

SlimPulse-Gamma Ray

2 in./ 100 ft and 5 in./ 100 ft Measured Depth

Recorded Mode, Composite Log



Company: Noble Energy INC

Well: Five Rivers K09-66-1HN

Field: Wattenberg

County: Weld

State: Colorado

Country: USA

Section:	8	APIN:	05-123-39482
Township:	4N	Rig Name:	H&P 330
Range:	66W	Rig Type:	Top Drive
FL:	NAD83 Colorado State Plane, Northern Zone, US Feet		
FL1:	Latitude: N 40° 19' 40.224", Easting: 1363063.153 ftUS		
FL2:	Longitude: W 104° 47' 27.636", Northing: 3197669.130 ftUS		



Permanent Datum: - Mean Sea Level

Acquisition Dates:	07-Aug-2014 -- 12-Aug-2014	Other Services:	Surveys / Continuous D&I
Log Interval:	589.00(ft) -- 11951.00(ft)		Downhole Temperature
Index Types:	Measured Depth		Downhole Shocks
Index Scales:	1:600 2" / 100', 1:240 5" / 100'		Directional Drilling
Depth Source:	Driller's Depth		
Depth Sensor:	PASON		
Print Type:	Final		
Spud Date:	06-Aug-2014		



Disclaimer

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Borehole Size/Casing Record

Bit						
Bit Size (in)	8.75	6.125				
Top Driller (ft)	0	7272				
Bottom Driller (ft)	7272	12018				

Operational Run Summary

Parameter (unit)	Run001	Run002	Run003			
Date Log Started	07-Aug-2014	08-Aug-2014	10-Aug-2014			
Time Log Started	00:29:33	05:38:30	08:07:55			
Date Log Finished	08-Aug-2014	09-Aug-2014	12-Aug-2014			
Time Log Finished	00:49:11	06:01:51	20:09:31			
Bit Size (in)	8.750	8.750	6.125			
Bit Start Depth (ft)	640.00	6225.00	7272.00			
Bit Stop Depth (ft)	6225.00	7272.00	12018.00			
Top Log Interval (ft)	589.00	6174.00	7213.00			
Bottom Log Interval (ft)	6174.00	7213.00	11951.00			
Max Hole Deviation (deg)	12.76	83.18	92.86			
Azimuth of Max Deviation (deg)	242.56	82.24	94.04			
Logging Unit Number	Command Center	Command Center	Command Center			
Logging Unit Location	Zone 2	Zone 2	Zone 2			
Recorded By	Zach Brunson	Zach Brunson	Mark Wilson			
Witnessed By	Derrick Dupee	Derrick Dupee	Derrick Dupee			
Service Order Number	14CCO0619	14CCO0619	14CCO0619			

Borehole Fluids

Parameter(unit)	Run001	Run002	Run003			
Fluid Type	Water	Water	Water			
Fluid Name	Fresh Water	Fresh Water	Fresh Water			
Max Recorded Temperatures (degF)	212	185	246.2			
Source of Sample	Active Tank	Active Tank	Active Tank			
Salinity (ppm)	19908.23	16130.02	17529.25			
Density (lbm/gal)	8.95	10.6	Zoned			
Funnel Viscosity (s)	30	39	Zoned			
Fluid Loss (cm3)	0	0	0			
PH	9.1	9.5	Zoned			
Source RMF						
RMC	Pressed	Pressed	Pressed			

RM @ Meas Temp (ohm.m@degF)	0.2 @ 116	0.2 @ 140	0.2 @ 130			
RMF @ Meas Temp (ohm.m@degF)	0.15 @ 68	0.15 @ 68	0.15 @ 68			
RMC @ Meas Temp (ohm.m@degF)						
RM @ BHT (ohm.m@degF)	0.11 @ 212	0.13 @ 212	0.13 @ 212			
RMF @ BHT (ohm.m@degF)	0.05 @ 212	0.05 @ 212	0.05 @ 212			
RMC @ BHT (ohm.m@degF)	NaN @ 212	NaN @ 212	NaN @ 212			
Total Solid (%)	3.7	10.8	Zoned			
High Gravity Solids (%)	0.9	6.1	Zoned			

Zoned Borehole Fluids

Run003		
Parameter	Value	Start
Density	9.85	8/10/2014 8:07:55 AM
Density	10.2	8/11/2014 1:30:00 AM
Density	10.3	8/11/2014 1:00:00 PM
Density	10.35	8/12/2014 1:30:00 AM
Funnel Viscosity	37	8/10/2014 8:07:55 AM
Funnel Viscosity	40	8/11/2014 1:30:00 AM
Funnel Viscosity	37	8/11/2014 1:00:00 PM
PH	11.5	8/10/2014 8:07:55 AM
PH	10.9	8/11/2014 1:30:00 AM
PH	9.3	8/11/2014 1:00:00 PM
PH	9.1	8/12/2014 1:30:00 AM
Total Solid	6.5	8/10/2014 8:07:55 AM
Total Solid	8.1	8/11/2014 1:30:00 AM
Total Solid	8.2	8/11/2014 1:00:00 PM
Total Solid	8.9	8/12/2014 1:30:00 AM
High Gravity Solids	4.8	8/10/2014 8:07:55 AM
High Gravity Solids	5.8	8/11/2014 1:30:00 AM
High Gravity Solids	6.4	8/11/2014 1:00:00 PM
High Gravity Solids	6.1	8/12/2014 1:30:00 AM

Remarks and Equipment Summary

Data presented is from tool memory and acquired while drilling from 640.0 ft MD to 12018.0 ft MD

Depth Reference: Driller's Depth

Environmental Corrections: Gamma Ray is corrected for bit size, mud weight, and tool collar thickness. Barite and Potassium in the mud affect Gamma Ray readings.

Run001: Remarks	Run002: Remarks	Run003: Remarks
Run Objective: Drill Vertical Section to KOP	Run Objective: Drill Curve to Landing Point	Run Objective: Drill Lateral Section to TD
Bit to GR: 50.71 ft Bit to DNI: 47.68 ft	Bit to GR: 58.63 ft Bit to DNI: 55.60 ft	Bit to GR: 66.17 ft Bit to DNI: 63.14 ft
Drilled from 640.0 ft MD to 6225.0 ft MD Logged from 589.0 ft MD to 6174.0 ft MD	Drilled from 6225.0 ft MD to 7272.0 ft MD Logged from 6174.0 ft MD to 7213.0 ft MD	Drilled from 7272.0 ft MD to 12018.0 ft MD Logged from 7272.0 ft MD to 11951.0 ft MD
SlimPulse Version Software: Version 11 SlimPulse GR Calibrated: 25-Jul-2014 SlimPulse D&I Calibrated: 06-May-2014	SlimPulse Version Software: Version 11 SlimPulse GR Calibrated: 11-Apr-2014 SlimPulse D&I Calibrated: 04-Jan-2014	SlimPulse Version Software: Version 11 SlimPulse GR Calibrated: 13-May-2014 SlimPulse D&I Calibrated: 18-Nov-2013
PathFinder, a Schlumberger Co Personnel: DD: Cotton Walker, Mike Hikes MWD: Mark Wilson, Zach Brunson	PathFinder, a Schlumberger Co Personnel: DD: Cotton Walker, Mike Hikes MWD: Mark Wilson, Zach Brunson	PathFinder, a Schlumberger Co Personnel: DD: Chris Sisseck, Mike Hikes MWD: Mark Wilson, Zach Brunson
Reason for POOH: Vertical Section TD	Reason for POOH: Curve Section TD	Reason for POOH: Well TD

Run001: Toolstring	Run002: Toolstring	Run003: Toolstring
	<div>Equip nameLengthMP nameOffset</div>	

Equip name
Flex DC: 6 3/4":D
R18825

Length
95.66

MP name
NMFC

Offset

SPULSE-GEN:DR8
494

64.87

SLB

GR 50.71

D&I 47.68

Flex DC: 6 3/4":D
R18825

103.53

NMFC

SPULSE-GEN:DR8
494

72.74

SLB

GR 58.63

D&I 55.6

Equip name
NMDC: 4 3/4"[2]:D
R23997

Length
110.79

MP name
SLB

Offset

SPULSE-GEN:DR10
035

80.16

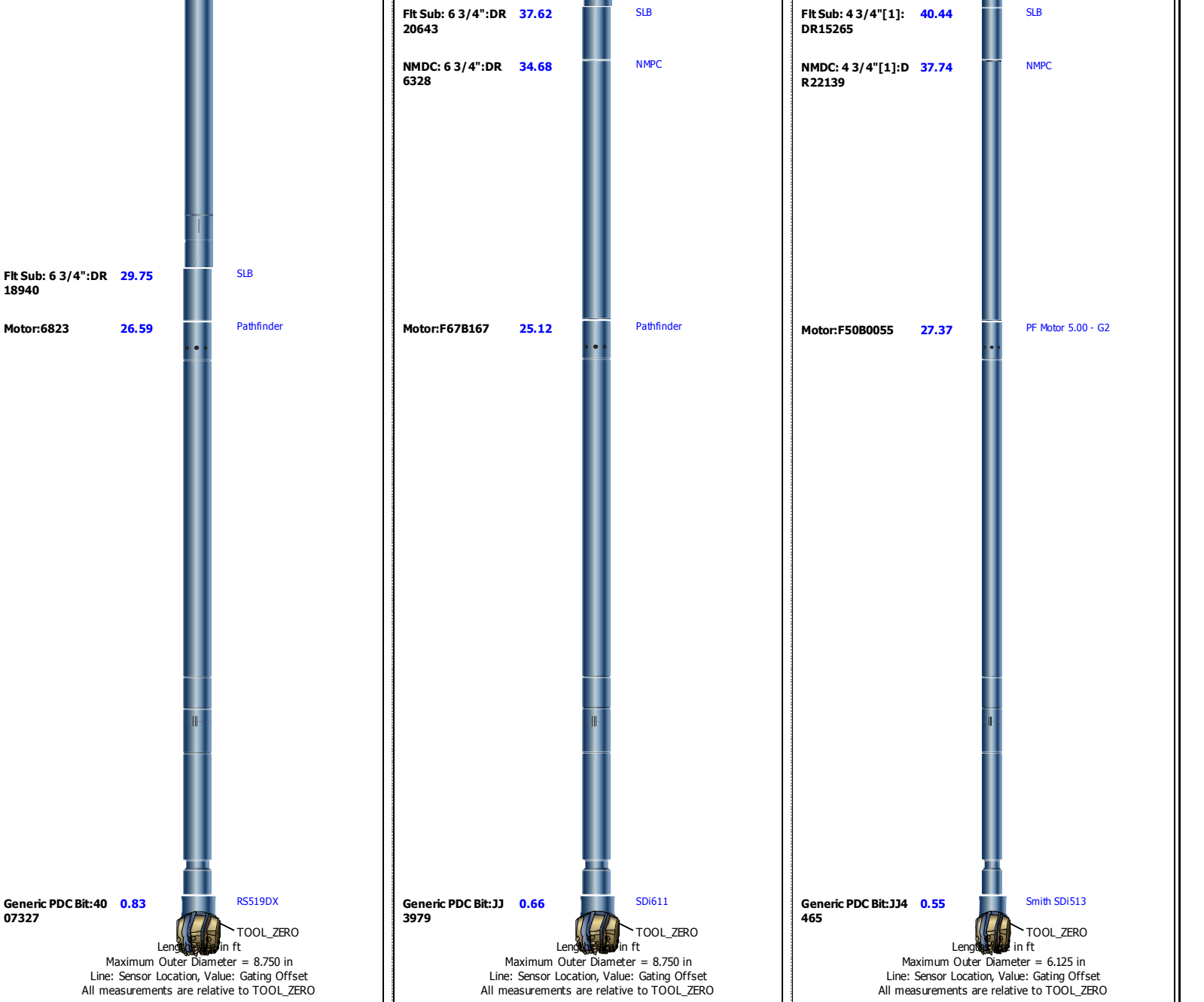
GR 66.17

D&I 63.14

Flt Sub: 4 3/4"[2]:
DR18570

43.92

SLB



Well Composite

Software Version

Acquisition System		Version	
MaxWell		4.0.9163.3000	
Application Patch		Patch-SP-10767_22480-4.0.9163.3001	
		Patch-NPD_ADN8D_SP3-23661-4.0.9530.3002	
		Patch-Hotfix_overwrite_survey_for_petrolink-23199-4.0.9530.3002	
		Patch-Hotfix_MRT_SP3-23306-4.0.9530.3002	
Tool Elements	Description	Software Version	Firmware Version
DRILLING_SURFACE	DRILLING_SURFACE	4.0.9469.3000	
SPEC	SlimPulse Electronics Cartridge	4.0.9469.3000	

Composite Summary

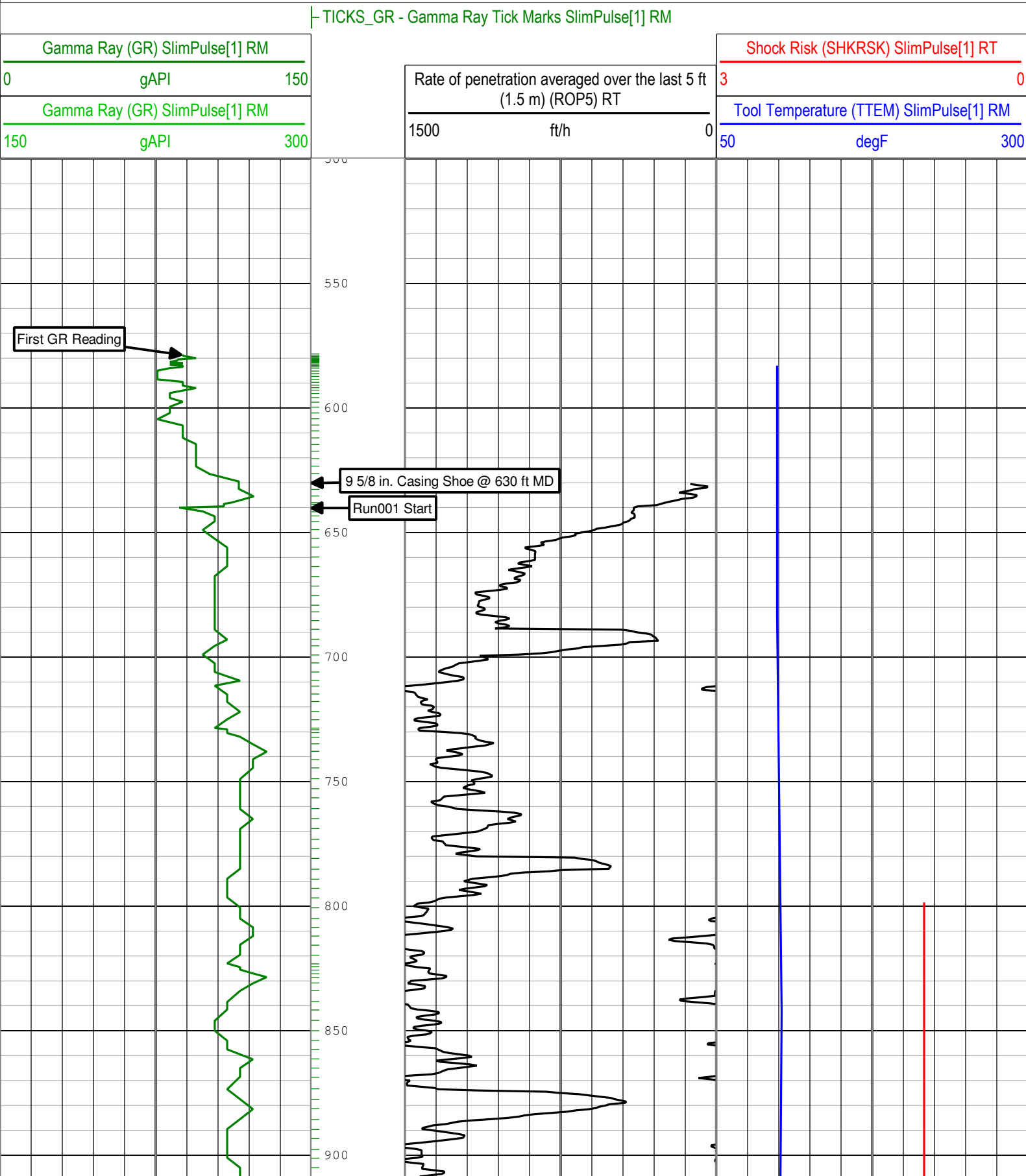
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	Include Parallel Data
Run001	Drilling	Down	629.08 ft	6226.83 ft	07-Aug-2014 12:29:33 AM	08-Aug-2014 12:49:11 AM	No
Run002	Drilling	Down	6229.08 ft	6279.08 ft	08-Aug-2014 12:49:11 AM	09-Aug-2014 12:49:11 AM	No

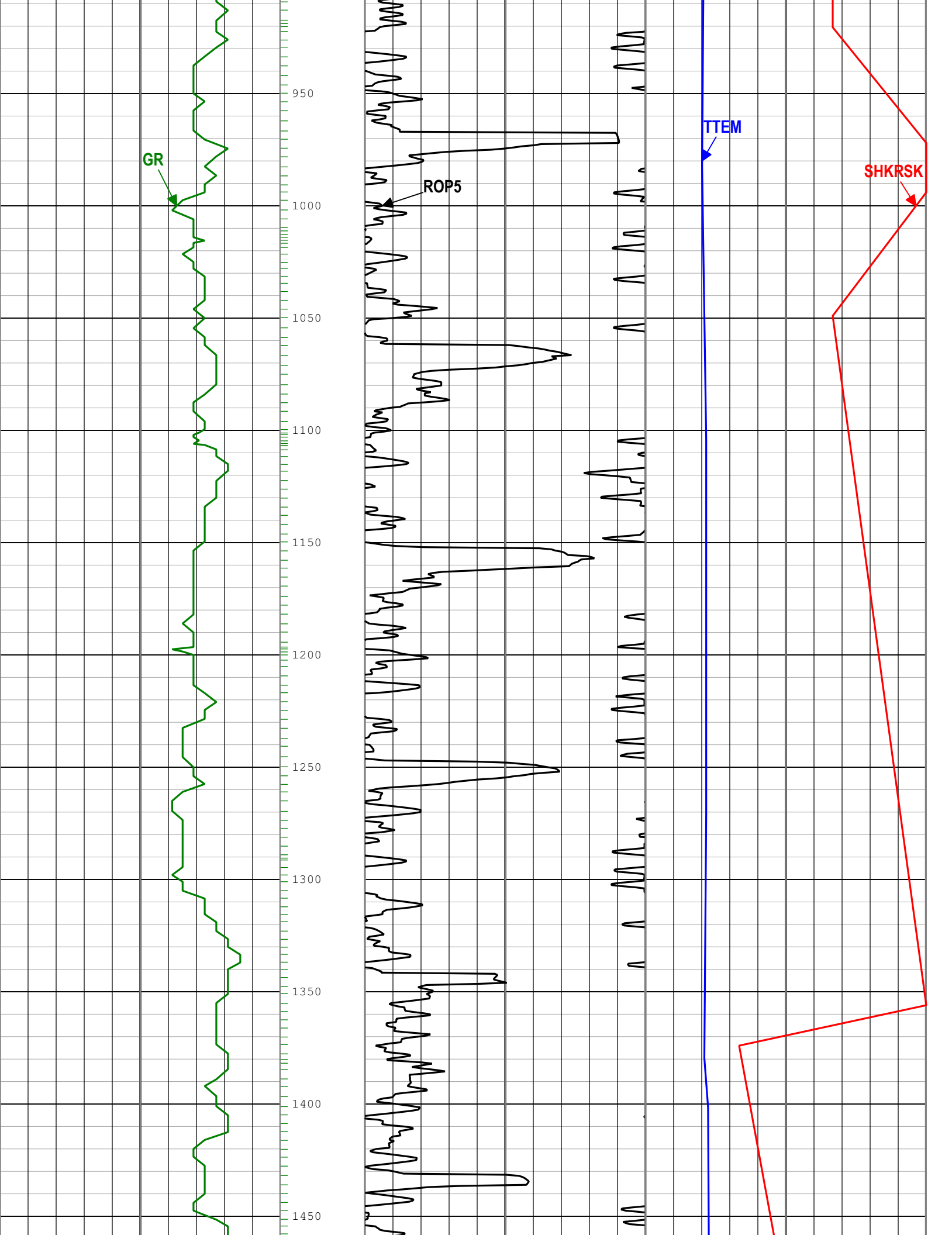
Run002	Drilling	Down	6226.83 ft	7272.92 ft	08-Aug-2014 5:38:30 AM	09-Aug-2014 6:01:51 AM	No
Run003	Drilling	Down	7272.25 ft	12017.67 ft	10-Aug-2014 8:02:51 PM	12-Aug-2014 8:09:31 PM	No

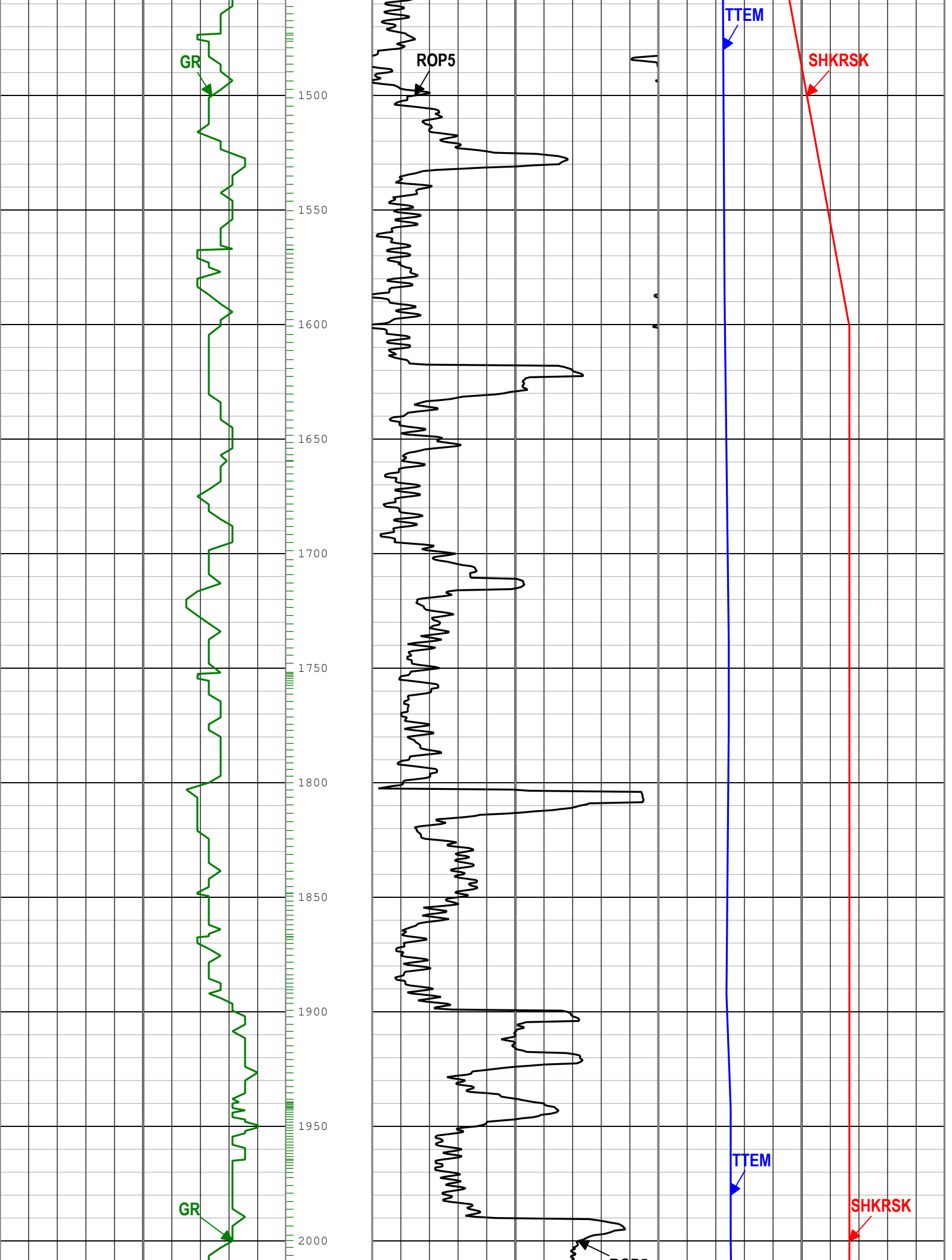
All depths are referenced to toolstring zero

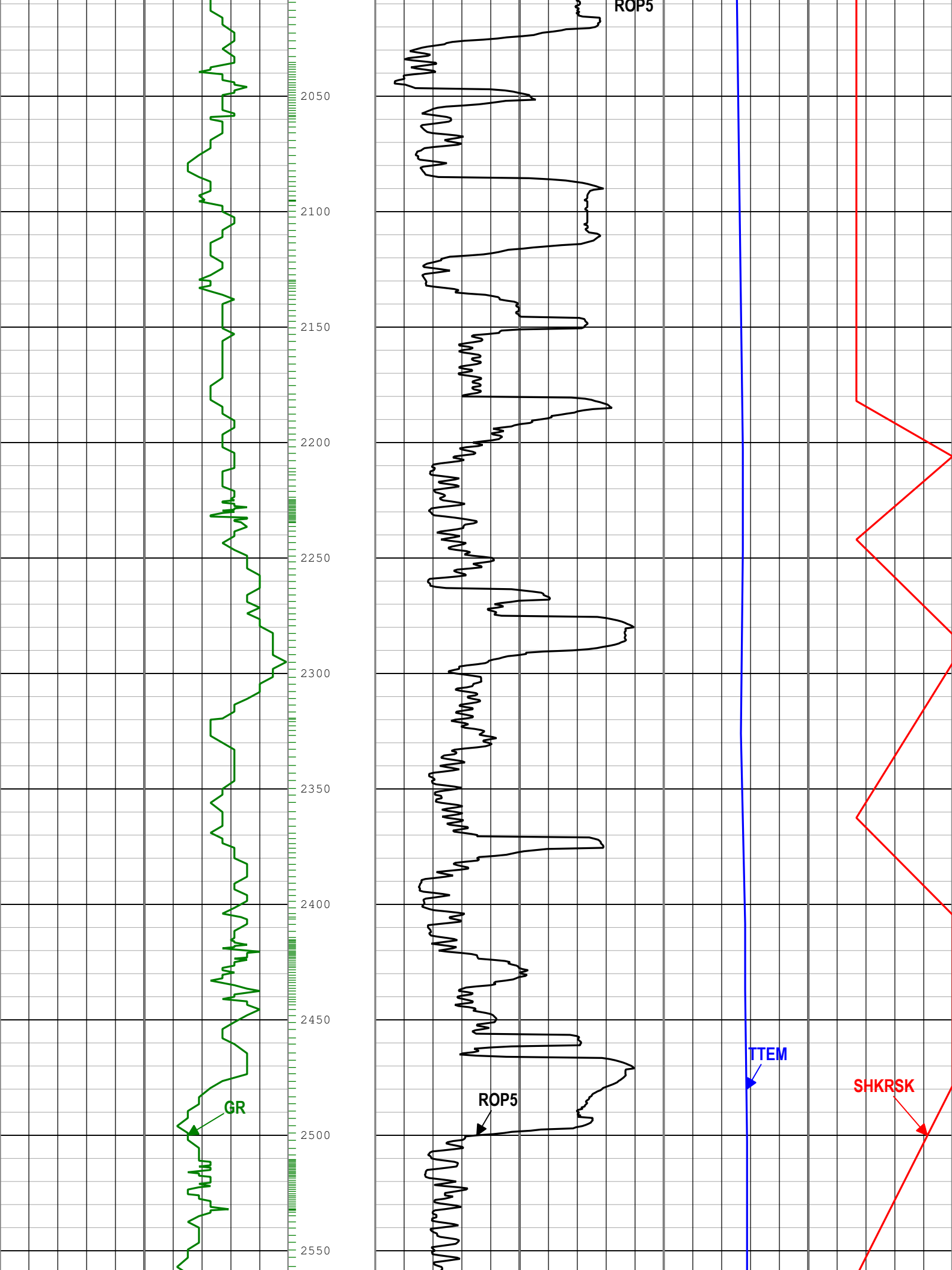
Log	Company:Noble Energy INC		Well:Five Rivers K09-66-1HN		Well Composite:S322		
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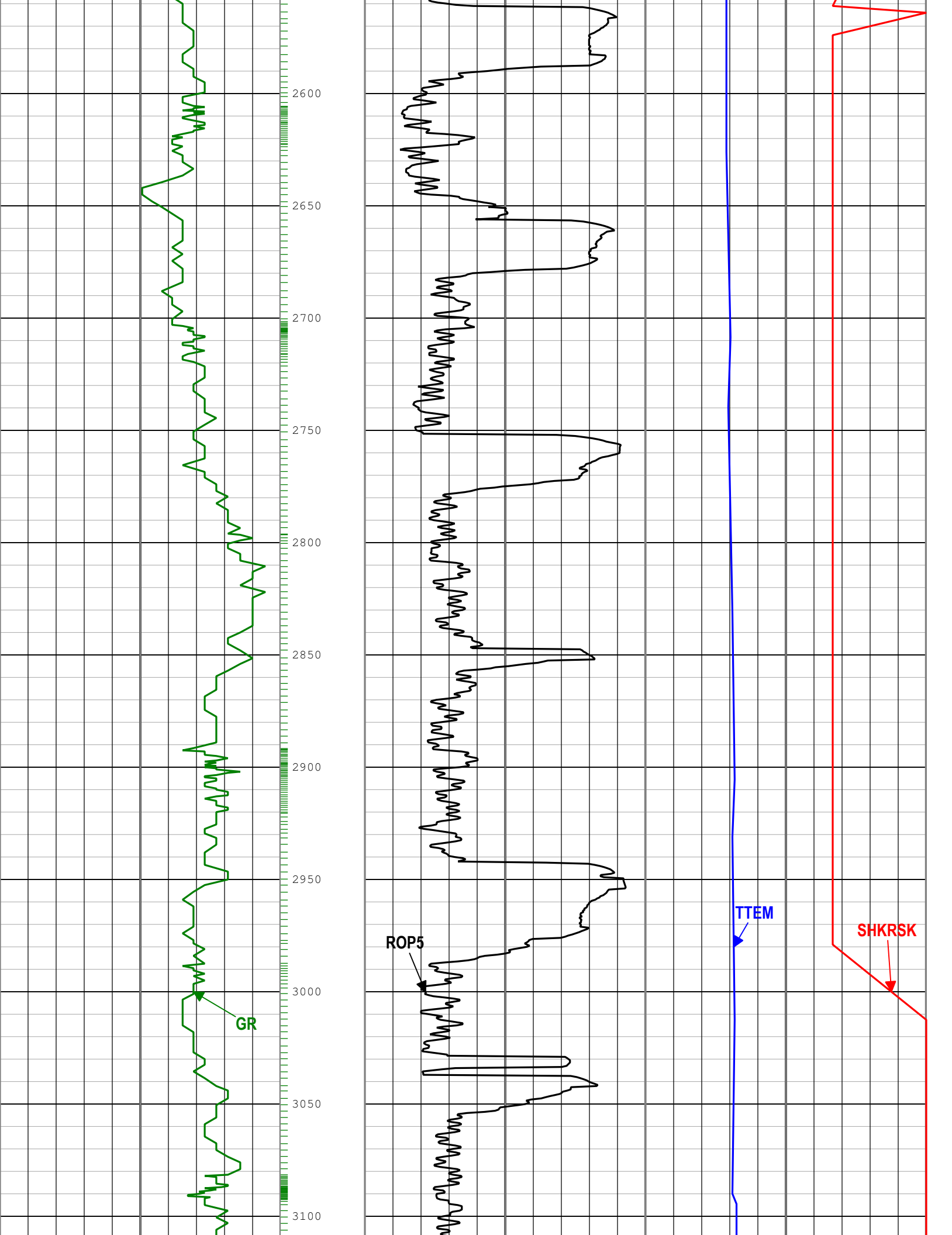
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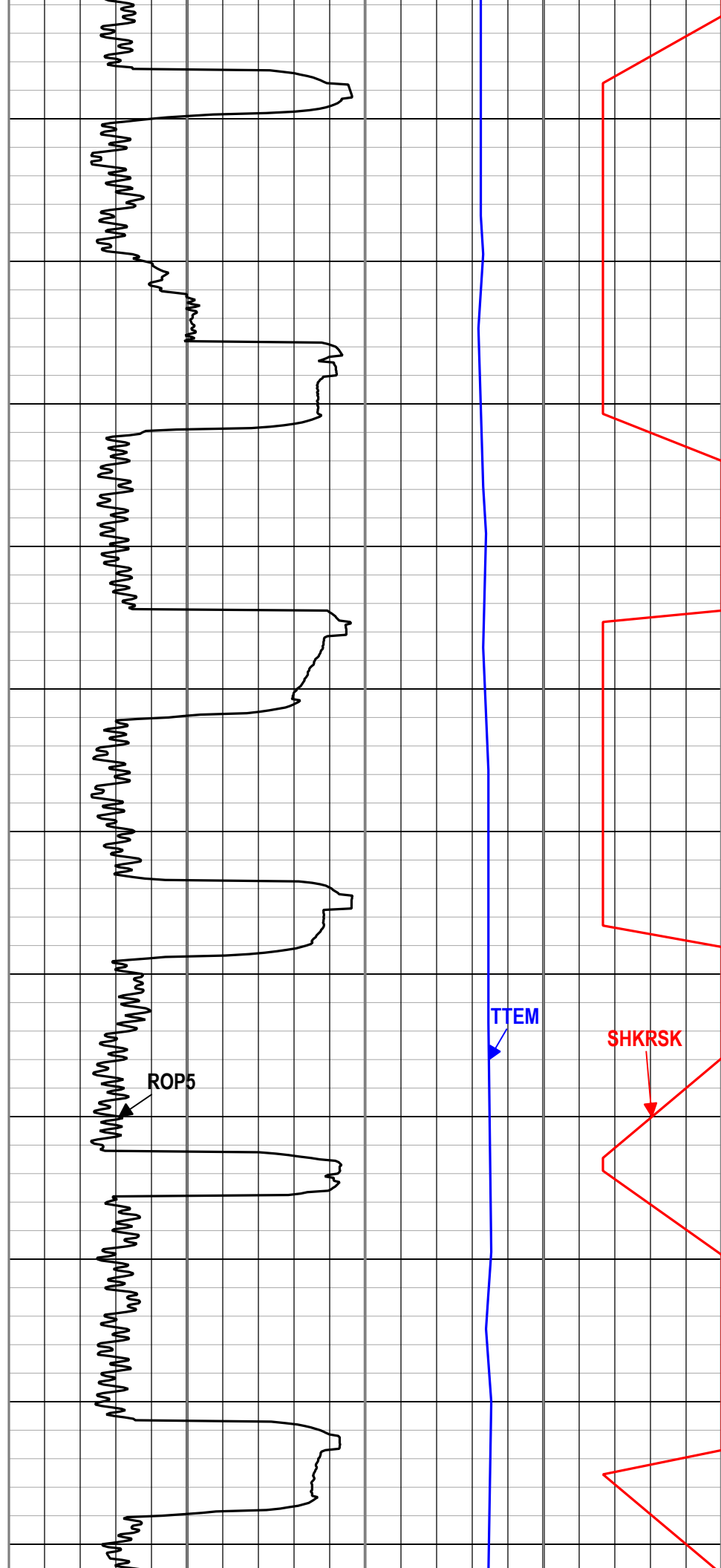
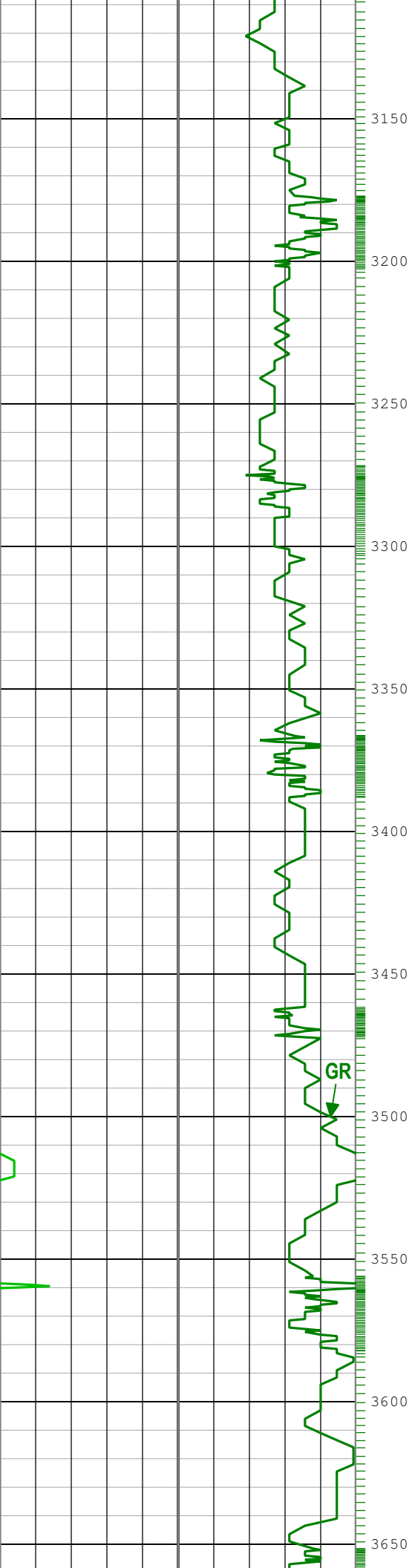


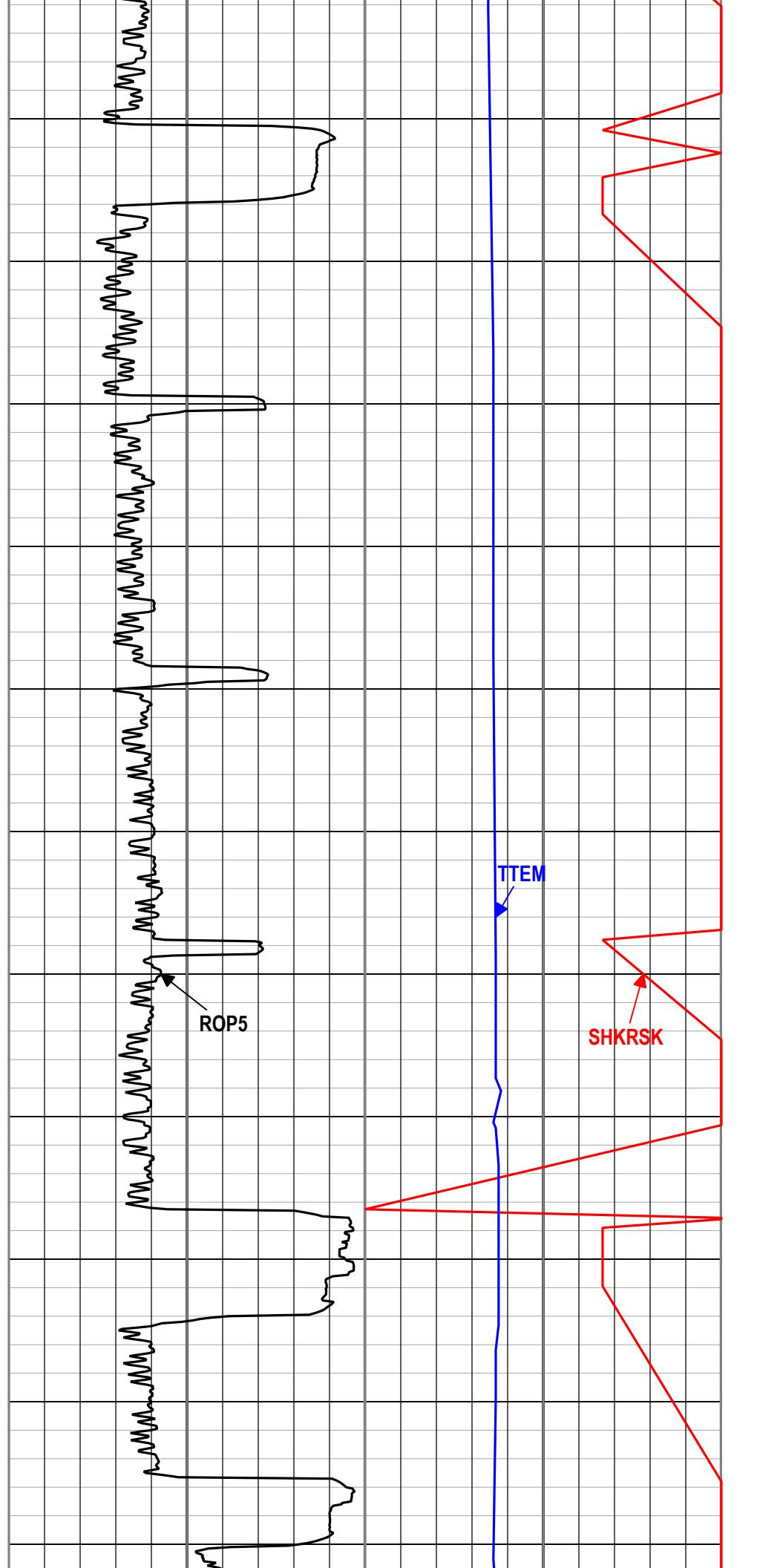
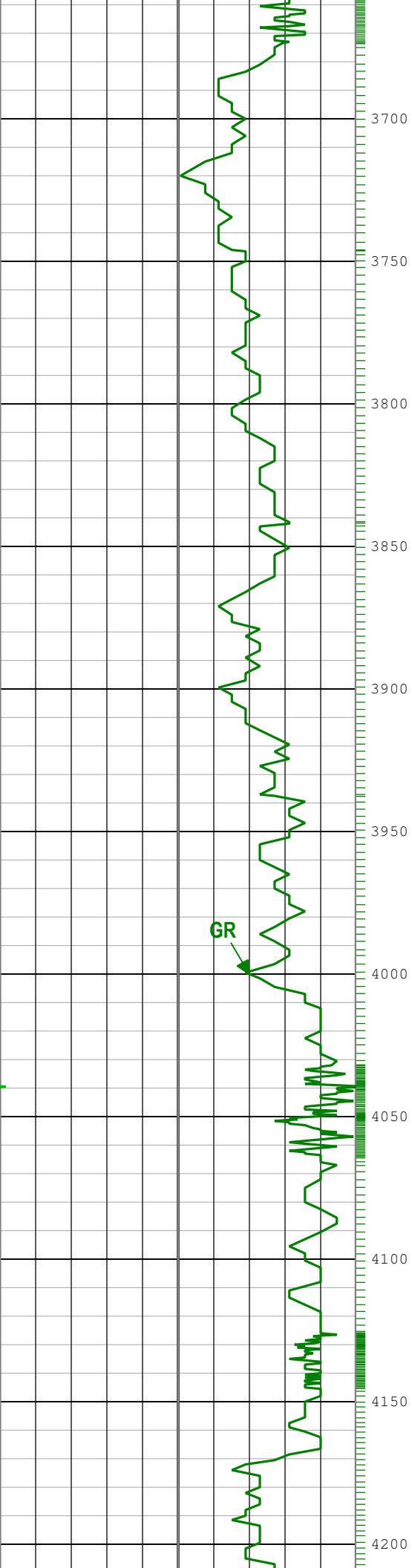


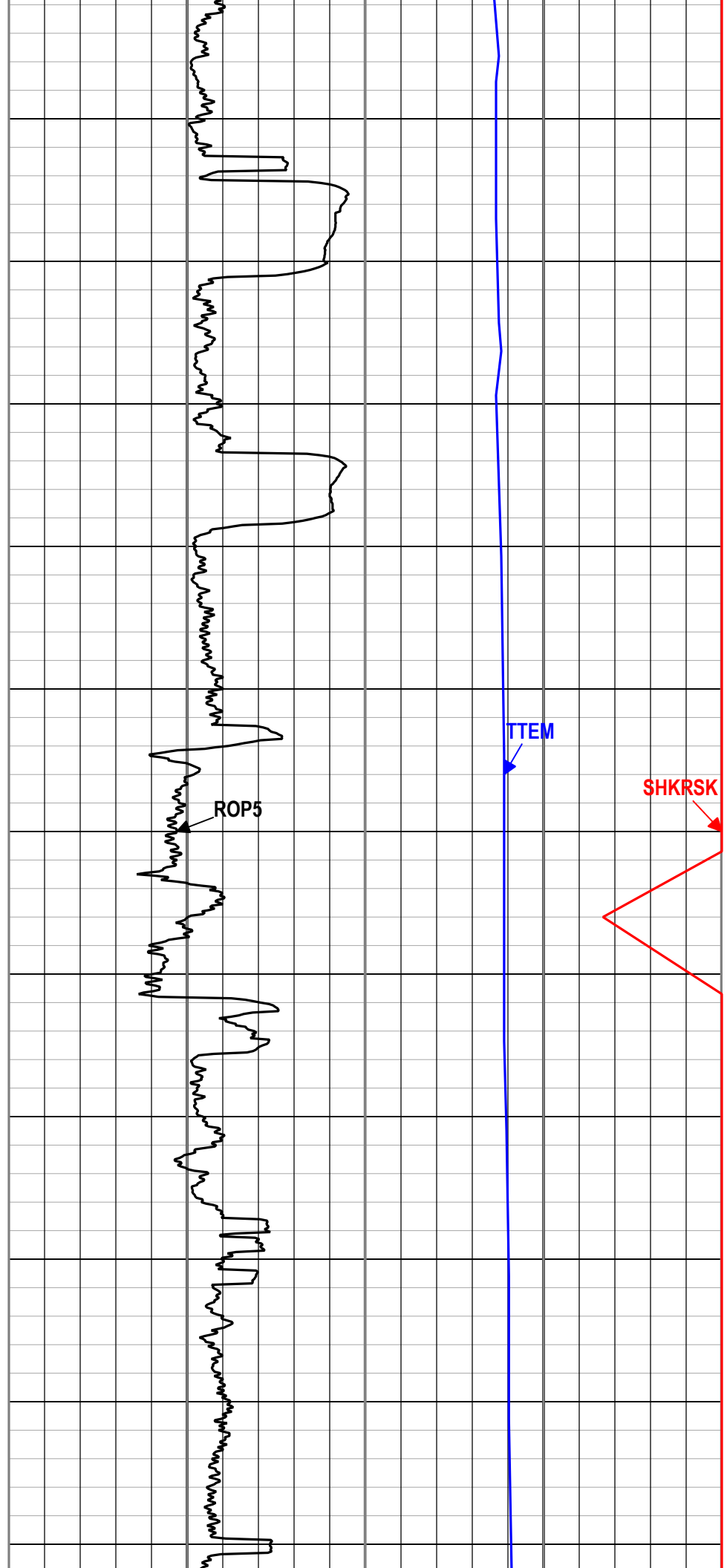
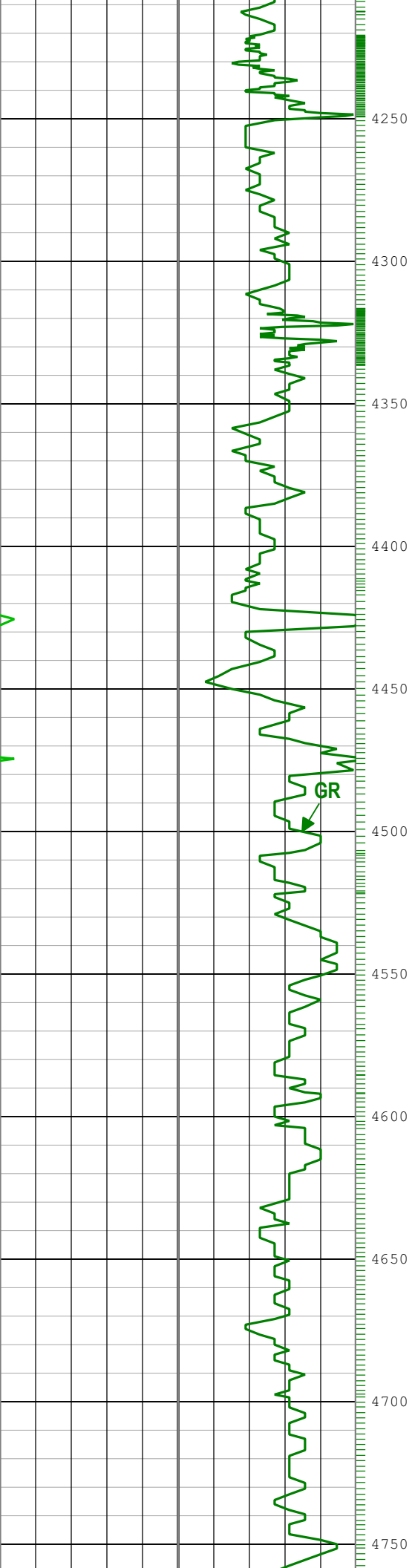


