



LWD Composite Log

Natural Formation Evaluation
Gamma Ray

Scale:

1:240 TVD

Company: Noble Energy

Well: Wells Ranch AA22-612

Depth Reference:

Field: Weld County (Noble NAD 83 Grid)

Driller's Depth

County: Weld County State: Colorado

Status:

Final Print

Surface Location:

Latitude:

Longitude:

Directional
Rotary Steerable
VSS

Other Services:

API No: 05-123-42264-00

Job ID: 7874166

SEC: 22

TWN: 6N

RGE: 63W

Permanent Datum (P.D.): Ground Level

Elevation: 4745.00 ft

N/A

Log Measured From: Rig Floor

Above P.D.

30.00 ft

KB: 4775.00 ft
DF: 4745.00 ft
GL:

Dates

Interval Logged

Magnetic Field Reference

Date From: 2016-04-14

Top: (ft)

1905.00

Azi Reference North:

Grid

Dip Angle: (deg)

67.18

Date To: 2016-04-17

Bottom: (ft)

11828.00

Total Magnetic Field Strength: (nT)

52447

Spud Date: 2016-04-13

Mag to Reference North Correction: (deg)

7.26 E

Borehole Record

Casing Record

Hole Size (in)

From (ft)

To (ft)

Size (in)

Weight (lb/ft)

From (ft)

To (ft)

8.500

1917.00

11828.00

9.625

36.00

0.00

1907.00

Mud Record

Deviation Record

Type

From (ft)

To (ft)

Hole Size (in)

Interval (ft)

Inc | Az (Start)

Inc | Az (End)

Oil Based Mud

1917.00

11828.00

8.500

9911.00

0.30 | 295.27

89.85 | 90.92

Acquisition System

Software Version

Other

Baker Hughes Cadence

G3.2

Rig: H&P 321

Prior Studio

3.2.7268.7

Contractor: Helmerich & Payne Drilling Co

District:

RMD

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	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	2	8.500	PDC	2.00	AutoTrak Curve	1905.00	11828.00	1917.00	11828.00	2016-04-14 14:22	2016-04-17 01:18	51.26

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Alex Osborne	2016-04-13	2016-04-17	Matthew Delmore	2016-04-13	2016-04-17	Mike Gurnsey	2016-04-13	2016-04-17
Will Drake	2016-04-13	2016-04-17						

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2016-04-14 13:30	1	1917.00	Oil Based Mud	9.8	14	N/A	16.4	62.0/24.5	Active Pit	46000	0.00
2016-04-15 02:30	1	5296.00	Oil Based Mud	9.8	16	N/A	16.0	60.5/26.0	Active Pit	42000	0.00
2016-04-15 13:30	1	6902.00	Oil Based Mud	9.8	14	N/A	15.8	62.0/24.0	Active Pit	46000	0.00
2016-04-16 02:30	1	9179.00	Oil Based Mud	9.8	13	N/A	15.6	63.5/23.0	Active Pit	43000	0.00
2016-04-16 13:30	1	10397.45	Oil Based Mud	9.9	13	N/A	15.2	66.0/20.0	Active Pit	50000	0.00
2016-04-17 02:45	1	11828.00	Oil Based Mud	9.9	13	N/A	15.2	65.0/21.0	Active Pit	48000	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	ATC_SU	11813726	Near Bit Inclination	5.93	6.55	7.000	4.330
1	ATC_SU	11813726	Near Bit VSS	5.93	6.55	7.000	4.330
1	ATC_MWD	12049472	Gamma (single)	2.19	12.17	7.000	3.250
1	ATC_MWD	12049472	Directional (mag)	12.26	22.24	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_LCBM	ATC_LCBM	Auto Trak Curve LCBM

Comments


- 1 Baker Hughes Run 1 utilized a 6.50 inch AutoTrak Curve Rotary Steerable assembly tool behind a 8.50 inch bit from 1917 ft MD to 11828 ft MD (1916.98 ft TVD to 6681.60 ft TVD).
- 2 Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to a lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 3 The gaps found in the gamma data are due to memory data not being recorded in these intervals.

Remarks

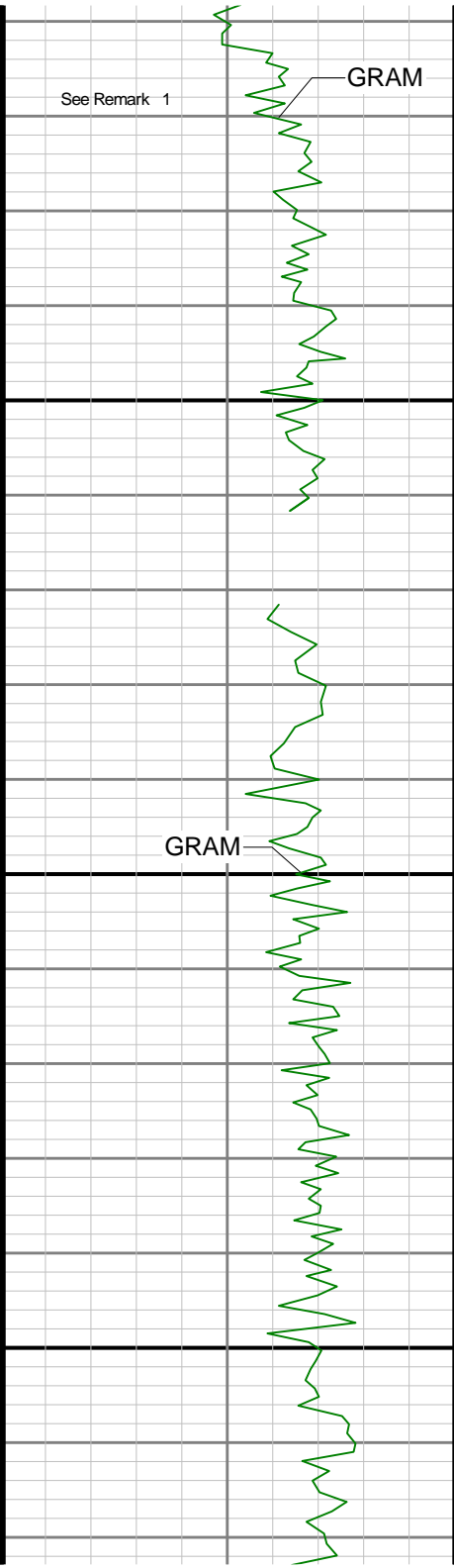
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	1910.00	8.500	1	The interval from 1905 ft MD to 1917 ft MD (1904.98 ft TVD to 1916.98 ft TVD) has no surface date due to the Gamma Ray sensor to bit offset

Curve Mnemonics

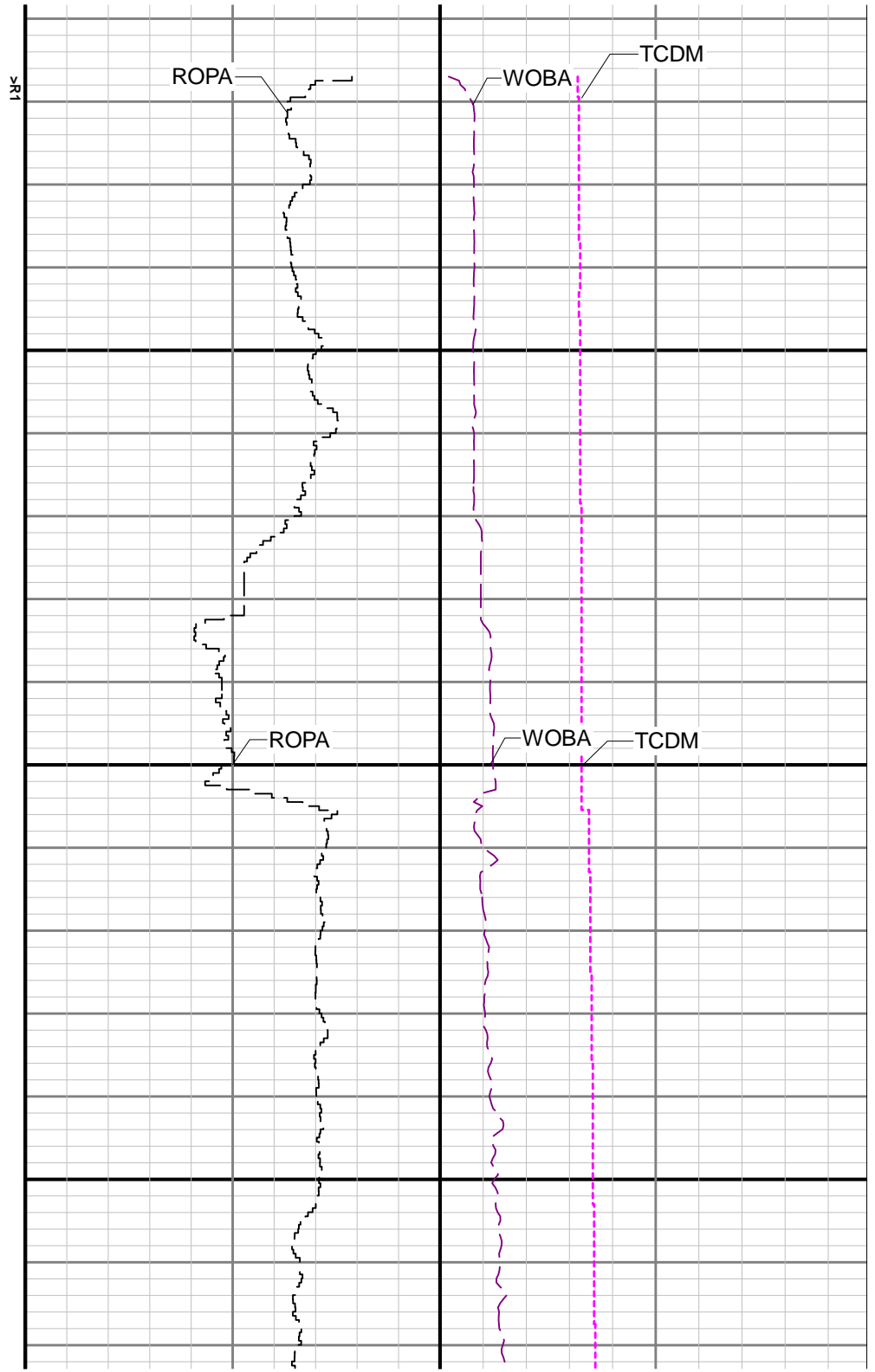
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
GRAM	Gamma Ray - Apparent 0.5 ft Average	API
TCDM	Downhole Temperature	degF
WOBA	Weight On Bit, Average 1 ft Average	klb

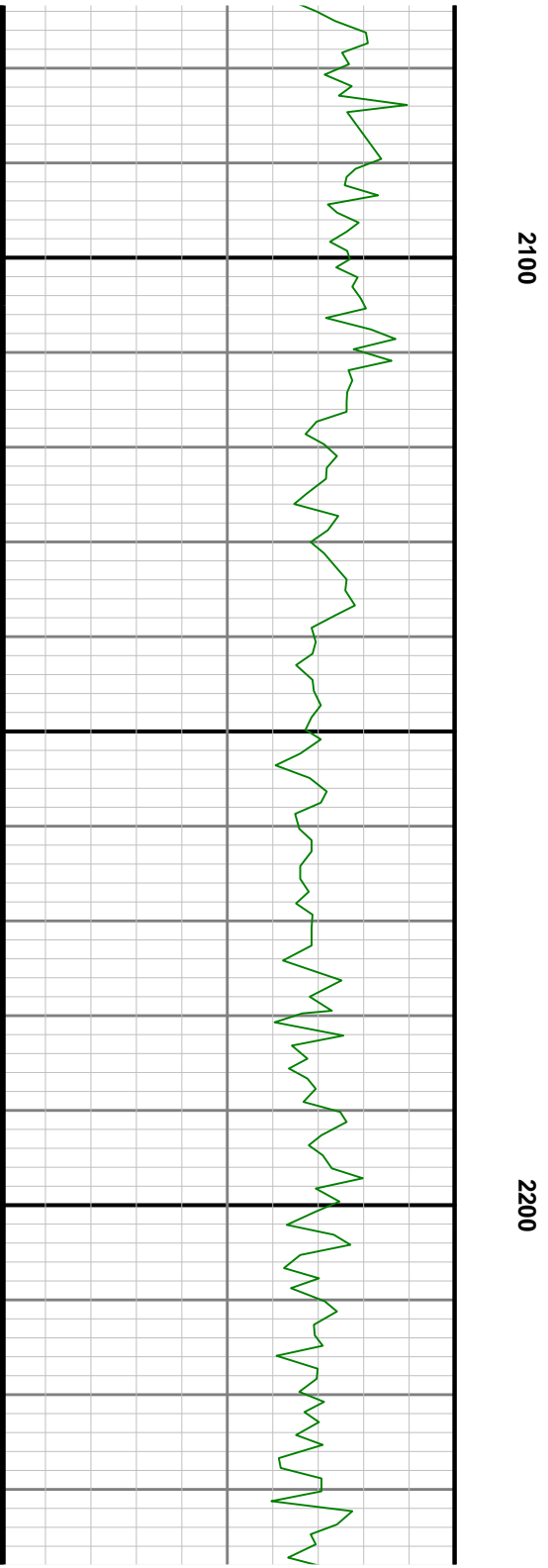
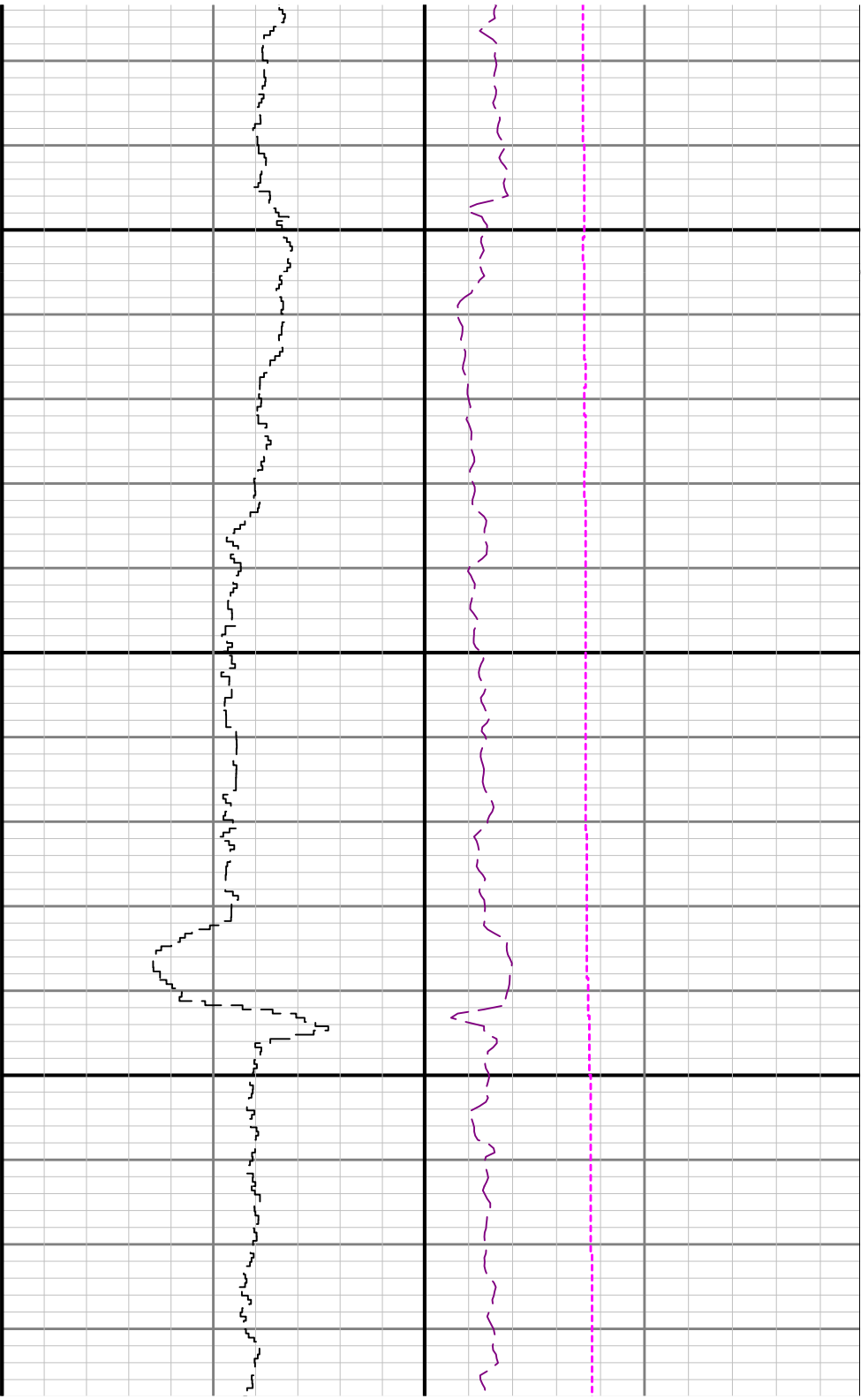
	Company	Noble Energy		
	Well	Wells Ranch AA22-612		
	Interval	Date From:	2016-04-14 14:22	Top: 1905.00
		Date To:	2016-04-17 01:18	Bottom: 11828.00
	Created	2016-04-21 17:25		

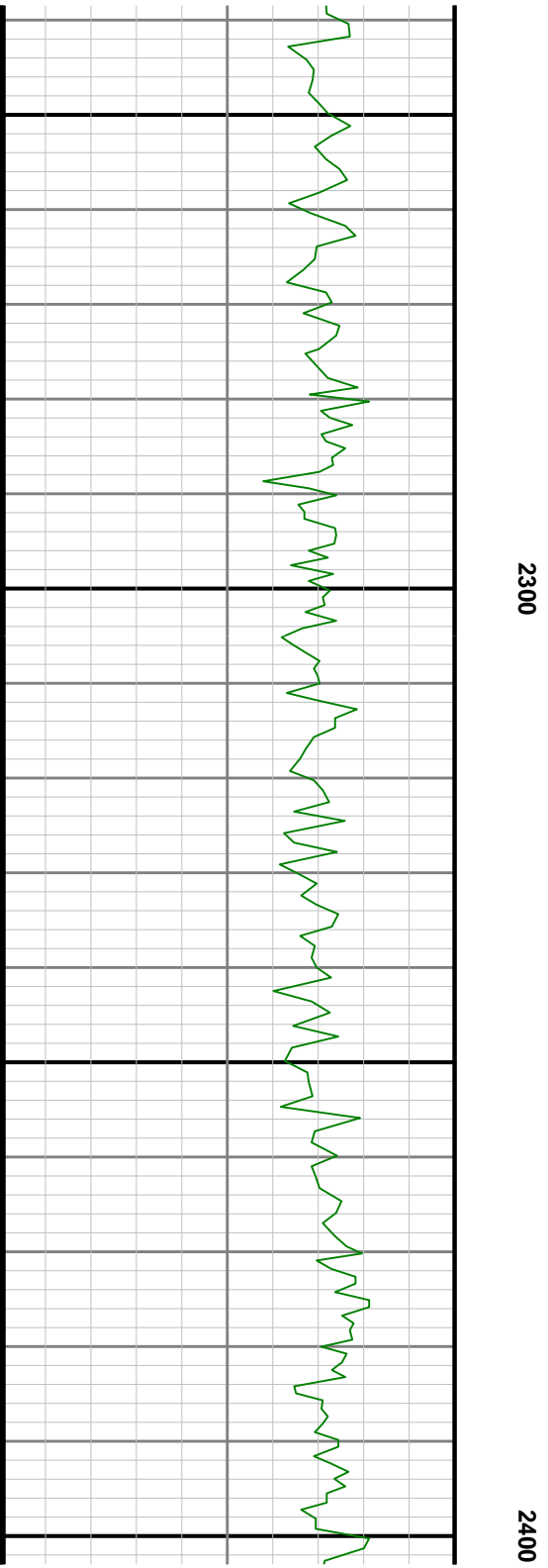
Gamma Ray - Apparent 0.5 ft Average GRAM	TVD 1:240 feet	Rate of Penetration 3 ft Average ROPA	Surface Weight On Bit 1 ft Average WOBA
0 150 API		1000 0 ft/h	0 100 klb Downhole Temperature TCDM 0 300 degF
	1900		



