



LWD MEMORY LOG

Azimuthal Gamma Ray

Company: Noble Energy

Well: RILEY LD19-752

Field: Weld County

County: Weld State: Colorado

Surface Location: Other Services:

Latitude: 40° 14' 18" N

Longitude: 105° 10' 11" W

UTM: N/A

SEC: 19 TWN: 9N RGE: 58W

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

Elevation: 0.00 ft

Log Measured From: Rig Floor

Above P.D. 4850.00 ft

KB: N/A

DF: 4850.00 ft

GL: 4820.00 ft

Interval Logged

Magnetic Field Reference

Date From:	2016-10-27	Top: (ft)	1935.50	Azi Reference North:	Grid	Dip Angle: (deg)	67.19
Date To:	2016-10-29	Bottom: (ft)	11065.00	Total Magnetic Field Strength: (nT)			52620
Spud Date:	2016-10-26			Mag to Reference North Correction: (deg)			6.67E

Borehole Record

Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
13.500	30.00	1950.00	30.000	36.00	30.00	1940.00
8.500	1950.00	11064.00				

Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
Water Based Mud	30.00	1950.00	8.500	9114.00	2.29 147.19	90.31 358.07
Oil Based Mud	1950.00	11064.00				

Acquisition System

Software Version

Other

Baker Hughes Cadence	RT4.0	Rig: H&P 524
PlotStudio	4.0.7570.8	Contractor: Helmerich & Payne Drilling Co
		District: RMD Unit: D&E

"These interpretations and analyses ("Interpretations") are opinions provided by Baker Hughes Oilfield Operations, Inc ("Baker Hughes"), based upon industry practice, empirical relationships, assumptions and measurements, (many of which may be provided by the customer). The Interpretations are not infallible and may be subject to different opinions. Vjwu."Dcmgt"Jwi jgu"fqgu"pqv"ycttcpv"vjgkt"ceewtce{"eqttgevgpguu."qt"eqornvgvpguu."qt"vjcv"vjg"ewuvqogtøu"cpflqt"cp{"vjktf"rctv{øu"tgnkcpvg"qp"uwej"Kpvgrtrtgvckvqpu"yknn"ceeqornkuj"cp{"rctvkewnct"tguwnvu0"Vjg"ewuvqogt"cuuwogu"hwnn"responsibility for the use of the Interpretations and for decisions based thereon and the customer agrees to release, defend and indemnify Baker Hughes, its parent, subsidiaries and affiliated or related entities, and subcontractors, together with its and their officers, directors, employees, agents and invitees against, any and all claims, losses, damages, or expenses sustained by the customer or any third party arising out of reliance upon or use of the Interpretations, without regard to the cause(s) thereof, including without limitation any form of negligence on the part of Baker Hughes. Unless other contract terms have been agreed to by the parties, each party's liabilities and qdnkicvkqpu"ujcnn"dg"iqxgtpgf"d{"Dcmgt"Jwi jgu"Kpeqtrrtcvvgføu"Yqtnfykfg"Vgtou"cpf"Eqpfkvkqpu0\$"

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	1935.00	11052.00	1948.00	11064.00	2016-10-27 12:27	2016-10-29 19:18	50.99

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
David Browning	2016-10-26	2016-10-30	Steven Cano	2016-10-26	2016-10-30			

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+ (%)
2016-10-27 10:33	1	1950.00	Water Based Mud	9.4	4	8.8	94.5	2/98	Active Pit	1000	0.00
2016-10-27 20:00	1	4060.00	Oil Based Mud	9.0	10	N/A	16.0	84.5/15.5	Active Pit	23500	0.00
2016-10-28 18:00	1	7534.00	Oil Based Mud	8.9	9	N/A	17.6	83.3/16.7	Active Pit	23500	0.00
2016-10-29 18:00	1	10829.00	Oil Based Mud	9.0	8	N/A	19.6	84.4/15.6	Active Pit	22500	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	14024148	Near Bit VSS	5.93	6.77	7.000	4.330
1	ATC_SU	14024148	Near Bit Inclination	5.93	6.77	7.000	4.330
1	ATC_MWD	12536636	Gamma (single)	2.75	12.94	7.000	3.250
1	ATC_MWD	12536636	Directional (mag)		22.46	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 6 3/4 inch Navigamma services (Gamma Ray and Directional) behind an 8 1/2 inch bit and rotary steerable assembly from 1950 to 11064 feet MD (1949 to 6064 feet TVD).

Remarks

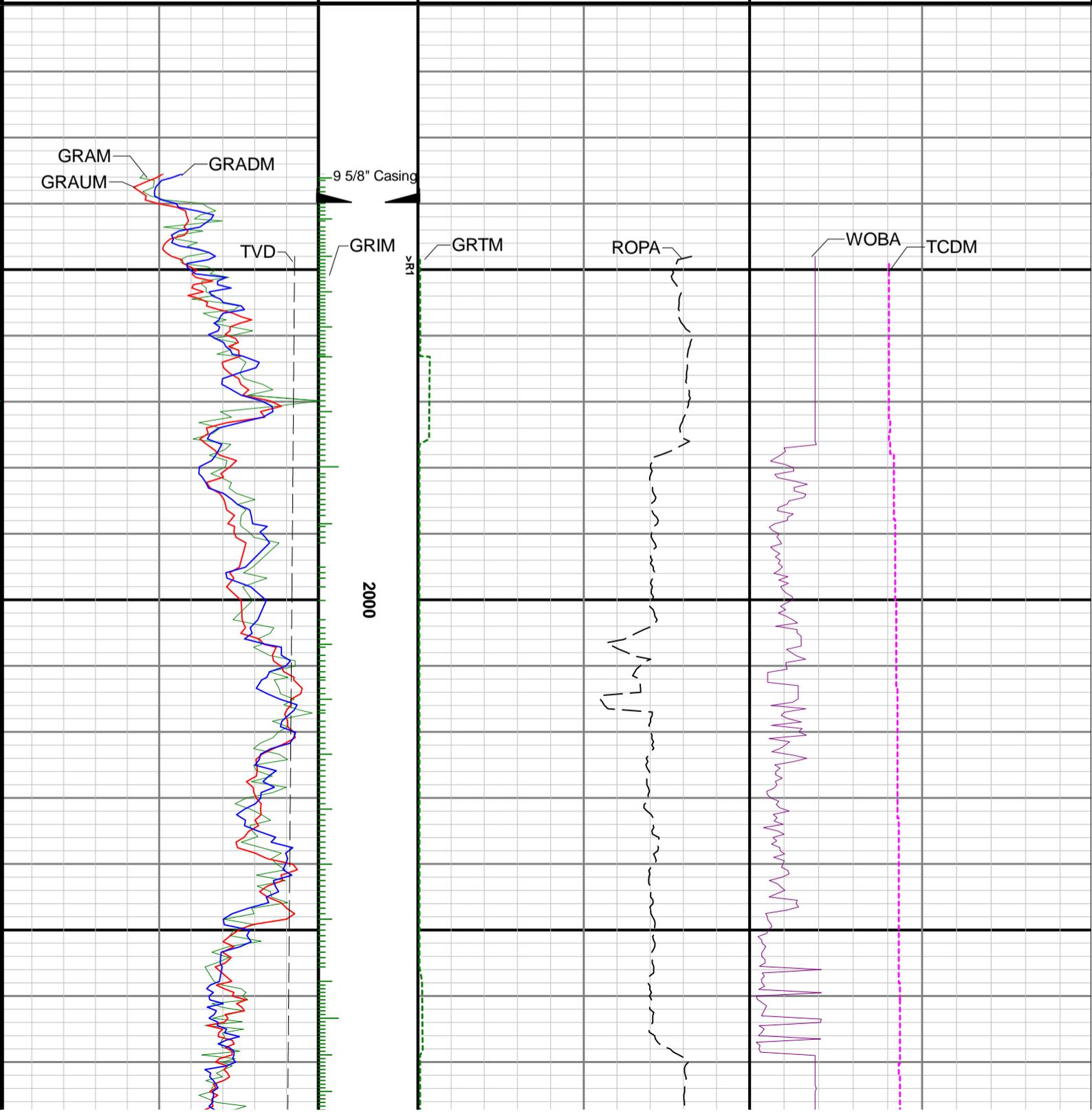
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	11064.00	8.500	1	The interval from 11051 to 11064 feet MD (6065 to 6064 feet TVD) has no gamma ray data due to sensor to bit offset at TD.

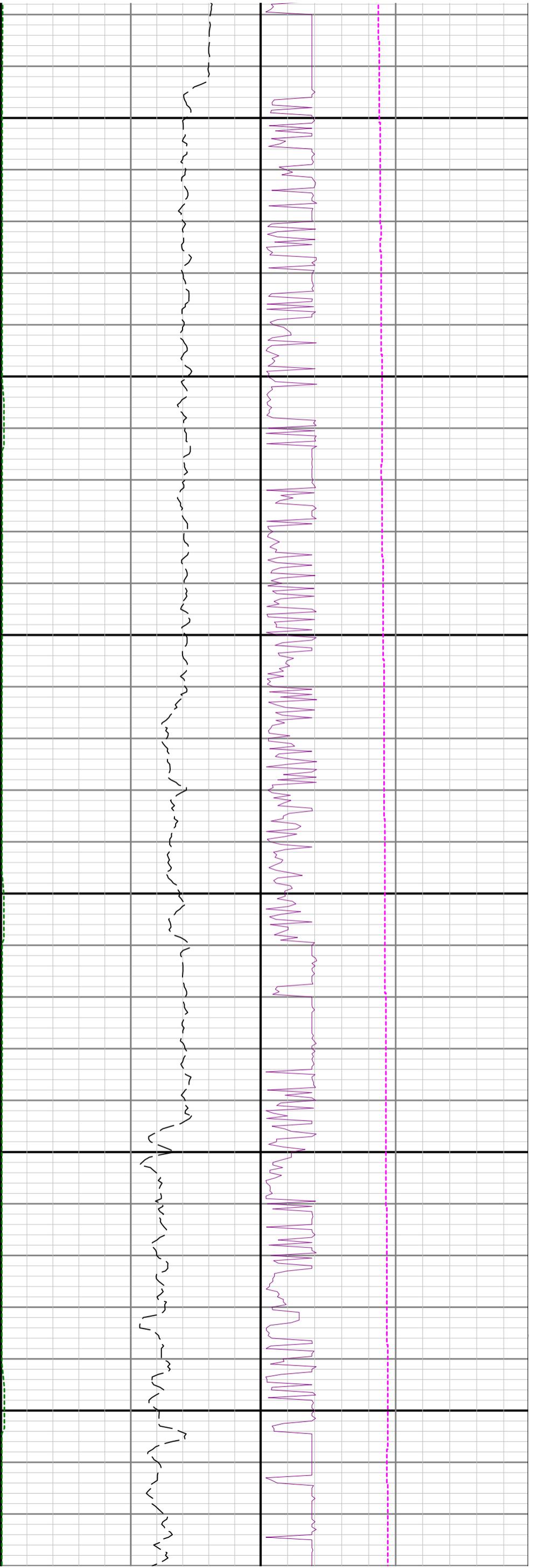
	Company	Noble Energy		
	Well	RILEY LD19-752		
	Interval	Date From:	2016-10-27 12:27:53	Top: 1935.50
	Created	Date To:	2016-10-29 19:18:18	Bottom: 11065.00
			2016-11-02 05:19	

Gamma Ray - Apparent 0.5 ft Average GRAM	0	150
API		
Azimuthal Gamma Ray - Apparent - Up Quadrant 0.5 ft Average GRAUM	0	150
API		
Azimuthal Gamma Ray - Apparent - Down Quadrant 0.5 ft Average GRADM	0	150
API		
True Vertical Depth TVD	7500	1500
ft		

Gamma Time Since Drilled GRTM	0	600
min		
Depth Averaged ROP 3 ft Average ROPA	1000	0
ft/h		

Weight On Bit, Average 1 ft Average WOB	0	50
klb		
Downhole Temperature TCDM	0	250
degF		

