

Company: Noble Energy Inc

Well: Larson AA19-635

Field: Wattenberg

County: Weld State: Colorado

Neutron Log

County:	Weld		
Field:	Wattenberg		
Location:	SESE 24-6N-64W		
Well:	Larson AA19-635		
Company:	Noble Energy Inc		
	Location:		
	SESE 24-6N-64W 1705 FSL & 0 FWL	Elev.: K.B. 4676.00 ft G.L. 4646.00 ft D.F. 4676.00 ft	
	Permanent Datum: Log Measured From: Drilling Measured From:	Ground Level Kelly Bushing Kelly Bushing	
		Elev.: 30.00 ft	
		4646.00 f above Perm.Datum	
API Serial No. 05-123-45550	Section: 24	Township: 6N	Range: 64W

Logging Date	19-Jun-2018
Run Number	UltraSonic-Nuetron
Depth Driller	17907.00 ft
Schlumberger Depth	17907.00 ft
Bottom Log Interval	6020.00 ft
Top Log Interval	100.00 ft
Casing Fluid Type	Water
Salinity	
Density	8.4 lbm/gal
Fluid Level	8.00 ft
BIT/CASING/TUBING STRING	
Bit Size	8.50 in
From	1963.00 ft
To	17907.00 ft
Casing/Tubing Size	5.5 in
Weight	20 lbm/ft
Grade	N/A
From	0.00 ft
To	17891.80 ft
Max Recorded Temperatures	187 degF
Logger on Bottom	19-Jun-2018
Unit Number	OSL C-EA 2377
Recorded By	L. Awalt
Witnessed By	B. Mansfield

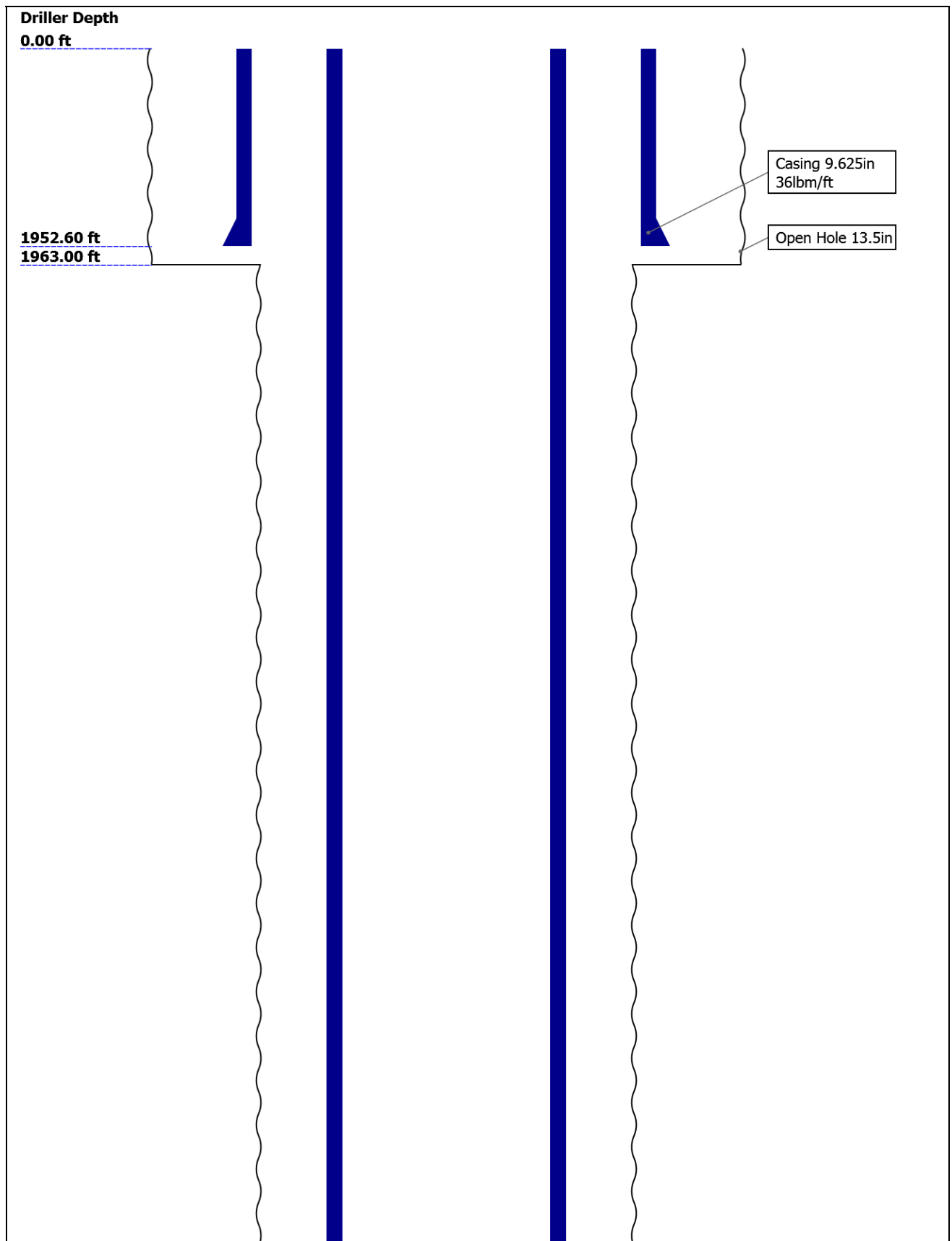
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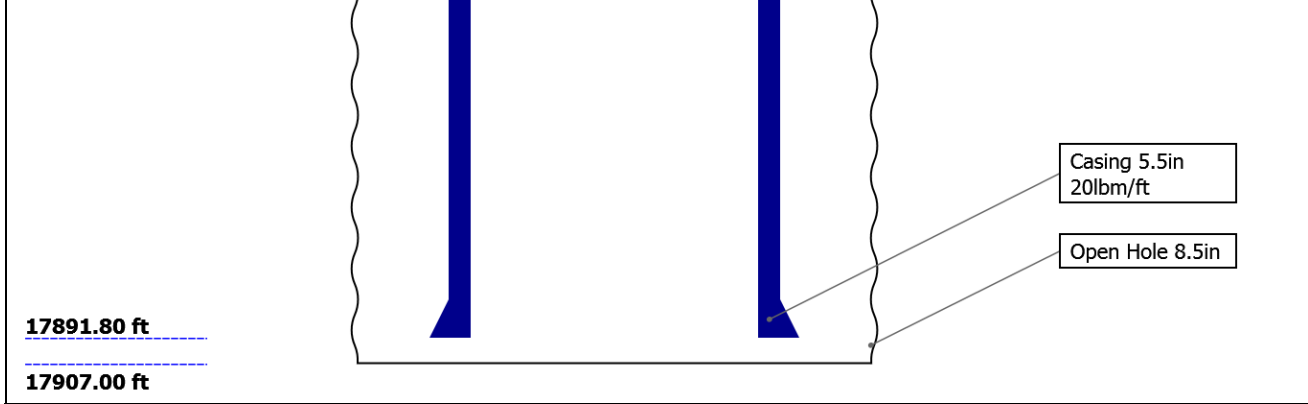
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Well Sketch



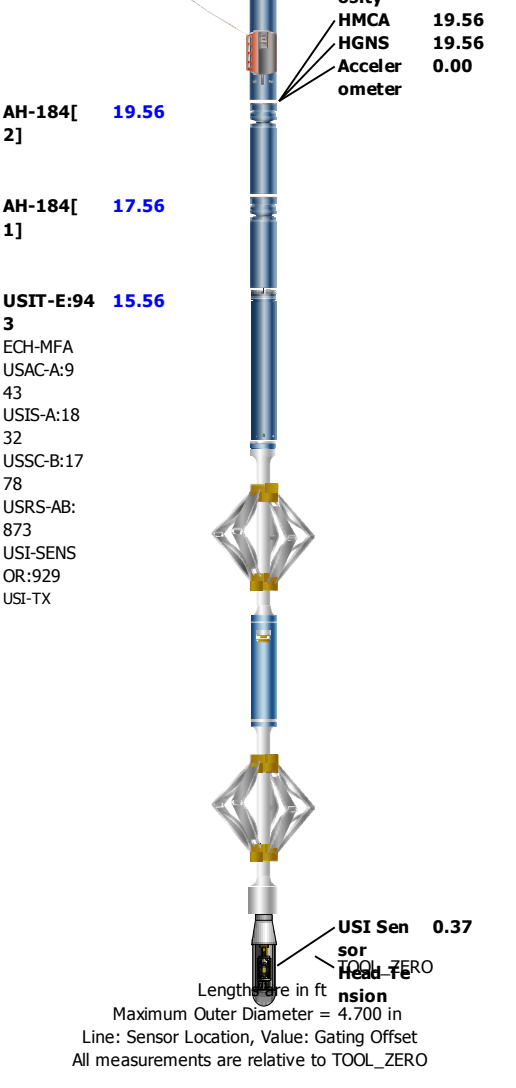


Borehole Size/Casing/Tubing Record

Bit						
Bit Size (in)	13.5	8.5				
Top Driller (ft)	0	1963				
Top Logger (ft)	0	1963				
Bottom Driller (ft)	1963	17907				
Bottom Logger (ft)	1963	17907				
Casing						
Size (in)	9.625	5.5				
Weight (lbm/ft)	36	20				
Inner Diameter (in)	8.921	4.778				
Grade	N/A	N/A				
Top Driller (ft)	0	0				
Top Logger (ft)	0	0				
Bottom Driller (ft)	1952.6	17891.8				
Bottom Logger (ft)	1952.6	17891.8				

Remarks and Equipment Summary

UltraSonic-Nuetron: Toolstring				UltraSonic-Nuetron: Remarks	
<div><div><div>Equip nameLengthMP nameOffset</div><div>LEH-QT38.38LEH-QT</div><div>EDTC-B:835.47478EDTH-BEDTG-AEDTC-B:8478</div><div>HGNS-H28.97HGNHNPV-NSR-F:5203HGNS-HHACZ-H:4168HMCA-H</div></div><div><div>CTEM31.97ACCZ0.00HV0.00Gamma30.1RayTelStatu28.97sTemper28.94atureGR28.23</div><div>CNL Por21.89osity</div></div></div>				Thank you for choosing Schlumberger!	
				Log run for cement evaluation	
				Tools run centralized as per tool sketch	
				USRS-AB sub run with USI-TX transducer	
				Crew: Gary Lapp, Diego Saldina	



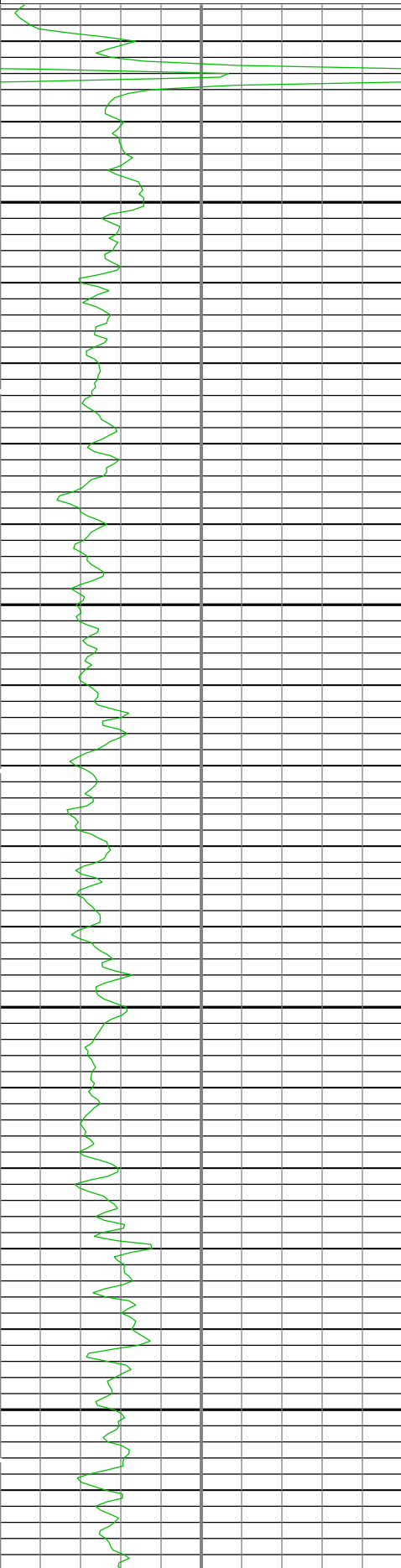
Depth Summary			
		UltraSonic-Nuetron	
Depth Measuring Device			
Type	IDW-B		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Calibration Cable Type			
Wheel Correction 1	0		
Wheel Correction 2	0		
Tension Device			
Type	CMTD-B/A		
Serial Number			
Calibration Date			
Calibrator Serial Number			
Number of Calibration Points	0		
Logging Cable			
Type	7-46NT-XS		
Serial Number			
Length	24000.00 ft		
Conveyance Type	Wireline		

Rig Type									
UltraSonic-Nuetron:Depth Control Parameters						Depth Control Remarks			
Log Sequence		First Log In the Well							
Rig Up Length At Surface									
Rig Up Length At Bottom									
Rig Up Length Correction									
Stretch Correction									
Tool Zero Check At Surface									
Composite 1									
Nuclear									
Integration Summary									
Output Channel(s)	Output Description		Input Parameter			Output Value		Unit	
ICV	Integrated Cement Volume		GCSE_UP_PASS, GCSE_DOWN_PASS:UltraSonic-Nuetron, FCD			0		ft3	
IHV	Integrated Hole Volume		GCSE_UP_PASS, GCSE_DOWN_PASS:UltraSonic-Nuetron			0		ft3	
Software Version									
Acquisition System						Version			
Maxwell 2017 SP3						7.3.92069.3100			
Application Patch						Wireline_NPD-ICE2-2017SP3_7.3.93033			
						Wireline_Hotfix-RTDLIS-2017SP3_7.3.92363			
						Wireline_Hotfix-SML-2017SP3_7.3.101161			
						Wireline_TestKit-CMR-NG-2017SP3_7.3.96073			
Composite Summary									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
UltraSonic-Nuetron	Log[3]:Up	Up	3529.70 ft	6030.76 ft	19-Jun-2018 11:48:35 AM	19-Jun-2018 12:18:17 PM	ON	-1.89 ft	No
UltraSonic-Nuetron	Log[4]:Up	Up	55.14 ft	3778.58 ft	19-Jun-2018 12:28:53 PM	19-Jun-2018 1:07:29 PM	ON	-1.43 ft	No
All depths are referenced to toolstring zero									
Log	Company:Noble Energy Inc Well:Larson AA19-635 Composite 1:S005								
Description: AIT Basic Log Two Format: Log (Noble Nuclear) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Jun-2018 09:51:56									
Channel	Source		Sampling						
GR	EDTC-B[1]:EDTC-B[1]:EDTC-B[1]		6in						
ICV	Borehole		6in - RT						
IHV	Borehole		6in - RT						
NPOR	HGNS[1]:HGNS-H[1]:HGNS-H[1]		6in						
TENS	WLWorkflow		6in						
TIME_1900	WLWorkflow		0.1in						
└─IHV - Integrated Hole Volume every 10.00 (ft3)									
└─IHV - Integrated Hole Volume every 100.00 (ft3)									
└─ICV - Integrated Cement Volume every 10.00 (ft3)									
TIME_1900 - Time Marked every 60.00 (s)									
└─ICV - Integrated Cement Volume every 100.00 (ft3)									
CUT OFF (TENS)									

GR Backup

Gamma Ray (ECGR_EDTC) EDTC-B[1]

0 gAPI 150

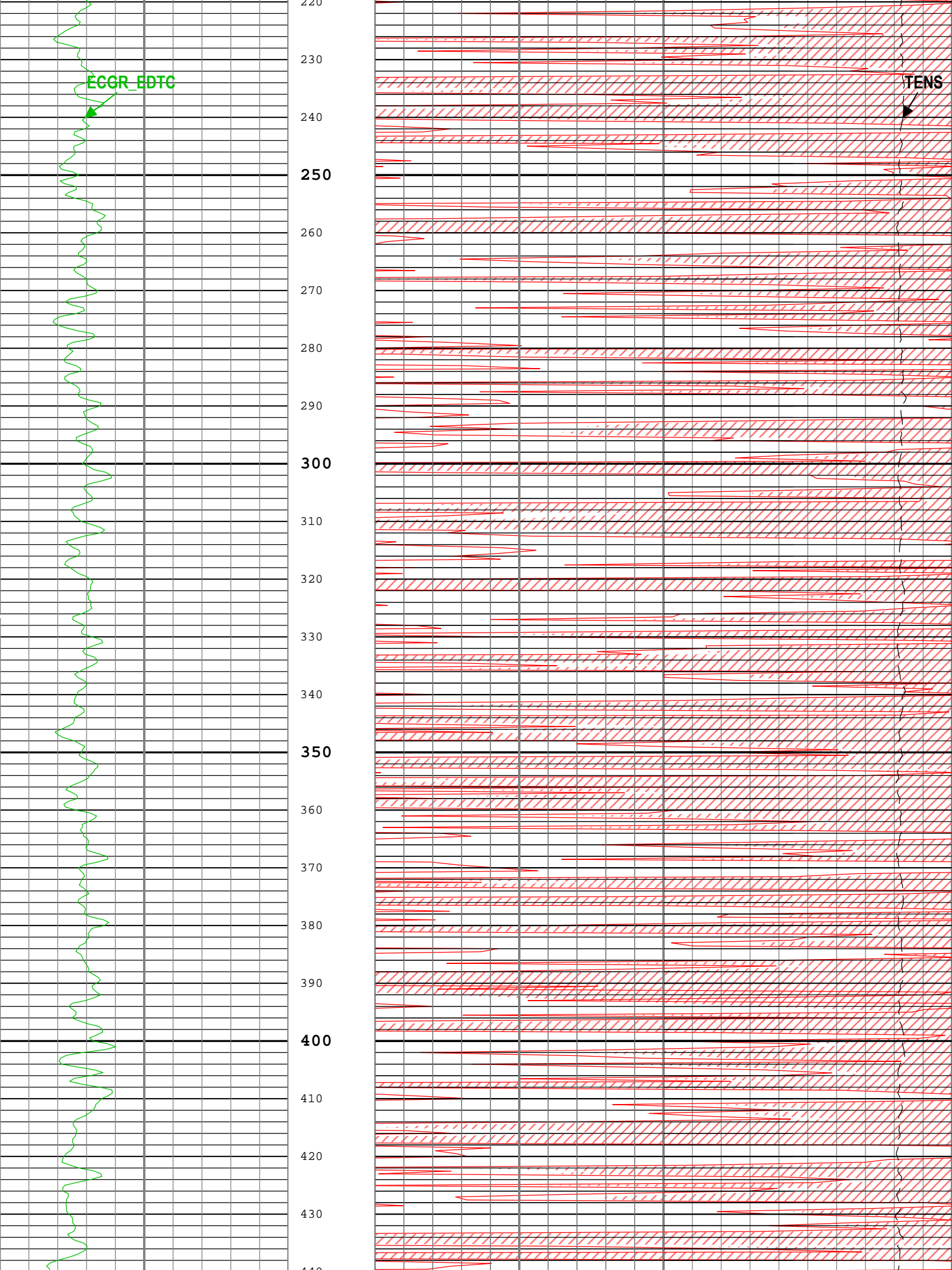


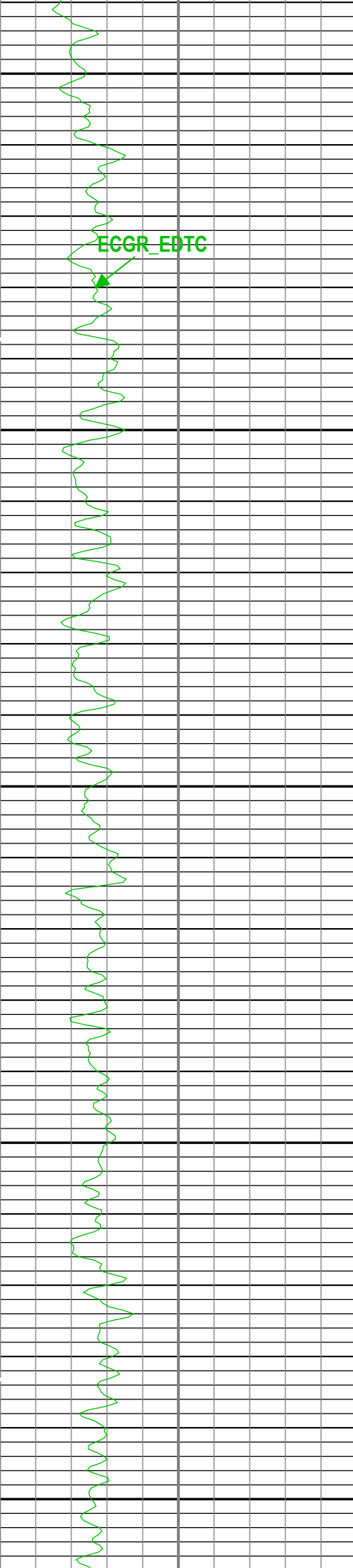
NPOR Backup

Enhanced Thermal Neutron Porosity in Selected Lithology (NPOR) HGNS[1]

