



Real Time Log

Natural Formation Evaluation
Gamma Ray

Scale:

Company: Anadarko E & P Company LP

Well: Howard 30C-29HZ

Field: Wattenburg

State: Colorado Country: United States

Status:

FIELD PRINT

API Number:
05123379110000

Surface Location:

Latitude: 40° 0' 30.784" N

Longitude: 104° 55' 20.474" W

Other Services:

Directional
VSS

Permanent Datum (P.D.): Ground Level Elevation: 5031.00 ft.

Log Measured From: Kelly Bushing 25.00 ft. Above P.D.

Depth Reference: Driller's Depth Elevations: KB: 5056.00 ft. DF: 0.00 ft. GL: 5031.00 ft.

Interval Logged

Dates

Magnetic Field Reference

Top: 7250.0 ft. Date From: 18 Jul 14 Dip Angle: 66.36° Azi Reference North: True

Bottom: 15596.0 ft. Date To: 28 Jul 14 Total Mag to Reference

Spud Date: 17 Jul 14 Field Strength: 52697.8 nT North Correction: 8.42°

Borehole Record

Casing Record

Hole Size	From	To	Size	Weight	From	To
13.500 in.	Surface	1025.0 ft.	9.625 in.	36.00 lb/ft	Surface	1011.0 ft.
8.750 in.	1011.0 ft.	8162.0 ft.	7.000 in.	26.00 lb/ft	Surface	8161.0 ft.
6.125 in.	8162.0 ft.	15596.0 ft.				

Mud Record

Deviation Record

Type	From	To	Hole Size	Interval	Inc / Az (Start)	Inc / Az (End)
Water Based	1011.0 ft.	8162.0 ft.	8.750 in.	7151.0 ft.	0.2° / 141.1°	76.1° / 0.2°
Water Based	8162.0 ft.	15596.0 ft.	6.125 in.	7434.0 ft.	76.1° / 0.2°	89.7° / 0.8°
					/	/
					/	/
					/	/
					/	/

Acquisition System

Software Version

Other

Advantage	2.20U4	Rig / Contractor:	Precision 595	/ Precision Drilling
PATS	6.4.1.34	Job No.:	6502596	/ D&E
		District / Unit:	RMD	

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Log Run Summary

LWD	BHA	Bit	Bit	Bit	Bit	Assembly	Logged Interval		Bit Depth Interval		Date / Time				Circ.
Run	Run	Run	Size	Type	Gauge	Type	Top	Bottom	From	To	Start		End		Time
No.	No.	No.	(in.)		(in.)		(m.)	(m.)	(m.)	(m.)					(hrs.)
1	1	1	8.750	PDC	4.000	Steer Bent Sub	7250.0	8116.0	7250.0	8162.0	18 Jul 2014	13:00	21 Jul 2014	07:00	44.3
2	2	2	6.125	PDC	3.000	Steer Bent Sub	0.0	0.0	0.0	0.0	22 Jul 2014	18:45	23 Jul 2014	14:30	2.5
3	3	2	6.125	PDC	3.000	Steer Bent Sub	8116.0	15542.0	8162.0	15596.0	23 Jul 2014	14:45	28 Jul 2014	11:15	83

Crew

Name	Arrive	Depart	Name	Arrive	Depart	Name	Arrive	Depart
	Wellsite	Wellsite		Wellsite	Wellsite		Wellsite	Wellsite

Dale Miranda	13 Jul 14	15 Jul 14				Ely Danner	13 Jul 14	16 Jul 14
Robert Roberts	13 Jul 14	21 Jul 14				Jason Cross	13 Jul 14	28 Jul 14
John Nguyen	16 Jul 14	28 Jul 14				Mark Snyder	16 Jul 14	28 Jul 14
Robert G. Klos	22 Jul 14	28 Jul 14						

Mud Properties Record

Date / Time		LWD Run No.	Measured Depth (ft.)	Mud Type	Density (lb/gal)	Viscosity (s/qt)	pH	Fluid Loss (cc)	Oil / Water	Source	Total Chlorides (mg/L)	K+ (%)
18 Jul 14	09:00	1	1011.0	Water base	8.5	28	8.8	N/A	0/100	Active Suction Line	500	N/A
19 Jul 14	09:30	1	4875.0	Water base	9.0	31	8.9	N/A	0/96	Active Suction Line	1600	N/A
20 Jul 14	10:30	1	7998.0	Water base	9.9	50	9.6	N/A	1/91	Active Suction Line	1800	N/A
21 Jul 14	10:30	2	8161.0	Water base	10.2	44	9.2	N/A	2/90	Active Suction Line	1800	N/A
22 Jul 14	09:30	2	8161.0	Water base	9.2	40	9.3	N/A	1/94	Active Suction Line	1900	N/A
23 Jul 14	09:00	3	8161.0	Water base	9.2	41	9.3	N/A	1/94	Active Suction Line	1700	N/A
25 Jul 14	12:00	3	11635.0	Water base	9.6	44	9.2	N/A	4/89	Active Suction Line	1800	N/A
26Jul 14	10:00	3	13227.0	Water base	9.6	50	9.3	N/A	4/89	Active Suction Line	1800	N/A
27 Jul 14	10:00	3	15362.0	Water base	9.9	55	9.2	N/A	4/87	Active Suction Line	1800	N/A
28 Jul 14	09:00	3	15362.0	Water base	10.0	58	9.2	N/A	4/87	Active Suction Line	1800	N/A

Mnemonics

Curve	Description	Units
GRAX	Gamma Ray Apparent, 0.5 ft. Avg	API
GRIX	Gamma Ray Data Density	Points
GRSI	Gamma Ray Sliding Indication	Unitless
GRTX	Gamma Ra Time Since Drilled	Mins
ROPA	Rate of Penetration, 3.0 ft. Avg	ft/hr
TCDX	Downhole Temperature	degF
TVD	True Vertical Depth	ft
WOBA	Surface Weight on Bit, 1.0 ft. Avg	klbs

Equipment and Service Data

LWD Run No.	Tool	Serial Number	Measurement	Bit Offset (m.)	Max O.D. (in.)	Min I.D. (in.)
1	DIR	12440860	Directional	48.20	6.750	3.250
1	SRIG	12131401	Gamma	44.83	6.750	3.250
2	DIR	12373456	Directional	51.81	4.750	1.847
2	SRIG	10341993	Gamma	48.43	4.750	1.847
3	DIR	12373463	Directional	52.22	4.750	2.003
3	SRIG	12622668	Gamma	48.84	4.750	2.026

Service and Tool Mnemonics

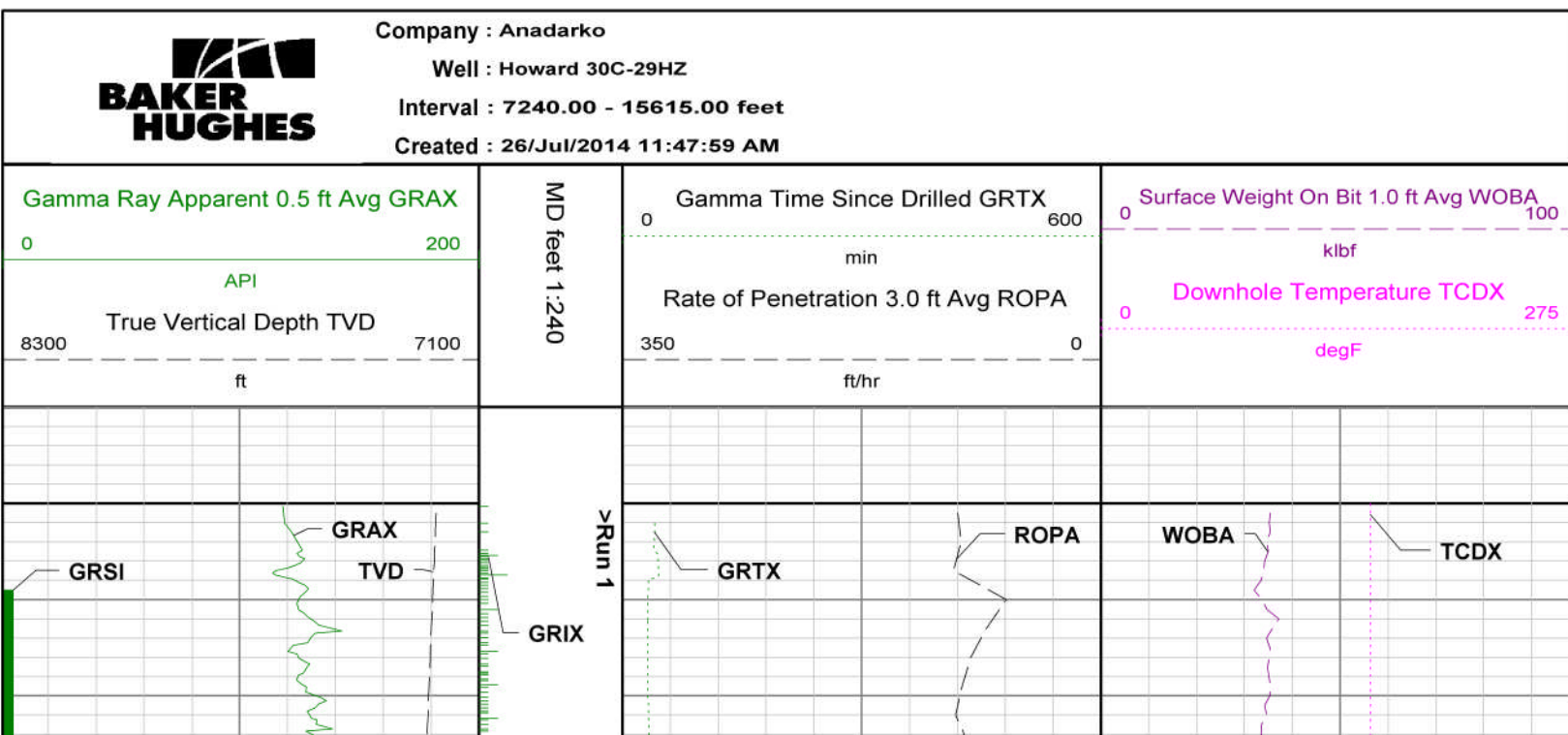
Mnemonic	Name	Description
DIR	Directional	Wellbore directional survey
SRIG	Inclination and Gamma	Probe based gamma ray and inclination module

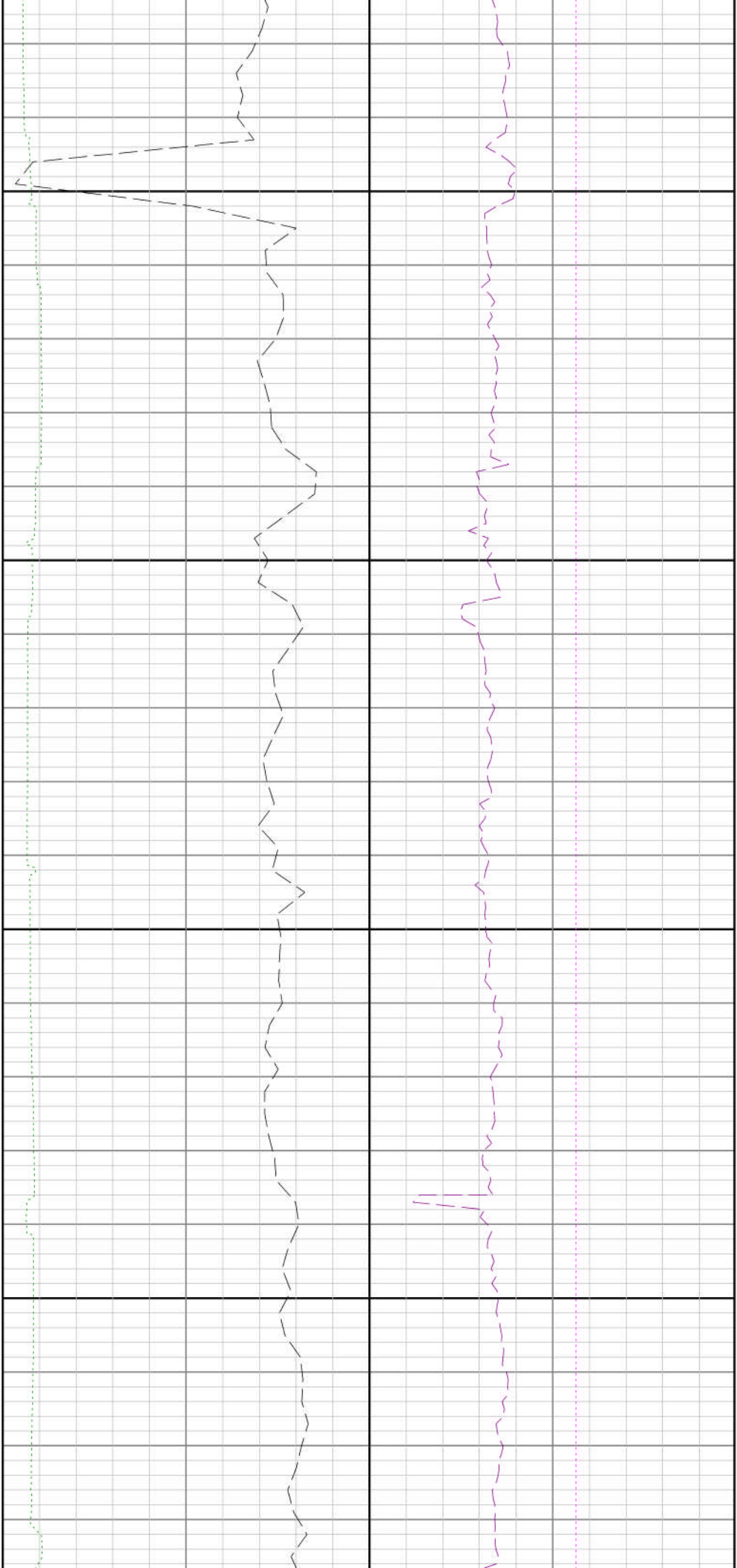
Comments

1. Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes INTEQ. Due to lack of control by Baker Hughes INTEQ logging engineers, depth calibrations and measurements could not be independently verified and the unverified depths as supplied to INTEQ are being used to represent logging data.
2. A sliding indicator is shown on the left side of track 1 as a heavy line. This indicator has been shifted to the gamma ray sensor offset to correspond with gamma ray data acquired while sliding.
3. Baker Hughes runs 1 utilized a 6.75 inch Navigamma (Gamma Ray and Directionl) tool behind a 8.75 inch bit and steerable assembly from 911 feet to 8162 feet MD (910.99 feet to 7799.24 feet TVD.)
4. Baker Hughes run 2 did not log Gamma or Footage due to an MWD Tool Failure once on bottom.
5. Baker Hughes run 2 and 3 utilized a 4.75 inch Navigamma (Gamma Ray and Directionl) tool behind a 6.125 inch bit and steerable assembly from 8162 feet to 15596 feet MD (7799.24 feet to 7788.92 feet TVD.)

Remarks

Number	Measured Depth (m.)	Hole Section (in.)	LWD Run No.	Remark
1	7489	8.750	1	GRAX values reached a max value of 261API at 7489 ft. MD (7432.51 ft. TVD) as we drilled through the Sharon Springs Formation.
2	8135	6.125	3	Gamma Ray Apparent from 8116 feet to 8162 feet MD (7790.48 feet to 7799.24 feet TVD) was logged 55.5 hours after being drilled due to tripping out of hole to pick up the Lateral Section Assembly, Casing Operations and another trip out of hole due to an MWD Tool failure as we got to bottom..
3	15575	6.125	3	GRAX, GRIX and GRTX values were not logged from 15542 ft. to 15596 ft. MD (7788.61 ft. to 7419.58 ft. TVD) due to sensor offset from bit.

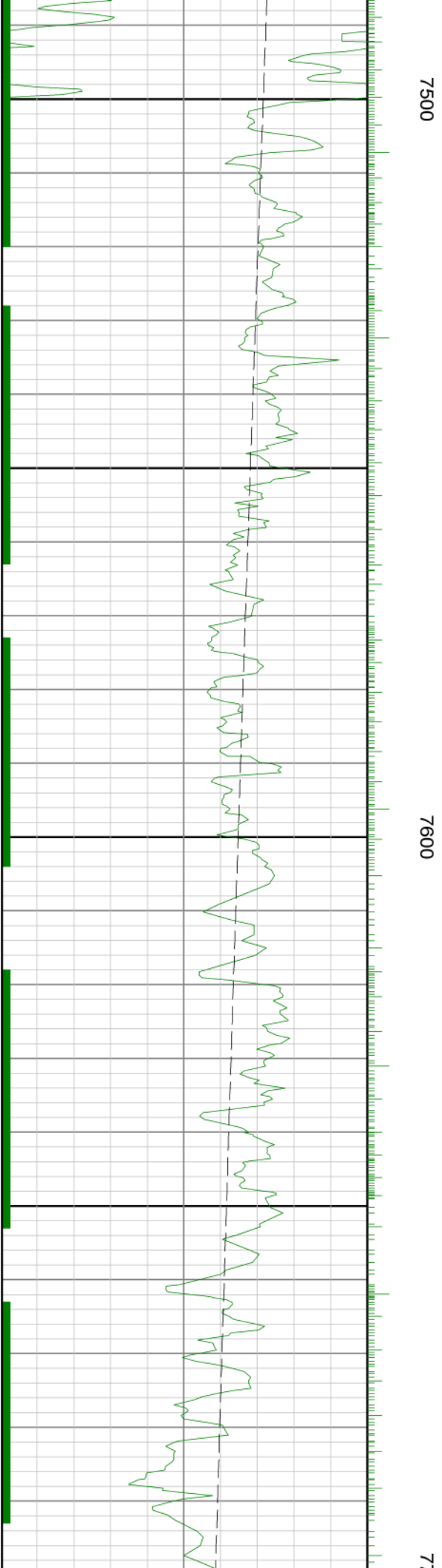
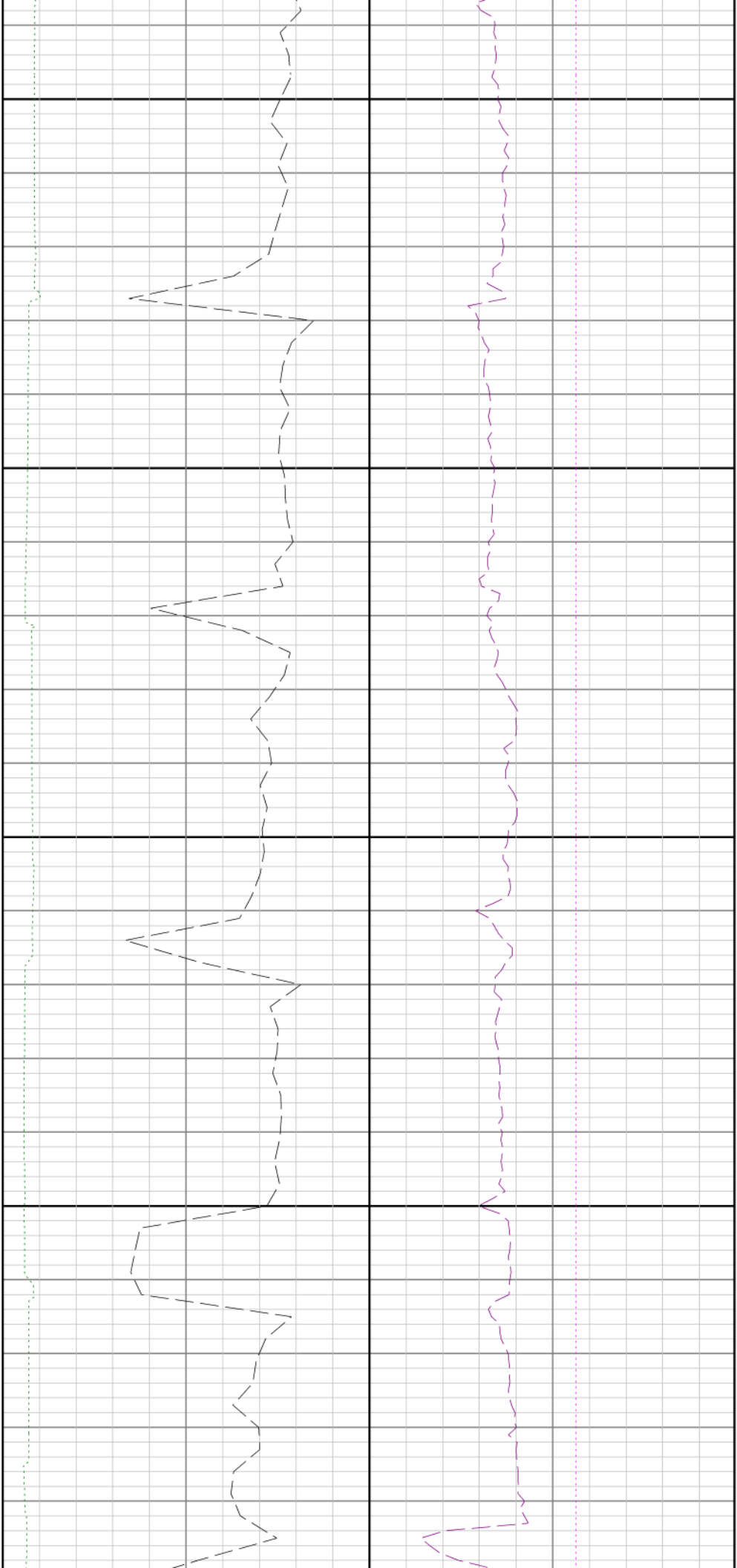


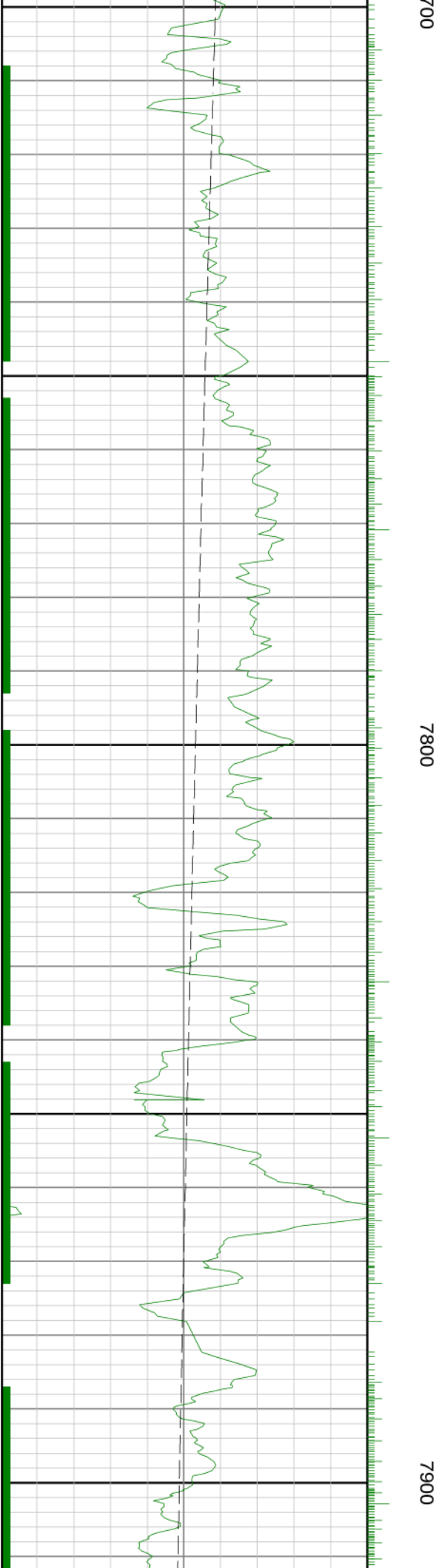
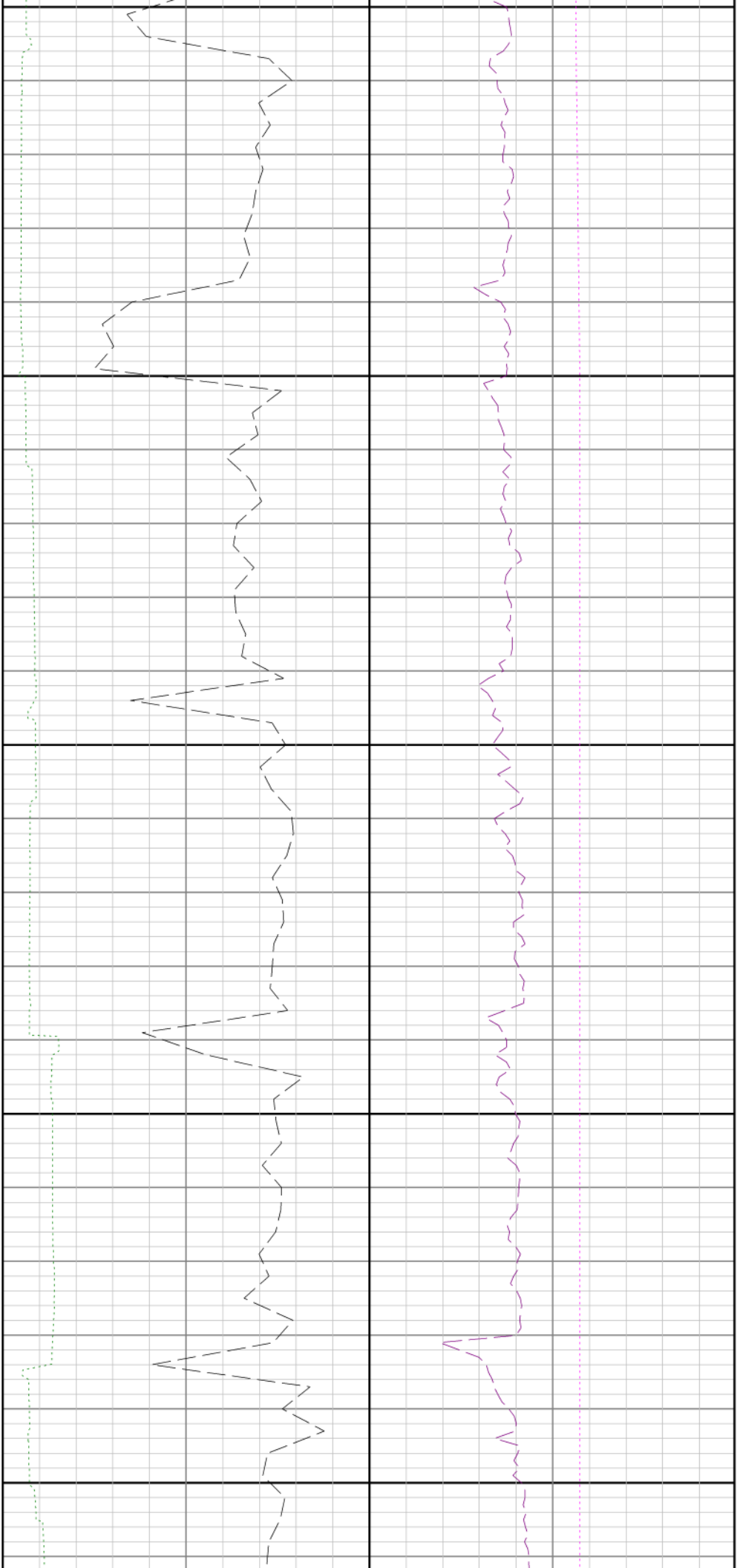


