



## LWD MEMORY LOG

# Gamma Ray

BAKER HUGHES a GE company				LWD MEMORY LOG																																																																																																																																											
<div><div><div><div><div><div>Scale:</div><div>1:240</div><div>True Vertical Depth</div></div><div><div>Depth Reference:</div><div>Driller's Depth</div></div></div><div><div>Status:</div><div>Final Print</div></div><div><div>API No:</div><div>05-123-50175-00</div></div><div><div>Job ID:</div><div>110096539</div></div><div><div>Permanent Datum (P.D.):</div><div>Mean Sea Level</div></div><div><div>Log Measured From:</div><div>Rig Floor</div></div></div><div><div>Dates</div><div><div>From: 2019-11-10</div><div>To: 2019-11-10</div><div>Spud: 2019-11-06</div></div></div></div><div><div><div><div><div><div>Company: Noble Energy</div><div>Well: Wells Ranch State AA32-789</div><div>Field: Wattenberg</div></div><div><div>Country: Weld</div><div>State: Colorado</div></div><div><div>Country: United States</div></div></div><div><div>Surface Location:</div><div>Latitude: 40° 26' 05.604" N</div><div>Longitude: 104° 28' 04.188" W</div></div><div><div>Other Services:</div><div>Directional</div></div></div><div><div>Elevation: 0.00 ft</div><div>Above P.D.: 4702.00 ft</div></div><div><div>Elev. KB: N/A</div><div>Elev. DF: 4702.00 ft</div><div>Elev. GL: 4672.00 ft</div></div></div><div><div>Interval</div><div><div>Drilled (ft)</div><div>Logged (ft)</div><div>Azi Reference North: 66.93</div><div>Top: 1945.00</div><div>Bottom: 16938.00</div><div>Total Magnetic Field Strength: (nT) 52089</div><div>Mag to Reference North Correction: (deg) 7.11</div></div></div><div><div>Borehole Record</div><div><div>Casing Record</div><table><tr><th>Hole Size (in)</th><th>From (ft)</th><th>To (ft)</th><th>Size (in)</th><th>Weight (lb/ft)</th><th>From (ft)</th><th>To (ft)</th></tr><tr><td>13.500</td><td>30.00</td><td>1945.00</td><td>9.625</td><td>36.00</td><td></td><td>1935.00</td></tr><tr><td>8.500</td><td>1945.00</td><td>16938.00</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></div><div><div>Mud Record</div><table><tr><th>Type</th><th>From (ft)</th><th>To (ft)</th><th>Hole Size (in)</th><th>Interval (ft)</th><th>Incl Az (Start)</th><th>Incl Az (End)</th></tr><tr><td>Oil Based Mud</td><td>1945.00</td><td>16938.00</td><td>8.500</td><td>14993.00</td><td>1.05   28.45</td><td>90.59   350.32</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr><tr><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td></tr></table></div><div><div>Deviation Record</div></div></div></div><div><div>Acquisition System</div><div><div>Software Version</div><div>Other</div></div><div><div>Cadence RT 5.4</div><div>Prior Studio 5.4.8632.4</div></div><div><div>Rig: H&amp;P 517</div><div>Contractor: Helmerich &amp; Payne Drilling Co</div><div>District: RMA</div><div>Unit: D&amp;E</div></div></div></div>				Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)	13.500	30.00	1945.00	9.625	36.00		1935.00	8.500	1945.00	16938.00																																																													Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Incl Az (Start)	Incl Az (End)	Oil Based Mud	1945.00	16938.00	8.500	14993.00	1.05   28.45	90.59   350.32																																																	
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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
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	0.800	PDC	3.00	AutoTrak Curve	1932.00	10830.00	1945.00	10843.00	2019-11-07 14:39	2019-11-08 19:20	28.60
2	2	0.800	PDC	3.00	AutoTrak Curve	10830.00	16925.00	10843.00	16938.00	2019-11-09 05:50	2019-11-10 05:50	25.05

## Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Adam Schlenz	2019-11-05	2019-11-09	Ryan Hull	2019-11-09	2019-11-10			

## 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+ (%)
2019-11-07 03:00	1	1945.00	Oil Based Mud	9.4	13	N/A	24.2	69/19	Active Pit	26239	0.00
2019-11-07 15:00	1	2017.00	Oil Based Mud	9.4	13	N/A	23.8	69/19	Active Pit	27211	0.00
2019-11-08 03:00	1	6371.00	Oil Based Mud	9.3	11	N/A	22.0	69/20	Active Pit	27510	0.00
2019-11-08 15:00	1	9912.00	Oil Based Mud	9.3	11	N/A	19.4	70/19	Active Pit	27992	0.00
2019-11-09 03:30	2	10843.00	Oil Based Mud	9.3	11	N/A	19.4	70/19	Active Pit	28538	0.00

## Equipment and Service Date

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	14236901	Near Bit VSS	5.93	5.93	7.000	4.330
1	AutoTrak Curve Steering Unit	14236901	Near Bit Inclination	5.93	5.93	7.000	4.330
1	AutoTrak Curve MWD	12558532	Gamma (single)	2.76	12.11	7.000	3.250
1	AutoTrak Curve MWD	12558532	Directional (mag)	12.27	21.62	7.000	3.250
2	AutoTrak Curve Steering Unit	14316004	Near Bit Inclination	5.93	5.93	7.000	4.330
2	AutoTrak Curve Steering Unit	14316004	Near Bit VSS	5.93	5.93	7.000	4.330
2	AutoTrak Curve MWD	14322690	Gamma (single)	2.77	12.12	7.000	3.250
2	AutoTrak Curve MWD	14322690	Directional (mag)	12.27	21.62	7.000	3.250

