



Weatherford

**ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG**

COMPANY

SHAKESPEAR OIL CO., INC.

WELL

OTTLEY 4-27

FIELD

SMOKY HILL

PROVINCE/COUNTY LOGAN

COUNTRY/STATE USA / KANSAS

LOCATION NE SW SW NW, 2235' FNL & 520' FWL

SEC 27

TWP 14S

RGE 32W

Other Services

Latitude

38.808963764

PHOTO DENSITY

Longitude

-100.871232007

DUAL SPACED NEUTRON

API Number

15-109-21586

MICRO RESISTIVITY

Permanent Datum GL, Elevation 2665 feet

Log Measured From KB, 8.00 feet above Permanent Datum

Drilling Measured From KB

18-MAR-2019

ONE

17876-240109006

4400.00

4400.00

4396.66

264.00

264.00

264.00

7.875

WBM

9.10

10.00

FLOWLINE

0.53 @ 78.0

0.39 @ 78.0

0.63 @ 78.0

CALC

0.40 @ 105.0

3 HOURS

105.00

13379

BANDAR BINOSFUR

TIM LAUER

deg F

ELRENO

2673.00

2671.00

2665.00

BOREHOLE RECORD

Last Edited: 19-MAR-2019 00:03

Bit Size
inches

7.875

Depth From
feet

264.00

Depth To
feet

4400.00

CASING RECORD

Type

Size
inches

8.625

Depth From
feet

0.00

Shoe Depth
feet

264.00

Weight
pounds/ft

24.00

REMARKS

- LOGGING SOFTWARE: 18.05.7089

- TOOLSTRING:

MCB, SHA, MCG, MMR, MDN, MPD, SKJ, MFE, MAI RAN IN COMBINATION.

- HARDWARE USED:

MAI: TOW 0.5 STANDOFFS.

MFE: ONE 0.5 STANDOFF

MDN: DUAL BOWSPRING

MPD: 8 INCH PROFILE PLATE.

2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY.

- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

- MAIN PASS :

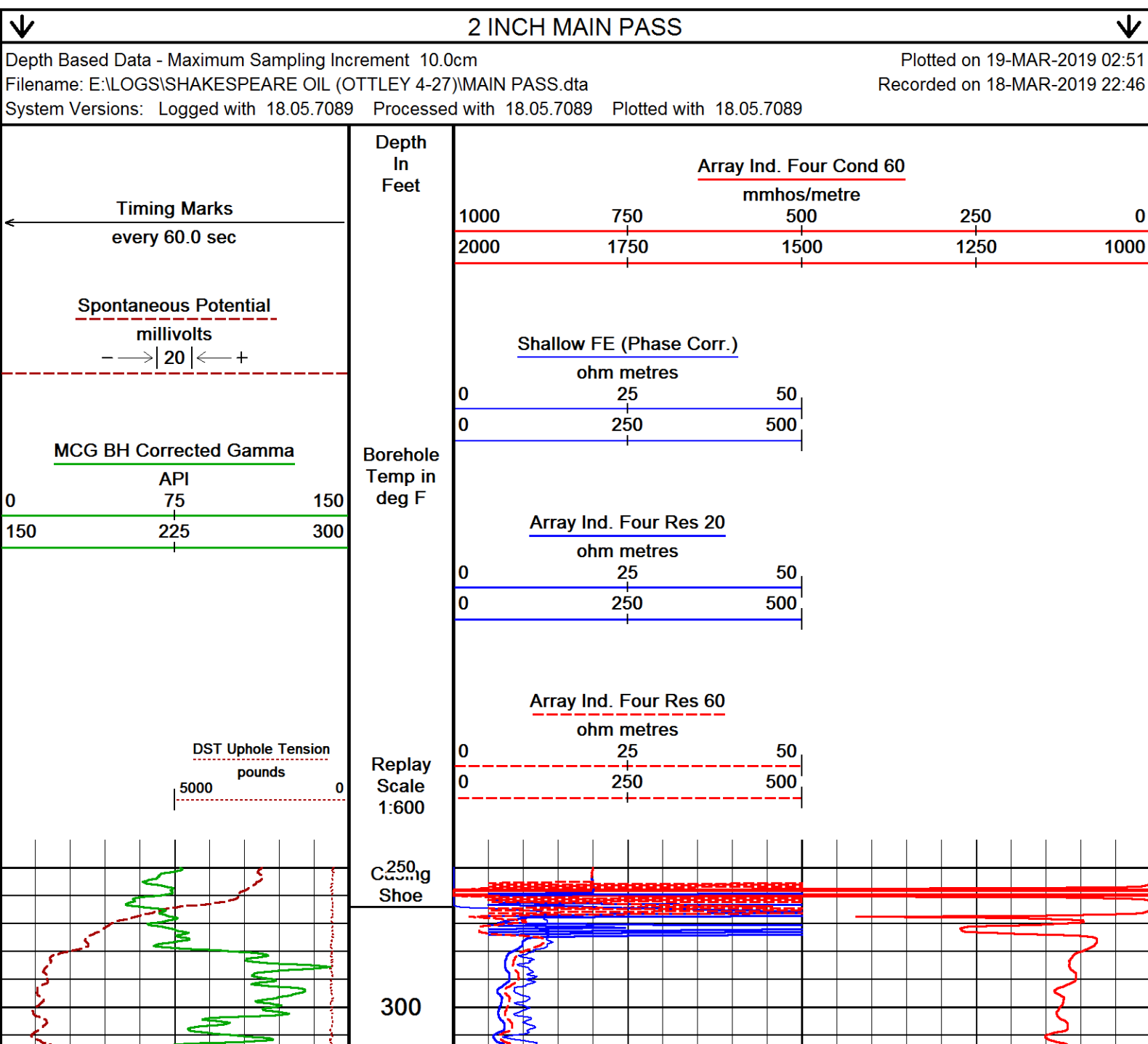
NEUTRON / DENSITY / MICROLOG = 4400' - 3450' _2200' - 2050'

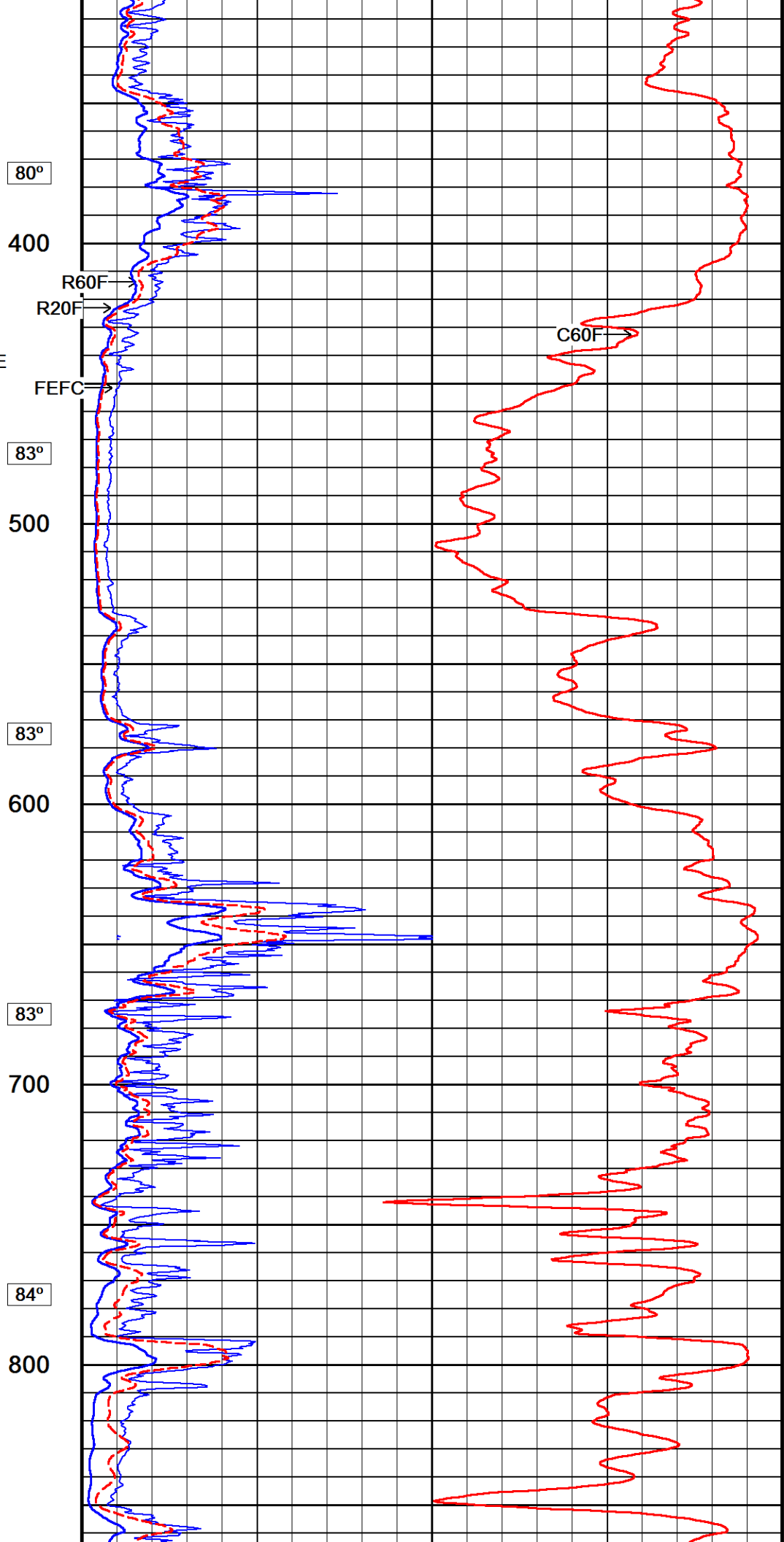
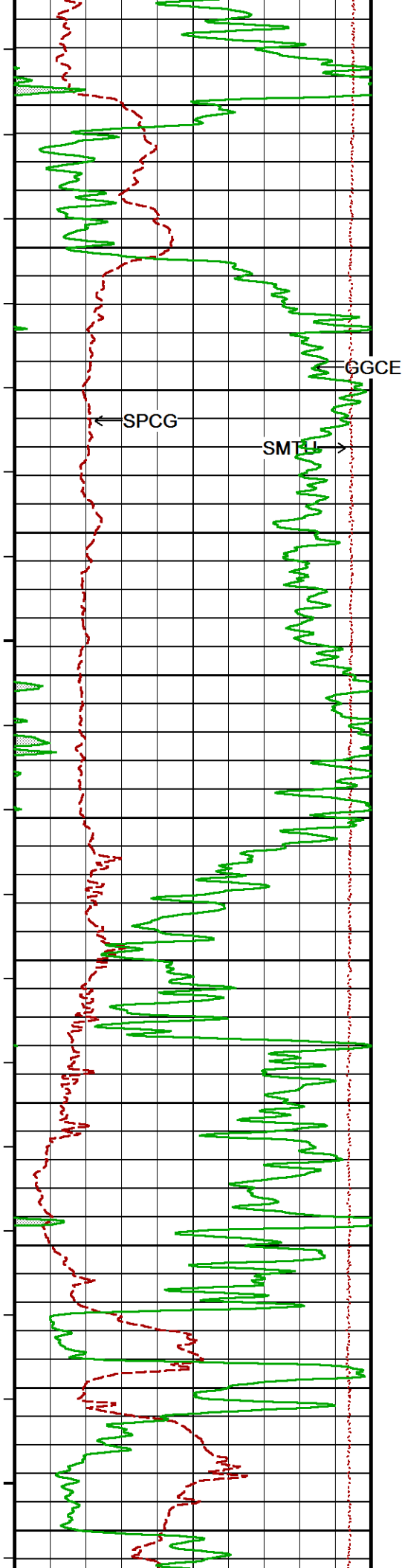
GAMMA / INDUCTION / CALIPER = 4400' - CASING SHOE

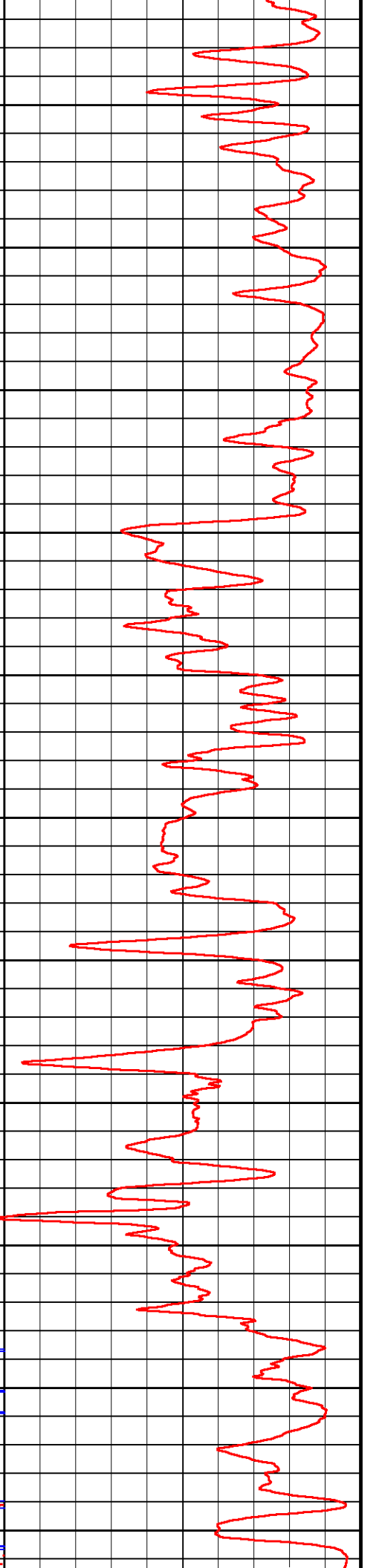
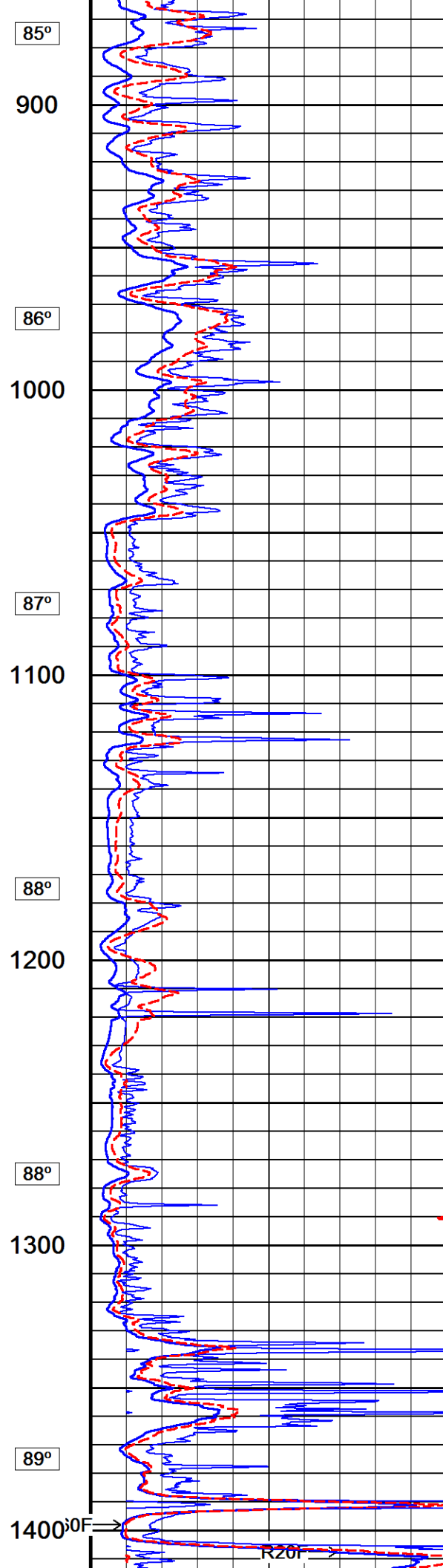
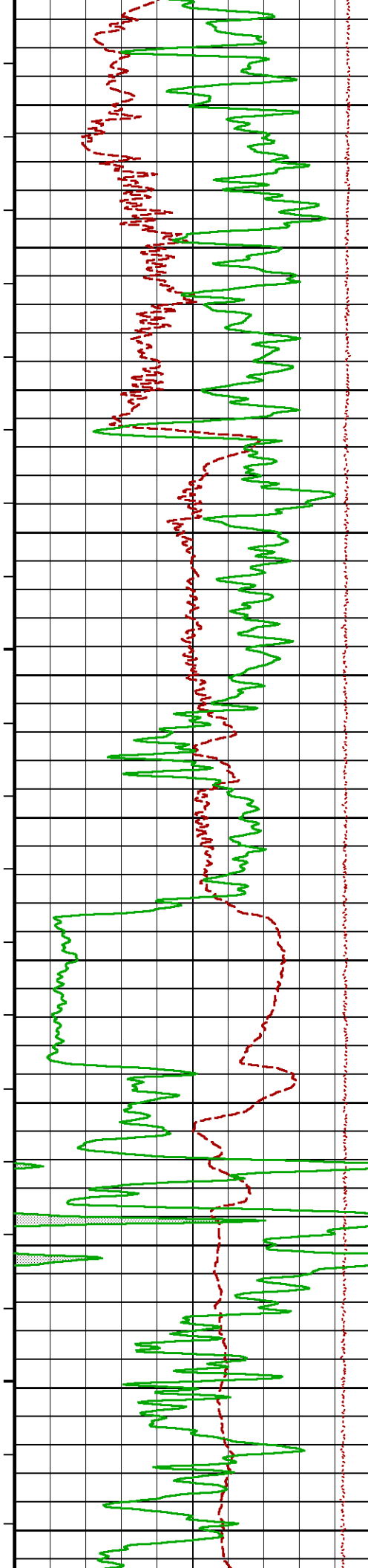
- REPEAT PASS :

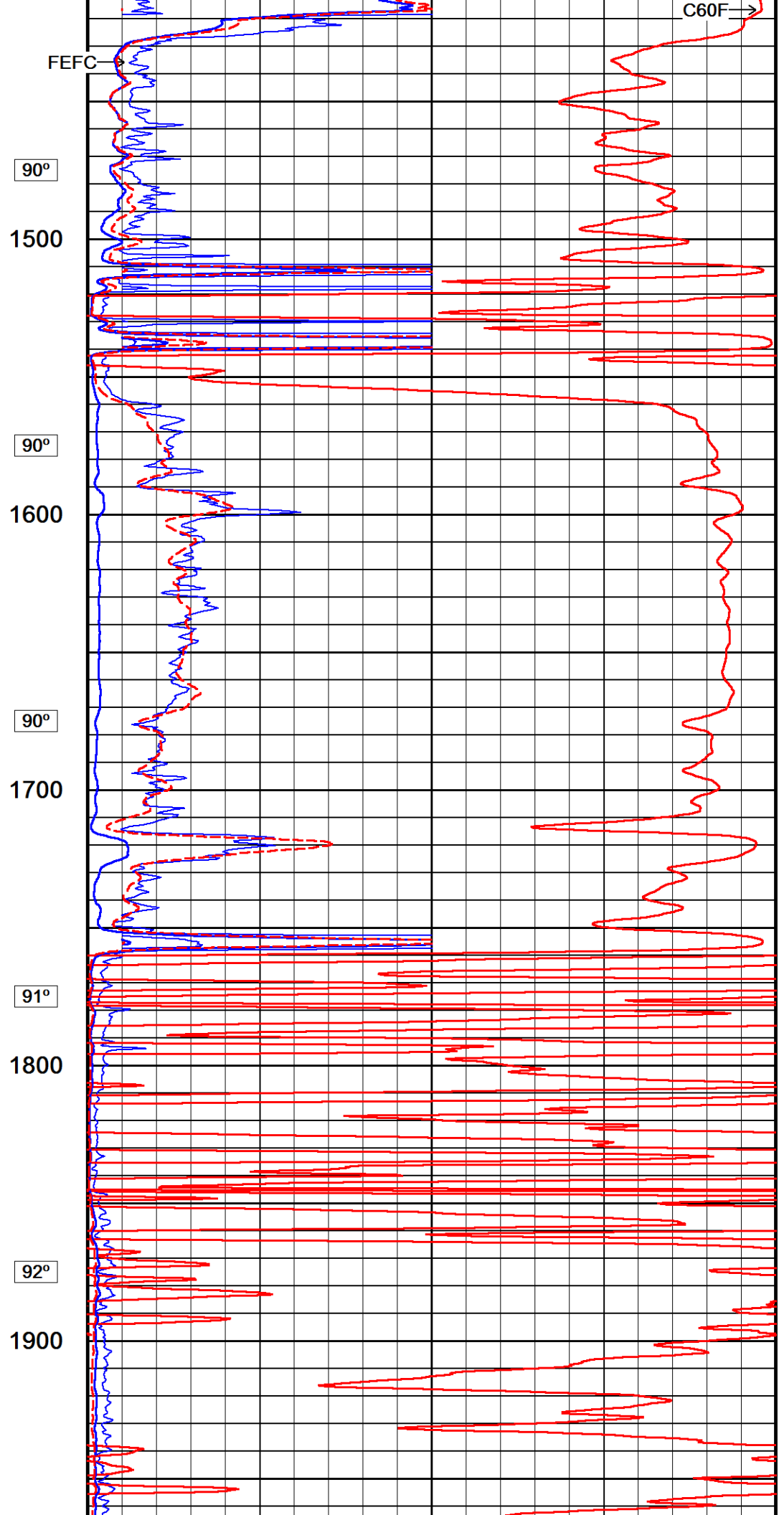
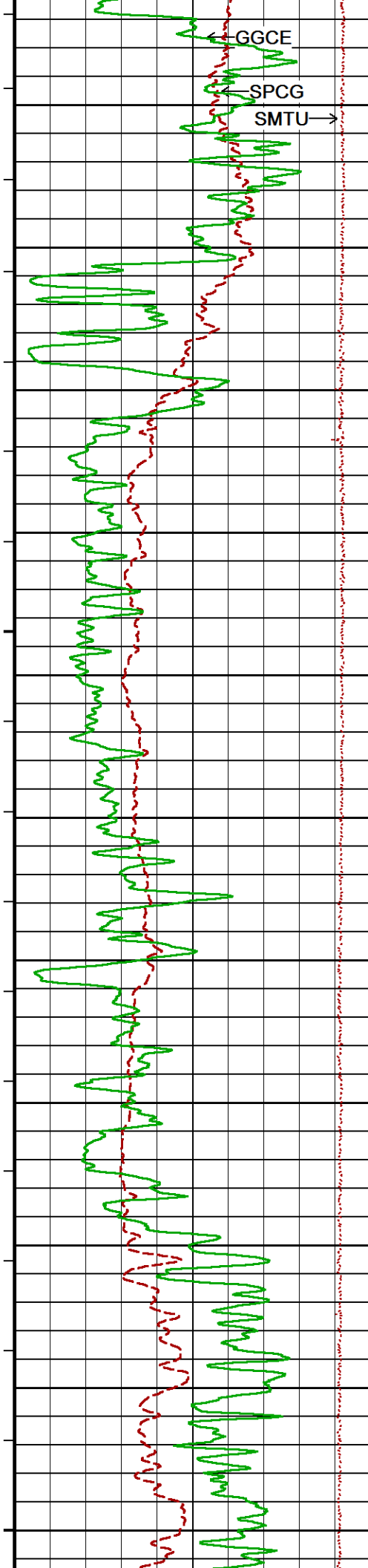
- OPERATORS: J. JOHNSON, G. FICA

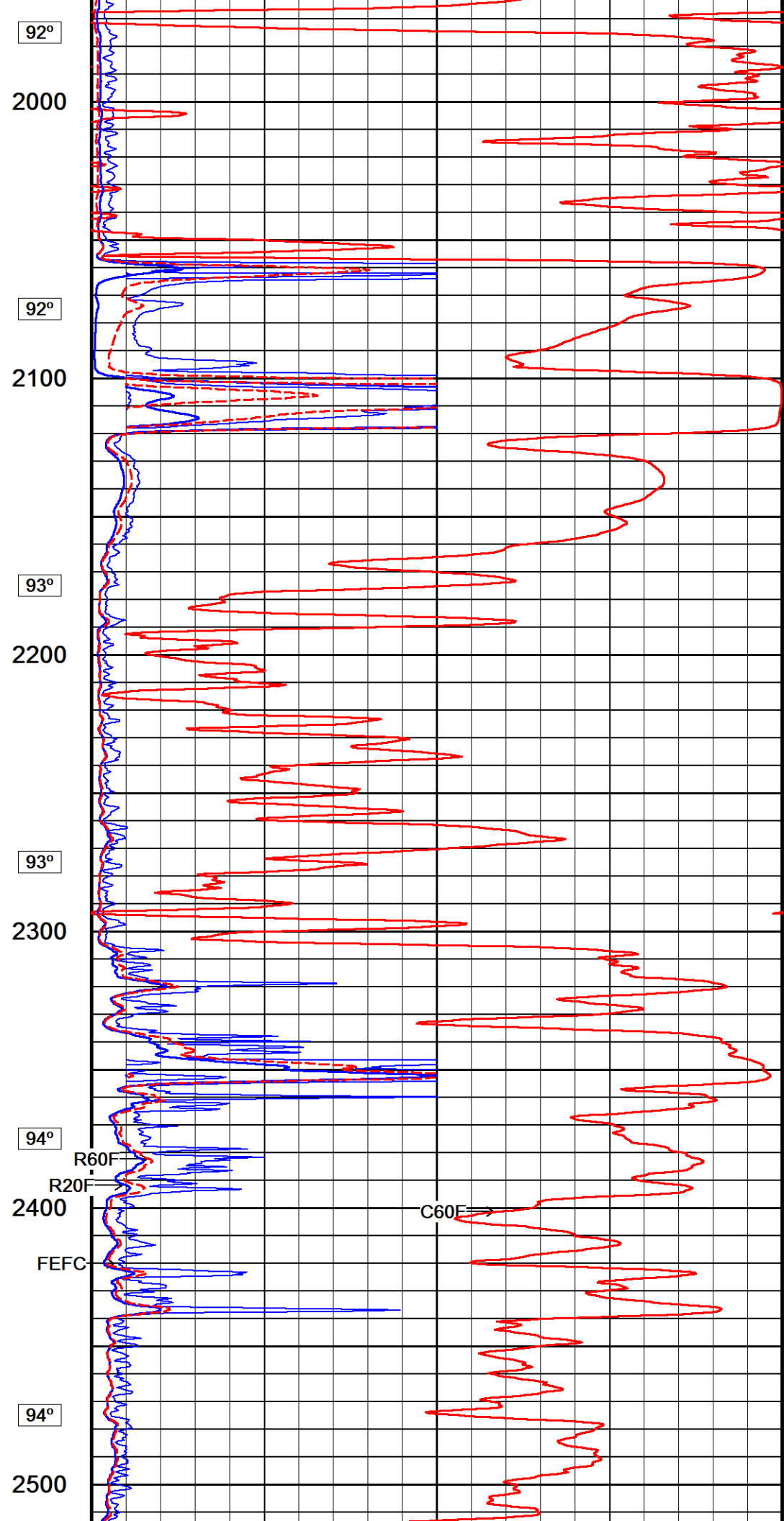
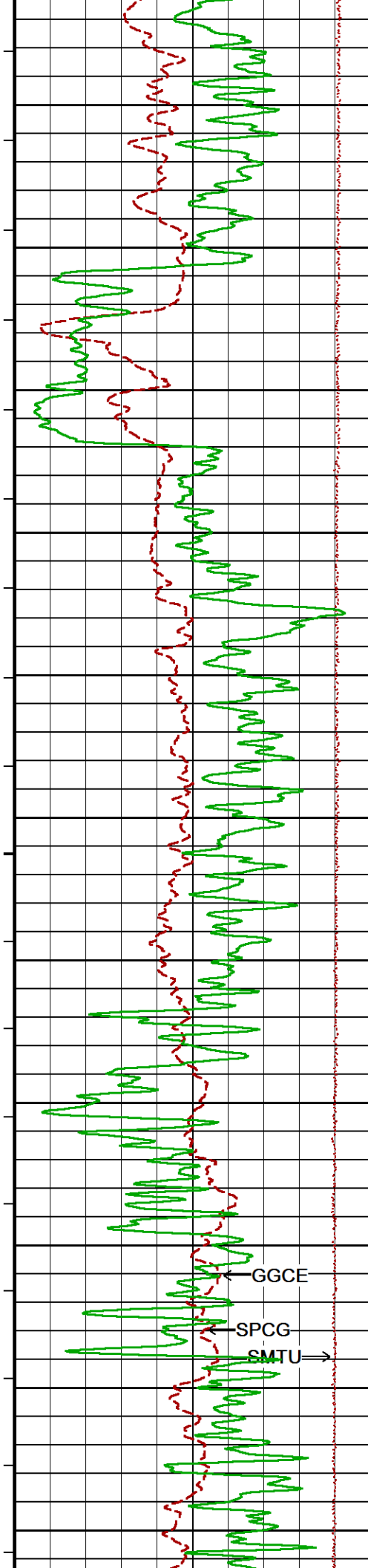
DECISIONS CONCERNING THE SERVICES.

