



Gamma Ray,Propagation Resistivity

Scale:

1:1200 MID

Depth Reference:

Driller's Depth

Company: Noble Energy

Well: Freedom Federal LC21-630

Field: Weld County

County: Weld Country: United States

State: Colorado

Status: Surface Location:

Final Print

Latitude: 40° 41' 48.00" N

Longitude: 105° 41' 48.00" W

Other Services:

Wellbore Surveys

API No: 0512342803

Job ID: 8597123

SEC: 22 TWN: 9N RGE: 59W

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

Elevation: 4882.00 ft

Elev. KB: N/A

Log Measured From: Rig Floor

Above P.D. 30.00 ft

Elev. DF: 4912.00 ft

Elev. GL: 4882.00 ft

Dates Interval Logged

Date From: 2017-07-14 Top: (ft) 1950.00

Date To: 2017-07-15 Bottom: (ft) 5504.00

Spud Date: 2017-07-13

Magnetic Field Reference

Azi Reference North: Grid Dip Angle: (deg) 67.08

Total Magnetic Field Strength: (nT) 52610

Mag to Reference North Correction: (deg) 6.72 E

Borehole Record

Casing Record

Hole Size (in)

From (ft)

To (ft)

Size (in)

Weight (lb/ft)

From (ft)

To (ft)

8.500 1938.00 11085.00

9.625

36.00

30.00

1928.00

Mud Record

Deviation Record

Type

From (ft)

To (ft)

Hole Size (in)

Interval (ft)

Inc | Az (Start)

Inc | Az (End)

Oil Based Mud

30.00

11085.00

8.500

9147.00

0.26 | 184.19

90.18 | 267.13

Acquisition System

Software Version

Other

Baker Hughes Cadence

RT4.1

Rig:

H&P 524

Plot Studio

4.0.7570.8

Contractor: Helmerich & Payne Drilling Co

District: RMA

Unit: D&E

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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours (h)
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	2.00	AutoTrak Curve	30.00	877.00	1938.00	6386.00	2017-07-13 09:28	2017-07-14 02:28	15.40
2	2	8.500	PDC	2.00	AutoTrak Curve	877.00	5510.00	6386.00	11085.00	2017-07-14 11:55	2017-07-15 10:05	21.72

Crew

Name		Arrive Wellsite	Depart Wellsite	Name		Arrive Wellsite	Depart Wellsite	Name		Arrive Wellsite	Depart Wellsite
Steven Cano		2017-07-12	2017-07-15	Ty Jackson		2017-07-12	2017-07-15				

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2017-07-12 19:03	1	1938.00	Oil Based Mud	9.2	9	N/A	N/A	78.2/21.8	Active Pit	25000	0.00
2017-07-14 08:16	2	6385.00	Oil Based Mud	9.3	9	N/A	N/A	81.5/18.5	Active Pit	28000	0.00
2017-07-15 14:00	2	10000.00	Oil Based Mud	9.2	10	N/A	N/A	76.3/23.7	Active Pit	25000	0.00

Mud Resistivity Record

Date / Time	Run No.	Measured Depth (ft)	Surface Temp (degF)	Surface			BHCT (degF)	Downhole		
				Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)		Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
2017-07-13 15:31	1	2000.00	90.0	100.000	N/A	N/A	200.0	100.000	N/A	N/A
2017-07-15 15:31	2	11085.00	90.0	100.000	N/A	N/A	212.0	100.000	N/A	N/A

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	OnTrak	12115658	Pressure	4.37	5508.38	6.750	0.000
1	OnTrak	12115658	Gamma (double)	5.26	5509.27	6.750	0.000
1	OnTrak	12115658	Resistivity (4tx)	9.30	5513.31	6.750	0.000
1	OnTrak	12115658	Directional (mag)	15.09	5519.10	6.750	0.000
2	OnTrak	12115658	Pressure	4.37	5508.38	6.750	0.000
2	OnTrak	12115658	Gamma (double)	5.26	5509.27	6.750	0.000
2	OnTrak	12115658	Resistivity (4tx)	9.30	5513.31	6.750	0.000
2	OnTrak	12115658	Directional (mag)	15.09	5519.10	6.750	0.000