Q. I. T. M. 1911

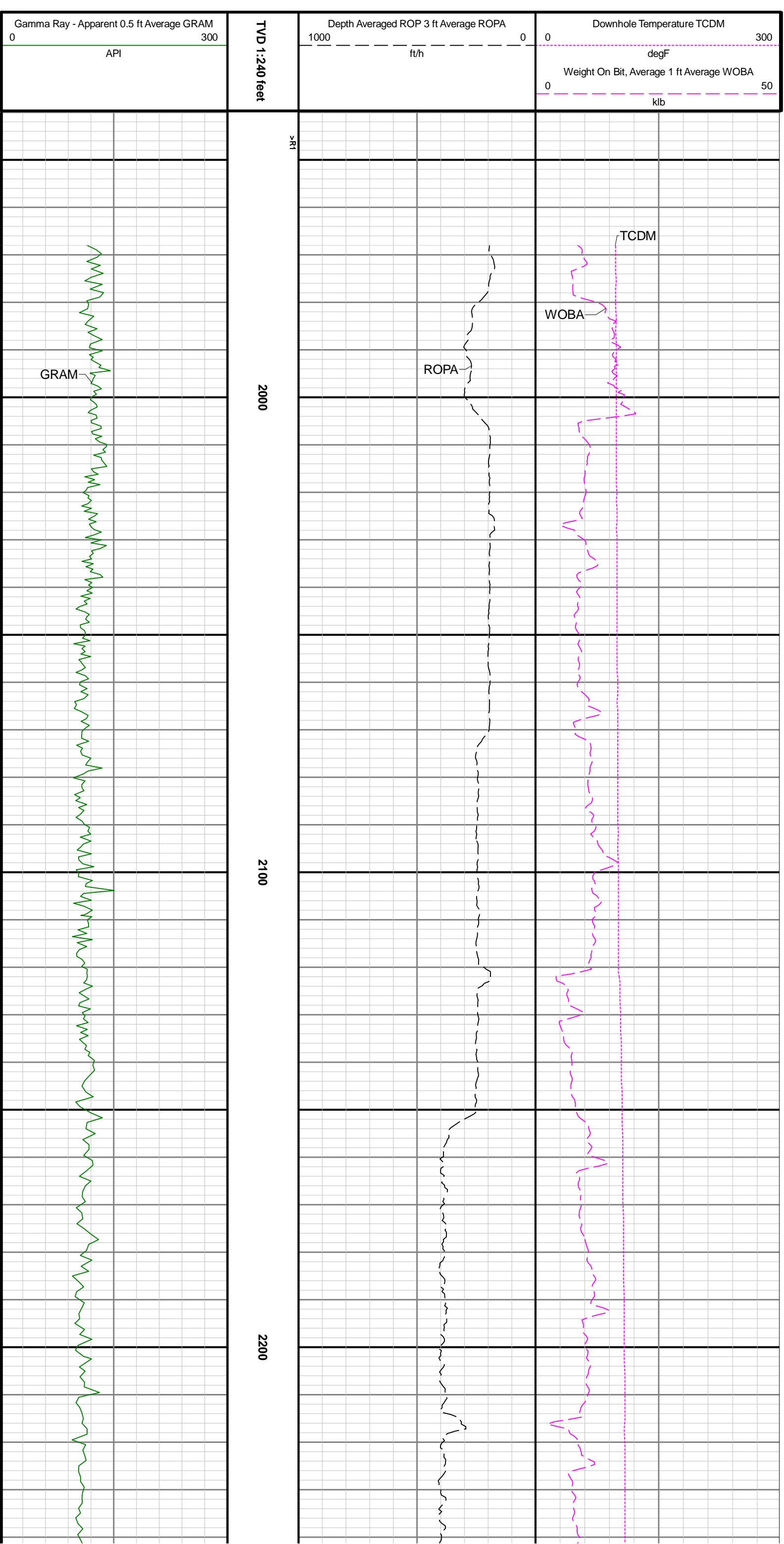
Mnemonic	Name	Description
ATC SU	AutoTrak Curve SU	Auto Trak Curve Steering Unit
ATC MWD	AutoTrak Curve MWD	Auto Trak Curve MWD
ATC L CPM	AutoTrak Curve L CPM	Auto Trak Curve L CPM

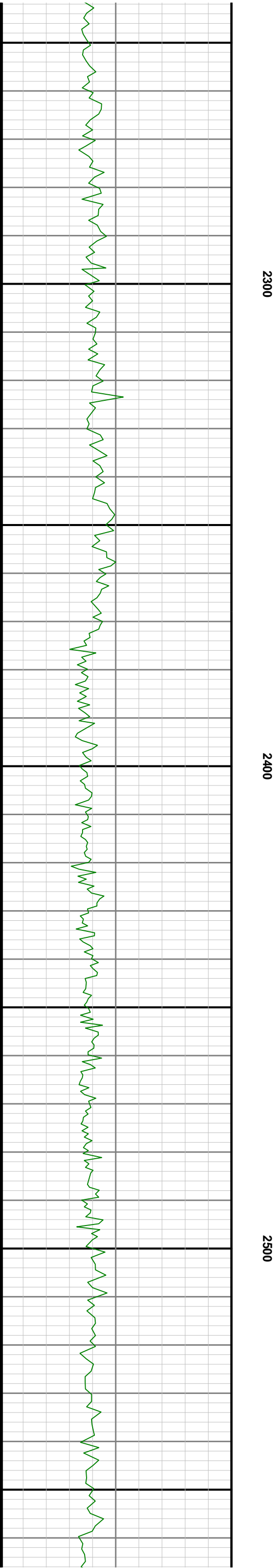
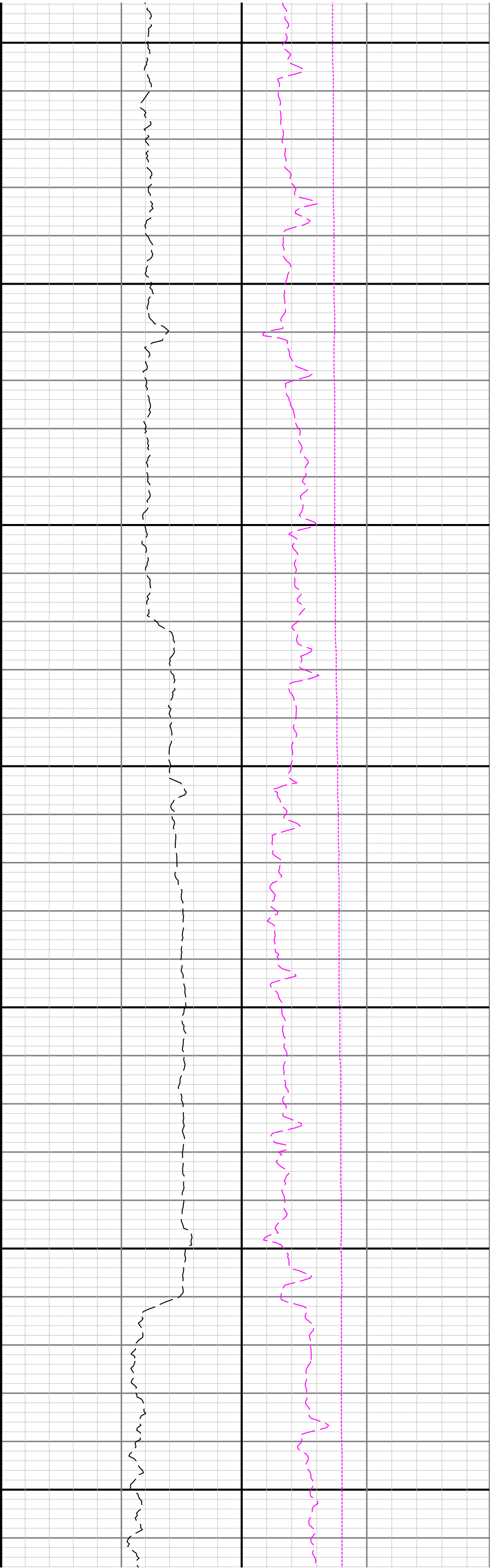
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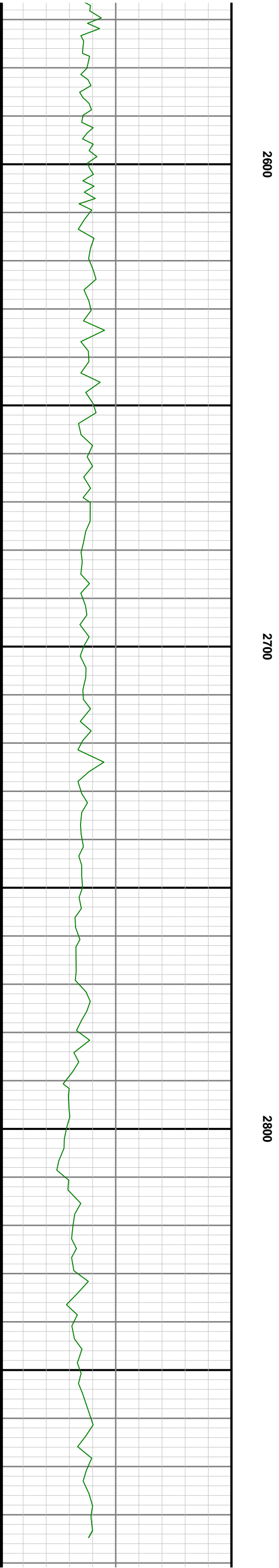
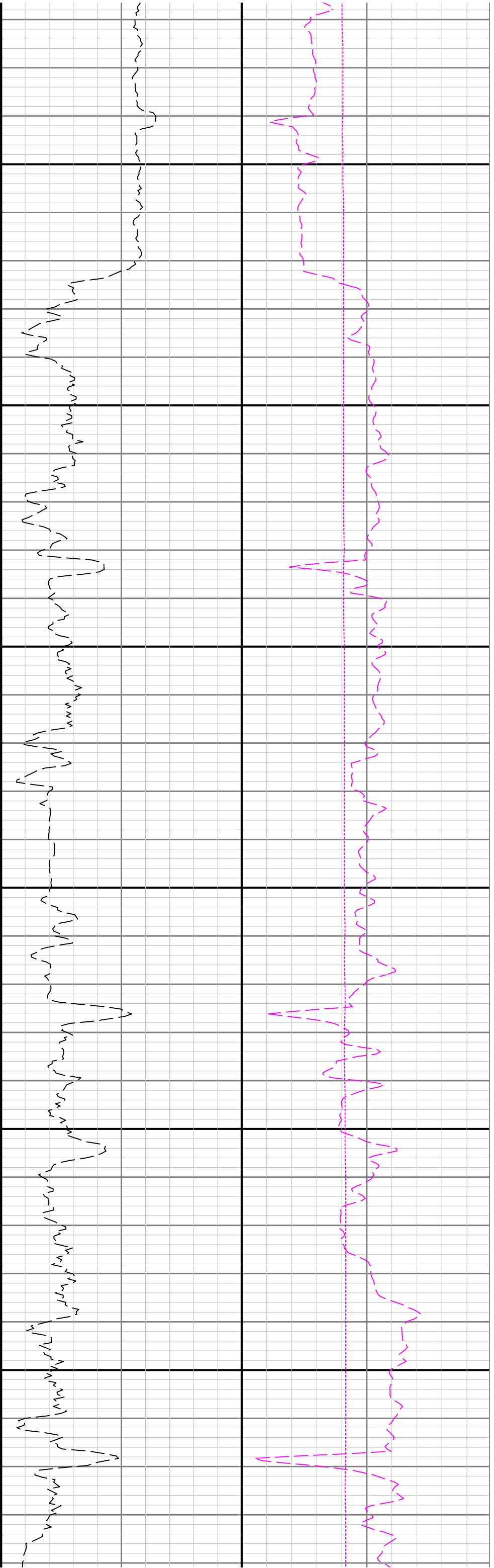
- 1 Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes, depth  
calibrations and measurements could not be independently verified.
- 2 Baker Hughes LWD run 1 and 2 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 1945  
to 16938 feet MD (1945 to 6693 feet TVD).