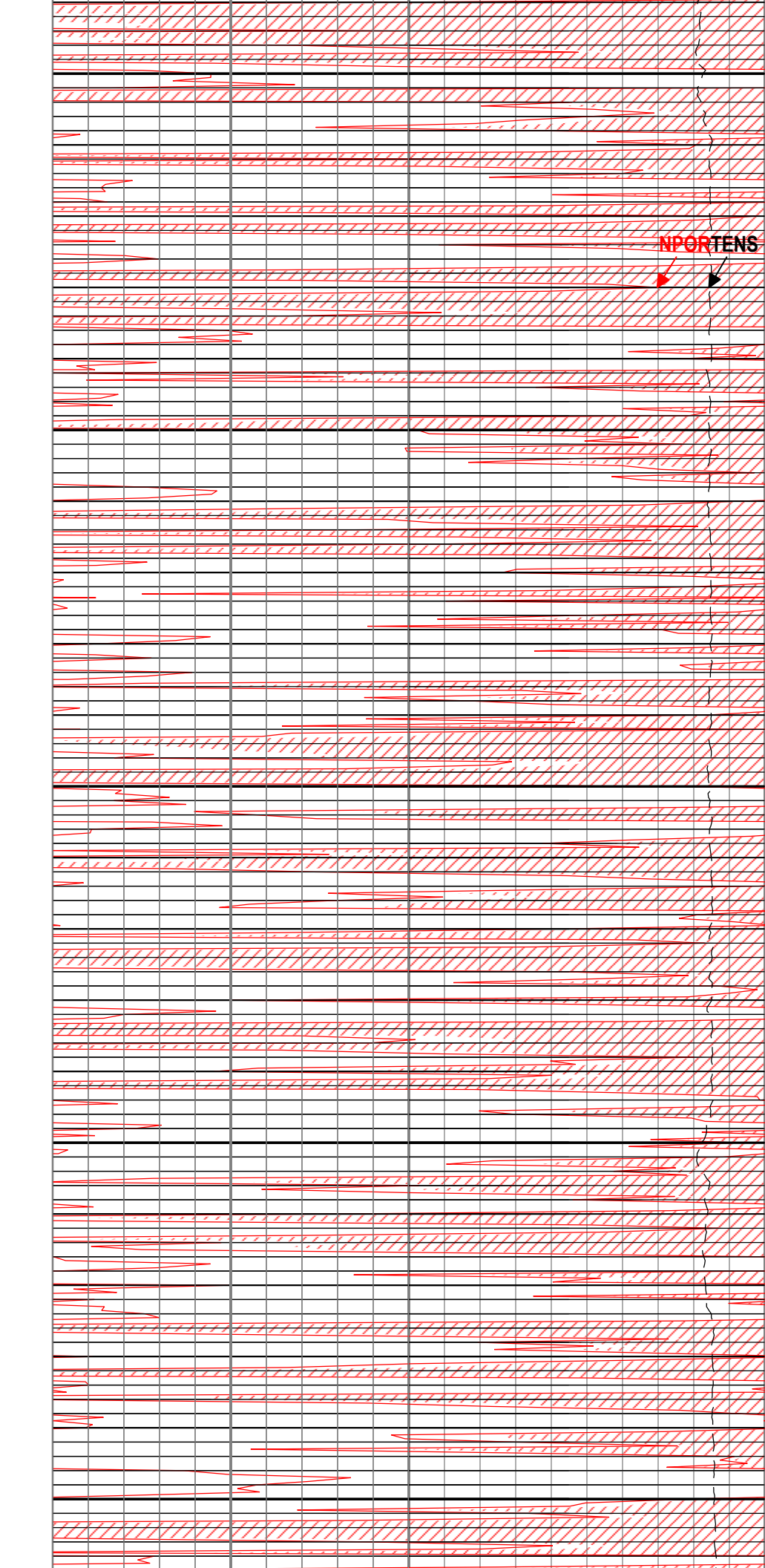
0.45 ft3/ft3 -0.15



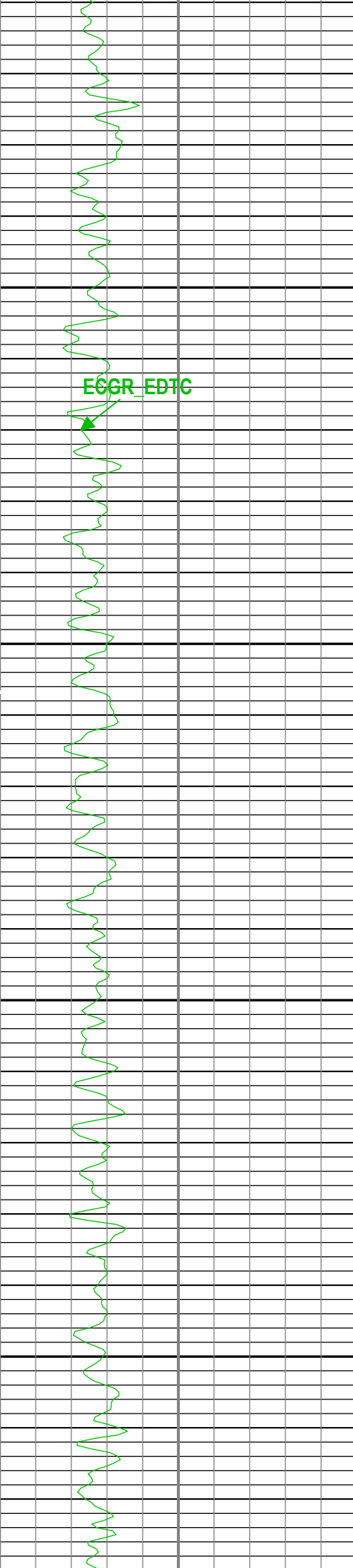




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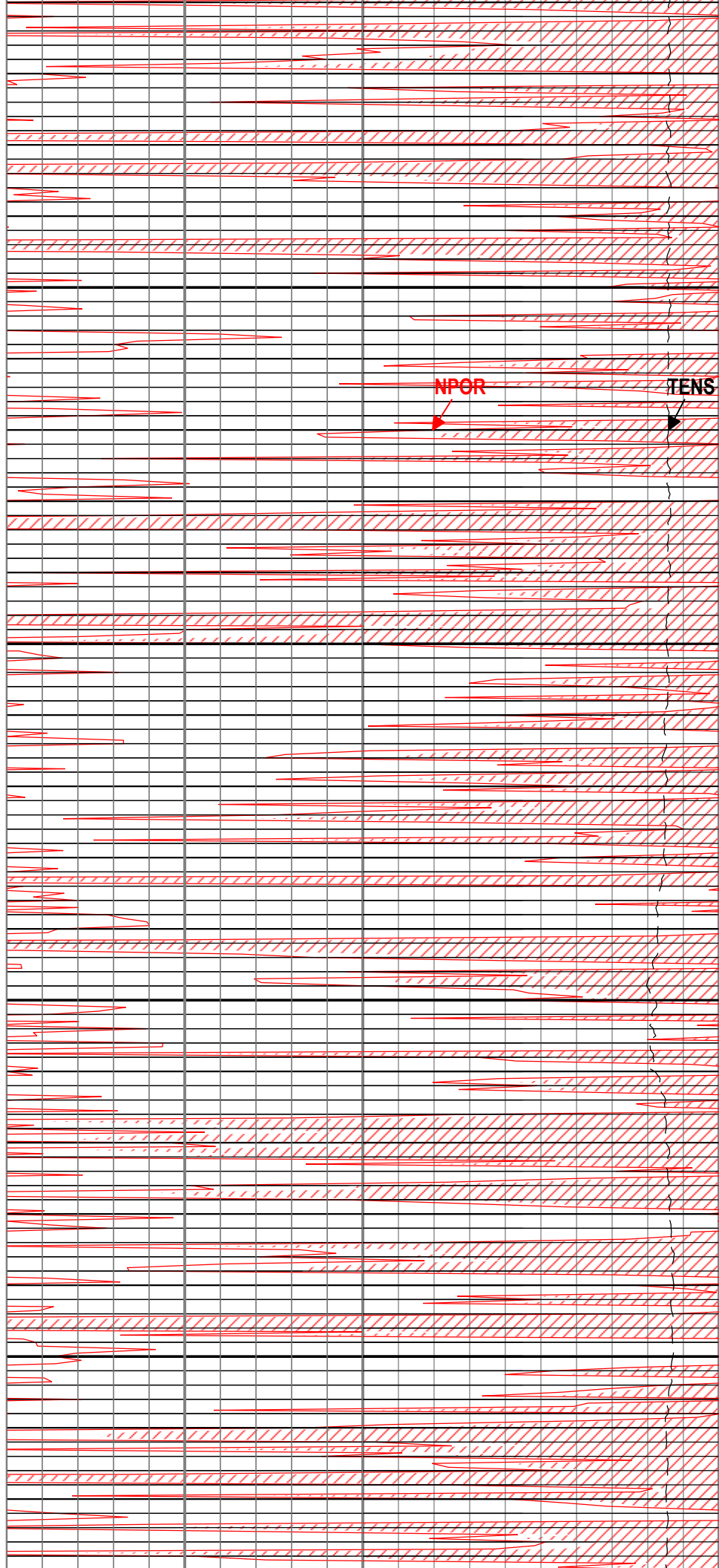


NPORTENS



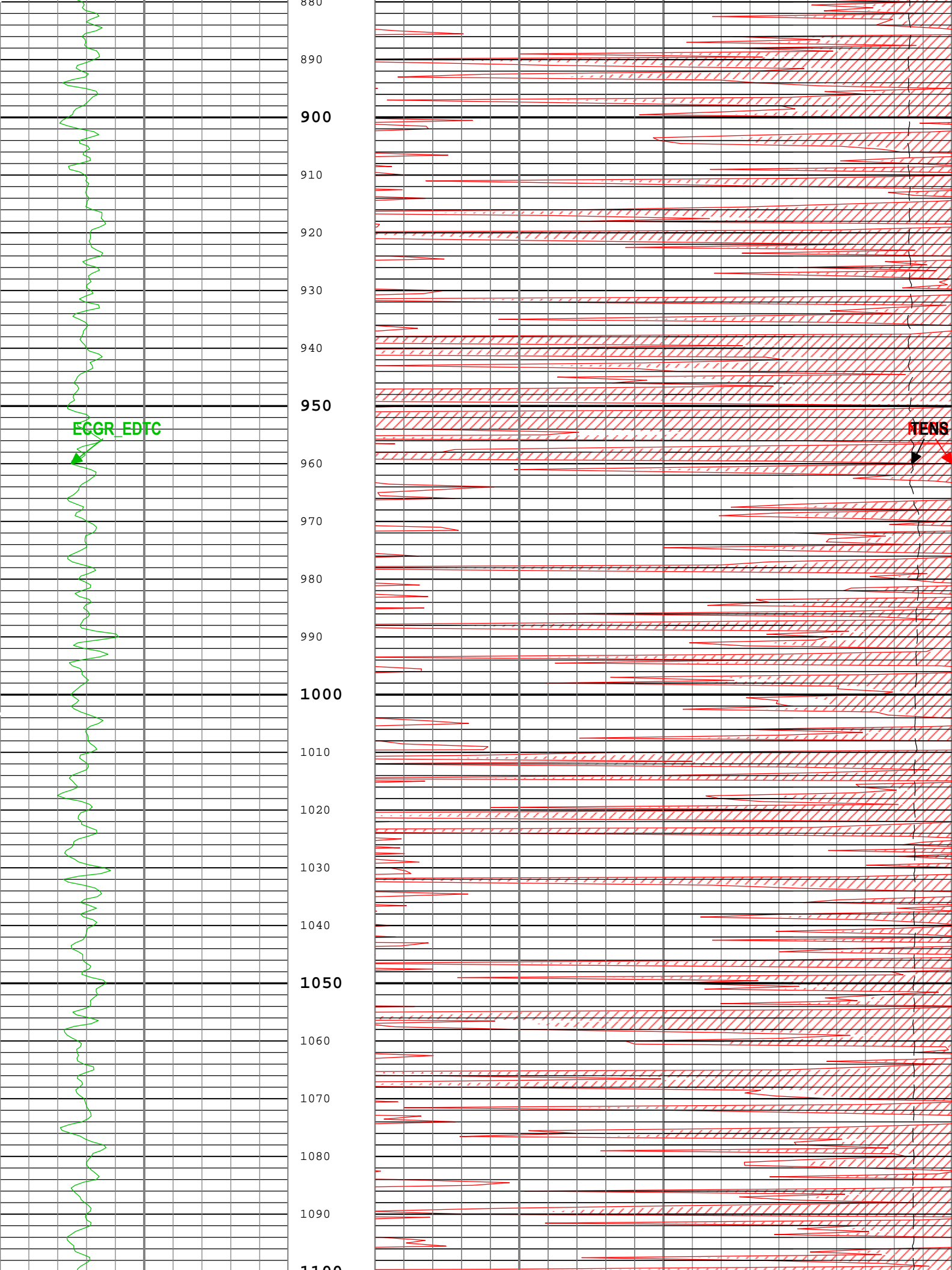
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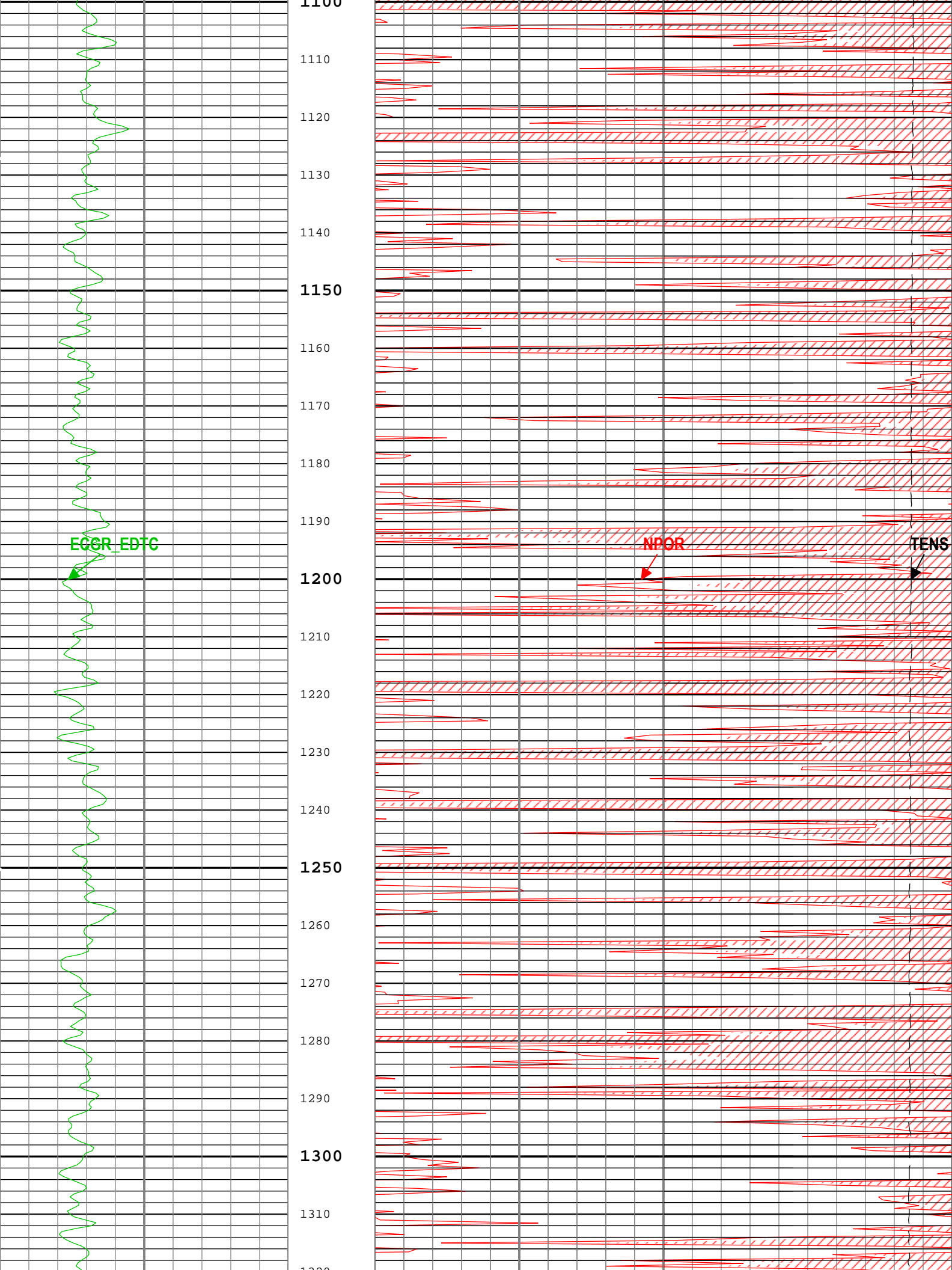
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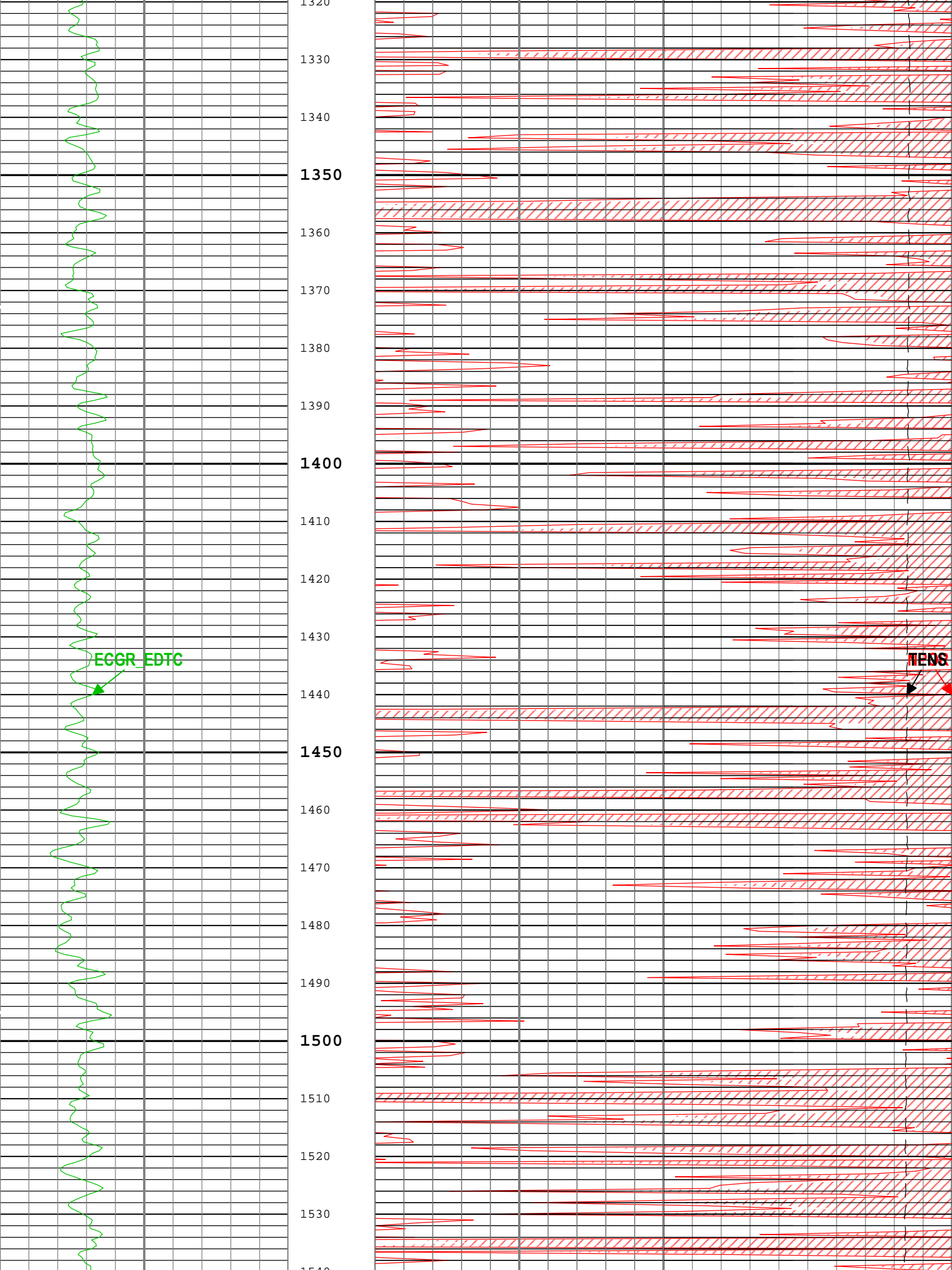