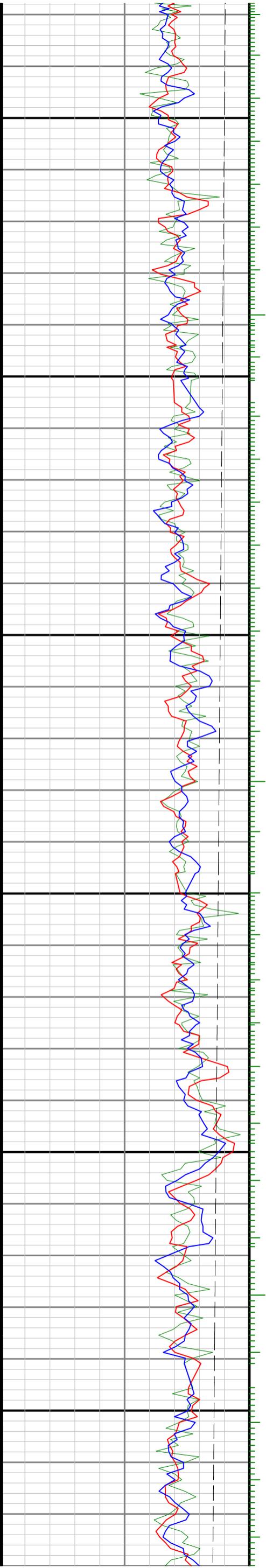


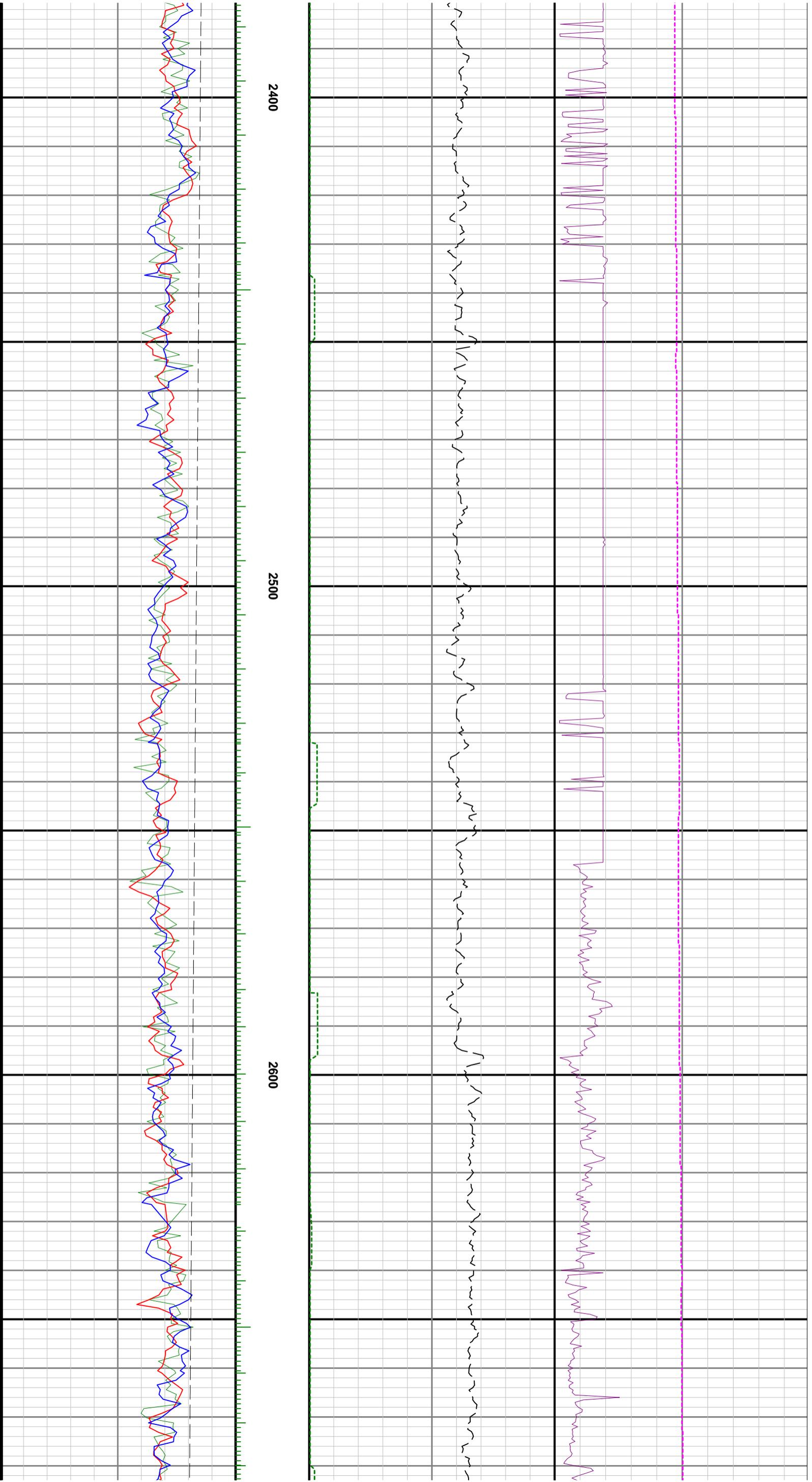


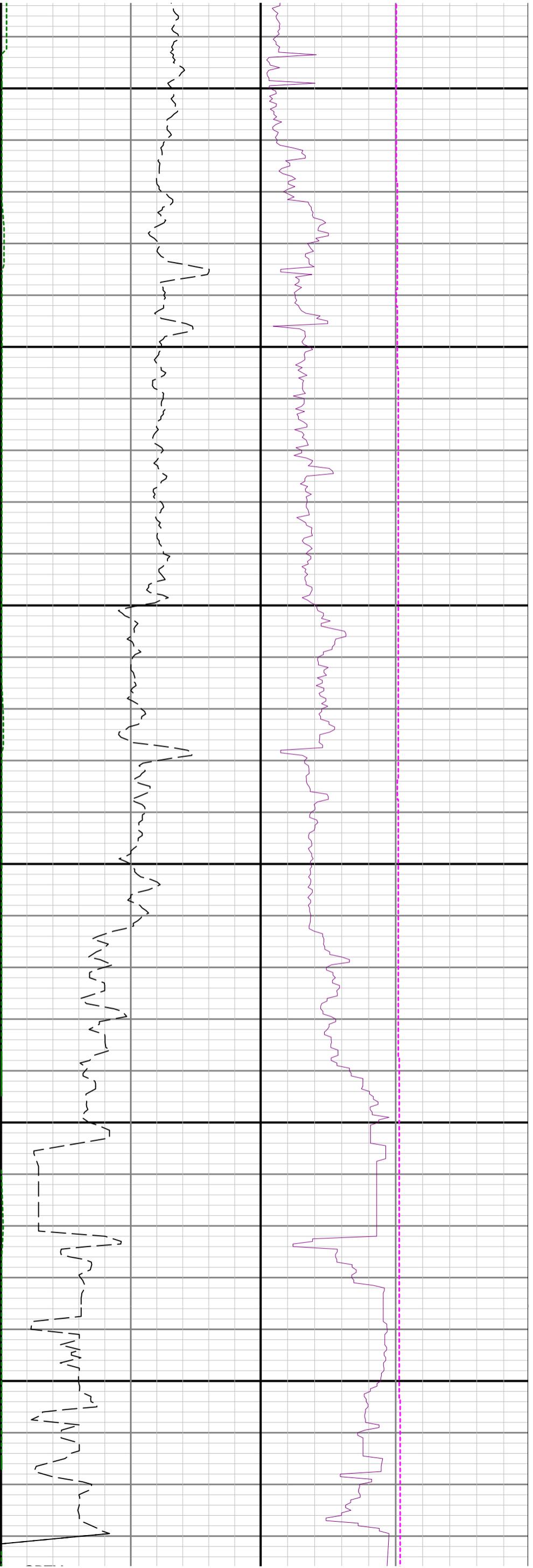
2100

2200

2300



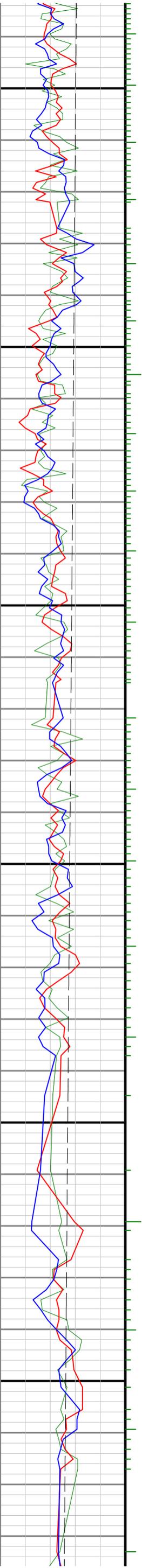


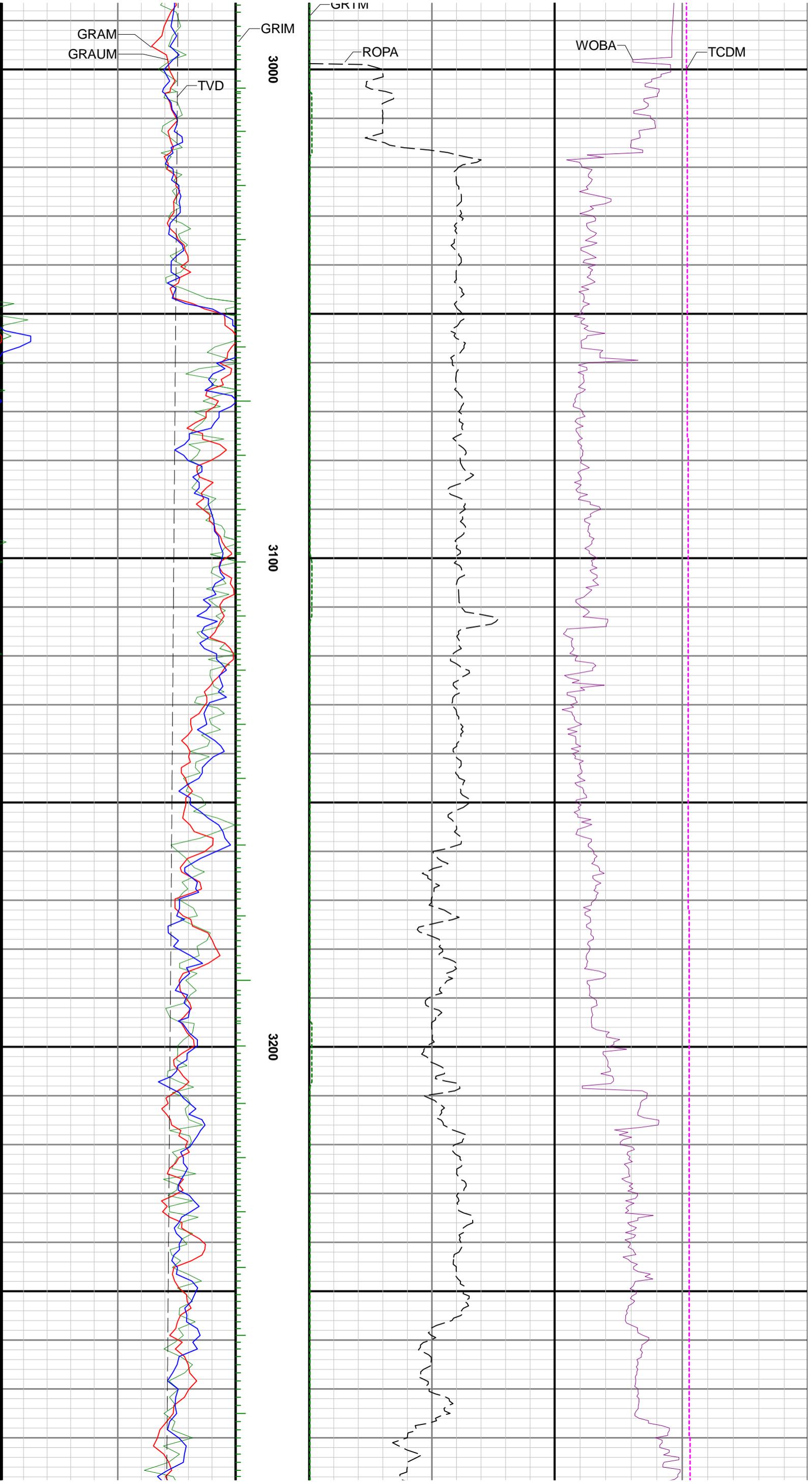


2700

2800

2900





GRAM
GRAUM

TVD

GRIM

3000

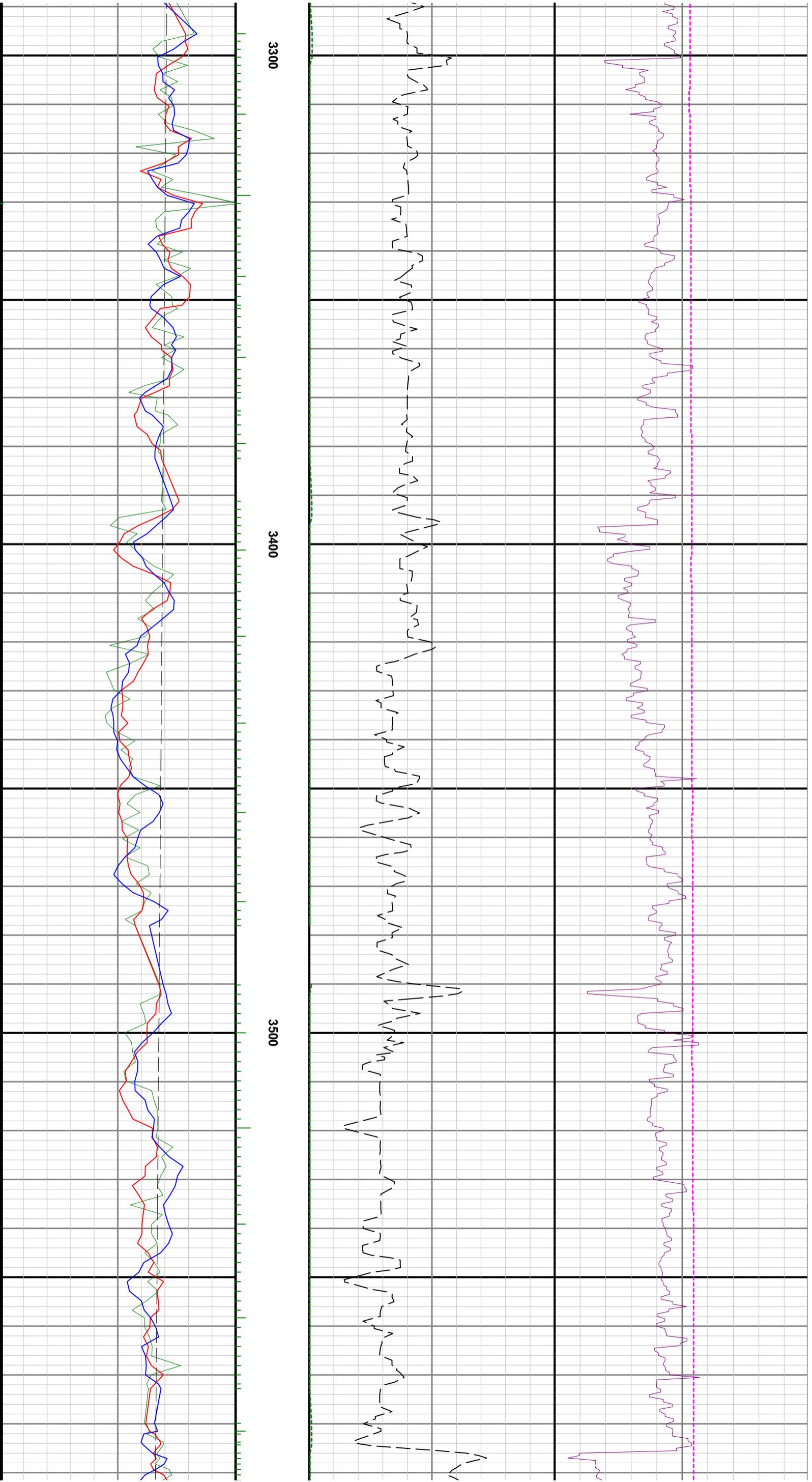
ROPA

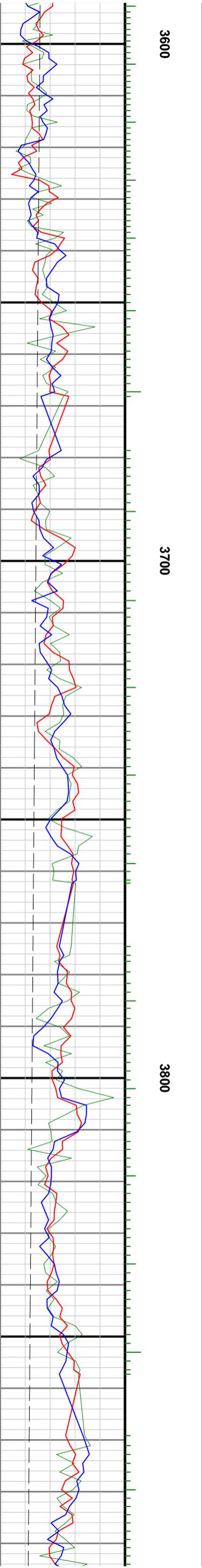
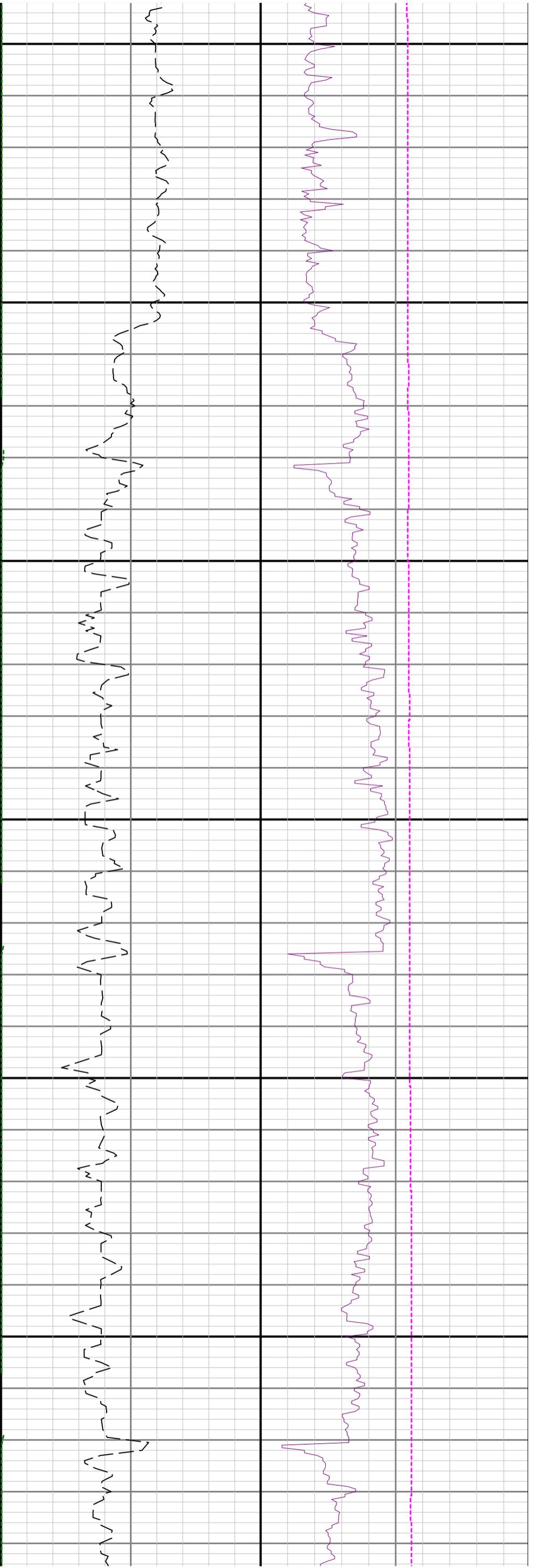
WOBA

