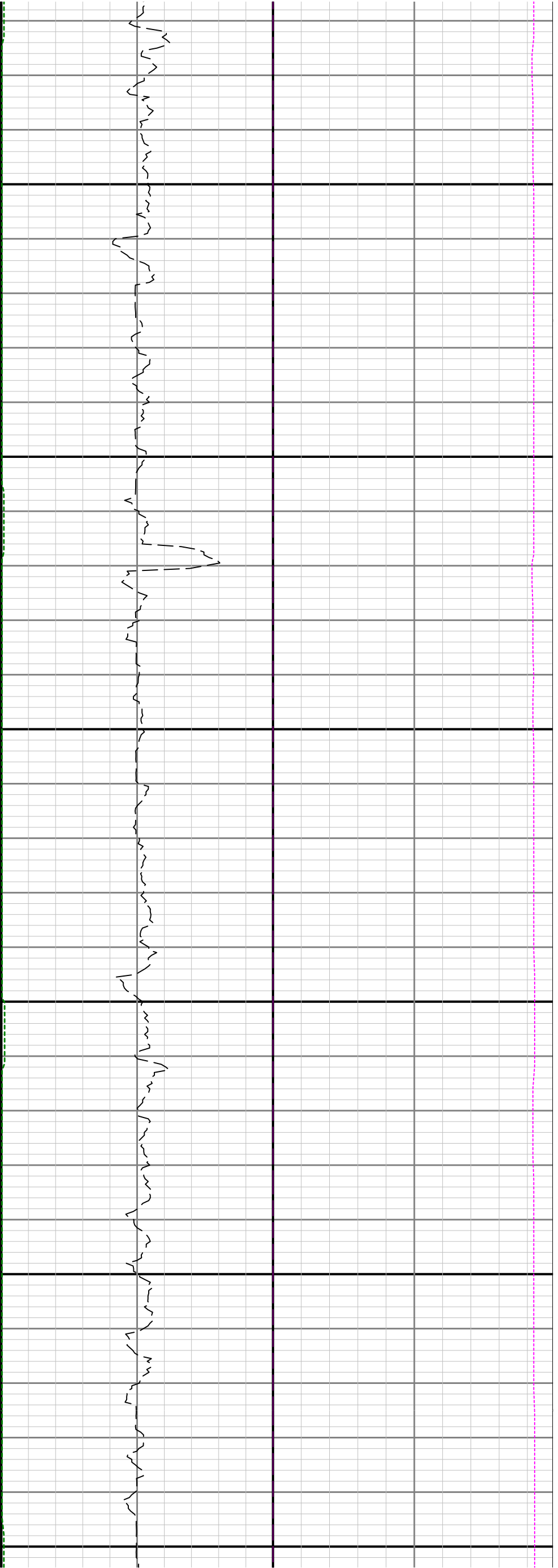


16200

16300

16400

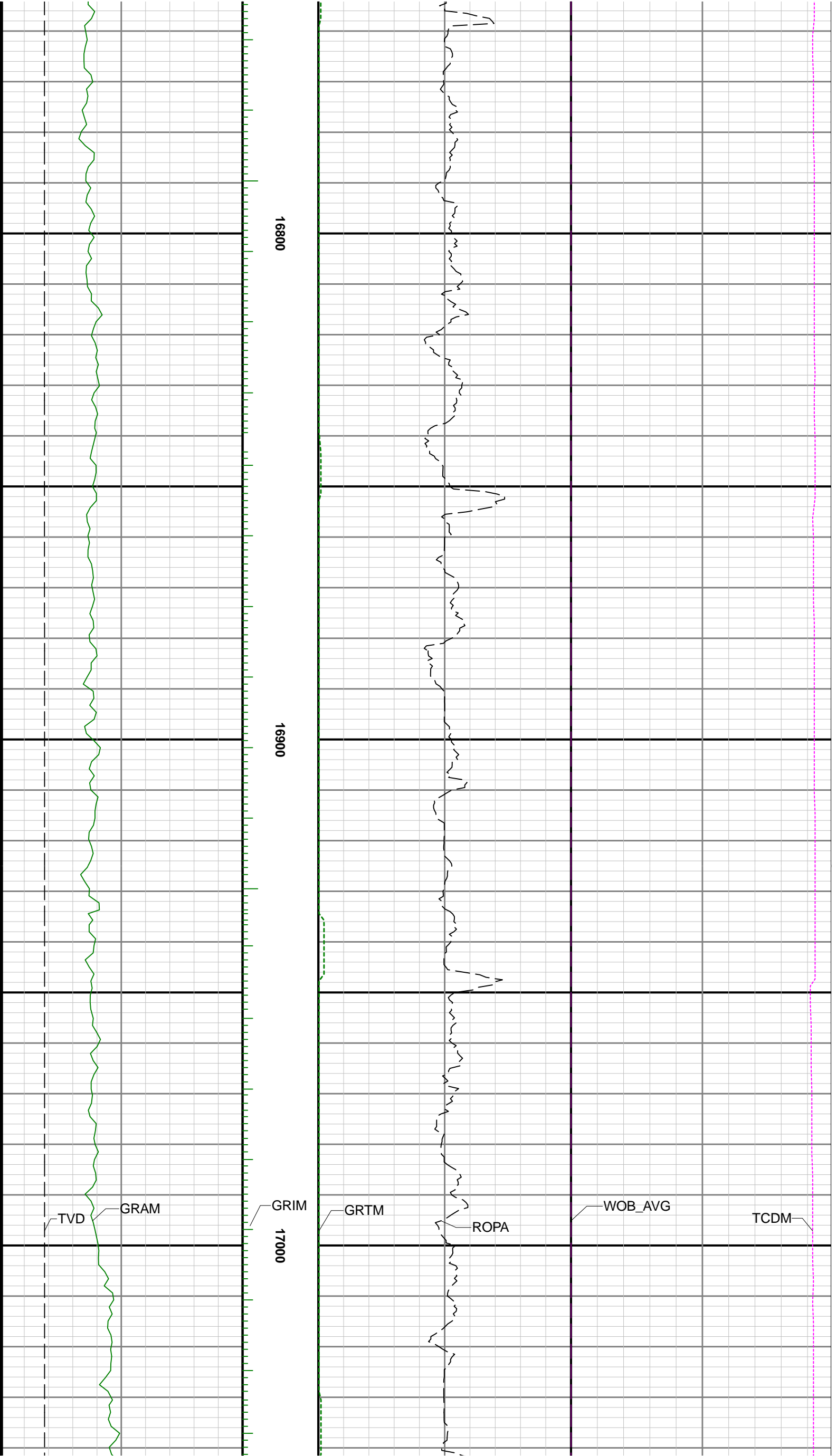