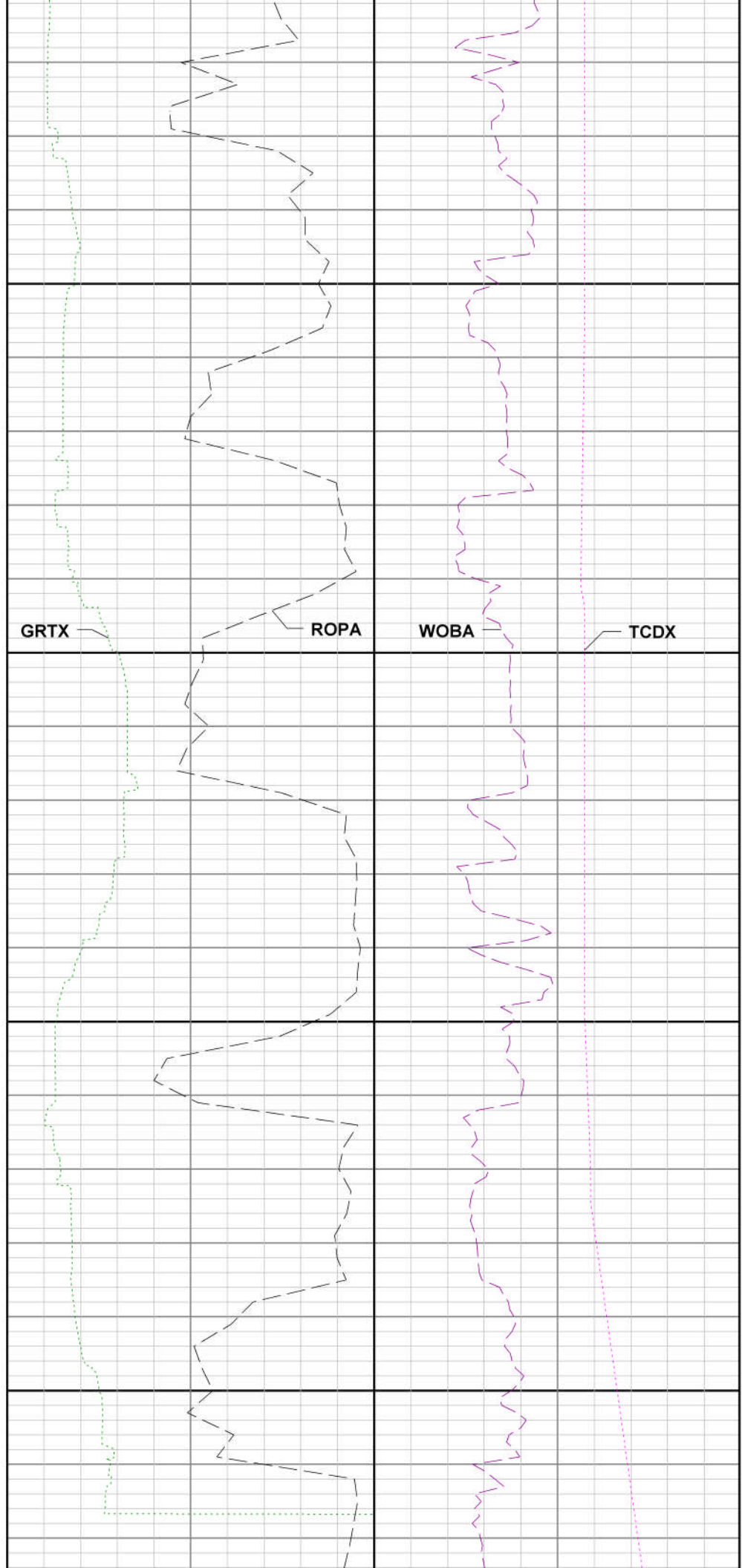
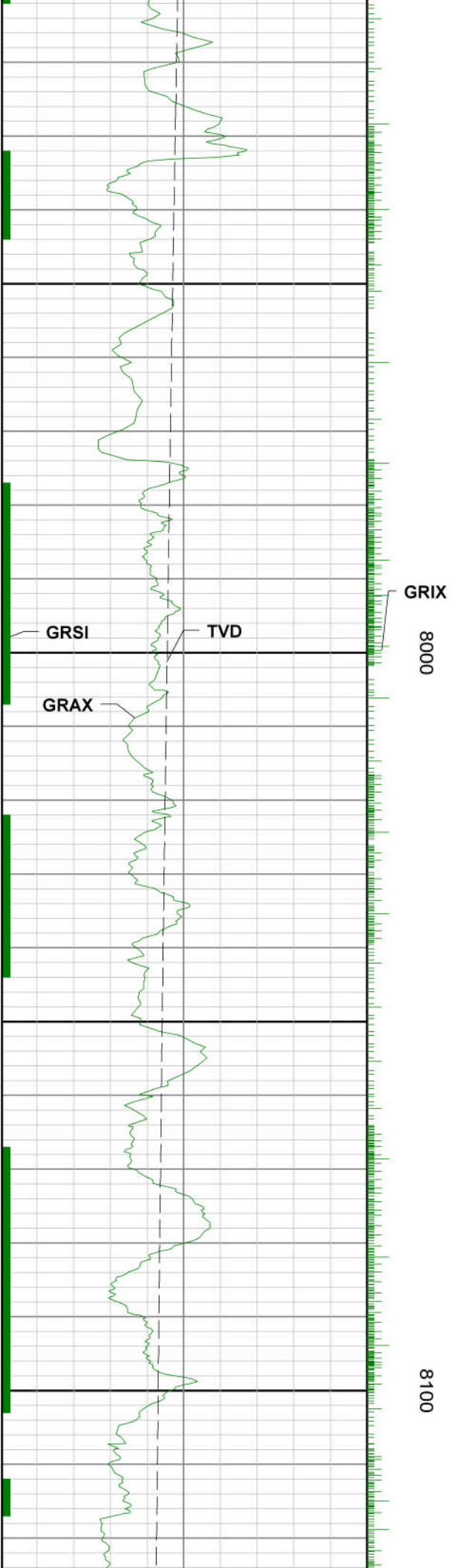
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7400

See Remark 1





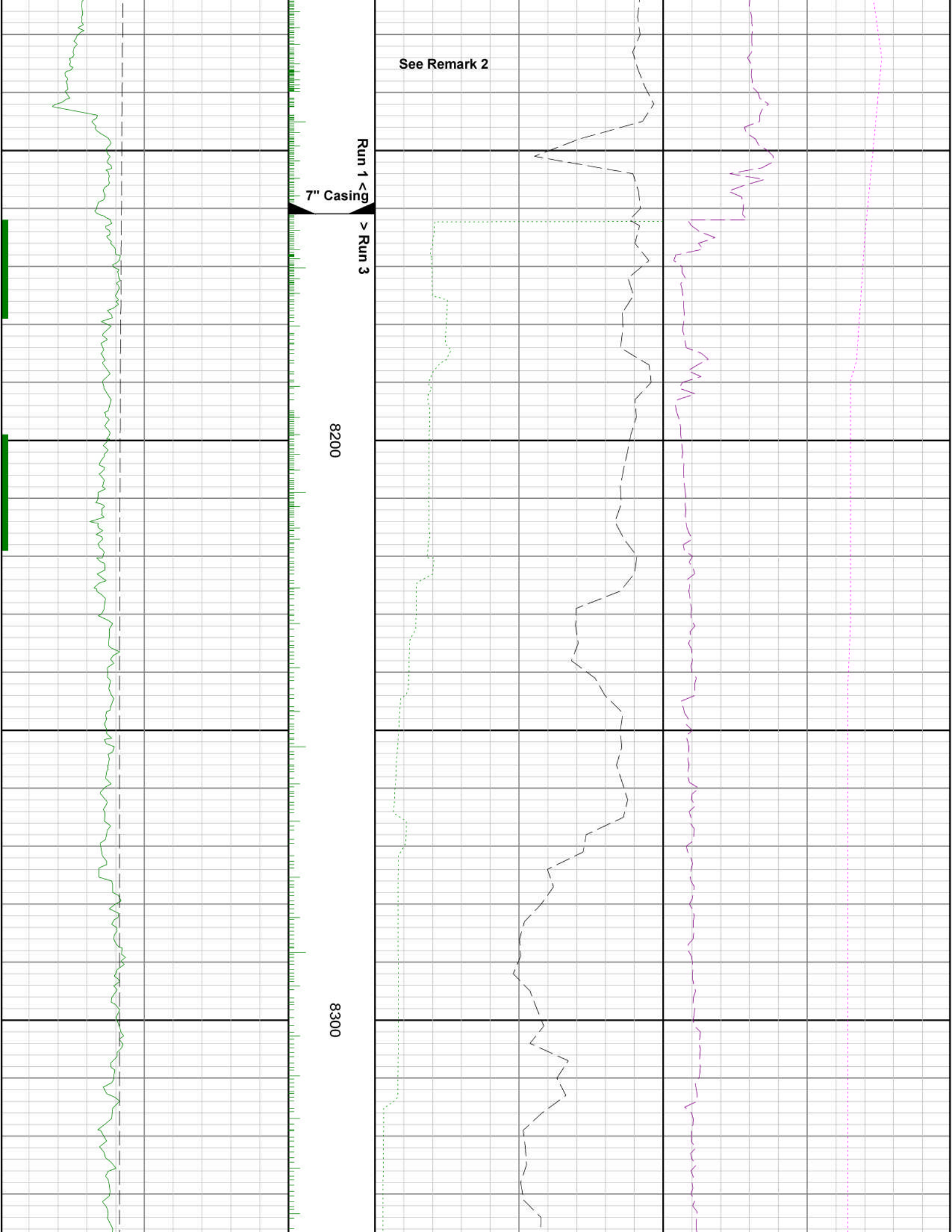


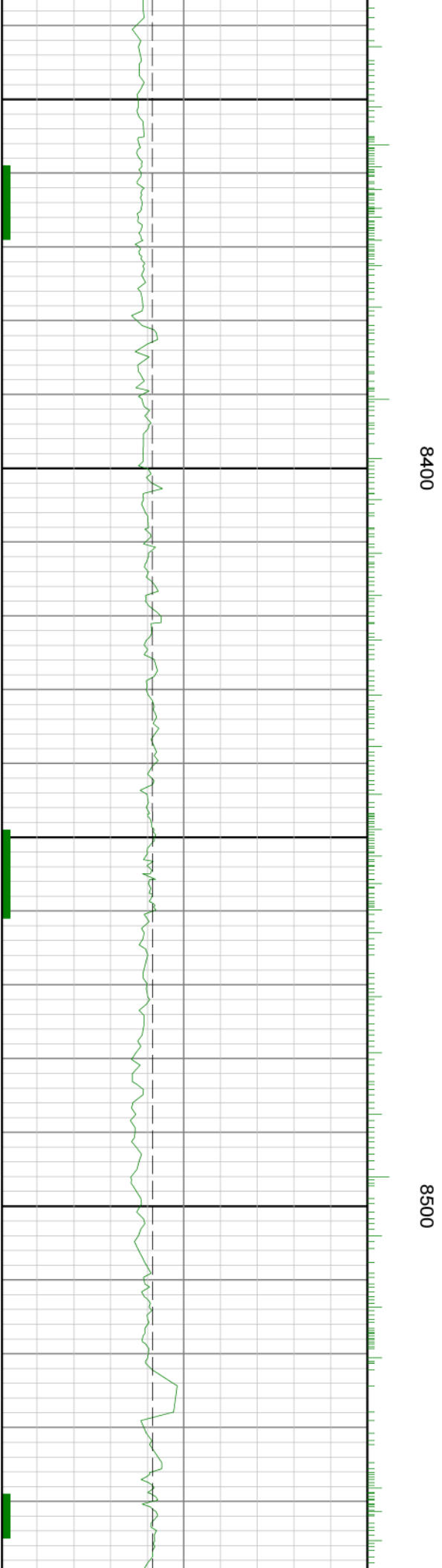
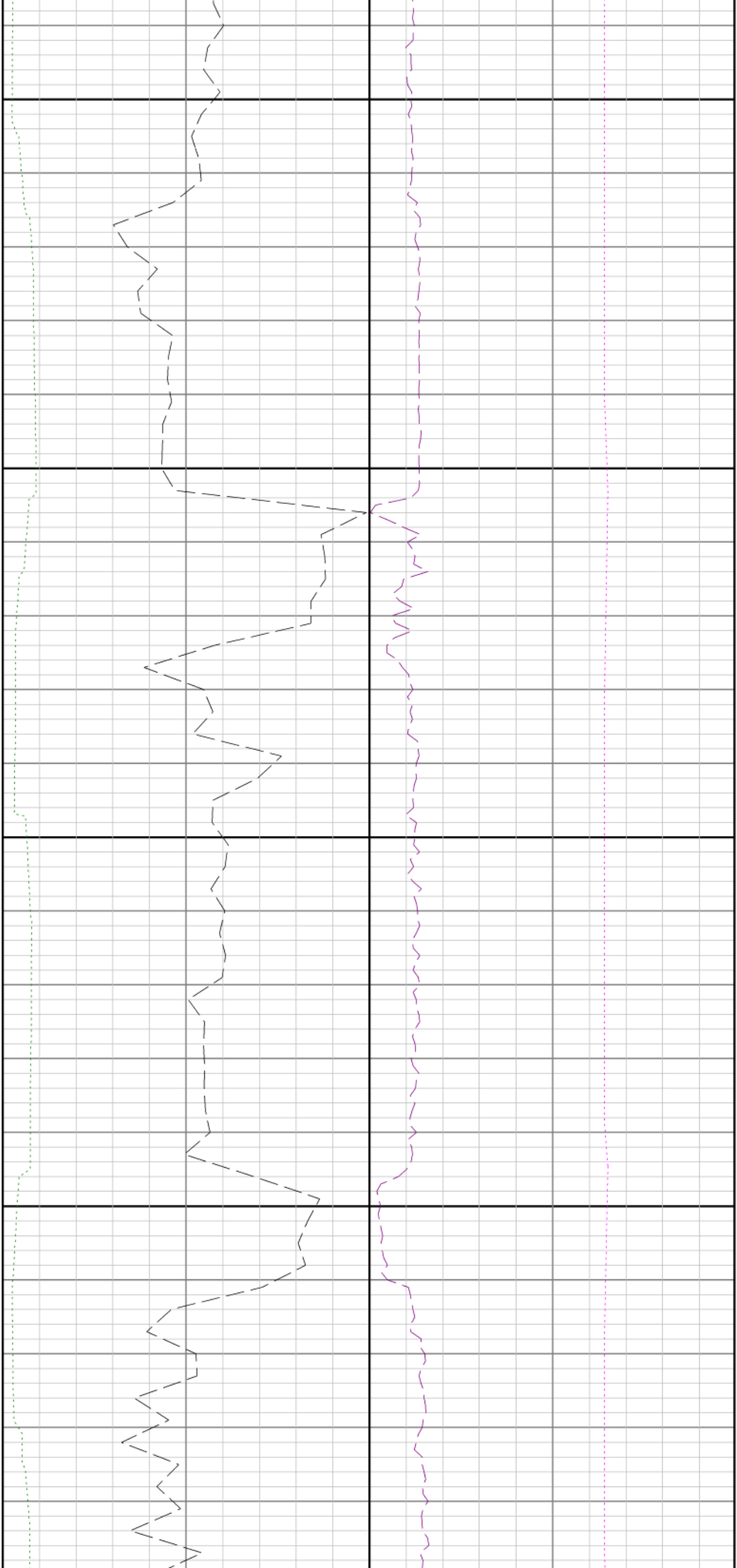
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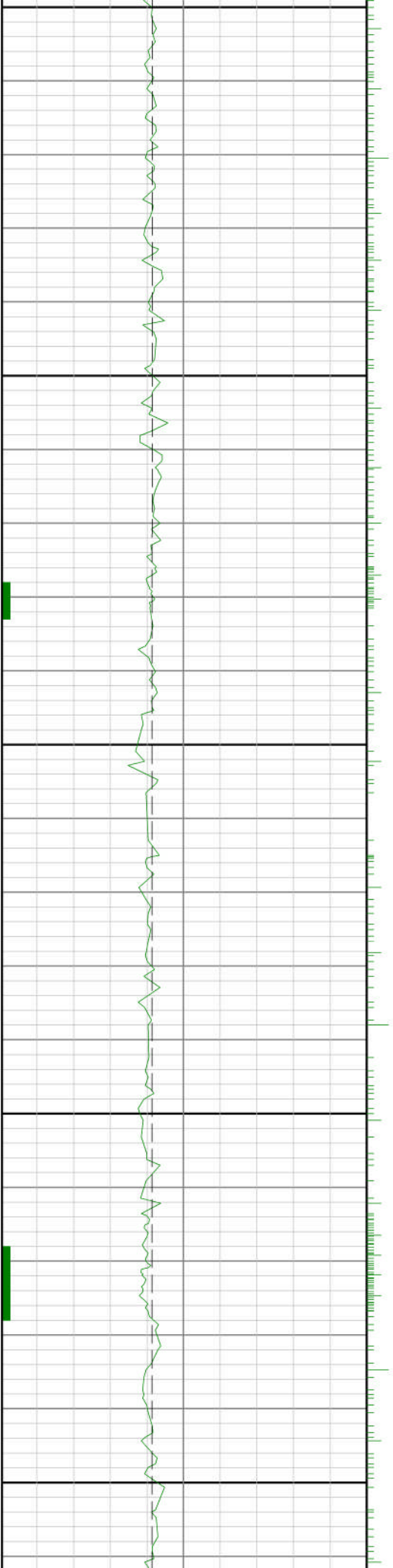
Run 1 < 7" Casing > Run 3