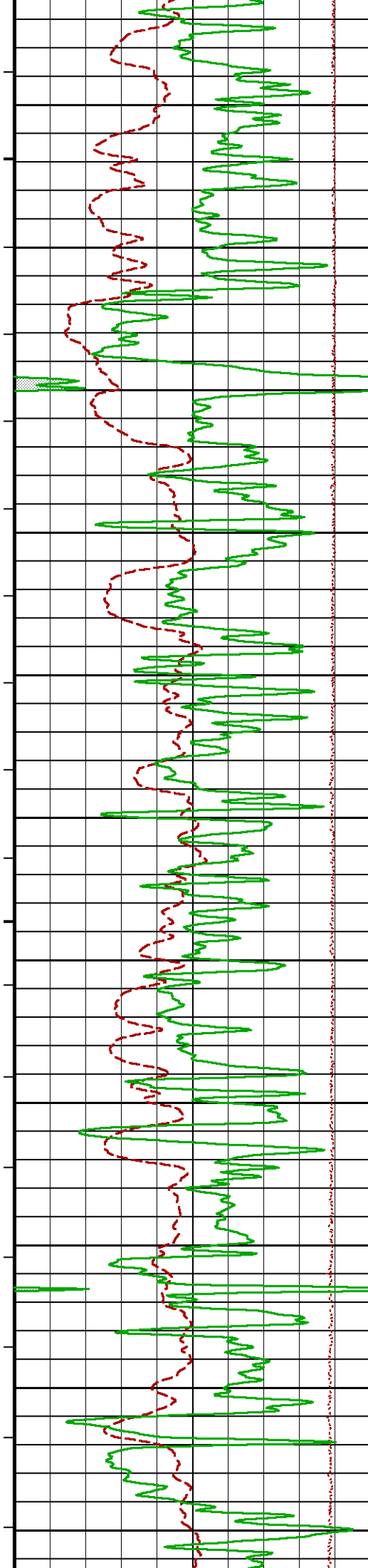












95°

2600

95°

2700

96°

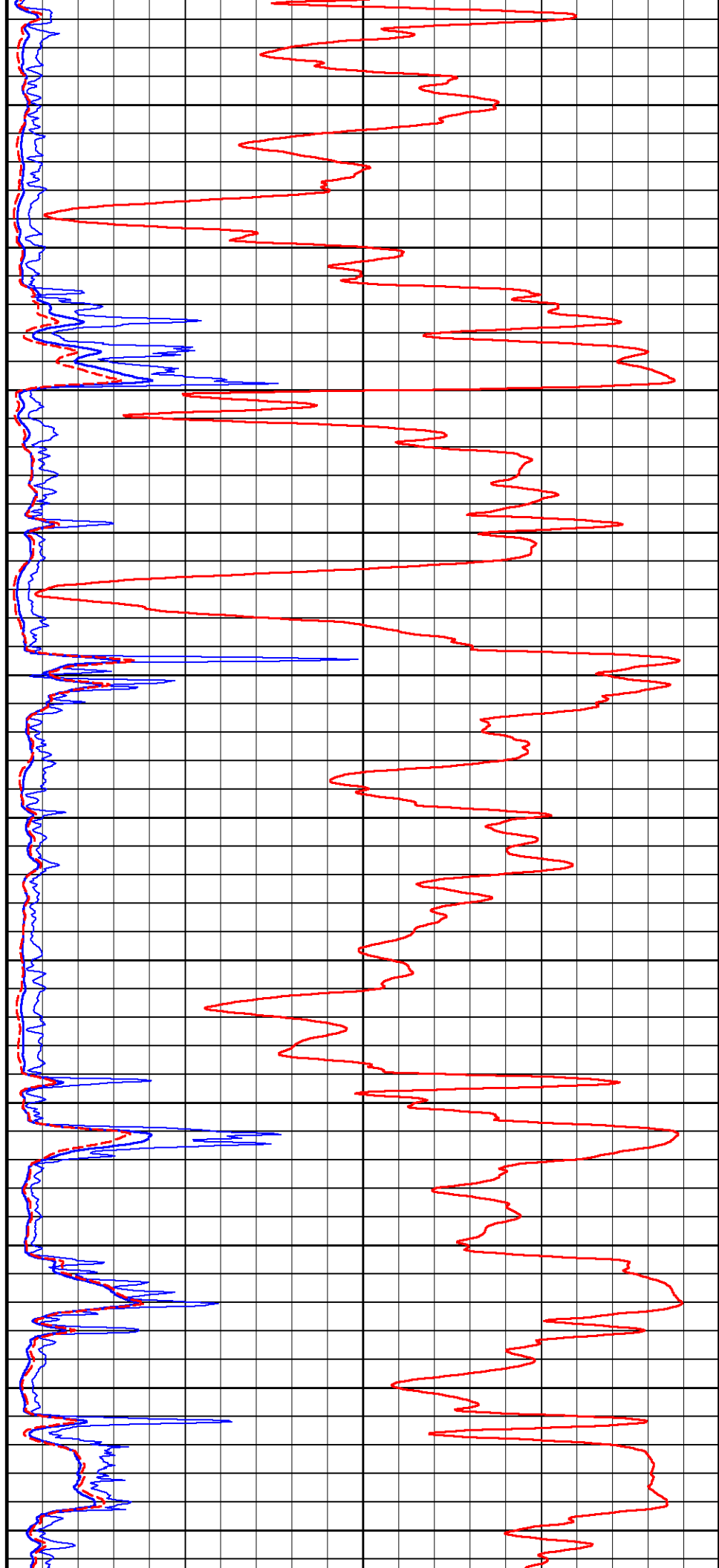
2800

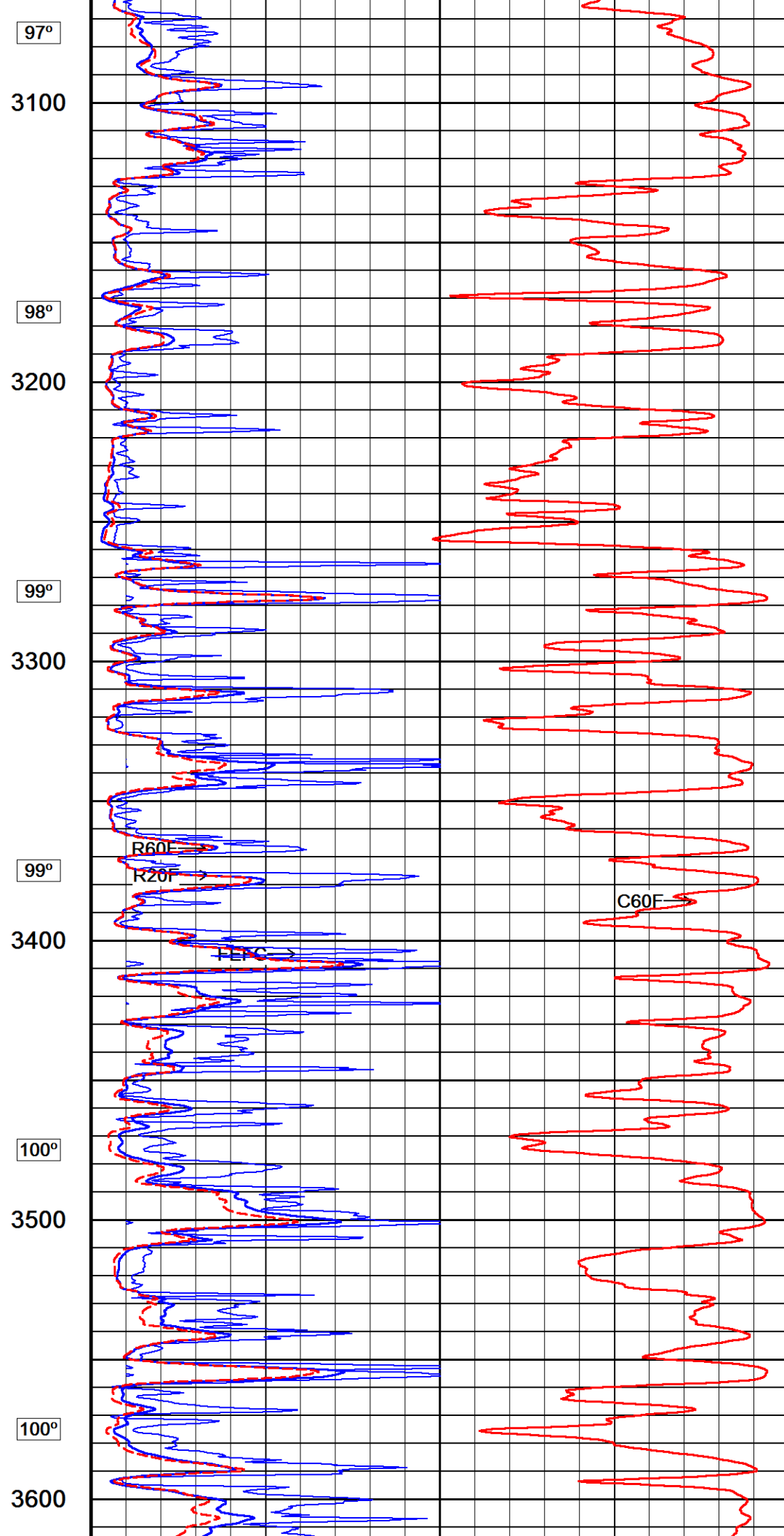
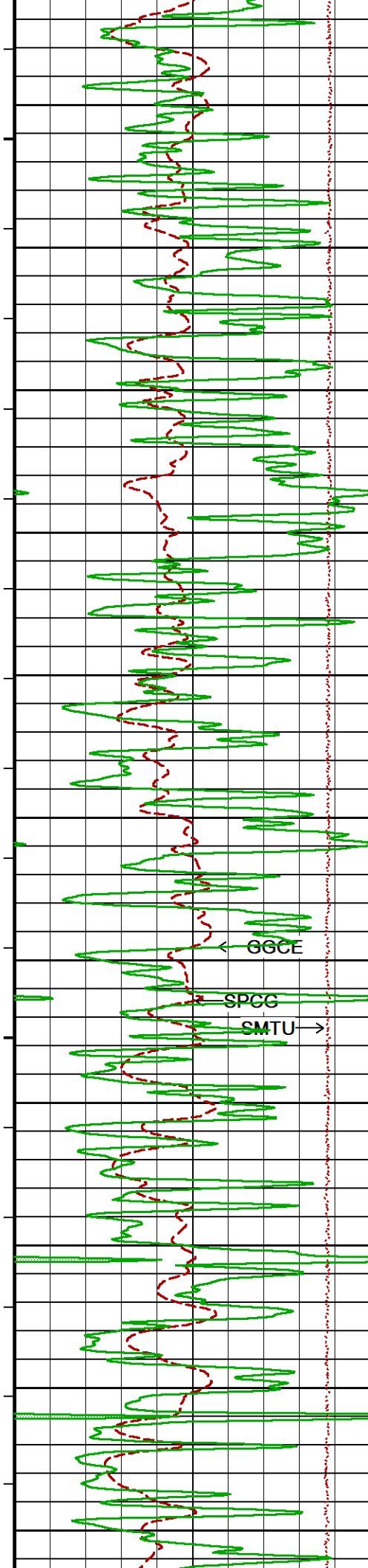
96°

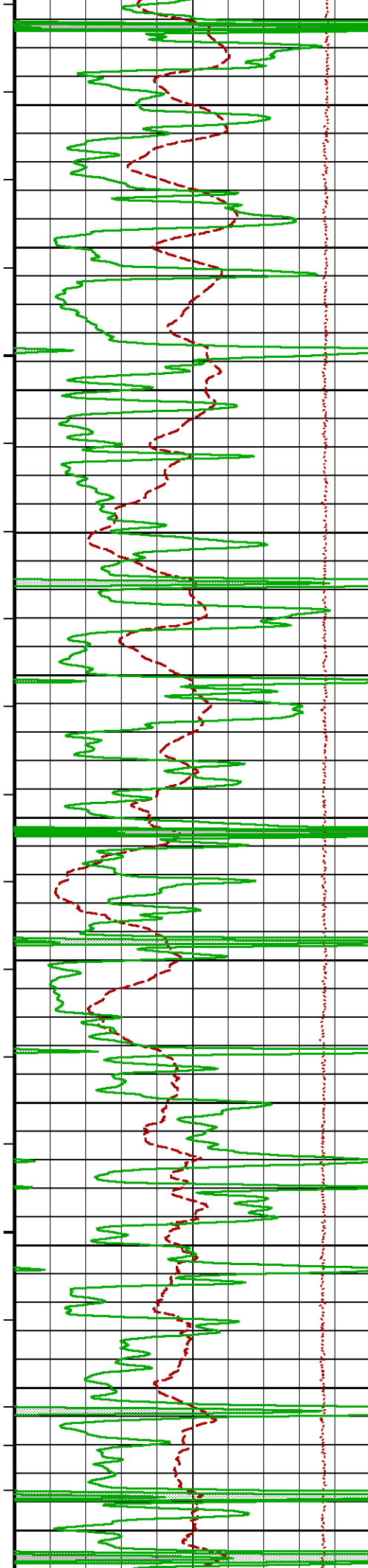
2900

97°

3000







101°

3700

101°

3800

102°

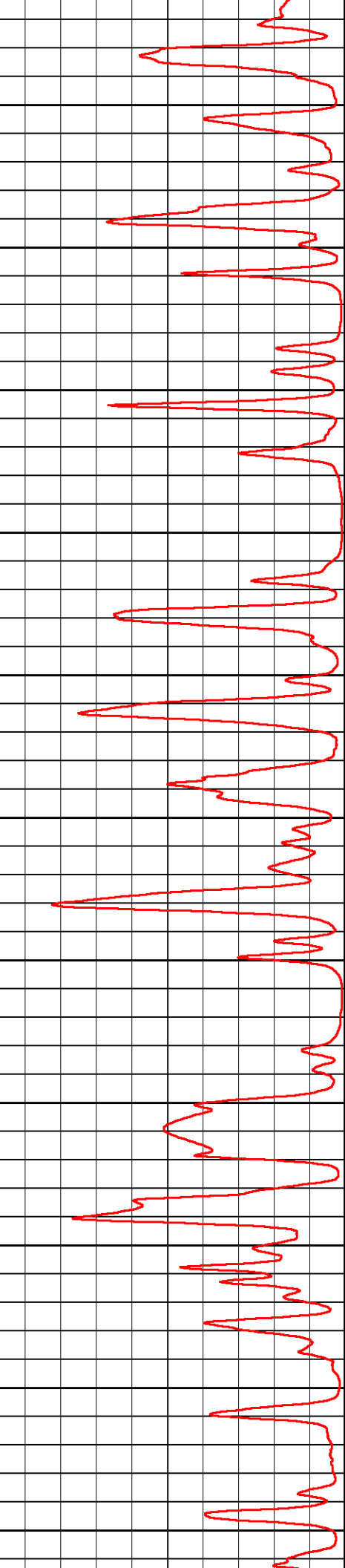
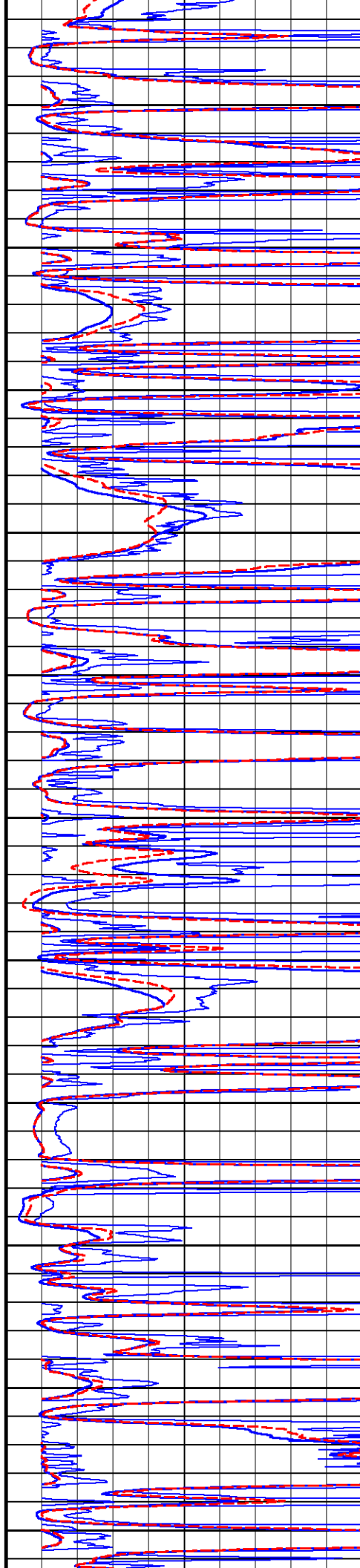
3900