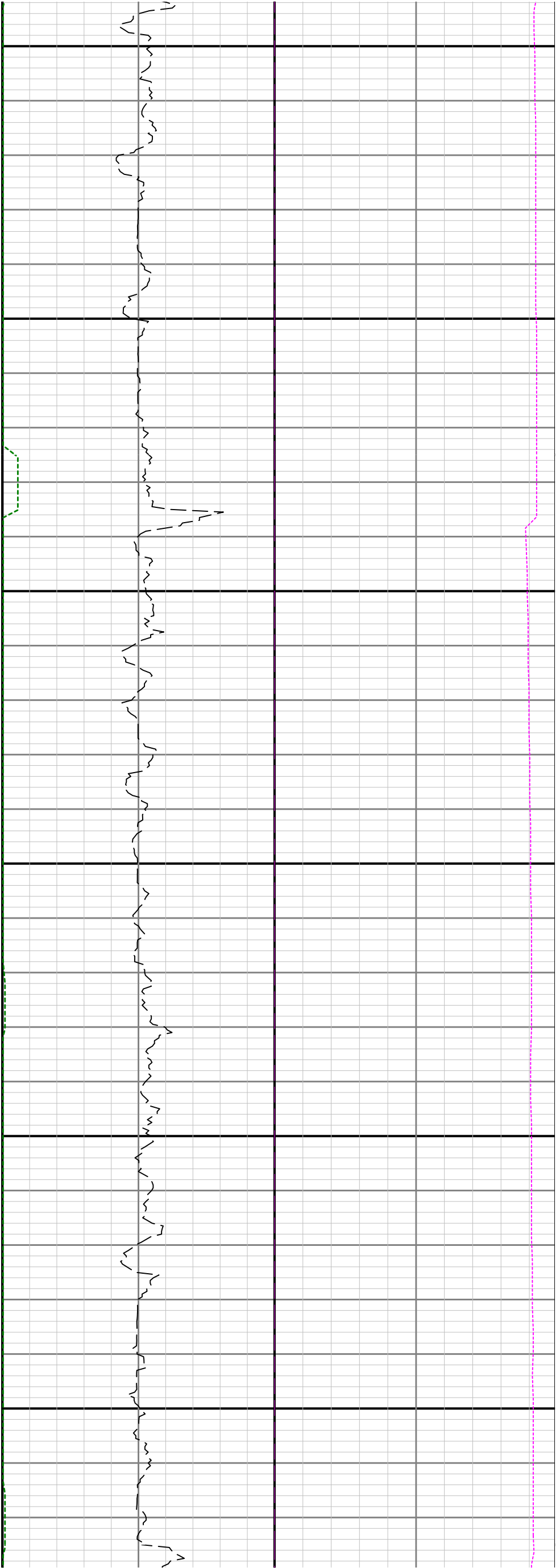


16500

16600

16700

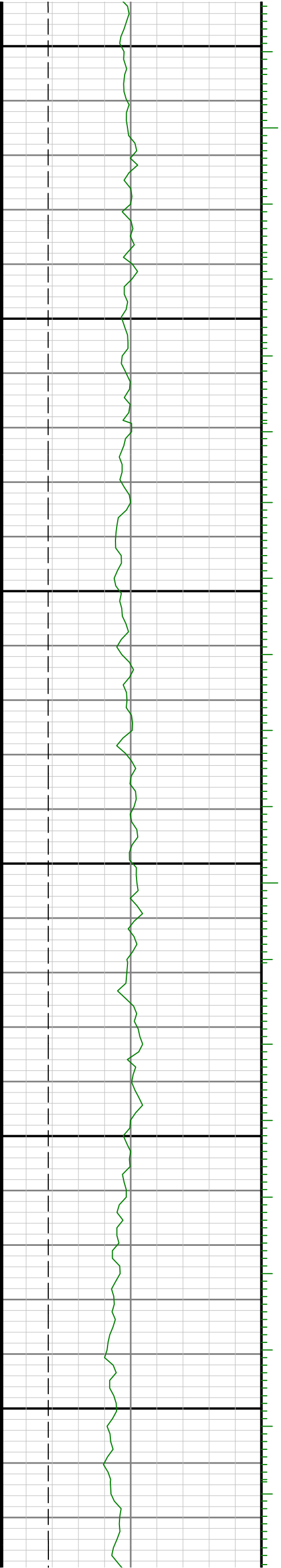


