

LWD MEMORY LOG



Natural Formation Evaluation
Azimuthal Gamma Ray\

Scale: Company: Cub Creek Energy

1:1200 MD Well: Markham 12

Depth Reference: Field: Weld County

Driller's Depth County: Weld County State: Colorado

Status: Surface Location: Other Services:

Final Print Latitude: 040° 16' 8.760" N

Longitude: 105° 01' 23.304" W

API No: 05-123-43274-00

Wellbore Survey

Job ID: 8071410 SEC: 32 TWN: 4N RGE: 68W

Permanent Datum (P.D.): Ground Level Elevation: 5038.00 ft KB: N/A

Log Measured From: Rig Floor Above P.D. 17.00 ft DF: 5055.00 ft

GL: 5038.00 ft

Dates Interval Logged Magnetic Field Reference

Date From: 2016-10-02 Top: (ft) 1526.00 Azi Reference North: True Dip Angle: (deg) 66.75

Date To: 2016-10-04 Bottom: (ft) 11955.00 Total Magnetic Field Strength: (nT) 52413

Spud Date: 2016-08-03 Mag to Reference North Correction: (deg) 8.58 E

Borehole Record Casing Record

Hole Size (in) From (ft) To (ft) Size (in) Weight (lb/ft) From (ft) To (ft)

13.500 97.00 1539.00 9.625 36.00 0.00 1529.00

8.500 1539.00 11955.00

Mud Record Deviation Record

Type From (ft) To (ft) Hole Size (in) Interval (ft) Inc | Az (Start) Inc | Az (End)

Water Based Mud 1539.00 11955.00 13.500 1442.00 0.28 | 84.16 0.97 | 50.21

8.500 10416.00 0.97 | 50.21 91.17 | 269.15

Acquisition System Software Version Other

Baker Hughes Cadence G3.3 Rig: Xtreme 18

PlotStudio 3.3.7410.1 Contractor: Xtreme Coil Drilling Corp

District: RMD 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)			
2	2	8.500	PDC	3.00	AutoTrak Curve	1526.11	11948.58	1539.00	11955.30	2016-10-02 02:12	2016-10-04 15:42	60.14

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Austin Small	2016-10-01	2016-10-05	Tien Bui	2016-10-01	2016-10-05			

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+ (%)
2016-10-01 12:46	2	1539.00	Water Based Mud	8.6	30	11.3	53.0	0/98.5	Suction	1500	0.00
2016-10-02 07:10	2	2494.08	Water Based Mud	8.5	30	11.3	53.0	0/98.5	Suction	1200	0.00
2016-10-03 05:59	2	6907.03	Water Based Mud	10.0	13	9.5	6.5	1.6/90.1	Suction	1600	0.00
2016-10-04 07:07	2	10221.10	Water Based Mud	10.0	13	10	5.7	2/89.6	Suction	1800	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)
2	ATC_SU	13993180	Near Bit Inclination	5.93	6.72	7.000	4.330
2	ATC_SU	13993180	Near Bit VSS	5.93	6.72	7.000	4.330
2	ATC_MWD	12070189	Gamma (single)	2.73	12.89	7.000	3.250
2	ATC_MWD	12070189	Directional (mag)	12.25	22.41	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 8 1/4 inch NaviTrak service (Directional only) behind a 13 1/2" inch bit and steerable assembly from surface to 1539 feet MD (surface to 1539 feet TVD).
3	Baker Hughes LWD Run 2 utilized 8 1/4 inch NaviTrak service (Directional only) behind a 13 1/2" inch bit and steerable assembly from surface to 1539 feet MD (surface to 1539 feet TVD).

- 3 Baker Hughes LWD Run 2 utilized 6 3/4 inch AziGamma services (Gamma Ray and Directional) behind an 8 1/2 inch bit and rotary steerable assembly from 1539 to 11955 feet MD (1539 to 7047 feet TVD).
- 4 Gamma Ray Apparent (GRAM) is presented 0 to 200 API per customer request.
- 5 Small gaps in Gamma Ray data are present from 1700 to 1900 feet MD (1700 to 1899 feet TVD) due to downlinking and surveying while drilling ahead.

Remarks				
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	1539.00	8.500	2	Gamma Ray logging operations began at 1539 feet (1539 feet TVD).
2	11937.00	8.500	2	The interval from 11937 to 11955 feet MD (7047 feet TVD) was not logged due to sensor offset at well TD.

Curve Mnemonics		
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
GRADM	Azimuthal Gamma Ray - Apparent - Down Quadrant 3 ft Average	API
GRAM	Gamma Ray - Apparent 3 ft Average	API
GRAUM	Azimuthal Gamma Ray - Apparent - Up Quadrant 3 ft Average	API
TCDM	Downhole Temperature	degF
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb



