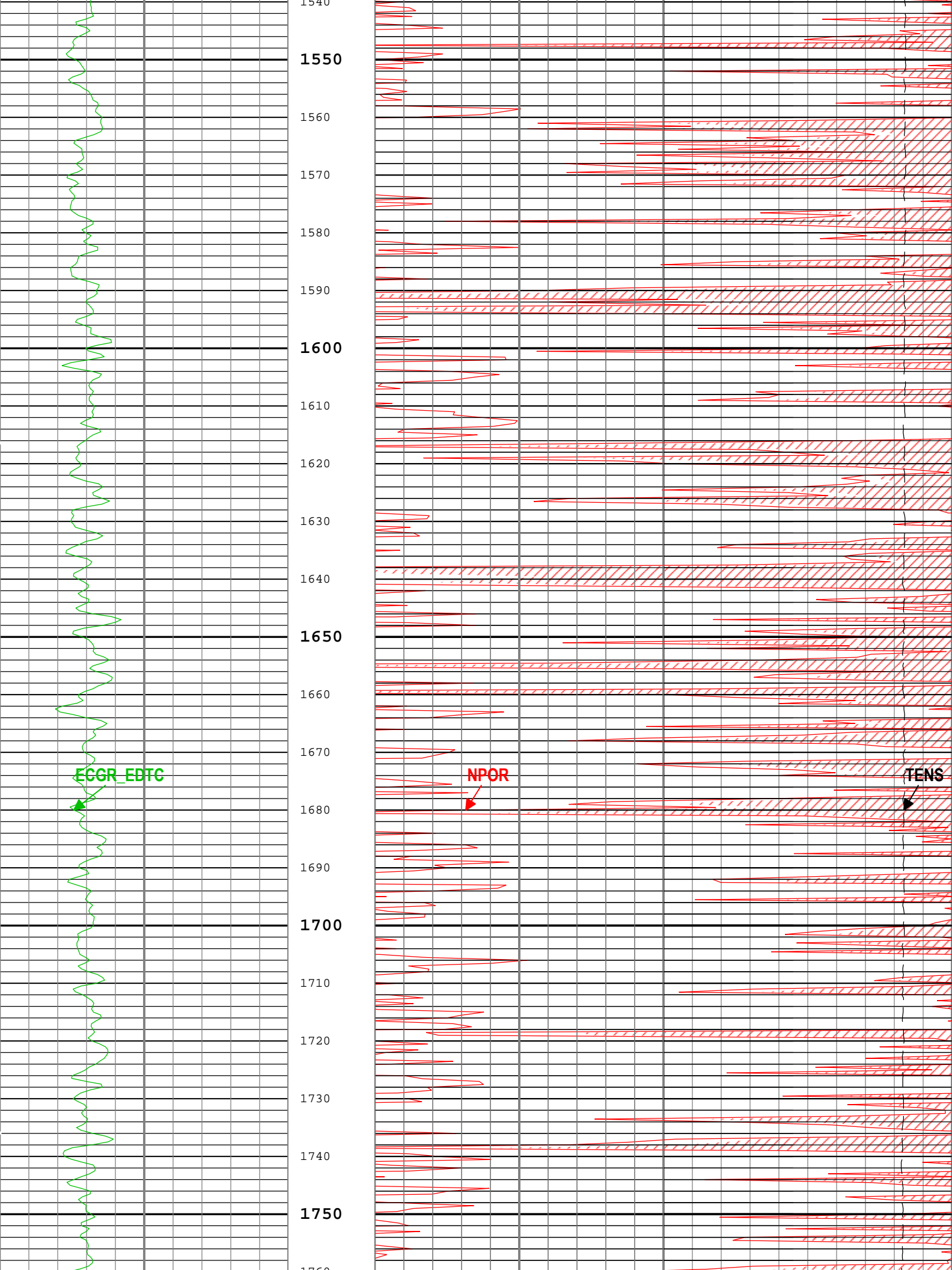
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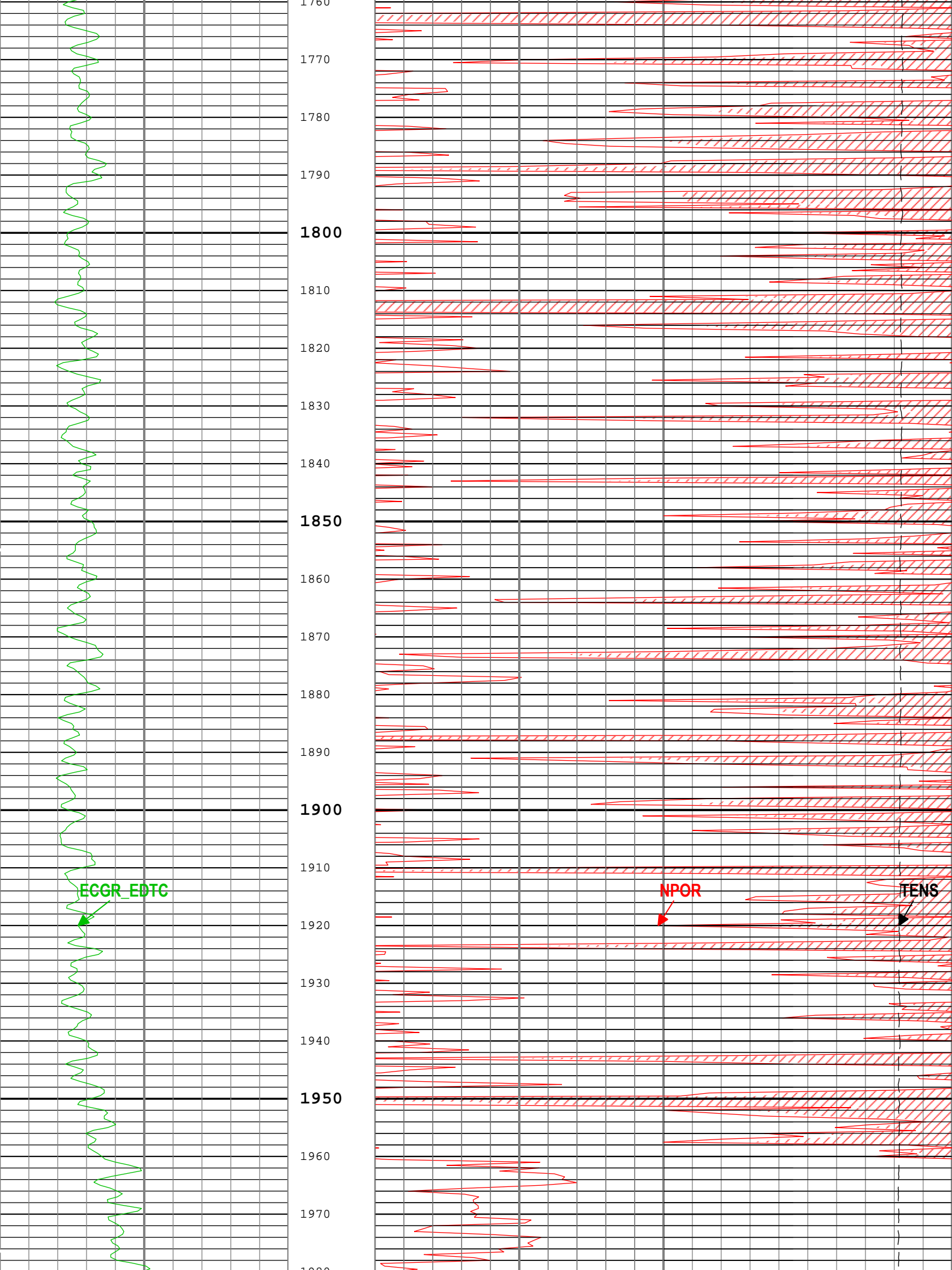
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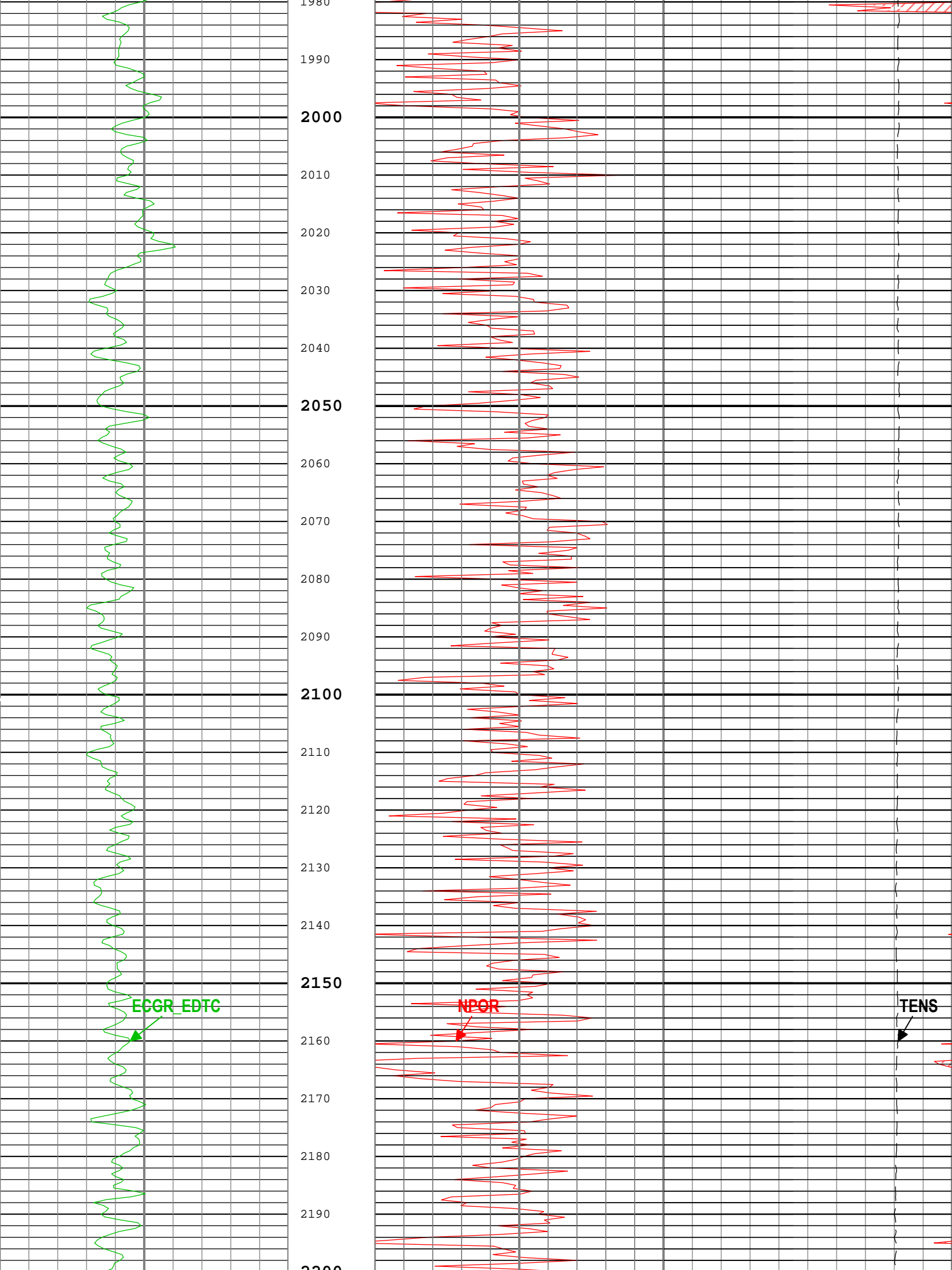