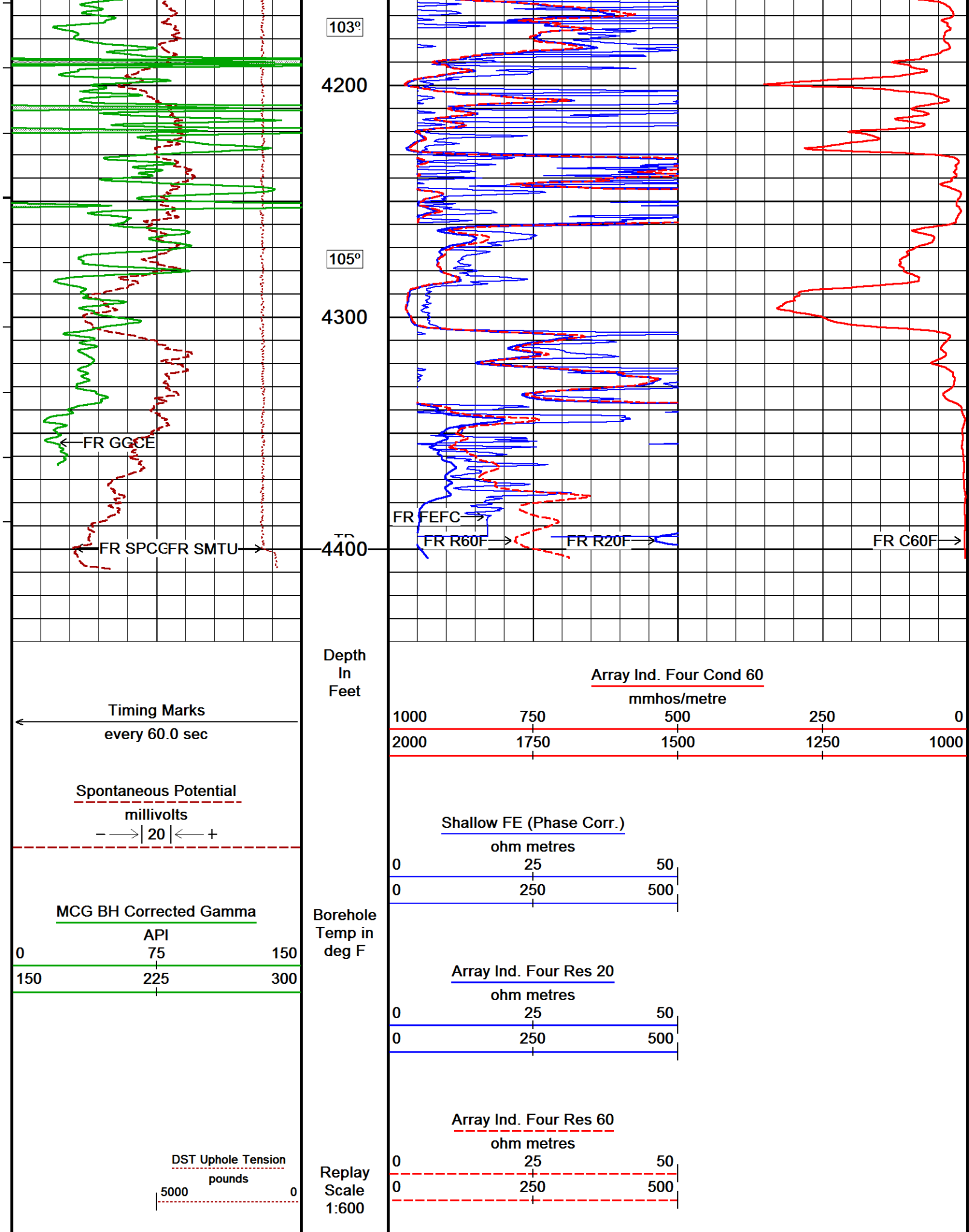
102°

4000

103°

4100

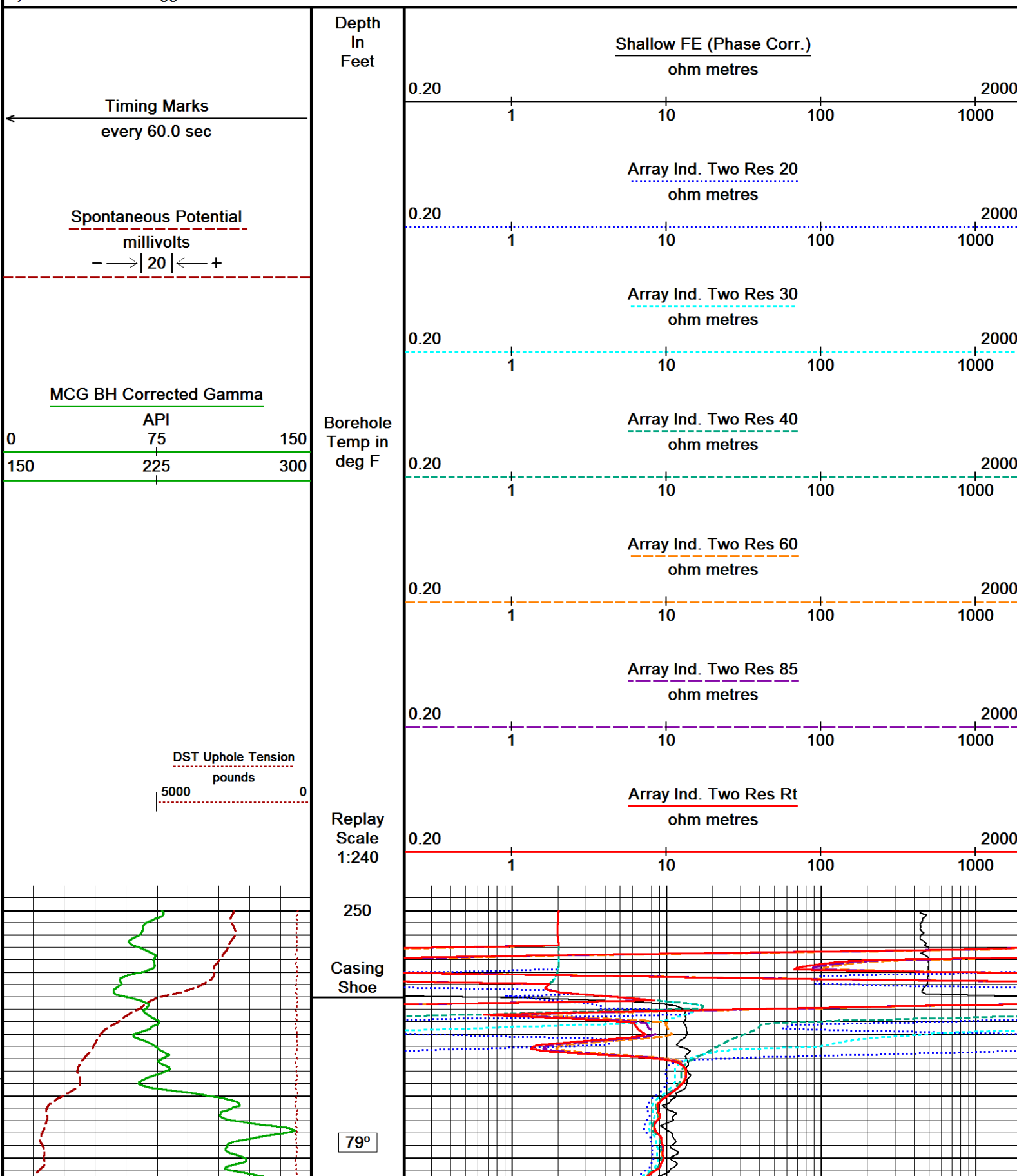


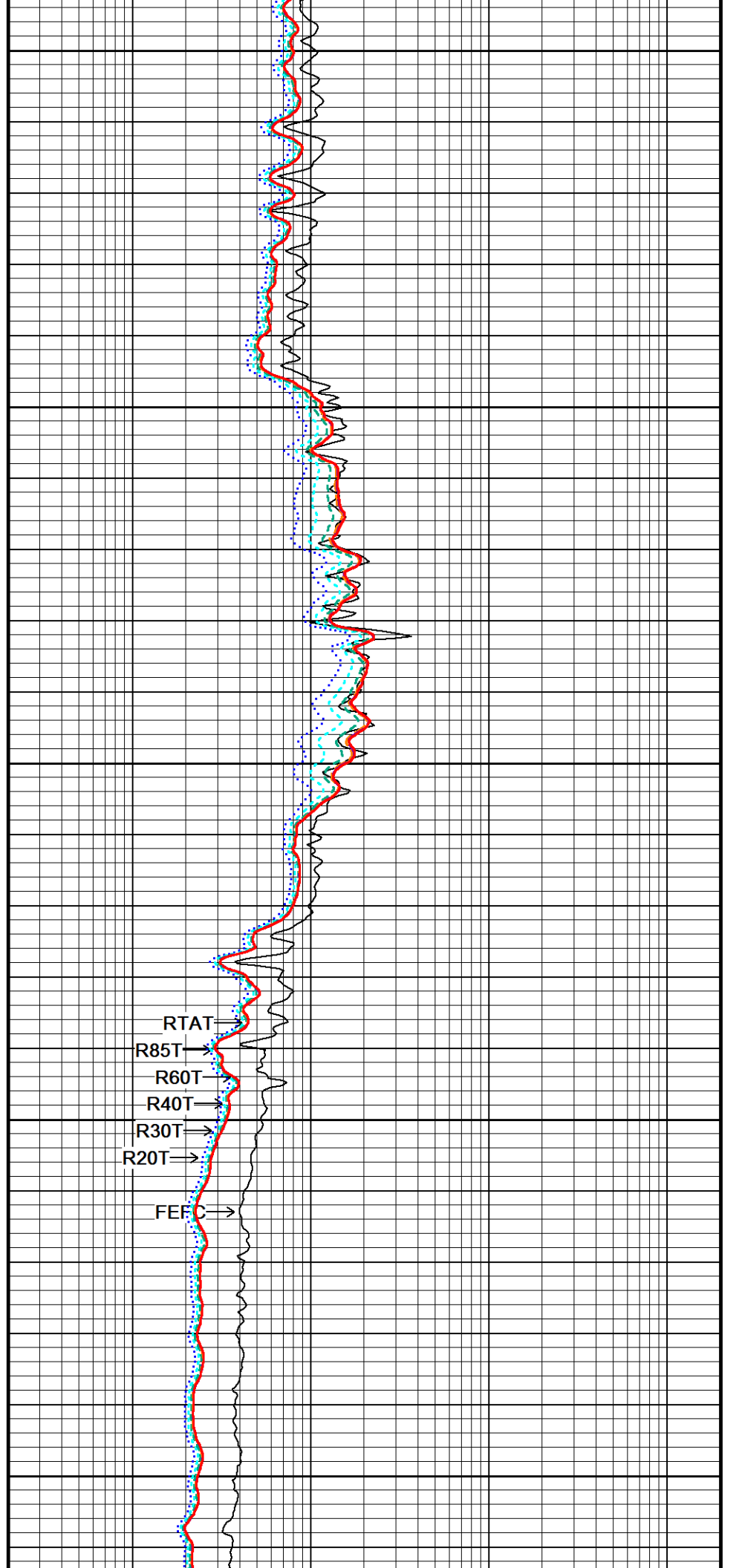
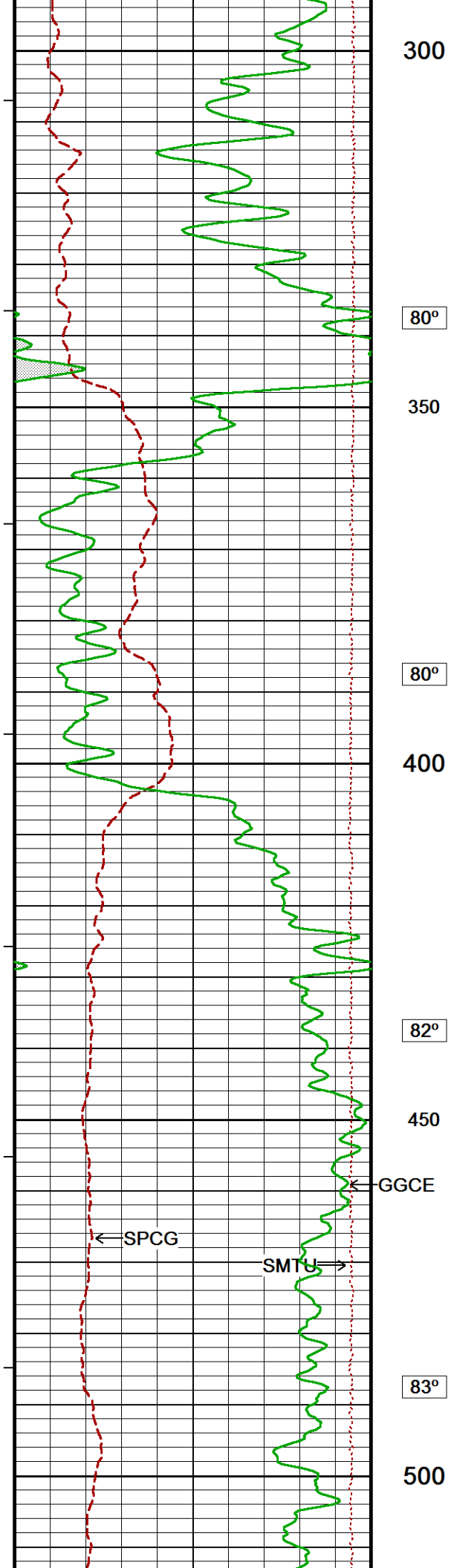


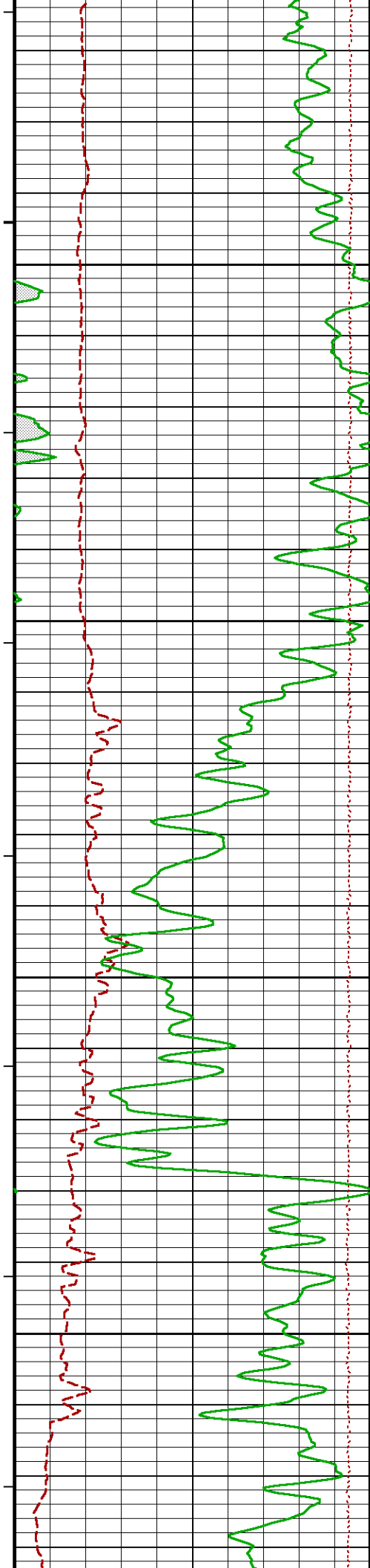
2 INCH MAIN PASS

5 INCH MAIN PASS

Depth Based Data - Maximum Sampling Increment 10.0cm
 Filename: E:\LOGS\SHAKESPEARE OIL (OTTLEY 4-27)\MAIN PASS.dta
 System Versions: Logged with 18.05.7089 Processed with 18.05.7089 Plotted with 18.05.7089
 Plotted on 19-MAR-2019 02:51
 Recorded on 18-MAR-2019 22:46







83°

550

83°

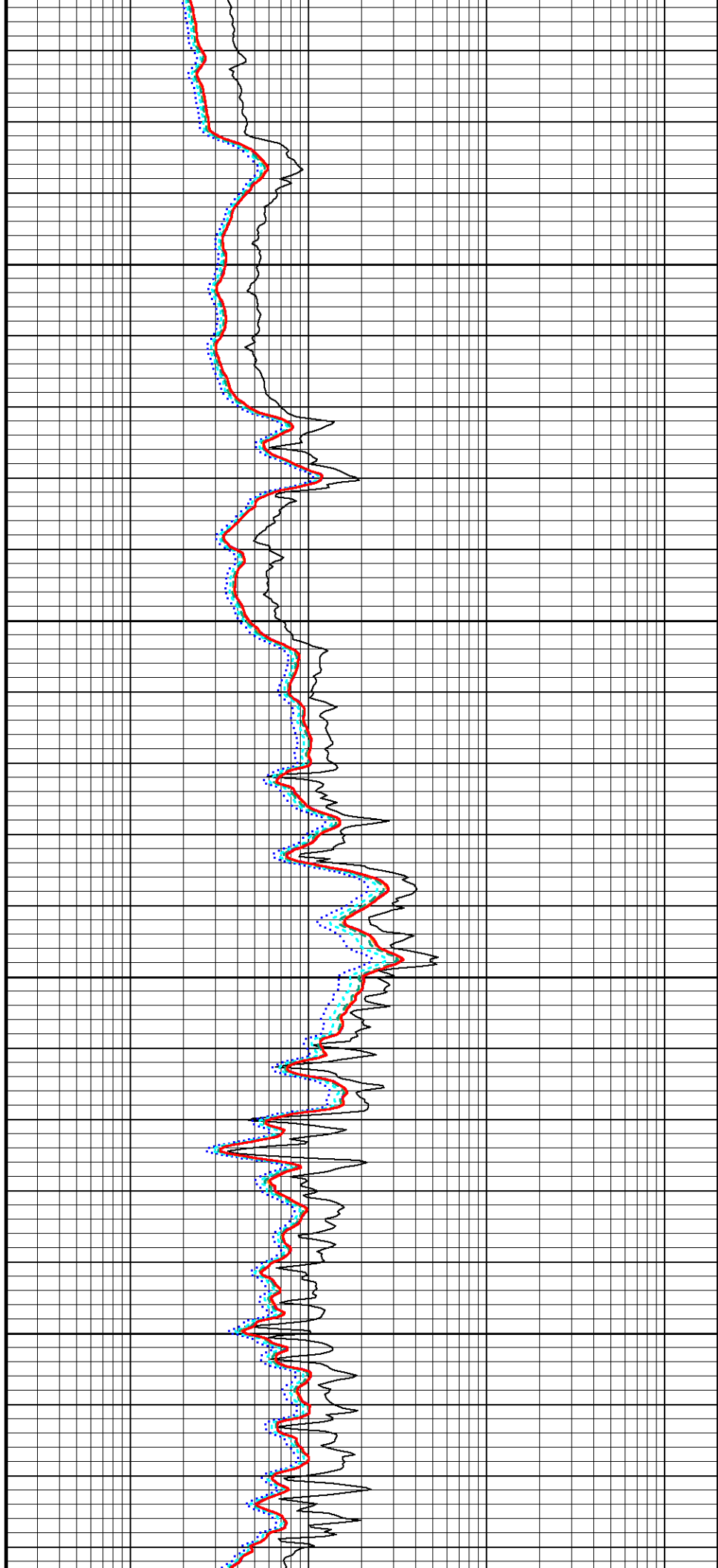
600

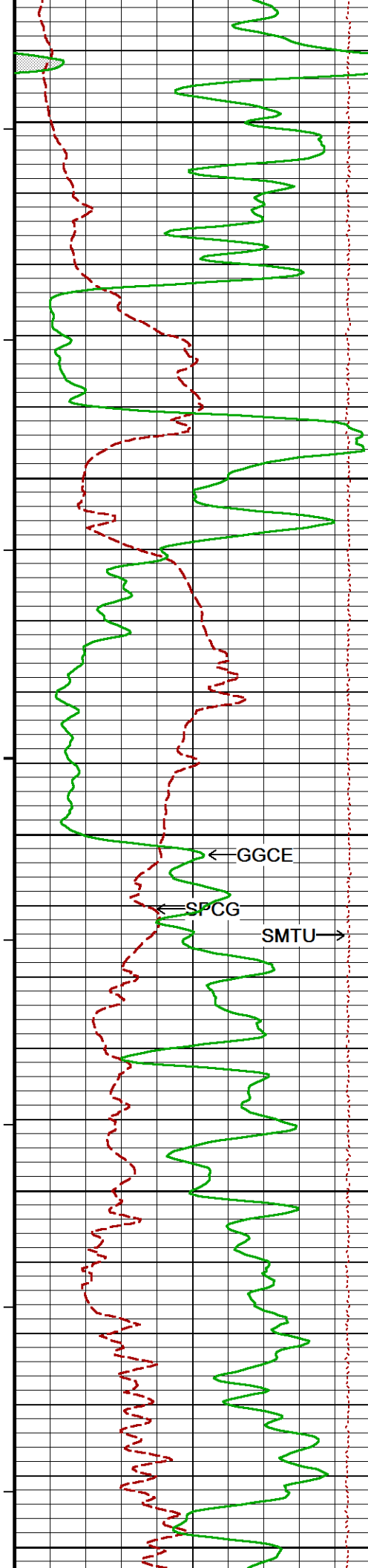
83°

650

83°

700





84°

750

84°

800

85°

850

85°

900

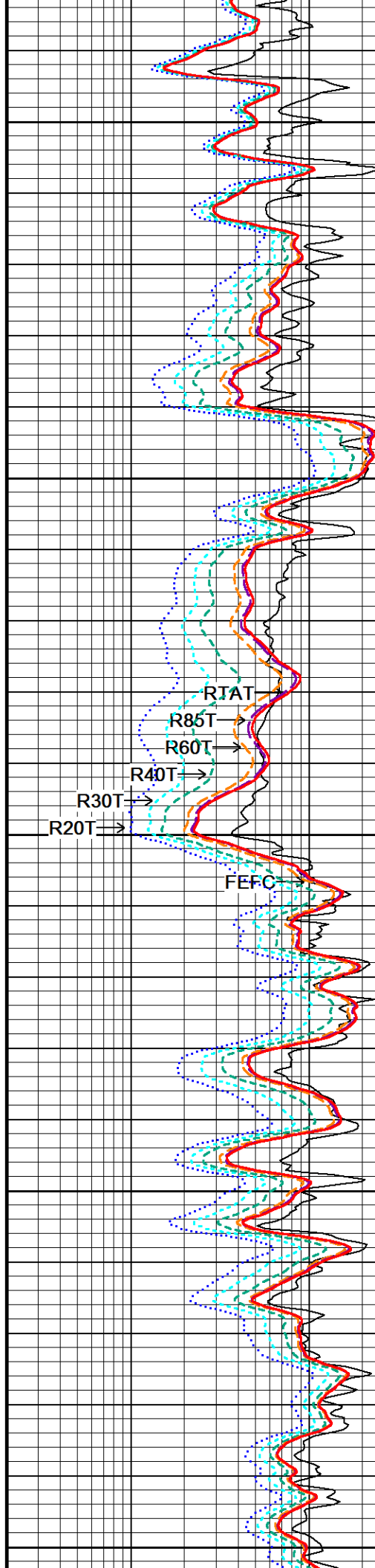
86°

950

← GGCE

← SPCG

SMTU →



RTAT

R85T

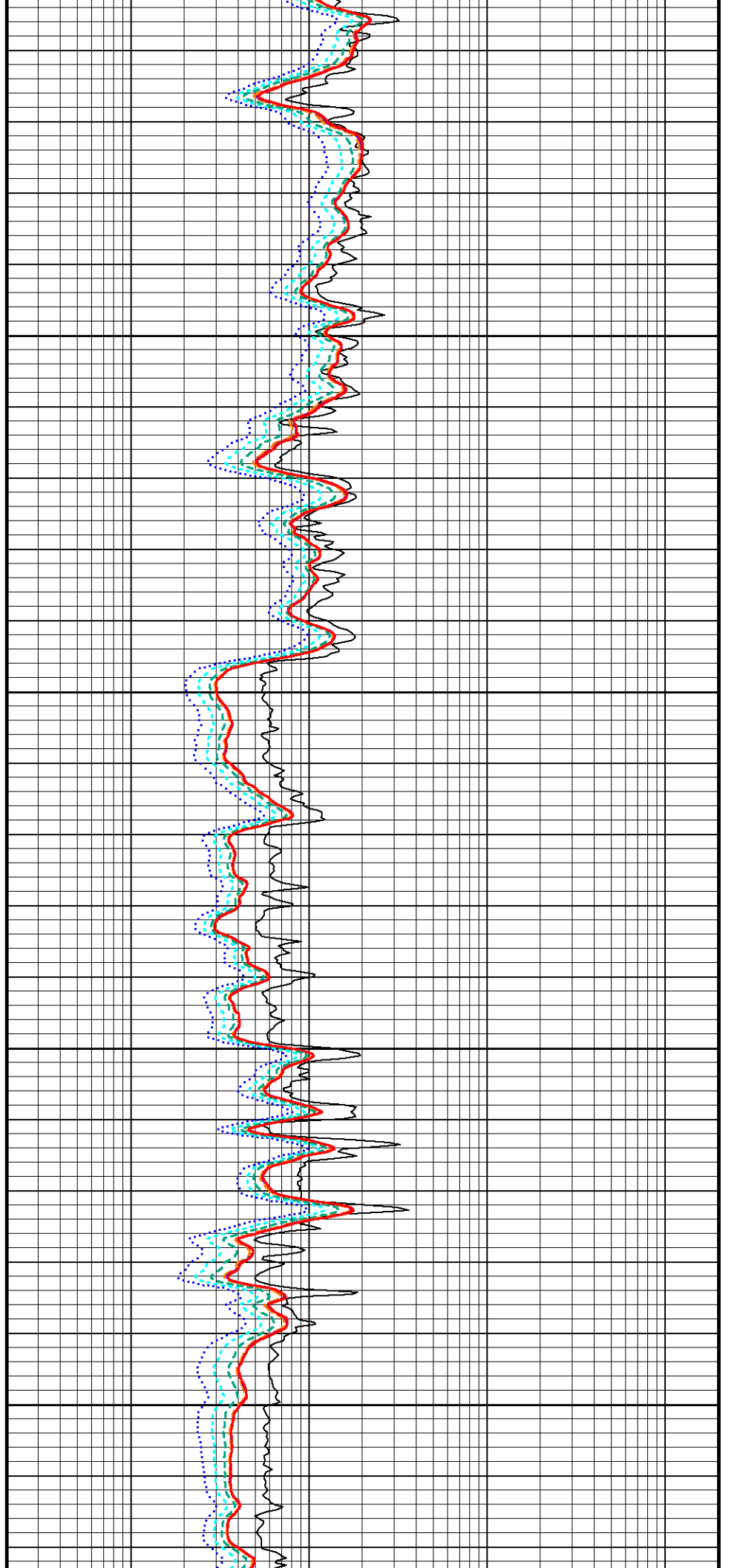
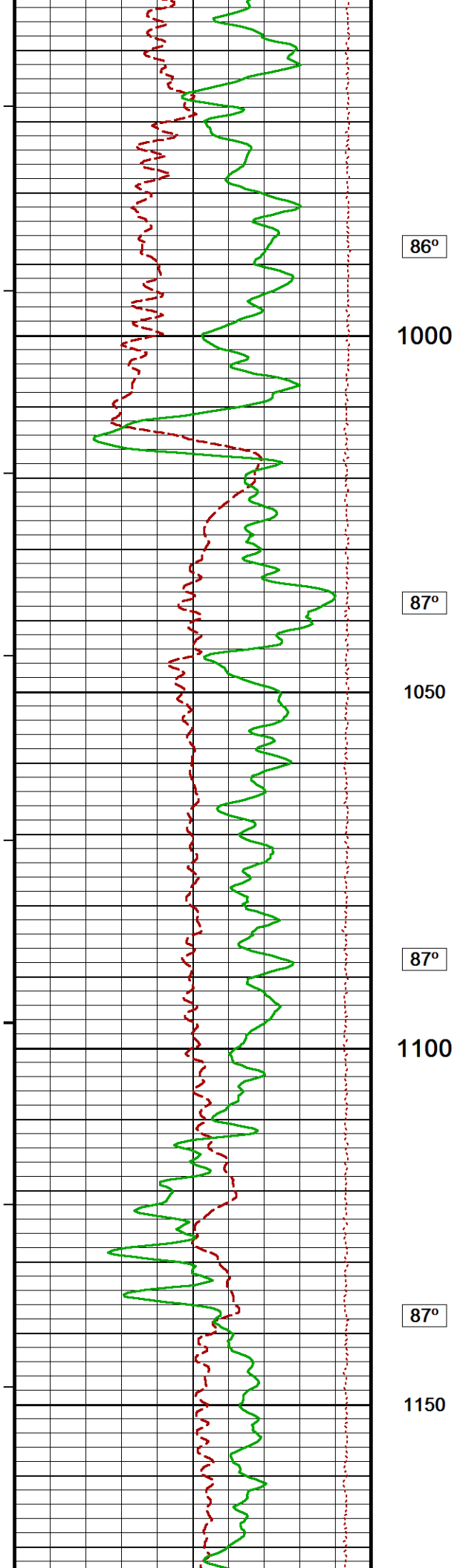
R60T