8200

8300

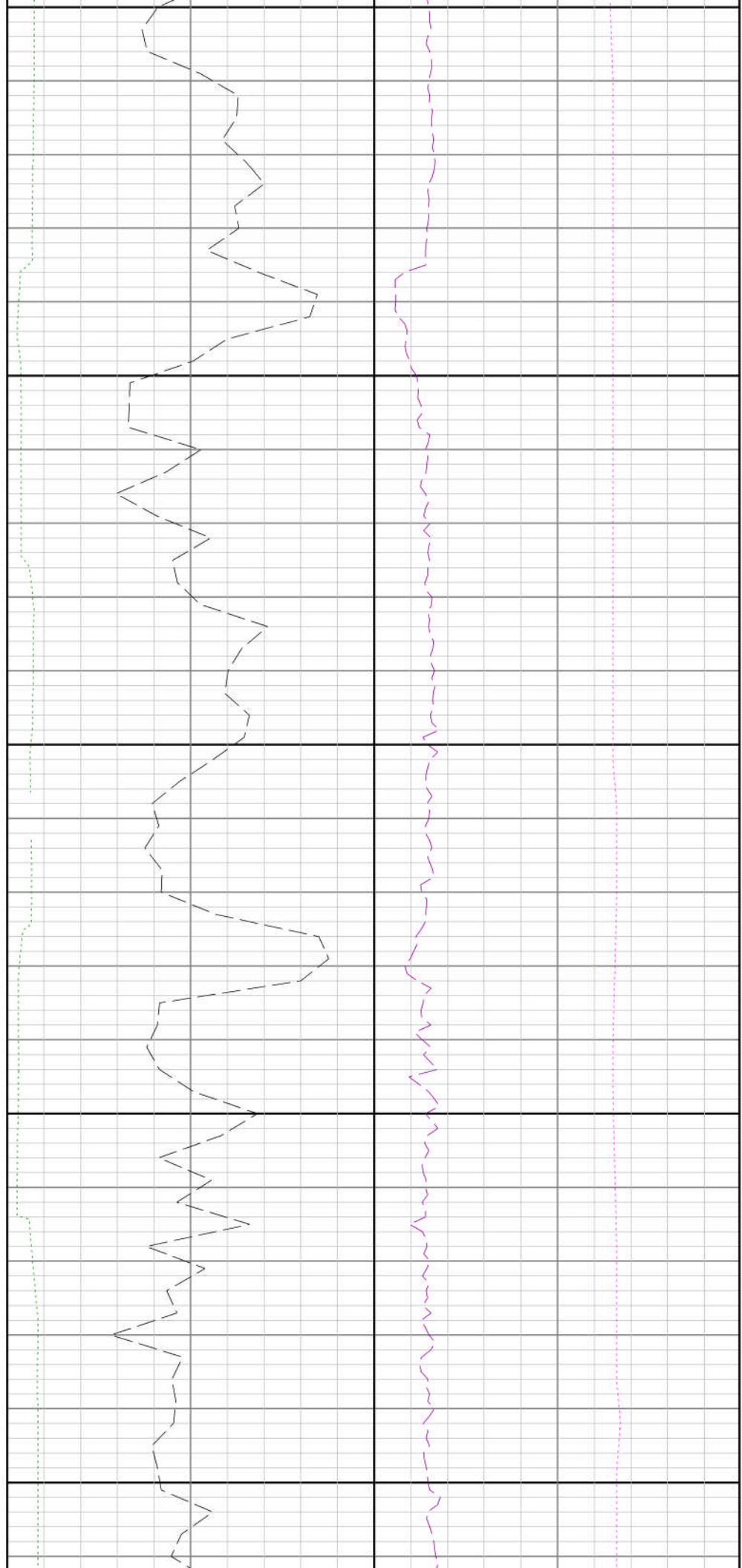


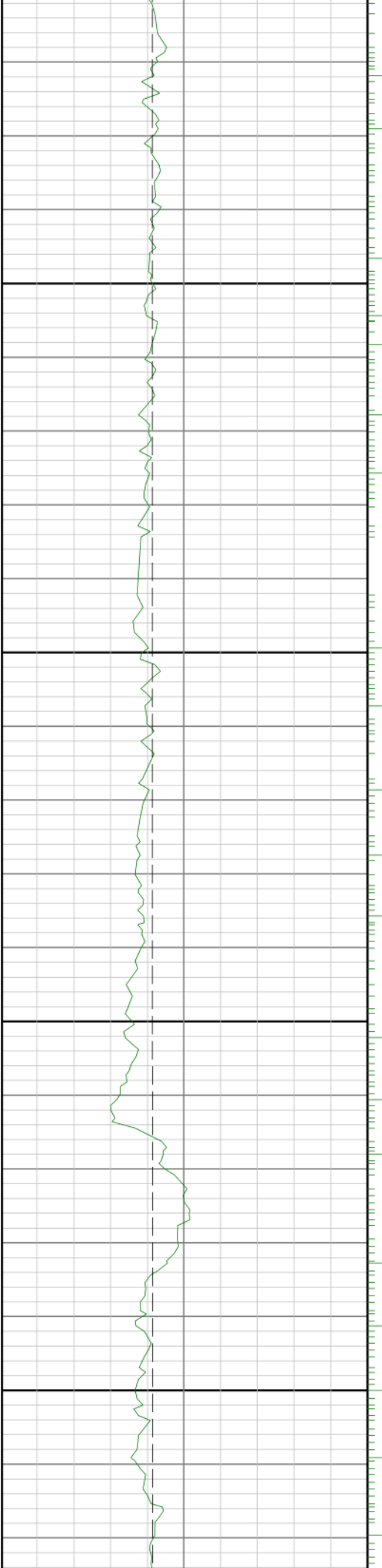




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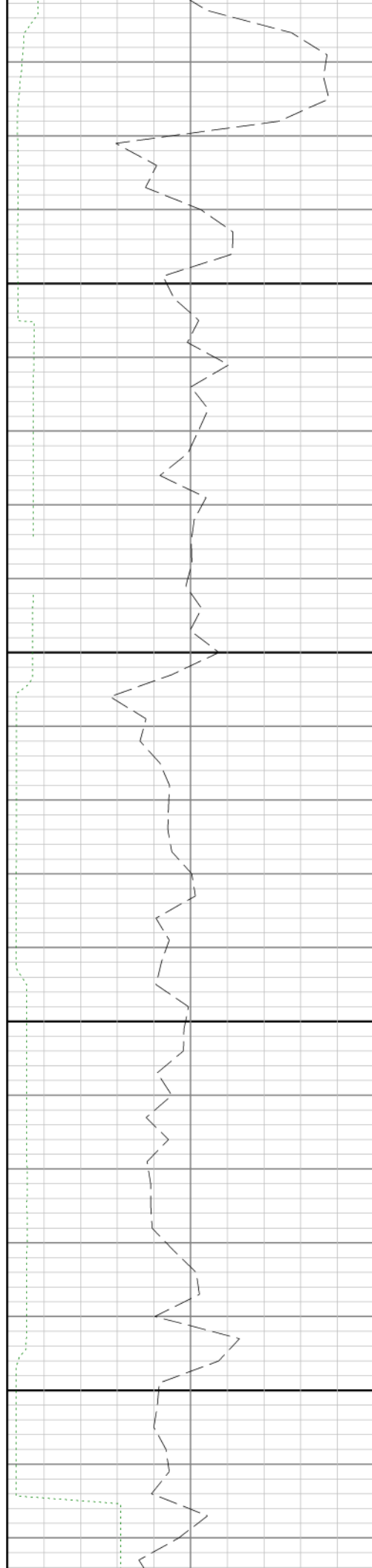
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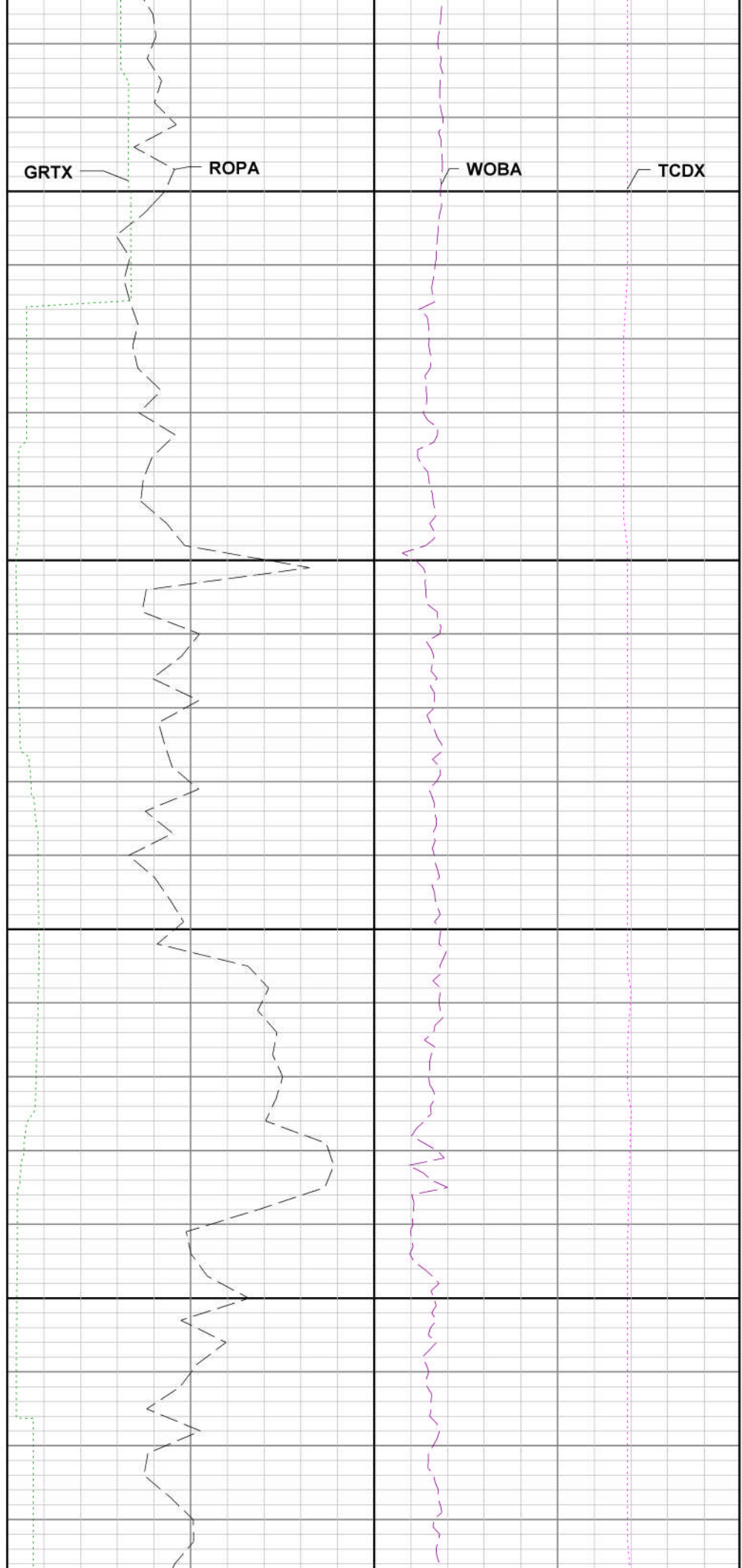
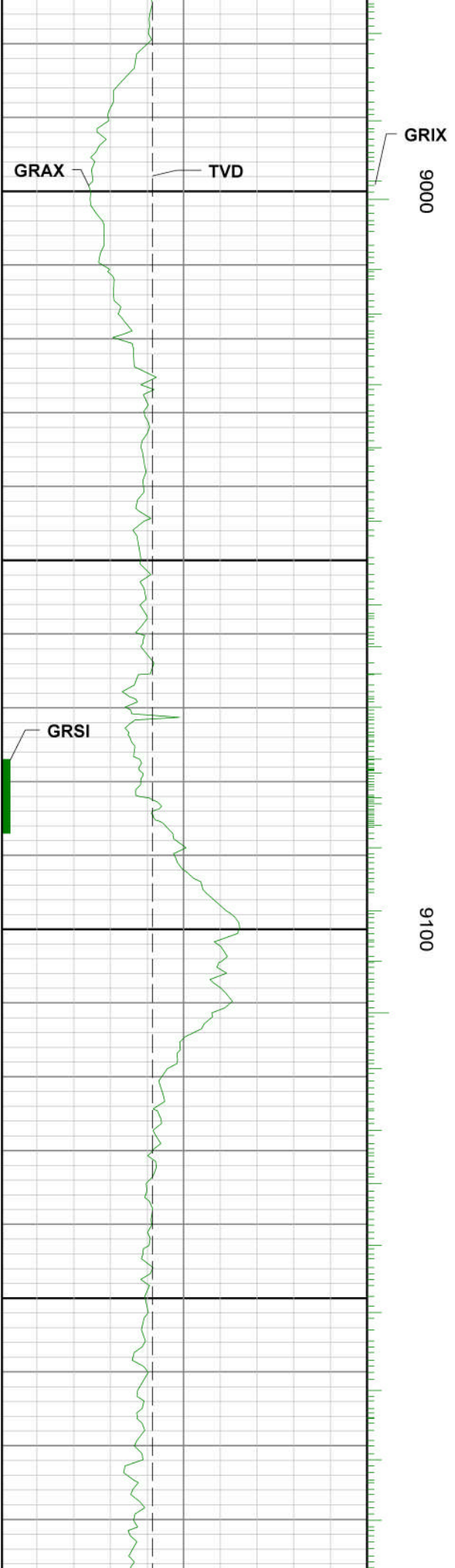


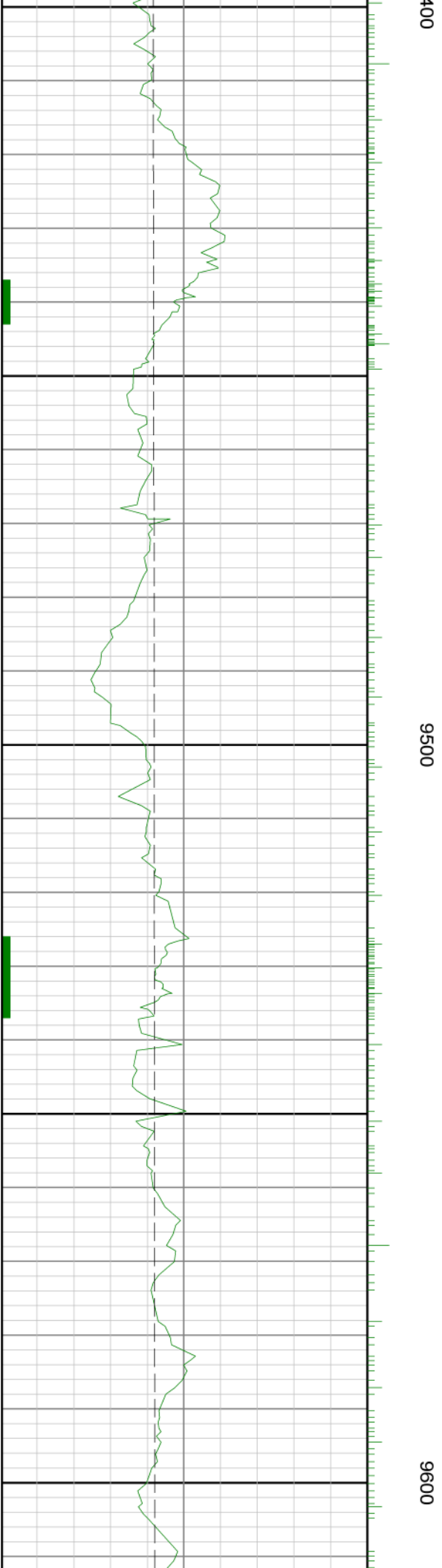
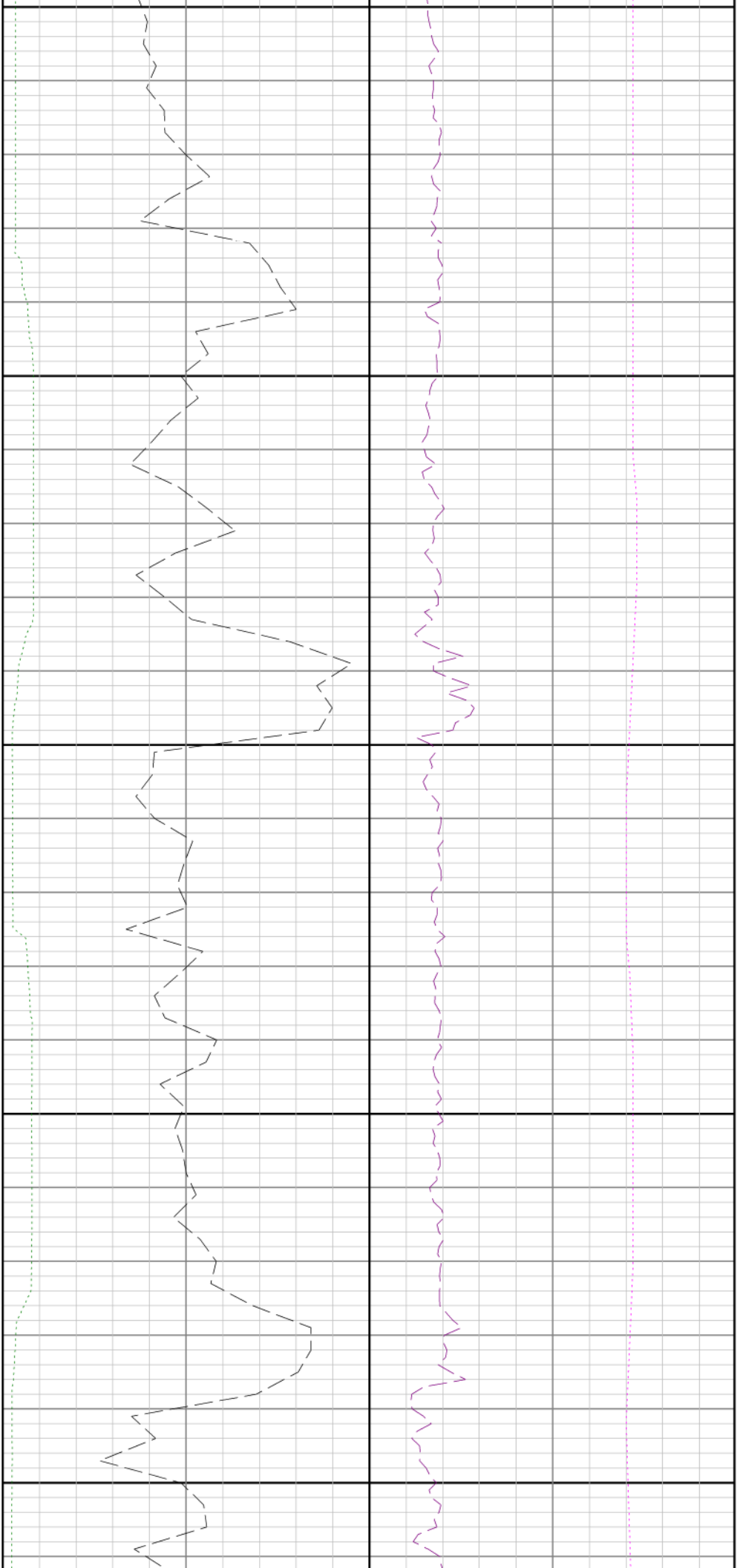


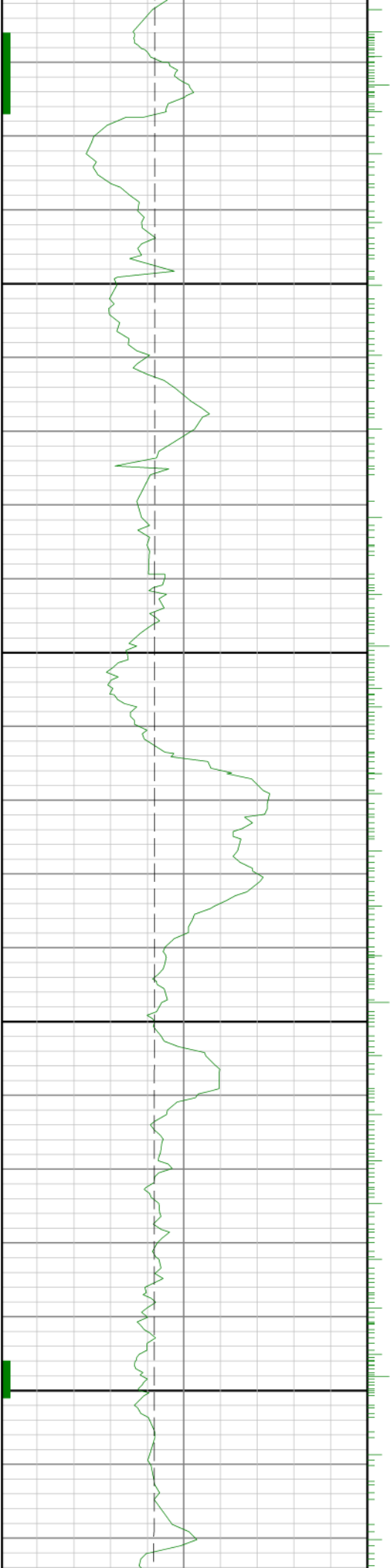
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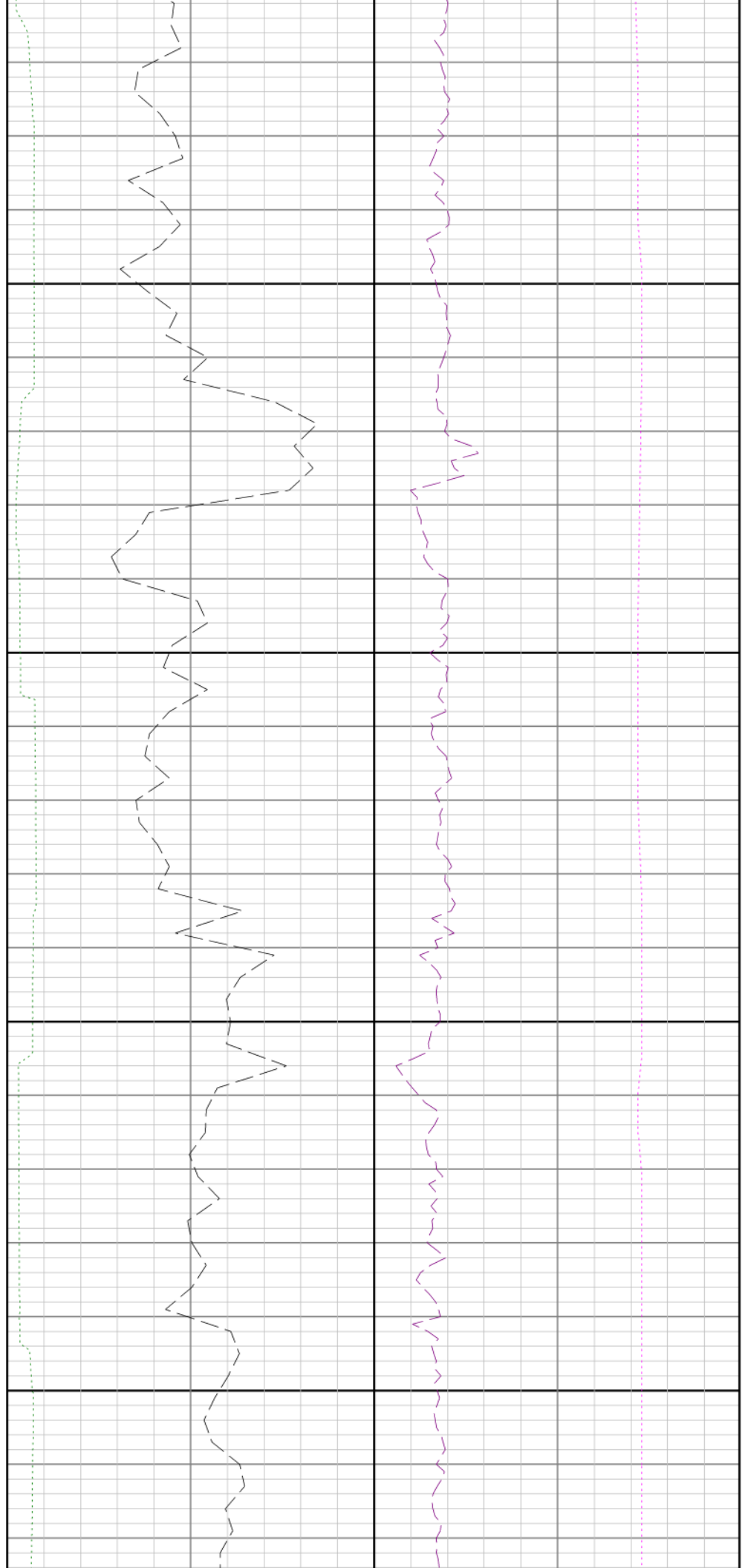


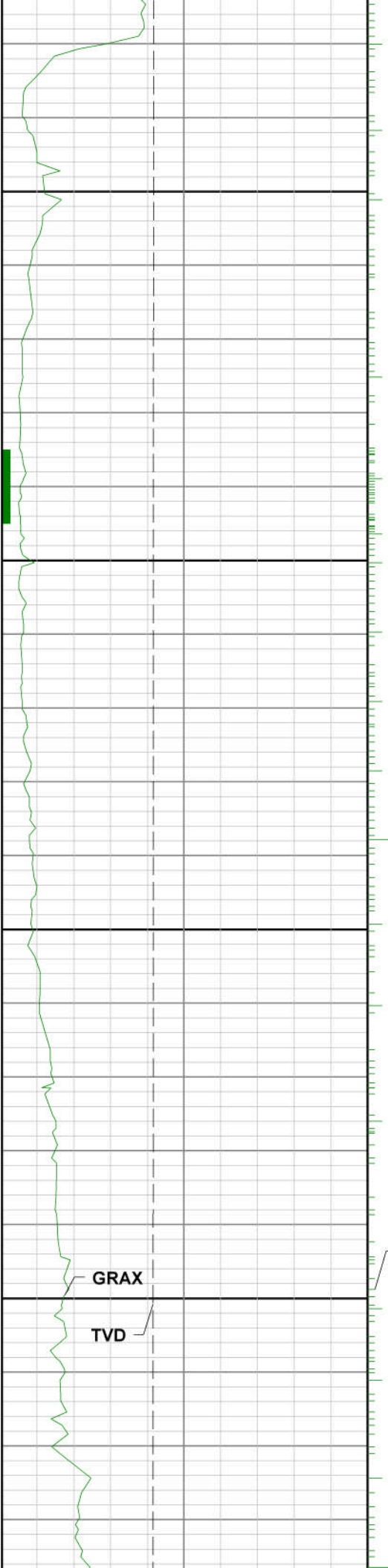




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9700





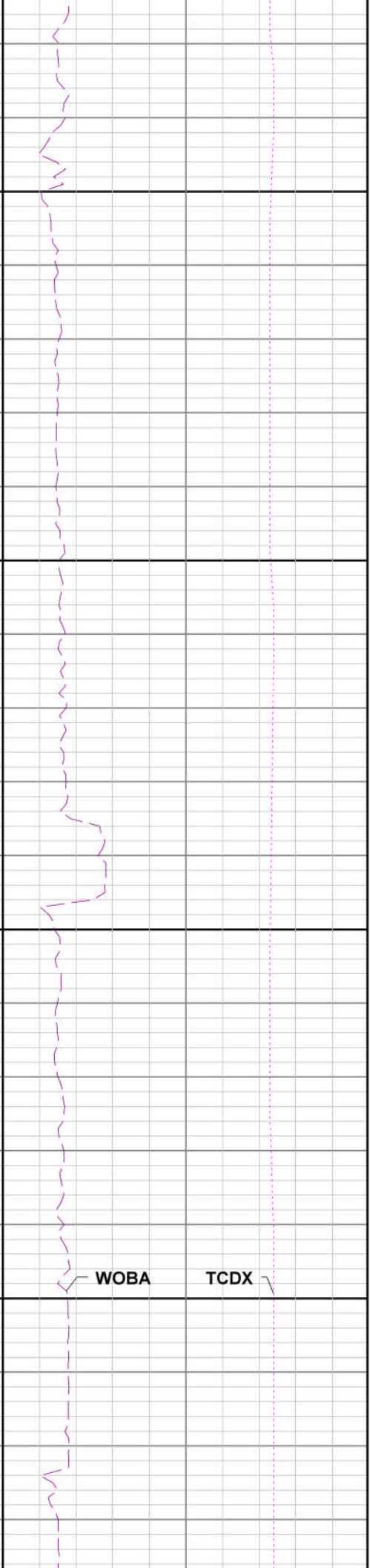
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GRAX
10000