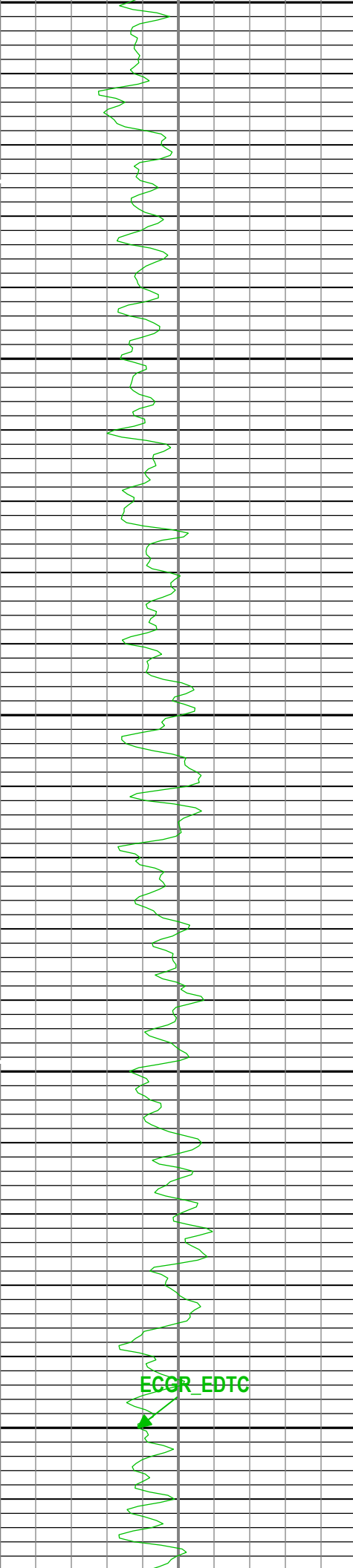




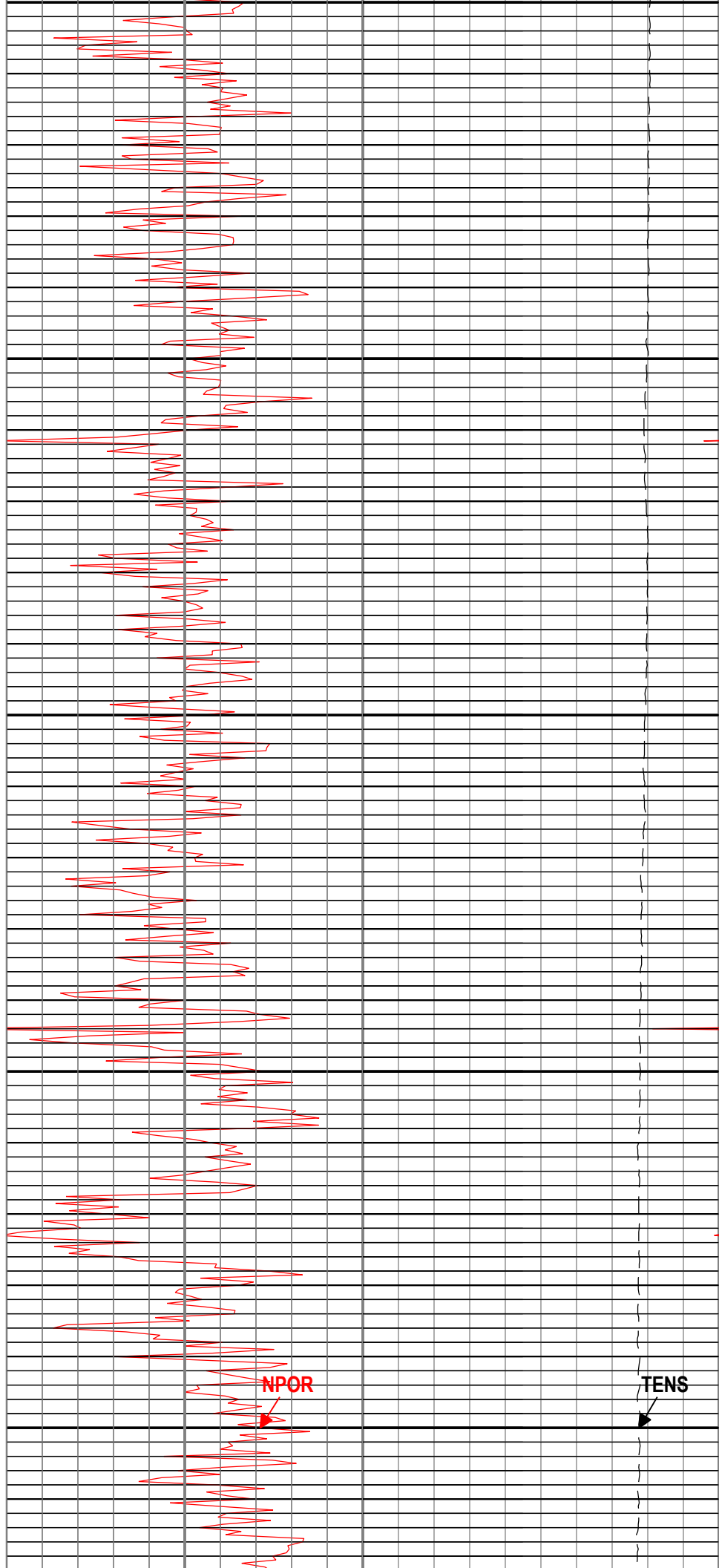


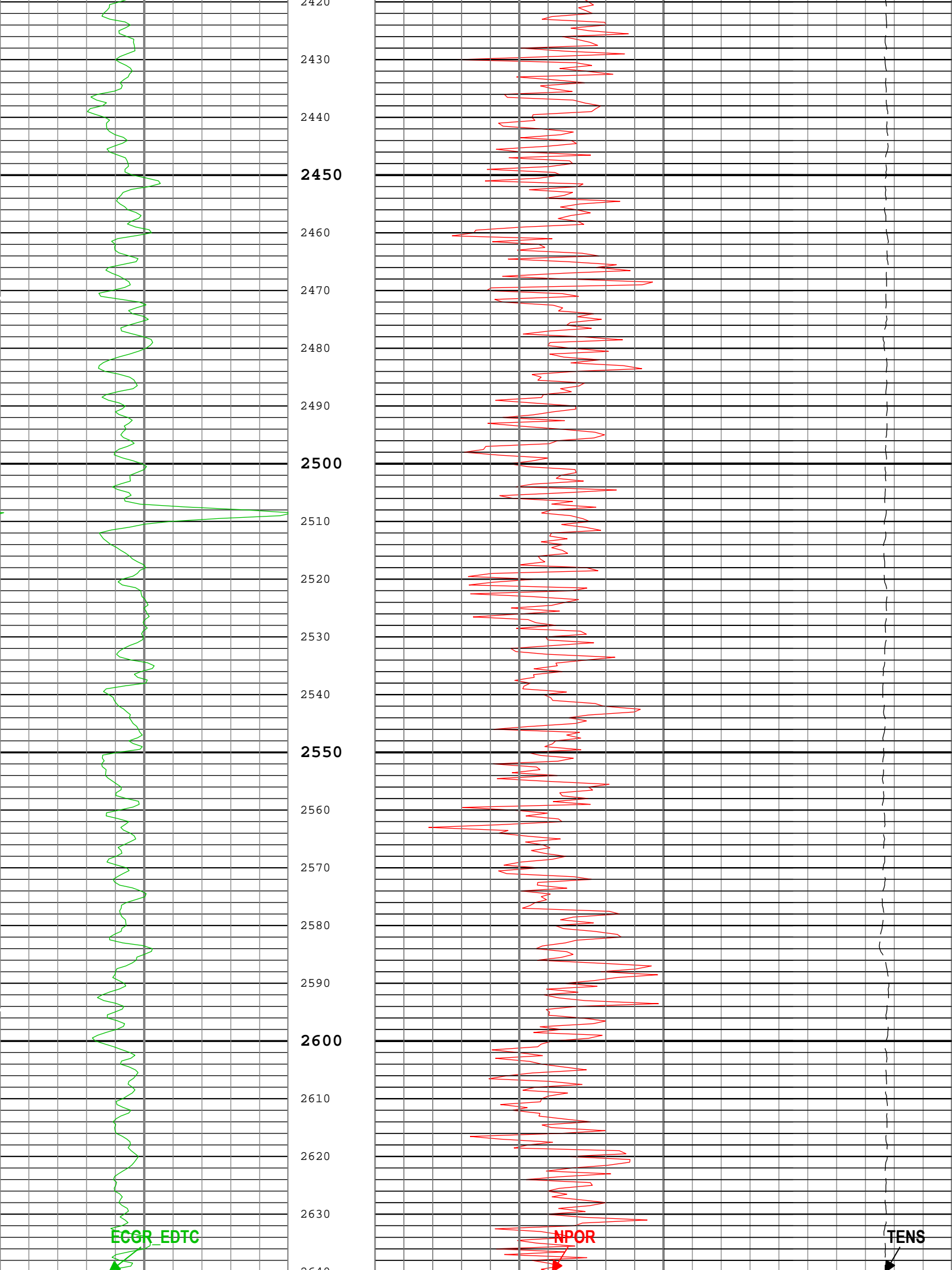


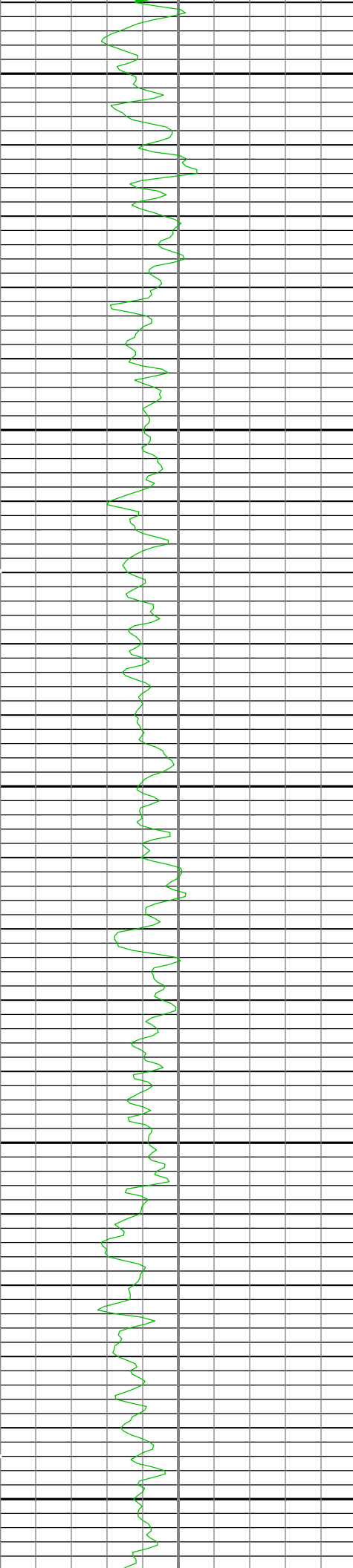




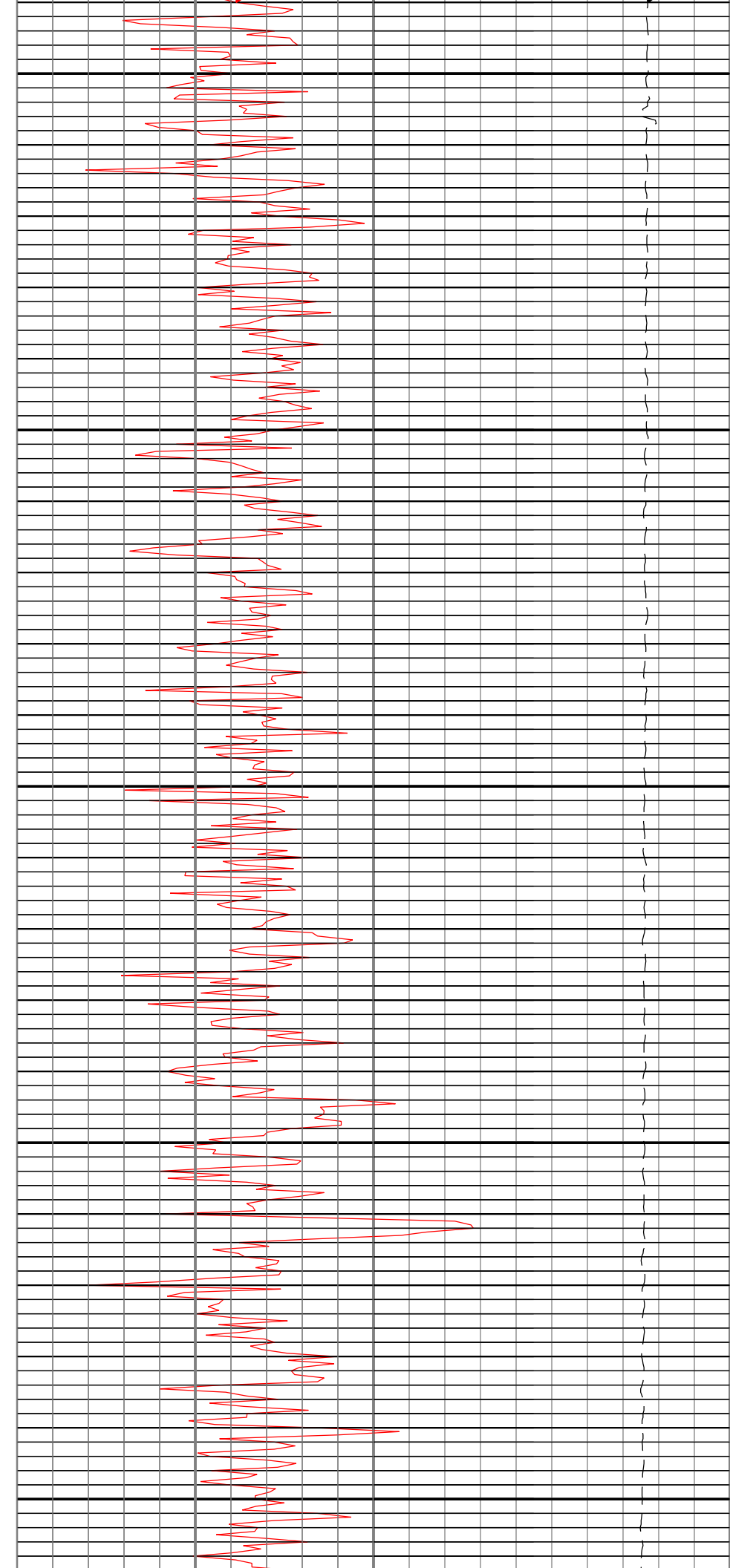
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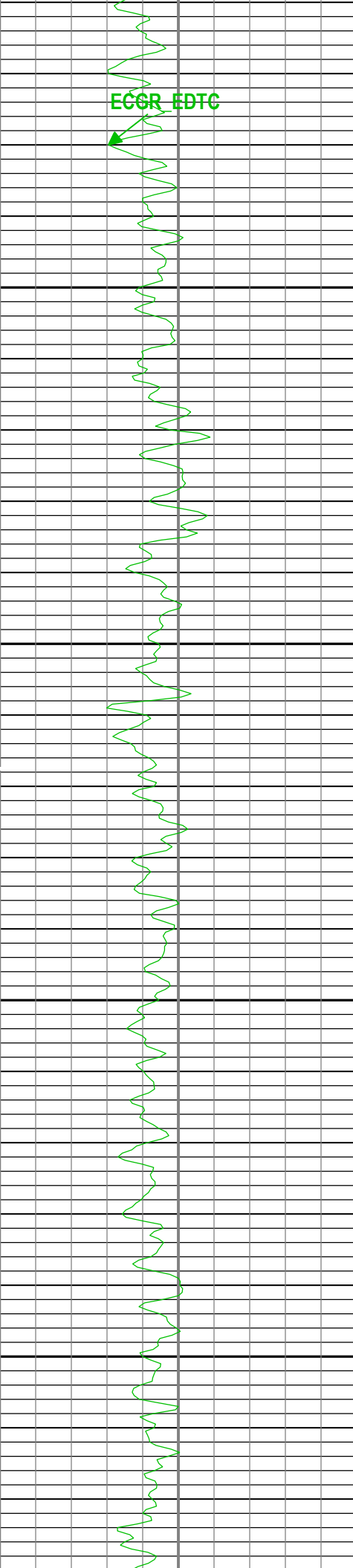




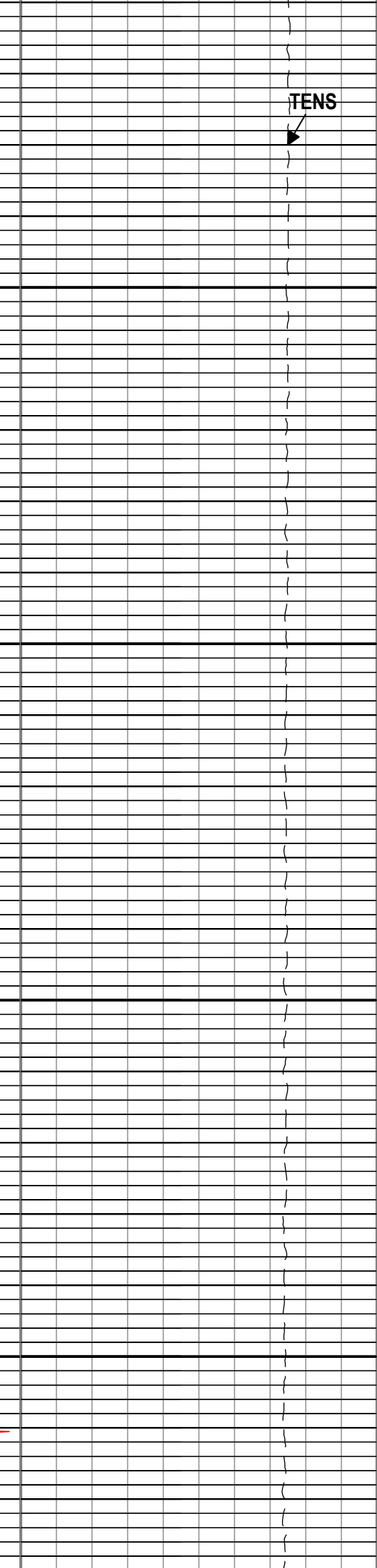
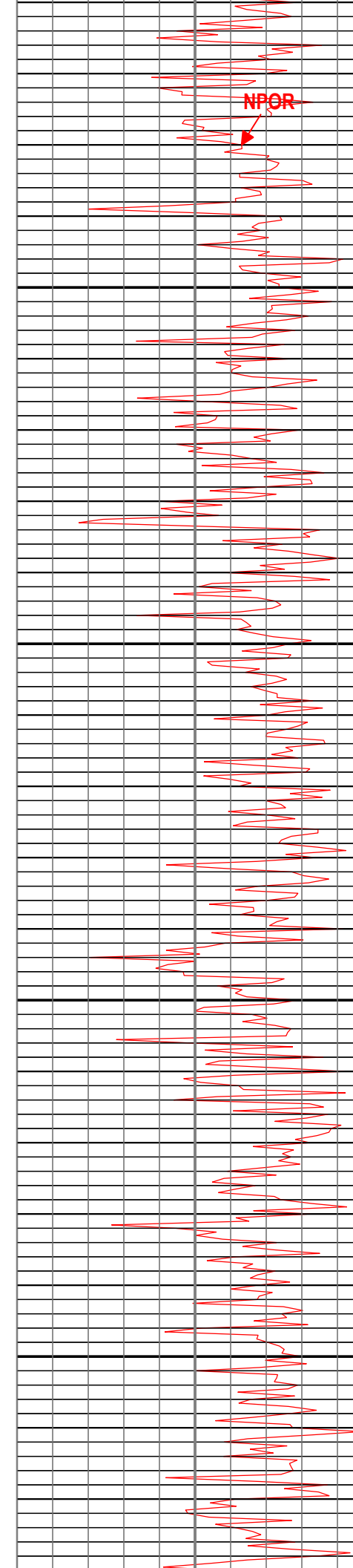


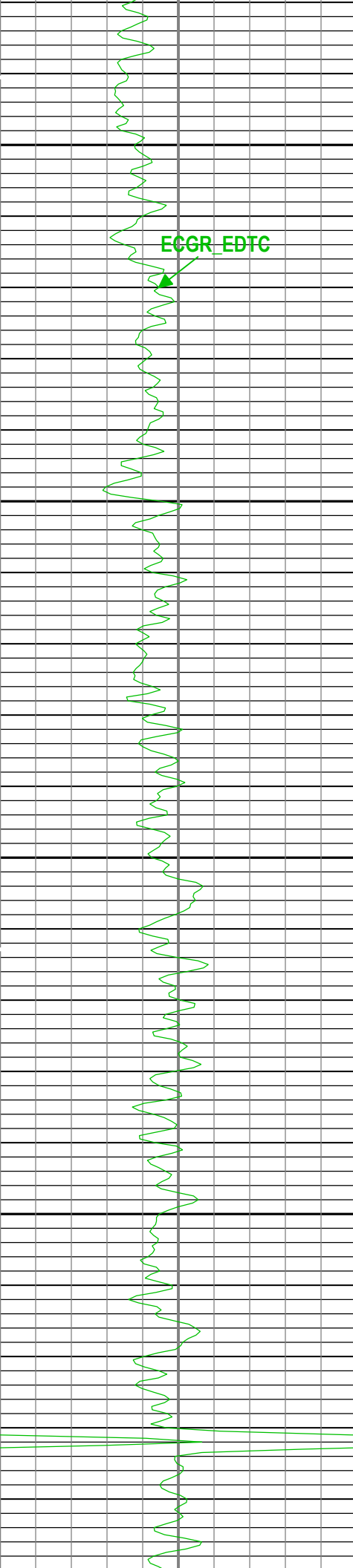
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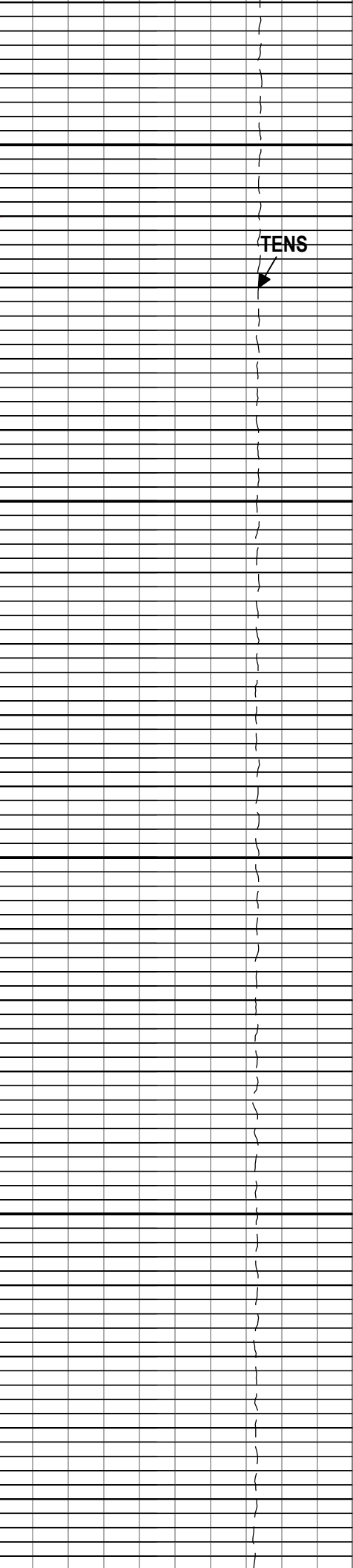