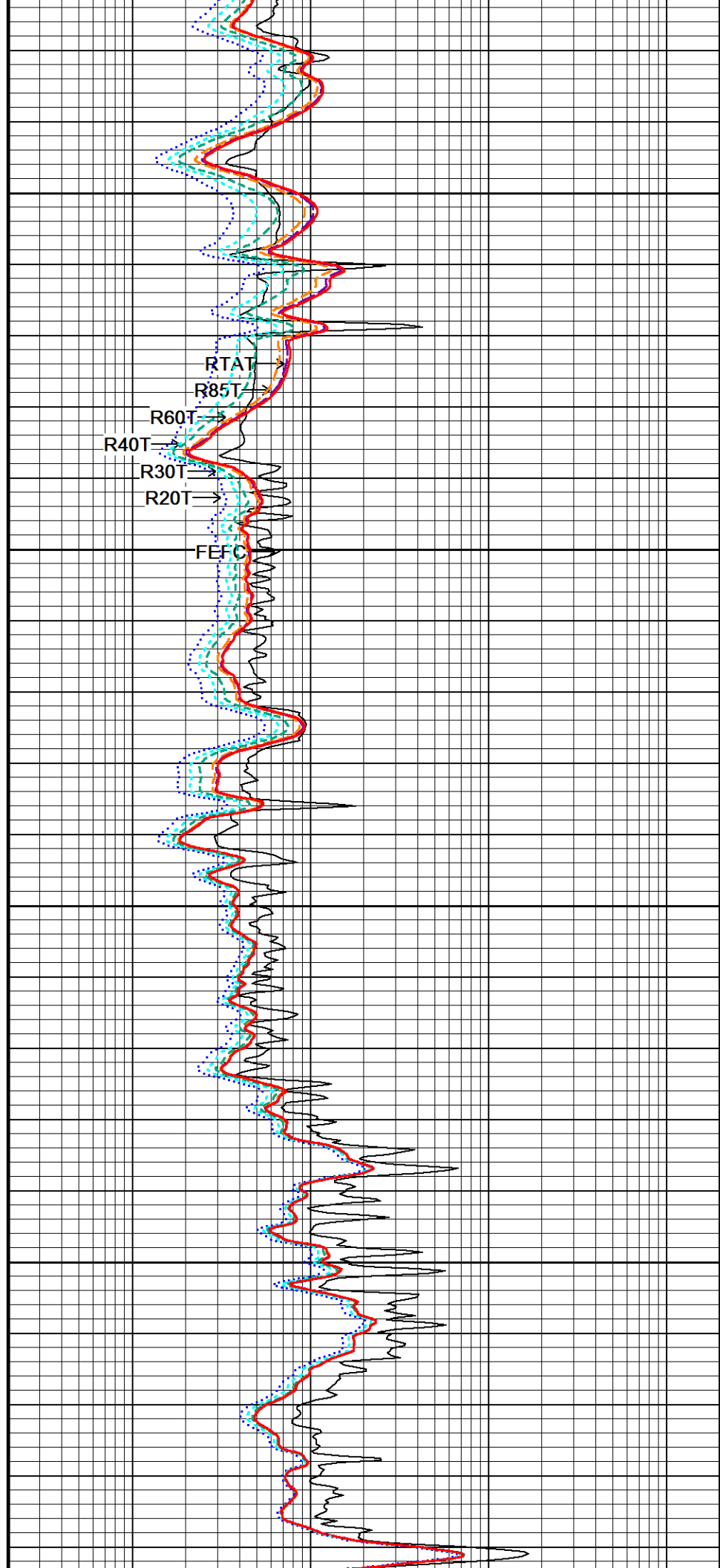
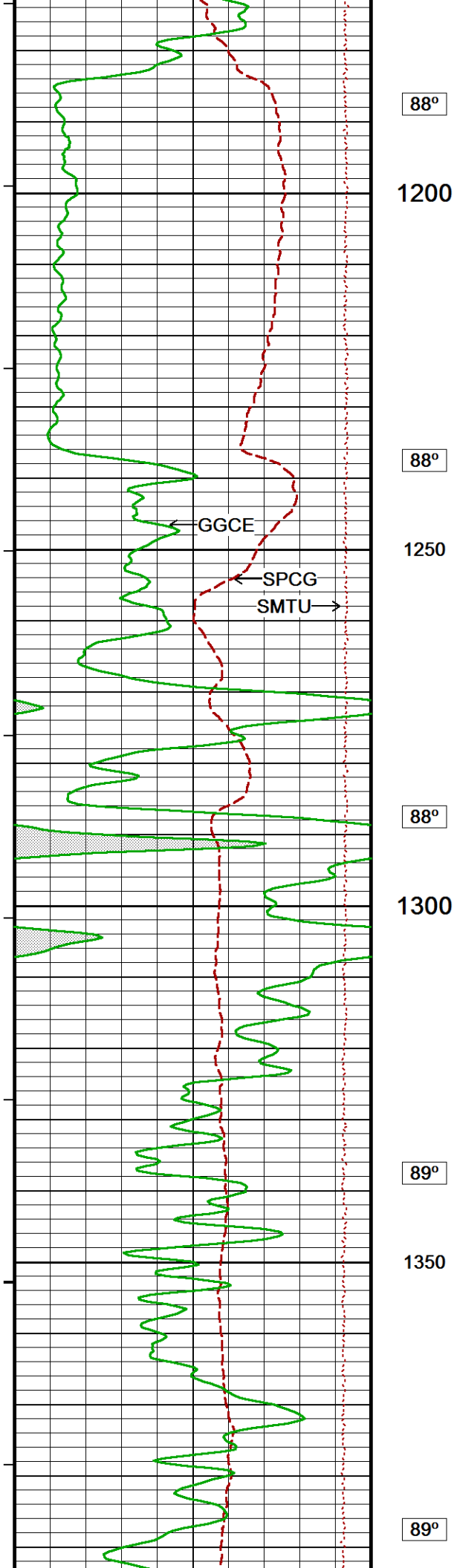
R40T

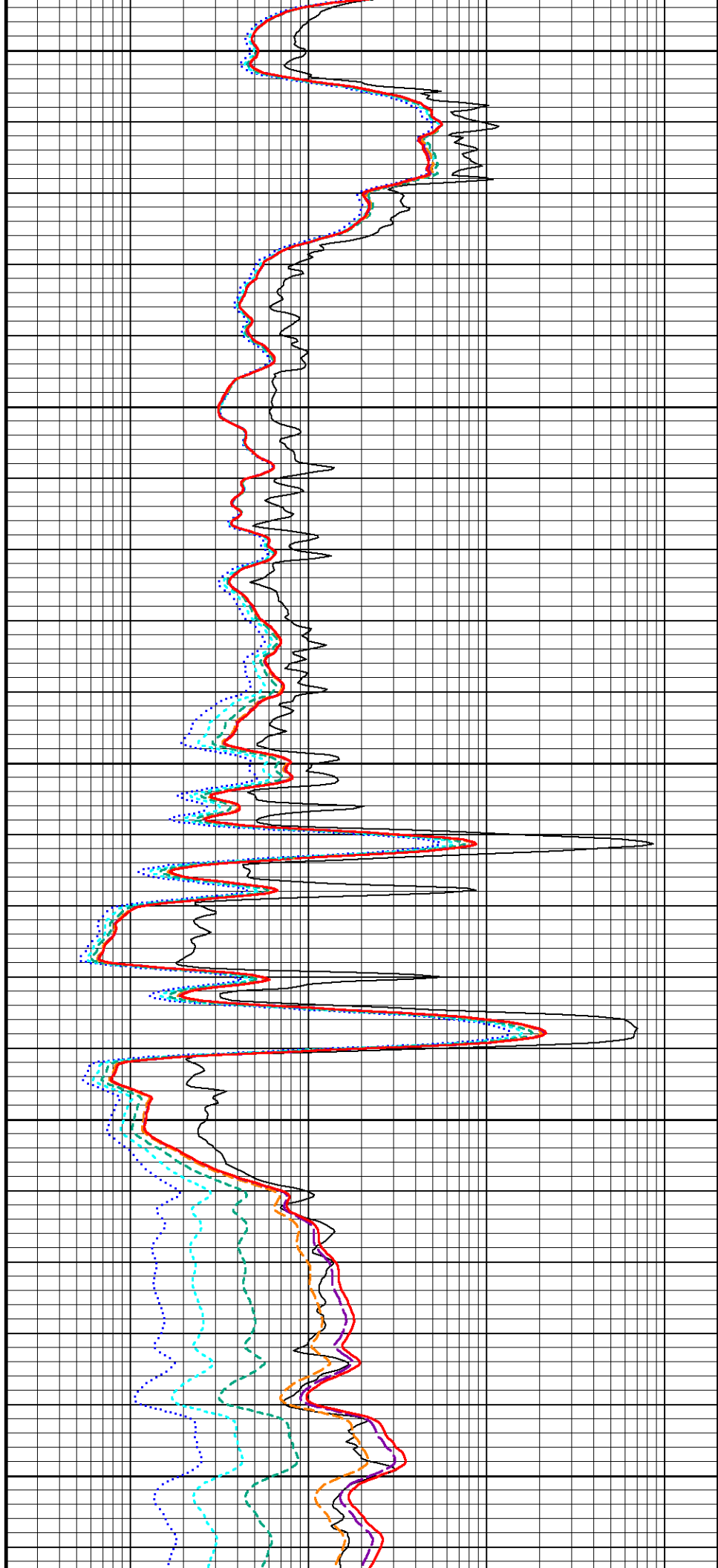
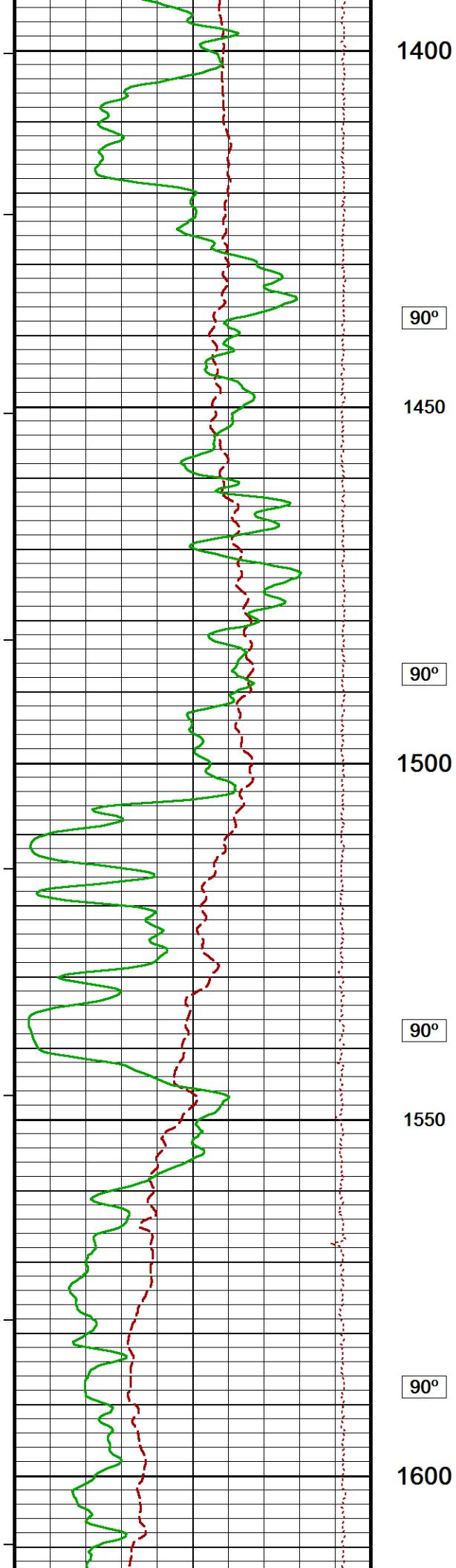
R30T

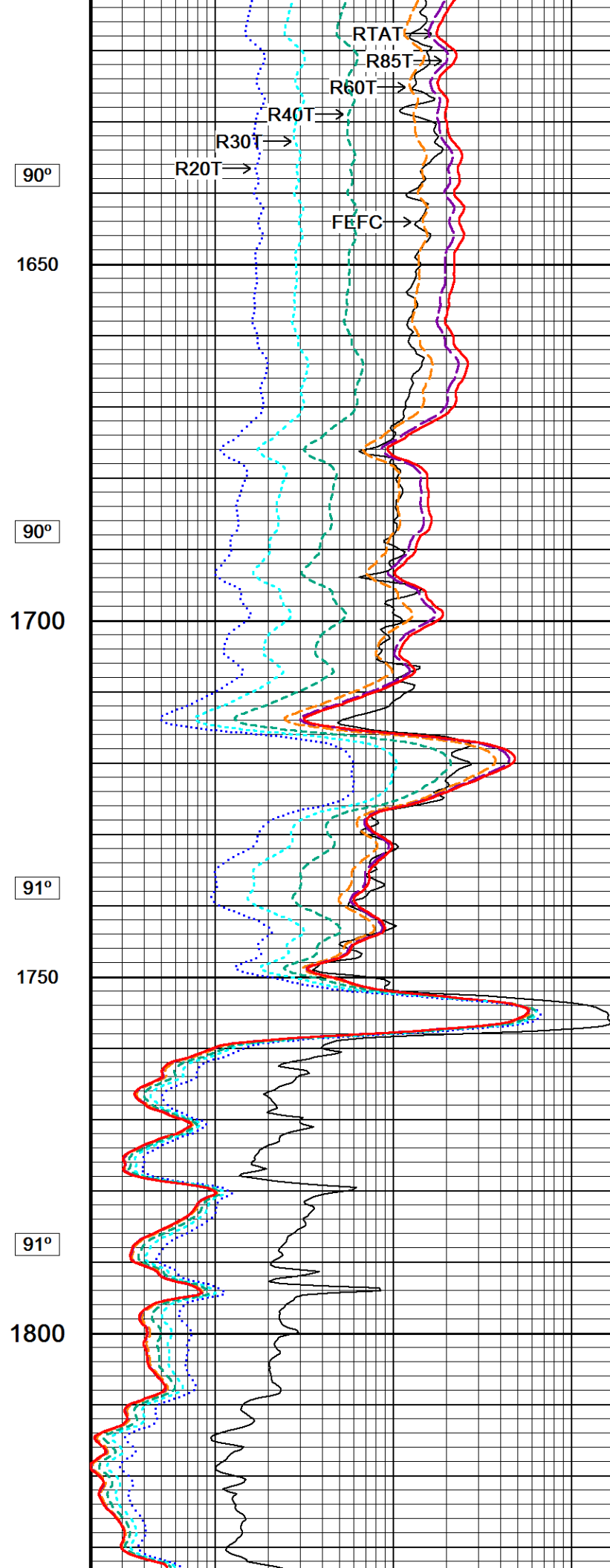
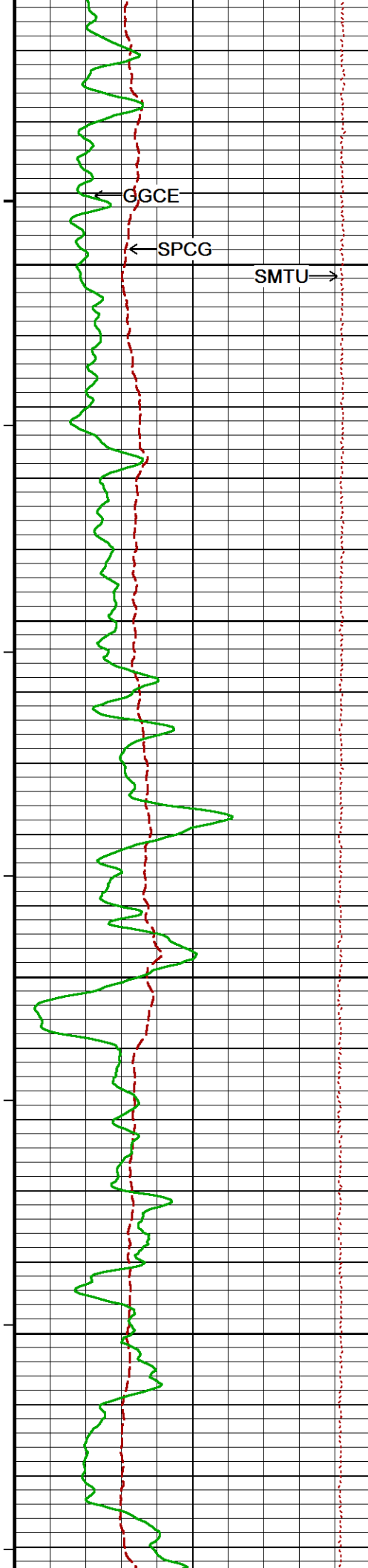
R20T