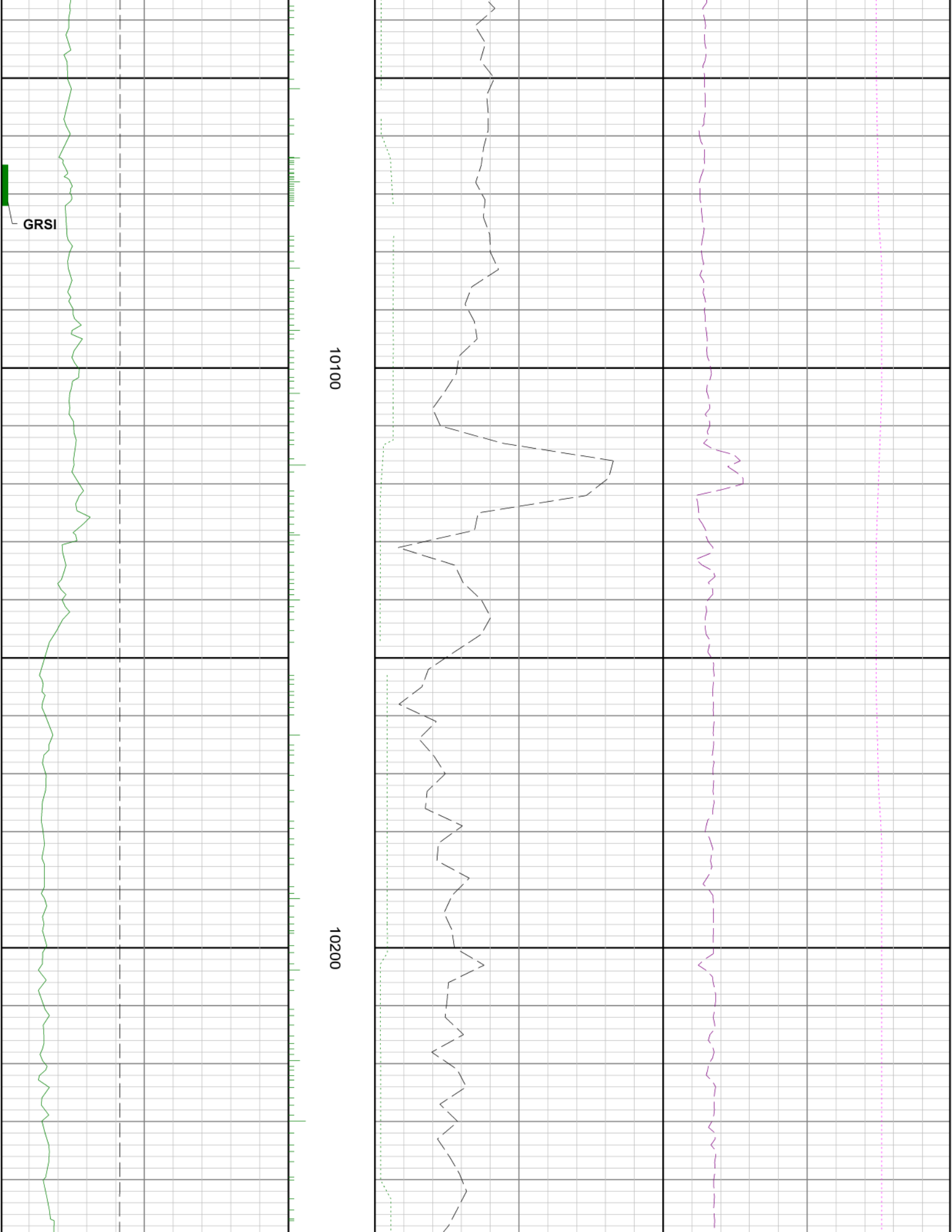
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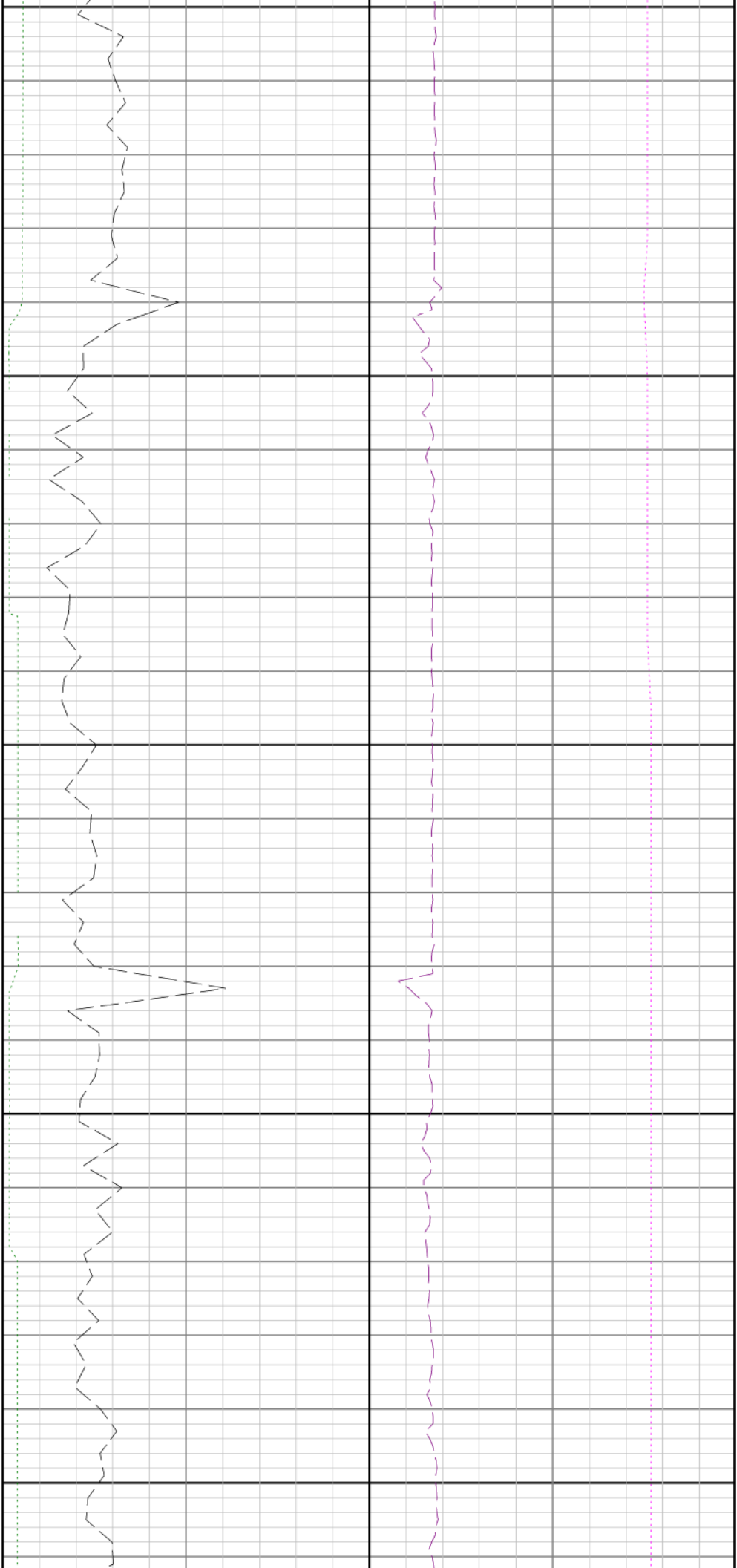
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WOBA

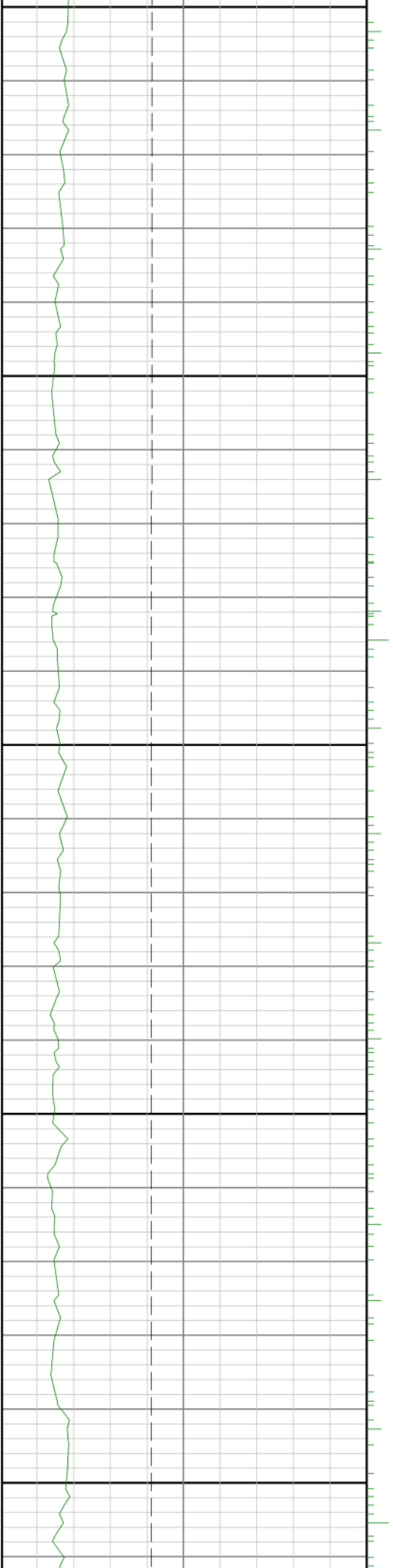
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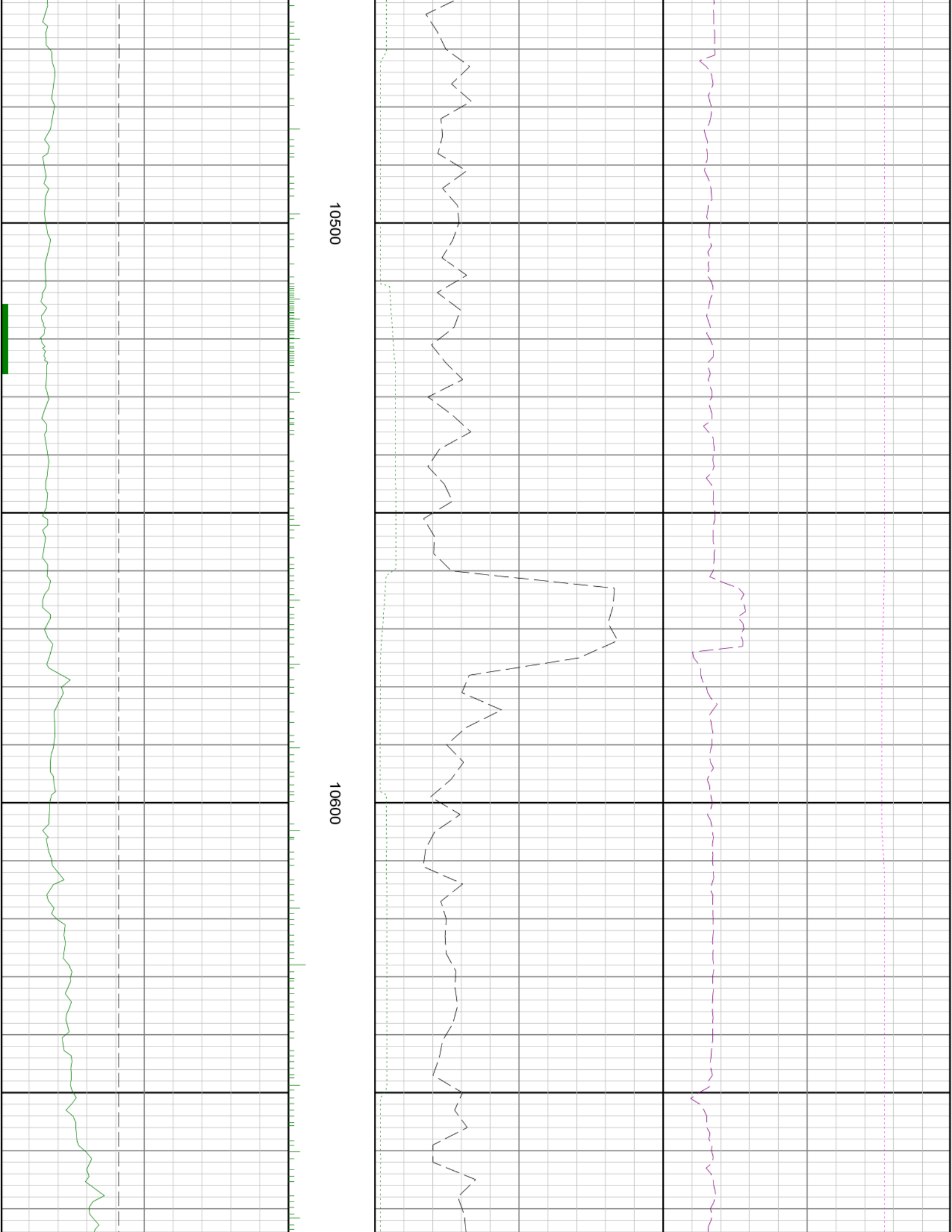


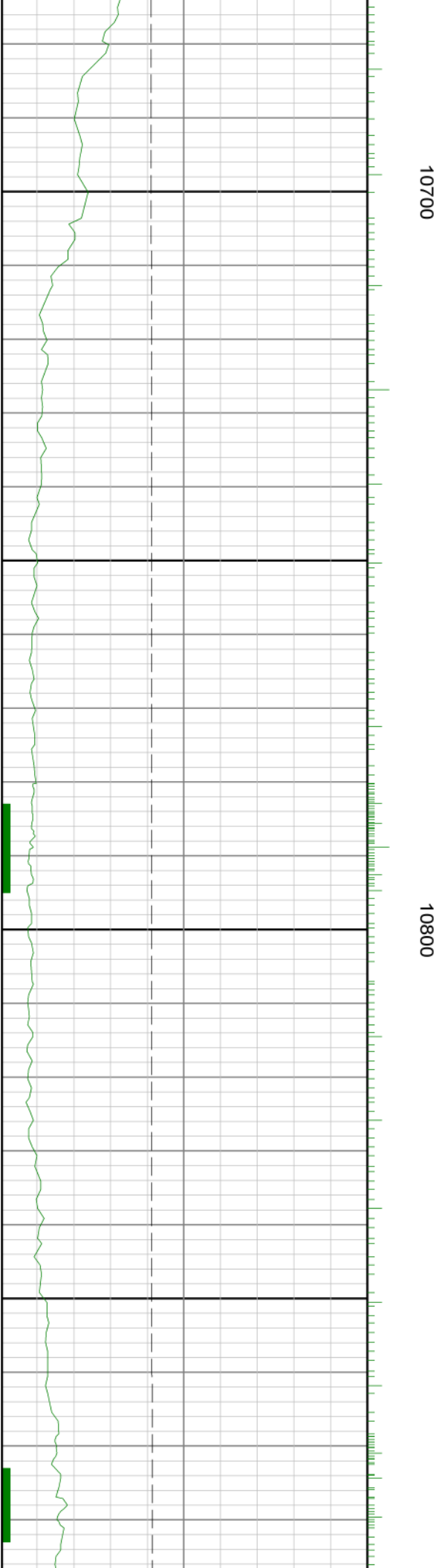
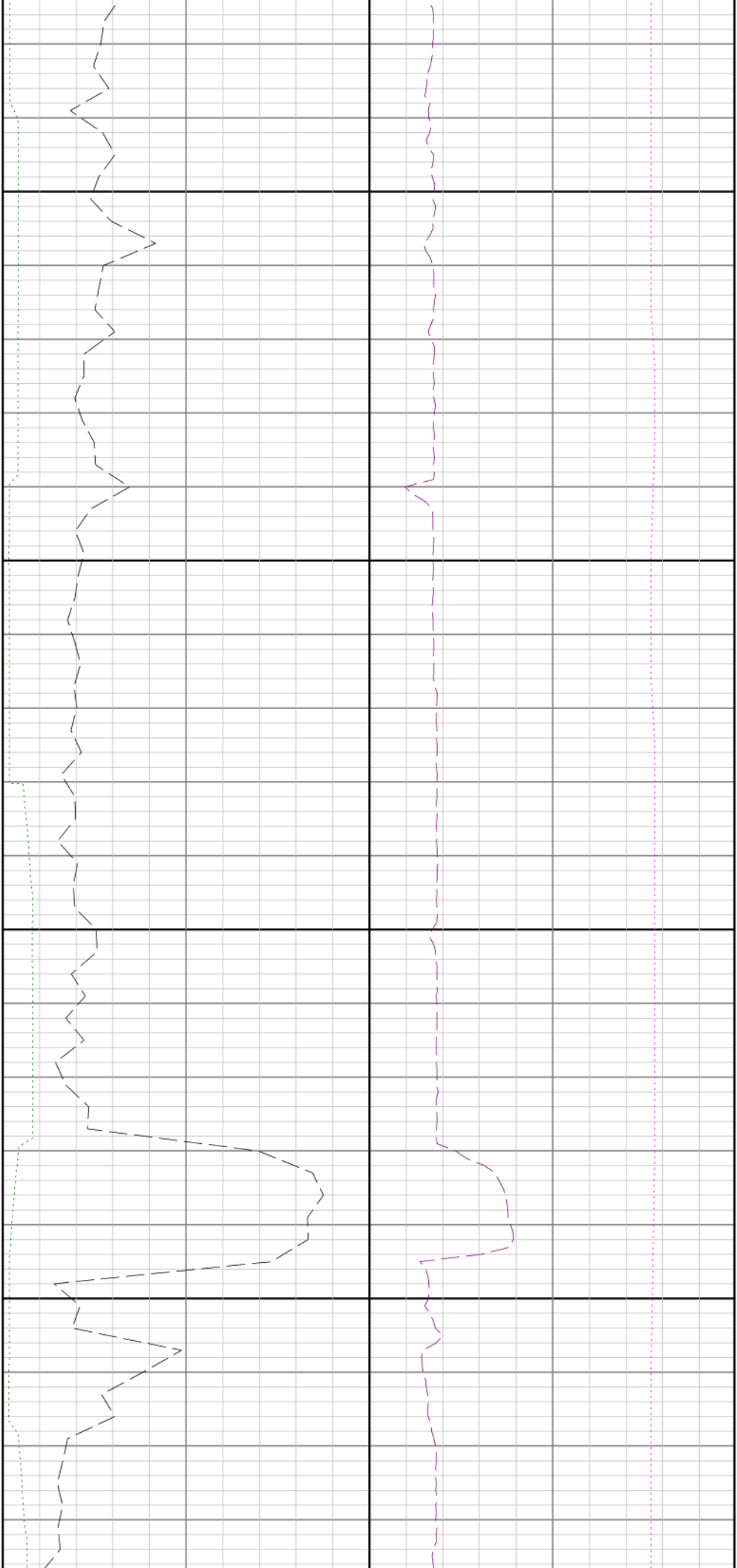