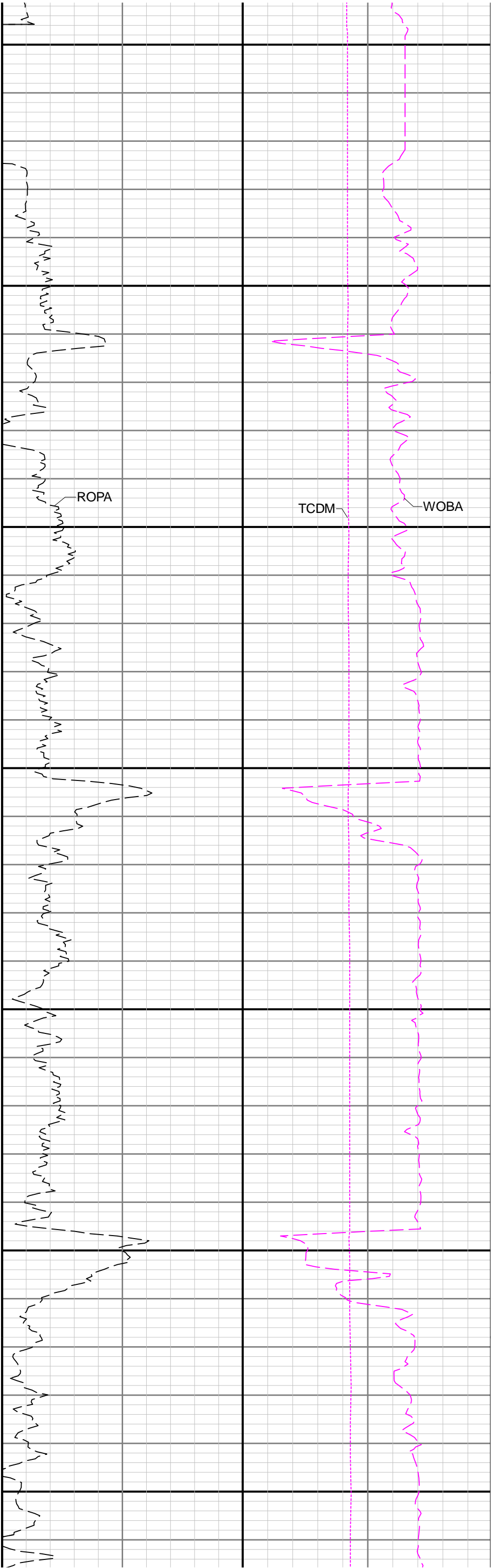
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Remarks				
Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	2920.00	8.500	2	The interval from 2894 to 2923 feet MD (2883 to 2912 feet TVD) does not have gamma ray data, due to the 3rd party depth tracking system, consider looking up