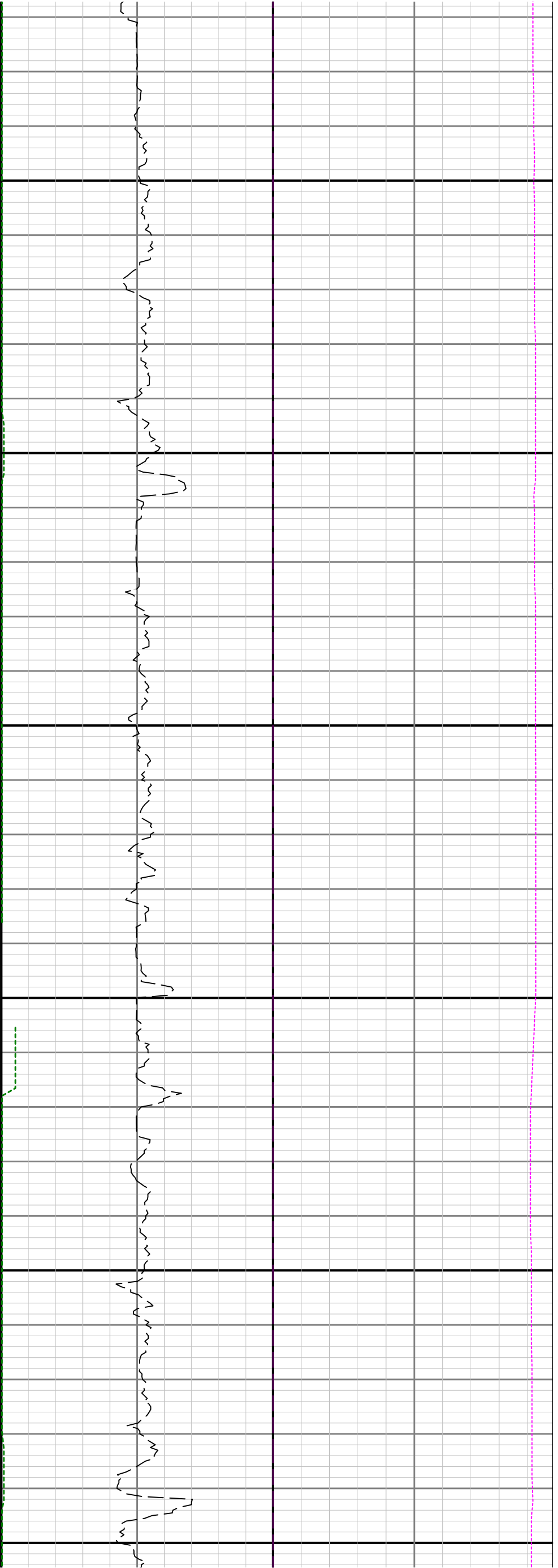


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17200