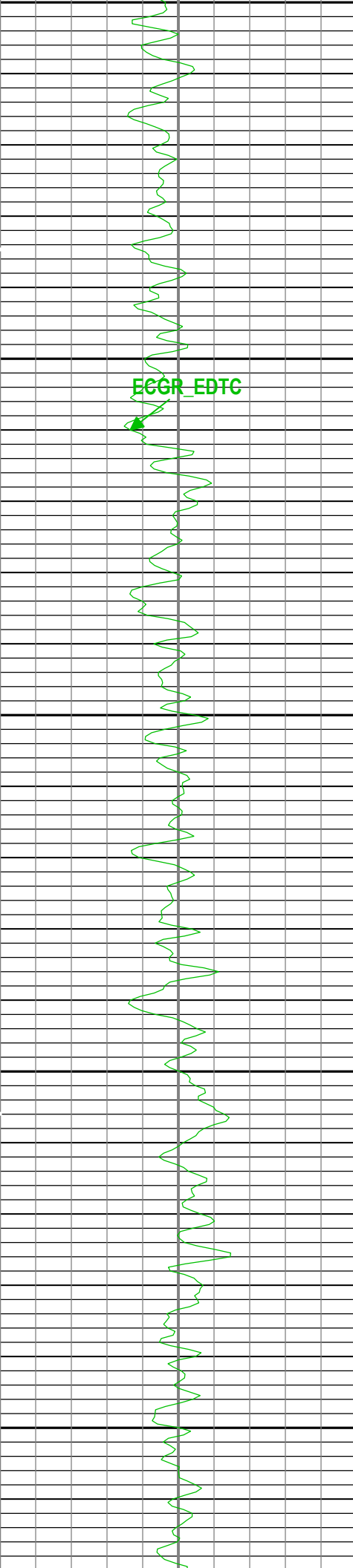
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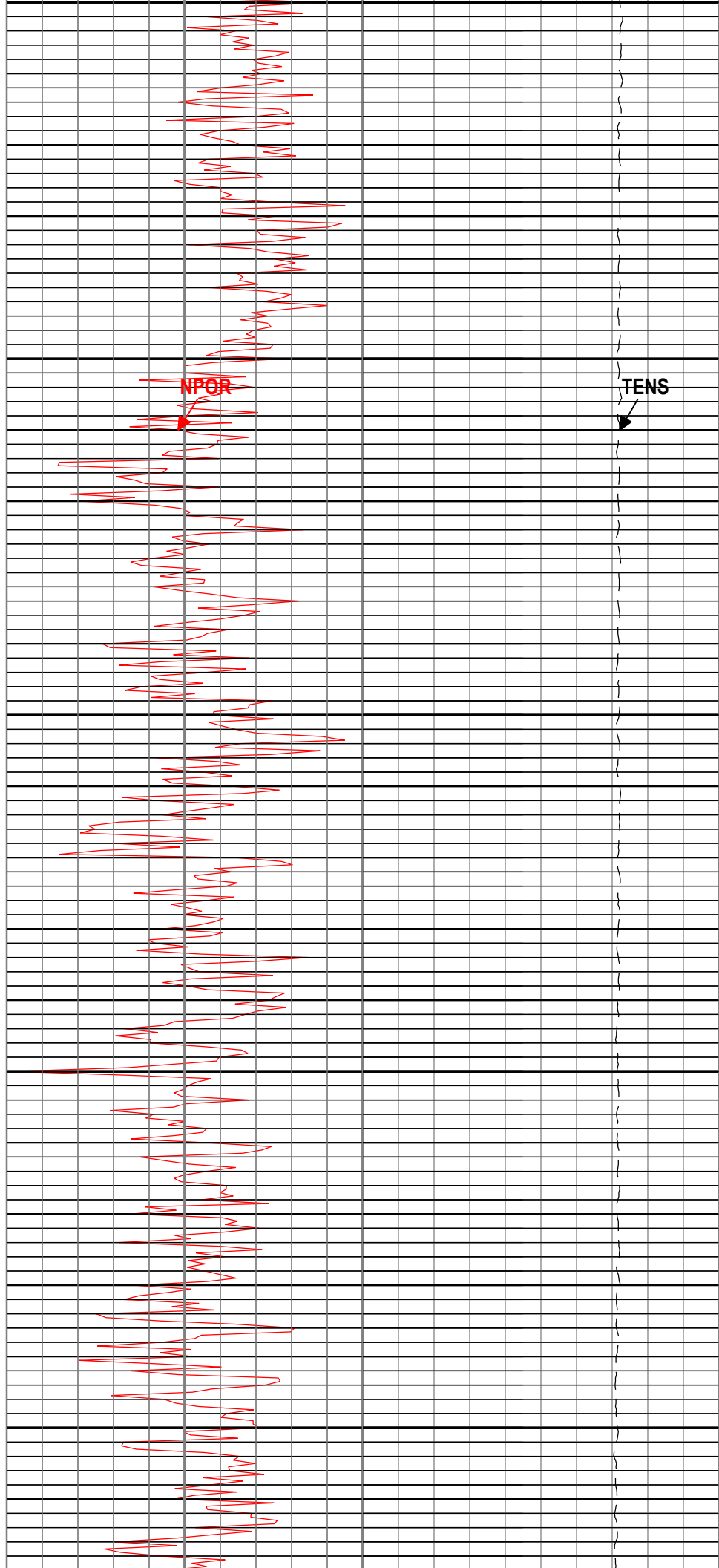
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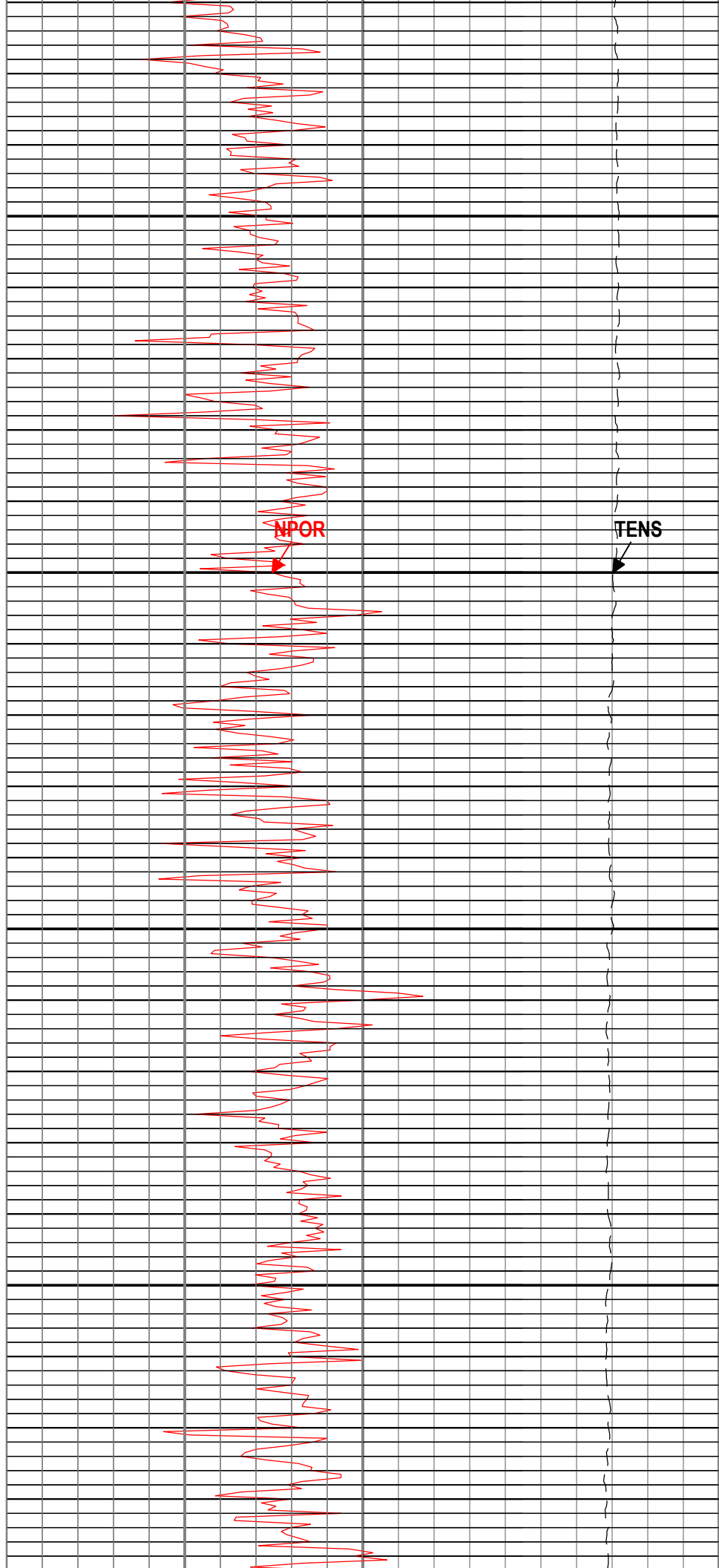
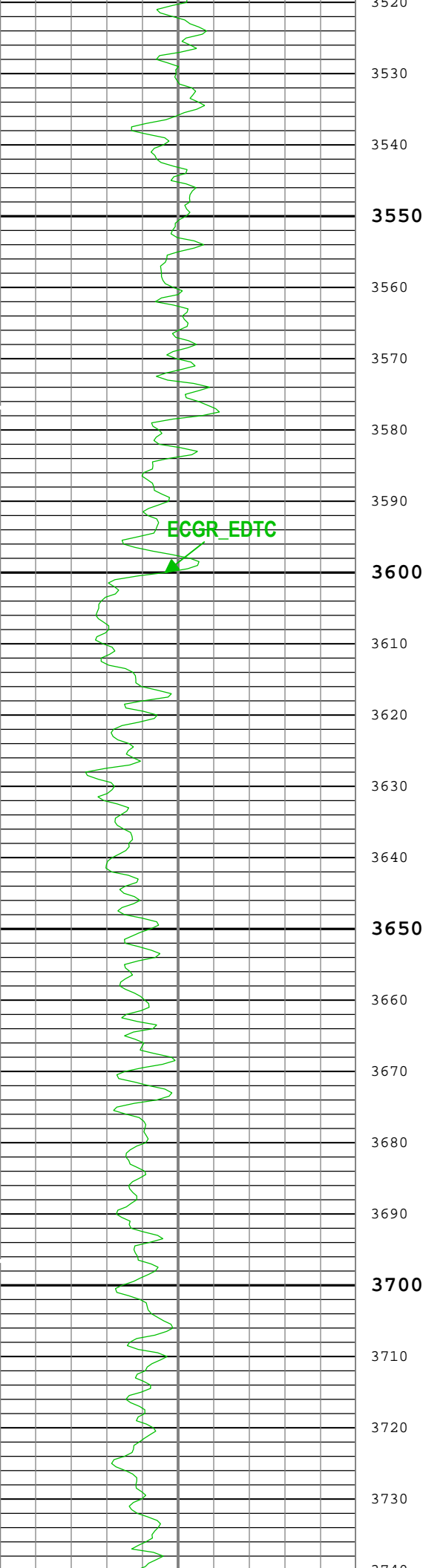
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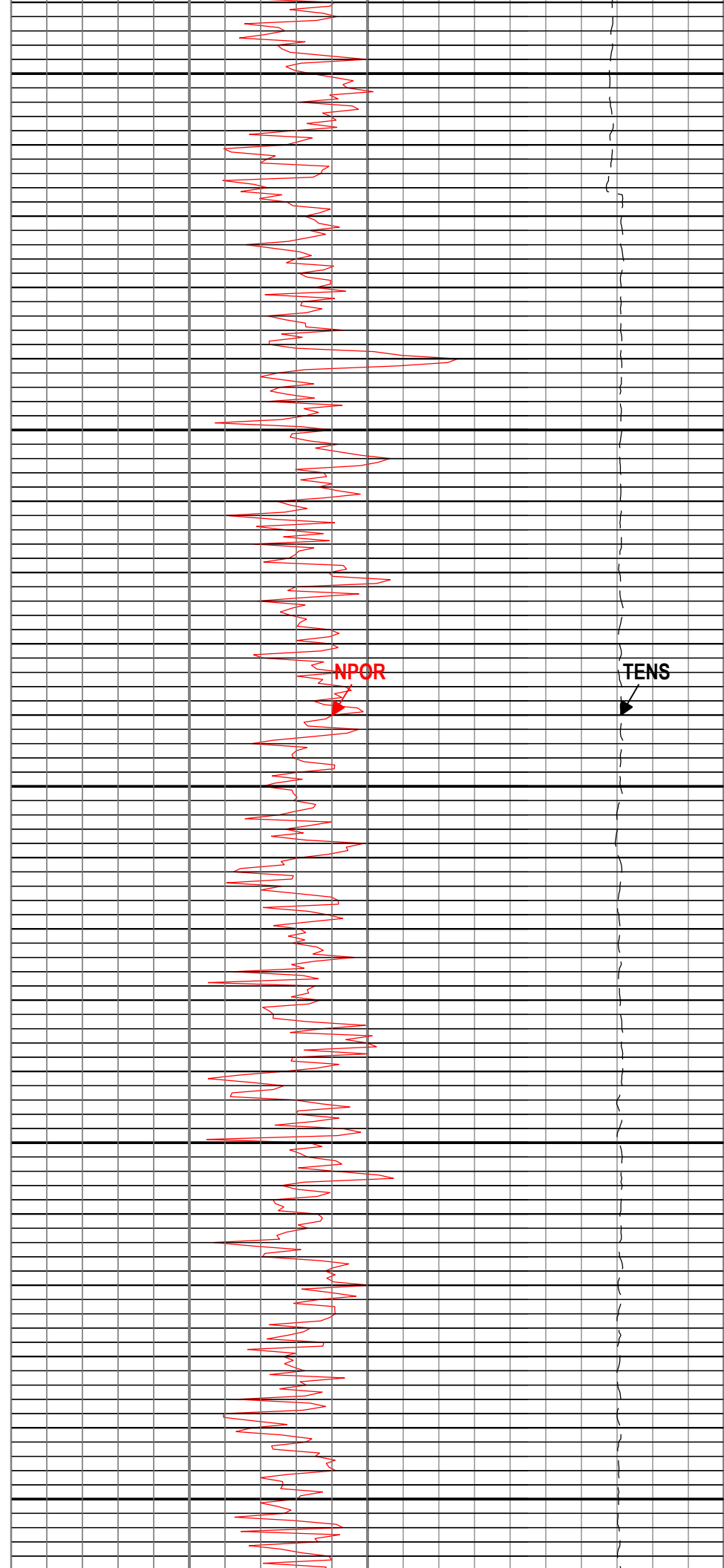
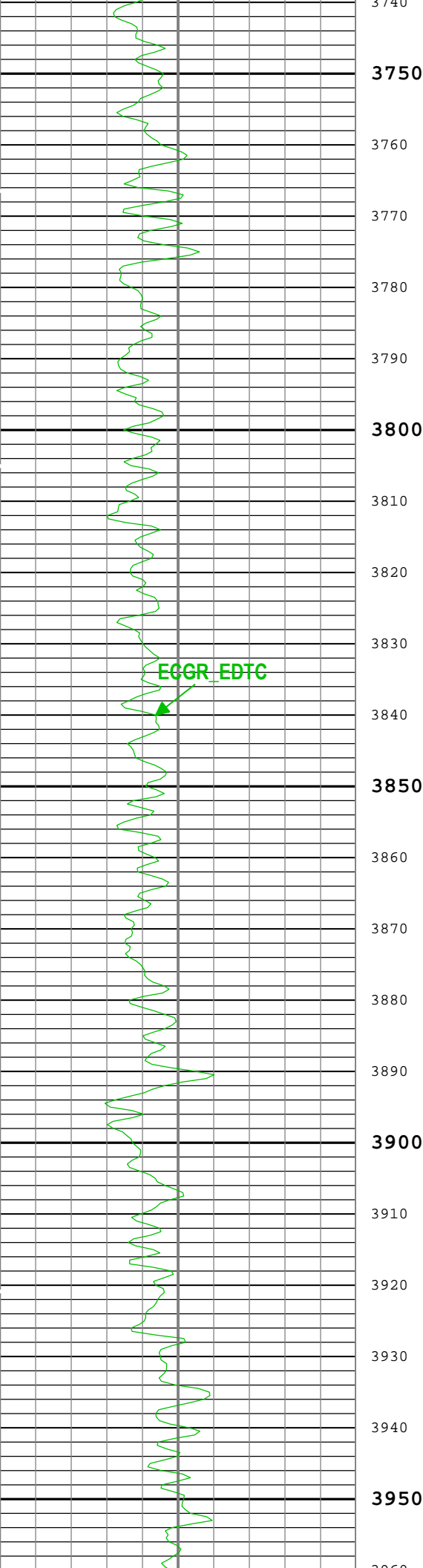
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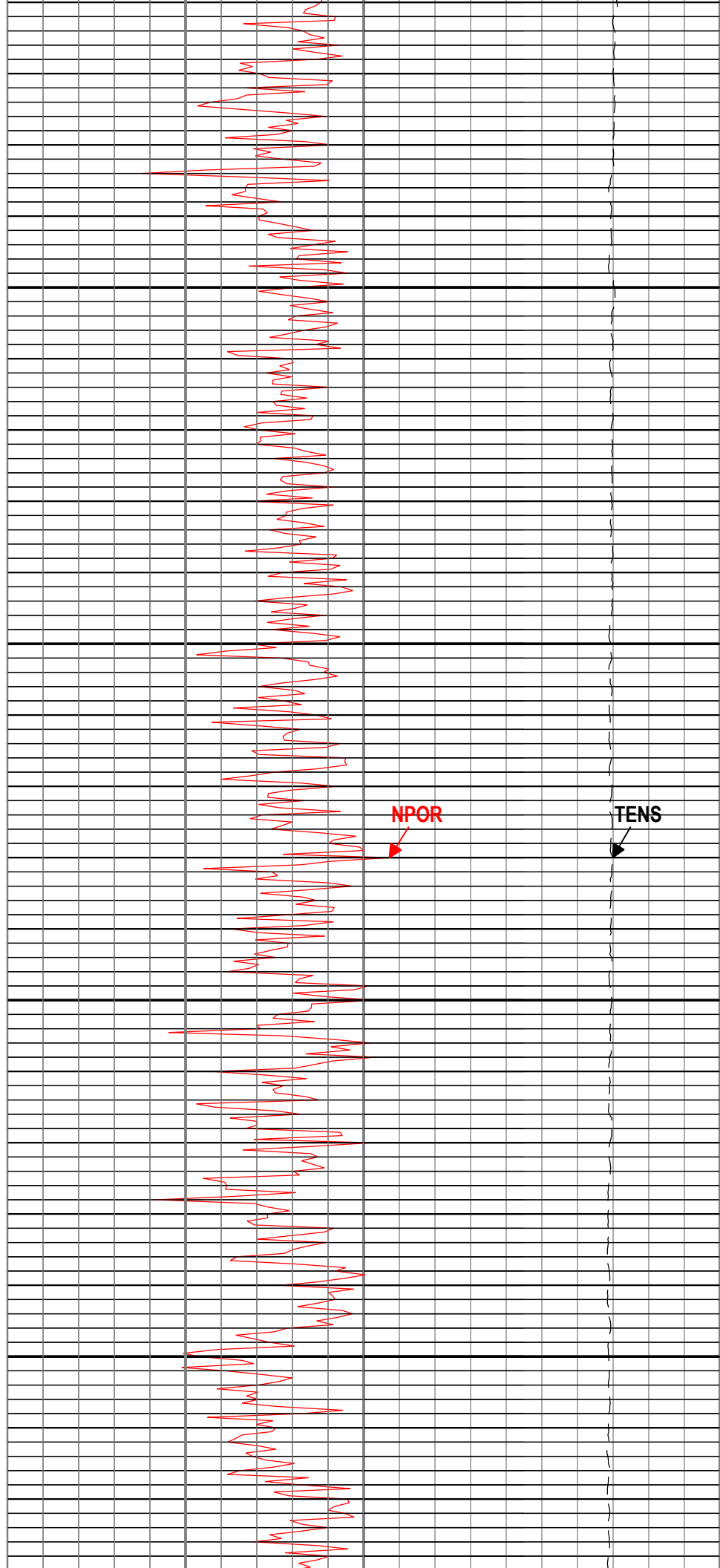
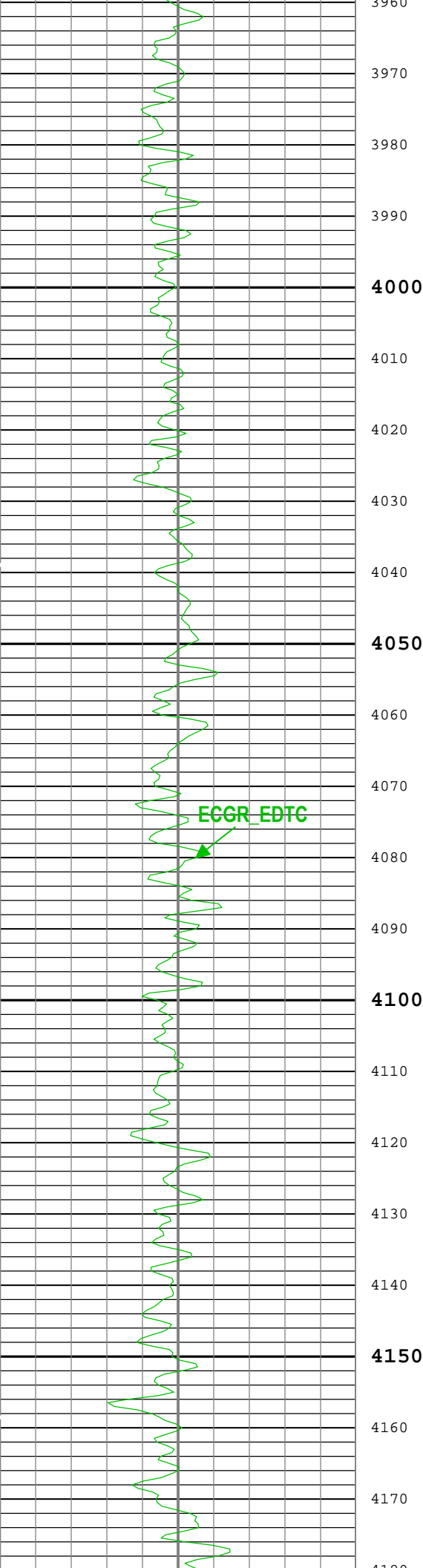