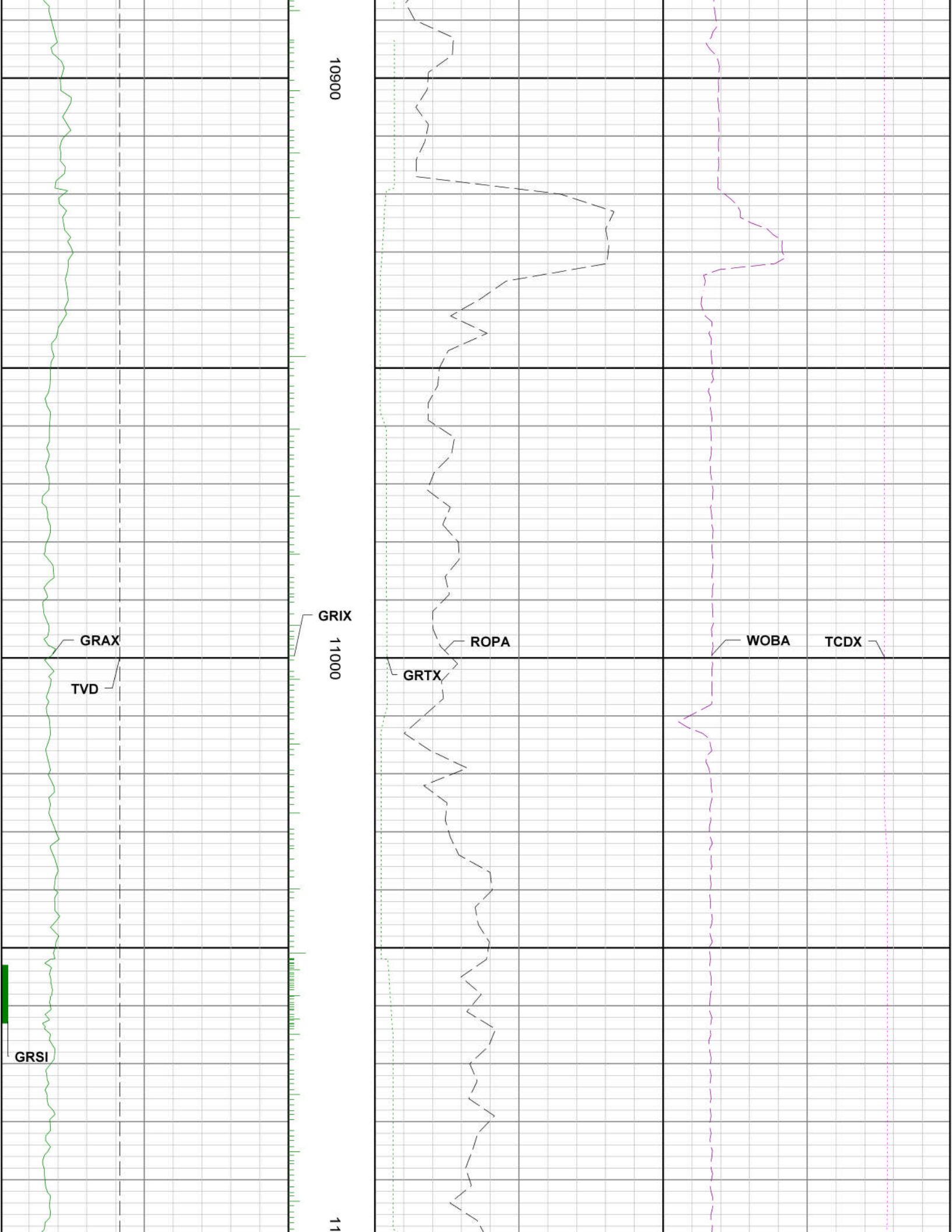
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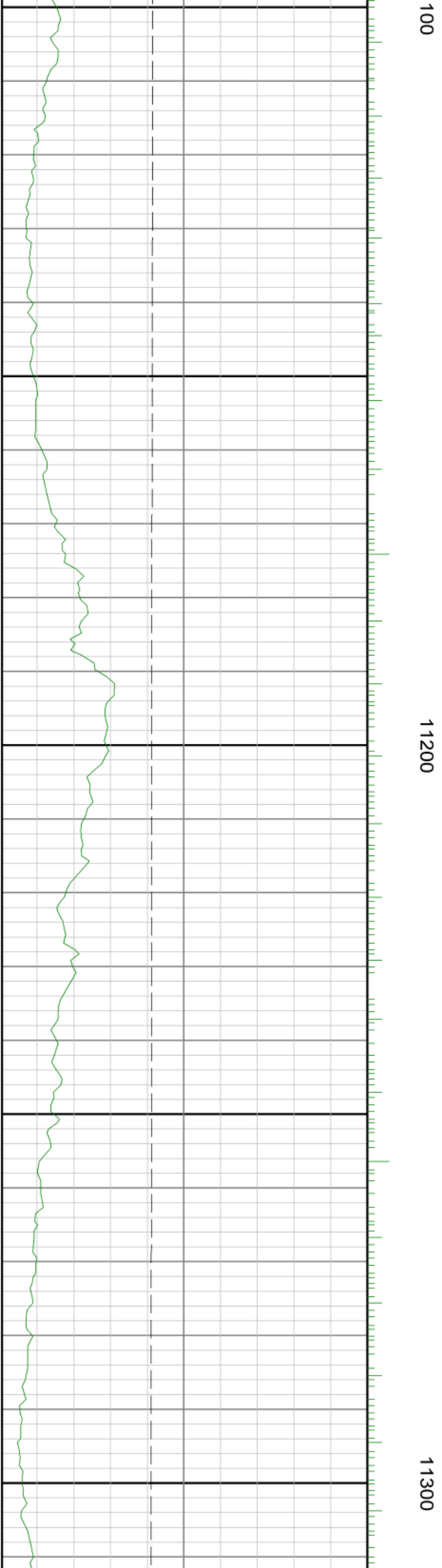
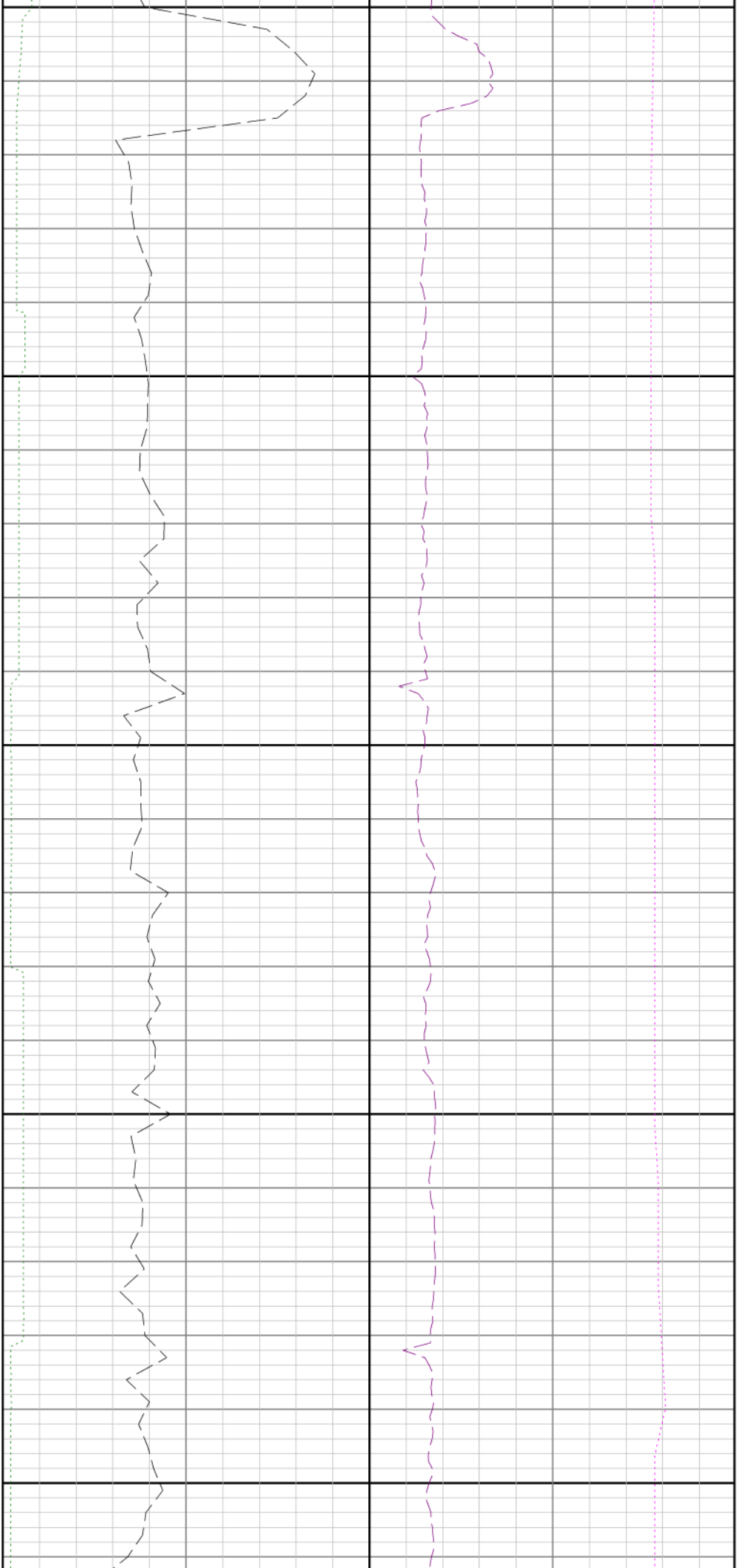
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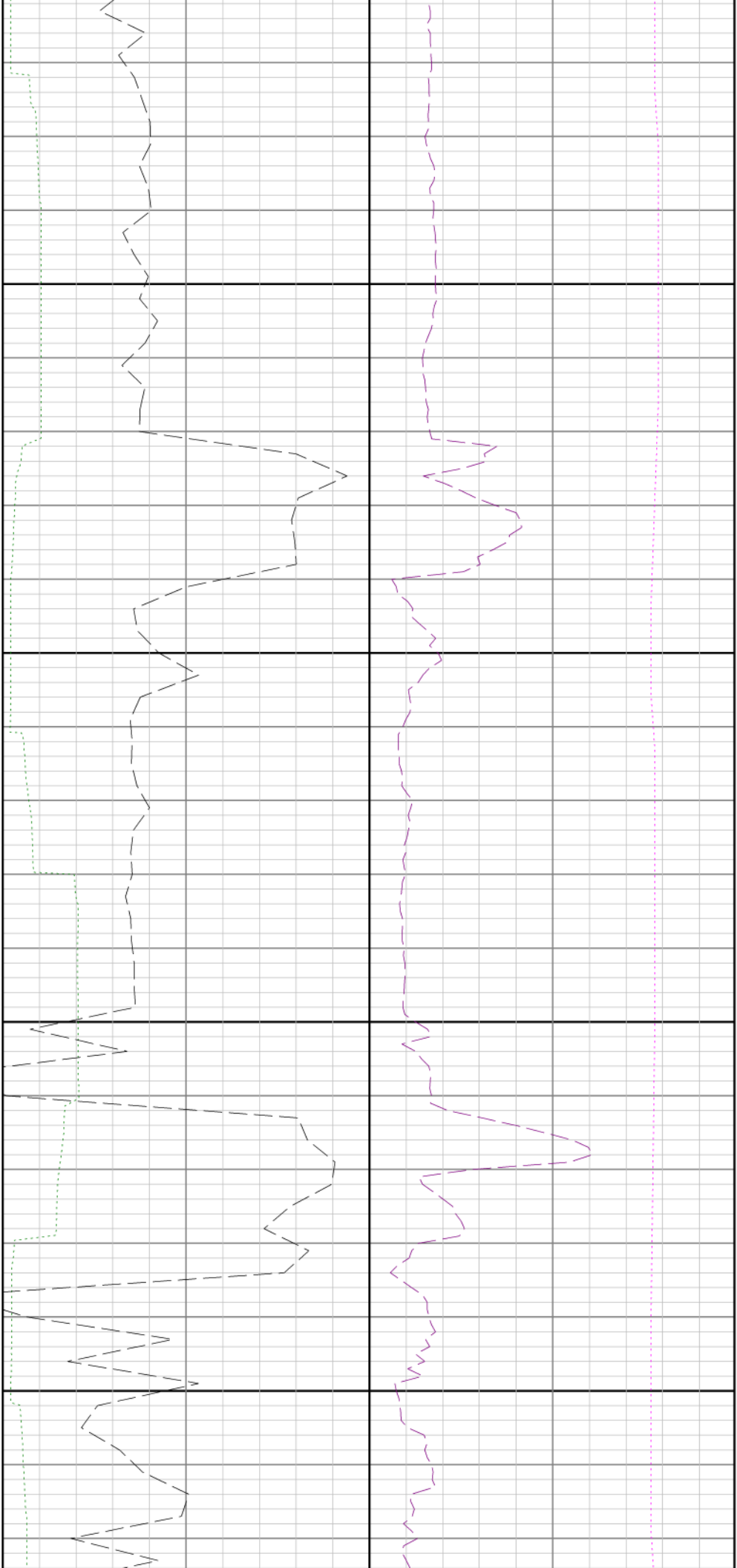






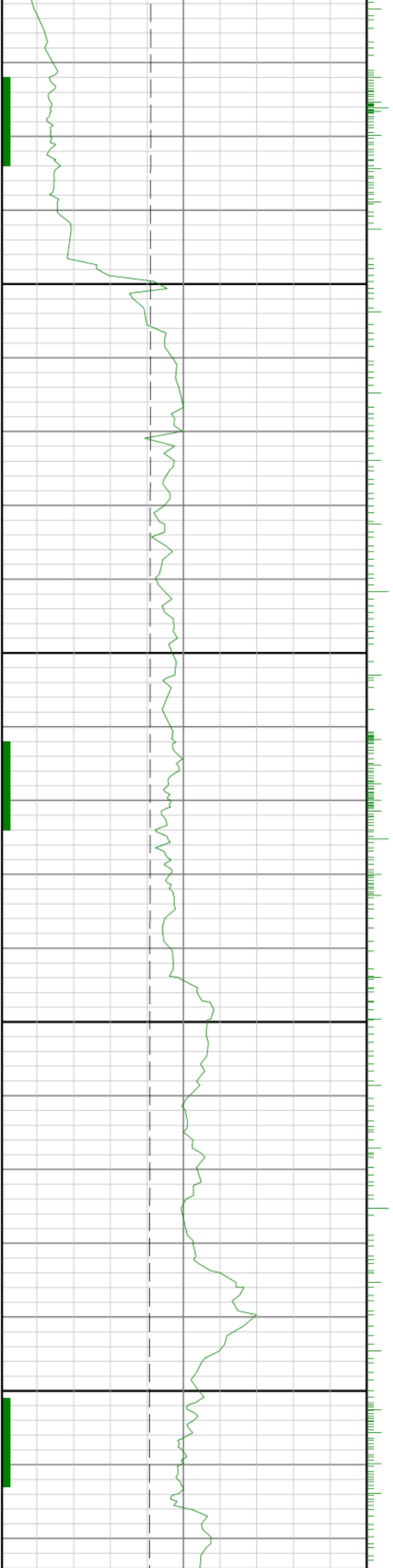


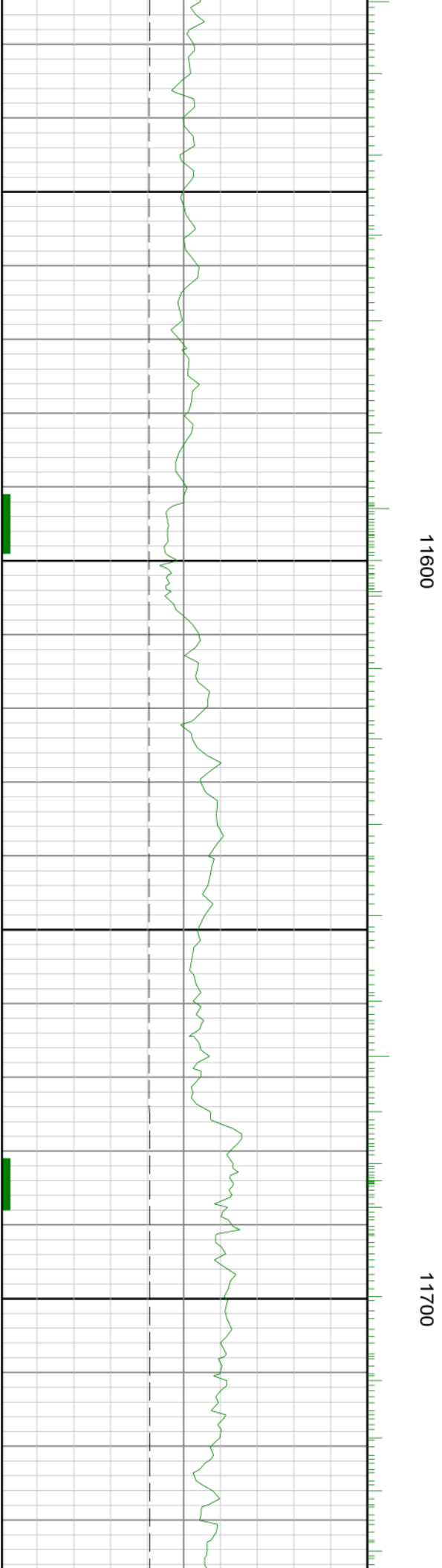
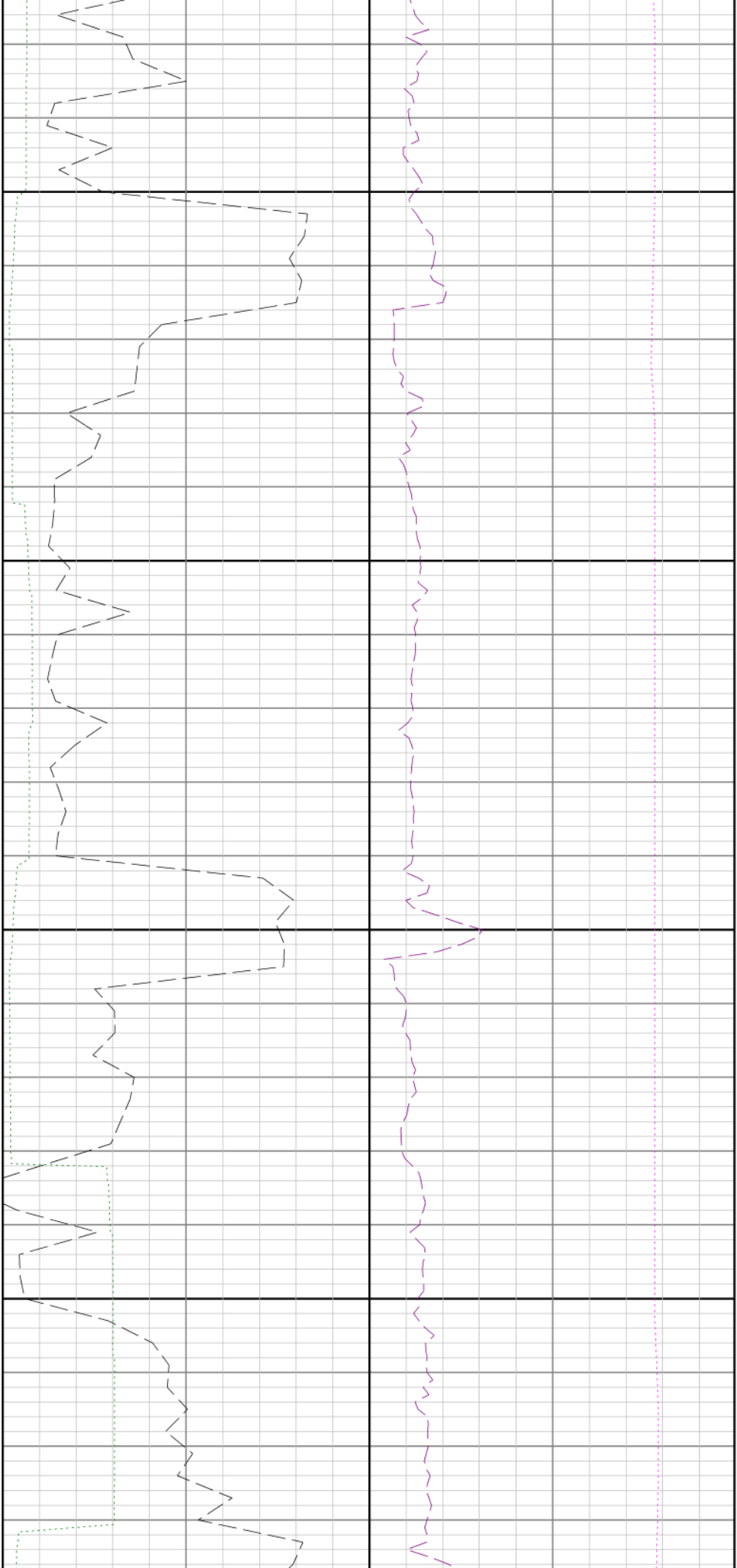


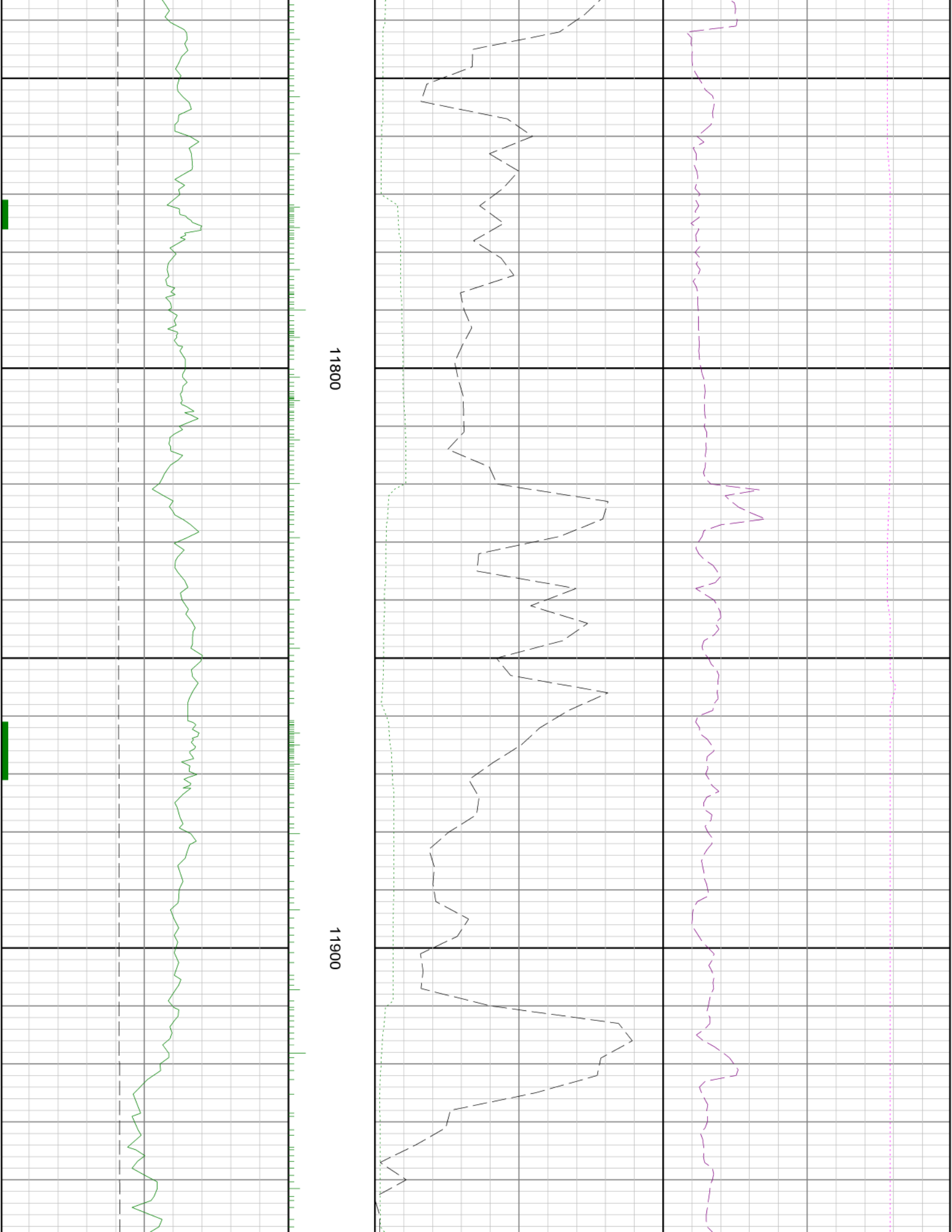


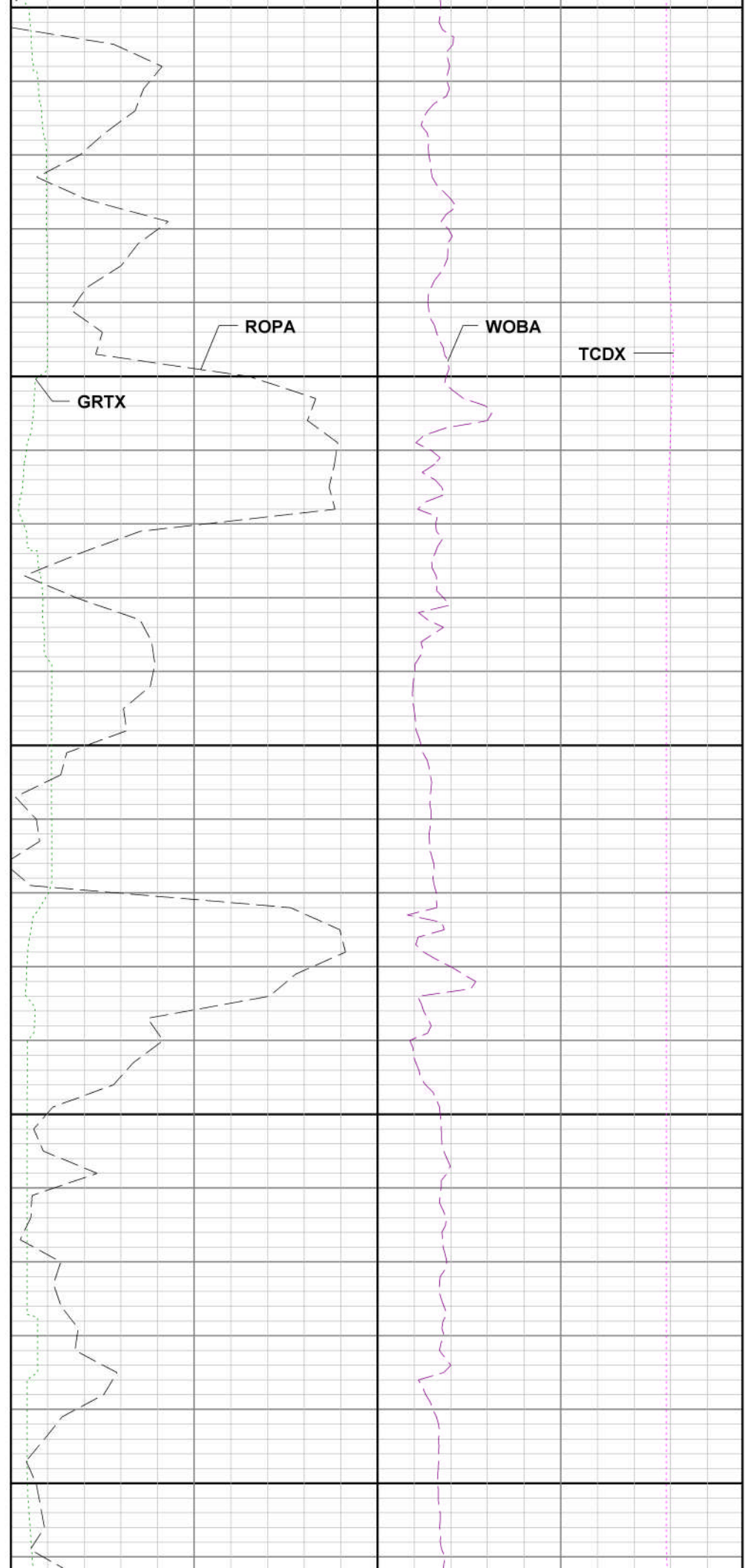
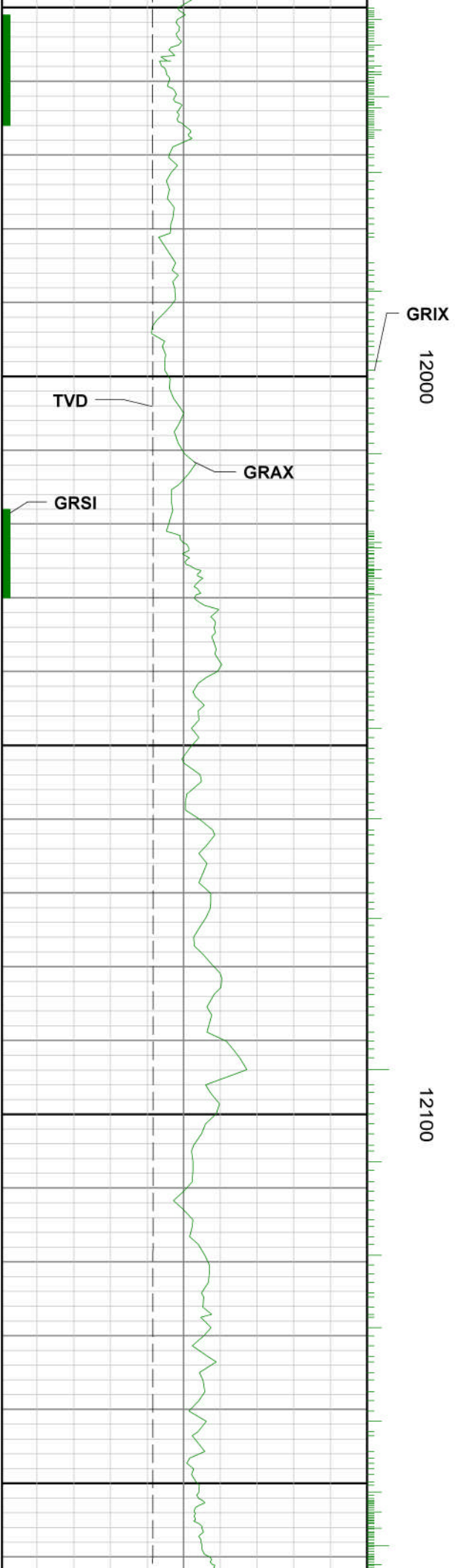
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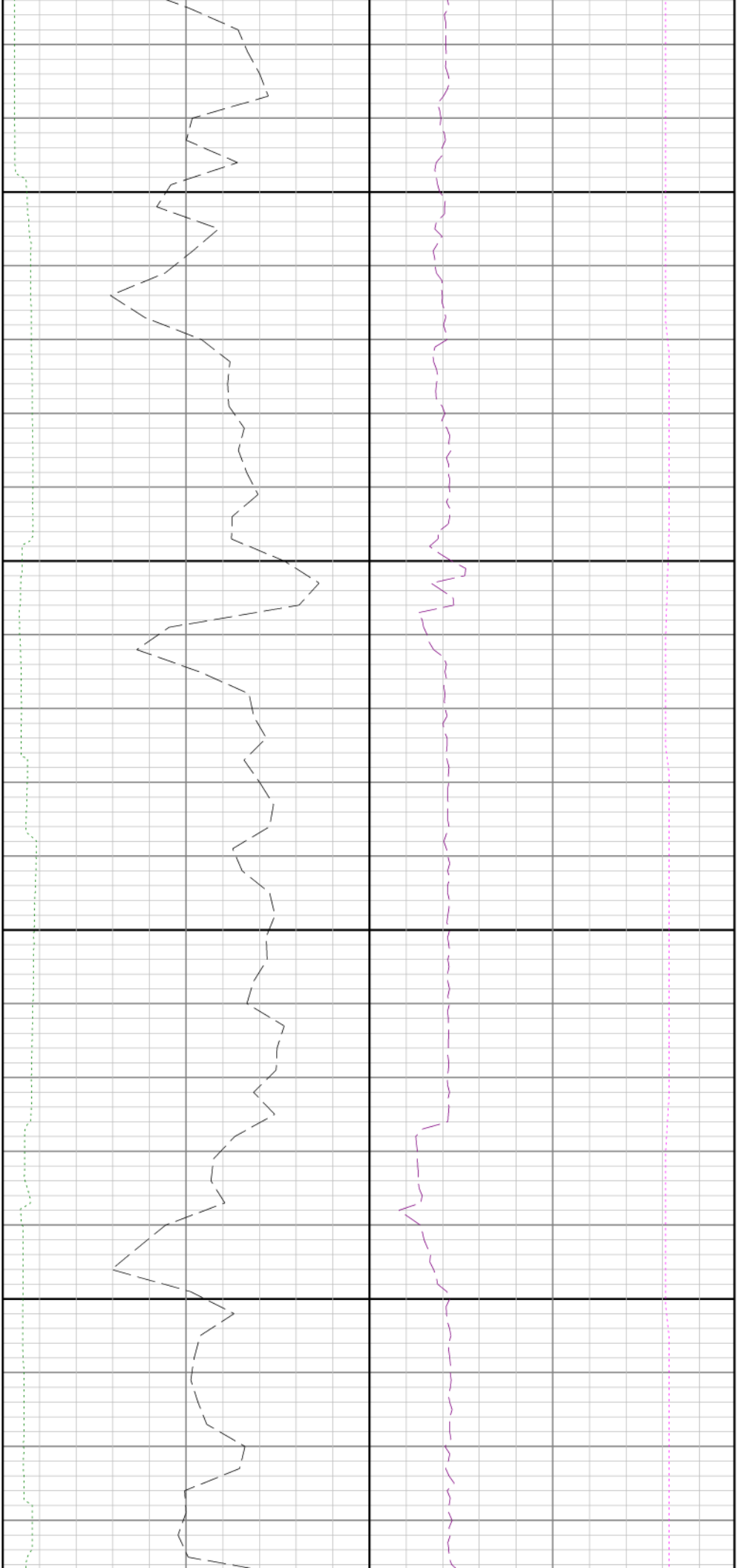
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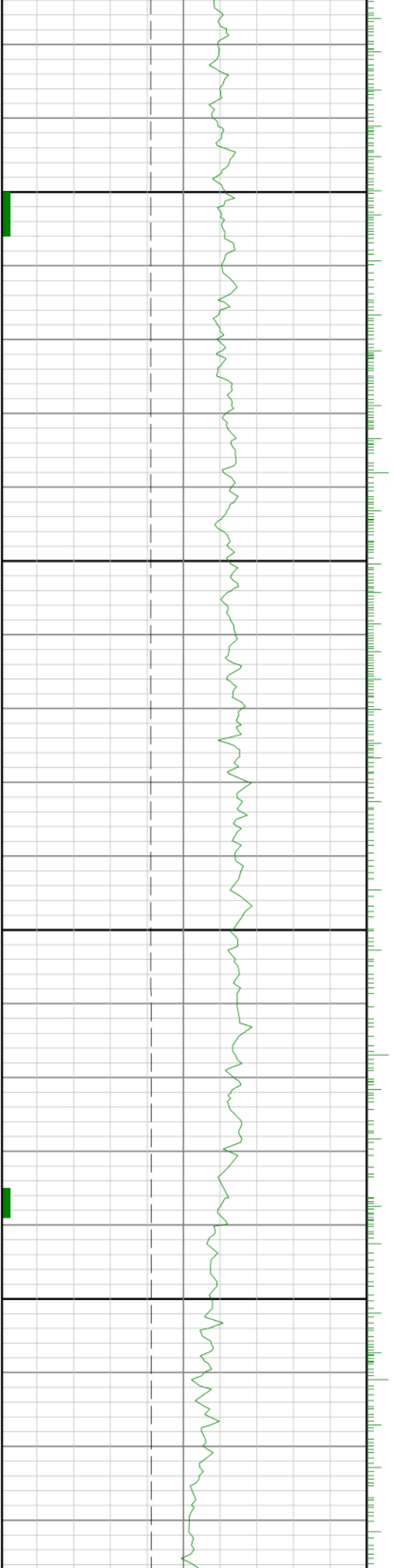