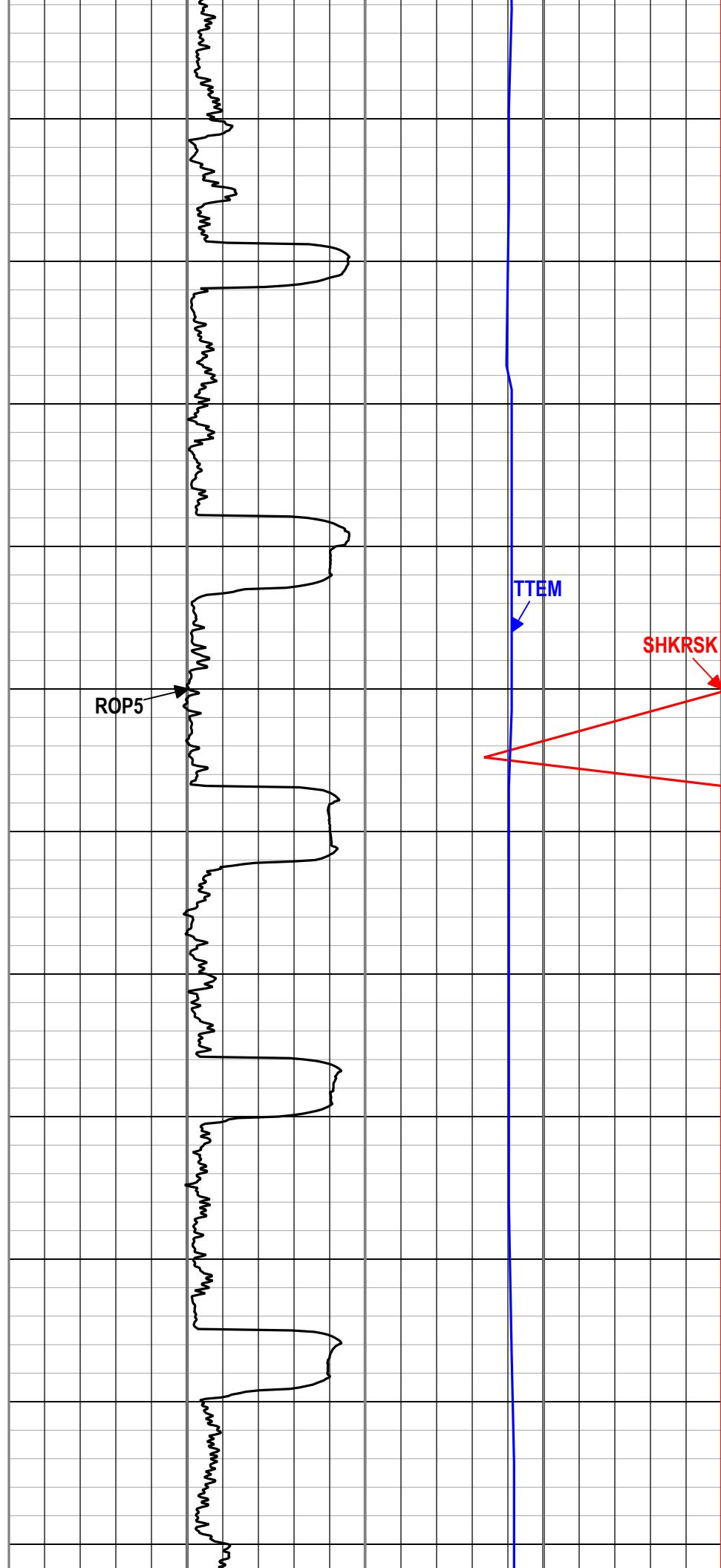
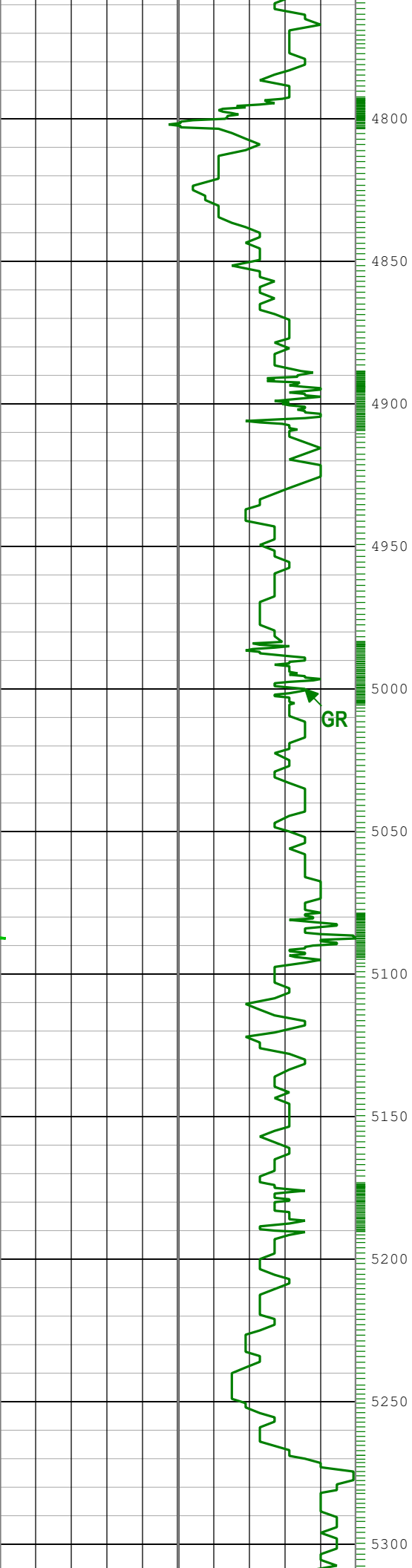


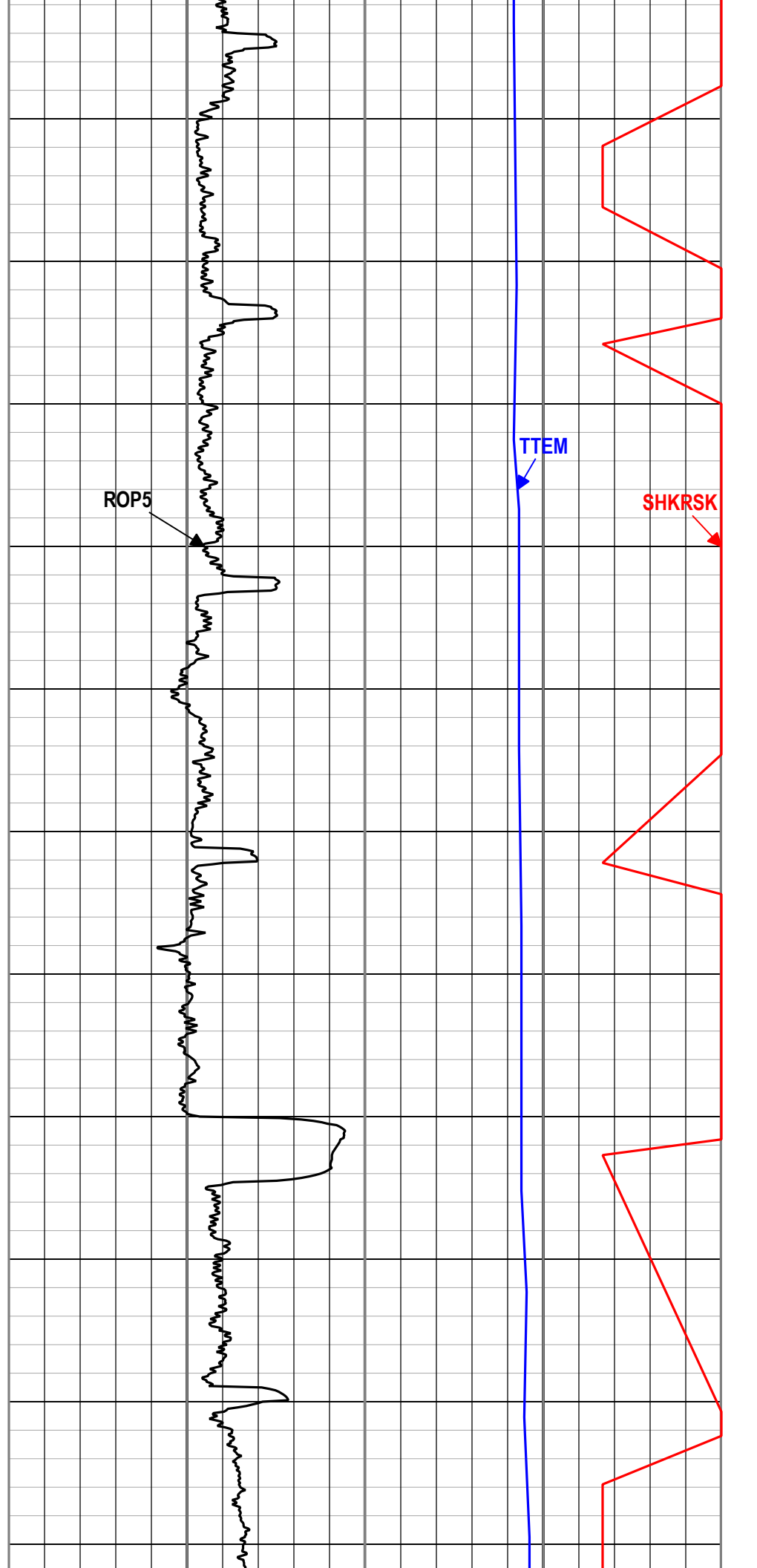
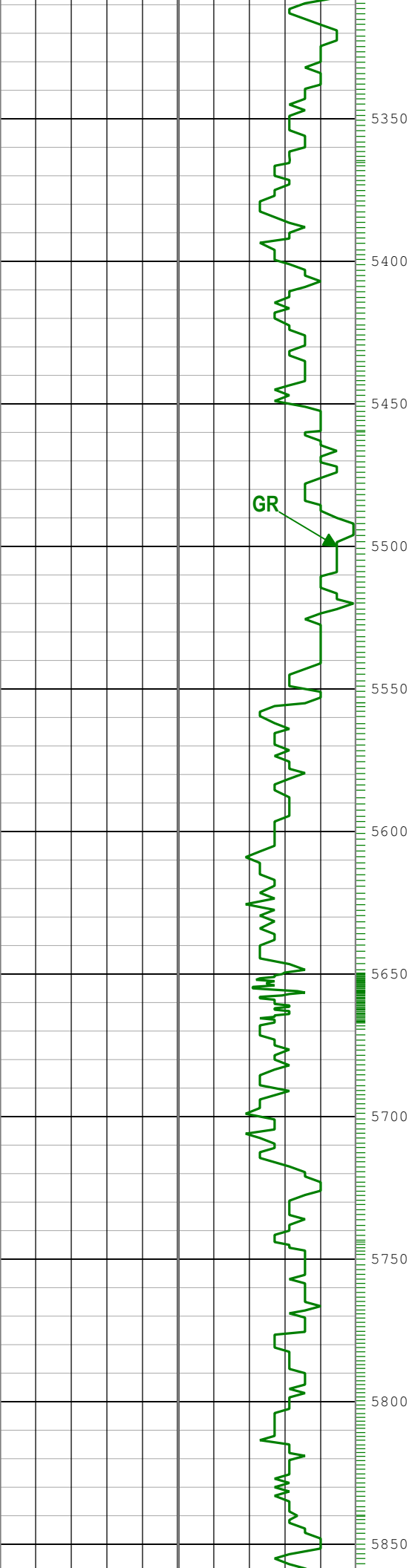


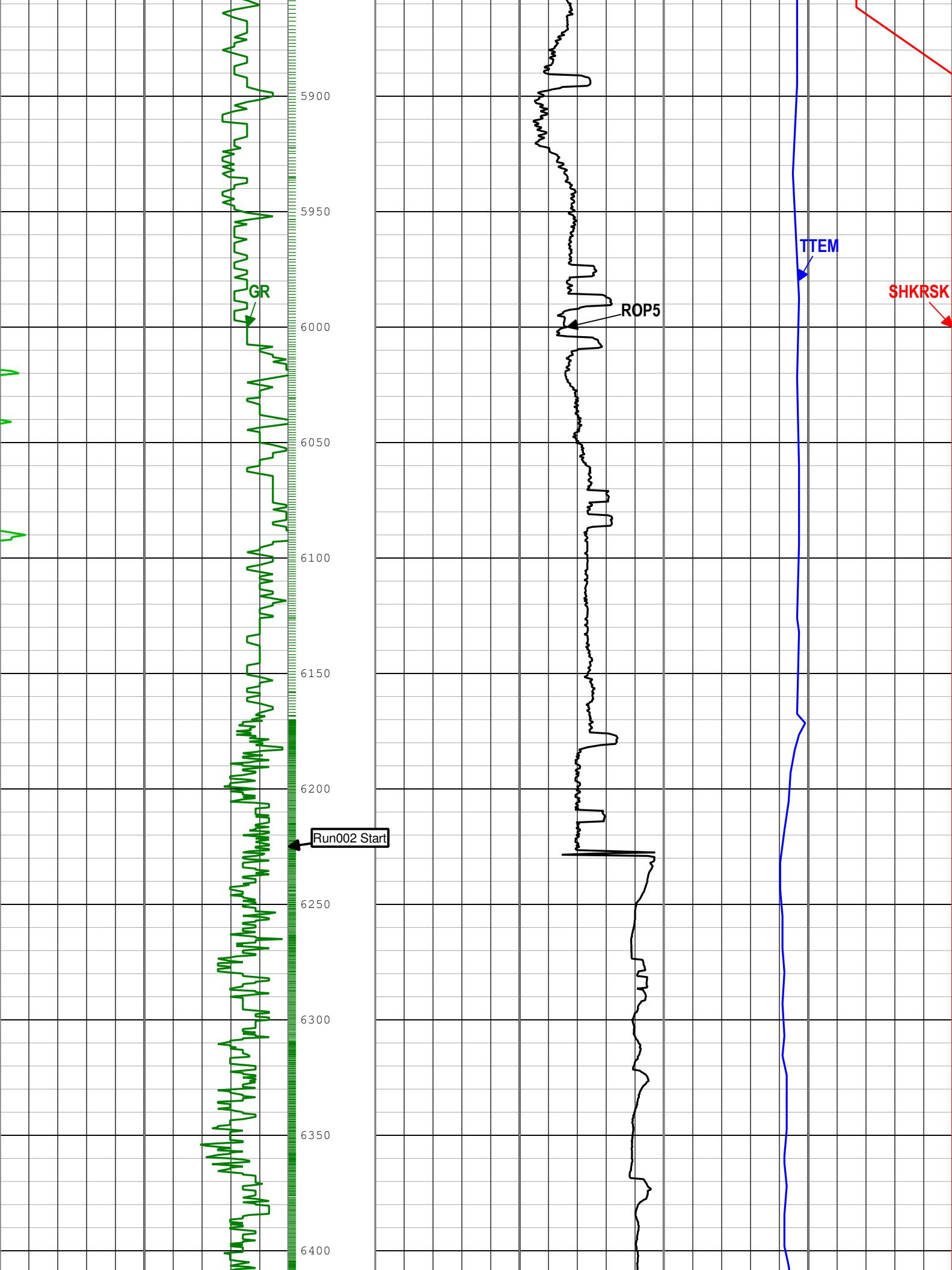


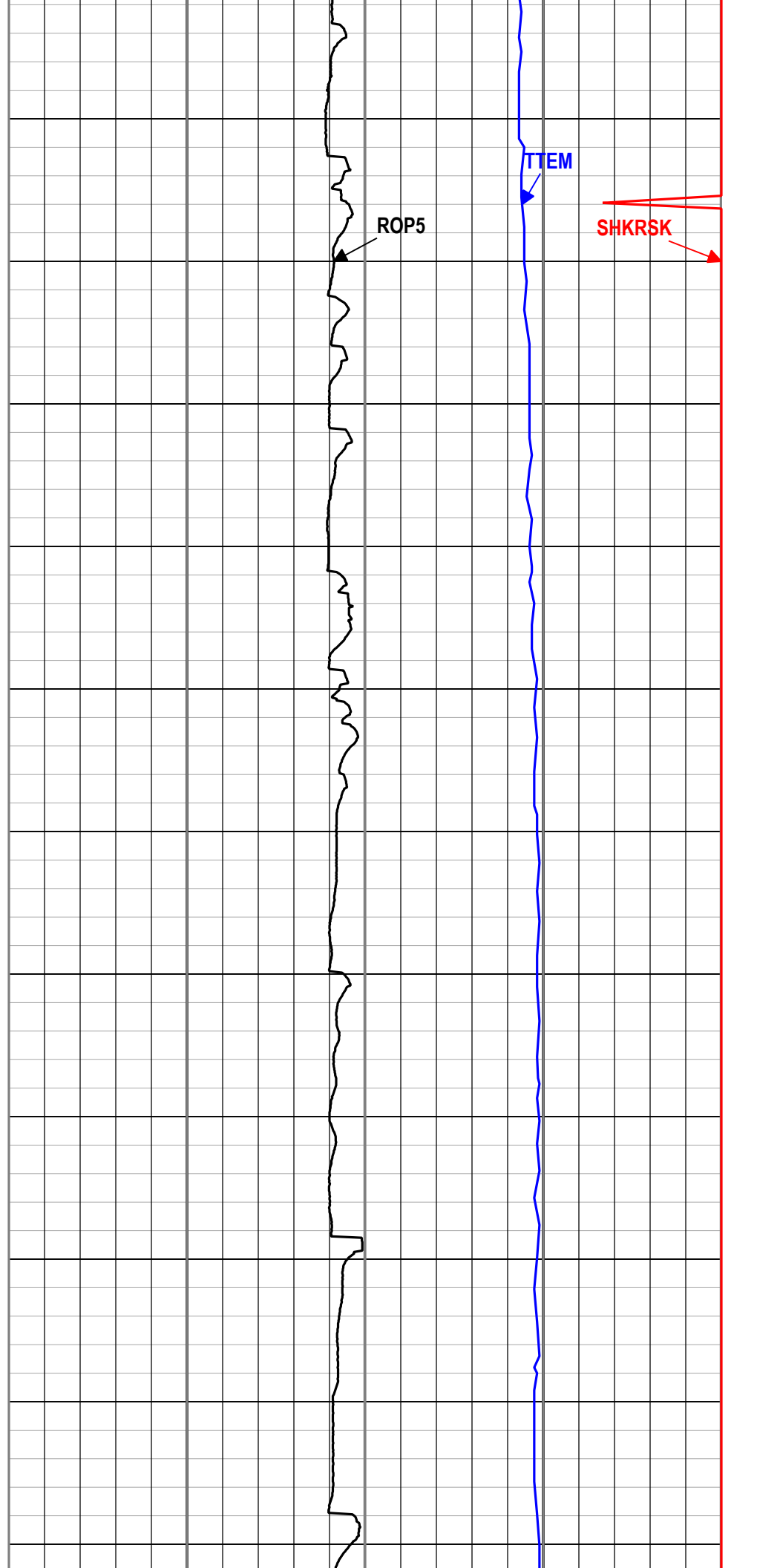
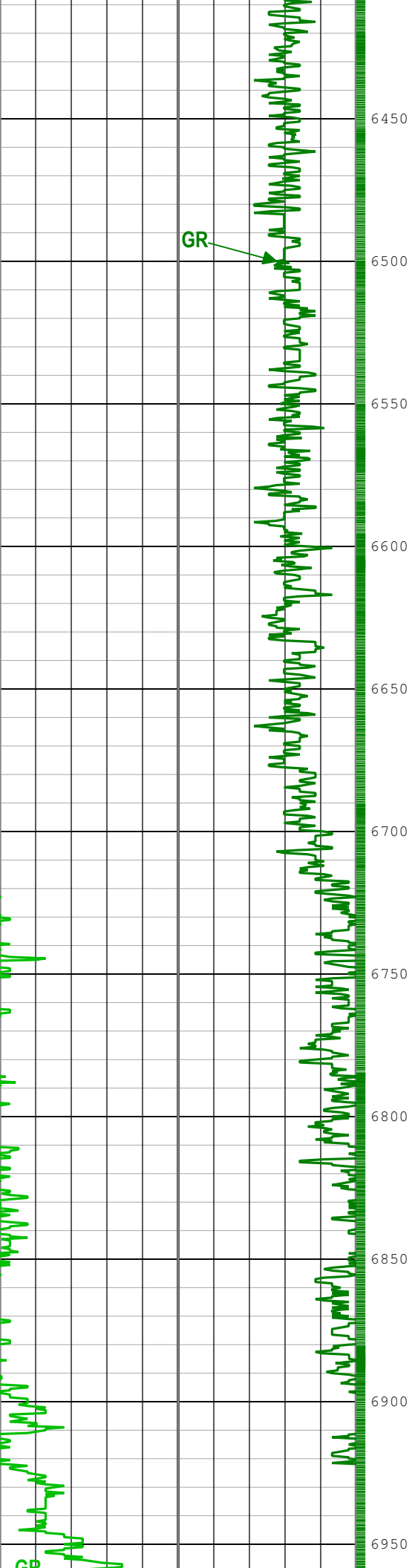


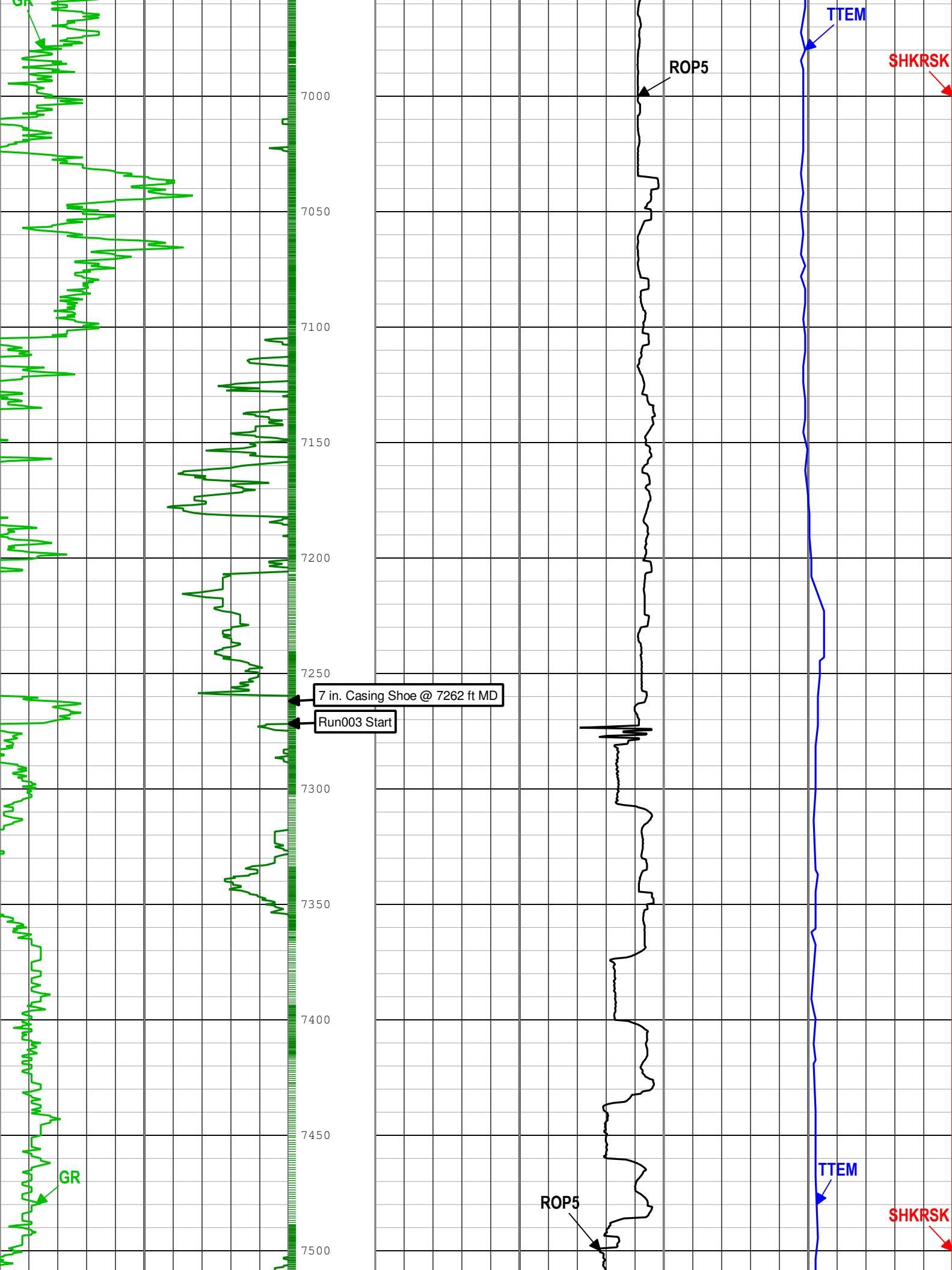


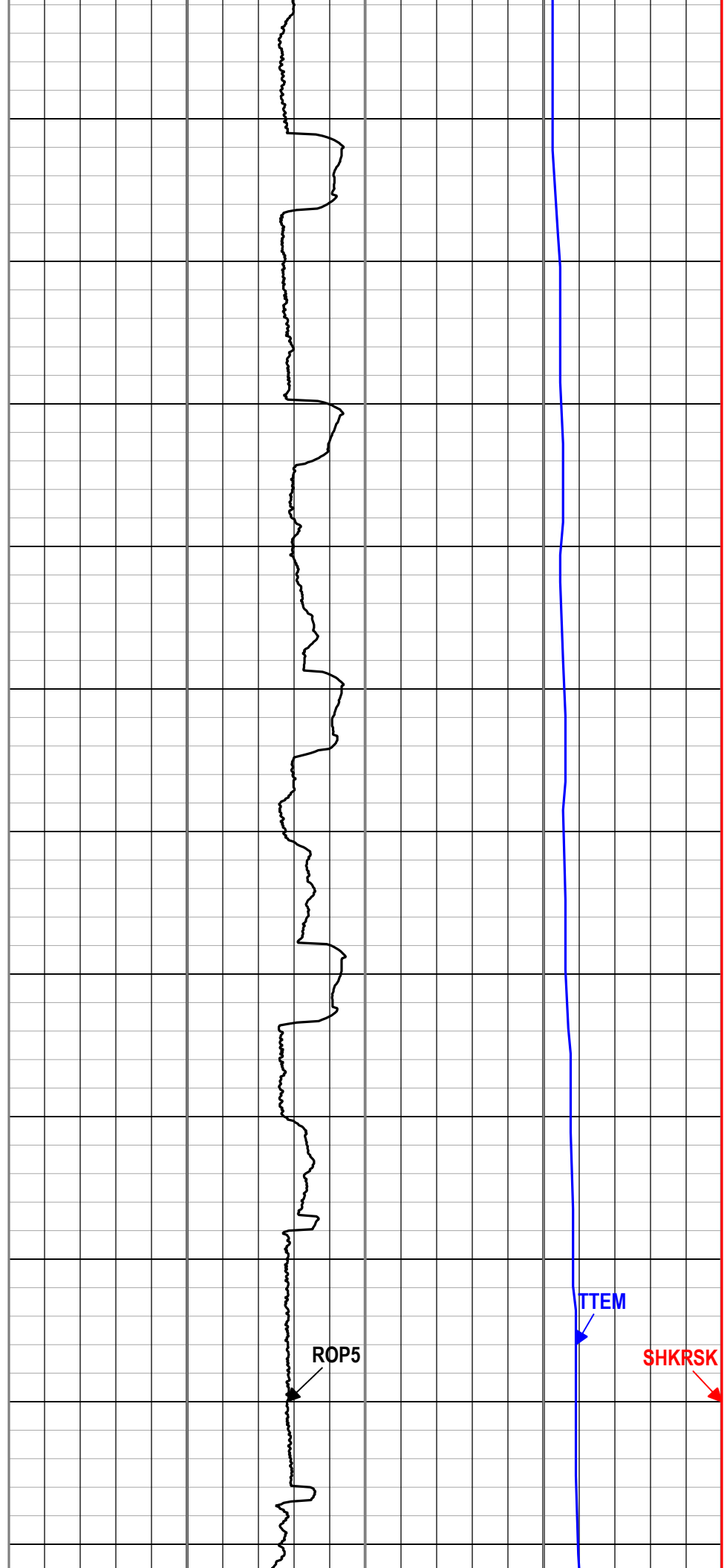
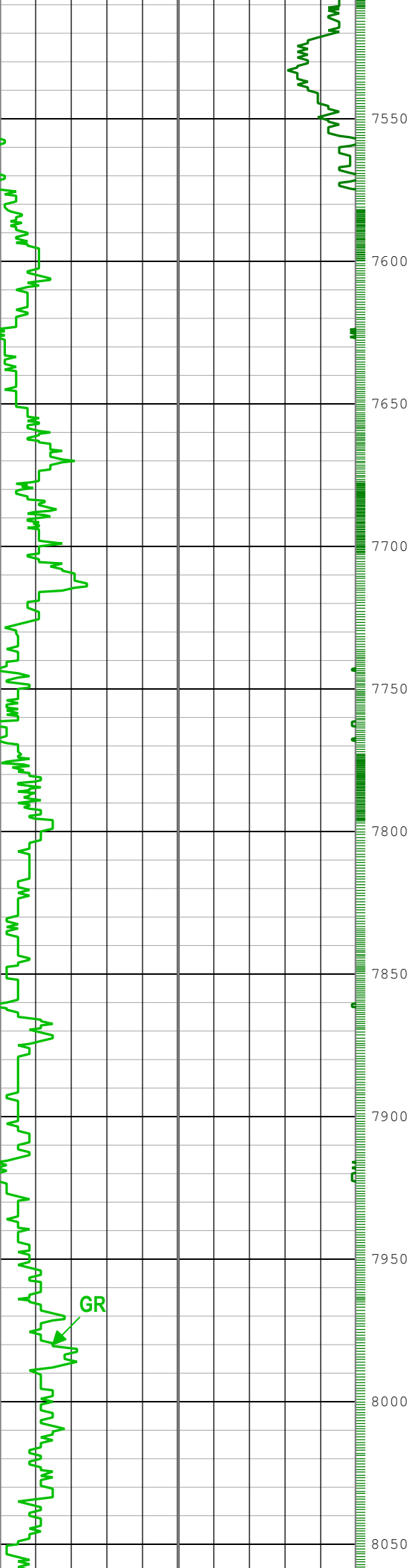


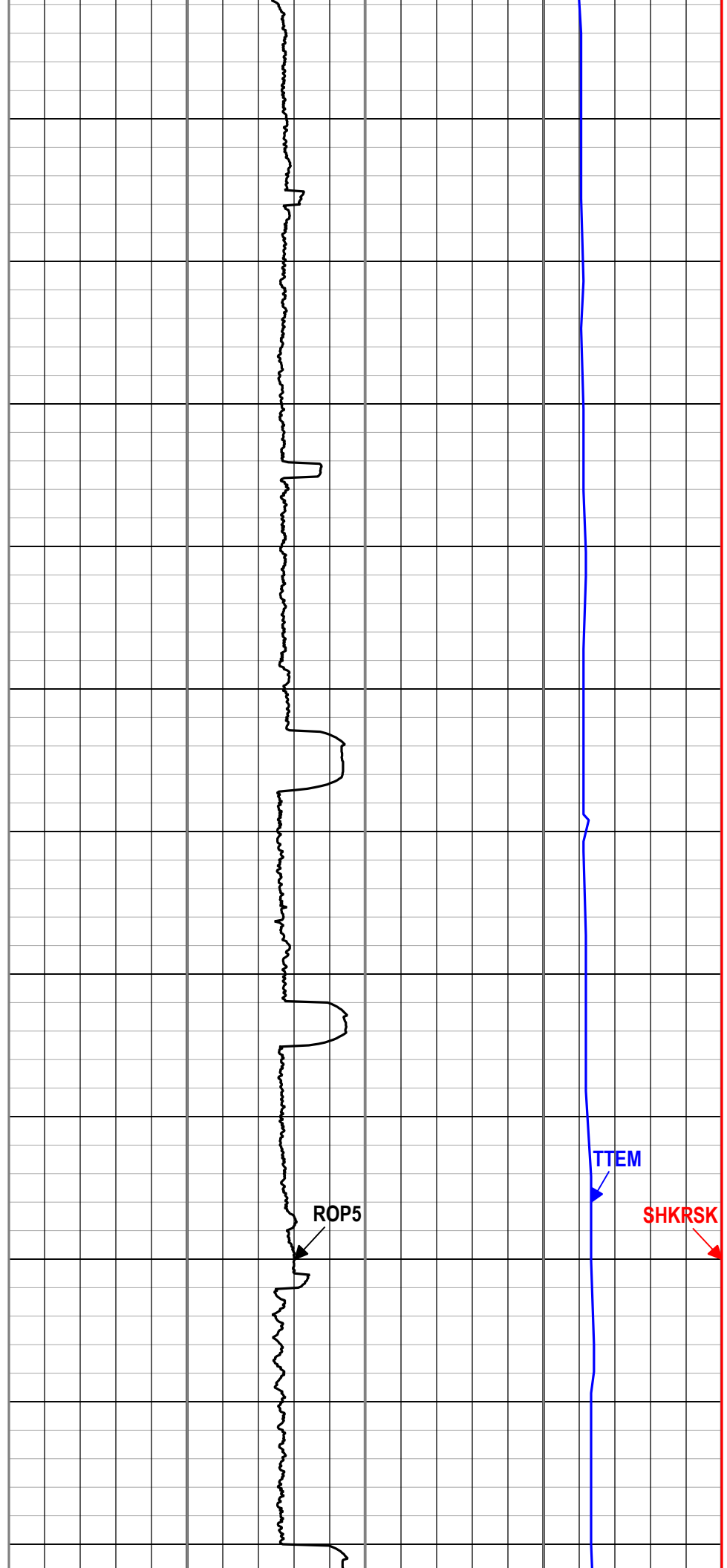
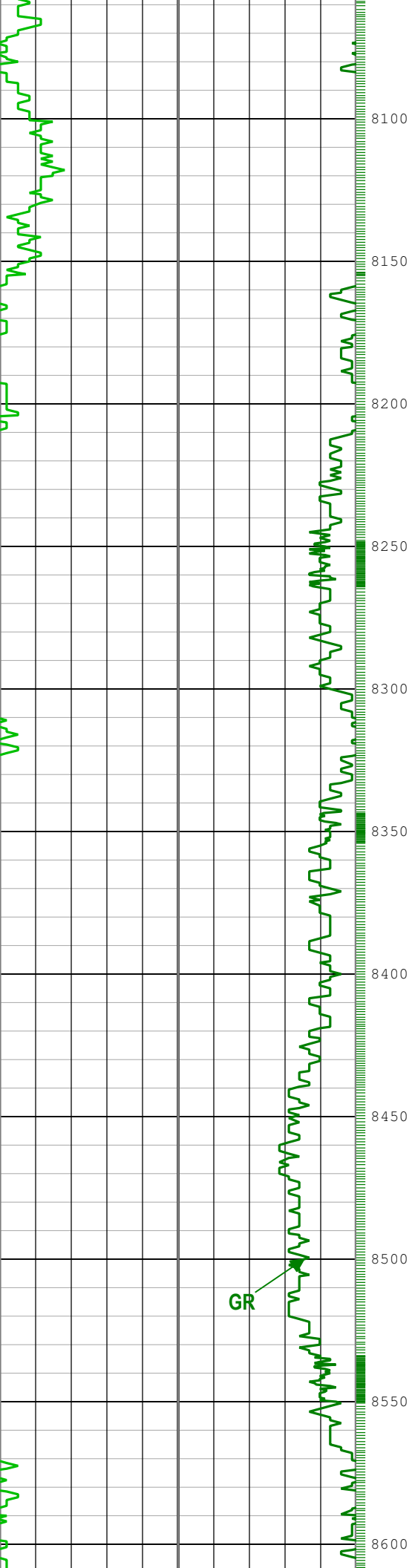


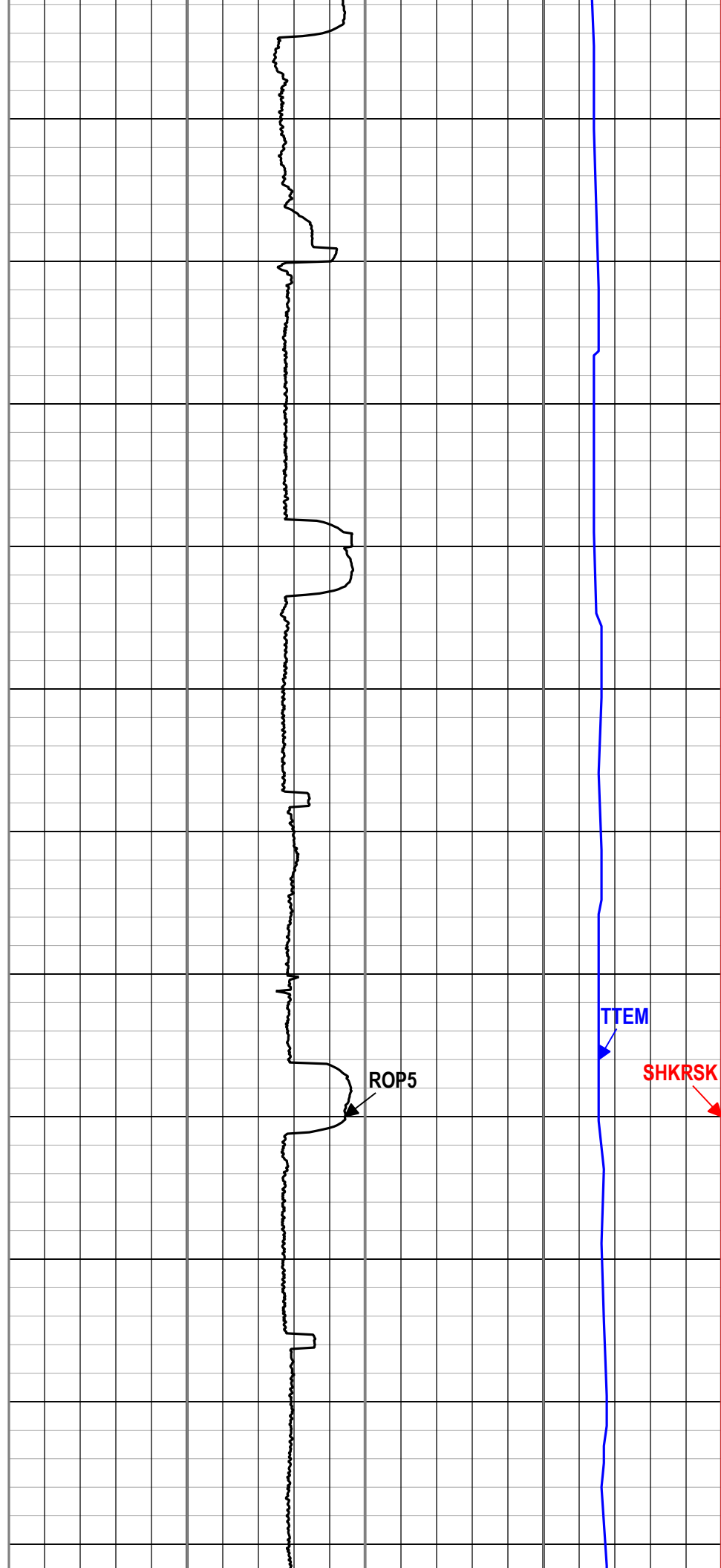
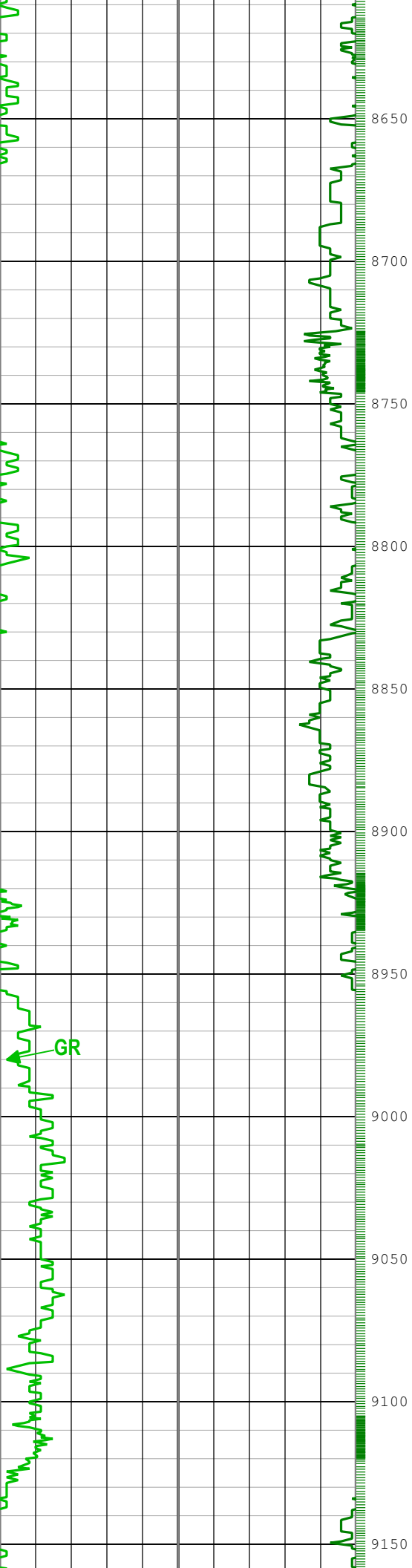


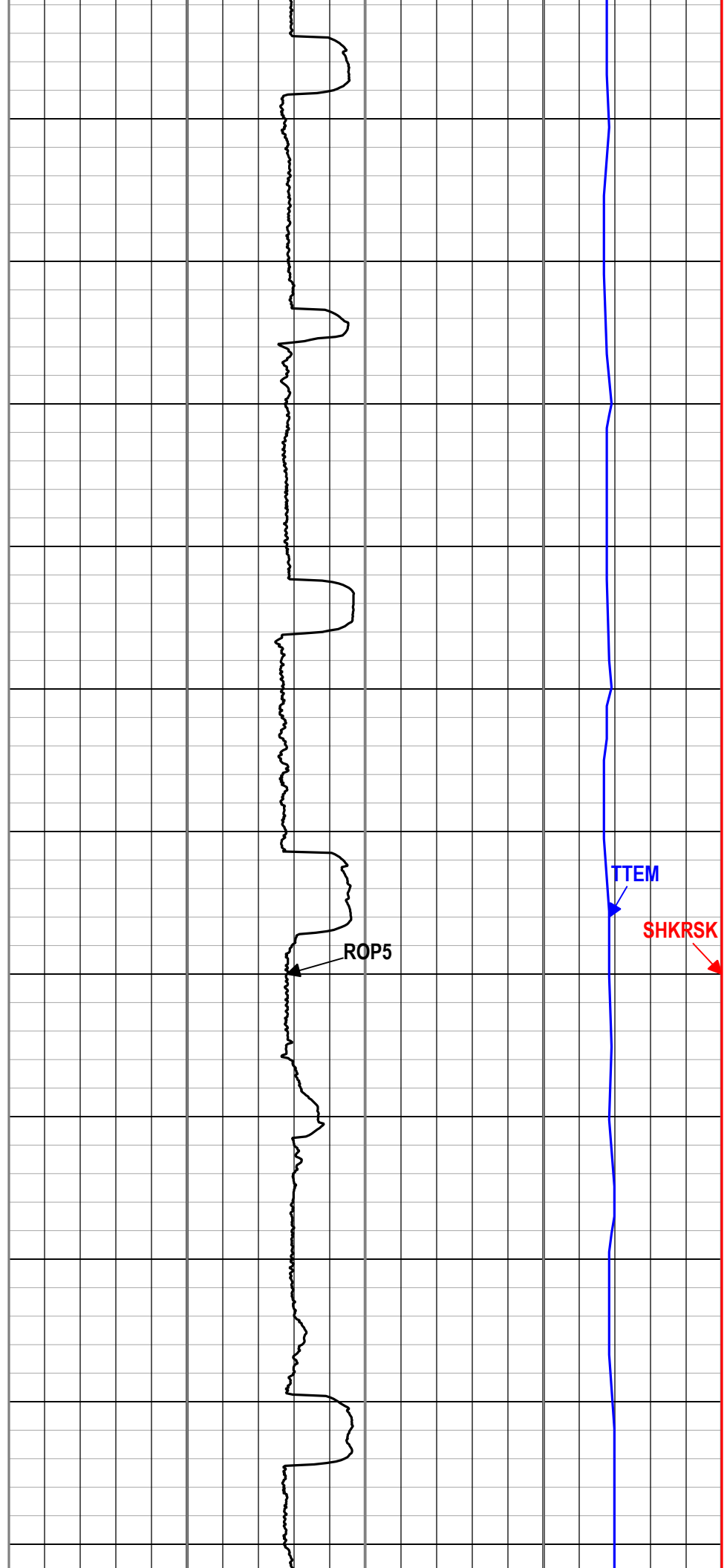
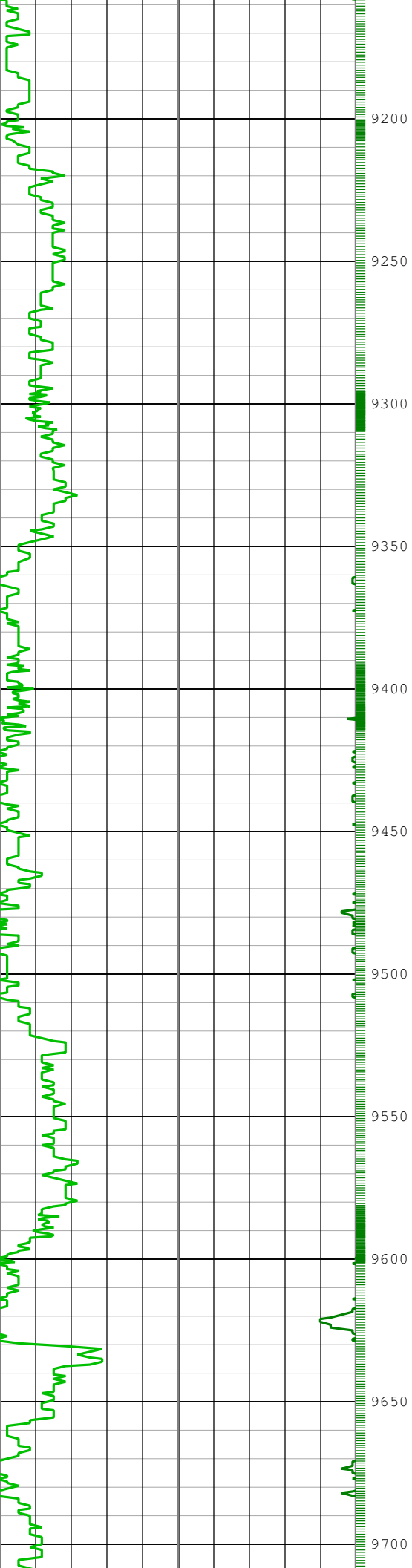








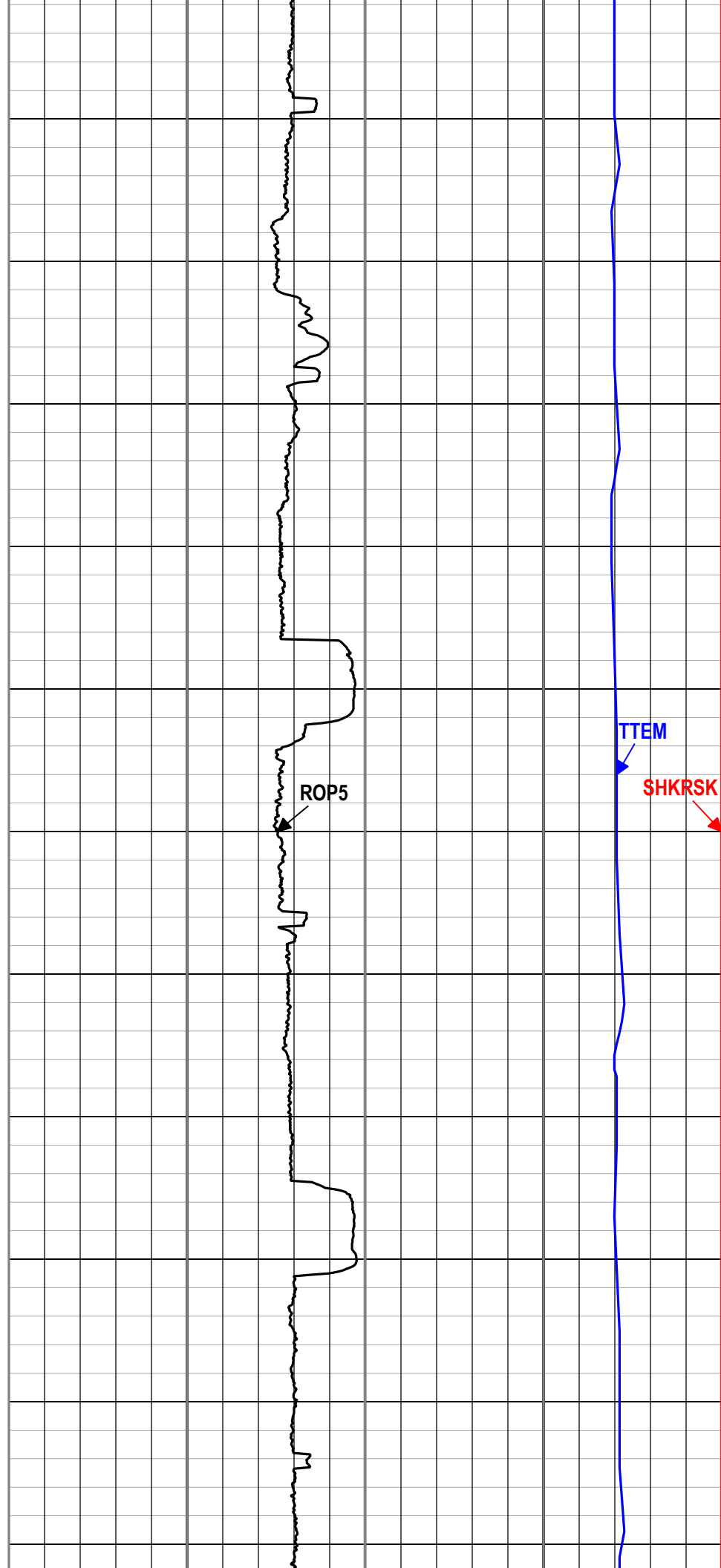
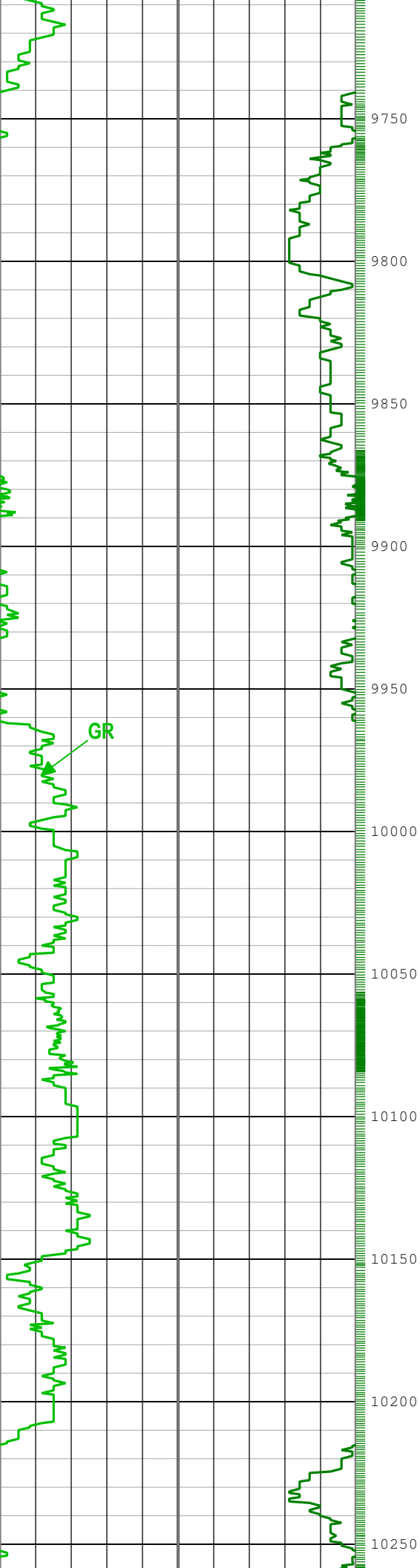