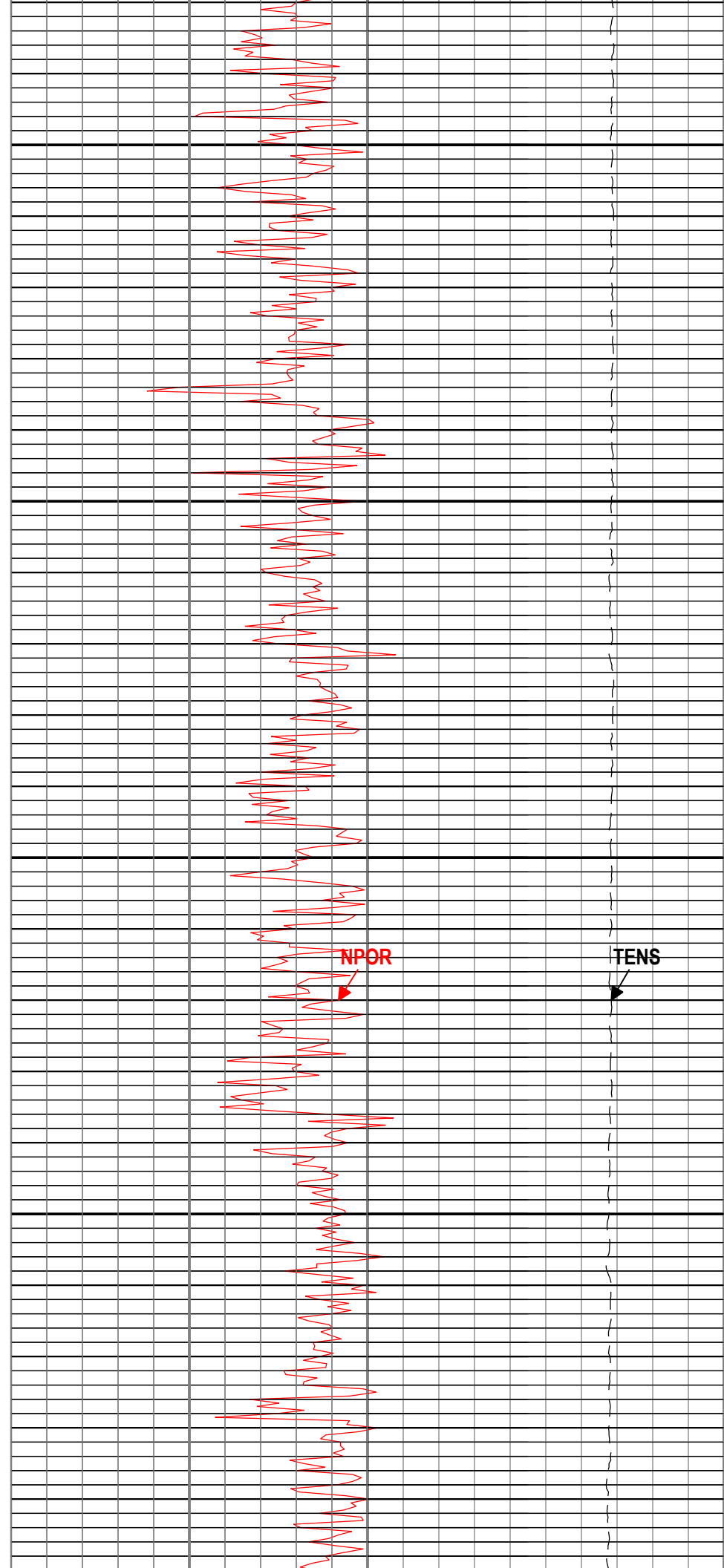
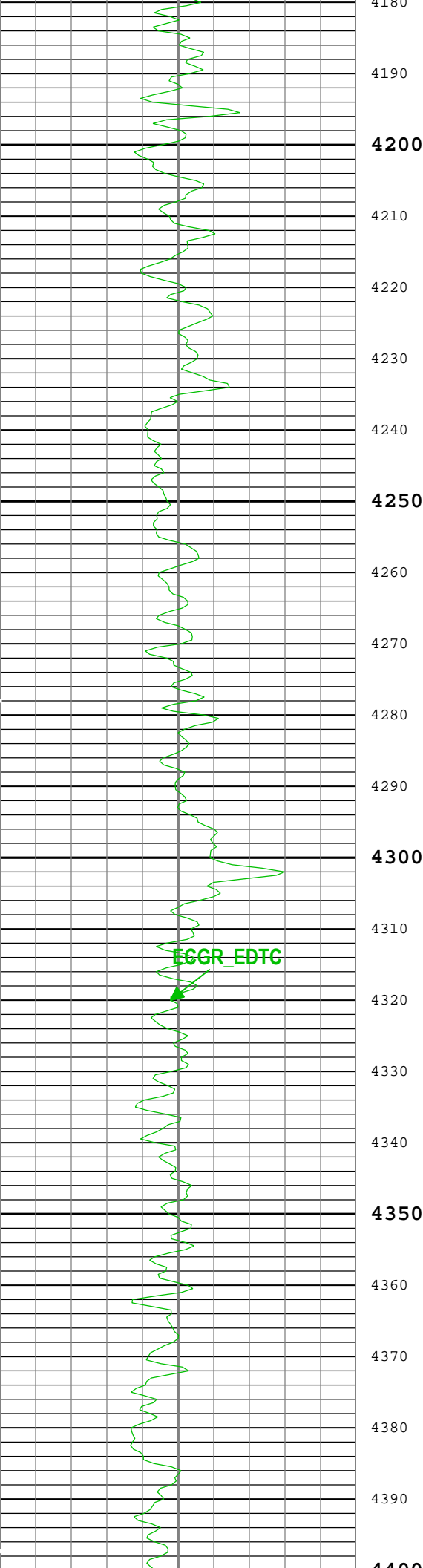
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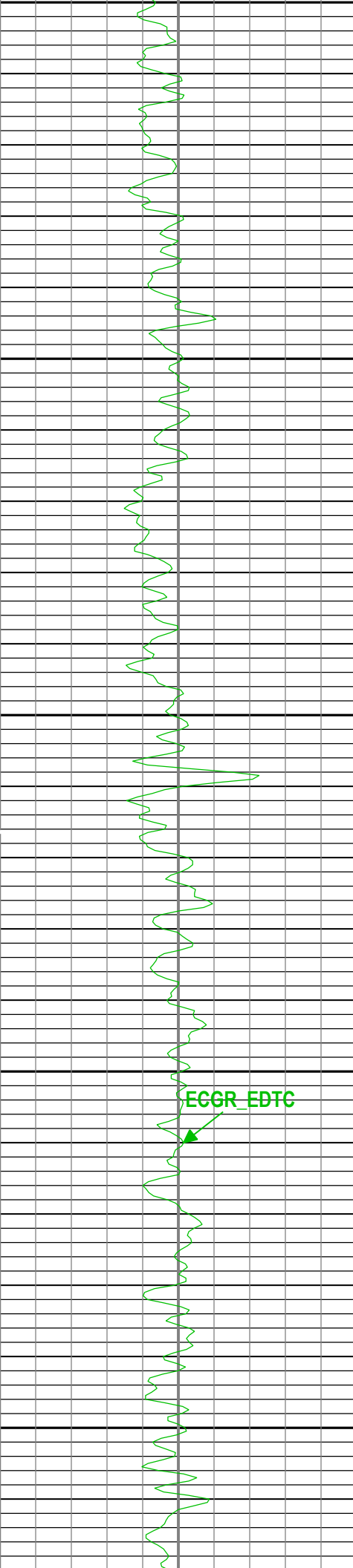
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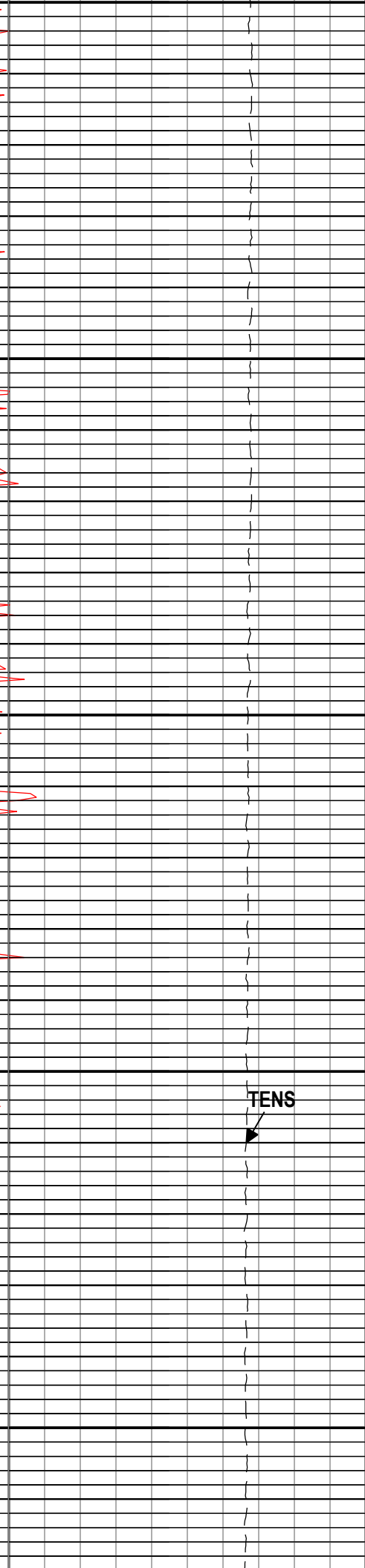
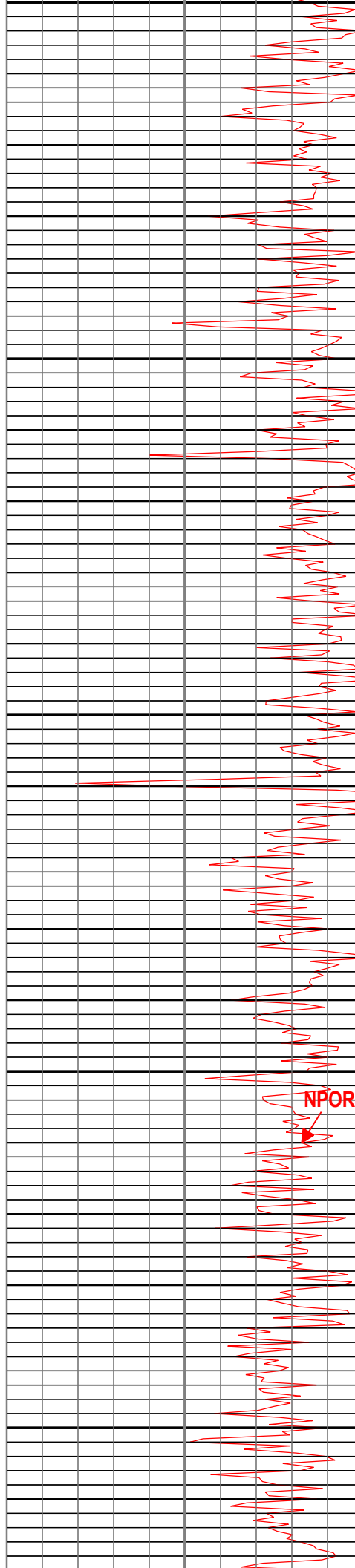








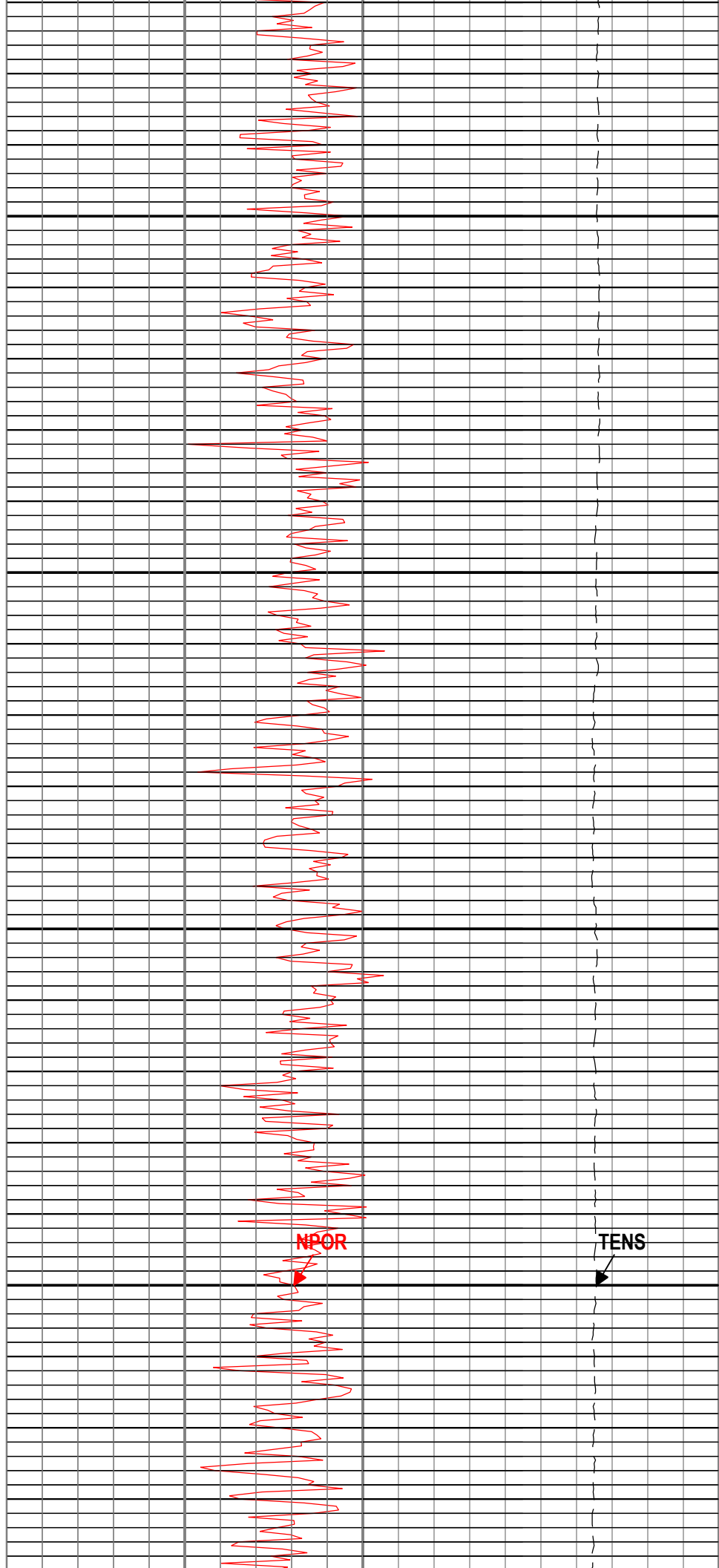
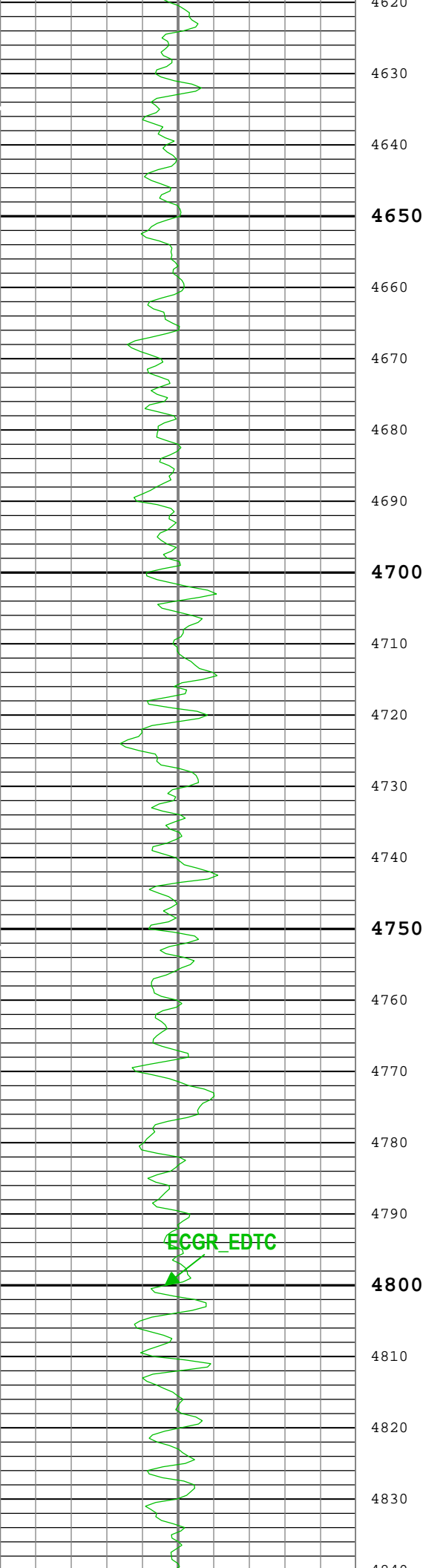
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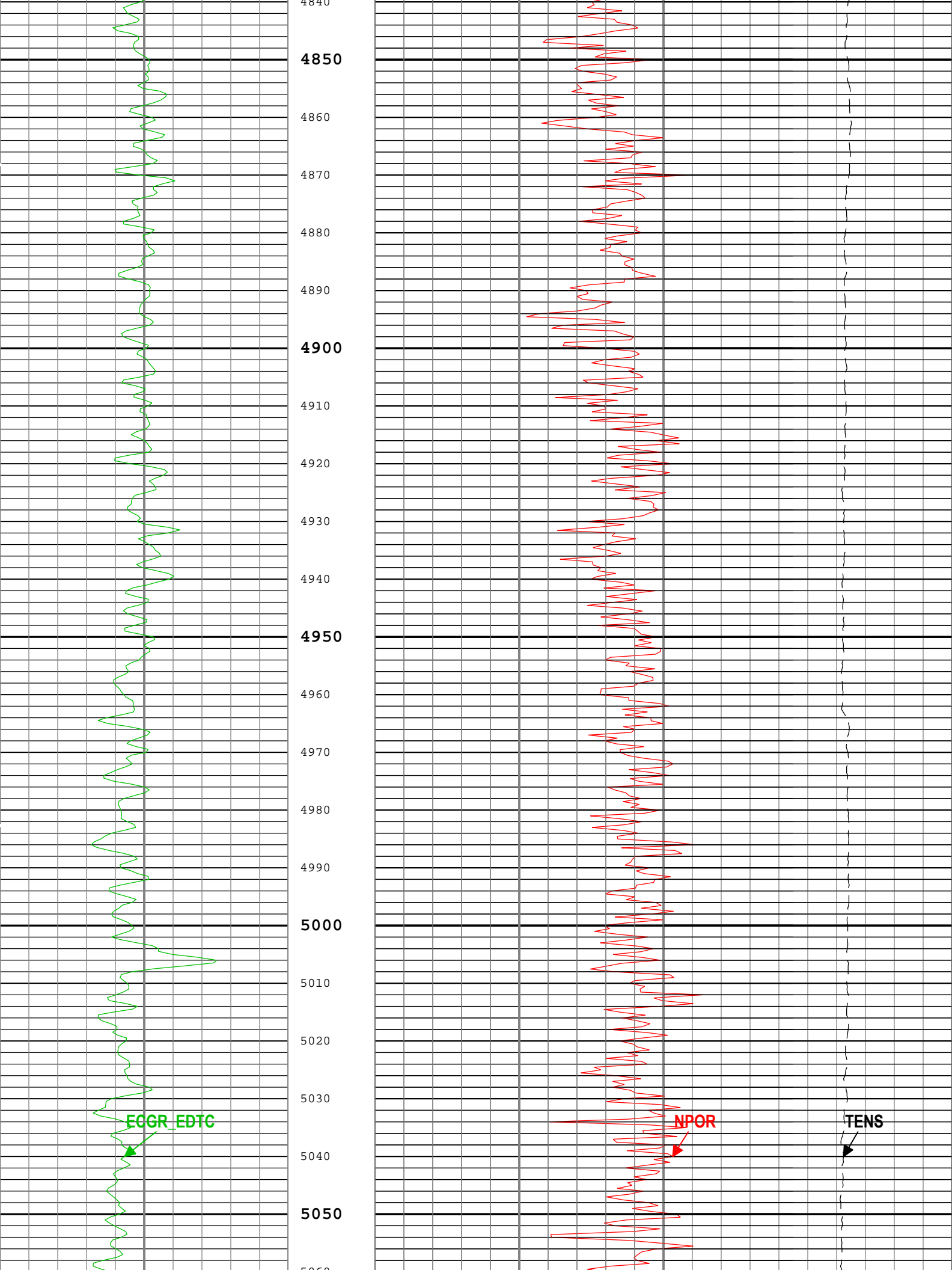