2900

3000

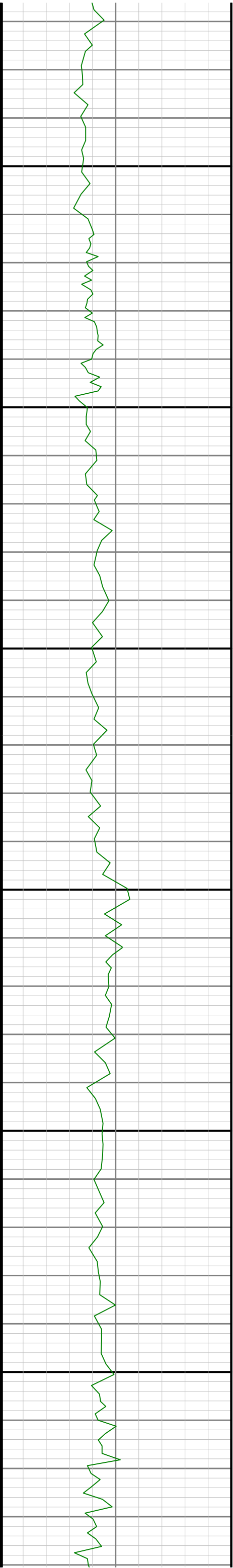
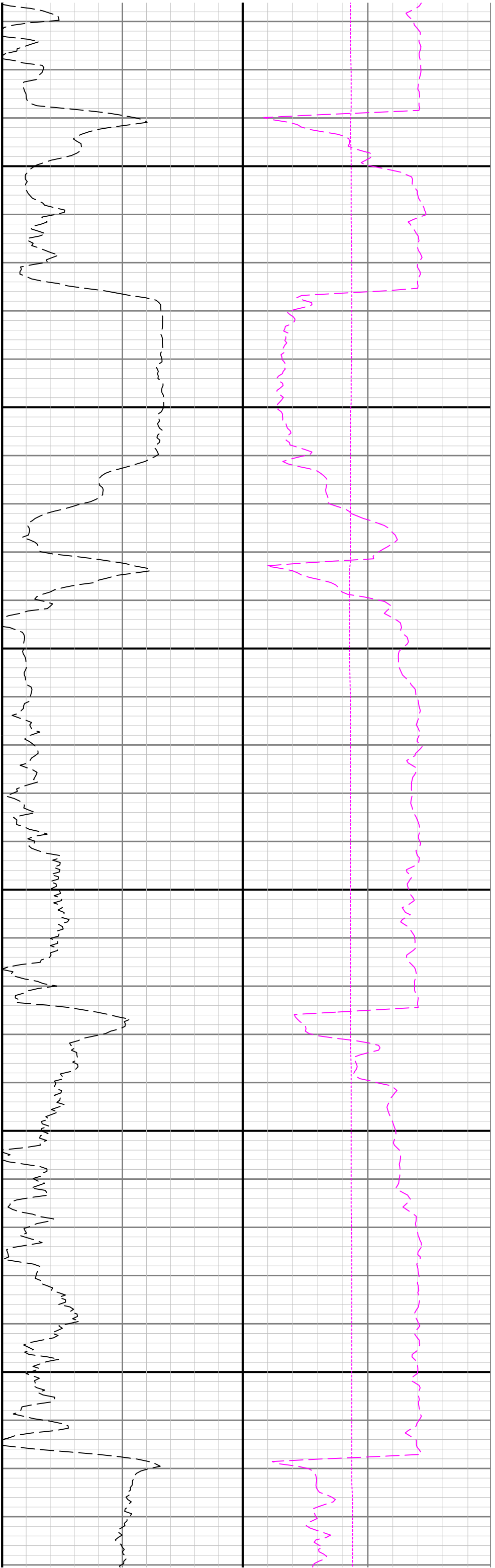
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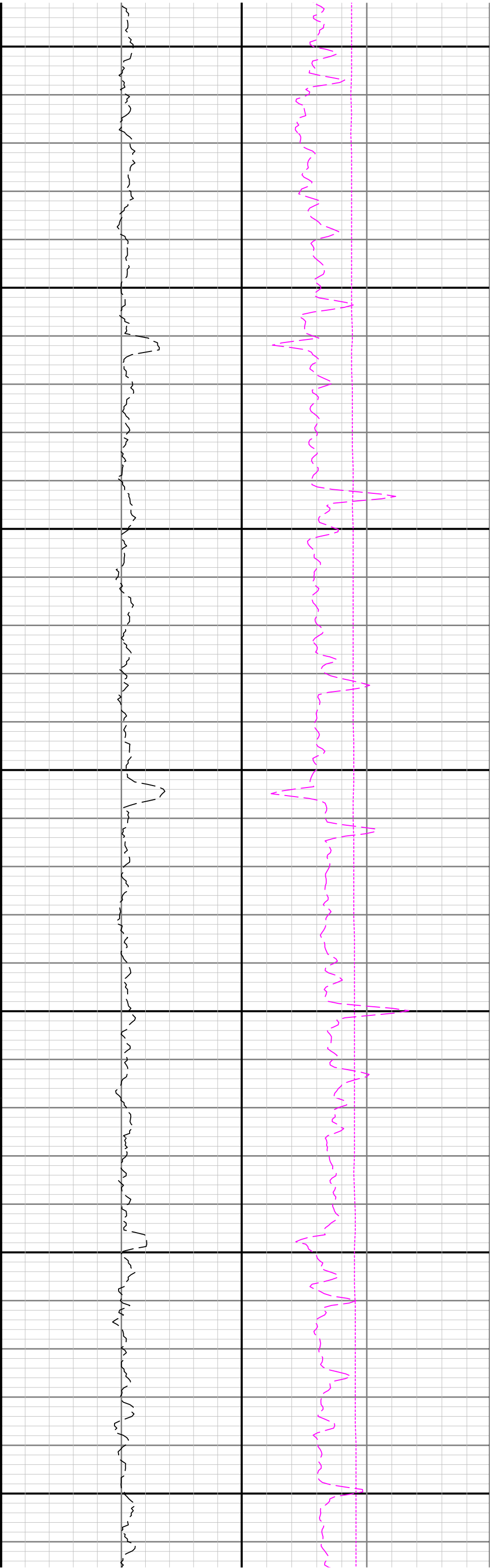
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ROPA