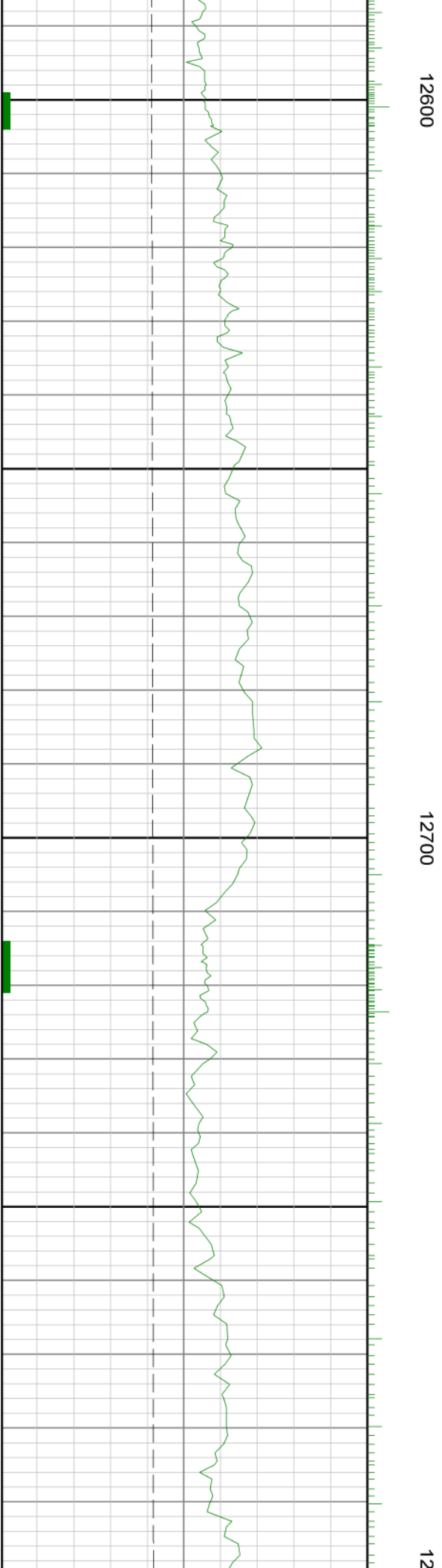
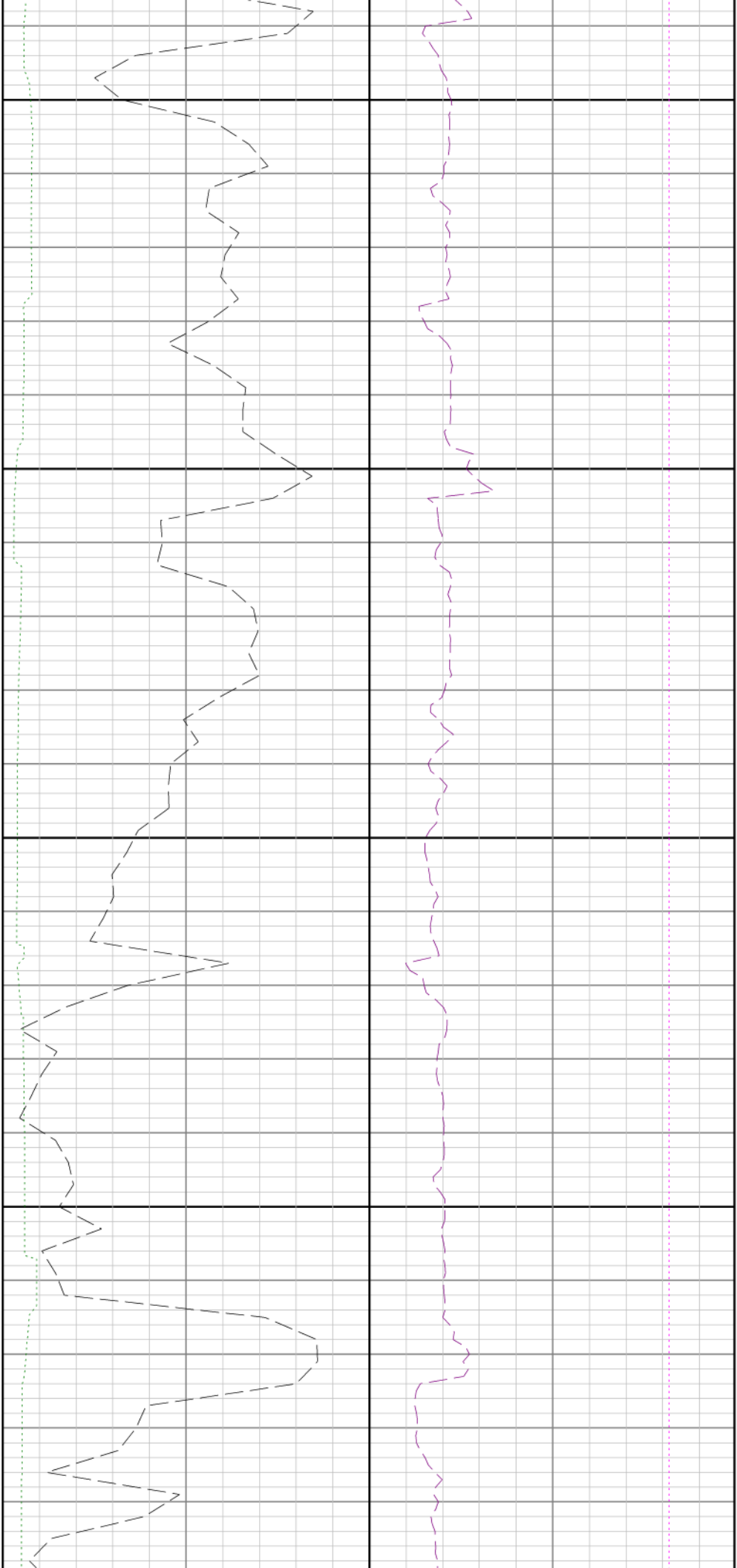


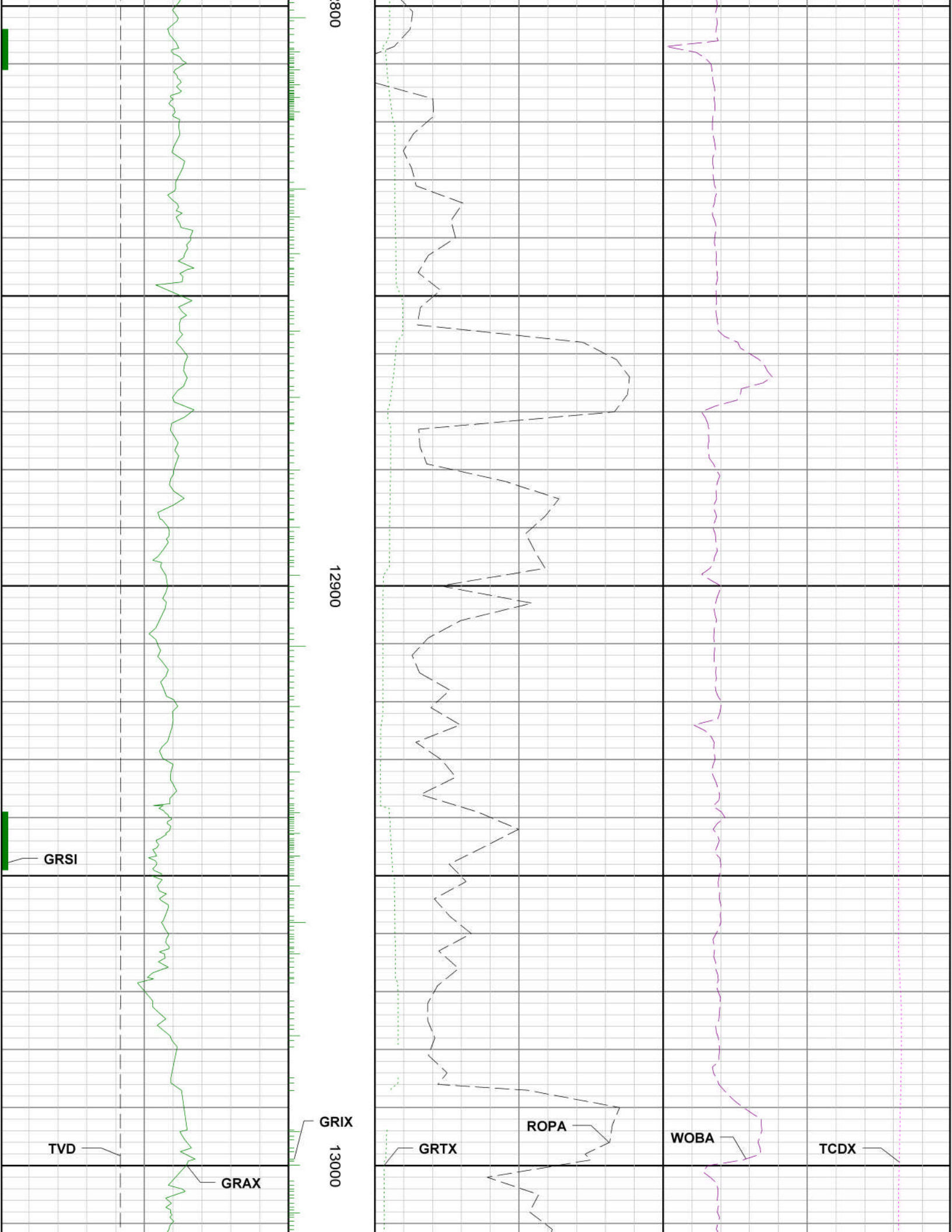


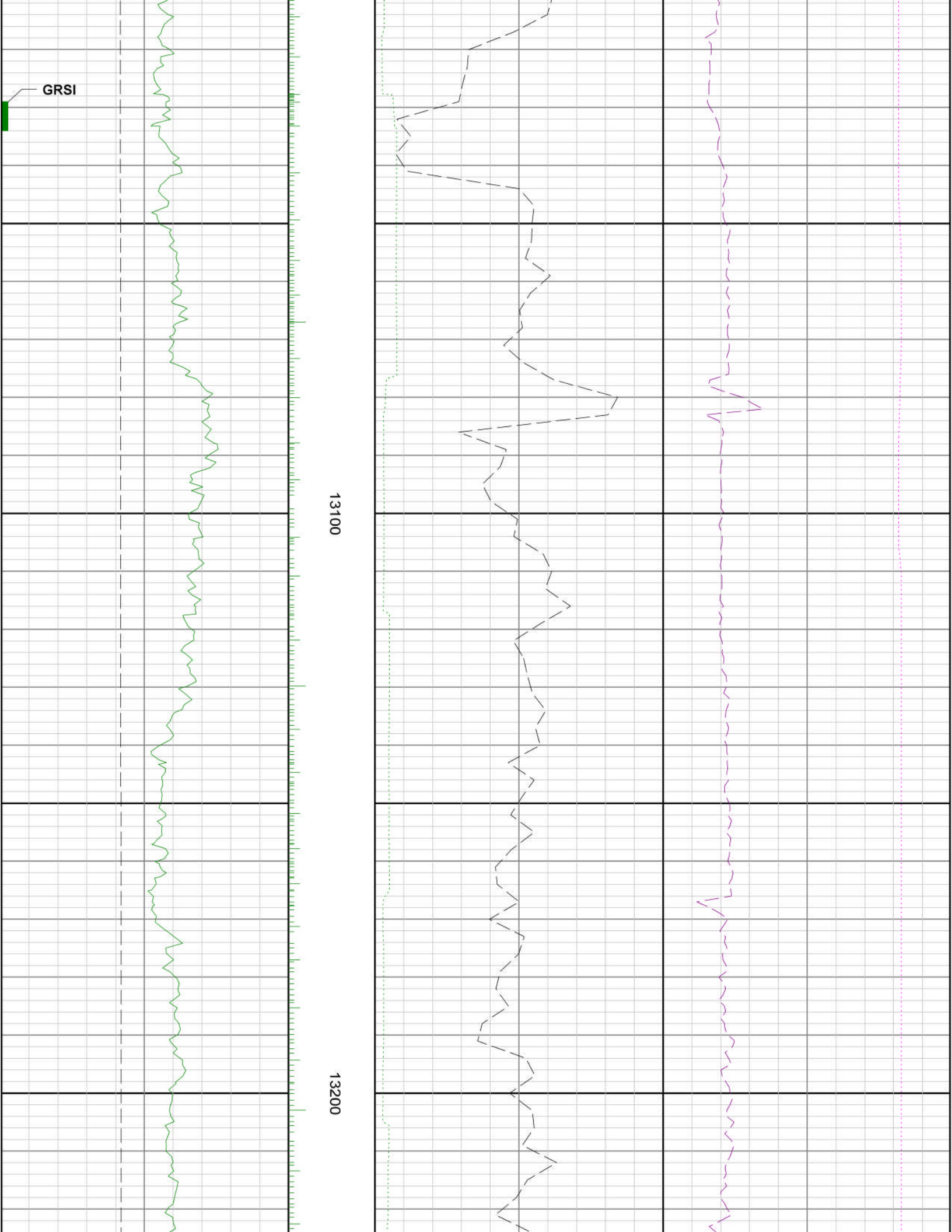
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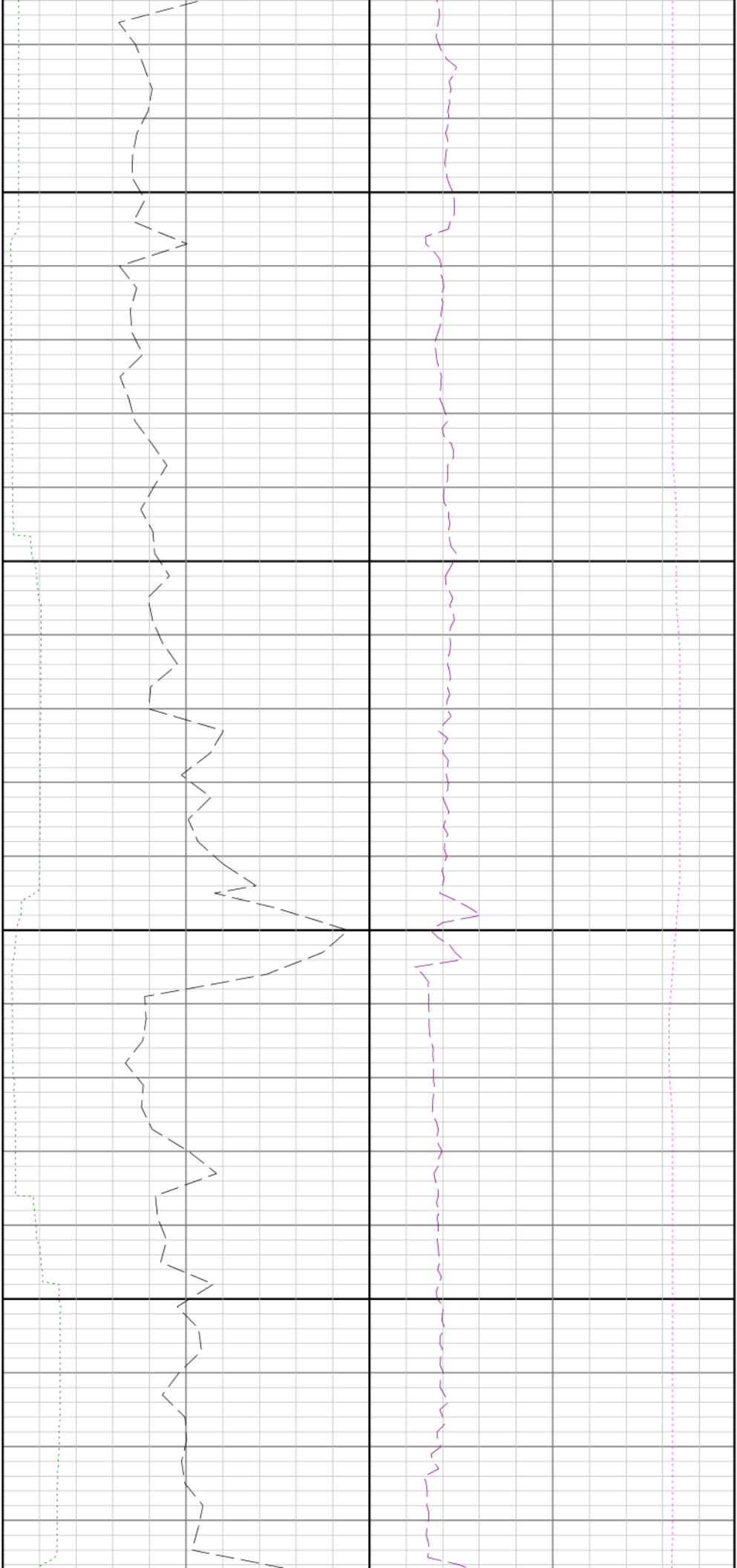
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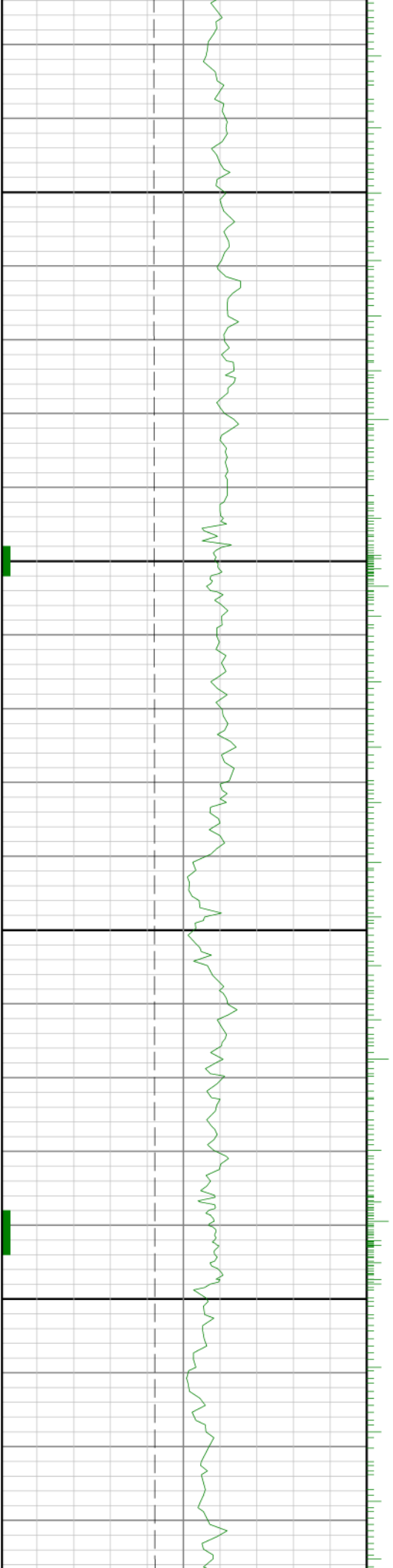