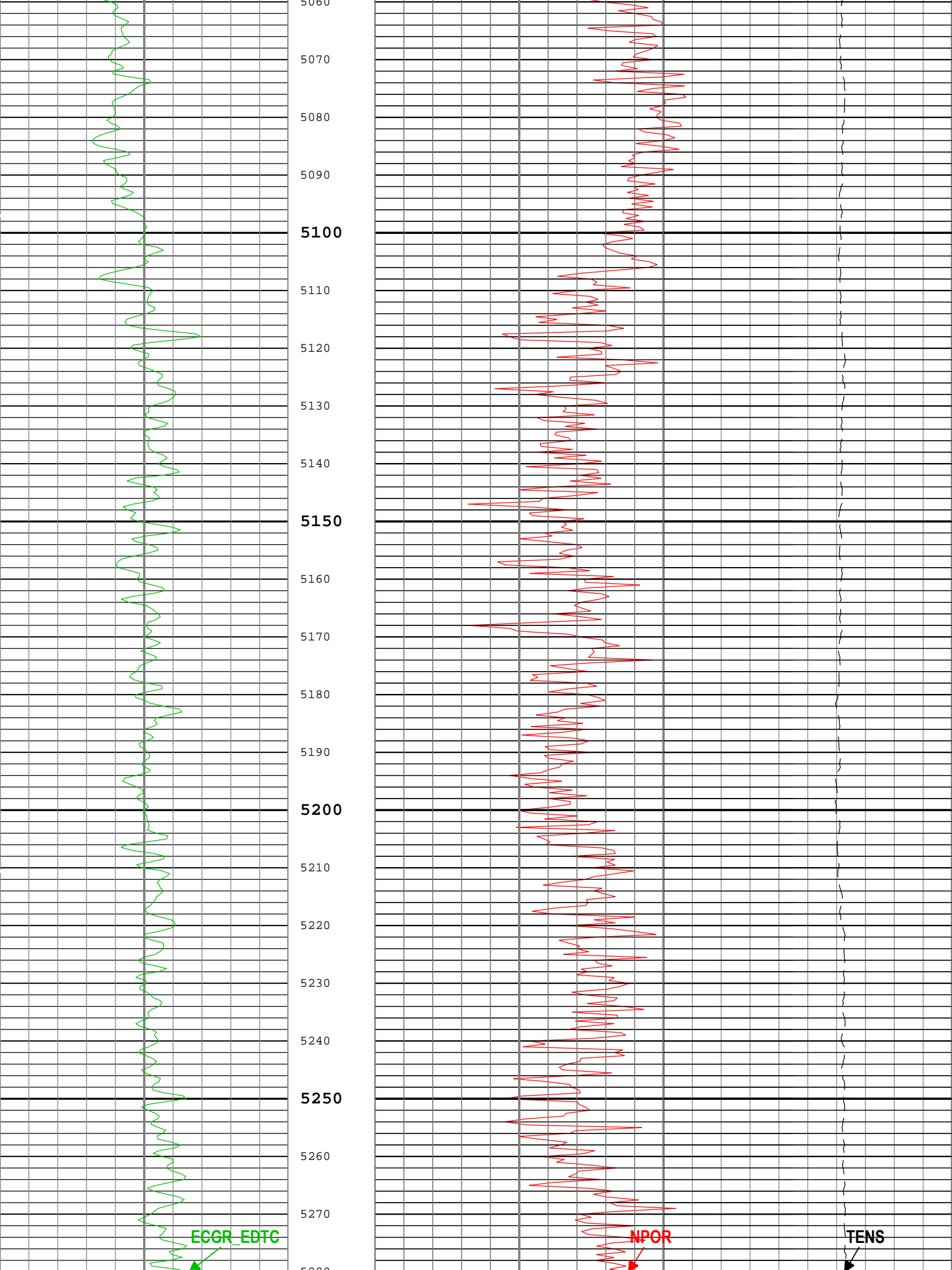
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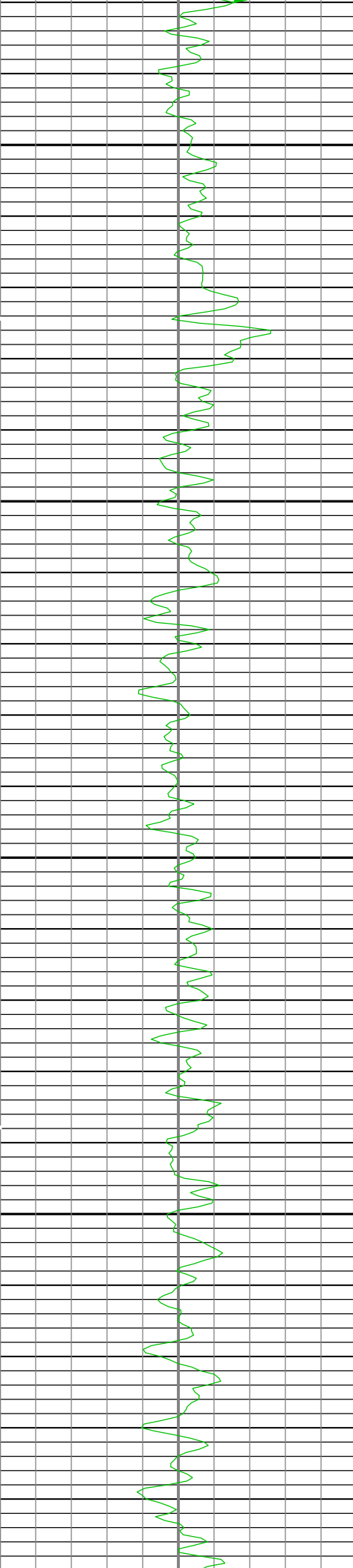
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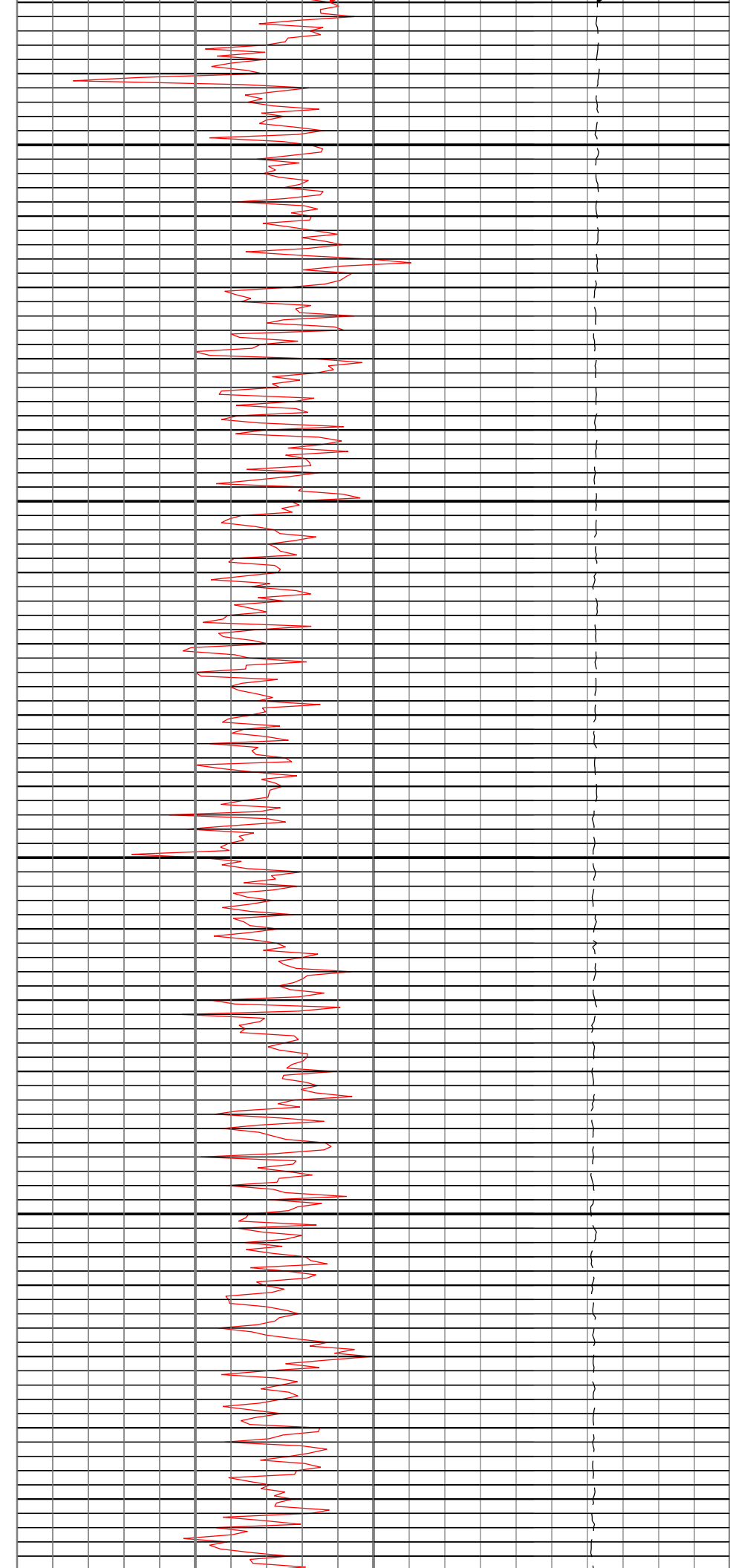


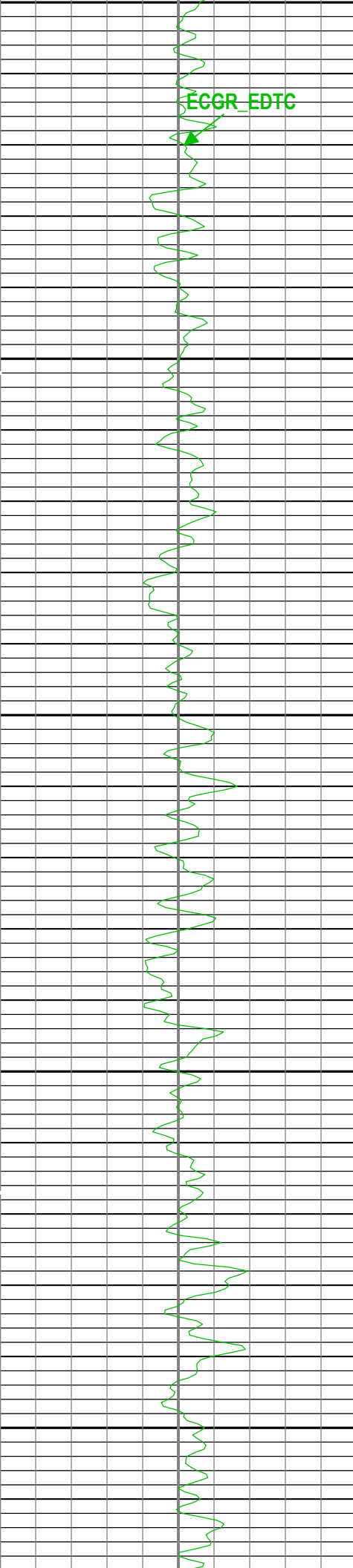




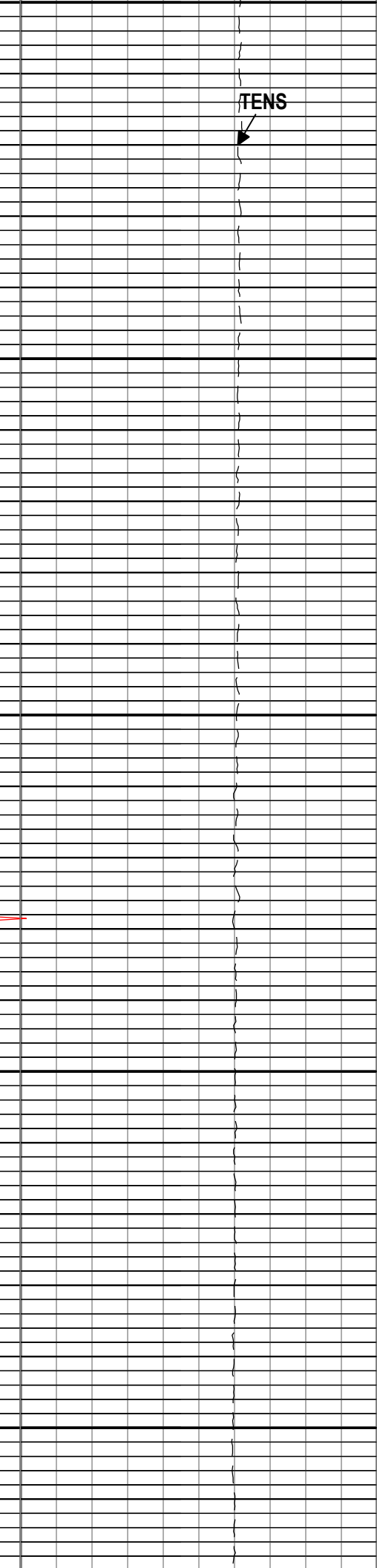
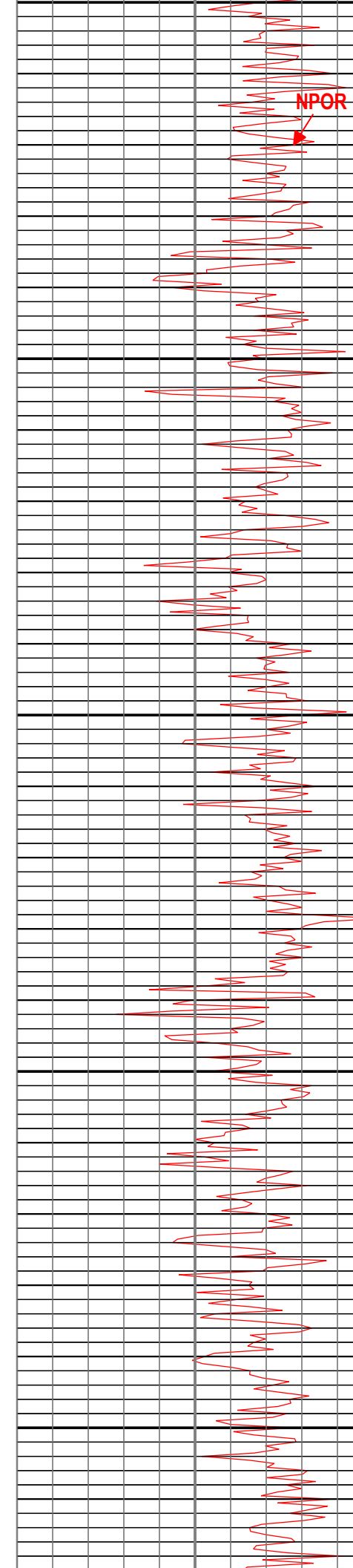


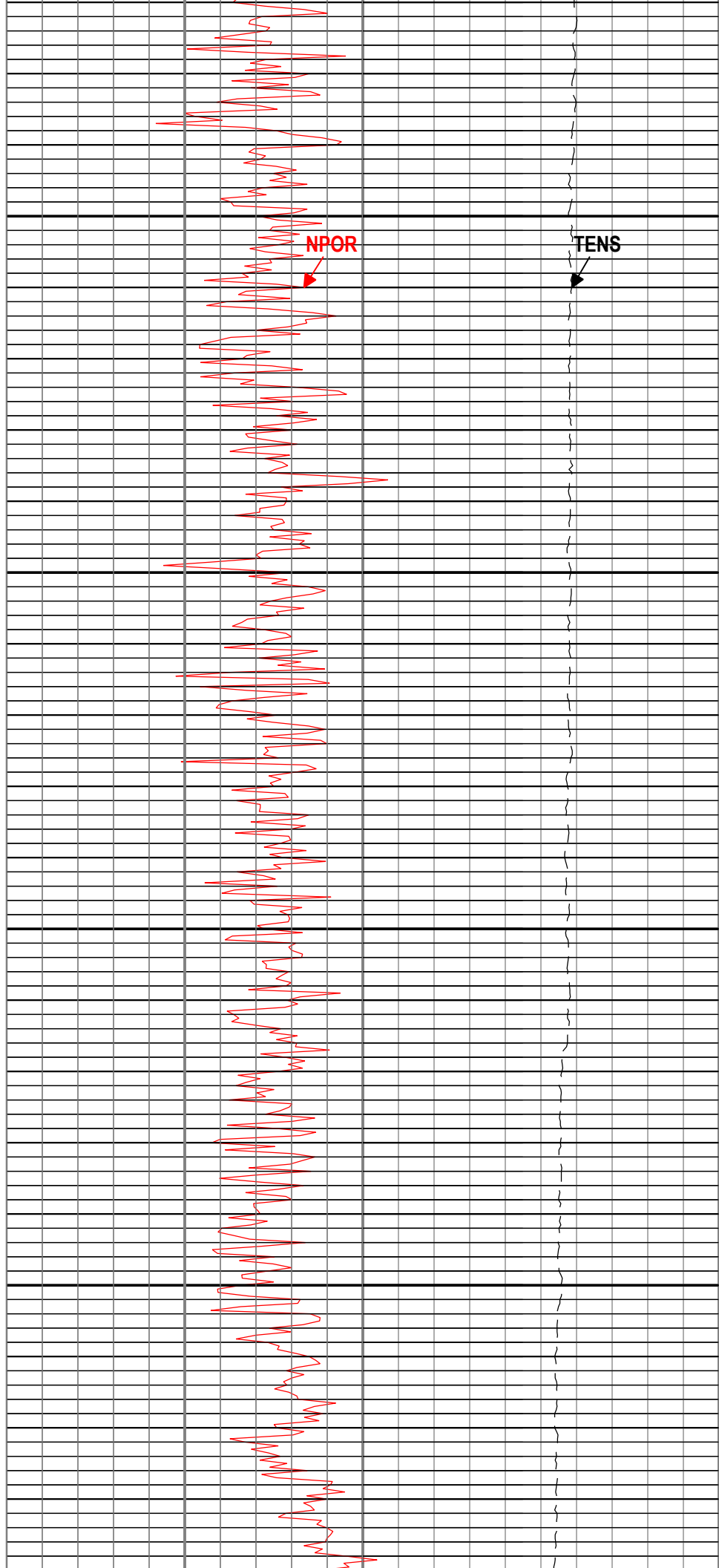
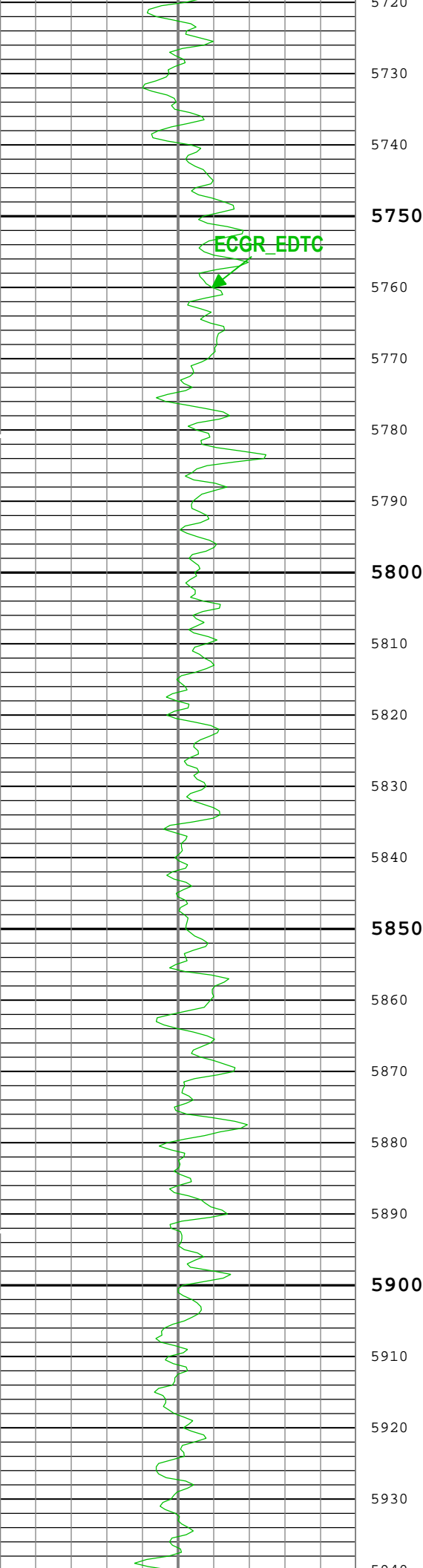
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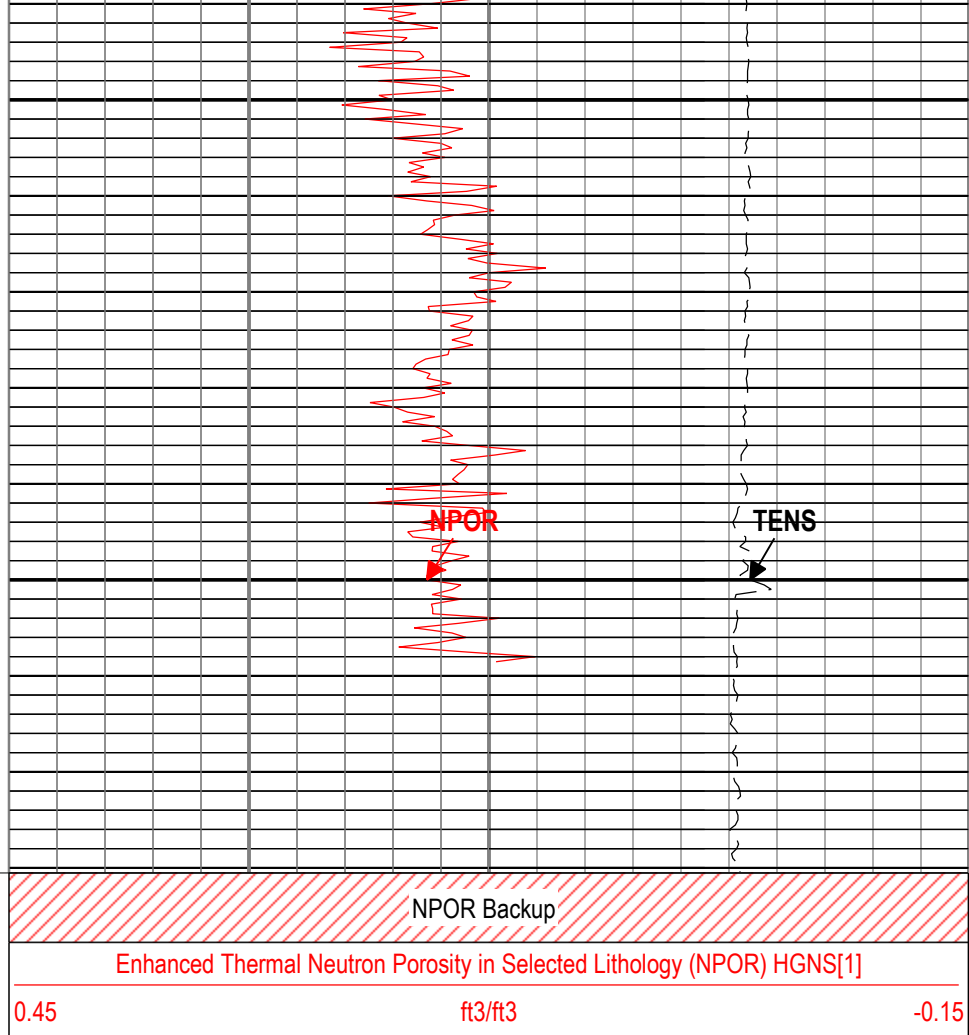
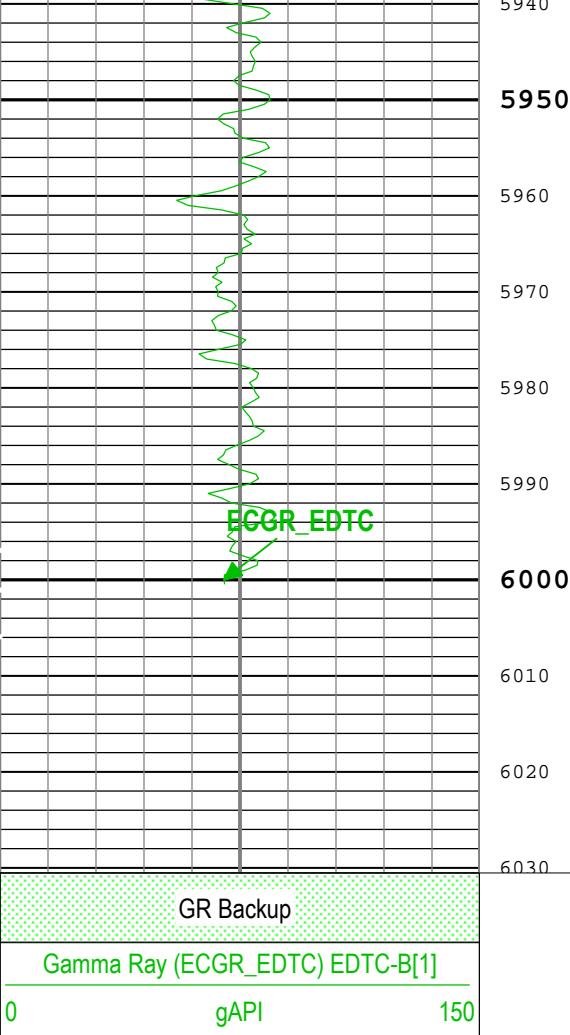