Service and Tool Mnemonics

Mnemonic	Name	Description
OTK	OnTrak	Sensor Sub (Inc, Azi, Temp, Azimuthal GR, Res, AP, VSS), OnTrak Platform
BCPM	BCPM	Bi-Directional Communication and Power Module, OnTrak Platform

Comments


- 1
- Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 2
- Baker Hughes LWD run 1 and 2 utilized a 6 3/4 inch Ontrak services (Multiple Propagation Resistivity, Gamma Ray, and Directional) behind a 8 1/2 inch bit and rotary steerable assembly to perform a MAD (Measurement After Drilling) pass from 1938 to 5485 feet MD (1938 to 5477 feet TVD). The data collected during this run was ream logged up to 16 hours after being drilled and it is presented independent of the drilling log.

Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	5485.00	8.500	2	The interval from 5485 to 11085 feet MD (5477 to 6075 feet TVD) due to sensor to bit offset at well TD.

Curve Mnemonics

Presented Curves	Description	Units
CACLM	Conductivity Attenuation - Corrected - 400kHz	mmho/m
RACHM	Resistivity Attenuation - Corrected - 2MHz	ohm.m
RACLM	Resistivity Attenuation - Corrected - 400kHz	ohm.m
RPCHM	Resistivity Phase - Corrected - 2MHz	ohm.m
RPCLM	Resistivity Phase - Corrected - 400kHz	ohm.m
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
GRAM	Gamma Ray - Apparent 3 ft Average	API
TCDM	Downhole Temperature	degF



Company

Well

Interval

Created

Noble Energy

Freedom Federal LC21-630

Date From:2017-07-14 03:30:55

Date To:2017-07-15 14:32:36

2017-07-17 10:03

Top:1955.00

Bottom:5510.00

Gamma Ray - Apparent 3 ft Average [GRAM]

0150

API

Depth Averaged ROP 3 ft Average [ROPA]

12000

ft/h

MD 1:1200 feet

Resistivity Phase - Corrected - 2MHz [RPCHM]

0.2200

ohm.m

Resistivity Phase - Corrected - 400kHz [RPCLM]

0.2200

ohm.m

Conductivity Attenuation - Corrected - 400kHz [CACLM]