17300



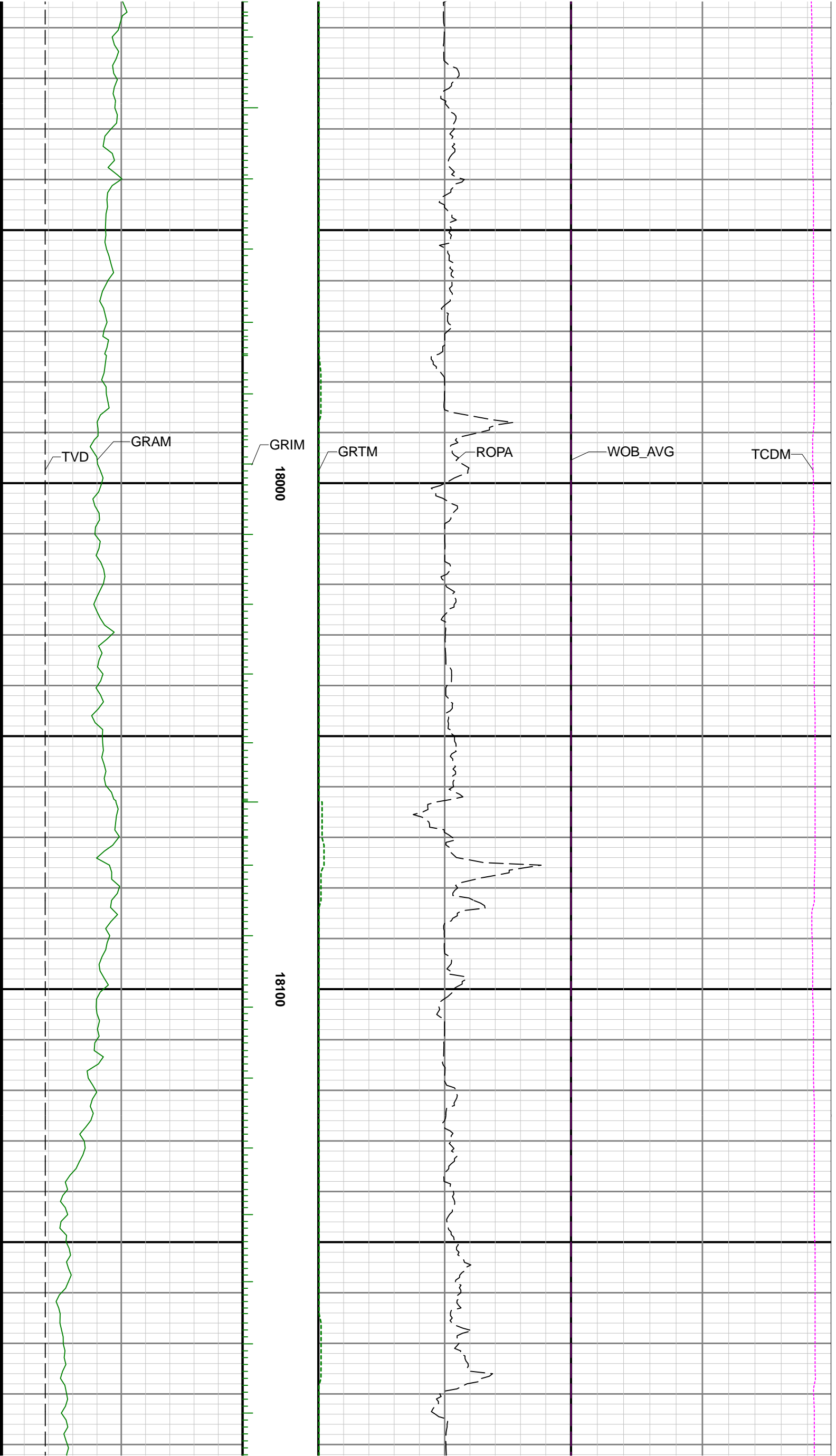


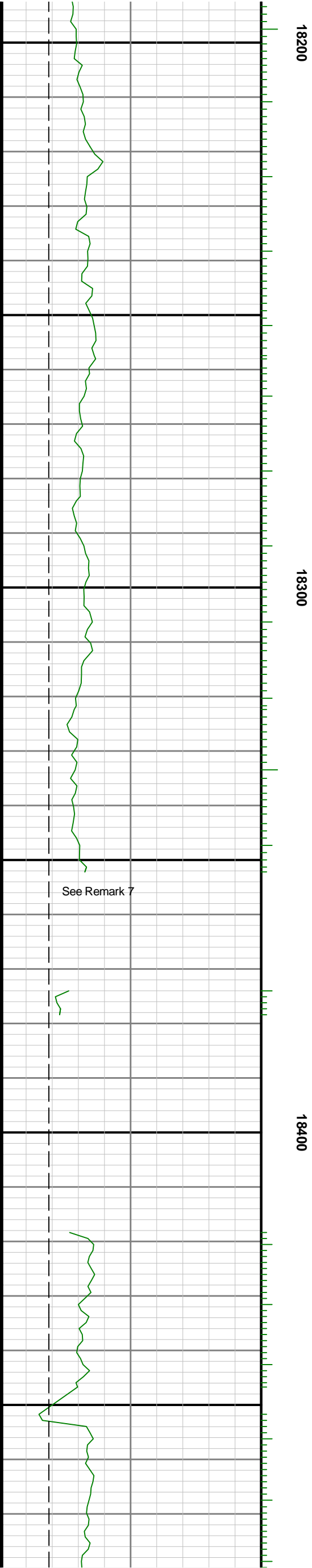