2000



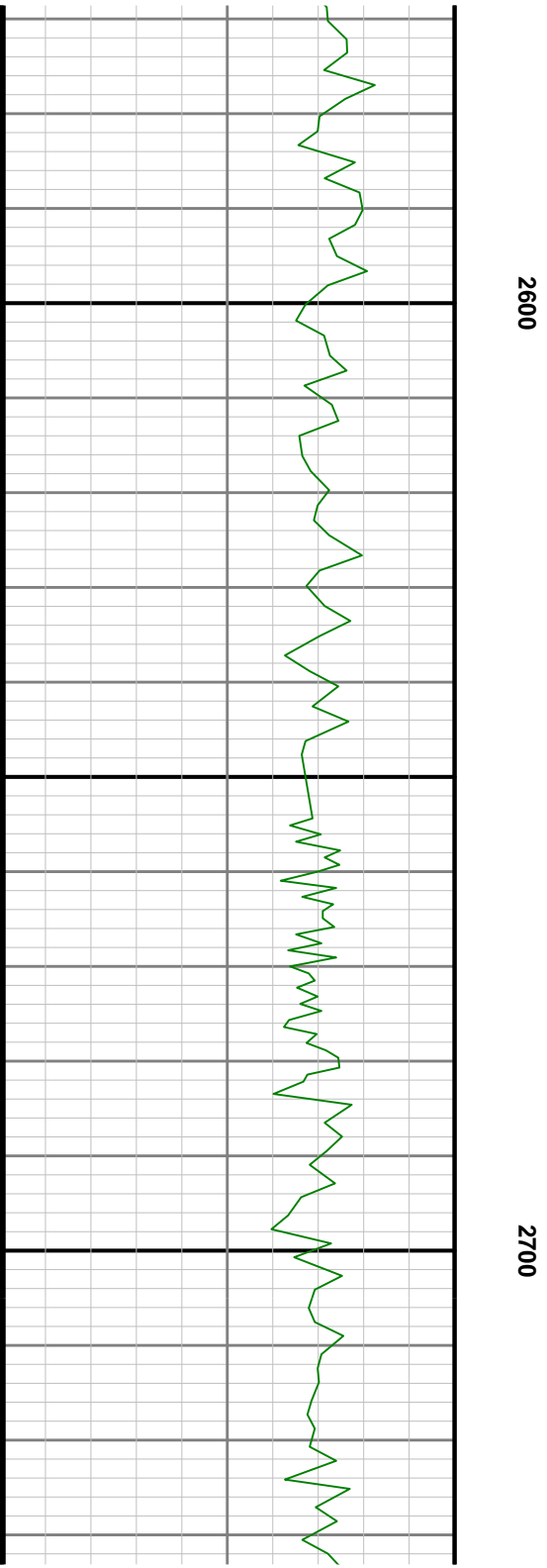
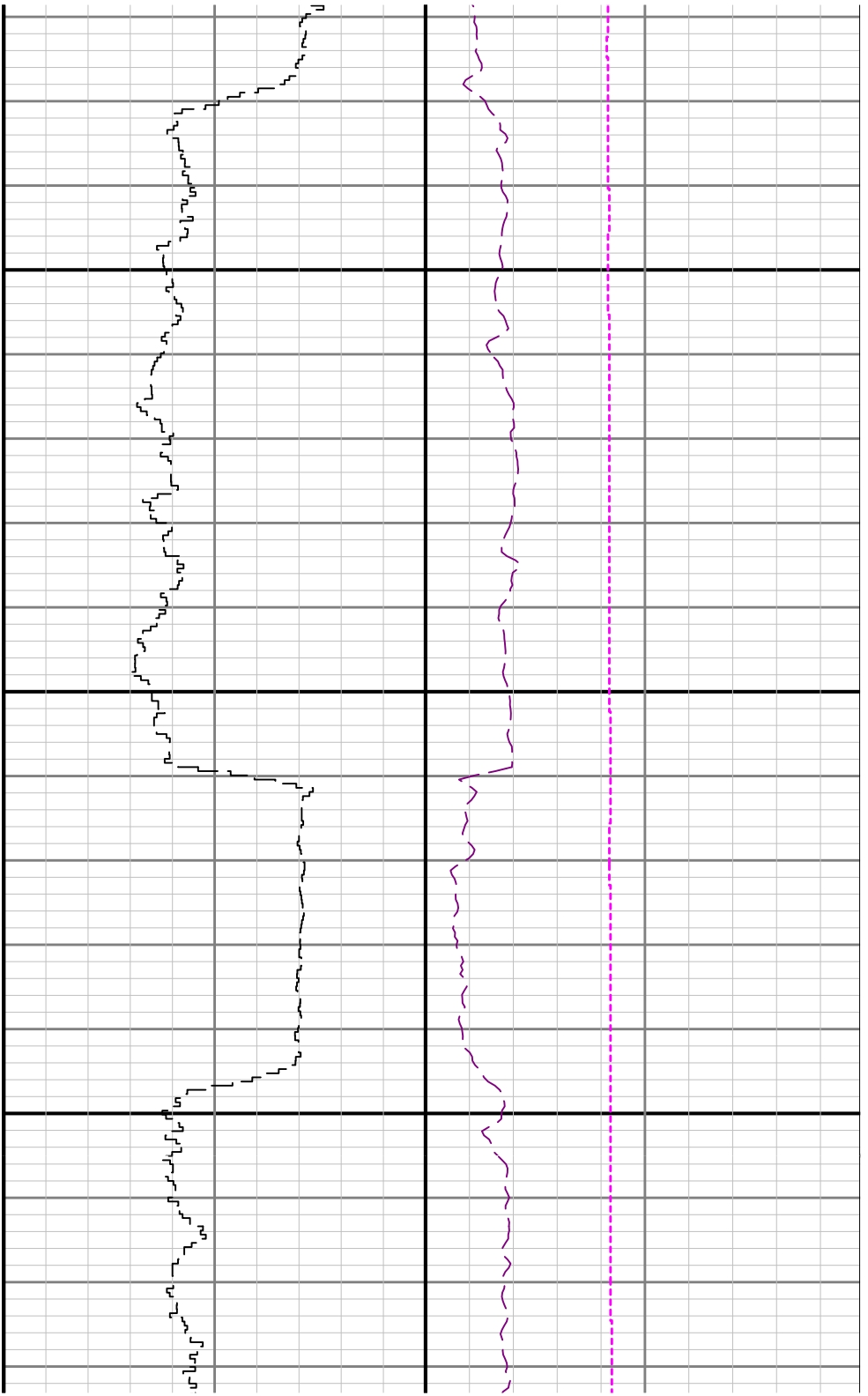


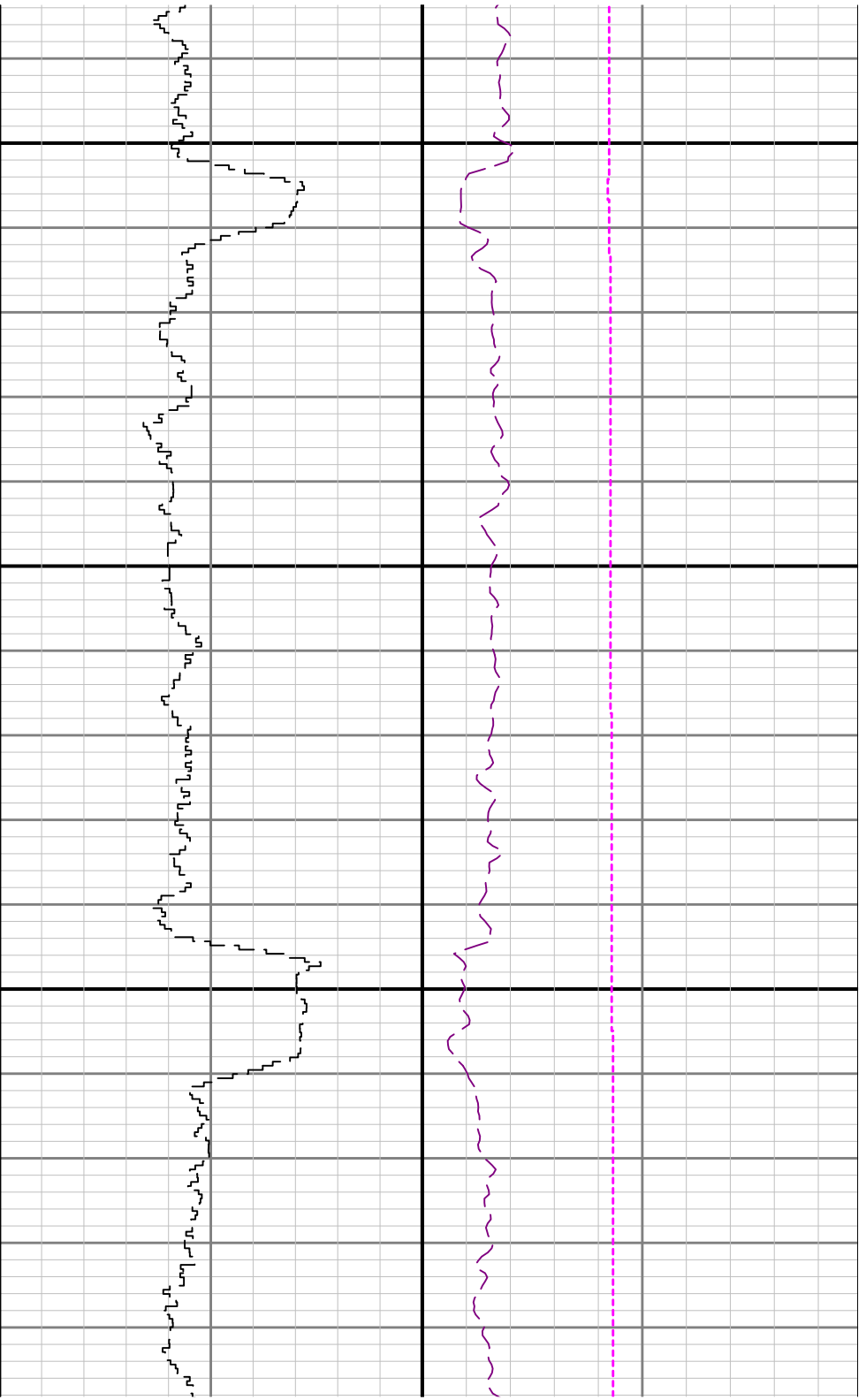




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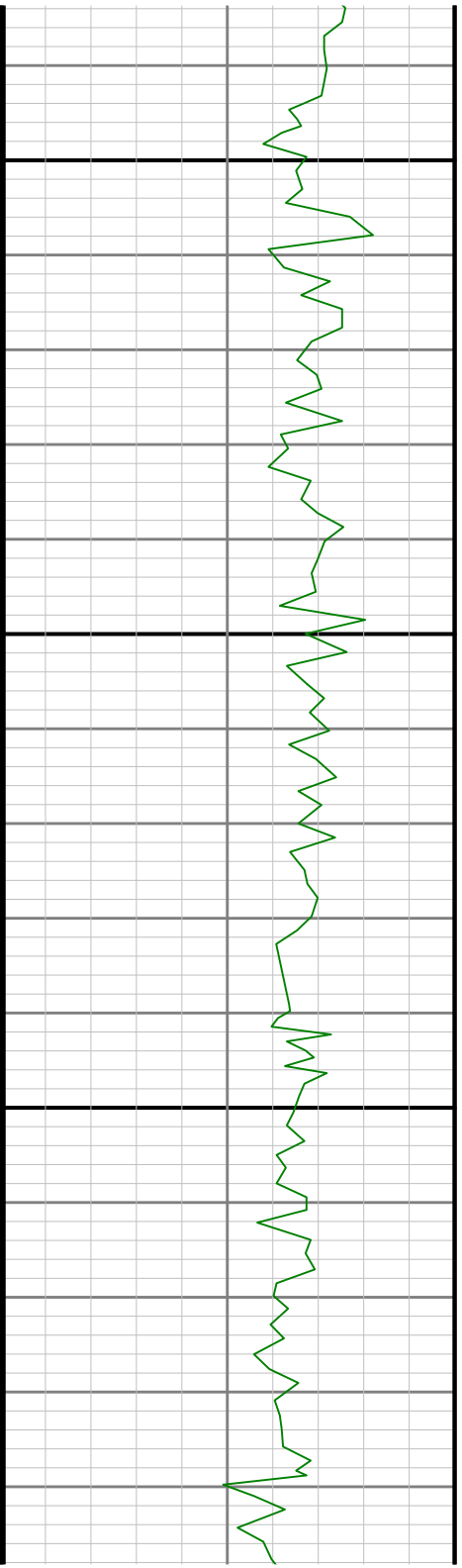


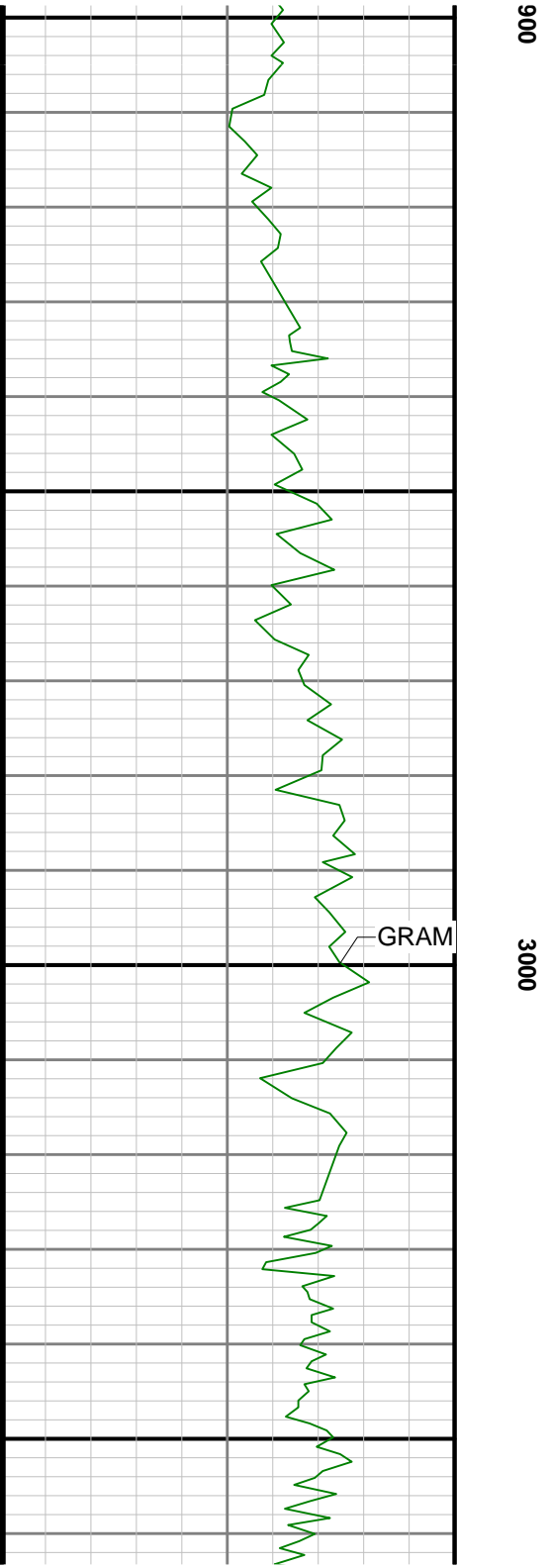
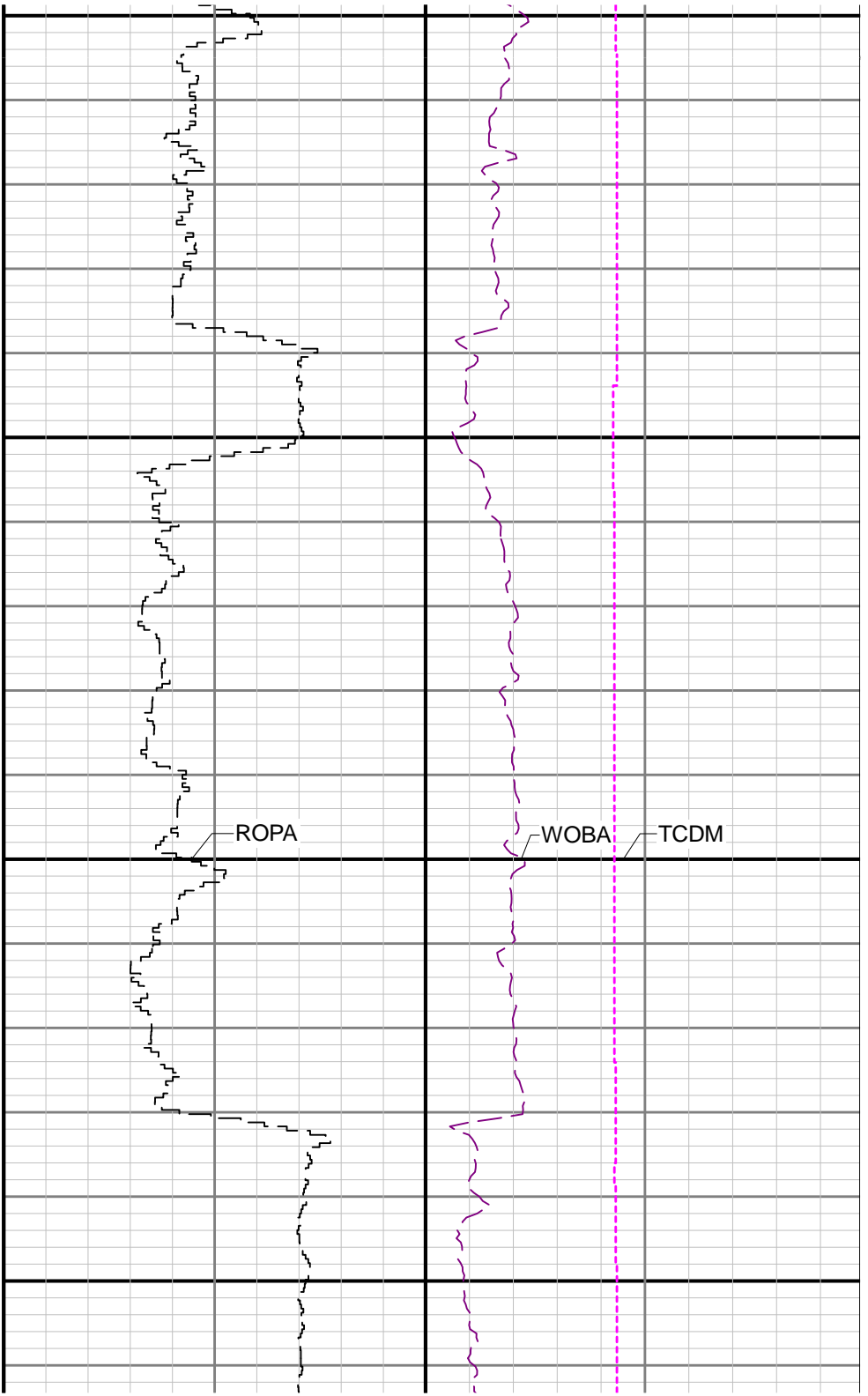


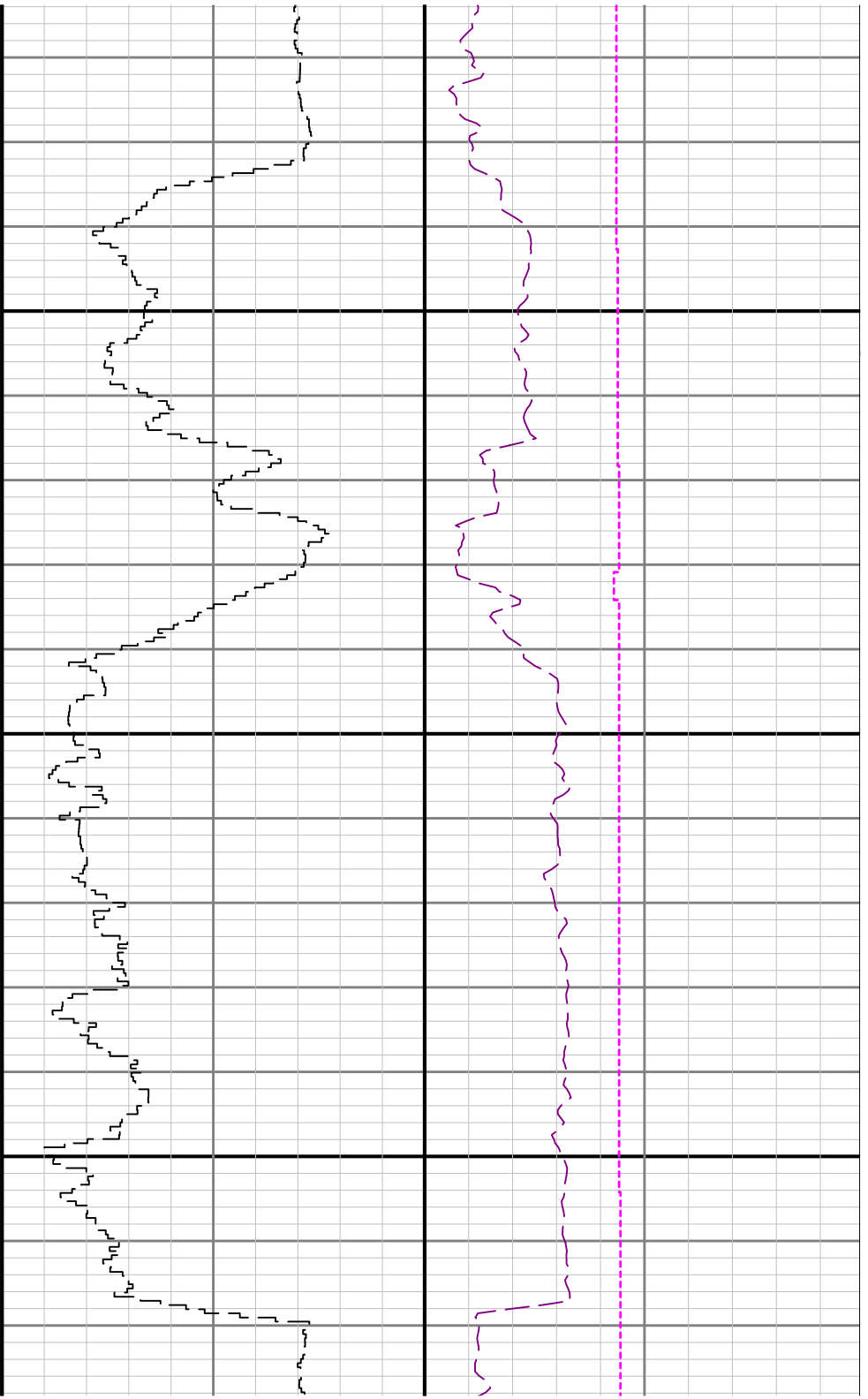


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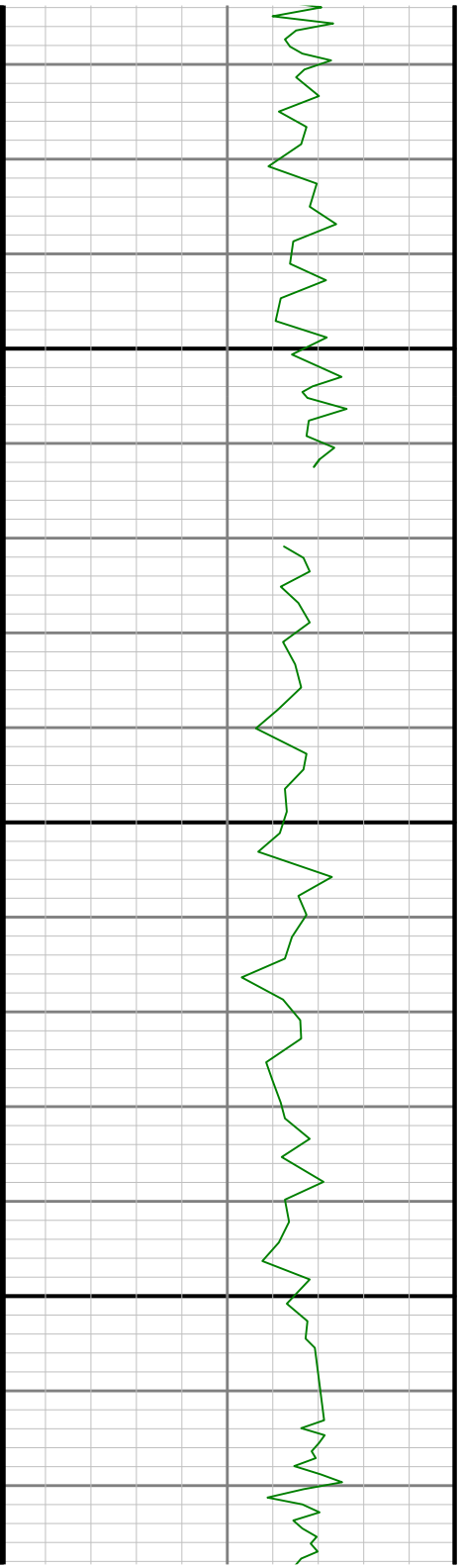


