



Gamma Ray

Scale: Company: Noble Energy

1:1200 MD Well: RATTLESNAKE FEDERAL LC10-785

Depth Reference: Field: Weld County

Driller's Depth County: Weld State: Colorado Country: United States

Status: Surface Location: Other Services:

Final Print Latitude: Longitude: Wellbore Surveys

API No: 0512342972 SEC: 22 TWN: 9N RGE: 59W

Job ID: 8597120 Permanent Datum (P.D.): Mean Sea Level Elevation: 4914.00 ft Elev. KB: N/A

Log Measured From: Rig Floor Above P.D. 30.00 ft Elev. DF: 4944.00 ft Elev. GL: 4914.00 ft

Dates Interval Logged Magnetic Field Reference

Date From: 2017-06-28 Top: (ft) 1943.00 Azi Reference North: Grid Dip Angle: (deg) 67.08

Date To: 2017-06-30 Bottom: (ft) 17287.00 Total Magnetic Field Strength: (nT) 52626

Spud Date: 2017-06-20 Mag to Reference North Correction: (deg) 6.66 E

Borehole Record

Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
13.500	30.00	1943.00	9.625	19.00	30.00	1928.00
8.500	1943.00	17299.00				

Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
Oil Based Mud	1943.00	17299.00	8.500	15356.00	0.34 66.28	90.58 359.19

Acquisition System

Software Version

Other

Baker Hughes Cadence RT4.1 4.0.7570.8

Rig: H&P 425 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 (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	2.00	AutoTrak Curve	1930.06	17287.29	1943.00	17300.23	2017-06-28 09:49	2017-06-30 22:21	58.31

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Ryan Wunderlich	2017-06-27	2017-06-30	Steven Cano	2017-06-27	2017-06-30			

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2017-06-28 17:43	1	4470.00	Oil Based Mud	9.0	9	N/A	N/A	75.4/24.6	Active Pit	25000	0.00
2017-06-28 22:51	1	5953.00	Oil Based Mud	9.1	9	N/A	N/A	75.2/24.8	Active Pit	28000	0.00
2017-06-29 22:54	1	11767.00	Oil Based Mud	9.5	12	N/A	N/A	75.5/24.5	Active Pit	27500	0.00
2017-06-30 22:49	1	15610.00	Oil Based Mud	9.2	12	N/A	N/A	75.4/24.6	Active Pit	25100	0.00
2017-06-30 22:51	1	17300.00	Oil Based Mud	9.4	10	N/A	N/A	75.5/24.5	Active Pit	26000	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	ATC_SU	14190607	Near Bit Inclination	5.93	6.77	7.000	4.330
1	ATC_SU	14190607	Near Bit VSS	5.93	6.77	7.000	4.330
1	ATC_MWD	14179564	Gamma (single)	2.75	12.94	7.000	3.250
1	ATC_MWD	14179564	Directional (mag)	12.27	22.46	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
ATC_SU	ATC_SU	Auto Trak Curve Steering Unit
ATC_MWD	ATC_MWD	Auto Trak Curve MWD
ATC_LCPM	ATC_LCPM	Auto Trak Curve LCPM

Comments

- 1 Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.
- 2 Baker Hughes LWD run 1 utilized a 6 3/4 inch Navigamma service (Gamma Ray and Directional) behind a 8 1/2 inch bit and rotary steerable from 1943 to 17299 (1942 to 6104 feet TVD).

Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	17287.00	8.500	1	The interval from 17287 to 17299 feet MD (6103 feet TVD) was not logged due to sensor offset at well TD.

Curve Mnemonics

Presented Curves	Description	Units
ROPA	Depth Averaged ROP 10 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent 3 ft Average	API
GRTM	Gamma Time Since Drilled	min
TCDM	Downhole Temperature	degF

Gamma Ray - Apparent 3 ft Average GRAM 0 150	MID 1:1200 feet	Time Since Drilled 0 600	Weight On Bit, Average 1 ft Average WOBA 0 50
API		min	klb
True Vertical Depth TVD 7500 1500		Depth Averaged ROP 10 ft Average ROPA 1000 0	Downhole Temperature TCDM 0 300
ft		ft/h	degF
	1800		



