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TIME_1900 - Time Marked every 60.00 (s)

ICV - Integrated Cement Volume every 100.00 (ft3)
ICV - Integrated Cement Volume every 10.00 (ft3)
IHV - Integrated Hole Volume every 100.00 (ft3)
IHV - Integrated Hole Volume every 10.00 (ft3)

Description: AIT Basic Log Two Format: Log (Noble Nuclear) Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Jun-2018 09:51:56

Channel Processing Parameters				
UltraSonic-Nuetron: Parameters				
Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BHT	Bottom Hole Temperature	Borehole	212	degF
BS	Bit Size	WLSESSION	Depth Zoned	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	17891.8	ft
CDEN	Cement Density	EDTC-B	2	g/cm3
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Regular Cement	
CSODDRL	Casing Outer Diameter - Zoned along driller depths	WLSESSION	5.5	in
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT_CATEGORY	Drilling Fluid Type	Borehole	Water	

EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	30	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4646	ft
FSAL	Formation Salinity	Borehole	0	ppm
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS(RT)	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS(RT)	
GGRD	Geothermal Gradient	Borehole	1	0.01 degF/ft
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	REMS(RT)	
GTSE	Generalized Temperature Selection, from Measured or Computed Temperature	Borehole	GTEM_LINEST(RT)	
HSCO	Hole Size Correction Option	HGNS-H	Yes	
IMAR	Image Rotation	USIT-E	Off	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	LIMESTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
PDAT	Permanent Datum	WLSESSION	GL	
RMFS	Resistivity of Mud Filtrate Sample	Borehole	0.15	ohm.m
RMS	Resistivity of Mud Sample	Borehole	0.2	ohm.m
SHT	Surface Hole Temperature	Borehole	68	degF
TD	Total Measured Depth	Borehole	17907	ft
U-USIT_DFSZ	Drilling Fluid Specific Acoustic Impedance	USIT-E	0.1	Mrayl
USI_FVEL_SEL	USI Fluid Velocity Selection	USIT-E	Automatic	
USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	Theoretical	

UltraSonic-NuetronDepth Zoned Parameters				
Parameter	Value	Start (ft)	Stop (ft)	
BS	13.5	25.5	1963	
BS	8.5	1963	6030.5	
All depth are actual.				

Tool Control Parameters				
UltraSonic-Nuetron: Parameters				
Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in	

UltraSonic-Nuetron									
Nuclear Repeat Analysis									

Software Version									
Acquisition System						Version			
Maxwell 2017 SP3						7.3.92069.3100			
Application Patch						Wireline_NPD-ICE2-2017SP3_7.3.93033			
						Wireline_Hotfix-RTDLIS-2017SP3_7.3.92363			
						Wireline_Hotfix-SML-2017SP3_7.3.101161			
						Wireline_TestKit-CMR-NG-2017SP3_7.3.96073			

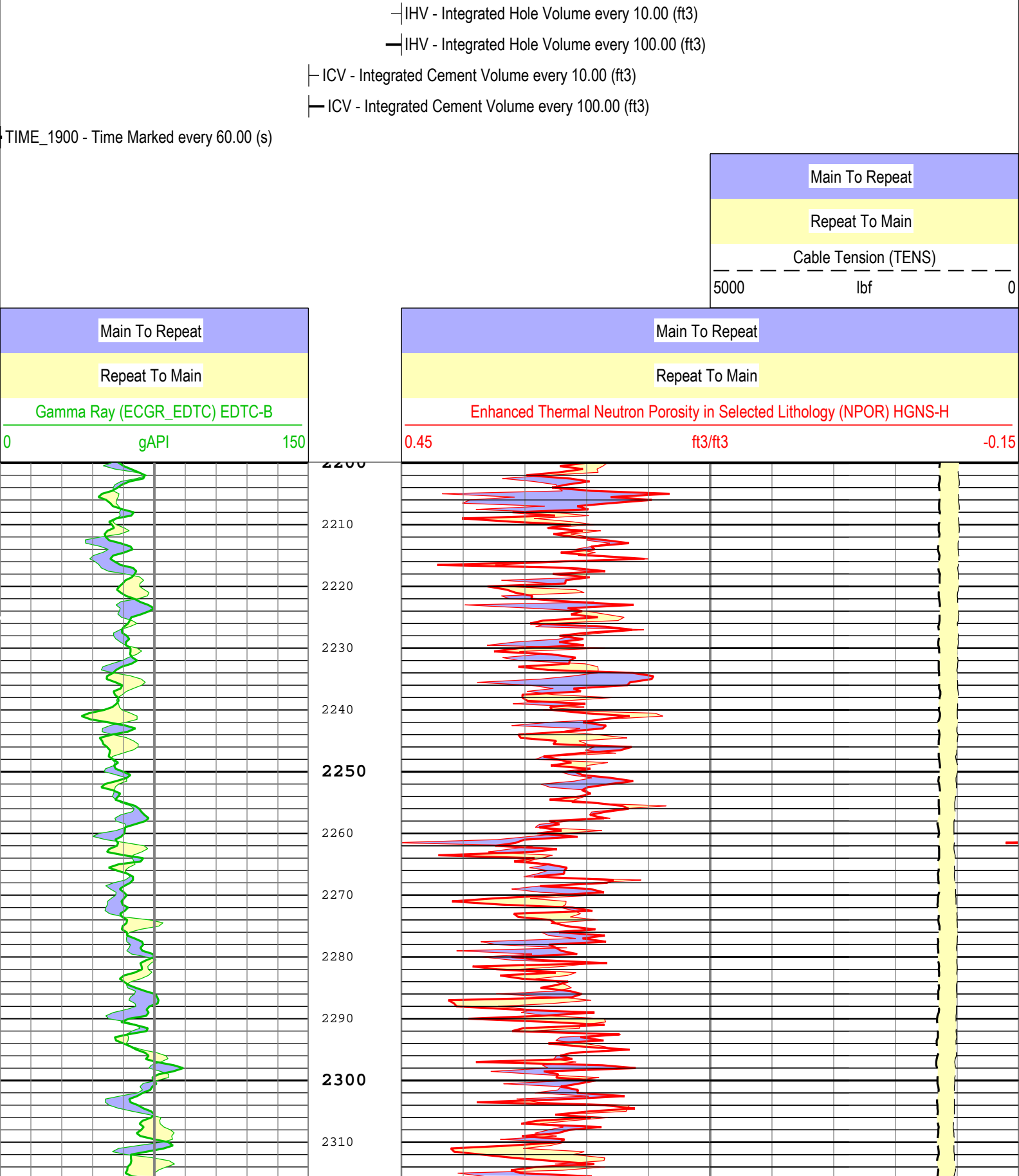
Pass Summary									
Run Name	Pass Objective	Direction	Top	Bottom	Start	Stop	DSC Mode	Depth Shift	Include Parallel Data
UltraSonic-Nuetron	Log[1]:Up	Up	2122.98 ft	2530.67 ft	19-Jun-2018 14:00:12.111	19-Jun-2018 14:07:42.111	ON	-2.54 ft	No

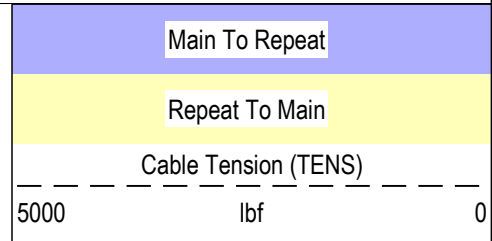
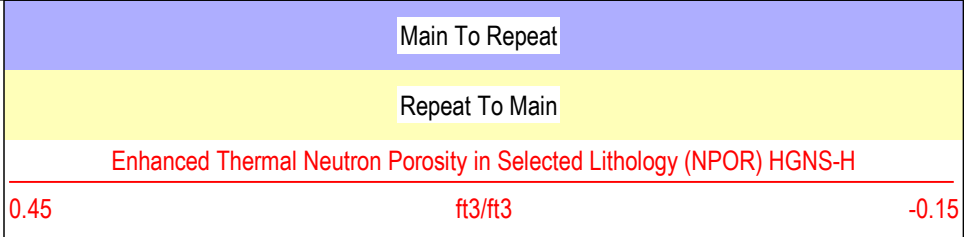
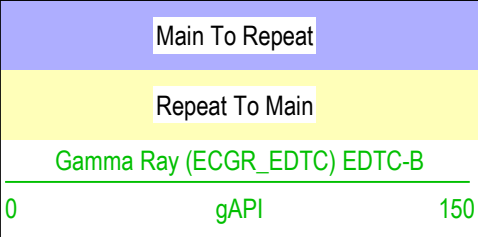
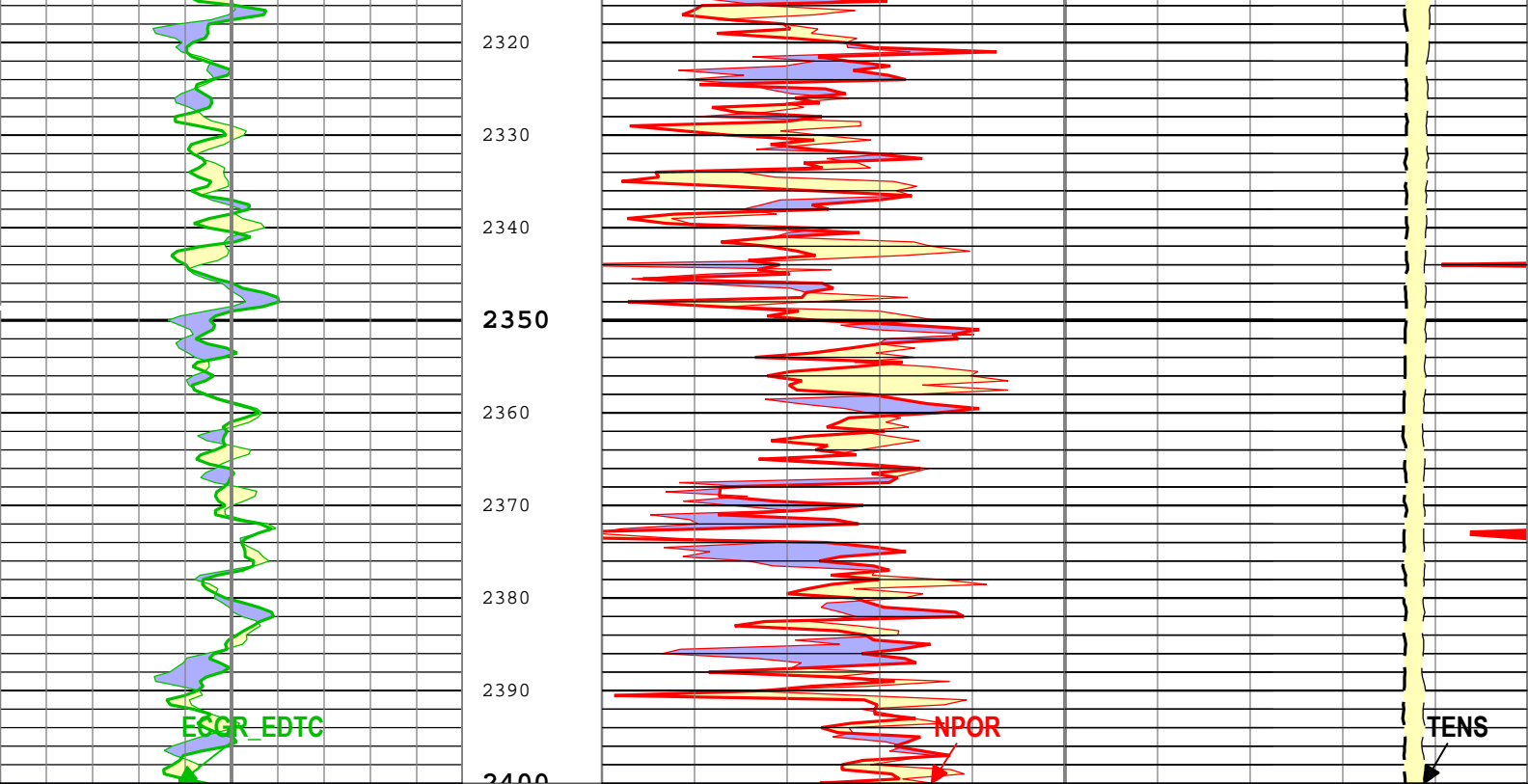
Nuetron					11:33:10 AM	11:37:12 AM			
UltraSonic-Nuetron	Log[4]:Up	Up	55.14 ft	3778.58 ft	19-Jun-2018 12:28:53 PM	19-Jun-2018 1:07:29 PM	ON	-1.43 ft	No

All depths are referenced to toolstring zero

Log	Company:Noble Energy Inc Well:Larson AA19-635 UltraSonic-Nuetron: Log[4]:Up:S005							
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Description: AIT Basic Log Two Format: Noble Nuclear RA Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Jun-2018 09:52:04





TIME_1900 - Time Marked every 60.00 (s)

- ICV - Integrated Cement Volume every 100.00 (ft3)
- ICV - Integrated Cement Volume every 10.00 (ft3)
- IHV - Integrated Hole Volume every 100.00 (ft3)
- IHV - Integrated Hole Volume every 10.00 (ft3)

Description: AIT Basic Log Two Format: Noble Nuclear RA Index Scale: 5 in per 100 ft Index Unit: ft Index Type: Measured Depth Creation Date: 20-Jun-2018 09:52:04

Channel Processing Parameters

UltraSonic-Nuetron: Parameters

Parameter	Description	Tool	Value	Unit
ISSBAR	Barite Mud Presence Flag	Borehole	No	
BHS	Borehole Status (Open or Cased Hole)	Borehole	Cased	
BHT	Bottom Hole Temperature	Borehole	212	degF
BS	Bit Size	WLSESSION	8.5	in
BSAL	Borehole Salinity	Borehole	0	ppm
CBLO	Casing Bottom (Logger)	WLSESSION	17891.8	ft
CDEN	Cement Density	EDTC-B	2	g/cm3
CMTY(U-USIT_CEMT)	Cement Type	USIT-E	Regular Cement	
CCORR	Cement Correction Factor	WLSESSION	5.5	

CSODDRL	Casing Outer Diameter - Zoned along driller depths	WLSESSION	5.5	in
DC_MODE	Depth Correction Mode	DepthCorrection	Real-time	
DFD	Drilling Fluid Density	Borehole	8.4	lbm/gal
DFT_CATEGORY	Drilling Fluid Type	Borehole	Water	
EDF	Elevation of Derrick Floor Above Permanent Datum	WLSESSION	30	ft
EPD	Elevation of Permanent Datum (PDAT) above Mean Sea Level	WLSESSION	4646	ft
FSAL	Formation Salinity	Borehole	0	ppm
GCSE_DOWN_PASS	Generalized Caliper Selection for WL Log Down Passes	Borehole	BS(RT)	
GCSE_UP_PASS	Generalized Caliper Selection for WL Log Up Passes	Borehole	BS(RT)	
GGRD	Geothermal Gradient	Borehole	1	0.01 degF/ft
GRSE	Generalized Mud Resistivity Selection, from Measured or Computed Mud Resistivity	Borehole	REMS(RT)	
GTSE	Generalized Temperature Selection, from Measured or Computed Temperature	Borehole	GTEM_LINEST(RT)	
HSCO	Hole Size Correction Option	HGNS-H	Yes	
IMAR	Image Rotation	USIT-E	Off	
MATR	Rock Matrix for Neutron Porosity Corrections	Borehole	LIMESTONE	
MFST	Mud Filtrate Sample Temperature	Borehole	68	degF
MST	Mud Sample Temperature	Borehole	68	degF
PDAT	Permanent Datum	WLSESSION	GL	
RMFS	Resistivity of Mud Filtrate Sample	Borehole	0.15	ohm.m
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USI_ZMUD_SEL	USI Mud Impedance Selection	USIT-E	Theoretical	

Tool Control Parameters

UltraSonic-Nuetron: Parameters

Parameter	Description	Tool	Value	Unit
MAX_LOG_SPEED	Toolstring Maximum Logging Speed	WLSESSION	3600	ft/h
ULOG	Logging Objective	USIT-E	MEASUREMENT	
UPAT	USIT Emission Pattern	USIT-E	Pattern 375 KHz	
UWKM	USIT Working Mode	USIT-E	Uncompressed 10 deg at 6.0 in	

Calibration Report

HGNS-H (HILT Gamma-Ray and Neutron Sonde, 150 degC) Calibration - Run UltraSonic-Nuetron

Primary Equipment :			
	HILT Gamma-Ray and Neutron Sonde, 150 degC	HGNS-H	
Auxiliary Equipment :			
	HGNS Accelerometer, 150 degC	HACCZ-H	4168
	AmBe Neutron Logging Source	NSR-F	5203
Calibration Parameter :			
	Water Temperature (Calibration Tank Water Temperature)	64.0	
	Housing Size (Thermal Housing Size)	3.37	
	JIG-BKG		

HGNS Accelerometer EEPROM - Accelerometer EEPROM Read

Master (EEPROM):		18:00:00 14-Jul-2005					
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	
Accelerometer Manufacturer		Master			QAT_160		
Accelerometer Reference Temperature	degF	Master		30.2	77.0	122.0	
Accelerometer Coefficient A		Master			1500.000		

Accelerometer Coefficients - 0		Master	----	----	1582.500	----		
Accelerometer Coefficients - 1		Master	----	----	35.100	----		
Accelerometer Coefficients - 2		Master	----	----	-0.047	----		
Accelerometer Coefficients - 3		Master	----	----	-0.001	----		
Accelerometer Coefficients - 4		Master	----	----	2.739	----		
Accelerometer Coefficients - 5		Master	----	----	0.000	----		
Accelerometer Coefficients - 6		Master	----	----	0.000	----		
Accelerometer Coefficients - 7		Master	----	----	0.000	----		
Accelerometer Coefficients - 8		Master	----	----	298.400	----		
Accelerometer Coefficients - 9		Master	----	----	0.991	----		

HGNS Neutron Calibration - HGNS Neutron Accumulations

Master (EEPROM):		12:16:40 17-May-2018							
Measurement	Unit	Phase	Nominal	Low Limit	Actual	High Limit	<div><div></div><div></div></div>		
Near Zero Measurement	1/s	Master	0	5.0	27.0	40.0	<div><div></div><div></div></div>		
Far Zero Measurement	1/s	Master	0	5.0	27.7	40.0	<div><div></div><div></div></div>		
Near Plus Measurement	1/s	Master	6031.0	4700.0	4992.0	6900.0	<div><div></div><div></div></div>		
Far Plus Measurement	1/s	Master	2793.0	1900.0	2078.0	2900.0	<div><div></div><div></div></div>		
Near Corrected Plus Measurement	1/s	Master		4700.0	4965.0	6900.0	<div><div></div><div></div></div>		
Far Corrected Plus Measurement	1/s	Master		1900.0	2047.0	2900.0	<div><div></div><div></div></div>		

Company:	Noble Energy Inc	Schlumberger
Well:	Larson AA19-635	
Field:	Wattenberg	
County:	Weld	
State:	Colorado	

Neutron Log