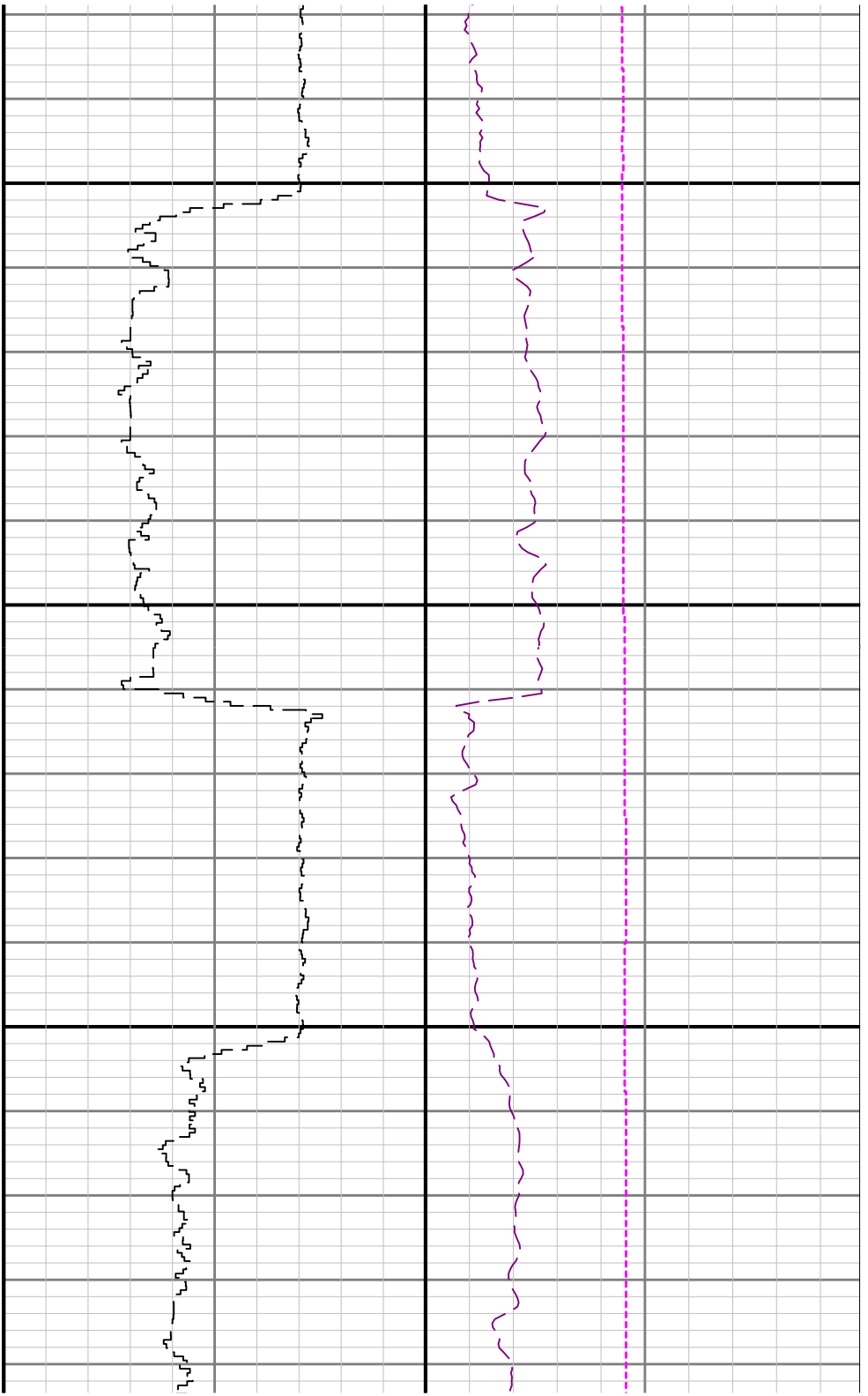




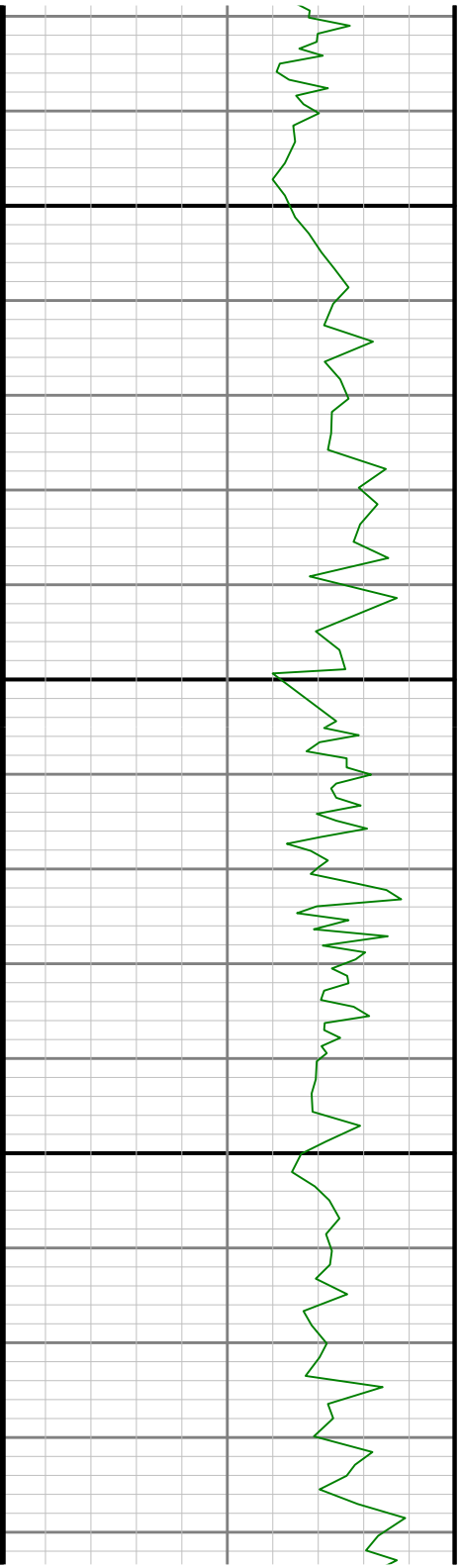
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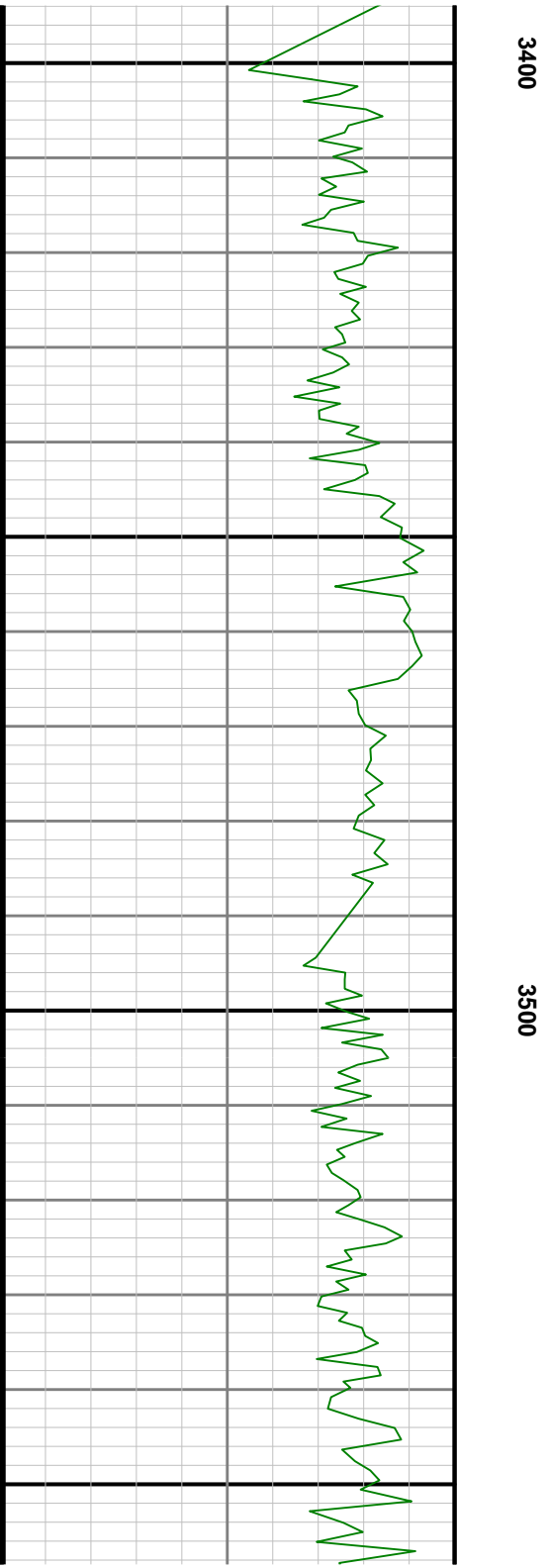
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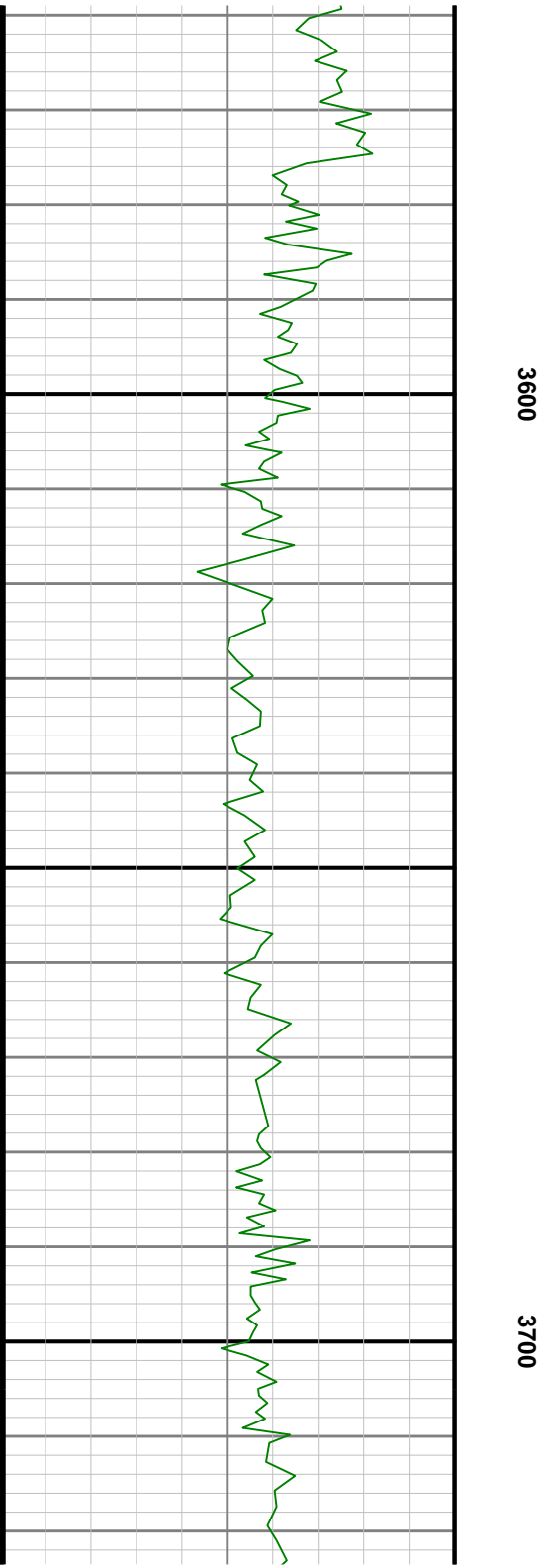
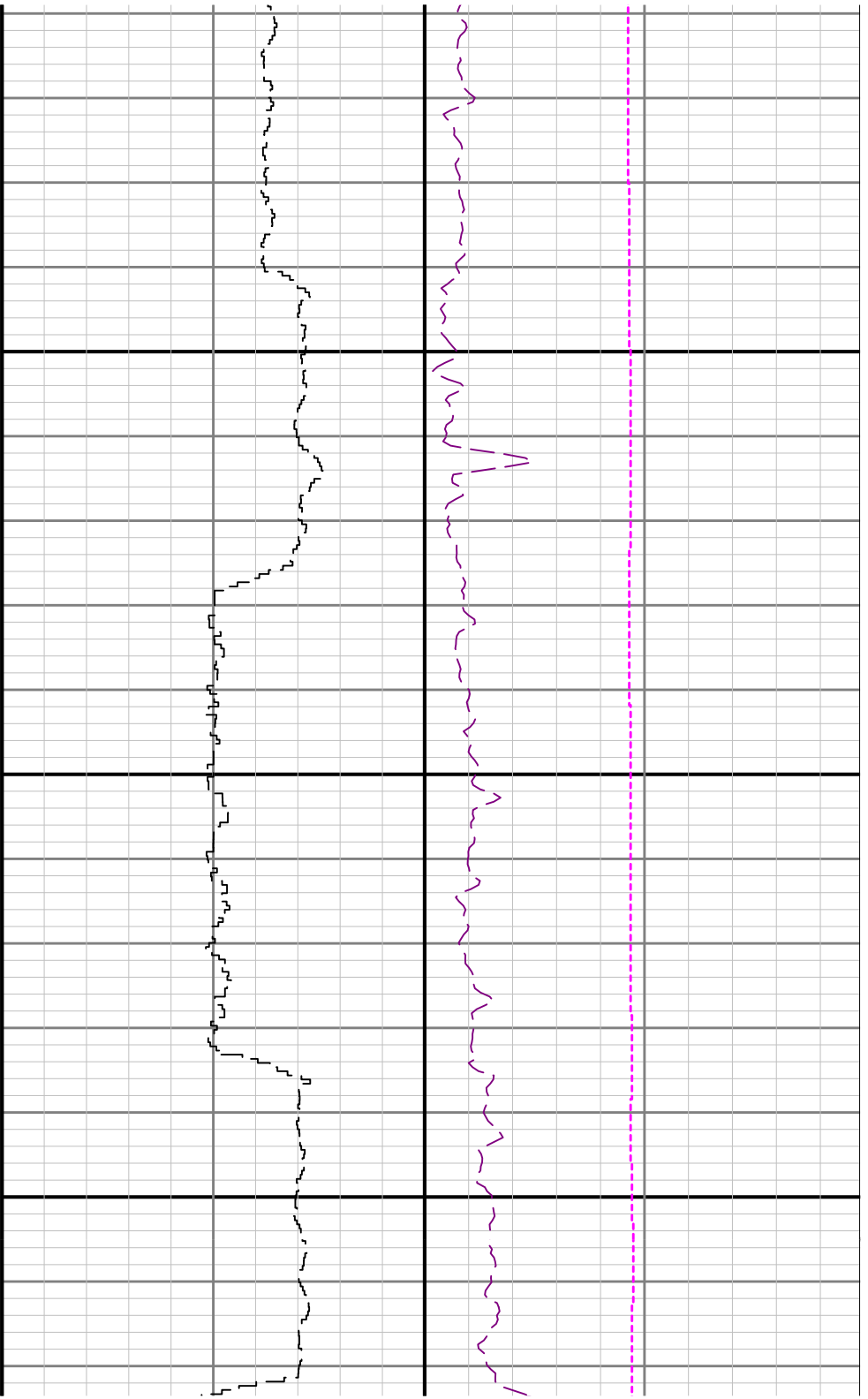


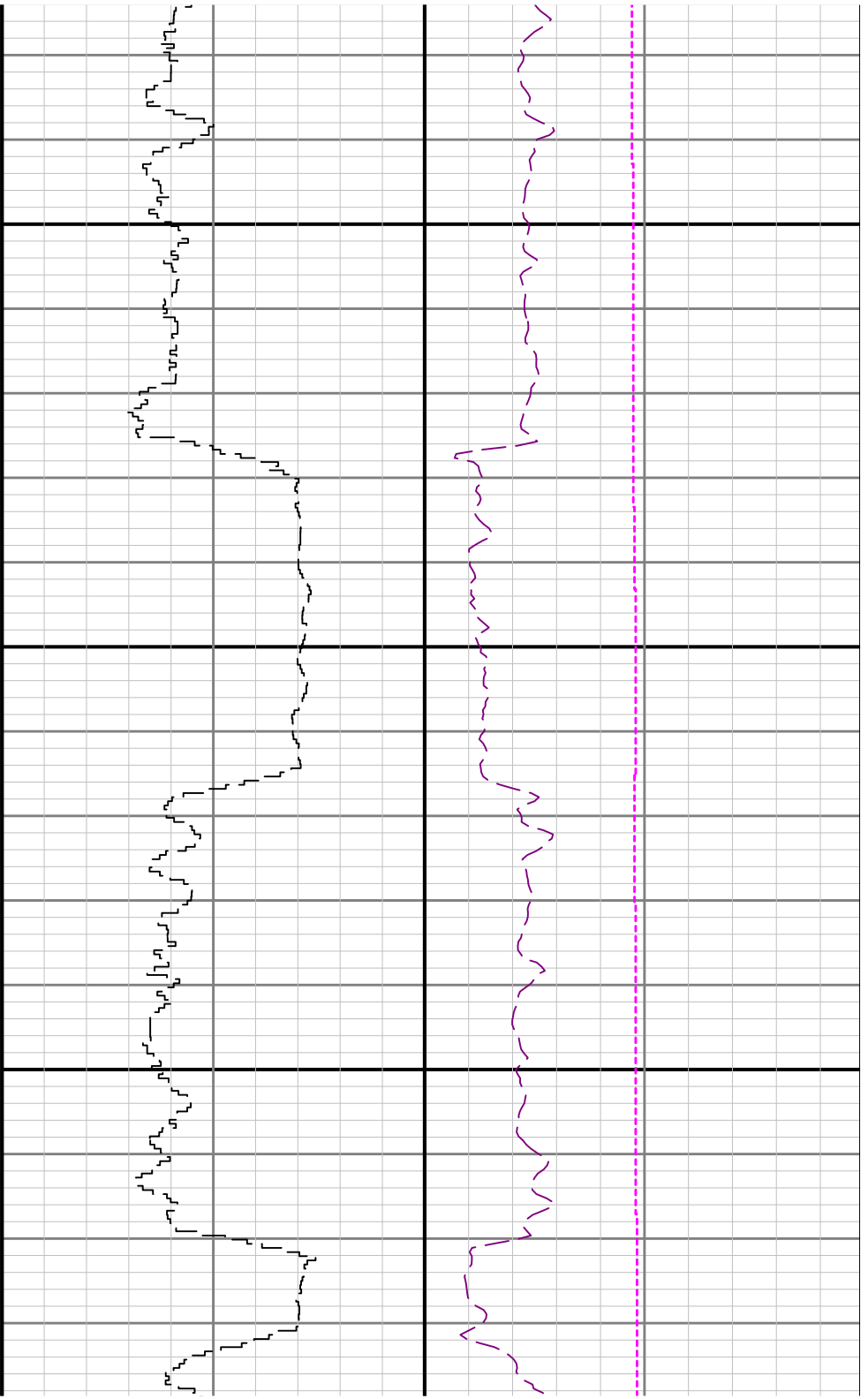


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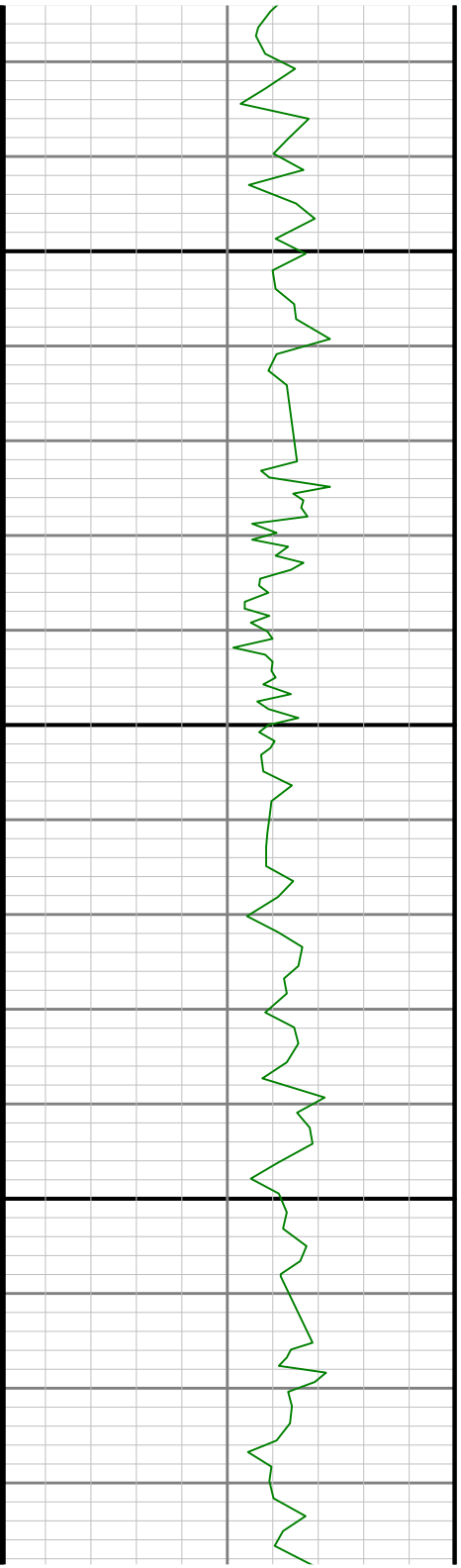