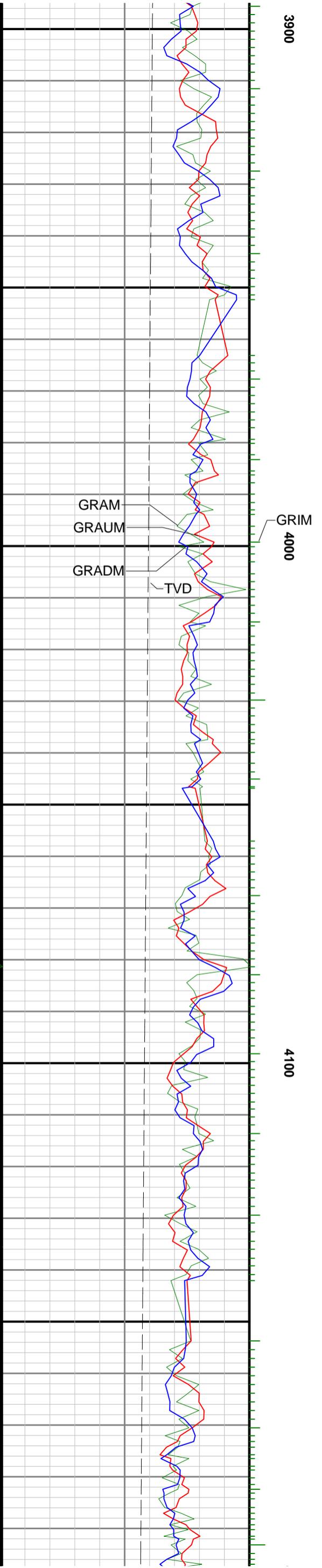
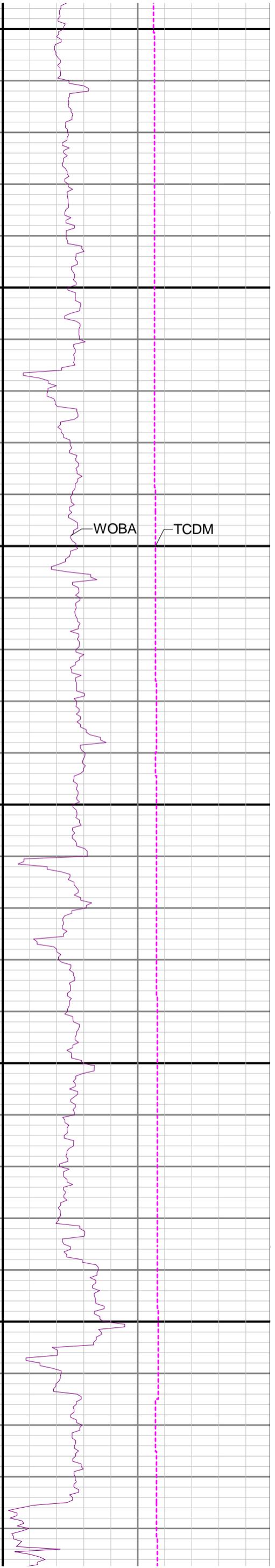
TCDM

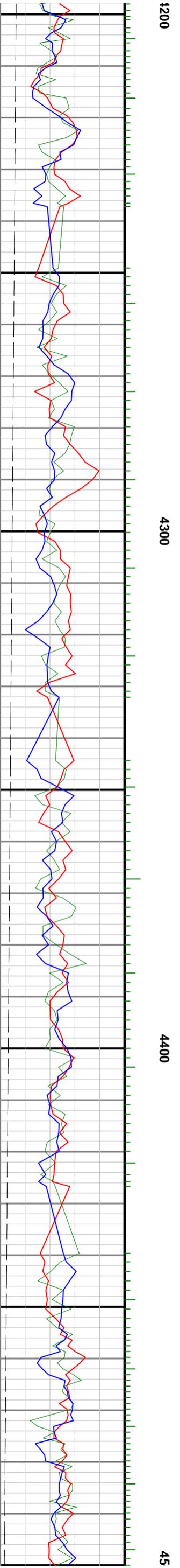
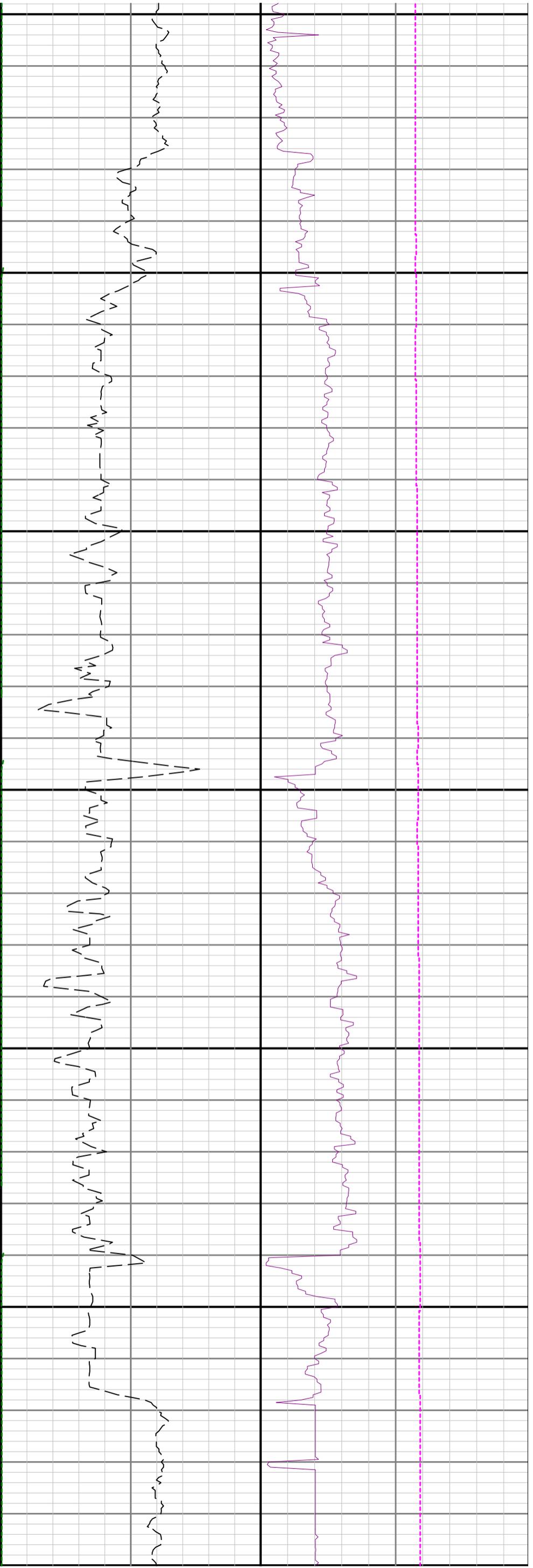
3100

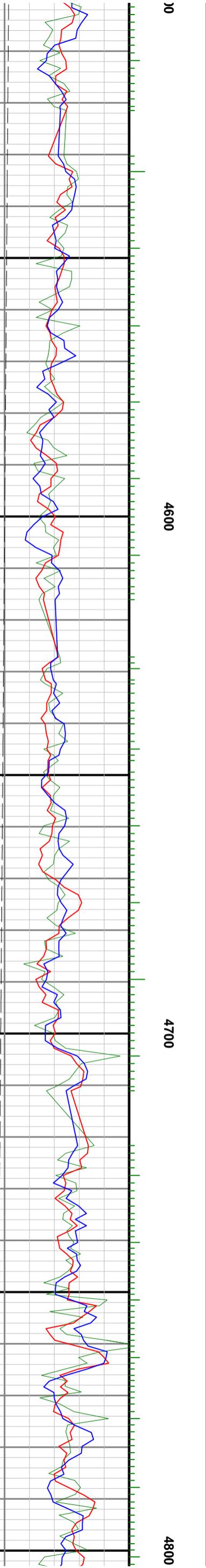
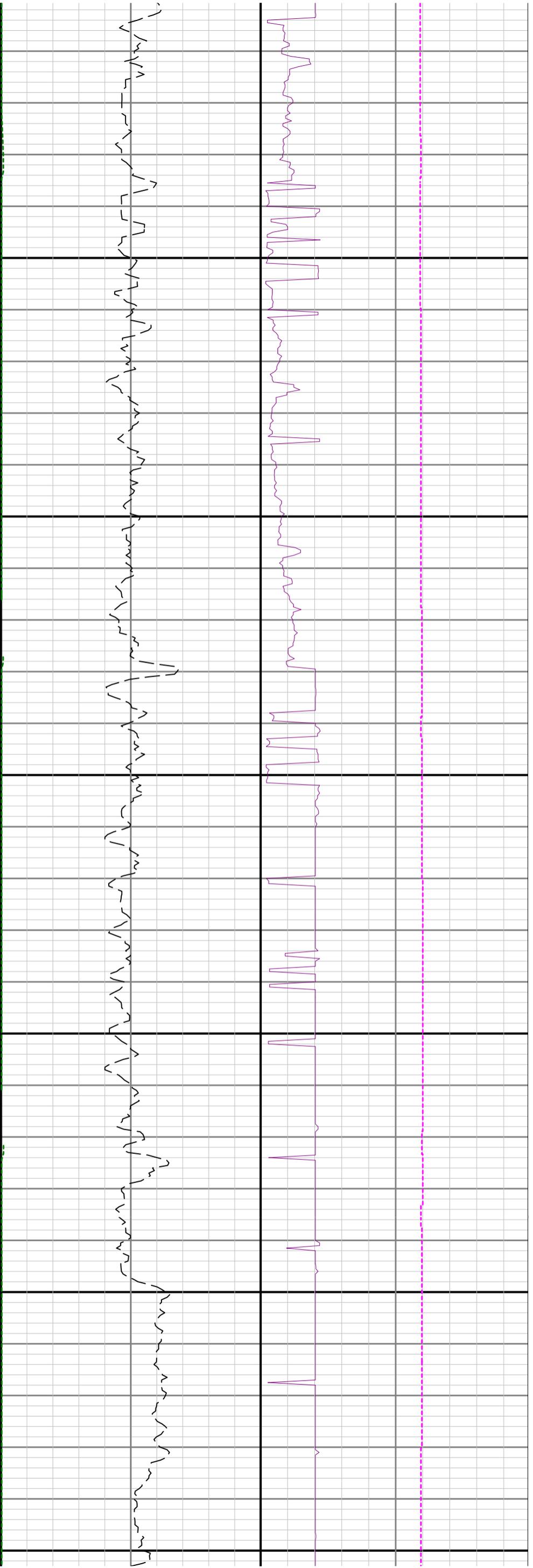
3200