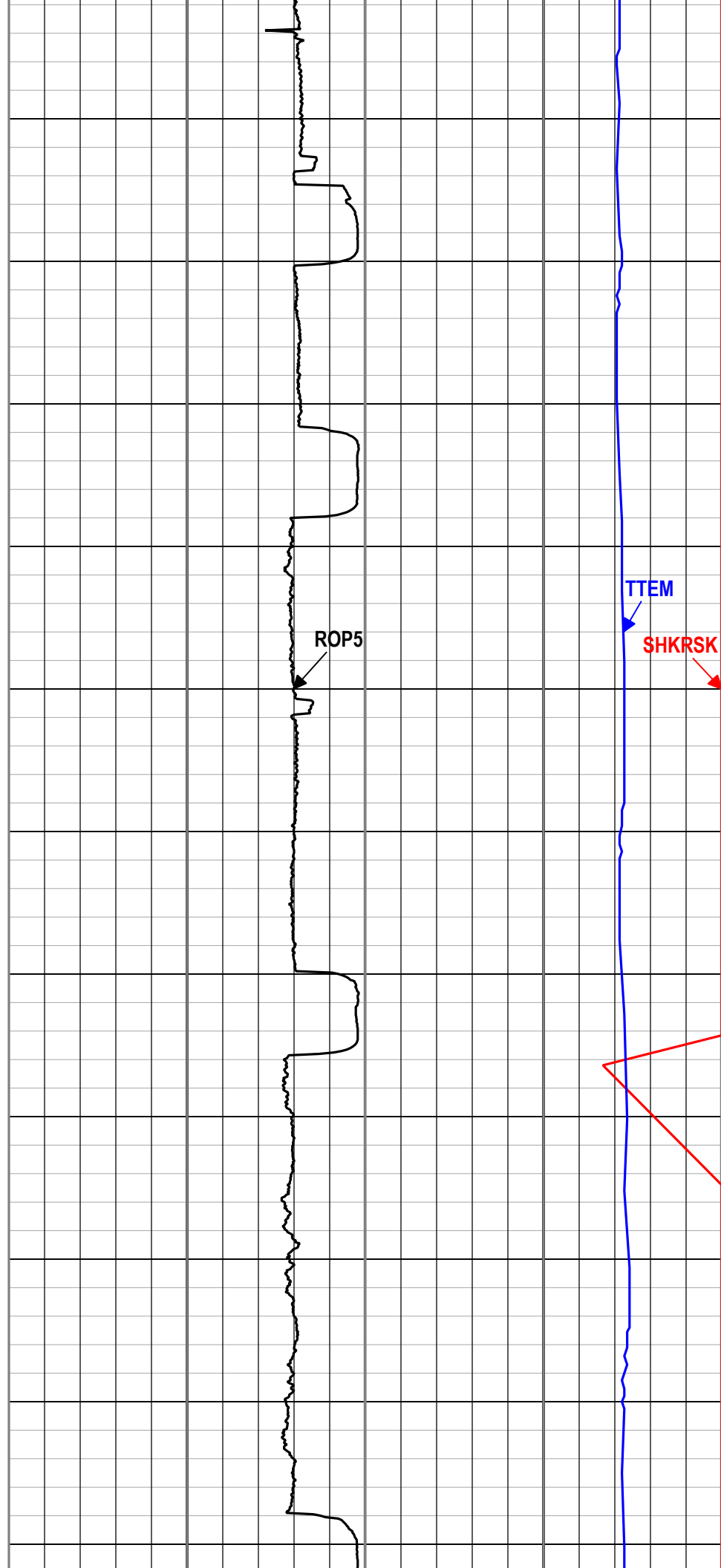
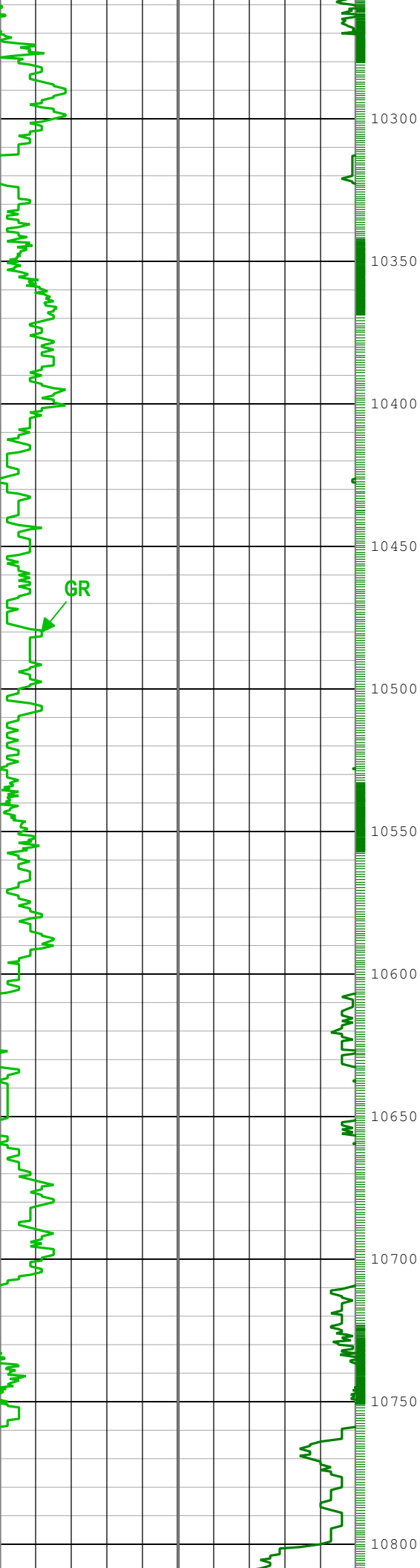


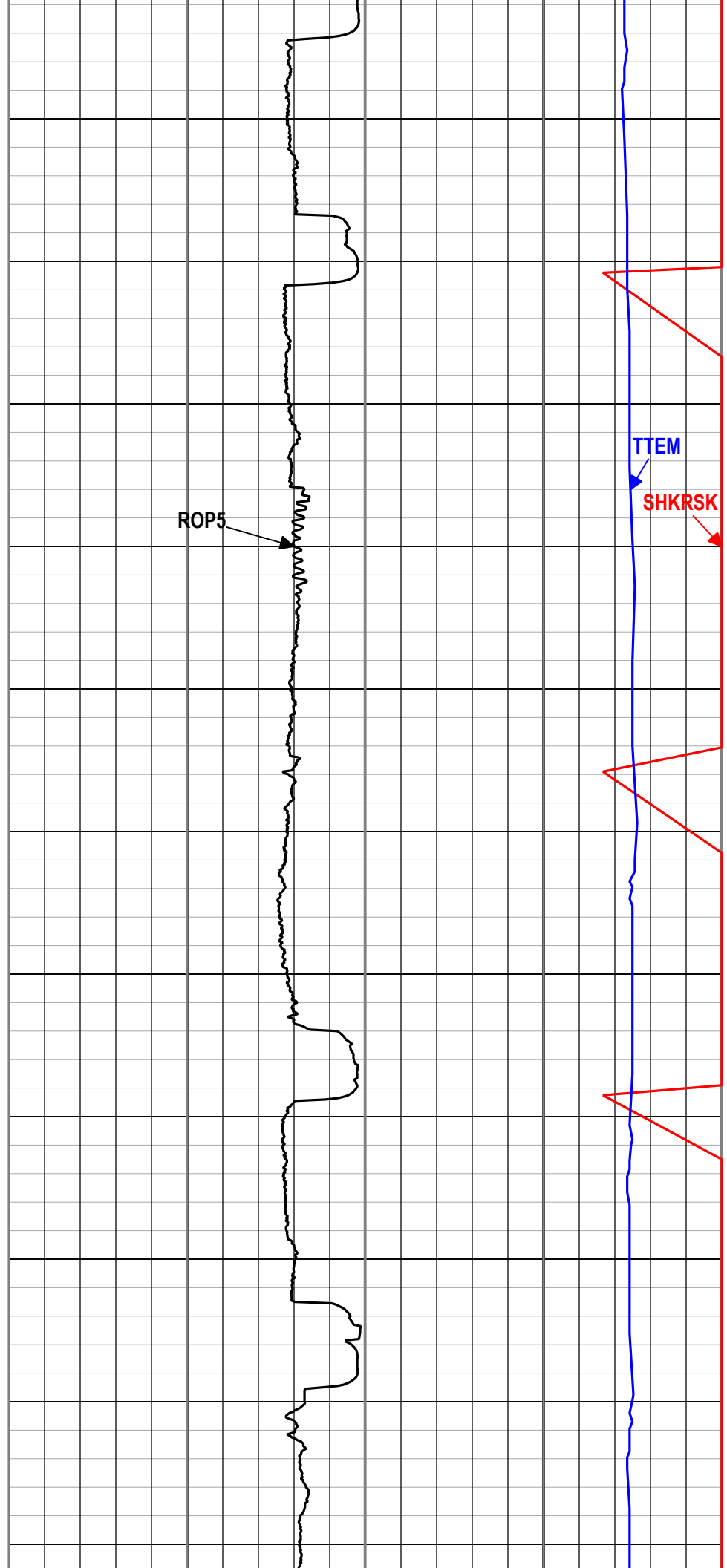
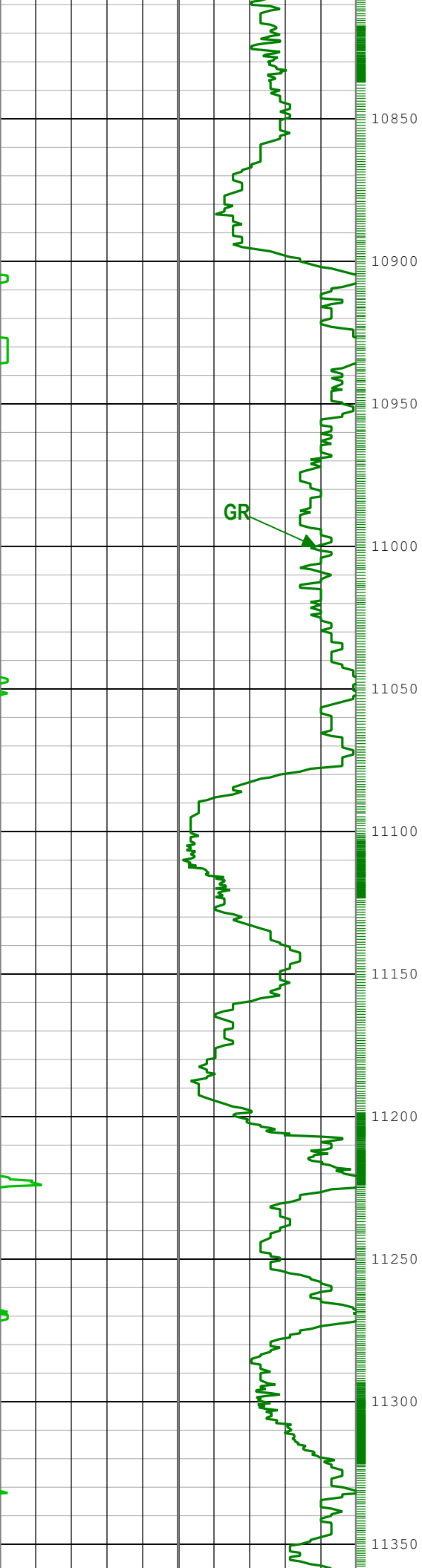
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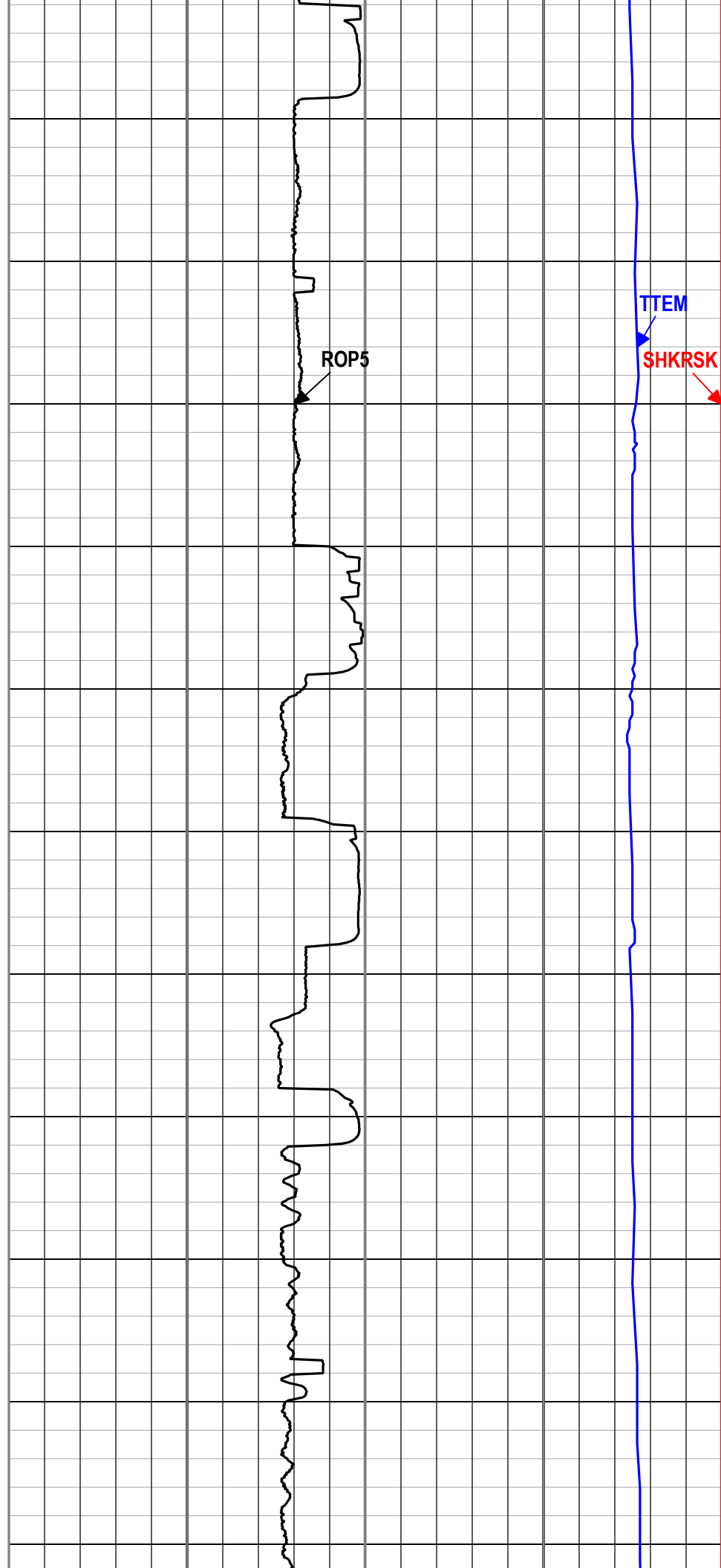
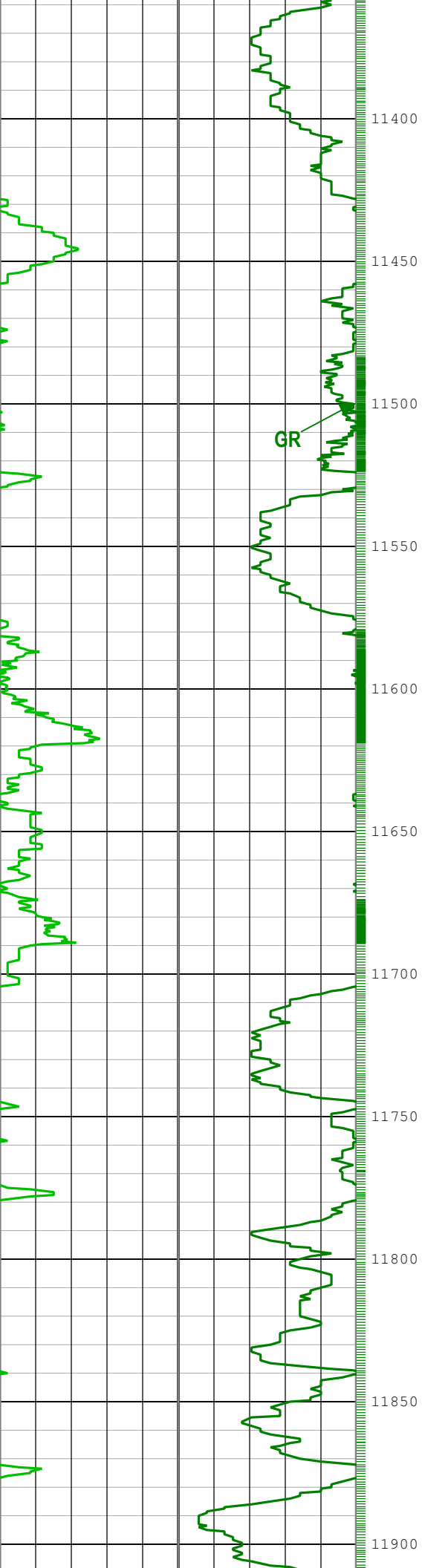
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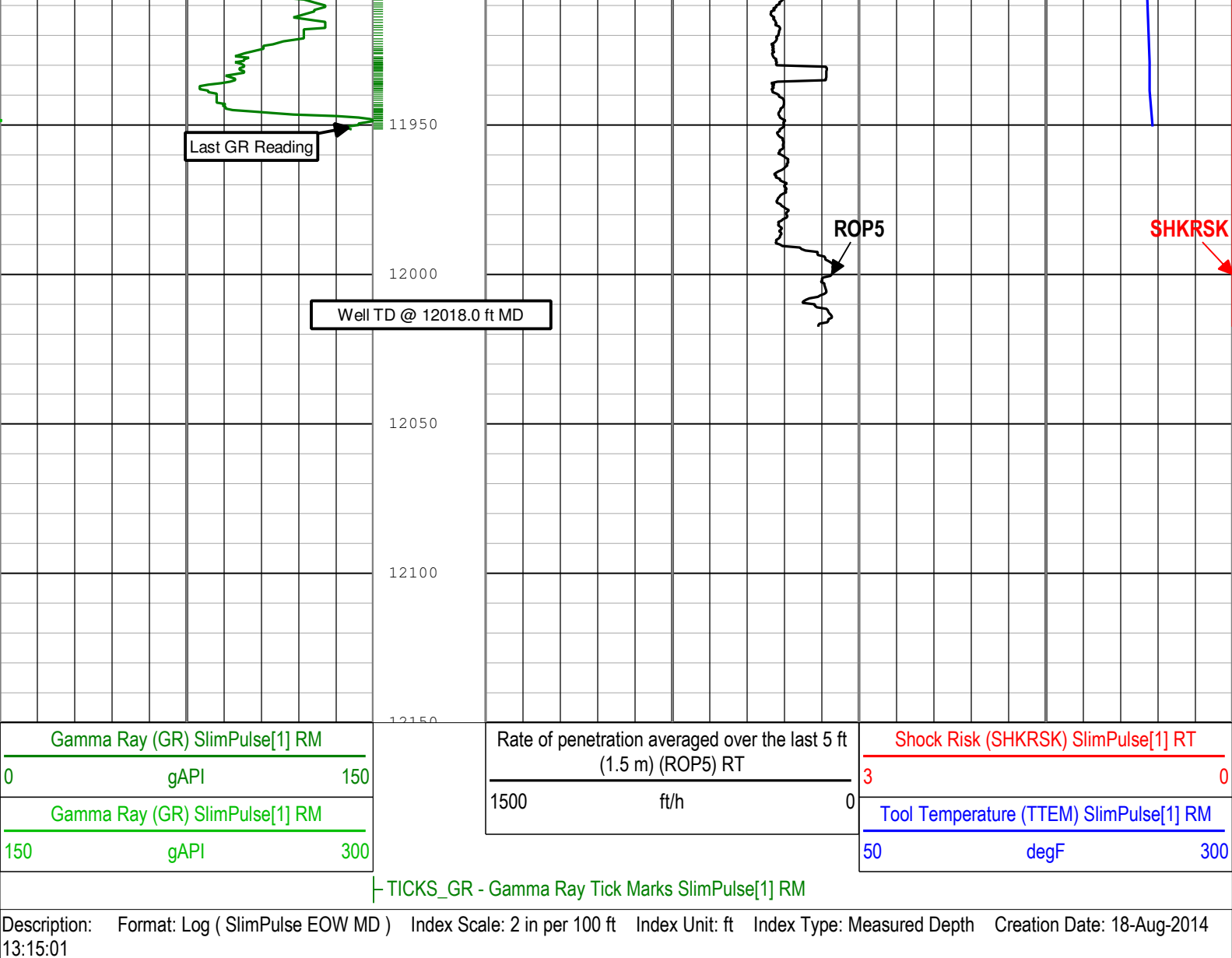
SHKRSK











Description: Format: Log (SlimPulse EOW MD) Index Scale: 2 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2014 13:15:01

Channel Processing Parameters

Run001: Parameters

Parameter	Description	Tool	Value	Unit
BS	Bit Size	DNMSESSION	Depth Zoned	in
DFD	Drilling Fluid Density	Borehole	8.95	lbm/gal
GR_SRC	GR Source Selection	SPULSE-GEN	GAMMA_EXT	

Run001Depth Zoned Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	13.5	533.42	640
BS	8.75	640	6226.83

All depth are actual.

Run002: Parameters

Parameter	Description	Tool	Value	Unit
BS	Bit Size	DNMSESSION	8.75	in
DFD	Drilling Fluid Density	Borehole	10.6	lbm/gal
GR_SRC	GR Source Selection	SPULSE-GEN	GAMMA_EXT	

Run003: Parameters

Parameter	Description	Tool	Value	Unit
BS	Bit Size	DNMSESSION	Depth Zoned	in

	Bit Size	DNMSESSION	Depth Zoned	in
DFD	Drilling Fluid Density	Borehole	Time Zoned	lbm/gal
GR_SRC	GR Source Selection	SPULSE-GEN	GAMMA_EXT	

Run003Depth Zoned Parameters

Parameter	Value	Start (ft)	Stop (ft)
BS	8.75	7161.46	7272
BS	6.125	7272	12017.67

All depth are actual.

Run003Time Zoned Parameters

Pass Drilling

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
DFD	9.85	10-Aug-2014 20:02:51	11-Aug-2014 01:30:00	7272.25	7797.17
DFD	10.2	11-Aug-2014 01:30:00	11-Aug-2014 13:00:00	7797.17	9389.17
DFD	10.3	11-Aug-2014 13:00:00	12-Aug-2014 01:30:00	9389.17	10643.83
DFD	10.35	12-Aug-2014 01:30:00	12-Aug-2014 20:09:31	10643.83	12017.67

All depth are at tool zero.

Tool Control Parameters

Well Composite

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Software Version

Acquisition System	Version
MaxWell	4.0.9163.3000
Application Patch	Patch-SP-10767_22480-4.0.9163.3001
	Patch-NPD_ADN8D_SP3-23661-4.0.9530.3002
	Patch-Hotfix_overwrite_survey_for_petrolink-23199-4.0.9530.3002
	Patch-Hotfix_MRT_SP3-23306-4.0.9530.3002

Tool Elements	Description	Software Version	Firmware Version
DRILLING_SURFACE	DRILLING_SURFACE	4.0.9469.3000	
SPEC	SlimPulse Electronics Cartridge	4.0.9469.3000	

Composite Summary

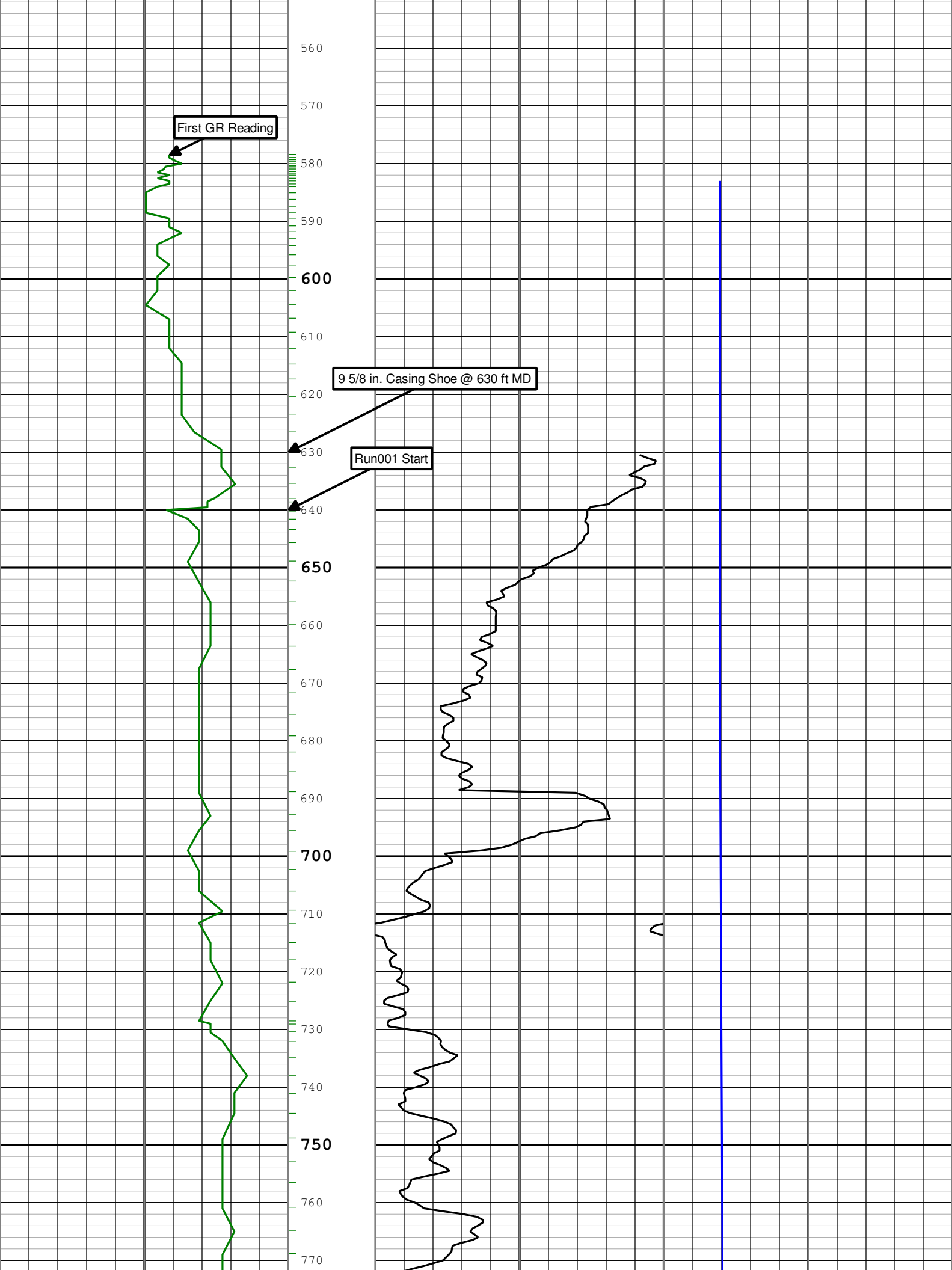
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	Include Parallel Data
Run001	Drilling	Down	629.08 ft	6226.83 ft	07-Aug-2014 12:29:33 AM	08-Aug-2014 12:49:11 AM	No
Run002	Drilling	Down	6226.83 ft	7272.92 ft	08-Aug-2014 5:38:30 AM	09-Aug-2014 6:01:51 AM	No
Run003	Drilling	Down	7272.25 ft	12017.67 ft	10-Aug-2014 8:02:51 PM	12-Aug-2014 8:09:31 PM	No

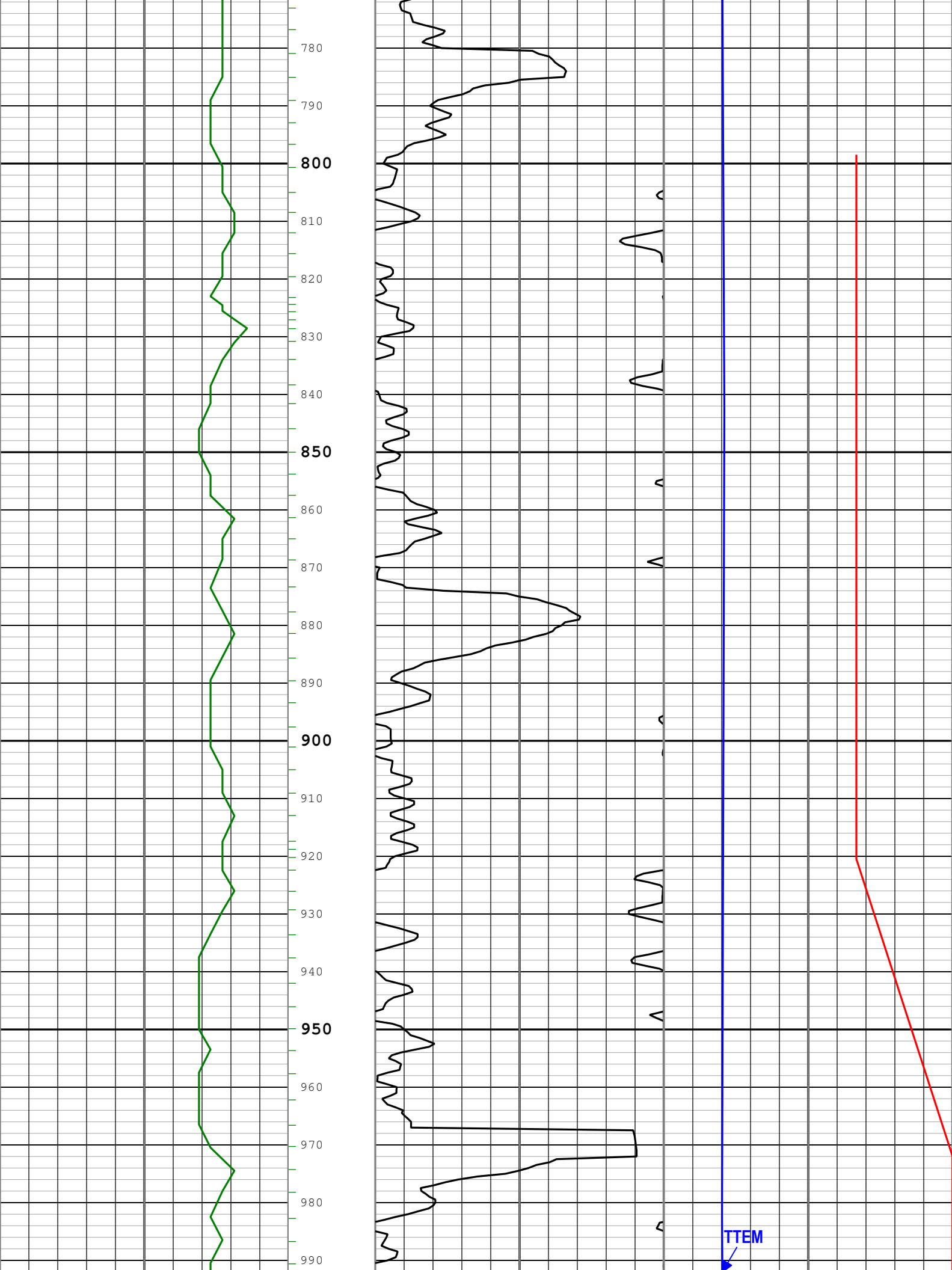
All depths are referenced to toolstring zero

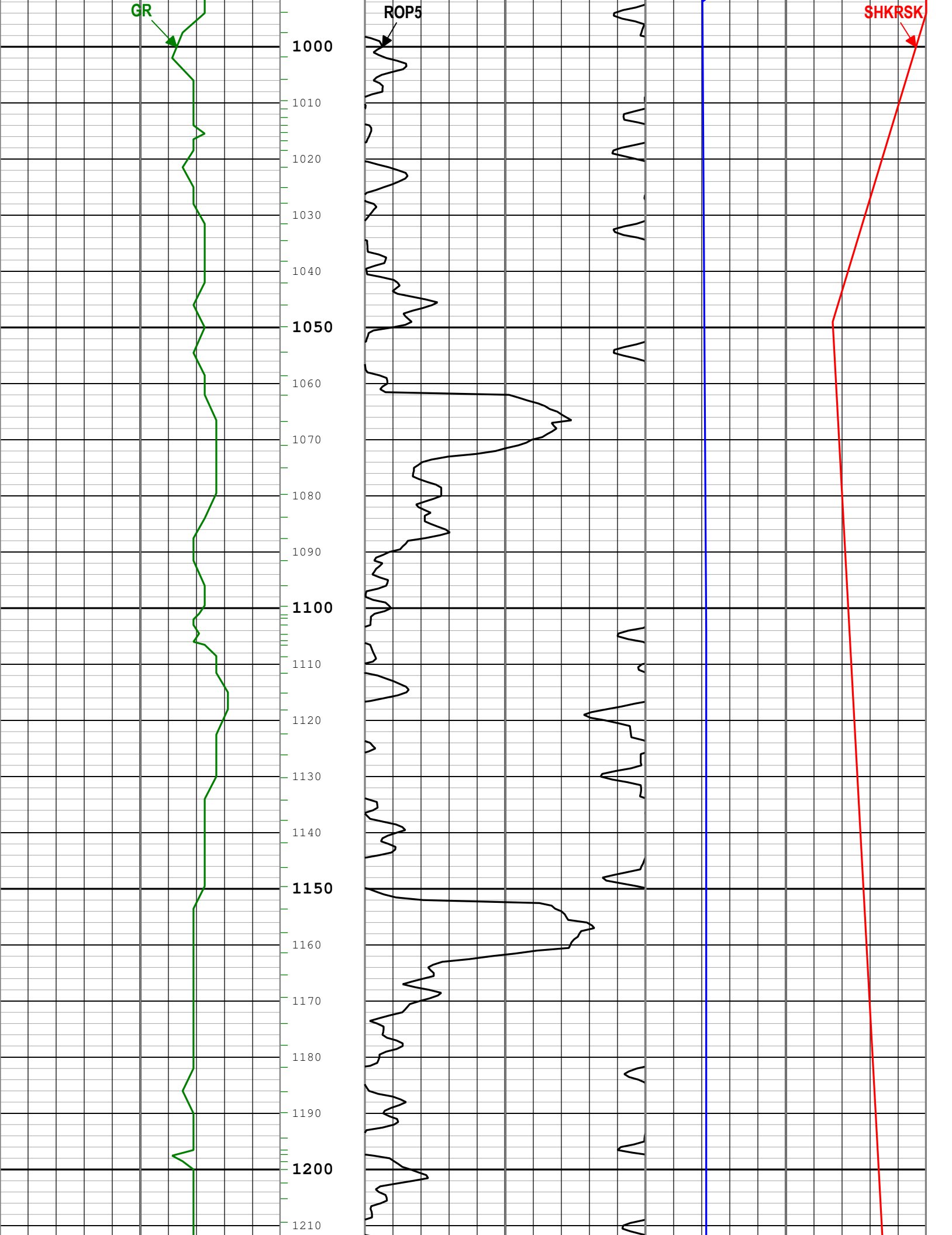
Log	Company:Noble Energy INC	Well:Five Rivers K09-66-1HN
		Well Composite:S322

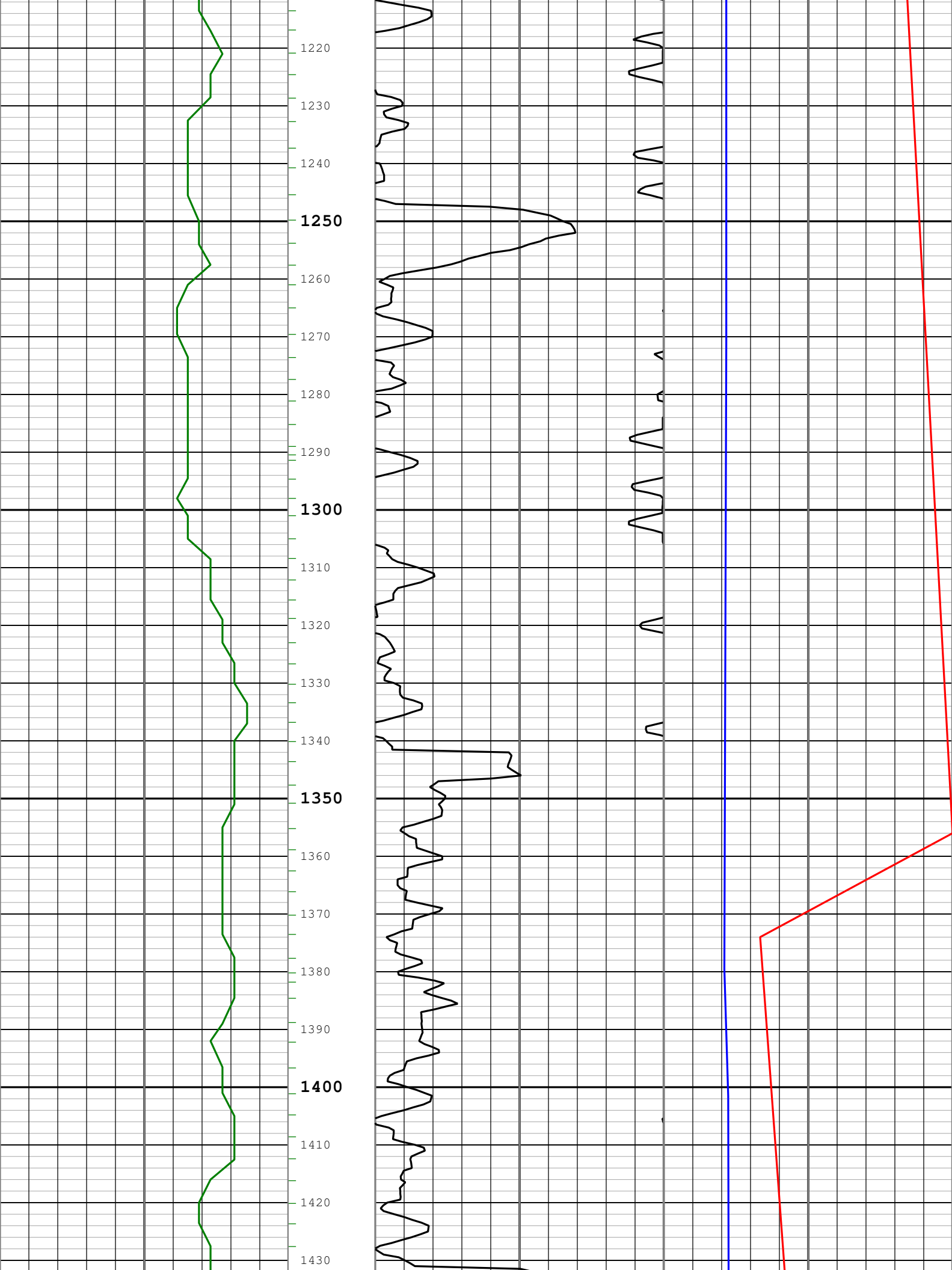
Description: Format: Log (SlimPulse EOW MD) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 18-Aug-2014 13:15:04

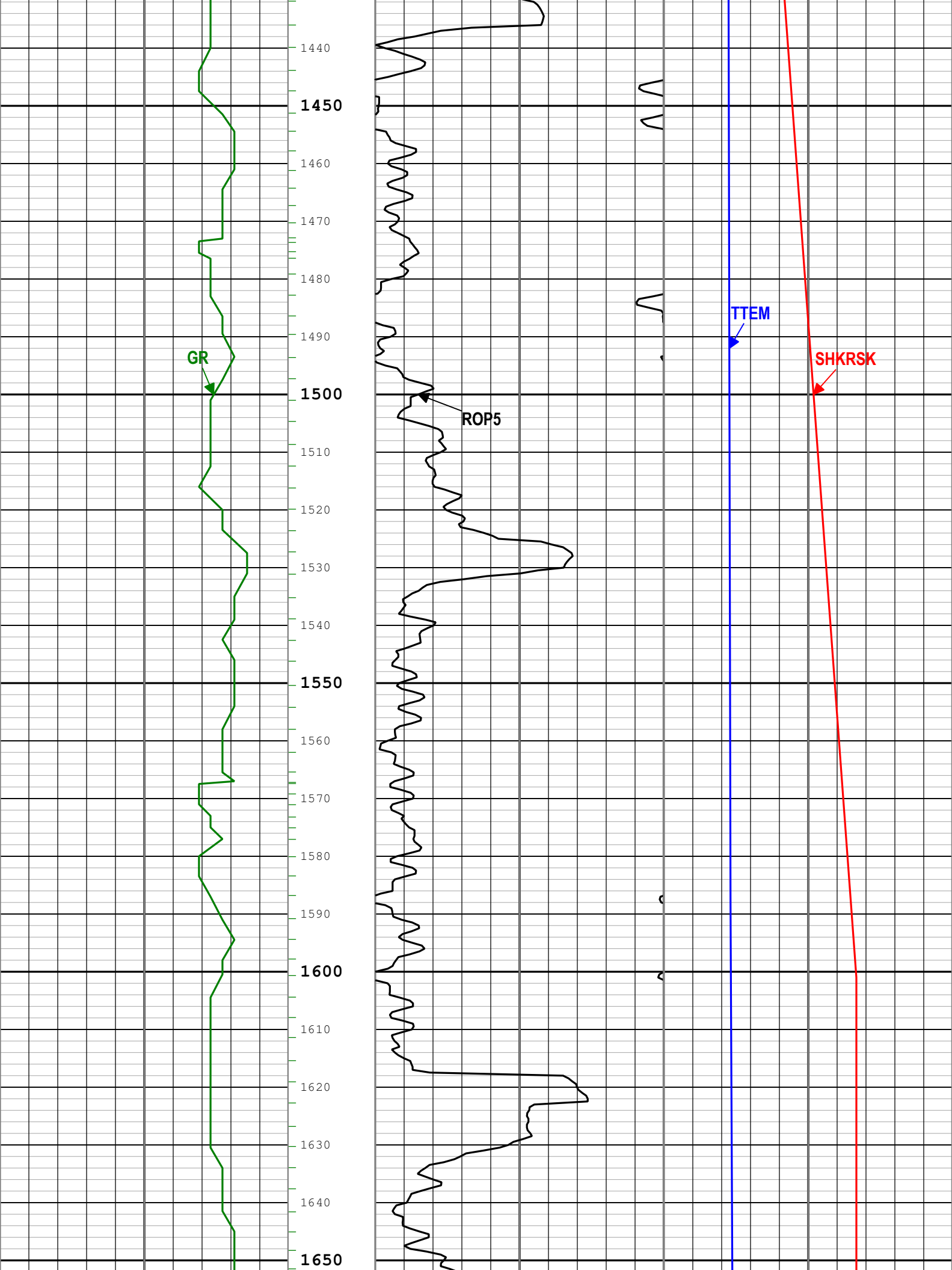
└─ TICKS_GR - Gamma Ray Tick Marks SlimPulse[1] RM									
Gamma Ray (GR) SlimPulse[1] RM			Shock Risk (SHKRSK) SlimPulse[1] RT						
0 gAPI 150			Rate of penetration averaged over the last 5 ft (1.5 m) (ROP5) RT			3 0			
Gamma Ray (GR) SlimPulse[1] RM			1500 ft/h 0			Tool Temperature (TTEM) SlimPulse[1] RM			
150 gAPI 300						50 degF 300			

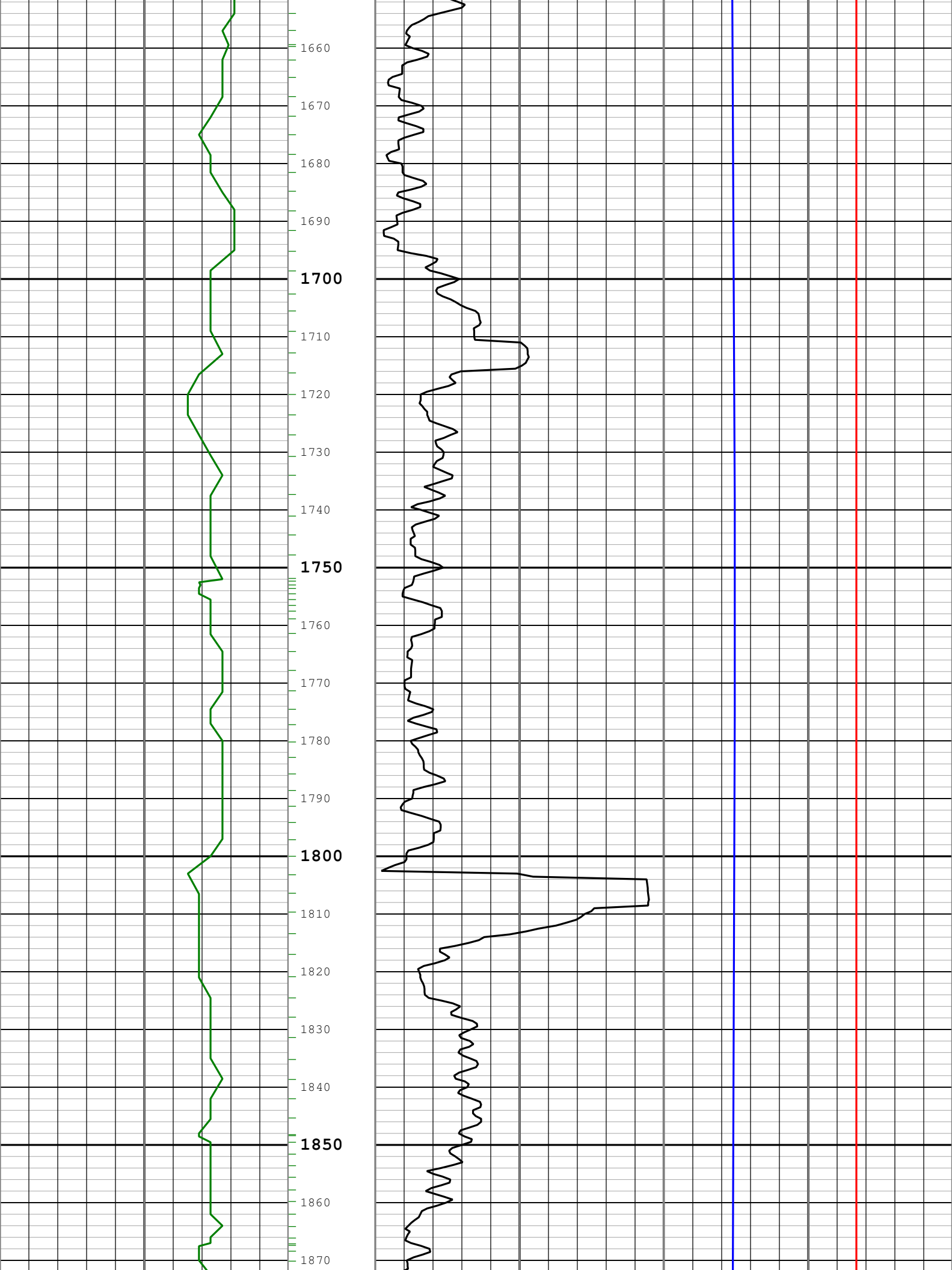


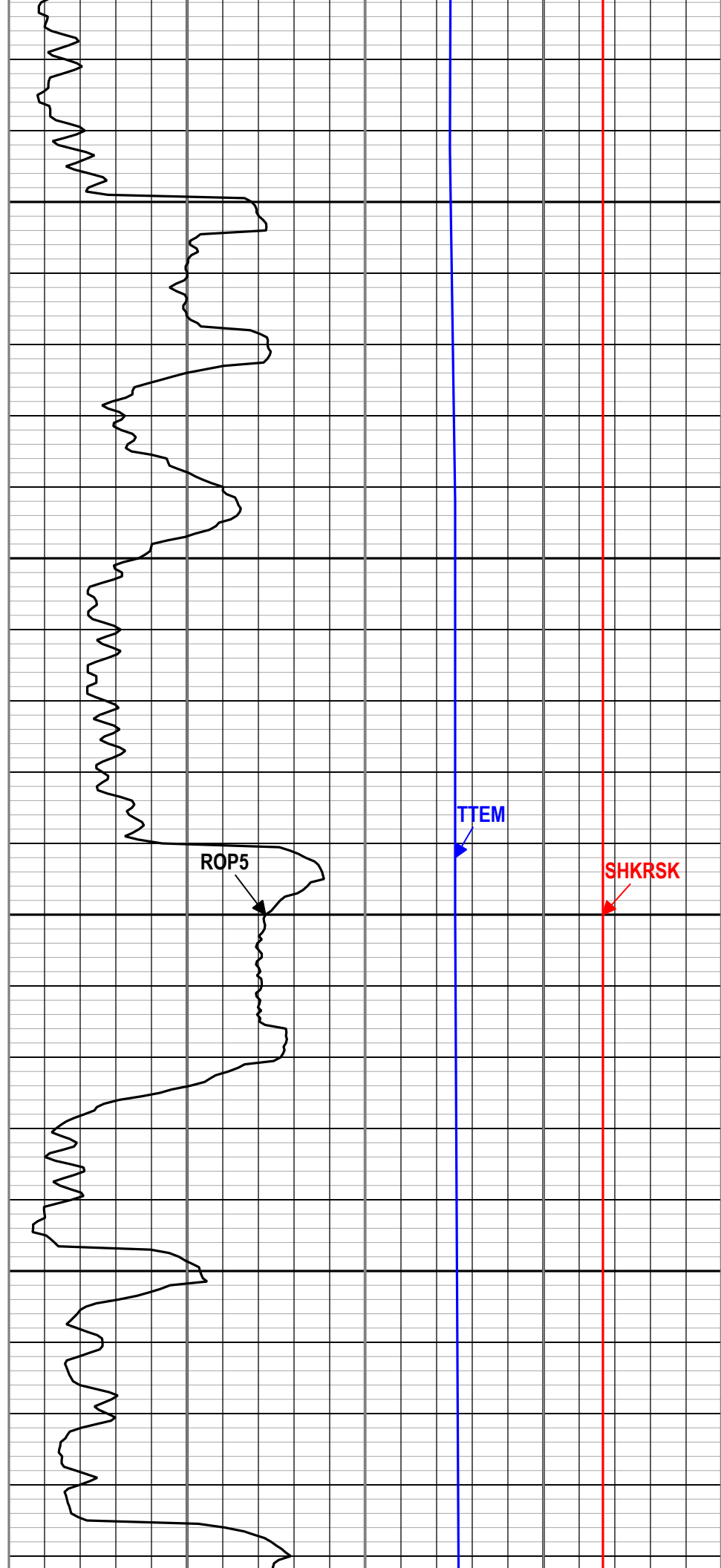
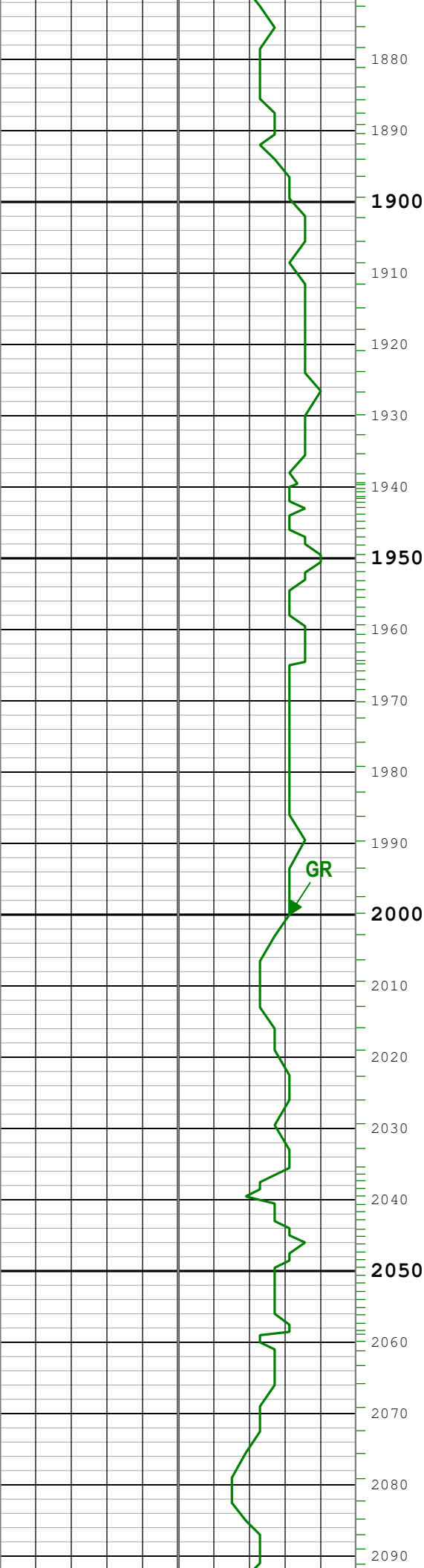