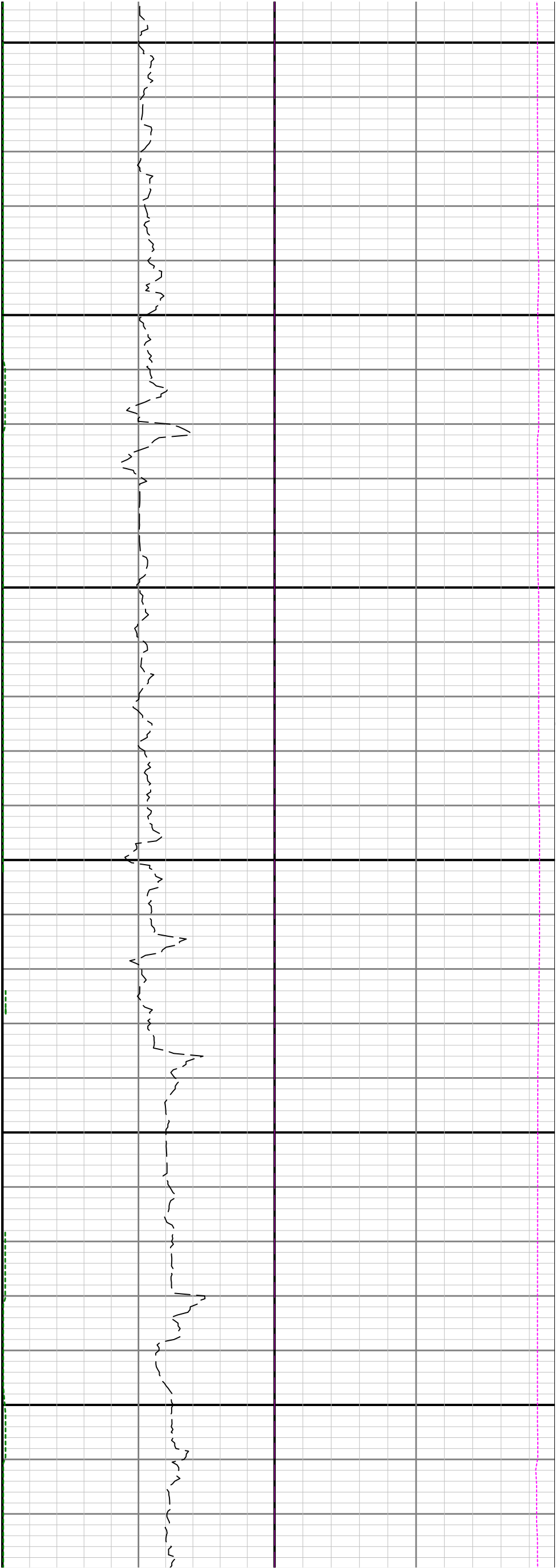
17700

17800

17900

See Remark 6







18500

18600

18700