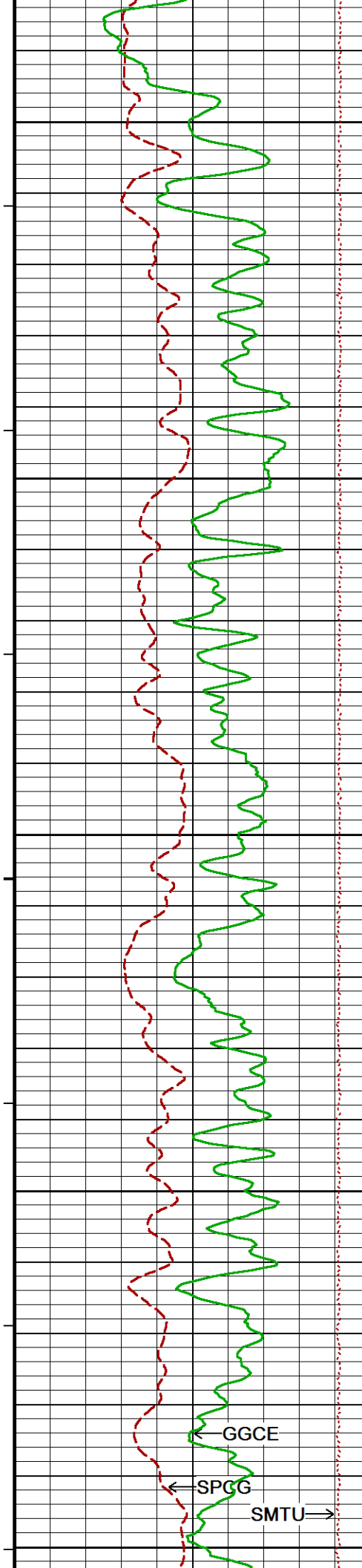
FEFC











91°

1850

92°

1900

92°

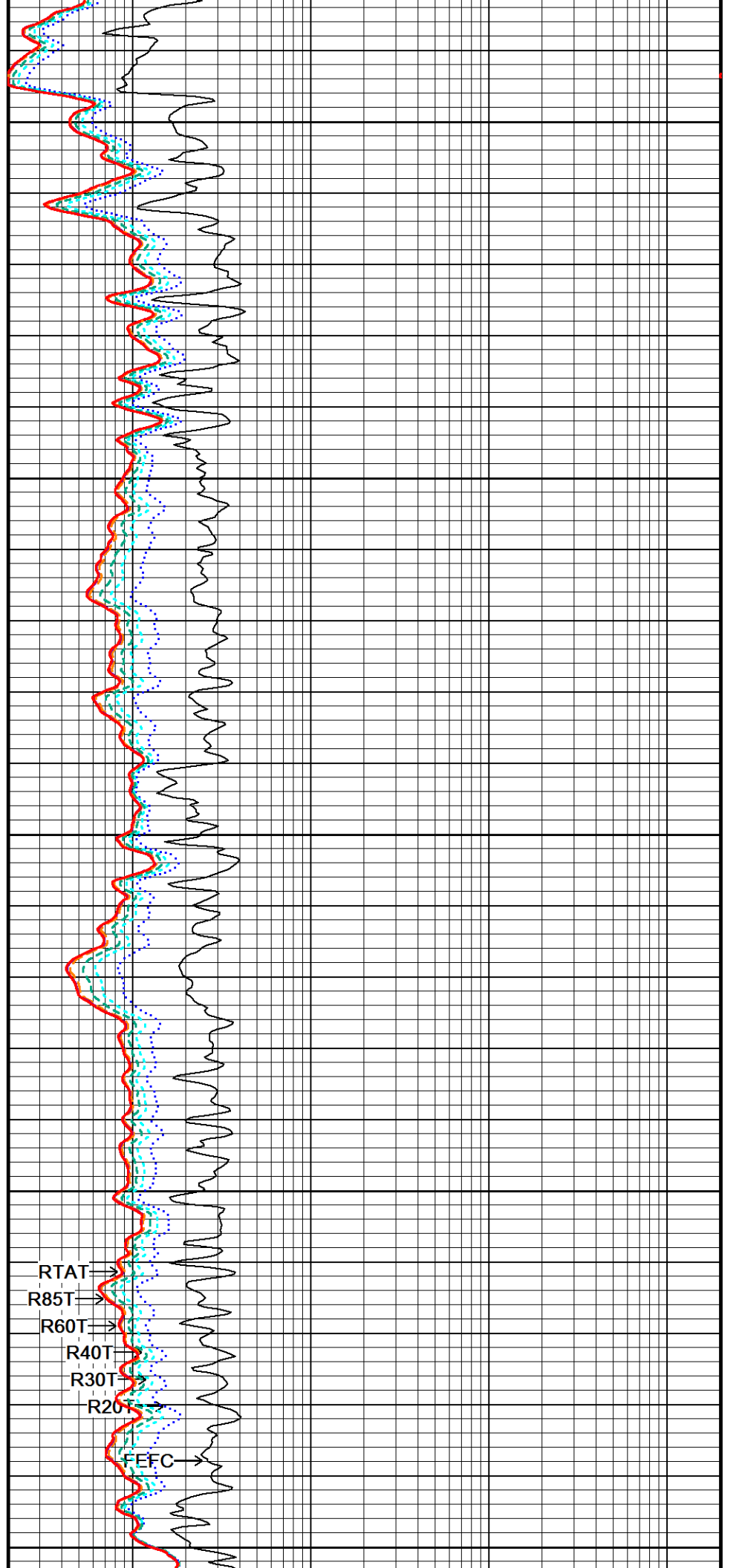
1950

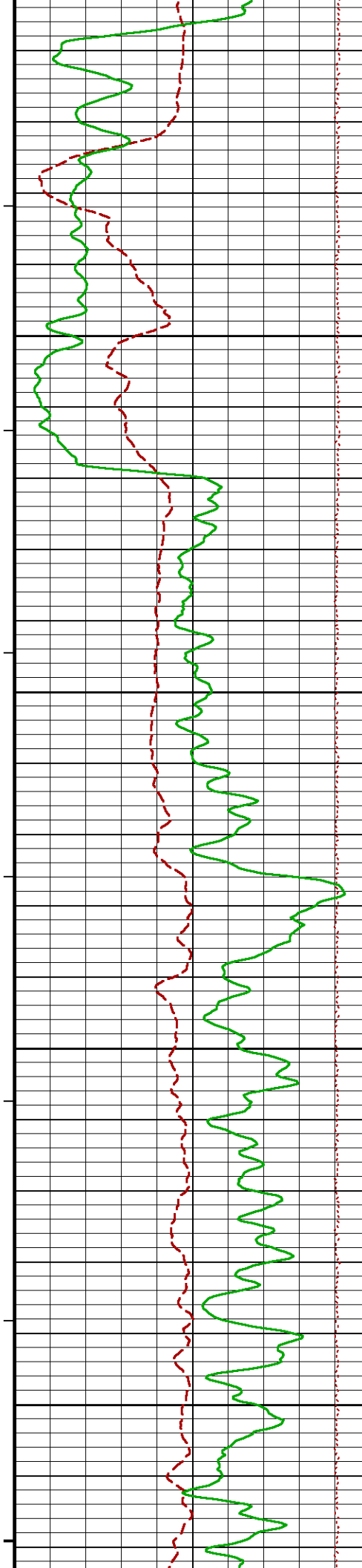
92°

2000

92°

2050





92°

2100

92°

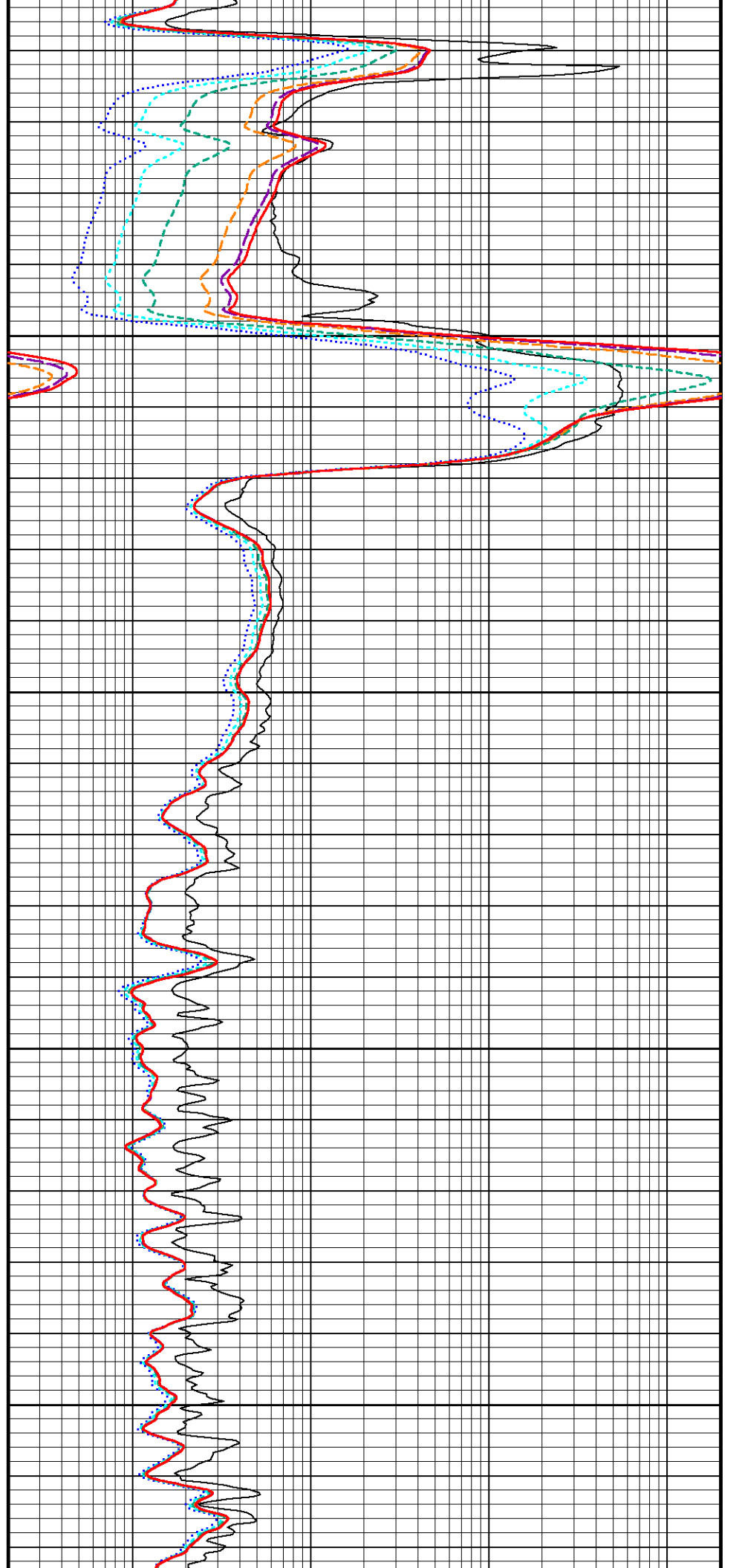
2150

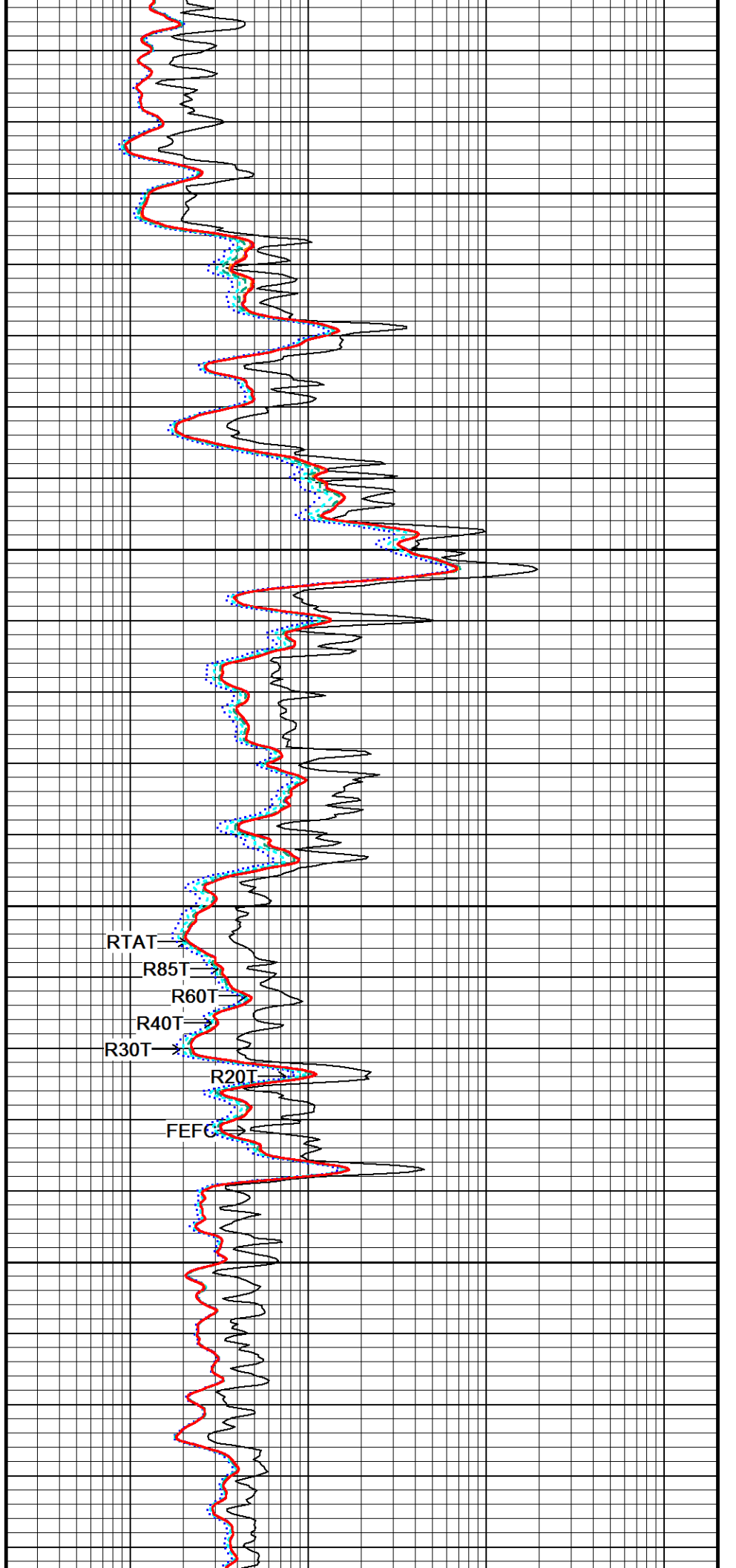
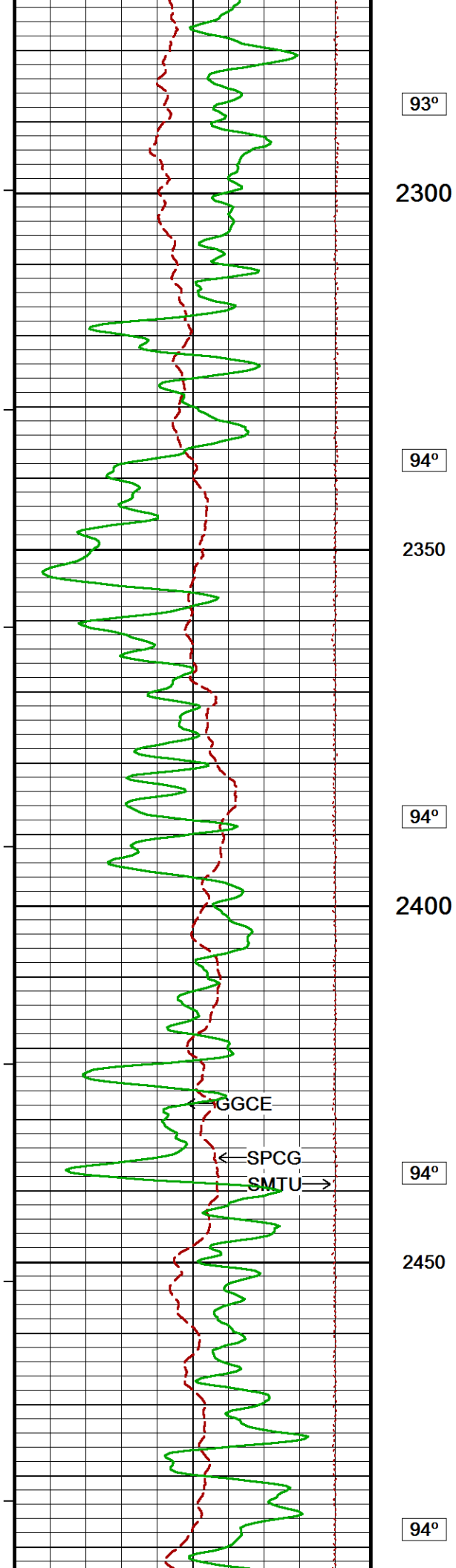
93°

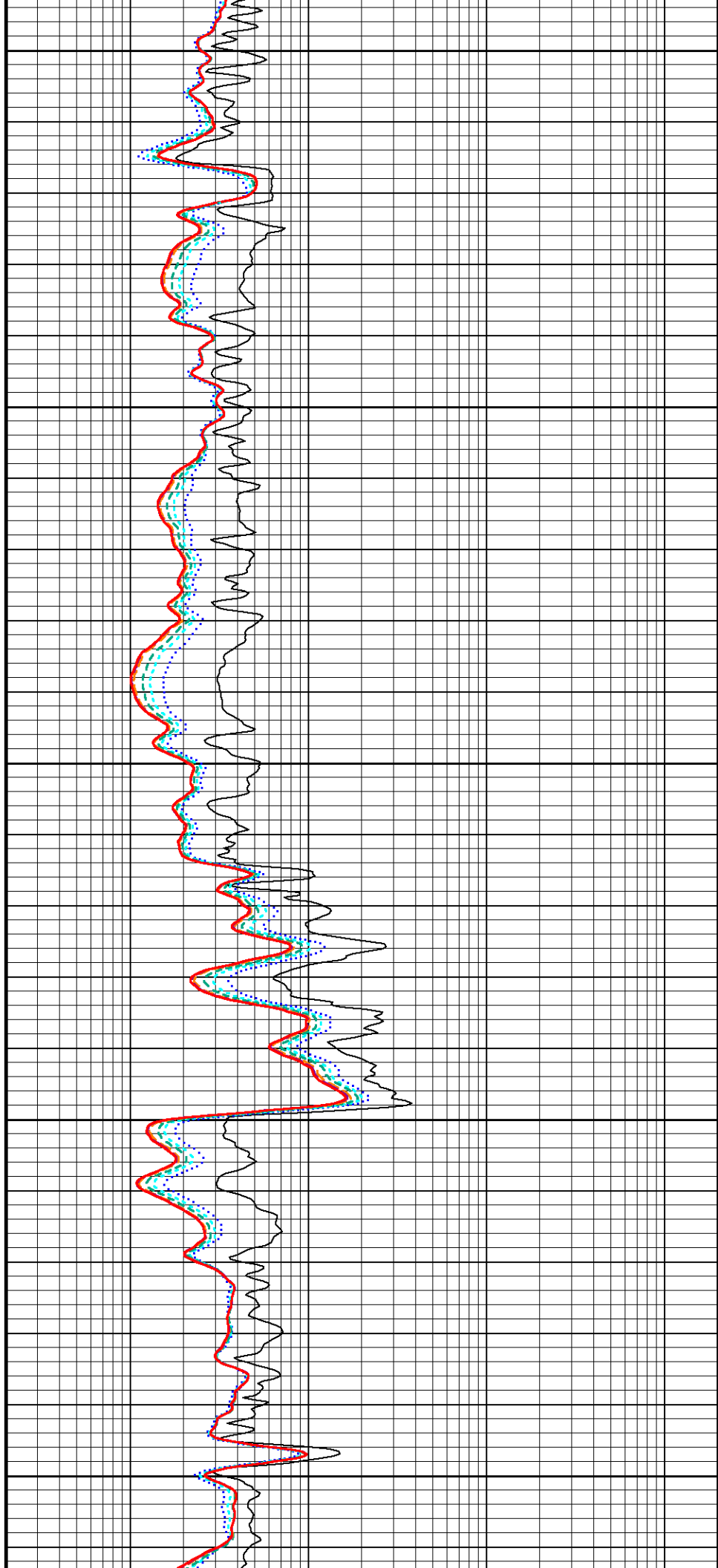
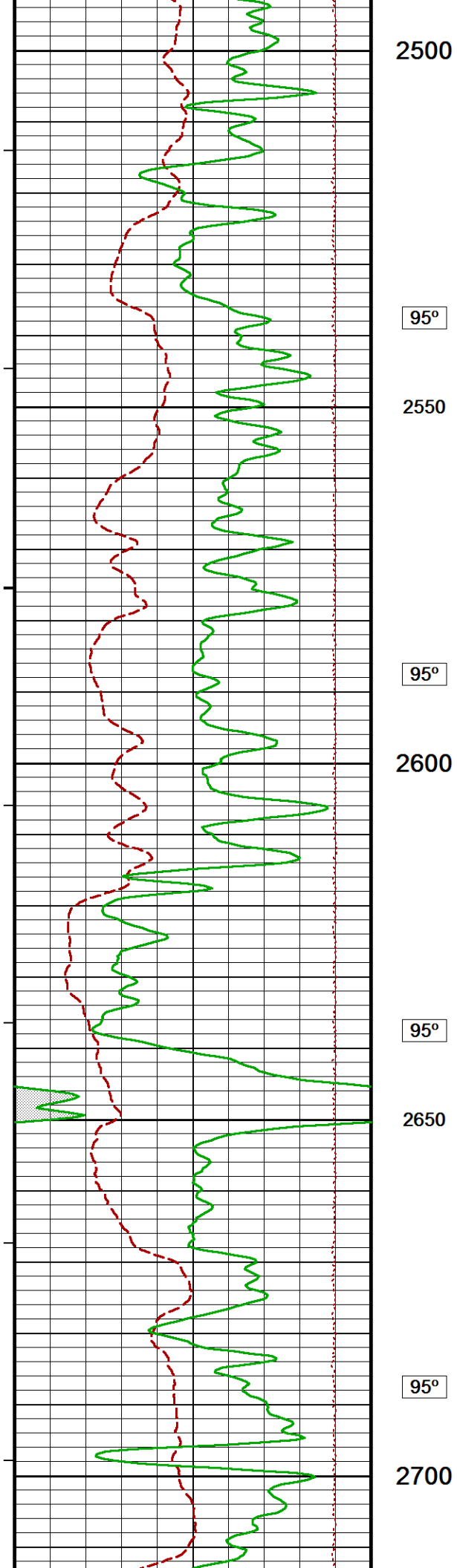
2200

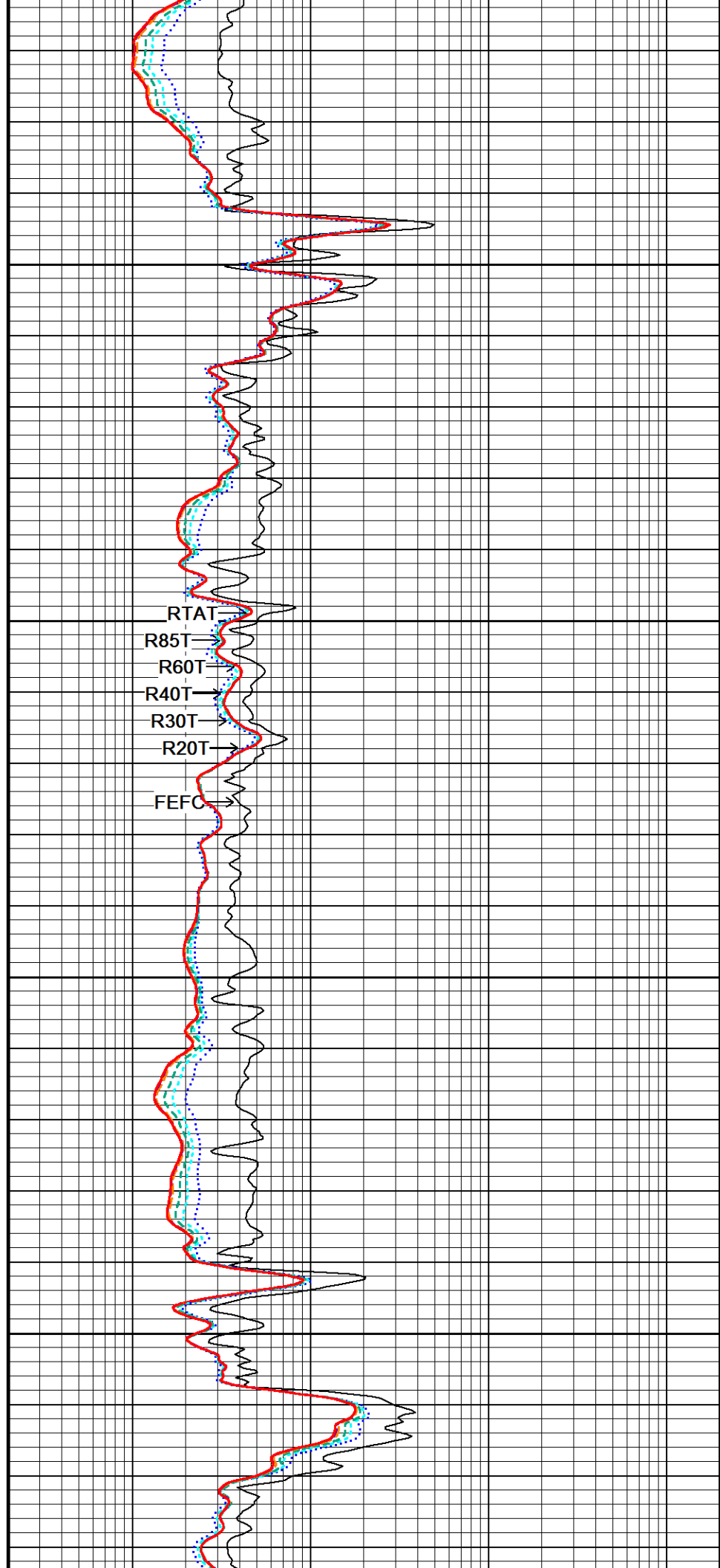
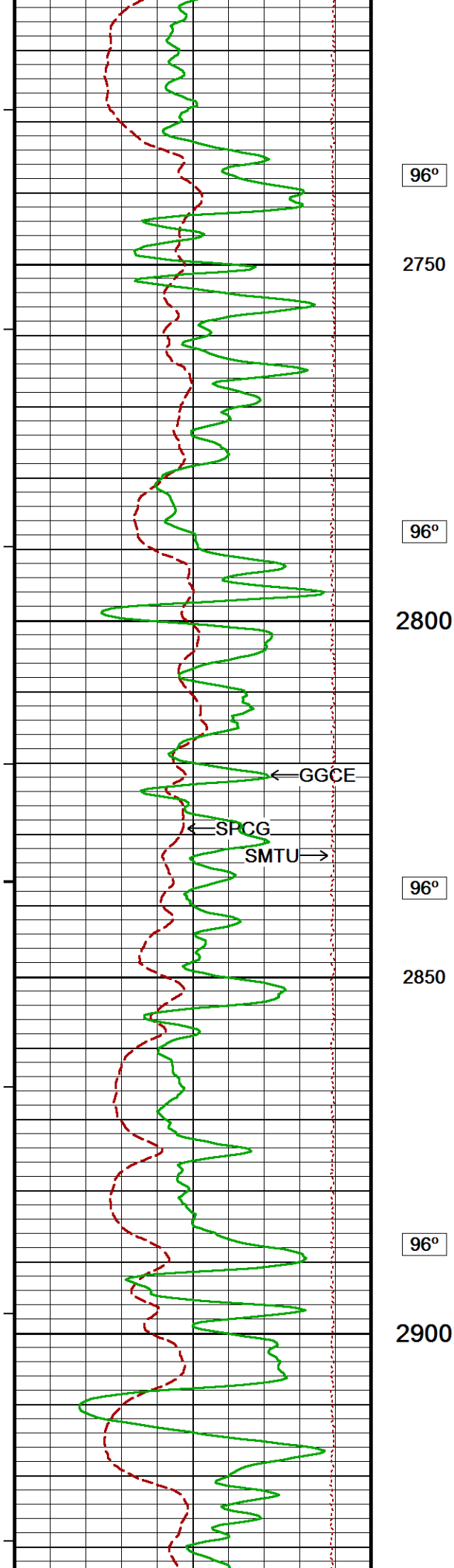
93°

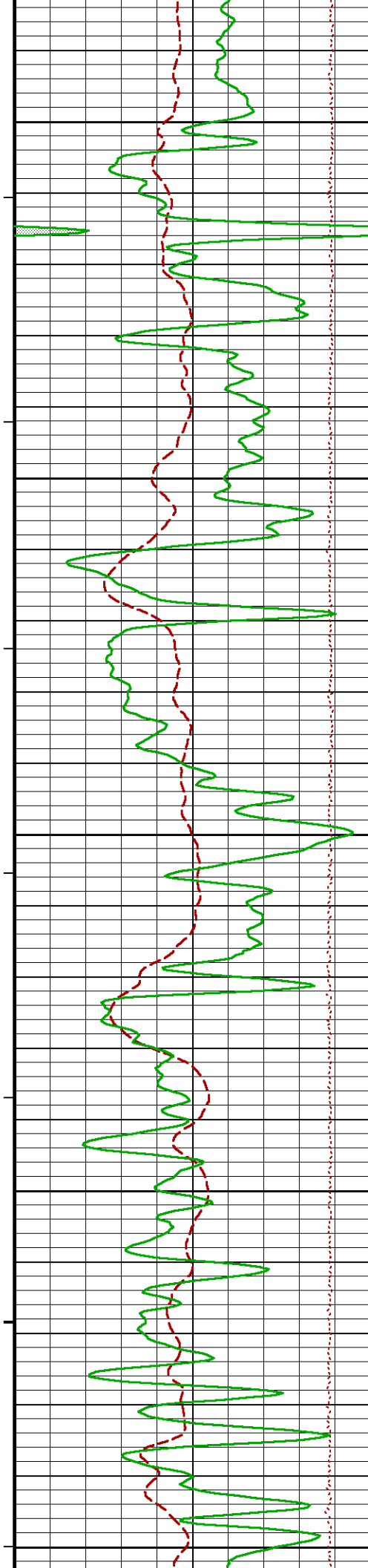
2250











97°

2950

97°

3000

97°

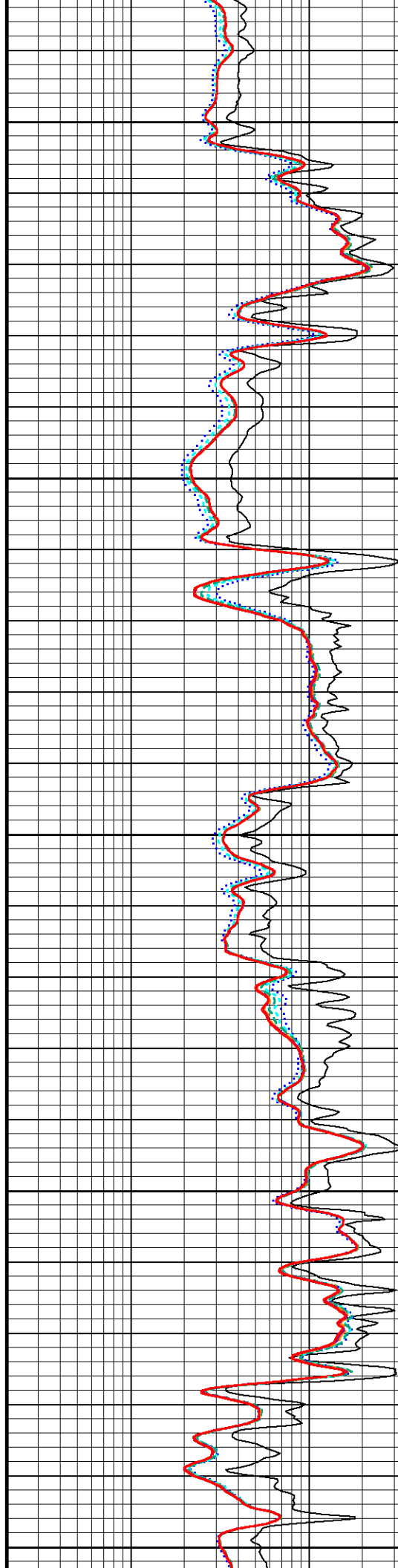
3050

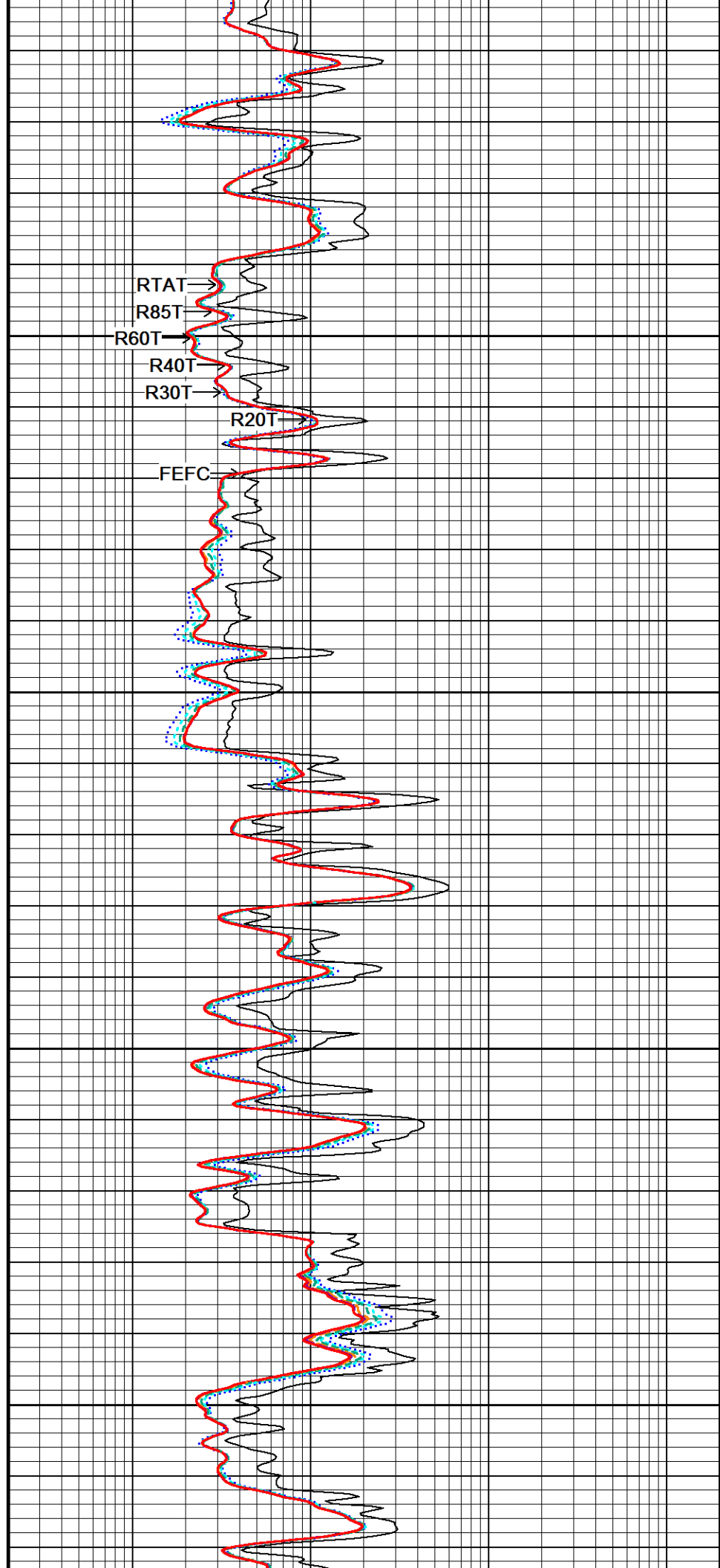
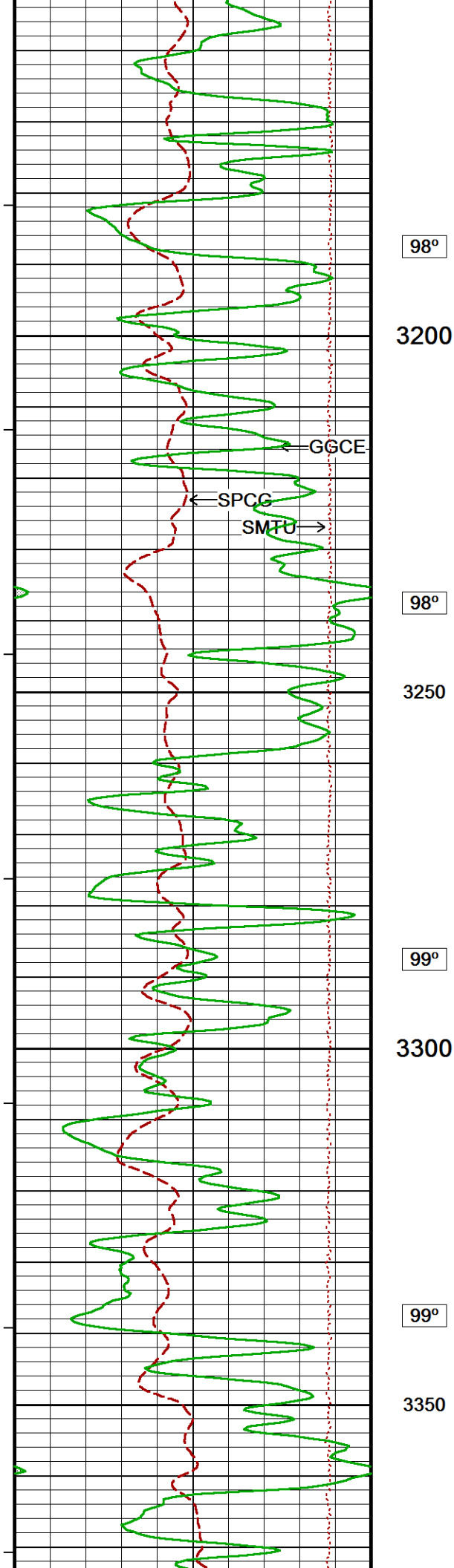
97°