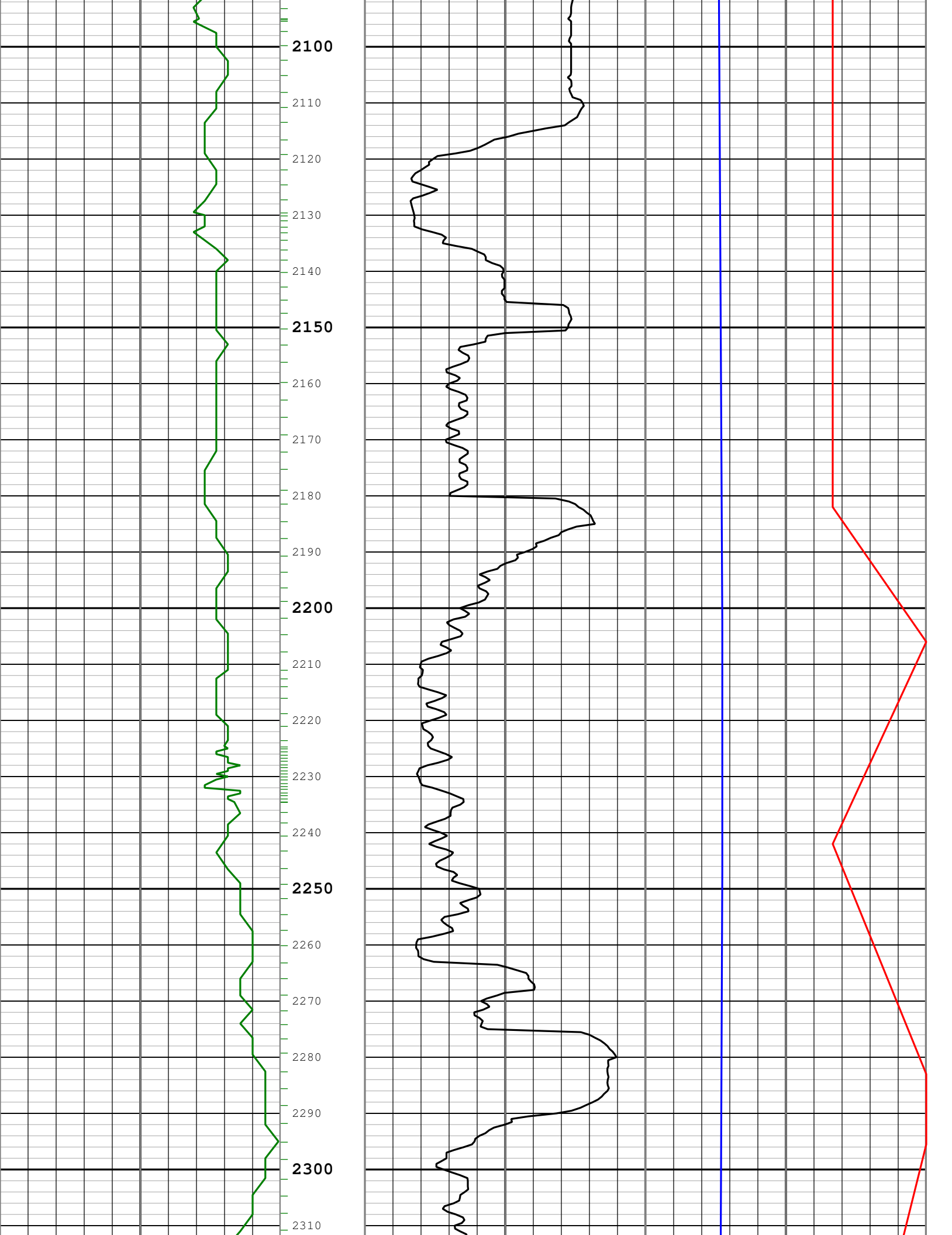


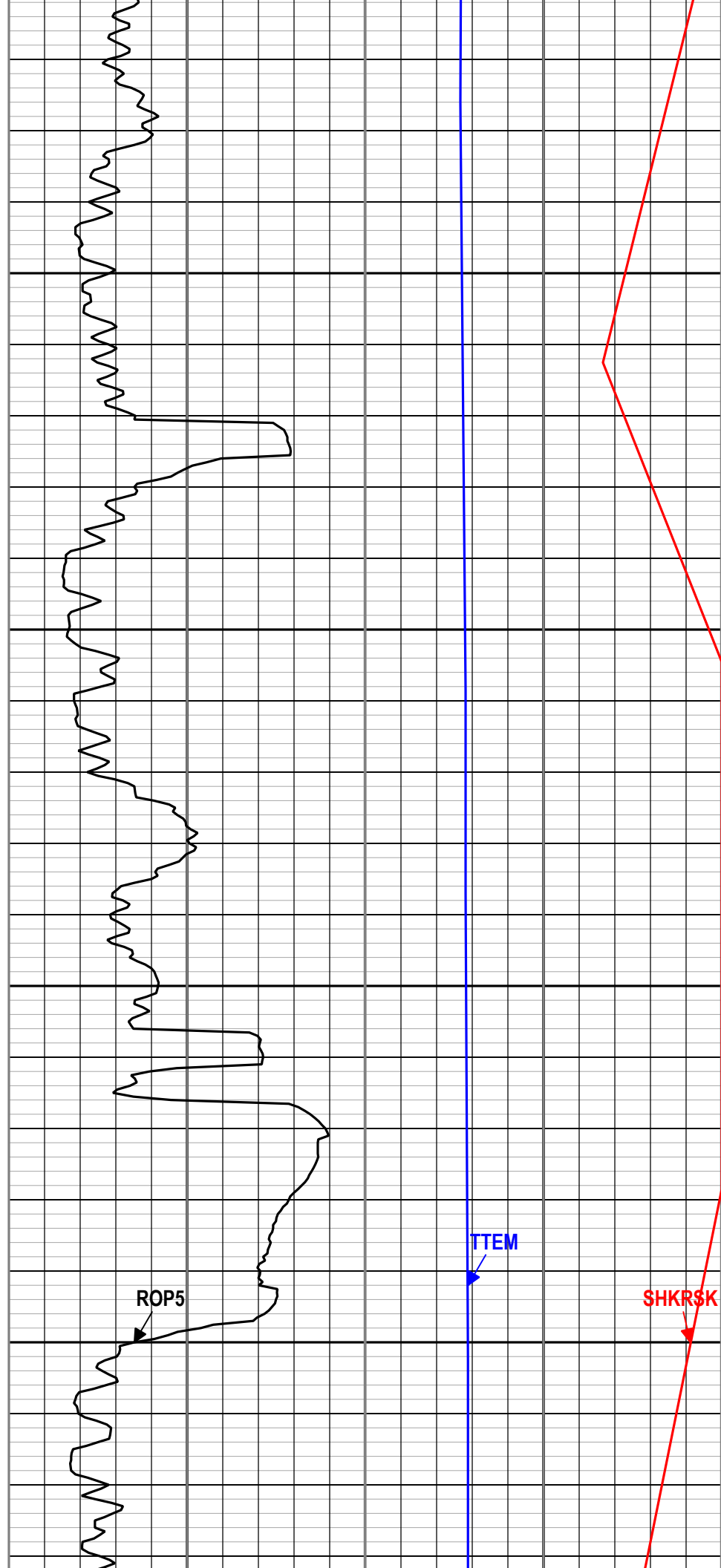
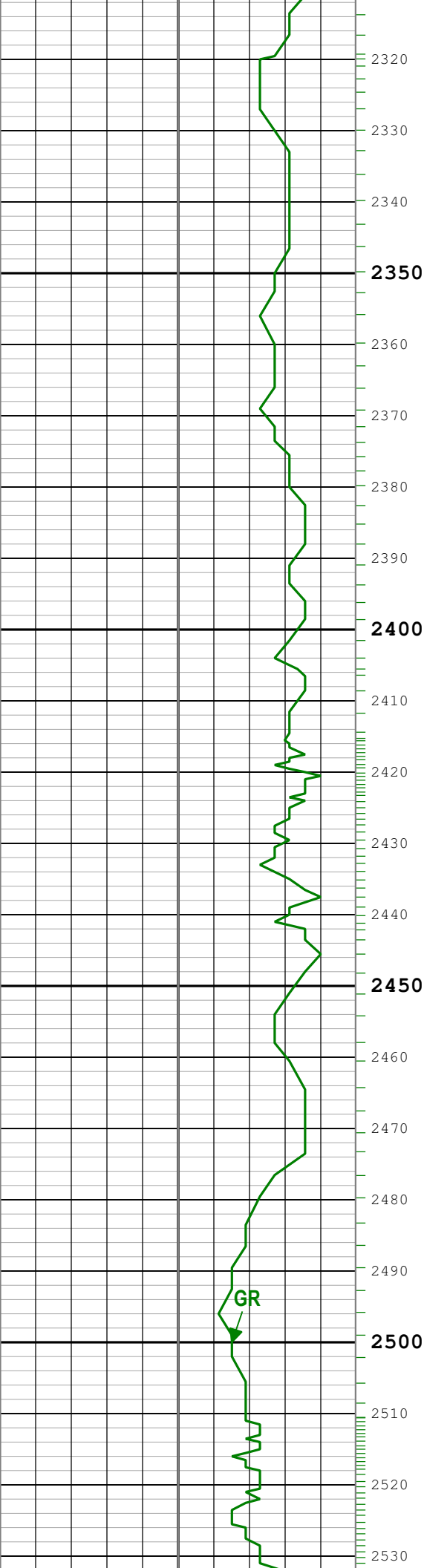


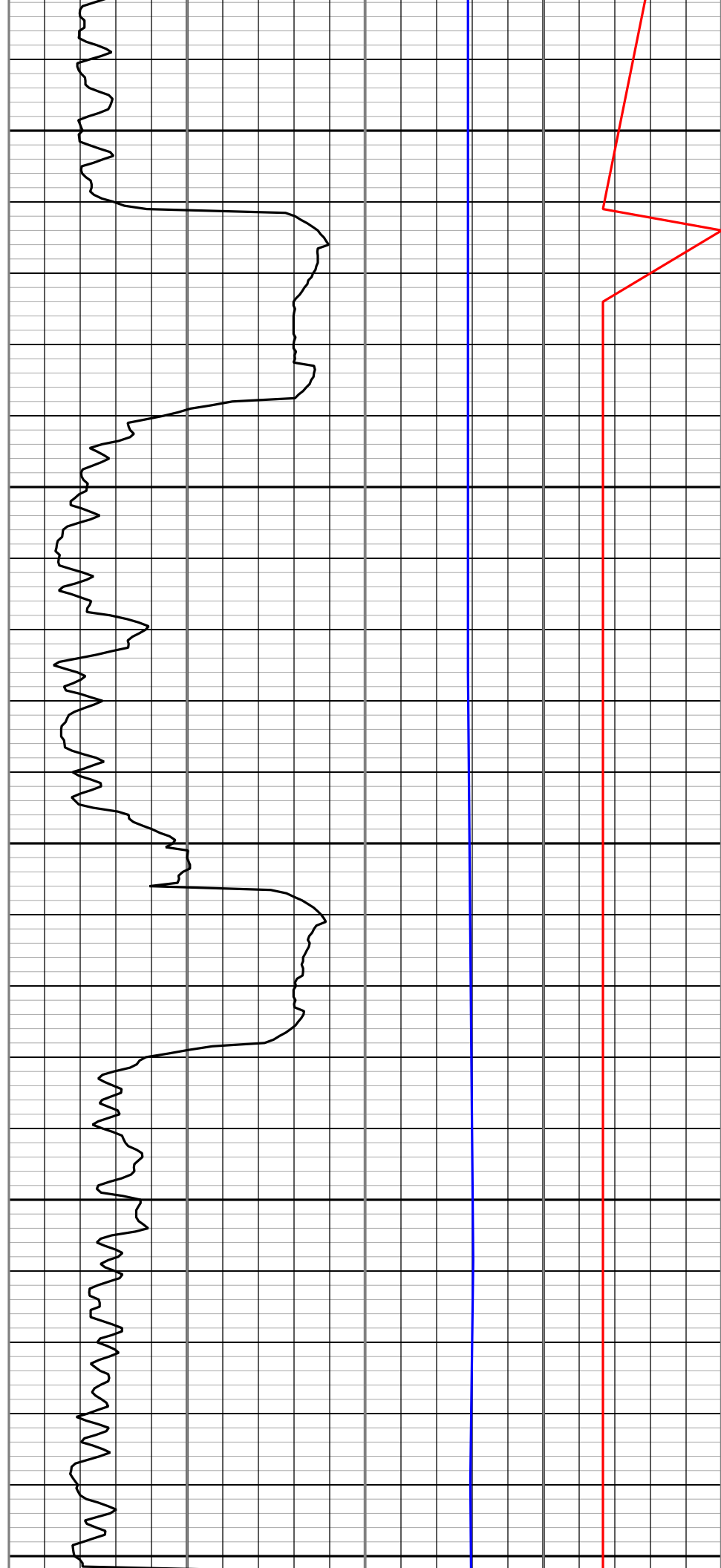
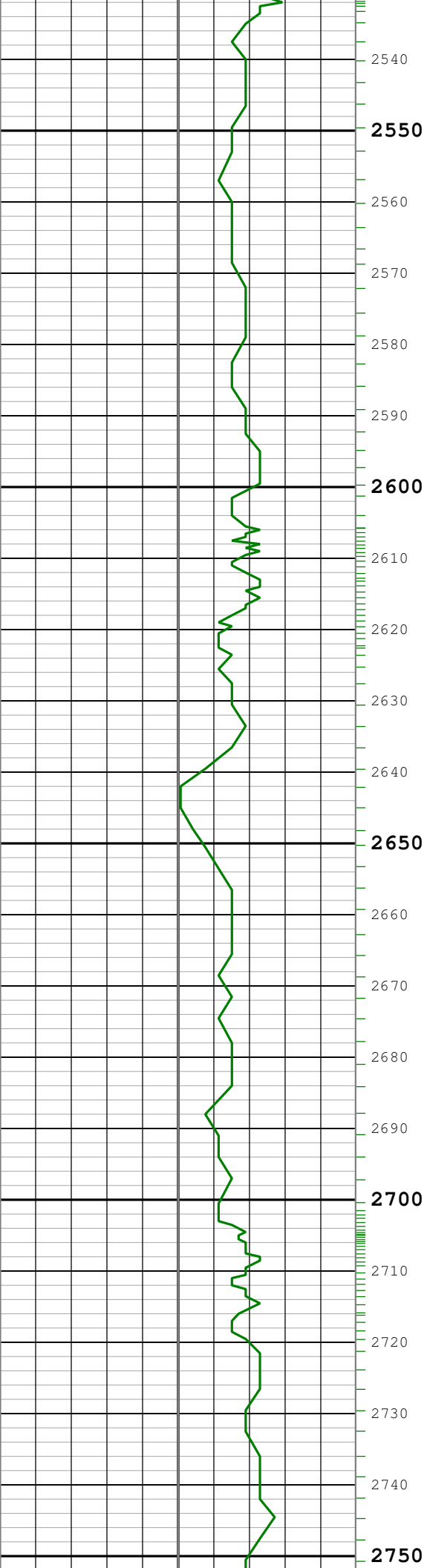


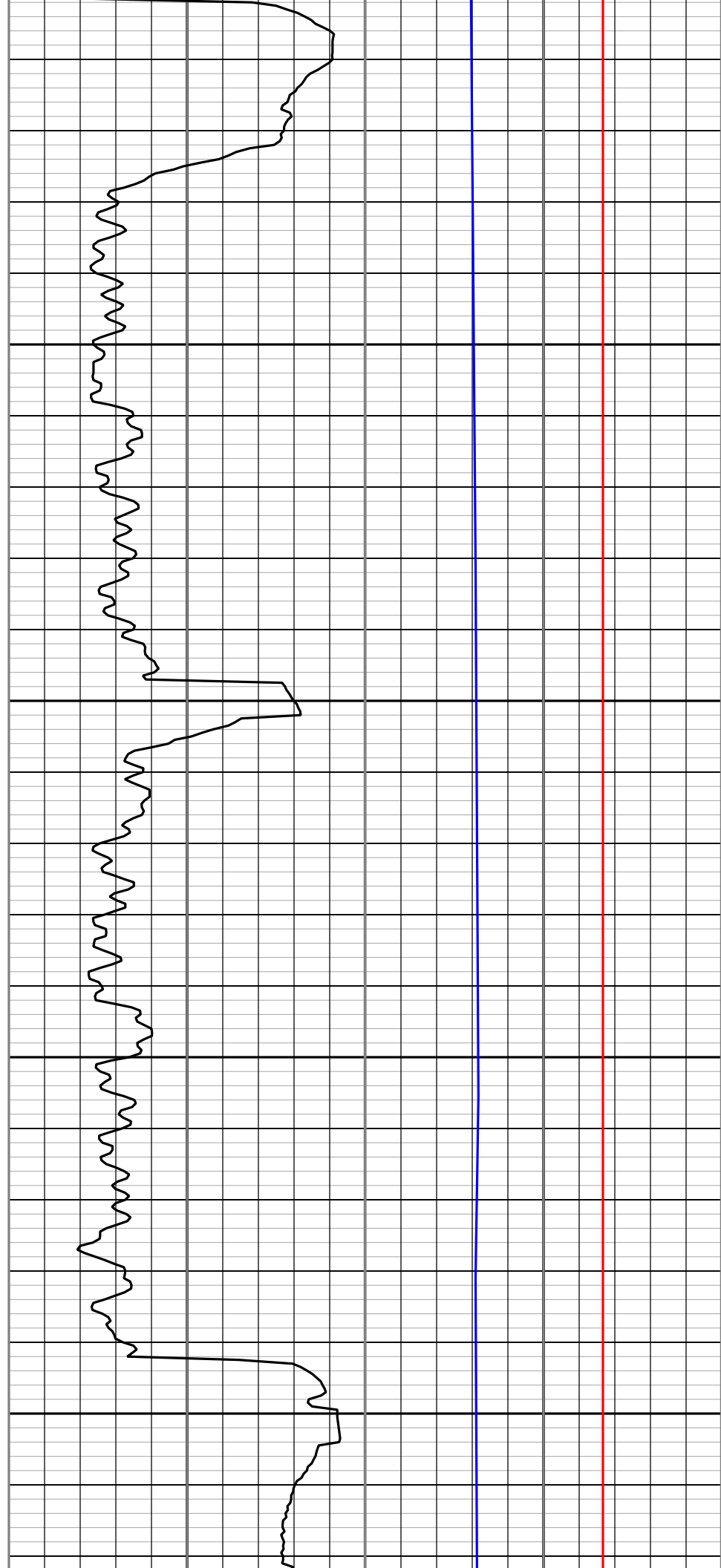
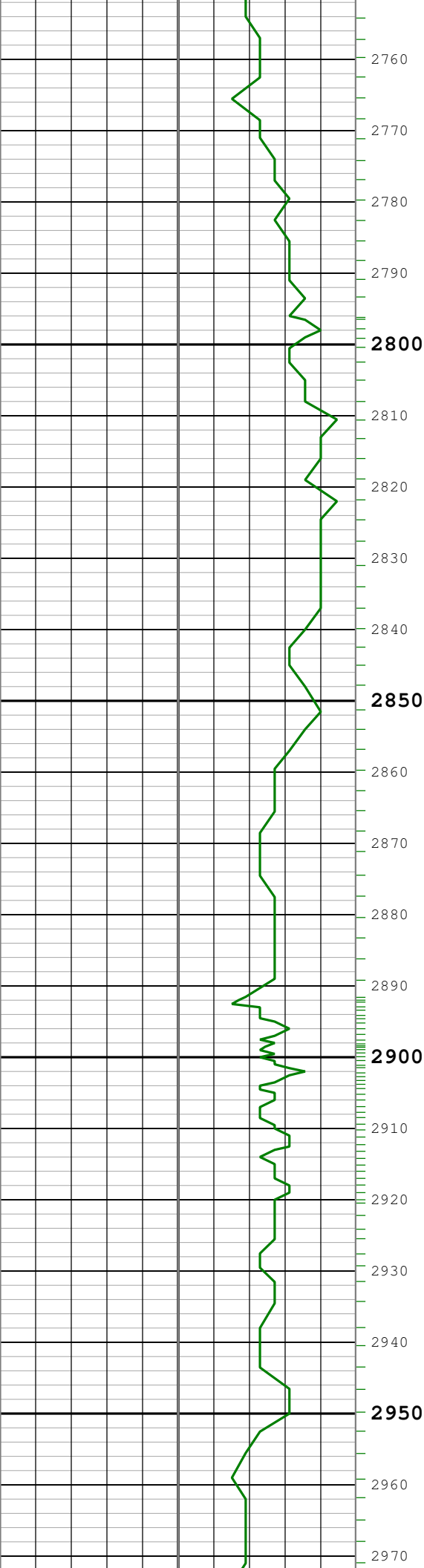


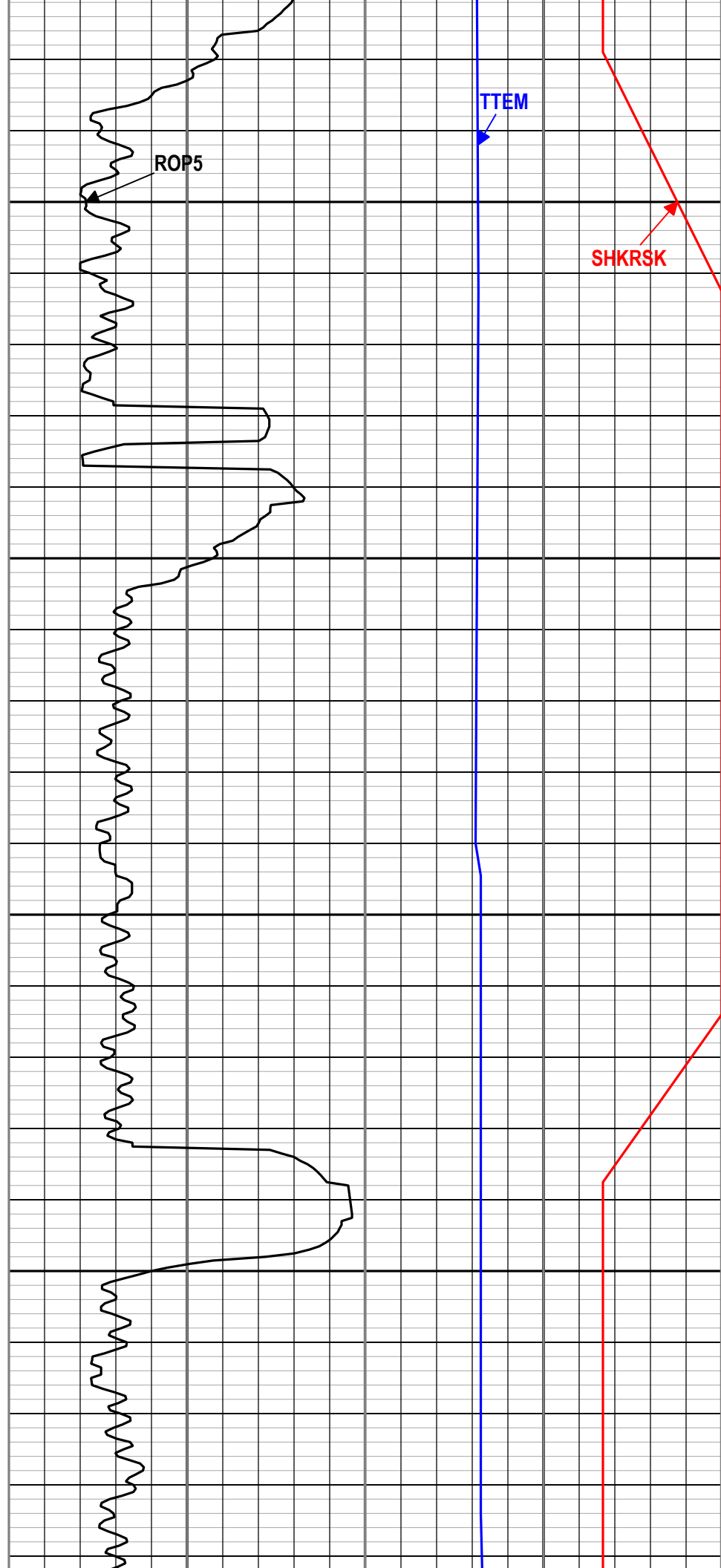
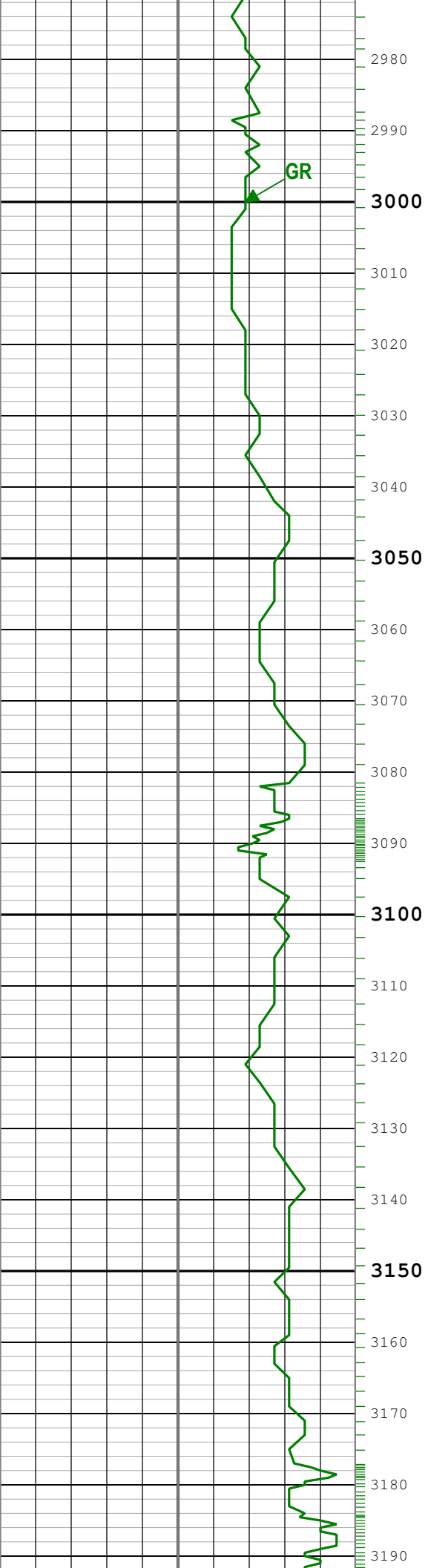


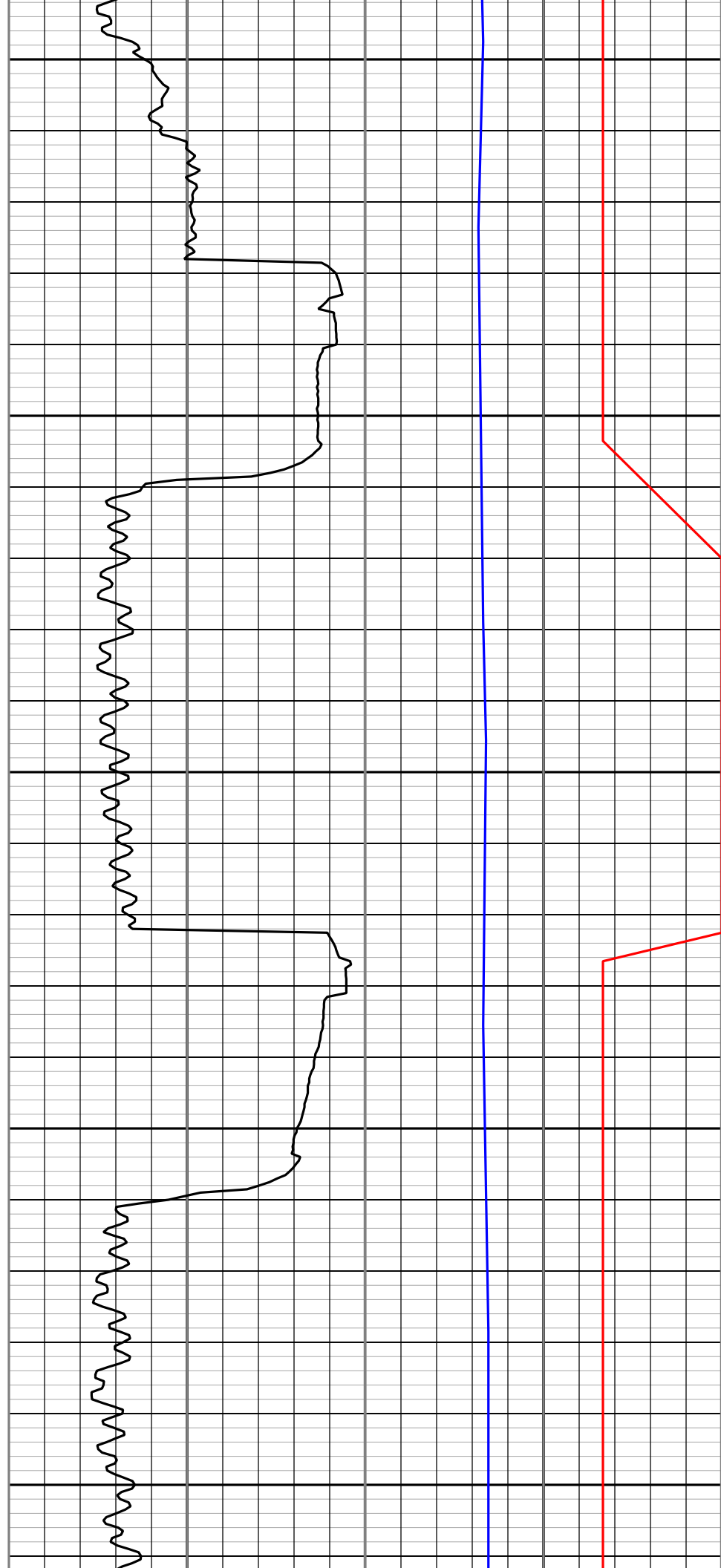
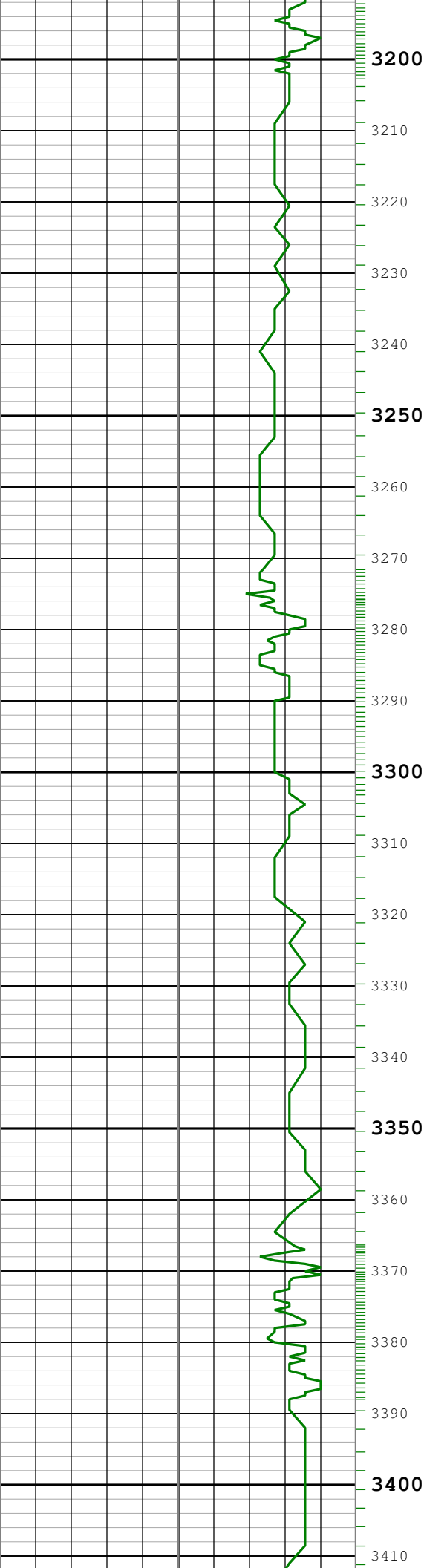


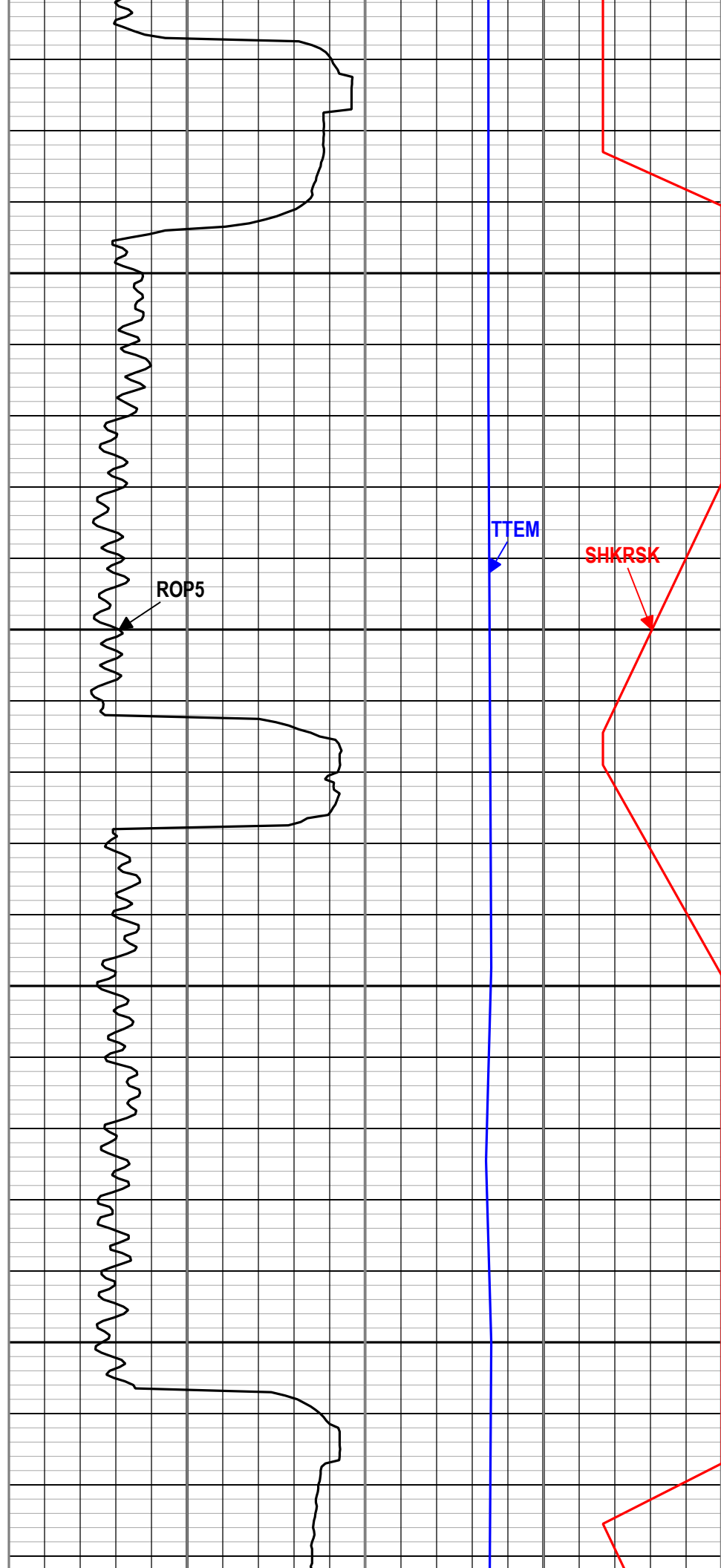
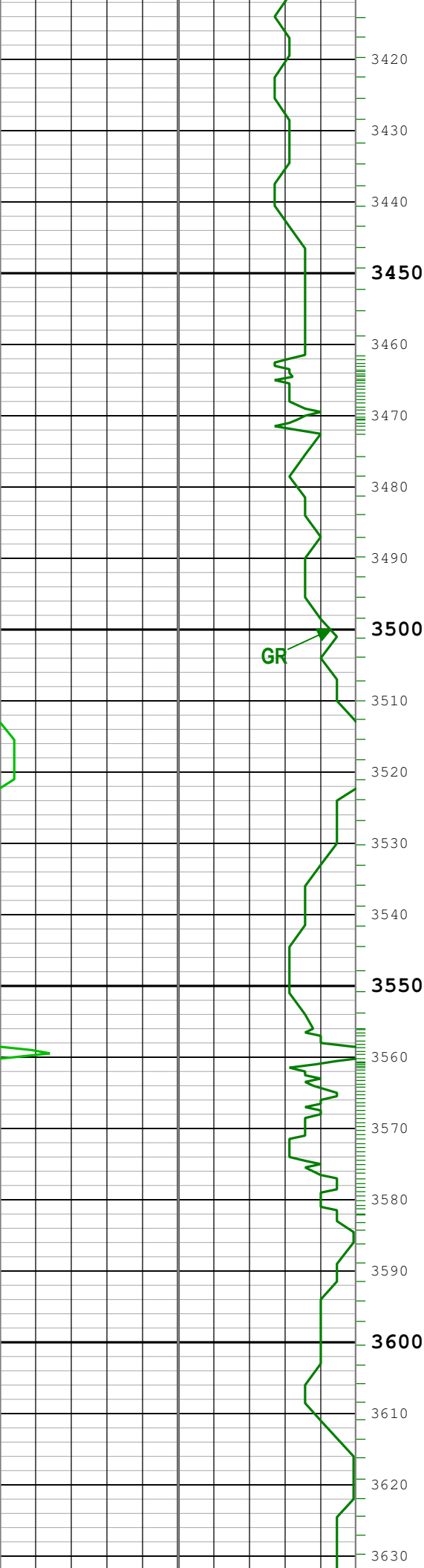


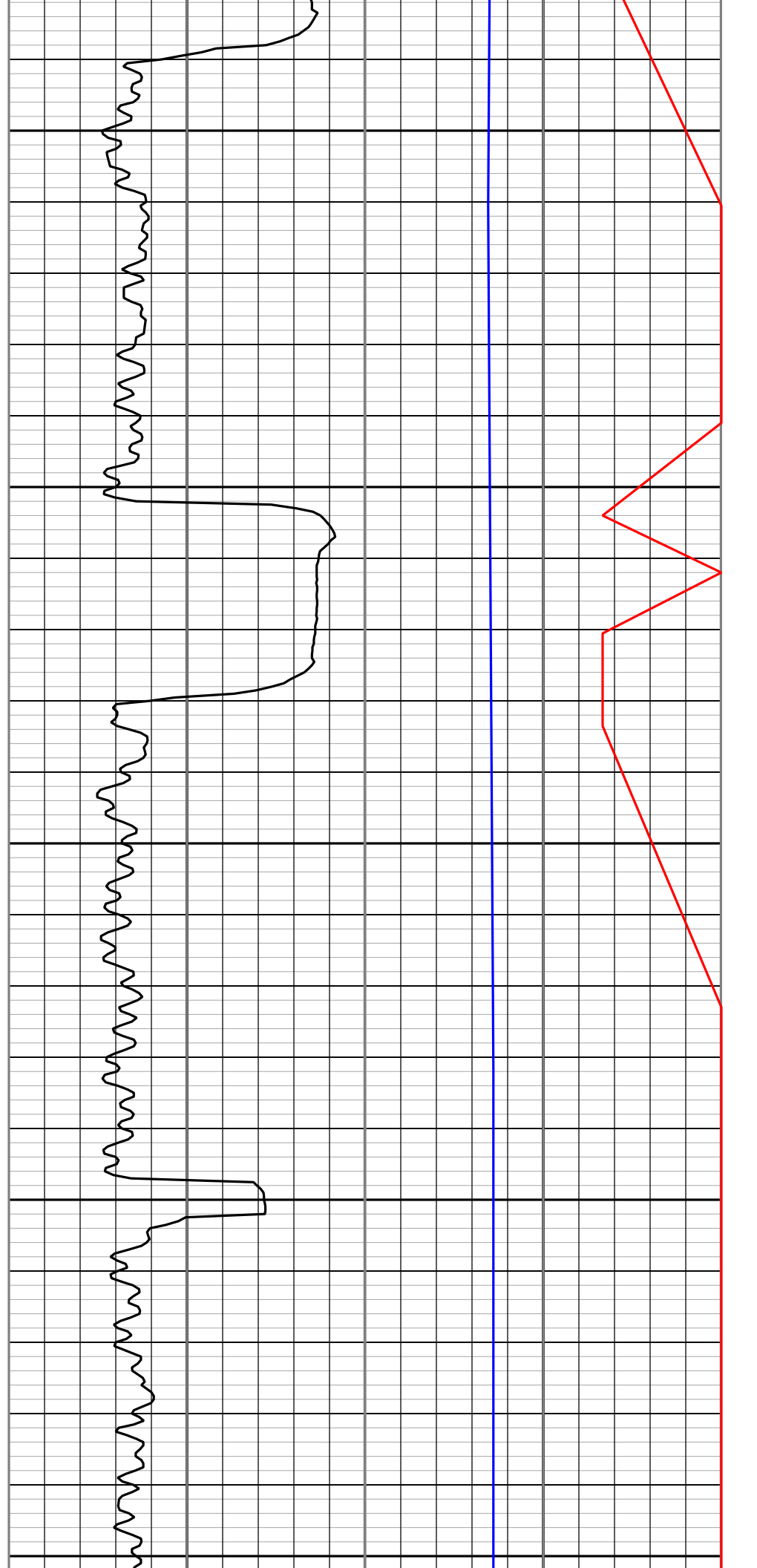
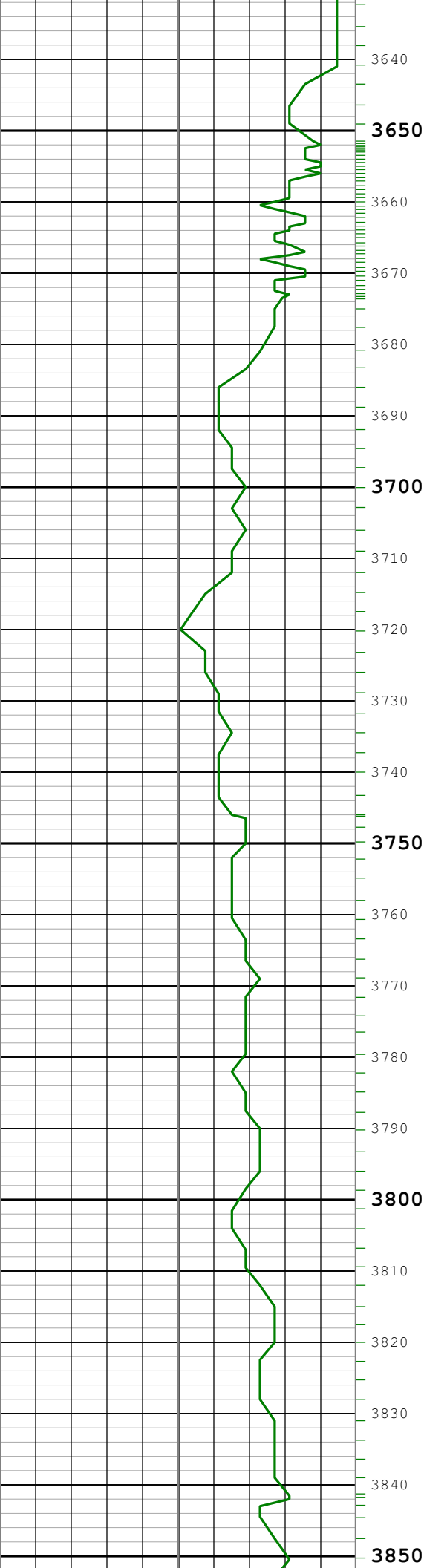


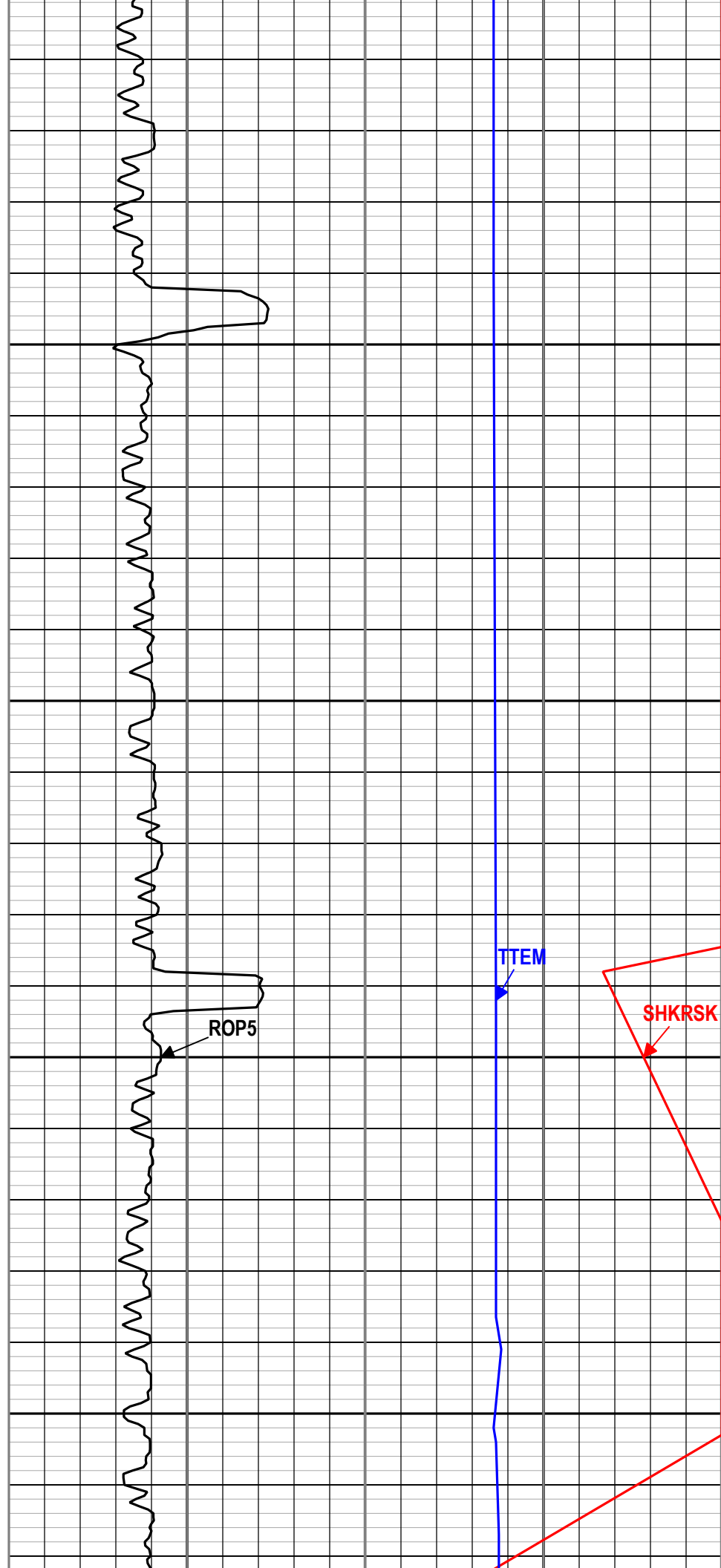
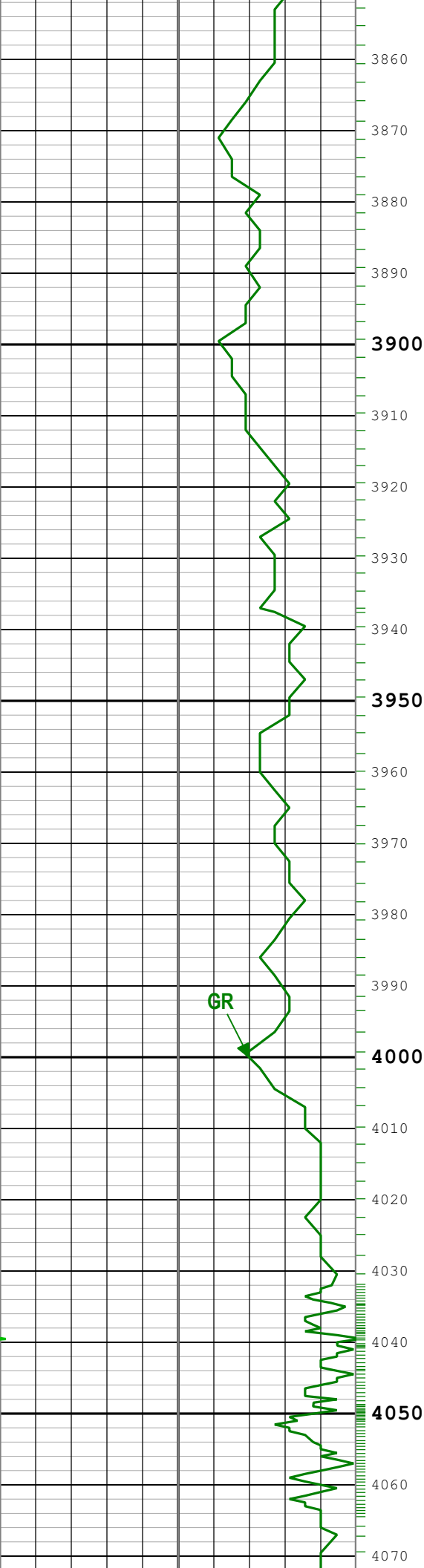