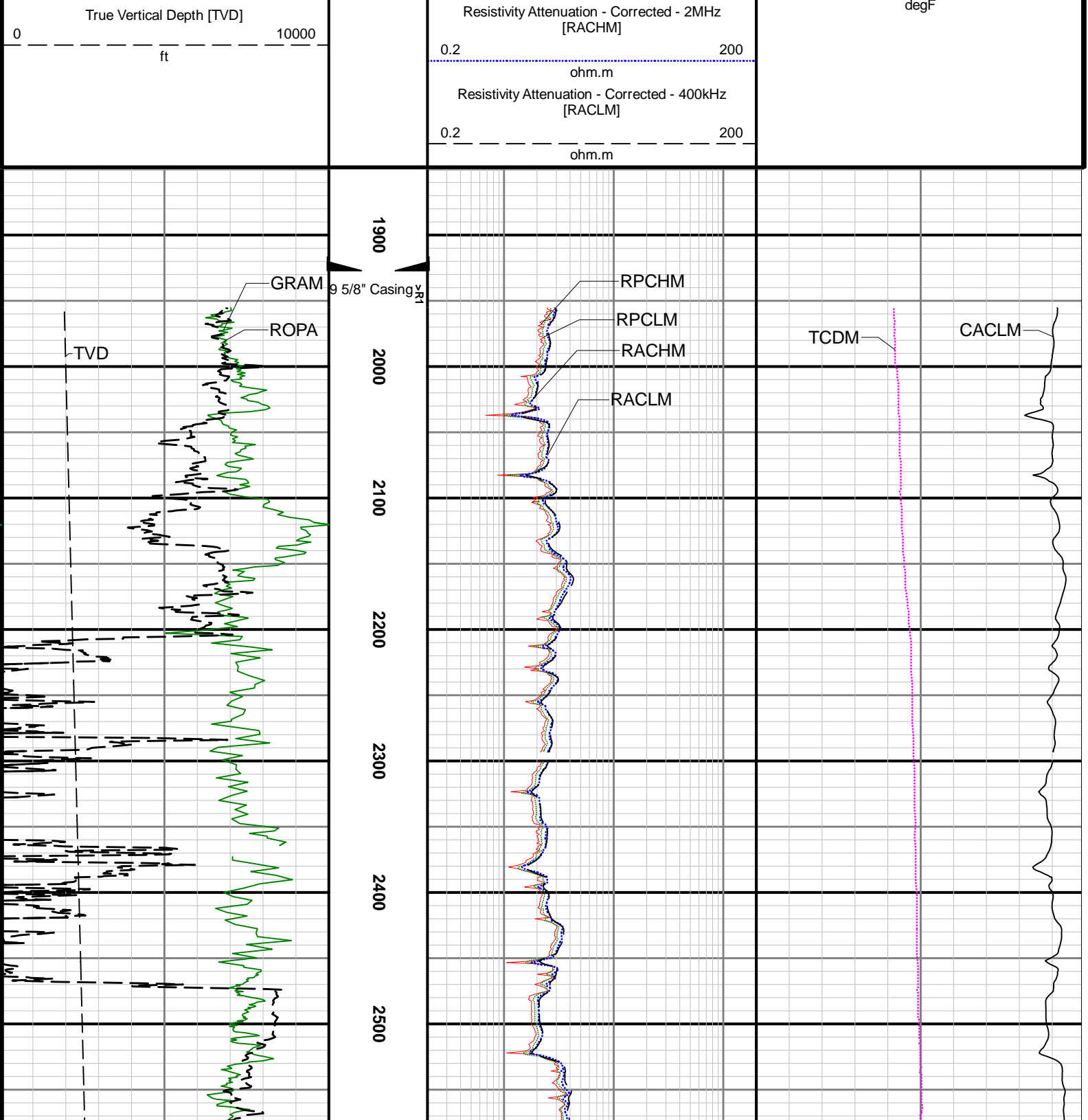
40000

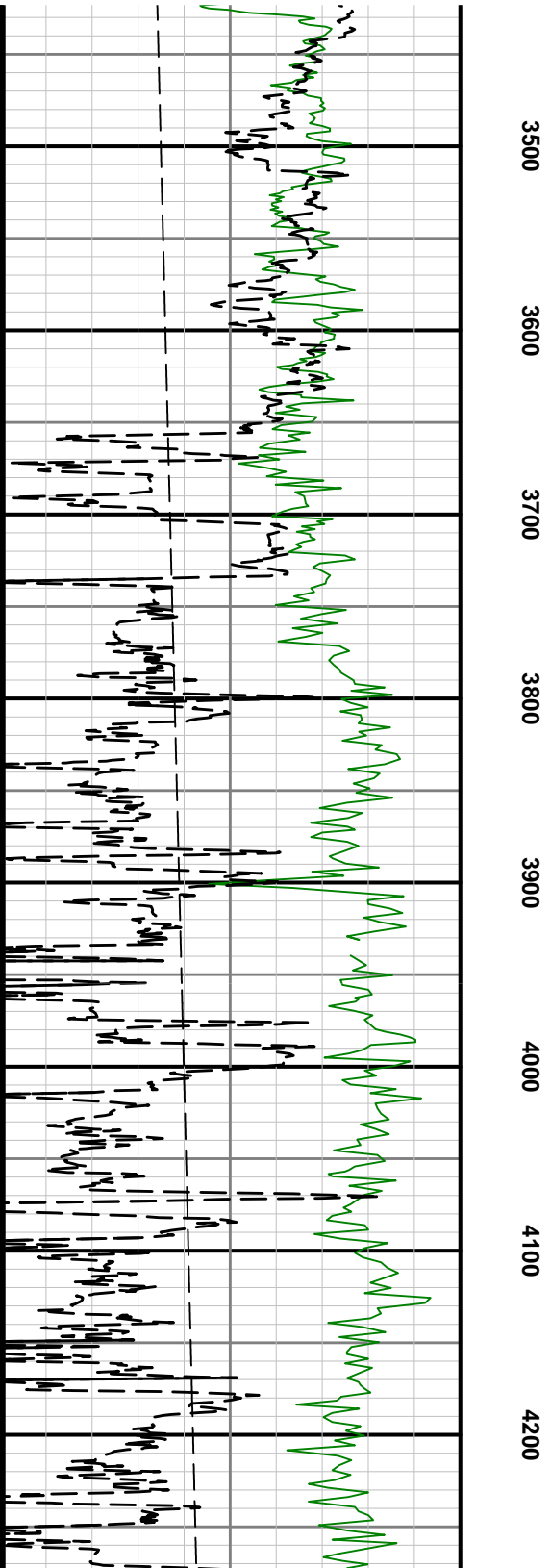
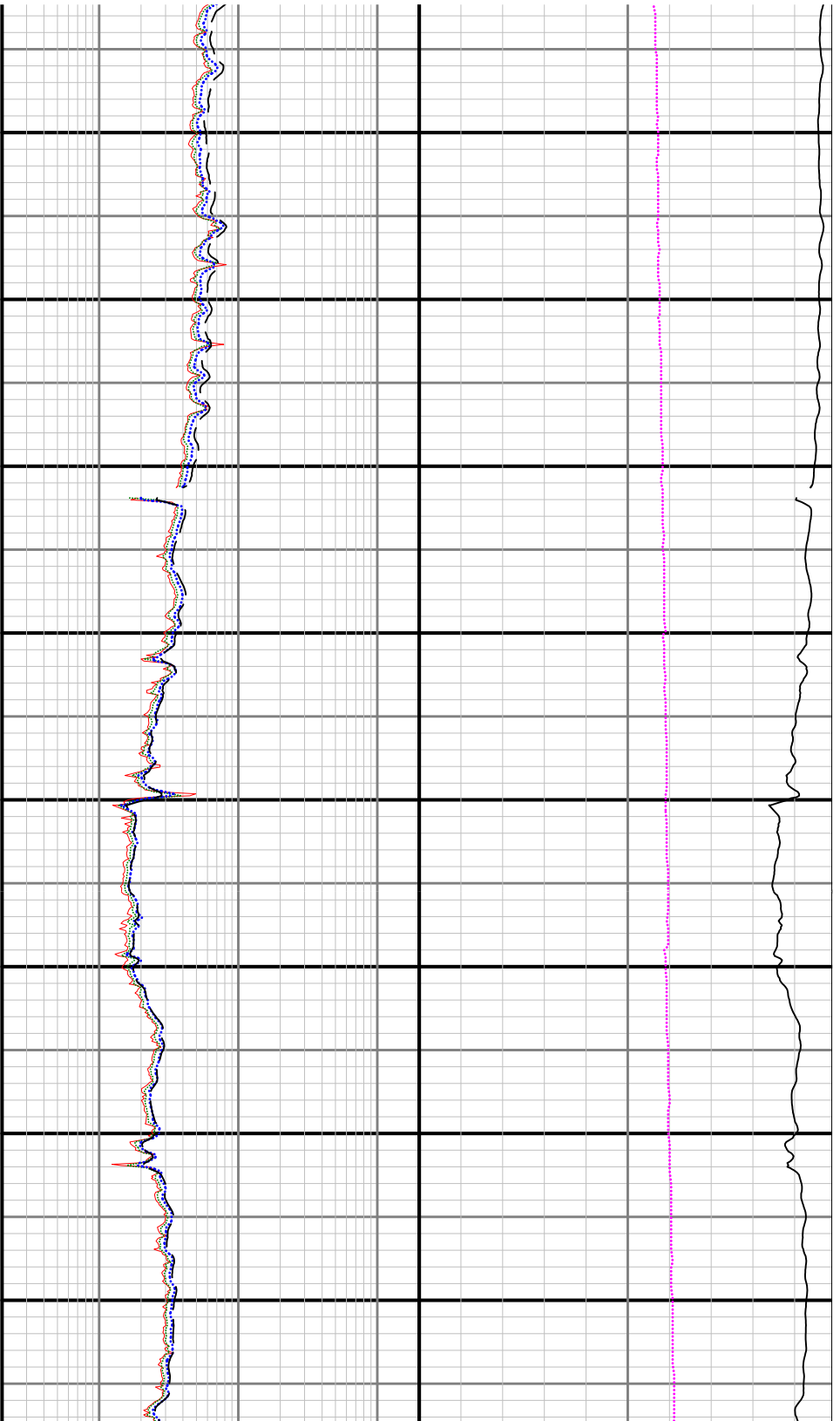
mmho/m