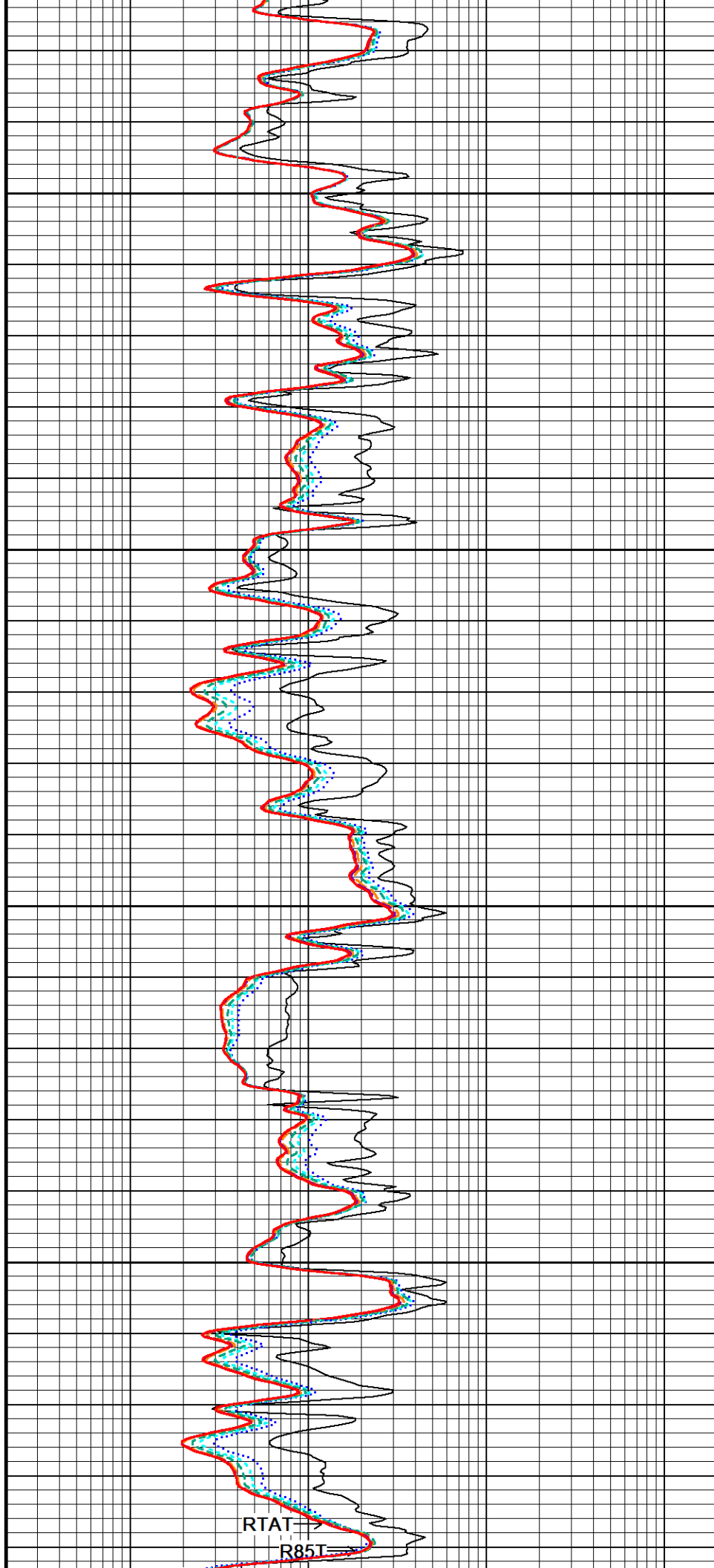
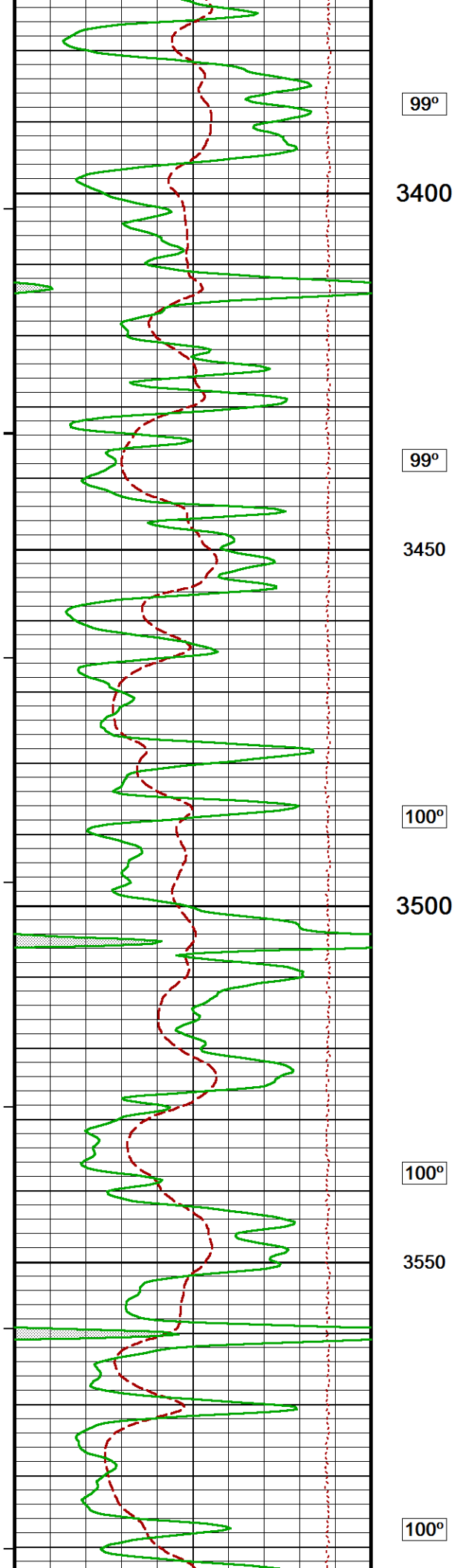
3100

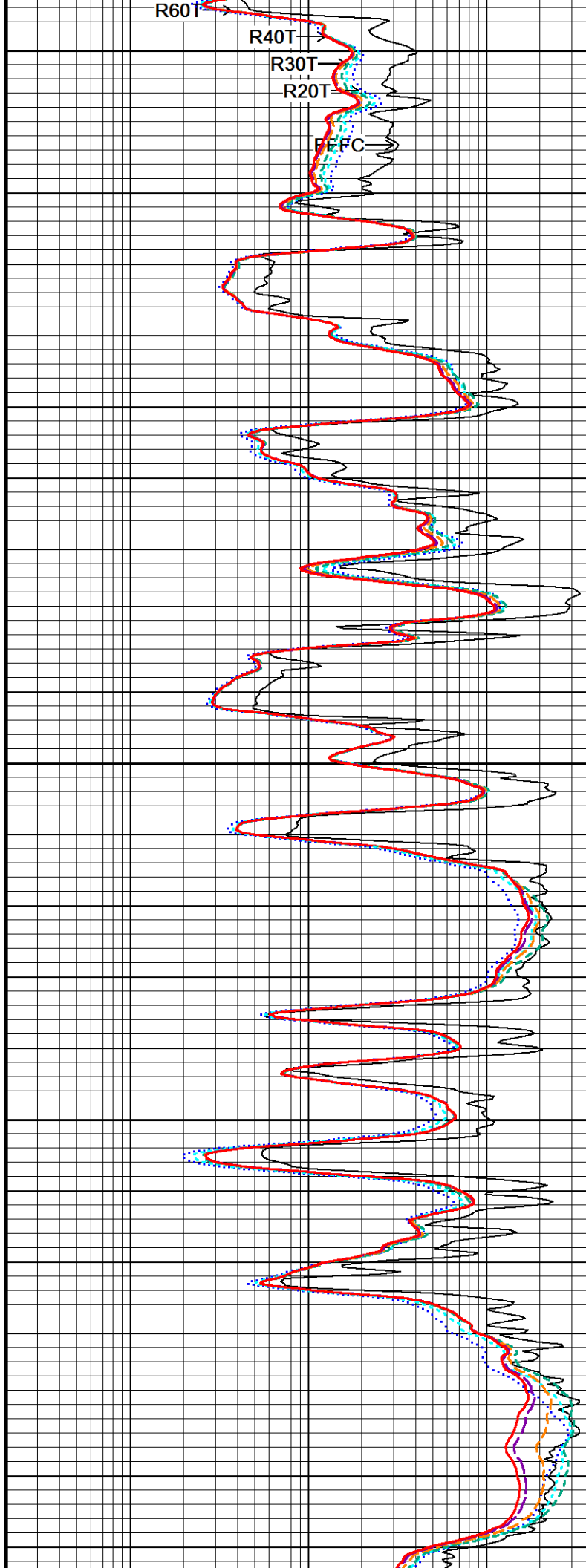
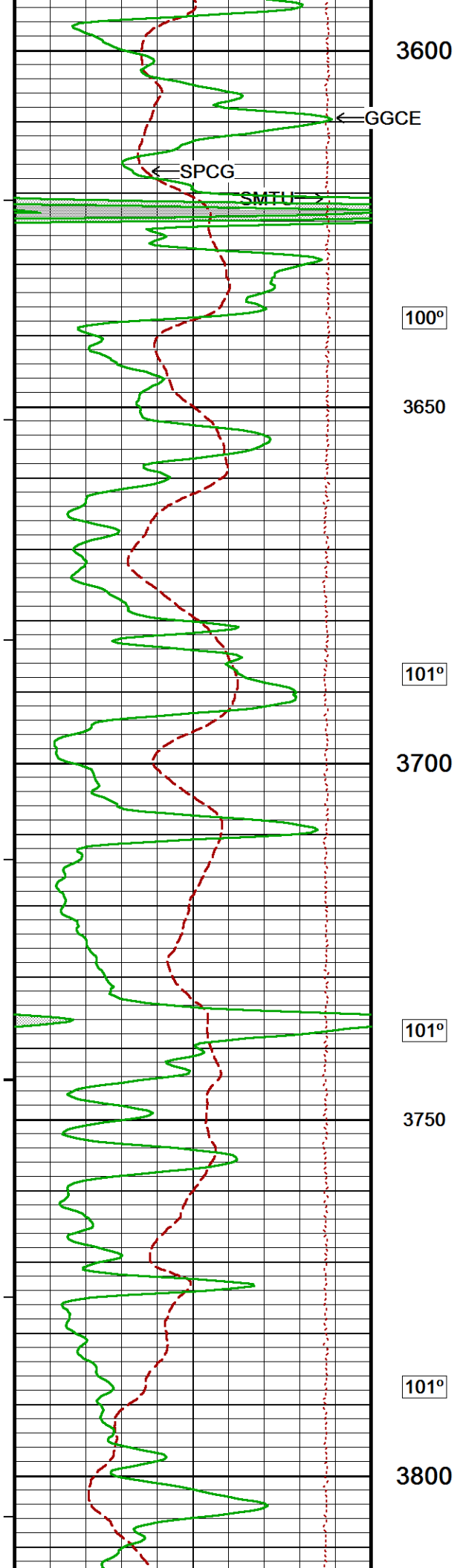
98°

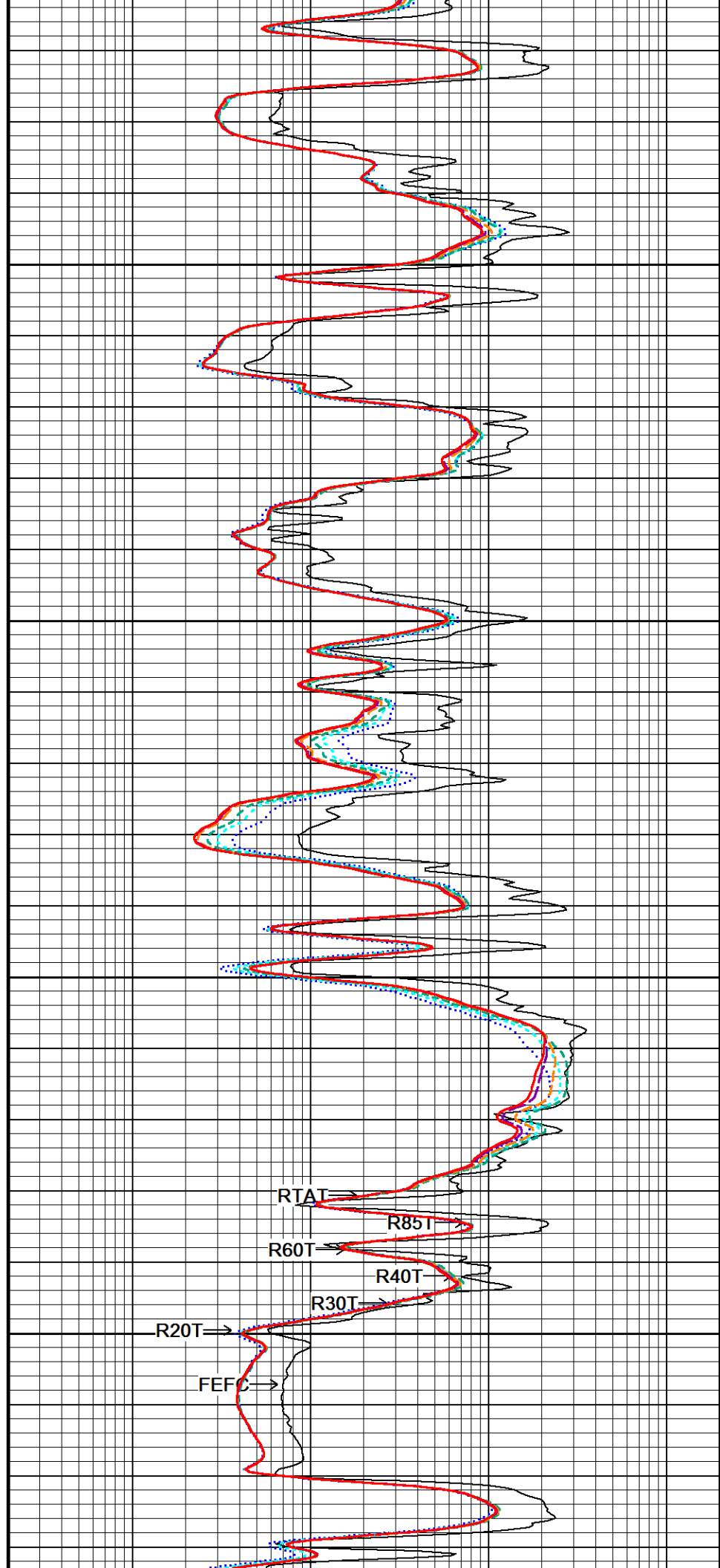
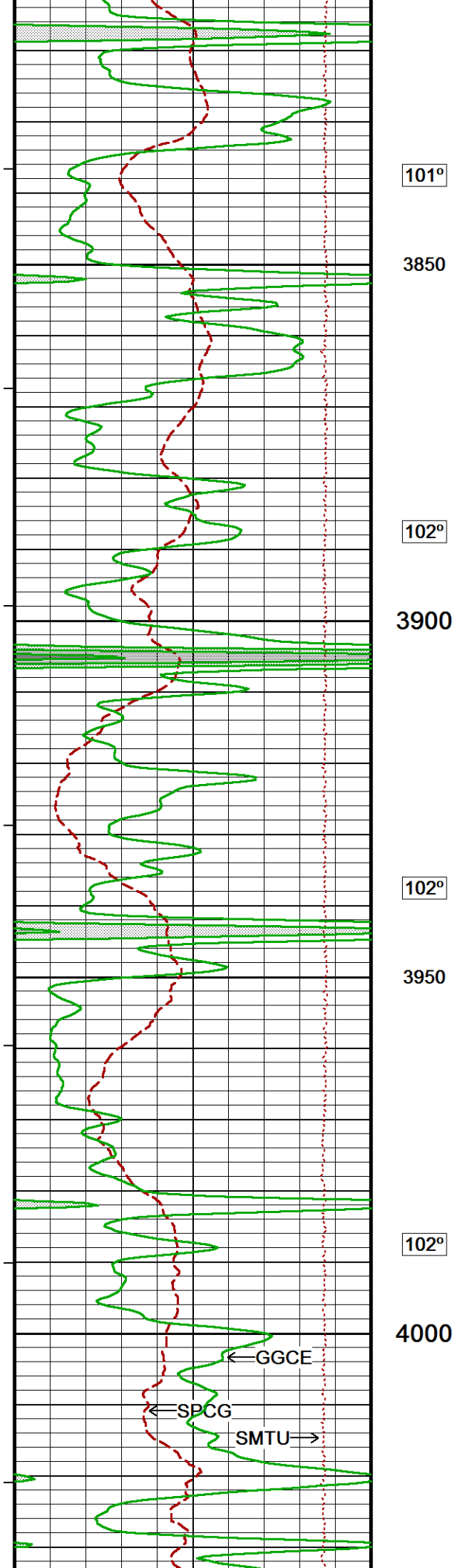
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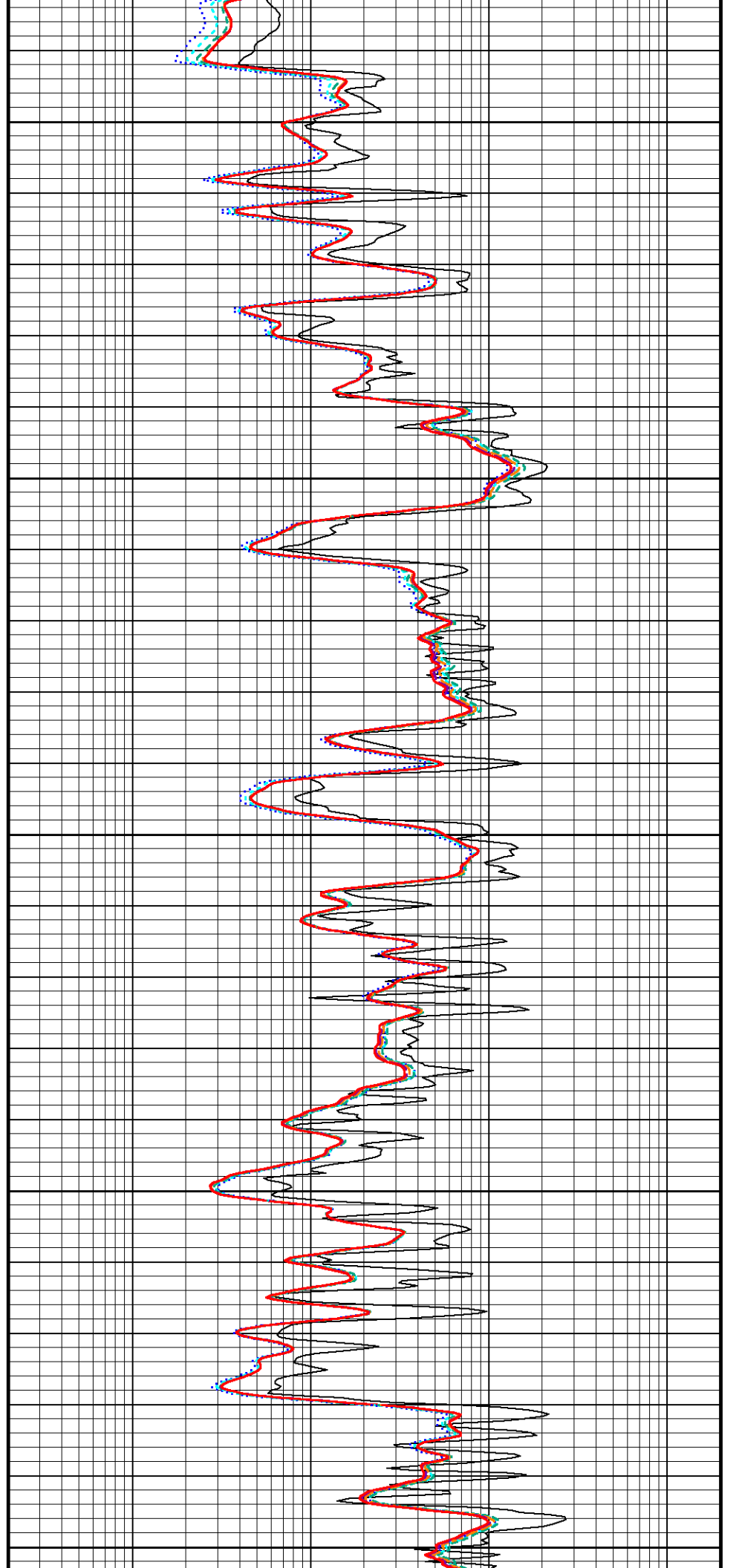
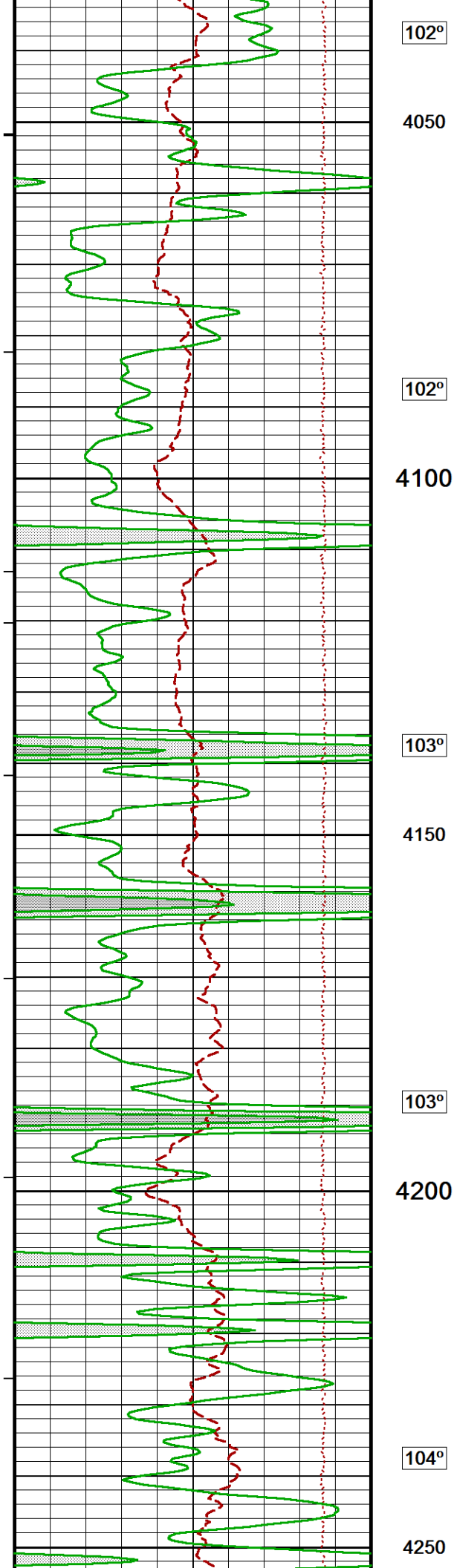