See Remark 1

GRAM

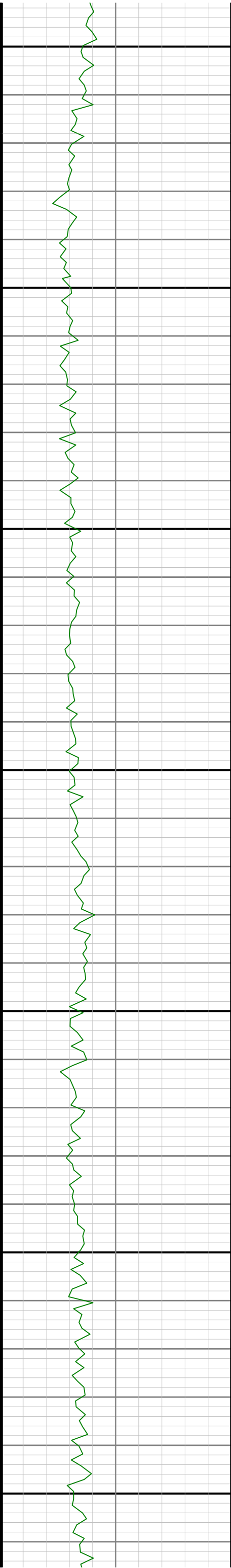


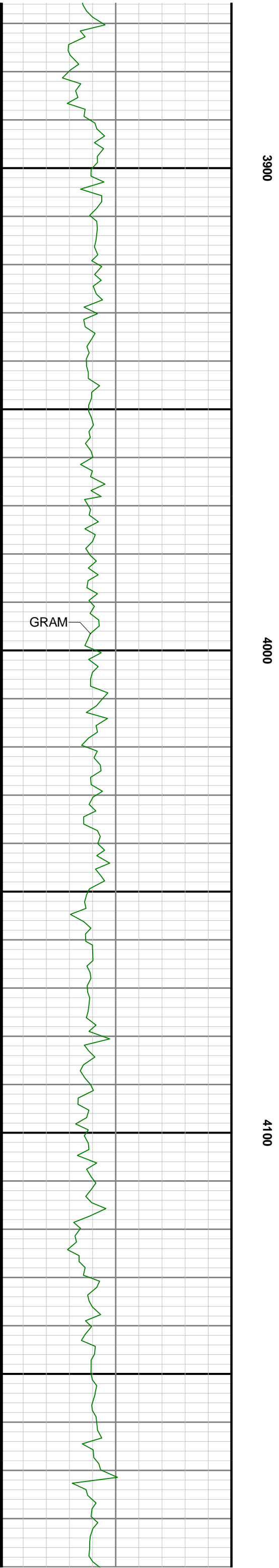
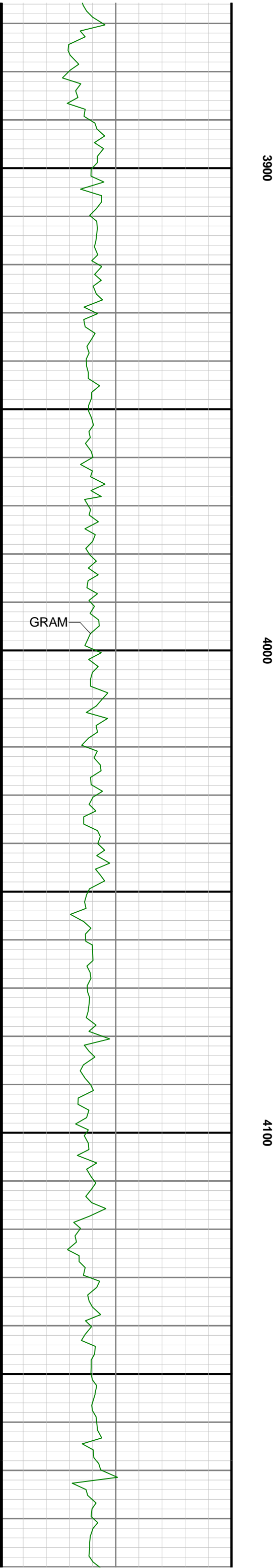
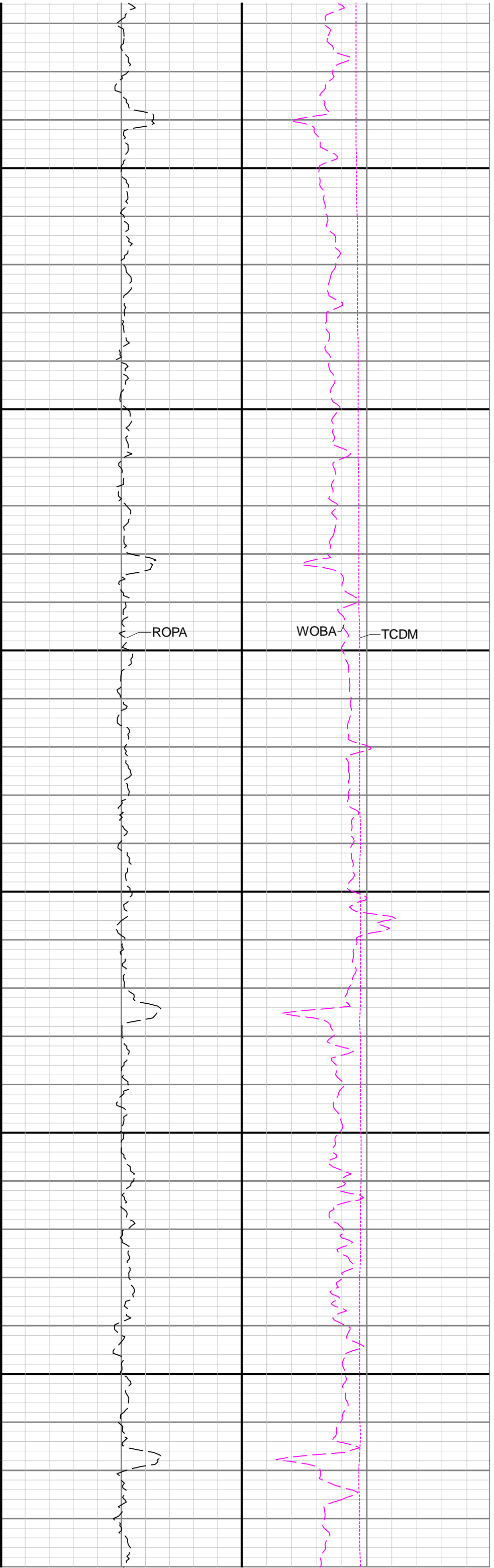


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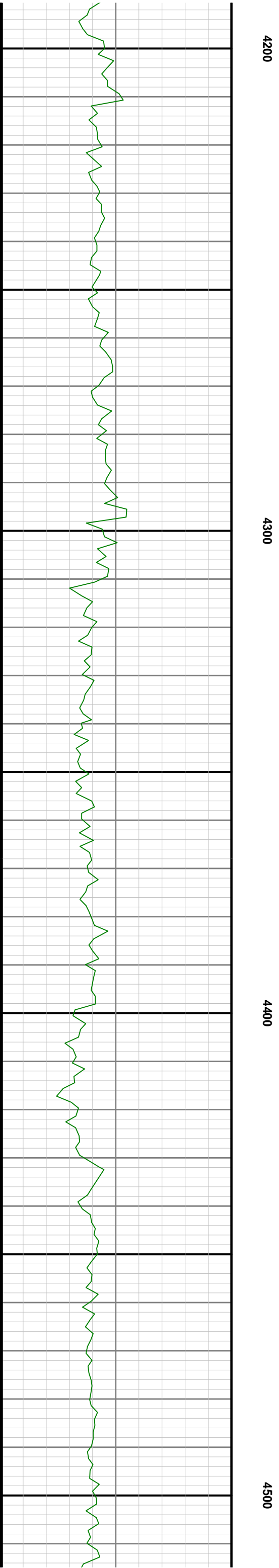
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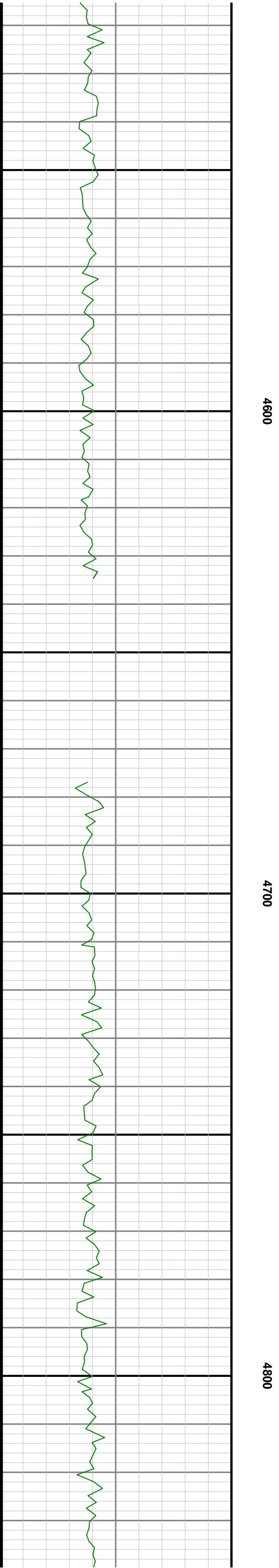
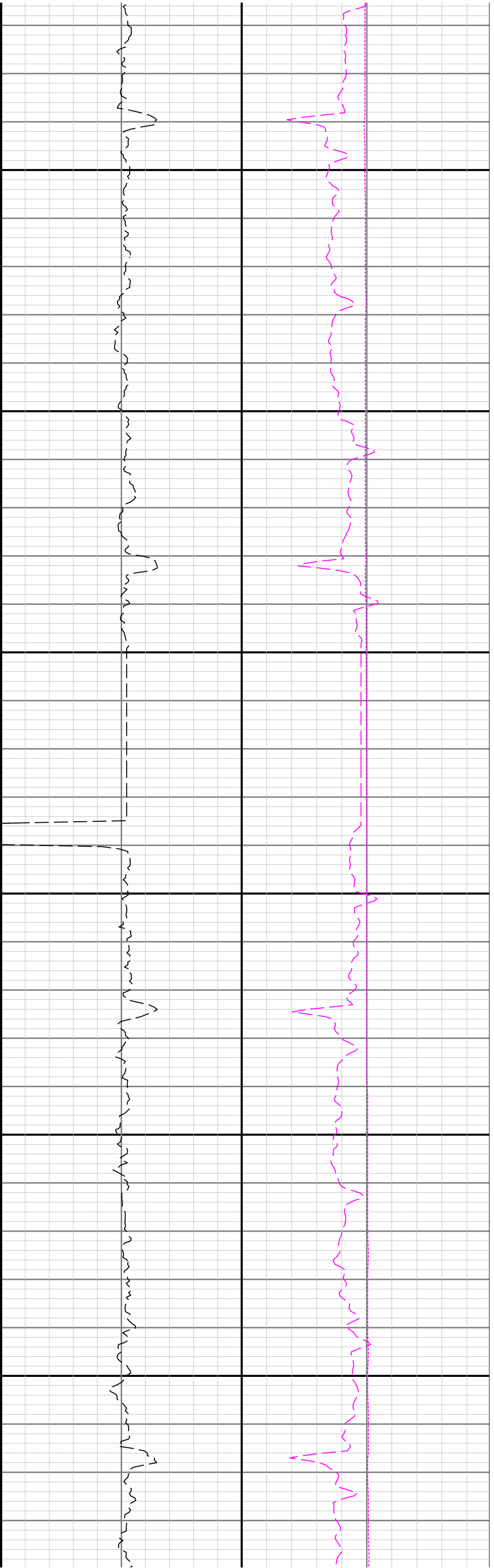
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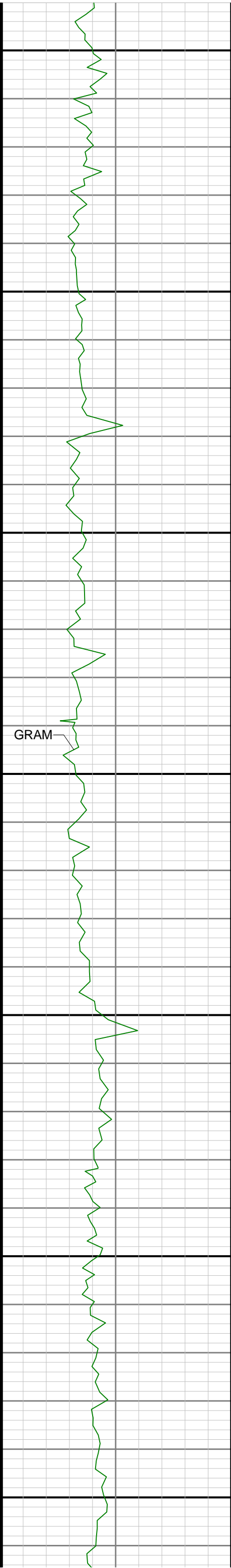








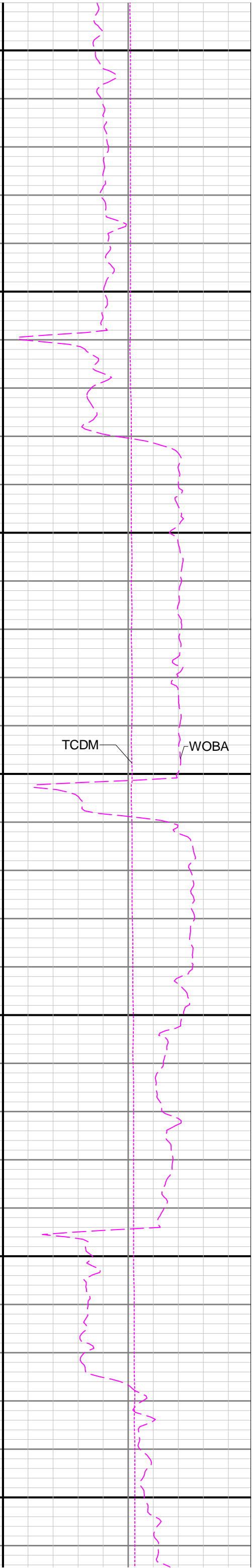
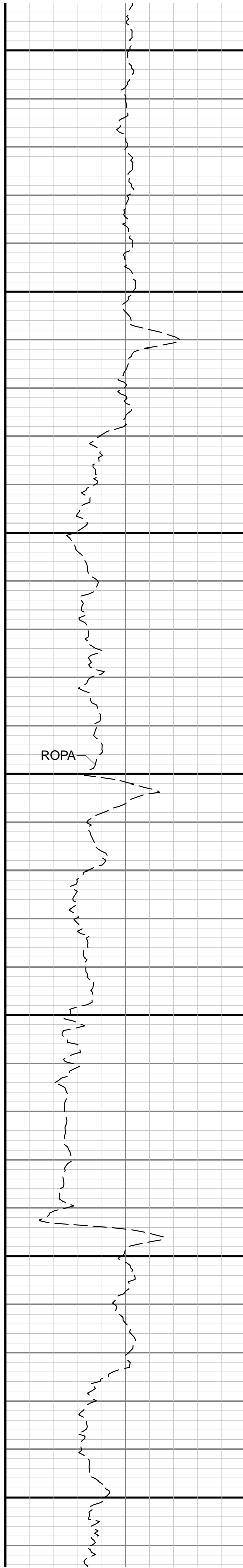


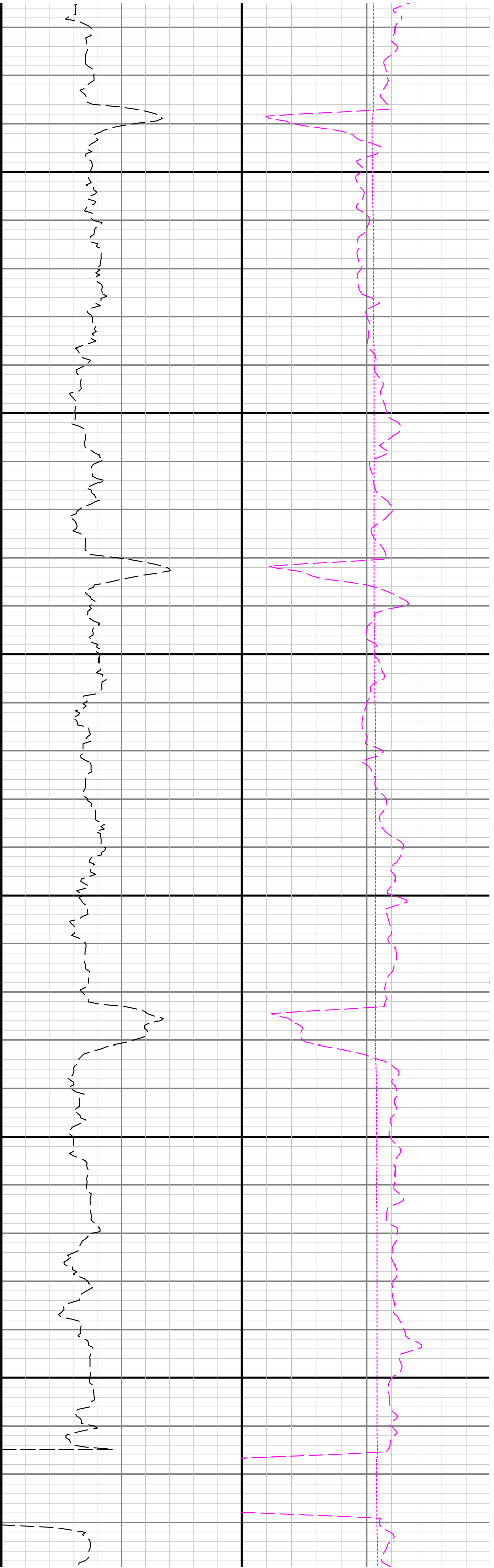


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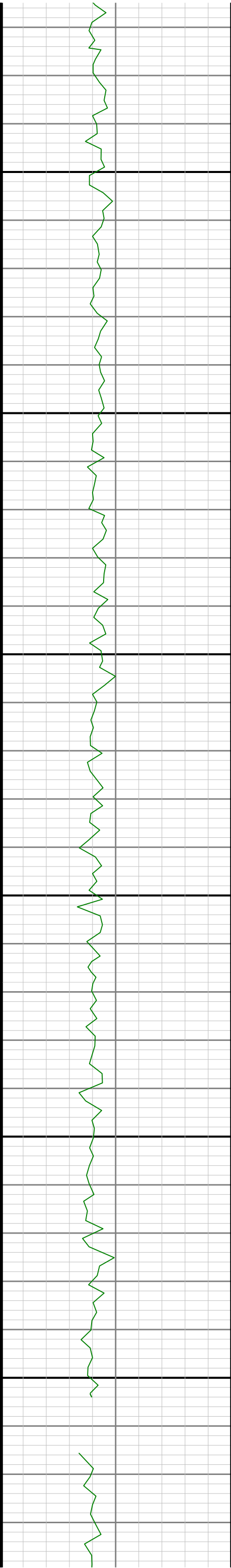


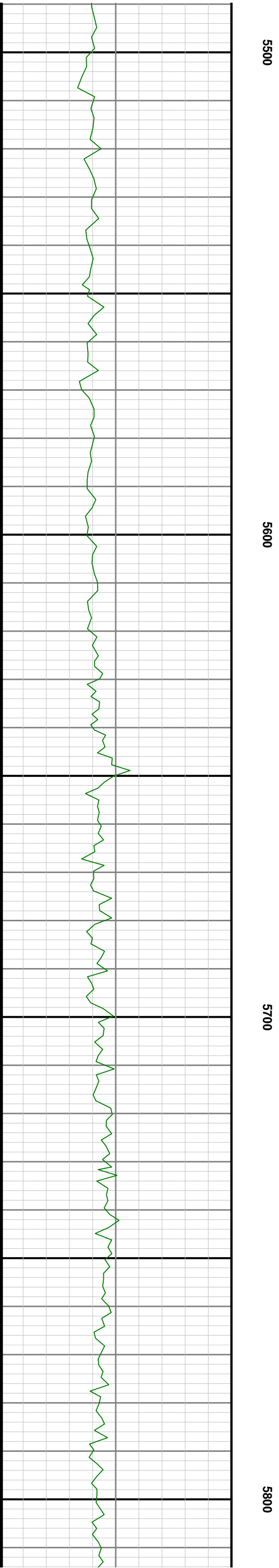
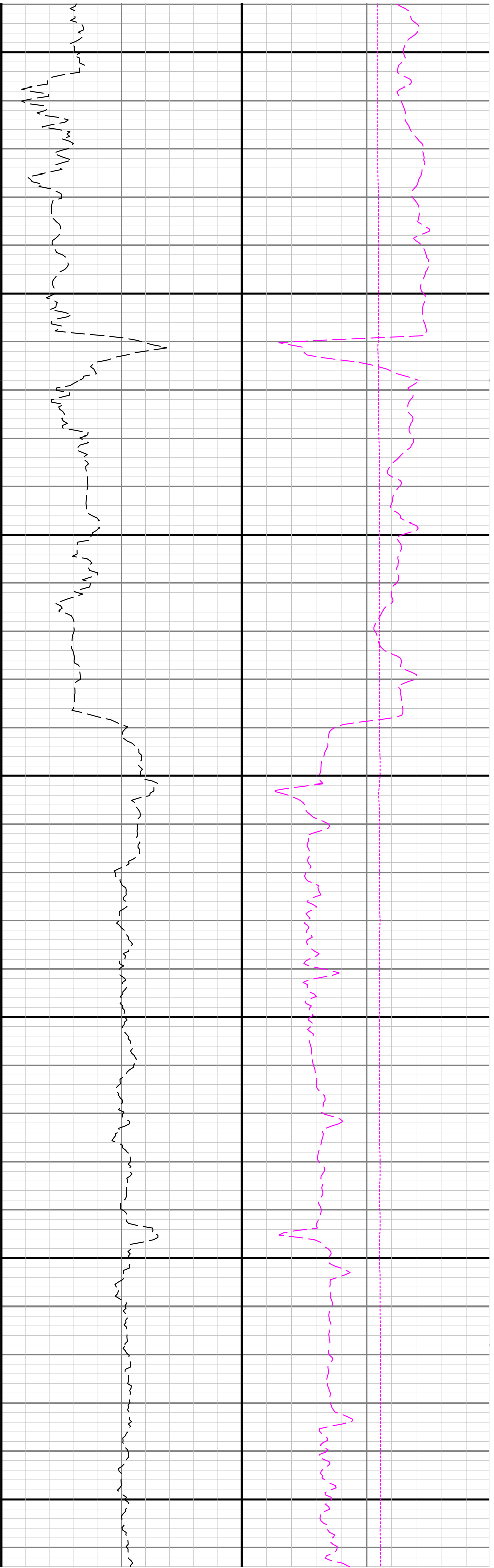