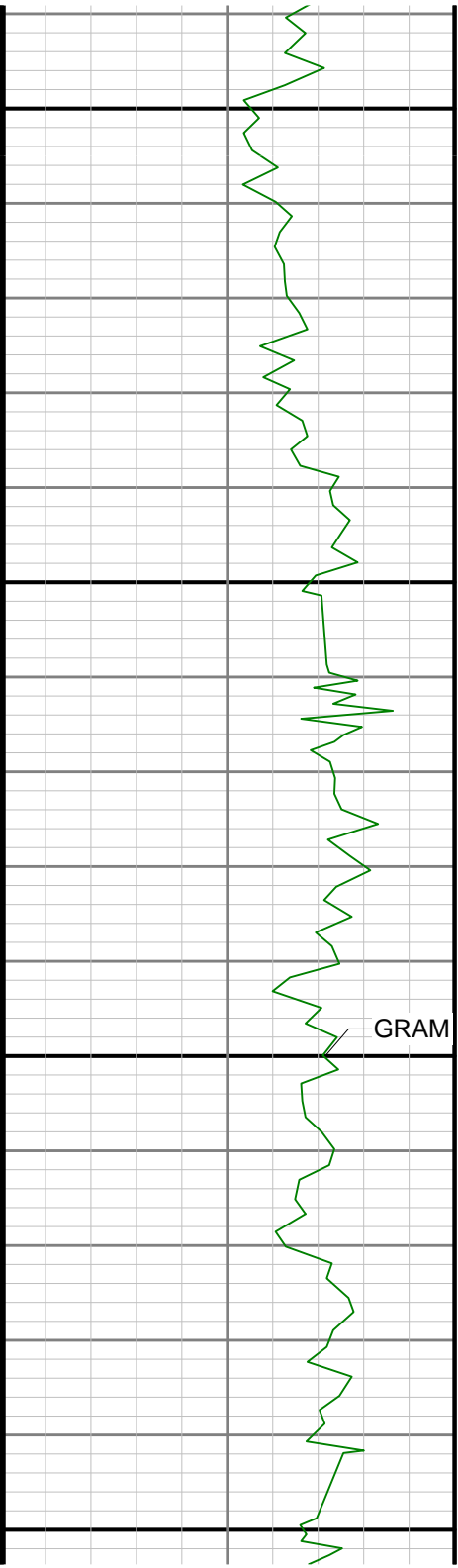






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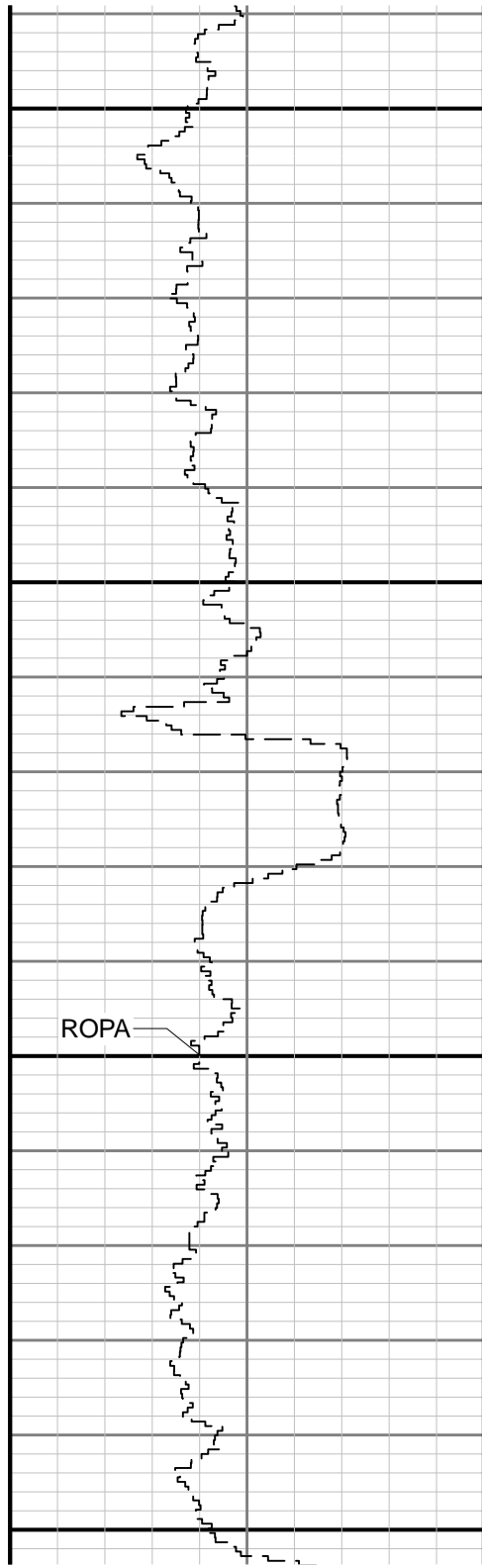




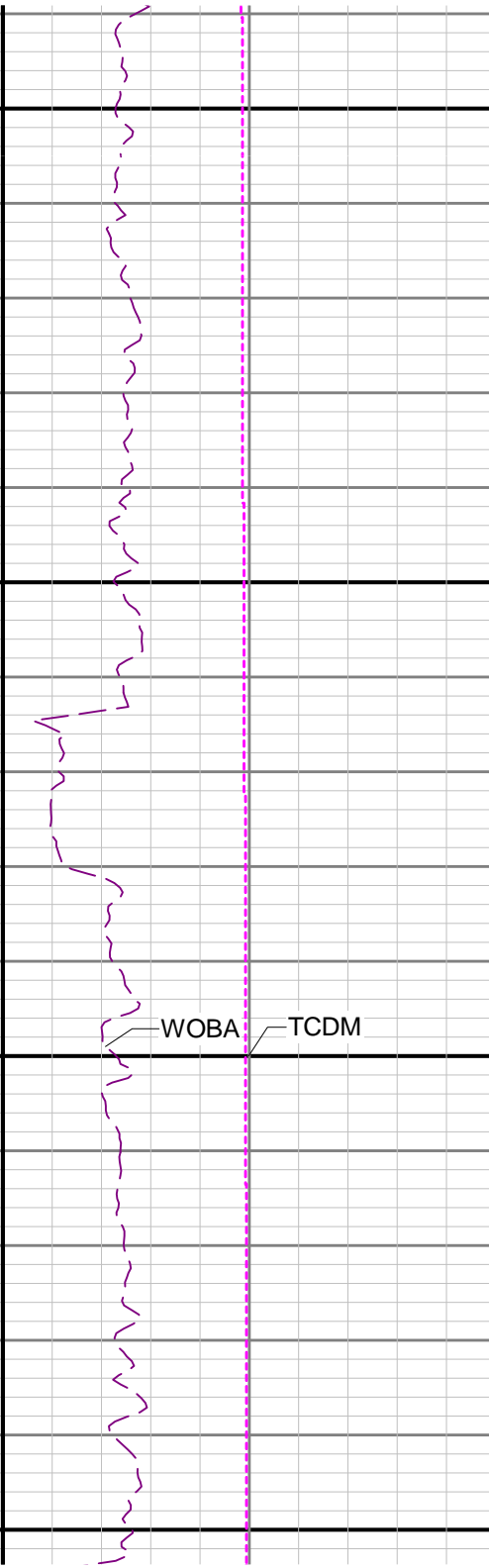
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GRAM

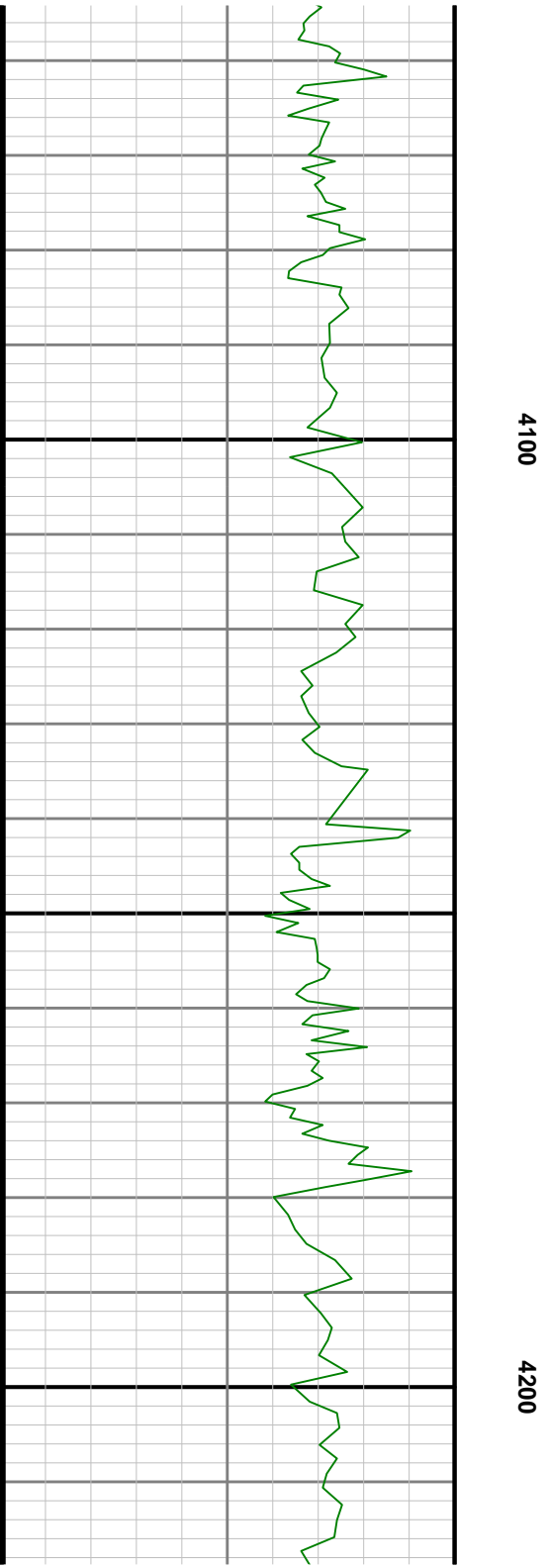
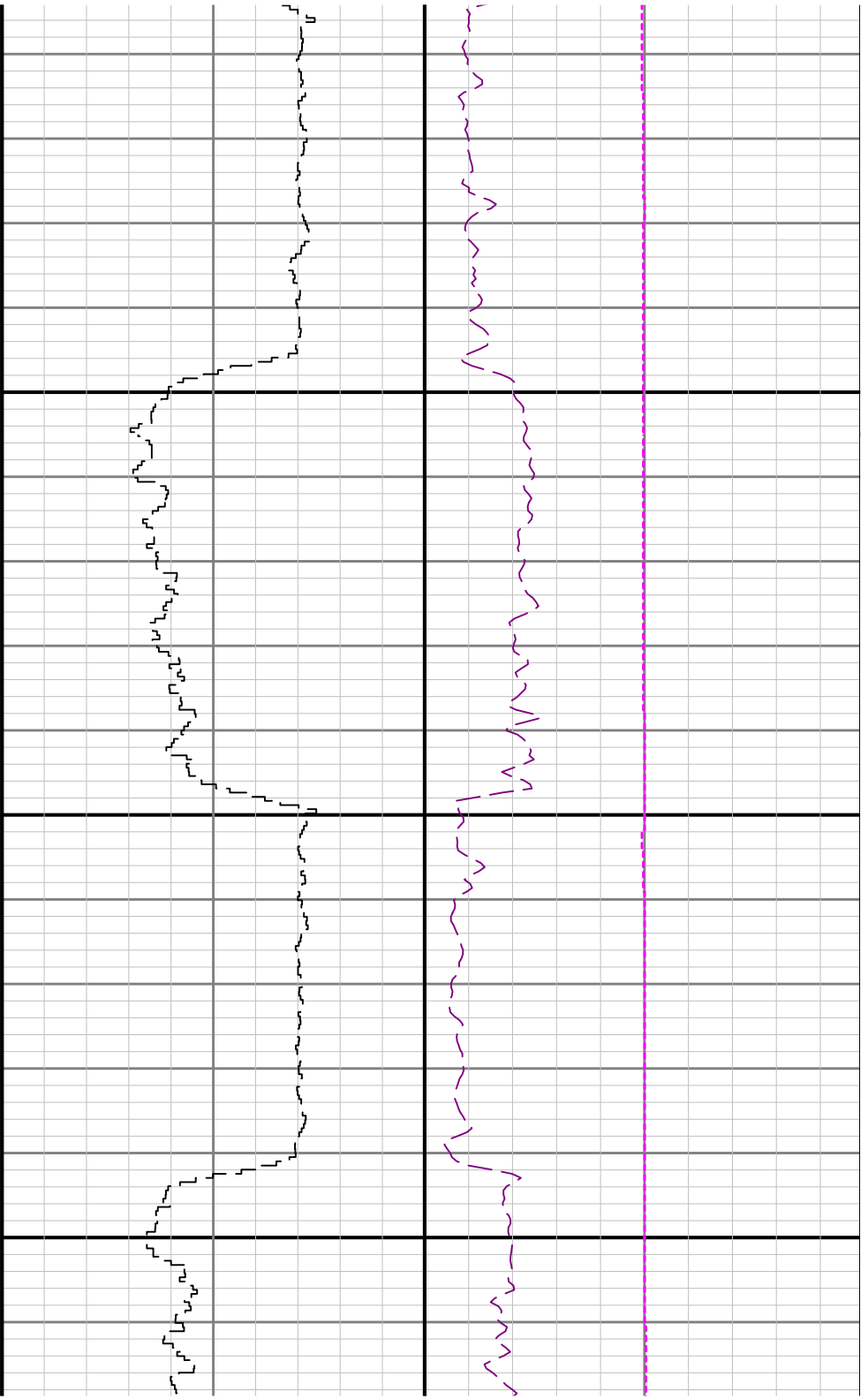


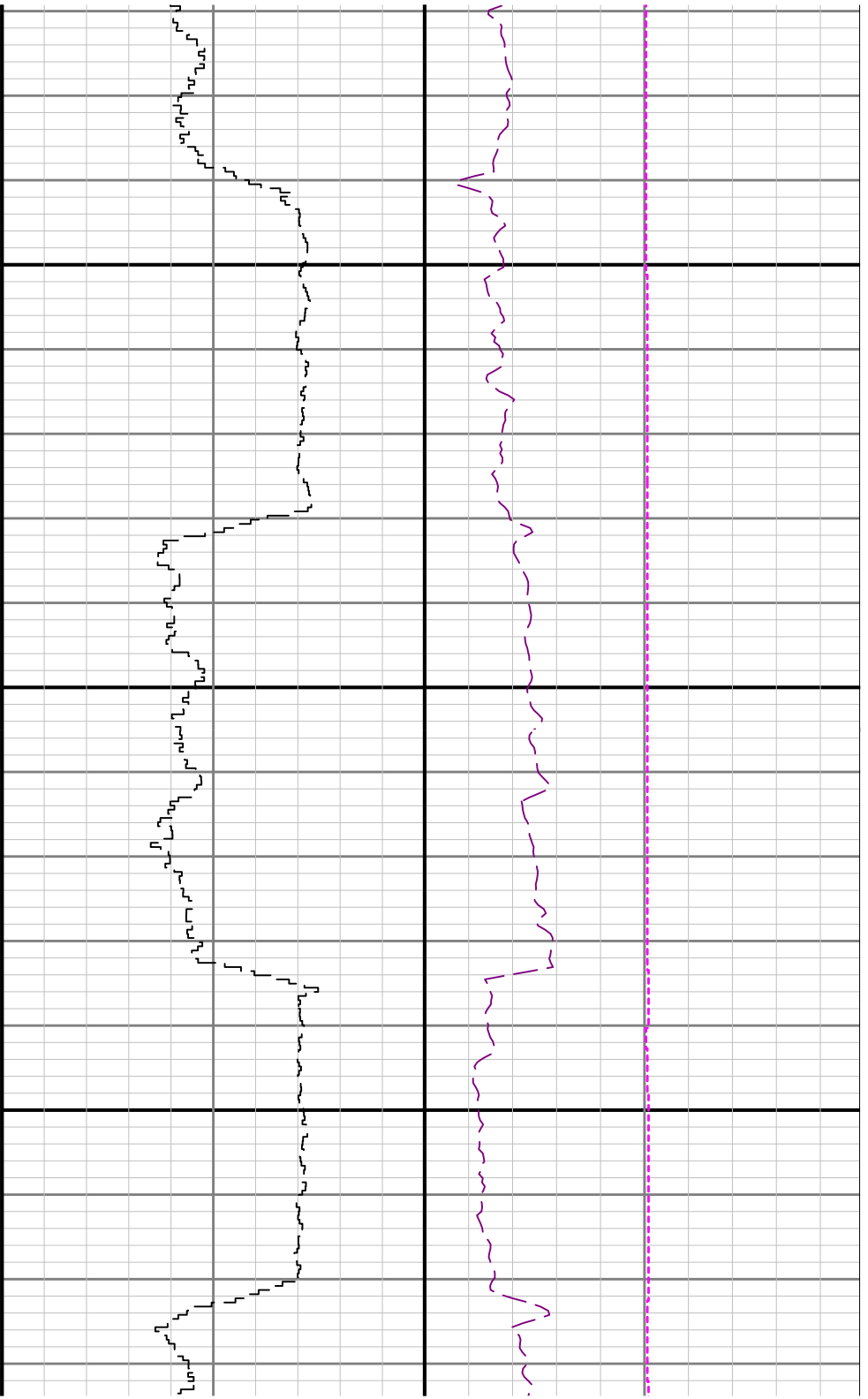
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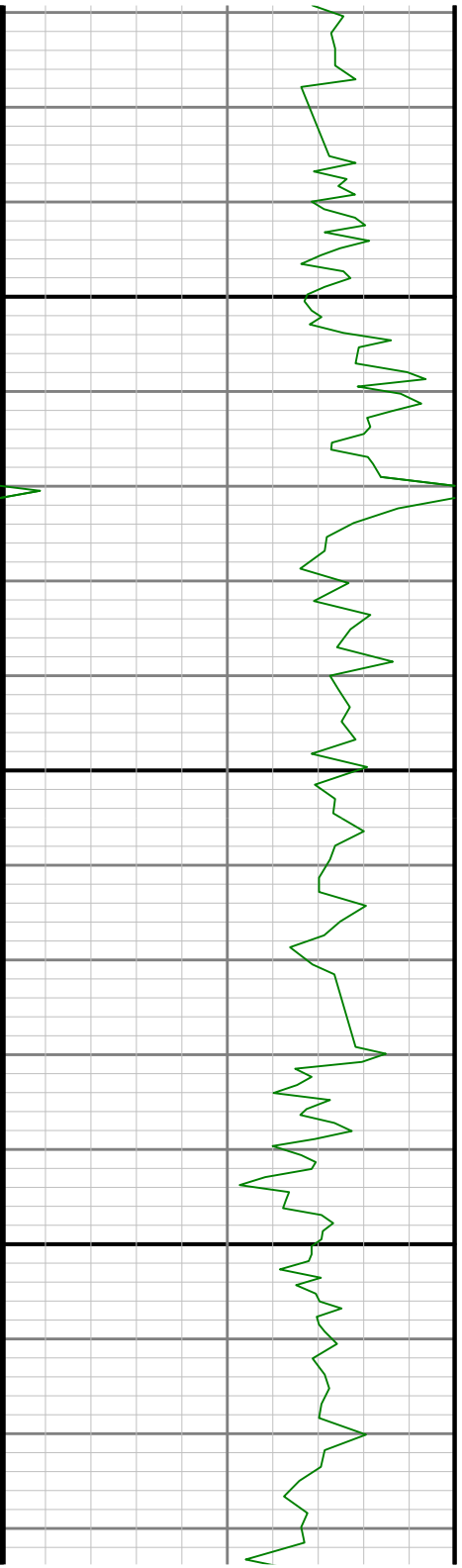
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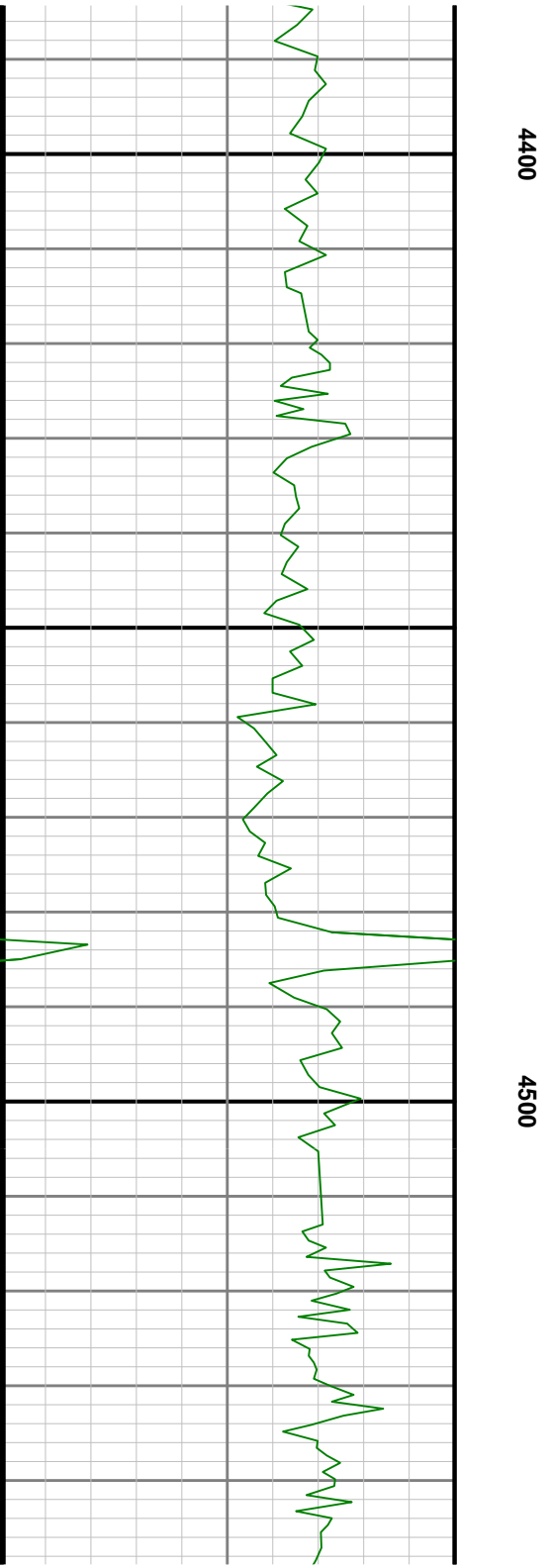
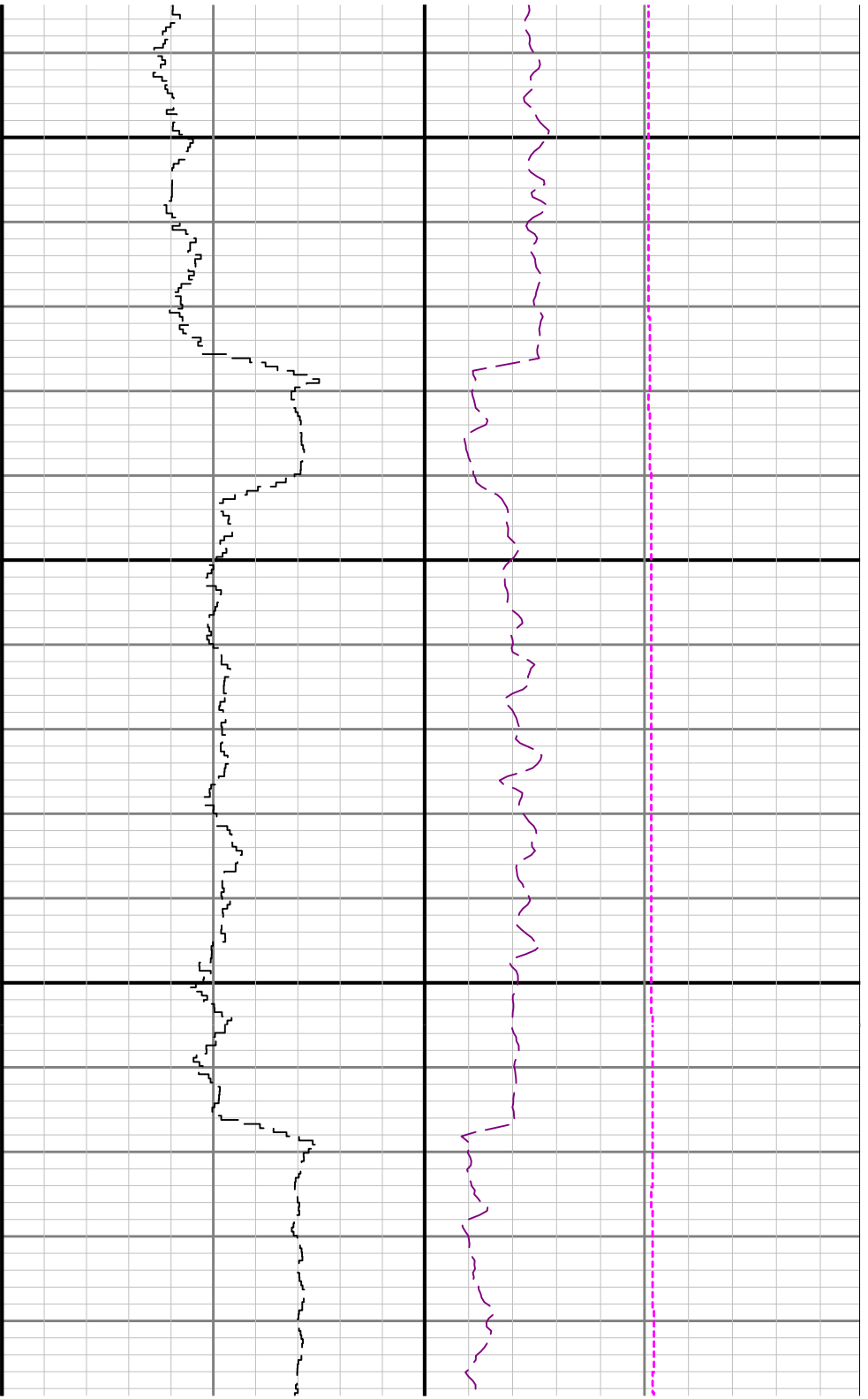
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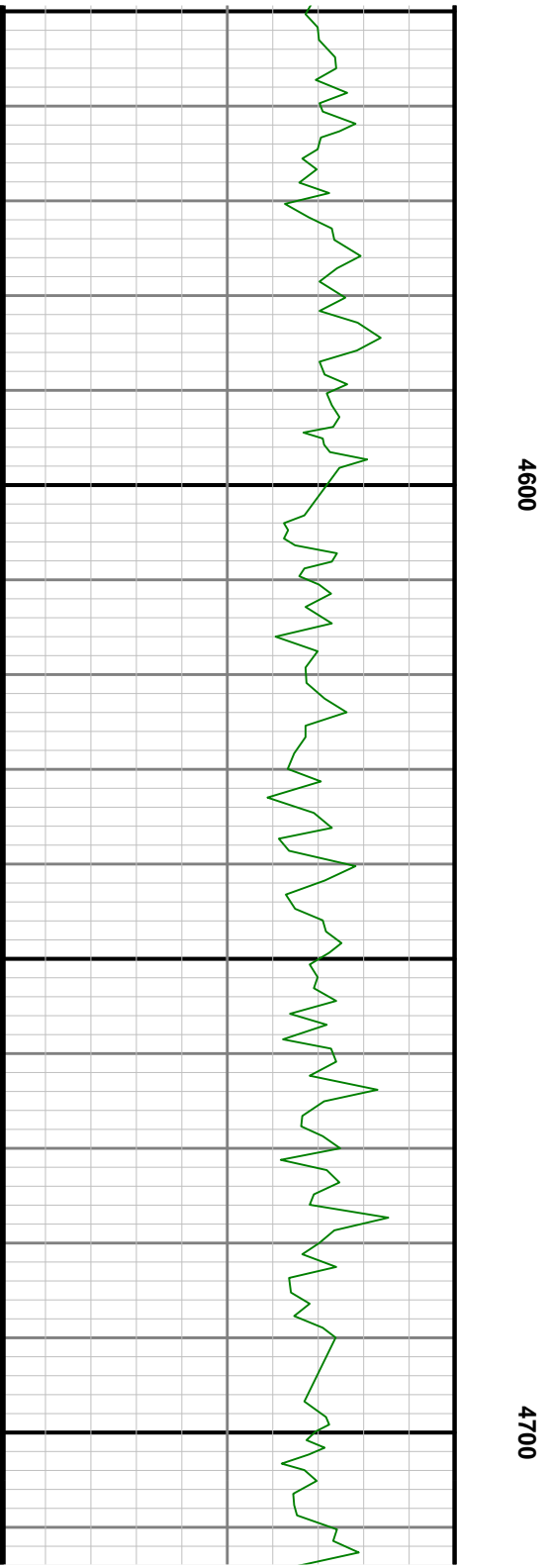
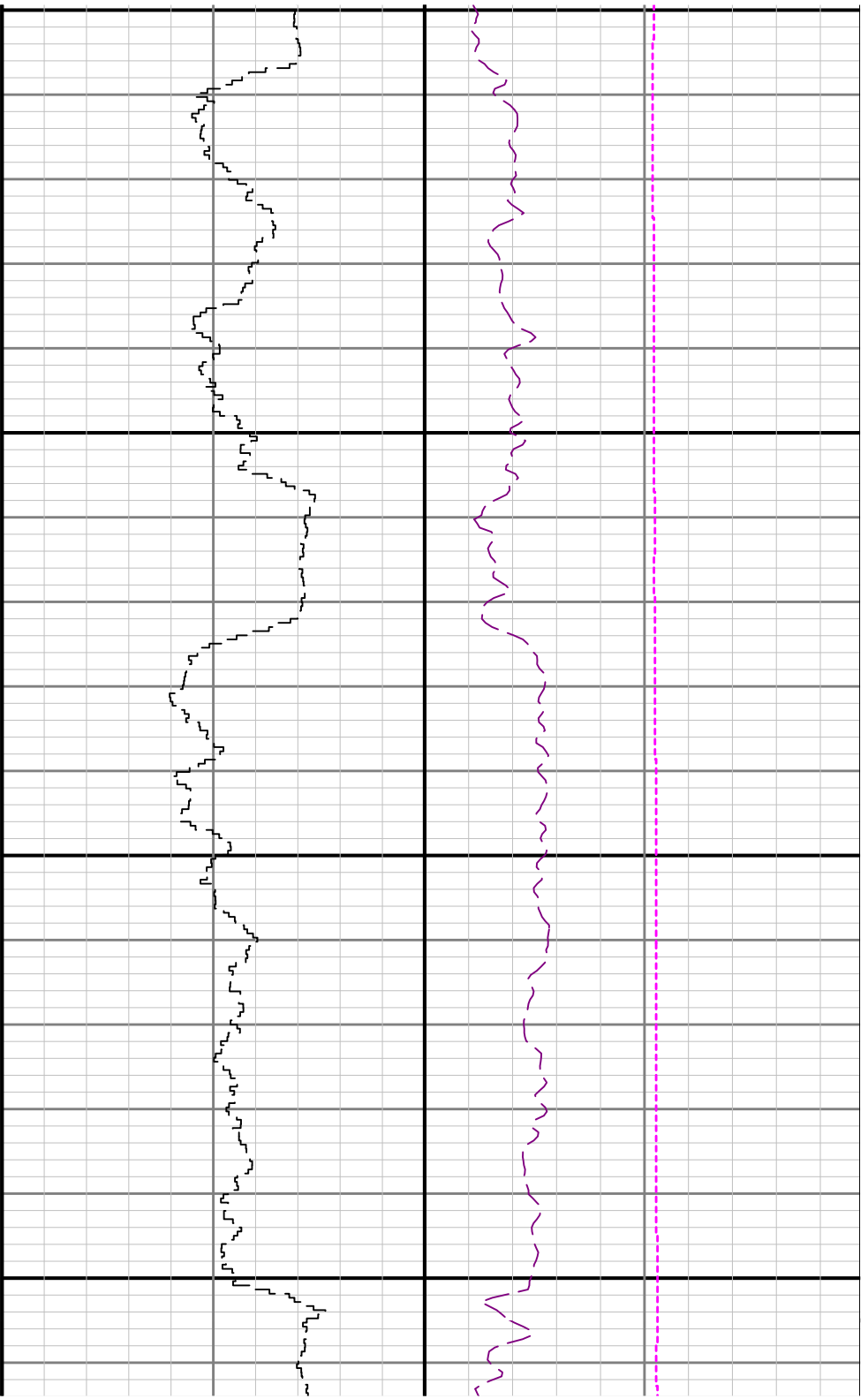


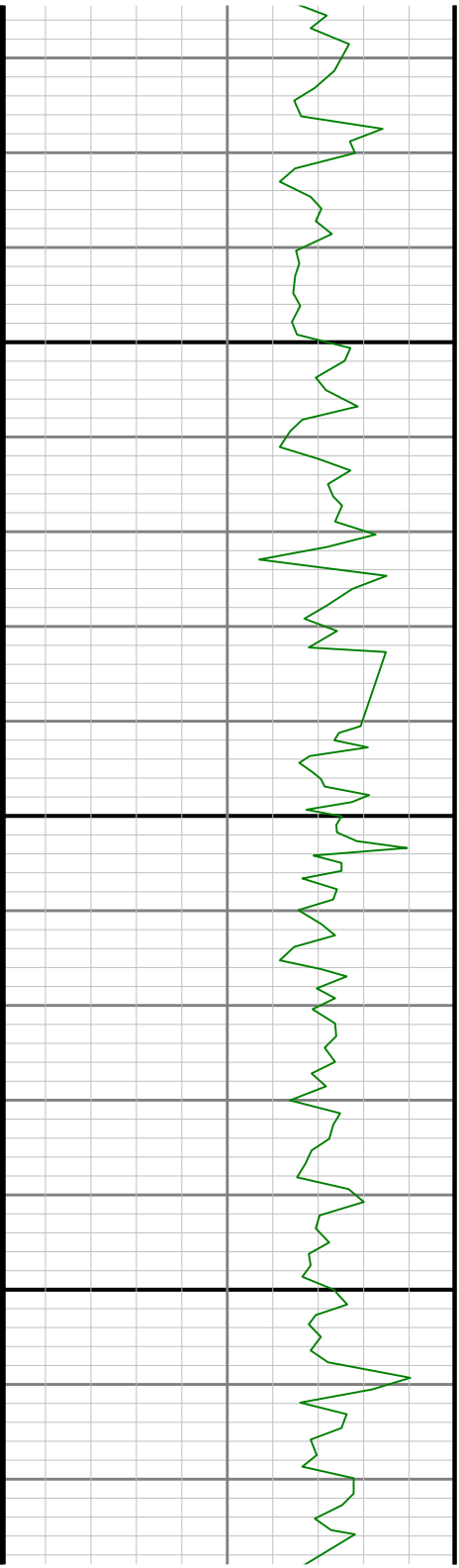


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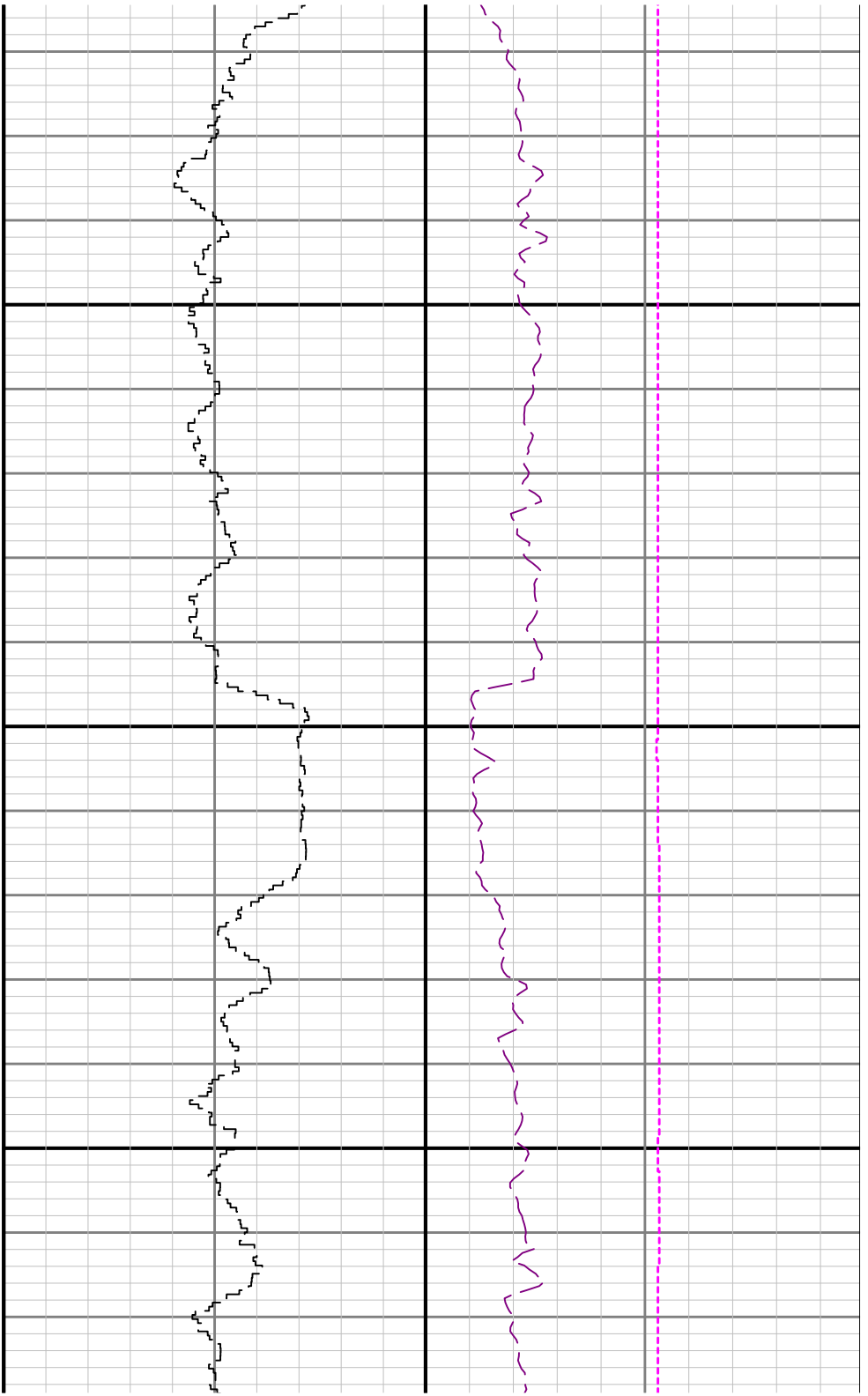


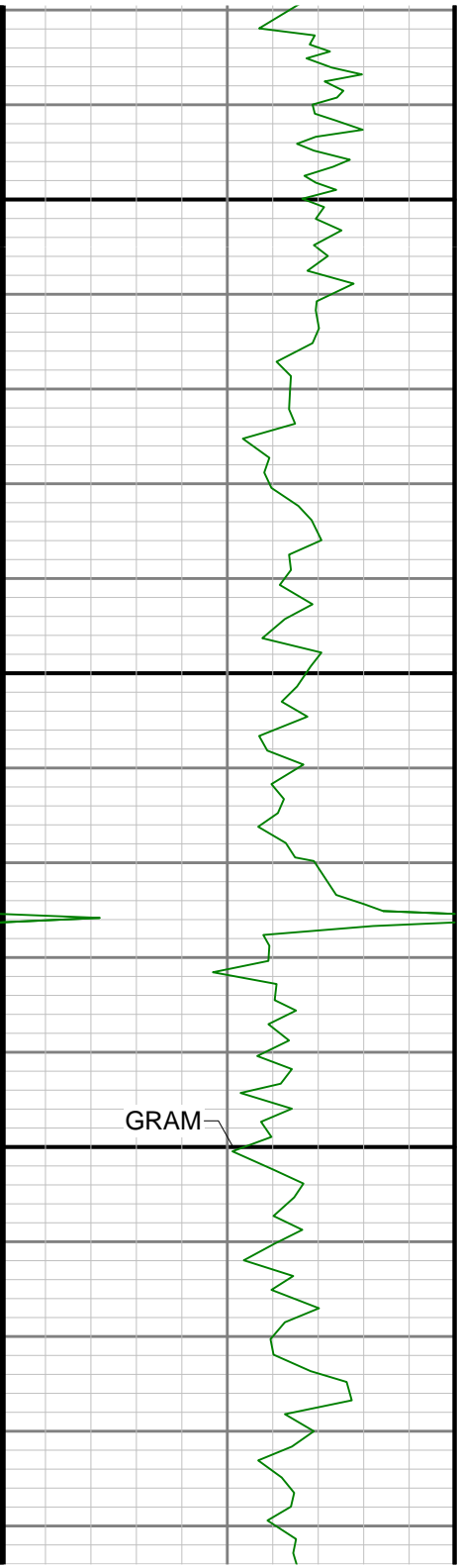






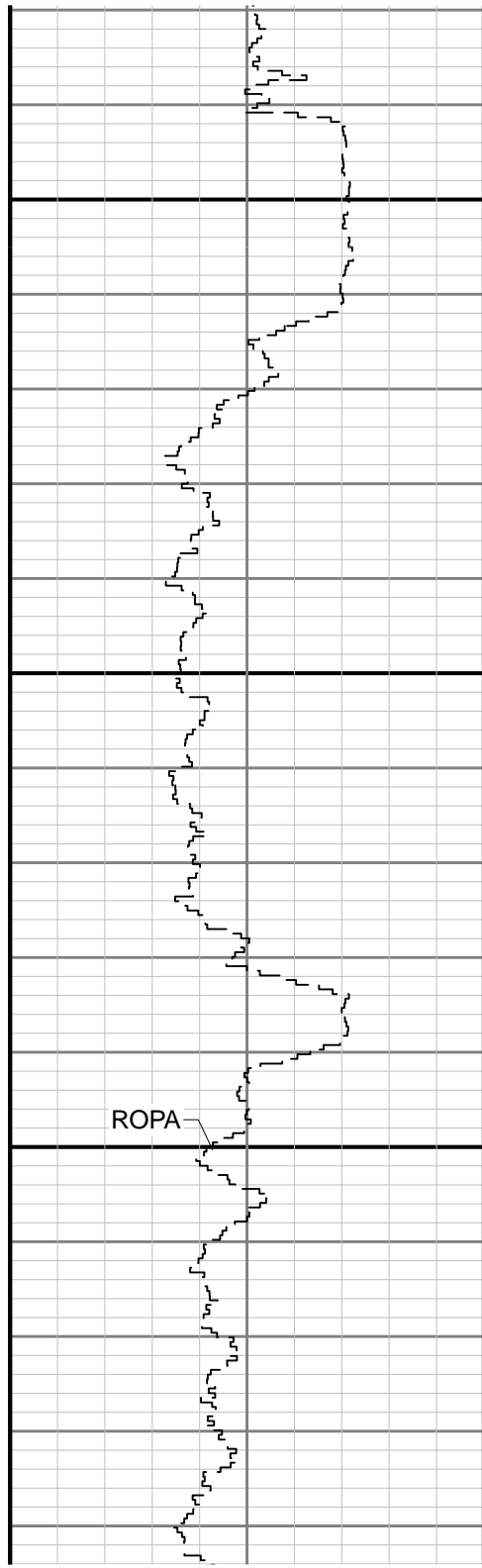
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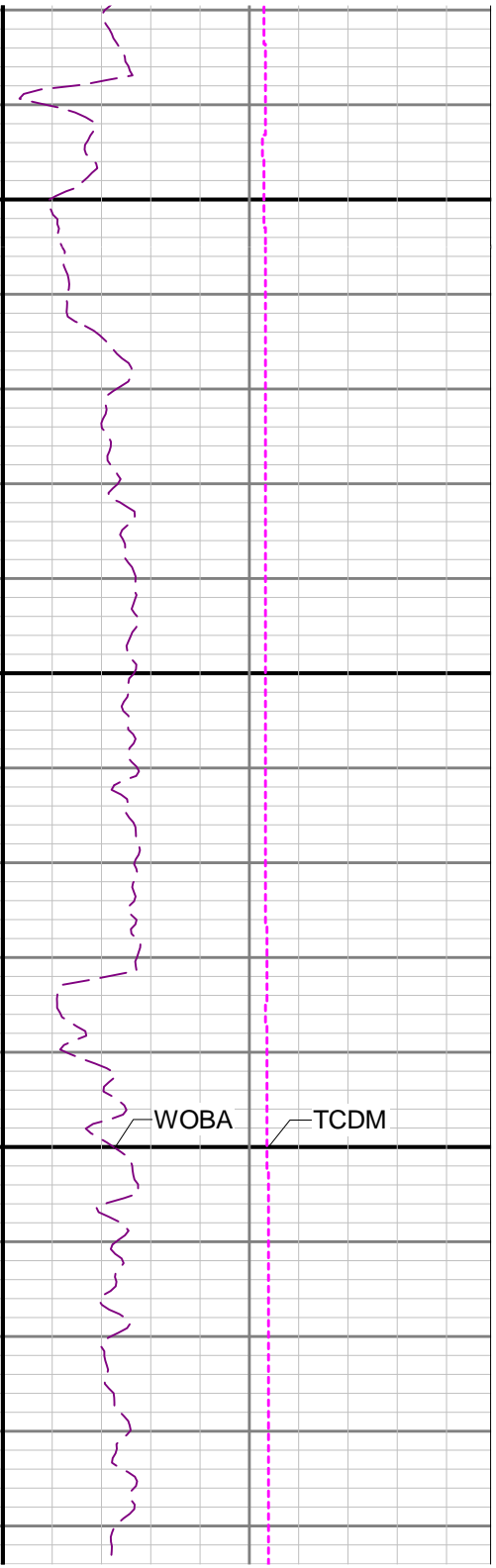