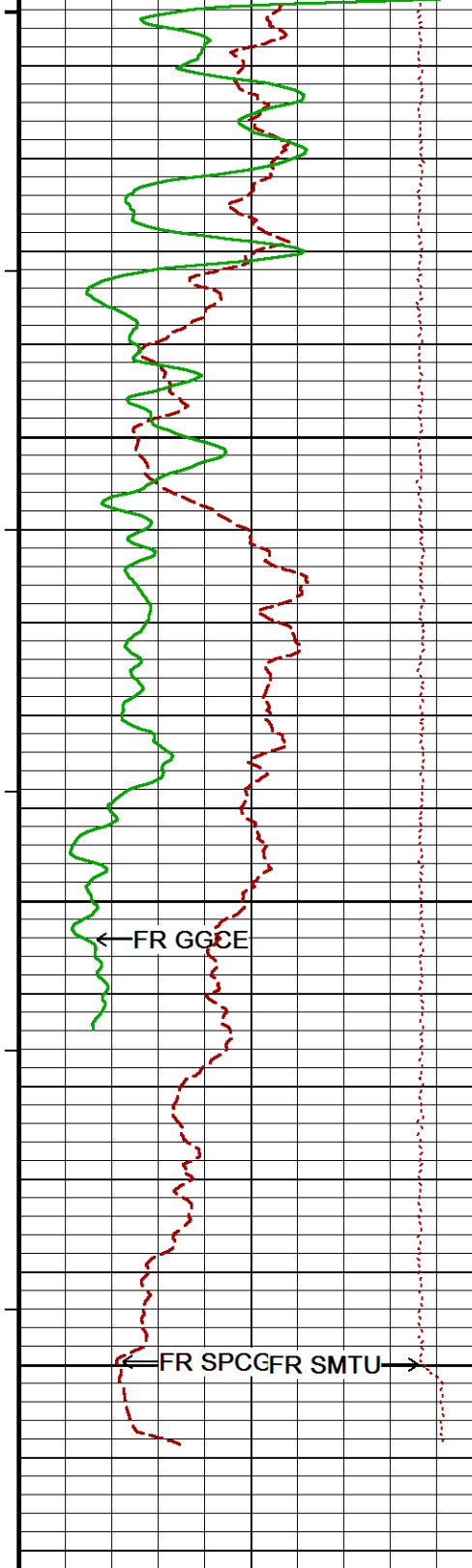












105°

4300

105°

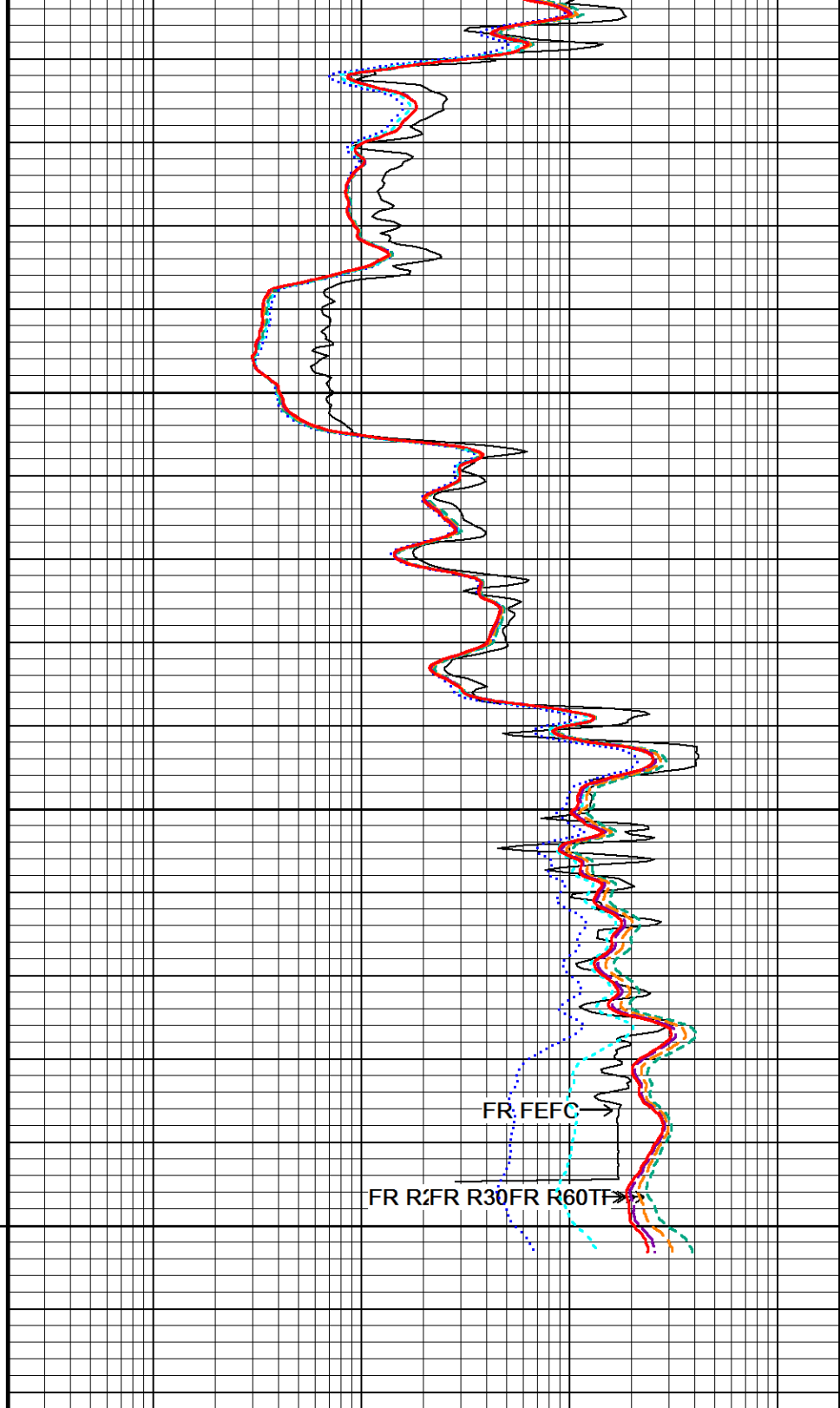
4350

4400

Depth
In
Feet

Timing Marks
every 60.0 sec

Spontaneous Potential
millivolts
- - - - - 20 - - - - - +



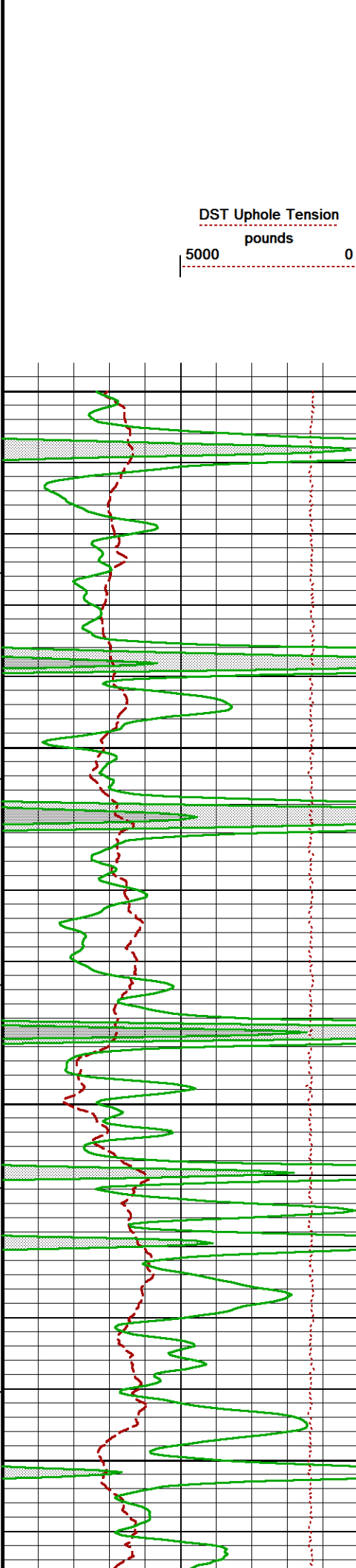
Shallow FE (Phase Corr.)
ohm metres

0.20 1 10 100 1000 2000

Array Ind. Two Res 20
ohm metres

0.20 1 10 100 1000 2000

Array Ind. Two Res 30
ohm metres



Replay
Scale
1:240

4100

102°

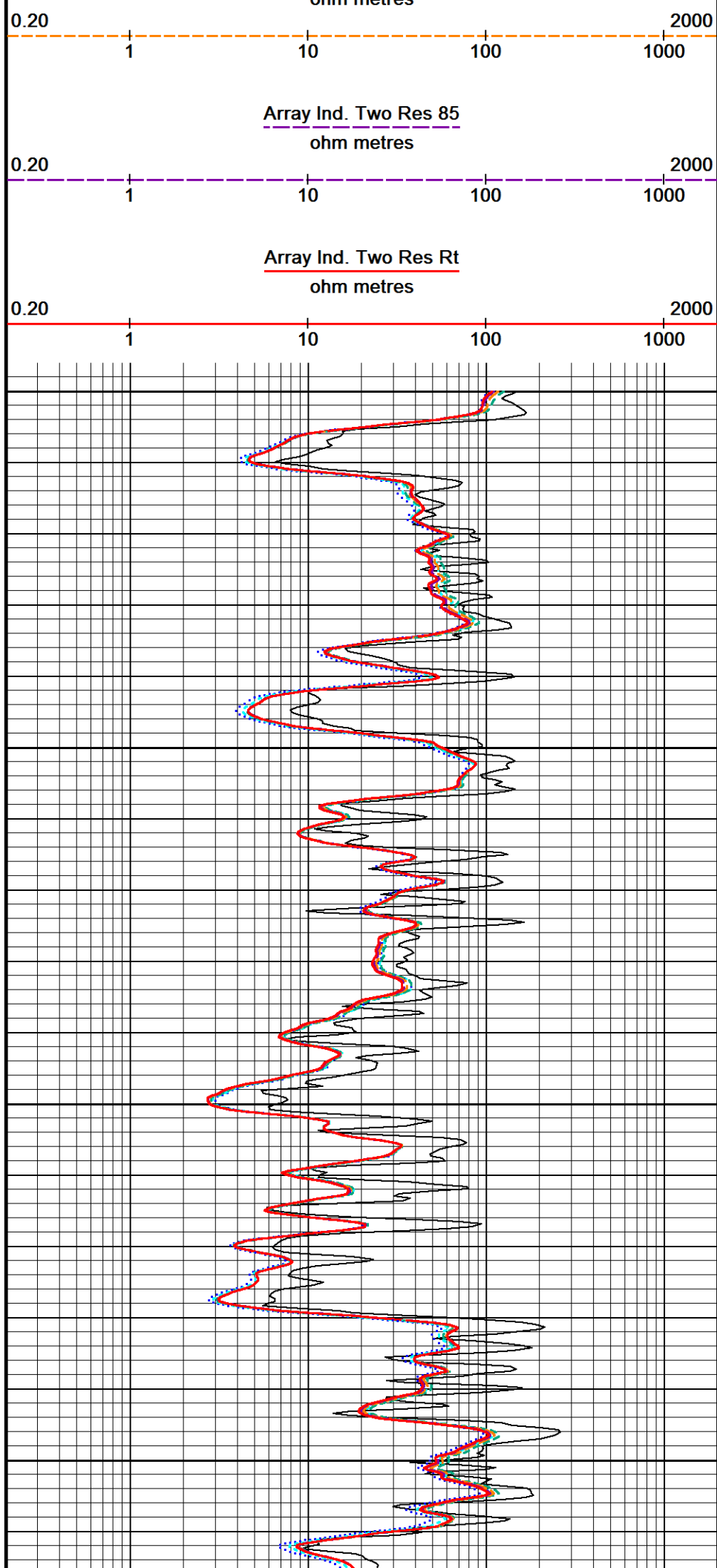
4150

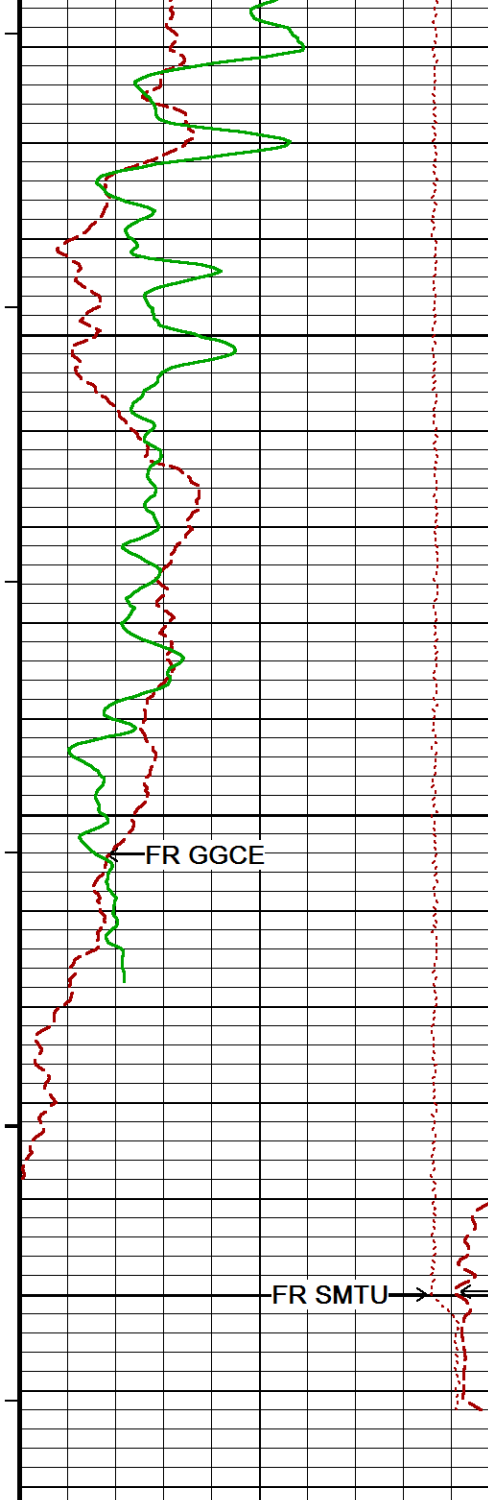
103°

4200

104°

4250





105°

4300

104°

4350

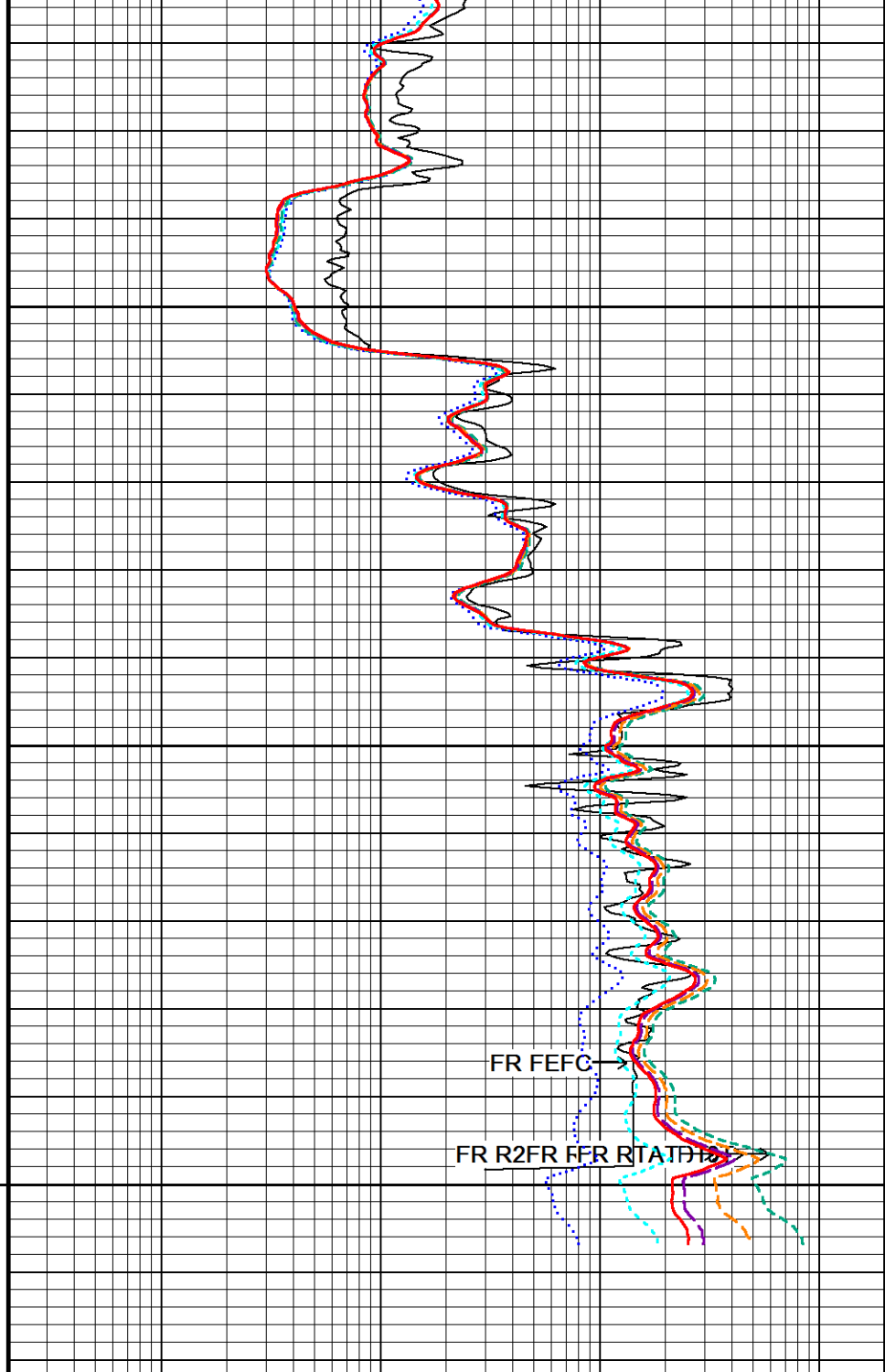
4400

Depth
in
Feet

Timing Marks
every 60.0 sec

Spontaneous Potential
millivolts
— — — — — 20 — — — — — +

MCG BH Corrected Gamma



Shallow FE (Phase Corr.)
ohm metres

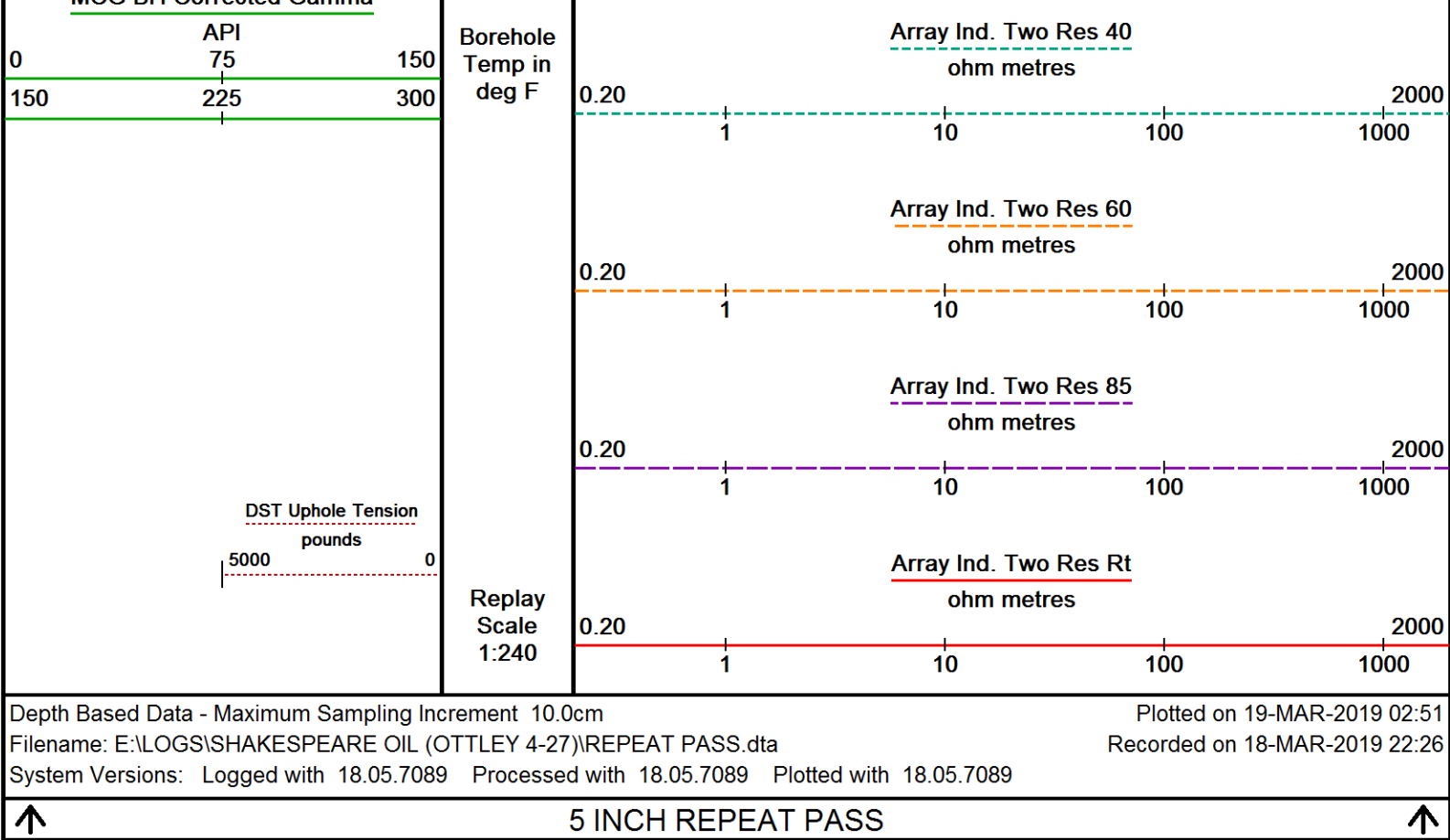
0.20 1 10 100 1000 2000

Array Ind. Two Res 20
ohm metres

0.20 1 10 100 1000 2000

Array Ind. Two Res 30
ohm metres

0.20 1 10 100 1000 2000



BEFORE SURVEY CALIBRATION			E:\LOGS\SHAKESPEARE OIL (OTTLEY 4-27)\MAIN PASS.dta
General Constants All 000		Last Edited on 18-MAR-2019,22:43	
General Parameters			
Mud Resistivity	0.530	ohm-metres	
Mud Resistivity Temperature	78.000	degrees F	
Water Level	0.000	feet	
Borehole Fluid Processing	Wet Hole		
Hole/Annular Volume and Differential Caliper Parameters			
HVOL Method	Single Caliper		
HVOL Caliper 1	Density Caliper		
HVOL Caliper 2	N/A		
Annular Volume Diameter	4.500	inches	
Caliper for Differential Caliper	Density Caliper		
Rwa Parameters			
Porosity used	Crossplot Porosity		
Resistivity used	Array Ind. One Res Rt		
RWA Constant A	0.620		
RWA Constant M	2.150		
SW/APOR Tool Source	0.000		
High Resolution Temperature Calibration MCG-D.K 431		Field Calibration on 07-MAR-2019,16:49	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	200.00	200.00	
High Resolution Temperature Constants MCG-D.K 431		Last Edited on 07-MAR-2018,11:29	
Pre-filter Length	11		
Gamma Calibration MCG-D.K 431		Field Calibration on 13-MAR-2019 09:40	
	Measured	Calibrated (API)	
Background	42	29	

Calibrator (Gross)	1864	1289
Calibrator (Net)	1822	1260

Gamma Calibration Tolerances MCG-D.K 431		
Ratio	1.446	1.40 1.475 1.55 Counts/API

Gamma Constants MCG-D.K 431		Last Edited on 18-MAR-2019,21:41	
Gamma Calibrator Number	046		
GRC-M Calibrator Jig in Use?	NO		
Inactive Background Jig in Use?	NO		
Mud Density	1.09	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Potassium Equivalence	Chloride		
K Mud Concentration	0.00	%	

FE Calibration MFE-B.J 359		Base Calibration on 07-MAR-2019 15:04 Field Check on 13-MAR-2019 09:51	
	Resistor 1 (ohm)	Resistor 2 (ohm)	
	0.0	1000.0	
Base Calibration			
	Measured	Calibrated (ohm-m)	
Reference 1	0.0	0.0	
Reference 2	966.6	126.8	
Base Check		278.7	
Field Check		278.7	

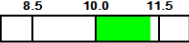
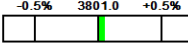
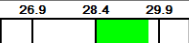
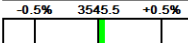
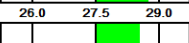
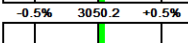
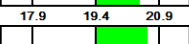
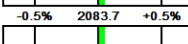
FE Calibration Tolerances MFE-B.J 359		
Reference 2	966.6	-3% 980.0 +3% ohm
Base Check	278.7	-2% 277.0 +2% ohm-m
Field Check	278.7	-2% 278.7 +2% ohm-m