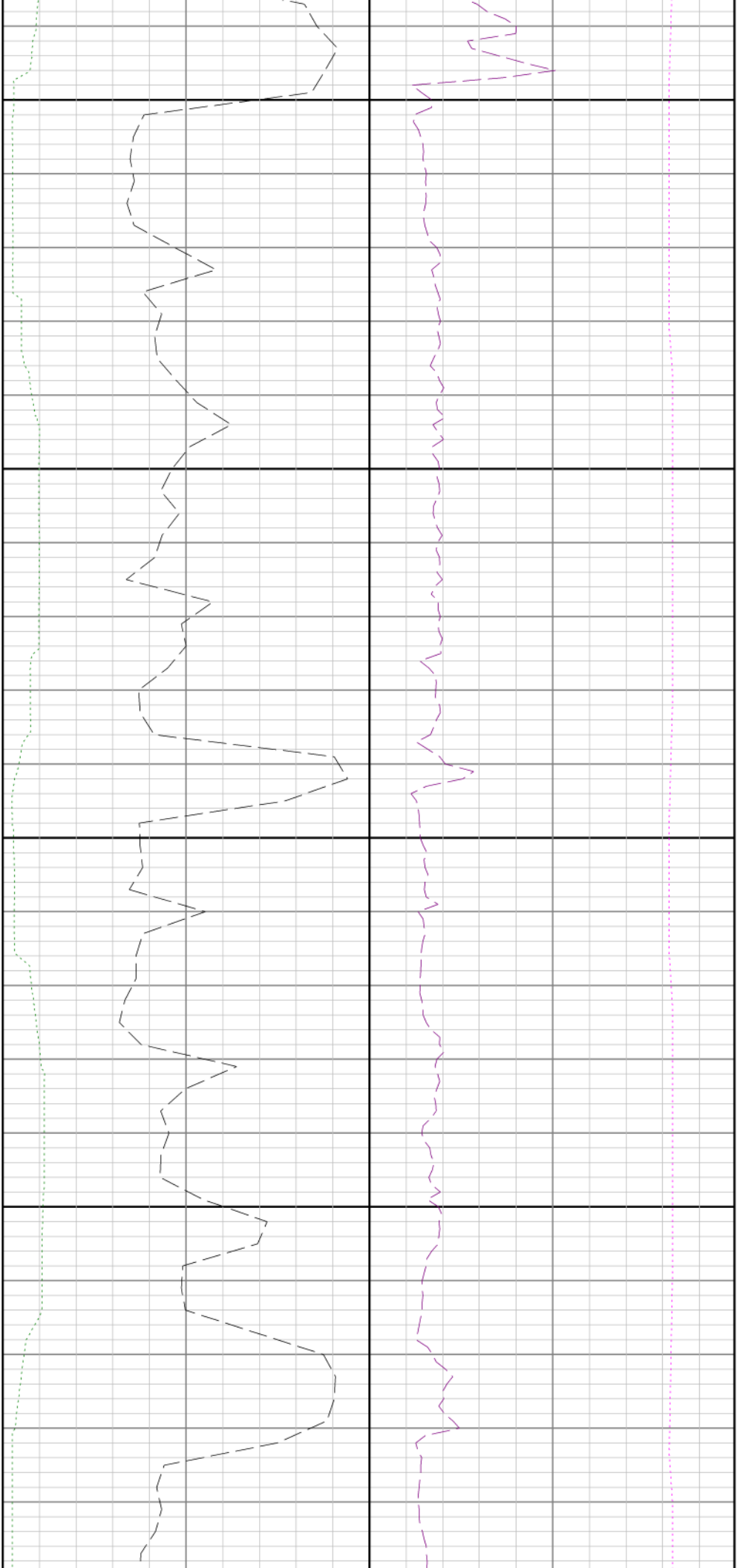




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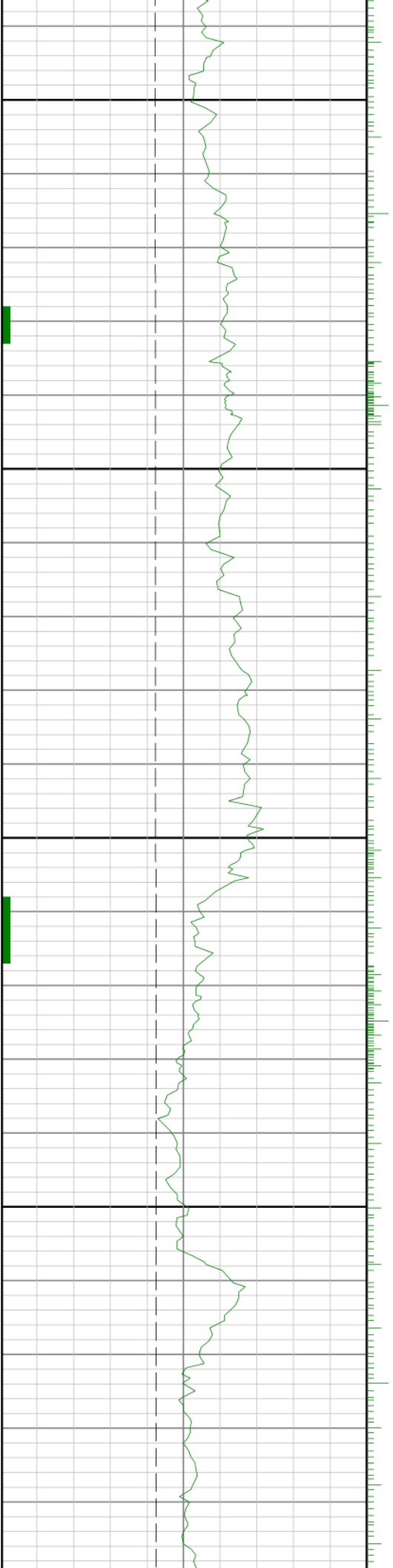
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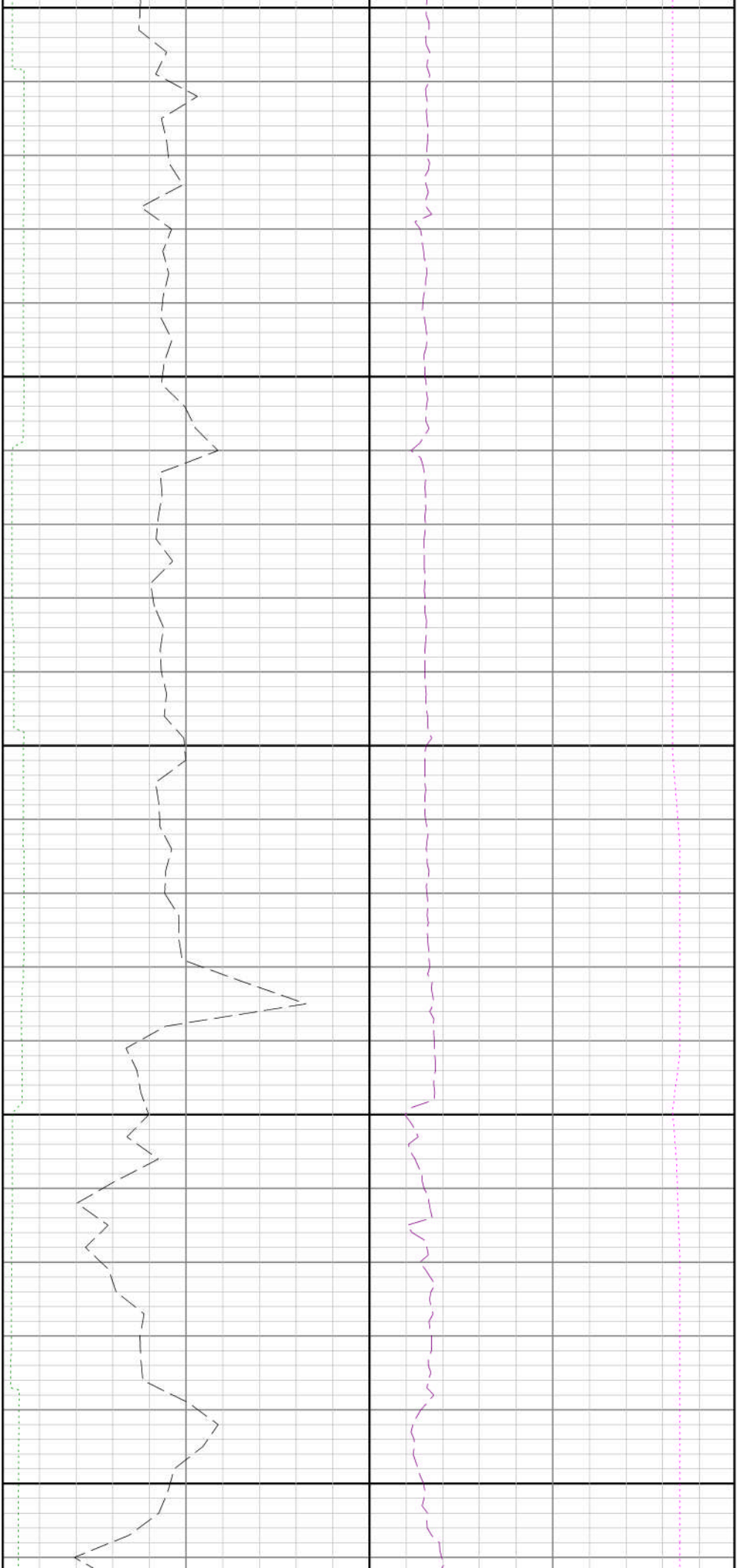




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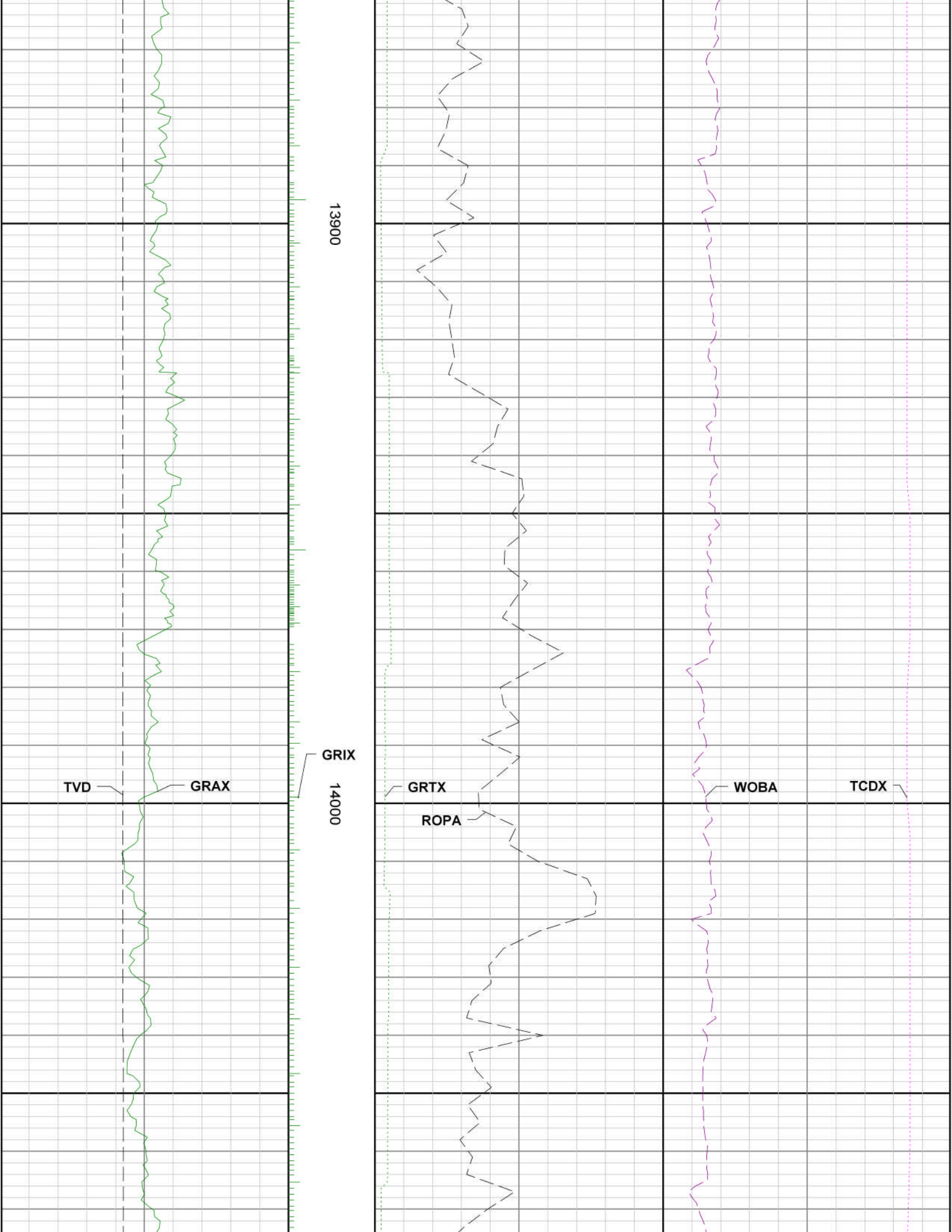
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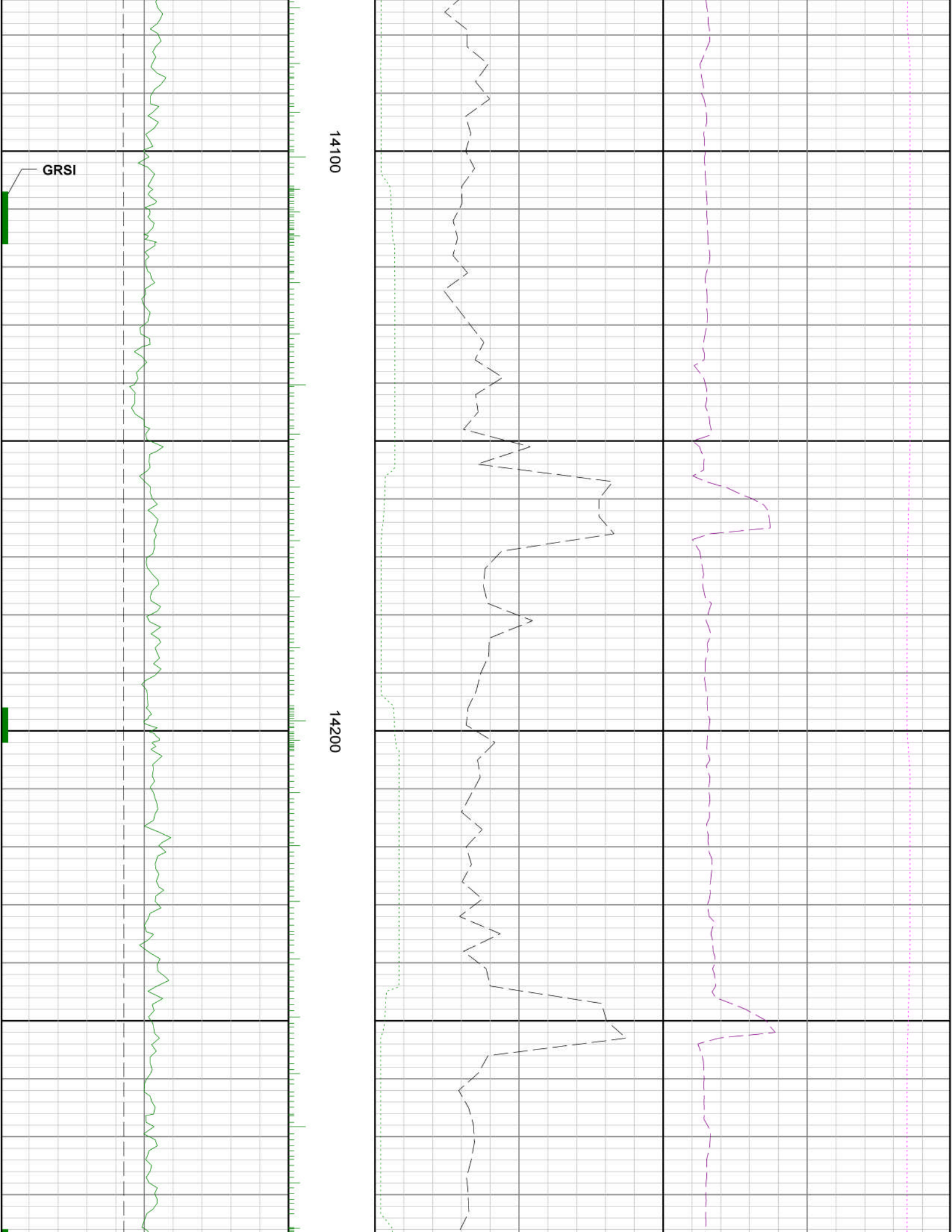


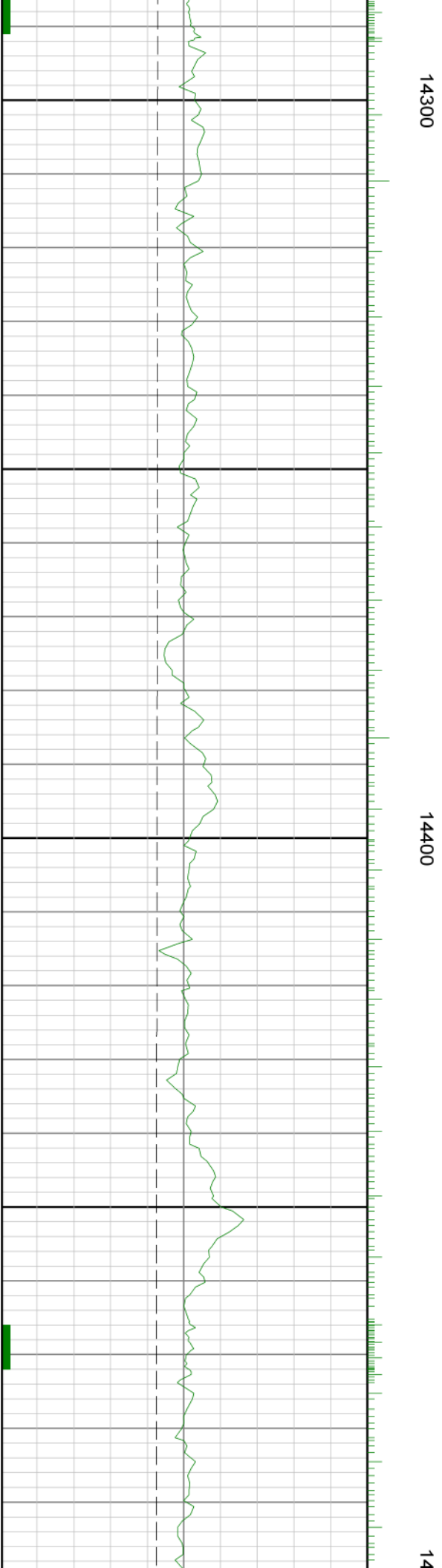
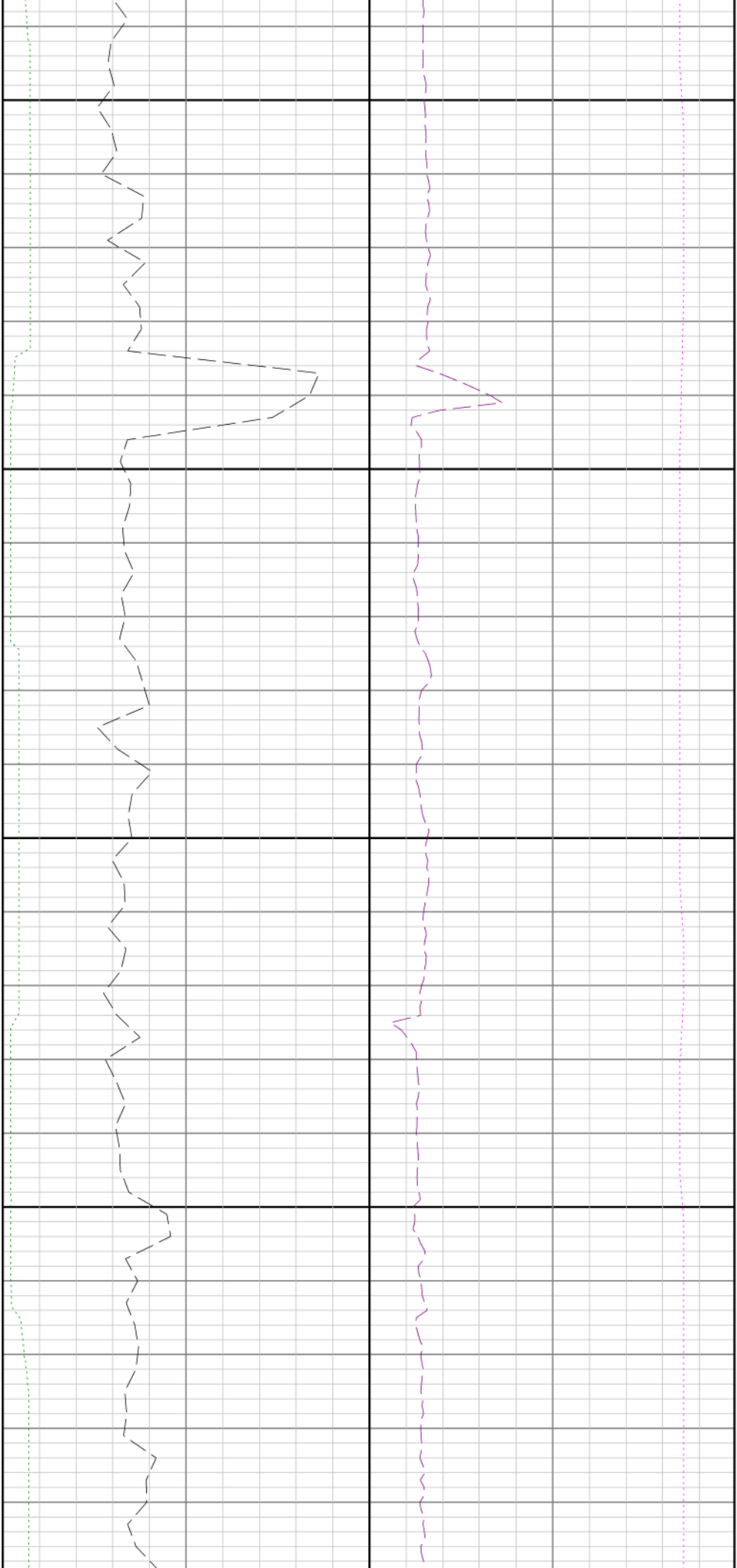