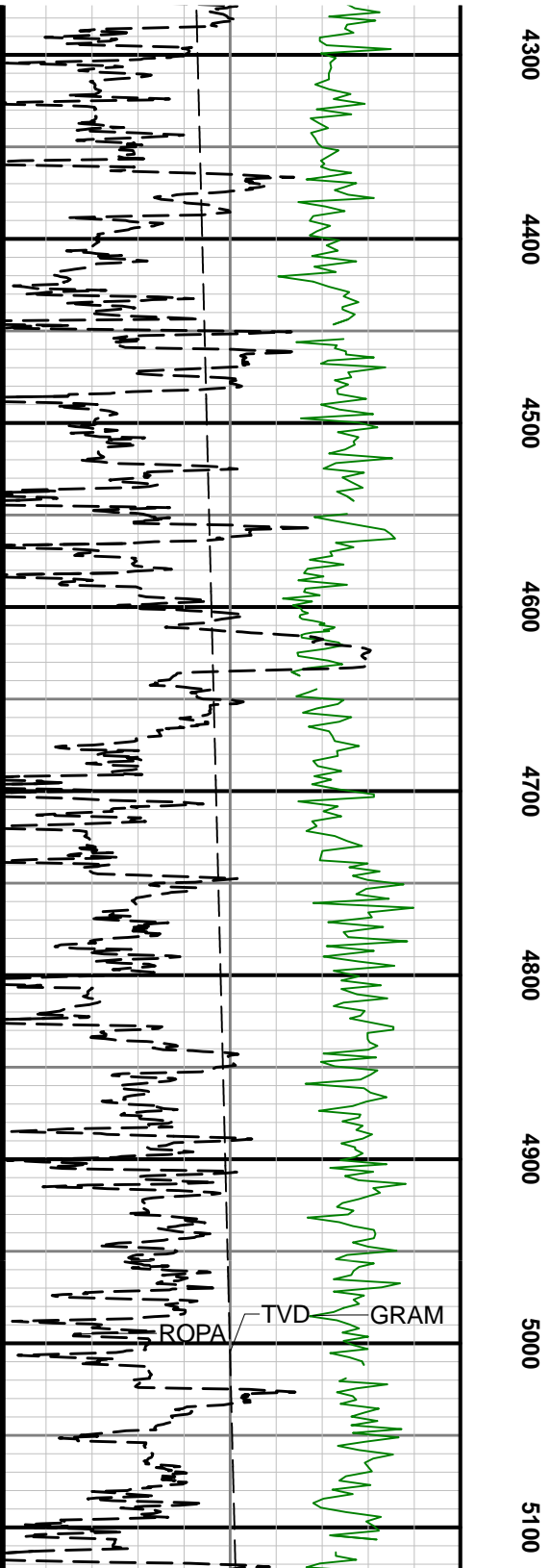
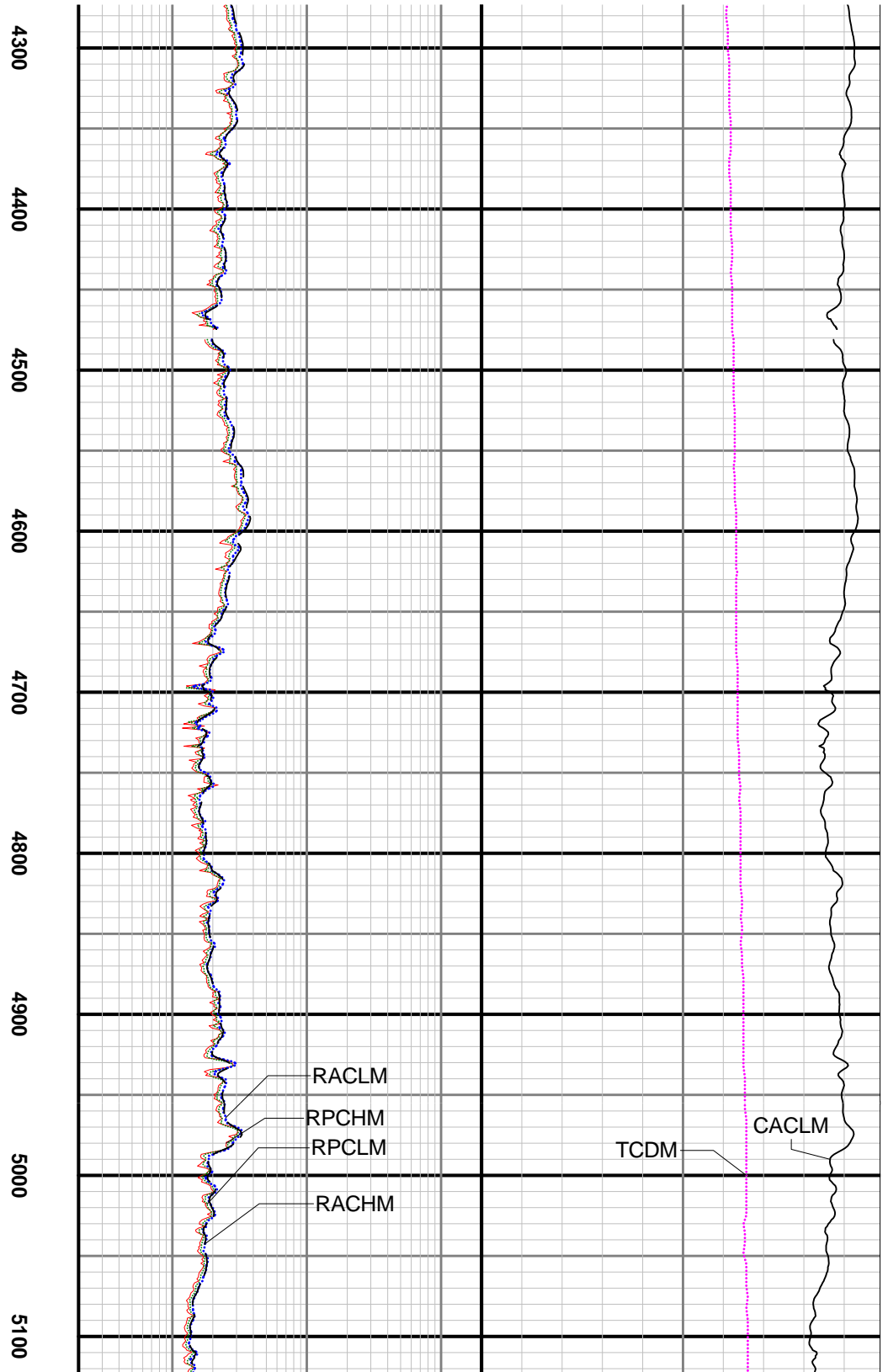
Downhole Temperature [TCDM]

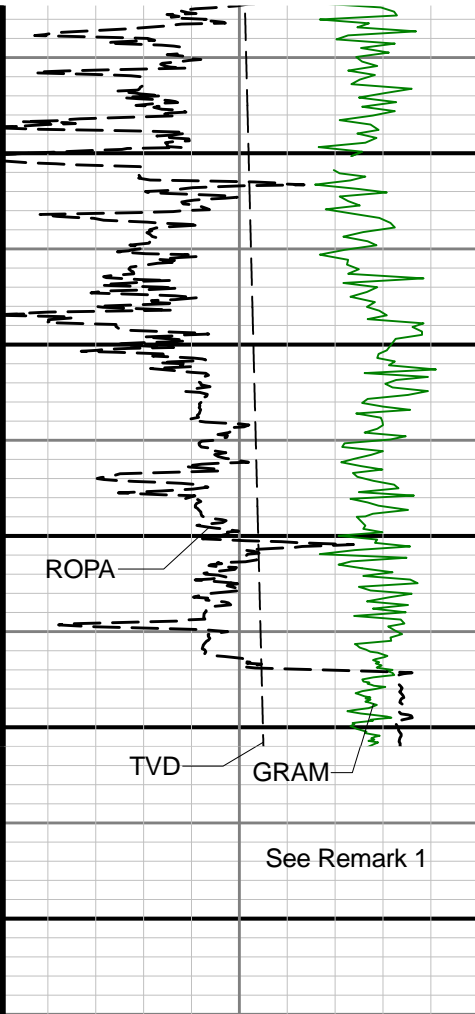
0250

degF









5200

5300

5400

5500

5600

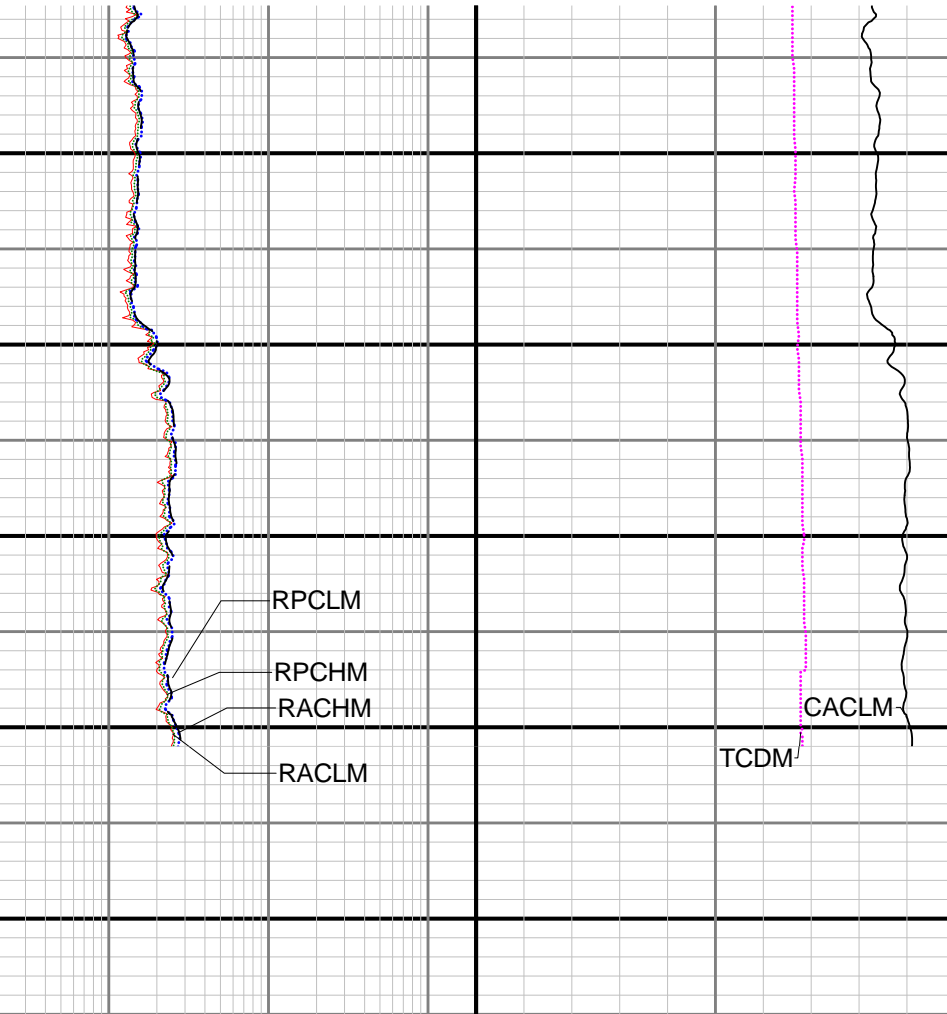
ROPA

TVD

GRAM

See Remark 1

MD 1:1200 feet



RPCLM

RPCHM

RACHM

RACLM

CACLM

TCDM

Gamma Ray - Apparent 3 ft Average [GRAM]

0 150

API

Depth Averaged ROP 3 ft Average [ROPA]

1200 0

ft/h

True Vertical Depth [TVD]

0 10000

ft

Resistivity Phase - Corrected - 2MHz [RPCHM]

0.2 200

ohm.m

Resistivity Phase - Corrected - 400kHz [RPCLM]

0.2 200

ohm.m

Resistivity Attenuation - Corrected - 2MHz
[RACHM]

0.2 200

ohm.m

Resistivity Attenuation - Corrected - 400kHz
[RACLM]

0.2 200

ohm.m

Conductivity Attenuation - Corrected - 400kHz
[CACLM]

4000 0

mmho/m

Downhole Temperature [TCDM]

0 250

degF