FE Constants MFE-B.J 359		Last Edited on 18-MAR-2019,21:43	
Running Mode	No Sleeve		
MFE K Factor	0.1268		
Borehole Correction Constants			
Sonde Position	0.5	inches	
Hole Size Source	Density Caliper		
Hole Size Constant Value	N/A	inches	
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		

Induction Calibration MAI-B.J 375				Factory Loop Calibration 07-MAR-2019 14:53			
				Field Check on 13-MAR-2019,14:49			
Factory Loop Calibration							
High Conductivity Reference Resistor			3.3	ohm			
Low Conductivity Reference Resistor			333.3	ohm			
		Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
Array		Low	High	Low	High	Gain	Offset
1 (near)		17.2	476.6	9.3	966.2	2.083	-26.5
2		5.9	379.2	7.6	821.4	2.180	-5.4
3		3.1	258.6	5.2	566.0	2.195	-1.5
4 (far)		1.4	132.0	2.6	279.2	2.119	-0.4
Array Temperature			73.2	Deg F			
Tool Checks							
		Factory Reference (mmho/m)		Before Survey (mmho/m)			
Array		Low	High	Low	High		
1 (near)		10.0	3801.0	11.3	3803.3		
2		28.4	3545.5	29.7	3547.5		

3	27.5	3050.2	28.6	3051.9
4 (far)	19.4	2083.7	20.6	2084.8
Array Temperature	62.9		75.2	Deg F

Induction Check Tolerances MAI-B.J 375

Low Array 1	11.3		mmho/m	High Array 1	3803.3		mmho/m
Low Array 2	29.7		mmho/m	High Array 2	3547.5		mmho/m
Low Array 3	28.6		mmho/m	High Array 3	3051.9		mmho/m
Low Array 4	20.6		mmho/m	High Array 4	2084.8		mmho/m

Induction Constants MAI-B.J 375

Last Edited on 18-MAR-2019,21:43

Induction Model RtAP-WBM

Borehole Correction Constants

Tool Centred	No	
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Stand-off Type	Pineapple	
Stand-off	0.49	inches
Number of Fins on Stand-off	5.0000	
Stand-off Fin Angle	72.00	degrees
Stand-off Fin Width	1.3878	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	
Borehole Correction Method	Default	

Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Symmetrised Receiver Gains

Receiver 1	1.00
Receiver 2	1.00
Receiver 3	1.00
Receiver 4	1.00

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

DOWNHOLE EQUIPMENT

E:\LOGS\SHAKESPEARE OIL (OTTLEY 4-27)\MAIN PASS.dta

Cablehead, 11 pin
CBH-CA 177 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in



Compact Swivel Head Adaptor
SHA-J.A 450 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 431 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-A 30 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-A.B 152 LG: 5.04 ft WT: 50.7 lb OD: 2.240 in

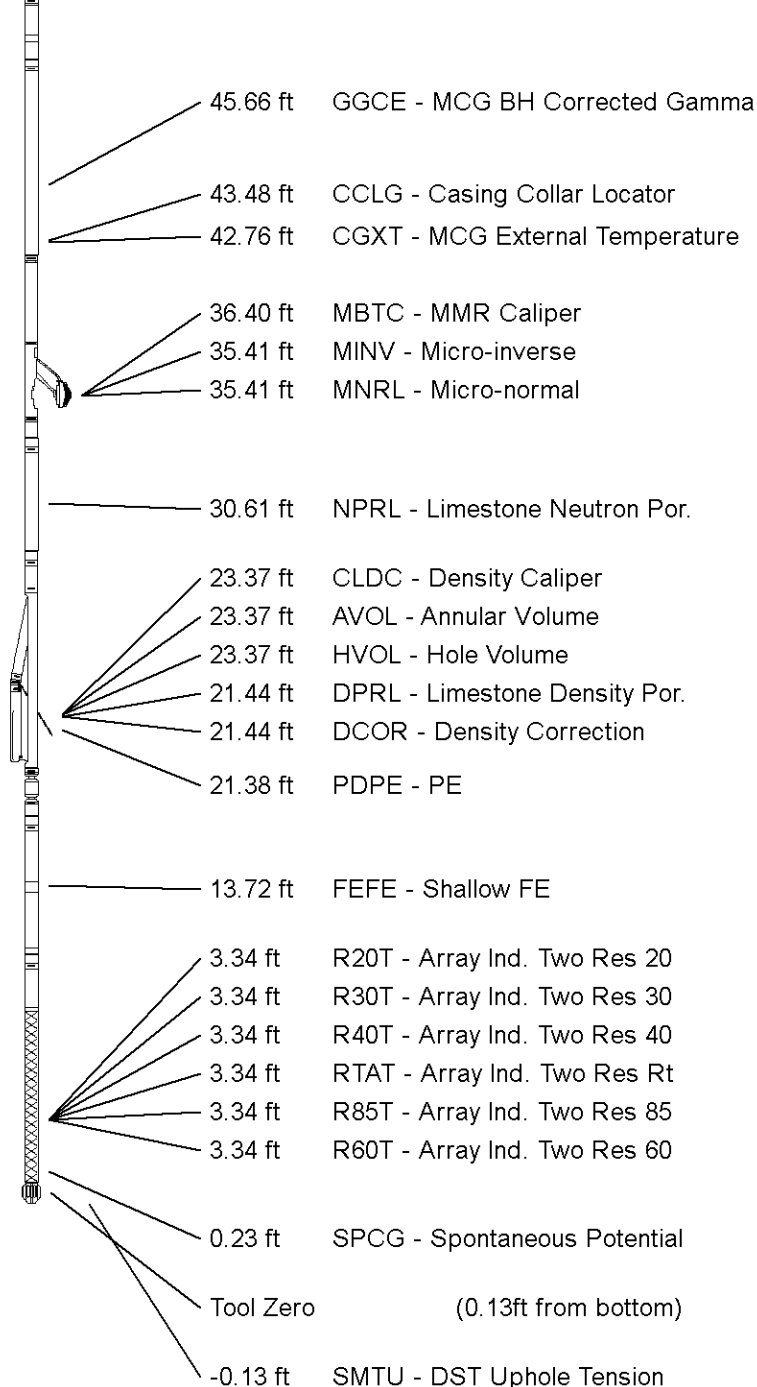
Compact Density/Caliper
MPD-B 166 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint
SKJ-E.B 474 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-B.J 359 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 375 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 55.64 ft Weight: 454.2 lb



All measurements relative to tool zero.

COMPANY	SHAKESPEAR OIL CO., INC.
WELL	OTTLEY 4-27
FIELD	SMOKY HILL
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS

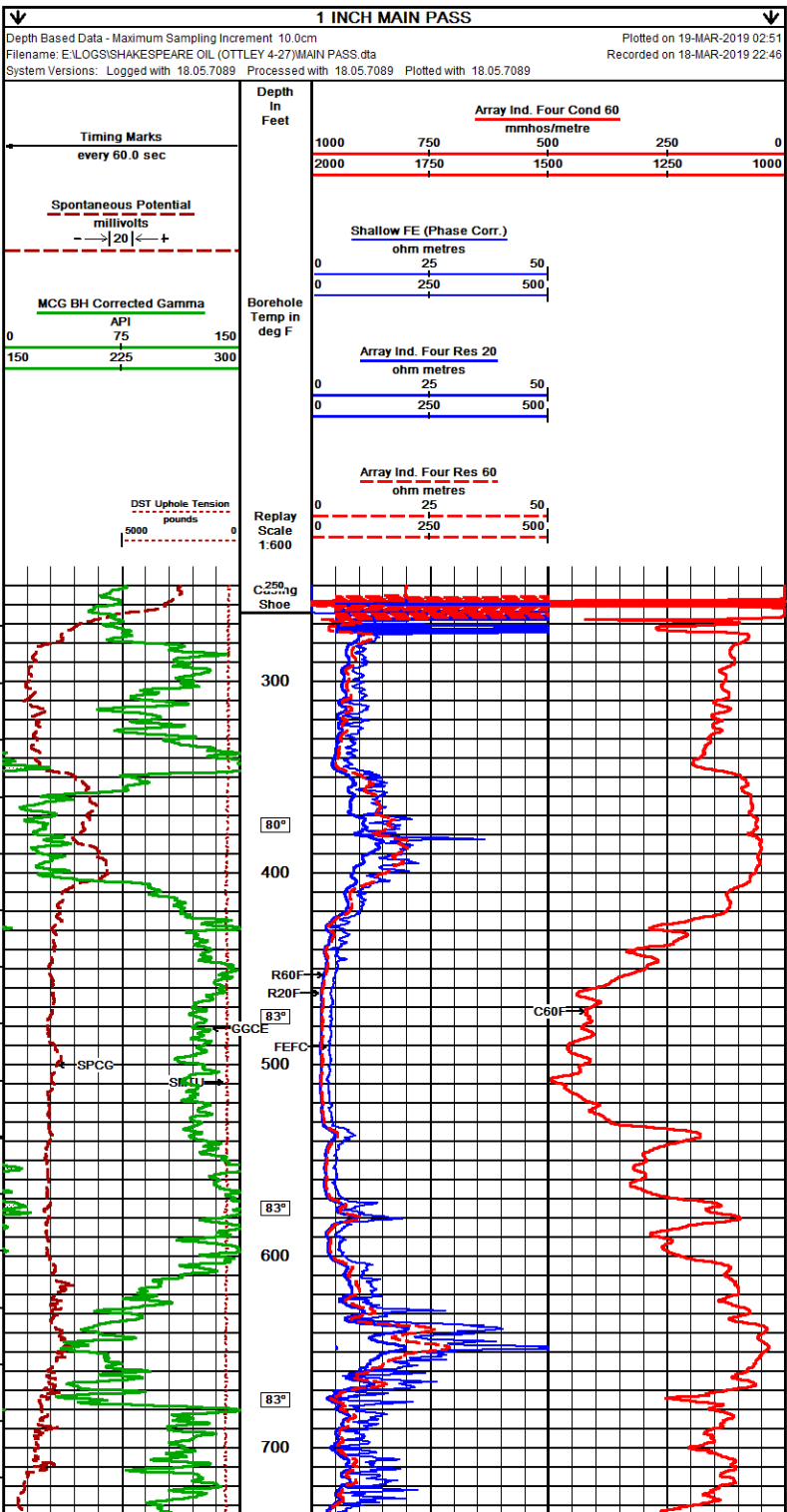
Elevation Kelly Bushing	2673	feet	First Reading	4396.66	feet
Elevation Drill Floor	2671	feet	Depth Driller	4400.00	feet
Elevation Ground Level	2665	feet	Depth Logger	4400.00	feet

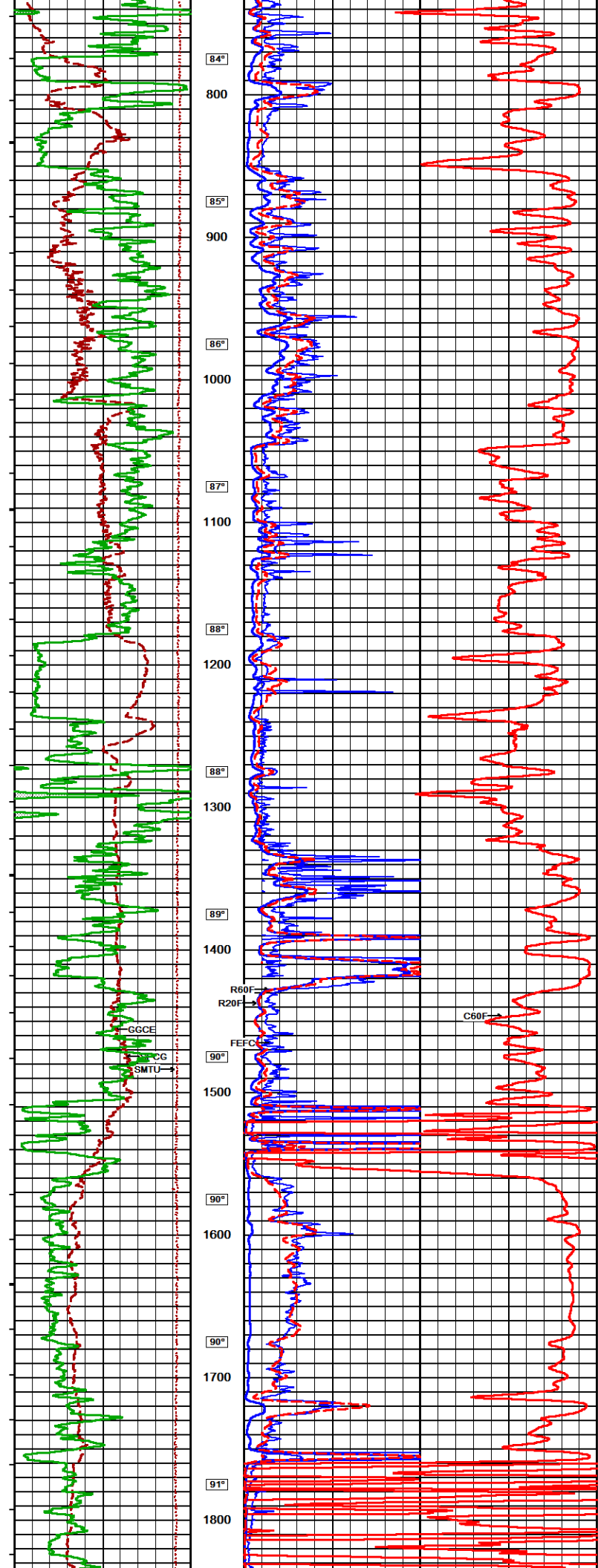


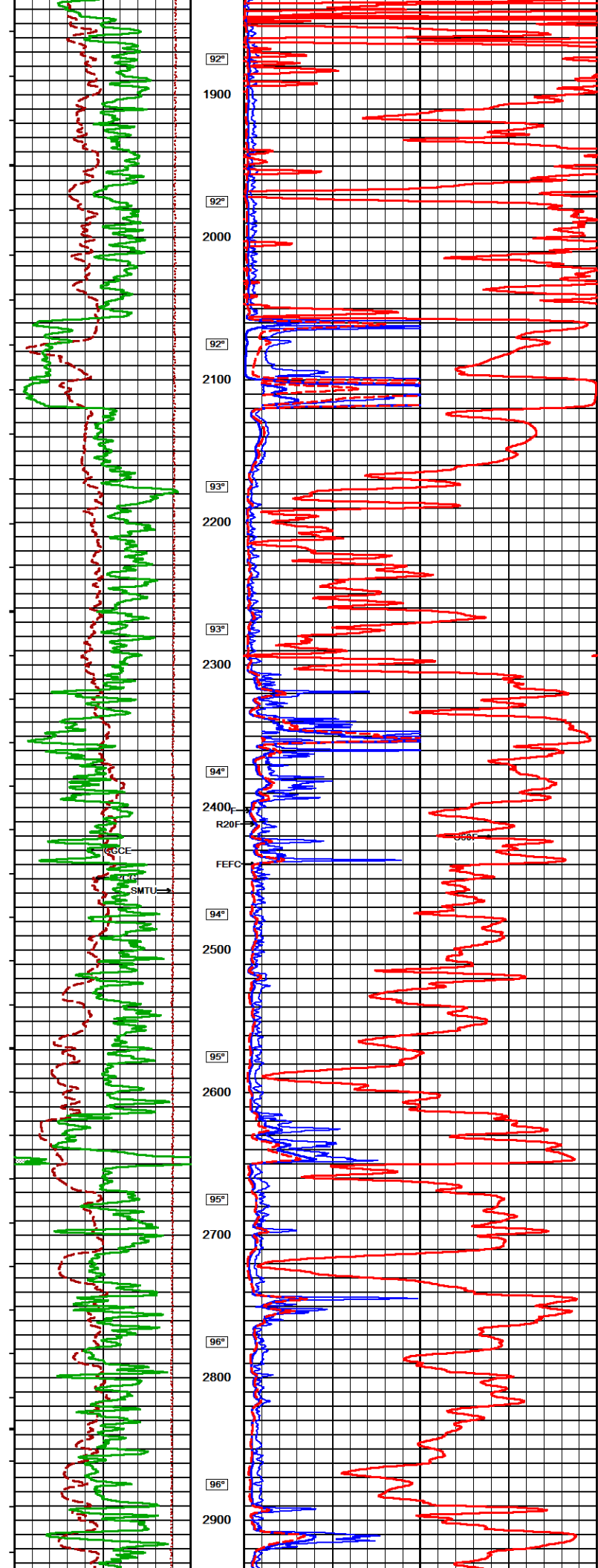
Weatherford®

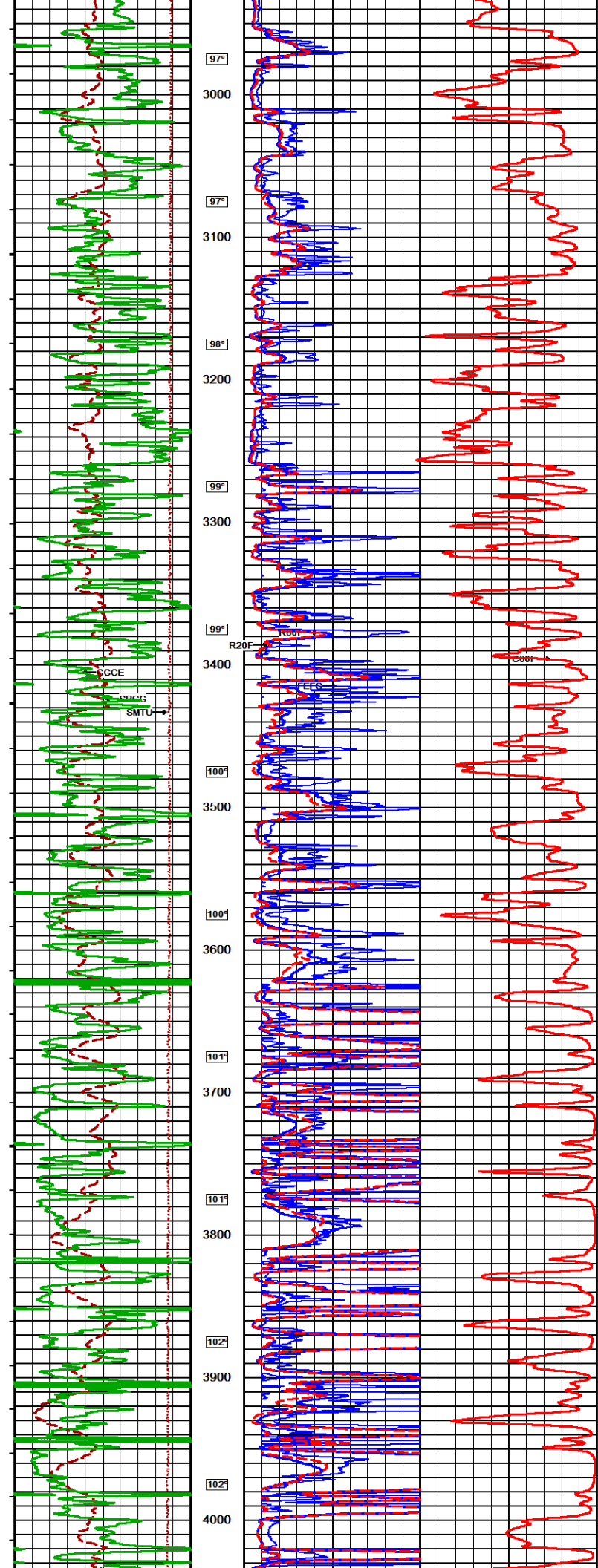
ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

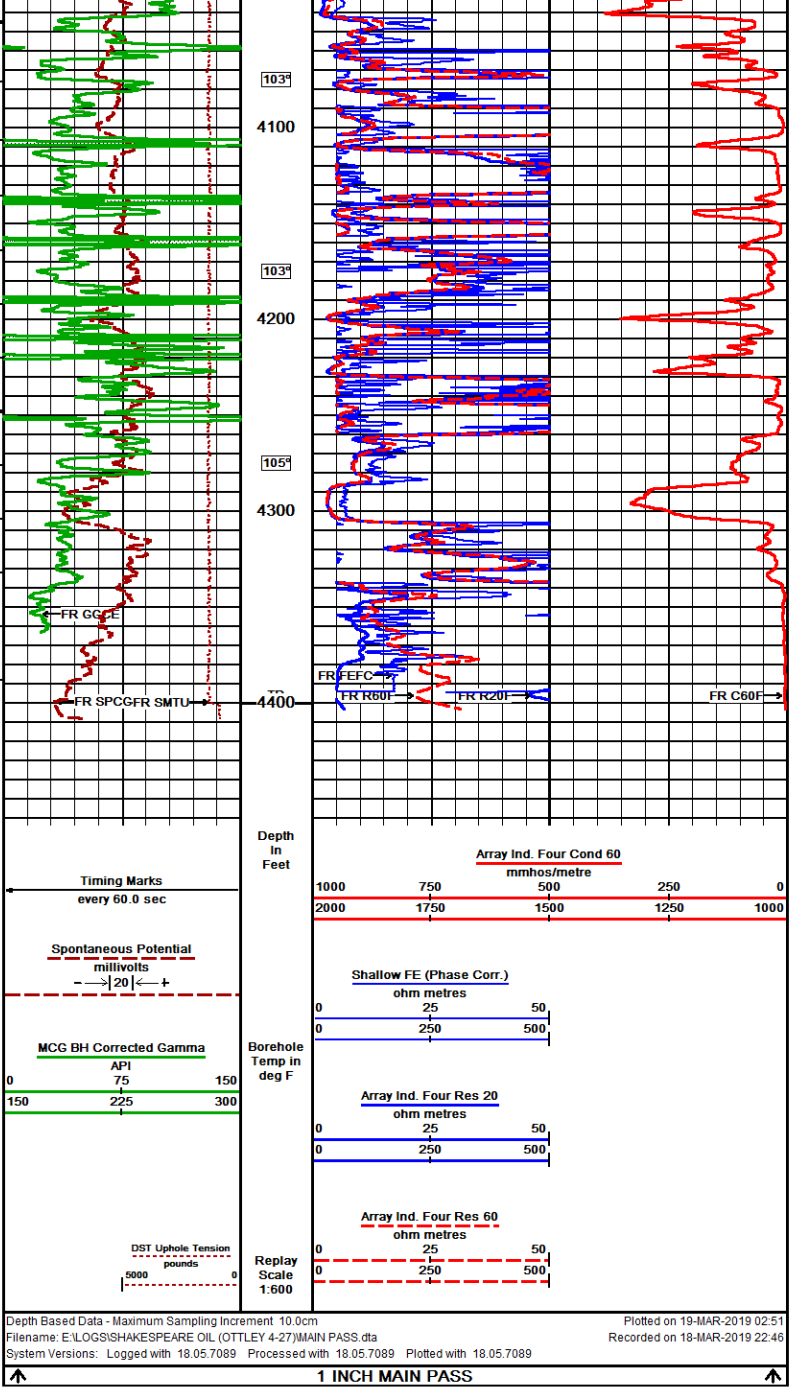
		ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG	
COMPANY SHAKESPEAR OIL CO., INC.			
WELL OTITLEY 4-27			
FIELD SMOXY HILL			
PROVINCE/COUNTRY LOKAN USA / KANSAS			
COUNTRY/STATE NE SW SW NW 2235' FNL & 520' FWL			
LOCATION NE SW SW NW 2235' FNL & 520' FWL			
SEC 27	TWP 14S	R6E 32N	OWAS SERVICE
Latitude 38.808333		PHOTO DENSITY	
Longitude -100.871222		DUAL SPACED NEUTRON	
API Number 15-09541089		MICRO RESISTIVITY	
Permanent Datum GL Elevation 2065 feet		Log Measured From KB 8.00 feet above Permanent Datum	
Drilling Measured From KB		Separations: KB DF GL 2673.00 2671.00 2665.00	
Date 18-MAR-2019			
Run Number	CNE		
Service Order	17876-244109006		
Depth Driller	4400.00	feet	
Depth Logger	4400.00	feet	
First Reading	4398.66	feet	
Last Reading	264.00	feet	
Casing Driller	264.00	feet	
Casing Logger	264.00	feet	
Bit Size	7.875	inches	
Flow Fluid Type	WBH		
Density/Viscosity	9.10 lb/USg	57.00 sec/cP	
PH/Fluid Loss	10.00	8.80 m3/min	
Sample Source	FLOWLINE		
RM @ Measured Temp	0.53 @ 78.0	ohm-m	
RM @ Measured Temp	0.39 @ 78.0	ohm-m	
RM @ Measured Temp	0.63 @ 78.0	ohm-m	
Source RM / RMC	CALC	CALC	
RM @ BHT	0.40 @ 105.0	ohm-m	
Time Since Circulation	3 HOURS		
Max Recorded Temp	105.00	deg F	
Equipment / Base	13379	ELEPHO	
Recorded By	BANDAR BHOSEUR		
Interfaced By	TIM LAYER		











COMPANY		SHAKESPEAR OIL CO., INC.			
WELL		OTTLEY 4-27			
FIELD		SMOKY HILL			
PROVINCE/COUNTY		LOGAN			
COUNTRY/STATE		USA / KANSAS			
Elevation Kelly Bushing	2673	feet	First Reading	4396.66	feet
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			ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG		