



Gamma Ray

Scale: Company: Noble Energy

1:1200 MD Well: RATTLESNAKE FEDERAL LC10-770

Depth Reference: Field: Weld County

Driller's Depth Country: Weld Country: United States

State: Colorado

Status: Surface Location: Other Services:

Final Print Latitude: Longitude:

API No: 0512342979 SEC: 22 TWN: 9N RGE: 59W Wellbore Surveys

Job ID: 8595359 Permanent Datum (P.D.): Ground Level Elevation: 4914.00 ft Elev. KB: N/A

Log Measured From: Rig Floor Above P.D. Elev. DF: 4944.00 ft Elev. GL: 4914.00 ft

Dates Interval Logged Magnetic Field Reference

Date From: 2017-07-04 Top: (ft) 1938.00 Azi Reference North: Grid Dip Angle: (deg) 67.08

Date To: 2017-07-07 Bottom: (ft) 17192.00 Total Magnetic Field Strength: (nT) 52630

Spud Date: 2017-07-03 Mag to Reference North Correction: (deg) 7.65 E

Borehole Record

Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
8.500	1950.00	17204.00	9.625	36.00	30.00	1939.00

Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc   Az (Start)	Inc   Az (End)
Oil Based Mud	1950.00	17204.00	8.500	15234.00	0.46   77.01	90.18   358.90

Acquisition System Software Version

Other

Baker Hughes Cadence RT4.1 4.0.7570.8

Rig: H&P 524 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	2.00	AutoTrak Curve	1938.00	17192.00	1950.00	17204.00	2017-07-04 17:21	2017-07-07 17:52	63.43

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Ryan Wunderlich	2017-07-03	2017-07-08	Steven Cano	2017-07-03	2017-07-08			

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+ (%)
2017-07-04 15:15	1	1950.00	Oil Based Mud	9.1	44	N/A	14.0	75/22.7	Active Pit	29500	0.00
2017-07-05 03:15	1	3950.00	Oil Based Mud	9.0	44	N/A	12.8	73.5/26.5	Active Pit	28000	0.00
2017-07-06 15:00	1	12986.00	Oil Based Mud	9.3	40	N/A	17.5	84.8/15.2	Active Pit	27000	0.00
2017-07-07 03:00	1	15269.00	Oil Based Mud	9.3	40	N/A	17.8	84.3/15.7	Active Pit	26000	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	14236902	Near Bit VSS	5.93	6.76	7.000	4.330
1	ATC_SU	14236902	Near Bit Inclination	5.93	6.76	7.000	4.330
1	ATC_MWD	12200472	Gamma (single)	2.76	12.93	7.000	3.250
1	ATC_MWD	12200472	Directional (mag)	12.28	22.45	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_LCPM	ATC_LCPM	Auto Trak Curve LCPM

Comments

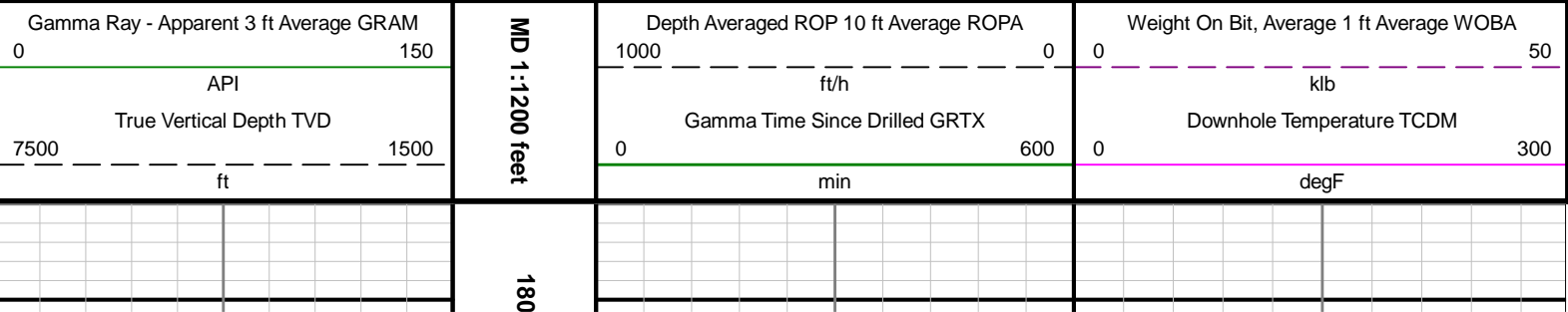
- 1
- Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 2
- Baker Hughes LWD run 1 utilized a 6 3/4 inch Navigamma service (Gamma Ray and Directional) behind a 8 1/2 inch bit and rotary steerable from 1950 to 17204 feet MD (1950 to 6083 feet TVD).
- 3
- Large gaps in the gamma ray data are due to powering issues with the tool after a connection and drilling ahead.

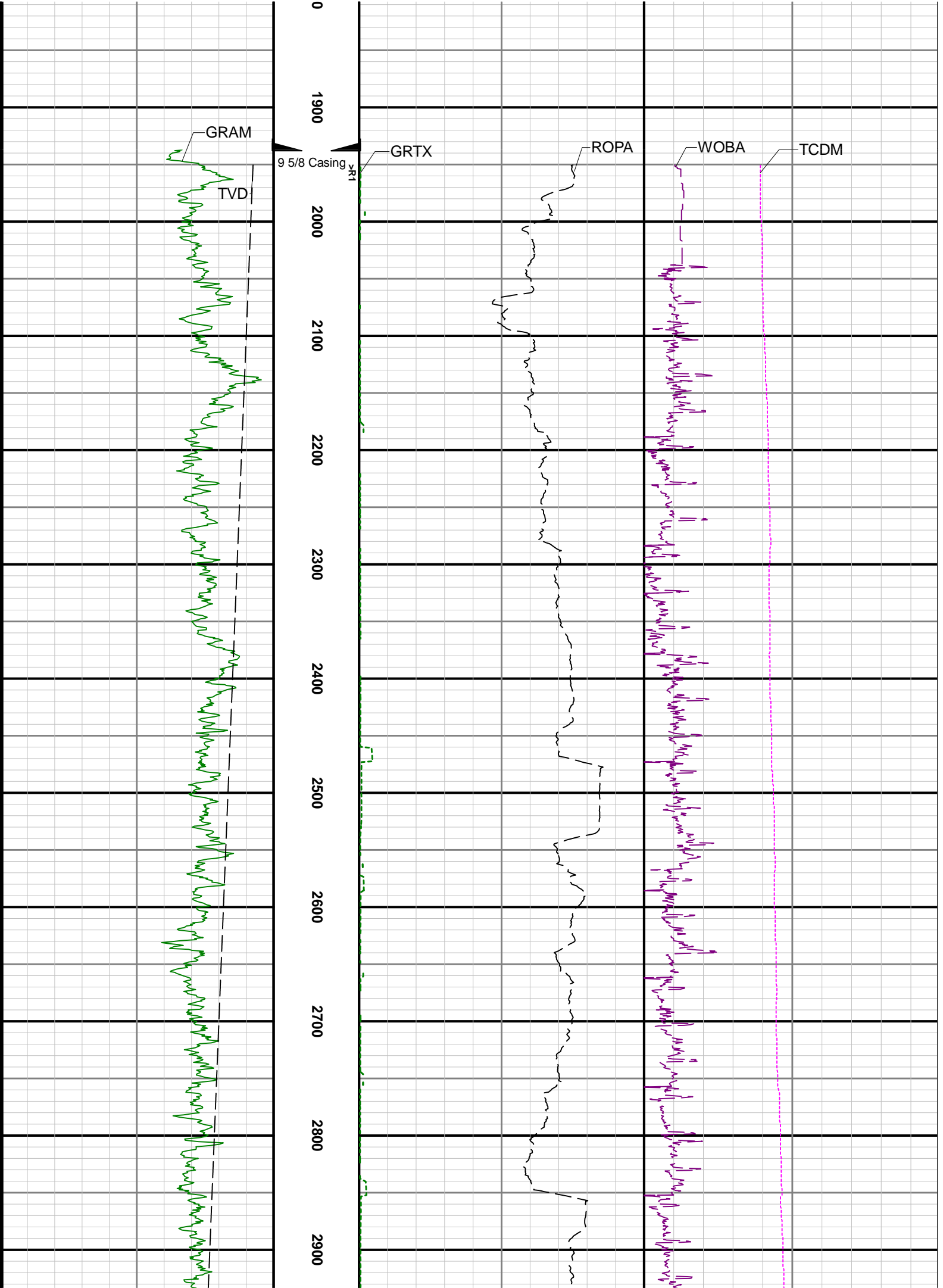
Remarks

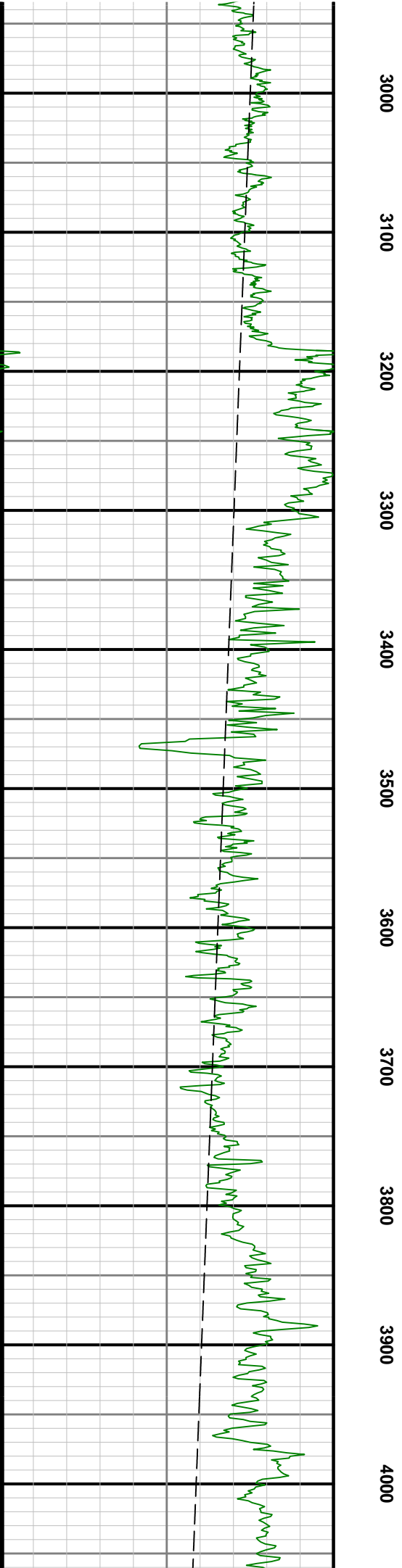
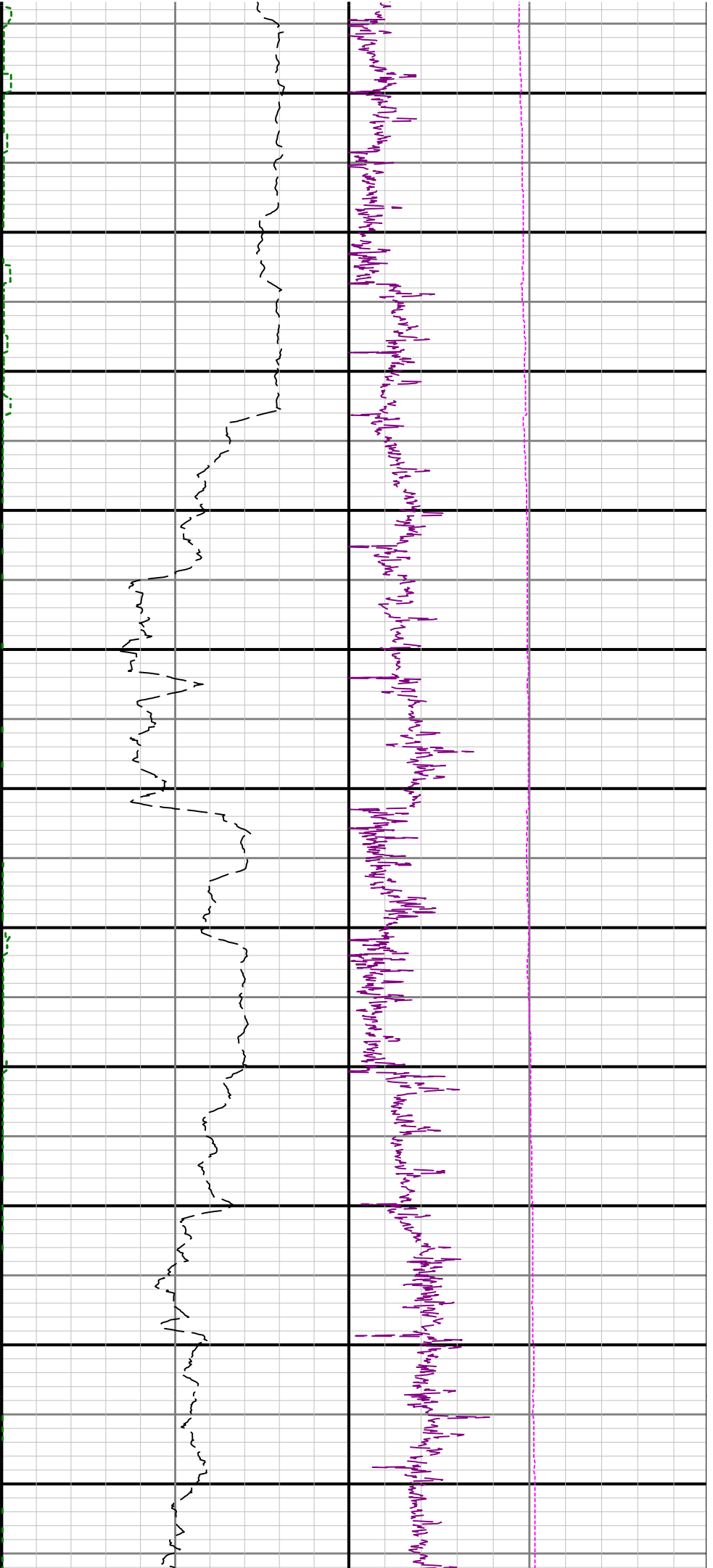
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	17192.00	8.500	1	The interval from 16926 to 17204 feet MD (6083 feet TVD) was not logged due to tool not powering on and sensor offset at well TD.

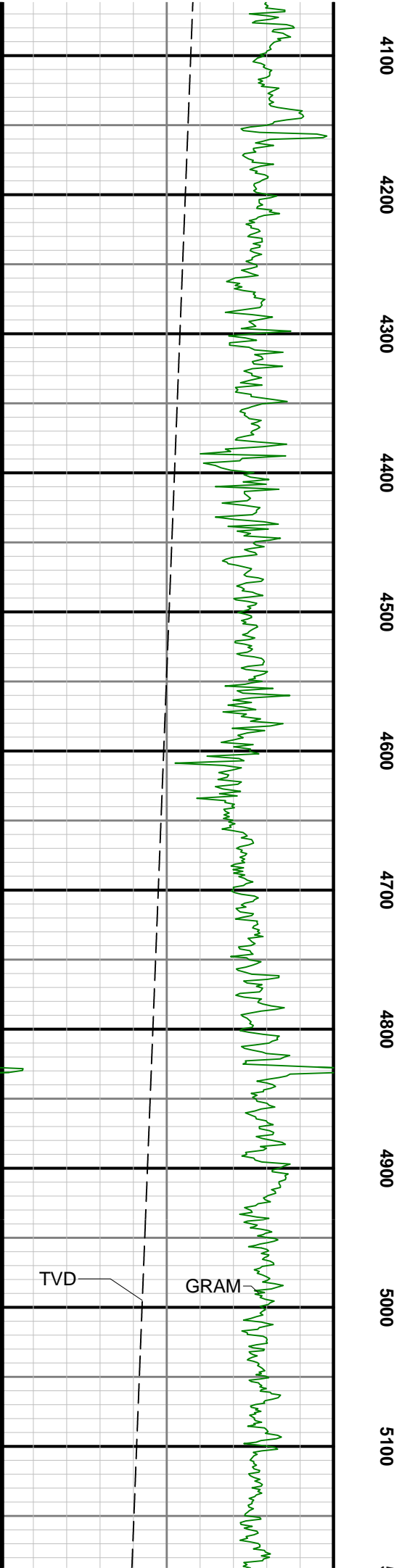
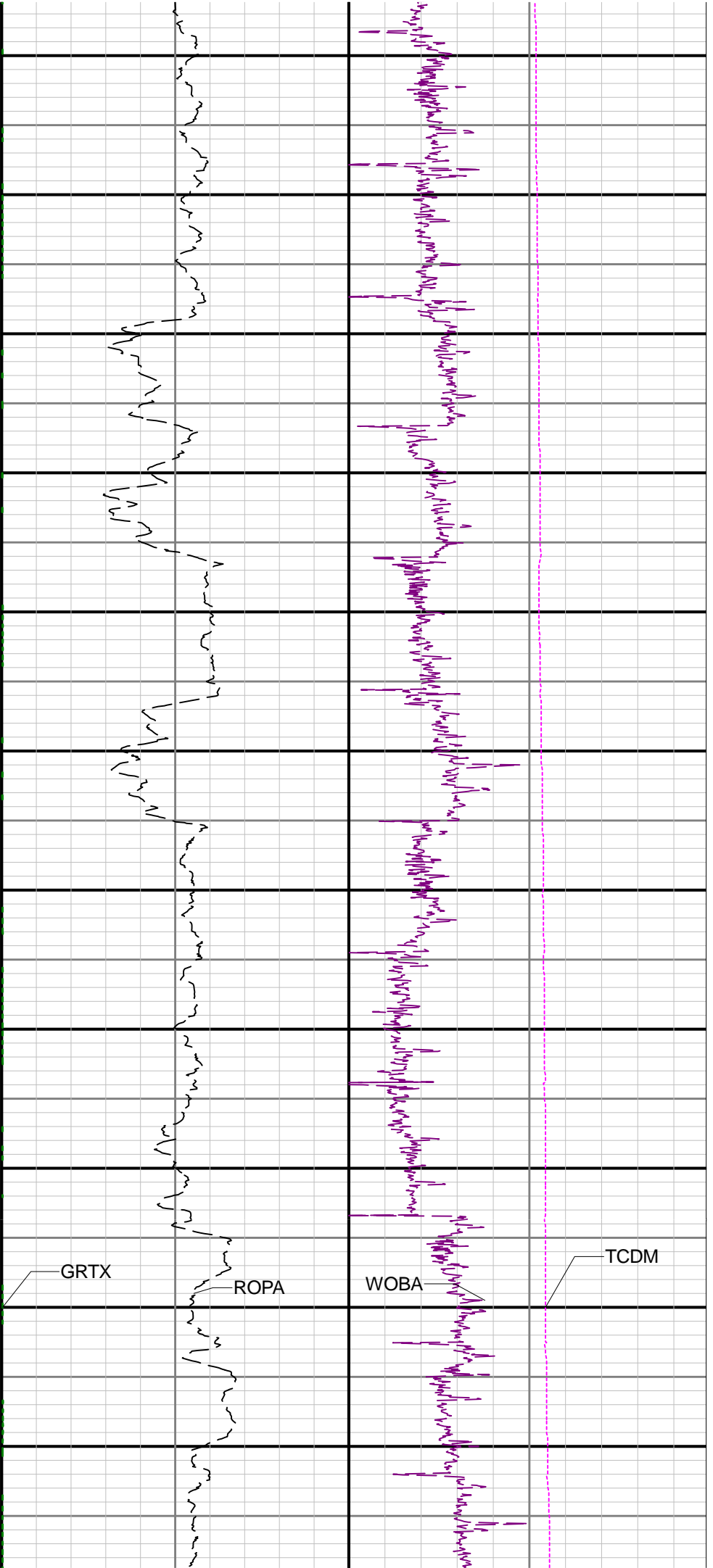
Curve Mnemonics

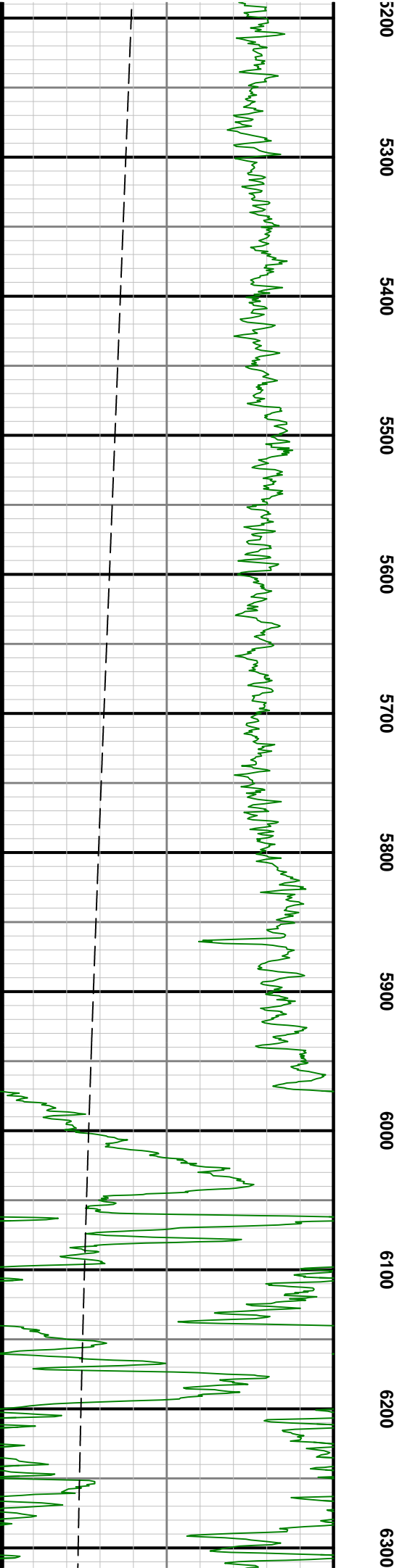
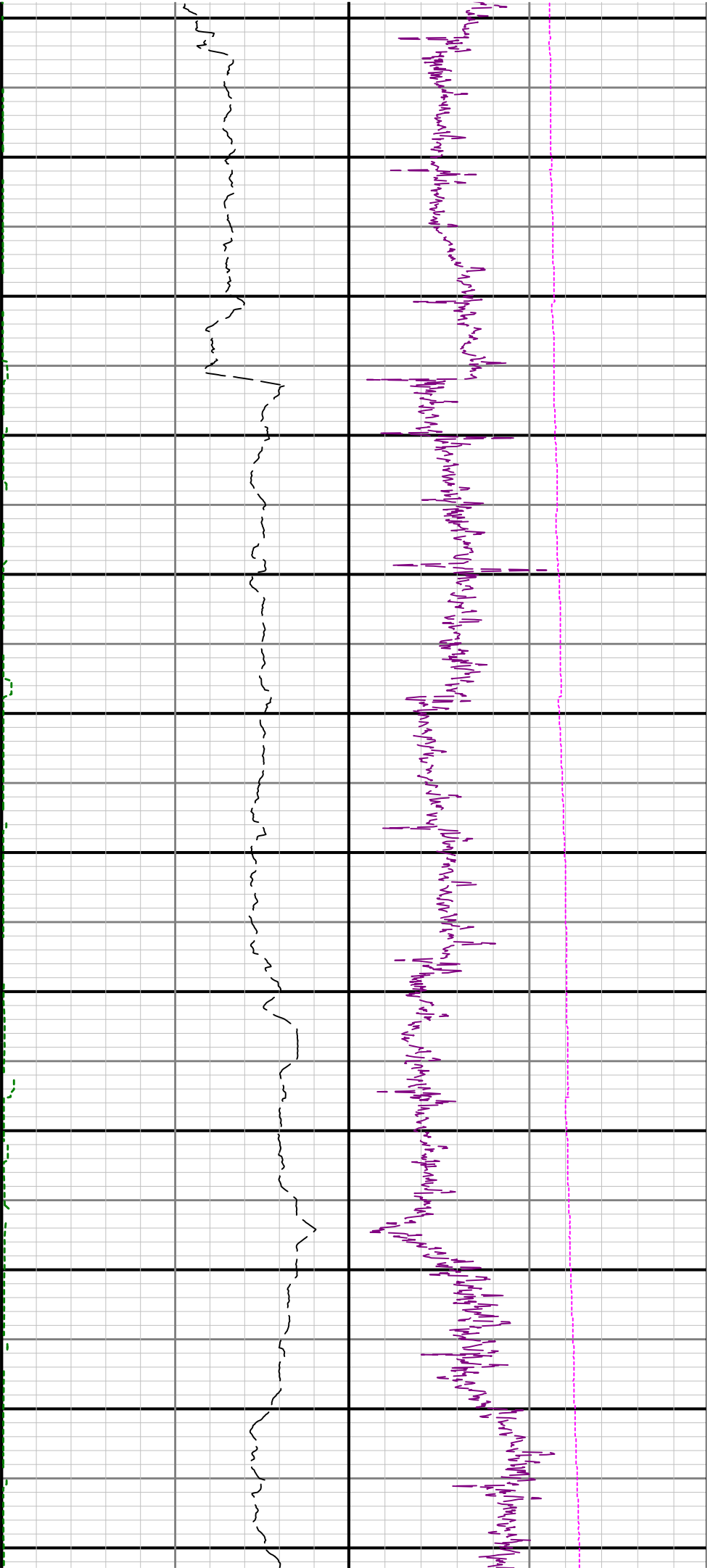
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 10 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent 3 ft Average	API
GRTX	Gamma Time Since Drilled	min
TCDM	Downhole Temperature	degF

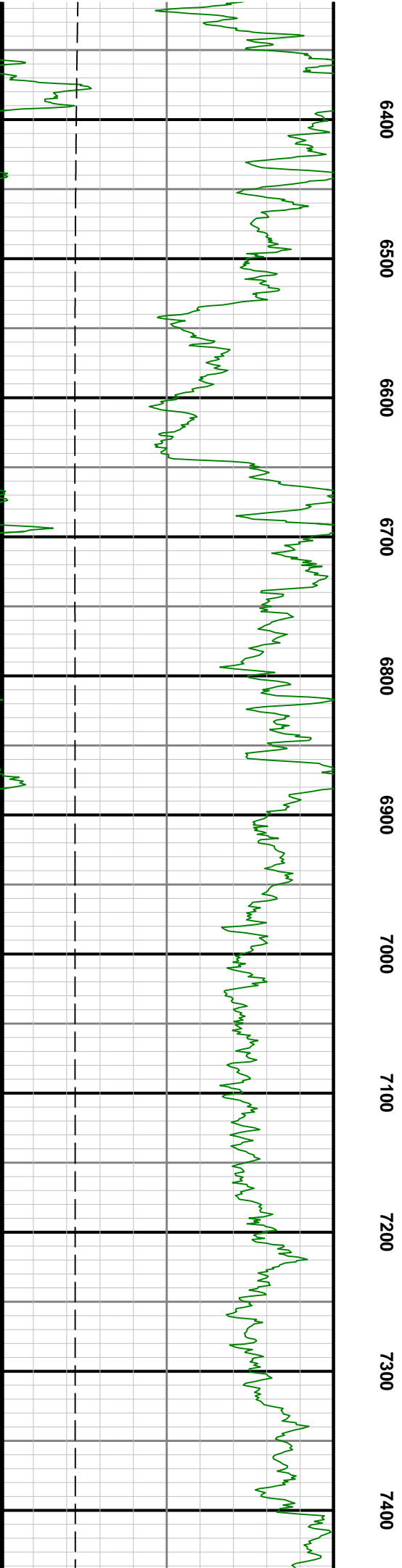
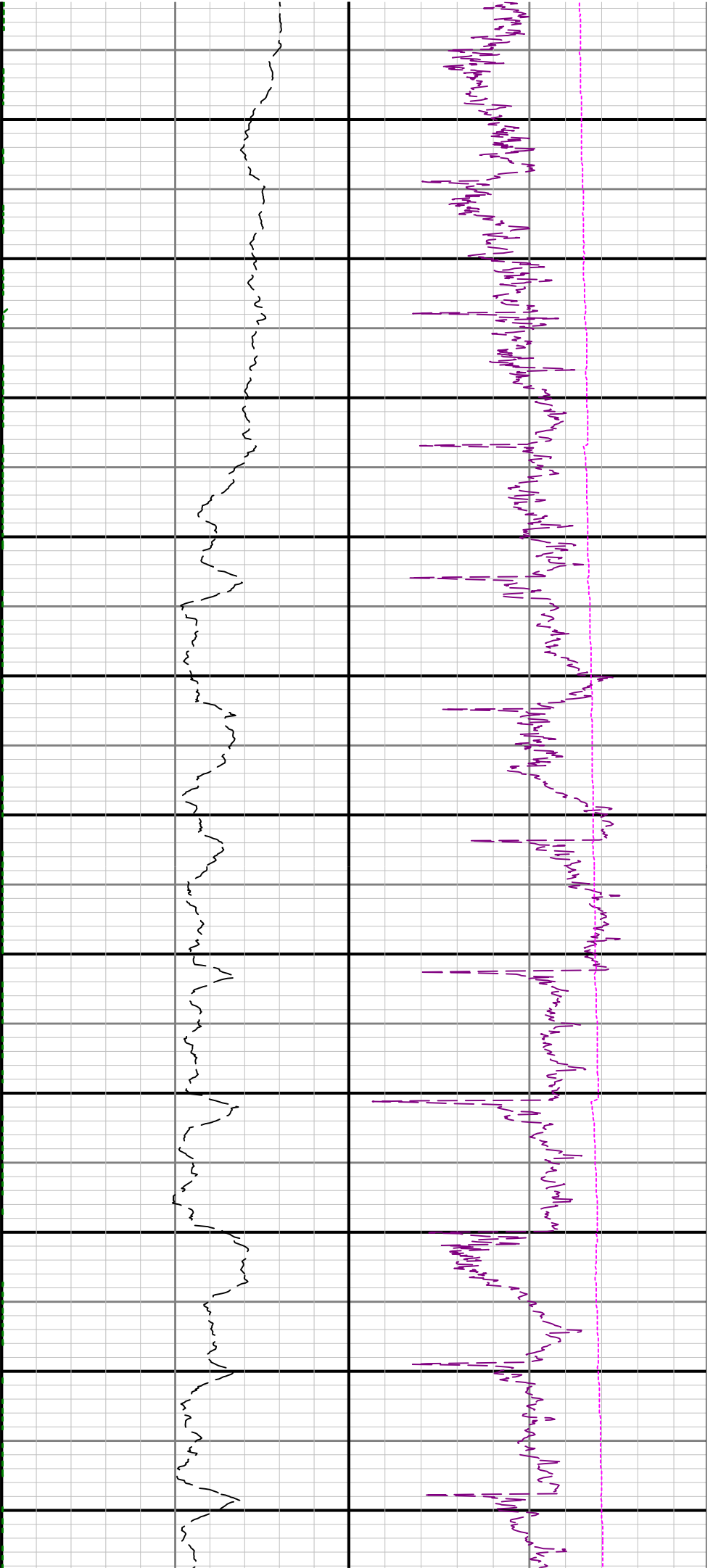


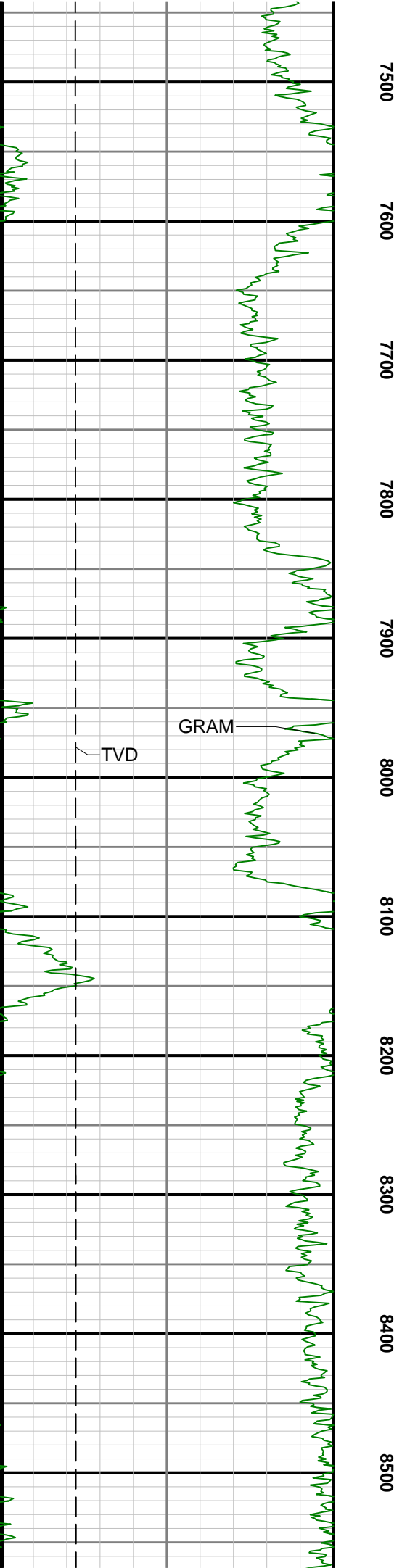
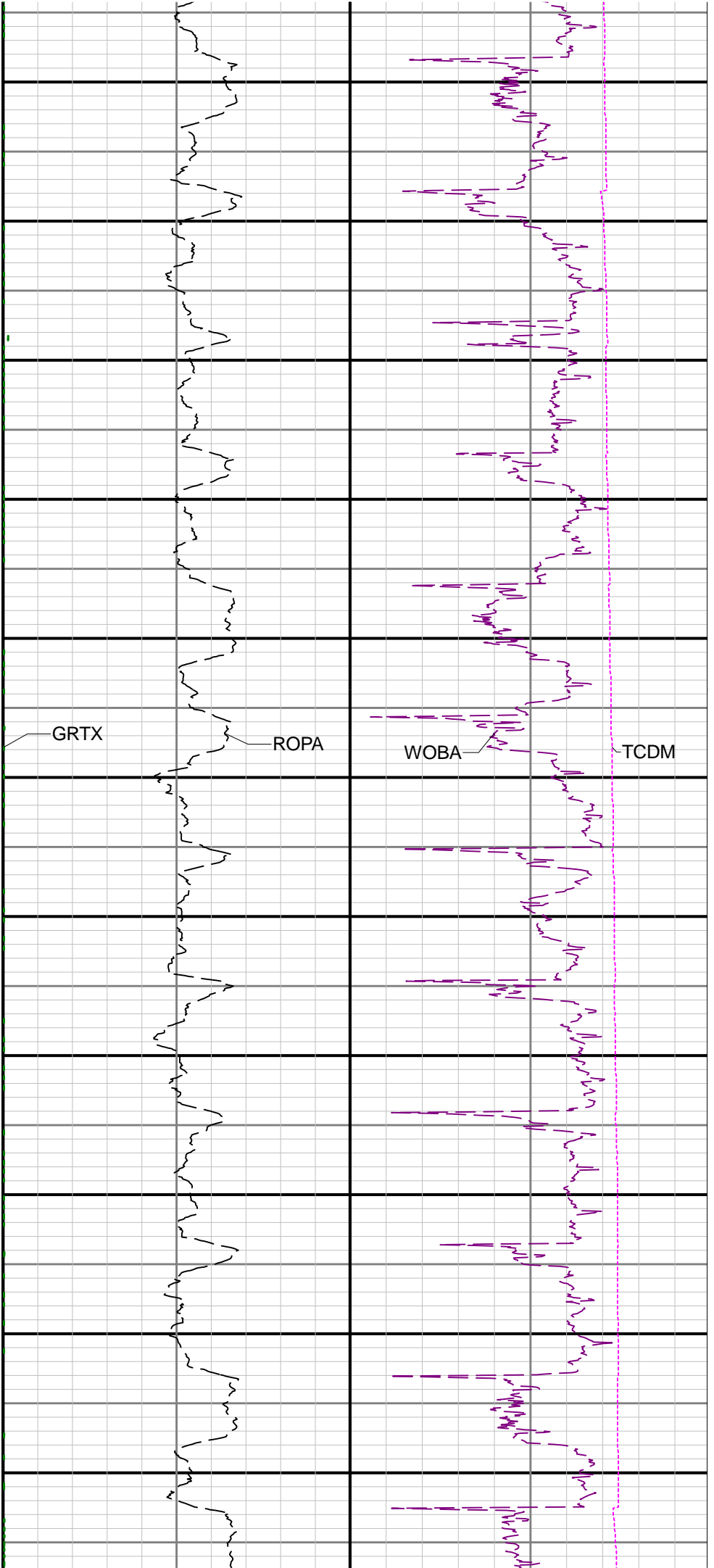




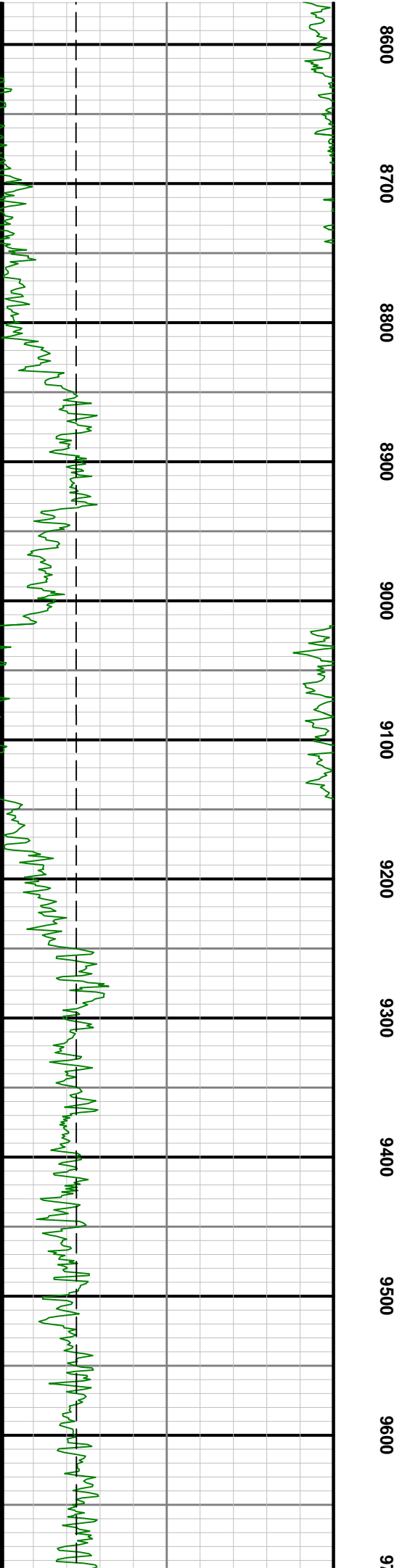
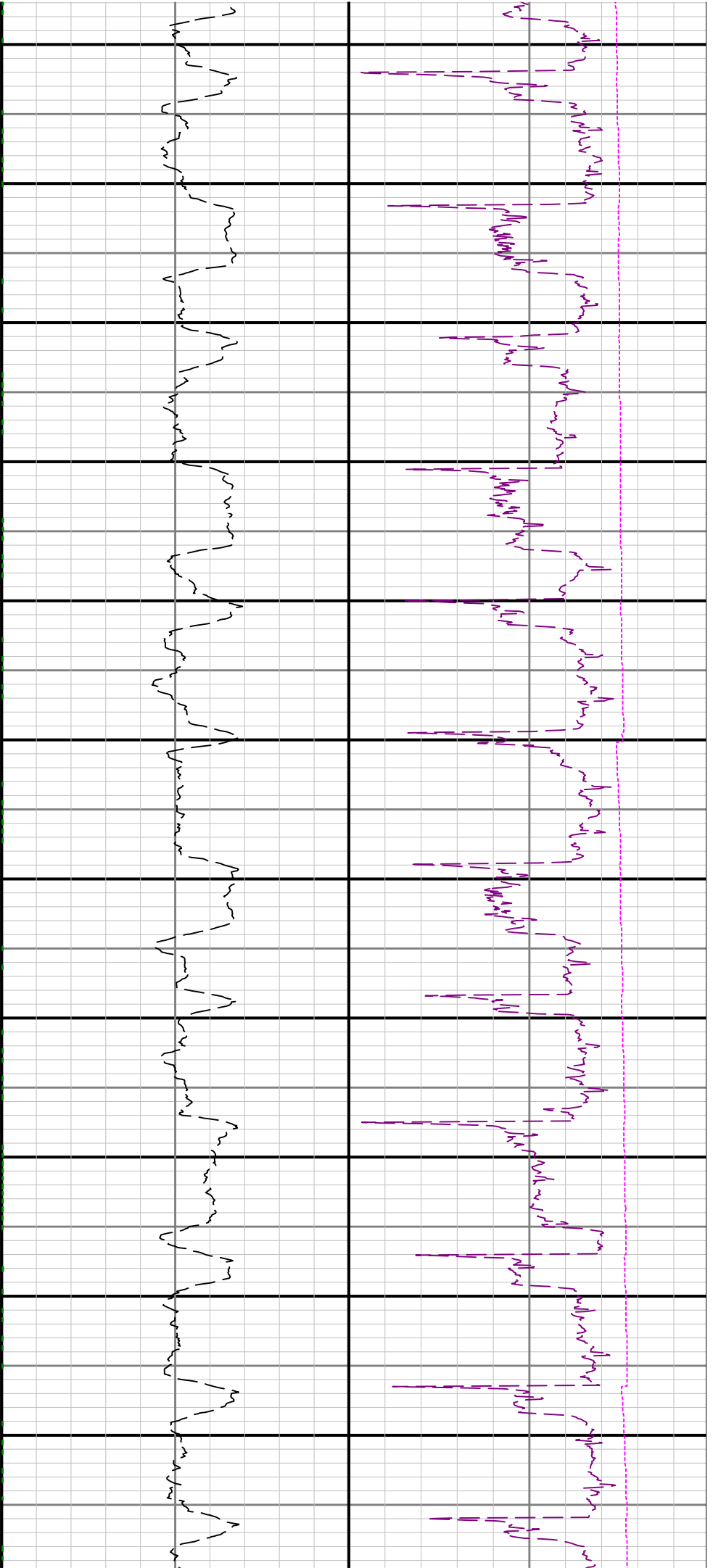


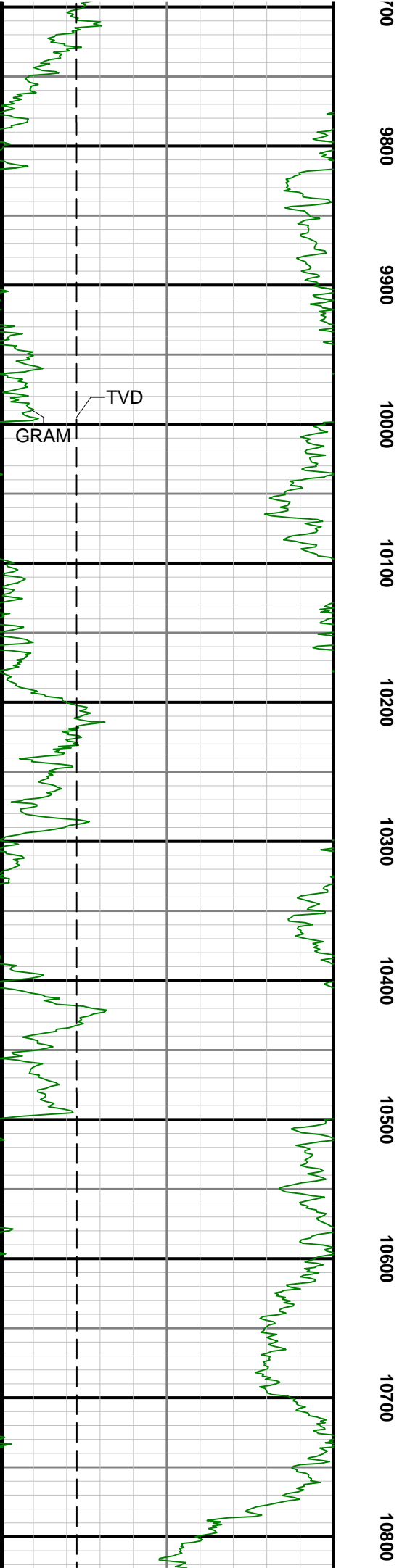
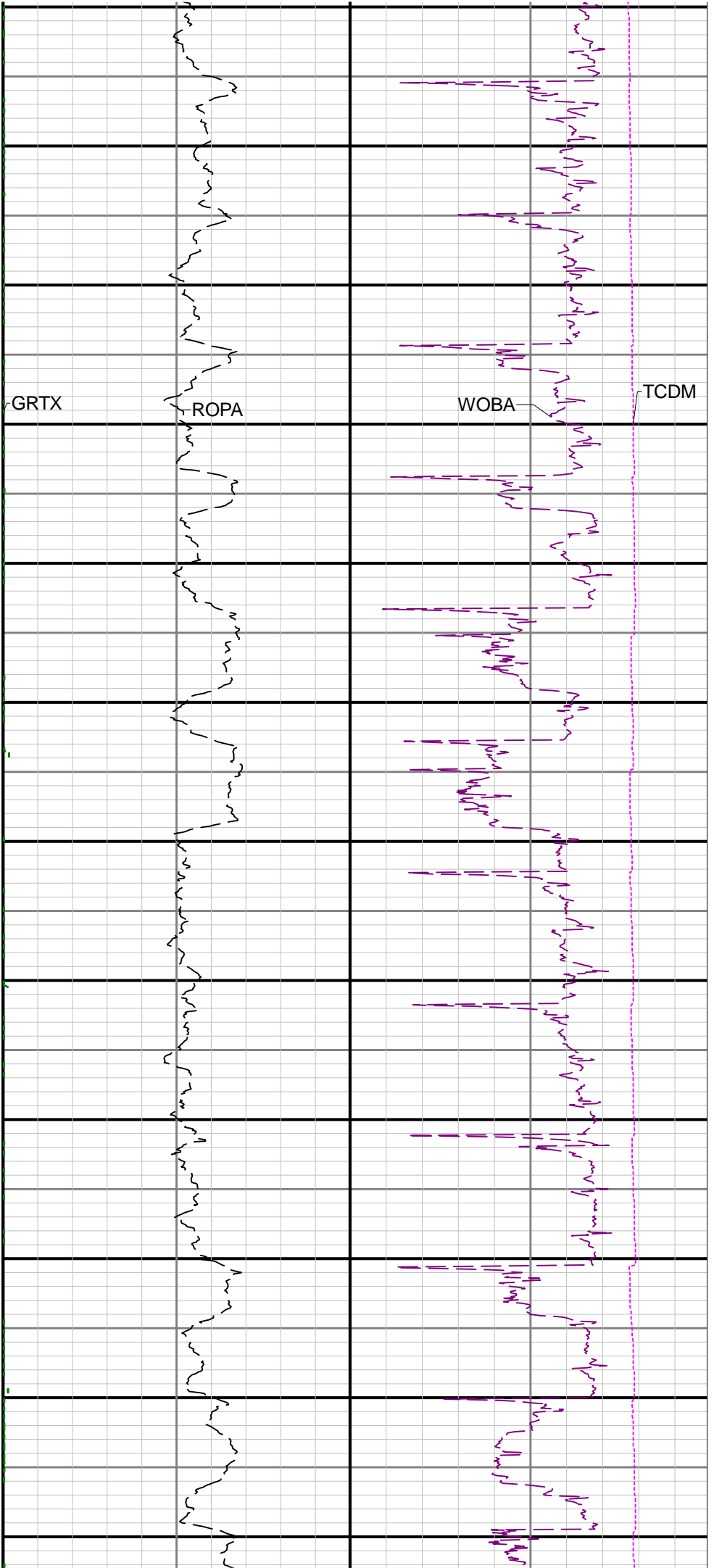


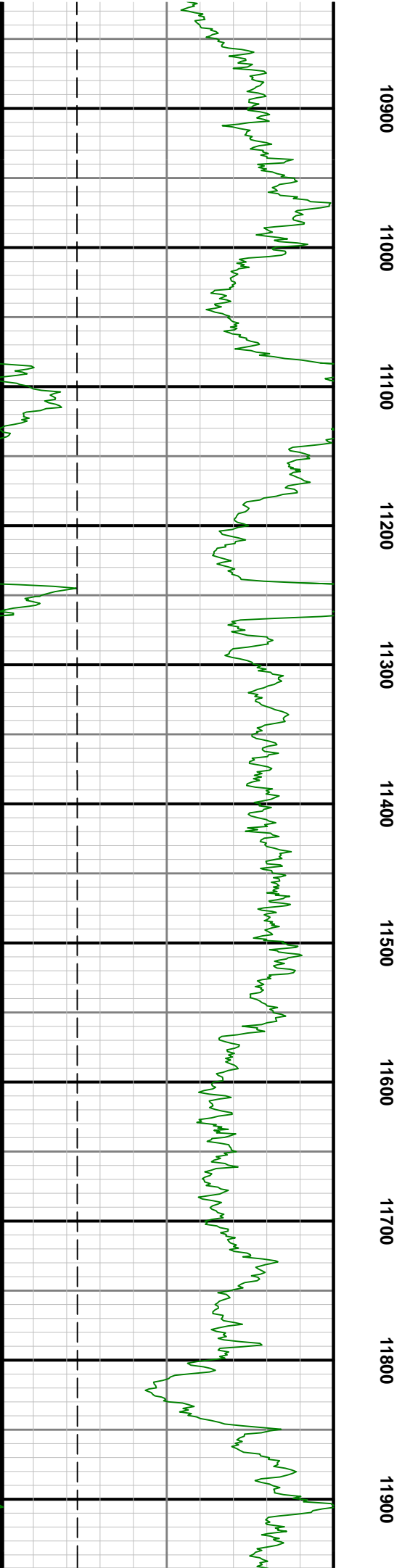
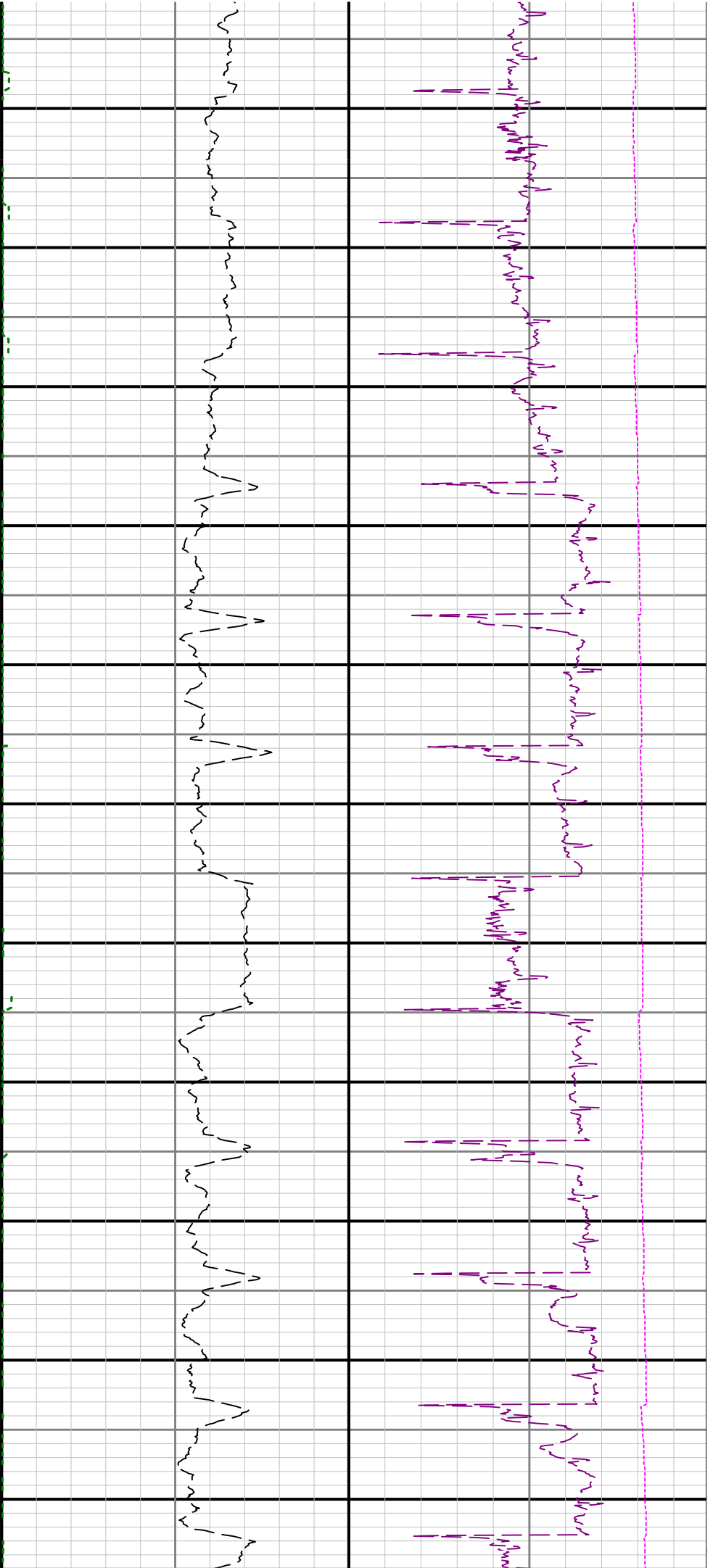


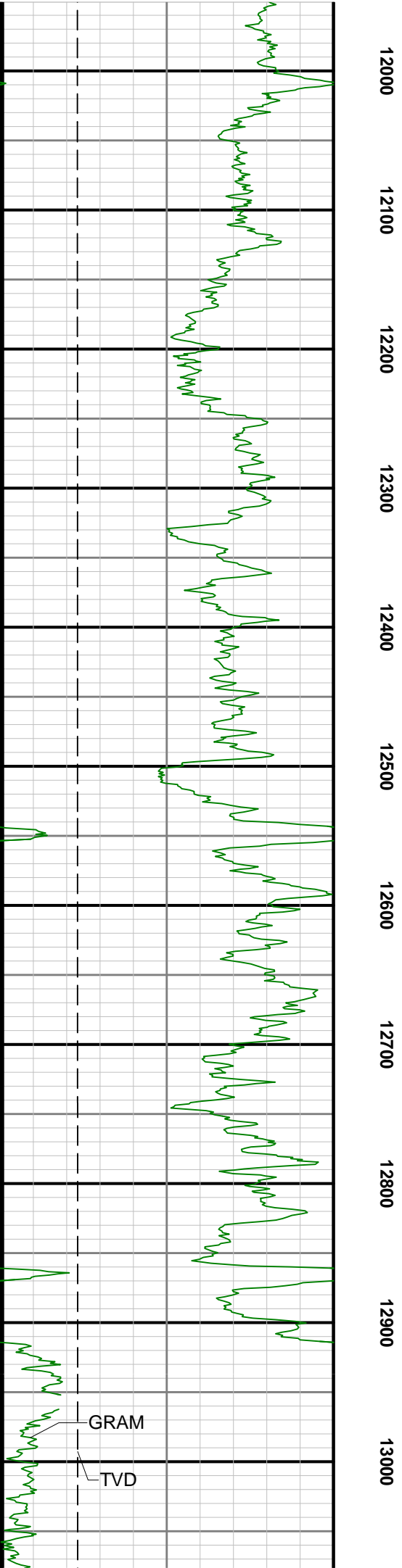
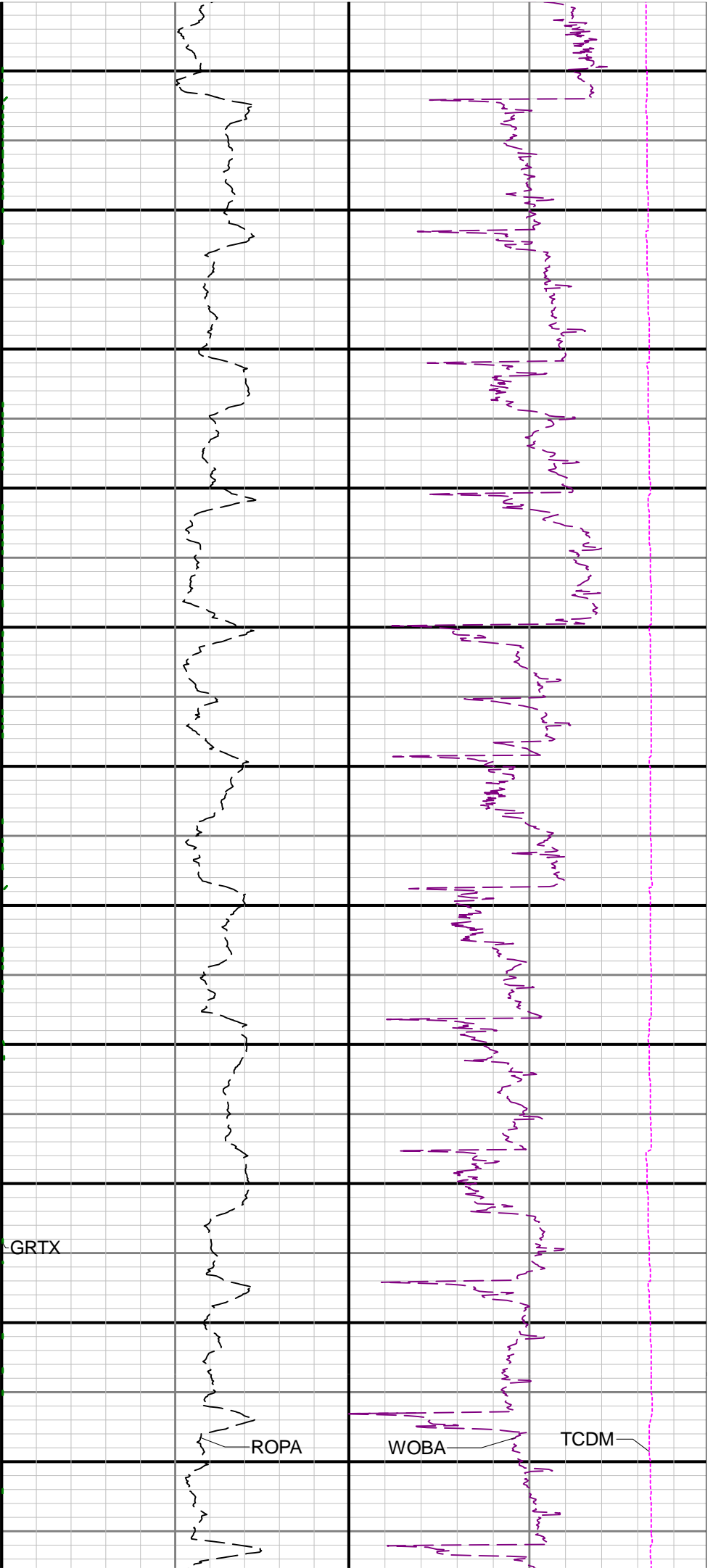


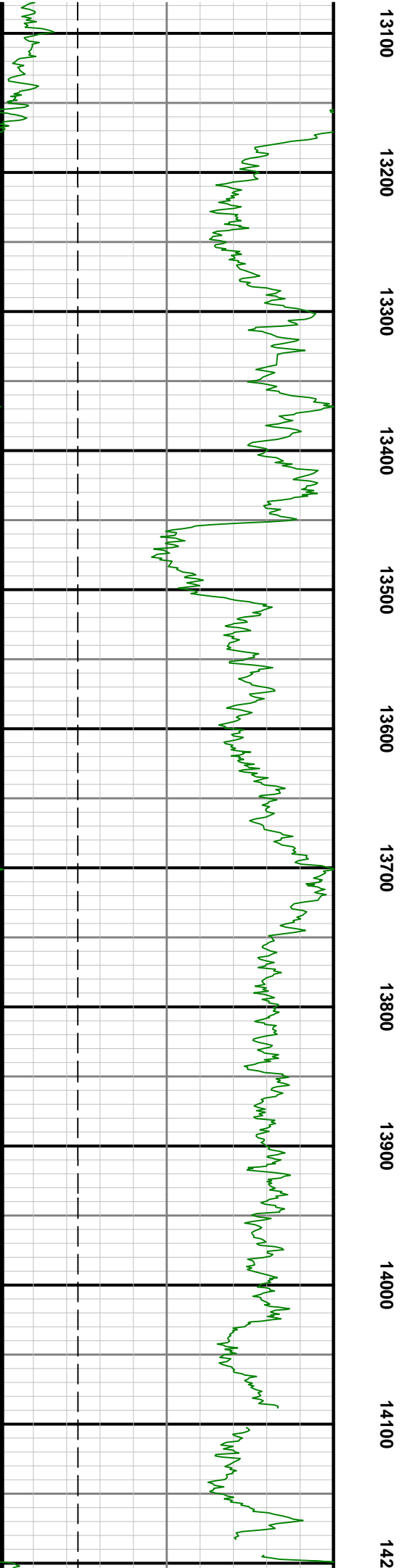
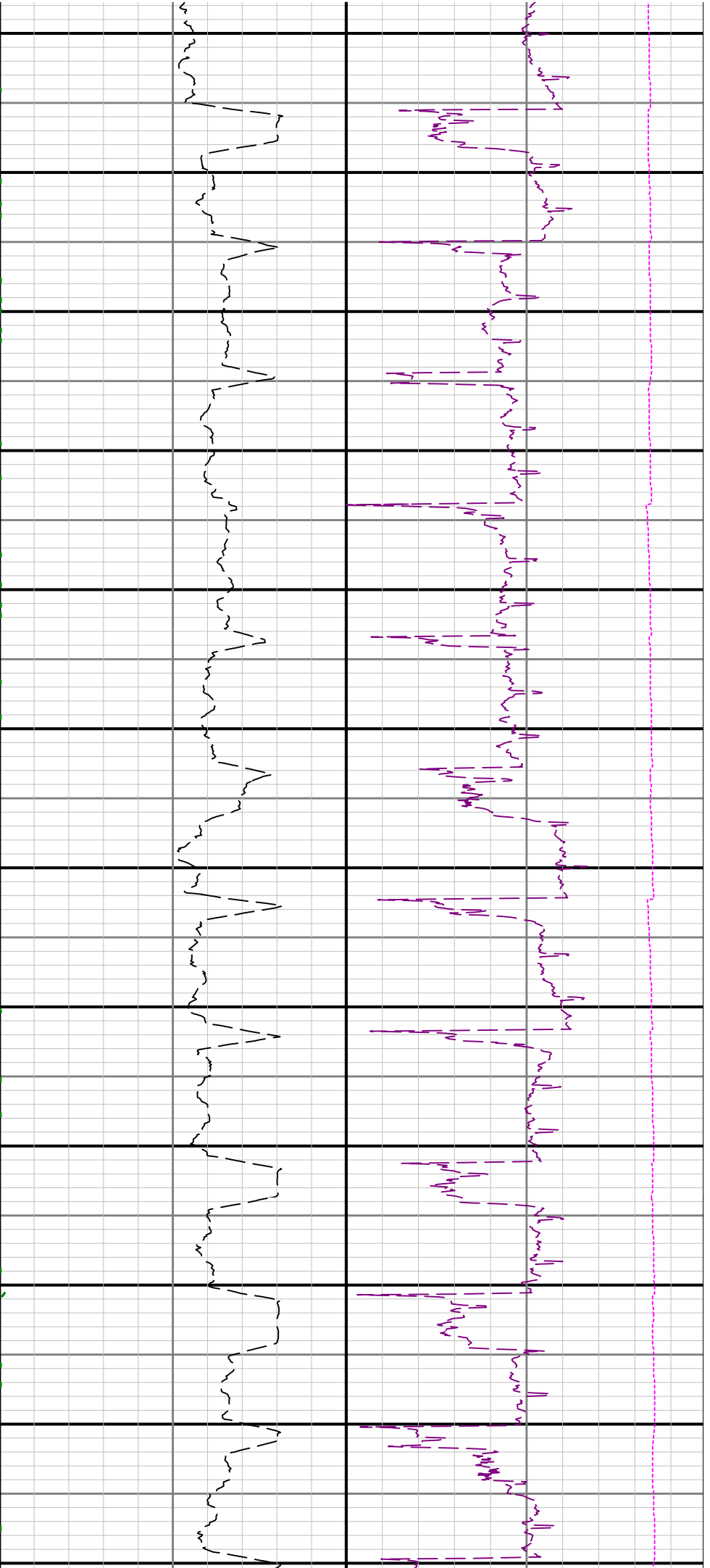


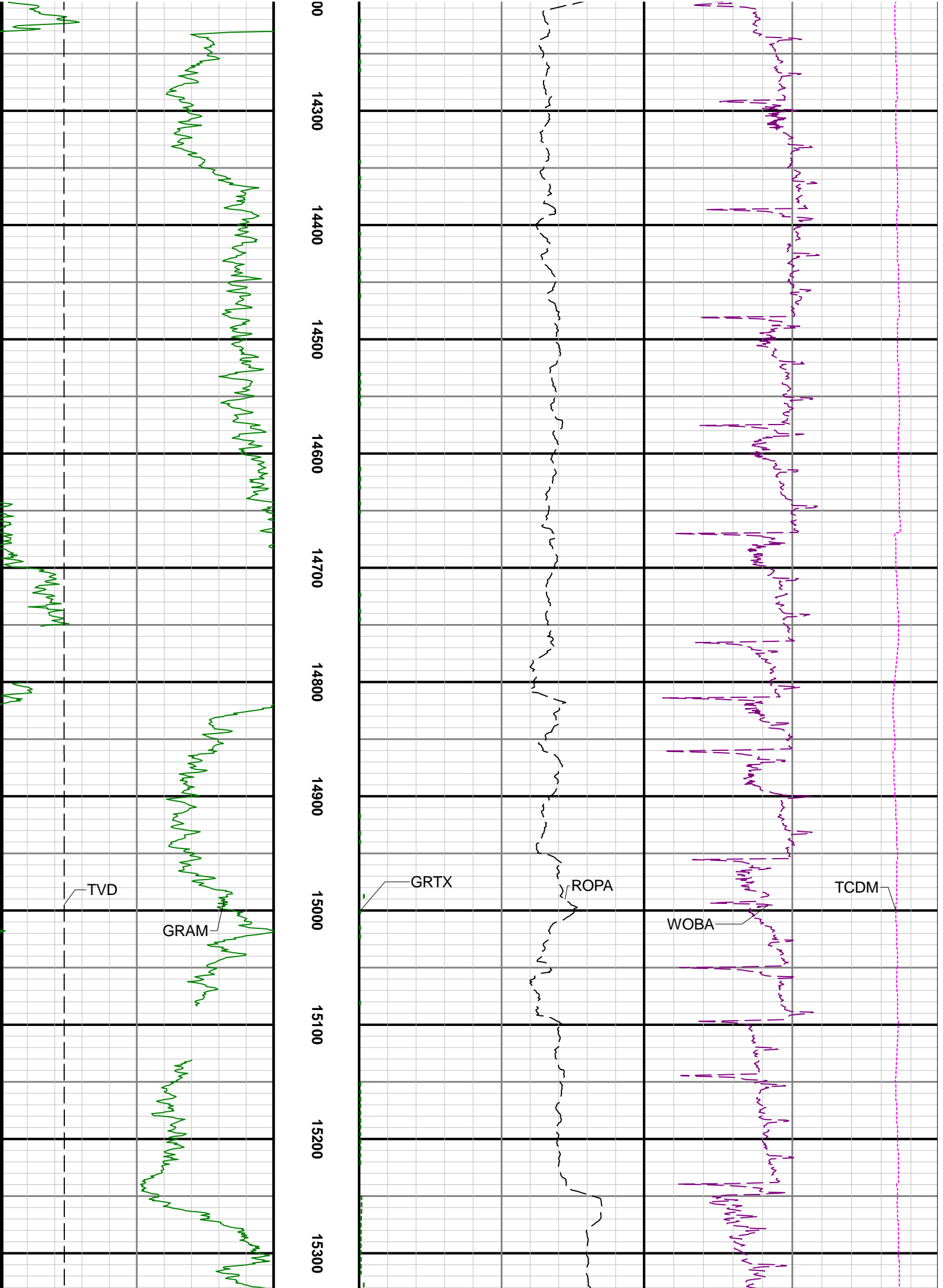


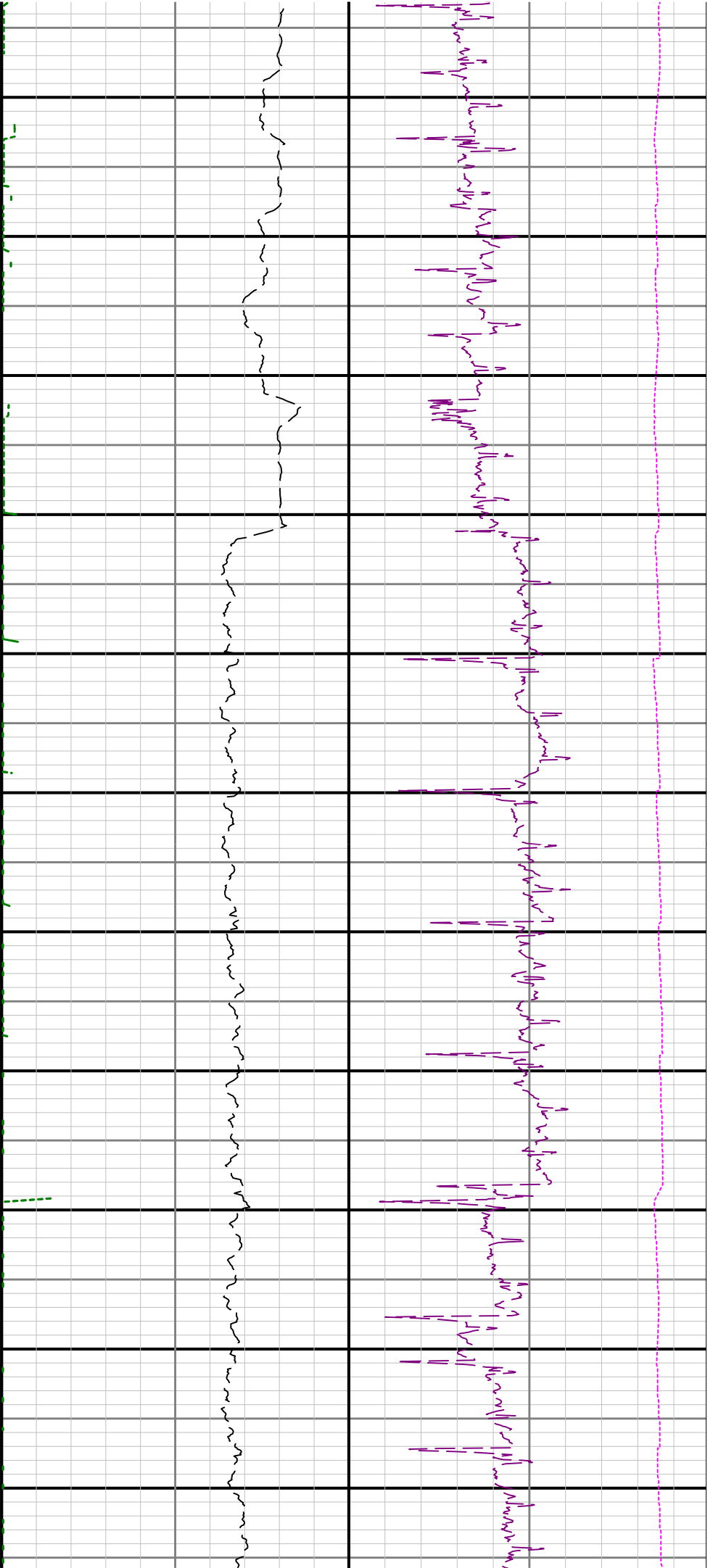












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