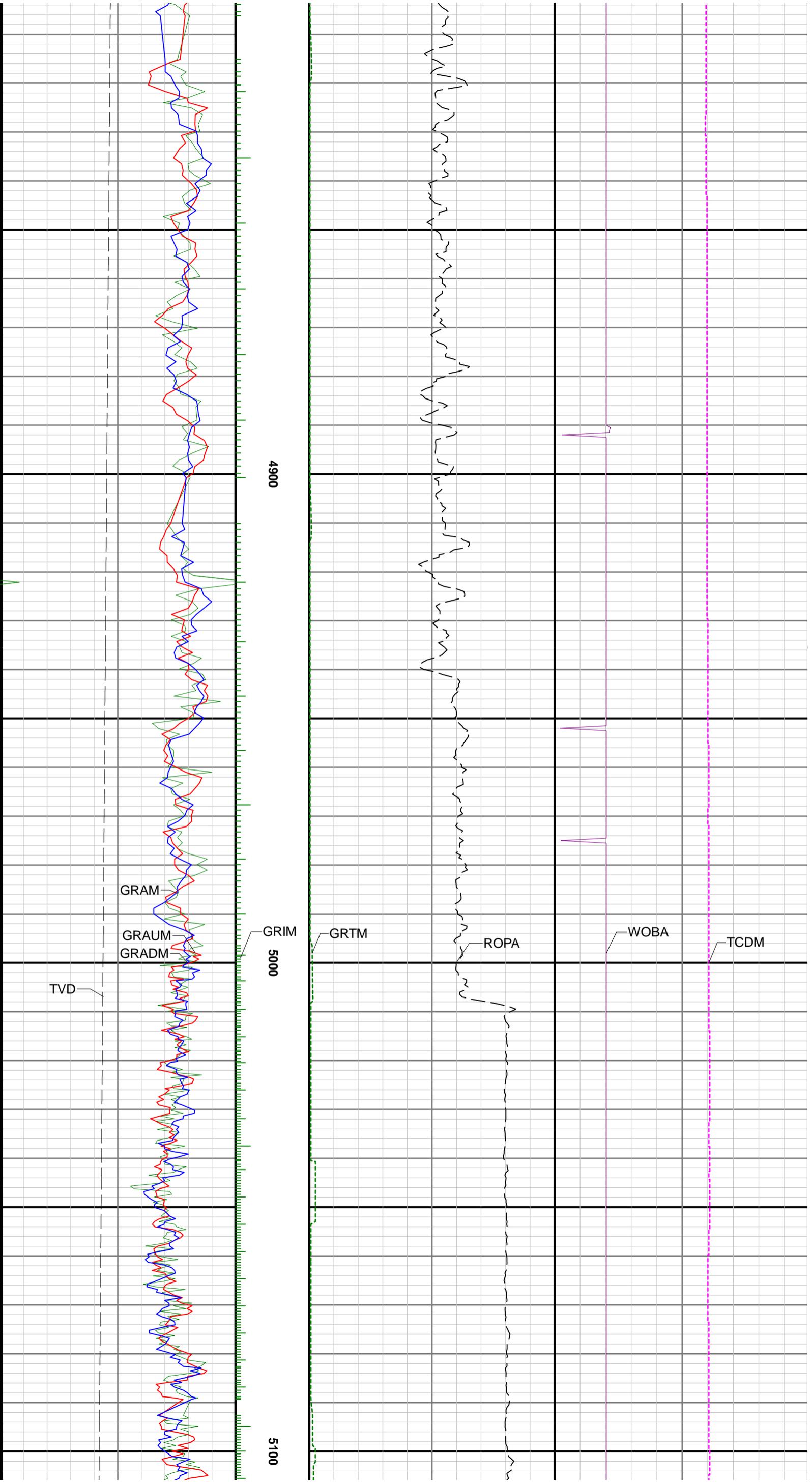


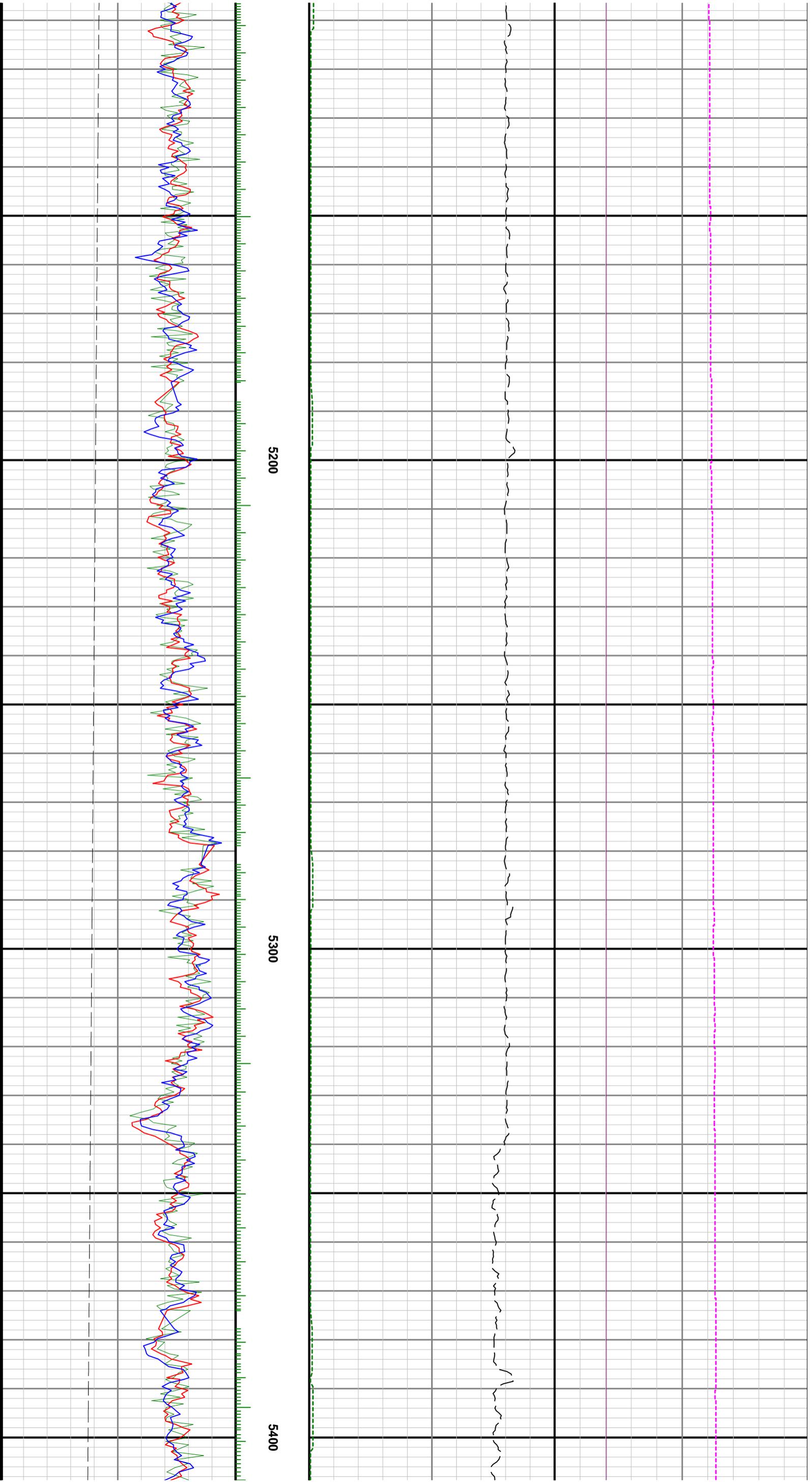


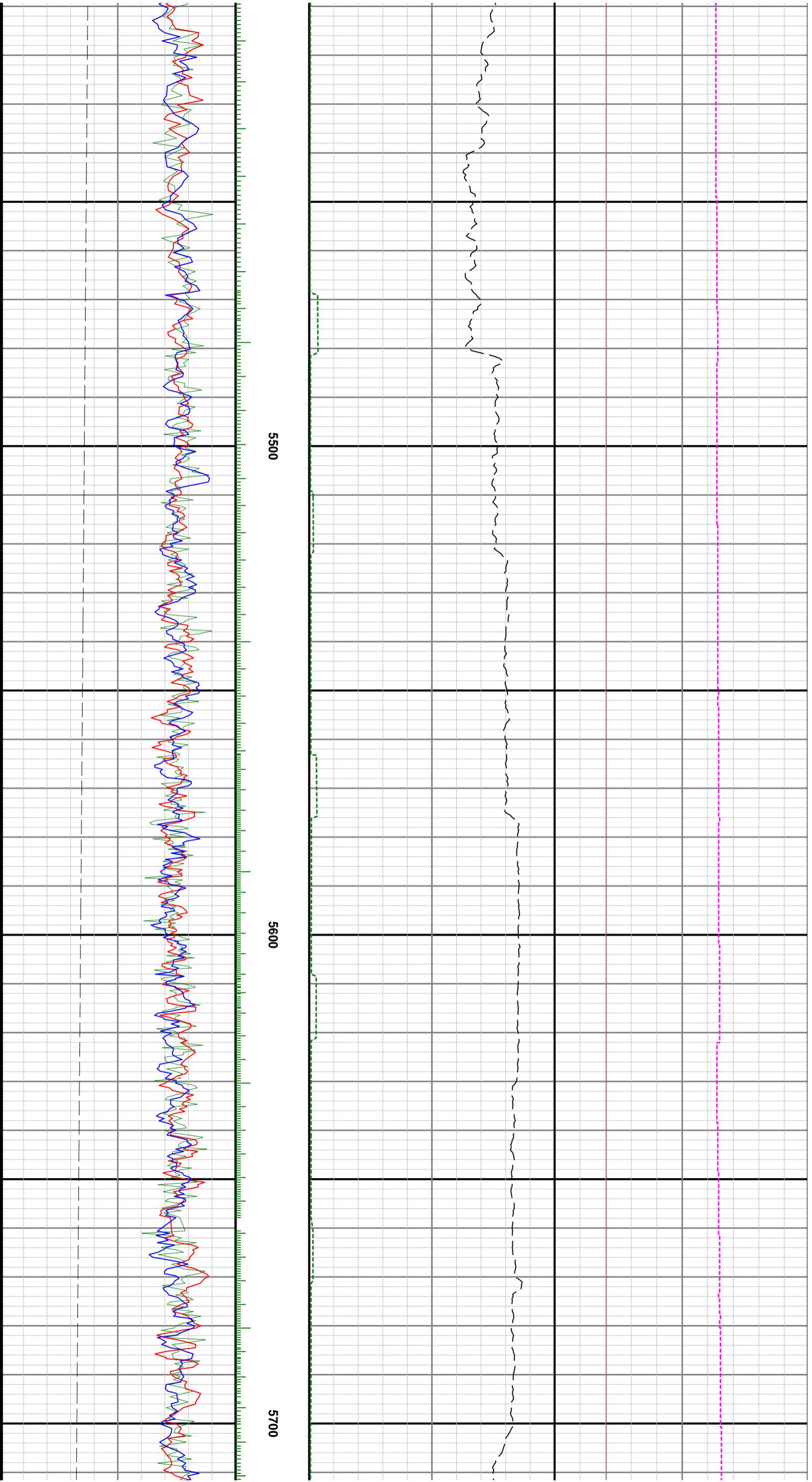


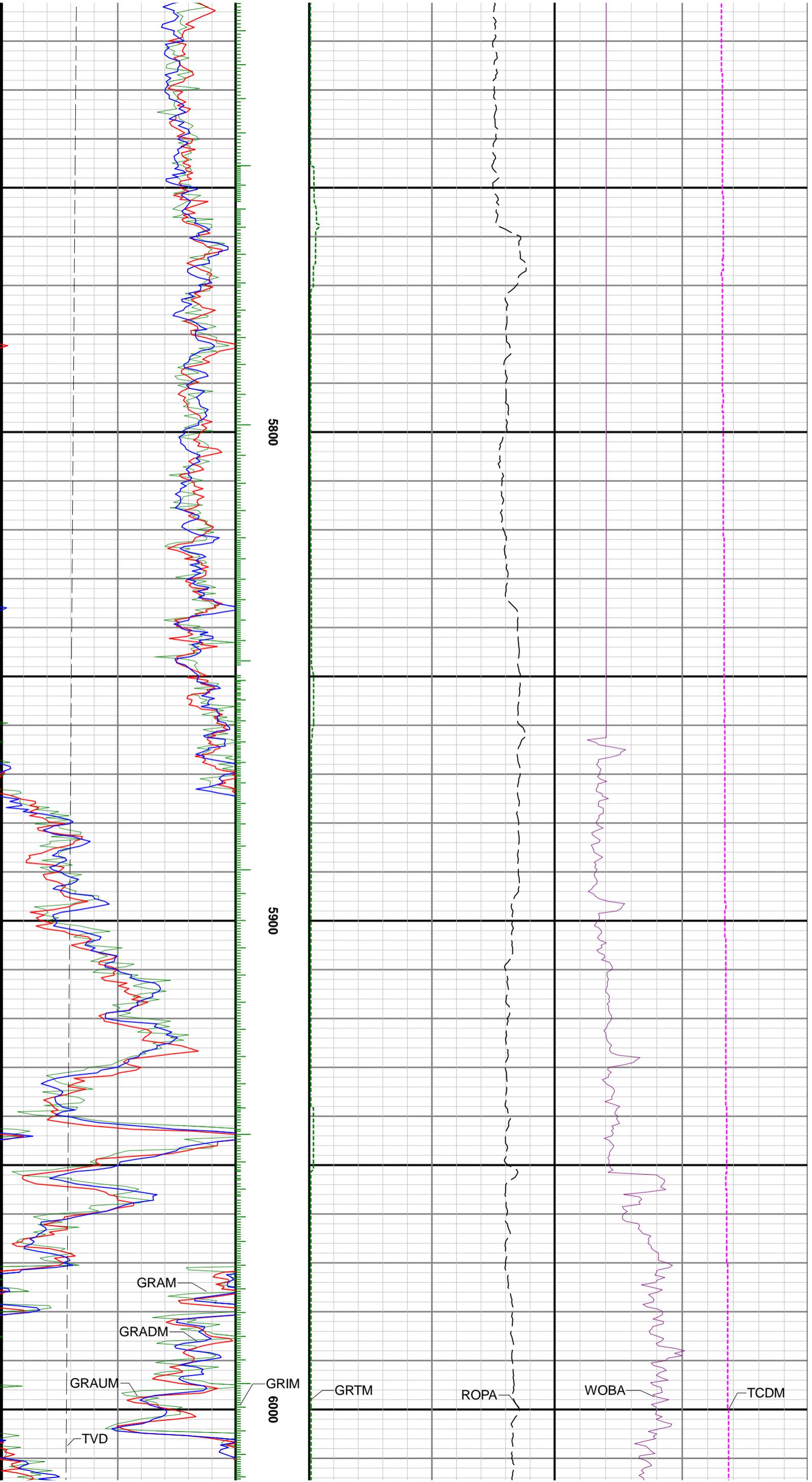


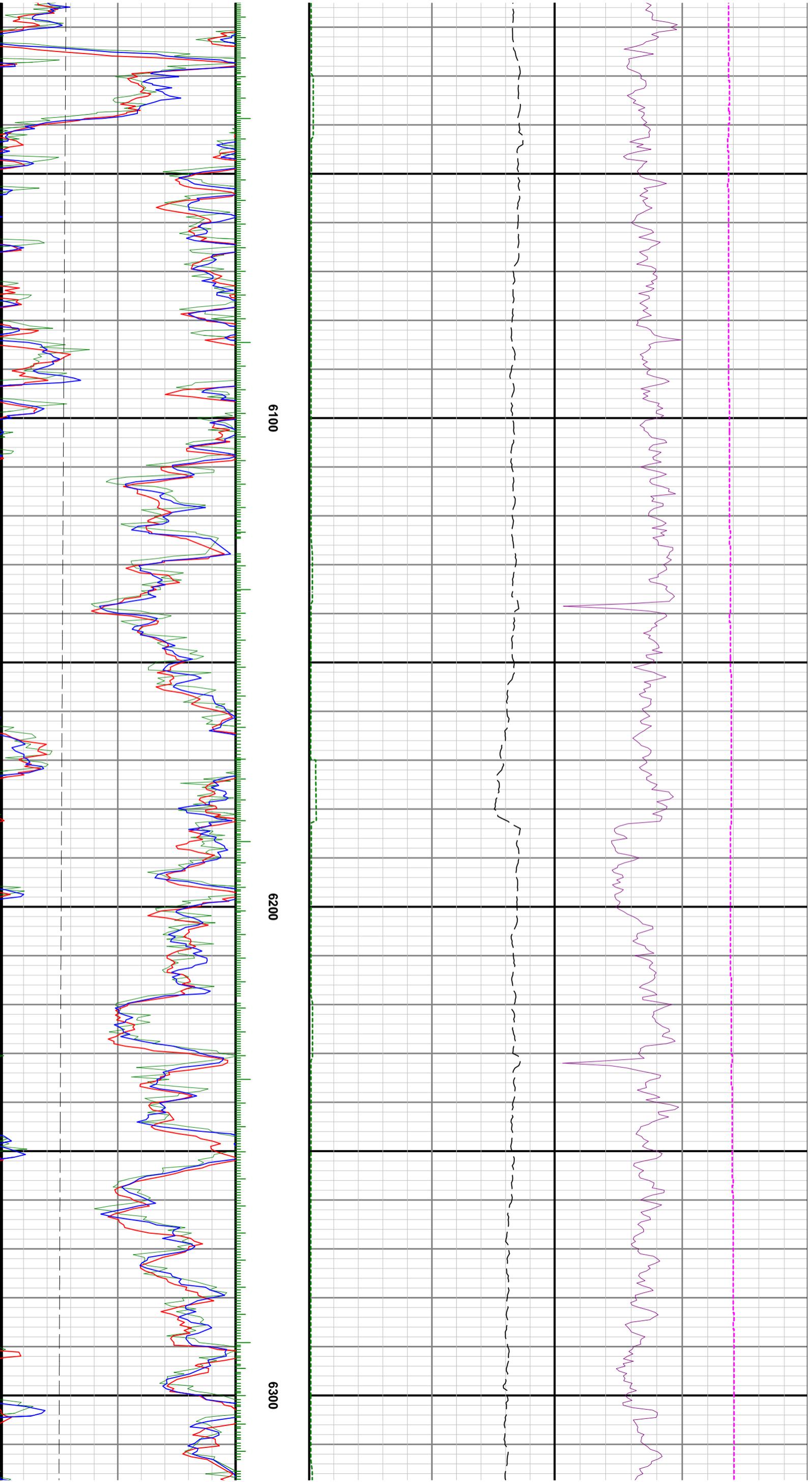


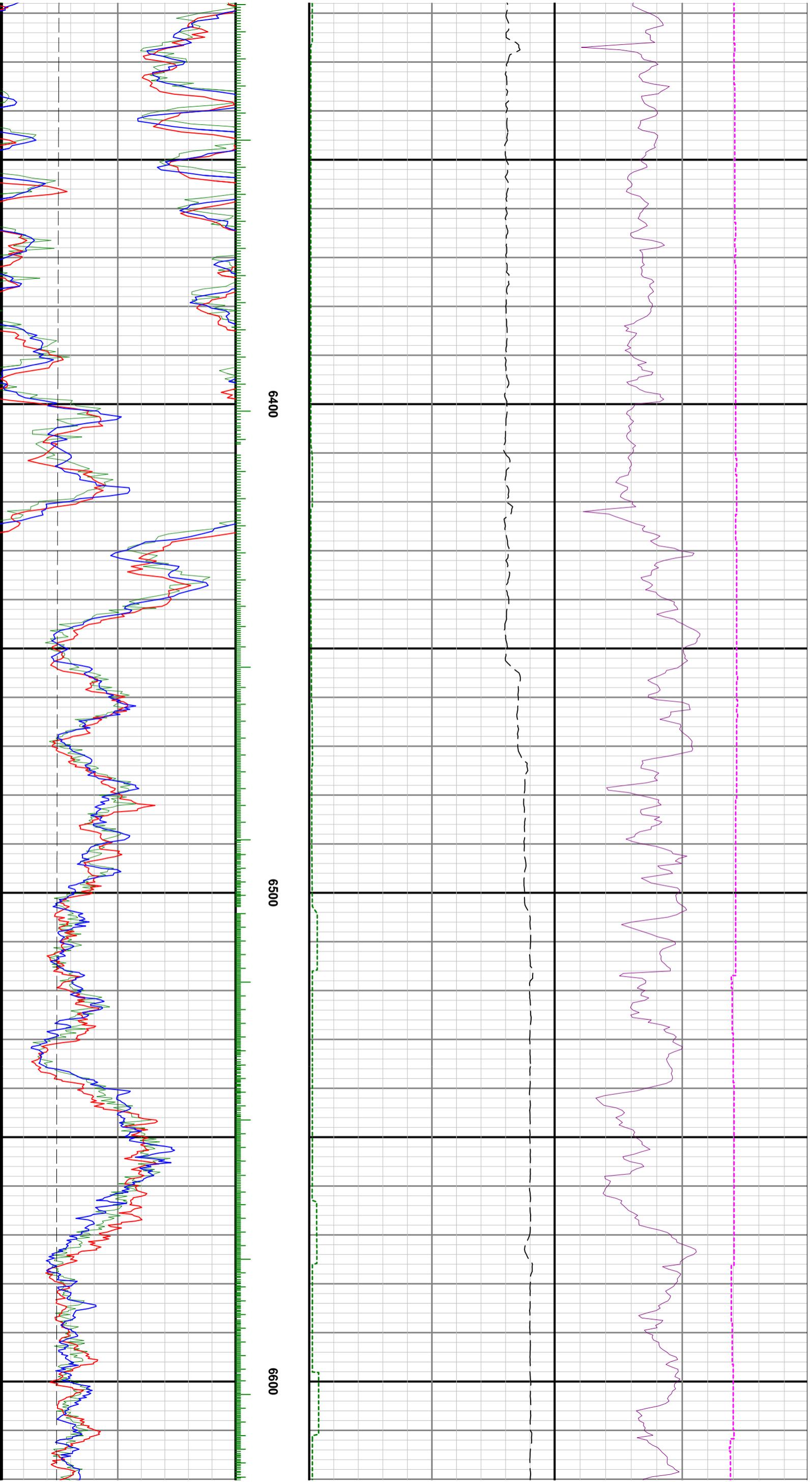


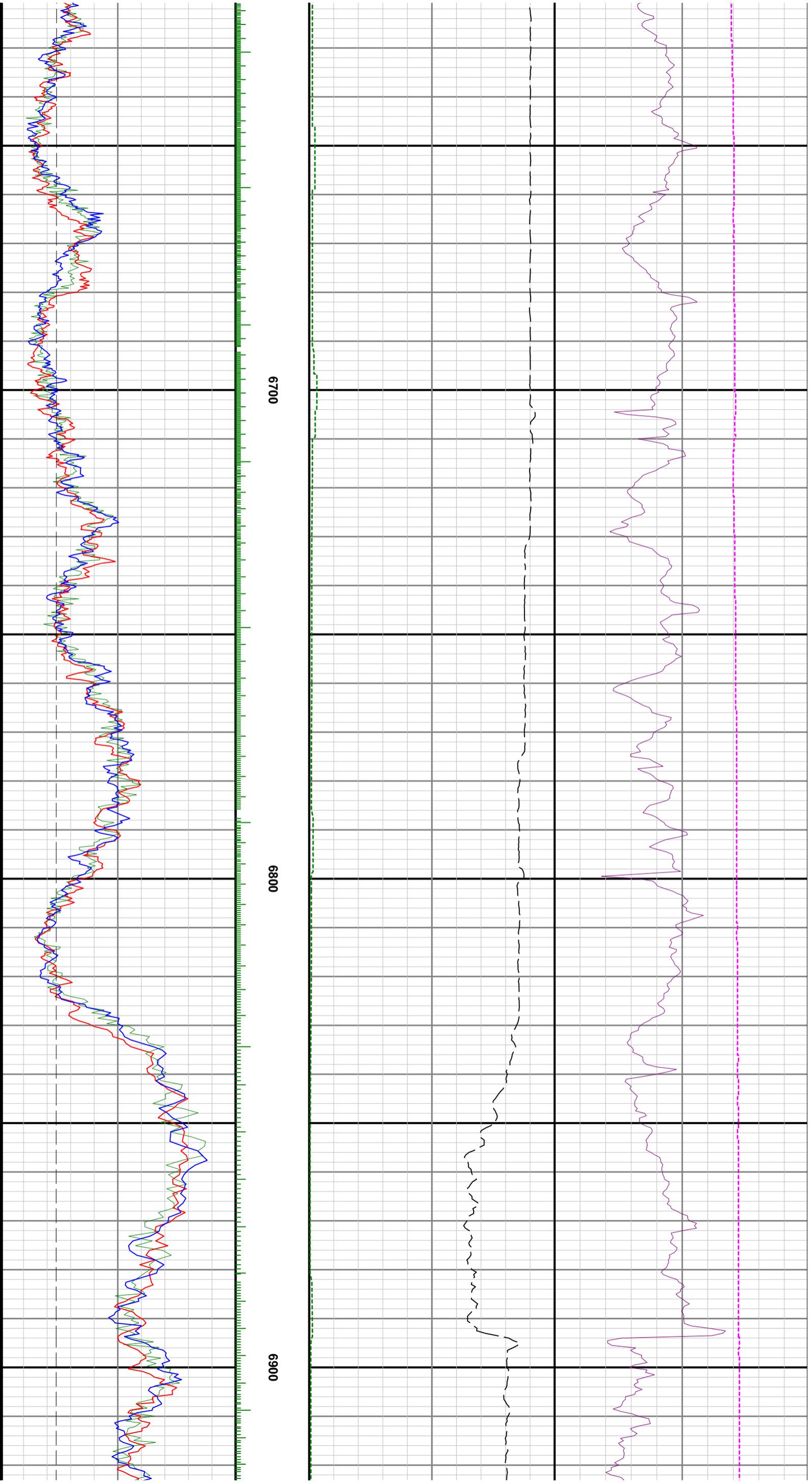