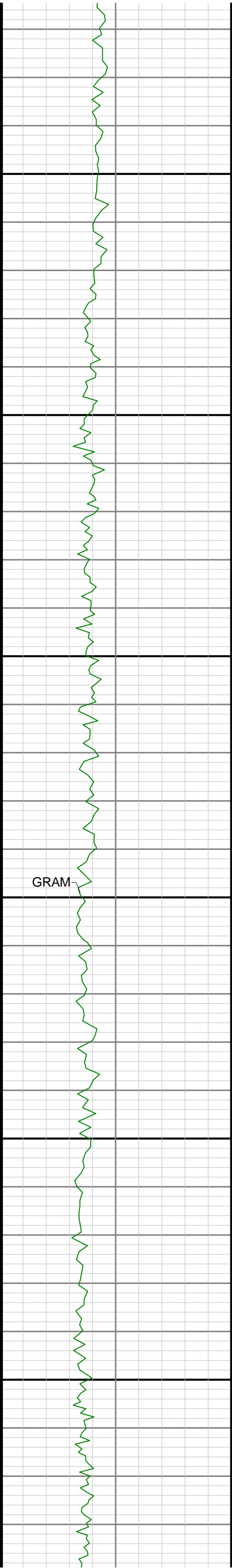
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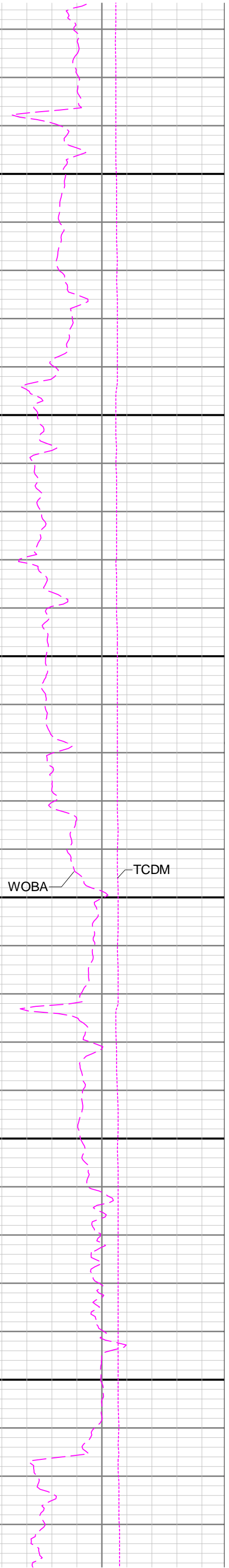
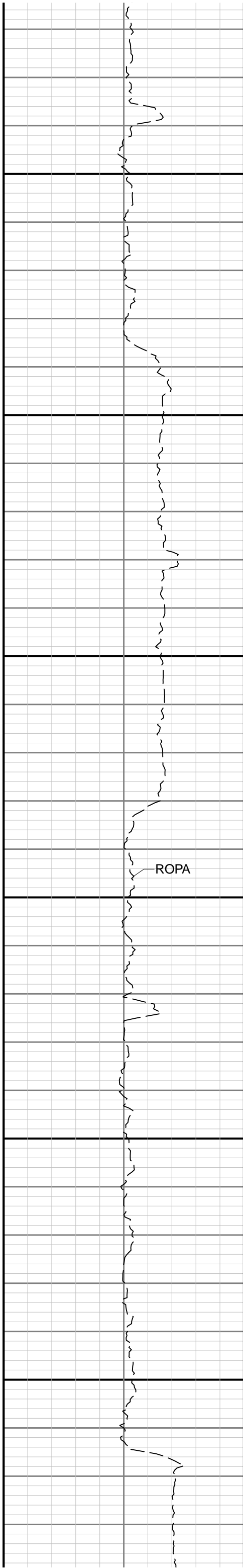


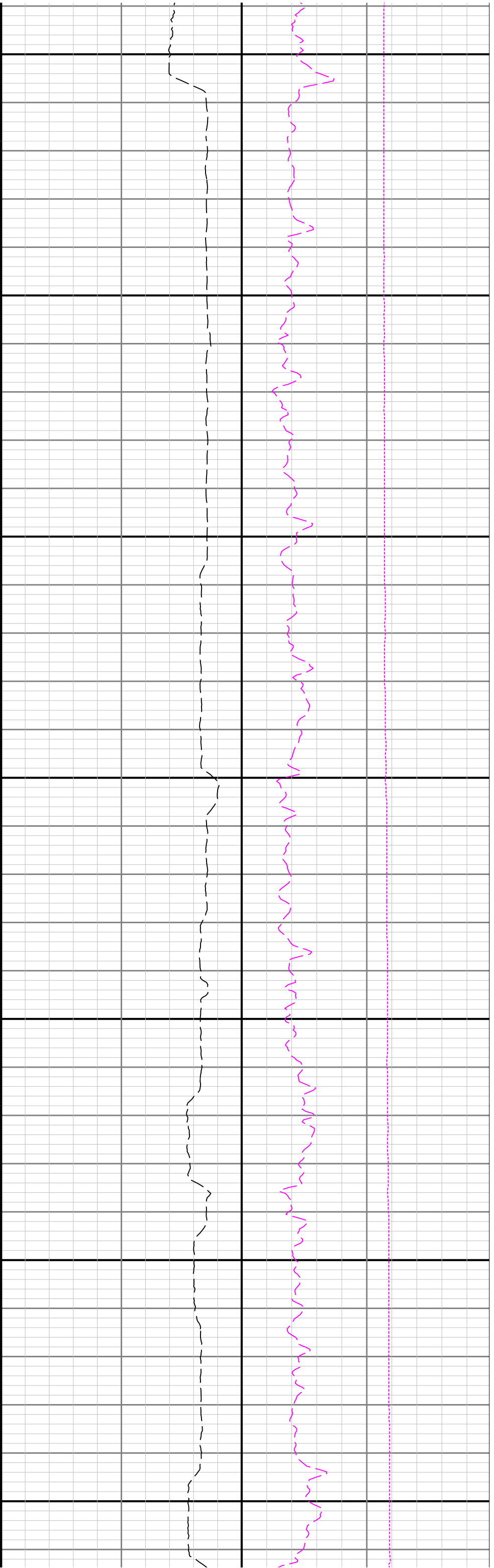


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