

MEMORY LOG



Azimuthal Gamma Ray

Scale: Company: Cub Creek Energy

1:1200 MD Well: Markham 2

Depth Reference: Field: Weld County

Driller's Depth County: Weld County State: Colorado

Status: Surface Location: 040° 16' 7.212" N Other Services:

Final Print Latitude: 105° 01' 23.232" W Directional

API No: 05-123-43649-00 Longitude: 105° 01' 23.232" W

Job ID: 8199200 SEC: 32 TWN: 4N RGE: 68W

Permanent Datum (P.D.): Ground Level Elevation: 5043.00 ft KB: N/A

Log Measured From: Rig Floor Above P.D. 17.00 ft DF: 5060.00 ft

Dates Interval Logged Magnetic Field Reference

Date From: 2016-10-09 Top: (ft) 1525.00 Azi Reference North: True Dip Angle: (deg) 66.74

Date To: 2016-10-13 Bottom: (ft) 12395.00 Total Magnetic Field Strength: (nT) 52419

Spud Date: 2016-10-09 Mag to Reference North Correction: (deg) 8.57 E

Borehole Record Casing Record

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

13.500 17.00 1538.00 9.625 36.00 17.00 1527.00

8.500 1538.00 12395.00

Mud Record Deviation Record

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

Water Based Mud 17.00 12395.00 13.500 1521.17 1.65 | 171.68 21.16 | 134.78

8.500 10857.27 21.16 | 134.78 91.54 | 259.09

Acquisition System Software Version Other

Baker Hughes Cadence G3.3

PlotStudio 3.3.7410.1 Rig: Xtreme 18

Contractor: Xtreme Drilling 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 (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	13.500	PDC	4.00	Motor	17.00	1538.17	17.00	1538.17	2016-10-09 09:44	2016-10-09 17:24	7.30
2	2	8.500	PDC	3.00	AutoTrak Curve	1525.28	2651.70	1538.17	2658.42	2016-10-10 15:06	2016-10-10 20:53	6.33
3	2	8.500	PDC	3.00	AutoTrak Curve	2645.53	12388.61	2658.42	12395.33	2016-10-11 02:35	2016-10-13 11:06	57.01

Crew												
Name			Arrive Wellsite	Depart Wellsite	Name		Arrive Wellsite	Depart Wellsite	Name		Arrive Wellsite	Depart Wellsite
Tien Bui			2016-10-09	2016-10-15	Scott Sims		2016-10-10	2016-10-15				

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+ (%)
2016-10-10 04:47		2	1538.17	Water Based Mud	8.6	27	10	4.0	0/98	Suction	1500	0.00
2016-10-11 00:17		3	2659.00	Water Based Mud	8.6	13	9.5	11.0	0/97	Suction	1500	0.00
2016-10-12 08:05		3	7761.00	Water Based Mud	10.0	12	9.8	14.0	0/91	Suction	1600	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	NaviTrak		12595928		VSS		16.97		52.94	8.125	3.250	
1	NaviTrak		12595928		Directional (mag)		16.97		52.94	8.125	3.250	
2	ATC_SU		13993179		Near Bit Inclination		5.93		6.72	7.000	4.330	
2	ATC_SU		13993179		Near Bit VSS		5.93		6.72	7.000	4.330	
2	ATC_MWD		12118955		Gamma (single)		2.77		12.89	7.000	3.250	
2	ATC_MWD		12118955		Directional (mag)		12.25		22.37	7.000	3.250	
3	ATC_SU		12606359		Near Bit VSS		5.93		6.72	7.000	4.330	
3	ATC_SU		12606359		Near Bit Inclination		5.93		6.72	7.000	4.330	
3	ATC_MWD		12441474		Gamma (single)		2.75		12.89	7.000	3.250	
3	ATC_MWD		12441474		Directional (mag)		12.25		22.39	7.000	3.250	

Service and Tool Mnemonics												
Mnemonic	Name			Description								
NTK	NaviTrak			Probe Based Directional Module, NaviTrak Platform								
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 1538 feet MD (surface to 1538 feet TVD). No logging data was acquired during this run.
- 3 Baker Hughes LWD Runs 2 and 3 utilized 6 3/4 inch AziGamma services (Gamma Ray and Directional) behind an 8 1/2 inch bit and rotary steerable assembly from 1538 to 12395 feet MD (1538 to 7284 feet TVD).
- 4 Gamma Ray Apparent (GRAM) is presented 0 to 200 API per customer request.
- 5 There are some gaps in Gamma Ray curves due to downlinking on bottom.

Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	1538.00	8.500	2	Gamma Ray logging operations began at 1538 feet (1538 feet TVD).
2	12383.00	8.500	3	The interval from 12383 to 12395 feet MD (7284 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



