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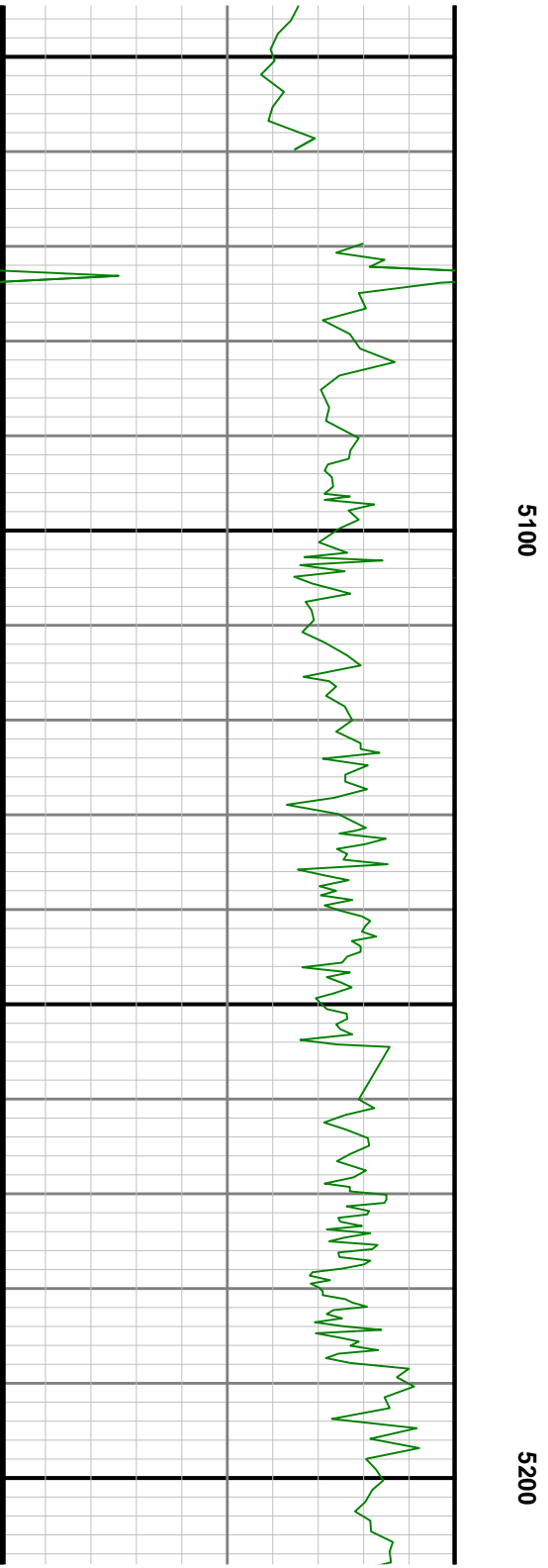
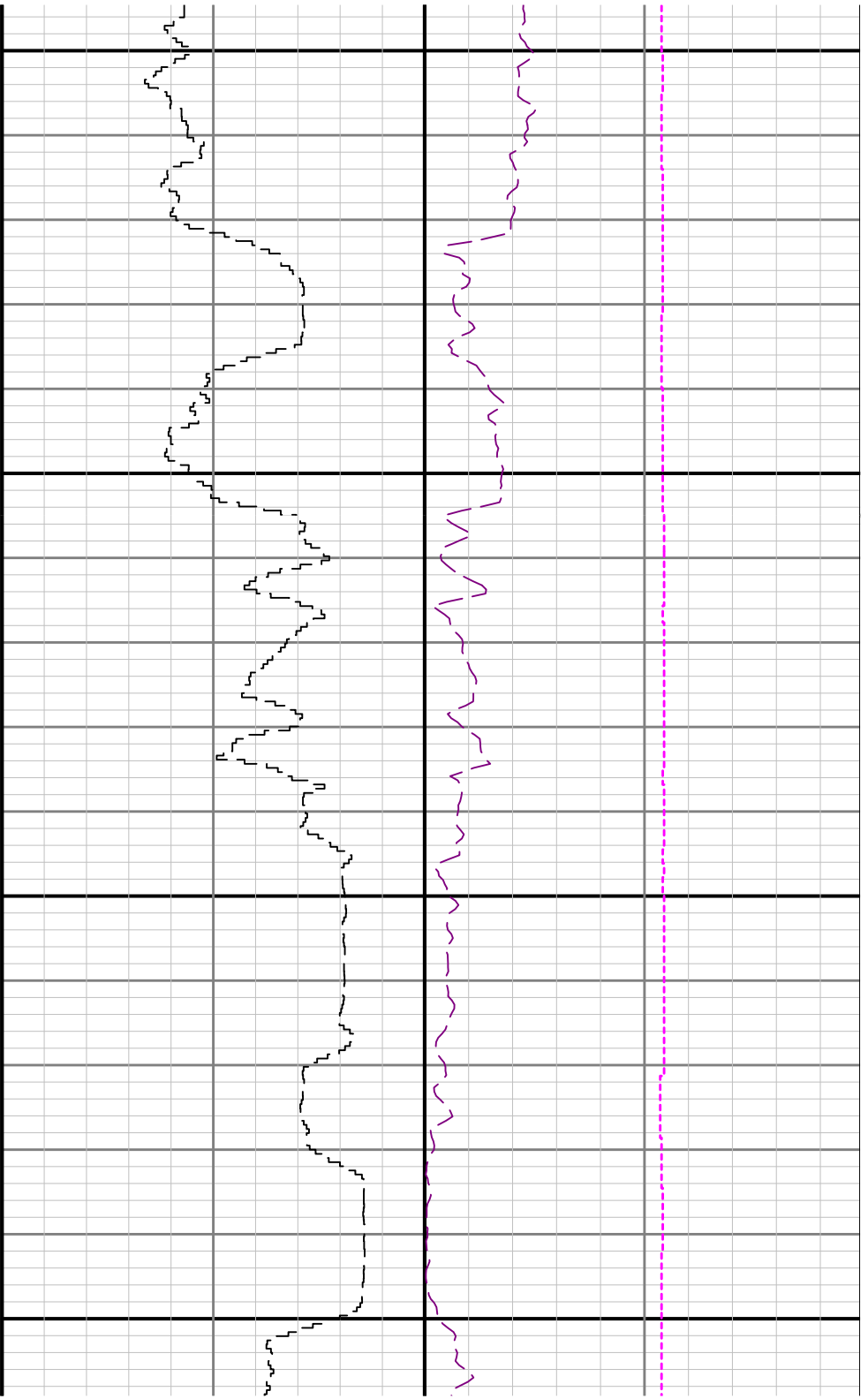


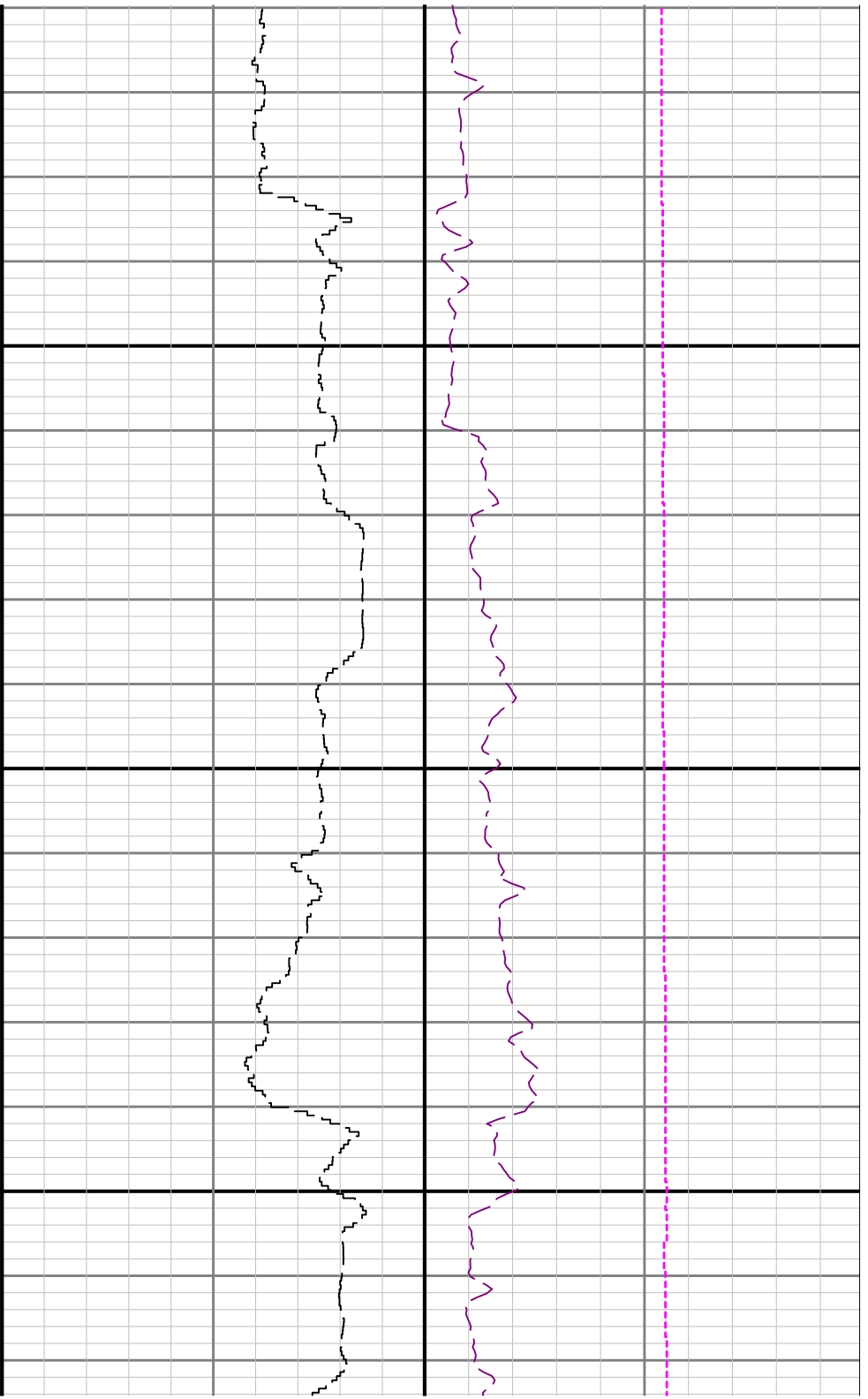
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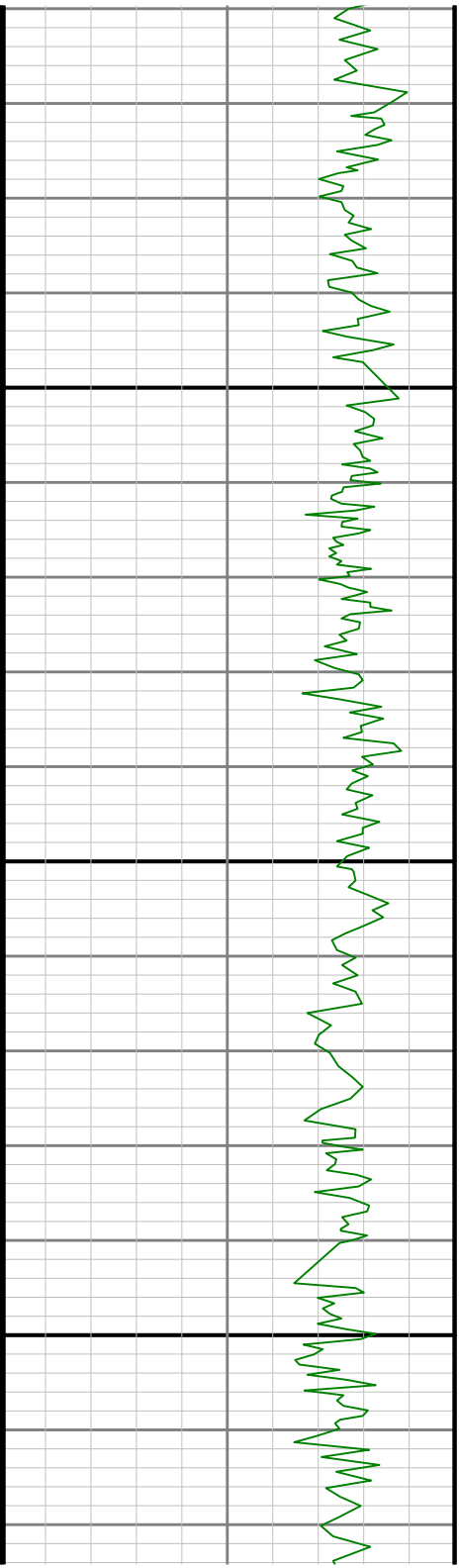
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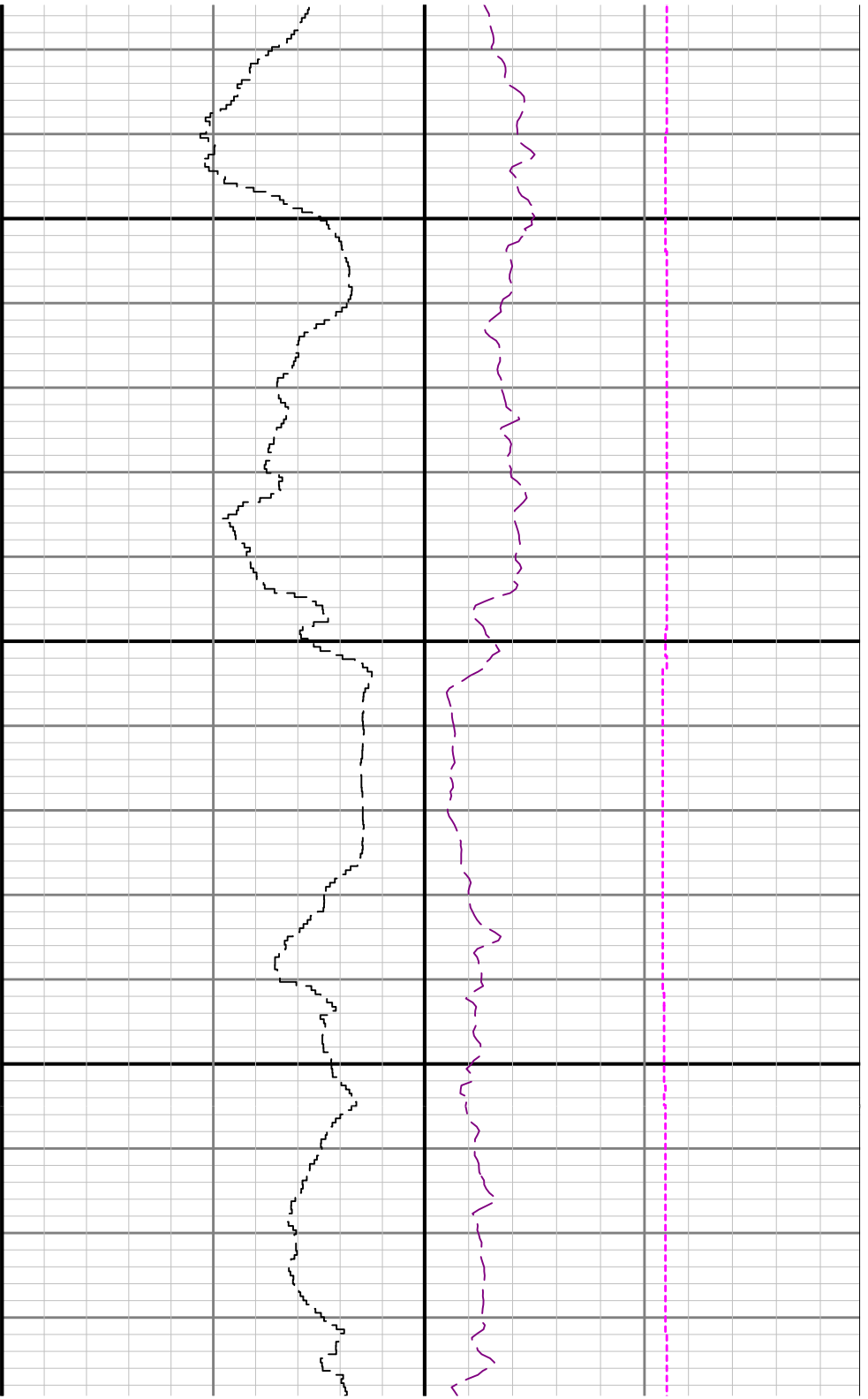
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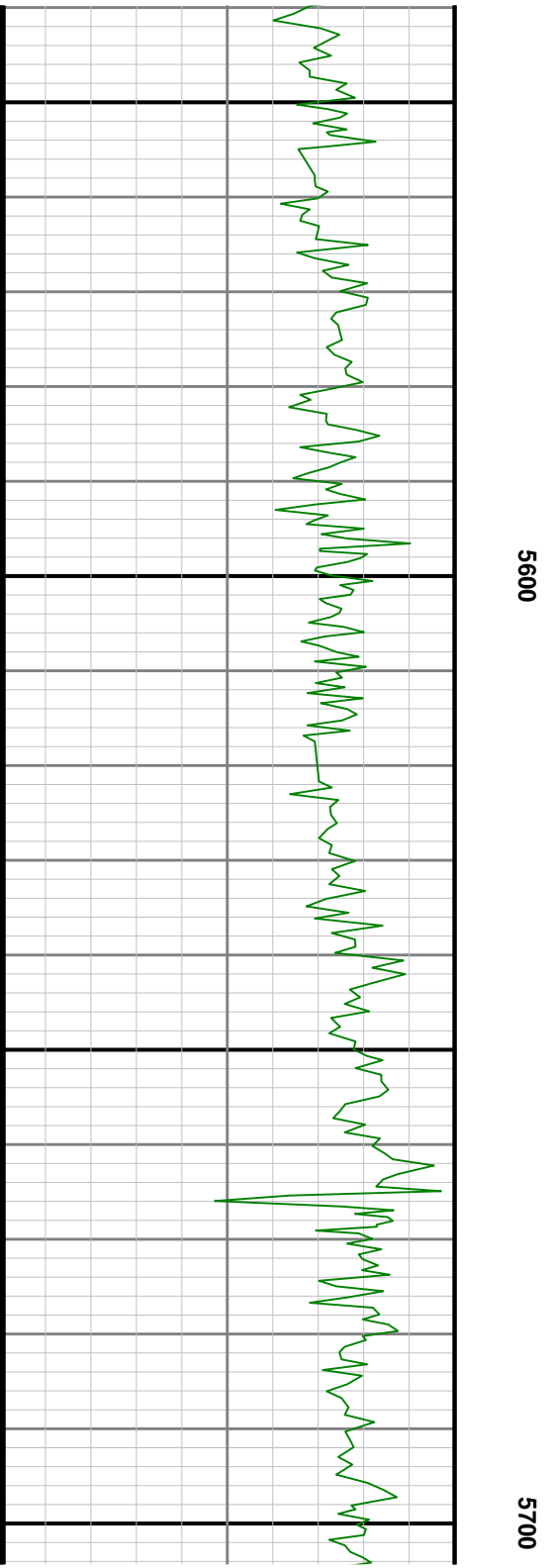
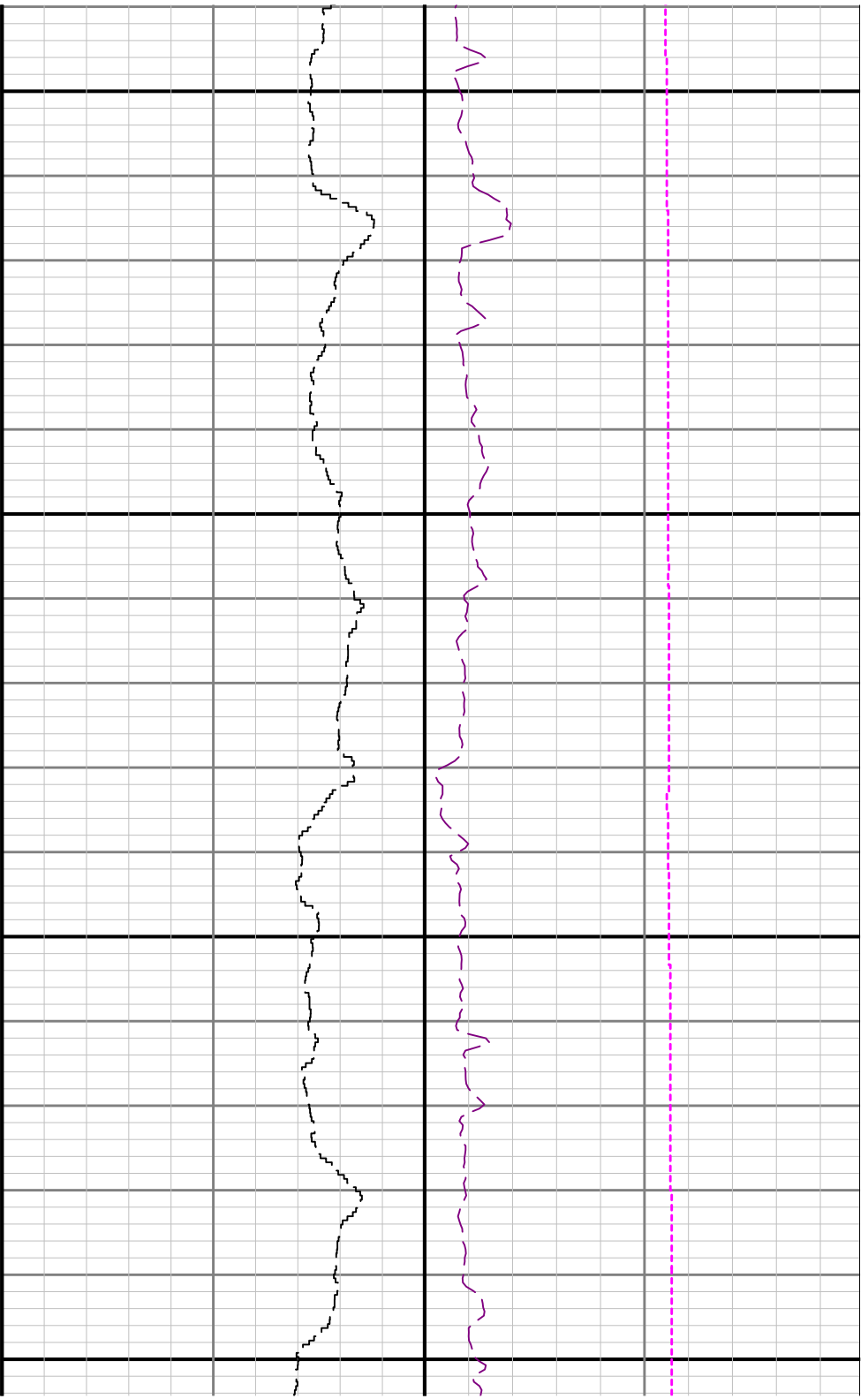
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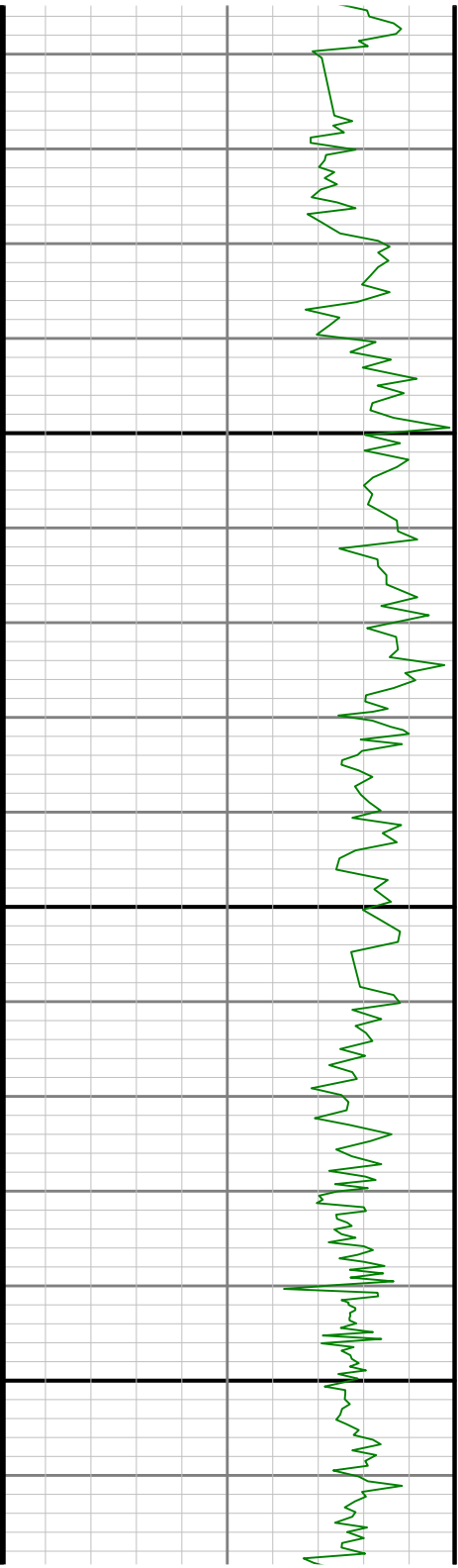