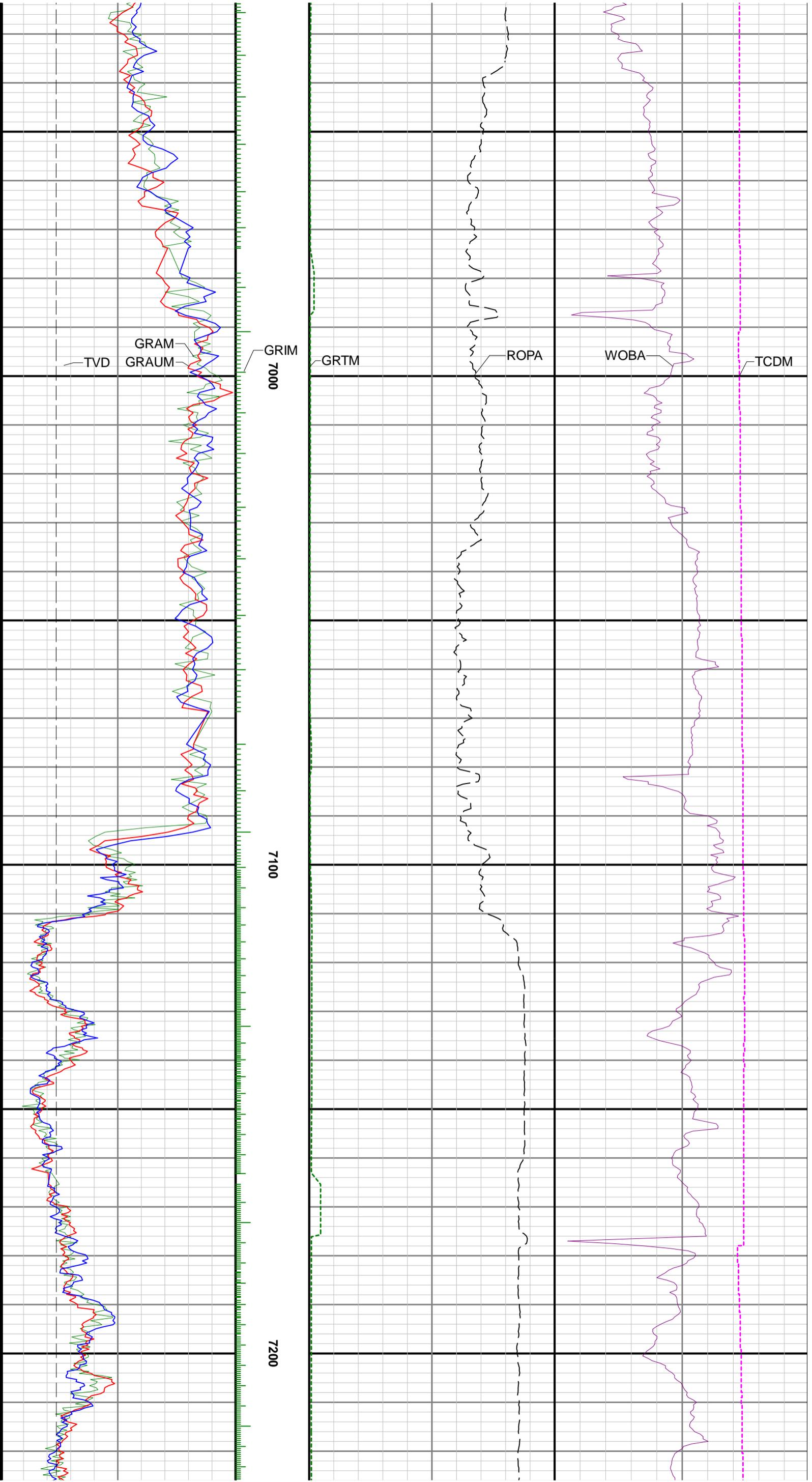


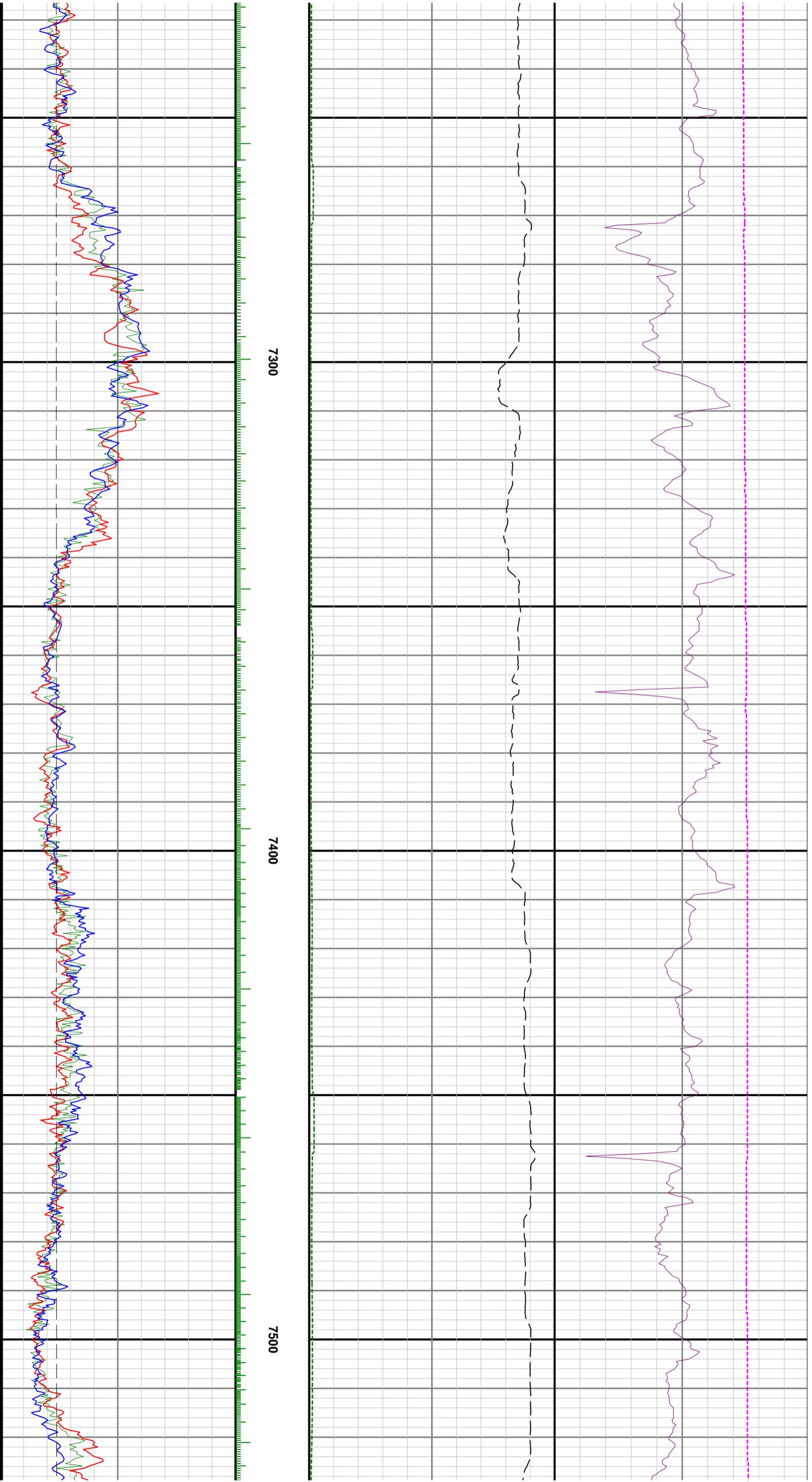


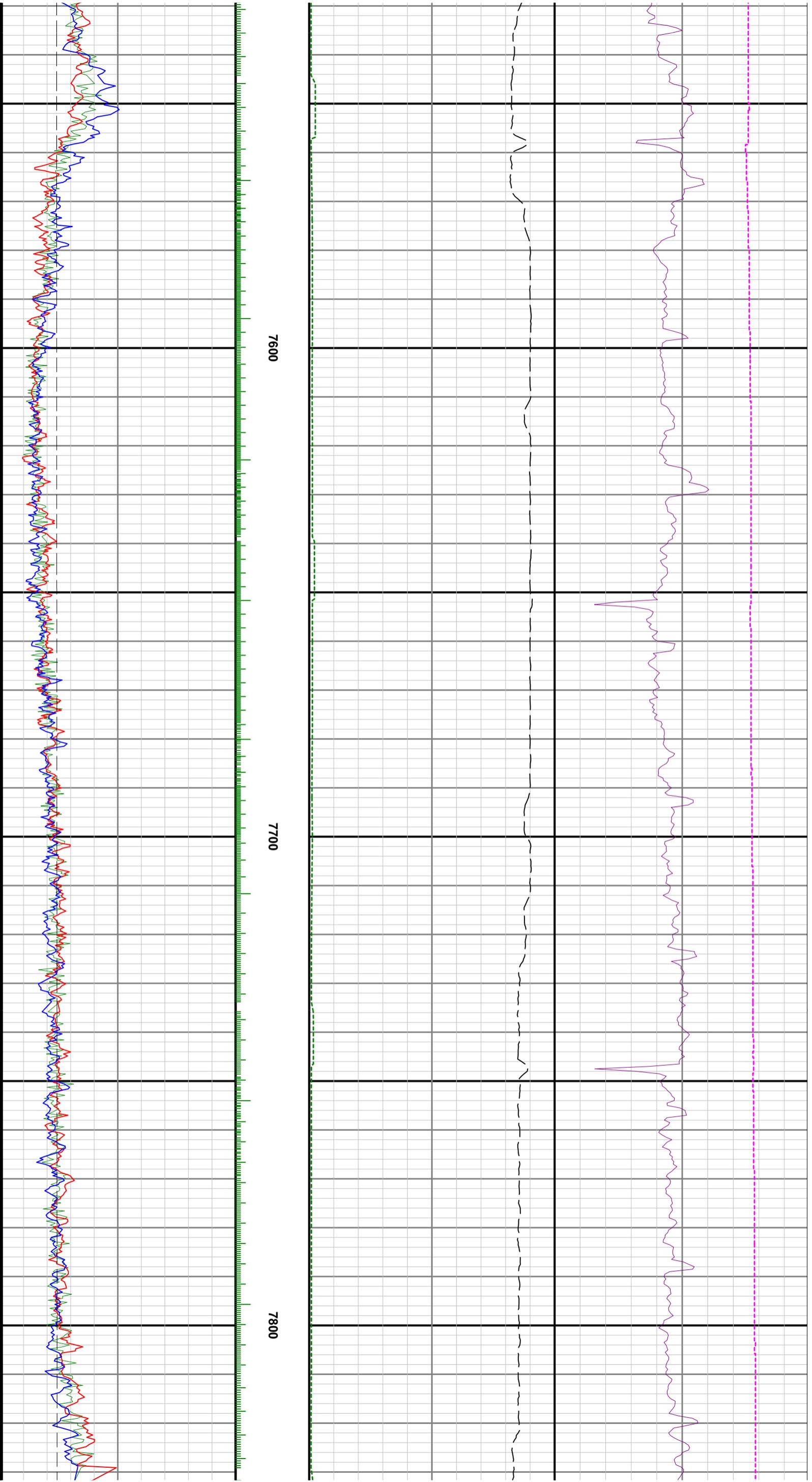


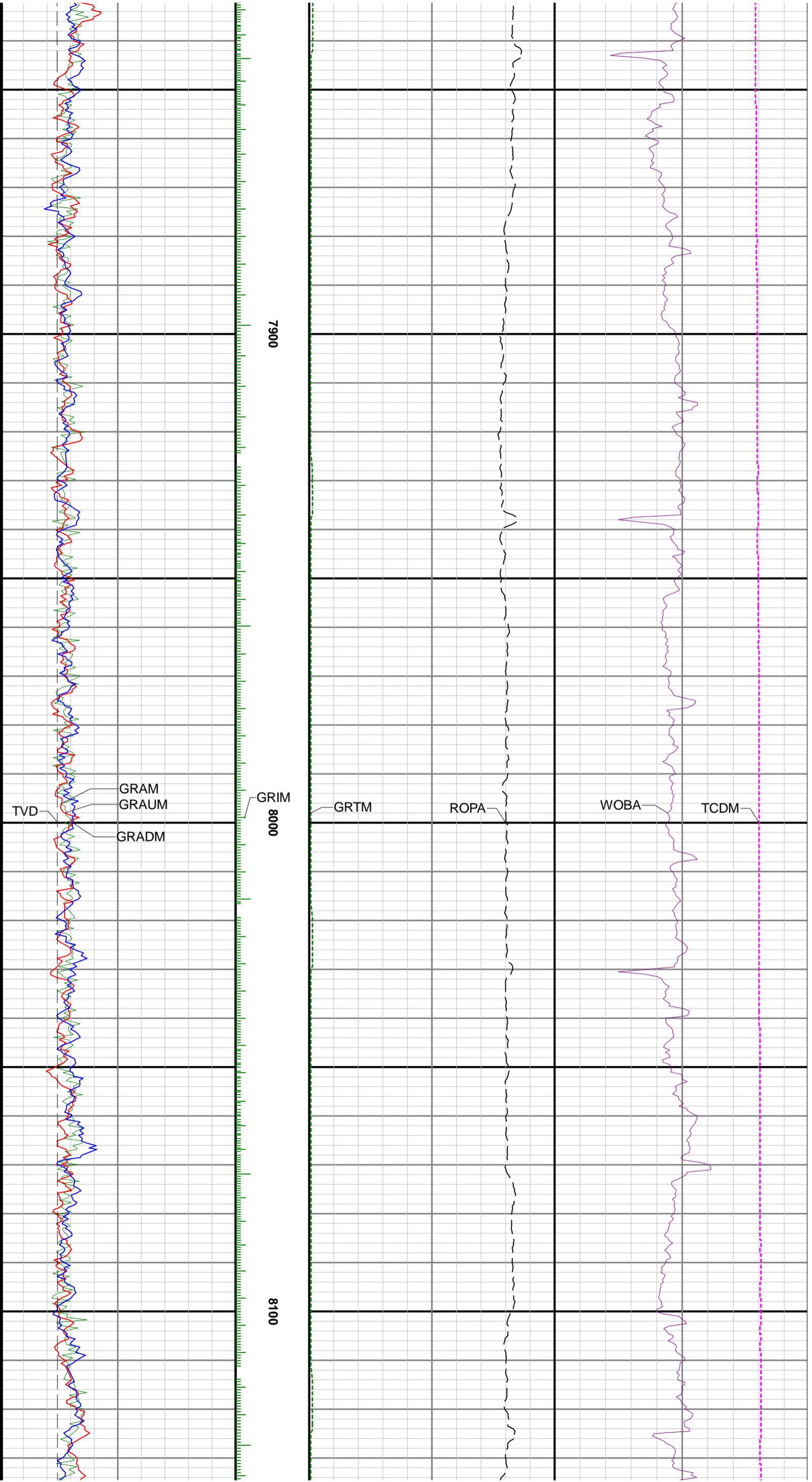


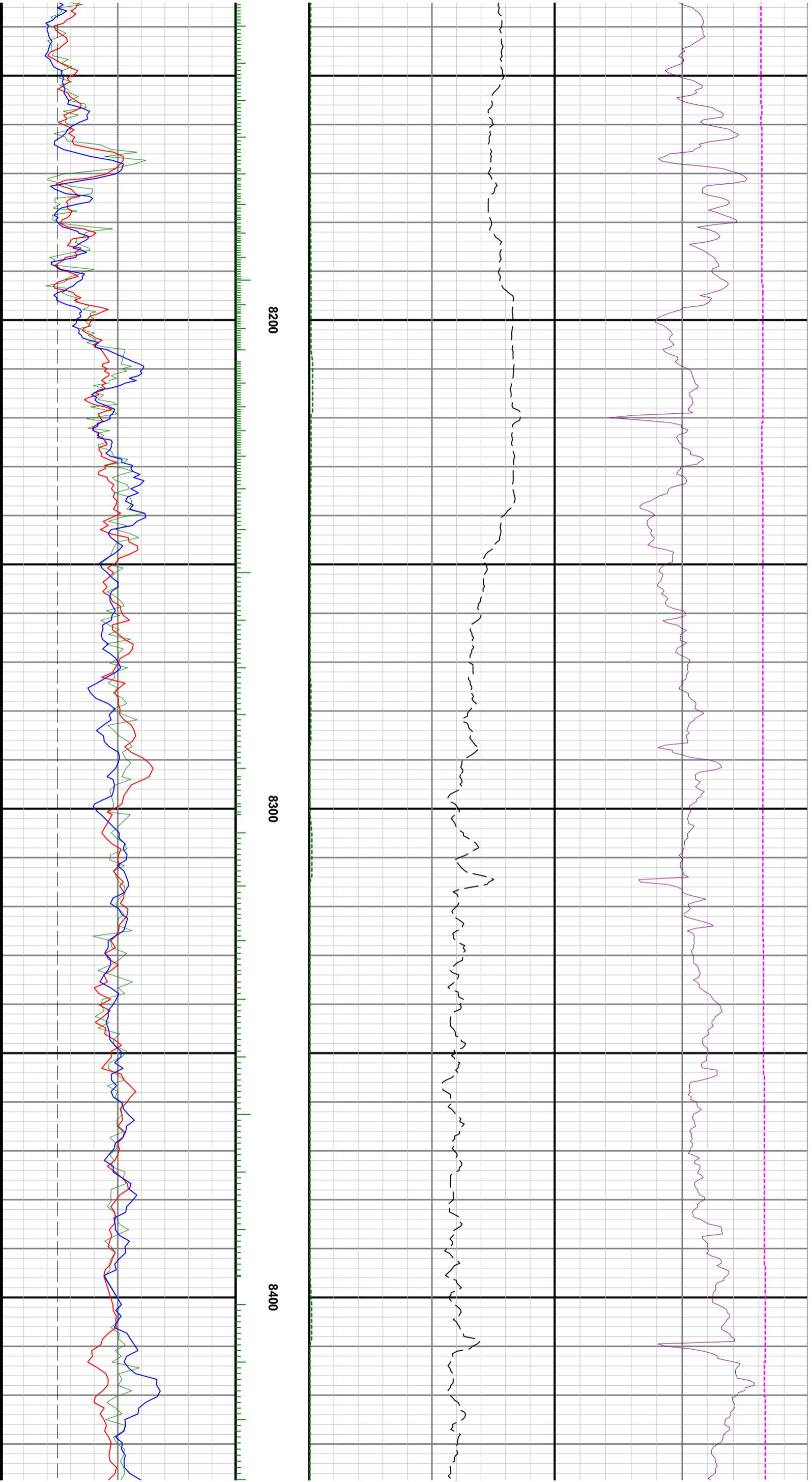


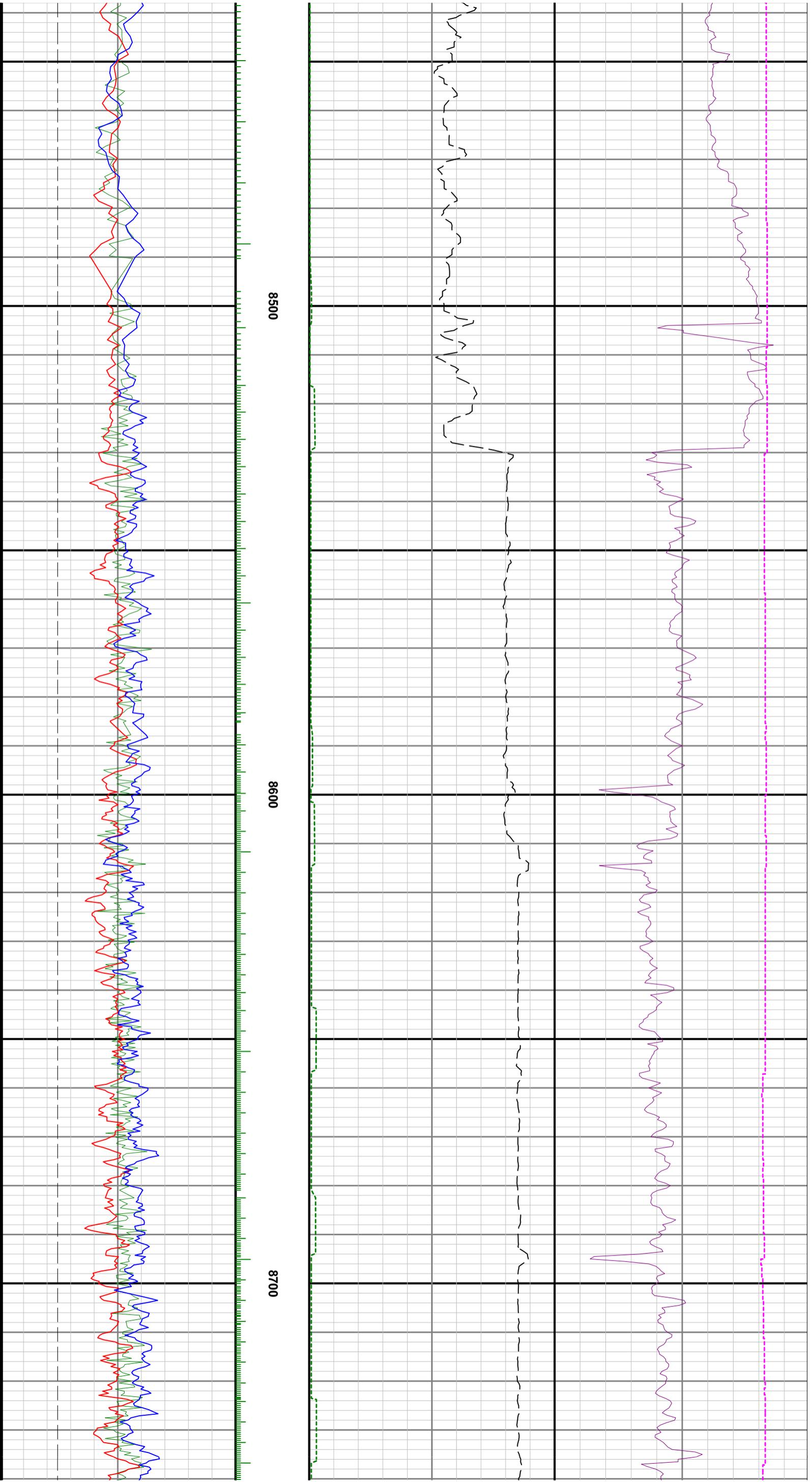


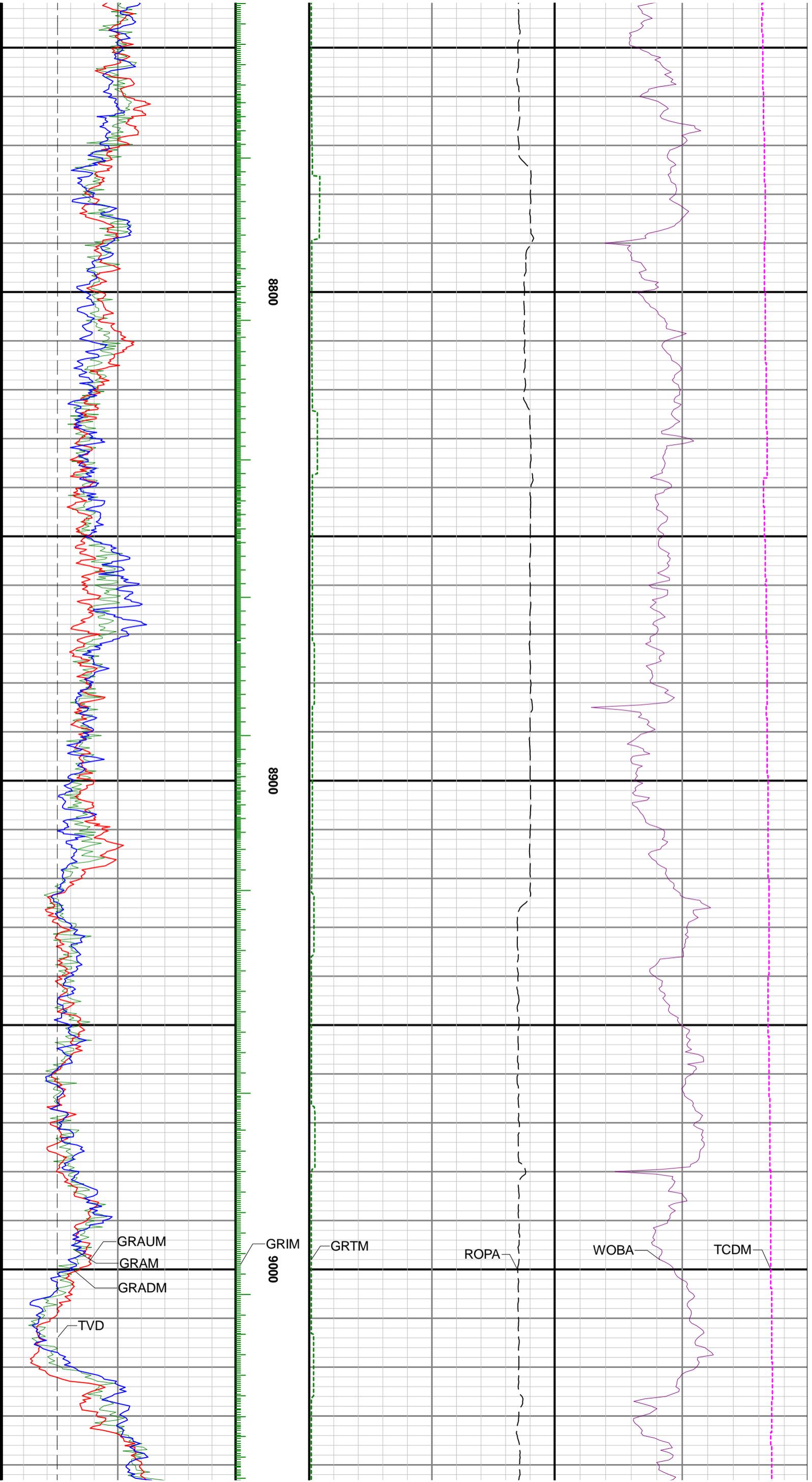


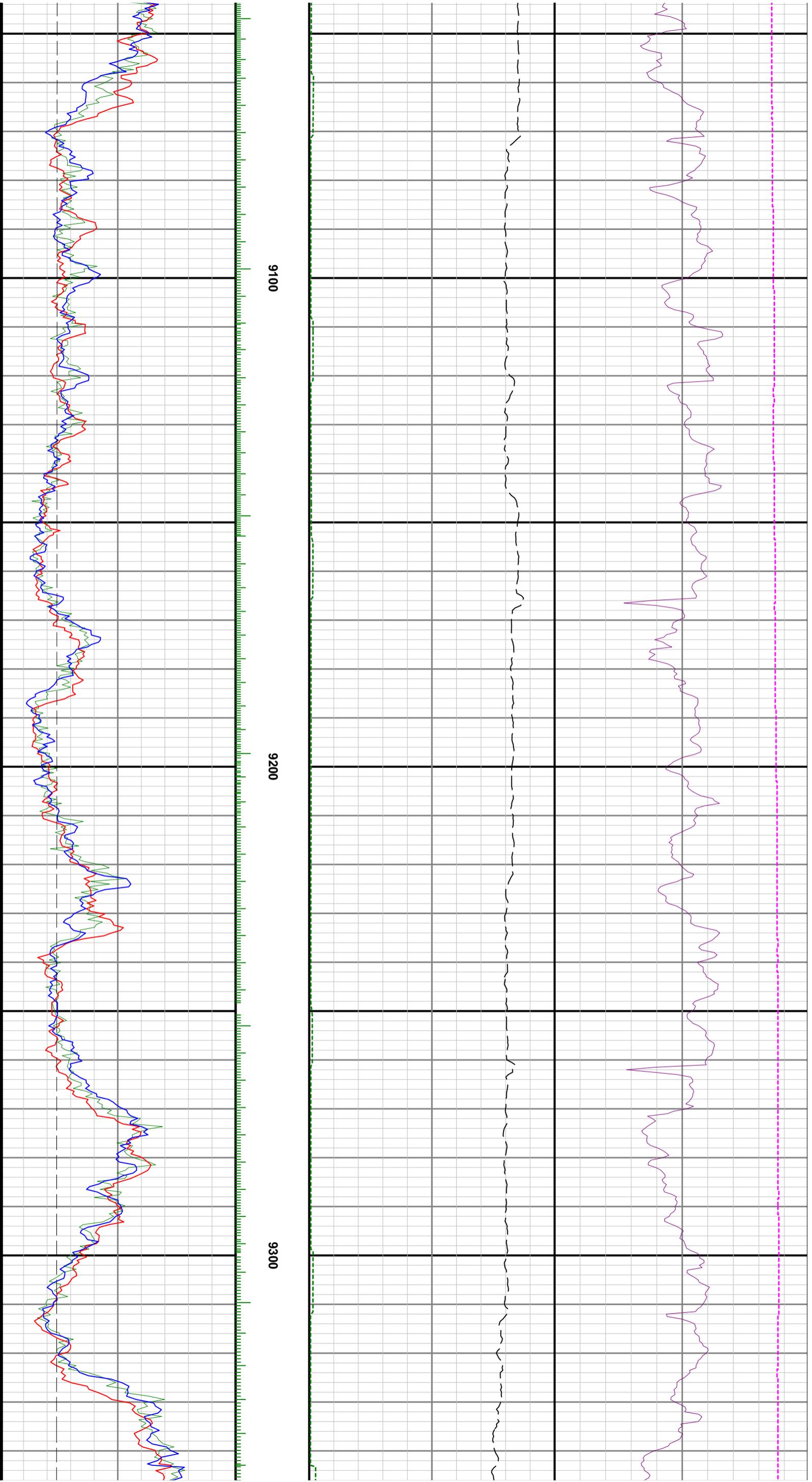


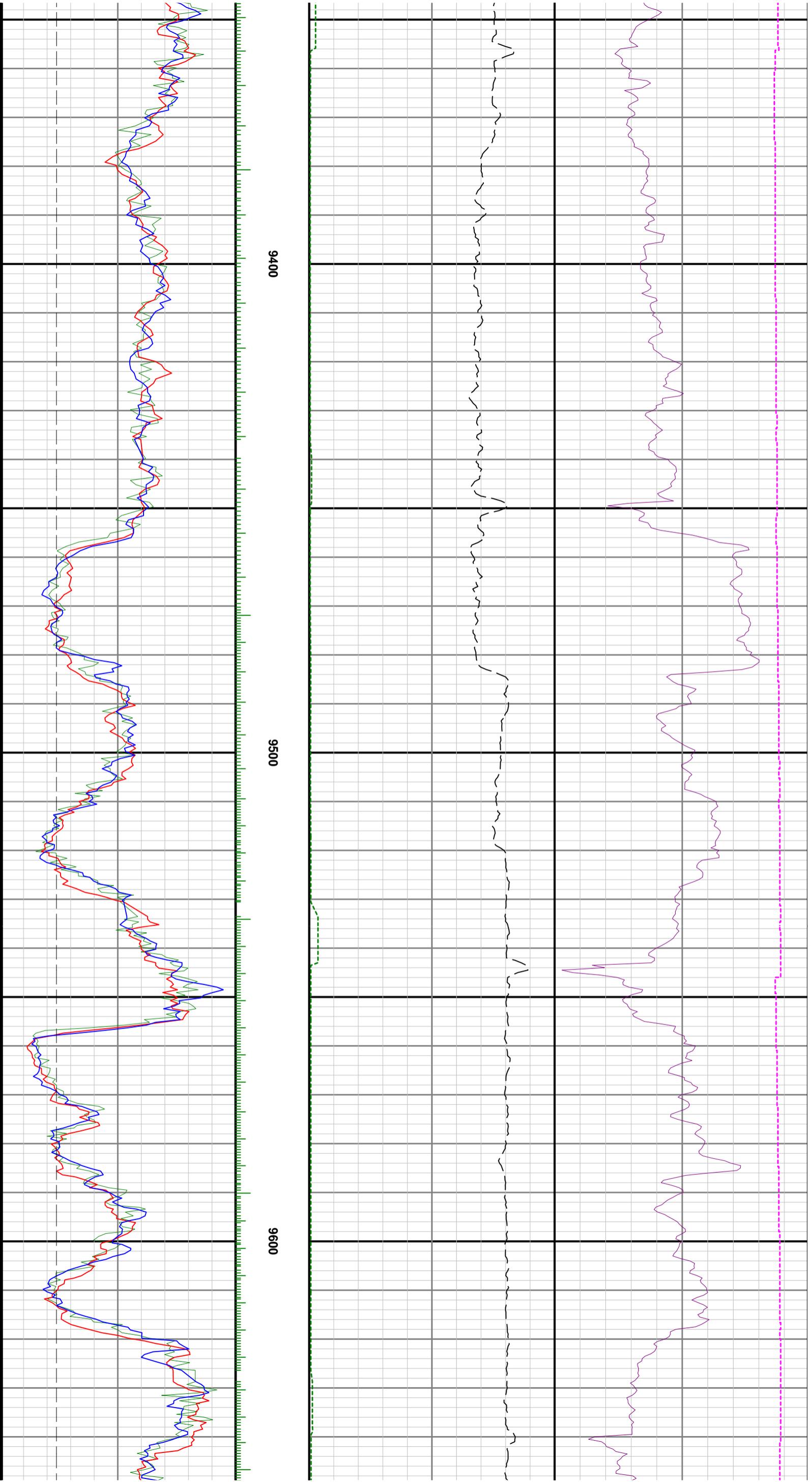


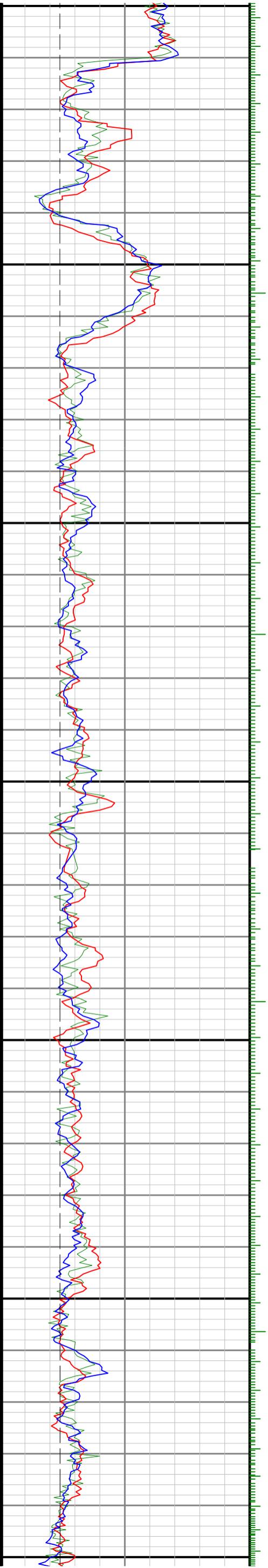








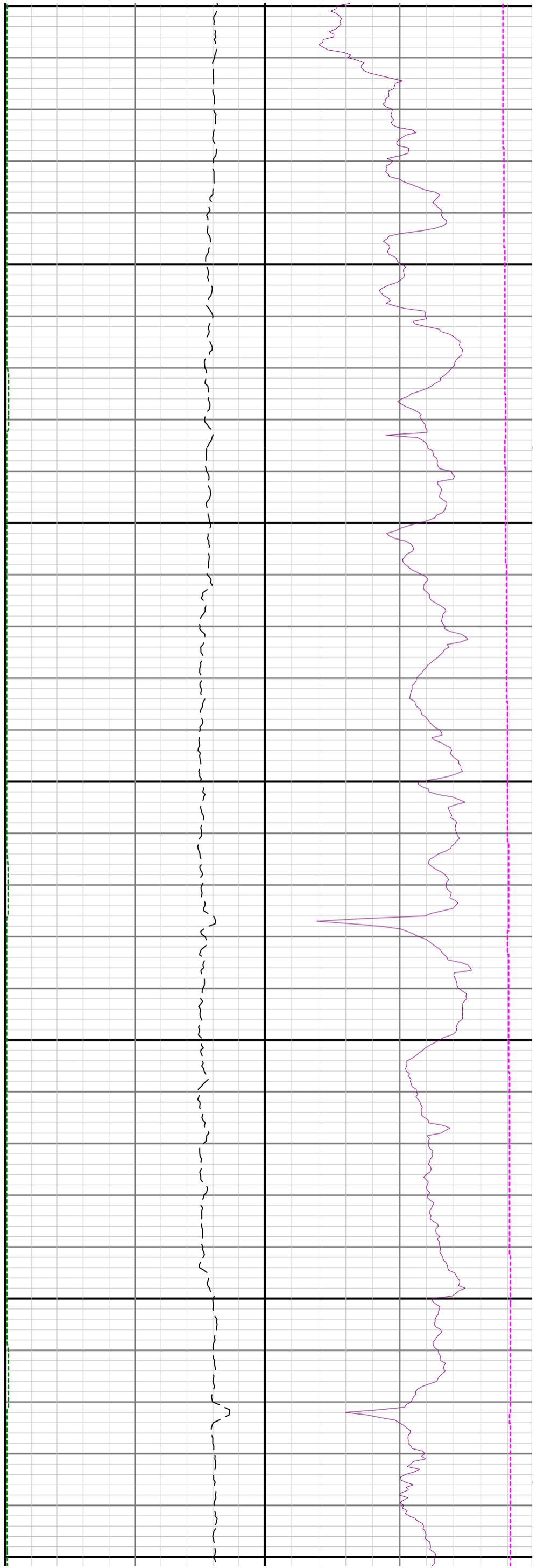


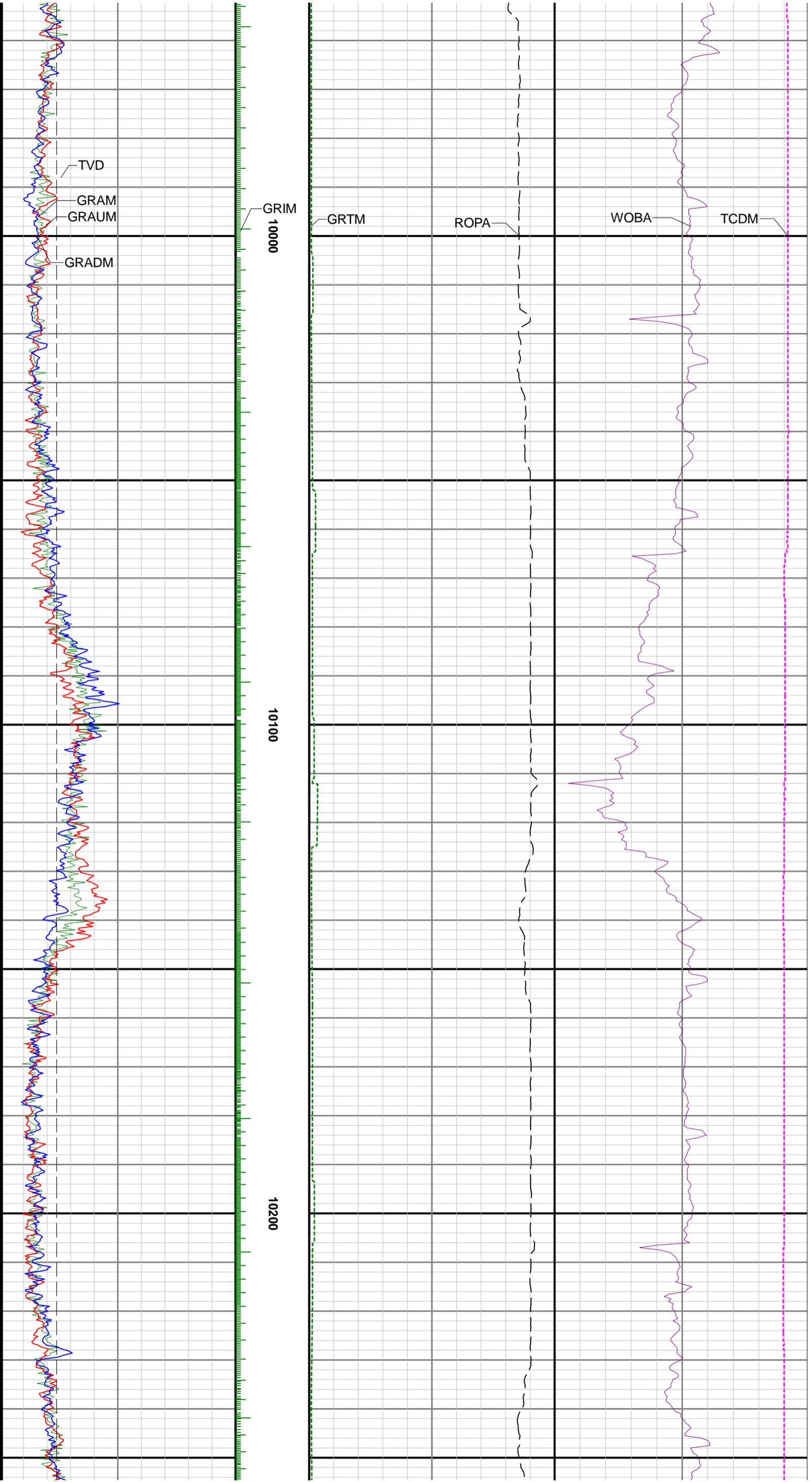


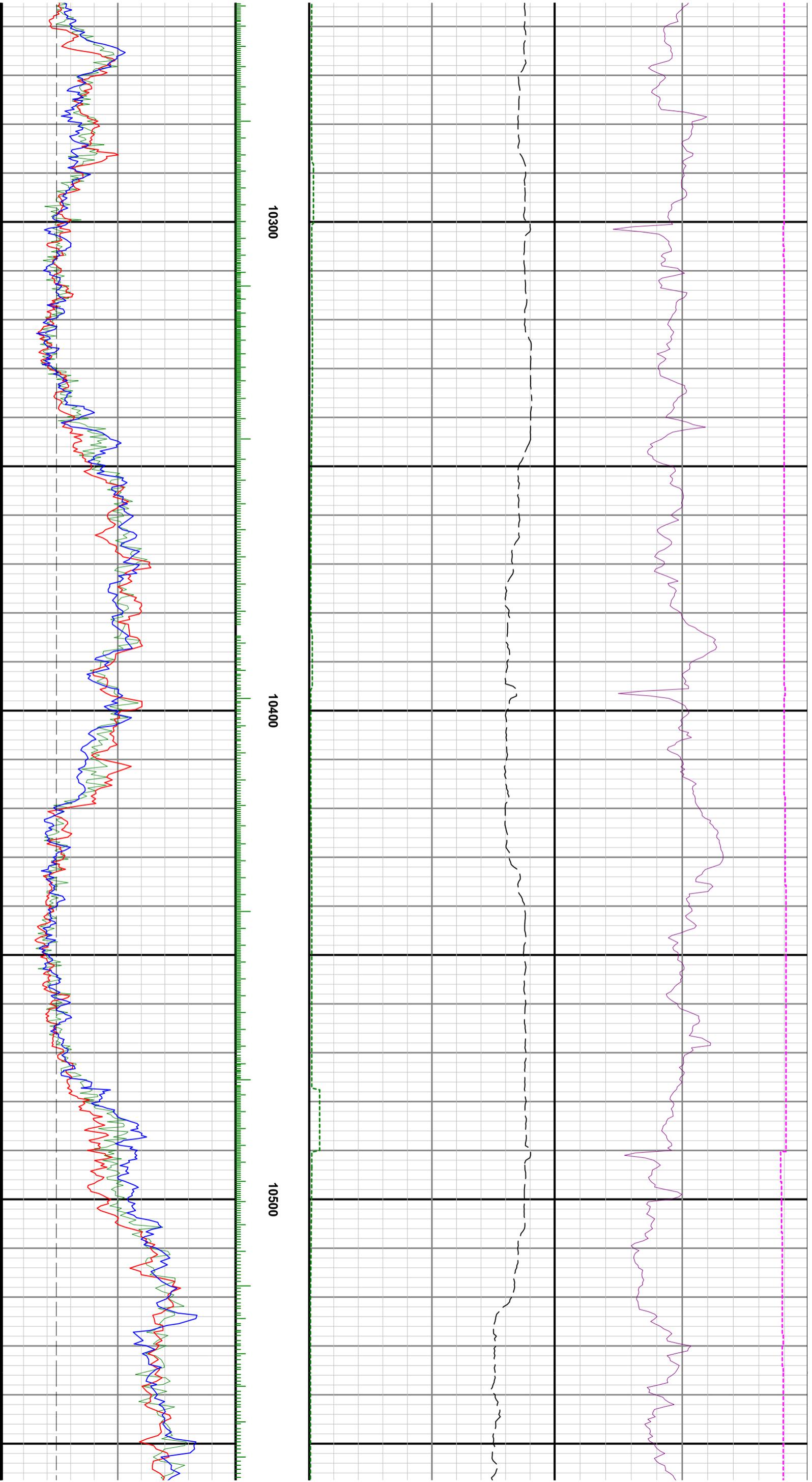
9700

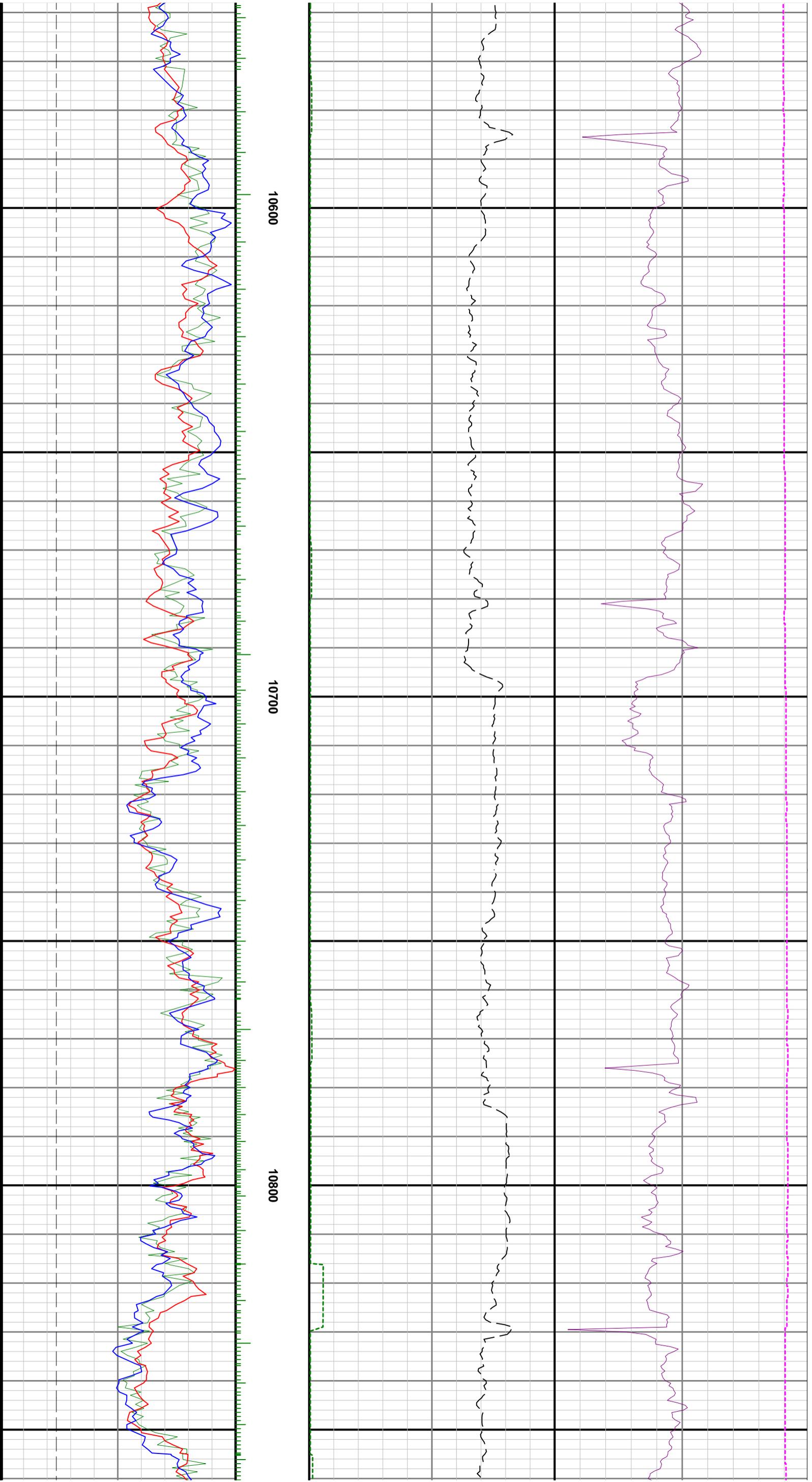
0086

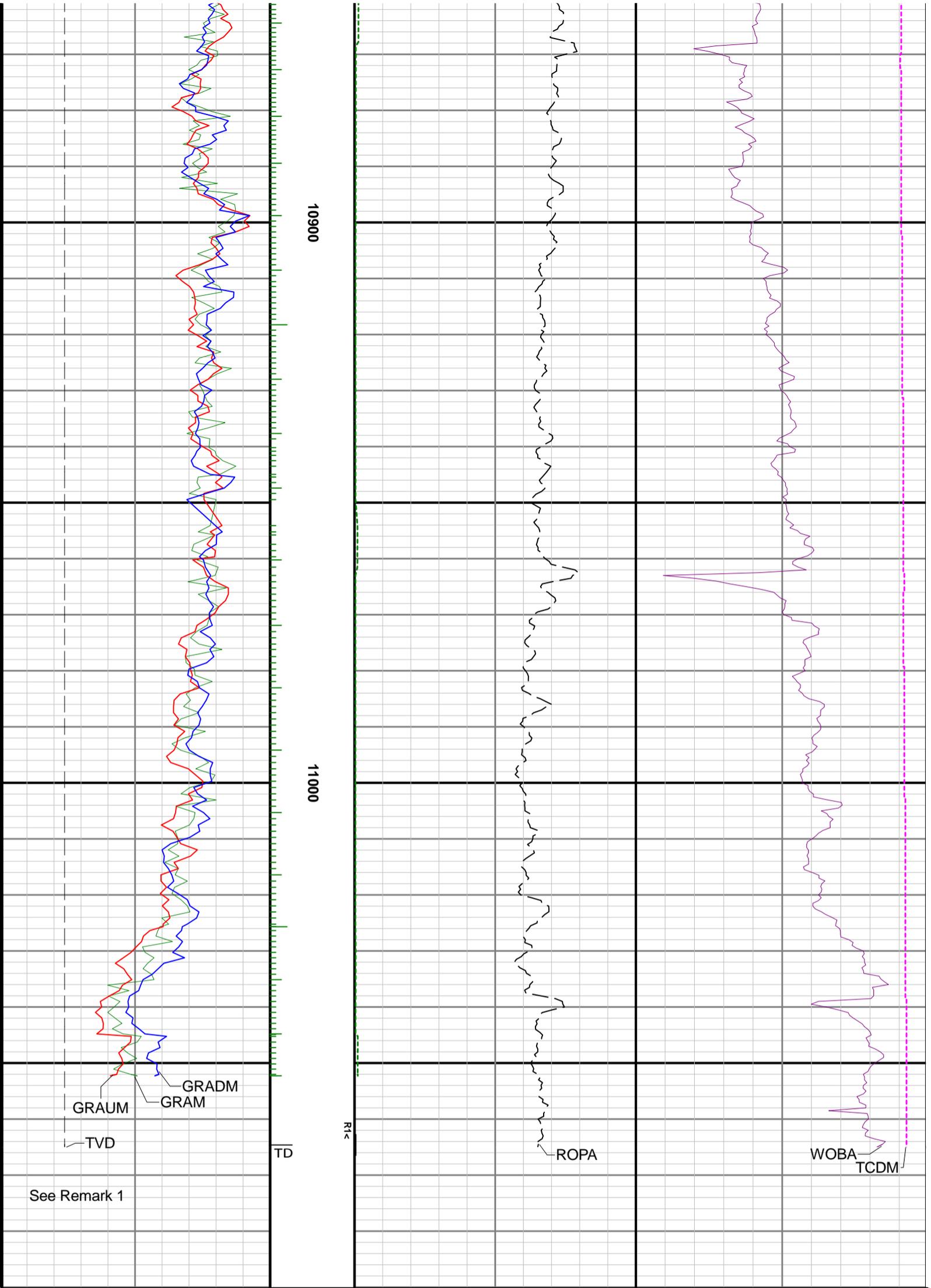
9900











Gamma Ray - Apparent 0.5 ft Average GRAM	0	150
API		
Azimuthal Gamma Ray - Apparent - Up Quadrant 0.5 ft Average GRAUM	0	150
API		
Azimuthal Gamma Ray - Apparent - Down Quadrant 0.5 ft Average GRADM	0	150
API		
True Vertical Depth TVD	7500	1500
ft		

MD 1:240 feet

Gamma Time Since Drilled GRTM	0	600
min		
Depth Averaged ROP 3 ft Average ROPA	1000	0
ft/h		

Weight On Bit, Average 1 ft Average WOBA	0	50
klb		
Downhole Temperature TCDM	0	250
degF		