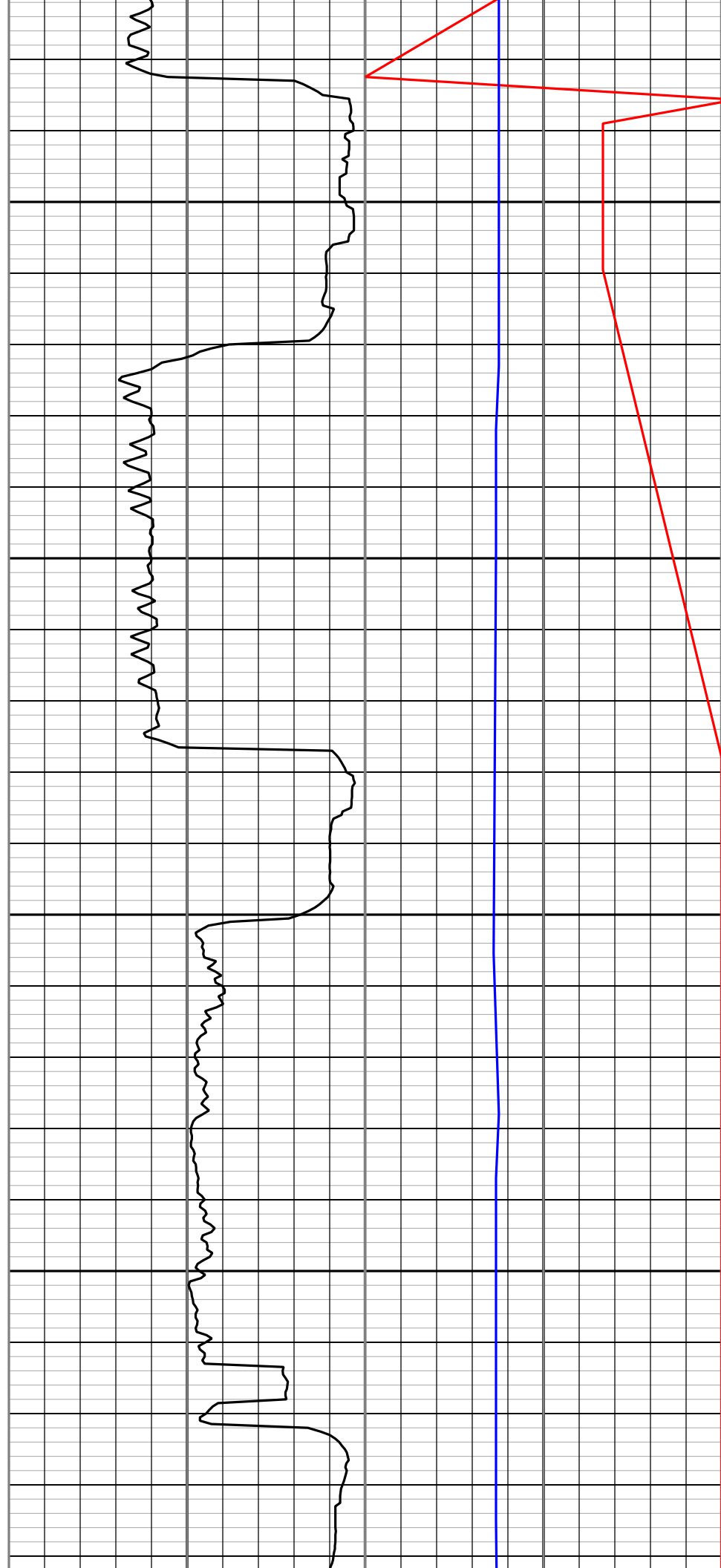
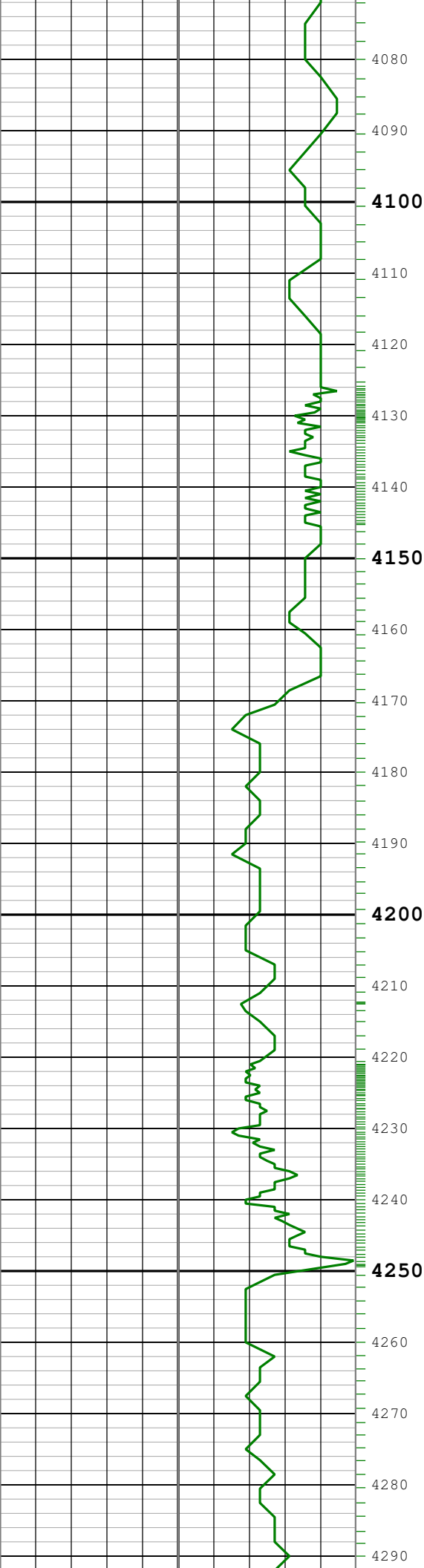


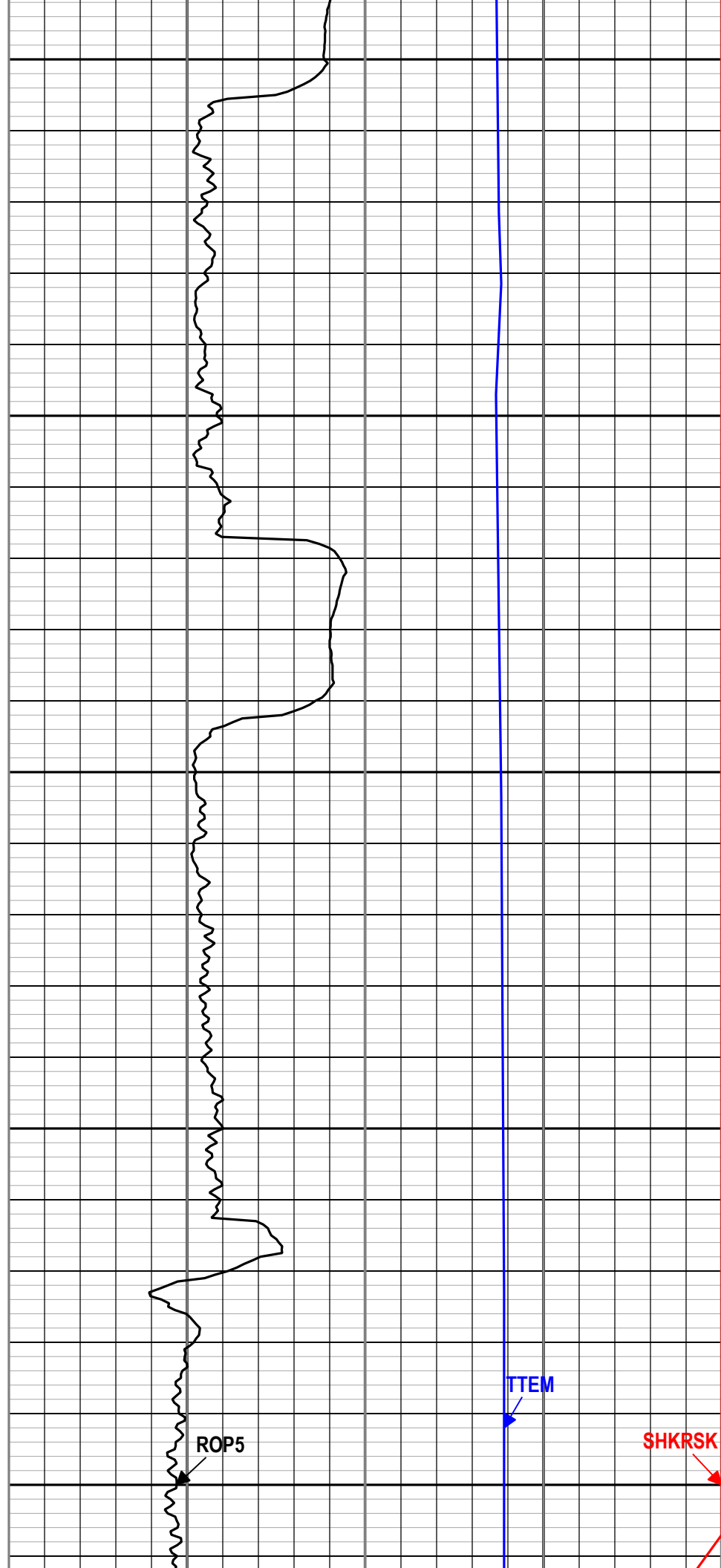
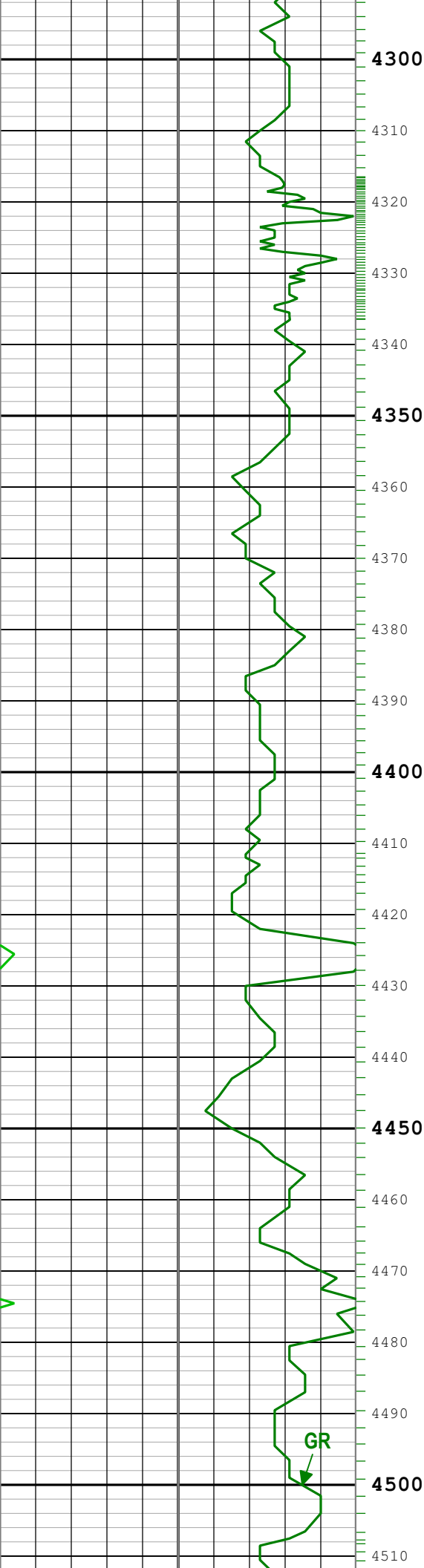


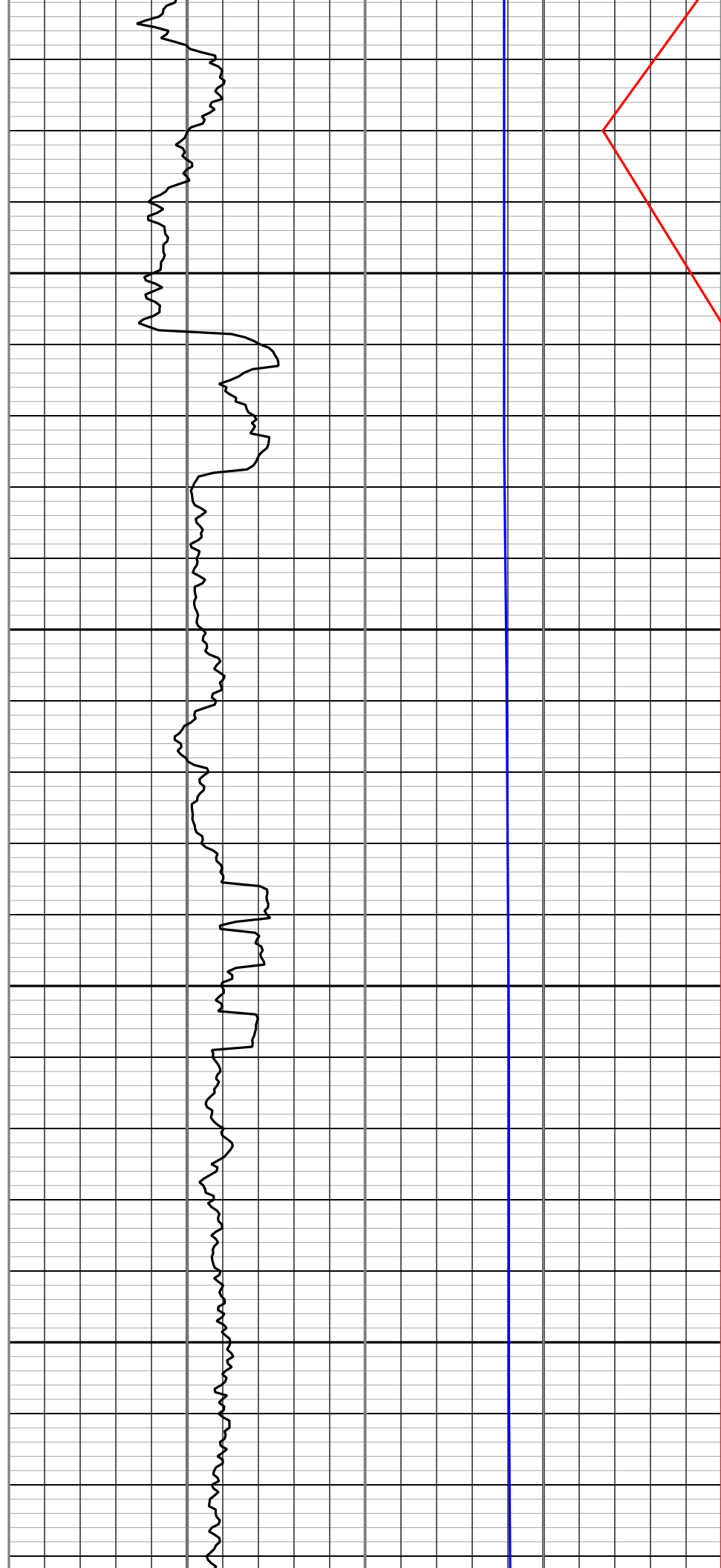
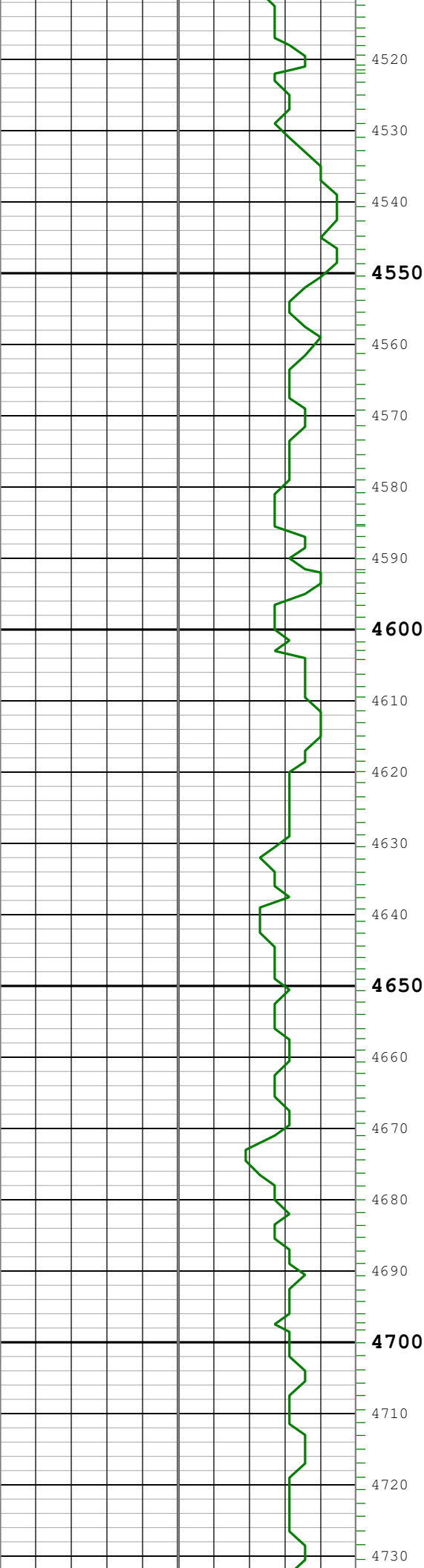


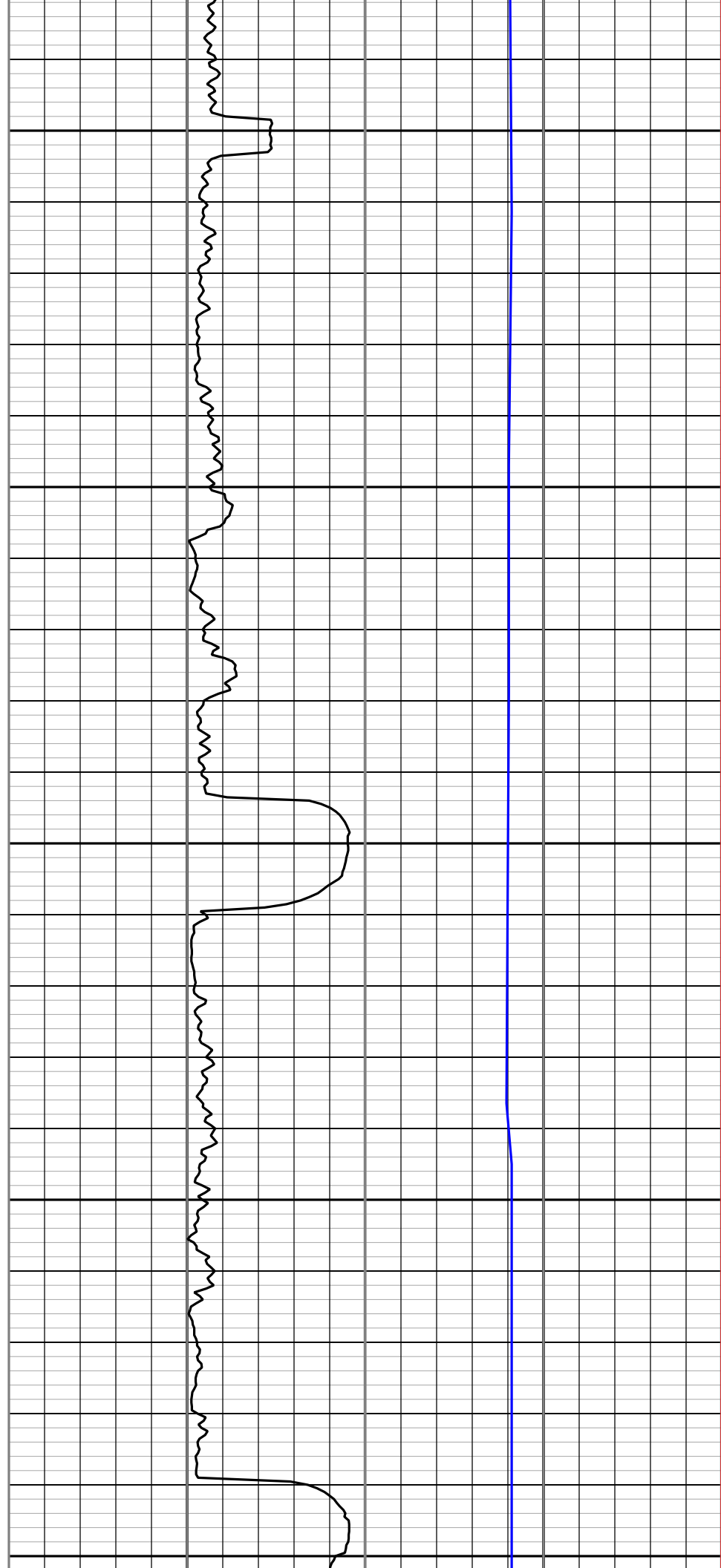
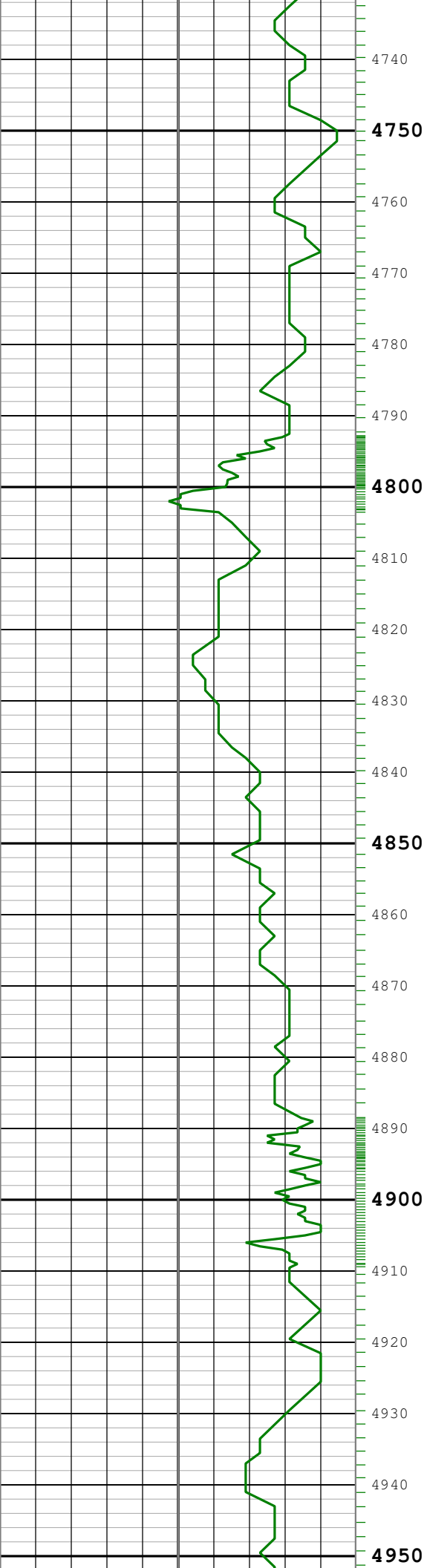


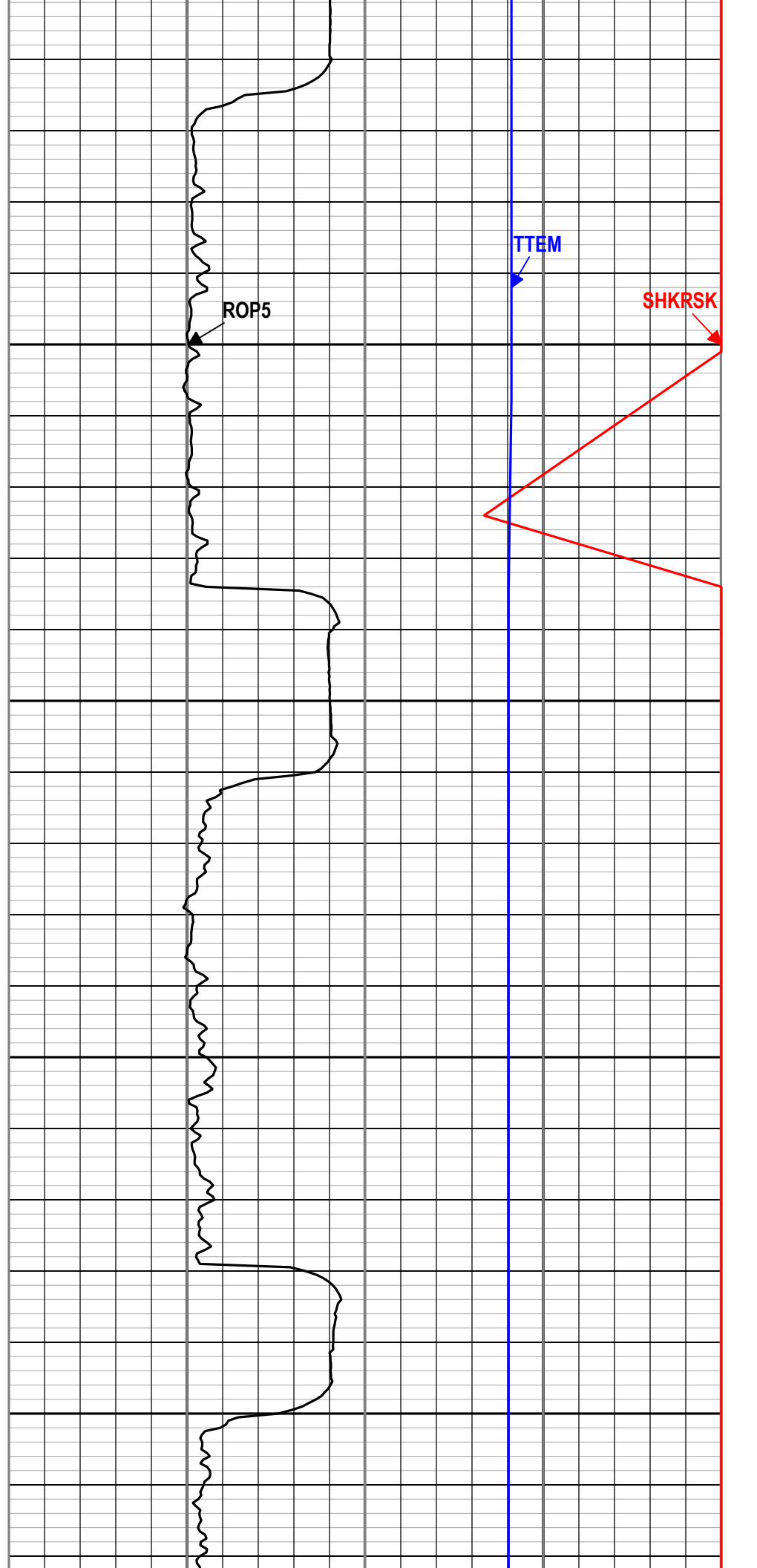
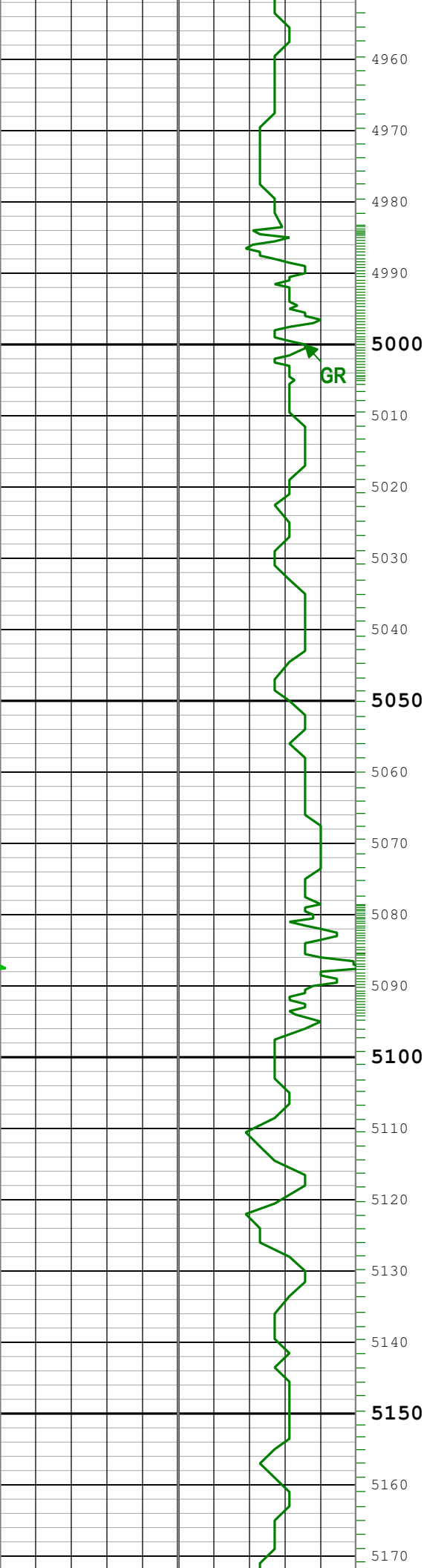


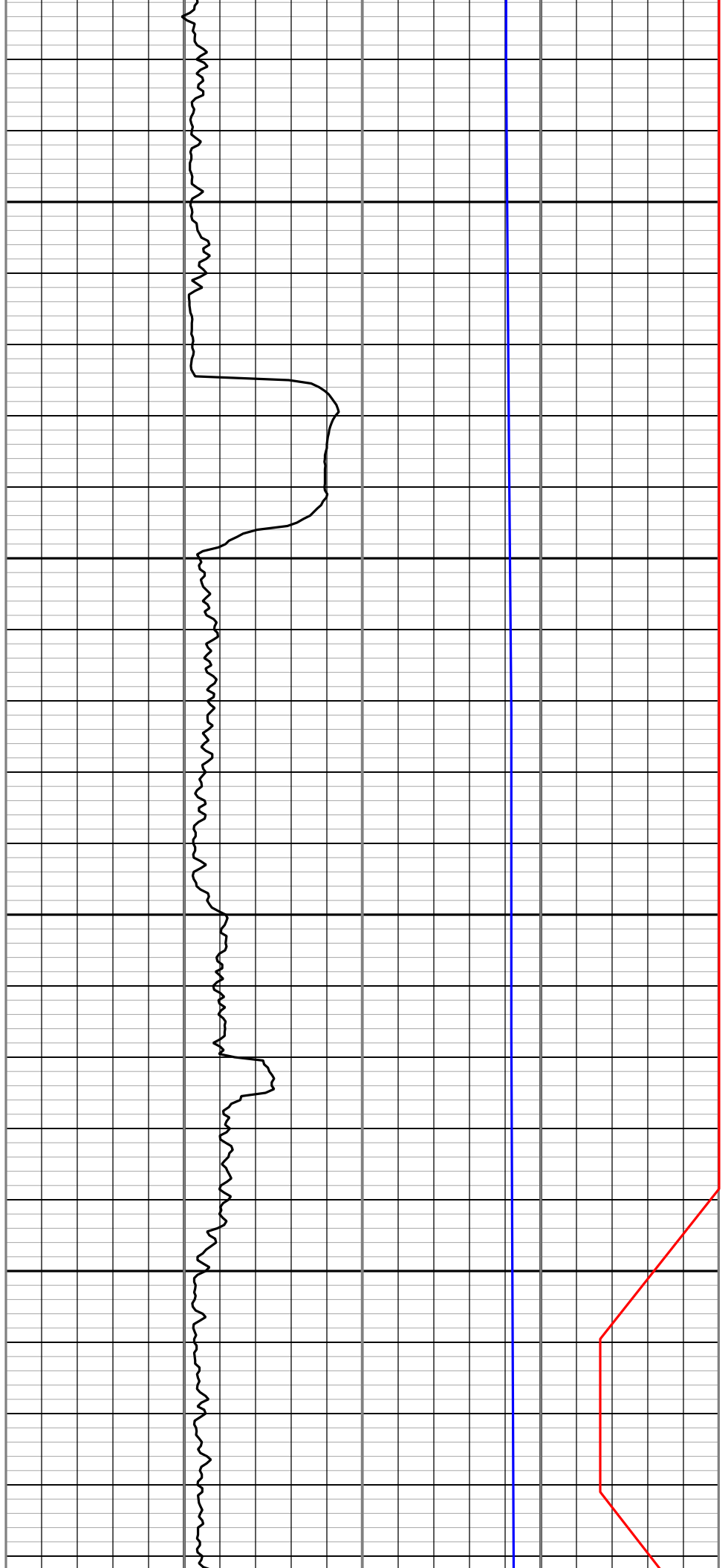
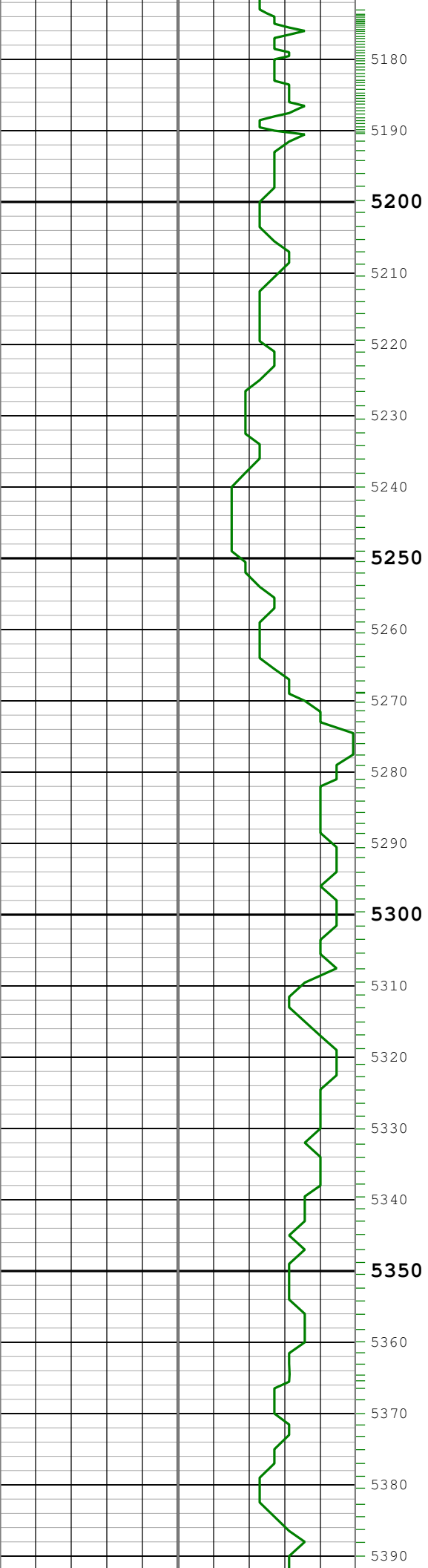


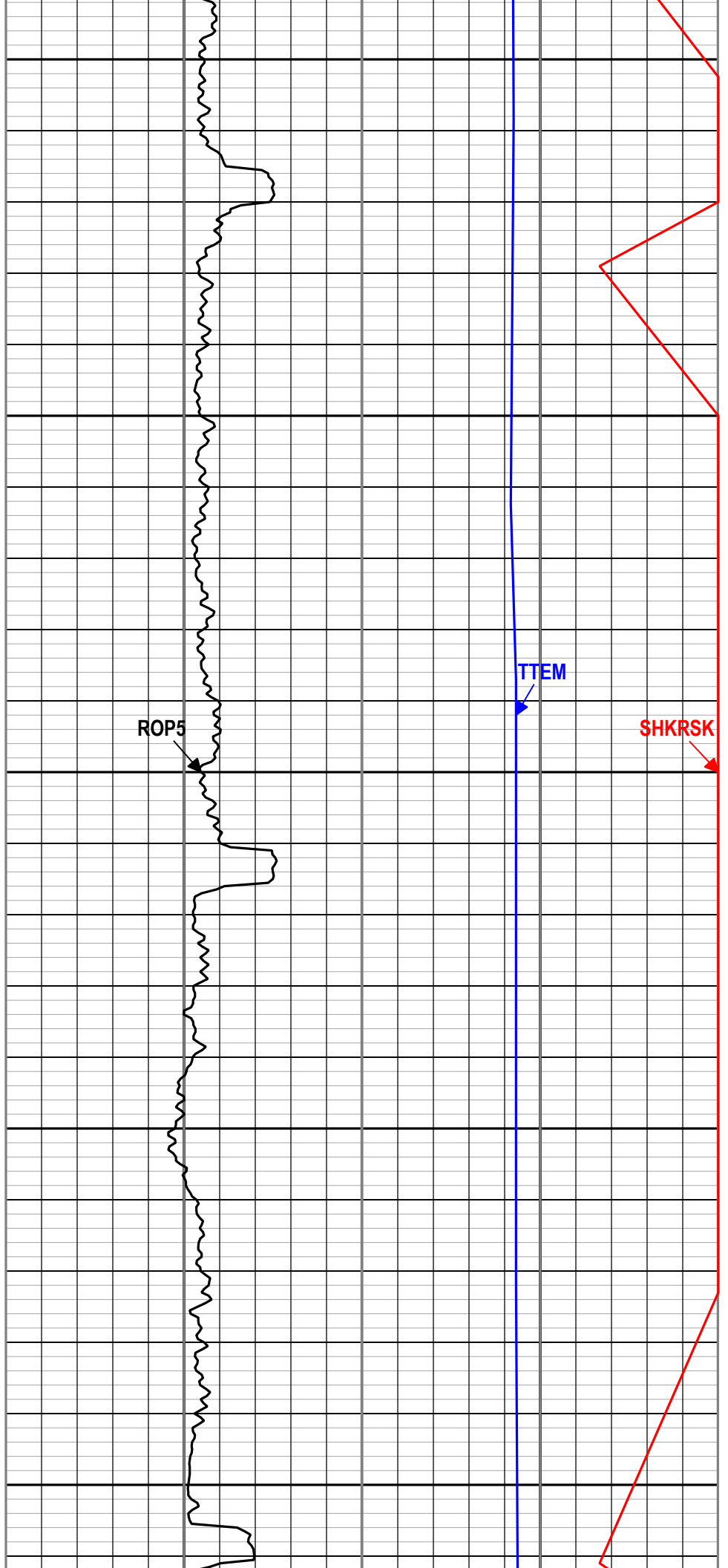
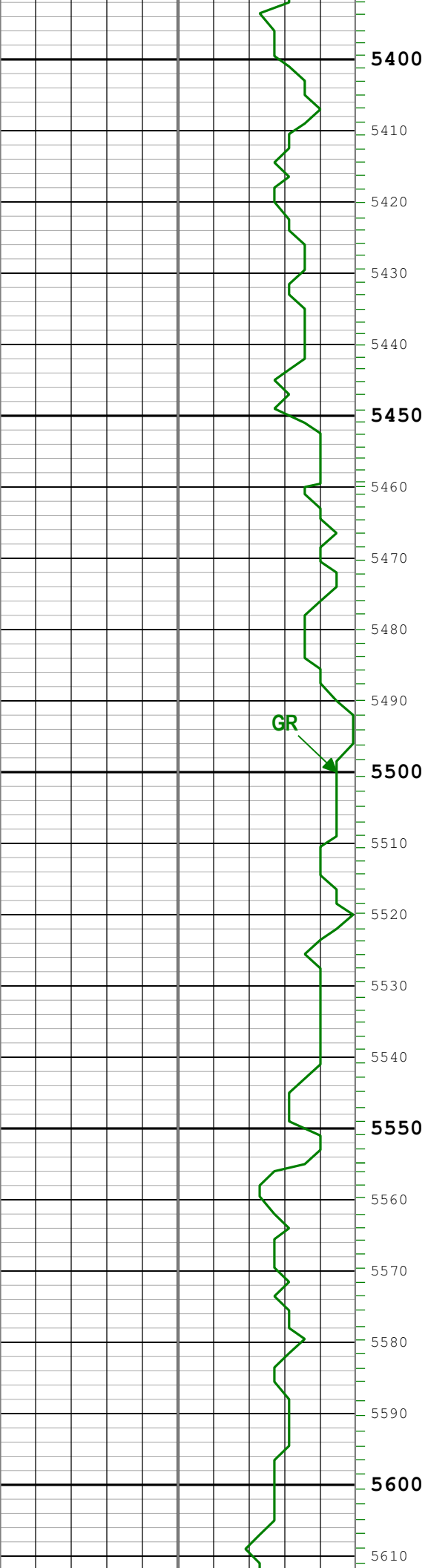


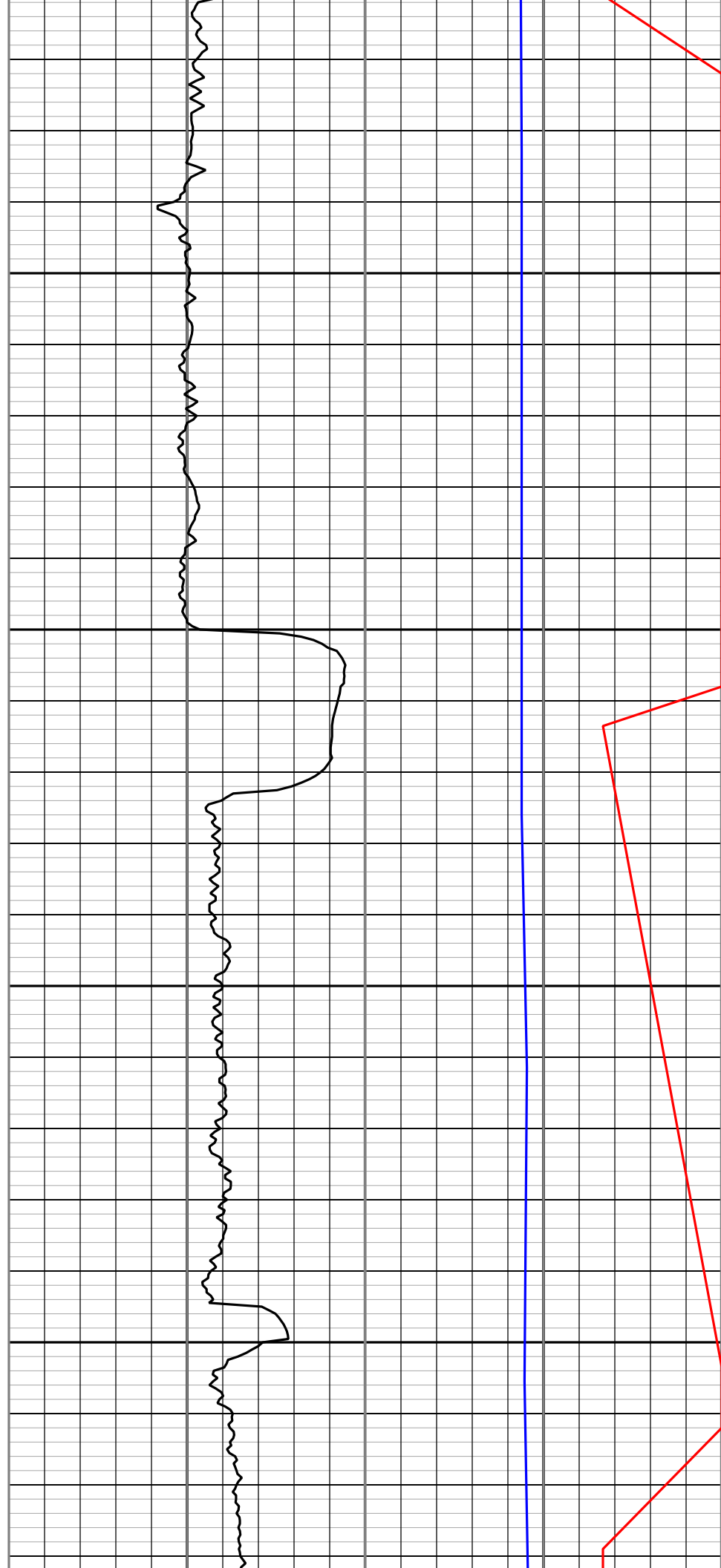
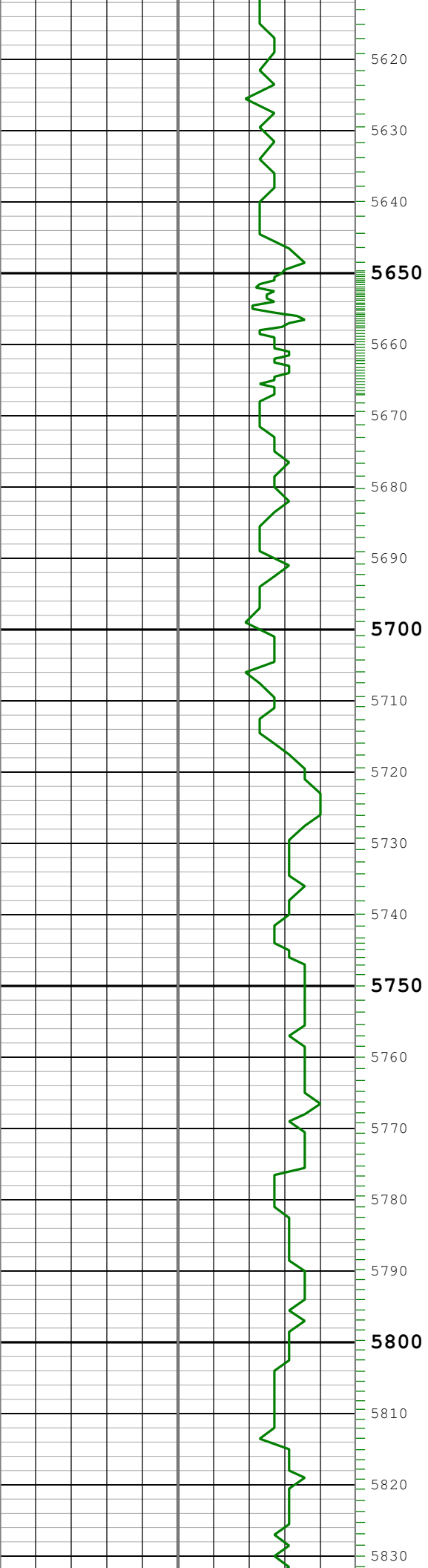


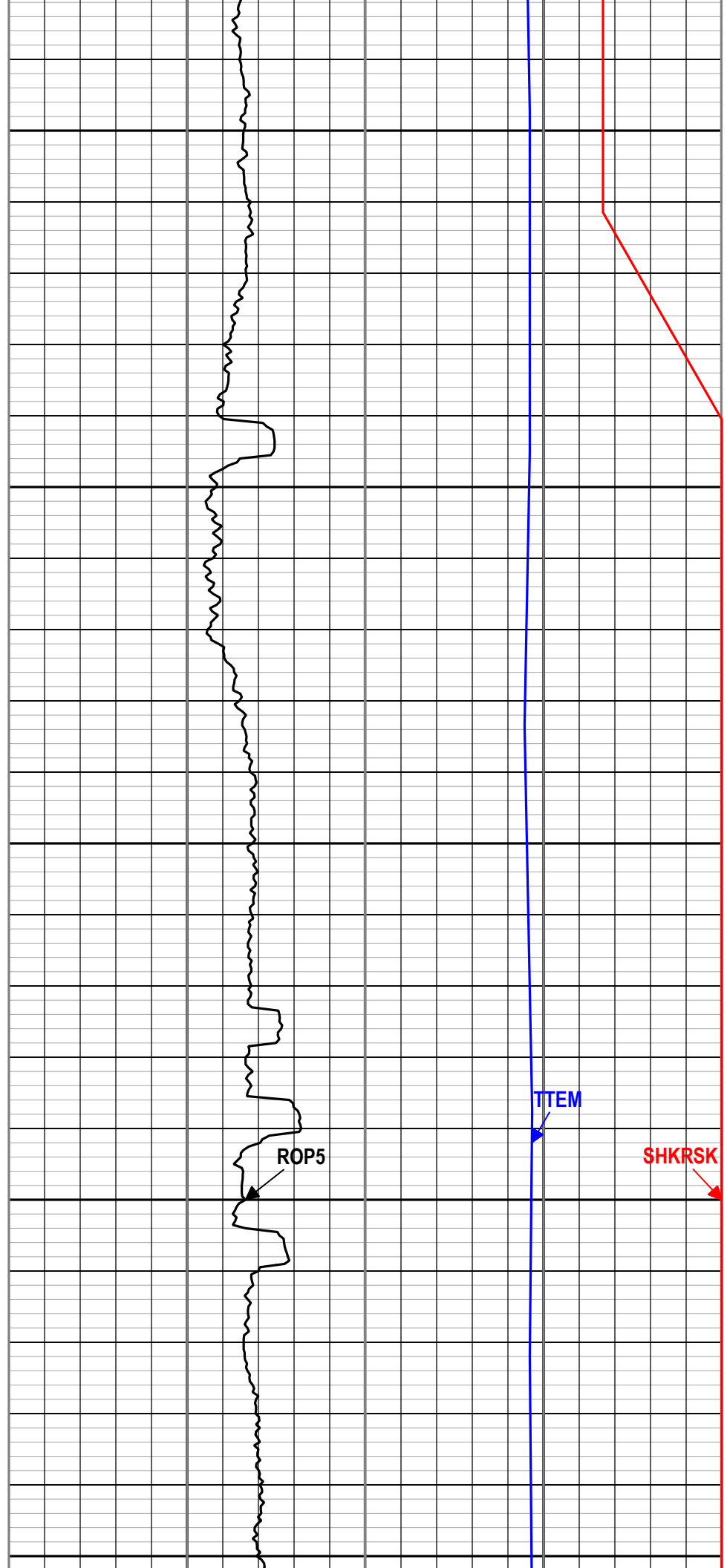
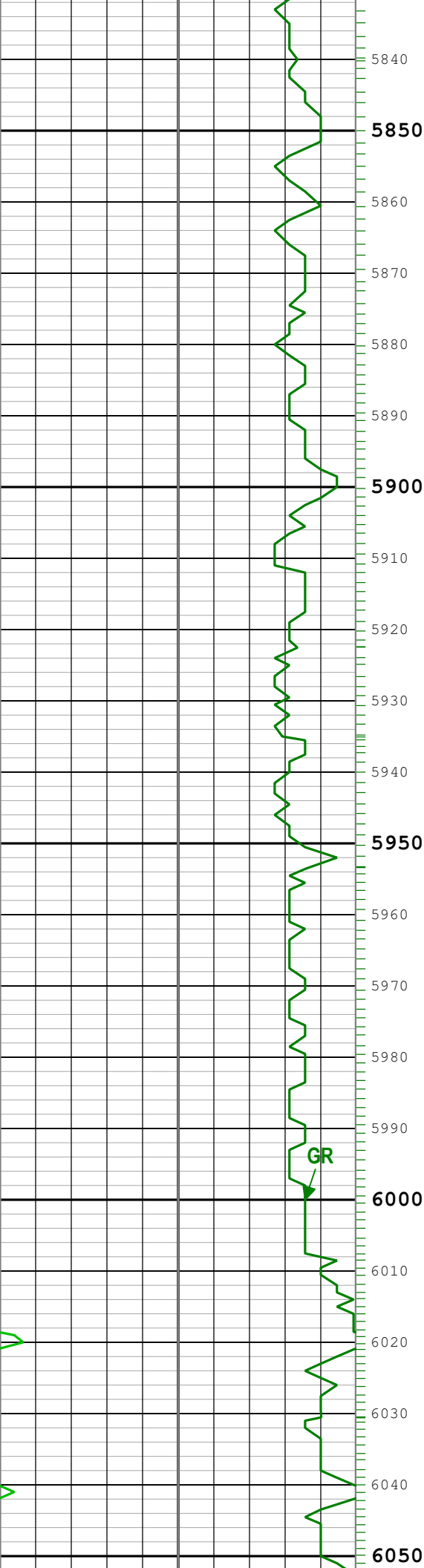


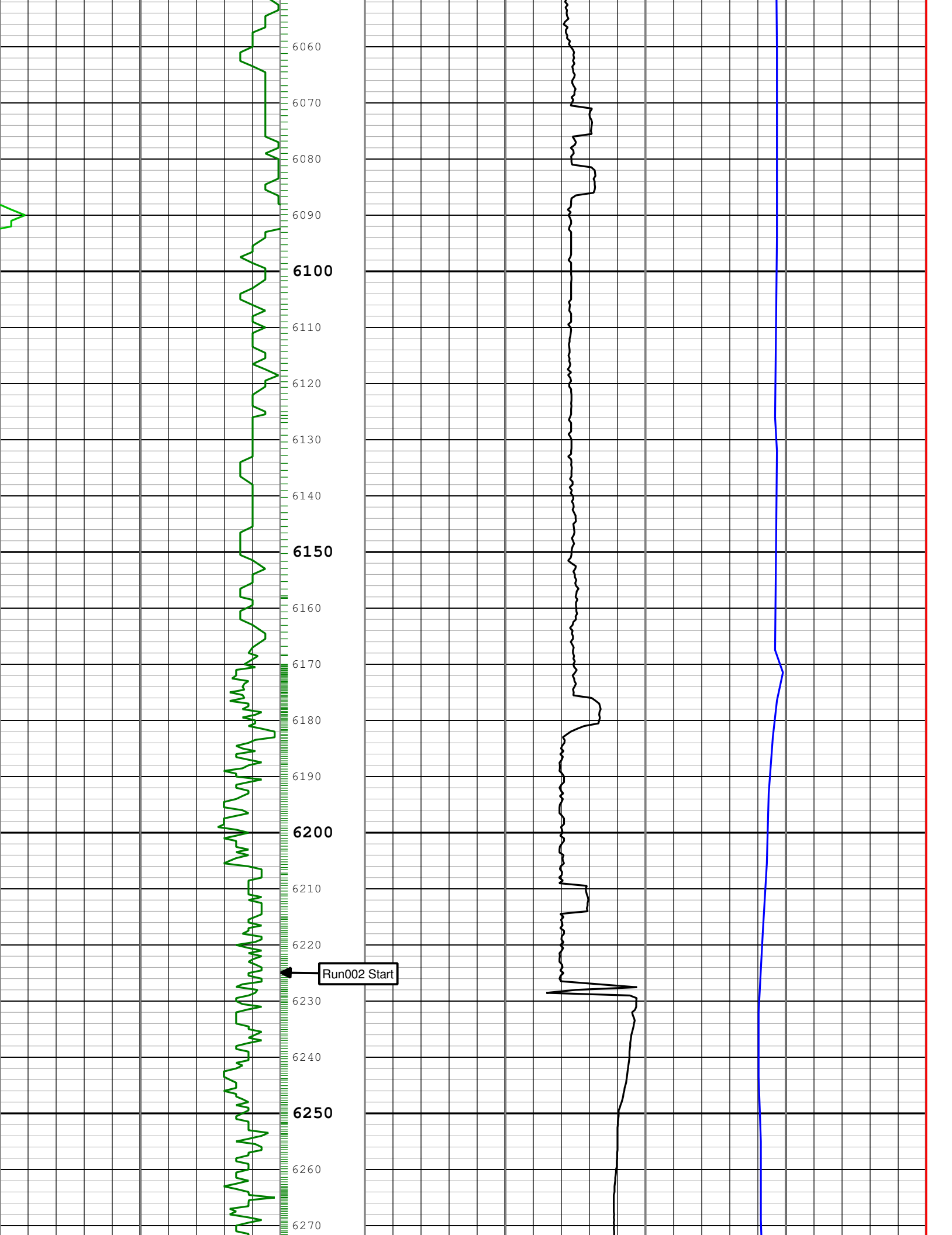


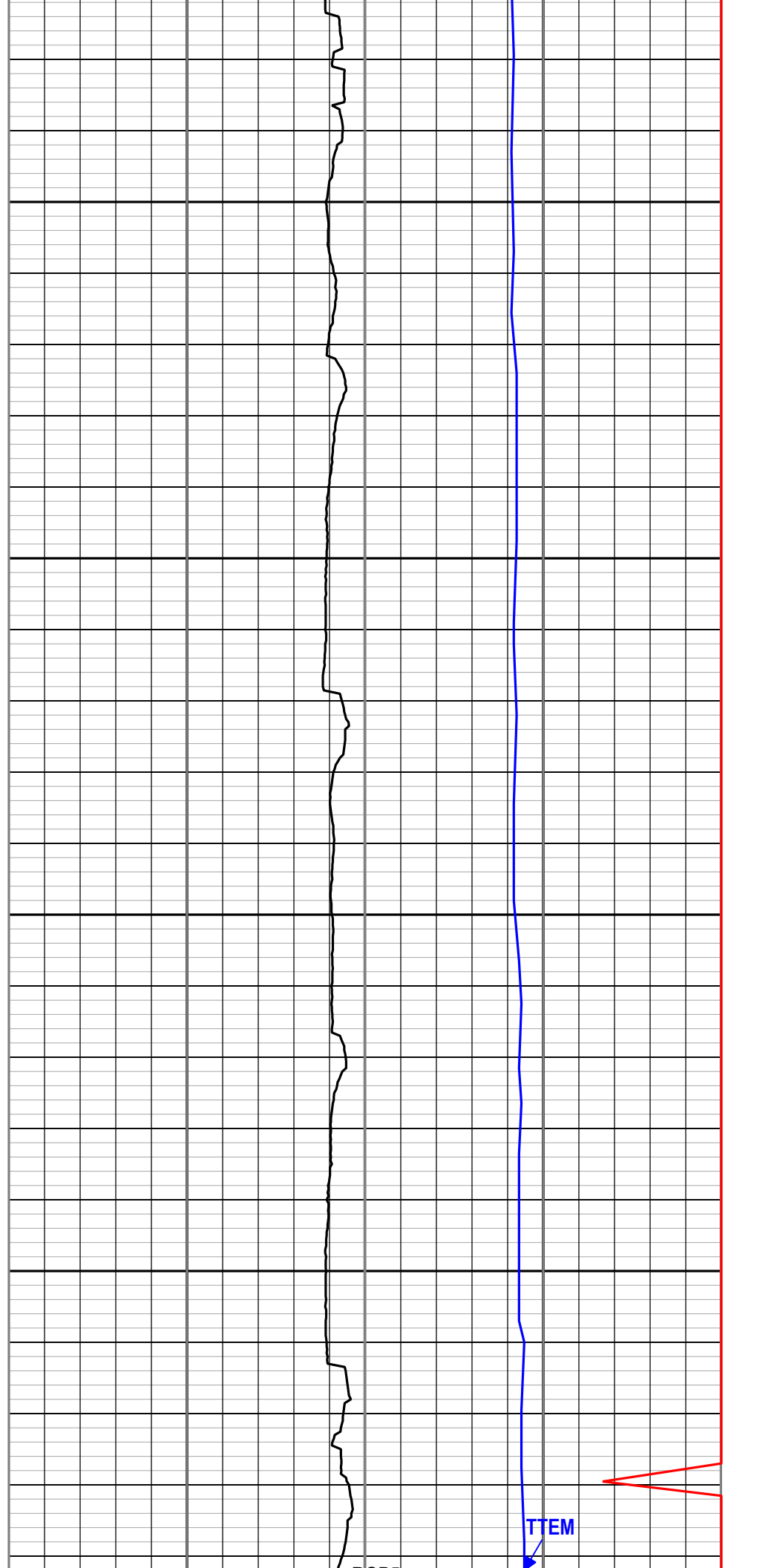
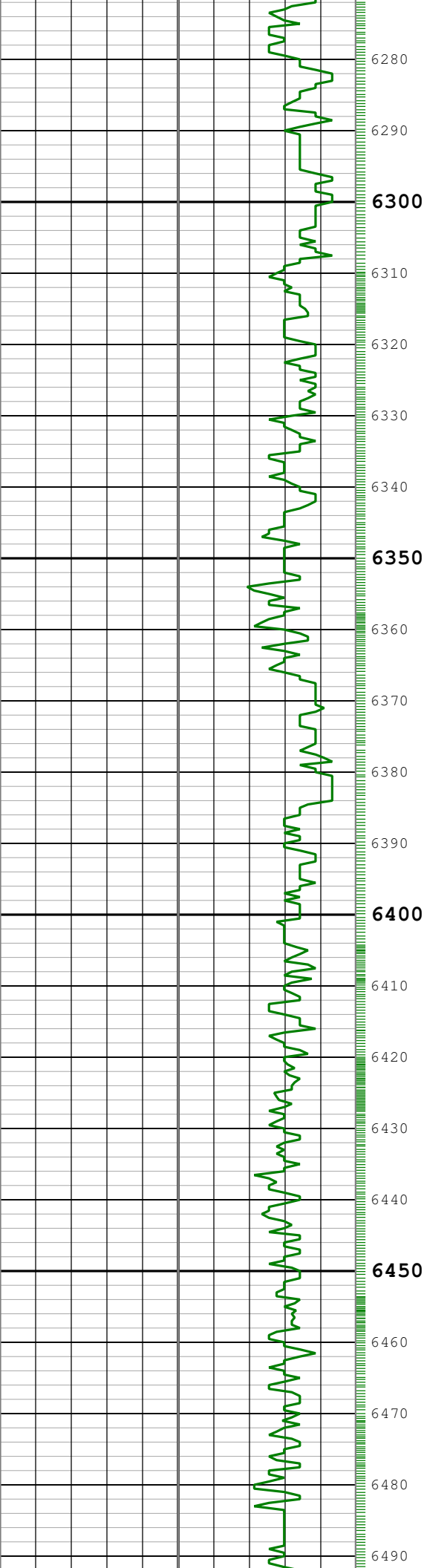


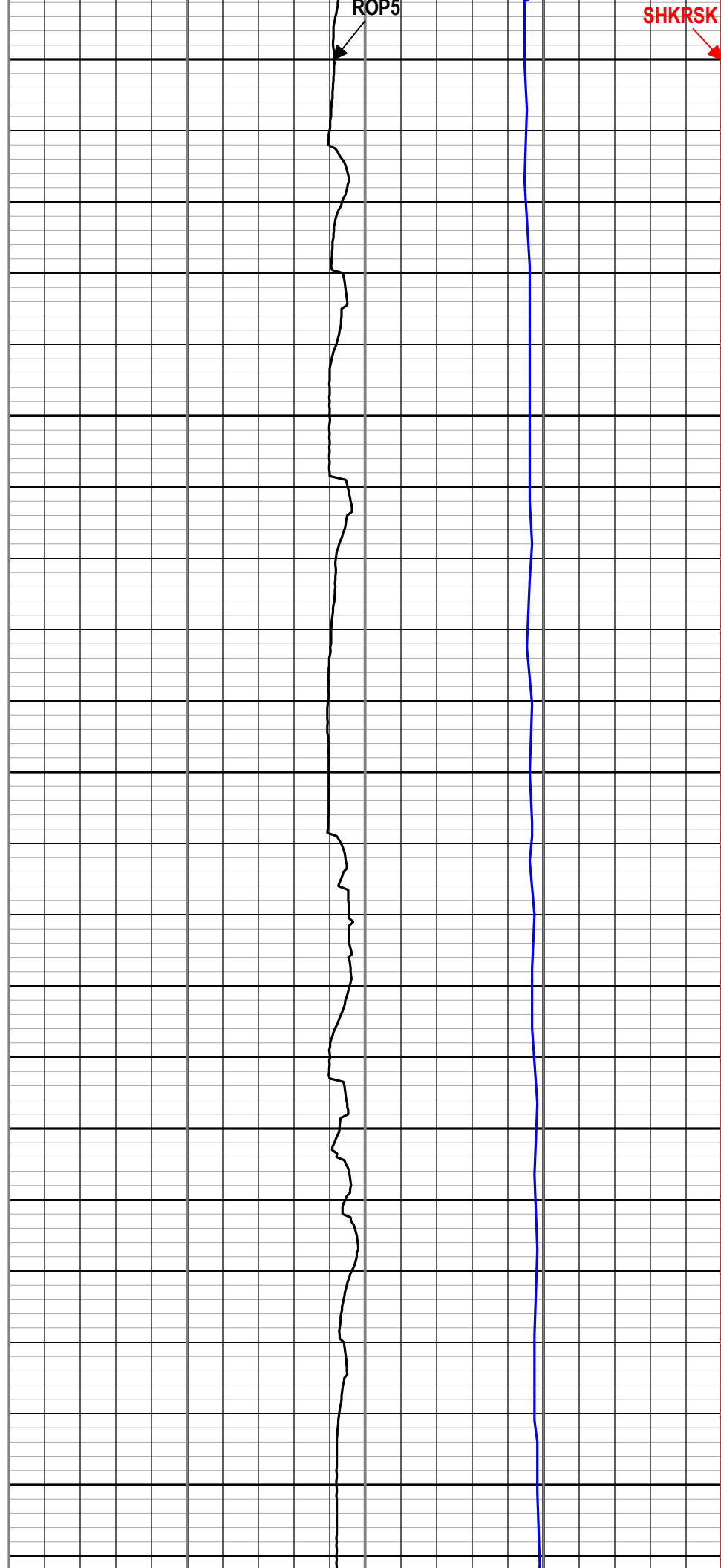
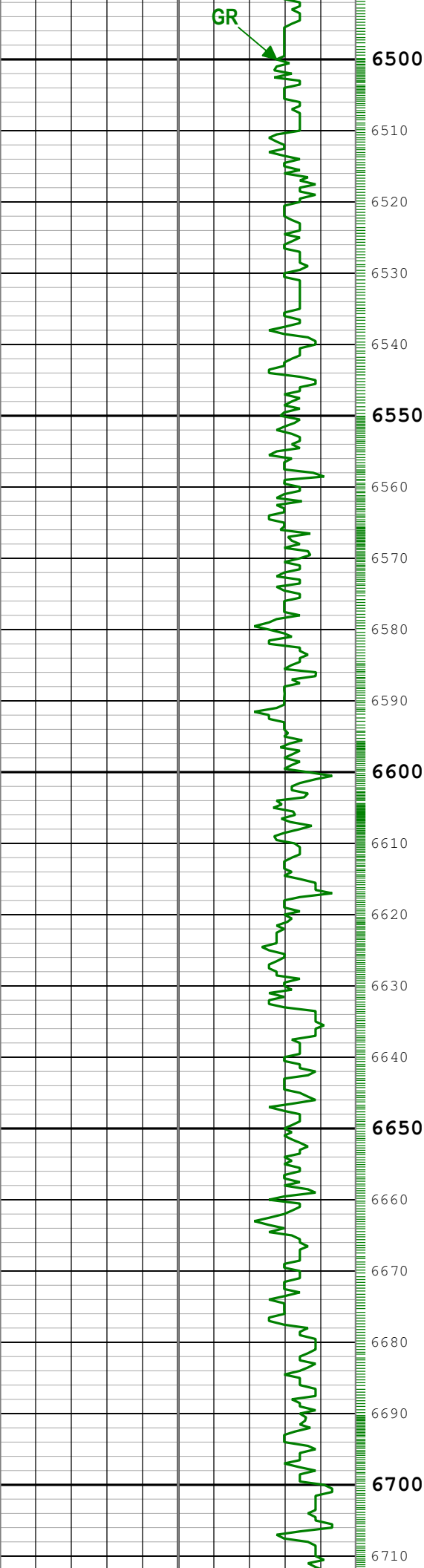


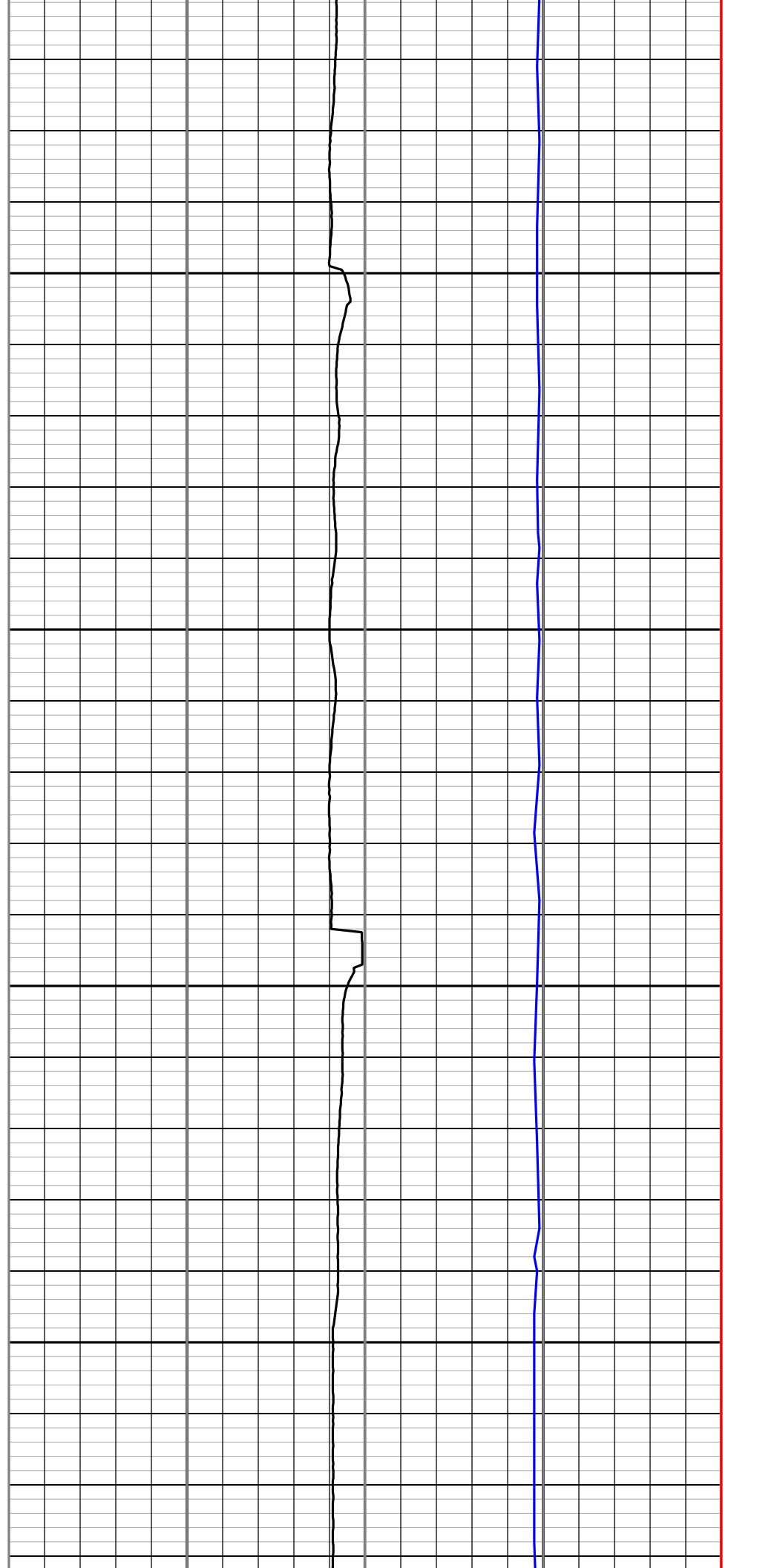
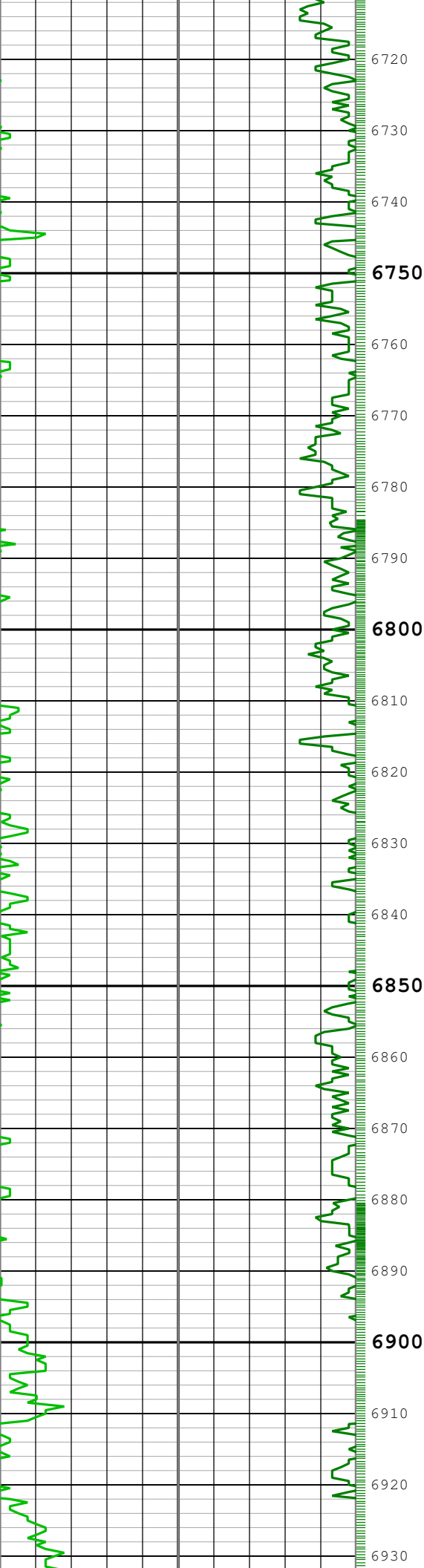


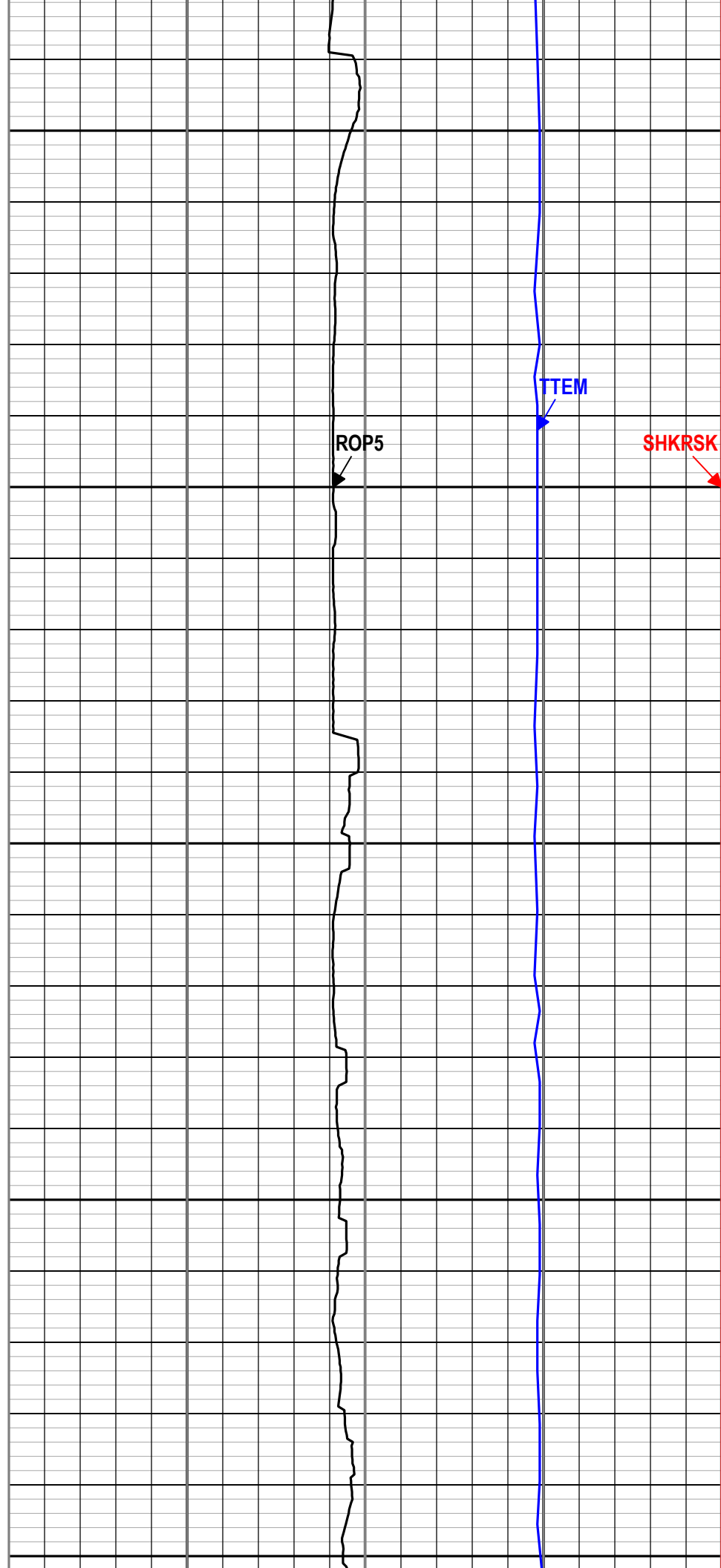
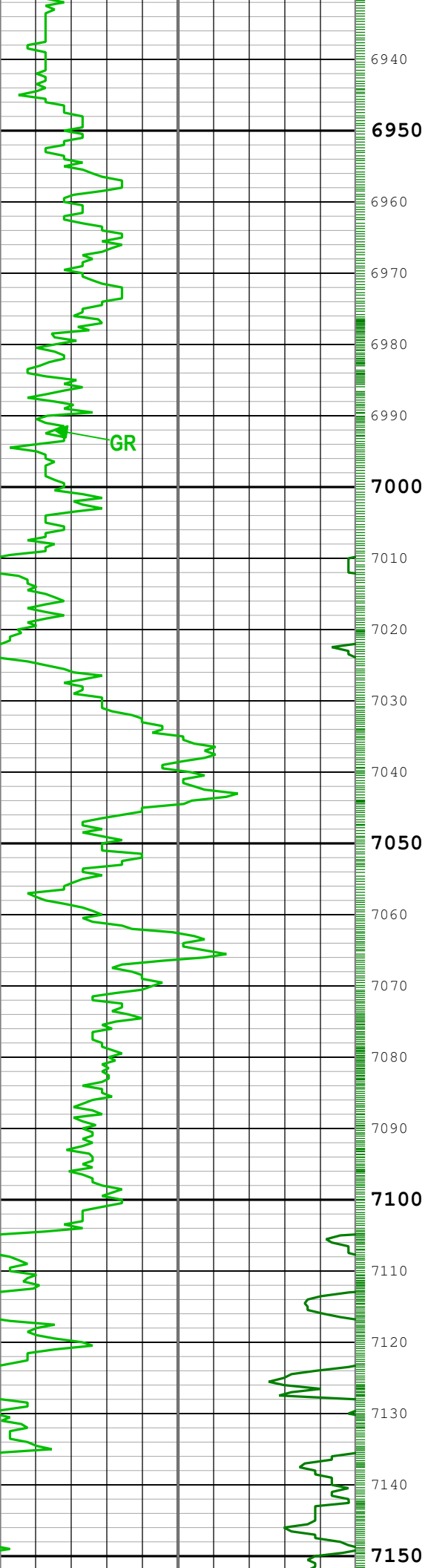


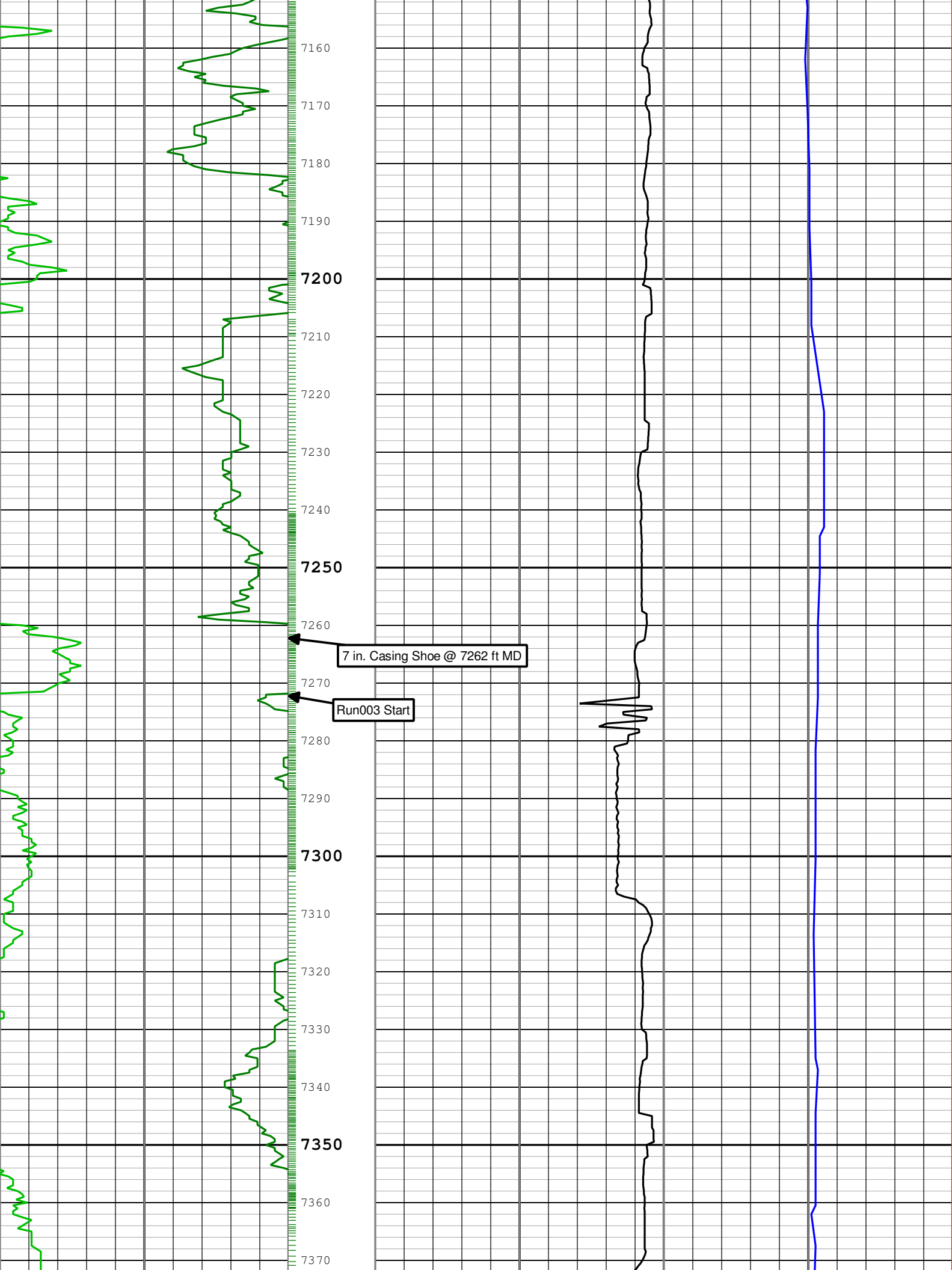


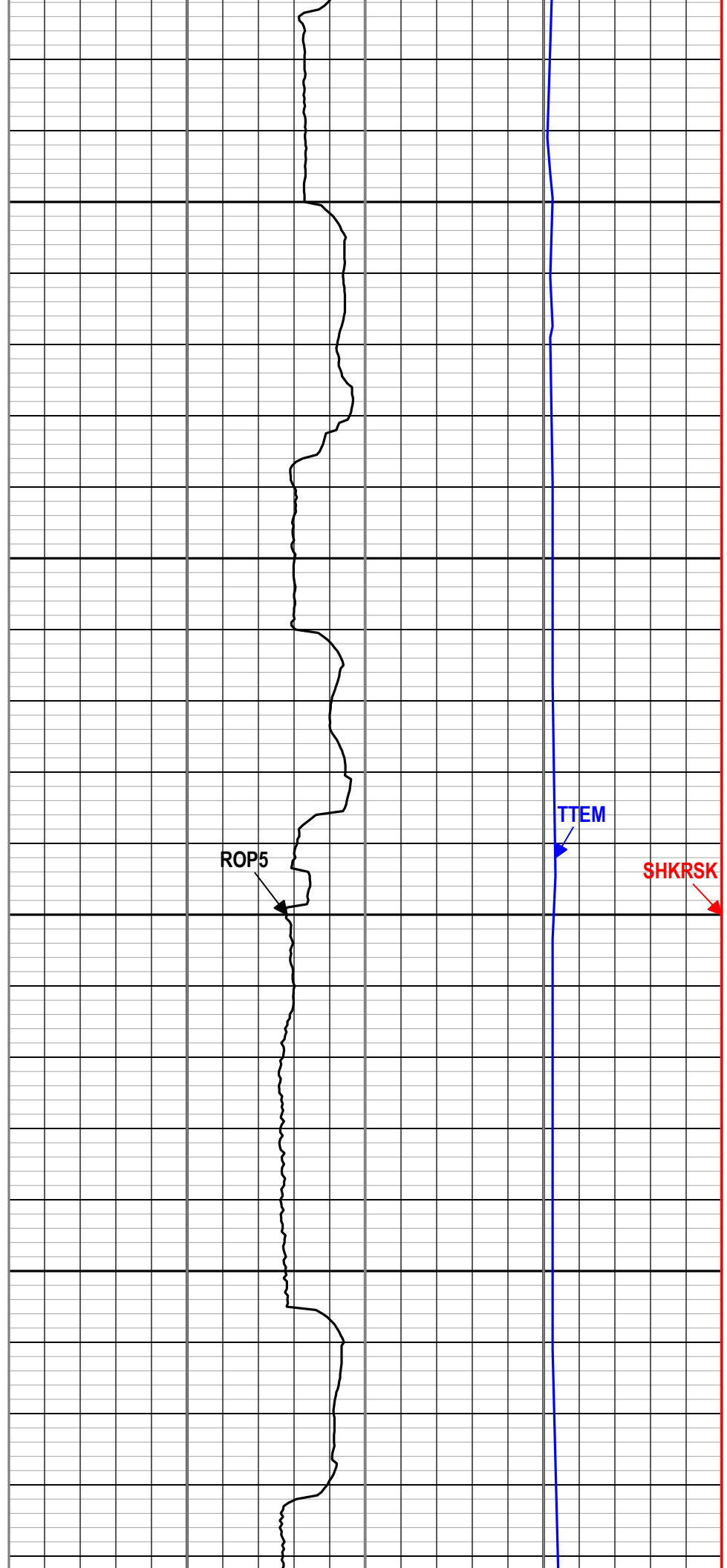
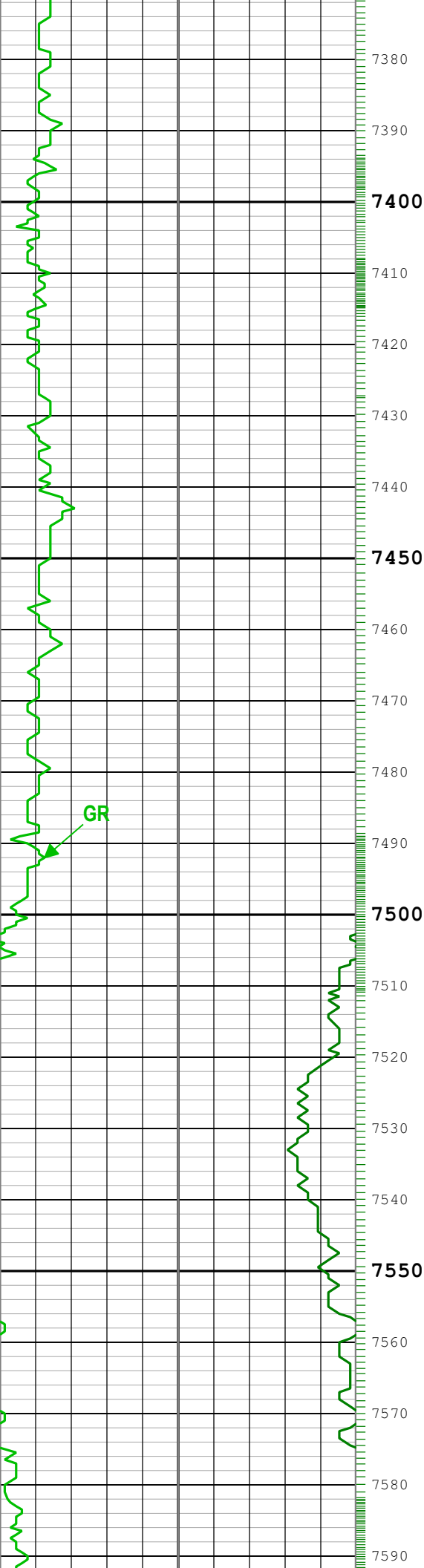


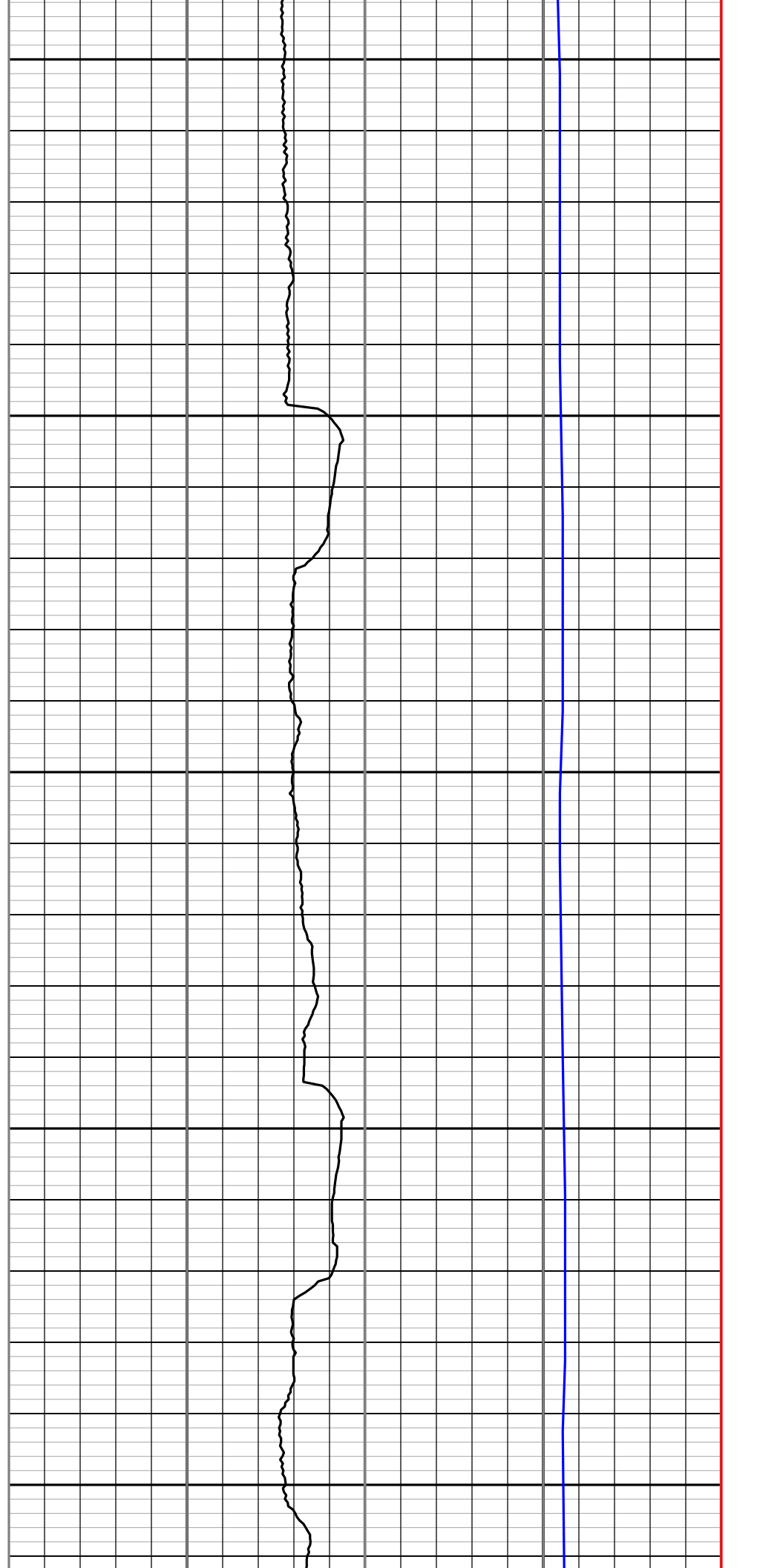
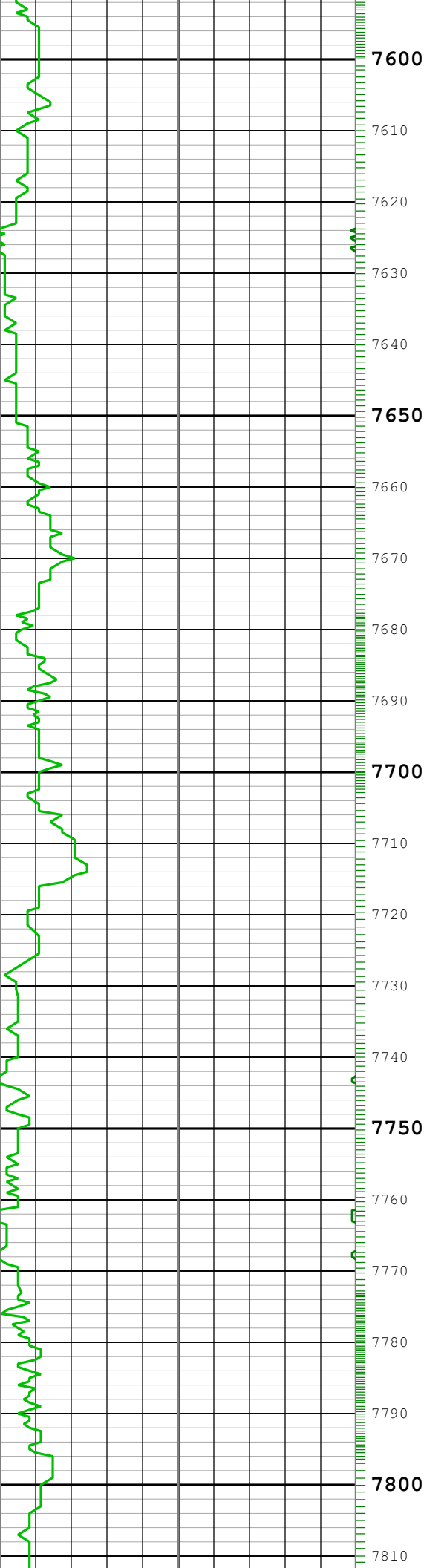


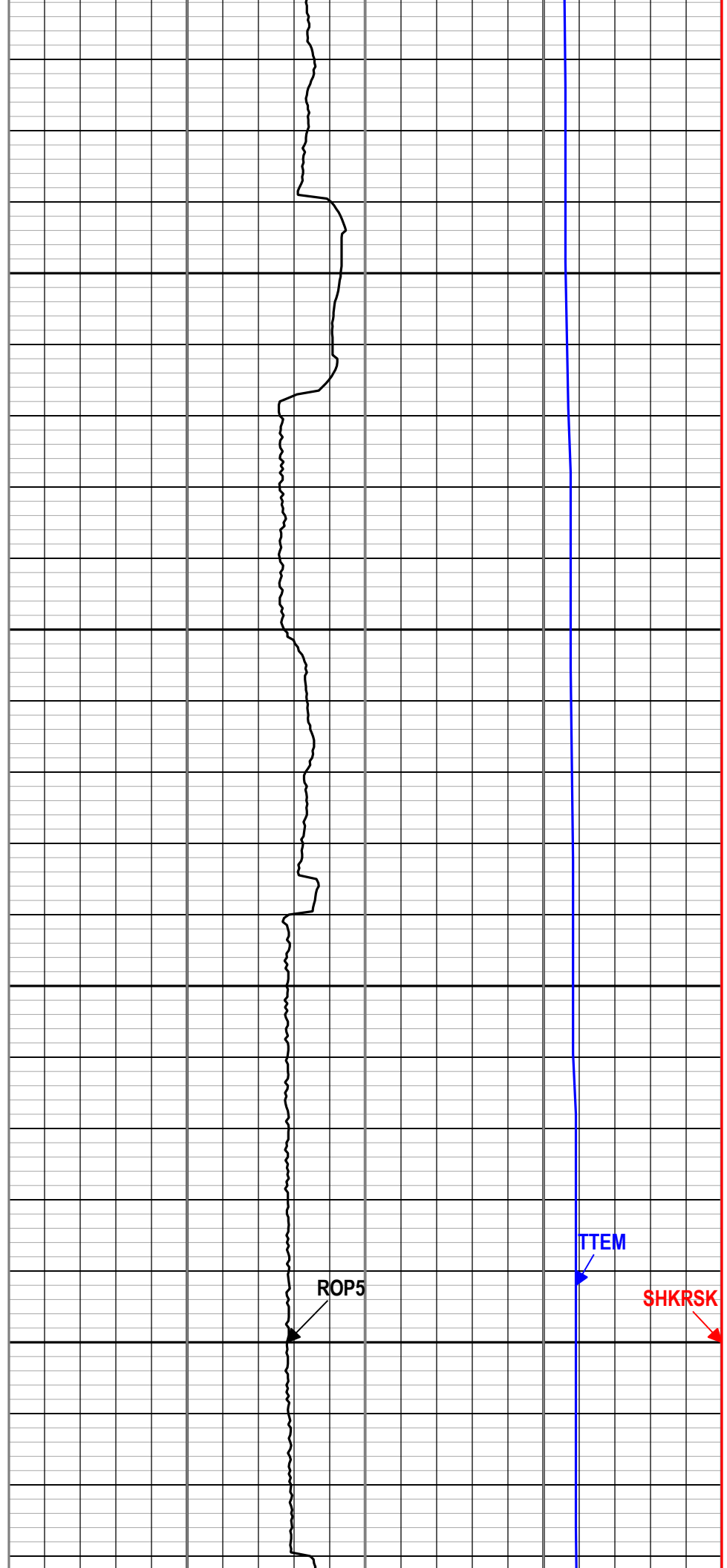
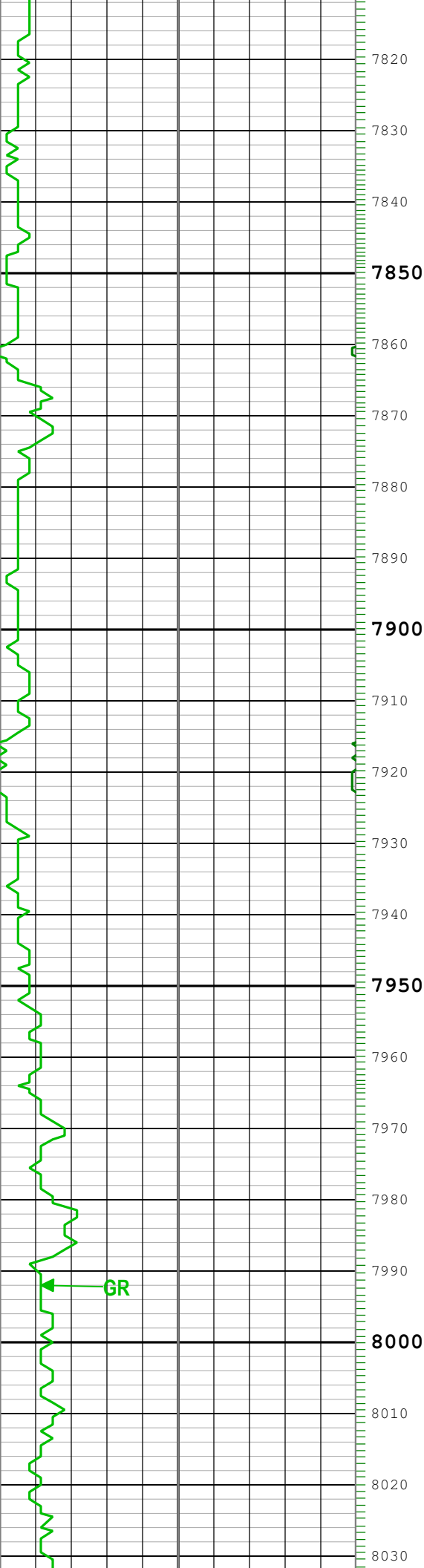