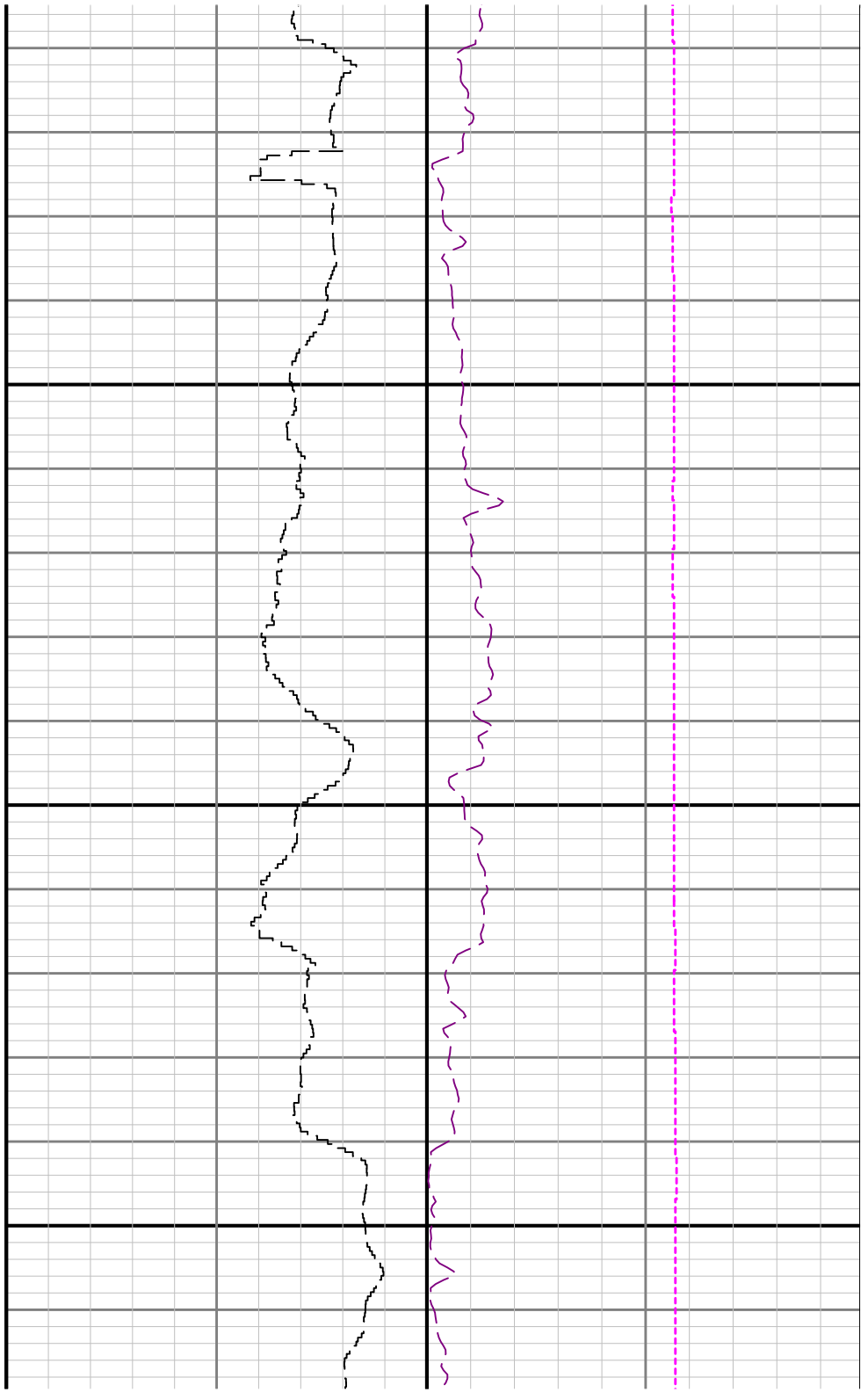
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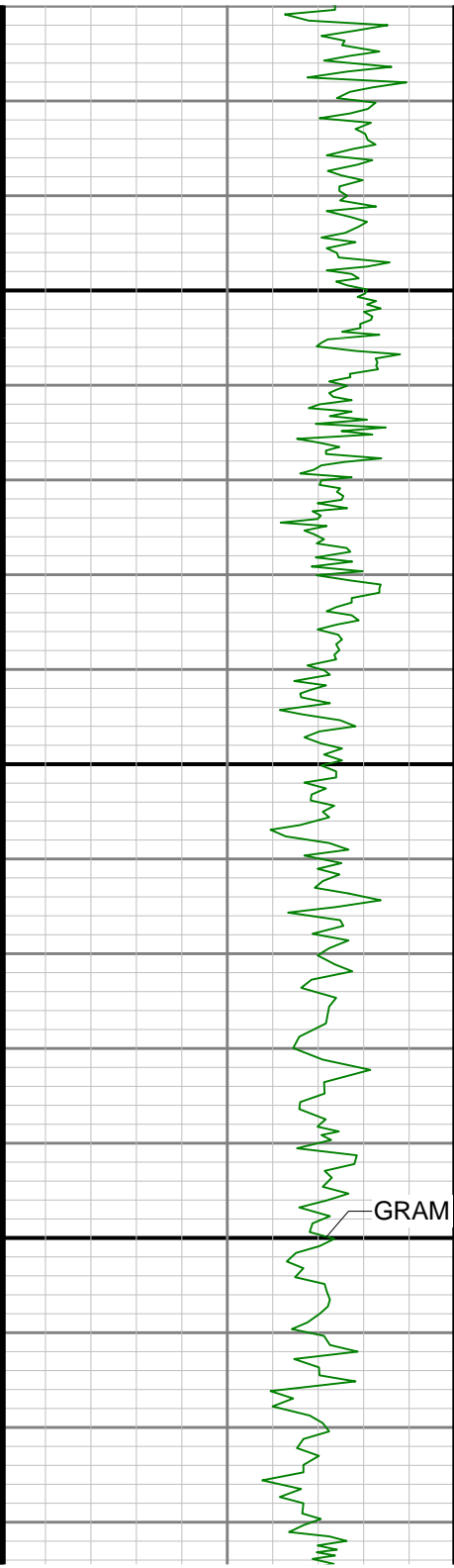
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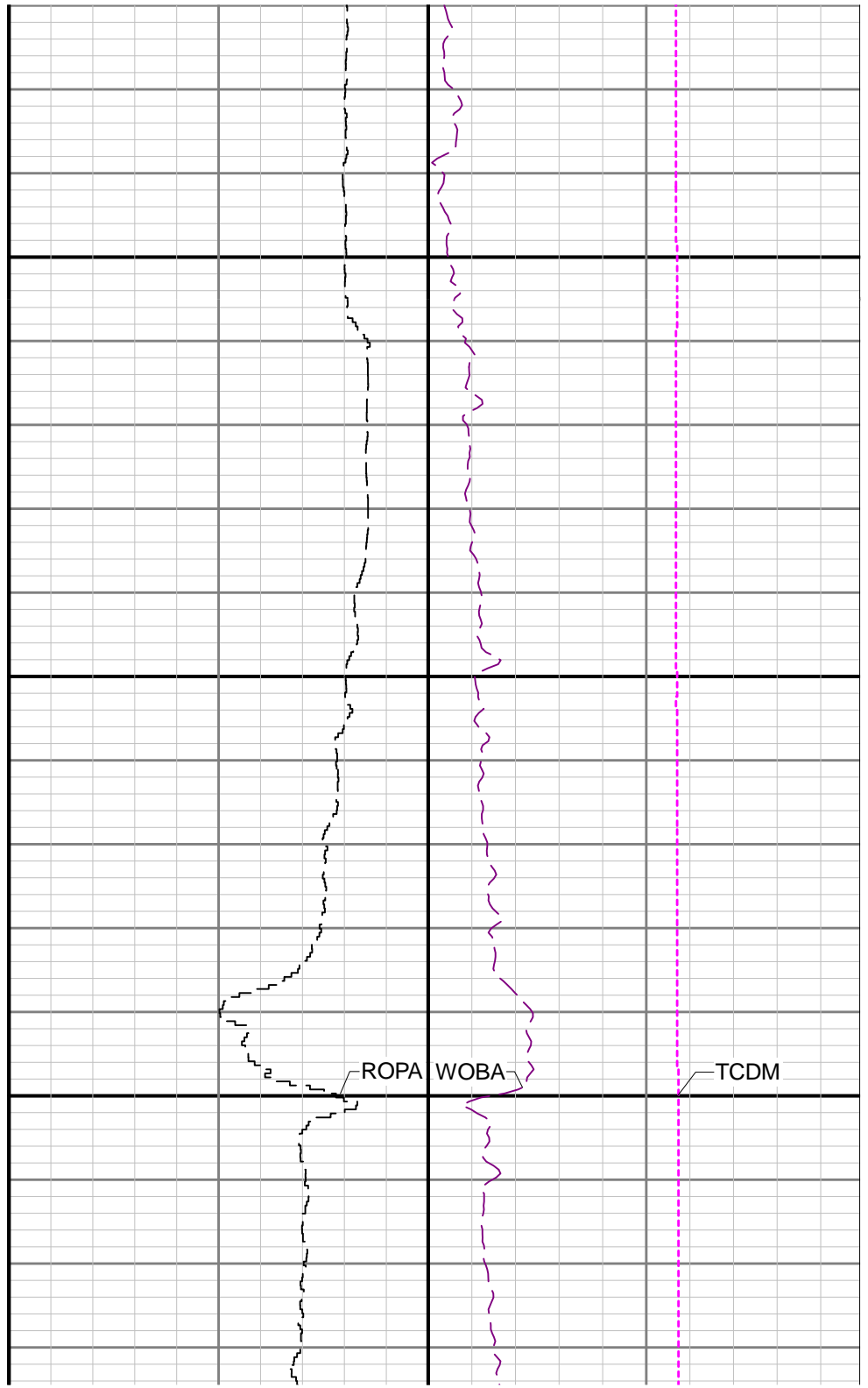




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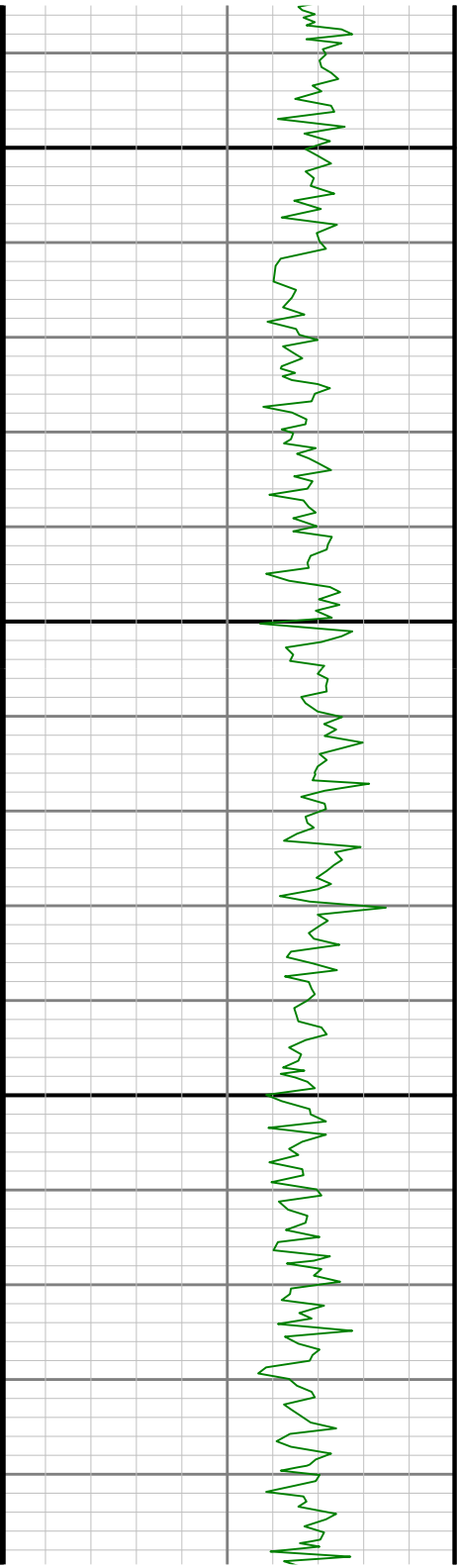
GRAM



ROPA

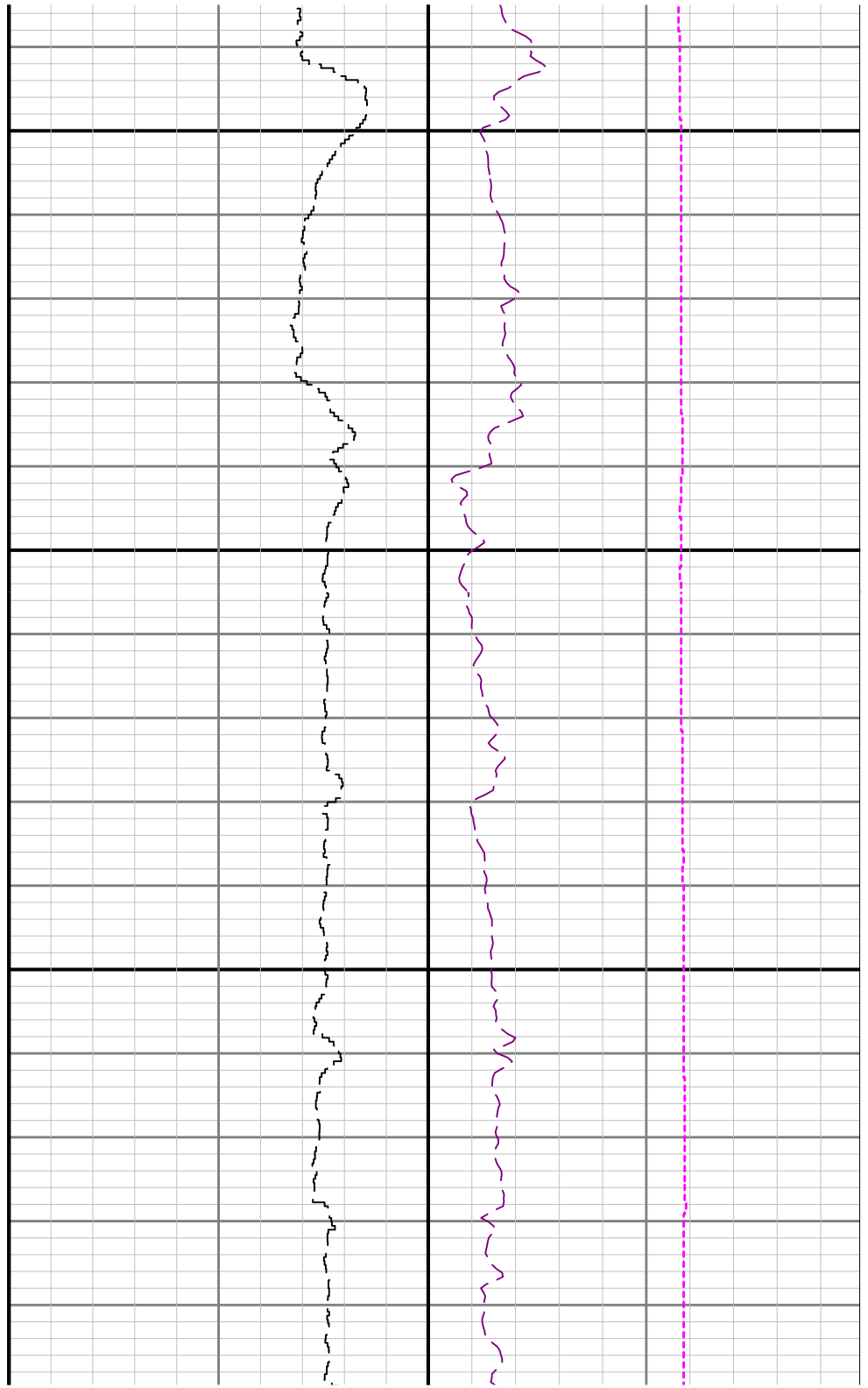
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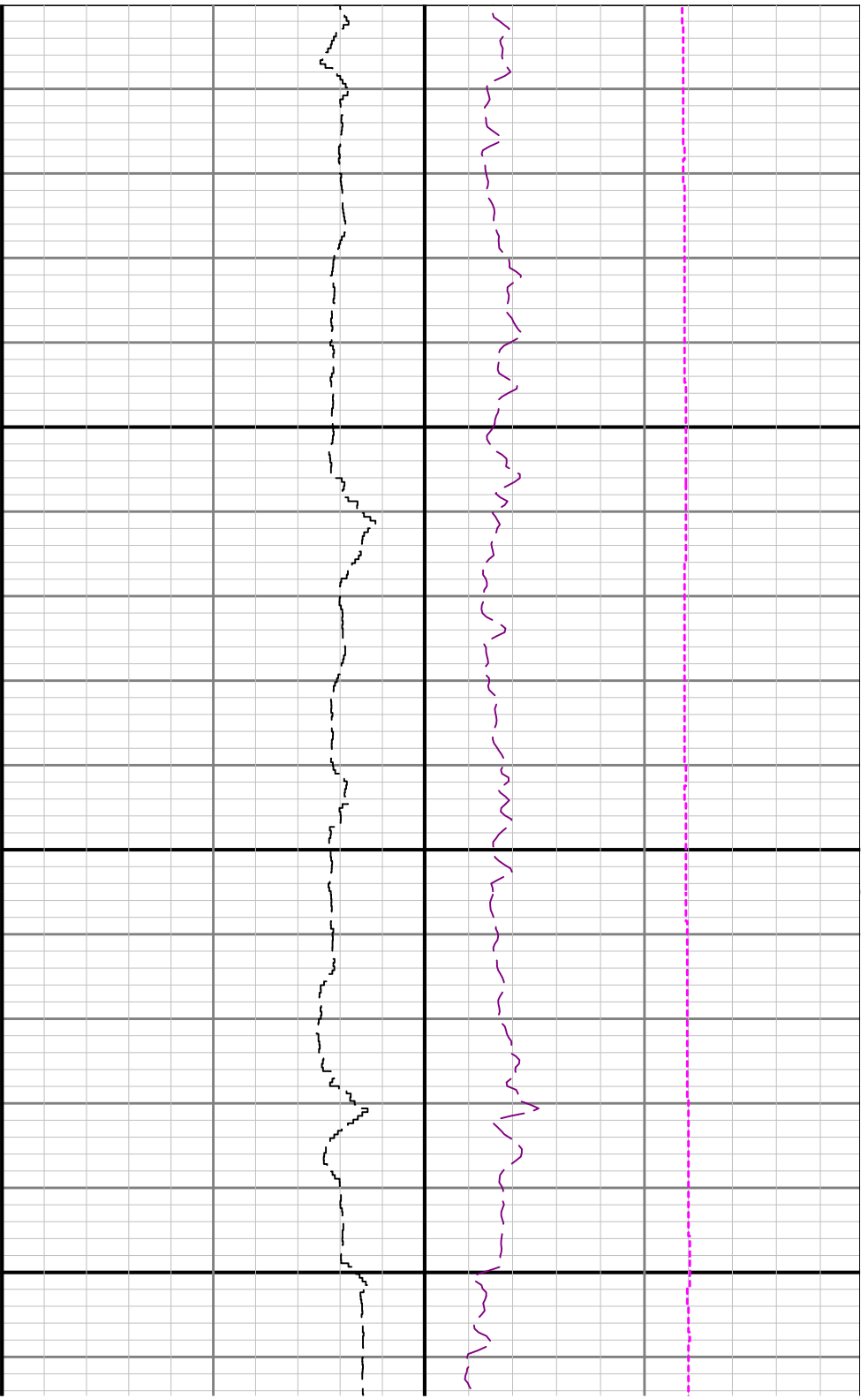
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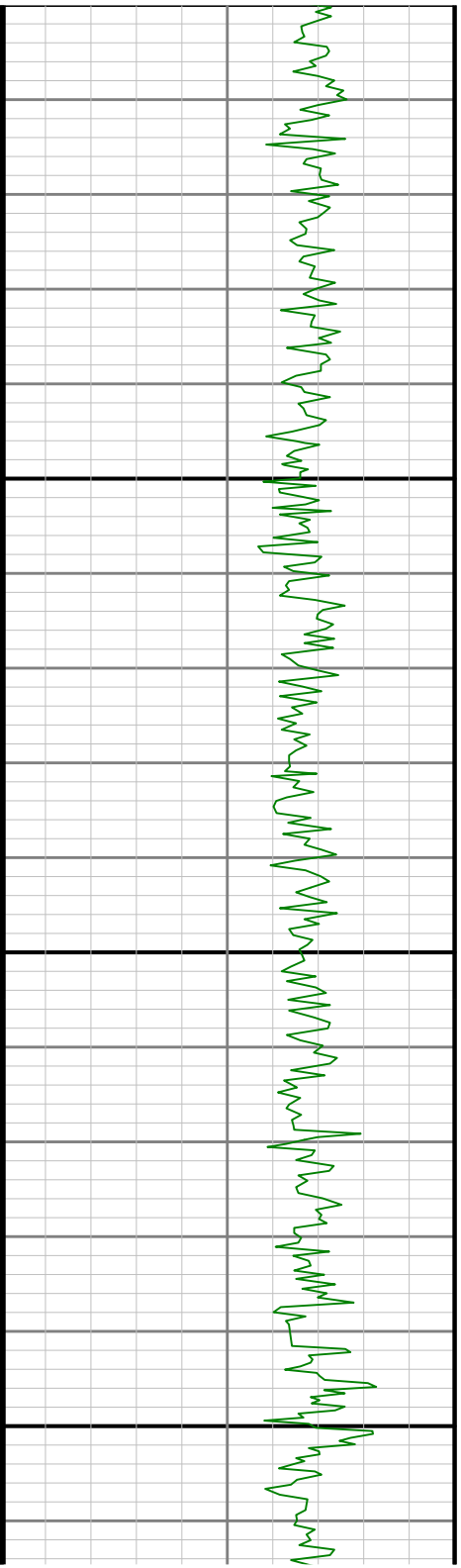
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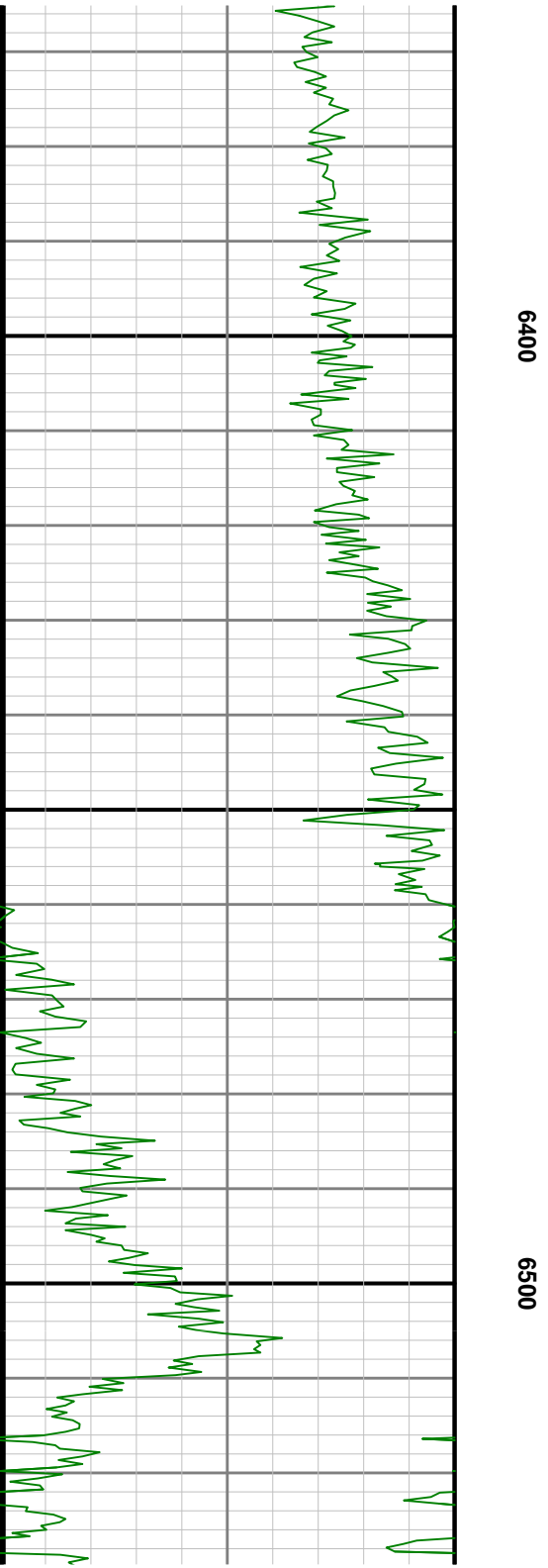
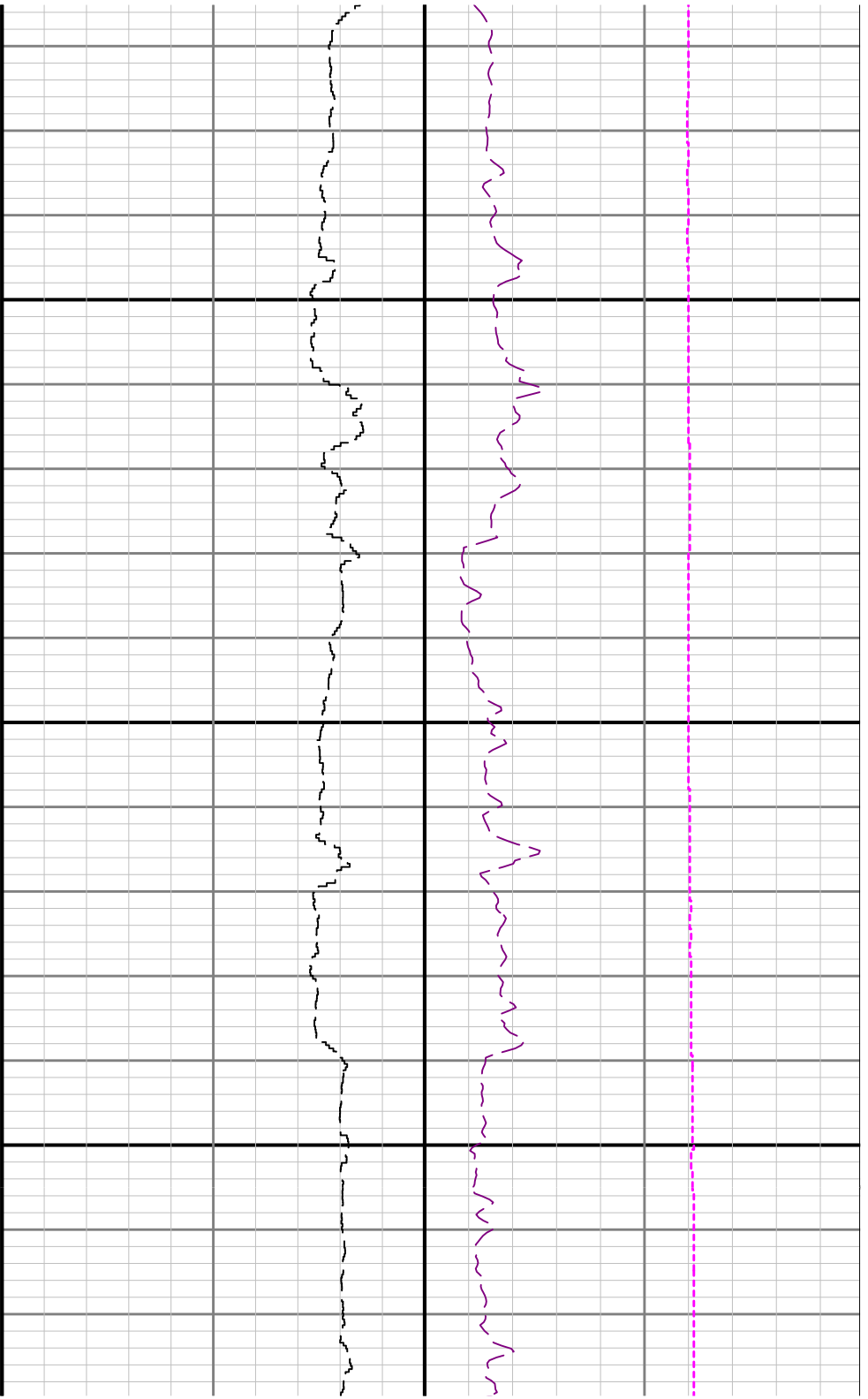


