



LWD MEMORY LOG

Gamma Ray, Multiple Propagation Resistivity

Scale:	Company: Noble Energy			
1:240 MD	Well: SHUFLY STATE Y34-714			
Depth Reference:	Field:	Wattenberg		
Driller's Depth	County:	Weld	Country: United States	
Status:	State:	Colorado		
Final Print	Surface Location:	Other Services:		
API No: 05-123-45621-00	Latitude:	Elev. KB: N/A		
Job ID: 8921826	Longitude:	Elev. DF: 5069.00 ft		
Permanent Datum (P.D.):	SEC: 34	TWN: 2N	RGE: 64W	Elev. GL: 5039.00 ft
Log Measured From:	Ground Level	Above P.D.	30.00 ft	5039.00 ft
Rig Floor				
Dates	Interval Logged	Magnetic Field Reference		
Date From: 2018-01-11	Top: (ft) 2142.00	Azi Reference North:	Grid	Dip Angle: (deg) 66.50
Date To: 2018-01-12	Bottom: (ft) 6440.00	Total Magnetic Field Strength: (nT)		52169
Spud Date: 2018-01-08		Mag to Reference North Correction: (deg)		7.32 E
Borehole Record				
Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)
13.500	30.00	2152.00	9.625	36.00
8.500	2152.00	19794.00		
Mud Record				
Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)
Oil Based Mud	2152.00	19794.00	8.500	17642.00
Deviation Record				
			Inc Az (Start)	Inc Az (End)
			0.48 35.35	89.94 358.46
Acquisition System				
Baker Hughes Cadence	RT4.1	H&P 517	Other	
PlotStudio	4.1.7763.3	Contractor: Helmerich & Payne Drilling Co	District: RMA Unit: D&E	

©"4239"Dcmgt"JwiJgu."c"IG"eqorcp{"NNE"ô"Cnn"tkijvu"tgugtXgf0"Dcmgt"JwiJgu."c"IG"eqorcp{"NNE"cpf"kvu"chhknkcvgu"*ôDJIGô+"rtqxkfgu"vjku"kphqtocvkqp"qp"cp"ôcu"kuô"dcuku"hqt"igpgtcn"kphqtocvkqp" purposes and believes it to be accurate as of the date of publication. BHGE does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. BHGE hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. The BHGE logo is a trademark of Baker Hughes, a GE company, LLC. GE and the GE monogram are trademarks of General Electric Company used under trademark license.

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	3.00	Rotary Steerable	2142.00	6440.00	13348.00	19794.00	2018-01-09 10:38	2018-01-12 11:08	65.84

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Adam Schlenz	2018-01-08	2018-01-13	Mohammad Odetallah	2018-01-08	2018-01-13			

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+ (%)
2018-01-09 02:30	1	2152.00	Oil Based Mud	9.4	13	N/A	20.7	68.6/31.4	Active Pit	24500	0.00
2018-01-09 13:30	1	3233.00	Oil Based Mud	9.1	11	N/A	18.7	72/28	Active Pit	25500	0.00
2018-01-10 02:30	1	7080.00	Oil Based Mud	9.3	10	N/A	18.5	72.7/27.3	Active Pit	25000	0.00
2018-01-10 13:30	1	9118.00	Oil Based Mud	9.4	10	N/A	19.0	72.8/27.2	Active Pit	24500	0.00
2018-01-11 04:00	1	13138.00	Oil Based Mud	9.4	10	N/A	20.5	74/26	Active Pit	24000	0.00
2018-01-11 13:30	1	15156.00	Oil Based Mud	9.4	10	N/A	24.0	74/26	Active Pit	22500	0.00

Mud Resistivity Record

Date / Time	Run No.	Measured Depth (ft)	Surface Temp (degF)	Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)	BHCT (degF)	Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
2018-01-11 06:00	1	13530.00	72.0	100.000	N/A	N/A	250.0	100.000	N/A	N/A

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset	Bit Offset	Max O.D.	Min I.D.
------------	------	------------------	-------------	------------------	---------------	-------------	-------------

				(ft)	(ft)	(in)	(in)
1	OnTrak	11716143	Pressure	1.28	13349.69	6.750	2.250
1	OnTrak	11716143	Gamma (double)	2.17	13350.58	6.750	2.250
1	OnTrak	11716143	Resistivity (4tx)	6.21	13354.62	6.750	2.250
1	OnTrak	11716143	Directional (mag)	12.00	13360.41	6.750	2.250

Service and Tool Mnemonics

Mnemonic	Name	Description
OTK	OnTrak	Sensor Sub (Inc, Azi, Temp, Azimuthal GR, Res, AP, VSS), OnTrak Platform

Comments

1	Baker Hughes LWD run 1 utilized a 6.75 inch OnTrak service (Gamma Ray and Multiple Propagation Resistivity) behind and 8.5 inch bit and rotary steerable assembly to perform a MAD (measurement after drilling) Pass from 2152 to 6440 feet MD (2152 to 6394 feet TVD). The data collected during this run was ream logged more than 10 hours after being drilled and presented independent of the drilled log.
2	There are gaps in gamma ray and multiple propagation resistivity data throughout the log due to downlink while drilling, during this process there was not enough flow to maintain power to the LWD tools.

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
RPTHM	Resistivity Time Since Drilled	min
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
GRAM	Gamma Ray - Apparent - Memory 3 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless





