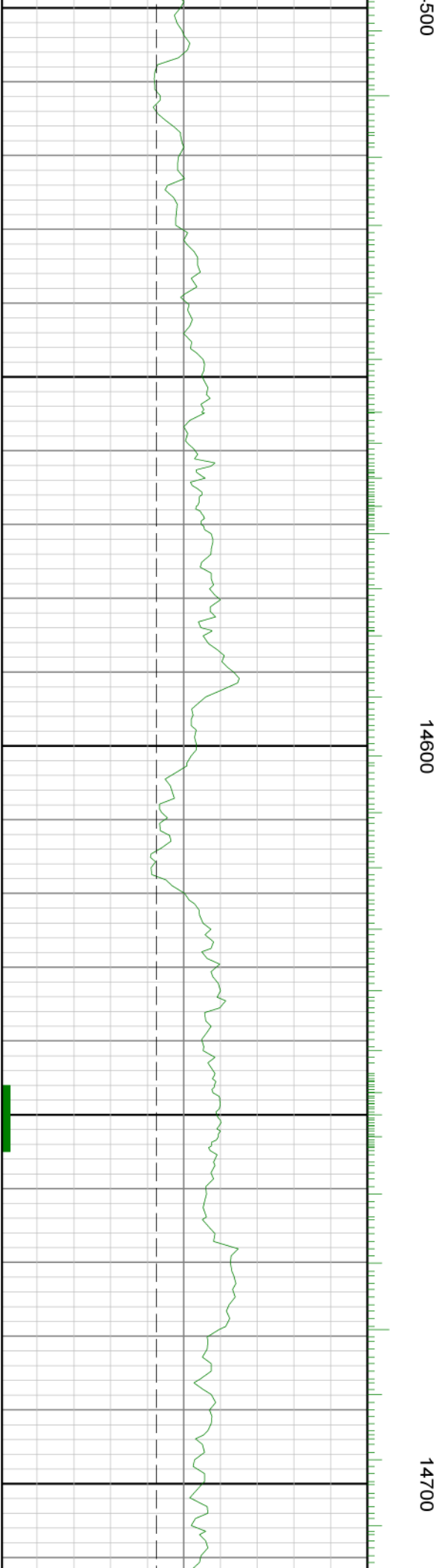
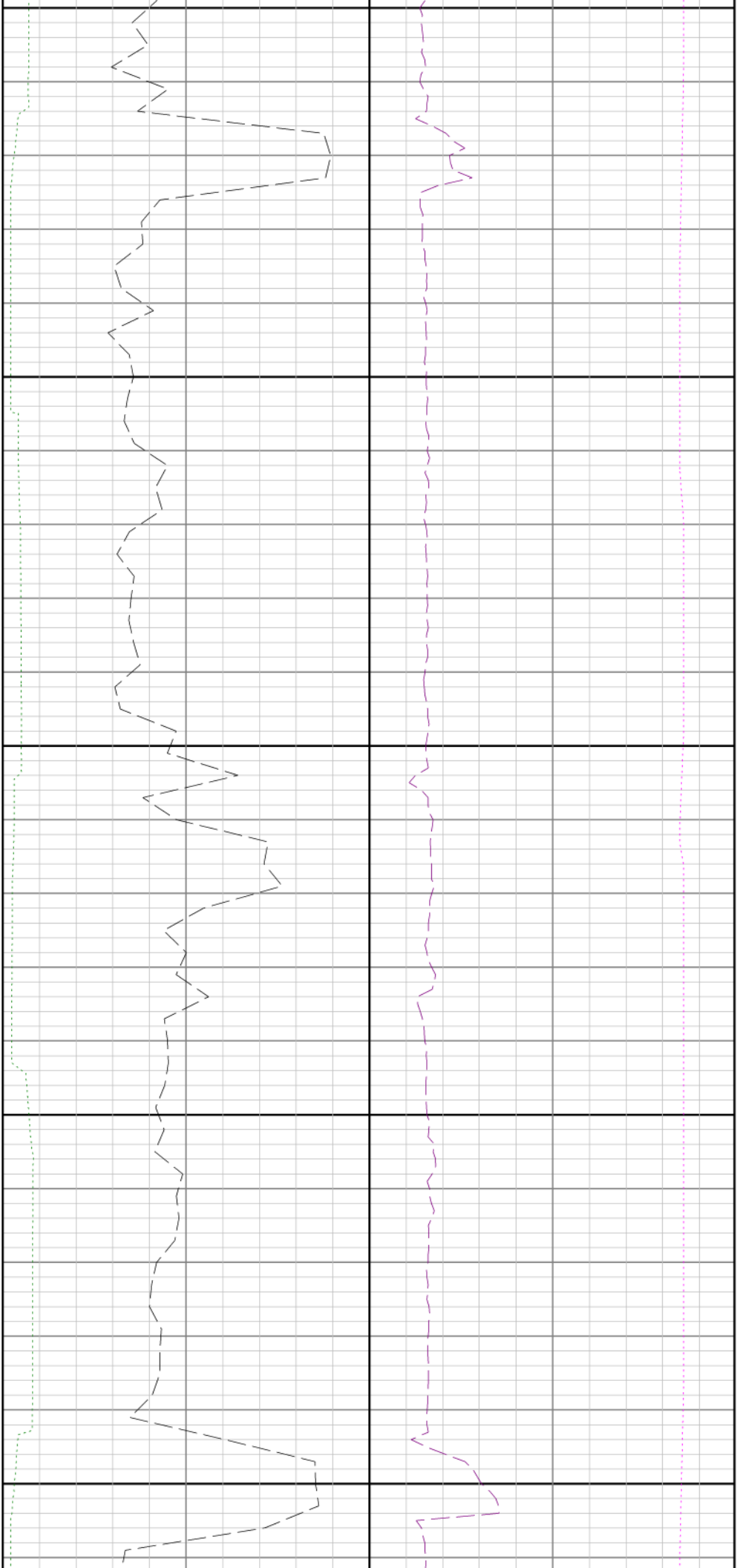
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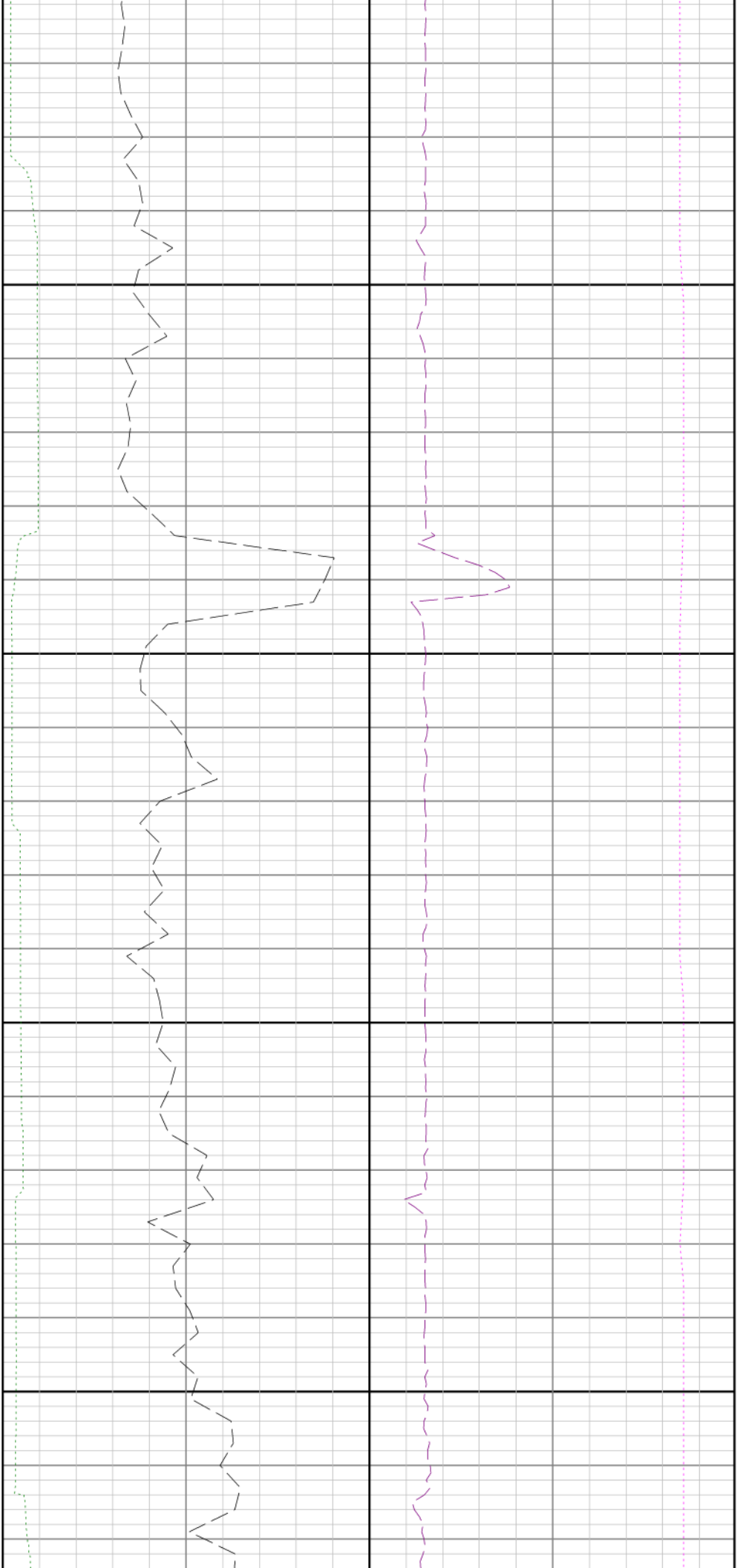
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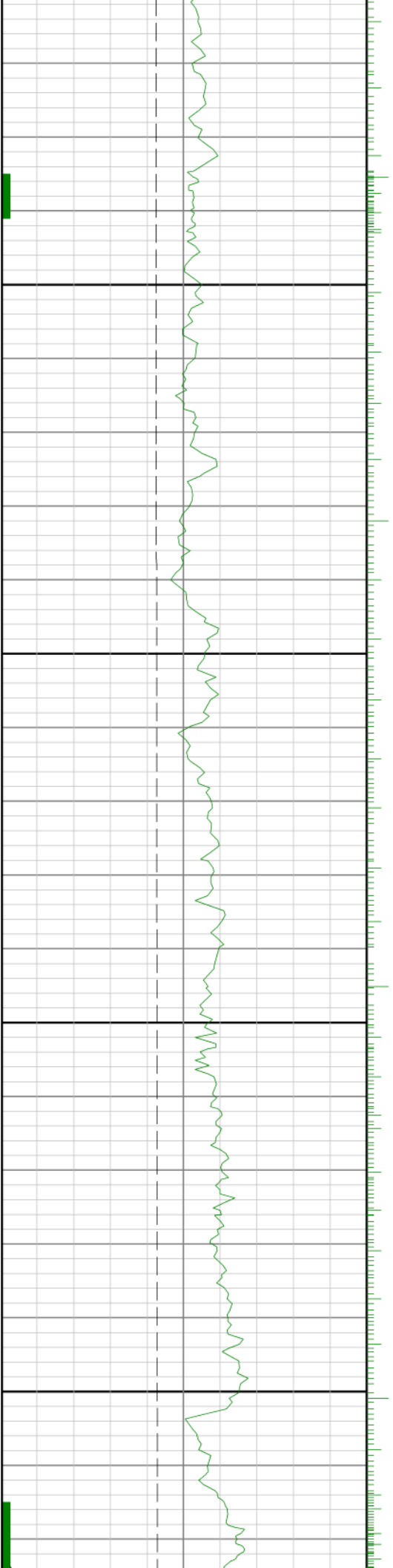


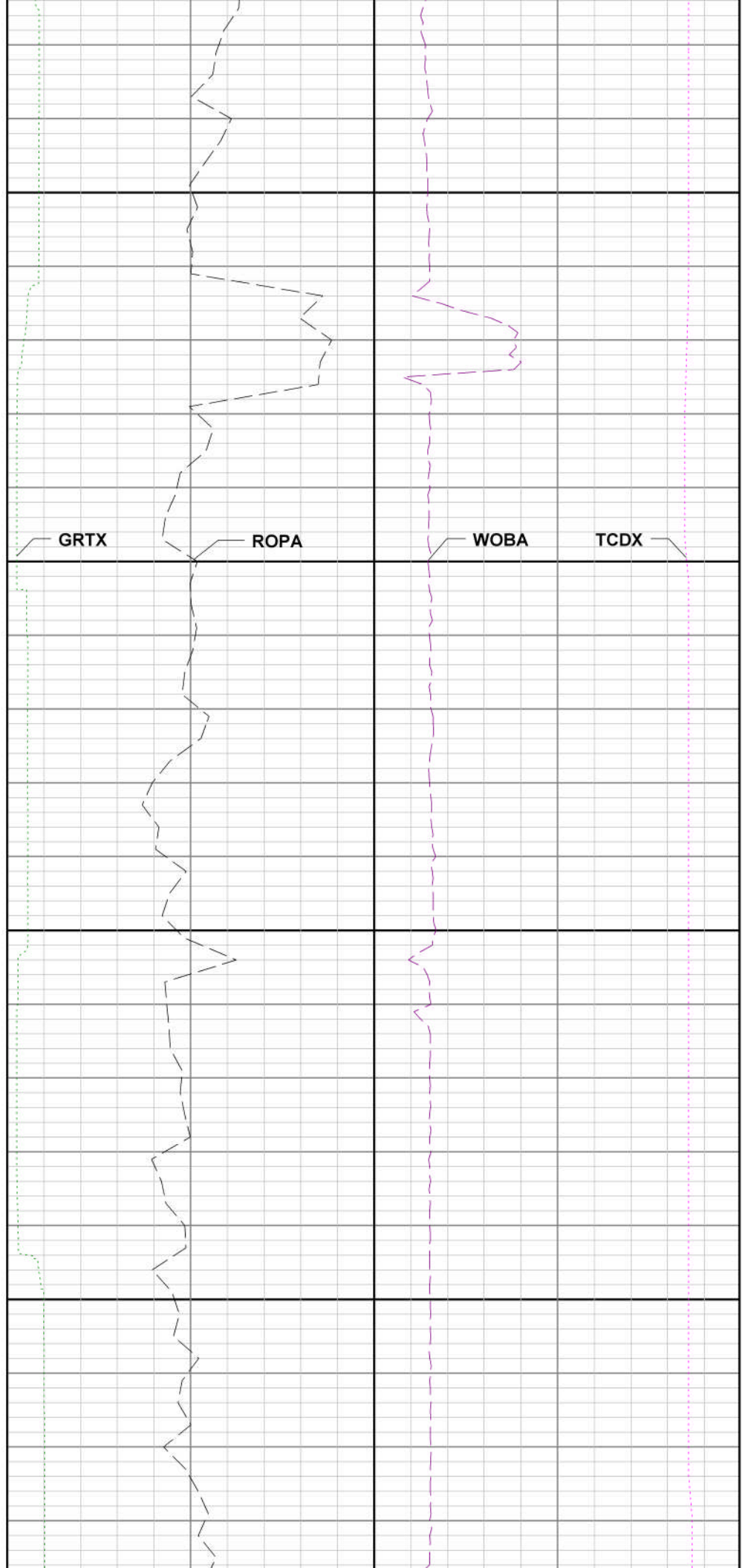
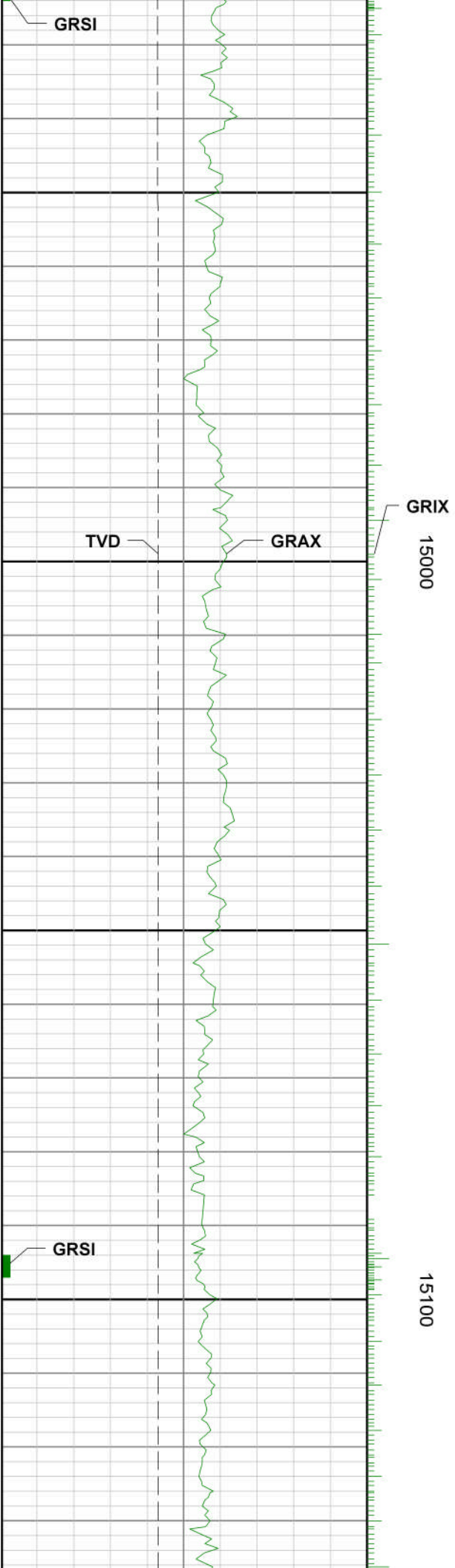


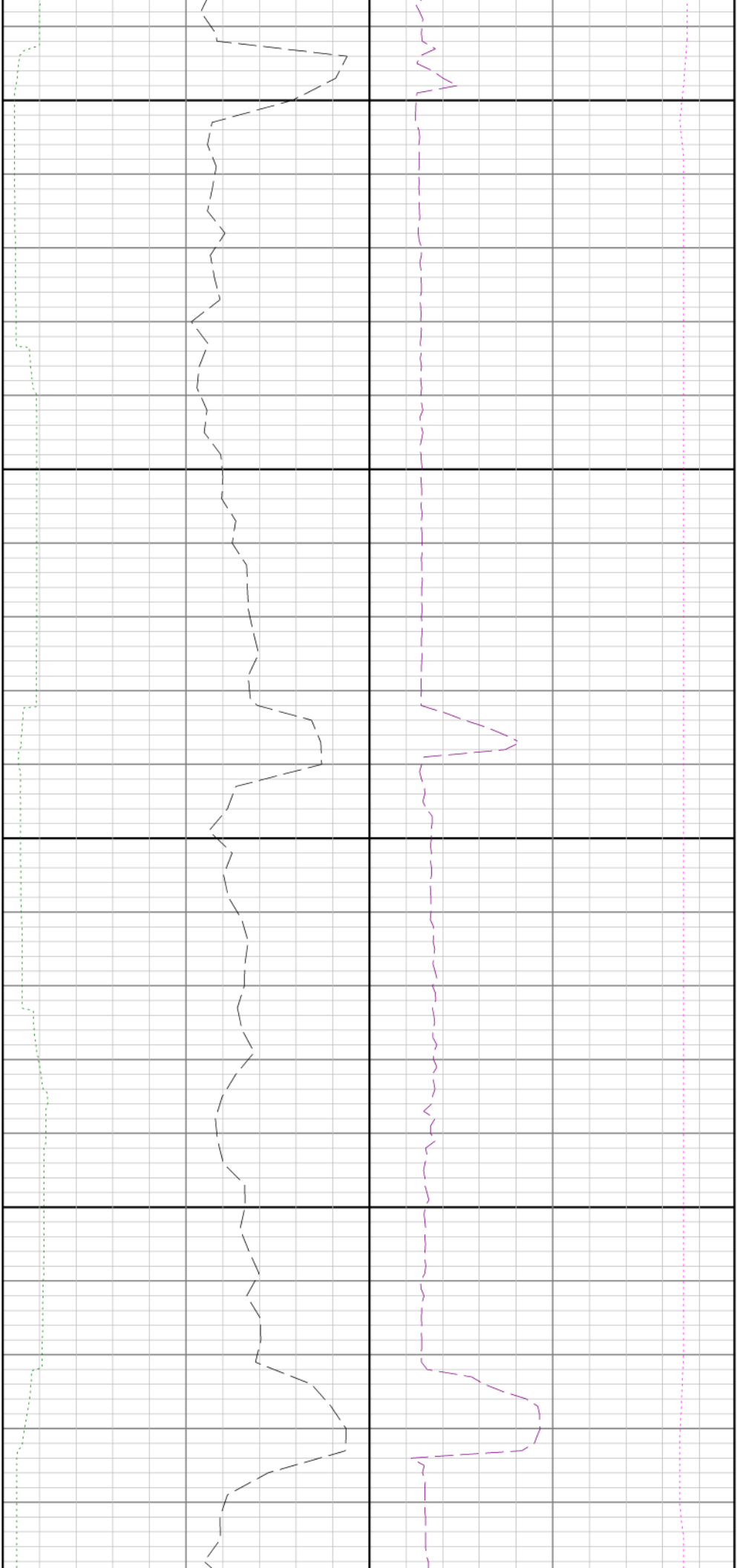


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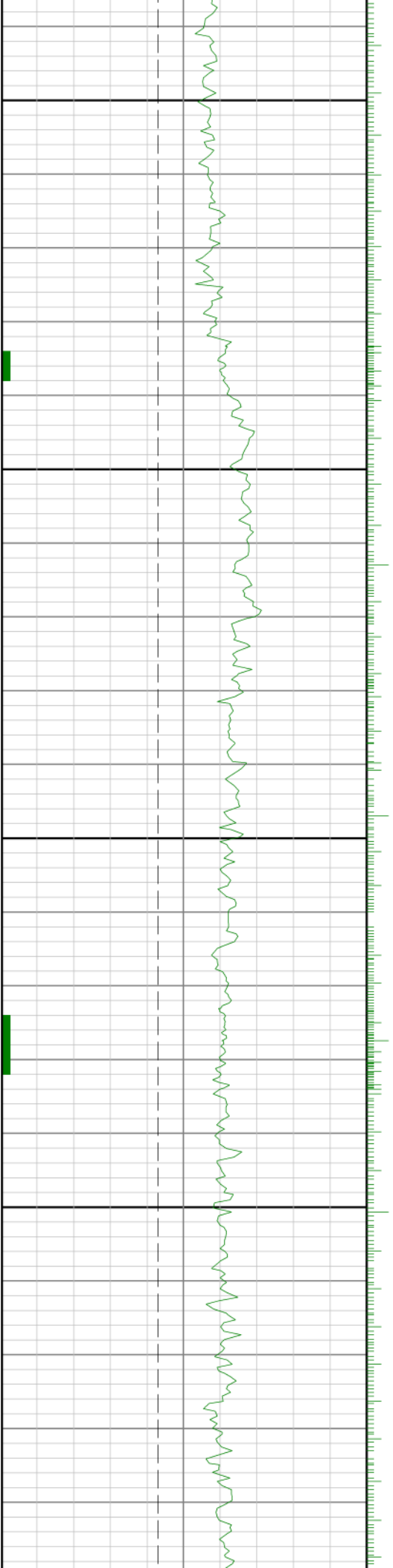


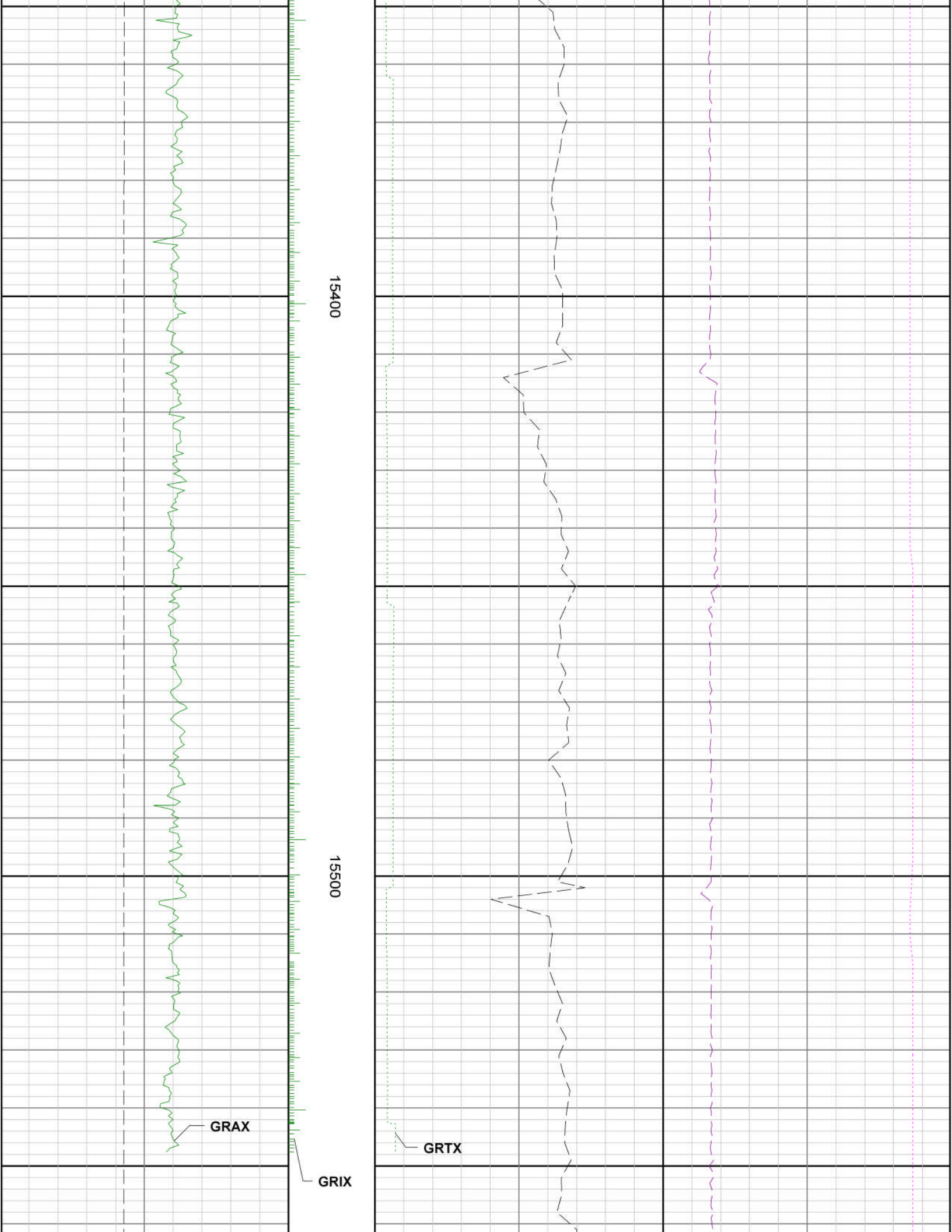




15200

15300





<div>See Remark 3</div> <div>TVD</div>	<div>Run 3 <</div> <div>15600</div>	<div>ROPA</div>	<div>WOBA</div>	<div>TCDX</div>
<div>Gamma Ray Apparent 0.5 ft Avg GRAX</div> <div>0200</div> <div>API</div> <div>True Vertical Depth TVD</div> <div>83007100</div> <div>ft</div>	<div>MD feet 1:240</div>	<div>Gamma Time Since Drilled GRTX</div> <div>0600</div> <div>min</div> <div>Rate of Penetration 3.0 ft Avg ROPA</div> <div>3500</div> <div>ft/hr</div>	<div>Surface Weight On Bit 1.0 ft Avg WOBA</div> <div>0100</div> <div>klbf</div> <div>Downhole Temperature TCDX</div> <div>0275</div> <div>degF</div>	