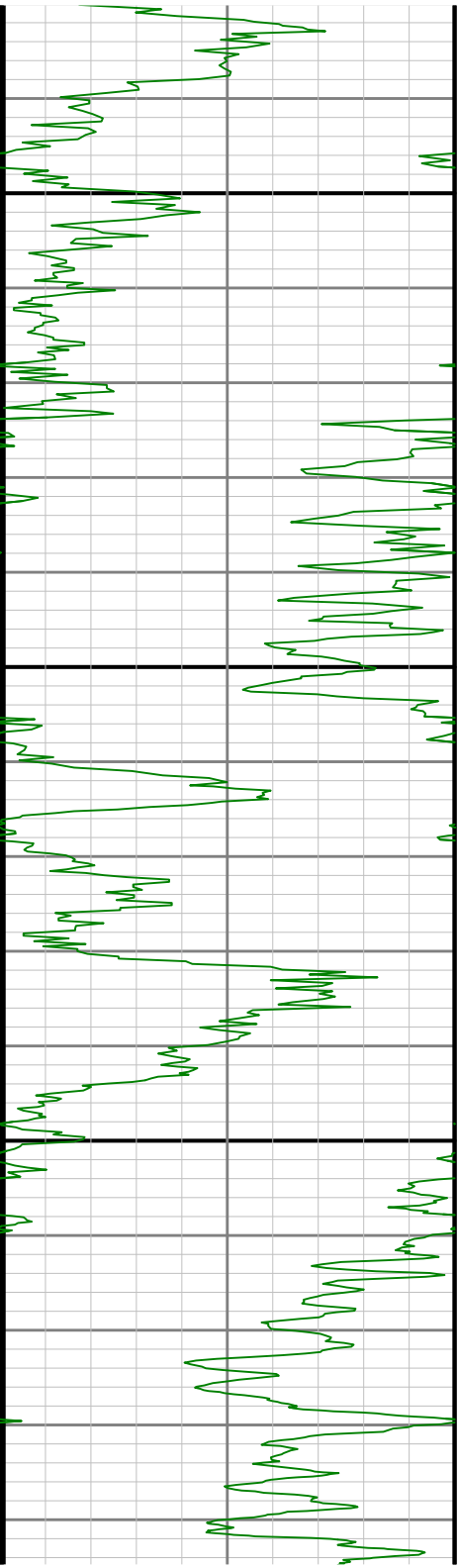


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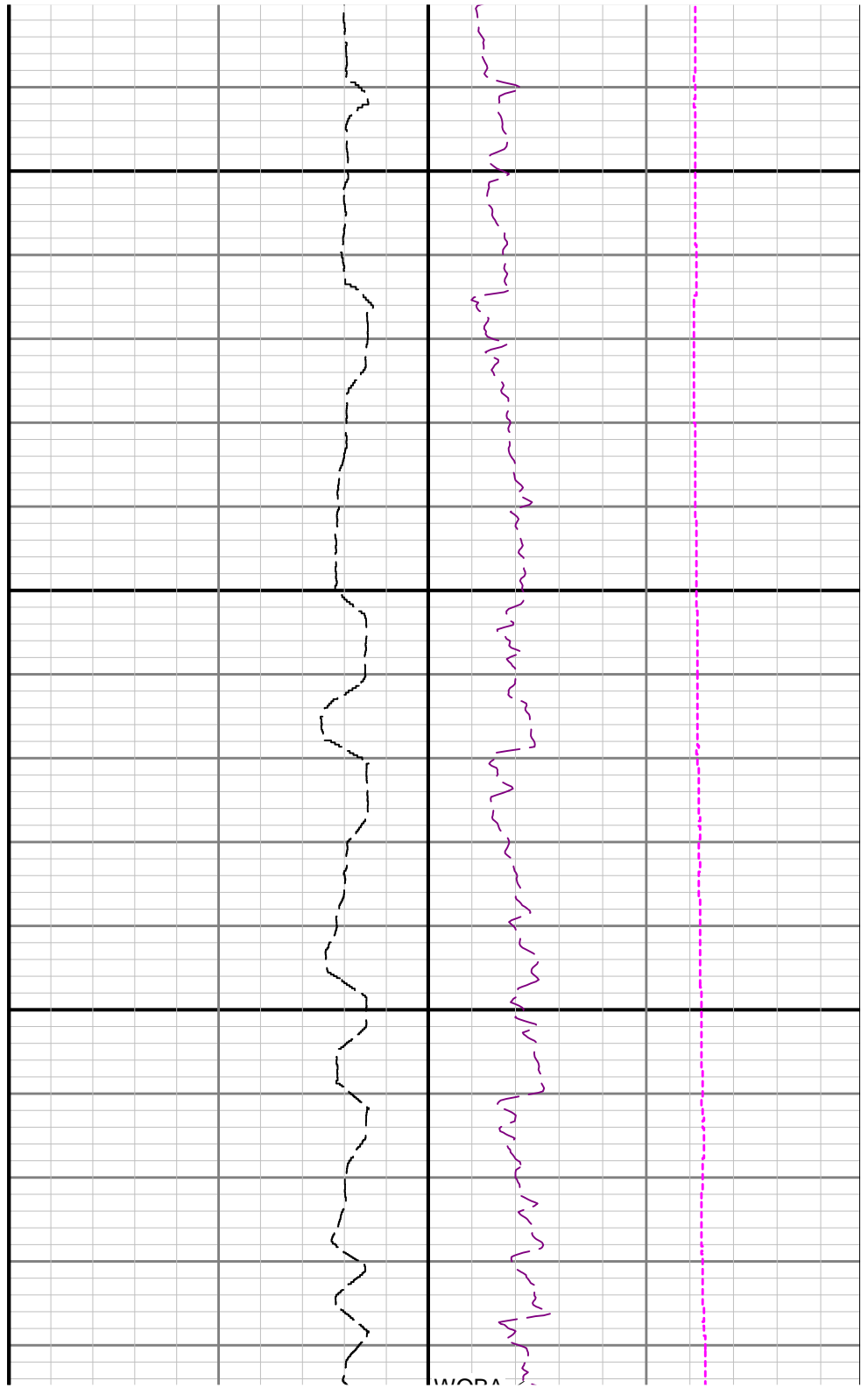
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0099



		11.41	174.44	N/A	-363.17	-30.92	4121.88	21.57	95.00	1.38	-0.16	6.87
	4253.00	11.47	180.36	N/A	-381.97	-30.07	4214.99	25.11	95.00	1.24	0.06	6.23
	4348.00	11.53	189.17	N/A	-400.79	-31.65	4308.09	26.26	95.00	1.85	0.06	9.27
	4442.00	11.68	194.18	N/A	-419.29	-35.47	4400.18	25.13	94.00	1.08	0.16	5.33
	4537.00	11.73	191.61	N/A	-438.07	-39.77	4493.20	23.57	95.00	0.55	0.05	-2.71
	4632.00	11.58	188.60	N/A	-456.96	-43.14	4586.24	22.95	95.00	0.66	-0.16	-3.17
	4726.00	11.62	185.51	N/A	-475.71	-45.46	4678.32	23.35	94.00	0.66	0.04	-3.29
	4821.00	11.72	183.59	N/A	-494.86	-46.99	4771.36	24.60	95.00	0.42	0.11	-2.02
	5010.00	11.69	182.44	N/A	-533.15	-49.00	4956.43	28.10	189.00	0.12	-0.02	-0.61
	5105.00	11.51	180.14	N/A	-552.24	-49.44	5049.49	30.42	95.00	0.52	-0.19	-2.42
	5199.00	10.75	185.56	N/A	-570.35	-50.31	5141.72	32.15	94.00	1.37	-0.81	5.77
	5294.00	11.97	187.55	N/A	-588.93	-52.46	5234.86	32.69	95.00	1.35	1.28	2.09
	5389.00	11.85	182.50	N/A	-608.44	-54.18	5327.82	33.79	95.00	1.10	-0.13	-5.32
	5483.00	11.80	176.37	N/A	-627.68	-53.99	5419.83	36.74	94.00	1.34	-0.05	-6.52
	5578.00	11.89	171.84	N/A	-647.06	-51.99	5512.81	41.51	95.00	0.98	0.09	-4.77
	5673.00	12.01	172.70	N/A	-666.55	-49.34	5605.75	46.93	95.00	0.23	0.13	0.91
	5767.00	11.54	173.07	N/A	-685.59	-46.97	5697.77	52.02	94.00	0.51	-0.50	0.39
	5862.00	11.61	173.55	N/A	-704.52	-44.75	5790.84	56.93	95.00	0.13	0.07	0.51
	5957.00	11.92	167.85	N/A	-723.61	-41.61	5883.85	62.78	95.00	1.27	0.33	-6.00
	6052.00	15.98	128.59	N/A	-741.40	-29.29	5976.22	77.53	95.00	10.58	4.27	-41.33
	6146.00	19.87	110.60	N/A	-755.11	-4.19	6065.71	104.33	94.00	7.15	4.14	-19.14
	6241.00	20.56	107.10	N/A	-765.70	26.86	6154.86	136.59	95.00	1.47	0.73	-3.68
	6336.00	22.79	97.10	N/A	-772.88	61.08	6243.17	171.48	95.00	4.53	2.35	-10.53
	6430.00	28.26	94.70	N/A	-776.96	101.36	6327.97	211.93	94.00	5.92	5.82	-2.55
	6525.00	35.81	95.30	N/A	-781.37	151.52	6408.44	262.20	95.00	7.95	7.95	0.63
	6619.00	41.45	93.10	N/A	-785.60	210.02	6481.85	320.70	94.00	6.17	6.00	-2.34
	6714.00	49.02	89.45	N/A	-786.96	277.38	6548.71	387.56	95.00	8.42	7.97	-3.84
	6809.00	57.10	87.42	N/A	-784.81	353.21	6605.76	462.30	95.00	8.67	8.51	-2.14
	6904.00	66.33	87.64	N/A	-781.22	436.70	6650.73	544.41	95.00	9.72	9.72	0.23
	6998.00	75.73	88.99	N/A	-778.64	525.46	6681.25	631.87	94.00	10.09	10.00	1.44
	7093.00	85.72	89.22	N/A	-777.18	619.09	6696.54	724.32	95.00	10.52	10.52	0.24
	7187.00	90.13	87.16	N/A	-774.21	712.95	6699.95	816.78	94.00	5.18	4.69	-2.19
	7282.00	90.16	88.37	N/A	-770.50	807.87	6699.70	910.19	95.00	1.27	0.03	1.27
	7377.00	90.16	88.38	N/A	-767.81	902.84	6699.44	1003.78	95.00	0.01	0.00	0.01
	7472.00	90.41	90.14	N/A	-766.58	997.82	6698.97	1097.60	95.00	1.87	0.26	1.85
	7566.00	90.44	90.59	N/A	-767.18	1091.82	6698.27	1190.71	94.00	0.48	0.03	0.48
	7661.00	90.44	91.73	N/A	-769.11	1186.79	6697.54	1284.98	95.00	1.20	0.00	1.20
	7756.00	90.28	92.15	N/A	-772.32	1281.74	6696.94	1379.40	95.00	0.47	-0.17	0.44
	7851.00	90.28	93.05	N/A	-776.63	1376.64	6696.48	1473.93	95.00	0.95	0.00	0.95
	7945.00	90.44	92.67	N/A	-781.32	1470.52	6695.89	1567.51	94.00	0.44	0.17	-0.40
	8040.00	90.44	91.70	N/A	-784.94	1565.45	6695.16	1661.98	95.00	1.02	0.00	-1.02
	8135.00	90.56	91.08	N/A	-787.25	1660.41	6694.33	1756.29	95.00	0.66	0.13	-0.65
	8324.00	90.41	89.83	N/A	-788.75	1849.40	6692.73	1943.53	189.00	0.67	-0.08	-0.66
	8419.00	90.50	87.74	N/A	-786.73	1944.37	6691.98	2037.22	95.00	2.20	0.09	-2.20
	8513.00	90.19	88.08	N/A	-783.31	2038.30	6691.41	2129.69	94.00	0.49	-0.33	0.36
	8608.00	90.31	91.45	N/A	-782.92	2133.29	6690.99	2223.64	95.00	3.55	0.13	3.55
	8798.00	90.47	91.16	N/A	-787.24	2323.23	6689.70	2412.23	190.00	0.17	0.08	-0.15
	8892.00	90.34	89.28	N/A	-787.60	2417.23	6689.04	2505.30	94.00	2.00	-0.14	-2.00
	9081.00	90.34	88.46	N/A	-783.88	2606.18	6687.92	2691.76	189.00	0.43	0.00	-0.43
	9271.00	90.44	86.24	N/A	-775.09	2795.96	6686.62	2878.31	190.00	1.17	0.05	-1.17
	9365.00	90.44	86.51	N/A	-769.15	2889.77	6685.90	2970.30	94.00	0.29	0.00	0.29
	9460.00	90.50	91.33	N/A	-767.36	2984.73	6685.12	3064.01	95.00	5.07	0.06	5.07
	9555.00	90.41	92.36	N/A	-770.42	3079.67	6684.37	3158.41	95.00	1.09	-0.09	1.08
	9649.00	90.47	88.63	N/A	-771.23	3173.65	6683.64	3251.53	94.00	3.97	0.06	-3.97
	9744.00	90.44	91.63	N/A	-771.45	3268.64	6682.89	3345.56	95.00	3.16	-0.03	3.16

	9774.00	89.77	87.85	N/A	-777.75	3255.54	6682.07	3439.37	94.00	7.83	0.13	7.83
	9838.00	90.56	98.99	N/A	-803.83	3550.64	6680.41	3629.29	190.00	1.92	-0.06	-1.92
	10028.00	90.44	95.34	N/A								
	10217.00	89.85	91.66	N/A	-815.37	3739.25	6679.93	3817.61	189.00	1.97	-0.31	-1.95
	10406.00	89.91	89.63	N/A	-817.50	3928.23	6680.33	4004.93	189.00	1.07	0.03	-1.07
	10596.00	89.94	87.78	N/A	-813.20	4118.18	6680.58	4192.28	190.00	0.97	0.02	-0.97
	10785.00	89.94	85.40	N/A	-801.96	4306.83	6680.77	4377.36	189.00	1.26	0.00	-1.26
	10974.00	89.94	84.92	N/A	-786.01	4495.15	6680.97	4561.44	189.00	0.25	0.00	-0.25
	11163.00	89.98	86.73	N/A	-772.25	4683.64	6681.10	4746.00	189.00	0.96	0.02	0.96
	11353.00	89.97	88.34	N/A	-764.08	4873.46	6681.19	4932.68	190.00	0.85	-0.01	0.85
	11542.00	90.04	90.57	N/A	-762.29	5062.44	6681.17	5119.44	189.00	1.18	0.04	1.18
	11731.00	89.85	90.92	N/A	-764.74	5251.42	6681.35	5306.81	189.00	0.21	-0.10	0.19
Projection	11828.00	89.85	90.92	N/A	-766.30	5348.41	6681.60	5403.02	97.00	0.00	0.00	0.00