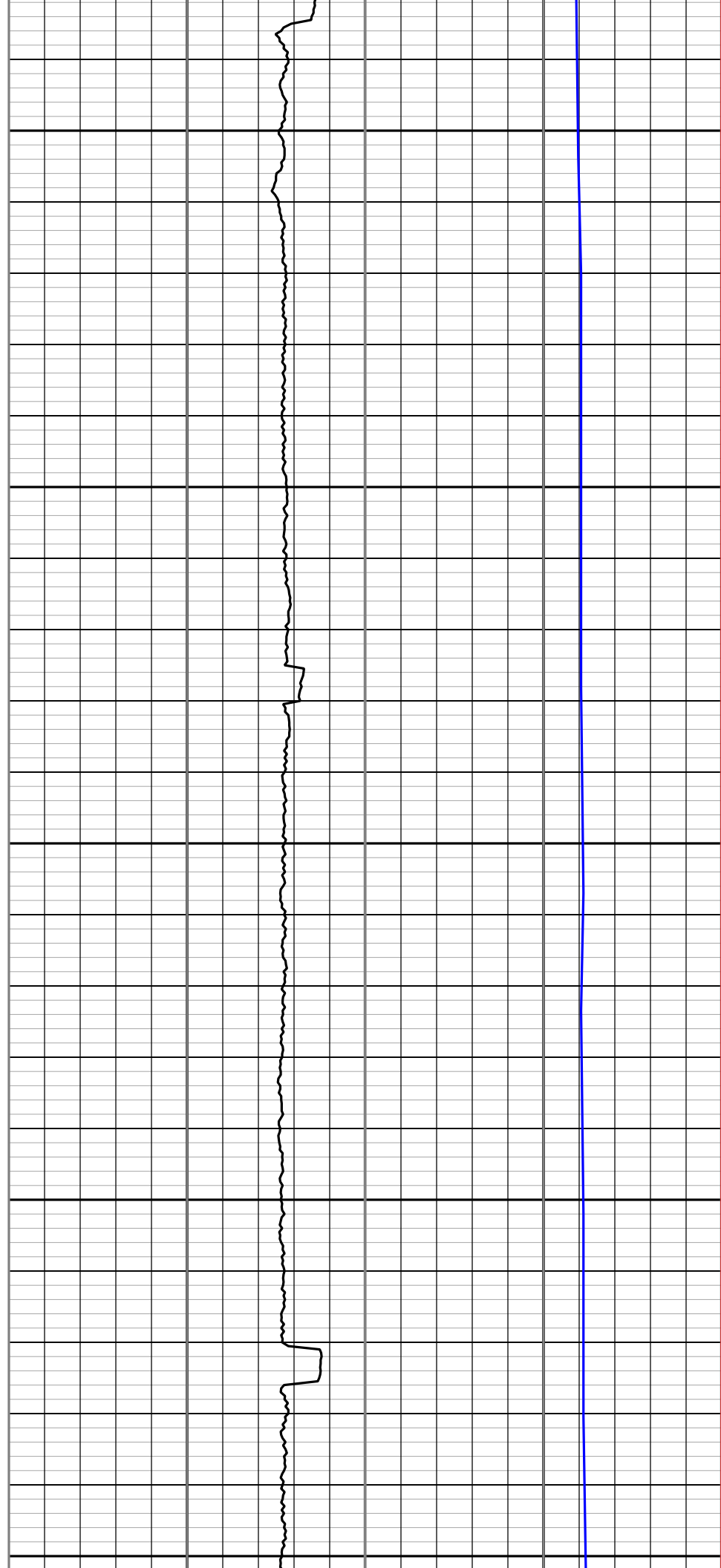
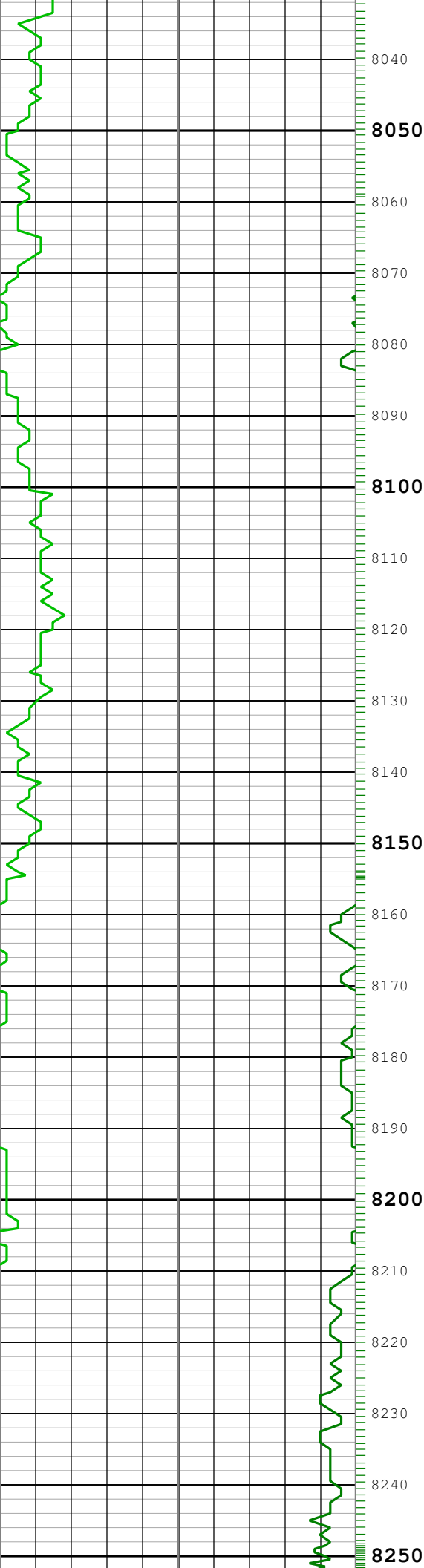


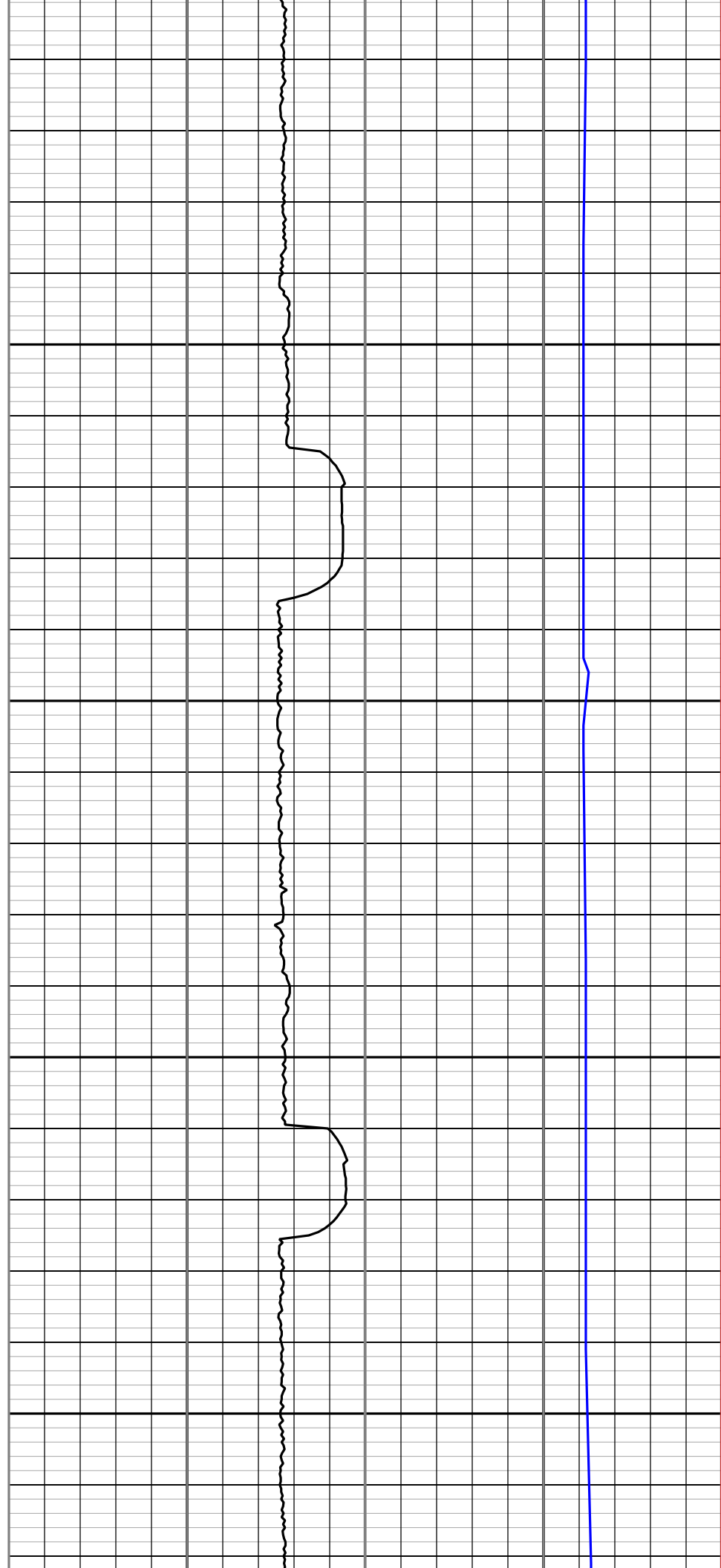
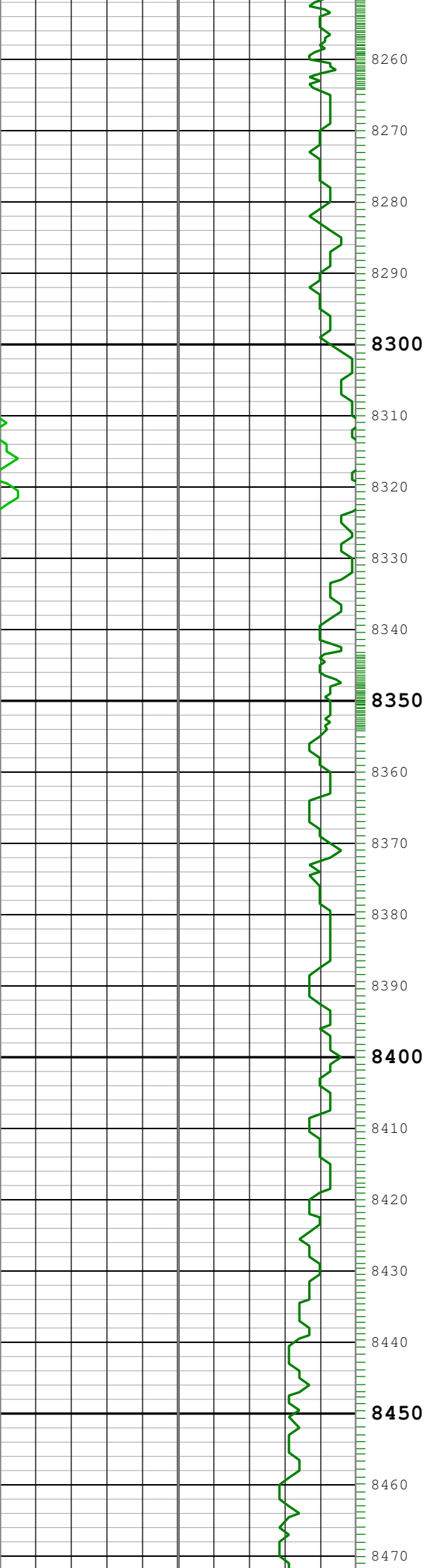


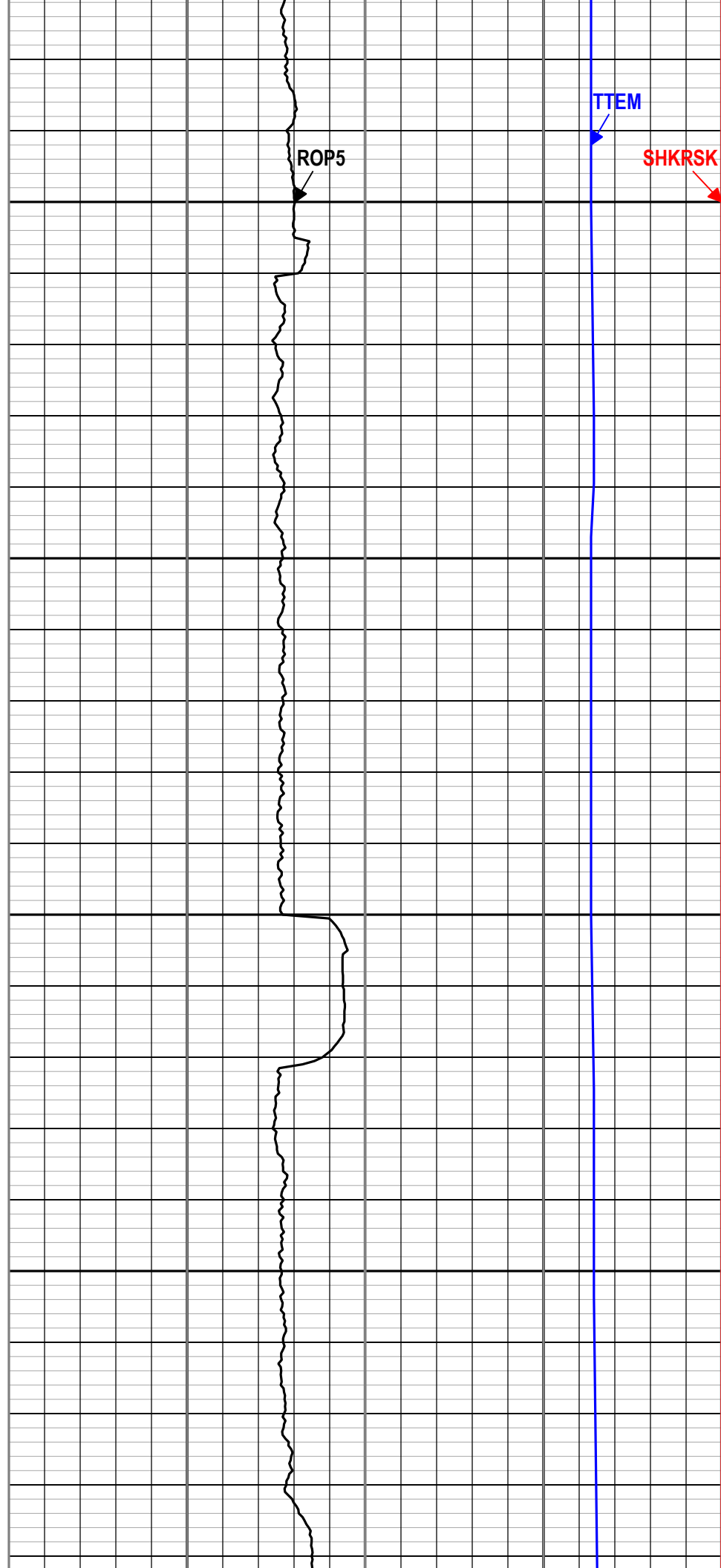
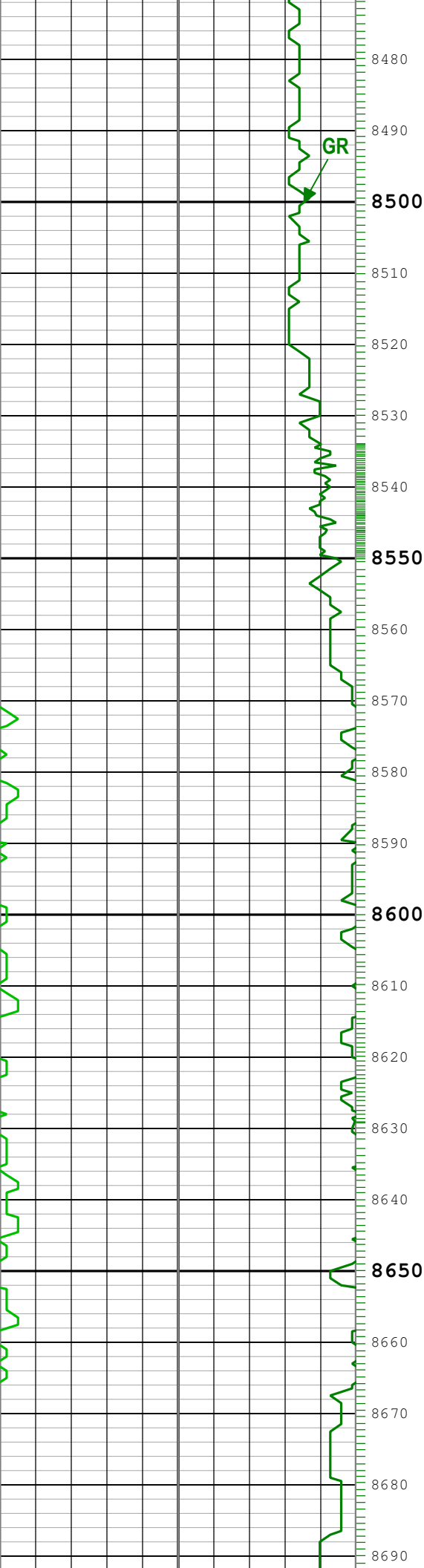


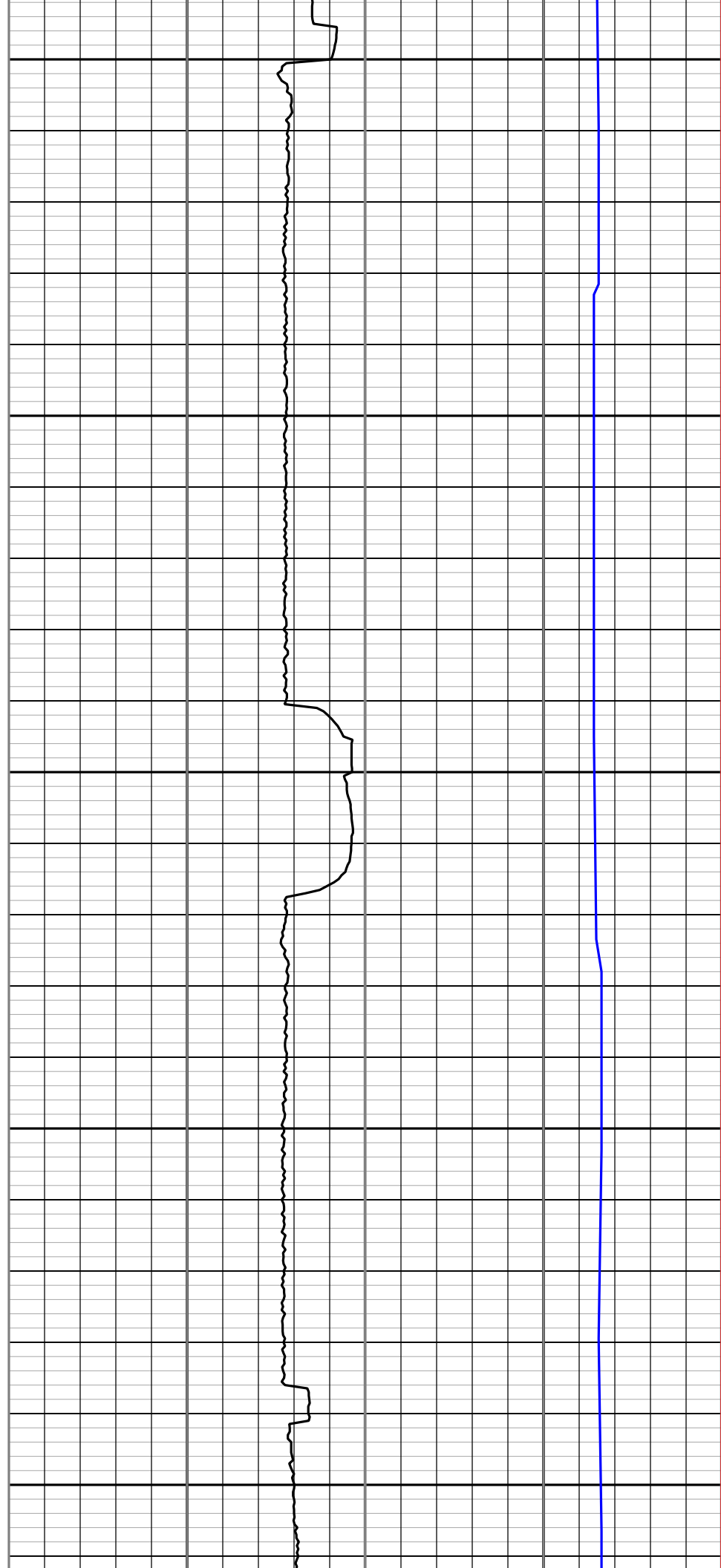
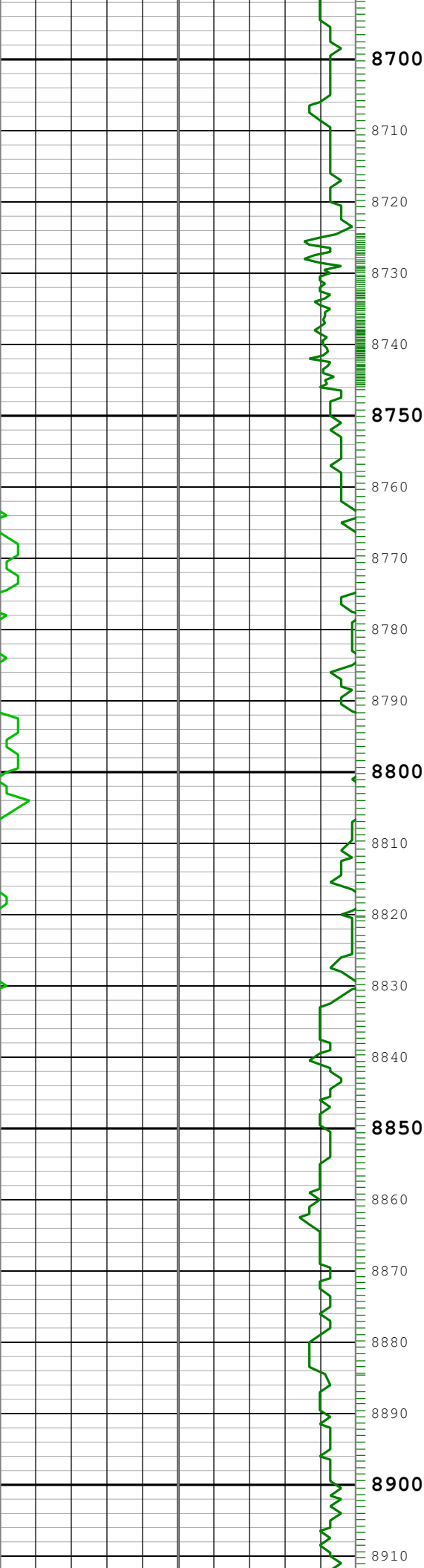


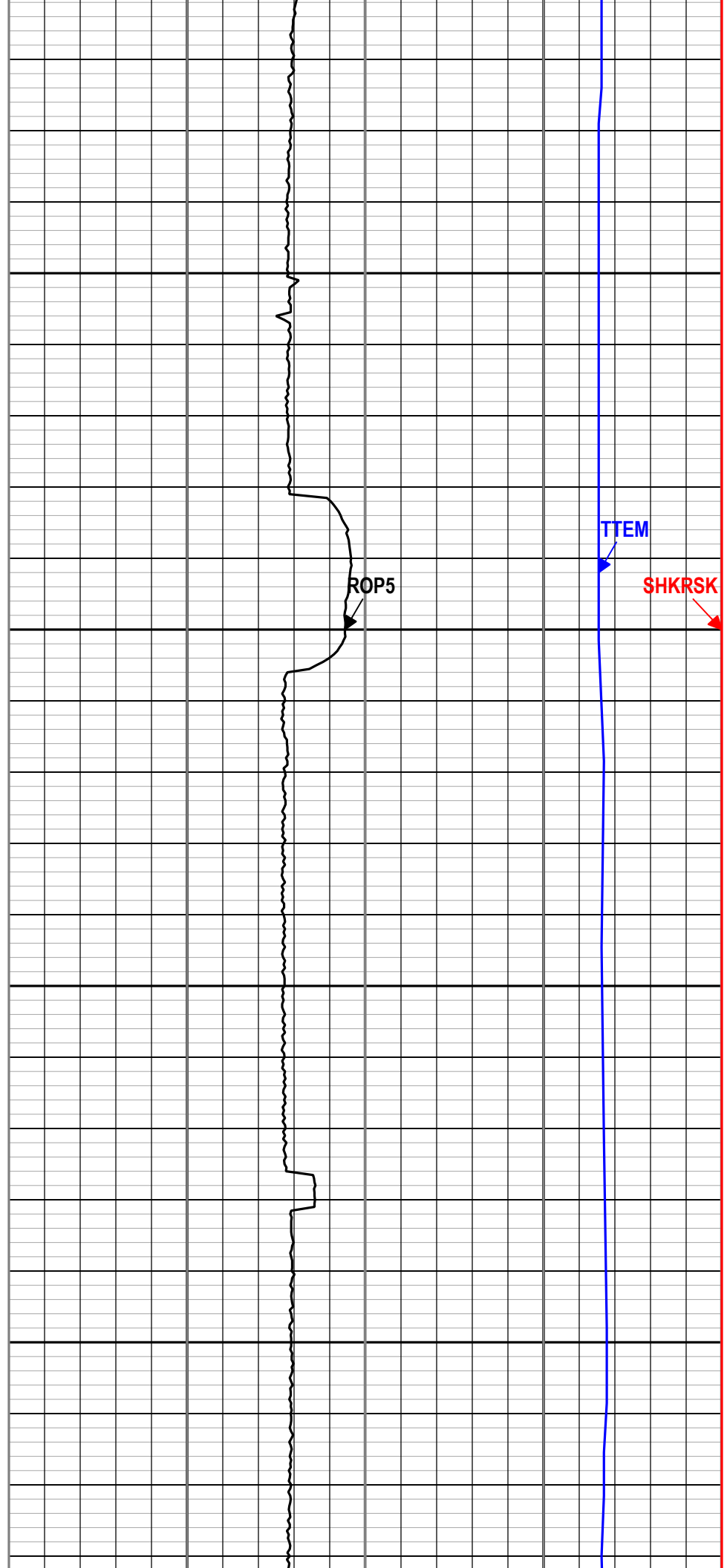
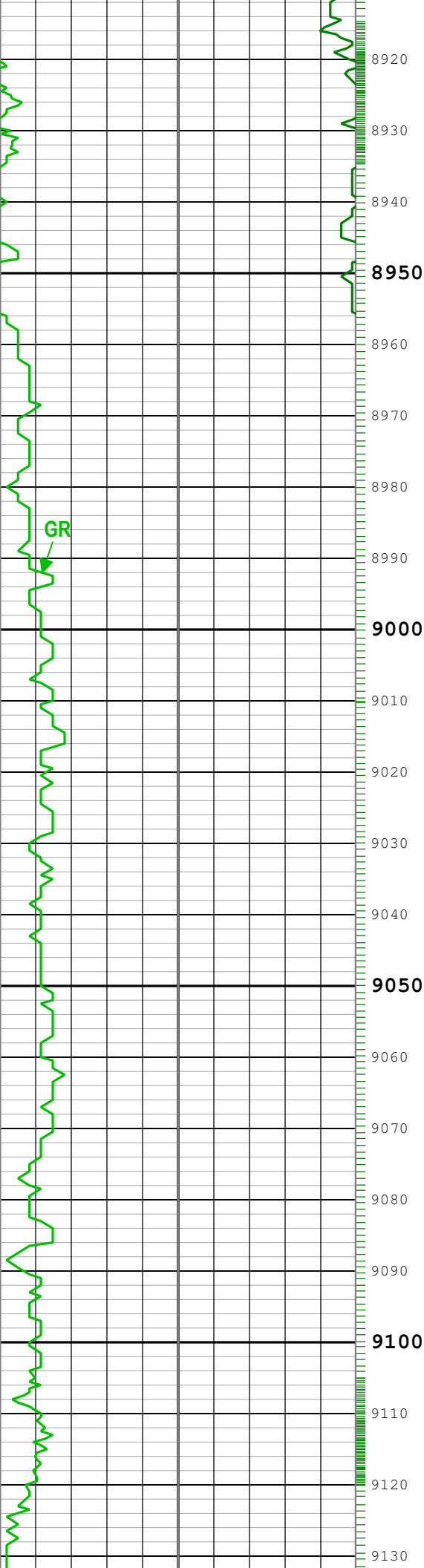


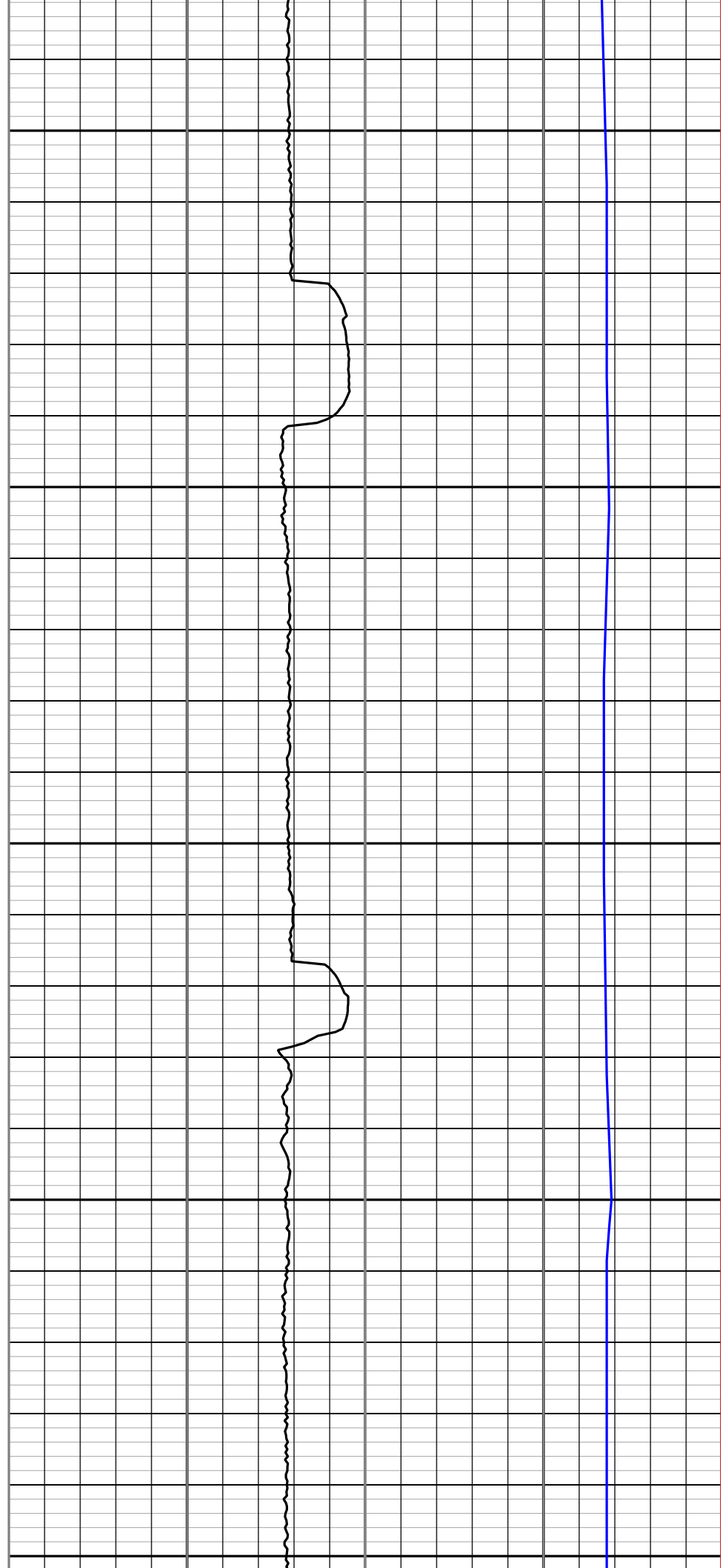
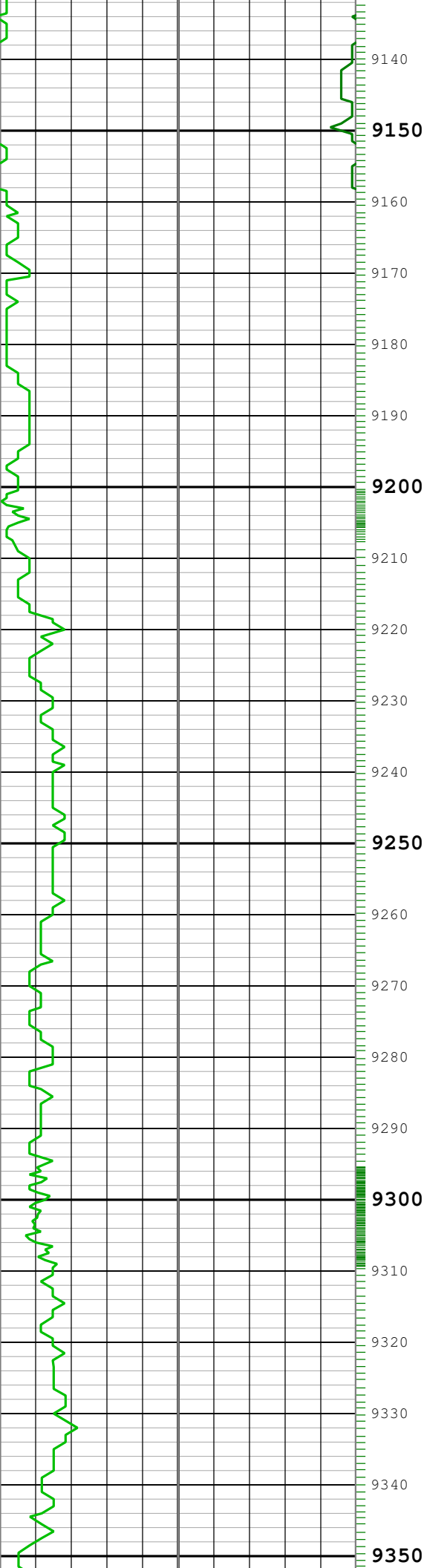


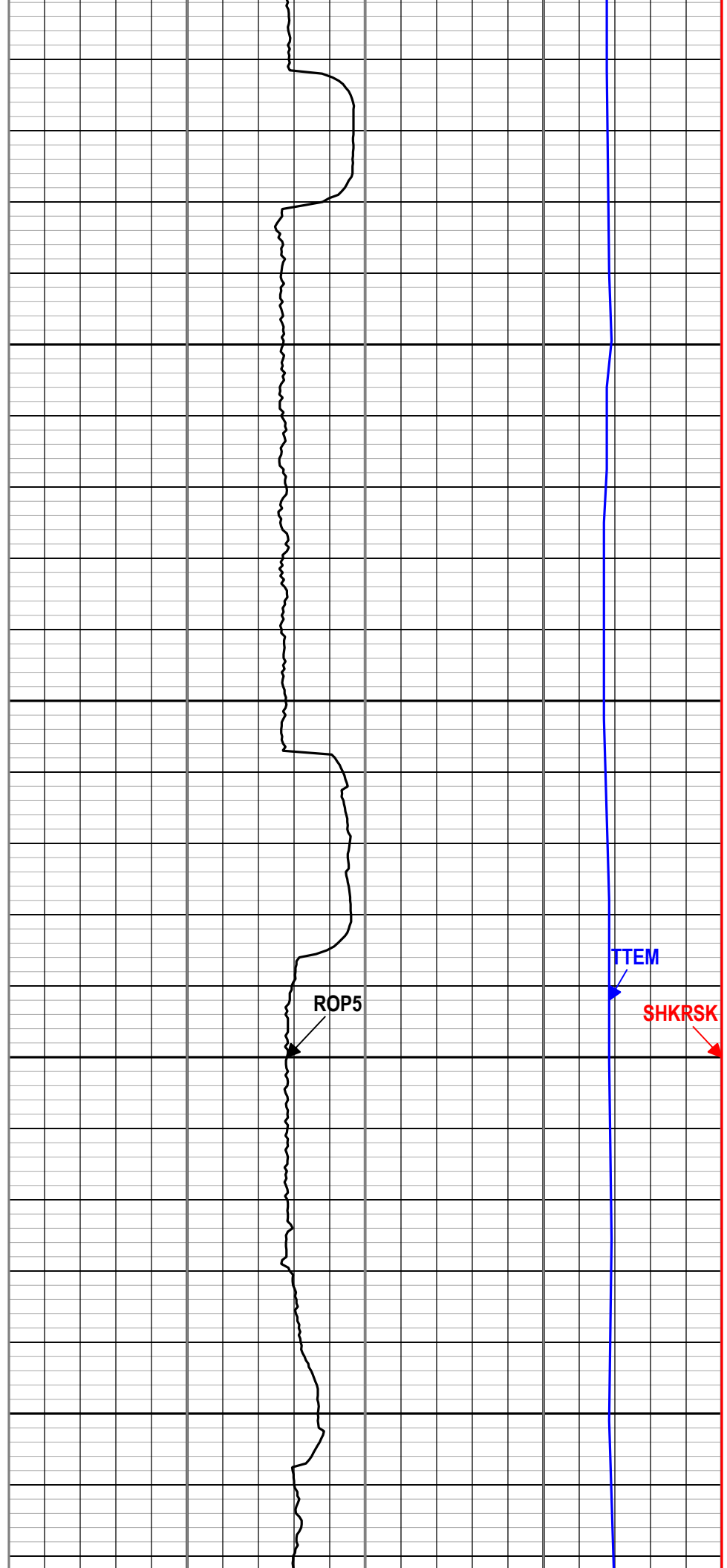
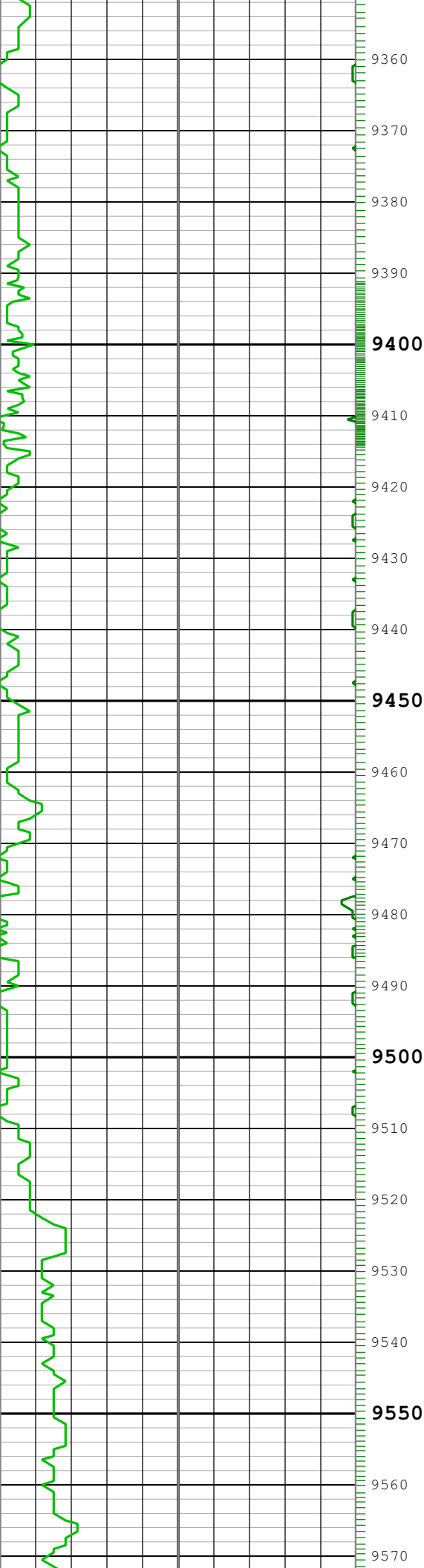


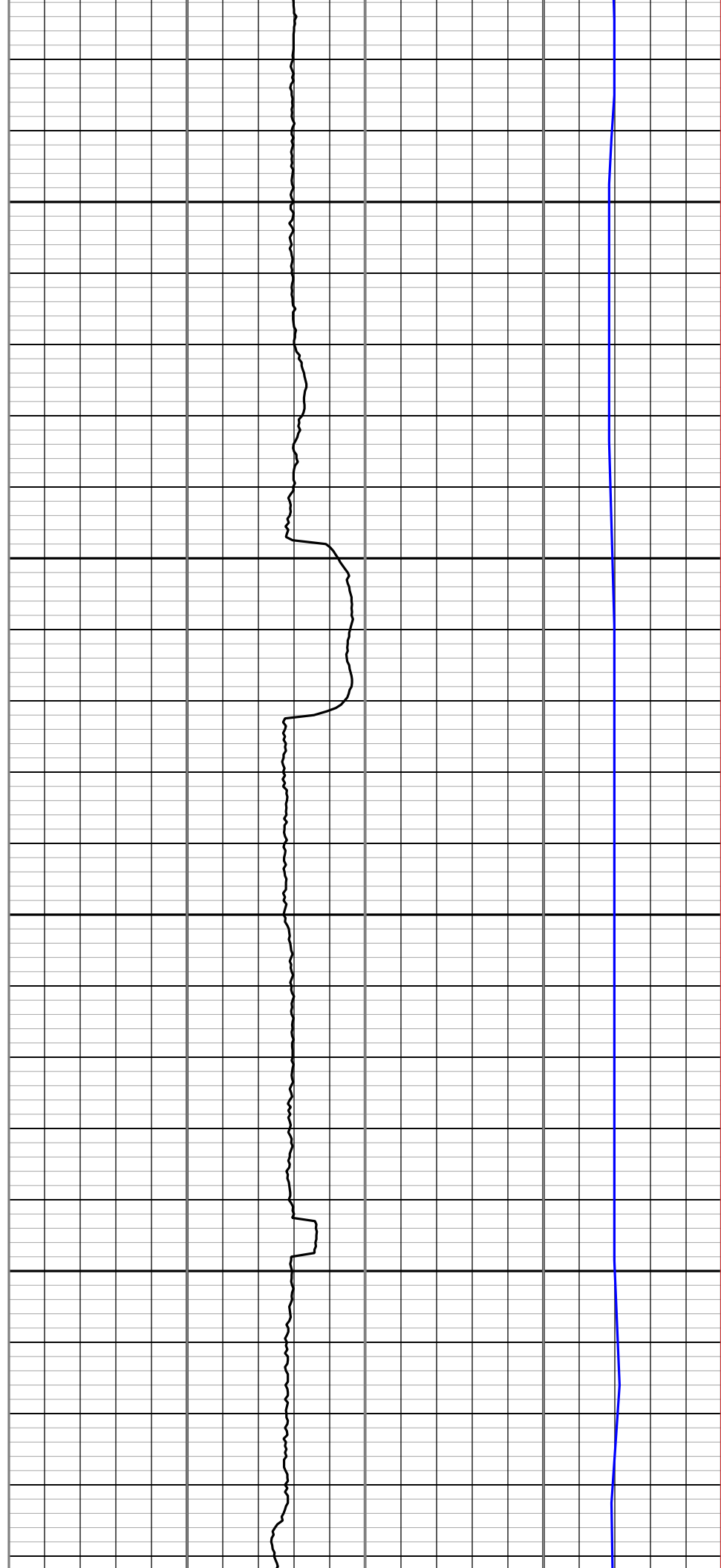
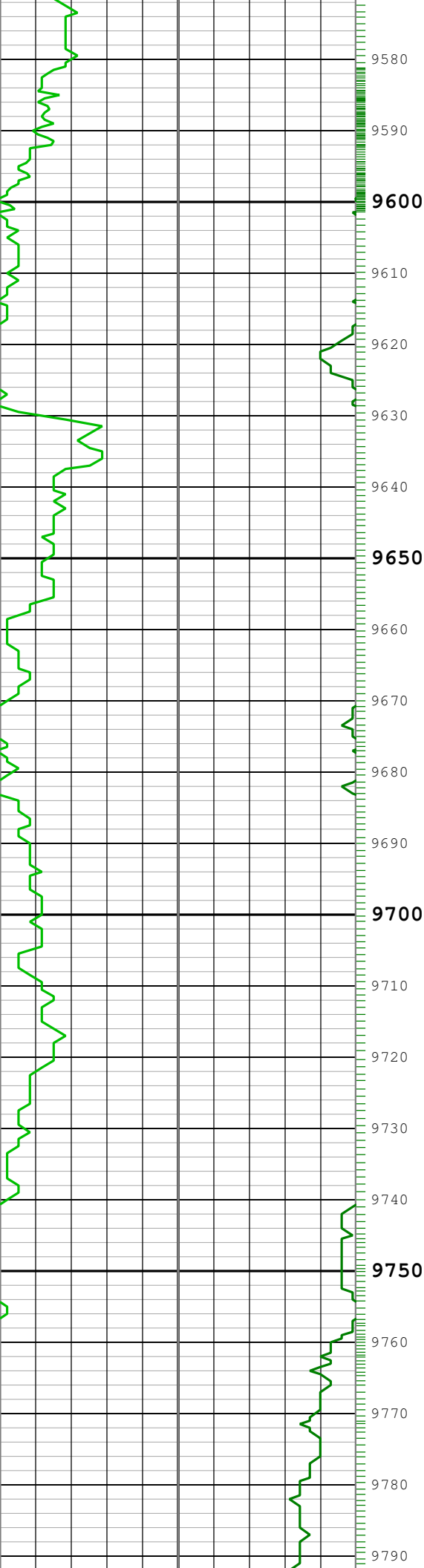


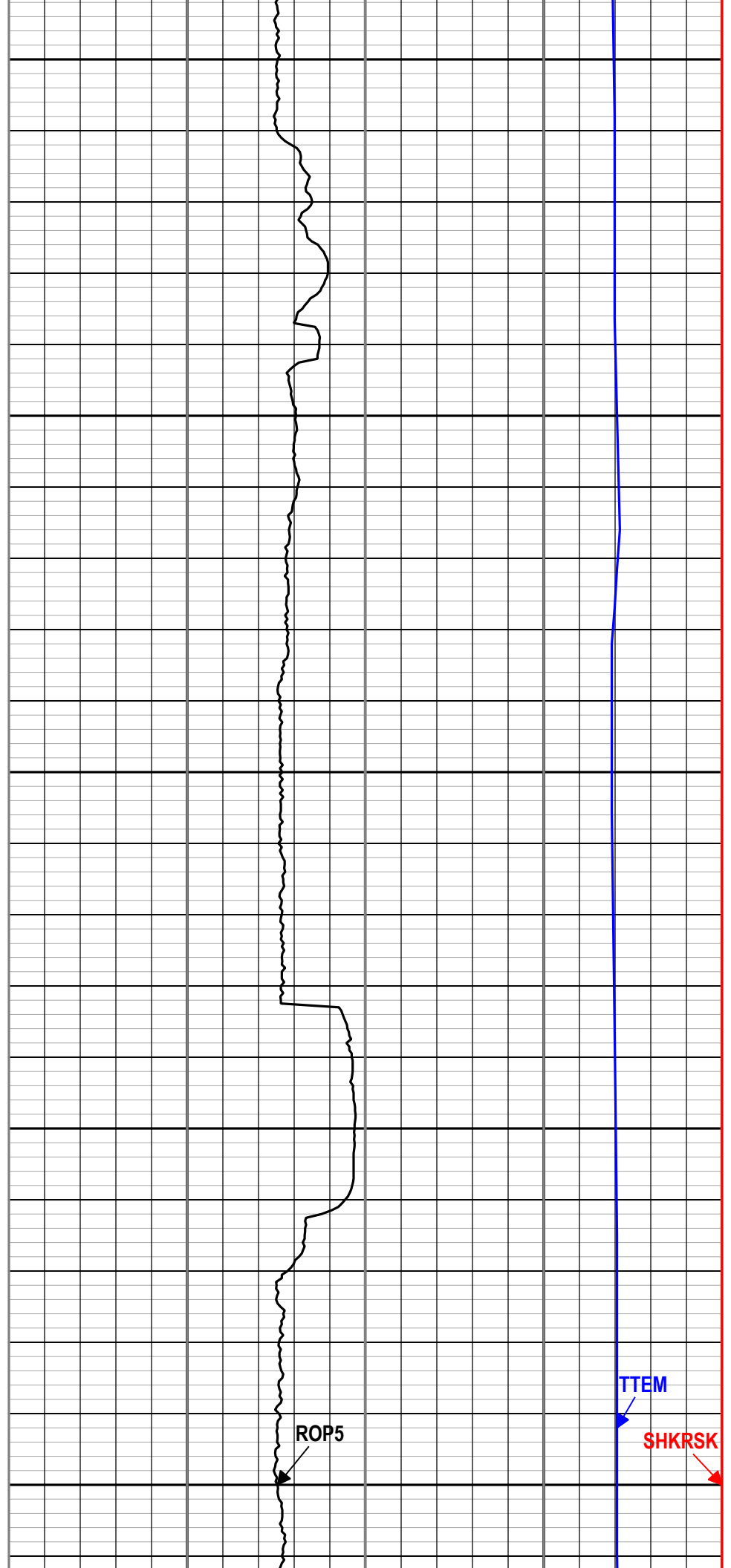
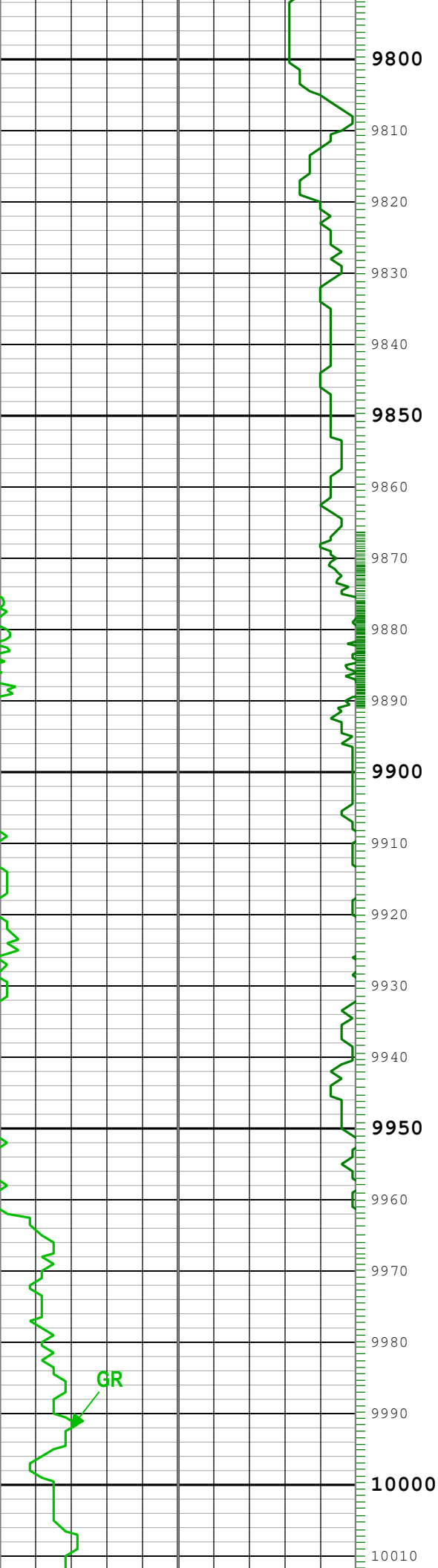


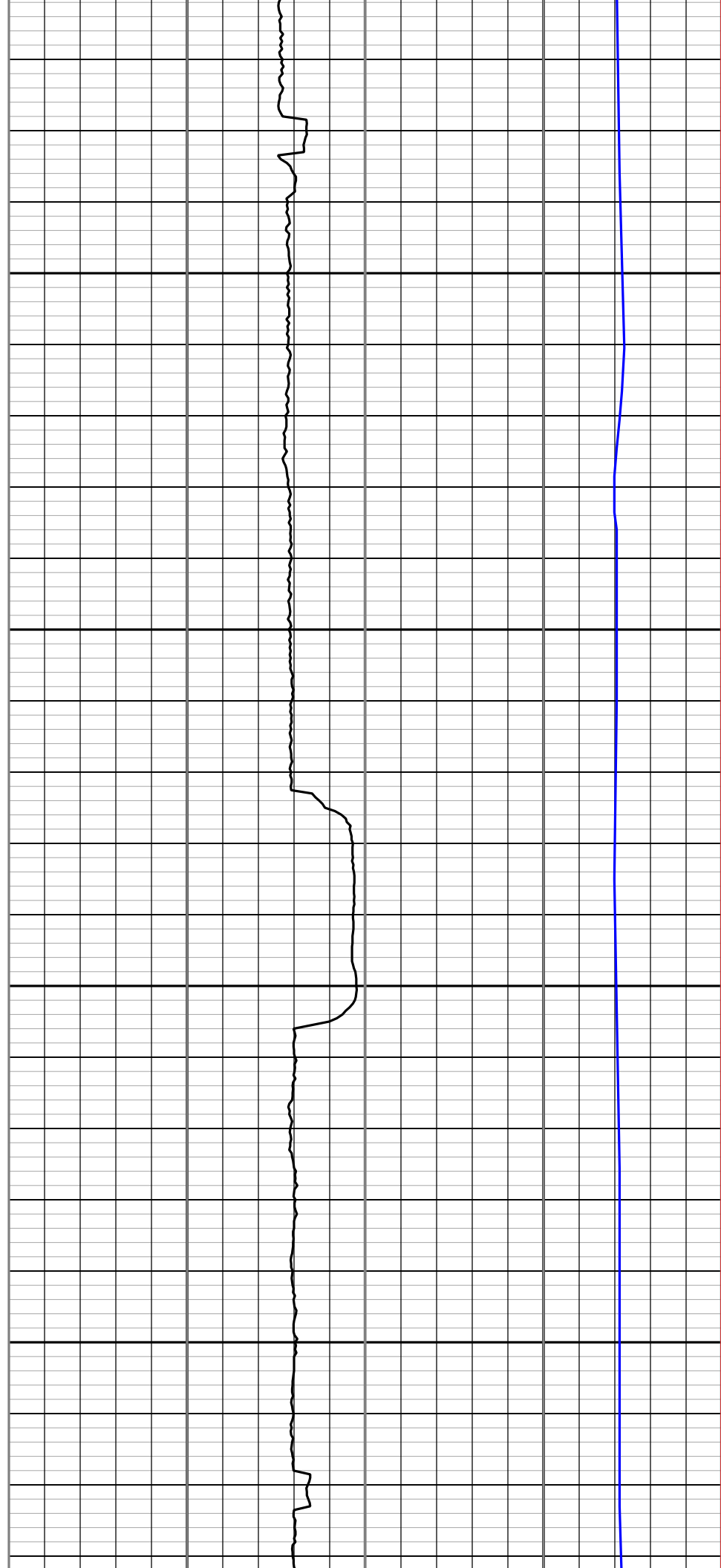
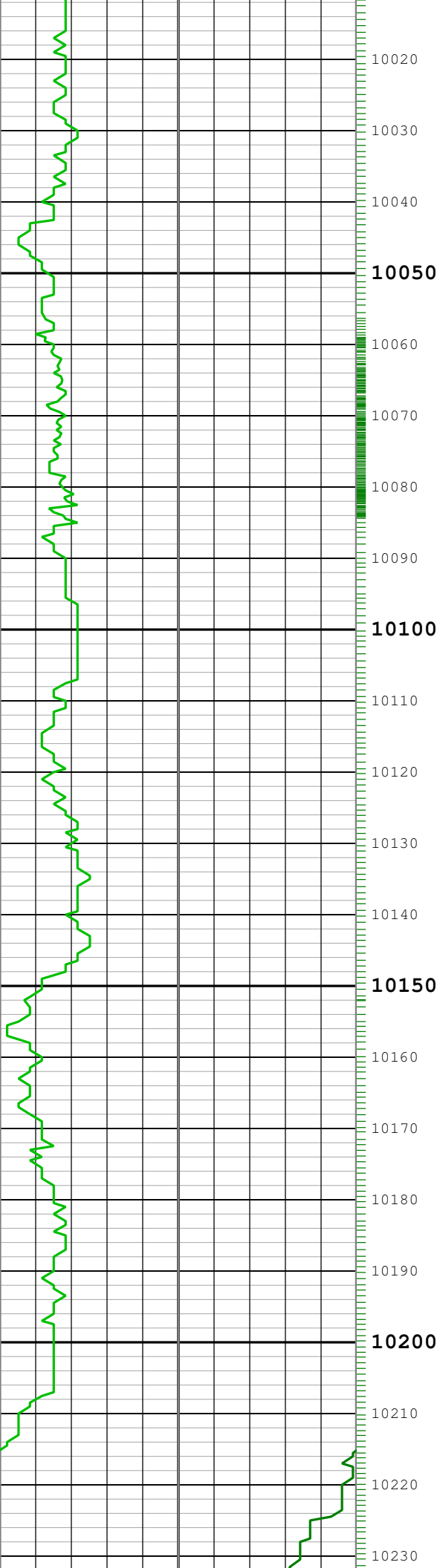


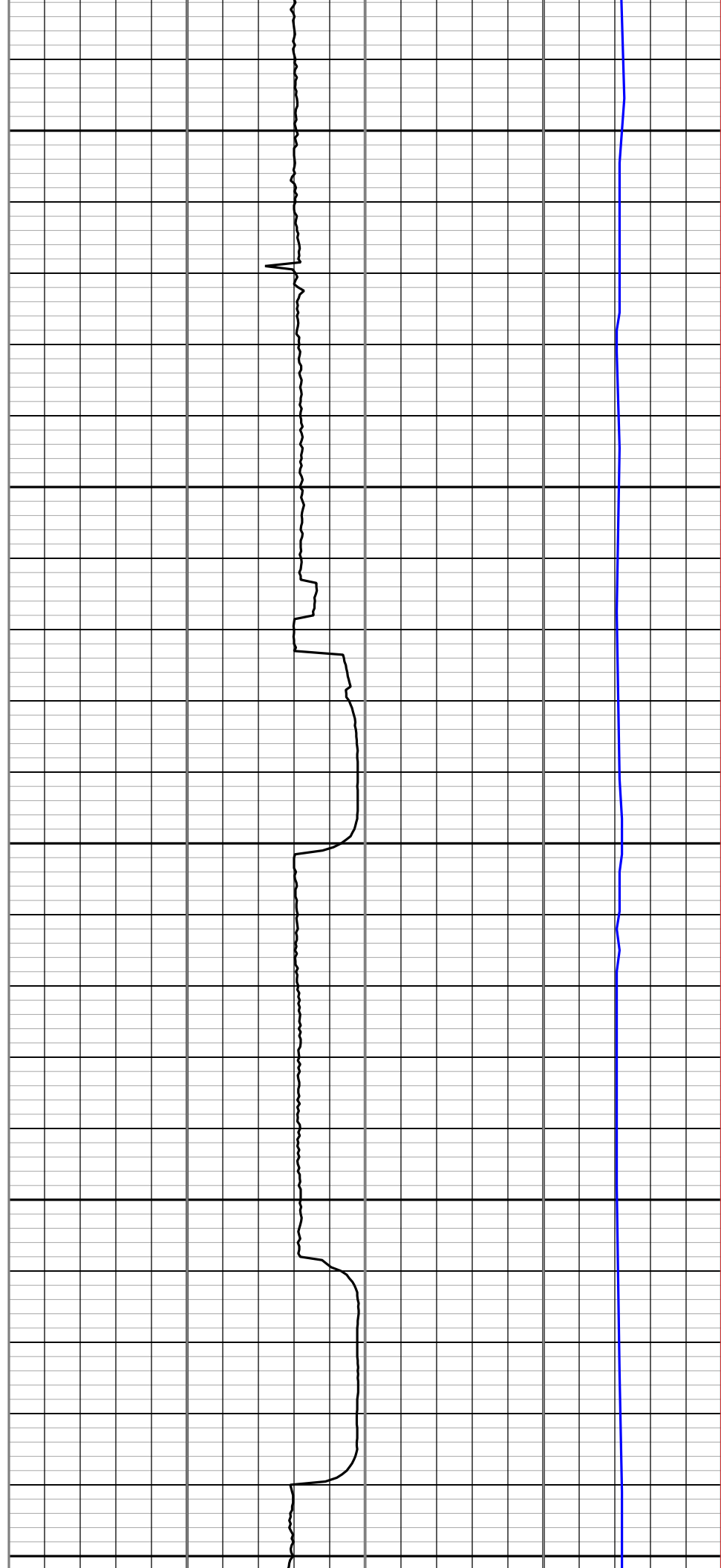
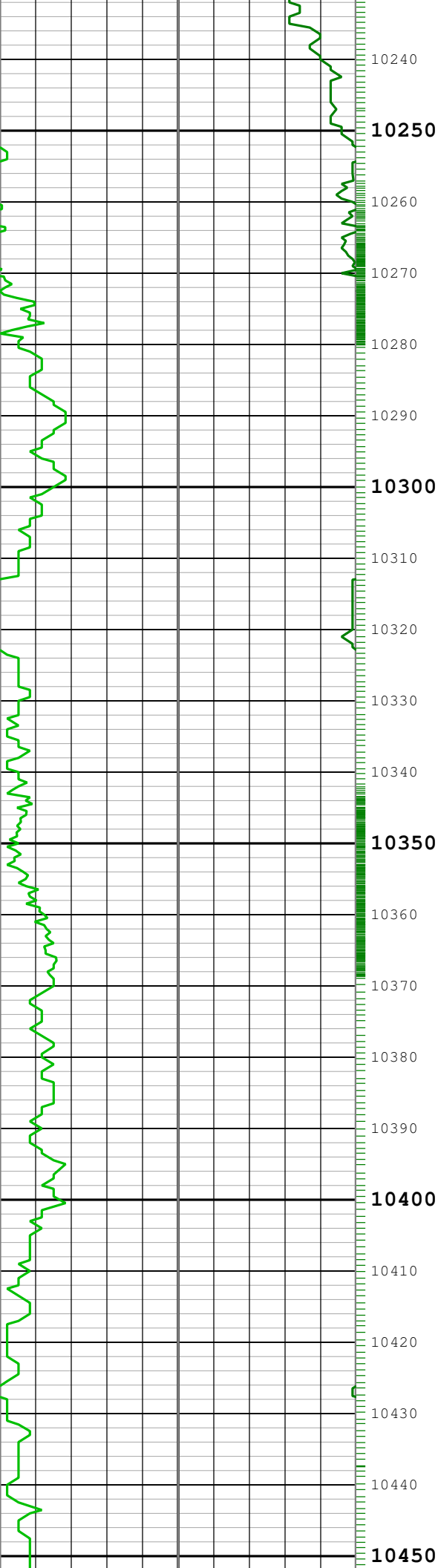


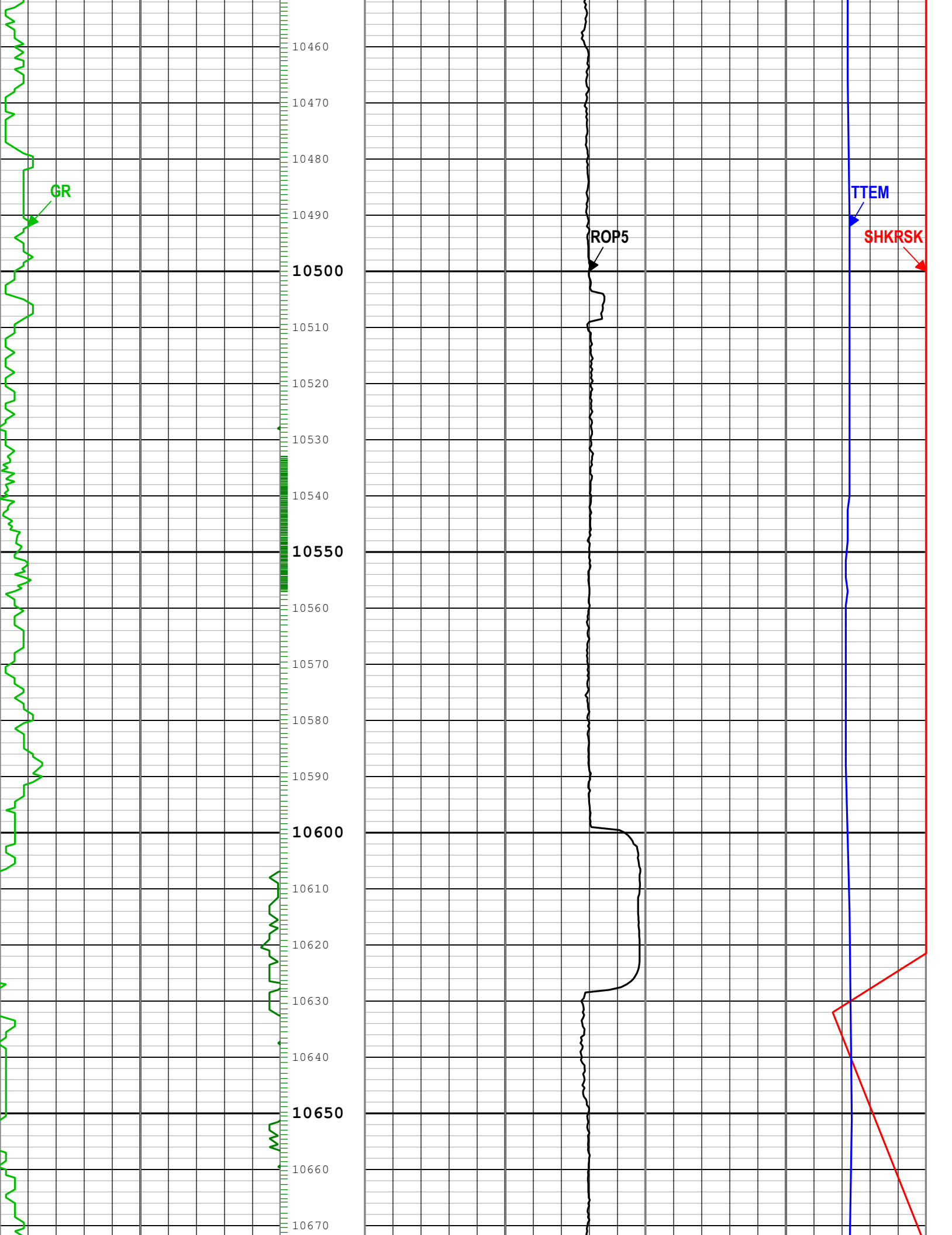


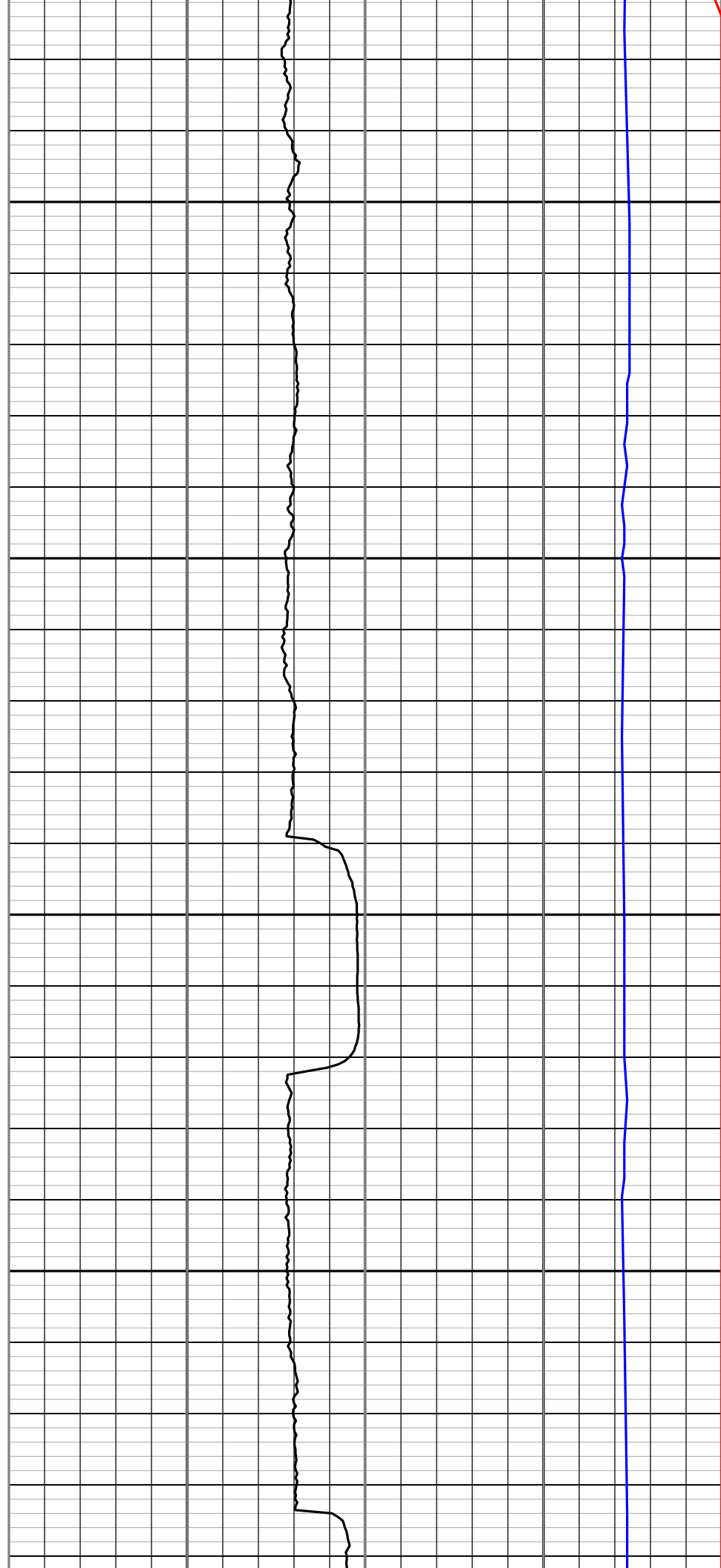
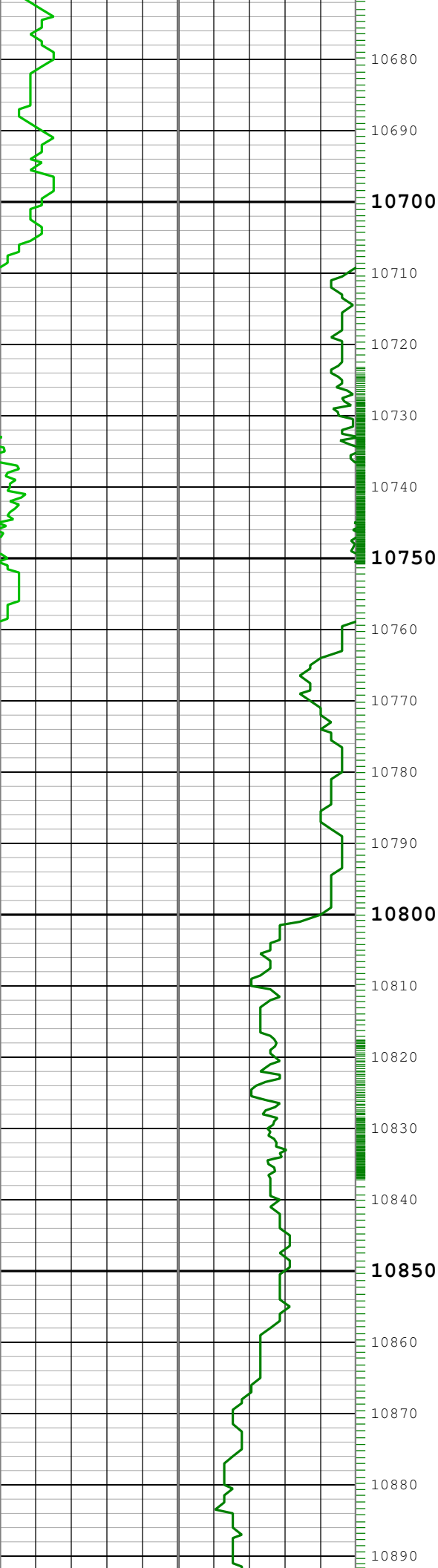


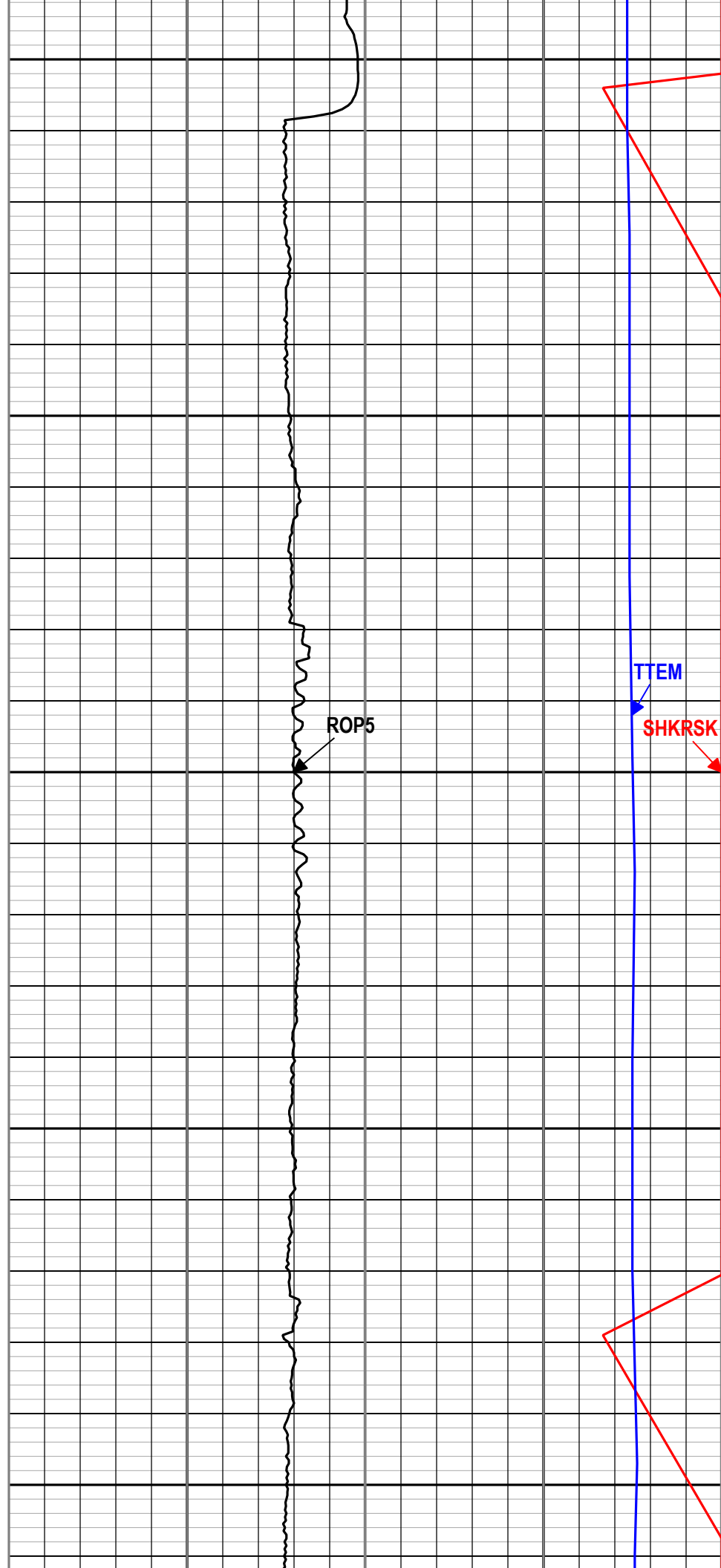
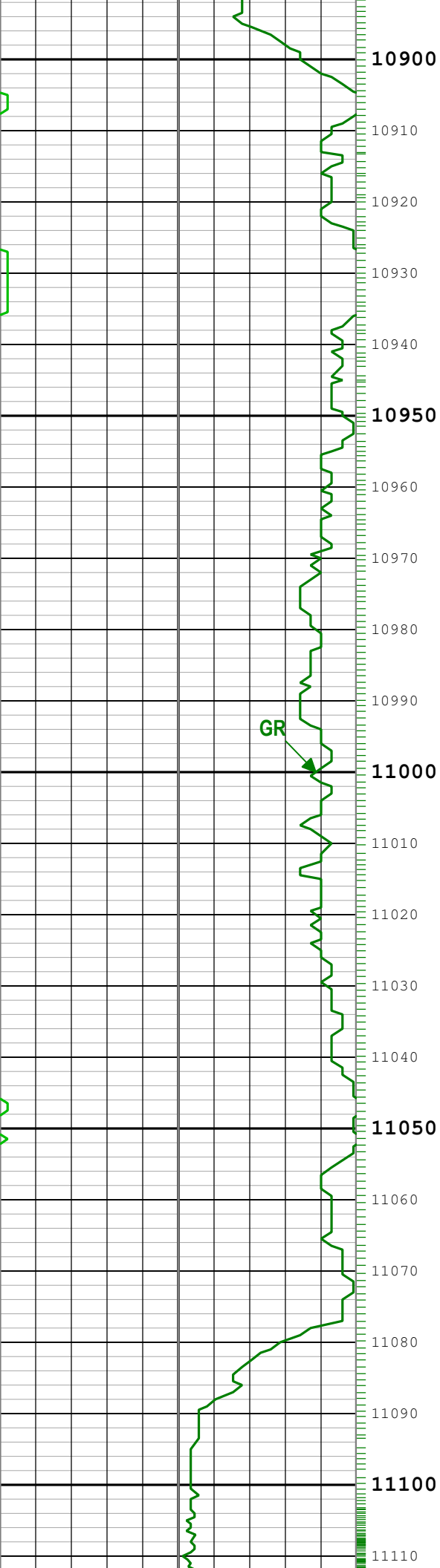


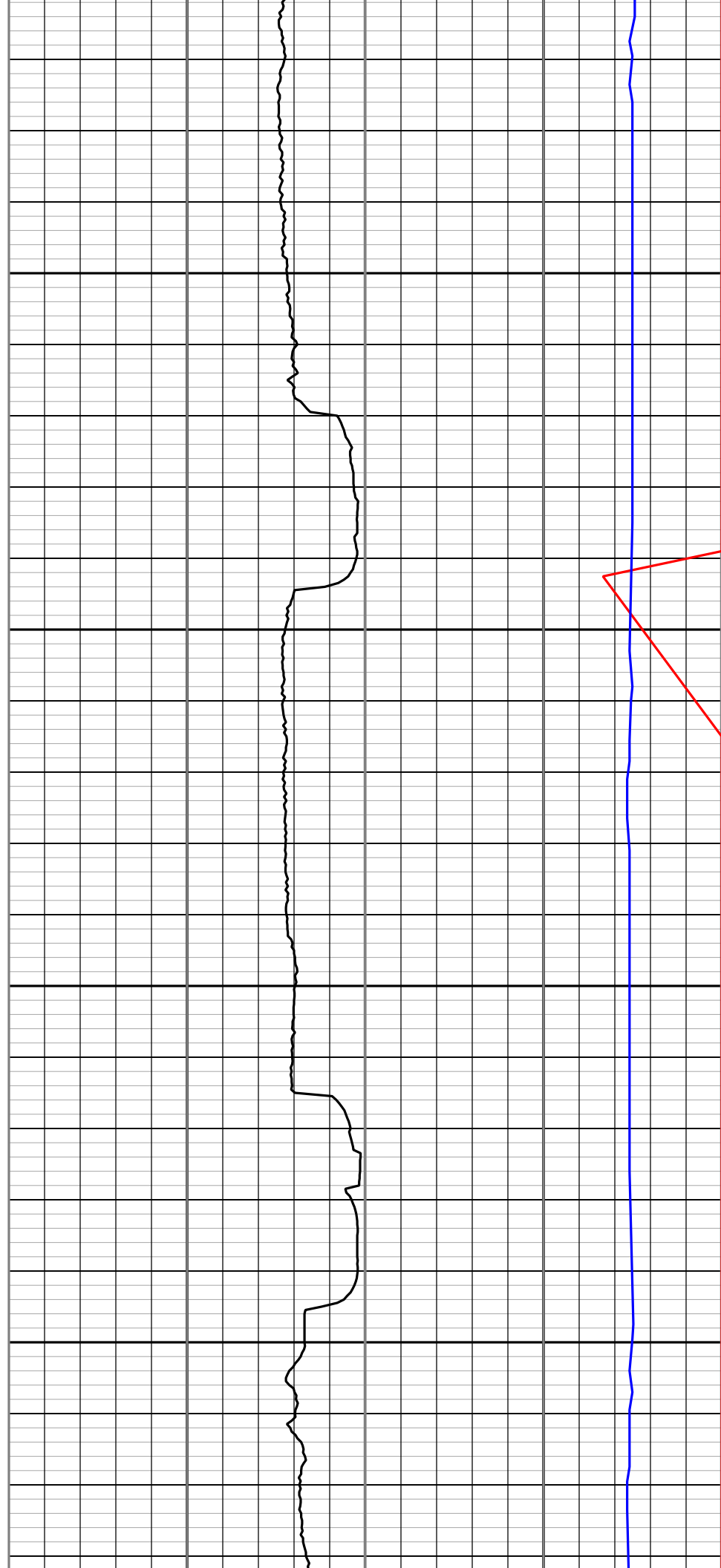
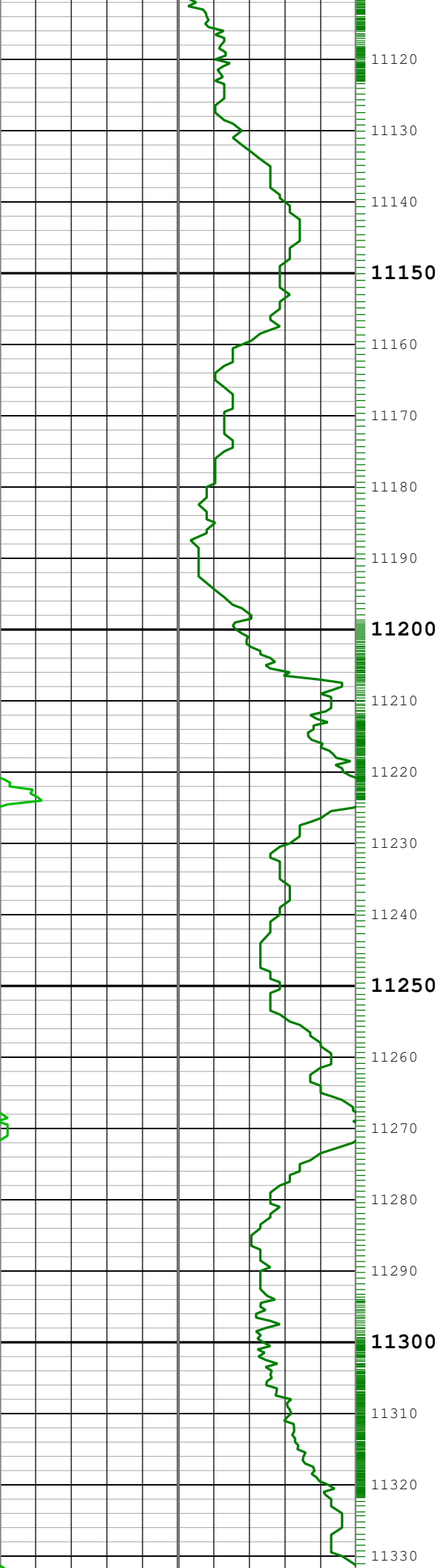


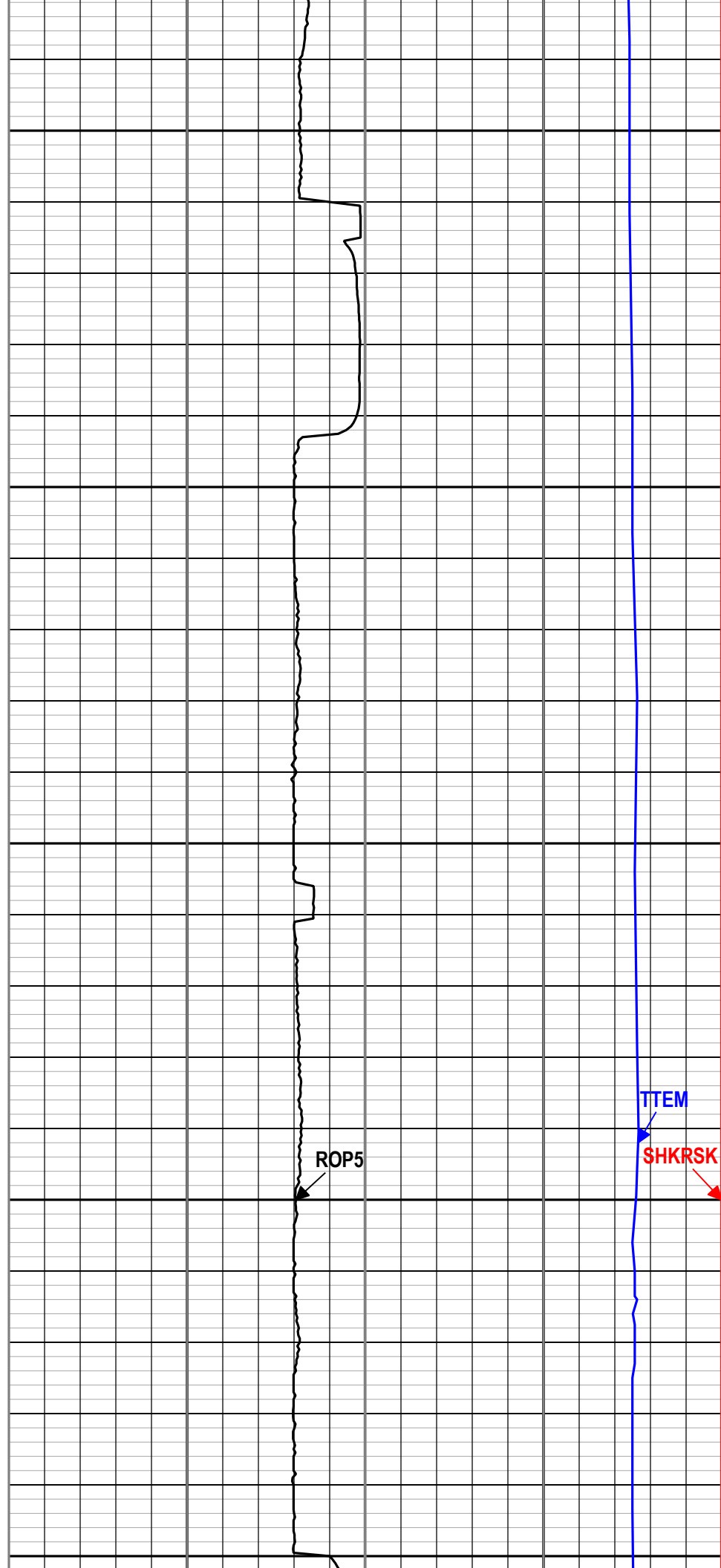
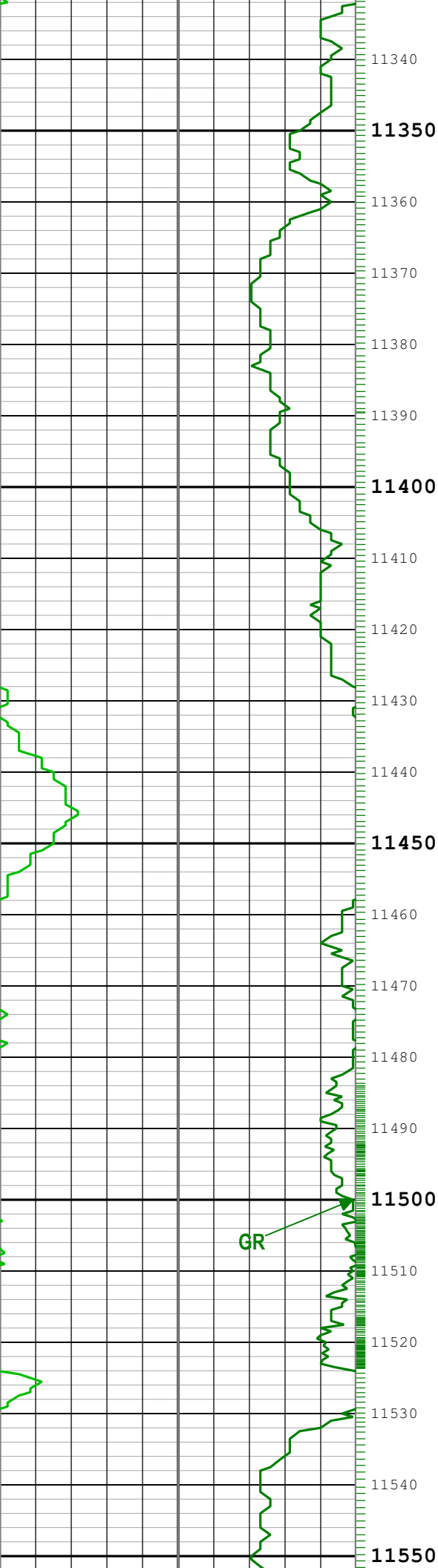


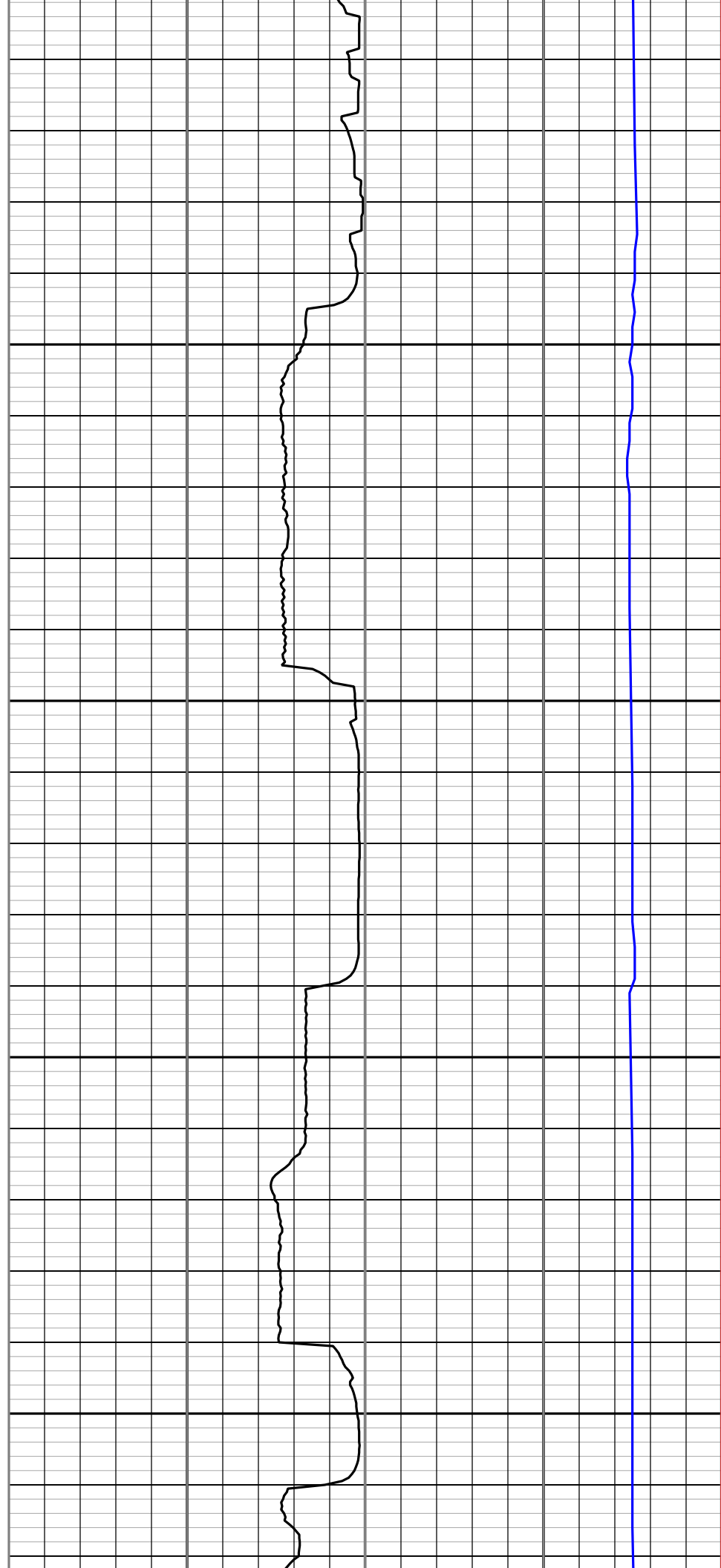
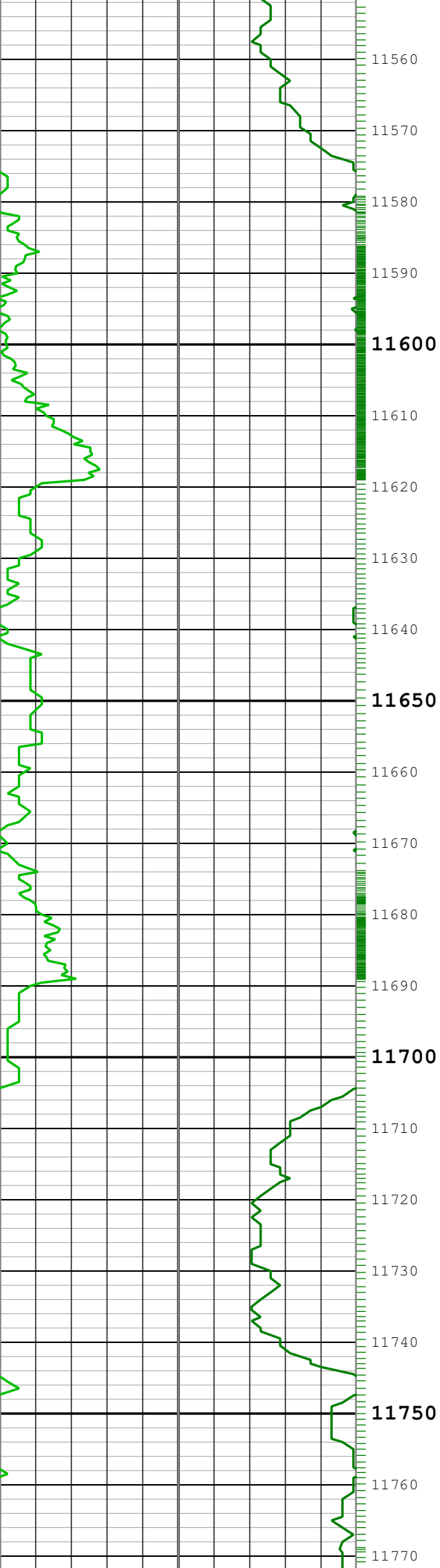


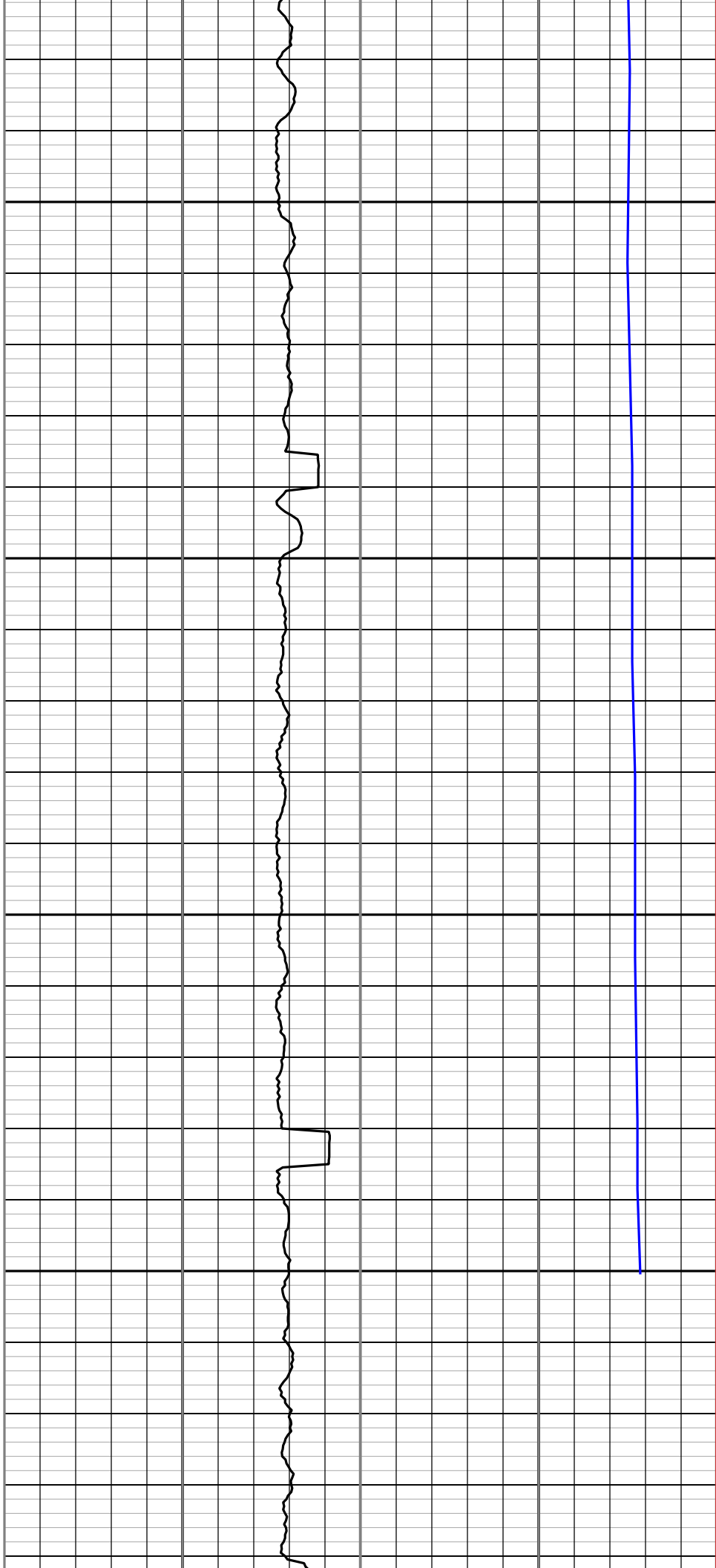
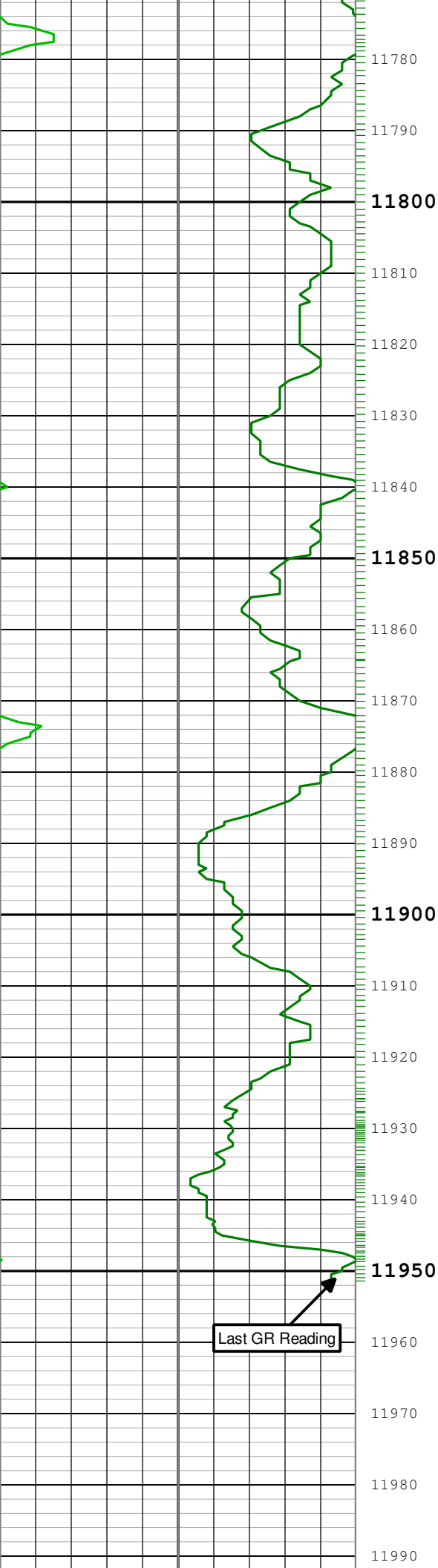












Run003 Time Zoned Parameters**Pass Drilling**

Parameter	Value	Start Time	Stop Time	Start Depth (ft)	Stop Depth (ft)
DFD	9.85	10-Aug-2014 20:02:51	11-Aug-2014 01:30:00	7272.25	7797.17
DFD	10.2	11-Aug-2014 01:30:00	11-Aug-2014 13:00:00	7797.17	9389.17
DFD	10.3	11-Aug-2014 13:00:00	12-Aug-2014 01:30:00	9389.17	10643.83
DFD	10.35	12-Aug-2014 01:30:00	12-Aug-2014 20:09:31	10643.83	12017.67

All depth are at tool zero.

Tool Control Parameters**Calibration Report****SPULSE-GEN (SlimPulse with Generic Collar) Calibration - Run Run001**

Primary Equipment :	Elec. cartridge, 150C max with GR	SPEC	H795
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GRGain - Gamma Ray: Blanket

Master (Time Frame File): 12:00:00 25-Jul-2014

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Gamma Ray Calibration Gain		Master	1.0000	0.9000	1.0983	1.1000	

SPULSE-GEN (SlimPulse with Generic Collar) Calibration - Run Run002

Primary Equipment :	Elec. cartridge, 150C max with GR	SPEC	6191
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GRGain - Gamma Ray: Blanket

Master (Time Frame File): 12:00:00 11-Apr-2014

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Gamma Ray Calibration Gain		Master	1.0000	0.9000	1.0258	1.1000	

SPULSE-GEN (SlimPulse with Generic Collar) Calibration - Run Run003

Primary Equipment :	Elec. cartridge, 150C max with GR	SPEC	1001
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GRGain - Gamma Ray: Blanket

Master (Time Frame File): 12:00:00 13-May-2014

Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Gamma Ray Calibration Gain		Master	1.0000	0.9000	1.0000	1.1000	

Company: Noble Energy INC

Well: Five Rivers K09-66-1HN

Field: Wattenberg

County: Weld

State: Colorado

Country: USA



SlimPulse-Gamma Ray

2 in./ 100 ft and 5 in./ 100 ft Measured Depth

Recorded Mode, Composite Log